



Service Manual

Chassis & Mast

E3000, E3500, EC4000

A4EC1-10200-up

A4EC1-20200-up

A4EC1-30200-up

E4000, E5000

A4EC2-10200-up

A4EC2-20200-up

EX5000, E5500, E6000

A4EC3-20200-up

A4EC3-30200-up

A4EC3-40200-up

E6500

A4EC4-10200-up

Suggestions

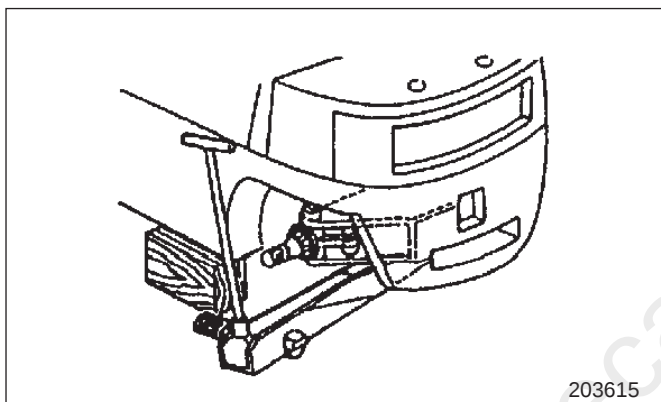
Removing Rear Axle Assembly



WARNING

Be sure the pressure in the hydraulic system is released before any lines or hoses are disconnected.

1. Put identification marks on the hoses, then disconnect them.
2. Support the rear axle at its center with a garage jack.
3. Loosen and remove the axle mounting bolts.



Installation

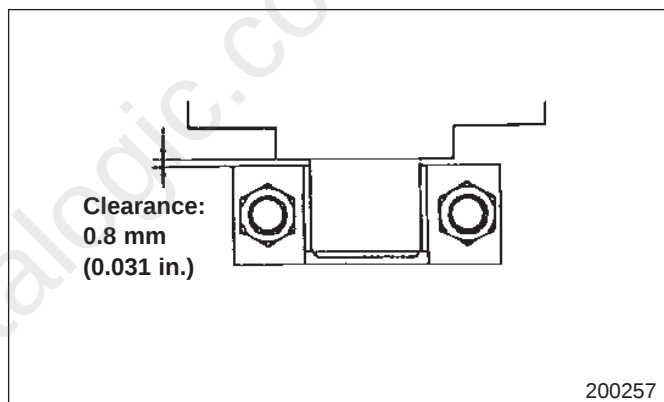
To install, reverse the removal sequence and do the following steps.

Adjusting Bearing Support Clearance

Adjust the longitudinal clearance to 0.8 mm (0.031 in.) with the thrust washer and tighten the bolts holding the bearing support to the specified torque.

Tightening torque for
bearing support bolts

14.8 kgf•m
(107 lbf•ft)
[145 N•m]



Weight of Rear Axle

E3000-EC4000	60kg [132 lb]
E4000-E6500	85kg [187 lb]

Inspection after Disassembly

Body

1. Inspect the body bore cut-in where gears wipe into the body.
2. The body can only be reused if the cut-in is bright and polished in appearance and the depth does not exceed .08 mm.
3. The body should be replaced if the surface is scored, has a matte appearance, or shows signs that the tips of the gears have dug in and torn away the surface material.
4. The body should be inspected to ensure that there is no superficial damage which may adversely affect performance or sealing. Pay particular attention to the port threads and body O-ring seal recesses.

Mounting Flange Face

1. The inner surfaces should be inspected to ensure that there is no unusual wear or scoring in the regions where the body O-rings and bush seals contact, which could result in external leakage.
2. Check the shaft seal recess for scoring or damage that could result in oil leakage around the outer diameter of the shaft seal. A replacement shaft seal can be refitted with Loctite hydraulic sealant to overcome slight damage in this area.

Bushes and Balance Plate

1. The side faces which abut the gears should be perfectly flat and show no signs of scoring. Characteristically there are bright polished areas on this surface caused by loading against the gear side faces. This is often more pronounced on the low-pressure side. These should be replaced if there is any general scoring or fine scoring with a matte appearance or tearing of the surface material.
2. Often, the tips of the opposing gears have wiped an overlap in a half-moon shape. There must be no noticeable wear step as it is critical that the bush side face and balance plate are completely flat to the gear side face.

3. The bush bearing liners are acceptable if they are not scored or do not show other damage. The general outside area of the bush should not show any prominent signs of wear.

Gears

1. The gear side faces should be examined for bushing or scoring. Often operation on contaminated fluid shows scoring between the root of the gear and the journal, which leaves a wear step. If a wear step can be felt, coincidental with the root diameter, by drawing a sharp-pointed tool across the surface from the journal outward towards the tip of the gear, then the gear must be replaced.
2. The gear teeth should be carefully examined to ensure that there are no signs of bruising or pitting.
3. The journal bearing surfaces should be completely free from scoring or bruising. The surface should be highly polished and smooth to the touch.
4. Examine the area where the shaft seal lips run on the drive shaft. This shows up as polished ring or rings. If a noticeable groove can be felt, or if there is scoring, the shaft should be replaced.
5. Examine drive keyway in driveshaft journal extension to ensure it is not damaged or chipped.
6. If the driveshaft is not damaged from the drive coupling and the gears have not been harmed as described above, then the gears can be reused. If the gears are damaged, they must be replaced as a matched set.
7. As a matter of good practice, when pumps have been dismantled, all the seals should be replaced.

Tightening Torques for Standard Bolts and Nuts

Fine Thread – With Spring Washer

	Nominal Size		Pitch		With Spring Washer		
							
	mm	in.	mm	in.	kgf·m	(lbf·ft)	[N·m]
Metric Fine Thread	6	0.24	1	0.04	0.6	4.3	5.9
	8	0.32	1.25	0.05	1.4	10.1	13.7
	10	0.39	1.25	0.05	2.9	21.0	28.4
	12	0.47	1.25	0.05	5.2	37.6	51.0
	14	0.55	1.5	0.06	8.4	60.8	82.4
	16	0.63	1.5	0.06	12.6	91.1	123.6
	18	0.71	1.5	0.06	18.2	131.6	178.5
	20	0.79	1.5	0.06	25.2	182.3	247.1
	22	0.87	1.5	0.06	33.4	241.6	327.5
	24	0.95	1.5	0.06	42.2	305.2	413.8

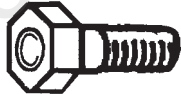
Fine Thread – Without Spring Washer

	Nominal Size		Pitch		Without Spring Washer		
							
	mm	in.	mm	in.	kgf·m	(lbf·ft)	[N·m]
Metric Fine Thread	6	0.24	1	0.04	0.7	5.1	6.9
	8	0.32	1.25	0.05	1.7	12.3	16.7
	10	0.39	1.25	0.05	3.4	24.6	33.3
	12	0.47	1.25	0.05	6.1	44.1	59.8
	14	0.55	1.5	0.06	9.9	71.6	97.1
	16	0.63	1.5	0.06	14.8	107.0	145.1
	18	0.71	1.5	0.06	21.4	154.8	209.9
	20	0.79	1.5	0.06	29.7	214.8	291.3
	22	0.87	1.5	0.06	39.3	284.3	385.4
	24	0.95	1.5	0.06	49.7	359.5	487.4

Note

1. These charts give the torques for standard bolts and nuts.
2. The tolerance for these torques is $\pm 10\%$.
3. Unless otherwise specified, use these torques.
4. These torques are for “dry” conditions.

Coarse Thread – With Spring Washer

	Nominal Size		Pitch		With Spring Washer		
							
	mm	in.	mm	in.	kgf·m	(lbf·ft)	[N·m]
Metric Coarse Thread	10	0.39	1.5	0.06	2.8	20.3	27.5
	12	0.47	1.75	0.07	4.9	35.4	48.1
	14	0.55	2.0	0.08	8.1	58.6	79.4
	16	0.63	2.0	0.08	12.1	87.5	118.7
	18	0.71	2.5	0.10	16.8	121.5	164.8
	20	0.79	2.5	0.10	23.5	170.0	230.5
	22	0.87	2.5	0.10	31.5	227.8	308.9
	24	0.95	3.0	0.12	40.5	292.9	397.2

Coarse Thread – Without Spring Washer

	Nominal Size		Pitch		Without Spring Washer		
							
	mm	in.	mm	in.	kgf·m	(lbf·ft)	[N·m]
Metric Coarse Thread	10	0.39	1.5	0.06	3.3	23.9	32.4
	12	0.47	1.75	0.07	5.8	42.0	56.9
	14	0.55	2.0	0.08	9.5	68.7	93.2
	16	0.63	2.0	0.08	14.2	102.7	139.3
	18	0.71	2.5	0.10	19.8	143.2	194.2
	20	0.79	2.5	0.10	27.7	200.4	271.6
	22	0.87	2.5	0.10	37.0	267.6	362.8
	24	0.95	3.0	0.12	47.7	345.0	467.8

Inspection after Disassembly

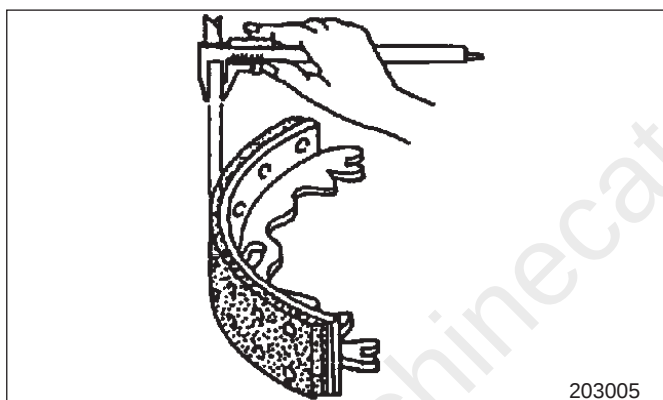
Backing Plate

1. Check the backing plate for cracks.
2. Tighten the backing plate mounting bolts to the specified torque.

Tightening torque for backing plate mounting bolts	16 kgf•m (116 lbf•ft) [157 N•m]
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Shoes and Linings

1. Check each shoe and lining for cracks.
2. Replace the lining if it is dirty, greasy, burnt, or glazed.
3. Check the thickness of the lining. Replace the lining if it exceeds the service limit.



		E3000 - EC4000	E4000-E6500
Lining thickness	A	4.87 (0.19)	6 (0.24)
	B	2.5 (0.10) maximum	3 (0.12) maximum

Unit: mm (in.)

A = Assembly standard B = Repair or service limit

Brake Drums

Check the inside (friction) surface of the drum for abnormal wear, grooving, and other defects. Minor grooving can be removed by grinding, provided that the service limit on the inside diameter is not exceeded.

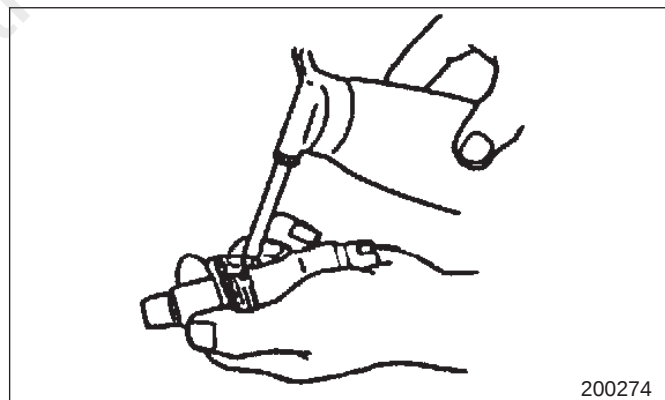
		E3000 - EC4000	E4000-E6500
Inside diameter of brake drum	A	$254 + {}^{0.13}_0$ ($10.0 + {}^{0.0051}_0$)	$310 + {}^{0.15}_0$ ($12.2 + {}^{0.0059}_0$)
	B	256 (10.08)	312 (12.28)

Unit: mm (in.)

A = Assembly standard B = Repair or service limit

Adjusting Screws

Check the wheel teeth for wear. Turn the screw by hand to ensure its rotating parts turn freely.



Parking Brake Cable

Replace a cable if it is permanently stretched, rusted, or damaged.

Other:

1. Check the return springs for cracks or fatigue.
2. Check the adjusting springs for cracks or fatigue.
3. Check the fitting cables for stretching.

Steering System

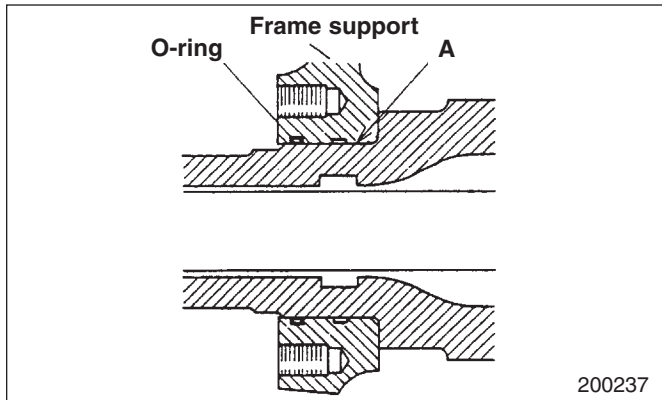
Complaint	Possible Cause		Remedy
Slow steering, hard steering or loss of steering	Worn or malfunctioning pump		Replace
	Malfunctioning relief valve		Readjust or replace
	Worn or malfunctioning steer gear		Replace
	Pipe or tube flattened, or restriction in an oil line		Clean or replace
Truck wanders	Air in system	Low level of oil	Fill as required
		Leaking joint	Tighten joint
		Pinched pipe or hose	Straighten or replace
	Worn steer gear		Replace
Steering slip	Worn steer gear		Replace
	Leakage of cylinder seals or at lines between steer gear and cylinder		Repair
Temporary hang-up in steering	Thermal shock—caused by actuation of hydraulic lift and tilt for long periods of time without actuation of steering system, creating more than a 28°C (50° F) temperature differential between the oil in the tank and the oil in the steer gear.		Correct operating procedure
Erratic steering	Air in system	Low level of oil	Fill as required
		Leaking joint	Tighten joint
		Pinched pipe or hose	Straighten or replace
	Thermal shock damage to steer gear		Replace
	Motor not operating at correct speed		Repair/replace
Spongy or soft steering	Air in system	Low level of oil	Fill as required
		Leaking joint	Tighten joint
		Pinched pipe or hose	Straighten or replace
		Air trapped in cylinder	Bleed air

Reassembly

To reassemble, reverse the steps of the disassembly sequence and do the following steps.

Axle Housing

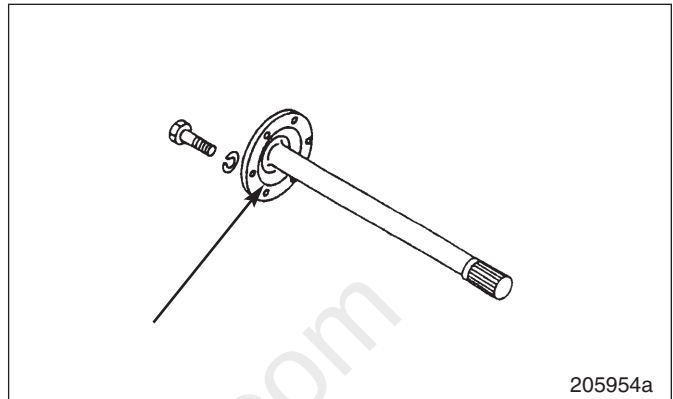
1. Install the O-ring in the outer groove (of the two grooves in the bore of each frame support).
2. Apply grease to the surfaces A of the support and axle housing.



Check for excessive movement between frame support and axle housing.

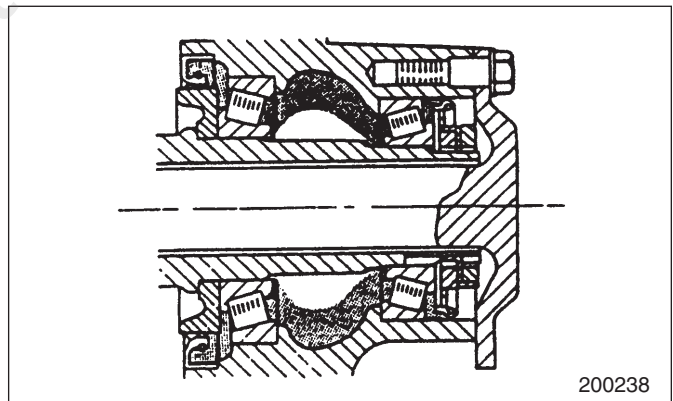
Front Wheel Hub

1. Fill the front wheel hub, especially the roller holder and oil seal lip groove, with grease.
Pack both bearings with grease.

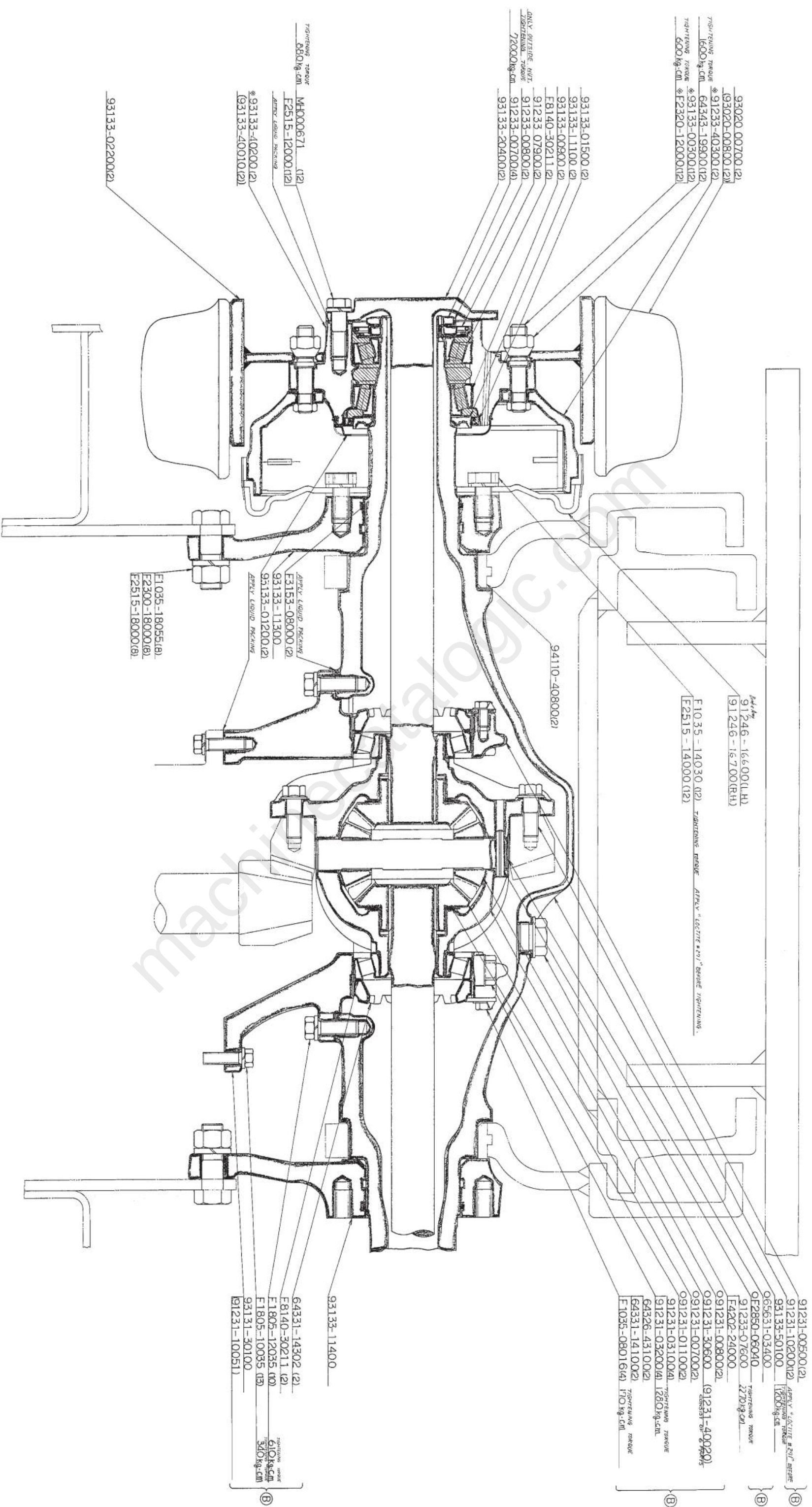


NOTE

Be careful not to apply grease to the brake drum.



FRONT AXLE ASSEMBLY



10. Always use tools that are in good condition and be sure you understand how to use them before performing any service work.
11. Reinstall all fasteners with same part number. Do not use a lesser quality fastener if replacements are necessary.
12. If possible, make all repairs with the truck parked on a level, hard surface. Block truck so it does not roll while working on or under truck.
13. Disconnect battery and discharge any capacitors (electric trucks) before starting to work on truck. Hang "Do not Operate" tag in the Operator's Compartment.
14. Repairs, which require welding, should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of parent metal.
15. Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will it be damaged in operation by contacting sharp corners, or by rubbing against some object or hot surface. Place wiring away from oil pipe.
16. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution.
17. Always support the mast and carriage to keep carriage or attachments raised when maintenance or repair work is performed, which requires the mast in the raised position.
18. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Pin hole (very small) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use cardboard or paper to locate pin hole leaks.
19. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure, must be installed correctly.
20. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.
21. Do not operate a truck if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.
22. When handling the parts containing asbestos, be careful not to inhale the asbestos. Doing so is hazardous to your health.

If the shop dust may contain asbestos, follow the precautions described below.

 - a. Do not use compressed air for cleaning.
 - b. Do not brush or apply grinder on asbestos containing materials.
 - c. To clean asbestos containing materials, wipe with moistened cloth or use a vacuum cleaner with particle filter.
 - d. If you have to handle the parts containing asbestos for a long time, be sure to do it in a well-ventilated area.
 - e. If the asbestos in the air cannot be removed, wear a mask.
 - f. Be sure to observe the working rules and regulations.
 - g. When disposing of materials with asbestos, be sure to observe the environmental protection regulations of your area.
 - h. Avoid working in the atmosphere where asbestos particles may be suspended.

Full Version Available

Caterpillar E5000 Forklift Service Manual (99759-8B110)

Caterpillar E5000 Forklift service manual, covers traction motor, controller, hydraulics, mast, wiring, and service data. Instant PDF download.

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