ZW20 WHEEL LOADER WORKSHOP MANUAL

PART NO. W4EJ-E-00

HITACHI

Workshop Manual

ZW 20
Wheel Loader

Hitachi Construction Machinery
URL:http://www.hitachi-c-m.com

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Service Manual consists of the following separate Part No.

Technical Manual	: Vol. No.T4EJ-E
Workshop Manual	: Vol. No.W4EJ-E

OPERATE ONLY FROM OPERATOR'S SEAT

- Inappropriate engine starting procedures may cause the machine to runaway, possibly resulting in serious injury or death.
  - Start the engine only when seated in the operator's seat.
  - NEVER start the engine while standing on the track or on ground.
  - Do not start engine by shorting across starter terminals.
  - Before starting the engine, confirm that all control levers are in neutral.
  - Before starting the engine, confirm the safety around the machine and sound the horn to alert bystanders.

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012-E01B-0431

JUMP STARTING

- Battery gas can explode, resulting in serious injury.
  - If the engine must be jump started, be sure to follow the instructions shown in the "OPERATING THE ENGINE" chapter in the operator's manual.
  - The operator must be in the operator's seat so that the machine will be under control when the engine starts. Jump starting is a two-person operation.
  - Never use a frozen battery.
  - Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.

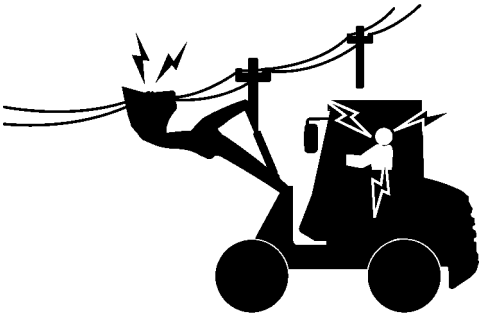
SA-032

S013-E01A-0032

AVOID POWER LINES

Serious injury or death can result from contact with electric lines.

Never move any part of the machine or load closer to any electric line than 3 m (10 ft) plus twice the line insulator length.



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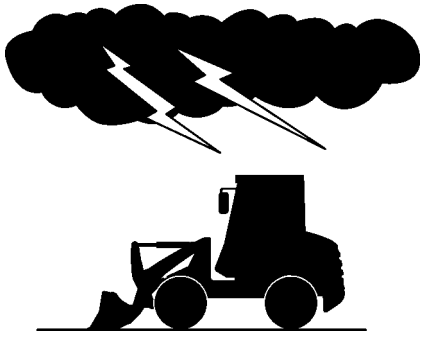
PRECAUTIONS FOR OPERATION

- If the front attachment or any part of the machine comes in contact with an overhead obstacle, both the machine and the overhead obstacle may become damaged, and personal injury may result.
  - Take care to avoid coming in contact with overhead obstacles with the bucket or arm during operation.

PRECAUTIONS FOR LIGHTENING

- The machine is vulnerable to lighting strikes.
  - In the event of an electrical storm, immediately stop operation, and lower the bucket to the ground. Evacuate to a safe place far away from the machine.
  - After the electrical storm has passed, check all of the machine safety devices for any failure. If any failed safety devices are found, operate the machine only after repairing them.



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OBJECT HANDLING

- If a lifted load should fall, any person nearby may be struck by the falling load or may be crushed underneath it, resulting in serious injury or death.
  - When using the machine for craning operations, be sure to comply with all local regulations.
  - Do not use damaged chains or frayed cables, sables, slings, or ropes.
  - Before craning, position the upperstructure with the position of the bucket support located on the chassis at the front.
  - Move the load slowly and carefully. Never move it suddenly.
  - Keep all persons well away from the load.
  - Never move a load over a person's head.
  - Do not allow anyone to approach the load until it is safely and securely situated on supporting blocks or on the ground.
  - Never attach a sling or chain to the bucket teeth. They may come off, causing the load to fall.

SA-132

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EVACUATING IN CASE OF FIRE

- If a fire breaks out, evacuate the machine in the following way:
  - Stop the engine by turning the key switch to the OFF position if there is time.
  - Use a fire extinguisher if there is time.
  - Exit the machine.

SA-393

BEWARE OF EXHAUST FUMES

- Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.
  - If you must operate in a building, be sure there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.

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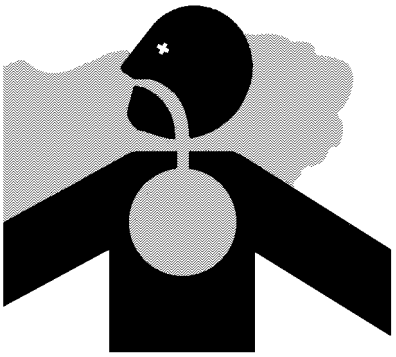
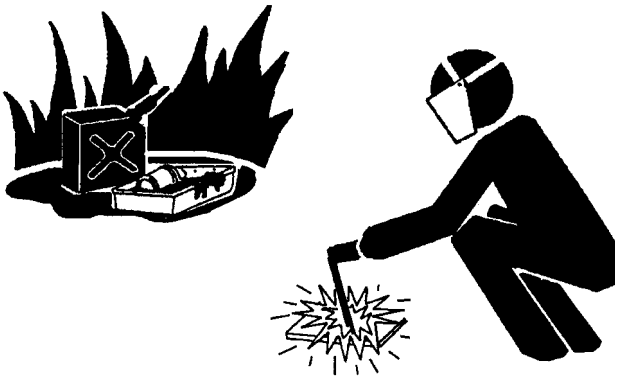


SA-016

PRECAUTIONS FOR WELDING AND GRINDING

- Welding may generate gas and/or small fires.
  - Be sure to perform welding in a well ventilated and prepared area. Store flammable objects in a safe place before starting welding.
  - Only qualified personnel should perform welding. Never allow an unqualified person to perform welding.
- Grinding on the machine may create fire hazards. Store flammable objects in a safe place before starting grinding.
- After finishing welding and grinding, recheck that there are no abnormalities such as the area surrounding the welded area still smoldering.



SA-818

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DISASSEMBLY AND ASSEMBLY

Precautions

- Clean the machine
  Thoroughly wash the machine before bringing it into the shop. Bringing a dirty machine into the shop may cause machine components to be contaminated during disassembling/assembling, resulting in damage to machine components, as well as decreased efficiency in service work.

- Inspect the machine
  Be sure to thoroughly understand all disassembling/assembling procedures beforehand. It is helpful to avoid incorrect disassembling of components as well as personal injury.
  Check and record the items listed below. It is helpful to prevent problems from occurring in the future.
  - Model, serial No., hour meter symptoms, failed parts and causes
  - Clogging of filters, oil quality and quantity, and oil, water or air leaks, if any.
  - Damage or looseness of parts

- Prepare and Clean Tools and Disassembly Area
  Prepare the necessary tools to be used and the area for disassembling work. Thoroughly clean the tools.

When Disassembling and Assembling

- Disassembly
  - In order to prevent dirt from entering, cap or plug the removed pipes.
  - Before disassembling, clean the exterior of the components. Place the components on a work bench.
  - Before disassembling, drain gear oil from the reduction gear.
  - Be sure to provide appropriate containers for draining fluids.
  - Put the matching marks in order not to confuse when reassembling.
  - Be sure to use the specified special tools, when instructed.
  - If a part or component cannot be removed after removing its securing nuts and bolts, do not attempt to remove it forcibly. Find the cause(s), then take the appropriate measures to remove it.
  - Orderly arrange disassembled parts. Mark and tag them as necessary.
  - Store common parts, such as bolts and nuts with reference to where they are to be used and in a manner that will prevent loss.
  - Inspect the contact or sliding surfaces of disassembled parts for abnormal wear, sticking, or other damage.
  - Measure and record the degree of wear and clearances.

- Assembling
  - Be sure to clean all parts and inspect them for any damage. If any damage is found, repair or replace part.
  - Dirt or debris on the contact or sliding surfaces may shorten the service life of the machine. Take care not to contaminate any contact or sliding surfaces.
  - Apply a film of grease before installing. Apply new hydraulic oil or gear oil onto the sliding part in order to prevent seizure.
  - Be sure to replace O-Rings, backup rings, and oil seals with new ones once they are disassembled.
  - Be sure that liquid-gasket-applied surfaces are clean and dry.
  - If an anti-corrosive agent has been used on a new part, be sure to thoroughly clean the part to remove the agent.
  - Utilize matching marks when assembling.
  - Be sure to use the designated tools to assemble bearings, bushings and oil seals.
  - Keep a record of the number of tools used for disassembly/assembly. After assembling is complete, count the number of tools, so as to make sure that no forgotten tools remain in the assembled machine.

TIGHTENING BOLTS AND NUTS

CAUTION: Use tools appropriate for the work to be done. Makeshift tools and parts can create safety hazards. For loosening and tightening nuts and bolts, use correct size tools. Otherwise, tightening tools may slip, potentially causing personal injury

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Kinds of Bolts

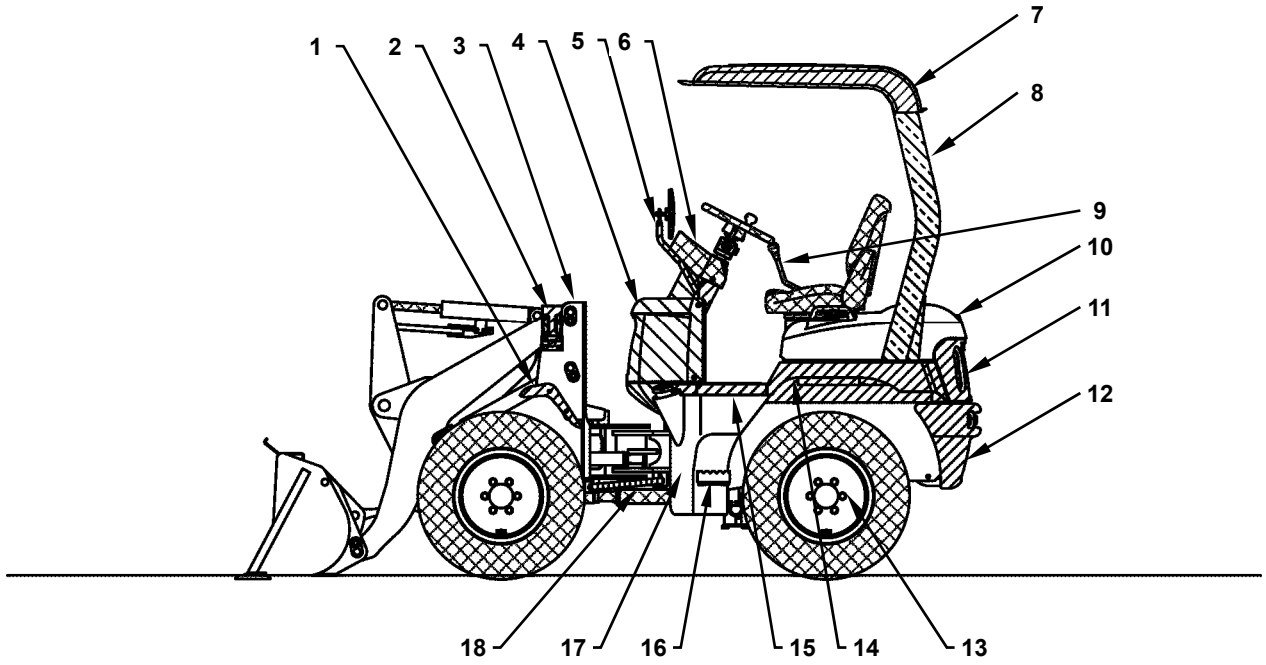
Tighten nuts or bolts correctly to torque specifications when assembling.

Make sure to employ correct bolts and tighten them correctly when assembling the machine or components.

Specified Tightening Torque

Bolt Diameter mm	Hexagon Bolt				Socket Bolt	
	10.9 Ⓣ T N·m (kgf·m)	8.8 Ⓗ H N·m (kgf·m)	 N·m (kgf·m)	Wrench Size mm	Socket Bolt N·m(kgf·m)	Wrench Size mm
6			3.3~4.2 (0.3~0.4)	10		5
8	29.5 (3.0)	19.5 (2.0)	9.8 (1.0)	13	29.5 (3.0)	6
10	64 (6.5)	49 (5.0)	19.5 (2.0)	17	64 (6.5)	8
12	108 (11)	88 (9.0)	34 (3.5)	19	108 (11)	10
14	175 (18)	137 (14)	54 (5.5)	22	175 (18)	12
16	265 (27)	205 (21)	78 (8.0)	24	265 (27)	14
18	390 (40)	295 (30)	118 (12)	27	390 (40)	14
20	540 (55)	390 (40)	167 (17)	30	540 (55)	17
22	740 (75)	540 (55)	215 (22)	32		
24	930 (95)	690 (70)	275 (28)	36		
27	1370 (140)	1030 (105)	390 (40)	41		
30	1910 (195)	1420 (195)	540 (55)	46		
33	2550 (260)	1910 (195)	740 (75)	50		
36	3140 (320)	2400 (245)	930 (95)	55		

PAINTING



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	Painted Surface	Painting Color		Painted Surface	Painting Color
1	Front Fender	HG Beige Deep	11	Rear Grill (*)	HG Beige Deep
2	Lamp Bracket	HG Beige Deep	12	Counterweight	HG Beige Deep
3	Body	TAXI Yellow	13	Rim	TAXI Yellow
4	Cowl Frame	HG Beige	14	Floor	HG Beige Deep
5	Handrail	HG Beige Deep	15	Operator Frame	HG Beige Deep
6	Steering Support / Column Cover	HG Beige Deep	16	Step	TAXI Yellow
7	Roof (Canopy) (*)	HG Beige Deep	17	Oil Tank / Fuel Tank	TAXI Yellow
8	Support (Canopy)	Japan Paint Manufacturers Association YH-65	18	Articulation Lock Bar	Scarlet Red
9	Front Control Lever	HG Beige Deep			

*) Material is resin.

IMPORTANT: When cleaning the front attachment, cylinder, etc. fitted with HN bushing, take care not to pour washing liquid directly on them. The ambient temperature should not exceed 70 °C when painting and drying.

Disassembly of Control Valve

Before disassembling, read GENERAL / Precautions and Precautions for Disassembling and Assembling thoroughly and start the work.

IMPORTANT: As many components of the control valve are in similar parts, disassemble the control valve while putting the mark as for the direction and the position to install for assembling. In addition, arrange the disassembled parts with positional relationships each other to install for assembling.

1. Place the control valve assembly on the clean workbench.
2. Remove main relief valve (0050) from inlet section (0020).
3. Remove overload relief valve (0060) from tilt section (0030).
4. Remove anti-void valve (0070) from lift section (0040).
5. Loosen nut (1030) and nut (1050). Remove tie rod (1020) and tie rod (1040) from the control valve assembly.
   : 13 mm, 17 mm
6. Separate the control valve assembly into inlet section (0020), tilt plunger section (0030), lilt plunger section (0040) and outlet section (1010).
7. Remove O-Ring (2020) from housing (2010) of inlet section (0020).
8. Disassemble tilt section (0030). Refer to DISASSEMBLY AND ASSEMBLY OF TILT PLUNGER SECTION.
9. Disassemble lilt section (0040). Refer to DISASSEMBLY AND ASSEMBLY OF LILT PLUNGER SECTION.

Assembly of Lilt Plunger Section

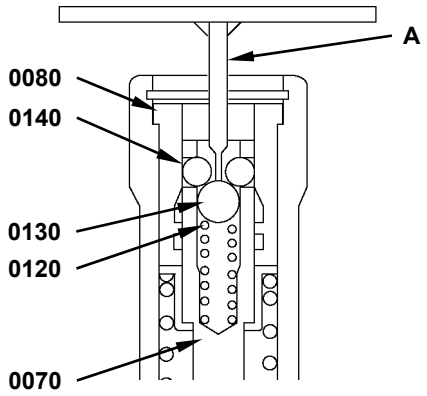
IMPORTANT: Check for the matching marks made when disassembling and the direction and the position to install for assembling.

1. Install O-Ring (0040) and O-Ring (0170) to spacer (0060).
2. Use a dolly block for a vise and secure plunger (0020).
3. Install spacer (0060), seat (0090), spring (0080) and seat (0090) to plunger (0020) in this order. Tighten them with pin (0090).
   : 20.1 N·m (2.1 kgf•m)
4. Install spring (0120), balls (0130) and (0140) with grease applied to pin (0090).
5. Install sleeve (0080) to cap (0070). Install cap (0070) while pushing ball (0130) by using special tool (A).
6. Install spacer (0150) to cap (0070) and secure with snap ring (0160).
7. Install plunger (0020) to housing (0010). Install the cap (0070) assembly with bolt (0220).

NOTE: For easy installation, install plunger (0020) to housing (0010) while twisting

: 9.8 N·m (1.0 kgf·m)

8. Install O-Ring (0040) and wiper ring (0050) to housing (0010).
9. Install seal plate (0230) to housing (0010) with screw (0220)
   : 2.9 N·m (0.3 kgf·m)



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MEMO

9. When brake fluid does not flow from the vinyl hose, tighten the air bleeder and return the brake pedal.

10. Repeat step 5 to step 9 until bubbles mixed in brake fluid disappear.

11. After bleeding air, tighten the air bleeder securely and install the cap to the air bleeder.

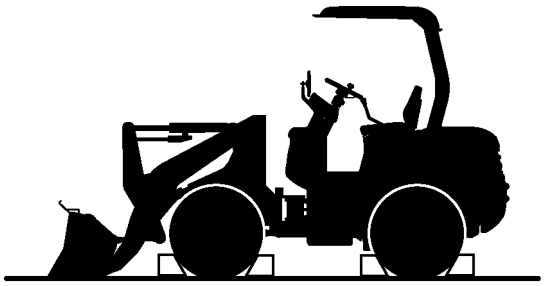
12. Bleed air from three remaining air bleeders in the same way.

REMOVAL AND INSTALLATION OF HST MOTOR

Preparation

1. Park the machine on a level and solid surface. Stop the engine. Lower the bucket onto the ground horizontally.

2. Place a wheel stopper in front of and behind the axle in order to secure the machine.



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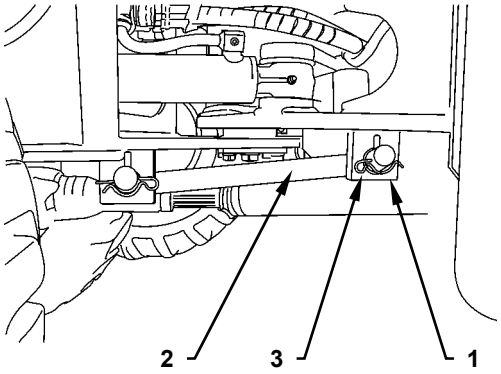
3. Install articulation lock bar (2) to rear frame (1). Secure with beta pin (3).



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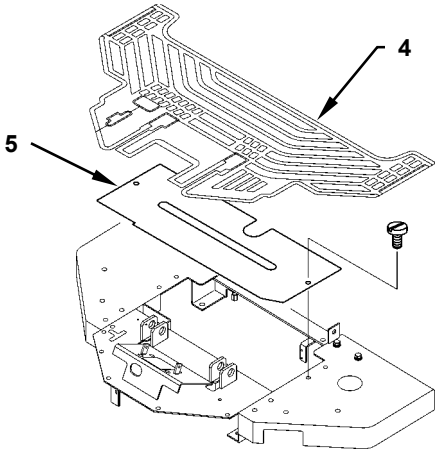
4. In case of the cab machine, remove the cab. Refer to REMOVAL AND INSTALLATION OF CAB.

5. Remove floor mat (4).Remove the bolt. Remove floor plate (5) from the floor.



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Removal

1. Disconnect hydraulic hose (4040) and brake hose (4110) from reduction gear (0011).
   : 17 mm, 19 mm

NOTE: Cap the disconnected hoses and piping. Attach an identification tag onto the disconnected hoses for assembling.

CAUTION: Reduction gear weight: 57 kg

2. Set the floor type hydraulic jack under the reduction gear.

3. Remove sems bolt (0041). Remove reduction gear (0011) from mounting bracket (0020) and mounting bracket (0030).
   : 19 mm

Installation

1. Place reduction gear (0011) on the floor type hydraulic jack.

2. Slowly raise the hydraulic jack. Install reduction gear (0011) to mounting bracket (0020) and mounting bracket (0030) with sems bolt (0041) applied LOCTITE #242 or THREEBOND #1324.
   : 19 mm
   : 83.4 to 93.2 N·m (8.5 to 9.5 kgf·m)

3. Connect hydraulic hose (4040) and brake hose (4110) to reduction gear (0011).
   : 17 mm, 19 mm

Assembly of Parking Brake Assembly

1. Install O-Ring (0311) and O-Rings (0301) (2 used) to parking brake piston (0290).

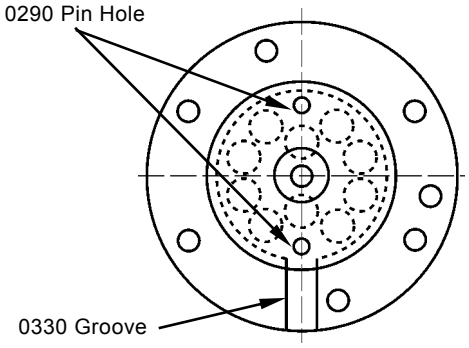
2. Place springs (0320) (10 used) onto the spring mounting hole on cap (0330). Set the groove on cap (0330) and the pin hole on parking brake piston (0290) vertically. Install spring (0320) while aligning with the spring mounting hole on parking brake piston (0290).

3. Install pins (0260) (2 used) to piston housing (0230).

4. Install parking brake piston (0290) assembly to piston housing (0230) with bolts (0340) (2 used).

IMPORTANT: As the spring (0320) force acts on cap (0330), slowly tighten and evenly install bolts (0340) (2 used).

5. Install piston housing (0230) assembly to brake housing (0160) with bolt (0370) and bolts (0350) (4 used) on step 4.



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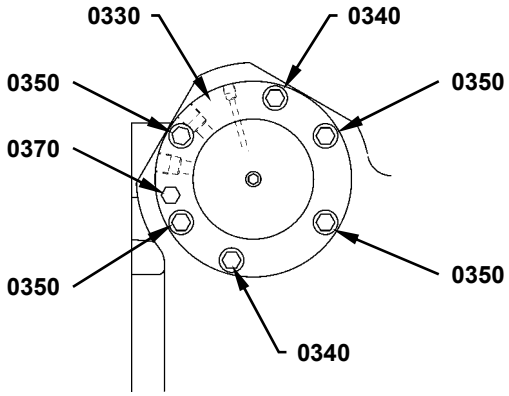

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5. End Plate (0190) Thickness

Unit: mm (in)

Standard	Limit Dimension
3.87 to 4.00	—

6. Parking Brake Spring (0320) Free Length

Unit: mm (in)

Standard	Limit Dimension
45.5	43.7

Disassembly of Axle

CAUTION: Front axle weight: 131 kg
Rear axle weight: 126 kg

Remove bolt (0130). Divide the axle into three parts, the differential assembly, the final drive assembly and the axle.

: 19 mm

Assembly of Axle

Apply LOCTITE FMD-127 onto the mating surface on the differential assembly and the final drive assembly. Align the pin (0150) hole and install with bolt (0130).

: 101 N·m (10.3 kgf·m)

Installation of Drive Pinion Assembly

1. Install the original quantity of shims (0320 to 0360) to differential body (0030). Install with bolts (0370) with the groove on bearing cage (0390) facing downward.

NOTE: As shims (0320 to 0360) are divided into two parts, install shims (0320 to 0360) on top and bottom.

2. Adjust the tooth contact and backlash of ring gear (0010).

Adjustment Methods

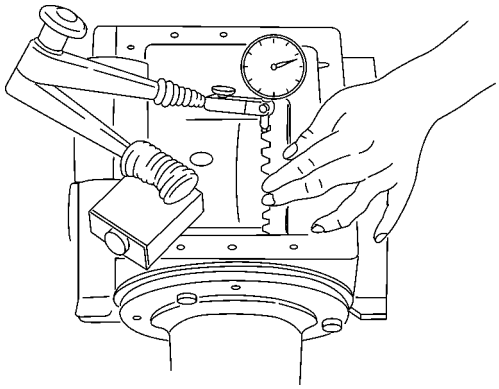
1-1. Set a dial gauge onto the teeth outer of ring gear (0010).

1-2. Secure the drive pinion. Rotate ring gear (0010) forward and backward. Measure the backlash. The specification is from 0.09 to 0.13 mm. If the backlash is not in the specification, adjust the backlash.

1-3. Increasing or decreasing quantity of right and left shims (0120 to 0160), adjust the backlash. At this time, do not change the total number of right and left shims.

When the backlash is beyond the specification, reduce the shim (thickness) on the ring gear (0010) side. Install the reduced shim to the opposite side. Ring gear (0010) closes to the drive pinion assembly side and the tooth contact is increased.

When the backlash is smaller than the specification, increase the shim on the ring gear (0010) side to install. Ring gear (0010) gets away from the drive pinion assembly side and the tooth contact is decreased.



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Removal

1. Disconnect hose (2110) from master cylinder (1020).
   : 17 mm, 19 mm

NOTE: Cap the disconnected hoses and attach an identification tag onto the disconnected hoses for assembling.

2. Remove snap pin (0111), washer (0100) and pin (0090). Remove yoke (0070) from the brake pedal.

3. Loosen nut (0081). Remove yoke (0070) from master cylinder (1020).
   : 13 mm

4. Remove nut (1050). Remove master cylinder (1020) from the machine.
   : 13 mm

Installation

1. Install master cylinder (1020) to the machine with nut (1050).
   : 24.5 to 28.4 N·m (2.5 to 2.9 kgf·m)

2. Temporary install nut (0081) and yoke (0070) to master cylinder (1020).

3. Install yoke (0070) to the brake pedal. Install pin (0090), washer (0100) and snap pin (0111).

4. Install yoke (0070) so that dimension A of the brake pedal and master cylinder connected parts is 5 mm. Tighten nut (0081).

5. Connect hose (2110) to master cylinder (1020).

7. Rotate spool (2010) and the sleeve (2020) assembly, and set pin (0080) horizontally. Push drive (0070) from the cap (0030) side. Remove seal grand bushing (0170) from the orbitroll.

8. 8. Remove oil seal (0140) and dust seal (0150) from seal grand bushing (0170).

NOTE: When removing oil seal (0140), do not damage seal grand bushing (0170).

9. Remove bearing race (1010) and thrust needle (0120) from housing (1010).

10. Remove spool (2010) and the sleeve (2020) assembly from housing (1010).

NOTE: Remove spool (2010) and the sleeve (2020) assembly from housing (1010) by turning slowly in order not to get spool (2010) and the sleeve (2020) assembly caught in housing (1010).

11. Remove pin (0080) from spool (2010) and the sleeve (2020) assembly.

12. Slightly push spool (2010) in sleeve (2020) from spool (2010) forward. Remove center spring (0090).

13. Slowly remove spool (2010) from sleeve (2020).

14. Remove O-Ring (0130) from housing (1010).

Removal

CAUTION: Steering cylinder weight: 8.3 kg

1. Disconnect the hoses (2 used) from steering cylinder (1021).
   : 19 mm, 22 mm

NOTE: Cap the disconnected hoses and attach an identification tag onto the disconnected hoses for assembling.

2. Remove bolt (0030). Remove lock plate (0020) and pin (0010) from the front frame and the rear frame. Remove steering cylinder (1021).
   : 17 mm

Installation

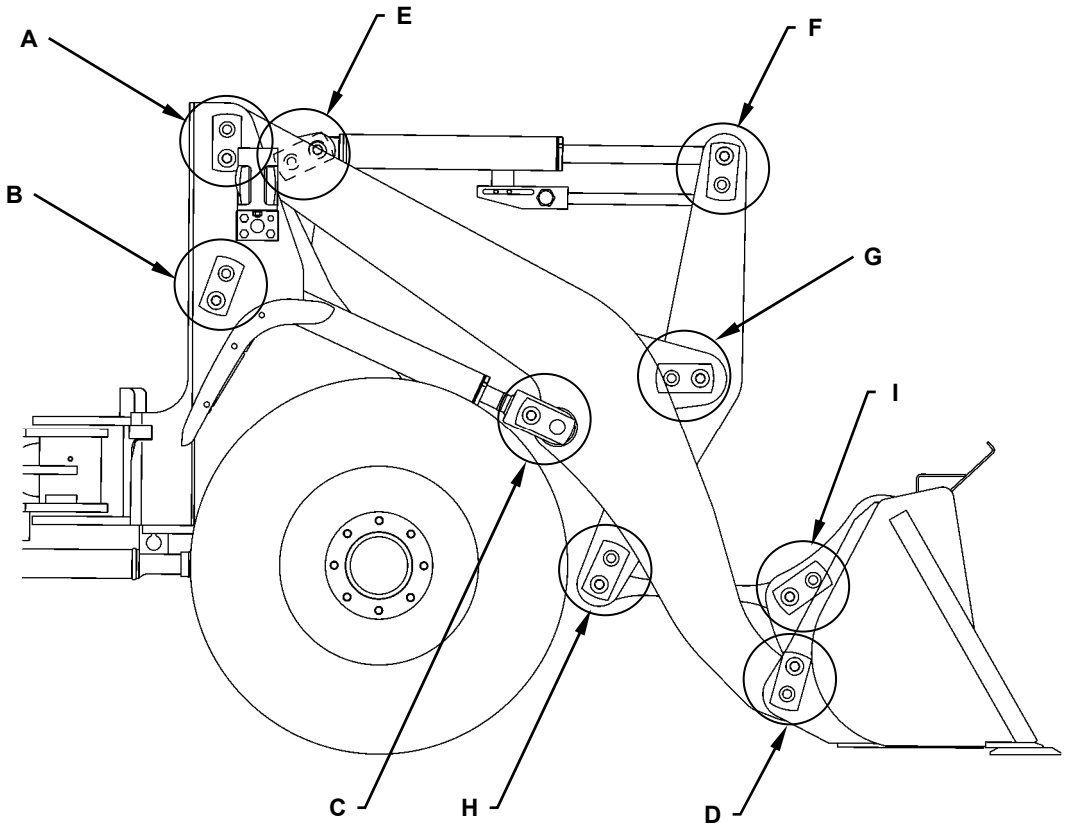
1. Install steering cylinder (1021) to the rear frame and the front frame. Adjust spacer (0050) so that clearance (A) between the rear frame and the bottom side of steering cylinder (1021) is from 0.5 to 1.4 mm. Adjust spacer (0050) so that clearance (A) between the front frame and the rod side of steering cylinder (1021) is from 0.5 to 1.4 mm.

2. Install pin2 (0010) (2 used) and lock plates (0020) (2 used) to steering cylinder (1021) and tighten with bolts (0030) (2 used).
   : 44.1 to 53.9 N·m (4.5 to 5.5 kgf·m)

3. Connect the hoses (2 used) to steering cylinder (1021).

MAINTENANCE STANDARD

Pin and Bushing



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Unit: mm (in)

	Item	Standard Clearance Dimension	Allowable Clearance Dimension	Remedy
A	Clearance between bushing (lift arm) and pin	0.5	2.0	Replacement
B	Clearance between bushing (lift arm cylinder) and pin	0.5	2.0	
C	Clearance between bushing (lift arm) and pin	0.5	2.0	
D	Clearance between bushing (lift arm) and pin	0.5	2.0	
E	Clearance between bushing (bucket cylinder) and pin	0.5	2.0	
F	Clearance between bushing (bucket cylinder) and pin	0.5	2.0	
G	Clearance between bushing (bell crank) and pin	0.5	2.0	
H	Clearance between bushing (bucket link) and pin	0.5	2.0	
I	Clearance between bushing (bucket link) and pin	0.5	2.0	

Removal

CAUTION: Lift cylinder weight: 23.5 kg

1. Attach the lifting belt on lilt cylinder (1020). Slightly hoist lilt cylinder (1020) by using a crane. Remove bolt (0090). Remove shim (0150) and pin (0080).
   : 19 mm
2. Remove the rod side of lilt cylinder (1020) from the lift arm.
3. Operate the control lever and retract the lilt cylinder. Pass a wire through the rod hole and secure the cylinder in order not to extend.
4. Stop the engine. Slowly loosen the cap on the hydraulic oil tank and bleed air.
5. Disconnect the hoses (2 used) from lilt cylinder (1020).
   : 19 mm, 22 mm
6. Remove bolt (0090) from the lilt cylinder (1010) bottom side. Remove shim (0150) and pin (0070).
   : 19 mm
7. Hoist and remove lilt cylinder (1020) by using a crane.
   Remove the opposite side lilt cylinder in the same way.

Installation

1. Attach the lifting belt on lilt cylinder (1020). Hoist lilt cylinder (1020) by using a crane. Align the pin holes on the bottom side of lilt cylinder (1020) and the front frame.
2. Insert pin (0070) to the lilt cylinder (1020) bottom side. Install with bolt (0090).
   Insert and adjust shim (0150) so that clearance (A) between the lilt cylinder (1020) bottom side and the front frame is from 0.4 to 2.0 mm.

IMPORTANT: Start the engine and check the hose connection for any oil leaks.

3. Connect the hoses (2 used) to lilt cylinder (1020).
4. Remove the wire, which is passed through the rod hole on lilt cylinder (1020).
5. Align the pin holes on the rod side of lilt cylinder (1020) the bell crank. Insert pin (0080) and install with bolt (0090).
   Insert and adjust shim (0150) so that clearance (A) between the lilt cylinder (1020) bottom side and the lift arm is from 0.4 to 2.0 mm.
   Install the opposite side lilt cylinder in the same way.

IMPORTANT: Bleed air from the cylinder. Refer to GENERAL / Precautions and Bleeding Air from Hydraulic Circuit.