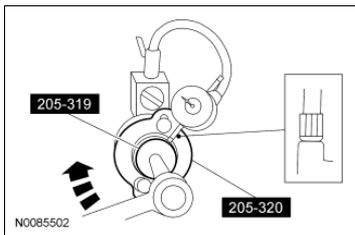


6. If the flange runout exceeds 0.25 mm (0.010 in), remove the pinion flange, re-index the flange one-half turn on the pinion and reinstall it. Refer to [Section 205-02A](#) .

7. Check the runout again. If necessary, rotate the flange until an acceptable runout is obtained. If the flange runout is still more than 0.25 mm (0.010 in), install a new pinion flange.



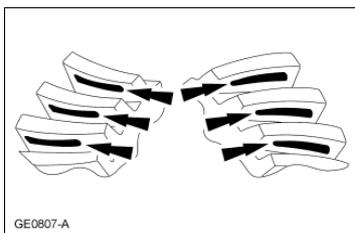
8. If excessive runout is still evident after installation of the pinion flange, install a new ring and pinion. Repeat the above checks until the runout is within specifications.

### Contact Pattern Location

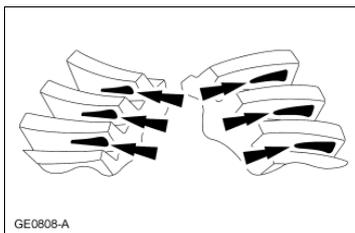
In general, desirable ring gear tooth patterns must have the following characteristics:

- Drive pattern on the drive side ring gear well centered on the tooth
- Coast pattern on the coast side ring gear well centered on the tooth
- Clearance between the pattern and the top of the tooth
- No hard lines where the pressure is high

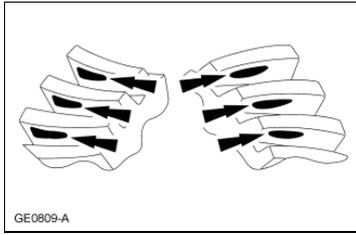
Acceptable ring gear tooth patterns for all axles.



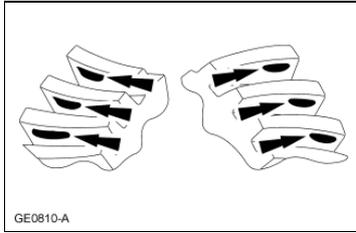
Correct backlash with a thinner pinion position shim required.



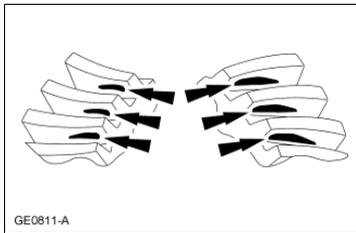
Correct backlash with a thicker pinion position shim required.



Correct pinion position shim that requires a decrease in backlash.



Correct pinion position shim that requires an increase in backlash.



**Driveline Angle Measurement**

## Special Tool(s)

	<p>Anglemaster II Driveline Inclinometer/Protractor 164-R2402 or equivalent</p>
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**NOTE:** This procedure does not apply to CV joints, flex couplers or double cardan joints that are used in some driveshafts. This check is for single-cross and roller-style joints found in the driveshafts.

**NOTE:** Prior to checking driveline angularity, inspect the U-joints for correct operation.

**NOTE:** An incorrect driveline angle can cause a vibration or shudder. For additional information, refer to [Section 100-04](#).

**NOTE:** Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height, rear spring and engine mounts.

**All vehicles**

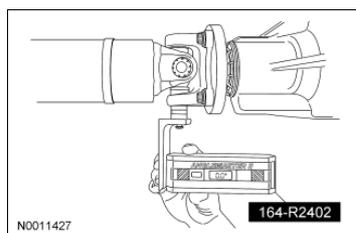
1. Carry out the following preliminary setup steps:
  - Inspect the U-joints for correct operation.
  - Park the vehicle on a level surface such as a drive-on hoist, or back onto a front end alignment rack.
  - Verify the curb position ride height is within specifications with the vehicle unloaded and all of the tires are inflated to their normal operating pressures.
  - Calibrate the Anglemaster II Driveline Inclinometer/Protractor by placing it on a clean, flat level section of the frame rail and press the ALT-ZERO button.

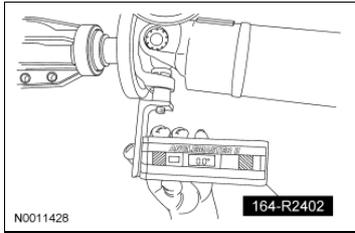
**Vehicles with flat-flanged, split-pin or slip-flanged U-joints**

2. **NOTE:** If equipped, remove the snap ring to allow access to the base of the U-joint cup. Make sure the Anglemaster II Driveline Inclinometer/Protractor is seated against the U-joint cup.

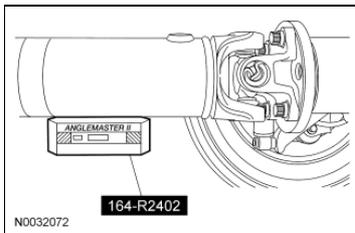
**NOTE:** Rotate the driveshaft until the flange U-joint cup is parallel with the floor. This will simplify taking measurements.

To check the U-joint operating angle, install the Anglemaster II Driveline Inclinometer/Protractor. Check and record the flange angle as angle A.





- Using the Anglemaster II Driveline Inclinator/Protractor, measure the slope of the connecting component. Record the measurement of the component angle as angle B.

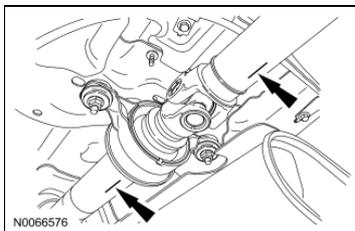


### Multiple piece driveshafts

- NOTE:** Repeat this step for each center support bearing on the driveshaft.

**NOTE:** It is not necessary to remove the U-joint snap ring, if equipped, for these measurements.

Using the Anglemaster II Driveline Inclinator/Protractor, measure the slope of the components in front and behind the center support bearing U-joint in the area indicated. Record the front component as angle A and the rear component as angle B.



### All vehicles

- NOTE:** When 2 connected components slope in the same direction, subtract the smallest number from the larger number to find the U-joint operating angle. When 2 connected components slope in the opposite direction, add the measurements to find the U-joint operating angle.

Calculate the difference in the slope of the components to determine the U-joint operating angle.

- The U-joint operating angle is the angle formed by 2 yokes connected by a cross and bearing kit. Ideally, the operating angles on each connection of the driveshaft must:
  - ◆ be equal or within one degree of each other.
  - ◆ have a 3 degree maximum operating angle.
  - ◆ have at least one-half of one degree continuous operating angle.

- If the angle is not within specifications, repair or adjust to obtain the correct angle. Inspect the engine mounts, transmission mounts, center support bearing mounting, rear suspension, rear axle, rear axle mounting or the frame for wear or damage.



## Driveshaft Runout and Balancing

### Special Tool(s)

 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
 ST3025-A	Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) 257-00018 or equivalent

### Driveshaft Inspection

**NOTE:** Driveline vibration exhibits a higher frequency and lower amplitude than high-speed shake. Driveline vibration is directly related to the speed of the vehicle and is noticed at various speeds. Driveline vibration can be perceived as a tremor in the floorpan or heard as a rumble, hum or boom.

**NOTE:** Refer to Specifications in this section for all runout specifications.

1. **NOTE:** Do not make any adjustments before carrying out a road test. Do not change the tire pressure or the vehicle load.

Carry out a visual inspection of the vehicle. Operate the vehicle and verify the condition by reproducing it during the road test.

- The concern should be directly related to vehicle road speed, not affected by acceleration or deceleration or could not be reduced by coasting in NEUTRAL.
2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02](#) .
    - The driveshaft should be kept at an angle equal to or close to the curb-weighted position. Use a twin-post hoist or a frame hoist with jackstands.
  3. Inspect the driveshaft for damage, undercoating or incorrectly seated U-joints. Rotate the driveshaft slowly by hand and feel for binding or end play in the U-joint trunnions. Remove the driveshaft. For additional information, refer to [Section 205-01](#) . Inspect the slip yoke splines for any galling, dirt, rust or incorrect lubrication. Clean the driveshaft or install new U-joints as necessary. Install a new driveshaft if damaged. After any corrections or new components are installed, recheck for the vibration at the road test speed.
    - If the vibration is gone, test drive the vehicle.
    - If the vibration persists or the driveshaft passes visual inspection, measure the driveshaft runout.

### Driveshaft Runout

1. Install the Dial Indicator Gauge with Holding Fixture. Rotate the driveshaft by turning the axle and measure the runout at the front, the center and the rear of the driveshaft.
  - If the runout exceeds 1 mm (0.040 in) at the front or center, install a new driveshaft.

- If the front and center is within 1 mm (0.040 in), but the rear runout is not, index-mark the rear runout high point and proceed to Step 2.
- If the runout is within 1 mm (0.040 in) at all points, recheck for vibration at road test speed. If the vibration persists, balance the driveshaft. For additional information, refer to Driveshaft Balancing in this procedure.

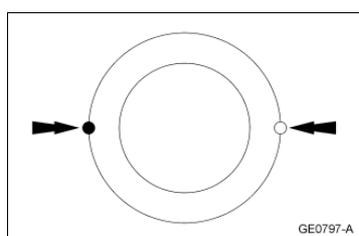
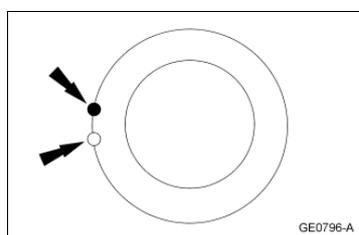
2. **NOTE:** Circular pinion flanges can be turned in 90 degree or one-fourth increments. Half-round pinion flanges are limited to 2 positions.

Index-mark the driveshaft to the pinion flange. Disconnect the driveshaft and rotate it 180 degrees. Reconnect the driveshaft. Recheck the runout at the rear of the driveshaft.

- If the runout is still over specification, mark the high point and proceed to Step 3.
- If the runout is within specification, check for the vibration at the road test speed. If the vibration is still present, balance the driveshaft. For additional information, refer to Driveshaft Balancing in this procedure.

3. Excessive driveshaft runout can originate in the driveshaft itself or from the pinion flange. To find the source, compare the 2 high points previously determined.

- If the index marks are close together, within 25 mm (1 in), the driveshaft is eccentric. Install a new driveshaft.
- If the marks are on opposite sides of the driveshaft, 180 degrees apart, the slip yoke or pinion flange is responsible. Check the pinion flange runout. If the pinion flange runout exceeds specifications, a bent pinion is indicated.
- If the pinion flange and pinion runouts are within specifications, road test and check for the vibration at the road test speed. If the vibration persists, balance the driveshaft. For additional information, refer to Driveshaft Balancing in this procedure.

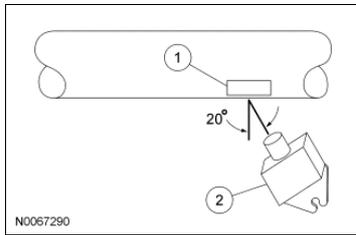


### Driveshaft Balancing — Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix)

#### All vehicles

1. Install the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) to the vehicle.
2. Working under the vehicle, install an accelerometer. The accelerometer can be attached and mounted near either the transmission or differential end of the driveshaft.

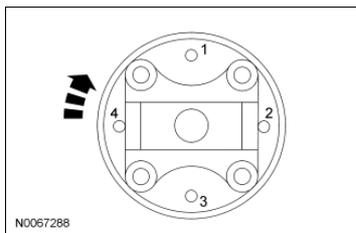
3. Clean an area of the driveshaft and install the reflective tape, then install the photo-tachometer sensor. The sensor should be placed at approximately a 20-degree angle from perpendicular to the surface of the reflective tape. Make sure the sensor does not get moved during the balance procedure.
  1. Reflective tape.
  2. Photo-tachometer sensor.



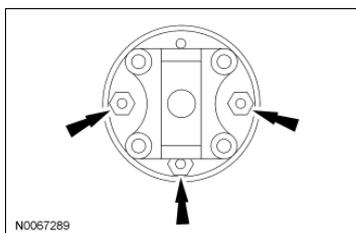
4. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a driveshaft balance test with the driveshaft unmodified.

### Vehicles with tapped pinion flanges

5. Label the tapped holes in the pinion flange numerically, starting at the top hole as 1. Mark the remaining holes 2, 3 and 4. Label in the direction of rotation.

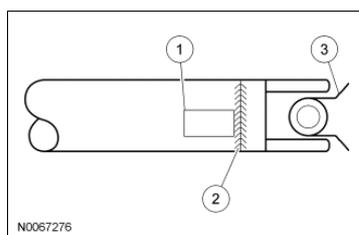


6. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a second test with the 12 mm (0.47 in) test weight set screw in the No. 1 hole, previously marked on the pinion flange.
7. Remove the test weight, then install the weight combination directed by the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix).



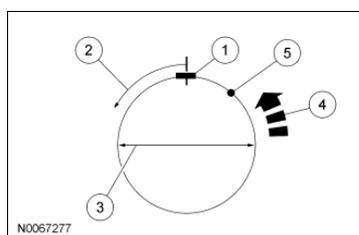
### Vehicles without tapped pinion flanges

8. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a second test with a test weight. Using a metal band, secure the test weight to the end of the driveshaft. The weight should be placed at the end of the driveshaft tube, as close to the tube-to-yoke weld seam as possible. Mark the location of the test weight on the driveshaft, as shown in the figure below.
  1. Test weight.
  2. Tube-to-yoke weld seam.
  3. Driveshaft pinion flange.
    - Select the test weight based on driveshaft size. Larger driveshafts use 10 g (0.353 oz). Smaller driveshafts use 5 g (0.176 oz).



9. Remove the test weight, then install the recommended weight at the position directed by the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix). Using a metal band and epoxy, secure the test weight to the driveshaft, as shown in the figure below.

1. Test weight.
  2. Measure in this direction.
  3. Driveshaft diameter.
  4. Directional rotation.
  5. Balance weight relative to test weight centerline.
- The results are displayed with respect to the location to where the test weight was placed.

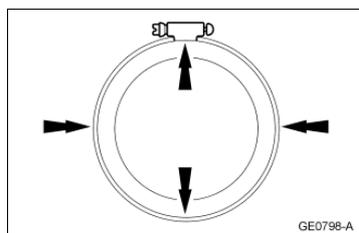


### All vehicles

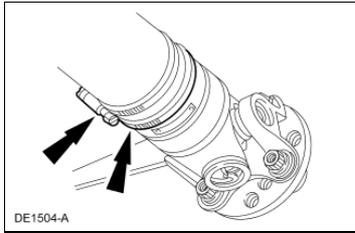
10. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a third test to verify the repair.

### Driveshaft Balancing — Hose Clamp Method

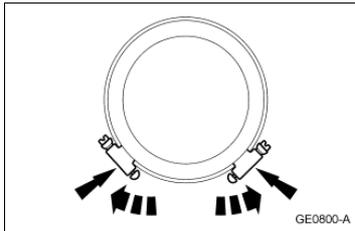
1. Install 1 or 2 hose clamps on the driveshaft, near the rear. Position of the hose clamp head(s) can be determined through trial and error.
2. Mark the rear of the driveshaft into 4 approximately equal sectors and number the marks 1 through 4. Install a hose clamp on the driveshaft with its head at position No. 1, as shown in the figure below. Check for vibration at road speed. Recheck with the clamp at each of the other positions to find the position that shows minimum vibration. If 2 adjacent positions show equal improvement, position the clamp head between them.



3. If the vibration persists, add a second clamp at the same position and recheck for vibration.



4. If no improvement is noted, rotate the clamps in opposite directions, equal distances from the best position determined in Step 2. Separate the clamp heads about 13 mm (1/2 in) and recheck for vibration at the road speed.



5. Repeat the process with increasing separation until the best combination is found or the vibration is reduced to an acceptable level.
-

## Material

Item	Specification	Fill Capacity
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B	—
Threadlock and Sealer TA-25	WSK-M2G351-A5	—

## Torque Specifications

Description	Nm	lb-ft
Center bearing bracket bolts	63	46
Driveshaft-to-pinion flange bolts	112	83
Front driveshaft bolts	103	76