



ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT)



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INSPECTION

SPICER LITE® ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT) INSPECTION

Before You Get Started

This manual is intended to be a supplement to your original equipment vehicle manufacturers' service manual. For complete detailed Spicer aluminum steering shaft (intermediate shaft) maintenance procedures use this manual.

Note - Spicer Lite aluminum steering shafts (intermediate shafts) are found on vehicles throughout the world. This manual includes international terminology. The international terms have been highlighted in teal.

Caution - Under no circumstances should an individual attempt to perform aluminum steering shaft (intermediate shaft) service and/or maintenance procedures for which he or she has not been trained or does not have the proper tools and equipment. ▲ See warning, below.

WARNING

Failure to take common-sense, precautionary measures when working on a vehicle could result in property damage, personal injury or death. In order to avoid property damage, personal injury or death, you must:

- 1. ALWAYS** wear safety glasses when performing maintenance or service. Failure to wear safety glasses could result in personal injury, partial or complete vision loss.
- 2. NEVER** attempt to remove an aluminum steering shaft (intermediate shaft) from a vehicle while the engine is running. Be sure that the vehicle's engine is off, and keys are removed from ignition.
- 3. NEVER** go under or work on a vehicle that is not on a level or flat surface.
- 4. NEVER** remove an aluminum steering shaft (intermediate shaft) without blocking the vehicle's wheels.
- 5. NEVER** heat an aluminum steering shaft (intermediate shaft) component or use a hammer on the aluminum components of the steering shaft to remove it from the vehicle.

- 6. NEVER** stand on an aluminum steering shaft (intermediate shaft) or use it as a leverage bar. See notification decal (reproduced below) on aluminum steering shaft (intermediate shaft).

NOTICE/AVISO/AVIS

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NO PISAR	NO PISAR	NO PISAR
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NE PAS APPUYER	NE PAS APPUYER	NE PAS APPUYER
Vou les exigences d'entretien et de sécurité Dans le manuel de service Spicer n° 3264-SLSTRG Ou: www.dana.com		

- 7. NEVER** make any modifications to an aluminum steering shaft (intermediate shaft) that were not original to the design of the product.

- 8. NEVER USE** an aluminum steering shaft (intermediate shaft) in non-power steering applications.

▲ See warning, below.

WARNING

Spicer Lite aluminum steering shafts (intermediate shafts) are to be used only in original equipment vehicle manufacturers' applications. Failure to do so can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

- 9. NEVER** use an aluminum steering shaft (intermediate shaft) in a cab over application. ▲ See warning, above.

- 10. NEVER** use an aluminum steering shaft (intermediate shaft) in a power-take-off (PTO) application.

- 11. NEVER** high-pressure wash aluminum steering shaft (intermediate shaft) u-joints or booted slip member with degreasing solvent or water.

- 12. NEVER** replace only one component of the slip member assembly (yoke shaft or slip yoke).

ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT) INSPECTION PROCEDURES

Spicer Lite aluminum steering shafts (intermediate shafts) should be carefully inspected at recommended original equipment vehicle manufacturers' service intervals and/or at Spicer recommended lubrication intervals, as shown in table A, below. Be sure to follow **ALL** inspection procedures described in this manual.

Note - The following procedures are to be performed **prior to** any lubrication of the universal joints. The addition of lubricant can mask the looseness in a component that is beginning to show wear and may be in need of replacement.

Required Tool

- Spicer Steering Wear Indicator
Part Number STWI-2 (See photo 1)
1-800-826-HELP (U.S. only)
(For proper tool usage instruction – refer to Appendix A.)



Photo 1

END FITTINGS PINCH BOLT STYLE

1. Check all input and output end fittings for looseness in the spline connection. Grasp the end fitting with both hands. Try to move it vertically and horizontally to feel any looseness. (See photo 2 below.) There should **NOT** be any movement in the end fittings relative to the input or output shaft to which they are connected.

▲ See warning, below.

WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

If looseness is evident, replacement of the end fitting is necessary. For proper end fitting replacement procedures, refer to the removal and installation sections of this manual.



Photo 2

UNIVERSAL JOINT MAXIMUM LUBRICATION INTERVALS

SERIES	CITY	ON-HWY.	LINEHAUL	OFF-HWY.
SPL 6 (relubeable style)	25,000 Mi.	50,000 Mi.	50,000 Mi.	25,000 Mi.
	40,000 Km	80,000 Km	80,000 Km	40,000 Km
	or	or	or	or
	3 Months	6 Months	6 Months	3 Months
	(whichever comes first)	(whichever comes first)	(whichever comes first)	(whichever comes first)

City is defined as all applications that require a minimum of 90% of operation time within city limits.

On-highway is defined as all applications requiring less than 10% of operating time on gravel, dirt or unpaved roads.

Linehaul is defined as 100% of operation time on smooth concrete or asphalt.

Off-highway is defined as all applications requiring more than 10% of operating time on gravel, dirt or unpaved roads.

Table A

2. Visually inspect both end fittings of the steering shaft for looseness or a gap at the pinch bolts and/or nuts. Also check to be sure the pinch bolts and/or nuts are not missing. (See photo 3.) If any of these situations are evident, inspect the male splined shaft for wear or damage. (See photo 4.) If the male shaft splines are worn or damaged, both the male shaft and end fitting must be replaced. **▲** See warning, below.

▲ WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

For proper end fitting replacement procedures, refer to the removal and installation sections of this manual. For proper male splined shaft replacement procedures, replace in accordance with the original equipment vehicle manufacturers' replacement procedures.

3. If no looseness or damage is evident, re-torque pinch bolts to proper torque specifications. (See table B, below.)

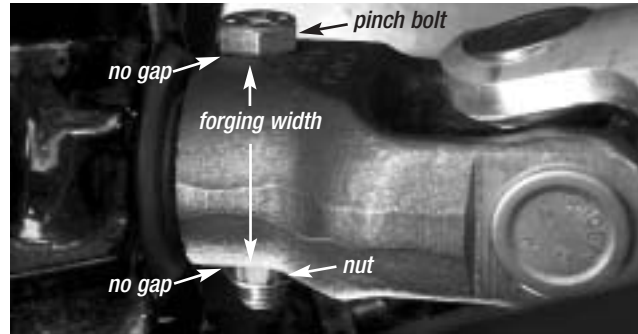


Photo 3



Photo 4

▲ WARNING

Failure to torque pinch bolts and/or nuts to required specifications can result in failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

PINCH BOLT* AND/OR NUT TORQUE SPECIFICATIONS

KIT #	BOLT	BOLT LENGTH FOR BOLT	WRENCH SIZE FOR NUT	NUT	WRENCH SIZE	BOLT HOLE DIAMETER	DRY TORQUE		FOR END YOKE WITH FORGING WIDTH OF***
							NM	FT.LB.	
211269X	included	2"	9/16"	included	9/16"	3/8"	30-35	40-48	1.500"
211270X	included	1.75"	9/16"	included	9/16"	3/8"	30-35	40-48	1.125" & 1.25"
211271X	included	2"	5/8"	included	11/16"	7/16"	46-55	63-75	1.500"
211272X	included	1.75"	5/8"	included	11/16"	7/16"	46-55	63-75	1.125" & 1.25"
211273X	included*†	1.25"	5/8"	not required	—	7/16" thread dia.	46-55	63-75	1.125" w/threads in yoke
211274X	included	2.125"	5/8"	included	11/16"	7/16"	46-55	63-75	1.620"

*Aluminum steering shaft (intermediate shaft) end fitting pinch bolts are to be S.A.E. grade eight. Nuts for pinch bolts are to be self-locking with a full nylon insert, serrated washer seat or upset threads. An S.A.E. grade five hex nut used in conjunction with a split lock washer is also acceptable. Do not use inferior grade bolts.

†Bolt must have self-locking feature.

***See photo 3, above

Note - When specified, use the original equipment vehicular manufacturers' recommended pinch bolts and/or nuts. If no original equipment vehicle manufacturers' specification is given, use the Spicer recommended hardware. (See table B, above.)

▲ See warning, above.

Table B

END FITTINGS COMPANION FLANGE/FLANGE YOKE STYLE

1. Check all input and output end fittings for looseness in the spline connection. Grasp the end fitting with both hands. Try to move it vertically and horizontally to feel any looseness. There should **NOT** be any movement in the end fittings relative to the input or output shaft to which they are connected. ▲ See warning, below.

▲ **WARNING**

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

2. Visually inspect all companion flange/flange yoke bolts and nuts (if applicable) for looseness, wear or damage. If bolts or nuts have looseness, wear or damage, replacement of the companion flange and flange yoke is necessary. ▲ See warning, above.

For proper replacement procedures for bolts, nuts, companion flange and flange yoke, refer to the removal and installation sections of this manual.

3. If no looseness or damage is evident, re-torque companion flange/flange yoke bolts and nuts (if applicable) to required specifications. (See table C, below.)

COMPANION FLANGE/FLANGE YOKE BOLT AND NUT TORQUE SPECIFICATIONS

WRENCH SIZE	DRY TORQUE	
	NM	FT. LB.
1/2"	22-26	30-35

Table C

UNIVERSAL JOINTS

1. Using the STWI-2 dial indicator, mounted to aluminum steering shaft (intermediate shaft), check for excessive circumferential (backlash) looseness of the universal joint across the yoke lug ear span. (See photo 5 and Appendix.) Try to rotate the shaft back and forth to indicate any looseness. There should never be more than .011 in. (.28 mm) movement in the universal joint kit relative to the inboard and outboard yokes. If looseness is greater than stated above, replacement of the universal joint kit is necessary. ▲ See warning, step 1, left.



Photo 5

Refer to the removal and installation sections of this manual for proper universal joint kit replacement procedures.

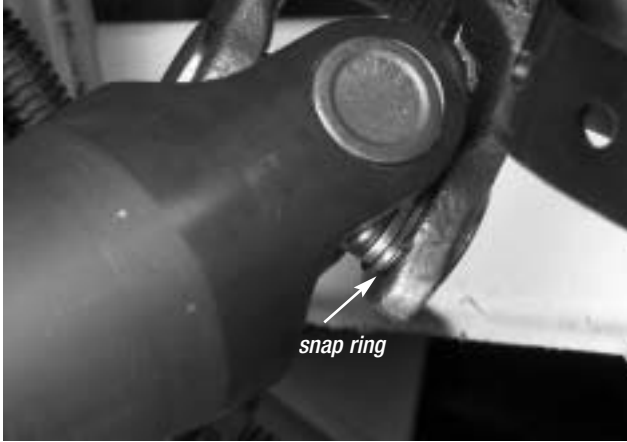


Photo 6

2. Visually check for damaged, severely corroded, or missing snap rings in both universal joint kits. (See photo 6.) If any snap rings are damaged, severely corroded or missing, replacement of the universal joint kit is necessary. ▲ See warning, below.

▲ WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

Refer to the removal and installation sections of this manual for proper universal joint kit replacement procedures.

3. Visually inspect all the universal joint kits for the presence of grease zerk (nipple) fittings (if applicable). Grease zerk (nipple) fittings should not be missing, loose or fractured. If the grease zerk (nipple) fitting is missing or fractured, the universal joint kit must be replaced.

▲ See warning, above.

Refer to the removal and installation sections of this manual for proper universal joint kit replacement procedures.

4. If the grease zerk (nipple) fitting is loose, tighten to snug. Continue to tighten until grease zerk (nipple) fitting is oriented for easy lubrication. Tighten to (31-55 in. lbs.) (1.9-3.4 Nm). (See table D, below.)

UNIVERSAL JOINT GREASE ZERK (NIPPLE) FITTING SPECIFICATIONS

SERIES	GREASE ZERK (NIPPLE) FITTING	ZERK (NIPPLE) TORQUE	
	P/N	NM	IN.LB.
SPL6	500175-2	1.9-3.4	31-55

Table D

SLIP MEMBER ASSEMBLY

1. Using the STWI-2 dial indicator, as illustrated, check the slip member assembly for excessive circumferential (backlash) looseness. (See photo 7 and Appendix.) Using both hands, one on each side of the gage, apply direct torque to the shaft by twisting the shaft in opposite directions as illustrated in photo 7, below. Total indicator travel should not exceed .040 in. (1.0 mm). If looseness, as read on dial indicator, is greater than stated above, replacement of the **complete** aluminum steering shaft (intermediate shaft) assembly is necessary. ▲ See warning, below.

▲ WARNING

Aluminum steering shaft (intermediate shaft) slip member components (yoke shaft and slip yoke) are matched sets.

NEVER replace only one component of the slip member assembly (yoke shaft or slip yoke). Replacing only one member of the slip member assembly can result in impaired steering and possible loss of vehicle control which can result in property damage, personal injury or death.



Photo 7

Refer to the removal section of this manual for proper aluminum steering shaft (intermediate shaft) assembly replacement procedures.

2. Using the STWI-2 dial indicator, as illustrated, check the slip member assembly for excessive radial (broken back) looseness. (See photo 8 and Appendix.) Grasp the aluminum steering shaft (intermediate shaft) and apply a load of five pounds (2.27 kgs.) to the shaft and perpendicular to dial indicator face. ① Then apply a load of five pounds 180 degrees opposite to the shaft.

① Tip

Loop a wire or plastic zip tie around the shaft, between the boot and the smaller clamp of STWI – 2 gage. Using a spring scale (e.g., fish scale) pull on loop to five pounds.

Total indicator travel should not exceed .060 in. (1.5 mm). If looseness, as read on dial indicator, is greater than stated above, replacement of the **complete** aluminum steering shaft (intermediate shaft) assembly is necessary.

▲ See warning, step 1.



Photo 8

3. Check for damaged or missing boot and/or clamps. (See photo 9.) Make sure the boot is properly clamped and square to the shaft and no looseness or damage is apparent. Check to make sure boot clamps are properly seated. If any looseness or damage is evident or boot clamps are not properly seated, replacement of the slip member boot is necessary. ▲ See warning, below.

Refer to the removal and installation sections of this manual for proper slip member boot replacement procedures.

▲ See warning, below.

▲ WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 9

4. Check to be sure the welch plug is not loose, missing or damaged. (See photo 10.) If the welch plug is loose, missing or damaged, replacement of the **complete** aluminum steering shaft (intermediate shaft) assembly is necessary. ▲ See warning, step 3.

5. Check the aluminum steering shaft (intermediate shaft) for dents in the aluminum and for damage to the lug ear shoulder. If either of these situations are evident, replacement of the **complete** aluminum steering shaft (intermediate shaft) assembly is necessary. ▲ See warning, step 3.

Refer to the removal and installation sections of this manual for proper aluminum steering shaft (intermediate shaft) assembly replacement procedures.

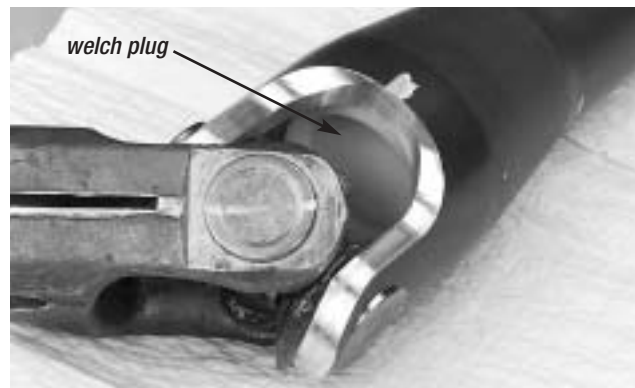


Photo 10

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LUBRICATION

SPICER LITE® ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT) LUBRICATION

Before You Get Started

This manual is intended to be a supplement to your original equipment vehicle manufacturers' service manual. For complete detailed Spicer aluminum steering shaft (intermediate shaft) maintenance procedures use this manual.

Note - Spicer Lite aluminum steering shafts (intermediate shafts) are found on vehicles throughout the world. This manual includes international terminology. The international terms have been highlighted in teal.

Caution - Under no circumstances should an individual attempt to perform aluminum steering shaft (intermediate shaft) service and/or maintenance procedures for which he or she has not been trained or does not have the proper tools and equipment. ▲ See warning, below.

WARNING

Failure to take common-sense, precautionary measures when working on a vehicle could result in property damage, personal injury or death. In order to avoid property damage, personal injury or death, you must:

1. **ALWAYS** wear safety glasses when performing maintenance or service. Failure to wear safety glasses could result in personal injury, partial or complete vision loss.
2. **NEVER** attempt to remove an aluminum steering shaft (intermediate shaft) from a vehicle while the engine is running. Be sure that the vehicle's engine is off, and keys are removed from ignition.
3. **NEVER** go under or work on a vehicle that is not on a level or flat surface.
4. **NEVER** remove an aluminum steering shaft (intermediate shaft) without blocking the vehicle's wheels.
5. **NEVER** heat an aluminum steering shaft (intermediate shaft) component or use a hammer on the aluminum components of the steering shaft to remove it from the vehicle.

6. **NEVER** stand on an aluminum steering shaft (intermediate shaft) or use it as a leverage bar. See notification decal (reproduced below) on aluminum steering shaft (intermediate shaft).

NOTICE/AVISO/AVIS

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NE PAS APPUYER	NE PAS APPUYER	NE PAS APPUYER
Vou les exigences d'entretien et de sécurité		
Dans le manuel de service Spicer n° 3264-SLSTRG Ou: www.dana.com		

7. **NEVER** make any modifications to an aluminum steering shaft (intermediate shaft) that were not original to the design of the product.
8. **NEVER USE** an aluminum steering shaft (intermediate shaft) in non-power steering applications. ▲ See warning, below.
WARNING
Spicer Lite aluminum steering shafts (intermediate shafts) are to be used only in original equipment vehicle manufacturers' applications. Failure to do so can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.
9. **NEVER** use an aluminum steering shaft (intermediate shaft) in a cab over application. ▲ See warning, above.
10. **NEVER** use an aluminum steering shaft (intermediate shaft) in a power-take-off (PTO) application.
11. **NEVER** high-pressure wash aluminum steering shaft (intermediate shaft) u-joints or booted slip member with degreasing solvent or water.
12. **NEVER** replace only one component of the slip member assembly (yoke shaft or slip yoke).

LUBRICATION

Lack of proper lubrication is one of the most common causes of aluminum steering shaft (intermediate shaft) universal joint problems. Inadequate relubrication cycles and failure to properly relubricate aluminum steering shaft (intermediate shaft) universal joints can cause premature wear of the universal joints. Proper relubrication flushes the universal joints, thus removing abrasive contaminants from the universal joint bearing assemblies.

▲ See warning, below.

WARNING

Inadequate lubrication can cause aluminum steering shaft (intermediate shaft) failure. Aluminum steering shaft (intermediate shaft) failure can result in impaired steering and possible loss of vehicle control, which can result in personal injury, property damage or death. In order to avoid aluminum steering shaft (intermediate shaft) failure, you must:

- Relubricate at recommended intervals, see table E, page 17;
- Use only recommended lubricant that meets the criteria listed below; and
- Carefully review aluminum steering shaft (intermediate shaft) inspection procedures.

Note – Spicer Lite aluminum steering shaft (intermediate shaft) replacement universal joint kits contain only enough grease to provide needle roller bearing protection during storage. It is therefore necessary to completely lubricate each replacement kit after assembly in the yokes.

RECOMMENDED LUBRICANTS FOR RELUBABLE ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT) UNIVERSAL JOINTS

Spicer recommends that the following requirements be met for any lubricant that will be used to service vehicular aluminum steering shaft (intermediate shaft) applications.

- Use a good quality **E.P. (extreme pressure)** grease
- Timken Test Load – **50 Lbs./23 Kgs. Minimum**
- Meeting N.L.G.I.,* E.P. **Grade 2** specifications
- Grease must have an operating range of **+325°F to -10°F (+163°C to -23°C)**

Note - There are numerous instances when vehicle specifications or a customer request requires alternative lubrication. The lubrication recommendations listed in this manual are prescribed by Spicer Driveshaft engineering. Any alternate lubricants or lubrication procedures are solely the responsibility of the user.

GREASE COMPATIBILITY**

When greases made from different thickeners are mixed, the mixture may result in lower service performance or physical properties than either of the original component products. This reduction in lubricant performance is called incompatibility. It may show up in any of several areas, such as:

- (1) Lower heat resistance;
- (2) Change in consistency, usually softening; or
- (3) Decrease in shear stability.

Mixtures which show none of these changes are considered compatible. Incompatibility is not always caused by the thickener, since each of the greases in the mixture is a complete package — thickener, fluid, and additives. Sometimes the thickener of one grease is incompatible with the fluid or the additives present in the second grease. If the mixture proves to be significantly softer, less shear stable, or less heat resistant than the original grease, the mixture must be deemed incompatible.

▲ See warning, below.

WARNING

Incompatible lubricants/greases, which are applied to aluminum steering shaft (intermediate shaft) universal joints can result in failure of the aluminum steering shaft (intermediate shaft). Failure of the aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

*N.L.G.I.: National Lubricating Grease Institute.

Consult your local lubricant source for greases that meet these specifications.

**Grease compatibility information – from National Lubricating Grease Institute.

Incompatibility is best determined in service or in service-related tests; it is not predictable. Certain thickener combinations often have been found unsatisfactory and are generally so recognized. These would include lithium and sodium greases and organo-clay and most soap greases. **Contact your local lubricant supplier for grease compatibility information.**

To help reduce the effects of incompatible greases, make sure to thoroughly purge **all** four bearing seals on each universal joint with the **new** grease. Purge seals until fresh grease is visible on the outside of **all** four bearing seals.

It is recommended that all purged grease be wiped clean to prevent discharge into the general environment.

LUBRICATION INTERVALS FOR RELIABLE UNIVERSAL JOINTS

Lubrication intervals vary depending on the service requirements and operating conditions of the vehicle. Table E, below, shows the maximum recommended universal joint lubrication intervals for aluminum steering shafts (intermediate shafts).

UNIVERSAL JOINT MAXIMUM LUBRICATION INTERVALS

SERIES	CITY	ON-HWY.	LINEHAUL	OFF-HWY.
SPL 6 (re-lubeable style)	25,000 Mi.	50,000 Mi.	50,000 Mi.	25,000 Mi.
	40,000 Km	80,000 Km	80,000 Km	40,000 Km
	or	or	or	or
	3 Months	6 Months	6 Months	3 Months
	(whichever comes first)	(whichever comes first)	(whichever comes first)	(whichever comes first)

City is defined as all applications that require a minimum of 90% of operation time within city limits.

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Linehaul is defined as 100% of operation time on smooth concrete or asphalt.

Off-highway is defined as all applications requiring more than 10% of operating time on gravel, dirt or unpaved roads.

Table E

LUBRICATION PROCEDURE FOR UNIVERSAL JOINTS

Required Tools

- N.L.G.I. Grade 2, E.P. Grease
- Grease Gun

Note - Be sure to have followed **all** the inspection procedures for the aluminum steering shaft (intermediate shaft). The inspection procedures are to be performed prior to any lubrication of the universal joints. The addition of lubricant can mask the looseness in a component that is beginning to show wear and may be in need of replacement.

1. Use the recommended lubricant to purge **all** four bearing seals of each universal joint. This flushes abrasive contaminants from each bearing assembly and assures proper filling of all four bearing assemblies. Make sure **fresh** grease is evident at all four universal joint bearing seals. (See photo 11.)

▲ See warning, below.



Photo 11

▲ **WARNING**

Failure to properly lubricate aluminum steering shaft (intermediate shaft) universal joints can cause premature failure of the aluminum steering shaft (intermediate shaft). Failure of the aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

2. If bearing seals fail to purge, try to move the aluminum steering shaft (intermediate shaft) while applying grease gun pressure. (See photo 12.)

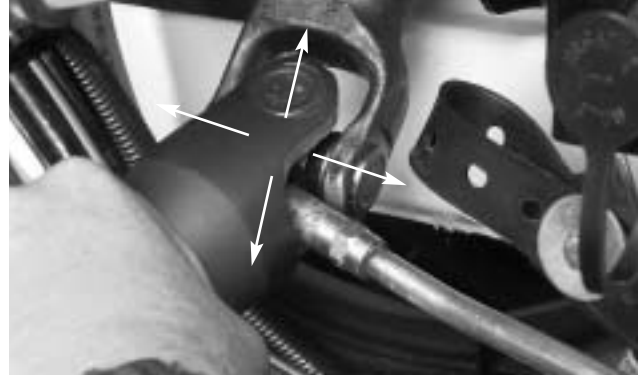


Photo 12

3. If bearing seals still do not purge, removal of the universal joint kit from the yoke is necessary to determine the cause of blockage.

Refer to the removal and installation sections of this manual for proper steering shaft (intermediate shaft) universal joint replacement procedures.

LUBRICATION PROCEDURE FOR SLIP MEMBER ASSEMBLY

Aluminum steering shaft (intermediate shaft) slip members are booted and permanently lubricated. If the boot is not torn and clamps are properly seated and secure, **NO** service is necessary. (See photo 13.) If the slip member boot is torn or clamps are not properly seated and secure, refer to the removal and installation sections of this manual for slip member boot replacement procedures.



Photo 13

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REMOVAL

SPICER LITE® ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT) REMOVAL

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5. **NEVER** heat an aluminum steering shaft (intermediate shaft) component or use a hammer on the aluminum components of the steering shaft to remove it from the vehicle.

6. **NEVER** stand on an aluminum steering shaft (intermediate shaft) or use it as a leverage bar. See notification decal (reproduced below) on aluminum steering shaft (intermediate shaft).

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Para informaciones de mantenimiento y requisitos de seguridad Vea el Manual de Servicios Spicer 3264-SLSTRG o www.dana.com		
NE PAS APPUYER	NE PAS APPUYER	NE PAS APPUYER
Vou les exigences d'entretien et de sécurité		
Dans le manuel de service Spicer n° 3264-SLSTRG Ou: www.dana.com		

7. **NEVER** make any modifications to an aluminum steering shaft (intermediate shaft) that were not original to the design of the product.

8. **NEVER USE** an aluminum steering shaft (intermediate shaft) in non-power steering applications.

▲ See warning, below.

WARNING

Spicer Lite aluminum steering shafts (intermediate shafts) are to be used only in original equipment vehicle manufacturers' applications. Failure to do so can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

9. **NEVER** use an aluminum steering shaft (intermediate shaft) in a cab over application. ▲ See warning, above.

10. **NEVER** use an aluminum steering shaft (intermediate shaft) in a power-take-off (PTO) application.

11. **NEVER** high-pressure wash aluminum steering shaft (intermediate shaft) u-joints or booted slip member with degreasing solvent or water.

12. **NEVER** replace only one component of the slip member assembly (yoke shaft or slip yoke).

Yoke Shaft (male splined shaft)

Slip Spline (female slip spline)

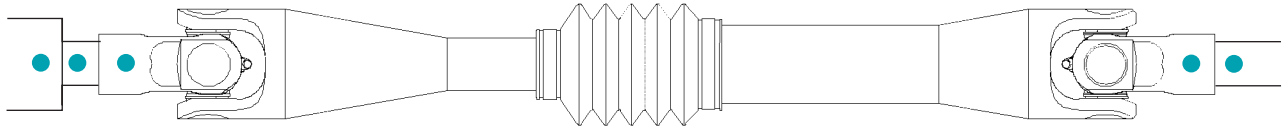


Figure B

REMOVAL PROCEDURES FOR ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT)

Required Tools:

- Socket Wrench
- Appropriate 6-point Socket
- Appropriate Box-end Wrench

PINCH BOLT STYLE

Mark Slip Member

1. It is imperative to mark all the mating components of an aluminum steering shaft (intermediate shaft) as illustrated in figure B, above. Mark the end fitting to gear box, (see photo 14) end fitting to steering column output shaft and steering column output shaft with a marking stick, paint marker or other legible marking device. This assures proper reassembly of the aluminum steering shaft (intermediate shaft) into the vehicle, in its original position and with the steering wheel and gear box.

▲ See warning, above right.

WARNING

Reassembly of an aluminum steering shaft (intermediate shaft) out of its original position or phase can cause failure of the aluminum steering shaft (intermediate shaft) and attaching components. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

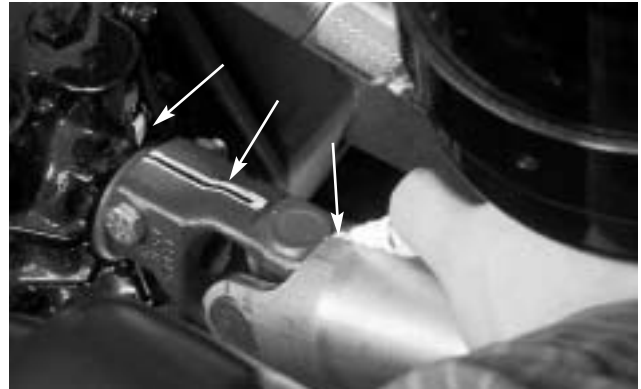


Photo 14

PINCH BOLT* AND/OR NUT TORQUE SPECIFICATIONS

KIT #	BOLT	BOLT LENGTH	WRENCH SIZE FOR BOLT	NUT	WRENCH SIZE FOR NUT	BOLT HOLE	DRY TORQUE		FOR END YOKE WITH FORGING WIDTH OF
							NM	FT.LB.	
211269X	included	2"	9/16"	included	9/16"	3/8"	30-35	40-48	1.500"
211270X	included	1.75"	9/16"	included	9/16"	3/8"	30-35	40-48	1.125" & 1.25"
211271X	included	2"	5/8"	included	11/16"	7/16"	46-55	63-75	1.500"
211272X	included	1.75"	5/8"	included	11/16"	7/16"	46-55	63-75	1.125" & 1.25"
211273X	included*†	1.25"	5/8"	not required	–	7/16" thread dia.	46-55	63-75	1.125" w/threads in yoke
211274X	included	2.125"	5/8"	included	11/16"	7/16"	46-55	63-75	1.620"

*Aluminum steering shaft (intermediate shaft) end fitting pinch bolts are to be S.A.E. grade eight. Nuts for pinch bolts are to be self-locking with a full nylon insert, serrated washer seat or upset threads. An S.A.E. grade five hex nut used in conjunction with a split lock washer is also acceptable. Do not use inferior grade bolts.


*† Bolt must have self-locking feature.

Table F

Note - When specified, use the original equipment vehicular manufacturers' recommended pinch bolts and/or nuts. If no original equipment vehicle manufacturers' specification is given, use the Spicer recommended hardware. (See table F, above.) ▲ See warning, above.

Note - For companion flange/flange yoke bolts and/or nut specifications refer to original equipment vehicular manufacturer's recommendations.

Disconnect Shaft

2. Remove and discard pinch bolts and/or nuts or companion flange/flange yoke bolts and nuts (if applicable) at both ends of the aluminum steering shaft (intermediate shaft). (See photo 15.)  See warning, below.

WARNING

DO NOT reuse the aluminum steering shaft (intermediate shaft) pinch bolts and/or nuts or companion flange/flange yoke bolts and nuts. Reuse of aluminum steering shaft (intermediate shaft) pinch bolts and/or nuts or companion flange/flange yoke bolts and nuts can cause failure of the aluminum steering shaft (intermediate shaft) and attaching components. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 15

Remove Shaft

3. Remove the aluminum steering shaft (intermediate shaft) from the vehicle. Remove the dash panel boot if required. Refer to the original equipment manufacturers' specifications for dash panel boot removal procedures. Take the aluminum steering shaft (intermediate shaft) to a workbench area.

REMOVAL PROCEDURES FOR END FITTINGS

Required Tools:

- Flat-blade Screwdriver
- Arbor Press (approximately one ton minimum)
- Push Rod - .75 in., (19.1 mm) maximum diameter
- Soft-faced Hammer
- Bearing-cup Spacer - .083 in., (2 mm) wall thickness, 1 in. (25.4 mm) minimum height
- Pliers

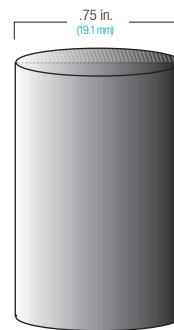


Figure C, Push Rod

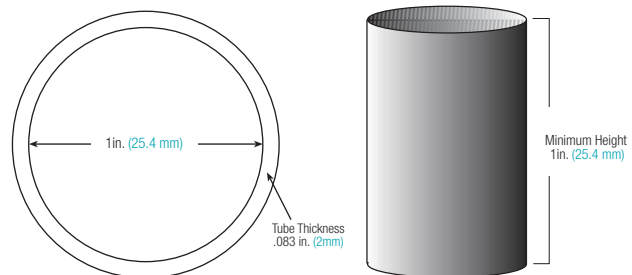


Figure D, Bearing Cup Spacer

PINCH BOLT AND COMPANION FLANGE/ FLANGE YOKE STYLE

Note - Be sure to have completed steps one through three found in the removal procedures for aluminum steering shaft (intermediate shaft) section of this manual prior to proceeding with step one.

1. Remove snap rings from end fitting. **DO NOT** damage universal joint bearing seals. Discard snap rings. (See photo 16.)

▲ See warning, below.

▲ WARNING

DO NOT reuse snap rings. Reuse of snap rings can be a cause of cross and bearing failure, which can cause failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

2. To remove the end fitting, place a bearing cup spacer onto the base of the arbor press. If the arbor is larger than the bearing cup diameter, a maximum .75 in. or smaller diameter push rod will be needed to avoid damaging the end fitting or bearing (see figures C and D, page 23.) Using an arbor press, do not use excessive force (permanent yoke ear deflection could occur and removal of end fitting will be difficult or impossible), press down on the upper bearing cup assembly until the shoulder of the journal cross makes contact with the inside of the end fitting ear. (See photo 17.)

3. The bearing cup is **NOT** designed to drop out of the end fitting. Grip the bearing cup with a pair of hand pliers. Twist and pull bearing cup to remove from end fitting ear and trunnion.

4. Place the end fitting in arbor press with remaining bearing cup face down. (See photo 18.) Using a push rod (if needed), press on the end of the journal cross trunnion until the shoulder of the journal cross just makes contact with the inside of the end yoke ear. (Do not overpress.) Repeat step three.



Photo 16

5. Remove the end fitting from the journal cross. Discard end fitting. ▲ See warning, below.

▲ WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

6. Proceed to end fitting installation section of this manual.

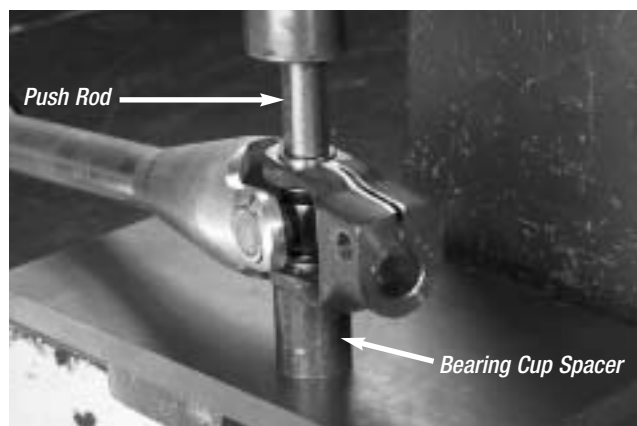


Photo 17

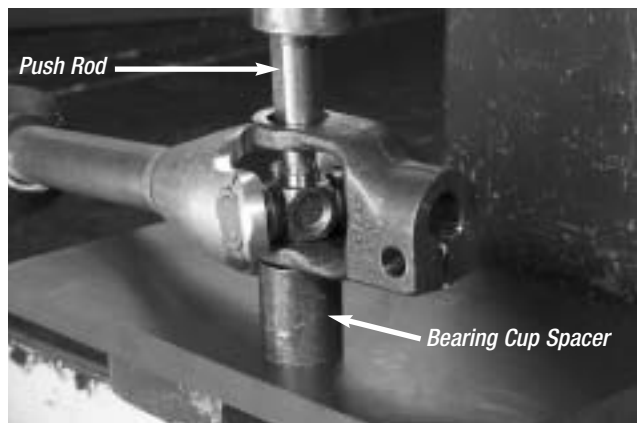


Photo 18

REMOVAL PROCEDURES FOR UNIVERSAL JOINTS

Required Tools:

- Flat-blade Screwdriver
- Arbor Press (approximately one ton minimum)
- Aluminum Steering Shaft Assembly/Disassembly Tool (See photo 19.) Included in Universal Joint Service Kit Spicer Part Number 5-755X
- Push Rod - .75 in., (19.1 mm) maximum diameter (See figure E.)
- Bearing-cup Spacer - .083 in., (2 mm) wall thickness, 1 in. (25.4 mm) minimum height (See figure F.)
- Soft-faced Hammer
- Pliers

Note - Be sure to have completed steps one through three found in the removal procedures for aluminum steering shaft (intermediate shaft) section of this manual prior to proceeding with step one, below.

1. Always remove end fitting first to avoid distortion of aluminum yoke lug ears. ▲ See warning, below.

▲ WARNING

Distortion of aluminum steering shaft (intermediate shaft) yoke lug ears can cause failure of an aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

2. Remove snap rings from end fitting. Discard snap rings. (See photo 20.) ▲ See warning, below.

▲ WARNING

DO NOT reuse snap rings. Reuse of snap rings can be a cause of cross and bearing failure, which can cause failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

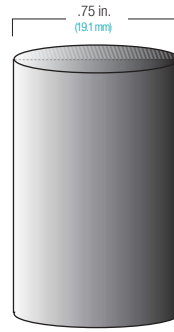


Figure E, **Push Rod**

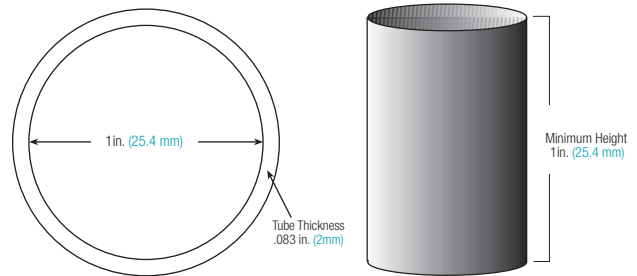


Figure F, **Bearing Cup Spacer**



Photo 19



Photo 20

3. Remove snap rings from the aluminum yoke end. Discard snap rings. (See photo 21.) ▲ See warning, step 2.

4. To remove the end fitting, place a bearing cup spacer onto the base of the arbor press. If the arbor is larger than the bearing cup diameter, a maximum .75 in. (19.1 mm) or smaller diameter push rod will be needed to avoid damaging the end fitting or bearing. (See figures E and F, page 25.) Using an arbor press, do not use excessive force (permanent yoke ear deflection could occur and removal of end fitting will be difficult or impossible), press down on the upper bearing cup assembly until the shoulder of the journal cross makes contact with the inside of the end fitting ear. (See photo 22.)

5. The bearing cup is **NOT** designed to drop out of the end fitting. Grip the bearing cup with a pair of hand pliers. Twist and pull bearing cup to remove from end fitting ear and trunnion.

6. Place the end fitting in arbor press with remaining bearing cup face down. (See photo 23.) Using a push rod (if needed), press on the end of the journal cross trunnion until the shoulder of the journal cross just makes contact with the inside of the end fitting ear. Do not overpress. Repeat step five.

7. Remove the end fitting from the journal cross.

8. Inspect the end fitting for signs of wear. Worn aluminum steering shaft (intermediate shaft) components must be replaced. ▲ See warning, below.

▲ WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 21

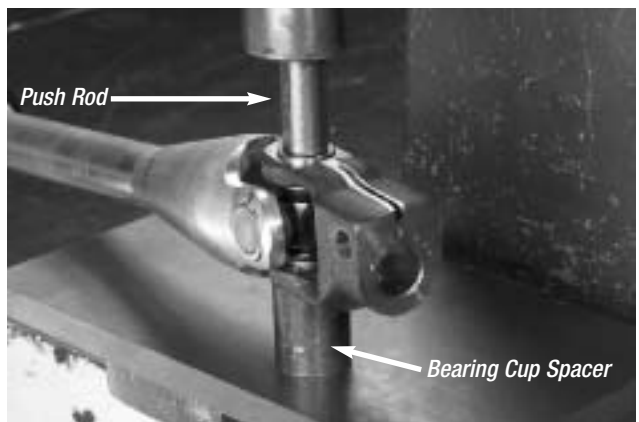


Photo 22

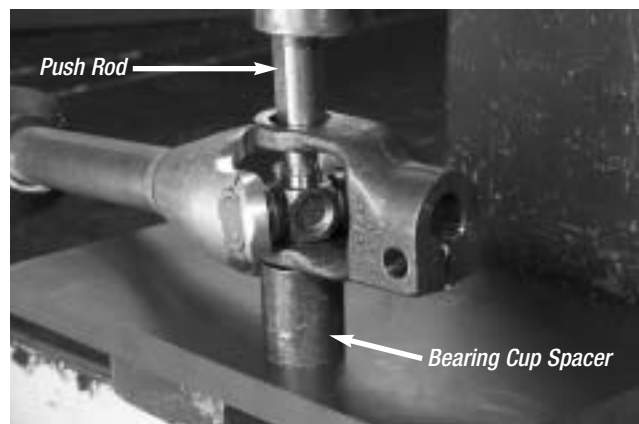


Photo 23

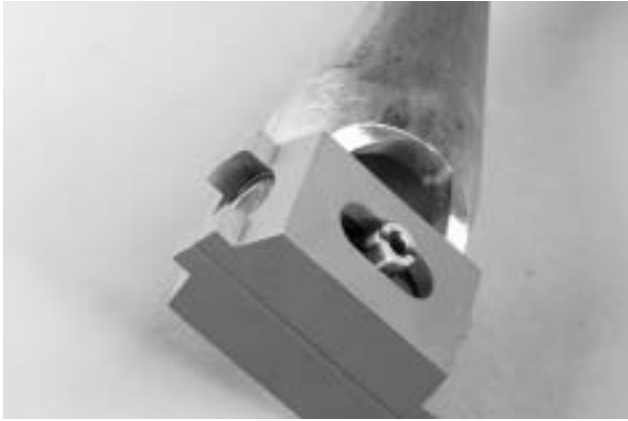


Photo 24

9. To prevent distorting aluminum yoke ears, attach the assembly/disassembly tool as shown. (See photo 24.)

▲ See warning, below.

WARNING

Failure to use the assembly/disassembly tool when servicing an aluminum steering shaft (intermediate shaft) can cause distortion of the aluminum yoke ears. Distorted aluminum yoke ears can result in failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

10. After the assembly/disassembly tool is attached, use an arbor press to remove the universal joint. If the arbor is larger than the bearing cup diameter, a maximum .75 in. (19.1 mm) or smaller diameter push rod will be needed to avoid damaging the yoke or bearing (See figures E and F, page 25). Using an arbor press, press down on the upper bearing cup assembly until the journal cross trunnion reaches the limit of the assembly/disassembly tool. (See photo 25.)

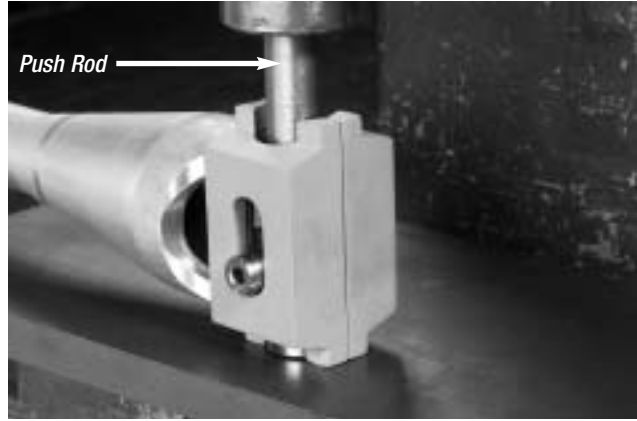


Photo 25

11. The bearing cup is **NOT** designed to drop out of the aluminum yoke. Grip the bearing cup with a pair of hand pliers. Twist and pull bearing cup to remove from aluminum yoke ear.

12. Place the aluminum yoke in an arbor press with remaining bearing cup face down. Using a push rod (if needed), (See figure E, page 25) press on the end of the journal cross trunnion until the journal cross reaches the limit of the assembly/disassembly tool (See photo 26.) Remove assembly/disassembly tool. Repeat step 11.

13. Remove the journal cross from the aluminum yoke.

14. Proceed to universal joint kit installation section of this manual.

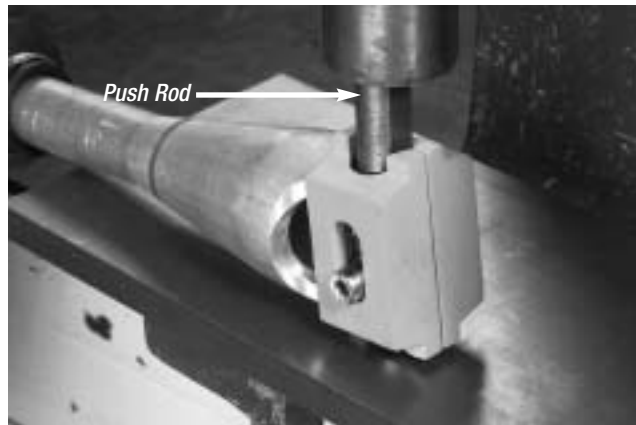


Photo 26

Yoke Shaft (male splined shaft)

Slip Spline (female slip spline)

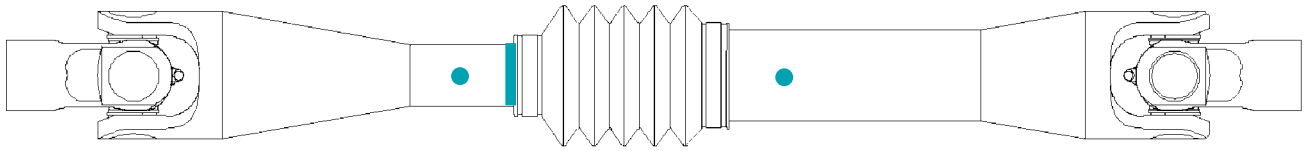


Figure G

REMOVAL PROCEDURES FOR DAMAGED SLIP MEMBER BOOT

Required Tools:

- Flat-blade Screwdriver or Chisel
- Hammer

Note - Be sure to have followed the inspection procedures of the aluminum steering shaft (intermediate shaft) slip member before removing the slip member boot from the aluminum steering shaft (intermediate shaft).

Note - Be sure to have completed steps one through three found in the removal procedures for aluminum steering shaft (intermediate shaft) section of this manual prior to proceeding.

Caution - The following step is an additional marking process to that described in step one in the aluminum steering shaft (intermediate shaft) removal section. Be sure to mark as directed.



Photo 27

Mark Slip Member (“Phasing Marks”)

1. Mark the position of the boot on the yoke shaft with a marking stick, paint marker, or other legible marking device. (See photo 27 and figure G.) This assures that the replacement boot will be reassembled at the original location on the yoke shaft. In addition, mark the yoke shaft and slip spline to ensure proper reassembly in original phasing. (See figure G.)

Caution - Take care when removing boot clamps so as not to damage or gouge aluminum steering shaft (intermediate shaft) components.

2. Remove and discard both boot clamps. The boot clamps may be separated using a screwdriver or chisel to disengage the locking hooks. ▲ See warning, below.

▲ WARNING

DO NOT reuse the aluminum steering shaft (intermediate shaft) boot clamps. Reuse of aluminum steering shaft (intermediate shaft) boot clamps can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

3. Separate the yoke shaft from the slip yoke. The boot will remain on the yoke shaft. Remove the boot from the yoke shaft. Discard boot.

4. Use mineral spirits to clean **ALL** grease and contaminants from the full depth of the yoke shaft and slip yoke splines. If all of the old grease and contaminants cannot be thoroughly removed from the full depth of the yoke shaft and slip yoke splines, the **complete** steering shaft assembly must be replaced. ▲ See both warnings, below.

5. After the aluminum steering shaft (intermediate shaft) has been thoroughly cleaned, remove **ALL** traces of the mineral spirits from the yoke shaft and slip yoke splines. The aluminum steering shaft (intermediate shaft) components **MUST** be **completely** dry before proceeding. ▲ See first warning, below.

▲ WARNING

*Failure to remove **ALL** old grease and contaminants or allowing mineral spirits to dry on the yoke shaft and slip yoke splines can result in damaged aluminum steering shaft (intermediate shaft) components. Damaged aluminum steering shaft (intermediate shaft) components can cause failure of an aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.*

▲ WARNING

*Aluminum steering shaft (intermediate shaft) components (yoke shaft and slip yoke) are matched sets. **NEVER** replace only one component of the slip member assembly (yoke shaft or slip yoke). Replacing only one member of the slip member assembly can result in aluminum steering shaft (intermediate shaft) failure. Aluminum steering shaft (intermediate shaft) failure can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.*

6. Inspect the yoke shaft spline surface for damage. If the splines are damaged, missing or twisted, or any Glidecote® is missing, replacement of the complete aluminum steering shaft (intermediate shaft) assembly is necessary. (See photo 28.) ▲ See warning, below, and second warning, step 5.

▲ WARNING

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

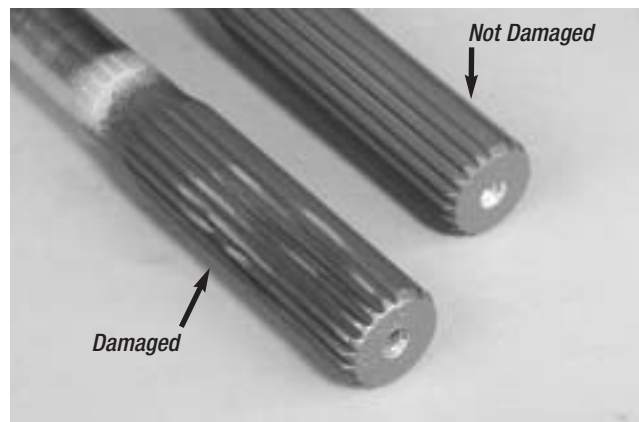


Photo 28

7. Inspect the slip yoke for damage. If the splines are damaged, missing or twisted, replacement of the **complete** aluminum steering shaft (intermediate shaft) assembly is necessary. ▲ See warning, above, and second warning, step 5.

8. Proceed to slip member boot installation section of this manual.

SPICER®



People Finding A Better Way™

SPICER LITE® ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT) INSTALLATION

Before You Get Started

This manual is intended to be a supplement to your original equipment vehicle manufacturers' service manual. For complete detailed Spicer aluminum steering shaft (intermediate shaft) maintenance procedures use this manual.

Note - Spicer Lite aluminum steering shafts (intermediate shafts) are found on vehicles throughout the world. This manual includes international terminology. The international terms have been highlighted in teal.

Caution - Under no circumstances should an individual attempt to perform aluminum steering shaft (intermediate shaft) service and/or maintenance procedures for which he or she has not been trained or does not have the proper tools and equipment. ▲ See warning, below.

WARNING

Failure to take common-sense, precautionary measures when working on a vehicle could result in property damage, personal injury or death. In order to avoid property damage, personal injury or death, you must:

1. **ALWAYS** wear safety glasses when performing maintenance or service. Failure to wear safety glasses could result in personal injury, partial or complete vision loss.
2. **NEVER** attempt to remove an aluminum steering shaft (intermediate shaft) from a vehicle while the engine is running. Be sure that the vehicle's engine is off, and keys are removed from ignition.
3. **NEVER** go under or work on a vehicle that is not on a level or flat surface.
4. **NEVER** remove an aluminum steering shaft (intermediate shaft) without blocking the vehicle's wheels.
5. **NEVER** heat an aluminum steering shaft (intermediate shaft) component or use a hammer on the aluminum components of the steering shaft to remove it from the vehicle.

6. **NEVER** stand on an aluminum steering shaft (intermediate shaft) or use it as a leverage bar. See notification decal (reproduced below) on aluminum steering shaft (intermediate shaft).

NOTICE/AVISO/AVIS

NO STEP	NO STEP	NO STEP
For Service and Safety requirements see Spicer Service Manual 3264-SLSTRG or www.dana.com		
NÃO PISAR	NÃO PISAR	NÃO PISAR
Para informações sobre manutenção e exigências de segurança Veja o Manual de Serviços Spicer 3264-SLSTRG ou www.dana.com		
NO PISAR	NO PISAR	NO PISAR
Para informaciones de mantenimiento y requisitos de seguridad Vea el Manual de Servicios Spicer 3264-SLSTRG o www.dana.com		
NE PAS APPUYER	NE PAS APPUYER	NE PAS APPUYER
Vou les exigences d'entretien et de sécurité		
Dans le manuel de service Spicer n° 3264-SLSTRG Ou: www.dana.com		

7. **NEVER** make any modifications to an aluminum steering shaft (intermediate shaft) that were not original to the design of the product.

8. **NEVER USE** an aluminum steering shaft (intermediate shaft) in non-power steering applications.

▲ See warning, below.

WARNING

Spicer Lite aluminum steering shafts (intermediate shafts) are to be used only in original equipment vehicle manufacturers' applications. Failure to do so can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

9. **NEVER** use an aluminum steering shaft (intermediate shaft) in a cab over application. ▲ See warning, above.

10. **NEVER** use an aluminum steering shaft (intermediate shaft) in a power-take-off (PTO) application.

11. **NEVER** high-pressure wash aluminum steering shaft (intermediate shaft) u-joints or booted slip member with degreasing solvent or water.

12. **NEVER** replace only one component of the slip member assembly (yoke shaft or slip yoke).

INSTALLATION PROCEDURES FOR END FITTINGS

Required Tools:

- Arbor Press (approximately one ton minimum)
- Push Rod - .75 in., (19.1 mm) maximum diameter
- End Fitting Replacement Kit (includes hardware)
Contact your local OEM dealership or Spicer distributor for correct part number information
- Soft-faced Hammer

PINCH BOLT AND COMPANION FLANGE/FLANGE YOKE STYLE

1. Place the new end fitting around the outboard trunnions of the journal cross in the same orientation as the old end fitting. Reference original markings made on end fitting during aluminum steering shaft (intermediate shaft) removal for proper replacement end fitting orientation. (See photo 29.)

2. Place one bearing cup assembly onto trunnion through end fitting yoke lug ear. **DO NOT** allow any needle roller bearings to drop. **▲** See warning, below. To prevent dropped needle rollers, be sure trunnion protrudes through end fitting yoke lug ear, far enough to get trunnion inserted into bearing cup assembly and engaging needle roller bearings. Hold engagement through pressing operation.

▲ WARNING

Dropped needle roller bearings can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

3. Place the aluminum steering shaft (intermediate shaft) in the arbor press. Using a push rod (if needed) that is .75 in., (19.1 mm) maximum diameter or smaller in diameter than the bearing cup assembly (See figure H and photo 30), press the bearing cup assembly into the end fitting cross hole far enough to install a **NEW** snap ring. Install **NEW** snap ring.

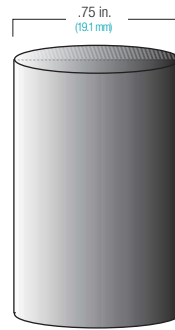


Figure H, Push Rod



Photo 29



Photo 30

4. Flip the end fitting 180 degrees and repeat steps two and three. (See photo 30.)

5. Flex the journal cross to make sure it moves smoothly and freely in the bearings. The end fitting should fall under its own weight in **both** directions. If not, check the snap rings to make sure they are seated properly in the bearing cup grooves and not on top of step on end fitting. (See figures I and J.)

6. If snap rings are seated correctly but joint is still stiff in the end fitting, **tap** the end fitting **lightly** (below the bearing cap) with a soft-faced hammer to seat the bearing cup assemblies. (See photo 31.) Flex the journal cross again to make sure it moves smoothly and freely in the bearings. If not, removal and reinstallation of the end fitting is required.

7. If the universal joint moves smoothly and freely in the bearings, completely lubricate the universal joint. Make sure **fresh** grease is evident at **all** four universal joint bearing assembly seals.

8. Proceed to page 44 to install the aluminum steering shaft (intermediate shaft) into the vehicle.

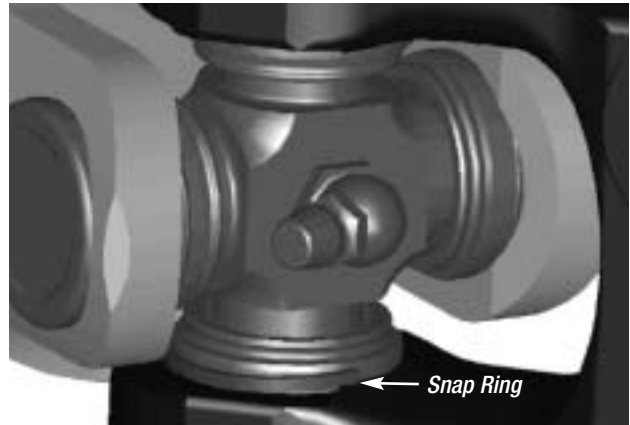


Figure I, **Incorrect**

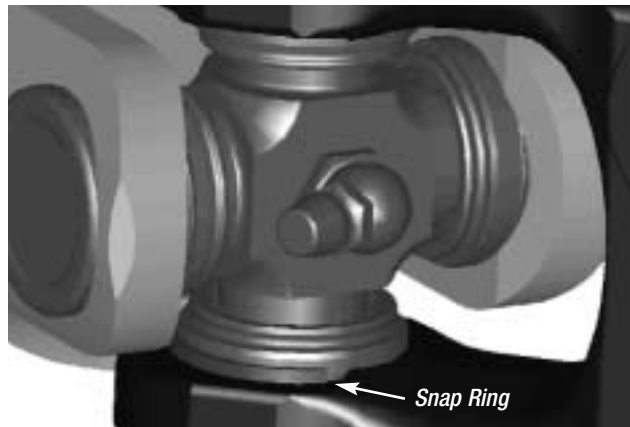


Figure J, **Correct**

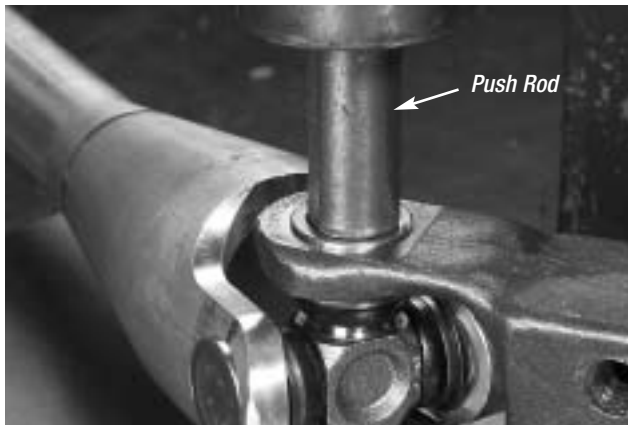


Photo 30



Photo 31

INSTALLATION PROCEDURES FOR UNIVERSAL JOINT KITS

Required Tools:

- Flat-blade Screwdriver
- Soft-faced Hammer
- Arbor Press (approximately one ton minimum)
- Push Rod - .75 in., (19.1 mm) maximum diameter
- Aluminum Steering Shaft Assembly/Disassembly Tool (See photo 32) included in universal joint service kit. Spicer Part Number 5-755X
- N.L.G.I., E.P. Grade 2 Grease

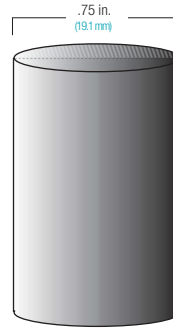


Figure K, **Push Rod**

Caution - Spicer Lite replacement universal joint kit bearing assemblies are specifically designed for proper installation into aluminum yoke lug ears. **DO NOT** substitute.

Note - Spicer Lite replacement universal joint kit bearing assemblies contain only enough grease to provide needle roller bearing protection during storage. It will be necessary to completely lubricate the replacement kit before it is assembled in the vehicle.



Photo 32

1. Remove all four bearing cup assemblies from the Spicer Lite replacement universal joint kit.

2. Using one bearing assembly, first check to make sure the bearing assembly **WILL NOT** easily fit into either the aluminum yoke or end fitting cross holes. (See photos 33 and 34.) If the bearing assembly falls through a yoke cross hole, or installs easily, this is an indication of a damaged component. If an **aluminum** cross hole is damaged, replacement of the **complete** aluminum steering shaft (intermediate shaft) assembly is required. If an end fitting cross hole is damaged or oversized, replacement of the end fitting is required.

▲ See warnings, below.

▲ **WARNING**

Failure to replace damaged aluminum steering shaft (intermediate shaft) components can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

▲ **WARNING**

*Aluminum steering shaft (intermediate shaft) components (yoke shaft and slip yoke) are matched sets. **NEVER** replace only one component of the slip member assembly (yoke shaft or slip yoke). Replacing only one member of the slip member assembly can result in aluminum steering shaft (intermediate shaft) failure. Aluminum steering shaft (intermediate shaft) failure can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.*

3. Using a high quality N.L.G.I.* , E. P. Grade 2 grease, wipe each bearing assembly with grease. Fill all cavities between the needle roller bearings. Also apply a liberal coating of grease on the bottom of each bearing cup assembly and on the lip of the seal. (See photo 35.)

▲ See warning, right.

*National Lubricating Grease Institute.



Photo 33, **Incorrect**



Photo 34, **Correct**



Photo 35

▲ **WARNING**

Inadequate lubrication can cause aluminum steering shaft (intermediate shaft) failure. Aluminum steering shaft (intermediate shaft) failure can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 36, **Incorrect**



Photo 37, **Correct**

4. Be sure you **DO NOT** have any needle roller bearings down in any bearing assembly. ▲ See warning, below.

▲ WARNING

Dropped needle roller bearings in a universal joint bearing assembly that are installed into an aluminum steering shaft (intermediate shaft) can cause aluminum steering shaft (intermediate shaft) failure. Aluminum steering shaft (intermediate shaft) failure can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

5. Always install universal joint replacement kit in the **aluminum yoke cross holes first**. Failure to do so eliminates the ability to use the aluminum steering shaft (intermediate shaft) assembly/disassembly tool.

▲ See warning, below.

▲ WARNING

Failure to use the assembly/disassembly tool when servicing an aluminum steering shaft (intermediate shaft) can cause distortion of the aluminum yoke ears. Distorted aluminum yoke ears can result in failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 38

6. Position the journal cross into the **aluminum yoke cross holes**. Failure to properly position grease-zerk (**nipple**) fitting (if applicable), in line with aluminum yoke cross holes, will result in the inability to relubricate the universal joint. (See photo 36.) ▲ See warning, step 3. Be sure the universal joint is in the proper orientation, with the grease-zerk (**nipple**) fitting (if applicable), normally inward toward boot. (See photo 37.)

7. Install the assembly/disassembly tool on the **aluminum yoke**, with the outboard trunnions of the journal cross protruding through the slots in the assembly/disassembly tool. (See photo 38.)



Photo 39

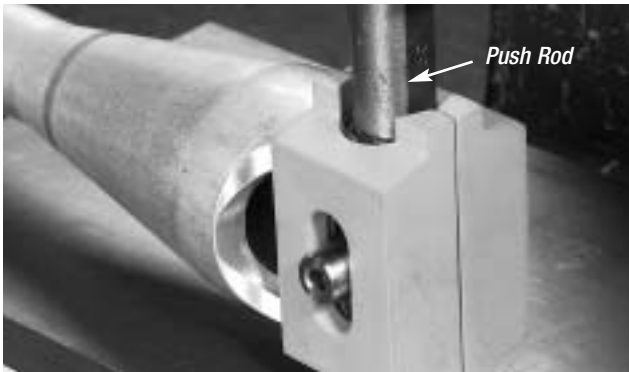


Photo 40



Photo 41



Photo 42

8. Visually check to make sure there are no needle roller bearings down in the bearing assemblies. Place a bearing cup through the hole in the assembly/disassembly tool. (See photo 39.) ▲ See warning, step 14. To prevent dropped needle rollers, be sure trunnion protrudes through end fitting yoke lug ear, far enough to get trunnion inserted into bearing cup assembly and engaging needle roller bearings. Hold engagement through pressing operation.

9. Place a push rod (if needed) that is .75 in. (19.1 mm) maximum diameter or smaller in diameter than the bearing cup (See figure K, page 34.), on top of the bearing cup and press the bearing cup far enough Ⓣ into the aluminum yoke to install a new snap ring. (See photo 40.)

Ⓣ Tip

Protruding trunnions should be near midpoint of slots in the assembly/disassembly tool.

10. Remove the assembly/disassembly tool from the aluminum yoke. Install a new snap ring. (See photo 41.)

▲ See warning, below.

▲ WARNING

DO NOT reuse snap rings. Reuse of snap rings can be a cause of cross and bearing failure, which can cause failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

11. Flip the aluminum yoke 180 degrees and reinstall the assembly/disassembly tool. Repeat steps eight through ten.

12. Discard assembly/disassembly tool.

13. Place the end fitting around the outboard trunnions of the journal cross, aligning marks made during removal. (See photo 42.)

14. Place one bearing cup assembly onto trunnion through end fitting yoke lug ear. **DO NOT** allow any needle roller bearings to drop. **▲** See warning, below. To prevent dropped needle rollers, be sure trunnion protrudes through end fitting yoke lug ear, far enough to get trunnion inserted into bearing cup assembly and engaging needle roller bearings. Hold engagement through pressing operation.

▲ WARNING

Dropped needle roller bearings in a universal joint bearing assembly that are installed into an aluminum steering shaft (intermediate shaft) can cause aluminum steering shaft (intermediate shaft) failure. Aluminum steering shaft (intermediate shaft) failure can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

15. Place the aluminum steering shaft (intermediate shaft) in the arbor press. Using a push rod (if needed) that is .75 in. (19.1 mm) maximum diameter or smaller in diameter than the bearing cup assembly (See figure K, page 34 and photo 43.), press the bearing cup assembly into the end fitting cross hole far enough to install a new snap ring. Install **new** snap ring.

16. Flip the end fitting 180 degrees and repeat step 15.

17. Flex the journal cross to make sure it moves freely in the bearings. The end fitting should fall under its own weight in **both** directions. If not, check the snap rings to make sure they are seated properly in the bearing cup grooves and not on top of step on end fitting. (See figures L and M.)

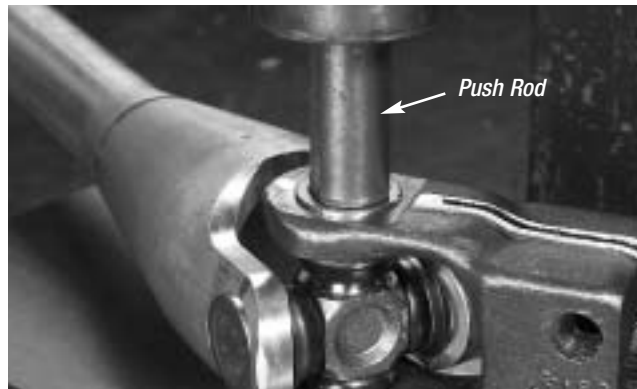


Photo 43

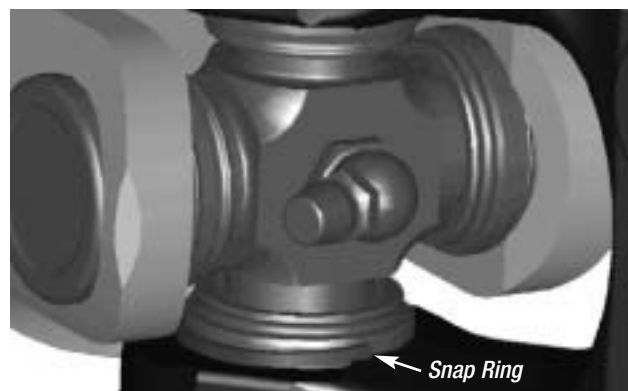


Figure L, **Incorrect**

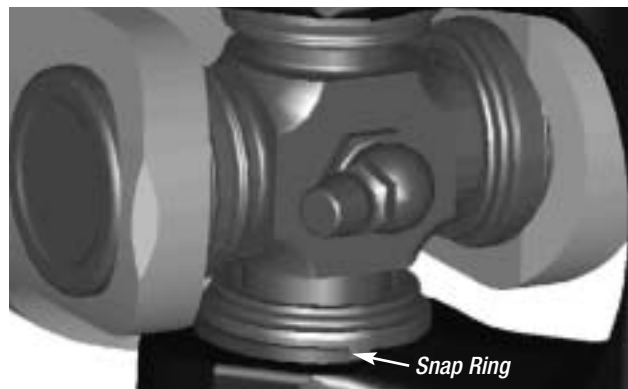


Figure M, **Correct**

18. If snap rings are seated correctly, but joint is still stiff in the end fitting, **tap** the end fitting **lightly** (below the bearing cap) with a soft-faced hammer to seat the bearing cup assemblies. (See photo 44.) Flex the journal cross again to make sure it moves smoothly and freely in the bearings. If not, removal and reinstallation of the end fitting is required.



Photo 44

19. If the universal joint is stiff in the aluminum yoke, **lightly tap** the suspected ear using a soft-faced hammer. (See photo 45.) Flex the journal cross again to make sure it moves smoothly and freely in the bearings. If not, removal and reinstallation of the end fitting and universal joint is required.



Photo 45

20. If the joint moves smoothly and freely in the bearings, completely lubricate the universal joint. Make sure **fresh** grease is evident at **all** four universal joint bearing assembly seals.

21. Proceed to page 44 to install the aluminum steering shaft (intermediate shaft) into the vehicle.

INSTALLATION PROCEDURES FOR SLIP MEMBER BOOT

Required Tools:

- Boot-clamp Pliers
Oetiker® Part Number 1096-10
- Slip Member Boot Replacement Kit
Spicer Part Number 212112X
Includes two clamps, boot and two ounces (56.7 grams)
of grease

Note - Be sure to have followed the removal procedures for damaged slip member boot **BEFORE** proceeding.

1. Using the smaller diameter boot clamp, 1.56 in. (39.6mm), provided in the slip member boot replacement kit, place clamp over the yoke shaft spline. (See photo 46.)

2. Take the replacement boot, and slide the smaller diameter end of the boot over the yoke shaft spline. **T** (See photo 47.) Align the boot end with the position mark made during the removal procedures. (See photo 48.)

T Tip - Place a very thin layer of liquid soap on the inside diameter of the smaller boot end to help it slide over the yoke shaft spline.



Photo 46



Photo 47

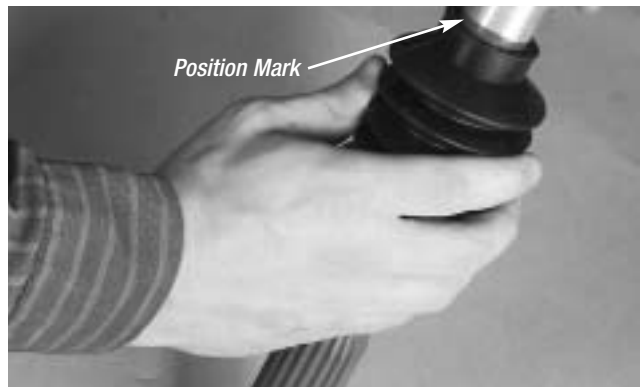


Photo 48

3. Using **all** the grease provided (no more/no less), apply the grease to the entrance of the slip yoke. Make sure **all** of the splined teeth around the diameter of the slip yoke are filled with grease to a depth of at least one inch. (See photo 49.) **▲** See warning, below.

▲ WARNING

Inadequate lubrication can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

4. Place the larger diameter boot clamp, 2.0 in. (51.5mm), over the slip yoke. (See photo 50.)

5. Assemble the yoke shaft into the slip yoke. (See photo 51.)

6. Extend and collapse the assembly several times to ensure an even distribution of the grease along the slip member.



Photo 49



Photo 50

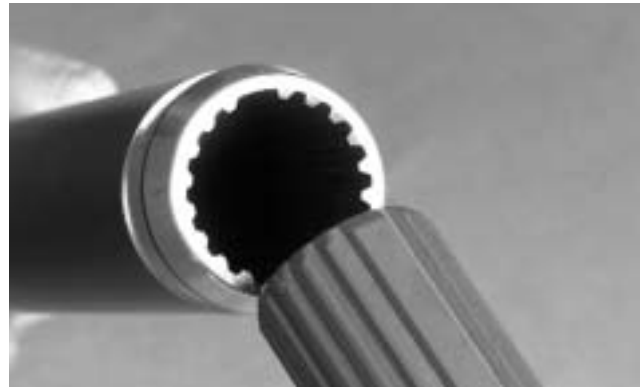


Photo 51

7. Thoroughly clean any grease that may have gotten into the boot groove on the slip yoke. Seat the larger diameter boot end into the boot groove. (See photo 52.)

8. Slide the larger diameter boot clamp over the larger diameter boot end. Using boot-clamp pliers, tighten clamp until the sides on the clamp “kernel” touch. (See photo 53.) ▲ See warning, below.

▲ WARNING

Failure to properly install and tighten boot clamps could allow intrusion of contaminants into the aluminum steering shaft (intermediate shaft), which can result in failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 52



Photo 53

9. To relieve pressure in the boot, “burp” the boot by **carefully** sliding a screwdriver between the smaller diameter boot end and yoke shaft, taking care not to scratch or gouge the aluminum or tear the boot. (See photo 54.)

Note - Make sure boot is in its relaxed length of 4.0 in. (10.16 cm) before proceeding to the following step.



Photo 54

10. Slide the smaller diameter boot clamp over the smaller boot end, ensuring boot end is still aligned at position mark. (See photo 55.) Using boot clamp pliers, tighten boot clamp until the sides of the boot clamp “kernel” touch. ▲ See warning, below.

▲ WARNING

Failure to properly install and tighten boot clamps to required specifications could allow intrusion of contaminants into the aluminum steering shaft (intermediate shaft) slip member assembly, which can result in failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.

11. Before the aluminum steering shaft (intermediate shaft) is installed in the vehicle, slowly collapse and extend the aluminum steering shaft (intermediate shaft) slip member assembly to make sure the boot clamps are stationary. If the clamps are not stationary, recheck the installed clamps to make sure they are properly tightened and seated squarely on the slip yoke and yoke shaft. If the clamps still are not stationary, repeat the slip member boot removal and installation procedures. **DO NOT** reuse clamps. ▲ See warning, below.

▲ WARNING

***DO NOT** reuse the aluminum steering shaft (intermediate shaft) boot clamps. Reuse of aluminum steering shaft (intermediate shaft) boot clamps can cause aluminum steering shaft (intermediate shaft) failure. Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.*

12. Proceed to page 44 to install the aluminum steering shaft (intermediate shaft) into the vehicle.



Photo 55

INSTALLATION PROCEDURES FOR ASSEMBLY OF ALUMINUM STEERING SHAFT (INTERMEDIATE SHAFT)

Required Tools:

- Torque Wrench
- Appropriate 6-point Socket
- Appropriate Box-end Wrench

1. Place dash panel boot (if applicable) on appropriate shaft end. Refer to the original equipment manufacturers' specifications for dash panel boot installation procedure.

2. Place the aluminum steering shaft (intermediate shaft) through the dash panel (if applicable).

3. Attach the aluminum steering shaft (intermediate shaft) to the steering column, aligning phasing marks made during removal and tighten the **new** pinch bolt to the specified torque requirements. See table G, below.

4. Attach the aluminum steering shaft (intermediate shaft) to the gearbox, aligning phasing marks made during removal and tighten the **new** pinch bolt to the specified torque requirements. (See photo 56.) (See table G, below.)

▲ See warning, below.

▲ **WARNING**

Failure to torque bolts and/or nuts to required specifications can result in failure of the aluminum steering shaft (intermediate shaft). Failure of an aluminum steering shaft (intermediate shaft) can result in impaired steering and possible loss of vehicle control, which can result in property damage, personal injury or death.



Photo 56

PINCH BOLT* AND/OR NUT TORQUE SPECIFICATIONS

KIT #	BOLT	BOLT LENGTH	WRENCH SIZE FOR BOLT	NUT	WRENCH SIZE FOR NUT	BOLT HOLE	DRY TORQUE		FOR END YOKE WITH FORGING WIDTH OF
							Nm	FT.LB.	
211269X	included	2"	9/16"	included	9/16"	3/8"	30-35	40-48	1.500"
211270X	included	1.75"	9/16"	included	9/16"	3/8"	30-35	40-48	1.125" & 1.25"
211271X	included	2"	5/8"	included	11/16"	7/16"	46-55	63-75	1.500"
211272X	included	1.75"	5/8"	included	11/16"	7/16"	46-55	63-75	1.125" & 1.25"
211273X	included*†	1.25"	5/8"	not required	—	7/16" thread dia.	46-55	63-75	1.125" w/threads in yoke
211274X	included	2.125"	5/8"	included	11/16"	7/16"	46-55	63-75	1.620"

**Aluminum steering shaft (intermediate shaft) end fitting pinch bolts are to be S.A.E. grade eight. Nuts for pinch bolts are to be self-locking with a full nylon insert, serrated washer seat or upset threads. An S.A.E. grade five hex nut used in conjunction with a split lock washer is also acceptable. Do not use inferior grade bolts.*

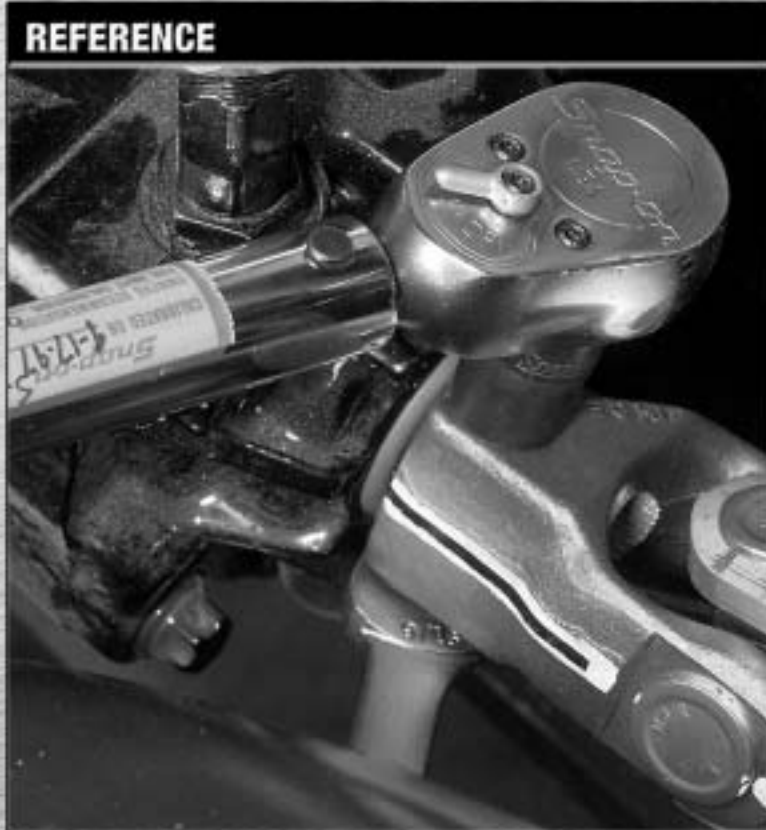
**† Bolt must have self-locking feature.*

Note - When specified, use the original equipment vehicular manufacturers' recommended pinch bolts and/or nuts. If no original equipment vehicle manufacturers' specification is given, use the Spicer recommended hardware. (See table G above.) ▲ See warning, above.

Note - For companion flange/flange yoke bolts and/or nut specifications refer to original equipment vehicular manufacturer's recommendations.

Table G

SPICER®



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REFERENCE

GLOSSARY

Bearing Cup Assembly — Consists of a bearing cup with needle rollers generally held in place by a seal guard and bearing seal. Sometimes the assembly includes a thrust washer.

Bearing Cup — A cup-shaped member used as the bearing bore of a bearing cup assembly and for positioning a thrust end of a cross trunnion.

Bearing Seal — A flexible member of a bearing cup assembly which prevents the escape of lubricant from or entry of foreign matter into a bearing.

Boot — A flexible member which prevents the escape of lubricant from or entry of foreign matter into the slip member assembly.

Boot Clamp — A thin adjustable band used to hold the boot in position on the slip member assembly.

Boot Seal — See Boot.

Companion Flange — A fixed flange member that attaches a steering shaft (intermediate shaft) to a steering gear box or steering column shaft.

Cross — See Journal Cross.

Cross Hole — A through hole in each lug ear of a yoke used to locate a bearing cup assembly.

Ear — One of two projecting parts of a yoke symmetrically located with respect to the yoke's rotational axis.

End Fitting — An end yoke or companion flange that attaches a steering shaft (intermediate shaft) to a steering gear box or steering column shaft.

End Yoke — A yoke that attaches a steering shaft (intermediate shaft) to a steering gear box or steering column shaft.

Flange Yoke — A full-round style yoke which attaches a steering shaft (intermediate shaft) to a steering gear box or steering column shaft.

Glidecote® — The blue, nylon, wear-resistant coating on Spicer yoke shafts.

Grease Zerk (Nipple) Fitting — The fitting on the shoulder or center of a journal cross that allows for lubrication.

Inboard Yokes — Yokes that make up the ends of a steering shaft (intermediate shaft), i.e. slip yokes and yoke shafts.

Intermediate Shaft — See Steering Shaft.

Journal Cross — The core component of a universal joint which is an intermediate drive member with four equally spaced trunnions in the same plane.

Lug Ear — See Ear.

Needle Roller Bearings — See Needle Rollers.

Needle Rollers — One of the rolling elements of a bearing cup assembly.

Outboard Yokes — Yokes that are not a part of a steering shaft (intermediate shaft).

Phasing — The relative rotational position of each yoke on a steering shaft (intermediate shaft).

Pinch Bolt — Bolt used to compress slotted end fittings for retention.

Purge — The act of flushing old grease and contaminants from universal joint kits with fresh grease.

Slip Member Assembly — Combination of slip spline, slip yoke and boot assembly.

Slip Spline — A patented tubular-type, machined element consisting of internal splines in a steering shaft (intermediate shaft) assembly.

Slip Yoke — A slip member yoke with a female machined spline used for axial movement.

Slip Yoke Plug — See Welch Plug.

Snap Ring — A removable member used as a shoulder to retain and position a bearing cup assembly in a yoke cross hole.

Snap Ring Groove — A groove used to locate a snap ring.

Spline — A machined element consisting of integral keys (splined teeth) or keyways (spaces) equally spaced around a circle or portion thereof.

Steering Shaft — An assembly of universal joints connected to a shaft member with a slip member assembly which connects steering column to steering gear.

Trunnion(s) — Any of the four projecting journals of a cross.

Universal Joint — A mechanical device which can transmit torque and/or rotary motion from one shaft to another at fixed or varying angles of intersection of the shaft axes. Consisting usually of a journal cross, grease zerk (nipple) fitting and four bearing cup assemblies.

Universal Joint Kit — See Universal Joint.

U-Joint — See Universal Joint.

Welch Plug — A plug in the slip yoke face that seals off one end of the spline opening. Also known as a slip yoke plug.

Yoke Lug Ear Cross Hole — See Cross Hole.

Yoke Shaft — A slip member yoke with a male machined spline used for axial movement.

APPENDIX

Gage Attachment-Slip Member

Step 1: Make sure vehicle is shut off and keys have been removed from ignition. Attach steering shaft wear gage (STWI-2) to steering shaft. Loosen set screws on Clamp A and Clamp C so that the smaller blocks can swing freely.

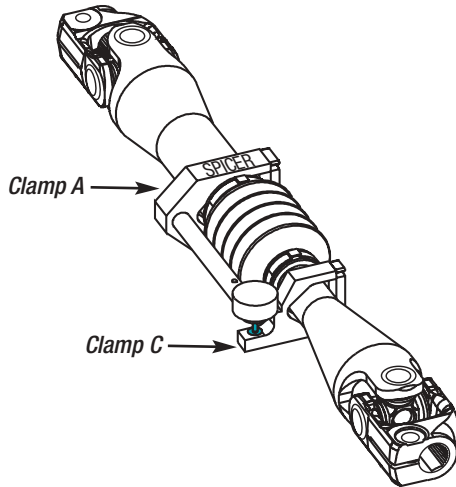


Figure N

Step 2: Attach Clamp A to the slip yoke and Clamp C to the yoke shaft. (See Figure N). Make sure the pieces are close enough to each other so that the gage can rest on Clamp C.

The word “SPICER” on Clamp A, as well as the gage’s dial indicator should be parallel to the extension arm of Clamp C. (See Figure O).

Make sure the dial indicator button is perpendicular to the surface it rests on and that only the bottom surface of the button is in contact with Clamp C.

The outline of the gage should **line up with** the step in the outline of Clamp C, but **not contact it**, as shown and circled below. (See Figure O.)

Step 3: Finger tighten set screws.

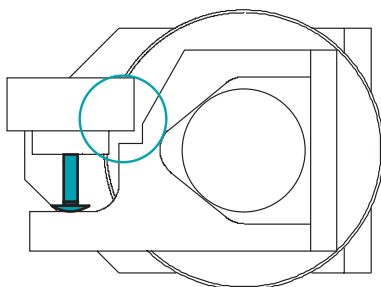


Figure O

Gage Attachment-Universal Joints

Step 1: Make sure vehicle is shut off and keys have been removed from ignition. Only **one** v-clamp is required at a time. Use Clamp A for the slip yoke and Clamp B for the yoke shaft.

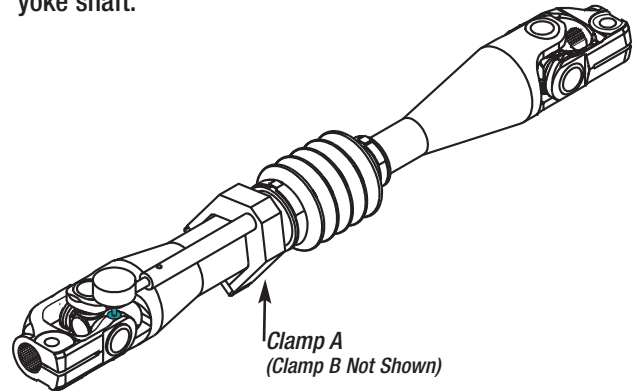


Figure P

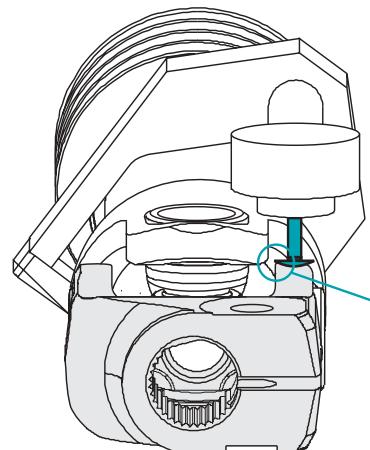
Step 2: Attach the v-clamp to the shaft, near u-joint kit. Adjust the angles of the v-clamp and the gage’s arm so that the arm is perpendicular to the kit and the button rests on the lug ear of the **end fitting**.

Note: The dial indicator button **should not** rest on the lug ear of the aluminum **shaft**.

Line up the inside edge of the button’s bottom surface with the inside of the end fitting lug ear. (See Figure Q.)

Step 3: Make sure dial indicator face is parallel to the plane of the end fitting. Finger tighten set screws.

Figure Q



Spicer Lite® Aluminum Steering Shaft Service Manual

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