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## SECTION 303-04D Fuel Charging and Controls — Turbocharger

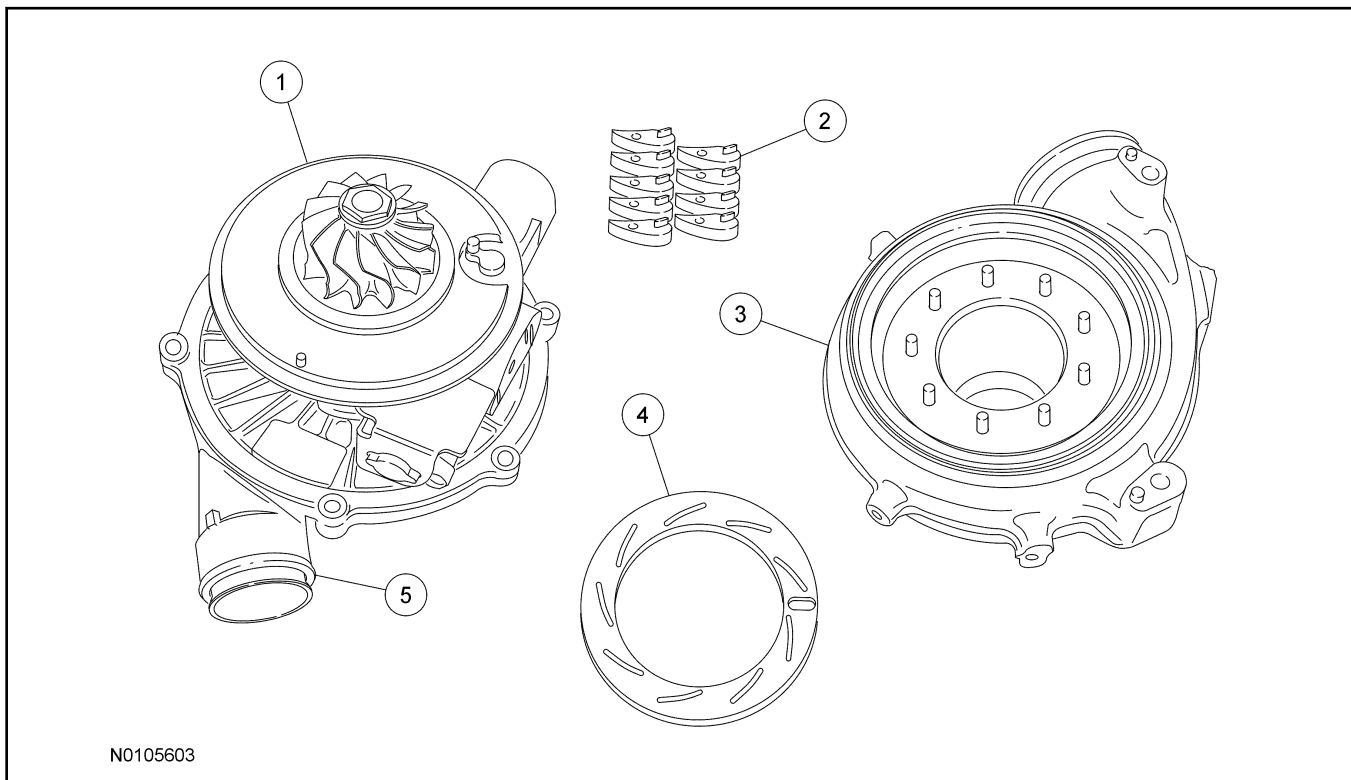
CONTENTS	PAGE
<b>GENERAL PROCEDURES</b>	
Turbocharger Reconditioning .....	303-04D-2
Turbocharger Disassembly .....	303-04D-2
Center Housing Rotating Assembly (CHRA) Replacement .....	303-04D-5
Turbocharger Cleaning .....	303-04D-6
Turbocharger Assembly .....	303-04D-8

## GENERAL PROCEDURES

### Turbocharger Reconditioning

#### Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	—
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	—
Motorcraft® Carburetor Tune-Up Cleaner (aerosol) PM-2	—
Motorcraft® SAE 15W-40 Super Duty Diesel Motor Oil XO-15W40-QSD (US); CXO-15W40-LSD12 (Canada); or equivalent	WSS-M2C171-E



Item	Part Number	Description
1	9G489	Center Housing Rotating Assembly (CHRA)
2	—	Turbocharger vanes (part of 6K682)
3	—	Turbine housing (part of 6K682)
4	6C885	Unison ring
5	—	Compressor housing (part of 6K682)

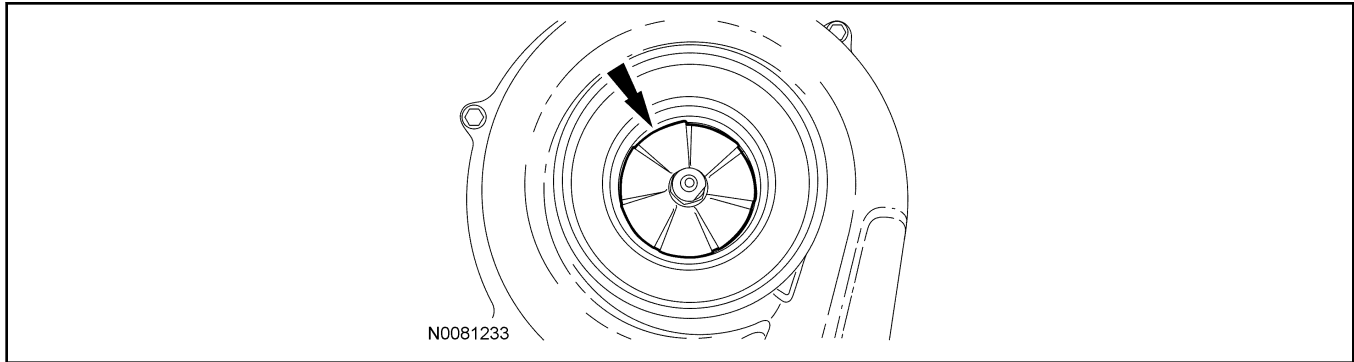
#### Turbocharger Disassembly

1. Remove the turbocharger. For additional information, refer to Turbocharger in this section.
2. **NOTE:**  
Turbocharger compressor side shown, turbocharger turbine side similar.

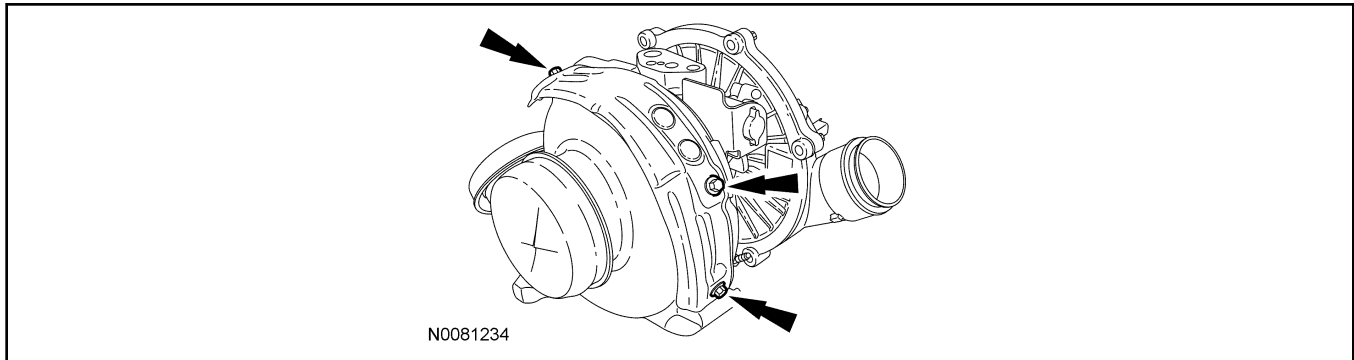
Inspect the turbocharger compressor and turbine fins for damage.

- If the compressor or turbine wheel fins are damaged, replace the turbocharger.
- Inspect the air intake system for foreign material or leakage that would allow unfiltered air to reach the turbocharger.

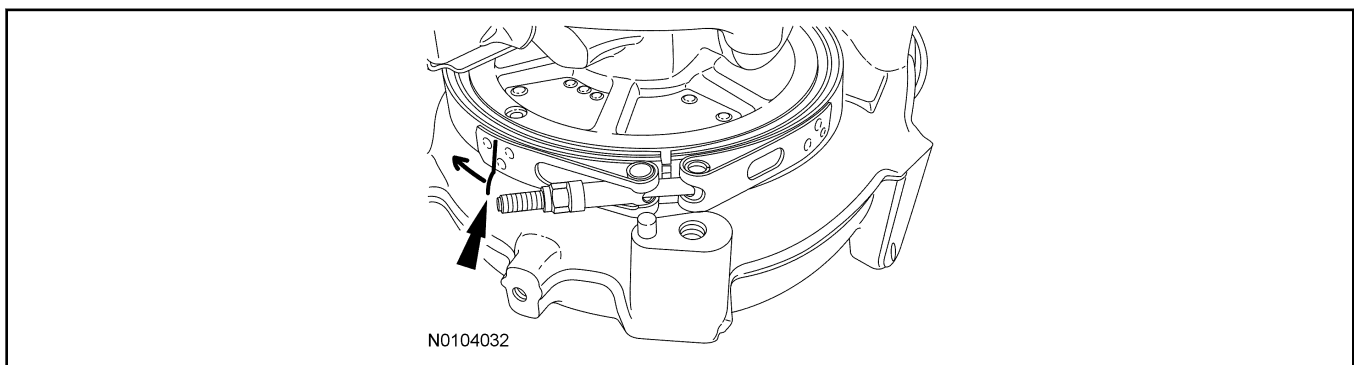
## GENERAL PROCEDURES (Continued)



3. Check the turbocharger bearing clearance. For additional information, refer to Diagnosis and Testing in this section.
4. Cover the inlet and outlet of the turbocharger compressor housing with duct tape or covers.
5. Clean the oil supply tube mounting surface and cover with duct tape or covers.
6. Cover or place a clean paper towel into the turbocharger oil drain passage.
7. Remove the 3 bolts and the turbocharger heat shield.

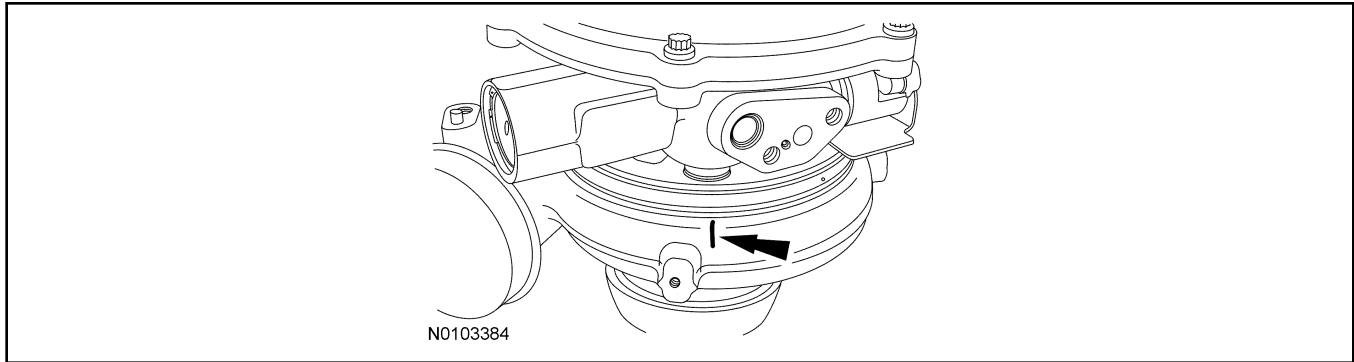


8. **NOTE:**  
Index-mark the clamp location on the compressor housing. Do not index-mark the center housing and rotating assembly, it may have to be replaced.  
Index-mark the location and direction of the V-band clamp to aid in assembly.

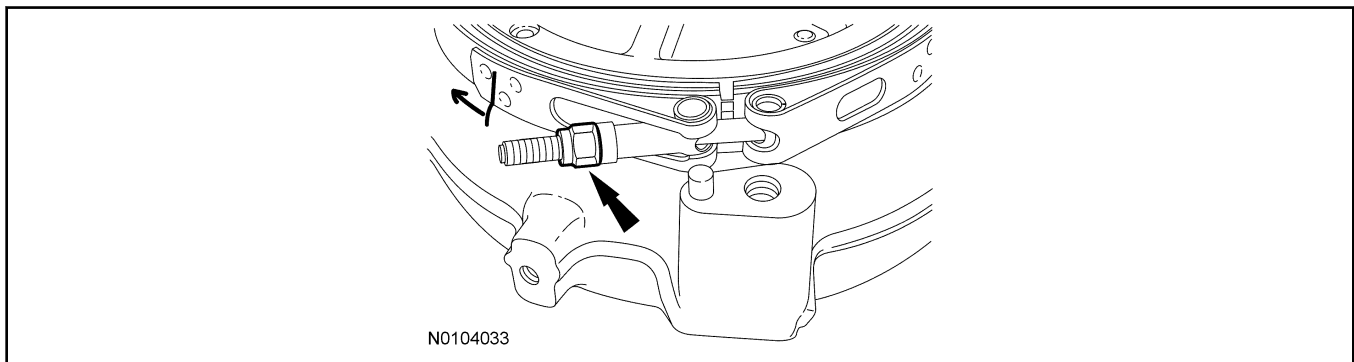


9. Index-mark the location of the turbine housing at the unison ring crank to aid in assembly.

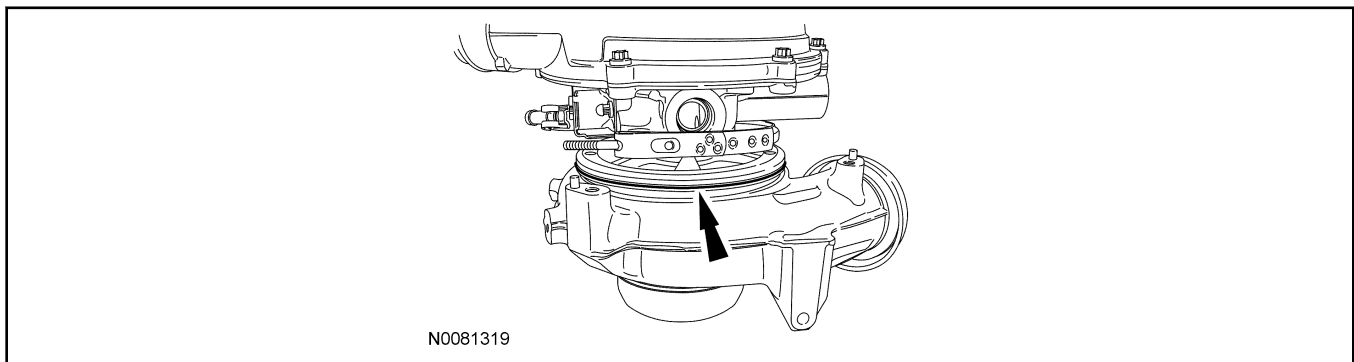
## GENERAL PROCEDURES (Continued)



10. Completely remove the V-band clamp retaining nut. Position the V-band clamp from the turbocharger flanges so that the turbocharger can be separated.



11. Using a brass drift, separate the turbine housing from the turbocharger assembly.
- Remove the V-band clamp.



12. **NOTE:**  
Do not attempt to clean rust, corrosion or pitting from the center housing flange.

**NOTE:**

Scaly rust, corrosion or pitting may be present inside the turbine housing. Do not replace the turbine housing. A turbocharger vane cleaning will be sufficient.

**NOTE:**

If the turbocharger is coked with carbon deposits from oil, the deposits will be wet and black and cover the complete inside of the turbine housing.

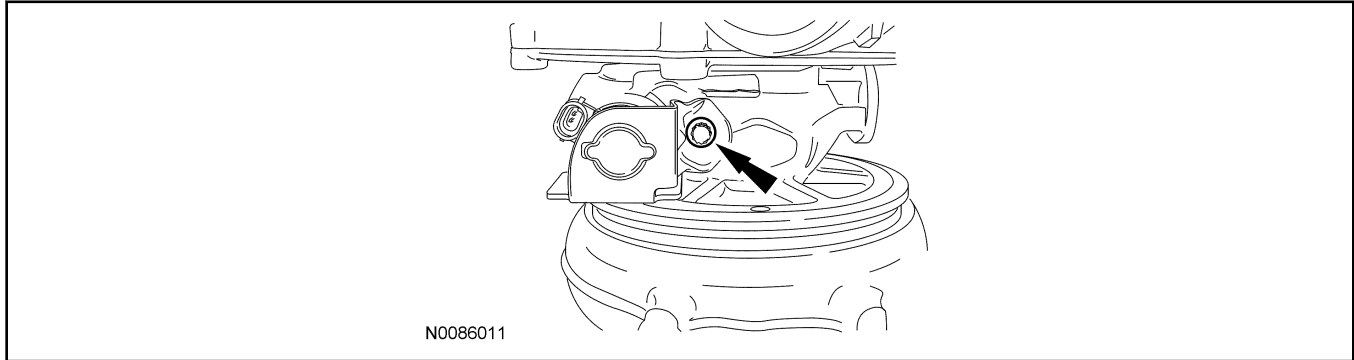
Remove the turbocharger vanes and unison ring from the turbine housing. Inspect all parts of the turbocharger assembly.

- If the unison ring is obviously cracked or has excessive wear in the slots, replace the unison ring. If no damage is obvious, the unison ring will be reinspected after cleaning. Proceed to Turbocharger Cleaning.
- If corrosion is present on the bearing housing flange, replace the Center Housing Rotating Assembly (CHRA). Proceed to Center Housing Rotating Assembly (CHRA) Replacement.
- If the turbocharger is oil coked, proceed to Turbocharger Cleaning.

**GENERAL PROCEDURES (Continued)****Center Housing Rotating Assembly (CHRA) Replacement**1. **NOTE:**

Use the turbine housing to hold the CHRA during disassembly.

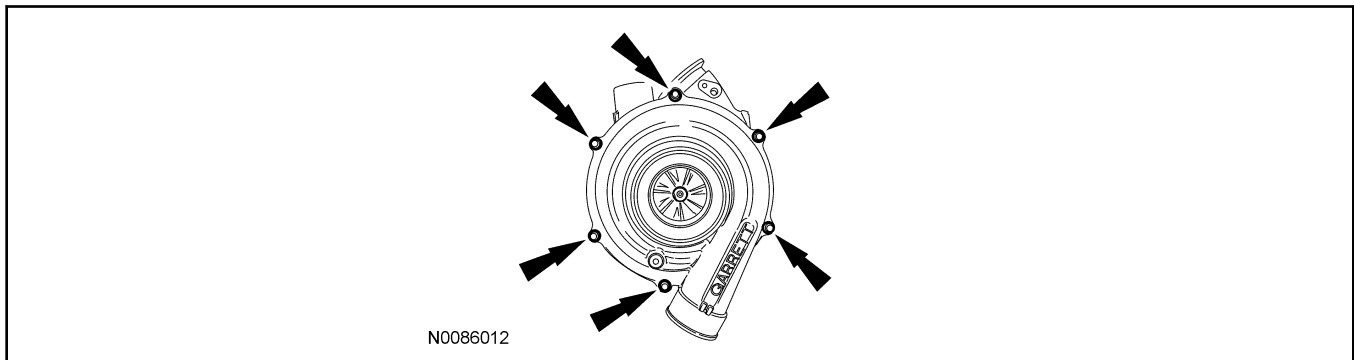
Remove the bolt, bracket and the turbocharger variable vane hydraulic control valve.

2. **NOTICE:**

**Use care not to damage the compressor wheel fins when removing the turbocharger compressor housing.**

Remove the 6 bolts for the turbocharger compressor housing.

- Tap on the compressor housing with a mallet to remove it from the CHRA.
- Clean the turbine housing and turbocharger vanes, proceed to Turbocharger Cleaning.

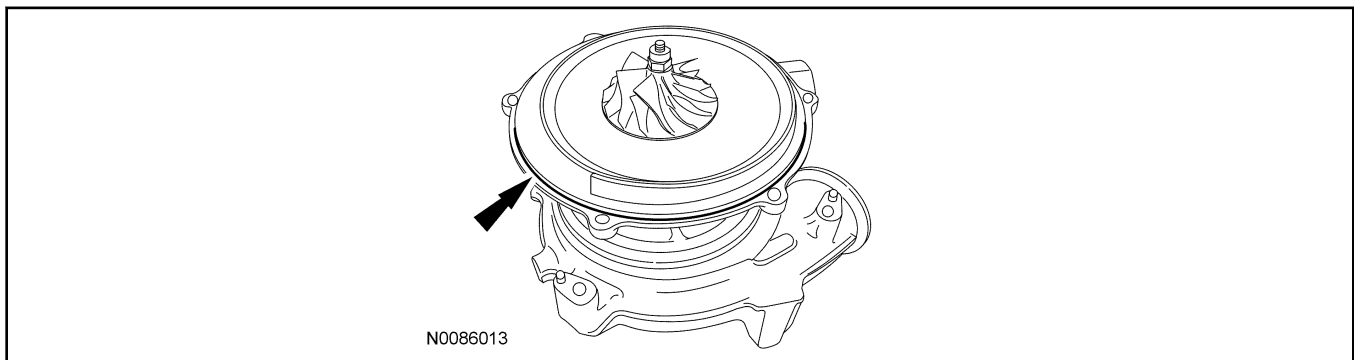
3. **NOTE:**

Use the turbine housing to hold the CHRA during assembly.

**NOTE:**

A new O-ring seal is supplied with the new CHRA.

Install the new O-ring seal on the new CHRA housing.

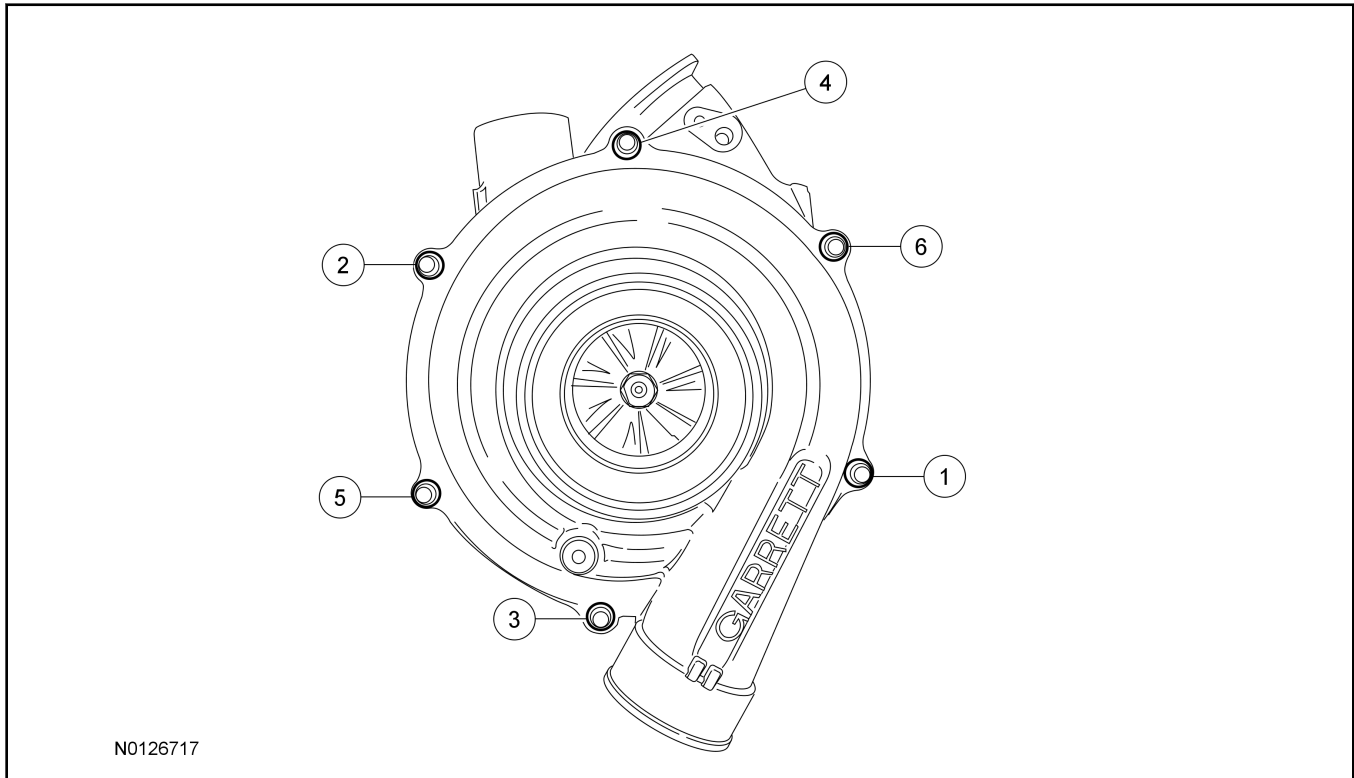
4. **NOTICE:**

**Use care to not damage the compressor wheel fins when installing the turbocharger compressor housing.**

**GENERAL PROCEDURES (Continued)**

Install the turbocharger compressor housing and 6 bolts. Tap the turbocharger compressor housing until it is fully seated. Tighten the bolts in 2 stages, in the sequence shown:

- Stage 1: Tighten to 11 Nm (97 lb-in).
- Stage 2: Tighten to 22 Nm (16 lb-ft).



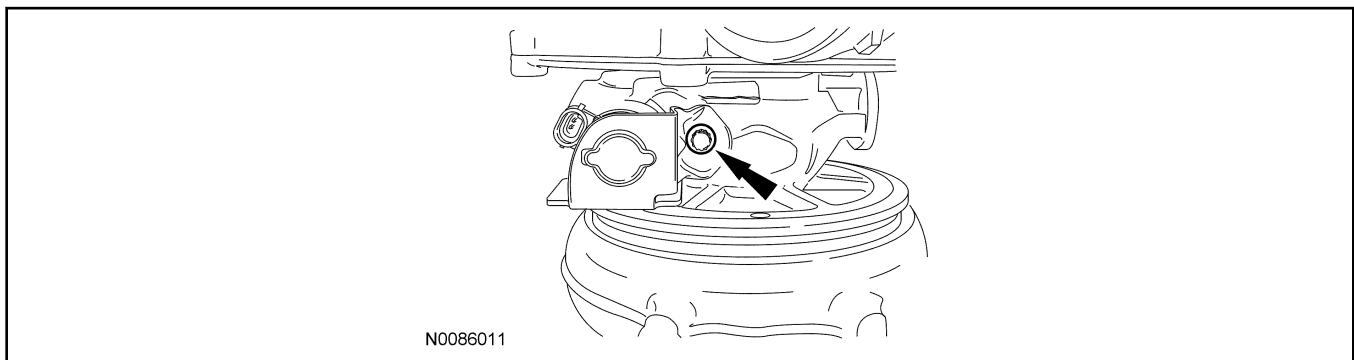
5. **NOTICE:**  
Do not use the retaining bolt to draw the valve into the housing or damage to the valve can occur.

**NOTE:**  
Inspect the O-ring seals to make sure they are not twisted or distorted.

**NOTE:**  
Apply clean engine oil to the O-ring seals prior to installing.

Install the turbocharger variable vane hydraulic control valve, bracket and bolt.

- Tighten to 24 Nm (18 lb-ft).

**Turbocharger Cleaning**

1. **NOTE:**  
Use a dust mask when cleaning the turbocharger.

**NOTE:**  
A razor scraper may be used to remove heavy carbon deposits where sufficient access exists.

**GENERAL PROCEDURES (Continued)**

Using carburetor tune-up cleaner, remove the carbon deposits from the unison ring, turbocharger vanes, vane contact areas and unison ring contact areas on the center housing.

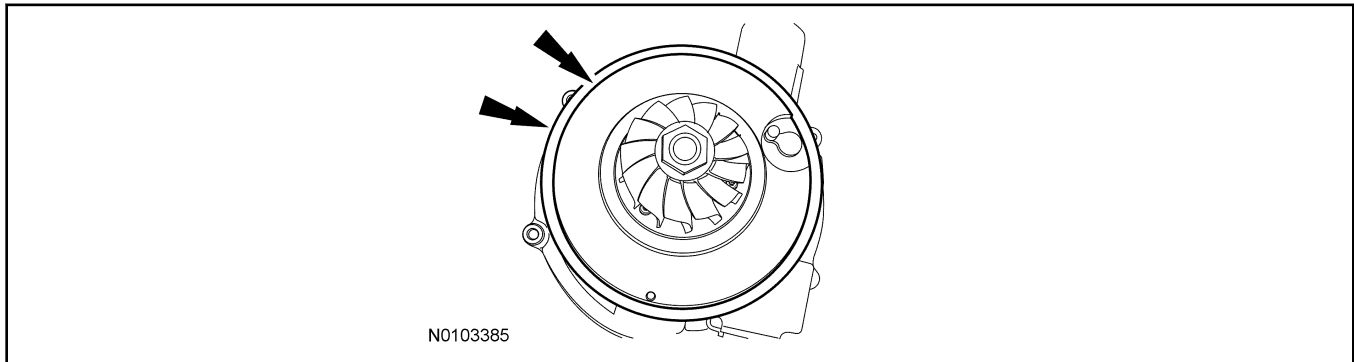
2. **NOTICE:**

**Do not clean the turbine wheel. Use care when cleaning around the turbine wheel or damage to the turbine wheel can occur.**

**NOTE:**

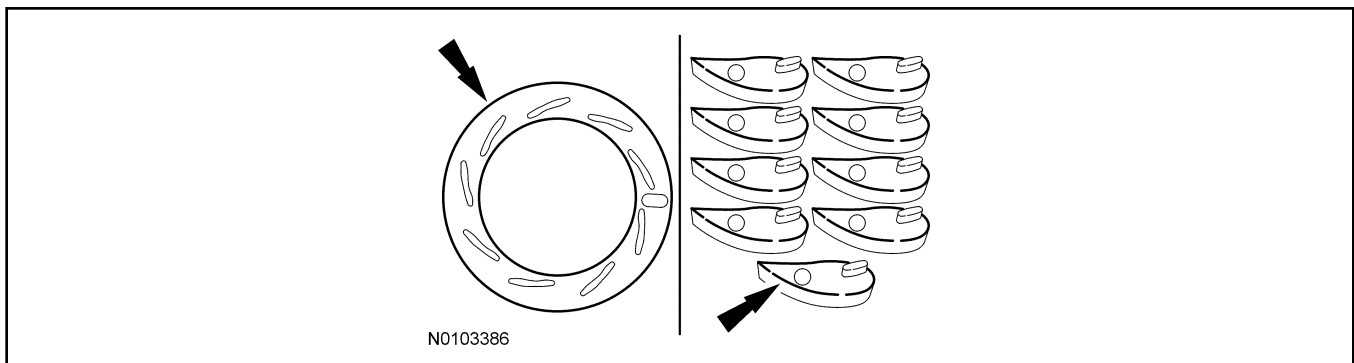
Use a 5 cm (2 in) abrasive disk (such as a Scotch-Brite® 051131-07480, or equivalent).

Using a 5 cm (2 in) abrasive disk, clean the remaining carbon deposits from the center housing unison ring hub and center housing facing surface.

3. **NOTE:**

Use a 5 cm (2 in) abrasive disk (such as a Scotch-Brite® 051131-07480, or equivalent).

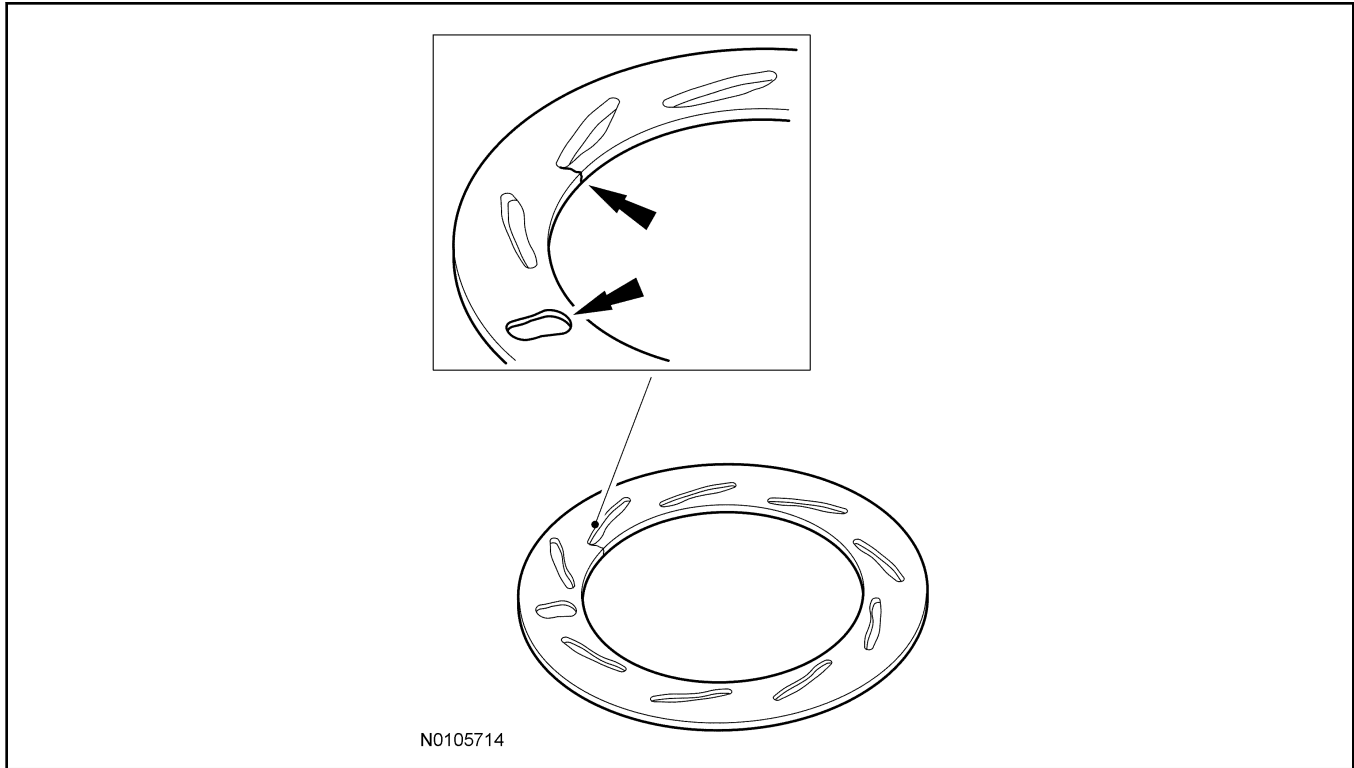
Using a 5 cm (2 in) abrasive disk, clean the remaining carbon deposits from the unison ring and turbocharger vanes.



## 4. Recheck the unison ring for cracks and excessive wear in the slots.

- Replace the unison ring if it is cracked or has excessive wear in the slots.

## GENERAL PROCEDURES (Continued)

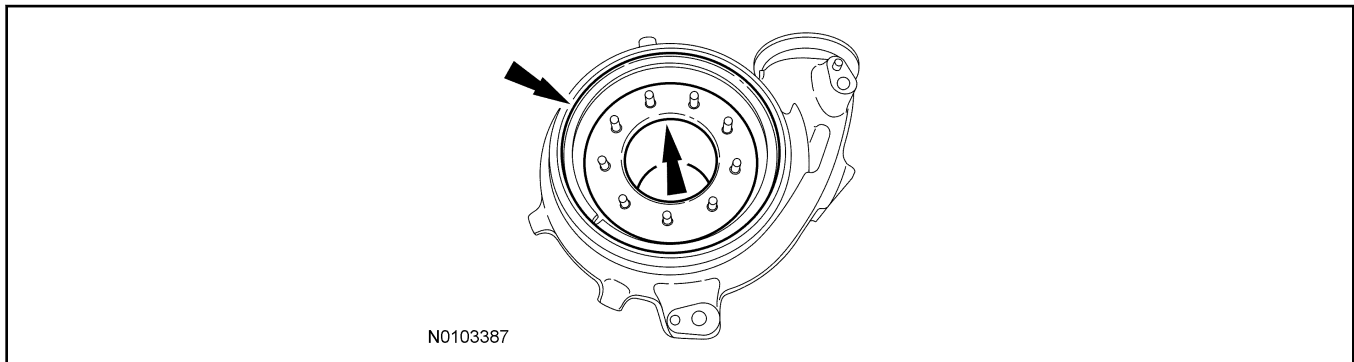


5. **NOTICE:**  
Use care when cleaning around the turbine vane pivot pins. Damaging the pins during the cleaning process can cause unwanted noise or affect turbocharger performance.

**NOTE:**

Use a 5 cm (2 in) abrasive disk (such as a Scotch-Brite® 051131-07480, or equivalent) and a 2.5 cm (1 in) holder (such as 3M™ Roloc® + Holder 61-5000-7982-9, or equivalent).

Using a 5 cm (2 in) abrasive disk cut down to a 2.5 cm (1 in) disk and a 2.5 cm (1 in) holder, clean the remaining carbon deposits from the turbine housing. Remove carbon deposits from all surfaces that contact moving parts as well as mating surfaces of the housing.

**Turbocharger Assembly**

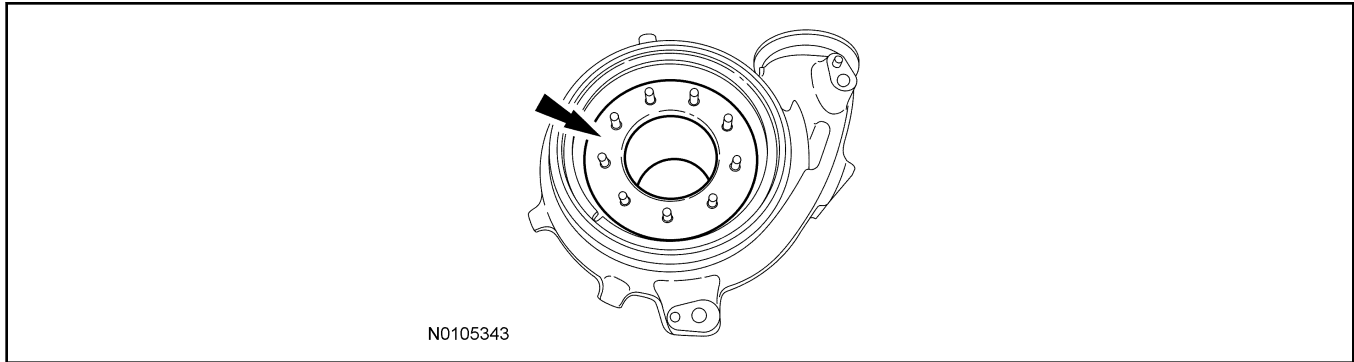
1. **NOTE:**  
Do not apply anti-seize lubricant to the turbocharger vanes and posts as it may prevent proper operation of the turbocharger vanes.

Apply a light coating of anti-seize lubricant to the turbine housing center section.

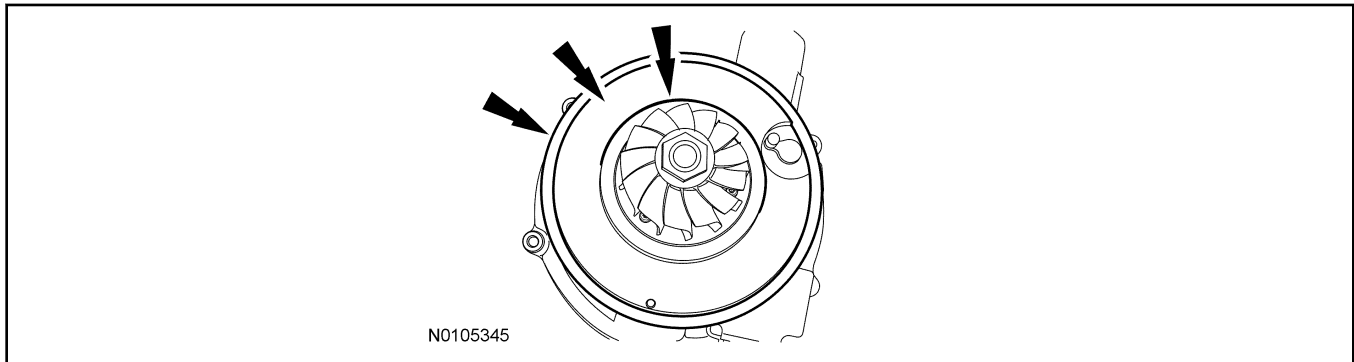
- Remove all excessive lubricant with a clean shop towel.



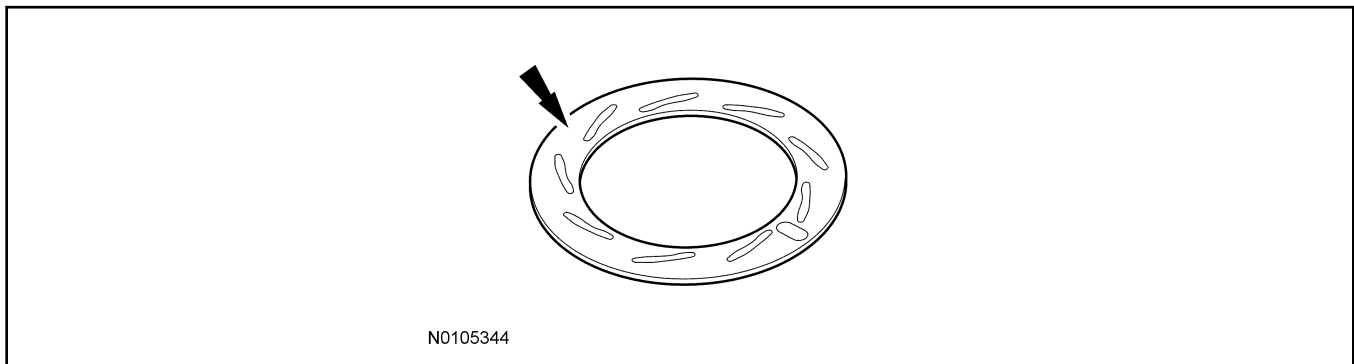
## GENERAL PROCEDURES (Continued)



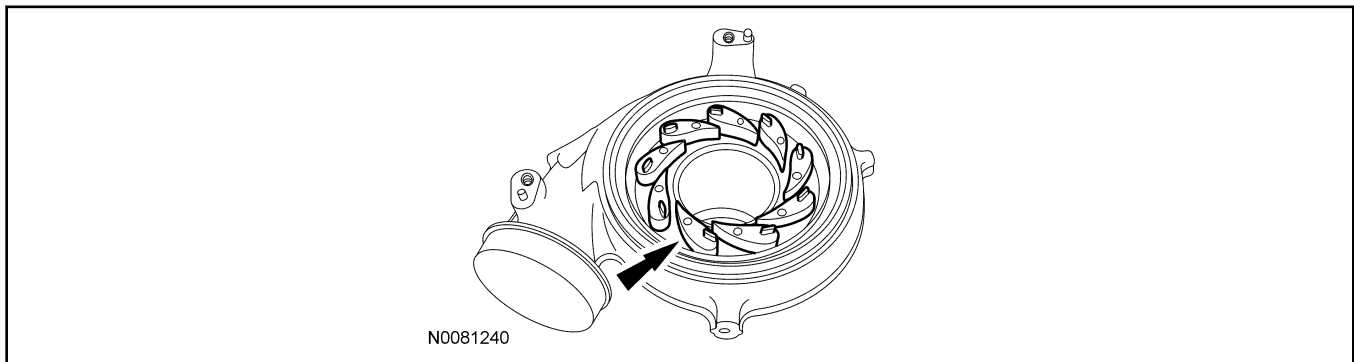
2. Apply a light coating of anti-seize lubricant to the turbine housing center section and pilot diameters.



3. Apply a light coating of anti-seize lubricant to both sides of the unison ring.
  - Remove all excessive lubricant from the unison ring grooves.

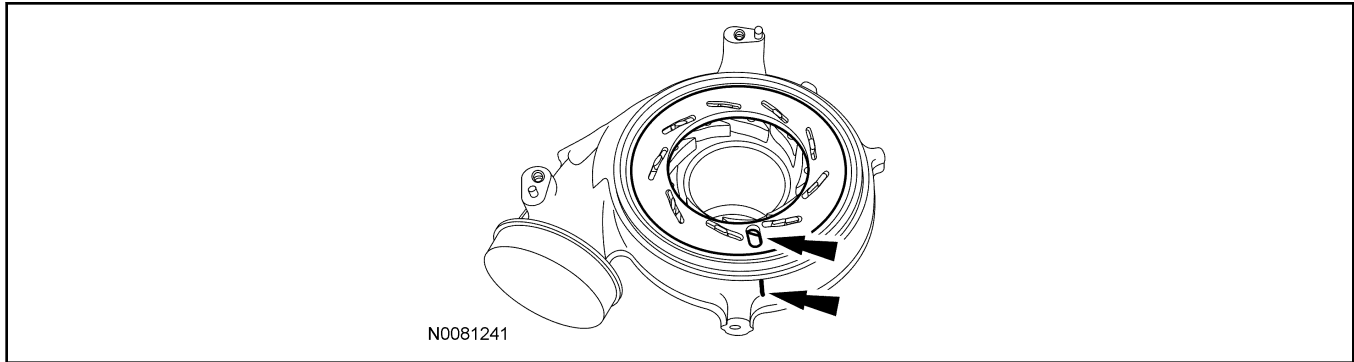


4. Install the turbocharger vanes into the turbine housing.



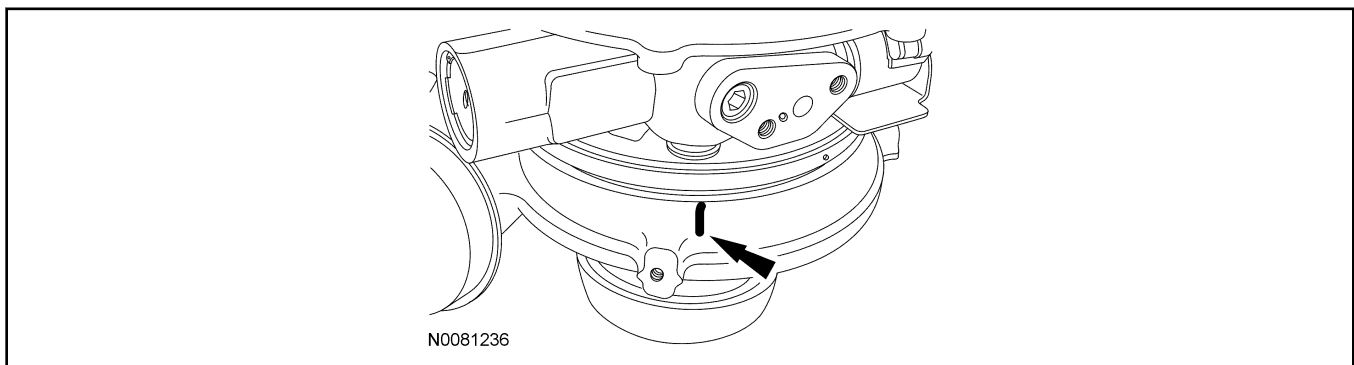
5. Position the unison ring onto the turbocharger vanes, aligning it with the mark on the side of the turbine housing.
  - Verify free movement of the turbocharger vanes and unison ring.

## GENERAL PROCEDURES (Continued)

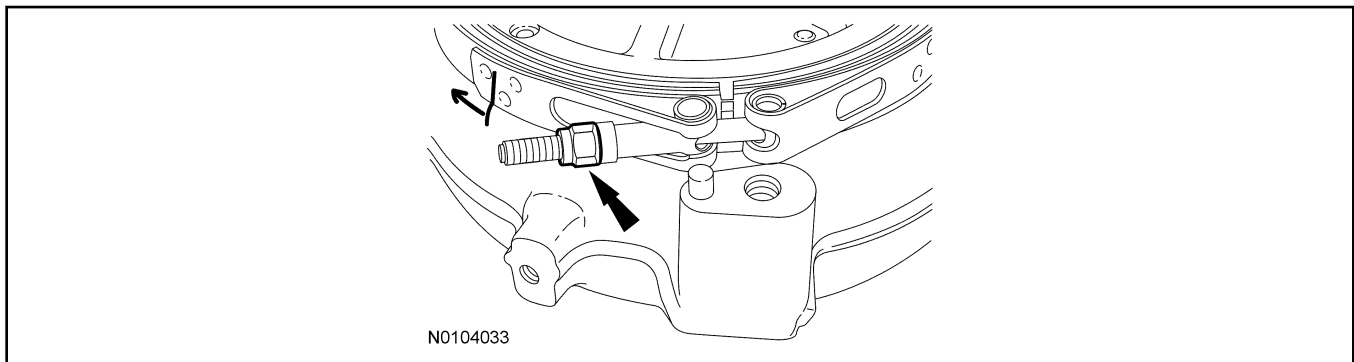


6. **NOTE:**  
Position the V-band clamp on the turbine housing prior to assembly of the turbocharger.

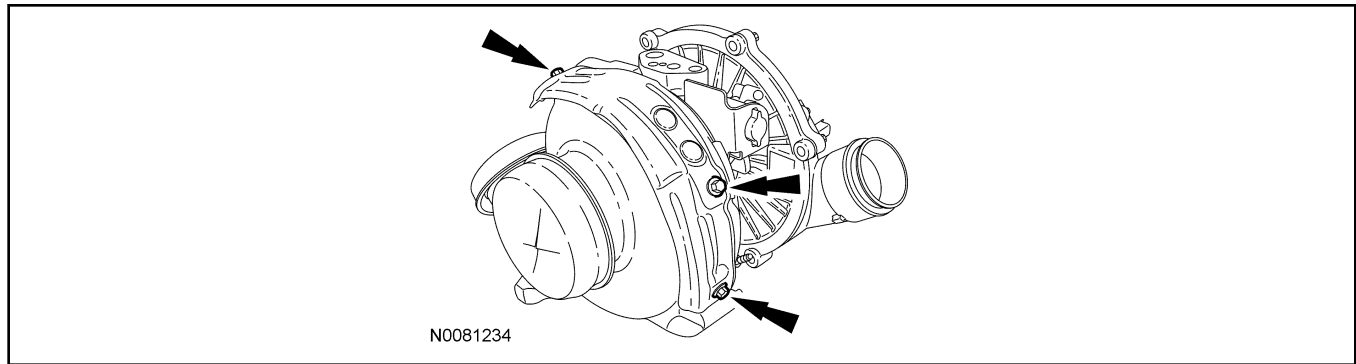
Lower the center housing section onto the turbine housing, aligning the unison ring crank first, then the housing dowel.



7. Align the V-band clamp with the paint mark. Install the locknut for the V-band clamp. Apply anti-seize lubricant to the threads of the V-band clamp. Tighten the nut in 5 stages.
- Stage 1: Tighten to 18 Nm (159 lb-in).
  - Stage 2: Loosen the nut.
  - Stage 3: Tighten to 5 Nm (44 lb-in).
  - Stage 4: Tap on the V-band clamp with a rubber mallet to seat the clamp.
  - Stage 5: Tighten to 17 Nm (150 lb-in).



8. Install the turbocharger heat shield and 3 bolts.
- Tighten to 11 Nm (97 lb-in).

**GENERAL PROCEDURES (Continued)**9. **NOTE:**

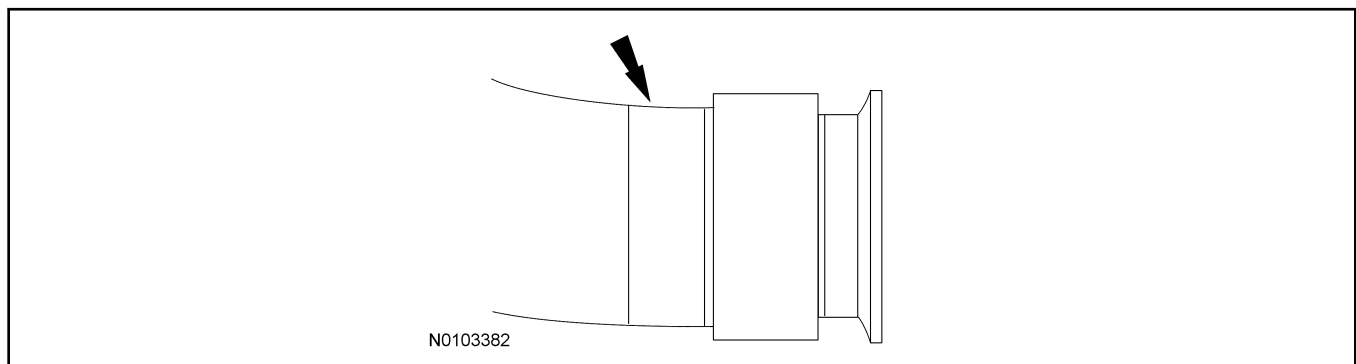
Do not spray brake parts cleaner directly into the turbocharger as it may remove the previously applied lubricants.

Remove the duct tape or covers from the turbocharger.

- Remove any tape residue with a shop towel dampened with brake parts cleaner.

## 10. Verify that the engine has the updated turbocharger oil drain tube.

- Measure the turbocharger drain tube diameter. An updated tube will measure approximately 22.225 mm (0.875 in). The old style drain tube will measure approximately 19.05 mm (0.750 in). Replace the turbocharger drain tube if it is the old style tube.



## 11. Install the turbocharger. For additional information, refer to Turbocharger in this section.