



INTRODUCTION


Safety Alert Symbol and Headline Notations

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

 This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury. Never fail to follow the safety instructions prescribed along with the safety alert symbol. The safety alert symbol is also used to draw attention to component/part weights. To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

 **CAUTION:**
Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

IMPORTANT:
Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

 **NOTE:**
Indicates supplementary technical information or know-how.


Units Used

SI Units (International System of Units) are used in this manual. MKSA system units and English units are also indicated in parentheses just behind SI units.

Example: 24.5 MPa (250 kgf/cm², 3560 psi)

A table for conversion from SI units to other system units is shown below for reference purposes.

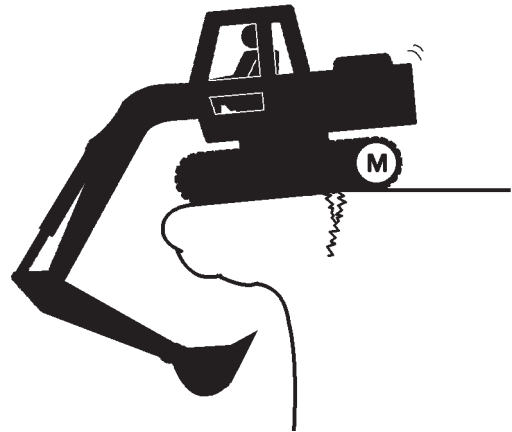
Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937
	mm	ft	0.003281
Volume	L	US gal	0.2642
	L	US qt	1.057
	m ³	yd ³	1.308
Weight	kg	lb	2.205
Force	N	kgf	0.10197
	N	lbf	0.2248
Torque	N·m	kgf·m	0.10197
Pressure	MPa	kgf/cm ²	10.197
	MPa	psi	145.0
Power	kW	PS	1.360
	kW	HP	1.341
Temperature	°C	°F	°C×1.8+32
Velocity	km/h	mph	0.6214
	min ⁻¹	rpm	1.0
Flow rate	L/min	US gpm	0.2642
	mL/rev	cc/rev	1.0

 **NOTE:** The numerical value in this manual might be different from the above-mentioned table.

SAFETY

Avoid Undercutting

- In order to retreat from the edge of an excavation if the footing should collapse, always position the undercarriage perpendicular to the edge of the excavation with the travel motors at the rear.
- If the footing starts to collapse and if retreat is not possible, do not panic. Often, the machine can be secured by lowering the front attachment, in such cases.



SA-488

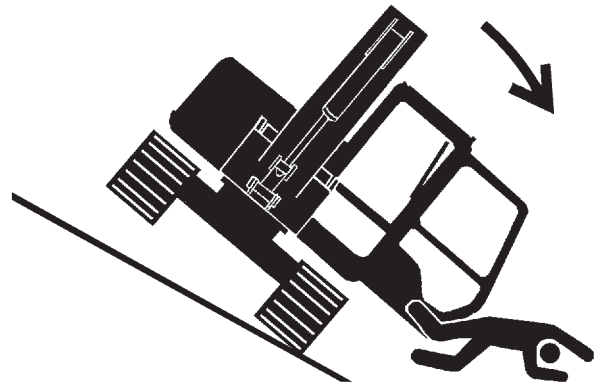
Avoid Tipping

**DO NOT ATTEMPT TO JUMP CLEAR OF TIPPING MACHINE
--- SERIOUS OR FATAL CRUSHING INJURIES WILL RESULT**

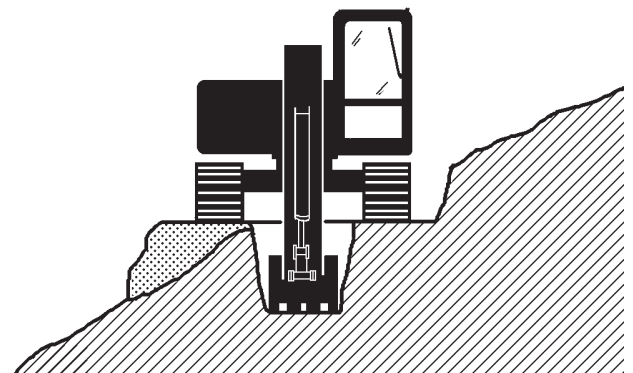
**MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP
FREE**

FASTEN YOUR SEAT BELT

- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death. To avoid tipping:
- Be extra careful before operating on a grade.
 - Prepare machine operating area flat.
 - Keep the bucket low to the ground and close to the machine.
 - Reduce operating speeds to avoid tipping or slipping.
 - Avoid changing direction when traveling on grades.
 - NEVER attempt to travel across a grade steeper than 15 degrees if crossing the grade is unavoidable.
 - Reduce swing speed as necessary when swinging loads.
- Be careful when working on frozen ground.
 - Temperature increases will cause the ground to become soft and make ground travel unstable.



SA-012



SA-440

SAFETY

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.
- In an emergency, if the cab door or front window can not be opened, break the front or rear window panes with the emergency evacuation hammer to escape from the cab. Refer to the explanation pages on the Emergency Evacuation Method in the operator's manual.



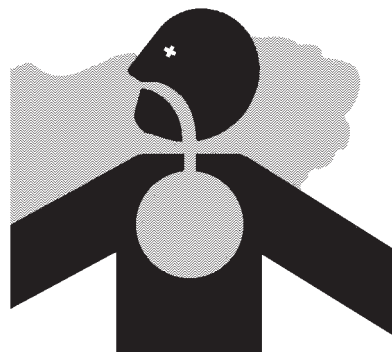
SA-393



SS-1510

Beware of Exhaust Fumes

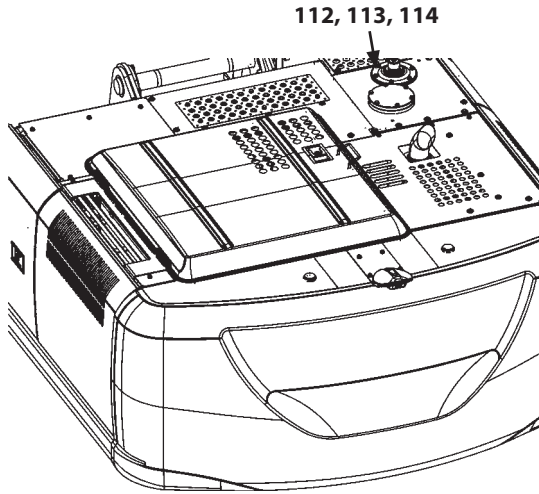
- Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.
 - If you must operate in a building, be sure there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.



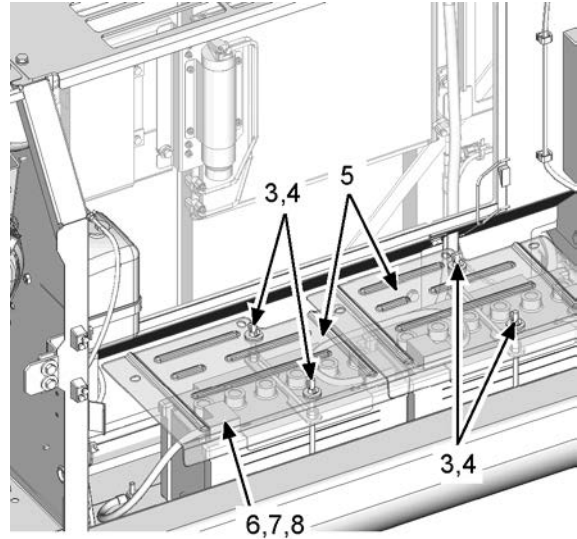
SA-016

SECTION 3 UPPERSTRUCTURE

Group 4 Engine





WDCD-03-04-019



WDCD-03-04-009

48. Connect ground (8) with washer (7) and bolt (6).


 : 17 mm

 : 20 N·m (2 kgf·m, 15 lbf·ft)

49. Install covers (5) (2 used) with washers (4) (4 used) and wing nuts (3) (4 used).


50. Add coolant to the radiator.


51. Fill hydraulic oil to the hydraulic oil tank.

 **NOTE:** Total oil amount of hydraulic oil tank: 201 L (53.1 US gal)

52. Install O-ring (114).

53. Install the cover (113) assembly to the top of hydraulic oil tank with bolts, washers (112) (6 used).

 : 17 mm

 : 50 N·m (5 kgf·m, 37 lbf·ft)

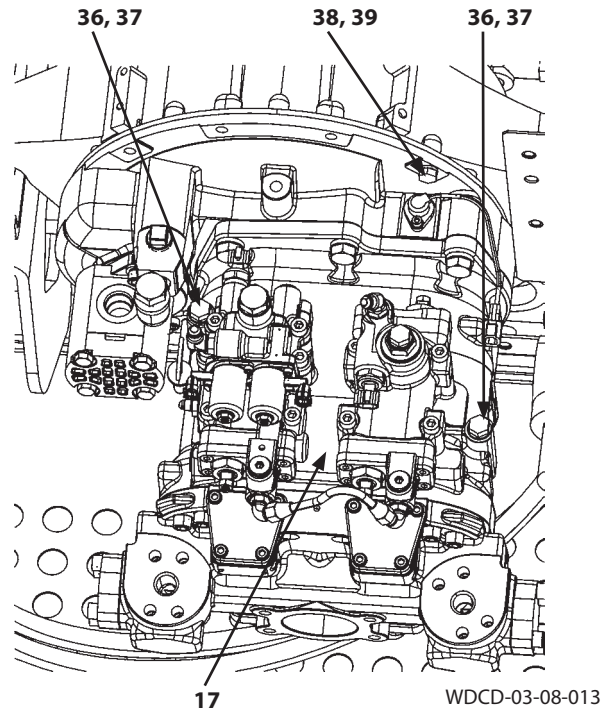
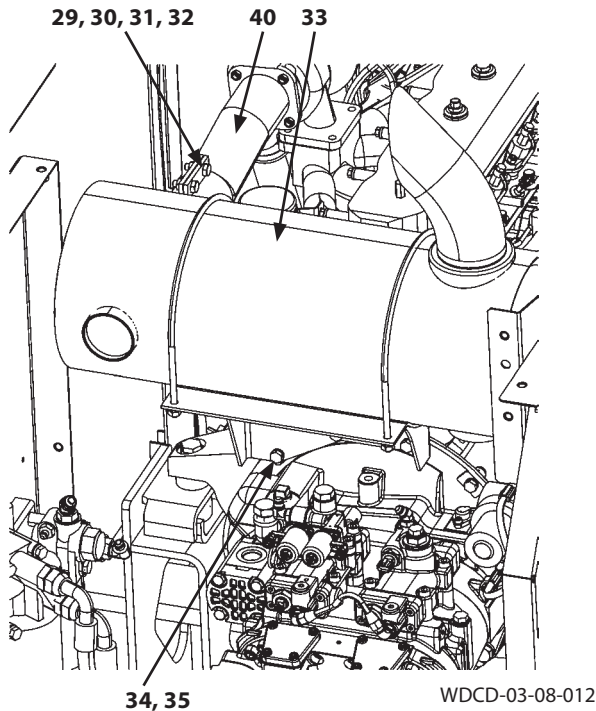
54. Bleed air from the fuel system. (Refer to W1-4-1.)

55. Bleed air from the hydraulic system. (Refer to W1-4-1.)

IMPORTANT: Check the hydraulic oil level. Start the engine and check for any oil leaks.

SECTION 3 UPPERSTRUCTURE

Group 8 Pump Device





Installation

1. Install all removed adapters to pump device (17).


CAUTION: Pump device (17) weight: 170 kg (375 lb)

2. Install eyebolts (M12, Pitch 1.75 mm) (2 used) to the bolt (36) holes (2 places). Attach nylon slings onto the eyebolts. Hoist pump device (17).
3. Install pump device (17) with spring washers (39) (5 used) and bolts (38) (5 used).

 : 17 mm

 : 65 N·m (6.5 kgf·m, 48 lbf·ft)


4. Remove the eyebolts (2 used) from the bolt (36) holes (2 places). Install washers (37) (2 used) and bolts (36) (2 used).


 : 19 mm

CAUTION: The muffler (33) assembly weight: 25 kg (56 lb)


5. Attach nylon slings onto muffler (33). Hoist the muffler (33) assembly.

6. Install the muffler (33) assembly with spring washers (35) (3 used) and bolts (34) (3 used).

 : 17 mm

 : 65 N·m (6.5 kgf·m, 48 lbf·ft)

7. Install gasket (32) and clamp (31) to muffler (33) and exhaust pipe (40) with nuts (30) (2 used) and bolts (29) (2 used).

 : 17 mm

 : 7 to 10 N·m (0.7 to 1 kgf·m, 5.2 to 7.4 lbf·ft)

SECTION 3 UPPERSTRUCTURE


Group 10 Swing Device

Disassembly of Swing Motor


CAUTION: The swing motor assembly weight: 48 kg (110 lb)

IMPORTANT: Do not disassemble relief valve (32).


1. Remove relief valves (32) (2 used) from valve casing (28).

 : 41 mm

2. Remove plug (24) from valve casing (28). Remove O-ring (25) from plug (24).

 : 14 mm

3. Remove spring (26) and poppet (27) from valve casing (28).
4. Remove another poppet (27) in the same way as step 3 to step 4.
5. Put the matching marks at the jointed surface between valve casing (28) and casing (1). Remove socket bolts (29) (4 used). Record the clearance between valve casing (28) and casing (1).

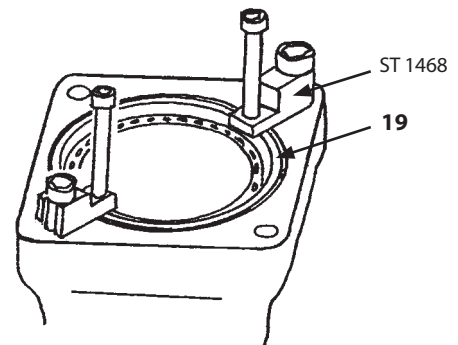
 : 17 mm

IMPORTANT: Do not remove bearing (22) unless necessary.

6. Remove valve casing (28) from casing (1). As valve plate (21) may be removed with valve casing (28) together, do not drop valve plate (21). Remove O-ring (23).

IMPORTANT: Do not damage the mating surfaces when separating valve plate (21) from valve casing (28) or rotor (9) by using a screwdriver.

7. If valve plate (21) is still attached on rotor (9) in step 7, remove valve plate (21) from the rotor (9) side. Remove springs (20) (24 used).
8. Put the matching marks on casing (1) and brake piston (19). Attach a claw of the special tool (ST 1468) onto the brake piston (19) groove by using the special tool (ST 1468). Raise and remove brake piston (19) straight.



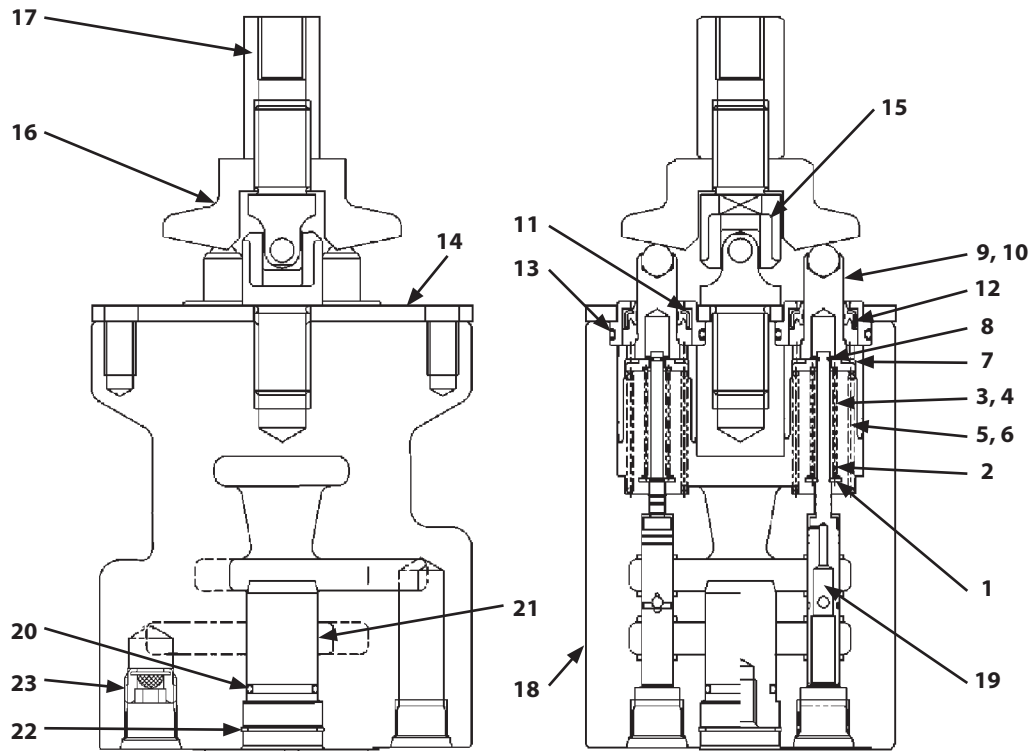
W1HH-02-06-006

9. Remove O-rings (17, 18) from casing (1).

SECTION 3 UPPERSTRUCTURE

Group 11 Pilot Valve

Assembly of Pilot Valves (Right and Left)

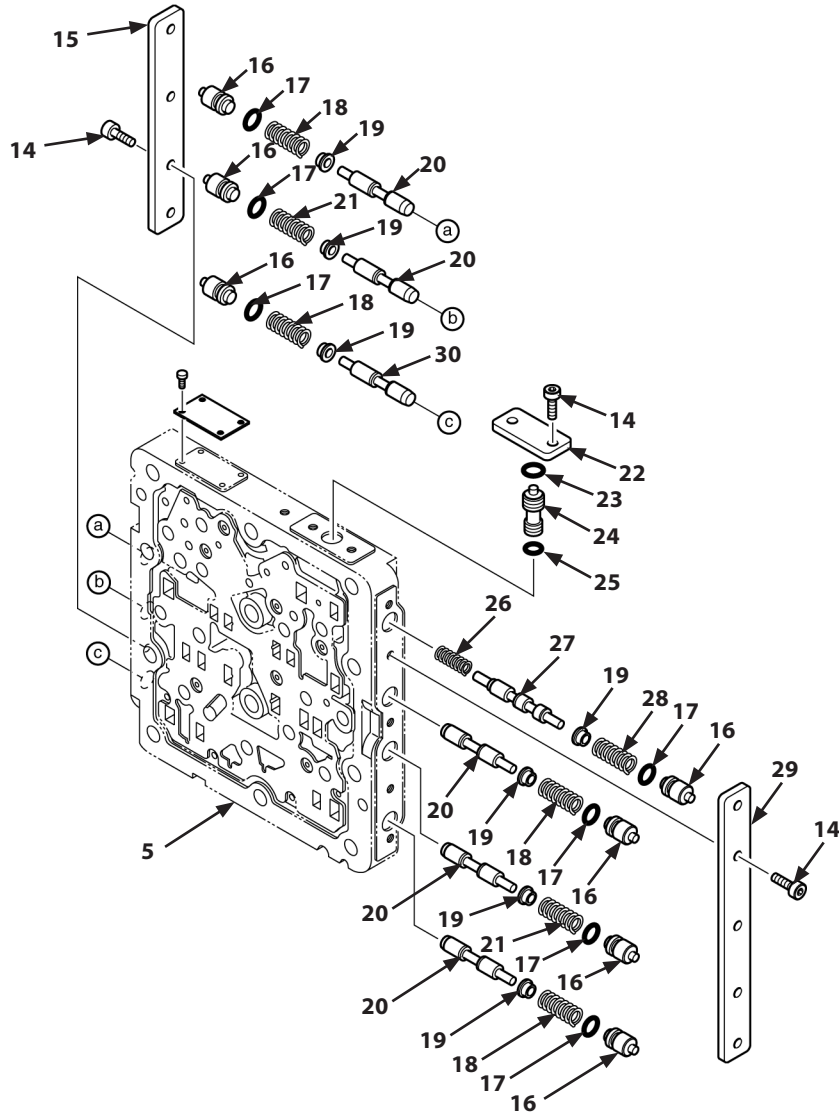


WDAA-03-12-022

- | | | | |
|----------------------------|----------------------------|---------------------|--------------------|
| 1- Spacer (4 Used) | 7- Spring Guide (4 Used) | 13- O-Ring (4 Used) | 19- Spool (4 Used) |
| 2- Shim (Several) | 8- Retaining Ring (4 Used) | 14- Plate | 20- O-Ring |
| 3- Balance Spring (2 Used) | 9- Pusher (2 Used) | 15- Universal Joint | 21- Plug |
| 4- Balance Spring (2 Used) | 10- Pusher (2 Used) | 16- Cam | 22- Retaining Ring |
| 5- Return Spring (2 Used) | 11- Oil Seal (4 Used) | 17- Screw Joint | 23- Filter |
| 6- Return Spring (2 Used) | 12- Sleeve (4 Used) | 18- Casing | |

SECTION 3 UPPERSTRUCTURE

Group 13 Signal Control Valve



W1JB-02-10-003

- | | | | |
|----------------------------|---------------------------|---------------------------|------------|
| 1- Bolt (12 Used) | 9- Body 3 | 17- O-Ring (7 Used) | 25- O-Ring |
| 2- Body 1 | 10- Gasket | 18- Spring (4 Used) | 26- Spring |
| 3- Gasket | 11- Body 4 | 19- Spring Guide (7 Used) | 27- Spool |
| 4- Filter (17 Used) | 12- Gasket | 20- Spool (5 Used) | 28- Spring |
| 5- Body 2 | 13- Body 5 | 21- Spring (2 Used) | 29- Plate |
| 6- Gasket | 14- Socket Bolt (11 Used) | 22- Plate | 30- Spool |
| 7- Shuttle Valve (21 Used) | 15- Plate | 23- O-Ring | |
| 8- Spring (4 Used) | 16- Plug (7 Used) | 24- Shuttle Valve | |


SECTION 4 UNDERCARRIAGE

Group 2 Travel Device

8. Remove sun gear (18) from third stage carrier (12).

CAUTION: Ring gear (20) weight: 39 kg (86 lb)

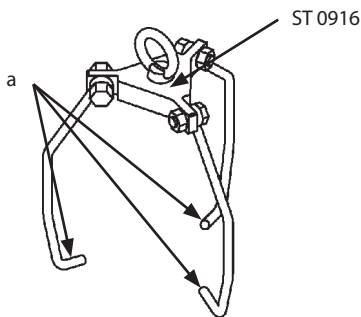
9. Remove bolts (21) (24 used). Install eyebolts (M12, Pitch 1.75 mm) (2 used) to the bolt, washer (43) holes (2 places) of ring gear (20). Attach nylon slings onto the eyebolts. Hoist and remove ring gear (20).

 : 24 mm

NOTE: *THREEBOND #1215 (or LOCTITE #5020) has been applied between ring gear (20) and drum (04). If it is difficult to remove, pry it by using a screwdriver.*

CAUTION: The third stage carrier (12) assembly weight: 31 kg (69 lb)

10. Attach claws (a) of the special tool (ST 0916) onto the outer surface of third stage carrier (12). Hoist the third stage carrier (12) assembly from drum (04).

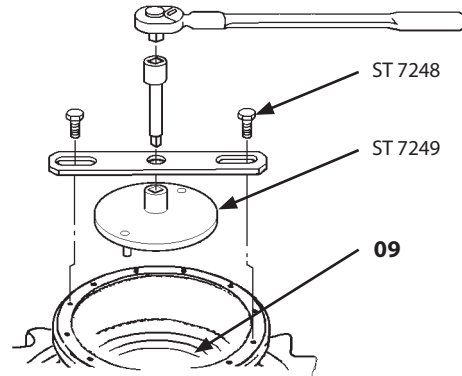


W178-02-11-203

a - Claw

IMPORTANT: Do not remove knock pin (10) unless necessary.

11. Remove bearing nut (09) from travel motor (00) by using special tools (ST 7248, ST 7249).



W178-03-02-013

CAUTION: Sprocket (05) + drum (04) weight: 96 kg (215 lb)

IMPORTANT: The travel motor (00) side of drum (04) is the seal sliding surface for travel motor (00). Place it on a wooden block after removing.

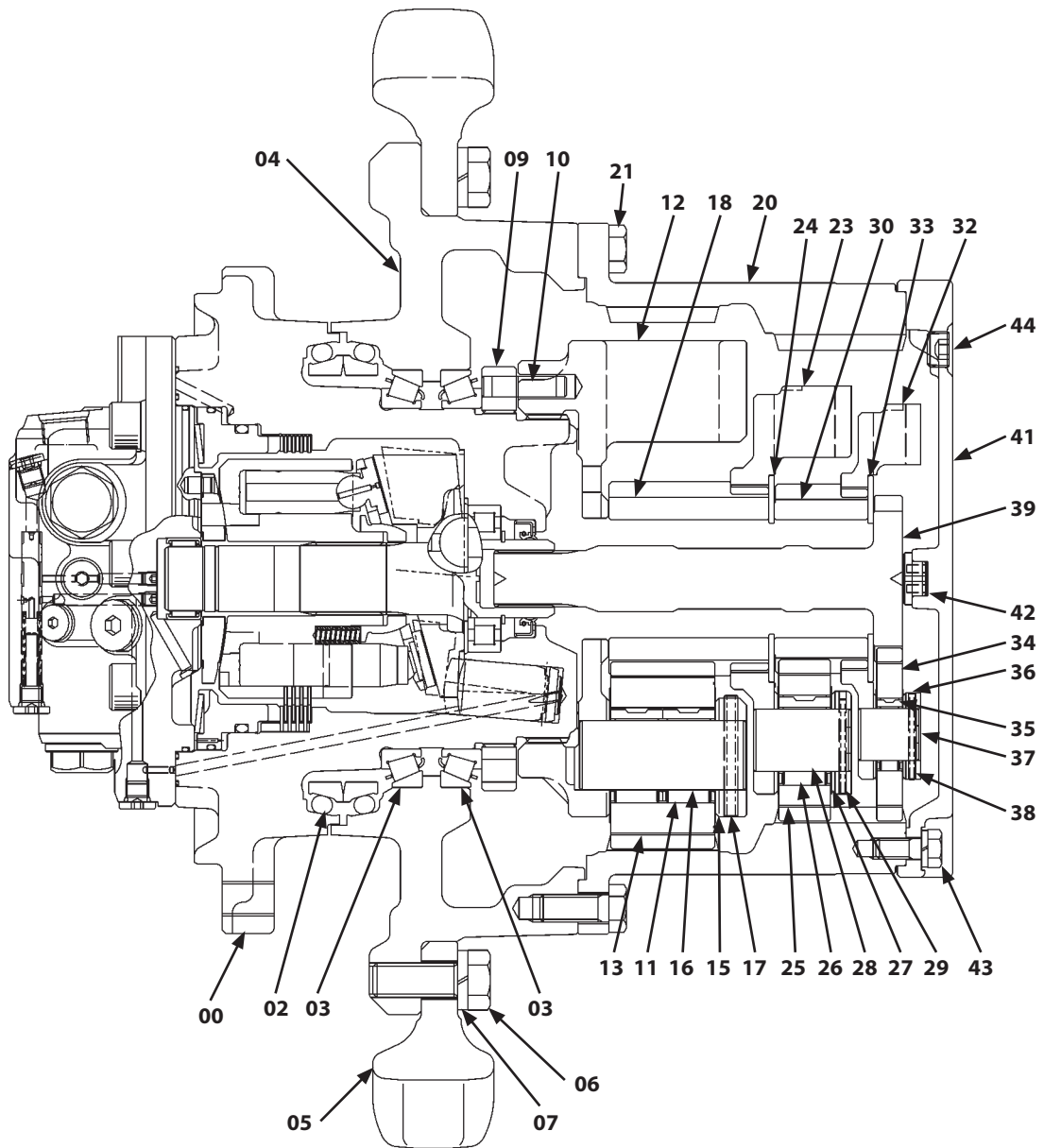
12. Install eyebolts (M16, Pitch 2.0 mm) (2 used) to the bolt holes (2 places) of drum (04). Attach nylon slings onto the eyebolts. Hoist and remove the drum (04) assembly from travel motor (00).

NOTE: *If it is difficult to remove, rotate sprocket (05).*

SECTION 4 UNDERCARRIAGE

Group 2 Travel Device

Assembly of Travel Device



WDCD-04-02-001

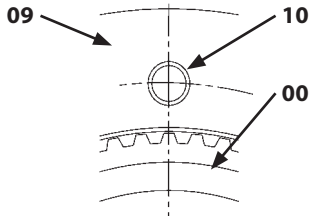
- | | | | |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| 00- Travel Motor | 12- Third Stage Carrier | 25- Planetary Gear (3 Used) | 35- Needle Bearing (3 Used) |
| 02- Floating Seal | 13- Planetary Gear (3 Used) | 26- Needle Bearing (3 Used) | 36- Thrust Plate (6 Used) |
| 03- Roller Bearing (2 Used) | 15- Thrust Plate (6 Used) | 27- Thrust Plate (6 Used) | 37- Pin (3 Used) |
| 04- Drum | 16- Pin (3 Used) | 28- Pin (3 Used) | 38- Spring Pin (3 Used) |
| 05- Sprocket | 17- Spring Pin (3 Used) | 29- Spring Pin (3 Used) | 39- Shaft |
| 06- Bolt (18 Used) | 18- Sun Gear | 30- Sun Gear | 41- Cover |
| 07- Spring Washer (18 Used) | 20- Ring Gear | 32- First Stage Carrier | 42- Stopper |
| 09- Bearing Nut | 21- Bolt (24 Used) | 33- Spacer | 43- Bolt, Washer (12 Used) |
| 10- Knock Pin | 23- Second Stage Carrier | 34- Planetary Gear (3 Used) | 44- Plug (3 Used) |
| 11- Needle Bearing (6 Used) | 24- Spacer | | |

SECTION 4 UNDERCARRIAGE

Group 2 Travel Device

IMPORTANT: When knock pin (10) has been removed, follow the procedure as step 18.

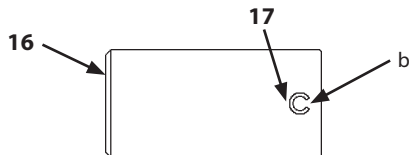
- Fit the phases of the spline center in travel motor (00) and the knock pin (10) center. If the center phases are not fitted, rotate bearing nut (09) in tightening direction until both center phases are fitted.



W178-02-11-208

IMPORTANT: There is an identification groove on one side of planetary gear (13). Install planetary gear (13) with the identification groove side facing to the spring pin (17) hole.

- Install needle bearings (11) (2 used) to planetary gear (13).
- Secure planetary gear (13) between thrust plates (15) (2 used). Install them to third stage carrier (12).
- Install pin (16) to third stage carrier (12). At this time, fit the spring pin (17) hole of third stage carrier (12) and the pin (16) hole.
- Install spring pin (17) to third stage carrier (12) with the slit (b) side facing to the second stage carrier (23) side.



W178-02-11-210

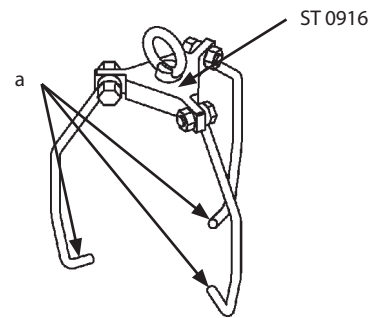
b - Slit

- Install other planetary gears (13) (2 used) to third stage carrier (12) in the same way as steps 19 to 22.

CAUTION: The third stage carrier (12) assembly weight: 31 kg (69 lb)

CAUTION: Third stage carrier (12) falls at the moment when knock pin (10) is inserted into third stage carrier (12). Do not catch fingers.

- Attach claws (a) of the special tool (ST 0916) onto the outer surface of third stage carrier (12). Hoist the third stage carrier (12) assembly. Install the third stage carrier (12) assembly to the spline in travel motor (00).



W178-02-11-203

a - Claw

- Clean the mating surfaces of drum (04) and ring gear (20), and apply THREEBOND #1215 or LOCTITE #5020.

SECTION 4 UNDERCARRIAGE

Group 2 Travel Device

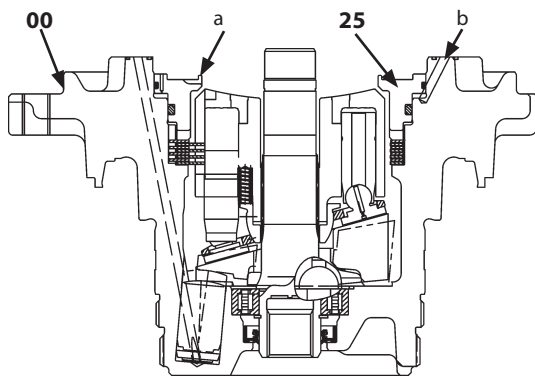
CAUTION: Metal fragments may fly off when a hammer is used. Wear necessary protection, such as goggles, helmets, etc in order to prevent personal injury.

IMPORTANT: The upper surface of brake piston (25) is the seat surface for high-pressure oil. Do not damage brake piston (25).

IMPORTANT: Install brake piston (25) so that notch (a) on the disc spring (29) mounting surface is located opposite the brake releasing oil passage (b) side.

18. Install brake piston (25) to housing (00) by using the special tools (ST 7272, ST 7273) and a hammer.

NOTE: As O-ring (28) is positioned around brake piston (25), brake piston (25) cannot be fully inserted. When installing brake valve (32), tighten brake piston (25) with socket bolt (40).



WDCD-04-02-005

- a - Notch
- b - Brake Releasing Oil Passage

IMPORTANT: Check the direction to install disc spring (29).

19. Place disc spring (29) to brake piston (25) with the inner diameter contacting to brake piston (25).

20. Install O-rings (31) (2 used) and O-ring (30) to housing (00).

21. Add hydraulic oil to housing (00) until plate (23) is submerged.

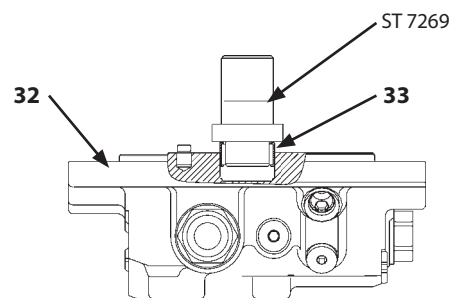
IMPORTANT: Check the direction to install knock pin (37).

22. Install knock pins (37) (2 used) to brake valve (32) with the large diameter side facing to the brake valve (32) side.

CAUTION: Metal fragments may fly off when a hammer is used. Wear necessary protection, such as goggles, helmets, etc in order to prevent personal injury.

IMPORTANT: Check the direction to install the outer race of needle bearing (33).

23. Install the outer race of needle bearing (33) to brake valve (32) with the stamped mark facing outside by using the special tool (ST 7269) and a hammer.



W178-02-11-227


SECTION 4 UNDERCARRIAGE

Group 3 Center Joint


Disassembly of Center Joint

CAUTION: Center joint weight: 27 kg (60 lb)

1. Remove bolts, washers (10) (2 used) diagonally. Install an eyebolt (M10, Pitch 1.5 mm) to the bolt (10) hole (2 places) of body (01). Attach a nylon sling onto an eyebolt. Hoist the center joint. Secure the center joint on a workbench.


 : 17 mm

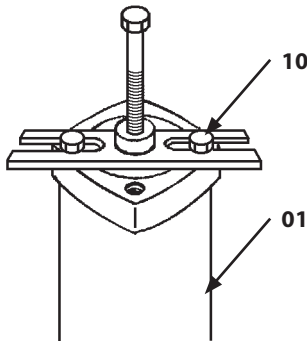
2. Put the matching marks on body (01) and spindle (00A). Remove other bolts, washers (10) (2 used). Remove cover (09) from body (01).

 : 17 mm

3. Remove O-ring (08), retaining ring (07), and ring (06) from body (01).

4. Install the special tools (ST 1033, ST 1020) to body (01) with bolts, washers (10) (2 used).

 : 17 mm



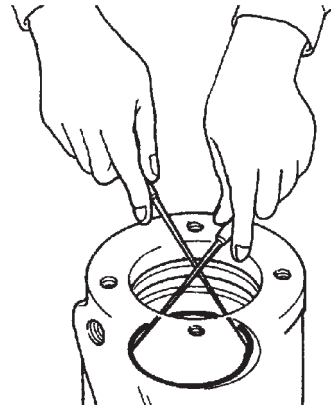
W506-03-03-002

IMPORTANT: Do not damage the seal sliding surface of spindle (00A).

5. Remove spindle (00A) from body (01).

IMPORTANT: For easy removal of oil seal (04), use the pins (2 used). Do not damage the seal groove.

6. Remove oil seals (04) (6 used), O-ring (03), and dust seal (02) from body (01).



W178-02-11-240

IMPORTANT: Do not damage the seal groove.

7. When replacing bushing (05), weld four places on the bushing (05) bore by using a welding bar. Shrink and remove bushing (05).