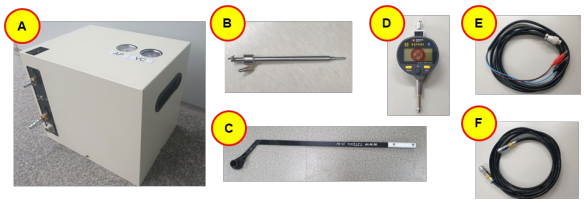
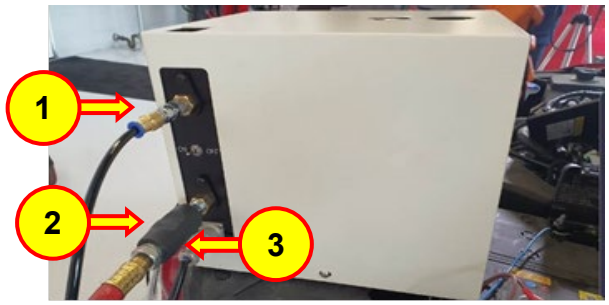
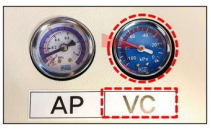
| HYUNDAI Technical Service Bulletin | GROUP<br>**ENGINE** | NUMBER<br>**21-EM-004H-1** |
|---|---|---|
| | DATE<br>**NOVEMBER 2021** | MODEL(S)<br>**APPLICABLE VEHICLES BELOW** |
| **SUBJECT:** | BEARING CLEARANCE TEST SERVICE PROCEDURE | |

***This TSB supersedes 21-EM-004H to include the enhanced "Skip Cylinder – No BCT" error detection feature with specific guided information to complete the inspection procedure.***

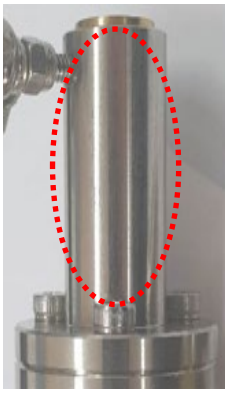
**Description:** This bulletin provides the service procedure for engine connecting rod bearing clearance testing. Perform the procedure outlined in this bulletin to fulfill the Bearing Clearance Test inspection requirements to determine next required steps.

**Applicable Vehicles:**
- Certain models as indicated per separate TSB.
- This TSB fulfills its Inspection Procedure requirements for the engine Bearing Clearance Test.

**SST Information**

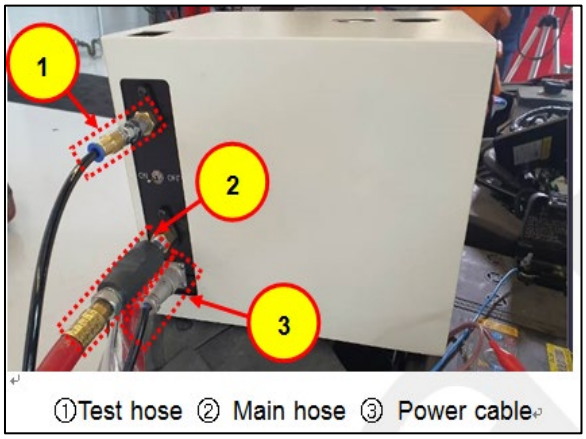
| Part Name | Part Number / Figure | Note |
|---|---|---|
| BEARING CLEARANCE TESTER SET (BEARING TOOL) |  <br>  <br>**(1) TEST HOSE (2) MAIN HOSE (3) POWER SUPPLY CABLE**<br><br>One BEARING CLEARANCE TESTER SET provided to dealers. (Additional units can be ordered.) | Confirm the shop air pressure and AP/VC pressures on the bearing tool meet requirements:<br><br>**Shop air supply: 50 psi minimum**<br><br>➢ **AP: 0.1 ~ 0.11MPa**<br>➢ **VC (Digital): -.073 ~ -.083MPa**<br>➢ **VC (Dial): -73 ~ -83kPa**<br>**(Refer to TSB 21-GI-009H or later for calibration procedure)**<br><br>  <br>  <br>[Digital Type] [Dial Type]<br><br>For Bearing Clearance Tester software related issues, contact GITA at: 888-437-0308<br><br>For Bearing Clearance Tester hardware related issues, refer to HTSS: "Fix it Right" under Symptom "SST – Other" |
| | KQ231-2T112QQH | BEARING CLEARANCE TESTER SET (BEARING TOOL) (Includes A - F) |
| | KQ231-2T100QQH | (A) BODY |

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

| | | |
|---|---|---|
| | KQ231-2T101QQH  | (B) SPARK PLUG ROD (**M12 for GDI and Theta II Hybrid MPI engines**) **← Upper body portion is smooth with no grooves.** |
| | KQ231-2T107QQH  | (B) SPARK PLUG ROD (**M14 for Theta II MPI engines**) **← 2 machined identification grooves on upper body.** |
| | KQ231-2T102QQH | (C) CRANK ROTATOR TOOL |
| | KQ231-2T103QQH | (D) CLEARANCE GAUGE |
| | KQ231-2T104QQH | (E) POWER SUPPLY CABLE |
| | KQ231-2T105QQH | (F) TEST HOSE (AIR HOSE FOR CLEARANCE GAUGE) |

**Service Procedure: Bearing Clearance Test**

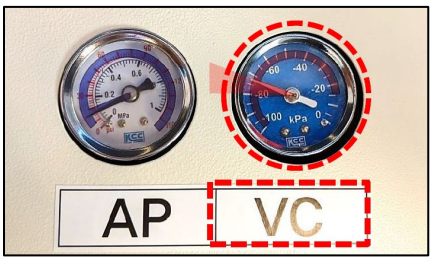
1. Connect the main hose (shop air supply) and test hose to the bearing tool (with the other end of the test hose disconnected). (The power to the bearing tool main unit is not necessary at this time.)



①Test hose ② Main hose ③ Power cable

Confirm the shop air pressure and AP/VC pressures on the bearing tool meet requirements. Using STUI in the GDS, take and submit AP/VC air pressure readings with the pressure levels clearly visible and the VIN in the background of the photo (RO or last 6 digits written on paper) for records.

- **(Digital Type)** Take 2 separate pictures showing the AP and VC readings of the digital gauge.
- **(Dial Type)** Take 1 picture showing both AP and VC dial gauge readings.


**Shop air supply:** 50 psi minimum
**AP/VC air pressure calibration check:**

a) Connect the main air compressor hose.
b) Connect the test hose. (The other end of the test hose should be left disconnected from the spark plug rod.)
c) Confirm that the AP/VC toggle switch at top is in the middle position.
d) Compare the set point AP/VC readings with the specification range after toggling the switch to AP and VC positions:
   - **AP:** 0.1 ~ 0.11MPa
   - **VC (Digital):** -.073 ~ -.083MPa
   - **VC (Dial):** -73 ~ -83kPa

## NOTICE

**Do not continue if any of the above readings are out of specification range.**

- **Adjust shop air to consistently provide at least 50 PSI of air pressure or greater.**
- **Do not use a portable air compressor to perform the bearing clearance testing.**
- **Be sure to check that the shop air water separator is functioning correctly.**
- **If any of the AP/VC air pressure indications are out of the specified range, recalibration of the Bearing Clearance Tester is required.**
  - **Refer to latest instructions outlined in the Engine Bearing Clearance Tester Calibration Procedure TSB 21-GI-009H or later for calibration procedure.**

**For Bearing Clearance Tester software related issues, contact GITA at: 888-437-0308**
**For Bearing Clearance Tester hardware related issues, refer to HTSS:**
- **"Fix it Right" under Symptom "SST – Other"**

2. Remove the engine cover and the 4 ignition coils.

***Tightening Torque (ignition coils):***
***9.8 - 11.8 N·m***
***(1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)***

**NOTE:** Use an air blow gun to clear away any dirt and debris from inside of each spark plug tubes.

3. Remove the 4 spark plugs.

***Tightening Torque:***
***14.7 - 24.5 N·m***
***(1.5 - 2.5 kgf·m, 10.9 - 18.0 lb·ft)***

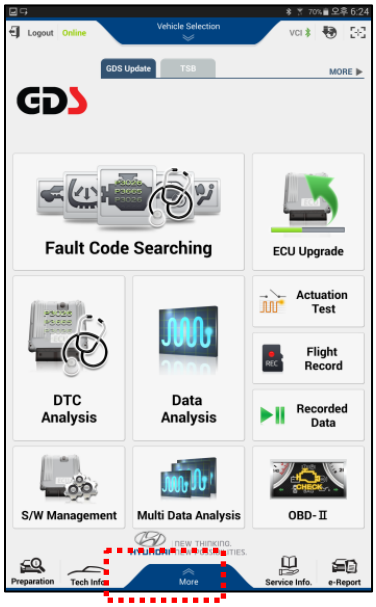
4. Insert the appropriate (use **M12 for GDI and Theta Hybrid MPI** engines or **M14 for all other MPI** engines) spark plug rod SST (A) into Cylinder #1 spark plug hole and turn until hand tight. Insert the clearance gauge SST into the spark plug rod and tighten using the thumb screw.


***NOTICE***

**DO NOT connect the test air hose to the clearance gauge at this time.**

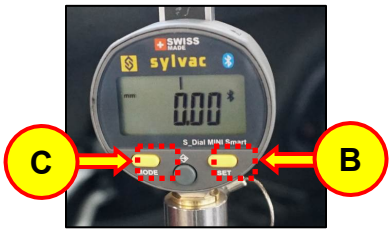
5. Connect the GDS to the vehicle and turn the ignition ON.

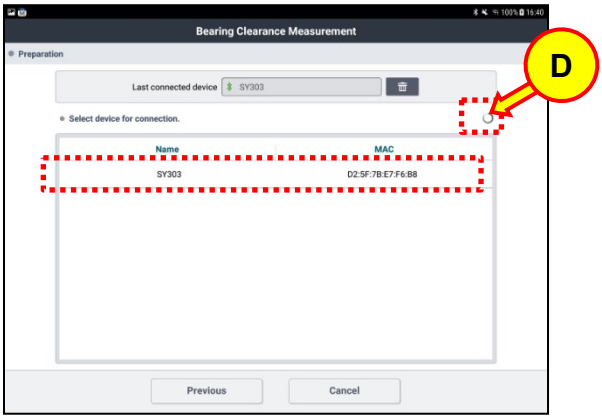
6. Swipe up on the “More” tab at the bottom of the GDS home screen. Select the “Special Inspection” function.




7. Enter the vehicle info into the GDS as prompted then select “Next”.

8. Connect the GDS to the clearance gauge SST via Bluetooth:
   - Press the “Set” button (B) on the gauge to turn it on.
   - Press the “Set” (B) and “Mode” (C) buttons at the same time for about 4 sec until the “reset” message is displayed.
   - Select the gauge in the list of devices on the GDS. Select the ‘Refresh’ icon (D) if the gauge doesn’t appear automatically.

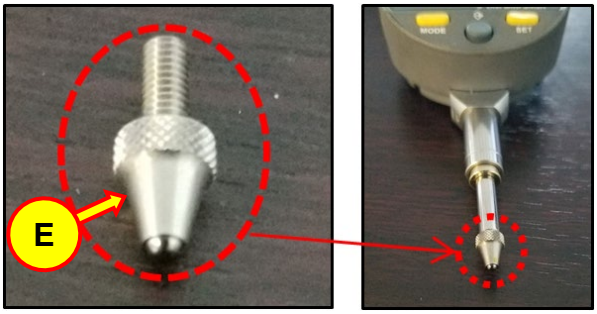



**NOTICE**

**If more than one device appears in the list of devices, there is another device in range. Move away from the other device to pair the gauge.**

   - Check that the ball point tip (E) of the clearance gauge SST is securely installed to the tool as shown. **Do not continue if ball point tip (E) is loose or missing.**




**NOTICE**

**If loose, apply Blue Loctite (or equivalent) to the tip thread and retighten securely to the gauge plunger.**

9. Turn the ignition ‘OFF’ and remove the VCI.

10. Follow the instructions on the GDS to start the test and select ‘Next’.

**NOTICE**

- **For the following steps, the Crank Rotator Tool or a long-handled wrench should be used for moving the crankshaft slowly and precisely.**
- **Ensure the test hose is disconnected from the clearance gauge when finding TDC piston depth.**

**Please take note of the following crank/piston position definitions.**

- ❖ **BTDC (Before Top Dead Center)**
- ❖ **TDC (Top Dead Center) ← Find TDC during the compression stroke.**
- ❖ **ATDC (After Top Dead Center)**

**In the following steps, the TDC point for testing must be at MAX (piston height) value minus 0.03mm as the crank has moved slightly into ATDC (from its TDC dwell point).**

- ➢ If TDC is difficult to find, refer to **Shop Manual Section Location:** Engine Mechanical System > Timing System > Timing Chain

11. To find TDC compression (TDC), rotate the crankshaft with the crank rotator SST at least one cycle (1/2 turn). (If the SST does not fit the specific vehicle type, remove the front passenger wheel and wheel liner or underbody tray as needed to rotate the crankshaft using standard shop tools.)

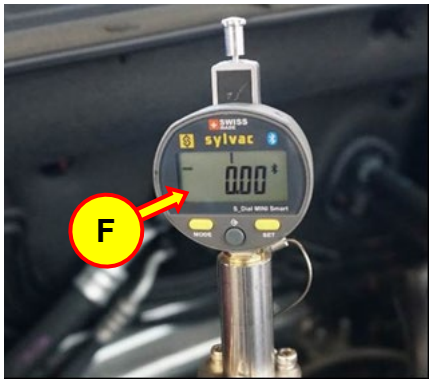
**IMPORTANT**

- **For the step below, the engine must be rotated SLOWLY using the crank rotator SST.**
  - **Abrupt or erratic movements may cause improper TDC setup and test errors.**
- **Do NOT stop rotating the engine before reaching MAX TDC, especially during the initial rotation towards TDC where the value may be at 0mm and change all the sudden.**
  - **Be sure to find TDC correctly by slowly and slightly nudging the engine a little more to verify no change in value to confirm that the piston is at MAX TDC.**

❖ Monitor the piston height value on GDS screen or the clearance gauge SST while rotating the engine clockwise using the Crank Rotator Tool.
- ➢ Rotate the engine **SLOWLY** as the value increases towards a MAX value. (BTDC → TDC)
- ➢ When the value changes direction (increasing/BTDC → TDC → decreasing/ATDC), stop rotating the crank when the piston height is at MAX value minus 0.03mm.

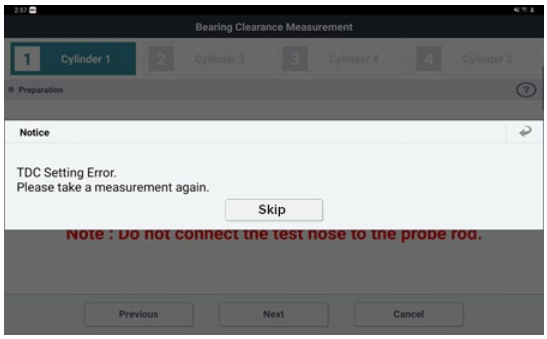
**NOTICE**

**The testing point is slightly towards ATDC from TDC when the piston has moved down 0.03mm from its highest position.**




12. Select “Next” when TDC is found.
- ❖ Ideal set point for testing from TDC is found when
- ❖ the maximum value minus 0.03mm is reached on
- ❖ the clearance gauge SST (F).
- ❖ The value is also displayed on the GDS.

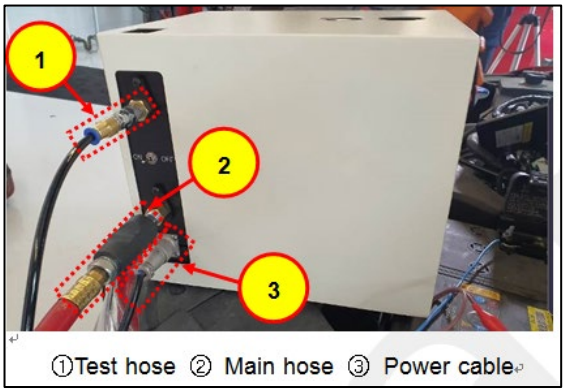
13. Once the set point for bearing testing is found, select “Start” in the GDS screen and proceed directly to the next step below.
- ➢ Do not turn the crank rotator SST until instructed to do so.




**NOTICE**

**The value at TDC varies depending on the specific vehicle and engine type. If TDC will not set, an error will be shown, and the cylinder may be skipped.**

14. Connect the test hose (1) to the spark plug rod SST and to the bearing tool SST.



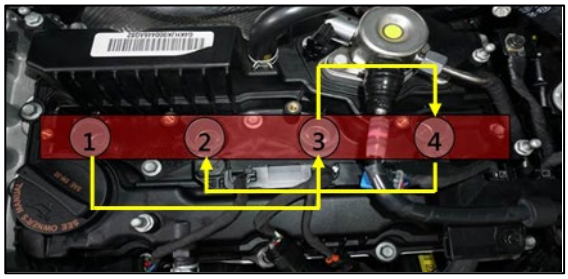

15. Connect the SST power cables to a fully charged 12V battery or to an external AC/DC power supply.
   - Turn the bearing tool SST power switch "ON".

**NOTICE**

***** Bearing Tool SST Power Check *****

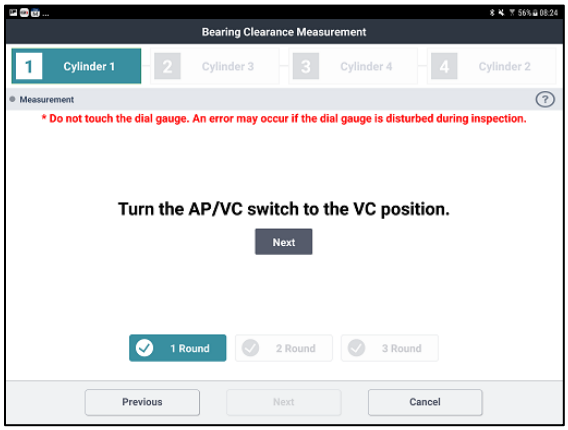
**a) Supply 12 volts (or an alternate external AC/DC 13.8-volt power supply with at least 2-amp output) to the power cable (3) connected to the bearing tool SST.**
**b) Turn power switch to ON.**
**c) Toggle AP/VC transfer switch between AP <> VC.**
- **The solenoids should "click" while switching between AP/VC when the unit is ON.**
- **If the solenoids are not switching, then check the power cable or the power supply.**

16. Locate the AP/VC switch on the bearing tool SST and switch it to the AP Position.




17. Follow the instructions on the GDS to test each cylinder. Cylinder #1 will be tested first.
   - The cylinders will be tested per the engine firing order: #1→#3→#4→#2.

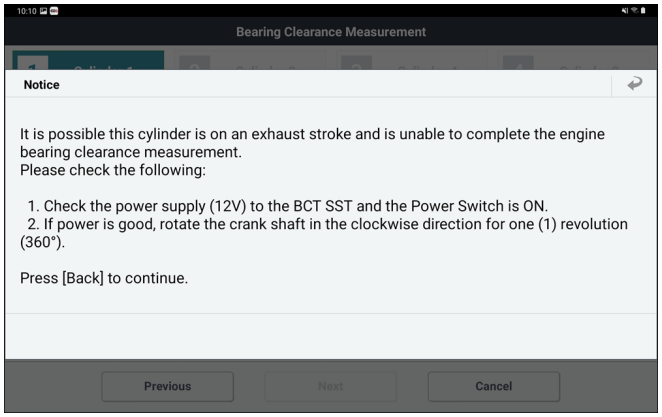
18. On the bearing tool SST, change the AP/VC switch to the VC position when instructed by the GDS.



**NOTICE**

**If the bearing measurement value does not change when the AP / VC is switched or the "Unable to measure" message appears on the GDS, rotate the crankshaft further as the exhaust valves could be open. Set the crankshaft to TDC again (Step 11).**

**Ensure the test hose is disconnected from the clearance gauge SST when finding TDC.**



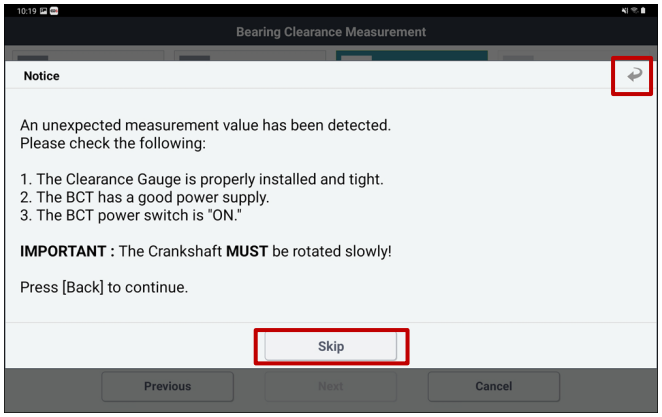

**NOTICE**

**If an error occurs, there will be pop up message (as shown on the right). Then click the [Back] symbol button to go back and do the test step again.**

**If the same error occurs within a cylinder during the BCT process after three consecutive attemps, the "*Skip*" button will be shown within the third error pop-up. Once the skip button is pressed, the BCT process will continue on to the next cyliner.**

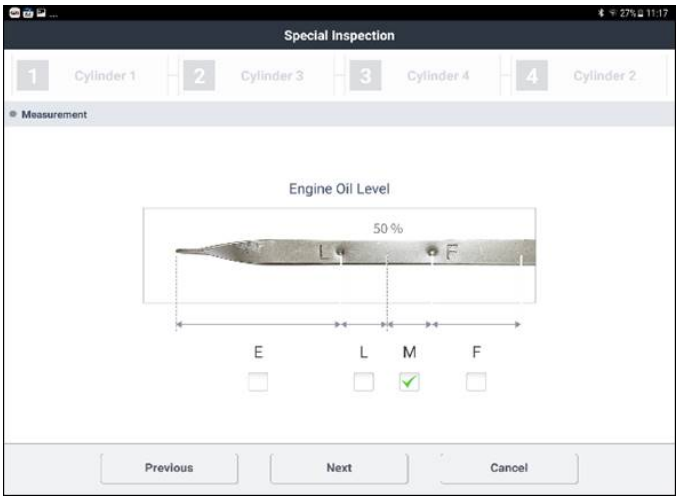
**Possible Errors:**

1. ***Unexpected Measurement***
2. ***Exhaust Stroke***
3. ***TDC Setting***
4. ***Clearance Deviation is too Large***
5. ***TDC Height Setting***
6. ***Range Exceeded***

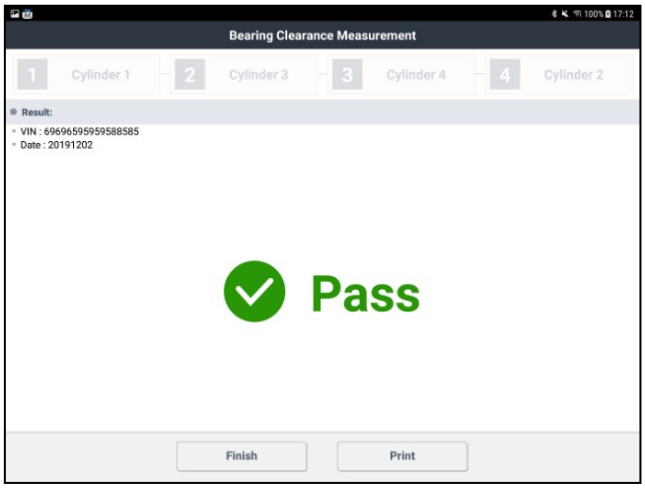



19. Continue following the instructions on the GDS to complete the bearing inspection.

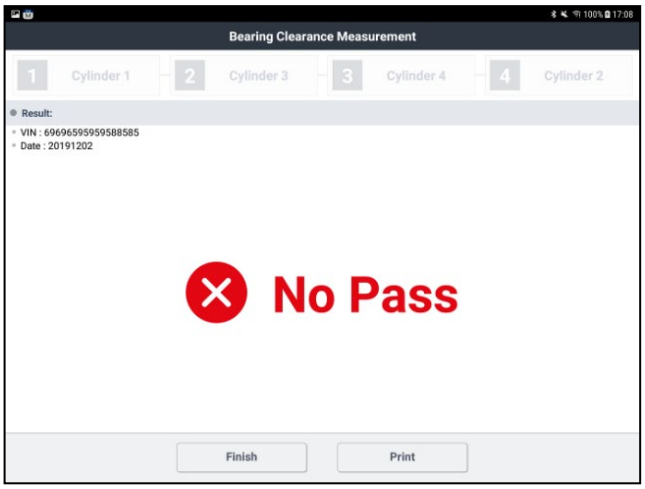
- Check the engine oil level and select the level in the GDS.



20. **If the test result is "Pass":**
    a) Save a screenshot of the results screen.
    b) Reinstall all components in the reverse order of removal.
    c) Check for DTCs and perform the appropriate diagnostic service. Ensure no warning lights are present to complete the procedure.



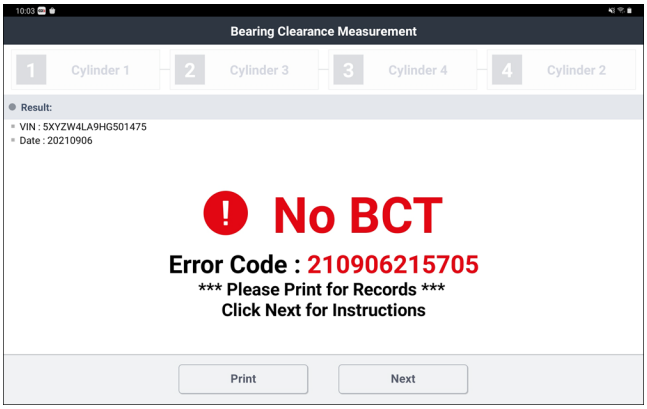

**If the test result is "No Pass":**
    a) Save a screenshot of the results screen.
    b) Submit PA for engine replacement approval.
    c) Follow remainder of the separate reference TSB to complete the service procedure.
    d) Check for DTCs and perform the appropriate diagnostic service. Ensure no warning lights are present to complete the procedure.




**NOTICE**

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

**If the test result is "No BCT":**
    a) This screen may result if one or more cylinders were skipped in the BCT Process.
    b) Save a screenshot of the results screen.
    c) Record Error Code Number on Repair Order.
    d) Follow *"Skipped Cylinder STUI Video Submission"* steps on page 10.



**Service Procedure: <u>Skipped Cylinder STUI Video Submission</u>**

1. Refer to "Service Procedure: Bearing Clearance Test" steps 1 ~ 12 to set failed cylinder at TDC ***(without the GDS).***

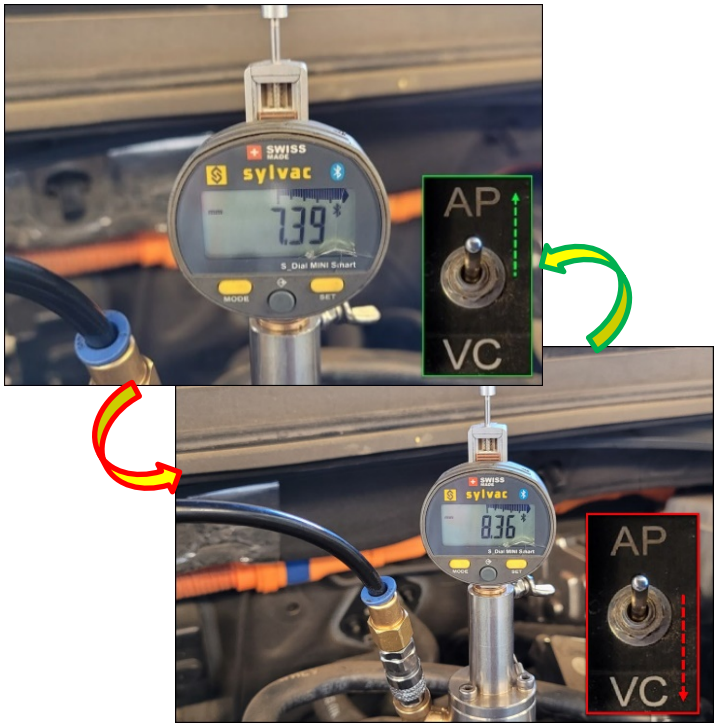
   **NOTE:** TDC is found when the Clearance Gauge shows highest reading possible. (The readings will vary by engine type and condition).


2. Refer to "Service Procedure: Bearing Clearance Test" steps 14 ~ 15 to connect the BCT.

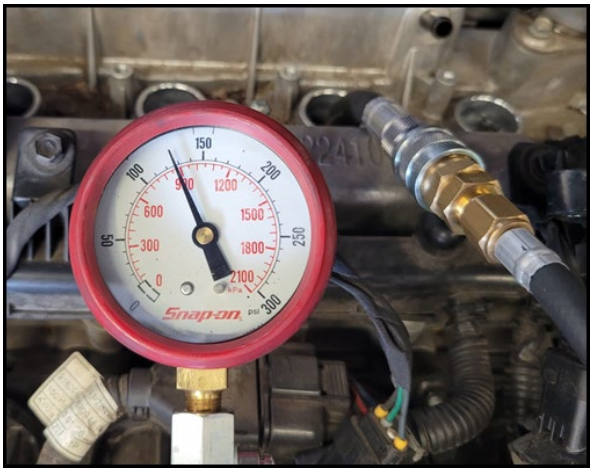
3. With shop air applied and BCT SST power switch "ON", and the Test Hose connected to the Spark Plug SST, verify a change in the Clearance Gauge reading.

4. ***For skipped cylinder only*** - Submit a STUI Video containing the following in one take:

*a)* Vehicle VIN Plate
*b)* Skipped cylinder being tested preset to TDC
*c)* Clear view of the Clearance Gauge while test is being completed
*d)* Cycle the AP/VC switch on the BCT <u>(3) three times</u>, pausing 1~2 seconds so the changes in the Clearance Gauge readings can be clearly seen (3) three times within the video.

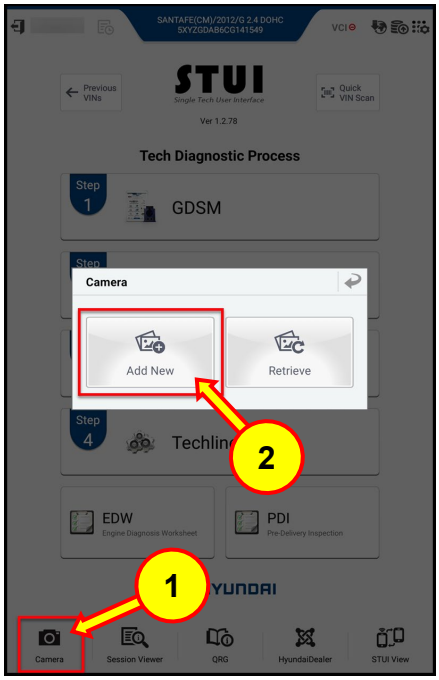


***If no change in the reading, verify that the cylinder is at TDC compression. If still no change and GDS Error received was "Exhaust Stroke", complete the following:***

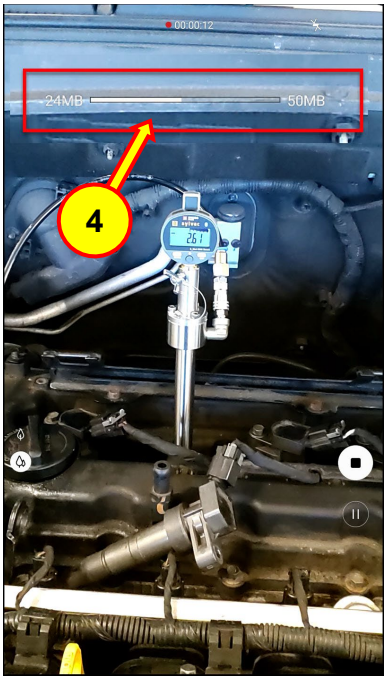


a) ***For skipped cylinder only*** *- Submit STUI Video while performing a Compression Test with 3 ~ 5 engine revolutions (refer to Shop Manual for procedure).*
b) *Clear Video of VIN Plate, Cylinder and Compression Gauge Reading in one take.*
c) *Record Compression reading on the Engine Diagnosis Worksheet (EDW).*

**NOTE:** STUI video mode using the GDS can be found by following figures 1 – 3 shown below. Be sure to monitor the session status bar (figure 4 shown below) within the STUI Video Screen to allow the complete test to be captured within the session limit.








5. Submit the video via STUI application.

6. Complete Engine Diagnosis Worksheet (EDW).

7. Verify PA Submission and await confirmation / approval.

## NOTICE

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