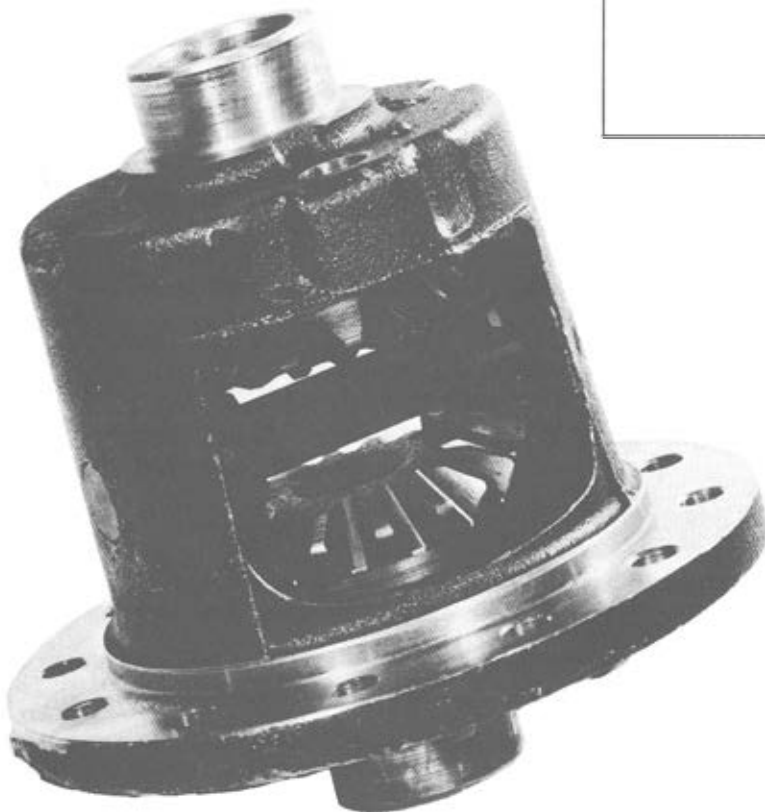


SERVICE MANUAL

SPICER®

MODEL 60

**TRAC-LOK™
LIMITED SLIP
DIFFERENTIAL**



SPICER MODEL 60 TRAC-LOK LIMITED SLIP DIFFERENTIAL

SPICER AXLE DIVISION



DANA CORPORATION

FORT WAYNE, INDIANA

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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.

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.

NOTE

Throughout this manual, reference is made to certain tool numbers whenever special tools are required. These numbers are numbers of the Miller Special Tools, 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.

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OPERATION

A conventional differential transmits all of the ring gear torque through the differential side gears to the axle shafts. Torque is at all times equal on the axle shafts, and if one wheel slips, the other wheel can only put out as much torque as the slipping wheel.

The Trac-Lok differential is similar, except that part of the torque from the ring gear is transmitted through clutch packs between the side gears and differential case. The multiple disc clutches with radial grooves on the plates, and concentric grooves on the discs, are engaged by a preload from Belleville Springs, plus separating forces from the side gears, as torque is applied through the ring gear.

The Trac-Lok construction permits differential action, when required, for turning corners and transmits equal torque to both wheels when driving straight ahead. However, when one wheel tries to spin due to leaving the ground, a patch of ice, etc., the clutch packs automatically provide more torque to the wheel which is not trying to spin.

The Trac-Lok differential resists wheel spin on bumpy roads and provides more pulling power when one wheel tries to slip. In many cases of differences in traction, pulling power will be automatically provided until both wheels start to slip.

In diagnosis of vehicle operators' complaints, it is important to recognize two things:

1. If, with unequal traction, both wheels slip, the Trac-Lok has done all it can possibly do.
2. In extreme cases of differences in traction, the wheel with the least traction may spin after the Trac-Lok has transferred as much torque as possible to the non-slipping wheel.

LUBRICATION

It is not our intent to recommend any particular brand or make of lubricant for Spicer axles. However, a S.A.E. 90 weight multipurpose gear lubricant meeting Mil. Spec. L-2105-B, or 80 W 90 multipurpose gear lubricant meeting Mil. Spec. L-2105-C, and suitable for A.P.I. Service Classification GL-5 is suggested as a minimum requirement.

IMPORTANT

Limited Slip Differentials impose additional requirements on lubricants which cannot be covered by the above specifications. Some otherwise good lubricants produce "chatter" or "bumping" in turning corners with Limited Slip Differentials. Many vehicle manufacturers find it necessary to specify a

special lubricant or lubricant additive for use with Limited Slip Differentials. Check the vehicle manufacturer's lubricant recommendations.

COLD WEATHER OPERATION

If the vehicle is operated below 0°F (-18°C), 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.

TROUBLE SYMPTOMS AND POSSIBLE CAUSES

If noises or roughness, such as chatter, are present in turning corners, the probable cause is incorrect or contaminated lubricant. (See Lubrication)

Before any differential is removed and disassembled for chatter complaints, the correctness of lubricant can and should be determined.

If the vehicle manufacturer recommends a lubricant additive for chatter complaints, add the specified type and amount of additive and recheck for chatter by warming the axle up, and then making a minimum of ten (10) figure eight turns.

If this is unsuccessful, or no lubricant additive is specified, a complete lubricant drain, flush, and refill with the specified Limited Slip Differential lubricant will usually correct chatter. The following procedure is recommended to ensure flushing the system of old lubricant.

1. Warm the lubricant by vehicle road operation or five (5) minutes of operation in gear at 30 m.p.h. with both rear wheels off the ground on a hoist.

CAUTION

NEVER PLACE THE TRANSMISSION IN GEAR WITH THE ENGINE RUNNING WHEN ONLY ONE WHEEL OF A LIMITED SLIP DIFFERENTIAL EQUIPPED VEHICLE IS RAISED. THE VEHICLE MIGHT DRIVE ITSELF OFF THE JACK AND CAUSE DAMAGE OR INJURY.

2. Drain lubricant while warm. Remove drain plug or cover plate to drain completely. If cover plate is removed, it may be necessary to replace gasket at this time.
3. Refill axle with specified Limited Slip Differential lubricant.
4. Operate the vehicle for approximately ten (10) miles, making at least ten (10) figure 8 turns to flush the old lubricant out of the clutch packs.

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5. Repeat Steps 2, 3, and 4, making sure to replace the cover gasket, if required, in Step 2.
6. It is possible that slight chatter, requiring additional vehicle operation may remain after Step 5. If chatter still persists after one hundred (100) miles of vehicle operation, or remains severe after Step 5 above, disassembly and repair will be necessary.

UNIT INOPERATIVE

Proper performance and capabilities of Limited Slip Differentials are often misunderstood. If in doubt, read "Operation" above.

No precise methods of measuring Limited Slip Differential performance are generally available in the field. A functioning unit can be determined by these relatively simple vehicle operational tests.

1. Place one wheel on good dry pavement, and the other on ice, mud, snow, etc.
2. Gradually open the throttle to obtain maximum traction prior to "break-a-way". The ability to move the vehicle effectively will demonstrate proper performance.
3. If extremely slick surfaces, such as ice is used, some question may exist as to proper performance at Step 2. In these extreme cases, a properly performing Limited Slip Differential will provide greater "pulling power" by lightly applying the parking brake.

It should be realized that even with a properly functioning limited slip differential, it is possible to have a vehicle hopelessly stuck. This can occur when vehicle resistance exceeds the maximum possible tractive effort which can be obtained. A differential can do no more than provide torque to slip both driving wheels. If this torque is not sufficient to move the vehicle, not even a completely locked differential can do more.

DISASSEMBLY REMOVAL, INSPECTION AND REPAIR OF TRAC-LOK

On Dana Spicer axles, it is recommended that the complete assembly be removed from the vehicle when it becomes necessary to remove the Trac-Lok from the housing.

Remove wheels, brake drums, brake backing plate screws and axle shafts. Brake backing plates can normally be wired to frame without loosening the hydraulic brake line connection at the wheel cylinder

if desired. Use caution to avoid damage to brake line.

Remove axle assembly and place in rack or stand to serve as a holding device.

Remove cover plate screws and cover plate. If cover gasket is used, discard gasket and replace with new one at time of assembly.

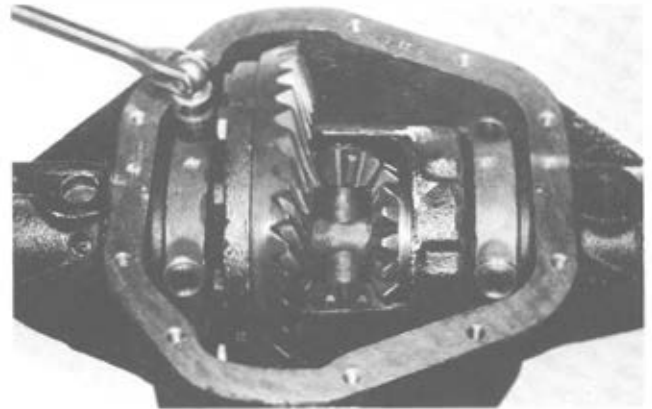


FIGURE #2

1015-2

Remove differential bearing caps. Note letters stamped on the bearing caps and the cover face of the housing. Letters are to correspond in horizontal and vertical positions. This is very important at time of assembly.

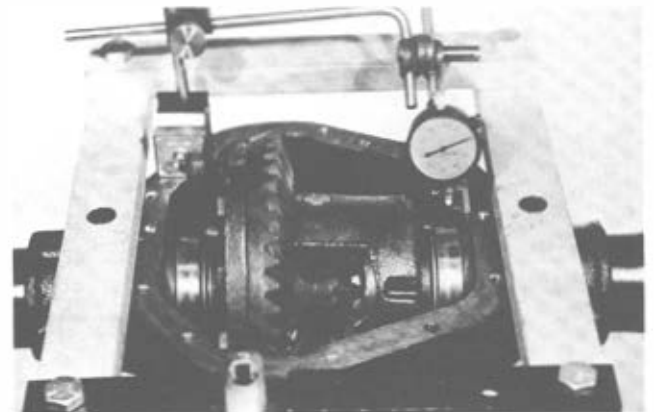


FIGURE #3

1015-3

Mount spreader to housing. Locate a dial indicator with a magnetic base on cover face as shown. Locate tip of indicator on housing as shown.

Set dial indicator at zero ("0"). Turn forcing screw of spreader until indicator records .015" (.38 mm).

CAUTION
DO NOT SPREAD CARRIER IN EXCESS OF
.015" (.38 mm).

Remove Indicator

Tools: D-167 Spreader D-128 Indicator Set

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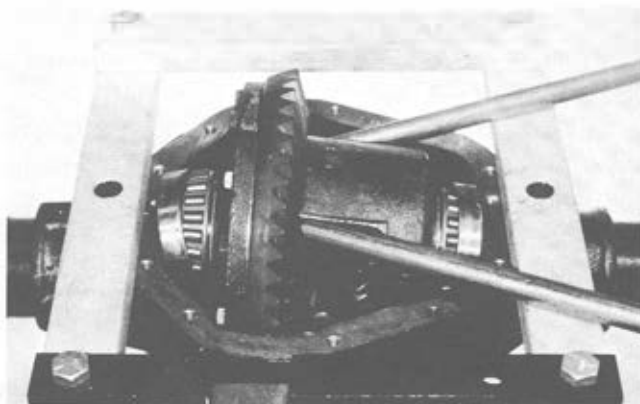


FIGURE #4

1015-4

Remove differential using two pry bars as shown. Use caution to avoid damage to ring and pinion. It will not be necessary to remove the differential bearings at this time; however, the bearing cups should be marked or tagged to indicate from which side of the case they were removed. After differential case has been removed, remove spreader.

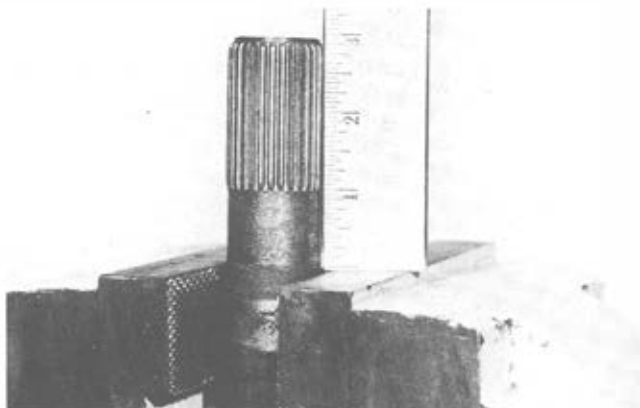


FIGURE #5

1015-5

Place one of the axle shafts, which was removed from the assembly, into a vise. Tighten shaft in vise firmly. The spline end of the shaft is not to exceed 3 inches (76.2 mm) above the top of the vise. This will prevent the shaft from fully entering into the side gear and causing interference with the spacer block* and step plate during disassembly of the pinion mate gears, etc. Caution should be used that the vise jaws do not locate on axle splines or any machined surfaces.

NOTE*

SOME SEMI-FLOAT AXLES REQUIRE SPACER BLOCKS BETWEEN THE AXLE SHAFTS FOR BEARING END PLAY ADJUSTMENT. THE SPACER BLOCK IS NOT USED

ON FULL-FLOAT OR SEMI-FLOAT AXLES WITH NON-ADJUSTABLE WHEEL BEARINGS.

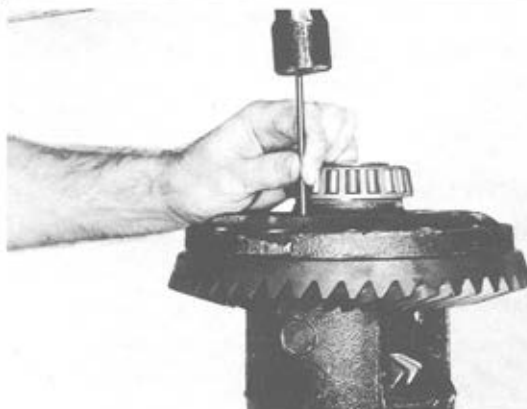


FIGURE #6

1015-6

Place a few shop towels over vise to prevent any damage during disassembly of ring gear. Assemble the differential on the axle shaft with the ring gear screw heads up. Assembling the differential onto the shaft will serve as a holding device to remove the ring gear and to disassemble the internal parts of the case. Remove the ring gear screws. Drive out the lock pin using a long drift.



FIGURE #7

1015-7

It is necessary to remove the ring gear to allow clearance for the removal of the cross pin. Tap ring gear with rawhide hammer to free it from case.

NOTE

IT IS RECOMMENDED THAT, ON SPICER AXLES, RING GEAR SCREWS BE REPLACED WHENEVER THE RING GEAR IS REMOVED.

Remove differential case from the axle shaft and remove ring gear.

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All Spicer Trac-Loks are identified with a manufacturing date and the complete part number stamped on the barrel of the case. If the axle assembly is equipped with a Trac-Lok Limited Slip Differential, a special tag will be located on the bottom right hand side of the cover plate specifying the use of the limited slip lubricant.



FIGURE #8

1015-8

In this figure the Trac-Lok is identified with .125" (3.17 mm) high numbers stamped on the case. For example:

The number 4-25-77A is the manufacturing or build date of the Trac-Lok 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. For example: April 25, 1977, first shift. The number stamped above the manufacturing date is the complete Trac-Lok assembly part number.

It is recommended that when referring to the Trac-Lok, obtain the complete part number and build date. To do this it will be necessary to wipe off the lubricant from the case.

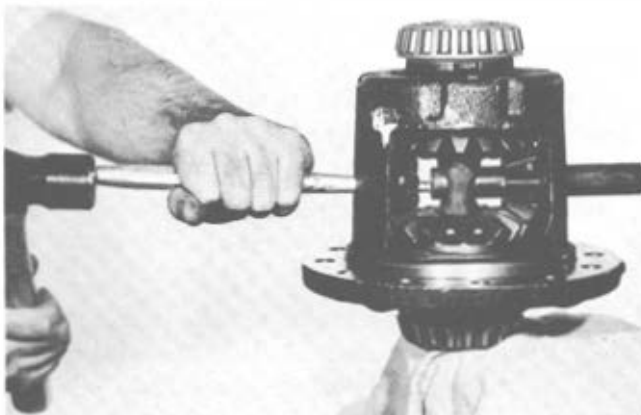


FIGURE #9

1015-9

Remove the cross pin and spacer block* (if so equip-

ped). Use a hammer and punch, as shown, to remove the cross pin from the case.

NOTE*

AXLE SHAFTS WHICH REQUIRE END PLAY ADJUSTMENT HAVE A SPACER BLOCK IN THE DIFFERENTIAL CASE. THE SPACER BLOCK CONTROLS THE END THRUST OF THE AXLE SHAFTS. SPACER BLOCK MUST NOT BE USED WITH BALL OR UNITIZED WHEEL BEARINGS.

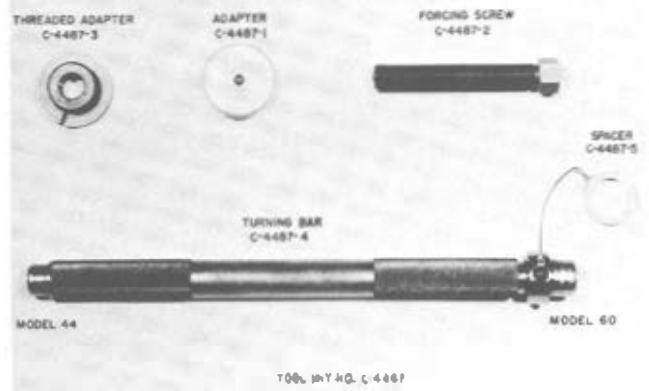


FIGURE #10

1015-10

Trac-Lok Tools:

C-4487-1 Adapter	C-4487-4 Turning Bar
C-4487-2 Forcing Screw	C-4487-5 Spacer
C-4487-3 Threaded Adapter	Tool Kit #C-4487

NOTE

THE TRAC-LOK TOOL CAN BE USED ON THE MODEL 44, MODEL 60 AND MODEL 60 WITH SHALLOW WALL. THE TURNING BAR HAS TWO SIZES. SMALL O.D. IS USED ON THE REGULAR MODEL 44. LARGE O.D. IS USED ON THE REGULAR MODEL 60.

THE SPACER IS TO BE USED ON LARGE O.D. ON TRAC-LOKS WITH SHALLOW WALL. THE SPACER PREVENTS THE TURNING BAR FROM ENTERING INTO PINION MATE GEAR.

MODEL 60 TRAC-LOK



FIGURE #11

1015-11

Assemble the adapter plate into the bottom side gear. Apply a small amount of grease to the centering hole of the adapter plate. Tool #C-4487-1 (adapter plate).

Lubricate threads of threaded adapter and forcing screw.

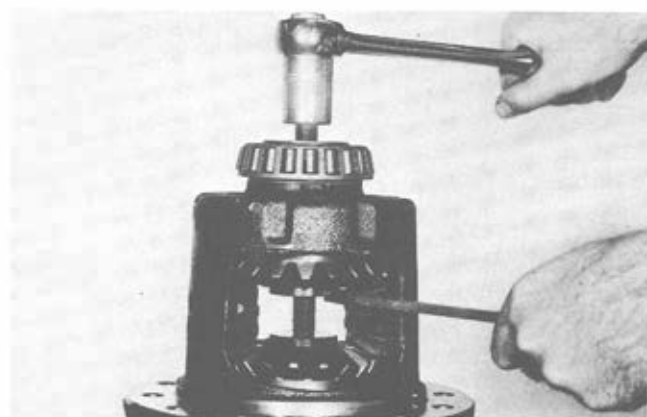


FIGURE #12

1015-12

Assemble threaded adapter into top side gear. Thread forcing screw into threaded adapter until it becomes centered into adapter plate.

Use a small screwdriver, position it in slot of threaded adapter. This will prevent the adapter from turning. Tools #C-4487-3 (threaded adapter), C-4487-2 (forcing screw).



FIGURE #13

1015-13

Torque forcing screw until it becomes slightly tight. This will collapse the Belleville plates and allow a loose condition between the side gears and pinion mate gears.

Remove both pinion mate spherical washers. Use a shim stock of .030" (.76 mm) thickness or an equivalent tool to push out the spherical washers.

Relieve the tension in the Belleville plates by loosening the forcing screw.

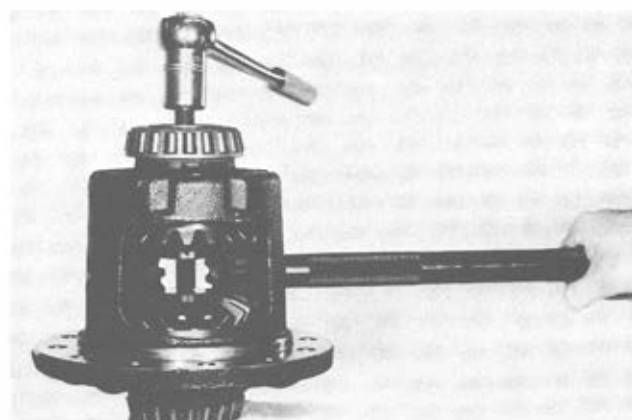


FIGURE #14

1015-14

Insert large O.D. end of turning bar into cross pin hole of case. Pull on bar and the case will rotate until the pinion mate gears can be removed from opening.

It might be necessary to adjust the forcing screw slightly to allow the case to rotate. Tool #C-4487-4 (turning bar).

Hold top clutch pack with one hand and remove tools. It might be necessary to hold threaded adapter with screwdriver as shown in Figure 12.

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FIGURE #15

1015-15

Remove top side gear and clutch pack. Keep the stack of plates and discs intact in exactly the same position while they are being removed.



FIGURE #16

1015-16

Remove the case from the axle shaft. Turn case with the flange or ring gear side up and allow the adapter, side gear and clutch pack to be removed from the case. Remove the retainer clips from both clutch packs to allow separation of the plates and discs. Keep the stack of plates and discs exactly as they were removed.

INSPECTION OF ALL PARTS FOR WEAR, SCORE, ETC.

Plates and discs — If any one member of either stack shows evidence of excessive wear or scoring, the complete stack is to be replaced on both sides.

Side gears and pinion mate gears — The gear teeth of these parts should be checked for extreme wear and possible cracks. The external teeth of the side gear, which retain the concentric groove discs, should also be checked for wear or cracks.

If replacement of one gear is required due to wear,

etc., then both side gears, pinion mate gears, and washers are to be replaced.

Cross Pin — If excessive wear is evident, the cross pin should be replaced.

Axle Shafts Spacer — If excessive wear is evident on the ends of the spacer block, it should be replaced and axle shaft end play should be adjusted. (Refer to vehicle service manual).

Clutch Retainer Clips — If wear is evident on any one of the retainer clips, all four clips must be replaced.

Differential Case — If scoring, wear or metal pickup is evident on the machined surfaces, then replacement of the case is necessary.

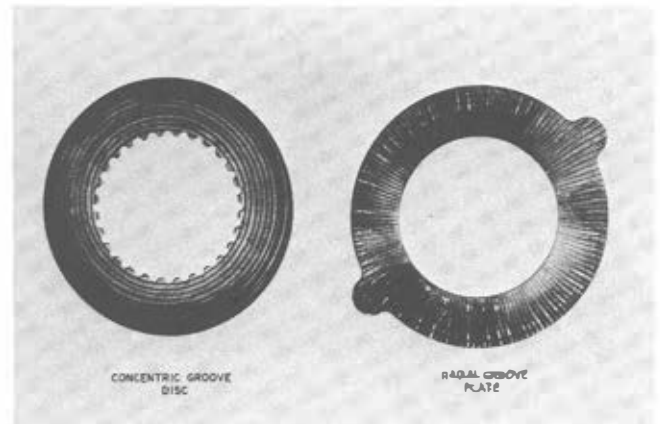


FIGURE #17

1015-17

Example of radial groove plate and the concentric groove disc.

MODEL 60 TRAC-LOK

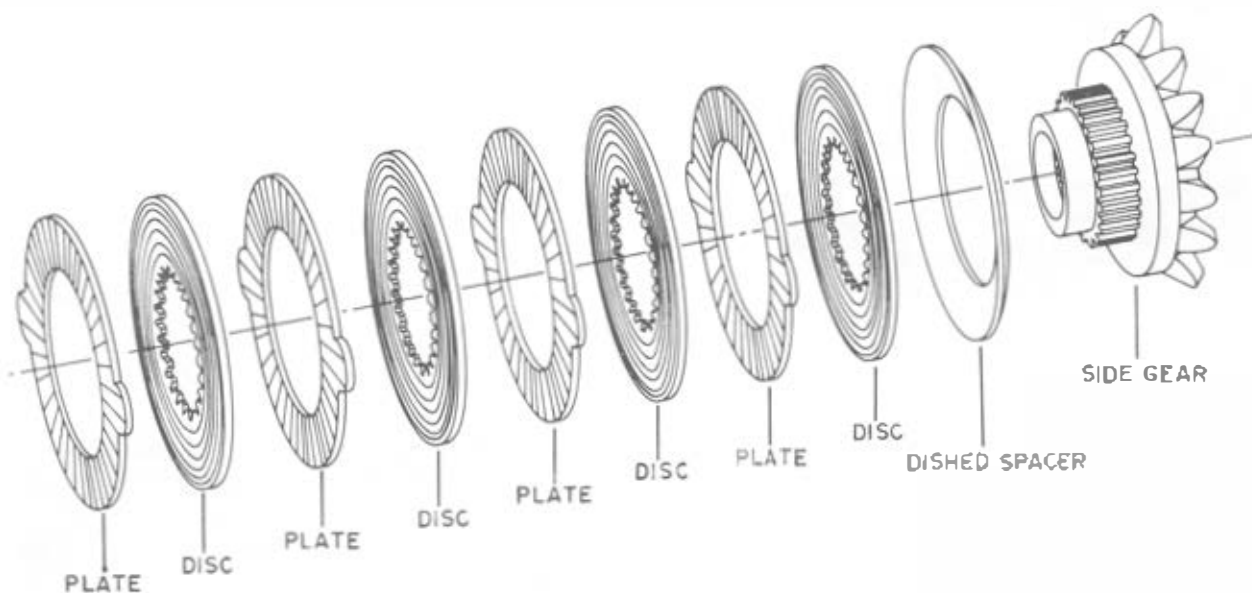


FIGURE #18

1015-18

Identification and arrangement of clutch pack.

REASSEMBLY



FIGURE #19

1015-19

Prelubricate the thrust face of the side gears and the plates and discs.

Assemble plates and discs in exactly the same position as they were removed, regardless of whether they are new parts or the original parts. Be sure lubricant that is used is of the specified lubricant.



FIGURE #20

1015-20

Assemble the retainer clips to the ears of the plates. Make sure both clips are completely assembled or seated onto the ears of the plates.

With the differential case positioned as shown, assemble the clutch pack and side gear into the case. Make sure the clutch pack stays assembled to the side gear splines, and that the retainer clips are completely seated into the pockets of the case. To prevent pack from falling out of the case, it will be necessary to hold them in place by hand while repositioning case on bench.

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FIGURE #21

1015-21

Reposition case on bench as shown. Assemble the adapter plate into the side gear. Apply a small amount of grease into the centering hole of the adapter plate.



FIGURE #22

1015-22

Assemble the other clutch pack and side gear as shown. Make sure the clutch pack stays assembled to the side gear splines, and that the retainer clips are completely seated into the pockets of the case.



FIGURE #23

1015-23

Hold the clutch pack in position and insert the threaded adapter into top side gear, insert forcing

screw. Tighten forcing screw into bottom plate. This will hold both clutch packs in position.

With tools assembled into the case, position case onto the axle shaft by aligning the splines of the side gear with those of the shaft.



FIGURE #24

1015-24

Loosen forcing screw slightly. Assemble both pinion mate gears as shown. Hold gears in position by hand.

While holding gears in place, insert turning bar into case. Pull on bar to rotate case allowing gears to turn. Make absolutely sure that the holes of the pinion mate gears are in alignment with holes of the case.

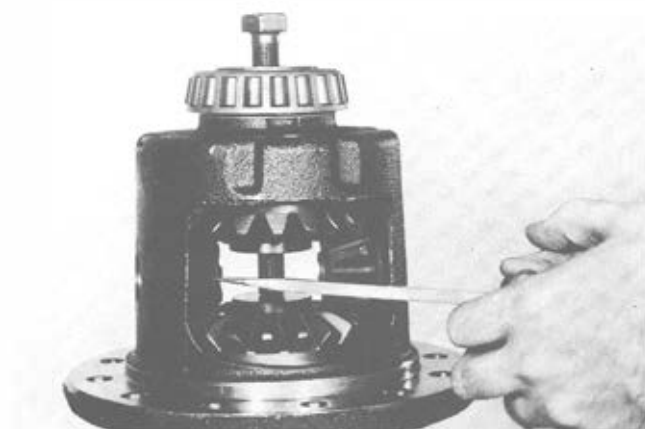


FIGURE #25

1015-25

Prelubricate spherical washers. Torque forcing screw until it is tight. This will collapse the Belleville plates and allow clearance between gears. Assemble spherical washers into case. Use a small screwdriver to push washers into place.

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CAUTION

BE SURE THE HOLES OF THE WASHERS AND GEARS ARE LINED UP EXACTLY WITH THOSE OF THE CASE.

Remove Tools.



FIGURE #26

1015-38

If spacer block* is used, assemble as shown. Use a drift to hold spacer block in position. Assemble cross pin shaft, drive in shaft with hammer. Be sure the vertical lock pin hole is lined up with that of the case.

NOTE*

SPACER BLOCK SHOWN IS USED ONLY WITH ADJUSTABLE SEMI-FLOAT WHEEL BEARINGS.

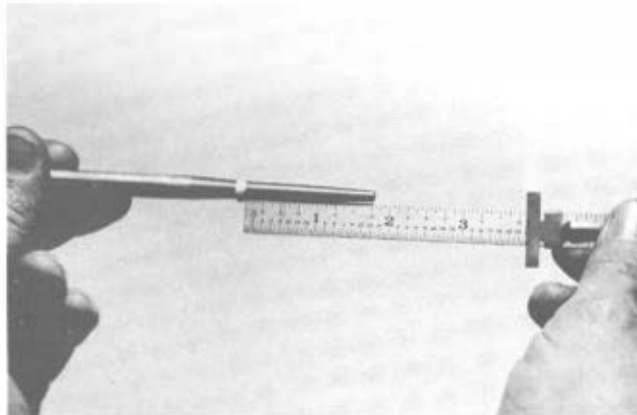


FIGURE #27

1015-27

Using a scale, as shown, wrap a piece of tape around the punch approximately 1 3/4 inches (44.5 mm) from the end of the punch. This indicates the necessary depth required for assembly of the lock pin.

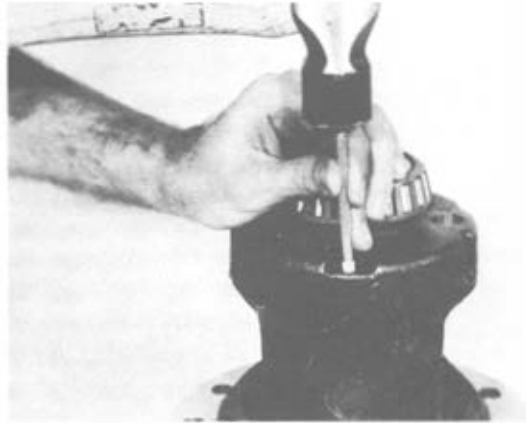


FIGURE #28

1015-28

Assemble lock pin. Hit on punch until the tape on the punch is lined up with the case. Remove case from axle shaft. Assemble ring gear to case. Line up the ring gear screw holes with those of the case.

IF SPICER AXLE, USE NEW RING GEAR SCREWS. ASSEMBLE NEW RING GEAR SCREWS FINGER TIGHT.

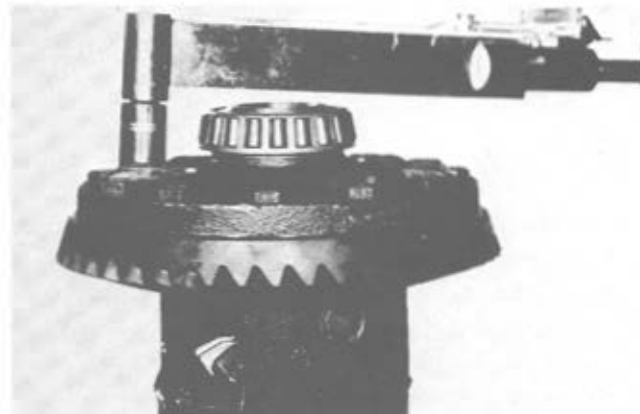


FIGURE #29

1015-29

Reposition case onto axle shaft as shown. Torque screws alternately and evenly. Torque screws to 100-110 lb. ft. (136-149 N-m).

MODEL 60 TRAC-LOK

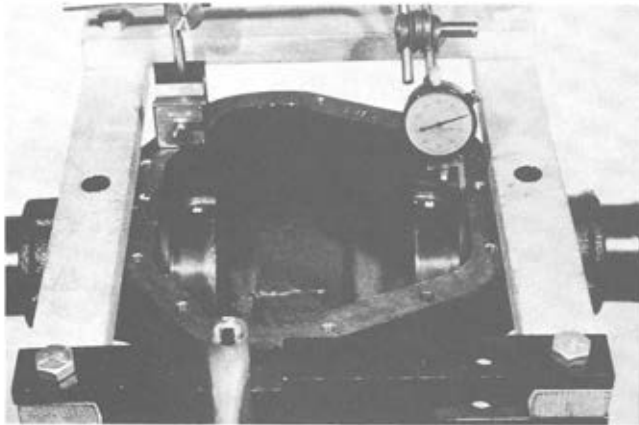


FIGURE #30

1015-30

Mount spreader onto housing. Locate a dial indicator with a magnetic base on cover face as shown. Locate tip of indicator on housing as shown. Set dial indicator at zero. Turn forcing screw of spreader until indicator records .015" (.38 mm).

CAUTION

DO NOT SPREAD HOUSING OVER .015" (.38 mm).

Remove dial indicator.

Tools: D-167 Spreader
D-128 Indicator Set

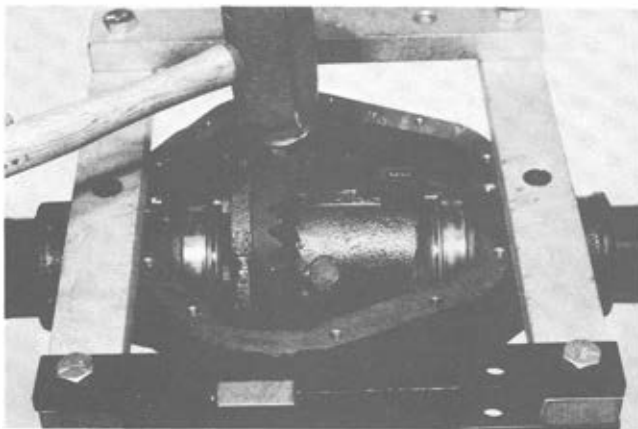


FIGURE #31

1015-31

Prelubricate differential bearings with the specified lubricant. Assemble differential bearing cups to differential cones.

Install differential assembly into housing. Make sure teeth of ring gear are meshed with those of pinion.

Use a rawhide hammer to seat differential assembly into cross bore of housing. Care should be taken to

avoid nicking the teeth of the ring gear and pinion during assembly.

Remove spreader

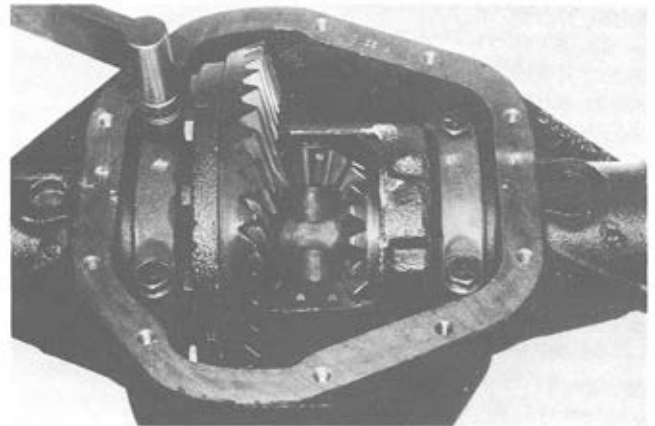


FIGURE #32

1015-32

Install bearing caps. Make sure the letters stamped on the caps correspond with those stamped on the housing in horizontal and vertical positions.

IF SPICER AXLE, TORQUE CAP SCREWS TO 70-90 LB. FT. (95-122 N.m).

NOTE

THERE ARE TWO DIFFERENT DESIGN COVER PLATES. ONE COVER IS OF THE FLAT MOUNTING SURFACE, AND THE OTHER DESIGN IS OF THE RIBS BETWEEN SCREW HOLES.

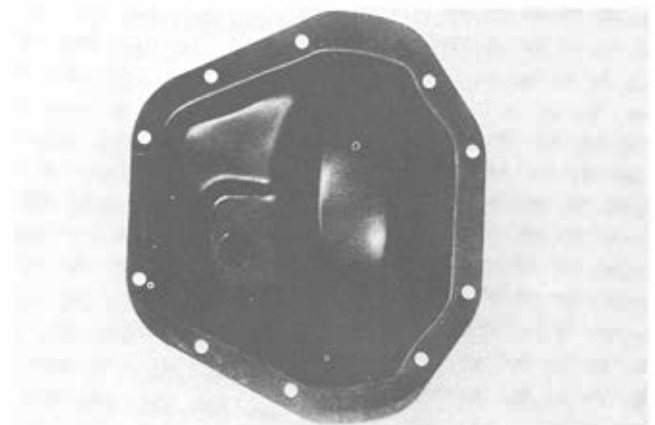


FIGURE #33

1015-33

Figure 33 shows the flat mounting surface cover plate on Dana design axles. This cover plate requires the use of a silicone rubber sealer material rather than a gasket.

MODEL 60 TRAC-LOK

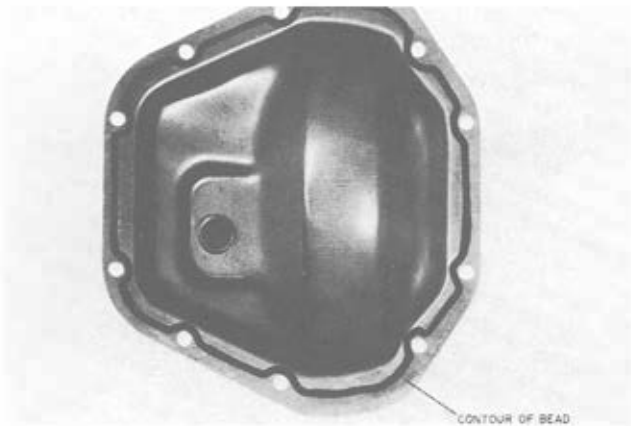


FIGURE #34

1015-34

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 of ASTM3, GE303, A19, B37, E16, E36, Z1, Z2 and Z3 sealant.

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 1/8" to 1/4" (3.18-6.35 mm) high and 1/8" to 1/4" (3.18-6.35 mm) wide.

Assemble two cover screws into cover at 8 o'clock and 2 o'clock position. Use these two holes to guide cover plate into position on the carrier.

Install remaining screws. Tighten alternately and evenly. Torque screws to 30-40 lbs. ft. (41-54 N.m). Allow one hour cure time before vehicle operation.



FIGURE #35

1015-35

On cover plate of the rib design a gasket must be used. Do not use silicone sealer. Torque screws to 30-40 lbs. ft. (41-54 N.m).

NOTE

IF SPICER AXLE, TORQUE SCREWS TO 30-40 LBS. FT. (41-45 N.m).

NOTE

ON ALL FRONT AXLES, THE COVER PLATE IS OF A DIFFERENT DESIGN AND REQUIRES THE USE OF A GASKET. DO NOT USE A SILICONE RUBBER SEALER MATERIAL.

Assemble axle in vehicle. Fill axle with the specified lubricant. Refer to vehicle manufacturer's lubricant recommendations.

Assemble brake backing plates, etc. and axle shafts into housing. Refer to vehicle service manual for the specified torques of wheel end components.

Assemble brake drums and wheels.

COMPLETE ASSEMBLY REPLACEMENT

If inspection reveals that the replacement of the Trac-Lok as a unit is required, the following steps should be followed.

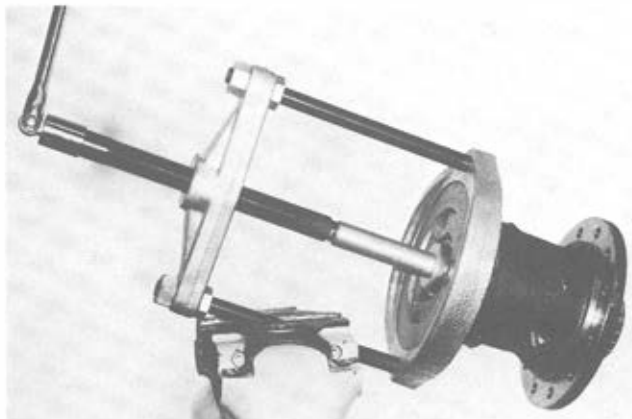


FIGURE #36

1015-36

Remove both differential bearing cones 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). Reposition case in puller and remove other bearing cone as described above. If shims are mutilated, replace with new ones at time of assembly. Shims are available in thicknesses of .003", .005", .010", and .030" (mm. .08, .13, .25, and .76).

Tools: DD-914-P Press
DD-914-62 Adapter

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DD-914-8 Adapter Ring
DD-914-7 Extension
DD-914-42 Button

To remove ring gear from case, follow steps as illustrated in Figures #6 and #7.

Assemble ring gear to new Trac-Lok case. Follow the same steps as illustrated in Figure #29. Make sure the gear flange on the differential case is free of nicks, burrs, etc.



FIGURE #37

1015-37

Inspect shims and bearings which were removed from the old case. If shims or bearings show excessive wear or damage, they should be replaced. Make sure they are used on exactly the same sides of the new case as they were removed from the old case. Assemble shims and differential bearing cones. Use button under bottom bearing, as shown, to protect the bearing from becoming damaged during assembly of top bearing.

Tools: C-4025 Installer
C-4171 Handle
DD-914-42 Button

Prelubricate differential bearing cones with the specified lubricant.

Assemble case into housing. Follow the steps as illustrated in Figures #30 thru #32.

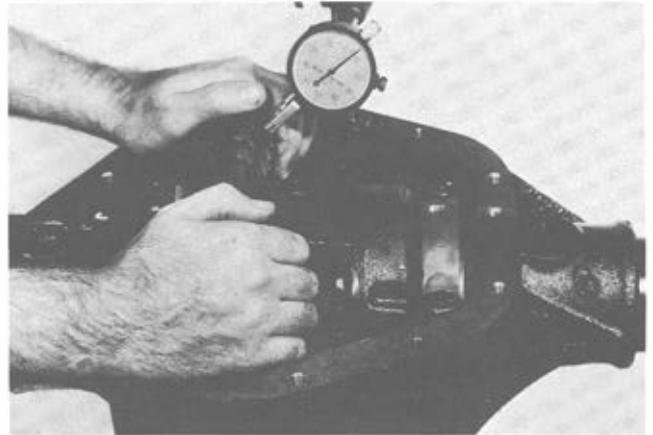


FIGURE #38

1015-38

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

If Spicer axle, backlash tolerance is .005" to .009" (.13 to .23 mm) and cannot vary more than .002" (.05 mm) 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.

NOTE

FOR CONVERSION FROM STANDARD DIFFERENTIAL TO TRAC-LOK DIFFERENTIAL FIGURES #36 THRU #38 SHOULD BE FOLLOWED.

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Dana Corporation, Spicer Axle Division, reserves the right to make changes from time to time, without notice or obligation, in specifications, descriptions, and illustrations, and to discontinue models or revise designs.

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