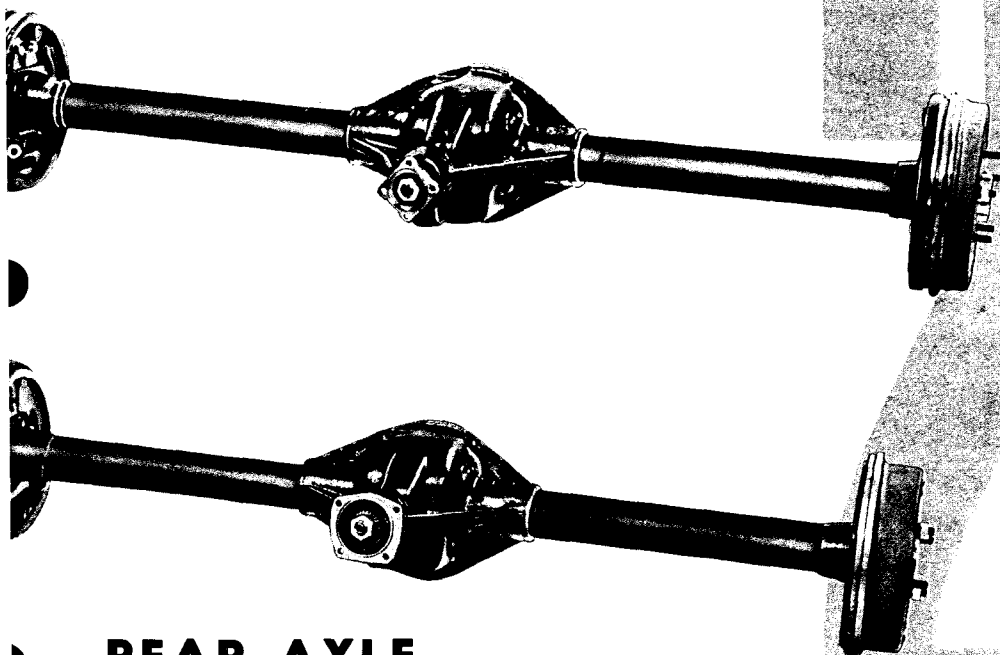


SPICER[®] AXLE

MAINTENANCE MANUAL

MODEL

20



**REAR AXLE
CARRIER TYPE**

SPICER AXLE DIVISION



DANA CORPORATION

FORT WAYNE, INDIANA

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NOTE

Through this manual, reference is made to certain tool numbers, whenever special tools are required, these numbers are numbers of the Miller Special Tool Company, 32615 Park Lane, Garden City, Michigan 48135. They are used herein for customer convenience only. Dana Corporation makes no warranty or representation with respect to these tools.

LUBRICATION

It is not our intent to recommend any particular brand or make of lubricant for the Spicer Hypoid axles. However, a S.A.E. 90 multipurpose gear lubricant meeting Mil. Spec. L-2105-B and suitable for A.P.I. Service Classification GL-5 is suggested as a minimum requirement. It must provide necessary and suitable load-carrying characteristics to prevent scoring and wear, good stability in storage and service, and good resistance to corrosion. Suppliers should assure these characteristics and be responsible for the quality and satisfactory performance of their product.

WHEEL BEARING LUBRICATION

Unit wheel bearings are lubricated from the hypoid gear lube in the axle housing.

COLD WEATHER OPERATION

If the vehicle is operated below 0° F. it is advisable to use S.A.E. 80 multipurpose gear lubricant meeting Mil. Spec. L-2105-B and suitable for A.P.I. Service Classification GL-5.

NOTE

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

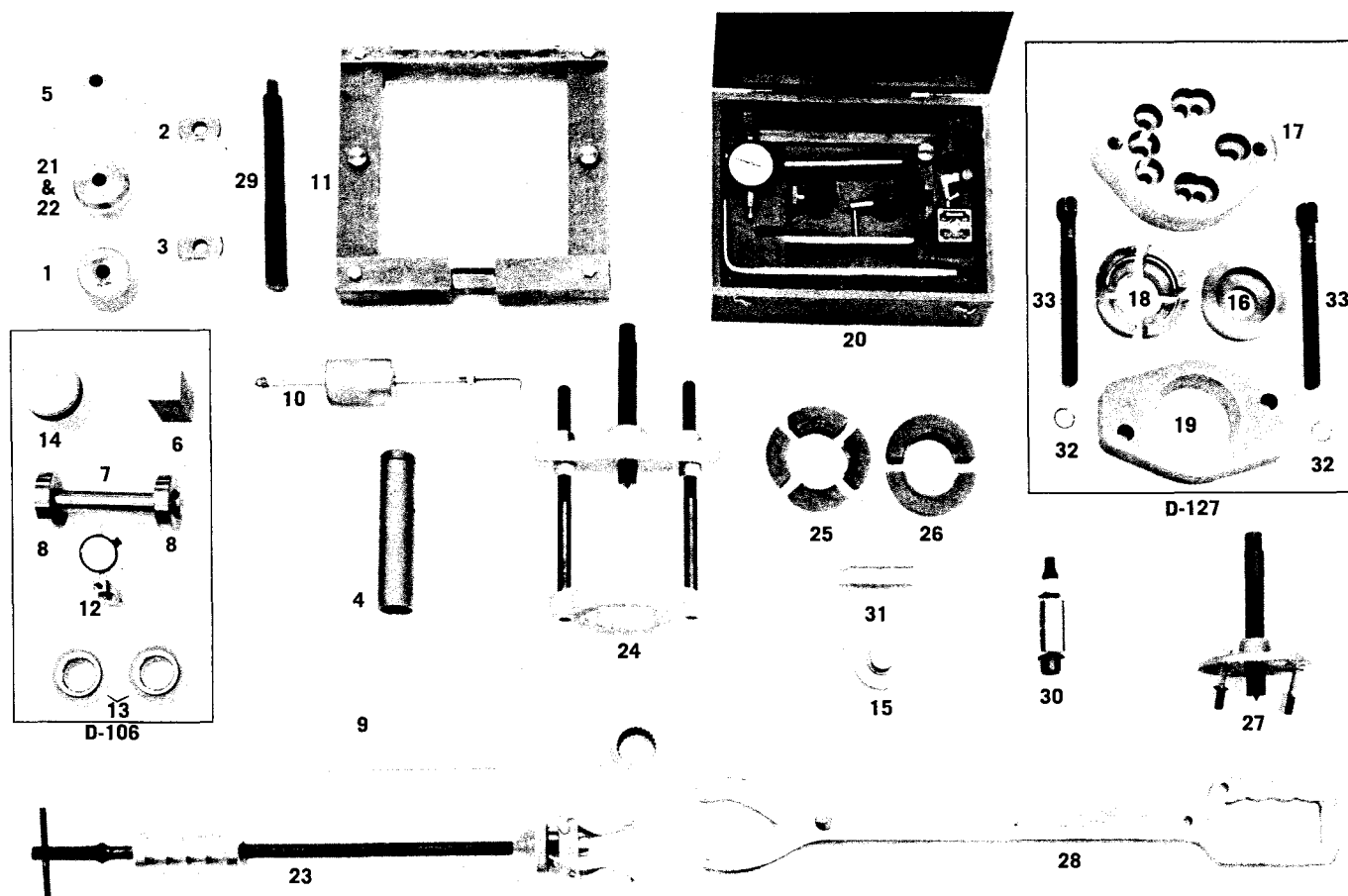


Figure and Slide 2

1007-2

The following is a detailed list of all special tools required to service a Model 26 Rear Axle:

Item No.	Tool No.	Description	Item No.	Tool No.	Description
1.	D-100	Installer—Differential Bearings	**18.	D-127-3	Adapters—Removal
2.	D-102	Remover—Front Pinion Bearing Cup	**19.	D-127-4	Forcing Plate
3.	D-103	Remover—Rear Pinion Bearing Cup	20.	D-128	Indicator Set
4.	D-104	Installer—Rear Pinion Bearing	21.	D-129	Installer—Rear Pinion Bearing Cup
5.	D-105	Installer—Pinion Oil Seal	22.	D-130	Installer—Front Pinion Bearing Cup
*6.	D-106-1	Pinion Height Block	23.	D-131	Slide Hammer
*7.	D-106-2	Arbor	24.	C-293-P	Press
*8.	D-106-3	Arbor Discs	25.	C-293-45	Adapters—Differential Bearing
9.	D-107	Sleeved Wrench—Torque Tube Drive	26.	C-293-46	Adapters—Pinion Bearing
10.	D-108	Remover—Oil Seal	27.	C-452	Remover—Flange or Yoke
11.	D-114	Spreader	28.	C-3281	Holder—Flange or York
*12.	D-115	Scooter Gage	29.	C-4171	Handle—Interchangeable
*13.	D-118	Master Bearings—Differential	30.	D-132	Installer—Flange or Yoke
*14.	D-119	Master Pinion Block	31.	SP-3183	Adapter Plug—Differential Hub
15.	D-121	Step Plate—Differential Hub	**32.	SP-3020	Washers
**16.	D-127-1	Installing Ring—Bearing	**33.	SP-5026	Bolts
**17.	D-127-2	Flange Plate—Axle	*Pinion Setting Gauge and Master Differential Bearing Kit D-106.		
			**Axle Shaft Bearing Removing and Installing Kit D-127.		

AXLE IDENTIFICATION

All Dana axles are identified with a manufacturing date and the complete part number stamped in the right hand tube. Also each axle contains a gear ratio tag.

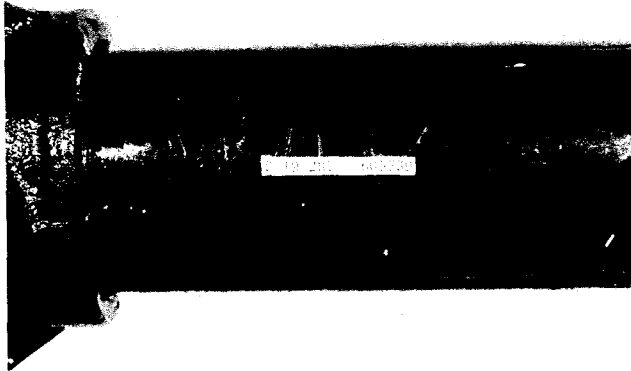


Figure and Slide 3

1007-3

In this figure the axle is identified with $\frac{1}{8}$ " high numbers stamped in the tube. For Example: The number 5 19 2B1 is the manufacturing or build date of the axle and is interpreted as follows. The first number is the month, second number is the day of the month, third number is the year, the letter is the shift, and the last number is the line that built the axle. For example: May 19, 1972, second shift, Line 1.

NOTE

In the event there are two build dates, the latter will be the date in which the brake components were assembled. The number stamped next to the manufacturing date is the complete axle assembly part number.

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

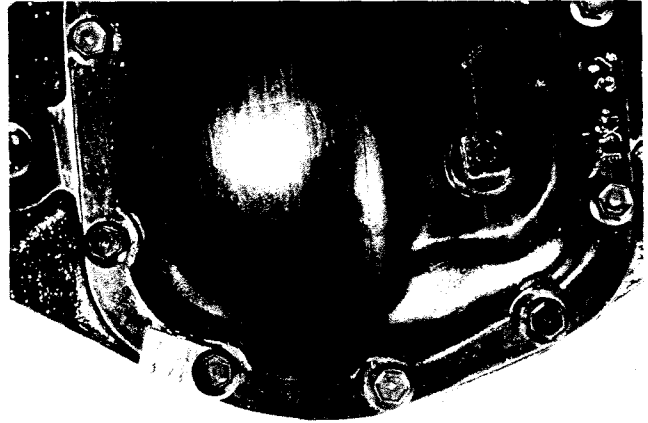


Figure and Slide 4

1007-4

The gear ratio tag is located at the bottom left hand side or left side of the cover plate and is held in place with one or two cover plate screws. This tag gives the tooth combination of the ring and pinion, and also the total gear ratio.

REAR AXLE—UNIT WHEEL BEARING DESIGN

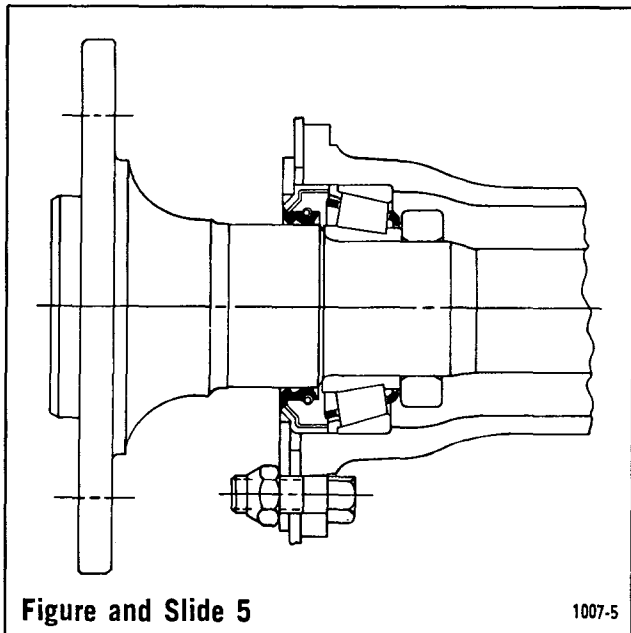


Figure and Slide 5

1007-5

Unit Wheel bearing L/D.

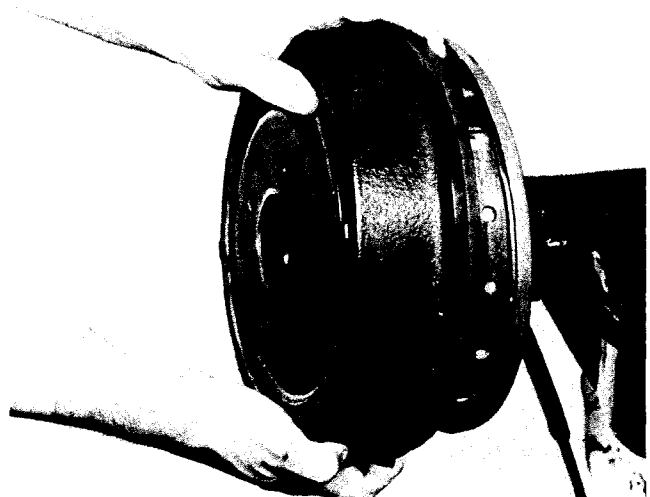


Figure and Slide 6

1007-6

DISASSEMBLY

After wheel is removed, remove brake drum.

REAR AXLE—UNIT WHEEL BEARING DESIGN

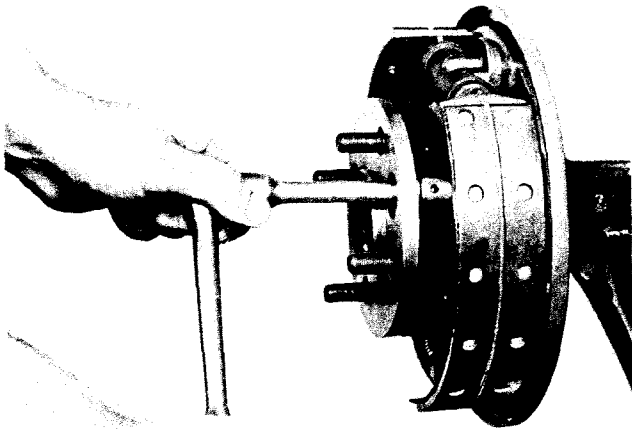


Figure and Slide 7

1007-7

Remove backing plate nuts which hold the brake backing plate to the axle housing. Discard nuts, replace with new ones at time of assembly. Nuts are of torque prevailing design and are not to be reused.

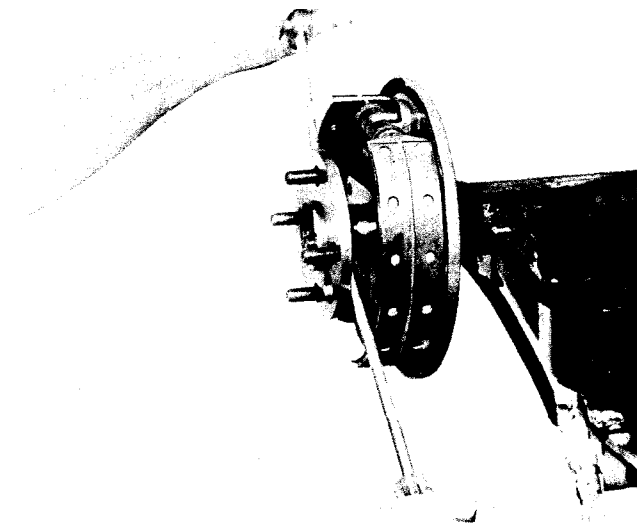


Figure and Slide 8

1007-8

Remove the axle shaft by pulling on the axle. It may be necessary to free the axle shaft by prying it loose with two screw drivers or pry bars as shown.

NOTE

Backing plate can normally be wired to the frame, without loosening the hydraulic brake line connection at the wheel cylinder, if desired. Use caution to avoid damage to brake line.

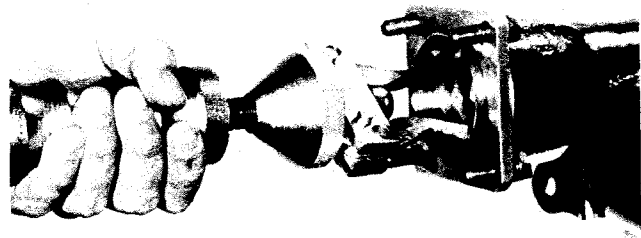


Figure and Slide 9

1007-9

The bearing cup will normally stay in place in the housing. To remove bearing cup, use puller as shown.

Tool: Slide Hammer #D-131.

CLEANING, INSPECTING AND RELUBRICATING WHEEL UNIT BEARING

Clean bearing cup with any of the standard metal cleaning solvents. Inspect cup for any possible wear, nicks, and etc.

The cone assembly can be cleaned in place on the axle shaft. Use any standard metal cleaning solvent and a stiff bristle brush to remove any dirt or any other contamination that might be present, then use compressed air. Air should be directed at the cone assembly so that it goes through the bearing from one end of the rollers to the other. It is important not to "spin dry" the bearing with compressed air. Spinning the dry bearing may score the raceways and rollers due to lack of lubricant.

Use a standard metal cleaning solvent to clean out the bearing bore in the housing. Wipe this area clean making sure it is free from dirt or any other contamination that might be present.

After the bearing has been inspected and approved for continued service, it must be lubricated prior to installation. The bearing must be lubricated by applying a small amount of the specified lube around the rollers of the bearing cone.

ASSEMBLY

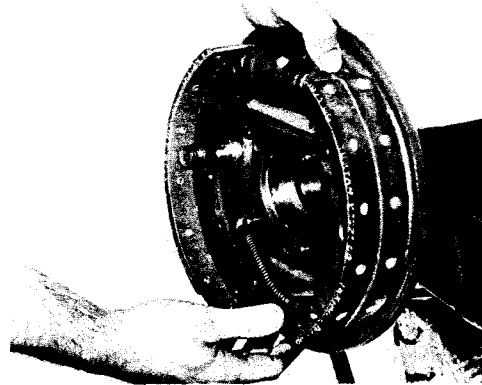


Figure and Slide 10

1007-10

Assemble backing plate bolts and backing plate assembly.

REAR AXLE—UNIT WHEEL BEARING DESIGN

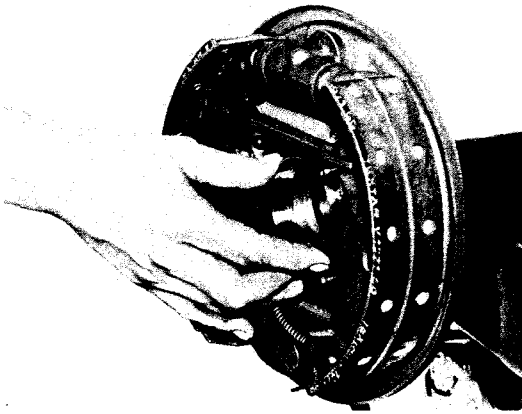


Figure and Slide 11

1007-11

Assemble bearing cup into bearing bore of the tube. Make sure the cup backface is against the bearing seat of the tube.

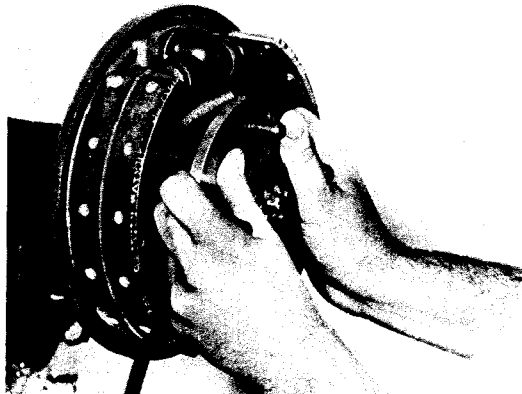


Figure and Slide 12

1007-12

Assemble axle shaft into housing. Care should be taken not to damage the bearing rollers.

Line up the holes of the retainer plate with the bolts, push axle shaft into the housing as far as possible.

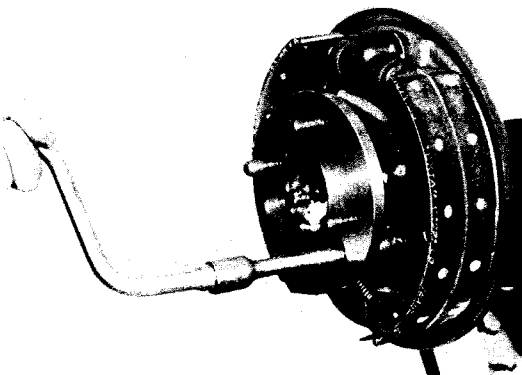


Figure and Slide 13

1007-13

Start nuts on backing plate bolts by hand. Use a speed wrench as shown and tighten to approximately 15 lbs. ft.

The nuts should be tightened in a manner that assures that the seal and cup rib ring are drawn evenly against the cup in the housing.



Figure and Slide 14

1007-14

Using a torque wrench as shown. Torque nuts to 25-35 lbs. ft. Assemble brake drums, retainer nuts, wheels, and etc.

REMOVAL OF UNIT BEARING FROM AXLE SHAFT

NOTE

To disassemble axle shaft from housing, follow the procedures illustrated in Figures #6 through #9.



Figure and Slide 15

1007-15

Place axle shaft in a vice. Drill a $\frac{1}{4}$ " hole in the outside of the retainer ring to a depth approximately $\frac{3}{4}$ the thickness of the ring. Do not drill all the way through the ring, the drill could damage the axle shaft.

REAR AXLE—UNIT WHEEL BEARING DESIGN

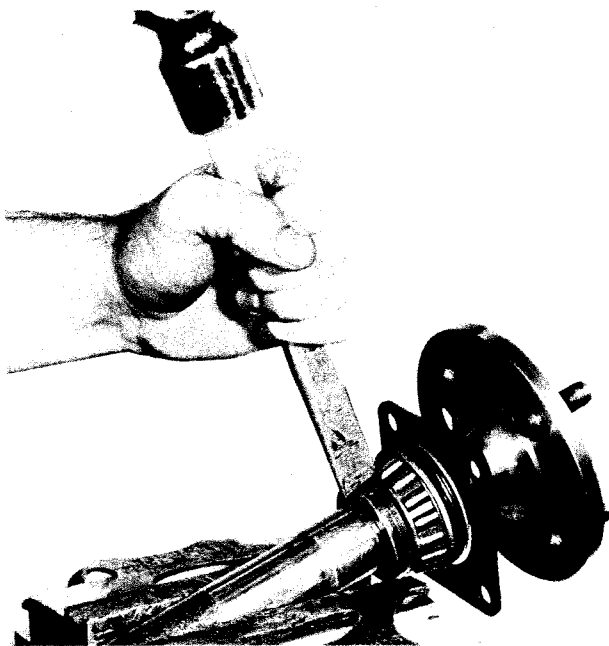


Figure and Slide 16

1007-16

After drilling the ring, use a chisel positioned across the hole and strike sharply to break the ring. Discard and replace with a new one at time of assembly.

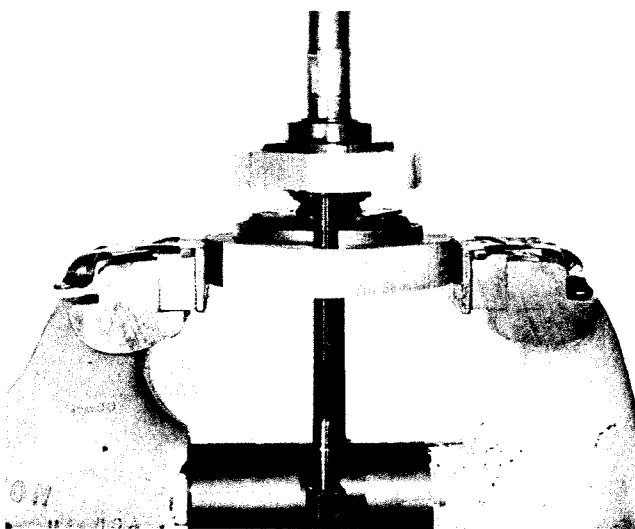


Figure and Slide 17

1007-17

Push retainer plate and seal towards flange of axle shaft. Install the flange plate to the flange of the axle shaft. Install bolts into flange plate. Slide forcing plate over the axle shaft. Install the adapters so they seat under the cup rib ring.

Gradually tighten the bolts until they locate in the dimples on the back side of the forcing plate.

Tools: Flange plate #D-127-2, Forcing Plate #D-127-4, Adapters #D-127-3, Bolts #SP-5026.

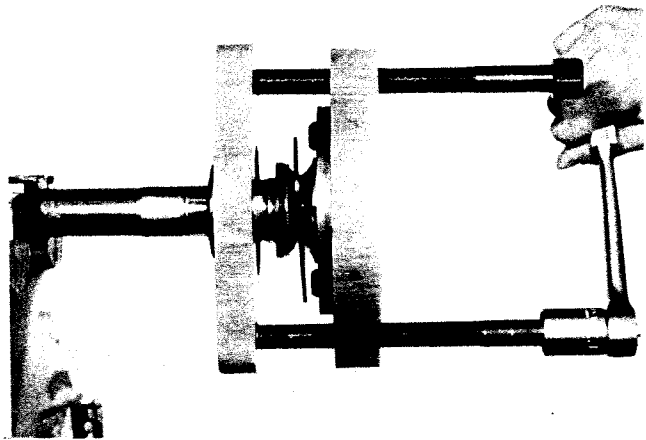


Figure and Slide 18

1007-18

Tighten bolts of tool alternately until bearing cone is removed from axle shaft. Be careful not to mar the machined surfaces of the axle shaft.

CAUTION

Do not heat or cut the bearing cone assembly with a torch to remove. Damage to the axle shaft will result.

Remove seal and retainer plate. Discard seal. Replace with new one at time of assembly. Inspect retainer plate for possible distortion. If any portion of the retainer plate is damaged, it should be replaced.

Inspect machined surfaces of the axle shaft, such as the seal and bearing diameters. Clean axle shaft, remove all nicks or burrs.

INSTALLATION OF NEW UNIT BEARING

NOTE

The retainer ring area of the axle shaft is 1.3790 minimum in diameter, and the retainer ring inside diameter is 1.374 maximum. Therefore, it should require some 6,000 lbs. minimum press to seat the ring against the unit bearing.

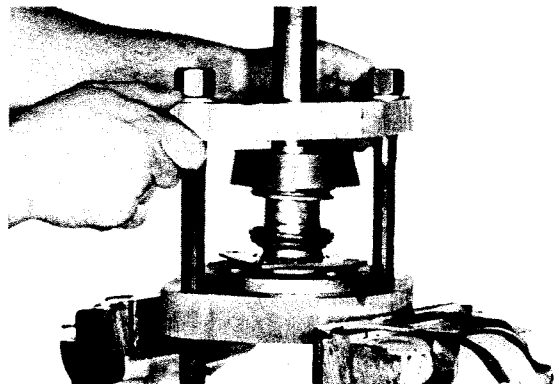


Figure and Slide 19

1007-19

REAR AXLE—UNIT WHEEL BEARING DESIGN

Flange plate should still be assembled to the flange of the axle shaft. Remove bolts from flange plate.

Assemble new retainer plate and oil seal. The rubber portion of the oil seal, which extends beyond the casing has numbers bonded in the rubber. These numbers are to face toward the flange of the axle shaft.

Assemble new unit wheel bearing on axle shaft.

Slide installing ring on axle shaft. Be sure to locate unit wheel bearing on the inside of the installing ring. Slide forcing plate on axle shaft and locate on installing ring. Install bolts and washers through the holes in the forcing plate and into the flange plate.

Tools: Flange Plate #D-127-2, Installing Ring #D-127-1, Forcing Plate #D-127-4, Bolts #SP-5026, Washers #SP-3020.

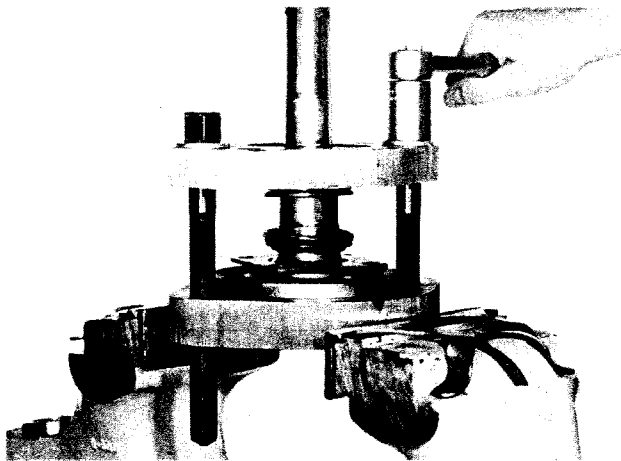


Figure and Slide 20

1007-20

Tighten bolts alternately and evenly making sure bearing is not cocked on axle shaft. Continue until unit wheel bearing is seated. To make sure bearing is seated, use a .0015" feeler gage between bearing seat and bearing. If gage enters, force bearing further on the axle shaft, until gage does not enter.

To install retainer ring on axle shaft, follow the same procedures as illustrated in figures #19 and #20.

Use a .0015" feeler gage between the bearing and retainer ring to be sure that the retainer ring is seated. At least one point should exist, where the gage will **not** enter between the retainer ring and bearing. If gage enters completely around the diameter, retainer ring must be forced further onto the axle shaft.

To assemble axle shaft assembly into housing, follow steps as illustrated in figures #10 through #14.

CARRIER SECTION

DISASSEMBLY OF CARRIER SECTION

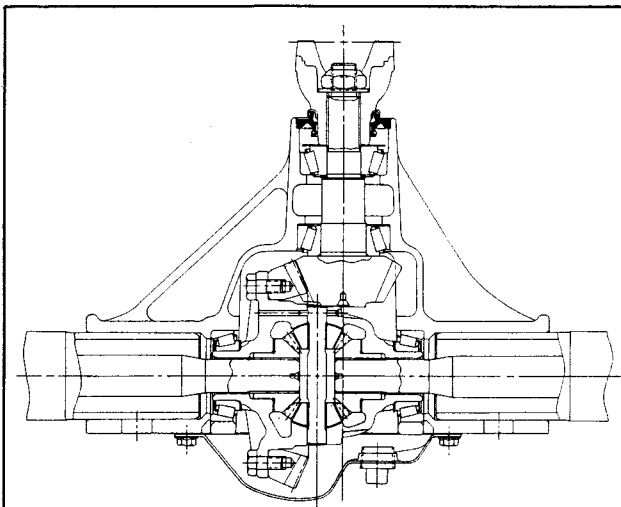


Figure and Slide 21

1007-21

NOTE

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

Remove drain plug and drain lubricant.

NOTE

In the event there is no drain plug in the carrier, the lube will drain out as the cover plate is removed.

CARRIER SECTION

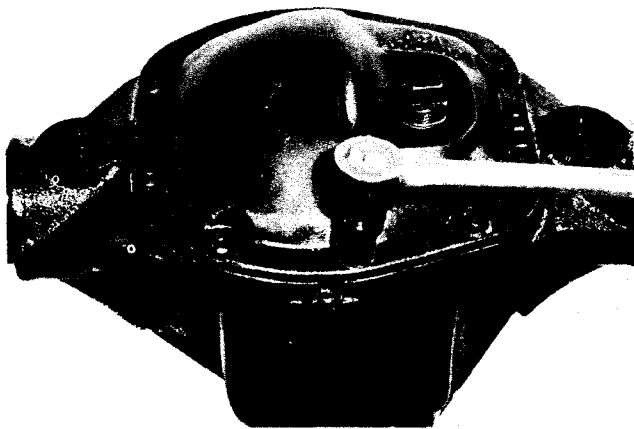


Figure and Slide 22

1007-22

Remove cover plate screws, cover plate, and cover plate gasket. Discard old gasket. Replace with new gasket during assembly.

Tip carrier to allow lube to drain completely.

Also, during this time, clean the cover face of the carrier making sure it is free of nicks and any particles left by the old gasket.

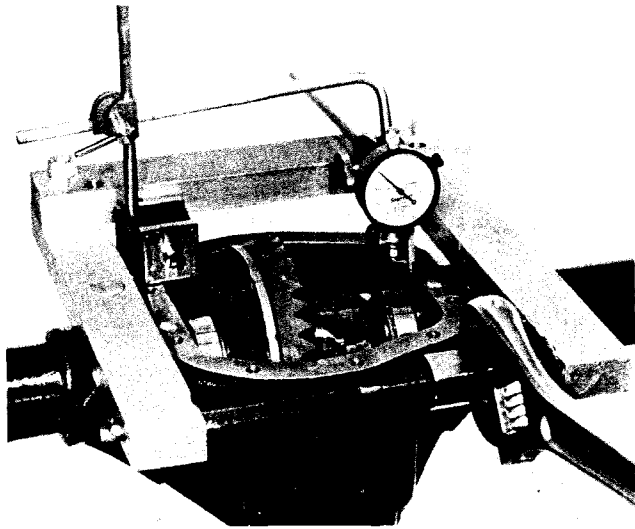


Figure and Slide 24

1007-24

Mount spreader to housing. Do not spread carrier over .015". Use dial indicator as shown.

After housing has been spread, remove the indicator.

Tools: Spreader #D-114, Indicator #D-128.

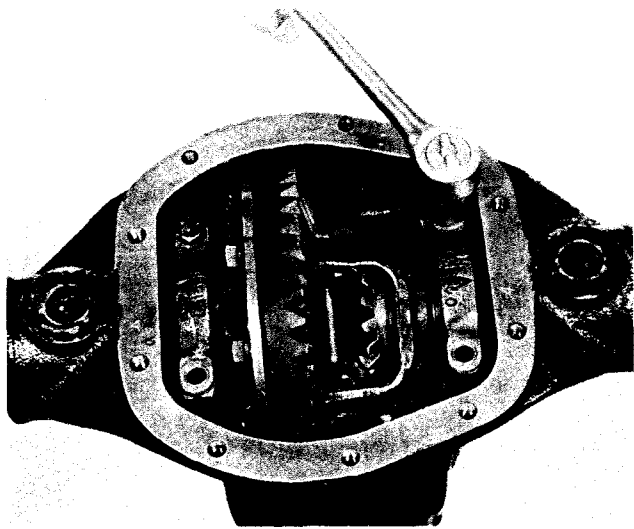


Figure and Slide 23

1007-23

Remove Bearing caps. Note 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 horizontal and vertical position.

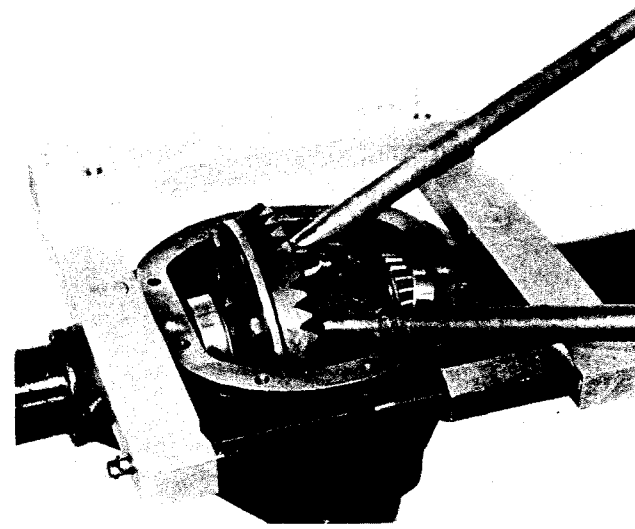


Figure and Slide 25

1007-25

Pry differential case from carrier with two pry bars as shown. After differential case have been removed, remove spreader.

Mark or tag bearing cups indicating from which side they were removed.

NOTE

Before removing differential case and ring gear, make sure axle shafts are pulled out far enough for clearance to remove differential.

CARRIER SECTION

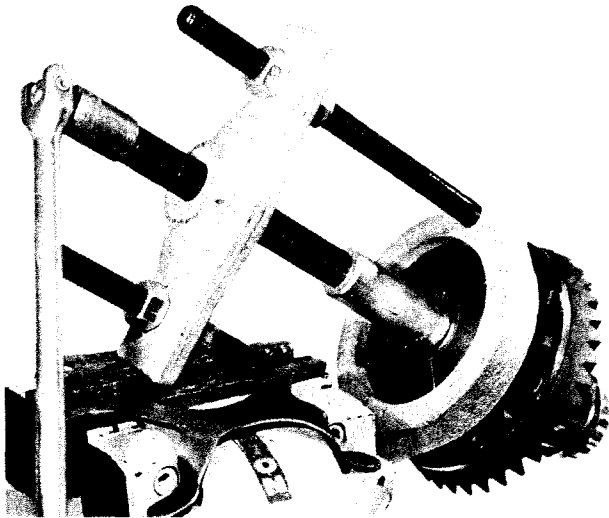


Figure and Slide 26

1007-26

Remove differential bearings with a puller as shown. Wire shims, bearing cup and bearing cone together. Identify from which side they were removed (ring gear side or opposite side.) If shims are mutilated, replace with new shims at the time of assembly. Shims are available in thicknesses of .003", .005", .010", and .030".

Tools: Press #C-293-P, Adapters #C-293-45, Plug #SP-3183.

Reposition case in puller and remove other bearing cone as described above.

NOTE

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

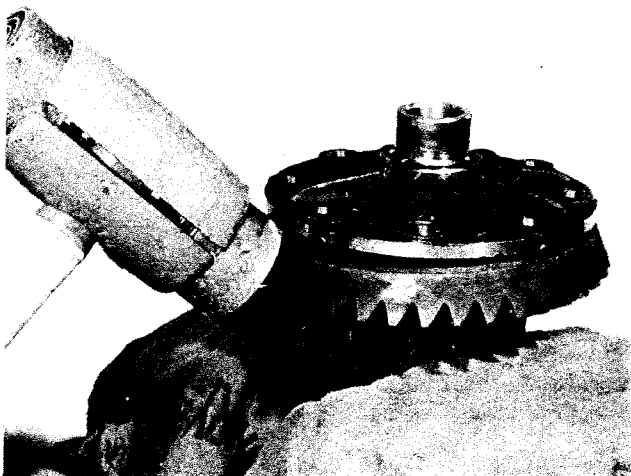


Figure and Slide 27

1007-27

Remove the ring gear screws and ring gear. Tap ring gear with a rawhide hammer to free it from the case. Place a few shop towels over the top of the vise to protect the gear teeth from being nicked, after it is free from the case. Remove differential case from the vise and remove ring gears.

NOTE

It is suggested that whenever the ring screws are removed, they are to be replaced with new screws.

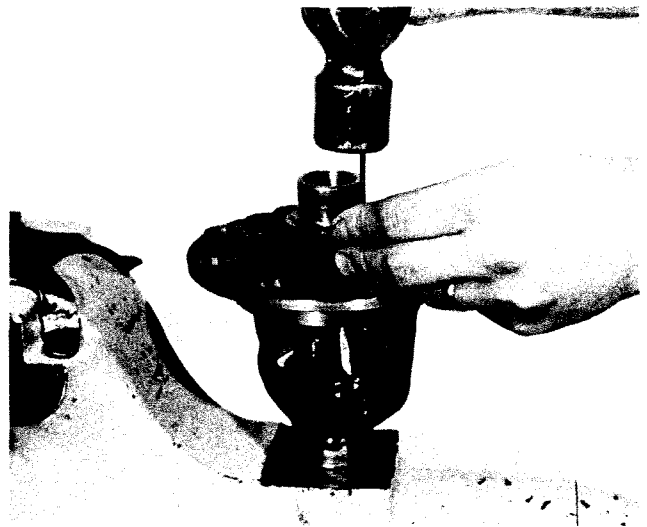


Figure and Slide 28

1007-28

Drive out lock pin which secures the pinion mate shaft. Use a small drift as shown.

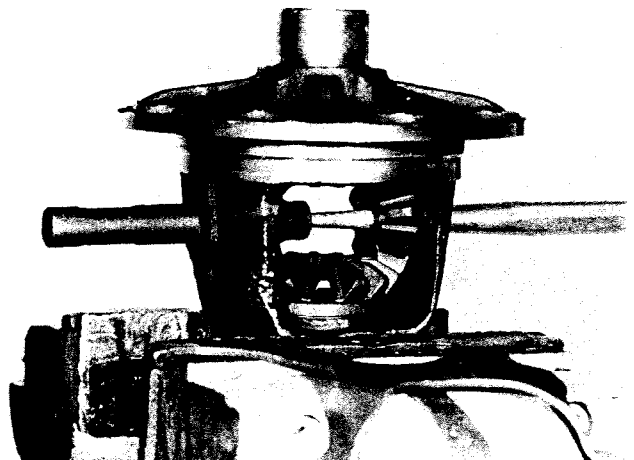


Figure and Slide 29

1007-29

Remove pinion mate shaft using a drift as shown.

CARRIER SECTION

tool similar to the the one shown, and remove pinion nut and washer.

Tool: Holder #C-3281.

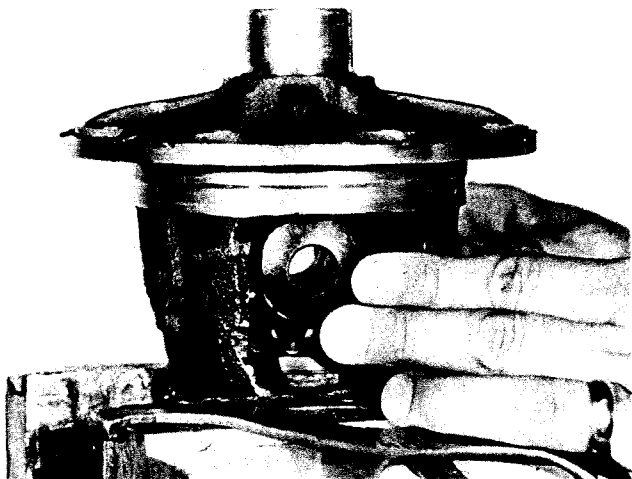


Figure and slide 30

1007-30

To remove side gears and pinion mate gears, rotate the side gears. This will allow the pinion mate gears to turn to the opening of the case. Remove pinion mate gears and also the spherical washers behind the gears. Lift out side gears and thrust washers. Inspect all parts, including the machined surfaces of the case itself. Where necessary replace all worn parts. If excessive wear is noticed on all parts, it is recommended that the complete differential assembly be replaced.

If any gears are to be replaced, they are to be replaced as sets.

NOTE

For torque tube drive design refer to Figure #38.

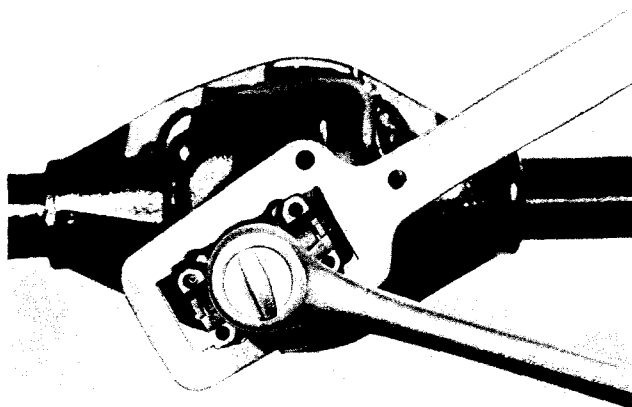


Figure and Slide 31

1007-31

Turn nose of carrier in a horizontal position to remove pinion nut. Hold end of yoke or flange with

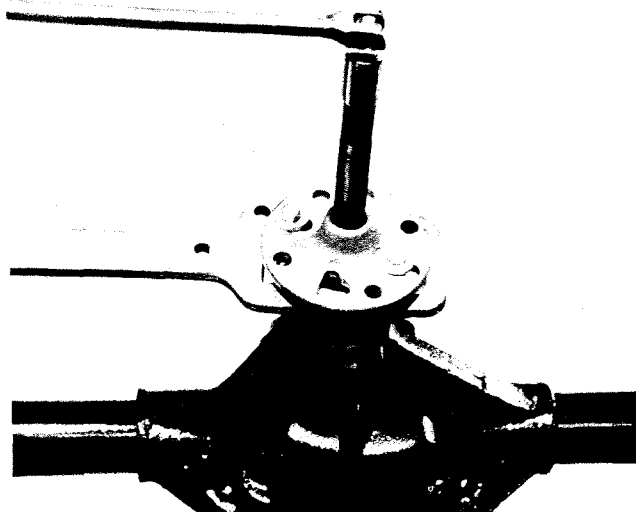


Figure and Slide 32

1007-32

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

Tools: Remover #D-452, Holder #3281.

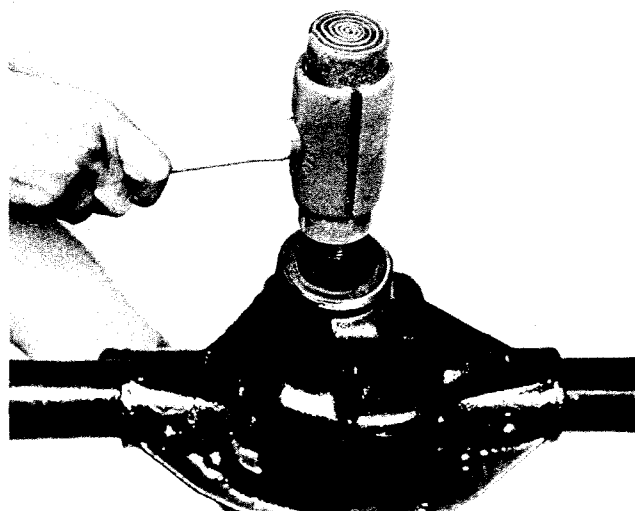


Figure and Slide 33

1007-33

Remove pinion by tapping with a rawhide hammer. Catch pinion with hand to prevent pinion from becoming damaged.

CARRIER SECTION

NOTE

On the spline end of the pinion, there are preload shims. These shims may stick to the bearing, pinion or even fall out. These shims are to be collected and kept together as they will be used later in assembly. Try not to mutilate. If shims are mutilated, replace. Shims are available in thicknesses of .003", .005", .010" and .030".

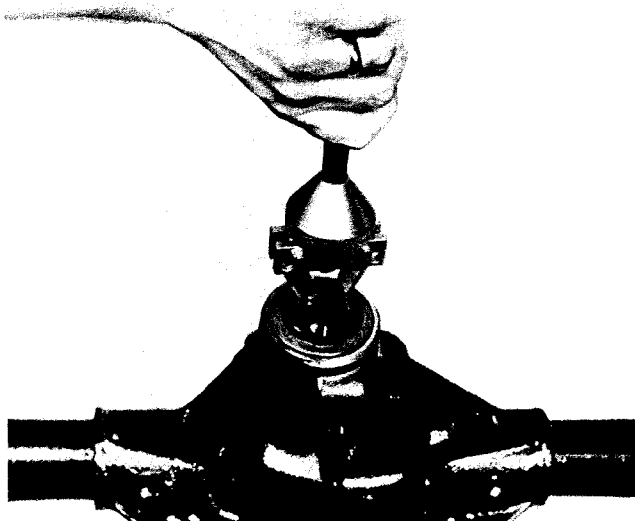


Figure and Slide 34

1007-34

Pull out pinion oil seal with slide hammer puller. Discard seal. Replace with new one at time of assembly. Remove bearing cone and outer pinion slinger.

Tool: Slide Hammer #D-131.

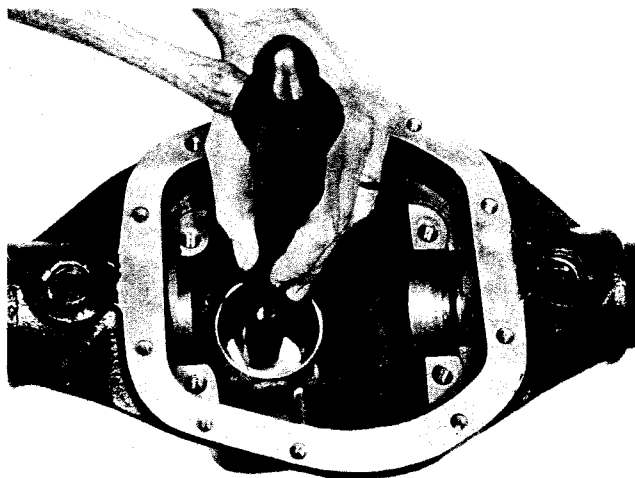


Figure and Slide 35

1007-35

Turn nose of carrier down. Remove outer pinion bearing cup as shown. Locate driver on back edge of cup, then drive cup out. Caution, do not nick carrier bore.

Tools: Remover #D-102, Handle #C-4171.

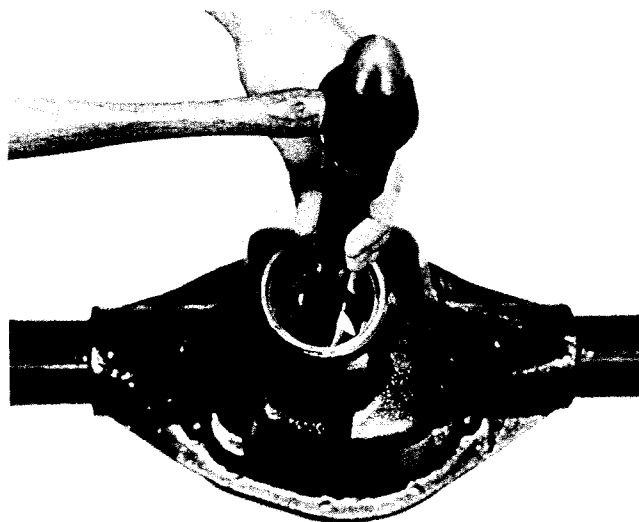


Figure and Slide 36

1007-36

Turn nose of carrier up.

Remove inner pinion bearing cup as shown. Locate driver on back edge of cup, then drive cup out.

Caution, do not nick carrier bore.

Tools: Remover #D-103, Handle #C-4171.

NOTE

Shims are located between the bearing cup and carrier bore. If shims are mutilated, they should be replaced at time of assembly. Wire the stack together and measure each. If stack has to be replaced, replace with the same thickness.

Shims are available in thicknesses of .003", .005", and .010".

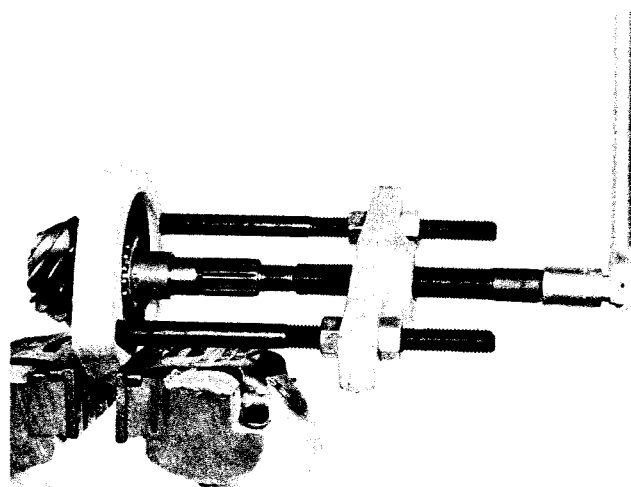


Figure and Slide 37

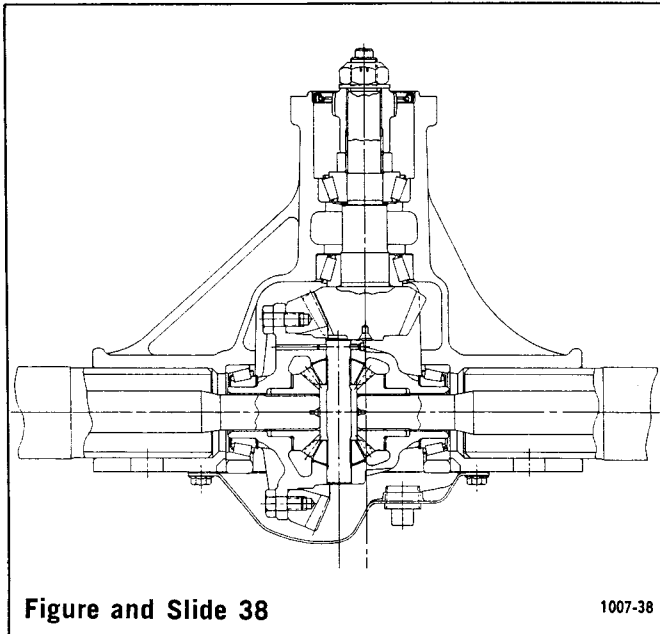
1007-37

Remove inner pinion bearing with tools as shown.

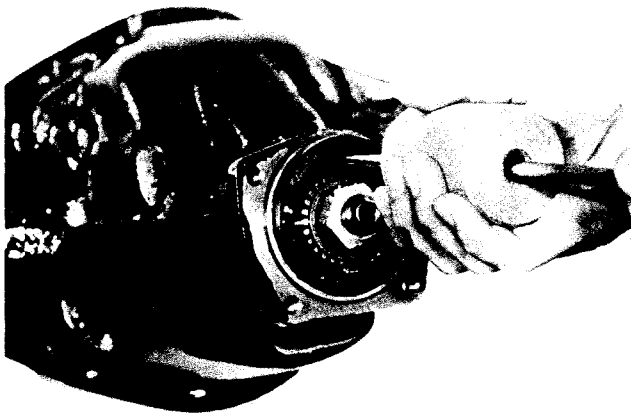
Tools: Press #C-293-P, Adapters #C-293-46.

CARRIER SECTION

DISASSEMBLY — TORQUE TUBE DRIVE DESIGN



Torque Tube Drive Design.

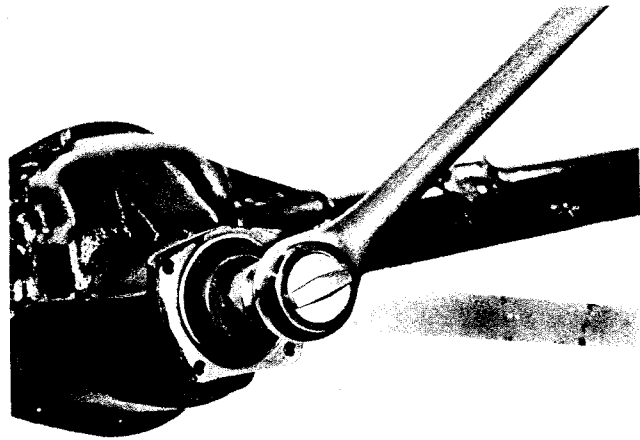


Remove pinion seal with seal remover as shown. Discard seal. Replace with new one at time of assembly.

Tool: Seal Remover #D-108.

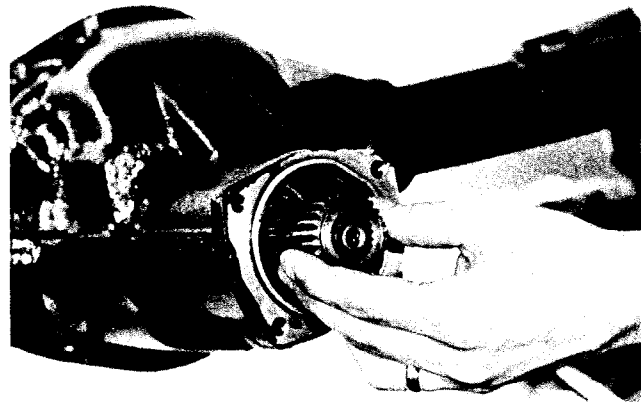
NOTE

Pinion oil seal can be replaced without removing pinion, or pinion nut.



Turn nose of carrier in a horizontal position to remove pinion nut. Slide sleeved wrench onto drive gear sleeve. Attach wrench to pinion nut and remove pinion nut and washer.

Tool: Sleeved wrench #D-107.



Remove drive gear sleeve.

CARRIER SECTION

ASSEMBLY

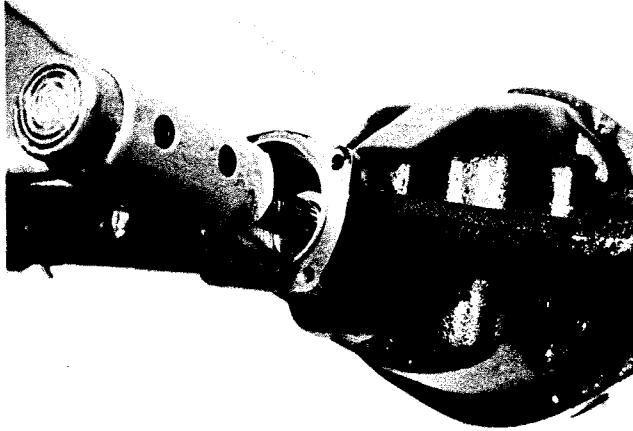


Figure and Slide 42

1007-42

Remove pinion by tapping with a rawhide hammer. Catch pinion with hand to prevent pinion from being damaged.

NOTE

On the spline end of the pinion, there are preloaded shims. These shims may stick to the bearing, pinion or even fall out. These shims are to be collected and kept together as they will be used later in assembly. Try not to mutilate. If shims are mutilated, replace. Shims are available in thicknesses of .003", .005", .010" and .030".

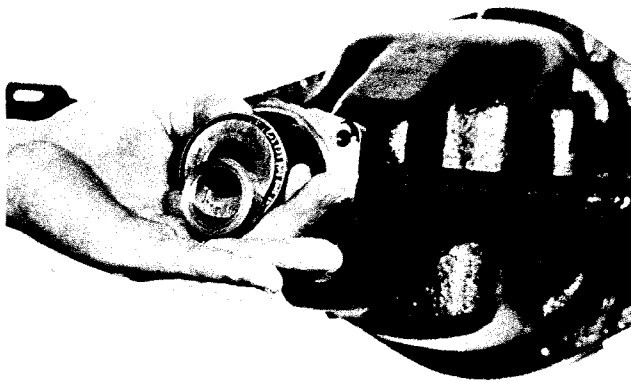


Figure and Slide 43

1007-43

Remove spacer and outer pinion bearing cone.

NOTE

To disassemble bearing cups and pinion bearing, refer to Figures #35 through #37.

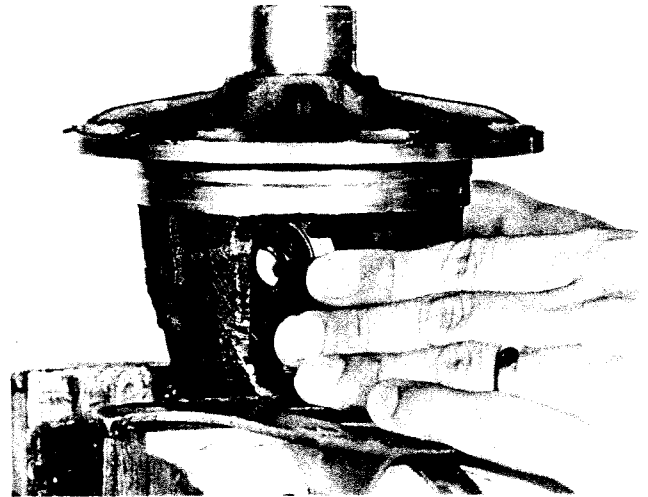


Figure and Slide 44

1007-44

Place differential case in vise as shown. Apply grease to new side gear thrust washers and hubs of side gears. Assemble both side gears. Apply grease to new pinion mate spherical washers, and the pinion mate gears. Assemble pinion mate gears.

An easy way to assemble the side gears and pinion mate gears is to have all parts lubricated before assembly. Assemble both side gears and thrust washers, hold them in place with one hand, then assemble the pinion mate gears to hold the side gears in place.

Rotate the side gears until the holes of the spherical washers and pinion mate gears line up with the holes in the case.

If the gears cannot be rotated by hand, install one of the axle shafts into the side gear splines and use a pipe wrench to turn the shaft.

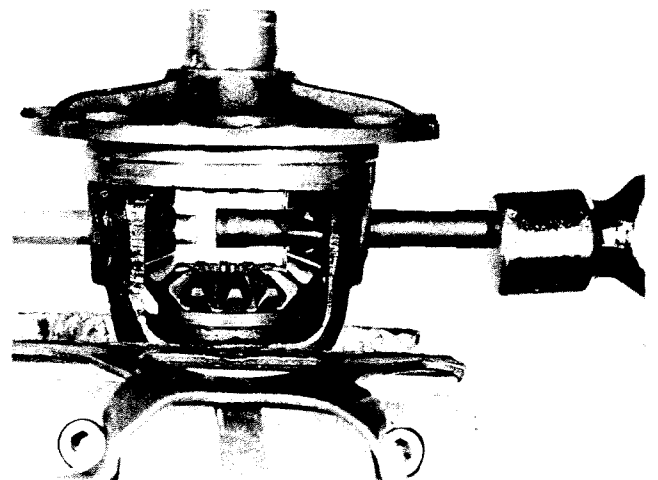


Figure and Slide 45

1007-45

CARRIER SECTION

Use a drift to line holes of the gears up with case. Assemble shaft, drive on shaft to remove drift. Be sure vertical lock pin hole is lined up with that of the case, and that pinion mate washers are in place and lined up with gear and case.



Figure and Slide 46

1007-46

Assemble lock pin. Peen metal of case, over pin to lock in place.
Use Tool #D-121 to protect Hub from becoming damaged.

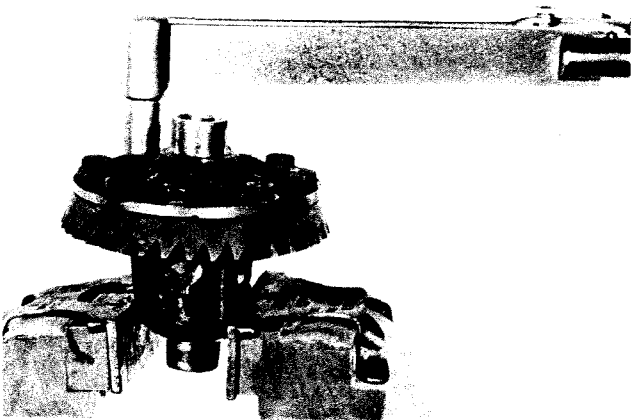


Figure and Slide 47

1007-47

Be sure flange face of the case is free of nicks or burrs. Assemble ring gear to case, using new ring gear screws. Line up holes of gear and case. Draw up screws alternately and evenly. Torque ring gear screws to 50-60 lbs. ft.

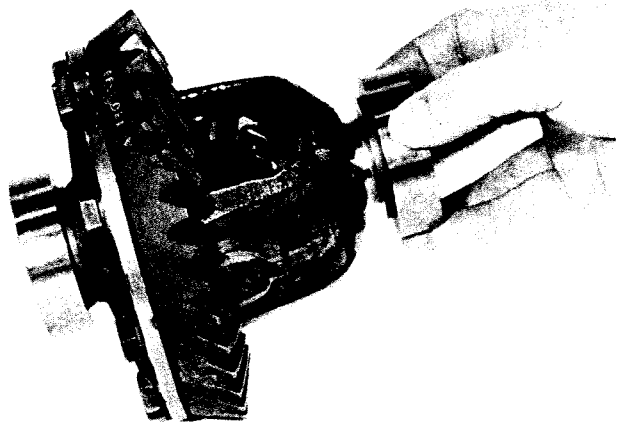


Figure and Slide 48

1007-48

Install master bearings onto case. Remove all nicks, dirt and etc. from hubs of case to allow master bearings to rotate freely.

Tools: Master Bearings #D-118.

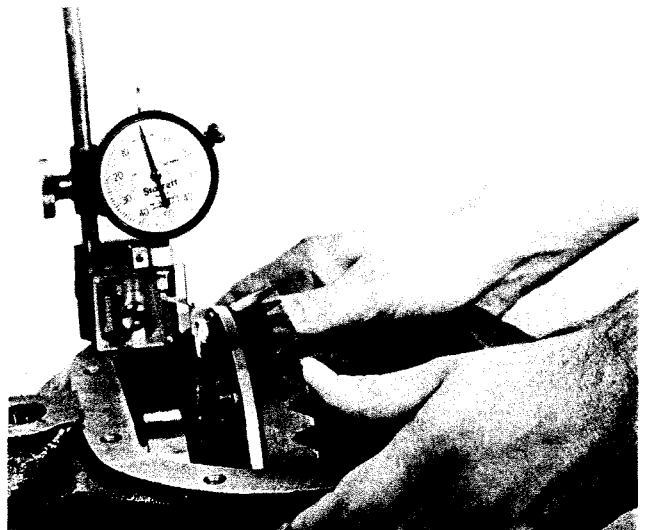


Figure and Slide 49

1007-49

Assemble differential case into carrier (less pinion).

Mount dial indicator, with a magnetic base as shown. Locate tip of indicator on flat surface of one of the ring gear screws. Mark screw with a piece of chalk. Force the differential assembly as

CARRIER SECTION

far as possible in the direction towards the indicator. With force still applied, set indicator at zero (0).

Tool: Indicator #D-128.

NOTE

Indicator should have a minimum of .002" travel.

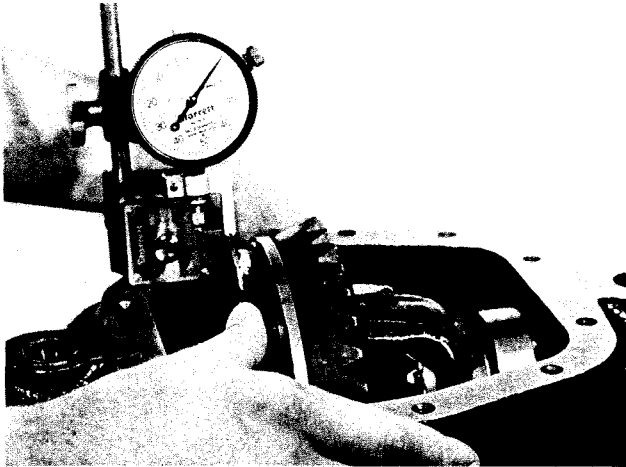


Figure and Slide 50

1007-50

Force the differential assembly as far as it will go in the opposite direction. Repeat these steps until the same reading is obtained. Record the reading of the indicator. This will be the total amount of shims required (less preload) and will be calculated later during assembly.

After making sure the readings are correct, remove indicator and differential assembly from housing. Do not remove master bearings from case at this time.

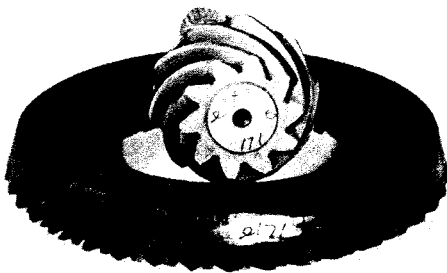


Figure and Slide 51

1007-51

View of ring and pinion set.

Ring gears and pinions are supplied in matched sets only. Matching numbers on both pinion and ring gear are etched for verification. If a new gear set is being used, verify the numbers of each

pinion and ring before proceeding with assembly. The distance from the centerline of the ring gear to the button end of the pinion for the Model 26 rear axle is 1.960 inches.

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

For example: If a pinion is etched +3, this pinion would require .003" less shims than a pinion etched "0". This means by removing shims, the mounting distance of the pinion is increased to 1.963" which is just what a +3 etching indicates. Or if a pinion is etched −3, we would want to add .003" more shims than would be required if the pinion were etched "0". By adding .003" shims, the mounting distance of the pinion was decreased to 1.957" which is just what a −3 etching indicated.

If the old ring and pinion set is to be reused, measure the old shim pack and build a new shim pack to this dimension. To change the pinion adjustment, shims are available in thicknesses of .003", .005" and .010".

NOTE

Measure each shim separately with a micrometer and add together to get total shim pack thickness from 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 old shim pack to compensate for the difference of these two figures.

For example: If the old pinion reads (+2) and the new pinion is (−2) add .004" shims to the original shim pack.

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

Figure and Slide 52

1007-52

CARRIER SECTION

Pinion setting chart. Use this chart as a guideline to set pinion.



Figure and Slide 53

1007-53

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

NOTE

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

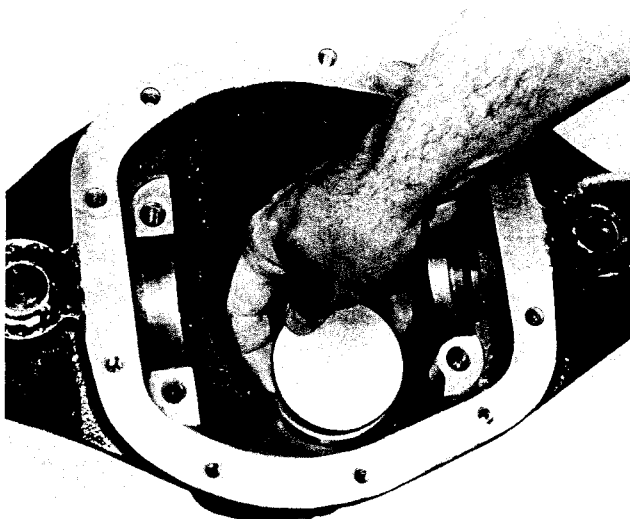


Figure and Slide 54

1007-54

Place the master pinion block into the pinion bore of the carrier as shown.

Tool: Master Pinion Block #D-119.

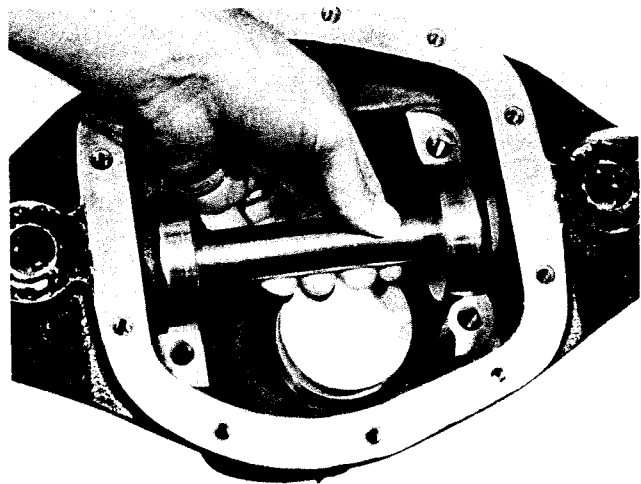


Figure and Slide 55

1007-55

Place arbor discs and arbor into the cross bores of the carrier as shown.

Tool: Arbor #D-106-2, Arbor Discs #D-106-3.

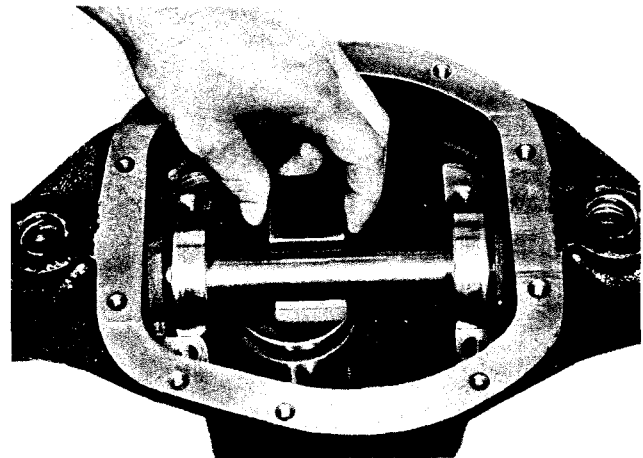


Figure and Slide 56

1007-56

Place pinion height block on top of master pinion block and against arbor as shown.

Tool: Pinion Height Block #D-106-1.

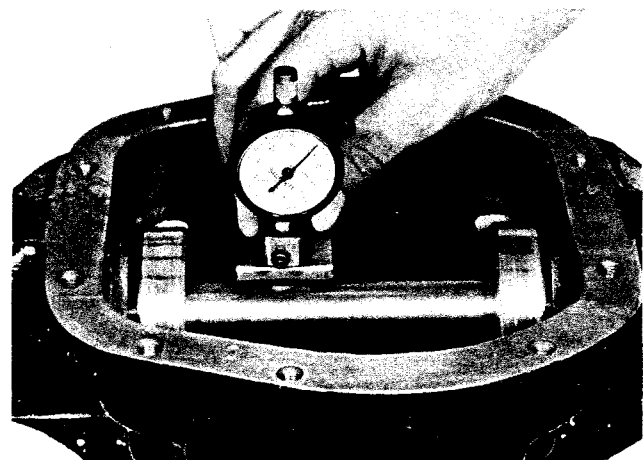


Figure and Slide 57

1007-57

CARRIER SECTION

Place scooter gage on top of pinion height block. Apply pressure with fingers making sure the gage is flat on the pinion height block, while pressure is applied, set indicator at zero "0".

Tool: Scooter Gage #D-115.

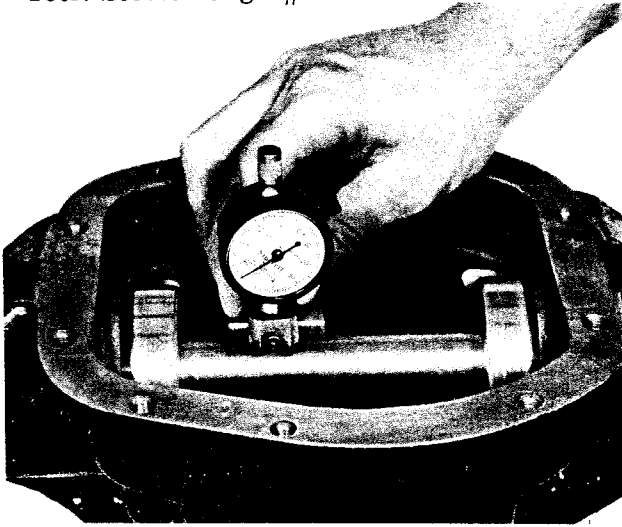


Figure and Slide 58

1007-58

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 counterclockwise direction, this means that 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 correct 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.

If a pinion is etched +3, this pinion would require .003" less shims than a pinion etched zero "0".

If a pinion is etched -3, we would want to add .003" more shims than would be required if the pinion were etched zero "0".



Figure and Slide 59

1007-59

Measure each shim separately with a micrometer and add together to get total shim pack thickness.

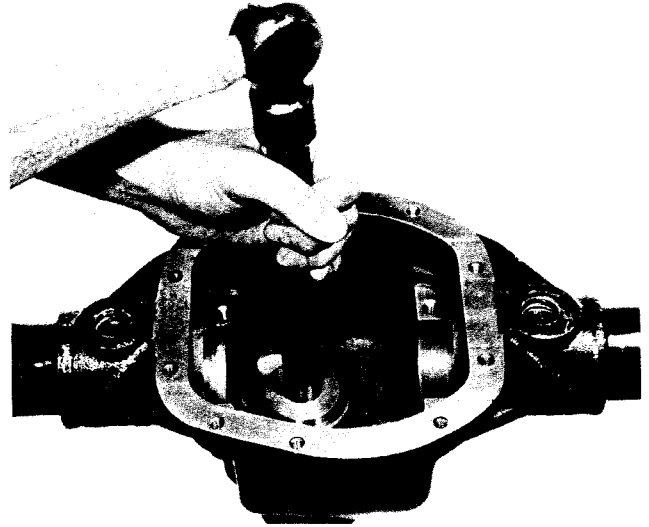


Figure and Slide 60

1007-60

Place the required amount of shims in inner bearing bore, drive the inner bearing cup into carrier with tool as shown.

Tools: Installer #D-129, Handle #C-4171.

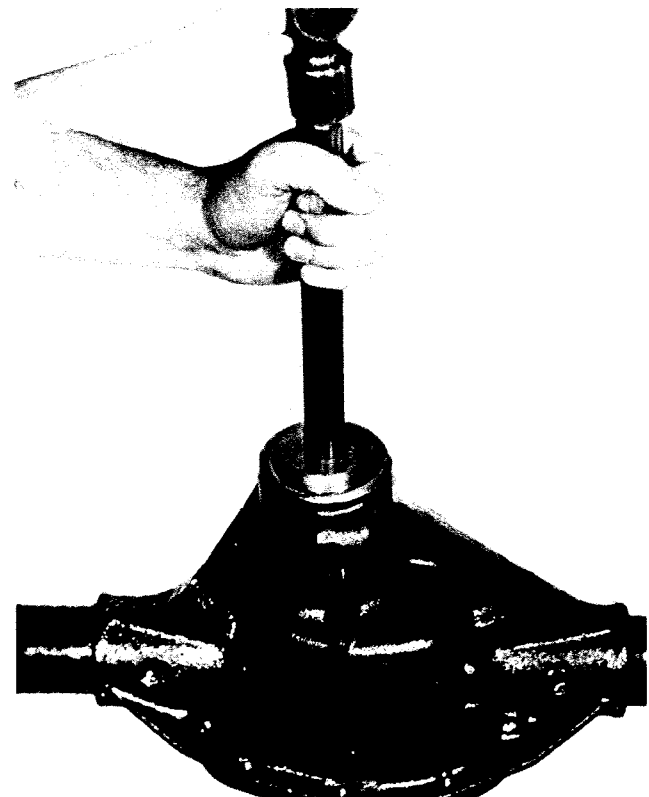


Figure and Slide 61

1007-61

CARRIER SECTION

Assemble the outer pinion bearing cup into the carrier.

Tools: Installer #D-130, Handle #C-4171.

NOTE

Refer to figure #78 to install pinion in the Torque Tube Drive Design.

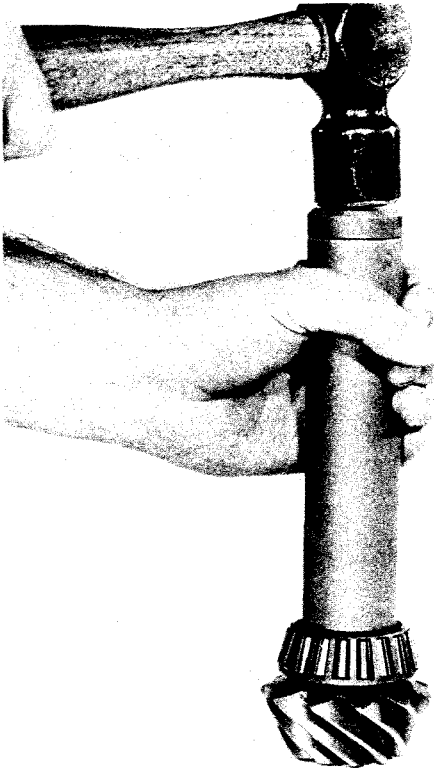


Figure and Slide 62

1007-62

Assemble bearing on pinion, place bearing installer on pinion shaft as shown. Drive bearing on until it seats against thrust face of pinion.

Tool: #D-104.

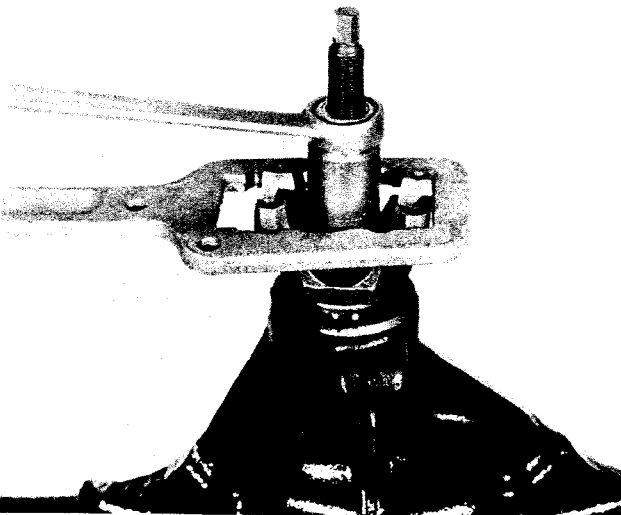


Figure and Slide 63

1007-63

Insert pinion into carrier.

Assemble outer pinion bearing, slinger and end yoke onto pinion spline (do not assemble oil seal and shims at this time).

Use yoke installer (as shown) to force end yoke onto spline of pinion.

Tool: Installer #D-132.

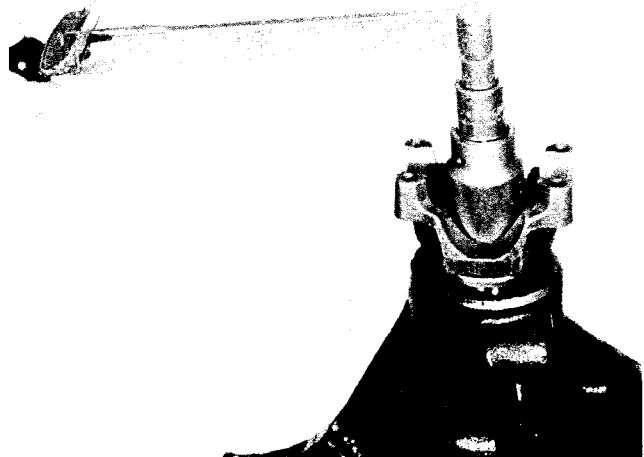


Figure and Slide 64

1007-64

Assemble washer and pinion nut. Torque nut until it requires 10 lbs. inch to rotate pinion. Rotate pinion several revolutions before checking pinion position. This is to seat the bearings and assure a more accurate reading.

NOTE

The reason for not assembling pinion oil seal and preload shims at this time is due to the possibility of having to adjust pinion preload or pinion adjustment. It would be necessary to again remove the seal, and as mentioned, whenever seals are removed they are to be discarded, because of possible damage.

CARRIER SECTION

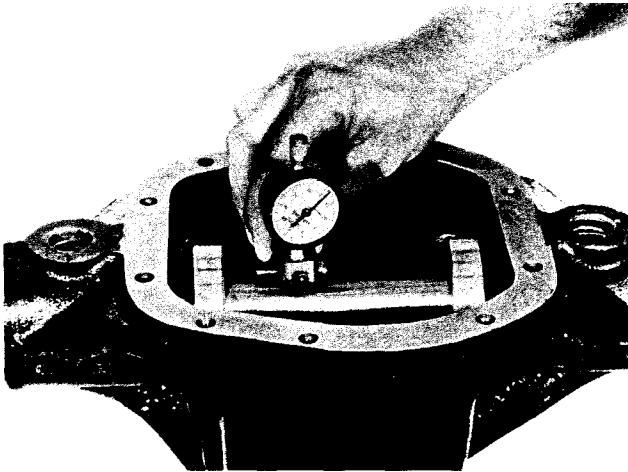


Figure and Slide 65

1007-65

Place arbor discs and arbor into cross bore of carrier. Place pinion height block on button end of pinion. Set dial indicator of scooter gage at zero (0). Slide scooter gage across or over arbor. Indicator will read a plus (+) or minus (-) at its highest point, depending upon the etching of the pinion.

Tools: Arbor #D-106-2, Arbor Discs #D-106-3, Pinion Height Block #D-106-1, Scooter Gage #D-115.

NOTE

Indicator reading within .002" of etching on pinion, is considered acceptable. If pinion position is found to be within specifications, remove pinion nut, washer, end yoke, slinger, bearing cone and pinion. Lubricate the inner and outer bearings by applying a small amount of the specified lube around the rollers of the bearing cone.

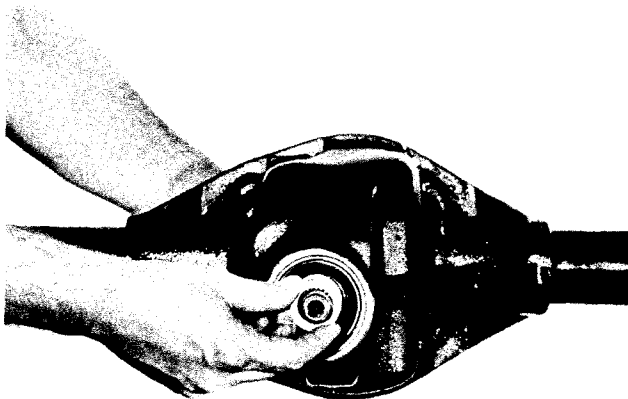


Figure and Slide 66

1007-66

Insert pinion into carrier.

Assemble preload shims (which were removed during disassembly) onto the pinion.

Assemble bearing cone, slinger, end yoke, washer and pinion nut.

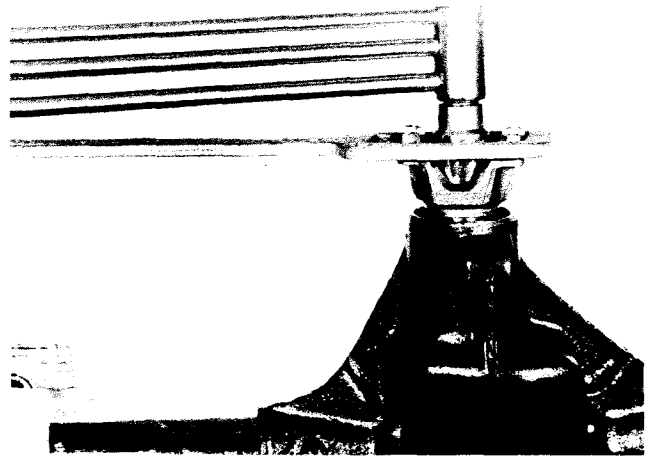


Figure and Slide 67

1007-67

Torque pinion nut to 200-210 lbs. ft.

Tool: Holder #C-3281.

Using an inch pound torque wrench as shown in figure #64, rotating torque of pinion should read between 15-30 lbs. inch with new bearings. If original bearings are used, torque reading should be 10-20 lbs. inch. To increase preload, remove shims, to decrease preload, add shims.

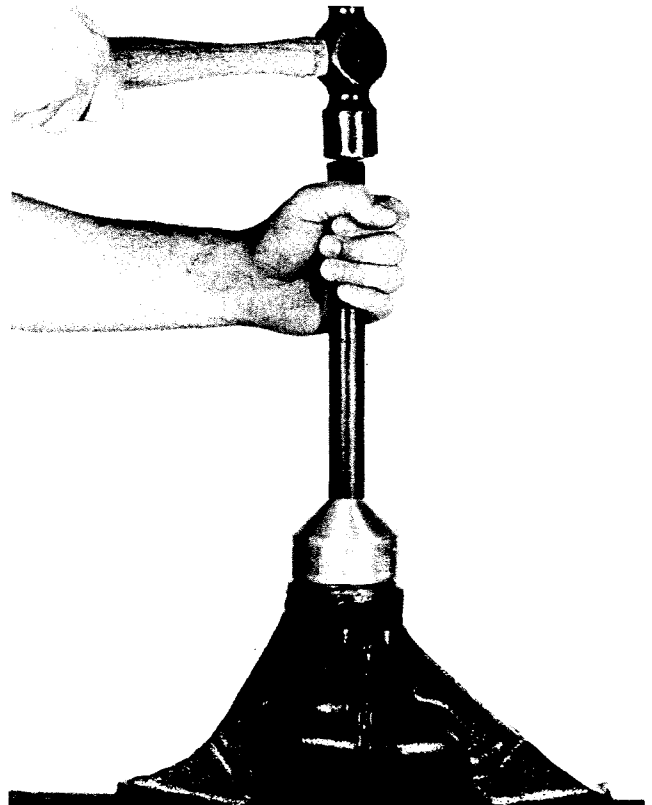


Figure and Slide 68

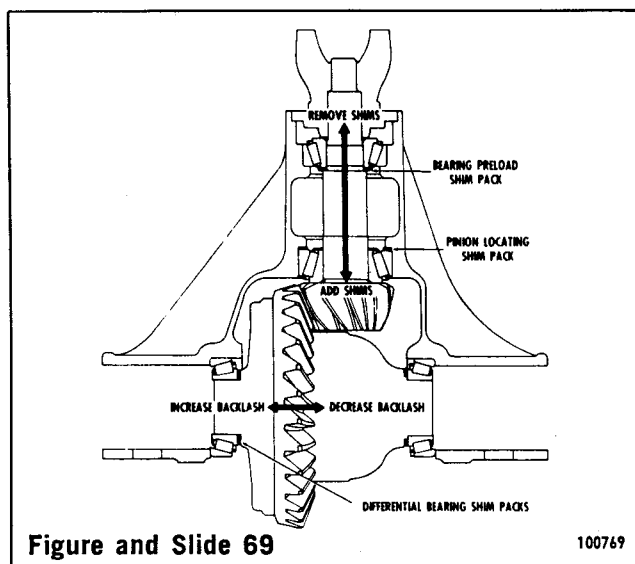
1007-68

CARRIER SECTION

If pinion preload is found to be to specifications, remove pinion nut, washer, end yoke and pinion. Assemble new pinion oil seal into housing as shown. Apply a light coat of oil to the lip of oil seal.

Tools: Installer #D-105, Handle #C-4171.

Assemble pinion, end yoke, washer and new pinion nut. Torque nut to 200-210 lbs. ft. as shown in figure #67.



CARRIER SECTION

The illustration in figure #69 shows the arrow in the pinion pointing in two directions. The direction of the arrow pointing towards the end yoke indicates that by removing pinion locating shims, the distance from the center line of the axle to the pinion button, is increased giving a plus reading. The preload shim pack does not affect the pinion depth setting.

Arrows on the ring gear illustrate the method to increase or decrease backlash, and differential bearing preload.

ASSEMBLY OF DIFFERENTIAL

Place differential assembly (with pinion assembled) into housing. Differential master bearings should still be installed to differential case.

Tools: Master Bearings #D-118.

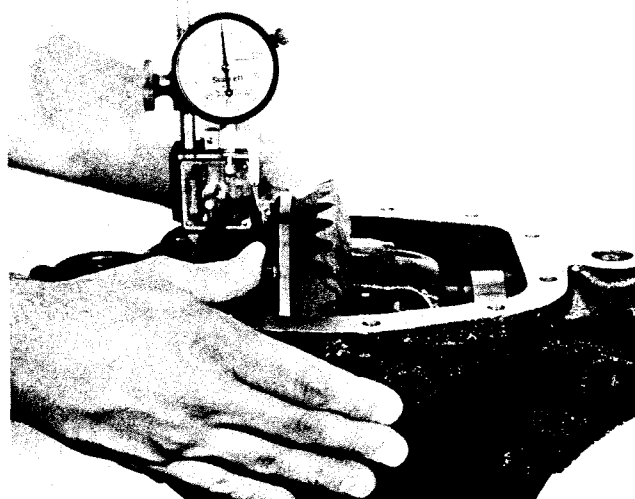


Figure and Slide 70

1007-70

Set up dial indicator as shown. Be sure to locate dial indicator on same ring gear screw as shown in Figure #49. Force ring gear to mesh with pinion gear. Rock ring gear to allow the teeth of the gears to mesh. With force still applied to the differential case, set indicator at zero (0).

Tool: Indicator #D-128.

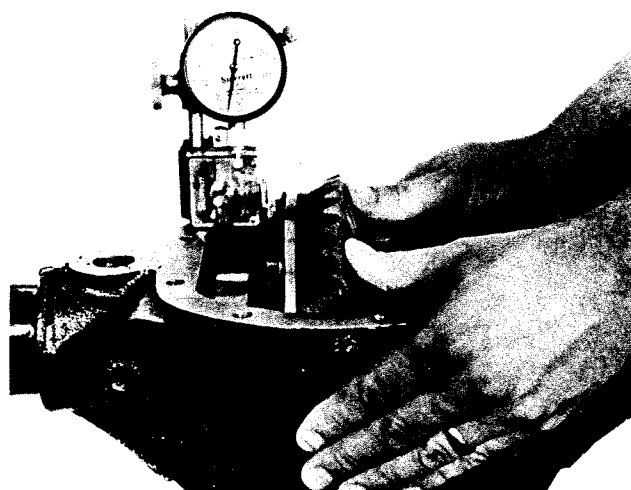


Figure and Slide 71

1007-71

Force the differential assembly (ring gear) away from the pinion gear, to obtain an indicator reading. Repeat until the same reading is obtained each time. This reading will be the necessary amount of shims between the differential case and differential bearing on the ring gear side. Remove indicator and differential case from carrier. Remove master bearings from differential case.

CARRIER SECTION



Figure and Slide 72

1007-72

Place differential case onto step plate as shown.

Assemble required amount of shims to hub (ring gear side) as determined in figure #71. Place bearing cone on hub of case. Use bearing installer to seat bearing cone as shown.

Step plate is used to prevent possible damage to hubs, while assembling bearing cones.

Tools: Step Plate #D-121, Installer #D-100, Handle #C-4171.

Assemble the remaining shims, of the total shim pack, as determined in figure #50. Add an additional .010" which should give the correct backlash and differential bearing preload. Assemble opposite differential bearing as described above.

EXAMPLE: In figure #50 (less pinion) a total of .85" was recorded. In figure #71 (with pinion) a total of .055" was recorded.

This leaves a balance of .030" for opposite side of ring gear, and adds up to .085" which was obtained at start.

With the addition of .010" shims to compensate for preload and backlash on the opposite side, gives total shim pack as follows:

Ring gear side .055" shims.

Opposite side .030" balance of total shim pack. Additional .010" preload backlash on opposite side of ring gear.

Total .040" shims required on opposite side.

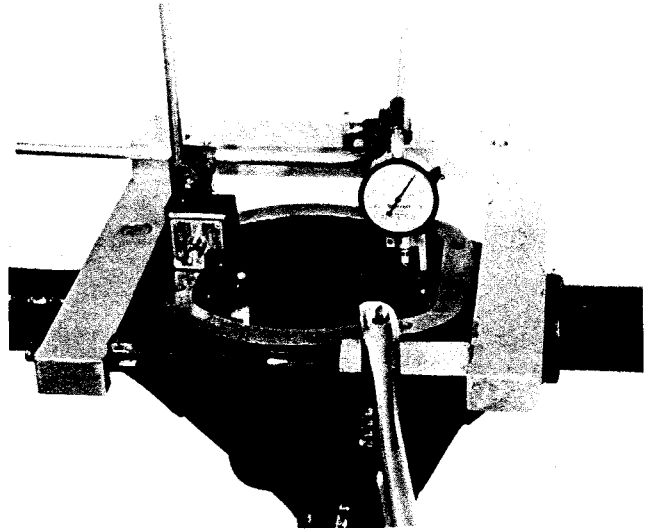


Figure and Slide 73

1007-73

Install spreader and indicator to carrier as shown. Spread carrier. Do not spread over .015".

Remove indicator.

Tools: Spreader #D-114, Indicator #D-128.

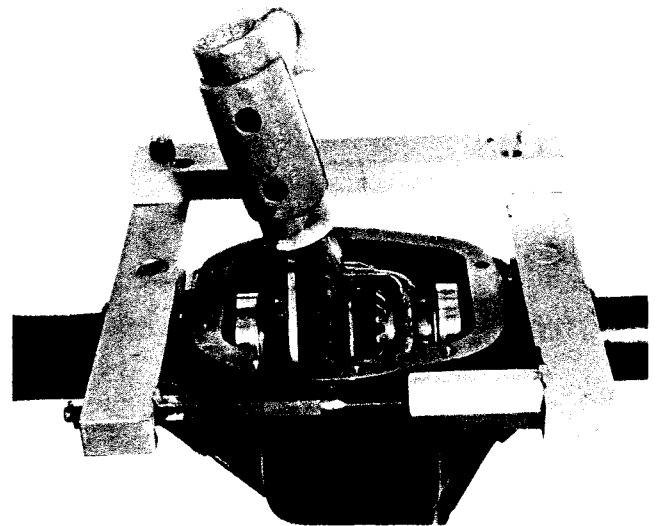


Figure and Slide 74

1007-74

Assemble differential bearing cups to differential bearing cones.

Install differential assembly into carrier as shown. Use a rawhide hammer to seat differential assembly into cross bore of carrier. Care should be taken to avoid nicking teeth of ring gear and pinion during assembly.

CARRIER SECTION

Total torque to rotate. Use an inch lb. torque wrench as illustrated in figure #64. The total torque to rotate both the pinion and ring gear is to be 5 to 15 inch lbs. over the total torque to rotate the pinion.

For example: If in figure #64, the torque to rotate the pinion was 30 lbs. inch, then the total torque to rotate both the pinion and ring gear should read 35 to 45 lbs. inch.

Low torque reading is corrected by adding shims to the opposite side of the ring gear.

High torque reading is corrected by removing shims from the opposite side of the ring gear.

If it becomes necessary to add or subtract shims for total turning torque, check backlash again to make sure it is within specifications as spelled out in figure #76.

NOTE

To disassemble differential bearings refer to figure #26. To assemble differential bearings refer to figure #72.

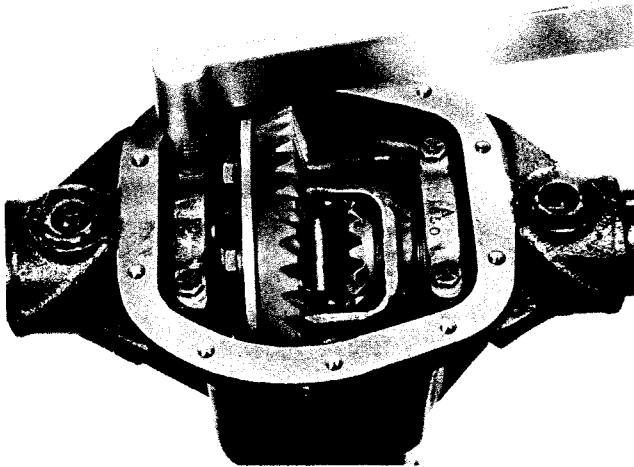


Figure and Slide 75

1007-75

Install bearing caps. Make sure the letter stamped on the caps correspond with those on the carrier. Torque bearing cap screws to 35-45 lbs. ft.

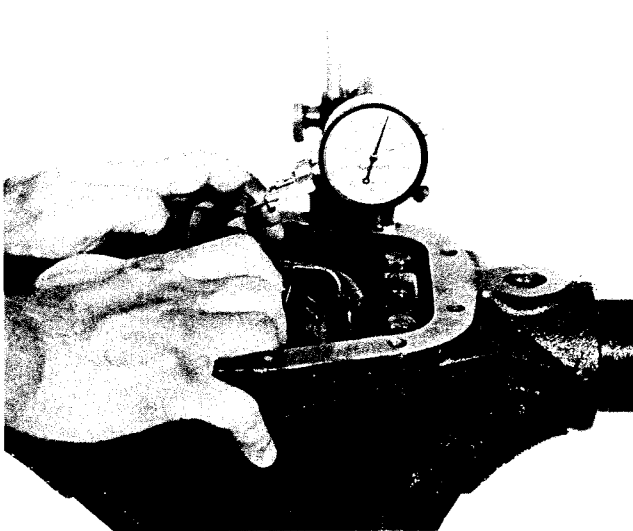


Figure and Slide 76

1007-76

Check ring gear and pinion backlash in three equally spaced points with dial indicator as shown.

Backlash tolerance is .005" to .008" and cannot vary more than .003" between points checked. 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.

Tool: Indicator #D-128.

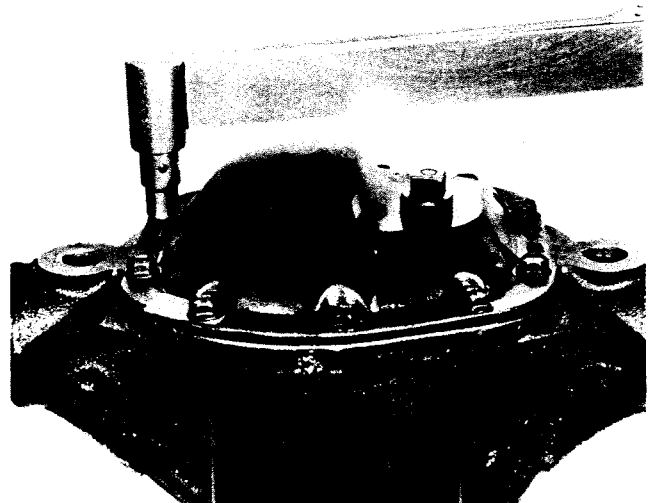


Figure and Slide 77

1007-77

Install new cover gasket and install cover plate. Torque screws to 30-35 lbs. ft.

Install axle in vehicle and fill carrier with the proper amount of specified lubricant.

CARRIER SECTION

ASSEMBLY — TORQUE TUBE DRIVE

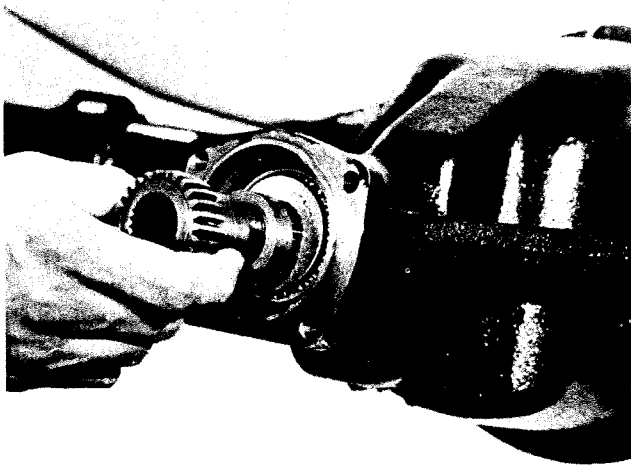


Figure and Slide 78

1007-78

Insert pinion into carrier.

Assemble outer pinion bearing, spacer and drive gear sleeve onto pinion spline. Do not assemble oil seal and shims at this time.

NOTE

Assemble pinion washer and pinion nut. Torque nut until it requires 10 lbs. inch to rotate pinion. Refer to figure #64 to rotate pinion.

NOTE

The reason for not assembling oil seal and shims at this time is due to the possibility of having to adjust pinion preload or pinion adjustment. It would be necessary to again remove the oil seal, and as mentioned, whenever seals are removed they are to be discarded, because of possible damage.



Figure and Slide 79

1007-79

Place arbor discs and arbor into cross bore of carrier. Place pinion height block on button end of pinion. Set dial indicator of scooter gage at zero (0). Slide scooter gage across or over arbor. Indicator will read a plus (+) or minus (-) at its highest point, depending upon the etching of the pinion.

Tools: Arbor #D-106-2, Arbor Discs #D-106-3, Pinion Height Block #D-106-1, Scooter Gage #D-115.

NOTE

Indicator reading within .002" of etching on pinion is considered acceptable. If pinion position is found to be within specification, remove pinion nut, washer, drive gear sleeve, spacer and bearing cone. Lubricate the inner and outer bearings by applying a small amount of the specified lube around the rollers of the bearing cone.

Insert pinion into carrier.

Assemble preload shims (which were removed during disassembly) onto the pinion.

Assemble bearing cone, spacer, drive gear sleeve, pinion washer and pinion nut.

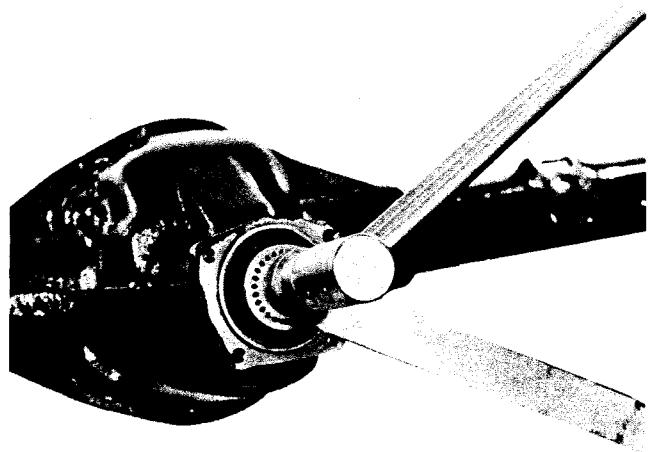


Figure and Slide 80

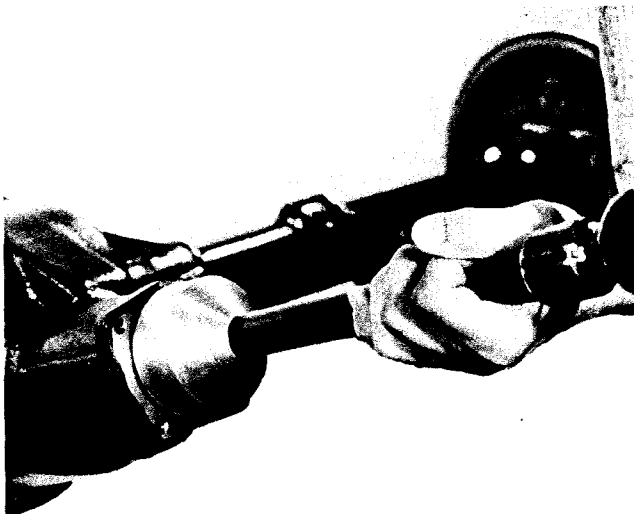
1007-80

Torque pinion nut to 200-300 lbs. ft.

Tools: Sleeved Wrench #D-107.

Using an inch pound torque wrench as shown in figure #64, rotating torque of pinion should read between 15-30 lbs. inch with new bearings. If original bearings are used, torque reading should be 10-20 lbs. inch. To increase preload, remove shims, to decrease preload, add shims.

CARRIER SECTION



If pinion preload is found to be to specifications, assemble new oil seal as shown. Apply a light coat of oil to lip of oil seal.

Tools: Installer #D-105, Handle #C-4171.

Continue buildup of center section of carrier with figure #69.

Figure and Slide 81

1007-81

For further information write to:

Spicer Axle Division
Dana Corporation
P.O. Box 1209
Fort Wayne, Indiana 46801

Attention: Technical Service Department