MERITOR®

an ArvinMeritor brand

Revised 03-02
$2.50

Drivelines

Maintenance Manual MM-96147

RPL Series Permalube™

Wing-Style Permalube™
Easy Service™
Full Round

Includes Driveline Angle Analysis
Program Instructions and Interactive CD

Before You Begin

This manual provides maintenance and service procedures for Meritor's RPL Series Permalube™, Full-Round, Wing-Style Permalube™ and Easy Service™ drivelines. Before you begin procedures:

1. Read and understand all instructions and procedures before you begin to service components.
2. Read and observe all Caution and Warning safety alerts that precede instructions or procedures you will perform. These alerts help to avoid damage to components, serious personal injury, or both.
3. Follow your company's maintenance and service, installation, and diagnostics guidelines.
4. Use special tools when required to help avoid serious personal injury and damage to components.

Safety Alerts, Torque Symbol and Notes

WARNING	A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury.
CAUTION	A Caution alerts you to an instruction or procedure that you must follow exactly to avoid damage to components.
	A torque symbol alerts you to tighten fasteners to a specified torque value.
NOTE	A Note provides information or suggestions that help you correctly service a component.

Order or Access Product and Service Information in the DriveTrain Plus™ by ArvinMeritor Tech Library on our Web Site

Enter the following address in your browser's address box. The screen will display an index of publications by category. Bookmark this screen for quick access to the Tech Library.

arvinmeritor.com/tech_library/home.asp

To Order Information by Phone

Call ArvinMeritor's Customer Service Center at 800-535-5560 to order the following items.

- Driveline Alignment (Publication TP-M/TG11)
- Driveline I.D. Gauge Kit (Publication SP-87101B)
- Straight Talk About U-Joints (Publication TP-8416)
- Drivetrain Plus™ by ArvinMeritor Technical Electronic Library on CD. Features product and service information on most Meritor, ZF Meritor and Meritor WABCO products. $20. Order TP-9853.

How to Order Special Tools

Call ArvinMeritor's Customer Service Center at 800-535-5560 to order the yoke gauge tool. Specify part number SP-87101B.

SPX Kent-Moore, 28635 Mound Road, Warren, Michigan, 48092. Call the company's customer service center at 800-345-2233, or visit their web site at spxkentmoore.com.

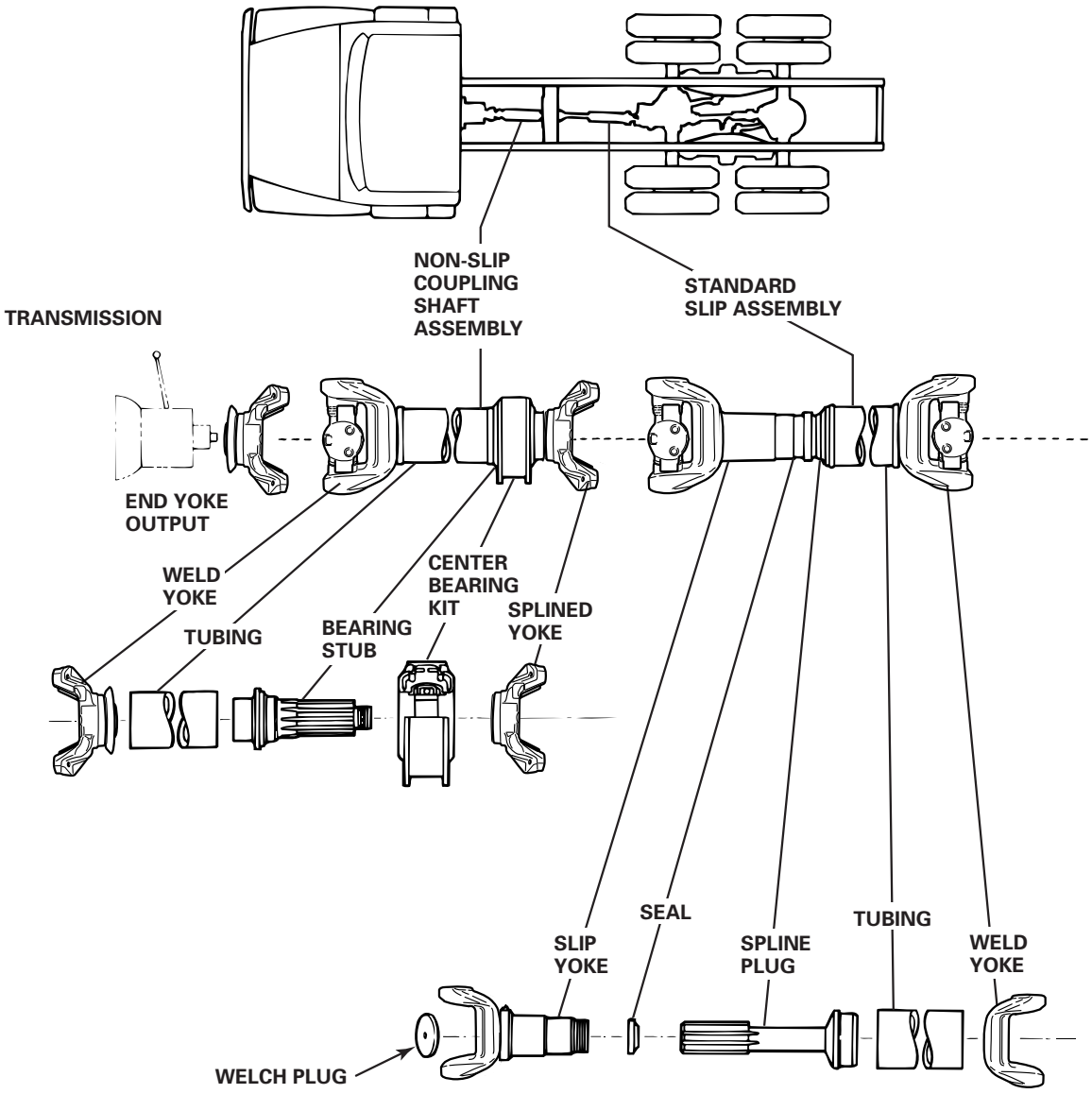
Tiger Tool. Call the company's customer service center at 800-661-4661, or visit their web site at tigertool.com.

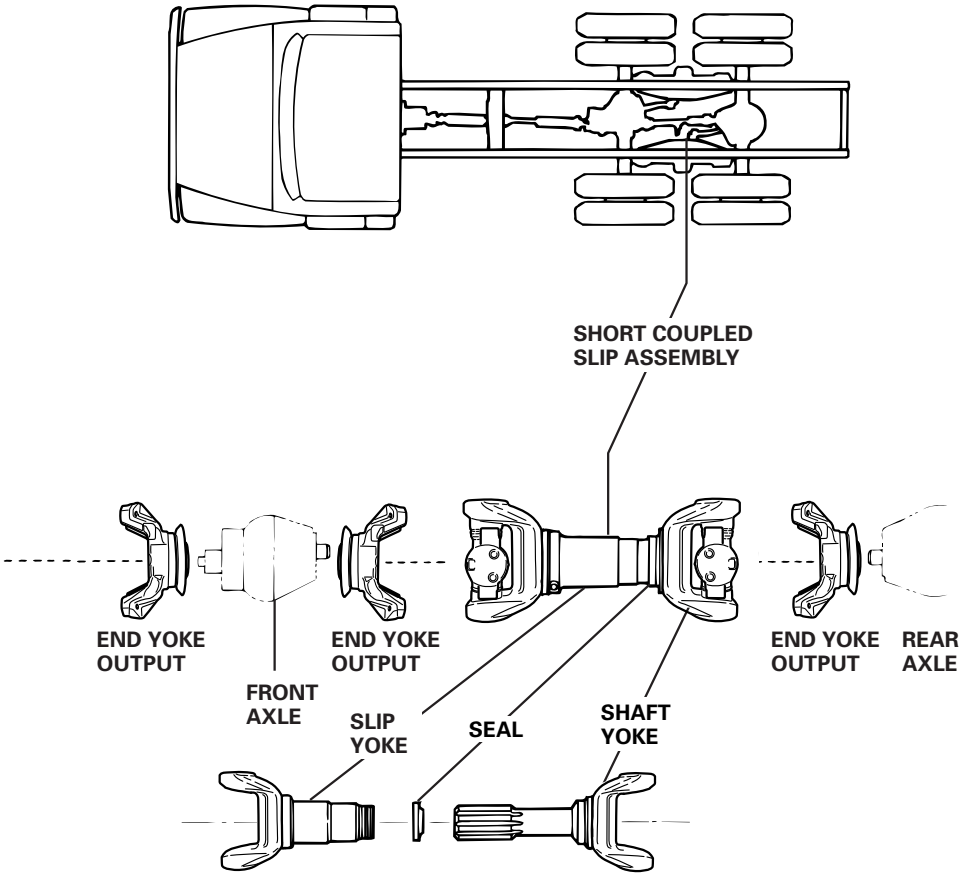
MERITOR®

Table of Contents

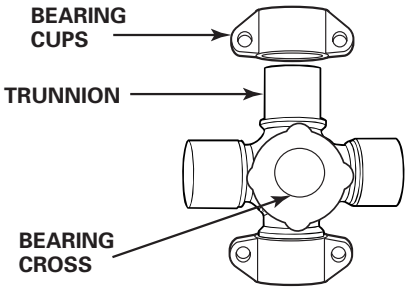
Typical Driveline System

NOTE: Series shown are for illustration only.





UNIVERSAL JOINT COMPONENTS



RPL Series Permalube™ (Non-Greaseable)

Meritor's RPL Series Permalube non-greaseable driveline is permanently lubricated and sealed at the factory and does not require lubricants. Arrows on the wing bushings help you to correctly install the universal joint. **Figure 1.1**.

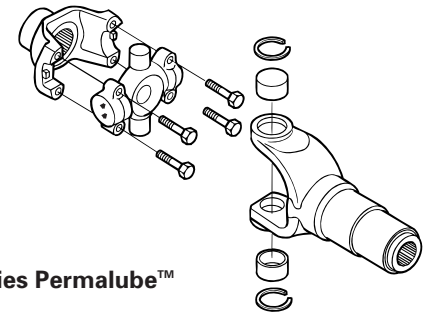
Wing-Style Permalube™

Meritor's Wing-Style Permalube driveline requires lubrication of the slip yoke splines only. **Figure 1.2**.

Full-Round, Easy Service™ and Wing-Style (Greaseable)

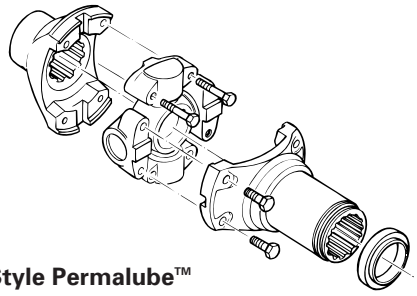
Full-Round, Easy Service and Wing-Style greaseable drivelines require periodic lubrication of the universal joints and slip yoke splines. **Figures 1.3 and 1.4**.

Figure 1.1



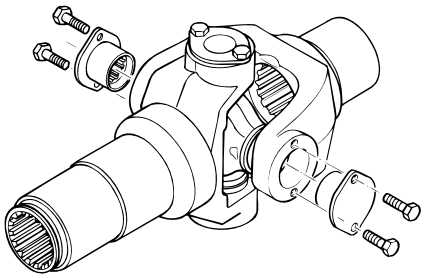
RPL Series Permalube™

Figure 1.2



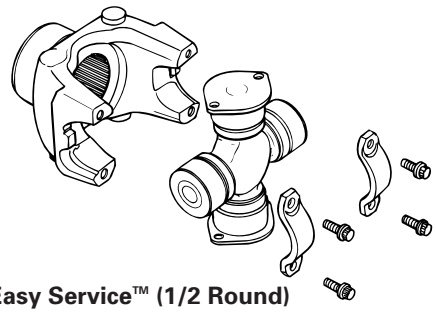
Wing-Style Permalube™

Figure 1.3



Full-Round

Figure 1.4



Easy Service™ (1/2 Round)

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Loose bolts, missing balance weights, damaged tubing, excessive slip spline wear or excessive looseness across the ends of universal joint bearing cup assemblies can cause imbalance or vibration in the driveline assembly. Imbalance and vibration can cause component wear, which can result in separation of the driveline from the vehicle. Inspect the driveline on a periodic basis to detect and replace damaged and worn components. A separated driveline can result in property damage and serious personal injury.

Inspection Guidelines

Inspect RPL Series Permalube™ and Wing-Style Permalube™ non-greaseable drivelines at least every 25,000 miles (40 000 km).

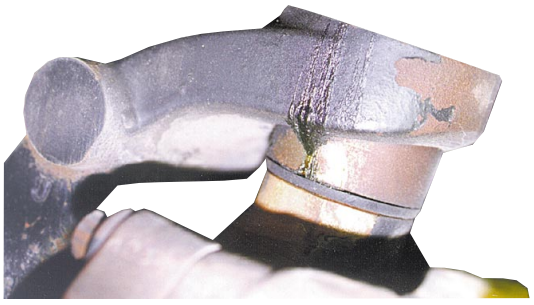
During vehicle operation, some of the universal joint grease may purge out at one or more of the universal joint seals. **Figure 2.1**.

- This is a normal occurrence and does not indicate that you must replace the universal joint.

Eventually the grease will stop purging, and the universal joint seals may have a “crusted” look. **Figure 2.2**.

- The “crusted” appearance is normal and does not indicate that you must replace the universal joint.

Figure 2.1



Damaged bearing cup seals or excessive universal joint wear may allow an excessive amount of grease to purge from one or more of the universal joint seals. **Figures 2.3 and 2.4**.

- Excessive grease around a universal joint seal indicates that you must replace the universal joint.

Figure 2.2

Figure 2.3

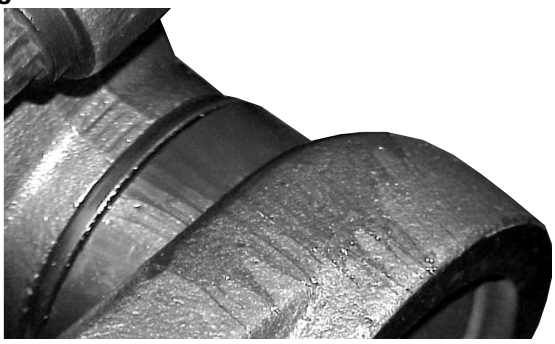


Figure 2.4

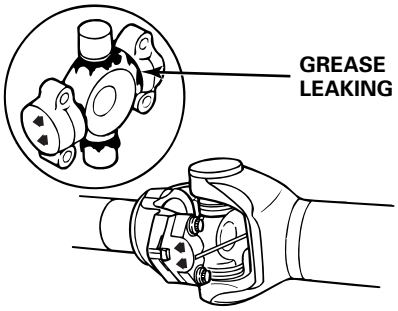


Table A: RPL Series Permalube and Wing-Style Permalube Driveline Inspection Intervals and Procedures

Mileage Intervals	Procedures
At initial inspection, or no more than 2,000 miles (3 200 km)	• Verify that all bolts are tightened to 115-135 lb-ft (155-183 N•m). T
Every 25,000 miles (40 000 km)	If you observe any of the following conditions, remove and replace components as needed. 1. Inspect all universal joints for grease leakage. • **If a universal joint shows normal grease leakage:** Do not replace the universal joint. **Figures 2.1 and 2.2.** • **If a universal joint shows excessive grease leakage:** Replace the universal joint. **Figure 2.3.** 2. Check for excessive looseness across the ends of the universal joint bearing cup assemblies and trunnions. • Grip the driveline near the INBOARD yoke with both hands. • Try to move the yoke VERTICALLY and HORIZONTALLY. Movement in the universal joint relative to the INBOARD or OUTBOARD yokes must not exceed 0.006-inch (0.152 mm). **Figure 2.5.** 3. Inspect the slip yoke spline seal for grease leakage or seal damage. 4. Inspect for missing balance weights, damaged tubing or a missing welch plug at the slip yoke.
Every 150,000 miles (240 000 km)	**In addition to the 25,000-mile (40 000 km) requirements:** • Use a dial indicator to inspect the slip splines for wear (backlash). Radial looseness between the slip yoke and the tube shaft must not exceed 0.017-inch (0.432 mm). **Figure 2.6.**

Figure 2.5

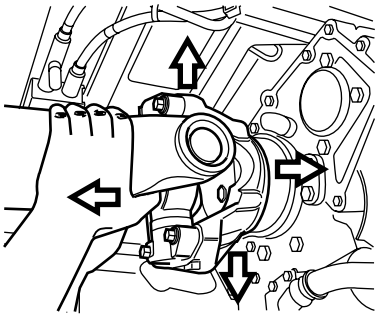
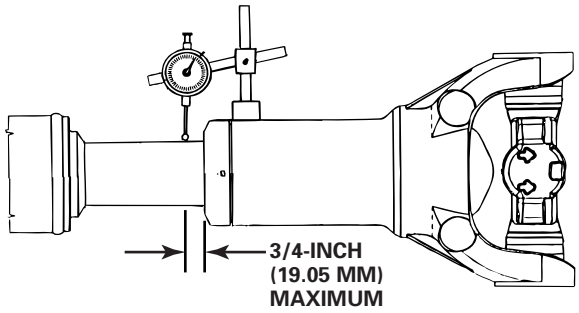


Figure 2.6



Driveline

WARNING

Check end yoke retaining nuts and bolts for looseness. Tighten loose fasteners to specification. Check the input and output shaft splines for wear and damage. Replace worn or damaged splines. Check for loose, missing or damaged driveline fasteners and parts. Tighten loose fasteners, and replace damaged and missing parts. Loose, damaged or missing parts can cause the driveline to separate from the vehicle. Serious personal injury and damage to components can result.

Only service a driveline when the engine is OFF. A rotating driveline can cause serious personal injury.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

1. Park the vehicle on a level surface. Block the wheels to keep the vehicle from moving. Raise the vehicle so that the area you will service is off the ground.
2. Inspect the driveline at regular intervals. Loose end yokes, excessive radial movement, slip spline radial movement, bent driveline tubing or missing plugs in the slip yoke can damage universal joints and bearings.
3. Check the output and input end yokes on both the transmission and axle for axial looseness. Refer to the axle or transmission manufacturer's service instructions.
   - **If the output and input end yokes are loose:** Disconnect the driveline. Tighten the end yoke retaining nut to the correct specification. Refer to the axle or transmission manufacturer's service instructions.
4. Inspect for worn universal joints. Apply vertical force of about 50 pounds (22.7 kg) to the driveline near the universal joints.
   - **If movement is greater than 0.006-inch (0.152 mm):** Replace the universal joint.
5. Use a dial indicator to examine the slip yoke spline for excessive radial movement. Radial movement between the slip yoke and the tube shaft must not exceed 0.017-inches (0.432 mm).
   - **If the radial movement exceeds 0.012-inch (0.305 mm):** Replace the slip yoke and the tube shaft.
6. Inspect the driveline for damaged or bent tubing. Carefully remove contaminants, such as mud and road debris.

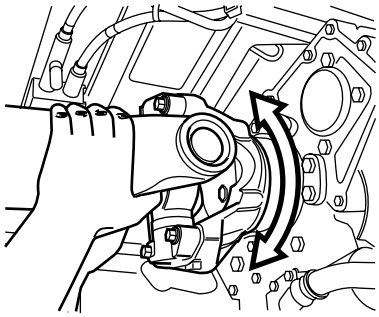
End Yokes

Perform the following procedures BEFORE you lubricate universal joints or slip yokes. If you lubricate these components before you inspect them, lubricant can cover wear, damage and looseness.

1. Do not lubricate components. Inspect all input and output end yoke retaining nuts and bolts for gaps between mating surfaces.
   - **If gaps are present:** Refer to the transmission, axle or transfer case manufacturer's service instructions.
2. Use the following procedure to check all input and output end yokes for looseness.
   A. Hold the end yoke with both hands.
   B. Move the end yoke UP-AND-DOWN and SIDE-TO-SIDE. There shouldn't be any movement where the yoke connects to the input and output shafts. **Figure 2.5.**
      - **If the input and output end yokes are loose:** Disconnect the driveline. Tighten the end yoke retaining nut or bolt to the correct specification. Refer to the axle or transmission manufacturer for correct inspection and replacement procedures.
      - **If the input and output end yokes are not loose, check that the transmission output shaft and axle input shaft splines aren't loose at the end yoke:** Hold the yoke with one hand and rotate it LEFT-TO-RIGHT while you check end play for radial looseness. **Figure 2.7.**
      - **If you find excessive radial looseness:** Replace the end yoke, or input or output shafts, as necessary.

3. Inspect for worn, damaged, missing and loose parts. Replace as required. Refer to the appropriate Removal and Installation sections in this manual for procedures.

Figure 2.7

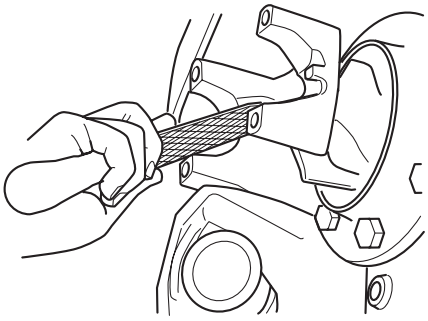


⚠ WARNING

Use a fine-tooth file or an emery cloth to remove raised metal or fretting from yoke cross hole surfaces. Take care not to remove an excessive amount of metal. These conditions can damage the cross and bearing and cause the driveline to separate from the vehicle. Serious personal injury and damage to components can result.

4. Inspect all end yoke cross hole surfaces and bolt hole threads for damage. Remove raised metal or fretting with a fine-tooth file or emery cloth. **Figure 2.8**.
   - **If bolt hole threads are damaged:** Replace the yoke.

Figure 2.8



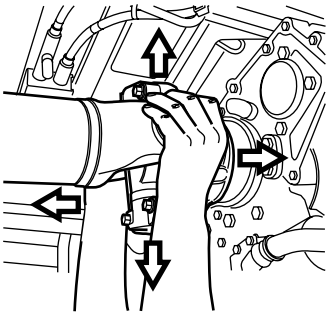
Universal Joints

⚠ WARNING

Excessive looseness across the ends of universal joint bearing cup assemblies can cause imbalance or vibration in the driveline assembly. Imbalance or vibration can cause component wear, which can result in separation of the driveline from the vehicle. Serious personal injury and damage to components can result.

1. Use the following procedure to check for looseness across the ends of the universal joint bearing cup assemblies and trunnions.
   A. Hold the INBOARD yoke on the driveline with both hands.
   B. Try to move the yoke UP-AND-DOWN and SIDE-TO-SIDE by applying at least 50 lb-ft (222.5 N•m) of force to the driveline near the universal joints. **Figure 2.9**.
      - **If movement is greater than 0.006-inch (0.152 mm):** Replace the universal joint.
2. Inspect all universal joint kits in the driveline assembly.

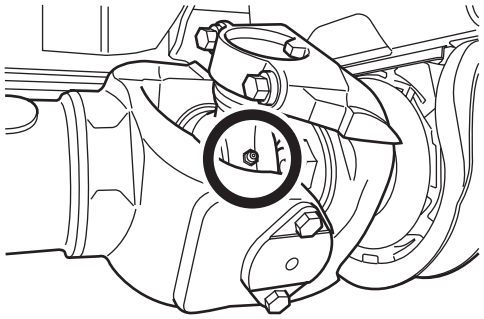
Figure 2.9



Greaseable Universal Joints

1. Check that all grease fittings are installed. Replace missing or damaged fittings. Tighten them to 6 lb-ft (8 N•m). **Figure 2.10**. T
2. Check for loose grease fittings. Tighten them to 6 lb-ft (8 N•m). T

Figure 2.10



Center Bearings

1. Inspect all center bearing and end yoke midship nuts for gaps between the mating surfaces. **Figure 2.11**.
   - **If you can see gaps between the mating surfaces:** Disconnect the driveline. Tighten the coupling yoke retaining nut to 450-600 lb-ft (612-816 N•m). T
2. Inspect the center bearing bracket bolts for looseness. **Figure 2.12**.
   - **If the bolts are loose:** Verify that the bracket is aligned correctly before you tighten the bolts. Tighten the center bearing bracket bolts. Refer to the vehicle manufacturer's procedures for the correct torque specification.
3. Inspect the center bearing rubber cushion for damage. If equipped, check that the deflectors are not rubbing against the rubber cushion. Verify that the rubber cushion is correctly seated in the metal bracket.
   - **If any of these conditions are evident:** Replace the center bearing assembly. Refer to Section 7.

Figure 2.11

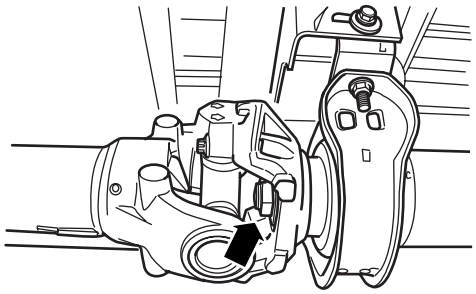
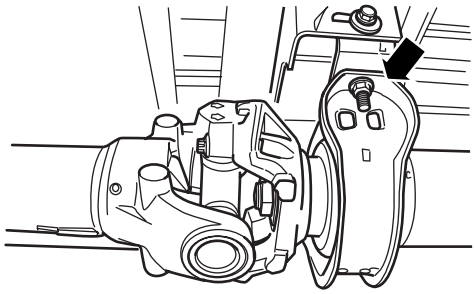


Figure 2.12



Self-Aligning Center Bearings

A self-aligning center bearing accepts ± 5 degrees of angular misalignment. This helps to ensure that the hanger bearing is correctly aligned to the driveline under all operating conditions.

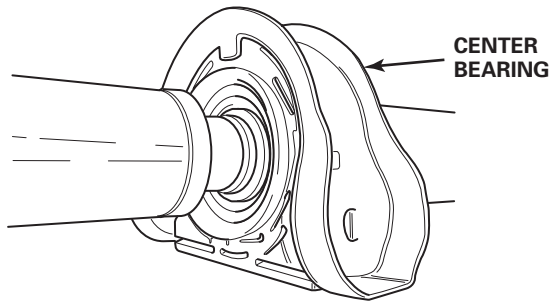
Use the same service procedures for a self-aligning center bearing as for a standard center bearing. You can identify a self-aligning center bearing by the bright gold color of the integral deflector.

Deflectors are integral to a self-aligning center bearing, so separate deflectors are not required.

Some vehicles manufactured after January 18, 2002, are equipped with self-aligning center bearings. **Figure 2.13**.

- **If you replace a self-aligning center bearing on a vehicle manufactured after January 18, 2002:** You must install a new self-aligning center bearing. Do not install an original-design bearing.

Figure 2.13



Slip Yoke

NOTE: Check a slip yoke for movement with the driveline installed and the vehicle on a level surface with its wheels on the ground.

1. Check that the vehicle is on a level surface with its wheels on the ground. The driveline should be installed.
2. Firmly mount a dial indicator with a magnetic base onto the slip yoke barrel next to the dust seal. **Figure 2.14**. You don't want the dial indicator to move when you check the slip yoke for looseness, or the measurement will not be correct.
3. Extend the dial indicator arm from the base, so that it contacts the neck of the spline plug within 3/4-inch (19.05 mm) from the dust seal. **Figure 2.14**.
4. With your hands near the center of the driveline, move the slip yoke UP-AND-DOWN. Check the dial indicator measurement. Movement between the spline plug and slip yoke must not exceed 0.017-inch (0.432 mm). **Figure 2.15**.
   - **If movement exceeds 0.017-inch (0.432 mm):** Components are worn or damaged. Replace as required.
5. Inspect the driveline for damage or bent tubing.
   - **If the driveline is damaged or bent:** Replace the driveline.
6. If necessary, carefully remove mud or road debris from the driveline.
7. Inspect the slip yoke spline seal for grease leakage or seal damage.
8. Inspect for missing balance weights, damaged tubing or a missing welch plug at the slip yoke.

Figure 2.14

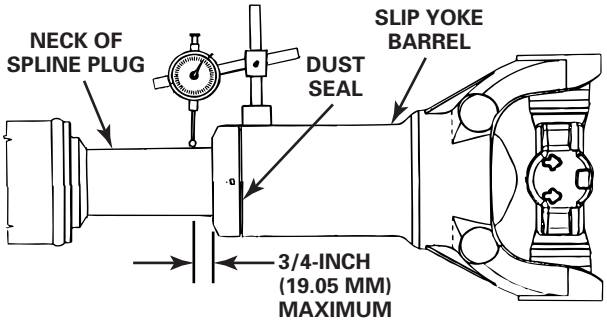
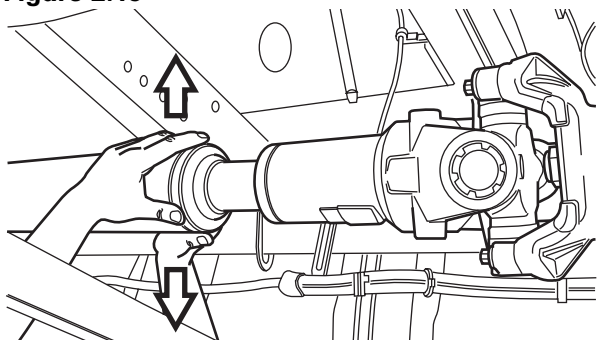


Figure 2.15



Universal Joint Capscrews

WARNING

Inspect RPL Series Permalube and Wing-Style Permalube drivelines for loose or missing capscrews and lockwashers. Loose or missing fasteners can allow the driveline to separate from the vehicle. Serious personal injury and damage to components can result. If fasteners are loose or missing:

- **RPL Series Permalube drivelines: Install new capscrews with Dri-Loc patches.**
- **Wing-Style Permalube drivelines: Install new capscrews with Dri-Loc patches and secure the capscrews with lockwashers.**

Meritor recommends that you inspect RPL Series Permalube bearing cup capscrews and Wing-Style capscrews and lockwashers at initial inspection, or no more than 2,000 miles (3 200 km).

RPL Series Permalube Driveline

1. Check that capscrews are installed on all universal joint positions. RPL Series Permalube capscrews and Wing-Style Permalube capscrews are not interchangeable.
   - **If capscrews are missing:** Check for damage to the universal joint and yoke. Replace damaged parts and missing capscrews.
   - **If capscrews are loose:** Remove and discard loose capscrews. Replace them with new capscrews.
2. Use a torque wrench to verify that capscrews are tightened to 115-135 lb-ft (155-183 N•m).

Wing-Style Permalube Drivelines

1. Check that both capscrews and lockwashers are installed on all universal joint positions. RPL Series Permalube capscrews and Wing-Style Permalube capscrews are not interchangeable.
   - **If capscrews and lockwashers are missing:** Check for damage to the universal joint and yoke. Replace damaged parts and capscrews and lockwashers. Refer to Section 5.
   - **If capscrews are loose:** Remove and discard loose capscrews. Replace them with new capscrews and lockwashers.
2. Use a torque wrench to verify that capscrews are tightened to the correct specification. Refer to Section 9.

Check End Play

1. Check the universal joint for end play. Apply force in an UP-AND-DOWN and SIDE-TO-SIDE motion. The universal joint must not move in either direction. **Figure 2.16**. There should be less than 0.006-inch (0.152 mm) BACK-AND-FORTH motion of the universal joint. **Figure 2.17**.
   - **If movement is greater than 0.006-inch (0.152 mm):** Replace the universal joint.

CAUTION

A broken weld strap can cause a wing bushing to rotate. When a bushing rotates, it's possible to assemble it into the yoke backward. To ensure correct assembly and prevent damage to components, you must insert both of the wing bushing's machined keyways into the yoke.

2. Replace the universal joint if it's loose or the weld strap is broken or missing.

Figure 2.16

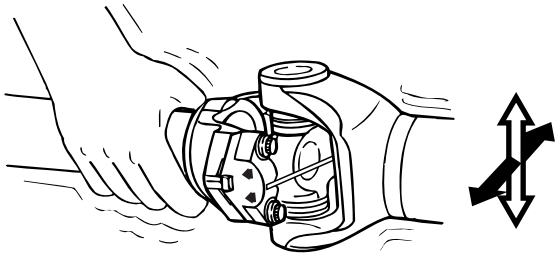
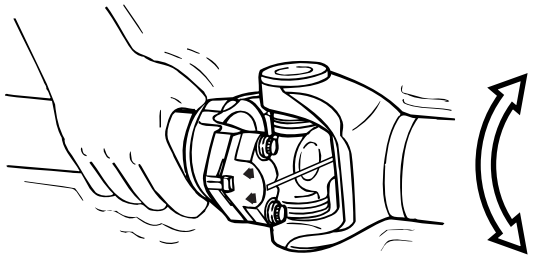
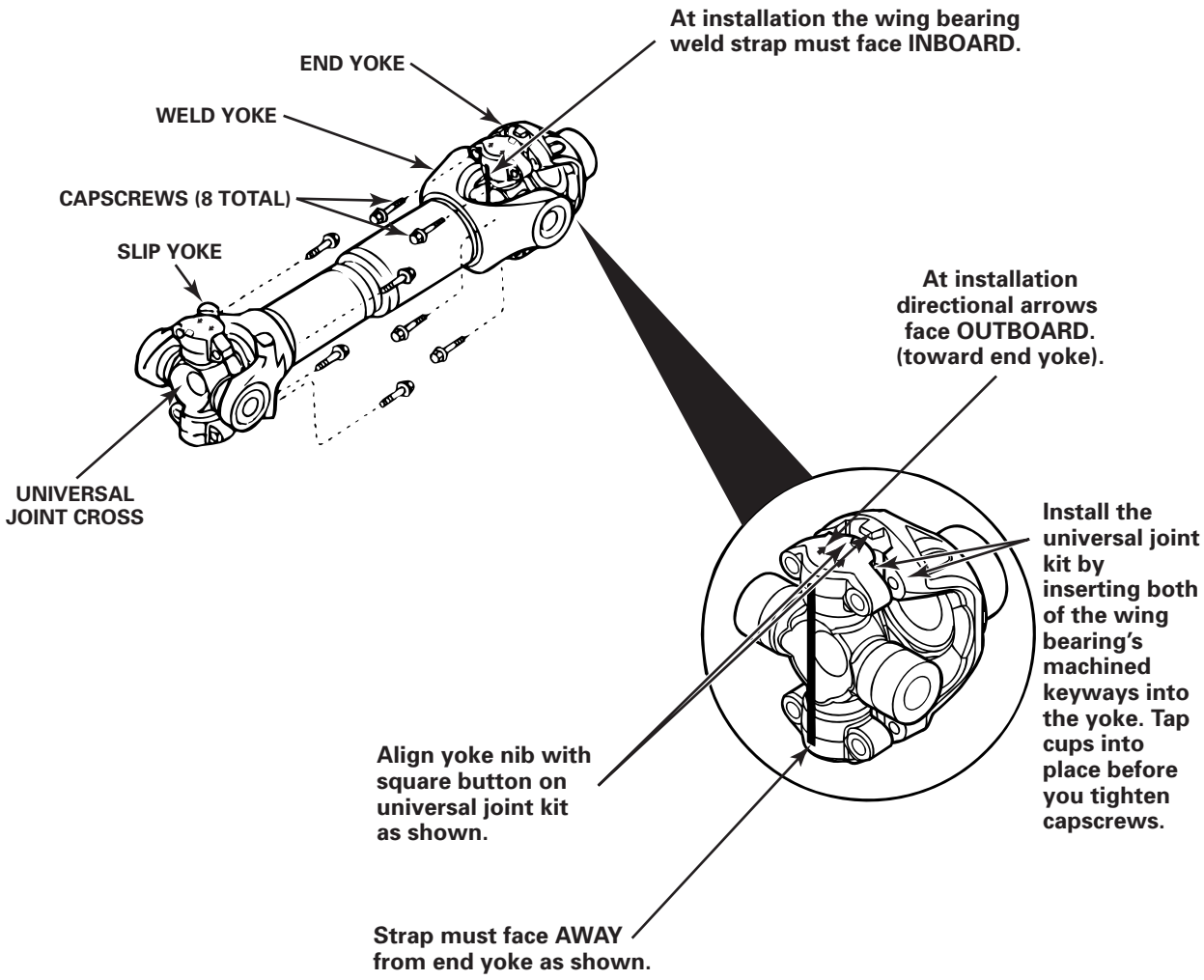


Figure 2.17



RPL Series Permalube™ Driveline



⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

Only install the correct grade new bearing retainer bolts and stamped strap bolts. Do not reuse these parts. If the bearing retainer straps are damaged, install new retainers. Damaged and reused parts can affect driveline operation, which can cause the driveline to separate from the vehicle. Serious personal injury and damage to components can result.

A driveline assembly can weigh more than 100 pounds (46 kilograms). Always use lifting devices and the correct procedures when you handle drivelines to prevent serious personal injury and damage to components.

Removal

Driveline

⚠ WARNING

Only service a driveline when the engine is OFF. A rotating driveline can cause serious personal injury.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

1. Park the vehicle on a level surface. Block the wheels to keep the vehicle from moving. Raise the vehicle so that the area you will service is off of the ground. Support the vehicle with safety stands.
2. Use a 12-point socket to loosen the four bolts (1/2 x 20-inch thread) located in the weld yoke end of the driveline. **Figure 3.1**.
3. Remove the bolts. **Figure 3.2**.

NOTE: Support the driveline when you remove it from the end yoke.

4. If necessary, use an appropriate tool to tap the wing bushing from the end yoke. **Figure 3.3**.
5. Repeat Steps 2-4 to remove the opposite end of the driveline.

Figure 3.1

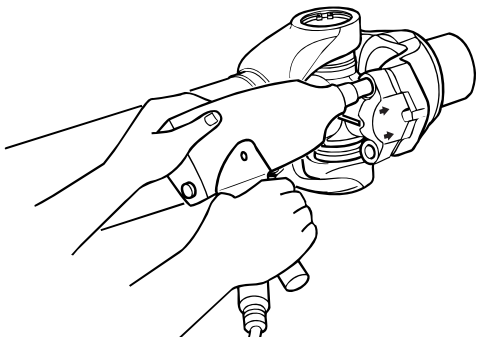


Figure 3.2

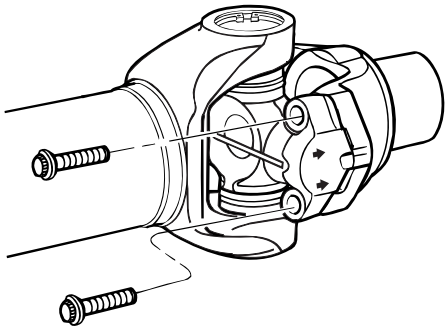
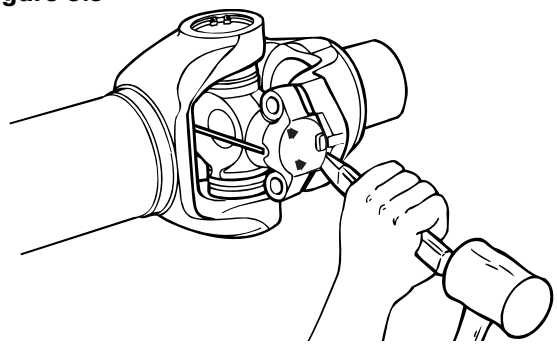


Figure 3.3



Universal Joint

Snap Ring

NOTE: Refer to the Service Notes page at the front inside cover of this manual for information on how to obtain SPX Kent-Moore tools.

1. Use snap ring pliers (SPX Kent-Moore tool number J-44676-1) to remove the snap rings. **Figure 3.4**.
2. If necessary, use a brass drift and lightly tap the center of the bushing to assist in snap ring removal. **Figure 3.5**.
3. Repeat the previous steps on the other side of the yoke.

Figure 3.4

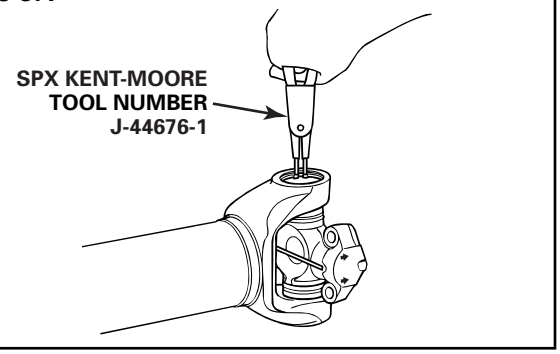
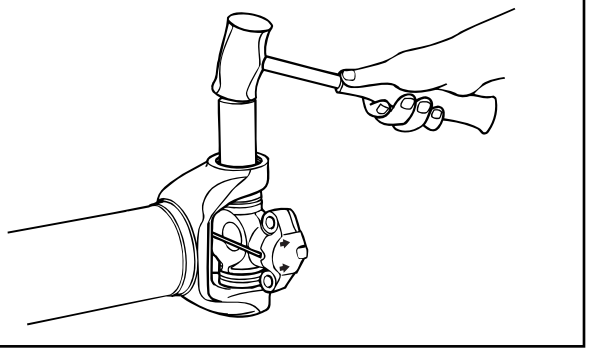


Figure 3.5



Round Bushings

NOTE: Use only the specified tools to remove the round bushings. Do not use the SPX Kent-Moore yoke bearing cup installation tool (number J-44516) to remove the round bushings. Damage to the tool can result.

Use one of the following procedures to remove and install round bushings.

- Press, bridge and bearing cup receiver
- Universal joint press
- Universal joint puller

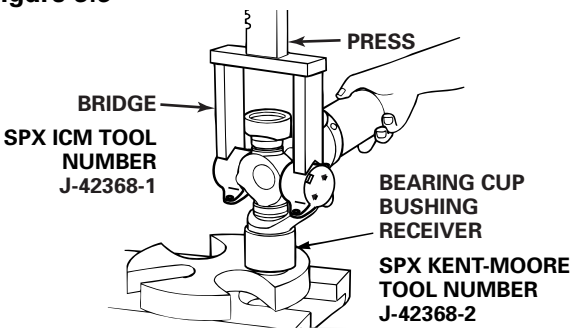
WARNING

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

Using a Press, Bridge and Bearing Cup Receiver

1. Use a press bridge (SPX Kent-Moore tool number J-42368-1) and bearing cup bushing receiver (SPX Kent-Moore tool number J-42368-2). **Figure 3.6**. Refer to the Service Notes page at the front inside cover of this manual for information to obtain these tools.
2. Press DOWN until the first round bushing loosens. **Figure 3.6**. Remove the round bushing. **Figure 3.7**.

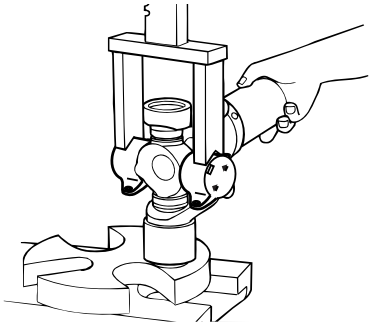
Figure 3.6



3. Rotate the shaft 180 degrees. Repeat the procedure for the opposite side of the universal joint. **Figure 3.8**.
4. Remove the universal joint from the yoke.

Figure 3.7

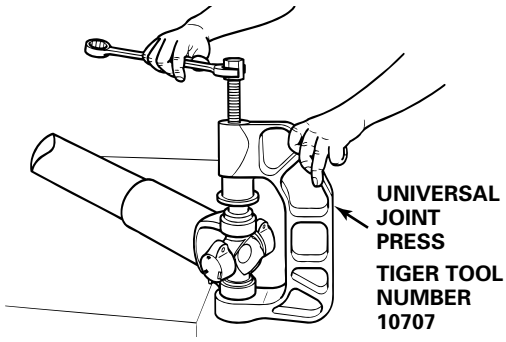
Figure 3.8



Using a Universal Joint Press

1. Position a universal joint press (Tiger Tool number 10707). **Figure 3.9**. Refer to the Service Notes page at the front inside cover of this manual for information to obtain this tool.
2. Turn the screw on the tool CLOCKWISE until the round bushing loosens.
3. Turn the screw on the tool COUNTERCLOCKWISE until you can remove the round bushing.
4. Turn over the universal joint. Repeat the procedure for the opposite side of the universal joint.
5. Remove the universal joint from the yoke.

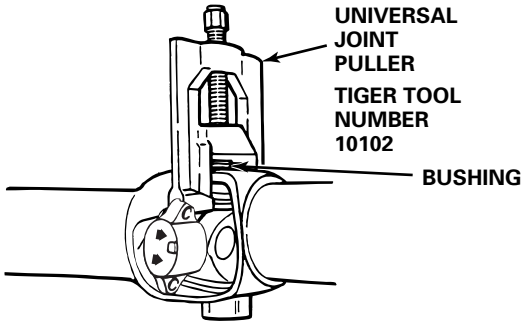
Figure 3.9



Using a Universal Joint Puller

1. Position a universal joint puller (Tiger tool number 10102). Refer to the Service Notes page at the front inside cover of this manual for information to obtain this tool. **Figure 3.10**.
2. Turn the screw on the tool CLOCKWISE until the round bushing loosens.
3. Turn the screw on the tool COUNTERCLOCKWISE and remove the round bushing.
4. Turn over the universal joint. Repeat the procedure for the opposite side of the universal joint.
5. Remove the universal joint from the yoke.

Figure 3.10



Disassembly

Slip Yoke

1. Use a brass or copper hammer and a drift to tap the shroud off of the slip seal. **Figure 3.11**.
2. Use a screwdriver to pry the seal out of the groove in the slip yoke. **Figure 3.12**.
3. Mark the slip yoke and slip shaft sections to ensure that you reassemble them into their original positions. **Figure 3.13**.
4. Pull the slip yoke and slip shaft sections apart. **Figure 3.14**.
5. Remove the seal. **Figure 3.15**. Remove the shroud. **Figure 3.16**.

Figure 3.11

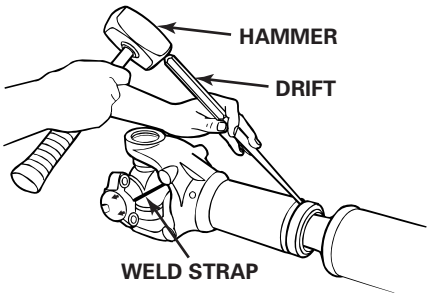


Figure 3.12

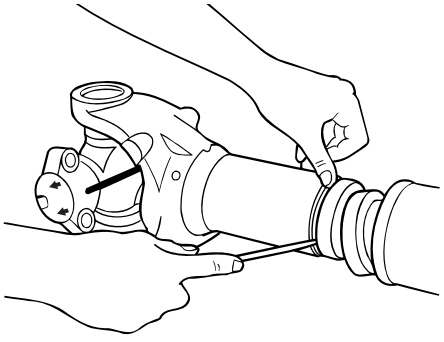


Figure 3.13

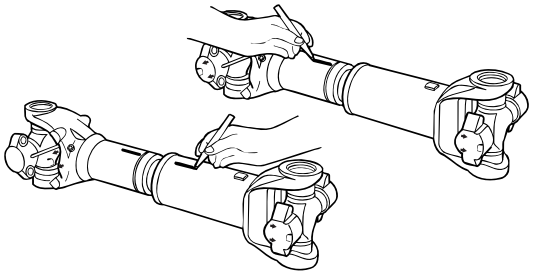


Figure 3.14

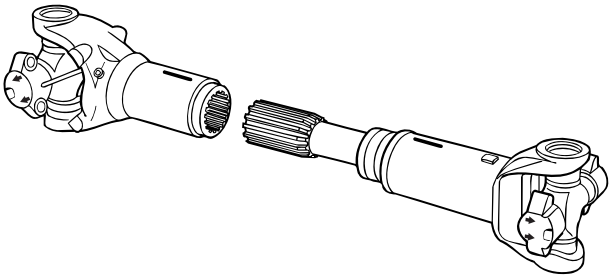


Figure 3.15

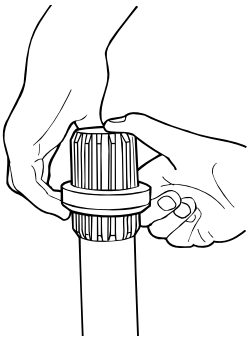
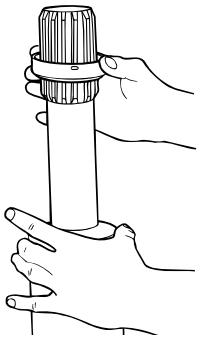


Figure 3.16



Assembly

Slip Yoke

1. Use an Allen wrench to remove the grease plug from the slip yoke before you assemble the slip yoke and spline shaft sections. **Figure 3.17**.
2. Use the grease packet supplied with the slip yoke to apply the entire amount of grease into the slip yoke. **Figure 3.18**.

Figure 3.17

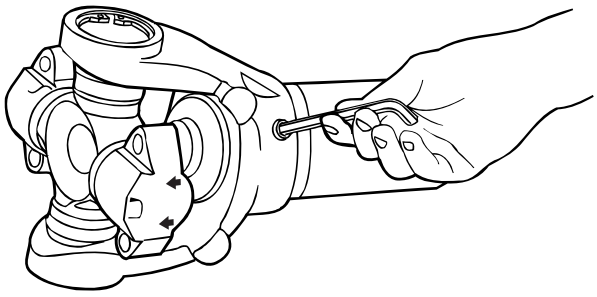
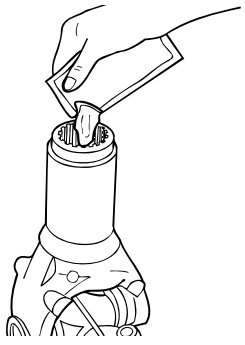


Figure 3.18



3. Use a brush to distribute lubricant on the splines. **Figure 3.19**.
4. Install the new shroud. **Figure 3.20**.
5. Install the new seal onto the spline shaft neck. Ensure that the small diameter side fits onto the splines first. **Figure 3.21**.

Figure 3.19

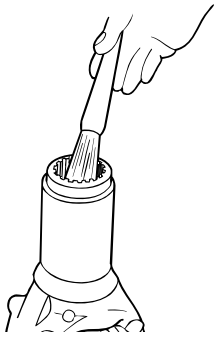


Figure 3.20

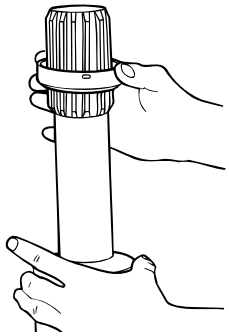
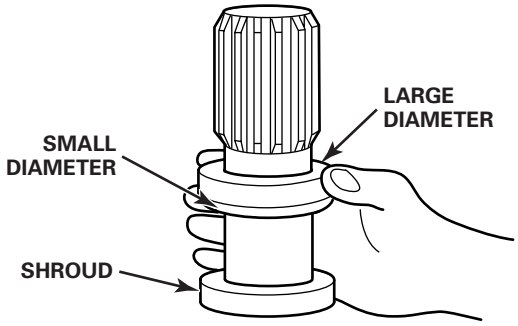


Figure 3.21



6. Align the slip yoke and spline shaft sections with the phasing marks you made on these sections during disassembly. **Figure 3.22**.
7. Install the spline shaft into the slip yoke until the splines fully engage. **Figure 3.22**.
8. Snap the seal into the groove. **Figures 3.23 and 3.24**.
9. Use a brass or copper hammer to tap the shroud over the seal. Push together the driveline sections. **Figures 3.25 and 3.26**.
10. Use an Allen wrench to reinstall the grease plug. **Figure 3.27**.

Figure 3.22

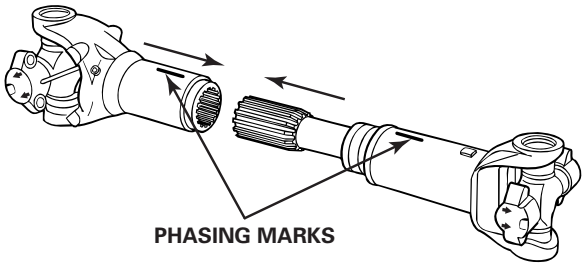


Figure 3.23

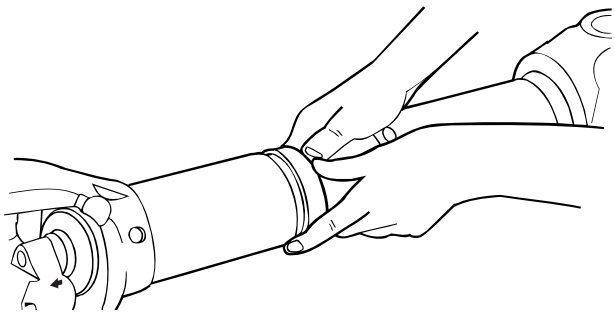


Figure 3.24

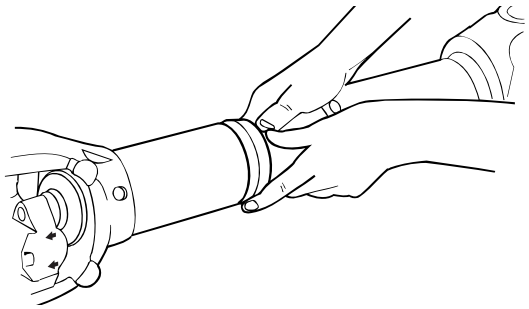


Figure 3.25

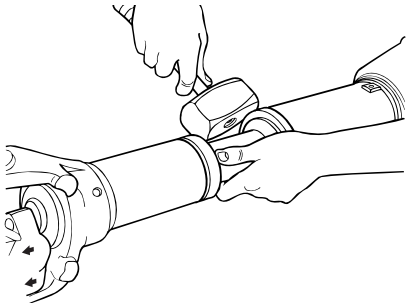


Figure 3.26

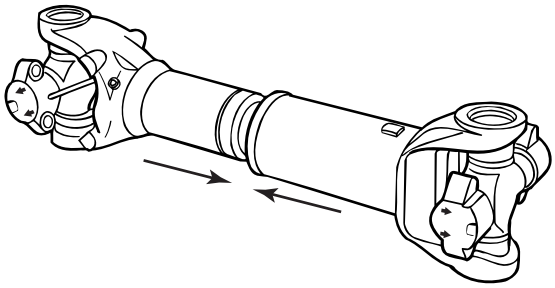
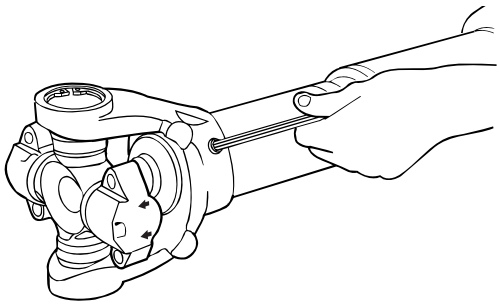


Figure 3.27



Installation

Universal Joint

CAUTION

Do not use grease or anti-seize compound in the yoke ear bores. Damage to components can result.

1. Clean dirt and contamination from the slip yoke and weld yoke ear bores.
2. Install the universal joint in the yoke so that the wing bearing weld straps face INBOARD and the arrows point toward the end or coupling yokes. **Figure 3.28**.

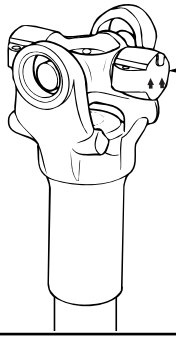
CAUTION

The universal joint is supplied with the correct amount of grease. Do not apply additional grease to the joint. Do not use grease or anti-seize compound on the outside diameter of the cups, the cross bore holes of the yoke, or the yoke saddles. Damage to components can result.

NOTE: The deflector is preassembled onto the round bushing.

3. Verify that the plastic deflectors are attached to the round bushings. **Figure 3.29**.
4. Position the first round bushing onto the trunnion by threading the cross trunnion through the yoke bore. **Figure 3.30**.

Figure 3.28



To correctly install the universal joint into the end yoke, the wing bushing weld strap must face INBOARD. Arrows must point TOWARDS the end yoke.

Figure 3.29

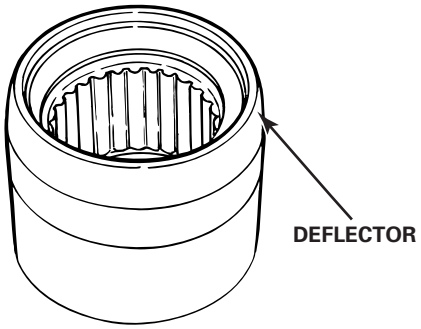
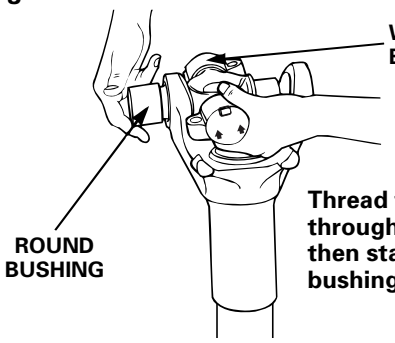


Figure 3.30



Thread the cross through the yoke bore, then start the round bushing on the trunnion.

CAUTION

Use an arbor press, universal joint press or yoke bearing cup installation tool to install the round bushing into the yoke. Do not use a hammer, which can loosen and damage components.

WARNING

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

NOTE: The SPX Kent-Moore press yoke bearing cup installation tool number J-44516 has a positive stop for correct installation. Refer to the Service Notes page at the front inside cover of this manual for information to obtain this tool.

5. Use a press, yoke bearing cup installation tool (SPX Kent-Moore tool number J-44516) or universal joint press (Tiger tool number 10707) to install the first round bushing slightly past the snap ring groove. When the bearing cup installation tool contacts the yoke, it is installed correctly. **Figures 3.31, 3.32 and 3.33**.

CAUTION

You must fully seat the snap ring into the snap ring groove to avoid damage to the driveline.

6. Use snap ring pliers to install the snap ring into the snap ring groove. **Figure 3.34**. Fully seat the snap ring.

Figure 3.31 INSTALLING THE BUSHING

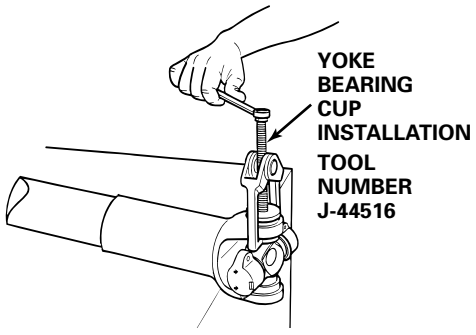


Figure 3.32 INSTALLING THE BUSHING

Universal Joint Press Method

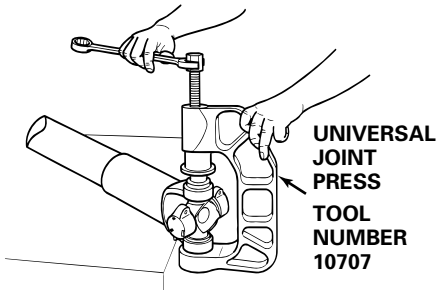


Figure 3.33 INSTALLING THE BUSHING

Press Method

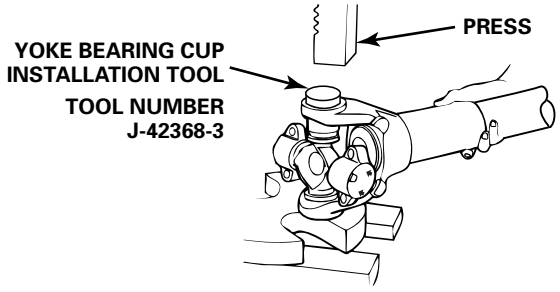
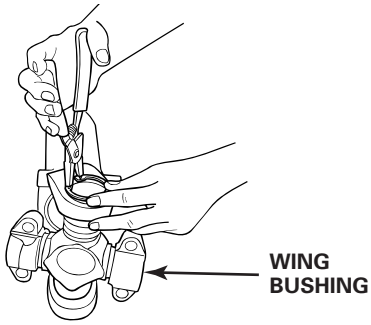


Figure 3.34



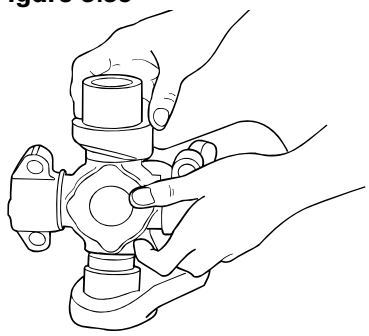
7. Position the second bushing onto the trunnion by threading the cross through the yoke bore as shown. **Figure 3.35**.
8. Use a press, yoke bearing cup installation tool (SPX Kent-Moore tool number J-44516) or universal joint press (Tiger tool number 10707) to install the second round bushing slightly past the snap ring groove. Check that the bushing is aligned with the universal joint. **Figures 3.31, 3.32 and 3.33**.

⚠ CAUTION

You must fully seat the snap ring into the snap ring groove to avoid damage to the driveline.

9. Use snap ring pliers to install the second snap ring into the snap ring groove. **Figure 3.36**.
10. Strike the yoke ear with a brass or copper hammer to ensure that the universal joint moves freely. **Figure 3.37**.

Figure 3.35



Thread the trunnion through the yoke bore to pilot the round bushing into the yoke.

Figure 3.36

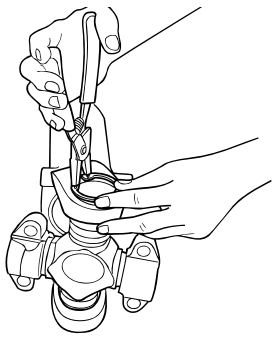
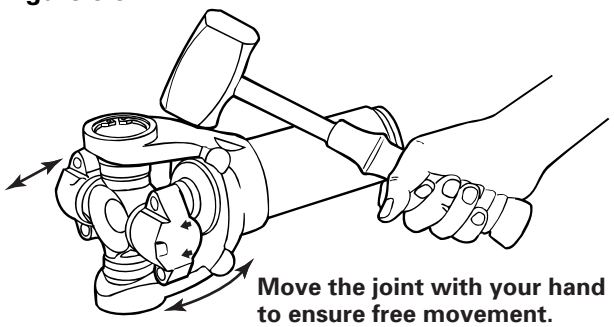


Figure 3.37



Move the joint with your hand to ensure free movement.

Driveline

⚠ WARNING

If you do not correctly install the universal joint and end yoke, the bushings will not correctly seat in the yoke, which can cause the capscrews that secure the universal joint to fatigue under normal operating conditions. Serious personal injury and damage to components can result.

You must position the wing bushing's machined keyway against the machined keyway of the end yoke ears when you install a universal joint. Ensure that the arrows stamped on the wing bushing point TOWARD the end yoke, and the universal joint weld strap faces the driveline and AWAY from the yoke.

⚠ CAUTION

A broken weld strap can cause a wing bushing to rotate. When a bushing rotates, it's possible to assemble it into the yoke backward. To ensure correct assembly and prevent damage to components, you must insert both of the wing bushing's machined keyways into the yoke.

1. Before you install the capscrews, check that the universal joint is fully seated in the end yoke. The arrows on the wing bushing should point toward the coupling yoke. **Figure 3.38**.
2. If necessary, tap the universal joint with a brass or copper hammer to ensure it is fully seated. **Figure 3.39**.

3. Install the new capscrews.
4. Use a torque wrench to alternately tighten the capscrews to 115-135 lb-ft (155-183 N•m). **Figure 3.40**.

Figure 3.38

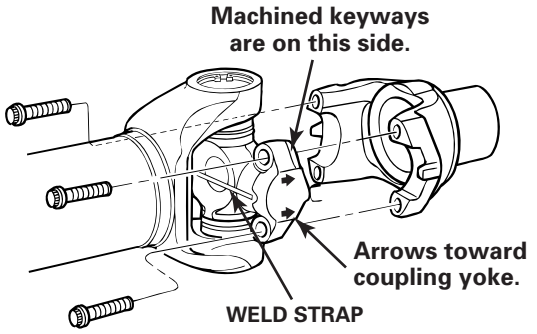


Figure 3.39

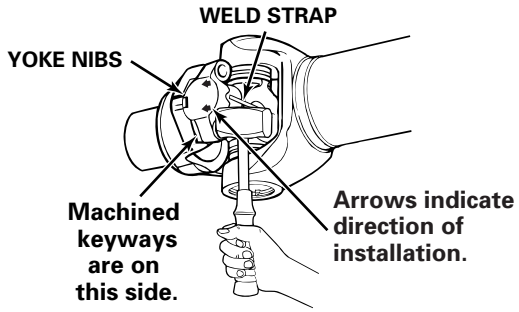
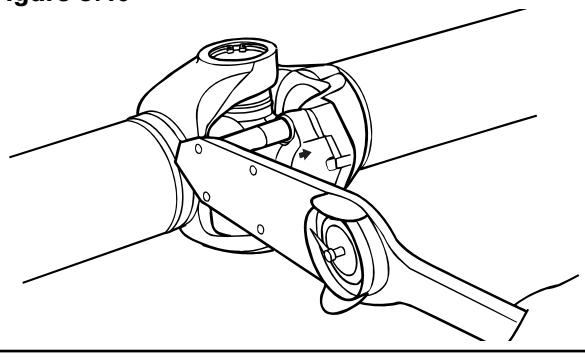


Figure 3.40



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Removal

Driveline

WARNING

Only service a driveline when the engine is OFF. A rotating driveline can cause serious personal injury.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

1. Park the vehicle on a level surface. Block the wheels to keep the vehicle from moving. Raise the vehicle so that the area you will service is off of the ground. Support the vehicle with safety stands.
2. Loosen and remove the capscrews from the end yoke bearing cups.
3. Remove the first bearing cup. If necessary, use a bearing puller to remove the bearing cup from the yoke bore. **Figure 4.1**.
4. Remove the second bearing cup. **Figure 4.2**.

NOTE: Support the driveline when you remove it from the end yoke.

5. Slide the yoke to one side until you can work a trunnion free from the yoke bore.
6. Slide the yoke in the OPPOSITE direction while removing the universal joint from the end yoke.
7. Repeat Steps 2-6 to separate the slip yoke end of the driveline.

Figure 4.1

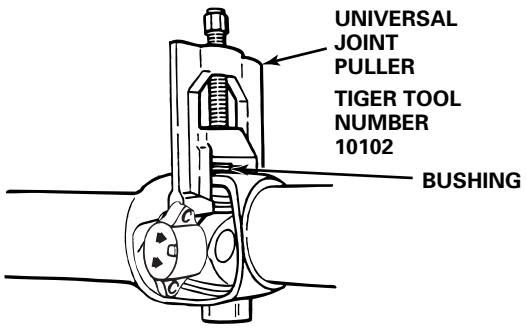
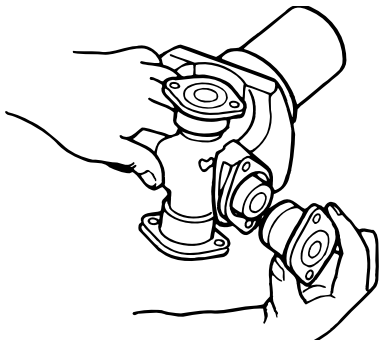


Figure 4.2



Universal Joint

1. Loosen and remove the capscrews from the two remaining bearing cups on the yoke end of the driveline.
2. Remove the bearing cups. If necessary use a commercial bearing puller to remove the bearing cups from the yoke bores.
3. Work the trunnions free of the yoke bores. Remove the universal joint cross from the weld yoke.
4. Repeat Steps 1-3 to remove the universal joint cross from the slip yoke.

Installation

WARNING

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

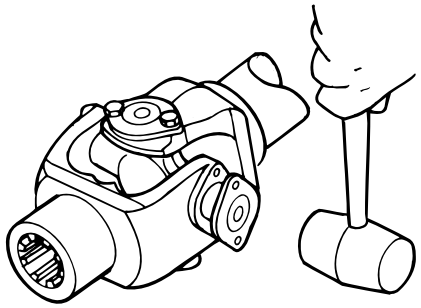
Universal Joint

1. Install the universal joint cross into the yoke.
2. Install the two bearing cups through the yoke bores and onto the universal joint cross trunnions. If necessary, use a copper or brass hammer to tap the bearing caps until they are fully seated.
3. Hand-tighten the capscrews through the bearing cover plate and into the slip yoke.
4. Use a torque wrench to alternately tighten the capscrews to the correct specifications. Refer to **Table B**.
5. Repeat Steps 1-3 to install the universal joint cross into the weld yoke.

Driveline

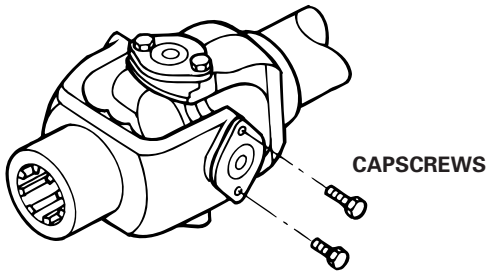
1. Wipe off the end yoke bearing bores. Insert the trunnion through the yoke bore.
2. Check the bearing cup to ensure that the needle bearings are in place. Replace the bearing cup when the needle bearings are missing or out of place.
3. Hold the cross. Use a copper or brass hammer to lightly tap the bearing cup completely into the yoke bore. **Figure 4.3**.

Figure 4.3



4. Align the cover plate holes and the yoke ear. **Figure 4.4**. Install the bearing cover plate flush against the milled surface of the yoke.
5. Install new capscrews and hand-tighten them through the bearing cover plate and into the yoke.
6. Repeat Steps 2-5 to install the second bearing cup.
   - **If the cover plate will not seat flush against the yoke surface:** Remove each bearing cup from the yoke bore. Check the bottom of each bearing cup. If you find a needle bearing, replace the bearing cup.

Figure 4.4



7. Use a torque wrench to alternately tighten the capscrews to correct specifications. Refer to **Table B**. **Figure 4.5**. T

Figure 4.5

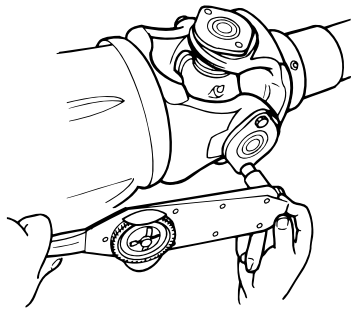
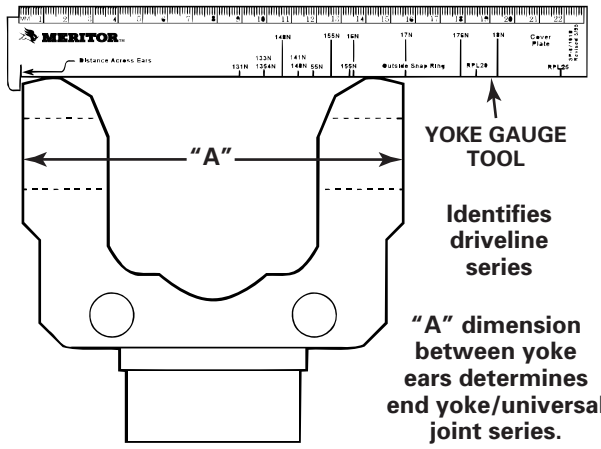


Table B: Torque Specifications — Full-Round

Driveline Series	"A" Inches (mm)	Thread Size Inches	Torque Specs lb-ft (N•m)
16N	5.31 (134.87)	5/16-24	26-35 (35-47)
17N	6.09 (154.69)	3/8-24	38-48 (51-65)
176N	7.00 (177.8)	3/8-24	38-48 (51-65)
18N	7.55 (191.77)	3/8-24	38-48 (51-65)



Lubrication

Universal Joint

1. After installation into the end yokes, lubricate the universal joints at the grease fitting until grease flows from the bearing cup seals on all four trunnions. Use Meritor grease specification O-634-B, NLGI Grade 2 with EP additive. **Figure 4.6**.

   - **If grease does not purge from the seals:** Follow the steps below.

   A. Move the assembly UP-AND-DOWN or SIDE-TO-SIDE while you apply grease gun pressure. **Figure 4.7**.

   B. Loosen the bearing cup capscrews. Add grease until grease purges from the seals.

      - **If grease still does not purge from all four trunnion seals:** Remove the universal joint and correct the problem.
      - **If you cannot determine the problem:** Replace the universal joint.

   C. Tighten the capscrews. Refer to **Table B**. T

Figure 4.6

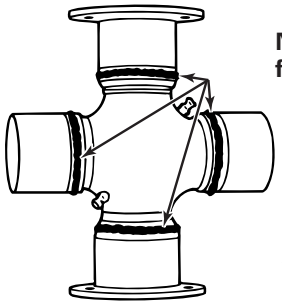
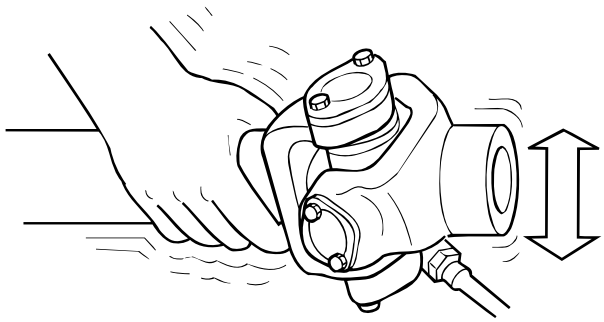


Figure 4.7

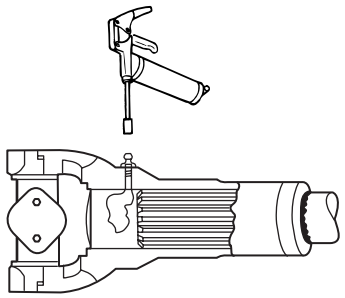


Slip Yoke Splines

NOTE: When you lubricate a slip yoke, the splined shaft can be either fully-extended or fully-collapsed.

After installation add Meritor specification O-634-B, NLGI Grade 2 with EP additive, lubricant to the slip yoke grease fitting. Six to eight pumps or approximately one oz (28 grams) is sufficient to lubricate the splines. **Figure 4.8**.

Figure 4.8



⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Use a brass or copper hammer to seat bearing cups into yoke bores. Do not use a steel hammer, which can cause the yoke or bearing cup to crack and break off. Serious personal injury and damage to the trunnion, yoke or bearing cup can result.

Removal

Driveline

⚠ WARNING

Only service a driveline when the engine is OFF. A rotating driveline can cause serious personal injury.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

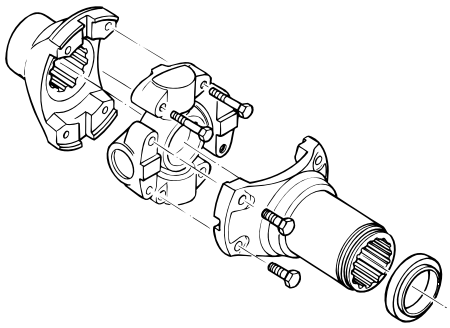
1. Park the vehicle on a level surface. Block the wheels to keep the vehicle from moving. Raise the vehicle so that the area you will service is off of the ground. Support the vehicle with safety stands.
2. Loosen and remove the four capscrews from the weld yoke end of the driveline. Support the weld yoke end, and separate it from the end yoke.
3. Loosen and remove the four capscrews from the slip yoke end of the driveline. Support the slip yoke end, and separate it from the vehicle.

Universal Joint

NOTE: Wing-style universal joints are permanently assembled. Welded steel straps attach the bearing cups to the trunnion to help ensure that the universal joint fits correctly into the mating yokes. Do not cut or remove the welded straps from universal joint kits.

1. Loosen and remove the four capscrews retaining the universal joint cross to the weld yoke.
2. Loosen and remove the four capscrews retaining the universal joint cross to the slip yoke. **Figure 5.1**.

Figure 5.1



Installation

Universal Joint

1. Tap the bearing cups lightly with a brass or copper hammer to seat the bearing cups into the yoke pilot.

NOTE: Capscrews have a “lock patch” and can be hand-tightened only two or three threads.

2. Install new capscrews and lockwashers. **Figure 5.1**. Refer to **Table C**.
3. Hand-tighten the capscrews to the yoke pilot.
4. Use a torque wrench to alternately tighten the capscrews to correct specifications. **Figure 5.2**. Refer to **Table C**. (T)

Figure 5.2

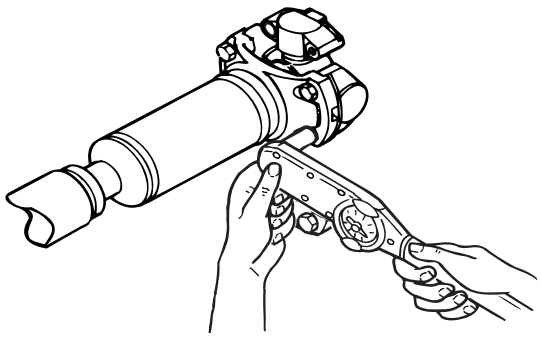


Table C: Replacement Parts and Torque Specifications

Drivelines	Name	Description	Torque Specs lb-ft (N•m)
Wing-Style Permalube	Capscrew	1/2-20 x 2-1/2" 1/2-20 x 1-1/2"	115-135 (155-183)
		3/8-24	40-55 (54-74)
		7/16-20	63-83 (85-112)
	Lockwasher	1/2" H.D. Lockwasher	63-83 (85-112)

Driveline

NOTE: You may install either the slip yoke or weld yoke driveline end first when following the instructions below. After you install one driveline end, repeat these steps to install the opposite end of the driveline.

1. Support the driveline.
2. Tap the bearing cups lightly with a brass or copper hammer to seat the bearing cups into the end yoke.
3. Install the four capscrews and lockwashers that attach the universal cross to the end yoke. **Figure 5.1**.

NOTE: Capscrews have a "lock patch" and can be hand-tightened only two or three treads.

4. Hand-tighten the capscrews to the yoke pilot.
5. Use a torque wrench to alternately tighten the capscrews to Meritor's driveline torque specifications. Refer to **Table C** and **Figure 5.2**. T
6. Repeat Steps 1-5 to install the opposite driveline end.

Lubrication

Universal Joint

Wing-style universal joints can be greaseable or non-greaseable. Non-greaseable Permalube universal joints do not have grease fittings.

Wing-Style Permalube Universal Joints (Non-Greaseable)

Wing-style Permalube universal joints are permanently lubricated with grease developed with specific wear and temperature properties. However, you must periodically lubricate the slip yoke splines. Refer to **Table E** in Section 8 and Slip Yoke Splines for specifications and maintenance procedures.

Wing-Style Permalube Universal Joints (Greaseable)

Wing-style greaseable universal joints have grease fittings and are not permanently lubricated. Refer to **Table E** in Section 8. To lubricate greaseable universal joints, follow the procedures provided for the Full-Round driveline in Section 4.

Slip Yoke Splines

⚠ CAUTION

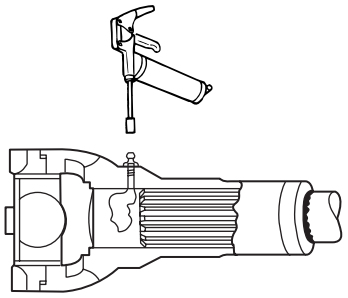
Do not remove the grease plugs from the cross in an attempt to add additional grease. Damage to the universal joint can result.

NOTE: When you lubricate a slip yoke, the splined shaft can be either fully-extended or fully-collapsed.

The slip yoke splines are not permanently-lubricated and must be greased periodically.

Add Meritor specification O-634-B, NLGI Grade 2 with EP additive, lubricant to the slip yoke grease fitting. Six to eight pumps or approximately one oz (28 grams) is sufficient to lube the splines. **Figure 5.3**.

Figure 5.3



WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Removal

Driveline

WARNING

Only service a driveline when the engine is OFF. A rotating driveline can cause serious personal injury.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

1. Park the vehicle on a level surface. Block the wheels to keep the vehicle from moving. Raise the vehicle so that the area you will service is off of the ground. Support the vehicle with safety stands.
2. Loosen and remove the capscrews and bearing straps from the weld yoke end of the driveline. Support the weld yoke end and separate it from the end yoke.
3. Loosen and remove the capscrews and bearing straps from the slip yoke end of the driveline. Support the slip yoke end and separate it from the vehicle.

Universal Joint

1. Loosen and remove the capscrews from the two bearing cups on the weld yoke end of the driveline.
2. Remove the bearing cups. If necessary, use a bearing puller to remove the bearing cups from the yoke bores.
3. Work the trunnions free of the yoke bores. Remove the universal joint cross from the weld yoke.
4. Repeat Steps 1-3 to remove the universal joint cross from the slip yoke.

Installation

Universal Joint

WARNING

Use a brass or leather mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.

CAUTION

Do not seat the bearing cups into the yoke saddle by tightening down the bearing straps and capscrews. Uneven load distribution, yoke bearing rotation, and damage to the straps and yoke nibs can result.

NOTE: To help ensure maximum driveline performance, do not apply lubricant, grease, anti-seize compound, etc., to the yoke saddles.

1. Install the universal joint cross into the yoke. Always use new bolts and straps.

NOTE: For easier installation, do not remove the wire that fastens the bearing cups to the universal joint trunnion.

2. Install the bearing cups through the yoke bores and onto the universal joint cross trunnions.
3. Tap the bearing cup lightly with a leather or rubber mallet to seat the bearing cups into the yoke saddle.

NOTE: Capscrews have a “lock patch” and can be tightened by hand only two or three threads.

4. Hand-tighten the bearing capscrews. Use a torque wrench to tighten the capscrews to the specified torque. **Table D.** T

Driveline

1. Wipe off the yoke saddle.
2. Support the driveline. Install the bearing straps and capscrews onto the slip yoke end of the driveline.

NOTE: Capscrews have a "lock patch" and can be hand-tightened only two or three threads.

3. Hand-tighten the capscrews through the bearing strap into the yoke.
4. Use a torque wrench to alternately tighten the capscrews to Meritor's driveline torque specification. Refer to **Table D**. **Figure 6.1**.
5. Repeat Steps 1-3 to attach the weld yoke end of the driveline to the vehicle.

Figure 6.1

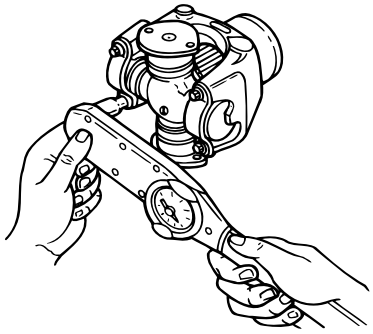
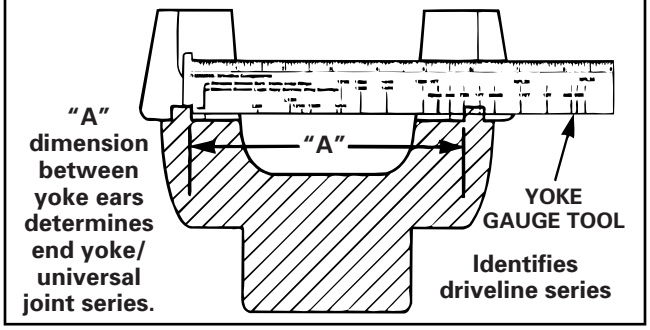


Table D: Torque Specifications — Easy Service

Driveline Series	"A" Inches (mm)	Thread Size Inches	Torque Specs lb-ft (N•m)
155T	4.97 (126.24)	3/8-24	40-60 (54-81)
16T	5.31 (134.87)	3/8-24	45-60 (61-81)
17T	6.19 (157.23)	1/2-20	115-135 (155-183)
176T	7.09 (180.08)	1/2-20	115-135 (155-183)
18T	7.63 (193.8)	1/2-20	115-135 (155-183)



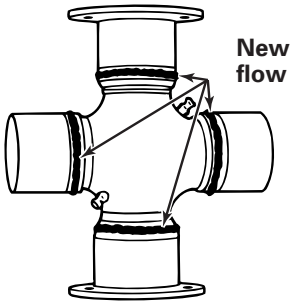
Lubrication

Universal Joint

Lubricate the universal joints at the grease fitting until grease flows from the bearing cup seals on all four trunnions. Use a grease that meets Meritor specification O-634-B, NLGI Grade 2 with EP additive. **Figure 6.2**.

- **If grease does not purge from all four trunnion seals:** Follow the steps below:
  - A. Move the assembly UP-AND-DOWN or SIDE-TO-SIDE while you apply grease gun pressure. **Figure 6.3**.
  - B. Loosen the bearing cup capscrews. Add grease until grease purges from the four seals.
  - C. Tighten the bearing cup capscrews after grease purges.
- **If grease still does not purge from all four trunnion seals**: Remove the universal joint and correct the problem. If you cannot, replace the universal joint.

Figure 6.2



New grease must flow at all four seals.

Figure 6.3

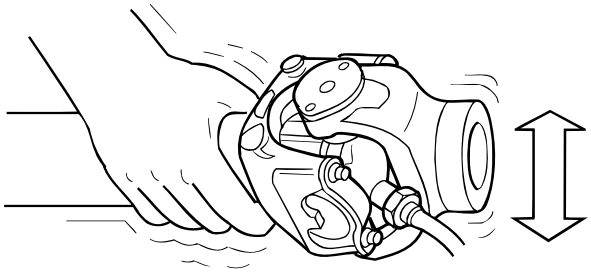
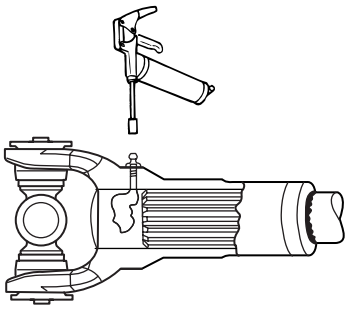


Figure 6.4



Slip Yoke Splines

NOTE: When you lubricate a slip yoke, the splined shaft can be either fully-extended or fully-collapsed.

Add a grease that meets Meritor specification O-634-B, NLGI Grade 2 with EP additive, to the slip yoke grease fitting. Six to eight pumps or approximately one oz (28 grams) is sufficient to lube the splines. **Figure 6.4**.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Do not use a steel hammer to seat bearing cups into yoke bores. A steel hammer can cause the yoke or bearing cup to crack and break off. Serious personal injury and damage to the trunnion, yoke or bearing cup can result.

Only install the correct grade new bearing retainer bolts and stamped strap bolts. Do not reuse these parts. If the bearing retainer straps are damaged, install new retainers. Damaged and reused parts can affect driveline operation, which can cause the driveline to separate from the vehicle. Serious personal injury and damage to components can result.

A driveline assembly can weigh more than 100 pounds (46 kilograms). Always use lifting devices and the correct procedures when you handle drivelines to prevent serious personal injury and damage to components.

The Procedures in This Section Apply to all Meritor Drivelines

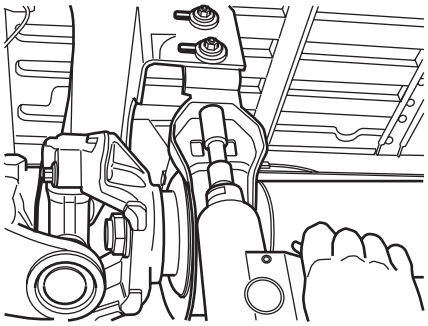
The center bearing removal and installation procedures in this section apply to Meritor's RPL Permalube™, Wing-Style Permalube™, Easy Service™ and Full Round Drivelines.

Removal

Coupling Shaft

1. Ensure that the support strap is in the correct position to support the weight of the driveline.
2. Remove the center bearing bracket bolts. **Figure 7.1**.

Figure 7.1



3. Remove the universal joint from the coupling yoke. Discard the universal joint mounting bolts.
   - **If it's necessary to unseat the bearing cup assemblies:** Use a rubber hammer to tap on the yoke or bearing cup. Once the coupling shaft is free, remove it from the support straps and move the driveline to a work bench.
   - **For driveline assemblies with more than two coupling shafts:** Repeat Steps 1-3 as necessary. Place the support straps on the additional coupling shafts.

Disassembly

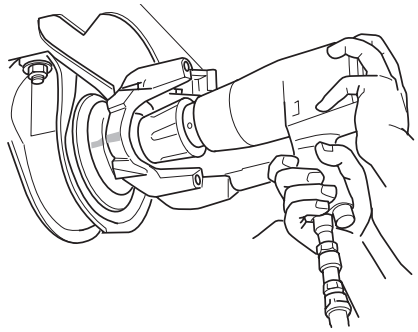
Coupling Yoke and Coupling Shaft

⚠ WARNING

Always replace a loose or damaged coupling yoke. Only install a new coupling shaft yoke nut. Do not reuse this part. A loose or damaged coupling yoke, or a reused yoke nut, can affect driveline performance and cause the driveline to separate from the vehicle. Serious personal injury and damage to components can result.

1. Remove the coupling shaft yoke nut. Discard the nut. Inspect the yoke washer. You can reuse the washer if it's not damaged. **Figure 7.2**.
   - **If the yoke washer is damaged:** Discard the washer and replace it with a new one.

Figure 7.2



WARNING

Always reassemble a driveline according to the vehicle's original phasing type. A driveline that is not balanced correctly can affect driveline performance and cause the driveline to separate from the vehicle. Serious personal injury and damage to components can result.

2. Mark the end yoke counterbore to the coupling shaft "nose." This will help you to reassemble the center bearing end yoke in its original phased position. **Figure 7.3**.
3. Remove center bearing bracket bolts. **Figure 7.4**. Allow the coupling shaft to rest on the support strap.
4. Remove the coupling shaft with the center bearing. Remove the coupling yoke, then the center bearing.
   - **If it's necessary to unseat the cup assemblies:** Use a rubber hammer to tap on the yoke or bearing cup. Once the coupling shaft is free, remove it from the support straps. Move the coupling shaft to a workbench area.

CAUTION

The center bearing end yoke has a press fit. Use a puller tool to remove it from the driveline. Do not use a hammer. Damage to components can result.

5. Place the driveline on a workbench. Use a puller to remove the center bearing end yoke. Do not use a hammer. Follow the puller tool manufacturer's instructions. **Figure 7.5**.
   - **If the yoke is loose enough to remove by hand:** Replace the entire coupling shaft.
6. Inspect the center bearing end yoke splines.
   - **If the splines are damaged or missing, or the yoke is cracked:** Replace the yoke.
7. Inspect the coupling shaft splines and threads.
   - **If the splines or threads are damaged or missing:** Replace the entire coupling shaft.

Figure 7.3

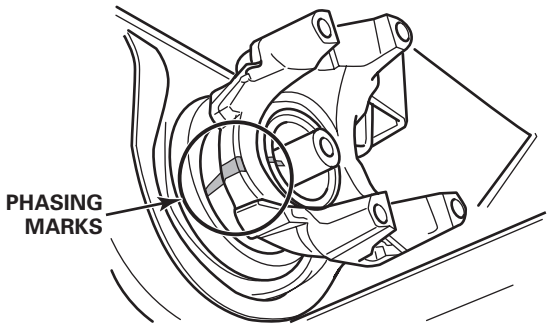


Figure 7.4

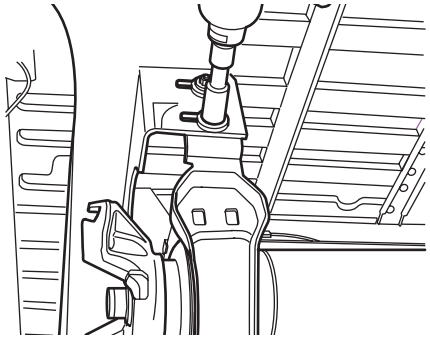
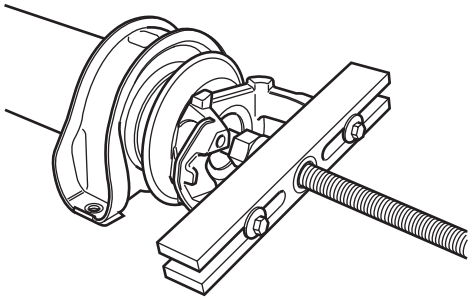


Figure 7.5



Center Bearing

1. Remove and discard the center bearing bracket. **Figure 7.6**.
2. Remove and discard the rubber cushion. **Figure 7.7**.
3. Use a puller to remove the bearing assembly from the coupling shaft. Follow the puller tool manufacturer's instructions. Discard the center bearing. **Figure 7.8**.
4. Inspect the coupling shaft for wear on the bearing diameter.
   - **If the coupling shaft is damaged from a seized bearing:** Replace the entire coupling shaft. **Figure 7.9**.

NOTE: Deflectors are integral to a self-aligning center bearing, so separate deflectors are not required.

5. Remove both deflectors, if equipped. Install a new center bearing, deflectors, if necessary, and coupling yoke.

Figure 7.6

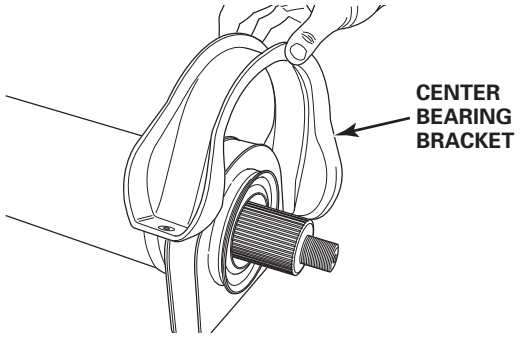


Figure 7.7

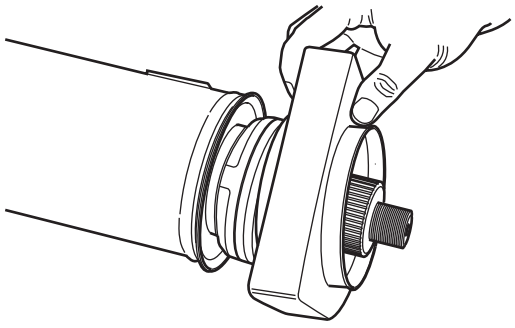


Figure 7.8

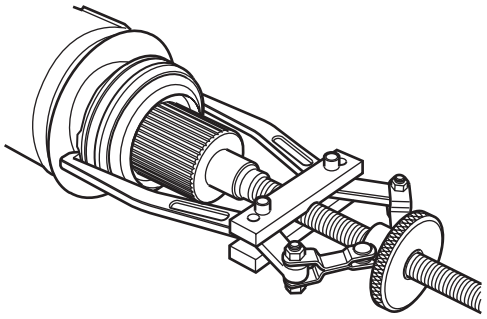
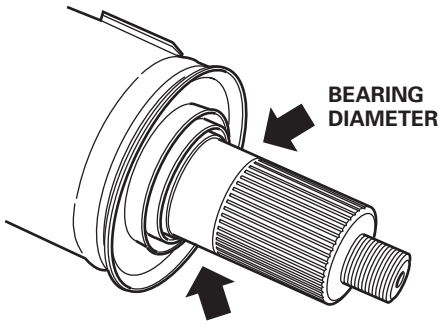


Figure 7.9



Installation

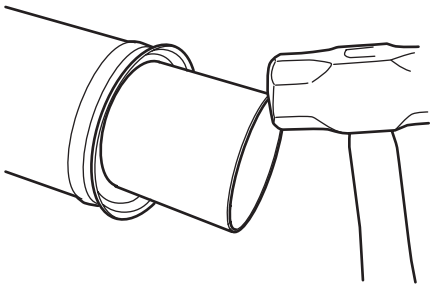
Deflectors

1. Wipe the center bearing support surface with a fine emery cloth.

NOTE: Deflectors are integral to a self-aligning center bearing, so separate deflectors are not required.

2. If necessary, install a new deflector on the coupling shaft. To avoid damaging the deflector, use a section of tubing and a brass hammer to seat the deflector. Verify that the deflector is completely seated against the center bearing support shoulder. **Figure 7.10**.

Figure 7.10



Center Bearing

NOTE: Deflectors are integral to a self-aligning center bearing, so separate deflectors are not required.

1. Install deflectors, if included in the center bearing kit. Otherwise deflectors are not required.
2. Carefully align the new center bearing assembly with the machined surface of the coupling shaft. Use your hands to push the center bearing onto the coupling shaft. **Figure 7.11**.
3. Use a punch and brass hammer to install the bearing.
4. If a deflector is required, use a section of tubing and a brass hammer to press the deflector remaining onto the end yoke to avoid damaging the deflector. **Figure 7.12**.

Figure 7.11

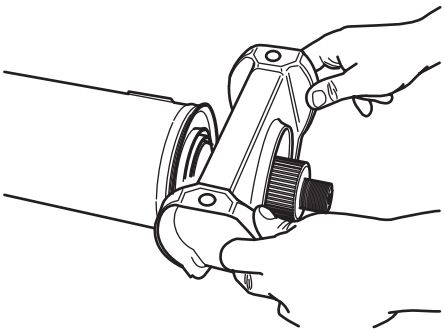
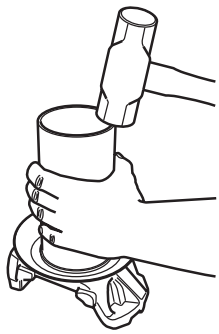


Figure 7.12

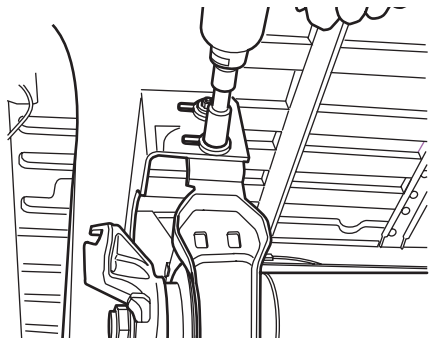


5. Use a rubber hammer to tap the yoke onto the coupling shaft splines. The phasing marks on the driveline must be aligned. **Figure 7.3**. Continue to tap the yoke until it is completely seated against the center bearing. Do not use the nut to draw the yoke down.
6. Install a washer and a new coupling shaft yoke nut. Tighten the nut to 450-600 lb-ft (612-816 N•m). T

Coupling Shaft

1. Verify that the support straps are in the correct position to support the weight of the driveline.
2. Align the center bearing bracket with the frame support.
3. Install bearing spacers, if necessary, to return the bearing bracket to its original position. **Figure 7.13**.
4. Install the center bearing bracket bolts. Tighten them to the vehicle manufacturer's specification.

Figure 7.13



⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Greaseable Drivelines

The Full-Round, Easy Service and Wing-Style greaseable drivelines require periodic lubrication of the universal joints and slip yoke splines. **Figures 8.1 and 8.2**.

Non-Greaseable Drivelines

The RPL Series Permalube non-greaseable driveline is completely lubricated and sealed at the factory and does not require lubrication. **Figure 8.3**.

The Wing-Style Permalube non-greaseable driveline requires lubrication of the slip yoke splines ONLY. **Figure 8.4**.

Figure 8.1

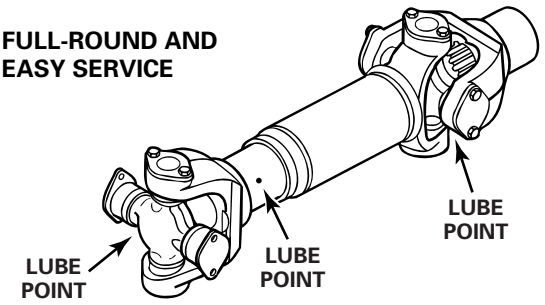


Figure 8.2

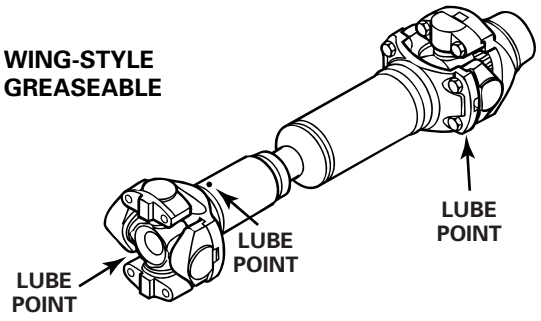


Figure 8.3

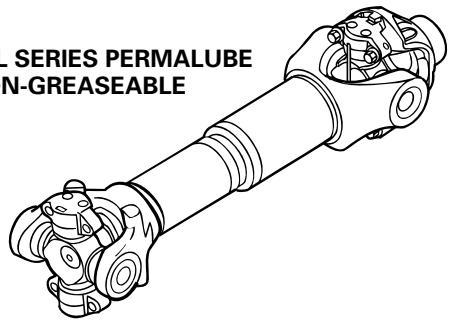
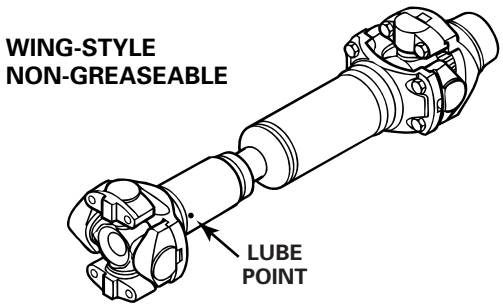


Figure 8.4



Driveline Inspection

1. Inspect the Full-Round, Easy Service and Wing-Style greaseable drivelines for wear and damage at regularly-scheduled maintenance intervals specified in **Table E**.
2. Inspect RPL Series Permalube™ and Wing-Style Permalube™ non-greaseable drivelines at least every 25,000 miles (40 000 km).

Table E: Lubrication Intervals for Full-Round, Easy Service and Wing-Style Greaseable Drivelines

Component	Application	Greasing Interval	Grease	Meritor Specification	NLGI Grade	Grease Description	Outside Temperature
Universal Joint, Slip Yoke and Splines	Line Haul — Applications where tractor is operated entirely on concrete or smooth paved road surfaces	50,000 miles (80 000 km)	Universal Joint Grease	O-634-B	2	Lithium 12-Hydroxy Stearate with Molybdenum Disulfide	②
	On-Highway — Applications where tractor is operated at least 90% on paved road surfaces and up to 10% on gravel, dirt or unpaved roads	16,000 miles (25 000 km)					
	City — Applications where truck is operated at least 90% in city environment	6,500 miles (10 000 km)					
	Construction — Straight trucks used in the construction industry to move materials to and from job sites. They operate 90% on-road and 10% off-road with a high number of stops and starts	①					

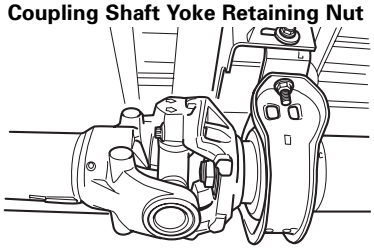
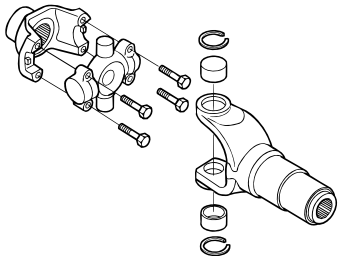
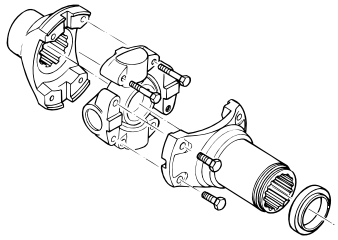
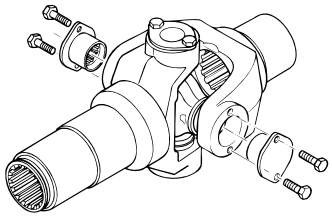
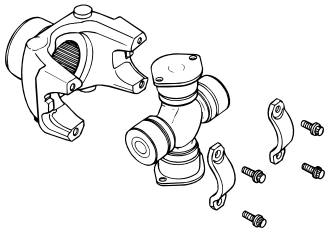
① The greasing interval depends on the individual operating conditions, speeds and loads. To determine the interval, inspect for the presence of grease at all positions until an interval can be determined. Grease the assembly as necessary.

② Refer to the grease manufacturer's specifications for the temperature service limits.

Table F: Approved Lubricants

Lubricant	Recommendation
Universal Joint Grease	Must meet Meritor Specification O-634-B (NLGI Grade No. 2, Lithium 12-Hydroxy Stearate with Molybdenum Disulfide) Amalie All-Purpose Grease with Moly-L1-2M Amoco Super Chassis Exxon 5160 Ford Part Number PN-C1AZ 19590 or Ford Specification M1C-75B Kendall L-424 Grease Marathon Maralube Molycode 529 Phillips Petroleum Philube MW-EP2 Grease Shell Super Duty Special FF Shell Moly Poly Grease

Table G: Torque Specifications

Description	Thread Size Inches	Torque Range lb-ft (N•m)
Coupling Shaft Yoke Retaining Nut 		450-600 (612-816)
RPL Series Permalube Capscrews 	1/2-20	115-135 (155-183)
Wing-Style Permalube Capscrews 	1/2-20 3/8-24 7/16-20	115-135 (155-183) 40-55 (54-74) 63-83 (85-112)
Full Round Capscrews 	5/16-24 3/8-24	26-35 (35-47) 38-48 (51-65)
Easy Service Capscrews 	3/8-24 ① ② 1/2-20	 40-60 (54-81) 45-60 (61-81) 115-135 (155-183)

① 155T Driveline Series
② 16T Driveline Series

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

NOTE: The EVA 2 vibration analyzer can be used to determine the source of a vibration. Refer to the Service Notes page at the front inside cover of this manual for information on how to obtain SPX Kent-Moore tools.

Table H: Vibration

Condition	Cause	Correction
Driveline vibration	1. Driveline phasing incorrect	1. Correct phasing by aligning yokes on both ends of driveline.
	2. Missing balance weights or foreign material on driveline tubing	2. Have driveline balanced.
	3. Transmission or axle end yokes loose	3. Inspect for radial looseness. Tighten nut or replace end yoke.
	4. Excessive end play in universal joints	4. Replace universal joints.
	5. Excessive hinging in slip section	5. Replace worn components.
	6. Welch plug loose or missing in slip yoke	6. Replace welch plug or replace slip yoke.
	7. Worn center bearing	7. Replace center bearing.
	8. Chassis ride height too low or too high	8. Readjust ride height.
	9. Torsional accelerations in driveline	9. Measure transmission, driveline and axle planes. Record readings and run Driveline Analysis Program. If angles are found to be out of specifications, adjust or replace components as directed.
Low gear shudder at full drive or full coast under light load conditions	1. Incorrect phasing	1. Reassemble with correct phasing.
	2. Driveline weight incompatible with engine-transmission mounting	2. Install two-piece driveline with shaft support bearing.
	3. Driveline too long for speed	3. Install two-piece driveline with shaft support bearing.
	4. Loose outside diameter fit on slip yoke spline	4. Change slip yoke and spline plug.
	5. Universal joint loose	5. Inspect universal joint for looseness; tighten to specification. Replace if necessary.
	6. Driveline out of balance or bent	6. Rebalance or replace.
	7. Worn universal joint	7. Replace universal joint.
	8. Torsional and/or inertial excitation	8. Reduce universal joint continuous running angle by adding shims to driveline components.

Table I: Premature Wear

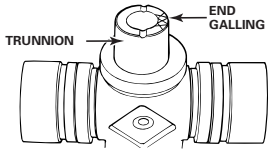
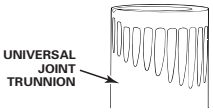
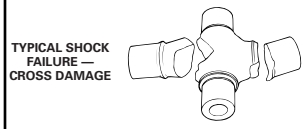
Condition	Cause	Correction
Low mileage universal joint wear	1. End yoke cross hole misalignment 2. Excess angularity 3. Incorrect lubrication	1. Use alignment bar to check for end yoke cross hole misalignment. Replace end yoke if misaligned. 2. Check universal joint operating angles. Reduce angles if necessary. 3. Lubricate according to specifications (non-RPL designs).
Repeat universal joint wear	1. Excessive continuous running load 2. Continuous operation at high angle/high speed 3. Worn or damaged seals	1. Replace with higher capacity universal joint and driveline. 2. Replace with higher capacity universal joint and driveline. Check universal joint operating angles. Reduce angles if necessary. 3. Replace universal joint kit.
End galling of cross trunnion and bearing assembly 	1. Excessive angularity 2. Excessive torque load for universal joint and driveline size	1. Check universal joint operating angles. Reduce angles if necessary. 2. Replace with higher capacity universal joint and driveline.
Needle rollers brinelled into bearing cup and cross trunnion 	1. Excessive continuous running load 2. Continuous operation at high angle/high speed 3. Insufficient operating angles	1. Replace with higher capacity universal joint and driveline. 2. Replace with higher capacity universal joint and driveline. Check universal joint operating angles. Reduce angles if necessary. 3. Increase operating angles to a minimum of 2°.
Broken cross and bearing assemblies 	Excessive torque load for universal joint and driveline size	Replace with higher capacity universal joint and driveline.

Table J: Slip Yoke Spline Wear

Condition	Cause	Correction
Seizure	1. Incorrect lubrication	1. Lubricate slip yoke spline according to specifications. Check seal.
	2. Worn or damaged part	2. Replace spline components.
	3. Contamination	3. Lubricate slip yoke spline according to specifications. Check seal.
Galling	1. Worn or damaged parts	1. Replace spline components.
	2. Contamination	2. Lubricate slip yoke spline according to specifications. Check seal.
Outside diameter wear at extremities	1. Incorrect lubrication	1. Lubricate slip yoke spline according to specifications. Check seal.
	2. Excessive loose outside diameter fit	2. Replace spline components.
Spline shaft or tube broken in torsion	1. Tube size inadequate	1. Use larger diameter tube.
	2. Excessive torque load for universal joints and driveline size	2. Replace with higher capacity universal joint and driveline.

Table K: Shaft and/or Tube

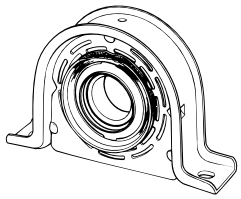
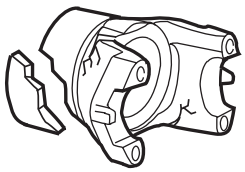
Condition	Cause	Correction
Shaft support bearing wear	1. Driveline too long for operating speeds	1. Install two-piece driveline with shaft support bearing.
	2. Incorrect lubrication of bearings	2. Replace center bearing.
Shaft support rubber insulator wear 	1. Bending fatigue due to secondary couple loads	1. Reduce universal joint continuous running angle.
	2. Excessive torque load for universal joint and driveline size	2. Replace with higher capacity universal joint and driveline.
	3. Shaft support bearing misaligned; interferes with deflector	3. Realign mounting bracket to frame crossmember to eliminate interference with deflector.
Tube circle weld fracture	1. Balance weight located in apex of weld yoke lug area	1. Replace tubing and rebalance.
	2. Balance weight too close to circle weld	2. Replace tubing and rebalance.
	3. Incorrect circle weld	3. Replace tubing and rebalance.

Table L: Yoke Fracture

Condition	Cause	Correction
Yoke broken or cracked 	1. Mating yoke lug interference at full jounce and rebound	1. Replace yoke. Check design for application. Use high angle yokes.
	2. Excessive torque load for universal joint and driveline size	2. Replace with higher capacity universal joint and driveline.
	3. Bending fatigue due to secondary couple loads	3. Reduce universal joint continuous running angles.

Tools You'll Need

- An inclinometer or a spirit level protractor to measure driveline angles. **Figures 11.1 and 11.2.**
- A tape measure to measure ride height for air-ride-equipped tractors
- A Data Gathering Worksheet. Photocopy one of the several Data Gathering Worksheets provided at the end of this manual. You will use this photocopy to record the tractor's specifications and driveline angle measurements. Refer to the Service Notes page at the front inside cover of this manual for information on how to obtain additional Data Gathering Worksheets.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Serious personal injury can result.

Prepare the Vehicle

1. Park the vehicle on a level surface. Do not engage the tractor brakes or the parking brakes.
2. Verify that all tires are on a level surface and inflated to the specified pressure.
3. Block the front tires at both the FRONT and REAR.

For Air-Ride-Equipped Tractors

1. Build air pressure to at least 115 psi (792.35 kPa).
2. Deflate air from the air bags: Use the dash-mounted deflate switch or release air pressure through the air valve at the rear of the tractor.
3. Allow the air bags to inflate completely.
4. Measure ride height with a tape measure. If necessary, adjust ride height to the correct vehicle manufacturer's specifications.

Figure 11.1

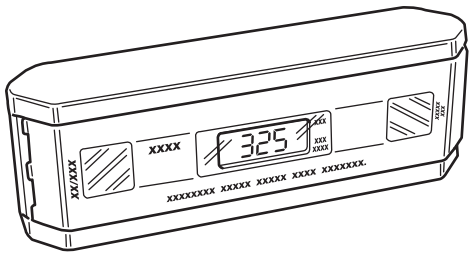
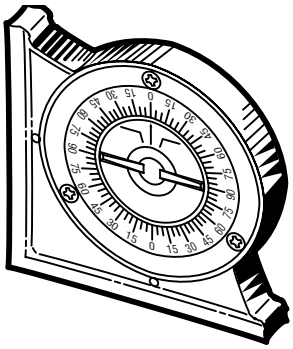


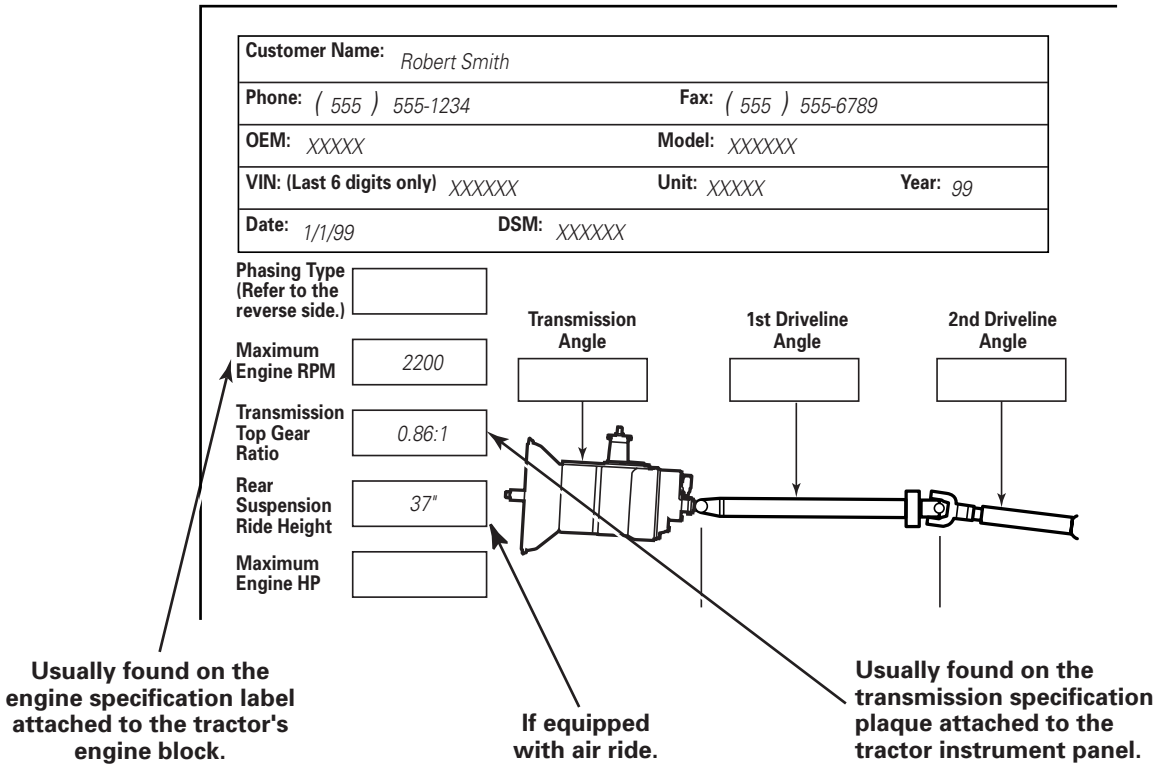
Figure 11.2



Data Gathering Worksheet

Fill In the General Information Section at the Top Right-Hand Corner of the Data Gathering Worksheet

NOTE: Worksheets can be located at the end of this manual.



Then Fill in the "Phasing Type" Box on the Data Gathering Worksheet

Refer to **Phasing Type 1**, **2**, **3** and **4** examples listed on the worksheet. **Figure 11.3**.

If you are unsure of the tractor's phasing type, use **"1"** in the box. **Figure 11.4**.

Figure 11.3

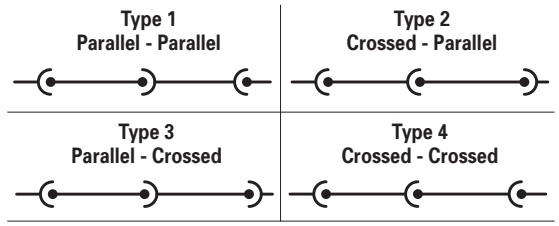
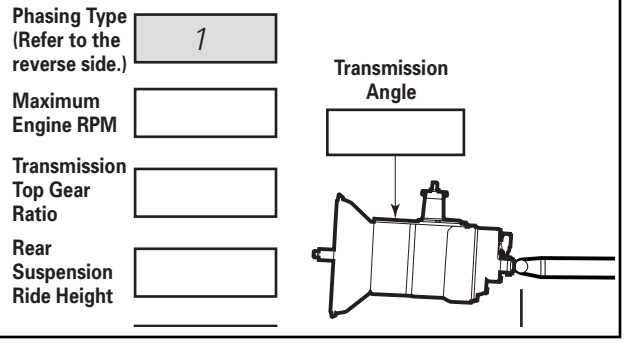


Figure 11.4



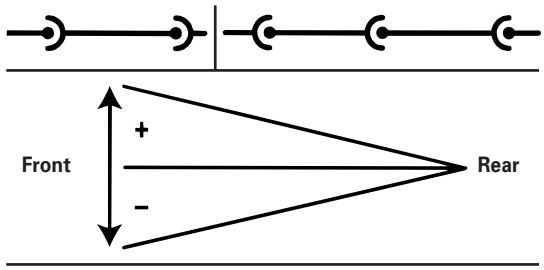
Before You Measure a Component, Determine the Positive (+) and Negative (–) Designations

You must fill in driveline angle measurements on the Data Gathering Worksheet as POSITIVE (+) and NEGATIVE (–) dimensions.

Before you measure a component, go to the side of the vehicle and look at the driveline. If the FRONT of the component is HIGHER than the REAR of the component, the dimension will be POSITIVE (+).

If the FRONT of the component is LOWER than the REAR of the component, the dimension will be negative (–). **Figure 11.5**.

Figure 11.5



Main Driveline Angles

Measure the Transmission Output Yoke Angle

Place the inclinometer or spirit level protractor on a spacer and on the transmission output yoke to measure the transmission output yoke angle. If a measurement is difficult to obtain on the yoke, you can measure from a flat transmission surface, including the countershaft bearing covers or the PTO cover. **Figures 11.6 and 11.7**.

Figure 11.6

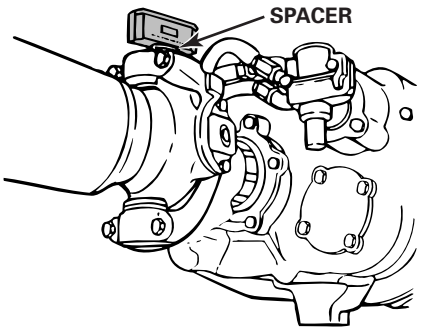
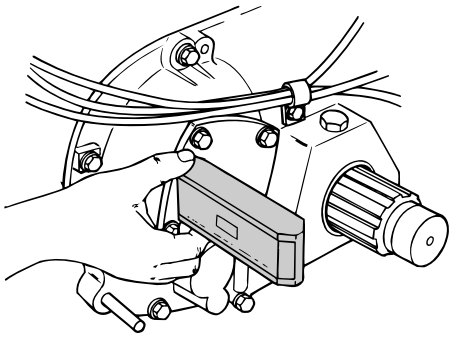
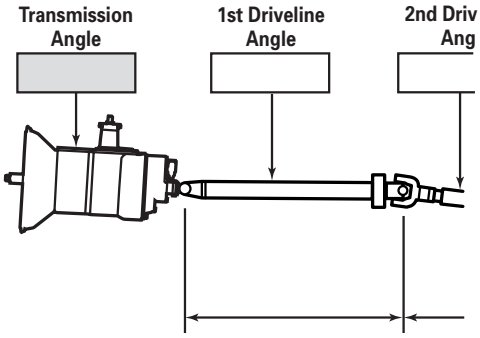


Figure 11.7



Record the measurement in the **Transmission Angle** box on the Data Gathering Worksheet. **Figure 11.8**.

Figure 11.8



Measure the First and Second Driveline Angles

Place the inclinometer or spirit level protractor on a smooth, flat portion of the driveline tubing to measure the first and second driveline angles. **Figure 11.9. Do not measure over welds or balance weights. The measurements will not be valid**.

Record the measurements in the **First Driveline Angle** and **Second Driveline Angle** boxes on the Data Gathering Worksheet. **Figure 11.10**.

Figure 11.9

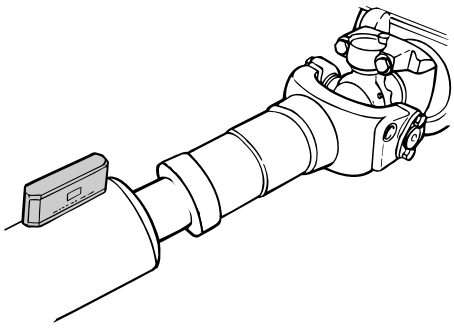
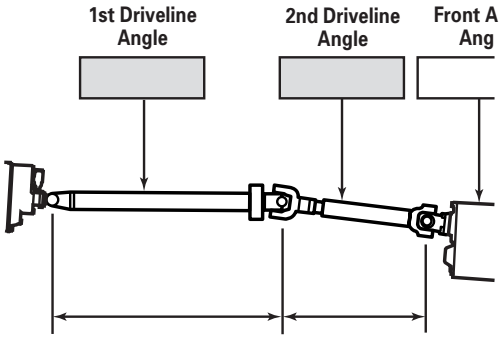


Figure 11.10



Measure the Forward Rear Drive Axle Angle

Place the inclinometer or spirit level protractor on a spacer and on the output yoke or on a smooth, flat portion of the axle housing tube (the “long” side, away from the bowl and near the suspension U-bolt) to measure the forward rear drive axle angle. **Figures 11.11 and 11.12**.

NOTE: Figure 11.12 is the preferred measurement method.

Write the measurement in the **Front Axle Angle** box on the Data Gathering Worksheet. **Figure 11.13**.

Figure 11.11

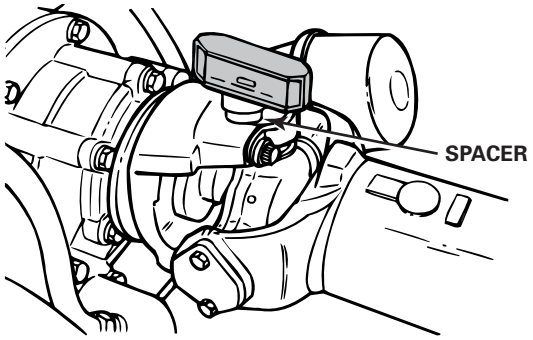


Figure 11.12

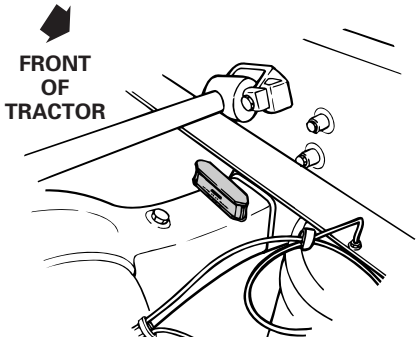
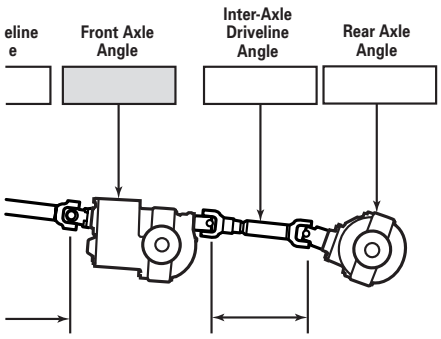


Figure 11.13



Measure the Inter-Axle Angle

Place the inclinometer or spirit level protractor on a smooth, flat portion of the driveline tubing to measure the inter-axle angle. **Figure 11.14**. **Do not measure over welds or balance weights. The measurement will not be valid.**

If the driveline tubing is too short, place the edge of the inclinometer or spirit level protractor vertically on the tube. Subtract 90 degrees from the reading to determine the correct angle. **Figure 11.15**.

Figure 11.14

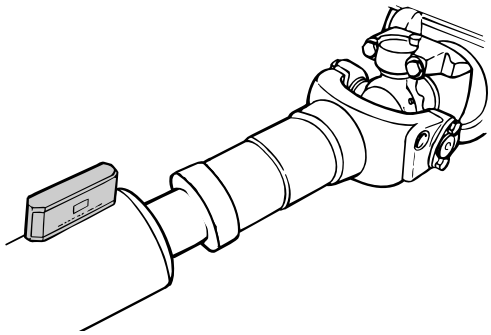
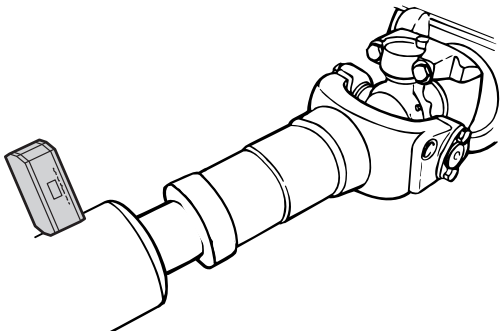
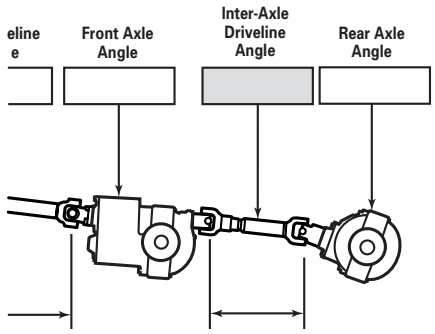


Figure 11.15



Write your measurement in the Inter-Axle Angle box on the Data Gathering Worksheet. **Figure 11.16**.

Figure 11.16



Measure the Rear Axle Angle

Place the inclinometer or spirit level protractor on a spacer and on the input yoke or on a smooth, flat portion of the axle tube (the "long" side, away from the bowl and near the suspension U-bolt) to measure the rear axle angle. **Figures 11.17 and 11.18**.

NOTE: Figure 11.18 is the preferred measurement method.

Write the measurement in the **Rear Axle Angle** box on the Data Gathering Worksheet. **Figure 11.19**.

Figure 11.17

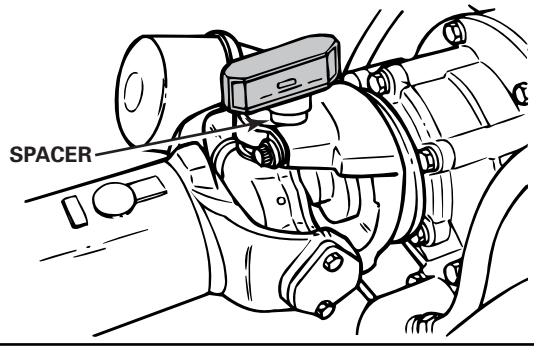


Figure 11.18

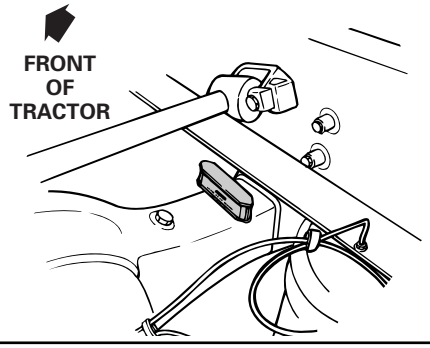
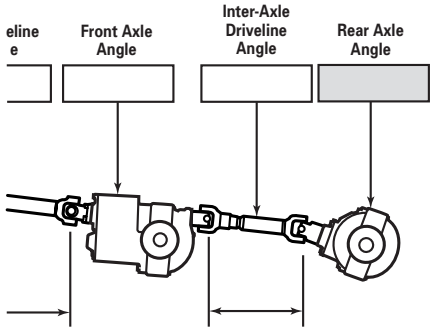


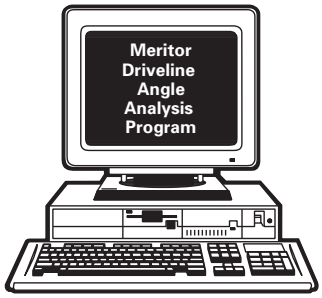
Figure 11.19



When You Finish Measuring the Driveline Angles

1. Set the tractor's parking brake.
2. Remove the blocks from the front tires.
3. You are now ready to enter the dimensions you recorded on the Data Gathering Worksheet into the Meritor Driveline Angle Analysis program on the disk included with this manual. Refer to Section 12. **Figure 11.20**.

Figure 11.20



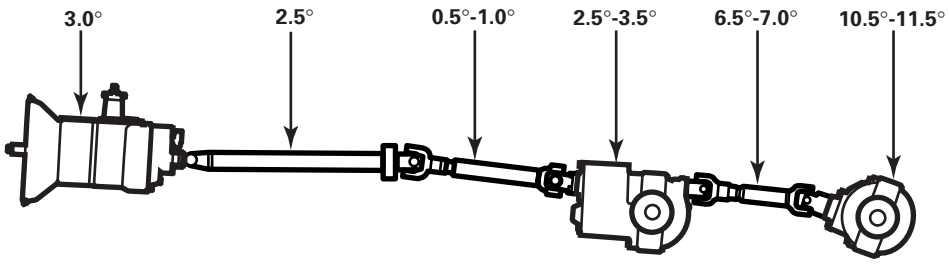
Hints for Driveline Set Up

After analyzing driveline angles, keep the following in mind when performing adjustment or replacement procedures:

- Keep operating angles below 5 degrees.
- Keep operating angles within 1 degree of each other.
- Typically, the Forward-Rear axle plane is the same as the Engine/Transmission plane (usually 3 to 3.5 degrees).
- Typically, the Rear-Rear axle plane is 10.5 to 11.5 degrees.

Recommended driveline angles are shown in **Figure 11.21**.

Figure 11.21



Driveline Angle Analysis Program

The Driveline Angle Analysis Program is used to determine the correct driveline angles for a Class 8 tractor with a two-piece main driveline and inter-axle. The program runs in Adobe Acrobat® Reader software. Refer to the Acrobat® Reader documentation for detailed information on using this program.

Open the Driveline Program

The Driveline Angle Analysis Program is on the CD-ROM included with this maintenance manual. To open the program, place the CD-ROM in the computer CD/DVD drive. The program will automatically launch. A menu page will appear on your screen with three options: View Manual, Run Program, and Exit.

If the program does not automatically launch:

1. Click the Windows® Start icon. Click Run.
2. In the Run window, click Browse to find your system's CD/DVD drive (for example, [D:]; or enter your drive in the Open field. Click OK.
3. Double-click the auto folder. Double-click Driveline.exe.

Confirm Vehicle Ride Height

Begin by confirming that the vehicle ride height is within specification.

1. Click on the **View Ride Height Measurement And Adjustment Procedures** field.
2. Follow the procedures to measure. If necessary, adjust vehicle ride height.
3. Road test the vehicle to determine if the driveline condition still exists.
4. If the condition still exists, click on the **Continue With Driveline Angle Analysis** field.
5. If the driveline condition was resolved by adjusting the ride height, click on the **Click Here To Exit This Program** field.

Measure Driveline Angles

Measure the following driveline angles. Refer to Section 11 for procedures.

- Transmission axis angle
- Coupling shaft angle
- Slip shaft angle
- Front axle input shaft angle
- Inter-axle angle
- Rear axle angle

Clicking on the **PHOTO** buttons displays examples of where to measure each angle.

NOTE: Several copies of the Data Gathering Worksheet are provided at the end of this manual. This worksheet can be taken to the vehicle, where you can record the relevant information.

Enter Data

1. Enter the following optional information in the appropriate fields at the top of the screen. **Figure 12.1**.
   - Customer name and phone numbers
   - OEM
   - Model
   - VIN
   - Unit
   - Year
   - DSM name

NOTE: You must correctly enter information in Steps 2-5 to obtain a correct analysis. If fields are left blank you will not obtain an analysis.

2. Enter the maximum engine RPM. **Figure 12.1**.
3. Enter the transmission overdrive ratio. This value should be less than 1. For direct drive applications, enter 1 (**Figure 12.1**). Click the **Select By Vendor** pull down menu. Click on the **GO** button. The screen will display lists of transmissions by manufacturer. You can select your specific transmission model and ratio from these lists.
4. Enter the driveline phasing type. Click on the **VIEW** button next to the **Phasing Type** field to view examples of the four phasing types. **Figure 12.2**. Passing the cursor over the example windows will close them.

NOTE: Each driveline section is designated either PARALLEL or CROSSED, which is determined by the position of the yokes at either end of the section. If the yoke lugs on the two yokes are aligned, the section is PARALLEL.

If the yoke lugs are not aligned (opposite or crossed), the section is CROSSED. Both sections are considered when determining the phasing type.

There are four driveline phasing types:

- Type 1: Parallel-Parallel
- Type 2: Crossed-Parallel
- Type 3: Parallel-Crossed
- Type 4: Crossed-Crossed

5. Enter the six driveline angle values that you measured on the vehicle.
6. After you've entered all of the required information, click anywhere on the screen to complete the calculations. Values will appear in the driveline analysis fields, which are located below the driveline diagram. Values shown in RED are not acceptable and must be corrected.
    - **If some values are shown in RED**: Click **Exceeds . . . Limit,** located beneath the data fields, to display troubleshooting boxes.

Figure 12.1

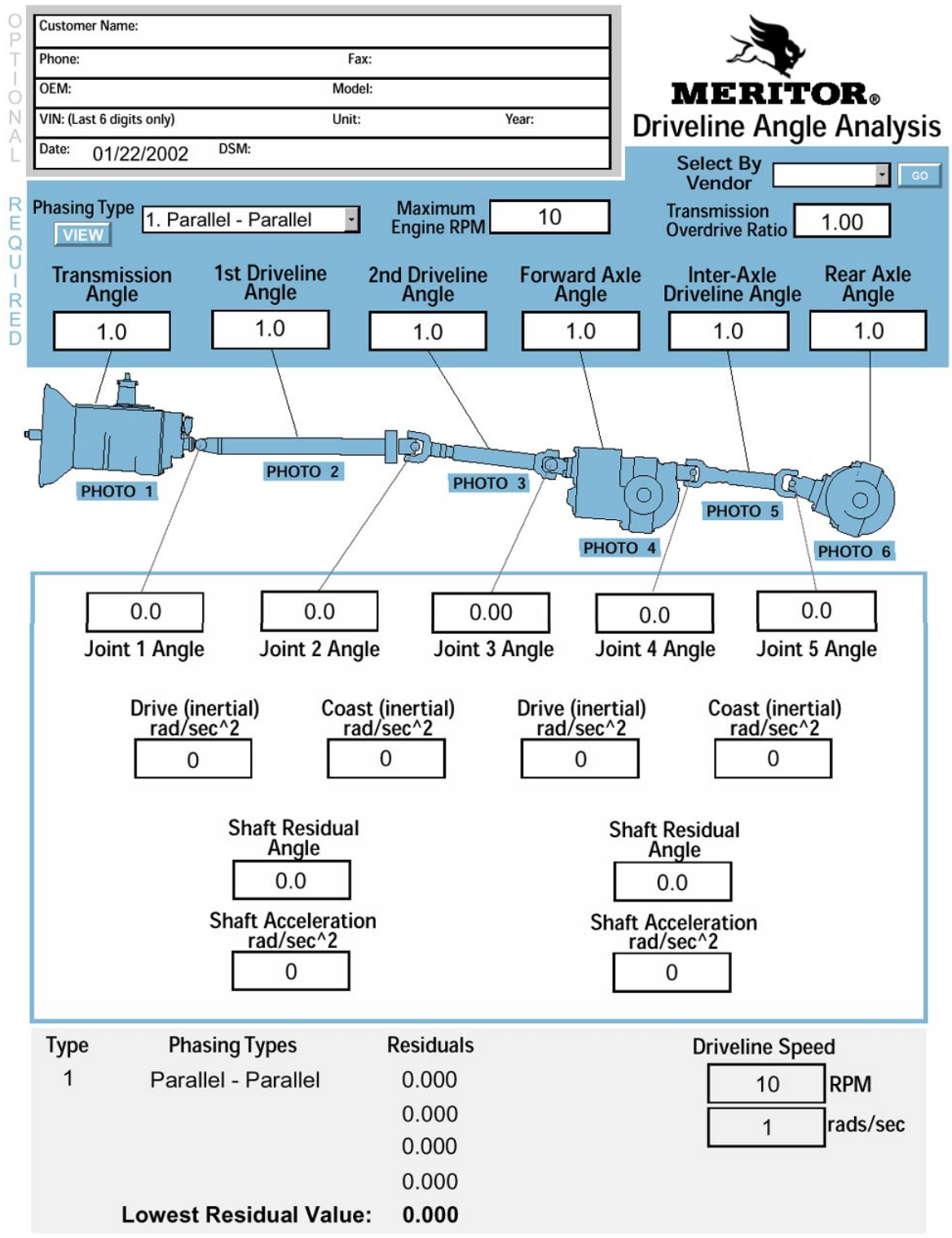
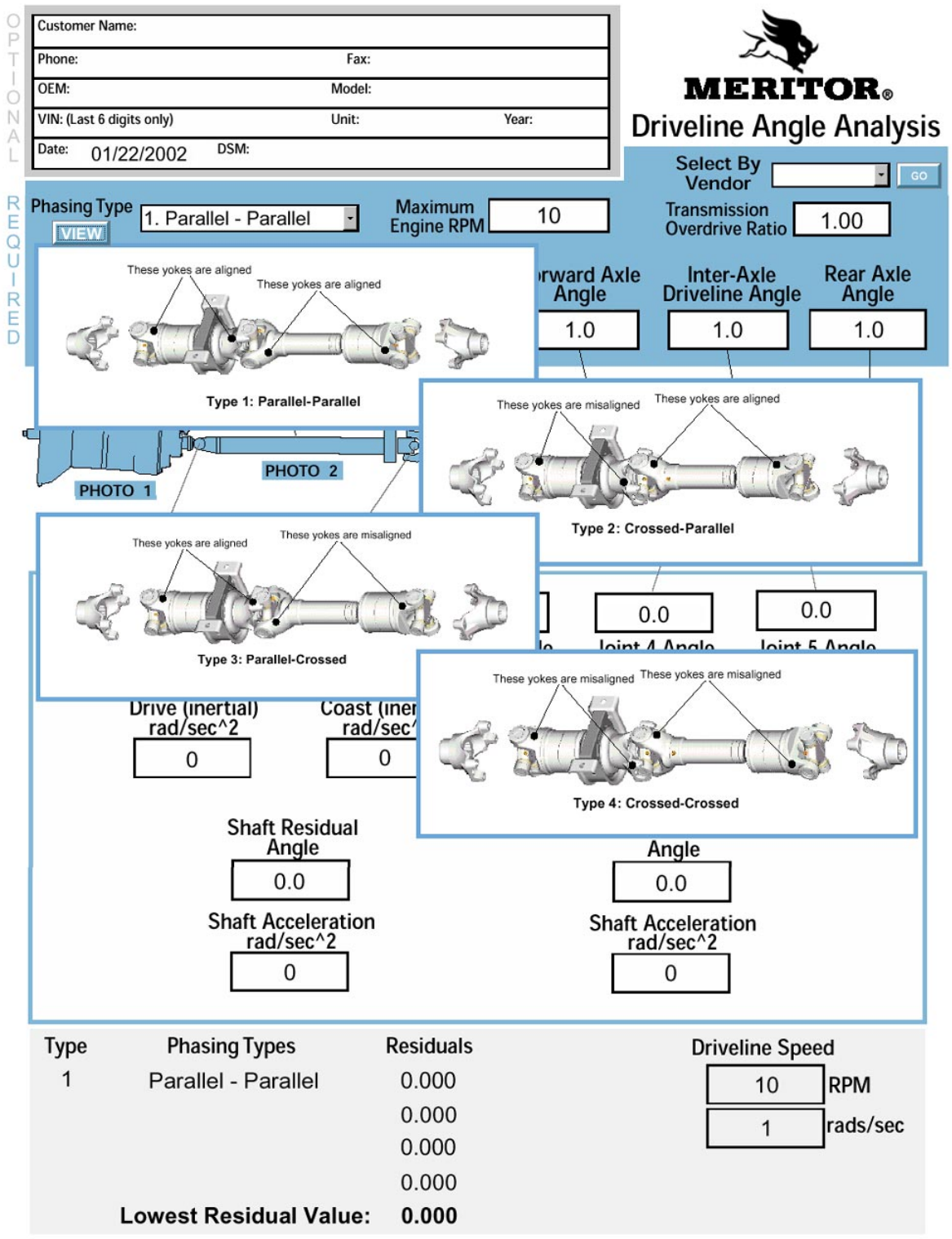
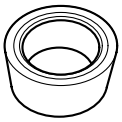


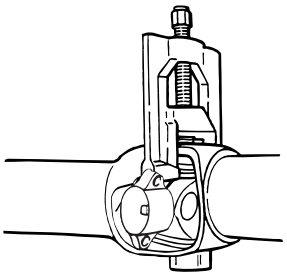
Figure 12.2



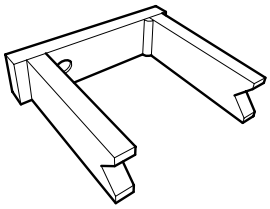
YOKE BEARING CUP
INSTALLATION
(PRESS ASSEMBLY)
SPX KENT-MOORE
TOOL NUMBER J-42368-3



BEARING CUP
BUSHING RECEIVER
SPX KENT-MOORE
TOOL NUMBER J-42368-2

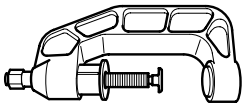


UNIVERSAL JOINT PULLER
TIGER TOOL NUMBER 10102

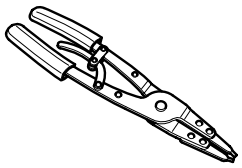


BRIDGE
SPX KENT-MOORE
TOOL NUMBER
J-42368-1

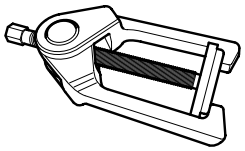
ELECTRONIC
PROTRACTER
SPX KENT-MOORE
TOOL NUMBER J-38460-A



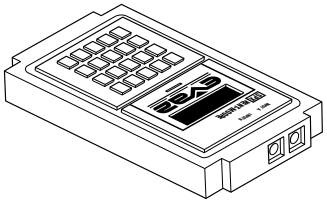
UNIVERSAL JOINT PRESS
SPX KENT-MOORE
TOOL NUMBER 10707



SNAP RING PLIERS
SPX KENT-MOORE
TOOL NUMBER J-44676-1



YOKE BEARING
CUP INSTALLER
SPX KENT-MOORE
TOOL NUMBER
J-44516



EVA 2
VIBRATION ANALYZER
SPX KENT-MOORE
TOOL NUMBER
J-38792-A AND
J-45733

Refer to the Service Notes page at the front inside cover of this manual for information on how to obtain these tools.

Bearing Stub — A splined stub that is pressed into and welded onto the tubing of a non-slip coupling shaft assembly.

Brinelling — Grooves worn into a cross and bearing kit trunnion by the needle rollers due to insufficient lubrication, excessive load or improper driveline angles.

Cardan Universal Joint — A mechanical device in which a cross and bearing kit connects yokes of a driving and a driven shaft.

Cross — The cross-shaped "body" of a universal joint kit.

Cross and Bearing Kit — Cross-shaped body with swivel bearings over each end that joins two driveline yokes in a Cardan universal joint. Cross and Bearing Kits are sometimes referred to as a "universal joint" or "universal joint kit."

End Yoke — A yoke mounted to an input or output transmission shaft or axle shaft and secured by a nut and washer.

Galling — A transfer or displacement of metal. Galling can be caused by lack of lubricant, improper lubrication or excessive loads.

Gear Efficiency (e) — Ratio of power out of a gear set and the power provided into that gear set.

Hinging-Loose Condition — Usually within a slip section, which causes vibration through the driveline.

Needle Cup — A cross and bearing component kit that fits over the trunnion and holds the needle rollers.

Needle Rollers — Cylindrical bearings positioned around the bore of the needle cup that enable the bearing to rotate freely on the trunnion.

Non-Slip Coupling Shaft Assembly — A driveline of fixed length consisting of a weld yoke, tubing, bearing stub, center bearing kit and an end yoke with splined hole.

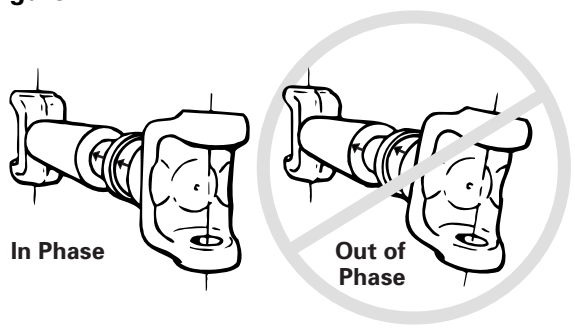
Operating Angle — The angle defined by the intersection of the centerlines of two shafts connected by a universal joint.

Permalube Universal Joint — A permanently lubricated and sealed universal joint that does not require regular lubrication.

Permalube Driveline — A driveline incorporating permanently lubricated universal joints with a permanently lubricated and sealed slip section. The entire assembly does not require regular lubrication.

Phasing — Correct alignment between yokes at each end of a driveline. **Figure 14.1**.

Figure 14.1



Round Bearing — A type of bearing cup used in cross and bearing kits for Cardan universal joints.

Runout — A condition in which a component's radius dimensions vary when the component is rotated. Excessive runout can negatively affect driveline operation.

Slip Yoke — A driveline assembly component that allows for driveline length changes by absorbing axial (backward-forward) movement of the driveline caused by axle articulation.

Standard Slip Assembly — A driveline assembly consisting of a slip yoke, spline plug, tubing and weld yoke.

Torsional Acceleration — Excessive rotation speed in an individual section of the driveline. Usually due to improper phasing.

Trunnion — Ground surfaces of the universal joint crossover in which the bearing cups fit.

Universal Joint — A joint providing a flexible coupling that allows torque transmission and rotary motion from one shaft to another, as well as angular changes in shaft alignment.

Welch Plug — A plate or cup used to seal the hole in the throat of a slip yoke and retain grease in the spline area.

Weld Yoke — A type of permanent fitting, welded to one or both ends of a driveline, designed for a specific combination of tubing and universal joint kit.

Wing Bearing — A type of bearing cup used in cross and bearing kits for specific types of yokes in Cardan universal joints. The cup has two flanges through which drilled or threaded holes extend to allow for cross and bearing kit mounting.

Customer Name:		
Phone: ( )	**Fax:** ( )	
OEM:	**Model:**	
VIN: (Last 6 digits only)	**Unit:**	**Year:**
Date:	**DSM:**	

MERITOR®

Driveline Angle Analysis Data Gathering Sheet

Phasing Type

Maximum Engine RPM

Transmission Top Gear Ratio

Rear Suspension Ride Height

Maximum Engine HP

Clutch Model

Transmission Model

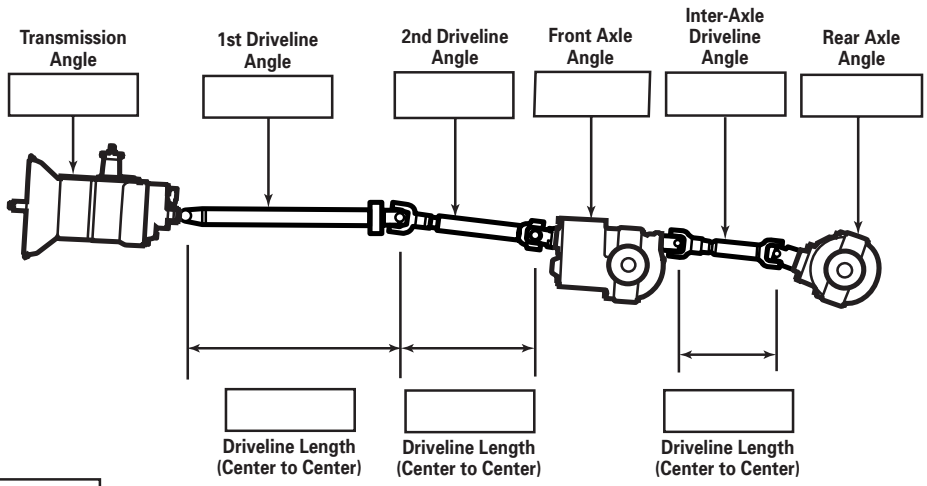
Main Driveline Series

Axle Model

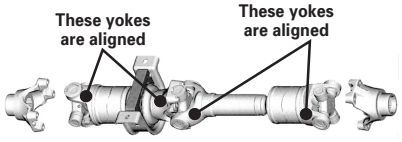
I/A Driveline Series

Tire Size

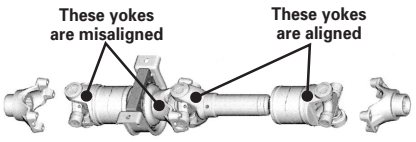
Ratio



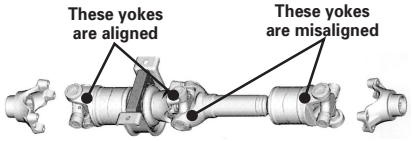
Type 1 PARALLEL – PARALLEL



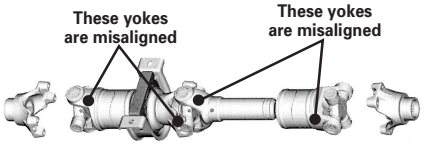
Type 2 CROSSED – PARALLEL



Type 3 PARALLEL – CROSSED

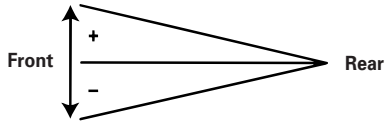


Type 4 CROSSED – CROSSED



Before you measure a component, go to the side of the vehicle and look at the driveline:

- If the **FRONT** of the component is **HIGHER** than the **REAR** of the component, the dimension will be **positive (+)**.
- If the **FRONT** of the component is **LOWER** than the **REAR** of the component, the dimension will be **negative (–)**.



Assumptions

1. **Drivelines are in the same plane. The top view shows all drivelines in a straight line.**

   For drivelines outside of the same plane, measure the offsets of each joint to the frame. Measure joint center to joint center lengths of each shaft. Fax this information to ArvinMeritor's Customer Service Center at 248-435-5580 or call the Center at 800-535-5560 for assistance.

2. **Drivelines are balanced according to Meritor's driveline specifications.**

Customer Name:	
Phone: ( )	**Fax:** ( )
OEM:	**Model:**
VIN: (Last 6 digits only)	**Unit:** **Year:**
Date:	**DSM:**

MERITOR®

Driveline Angle Analysis Data Gathering Sheet

Phasing Type

Maximum Engine RPM

Transmission Top Gear Ratio

Rear Suspension Ride Height

Maximum Engine HP

Clutch Model

Transmission Model

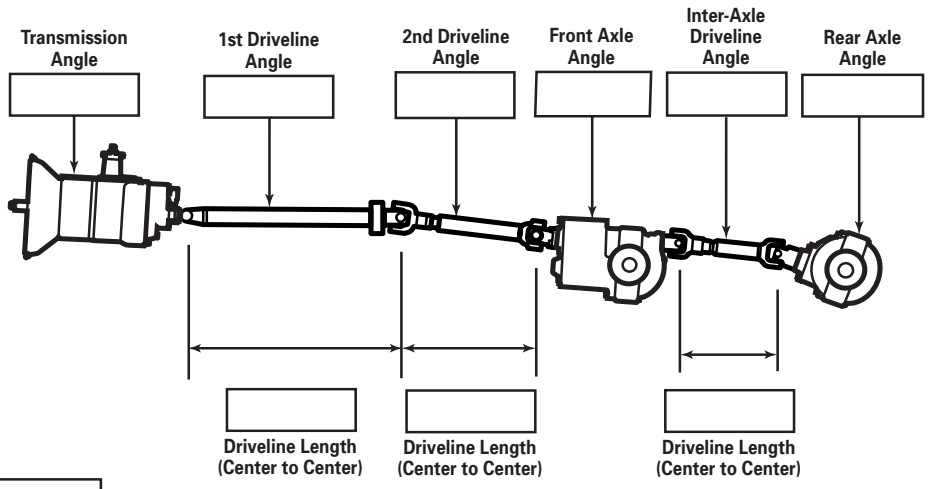
Main Driveline Series

Axle Model

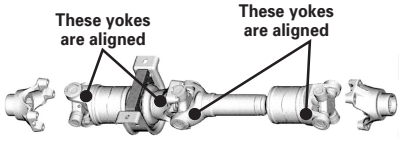
I/A Driveline Series

Tire Size

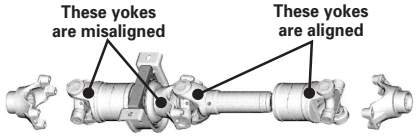
Ratio



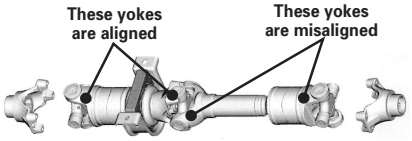
Type 1 PARALLEL – PARALLEL



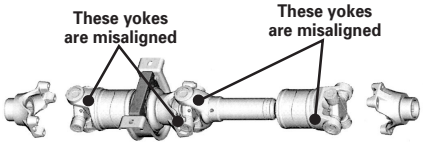
Type 2 CROSSED – PARALLEL



Type 3 PARALLEL – CROSSED

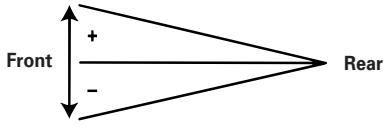


Type 4 CROSSED – CROSSED



Before you measure a component, go to the side of the vehicle and look at the driveline:

- If the **FRONT** of the component is **HIGHER** than the **REAR** of the component, the dimension will be **positive (+)**.
- If the **FRONT** of the component is **LOWER** than the **REAR** of the component, the dimension will be **negative (–)**.



Assumptions

1. **Drivelines are in the same plane. The top view shows all drivelines in a straight line.**

   For drivelines outside of the same plane, measure the offsets of each joint to the frame. Measure joint center to joint center lengths of each shaft. Fax this information to ArvinMeritor's Customer Service Center at 248-435-5580 or call the Center at 800-535-5560 for assistance.

2. **Drivelines are balanced according to Meritor's driveline specifications.**

Customer Name:		
Phone: ( )	**Fax:** ( )	
OEM:	**Model:**	
VIN: (Last 6 digits only)	**Unit:**	**Year:**
Date:	**DSM:**	

MERITOR®

Driveline Angle Analysis Data Gathering Sheet

Phasing Type

Maximum Engine RPM

Transmission Top Gear Ratio

Rear Suspension Ride Height

Maximum Engine HP

Clutch Model

Transmission Model

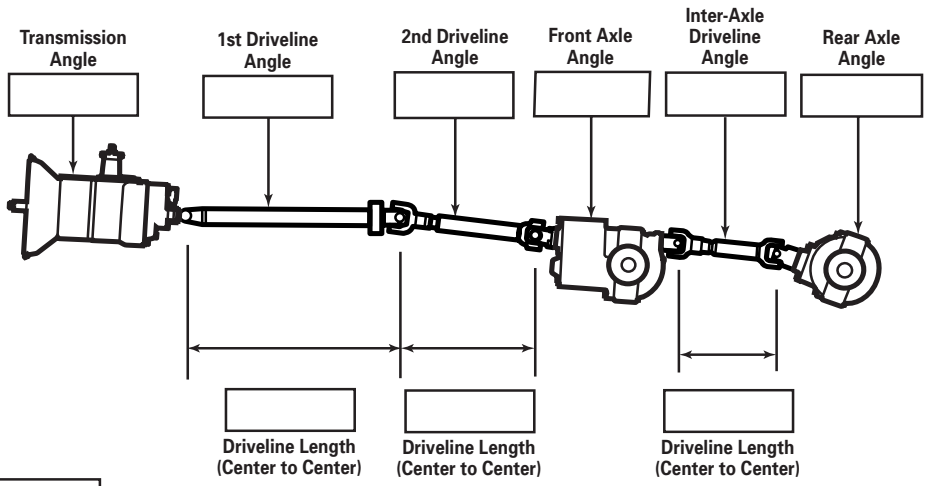
Main Driveline Series

Axle Model

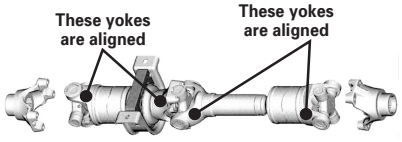
I/A Driveline Series

Tire Size

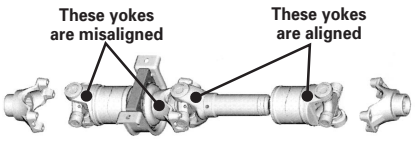
Ratio



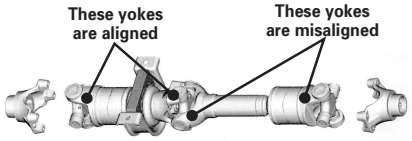
Type 1 PARALLEL – PARALLEL



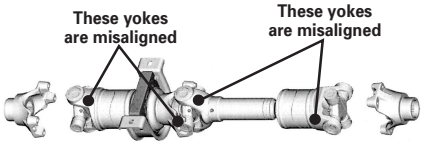
Type 2 CROSSED – PARALLEL



Type 3 PARALLEL – CROSSED

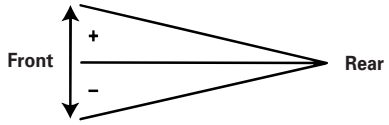


Type 4 CROSSED – CROSSED



Before you measure a component, go to the side of the vehicle and look at the driveline:

- If the **FRONT** of the component is **HIGHER** than the **REAR** of the component, the dimension will be **positive (+)**.
- If the **FRONT** of the component is **LOWER** than the **REAR** of the component, the dimension will be **negative (–)**.



Assumptions

1. **Drivelines are in the same plane. The top view shows all drivelines in a straight line.**

   For drivelines outside of the same plane, measure the offsets of each joint to the frame. Measure joint center to joint center lengths of each shaft. Fax this information to ArvinMeritor's Customer Service Center at 248-435-5580 or call the Center at 800-535-5560 for assistance.

2. **Drivelines are balanced according to Meritor's driveline specifications.**

Customer Name:	
Phone: ( )	**Fax:** ( )
OEM:	**Model:**
VIN: (Last 6 digits only)	**Unit:** **Year:**
Date:	**DSM:**

MERITOR®

Driveline Angle Analysis Data Gathering Sheet

Phasing Type

Maximum Engine RPM

Transmission Top Gear Ratio

Rear Suspension Ride Height

Maximum Engine HP

Clutch Model

Transmission Model

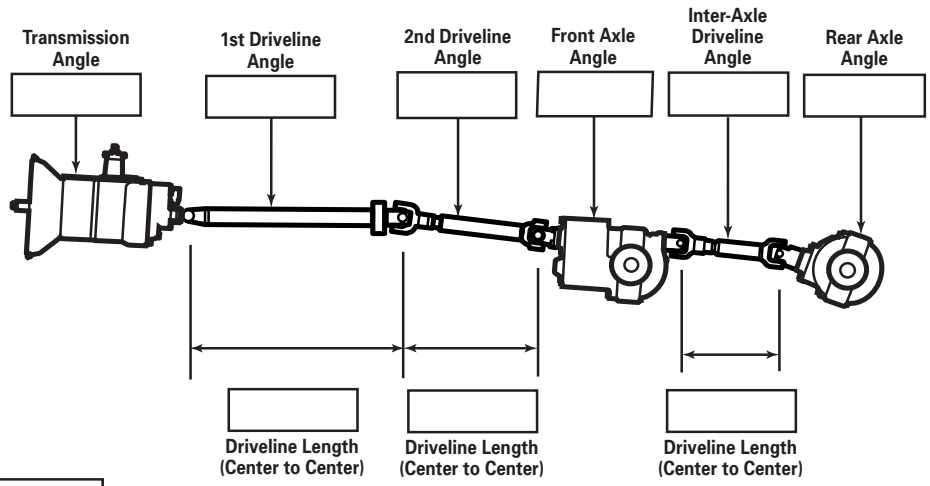
Main Driveline Series

Axle Model

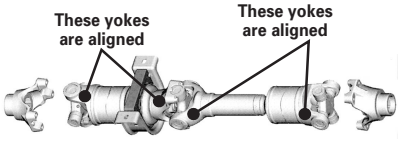
I/A Driveline Series

Tire Size

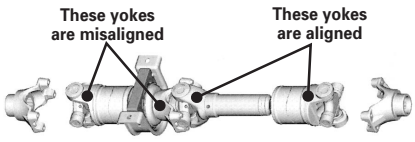
Ratio



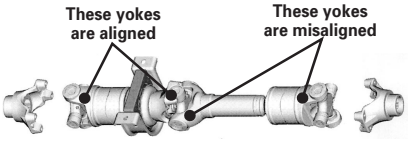
Type 1 PARALLEL – PARALLEL



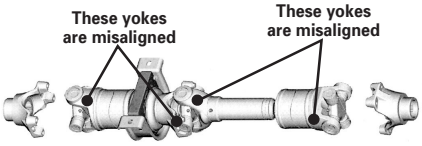
Type 2 CROSSED – PARALLEL



Type 3 PARALLEL – CROSSED

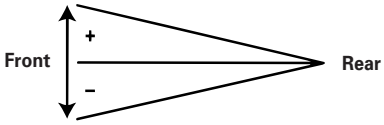


Type 4 CROSSED – CROSSED



Before you measure a component, go to the side of the vehicle and look at the driveline:

- If the **FRONT** of the component is **HIGHER** than the **REAR** of the component, the dimension will be **positive (+)**.
- If the **FRONT** of the component is **LOWER** than the **REAR** of the component, the dimension will be **negative (–)**.



Assumptions

1. **Drivelines are in the same plane. The top view shows all drivelines in a straight line.**

   For drivelines outside of the same plane, measure the offsets of each joint to the frame. Measure joint center to joint center lengths of each shaft. Fax this information to ArvinMeritor's Customer Service Center at 248-435-5580 or call the Center at 800-535-5560 for assistance.

2. **Drivelines are balanced according to Meritor's driveline specifications.**

Customer Name:		
Phone: ( )	**Fax:** ( )	
OEM:	**Model:**	
VIN: (Last 6 digits only)	**Unit:**	**Year:**
Date:	**DSM:**	

MERITOR®

Driveline Angle Analysis Data Gathering Sheet

Phasing Type

Maximum Engine RPM

Transmission Top Gear Ratio

Rear Suspension Ride Height

Maximum Engine HP

Clutch Model

Transmission Model

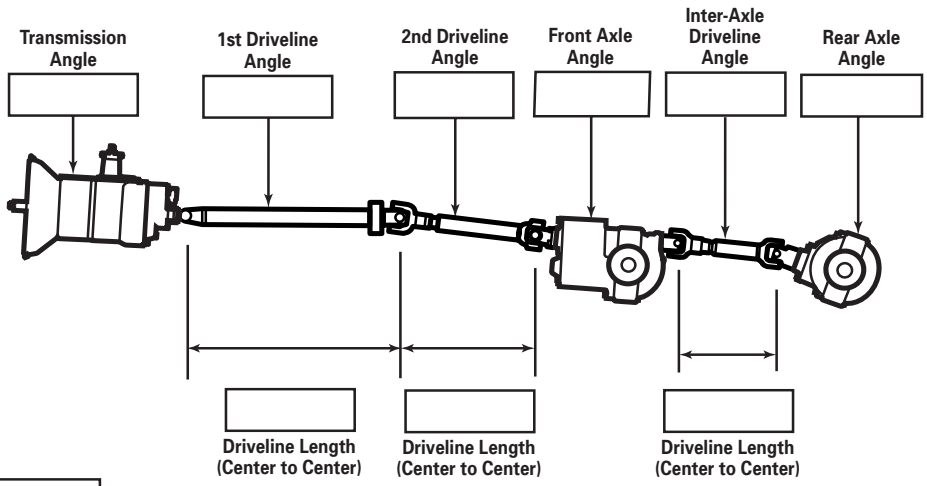
Main Driveline Series

Axle Model

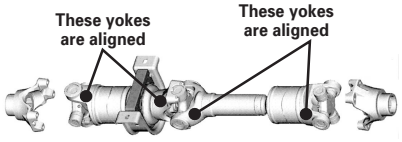
I/A Driveline Series

Tire Size

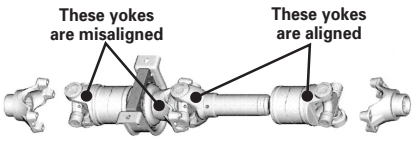
Ratio



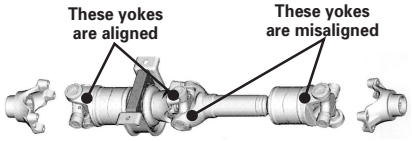
Type 1 PARALLEL – PARALLEL



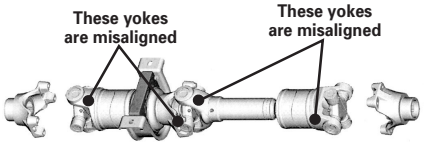
Type 2 CROSSED – PARALLEL



Type 3 PARALLEL – CROSSED

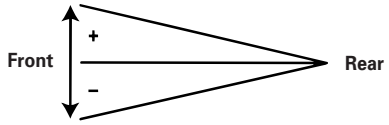


Type 4 CROSSED – CROSSED



Before you measure a component, go to the side of the vehicle and look at the driveline:

- If the **FRONT** of the component is **HIGHER** than the **REAR** of the component, the dimension will be **positive (+)**.
- If the **FRONT** of the component is **LOWER** than the **REAR** of the component, the dimension will be **negative (–)**.



Assumptions

1. **Drivelines are in the same plane. The top view shows all drivelines in a straight line.**

   For drivelines outside of the same plane, measure the offsets of each joint to the frame. Measure joint center to joint center lengths of each shaft. Fax this information to ArvinMeritor's Customer Service Center at 248-435-5580 or call the Center at 800-535-5560 for assistance.

2. **Drivelines are balanced according to Meritor's driveline specifications.**

Customer Name:	
Phone: ( )	**Fax:** ( )
OEM:	**Model:**
VIN: (Last 6 digits only)	**Unit:** **Year:**
Date:	**DSM:**

MERITOR®

Driveline Angle Analysis Data Gathering Sheet

Phasing Type

Maximum Engine RPM

Transmission Top Gear Ratio

Rear Suspension Ride Height

Maximum Engine HP

Clutch Model

Transmission Model

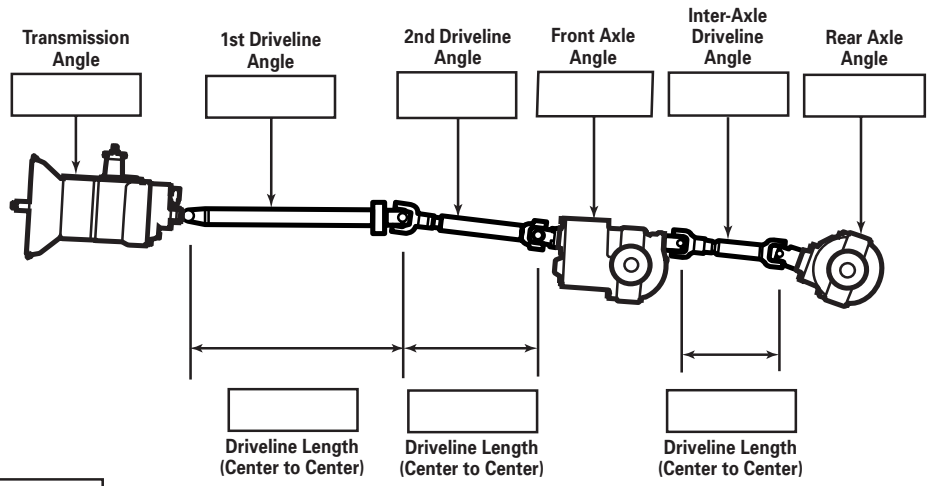
Main Driveline Series

Axle Model

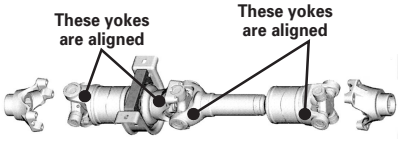
I/A Driveline Series

Tire Size

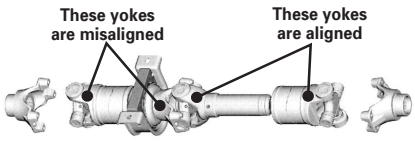
Ratio



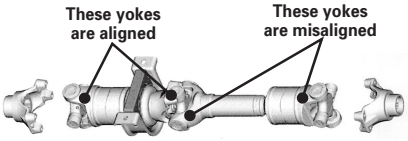
Type 1 PARALLEL – PARALLEL



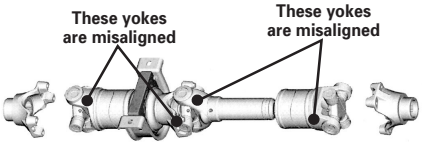
Type 2 CROSSED – PARALLEL



Type 3 PARALLEL – CROSSED

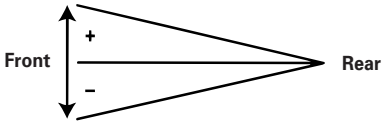


Type 4 CROSSED – CROSSED



Before you measure a component, go to the side of the vehicle and look at the driveline:

- If the **FRONT** of the component is **HIGHER** than the **REAR** of the component, the dimension will be **positive (+)**.
- If the **FRONT** of the component is **LOWER** than the **REAR** of the component, the dimension will be **negative (–)**.



Assumptions

1. **Drivelines are in the same plane. The top view shows all drivelines in a straight line.**

   For drivelines outside of the same plane, measure the offsets of each joint to the frame. Measure joint center to joint center lengths of each shaft. Fax this information to ArvinMeritor's Customer Service Center at 248-435-5580 or call the Center at 800-535-5560 for assistance.

2. **Drivelines are balanced according to Meritor's driveline specifications.**

ArvinMeritor™
Commercial Vehicle Systems

Meritor Heavy Vehicle Systems, LLC
2135 West Maple Road
Troy, MI 48084 USA
800-535-5560
arvinmeritor.com

Printed in the USA

Maintenance Manual MM-96147
Revised 03-02
16579/24240