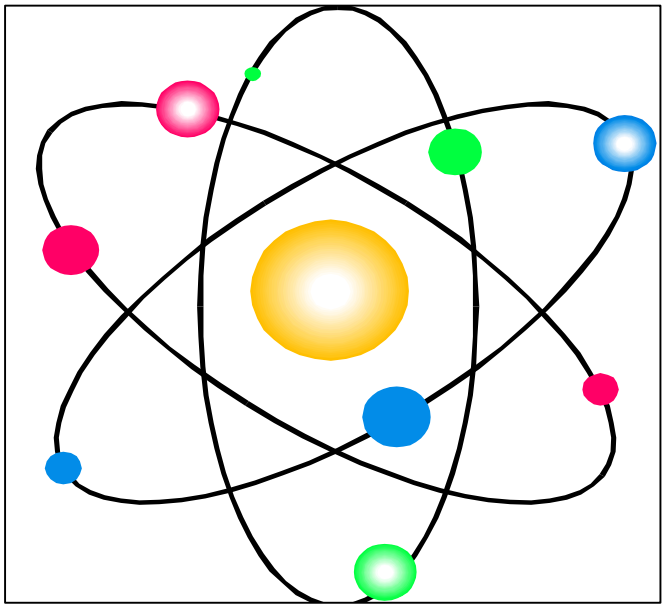
SERVICE

Spicer Technology Inc.



SPECIFICATIONS

IMPORTANT SAFETY NOTICE

SAFETY PRECAUTIONS

A serious or fatal injury can occur if:

- ***You lack proper training.***
- ***You fail to follow proper procedures.***
- ***You do not use proper tools and safety equipment.***
- ***You assemble components improperly.***
- ***You use incompatible components.***
- ***You use worn-out or damaged components.***
- ***You use components in a non-approved application.***

SAFETY GLASSES MEETING OSHA REQUIREMENTS SHOULD BE WORN AT ALL TIMES WHEN WORKING ON VEHICLES OR VEHICLE COMPONENTS.

NOTE

DANA CORPORATION RESERVES THE RIGHT TO MAKE CHANGES FROM TIME TO TIME, WITHOUT NOTICE OR OBLIGATIONS, IN SPECIFICATIONS, DESCRIPTIONS, AND ILLUSTRATIONS, AND TO DISCONTINUE MODELS OR REVISE DESIGNS.

SERVICE SPECIFICATIONS

NOTE:

Service specifications for some components may not be covered because they are unique to the vehicle application. Refer to the vehicle manufacturer's service manual for specifications on those components. (e.g. brakes, hubs, rotors, and wheel-end components).

SERVICE PARTS

Should an axle assembly require component parts replacement, it is recommended that "Original Equipment" replacement parts be used. They may be obtained through your local service dealer or other original equipment manufacturer parts supplier. CAUTION: THE USE OF NON-ORIGINAL EQUIPMENT REPLACEMENT PARTS IS NOT RECOMMENDED AS THEIR USE MAY CAUSE UNIT FAILURE AND/OR AFFECT VEHICLE SAFETY.

Dana Spicer replacement parts may be obtained through Dana Corporation, Spicer Drivetrain Service Divisions' distributor network. The closest supplier to your area may be located by calling: 1-800-729-3262.

Service kits for your axle assembly may also be determined by using the following website:

www2.dana.com/expert

AXLE MODELS

NEW MODEL NUMBER	OLD MODEL NUMBER
174	28
181	30
186	Super 30
194	35
198	Super 35
200	36
216	44
226	Super 44
229	50
248	60
267	70
286	80

FASTENER STRENGTH IDENTIFICATION

Grade 5

Grade 7

Grade 8

SPECIAL GRADE
(High Strength Applications)

<u>Customary (Inch) Bolts</u> – Identification marks correspond to bolt strength – increasing numbers represent increasing strength.
Inch grade fasteners can be identified by the radial lines embossed upon the head of the fastener and will correspond to the fastener strength by two lines less than actual grade (i.e., grade 8 fastener will display 6 radial lines on the head).

<u>Metric Bolts</u> – Identification class numbers correspond to bolt strength – increasing numbers represent increasing strength.
Metric fastener strength can be identified with the class identification embossed on the head of each fastener. Increasing numbers represent increasing strength.

IMPORTANT

Whenever fasteners are replaced, it is very important that the fastener be replaced with one of equal or higher grade and quality. Fasteners should be torqued as recommended or specified for the application.

WARNING

IF FASTENERS OF A LOWER GRADE OR CLASS ARE TORQUED TO THE REQUIREMENTS OF A HIGHER GRADE OR CLASS FASTENER, IT MAY RESULT IN COMPONENT FAILURE. (E.G. GRADE 5 FASTENER TORQUED TO THE REQUIREMENTS OF A GRADE 8 FASTENER).

Dana Spicer Light Axle Service Specifications

DRIVE PINION NUT Model	Size & Thread	Wrench Torque Lbs-ft (N.m)	Pinion Bearing Preload Contolled by	Notes
174 (28-IFS)	.750-16	140-500 (176-678)	Collapsible Spacer	1
181 (30)	.750-16	160-500 (217-678)	Collapsible Spacer	1
181 (30)	.750-16	160-200 (217-271)	Solid Shims	2
186 (Super 30)	.875-20	160-500 (217-271)	Collapsible Spacer	1
194 (35-IFS)	.875-20	170-500 (230-678)	Collapsible Spacer	1
194 (35)	.875-20	170-500 (230-678)	Collapsible Spacer	1
198 (Super 35)	.875-20	200-350 (271-475)	Collapsible Spacer	1
200 (36 -0ICA) Corvette	.750-16	170-210 (230-285)	Solid Shims	2
216 (44)	.750-16	160-500 (217-678)	Collapsible Spacer	1
216 (44, 44-3)	.750-16	160-200 (217-271)	Solid Shims	2
216 (44-0ICA) Corvette	.875-14	230-290 (312-393)	Solid Shims	2
216 (44-ICA)	.875-14	220-280 (298-380)	Solid Shims	2
226 (44-4) (Super 44)	.875-14	220-500 (298-678)	Collapsible Spacer	1
229 (50)	.750-16	160-500 (217-678)	Collapsible Spacer	1
229 (50-IFS)	.750-16	160-200 (217-271)	Solid Shims	2
248 (60)	.875-14	160-500 (217-678)	Collapsible Spacer	1
248 (60, 61)	.875-14	220-280 (298-380)	Solid Shims	2
267 (70)	.875-14	220-280 (298-380)	Solid Shims	2
286 (80)	1.250-12	440-500 (597-678)	Solid Shims	2

NOTES

(1) Torque pinion nut until all end-play is removed and the minimum wrench torque is achieved. Check torque to rotate of pinion with inch-lb (N.m) torque wrench for proper rotating torque. See Specification for proper pinion bearing preload. Continue to tighten in small increments until the proper rotating torque is achieved. Measure the preload torque frequently to avoid overtightening of the pinion nut. CAUTION: IF PRELOAD TORQUE IS EXCEEDED, A NEW COLLAPSIBLE SPACER MUST BE INSTALLED AND THE TORQUE SEQUENCE REPEATED.

(2) Pinion bearing preload is controlled by increasing or reducing the amount of solid shims. For service, one should torque the pinion nut to the mid-range of the wrench torque specification.

DRIVE GEAR SCREWS		Wrench Torque	Screw
Model	**Size & Thread**	**Lbs-ft (N.m)**	**Grade**
174 (28-IFS)	.375-24	70-90 (95-122)	Grade 9
181 (30)	.375-24	70-90 (95-122)	Grade 9
186 (Super 30)	.375-24	70-90 (95-122)	Grade 9
194 (35)	.375-24	70-90 (95-122)	Grade 9
198 (Super 35)	.437-20	95-105 (129-142)	Grade 9
200 (36-0ICA)	.375-24	70-90 (95-122)	Grade 9
216 (44-0ICA)	.375-24	70-90 (95-122)	Grade 9
216 (44)	.375-24	70-90 (95-122)	Grade 9
226 (44-4) (Super 44)	.375-24	70-90 (95-122)	Grade 9
229 (50-IFS)	.437-20	95-105 (129-142)	Grade 9
248 (60, 61)	.500-20	120-140 (163-190)	Grade 9
267 (70)	.500-20	120-140 (163-190)	Grade 9
286 (80)	.562-18	200-240 (271-325)	Grade 9

NOTES

Inch grade fasteners can be identified by the radial lines embossed upon the head of the fastener and will correspond to the fastener strength by two lines less than actual grade. For example, grade 8 fastener will display 6 radial lines on the head.

Metric fastener strength can be identified with the class identification embossed upon the head of the fastener. Increasing numbers represent increasing strength.

DIFFERENTIAL BEARING CAP SCREWS Model	Size & Thread	Wrench Torque Lbs-ft (N.m)	Screw Grade
174 (28-IFS)	M10 X 1.5	30-45 (41-61)	Metric
181 (30)	.437-14	35-50 (47-68)	Grade 8
186 (Super 30)	.437-14	35-50 (47-68)	Grade 8
194 (35 IFS)	.437-14	40-50 (54-68)	Grade 8
194 (35)	.437-14	47-67 (64-91)	Grade 8
198 (Super 35)	.437-14	47-67 (64-91)	Grade 8
216 (44-ICA)	.500-13	55-70 (75-95)	Grade 7
216 (44)	.500-13	70-90 (95-122)	Grade 8
226 (44-4) (Super 44)	.500-13	55-70 (75-95)	Grade 5
229 (50 IFS)	.500-13	70-90 (95-122)	Grade 8
248 (60, 61)	.500-13	70-90 (95-122)	Grade 8
267 (70)	.500-13	70-90 (95-122)	Grade 8
286 (80)	.500-13	70-90 (95-122)	Grade 8

NOTES

Inch grade fasteners can be identified by the radial lines embossed upon the head of the fastener and will correspond to the fastener strength by two lines less than actual grade. For example, grade 8 fastener will display 6 radial lines on the head.

Metric fastener strength can be identified with the class identification embossed upon the head of the fastener. Increasing numbers represent increasing strength.

IFS: INDEPENDENT FRONT SUSPENSION

COVER SCREWS Model	Size & Thread	Wrench Torque Lbs-ft (N.m)	Screw Grade
174 (28)	M8 X 1.25	14-19 (19-26)	Metric
181 (30)	.312-18	28-33 (38-45)	Grade 5
186 (Super 30)	.312-18	28-33 (38-45)	Grade 5
194 (35C)	.312-18	28-33 (38-45)	Grade 5
198 (Super 35)	.312-18	28-33 (38-45)	Grade 5
216 (44)	.312-18	28-33 (38-45)	Grade 5
216 (44-ICA)	.437-14	50-65 (68-88)	Grade 5
226 (44-4) (Super 44)	.312-18	28-33 (38-45)	Grade 5
229 (50)	.375-16	49-65 (67-88)	Grade 8
248 (60, 61)	.375-16	30-40 (41-54)	Grade 5
248 (60)	.375-16	40-50 (54-68)	Grade 8
267 (70)	.375-16	30-40 (41-54)	Grade 5
267 (70)	.375-16	40-50 (54-68)	Grade 8
286 (80)	.375-16	30-40 (41-54)	Grade 5

NOTES

Inch grade fasteners can be identified by the radial lines embossed upon the head of the fastener and will correspond to the fastener strength by two lines less than actual grade. For example, grade 8 fastener will display 6 radial lines on the head.

Metric fastener strength can be identified with the class identification embossed upon the head of the fastener. Increasing numbers represent increasing strength.

FILL PLUG Model	Size & Thread	Wrench Torque Lbs-ft (N.m)
All	.500-14	15-25 (20-34)
All	.750-14	20-30 (27-41)

PINION BEARING PRELOAD Model	Preload Torque Lb-in. (N.m)
174 (28-IFS & 28 Rear)	15-35 (1.7-3.9)
181 (30)	15-30 (1.7-3.4)
186 (Super 30)	15-30 (1.7-3.4)
194 (35-IFS, & 35 Rear)	15-35 (1.7-3.9)
198 (Super 35)	15-35 (1.7-3.9)
200 (36-0ICA)	15-40 (1.7-4.5)
216 (44)	20-45 (2.3-5.0)
226 (44-4) (Super 44)	25-35 (2.8-3.9)
229 (50)	20-45 (2.3-5.0)
248 (60)	20-45 (2.3-5.0)
267 (70)	20-45 (2.3-5.0)
286 (80)	25-45 (2.8-5.0)

DIFFERENTIAL BEARING PRELOAD Gear Ratio	Added To Pinion Torque To Rotate Lb-in. (N.m)
2.35 - 2.72	10-15 (1.13-1.69)
3.07 - 3.91	8-12 (.90-1.36)
4.10 - 4.88	6-8 (.68-.90)
5.38 - 7.17	4-6 (.45-.68)

IMPORTANT: FOR PROPER BEARING OPERATION, DO NOT MIX SUPPLIER CUPS AND CONES. THE PRELOAD GIVEN ABOVE ARE FOR NEW BEARINGS ONLY.

NOTE: NEW PINION SEAL WILL ADD 3 LB-IN (.34) TO THE TOTAL TORQUE TO ROTATE

EXAMPLE

Axle model 226 with a 3.54 gear ratio

	Build	Specification
Torque to rotate pinion	30 lbs-in (3.39 N.m)	25-35 lbs-in (2.8-4.0 N.m)
Ratio 3.54	10 lbs-in (1.13 N.m)	8-12 lbs-in (.9-1.4 N.m)
New seal	3 lbs-in (.34 N.m)	
Finial Total Torque To Rotate	**43 in-lbs (4.86 N.m)**	

ENGLISH / METRIC CONVERSION TABLE

Multiply	By	To Get
Length		
Inch (")	25.4	Millimeter (mm)
Millimeter (mm)	0.03937	Inch (")
Torque		
Inch-pound	0.113	Newton-meter (N.m)
Newton-meter (N.m)	8.8496	Pound-inch
Foot-pound	1.356	Newton-meter (N.m)
Newton-meter (N.m)	0.7375	Pound-foot
Weight		
Pound	0.4536	Kilogram (Kg)
Kilogram (Kg)	2.2046	Pound
Volume		
Quart	0.946	Liter
Liter	1.0571	Quart
Fluid-ounce	0.02957	Liter
Liter	33.8181	Fluid-ounce

TROUBLE SHOOTING GUIDE

PROBLEM DIAGNOSIS

Most drive axle problems fall into the categories of noise, vibration, leaks and failure to transmit power.

Problem diagnosis normally begins with the customer's complaint, which should include an exact description of the type of noise or vibration and when it occurs. This is followed up by a road test over various types of road surfaces through the speeds where the complaint occurs.

It should be remembered that some sounds will appear to come from locations other than the real source of the problem. Sounds in the drive shaft, exhaust system, and body floor pan can do this, making it more difficult to locate the problem source.

CONDITION	POSSIBLE CAUSES
Noise in all driving modes	Road and tires, wheel bearings
Noise changes with type of road Surface	Road and tires
Noise tone lowers with car speed	Tires
Noise louder on turns	Differential pinion and side gears, axle wheel bearings
Noise in one or more driving modes	Ring and pinion gears
Clunk on change of speed or direction of power flow	Worn differential shaft or thrust washers; worn U-joints.
Wheel noise	Wheel loose; faulty or bad wheel bearing
Vibration	Damaged drive shaft, missing drive shaft balance weight, worn or out-of-balance wheels, loose wheel lug nuts, worn U-joints, loose spring U-bolts, loose/broken spring, damaged axle shaft bearings, loose pinion gear nut, excessive pinion yoke run-out, bent axle shaft.
Differential gears scored	Insufficient lubrication, improper grade of lubricant, lubricant contamination, excessive spinning of wheels.
Loss of lubricant	Lubricant level too high, worn axle shaft seals, cracked differential housing, worn drive pinion gear shaft seal, scored and worn yoke, axle cover not properly sealed, plugged vent or vent tube.

Axle overheating	Lubricant level to low, incorrect grade of lubricant, contaminated lubricant, bearing preload too high, excessive gear wear, insufficient ring gear backlash.
Gear teeth broke	Overloading, erratic clutch operation, wheel spinning, improper adjustment.
Axle gear noise	Insufficient lubricant, incorrect backlash, improper tooth contact, worn/damaged gears.
Axle noise	Insufficient lubricant, improper ring gear and drive pinion gear adjustment, unmatched ring gear and drive pinion gear, worn teeth on ring gear or drive pinion gear, loose drive pinion gear shaft bearings, loose differential bearings, misalign ring and pinion gear, loose differential bearing cap-screws, worn bearings.
Limited slip differential	The most common problem is a “chatter” noise when turning corners. The probable cause is incorrect or contaminated lubricant, or lack of “friction modifier” additive in the lubricant. Worn or damaged plates and discs; plates and discs improperly assembled.

GLOSSARY

AXLE SHAFT SEMI-FLOATING – Shaft that carries vehicle load and transmits torque.

BACKLASH – The amount of clearance or play between two meshed gears.

BANJO-AXLE DESIGN – Axle assembly with a final drive assembly that assemblies into the housing and bolted into place.

BEARING CAP – The portion of the axle housing that is bolted in place to secure the differential bearings and differential assembly.

BEARING CONE – The inner race of a tapered roller bearing.

BEARING CUP – The outer race of a bearing assembly.

CARRIER – The casting center section of a drive axle that contains the differential assembly, ring gear, pinion gear and supporting bearings.

CENTER SECTION – The carrier portion of a drive axle.

COAST – A load condition in which the vehicle is driving the engine, as during deceleration.

DECELERATE – To reduce speed.

DIFFERENTIAL – A gear arrangement that allows the drive wheels to be driven at different speeds and divides the input torque of one shaft between two output shafts.

DRIVE – A load condition in which the engine is applying power to the drive wheels.

DRIVE GEAR – A large gear that meshes with a smaller gear. Also known as a Crown Gear in some countries.

END YOKE – Yoke-shaped forging that forms part of the universal joint connecting the drive shaft to the transmission or axle.

EXTREME PRESSURE (EP) LUBRICANT – A lubricant designed to stay in place and keep the gears from touching when under extremely high pressure (e.g., heavy torque loads).

FLOAT – A load condition where two parts are turning at the same speed with no driving force between them.

FLANGE YOKE – Same as an end yoke except circular in design.

FULL-FLOATING AXLE – Axle shaft which transmits torque only and carries no vehicle load.

GEAR – A wheel with teeth that transmits power or motion to another gear.

GEAR RATIO – The ratio in the number of teeth on the driving and driven gears; it is calculated by dividing the number of teeth on the driven gear bt the number of teeth on the driving gear.

HEEL – The outer end of a bevel or hypoid ring gear tooth.

HOUSING – Portion of the axle assembly that consists of the carrier and axle tubes.

HYPOID GEAR – A special form of bevel gear that positions the gear axis on non-intersecting planes and is commonly used in drive axles.

LIMITED SLIP DIFFERENTIAL – Differential in which the difference in rotational speed or torque between the two output shafts is mechanically limited to prevent wheel spin on difficult terrain.

NEWTON METER – (N.M) The metric measurement for torque.

PINION GEAR – A small gear that meshes with a larger gear.

PITCH LINE – The effective diameter of a gear; midpoint of the gear tooth.

PRELOAD – A load placed on parts during assembly to maintain critical clearances and adjustments when operating loads are applied.

R.T.V. – A formed-in-placed gasket material; a rubber like material that vulcanizes at room temperature.

SALISBURY AXLE DESIGN – Axle assembly with final drive components assembled into one piece housing.

SHIM – A thin spacer used to adjust preloads and ring gear to pinion gear backlash may also be used for controlling pinion gear positions.

TOE – The inner end of a bevel or hypoid ring gear tooth.

TORQUE – A turning or twisting force that is normally measured in Pound-Feet or NewtonMeters

VISCOSITY – The resistance to flow of a fluid.