

ATTENTION:

- GENERAL MANAGER
- PARTS MANAGER
- CLAIMS PERSONNEL
- SERVICE MANAGER

IMPORTANT - All Service Personnel Should Read and Initial in the boxes provided, right.

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QUALITY DRIVEN® SERVICE

SERVICE BULLETIN

APPLICABILITY: 2020-**22**MY Legacy and Outback 2.5L NA and 2.4L DIT
 2018-**22**MY Crosstrek
 2017-**22**MY Impreza
 2019-**22**MY Forester 2.5 NA
 2014-18MY Forester 2.0L DIT
 2015-**22**MY WRX 2.0 DIT
 2019-**22**MY Ascent

NUMBER: 09-74-21R

DATE: 05/06/21

REVISED: 09/27/22

SUBJECT: Cleaning Procedure for Carbon Deposit Removal to Address Engine Misfire DTCs, Black Smoke from the Exhaust, Lack of Power, Knocking (Ping) and / or Rough Idle Concerns

INTRODUCTION:

This bulletin provides updated parts information and a service procedure to follow for removing accumulated carbon deposits from fuel injectors and internal engine components (e.g. intake valves and / or manifold, and combustion chambers). Fuel quality and how the vehicle is operated are both major contributing factors which will have a direct effect on carbon deposit accumulation. This cleaning procedure for carbon deposit removal is recommended to address engine misfire DTCs, black smoke from the exhaust, lack of power, knocking (ping) and / or rough idle concerns. The procedure outlines the use of Genuine Subaru P.E.A. (Polyether Amine) Carbon Cleaner (p.n. SOA868V9166) and the “Carbon Clean Tool” applicator tools (p.n. SOA868V9430 or SOA868V9432) which are both available through the Subaru Chemical Program.

IMPORTANT NOTES:

- The actual P.E.A. bottle may appear different than the black long-neck bottle shown in the photo below.
- When the cleaning procedure is determined to be necessary, a minimum of two bottles of the P.E.A. carbon cleaner will be required to complete it.
- An order quantity of 1 (one) **SOA868V9166** will be shipped as a “case” of 12- 6.76 oz. bottles.
- There are 2 different applicator tools for use with specific bottles as specified below. These tools are **not** interchangeable. The current long-neck bottle will be replaced with the shorter versions soon.

CAUTION: VEHICLE SERVICING PERFORMED BY UNTRAINED PERSONS COULD RESULT IN SERIOUS INJURY TO THOSE PERSONS OR TO OTHERS.

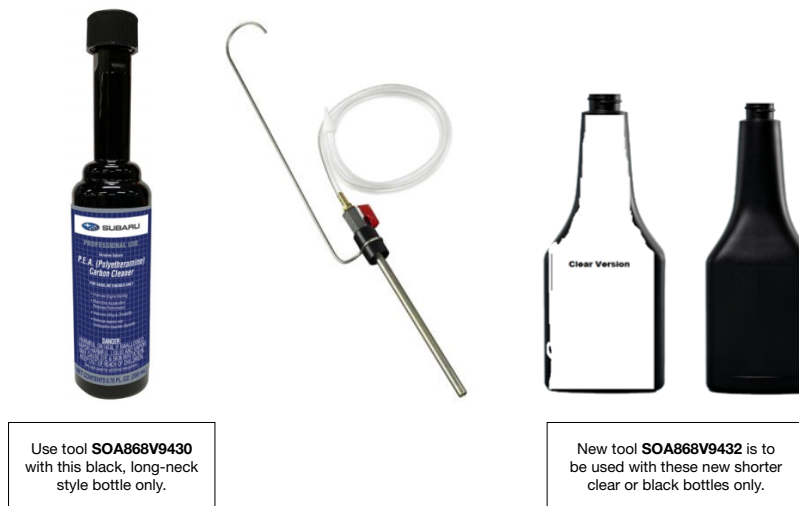
Subaru Service Bulletins are intended for use by professional technicians ONLY. They are written to inform those technicians of conditions that may occur in some vehicles, or to provide information that could assist in the proper servicing of the vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do the job correctly and safely. If a condition is described, DO NOT assume that this Service Bulletin applies to your vehicle, or that your vehicle will have that condition.

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- The new (shorter) bottle contains the same amount of P.E.A. product (6.76 oz.) but utilizes the newer version (**SOA868V9432**) of the applicator tool which has a shorter siphon tube designed to work in conjunction with the new bottle.
- Be sure to use the correct tool for the corresponding bottle style. The siphon tube on the original (long-style) tool is approximately **7 5/8"** long while the new version for use with the shorter bottles measures **6 3/8"**.
- The end of the siphon tube on the tool should not contact the bottom of the bottle. If it does, the old tool is being used with the new style bottle.
- If the tool does not extract all the contents of the bottle, the new tool may have been used with the old bottle.
- Each retailer has been automatically shipped ONE of the new (shorter siphon tube) applicator tools at no charge.
- In cases where more than one (1) P.E.A. cleaning procedure is claimed, SSM4 data will be required.



SERVICE PROCEDURE / INFORMATION:

VERY IMPORTANT: APPENDIX A has been added to the end of this bulletin (pg. 10) and it provides a Flow Chart for the overall Service Procedure described below. It is **STRONGLY RECOMMENDED** Technicians review the Flow Chart closely to ensure their understanding of the Service Procedure before proceeding further.

REMINDERS:

- Customer satisfaction and retention starts with performing quality repairs.
- **ALWAYS** road test the vehicle to confirm the customer's concerns. If necessary, road test with the customer to ensure a full understanding of the condition(s) before proceeding with the procedure.
- **STEP 1: Preliminary Inspection Procedure:**
Step 1a) Connect the SSM4.

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Step 1b) Check for any DTC(s) other than P030* (misfire). Correct any external spark plug / ignition coil concerns, poor connection, etc. before attempting this procedure. Remove the intake manifold assembly following all precautions and the service procedure supplied in the applicable Service Manual. Inspect inside the runners closely along with the cylinder head intake ports, plates and intake valves for any excessive amount of carbon / soot accumulation. Clean any readily accessible components with carburetor / throttle plate cleaner prior to re-assembly. Do not attempt to clean the intake valves at this point. Avoid allowing cleaners to enter the engine. If any other concerns are found, diagnose according to the applicable Service Manual procedure before attempting this carbon cleaning procedure.

IMPORTANT NOTES:

- **ALWAYS** use new intake manifold and EGR pipe gaskets along with any other one-time use parts as specified in the applicable Service Manual procedure during re-assembly.
- **NOTE:** The P.E.A. cleaner may worsen the conditions if other concerns exist outside of carbon / soot accumulation.

Step 1c) Road test the vehicle and perform Drive Cycle A and B according to the applicable Service Manual. On STIS, go to Service Diagnostics and select the related Model Year and Model of the vehicle being repaired. Select Diagnostics then go to Engine (Diagnostics) > (Applicable Engine Type). Scroll down to Inspection Mode > Procedure > Inspection Mode A and Inspection Mode B then follow the related driving cycle patterns for each. Check if any DTC(s) other than P030* are set. If any other DTC(s) are found, diagnose and repair according to the applicable Service Manual.

Step 1d) Obtain customer authorization (if the fuel tank is not already full) to fill the fuel tank (for later P.E.A. application). **NOTE:** Fueling and engine oil top-off expenses cannot be claimed.

IMPORTANT: DO NOT add P.E.A. carbon cleaner to the fuel tank before completing all of **Step 2** below.

Step 1e) Inspect the ignition coils and spark plugs closely for evidence of tracking, poor electrical connection, etc.

Step 1f) Confirm the engine oil level is full. Top off if necessary.

Step 1g) For 2.5L DINA engines, proceed to **Step 2**. For Turbo and other engines, proceed to **Step 3**.

- **STEP 2: Checking the Roughness Counter with SSM4 (NATURALLY ASPIRATED 2.5L MODELS (DINA) ONLY):**

IMPORTANT CAUTION: Always confirm the parking brake is fully applied and the select lever is in the Park position (CVT models) or the shift lever is in the neutral position (MT models).

Step 2a) With the SSM4 connected, turn the ignition to ON and access the Data Monitor. Begin sampling data (all PIDs).

Step 2b) Start the engine and warm it up until the radiator fan cycles on. Document any unusual noises or concerns with the engine.

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Step 2c) Turn the ignition OFF and allow the engine to cool down. The use of a supplemental cooling fan to circulate air and cool the engine compartment is recommended.

Step 2d) Turn the ignition and SSM4 back ON (engine OFF) access the Data Monitor again and monitor the coolant temperature until it is 60 +/- 2 deg. C (140+/- 3.6 deg. F).

Step 2e) Restart the engine, turn the A/C ON and set the system to “MAX” then allow the engine to idle for one minute.

Step 2f) Save the SSM4 data and turn the ignition OFF.

Step 2g) Confirm the data is correctly captured as listed below:

- Coolant temperature is 60 +/-2 deg. C (140+-3.6 F deg. F) at the start of measurement.
- A/C is ON at the start of measurement.
- “Flag control of Catalyst Rapid Warming-up reflect Ignition Timing” is ON at the start of measurement (it is OK if it changes to OFF during the measurement).

Step 2h) Read the roughness counter values on all cylinders by referring to **FIG 1** below and record the values on the Repair Order for reference later in the procedure.

- **FIG 1: How to Read the Roughness Counter:**

On the SSM4, display the items listed below:

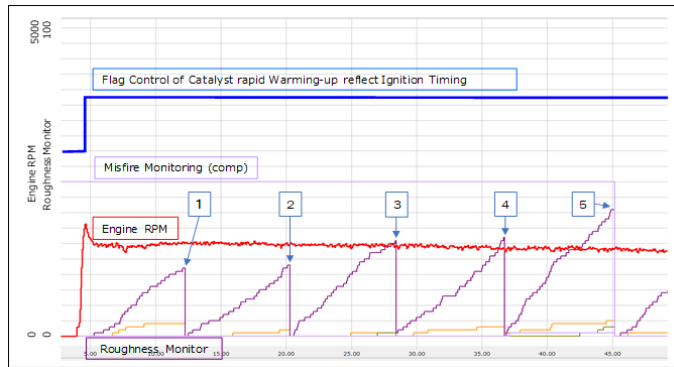
- Flag control of Catalyst Rapid Warming-up reflect Ignition Timing
- Misfire Monitoring (comp)
- Engine RPM
- Roughness Counters #1, #2, #3 and #4.
- The roughness counter rises and resets (drops sharply) repeatedly which is the reason the signals form triangles. Read the peak values of each triangle on all cylinders until the “Misfire Monitoring (comp)” changes to “0” then, add all the values to get a “total” value. A **TOTAL** count of **34 or less** is to be considered acceptable.

If the **TOTAL** Roughness Counter number:

- **EXCEEDS 34**, proceed to the P.E.A. cleaning procedure starting with **Step 3** below.
- **Is 34 OR LESS**, proceed to the Warranty and Claim Information and process a claim for Roughness Counter Inspection Only.

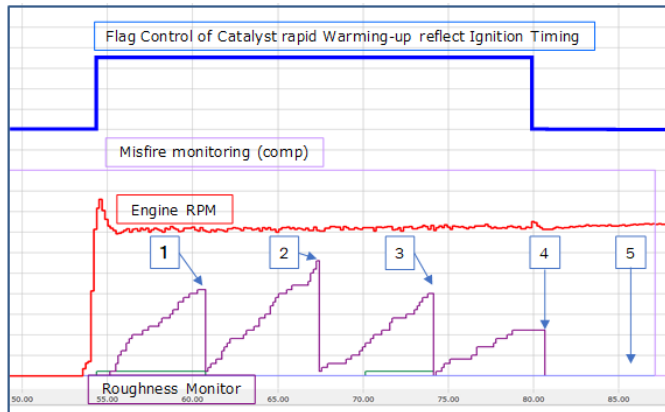
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EXAMPLE 1:



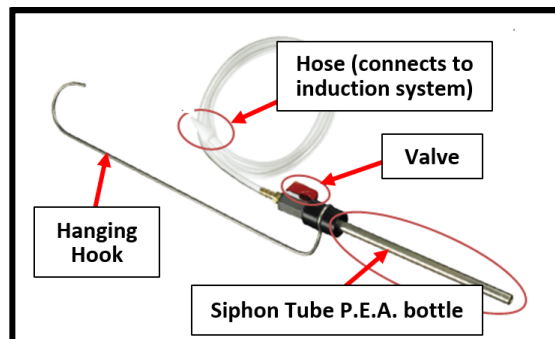
Cylinder:	Peak 1	Peak 2	Peak 3	Peak 4	Peak 5	Total:
#1 (Orange)	4	2	1	3	5	169
#2 (Blue)	0	0	1	0	3	
#3 (Purple)	22	23	31	32	41	
#4 (Green)	0	0	0	0	1	

EXAMPLE 2:



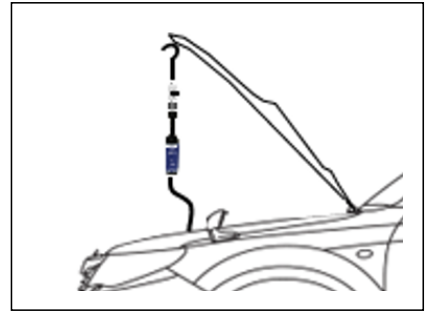
Cylinder:	Peak 1	Peak 2	Peak 3	Peak 4	Peak 5	Total:
#1 (Orange)	0	0	0	0	0	82
#2 (Blue)	1	0	1	0	1	
#3 (purple)	21	28	20	11	0	
#4 (Green)	0	0	0	0	0	

- **STEP 3 (all models):** Pour **ONE** full bottle of P.E.A. carbon cleaner into the vehicle's **FULL** fuel tank. **REMINDER:** The fuel tank **MUST** be **FULL**.
- **STEP 4:** With the valve **CLOSED** as shown below, remove the cap and thread the applicator tool onto the P.E.A. bottle. During use, try to keep the bottle vertical to insure all the contents are consumed.



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- **STEP 5:** Use the hanging hook to hold the assembled applicator tool on the hood striker as shown here.

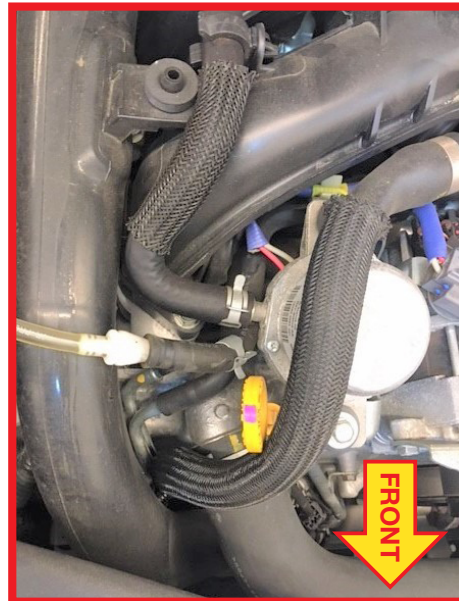


- **STEP 6:** Remove the purge hose and connect the hose from the applicator tool. Refer to the images below for the hose locations.

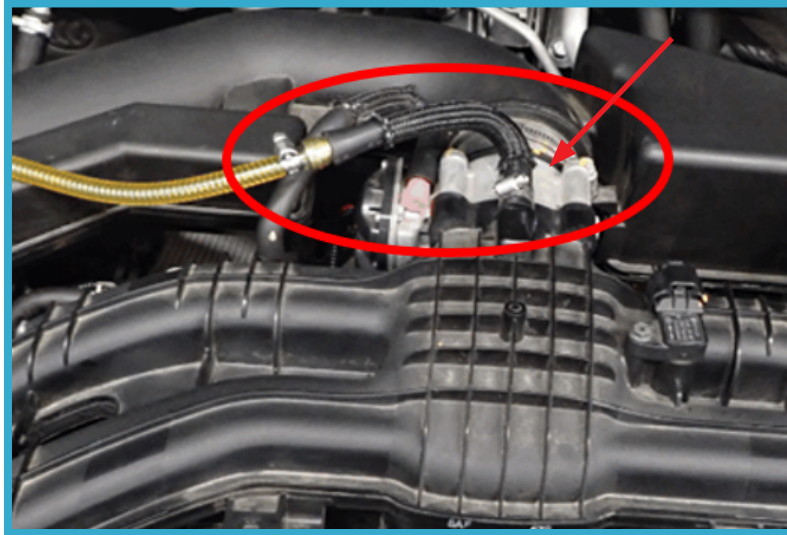
2.4 DIT



2.0 DIT



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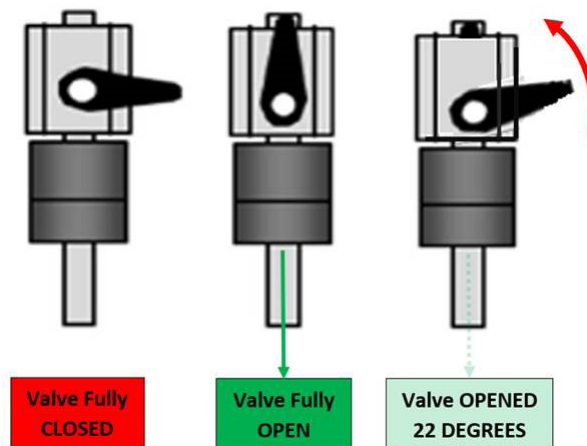
- **STEP 7: Application of P.E.A. Carbon Cleaner into the Intake Manifold:**

IMPORTANT CAUTION: The cleaning operation **MUST** be performed in well-ventilated area. If performed inside, always confirm the vehicle is connected to an exhaust evacuation system before proceeding.

Step 7a) Start the engine and warm it up until the radiator fan cycles on. Keep the engine speed at 2000rpm using the SSM4.

IMPORTANT: To avoid engine overheating, keep the engine hood open. The use of a supplemental cooling fan to circulate air and cool the engine compartment is recommended.

Step 7b) Open the valve on the applicator tool carefully and adjust to approximately **22** degrees from closed. Use the illustration below for reference. At that flow rate, it should take about 1 hour to empty the 6.76 oz. bottle. **IMPORTANT:** This flow rate is critical. Some trial and error (e.g. put the intake supply hose into a **CLEAN** container and experiment as needed to determine the proper opening position of the valve to achieve the required flow rate). Return any used P.E.A. to the supply bottle.



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Step 7c) When the bottle has been emptied, return the engine speed to idle, allow to idle for a few moments then switch the ignition OFF.

Step 7d) Close the valve, remove the tool from the purge hose connection and reconnect the purge hose.

- **STEP 8: Burning of Carbon Deposits Off the Spark Plugs:**

Step 8a) Start the engine, warm it up until the radiator fan cycles on then return the engine speed to idle.

Step 8b) Raise the engine speed to 3500 rpm, hold it there for 25 seconds then return it to idle for 5 seconds. Repeat this cycle 5 times then keep it at idle for 30 seconds to allow the engine to cool down. Repeat the above procedure 2 more times (3 times total).

REMINDER: To avoid overheating, keep the engine hood open. The use of a supplemental cooling fan to circulate air and cool the engine compartment is recommended.

- **STEP 9: Verification of Cleaning Status: Follow A) or B) below depending on the engine type:**

A) FOR 2.5L NATURALLY ASPIRATED 2.5L (DINA) MODELS ONLY:

Step 9a) Read the Roughness Counter again referencing **Step 2** above for the procedure.

Step 9b) Verify the results of the cleaning procedure by confirming the condition below:

- Has the Roughness Counter total value become **less than 34**?
If YES (successful), proceed to **Step 10**.

B) FOR ALL MODELS OTHER THAN 2.5L DINA:

Step 9a) Verify the cleaning procedure results by confirming the 2 conditions below:

- Has the rough idle condition smoothed out?
- Have the other conditions confirmed before cleaning been successfully addressed including: engine misfire DTCs, black smoke from the exhaust, lack of power, and/or knocking (ping)?

Step 9b) If the answers to the above questions (**9a / 9b**) are YES (successful), proceed to **Step 10**.

If one or more answers to the questions above is **NO** (NOT successful), return to **Step 4** and repeat the P.E.A. cleaning process. If the conditions above are not satisfied after the second attempt, CHANGE THE ENGINE OIL (no filter change) and perform a third attempt. If a fourth attempt is required and the result is still unsuccessful, CHANGE THE ENGINE OIL AGAIN (no filter change) and follow the SOA Escalation Process for additional support.

IMPORTANT: In a case where more than one cleaning attempt is required, it is STRONGLY recommended to change the engine oil (oil only, no filter change) after every 2 bottles of P.E.A. are consumed by the engine. Do NOT add more P.E.A. to the fuel tank.

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- **STEP 10: Confirmation Road Test**

Step 10a) Clear the ECM memory and road test the vehicle to confirm the Check Engine light does not come back on to complete the procedure.

VERY IMPORTANT: When returning the vehicle to the customer, always advise to **NOT** refill the fuel tank until the gauge reads **BELOW 1/4 full**. This will maximize the effect of the P.E.A. poured into the fuel tank in **Step 3**.

WARRANTY / CLAIM INFORMATION:

For vehicles within the Basic New Car Limited or Powertrain Limited Warranty period, this repair may be submitted using the following claim information:

IMPORTANT NOTES:

- In a case where multiple cleaning attempts are required, it is **STRONGLY** recommended to change the engine oil **after every 2 bottles** of P.E.A. are consumed by the engine (oil only, no filter).
- The claimable Warranty Part Number for 1 (one) bottle of the P.E.A. cleaner is **SOA635328**.

TESTING / REPAIR OUTCOMES and CLAIM CODING INFORMATION			Fail Code
TEST DRIVE, DTC CHECK, SPARK PLUG, IGNITION COIL AND INTAKE MANIFOLD INSPECTIONS (TURBO AND NA MODELS), P.E.A. CLEANING PROCEDURE <u>NOT</u> REQUIRED	A449-208	2.7	DGR-85

****NOTE:** In cases where more than one (1) P.E.A. cleaning procedure is claimed, SSM4 data will be required.

DIT (TURBO) MODELS ONLY P.E.A. CLEANING PROCEDURE <u>REQUIRED</u>	Model Applicability		Fail Codes	
	Ascent, Leg / Obk	WRX, Forester XT		
INTAKE MANIFOLD R&R & CLEAN, 1 TREATMENT REQUIRED	A449-211	5.6	5.3	DGN-42
INTAKE MANIFOLD R&R & CLEAN, 2 TREATMENTS REQUIRED AND 1 ENGINE OIL CHANGE	A449-212**	7.6	7.3	DGO-42
INTAKE MANIFOLD R&R & CLEAN, 3 TREATMENTS REQUIRED AND 1 ENGINE OIL CHANGE	A449-213**	9.3	9.0	DGP-42
INTAKE MANIFOLD R&R & CLEAN, 4 TREATMENTS REQUIRED AND 2 ENGINE OIL CHANGES	A449-214**	11.3	11.0	DGQ-42

Continued...

DINA (N/A) MODELS ONLY P.E.A. CLEANING PROCEDURE <u>REQUIRED</u>		Model Applicability		Fail Codes
		Crosstrek Sport, Leg / Obk, Forester	Impreza / Crosstrek 2.0 DINA	
INTAKE MANIFOLD R&R & CLEAN, 1 TREATMENT REQUIRED	A449-201	7.1	6.9	DGN-42
INTAKE MANIFOLD R&R & CLEAN, 2 TREATMENTS REQUIRED AND 1 ENGINE OIL CHANGE	A449-202	9.6	9.4	DGO-42
INTAKE MANIFOLD R&R & CLEAN, 3 TREATMENTS REQUIRED AND 1 ENGINE OIL CHANGE	A449-203	12.1	11.9	DGP-42
INTAKE MANIFOLD R&R & CLEAN, 4 TREATMENTS REQUIRED AND 2 ENGINE OIL CHANGES	A449-204	14.9	14.7	DGQ-42

IMPORTANT REMINDERS:

- SOA strongly discourages the printing and/or local storage of service information as previously released information and electronic publications may be updated at any time.
- Always check for any open recalls or campaigns anytime a vehicle is in for servicing.
- Always refer to STIS for the latest service information before performing any repairs.

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Appendix A: Service Procedure Flow Chart

