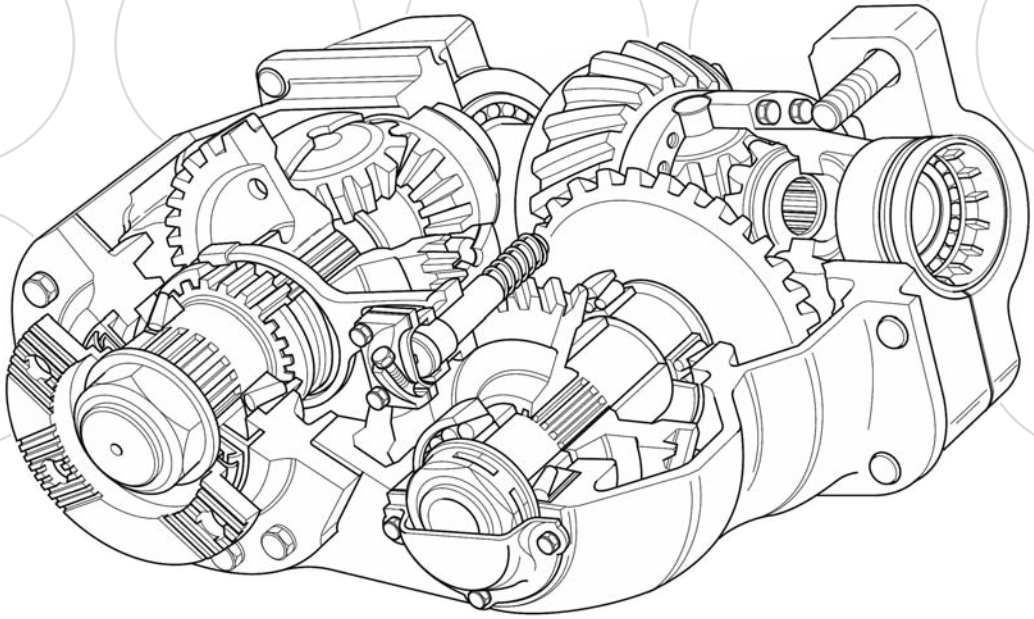
MERITOR™

Maintenance Manual MM-0194

Single reduction leading axle carrier for tandem axle series MD61

Revised July 2015



Service Notes

Before You Begin

This publication provides installation and maintenance procedures for the MERITOR Single reduction leading axle carrier for tandem axle series MD61.

The information contained in this publication was current at the time of printing and is subject to revision without notice or liability.

You must understand all procedures and instructions before you begin maintenance and service procedures.

You must follow your company's maintenance and service guidelines.

You must use special tools, when required, to avoid serious personal injury and damage to components.

MERITOR uses the following notations to alert the user of possible safety issues and to provide information that will help to prevent damage to equipment and components.

⚠ WARNING

A WARNING indicates a procedure that you must follow exactly to avoid serious personal injury.

⚠ CAUTION

A CAUTION indicates a procedure that you must follow exactly to avoid damaging equipment or components. Serious personal injury can also occur.

NOTE: A note indicates an operational, procedure or instruction that is important for proper service. A NOTE can also supply information that will help to make service quicker and easier.

This symbol indicates that you must tighten fasteners to a specific torque.

Access Information on Meritor's Web Site

Additional maintenance and service information for Meritor's commercial vehicle systems component lineup is also available at **www.meritor.com**

To access information, click on Products, Publications. The screen will display an index of publications by type.

Terms used in this manual

Manufacturer:
MERITOR

Manual:
Maintenance manual no. MM-0194

Device:
Single reduction leading axle carrier

Technician:
Qualified personnel working on the leading axle carrier maintenance and servicing.

Maintenance and servicing:
Maintenance and servicing refer to periodical checks and/or replacement of the leading axle carrier parts or components. It also refers to the determining of the cause of a malfunction in order to restore the initial operating conditions.

Operator:
Any person who will use the leading axle carrier as part of a more complex device.

Warranty
Warranty applies to the leading axle carrier installed on vehicles for which it was designed. Warranty is void in the following cases:

- Improper use of the vehicle on which the leading axle carrier is installed (usage conditions, overloading etc.)
- Tampering with vehicle components that may affect the leading axle carrier performance.
- Use of non-original spare parts.
- Improper installation, adjustment, repair or modification.
- Poor or improper maintenance (including consumables other than those specified).

Further information on warranty conditions may be obtained directly from the manufacturer or by referring to the Meritor web site www.meritor.com

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- 94 MST4408 CT24 Fitting Tool - Bearing Cup
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Design and Function

The input shaft is journalled in two roller bearings.

The roller bearings are in the transfer gear housing and the needle bearing in the rear differential side gear of the transfer gear. The shaft has splines for meshing with the transfer gear spider and the differential lock flange.
The flange is connected to the input shaft via splines.

The transfer housing gear seal is protected against dirt, etc., by means of the dust cover and V-ring on the flange.

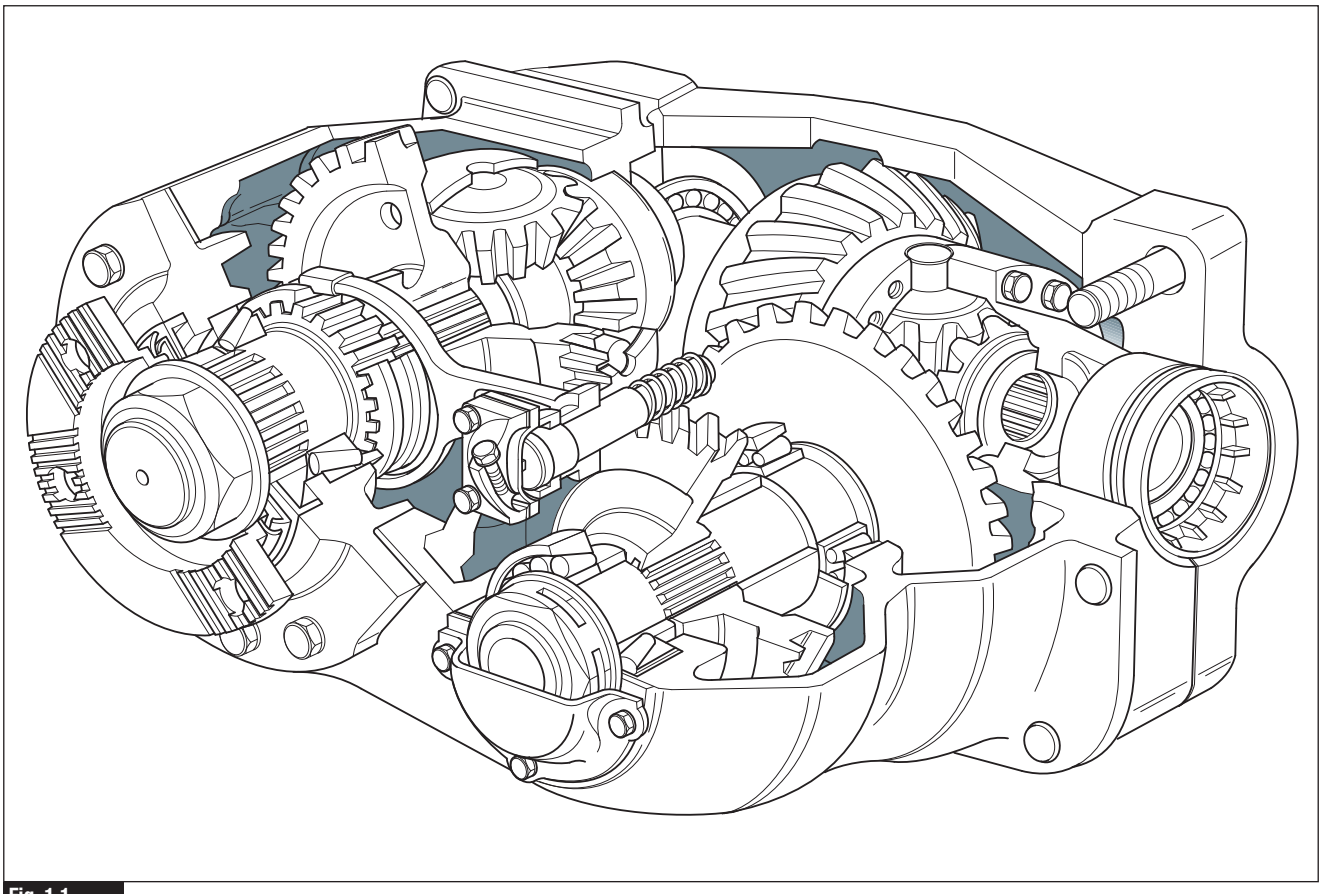
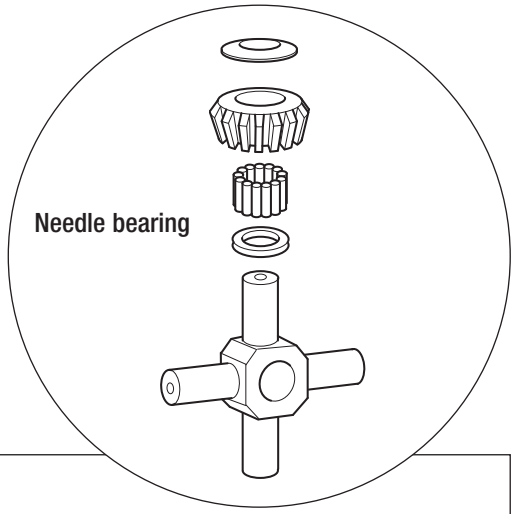


Fig. 1.1

1 Introduction

The transfer gear differential consists of a spider with four small differential pinions and two side gears. The four small pinions are journalled on the spider by means of needles (4x41=164) and are held in position by a carrier. The side gears are needle-bearing journalled on the input shaft.

The rear side gear is also roller-bearing journalled in the final drive housing. A drive gear is fixed to the front side gear. The rear side gear has internal splines for meshing with the output shaft. The drive gear, on the front side gear, is provided with teeth for the diff. lock.



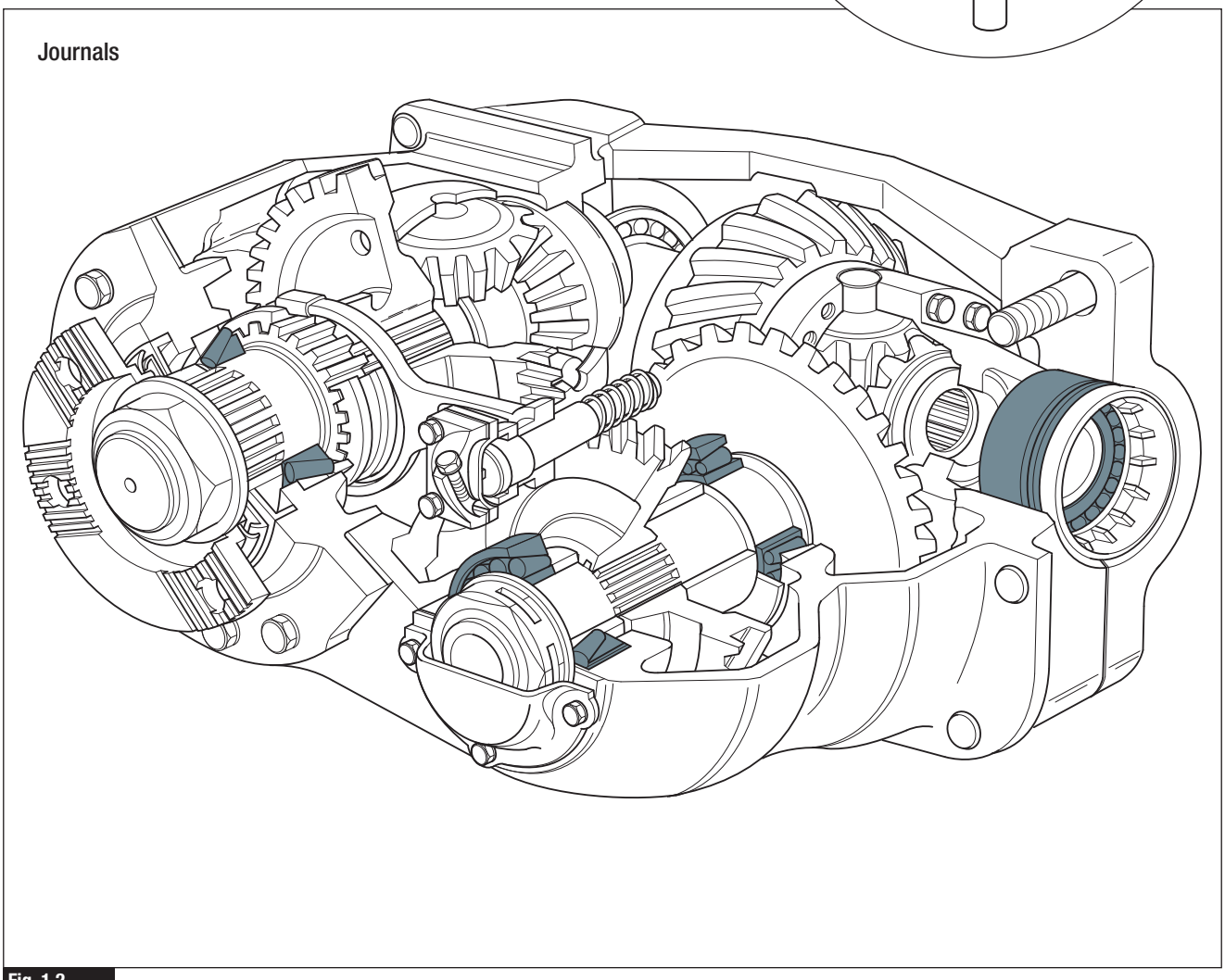


Fig. 1.2

The main pinion is journalled on two tapered roller bearings. One is in the transfer gear housing and the other in the final drive housing.

The intermediate gear is splined to the pinion.
The single reduction is of the spiral-bevel type.

It is designed for a small reduction with a view to fuel economy.

Because of the small reduction, the pinion is large and, for reasons of space, of the spiral-bevel type, which means that the pinion centreline coincides with that of the crown wheel.

Transfer gear assembly

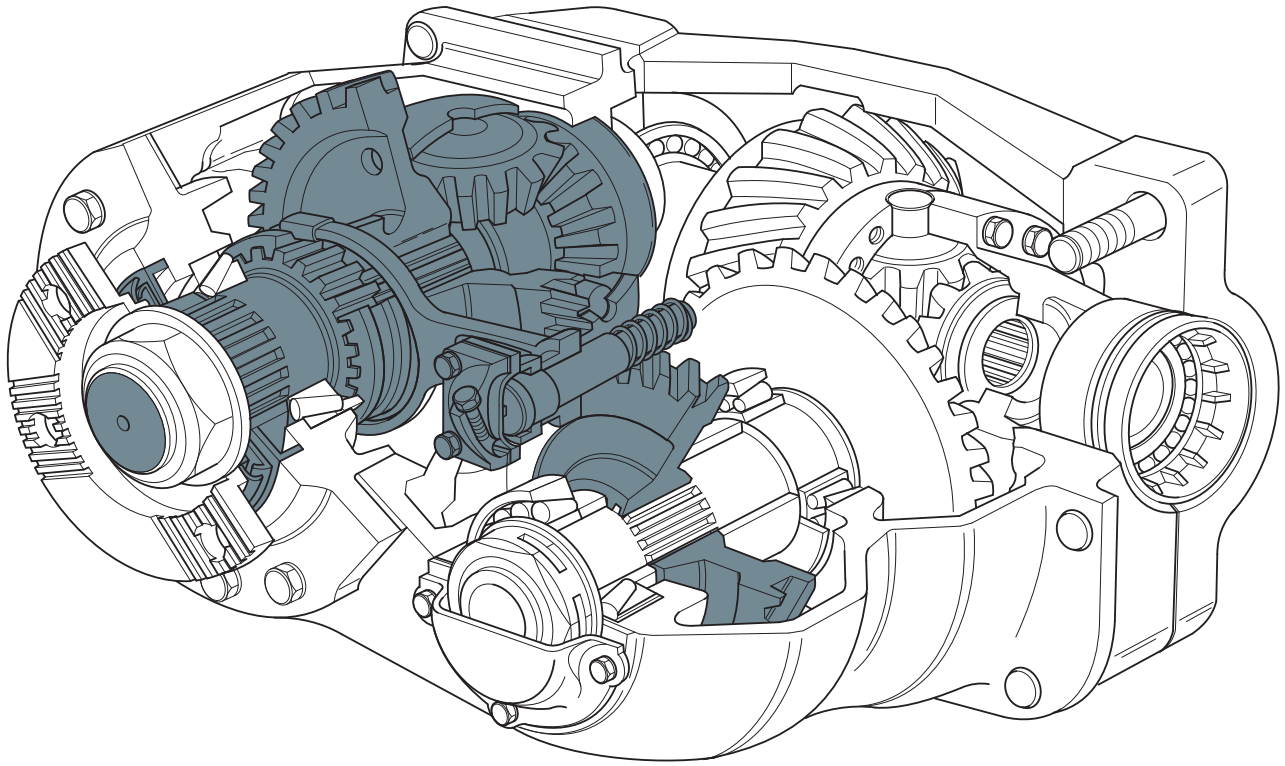


Fig. 1.3

The differential housing is journalled in two tapered roller bearings.

The crown wheel is bolted to the differential flange case by means of 10 bolts and is further braced by 10 guide pins. The bolting for the differential case consists of 12 bolts. Needles (4x35=140) are used for journalling the differential pinions on the spider.

The output shaft to the rear final drive is journalled in a cylindrical ball bearing in the rear axle casing.

The flange for driving the propeller shaft between the final drives is spline-connected to the shaft.

On the flange there is a dust cover and in the casing an oil seal.

Final drive

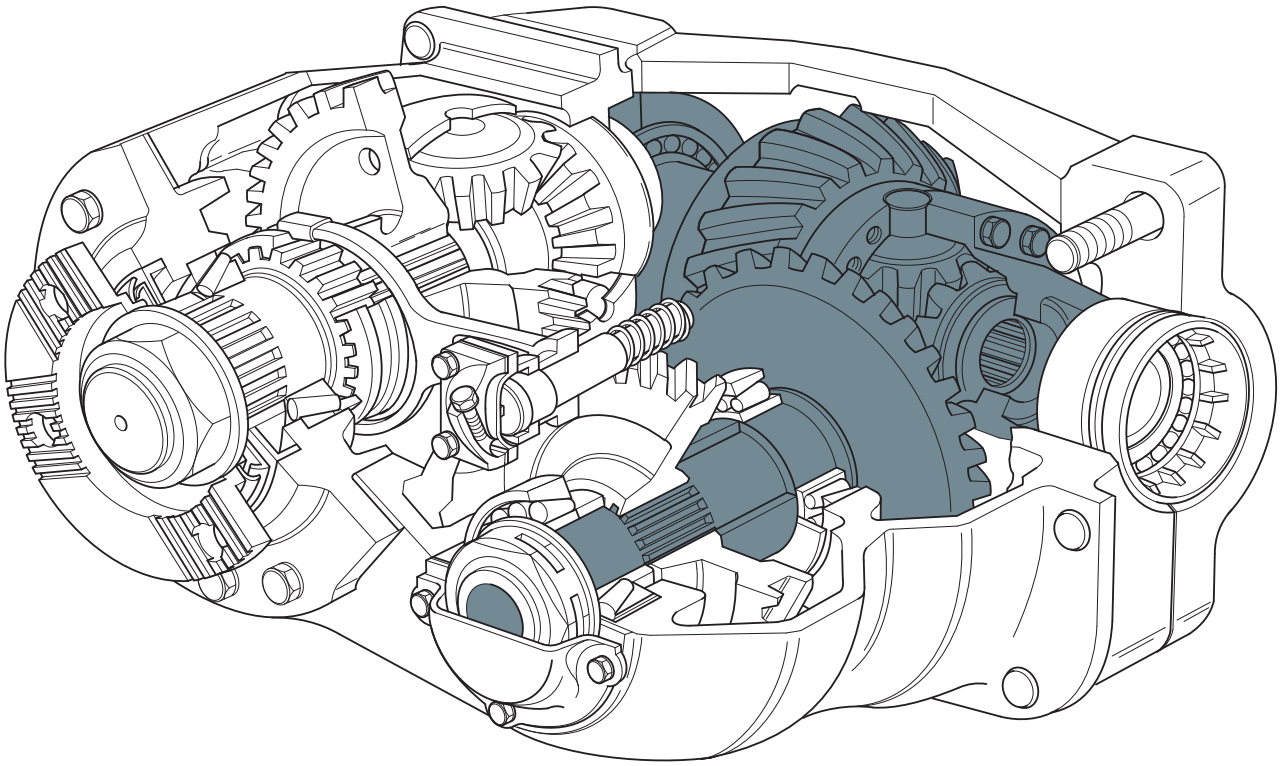


Fig. 1.4

1 Introduction

In order to ensure reliable and efficient leading axle carrier assembly operation, maintenance intervals, use of lubricants and correct procedures specified by the manufacturer should be strictly observed (refer to Lubrication Maintenance Manual no. 1). For further information contact the manufacturer's engineering department or refer to the Meritor Web site at www.meritor.com (see "Technical manuals" section)

⚠ WARNING
Only original Meritor spare parts should be used.

⚠ WARNING
Use of non-recommended lubricants will adversely affect performance and service life.

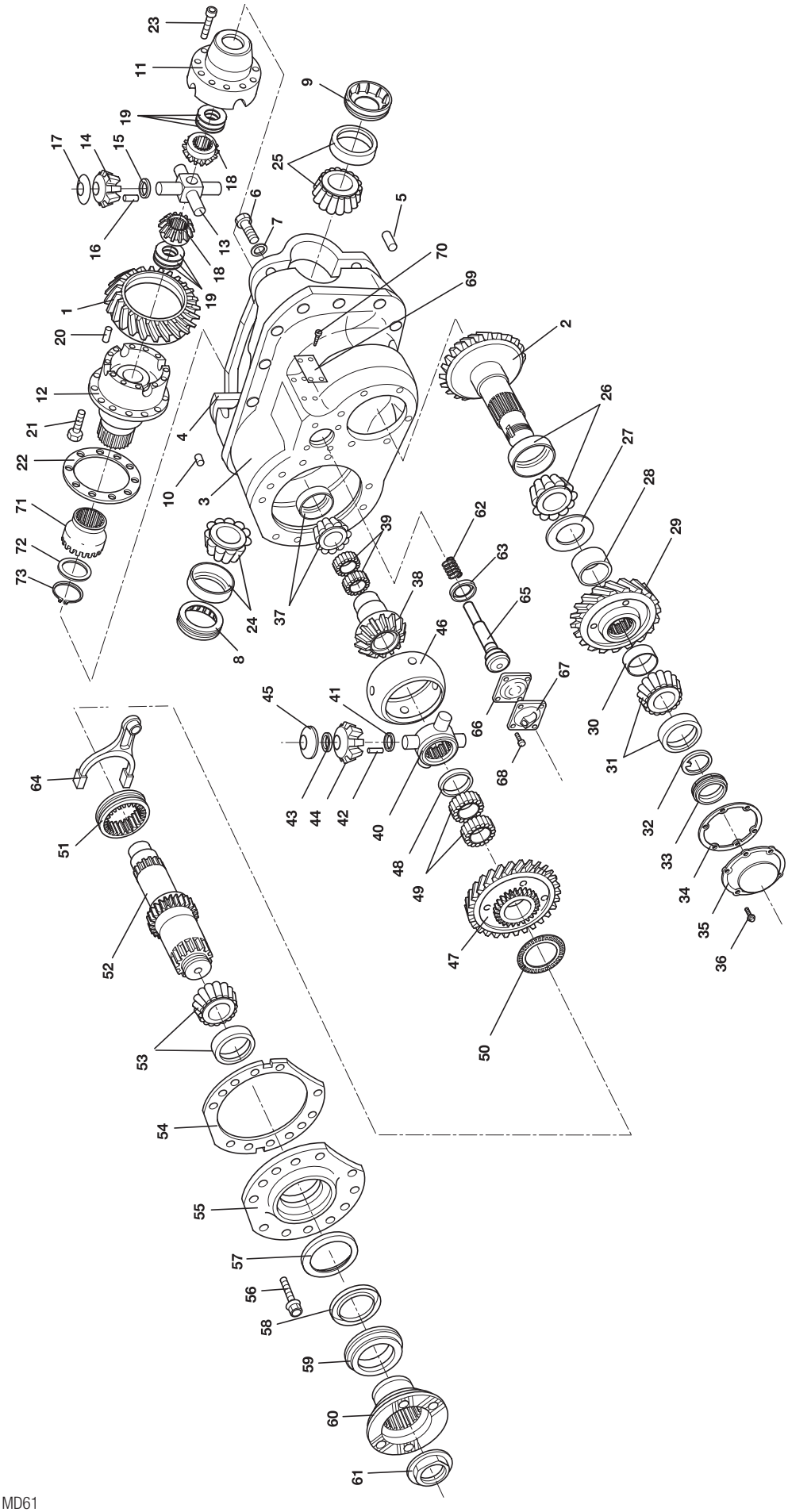
⚠ WARNING
Use of non-original parts could seriously affect leading axle carrier assembly performance.

Routine inspections

Service	Interval	Maintenance operations
Delivery Service		
		• Check for oil leakage
		• Check bolting
		• Check oil level and top-up if necessary
Routine inspections		
	within 6 weeks or at least	• Check for oil leakage
	max. 10,000 Km	• Check bolting
	every 6 months	• Check for oil leakage
		• Check rear axle breathers
Lubrication		
	See manufacturers' lubrication chart	Change oil according to lubrication manufacturers' chart

Exploded view

MD16 with leg cap bridge



Parts list

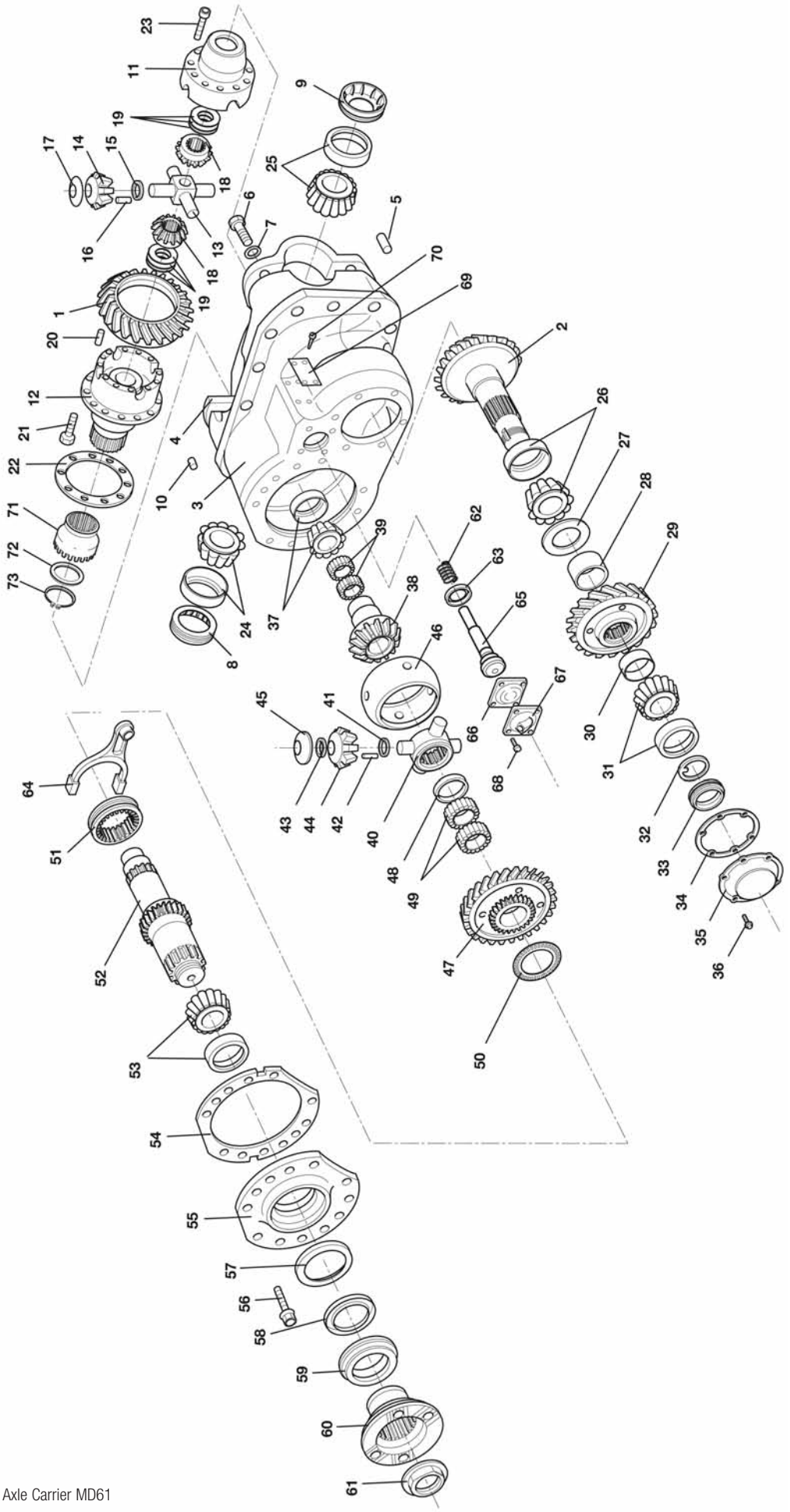
MD16 with leg cap bridge

Ref.	Description	q.ty
1	Crown wheel	1
2	Pinion	1
3	Diff. carrier	1
4	Diff. bearing cap	1
5	Locating pin	1
6	Cap screw	1
7	Washer cap screw	1
8	Adjusting ring	1
9	Adjusting ring	1
10	Set screw	2
11	Diff. housing left	1
12	Diff. housing right	1
13	Spider	1
14	Diff. pinion	4
15	Spacer plate	4
16	Needle	140
17	Thrust washer	4
18	Diff. side gear	2
19	Trust washer	6
20	Pin	10
21	Screw	10
22	Lock plate	1
23	Hex. socket screw	12
24	Roller bearing	1
25	Roller bearing	1
26	Pinion bearing	1
27	Shim	
28	Spacer sleeve	1
29	Gear helical	1
30	Spacer sleeve	1
31	Pinion bearing	1
32	Thrust washer	1
33	Nut	1
34	Gasket	1
35	Cover	1
36	Flange screw	6

Ref.	Description	q.ty
37	Roller bearing	1
38	Diff. side gear	1
39	Needle roller assy	1
40	Spider	1
41	Spacer plate	4
42	Needle	84
43	Spacer ring	4
44	Diff. pinion	4
45	Thrust washer	4
46	Carrier interaxle diff.	1
47	Gear helical	1
48	Spacer sleeve	1
49	Needle roller assy	1
50	Spacer sleeve	1
51	Engaging sleeve diff. lock	1
52	Input shaft	1
53	Roller bearing	1
54	Shim	
55	Input bearing cage	1
56	Flange screw	12
57	Seal	1
58	Seal, v-ring	1
59	Shield	1
60	Companion flange	1
61	Lock nut	1
62	Spring	1
63	Diaphragm seat	1
64	Fork shift	1
65	Piston	1
66	Diaphragm	1
67	Cover	1
68	Flange screw	4
69	Identification plate	1
70	Drive screw	4
71	Fixed collar	1
72	Spacer ring	1
73	Circlip	1

Exploded view

MN16 without leg cap bridge



Parts list

MN16 without leg cap bridge

Ref.	Description	q.ty
1	Crown wheel	1
2	Pinion	1
3	Diff. carrier	1
4	Diff. bearing cap	1
5	Locating pin	1
6	Cap screw	1
7	Washer cap screw	1
8	Adjusting ring	1
9	Adjusting ring	1
10	Set screw	2
11	Diff. housing left	1
12	Diff. housing right	1
13	Spider	1
14	Diff. pinion	4
15	Spacer plate	4
16	Needle	140
17	Thrust washer	4
18	Diff. side gear	2
19	Trust washer	6
20	Pin	10
21	Screw	10
22	Lock plate	1
23	Hex. socket screw	12
24	Roller bearing	1
25	Roller bearing	1
26	Pinion bearing	1
27	Shim	
28	Spacer sleeve	1
29	Gear helical	1
30	Spacer sleeve	1
31	Pinion bearing	1
32	Thrust washer	1
33	Nut	1
34	Gasket	1
35	Cover	1
36	Flange screw	6

Ref.	Description	q.ty
37	Roller bearing	1
38	Diff. side gear	1
39	Needle roller assy	1
40	Spider	1
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43	Spacer ring	4
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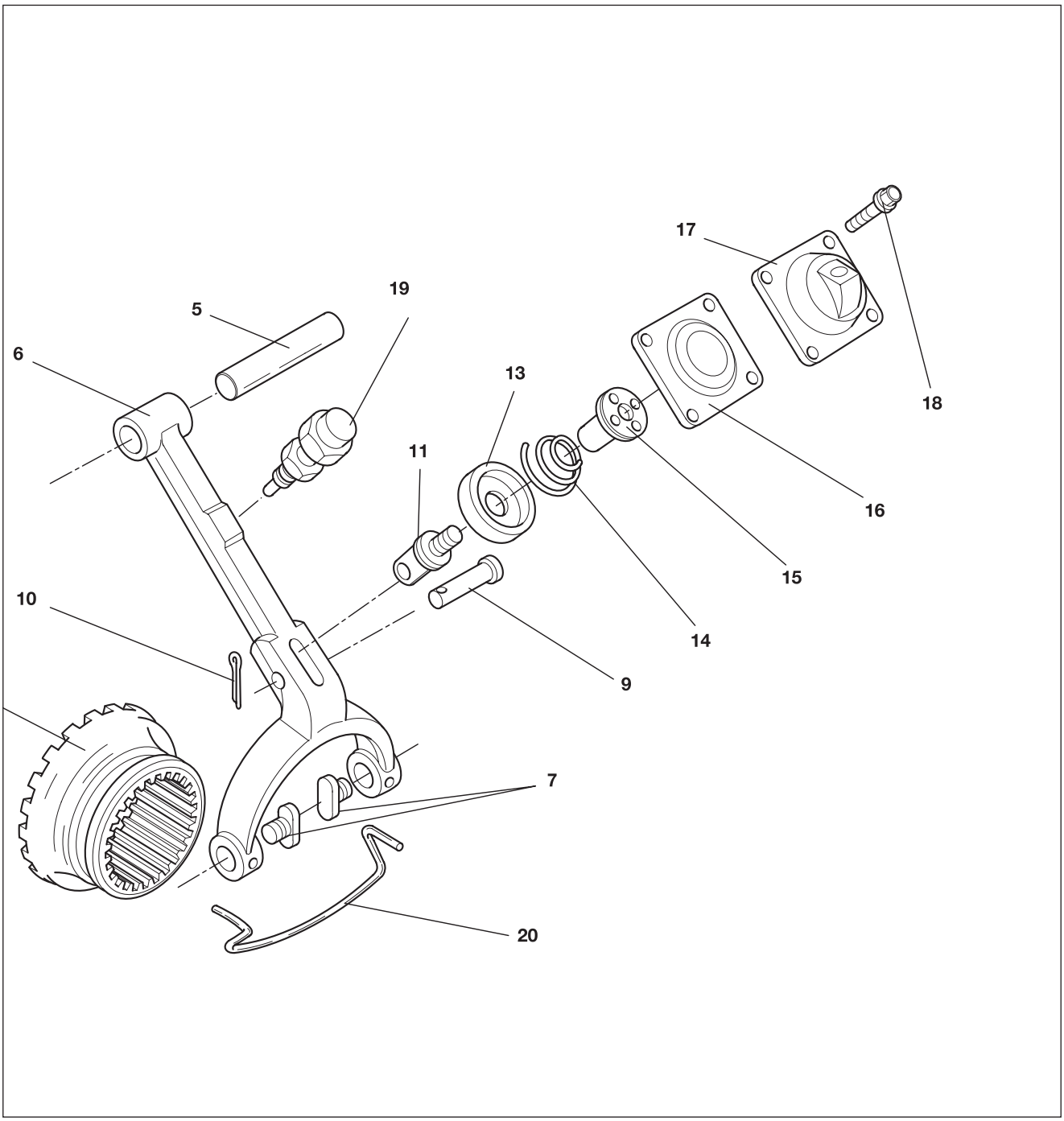
62	Spring	1
63	Diaphragm seat	1
64	Fork shift	1
65	Piston	1
66	Diaphragm	1
67	Cover	1
68	Flange screw	4
69	Identification plate	1
70	Drive screw	4
71	Fixed collar	1
72	Spacer ring	1
73	Circlip	1

Exploded view

Inter axle diff. lock

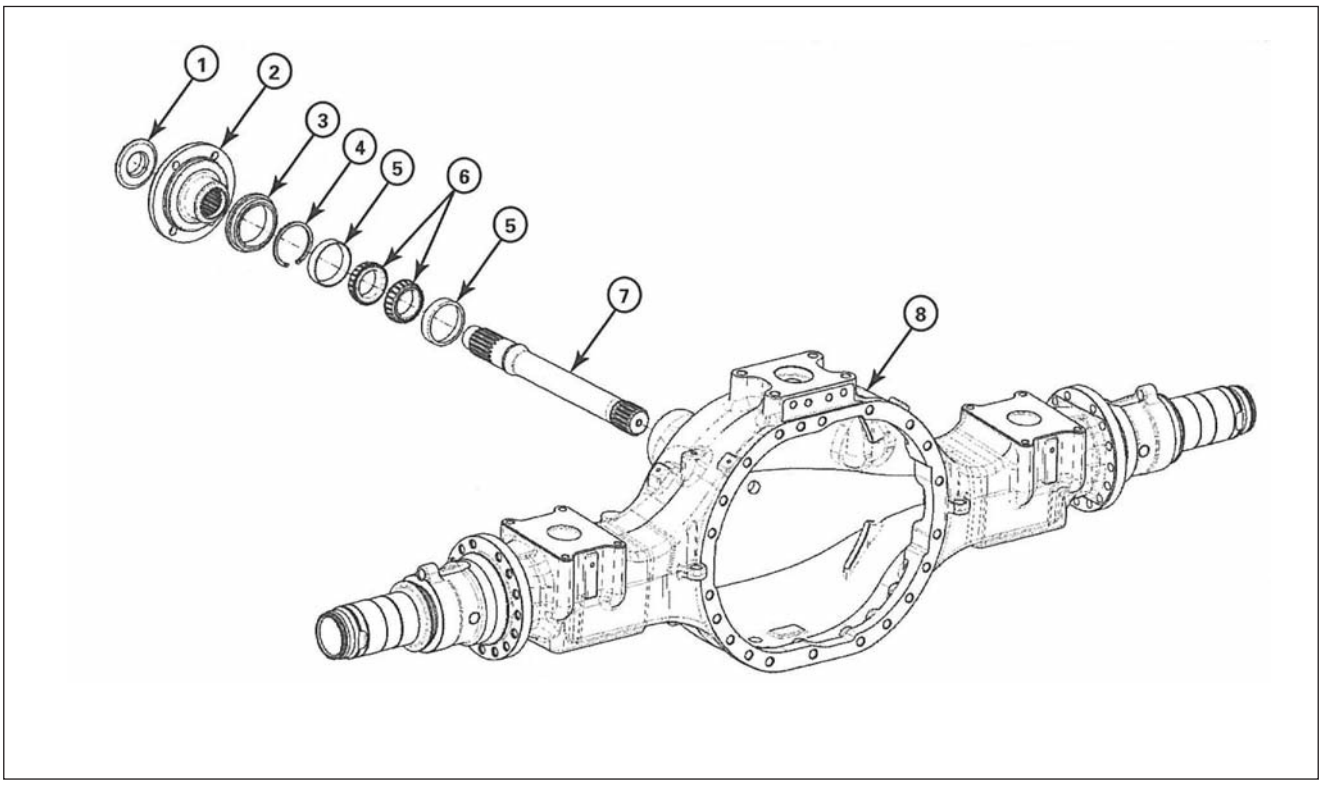


Parts list

Inter axle diff. lock

Ref.	Description	q.ty
4	Dog clutch, free	1
5	Pivot pin	1
6	Diff. lock	1
7	Pin	2
9	Clevis pin, 8X30	1
10	Split pin, 2X12	1
11	Selector bar (screw)	1
13	Diaphragm seat	1
14	Spring	1
15	Sleeve	1
16	Diaphragm	1
17	Cover	1
18	Flange screw, M8X25	4
19	Switch plunger	1
20	Lock brace	1

Exploded view



Ref.	Description
1	Nut - Companion Flange
2	Companion Flange
3	Output Oil Seal
4	Snap Ring Spacer
5	Output Bearing Cone
6	Output Bearing Cup
7	Output Thru Shaft
8	Axle Housing

Maintenance

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33 Carrier rebuild procedures
34 Shim pack calculation
36 Calculating the Preload Spacer
56 Removal and replacement of cross axle diff. lock unit
59 Install the Inter-Axle Differential (IAD) and Lock Shift Assembly
60 IAD Lock Shift Shaft Stop Adjustment
60 Install the Output Bearings ad Thru-Shaft
61 Inspect and Adjust Output Bearing End Play
62 Adjustment of warning light switch
63 Refitting the carrier to axle housing

Removing the carrier for servicing

Drain the oil from the axle.
Jack up the axle and chock front wheels.
Release the parking brake.
Drain the oil from the hubs.
Remove the hub covers.

Pull out the sun gear and the axle shaft approximately 160mm taking care not to damage the shaft seals.

Lower the vehicle to stand on its wheels, chock wheels and remove the jack.

Disengage the differential lock, and remove the cover and diaphragm.

Remove the input propeller shaft from the leading axle carrier, and the inter-axle drive shaft to the rear axle at the coupling flanges.

Position a suitable lifting device or trolley under the leading axle carrier.

Remove the screws fastening the carrier to the axle housing – leaving two screws slackened but in position.

Use a suitable crowbar in the built-in lever points to extract the leading axle carrier – breaking the seal between the leading axle carrier and the axle housing.

Ensuring that the leading axle carrier is safely supported on the lifting trolley – remove the final two screws and pull the leading axle carrier out of the axle.

Fit the leading axle carrier to a rigid overhaul stand.

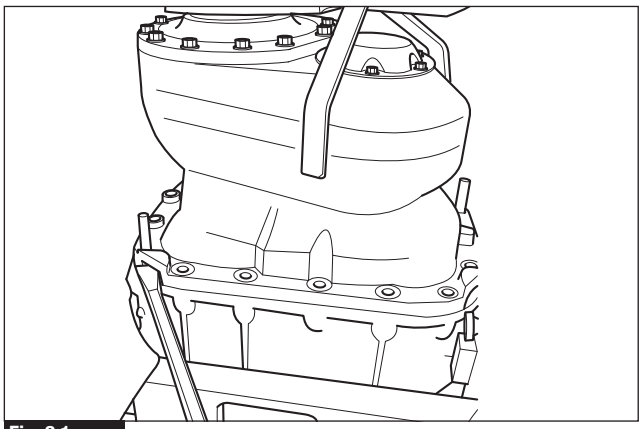


Fig. 2.1

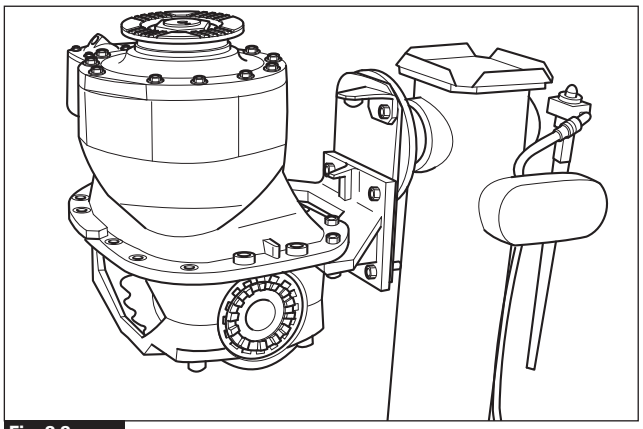


Fig. 2.2

Carrier strip down procedure

Remove the pinion nut cover and discard the cover gasket.

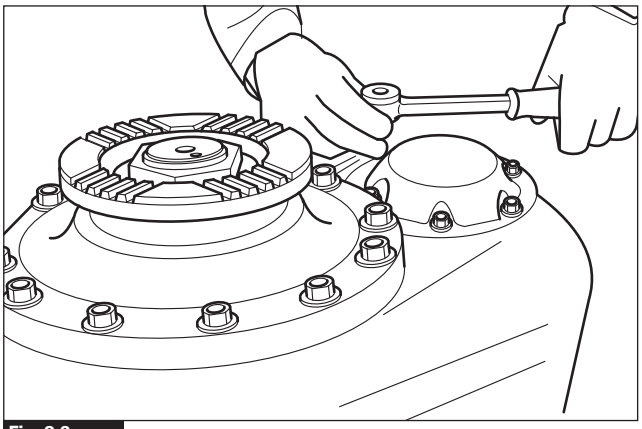


Fig. 2.3

Open the staking on the pinion stem locking nut.

Engage the inter-axle differential lock by applying air pressure.

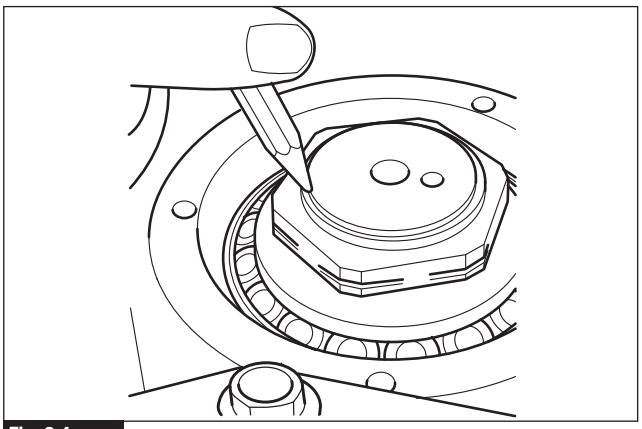


Fig. 2.4

Block the rotation of the input shaft using a suitable tool fastened to the drive flange. MST 4400 - CT13

Unscrew, using a torque multiplier, and remove the pinion stem nut. Discard the nut – (do not reuse)

Remove the tabbed washer under the nut.

Disengage the inter-axle differential lock by removing the air line.

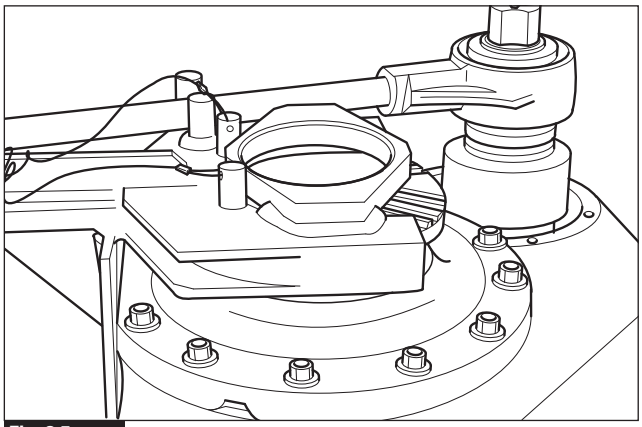


Fig. 2.5

Unscrew the differential lock cover plate bolts and remove the cover plate.

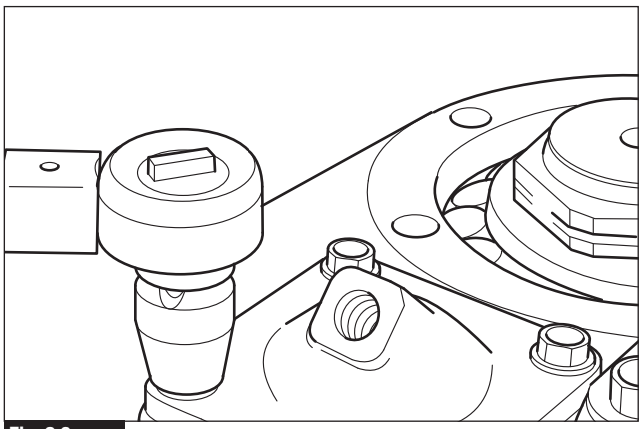


Fig. 2.6

Slacken the differential lock shaft using a hexagon headed key. (This facilitates subsequent dismantling).

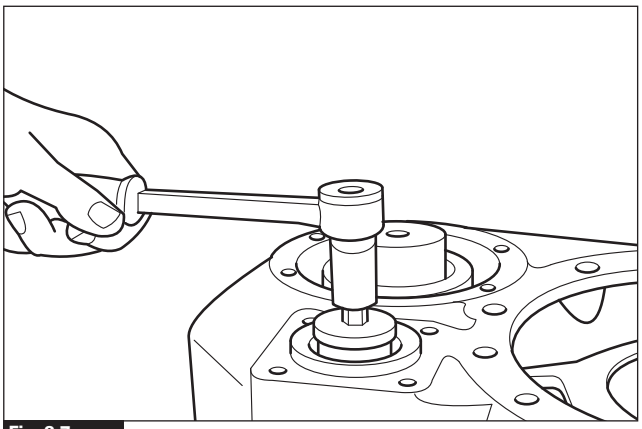


Fig. 2.7

Unscrew, using a torque multiplier, and remove the input flange nut.

Discard the nut - (do not reuse)

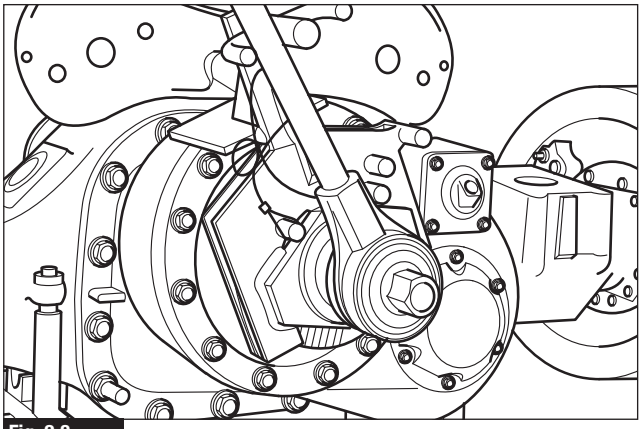


Fig. 2.8

Pull off the drive flange - using a standard puller.

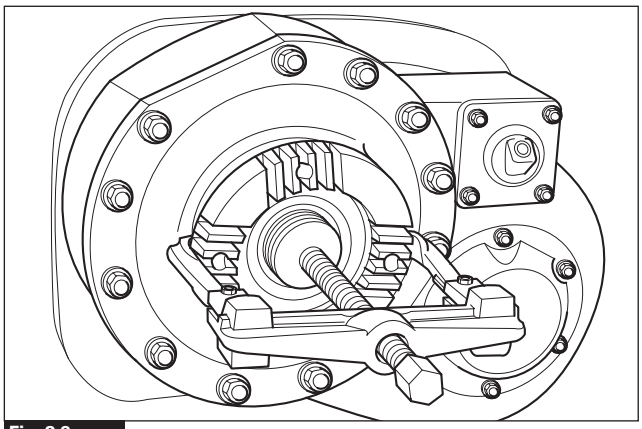


Fig. 2.9

Unscrew the screws around the input shaft bearing carrier plate.

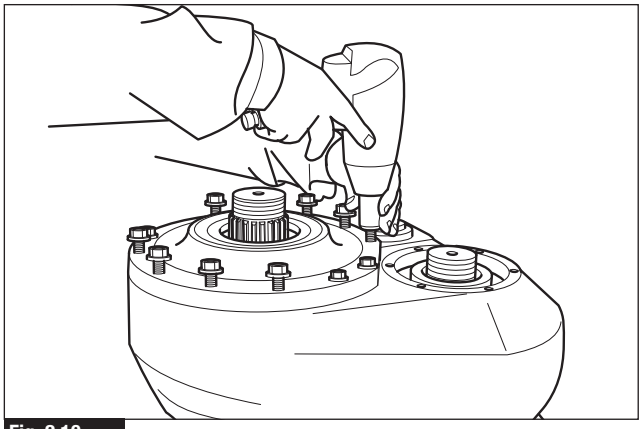


Fig. 2.10

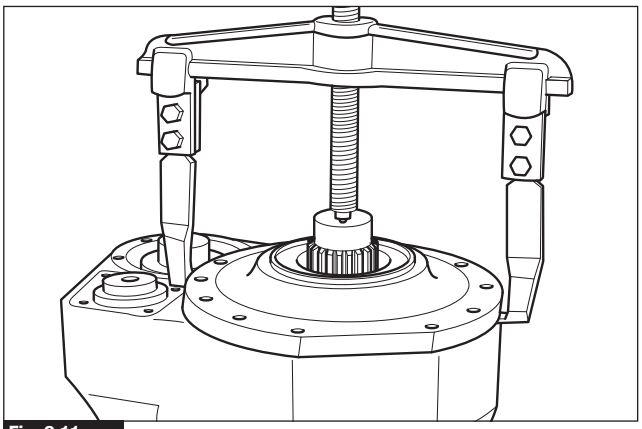


Fig. 2.11

Withdraw the input shaft bearing carrier plate using a puller.

Remove the steel shims and retain.

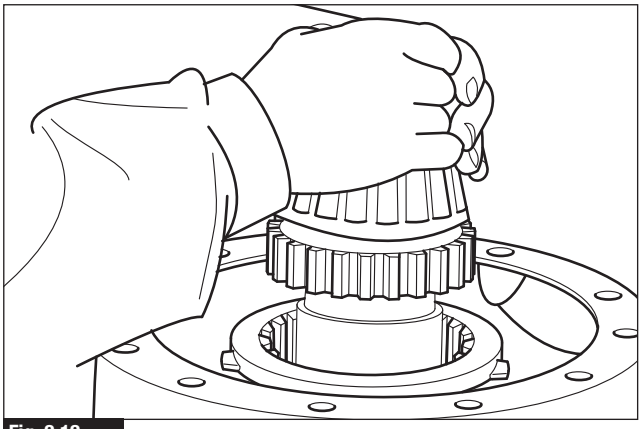


Fig. 2.12

Withdraw the input shaft. Remove roller bearing cone from input shaft and cup from input bearing cage.

Remove the differential lock collar.

Remove the thrust roller bearing.

Withdraw and remove the two upper needle roller bearing assemblies and spacer sleeve

Slacken the differential lock shaft using a hexagon headed key.

(This facilitates subsequent dismantling).

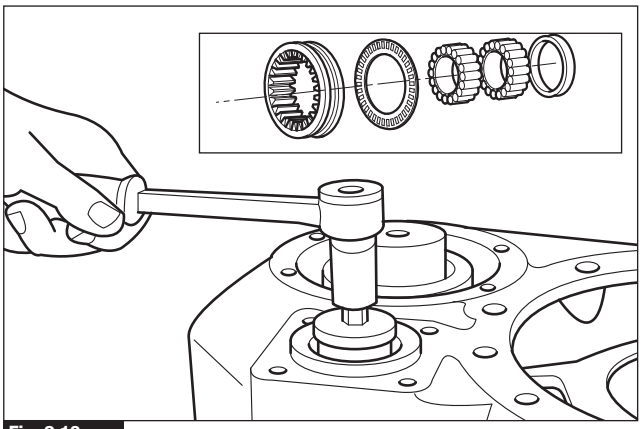


Fig. 2.13

Unscrew the differential lock piston, using a hexagon socket.

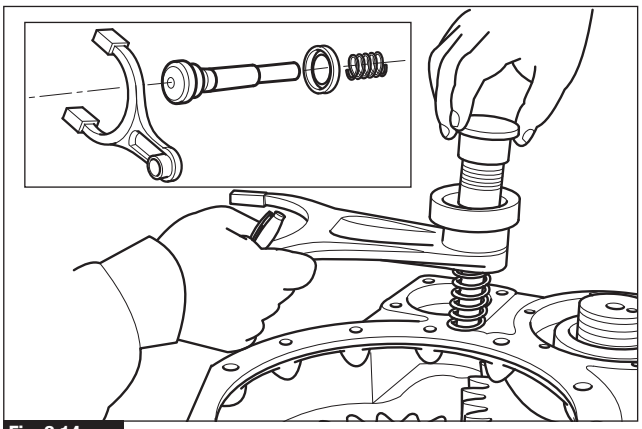


Fig. 2.14

Withdraw the piston and spring, take out the diaphragm seat sleeve), and the differential lock fork.

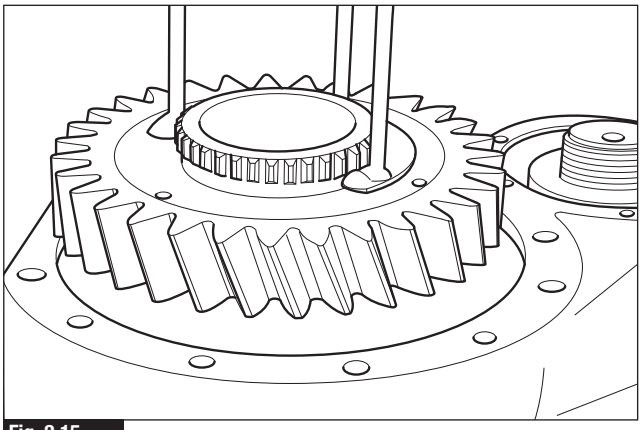


Fig. 2.15

Take out the helical spur gear

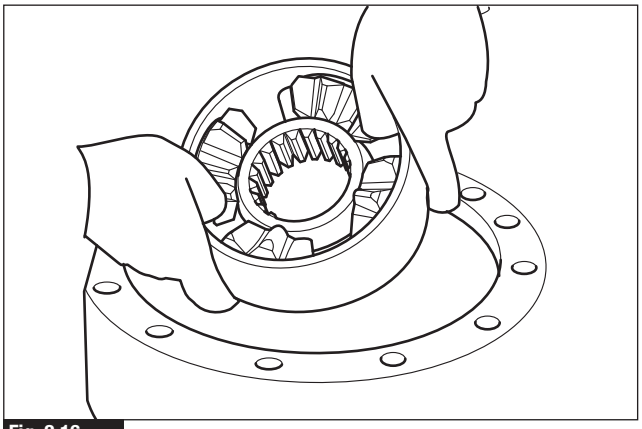


Fig. 2.16

Lift out the differential nest assembly

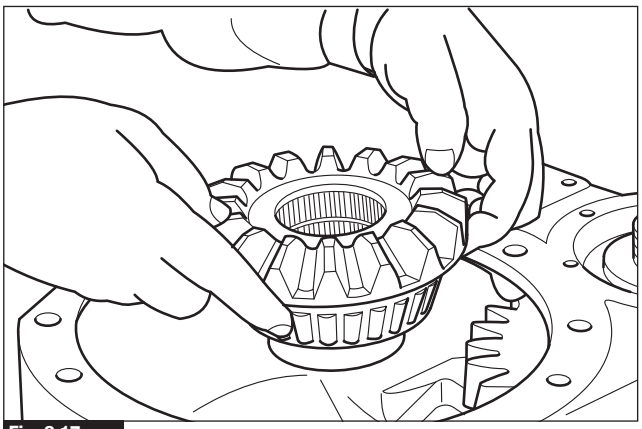


Fig. 2.17

Take out the differential side gear with bearing.

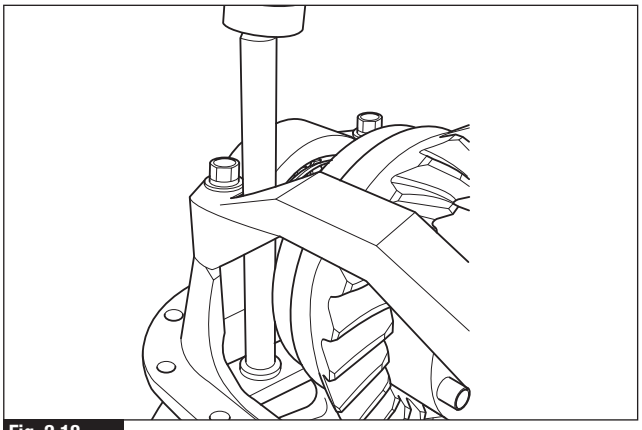


Fig. 2.18

Invert the carrier to allow access to the output side of the unit.

Using a purpose made drift - push out the bearing cup.

This bearing supports the differential side gear.

MST 4404 - CT18

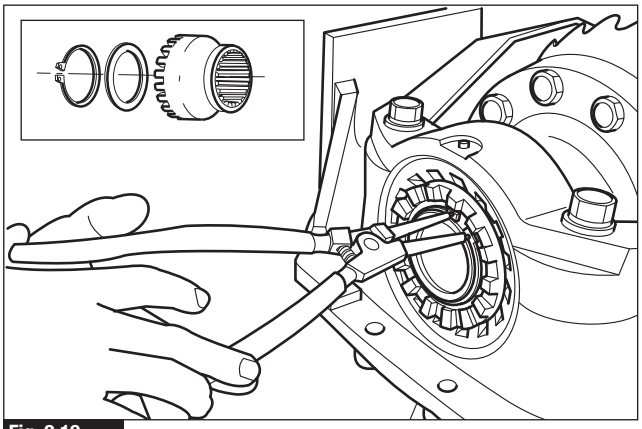


Fig. 2.19

Remove the circlip retaining the cross-axle differential dog clutch, and remove the spacer ring.

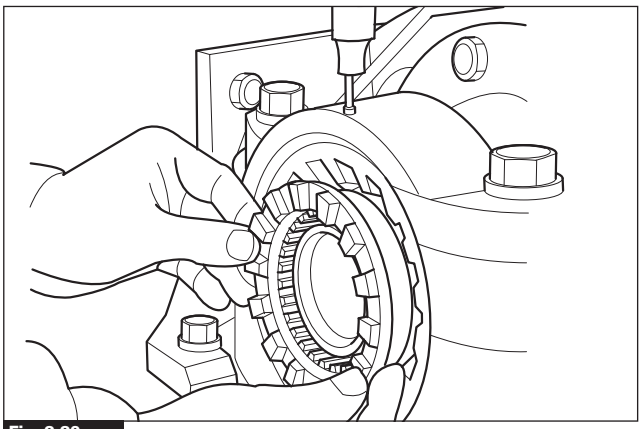


Fig. 2.20

ake the differential lock dog clutch off the differential case splines.

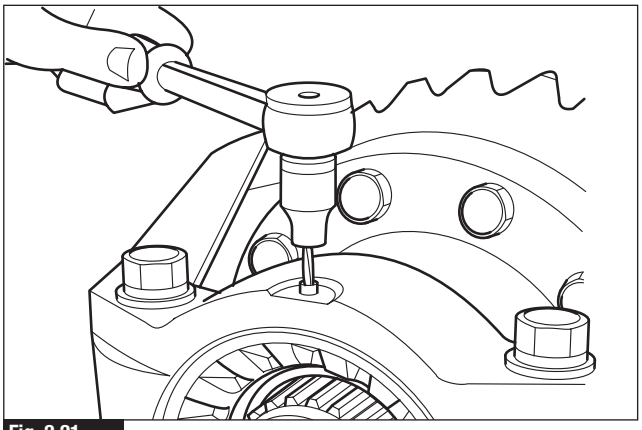


Fig. 2.21

Unscrew and remove the two set screws on both sides of the drive unit - discard the screws and use new replacements.

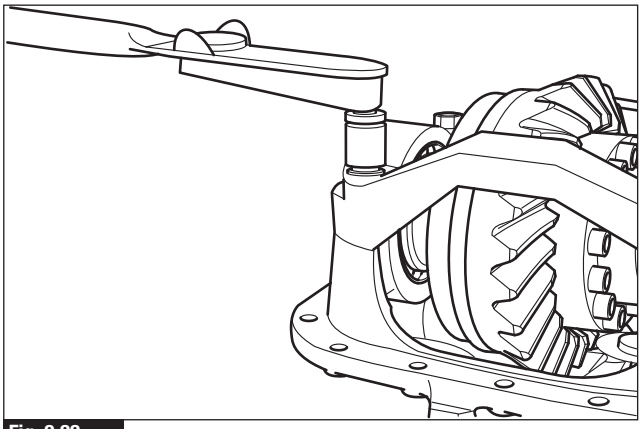


Fig. 2.22

Unscrew and remove the four bearing cup screws - discard the screws and replace with new for rebuild.

Lift off the bearing cap casting.

Remove from right and left side the bearing adjuster rings and bearing cups.

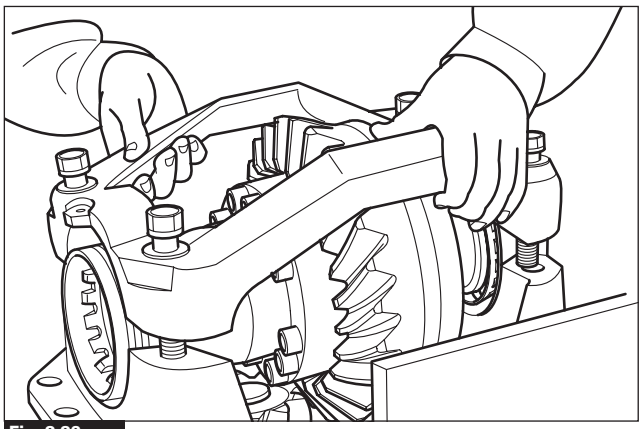


Fig. 2.23

Lift out the ring gear and differential case assembly – using a bar and sling.

⚠ WARNING

The use of the hoist must be done by experienced trained staff as an incorrect manoeuvre or faulty connection could cause a serious accident.

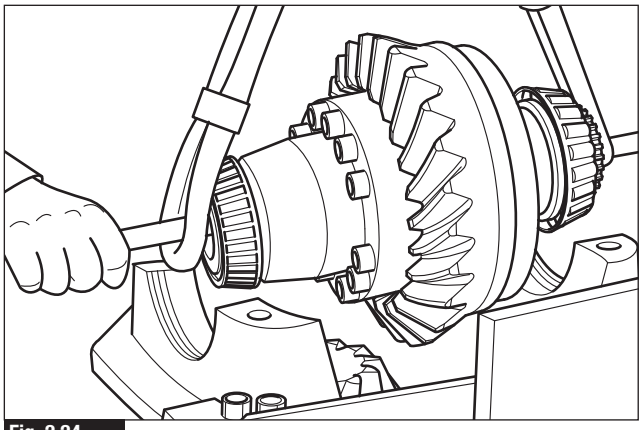


Fig. 2.24

Transfer the ring gear/differential case assembly to bench fixture.

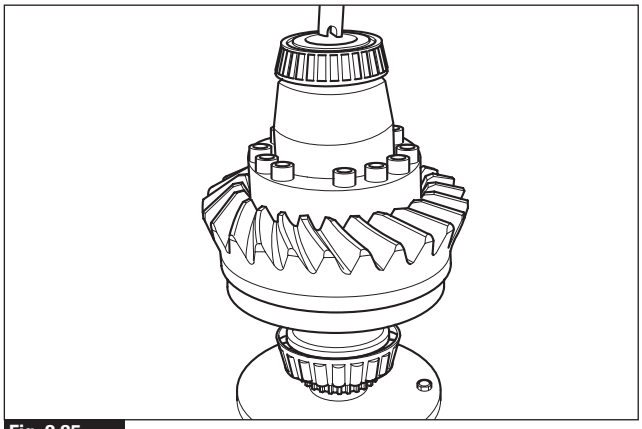


Fig. 2.25

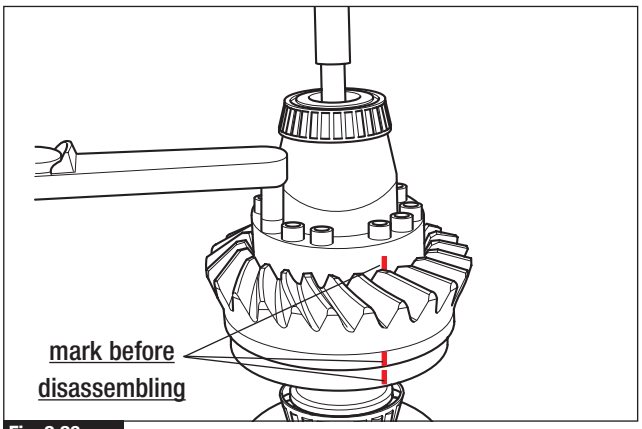


Fig. 2.26

Unscrew the twelve hexagon socket headed screws on the differential case.

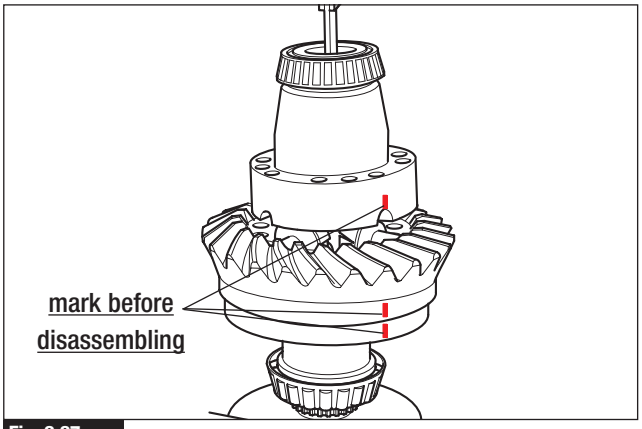


Fig. 2.27

Lift off the differential case half.

(tool MST4406 - CT21)

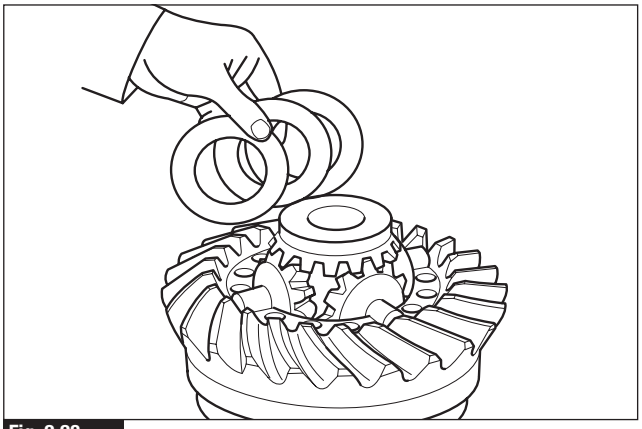


Fig. 2.28

Remove and retain the three thrust washers on the side gear.

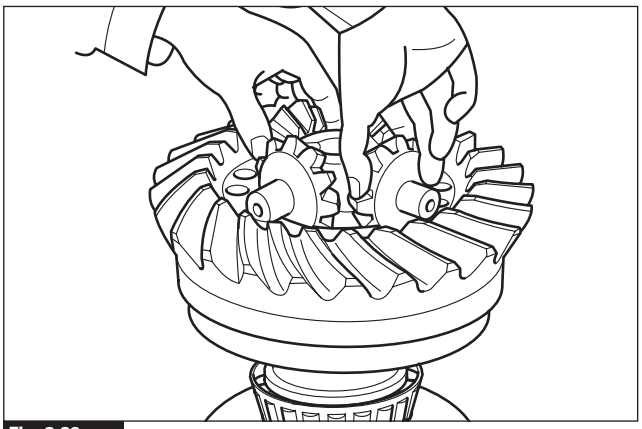


Fig. 2.29

Lift off the cross-axle differential nest (spider and pinion assembly)

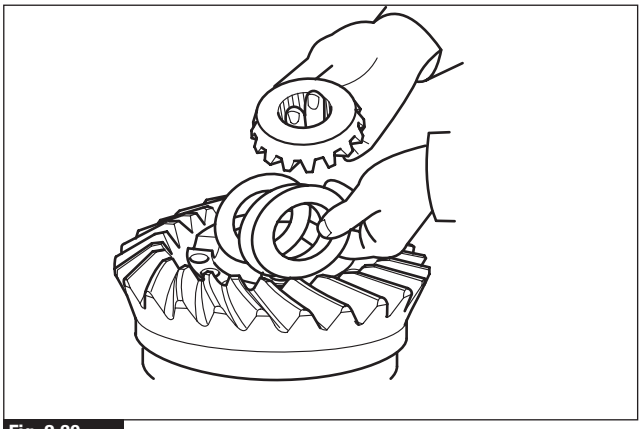


Fig. 2.30

Remove the opposite differential side gear and three thrust washers

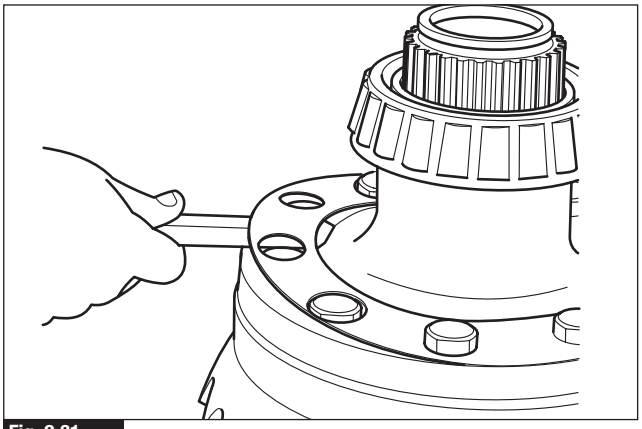


Fig. 2.31

Invert the ring gear and prise off the metal locking plate around the ring gear screws.

Remove the differential casing side bearings – using a standard puller.

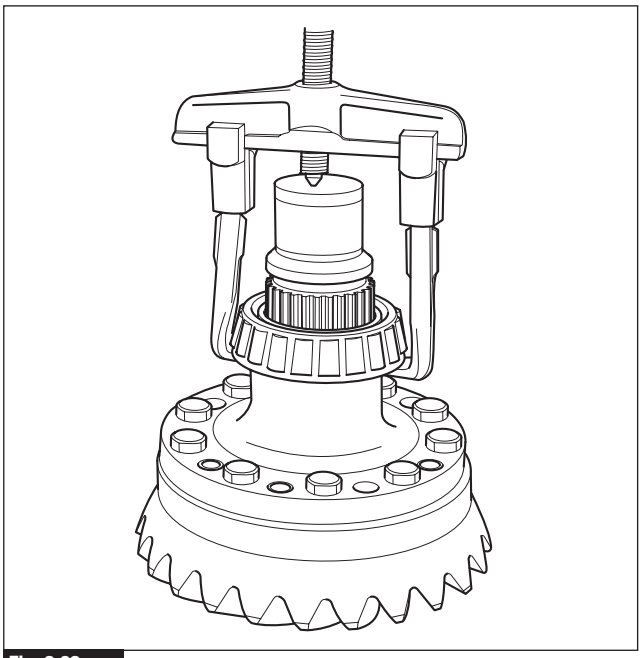


Fig. 2.32

Unscrew the ring gear screws to allow replacement of the ring gear.

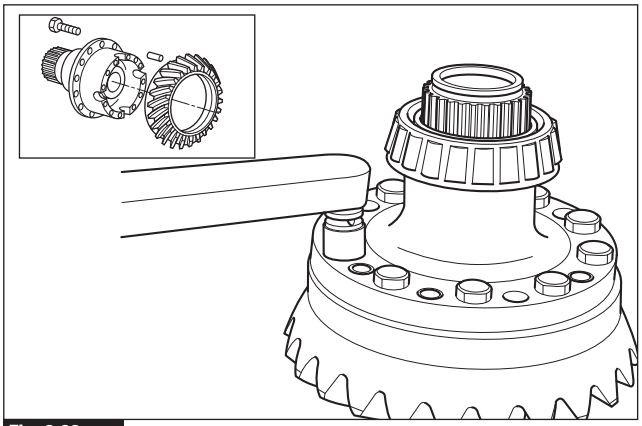


Fig. 2.33

Temporarily mount fixture (MST4402 - CT15) on the drive unit casing using the four cap bolts.

Invert the carrier to allow access to the input side.

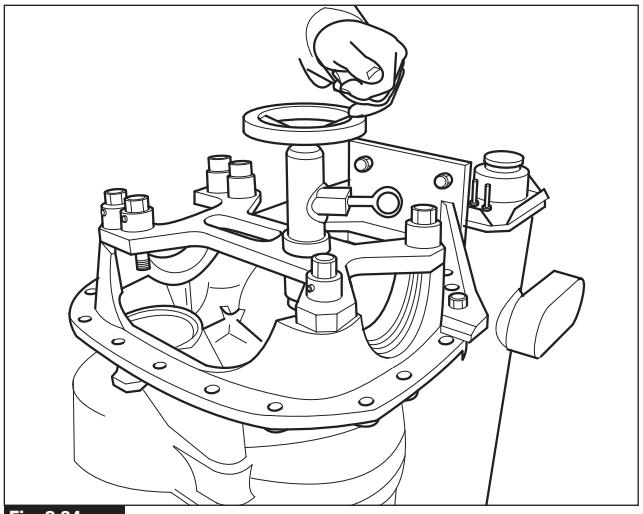


Fig. 2.34

Fit a spacer block or a piece of wood under the helical gear.

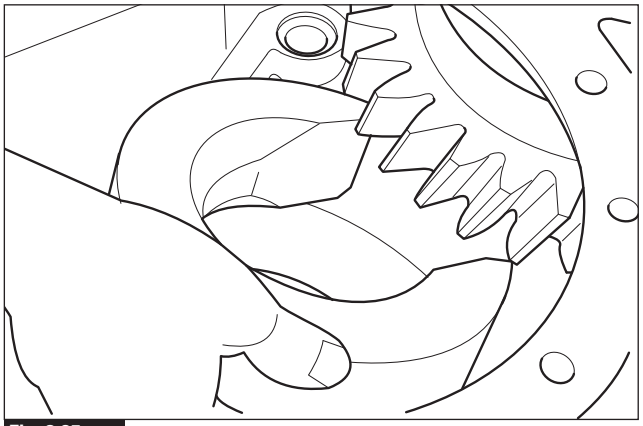


Fig. 2.35

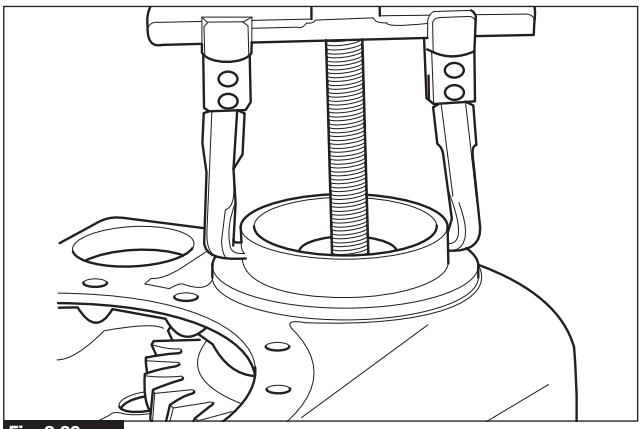


Fig. 2.36

Use a puller to push the pinion shaft through the bearings.

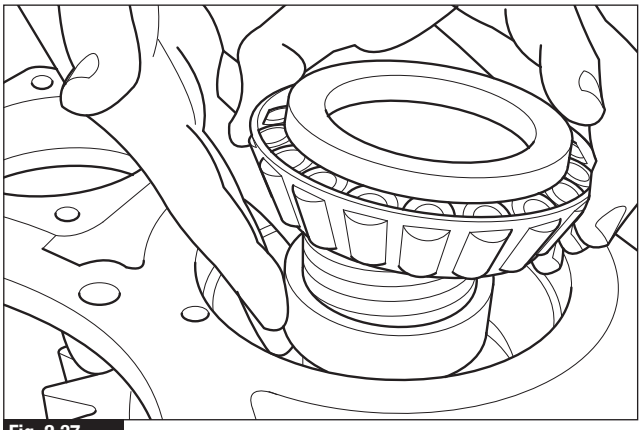


Fig. 2.37

Remove the bearing and spacer.

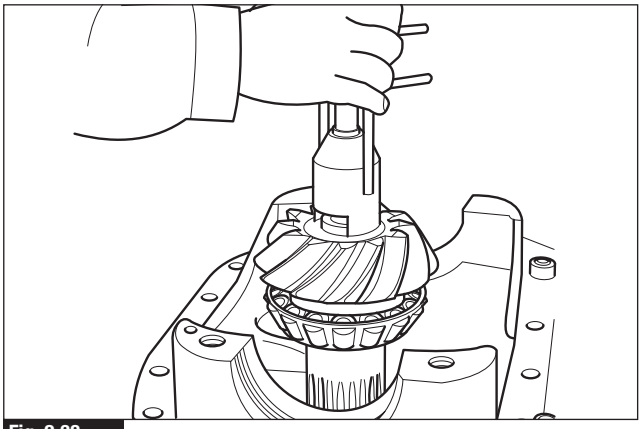


Fig. 2.38

Withdraw the pinion, the bearing assembly and helical spur gear.
(MST 4403 - CT17)

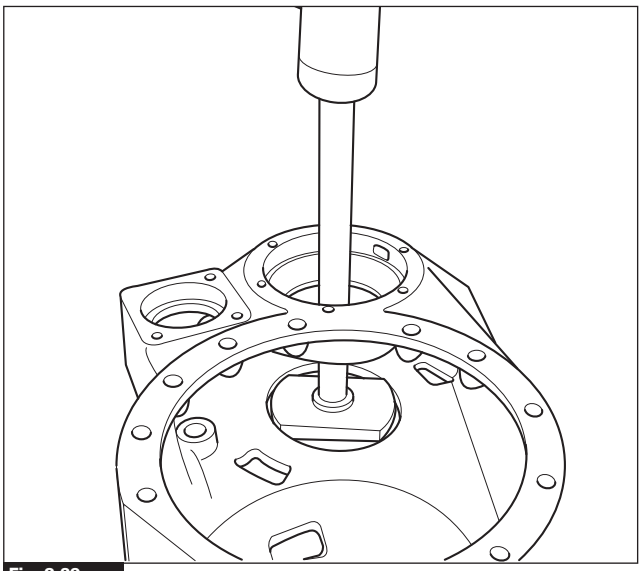


Fig. 2.39

Drive out pinion bearing cups – using a purpose made drift of the correct diameter.

(MST4404 - CT18)

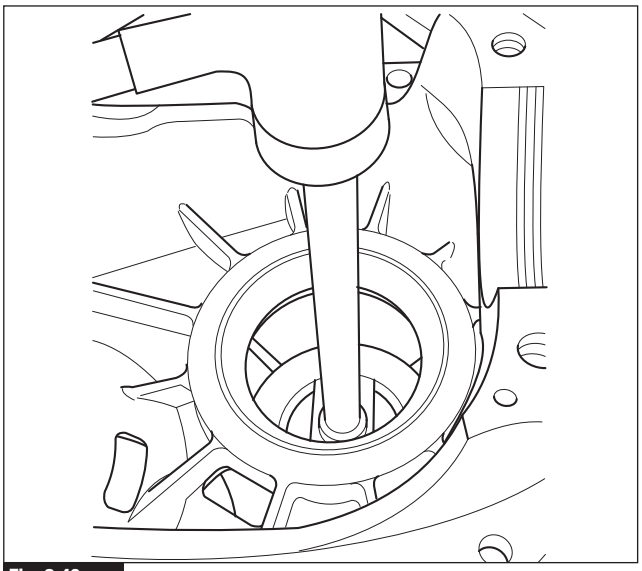


Fig. 2.40

(MST4405 - CT19)

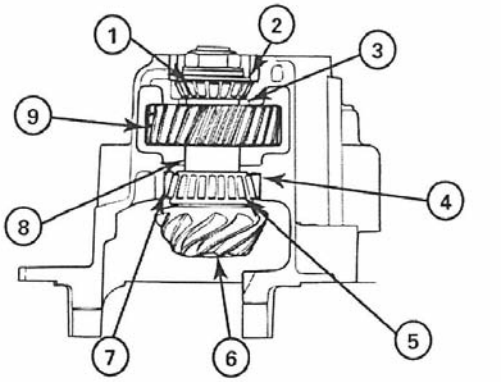
Carrier Rebuild Procedure

Shim pack calculation

Gear Set replacement only

If the original ring gerar and drive pinion are being installed, refer to Assemble and Install the Drive Pinion Assembly. If a new ring gear and drive pinion are installed, the correct thickness of the shim pack between the inner bearing cup and the carrier must be determined. - Fig. 2.41

Refer to the following procedure.



1 - Outer Bearing Cone
2 - Outer Bearing Cup
3 - Spacer
4 - Shims
5 - Inner Bearing Cone
6 - Drive Pinion
7 - Inner Bearing Cup
8 - Spacer
9 - Helical Driven Gear

Fig. 2.41

Each drive gear is marked with a variation number (PC number) that indicates the nominal assembly distance. Use this umber to calculate the thickness of the shim pack between the pinion bearing cage and differential carrier. This variation number is stamped on outer face of the drive gear.

For example PC + 0.1 mm or PC - 0.1 mm

Use the value obtained in Example 2 in Table A to calculate the thickness of the shim pack to install between the bearing cup and the differential carrier.

Shims between the differential carrier and inner bearing cup are available in thicknesses of 0.125/0.200/0.500 mm (0.005-/0.008-/0.020-inch).

Use this procedure if you'll install a new drive pinion or ring gear set, or if you have to adjust the depth of the original drive pinion.

1. Use a micrometer or a gauge to measure the thickness of the shim pack that you removed from under the inner bearing cup. Record the measurement. - Fig. 2.42

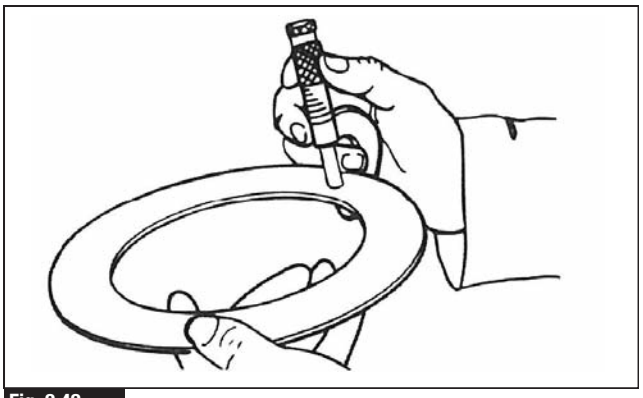
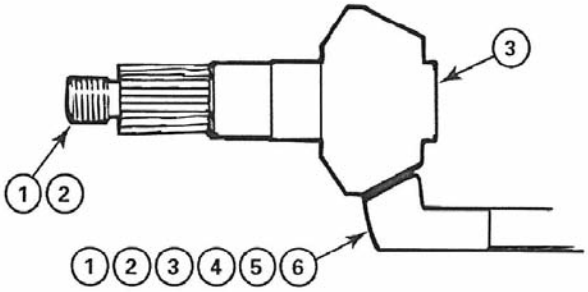


Fig. 2.42

2. Find the pinion cone (PC) variation number on the drive pinion you'll replace. Fig. 2.43 and Fig. 2.44
   Record the number for use later. The PC number can be one of the following values. Refer to calculate Shim Pack Thickness.
   - 0.000-inch (a thousandth of an inch)
   - PC +3 = 0.076 mm (0.003-inch)
   - PC -3 = 0.076 mm (0.003-inch)
3. If you can't find the PC number or it's unreadable, install a new shim pack of the same thickness that you measured in Step 1.
4. Inspect the gear tooth contact pattern. Refer to Inspect the Gear Set Tooth Contact Patterns (Backlash) in this section.
5. Find the PC variation on the new drive pinion you'll install. Record the number. Refer to Calculate Shim Pack Thickness in this section.



1 - Part number
2 - Tooth combination number
3 - Pinion Drive Gear pair set number
4 - Variation number
5 - Pinion Drive Gear set manufacturing and testing date, month/year
6 - Pinion Drive Gear set nominal backlash value

Fig. 2.43

Calculate Shim Pack Thickness

1. **If the old PC number for a forward tandem carrier is plus (+):**
   Add the PC number to the thickness of the old shim pack that you measured in Step 1

2. **If the old PC number for a forward tandem carrier is minus (-)**
   Subtract the PC number from the thickness of the old shim pack that you measured in Step 1

3. **If the new PC number for a forward tandem carrier is plus (+):**
   Subtract the number from the standard shim pack thickness that you calculated in Step 1 or 2. Use new shims to make a shim pack to the correct thickness.
   Refer to Table A.

4. **If the new PC number for a forward tandem carrier is minus (-):**
   Add the number from the standard shim pack thickness that you calculated in Step 1 or 2. Use new shims to make a shim pack to the correct thickness.
   Refer to Table A.

TABLE A

Example	mm	Inches
1. Old Shim Pack Thickness	0.76	0.030
Old PC number, PC +0.05	+0.05	+0.002
Resulting Value	0.81	0.032
New PC Number, PC +0.12	-0.12	-0.005
New Shim Pack Thickness	0.69	0.027
2. Old Shim Pack Thickness	0.76	0.030
Old PC number, PC -0.05	-0.05	-0.002
Resulting Value	0.71	0.028
New PC Number, PC +0.12	-0.12	-0.005
New Shim Pack Thickness	0.59	0.023
3. Old Shim Pack Thickness	0.76	0.030
Old PC number, PC +0.05	+0.05	+0.002
Resulting Value	0.81	0.032
New PC Number, PC -0.12	+0.12	+0.005
New Shim Pack Thickness	0.93	0.037
4. Old Shim Pack Thickness	0.76	0.030
Old PC number, PC -0.05	-0.05	-0.002
Resulting Value	0.71	0.028
New PC Number, PC -0.12	+0.12	+0.005
New Shim Pack Thickness	0.83	0.033

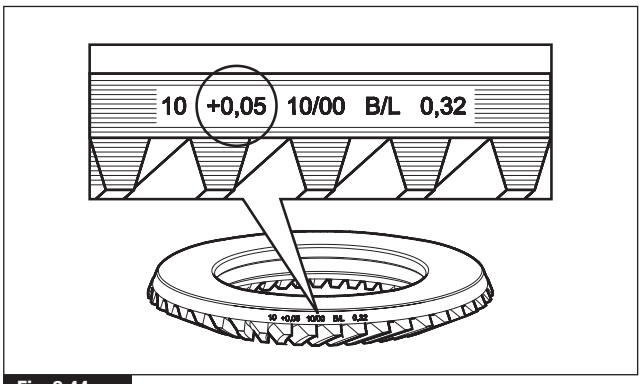


Fig. 2.44

Gear Set and Pinion's Bearings Replacement Only

A procedure must carried out to determine the Shim thickness to be used for the correct stack height from the centre line of the crown wheel to the inner pinion bearing cup as **when we replace pinion's bearings.**

Dimension "B" is the shim pack thickness to be determined as formula.

Dimension "B" calculation

B = 41.0 - E + F - H
E = Width of the Forward Pinion Bearing Assy
F = Value in triangle stamped on Carrier face
H = PC value marked on Pinion.
All dimension are in mm

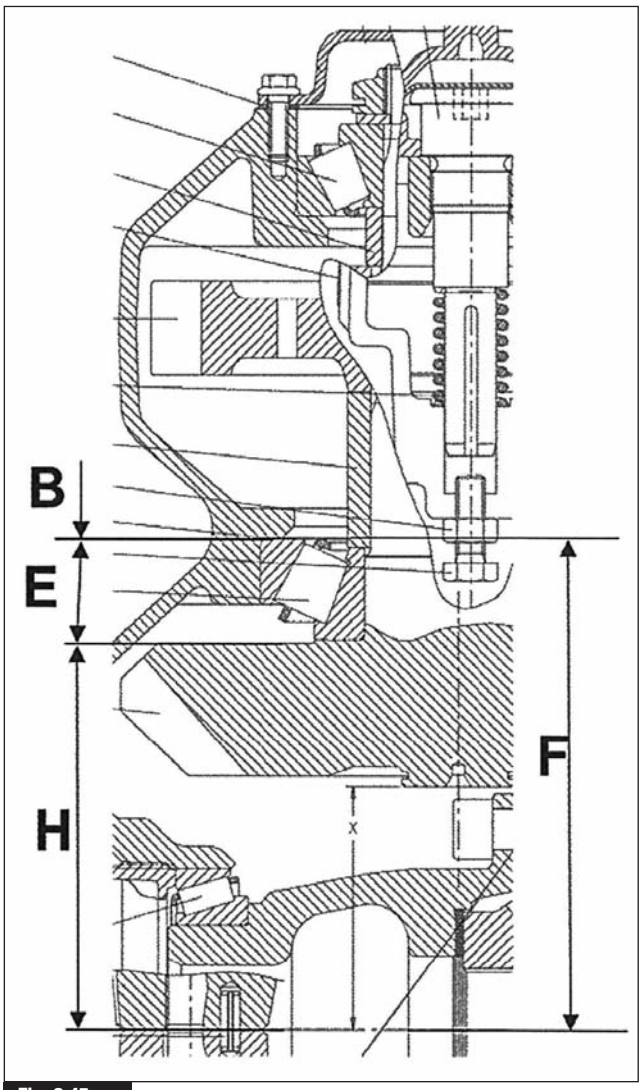


Fig. 2.45

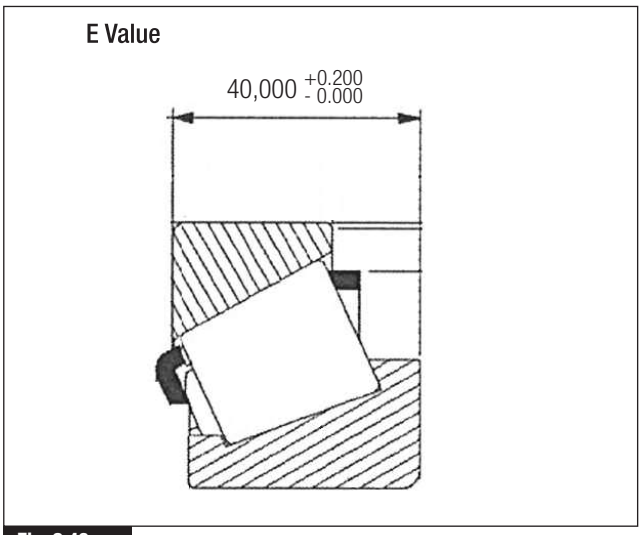


Fig. 2.46

In order to determine the shim thickness, the following formula applies:

E: 40.18 mm

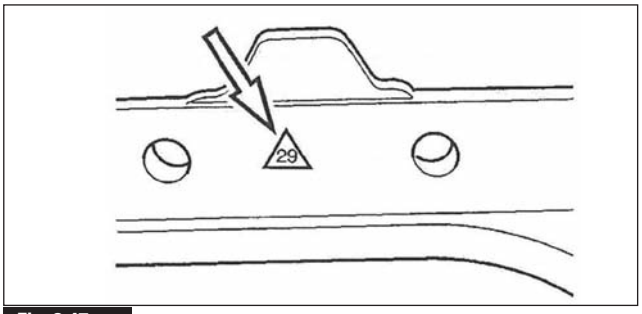


Fig. 2.47

F = Carrier distance tolerance stamped on Carrier face:
29/100 = + 0.29 mm

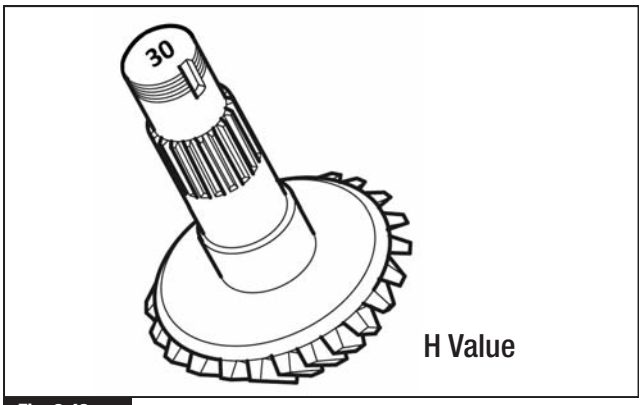


Fig. 2.48

H = PC - Value marked on Pinion or drive gear:
30/100 = + 0.30 mm

Final Shim Pack Thickness

B = 41.0 - E + F - H
E = + 40.18 mm
F = + 0.29 mm
H = + 0.30 mm

B= 41.0-40.18+0.29-0.30 = +0.81 mm

NOTE: If "H" value is negative add instead to subtract the value (algebraic expressions)

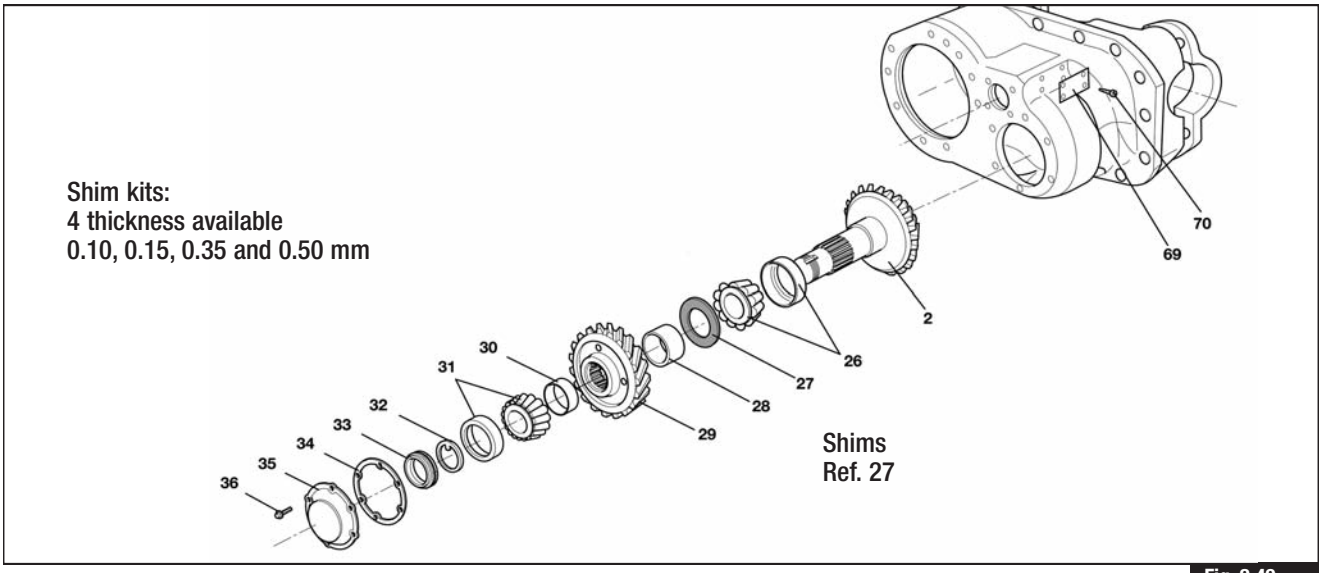


Fig. 2.49

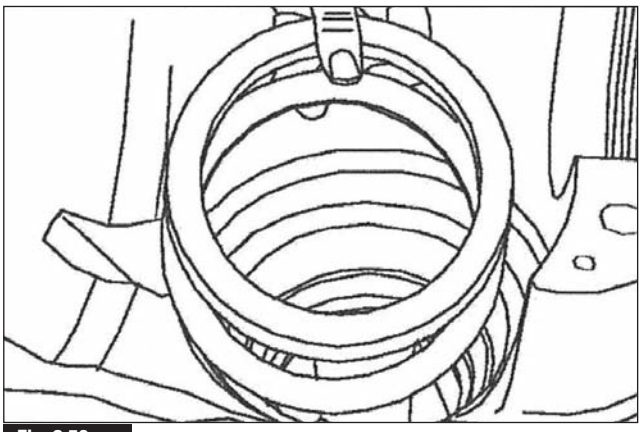


Fig. 2.50

Having established the value of shim thickness “B”, insert shims into the carrier bearing journal.

Calculating the Preload Spacer

In the DT100 there are 2 different spacers. The first one is present in the position 28.

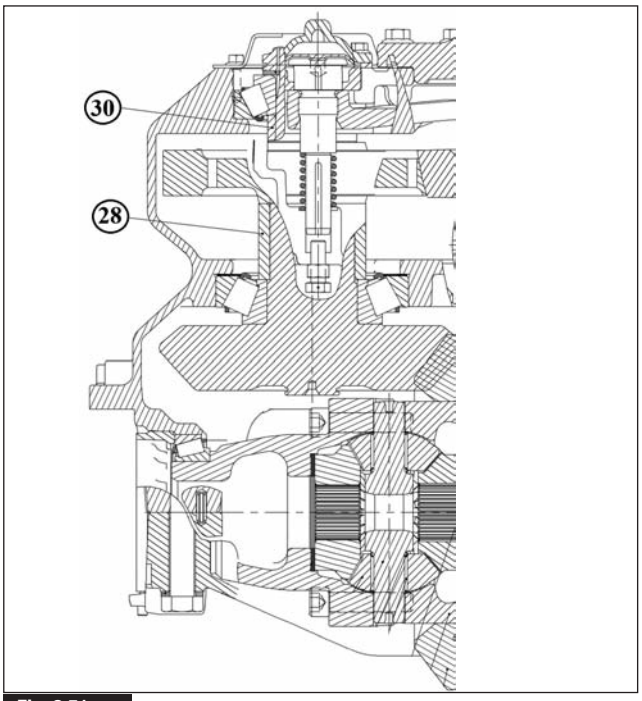


Fig. 2.51

Do not scrap the spacer. It is specific for each carrier.

NOTE: In case the spacer is damaged use another spacer but with the same dimension.

NOTE: The kit contains three different dimensions of the spacer. Choose the same dimension present in the original carrier assembly:

“d” (mm)	P/N ref. (Pos. 28)
63.3	1524870
62.8	1525996
62.3	1525997

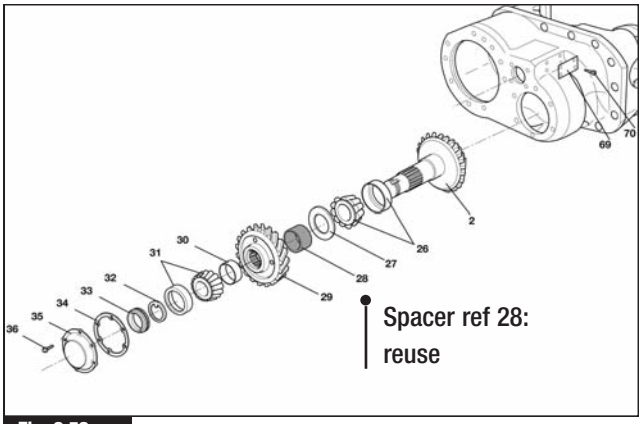


Fig. 2.52

The second spacer is in position 30 (See details in Section 9)

The max spacer dimension is the Masterspacer: 23.44 mm

A method to assemble the bearings with the correct preload is to measure the end play of pinion using

Masterspacer 23.44mm

Tightening the nut to prescribe torque and measured the end play = **X mm.**

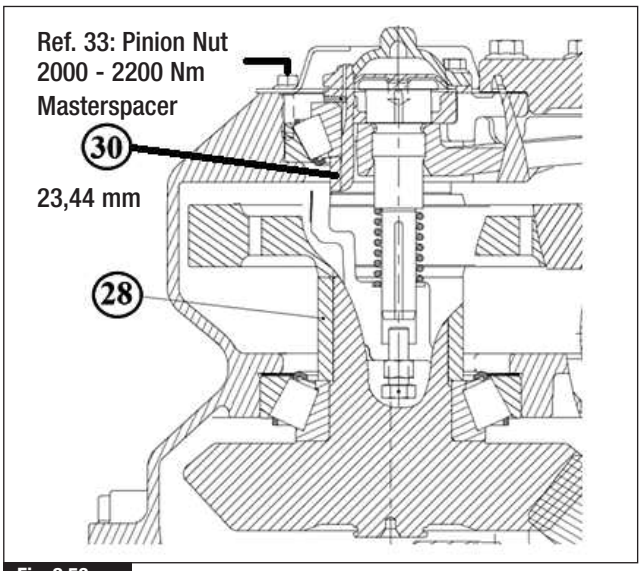


Fig. 2.53

Calculated spacer formula:

Calculated spacer = Masterspacer - (x + K)

Where: Masterspacer = 23.44mm

x = End play measured (e.g. 0.06mm)

K = 0.04mm constant value

Calculated spacer = Masterspacer - (x + K)
= 23.44 - (0.06+0.04) = 23.34mm

From Section 9 it is possible to use the spacer with the same value or, if the exact dimension is not available, it is necessary to use the closest one.

The preload is checked turning the pinion through the Pinion Nut (without seal).

Requested value **without companion flange: 6Nm ± 2Nm.**

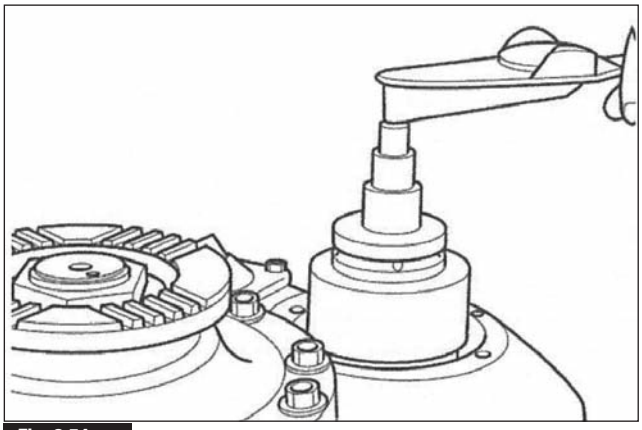


Fig. 2.54

For final value see chapter "Rebuilt procedure" section.

Ref. final torque check **with input shaft and seal.** Using a torque wrench on the pinion stem nut, measure the break torque required to rotate the shaft and drive train.

The torque should be between **8 ÷ 20Nm.**

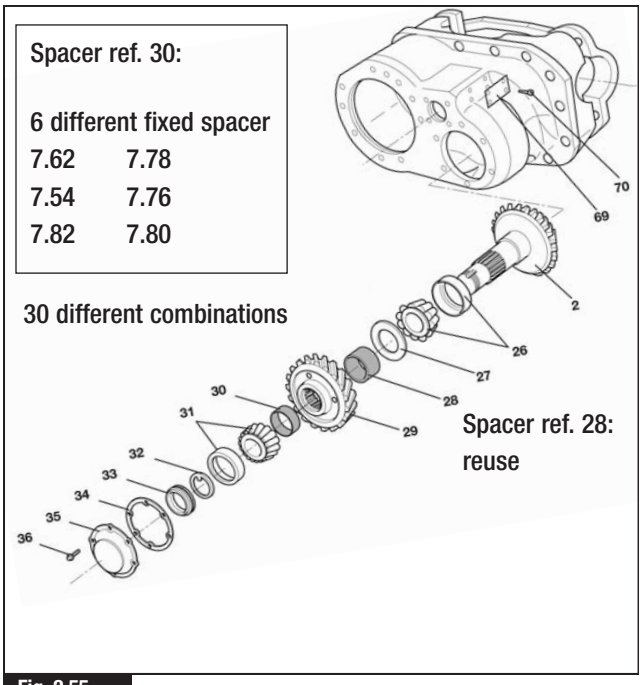


Fig. 2.55

⚠ WARNING

Carefully inspect all parts for damage - cracks - and wear. In case of doubt as to suitability for continued service, discard the part and replace with new.

⚠ WARNING

Meritor recommends that all seals, bearings, and split pins, and certain key fasteners are replaced with new items to ensure reliability in future service.

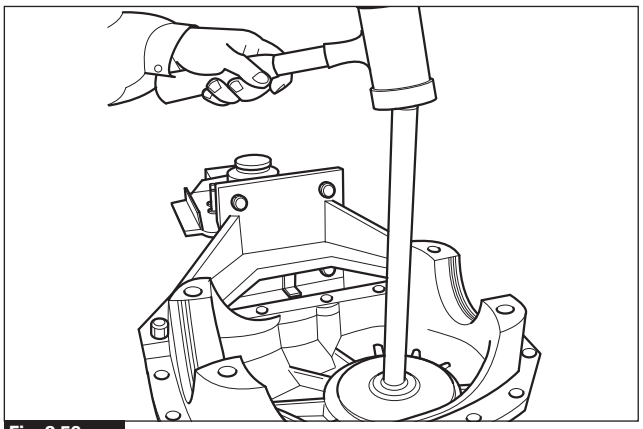


Fig. 2.56

With the carrier in its fixture - output side uppermost - place helical spur gear in position in the carrier casting.

NOTE: The gear must be oriented so that the chamfer on the internal splines faces the pinion head.

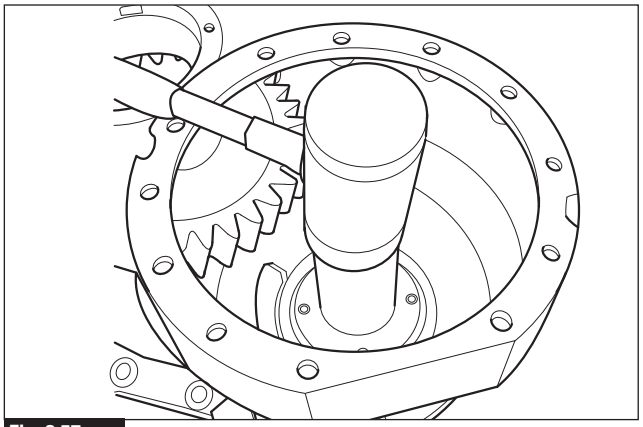


Fig. 2.57

Drive a new pinion bearing cups into position using a purpose made driver of the correct diameter.
Drive squarely until fully seated.

Drive a new bearing cup into position using a purpose made driver of the correct diameter. Drive squarely until fully seated.

Determine the length of the spacer

NOTE: See Appendix 2 for details of how to select the length of this spacer which governs the preload on the pinion bearings.

Fit new bearing on the pinion stem and press into position.

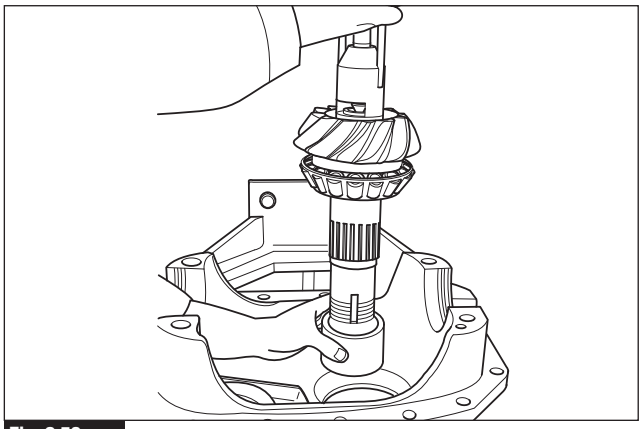


Fig. 2.58

Fit the pinion and spacer in position through the helical gear engaging the splines in the helical gear.

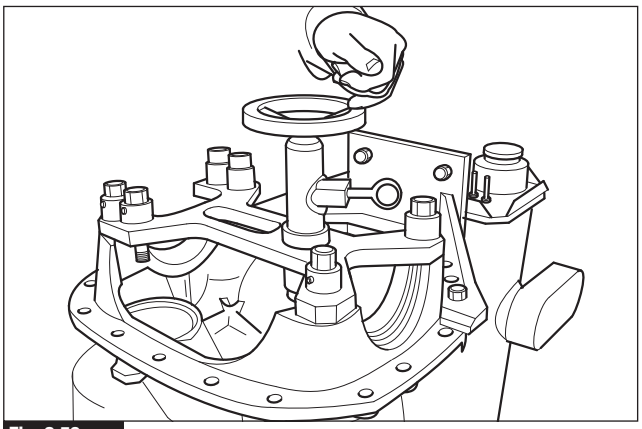


Fig. 2.59

Fit holding fixture (MST 4402 - CT15) in place - using the four carrier cap bolts and invert the drive unit to allow access to the input side of the unit.

Drive the helical gear down onto the splines of the pinion - using a suitable sleeve.

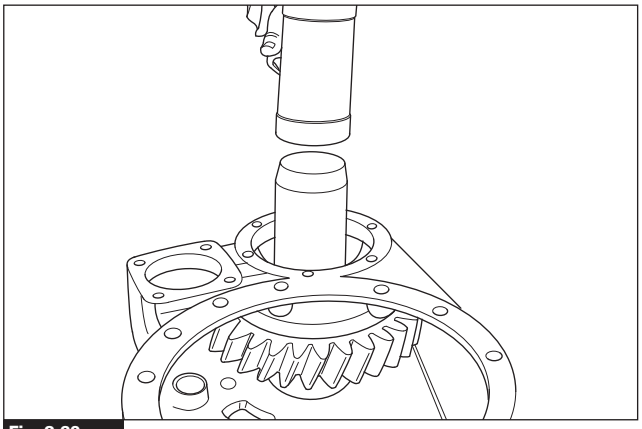


Fig. 2.60

Fit spacer and new bearing.

Drive the bearing into its seat using a suitable sleeve or driver.
Tool MST 4409 - CT25

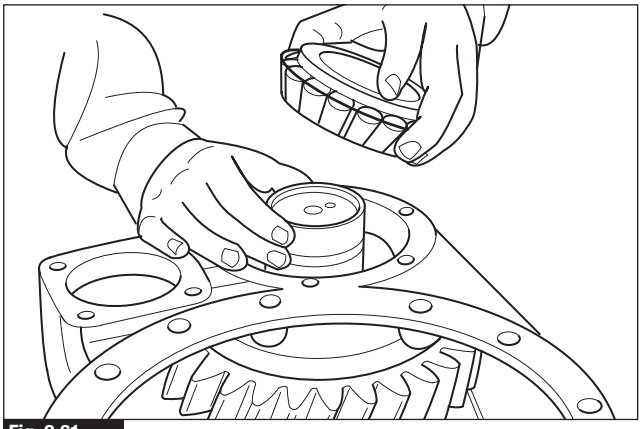


Fig. 2.61

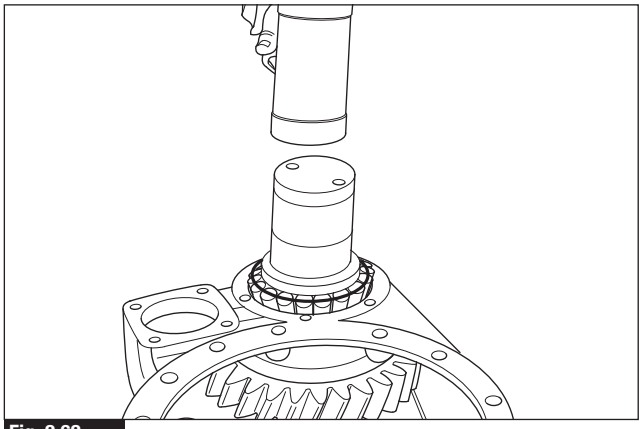


Fig. 2.62

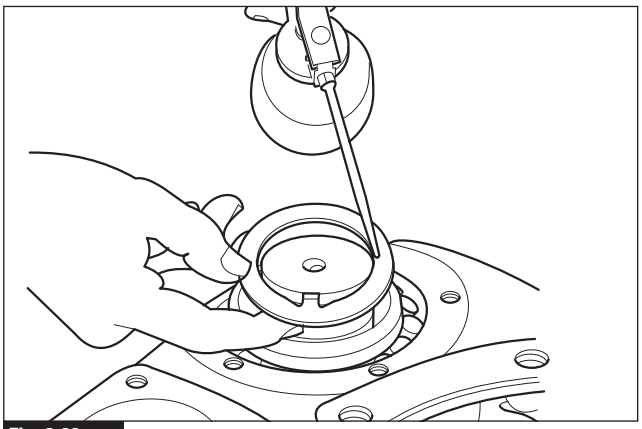


Fig. 2.63

Fit locking washer and lubricate with oil.

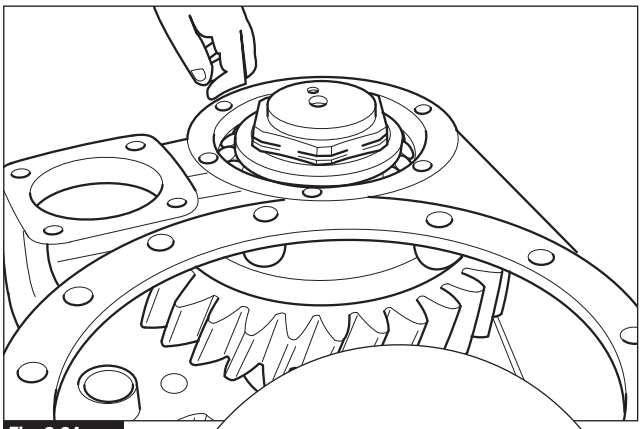
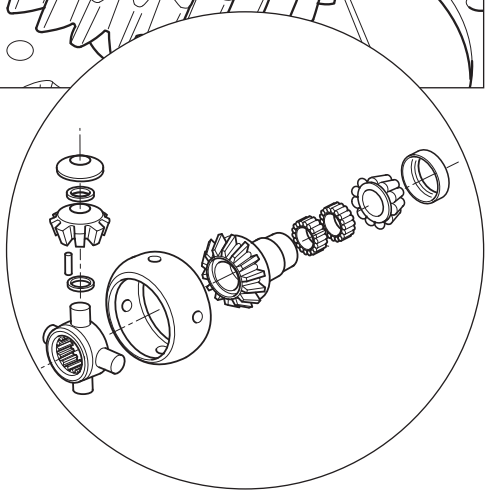


Fig. 2.64

Fit locking nut using lubricant.

Press new bearing onto the differential side gear and place side gear in position.



Lubricate teeth thoroughly with grease and bearing cone with axle oil.

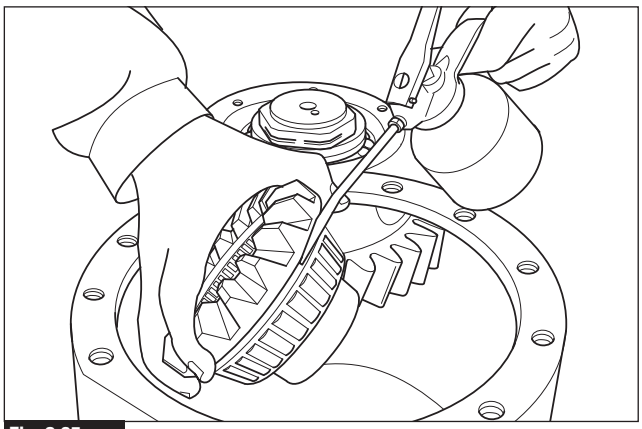


Fig. 2.65

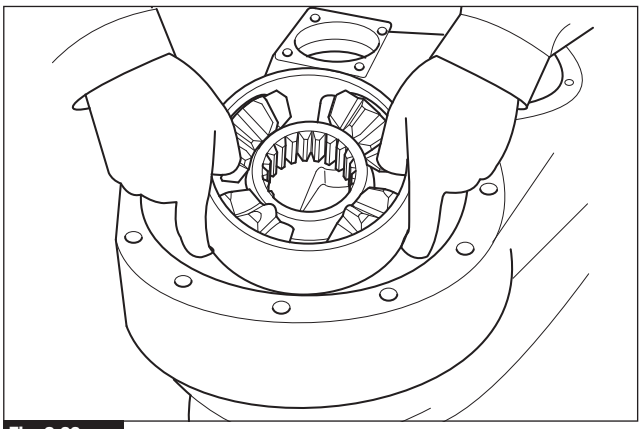


Fig. 2.66

Fit new needle roller bearings in the side gear and lubricate thoroughly with grease.

Replace needle bearings in the differential nest pinions, lubricate thoroughly and assemble onto the differential spider.

Place differential nest in position on the side gear.

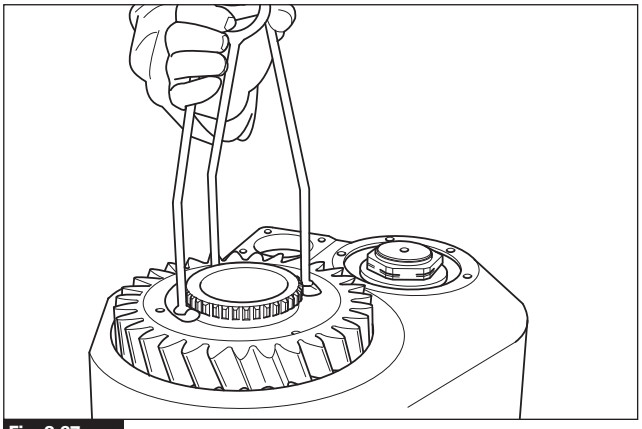


Fig. 2.67

Place helical gear in position on the differential nest - with the side gear teeth engaged in the differential nest pinions.

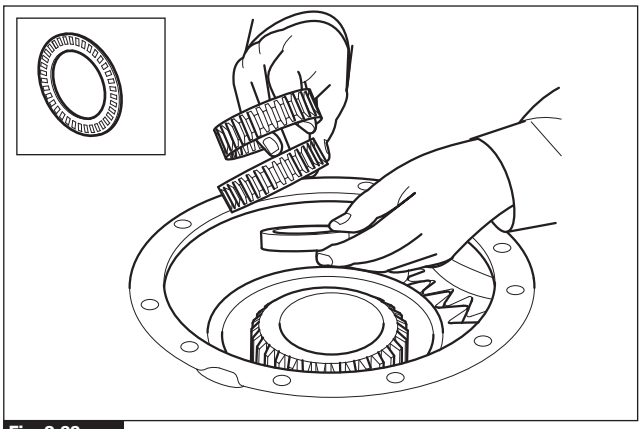


Fig. 2.68

Lubricate the inner bore of the gear and fit spacer sleeve followed by two needle roller assemblies.

Lubricate and place needle roller thrust bearing in position on the helical gear.

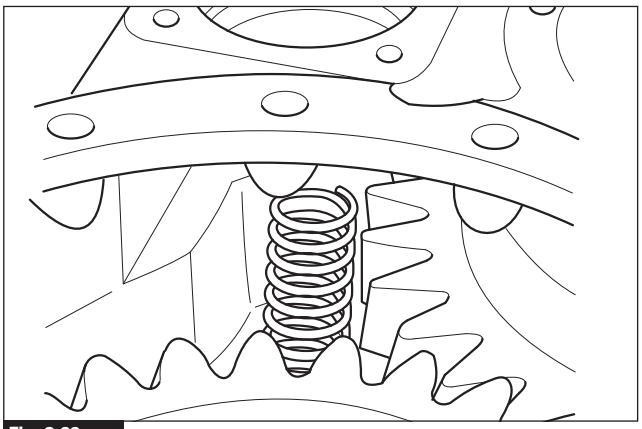


Fig. 2.69

Fit spring in the differential lock actuator bore.

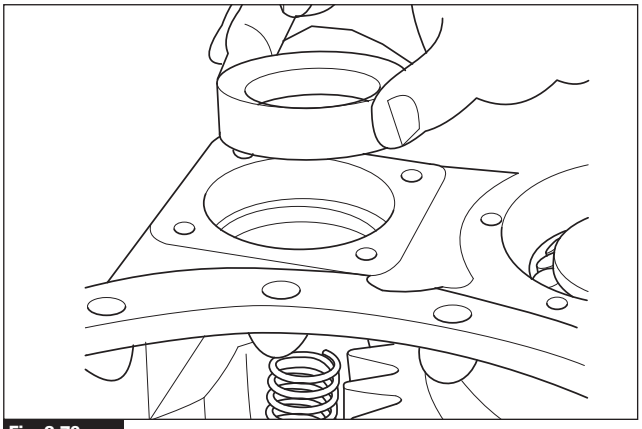


Fig. 2.70

Place the diaphragm seat collar in position.

Lubricate the inter-axle differential lock splined collar engage with differential actuating fork and locate the assembly in position.

Apply thread locking compound (Loctite 243) to the threads on the differential lock piston.

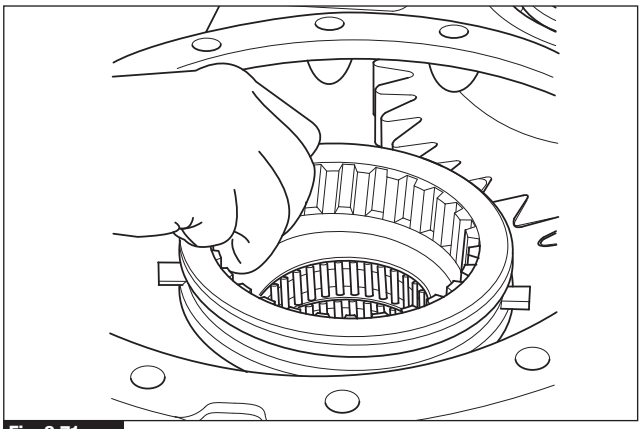


Fig. 2.71

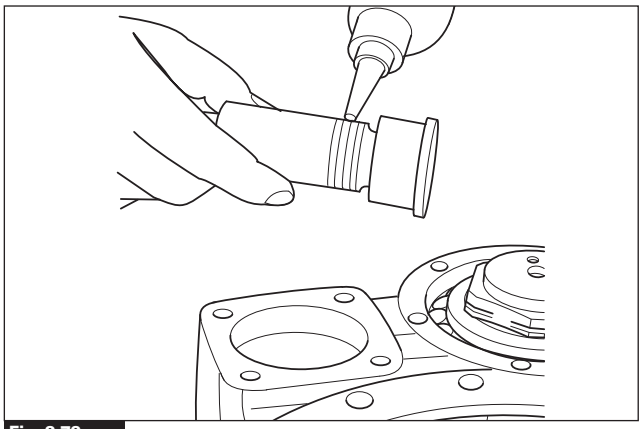


Fig. 2.72

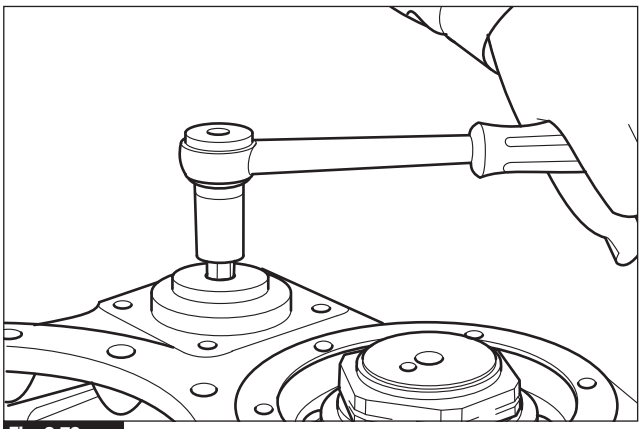


Fig. 2.73

Fit the differential lock piston in position engaging the threads in the differential lock fork and screw the piston using the hexagon socket head to a torque of 200 ± 20Nm.

Press new bearing cone onto the input shaft and cup on input bearing cage.

Place input shaft and bearings in position engaging the splines in the gear and differential collar.

Clean the gasket face of the drive unit - scraping clean of all debris - old sealing compound, etc, to produce a clean smooth mating surface.

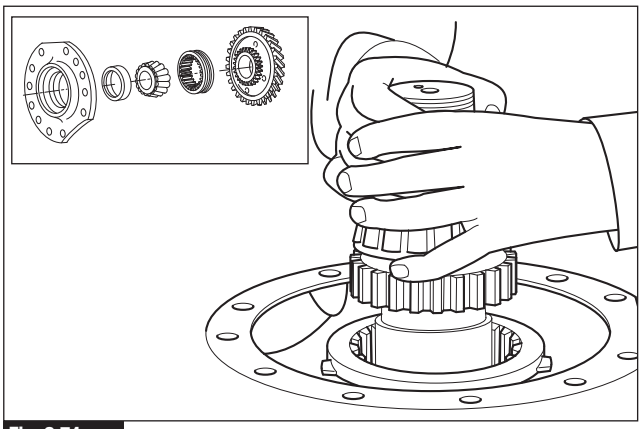


Fig. 2.74

Apply sealing compound (Dowcorning 7091), in a continuous bead around the gasket face, inside the screw hole positions.

Fit two locating dowels in diametrically opposite positions.

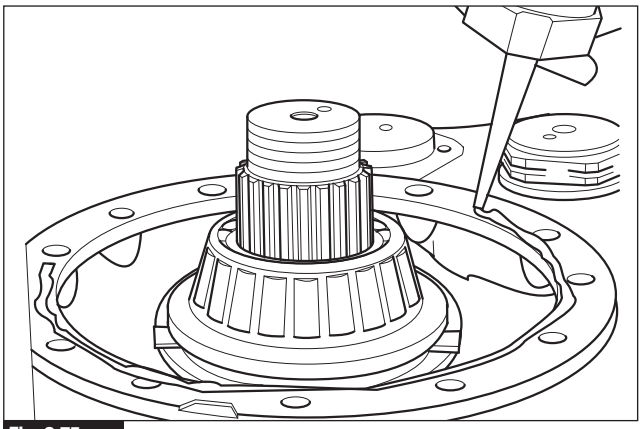


Fig. 2.75

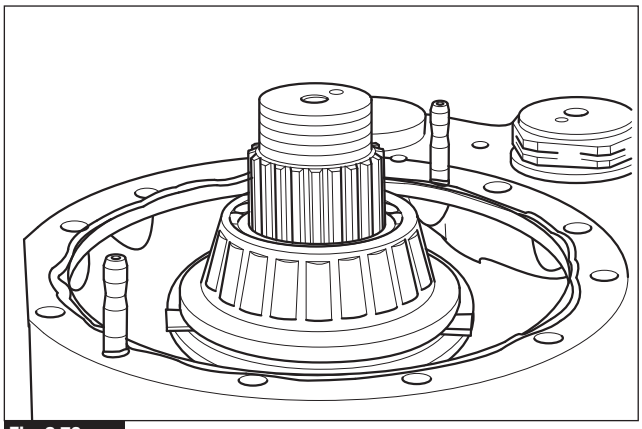


Fig. 2.76

Locate shims in position on the sealing compound.

The thickness of this shim pack determines the end float on the input shaft bearings.

See App. 3 for details of how to set the thickness.

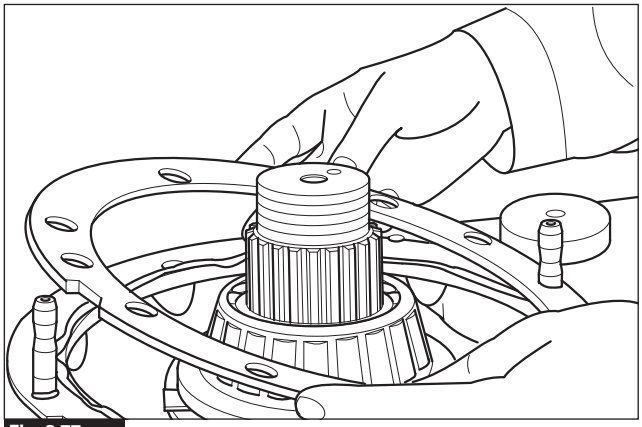


Fig. 2.77

Fit the bearing housing cover plate in position on the two locating dowels.

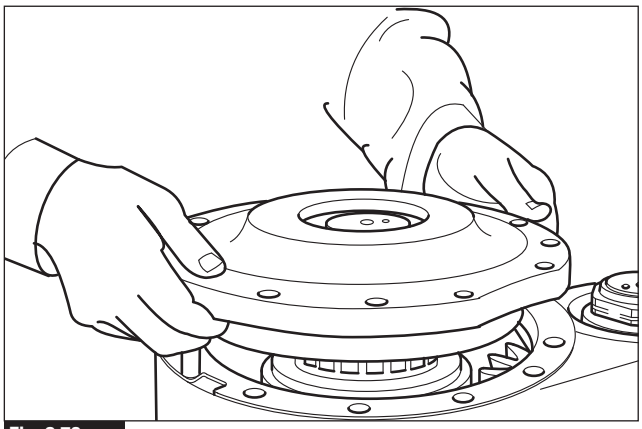


Fig. 2.78

Fit and cross tighten the cover plate fasteners - tightening to a torque of 85 ± 10 Nm.

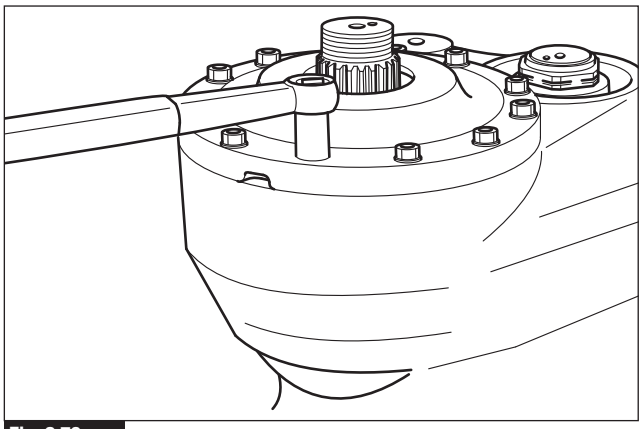


Fig. 2.79

Fit the differential lock diaphragm and cover (note correct orientation) - ensuring firstly that the piston is free and can be depressed slightly by hand.

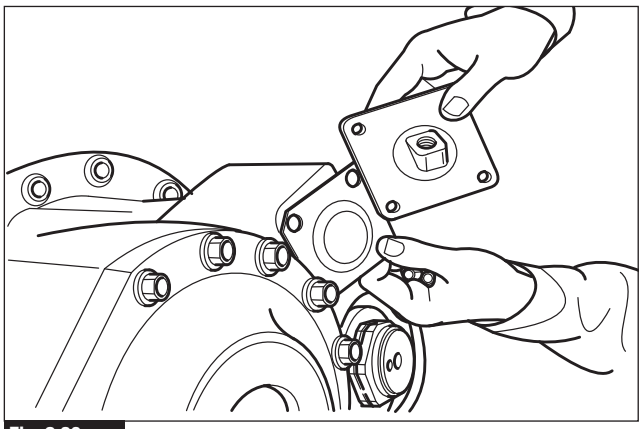


Fig. 2.80

Fit the air adapter elbow connector to the differential lock cover, and cross tighten the cover plate fasteners to a torque of 20 ± 5 Nm.

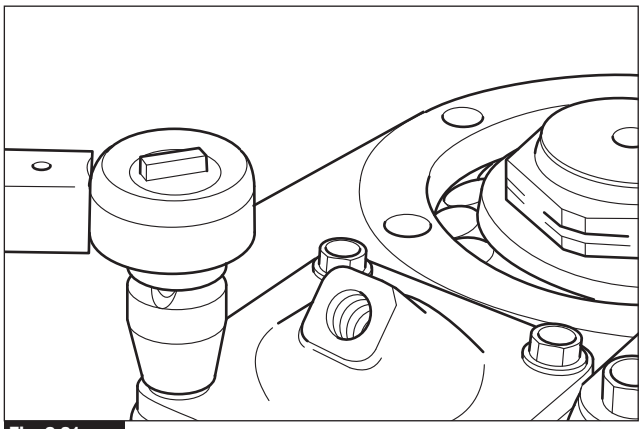


Fig. 2.81

Unscrew the differential lock cover plate bolts and remove the cover plate.

Block the rotation of the input flange with a suitable tool fastened to the drive flange, engage the inter-axle differential lock by applying air pressure (at around 6 bar), and tighten the flange retaining nut to a torque of 1200 ± 200 Nm.

Tighten the pinion stem retaining nut to a torque of 2000 ± 200 Nm.

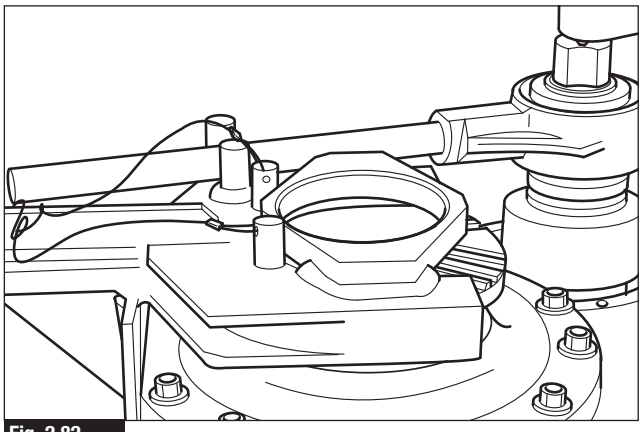


Fig. 2.82

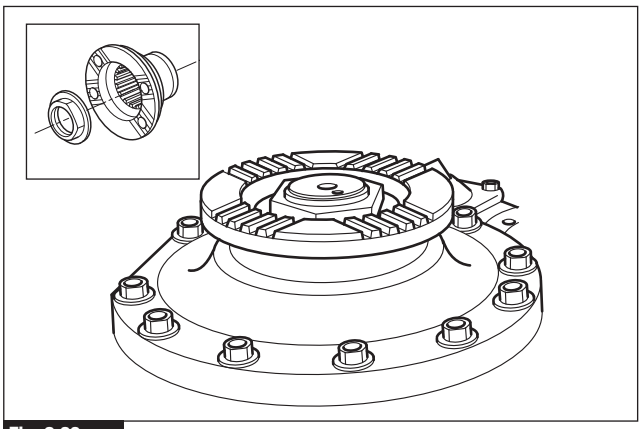


Fig. 2.83

Fit the input drive flange - ensuring that the rear facing seal is lubricated.

Fit the flange retaining nut (do not lubricate).

Measure end float on the input shaft by mounting a Dial Test Indicator (DTI) onto the drive unit casting and lifting the drive flange with a lever. The end play movement should be 0.05 ± 0.04 mm.

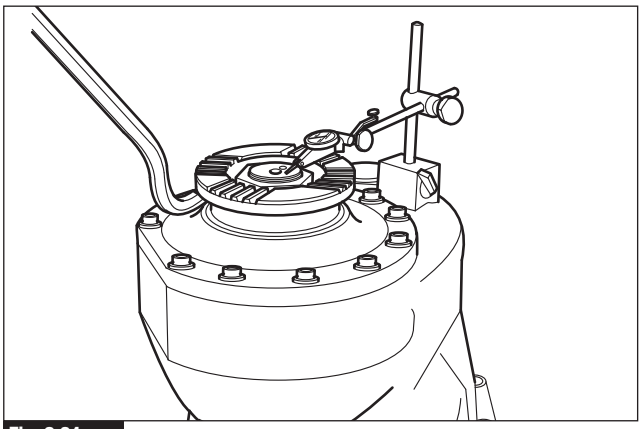


Fig. 2.84

Using a torque wrench on the pinion stem nut, measure the break torque required to rotate the shaft and drive train. The torque should be between 8 to 20 Nm.

Standard Tool 75 mm.

Stake the retaining nuts on the pinion stem and input shaft using a suitably shaped staking tool to deform the nut flange into the staking indentations in two diametrically opposite positions.

The staking deformations should be 3 ± 1 mm deep.

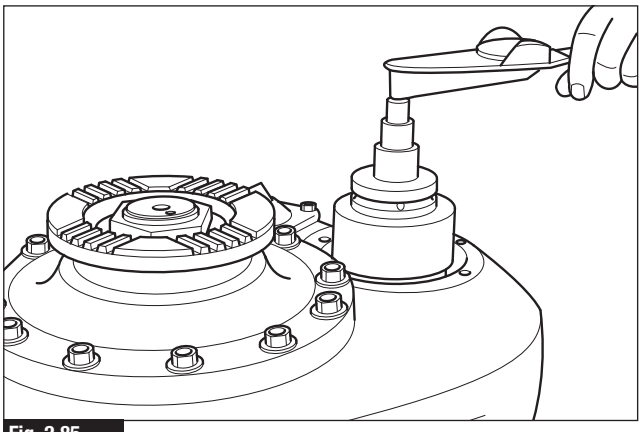


Fig. 2.85

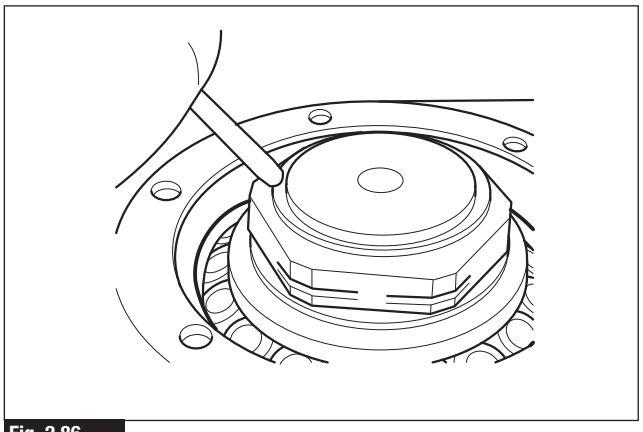


Fig. 2.86

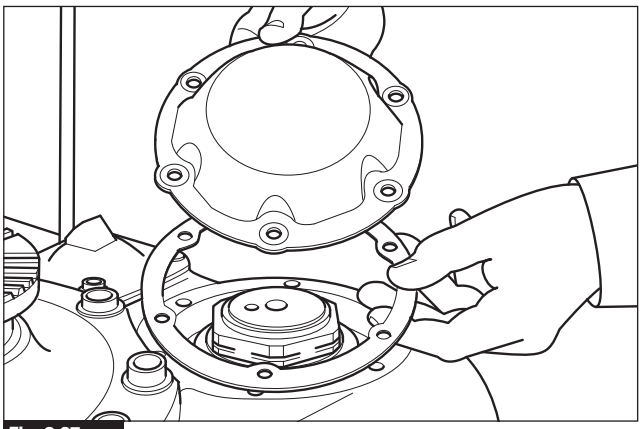


Fig. 2.87

Fit the pinion stem cover plate and new gasket, and fasten down with 6 cap headed screws tightened to a torque of 20 ± 5 Nm.

Fit the ring gear the pin and tighten the screws to a torque of 200 ÷ 20 Nm.

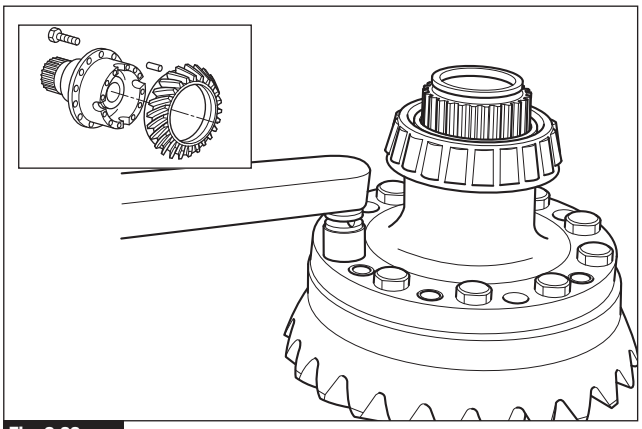


Fig. 2.88

Place a new locking plate on the ring gear carrier and set in position flat against the differential half casing by using a cylindrical drift to hammer down around the ring gear fixing bolts.

Inspect the spider journals and fit new needle bearings in the differential pinions. Lubricate thoroughly.

Place the ring gear and differential case in a holding fixture, and assemble three thrust washers and side gear and the differential nest in position, oiling the parts.

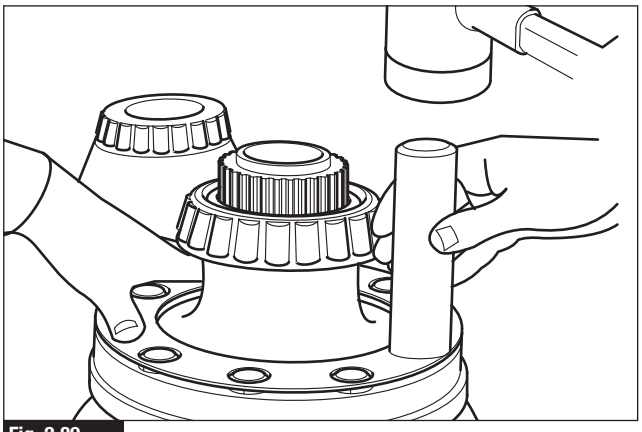


Fig. 2.89

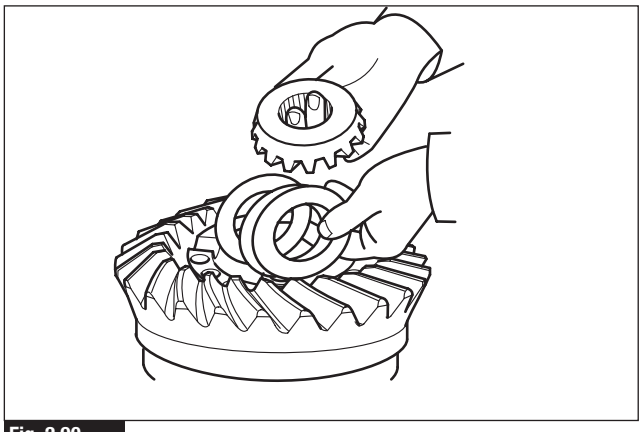


Fig. 2.90

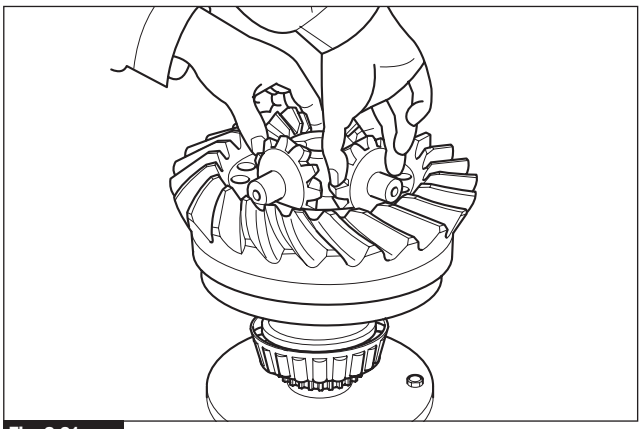


Fig. 2.91

Place differential spider and pinion assembly in position, oiling the parts.

Assemble opposite side gear and three thrust washers in position, oiling the parts.

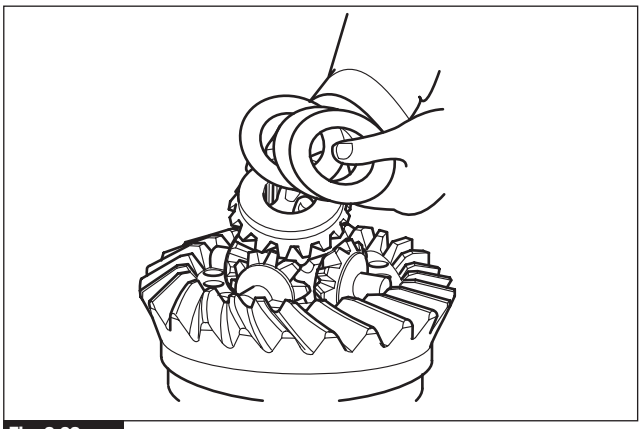


Fig. 2.92

Place second half of the differential case in position.

Fasten the two differential housing halves together using 12 socket headed screws tightened to a torque of 200 ± 20 Nm.

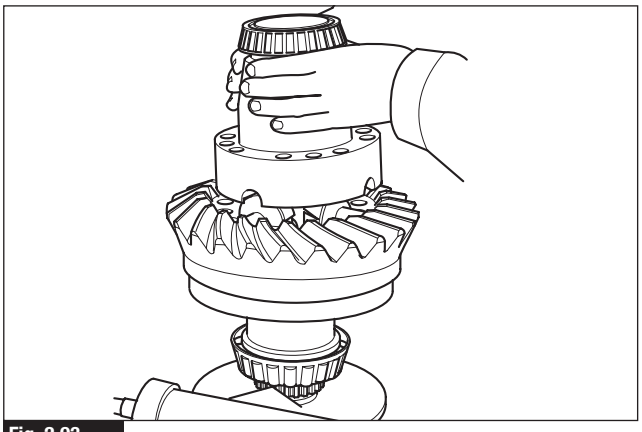


Fig. 2.93

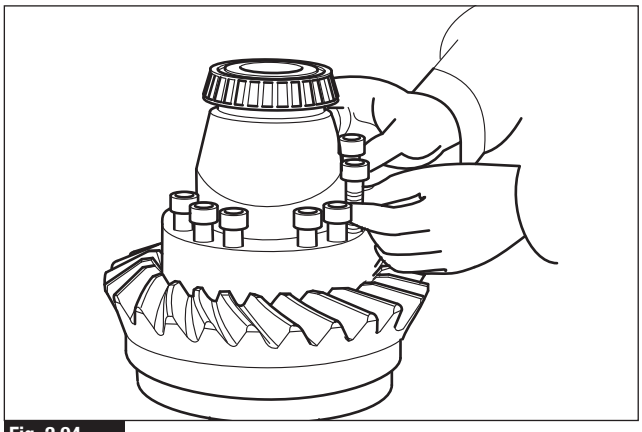


Fig. 2.94

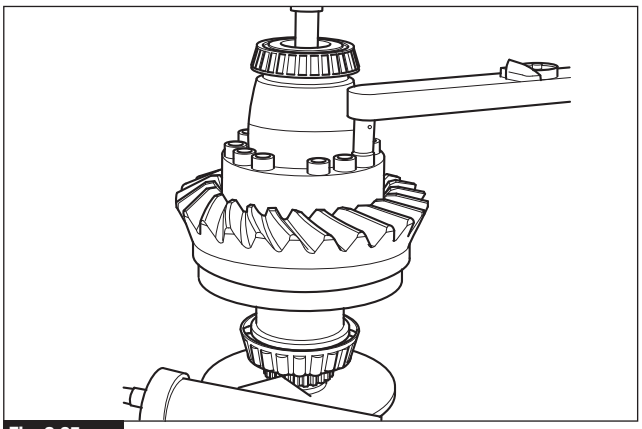


Fig. 2.95

Tighten in cross diameter sequence to a torque of 200 ± 20Nm

Lubricate the bearing seats with oil.

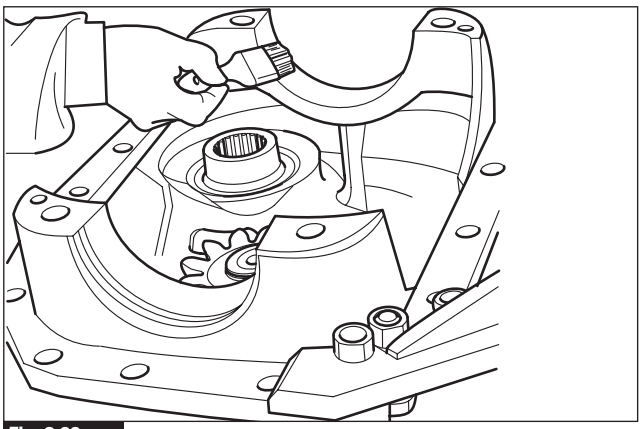


Fig. 2.96

Locate ring gear and differential assembly in position in the carrier.

⚠ WARNING

The use of the hoist must be done by experienced trained staff as an incorrect manoeuvre or faulty connection could cause a serious accident.

Locate new bearing cups on each side.

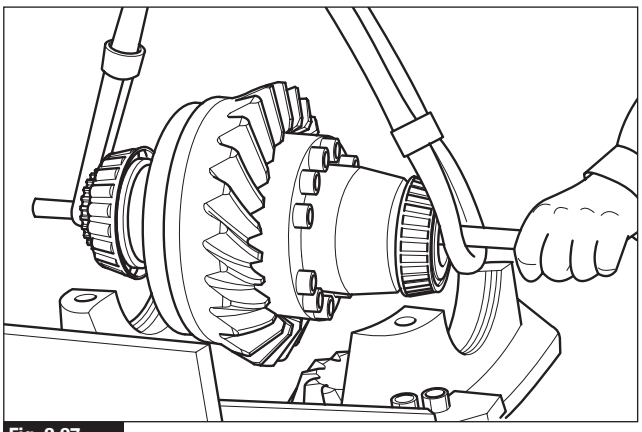


Fig. 2.97

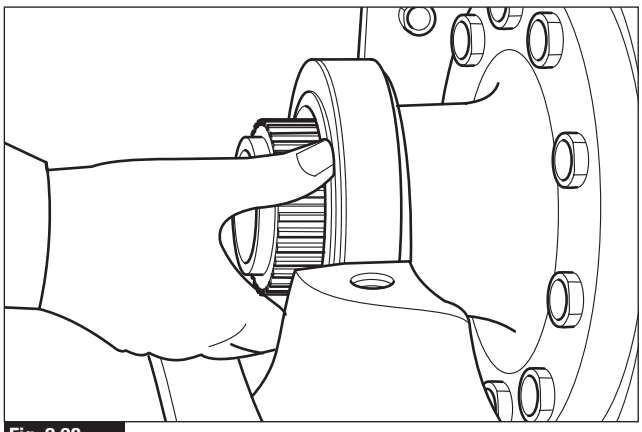


Fig. 2.98

Locate the bearing adjusting rings in their respective threads.

Lubricate the outer surfaces of the bearing cups and adjusters with oil.

Locate the bearing cap casting in position - ensuring that the adjuster threads in each adjuster are engaged correctly.

Fasten the carrier cap casting in place using four bolts cross torqued to 200 ± 20 Nm.

Screw up the differential bearing adjusters to preload the bearings prior to measuring gear backlash. (MST 4411 - CT27)

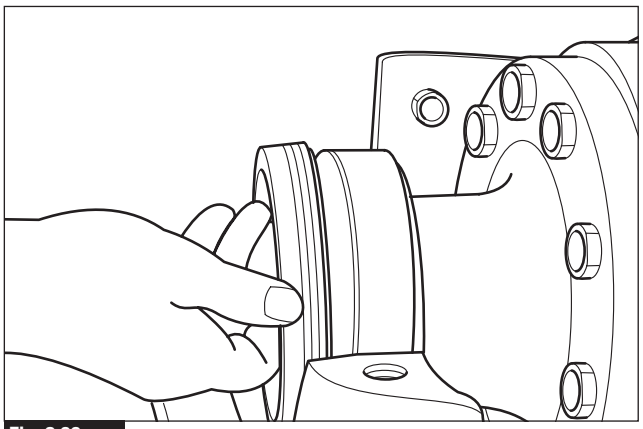


Fig. 2.99

Preload instruction with leg cap bridge

Details of preload instructions

- set gear with 0 backlash;
- set the 2 adjusting rings against the BRGS and mark the position;
- turn back and on the two adjusting rings of the same amount and beat with hammer the caps to set the bearing cups. Set a DTI on the carrier casing and locate the sensor on the face of a tooth on the ring gear.

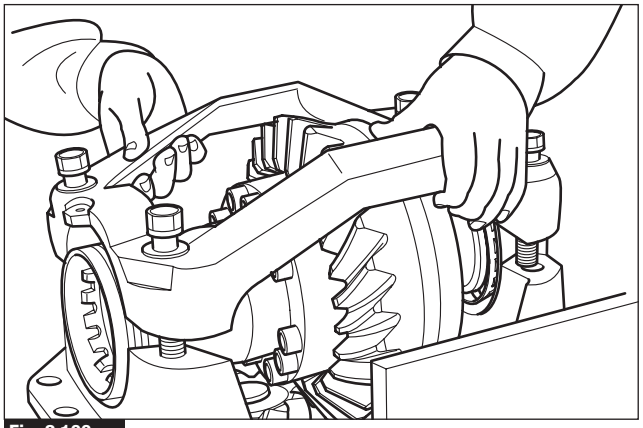


Fig. 2.100

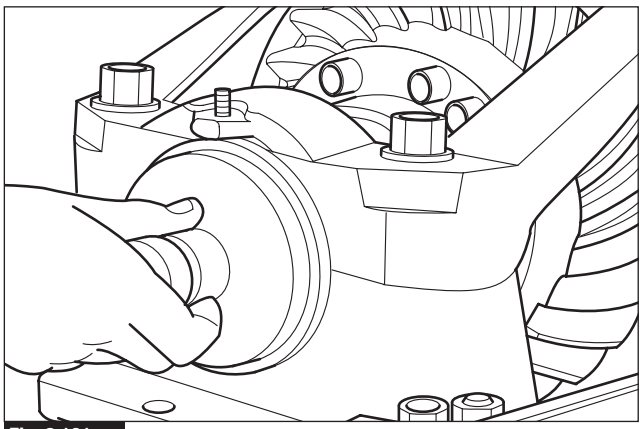


Fig. 2.101

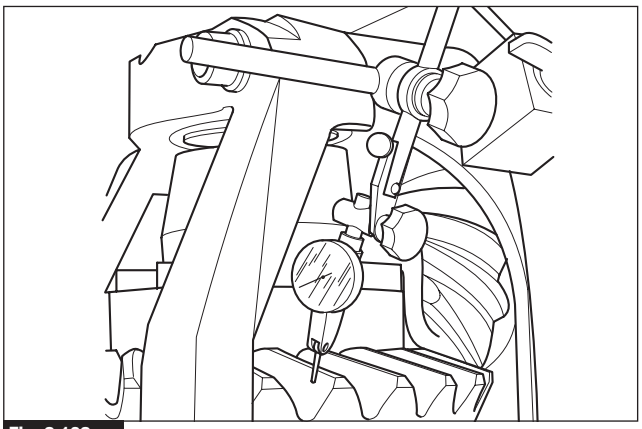


Fig. 2.102

Rock the ring gear back and forth without disturbing the position of the drive pinion in order to measure gear backlash or free movement.

This should be between 0.3 and 0.4 mm

Set a DTI on the carrier casing with the indicator probe in contact with the end of the pinion stem.

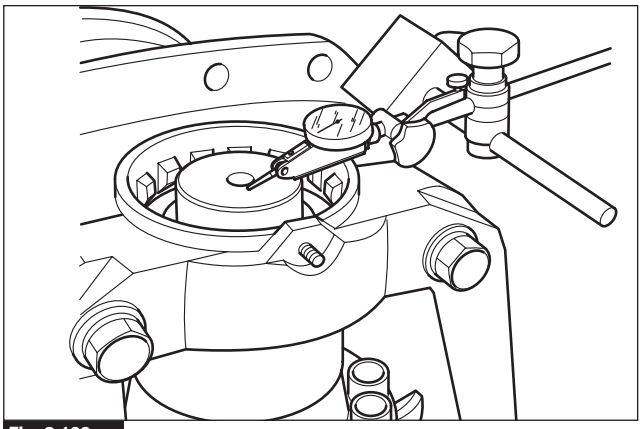


Fig. 2.103

Lever up the crown wheel - and measure the axial movement on the DTI - this should be 0.02 - 0.1mm

No bearing preload is allowed.

Retighten the carrier cap bolts by turning clockwise a further 90 deg ± 5 deg. (i.e. a total of 200 Nm plus 90 deg)

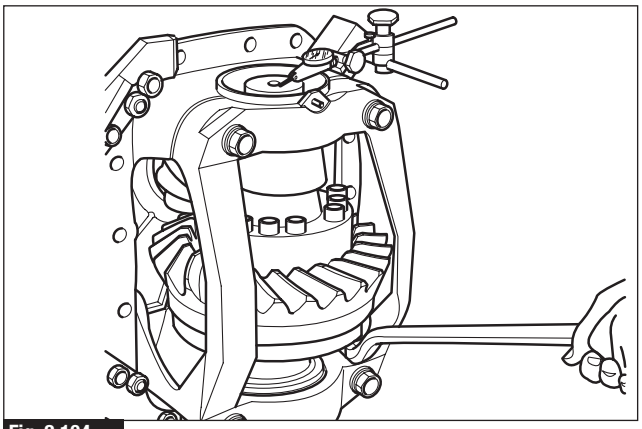


Fig. 2.104

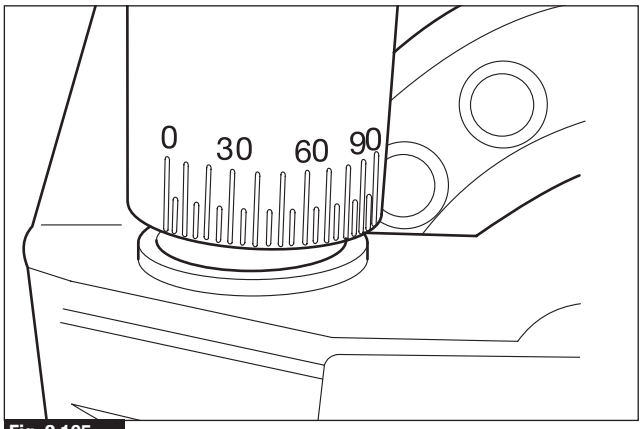


Fig. 2.105

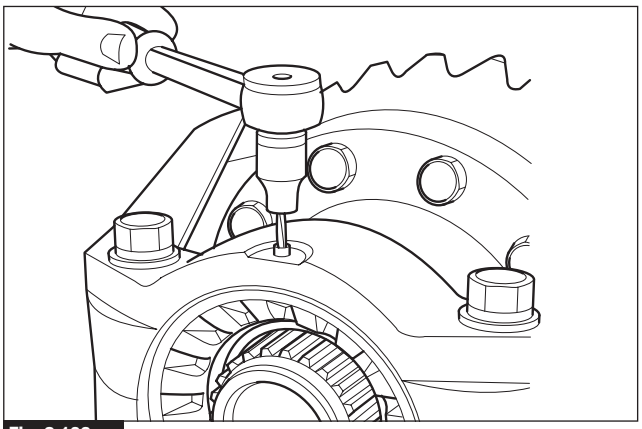


Fig. 2.106

Apply thread locking compound to the bearing adjuster set screws, and tighten to a torque of 20 ± 5 Nm

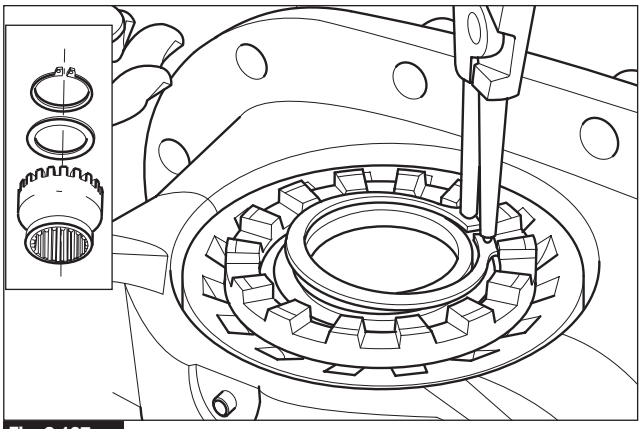


Fig. 2.107

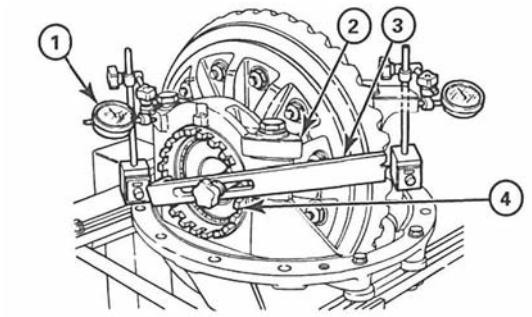
Fit differential lock dog clutch spacer and retain with circlip.

Preload instruction without leg cap bridge

Details of preload instructions

Method one

1. Place two dial indicators in central and crossways positions onto the outer machined faces of the caps. Fig. 2.108
2. Use a wrench to tighten bearing adjusting rings until pinion-to-drive gear end play and backlash readings are **zero**. Check that the drive gear is not tight against the pinion.
3. When backlash and end play are **zero**, continue tightening both adjusting rings until the cap expansion reading is between 0.05-0.20 mm (0.002-0.008-inch). This measurement is the sum of readings on both dial gauges.



1 - Dial indicator
2 - Bearing Cap
3 - Adjusting Ring Wrench
4 - Adjusting Ring

Fig. 2.108

Adjust Differential Bearings Preload

Method two

Fit two dial indicators according to the above scheme on “X” or “Y” axis against the wing’s caps. Fig. 2.109

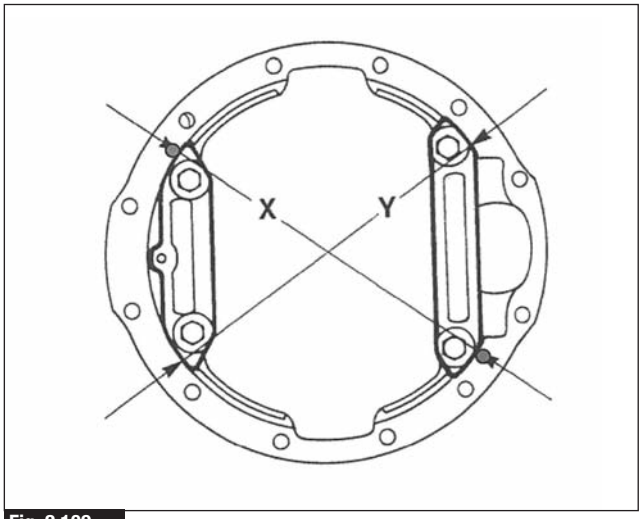


Fig. 2.109

Set the indicators in the zero position. Fig. 2.110

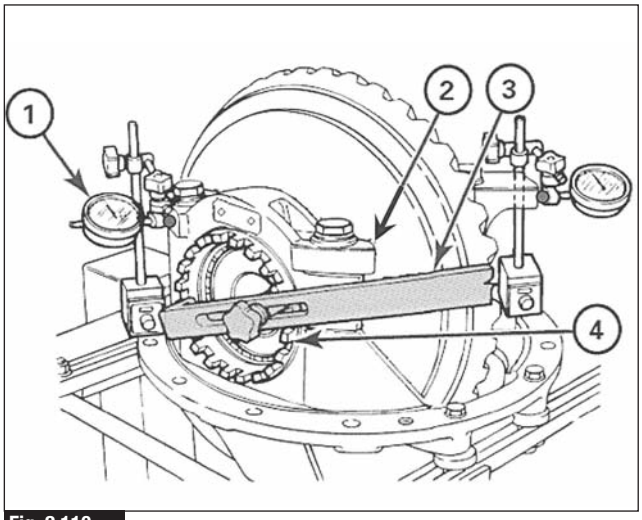


Fig. 2.110

1. Use the wrench to tighten the adjusting ring bearing opposite of crown side. When one of the DTI moves from **zero** position. stop the adjusting ring rotation. Mark one of the adjusting ring top notches position as "**0**".

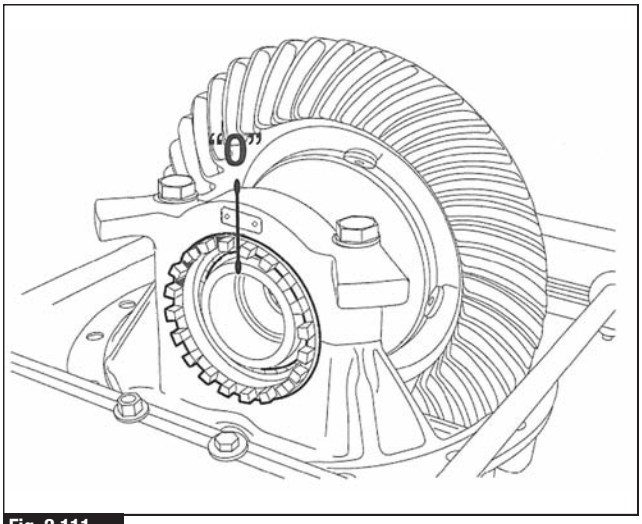


Fig. 2.111

2. From previous "**0**" marked position, rotate the adjusting ring among 2 or 3 notches aligning the notches to the lock plate tooth.

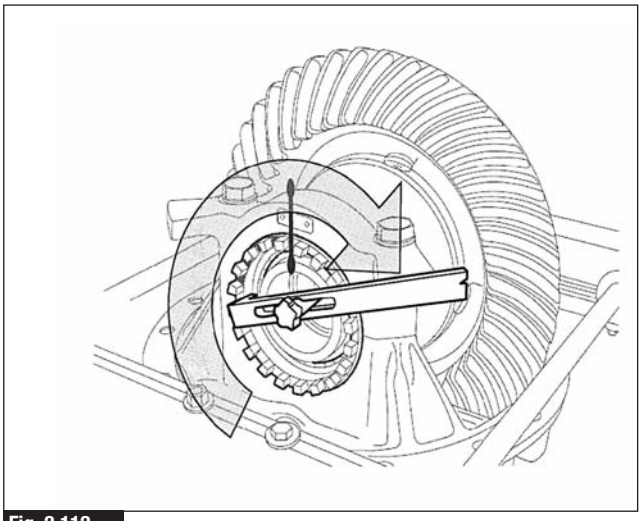


Fig. 2.112

NOTE: while rotating the adjusting ring, thump with a plastic or rubber mallet to set properly the diff bearings.

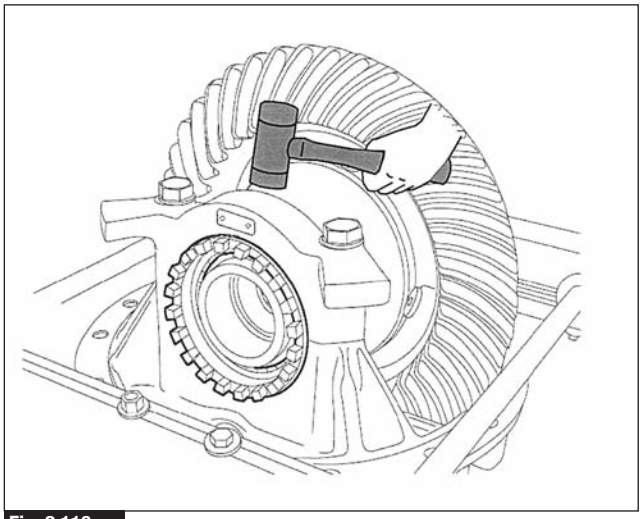


Fig. 2.113

Removal and replacement of cross axle Differential Lock unit

Adjustment of differential lock

The differential lock mechanism is designed as a preset assembly and adjustment is not possible – if problems occur a new differential lock mechanism should be fitted.

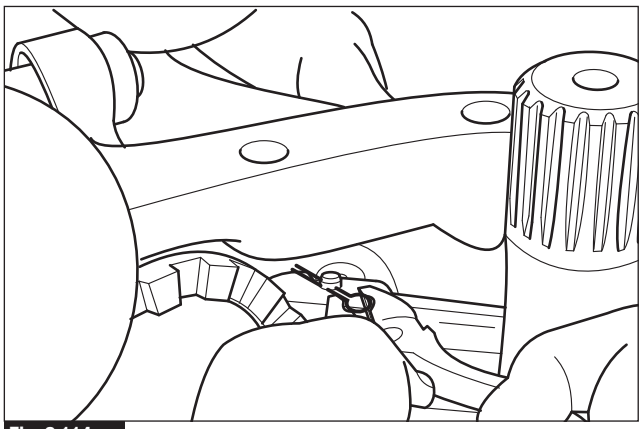


Fig. 2.114

Remove the split pin in the clevis pin joining the differential lock piston to the differential lock lever.

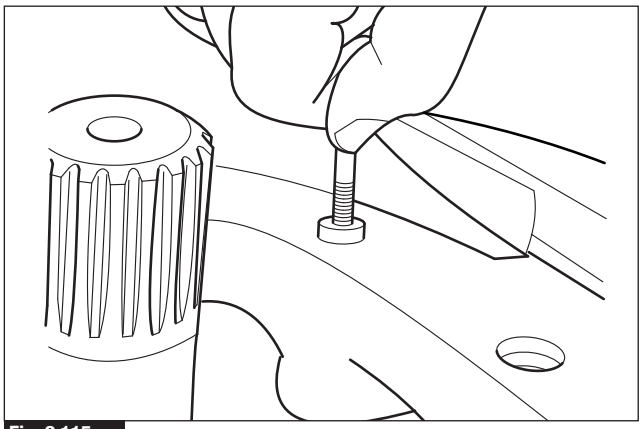


Fig. 2.115

Using an extractor bolt threaded into the pivot pin - withdraw the lever pivot pin to allow removal of the differential lock fork and collar.

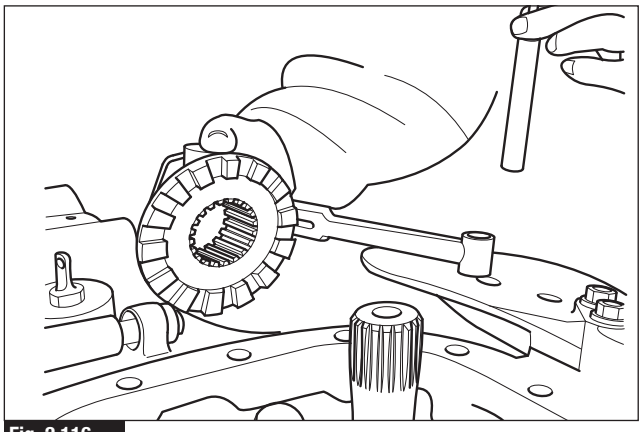


Fig. 2.116

Split the differential lock actuator.

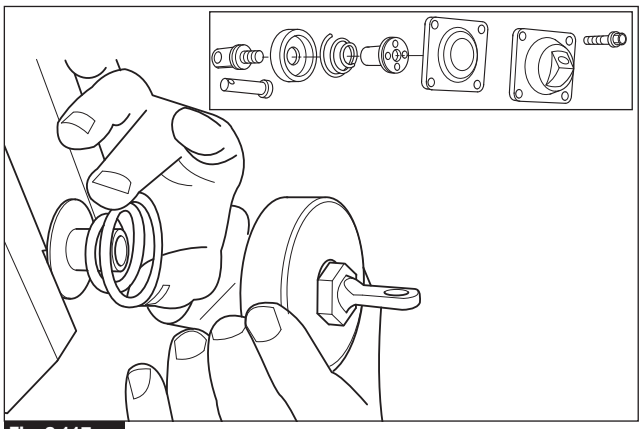


Fig. 2.117

Replace parts if necessary and reassembly.

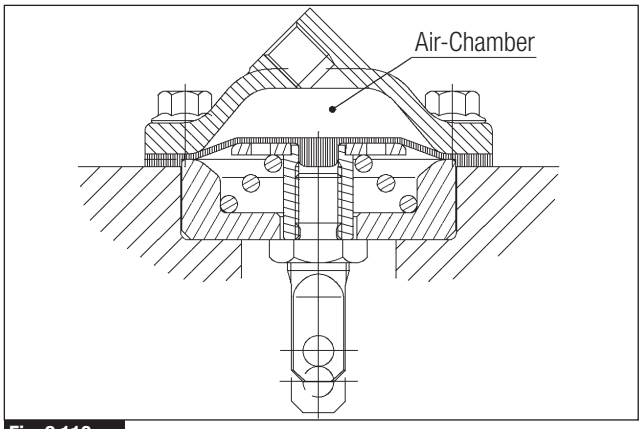


Fig. 2.118

Apply thread locking compound (Loctite 243) to the screw - and tighten to a torque of 30 ± 5 Nm. Fit the differential lock diaphragm and cover ensuring firstly that the piston is free and can be depressed slightly by hand,

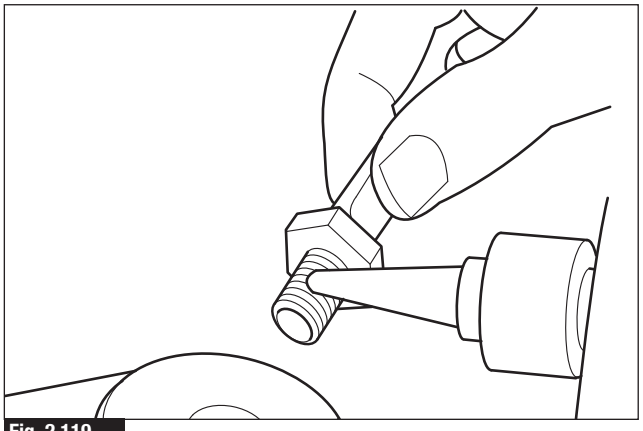


Fig. 2.119

and cross tighten the cover plate fasteners to a torque of 20 ± 5 Nm.

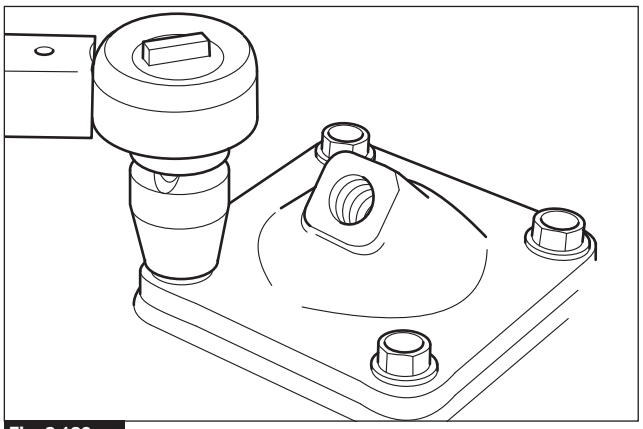


Fig. 2.120

Assemble the differential lock mechanism back into the housing

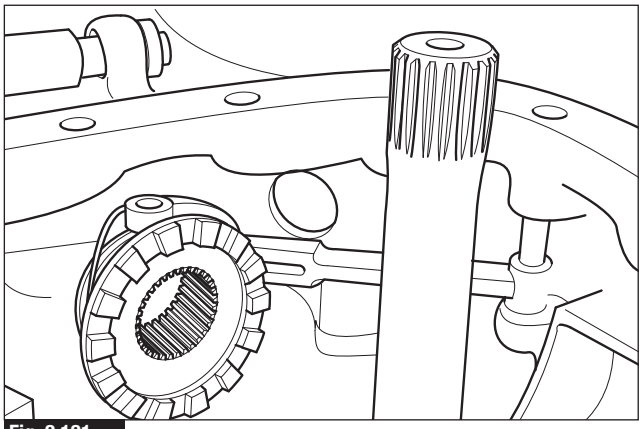


Fig. 2.121

Fit the pivot pin in position.

Connect the differential lock lever to the differential lock actuating piston with a clevis pin and split pin.

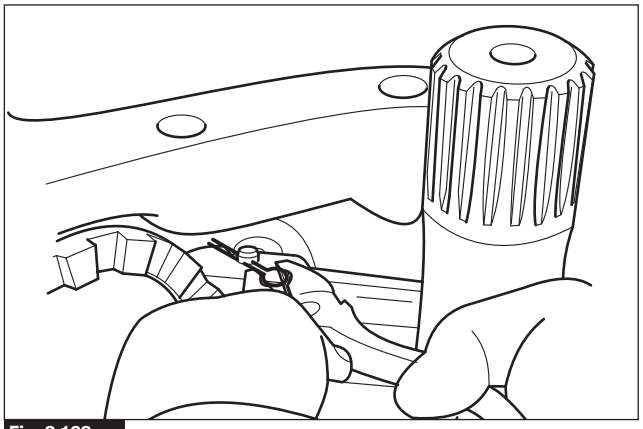


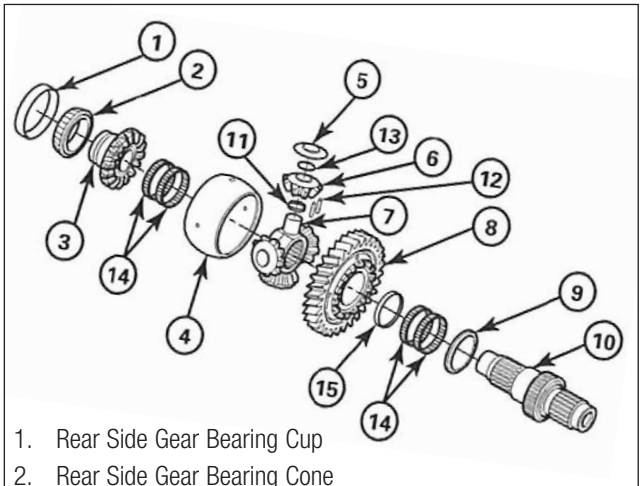
Fig. 2.122

Install the Inter-Axle Differential (IAD) and Lock Shift Assembly

1. If removed, use a hammer and brass drift to install the rear side gear bearing cup. Strike the cup evenly until it is fully seated in the bore.

NOTE:if a new rear bearing cone is required, a new matching bearing cup must be installed at the same time.

2. If removed, use a press to install the rear side bearing cone on the rear side gear.
3. Apply lubricant to the IAD spider legs, pinion teeth, side giear teeth, bearing cones, forward and rear side gear journals, and thrust washer surfaces as they are being assembled. Fig.2.123
   To obtain this lubricant, refer to the Service Notes page on the front inside cover of this manual.
4. If removed, install the bearing cup into the input bearing cage. Use a press and a sleeve to install the cup in the cage. The cup is correctly installed when the bottom of the cup is fully seated in the cage bore.
5. Install the two caged needle bearing assemblies into the rear side gear. Install the rear side gear into the carrier.
6. Lubricate with light grease and assemble the needle bearings into the pinions.
7. Install the inter-axle differential spider, pinions and thrust washers into the IAD carrier. Install the IAD assembly into the carrier housing.
8. Install the helical drive gear in its original position using the previously painted marks.
9. Install the helical drive gear spacer, thrust needle bearing and two caged needle bearing assemblies.
10. Insert the IAD lock spring into the IAD opening.
11. Install the IAD clutch collar and shift fork with the fork boss facing outwards.
12. Insert the diaphragm seat.



1. Rear Side Gear Bearing Cup
2. Rear Side Gear Bearing Cone
3. Rear Side Gear
4. Inter-Axle Differential Carrier
5. Differential Pinion Thrust Washer
6. Inter-Axle Differential Pinion
7. Inter-Axle Differential Spider
8. Helical Drive Gear
9. Helical Drive Gear Thrust Washer
10. Input Shaft
11. Needle Bearing Plate
12. Needle Bearings
13. Needle Bearing Retainer Ring
14. Caged Needle Bearing Assembly
15. Spacer

Fig. 2.123

13. Apply sealant to the IAD piston threads. To obtain this sealant, refer to the Service Notes page on the front inside cover of this manual. Install the piston into the shift fork and tighten to 180-220 Nm (133-162 lb-ft).
14. Place the IAD lock diaphragm and cover in position over the opening.
15. Install the cover capscrews and tighten to 15-25 Nm (11-18 lb-ft).

IAD Lock Shift Shaft Stop Adjustment

1. Apply sealant around the circumference of the adjusting screw threads.

2. Install the adjusting screw and jam nut.

3. Loosen the jam nut and adjusting screw until the screw does not touch the end of the shift shaft. Figure 2.124

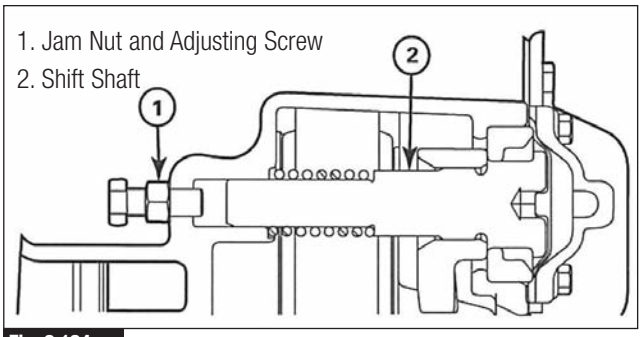


Fig. 2.124

4. Apply and hold 800 kPa (116 psi) of air pressure to the IAD lock cover valve, so that the shift collar engages the splines on the drive gear.

5. Tighten the adjusting screw until the tip of the screw touches the end of the IAD lock piston. Tighten the screw one additional turn. Tighten the jam nut to 55-75 Nm (40-55 lb-ft).

6. Check that the clutch collar moves freely and is not clamped to the drive gear. Release the air pressure.

Install the Output Bearings and Thru-Shaft

1. Lubricate the bearing cups and the cones with axle lubricant. Fig.2.125

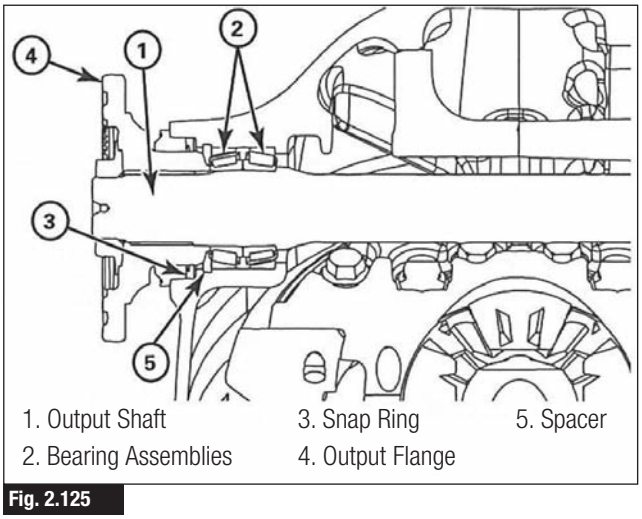


Fig. 2.125

NOTE: If either the bearing cup or the cone need replacement, both parts must be replaced in a fully-matched set from the same manufacturer.

2. If the bearing cones were removed from the thru-shaft, install new bearing cones. Place both cones back-to-back on the thru-shaft. Use a press and a sleeve to install both cones. Apply pressure until the inner cone seats on the shoulder of the thru-shaft. Fig. 2.126

3. Use a press and a sleeve to install the inner bearing cup in the cage. Place the thru-shaft and bearing assembly in the cage.

4. Use a brass drift, bearing driver tool and a sleeve to install the outer bearing cup into the housing over the thru-shaft. Fig. 2.127

5. Install the snap ring that fastens the outer cup in the cage. The snap ring controls the end play of the output bearing.

6. Inspect and adjust the end play of the thrushaft bearing. Refer to the following procedure.

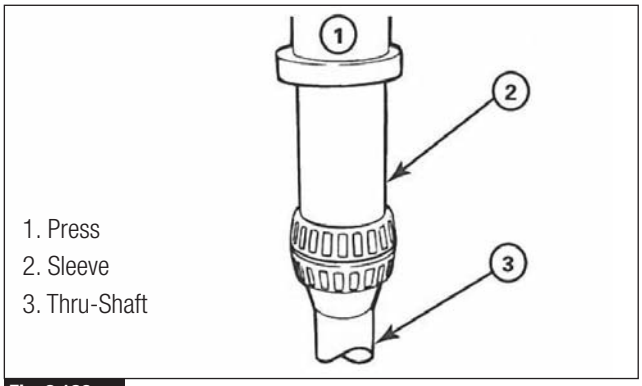


Fig. 2.126

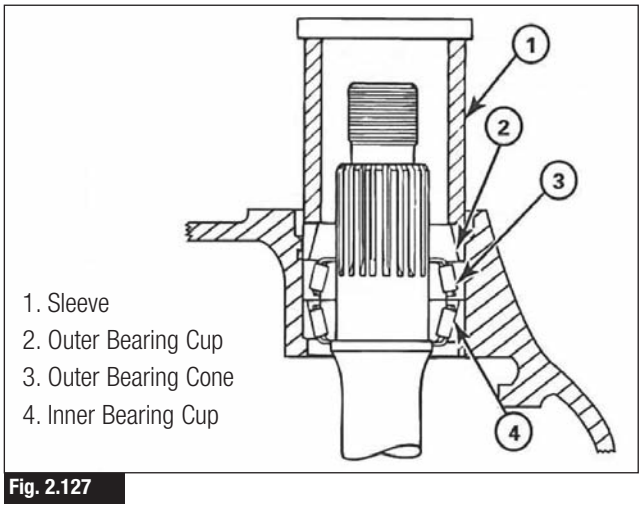


Fig. 2.127

Inspect and Adjust Output Bearing End Play

The end play of the output bearing is controlled by the size of the snap ring that holds the bearings in the output cage. The snap rings are available in increments of 0.076 mm (0.003-inch). Install the snap ring which results in an end play of 0.025-0.127 mm (0.001-0.005-inch).

1. Use an installation tool to install the yoke or flange on the thru-shaft. Do not use the nut to draw the yoke onto the shaft. Do not install the oil seal at this time.
2. Install the nut that fastens the yoke or flange to the thru-shaft. Place a holding tool on the yoke or flange and tighten the nut to the specified torque. Refer to Section 5.
3. Push the yoke or flange toward the axle housing and rotate the shaft in each direction to verify that the bearings are correctly installed.
4. Install a dial indicator so that the base of the indicator is on the axle housing. The pointer of the indicator must touch the yoke or flange end of the thru-shaft. Adjust the dial indicator to the **ZERO** setting. Figure 2.128
5. Place pry bars under the yoke or flange and push the yoke or flange away from the axle housing. Record the reading on the dial indicator. The reading must be 0.025-0.127 mm (0.001-0.005-inch). The reading is the measurement of the end play on the output bearing.
6. If the end play reading is not within the 0.025-0.127 mm (0.001-0.005-inch) specification, remove and replace the snap ring that fastens the bearings in the cage. Install a thinner snap ring to increase end play. Install a thicker snap ring to decrease end play. Figure
7. Remove the nut that fastens the yoke or flange to the thru-shaft. Use the correct puller tool to remove the yoke.
8. Install the seal using a seal driver and mallet. Refer to Install a Unitized Seal on the Output Shaft in Section 4.
9. Assemble the yoke and nut, then place the holding tool on the yoke or flange. Tighten the nut to specifications.
10. Using a punch or suitable tool, stake the nut on the flange in two places.

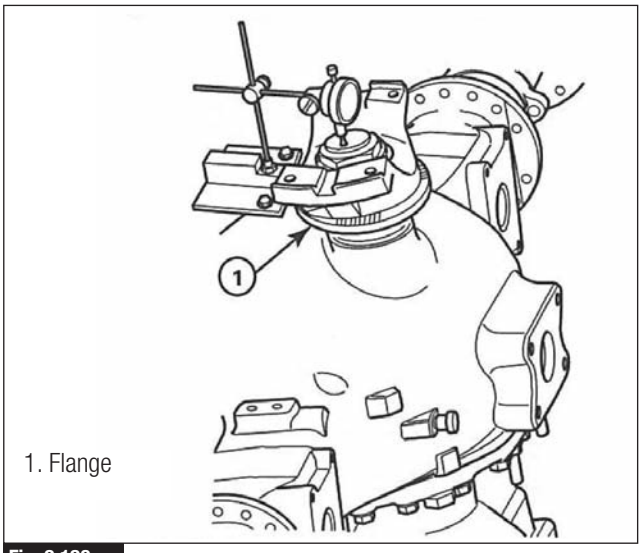


Fig. 2.128

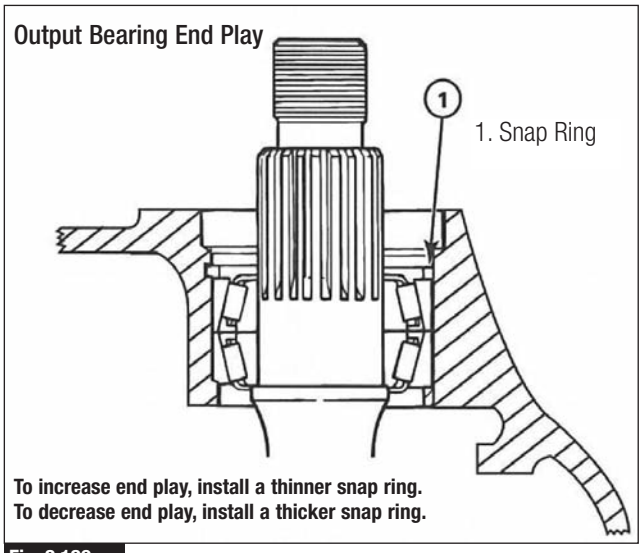


Fig. 2.129

Instructions to install and adjust Differential Lock Sensor Switch

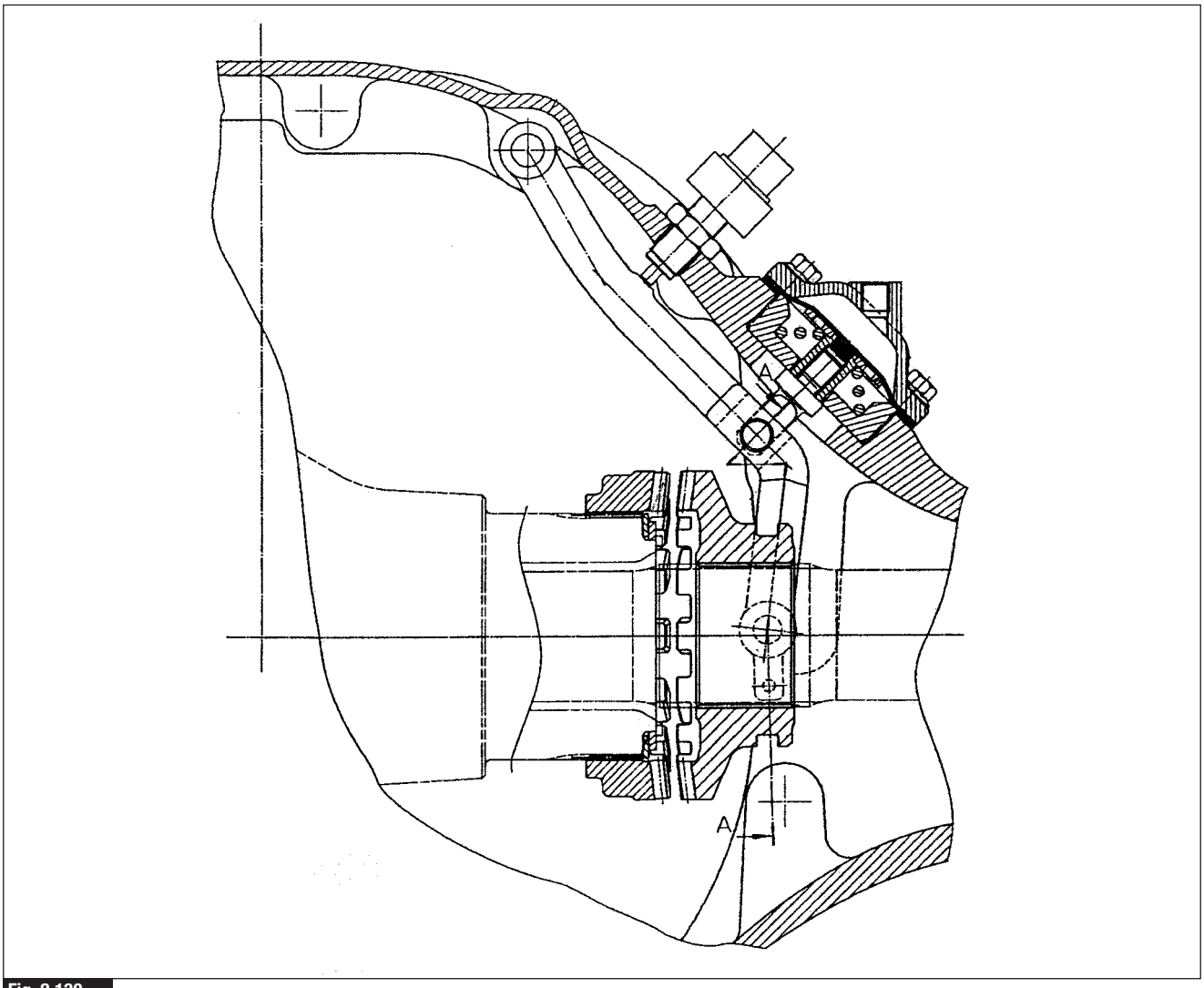


Fig. 2.130

Adjustment of the differential warning light switch.

Check and adjustment of differential sensor switch is carried out with rear axle installed on vehicle.

1) Check differential lock engagement by blowing in air (6 kg/cm^2/6 bar approximately)
2) Engage differential lock and tighten sensor switch until the switch point touches the shift fork lever slightly; check that the contact is the one required from the vehicle manufacturer.
3) Starting from the contact, turn the switch of 270°
4) Tighten the lock nut to 40 ± 5 Nm
5) Check differential lock engagement several times before running the vehicle on the road.

Refitting the Carrier to the Axle Housing

Clean the axle housing to carrier mounting face by scraping clear of debris - old sealing compound, etc.

Apply a continuous bead of sealing compound (Loctite 5101) to the mounting face.

Fit carrier to housing - rotating the drive flange if necessary to engage to output shaft.

Take care that the differential lock mechanism is not fouled and remains free to operate when the carrier is fitted.

Fasten the carrier to the axle housing with 16 screws tightened in a progressive cross pattern to a torque of 250 ÷ 330 Nm.

Fit axle shafts in position and sun gears on the ends of the axle shaft splines.

Fit end caps on the hubs (see procedure to set the dowel height correctly which governs the half shaft free axial movement or float).

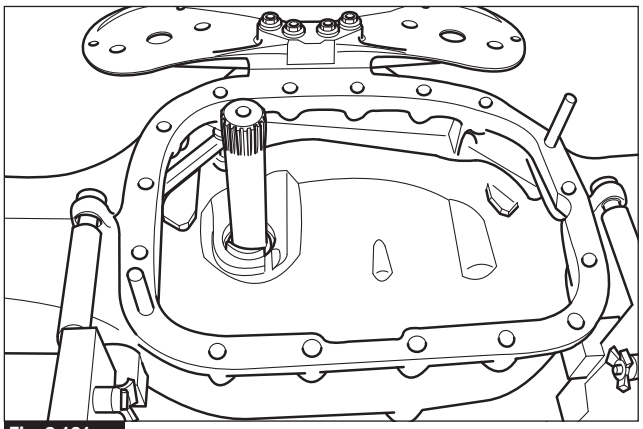


Fig. 2.131

Hypoid Gear Contact Patterns

3

pg. 66 Hypoid Gear Pattern Tables

3 Hypoid Gear Contact Patterns

Tooth contact pattern of the gear set

1. Coast (concave side)
2. Toe
3. Drive (convex side)
4. Heel

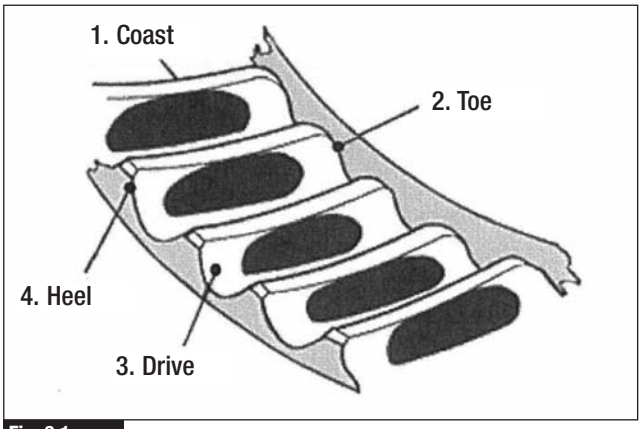


Fig. 3.1

Coast side

Central toward the heel over the face of the gear tooth and in the centre along the tooth profile.

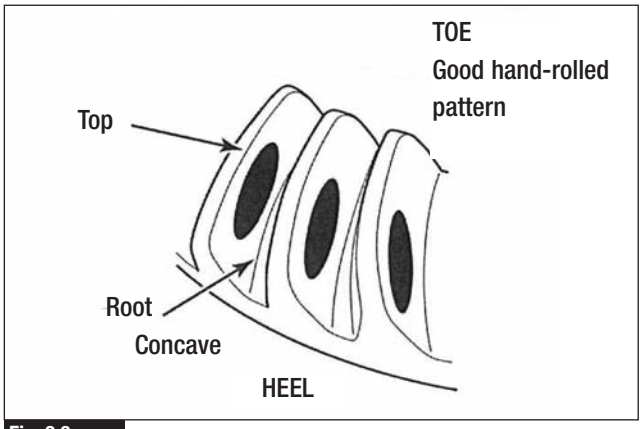


Fig. 3.3

Ideal gear contact pattern

Drive side

Central toward the toe over the face of the gear tooth and in the centre on the tooth profile.

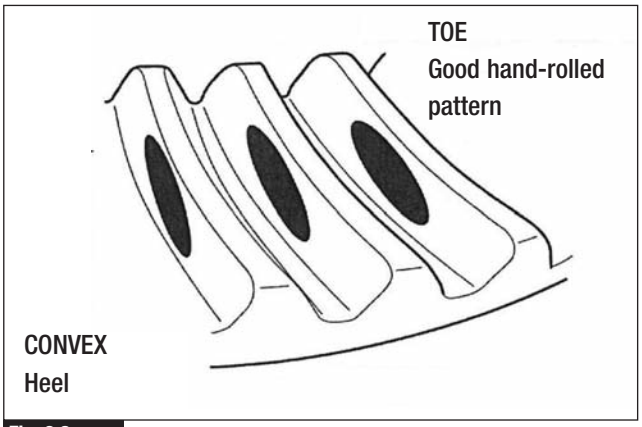


Fig. 3.2

Verification of the gear contact pattern is to be conducted with acceptance criteria as follows:

Accepted gear contact pattern at Drive side

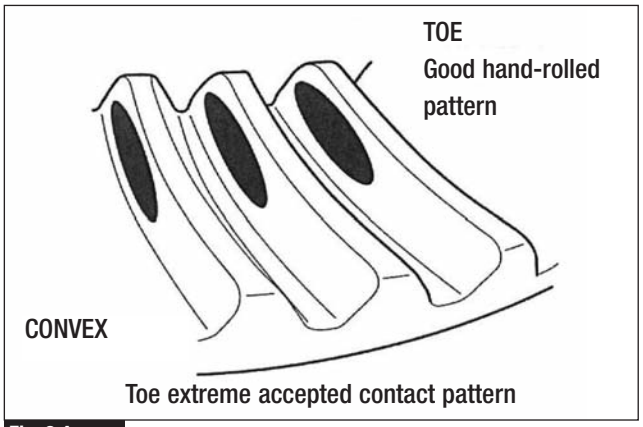


Fig. 3.4

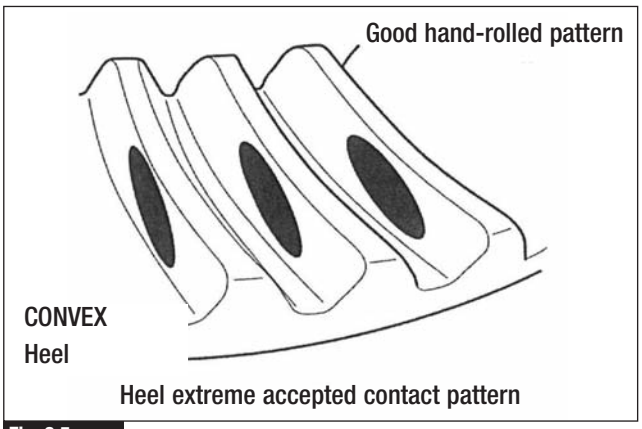


Fig. 3.5

Accepted gear contact pattern at Coast side

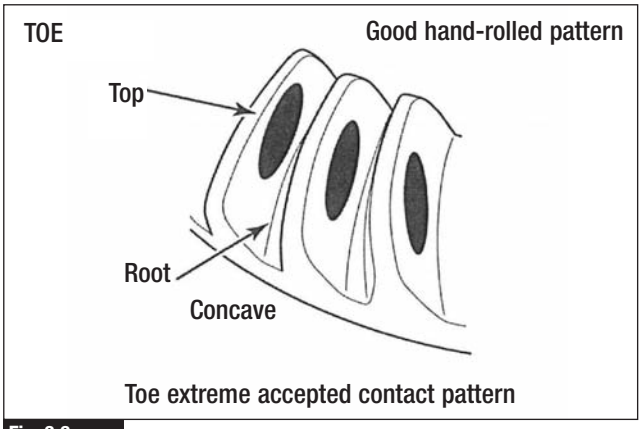


Fig. 3.6

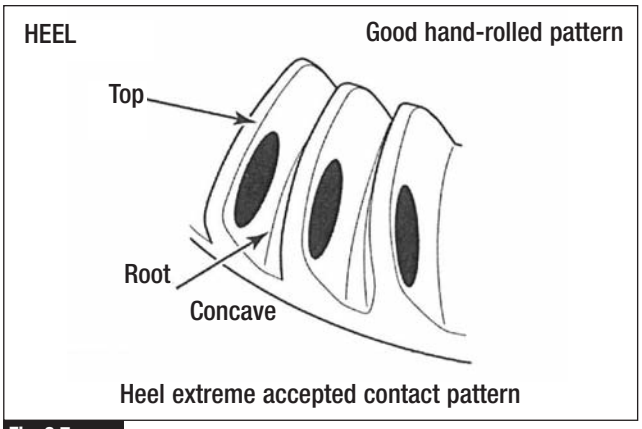


Fig. 3.7

Pinion Seal & Output Shaft Replacement

4

pg. 70 Service procedures:forward through-drive carrier
Pinion seal replacement
74 Output shaft seal replacement

4 Pinion Seal & Output Shaft Replacement

The pinion seal replacement detailed below may be carried out with the differential unit installed on the vehicle.

Disassembly

1. Unscrew the nuts (1) securing the propeller shaft to the differential companion flange.

2. Disconnect the propeller shaft (2) and secure it to the chassis. (Fig. 4.1)

3. With a drilling tool, remove the staking on the pinion lock nut. (fig. 4.2)

4. Block the rotation of the flange (1) using a suitable tool (2).

5. Using a suitable wrench (3), torque multiplier (4) and a suitable service tool slacken the pinion nut.

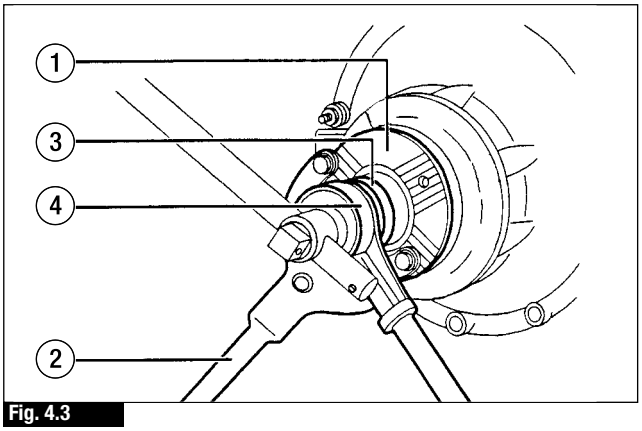


Fig. 4.3

6. If you do not discard the pinion nut and flange, mark the flange position on the pinion and remove it. This may require the use of a standard bearing puller tool. (Fig. 4.4)

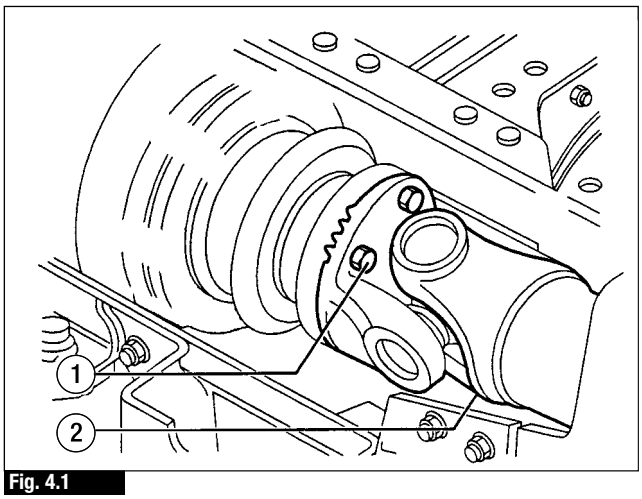


Fig. 4.1

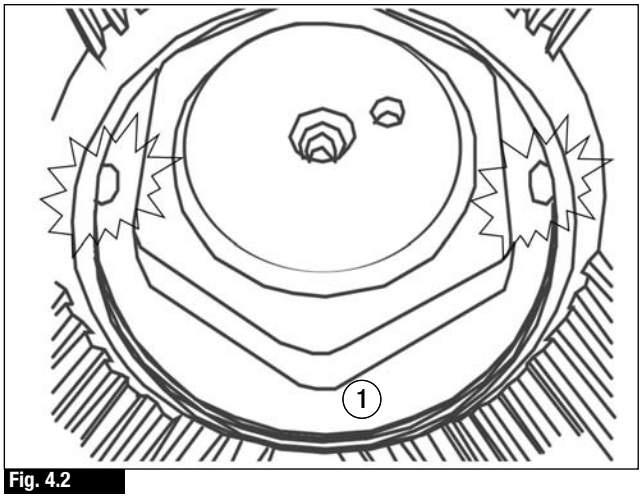


Fig. 4.2

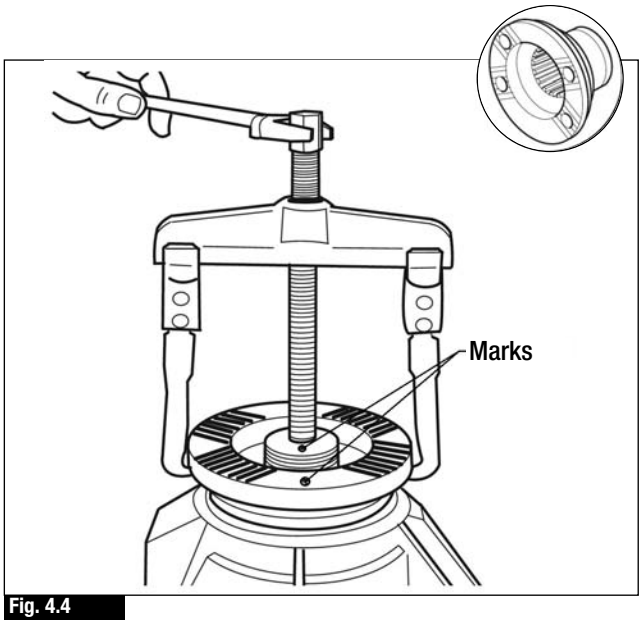


Fig. 4.4

7. Inspect the deflector for damage. If necessary replace the part. (Fig. 4.5)
8. Remove the rotary seal sleeve from the flange. (Fig. 4.5)

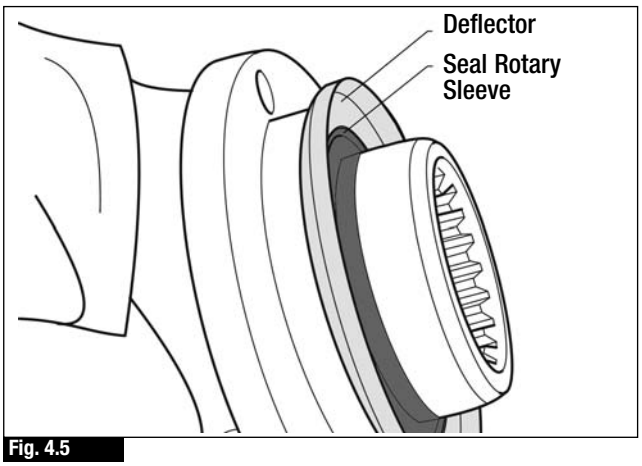


Fig. 4.5

9. Remove seal outer case with use of service tool MST4401 - CT14.
   Discard seal and replace with new for rebuild (Fig. 4.6)

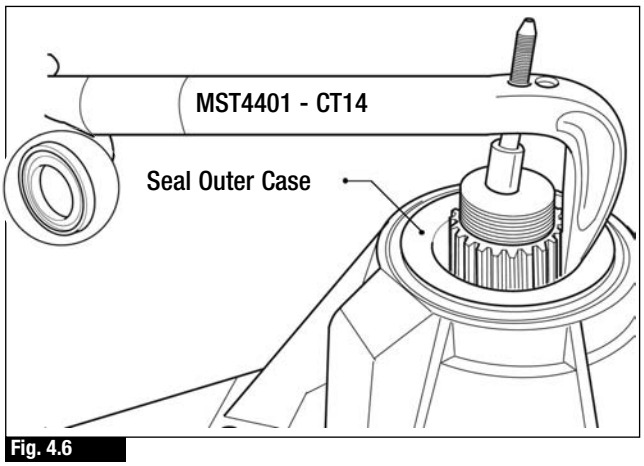


Fig. 4.6

Assembly

1. If the deflector needs to be replaced, lubricate the flange and use the suitable tool MST4807 for assembly.

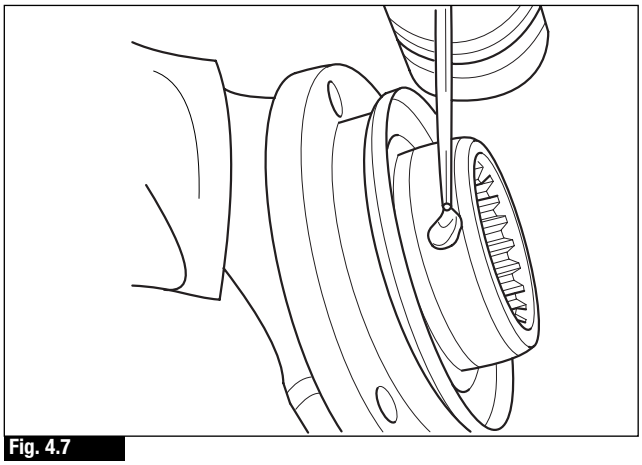


Fig. 4.7

2. If the deflector does **not** need to be replaced, lubricate the seal rotary sleeve journal of the flange (Fig. 4.7)
3. Fit the seal rotary sleeve on the flange using the suitable tool MST4808.

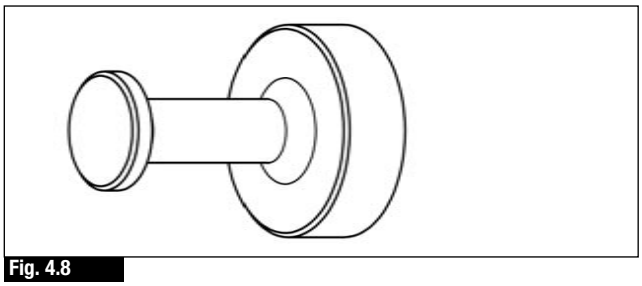


Fig. 4.8

4. Insert seal outer case into service tool MST4410 - CT26 (Fig.4.9)

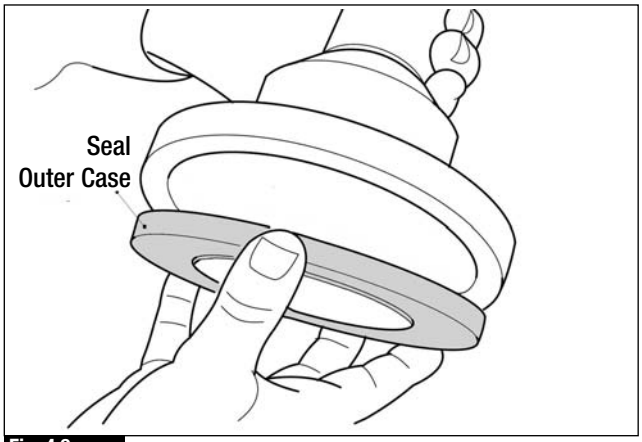


Fig. 4.9

4 Pinion Seal & Output Shaft Replacement

5. Press seal into the bore in carrier. When service tool contacts the carrier the seal will be correctly positioned into the bore. (Fig. 4.10)

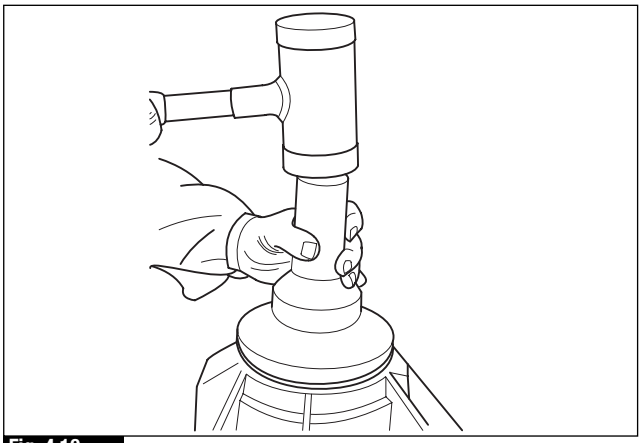


Fig. 4.10

6. Check seal spring has remained in position. (Fig. 4.11)

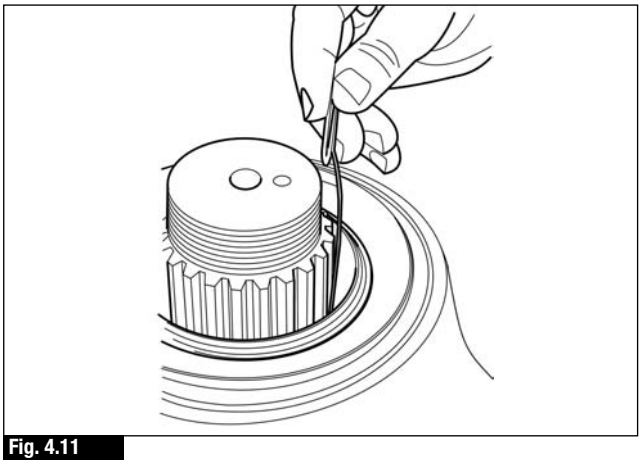


Fig. 4.11

7. If reused, remove any burrs found on the flage with the aid of a small ball nosed grinding wheel. (Fig. 4.12)

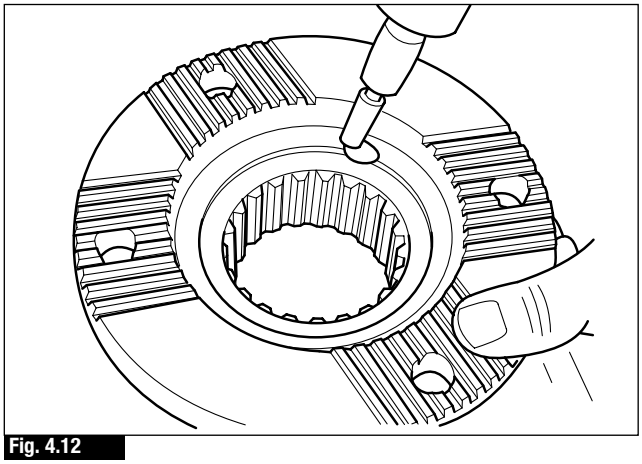


Fig. 4.12

NOTE: Lubricate the surface of the flange nut and companion flange.

Oil the threads.

8. Refit flange and pinion nut. (Fig. 4.13)

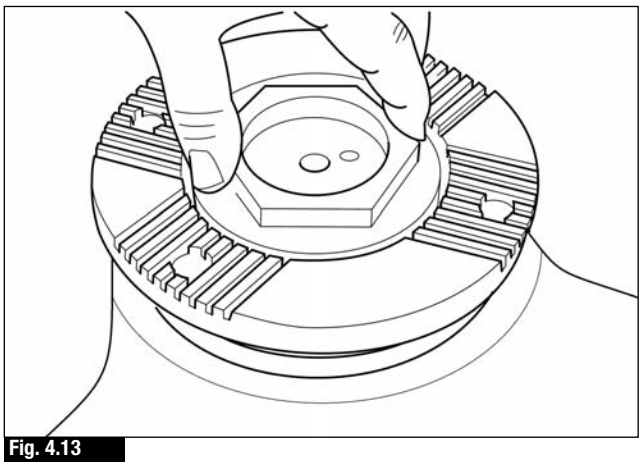


Fig. 4.13

NOTE: The marks on Pinion and reused flange must now be rotated at 90° avoiding same staking location on nut.

Skip note if you use new flange seal nut.

9. Lock flange with service tool MST4400 - CT13 (Fig.4.14)

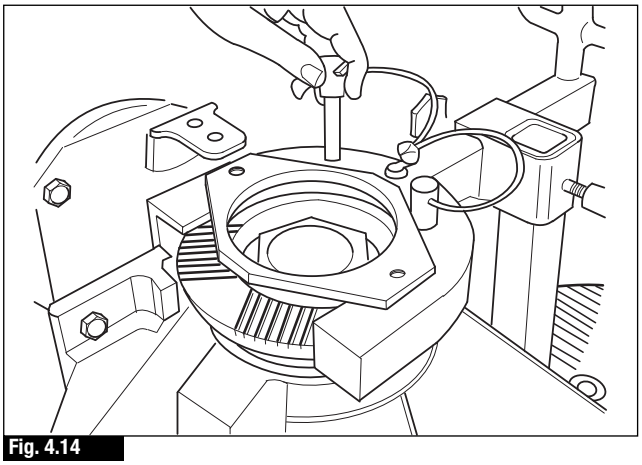


Fig. 4.14

10. Tighten flange lock nut to a torque of 2000-2500Nm (Fig. 4.15)

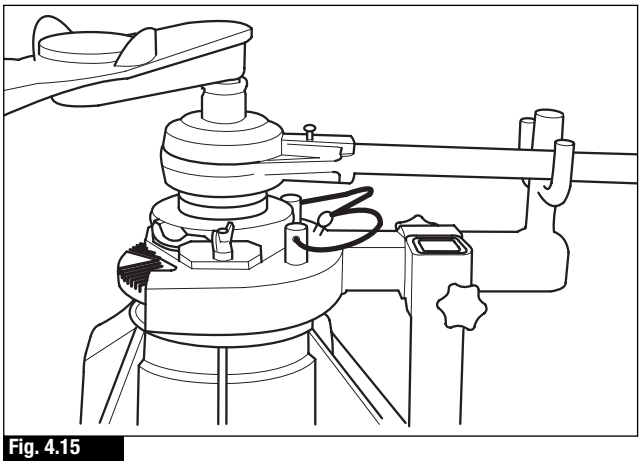


Fig. 4.15

11. With a suitable ball nosed punch, indent lock nut in two places directly above the slots in the flange. (Figs. 4.16 and 4.17)

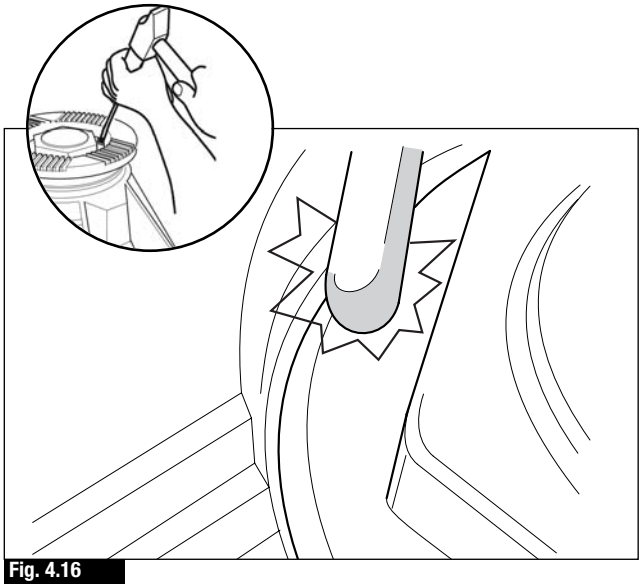


Fig. 4.16

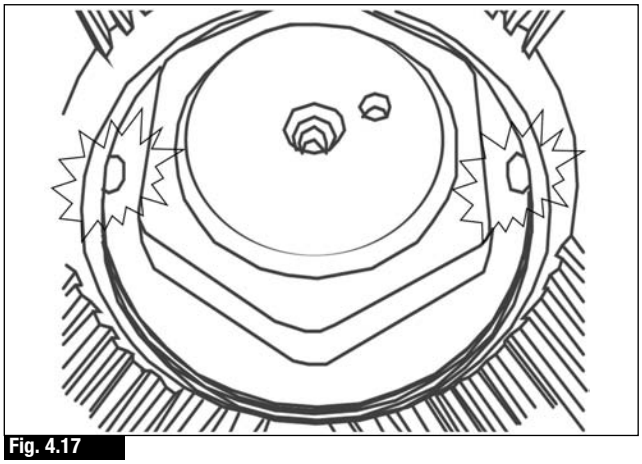


Fig. 4.17

4 Pinion Seal & Output Shaft Replacement

Output shaft seal Disassembly

Remove the inter-axle drive shaft at the output flange.

Block the rotation of the drive flange with a suitable fixture (MST 4400-CT13)

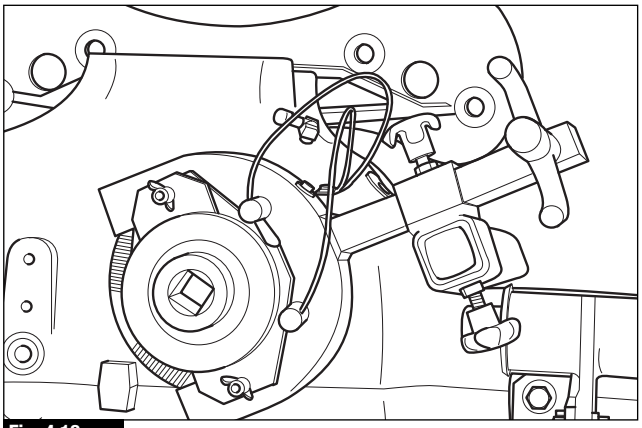


Fig. 4.18

Unscrew the drive flange retaining nut (note this is double staked and the stakes will be sheared during removal). Discard the nut and always replace with new item.

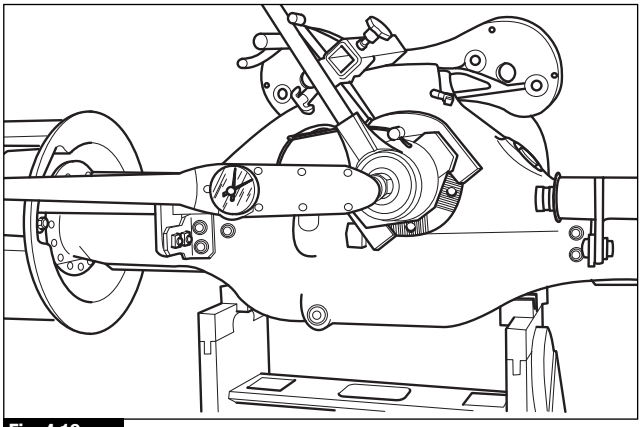


Fig. 4.19

Pull off the drive flange using a suitable puller.

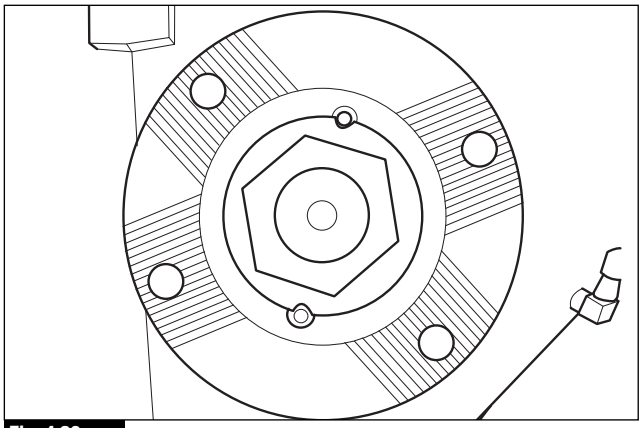


Fig. 4.20

Lever out the drive shaft seal and discard (do not reuse). Tool MST 4401-CT14

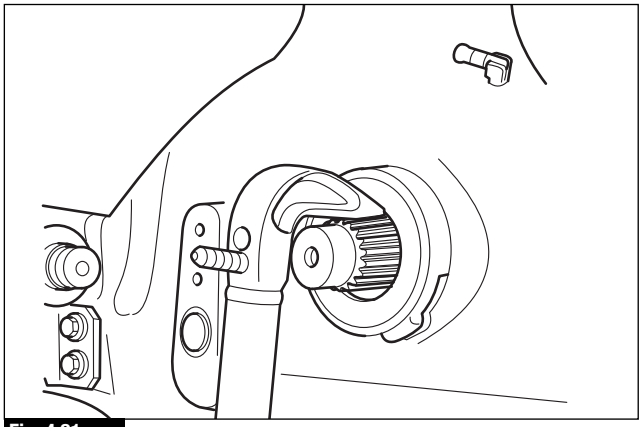


Fig. 4.21

Output shaft seal Assembly

1. If the deflector needs to be replaced, lubricate the flange and use the suitable tool MST4807 for assembly.

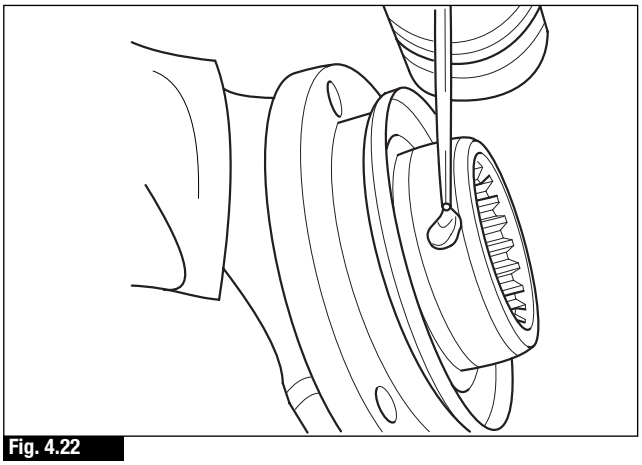


Fig. 4.22

2. If the deflector does **not** need to be replaced, lubricate the seal rotary sleeve journal of the flange (Fig. 4.22)
3. Fit the seal rotary sleeve on the flange using the suitable tool MST4808.

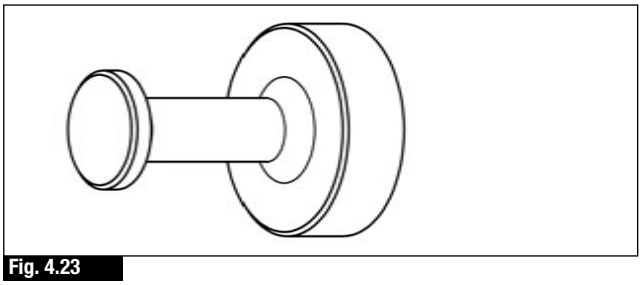


Fig. 4.23

4. Insert seal outer case into service tool MST4410 - CT26 (Fig.4.24)

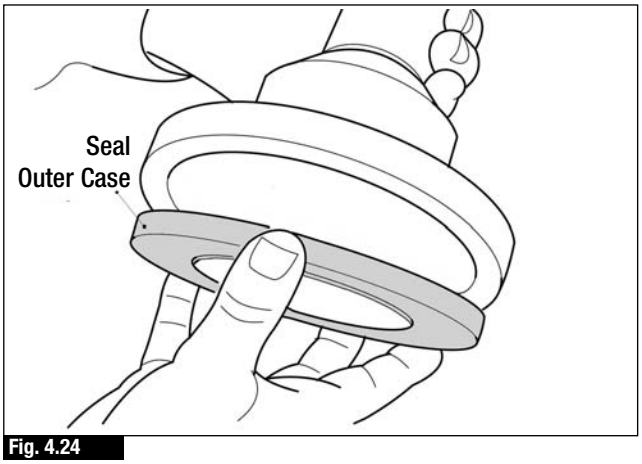


Fig. 4.24

5. Replace the seal after thoroughly lubricating with grease – and drive into position using a sleeve of the appropriate diameter or a driver tool to ensure that the seal is driven in squarely and correctly seated.

   (tool MST 4412)

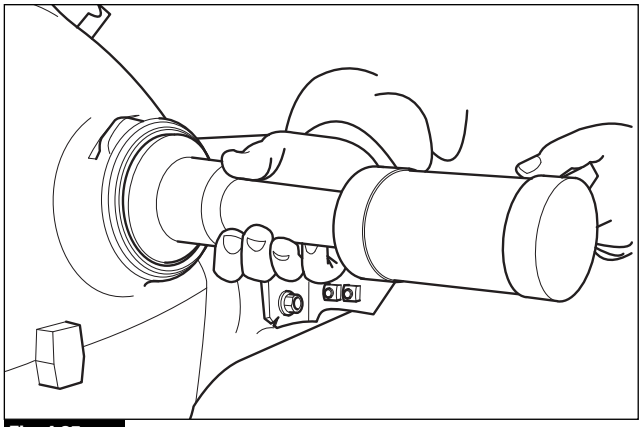


Fig. 4.25

6. Check seal spring has remained in position. (Fig. 4.26)

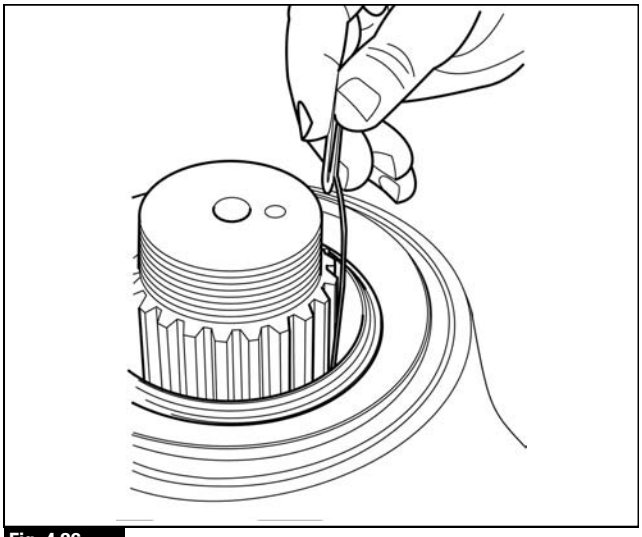


Fig. 4.26

7. If reused, remove any burrs found on the flage with the aid of a small ball nosed grinding wheel. (Fig. 4.27)

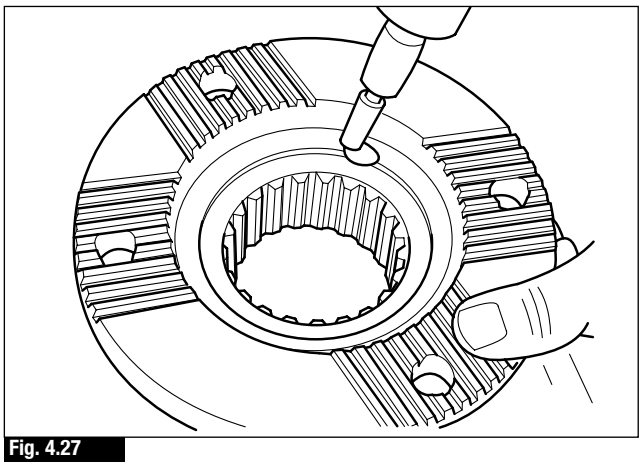


Fig. 4.27

NOTE: Lubricate the surface of the flange nut and companion flange.

Oil the threads.

8. Refit flange and pinion nut. (Fig. 4.28)

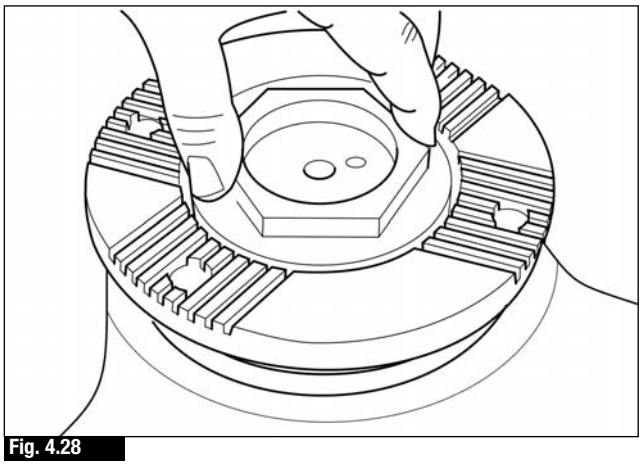


Fig. 4.28

NOTE: The marks on Pinion and reused flange must now be rotated at 90° avoiding same staking location on nut.

Skip note if you use new flange seal nut.

Tightening Torque Values

5

pg. 78 Carrier section & Tightening Torque Table
79 Carrier & Housing assy & Tightening Torque Table
80 Lubrication

5 Tightening Torque Values

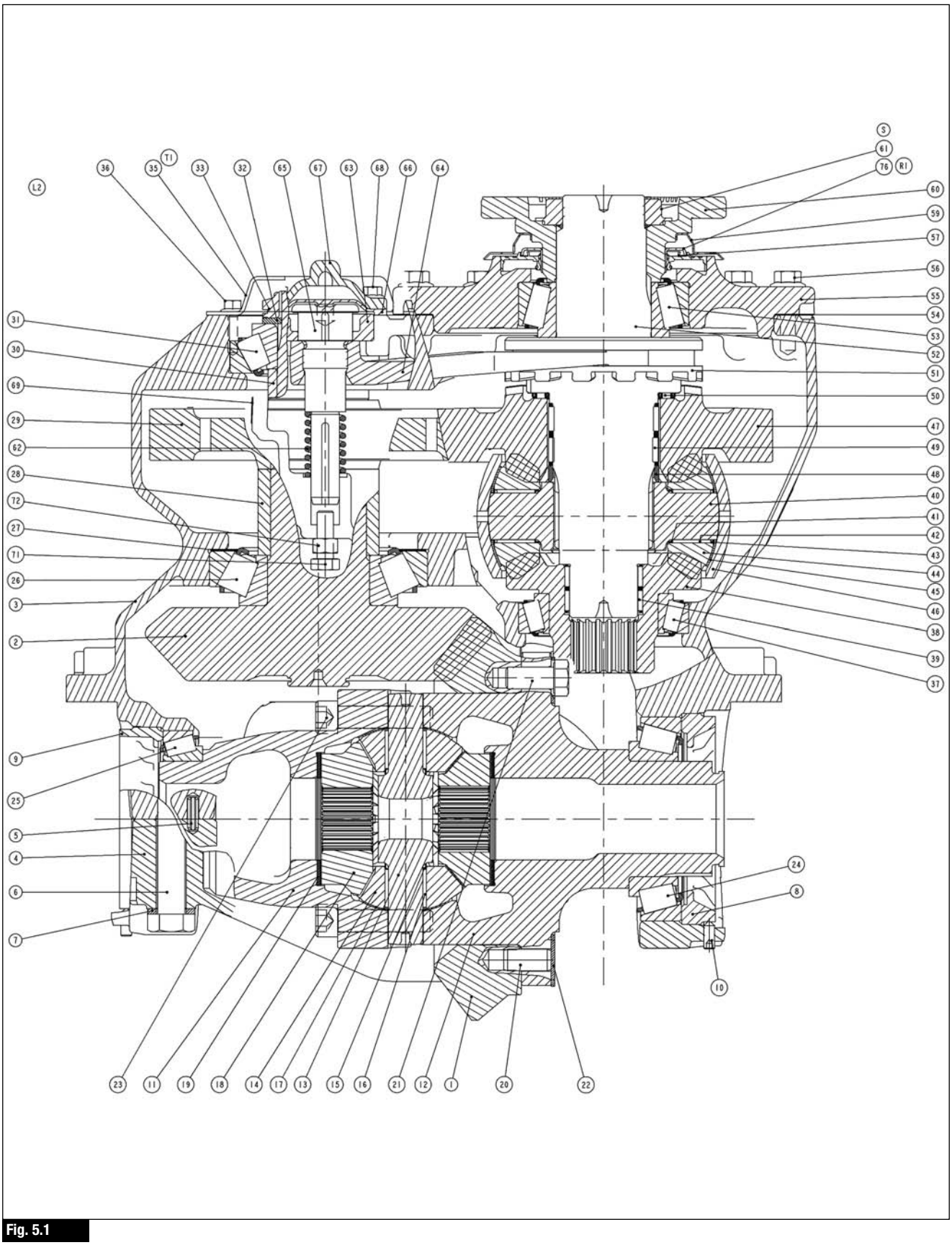


Fig. 5.1

5 Tightening Torque Values

Tightening torque :

PN	Description		Torque (Nm)	Degrees	Demands
21	Screw - Crown Wheel – M16X2		180 ÷ 220		1), 2)
23	Screw - Differential Housing – M16X2		180 ÷ 220		1), 2)
6	Screw - Differential Bearing Cap – M22X2	[torque + angle procedure]	180 ÷ 220	90 ÷105	5)
		[torque only]	650 ÷ 810		5)
10	Locking Screw – Adjusting screw M8X1.25		15 ÷ 25		6)
65	Piston - Diff-lock – M33x2		180 ÷ 220		7)
36	Screw - Pinion Cover – M8X1.25		15 ÷ 25		2)
68	Screw - Diff-lock Cover – M8X1.25		15 ÷ 25		2)
56	Screw - Cover for input Shaft – M12X1.75		75 ÷ 95		2)
33	Nut - Pinion – M60X2		2000 ÷ 2200		1), 3), 8)
61	Nut - Input Shaft/Companion Flange M60X2		1200 ÷ 1400		1), 3), 4)
*	Sensor switch		35 ÷ 45		

* not shown in the section view

NOTE:

1. Threads to be oiled before assembling.
2. Cross-wise tightening = Tightening the fasteners in pairs opposite each other.
3. The axial contact-surface is to be oiled before assembling the nut, PN 33 and 61.
4. After tightening to prescribed torque, the nut, PN 61, must be locked by two opposite deformations of the flange on the nut at the recesses in the companion flange, PN 60. The deformations should be 3 +/-1 mm deep.
5. Change to new screws after 3 reassemblies.
6. For reassembly; use new screws or apply locking fluid.
7. Apply locking fluid, (Loctite 243), before assembly.
8. Nut to be upset in groove.

5 Tightening Torque Values

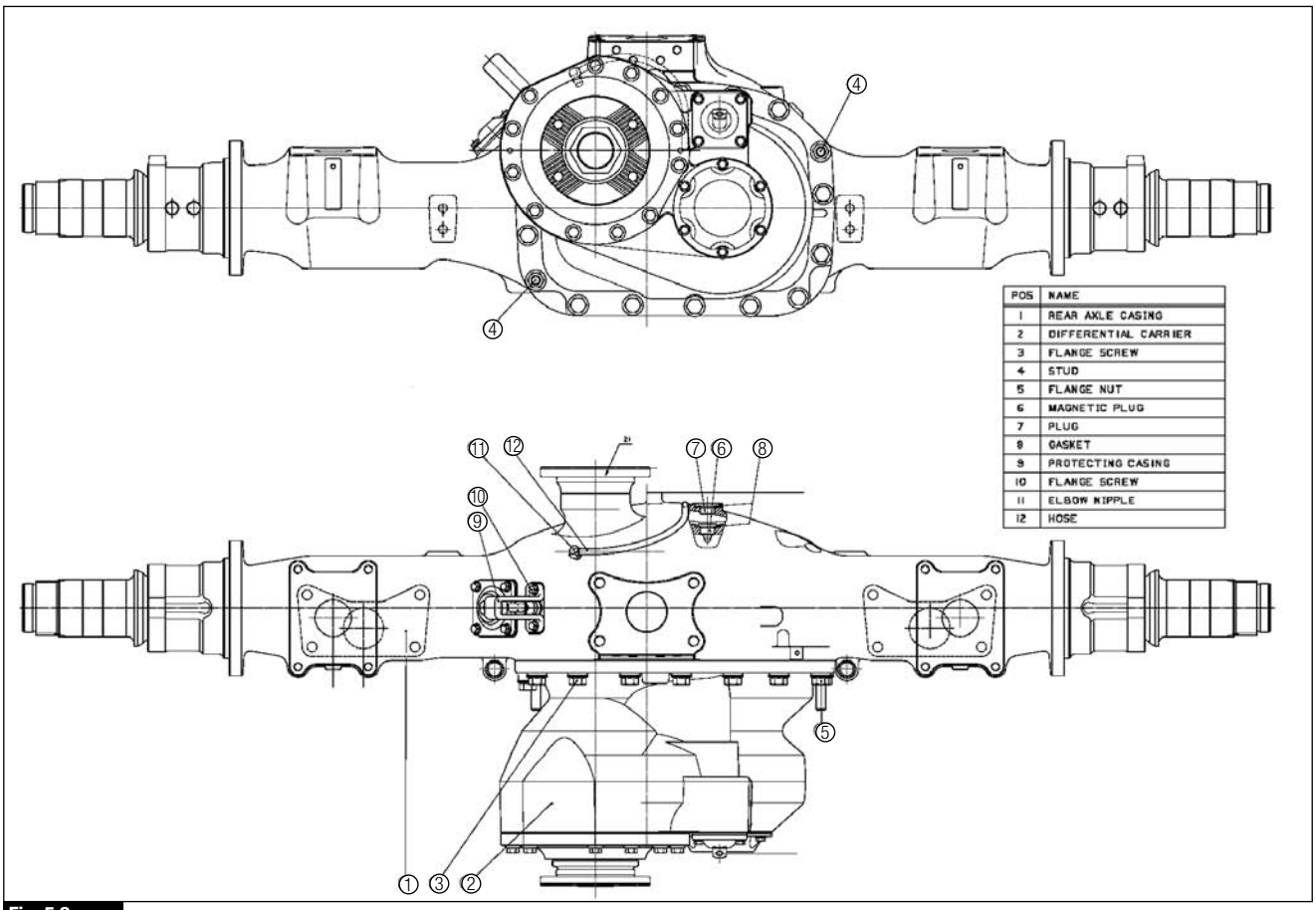


Fig. 5.2

Tightening torque :

PN	Description	Torque (Nm)	Demands
3	Flange Screw – M16X2	250 ÷ 310	1), 3)
4	Stud – Differential Carrier – M16X2	63 ÷ 77	1), 3)
5	Flange Nut – M16X2	250 ÷ 310	1), 3)
6	Magnetic Plug – M	60 ÷ 100	1), 3)
7	Plug	60 ÷ 100	3)
10	Flange Screw protecting casting	20 ÷ 30	3)
21	Output Nut	630 ÷ 770	2)

NOTE:

1. Cross-wise tightening = Tightening the fasteners in pairs opposite each other.
2. After tightening to prescribed torque, the nut, must be locked by two opposite deformations of the flange on the nut at the recesses in the companion flange. The deformations should be 3 +/-1 mm deep.
3. For reassembly; use new screws or apply locking fluid.

Lubrication

Oil Specification:
Hypoid Gear Oil - S.A.E. J2360 - GL5 - tested and approved.

Oil Capacity:
MN61 = 20 Litres

NOTE: For additional information about lubricant please refer to TP0838 and TP0445.

Troubleshooting

6

pg. 82 Troubleshooting Chart

6 Troubleshooting

Shown below is a chart of the most common faults occurring to leading axle carrier.

CONDITION	POSSIBLE CAUSES	REMEDIES
Noise, possibly followed by high temperature.	Incorrect oil	Drain oil and fill up with new in accordance with "Specifications
	Oil level too low	Check oil level
	Incorrect backlash	Adjust
	Incorrect tooth contact	Adjust
	Damaged gears	Remove the final drive. Examine gear wheels for damage. Replace damaged parts. Adjust according to instructions.
	Worn or incorrectly adjusted roller bearings	Check and adjust bearings. Replace worn or damaged bearings
Thump in leading axle carrier when operating accelerator pedal. First check that the noise is not due to worn universal joints	Thrust washers for differential gears worn	Replace all thrust washers
	Differential gears or spider worn	Replace worn parts
	Driving wheel loose on hub	Tighten up wheel nuts
	Worn splines on drive shafts or final drive	Replace worn parts
Oil leakage	Oil level too high	Check oil level
	Breather valve clogged	Check breather valve
	Sealing rings damaged	Replace sealing rings
	Incorrectly adjusted or damaged wheel bearings	Adjust or replace bearings
	Damaged sealing ring and/or damaged flange	Replace damaged parts
	Incorrectly adjusted or damaged pinion bearings	Adjust or replace bearings
	Diff. lock diaphragm cracked so that compressed air gets into final drive when diff. lock is engaged	Replace diaphragm

CONDITION	POSSIBLE CAUSES	REMEDIES
Diff. lock does not engage	Leaking air lines	Check air lines and unions.
	Leaking control cylinder	1. Tighten the screws for the upper part of the control cylinder and check for leakage using soapy water
		2. Replace diaphragm
	Diaphragm cracked	Replace diaphragm
	Deformed diff. lock control	Replace diff. lock control
	Shift fork guide pin holes staved	Replace guide pins
	Electrical fault, switch - solenoid valve	1. Check for cable and connection failure
		2. Check solenoid valve
		3. Check switch
	Push rod nut incorrectly adjusted	Adjust according to instructions
Diff. lock does not disengage	Faulty solenoid valve	Replace solenoid valve
	Broken return spring	Replace spring
	Shift fork guide pin holes staved	Replace guide pins
Diff. lock indicator lamp does not light	Diff. lock does not engage or engages only partly	See under “Diff. lock does not engage”
	Electrical fault in lines or connections	Check lines and connections
	Bulb blown	Replace bulb
	Incorrectly adjusted indication contact	Replace according to instructions
Diff. lock indicator lamp lights continuously	Diff. lock does not disengage or disengages only partly	See under “Diff. lock does not disengage”
	Electric cable between indicator lamp and control cylinder has contact with chassis	Insulate or replace cable
	Indicator incorrectly adjusted	Adjust indicator

Service Tools

7

pg. 86	MST4400	CT13	Tool - Flange Lock
87	MST4401	CT14	Tool - Seal removal
88	MST4402	CT15	Setting Tool - Pinion
89	MST4403	CT17	Lifting Tool - Pinion
90	MST4404	CT18	Removal Tool - Bearing Cup
91	MST4405	CT19	Removal Tool - Bearing Cup
92	MST4406	CT21	Lifting Tool - Diff. Case
93	MST4407	CT23	Fitting Tool - Bearing Cup
94	MST4408	CT24	Fitting Tool - Bearing Cup
95	MST4409	CT25	Fitting Tool - Bearing Cone
96	MST4410	CT26	Fitting Tool - Pinion Shaft Seal
97	MST4411	CT27	Adjusting Tool - Differential Bearing Adjusters
98	MST4412		Output seal tool
99	MST4807		Inner deflector
100	MST4808		Inner ring

7 Service Tools

MST4400 CT13 Tool - Flange lock

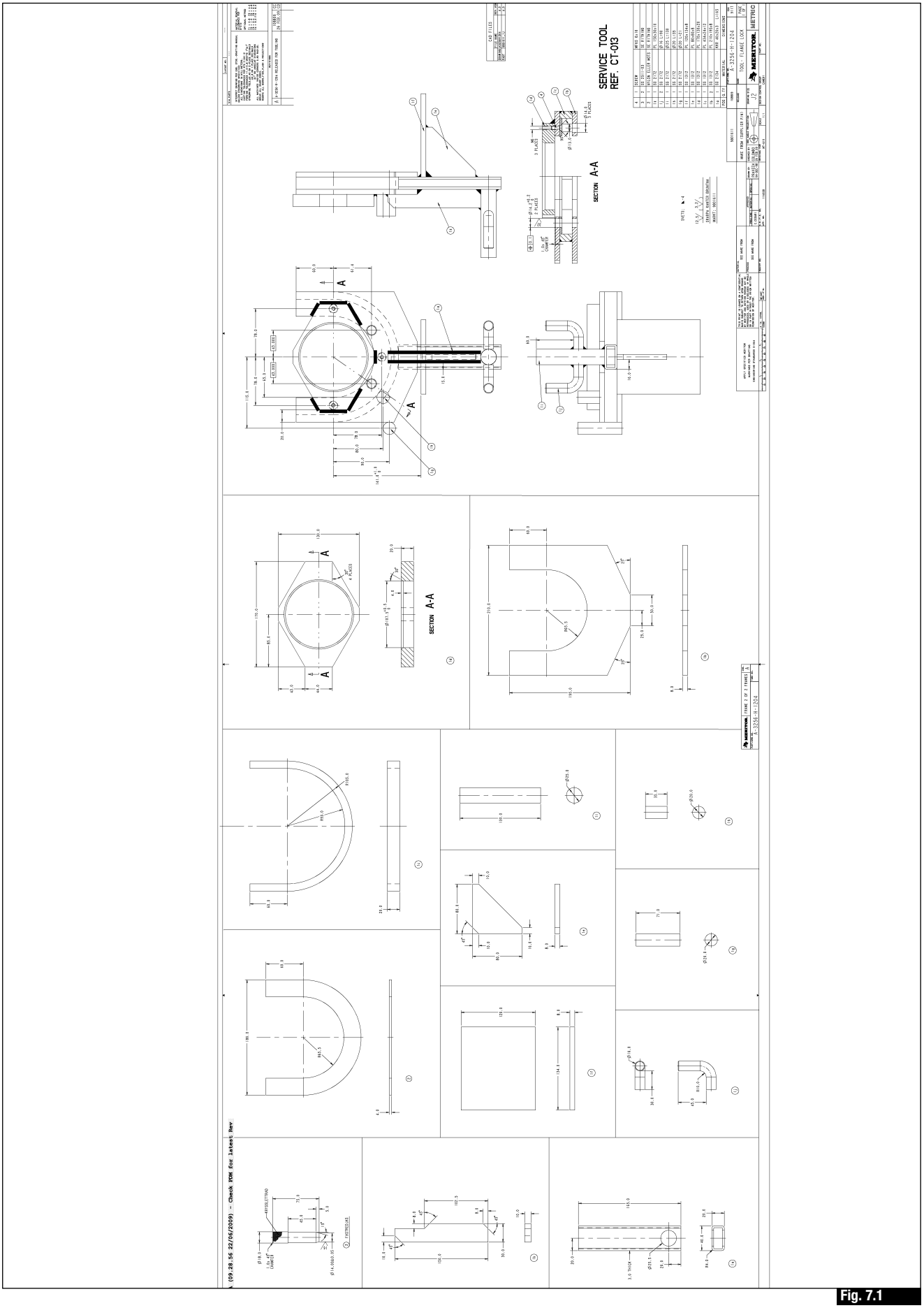
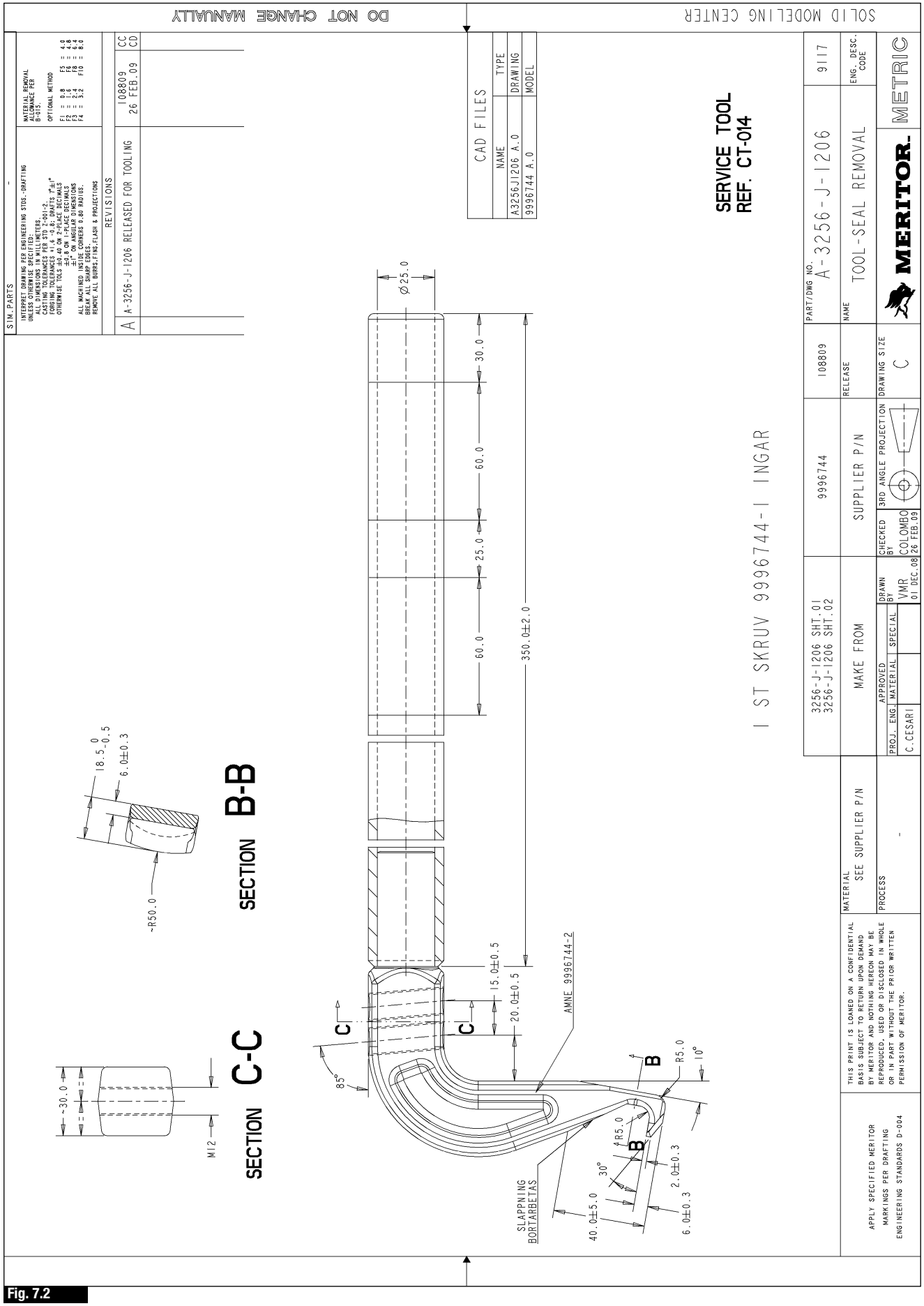


Fig. 7.1


DO NOT CHANGE MANUALLY
SOLID MODELING CENTER
SIM.PARTS
INTERPRET DRAWING PER ENGINEERING STDS.-DRAFTING
UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS
CASTING TOLERANCES PER STD-2301-2.
FORGING TOLERANCES +1.6 -0.8; DRAFTS 7°±1°
OTHERWISE TOLS ±0.40 ON 2-PLACE DECIMALS
±0.8 ON 1-PLACE DECIMALS
±1° ON ANGULAR DIMENSIONS
ALL MACHINED INSIDE CORNERS 0.80 RADIUS
REMOVE ALL BURRS,FINS,FLASH & PROJECTIONS
BREAK ALL SHARP EDGES
MATERIAL REMOVAL ALLOWANCE PER B-015.
OPTIONAL METHOD
F1 = 0.8 F5 = 4.0
F2 = 1.6 F6 = 4.8
F3 = 2.4 F7 = 6.4
F4 = 5.2 F10 = 8.0
REVISIONS
A A-3256-J-1206 RELEASED FOR TOOLING 108809 26 FEB.09 CC CD
CAD FILES
NAME TYPE
A3256J1206 A.0 DRAWING
9996744 A.0 MODEL
SERVICE TOOL
REF. CT-014
I ST SKRUV 9996744-1 INGAR
Ø25.0
30.0
60.0
25.0
60.0
350.0±2.0
15.0±0.5
20.0±0.5
AMNE 9996744-2
85°
C
C
B
B
R5.0
10°
R5.0
30°
2.0±0.3
40.0±5.0
6.0±0.3
SLAPPNING
BORTARBETAS
SECTION B-B
18.5 0 -0.5
6.0±0.3
~R50.0
SECTION C-C
~30.0
M12
3256-J-1206 SHT.01
3256-J-1206 SHT.02
MAKE FROM
9996744
SUPPLIER P/N
108809
RELEASE
PART/DWG NO. A-3256-J-1206
NAME TOOL-SEAL REMOVAL
9117
ENG. DESC. CODE
DRAWING SIZE C
3RD ANGLE PROJECTION
APPROVED
PROJ. ENG. C.CESARI
MATERIAL
SPECIAL
DRAWN BY VMR 01 DEC.08
CHECKED BY COLOMBO 26 FEB.09
MERITOR
METRIC
MATERIAL SEE SUPPLIER P/N
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APPLY SPECIFIED MERITOR MARKINGS PER DRAFTING ENGINEERING STANDARDS D-004

Fig. 7.2

7 Service Tools

MST4402 CT15 Setting Tool - Pinion

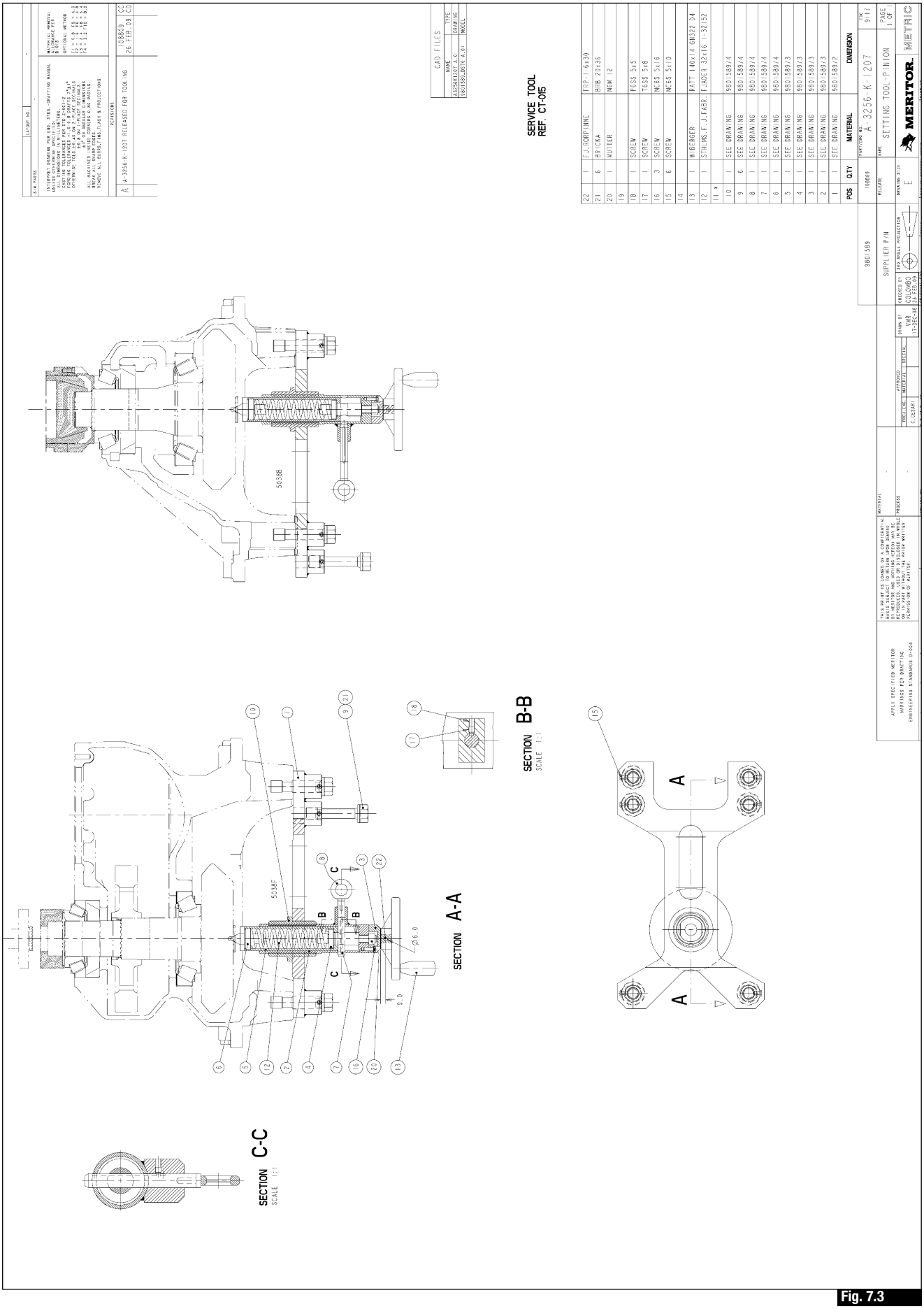

Fig. 7.3

7 Service Tools

MST4403 CT17 Lifting Tool - Pinion

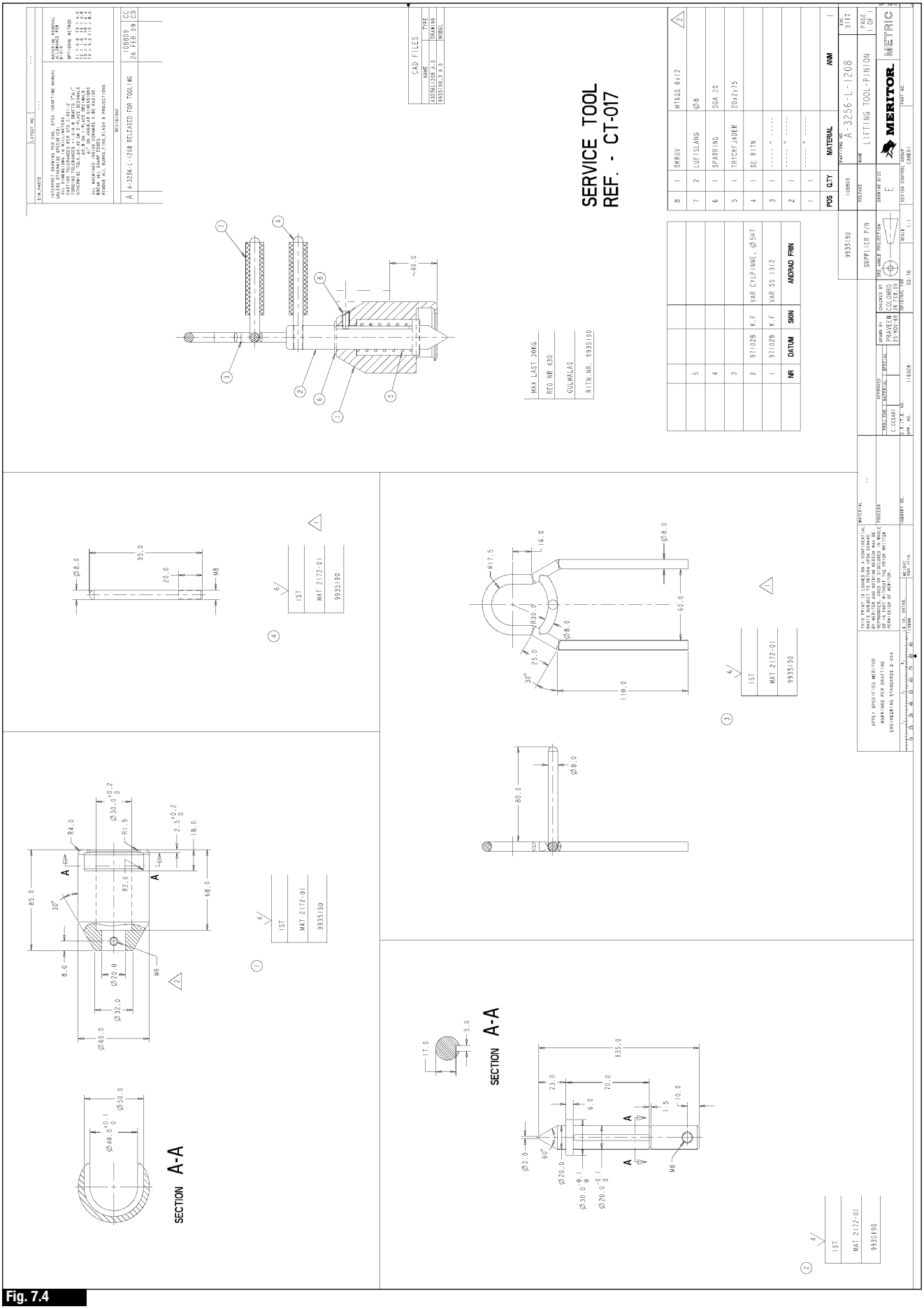

Fig. 7.4

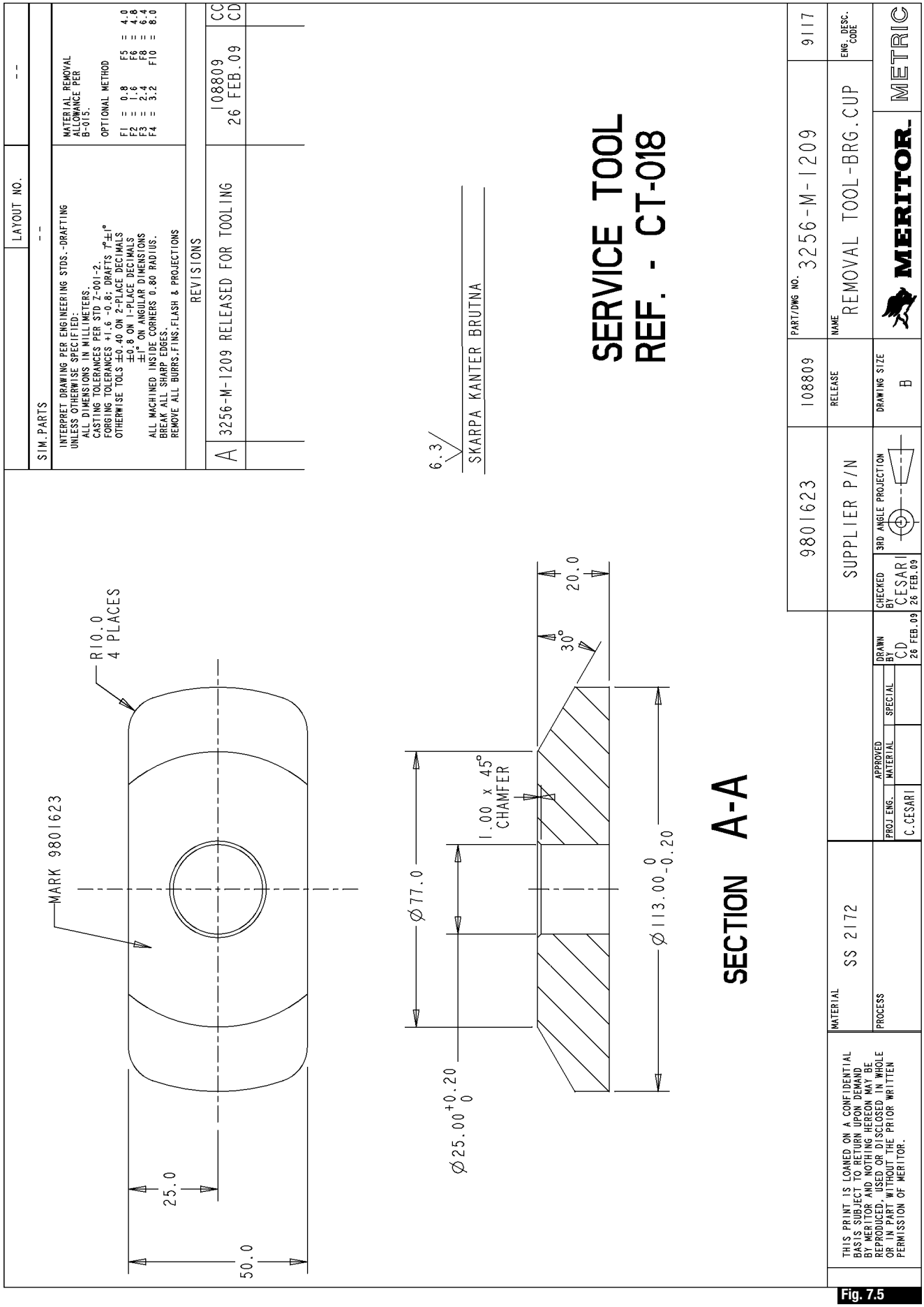
LAYOUT NO. --
SIM.PARTS --
INTERPRET DRAWING PER ENGINEERING STDS.-DRAFTING
UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS IN MILLIMETERS.
CASTING TOLERANCES PER STD Z-001-2.
FORGING TOLERANCES +1.6 -0.8; DRAFTS 7°±1°
OTHERWISE TOLS ±0.40 ON 2-PLACE DECIMALS
±0.8 ON 1-PLACE DECIMALS
±1° ON ANGULAR DIMENSIONS
ALL MACHINED INSIDE CORNERS 0.80 RADIUS.
BREAK ALL SHARP EDGES.
REMOVE ALL BURRS,FINS,FLASH & PROJECTIONS
MATERIAL REMOVAL ALLOWANCE PER B-015.
OPTIONAL METHOD
F1 = 0.8 F5 = 4.0
F2 = 1.6 F6 = 4.8
F3 = 22.4 F8 = 6.4
F4 = 3.2 F10 = 8.0
REVISIONS
A 3256-M-1209 RELEASED FOR TOOLING 108809 26 FEB.09 CC CD
6.3
SKARPA KANTER BRUTNA
SERVICE TOOL
REF. - CT-018
R10.0
4 PLACES
MARK 9801623
25.0
50.0
SECTION A-A
Ø77.0
1.00 x 45° CHAMFER
Ø25.00 +0.20 0
30°
20.0
Ø113.00 0 -0.20
9801623
SUPPLIER P/N
108809
RELEASE
3RD ANGLE PROJECTION
DRAWING SIZE B
PART/DWG NO. 3256-M-1209
NAME REMOVAL TOOL-BRG.CUP
9117
ENG. DESC. CODE
MERITOR.
METRIC
MATERIAL SS 2172
PROCESS
APPROVED
PROJ ENG. C.CESARI
MATERIAL
SPECIAL
DRAWN BY CD 26 FEB.09
CHECKED BY CESARI 26 FEB.09
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Fig. 7.5

7 Service Tools

MST4405 CT19 Removal Tool - Bearing Cup

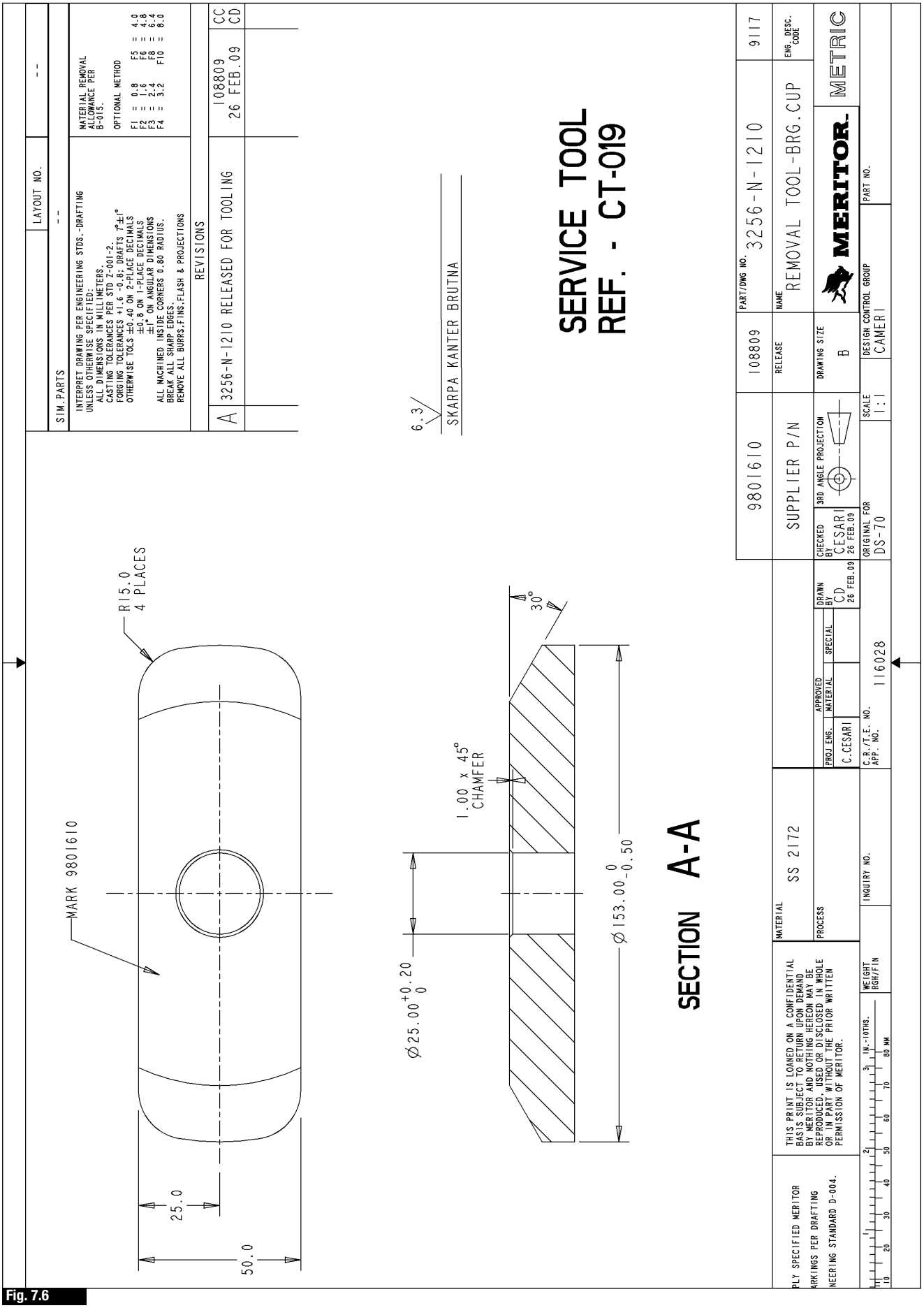


Fig. 7.6

7 Service Tools

MST4406 CT21 Lifting Tool - Diff.Case

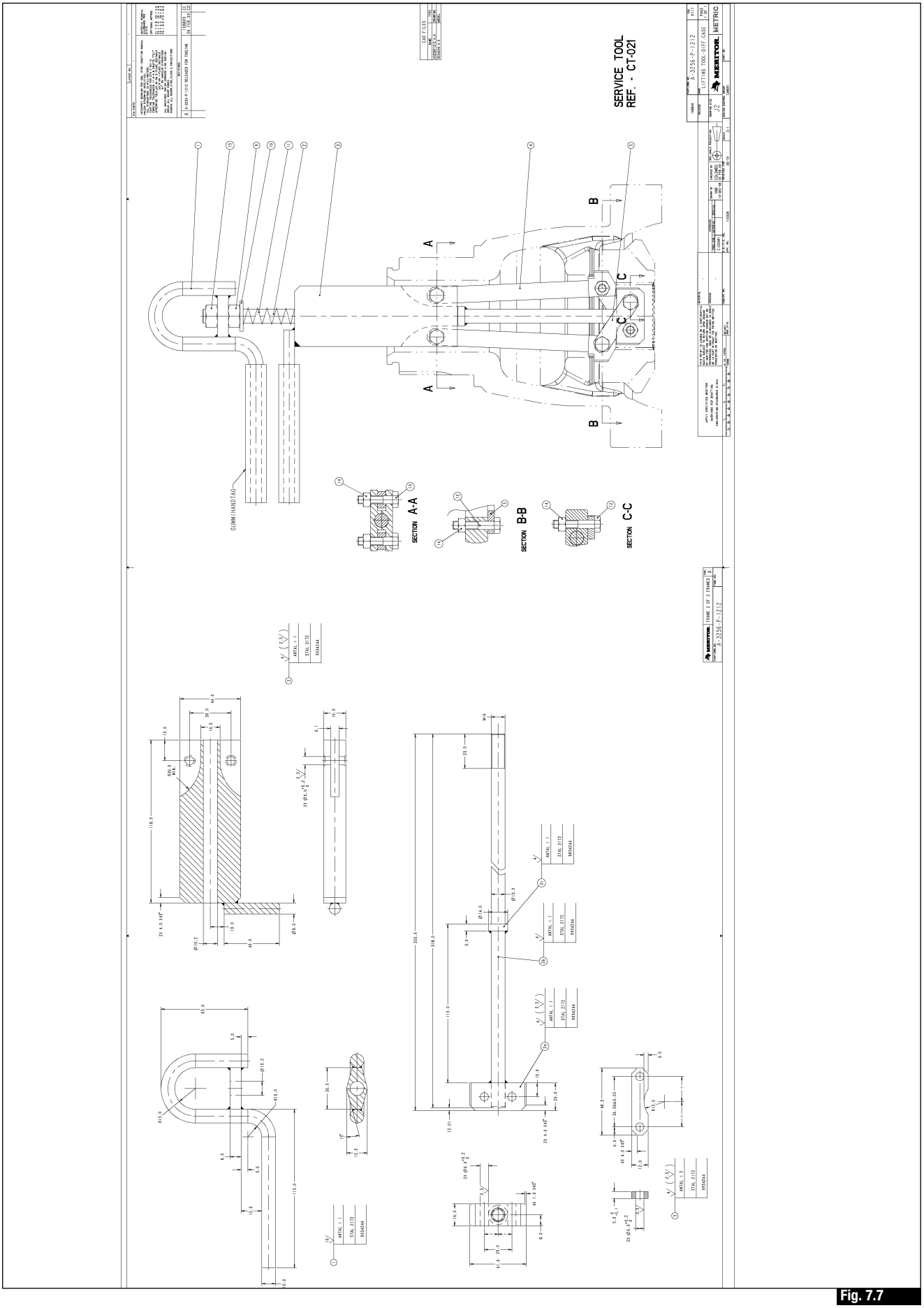


Fig. 7.7

7 Service Tools

MST4407 CT23 Fitting Tool - Bearing Cup

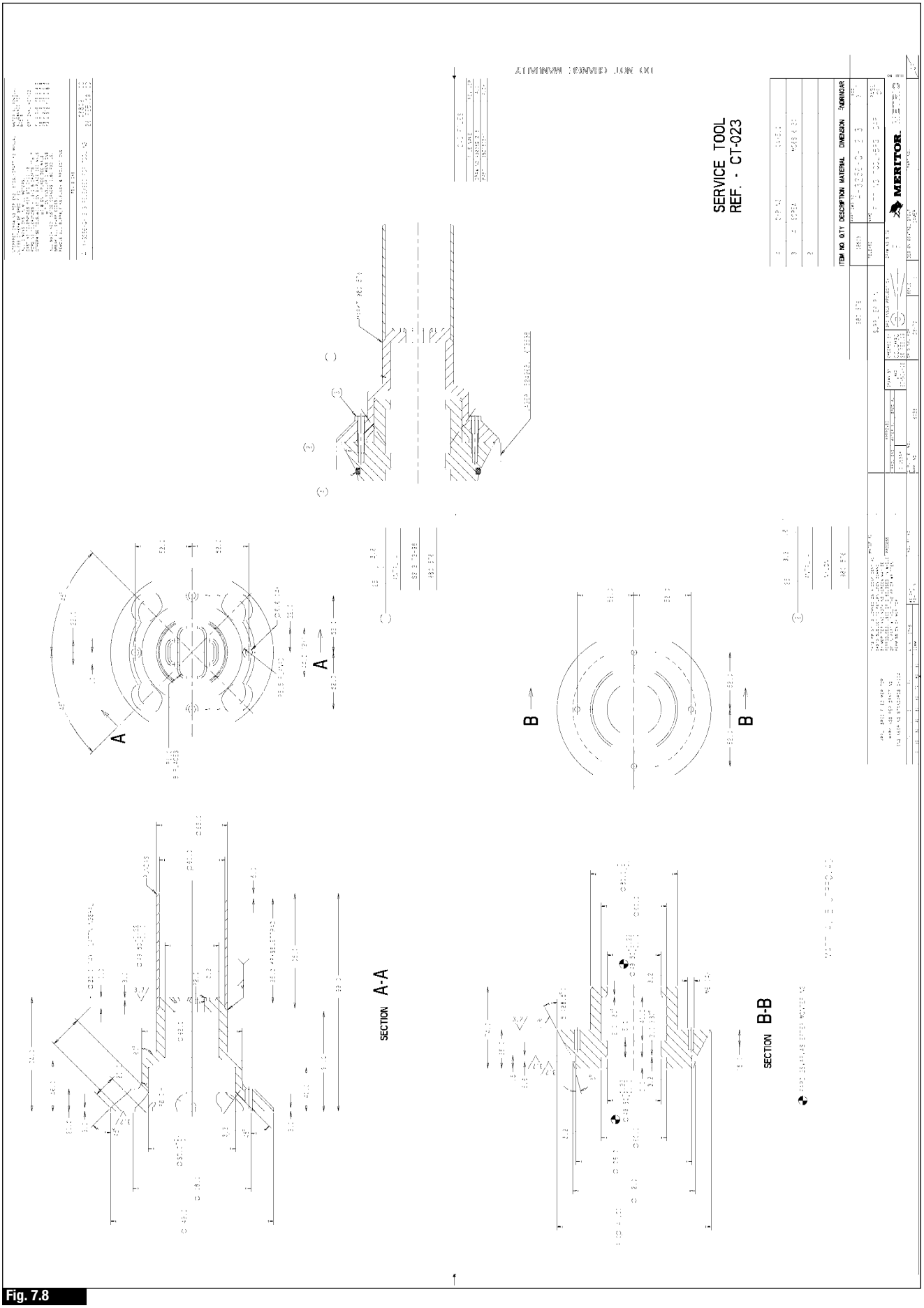


Fig. 7.8

7 Service Tools

MST4408 CT24 Fitting Tool - Bearing Cup

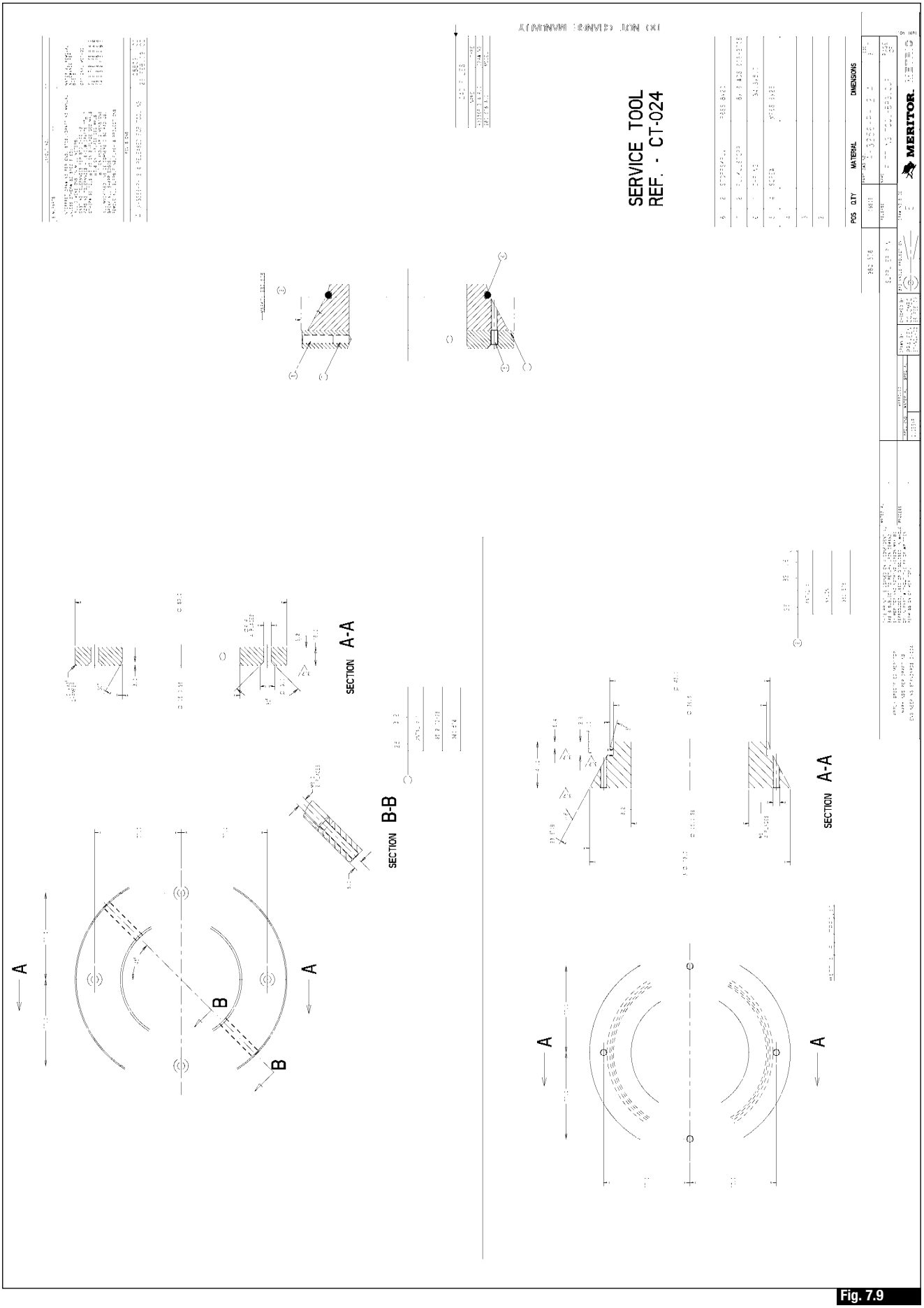


Fig. 7.9

7 Service Tools

MST4409 CT25 Fitting Tool - Bearing Cone

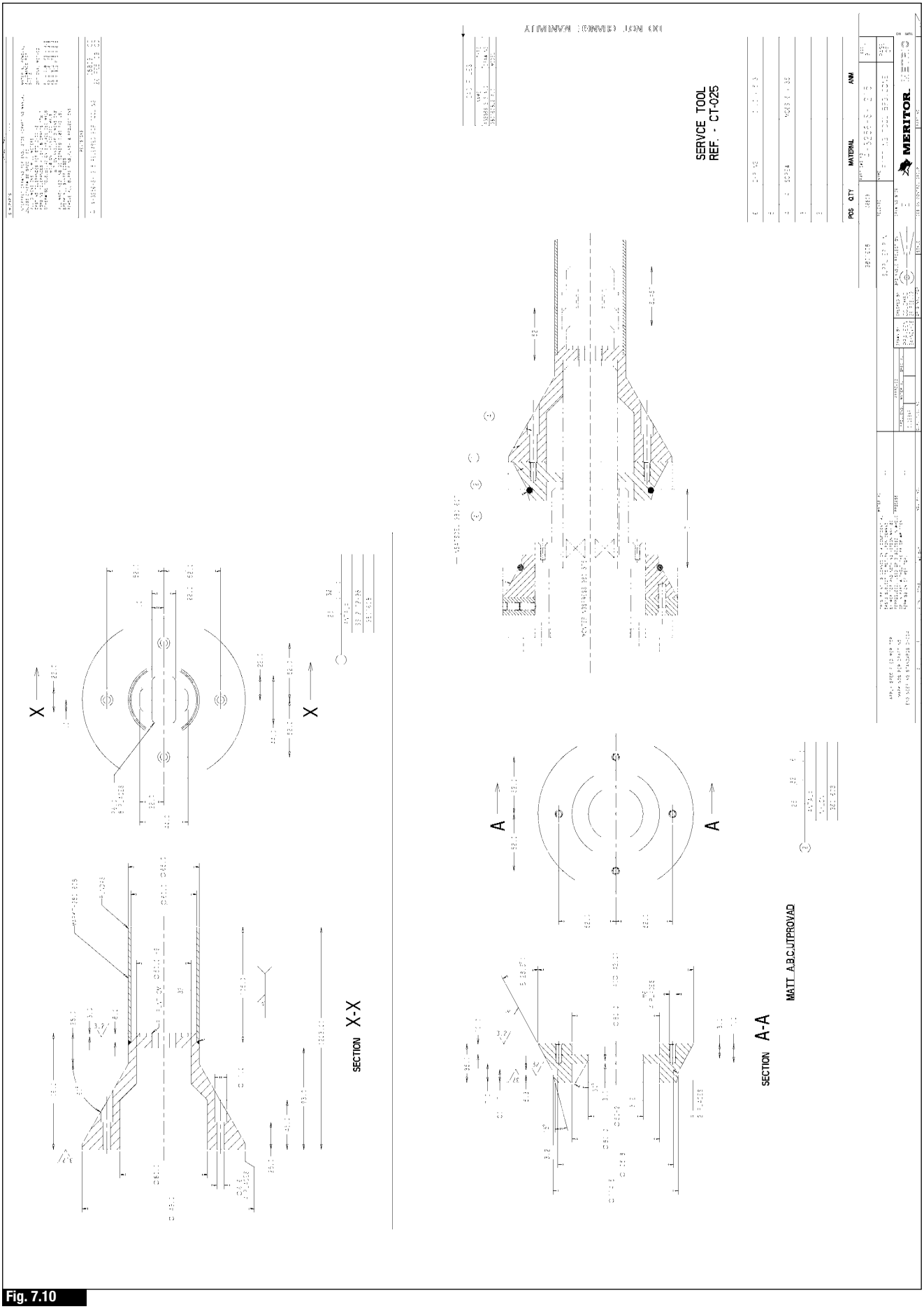


Fig. 7.10

7 Service Tools

MST4410 CT26 Fitting Tool - Pinion Shaft Seal

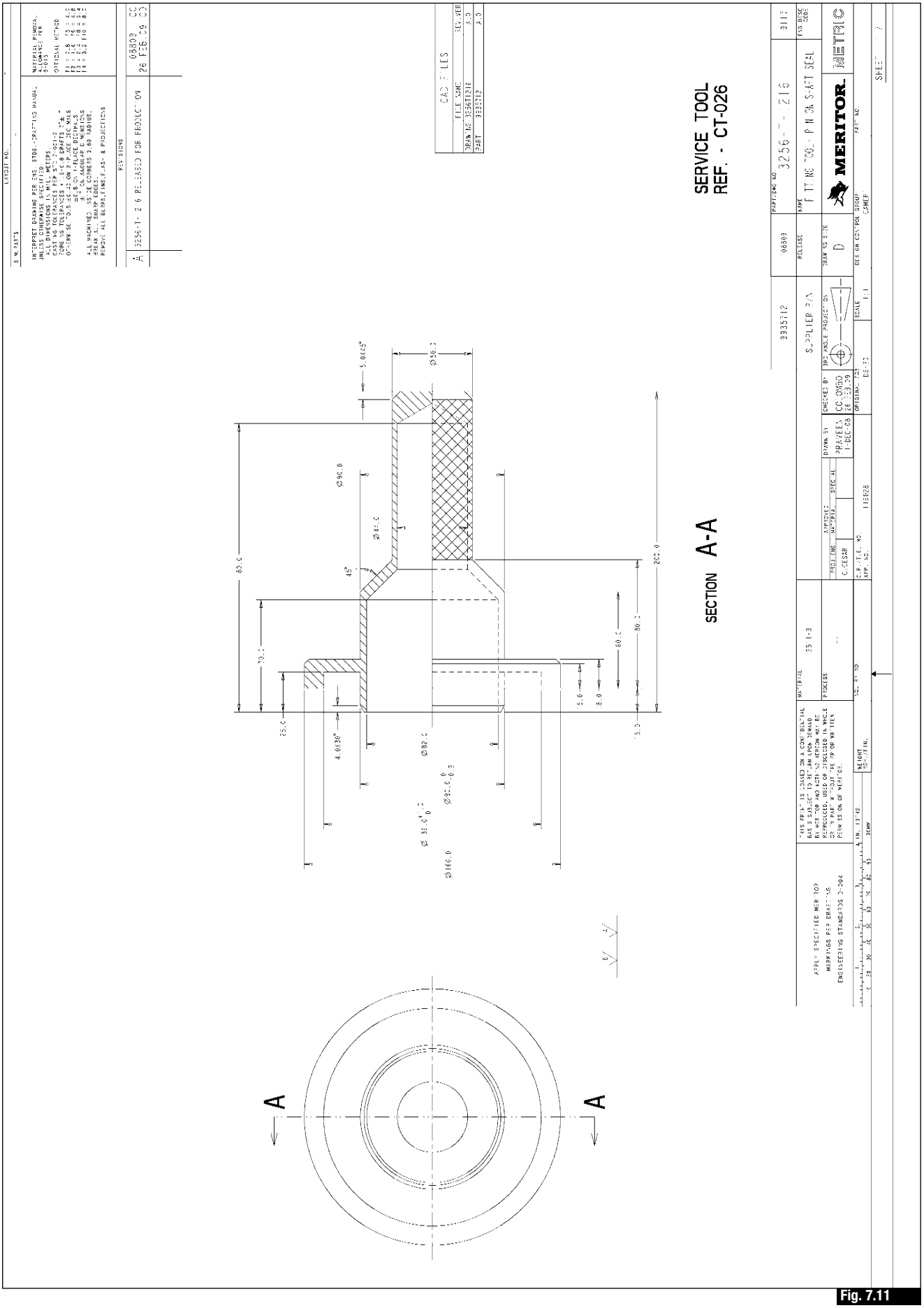


Fig. 7.11

7 Service Tools

MST4411 CT27 Adjusting Tool - Diff. Bearing Adjusters

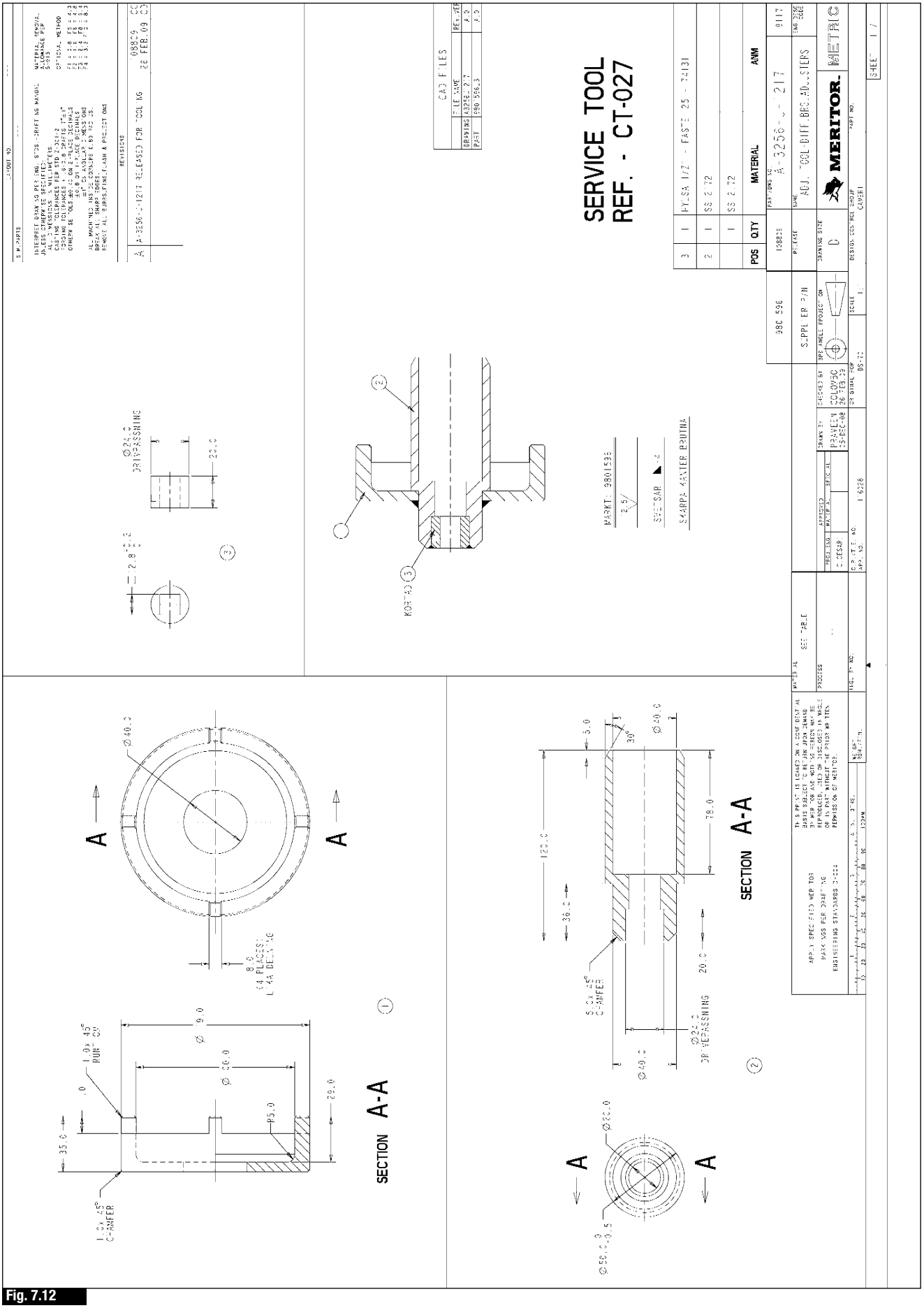


Fig. 7.12

7 Service Tools

MST4412 Output seal tool

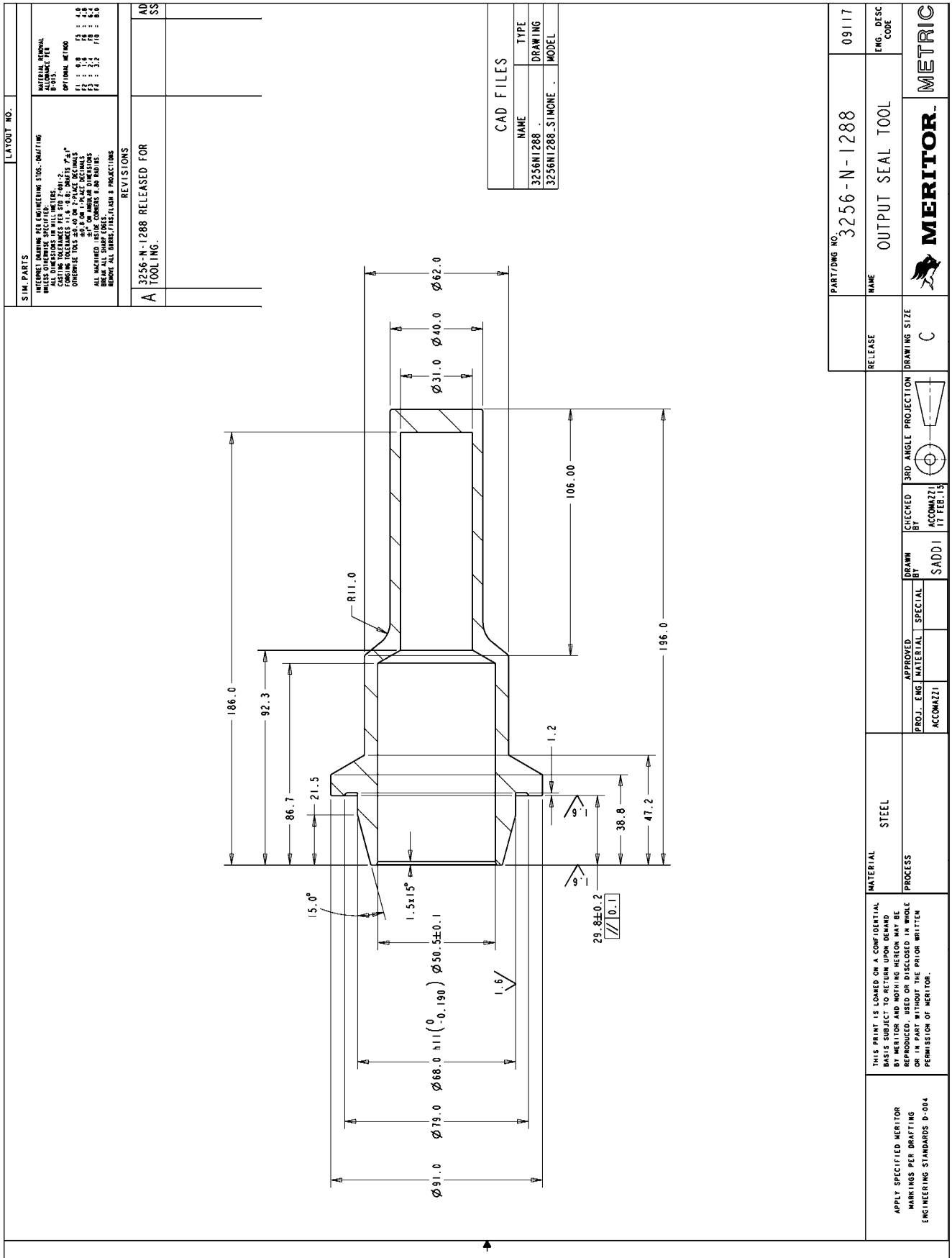


Fig. 7.13

7 Service Tools

MST4807 Inner deflector

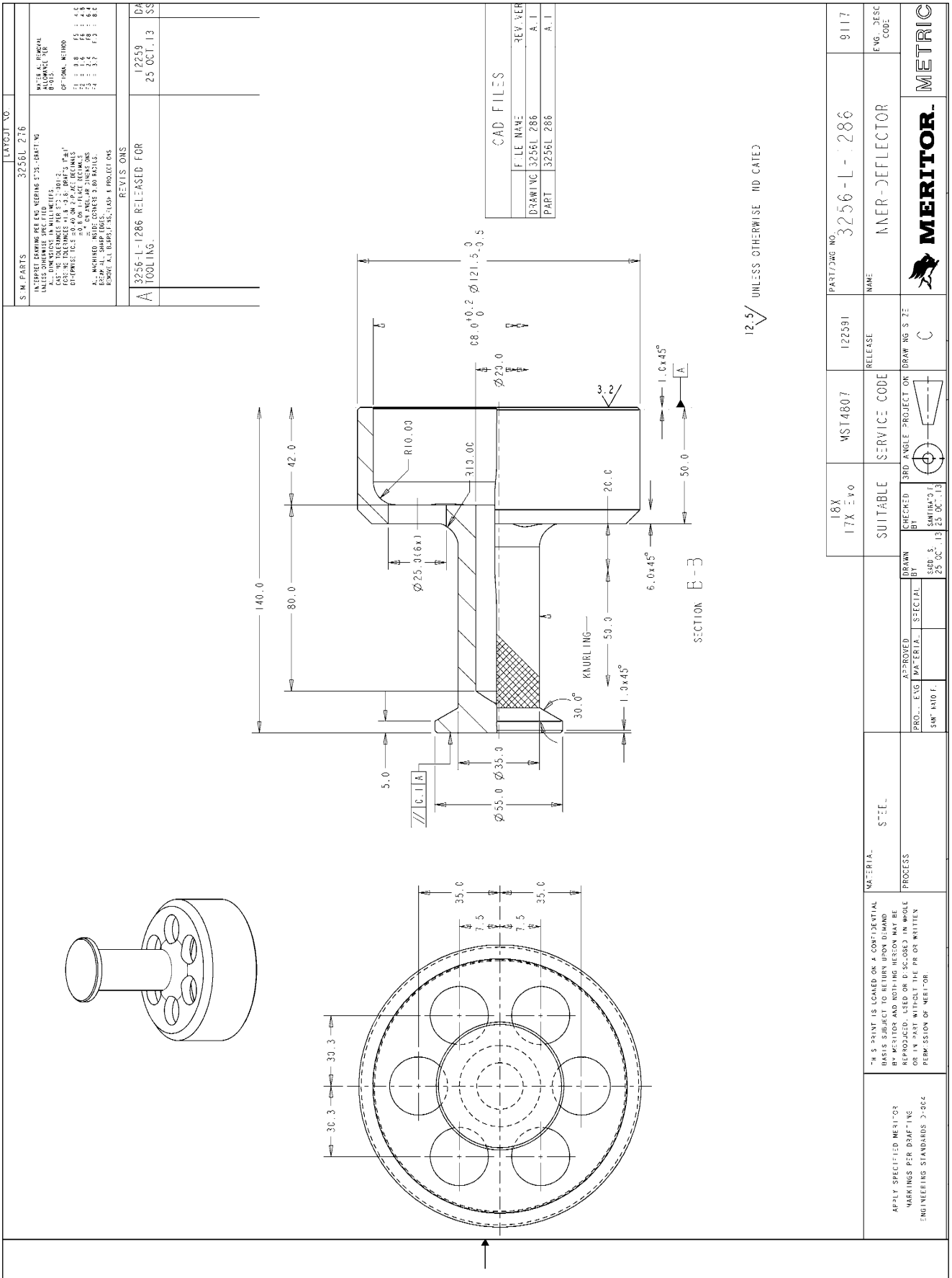


Fig. 7.14

7 Service Tools

MST4808 Inner ring

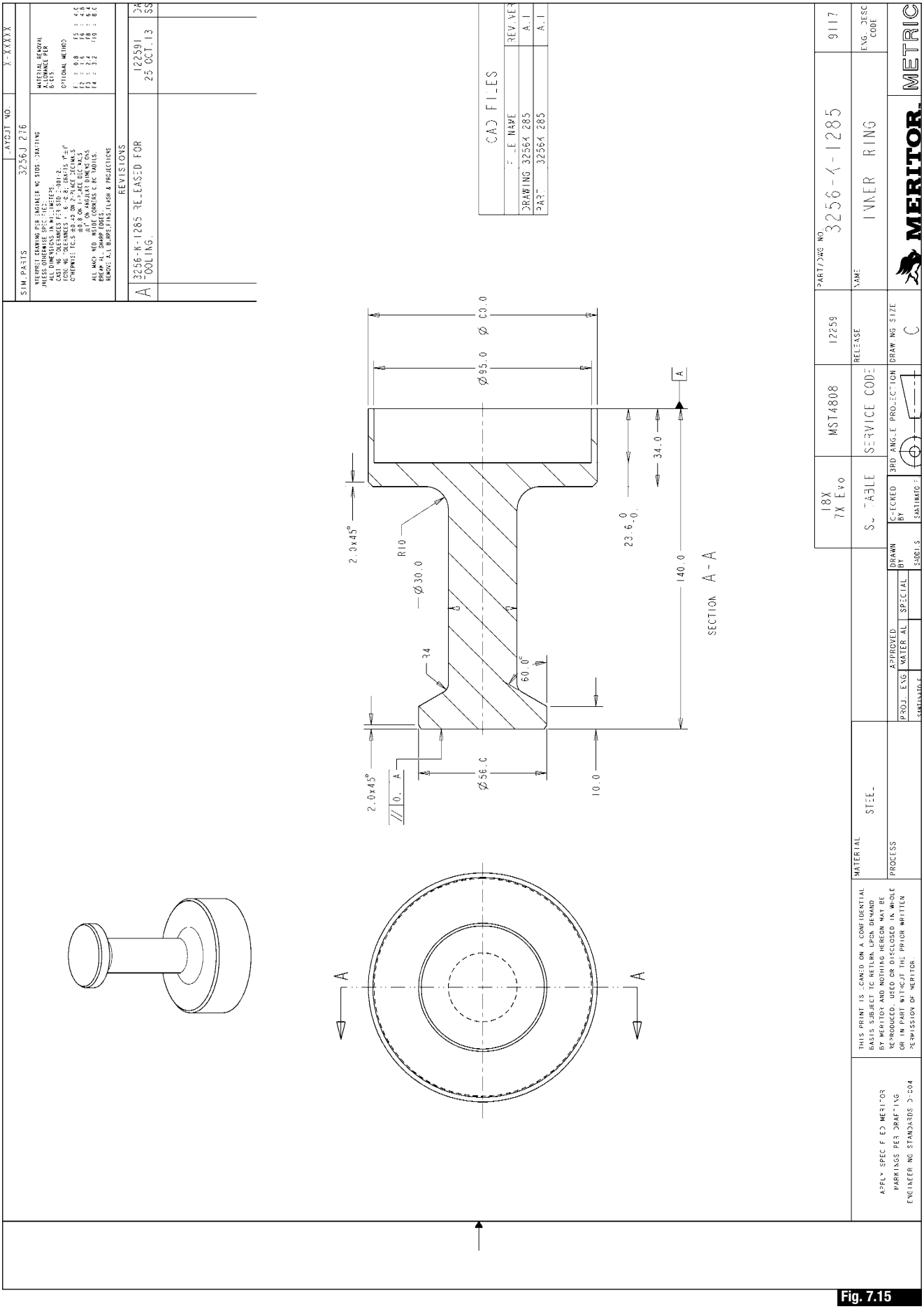


Fig. 7.15

Annex 1

8

pg. 102 Product Notification Letter

8 Product Notification Letter

Introduction Date: First quarter 2013

Subject: MT610 development with separated bearing caps.

Product: RS1352HV; RS1370HV; RTH3312; RSH1370, RTH2610B; RT2610HV; RTH3212E; RTH3212D; RT3210HV; RS1365HV; RSH1370E.

NOTE: for any information not included in this section please refer to Part 1 of this manual.

Forward and rear carriers for MT610 axles will be updated with a new design solution.

The current product has a bridge between the two bearing caps, with the planned change this bridge will be removed.

Both old and new carriers will be interchangeable.

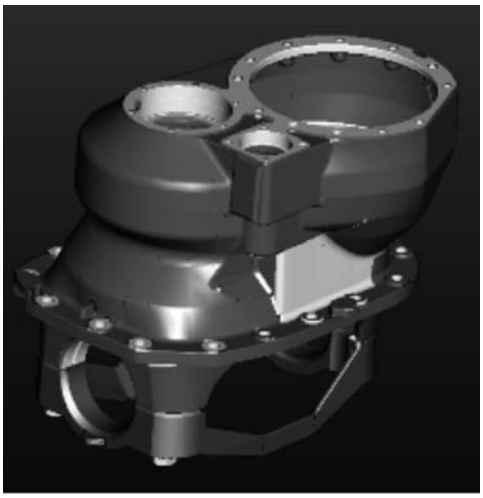
The introduction of this change is driven by product optimization.

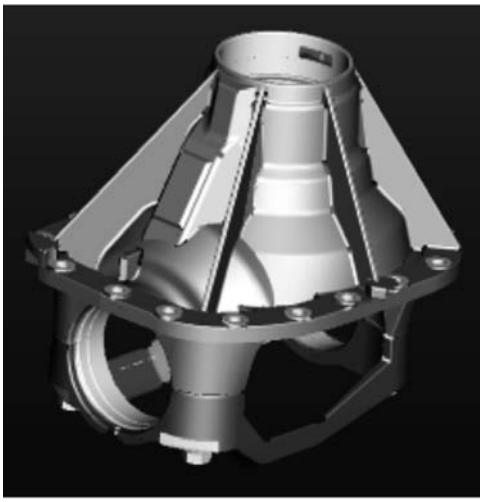
Old

New

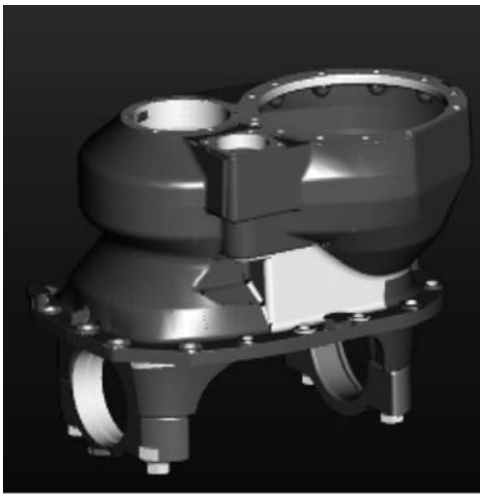
8 Product Notification Letter

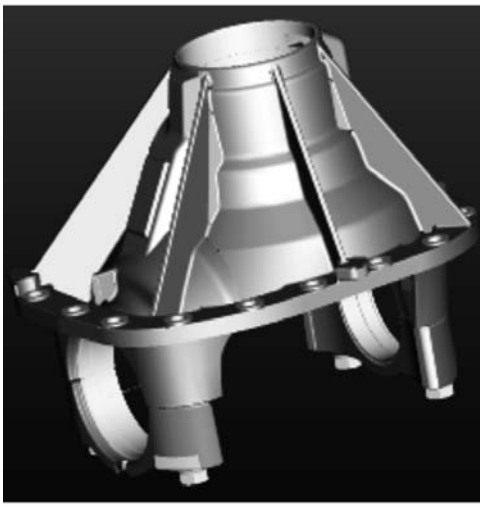
Old





New





Parts that will be replaced are as follows :

Old p/n	Name	PCS	New p/n	Name	PCS
1524916	Carrier Housing DS70	1	A23200W2415	Carrier Housing DS70	1
A23200F2060	Carrier Housing DS65	1	A23200T2412	Carrier Housing DS65	1
A23200C2057	Carrier Housing DT100	1	A23200S2411	Carrier Housing DT100	1

8 Product Notification Letter

Assembly instructions will change as follow.

Adjust Axial Play of Differential Bearings

Solution one: carriers with leg cap bridges.
The axial play of the differential bearings is adjusted to 0.05 +/- 0.05 mm. The play is measured after tightening the bolts to 200 Nm, tighten another 90 +/- 5 degrees.
No bearing preload is allowed.

Solution two: Carriers without leg cap bridges.
Tighten the differential bearing caps screws PN6 min 40Nm .

- Tighten the crown wheel side bearing adjuster ring while turning the crown wheel by hand. When a resistance is felt at the crown wheel stop tightening the adjuster ring.
- Back off the adjuster ring till the back lash spec is reached (approx.. 2 segments/notches).
- Set a DTI gauge at machined surfaces (RL+LU) or (LL+RU) or (LM+RM). Set both DTI gauges to “0”. See Figure 1.
- Move to the opposite side of the crown wheel and tighten the bearing adjusting ring until there is movement on the DTI gauges.

NOTE:The bearing cap divergence figure is the combined reading of both DTI gauges.

Example:

(RL) Gauge 1 = 0.12mm
(LU) Gauge 2 = 0.07mm

Bearing cap divergence is:
0.12mm + 0.07mm = 0.19mm.

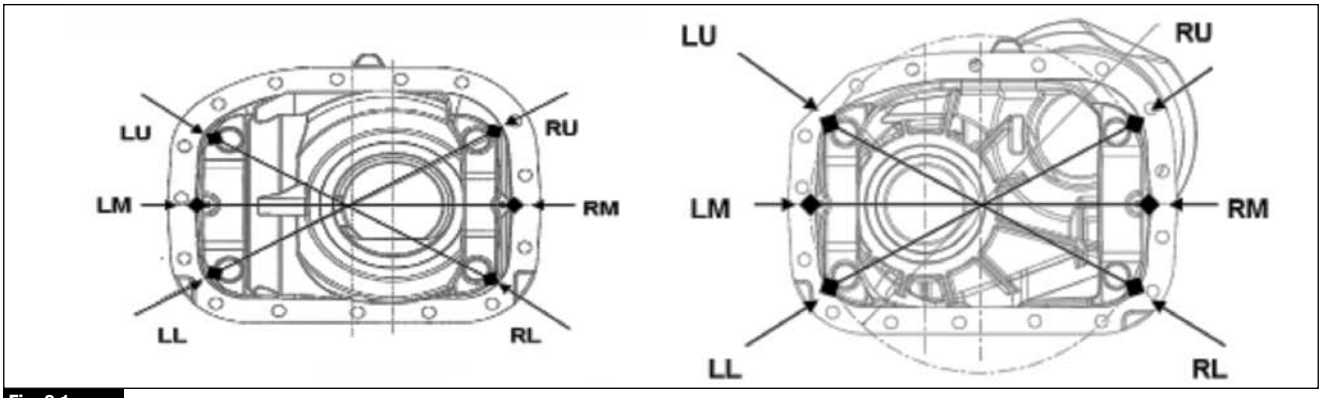


Fig. 8.1

- Continue to tighten the bearing adjuster ring until a bearing cap divergence value between 0.05mm and 0.20mm is obtained. Measurements should be taken on (LM+RM) or on both (RU+LL) and (RL+LU) and both have to be inside the tolerance 0.05÷0.20.
  This will ensure the correct bearing pre-load is achieved.

Tightening the bolts to 200 Nm, tighten another 90 +/- 5 degrees.

Diameters (RU,LL) and (RL,LU) should be max 420.90(for DS70) and max 460.90.

Appendix

9

pg. 106 Available spacers and combination of calculated spacers (position 30)

9 Appendix

Available spacers and combination of calculated spacers (position 30)

Part no.	Dimension (mm)
1673011	22.84
1673012	22.86
1673013	22.88
1673014	22.90
1673015	22.92
1673016	22.94
1673017	22.96
1673018	22.98
1673019	23.00
1673020	23.02
1673021	23.04
1673022	23.06
1673023	23.08
1673024	23.10
1673025	23.12
1673026	23.14

Part no.	Dimension (mm)
1673027	23.16
1673028	23.18
1673029	23.20
1673030	23.22
1673031	23.24
1673032	23.26
1673033	23.28
1673034	23.30
1673035	23.32
1673036	23.34
1673037	23.36
1673038	23.38
1673039	23.40
1673040	23.42
1673041	**23.44 MASTERSPACER**

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