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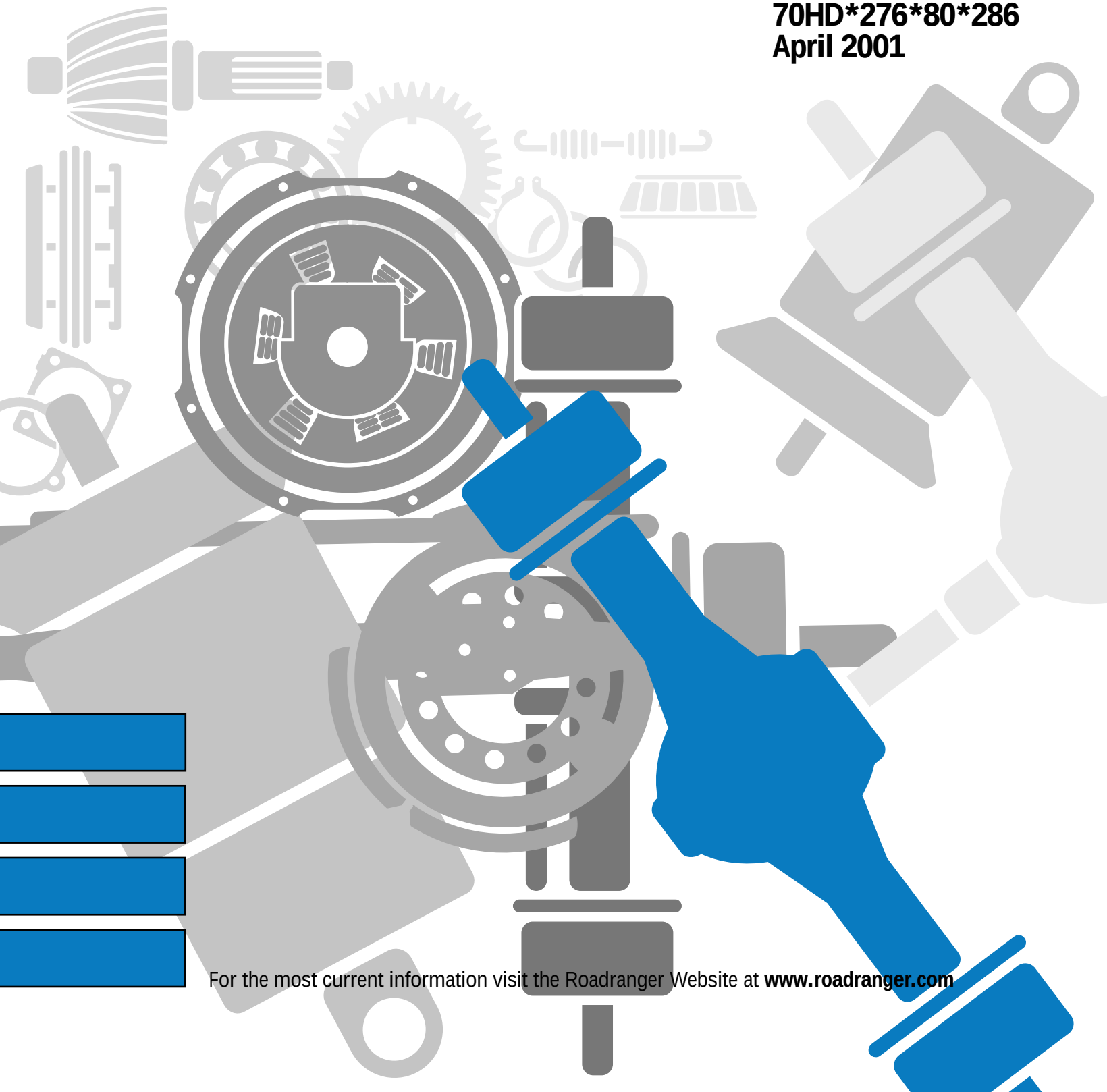
DANA

Dana® Spicer®

Service Manual

Single Speed Axle

AXSM-0053
70HD*276*80*286
April 2001



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SECTION 1

GENERAL INFORMATION
IMPORTANT SAFETY NOTICE

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.

Proper service and repair is important to the safe, reliable operation of all motor vehicles or driving axles whether they be front or rear. The service procedures recommended and described in this service manual are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tool should be used when and as recommended.

CAUTION: EXTREME CARE SHOULD BE EXERCISED WHEN WORKING ON COMPO- NENTS UTILIZING SNAP RINGS OR SPRING LOADED RETENTION DEVICES. FOR PERSONAL SAFETY, IT IS RECOMMENDED THAT INDUSTRIAL STRENGTH SAFETY GOGGLES OR GLASSES BE WORN WHENEVER REPAIR WORK IS BEING DONE ON ANY VEHICLE OR VEHICLE COMPONENTS.

It is impossible to know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way.

Accordingly, anyone who uses a service procedure or tool which is not recommended must first satisfy himself thoroughly that neither his safety or vehicle safety will be jeopardized by the service methods he selects.

WARNING

Some vehicle manufacturers may require the assembly of brake components on Dana axles that utilize materials containing asbestos fibers.

BREATHING ASBESTOS DUST MAY BE HAZARDOUS TO YOUR HEALTH AND MAY CAUSE SERIOUS RESPIRATORY OR OTHER BODILY HARM.

Follow O.S.H.A. standards for proper protective devices to be used when working with asbestos materials.

SILICONE RUBBER SEALANT (RTV) AND LUBRICATING GREASE AND OILS

Silicone rubber sealant is used as a gasket material on Dana axles, as well as various lubricants for lubricating purposes. Before using any of these materials, one should become familiar with and follow all safety precautions as recommended by the product manufacturer/supplier. All personnel involved with these materials should follow good industrial hygiene practices (e.g. before eating, hands and face should be thoroughly washed. Eating, drinking and smoking should be prohibited in areas where there is potential for significant exposure to these materials).
When discarding any of the materials, observe all local, state, and federal laws and regulations for proper disposal procedures.

Safety Precautions

This symbol warns of possible personal injury.

A serious or fatal injury can occur . . .

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

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

AXLE IDENTIFICATION

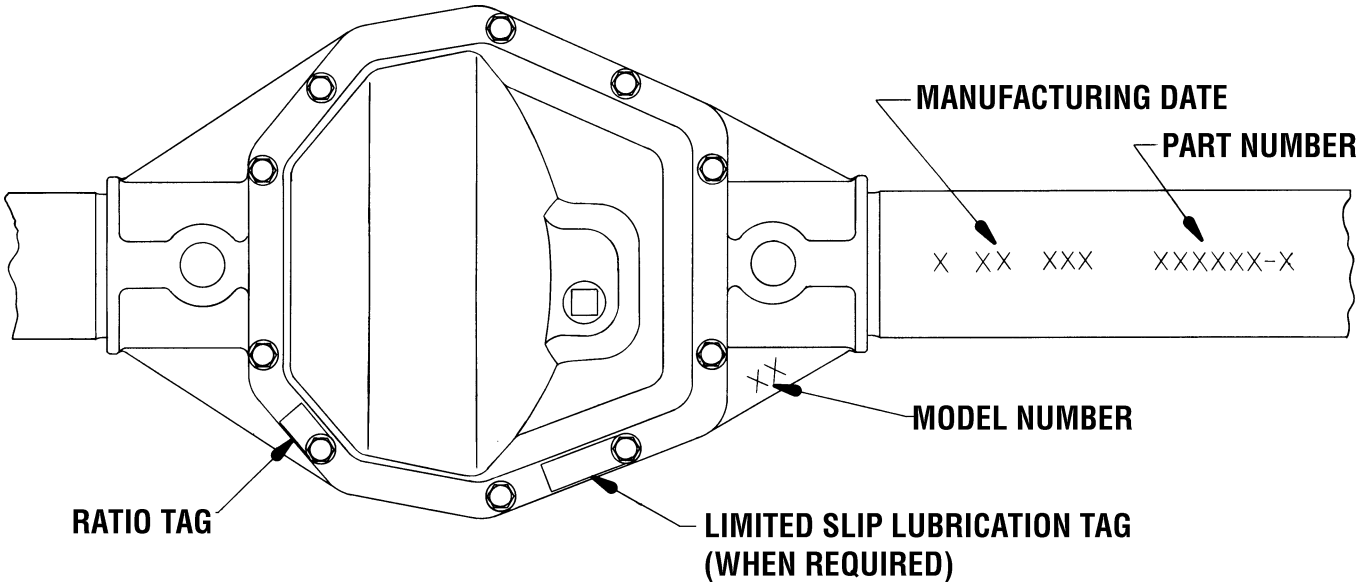

Figure 1-1

Spicer axles are identified with a manufacturing date and complete part numbers stamped on the right-hand tube. The part number may also appear on a metal tag attached to the cover plate by the cover screws, depending upon the requirements of the vehicle manufacturer.

The part number, consisting of six digits reading from left to right, is the basic number for identifying the particular axle assembly. The seventh digit following the dash will identify ratio, differential, and end yoke options used in the assembly. The next group of numbers is the manufacturing date of the axle and is interpreted as follows. The first number is the month, the second number is the day of the month, the third number is the year, the fourth is the line that built the axle, and the letter is the shift.

NOTE

It is recommended that when referring to the axle, the complete part number and build date be obtained. To do this, it may be necessary to wipe or scrape off dirt, etc., from the axle housing.

If the axle is unique on design such that the unit cannot be identified in the standard manner as described above, refer to the vehicle manufacturer's service and/or parts manual for proper identification.

SERVICING COMPONENTS NOT COVERED IN THIS MANUAL

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

VEHICLE STORAGE OR PROLONGED INOPERATION

If the vehicle has not been operated on a regular daily basis, it is recommended that the vehicle be operated at least once every two weeks. The vehicle should be moved far enough to cause the drivetrain components to make several complete revolutions. This procedure will help assure that all internal components receive adequate amount of lubrication to help reduce component deterioration caused by an undesirable environment (e.g. high humidity).

EXPLODED VIEW OF AXLE ASSEMBLY

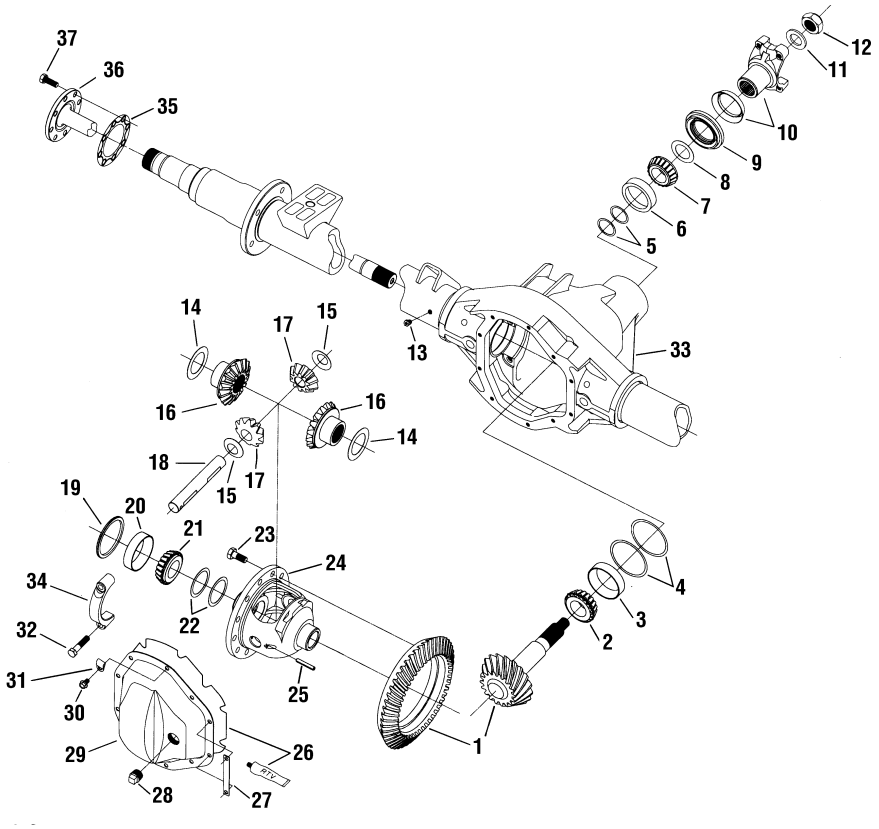

Figure 1-2

The model 80 single-speed axle assembly is an integral-type housing. Shown in figure 1-2 is a Model 80 full-float design.

Item	Part Description
1	Ring Gear and Drive Pinion Assembly
2	Inner Pinion Bearing Cone
3	Inner Pinion Bearing Cup
4	Pinion Position Shims
5	Pinion Bearing Preload Shims
6	Outer Pinion Bearing Cup
7	Outer Pinion Bearing Cone
8	Thrust Washer
9	Pinion Seal
10	End Yoke and Flinger Assembly
11	Washer
12	Nut
13	Shipping Plug (Shipping purposes only Removed by vehicle manufacturer)
14	Side Gear Thrust Washer
15	Pinion Mate Gear Thrust Washer
16	Differential Side Gear
17	Differential Pinion Mate Gear
18	Differential Pinion Mate Shaft
19	Differential Outboard Spacer
20	Differential Bearing Cup
21	Differential Bearing Cone
22	Differential Bearing Preload and Backlash Shims
23	Ring Gear Screw
24	Differential Case
25	Roll Pin (Pinion Mate Shaft)
26	RTV Sealant
*27	Identification Tag
28	Pill Plug
29	Cover Plate
30	Cover Screw
31	Brake Line Clip
32	Differential Bearing Cap Screw
33	Housing
**34	Differential Bearing Cap
35	Gasket-Axle Shaft Flange
36	Axle Shaft
37	Screw - Axle Shaft Flange

*Specified by vehicle manufacturer.

**Differential bearing caps are part of the housing and cannot be serviced separately.

SECTION 2
SERVICE TOOLS
PROCUREMENT

Throughout the manual reference is made to certain tool numbers whenever special tools are required. These tool numbers

are numbers of Miller Special Tools, 326 15 Park Lane. Garden City, MI 48135. They are used herein for customer convenience only. Dana makes no warranty or representation to these tools.

Miller Tool Number	Description
	2 Jaw Puller
DD-914-8	Adapter Ring
DD-914-99	Adapters
DD-914-95	Adapters
D-115	Arbor*
C-4308	Bearing Cup Installer
C-4204	Bearing Cup Installer*
D-4308	Bearing Cup Installer
D-389	Bearing Installer
DD-914-42	Button
DD-914-42	Button
C-3339	Dial Indicator Set
W-129-B	Differential Spreader
6776	Dummy Differential Bearing Set*
DD-914-7	Extension
C-4171	Handle
C-1490	Installer
	Long Handle break-over bar (wrench)
D-159	
6775	Pinion Bearing Cup Remover
D-191	Pinion Height Set*
DD-914	Pinion Yoke Installer
DD-914-P	Press
D115-2, 6739	Press
8152	Scooter Gage**
D-131	Slide Hammer
	Torque Multiplier***
	Torque Wrench
6719	Yoke Holder

* Gage set for setting differential bearing preload , gear backlash, and pinion position.

** Consist of D-106-5 dial indicator and D-115-2 Scooter Block.

*** The Torque Multiplier increases torque (4 to 1) by means of gear ratio: ½" drive (female), ¼" drive (male).

NOTES

SECTION 3
CARRIER SECTION

DISASSEMBLY

NOTE

The photos or pictures contained herein are for illustrative and instructional purposes only. The appearance of your axle assembly and/or components may vary from that shown. However, the service procedures described will apply.

If it becomes necessary to disassemble any parts inside the carrier, it is suggested that the entire axle be removed from the vehicle and held tight in a stand or rack.

All dimensions are in inches unless otherwise stated. Dimensions in parentheses followed by mm are in millimeters.

WARNING: When removing axle assembly, make sure vehicle is properly supported. Improperly supported vehicle can cause serious injury or death. Follow vehicle manufacturers recommendations for proper axle assembly removal procedures.

Step (1) Remove cover plate from housing and drain lubricant.

NOTE

Before removing differential case assembly, make sure the axle shafts are pulled out far enough for clearance to allow removal.

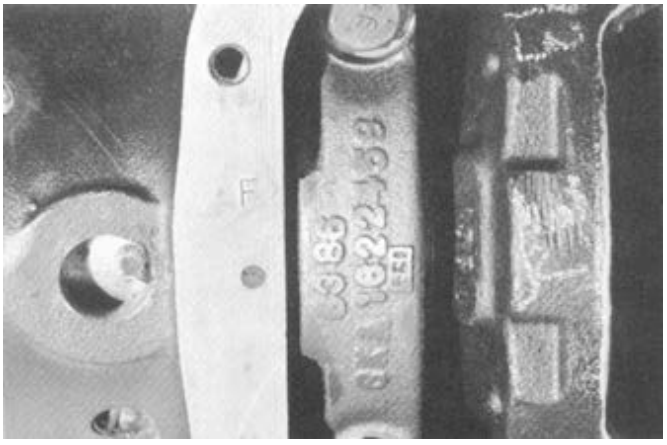

Figure 3-1

Step (2) Remove bearing caps. Note mating letters stamped on caps and carrier. This is important at time of assembly as they are to be assembled exactly as removed. Letters or numbers are in vertical and horizontal position.

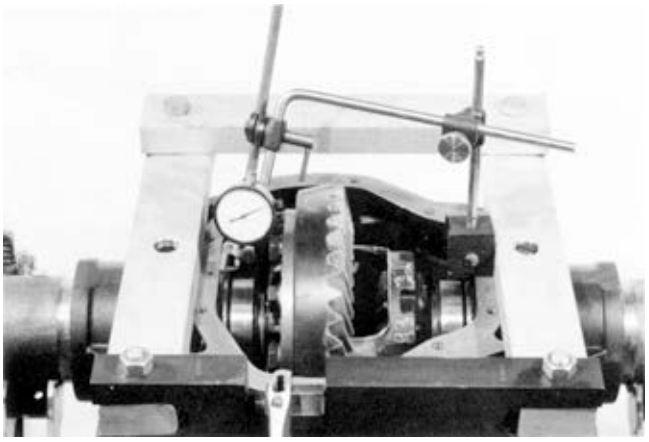

Figure 3-2

Step (3) Mount spreader to housing. DO NOT SPREAD CARRIER OVER ,015 (.38 mm). Use dial indicator as shown.

TOOL: W- 129-B Differential Spreader
C-3339 Dial Indicator Set

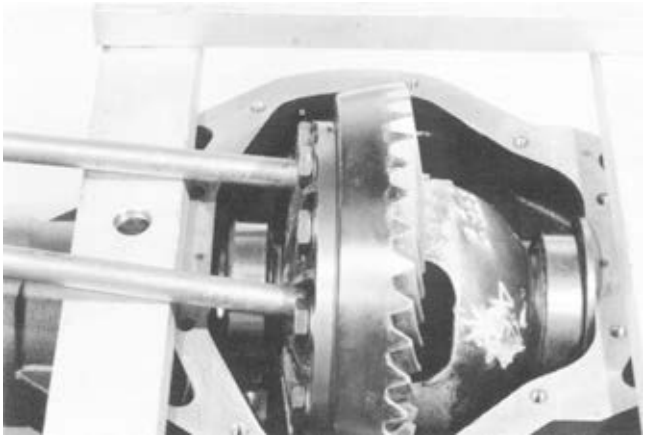

Figure 3-3

Step (4) Pry differential case from carrier with two pry bars. After differential case has been removed, remove spreader. Use caution to avoid damage to components. Tag bearing cups indicating from which side they were removed from. See note below regarding the use of bearings.

NOTE

It is recommended that whenever bearings are removed, they are to be replaced with new ones, regardless of mileage.

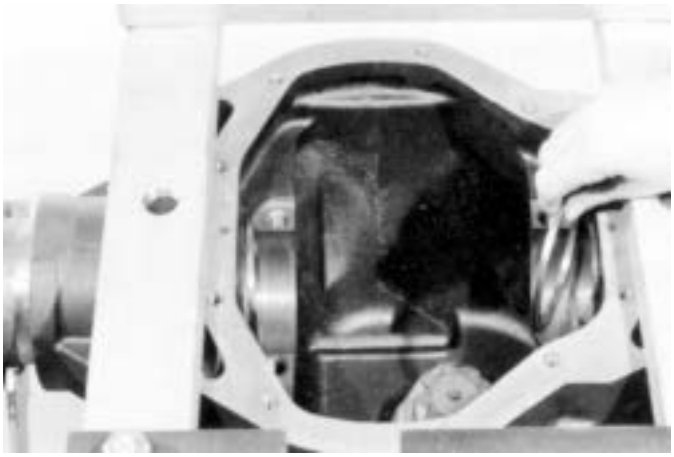

Figure 3-4

Step (5) Note the differential bearing outboard spacers located on each side of the differential bearing bore. Remove and tag which side they were removed from. Ring gear side or opposite side. They will be reused during assembly, unless damaged or worn.

> **NOTE**
> Check outboard spacers for damage. (e.g. caused by worn bearings). If damaged, they should be replaced with new ones at time of reassembly.

Figure 3-5

Step (6) Remove differential bearing cones with a puller as shown. Tag cones indicating from which side they were removed from.

TOOL: DD-914 Press
DD-914-99 Adapters
DD-914-8 Adapter Ring
DD-914-7 Extension
DD-914-42 Button

> **WARNING: When pulling bearings, do not allow differential assembly to fall. It can strike legs or feet and may cause serious injury.**

RING GEAR REMOVAL

Figure 3-6

Step (7) Place differential case in vise or suitable holding fixture. Remove ring gear screws. Leave 4 screws loosely assembled 90 degrees apart. Place assembly on a solid bench. Tap screws alternately and evenly to free ring gear from differential case. Remove screws and ring gear. Discard ring gear screws. Ring gear screws are to be replaced with new ones at time of reassembly.

SERVICING STANDARD DIFFERENTIAL CASE ASSEMBLY

The differential assembly may be serviced at this time, if required. If differential case, side gears and pinion mate gears are useable and do not require servicing, proceed to DRIVE PINION REMOVAL.

CASE DISASSEMBLY

Figure 3-7

Step (8) Remove roll pin with a small drift.

Figure 3-8
Step (9) Remove differential pinion mate shaft with drift.

Figure 3-9
Step (10) Rotate gears until the pinion mate (small gears) enter the large opening of the case. Remove pinion mate gears and spherical washers. After removal of the pinion mate gears, the side gear and thrust washers can be easily removed.
Step (11) Inspect and replace components as required.

> **NOTE**
> Always replace gears as a complete set. Do not mix new gears with old gears, as this may cause uneven wear and short gear life.

CASE REASSEMBLY

Step (12) Apply a small amount of grease on both side gear hubs. Assemble new thrust washers onto side gears.

Figure 3-10
Step (13) Assemble both side gears into case. Hold top side gear up with fingers. Assemble one pinion mate gear. Rotate gears until pinion mate gear is directly in the center of the small opening of the case. Line up the other pinion mate gear with the gear which has just been assembled. Rotate gears until the holes of pinion mate gears are in direct line with the holes of the differential case.
Step (14) Aft er making sure the gears are in alignment, apply a small amount of grease to the new spherical washers. Assemble washers between the gears and case. Also line up the holes of the washers with those of the gears and case. Assemble pinion mate cross shaft, make sure lock pin hole of the shaft is in verticle position and lined up with the lock pin hole of the case.

Figure 3-11
Step (15) Assemble new roll pin. Peen metal of case over pin to lock in place.

DRIVE PINION REMOVAL

Step (16) Secure end yoke or flange with holding wrench, and remove pinion nut and washer. NOTE: PINION NUT HAS 500 LBS. FT. (677.9 Nom) MAX. OF TORQUE FOR RETENTION.

TOOL: 67 19 Yoke Holder
Torque Multiplier
Long Handle break-over bar (wrench)

Figure 3-12

Step (17) Remove end yoke or flange with tools as shown. If end yoke or flange shows wear in the area of the seal contact surface, it should be replaced.

TOOL: 2 Jaw Puller

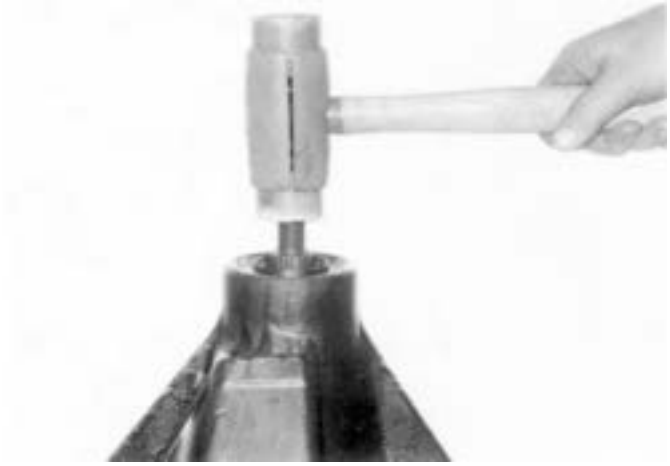

Figure 3-13

Step (18) Remove pinion by tapping with a rawhide or plastic hammer. Catch the pinion with your hand to prevent it from falling and being damaged.

WARNING: Gear teeth may have sharp edges. When handling gears, use care to avoid personal injury.

NOTE

On the spline end of the pinion, there are bearing preload shims. These shims may stick to the pinion or bearing or even fall out. These shims are to be collected and kept together since they will be used later in assembly. Try not to mutilate shims. If' shims are mutilated, replace with new ones.

Figure 3-14

Step (19) Pull out pinion seal with puller as shown. Discard seal. REPLACE WITH NEW ONE AT TIME OF ASSEMBLY. Remove bearing cone and outer thrust washer.

TOOL: D- 131 Slide Hammer

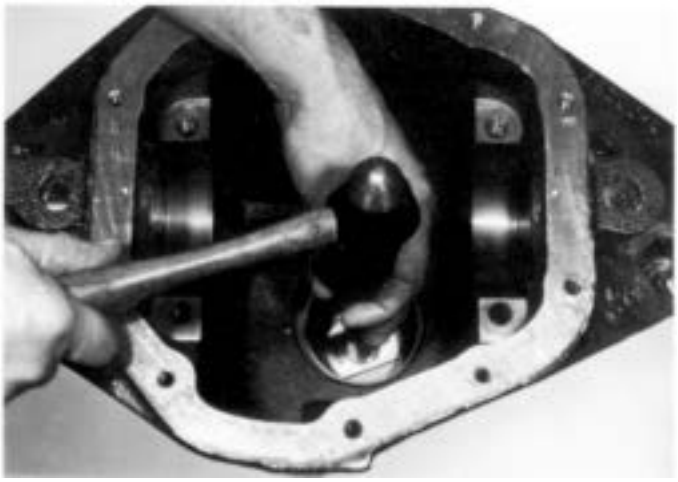

Figure 3-15
Step (20) Turn nose of carrier down. Remove outer pinion bearing cup. Locate driver on back edge of cup; drive cup out of carrier. CAUTION: DO NOT NICK CARRIER BORE.

TOOL: D-159 Pinion Bearing Cup Remover
C-4171 Handle

Figure 3-16
Step (21) Remove the inner bearing cup with tools as shown.

TOOL: C-4307 Bearing Cup Remover
C-4171 Handle

NOTE:
Shims are located between the bearing cup and carrier bore and may also include an oil baffle, depending upon the application. If shims and baffle are bent or nicked, they should be replaced at time of assembly.

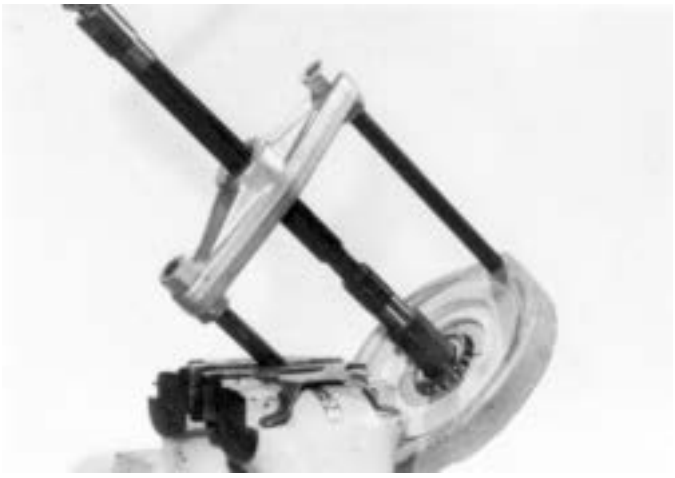

Figure 3-1 7
Step (22) Remove pinion bearing with tools as shown.

TOOL: DD-914-P Press
DD-914-8 Adapter Ring
DD-914-95 Adapters

WARNING: Do not allow gear to fall. It can strike legs or feet and may cause serious injury. Gear teeth may have sharp edges. When handling, use care to avoid cutting hands.

RING & PINION GEAR ASSEMBLY THEORY

Figure 3-18 (View of ring 81 pinion set)
Step (23) Ring gears and pinions are supplied in matched sets only. Matching numbers on both the pinion and ring gear are etched for verification. If a new gear set is being used, verify the numbers of each pinion and ring gear before proceeding with assembly.

The nominal distance from the centerline of the ring gear to the button end of the pinion for the Model 80 axle is 3.500 (88.9 mm).

On the button end of each pinion, there is etched a plus (+) number, a minus (-) number, or a zero (0) which indicates the best running position for each particular gear set. This dimension is controlled by the shimming behind the inner pinion bearing cup.

For example: If a pinion is etched a plus +3 (m+8), this pinion would require .003 (.08 mm) less shims than a pinion etched “0”. This means by removing shims, the mounting distance of the pinion is increased to 3.503 (88.98 mm), which is just what a +3 (m+8) indicates. Or if a pinion is etched -3 (m-8), we would want to add .003" (.08 mm) more shims than would be required if the pinion were etched “0”. By adding .003 (08 mm) shims, the mounting distance of the pinion was decreased to 3.497 inches (88.82 mm) which is just what a -3 (m-8) indicates.

If the old ring and pinion set is to be reused, measure the old shim pack and build a new shim pack to this same dimension. If a baffle is used in the axle assembly, it is considered as part of the shim pack.

To change the pinion adjustments, use different combination of the pinion shims which come in different thicknesses.

NOTE

If baffle or slinger is bent or mutilated, it should be replaced.

Measure each shim separately with a micrometer and add together to get total shim pack thickness from the original build-up.

If a new gear set is being used, notice the (+) or (-) etching on both the old and new pinion and adjust the thickness of the new shim pack to compensate for the differences of these two figures.

For example: If the old pinion reads +2 (m+5) and the new pinion is -2 (m-5), add .004" (. 10 mm) shims to the original shim pack.

Old Pinion Marking	New Pinion Marking								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-.0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-.0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-.0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-.0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-.0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-.0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-.0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-.0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

Figure 3-19 (Pinion Setting Chart - English U.S. Standard)

Old Pinion Marking	New Pinion Marking								
	-10	-8	-5	-3	0	+3	+5	+8	+10
+10	+.20	+.18	+.15	+.13	+.10	+.08	+.05	+.03	0
+8	+.18	+.15	+.13	+.10	+.08	+.05	+.03	0	-.03
+5	+.15	+.13	+.10	+.08	+.05	+.03	0	-.03	-.05
+3	+.13	+.10	+.08	+.05	+.03	0	-.03	-.05	-.08
0	+.10	+.08	+.05	+.03	0	-.03	-.05	-.08	-.10
-3	+.08	+.05	+.03	0	-.03	-.05	-.08	-.10	-.13
-5	+.05	+.03	0	-.03	-.05	-.08	-.10	-.13	-.15
-5	+.03	0	-.03	-.05	-.08	-.10	-.13	-.15	-.18
-10	0	-.03	-.05	-.08	-.10	-.13	-.15	-.18	-.20

Figure 3-20 (Pinion Setting Chart - Metric)

If metric, pinion will be etched (m+ some number). Example (m+5). Use these charts as a guideline to set pinion.

ESTABLISHING PINION GEAR DEPTH USING SERVICE TOOL GAGES.

Figure 3-21

View of master pinion bearing, pinion height block, scooter gage, cross arbor, arbor discs and master differential bearings.

NOTE

Make sure that all carrier bores are free from all nicks, dirt or any other contamination.

Figure 3-22

Step (24) Assemble the outer pinion bearing cup into carrier as shown. Make sure cup is seated.

TOOL: C-4171 Handle
C-4308 Bearing Cup Installer

Figure 3-23

Step (25) Assemble master pinion bearing on pinion.

TOOL: C-4204 Bearing Cup Installer

WARNING: Gear teeth may have sharp edges. When handling gears, use care to avoid personal injury.

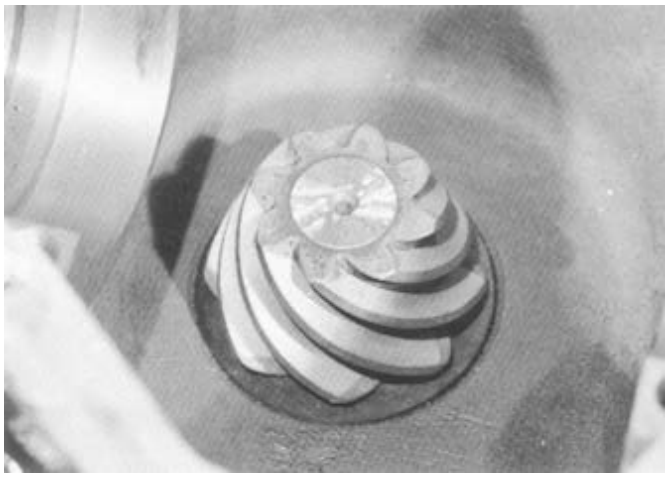

Figure 3-24

Step (26) Assemble pinion with master bearing into housing. Assemble outer pinion bearing cone, end yoke, washer, and nut. Torque nut until pinion gear and master bearing is snug (seated) in housing. The pinion gear should not have any end play. NOTE: Do not try to rotate pinion using master bearing.

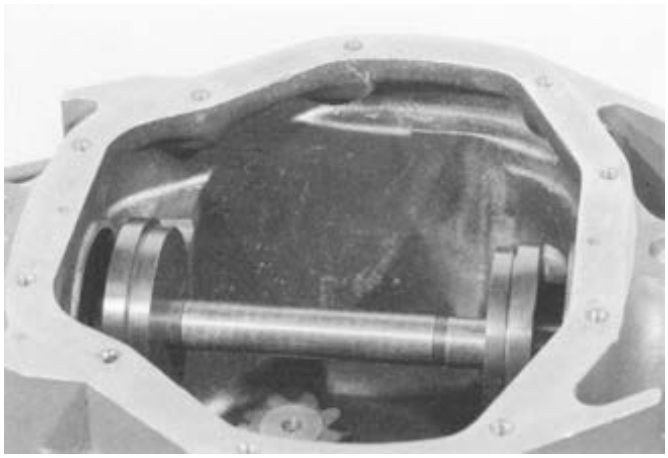

Figure 3-25

Step (27) Place arbor discs (large diameter) and arbor into cross bores of carrier as shown.

TOOL: 6776 Dummy Differential Bearing Set
D-115 Arbor

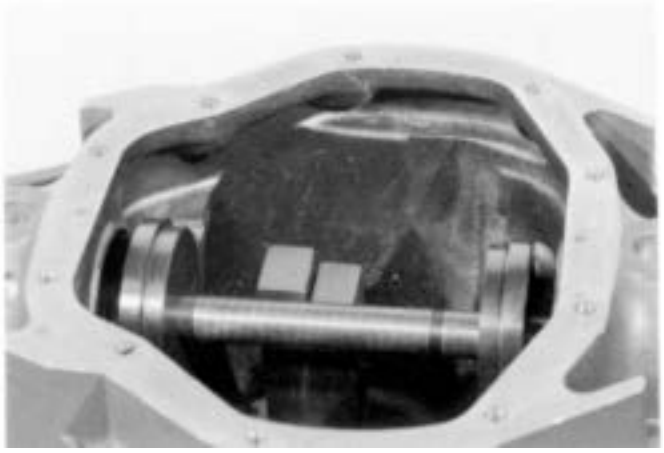

Figure 3-26

Step (28) Place pinion height block on top of the button end of the pinion gear and against arbor as shown.

TOOL: 6775 Pinion Height Set

Figure 3-27

Step (29) Place scooter gage on pinion height block. Apply pressure with fingers, making sure the gage is flat on the pinion block. While pressure is applied, set indicator at zero “0”.

TOOL: D115-2,6739 Scooter Gage

Figure 3-28

Step (30) Slide scooter gage over arbor. As gage slides over top of arbor, it will travel in a clockwise direction. When indicator is on center of arbor (on top) it will stop traveling in a clockwise direction. If indicator starts to travel in a counter-clockwise direction, this means you have passed the center (top) of the arbor. Record only the reading when the indicator is at the highest point.

This reading indicates the amount of shims necessary to obtain the shim pack plus (+) or minus (-) the etching on the button end of the pinion.

If the etching is zero (0), the shim pack will remain unchanged.

For example: If the pinion is etched +3 (m+8), this pinion would require .003" (.08 mm) less shims than a pinion etched zero (0).

If the pinion is etched -3 (m-8), this would require. 003" (.08 mm) more shims than a pinion etched zero (0).

Figure 3-29

Step (31) Measure each shim separately with a micrometer and add together to get total shim pack thickness. If baffle is required it is to be included in the shim pack. If slinger is used between the inner bearing cone and thrust face of pinion, the slinger is also to be measured and included as part of the total shim pack.

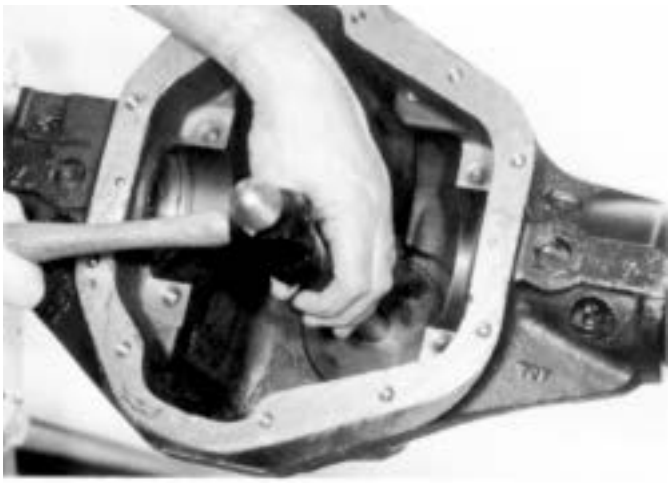

Figure 3-30
Step (32) Place the required amount of shims (and baffle if used) in the inner bearing bore. Drive the inner bearing cup into the carrier. Make sure cup is seated.

TOOL: C-4308 Bearing Cup Installer
C-4171 Handle

Figure 3-31
Step (33) Assemble inner bearing cone (and slinger if used) on pinion. Drive bearing on shaft until it is completely seated.

TOOL: D-389 Bearing Installer

Figure 3-32
Step (34) Assemble pinion into carrier. Assemble outer pinion bearing cone, thrust washer, and end yoke onto pinion spline.

NOTE
Do not assemble preload shims or pinion oil seal at this time.

Use yoke installer as shown to assemble end yoke onto spline of pinion.

TOOL: D- 191 Pinion Yoke Installer
6719 Yoke Holder

Figure 3-33
Step (35) Assemble washer and pinion nut. Torque nut until it requires 10 Lbs. in. 1.13 Nom of torque to rotate the pinion. Rotate pinion several times before checking pinion position. This is to seat the bearings and assure a more accurate reading when checking the pinion depth setting.

TOOL: Torque Wrench

Figure 3-34

Step (36) Place arbor and discs (large diameter end) into cross bore of carrier. Place pinion height block on button end of pinion. Set dial indicator on height block (high step of block). Set dial indicator at zero (0). Slide scooter gage across or over arbor.

Indicator will read a plus (+) or minus (-) at its highest point, depending on the etching of the pinion.

> **NOTE**
> Indicator reading within .002 (.05 mm) of etching is considered acceptable. If pinion position is found to be within specification, continue with build-up. If pinion position is not within specification, change shim pack thickness under inner bearing cup.

Remove pinion nut, washer, end yoke, and pinion. Assemble preload shims onto pinion.

NOTE: If old shims are available, measure shim pack and build up new shim pack using new shims of the same thickness. If old shim pack is not available for reference, build shim pack up to .060 (1.52 mm) thick. This will provide a starting point and may require adjustment.

Figure 3-35

Step (37) Apply a light coat of hypoid lubricant on the lip of pinion seal and assemble into carrier.

TOOL: 8152 Seal Installer
C-4171 Handle

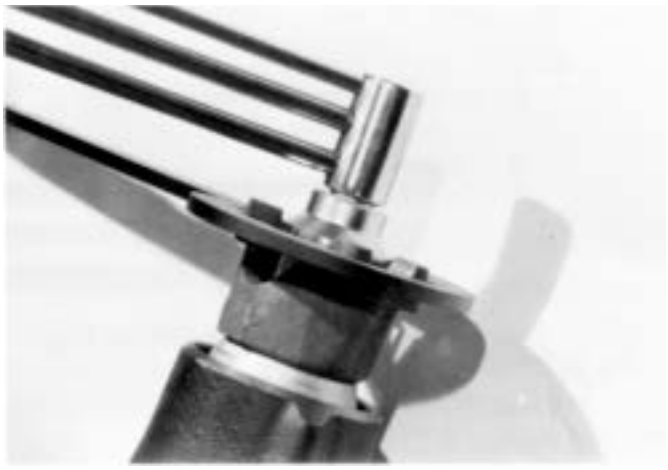

Figure 3-36

Step (38) Assemble pinion, end yoke, washer, and new pinion nut. Torque nut to specification.

TOOL: 6719 Yoke Holder
Torque Wrench

NOTE: Torque wrench must be capable of 500 lbs. ft. (677.9 N•m) torque.

Figure 3-37

Step (39) Using an in. Lbs. torque wrench as shown, rotate pinion. Torque to rotate pinion should be within specification. To increase preload, remove shims, to decrease preload add shims.

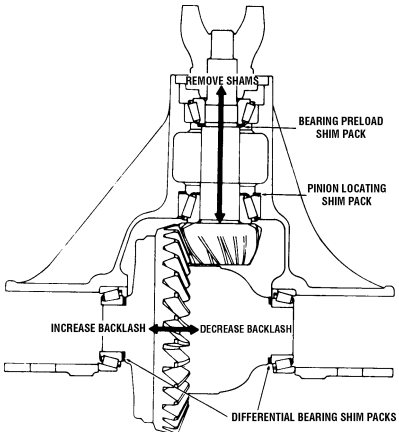

Figure 3-38

The illustration in figure 338 shows the arrow in the pinion pointing in two directions. The direction pointing towards the end yoke indicates that by removing pinion position shims, the distance from the centerline of the axle to the pinion button is increased giving a plus reading. The preload shim pack does not effect the pinion depth setting. Arrows on the ring gear illustrate the method to increase or decrease backlash and differential bearing preload.

ASSEMBLY OF DIFFERENTIAL

Figure 3-39

Step (40) Assemble master differential bearings onto case. Remove all nicks, burrs, dirt etc., from hubs to allow master bearings to rotate freely.

TOOL: 6776 Dummy Differential Bearing Set

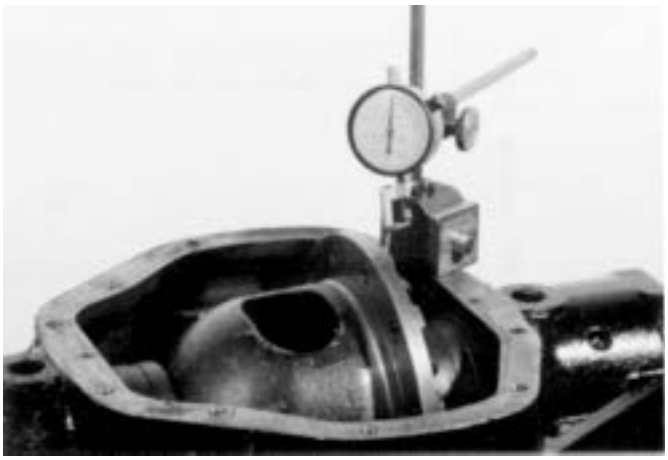

Figure 3-40

Step (41) Assemble the differential bearing outboard spacers into the carrier housing, as removed in step 5, figure 34.

Assemble differential case into carrier (less ring gear). Mount dial indicator with a magnetic base as shown. Locate tip of indicator on flat surface of case. Force differential assembly as far as possible in the direction towards the indicator. With force still applied, set indicator at zero (0).

TOOL: C-3339 Dial Indicator Set

NOTE

Dial indicator should have a minimum travel capability of .200 (5.08 mm).

Force the differential assembly as far as it will go in the opposite direction. Repeat these steps until you have obtained the same reading. Record the reading of the indicator on the worksheet, page 313. This reading will be measurement “A”. After making sure the readings are correct, remove indicator and differential assembly from housing. Remove master bearings from hubs and set aside.

Figure 3-41

Step (42) Place case assembly in a vise. Be sure flange

face of the case is free of nicks or burrs. Assemble ring gear to case. Line up holes of the ring gear with those of the case. Use new ring gear screws. Draw up screws alternately and evenly. Torque ring gear screws to specification.

TOOL: Torque Wrench

Figure 3-42

Step (43) Assemble master differential bearings onto case hubs. Place differential assembly into housing. Set up dial indicator as shown. Locate tip of indicator on flat surface of one of the ring gear screws. Force the differential case assembly (ring gear) away from the pinion gear. With force still applied to the differential case, set indicator at zero "0".

TOOL: C-3339 Dial Indicator Set

Figure 3-43

Step (44) Force the differential case assembly and ring gear into mesh with the pinion gear. Rock ring gear to allow the teeth of the gear to mesh. Repeat until the same reading is obtained each time. Record this reading on the worksheet, page 313. This reading will be measurement "B". Remove indicator and differential case assembly from the carrier. Remove master differential bearings from the differential case. Refer to the worksheet for calculating ring gear backlash and differential bearing preload shims, page 3-13.

Figure 3-44

Step (45) Assemble the required amount of shims onto hub (ring gear side) and opposite side as determined using the worksheet. Place bearing cone on hub of case. Use bearing installer to seat bearing cone as shown.

TOOL: C- 1490 Installer
C-4171 Handle
DD-914-42 Button

NOTE
Button is used to raise case from bench to protect bearing cone cage from being damaged when installing opposite bearing cone.

Figure 3-45

Step (46) Install spreader and indicator as shown. DO NOT SPREAD CARRIER OVER .015 (.38 mm). Remove indicator.

TOOL: W- 129 B Differential Spreader
C-3339 Dial Indicator Set

WORKSHEET FOR CALCULATING RING GEAR BACKLASH AND DIFFERENTIAL BEARING PRELOAD SHIMS

(1) Total amount of space measured without ring gear as shown in step 41, figure 3-40 — Measurement A _____

(2) Total amount of space measured with gear set assembled in carrier as shown in step 44, figure 3-43 — Measurement B _____

(3) Measurement A minus Measurement B equals calculated — Measurement C _____

After the measurements and calculations have been made, assemble the shim packs using the figures determined in A, B, & C, and adjusting the pack as described below.

RING GEAR SIDE:

Assemble shim pack to measurement B.

OPPOSITE SIDE OF RING GEAR:

Assemble shim pack to measurement C. Add .010 (.25 mm) for differential bearing preload and backlash.

EXAMPLE

(1) Total amount of space measured without ring gear as shown in step 41, figure 3-40 — Measurement A .105" (2-67 mm)

(2) Total amount of space measured with gear set assembled in carrier as shown in step 44, figure 3-43 — Measurement B .065" (1.65 mm)

(3) Measurement A minus Measurement B equals calculated — Measurement C .040" (1.02 mm)

After the measurements and calculations have been made, assemble the shim packs using the figures determined in A, B, & C, and adjusting the pack as described below.

RING GEAR SIDE:

Assemble shim pack to measurement B, In this example it is .065" (1.65 mm).

OPPOSITE SIDE OF RING GEAR

Assemble shim pack to measurement C. Add .010 (.25 mm) for differential bearing preload and backlash. .040" + .010" = .050", (1.02 mm + 25 mm = 1.27mm).

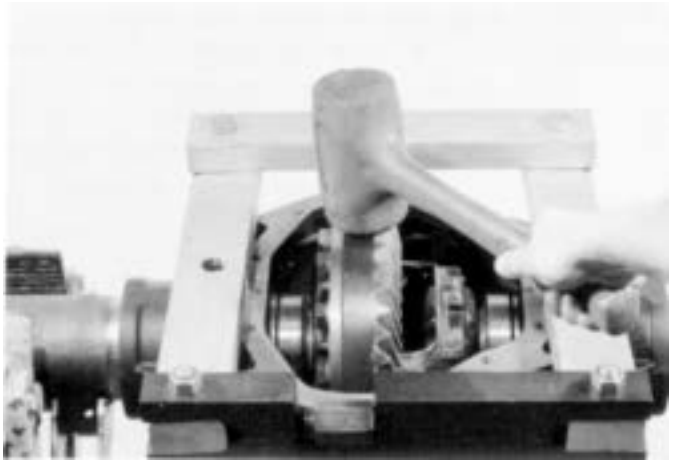

Figure 3-46

Step (47) Assemble differential bearing cups to differential bearing cones. Install differential assembly into carrier. Use a rawhide or plastic hammer to seat differential assembly into cross bores of carrier. Care should be taken to avoid nicking the teeth of the ring gear and pinion during assembly. Remove spreader.

WARNING: When differential assembly is installed into carrier, use care to avoid pinching hand or fingers between differential bearing cup and carrier housing.
Gear teeth may have sharp edges. When handling gear, use care to avoid cutting hands.

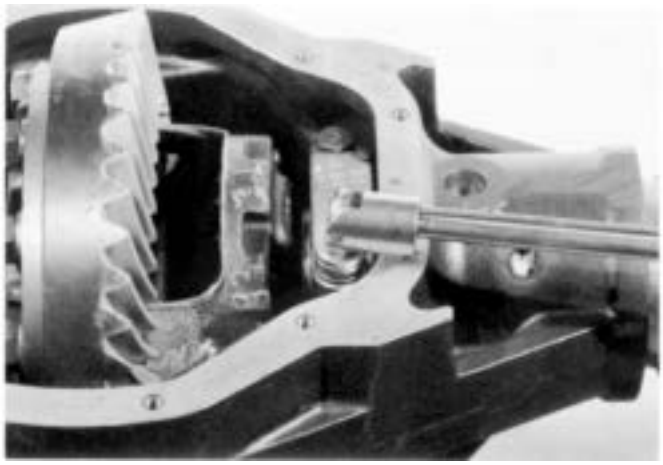

Figure 3-47

Step (48) Install bearing caps. Make sure the letters stamped on the caps correspond with those on the carrier. Torque bearing cap screws to specification.

TOOL: Torque Wrench

Figure 3-48

Step (49) Check ring gear and pinion backlash in three equally spaced points with dial indicator as shown. Backlash should be within specification and cannot vary more than .002 (-05 mm) between points checked.

TOOL: C-3339 Dial Indicator Set

High backlash is corrected by moving the ring gear closer to the pinion.

Low backlash is corrected by moving the ring gear away from the pinion.

These corrections are made by switching shims from one side of the differential case to the other.

Figure 3-49

Step (50) Using an in. lb. torque e wrench as shown, rotate pinion and differential assembly, Torque reading should be within specifi ication. If preload is to high, remove an equal amount of shims from both sides of the differential case hubs. If preload is to low, add an equal amount of shims to both sides of differential case hubs.

NOTE
If shims are added to one side only, it will affect backlash reading.

APPLYING RTV SILICONE GASKET SEALER TO COVER PLATE

Figure 3-50
Step (51) Apply gasket sealer to cover plate and assemble to carrier. Torque screws to specification.

TOOL: Torque Wrench

NOTE

The cover face of the carrier and the flat surface of the cover plate must be free of any oil film or foreign material. Sealant material must meet specifications as described in the specification section of this manual.

Apply sealer to cover plate surface. Ensure that the sealer bead is laid on the inside of the cover screw holes. The bead is not to pass through the holes or outside of the holes.

The bead is to be ⅛" to ¼" (3.18 - 6.35 mm) high and ⅛" to ¼" (3.18 - 6.35 mm) wide.

Allow one hour cure time before filling carrier with the proper amount of specified lubricant and vehicle operation.

Assemble axle shafts and wheel end components. Refer to your vehicle service manual for proper wheel bearing setting specification.

NOTES

SECTION 4

SPECIFICATIONS

DIFFERENTIAL LUBRICATION

It is not our intent to recommend any particular brand or make of lubricant for the Spicer hypoid axle. However, an S.A.E. 8OW-90 multi-purpose gear lubricant meeting Mil. Spec. L-2105C, and suitable for [1] A.P.I. Service Classification GL5, is suggested as a minimum requirement.

IMPORTANT

Motor vehicles are operated under various requirements, conditions, and environments. This manual specifies the minimum requirements that the lubricants should meet. However, it is recommended that the lubricants specified by the vehicle manufacturer be used. They may provide additional lubricating characteristics which may be required for your vehicle's operation. Contact your local service dealer or refer to your owner's manual for obtaining the proper lubricant specification.

AXLE LUBRICANT CHANGE SCHEDULE

The following schedule is a suggested lubricant change schedule. Lubricant in your vehicle may require more frequent changes depending upon the environment in which it is operated in. Contact your local service dealer or refer to your owner's manual for obtaining the proper lubricant change schedule for your vehicle.

Drain lubricant at first oil change and refill with specified lubricant. FOR NORMAL ON HIGHWAY USE, change lubricant every 100,000 miles or 24 months, whichever comes first. FOR OFF HIGHWAY, SANDY, DUSTY, OR WET CONDITIONS, change lubricant every 25,000 miles or 6 months, whichever comes first.

Lubricant may be drained by removing the carrier cover plate. This also allows for visual inspection of the internal components. Follow the service procedure in the manual for reassembly of the cover plate.

WHEEL BEARING LUBRICATION

Wheel bearings are lubricated by packing with grease. For grease packing it is recommended that a [2]N.L.G.I. No. 2 lithium EP grease suitable for automotive wheel bearings be used. Contact your local vehicle service dealer or refer to your owner's manual for obtaining the proper lubricant specification, and maintenance schedule.

SUBMERSION OR DEEP WATER FORDING

If the vehicle is exposed to water deep enough to cover the hubs, it is recommended that the wheel ends be diassembled and inspected for water damage and/or contamination.

In the event the carrier housing should become submerged in water, particularly if over the breather, it is recommended that the hypoid gear lubricant be drained and internal parts be inspected for water damage and/or contamination.

Clean, examine, and replace damaged parts if necessary, prior to assembling the housing cover and refilling with the specified hypoid lubricant.

NOTE

If the hubs are exposed to deep water, it is possible that the water could enter the carrier at the point the axle shaft enters the tube in the wheel end. This could also necessitate the draining of the hypoid lubricant as described above.

It is recommended that whenever bearings are removed, they be replaced with new ones, regardless of mileage.

[1]A.P.I. - American Petroleum Institute

[2]N.L.G.I. - National Lubricating Grease Institute

RTV SILICONE RUBBER SEALER SPECIFICATION

Sealant material must meet specification of [1]A.S.T.M. 1, GE 503, Z1, Z2, 23.

FASTENER STRENGTH IDENTIFICATION

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.)

GRADE 5 | GRADE 7 | GRADE 8 | SPECIAL GRADE (High Strength Applications)

Customary (Inch) Bolts - Identification marks correspond to bolt strength - Increasing numbers represent increasing strength.

Metric Bolts - Identification class numbers correspond to bolt strength - increasing numbers represent increasing strength.

Figure 4-I

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).

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

[1]A.S.T.M. - American Society for Testing and Material

WRENCH TIGHTENING TORQUE SPECIFICATIONS

	LBS. FT. 1	N•m
Cover Screws	35	47.5
Differential Bearing Cap Screws	80	108.5
Drive Pinion Nut	470	637.2
Fill Plug	25	33.9
Ring Gear Screws	220	298.3

PINION BEARING AND DIFFERENTIAL BEARING PRELOAD SPECIFICATION

	LBS. FT. 1	N•m
Torque to Rotate Drive Pinion Only (New bearings only)	20-40	2.26 - 4.52
Torque to Rotate Drive Pinion and Differential Case Assembly (Less Axle Shafts) (New bearings only)	SEE NOTE 1	

BACKLASH SPECIFICATION

Drive Gear to Drive Pinion	005 - .008 (.13 -20 mm)

DRIVE PINION GEAR DEPTH SPECIFICATION

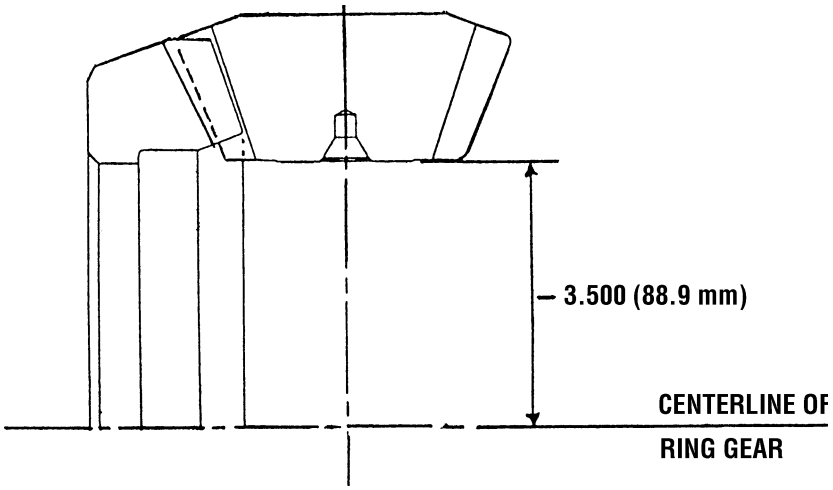

Figure 4-2

The pinion setting dimension is measured from the centerline of differential carrier (center line of ring gear) to face of pinion (button), plus or minus the etch on the button of the pinion. This dimension must be held within ± .002 in (.05 mm). For example: The model 80 pinion setting dimension is 3.500 (88.9 mm). If the pinion etch is a +2, this dimension becomes 3.502 (88.95 mm).

WHEEL BEARING SPECIFICATION

SPECIFIED BY VEHICLE MANUFACTURER. CONTACT YOUR LOCAL VEHICLE SERVICE DEALER OR REFER TO YOUR VEHICLE SERVICE MANUAL FOR OBTAINING THE PROPER WHEEL BEARING SPECIFICATION.

Notes:

(1) Torque to rotate drive pinion only plus 6-8 lbs. in. (.68 - .90 N•m) for ratios 4.63 to 5.13.

NOTES