

SERVICE MANUAL

S24 (6+2) GEAR DRIVE
Front Axle

SERVICE MANUAL

FRONT AXLE & STEERING FOR 20,22,24,26

INTERNATIONAL TRACTORS USA CORPORATION

2332 MT. ZION ROAD

GREEN WOOD, AR

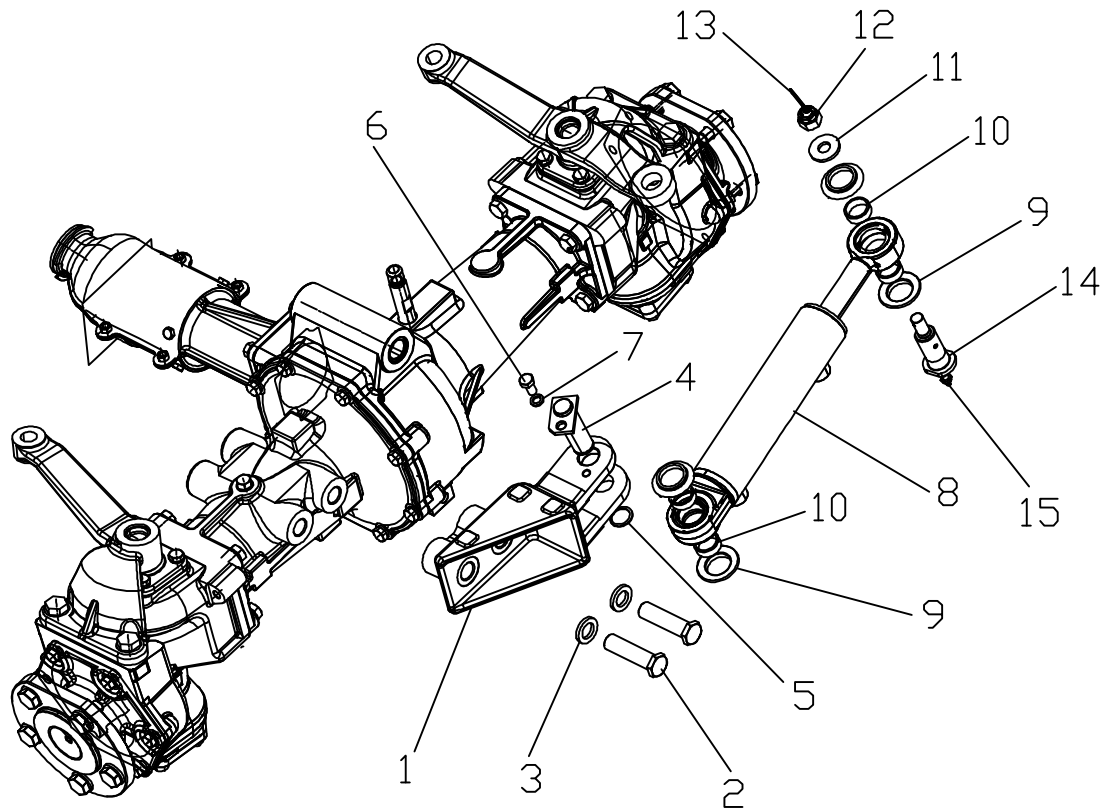
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FRONT AXLE - 4WD

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C 1.0 DISMANTLING OF FRONT AXLE



Step 1: Dismantling of Power Steering Cylinder

Remove the Split Pin - dia 2x25 (13) from Castle nut (12).

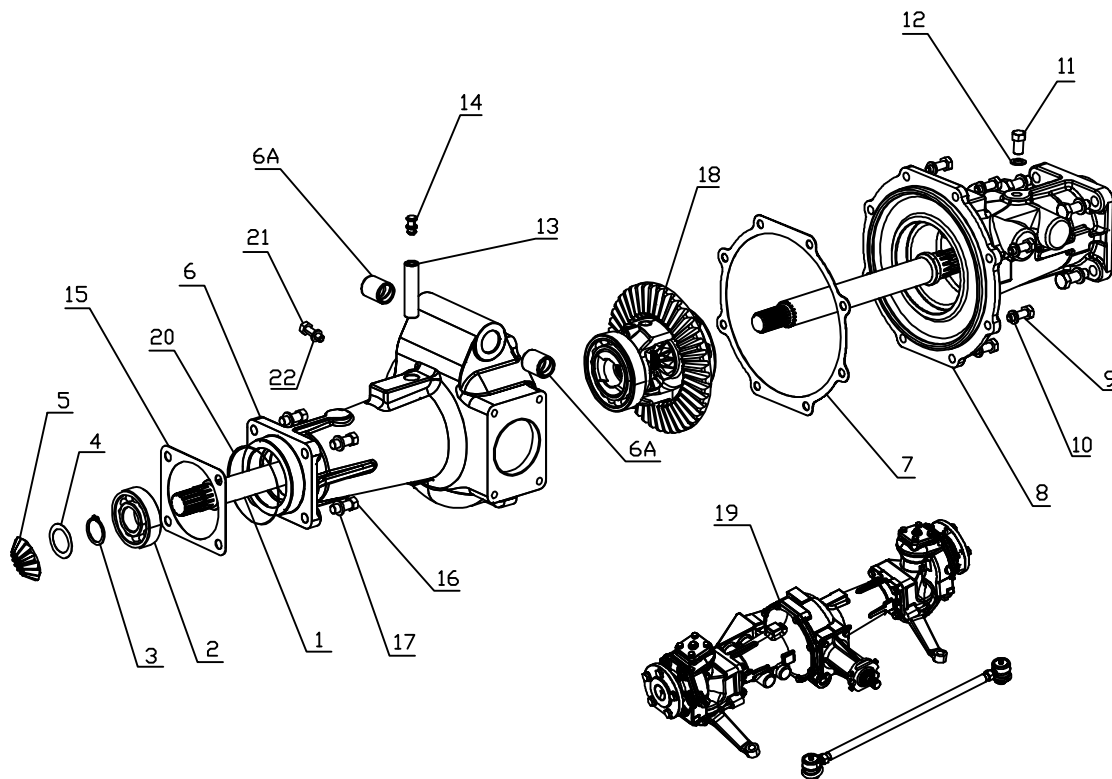
Unscrew Castle Nut (12) from Pin dia A-20 (14) to unlock Steering cylinder (8) from Steering arm guide (LH).

Remove Spacer (11) from Pin dia A-20 coming out from steering arm guide(LH).

Remove Pin dia A-20 from Steering cylinder by pressing it in downward direction so as to unlock the assy of steering cylinder (8) from Steering arm guide (LH).

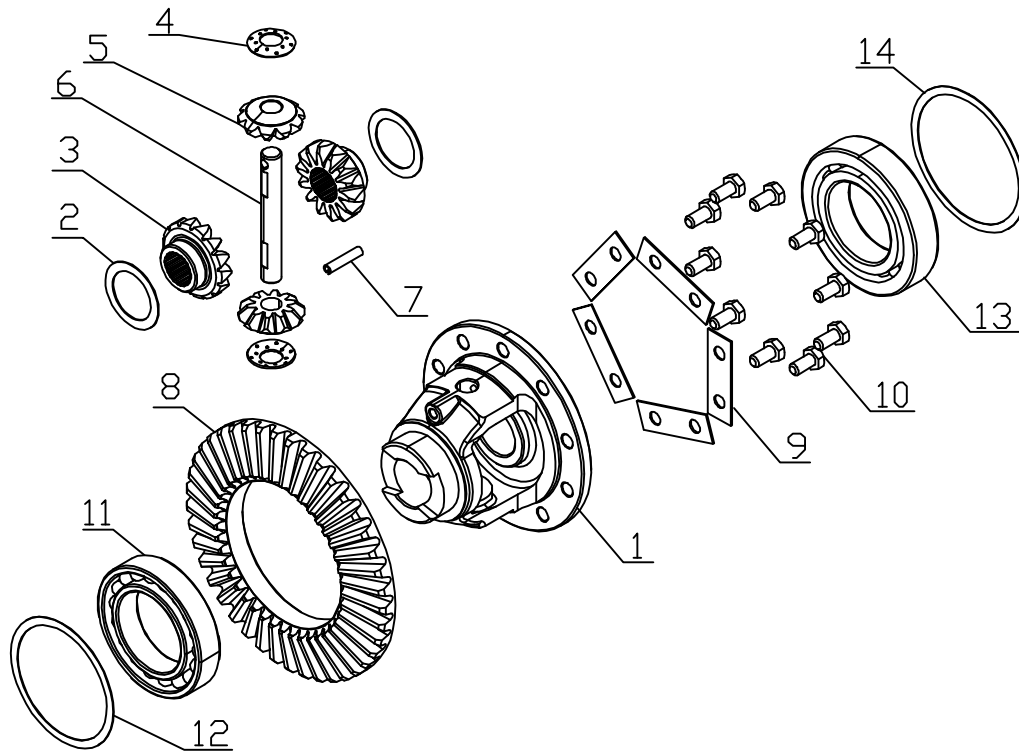
Unscrew hex head screw M8x1.25x16 (6) to unlock pin (7) so as to unlock the Steering cylinder (8) from Steering cylinder mounting bracket (1), remove Rubber pad for spacer (9) & Spacer (10).

Dismantle Steering cylinder mounting bracket (1) by unscrewing Hex bolt M16x1.5x60 from the location as specified in the figure.



Step 2: Dismantling of Trumpet Assy

- Unscrew the drain plug (21) along with Sealing washer (22) and drain the oil from Front Axle Assy.
- Uncouple the entire assy of Trumpets from the Stub Axle Housing by unscrewing screws - M10x1.5x30 (16).
- Unscrew the Screw - M10 (11) & Washer (12).
- Dismantle the Breather (13) & Breather cap (14).
- Unscrew Hex screws (9) - 8 Nos to remove the Cage assy (18) and uncouple the Trumpet housing right (8).
- Remove the Shims (4) & remove the Bevel gear Z-15 (5).
- Remove Shaft (1) from Trumpet Housing Left (6) & remove 2 bushes (6A).
- Unlock the External circlip A-28 (3) and remove the ball bearing 63/28 (2) from the Front Axle shaft (1).



Step 3: Dismantling Differential Cage & Crown Wheel Assy

Remove ball bearing 6011 (11) from LH side of the Diff cage (1) and ball bearing 6211 (13) from RH side of Diff cage (1).

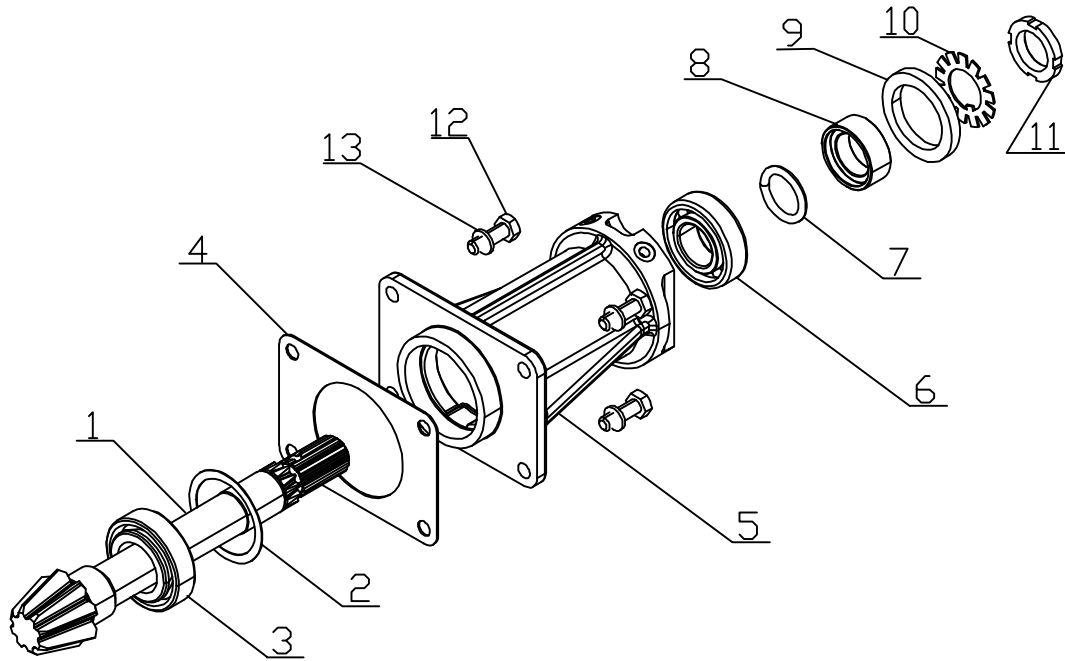
Lock the Differential in a vice, unlock the locking washers (9) & unscrew the fastening screws M8x1.25x16 (10) and remove the bevel gear crown (8).

Warning: This will make the Differential parts free, so remove with care not to drop the internal components.

Unlock the spring cotter (7) to remove the pinion shaft (6)

Dismantle gear diff pinions Z-10 (5) - 2 nos and spherical washers (4).

Dismantle the Diff. side gear liner/washer (2) from both inner sides of cage & both gears diff side (3).



Step 4: Dismantling Tail Pinion Assy

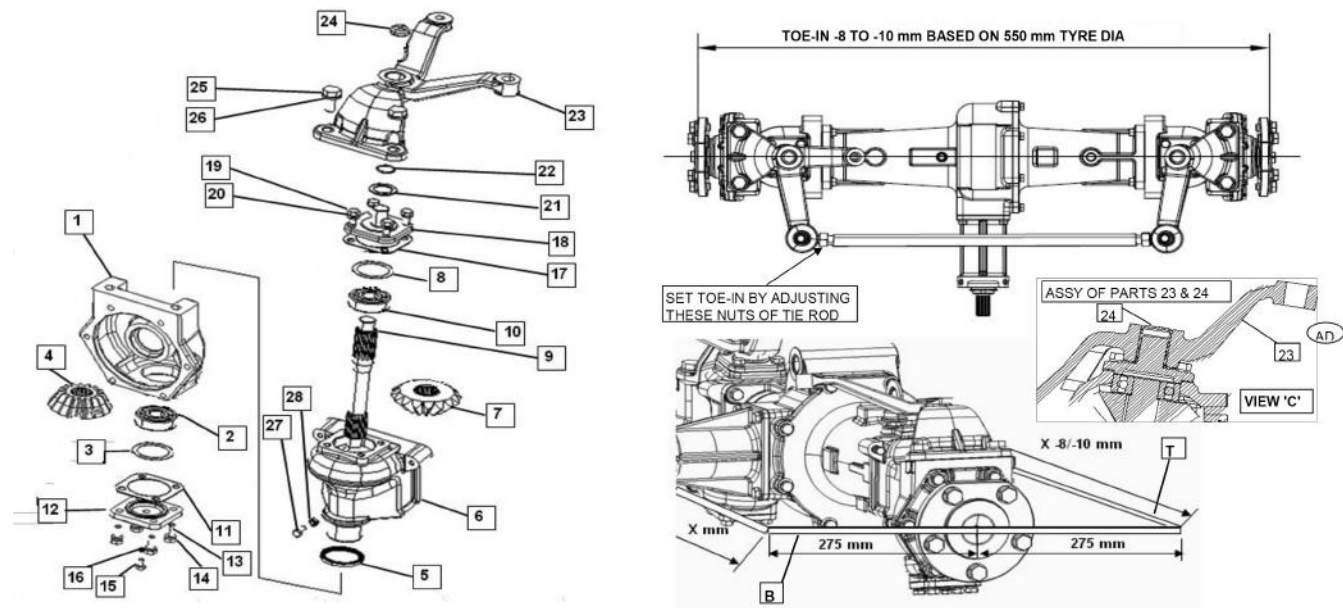
Unscrew the Hex Screws M8x1.25x25 (12) - 4 nos. to dismantle sub assembly of TP carrier (with Tail Pinion) from the Front Trumpet Assembly.

Unlock the Withdrawal Nut (11).

Remove the O-Ring (7), Sleeve (8) and Oil Seal (9).

Remove the Tail Pinion (1) from TP Carrier (5) and dismantle the Ball Bearing 6205 (6)

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Step 5: Dismantling Stub Axle Assy

Remove the Stopper Screw (27) and Washer (26) both from LH & RH Side. Remove the Cap (24).

Unscrew the Hex Screw M12x1.75x25 (25) - 4 nos for dismantling Steering Arm Assembly (23) from Steering Arm Guide. Remove Washer (21) and O-Ring (22) from Steering Arm Guide.

Unscrew Hex Screw M8x1.25x20 (19) - 8 nos to unlock Steering Arm Guide (18) from both LH & RH Side.

Unscrew the Hex Screw M8x12 (15) - 2 nos at the bottom, and remove the Sealing Washer 8x12 (16).

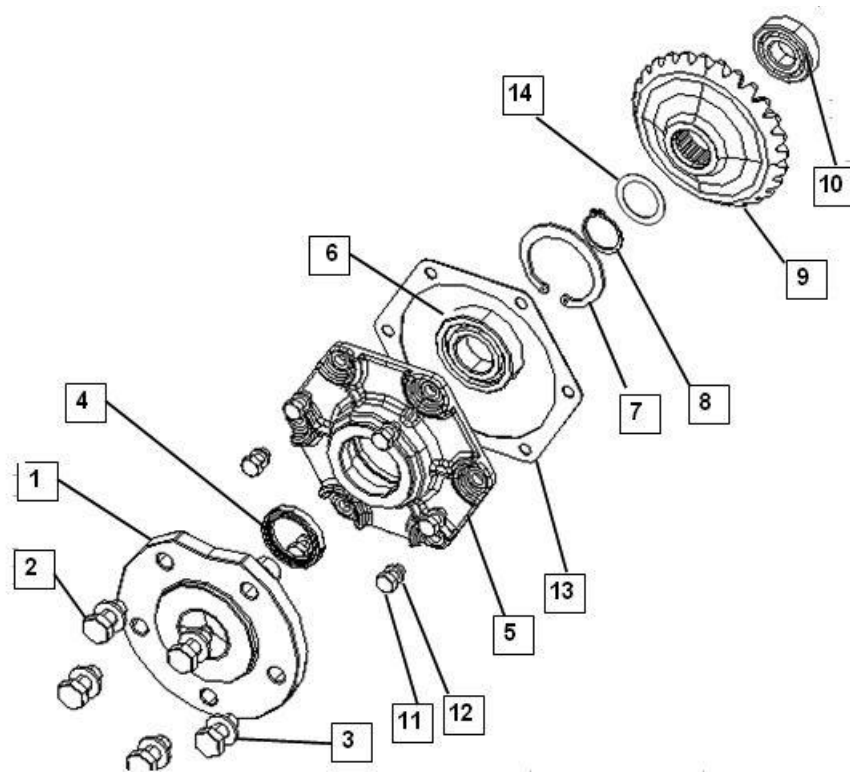
Unscrew Hex Screws M8x1.25x20 (13) - 8 nos for removal of Cover (12) and Gasket (11).

Remove Front Axle Cover Assembly from Front Axle Housing (1).

Remove the TR Bearings 30304 (2, 10) from both sides and remove the Shims (3, 8) at the ends of these Bearings.

Remove the Bevel Gear Lower (4) and Upper (7) and remove the Stub Axle (9) from Stub Axle Housing.

Dismantle the Stub Axle Housing (6) from Front Axle Housing (1) and remove the Oil Seal (5). Similar process to be repeated at other end.



Step 6: Dismantling Front Axle Cover Assembly

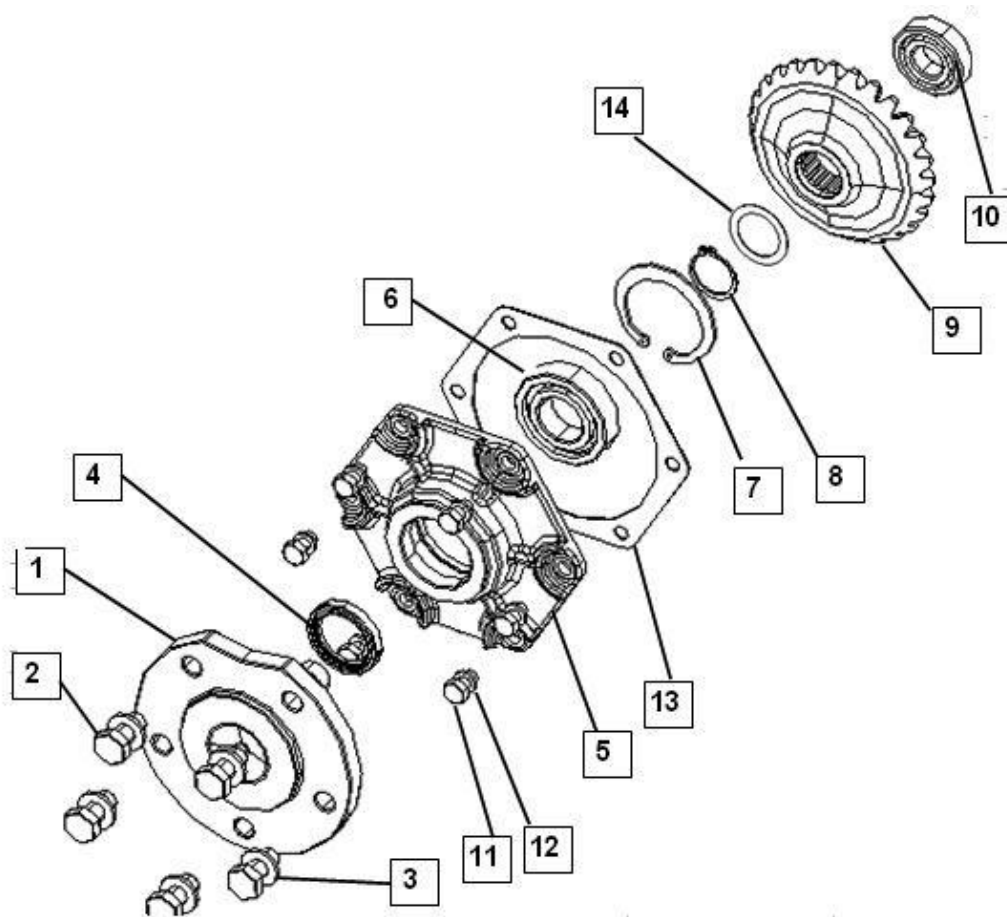
Unscrew Hex Screws M8x1.25x16 (11) - 12 nos from Front Axle Housing to uncouple the sub assembly of Front Axle Cover Assembly.

Remove the Internal Circlip (7) as well as External Circlip (8) with the help of Nose Pliers.

Remove the Ball Bearings 6206 (6) and remove the Front Axle from Front Axle Cover.

Remove the Oil Seal (4) from Front Axle Cover (5).

C 2.0 RE-ASSEMBLY OF FRONT AXLE



Step 1: Re-assembly of Cover Assy

Loose fit (for assembling front wheels) the Hex Screws M12x1.25x25 (2) - 10 nos with Spring Washers (3) - 10 nos to the Front Axle (1).

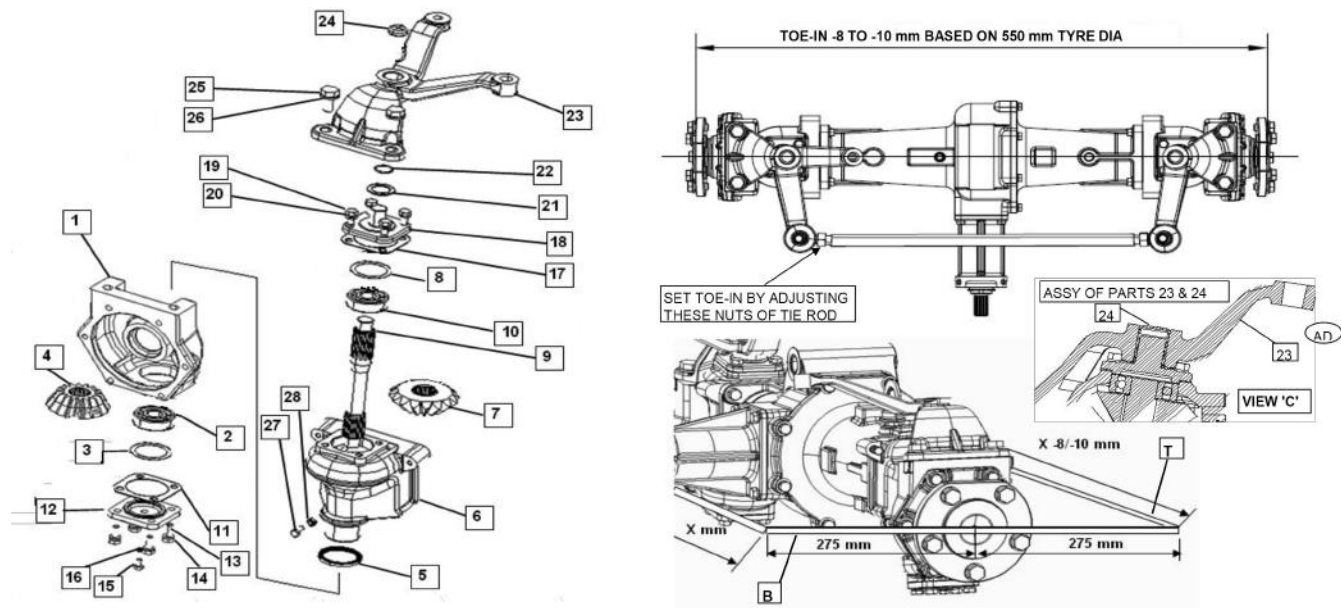
Fit the Oil Seal (4) into the Front Axle cover (5) with the help of Special Tool. Visually check for proper seating of Oil Seal.

Assemble Front Axle (1) into the Front Axle Cover (5) & Fit the Ball Bearing 6206 (6) with the help of Special Tool.

Fit the Internal Circlip (7) as well as External Circlip (8) with the help of Nose Pliers.

Shimming: Assemble the bevel Gear Z-27 (9) & Fit the bearing (10). Check for any play in gear Z-27. If more play put the shims (14) as per need to adjust the play with the help of Special Tool.

Finally, put the gasket (13) and apply Loctite 243 grade & Couple this entire sub-assy to the Front Axle HSG Assy with the help of Hex Screws M8x1.25x16 (11) - 12 nos & Spring Washers B8 (12) - 12 nos with torque of 21~23 Nm.
Tools used: Torque Wrench



Step 2: Re-assembly of Stub Axle Assy

Take the Front Axle Housing & Bush Assy (1) & fit the Oil Seal (5) into it. Now assemble the Stub Axle Housing (6) with it with the help of Special Tool / Mandrel.

Make the entire assy horizontal (in special Fixture, preferably) & place the Bevel Gear Z-16 Lower (4) & Upper (7) as shown & pass the Stub Axle (9) thru them. *Tools Used: Special Fixture*

Fit the TRB Bearings 30304 (2) & (10) on both sides, as shown. Then, put Shims (3) & (8) at the ends of these bearings. *Tools Used: Special Tool / Mandrel*

Available Shim Sizes: 0.20mm, 0.30mm, 0.50mm

Now, take the Front Axle Cover Assy (Already assembled) & assemble to Front Axle housing (1) temporarily.

Shimming 2: Check the backlash by rotating the Front Axle. Adjust the Shims (3) at Lower Bearing (2), if need be & re-assemble. *Tools Used: Bearing Remover / False Bearing, Back Lash: 0.08~0.27mm*

Remove the Front Cover Assy. & Fit the Front Trumpet Assy (single side - with Axle shaft & bevel gear Z-15 - w/o coupling both Trumpet) temporarily.

Shimming 3: Check the backlash by rotating the Front Axle shaft. Adjust the Shims (8) at Upper bearing (10), if need be & re-assemble. *Tools Used: Bearing Remover / False Bearing, Back Lash: 0.08~0.27mm*

Fit cover (12) with gasket (11) by applying Loctite 243 grade using the Hex Screws M8x1.25x20 (13) & washers (14) to torque of 21~23 Nm. *Tools Used: Torque Wrench*

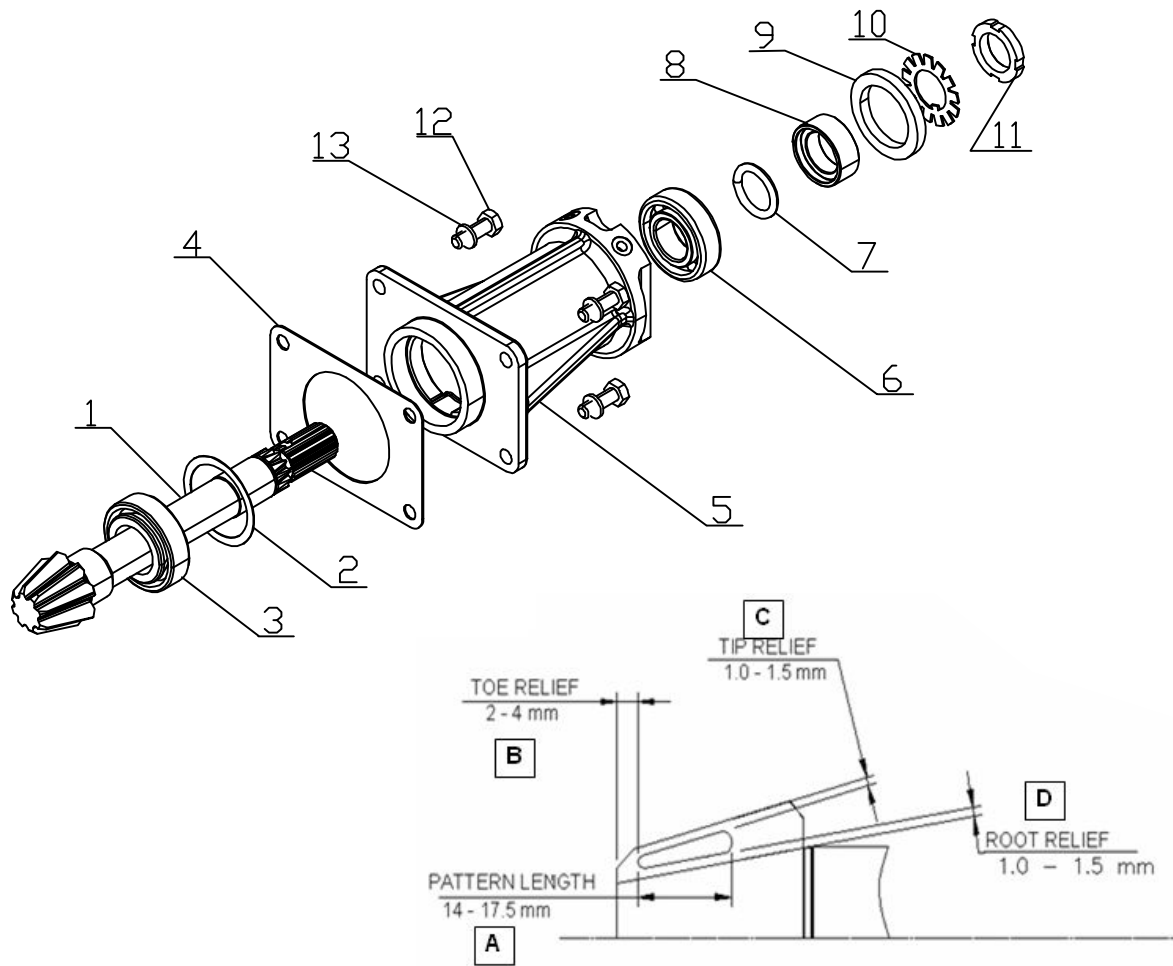
Also fit Screw M8x12 (15) and Sealing Washer 8x12 (16) at the bottom with torque of 21~23 Nm. *Tools Used: Torque Wrench. Apply Loctite: 243 grade*

Fit steering arm guide (18) with gasket (17) using the screws (19) & washers (20) to torque of 21~23 Nm. *Tools Used: Torque Wrench. Apply Loctite: 243 grade*

Place washer (21) & O-ring (22) on the steering arm guide (18). Apply grease over them & assemble the steering Arm assy (23) using screw M12x1.75x25 (25) - 4 nos & washer (26) - 4 nos and tighten to torque of 60~65 Nm. *Tools Used: Torque Wrench*

Fit the Cap (24) with convex side keeping upward (as shown in view 'C'). Also Fit the Stopper Screw (27) & lock Nut (28). Similarly fit the assy on RH side also. *Setting length of Stopper Screw: 37.5 mm (Torque: 21~23 Nm)*

Set the Toe-in Value as specified, at the hub flanges of front axle using a bar (B) of 550mm length & measuring-tape (T) and by adjusting the nuts of across tie-rod (see fig.) (Also ref. vehicle assy proceed. No. GT/VH/0021AA). *Tools Used: Special bar of 550mm length & measuring-tape, Toe-in Value: 8-10mm based on tyre dia 550mm*



Step 3: Re-assembly of Tail Pinion Assy

Get the tail Pinion (1) & assemble the appropriate shims (2), & fit the bearing (3) on it. *Tools Used: Special Tool/ Mandrel*

Available Shim Sizes: 0.20mm, 0.30mm, 0.50mm

Put this assy into the TP carrier (5) & assemble the ball bearing 6205 (6).

Put the O-ring dia 24.3x4.6 (7), Sleeve TP Shaft (8), Oil Seal (9).

Place the Locking washer (10) & lock with withdrawal nut (11).

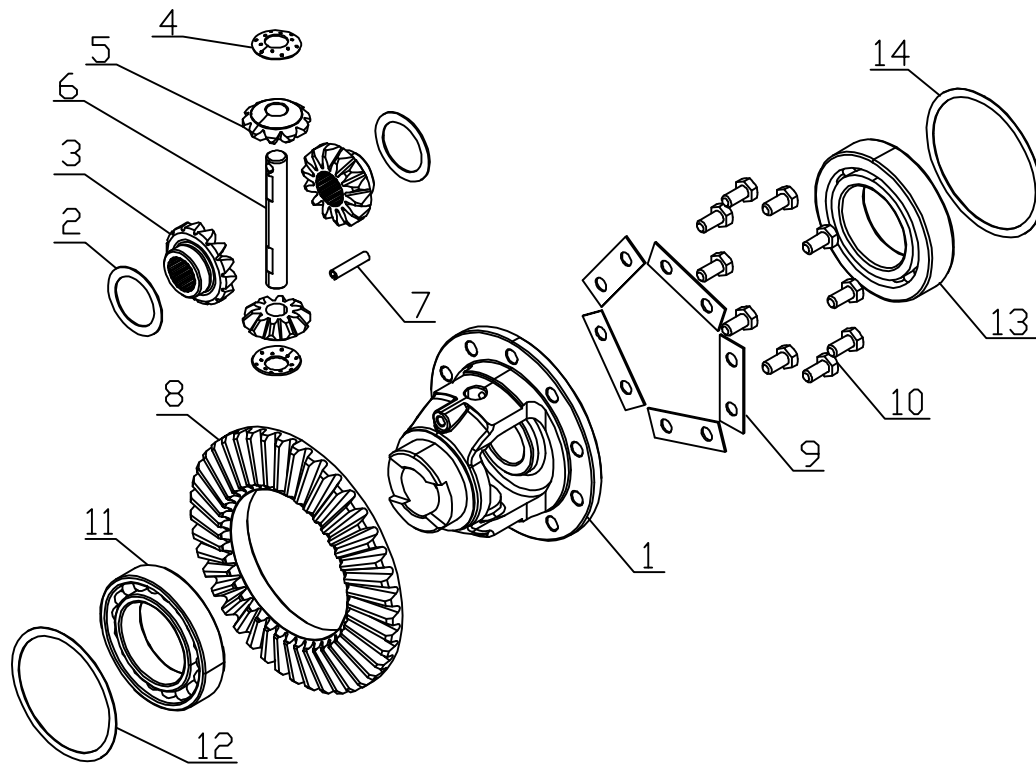
Assemble this sub-assy of TP carrier (with Tail pinion) to the Front trumpets assy (with Crown & Cage assy in it) using screws (12) & washer (13). *Tools Used: Torque Wrench, Torque: 21~23 Nm, Loctite: 243 grade*

Shimming: Rotate the TP shaft end to check the pre-load. Adjust the shims below TR bearing (3), if needed & re-assemble the entire assy. *Tools Used: Bearing Remover/ False Bearing, Pre-load: 3~4 kgf*

Check the Contact-pattern with the crown-wheel of Cage-assy. Adjust the no. of shims to get the desired values as specified. *Contact pattern: Values A, B, C, & D to be controlled as per layout given in figure above.*

Check the back-lash with the crown-wheel of Cage-assy. Adjust the number of shims if desired. **Back-lash:0.13~0.18mm**

Lock the withdrawal Nut till the required pre-load is achieved. Crimp the ends of Locking washer with the help of Special Tool.



Step 4: Re-assembly of Differential Cage & Crown Wheel Assy

Assemble the Diff. side gear liner/ washer (2) on both inner sides of cage & place both gears diff side (3).

Now, place the spherical thrust washer (4) on both sides cavities into the cage with the help of grease for sticking them with the wall.

Place the two Gear diff pinion (5), one on top & other on bottom of assy and rotate the entire gears assy by locking them (by holding together) till they take the seating upon the spherical washers (4).

Pass the pinion shaft (6) & lock it with the spring cotter (7) with the help of Special Tool & Soft Hammer.

Assemble crown wheel (8) with the above cage assy (1) using locking washers (9) & screws (10). *Tools Used: Torque Wrench, Torque: 21~23 Nm, Loctite: 243 grade*

Fit ball bearing 6011 (11) to the LH side of the Diff cage (1) & ball bearing 6211 (13) to the RH side of the Diff Cage (1). *Tools Used: Special Tool & Torque Wrench*

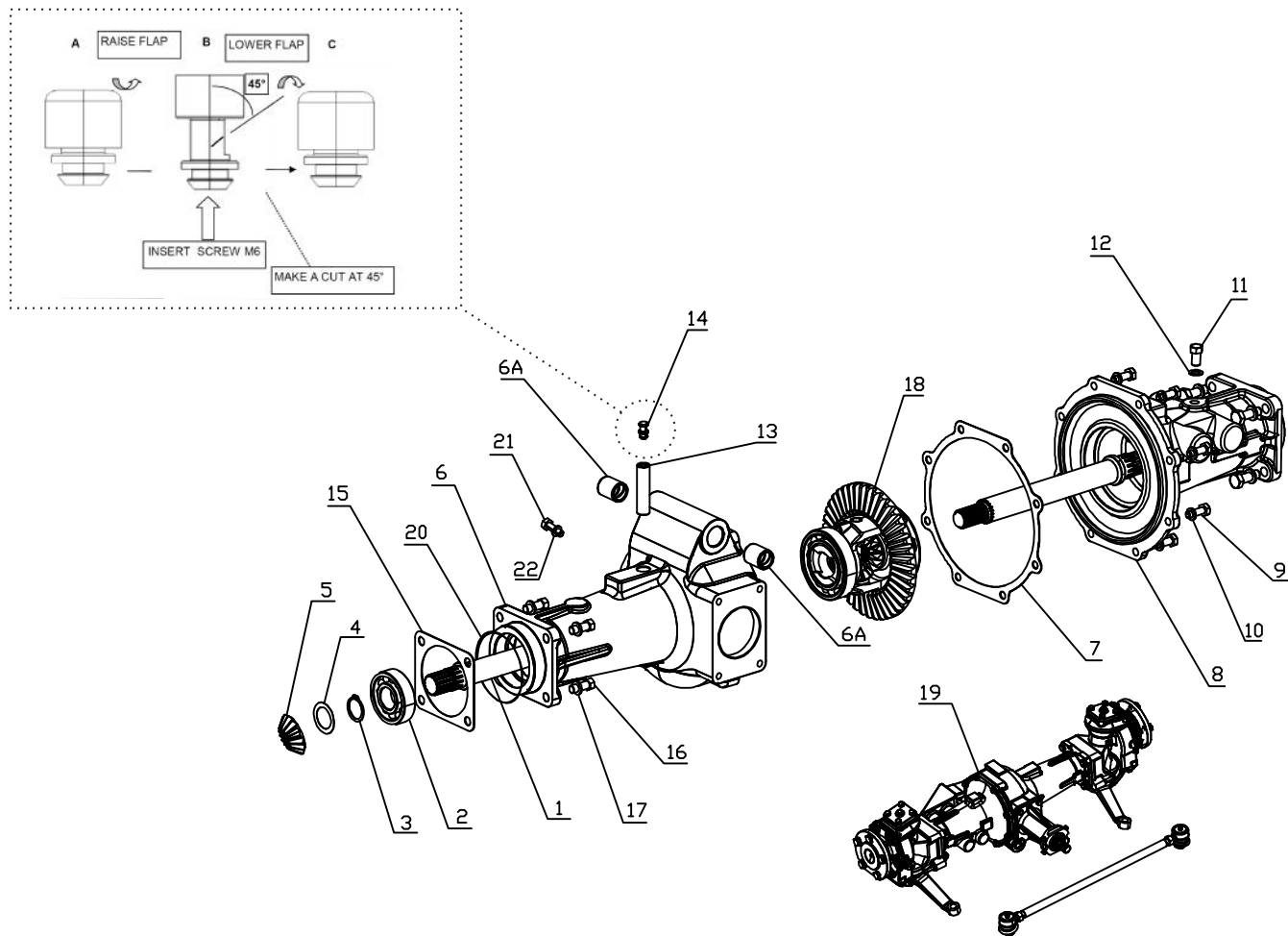
Put the Shim dia 90 (12) into the LH side Trumpet HSG with bearing (11) & Place the Diff Cage assy into trumpet HSG. *Tools Used: Special Tool & Torque Wrench*

Put the shim dia 100 (14) into the RH side trumpet hsg & Couple it to LH trumpet (as per procedure given separately) along with the Cage assy - with bearing (13) as above.

Shimming: Check the back-lash & contact-pattern with mating Tail-pinion. Adjust the shims (12 & 14) on both sides, if needed to achieve the optimum values of back-lash/ contact-pattern with the help of Yellow-Paste & Dial Indicator. **Back-lash: 0.13~0.18mm, Contact-pattern: (Refer section for Tail-Pinion Assy)**

Re-assemble & finally torque all the screws as specified in respective sections.

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Step 5: Re-assembly of Trumpet Assy

Fit the ball bearing 63/28(2) to the Front Axle shaft (1) & Lock it with External Circlip A-28 (3). *Tools Used: Special Tool/Mandrel*

Assemble Front Axle Shaft (1) into the Assy of Trumpet Housing Left with 2 bushes (6+6A).

Put the Shims (4) & assemble the bevel gear z-15 (5). Adjust the shims in combination with Stub axle assy (as given in relevant sections). *Available Shim Sizes: 0.20mm, 0.30mm, 0.50mm*

Assemble the Cage assy (18) - as per its respective procedure & couple the Trumpet Housing right (8) using gasket (7) with the help of screws M8x1.25x25 (9) & spring washer B-8 (10) with proper torque. *Tools Used: Torque Wrench, Torque: 21~23 Nm, Loctite: 243 grade*

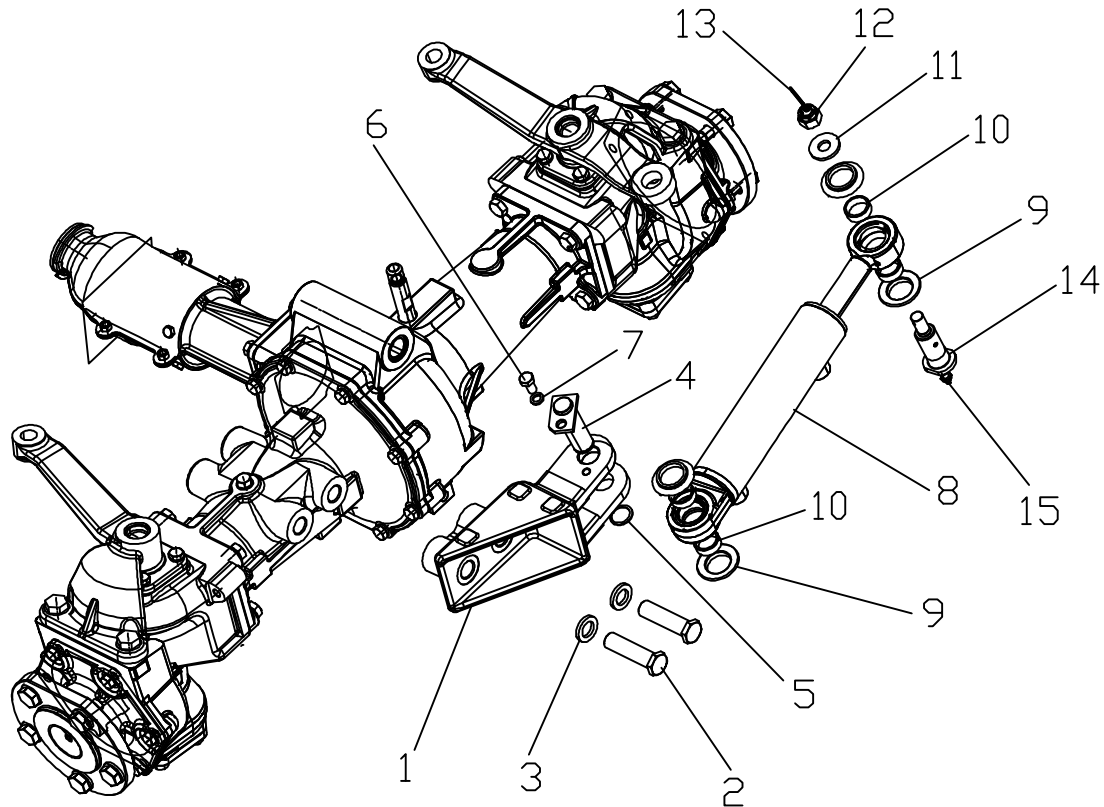
Take the breather cap (14) & raise its flaps. Insert a screw M6 (part 20) & make a cut on its mid portion @ approx. 45° (as shown in fig.). Take the screw out & lower the flaps. Assemble the breather (13) & breather cap (14).

Assemble the screw (11) & washer (12) to proper torque. *Tools Used: Torque Wrench, Torque: 35~40 Nm, Loctite: 243 grade*

Finally couple the entire assy of Trumpets as above with the Stub Axle Housing using gasket (15) & with the help of screws M10x1.5x30 (16) - 8 nos & spring washers B10 (17) - 8 nos to specified torque. *Tools Used: Torque Wrench, Torque: 35~40 Nm, Loctite: 243 grade*

Plug the drain plug with Sealing washer (19) & Hex screw M6x10 (20). *Tools Used: Torque Wrench, Torque: 6~9 Nm, Loctite: 243 grade*

Fill the specified quantity of oil into the Front Axle Assembly. Gear Oil Qty: 2.7 Ltrs



Step 6: Re-assembly of Power Steering Cylinder

Assemble Steering cylinder mounting bracket (1) to front axle at the specified location as shown in figure by using Hex bolt M16x1.5x60 (2) - 2 nos and spring washers B16 (3) - 2 nos. Tightening Torque: 140~160 Nm, apply Loctite; 243 grade, Tools used: Socket 24mm, Torque Wrench

Assemble Steering cylinder (8) to Steering cylinder mounting bracket (1) by placing rubber pad for spacer (9) and spacer cylinder (10) individually on up and down side as shown in figure.

Insert locking pin dia (4) into Steering cylinder mounting bracket (1) so as to lock the assembly of steering cylinder (8) with steering cylinder mounting bracket (1).

Assemble Hex Head Screw M8x1.25x16 (6) and Spring Washer B8 (7) to locking pin (4) so as to lock the assembly. *Tightening torque: 14~21 Nm, apply Loctite: 243 grade, Tools used: Socket 13mm & Torque Wrench*

Assemble Steering cylinder (8) to Steering Arm Guide LH by placing rubber pad for spacer (9) and spacer cylinder (10) individually on up and down side as shown in figure. Place Steering Cylinder with rubber pads over steering arm guide LH.

Pass pin dia 20 (14) into steering cylinder (8) from downward direction as shown in figure so as to lock the assembly of steering cylinder (8) with steering arm guide LH.

Place Spacer (11) on Pin dia A-20 coming out from steering arm guide(LH) and steering cylinder (8).

Assemble Castle Nut (12) to Pin dia A-20 (14) as shown in figure to lock Steering cylinder (8) with Steering arm guide (LH).

Assemble Split Pin dia 2x25 (13) to castle nut (12).

Assemble circlip 20x1.75 (5) to locking pin (4) as specified location as shown in figure.

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C 3.0 TROUBLESHOOTING

Problem	Causes	Action
Ring gear tooth broken on the outer side.	<ol style="list-style-type: none"> Excessive gear load incorrect gear adjustment (excessive backlash) Pinion nut loose 	<ul style="list-style-type: none"> -Replace bevel gear set -Follow carefully the recommended operations for the adjustment of bevel gear set backlash
Ring gear tooth broken on the inner side.	<ol style="list-style-type: none"> Load bump Incorrect gear adjustment (Insufficient backlash) 	<ul style="list-style-type: none"> -Replace bevel gear set -Follow carefully the recommended operations for the adjustment of bevel gear set backlash
Pinion or ring gear teeth worn	<ol style="list-style-type: none"> 4.3 Pinion nut loosened 5.1 Insufficient lubrication 6.2 Contaminated oil 7.3 Incorrect lubrication or depleted additives 4. Worm out pinion bearing that cause an incorrect pinion axle backlash and wrong contact between pinion and ring. 	<ul style="list-style-type: none"> -Replace bevel gear set -Follow carefully the recommended operations for the adjustment of bevel gear set backlash -Use correct lubrication, fill up to the right level and replace according to the recommended program.
Worn out pitted bearings	<ol style="list-style-type: none"> Insufficient lubrication Contaminated oil Excessive use Normal wear out. Pinion nut loosened. 	<ul style="list-style-type: none"> -replace bearings. -Use correct lubrication fill up to the right level and replace at recommended intervals
Oil leakage from gasket and seals	<ol style="list-style-type: none"> Prolonged functioning at high temperature of the oil Oil gasket assembled incorrectly Seal lip damaged Contaminated oil 	<ul style="list-style-type: none"> -Replace the gasket or seal and matching surface if damaged. - Use correct lubrication and replace at recommended intervals.
Fatigue failure of pinion teeth. See if the fracture line is well defined (wave lines, beach lines)	<ol style="list-style-type: none"> Exhaustive use Continuous overload 	<ul style="list-style-type: none"> -Replace bevel gear set.
Pinion and ring teeth breakage	<ol style="list-style-type: none"> Crash load of differential components 	<ul style="list-style-type: none"> -Check and/or replace other differential components.
Side gear spline worn out, Replace all scratched Washer (Excessive backlash)	Excessive use	<ul style="list-style-type: none"> - Replace differential gear group. -Replace half shaft if required
Thrust washer surface worn out or scratched.	<ol style="list-style-type: none"> Insufficient lubrication Incorrect lubrication Contaminated oil 	<ul style="list-style-type: none"> -Use correct lubrication and fill up to right level. -replace at intervals recommended -Replace all scratched washers and those with 0.1 mm thickness lower than the new ones.
Inner diameter of tapered needle bearing worn out.	<ol style="list-style-type: none"> Excessive use Excessive pinion axial backlash Insufficient lubrication Contaminated oil 	<ul style="list-style-type: none"> -Replace bearing . -Check pinion axial backlash. -Use proper lubrication, fill up to right lever and replace at recommended intervals.
Bend or broken half shaft	Vehicle intensively operated or overloaded	<ul style="list-style-type: none"> -Replace