MAHINDRA & MAHINDRA LTD. TORRO 25 WORKSHOP MANUAL

(In continuation with TRUXO 25 WM)

[Part No. 6003AAR0003PB]

MAHINDRA MAHINDRA LTD. TRUCK AND BUS DIVISION. PUNE

All specifications are given in C.G.S. system (Metric System) unless otherwise specified.

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PREFACE

This workshop manual is prepared for TORRO 25 in continuation with TORRO 25Cargo assuming that the technician working on TORRO 25 is fully conversant with general automobile practices and trained at Extramile, Pune.

This will boost the confidence of the customer with respect to quality repairs through skilled manpower with less downtime.

All the data available in this manual is based on the latest information sourced at the time of printing.

Any change in design / supplier / repair procedure will be communicated through service bulletin from the service department.

All the groups of this manual is described as,

- General information
- ♦ Specifications
- ♦ Tightening torque table
- ♦ Service Limit / service standards
- Removal & Installation from the vehicle
- Assembly sequence
- Trouble shooting guidelines

Apart from this if you need any further technical support, any querry, any suggestion regarding this manual please free to contact,

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TORRO 25

VEHICLE OVERVIEW (Refer Fig. 1, 2 & 3)



Fig. 1



Fig. 2





COMPARISON OF SPECIFICATION

SR. NO.	MODEL	TORRO 25CARGO	TORRO 25TIPPER
	GVW (Kgs)	25000	25000
1	WEIGHTS (Kgs)		
1.01	Front axle (Laden)	6000	6000
1.02	Rear axle (Laden)	19000	19000
2	DIMENSIONS (MM)		
2.01	Wheel base	5000 / 5350	4250
2.02	Overhang - Front	1465	1465
2.03	Overhang - Rear (Over body)	2850 / 3200	1953
2.04	Bogie spread	1445	1445
2.05	Overall length	9315 / 9915	7668
2.06	Loading span	22ft / 24ft (Steel FSD body)	16 Cum / 14 Cum box body
2.07	Frame height	983 (Front laden) 1027 (Front unladen)	1035 (Front laden) 1049 (Front unladen)
2.08	Overall width (Cab chassis / Over body)	2490	2490 / 2518
2.09	Overall height (Over cab / Over load body) in laden condition		2980/3513
2.10	Front track	2083	2073
2.11	Rear track	1830	1830
2.12	Ground clearance (Laden)	250	292 / 248
2.13	Angle of approach (Deg) - Laden	16	25 (Bumper height = 655)
2.14	Angle of departure (Deg) - Laden	20	60.8
2.15	Angle of ramp-over (Deg) - Laden	19	
3	ENGINE		
3.01	Max power (Hp)	MWM 7.2L 202 hp @ 2200	MWM 7.2L 202 hp @ 2200
3.02	Max torque (Nm)	920 +/-40 @ 1250 +/- 50 rpm	920 +/-40 @ 1250 +/- 50 rpm
3.03	Туре	4 Valve, Mechanical, Turbocharged (with WGT)	4 Valve, Mechanical, Turbocharged (with WGT)
3.04	No. of cylinders	6	б
3.05	Air intake system	14" dry type without prefilter, Snorkel type	14" dry type with prefilter, Snorkel type
3.06	Coolant / coolant capacity	24L, Ethylene glycol solution with water (50-50 %)	24L, Ethylene glycol solution with water (50-50 %)
3.07	Cooling fan (Viscous)	Crankshaft mounted 26"	Crankshaft mounted 26"
3.08	Oil capacity	19.8 L	19.8 L



SR. NO.	MODEL	TORRO 25CARGO	TORRO 25TIPPER
4	CLUTCH		
4.01	Туре	Diaphragm type, Single plate dry, Push type clutch	Single plate, Diaphragm spring, dry, Push type clutch
4.02	Facing dia (mm)	380 - Organic material	395 - Organic material
4.03	Clutch control	Hydraulic actuation with Pneumatic assistance	Hydraulic actuation with Pneumatic assistance
5	GEAR BOX	ES 9106	ES 9306 A
5.01	Туре	Manual Synchromesh	Manual synchromesh
5.02	No. of speeds	6 Forward & 1 Reverse	6 Forward & 1 Reverse
5.03	Gear shift	Cable type	Cable type
5.04	Gearbox oil	SAE 80W90 GL-4	SAE 80W90 GL-4
5.05	РТО	NA	IPH with universal mounting
5.06	PTO ratio	NA	1.4535
5.07	PTO torque	NA	300 Nm
5.08	PTO rotation of direction	NA	Anticlockwise when viewed from rear
5.09	PTO mounting	NA	Rear mounted
5.10	PTO shifting	NA	Pneumatic
5.11	Oil capacity	9.2 Ltrs	9.5 Ltrs (With PTO)
6	PROPELLER SHAFT	1710 series	Main Shaft–1710 series Interaxle Shaft–SPL 90 Series
6.01	No. of shafts	2 piece	2 (Main+Interaxle shaft)
6.02	Centre bearing	Rubber mounted	NA
7	REAR AXLES		Meritor MT 1495
7.01	First axle	Live, Banjo type, Single reduction, fully floating axle shafts	Tandem, Banjo type, Single reduction, fully floating axle shafts
7.02	Ratio	5.29	6.17
7.03	Second axle	Tag, Non-driven	Live axle
7.04	Combined axles capacity (Ton)	19.2	19.2
7.05	Oil capacity	16.4 Ltr.	17 L Front Tandem + 14.5 L Rear Tandem
8	FRONT AXLE		
8.01	Туре	Forged I-beam, reverse elliot type	Forged I-beam, reverse elliot type
8.02	Capacity (Ton)	6T	6Т



SR. NO.	MODEL	TORRO 25CARGO	TORRO 25TIPPER
9	WHEELS & TYRES		
9.01	Rim size	7.5"×20"	7.5"×20"
9.02	Tyre (Front)	10×20-16PR / 10R20 - 16PR	10×20-16PR 10R20 (optional)
10	FRAME		
10.01	Section / Thickness	Parallel / 285×70×9.5	Parallel / 285×70×9.5
10.02	No. of cross members	8	6
10.03	Reinforcement	No	Yes (5 mm thick)
11	FRONT SUSPENSION		
11.01	Туре	Leaf spring	Leaf spring
11.02	Span	1650	1650
11.03	No. of leaves	8	11
12	REAR SUSPENSION		
12.01	Туре	4 Spring suspension with compensating link mechanism	4 Spring suspension with compensating link mechanism
12.02	Span	1280	1280
12.03	Spread	1445	1445
13	STEERING		
13.01	Туре	Hydraulic power assisted tiltable and telescopic	Hydraulic power assisted tiltable and telescopic
13.02	Ratio	20.2:1	20.2:1
13.03	Operating pressure	130 bar	130 bar
13.04	Steering pump	16 LPM,ZF	16 LPM,ZF
13.05	Drive	RH	RH
13.06	Wheel dia. (mm)	470 mm	470 mm
14	BRAKES		
14.01	Туре	Spring actuated pneumatic	Spring actuated pneumatic
14.02	Foundation brakes	Front - 410×200 Rear - 410×220	Front - 410×200 Rear - 410×220
14.03	Parking brake type	Graduated hand operated valve on RR wheels	Graduated hand operated valve on RR wheels
14.04	Engine exhaust brake	Solenoid operated butterfly	Solenoid operated butterfly
14.05	System pressure	10 bar	10 bar
14.06	Air tank / reservoirs capacity	3 × 20L +5L	3 × 20L + 10 L
14.07	ABS system	ABS	NON-ABS; with LCRV



SR. NO.	MODEL	TORRO 25CARGO	TORRO 25TIPPER
15	FUEL TANK		
15.01	Туре	Steel rectangular	Steel rectangular
15.02	Capacity (Litres)	417 Ltrs (Optional 250L, 350L)	250L
16	CAB/COWL		
16.01	Туре	SI cab	Day cab
16.02	Cab / cowl length	2270	1675
16.03	Cab / cowl width	2490	2490
16.04	Cab / cowl height	-	1700
16.05	Floor height (Laden)	1250	1302
16.06	Chassis adaptation	4-Point SL suspension	4-Point SL suspension
16.07	HVAC (Option)	AC (optional)	AC (optional)
17	PERFORMANCE		
17.01	Max geared speed (Kmph)	90	76.53
17.02	Max gradeability % (Deg) in 1 st gear	29%	31.60%
17.03	Startability in 1 st gear	18.30%	21.48%
17.04	Min. turning circle dia. (M) wall to wall	19.5	16.5
18	TIPPER BODY KVUL		
18.01	Tipper body with tail gate operated along with body	NA	4915×2340×1400 mm Internal 6210×2518×2406 mm External
18.02	Tipping cylinder	NA	FE 129/3/3850 – HYVA make (Stroke length - 3850 mm)
18.03	Oil tank	NA	60 liters
18.04	Oil grade	NA	D - 68
18.05	PTO pump	NA	82 CC
18.06	PT valve	NA	220 LPM
18.07	Air control valve	NA	Working pressure maximum 8 to 10 bar.
18.08	Suction hose	NA	1 ¾ " Dia – HYVA make
18.09	Discharge hose	NA	³ ⁄ ₄ " Dia – HYVA make



INTRODUCTION

DIFFERENTIAL



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1. GENERAL INFORMATION

TORRO 25 is equipped with meritor MT 1495 tendam series of axle.

Both the axles are fitted with differential unit, so both are live axles. They are connected with interaxle shaft fitted in between two differential unit (Refer Fig. 1).

The front rear axle is equipped with interaxle drive unit & can be activated by a switch provided in the cabin whenever required. This is pneumatic operated switch.

The power is transmitted in both the axles equally in normal condition.

When one of the wheel out of four starts spinning due to slippery road or mud, activate the interaxle switch.

At this moment power gets transmitted to other wheel which boosts the vehicle to come out of slippery road or muddy road.



- 2. Interaxle shaft.
- 3. Differential unit (Rear rear axle)







2. SPECIFICATIONS

SR. NO.	DESCRIPTION	SPECIFICATION
1	Oil grade	SAE 85W140 with 6.5% Anglomol by weight of API GL5
2	Oil filling capacity	31.5 Litrs. (17 + 14.5 Litrs.)
3	Oil change interval	First at 500 Hrs & then after every 1500 Hrs.
4	Rear axle type	Fully floating with banjo housing tandom axle MT 1495
5	Gear set reduction ratio	6.17 (37/6)
6	Gear set type	Hypoid
7	Wheel bearing grease grade	NLGI 3
8	Wheel bearing grease quantity	900 +/- 10% gms per (Rear) Hub
9	Hub greasing interval	500 Hrs. / 40000 Kms.





3. SPECIAL TOOLS

TOOL NAME	PART NO	SHAPE OF THE TOOL	USAGE OF THE TOOL
Inner bearing puller pinion front & rear	7006AAQ0004ST		
Side bearing adjuster	7006AAQ0005ST	3	
Differential side bearing puller (LH & RH) common	7006AAQ0006ST		



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TOOL NAME	PART NO.	SHAPE OF THE TOOL	USAGE OF THE TOOL
Removing sleeve use with 8ST & 9ST	7006AAQ0007ST		
Pinion inner bearing cup remover	7006AAQ0008ST		
Pinion outer bearing cup remover	7006AAQ0009ST		
Interaxle rear bearing puller (Small)	7006AAQ0010ST		





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Interaxle flange cage pinion outer bearing cup remover	
Differential side bearing installer 7006AAQ0012ST	
Pinion inner bearing installer 7006AAQ0014ST	
Interaxle rear bearing cone installer 7006AAQ0016ST	



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TOOL NAME	PART NO.	SHAPE OF THE TOOL	USAGE OF THE TOOL
Interaxle front bearing cone installer	7006AAQ0017ST		
Rear flange pinion inner & outer cup installer	7006AAQ0018ST		
Interaxle differential rear bearing cup installer	7006AAQ0019ST		
Pinion cage inner bearing cup installer	7006AAQ0020ST		





DIFFERENTIAL & REAR AXLE

TOOL NAME	PART NO.	SHAPE OF THE TOOL	USAGE OF THE TOOL
Interaxle differential front bearing cup installer	7006AAQ0021ST		
Installer sleeve use with 19 & 20ST	7006AAQ0022ST		
Interaxle differential oil seal installer	7006AAQ0024ST		
Input shaft bearing cup installer	7006AAQ0026ST		
32			

DIFFERENTIAL & REAR AXLE

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TOOL NAME	PART NO.	SHAPE OF THE TOOL	USAGE OF THE TOOL
Interaxle Input shaft front bearing puller (Big)	7006AAQ0035ST		
Rear pinion inner cage bearing cup remover	7006AAQ0036ST		
Pinion cage outer bearing cup installer	7006AAQ0039ST		
Rear pinion pilot bearing installer	7006AAQ0040ST		





TOOL NAME	PART NO.	SHAPE OF THE TOOL	USAGE OF THE TOOL
Rear differential flange oil seal installer	7006AAQ0044ST		

4. TIGHTNING TORQUE

SR.NO.	PART	THREAD SIZE (DIA×PITCH)	TORQUE VALUE (Nm)
1	Pinion check nut	M42×15×2	814 - 1085
2	Pinion cover mounting bolts	M12×1.5	48 - 68
3	Crown flange half bolt	M16×2	90 - 110
4	Main bearing cap	M22×135×2.5	570 - 745
5	Inter axle check nut	M22×15×2	814 - 1085
6	Interaxle flange half	M12	68 - 88
7	Interaxle cage mounting bolt	M12×40×2	81 - 102
8	Interaxle fork mounting bolt	M10×25×1.5	48 - 68
9	Rear rear pinion flange nut	M42×15×2	814 - 1085
10	Rear rear pinion cage mounting bolt	M12×1.5	81 - 102
11	Differential assembly to housing mounting bolt	M16×2	244 - 300
12	Drain plug	_	48
13	Filler plug	_	48
14	Propeller shaft and interaxle shaft flange mounting bolt	M12×1.75	80 - 100
15	Input shaft check nut	M36×15×2	610 - 881
16	Axle shaft mounting bolt	M16×1.5×55	252 - 278



5. DISASSEMBLY

REMOVAL OF DIFFERENTIAL CARRIER FROM THE AXLE HOUSING :

- 1. Remove the oil drain plug from bottom of the axle housing & drain the oil in a container.
- 2. Loosen the axle shaft nut & take out the axle shaft from both the side.
- 3. Disconnect the forward axle & rear axle drive shaft.(Inter axle shaft)
- 4. Disconnect the pneumatic connection from the inter axle housing.
- 5. Remove the output shaft nut, washer & flange.
- 6. Loosen the differential housing peripheral nuts.
- 7. Use pry bar for taking out the assembly away from the axle housing.
- 8. Take precaution not to damage the mating housing surface.
- 9. Use trolley to take out the differential assembly away from the housing.

() CAUTION

Do not use hammer to loosen the yoke or flange. Hammer can damage the parts & cause alignment problem.

10. Put the differential unit on the fixture made for dismantling the assembly carefully (Refer Fig. 2).





DISASSEMBLY OF DIFFERENTIAL / INTERAXLE ASSEMBLY :

11. Loosen the thrust screw jam nut & remove the thrust screw from the side of the carrier (Refer Fig. 3).



Fig. 3

12. Remove the inter axle housing by loosening four mounting bolts (Refer Fig. 4).





13. Take out the shift unit by pulling it out side (Refer Fig. 5 & 6).









DIFFERENTIAL & REAR AXLE

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14. Keep the differential assembly in vertical position in the stand (Refer Fig. 7).



Fig. 7

15. Loosen the interaxle drive head flange nut by using the special tool as shown in the figure. Loosen the single thread. Don't take out the nut. Keep it on it's position (Refer Fig. 8).



16. Remove the pinion cover along with the gasket from the differential cage by unscrewing the mounting bolts (Refer Fig. 9).



17. Loosen the pinion nut by using special tool as shown in the figure. Don't take it away from the position (Refer Fig. 10).





- 18. Loosen the inter axle cage bolts.
- 19. Keep the differential unit in vertical position. Check all the mounting bolts are removed from the inter axle cage assembly. By using the long tomy bar or hydraulic lifter lift the inter axle assembly vertically upwards. Take care while lifting that assembly should not touch at corners of cage. (Refer Fig. 11)

If required use screw driver to change the direction while lifting not to touch at cage corner.



Fig. 11

20. Keep the assembly aside (Refer Fig. 12).



Fig. 12

21. Take the shim pack aside (Refer Fig. 13).



Fig. 13

22. Check the thickness of the shim pack by using the micrometer. If you are not replacing the crown pinion assembly use the same shims as it is (Refer Fig. 14).



Fig. 14

23. Remove the rear side gear along with the bearing cone from the carrier (Refer Fig. 15).







24. The inter axle drive assembly is as shown in the figure (Refer Fig. 16).





25. Take out the input shaft bearing cone. Already we have removed it from carrier housing. In this figure you will see the whole assembly for drive transmission (Refer Fig. 17).





26. Remove input shaft bearing by using the bearing puller (Refer Fig. 18).



27. Remove the retainer snap ring from the input shaft (Refer Fig. 19 & 20).



Fig. 19



Fig. 20

28. Lift the inter axle differential assembly. Keep the assembly aside as it is (Refer Fig. 21).





29. Take out the helical drive gear. It will easily slide on the shaft (Refer Fig. 22).



Fig. 22

30. Remove the thrust washer from the input shaft (Refer Fig. 23 & 24).



Fig. 23





31. Remove clutch collar from the input shaft (Refer Fig. 25).



Fig. 25

32. Remove flange nut from the input shaft (Refer Fig. 26 & 27).











33. Take away the flange (Refer Fig. 28).



Fig. 28

34. Remove bearing cage from the input shaft. If required use hydraulic press for removal of bearing cage (Refer Fig. 29).



- Fig. 29
- 35. Remove the input shaft bearing by using the bearing puller (Refer Fig. 30).



Fig. 30

36. Now the input shaft is free from any assembly (Refer Fig. 31).



Fig. 31



REMOVAL OF INTER AXLE DIFFERENTIAL ASSEMBLY

37. Mark the differential upper & lower half with a straight line for correct alignment while assembling (Refer Fig. 32 & 33).







Fig. 33

 By keeping the assembly horizontal & marked as per straight line, loosen the cage bolts (Refer Fig. 34).



Fig. 34



39. Separate the two half by tapping by mallet (Refer Fig. 35).



Fig. 35

40. Lift the differential unit along with the spider & four star gears & thrust washers (Refer Fig. 36).





41. Separate the star gears & thrust washers from the spider (Refer Fig. 37 & 38).







Fig. 38

42. Check the spider which is free from gear & lower half (*Refer Fig. 39 & 40*).



Fig. 39





REMOVAL OF CROWN PINION ASSEMBLY :

- 43. Mark the RH & LH side bearing cap so that while assembling it is easier to match the mating parts.
- 44. Remove the quarter pin from both the caps.
- 45. Loosen the bolts of side bearing caps (Refer Fig. 41).



Fig. 41

46. Remove two bearing caps & adjusting rings. Keep the assembly of bearing cap & adjuster ring of left and right seperately (Refer Fig. 42 & 43).





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Fig. 43

47. Lift the crown assembly by using the tommy bar or by hydraulic lifter (Refer Fig. 44).



Fig. 44

48. By using the bearing puller take out the side RH & LH half bearing. Same puller is to be used for left and right bearing (Refer Fig. 45).



Fig. 45

49. Mark the case halves on both the side to match the marks while assembling.





50. Separate the case halves. If required use soft mallet to loosen the parts (Refer Fig. 46 & 47).



Fig. 46





51. Remove the half from ring gear (Refer Fig. 48).



Fig. 48

52. Remove upper sun gear & it's thrust washer.

DIFFERENTIAL & REAR AXLE

53. Remove four star gears, thrust washer along with spider cross (Refer Fig. 49).



Fig. 49

54. Remove star gears & it's washers away from the spider cross.

() CAUTION

Do not use used thrust washer for assembly.

55. Remove bottom sun gear & it's thrust washer from the half cage (Refer Fig. 50).





56. Take away the crown ring gear from half by loosining the mounting bolts (Refer Fig. 51).





REMOVAL OF PINION ASSEMBLY FROM DIFFERENTIAL CAGE :

57. The pinion check nut is already loosen. Take away the check nut (Refer Fig. 52).





58. Remove the thrust washer (Refer Fig. 53).





59. Hammer on the pinion shaft by using mallet in between the pinion shaft or use hydraulic press for removal of pinion assembly. Care has to take that pinion should not dropped on the ground directly. It will damage the pinion teeth. Keep wooden piece below the housing (Refer Fig. 54).



Fig. 54

- 60. Take out the pinion assembly from bottom side.
- 61. Take out pinion upper bearing (Refer Fig. 55 & 56).











62. Remove the spacer from the housing (Refer Fig. 57).





63. Remove helical drive gear mounted on the pinion & in the housing groove (Refer Fig. 58 & 59).



Fig. 58





64. Remove the inner bearing cup, outer bearing cup by using the special tool (Refer Fig. 60). Check the number of shims (Refer Fig. 61) & thickness (Refer Fig. 62) of the shims placed below the bearing cup.



Fig. 60



Fig. 61





DISMANTLING PINION ASSEMBLY :

- 65. Remove bearing spacer.
- 66. Remove the pinion lower bearing by using the bearing puller (Refer Fig. 63).





6. INSPECTION :

Clean the differential housing, all taper rolling bearings, gears, etc.

Check the bearings for noise or pitting marks, wear & tear of rollers, cones, cups for any abnormality, mark of wear & tear, pitting marks on cup & cone.

Check the crown wheel, pinion teeth, helical gear teeth for any abnormal wear.

7. ASSEMBLY :

Before the assembly of a new gear set check the following

- a) Gear set part number Location on drive pinion – End at splines Location on ring gear – Front face or outer diameter
- b) Tooth combination number –
 Location on drive pinion End at splines
 Location on ring gear Front face or outer diameter
- c) Gear set match number Location on driver pinion– End of gear head Location on ring gear – Front face or outer diameter
- d) Pinion cone variation number Location on gear set – End of pinion gear head or outer diameter of ring gear.

67. Install the bearing cone by using the special tool.Use the shims as it is if you are not changing the crown wheel & pinion assembly (Refer Fig. 64,

PINION ASSEMBLY :

compressed air.



Before assembly clean the housing with kerosene

Fig. 64










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SHIM PACK THICKNESS CALCULATION FOR A NEW DRIVE PINION

If a new crown wheel and Pinion is used, the depth of the drive pinion has to be adjusted. Use below procedure for shim pack thickness calculation.

If the pinion depth shims are misplaced during carrier repair, use 1.14 mm for the initial pinion position (Refer Fig. 67).



Fig. 67

68. Use a micrometer to measure the thickness of the old shim pack that was removed from under the pinion cage. Record the measurement (Refer Fig. 68).



Fig. 68

69. Find the pinion cone (PC) variation number on the drive pinion you'll replace. Record the number. The pinion cone number can be one of the following values (Refer Fig. 69).

 \cdot PC +3, PC -3, +3 or -3 = 0.003-inch

PC +0.03, PC 0.03 mm, +0.03 mm
 or -0.03 = 0.03 mm





- 70. 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
- 71. If the old pinion cone number is a plus (+) number, subtract the number from the old shim pack thickness that was measured in Step 2.
- 72. If the old pinion cone number is a minus (–) number, add the number to the old shim pack thickness that was measured in Step 2.
- 73. Find the pinion cone (PC) variation number on the new drive pinion that will be installed. Record the number.
- 74. If the new pinion cone number is a plus (+) number, add the number to the standard shim pack thickness that was calculated in Step 4 or Step 5. Use new shims to make a shim pack to the correct thickness. Refer to Table 1.
- 75. If the new pinion cone number is a minus (–) number, subtract the number from the standard shim pack thickness that was calculated in Step 4 or Step 5. Use new shims to make a shim pack to the correct thickness. Refer to Table 1.



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TABLE 1 - SHIM PACK THICKNESS CALCULATION

NO.	EXAMPLES	SHIM SIZE (MM)
1.	Old shim pack thickness.	0.760 - 0.050 = 0.710
	Old PC number, PC + 0.05 mm standard shim pack thickness.	0.710 + 0.130 = 0.840
	New PC number, PC + 0.13 mm new shim pack thickness	= 0.84
2.	Old shim pack thickness. old PC number, PC – 0.05 mm	0.760 + 0.050 = 0.810
	Standard shim pack thickness new PC number, PC + 0.13 mm	0.810 + 0.130 = 0.940
	New shim pack thickness	= 0.94
3.	Old shim pack thickness. old PC number, PC + 0.05 mm	0.760 - 0.050 = 0.710
	Standard shim pack thickness. new PC number, PC – 0.13 mm	0.710 - 0.130 = 0.580
	New shim pack thickness	= 0.58
4.	Old shim pack thickness. old PC number, PC – 0.05 mm	0.760 + 0.050 = 0.810
	Standard shim pack thickness. new PC number, PC – 0.13 mm	0.810 - 0.130 = 0.680
	New shim pack thickness	= 0.68



76. Install the lower bearing on the pinion (Refer Fig. 70).





77. Install the upper bearing cone (Refer Fig. 71).





78. Insert the gear in the cavity of the housing (Refer Fig. 72).



Fig. 72

79. Insert the pinion from the bottom & pass through the gear (Refer Fig. 73 & 74).



Fig. 73





80. Install the spacer above the gear (Refer Fig. 75).





81. Install the upper bearing on the pinion (Refer Fig. 76 & 77).









82. Install the washer & check nut (Refer Fig. 78).



Fig. 78

83. Rotate the pinion by hand and check for free / smooth rotation.



CROWN WHEEL ASSEMBLY :

84. Fit the lower half to the ring gear (Refer Fig. 79).



Fig. 79

85. Assemble the bottom sun gear along with the thrust washer (Refer Fig. 80).



Fig. 80

NOTE

Replace the thrust washer at the time of overhaul of the crown pinion assembly.

86. Check the backlash of the gears (Refer Fig. 81).



Fig. 81

87. Assemble four star gears & upper sun gear with washers along with the cross (Refer Fig. 82).





88. Assemble four star gears & upper sun gear with washers along with the cross (Refer Fig. 83).





89. Assemble the top half and torque both the left and right hubs (Refer Fig. 84).



Fig. 84

90. Torque both the left and right hubs as specified (Refer Fig. 85).





91. Install both side bearings RH & LH on the cage by using installer (Refer Fig. 86).







92. Lift the crown assembly & insert in the diffrerential cage (Refer Fig. 87).



Fig. 87

93. Fit the bearing adjuster ring on both side as marked earlier while dismantling (Refer Fig. 88).



Fig. 88

94. Install the bearing caps in correct location. Care has to be taken not to damage the threads (Refer Fig. 89).



Fig. 89





95. Adjust the backlash for used set 0.20 - 0.46 mm & for new set adjustthe backlash up to 0.20 - 0.30 mm. As per regular method by adjusting the side bearing adjuster ring (Refer Fig. 90).



Fig. 90

- 96. The backlash is increased by using the adjuster ring to move the ring gear away from the drive pinion. Backlash is decreased by adjusting the ring to move the ring gear towards the drive pinion.
- 97. The contact pattern is depends upon the the shim adjustment in the pinion lower bearing cup. By increasing the shim pack below the inner bearing cup the drive pinion will move towards the ring gear. By decreasing the shim pack the drive pinion will move away from the ring gear.
- 98. Do the exercise till you will get the correct contact pattern.

Also check the crown wheel runout. It should be in the range of **0.1 - 0.2 mm.**

PRELOADING OF THE PINION BEARING :

- 99. The preload on the inner & outer pinion bearing is adjusted by using the different size of spacer used in between the helical gear & the outer bearing. This spacer is available in several different sizes.
- 100. Install the thicker spacer to decrease the preload & thiner spacer to increas the preload.

For used bearings the preload value is in between 0.56 – 2.82 Nm rotational torque. For new bearings 0.56 – 1.69 Nm rotational torque.

101. The spring scale method can be used to check the preloading value. Rotate the drive pinion & check the rotational torque value.

INTER AXLE ASSEMBLY :

102. Install the bearing on the shaft by using the bearing installer (Refer Fig. 91 & 92).



Fig. 91





103. Install the bearing cup in to the bearing cage (Refer Fig. 93).



Fig. 93

104. Fit the oil seal in the cage (Refer Fig. 94).



Fig. 94

105. Fit the O ring in the groove on the outer diameter of the bearing cage & assemble the case on the bearing (Refer Fig. 95).





106. Fit the cage assembly on the bearing (Refer Fig. 96).







107. Install the flange on the cage & tightened the nut (Refer Fig. 97 & 98).



Fig. 97



Fig. 98

108. Install the clutch collor on the shaft. The collor teeth must be towards the rear of the shaft & smooth side of the collor next to the bearing (Refer Fig. 99).



Fig. 99

109. Insert thrust washer (Refer Fig. 100).



Fig. 100

110. Slide helical gear on the input shaft. (Refer Fig. 101)





111. Assemble the four gear along with the washers. It is recommended to replace the thrust washers at the time of assembly overhaul (Refer Fig. 102).



Fig. 102





NOTE

Do not use removed thrust washer.

112. Assemble the top half. Align the marking made at the time of removal (Refer Fig. 103).



Fig. 103

113. Tighten the periferial nuts with aligned mark as shown in the figure (Refer Fig. 104).



Fig. 104

114. Align this inter axle assembly on the input shaft with the bolt head towards the rear.Engage the teeth of the pinion with the teeth on the helical gear (Refer Fig. 105).



Fig. 105

115. Fit the circlip lock (Refer Fig. 106 & 107).



Fig. 106





ASSEMBLY OF INTER AXLE DIFFERENTIAL IN THE HOUSING :

116. Install the bearing on the in put shaft gear (Refer Fig. 108).



Fig. 108

117. Install the interaxle small bearing cup in the differential housing (Refer Fig. 109).



Fig. 109

118. Install the rear side gear in the differential housing (Refer Fig. 110).



Fig. 110





119. Install the old shim pack on the housing (Refer Fig. 111).



Fig. 111

120. Lift the interaxle assembly. Carefully lower the assembly in to the carrier housing making sure that two helical gears aligned with each other by rotating the drive pinion (Refer Fig. 112).





121. Tighten the bolts. Rotate the input shaft several times. Check the gap at 4/5 places on the cage.

122. Adjust the end play up to 0.05-0.20 mm vertically by using shims.Add shims to increase end play & remove shims to decrease the end play. (Refer Fig. 113)



Fig. 113

123. Tighten the interaxle shaft check nut and pinion check nut with specified torque. (Torque 814-1085 Nm.)

After tightening once again check the end play.

124. Refit the pinion cover with gasket & sealing material (Refer Fig. 114).



Fig. 114

125. Fit the inter axle shift fork assembly. Use proper sealent & tight the mounting bolts (Refer Fig. 115).



Fig. 115

126. Use adhesive 2297-C-3747 or Loctite 277 wherever the sealent is required to apply for the entire assembly (Refer Fig. 116).



Fig. 116

127. Adjust the thrust screw bolt and torque it (Refer Fig. 117).





DISMANTLING OF REAR REAR DIFFERENTIAL ASSEMBLY :

- 128. Remove the differential assembly from the axle housing as per the process given in the first axle removal.
- 129. Keep the differential unit on the overhaul stand.
- 130. Remove the crown wheel assembly from the differential housing.
- 131. By using the special tools dismantle the crown disassembly as explained in the first rear axle.
- 132. Loosen the pinion check nut. Loosen the peripheral bolts of the pinion cage (Refer Fig. 118).



Fig. 118

133. Hammer the pinion or by use the hydraulic press remove the pinion away from the differential housing (Refer Fig. 119).





134. Take away the pinion assembly from the housing (Refer Fig. 120).



Fig. 120

135. Check the shim pack & measure the thickness of the shim (Refer Fig. 121).





136. Remove the pinion cage by pressing the pinion on the press (Refer Fig. 122 & 123).











Fig. 123

137. Remove the bearing spacer (Refer Fig. 124).



Fig. 124

138. Remove the lower bearing (Refer Fig. 125).



Fig. 125

139. Remove the upper bearing,oil seal from top by tapping from inner side (Refer Fig. 126 & 127).



Fig. 126





140. Remove the bearing cup by using the special tool both for inner & outer bearing. (Refer Fig. 128 & 129)







Fig. 129

141. Remove the circlip & washer of tail pinion pilot bearing (Refer Fig. 130 & 131).



Fig. 130









142. Remove the bearing from pinion (Refer Fig. 132).





8. INSPECTION

Inspect pinion for any abnormal wear on the teeth, bearings & cone, cups for pitting marks, wear and tear.

9. ASSEMBLY

Before assembly clean the housing carefully with kerosene & compressed air.

143. Install the bearing on the pinion by using the special tool (Refer Fig. 133).





144. Install pilot bearing on the pinion by using the bearing installer. Fit the washer lock nut at its position (Refer Fig. 134).





145. Assemble the washer & circlip of tail pinion pilot bearing (Refer Fig. 135 & 136).



Fig. 135



Fig. 136

146. Reverse the position of the pinion as shown in the diagram.

Insert the bearing spacer (Refer Fig. 137).







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147. Install both the bearing cups in the cage by using installer (Refer Fig. 138 & 139).









148. Insert the cage on the lower bearing (Refer Fig. 140).



Fig. 140

149. Install the upper pinion bearing in the bearing cage (Refer Fig. 141 & 142).



Fig. 141





150. Press the bearing by using the press if required (Refer Fig. 143).









151. Install the washer (Refer Fig. 144).



Fig. 144

152. By using oil seal installer fit the oil seal in the cage (Refer Fig. 145).





153. Install the flange (Refer Fig. 146).



Fig. 146

154. Tighten the check nut upto hand tight level (Refer Fig. 147).



Fig. 147

155. Keep the same shim pack, if you are using the same unit. If you are replacing the unit then use same pattern of shim selection as per first axle and check the teeth contact pattern (Refer Fig. 148).





156. Insert the pinion assembly in the housing and tighten the pinion check nut at specified torque (814-1085 Nm) (Refer Fig. 149).







CROWN WHEEL ASSEMBLY :

157. Fit the lower half to the ring gear (Refer Fig. 150).





158. Assemble the bottom sun gear along with the thrust washer (Refer Fig. 151).





NOTE

Replace the thrust washer at the time of overhaul of the crown pinion assembly.

159. Check the backlash of the gears (Refer Fig. 152).



Fig. 152

160. Assemble four star gears along with washers and the cross (Refer Fig. 153).



Fig. 153

161. Insert upper sun gear & it's thrust washer. Fit the half on the ring gear (Refer Fig. 154 & 155).











Fig. 155

162. Fit the case halves. Use mallet for fitment as per the mark (Refer Fig. 156).



Fig. 156

163. Install both side bearings RH & LH on the cage by using installer (Refer Fig. 157).





DIFFERENTIAL ASSEMBLY :

164. Lift the crown assembly by using the tommy bar or by hydraulic lifter & fit in the hosing (Refer Fig. 158 & 159).



Fig. 158





165. Fit the bolts of side bearing caps (Refer Fig. 160).





166. Assemble two bearing caps & adjusting rings. Keep the assembly of bearing cap & adjuster ring of left and right seperately (Refer Fig. 161).



Fig. 161

① CAUTION

Do not use used thrust washer for assembly.

167. Adjust the backlash as specified for forward rear axle & tighten the cap bolts with specific torque (Refer Fig. 162).



Fig. 162

Also check the crown wheel runout. It should be in the range of **0.1 - 0.2 mm.**



168. Adjust the thrust pad screw (Refer Fig. 163).



INSTALL AND ADJUST RING GEAR THRUST BOLT

Procedure

- 169. Thread thrust screw into the carrier until firm contact with the back face of the ring gear is made.
- 170. Loosen the thrust screw 1/4 turn to obtain the correct adjustment of .020" (.50mm) clearance between gear face and screw. Tighten jam nut, holding thrust screw stationary with a wrench, torque jam nut 150–190 ft. lbs. (203–258 Nm).
- 171. Recheck to assure minimum clearance during full rotation of ring gear. (Refer Fig. 164)





1. Thrust bolt 2. Thrust bolt jam nut





Fig. 165

1. Face width	2. Tooth depth	3. Heel
4. Top land	5. Root	6. Toe

New Gearing - Correct Pattern

Paint six ring gear teeth 180° apart with marking compound and roll the gear to obtain a contact pattern. The correct pattern is slightly below center on the ring gear tooth with lengthwise contact upside of the toe. The length of the tooth pattern in unloaded condition is approximately one-half to two-thirds of the ring gear tooth in most models and ratios. (Refer Fig. 166)



Fig. 166

Used Gear - Contact Pattern (Refer Fig. 167)





Pattern along the face width could be longer



Adjust Contact Pattern

If necessary, adjust the contact pattern by moving the ring gear and drive pinion.

- Ring gear position controls the backlash. This adjustment moves the contact pattern along the face width of the gear tooth.
- Pinion position is determined by the size of the pinion bearing cage shim pack. It controls contact on the tooth depth of the gear tooth.

Adjust Pinion Position

If the gear pattern shows incorrect tooth depth contact, change the drive pinion position by altering the shim pack. Used gears should achieve proper contact with the same shims removed from the axle at disassembly.

If the pattern is too close to the top land of the gear tooth, remove pinion shims. Move pinion toward the ring gear. (Refer Fig. 168)



Fig. 168

If the pattern is too close to the root of the gear tooth, add pinion shims. Move pinion away from the ring gear. (Refer Fig. 169)





Adjust Ring Gear Position (Backlash)

If the gear pattern shows incorrect face width contact, change backlash by adjusting the ring gear.

If the pattern is too close to the edge of the tooth toe, move the ring gear away from the pinion to increase backlash.

- 172. Loosen the bearing adjuster on the teeth side of the ring gear.
- 173. Loosen the opposite adjuster one notch.
- 174. Return to adjuster on teeth side of ring gear and tighten adjuster until it contacts the bearing cup.
- 175. Continue tightening the same adjuster upto 2 or 3 notches and recheck backlash.





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If the pattern is concentrated at the heel (too far up the tooth), move the ring gear toward the pinion to decrease backlash. (Refer Fig. 170)



Fig. 170

- 176. Loosen the bearing adjuster on the teeth side of the ring gear.
- 177. Tighten the opposite adjuster one notch.
- 178. Return to adjuster on teeth side of ring gear and tighten adjuster until it contacts the bearing cup.
- 179. Continue tightening the same adjuster upto 2 or 3 notches and recheck backlash.

10. INSTALLATION OF DIFFERENTIAL ASSEMBLY TO ITS HOUSING

- 180. Install the differential assembly to the axle housing and position it properly. Apply the proper gasket sealent (2297-C-3747 or Locktite 277) and install the mounting bolts and tighten them with specified torque.
- 181. Connect the propeller shaft rear end flange to the differential flange and tighten its holding bolts to specified torque.
- 182. Install the rear brake actuator and connects its hoses.
- 183. Fill the differential with oil as specified.





11. SHIM PACK THICKNESS CALCULATION FOR A NEW DRIVE PINION

If a new crown wheel and Pinion is used, the depth of the drive pinion has to be adjusted. Use below procedure for shim pack thickness calculation.

If the pinion depth shims are misplaced during carrier repair, use 1.14 mm for the initial pinion position (Refer Fig. 171).



Fig. 171

184. Use a micrometer to measure the thickness of the old shim pack that was removed from under the pinion cage. Record the measurement (Refer Fig. 172).



Fig. 172

- 185. Find the pinion cone (PC) variation number (Refer Fig. 173) on the drive pinion you'll replace. Record the number. The pinion cone number can be one of the following values.
 - PC +3, PC -3, +3 or -3 = 0.003-inch
 - PC +0.03, PC 0.03 mm, +0.03 mm or -0.03 = 0.03 mm





- 186. 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
- 187. If the old pinion cone number is a plus (+) number, subtract the number from the old shim pack thickness that was measured in Step 2.
- 188. If the old pinion cone number is a minus (-) number, add the number to the old shim pack thickness that was measured in Step 2.
- 189. Find the pinion cone (PC) variation number on the new drive pinion that will be installed. Record the number.
- 190. If the new pinion cone number is a plus (+) number, add the number to the standard shim pack thickness that was calculated in Step 4 or Step 5. Use new shims to make a shim pack to the correct thickness. Refer to Table 1.
- 191. If the new pinion cone number is a minus (–) number, subtract the number from the standard shim pack thickness that was calculated in Step 4 or Step 5. Use new shims to make a shim pack to the correct thickness. Refer to Table 1.





12. SHIM PACK THICKNESS CALCULATION

TABLE 1 -

NO.	EXAMPLES	SHIM SIZE (MM)
1.	Old shim pack thickness.	0.760 - 0.050 = 0.710
	Old PC number, PC + 0.05 mm standard shim pack thickness.	0.710 + 0.130 = 0.840
	New PC number, PC + 0.13 mm new shim pack thickness	= 0.84
2.	Old shim pack thickness. old PC number, PC – 0.05 mm	0.760 + 0.050 = 0.810
	Standard shim pack thickness new PC number, PC + 0.13 mm	0.810 + 0.130 = 0.940
	New shim pack thickness	= 0.94
3.	Old shim pack thickness. old PC number, PC + 0.05 mm	0.760 - 0.050 = 0.710
	Standard shim pack thickness. new PC number, PC – 0.13 mm	0.710 - 0.130 = 0.580
	new shim pack thickness	= 0.58
4.	Old shim pack thickness. old PC number, PC – 0.05 mm	0.760 + 0.050 = 0.810
	Standard shim pack thickness. new PC number, PC – 0.13 mm	0.810 - 0.130 = 0.680
	New shim pack thickness	= 0.68



13. TROUBLE SHOOTING

SR. NO.	SYMPTOM	PROBABLE CAUSE	REMEDY	
1.	Oil leaks	Oil leaks from companion flange		
		• Oil overcharge	• Correct quantity	
		• Worn or damaged oil seal	Replace	
		Oil leaks from differential carrier an	d housing	
		 Loose differential carrier tightening screw 	• Tighten to specified torque	
		• Faulty sealant	• Apply again	
		• Cracked differential carrier	• Replace	
2.	Power transmission	Oil leaks from axle shaft		
	failure	• Overcharge	• Adjust to correct quantity	
		• Worn or damaged oil seal	• Replace	
		• Clogged air breather	• Clean	
3.	Abnormal noise at start-up or gear shift	Propeller shaft turns but vehicle does not move		
		 Broken or loose axle shaft 	• Replace or tighten to specified torque	
		 Broken final drive gear or differential gear 	 Replace broken parts 	
		• Final drive gear backlash too large	• Adjust	
		 Differential gear backlash too large 	 Adjust or replace differential gear set and spacer 	
		 Final drive pinion starting torque inadequate 	 Adjust 	
		• Loose final drive pinion lock nut	• Tighten to specified torque	
		 Loose final drive gear and differential case 	• Tighten to specified torque	
		 Abnormal noise from propeller shaft 	 Refer propeller shaft trouble-shooting 	





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TORRO 25

SR.NO.	SYMPTOM	PROBABLE CAUSE	REMEDY
4.	Continuous abnormal noise during drive	 Poor adjustment of final drive gear backlash or tooth contact or worn teeth 	 Adjust or replace
		 Poor preload adjustment of final drive gear side bearing or worn side bearing 	 Adjust or replace
		• Damaged wheel hub bearing	• Replace bearing
5.	Irregular abnormal noise during drive	 Damaged wheel hub bearing or final drive side bearing 	 Replace faulty part
		 Damaged differential gear or worn spacer 	 Replace faulty part
		• Foreign matter in housing	 Replace gear if damaged and foreign matter if any and clean inside
		• Loose axle shaft or differential carriers	 Tighten to specified torque
6.	Abnormal noise when making a turn	• Abnormally worn or damaged final drive gear or drive pinion gear	• Replace faulty part
		 Damaged differential gear or pinion gear or seizure to pinion shaft 	 Replace faulty part
		Abnormally worn or damaged differential gear spacer	• Replace spacer
		 Damaged or seized final drive gear side bearing 	 Replace side bearing



BRAKES

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TORRO 25 WORKSHOP MANUAL (In continuation with TORRO25 WM)

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BRAKES

TORRO 25

1. BRAKE CIRCUIT (Refer Fig. 1)







2. SPECIFICATIONS

SR.NO.	ITEM	DESCRIPTION	SPECIFICATION
1	Brake pedal	Brake pedal full stroke	95 mm
2 Air compressor		Air compressor type	Water cooled
		Stroke	46 mm
		Displacement	230 сс
		Max pressure	10 bar
		Drive	Gear
		Cooling type	Water
		Lubricant type	Engine Oil
3	System protection	Туре	QSPV
	valve	Setting pressure	Cut-in: 8.8 bar, Cut-out : 10 bar
		Max working pressure	10 bar
4	DDU	Unloader valve cut off pressure	10 bar
		Unloader valve cut in pressure	8.8 bar
		Max working pressure	10 bar
5	Duel brake valve	Туре	Pnematic
		Max working pressure	10 bar
6	Hand control valve	Туре	Pnematic
		Max working pressure	10 bar
		Operating pressure	7.5 bar
7	Slack adjuster	Туре	ASA
		Brake adjustment type	Automatic
		Working arm	140 mm
8	Low pressure	Max working pressure	10 bar
	indicator switch	Operating voltage	24V
		Current	2A
		Contact closing pressure	4.9 ± 0.5 bar
9	Brake chamber front	Туре	Pnematic
		Max working pressure	10 bar
		Normal working stroke	35 - 45 mm
		Max working stroke	57 mm
		Effective diaphragm area	24 inch





BRAKES

SR.NO.	ITEM	DESCRIPTION	SPECIFICATION
10	Spring brake actuator	Туре	Pneumatic
		Max working pressure	10 bar
		Normal working stroke	35-45 mm
		Max working stroke	57 mm
		Effective diaphragm area	24 inch
		Spring hold of pressure	4.3+/-0.4 bar
11	Front wheel brake	Brake type	S-Cam
		Brake drum ID	410 mm
		Brake lining length×width×thickness	410×200×21.4
		Type of brake liner	Non-Asbestos
		Frictional area	1120 sq.cm / brake
		S cam shaft - max cam throw	Max machined drum dia 416 mm
12	Rear wheel brake	Brake type	S-Cam
		Brake drum ID	410 mm
		Brake lining length×width×thickness	410×220×21.4
		Type of brake liner	Non-asbestos
		Frictional area	1240 sq.cm / brake
		S cam shaft - max cam throw	Max machined drum dia 416 mm
13	ALSV/LCRV	Туре	Pneumatic
		Normal working pressure	10 bar
		Lever length	150 mm





3. TIGHTNING TORQUE / SERVICE STANDARDS

SR. NO.	DESCRIPTION	NOMINAL VALUE		SERVICE STANDARDS (mm)
1	Brake pedal	Brake pedal play		
		Pedal installed length		
		Stop lamp switch installation clearance		
		Pedal full working stroke		95 mm
		Pedal to fork bore clearance		
2	Air compressor	Crank shaft end play		0.25 ± 0.2
		Piston ring to piston groove clearance	1st ring	0.052 ± 0.02
			2nd ring	0.052 ± 0.02
			Oil ring	0.052 ± 0.02
		Piston ring gape	1st ring	0.45 ± 0.20
			2nd ring	0.45 ± 0.20
			Oil ring	0.5 ± 0.20
		Piston pin toconnecting rod small end cle	earance	0.011 ± 0.003
		Piston to cylinder clearance		—
		Cylinder ID		0.009 ± 0.009
		Cylinder roundness & cylindericity		0.006, Taper 0.05
		Crank shaft pin roundness & cylidericity		41.00±0.006,0.003
		Connecting rod bearing oil clearance		NA
		Pump up time from zero to cut out pressure at full engine RPM		3.1 minutes
		Oil carry over limit		0.5 gm/hr
		Max drop in air pressure due to leakage		0.5 bar/hr
3	System protection	Opening pressure of port 21 & 22		7.2 bar
	valve	Auxilary port 23 & 24		6.9 bar
		Closing pressure service port 21 & 22		
		Auxilary port 23 & 24		
4	DDU	Cut out pressure		10 bar
		Cut in Pressure		8.8 bar
5	Duel brake valve	Pressure difference between primary & se	econdary	0.25 bar
		Max plunger travel		15.7 mm
		Opening pressure		0.2 mm valve stroke





TORRO 25 STANDARD TIPPER

BRAKES

SR. NO.	DESCRIPTION	NOMINAL VALUE	SERVICE STANDARDS (mm)
6	Brake chamber	Normal working stroke	35 - 45 mm
		Stand out stroke	72 mm
7	Spring brake actuator	Normal working stroke	35 - 45 mm
		Stand out stroke	72 mm
8	Front wheel brake	Brake drum ID	410 mm
		Brake drum out of roundness	0.1 mm
		Brake lining thickness	21.4 mm
		Height of liner above rivet head	16.5 mm
		Depth of scalopping from lining top surface	16.5 mm
		Cam end return spring free length	240 mm
		Cam end return spring length in fitted condition	257 mm
		Cam end return spring extended length	322 mm
		Abutement end return spring free length	143 mm
		Abutement end return spring fitted length	150 mm
		Abutement end return spring extended length	167 mm
		Brake shoe clearance	0.8 - 1.0 mm
		Cam shaft end play	0.8 - 0.3 mm
		Radial play of cam shaft in bush	0.6 - 1.2 Max
9	Rear wheel brake &	Brake drum ID	410 mm
	dumy axle brake	Brake drum out of roundness	0.1 mm
		Brake lining thickness	21.4 mm
		Height of liner above rivet head	16.5 mm
		Depth of scalopping from lining top surface	16.5 mm
		Cam end return spring free length	240 mm
		Cam end return spring length in fitted condition	257 mm
		Cam end return spring extended length	322 mm
		Abutement end return spring free length	143 mm
		Abutement end return spring fitted length	150 mm
		Abutement end return spring extended length	167 mm
		Brake shoe clearance	0.8 - 1.0 mm
		Cam shaft end play	0.8 - 0.3 mm
		Radial play of cam shaft in bush	0.6 - 1.2 Max
10	ALSV/LCRV	Lever setting angle	$14^{\circ} \pm 2.5^{\circ}$ in unladen condition





BRAKES

4. VIEW OF AUTO LOAD SENSING VALVE ASSEMBLY (ALSV) (Refer Fig. 2)












MAIN ASSEMBLY : AUTO LOAD SENSING VALVE (Refer Fig. 3)

Components

SK. NO.	DESCRIPTION	SR. NO.	DESCRIPTION		
1	Upper body	30#	Seal		
2#	Sealing ring	31	Diaphragm retainer		
3	Body	32	Lower body		
4	Valve	33#	Dust seal		
5	Spring	34	Clamp ring		
6#	Sealing ring	35	Collet		
7	Dust cap	36	Сар		
8#	Strainer	37	Angle indicator		
9#	Sealing ring	38	Hex head screw lever assembly		
10	Bolt	39	Lever		
11	Hex head screw	40#	Split pin		
12	Spring	41	Steel washer		
13	Valve	42	Link automatic load sensing valve		
14#	Sealing ring	43	Worm drive hose clamp		
15	Valve housing	44	Silencer sub-assembly		
16#	Bonded valve	45	Screw		
17	Valve housing spring	46	Pressure test connector		
18	Spring retainer	47#	'O' ring		
19#	Sealing ring	48	Cam roller		
20	Internal circ lip	49	Tappet		
21	Internal circlip	50	Torsion spring		
22#	Bonded valve	51#	Split bush		
23	Moving fin spring	52	Cam shaft		
24	Moving fin spring stopper	53	Cam		
25#	Sealing ring	54	Grooved dowel pin		
26	Moving fin	55	Cam retainer		
27	Stationary fin	56	Sun lock nut		
28#	Diaphragm disc	57	Pan head screw		
29#	Diaphragm				

MSP 3/85 Repair kit consists items marked (#) and Grease sachet - 2 off.





FUNCTION

The Automatic Load Sensing Valve (ALSV) has been designed to regulate the braking force on a particular axle in proportion to the load on that axle, and is controlled by the variations in the spring deflection of mechanical suspension systems. In ALSV, the regulation of delivery pressure takes place automatically in response to the change in the load on the axles of the vehicle.

OPERATION

The ALSV is mounted on the vehicle chassis (Fig. 4) and the operating lever is connected to the axle through a simple linkage. When the vehicle is empty the distance between the axle and the ALSV is greatest and the lever end is in its lower most position. As the vehicle is loaded (Fig. 5) the distance between axle and chassis decreases and the lever end moves upwards causing the cam to rotate which in turn moves the tappet to a position corresponding to the vehicle load.

When a brake application is made air at brake line pressure is fed through inlet port into the upper chamber forcing the moving with piston downwards which closes delivery from exhaust and connects inlet to delivery. The air now flows into the chamber below diaphragm and flows out through delivery ports to brake actuators. At the same time air flows into chamber above diaphragm through the opened in-shot valve and acts on the upper side of the diaphragm. Thus pressures above and below the diaphragm are equalized. This pressure control provides unmodulated output at low inlet pressure. If the inlet pressure increases further the inshot piston is pressed further against the in-shot spring load and in-shot valve closes. There will not be any further increase in pressure above the diaphragm.

As the moving with piston moves down the diaphragm begins to move away from the stationary fin pushed away by the fanned out portion of the moving fin. This alters the effective area of the diaphragm supported by the moving fin with piston until the force under the diaphragm which depends on the pressure and the effective area equals that acting on the top of the moving fin piston and the inlet valve closes. Balance is therefore achieved with a lower delivery pressure than that applied at the inlet port keeping the valve assembly in the lapped condition with the inlet and exhaust closed. The applied pressure is thus regulated in proportion to vehicle spring deflection. As the effective area of the diaphragm depends on the position of the moving fin attached to the piston which in turn depends on the position of cam attached to lever the output pressure to the brake actuators will be increased or decreased according to the load on the axle.

When the brake is released the pressure in the ALSV supply line (between the Dual Brake Valve and ALSV) falls and will result in loss of balance of air forces on the moving fin piston. This results in unseating of the valve from the tappet allowing air below the diaphragm to exhaust to atmosphere through the hollow tappet and out of the exhaust. A silencer is provided to reduce the noise due to exhaust.





LINK ACTUATION MECHANISM



Fig. 4



SR. NO.	PART NUMBER	DESCRIPTION
1	7708AAQ00030N	Automatic load sensing valve (150 mm)
2	7715EAQ00060N	ALSV MTG bracket
3	7715EAQ00030N	Verticle link rod (Dia. 8)
4	7708AAQ00010N	Arm assembly (105 mm)
5	SF0201099	Screw hex M12×1, 5×20×8, 8×GR
6	7715EAQ00070N	Assembly bracket arm assembly
7	7715EAQ00040N	Assembly rubber pad (Dia. 50)
8	SF0301061	Nut hex M10×1, 5×8×8
9	7715EAQ00050N	'C' Type bracket



AUTO LOAD SENSING MECHANISM CONSIST OF

- 1. Link rod mechanism
- 2. Auto load sencing valve

Link rod mechanism consist of vertical link rod, actuating arm assembly & rubber pad.

Adjustment :

LCRV lever angle setting to be done at 14°±2.5° in unladen condition with respect to angle indicator given on valve or refer 197.5±6 mm control dimension for setting as shown by adjusting/sliding the Lever Rubber Bush.



Fig. 6

Do not add or camber the spring leaves. The braking performance of ALSV will affect drastically.

Check & Replace rubber pads (4 Nos.) if found wear or found excessive play with the link rod.

SETTING PROCEDURE :

- 1. Loosen the worm drive hose clamp.
- 2. Adjust the vertical rod in such a way that the gap of 5 mm is maintained from bottom of the rubber boot (Refer Fig. 6).
- 3. Tighten the hose clamp.
- 4. Check the dimension from cross member top (Refer Fig. 6) i.e. 197.5 mm \pm 6 mm.





6. TROUBLESHOOTING

SYMPTOM		PROBABLE CAUSE	ACTION		
1.	Excessive wear of brake lining/	Obstruction in returning of slack adjuster during brake release.			
	brake pulling	 Control arm misalignment with the anchor bracket and stretched during fixing. anchor bracket. 	Correct the mis-alignment by loosening the nut of the chamber mounting bracket and aligning		
		 Control arm bent and rubbing with the body 	Straighten the control arm or fit proper control arm		
		 Slack adjuster body rubbing with chamber mounting bracket 	Fit washer between slack adjuster and chamber mounting bracket to create at least 1 mm clearance		
		• Excessive run out of brake drum ID	If run out of brake drum ID is more than 0.5 mm, take light reboring cut on the brake drum ID		
		• Excessive play of the cam in the cam bush	If the cam shaft play at the cam end or slack adjuster end is more than 1.2 mm than replace the cam bush.		
		 Incorrect initial adjustment of automatic slack adjuster 	De-adjust the automatic slack adjuster by rotating adjustment hex screw counter clock wise so that free stroke is 15 to 20 mm.		
2.	Poor braking	No brake adjustment	 Brake checking Rotate worm shaft in the anticlockwise direction to increase the lining clearance to slightly more than 1.0 mm. During this rotation which requires approx. 18 Nm torque, a ratcheting sound will be heard which indicates healthy functioning of the clutch mechanism. Apply the brake around 10 to15 times. Observe for worm shaft rotation, during every application and release. The worm shaft should rotate and lining clearance should keep reducing. This operation will confirm satisfactory working of the auto brake adjuster. Replace automatic slack adjuster 		





BRAKES	
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TORRO 25 STANDARD TIPPER

	NOTES	
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HYDRAULICS

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TORRO 25 WORKSHOP MANUAL (In continuation with TORRO 25WM)

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HYDRAULICS

1. GENERAL INFORMATION





HYDRAULICS (Refer Fig. 2)





TIPPING CYLINDER

This is hydraulic cylinder used for lowring and tipping operation of tipper body. (Refer Fig. 3)



Fig. 3

This cylinder is working on hydraulic pressure created by PTO Pump.

HYDRAULIC OIL RESERVIOR

This is the storage of hydraulic oil used for lowring and tipping of Air Cylinder through pressure developed by PTO Pump.

This is suspended type of fitment on the tipper subframe.

The oil level indicaor is provided on the tank for visual impection (Refer Fig. 4).



Fig. 4

P.T.O. (HYVA)

A P.T.O. (Refer Fig. 5) (Power Take Off) is an auxillary gear box mounted on the transmission. Its function is to transmit the power from rotation of the engine.





P.T.O. PUMP

PTO Pump is a mechanical device which converts mechanical energy into hydraulic energy. It consists of two gears with external teeth meshing with each other. (Refer Fig. 6)







PT VALVE (HYVA)

The PT Valve is mounted on the hydraulic tank (Refer Fig. 7). PT valve delivers 220 liters of oil per minute.



Fig.7

AIR CONTROL VALVE

Air Control Valve is mounted in the cabin close to driver reach to operate easily by seating on driver seat (Refer Fig. 8).

The function of the air control valve is to operate PTO as and when require while tipping and lowering of the tipper body.

To operate this valve the minimum air pressure required is 6-7 bar.



Fig.8

SERVEC LIVE Tipping value -3 - DMM Tipping value -3

Fig. 9



IDLE CONDITION

IDLE CONDITION WITH PTO ENGAGED



Fig. 10

TIPPING FUNCTION





HYDRAULICS

TORRO 25

PRESSURE RELEIF FUNCTION



LOWERING FUNCTION





HYFIX

Hyfix clamp mounted underneath the body, stops rattling of the empty tipper body on the chassis and thus prevents damage to the chassis, structural part and subframe and reduce the noise nuisance (Refer Fig. 14).

This hyfix clamp is a revolutionary solution for continuous tipper problem of chassis receiving enormous hammering from the tipper body caused by potholes and bumps on the road.

Hyfix ensures a fixed connection between tipper body chassis. The continuous bolt and nut, depending on where hyfix is fitted and the dimensions of the tipper body can adjust the compression load in the power block. The compression load can vary from 250 to 1600 kgs.



Fig. 14

PROCEDURE FOR TIPPING AND LOWERING OF TIPPER BODY



Fig.15

TIPPING

- Before tipping, make sure the tipper is standing on level & stable ground.
- Make sure that front wheels are in line with rear wheels.
- Ensure that hand brake of the vehicle is in "ON" position.
- In neutral gear, start the engine, build up the air pressure upto 8-10 bar, then press the clutch pedal and engage the PTO slowly using air control valve lever inside the cabin
- Release the clutch pedal slowly.
- Start tipping by using the air control valve inside the cabin at 1200 to 1500 rpm.

LOWERING

- Using the air control valve inside the Cabin, lower the tipper body. Lowering operation automatically disengages PTO.
- Do not put the engine in high R.P.M, while lowering the body.

GENERAL TIPS

- Please ensure the raising of body prop while doing any work on chassis or sub-frames underneath the body.
- Please remember, incorrect operational practice may be fatal to the vehicle and cause even casualty of human life.





2. SPECIFICATIONS

SR. NO.	TIPPER BODY & HYDRAULICS	SPECIFICATION
1	Tipper body with tail gate operated along with body for 16 m ³	4915×2340×1400 mm (Internal) 6210×2518×2406 mm (External)
	Tipper body with tail gate operated along with body for 14 m ³	4895×2340×1230 mm (Internal) 6210×2518×2406 mm (External)
2	Tipping cylinder	FE 129/3/3850 – HYVA make (Stroke length - 3850 mm)
3	Oil tank	60 liters
4	Oil grade	D - 68
-	PTO pump (Hyva)	82 cc
5	PTO (IPH)	1 : 1.4535 Torque 300 Nm
6	PT valve (Hyva)	220 LPM
7	Air control valve	Working pressure 6-7 bar
8	Suction hose	1¾ " Dia – HYVA make
9	Discharge hose	¾ " Dia – HYVA make

3. TIGHTENING TORQUE

SR. NO.	ITEM	THREAD SIZE	TORQUE (NM)
1	Cradle mounting bolts	M16	310
2	Hydraulic tank mounting	M12	126
3	Pivot spring bolt	M16	310
4	Pivot outrigger bracket	M16	310
5	Subframe bolt to chassis	M16	310
6	Tail gate pivot rod	M10	72
7	Tail gate hinge	M6	15
8	Body prop mounting	M10	77
9	Cylinder	M8	39
10	Pump	M12	140





4. REMOVAL OF TIPPER BODY FROM THE VEHICLE

- 1. Park the vehicle on the level road, apply hand brake & keep the wheel choke at rear & front wheel.
- 2. Drain the hydraulic oil from PTO pump
- 3. Disconnect the pneumatic connection & hydraulic connections from PT valve mounted on the hydraulic tank & PTO pump, air cylinder assembly, etc.
- 4. Disconnect the air cylinder pin from the tipper body by removing the split pin & keep it as it is with proper support to the air cylinder.
- 5. Remove strap mounted hydraulic tank from the cradle fitted on the sub frame.
- 6. Loosen the bottom mounting of air cylinder assembly
- 7. Carefully take away the air cylinder from the vehicle with proper lifting deveice and proper precaution & keep it horizontal on the ground.
- 8. Loosen the subframe pivot mounting bolts & pivot spring from the chassis.
- 9. Loosen the sub frame mountings from both side of chassis long member.
- 10. Support the tipper body by crane for lifting from the vehicle. Remove mudguard from body.
- 11. Keep the tail gate in locked condition. Care has to taken not to open the tail gate while lifting the tipper body by the crane.
- 12. Lift the tipper body along with the subframe & cradle by crane with proper support & precaution.

The hooks are provided for lifting the tipper body.

13. Keep the body on wooden block & support it properly.

5. ASSEMBLY SEQUENCE

- a) Lift the tipper body by using crane. The rope hooks provided on the side panel for lifting.
- b) Drop tipper body on the chassis slowly by taking care not to foul with any aggregate.
- c) Tighten the flexible mountings and the rigid mountings alongwith the chassis and sub frame pivot mounting bolts.
- d) Do the hydraulic connections. (Refer Fig. 16 & 17)



C. Hydraulic tank to pump suction hose.

Fig. 16

e) Do the pneumatic connections and routing.





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- PT valve fitted on hydraulic tank.
- C. PTO pump fitted with gear box and PTO.
- D. Auxilary air tank fitted on the chassis.

Fig. 17



PORT NO.	PIPE COLOUR CODE	PIPE DIA MM
EXHAUST (3)	Red - Black	6
PTO (23)	Red - Blue	6
TIP (22)	Red - Yellow	6
LOW (21)	Red - Green	6
INLET (1)	Red	6

Three numbers of outriger brackets to be fitted as follows (Refer Fig. 18) :



Fig. 18

The spring to be compressed till the solid length and released as follows :

1 st Outrigger	Released by 10 mm
2 nd Outrigger	Released by 8 mm
3 rd Outrigger	Released by 4 mm

- Fit the mudguard to the body at the position. f)
- Check the tail gate locking for smooth g) operation. Adjust the locking mechanism.



6. TAIL GATE OPENING & LOCKING MECHANISM ADJUSTMENT

 Pin of Profile Plate Assembly which passes through CAM should be mounted at a distance of 120 mm with respect to rod of hammer assembly (Refer Fig. 19).



Fig. 19

15. Distance between outer surface of CAM and Gusset should be around 5 mm.

If the distance is more, then CAM has to be adjusted by revolving around PIN.

Also the position of CAM can be adjusted by losening & tightening of the nut present on Tie Rod.

After the adjustment check the motion of CAM while tipping.

CAM should revolve around the rod and should create tension in Tie Rod (Refer Fig. 20).



Fig.20





16. Locking Pin used for holding CAM and Tie Rod assembly should be mounted at a distance of 101mm from Rod of Hammer Assembly (Refer Fig. 21).



17. Clean the Surfaces of Tail Gate, Side Board & Floor, Such that there should be no gap between Tail Gate & Floor, Tail Gate & Side Board (Refer Fig. 22)



18. Tight the Nut, such that there should be no gap between Hinge and hood (Refer Fig. 23).



- 19. Cam of Locking Assy should be mounted perfectly vertical.
- 20. Now Tight the adjustable nut provided on spring (Refer Fig. 24).



Fig. 24

NOTE

- 1) After dropping the body on the chassis, ensure the tilting of the cabin without fouling with the body.
- 2) The body should not foul with the vehicle at any stage of the tipping operation.
- 3) Use 3 Nos. of cable tie and 2 P-clamps for hydraulic hose routing at appropriate positions to avoid fouling while operation.
- 4) Allow maximum of 2 mm clearance between the cylinder & chassis brackets.

7. AIR CYLINDER

REMOVAL FROM VEHICLE

21. Park the tipper on good, firm and even ground(Refer Fig. 25).



Fig. 25

22. Apply the hand brake and wedge the wheels (Refer Fig. 26).





23. Lift the cylinder and install the prop (Refer Fig. 27 & 28).



Fig. 27



Fig. 28

24. Loosen all the mounting bracket bolts (Refer Fig. 29).



Fig. 29

25. Lift the body & remove the prop. Lower down ensure the body is fully rested on the chassis (Refer Fig. 30).







Fig. 30

26. Disconnect the cylinder hose after releasing the hydraulic pressure. Collect the spillage oil in a tray (Refer Fig. 31).





27. Sling the ram suitably and remove top pin (Refer Fig. 32).





28. Remove the bolt of one bracket and slide cylinder mounting bracket from the cradle (Refer Fig. 33).



Fig. 33

29. Slide the cylinder away from the bracket with help of tyre lever (Refer Fig. 34).





30. Taking all possible care, with draw cylinder from the Tipper (Refer Fig. 35).







— 29 ĕ - 22 - 23 - 16 - 24 - 25 - 10 -12

SR. NO.

TIPPING CYLINDER (EXPLODED VIEW) (FE 129-3-03850-001A-K1609-HD3-HC)

Fig. 36

SR. NO.	DESCRIPTION
	Tipping cylinder
	FE 129-3-03850-001A-K1609-HD3-HC
1	Packset
2	Base
3	Seal bottom plate
4	Bottom plate
5	Locking plate
6	Spring washer M8 Set
7	Bolt M8×1.25×20 Set
8	Packset
9	Stage 129-1520-HD3-HC
10	Outer stop ring 129 HD
11	Slider 129 (2×1/2) MK4
12	Liftring 129
13	Packset 110
14	Stage 110-1520-HD3-HC
15	Outer stop ring 110





DESCRIPTION

Slider 110

Liftring 110

CYLINDER DISASSEMBLY

Clean the cylinder external surface and keep cylinder in a clear place or on V block (Refer Fig. 37).



Fig.37

32. Remove the rod eye grub screw (Refer Fig. 38).



Fig.38

33. Remove the rod eye (Refer Fig. 39).



Fig.39

34. Detorque the cap end cover bolts and remove (Refer Fig. 40).



Fig.40

35. Install four long bolt with the lock plates to remove the cap end cover (Refer Fig. 41).





36. Remove the spring ring. 1, 2 & 3 use screwdriver by inserting in the wedge (Refer Fig. 42).





37. Tap the Third stage piston rod out. Remove piston bearing (Refer Fig. 43).



Fig.43

38. Remove third stage Dia 91 piston rod out from Cylinder (Refer Fig. 44).



Fig.44

39. Remove second stage piston bearing (Refer Fig. 45).



Fig.45





40. Remove Second stage Dia 110 piston rod out from Cylinder (Refer Fig. 46).



Fig.46

41. Remove First stage Piston bearing (Refer Fig. 47).



42. Remove First stage Dia 129 piston rod out from Cylinder (Refer Fig. 48).



INSPECTION

- 43. Check all the three stages of the cylinder outer surface for any scoring marks / band.
- 44. Check the bottom lock plate condition.
- 45. Check piston bearing stiffness / crack.

CYLINDER ASSEMBLY

Clean the cylinder outer surface and apply small layer of grease.

46. Slide 1st stage (129 Dia tube S/A into the outer tube or base tube. (ensure proper alignment and entry, use grease at entry point) (Refer Fig. 49)





47. Assemble the 1st stage piston bearings. use sufficient grease. Slide the stage tube fully inside the outer tube / base tube (Refer Fig. 50).



NOTE

Apply small layer of grease before entry of the cylinder. Dry assembly will lead to rubbing/scoring of to the tube



48. Assemble (110 Dia tube S/A) 2nd Stage (Refer Fig. 51).



Fig. 51

49. Assemble the 2nd stage piston bearings use sufficient grease. Slide the second stage tube fully inside the outer tube & first stage (Refer Fig. 52).





50. Assemble 3rd stage tubes (91 Dia tube S/A) (Refer Fig. 53).



Fig. 53



51. Assemble the 3rd stage piston bearings. Use sufficient grease. Slide the 3rd stage tube fully inside the 2nd ,1st & outer tube (Refer Fig. 54).



Fig. 54

52. Insert spring ring into groove (Refer Fig. 55).





53. Insert Cap end cover ensure O ring does not get cut. (apply grease on O ring for easy entry) (Refer Fig. 56, 57 & 58)





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Fig. 57



Fig. 58

54. Assemble the lock plate & bolts. Tighten equally. (Refer Fig. 59)



Fig. 59

55. Assemble rod eye and lock by tightening the grub screw. (hand tight) (Refer Fig. 60 & 61).



Fig. 60



Fig. 61

NOTE

Do not dismantle / assemble the air cylinder assembly in dusty condition.

Take support from Hyva Service Network whenever required.



DISASSEMBLY OF THE SEALS FROM THE PISTON

(Refer Fig. 62)

- 56. Remove wipers from the tubes.
- 57. Remove rod bearings from all tubes' shape
- 58. Remove back up rings & O rings.
- 59. Remove rod bearings.
- 60. Remove rod seal



Fig. 62

- 1. 'O' ring
- 2. Backup ring
- 3. 'L' shape bearing
- 4. Wiper
- 5. Rod seal

REMOVAL OF SEALS FROM PISTON ROD

61. Remove wipers from all tubes (Refer Fig. 63).



Fig.63



62. Remove rod bearings from all tubes (L Shape) (Refer Fig. 64).



Fig.64

63. Remove back up rings & O rings (Refer Fig. 65).



Fig.65

64. Remove rod bearings (Refer Fig. 66).







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65. Remove rod seals (Refer Fig. 67).





INSPECTION :

Before commencing to assemble the cylinder should be cleaned with cloth.

- 66. Thoroughly clean components of all dirt wash them with oil and wipe out soft mul cloth
- 67. Inspect the spring rings of all the stages for sign of damage. If found defective replace it.
- 68. Inspect the inner surface of each stage tube and seal grooves for any irregularities. (scratches, rust) Use torch to check.
- 69. Inspect tube for scoring, if slight scoring polish the tube. If more that 0.5 micron deep change the tube.
- 70. Check the wiper lip for wear. Replace if it is worn out or distorted or damaged.
- 71. Inspect stopper ring, do not remove if no damage, if damaged replace.
- 72. Inspect piston bearing, if scored or damage replace with near piston bearing.

NOTE

Do not use cotton waste to clean cylinders.

8. ROD SEAL ASSEMBLY

73. Assemble the rod seals (make kidney shape for Insertion) (Out tube, First & second Stage. Ensure direction of lip. Lip should always face pressure side (Refer Fig. 68).





74. Assemble the rod bearing for all stages.

These are L shape bearing the L should be assemble in opposite direction. (back to back) (Refer Fig. 69)





75. Assemble O rings & back up ring for all stages (Back up ring towards out side) (Refer Fig. 70).





76. Assemble rod bearings ensure the bearing sit in the groove (Refer Fig. 71).



Fig. 71

77. Assemble the wiper for all stages. (with lip towards out side) (Refer Fig. 72).



Fig. 72





78. Apply clean white grease on the seal area. (O ring, rod seal, bearings & wiper) (Refer Fig. 73 & 74)





MOUNTING OF THE CYLINDER

79. Mount one of cylinder mounting bracket (Refer Fig. 75) on to the cross members. Use specified screws, washers and locknuts to fasten initially hand tighten the cylinder-mounting bracket. Bring the cylinder into the assembly. Remove the protecting covers from the cylinder trunion pins and lubricate with grease.





NOTE

Always use SAE 140 grease for Lubrication. Ensure the port position is in right direction.

 Align the trunion pin (Refer Fig. 76) with the mounting hole in the bracket. Move the cylinder into the bracket. Ensure 1-mm clearance between bracket and cylinder. Bring another mounting bracket into the assembly.



Fig. 76

81. Slide the bracket into the cross members. Align fastening holes (Refer Fig. 77) of the bracket and the cross member. Use specified screws, washers and locknuts to fasten. Initially hand tightens the cylinder-mounting bracket. **Ensure 1 mm clearance between brackets and cylinder**.





- 82. Tighten the bolts of the bracket to the specified torque. After removing sling, cylinder may fall in the direction of the cabin, this may result in damaging the cabin or may injure person. To keep the cylinder in right place, use wooden wedges between the cylinder and cross member. Remove the sling.
- 83. Insert 16 mm collar on both side of the rod eye, position into the bracket.
- 84. Insert the rod eye pin and lock by split pin. Ensure 1mm gap.



85. Remove the plug (Refer Fig. 78) from the oil inlet and connect the cylinder to the hydraulic system. Connect the hose to the inlet with sufficient loop, so that it is not obstructing the movement of the cylinder while tipping.



Fig. 78

- 86. First tipping should be slow and all the movements are to be closely observed. Cylinder movement is smooth. Hoses are not interfering with any parts. Cylinder extension is in straight line
- 87. Tight all the fasteners with specified torque.
- 88. Tip the body 4 to 5 times fully and check for smooth operation.

9. AIR CONTROL VALVE

- 89. Disconnect the pneumatic connection from air control valve
- 90. Disconnect electrical socket from air control valve
- 91. Loosen the mounting bolts & remove the air control valve from its position. (Refer Fig. 79)



Fig. 79



92. Repeat the reverse procedure to fit the air control valve in the cabin.

10. PT VALVE & HYDRAULIC TANK ASSEMBLY

- 93. Disconnect the pneumatic connection from PT valve
- 94. Disconnect the hydraulic connection from the PT valve
- 95. Loosen the Allen bolts & take away the PT valve from the tank. (Refer Fig. 80)



Fig. 80

NOTE

Do not dismantle the PT Valve. Take support from Hyva Service Network whenever required.

HYDRAULICS

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PT VALVE (EXPLODED VIEW) (Refer Fig. 81)



SR. NO.	DESCRIPTION	SR. NO.	DESCRIPTION	SR. NO.	DESCRIPTION
1	Housing	11	Spring	22	Bonded seal
2	Aluminium head	12	Retaining ring	23	Straight coupling
3	Spring disk	13	'O' Ring	24	Blind plug
4	Plunger	14	Quadring	39	Blind plug
5	Closing plug	15	Sealing nut	40	Blind plug
6	Air cover	16	Allen bolt	41	'O' ring
7	Piston air cylinder	17	Sealing nut	42	Washer
8	Restrictor	18	Quadring	43	Bolt
9	Pressure catridge	19	Retaining ring		'O' ring kit - PT valve
10	Non return valve	20	Expender		(consists of item
		21	Usit ring		No. 13,14, 18 & 41)



11. PTO PUMP AND PTO REMOVAL FROM VEHICLE

96. Lock the hydraulic tank knob, so that the oil does not fall out from the hydraulic tank. (Refer Fig. 82)



Fig. 82

97. Drain the hydraulic oil from PTO (Refer Fig. 83).



Fig. 83

98. Loosen one by one the PTO mounting bolts, and remove them (Refer Fig. 84).



Fig. 84



99. Loosen the nut of PTO (Refer Fig. 85).



Fig. 85

100. Disconnect the PTO from the PTO pump, and take it out (Refer Fig. 86).



Fig. 86

101. Rotate the PTO, then take it out and allow the oil to drain completely (Refer Fig. 87 & 88).




Fig. 88

102. Remove the drain plug on gear box and drain the gear oil (Refer Fig. 89).





103. Disconnect pneumatic connection from PTO.

Remove the bolt of PTO pump and remove the pump (Refer Fig. 90 & 91).



Fig. 90



Fig. 91

104. Take out the shims from gear box countershaft rear end. (Refer Fig. 92)



Fig. 92

NOTE

Measure the shim thickness and use the same while assembly.





12. PTO PUMP (EXPLODED VIEW) (Refer Fig. 93) :



SR. NO.	DESCRIPTION
1	Body
2	Cover
3	Screw
4	Washer
5	Driver shaft
6	Driven shaft
7	Housing 'O' ring
8	Backup ring
9	Seal
10	Thrust plate
11	Shaft seal

SR. NO.	DESCRIPTION
12	Circlip
13	Lock ring
14	Roller bearing
15	Support shaft
16	Roller bearing
17	Oil rings
18	Grease ring
19	Bush
20	Shaft seal
21	Shaft seal
	Seal kit (Sr. No. 7, 8, 9, 17, 18)





DISASSEMBLY

105. Loosen the adoptors of hydraulic pipe connection. (Refer Fig. 94)



Fig. 94

106. Loosen the allen bolts (8 Nos.) (Refer Fig. 95)



Fig. 95

107. Mark the two halves of the pump (Refer Fig. 96).



Fig. 96

108. Make the two halves seperate by using mallet. Do not use hammer (Refer Fig. 97 & 98).



Fig. 97





109. Take out thrust plate (Refer Fig. 99).





110. Take out drive shaft & driven shaft from the housing (Refer Fig. 100 & 101).



Fig. 100





Remove shaft support bush from housing.

111. Remove the 'O' ring from the housing (Refer Fig. 102).



Fig. 102



112. Take out support shaft gear along with gear by removing snap ring (Refer Fig. 103).



Fig. 103

113. Remove the housing spacer along with oil seal (Refer Fig. 104).





114. Take out the support shaft by removing the snap ring (Refer Fig. 105).





115. Remove the support shaft oil seal (Refer Fig. 106).



Fig. 106

INSPECTION

- 116. Clean both the housing by kerosene and compressed air.
- 117. Check for abnormal wear.
- 118. Check the driver & driven shaft for wear at mating surface.

ASSEMBLY

119. Fit the support shaft alongwith the oil seal.

Replace the oil seal with new one (Refer Fig. 107).



Fig. 107

120. Fit the driver & driven gear shaft bush inside the housing.

121. Fit the 'O' ring in the housing (Refer Fig. 108).



Fig. 108

122. Fit the thrust plate in the housing. Ensure backup ring fitted (red color) in the thrust plate (Refer Fig. 109).





123. Align the mark (Made at the time of disassembly) (Refer Fig. 110).





124. Fit the housing of support shaft on the driver and driven shaft (Refer Fig. 111).





125. Insert the snap ring (Refer Fig. 112).



Fig. 112

126. Fit the housing spacer alongwith the oil seal (Refer Fig. 113).



Fig. 113

Insert the snap ring.



127. Fit the gear on the support shaft (Refer Fig. 114 & 115).



Fig. 114



Fig. 115

- 128. Check the free rotation of the pump by hand.
- 129. Tighten the allenkey screws by specific torque (Refer Fig. 116).



- 130. Again confirm the free rotation of the pump.
- 131. Fit the suction and discharge elbow on the housing.



13. PTO (EXPLODED VIEW) (Refer Fig. 117)



SR. NO.	DESCRIPTION	
1	Housing	
2	Driven gear Z 22	
3	Deep groove NR6010 bearing	
4	Needle roller bearing (BK 3020)	
5	External circlip (50e UNI 7435)	
6	Gearbox mounting adaptor	
7	Bearing-HK 6012	
8	Hex head bolt - SPL	
9	Spring	
10	Drive gear Z 29	
11	Needle roller BRG	
12	Retainer	
13	'O' ring - viton	
14	'O' ring - viton	
15	Piston	
16	Adapter for ISO 4 bolt mounting	

SR. NO.	DESCRIPTION
17	Shaft seal (50×72×8)
18	Gasket
19	Stud (M12×60l)
20	Hex nut (M12)
21	Spring washer (M12)
22	'O' ring – viton (88.49×S3.53)
23	Bearing 6009
24	Coupling sleeve
25	Cover
26	Plastic plug M16
27	Plain washer
28	Air adaptor (M12S1.25- 6OD)
29	Stud (M12×1.75P×125L)
30	Bolt (M12×1.75P×80L)
31	Spicer 1300 / Din 10
	1



DISMANTLING

- 132. Remve the PTO pump away from PTO.
- 133. Remove air connection knob from PTO & plastic plug.
- 134. Disconnect PTO from gear box. (Refer Fig. 118)



Fig. 118

135. Remove the shims fitted on the gear counter shaft (Refer Fig. 119).



Fig. 119

136. Take out the packing (Refer Fig. 120).



Fig. 120

137. Loosen the bolts & studs from the housing (Refer Fig. 121).



Fig. 121

138. Mark the two halves (Refer Fig. 122).



Fig. 122





139. Make the flange & housing seperately by using mallet (Refer Fig. 123 & 124).



Fig. 123



Fig. 124

140. Remove the circlip (Refer Fig. 125).



Fig. 125

141. Take out the driven gear & bearing.

142. Take out the needle roller bearing away from housing (Refer Fig. 126).



Fig. 126

- 143. Turn the PTO over to drive gear.
- 144. To remove the drive gear loosen the special hexagonal bolt. Remove along with spring & retainer. (Refer Fig. 127 & 128)









145. Take out drive gear from the housing (Refer Fig. 129).



Fig. 129

146. Remove needle rollen bearing from the housing. (Refer Fig. 130)





INSPECTION

- 147. Clan the housing, drive gear, driven gear with kerosene & compressed air.
- 148. Check for free rotation of bearing
- 149. Wear & tear on driver gear & driven gear.

ASSEMBLY

Reverse the procedure for assembly.

NOTE

Do not dismantle PTO and PTO Pump assembly locally. Take support from Hyva Service Network.





OPERATION CHECK LIST :

⚠ WARNING

Do not engage or disengage the PTO with out pressing the clutch pedal. If not the drive gear internal splines will get wornout.

ENGAGEMENT / DISENGAGEMENT CHECK

- Fill the gearbox to the specified level with the recommended grade oil.
- Check for the air pressure to be at a minimum of 6 kg/cm² .to engage the PTO.
- Press the clutch pedal and wait for 10 to 15 sec, then engage the pto (while engaging the PTO ensure that the pump does not run dry)
- Ensure pto is disengaged before driving the tipper.









14. HYFIX (Refer Fig. 133)



SR. NO.	DESCRIPTION	S
0	Hyfix assembly	
1	Power block (Rubber pad)	
2	Compresion plate	
3	Pin-3	
4	Locking plate	
5	Hyfix pivoting	
6	Stud with nut	









ITEM CODES FOR SPARES

SR. NO.	DESCRIPTION	QTY.
1	Hydraulic oil tank	1
2	Rubber base pad	2
3	Rubber strap	2
4	Tipping valve mounting block	1

SR. NO.	DESCRIPTION	QTY.
5	Cradle mounting	2
6	Return oil filter assembly	1
7	Breather assembly	1
8	Oil inspection eye	1



16. RETURN LINE FILTER ASSEMBLY

Return line filter assembly is located on top of the hydraulic oil tank & adjacent to tipping valve. Oil from cylinder on its return path, (Cylinder Tipper Valve) flows to the tank through return line filter.

The function of Return Line Filter assembly is to remove contamination from the hydraulic oil on its way back to the tank. (Refer Fig. 135)



SR. NO.	DESCRIPTION	
1	Cover (plastic or aluminium)	
2	Aluminium body	
3	Flange pipe	
4	Return line filter element	
5	Flange seal	

SR. NO.	DESCRIPTION	
6	ʻOʻ ring	
7	'O' ring (Cover)	
8	Spring	
9	Hex. head screw M8x30	
10	M8 Spring washer	





17. AIR BREATHER (BREATHER FILTER ASSEMBLY)

Breather Assembly

As the name indicates, this helps the Hydraulic oil tank to 'Breath in' or 'Breath out' air, in order to maintain the atmospheric pressure inside tank, even when there is lower level of oil (in tipped condition) or higher level of oil (due to lowering down or heat generation in the system), in order to prevent any kind of deformation of tank. A Breather filter element of 10-micron filtration capacity ensures entry of dust and foreign particle - free air inside hydraulic tank (Refer Fig. 136).





SR. NO.	DESCRIPTION	SR. NO.	DESCRIPTION
1	Cover	4	Seal
2	Housing	5	Screw
3	Breather filter element	6	Sleeve





18. LOCATION OF RETURN LINE FILTER AND BREATHER ASSEMBLY (Refer Fig. 137)



19. GREASING POINTS (Refer Fig. 138)



Fig. 138

SR. NO.	DESCRIPTION	
1.	Cylinder mounting bracket	
2.	Cylinder piston eye	
3.	Rear hinge greasing	
4.	Tail door locking mechanism	
5.	Tail door hinge	
6.	Body prop	
7.	Hyfix	
	1	



20. DO'S & DON'TS

Do's

- Grease the mounting brackets & all pin every day.
- Change the Hydraulic filter within the specified period.
- Replace hydraulic oil within the specified period.
- Check all mounting bolts before operation.
- Operate the system for 5 Minutes before operation.
- Load the tipper body evenly.
- Place the body on even surface during tipping.
- Used proper tool for dismantling & assembly

Don'ts

- Do not tamper the relief valve setting.
- Do not open the cylinder, valve or pump by local mechanic.
- Do not work under the body without the prop.
- Do not open any hose before releasing the hydraulic pressure.
- Do not open the components in dust environment.
- Do not heat the bolt & nut for opening.
- Do not carry our welding without removing the battery terminals.
- Do use the cylinder cradle earthing points during welding of body.
- Do not driver the tipper when the cylinder is in extended position.
- Do not under the tipper if the tailgate is not working.





21. TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	ACTION
Valve works properly but suddenly fails	Broken air tube	Check air tubes and replace as required
Cylinder jerks when extending	• Air in the system	Bleed the pump by slightly opening the adapters from the pressure hose
Cylinder raises very slowly	Pump defectiveToo low air pressure	 Replace pump Check air pressure, check air control, air tubes and tipping valve as described before
Cylinder does not extend fully	• Relief valve malfunctioning	 Check the pressure at which the relief valve is opening by connecting a pressure gauge to the serial port. If this pressure is not being obtained then contact Hyva authorised service centre Top up the tank
Body comes down too fast	 The lowering speed adjuster screw is worn out PT valve pressure catridge choked 	Extend the cylinder fully. Put cab control in 'HOLD' position. Adjust the screw in position as far as possible. Move cab control to 'LOWER'; unscrew the adjuster until the body operates at correct speed.
	PT valve pressure catridge choked	Clean & refit.
Valve selector shaft (Spool) does not move even with sufficient air pressure	 The selector shaft (Spool) is sticky or stopped 	 Loose three fixing bolts by half a turn and try to switch the valve again. The torque of the bolts should not exceed 15 Nm'.
Cylinder does not extend smoothly	Air in the systemPump is performing irregularly	 Bleed the system, check oil level in tank Replace pump
Excessive oil temp. (> 60°C)	 Check for increase in system pressure check relief valve cartridge for dirt 	 Clean the filter cartridge. Replace the cartridge if necessary.
The cylinder does not extend when th air control is in tipping position	 The PTO is not engaged Pump doe not deliver oil No oil in tank Gate valve closed Insufficient air pressure 	 Move cab control to "in mesh" position Disconnect hose at 'P' and check if oil circulates Fill the oil tank Open the gate valve Check air supply





SYMPTOM	PROBABLE CAUSE	ACTION
	Cylinder is connected to wrong Valve port	• Connect cylinder to port 'A'
Air supply correct but tipping valve does rot gel actuated	 Air control fault Air Tube 'kinked' or restricted 	 Remove all air tubes except feed and exhaust. Check if a passes through relevant port when control move on to correct position. Replace this valve if faulty. Check all Tubes for sharp bends. Disconnect both air tubes from valve and check air flow with air control in <i>relevant</i> position. If no air escapes from air tube ends, replace tubes.
Cylinder raises but not lower or lowers too slowly	 Lowering speed adjusting screw turned in completely (PT valve only) Air control fails Return filter is chocked Grade of oil being used too heavy 	 Turn the screw anticlockwise Check air supply in lowering position Replace filter element Refill with proper grade of oil
Cylinder drops when clutch is depressed	 Non return valve in port 'P' not fitting 	Replace tipping valve
Air supply is sufficient but tipping valve is not working	Internal leak in tipping	Change tipping valve



22. OPERATIONAL / ABUSE FAILURE

SYMPTOM	PROBABLE CAUSE	ACTION
1. TIPPING CYLINDER		
Cylinder bent	Tipping on uneven ground	Educate the operator
	 Running of vehicle by keeping body in tipping condition 	Educate the operator
	Vehicle toppling in an accident	Educate the operator
Cylinder bulge	 Tipping valve set pressure is tampered 	Set the pressure
	 Pressure relief valve is malfunctioning 	Replace
	Sticky spool of tipping valve	Replace or adjust
	Lowering operation is too fast	Educate the driver
	Choked filter	Replace regularly
Cylinder scoring	 Scoring on stages due to slider chip off 	Replace
	 Scoring in the axis of trunion due to side load 	Educate the operator
	 Scoring due to stop ring dislocation and groove deformation 	Replace
	 Welding spatter and spark jumping due to earthing through cylinder 	Do not cylinder for earthing
Oil leakages from stages	Wrong fitment of seal	Replace
	Excess load	Educate the operator
	Body extension	Not permitted
	Operational abuse	Educate the operator
	 High oil temperature due to more number of tippings 	Educate the operator
	 High oil temperature due to continuous PTO engagement 	Educate the operator
	Contaminated oil	Replace regularly
	Welding spatter on seal running area	Do not cylinder for earthing
Oil leakage from cylinder bottom	Poor quality seal	Use genuine spares
plate	Wrong fitment of seal	Replace
Piston coming out	 Jerky operation by pushing backward after unloading 	Educate the operator





SYMPTOM	PROBABLE CAUSE	ACTION
Piston eye coming out	Poor locking arrangement	Repair
Cylinder base tube crack	 Crack is on trunion side due to side loads 	Educate the operator
	Crack is on all around trunion	Educate the operator
Cylinder Stuck	Sliders over riding	Replace
2. TIPPING VALVE		
Oil leakage	Seal failure due to wrong fitment	Use correct procedure
Malfunctioning of valve	Sticky spool	Replace
High operating pressure	Pressure relief valve tampered	Adjust properly
Working pressure is too low.	Low system pressure as relief valve malfunctioning	Replace
3. HYDRAULIC PUMP		
Pump fails	 Relief valve set pressure is tampered 	Adjust
	• No hydraulic oil in the tank	Check oil level daily
	 Pump operated without opening ball valve 	Educate the operator
	 External damage due to hit by external object 	Educate the operator
	 Correct grade of oil is not used 	Replace
	 Thrust plate & housing wear out due to excess raving of engine rpm 	Educate the operator
Pump leakage	 Pump reversing procedure not followed 	Educate the operator
	Oil contamination levels are high	Replace regularly as specified
Pump drive shaft broken	Manufacturing defect	Replace
	System pressure relief is tampered	Adjust
	Entry of foreign particles	Replace the oil / replace pump
Thrust plate &	Excess raving up of engine	Educate the operator
wear out of pump housing	Oil contamination	Replace





SYMPTOM	PROBABLE CAUSE	ACTION
4. TIPPER SUB-FRAME		
Sub frame crack	 Crack develop due to not tightening mounting bolts 	Tighten the subframe hardwares regularly as specified
	 Crack due to improper loading pattern 	Educate the operator
	 Crack develops near welding joints under normal working conditions 	Repair
	Cracks due to accident to vehicle	Replace
Sub frame twisted	• Twist is due to accident	Replace
5. HYDRAULIC HOSES		
Oil leakage	Leakage from crimping	Replace
	• Burst age of hose	Replace
	 Twisting due to wrong fitment 	Replace
	 External damage due to rubbing / hitting 	Correct the routine



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SUSPENSION

BOGIE : WORKSHOP MANUAL

Bogie suspension is on alternate for link suspension fitted on MN 25 tipper It consist of

- 1. Leaf spring assembly
- 2. Bogie assembly
- 3. Torque rod

Changes with respect to MN25 tipper with link suspension.

- 1. Rear suspension bogie as optional
- 2. Rear leaf spring assy. Vikrant make
- 3. Chassis frame as per bogie fitment
- 4. Propeller shaft /Inter axle shaft
- 5. Rear axle housing & axle shaft
- 6. Brake booster position change to suit bogie

1. Leaf spring

Leaf spring assembly is fitted in inverted condition on the bogie trunion assembly with inverted U bolt. On both the axles the assembly is rested & it acts as a seesaw function.

2. Bogie assembly

Bogie assembly is consist of trunion assembly (2nos) & it is assembled & connected with centre cross shaft. The trunion bushes are replaceable.

3. Torque Rod (6 Nos)

In this suspension instead of link of bell crank & equaliser rod, 6 No's of torque rods are fitted at the bottom of the bogie with respect to rear axles & connected on the chassis. With centre cross shaft.

The torque rod bush can be replaced as and when after weared off depending upon the operation.



Bogie Suspension side view



EXPLODED VIEW - BOGIE SUSPENSION

Sr. No.	Part Number	Part Name	Qty
1.	7402DAQ00090N	Assy Trunion Complete	1
2.	7402AAQ00380N	Assy Spring Complete	2
3.	7402AAQ00500N	U Bolt Seat	2
4.	7402AAQ00510N	U Bolt	4
5.	7402EAQ01360N	Washer U Bolt	8
6.	7402AAQ00530N	U Bolt Nut	8
7.	7402EAQ01260N	Torque Rod Mtg Brkt - CM	2
8.	7402EAQ00800N	Assy Torque Rod	6
9.	7402EAQ01140N	Assy Bracket Bump Stopper	4
10.	7402EAQ01030N	Assy Bump Stopper	4
11.	SF0101261	Bolt Hex M18x2x70x10.9	28
12.	SF0101262	Bolt Hex M18x2x100x10.9	12
13.	SF0101263	Bolt Hex M18x2x245x10.9	6
14.	7502AAP00150N	Hard Washer	46
15.	SF0301090	Nut Hex M18x2x15.8x10	46
16.	SF0101074	Bolt Hex M14x1.5x85x10.9xZN	10
17.	SF0301065	Nut Hex M14x1.5x13x10	10
18.	SF0102174	Bolt Hex Fl M14x2x50x10.9	16
19.	SF0303031	Nut Hex FI M14x2x14x10	16
20.	SF0202085	Screw Hex Fl M12x1.75x30x10.9	8

SUSPENSION

BOGIE



21.	7402EAQ01420N	Sub Assy Fwd Axle	1
22.	7402EAQ01430N	Sub Assy Rwd Axle	1
23.	7402EAQ01400N	Shim Torque Rod 2mm Thk	As Required
24.	7402EAQ01390N	Shim Torque Rod 1mm Thk	As Required
25.	7402EAQ01410N	Shim Torque Rod 3.15mm	As Required
26.	7402EAQ00920N	Top Clamp Plate	4
27.	SF0202137	Screw Hex Fl M16x2x55x10.9	8

MN25 BOGIE TIPPER SERVICE SCHEDULE

Sr No.	Parameters	Frequency	Torque value
1	Check & tighten leaf spring U Bolt (4 nos)	First at PDI & then every 150 hrs or weekly once	716 - 843 Nm
2	Check & tighten torque rod mounting bolt	First at PDI & then every 150 hrs or weekly once	340 - 380 Nm
3	Check & tighten trunion check nut	First at PDI & then every 300 hrs or fortnightly once	96 - 126 Nm
4	Check & tighten of trunion to chassis bolt	First at PDI & then every 600 hrs or monthly once	340 - 380 Nm
5	Check & tighten side & bottom wear pad mounting bolts	First at PDI & then every 150 hrs or weekly once	96 - 126 Nm
6	Check & tighten bump stopper mounting bolts	First at PDI & then every 150 hrs or weekly once	108 - 132 Nm
7	Check & tighten bump stopper bracket mounting bolts	First at PDI & then every 150 hrs or weekly once	113 - 138 Nm
8	Check & tighten trunion check nut.	First at PDI & then every 300 hrs or fortnightly once	Pinch Bolt 165 - 198Nm Nut 96 - 126Nm

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BOGIE DISMANTLING: LEAF SPRING ASSEMBLY

Park the vehicle on a leveled road. Keep wheel choke on front wheel. (Refer *Fig. 1*)



Fig. 1

Tip up the Tipper body. Support with body prop. (Refer *Fig. 2*)



Fig. 2

Loosen the rear wheels. (Refer Fig. 3)



Fig. 3

Support the chassis at rear of the bogie & at front end of the bogie. Take care while support that all the four corners of chassis supported properly by using screw jack. (Refer *Fig. 4*)



Fig. 4

Remove the tyres (all four side). (Refer Fig. 5)





$\overline{\mathbf{I}}$ Caution

Take proper care for supporting the chassis to avoid personal injury. Use proper size wooden blocks.

While working under the vehicle take proper precaution.

SUSPENSION

Loose the front & rear leaf spring top clamp. (Refer *Fig. 6*)



Fig. 6



Fig. 7

Take away the top clamp bracket from front & back of the leaf spring assembly. (Refer *Fig. 8*)





Loosen the U bolt (2 at each side). (Refer Fig. 9)



Fig. 9



Fig. 10

Remove the U bolt from one side either LH or RH. Don't remove from both side at a time. Take care while working below the vehicle.

Take away the U Bolt both front & Rear of the leaf spring (Refer *Fig. 11*)





Lift the leaf spring assembly by using proper lifter or chain pulley block. (Refer *Fig. 12*)



Fig. 12

Keep the leaf spring away from working area. Check for any breakage of suspension leaf / centre bolt If any replace while assembly

Do not add suspension leafs in assembly

TRUNION HOUSING REMOVAL

Remove the metallic cap along with the gasket. (Refer *Fig. 13*)



Fig.13



Fig.14

Clean the grease observed on the trunion check nut. (Refer *Fig. 15*)





Loosen the trunnion check nut & tap it to take it out. This is threaded bolt so tap the bolt slightly after losening. (Refer *Fig. 16*)



Fig. 16


Fig. 17

Loosen the mounting bolt's (2 Nos) of the trunion checknut. (Refer *Fig. 18*)



Fig. 18

Remove the trunion check nut from the housing.

Take out the check nut by loosening from trunnion shaft by rotating clock wise. (Refer *Fig. 19*)







Fig. 20

NOTE Replace the 'O' ring while assembly

Take out the lock plate along with 'O' ring by using screw driver. (Refer *Fig. 21*)





Remove grooved washer given for lubrication. (Refer *Fig. 22*)





By rotating the trunion housing clockwise & anti clockwise. (Refer *Fig. 23)*



Fig. 23

Take out the trunion housing from trunion shaft. (Refer *Fig. 24*)



Fig. 24

Remove the grooved washer from other side, along with oil seal after removal of trunion bracket. (Refer *Fig. 25*)



Fig. 25

Using punch or screw driver remove grooved washer oil seal. (Refer *Fig. 26)*



Fig. 26



Fig. 27

NOTE Replace the oil seal while assembly

REMOVAL OF TRUNION METAL BUSH (2NOS)

Wash the trunion housing. Check for wear of metal bearing. If found excessive wear, remove from trunion housing for replacement. (Refer *Fig. 28*)





Tap the copper cylindrical bearing from trunion bracket & remove both the bearings. (Refer *Fig. 29*)



Fig. 29

The bearing can be removed on hydraulic press by using special tool no. 7601BAP0002ST

Check the trunion housing for any crack. Clean the trunnion shaft & check for any damage on the surface. (Refer *Fig. 30*)



Fig. 30

Follow the same process for removal of trunion housing on the other side of the bogie. (Refer *Fig. 31*)



REMOVAL OF SIDE TORQUE ROD.

Loosen the torque rod mounting from cross shaft link rod end take away the mounting bolt. (Refer *Fig. 32*)





Loosen the torque rod bracket from both axle end. (Refer *Fig. 33*)





Take out the both the torque rod away from the vehicle. Ensure the vehicle is supported properly. (Refer *Fig. 34*)





5

Apply the same procedure for removal of other side of the bogie.

REMOVAL OF CENTRE LINK ROD

Loosen the link rod cover stud nut from both side of 'A' bracket. (Refer *Fig. 35*)



Fig. 35

Ensure that all the attachment like torque rod fitted on the cross shaft has been removed. (Refer *Fig. 36*)



Fig. 36

Remove both the caps from centre cross shaft (Refer *Fig. 37*)





Take out the studs fitted on the center cross shaft with proper care & support. (Refer *Fig. 38*)





Mark the LH/RH side on link rod for proper assembly. and take out centre cross shaft from bogie 'A' bracket (Refer *Fig. 39*)





REMOVAL OF 'A' BRACKET

Loosen the 'A' bracket bolt fitted on chassis long member & bogie cross member. (Refer *Fig. 40*)



Fig. 40

Take out 'A' bracket & check for any damage/crack. (Refer *Fig. 41*)





REMOVAL OF TRUNION SHAFT FROM 'A' BRACKET

After removing 'A' bracket remove dowl. (Refer Fig. 42)





Tap trunion shaft and remove from back end of 'A' bracket. Care has to be taken not to damage the threads of trunion shaft check nut. (*Refer* Fig. 43)





Take out trunion shaft from the bracket. Check the bracket for any damage or breakage. (Refer Fig. 44)





REMOVAL OF BOTTOM WEAR PAD.

Lift the leaf spring assembly by jack from one side. (Refer *Fig. 45*)



Fig. 45

Loosen the mounting bolt of bottom wear pad. (Refer *Fig. 46*)



Fig. 46

Take away the bottom wear pad. (Refer Fig. 47)





REMOVAL OF SIDE WEAR PAD

Loosen the mounting bolt fitted on the common bracket for torque rod and both side & bottom wear pad. (Refer *Fig. 48*)



Fig. 48

Remove the side wear pad from the location. (Refer *Fig. 49*)



Fig. 49

you need not to remove the spring assembly. The mounting bolts are accessible from back side or towards brake drum side.

REMOVAL OF TORQUE ROD BRACKET

Loosen the bolts fitted on the axle housing. (Refer *Fig. 50*)



Fig. 50

Take out the upper bracket and mark for identification. (Refer *Fig. 51*)



Fig. 51

Take out bottom bracket and mark for the identification. (Refer *Fig. 52*)



Fig. 52



Fig. 53

The bracket is fitted for bottom wear pad & torque rod as a combined set. (Refer *Fig. 54*)



Fig. 54

The dowl is provided for location of the bracket. (Refer *Fig. 55*)



Fig. 55

Check the for slackness of the bracket with respect to dowl. (Refer *Fig. 56*)



Fig. 56

REMOVAL OF TORQUE ROD BUSH

Mark the torque rod after removal for the same fitting which side is at center & which as at rear axle end. Follow the same procedure to other side also. Remove the circlip fitted on one side of the torque rod. (Refer *Fig. 57*)



Fig. 57

While fitting the torque rod bush, the position has to be the same for centre pin so before removing the bush mark the position on the torque rod edge. As shown in On hydraulic press make arrangement for to remove the bush from the torque rod, by slightly pressing down wards. (Refer Fig. 58)



Fig. 58

CAUTION Do take care while using hydraulic press support the torque rod properly at the other free end.

CENTER TORQUE ROD REMOVAL.

Central torque rods are mounted centrally on bogie cross member & center af the housing top with welded brackets. on the dome area.

Loosen the mounting bolts of the center bracket from bogie cross member & from the axle top end. (Refer *Fig. 59*)



Fig. 59

SUSPENSION

Loosen the mounting bolts from housing center welded bracket & take it out. (Refer *Fig. 60*)



Fig. 60



Fig. 61

Mark the bracket for fitting on correct side. (Refer *Fig. 62*)



Fig. 62

CAUTION If the bracket are not fitted in same direction the fitments of the torque rod will not be correct.

Remove the torque rod from the vehicle. (Refer Fig. 63)





Follow the same process for other side of the torque rod.

TORQUE ROD BRACKET.

The torque rod bracket is fitted with bogie cross member. Lossen the bolts fitte with boggi cross member and take out the bracket (Refer *Fig. 64*)



Loosen the bolts from the bracket & disconnect the torque rod bracket fitted on the axle housing & take away. While removing the bracket mark the postion as front & back. (Refer *Fig. 65*)



Fig. 65





REMOVAL OF BUMP STOPPER

Loosen the mounting bolts (2) from bump stopper & take away the rubber bump stopper. (Refer *Fig. 67*)





BUMP STOPPER BRACKET

Loosen the four mounting bolts fitted along with chassis. (Refer *Fig. 68)*



FITMENT OF TRUNION SHAFT IN 'A' BRACKET

Check 'A' bracket for any damage or breakage before fitment. (Refer *Fig. 70*)



Fig. 70

Insert trunion shaft in the bracket. Take care not to damage trunion shaft threads. Tap gently on the trunion shaft for insertion. (*Refer* Fig. 75)





Insert dowl in 'A' bracket. (Refer Fig. 76)



Fig. 72

'A' BRACKET ASSEMBLY

Fit the 'A' bracket on the chassis & apply the torque as specified. (Refer *Fig. 73*)



Fig. 73

NOTE

Both the bracket are identical & can be fitted on either side of the assembly.

Before assembly check the 'A' bracket for any crack / damage.

TRUNION HOUSING ASSEMBLY

Clean the trunion shaft & housing assembly with clean cloth.

Fit 2 grooved washers with oil seal on the trunion housing back side. (Refer *Fig. 74*)



Apply small quantity of grease on the trunion shaft from outside & trunion housing bearing from inside. (Refer *Fig. 75*)





Insert the trunion on the shaft Rotate clockwise & anticlockwise. (Refer Fig. 76)



Fig. 76

Fit 2 grooved washer as per the position shown on the shaft, with guide pins oil seal. (Refer *Fig. 77*)



Fig. 77

Fit lock plate on the shaft along with 'O' ring. Tap it gently on the lock plate to fit in the position. (Refer *Fig. 78*)



Fig. 78

Assembly the trunion check nut by rotating anticlock wise. (Refer *Fig. 79*)



Fig. 79

Fit the bolts and apply specified torque. (Refer Fig. 80)



Fit the nut and apply the torque. (Refer Fig. 81)



Fig.81

Insert the lock bolt & tighten the nut. Apply the torque as specified. (Make sure that the trunion check nut is tightened fully & release by1/4 thread then apply the torque to check nut.) (Refer *Fig. 82*)







Fit metallic cap along with the gasket. (Refer Fig. 83)

Apply torque to mounting bolts. (Refer Fig. 84)



Fig. 84

Check the trunion housing for free movement on the shaft. Rotate clockwise & anticlockwise. It should be push press.

SPRING ASSEMBLY

Assembly the leaves with the support of centre bolt. Before assembly check each leaf for crack. Replace centre bolt whenever removed from assembly.

Lift the assembly with proper lifter or chain pulley block. (Refer Fig. 85)



Fig. 85

Fix it on the trunion along with the U bolt. Apply the torque to the U bolt nut as specified. (Refer *Fig. 86*)









Fix the top clamp (Front & Rear). (Refer Fig. 88)



Fig. 88

For the other side use the same procedure.



ASSEMBLY OF CENTRE CROSS SHAFT

As per the marking kindly position the cross shaft. (Refer *Fig. 89*)





Fit the studes in the 'A' bracket. (Refer Fig. 90)





Insert the cross shaft correctly in the position & keep the caps on the cross shaft with the dowl position. (Refer *Fig. 91*)



Fig. 91

Tighten the nuts on the studs & apply the torque as specified. (Refer *Fig. 92*)



Fig. 92

ASSEMBLY OF TORQUE ROD BRACKET

Fit the torque rod bracket upper & lower on the axle housing & apply the torque. This can be identified by the shape visually. (Refer *Fig. 93*)



Fig. 93

NOTE Fit the bracket s as per correct position.

ASSEMBLY OF TORQUE ROD

All the torque rods are similar & can be fitted anywhere at any position.

The only precaution required is while fitting the torque rod bush the position has to be fixed. Otherwise the fitment will not be clear.

CENTRAL TORQUE ROD.

Fit the torque rod bracket on the axle housing dome welded bracket. (Refer *Fig. 94*)



Fig. 94

Apply the torque as specified. (Refer Fig. 95)





At boggi cross member fit the bracket & apply the toque as specified. (Refer *Fig. 96*)





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ASSEMBLY OF BOTTOM WEAR PAD.

Fit bottom wear pad at the location. (Refer Fig. 97)



Fig. 97

Tighten the mounting bolt of bottom wear pad. (Refer *Fig. 98*)





FITTMENT OF SIDE WEAR PAD

Assemble the side wear pad at the location. (Refer *Fig. 99*



Fig. 99

Tighten the mounting bolt fitted on the common bracket for torque rod and both side & bottom wear pad. (Refer *Fig. 100*)



Fig. 100

Fit top clamp on the bracket. (Refer Fig. 101)



Fig. 101

ALSV SETTING

Maintaining the LCRV Angle 14deg +/-2.5degree in Vehicle Unladen condition.

127.8 +/-6mm (From Bogie Suspension Cross member Gusset Bottom to LCRV Rubber Bush Top) OR

178.8 +/-6mm (From Bogie Suspension Cross member Gusset Bottom to LCRV Rubber Bush Bottom)

(Refer Fig. 69)

