

PART NO. W4GB-E-00

**HITACHI**

# Workshop Manual

# ZW

# 220

# 250

# Wheel Loader (EU Specification)

ZW220 · 250 WHEEL LOADER (EU SPECIFICATION) WORKSHOP MANUAL

 **Hitachi Construction Machinery**

URL:<http://www.hitachi-c-m.com>

PRINTED IN JAPAN (K) 2007.09

Service Manual consists of the following separate Part No.  
Technical Manual (Operational Principle) : Vol. No.TO4GB-E  
Technical Manual (Troubleshooting) : Vol. No.TT4GB-E  
Workshop Manual : Vol. No.W4GB-E



# INTRODUCTION

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## TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
- Be sure to thoroughly read this manual for correct product information and service procedures.
- If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using "Service Manual Revision Request Form" at the end of this manual.  
(Note: Do not tear off the form. Copy it for usage.)  
Publications Marketing & Product Support  
Hitachi Construction Machinery Co. Ltd.  
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## ADDITIONAL REFERENCES

- Please refer to the materials listed below in addition to this manual.
  - The Operator's Manual
  - The Parts Catalog
  - The Engine Manual
  - Parts Catalog of the Engine
  - Hitachi Training Material

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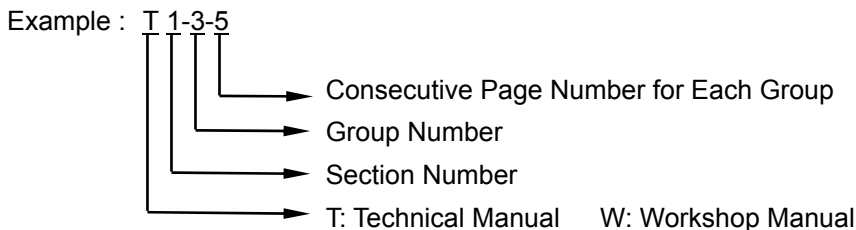
## MANUAL COMPOSITION

- This manual consists of three portions: the Technical Manual (Operational Principle), the Technical Manual (Troubleshooting) and the Workshop Manual.
- Information included in the Technical Manual (Operational Principle):  
technical information needed for redelivery and delivery, operation and activation of all devices and systems.
- Information included in the Technical Manual (Troubleshooting):  
technical information needed for operational performance tests, and troubleshooting procedures.
- Information included in the Workshop Manual:  
technical information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, and removal/installation and assemble/disassemble procedures.

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## PAGE NUMBER

- Each page has a number, located on the center lower part of the page, and each number contains the following information:




# INTRODUCTION

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## 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 or 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.

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## 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/cm<sup>2</sup>, 3560 psi)

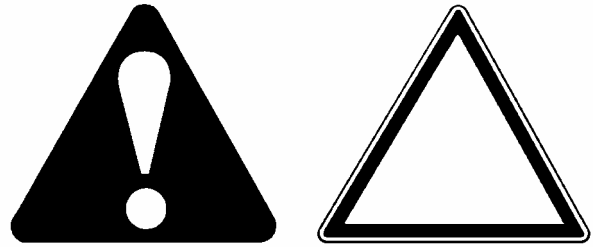
A table for conversion from SI units to other system units is shown below for reference purposes.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm <sup>2</sup>	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m <sup>3</sup>	yd <sup>3</sup>	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min <sup>-1</sup>	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

# SAFETY

## RECOGNIZE SAFETY INFORMATION


- These are the **SAFETY ALERT SYMBOLS**.
  - When you see these symbols on your machine or in operator`s manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.



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SA-688

## UNDERSTAND SIGNAL WORDS

- On machine safety signs, signal words designating the degree or level of hazard - **DANGER**, **WARNING**, or **CAUTION** - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation
    - which, if not avoided, may result in minor or moderate injury.
  - **DANGER** or **WARNING** safety signs are located near specific hazards. General precautions are listed on **CAUTION** safety signs.
  - Some safety signs don't use any of the designated signal words above after the safety alert symbol are occasionally used on this machine.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
-  **NOTE** indicates an additional explanation for an element of information.



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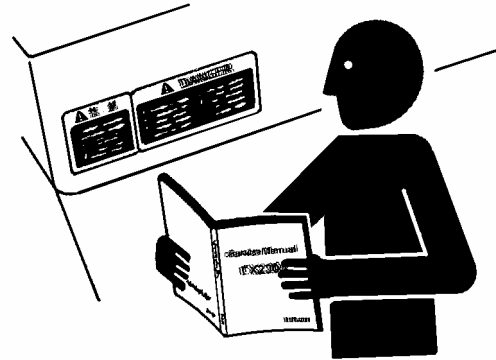
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# SAFETY

## FOLLOW SAFETY INSTRUCTIONS

- Carefully read and follow all safety signs on the machine and all safety messages in operator's manual.
- Safety signs should be installed, maintained and replaced when necessary.
  - If a safety sign or operator's manual is damaged or missing, order a replacement from your authorized dealer in the same way you order other replacement parts (be sure to state machine model and serial number when ordering).
- Learn how to operate the machine and its controls correctly and safely.
- Allow only trained, qualified, authorized personnel to operate the machine.
- Keep your machine in proper working condition.
  - Unauthorized modifications of the machine may impair its function and/or safety and affect machine life.
  - Do not modify any machine parts without authorization. Failure to do so may deteriorate the part safety, function, and/or service life. In addition, personal accident, machine trouble, and/or damage to material caused by unauthorized modifications will void Hitachi Warranty Policy.
  - Do not use attachments and/or optional parts or equipment not authorized by Hitachi. Failure to do so may deteriorate the safety, function, and/or service life of the machine. In addition, personal accident, machine trouble, and/or damage to material caused by using unauthorized attachments and/or optional parts or equipment will void Hitachi Warranty Policy.
- The safety messages in this SAFETY chapter are intended to illustrate basic safety procedures of machines. However it is impossible for these safety messages to cover every hazardous situation you may encounter. If you have any questions, you should first consult your supervisor and/or your authorized dealer before operating or performing maintenance work on the machine.

003-E01B-0003



SA-003

## PREPARE FOR EMERGENCIES

- Be prepared if a fire starts or if an accident occurs.
  - Keep a first aid kit and fire extinguisher on hand.
  - Thoroughly read and understand the label attached on the fire extinguisher to use it properly.
  - To ensure that a fire-extinguisher can be always used when necessary, check and service the fire-extinguisher at the recommended intervals as specified in the fire-extinguisher manual.
  - Establish emergency procedure guidelines to cope with fires and accidents.
  - Keep emergency numbers for doctors, ambulance service, hospital, and fire department posted near your telephone.



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# SAFETY

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## WEAR PROTECTIVE CLOTHING

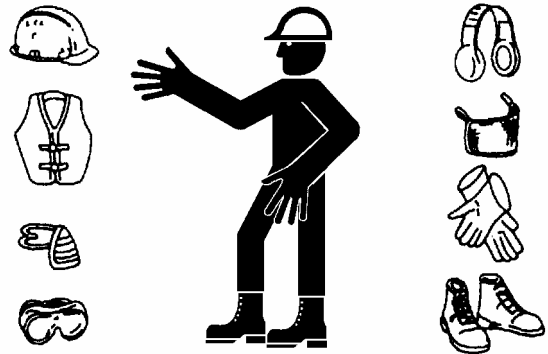
- Wear close fitting clothing and safety equipment appropriate to the job.

You may need:

- A hard hat
- Safety shoes
- Safety glasses, goggles, or face shield
- Heavy gloves
- Hearing protection
- Reflective clothing
- Wet weather gear
- Respirator or filter mask.

Be sure to wear the correct equipment and clothing for the job. Do not take any chances.

- Avoid wearing loose clothing, jewelry, or other items that can catch on control levers or other parts of the machine.
- Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating the machine.



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## PROTECT AGAINST NOISE

- Prolonged exposure to loud noise can cause impairment or loss of hearing.
  - Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortably loud noises.



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## INSPECT MACHINE

- Inspect your machine carefully each day or shift by walking around it before you start it to avoid personal injury.
  - In the walk-around inspection be sure to cover all points described in the “PRE-START INSPECTION” chapter in the operator’s manual.



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SA-435

## SAFETY

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### GENERAL PRECAUTIONS FOR CAB

- Before entering the cab, thoroughly remove all dirt and/or oil from the soles of your work boots. If any controls such as a pedal is operated while with dirt and/or oil on the soles of the operator's work boots the operator's foot may slip off the pedal, possibly resulting in a personal accident.
- Do not leave parts and/or tools lying around the operator's seat. Store them in their specified locations.
- Avoid storing transparent bottles in the cab. Do not attach any transparent type window decorations on the windowpanes as they may focus sunlight, possibly starting a fire.
- Refrain from listening to the radio, or using music headphones or mobile telephones in the cab while operating the machine.
- Keep all flammable objects and/or explosives away from the machine.
- After using the ashtray, always cover it to extinguish the match and/or tobacco.
- Do not leave cigarette lighters in the cab. When the temperature in the cab increases, the lighter may explode.

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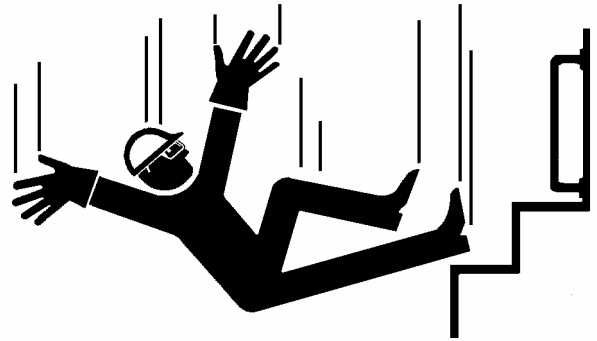


## SAFETY

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### USE HANDHOLDS AND STEPS

- Falling is one of the major causes of personal injury.
  - When you get on and off the machine, always face the machine and maintain a three-point contact with the steps and handrails.
  - Do not use any controls as hand-holds.
  - Never jump on or off the machine. Never mount or dismount a moving machine.
  - Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



008-E01A-0439

SA-439

### ADJUST THE OPERATOR'S SEAT

- A poorly adjusted seat for either the operator or for the work at hand may quickly fatigue the operator leading to misoperations.
  - The seat should be adjusted whenever changing the operator for the machine.
  - The operator should be able to fully depress the pedals and to correctly operate the control levers with his back against the seat back.
  - If not, move the seat forward or backward, and check again.
  - Adjust the rear view mirror position so that the best rear visibility is obtained from the operator's seat. If the mirror is broken, immediately replace it with a new one.



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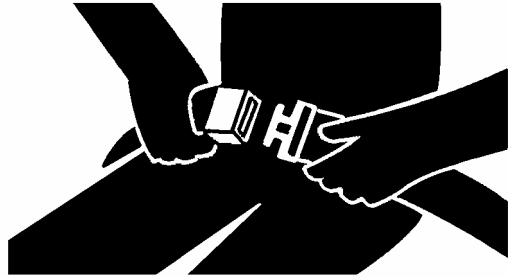
### ENSURE SAFETY BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

- Before rising from the operator's seat to open/close either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes in contact with a control lever, possibly resulting in serious personal injury or death.
  - Before leaving the machine, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Turn the key switch OFF to stop the engine.
  - Before leaving the machine, close all windows, doors, and access covers and lock them up.

# SAFETY

## FASTEN YOUR SEAT BELT

- If the machine should overturn, the operator may become injured and/or thrown from the cab. Additionally the operator may be crushed by the overturning machine, resulting in serious injury or death.
  - Prior to operating the machine, thoroughly examine webbing, buckle and attaching hardware. If any item is damaged or worn, replace the seat belt or component before operating the machine.
  - Be sure to remain seated with the seat belt securely fastened at all times when the machine is in operation to minimize the chance of injury from an accident.
  - We recommend that the seat belt be replaced every three years regardless of its apparent condition.

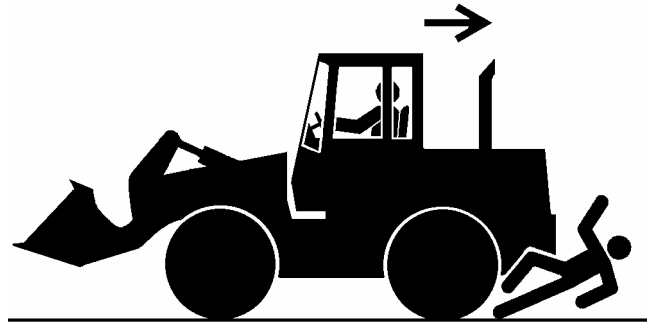


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## MOVE AND OPERATE MACHINE SAFELY

- Bystanders can be run over.
  - Take extra care not to run over bystanders. Confirm the location of bystanders before moving, or operating the machine.
  - Always keep the travel alarm and horn in working condition (if equipped). It warns people when the machine starts to move.
  - Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the machine.
  - Use appropriate illumination. Check that all lights are operable before operating the machine. If any faulty illumination is present, immediately repair it.



SA-398

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## HANDLE STARTING AIDS SAFELY

Starting fluid:

- Starting fluid is highly flammable.
  - Keep all sparks and flame away when using it.
  - Keep starting fluid well away from batteries and cables.
  - Remove container from machine if engine does not need starting fluid.
  - To prevent accidental discharge when storing a pressurized container, keep the cap on the container, and store it in a cool, well-protected location.
  - Do not incinerate or puncture a starting fluid container.



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## SAFETY

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### 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.



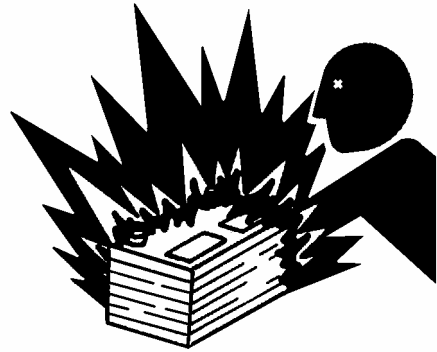
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### JUMP STARTING

- 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.



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# SAFETY

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## INVESTIGATE JOB SITE BEFOREHAND

- When working at the edge of an excavation or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death.
  - Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or banks from collapsing.
  - Make a work plan. Use machines appropriate to the work and job site.
  - Reinforce ground, edges, and road shoulders as necessary. Keep the machine well back from the edges of excavations and road shoulders.
  - When working on an incline or on a road shoulder, employ a signal person as required.
  - Confirm that your machine is equipped a FOPS cab before working in areas where the possibility of falling stones or debris exist.
  - When the footing is weak, reinforce the ground before starting work.
  - When working on frozen ground, be extremely alert. As ambient temperatures rise, footing becomes loose and slippery.
  - Beware the possibility of fire when operating the machine near flammable objects such as dry grass.



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## SAFETY

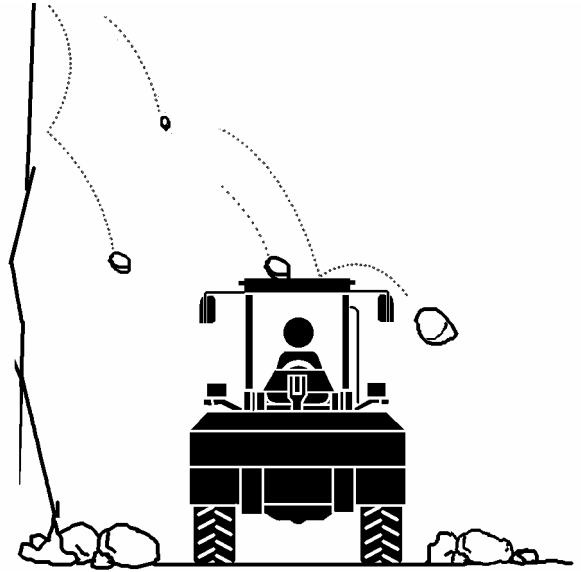
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### EQUIPMENT OF HEAD GUARD, ROPS, FOPS

In case the machine is operated in areas where the possibility of falling stones or debris exist, equip a head guard, ROPS, or FOPS according to the potential hazardous conditions. (The standard cab for this machine corresponds to ROPS and FOPS.)

ROPS: Roll-Over Protective Structure

FOPS: Falling Object Protective Structure

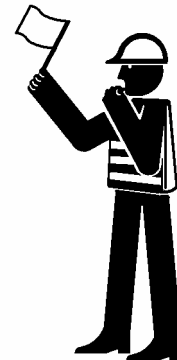


SA-521

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### PROVIDE SIGNALS FOR JOBS INVOLVING MULTIPLE NUMBERS OF MACHINES

- For jobs involving multiple numbers of machines, provide signals commonly known by all personnel involved. Also, appoint a signal person to coordinate the job site. Make sure that all personnel obey the signal person's directions.



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SA-481

# SAFETY

## KEEP RIDERS OFF MACHINE

- Riders on machine are subject to injury such as being struck by foreign objects and being thrown off the machine.
  - Only the operator should be on the machine. Keep riders off.
  - Riders also obstruct the operator's view, resulting in the machine being operated in an unsafe manner.

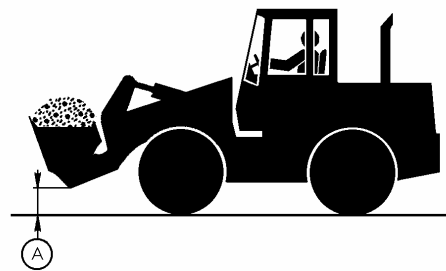


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SA-427

## DRIVE SAFELY

- Beware of the possibility of slipping and/or turning over the machine when driving on a slope.
  - When driving on level ground, hold the bucket at mark (A) 400 to 500 mm above the ground as illustrated.
  - Avoid driving over any obstacles.
  - Drive the machine slowly when driving on rough terrain.
  - Avoid quick direction changes. Failure to do so may cause the machine to turn over.
  - If the engine stops while driving, the steering function becomes inoperative. Immediately stop the machine by applying the brake to prevent personal accident.

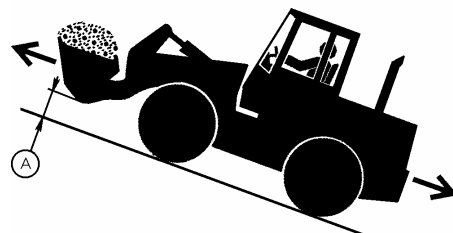


SA-448

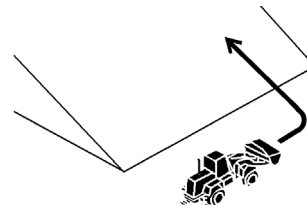
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## DRIVE MACHINE SAFELY (WORK SITE)

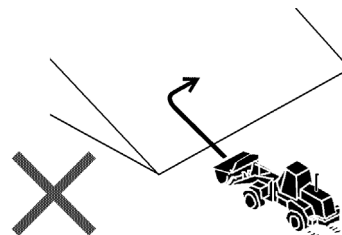
- Before driving the machine, always confirm that the steering wheel/F-N-R lever direction corresponds to the direction you wish to drive.
  - Be sure to detour around any obstructions.
- Driving on a slope may cause the machine to slip or overturn, possibly resulting in serious injury or death.
  - When driving up or down a slope, keep the bucket facing the direction of travel, approximately 200 to 300 mm (approximately 8 to 12 in) (A) above the ground.
  - If the machine starts to skid or becomes unstable, immediately lower the bucket to the ground and stop.
- Driving across the face of a slope or steering on a slope may cause the machine to skid or overturn. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.



SA-449



SA-450



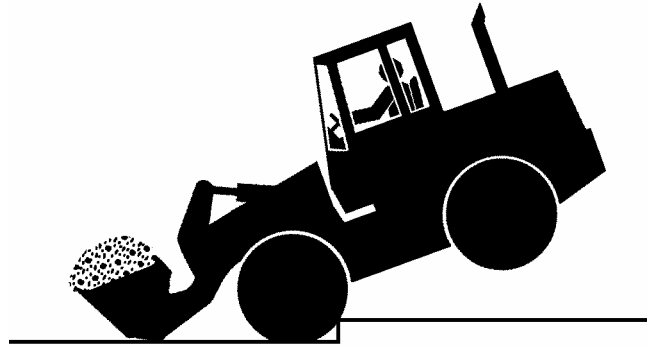
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SA-451

## SAFETY

### DRIVE SAFELY WITH BUCKET LOADED

- If the machine is incorrectly operated while driving with the bucket loaded, turning over of the machine may result. Be sure to follow all the instructions indicated below.
  - When driving the machine on a job site with the bucket loaded, hold the bucket as low as possible to keep the machine balanced and to have good visibility.
  - Do not exceed the rated load capacity. Always operate the machine within the rated load capacity.
  - Avoid fast starts, stops, and quick turns. Failure to do so may result in personal injury and/or death.
  - Avoid rapid drive direction changes which could possibly cause personal injury and/or death.



SA-400

051-E02A-0400

### DRIVE ON SNOW SAFELY

- Beware of the possibility of slipping or turning over the machine when driving on frozen snow surfaces.
  - The machine may slip more easily than expected on frozen snow surfaces even if the inclination is small. Reduce speed when driving. Avoid fast starts, stops and quick turns.
  - Road shoulder and/or set-up utilities covered with snow are difficult to locate. Be sure where they are before removing snow.
  - Be sure to use tire chains when driving on snow.
  - Avoid applying the brake for quick stops on snow. If a quick stop is required, lower the bucket to the ground.

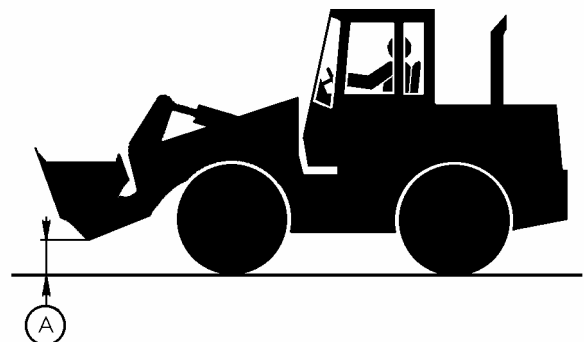


SA-452

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### TRAVEL ON PUBLIC ROADS SAFELY

- This machine is not allowed to drive on public roads with the bucket loaded.
  - Be sure to empty the bucket.
  - Hold the bucket at mark (A) 400 to 500 mm above the road surface as illustrated.



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SA-453

## SAFETY

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### AVOID INJURY FROM ROLLAWAY ACCIDENTS

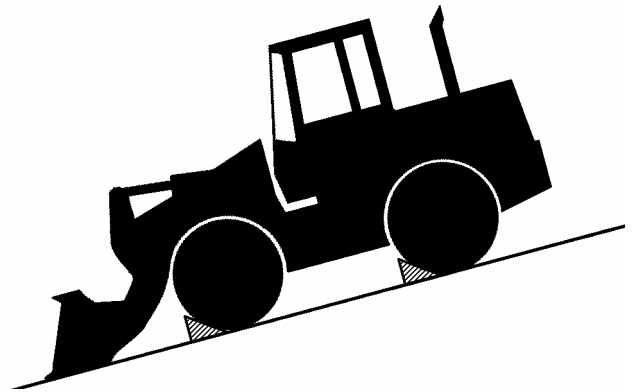
- Death or serious injury may result if you attempt to mount or stop a moving machine.

To avoid rollaways:

- Select level ground when possible to park machine.
- Do not park the machine on a grade.
- Lower the bucket to the ground.
- Place the F-N-R lever in neutral, and put the park brake switch in the ON (parking brake) position.
- Run the engine at slow idle speed without load for 5 minutes to cool down the engine.
- Stop the engine and remove the key from the key switch.
- Pull the lock lever to LOCK position.
- Block both tires and lower the bucket to the ground.
- Position the machine to prevent rolling.
- Park a reasonable distance from other machines.



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SA-458

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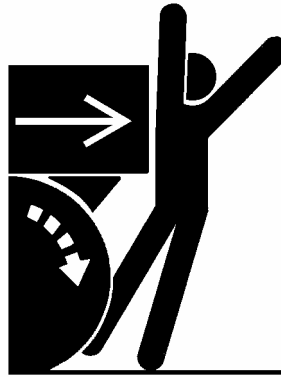
## SAFETY

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### AVOID ACCIDENTS FROM BACKING UP AND TURNING

- Make sure no one is working under or close to the machine before backing up or turning the machine to avoid personal injury and/or death by being run over or entangled in the machine.
  - Keep all personnel away from the machine by sounding the horn and/or using hand signals. Use extra care to be sure no one is in from the articulation area before turning the machine.
  - Keep windows, mirrors, and lights in good condition.
  - Reduce travel speed when dust, heavy rain, fog, etc., reduce the visibility.
  - In case good visibility is not obtained, use a signal person to guide you.

021-E02A-0517



SA-383



SA-312

## SAFETY

### AVOID POSITIONING BUCKET OVER ANYONE

- Never allow the bucket to pass over co-workers and/or the dump truck operator's cab. Falling soil from the bucket or contact with bucket may cause serious personal accidents and/or damage to the machine.
  - Avoid carrying the bucket over the co-workers to ensure safe operation.



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SA-518

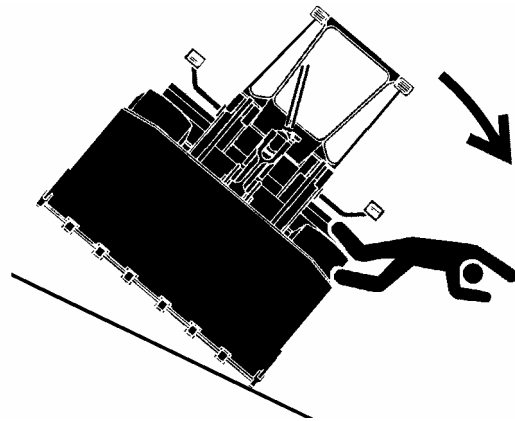
### AVOID TIPPING

**DO NOT ATTEMPT TO JUMP CLEAR OF TIPPING MACHINE. MACHINE WILL TIP OVER FASTER THAN YOU CAN JUMP FREE, POSSIBLY RESULTING IN SERIOUS PERSONAL INJURY OR DEATH. IF TIPPING OVER OF THE MACHINE IS PREDICTED, SECURELY HOLD THE STEERING WHEEL TO PREVENT YOUR BODY FROM BEING THROWN OUT OF THE MACHINE.**

**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 5 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-463

## SAFETY

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### NEVER UNDERCUT A HIGH BANK

- The edges could collapse or a land slide could occur causing serious injury or death.

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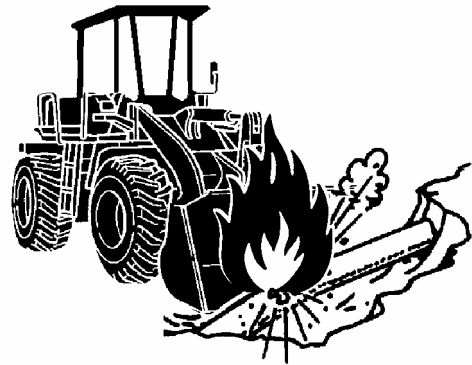


SA-519

### DIG WITH CAUTION

Before digging, check the location of cables, gas lines, and water lines.

027-E01A-0396



SA-396

### PERFORM TRUCK LOADING SAFELY

- Do not operate the machine involuntarily. Unexpected machine movement may cause personal injury and/or death.
  - Do not lower the bucket with the loader control lever in the FLOAT position. The bucket may free fall, possibly causing personal injury and/or death.
  - Always select a level surface for truck loading.

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SA-397

# SAFETY

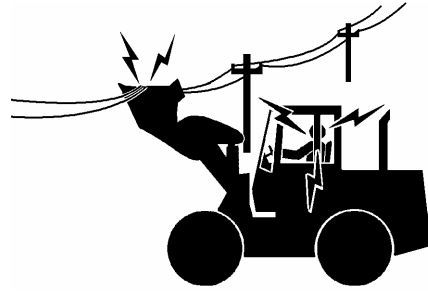
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## AVOID POWER LINES

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.

29-E01A-0455



SA-455

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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.

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## PRECAUTIONS FOR LIGHTENING

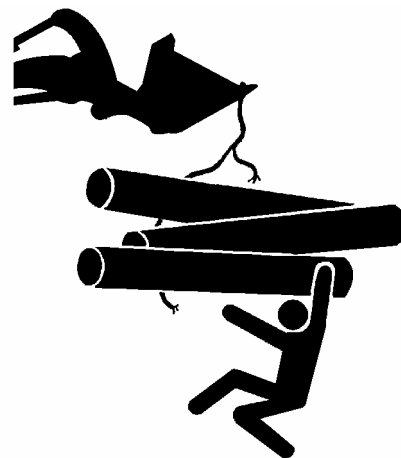
- The machine is vulnerable to lightning strikes.
  - In the event of an electrical storm, immediately stop operation, and lower the bucket to the ground. Evacuate to a safe place far away from the machine.
  - After the electrical storm has passed, check all of the machine safety devices for any failure. 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, cables, 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.

032-E01A-0132



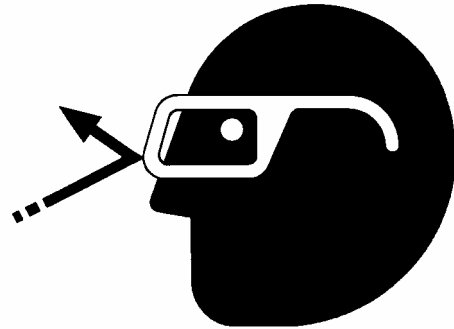
SA-132

## SAFETY

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### PROTECT AGAINST FLYING DEBRIS

- If flying debris hit eyes or any other part of the body, serious injury may result.
  - Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.
  - Keep bystanders away from the working area before striking any object.



031-E01A-0432

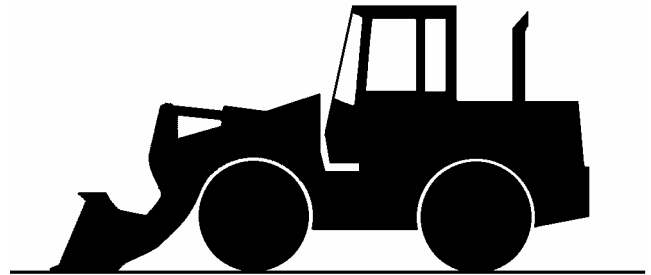
SA-432

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### PARK MACHINE SAFELY

To avoid accidents:

- Park machine on a firm, level surface.
- Lower bucket to the ground.
- Place the F-N-R lever in neutral, and put the park brake switch in the ON (parking brake) position.
- Run engine at slow idle speed without load for 5 minutes.
- Turn key switch to OFF to stop engine.
- Remove the key from the key switch.
- Lower the lock lever to the LOCK position.
- Close windows, roof vent, and cab door.
- Lock all access doors and compartments.



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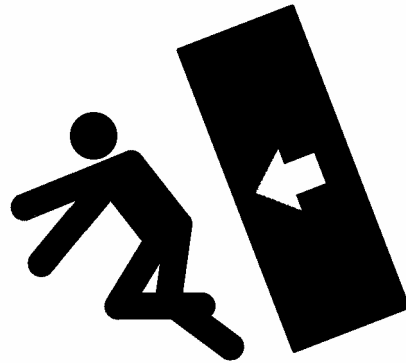
SA-456

# SAFETY

## STORE ATTACHMENTS SAFELY

- Stored attachments such as buckets, hydraulic hammers, and blades can fall and cause serious injury or death.
  - Securely store attachments and implements to prevent falling. Keep children and bystanders away from storage areas.

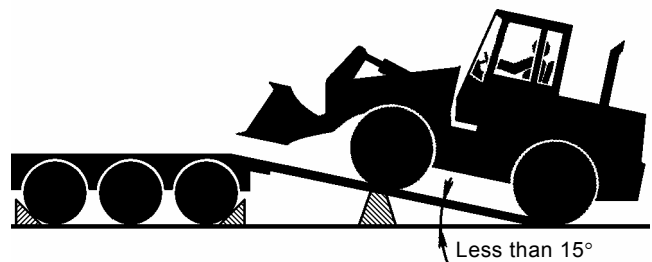
504-E01A-0034



SA-034

## TRANSPORT SAFELY

- Take care the machine may turn over when loading or unloading the machine onto or off of a truck or trailer.
  - Observe the related regulations and rules for safe transportation.
  - Select an appropriate truck or trailer for the machine to be transported.
  - Be sure to use a signal person.
  - Always follow the following precautions for loading or unloading:
    1. Select solid and level ground.
    2. Always use a ramp or deck strong enough to support the machine weight.
    3. Use the low speed gear.
    4. Never steer the machine while on the ramp. If the traveling direction must be changed while the ramp, unload the machine from the ramp, reposition the machine on the ground, then try loading again.
    5. After loading, install the lock bar to securely hold the articulation mechanism.
    6. Wedge the front and rear of tires. Securely hold the machine to the truck or trailer deck with wire ropes.



SA-454

Be sure to further follow the details described in the TRANSPORTING section.

035-E07A-0454

## SAFETY

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### HANDLE FLUIDS SAFELY-AVOID FIRES

- Handle fuel with care; it is highly flammable. If fuel ignites, an explosion and/or a fire may occur, possibly resulting in serious injury or death.
  - Do not refuel the machine while smoking or when near open flame or sparks.
  - Always stop the engine before refueling the machine.
  - Fill the fuel tank outdoors.
- All fuels, most lubricants, and some coolants are flammable.
  - Store flammable fluids well away from fire hazards.
  - Do not incinerate or puncture pressurized containers.
  - Do not store oily rags; they can ignite and burn spontaneously.
  - Securely tighten the fuel and oil filler cap.



SA-018



034-E01A-0496

SA-019

# SAFETY

## PRACTICE SAFE MAINTENANCE

To avoid accidents:

- Understand service procedures before starting work.
- Keep the work area clean and dry.
- Do not spray water or steam inside cab.
- Never lubricate or service the machine while it is moving.
- Keep hands, feet and clothing away from power-driven parts.

Before servicing the machine:

1. Park the machine on a level surface.
2. Lower the bucket to the ground.
3. Turn the auto-idle switch off.
4. Run the engine at slow idle speed without load for 5 minutes.
5. Turn the key switch to OFF to stop engine.
6. Relieve the pressure in the hydraulic system by moving the control levers several times.
7. Remove the key from the switch.
8. Attach a "Do Not Operate" tag on the control lever.
9. Lower the lock lever to the LOCK position.
10. Lock bar connects the front and rear frames.
11. Allow the engine to cool.

- If a maintenance procedure must be performed with the engine running, do not leave machine unattended.
- Never work under a machine raised by the lift arm.
- Inspect certain parts periodically and repair or replace as necessary. Refer to the section discussing that part in the "MAINTENANCE" chapter of operator's manual.
- Keep all parts in good condition and properly installed.
- Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.
- When cleaning parts, always use nonflammable detergent oil. Never use highly flammable oil such as fuel oil and gasoline to clean parts or surfaces.
- Disconnect battery ground cable (-) before making adjustments to electrical systems or before performing welding on the machine.

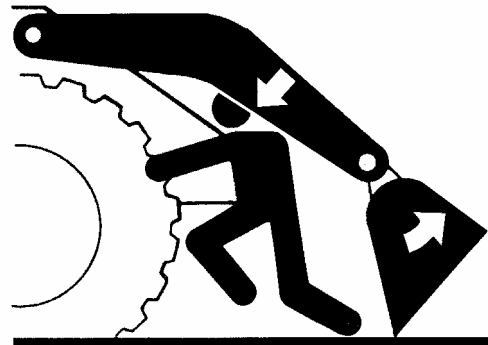
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SA-028



SA-312



SA-134



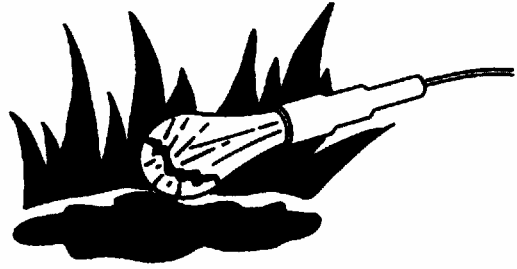
SA-527



## SAFETY

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- Sufficiently illuminate the work site. Use a maintenance work light when working under or inside the machine.
- Always use a work light protected with a guard. In case the light bulb is broken, spilled fuel, oil, anti-freeze fluid, or window washer fluid may catch fire.



SA-037

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### WARN OTHERS OF SERVICE WORK

- Unexpected machine movement can cause serious injury.
  - Before performing any work on the machine, attach a “Do Not Operate” tag on the control lever. This tag is available from your authorized dealer.

501-E01A-0287



SS2045102

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### SUPPORT MACHINE PROPERLY

- Never attempt to work on the machine without securing the machine first.
  - Always lower the attachment to the ground before you work on the machine.
  - If you must work on a lifted machine or attachment, securely support the machine or attachment. Do not support the machine on cinder blocks, hollow tires, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack.

519-E01A-0527



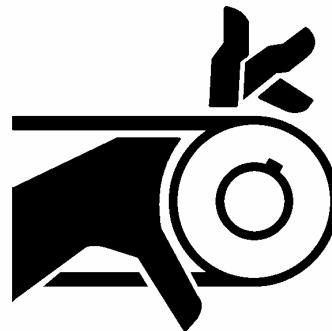
SA-527

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### STAY CLEAR OF MOVING PARTS

- Entanglement in moving parts can cause serious injury.
  - To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewelry and hair do not become entangled when working around rotating parts.

502-E01A-0026



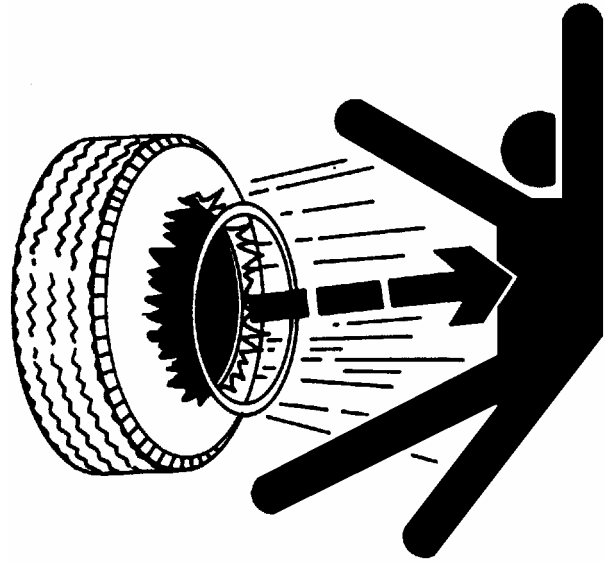
SA-026

## SAFETY

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### SUPPORT MAINTENANCE PROPERLY

- Explosive separation of a tire and rim parts can cause serious injury or death.
  - Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job. Have it done by your authorized dealer or a qualified repair service.
  - Always maintain the correct tire pressure. DO NOT inflate tire above the recommended pressure.
  - When inflating tires, use a chip-on chuck and extension hose long enough to allow you to stand to one side and not in front of or over the tire assembly. Use a safety cage if available.
  - Inspect tires and wheels daily. Do not operate with low pressure, cuts bubbles, damaged rims, or missing lug bolts and nuts.
  - Never cut or weld on an inflated tire or rim assembly. Heat from welding could cause an increase in pressure and may result in tire explosion.

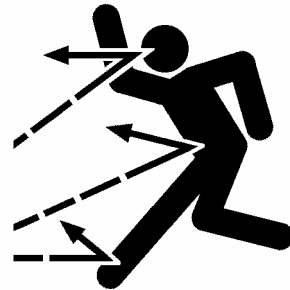


SA-249

521-E02A-0249

### PREVENT PARTS FROM FLYING

- Travel reduction gears are under pressure.
  - As pieces may fly off, be sure to keep body and face away from AIR RELEASE PLUG to avoid injury.
  - GEAR OIL is hot. Wait for GEAR OIL to cool, then gradually loosen AIR RELEASE PLUG to release pressure.



SA-344

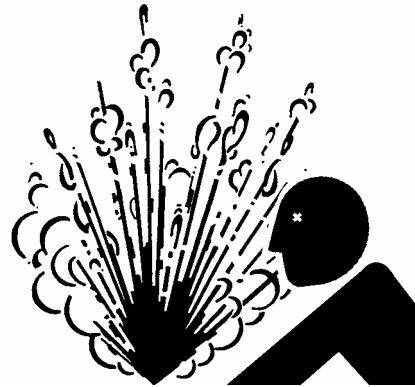
503-E03A-0344

# SAFETY

## PREVENT BURNS

Hot spraying fluids:

- After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator and heater lines. Skin contact with escaping hot water or steam can cause severe burns.
  - To avoid possible injury from hot spraying water. DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be released before removing the cap.
  - The hydraulic oil tank is pressurized. Again, be sure to release all pressure before removing the cap.



SA-039

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also become hot during operation. The engine, hoses, lines and other parts become hot as well.
  - Wait for the oil and components to cool before starting any maintenance or inspection work.



SA-225

505-E01B-0498

## REPLACE RUBBER HOSES PERIODICALLY

- Rubber hoses that contain flammable fluids under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by inspection alone.
  - Periodically replace the rubber hoses. (See the page of "Periodic replacement of parts" in the operator's manual.)
- Failure to periodically replace rubber hoses may cause a fire, fluid injection into skin, or the front attachment to fall on a person nearby, which may result in severe burns, gangrene, or otherwise serious injury or death.



SA-019

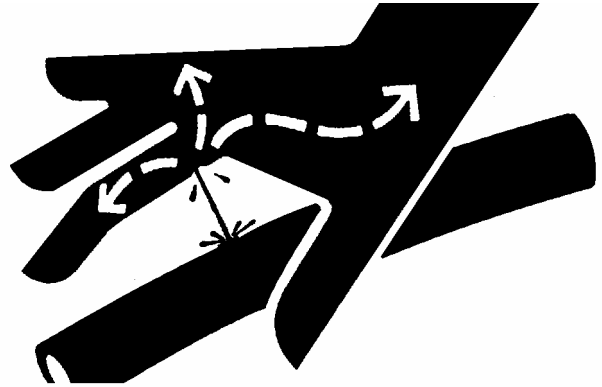
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## SAFETY

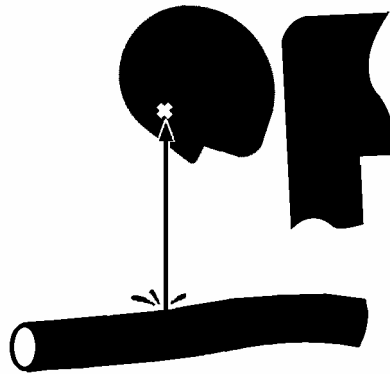
### AVOID HIGH-PRESSURE FLUIDS

- Fluids such as diesel fuel or hydraulic oil under pressure can penetrate the skin or eyes causing serious injury, blindness or death.
  - Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines.
  - Tighten all connections before applying pressure.
  - Search for leaks with a piece of cardboard; take care to protect hands and body from high-pressure fluids. Wear a face shield or goggles for eye protection.
  - If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

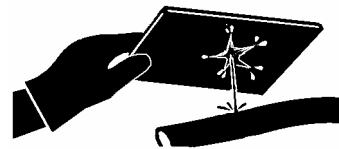
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SA-031



SA-292



SA-044

# SAFETY

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## PREVENT FIRES

### Check for Oil Leaks:

- Fuel, hydraulic oil and lubricant leaks can lead to fires.
  - Check for oil leaks due to missing or loose clamps, kinked hoses, lines or hoses that rub against each other, damage to the oil-cooler, and loose oil-cooler flange bolts.
  - Tighten, repair or replace any missing, loose or damaged clamps, lines, hoses, oil-cooler and oil-cooler flange bolts.
  - Do not bend or strike high-pressure lines.
  - Never install bent or damaged lines, pipes, or hoses.



SA-019

### Check for Shorts:

- Short circuits can cause fires.
  - Clean and tighten all electrical connections.
  - Check before each shift or after eight(8) to ten(10) hours operation for loose, kinked, hardened or frayed electrical cables and wires.
  - Check before each shift or after eight(8) to ten(10) hours operation for missing or damaged terminal caps.
  - DO NOT OPERATE MACHINE if cable or wires are loose, kinked, etc..

### Clean up Flammables:

- Spilled fuel and oil, and trash, grease, debris, accumulated coal dust, and other flammables may cause fires.
  - Prevent fires by inspecting and cleaning the machine daily and by removing spilled or accumulated flammables immediately.

### Check Key Switch:

- If a fire breaks out, failure to stop the engine will escalate the fire, hampering fire fighting.  
Always check key switch function before operating the machine every day:
  1. Start the engine and run it at slow idle.
  2. Turn the key switch to the OFF position to confirm that the engine stops.
  - If any abnormalities are found, be sure to repair them before operating the machine.

508-E02B-0019

### Check Heat Shields:

- Damaged or missing heat shields may lead to fires.
  - Damaged or missing heat shields must be repaired or replaced before operating the machine.

508-E02A-0393

## SAFETY

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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.

518-E01A-0393

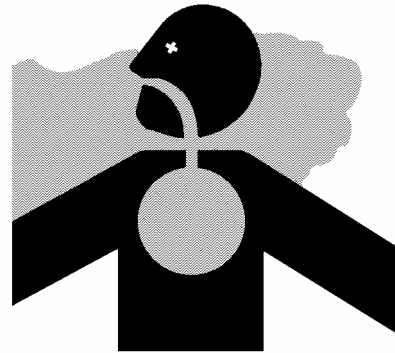


SA-393

### 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.

509-E01A-0016



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.

523-E01A-0818



SA-818

## SAFETY

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### AVOID HEATING NEAR PRESSURIZED FLUID LINES

- Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders.
  - Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.
  - Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install temporary fireresistant guards to protect hoses or other materials before engaging in welding, soldering, etc..



SA-030

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### AVOID APPLYING HEAT TO LINES CONTAINING FLAMMABLE FLUIDS

- Do not weld or flame cut pipes or tubes that contain flammable fluids.
- Clean them thoroughly with nonflammable solvent before welding or flame cutting them.

510-E01B-0030

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### REMOVE PAINT BEFORE WELDING OR HEATING

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.
    - Avoid potentially toxic fumes and dust.
    - Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.
    - Remove paint before welding or heating:
1. If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
  2. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.



SA-029

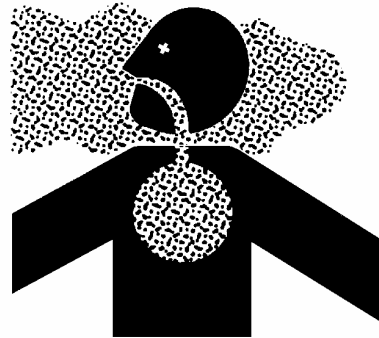
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## SAFETY

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### BEWARE OF ASBESTOS DUST

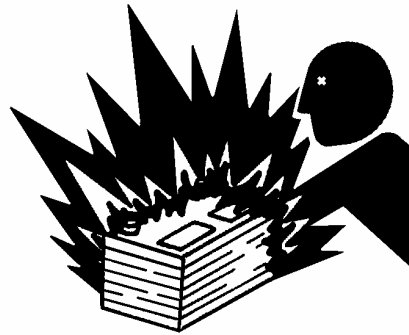
- Take care not to inhale dust produced in the work site. Inhalation of asbestos fibers may be the cause of lung cancer.
  - Depending on the work site conditions, the risk of inhaling asbestos fiber may exist. Spray water to prevent asbestos from becoming airborne. Do not use compressed air.
  - When operating the machine in a work site where asbestos might be present, be sure to operate the machine from the upwind side and wear a mask rated to prevent the inhalation of asbestos.
  - Keep bystanders out of the work site during operation.
  - Asbestos might be present in imitation parts. Use only genuine Hitachi Parts.



SA-029

### PREVENT BATTERY EXPLOSIONS

- Battery gas can explode.
  - Keep sparks, lighted matches, and flame away from the top of battery.
  - Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
  - Do not charge a frozen battery; it may explode. Warm the battery to 16 °C (60 °F) first.
  - Do not continue to use or charge the battery when electrolyte level is lower than specified. Explosion of the battery may result.
  - Loose terminals may produce sparks. Securely tighten all terminals.
- Battery electrolyte is poisonous. If the battery should explode, battery electrolyte may be splashed into eyes, possibly resulting in blindness.
  - Be sure to wear eye protection when checking electrolyte specific gravity.

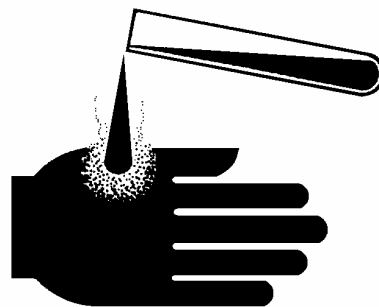


SA-032

512-E01B-0032

### SERVICE AIR CONDITIONING SYSTEM SAFELY

- If spilled onto skin, refrigerant may cause a cold contact burn.
  - Refer to the instructions described on the container for proper use when handling the refrigerant.
  - Use a recovery and recycling system to avoid leaking refrigerant into the atmosphere.
  - Never touch the refrigerant.



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SA-405

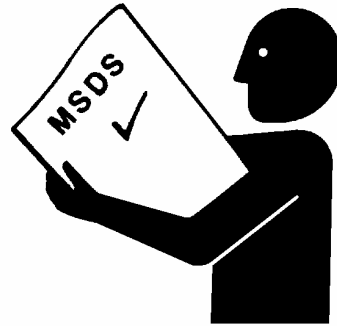


# SAFETY

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## HANDLE CHEMICAL PRODUCTS SAFELY

- Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with your machine include such items as lubricants, coolants, paints, and adhesives.
  - A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.
  - Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and use recommended equipment.
  - See your authorized dealer for MSDS's (available only in English) on chemical products used with your machine.

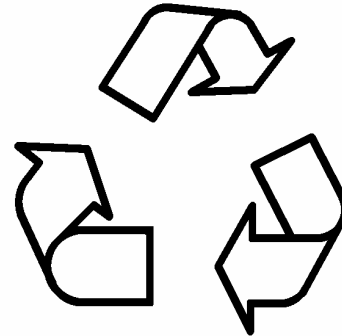


SA-309

515-E01A-0309

## DISPOSE OF WASTE PROPERLY

- Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with HITACHI equipment includes such items as oil, fuel, coolant, brake fluid, filters, and batteries.
  - Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.
  - Do not pour waste onto the ground, down a drain, or into any water source.
  - Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.
  - Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your authorized dealer.



SA-226

516-E01A-0226

## SAFETY

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### BEFORE RETURNING THE MACHINE TO THE CUSTOMER

- After maintenance or repair work is complete, confirm that:
  - The machine is functioning properly, especially the safety systems.
  - Worn or damaged parts have been repaired or replaced.



S517-E01A-0435

SA-435

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Group 2 Tightening
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Group 3 Painting
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Group 4 Bleeding Air from Hydraulic Oil Tank
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Group 2 Counterweight
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Group 3 Center Hinge
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Group 4 Hood
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Group 5 Hydraulic Oil Tank
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Group 8 Pilot Valve
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Group 9 Pilot Shut-Off Valve
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Group 10 Hydraulic Fan Pump and Motor
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Group 3 Axle
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Group 4 Propeller Shaft
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Group 5 Brake Valve
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Group 6 Charging Block
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Group 7 Steering Pilot Valve
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Group 8 Steering Valve
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Group 9 Steering Cylinder
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Group 10 Parking Brake Solenoid
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Group 2 Cylinder
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*All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.*

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- Group 2 Component Layout
- Group 3 Component Specifications

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- Group 2 Standard
- Group 3 Engine Test
- Group 4 Wheel Loader Test
- Group 5 Component Test
- Group 6 Adjustment

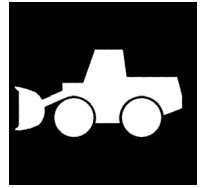
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  - Group 2 Dr. ZX
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  - Group 4 Component Layout
  - Group 5 Troubleshooting A
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# SECTION 1 GENERAL



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### **Group 4 Bleeding Air from Hydraulic Oil Tank**

Bleeding Air from Hydraulic Oil Tank .....	W1-4-1
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## GENERAL / Precautions for Disassembling and Assembling

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### PRECAUTIONS FOR DISASSEMBLING AND ASSEMBLING

#### Precautions for Disassembling and Assembling

- 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, to help avoid incorrect disassembling of components as well as personal injury. Check and record the items listed below to prevent problems from occurring in the future.

- The machine model, machine serial number, and hour meter reading.
- Reason for disassembly (symptoms, failed parts, and causes).
- Clogging of filters and oil, water or air leaks, if any.
- Capacities and condition of lubricants.
- Loose or damaged parts.

- Prepare and Clean Tools and Disassembly Area

Prepare the necessary tools to be used and the area for disassembling work.

- Precautions for Disassembling

- To prevent dirt from entering, cap or plug the removed pipes.
- Before disassembling, clean the exterior of the components and place on a work bench.
- Before disassembling, drain gear oil from the reduction gear.
- Be sure to provide appropriate containers for draining fluids.
- Use matching marks for easier 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.

## GENERAL / Precautions for Disassembling and Assembling

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- Precautions for 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.
- Be sure to replace O-rings, backup rings, and oil seals with new ones once they are disassembled. Apply a film of grease before installing.
- 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.

### Bleeding Air from Hydraulic System

When hydraulic oil is drained, the suction filter or the suction lines are replaced, or the removal and installation of the pump, swing motor, travel motor or cylinder is done, bleed air from the hydraulic system in the following procedures:

**IMPORTANT: If the engine is started with air trapped in the hydraulic pump housing, damage to the pump may result. If the cylinder is operated with air trapped in the cylinder tube, damage to the cylinder may result. Be sure to bleed air before starting the engine.**

- Bleeding Air from Hydraulic Pump

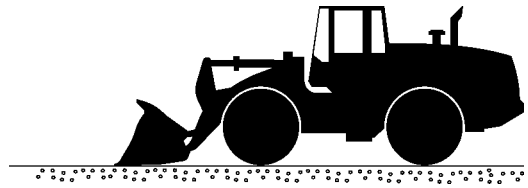
- Remove the air bleeding plug from the top of the pump and fill the pump housing with hydraulic oil.
- After the pump housing is filled with hydraulic oil, temporarily tighten the plug. Then, start the engine and run at slow idle speed.
- Slightly loosen the plug to bleed air from the pump housing until hydraulic oil oozes out.
- After bleeding all the air, securely tighten the plug.



## GENERAL / Precautions for Disassembling and Assembling

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- Bleeding Air from Hydraulic Circuit
  - After refilling hydraulic oil, start the engine. While operating each cylinder, operate the machine under light loads for 10 to 15 minutes. Slowly start each operation (never fully stroke the cylinders during initial operation stage). As the pilot oil circuit has an air bleed device, air trapped in the pilot oil circuit will be bled while performing the above operation for approx. 5 minutes.
  - Reposition the front attachment to check hydraulic oil level.
  - Stop the engine. Recheck hydraulic oil level. Replenish oil as necessary.



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# GENERAL / Precautions for Disassembling and Assembling

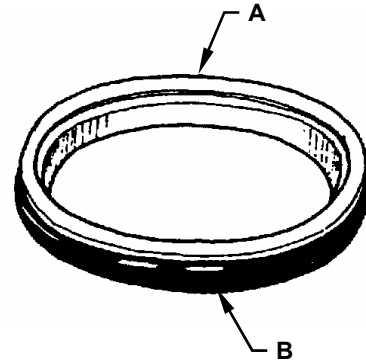
## Floating Seal Precautions

1. In general, replace the floating seal with a new one after disassembling.  
If the floating seal is to be reused, follow these procedures:

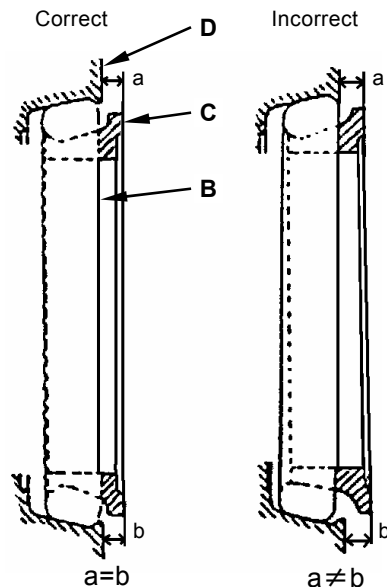
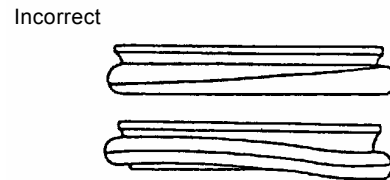
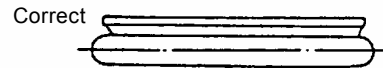
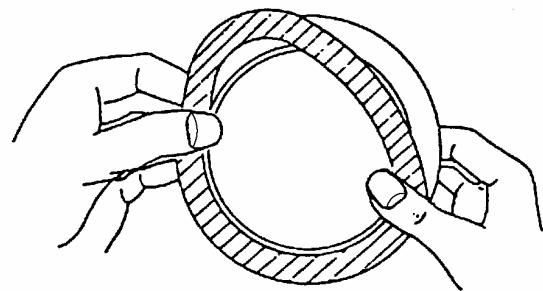
- (1) Keep seal rings together as a matched set with seal ring faces together. Insert a piece of cardboard to protect surfaces.
- (2) Check sliding surface (C) on seal ring (A) for scuffing, scoring, corrosion, deformation or uneven wear.
- (3) Check O-ring (B) for tears, breaks, deformation or hardening.

2. If incorrectly assembled, oil leakage or damage will occur. Be sure to do the following, to prevent trouble.

- (1) Clean the floating seal and seal mounting bores with cleaning solvent. Use a wire brush to remove mud, rust or dirt. After cleaning, thoroughly dry parts with compressed air.
- (2) Clean the floating seal and seal mounting bores. Check the bore surface for scuffing or scoring by touching the surface with touch.
- (3) Check that O-ring (B) is not twisted, and that it is installed correctly on seal ring (A).
- (4) After installing the floating seal, check that seal ring surface (C) is parallel with seal mating face (D) by measuring the distances (C) and (D) at point (a) and (b), as illustrated. If these distances differ, correct O-ring (B) seating.



W105-03-05-019



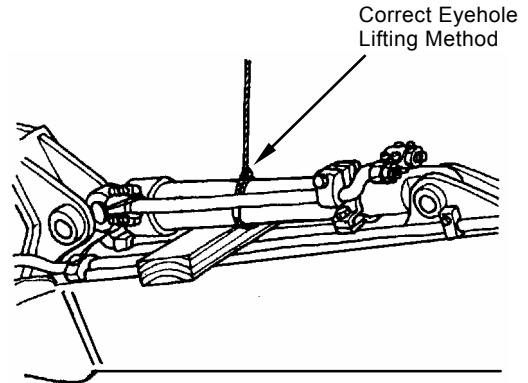
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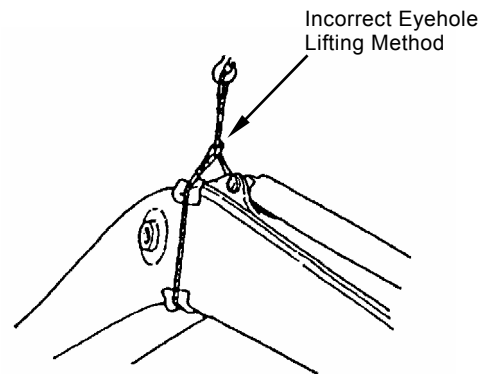
## GENERAL / Precautions for Disassembling and Assembling

### Precautions for Using Nylon Sling

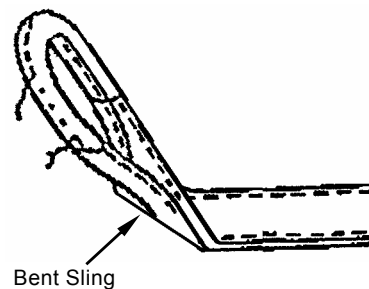
1. Follow the precautions below to use nylon slings safely.
  - Attach protectors (soft material) on the corners of the load so that the nylon sling does not directly contact the corners. This will prevent the nylon sling from being damaged and the lifted load from slipping.
  - Lower the temperature of the lifted load to lower than 100 °C (212 °F). If unavoidably lifting a load with a temperature of 100 °C (212 °F) or more, reduce the load weight.
  - Do not lift acid or alkali chemicals.
  - Take care not to allow the sling to become wet. The load may slip.
  - When required to use more than one sling, use slings with the same width and length to keep the lifted load balanced.
  - When lifting a load using an eyehole, be sure to eliminate any gaps between the sling and load. (Refer to the right illustration.) Reduce the load weight so that it is less than 80 % of the sling breaking force.
  - Avoid using twisted, bound, connected, or hitched slings.
  - Do not place any object on twisted or bent slings. (Refer to the right illustration.)
  - When removing the slings from under the load, take care not to damage the nylon slings. Avoid contact with protrusions.
  - Avoid dragging slings on the ground, throwing slings or pushing slings with a metal object.
  - When using with other types of slings (wire rope) or accessories (shackle), protect the joint so that the nylon sling is not damaged.
  - Store the nylon slings indoors so they won't deteriorate with heat, sun light, or chemicals.



W102-04-02-016



W105-04-01-008



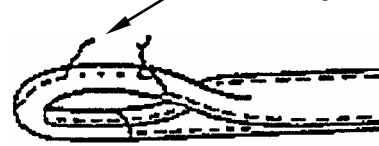
W162-01-01-009

## GENERAL / Precautions for Disassembling and Assembling

**CAUTION:** If a load is lifted with a damaged nylon sling, serious personal injury may result. Be sure to visually check the nylon sling for any damage before using.

2. Before using a nylon sling, visually check the nylon sling for any damage corresponding to examples shown to the right. If any damage is found, cut and discard the sling. Even if no damage is found, do not use slings older than 7-years.

Damaged Appearance Broken Sewing Thread



W162-01-01-002

Scuffing



W162-01-01-003



W162-01-01-004

Broken Sewing Thread



W162-01-01-005

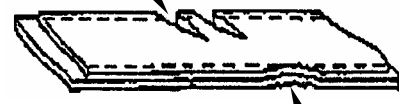
Broken Sewing Thread



W162-01-01-006

Scoring

Separation of Belt



W162-01-01-007

Fuzz

Scuffing

Broken Warp



W162-01-01-008

## **GENERAL / Precautions for Disassembling and Assembling**

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### **MAINTENANCE STANDARD TERMINOLOGY**

#### **“Standard”**

1. Dimension for parts on a new machine.
2. Dimension of new components or assemblies adjusted to specification.

#### **“Allowable Limit”**

1. Normal machine performance cannot be accomplished after exceeding this limit.
2. Repair or adjustment is impossible after exceeding this limit.
3. Therefore, in consideration of operation efficiency and maintenance expense, proper maintenance shall be carried out before reaching the “Allowable Limit”.

## **GENERAL / Precautions for Disassembling and Assembling**

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## GENERAL / Tightening


### TIGHTENING TORQUE SPECIFICATIONS

Bolts and Nuts of Machine: Standard Tightening Torque Chart

	Descriptions	Machine	Bolt Dia.	Q'ty	Wrench Size (mm)	Torque N·m (kgf·m)
1	Front axle mounting bolt	ZW220	27	8	41	1128 (115)
		ZW250	30	8	46	1579 (161)
2	Rear axle support mounting bolt	ZW220	24	8	36	1128 (115)
		ZW250	27	8	41	1128 (115)
3	Wheel rim mounting bolt	ZW220	24	72	36	890 (91)
		ZW250	24	80	36	890 (91)
4	Propeller shaft mounting bolt	In common	12	20	17	**143 (15)
5	Propeller shaft support bearing mounting bolt	In common	20	2	30	206 (21)
6	Transmission mounting bolt; bracket	In common	20	4	30	**401 (41)
			12	8	17	**81.2 (8)
7	Transmission mounting bolt; cushion rubber	In common	18	2	27	315 (32)
8	Engine mounting bolt; bracket	In common	10	12	14	**46.2 (5)
9	Engine mounting bolt; cushion rubber	In common	18	2	27	315 (32)
10	Counterweight mounting bolt	In common	30	4	46	1510 (154)
11	Flange above upper center pin fixing (The bolts with mark ** are located at center of flange.)	ZW220	16	7	24	224 (23)
		ZW250	16	10	24	**224 (23)
12	Lower center pin stopper	In common	16	1	24	86.9 (9)
13	Loader front pin stopper	In common	16	13	24	86.9 (9)
14	Steering cylinder pin stopper	In common	16	4	24	86.9 (9)
15	Radiator frame mounting bolt	In common	16	6	24	**154 (16)
16	Radiator mounting bolt	In common	8	4	12	17.6 (2)
17	Intercooler mounting bolt	In common	10	4	14	36.2 (4)
18	Oil cooler mounting bolt	In common	10	4	14	36.2 (4)
19	Torque converter mounting bolt	In common	10	2	14	36.2 (4)
20	Air conditioner condenser mounting bolt	In common	8	4	12	12.5 (1)
21	Air conditioner compressor mounting bolt	In common	8	4	12	23 to 0 (2 to 3)
22	Cab cushion rubber	In common	16	4	24	**205 (21)
23	Bucket teeth mounting bolt (optional)	In common	*11/4'	16	46	1940 (198)
24	Cutting edge mounting bolt	In common	*1'	12	37.47	1068 (109)
25	Wear plate mounting bolt	In common	*1'	4	37.47	1068 (109)

As for the bolt Dia. with mark \*, the dimension is indicated in inch.

As for torque with mark \*\*, LOCTITE #262 is used.

 **NOTE:** When tightening, apply lubricant in order to reduce friction coefficient of bolts and nuts.  
(Ex. white zinc B dissolved into spindle oil)  
Remove rust, dirt and dust before installing fasteners.

## GENERAL / Tightening

### TORQUE CHART



**CAUTION:** Use tools appropriate for the work to be done. The make-do tools or parts are dangerous. As the incorrect size tools are slipped or removed, personal injury may be caused.



#### Bolt Types

Tighten the nuts or bolts correctly to the torque specifications.

As the different types and grades of bolt are used, use and tighten the correct bolts correctly when assembling the machine or components.

SA-040

#### Specified Tightening Torque

Bolt Dia. (mm)	Hexagon Wrench												Wrench Size mm
	4.6				8.8				10.9				
	M4GB-07-121		M4GB-07-122		M4GB-07-123		M4GB-07-123		M4GB-07-123		M4GB-07-123		
	Target Value		Allowable Value		Target Value		Allowable Value		Target Value		Allowable Value		
	N·m	kgf·cm	N·m	kgf·cm	N·m	kgf·cm	N·m	kgf·cm	N·m	kgf·cm	N·m	kgf·cm	
4	1.15	11.7	0.92 to 1.38	9.4 to 14.1	3.06	31.2	2.45 to 3.67	25.0 to 37.4	4.49	45.8	3.60 to 5.39	36.7 to 55.0	7
5	2.36	24.1	1.89 to 2.82	19.3 to 28.8	6.30	64.2	5.03 to 7.55	51.3 to 77.0	9.24	94.2	7.40 to 11.1	75.5 to 113	8
6	4.98	40.6	3.20 to 4.79	32.6 to 48.8	10.6	108	8.50 to 12.7	86.7 to 130	15.6	159	12.6 to 18.7	128 to 191	10
8	9.81	100	7.84 to 11.7	79.9 to 119	26.1	266	20.9 to 31.0	213 to 319	38.3	391	30.7 to 46.0	313 to 469	13
10	19.5	199	15.6 to 23.4	159 to 239	52.1	531	41.6 to 62.5	424 to 638	76.5	780	61.2 to 91.8	624 to 936	17
12	34.2	349	27.5 to 41.1	280 to 419	91.2	930	73.1 to 109	745 to 1110	133	1360	108 to 161	1100 to 1640	19
14	55.0	561	43.9 to 65.9	448 to 672	146	1490	117 to 177	1190 to 1800	216	2200	173 to 258	1760 to 2630	22
16	86.9	886	69.5 to 104	709 to 1060	232	2370	185 to 279	1890 to 2840	341	3480	272 to 409	2770 to 4170	24
18	118	1200	94.6 to 142	965 to 1450	315	3210	252 to 379	2570 to 3860	463	4720	370 to 555	3770 to 5660	27
20	171	1740	136 to 204	1390 to 2080	452	4610	362 to 543	3690 to 5540	665	6780	534 to 797	5440 to 8130	30
22	234	2390	187 to 252	1910 to 2570	624	6360	499 to 749	5090 to 7640	918	9360	734 to 1100	7480 to 11200	32
24	293	2990	234 to 352	2390 to 3590	782	7970	626 to 938	6380 to 9560	1150	11700	919 to 1380	9370 to 14100	36
27	436	4450	349 to 524	3560 to 5340	1160	11800	931 to 1400	9490 to 14300	1720	17500	1370 to 2050	14000 to 20900	41
30	588	6000	471 to 706	4800 to 7200	1570	16000	1260 to 1880	12800 to 19200	2300	23500	1840 to 2770	18800 to 28200	46
33	810	8260	648 to 972	6610 to 9910	2160	22000	1730 to 2590	17600 to 26400	3170	32300	2540 to 3810	25900 to 38800	50
36	1030	10500	828 to 1250	8440 to 12700	2770	28200	2210 to 3310	22500 to 33800	4060	41400	3240 to 4860	33000 to 49600	55
39	1350	13800	1080 to 1140	11000 to 11650	3600	36700	2880 to 4320	29400 to 44100	5290	53900	4240 to 6350	43200 to 64800	60



## GENERAL / Tightening

### Specified Tightening Torque

Bolt Dia. (mm)	Socket Bolt				Wrench Size (mm)
	Target Value		Allowable Value		
	N-m	kgf-cm	N-m	kgf-cm	
4	4.49	45.8	3.60 to 5.39	36.7 to 55.0	3
5	9.24	94.2	7.40 to 11.1	75.5 to 113	4
6	15.6	159	12.6 to 18.7	128 to 191	5
8	38.3	391	30.7 to 46.0	313 to 469	6
10	76.5	780	61.2 to 91.8	624 to 936	8
12	133	1360	108 to 161	1100 to 1640	10
14	216	2200	173 to 258	1760 to 2630	12
16	341	3480	272 to 409	2770 to 4170	14
18	463	4720	370 to 555	3770 to 5660	14
20	665	6780	534 to 797	5440 to 8130	17
22	918	9360	734 to 1100	7480 to 11200	17
24	1150	11700	919 to 1380	9370 to 14100	19
27	1720	17500	1370 to 2050	14000 to 20900	19
30	2300	23500	1840 to 2770	18800 to 28200	22
33	3170	32300	2540 to 3810	25900 to 38800	24
36	4060	41400	3240 to 4860	33000 to 49600	27
39	5290	53900	4240 to 6350	43200 to 64800	27

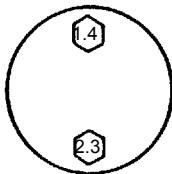
**IMPORTANT:** The following items are applied to both fine and coarse pitch threads.

1. When tightening, apply lubricant in order to reduce friction coefficient of bolts and nuts. (Ex. white zinc B dissolved into spindle oil)
2. Torque tolerance is  $\pm 20\%$ .
3. Use the bolts of correct length. The bolts that are too long cannot be tightened as the bolt tip comes into contact with the bottom of bolt hole. The bolts that are too short cannot develop sufficient tightening force.
4. The torques given in table on the previous page are for general use only. Do not use these torques if a different torque is given for a specific application.
5. Clean the nut and bolt threads and remove dirt or corrosion before installing.

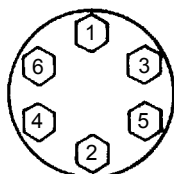
### Tightening Order

When tightening two or more bolts, tighten them alternately, as shown, to ensure even tightening.

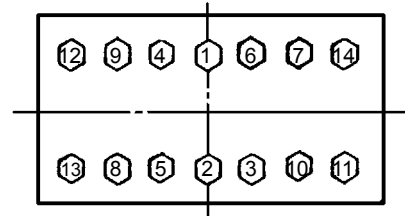
Equally tighten upper and lower alternately



Tighten diagonally



Tighten from center and diagonally

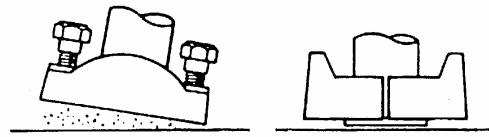


W105-01-01-003

# GENERAL / Tightening

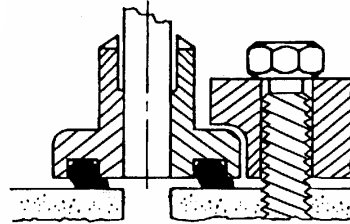
## Precautions for Spilt Flange

- IMPORTANT:**
1. Clean the sealing surfaces. Check if the scratches / roughness that cause leaks and damage of O-ring are found.
  2. Use only specified O-rings. Inspect O-rings for any damage. Do not file the O-ring surfaces. When installing O-ring into a groove, use grease in order to hold O-ring in place.
  3. While tightening the bolt by hand, check that flange is installed to the port correctly. Do not pinch the O-ring.
  4. Tighten the bolts alternately and diagonally, in order to ensure even tightening to the specified torque.
  5. Do not use air wrenches. Using an air wrench often causes tightening of one bolt fully before tighten the others, resulting in damage to O-rings or uneven tightening of bolts.

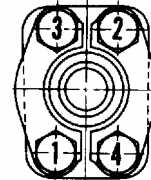


**WRONG**

W105-01-01-015



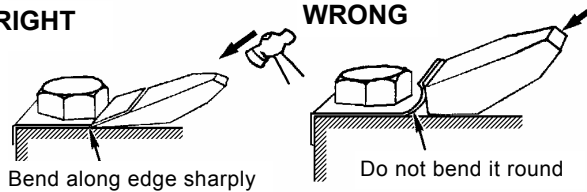
W105-01-01-016



**RIGHT**

**WRONG**

W105-01-01-008



## Nut and Bolt Locking

- Lock Plate

**IMPORTANT:** Do not reuse the lock plates. Do not try to bend the same point twice.

- Split Pin

**IMPORTANT:** Do not align the holes in the bolt and nut while loosening. Tighten and align anytime. Do not reuse the cotter pins.

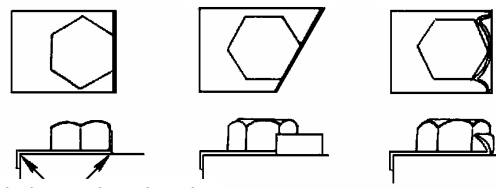
- Wire

**IMPORTANT:** Attach a wire to bolts in the bolt-tightening direction. Do not reuse the wire.

**RIGHT**

**RIGHT**

**WRONG**



Bend along edge sharply

W105-01-01-009

**RIGHT**

**RIGHT**

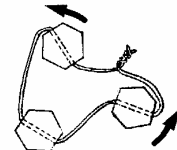
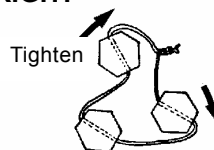
**WRONG**



**RIGHT**

Loosen

**WRONG**

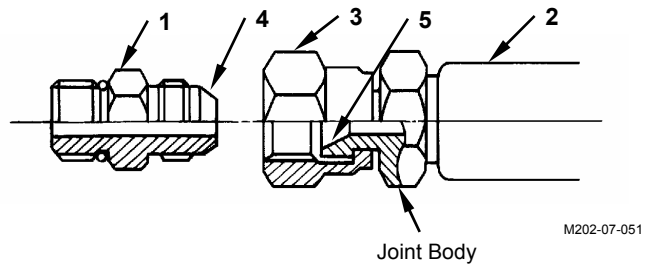


W105-01-01-010

## GENERAL / Tightening

### PIPING JOINT

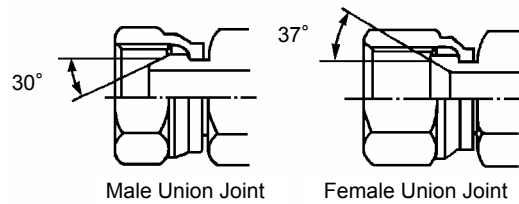
**IMPORTANT:** The torques given in the chart below are for general use only. Do not use these torques if a different torque is given for a specific application.



#### Union Joint

Metal sealing surfaces (4) and (5) of adapter (1) and hose (2) fit together to seal pressure oil. Union joints are used to join small-diameter lines.

- IMPORTANT:**
1. Do not over-tighten nut (3). Excessive force will be applied to metal sealing surfaces (4) and (5), possibly cracking adapter (1). Be sure to tighten nut (3) to specifications.
  2. Scratches or other damage to sealing surfaces (4) or (5) will cause oil leakage at the joint. Take care not to damage them when connecting/disconnecting.



W105-01-01-017

Description	Wrench Size mm	Wrench Size mm	Tightening Torque
	Union Nut	Joint Body	N-m (kgf-m, lbf-ft)
37° female	17	14	24.5 (2.5, 18)
	19	17	29.5 (3.0, 21.5)
	22	19	39 (4.0, 28.5)
	27	22	93 (9.5, 69)
	32	27	137 (14.0, 101)
	36	32	175 (18.0, 129)

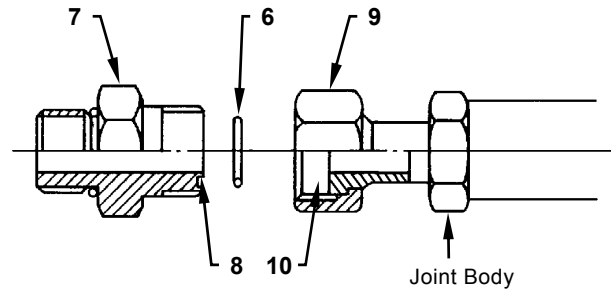
**NOTE:** Tightening torque of 37° male coupling without union is similar to tightening torque of 37° female.

## GENERAL / Tightening

### O-ring Seal Joint

O-ring (6) is installed against the end face of adapter (7) and seals pressure oil.

- IMPORTANT:**
1. Replace O-ring (6) with a new one when reinstalling.
  2. Before tightening union nut (9), confirm that O-ring (6) is seated correctly in O-ring groove (8). Tightening union nut (9) with O-ring (6) displaced will damage O-ring (6), resulting in oil leakage.
  3. Do not damage O-ring groove (8) or sealing surface (10) in adapter (7). Damage to O-ring (6) may cause oil leakage.
  4. If union nut (9) is found to be loose, causing oil leakage, do not tighten it to stop the leak. Instead, replace O-ring (6) with a new one, then tighten union nut (9) after confirming that O-ring (6) is securely seated in place.



M104-07-033

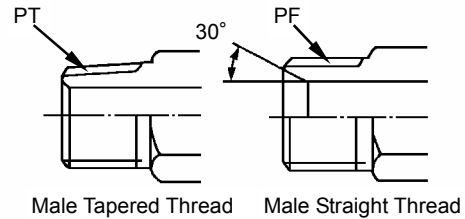
Wrench Size mm	Wrench Size mm	Tightening Torque
Union Nut	Joint Body	N·m (kgf·m, lbf·ft)
27	22	93 (9.5, 69)
32	27	137 (14.0, 101)
36	30,32	175 (18.0, 129)
41	36	205 (21.0, 151)
50	46	330 (33.7, 243)

## GENERAL / Tightening

### Screw-In Connection

Depending on types of screw and sealing, different types of screw-in connection are used.

**IMPORTANT:** Check that the thread pitch and thread type (tapered or straight) are the correct type before using any screw-in connection.  
 (In general, the screw-in connection of male tapered thread is used except when measuring.)



W105-01-01-018

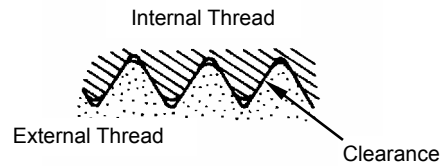
Wrench Size mm	Tightening Torque N·m (kgf·m, lbf·ft)	
	FC material	SS material
19	14.5 (1.5,10.5)	34 (3.5,25)
22	29.5 (3.0,21.5)	49 (5.0,36)
27	49 (5.0,36)	93 (9.5,69)
36	69 (7.0,51)	157 (16,116)
41	108 (11,80)	205 (21,151)
50	157 (16,116)	320 (33,235)
60	195 (20,144)	

### Seal Tape Application

Seal tape is used in order to seal clearances between male and female threads so that any leaks between threads may be prevented. Apply just enough seal tape to fill up thread clearances. Do not overwrap.

- Application Procedure

Check that the thread surface is clean and, free of dirt or damage. Apply the seal tape around threads in order to leave one to two pitch threads uncovered. Wrap the seal tape in the same direction as the threads.



W105-01-01-019

### Low-Pressure-Hose Clamp Tightening

Low-pressure-hose clamp tightening torque differs depending on the type of clamp.

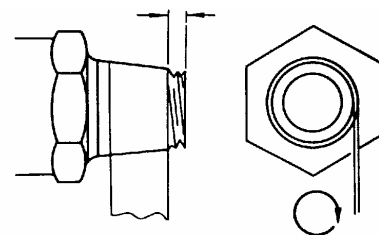
T-Bolt Type Band Clamp:

4.4 N·m (0.45 kgf·m, 3.25 lbf·ft )

Worm Gear Type Band Clamp:

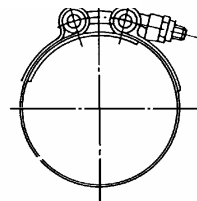
5.9 to 6.9 N·m (0.6 to 0.7 kg·m, 4.3 to 5.1 lbf·ft)

Leave one to two pitch threads uncovered



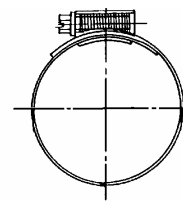
M114-07-041

T-Bolt Type Band Clamp



M114-07-043

Worm Gear Type Band Clamp



M114-07-042

# GENERAL / Tightening

## Connecting Hose



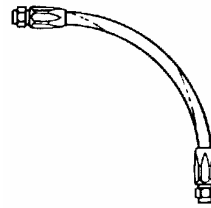
**CAUTION:** When replacing the hoses, use only genuine Hitachi service parts. Using hoses other than genuine Hitachi hoses may cause oil leaks, hose rupture or separation of fitting, possibly resulting in a fire on the machine.

Do not install hoses kinked. Application of high oil pressure, vibration, or an impact to a kinked hose may result in oil leaks, hose rupture or separation of fitting. Utilize the print marks on hoses when installing in order to prevent hose from being kinked.

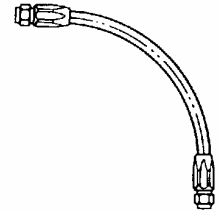
Take necessary measures to protect hoses from rubbing against each other. If the hoses rub against each other, wear to the hoses may result and lead to hose rupture.

Take care so that the hoses do not come into contact with the moving parts or sharp objects.

**WRONG**

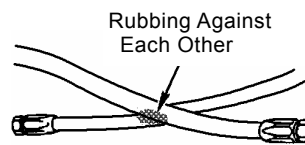


**RIGHT**

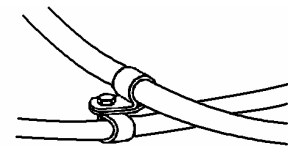


W105-01-01-011

**WRONG**

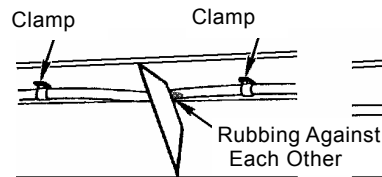


**RIGHT**

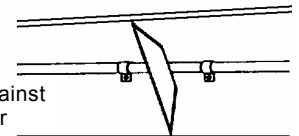


W105-01-01-012

**WRONG**

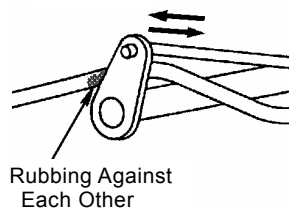


**RIGHT**

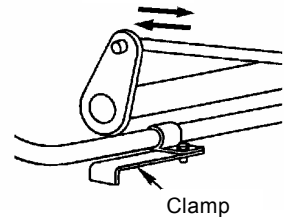


W105-01-01-013

**WRONG**



**RIGHT**



W105-01-01-014

## GENERAL / Tightening

### PERIODIC REPLACEMENT PARTS

#### 1. Periodic Replacement Parts (1) (Safety Inspection Object)

In order to ensure safe operation, the users must conduct daily checking before starting operation and periodic inspection of the machine by law.

In order to ensure safe operation, conduct periodic replacement of the security parts below.

		Replacement Parts Name	Replacement Intervals	Replacement Cause
Engine	Fuel tank	Hose	Every 2 years	Fire breaking may occur because of fuel leakage.
Brake system	Brake valve	Seals (rubber)	Every 1 year	If oil leakage occurs when traveling, the machine cannot be controlled.
	Wet-type brake	D-ring in piston	Every 4 years	
	Brake pipe	Hose	Every 2 years	
	Stop Lamp	Switch	Every 2 years	
	Accumulator	Accumulator (3 used)	Every 2 years	
Steering system	Steering pipe	Hose	Every 2 years	If oil leakage occurs, the steering cannot be controlled.
	Steering cylinder	Seals (rubber)	Every 4 years	
	Steering valve	Seals (rubber)	Every 2 years	

1. These parts deteriorate, fatigue and weaken with time. As it is very difficult to gauge extent of the damaged parts according to periodic inspection, replace them with the new ones regardless of defect in the interval.
2. If any of these parts are found to be defective regardless of the interval, repair or replace these parts.

## GENERAL / Tightening

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### 2. Periodic Replacement Parts (2)

In order to ensure safe operation, conduct periodic inspection of the machine. In order to ensure safe operation further, conduct periodic replacement of the parts below specially related to safety.

These parts deteriorate, fatigue and weaken with time. This may cause serious personal/impersonal hazard. As it is very difficult to gauge remnant life of these parts according to driving sensation or appearance inspection, replace them with the new ones regardless of defect in the interval.

If any of these parts are found to be defective according to periodic inspection regardless of the interval, replace these parts

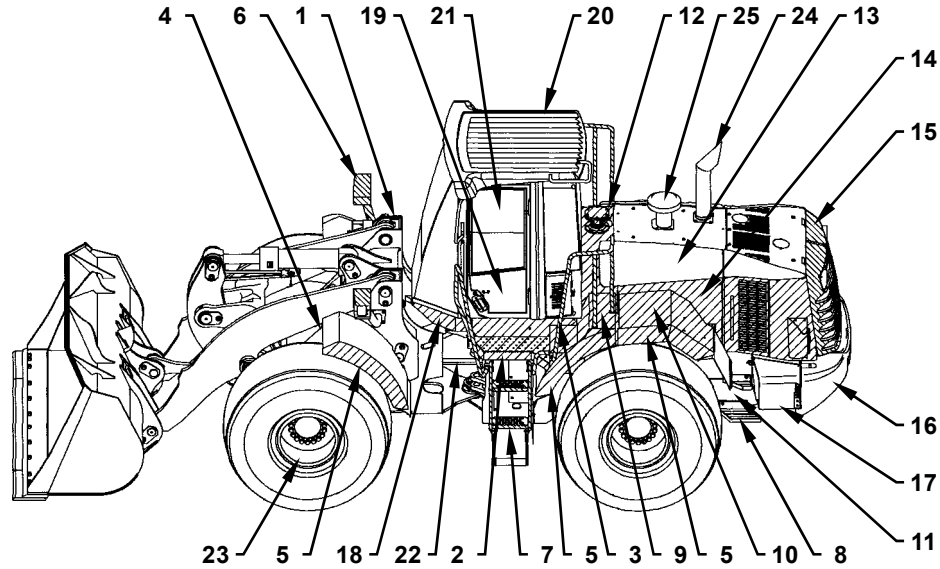
		Replacement Parts Name	Replacement Intervals
Hydraulic system	Pump	Suction hose Delivery hose	Every 2 years
	Working system	Bucket cylinder hose Pilot hose Lift arm cylinder line hose	Every 2 years
Driver's seat	Seat belt	Seat belt	Every 3 years

 **NOTE:** Replace O-rings and the gaskets when replacing the hoses.



## GENERAL / Painting

### PAINTING



W4GB-01-03-001

	Surfaces to Be Painted	Painting Colour		Surfaces to Be Painted	Painting Colour
1	Body	TAXI Yellow	15	Rear Grill	Not painted
2	Deck Plate	HG Beige Deep	16	Counterweight	TAXI Yellow
3	Handrail	Warm Gray	17	Battery Box	TAXI Yellow
4	Front Fender	TAXI Yellow	18	Cockpit Skirt	HG Beige Deep
5	Fender Cover	Not painted	19	Cockpit and mounting parts (Valve control box and so on)	HG Beige Deep
6	Lamp Bracket	Warm Gray	20	Outside of Cab	HG Beige Deep
7	Step	Warm Gray	21	Inside and Outside Surface of Cab	HG Beige Deep
8	Rear Step	TAXI Yellow	22	Articulate lock Bar	Red
9	Rear Fender	HG Beige Deep	23	Rim	TAXI Yellow
10	Full Fender	HG Beige Deep	24	Tail Pipe	Not painted
11	Fuel Tank	TAXI Yellow	25	Pre-Cleaner	Not painted
12	Oil Tank	HG Beige Deep			
13	Side Cover	TAXI Yellow			
14	Lower Cover	HG Beige Deep			

**IMPORTANT:** When cleaning around front attachment or cylinder, etc. fitted with HN bushing, do not pour washing liquid directly on the bushing.  
The ambient temperature should not exceed 70 °C (158 °F) when painting and drying.

## GENERAL / Painting

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(Blank)

## GENERAL / Bleed Air From Hydraulic Oil Tank

### BLEED AIR FROM HYDRAULIC OIL TANK




**CAUTION:** Escaping fluid under pressure may penetrate the skin and eyes, and cause serious injury. Release the pressure before removing hydraulic or other lines.

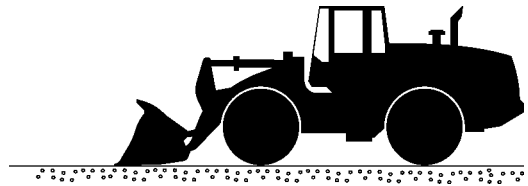
Hot hydraulic oil just after operation may spout and cause severe burns. Wait for oil in order to cool before starting any work.

Do not turn the cap on hydraulic oil tank quickly. The cap may fly off by internal pressure. Release any remaining pressure and remove the cap.

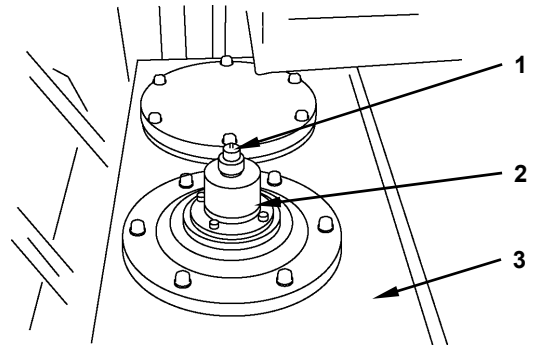
#### Preparation

1. Park the machine on a solid, level surface. Lower the front attachment onto the ground.
2. Stop the engine. Push valve (1) on hydraulic oil tank (3) and release any remaining pressure.
3. Remove cap (2) on hydraulic oil tank (3).
4. Install a vacuum pump to the hole without cap (2). Operate the vacuum pump and maintain negative pressure in hydraulic oil tank (3).

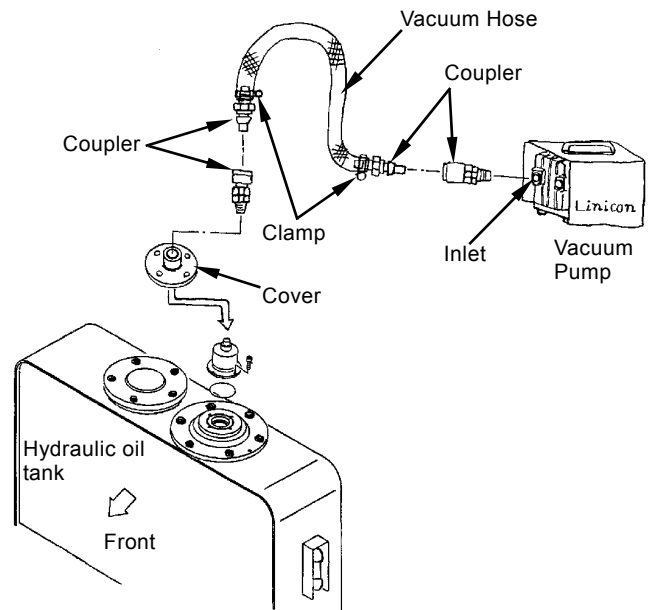
 **NOTE:** Run the vacuum pump continuously while working.



W4GB-01-01-001



W4GB-01-01-002



W4GB-01-04-001

## **GENERAL / Bleed Air From Hydraulic Oil Tank**

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(Blank)





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# SECTION 2 BODY (UPPERSTRUCTURE)



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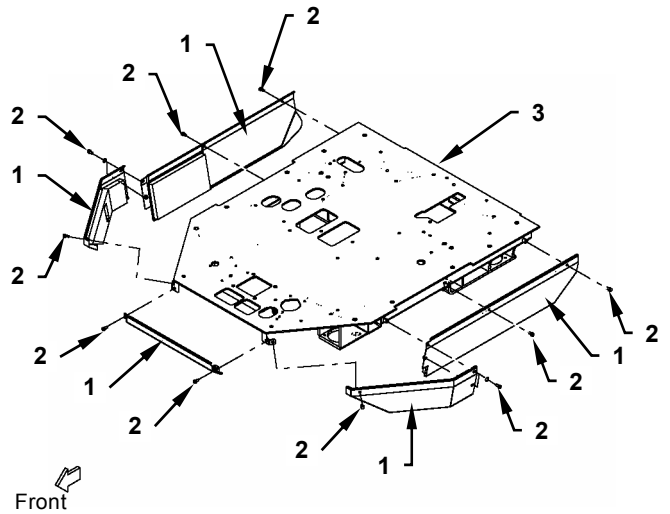
## BODY (UPPERSTRUCTURE) / Cab

### REMOVE AND INSTALL CAB


#### Removal of Cab with Cockpit Attached

1. Remove sems bolts (2) (12 used) from covers (1) (5 used). Remove covers (1) (5 used) from cockpit (3).


 : 17 mm

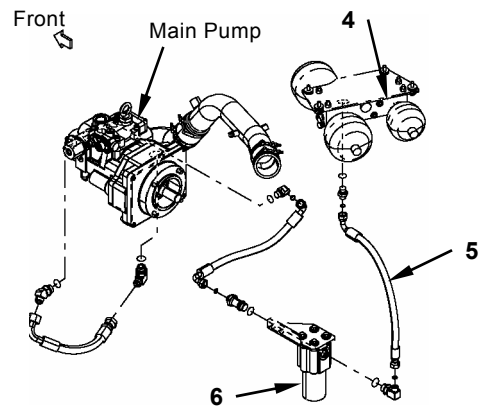


W4GB-02-01-001

 **CAUTION:** Hydraulic pressure is accumulated in the hydraulic system by an accumulator. Reduce pressure according to the work point for each before disconnecting the main, steering and brake system hoses.


2. Disconnect hose (5) between charging block (4) and oil filter (6). Attach an identification tag onto the disconnected hoses for assembling. Cap the disconnected hoses.

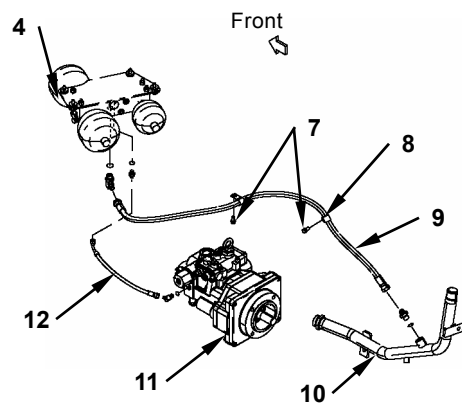
 : 22 mm, 27 mm



W4GB-02-01-002

3. Remove sems bolts (7) (2 used) from clamps (8) (2 used). Disconnect hose (9) between charging block (4) and return pipe (10). Disconnect hose (12) between main pump (11) and charging block (4).


 : 14 mm, 17 mm, 22 mm, 27 mm

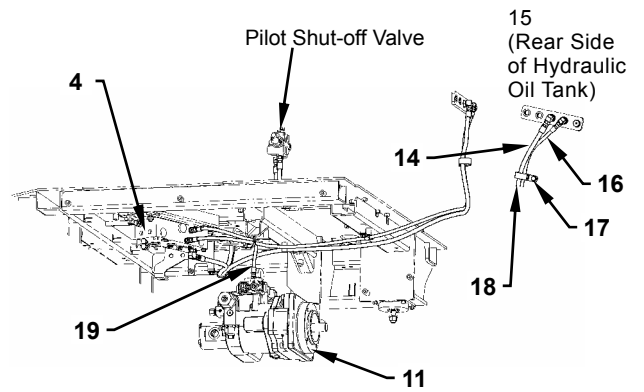


W4GB-02-01-003

## BODY (UPPERSTRUCTURE) / Cab


4. Remove sems bolts (17) (3 used) from clamps (18) (3 used). Disconnect hose (19) between charging block (4) and main pump (11). Disconnect hoses (14, 16) between charging block (4) and the rear side of hydraulic oil tank (15).

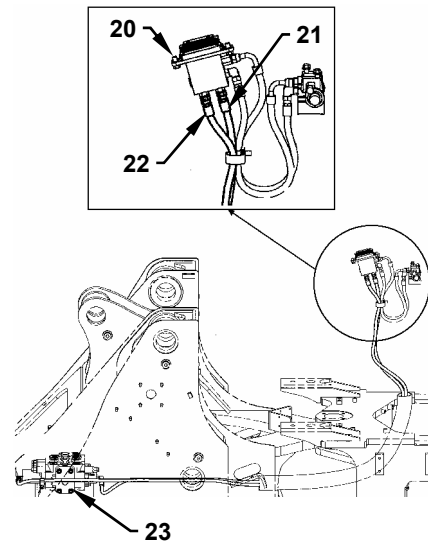
 : 14 mm, 17 mm



W4GB-02-01-004


5. Disconnect hoses (21, 22) between pilot valve (20) and main valve (23).

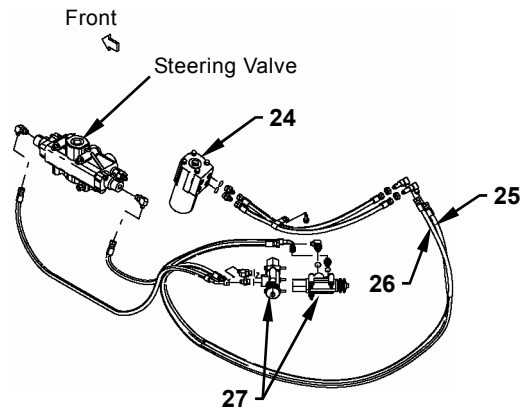
 : 19 mm, 22 mm



W4GB-02-01-005

6. Disconnect hoses (25, 26) between steering pilot valve (24) and stop valve (27).

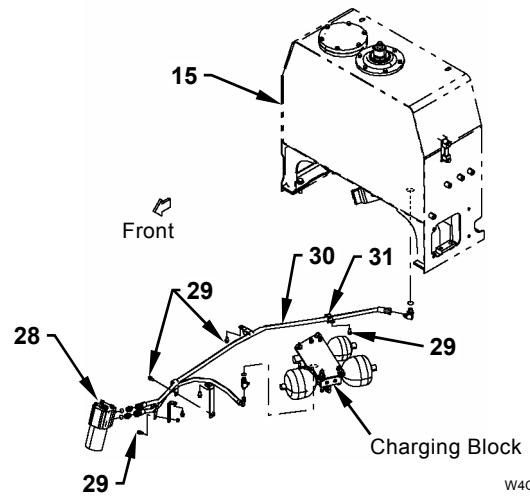
 : 19 mm, 22 mm



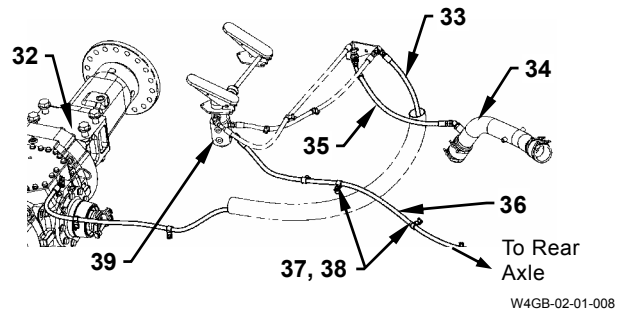
W4GB-02-01-006

## BODY (UPPERSTRUCTURE) / Cab

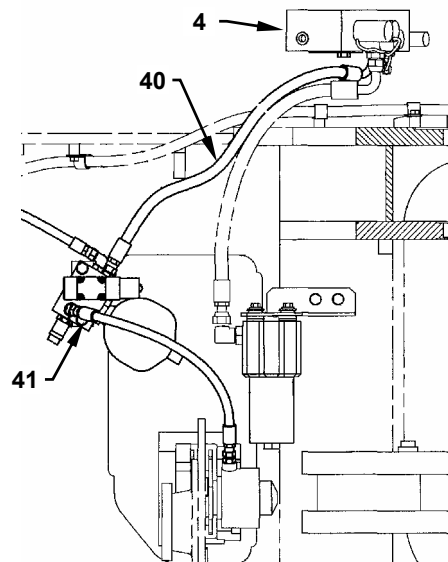
7. Remove sems bolts (29) (4 used) from clamps (31) (4 used). Disconnect hose (30) between steering pilot valve (28) and hydraulic oil tank (15).  
🔧 : 17 mm, 22 mm, 27 mm



8. Remove sems bolts (38) (4 used) from clamps (37) (4 used). Disconnect hose (33) between brake valve (39) and front axle (32). Disconnect hose (35) between brake valve (39) and suction tube (34). Disconnect hose (36) between brake valve (39) and the rear axle.  
🔧 : 17 mm, 19 mm, 22 mm, 27 mm




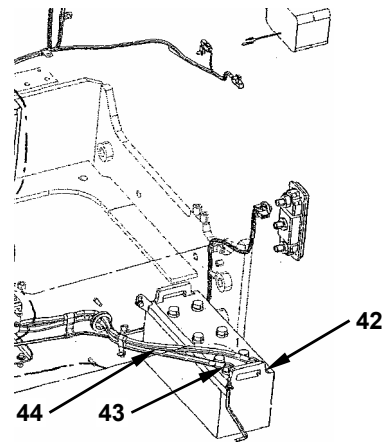
9. Disconnect hose (40) between charging block (4) and parking brake lock (41).  
🔧 : 22 mm



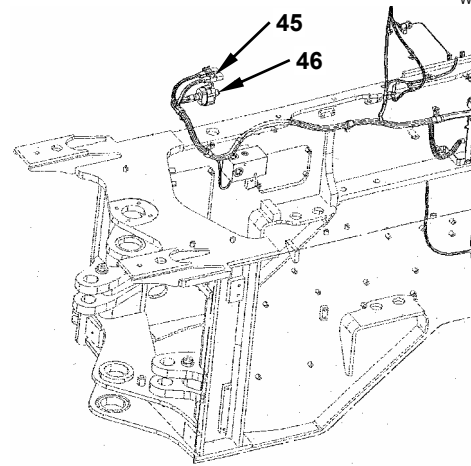
## BODY (UPPERSTRUCTURE) / Cab

10. Remove bolt (43) for terminal minus from battery (42) either left or right side. Disconnect battery cable (44).


 : 12 mm




11. Disconnect connectors (45, 46) of the wire harness under the cab.



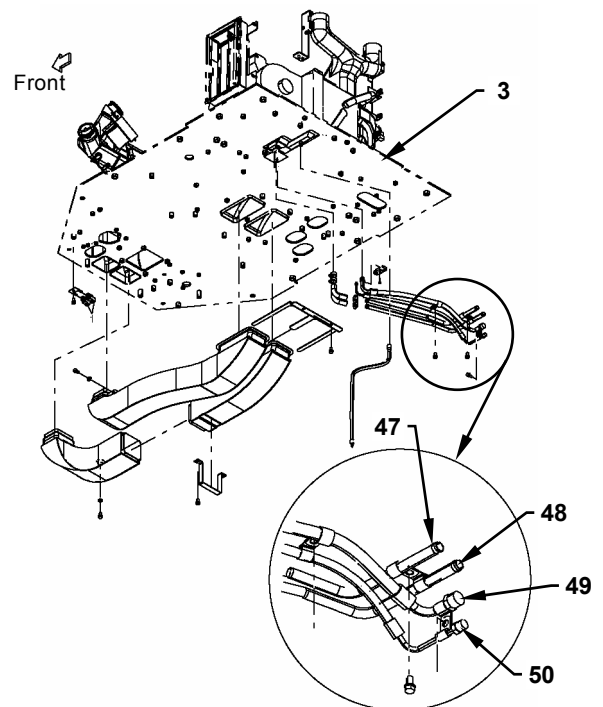
W4GB-02-01-010

 **CAUTION:** This machine uses new freon R134a as refrigerant. Recover all the refrigerants. Do not release them into the atmosphere.

12. Disconnect refrigerant hoses (49, 50) attached to the lower of cockpit (3).

 : 17 mm, 19 mm, 24 mm, 27 mm

13. Drain off coolant from the radiator. Disconnect the hose from heater pipings (47, 48).

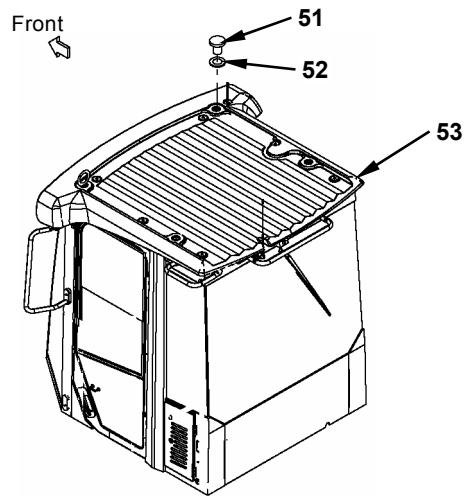


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W4GB-02-01-012

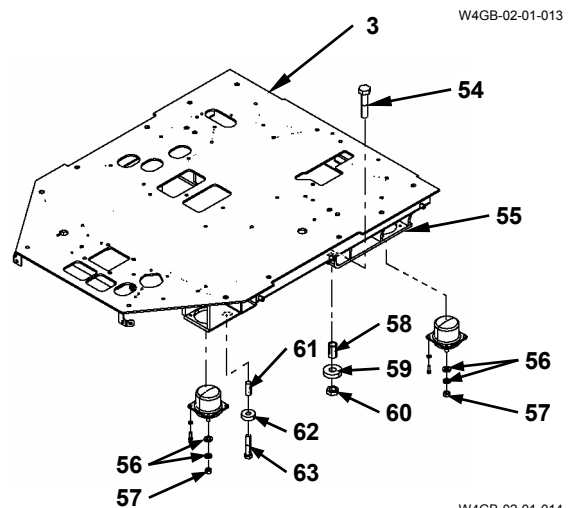
## BODY (UPPERSTRUCTURE) / Cab

14. Remove caps (51) (4 used) and plates with the packing attached (52) (4 used) from the top of cab (53). Install eyebolts (M16, Pitch 2.0 mm) (4 used) to cab (53).



15. Remove bolts (54, 63) (2 used for each), nuts (60) (2 used), (57) (4 used), plates (59, 62) (2 used for each), spacers (58, 61) (2 used for each) and washers (56) (8 used) securing cockpit (3) and frame (55).

 : 17 mm, 30 mm

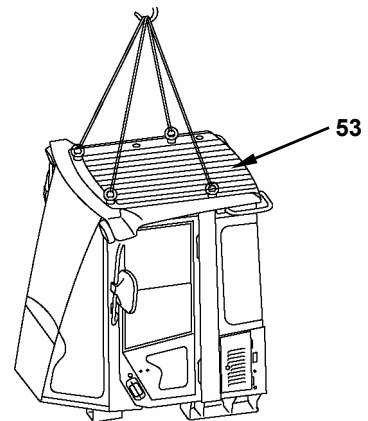


**CAUTION: Cab (53) Weight:**

**ZW220: 1085 kg (2400 lb)**

**ZW250: 1145 kg (2550 lb)**

16. Attach a nylon sling onto the eyebolt on the top of cab (53). Hoist and remove cab (53) from the cockpit.



# BODY (UPPERSTRUCTURE) / Cab

## Installation of Cab

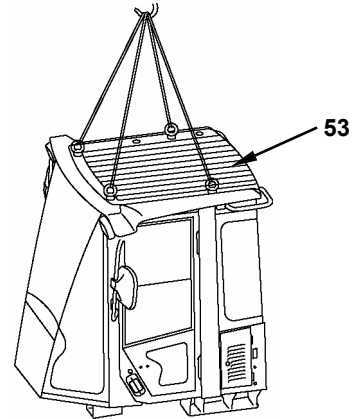


**CAUTION: Cab (53) Weight:**

**ZW220: 1085 kg (2400 lb)**


**ZW250: 1145 kg (2550 lb)**


1. Attach a nylon sling onto eyebolt on the top of cab (53). Hoist and align cab (53) with the holes on the cockpit.





W4GB-02-01-015

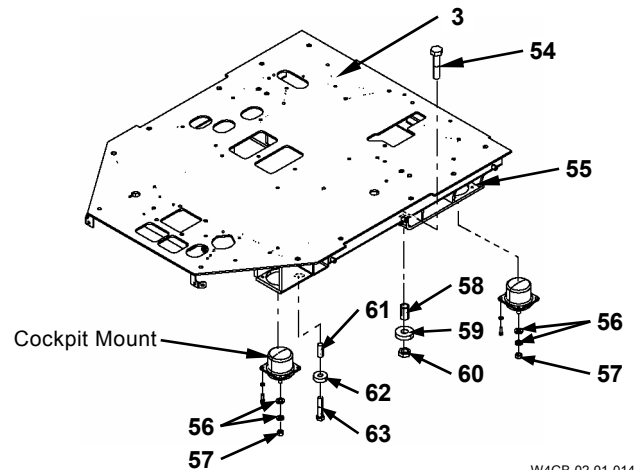
2. Install cockpit (3) to frame (55) with bolts (54, 63) (2 used for each), nuts (60) (2 used), (57) (4 used), plates (59, 62) (2 used for each), spacers (58, 61) (2 used for each) and washers (56) (8 used). At this time, install washer (56) between the cockpit mount and frame (55).

 : 17 mm

 : 50 N·m (5 kgf·m, 36 lbf·ft)

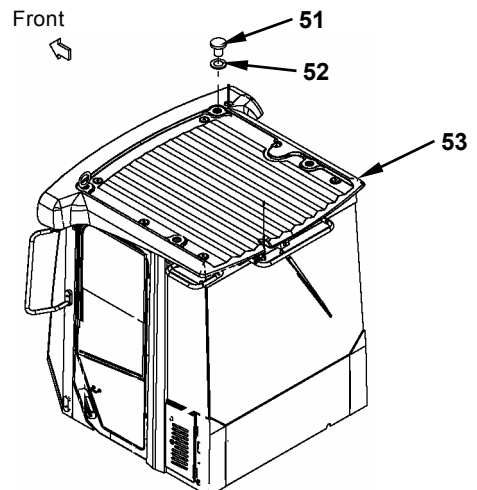
 : 30 mm

 : 137 N·m (14 kgf·m, 101 lbf·ft)



W4GB-02-01-014

3. Remove eyebolts (4 used) from the top of cab (53). Install caps (51) (4 used) and plates with the packing attached (52) (4 used) to cab (53).



W4GB-02-01-013

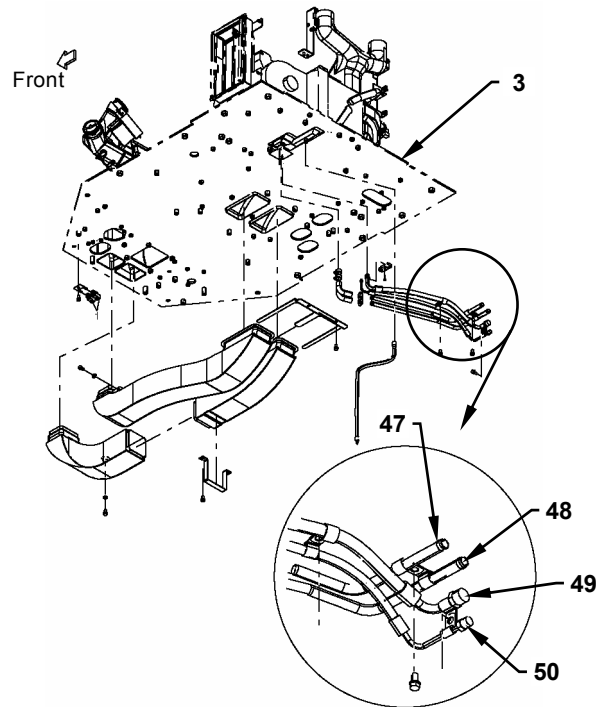
## BODY (UPPERSTRUCTURE) / Cab

4. Connect hoses (49, 50) under cockpit (3).  
Connect heater pipings (47, 48).

-  : 17 mm
-  : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)
-  : 19 mm
-  : 29.4 N·m (3 kgf·m, 21.5 lbf·ft)
-  : 24 mm
-  : 39 N·m (4 kgf·m, 28.5 lbf·ft)
-  : 27 mm
-  : 78 N·m (8 kgf·m, 57.5 lbf·ft)

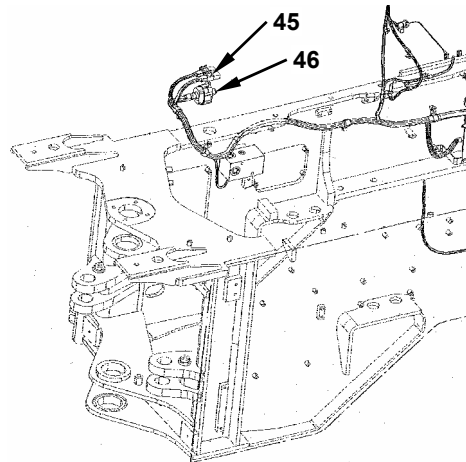
5. This machine uses new freon R134a as refrigerant. Check for any gas leakage after injecting gas for the required amount.

Type	Refrigerant Number	Q'ty kg (lb)
HFC	R134a	1.05±0.05 (2.32±0.11)





W4GB-02-01-012

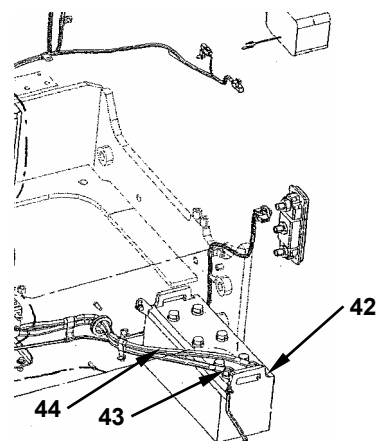
6. Connect connectors (45, 46) of the wire harness under the cab.



W4GB-02-01-011

7. Connect battery cable (44) to terminal minus of battery (42) with bolt (43).


-  : 12 mm
-  : 10 N·m (1 kgf·m, 7.2 lbf·ft)




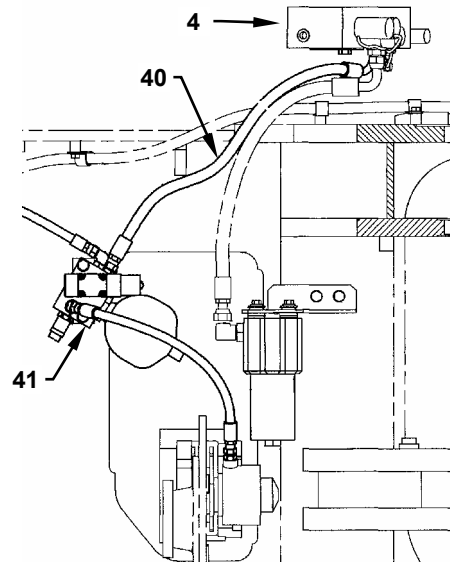
W4GB-02-01-010

## BODY (UPPERSTRUCTURE) / Cab

8. Connect hose (40) between charging block (4) and parking brake block (41).


 : 22 mm


 : 39 N·m (4 kgf·m, 28.5 lbf·ft)





W4GB-02-01-016


9. Connect hose (33) between brake valve (39) and front axle (32). Connect hose (35) between brake valve (39) and suction tube (34). Connect hose (36) between brake valve (39) and the rear axle. Secure clamps (37) (4 used) to the frame with sems bolts (38) (4 used).


 : 17 mm


 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)


 : 19 mm

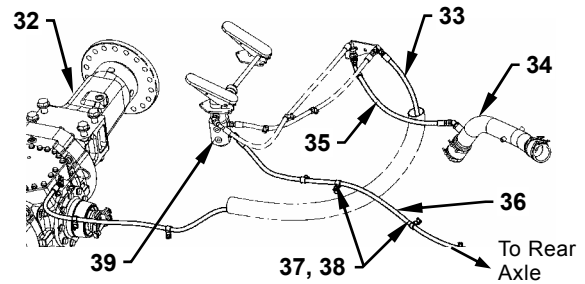
 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)

 : 22 mm

 : 39 N·m (4 kgf·m, 28.5 lbf·ft)


 : 27 mm


 : 78 N·m (8 kgf·m, 57.5 lbf·ft)





W4GB-02-01-008


10. Connect hose (30) between steering pilot valve (28) and hydraulic oil tank (15). Secure clamps (31) (4 used) to the frame with sems bolts (29) (4 used).


 : 17 mm

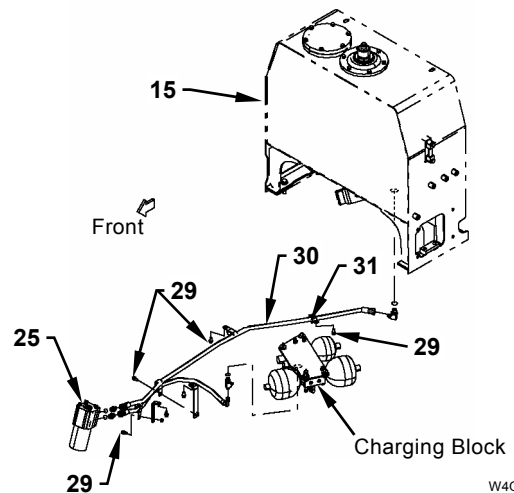
 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)

 : 22 mm

 : 39 N·m (4 kgf·m, 28.5 lbf·ft)

 : 27 mm

 : 78 N·m (8 kgf·m, 57.5 lbf·ft)







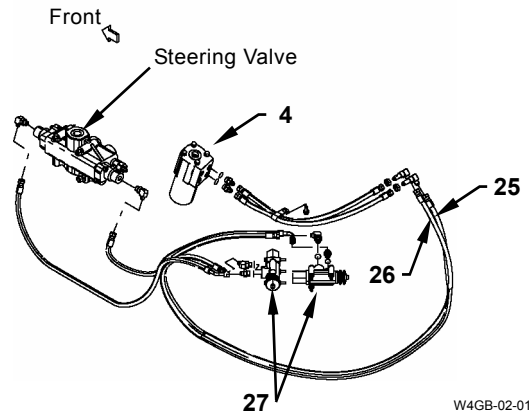
W4GB-02-01-007



## BODY (UPPERSTRUCTURE) / Cab





11. Connect hoses (25, 26) between steering pilot valve (4) and stop valve (27).

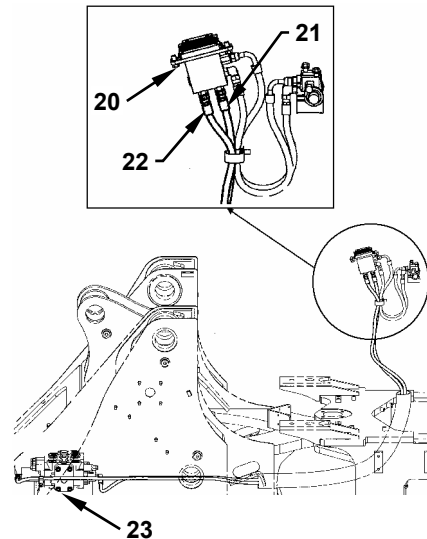
-  : 19 mm
-  : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)
-  : 22 mm
-  : 39 N·m (4 kgf·m, 28.5 lbf·ft)



W4GB-02-01-006

12. Connect hoses (21, 22) between pilot valve (20) and main valve (23).





-  : 19 mm
-  : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)
-  : 22 mm
-  : 39 N·m (4 kgf·m, 28.5 lbf·ft)

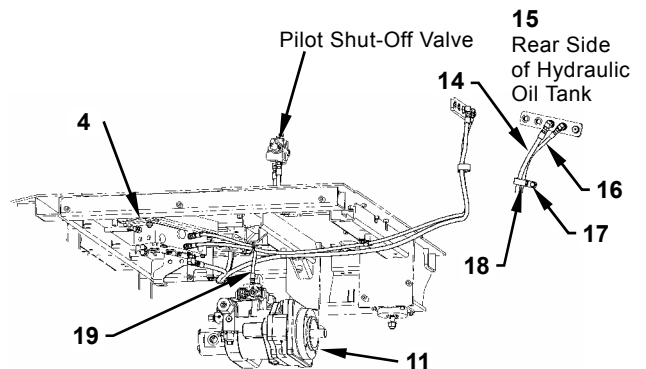


W4GB-02-01-005

13. Connect hose (19) between charging block (4) and main pump (11). Connect hoses (14, 16) between charging block (4) and the rear side of hydraulic oil tank (15).

Secure clamps (18) (3 used) to the frame with sems bolts (17) (3 used).

-  : 14 mm
-  : 20 N·m (2 kgf·m, 14.5 lbf·ft)
-  : 17 mm
-  : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)

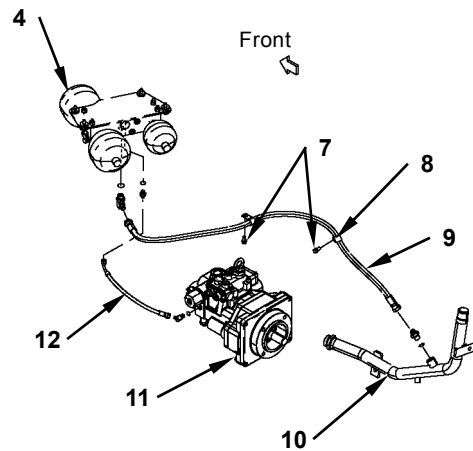


W4GB-02-01-004

## BODY (UPPERSTRUCTURE) / Cab





14. Connect hose (9) between charging block (4) and return pipe (10). Secure clamps (8) (2 used) to the frame with sems bolts (7) (2 used). Connect hose (12) between main pump (11) and charging block (4).

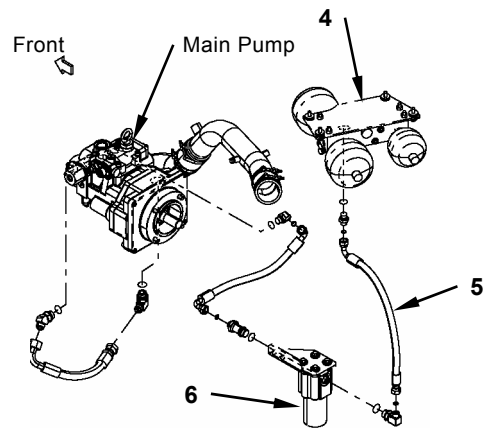
	: 14 mm
	: 20 N·m (2 kgf·m, 14.5 lbf·ft)
	: 17 mm
	: 24.5 N·m (2.5 kgf·m, 18 lbf·ft)
	: 22 mm
	: 39 N·m (4 kgf·m, 28.5 lbf·ft)
	: 27 mm
	: 78 N·m (8 kgf·m, 57.5 lbf·ft)



W4GB-02-01-003

15. Connect hose (5) between charging block (4) and oil filter (6).

	: 22 mm
	: 39 N·m (4 kgf·m, 28.5 lbf·ft)
	: 27 mm
	: 78 N·m (8 kgf·m, 57.5 lbf·ft)



W4GB-02-01-002

16. Add coolant to the radiator. Start the engine and the test run.


Check for any oil leakage at the hose connections.




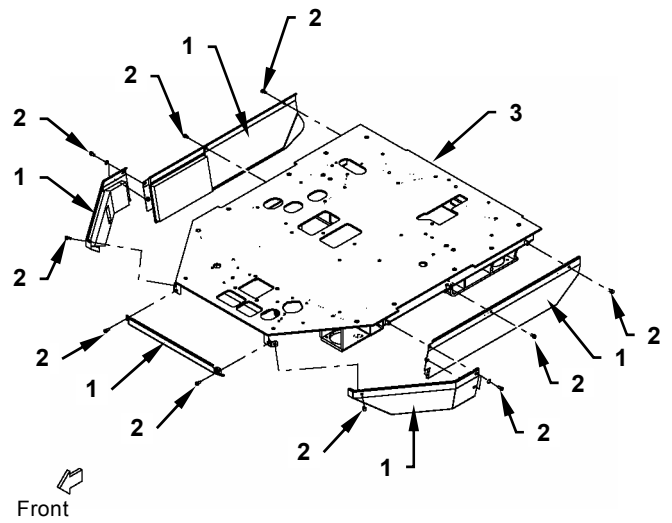
**CAUTION:** Wear safety goggles and gloves when checking oil leaks. Apply cardboard or laminated wood at the check point. High-pressure oil may cause serious injury to the skin and eyes.

## BODY (UPPERSTRUCTURE) / Cab

17. Install covers (1) (5 used) to cockpit (3) with sems bolts (2) (12 used).

 : 17 mm

 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)



W4GB-02-01-001

## **BODY (UPPERSTRUCTURE) / Cab**

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(Blank)

## BODY (UPPERSTRUCTURE) / Counterweight

### REMOVE AND INSTALL COUNTERWEIGHT

#### Removal

**CAUTION:** Counterweight Weight:  
ZW220: 1620 kg (3600 lb)  
ZW250: 1900 kg (4200 lb)

**CAUTION:** 1. Park the machine on a flat place and stop the engine.  
2. Put a check and apply the parking brake in order not to move the machine.  
3. Lower the bucket onto the ground. Release hydraulic pressure in the hydraulic device.


1. Open the rear grill.

**CAUTION:** When removing counterweight (3) with the rear grill closed, the rear grill may be damaged.


2. Install the lifting tool to counterweight (3). Hoist counterweight (3) a little.

**CAUTION:** When hoisting counterweight (3) too much, it difficult to remove bolt (5) and the screw part may be damaged.

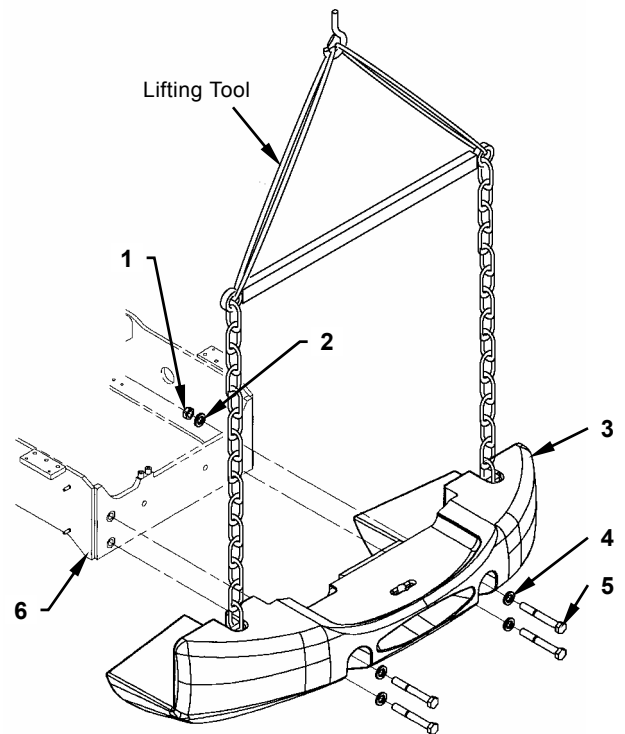
3. Remove nuts (1) (2 used) and washers (2) (2 used) from bolts (5) (2 used) on the upper side.

 : 46 mm

4. Loosen bolts (5) (4 used). Remove bolts (5) (4 used) and washers (4) (4 used) from counterweight (3) while finely adjusting the hoist of counterweight (3).

 : 46 mm

5. Move counterweight (3) to the rear side of frame (6) and remove the counterweight (3).



W4GB-02-02-001

## BODY (UPPERSTRUCTURE) / Counterweight





### Installation

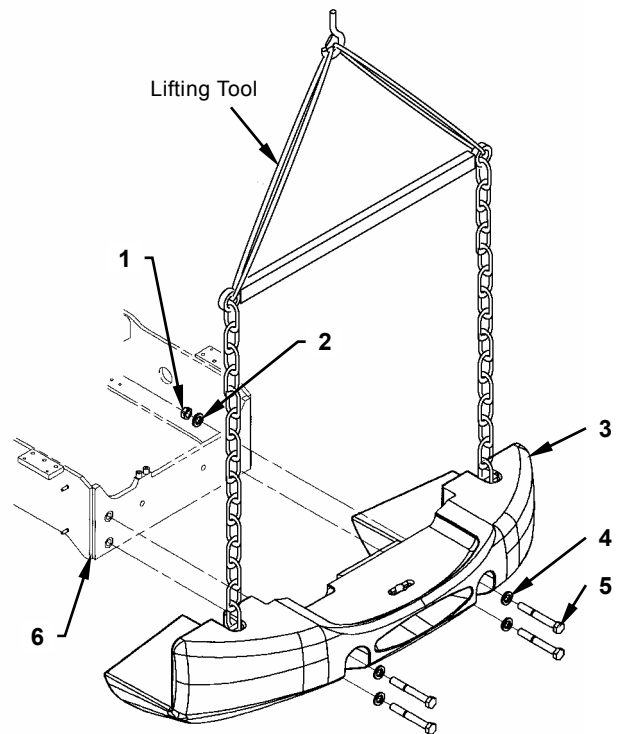


**CAUTION: Counterweight Weight:**

**ZW220: 1620 kg (3600 lb)**

**ZW250: 1900 kg (4200 lb)**

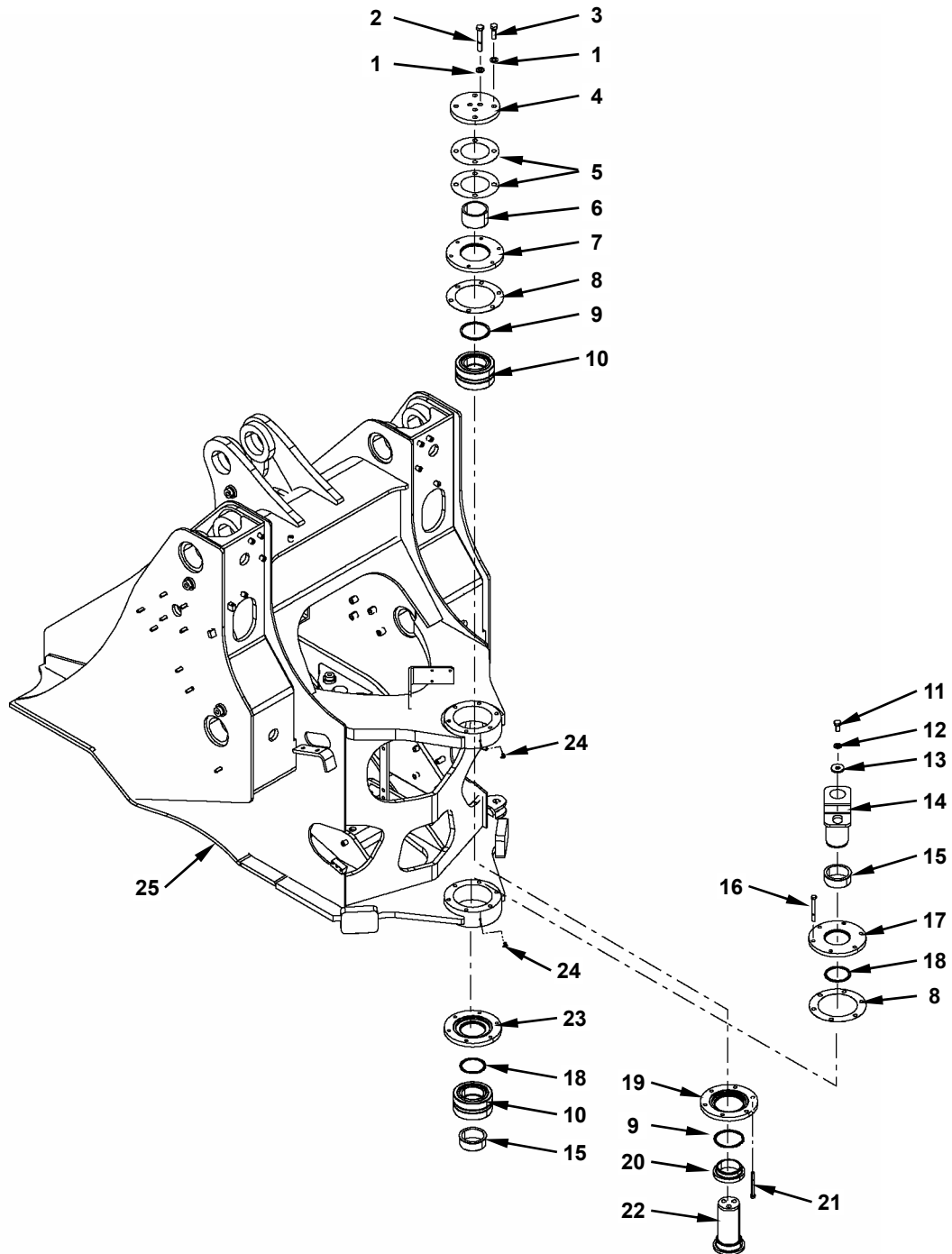
1. Hoist counterweight (3) by using lifting tool. Move counterweight (3) to about 200 mm (8 in) in front of the counterweight (3) mounting part of frame (6).
2. Align the screw holes on counterweight (3) and frame (6). Place counterweight (3) onto frame (6).
3. Install counterweight (3) to frame (6) with bolts (5) (4 used) and washers (4) (4 used).  
 : 46 mm  
 : 1510 N·m (154 kgf·m, 1110 lbf·ft)
4. Install nuts (1) (2 used) and washers (2) (2 used) to bolts (5) (2 used) on the upper side.  
 : 46 mm  
 : 1510 N·m (154 kgf·m, 1110 lbf·ft)



W4GB-02-02-001

# BODY (UPPERSTRUCTURE) / Center Hinge

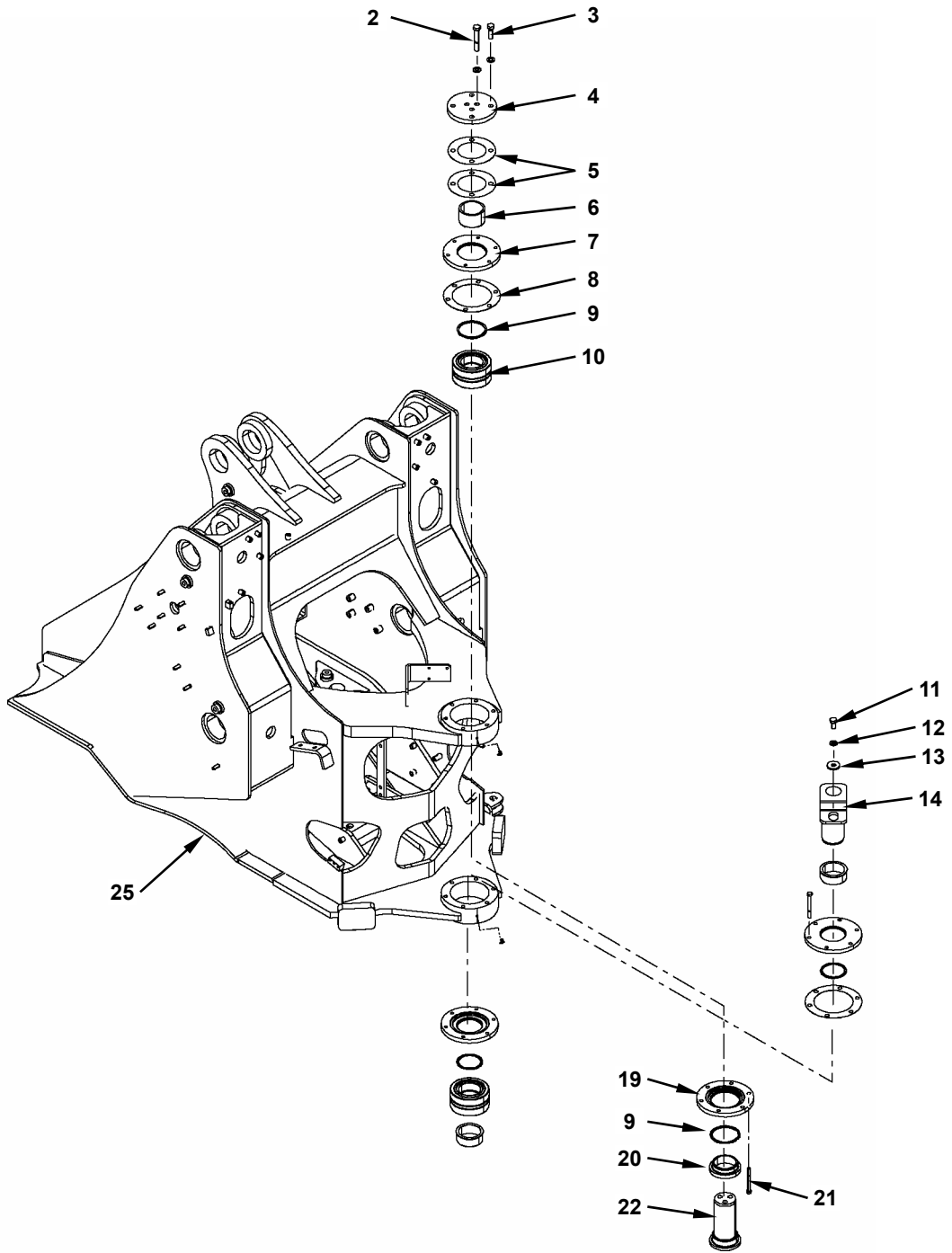
## DISASSEMBLE CENTER HINGE



W4GB-02-03-001

- |  |                        |                         |                              |
|--|------------------------|-------------------------|------------------------------|
| 1 - Washer<br>(ZW220: 7 Used) (ZW250: 10 Used) | 8 - Shim (2 Used)      | 14 - Pin                | 20 - Bushing                 |
| 2 - Bolt<br>(ZW220: 3 Used) (ZW250: 4 Used)    | 9 - Dust Seal (2 Used) | 15 - Bushing (2 Used)   | 21 - Bolt (6 Used)           |
| 3 - Bolt<br>(ZW220: 4 Used) (ZW250: 6 Used)    | 10 - Bearing (2 Used)  | 16 - Bolt (6 Used)      | 22 - Pin                     |
| 4 - Flange                                     | 11 - Bolt              | 17 - Cap                | 23 - Cap                     |
| 5 - Shim (2 Used)                              | 12 - Washer            | 18 - Dust Seal (2 Used) | 24 - Grease Fitting (2 Used) |
| 6 - Bushing                                    | 13 - Washer            | 19 - Cap                | 25 - Front Frame             |
| 7 - Cap  |                        |                         |                              |

# BODY (UPPERSTRUCTURE) / Center Hinge



W4GB-02-03-001



## BODY (UPPERSTRUCTURE) / Center Hinge

### Disassemble Center Hinge



**CAUTION:** The center hinge is required to disassemble for the major maintenance work such as removal of the front frame from the rear frame. At this time, move the machine into the factory.

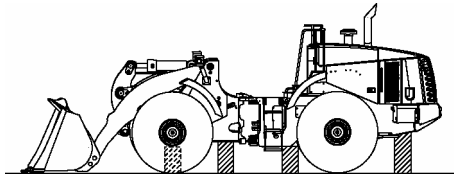
### Preparation

Carry out the following procedures before disassembling the center hinge.

1. Remove the cab and the cockpit.
2. Remove the mounting component between the front frame and the rear frame.
  - Propeller Shaft
  - Steering Cylinder
  - Hydraulic Hose
  - Brake Piping
  - Wire Harness


### Removal of Hinge Pin

1. Support the front frame and the rear frame by using the firm support stands.




W4GB-02-03-002

2. Remove bolts (2) (ZW220 (3 used), ZW250 (4 used)) and bolts (3) (ZW220 (4 used), ZW250 (6 used)) from flange (4) of the upper hinge part. Remove flange (4), shims (5) (2 used) and pin (22) from front frame (25).

 : 24 mm

3. Remove bolt (11) and washers (12, 13) from pin (14). Remove pin (14) from front frame (25).

 : 24 mm

4. Remove bushing (6) from front frame (25). (Remove bushing (6) after cutting by gas or pulling out by welding a cardboard.)




**CAUTION: Front frame (25) weight:**  
**ZW220: 1450 kg (3200 lb)**  
**ZW250: 1910 kg (4250 lb)**

5. Attach a nylon sling onto front frame (25). Hoist and move front frame (25) so that bearing (10) can be removed.


6. Remove bushing (20) from front frame (25).

7. Remove bolts (21) (6 used) from cap (19). Remove caps (7, 19) and shim (8) from front frame (25).

ZW220

 : 17 mm

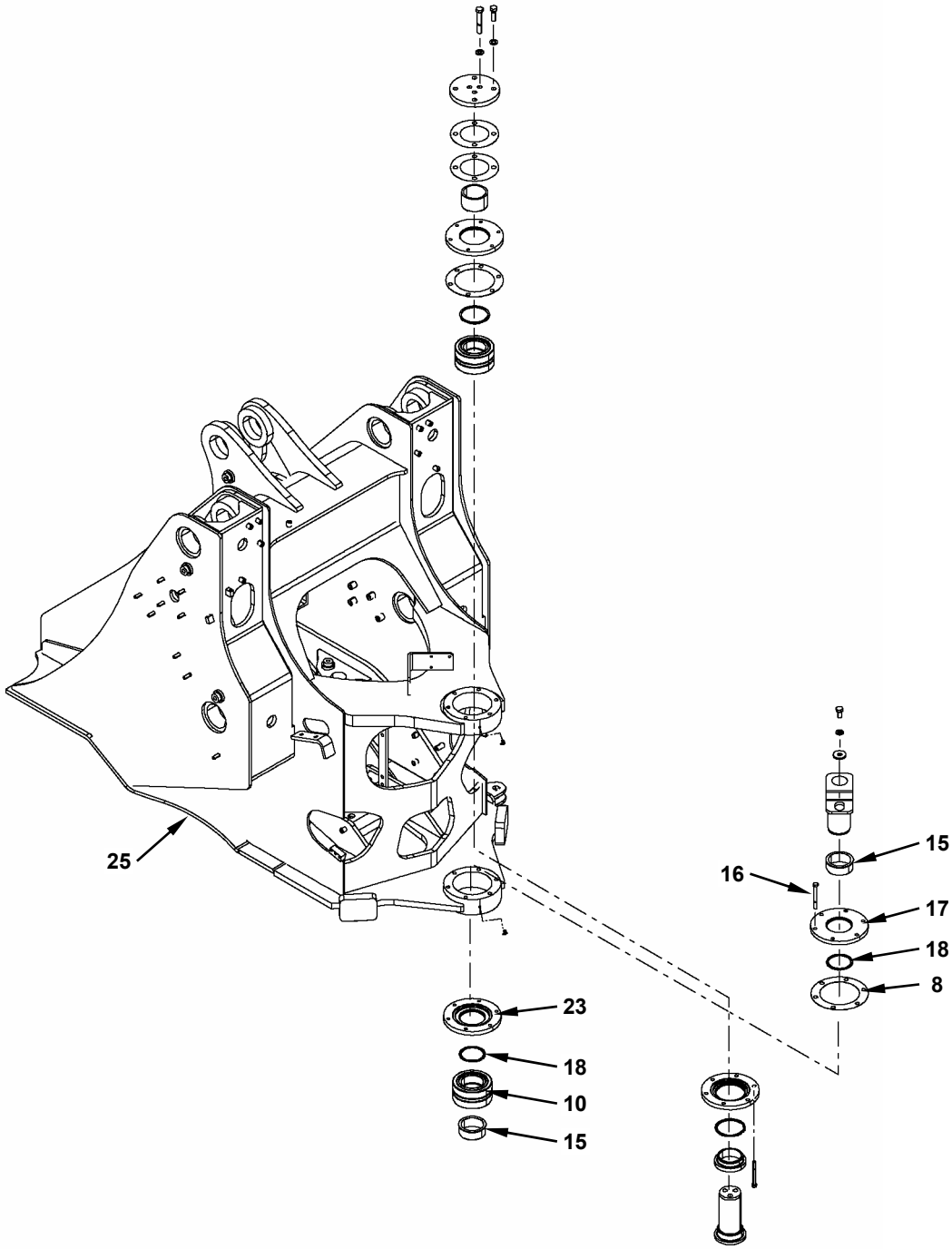
ZW250

 : 24 mm

8. Remove dust seals (9) (2 used) from caps (7, 19).

9. Remove bearing (10) from front frame (25).

# BODY (UPPERSTRUCTURE) / Center Hinge




W4GB-02-03-001

## BODY (UPPERSTRUCTURE) / Center Hinge

---

10. Remove bolts (16) (6 used) from cap (17).  
Remove caps (17, 23) and shim (8) from front  
frame (25).

 : 17 mm

11. Remove dust seals (18) (2 used) from caps (17,  
23).

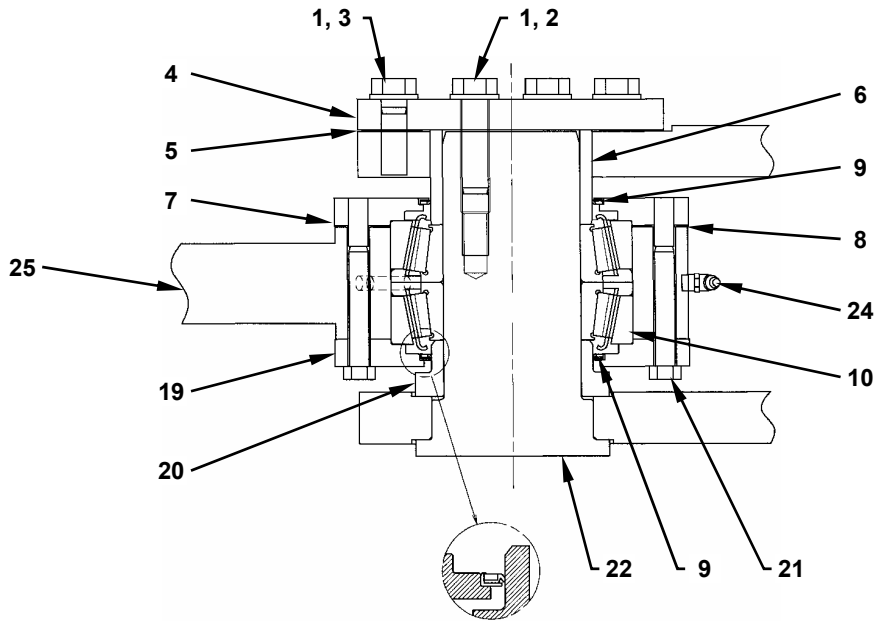
12. Remove bearing (10) from front frame (25).

13. Remove bushings (15) (2 used) from the lower  
hinge part of the rear frame.

# BODY (UPPERSTRUCTURE) / Center Hinge

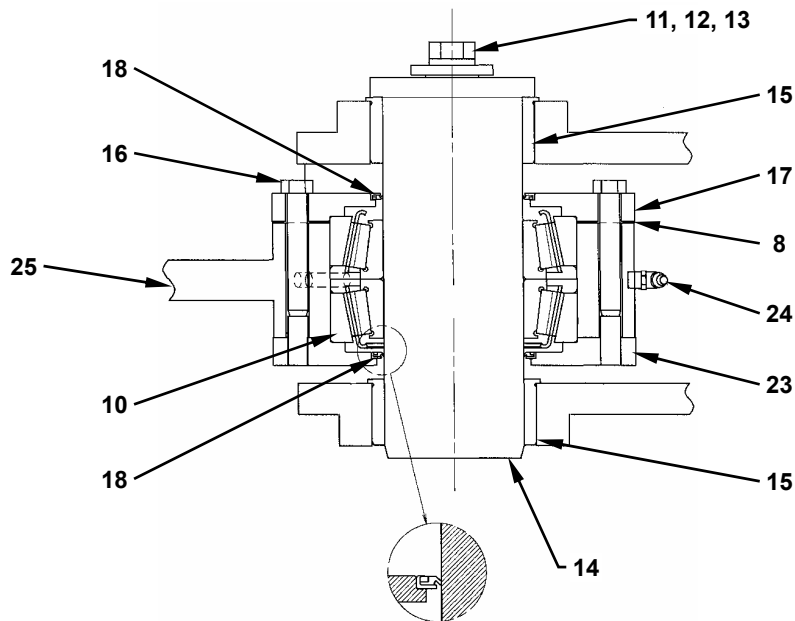
## ASSEMBLE CENTER HINGE

Upper Hinge



W4GB-02-03-003

Lower Hinge Pin



W4GB-02-03-004

- |  |                        |                         |                              |
|--|------------------------|-------------------------|------------------------------|
| 1 - Washer<br>(ZW220: 7 Used) (ZW250: 10 Used) | 8 - Shim (2 Used)      | 14 - Pin                | 20 - Bushing                 |
| 2 - Bolt<br>(ZW220: 3 Used) (ZW250: 4 Used)    | 9 - Dust Seal (2 Used) | 15 - Bushing (2 Used)   | 21 - Bolt (6 Used)           |
| 3 - Bolt<br>(ZW220: 4 Used) (ZW250: 6 Used)    | 10 - Bearing (2 Used)  | 16 - Bolt (6 Used)      | 22 - Pin                     |
| 4 - Flange                                     | 11 - Bolt              | 17 - Cap                | 23 - Cap                     |
| 5 - Shim (2 Used)                              | 12 - Washer            | 18 - Dust Seal (2 Used) | 24 - Grease Fitting (2 Used) |
| 6 - Bushing                                    | 13 - Washer            | 19 - Cap                | 25 - Front Frame             |
| 7 - Cap  |                        |                         |                              |

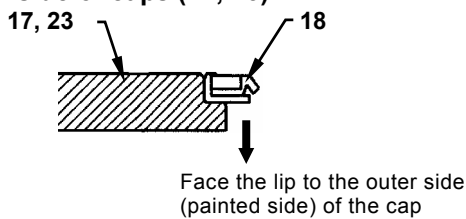
## BODY (UPPERSTRUCTURE) / Center Hinge

### Assemble Center Hinge

1. Continuously apply LOCTITE #262 onto the outer circumference of dust seal (18). Lightly tap and insert dust seal (18) into cap (17) by using a hammer. Wipe out the stick-out LOCTITE #262 by using a waste.

Install dust seal (18) to cap (23) in the same way.

**IMPORTANT: Check the direction of dust seal (18). Install dust seal (18) with the wider rubber side facing to the unpainted side of caps (17, 23).**

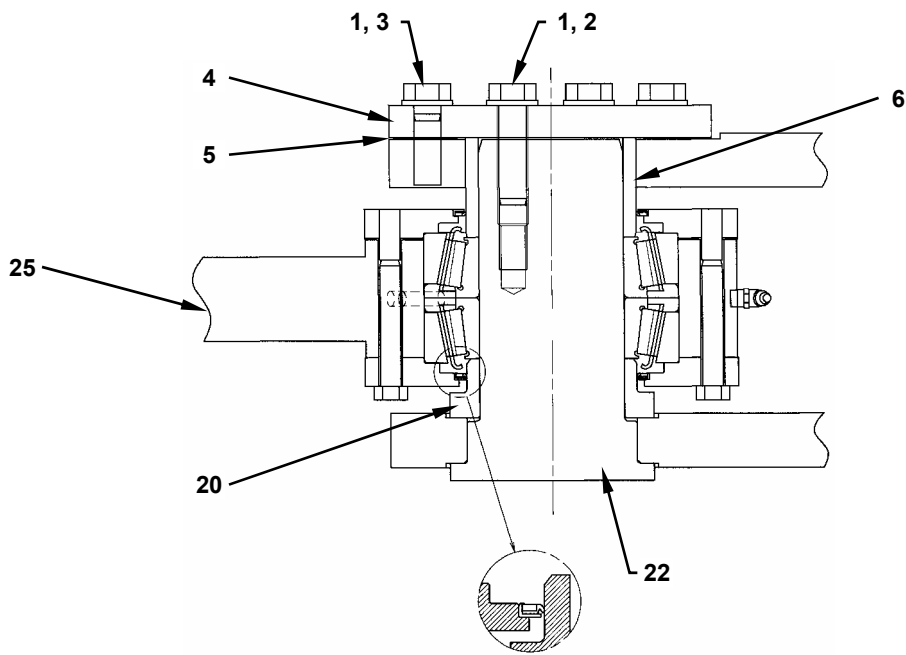


W4GB-02-03-005

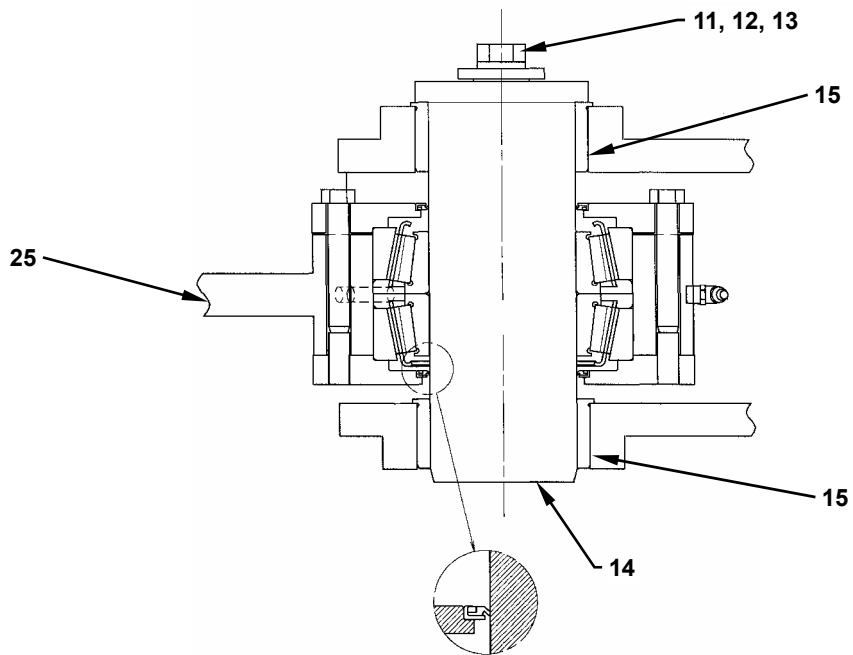
2. Insert dust seals (9) (2 used) into caps (7, 19) in the same way.
3. Insert bearing (10) into the upper hinge part of front frame (25).
4. Add grease through grease fitting (24) into the inside of bearing (10) while rotating bearing (10).
5. Insert bearing (10) into the lower hinge part of front frame (25). Add grease through grease fitting (24).
6. Install caps (7, 19) and shim (8) to the upper hinge part of front frame (25). Apply LOCTITE #262 onto bolts (21) (6 used). Install caps (7, 19) to front frame (25) with bolts (21) (6 used).  
ZW220  
🔧 : 17 mm  
🔩 : 88 N·m (9 kgf·m, 65 lbf·ft)  
ZW250  
🔧 : 24 mm  
🔩 : 224 N·m (23 kgf·m, 165 lbf·ft)
7. Tap the space among caps (7, 19) and dust seals (9) (2 used) by using an iron nail.
8. Install caps (17, 23) and shim (8) to the lower hinge part of front frame (25). Apply LOCTITE #262 onto bolts (16) (6 used). Install caps (17, 23) to front frame (25) with bolts (16) (6 used).  
🔧 : 17 mm  
🔩 : 88 N·m (9 kgf·m, 65 lbf·ft)
9. Tap the space among caps (17, 23) and dust seals (18) (2 used) by using an iron nail.

# BODY (UPPERSTRUCTURE) / Center Hinge

Upper Hinge



Lower Hinge Pin



W4GB-02-03-003

W4GB-02-03-004

## BODY (UPPERSTRUCTURE) / Center Hinge

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10. Insert bushings (15) (2 used) into the lower hinge part of the rear frame.




**CAUTION: Front frame (25) weight:**


**ZW220: 1450 kg (3200 lb)**

**ZW250: 1910 kg (4250 lb)**


11. Attach a nylon sling onto front frame (25). Hoist and align front frame (25) with the center hinge pin holes on the rear frame.


12. Install pin (22), bushings (6, 20), shims (5) (2 used) and flange (4) to the upper hinge part. Tighten bolts (2) (ZW220 (3 used), ZW250 (4 used)), bolts (3) (ZW220 (4 used), ZW250 (6 used)) and washers (1) (ZW220 (7 used), ZW250 (10 used)).

 : 24 mm

 : 224 N·m (23 kgf·m, 165 lbf·ft)

13. Insert pin (14) into the lower hinge part. Tighten bolt (11) and washers (12, 13).

 : 24 mm (0.94 in)

 : 86.9 N·m (8.9 kgf·m, 64 lbf·ft)

## **BODY (UPPERSTRUCTURE) / Center Hinge**

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(Blank)



# BODY (UPPERSTRUCTURE) / Hood


## REMOVAL AND INSTALLATION OF HOOD

### Removal

1. Open the left and right side covers.
2. Loosen hose bands (3) (2 used) securing intake hose (4). Disconnect intake hose (4) from pipe (2) and the engine.
3. Disconnect the harness for sensor (1) at the connector part.

**CAUTION:** The hood (5) assembly weight:  
ZW220: 117 kg (260 lb)  
ZW250: 120 kg (265 lb)


4. Attach a nylon sling onto hood (5). Hoist and hold hood (5). Remove bolts (7) (4 used) and washers (6) (4 used) from hood (5). Hoist and remove hood (5) from the frame.


 : 17 mm

### Installation

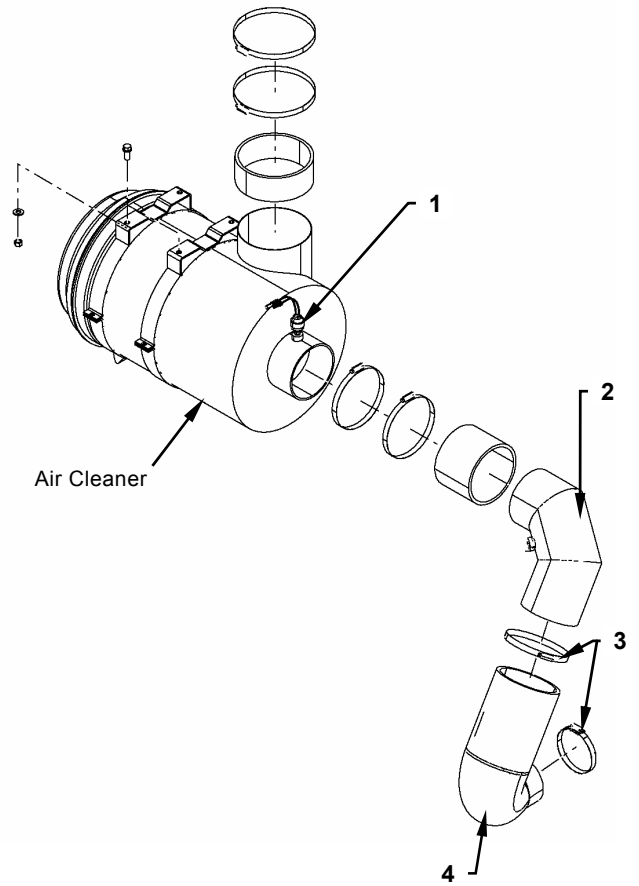
**CAUTION:** The hood (5) assembly weight:  
ZW220: 117 kg (260 lb)  
ZW250: 120 kg (265 lb)

1. Attach a nylon sling onto hood (5). Hoist hood (5). Align the exhaust pipe and the vent of the muffler and install hood (5) to the frame with bolts (7) (4 used) and washers (6) (4 used).

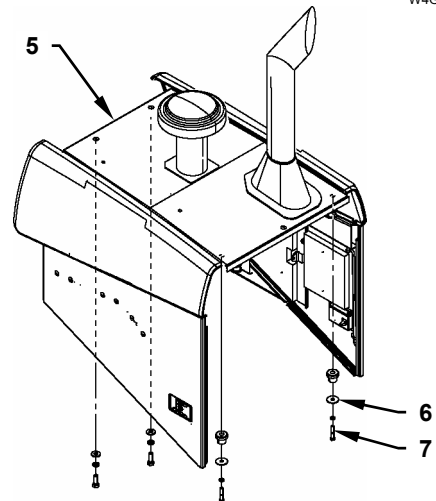
 : 17 mm

 : 50 N·m (5 kgf·m, 36 lbf·ft)

2. Connect the harness for sensor (1) at the connector part.
3. Connect intake hose (4) to the engine and pipe (2). Secure intake hose (4) with hose bands (3) (2 used).
4. Shut the left and right side covers.



W4GB-02-03-007



W4GB-02-03-006

## **BODY (UPPERSTRUCTURE) / Hood**

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(Blank)

## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank

### REMOVAL AND INSTALLATION OF HYDRAULIC OIL TANK

**CAUTION:** Hydraulic oil tank (5) weight:  
ZW220: 165 kg (365 lb)  
ZW250: 170 kg (375 lb)

#### Removal

1. Remove the hood. (Refer to W2-4-1.)
2. Remove the left and right side fenders.  
🔧 : 17 mm
3. Remove bolts (1) (6 used) and washers (2) (6 used) from cover (3). Remove cover (3) and suction filter (4) from hydraulic oil tank (5).  
🔧 : 14 mm
4. Drain the hydraulic oil from the suction filter mounting part of hydraulic oil tank (5) by using a pump.

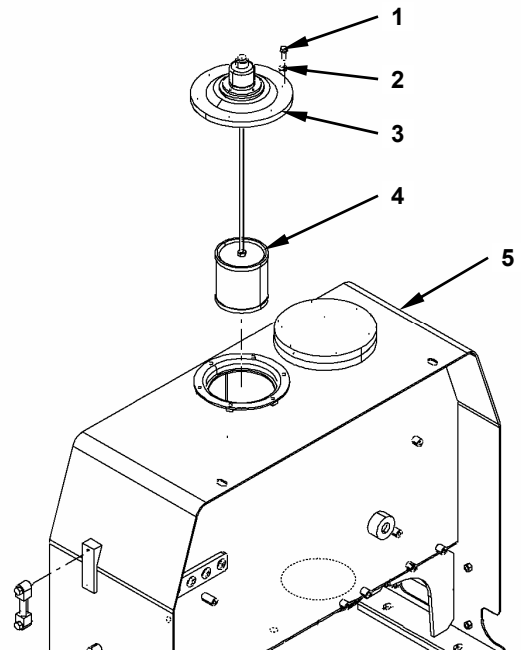
**CAUTION:** Drain the hydraulic oil from the suction pipe at the bottom of hydraulic oil tank (5).

**CAUTION:** Attach an identification tag onto each hose connected to hydraulic oil tank (5) for assembling.

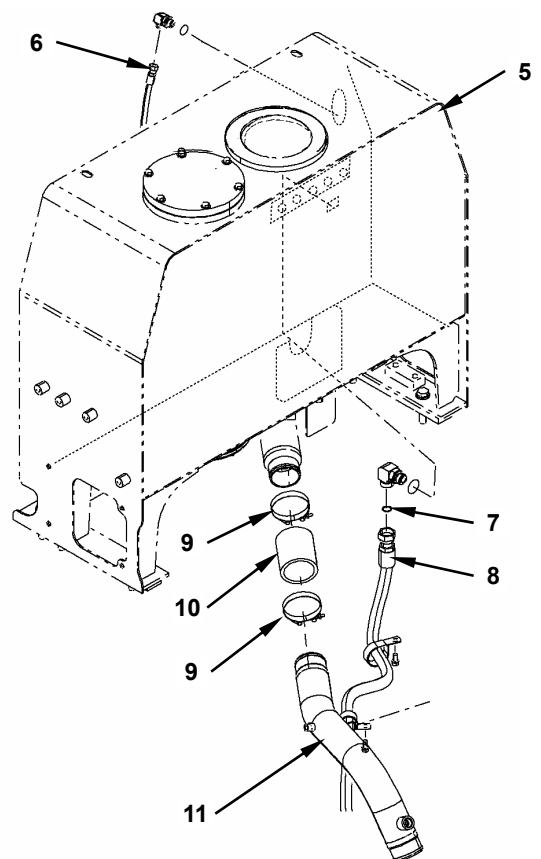
5. Disconnect hose (6) from hydraulic oil tank (5).  
🔧 : 22 mm
6. Disconnect hose (8) and remove O-ring (7) from hydraulic oil tank (5).  
🔧 : 36 mm

**CAUTION:** O-ring (7) cannot be reused.

7. Loosen hose clamps (9) (2 used). Disconnect hose (10) from hydraulic oil tank (5) and pipe (11).



W4GB-02-03-010




W4GB-02-03-011


## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank

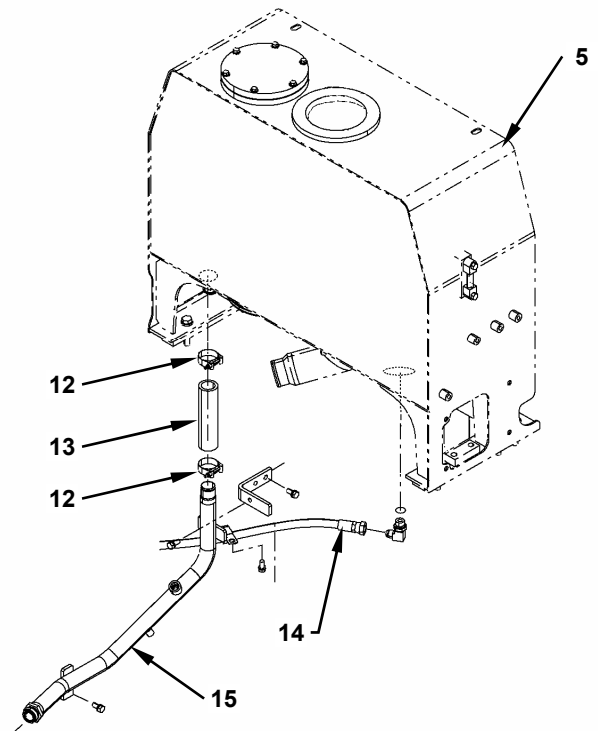
8. Loosen hose clamps (12) (2 used). Disconnect hose (13) from hydraulic oil tank (5) and pipe (15).

9. Disconnect hose (14) from hydraulic oil tank (5).

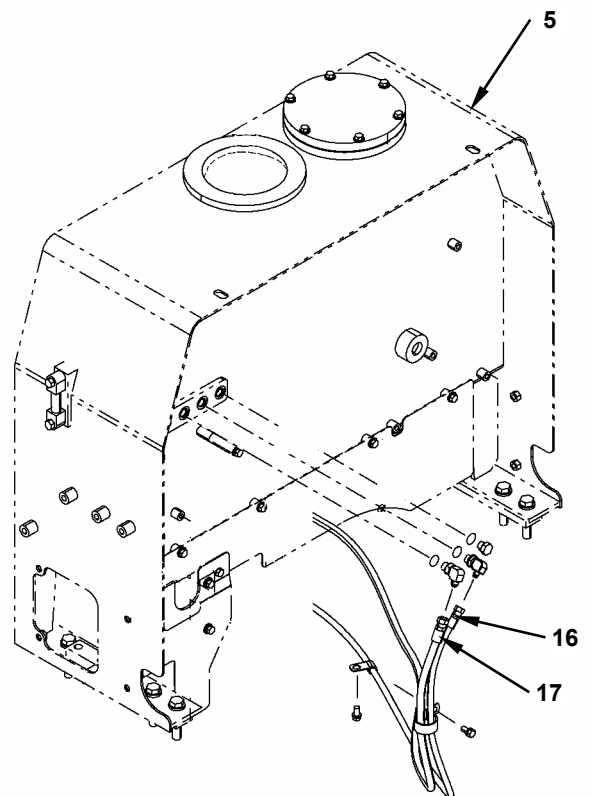
 : 27 mm

10. Disconnect hoses (16, 17) from hydraulic oil tank (5).

 : 17 mm




W4GB-02-03-012

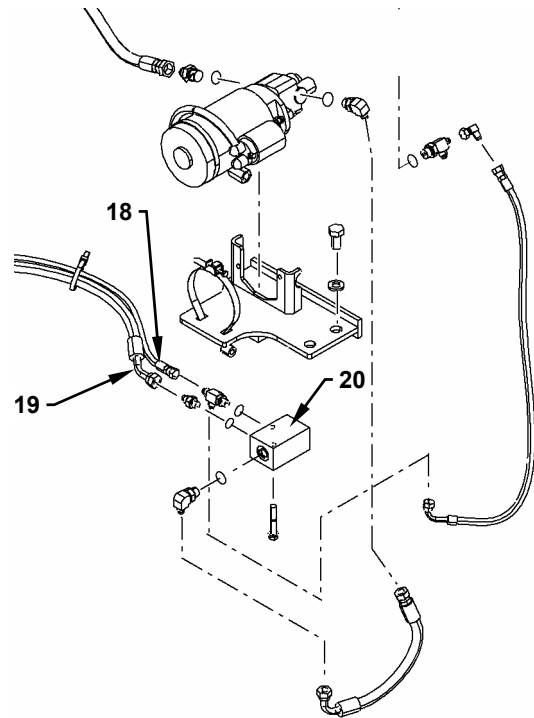


W4GB-02-03-013

## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank

11. Disconnect hoses (18, 19) from block (20) when the emergency steering pump is installed.


 : 17 mm, 22 mm

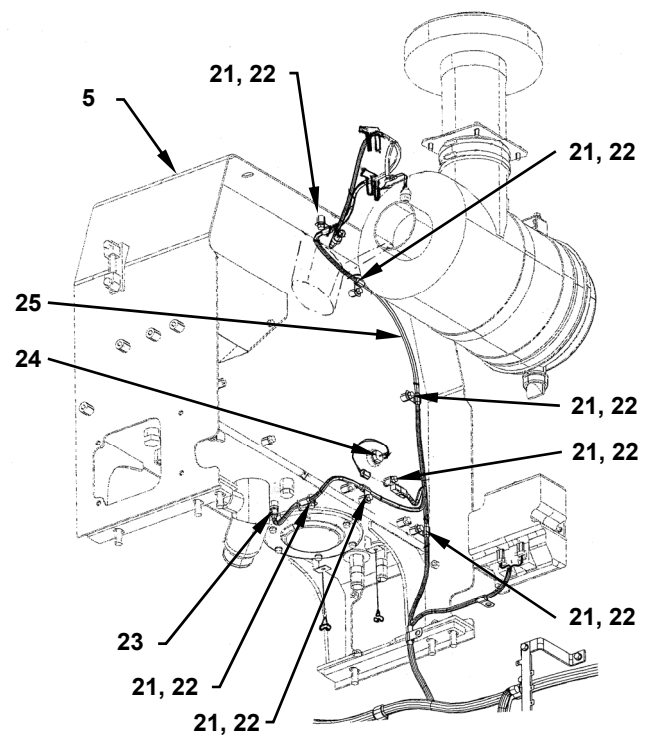


W4GB-02-03-014

12. Disconnect the connector from hydraulic oil temperature sensor (23) and level sensor (24).

13. Remove bolts (22) (7 used) from clamps (21) (7 used). Remove wire harness (25) from hydraulic oil tank (5).

 : 12 mm



W4GB-02-03-015

## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank




**CAUTION:** Hydraulic oil tank (5) weight:

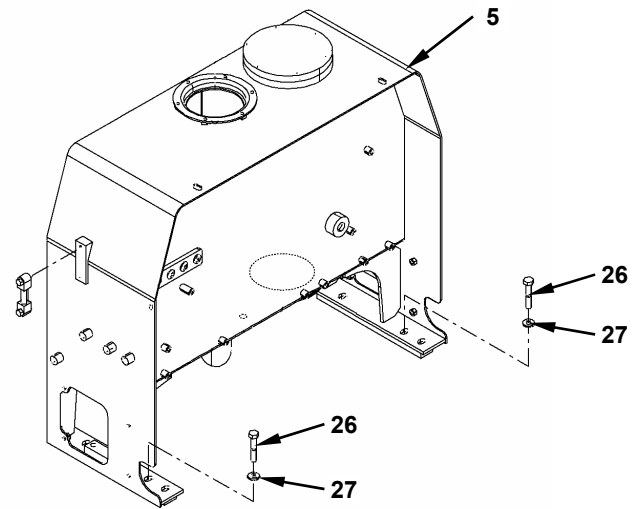
**ZW220: 165 kg (365 lb)**

**ZW250: 170 kg (375 lb)**

14. Attach a nylon sling onto hydraulic oil tank (5). Hoist and hold hydraulic oil tank (5). Remove bolts (26) (4 used) and washers (27) (4 used) from hydraulic oil tank (5).

 : 24 mm

15. Hoist and remove hydraulic oil tank (5) from the frame.



W4GB-02-03-016


## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank


### Installation

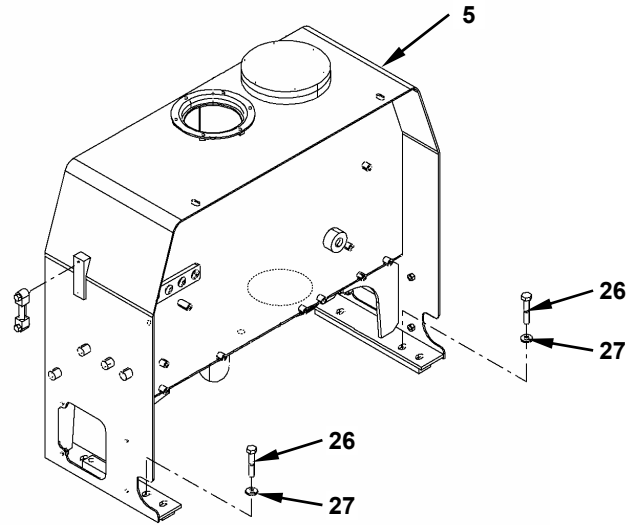
**CAUTION:** Hydraulic oil tank (5) weight:  
ZW220: 165 kg (365 lb)  
ZW250: 170 kg (375 lb)

1. Attach a nylon sling onto hydraulic oil tank (5). Hoist and align hydraulic oil tank (5) with the mounting position of the frame.

2. Install hydraulic oil tank (5) to the frame with bolts (26) (4 used) and washers (27) (4 used).


 : 24 mm


 : 210 N·m (21.5 kgf·m, 152 lbf·ft)





W4GB-02-03-016

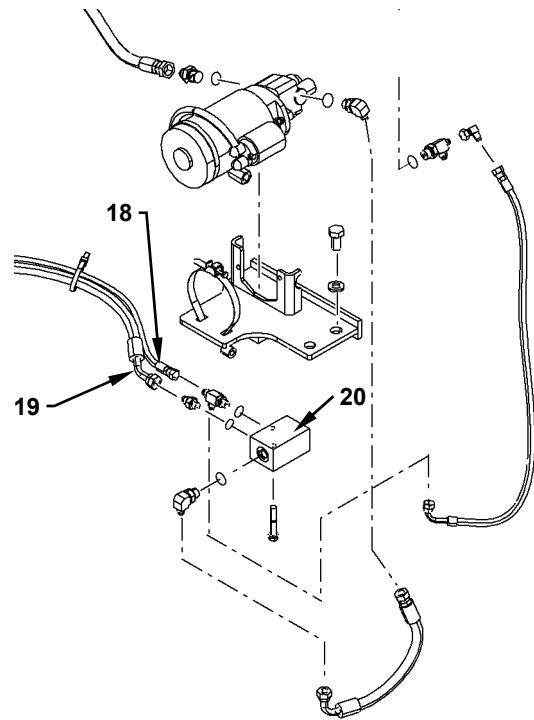
3. Connect hoses (18, 19) to block (20) as shown in the identification tag when the emergency steering pump is installed.

 : 17 mm

 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)

 : 22 mm


 : 39 N·m (4 kgf·m, 28.5 lbf·ft)




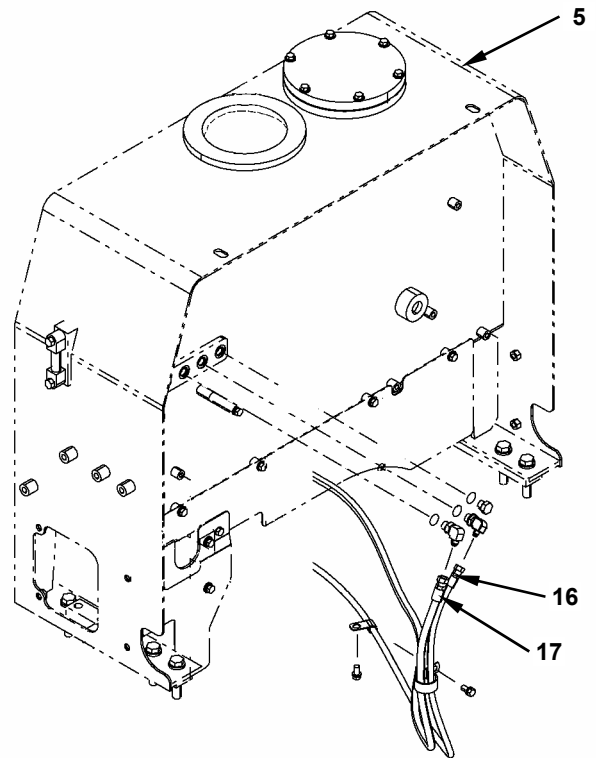
W4GB-02-03-014

## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank

4. Connect hoses (16, 17) to hydraulic oil tank (5).


 : 17 mm


 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)



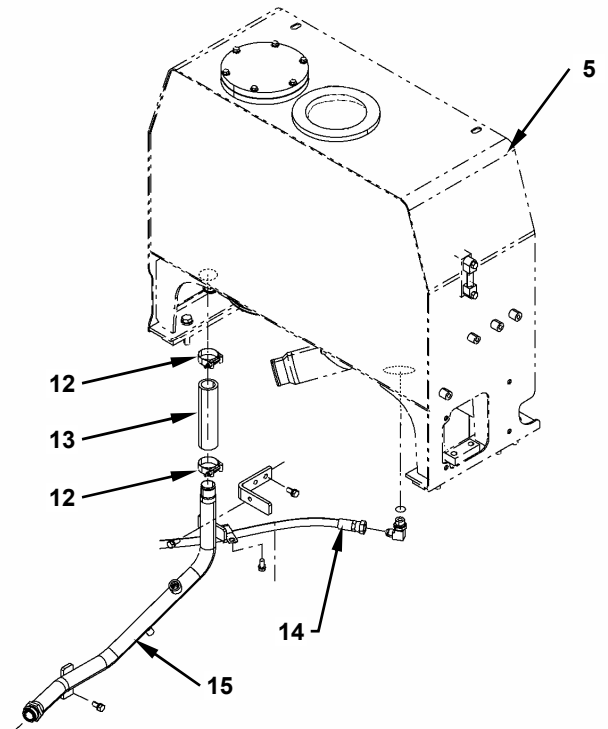
W4GB-02-03-013

5. Connect hose (14) to hydraulic oil tank (5).

 : 27 mm

 : 93 N·m (9.5 kgf·m, 68.5 lbf·ft)

6. Connect hose (13) to hydraulic oil tank (5) and pipe (15). Secure hose (13) with hose clamps (12) (2 used).




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## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank


7. Connect hose (10) to hydraulic oil tank (5) and pipe (11). Secure hose (10) with hose clamps (9) (2 used).


8. Install hydraulic oil tank (5) and new O-ring (7), and connect hose (8).

 : 36 mm

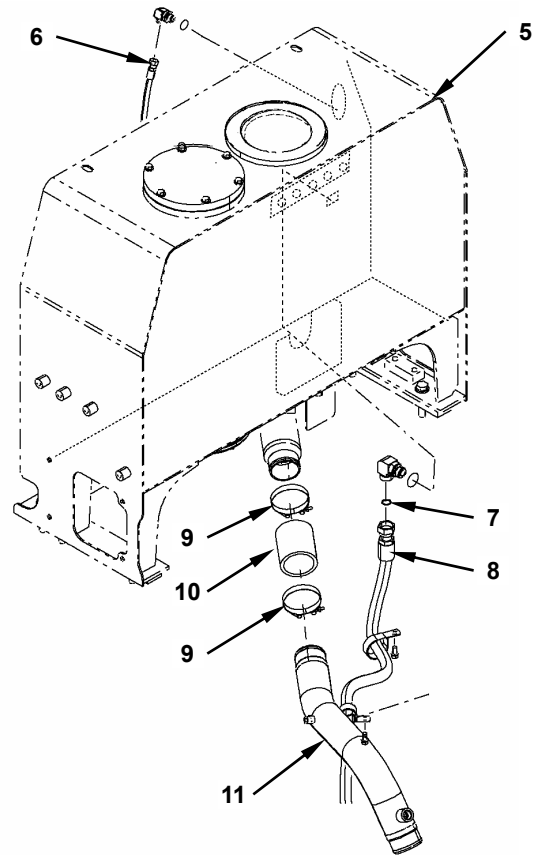
 : 175 N·m (18 kgf·m, 129 lbf·ft)

9. Connect hose (6) to hydraulic oil tank (5).

 : 22 mm

 : 39 N·m (4 kgf·m, 28.5 lbf·ft)


10. Add hydraulic oil to hydraulic oil tank (5).  
Hydraulic oil amount: 120 L (31.7 US gal.)




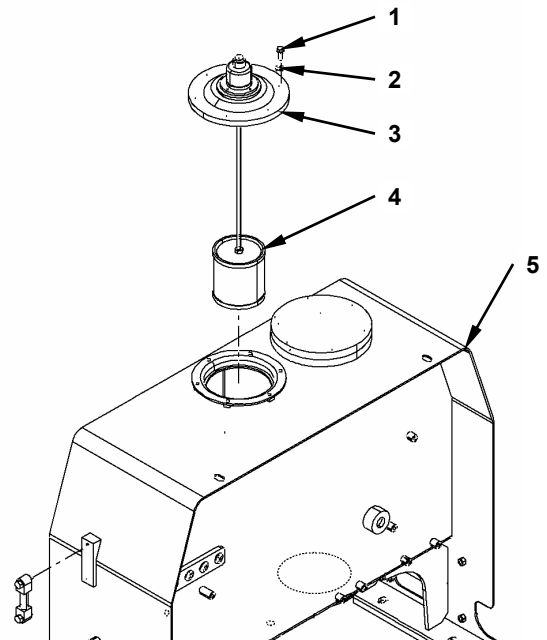
W4GB-02-03-011

11. Install suction filter (4) to hydraulic oil tank (5).

12. Install cover (3) to hydraulic oil tank (5) with bolts (1) (6 used) and washers (2) (6 used).

 : 14 mm


 : 20 N·m (2 kgf·m, 14.5 lbf·ft)




W4GB-02-03-010

## BODY (UPPERSTRUCTURE) / Hydraulic Oil Tank


13. Install wire harness (25) to hydraulic oil tank (5) with bolts (22) (7 used) and clamps (21) (7 used).


 : 12 mm

 : 20 N·m (2 kgf·m, 14.5 lbf·ft)

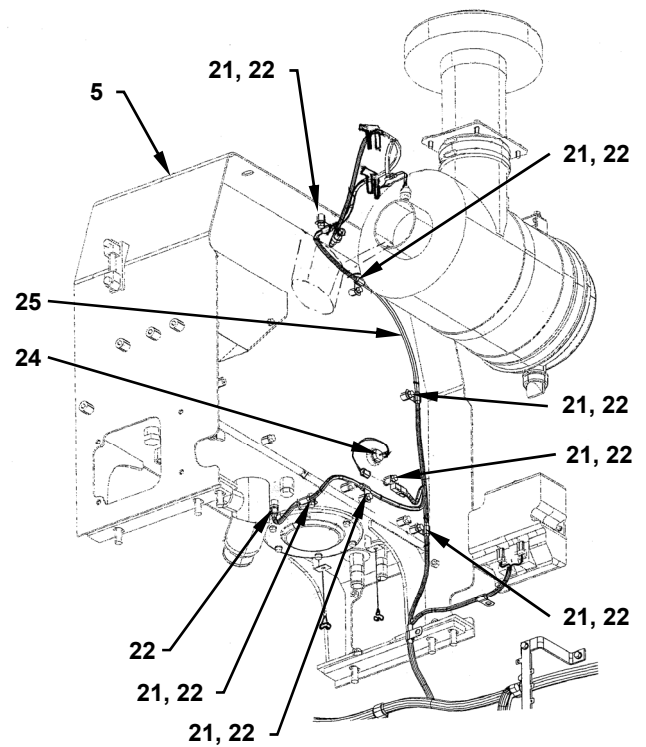
14. Connect the connectors of level sensor (24) and hydraulic oil temperature sensor (23).

15. Install the left and right side fenders.

 : 17 mm

 : 50 N·m (5.1 kgf·m, 36 lbf·ft)

16. Install the hood. (Refer to W2-4-1.)



W4GB-02-03-015

## BODY (UPPERSTRUCTURE) / Pump Device

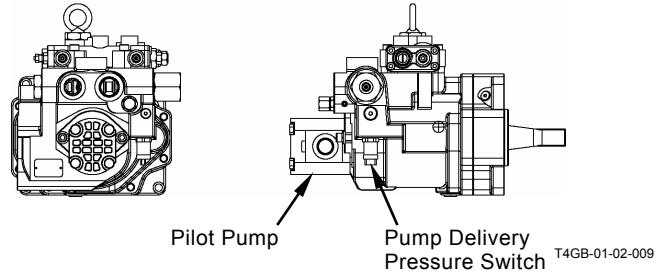
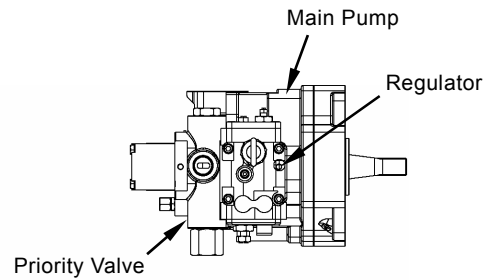
### REMOVAL AND INSTALLATION OF PUMP DEVICE

#### Removal

1. Remove the cab with the cockpit attached.  
(Refer to REMOVAL AND INSTALLATION OF CAB on W2-1.)




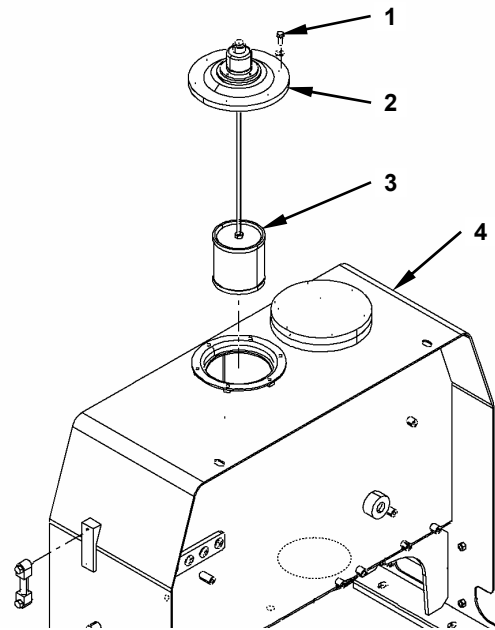
**CAUTION: Pump device weight:**  
ZW220: 83 kg (185 lb)  
ZW250: 107 kg (240 lb)



T4GB-01-02-009


2. Remove sems bolts (1) (6 used) from hydraulic oil tank (4). Remove cover (2) and suction filter (3) from hydraulic oil tank (4). Drain hydraulic oil.

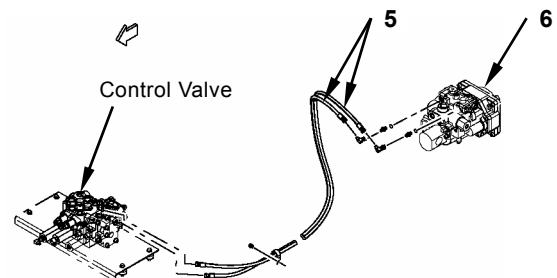
 : 14 mm



W4GB-02-03-010

3. Disconnect hoses (5) (2 used) from main pump (6). Cap the open ends. Attach an identification tag onto the disconnected hoses for assembling.


 : 19 mm, 22 mm




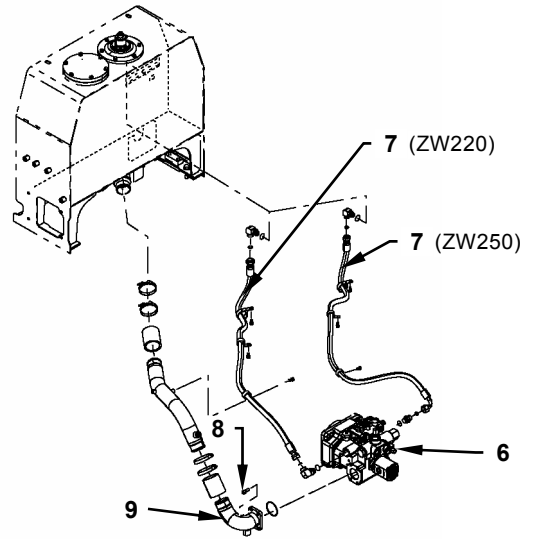
W4GB-02-04-012

## BODY (UPPERSTRUCTURE) / Pump Device

4. Disconnect hose (7) from main pump (6). Cap the open ends. Remove socket bolts (8) (4 used) from pipe (9). Disconnect pipe (9) from main pump (6).


 : 32 mm, 36 mm

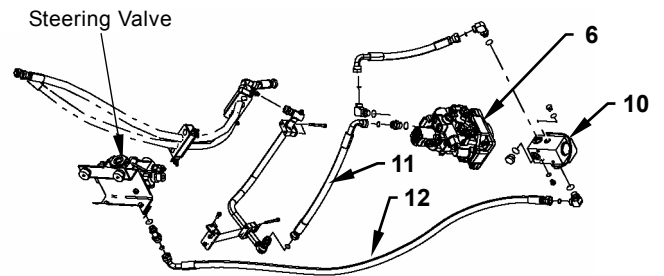
 : 10 mm



W4GB-02-04-013


5. Disconnect hose (11) from main pump (6). Disconnect hose (12) from priority valve (10). Cap the open ends.

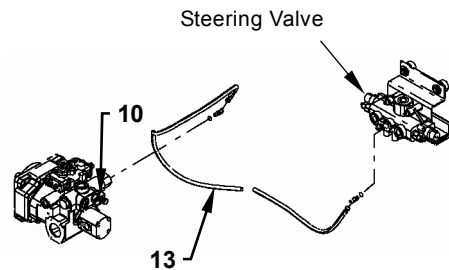
 : 36 mm, 41 mm



W4GB-02-04-014

6. Disconnect hose (13) from priority valve (10). Cap the open ends.


 : 14 mm, 17 mm

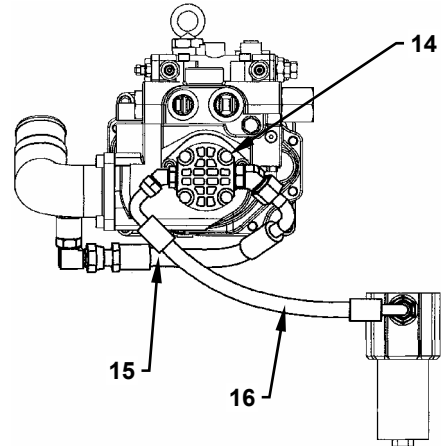


W4GB-02-04-015

## BODY (UPPERSTRUCTURE) / Pump Device

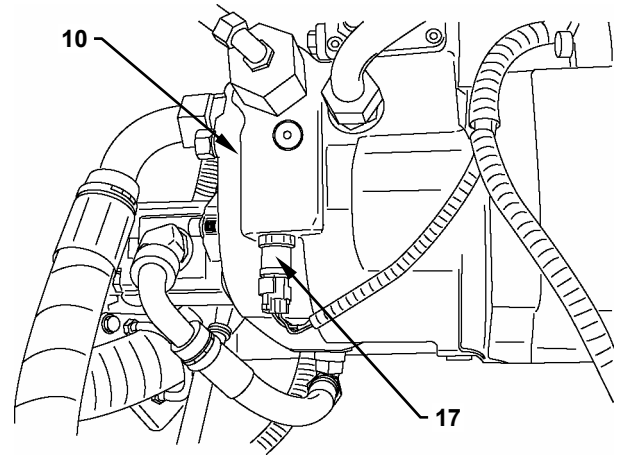
7. Disconnect hoses (15, 16) from pilot pump (14).  
Cap the open ends.

 : 27 mm, 36 mm



W4GB-02-04-018

8. Disconnect the connector of pump delivery pressure switch (17) under priority valve (10).




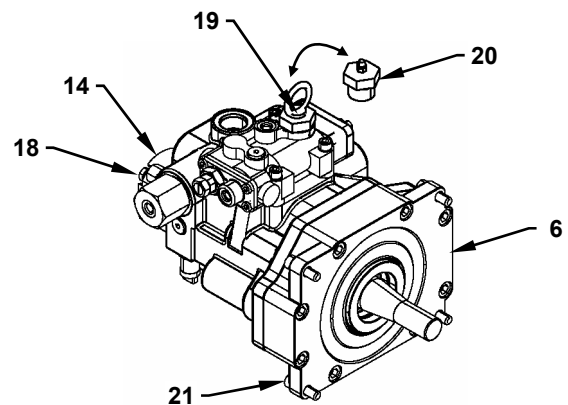
W4GB-02-04-016

9. Remove socket bolts (18) (2 used) from pilot pump (14). Remove pilot pump (14) from main pump (6).

Remove reducer (20) from the regulator. Install plug (19) (with eyebolt attached) (screw size G1, wrench size 41 mm) to the regulator.


 : 8 mm

 : 41 mm



W4GB-02-04-017







10. Attach a nylon sling onto eyebolt. Hoist and hold main pump (6). Remove socket bolts (21) (4 used) from main pump (6). Hoist and remove main pump (6) from the engine.

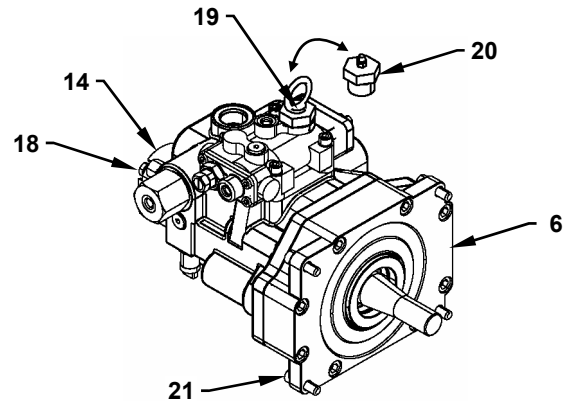
 : 10 mm

## BODY (UPPERSTRUCTURE) / Pump Device

### Installation

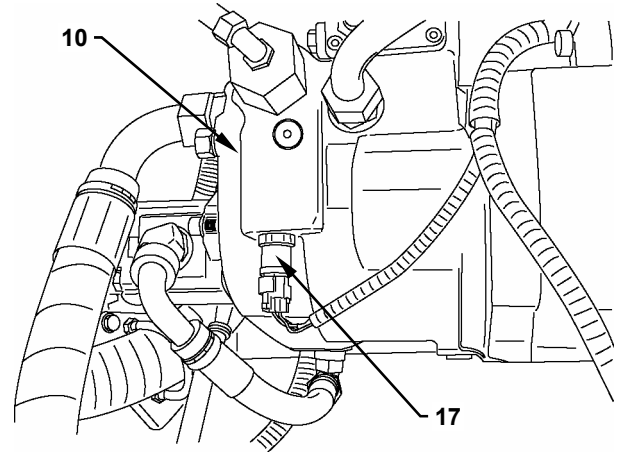
1. Attach a nylon sling onto plug (19) (with eyebolt attached). Hoist and align main pump (6) with the mounting hole on the engine. Install main pump (6) to the engine with socket bolts (21) (4 used). Remove plug (19) from the regulator. Install reducer (20). Install pilot pump (14) to main pump (6) with socket bolts (18) (2 used).

-  : 8 mm
-  : 50 N·m (5 kgf·m, 36 lbf·ft)
-  : 10 mm
-  : 90 N·m (9 kgf·m, 65 lbf·ft)
-  : 41 mm
-  : 81 N·m (8 kgf·m, 59.5 lbf·ft)







W4GB-02-04-017

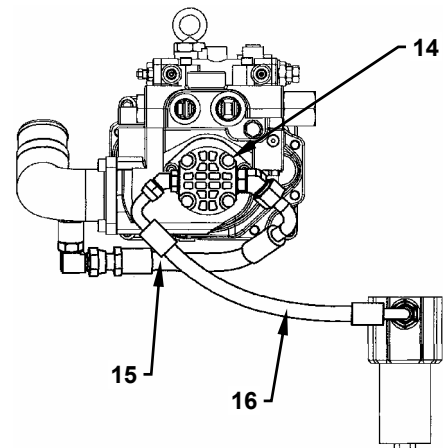
2. Connect the connector of pump delivery pressure switch (17) under the priority valve (10).



W4GB-02-04-016

3. Connect hoses (15, 16) to pilot pump (14).


-  : 27 mm
-  : 78 N·m (8 kgf·m, 58 lbf·ft)
-  : 36 mm
-  : 175 N·m (18 kgf·m, 129 lbf·ft)




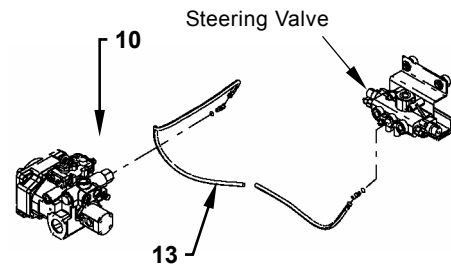
W4GB-02-04-018

## BODY (UPPERSTRUCTURE) / Pump Device

4. Connect hose (13) to priority valve (10).


 : 14 mm, 17 mm


 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)





W4GB-02-04-015

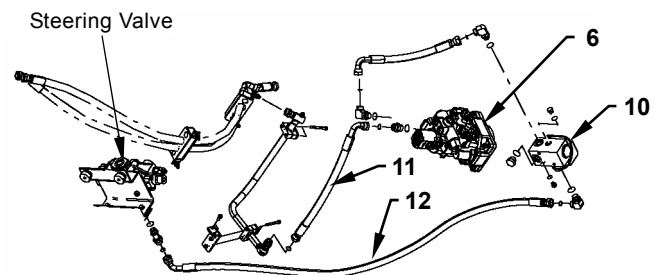
5. Connect hose (12) to priority valve (10). Connect hose (11) to main pump (6).

 : 36 mm

 : 175 N·m (18 kgf·m, 129 lbf·ft)


 : 41 mm


 : 205 N·m (21 kgf·m, 151 lbf·ft)





W4GB-02-04-014

6. Connect hose (7) to main pump (6). Install bolts (8) (4 used) of pipe (9).


 : 32 mm


 : 137 N·m (14 kgf·m, 101 lbf·ft)

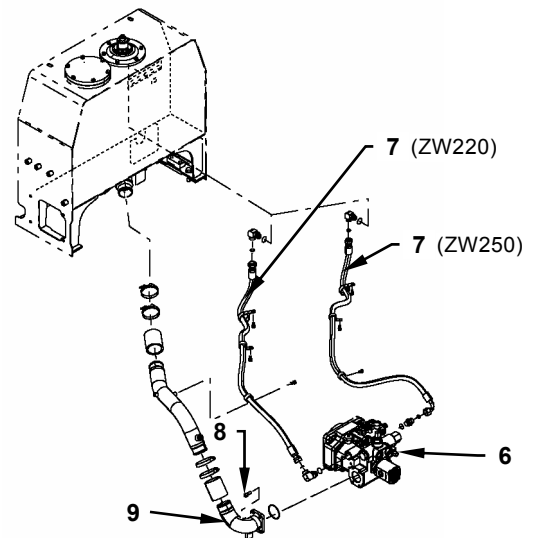
 : 36 mm

 : 175 N·m (18 kgf·m, 129 lbf·ft)

7. Connect pipe (9) to main pump (6) with socket bolts (8) (4 used).

 : 10 mm





 : 90 N·m (9 kgf·m, 65 lbf·ft)

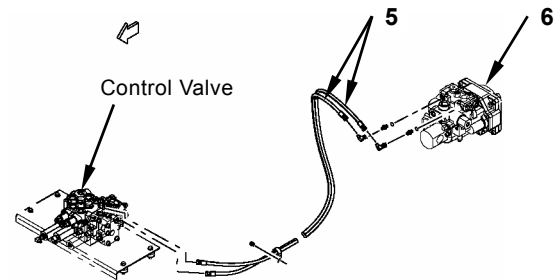


W4GB-02-04-013

## BODY (UPPERSTRUCTURE) / Pump Device

8. Connect hoses (5) (2 used) to main pump (6).



-  : 19 mm
-  : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)
-  : 22 mm
-  : 39 N·m (4 kgf·m, 28.5 lbf·ft)



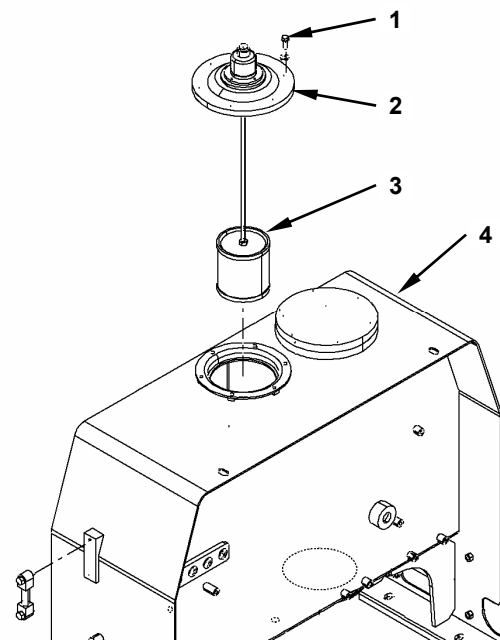
W4GB-02-04-012

9. Install suction filter (3) to hydraulic oil tank (4). Add hydraulic oil to hydraulic oil tank (4). Install cover (2) to hydraulic oil tank (4) with sems bolts (1) (6 used).

Fill the hydraulic oil tank with hydraulic oil. Loosen the bleeder valve and bleed the air.

-  : 14 mm
-  : 15 N·m (1.5 kgf·m, 11 lbf·ft)

10. Install the cab with the cockpit attached.  
(Refer to REMOVAL AND INSTALLATION OF CAB on W2-1.)



W4GB-02-03-010



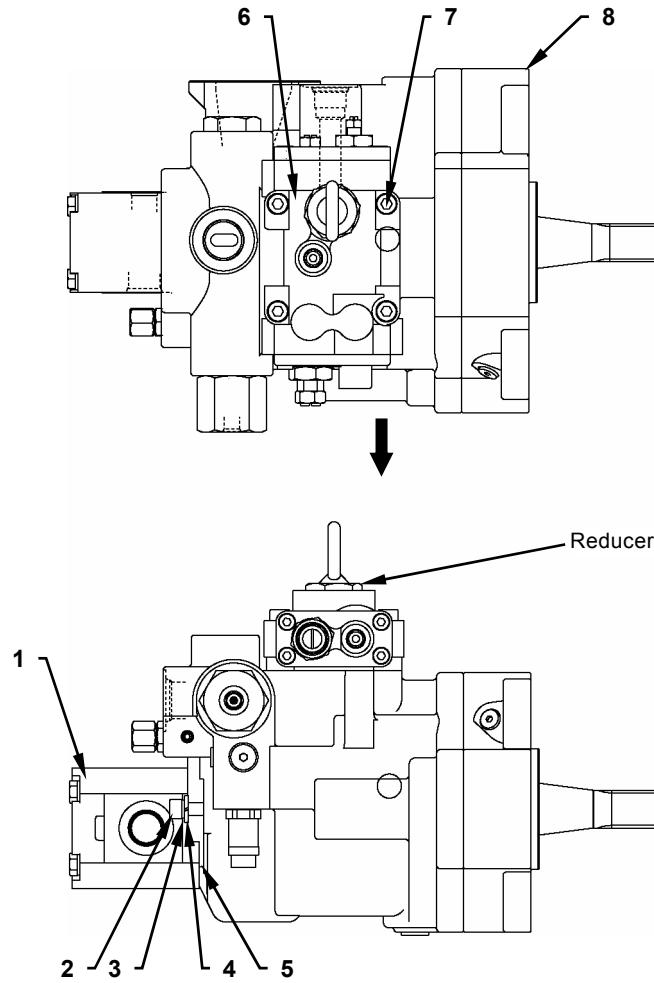
## **BODY (UPPERSTRUCTURE) / Pump Device**

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(Blank)

# BODY (UPPERSTRUCTURE) / Pump Device

## REMOVAL AND INSTALLATION OF PILOT PUMP AND REGULATOR



T4GB-03-01-001

1 - Pilot Pump  
2 - Socket Bolt (2 Used)

3 - Spring Washer (2 Used)  
4 - Washer (2 Used)

5 - O-Ring  
6 - Regulator

7 - Socket Bolt (4 Used)  
8 - Main Pump


## BODY (UPPERSTRUCTURE) / Pump Device

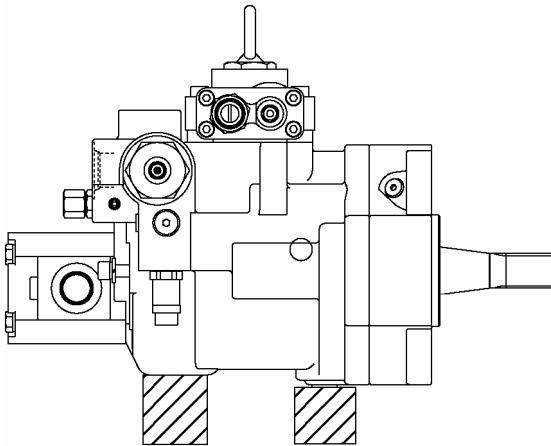
### Removal



**CAUTION:** Pump device weight:  
ZW220: 83 kg (185 lb)  
ZW250: 107 kg (240 lb)


1. Remove the reducer (with the bleeder valve attached) at the regulator part of the pump device. Install the plug (with eyebolt attached). Attach a nylon sling onto eyebolt. Hoist the pump device. Place the pump device onto a wooden block of approximately 100 square mm (3.9 square in) with the regulator facing upward.

 : 41 mm




W4GB-02-04-001

2. Remove socket bolts (2) (2 used), spring washers (3) (2 used) and washers (4) (2 used) from pilot pump (1). Remove pilot pump (1) and O-ring (5) from main pump (8).


 : 8 mm

3. Remove socket bolts (7) (4 used) from regulator (6).

 : 8 mm

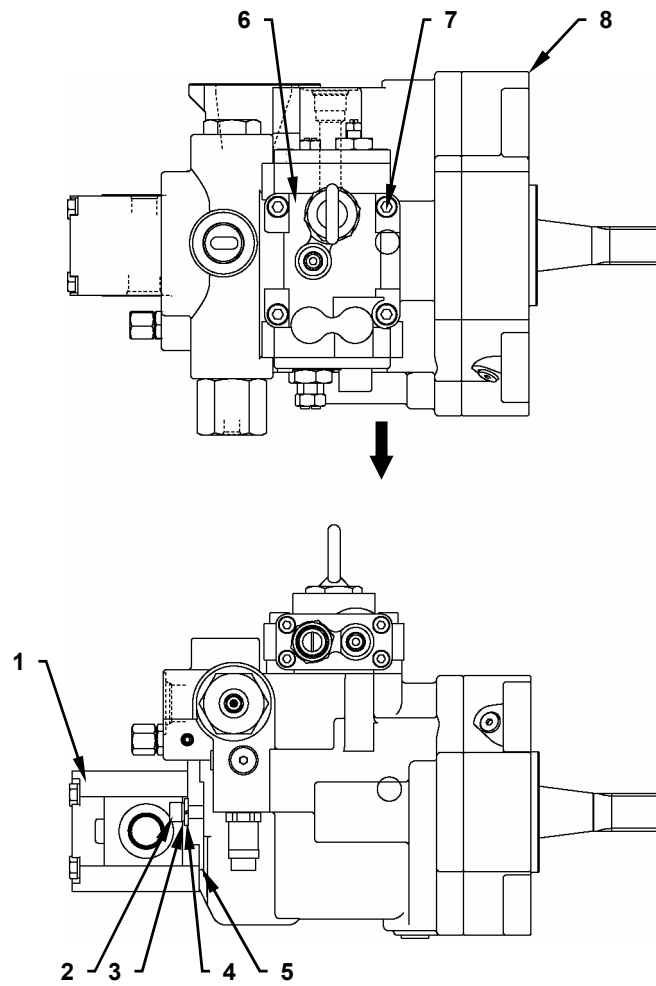
**IMPORTANT:** Pay attention to the removal and installation of O-ring between regulator (6) and main pump (8).

4. Remove regulator (6) from main pump (8).

 **NOTE:** Pull the regulator obliquely upward when it floats up. Refer to W2-6-8.

# BODY (UPPERSTRUCTURE) / Pump Device

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T4GB-03-01-001


## BODY (UPPERSTRUCTURE) / Pump Device


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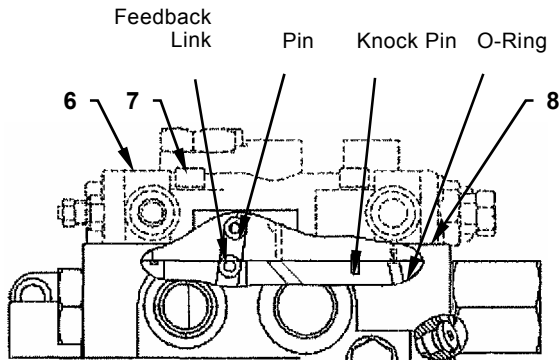
### Installation

**IMPORTANT: Check that five O-rings are attached on the regulator mounting surface.**

1. Install regulator (6) to main pump (8) in the following procedures.
  - Adjust the two sleeve positions and align the two grooves in both sleeves on the regulator.
  - Place regulator (6) on main pump (8). Insert the feedback link pins into the two grooves in both sleeves.
  - Move the regulator so that two knock pins extended from main pump (8) can enter regulator (6).
  - Install regulator (6) to main pump (8) with socket bolts (7) (4 used).

 : 8 mm

 : 50 N·m (5 kgf·m, 36 lbf·ft)





W4GB-02-04-002

2. Install O-ring (5) to pilot pump (1).

**IMPORTANT: Place the pilot pump with the suction port (the larger port diameter) facing upward.**

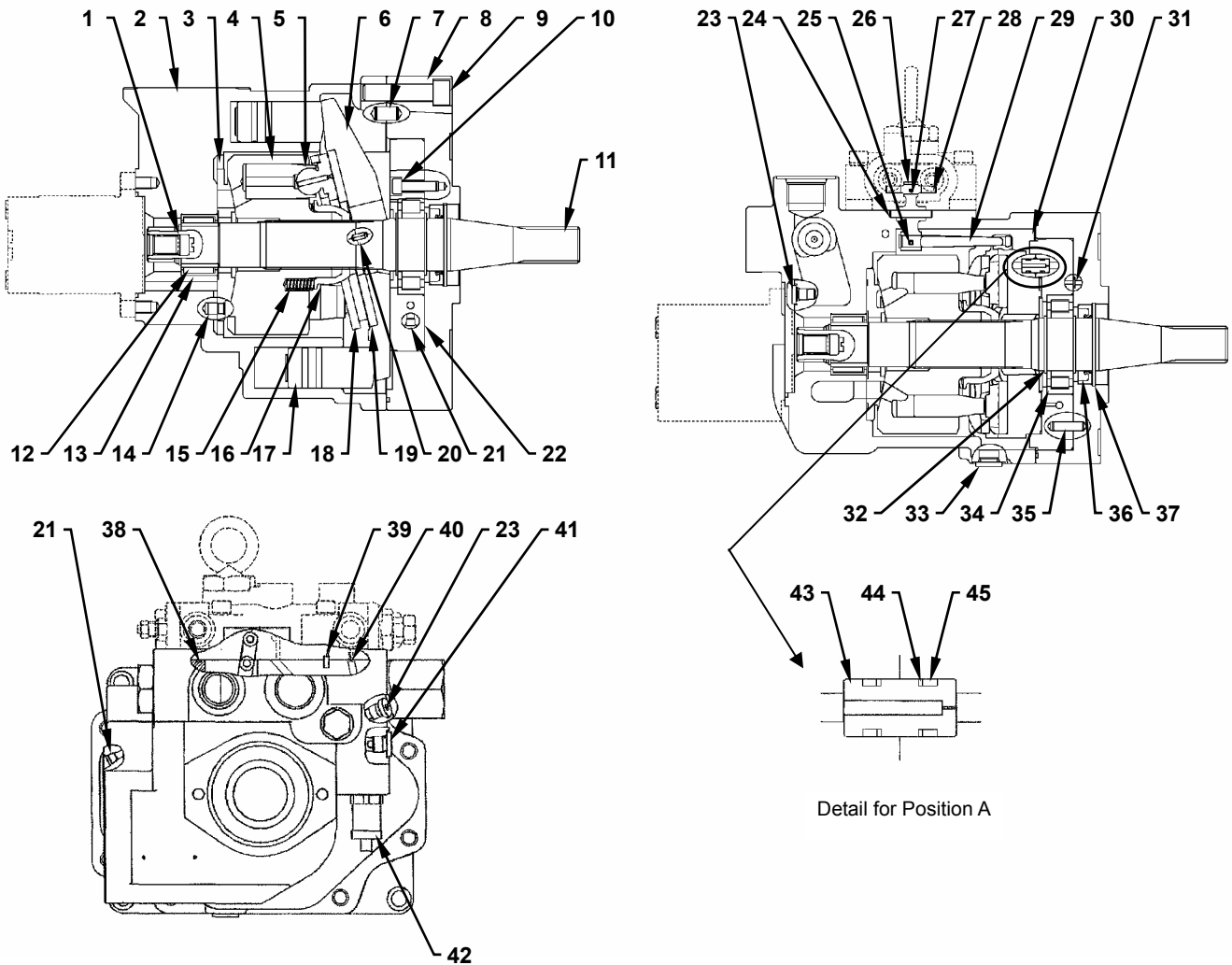
3. Install pilot pump (1) to main pump (8) with socket bolts (2) (2 used), spring washers (3) (2 used) and washers (4) (2 used).

 : 8 mm (0.31 in)

 : 50 N·m (5 kgf·m, 36 lbf·ft)

# BODY (UPPERSTRUCTURE) / Pump Device

## DISASSEMBLY OF MAIN PUMP



W4GB-02-04-003

- |   |   |                              |                           |
|---|---|------------------------------|---------------------------|
| 1 - Retaining Ring                                | 13 - Needle Bearing                               | 24 - Pin                     | 35 - Knock Pin            |
| 2 - Pump Casing                                   | 14 - Knock Pin                                    | 25 - Spring Pin              | 36 - Oil Seal             |
| 3 - Valve Plate                                   | 15 - Spring<br>(ZW220: 7 Used)<br>(ZW250: 4 Used) | 26 - Feedback Link           | 37 - Retaining Ring       |
| 4 - Rotor   | 16 - Bushing                                      | 27 - Spring Pin              | 38 - O-Ring               |
| 5 - Plunger<br>(ZW220: 7 Used)<br>(ZW250: 9 Used) | 17 - Servo Piston (3 Used)                        | 28 - Pin                     | 39 - Spring Pin (2 Used)  |
| 6 - Swash Plate                                   | 18 - Retainer                                     | 29 - Link pin                | 40 - O-Ring (5 Used)      |
| 7 - Knock Pin                                     | 19 - Cam Plate                                    | 30 - O-Ring                  | 41 - Plug                 |
| 8 - Front Casing                                  | 20 - Knock Pin                                    | 31 - O-Ring                  | 42 - Pressure Sensor      |
| 9 - Socket Bolt (8 Used)                          | 21 - Plug   | 32 - Retaining Ring (2 Used) | 43 - Restrictor Pin       |
| 10 - Socket Bolt (4 Used)                         | 22 - Cradle Plate                                 | 33 - Plug                    | 44 - Backup Ring (2 Used) |
| 11 - Drive Shaft                                  | 23 - Plug   | 34 - Roller Bearing          | 45 - O-Ring (2 Used)      |
| 12 - Inner Race                                   |   |                              |                           |

## BODY (UPPERSTRUCTURE) / Pump Device

---

### Disassembly of Main Pump



**CAUTION: Pump device weight:**

**ZW220: 83 kg (185 lb)**

**ZW250: 107 kg (240 lb)**

1. Secure the pump device on a workbench with the pilot pump side facing downward.




**CAUTION: Front casing (8) weight:**

**ZW220: 36 kg (79.5 lb)**


**ZW250: 48 kg (110 lb)**

2. Remove socket bolts (9) (8 used) from front casing (8).

ZW220

 : 12 mm

ZW250

 : 14 mm

**IMPORTANT: Inner race (12) installed to drive shaft (11) cannot be replaced. Do not damage inner race (12).**

3. Remove the front casing (8) assembly from pump casing (2). At this time, drive shaft (11), the rotor (4) assembly and restrictor pin (43) are removed together with front casing (8).



*NOTE: When removing front casing (8), raise the pump casing (2) side a little in order to prevent rotor (4) from falling off.*



*NOTE: Do not remove restrictor pin (43) unless necessary. Restrictor pin (43) may stay in pump casing (2).*

4. Place front casing (8) onto a wooden block of more than 30 square mm (1.2 square in) with the rotor (4) side facing upward.

**IMPORTANT: The valve plate (3) side of rotor (4) is a sliding surface. Do not damage the sliding surface.**

5. Put a hand on retainer (18) and remove the rotor (4) assembly from drive shaft (11). Place the rotor (4) assembly with the valve plate side facing downward.

6. Put a hand under retainer (18) and remove retainer (18) with servo piston (17) together from rotor (4).


7. Remove bushing (16), springs (15) (ZW220 (7 used), ZW250 (4 used)) from rotor (4).

8. Remove plate (19) from swash plate (6).



*NOTE: By tapping the yoke part with plate (19) facing upward plate (19) is floated.*

9. Remove socket bolts (10) (4 used) from cradle plate (22). Remove cradle plate (22) from front casing (8).

 : 6 mm

10. Remove drive shaft (11) with roller bearing (34) together from front casing (8) by hands.

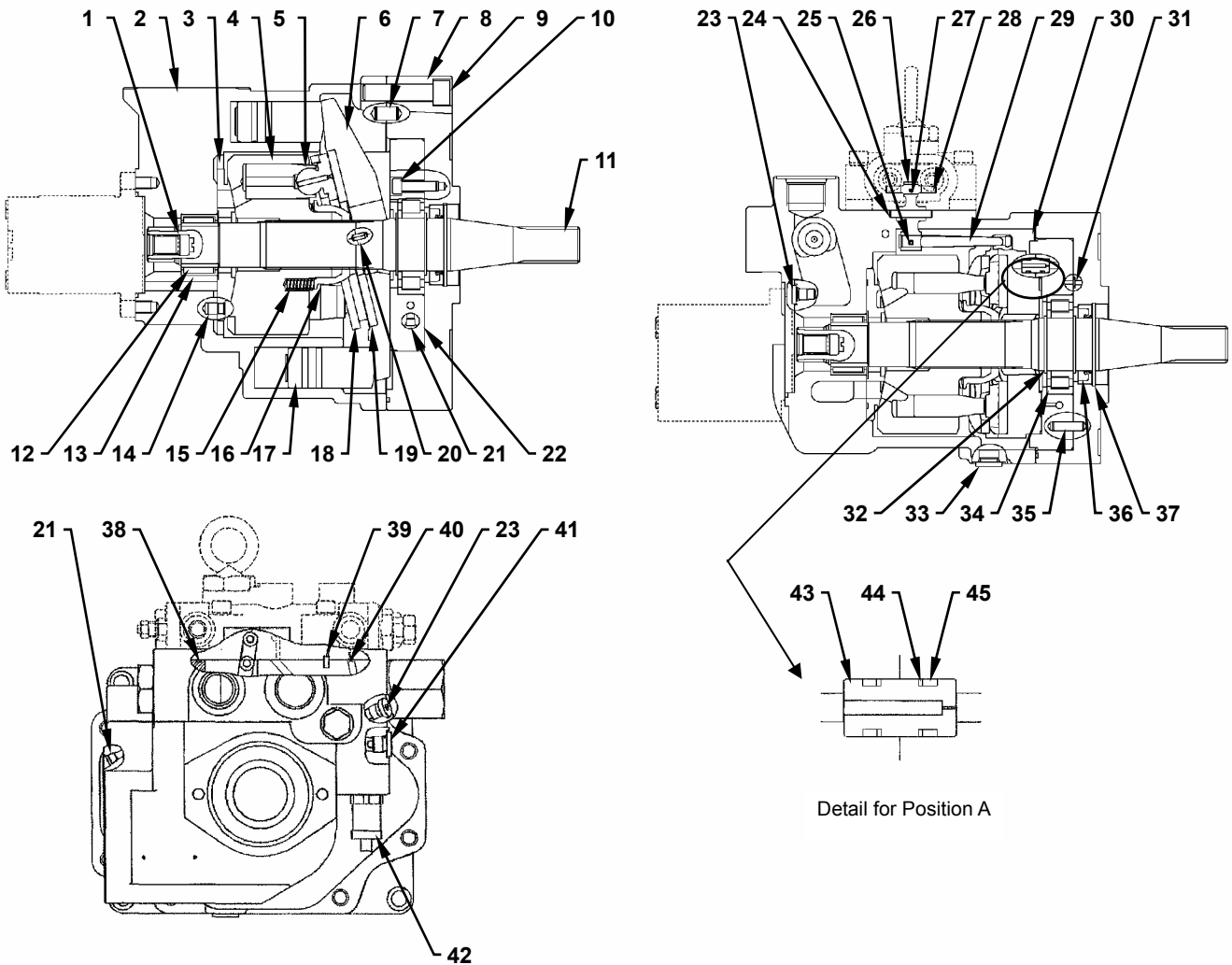
**IMPORTANT: When removing retaining ring (32), do not damage the seal lip surface of drive shaft (11).**

11. Remove retaining rings (32) (2 used) from drive shaft (11).

12. Remove the roller and the outer ring of roller bearing (34).

# BODY (UPPERSTRUCTURE) / Pump Device

## ASSEMBLY OF MAIN PUMP



W4GB-02-04-003

- |   |   |                              |                           |
|---|---|------------------------------|---------------------------|
| 1 - Retaining Ring                                | 13 - Needle Bearing                               | 24 - Pin                     | 35 - Knock Pin            |
| 2 - Pump Casing                                   | 14 - Knock Pin                                    | 25 - Spring Pin              | 36 - Oil Seal             |
| 3 - Valve Plate                                   | 15 - Spring<br>(ZW220: 7 Used)<br>(ZW250: 4 Used) | 26 - Feedback Link           | 37 - Retaining Ring       |
| 4 - Rotor   | 16 - Bushing                                      | 27 - Spring Pin              | 38 - O-Ring               |
| 5 - Plunger<br>(ZW220: 7 Used)<br>(ZW250: 9 Used) | 17 - Servo Piston (3 Used)                        | 28 - Pin                     | 39 - Spring Pin (2 Used)  |
| 6 - Swash Plate                                   | 18 - Retainer                                     | 29 - Link pin                | 40 - O-Ring (5 Used)      |
| 7 - Knock Pin                                     | 19 - Cam Plate                                    | 30 - O-Ring                  | 41 - Plug                 |
| 8 - Front Casing                                  | 20 - Knock Pin                                    | 31 - O-Ring                  | 42 - Pressure Sensor      |
| 9 - Socket Bolt (8 Used)                          | 21 - Plug   | 32 - Retaining Ring (2 Used) | 43 - Restrictor Pin       |
| 10 - Socket Bolt (4 Used)                         | 22 - Cradle Plate                                 | 33 - Plug                    | 44 - Backup Ring (2 Used) |
| 11 - Drive Shaft                                  | 23 - Plug   | 34 - Roller Bearing          | 45 - O-Ring (2 Used)      |
| 12 - Inner Race                                   |   |                              |                           |



## BODY (UPPERSTRUCTURE) / Pump Device

### Assembly of Main Pump

1. Tap and install needle bearing (13) with the stamped mark on the outer race facing upward to pump casing (2) by using special tool and a hammer.


**IMPORTANT: Valve plate (3) and rotor (4) must be replaced as an assembly.**

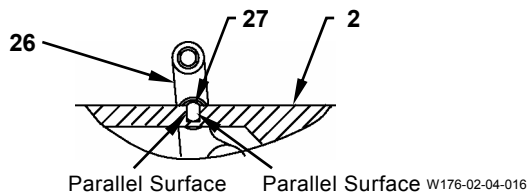
**IMPORTANT: Install valve plate (3) of the rotor (4) assembly with the slotted hole facing downward.**

2. Apply grease onto the flat surface of valve plate (3). Align the position of knock pin (14) in pump casing (2) and install valve plate (3).
3. Install servo pistons (17) (3 used) to pump casing (2).

**IMPORTANT: Check the direction install feedback link (26).**

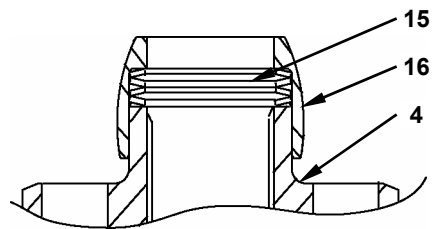
4. Align the groove for pin (24) in pump casing (2) and install the feedback link (26) assembly. At this time, face link pin (29) to the front casing (8) side.

 **NOTE:** Both surfaces of spring pin (27) are parallel to each other. Align the parallel surface with the groove and install the surface.




**IMPORTANT: Check the directions of spring (15) and retainer (18). (ZW250 only)**

5. Assemble rotor (4) into an assembly by the following procedures.
  - Place rotor (4) with the center projection part facing upward.
  - Install springs (15) (7 used) to rotor (4). (ZW220 only)
  - Assemble springs (15) (4 used) so that the outer surface is matching with the outer surface and the inner surface is matching with the inner surface. Place springs (15) (4 used) to the center projection part of rotor (4). (ZW250 only)



W176-02-06-015

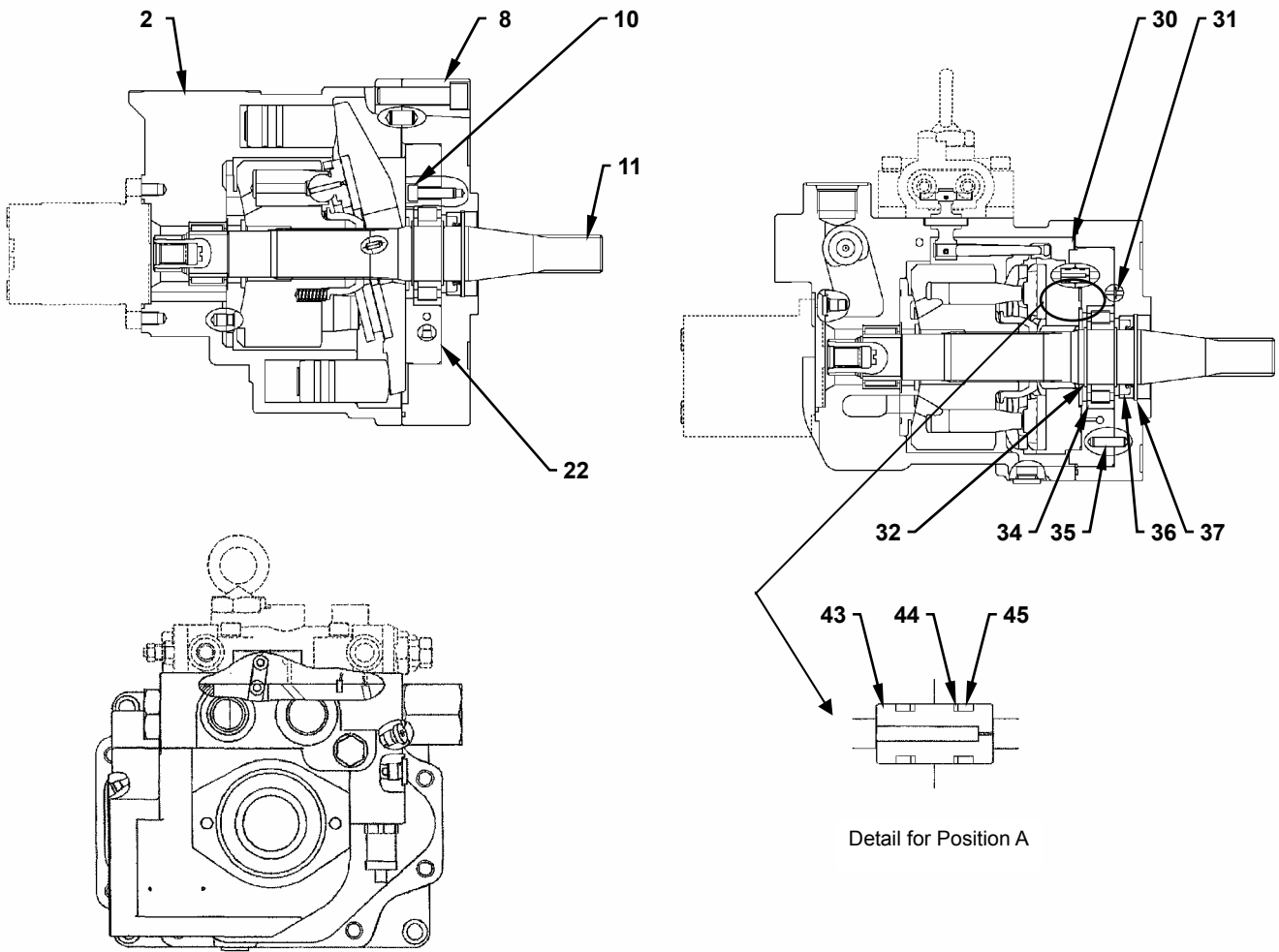
- Cover disc spring (15) with bushing (16). (ZW250 only)
- Cover rotor (4) with bushing (16). (ZW220 only)

 **NOTE:** When covering bushing (16), aligning the spline of bushing (16) with the spline of rotor (4) makes it easy to install the shaft later.

- Insert plungers (5) (ZW220 (7 used), ZW250 (9 used) from the flat surface of retainer (18) and install them to rotor (4).

6. Evenly tap and install inner race (12) to drive shaft (11) by using a special tool and a hammer.
7. Install retaining ring (1) to drive shaft (11).

# BODY (UPPERSTRUCTURE) / Pump Device



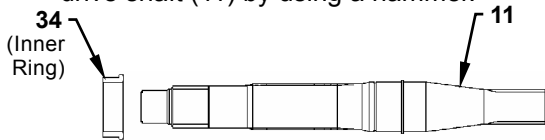
W4GB-02-04-003

## BODY (UPPERSTRUCTURE) / Pump Device

**IMPORTANT: Do not damage the oil seal (36) sliding surface of drive shaft (11).**

8. There are two ring grooves in drive shaft (11). Install retaining ring (32) to the ring groove closer to the end surface.

9. Check the direction of the inner ring of roller bearing (34). Tap and install roller bearing (34) to drive shaft (11) by using a hammer.




W4GB-02-04-004


10. Install the roller and outer/inner ring plates of roller bearing (34), to drive shaft (11) with the stamped mark facing out.

11. Install retaining ring (32) to drive shaft (11).

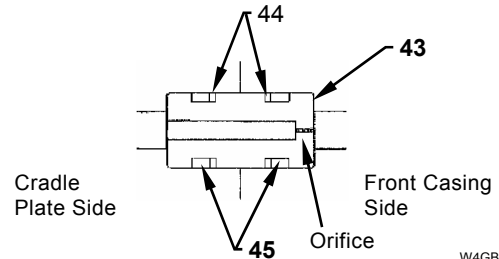
12. Assemble front casing (8) into an assembly by the following procedures.

- Place front casing (8) with the pump casing (2) side facing downward.
- Apply grease onto the inner surface of oil seal (36).
- Evenly tap and install oil seal (36) into front casing (8) by using a special tool and a plastic hammer.
- Install retaining ring (37) to front casing (8).
- Turn over front casing (8) and place onto a wooden block of more than 30 square mm (1.2 square in).
- Install O-ring (31) to front casing (8).
- Install drive shaft (11) to front casing (8). At this time, by tapping drive shaft (11) by using a plastic hammer, roller bearing (34) can be inserted easily.
- Align with pin (35) and install cradle plate (22) to front casing (8). Tighten with socket bolts (10) (4 used).

 : 6 mm

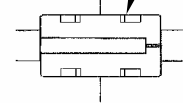
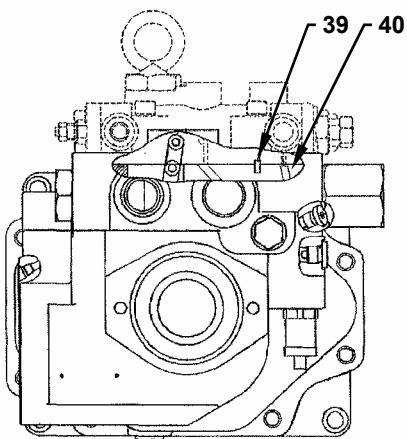
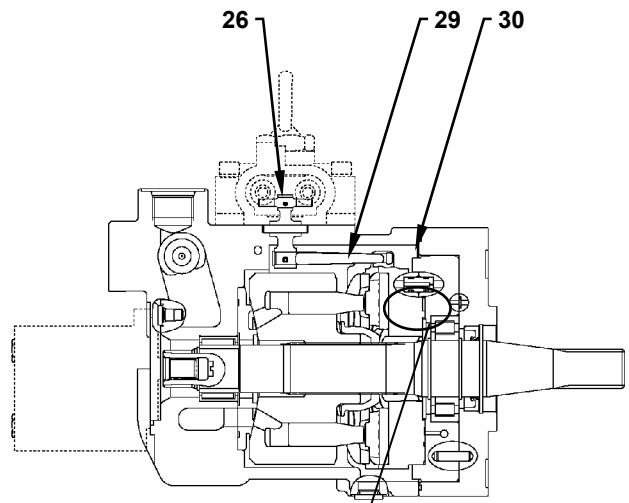
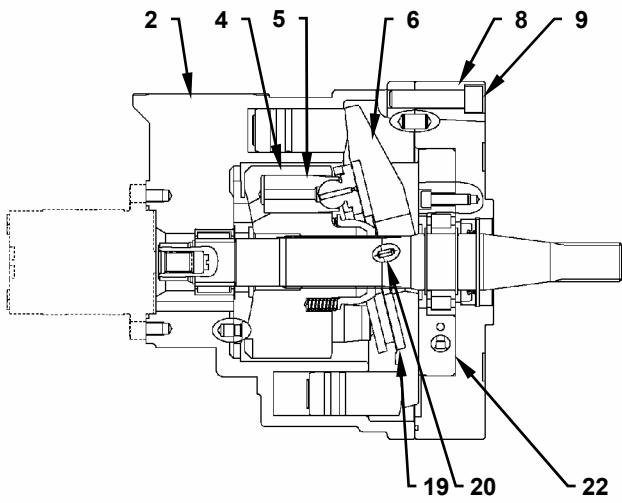
 : 20 N·m (2 kgf·m, 14.5 lbf·ft)

- Install O-ring (30) to front casing (8).
- Install backup rings (44) (2 used) and O-rings (45) (2 used) to restrictor pin (43) when restrictor pin (43) is removed. Install restrictor pin (43) to front casing (8). At this time, install restrictor pin (43) with the orifice hole side facing inside.



W4GB-02-04-005

# BODY (UPPERSTRUCTURE) / Pump Device



Detail for Position A

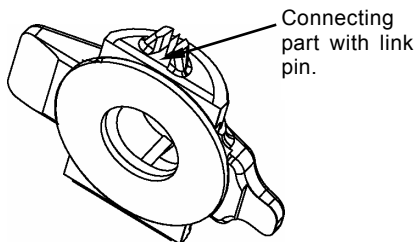
W4GB-02-04-003

## BODY (UPPERSTRUCTURE) / Pump Device

13. Apply grease onto the surface of the knock pin (20) hole side of cam plate (19). Align the position of knock pin (20) with swash plate (6) and install cam plate (19).

**IMPORTANT:** Install swash plate (6) so that the connecting part with link pin (29) of swash plate (6) faces upward (the regulator mounting side).

14. Apply grease onto the cylindrical surface of swash plate (6). Install swash plate (6) to the front casing (8) assembly by aligning with the cylindrical surface of cradle plate (22).



W176-02-04-018

15. Install the rotor (4) assembly to the front casing (8) assembly. Do not drop plunger (5) from the rotor (4) assembly.

**CAUTION:** Front casing (8) assembly weight:  
ZW220: 36 kg (79.5 lb)  
ZW250: 48 kg (110 lb)

16. Raise the front casing (8) assembly almost to the vertical position and hold the position.

**NOTE:** If the front casing (8) assembly is raised too much, swash plate (6) may come off.

**CAUTION:** Front casing (8) assembly weight:  
ZW220: 36 kg (79.5 lb)  
ZW250: 48 kg (110 lb)

17. Hoist the front casing (8) assembly.


**NOTE:** Do not incline while hoisting the front casing (8) assembly as the center of gravity is on the rotor (4) side. Rotor (4) may come off if the front casing (8) assembly inclines.


**IMPORTANT:** When installing, so that link pin (29) can be inserted to the convex part for connecting swash plate (6) and feedback link (26).

18. Align the position with link pin (29) and install the front casing (8) assembly to pump casing (2).


19. Tighten front casing (8) to pump casing (2) with socket bolts (9) (8 used).


ZW220

 : 12 mm

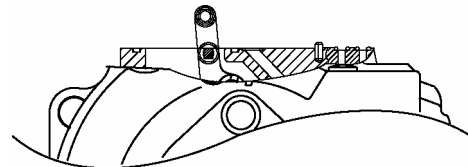
 : 140 N·m (14 kgf·m, 101 lbf·ft)

ZW250

 : 14 mm

 : 210 N·m (21.5 kgf·m, 152 lbf·ft)

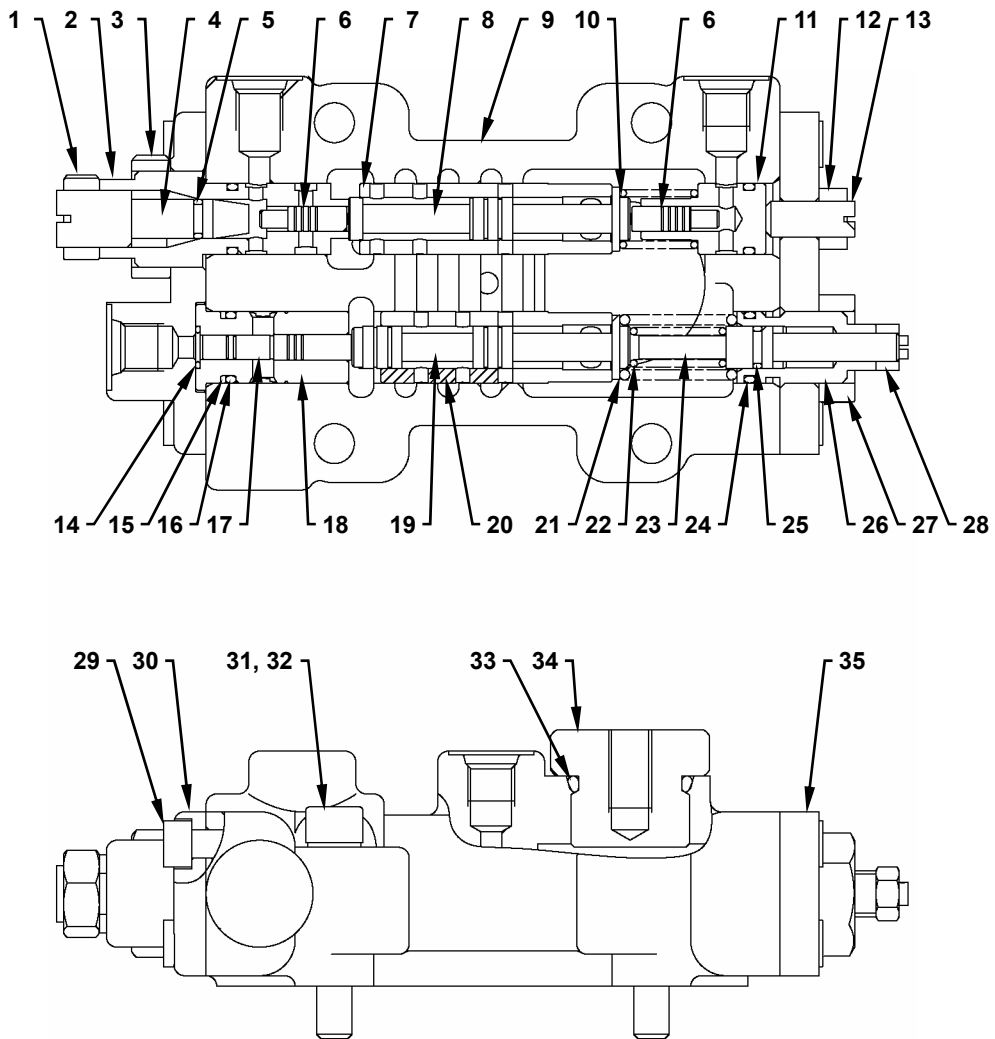
20. Install O-ring (30), O-rings (40) (5 used) and spring pins (39) (2 used) to pump casing (2).



W176-02-04-014

# BODY (UPPERSTRUCTURE) / Pump Device

## DISASSEMBLY OF REGULATOR



W4GB-02-04-006

- |                     |                  |                      |                           |
|---------------------|------------------|----------------------|---------------------------|
| 1 - Nut             | 10 - Spring      | 19 - Spool           | 28 - Lock Nut             |
| 2 - Cylinder        | 11 - Cylinder    | 20 - Sleeve          | 29 - Socket Bolt (8 Used) |
| 3 - Lock Nut        | 12 - Lock Nut    | 21 - Spring          | 30 - Cover                |
| 4 - Stopper         | 13 - Set Screw   | 22 - Spring          | 31 - Socket Bolt (4 Used) |
| 5 - O-Ring          | 14 - O-Ring      | 23 - Stopper         | 32 - Washer (4 Used)      |
| 6 - Piston (2 Used) | 15 - Backup Ring | 24 - O-Ring (3 Used) | 33 - O-Ring               |
| 7 - Sleeve          | 16 - O-Ring      | 25 - O-Ring          | 34 - Plug                 |
| 8 - Spool           | 17 - Piston      | 26 - Stopper         | 35 - Cover                |
| 9 - Casing          | 18 - Cylinder    | 27 - Lock Nut        |                           |

## BODY (UPPERSTRUCTURE) / Pump Device


---

### Disassembly of Regulator

**IMPORTANT:** As the setting changes, do not disassemble adjusting screws (1 to 4, 12, 13, 26 to 28) of the regulator. When disassembling is required, adjust the adjusting screws according to the performance measurement procedure after assembling.


**IMPORTANT:** As the settings changes, do not rotate set screw (13) and lock nuts (12, 27, 28).

1. Remove socket bolts (29) (4 used) from cover (35). Remove cover (35) from casing (9). At this time, set screw (13) and the stopper (23) assembly are removed together with cover (35).

 : 6 mm

**IMPORTANT:** As the setting changes, do not rotate lock nut (3) and lock nut (1).

2. Remove socket bolts (29) (4 used) from cover (30). Remove cover (30) from casing (9). At this time, the stopper (4) assembly are removed with cover (30).

 : 6 mm

3. Remove springs (21, 22) from casing (9).

4. Insert a round bar into the hole on casing (9). Remove cylinder (18), sleeve (20) and spool (19) from casing (9) by pushing the end surface of spool (19). At this time, piston (17) is removed with cylinder (18) together.

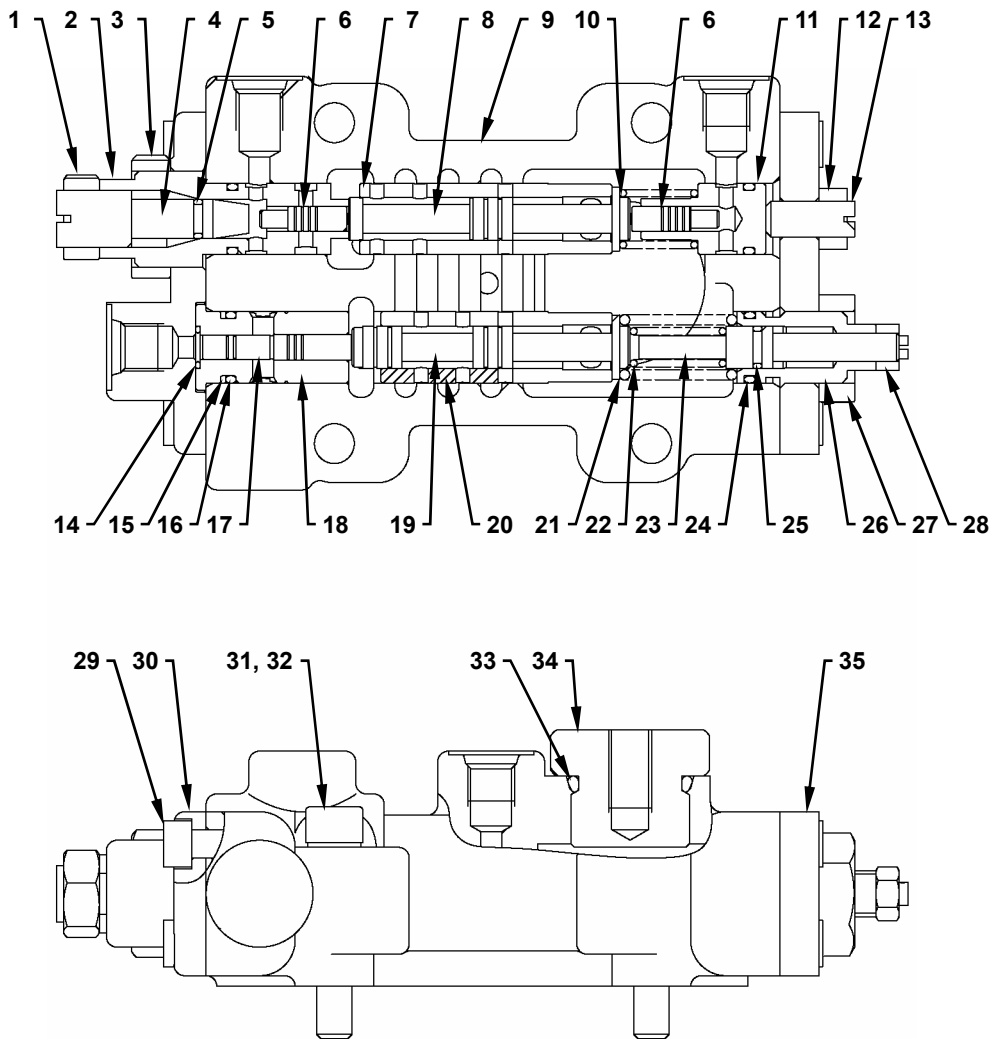
5. Remove piston (17) from cylinder (18).

6. Insert a round bar into the hole on casing (9). Remove cylinder (11), sleeve (7) and spool (8) from casing (9) by pushing the end surface of spool (8). At this time, piston (6) is removed with cylinder (11) together.

7. Remove piston (6) from cylinder (11).

# BODY (UPPERSTRUCTURE) / Pump Device

## ASSEMBLY OF REGULATOR



W4GB-02-04-006

- |                     |                  |                      |                           |
|---------------------|------------------|----------------------|---------------------------|
| 1 - Nut             | 10 - Spring      | 19 - Spool           | 28 - Lock Nut             |
| 2 - Cylinder        | 11 - Cylinder    | 20 - Sleeve          | 29 - Socket Bolt (8 Used) |
| 3 - Lock Nut        | 12 - Lock Nut    | 21 - Spring          | 30 - Cover                |
| 4 - Stopper         | 13 - Set Screw   | 22 - Spring          | 31 - Socket Bolt (4 Used) |
| 5 - O-Ring          | 14 - O-Ring      | 23 - Stopper         | 32 - Washer (4 Used)      |
| 6 - Piston (2 Used) | 15 - Backup Ring | 24 - O-Ring (3 Used) | 33 - O-Ring               |
| 7 - Sleeve          | 16 - O-Ring      | 25 - O-Ring          | 34 - Plug                 |
| 8 - Spool           | 17 - Piston      | 26 - Stopper         | 35 - Cover                |
| 9 - Casing          | 18 - Cylinder    | 27 - Lock Nut        |                           |



## BODY (UPPERSTRUCTURE) / Pump Device

---

### Assembly of Regulator

**IMPORTANT:** Inner diameters of the two holes for sleeve on casing (9) are the same. The shapes of each part is similar. Check the illustration when assembling.


1. Clean all parts and apply hydraulic oil.


**IMPORTANT:** Check the direction to install sleeve (7) and spool (8).

2. Insert spool (8) into sleeve (7). Install the sleeve (7) assembly to the center of casing (9) by using a round bar.
3. Install O-ring (24) to cylinder (11).
4. Insert piston (6) into cylinder (11). Install the cylinder (11) assembly to casing (9).


**IMPORTANT:** Check the direction to install sleeve (20) and spool (19).


5. Insert spool (19) into sleeve (20). Install the sleeve (20) assembly to the center of casing (9) by using a round bar.
6. Install O-rings (14, 16) and backup ring (15) to cylinder (18).
7. Insert piston (17) into cylinder (18). Install the cylinder (18) assembly to casing (9).
8. Install O-ring (5) and piston (6) to the stopper (4) assembly installed to cover (30). Install the cover (30) assembly to casing (9) with socket bolts (29) (4 used).

 : 6 mm

 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)

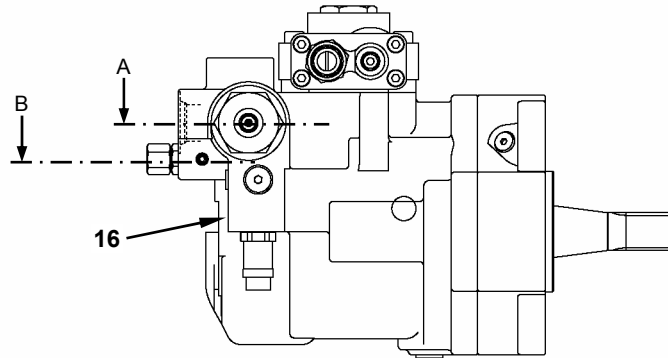
9. Install O-ring (24) and springs (21, 22) to the stopper (23) assembly installed to cover (35). Install the cover (35) assembly to casing (9) with socket bolts (29) (4 used).

 : 6 mm

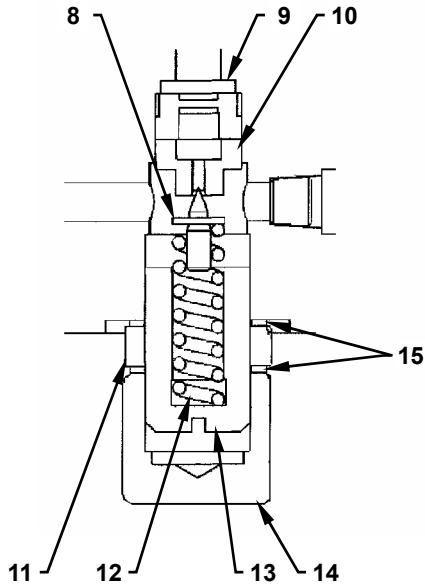
 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)

# BODY (UPPERSTRUCTURE) / Pump Device

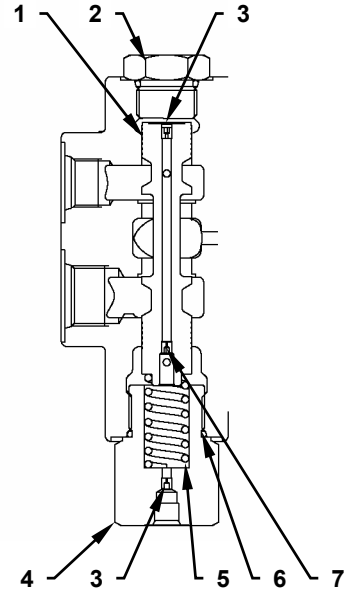
## DISASSEMBLY OF PRIORITY VALVE



Section B



Section A



W4GB-02-04-007

- |                      |             |             |                      |
|----------------------|-------------|-------------|----------------------|
| 1 - Spool            | 5 - Spring  | 9 - Plug    | 13 - Screw           |
| 2 - Plug             | 6 - O-Ring  | 10 - Seat   | 14 - Nut Cap         |
| 3 - Orifice (2 Used) | 7 - Orifice | 11 - Nut    | 15 - Gasket (2 Used) |
| 4 - Plug             | 8 - Poppet  | 12 - Spring | 16 - Casing          |









## BODY (UPPERSTRUCTURE) / Pump Device

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### Disassembly of Priority Valve

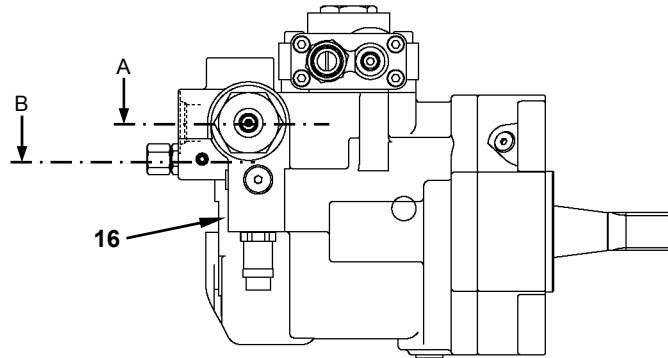


**CAUTION:** The components of the priority valve are easily contaminated by dirt. Prevent any foreign material from entering the components when disassembling and assembling.

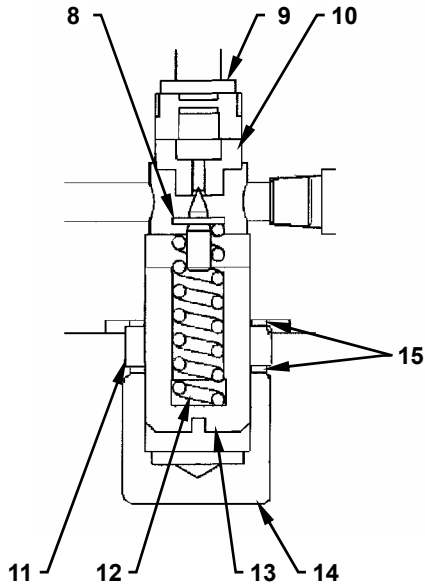
1. Remove plug (2) from casing (16).  
 : 41 mm
2. Remove plug (4) from casing (16). Remove O-ring (6) from plug (4).  
 : 50 mm
3. Remove orifice (3) [blue-white] from plug (4).  
 : 3 mm
4. Remove spool (1) and spring (5) from casing (16).
5. Remove orifice (3) [blue-white] and orifice (7) [red] from plug (4).  
 : 3 mm
6. Remove nut cap (14) from screw (13). At this time, prevent gasket (15) from falling off.  
 : 22 mm
7. Remove nut (11) from casing (16). At this time, prevent gasket (15) from falling off.  
 : 22 mm
8. Remove screw (13) from casing (16). At this time, spring (12) and poppet (8) from falling off.
9. Remove spring (12) and poppet (8).
10. Remove seat (10) from casing (16).  
 : 7 mm
11. Remove plug (9) from casing (16).  
 : 6 mm

# BODY (UPPERSTRUCTURE) / Pump Device

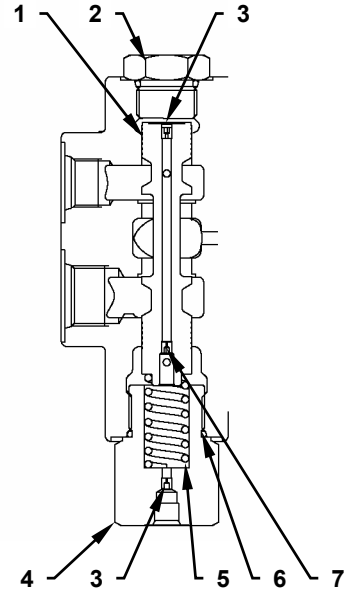
## ASSEMBLY OF PRIORITY VALVE



Section B



Section A



W4GB-02-04-007

- |                      |             |             |                      |
|----------------------|-------------|-------------|----------------------|
| 1 - Spool            | 5 - Spring  | 9 - Plug    | 13 - Screw           |
| 2 - Plug             | 6 - O-Ring  | 10 - Seat   | 14 - Nut Cap         |
| 3 - Orifice (2 Used) | 7 - Orifice | 11 - Nut    | 15 - Gasket (2 Used) |
| 4 - Plug             | 8 - Poppet  | 12 - Spring | 16 - Casing          |


















## BODY (UPPERSTRUCTURE) / Pump Device

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### Assembly of Priority Valve

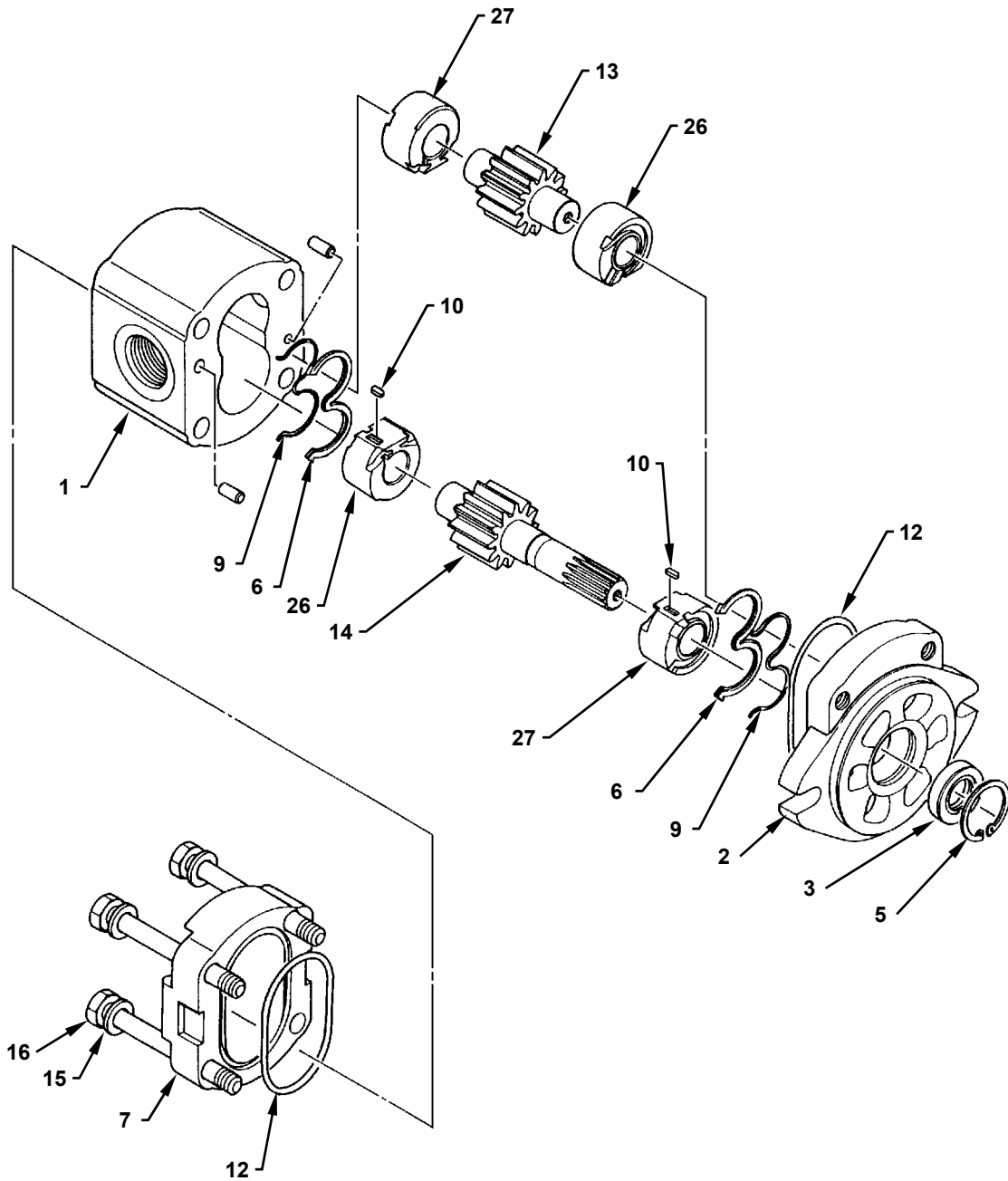


**CAUTION:** The components of the priority valve are easily contaminated by dirt. Prevent any foreign material from entering the components when disassembling and assembling.

1. Install plug (9) to casing (16).  
 : 6 mm  
 : 15 N·m (1.5 kgf·m, 11 lbf·ft)
2. Install seat (10) to casing (16).  
 : 7 mm  
 : 15 N·m (1.5 kgf·m, 11 lbf·ft)
3. Install spring (12) and poppet (8) to screw (13). Install poppet (8) to casing (16) so that the end of poppet (8) can be installed into the hole on seat (10).
4. Install nut (11) and gasket (15) to screw (13).  
 : 22 mm  
 : 46 N·m (4.7 kgf·m, 34 lbf·ft)
5. Install orifice (3) [blue-white] and orifice (7) [red] to spool (1).  
 : 3 mm  
 : 3 N·m (0.3 kgf·m, 2.2 lbf·ft)
6. Insert spool (1) and spring (5) into casing (16). At this time, check the direction of spool (1).
7. Install orifice (3) to plug (4).  
 : 3 mm  
 : 3 N·m (0.3 kgf·m, 2.2 lbf·ft)
8. Install O-ring (6) to plug (4). Install plug (4) to casing (16).  
 : 50 mm  
 : 550 N·m (56 kgf·m, 400 lbf·ft)
9. Install plug (2) to casing (16).  
 : 41 mm  
 : 450 N·m (46 kgf·m, 330 lbf·ft)
-  **NOTE:** Measure, adjust the steering relief pressure, and install nut cap (14).
10. Install nut cap (14) and gasket (15) to screw (13).  
 : 22 mm  
 : 37 N·m (3.7 kgf·m, 27.5 lbf·ft)

# BODY (UPPERSTRUCTURE) / Pump Device


## STRUCTURE OF PILOT PUMP



W137-02-04-034

## BODY (UPPERSTRUCTURE) / Pump Device

**IMPORTANT:** The housing is made of aluminum.  
Do not damage the housing. Take extreme care in order to control the tightening torque.

Item	Part Name	Q'ty	Wrench Size (mm)	Tightening Torque			Remark
				N·m	(kgf·m)	(lbf·ft)	
1	Housing	1					
2	Flange	1					
3	Oil Seal	1					Apply grease onto the lip when assembling.
5	Retaining Ring	1					
6	Seal	2					Apply grease onto the lip when assembling.
7	Cover	1					
9	Backup Ring	2					Apply grease onto the lip when assembling.
10	Key	2					
12	O-Ring	2					Apply grease onto the lip when assembling.
13	Gear	1					
14	Gear	1					
15	Washer	4					
16	Bolt	4	 : 17	39 to 44	(4 to 4.5)	(28.5 to 32.5)	
26	Bushing	2					Apply hydraulic oil when assembling.
27	Bushing	2					Apply hydraulic oil when assembling.

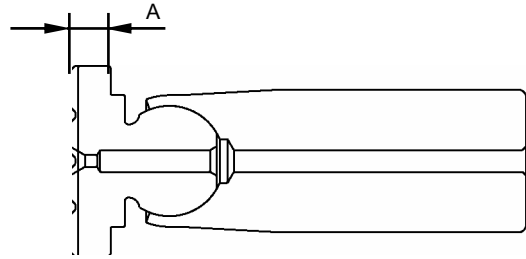
## BODY (UPPERSTRUCTURE) / Pump Device

### MAINTENANCE STANDARD

#### Pump Device

1. Plunger assembly: Shoe thickness

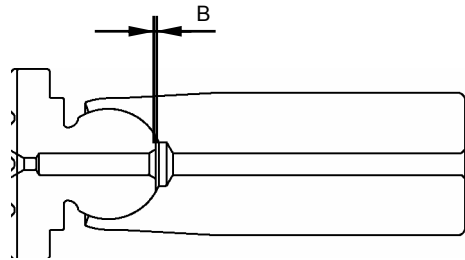
	Standard	Allowable Limit
A	8 mm (0.31 in)	7.7 mm (0.30 in)



W176-02-04-020

2. Plunger: Clearance between shoe and plunger

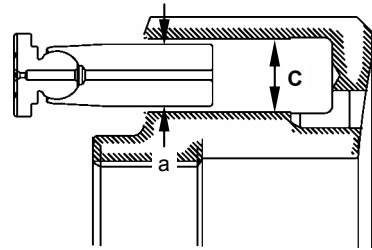
	Standard	Allowable Limit
B	0.15 mm (0.01 in)	0.4 mm (0.02 in)



W176-02-04-020

3. Rotor: Clearance between plunger outer diameter and cylinder block bore

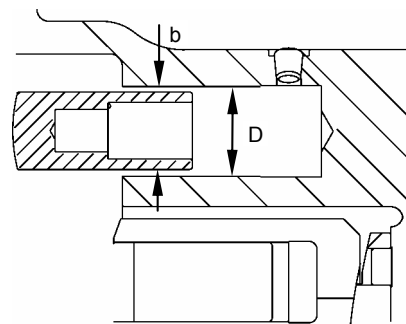
	Standard	Allowable Limit
(C-a)	0.03 mm (0.001 in)	0.07 mm (0.003 in)



W176-02-04-021

4. Clearance between housing inner diameter and servo piston outer diameter

	Standard	Allowable Limit
(D-b)	0.02 mm (0.0008 in)	0.04 mm (0.002 in)

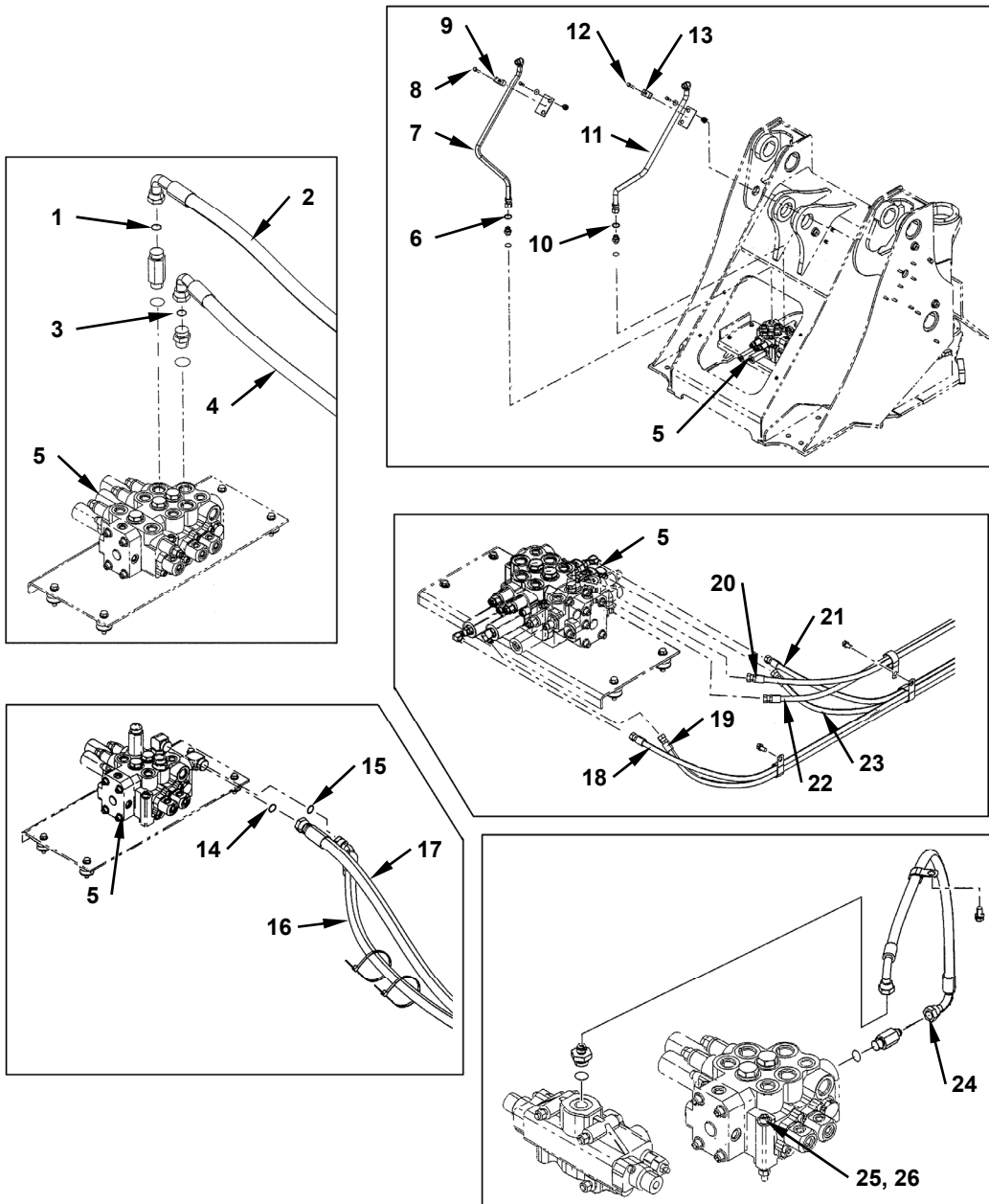


W176-02-04-022



## BODY (UPPERSTRUCTURE) / Control Valve

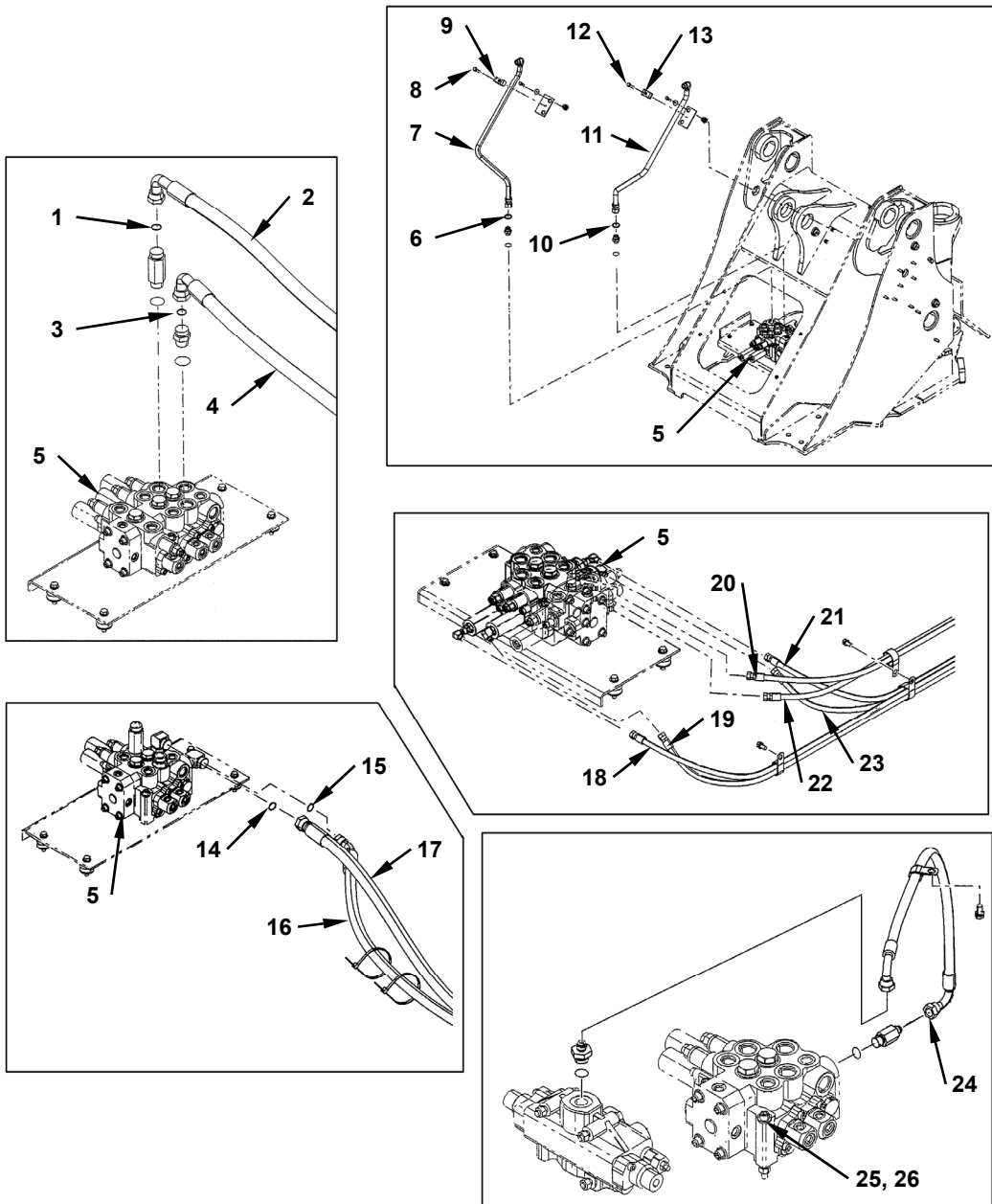
### REMOVAL AND INSTALLATION OF CONTROL VALVE (ZW220)



W4GB-02-05-021

- |                   |                |             |                           |
|-------------------|----------------|-------------|---------------------------|
| 1 - O-Ring        | 8 - Sems Bolt  | 15 - O-Ring | 21 - Hose                 |
| 2 - Hose          | 9 - Clamp      | 16 - Hose   | 22 - Hose                 |
| 3 - O-Ring        | 10 - O-Ring    | 17 - Hose   | 23 - Hose                 |
| 4 - Hose          | 11 - Pipe      | 18 - Hose   | 24 - Hose                 |
| 5 - Control Valve | 12 - Sems Bolt | 19 - Hose   | 25 - Socket Bolt (3 Used) |
| 6 - O-Ring        | 13 - Clamp     | 20 - Hose   | 26 - Washer (3 Used)      |
| 7 - Pipe          | 14 - O-Ring    |             |                           |

# BODY (UPPERSTRUCTURE) / Control Valve




W4GB-02-05-021

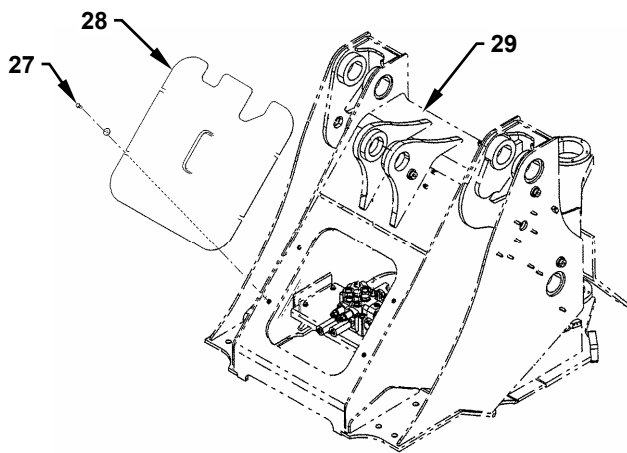
## BODY (UPPERSTRUCTURE) / Control Valve

### Removal (ZW220)




**CAUTION:** Bleed air from the hydraulic oil tank before doing any work. (Refer to BLEED AIR FROM HYDRAULIC OIL TANK on W1-4-1.)


**CAUTION:** Attach an identification tag onto the disconnected hose and the pipe for assembling.


1. Remove sems bolts (27) (4 used) from cover (28). Remove cover (28) from front frame (29).  
 : 14 mm




W4GB-02-05-022


2. Remove sems bolt (8) from clamp (9). Remove clamp (9) from piping (7).  
 : 17 mm
3. Remove sems bolt (12) from clamp (13). Remove clamp (13) from piping (11).  
 : 17 mm
4. Remove pipings (7, 11) from control valve (5). Cap the open ends.  
 : 35 mm

5. Disconnect hoses (2, 4) from control valve (5). Cap the open ends.  
 : 41 mm

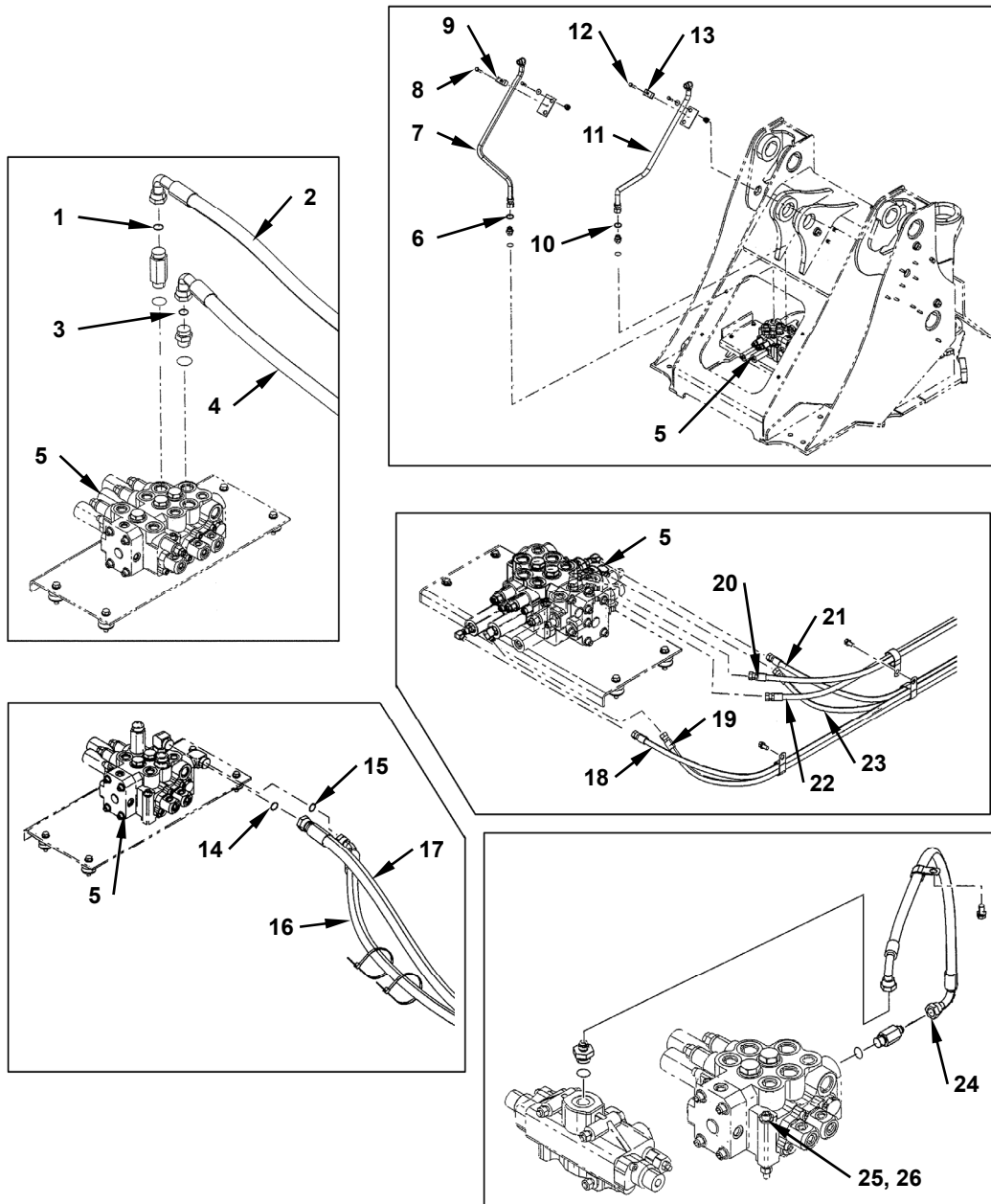
6. Disconnect hoses (16, 17) from control valve (5). Cap the open ends.  
 : 36 mm, 41 mm

7. Disconnect hoses (18, 19, 20, 21, 22, 23 and 24) from control valve (5). Cap the open ends.  
 : 19 mm, 22 mm

**CAUTION:** Control valve (5) weight: 41 kg (90.5 lb)

8. Remove socket bolts (25) (3 used) from control valve (5).  
 : 10 mm
9. Attach a nylon sling onto control valve (5). Hoist and remove control valve (5) from front frame (29).

## BODY (UPPERSTRUCTURE) / Control Valve



W4GB-02-05-021

- |                   |                |             |                           |
|-------------------|----------------|-------------|---------------------------|
| 1 - O-Ring        | 8 - Sems Bolt  | 15 - O-Ring | 21 - Hose                 |
| 2 - Hose          | 9 - Clamp      | 16 - Hose   | 22 - Hose                 |
| 3 - O-Ring        | 10 - O-Ring    | 17 - Hose   | 23 - Hose                 |
| 4 - Hose          | 11 - Pipe      | 18 - Hose   | 24 - Hose                 |
| 5 - Control Valve | 12 - Sems Bolt | 19 - Hose   | 25 - Socket Bolt (3 Used) |
| 6 - O-Ring        | 13 - Clamp     | 20 - Hose   | 26 - Washer (3 Used)      |
| 7 - Pipe          | 14 - O-Ring    |             |                           |

## BODY (UPPERSTRUCTURE) / Control Valve


### Installation (ZW220)




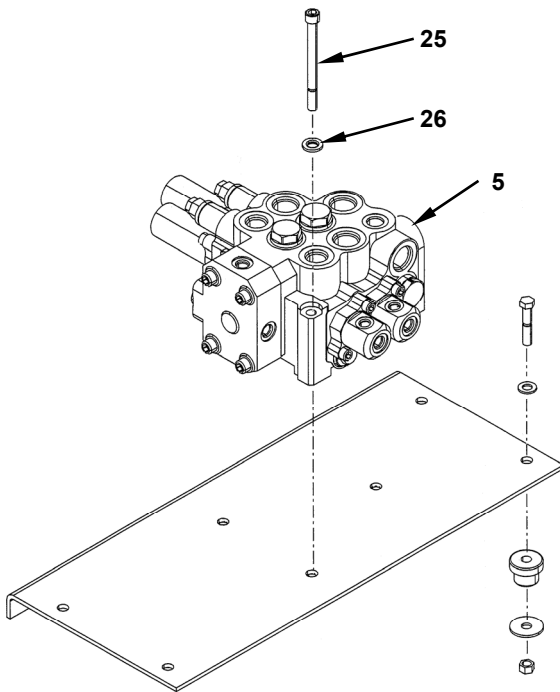
**CAUTION: Control valve (5) weight: 41 kg (90.5 lb)**

1. Attach a nylon sling onto control valve (5). Hoist to and align control valve (5) with the mounting hole on front frame (29).

2. Secure control valve (5) to front frame (29) with socket bolts (25) (3 used) and washers (26) (3 used).


 : 10 mm


 : 88 N·m (9 kgf·m, 65 lbf·ft)





W4GB-02-05-023

3. Connect hoses (18, 19, 20, 21, 22, 23 and 24) to control valve (5).


 : 19 mm


 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)


 : 22 mm


 : 39 N·m (4 kgf·m, 28.5 lbf·ft)

4. Connect hoses (16, 17) to control valve (5).


 : 36 mm


 : 175 N·m (18 kgf·m, 129 lbf·ft)

 : 41 mm


 : 205 N·m (21 kgf·m, 151 lbf·ft)


5. Connect hoses (2, 4) to control valve (5).

 : 41 mm


 : 205 N·m (21 kgf·m, 151 lbf·ft)

6. Connect pipes (7, 11) to control valve (5).


 : 35 mm


 : 175 N·m (18 kgf·m, 129 lbf·ft)

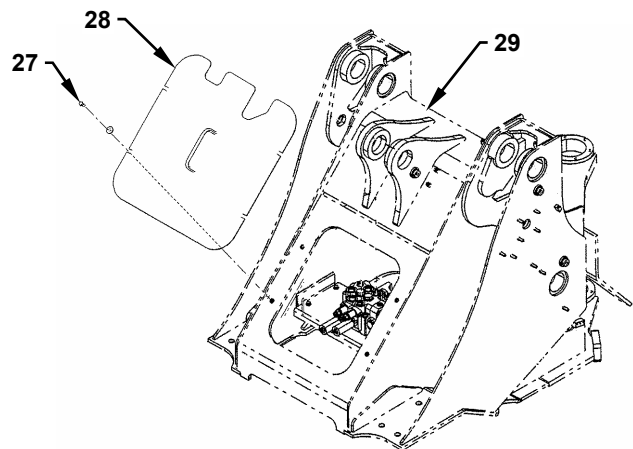
7. Secure pipes (7, 11) to front frame (29) with sems bolts (8, 12) and clamps (9, 13).

 : 17 mm

8. Install cover (28) to front frame (29) with sems bolts (27) (4 used).

 : 14 mm

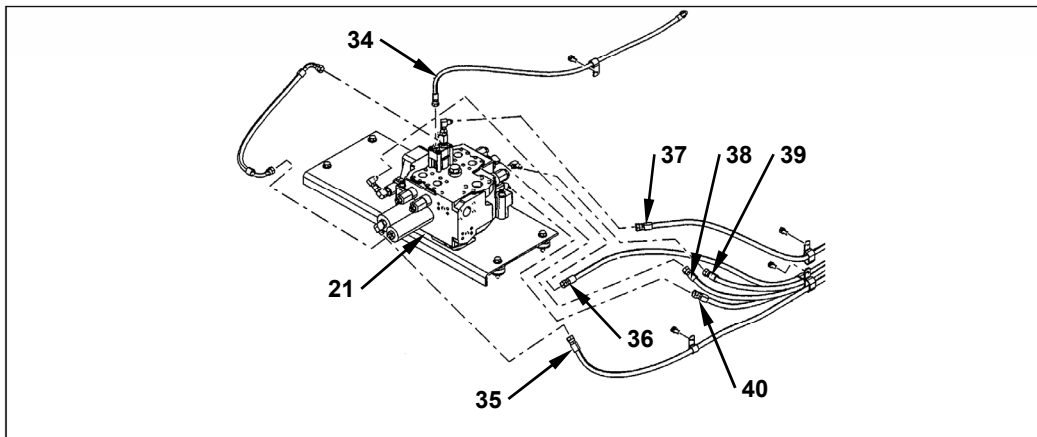
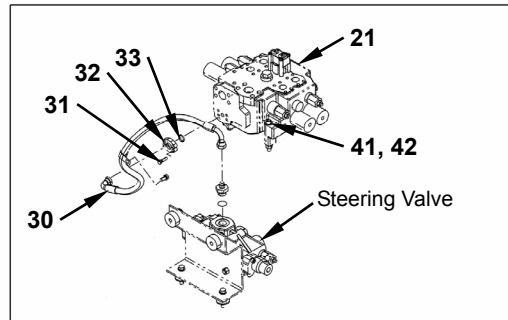
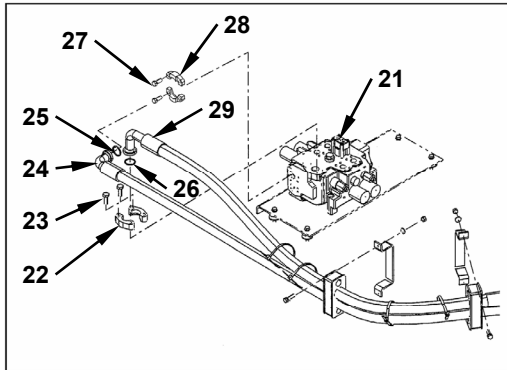
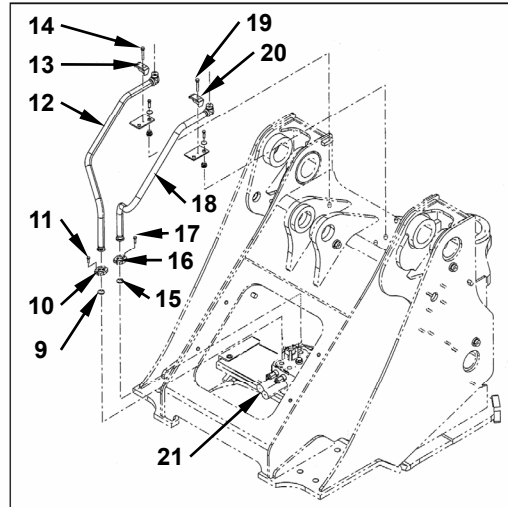
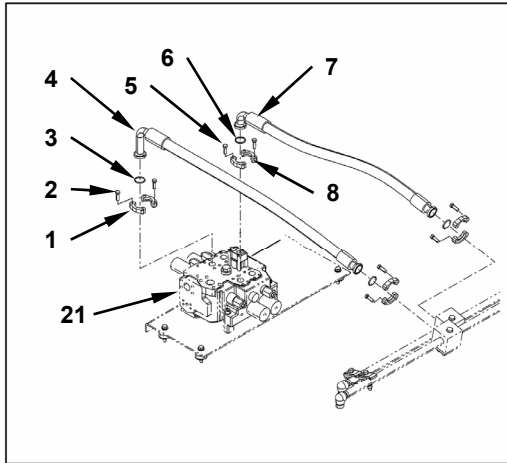
 : 49 N·m (5 kgf·m, 36 lbf·ft)



W4GB-02-05-022

## BODY (UPPERSTRUCTURE) / Control Valve

### REMOVAL AND INSTALLATION OF CONTROL VALVE (ZW250)



W4GB-02-05-024

- |                            |                            |                            |                           |
|----------------------------|----------------------------|----------------------------|---------------------------|
| 1 - Split Flange (2 Used)  | 12 - Pipe                  | 23 - Bolt (4 Used)         | 33 - O-Ring               |
| 2 - Bolt (4 Used)          | 13 - Clamp                 | 24 - Hose                  | 34 - Hose                 |
| 3 - O-Ring                 | 14 - Sems Bolt             | 25 - O-Ring                | 35 - Hose                 |
| 4 - Hose                   | 15 - O-Ring                | 26 - O-Ring                | 36 - Hose                 |
| 5 - Bolt (4 Used)          | 16 - Split Flange (2 Used) | 27 - Bolt (4 Used)         | 37 - Hose                 |
| 6 - O-Ring                 | 17 - Bolt (4 Used)         | 28 - Split Flange (2 Used) | 38 - Hose                 |
| 7 - Hose                   | 18 - Pipe                  | 29 - Hose                  | 39 - Hose                 |
| 8 - Split Flange (2 Used)  | 19 - Sems Bolt             | 30 - Hose                  | 40 - Hose                 |
| 9 - O-Ring                 | 20 - Clamp                 | 31 - Bolt (4 Used)         | 41 - Socket Bolt (3 Used) |
| 10 - Split Flange (2 Used) | 21 - Control Valve         | 32 - Split Flange (2 Used) | 42 - Washer (3 Used)      |
| 11 - Bolt (4 Used)         | 22 - Split Flange (2 Used) |                            |                           |

## BODY (UPPERSTRUCTURE) / Control Valve

### Removal (ZW250)




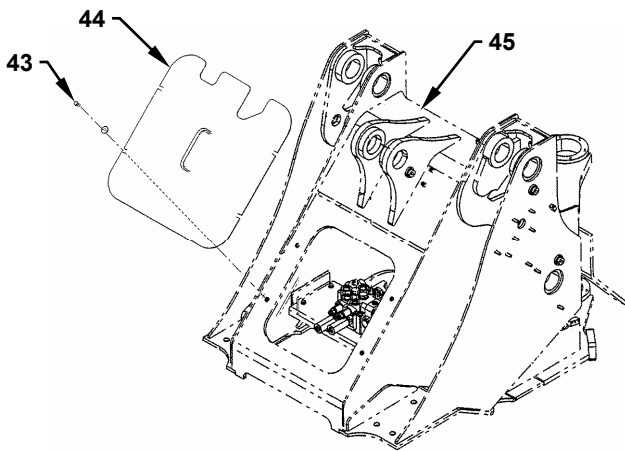
**CAUTION: Bleed air from the hydraulic oil tank before doing any work. (Refer to BLEED AIR FROM HYDRAULIC OIL TANK on W1-4-1.)**



**CAUTION: Attach an identification tag onto the disconnected hose and the pipe for assembling.**


1. Remove semi bolts (43) (4 used) from cover (44). Remove cover (44) from front frame (45).

 : 14 mm




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2. Remove semi bolts (14, 19) and clamps (13, 20) from pipes (12, 18).

 : 17 mm


3. Remove semi bolts (11, 17) (4 used for each) and split flanges (10, 16) (2 used for each). Disconnect pipes (12, 18) from control valve (21).

 : 14 mm


4. Remove bolts (2) (4 used for each) and split flanges (1, 8) (2 used for each). Disconnect hoses (4, 7) from control valve (21).

 : 14 mm


5. Remove bolts (23) (4 used) and split flanges (22) (2 used). Disconnect hose (24) from control valve (21).

 : 22 mm


6. Remove bolts (27) (4 used) and split flanges (28) (2 used). Disconnect hose (29) from control valve (21).

 : 17 mm

7. Remove bolts (31) (4 used) and split flanges (32) (2 used). Disconnect hose (30) from control valve (21).

 : 27 mm


8. Disconnect hoses (34, 35, 36, 37, 38, 39, and 40) from control valve (21). Cap the open ends.

 : 19 mm, 22 mm



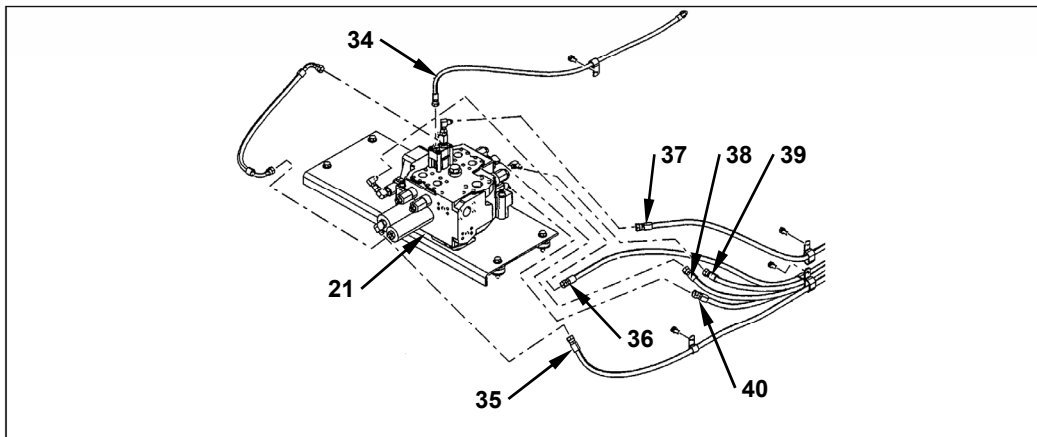
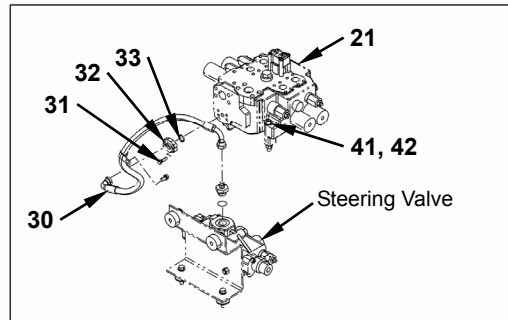
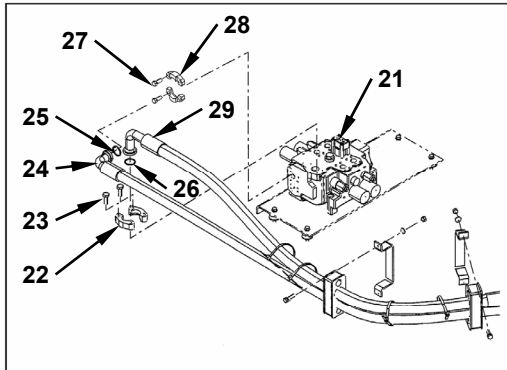
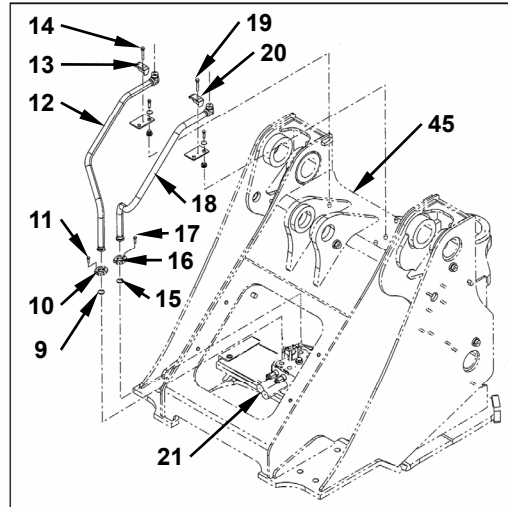
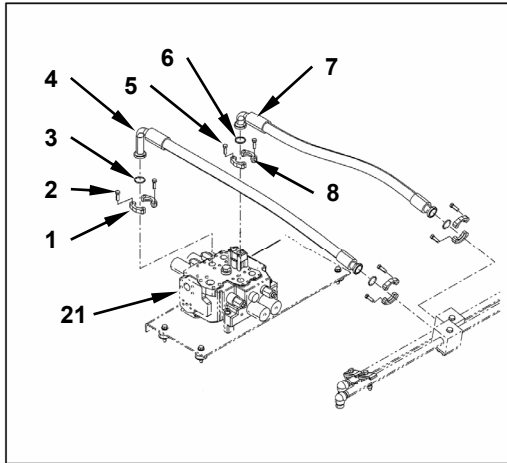
**CAUTION: Control valve (21) weight: 65 kg (145 lb)**

9. Remove bolts (41) (3 used) and washers (42) (3 used) from control valve (21).

 : 10 mm

10. Hoist and remove control valve (21) from front frame (45).

## BODY (UPPERSTRUCTURE) / Control Valve



W4GB-02-05-024

- |                            |                            |                            |                           |
|----------------------------|----------------------------|----------------------------|---------------------------|
| 1 - Split Flange (2 Used)  | 12 - Pipe                  | 23 - Bolt (4 Used)         | 33 - O-Ring               |
| 2 - Bolt (4 Used)          | 13 - Clamp                 | 24 - Hose                  | 34 - Hose                 |
| 3 - O-Ring                 | 14 - Sems Bolt             | 25 - O-Ring                | 35 - Hose                 |
| 4 - Hose                   | 15 - O-Ring                | 26 - O-Ring                | 36 - Hose                 |
| 5 - Bolt (4 Used)          | 16 - Split Flange (2 Used) | 27 - Bolt (4 Used)         | 37 - Hose                 |
| 6 - O-Ring                 | 17 - Bolt (4 Used)         | 28 - Split Flange (2 Used) | 38 - Hose                 |
| 7 - Hose                   | 18 - Pipe                  | 29 - Hose                  | 39 - Hose                 |
| 8 - Split Flange (2 Used)  | 19 - Sems Bolt             | 30 - Hose                  | 40 - Hose                 |
| 9 - O-Ring                 | 20 - Clamp                 | 31 - Bolt (4 Used)         | 41 - Socket Bolt (3 Used) |
| 10 - Split Flange (2 Used) | 21 - Control Valve         | 32 - Split Flange (2 Used) | 42 - Washer (3 Used)      |
| 11 - Bolt (4 Used)         | 22 - Split Flange (2 Used) |                            |                           |





## BODY (UPPERSTRUCTURE) / Control Valve

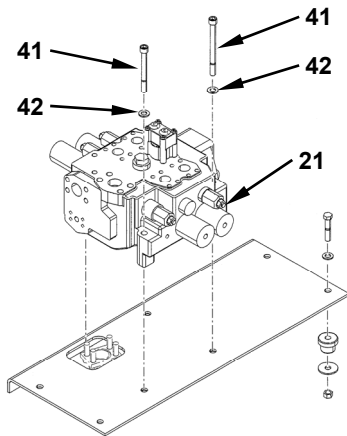
### Installation (ZW250)

**CAUTION:** Control valve (21) weight: 65 kg (145 lb)

1. Hoist control valve (21). Lower control valve (2) to the mounting position on front frame (45).
2. Check the direction for installation and align the mounting holes.
3. Secure control valve (21) to front frame (45) with socket bolts (41) (3 used) and washers (42) (3 used).


 : 10 mm


 : 89 N·m (9 kgf·m, 65 lbf·ft)





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4. Connect hoses (34, 35, 36, 37, 38, 39 and 40) to control valve (21) as shown in the identification tag.


 : 19 mm


 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)

 : 22 mm


 : 39 N·m (4 kgf·m, 28.5 lbf·ft)


5. Connect hose (30) to control valve (21) with split flanges (32) (2 used) and bolts (31) (4 used).


 : 12 mm


 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)

6. Connect hoses (24, 27) to control valve (21). Secure hoses (24, 29) with split flanges (22, 28) (2 used for each) and bolts (23, 27) (4 used for each).


 : 17 mm


 : 93 N·m (9.5 kgf·m, 67 lbf·ft)

 : 22 mm

 : 146 N·m (15 kgf·m, 108 lbf·ft)


7. Connect hoses (4, 7) to control valve (21). Secure hoses (4, 7) with split flanges (1, 8) (2 used for each) and bolts (2, 5) (4 used for each).

 : 14 mm

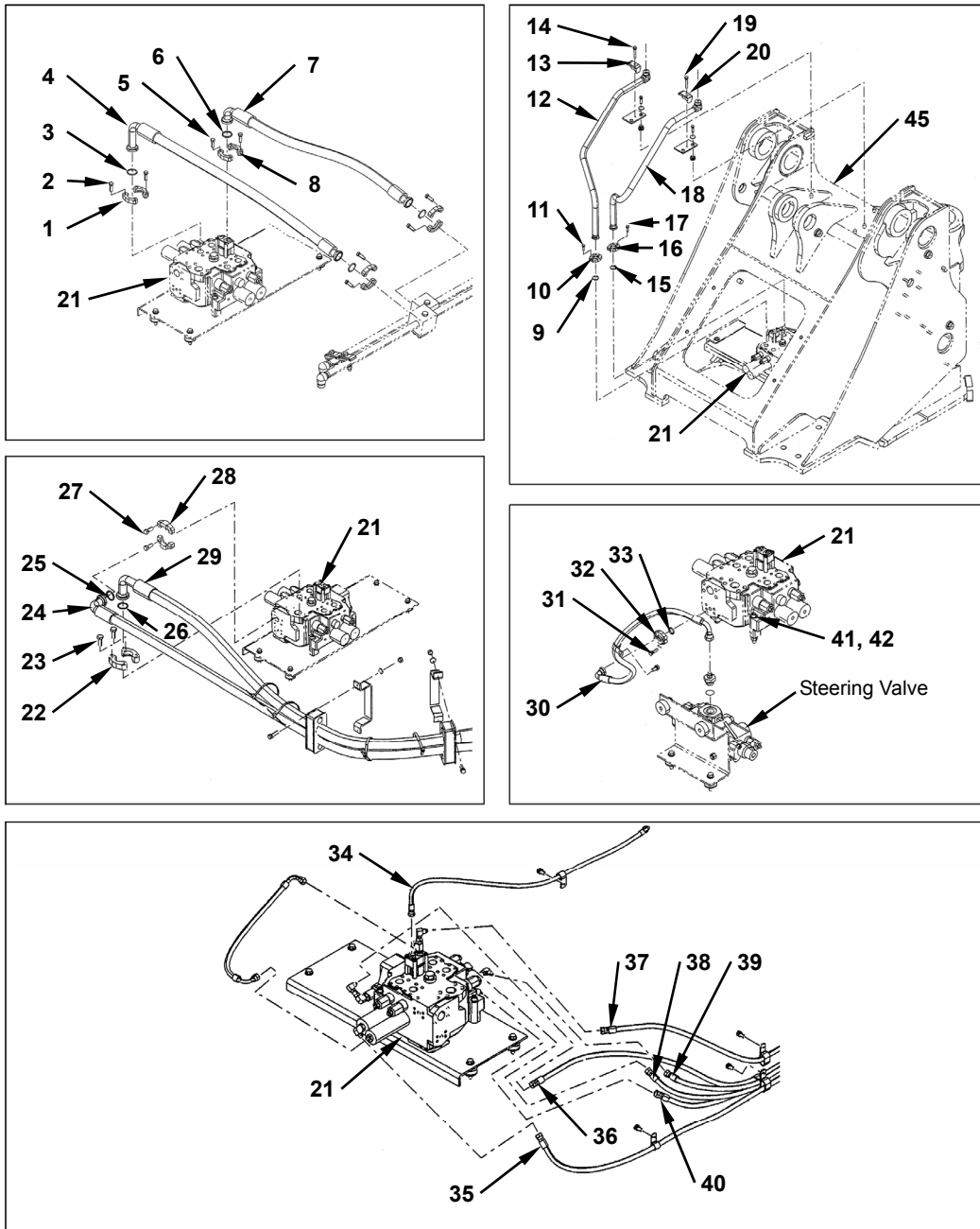
 : 54 N·m (5.5 kgf·m, 38 lbf·ft)

8. Connect pipes (12, 18) to control valve (21). Secure pipes (12, 18) with split flanges (10, 16) (2 used for each) and bolts (11, 17) (4 used for each).

 : 14 mm

 : 54 N·m (5.5 kgf·m, 38 lbf·ft)

# BODY (UPPERSTRUCTURE) / Control Valve





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## BODY (UPPERSTRUCTURE) / Control Valve


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
9. Secure pipes (12, 18) to front frame (45) with clamps (13, 20) and bolts (14, 19).

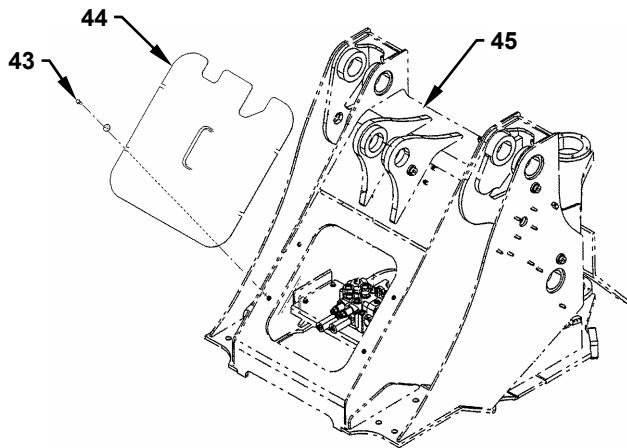
 : 17 mm

 : 49 N·m (5 kgf·m, 36 lbf·ft)

10. Install cover (44) to front frame (45) with semi bolts (43) (4 used).

 : 14 mm

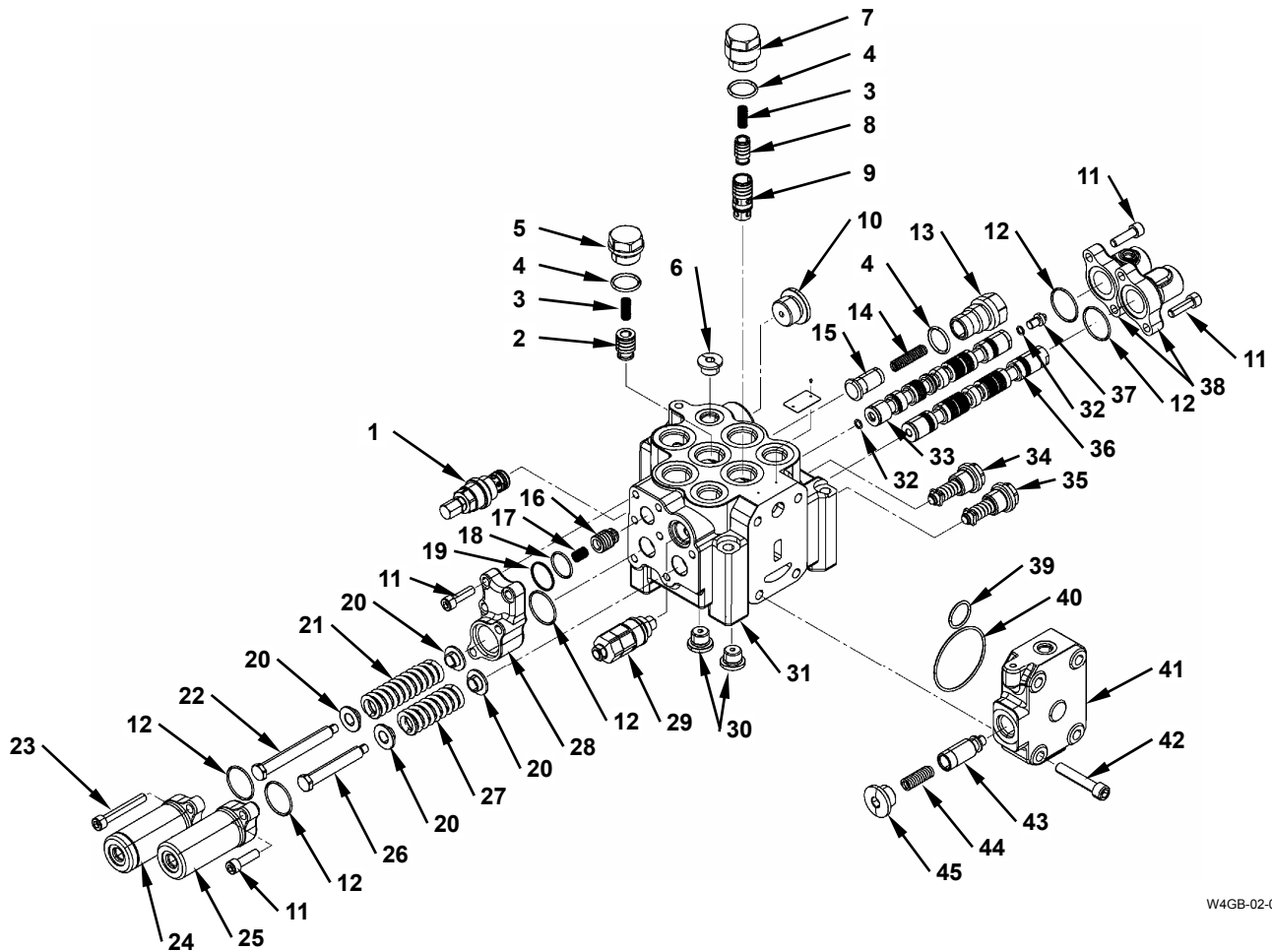
 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)



W4GB-02-05-022

# BODY (UPPERSTRUCTURE) / Control Valve

## DISASSEMBLY OF CONTROL VALVE (ZW220)






W4GB-02-05-001

- |                           |                           |                      |                           |
|---------------------------|---------------------------|----------------------|---------------------------|
| 1 - Main Relief Valve     | 13 - Plug                 | 25 - Pilot Housing   | 37 - Plug                 |
| 2 - Poppet                | 14 - Spring               | 26 - Bolt            | 38 - Pilot Housing        |
| 3 - Spring (2 Used)       | 15 - Poppet               | 27 - Spring          | 39 - O-Ring               |
| 4 - O-Ring (3 Used)       | 16 - Poppet               | 28 - Pilot Housing   | 40 - O-Ring               |
| 5 - Plug                  | 17 - Spring               | 29 - Relief Valve    | 41 - End plate            |
| 6 - Plug                  | 18 - O-Ring               | 30 - Plug            | 42 - Socket Bolt (4 Used) |
| 7 - Plug                  | 19 - Backup Ring          | 31 - Housing         | 43 - Poppet               |
| 8 - Poppet                | 20 - Spring Seat (4 Used) | 32 - O-Ring (2 Used) | 44 - Spring               |
| 9 - Poppet                | 21 - Spring               | 33 - Spool           | 45 - Plug                 |
| 10 - Plug                 | 22 - Bolt                 | 34 - Relief Valve    |                           |
| 11 - Socket Bolt (9 Used) | 23 - Bolt (2 Used)        | 35 - Relief Valve    |                           |
| 12 - O-Ring (5 Used)      | 24 - Pilot Housing        | 36 - Spool           |                           |



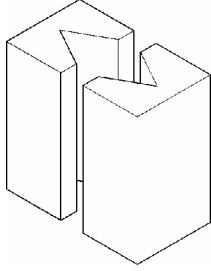




## BODY (UPPERSTRUCTURE) / Control Valve

### Disassembly of Control Valve (ZW220)

1. Remove plug (10) from housing (31).  
 : 17 mm
2. Remove plug (13) from housing (31). Remove poppet (15) and spring (14) from housing (31). Remove O-ring (4) from plug (13).  
 : 36 mm
3. Remove relief valve (29) from housing (31).  
 : 32 mm

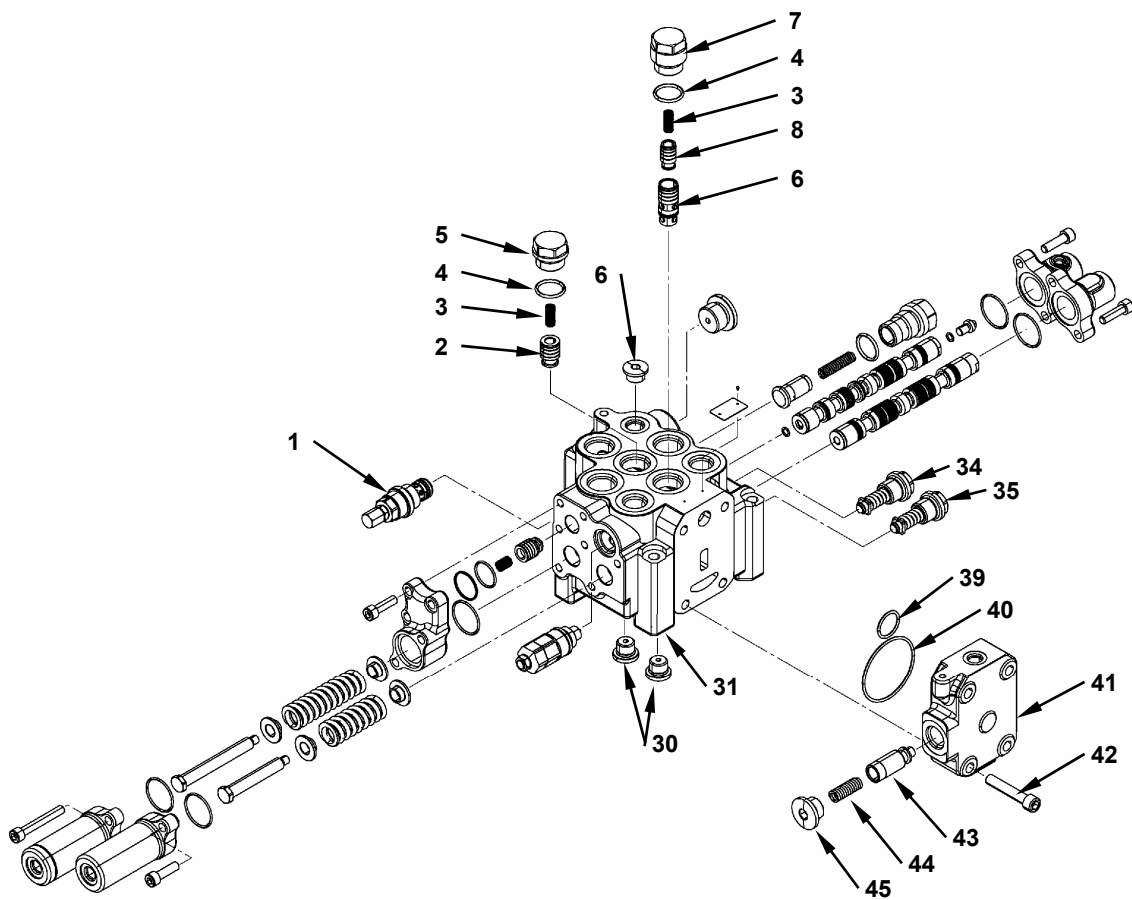


**CAUTION: Attach a spanner onto the hexagonal part of the relief valve case.**

4. Remove socket bolts (11) (6 used) from pilot housings (38) (2 used), pilot housing (25). Remove pilot housing (25) and pilot housing (38) (2 used) from housing (31).  
 : 8 mm
5. Remove socket bolts (23) (2 used) from pilot housing (24). Remove pilot housing (24) from pilot housing (28).  
 : 8 mm
6. Remove O-rings (12) (4 used) from pilot housings (24, 25) and pilot housings (38) (2 used).
7. Slowly turn and remove spools (33, 36) from housing (31).
8. Secure spools (33, 36) in a vise by using wooden pieces as illustrated.  

9. Remove bolt (26) from spool (36). Remove spring seat (20), spring (27) and spring seat (20) from spool (36).  
 : 19 mm
10. Remove bolt (22) from spool (33). Remove spring seat (20), spring (21), and spring seat (20) from spool (33).  
 : 19 mm
11. Remove plug (37) from spool (33). Remove O-ring (32) from plug (37).  
 : 8 mm
12. Remove socket bolts (11) (3 used) from pilot housing (28). Remove pilot housing (28).  
 : 8 mm
13. Remove O-rings (12, 18) and backup ring (19) from pilot housing (28).
14. Remove spring (17) and poppet (16) from housing (31).

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
# BODY (UPPERSTRUCTURE) / Control Valve



W4GB-02-05-001

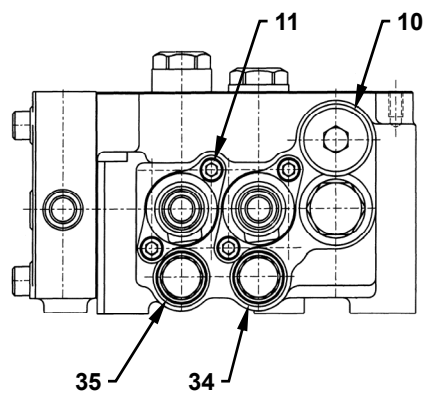
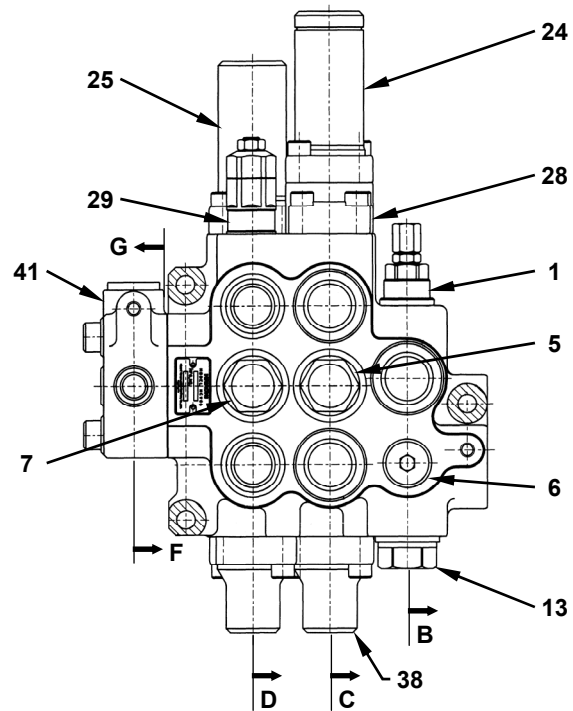
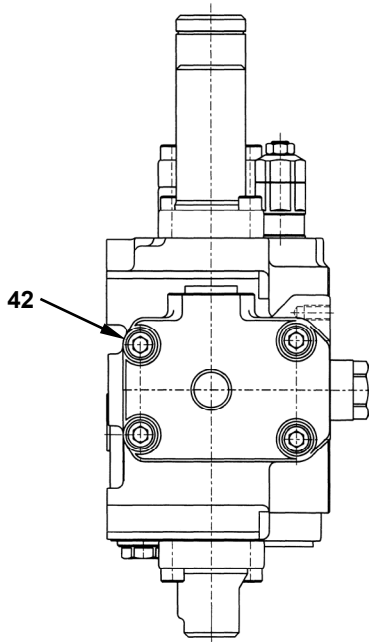
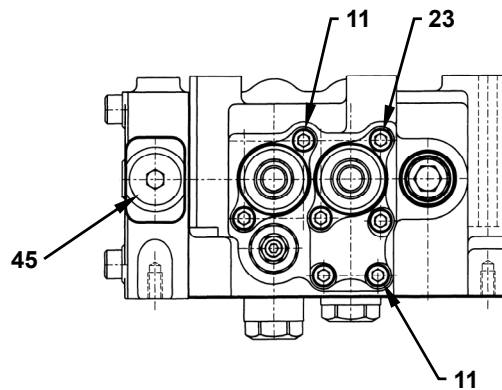
## BODY (UPPERSTRUCTURE) / Control Valve

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15. Remove plug (45), spring (44) and poppet (43) from end plate (41).  
 : 12 mm
16. Remove relief valves (34, 35) from housing (31).  
 : 27 mm
17. Remove main relief valve (1) from housing (31).  
 : 27 mm
18. Remove plug (7) from housing (31). Remove spring (3) and poppets (8, 9) from housing (31) by using a magnet. Remove O-ring (4) from plug (7).  
 : 36 mm
19. Remove plug (5) from housing (31). Remove spring (3) and poppet (2) from housing (31) by using a magnet. Remove O-ring (4) from plug (5).  
 : 36 mm
20. Remove socket bolts (42) (4 used) from housing (31). Remove end plate (41) from housing (31).  
 : 10 mm
21. Remove plugs (30) (2 used) and plug (6) from housing (31).  
 : 10 mm
22. Remove O-rings (39, 40) from end plate (41).

# BODY (UPPERSTRUCTURE) / Control Valve

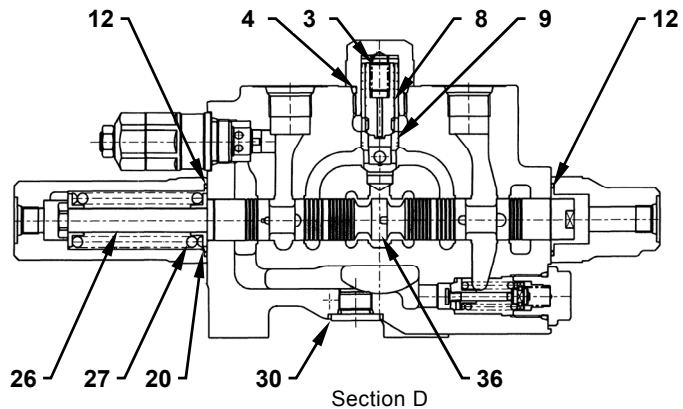
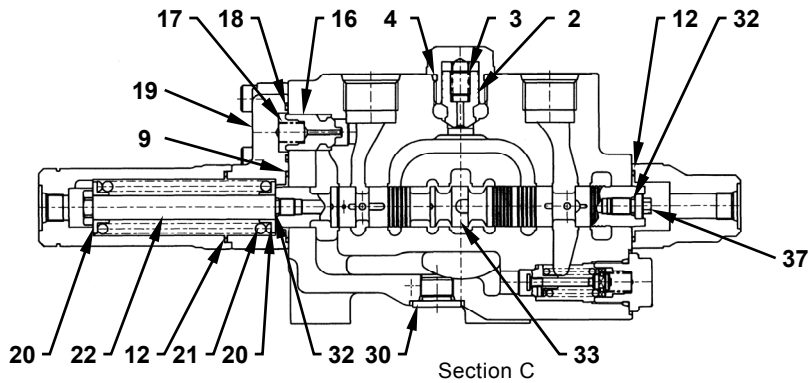
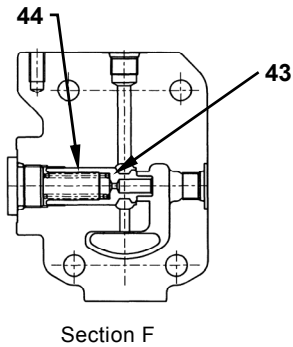
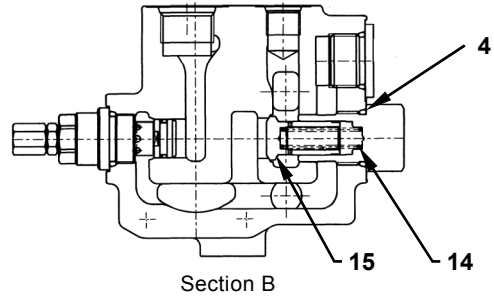
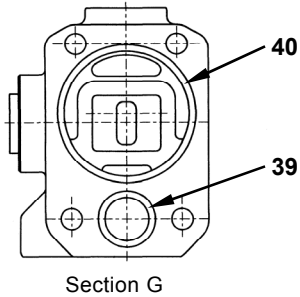
## ASSEMBLY OF CONTROL VALVE (ZW220)



W4GB-02-05-003



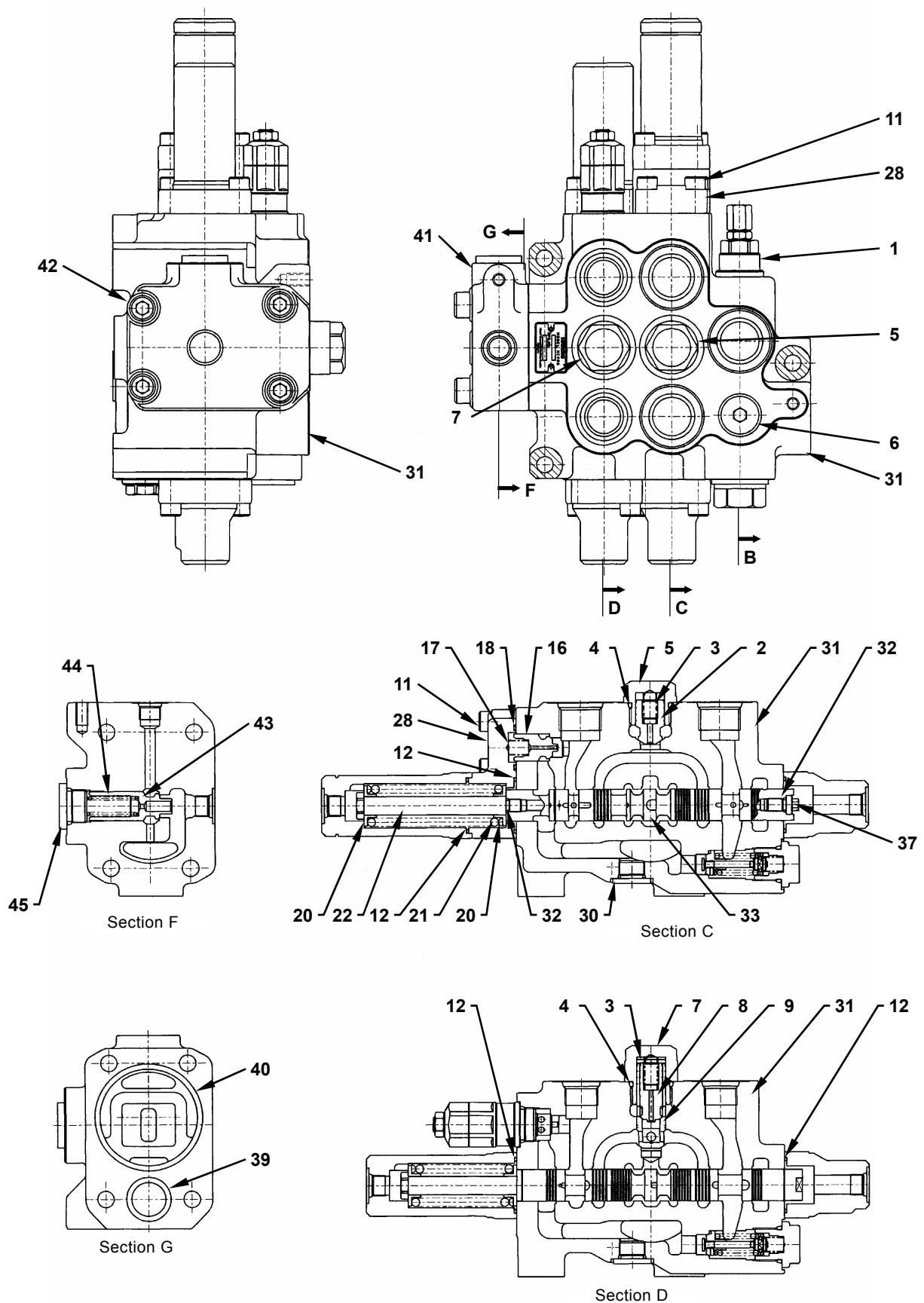
# BODY (UPPERSTRUCTURE) / Control Valve



W4GB-02-05-004



















- |                           |                           |                      |                           |
|---------------------------|---------------------------|----------------------|---------------------------|
| 1 - Main Relief Valve     | 13 - Plug                 | 25 - Pilot Housing   | 37 - Plug                 |
| 2 - Poppet                | 14 - Spring               | 26 - Bolt            | 38 - Pilot Housing        |
| 3 - Spring (2 Used)       | 15 - Poppet               | 27 - Spring          | 39 - O-Ring               |
| 4 - O-Ring (3 Used)       | 16 - Poppet               | 28 - Pilot Housing   | 40 - O-Ring               |
| 5 - Plug                  | 17 - Spring               | 29 - Relief Valve    | 41 - End Plate            |
| 6 - Plug                  | 18 - O-Ring               | 30 - Plug            | 42 - Socket Bolt (4 Used) |
| 7 - Plug                  | 19 - Backup Ring          | 31 - Housing         | 43 - Poppet               |
| 8 - Poppet                | 20 - Spring Seat (4 Used) | 32 - O-Ring (2 Used) | 44 - Spring               |
| 9 - Poppet                | 21 - Spring               | 33 - Spool           | 45 - Plug                 |
| 10 - Plug                 | 22 - Bolt                 | 34 - Relief Valve    |                           |
| 11 - Socket Bolt (9 Used) | 23 - Bolt (2 Used)        | 35 - Relief Valve    |                           |
| 12 - O-Ring (5 Used)      | 24 - Pilot Housing        | 36 - Spool           |                           |

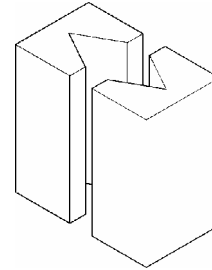
# BODY (UPPERSTRUCTURE) / Control Valve



## BODY (UPPERSTRUCTURE) / Control Valve

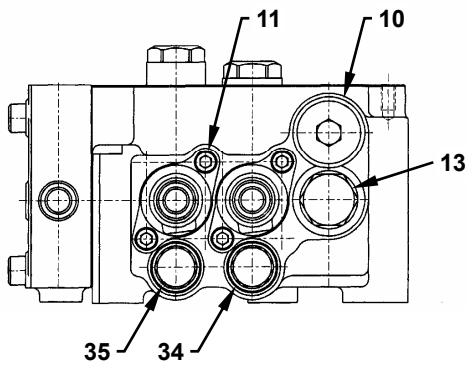
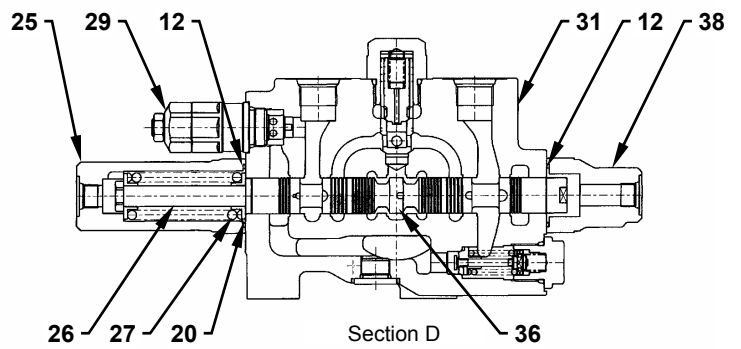
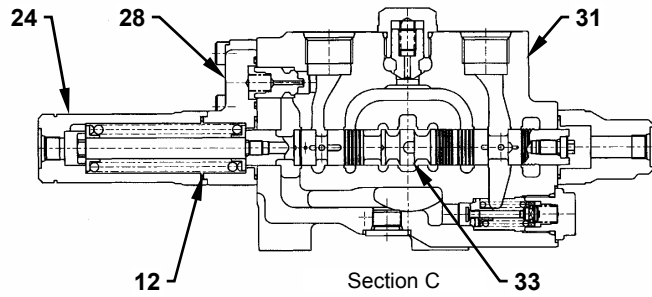
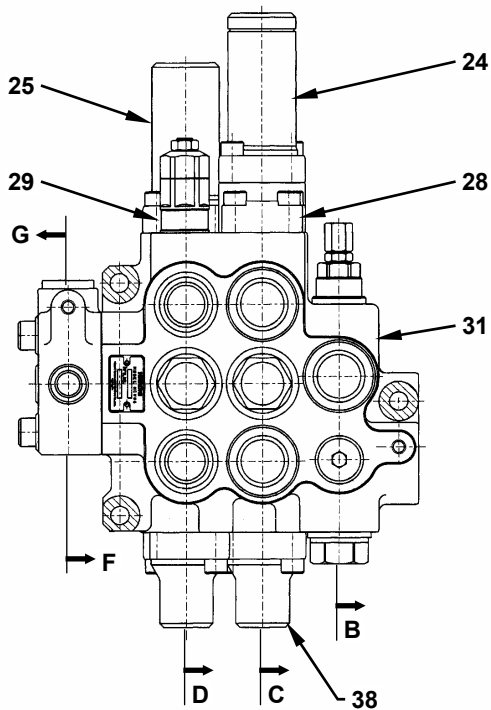
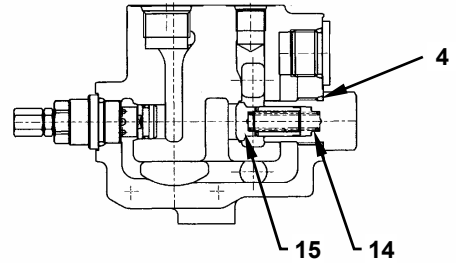
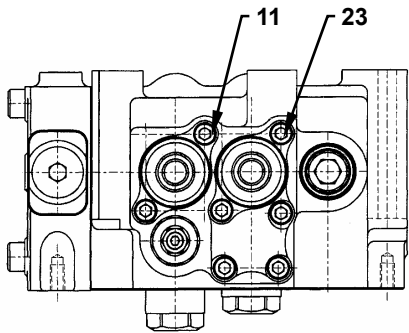
### Assembly of Control Valve (ZW220)

1. Install O-rings (39, 40) to end plate (41).
2. Install end plate (41) to housing (31) with socket bolts (42) (4 used).  
 : 10 mm  
 : 88 to 93 N·m  
(9 to 9.5 kgf·m, 65 to 68.5 lbf·ft)
3. Install plugs (30) (2 used) and plug (6) to housing (31).  
 : 10 mm  
 : 118 to 138 N·m  
(12 to 14 kgf·m, 87 to 102 lbf·ft)
4. Install poppet (2) and spring (3) into housing (31). Install O-ring (4) to plug (5). Install plug (5) to housing (31).  
 : 36 mm  
 : 275 to 300 N·m  
(28 to 31 kgf·m, 205 to 225 lbf·ft)
5. Install poppets (9, 8) and spring (3) to housing (31). Install O-ring (4) to plug (7). Install plug (7) to housing (31).  
 : 36 mm  
 : 275 to 300 N·m  
(28 to 31 kgf·m, 205 to 225 lbf·ft)
6. Install main relief valve (1) to housing (31).  
 : 27 mm  
 : 177 to 205 N·m  
(18 to 21 kgf·m, 131 to 152 lbf·ft)
7. Install poppet (43) and spring (44) to end plate (41). Install plug (45) to end plate (41).  
 : 12 mm  
 : 175 to 205 N·m  
(18 to 21 kgf·m, 131 to 152 lbf·ft)
8. Install poppet (16) and spring (17) into housing (31).
9. Install O-rings (18, 12) and backup ring (19) to pilot housing (28). Install pilot housing (28) to housing (31) with socket bolts (11) (3 used).  
 : 8 mm  
 : 49 to 54 N·m  
(5 to 5.4 kgf·m, 36 to 40 lbf·ft)
10. Secure spool (33) in a vise by using wooden pieces as illustrated. Install O-ring (32) to plug (37). Install O-ring (32) to the edge of the chamfered sides of spool (33).  
 : 8 mm  
 : 24.5 to 29 N·m  
(2.5 to 3 kgf·m, 18.5 to 21.5 lbf·ft)
11. Install O-ring (32) to bolt (22). Install spring seat (20), spring (21) and spring seat (20) through bolt (22) in this order. Install the bolt (22) assembly to spool (33).  
 : 19 mm  
 : 24.5 to 29 N·m  
(2.5 to 3 kgf·m, 18.5 to 21.5 lbf·ft)



W4GB-02-05-002


# BODY (UPPERSTRUCTURE) / Control Valve




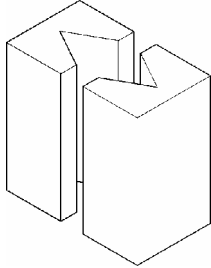
W4GB-02-05-027

## BODY (UPPERSTRUCTURE) / Control Valve

12. Secure spool (36) in a vise by using wooden pieces as illustrated. Install spring seat (20), spring (27) and spring seat (20) through bolt (26) in this order. Install the bolt (26) assembly to spool (36).

 : 19 mm


 : 24.5 to 29 N·m  
(2.5 to 3 kgf·m, 18.5 to 21.5 lbf·ft)




W4GB-02-05-002


13. Apply hydraulic oil onto spools (33, 36). Turn and insert spools (33, 36) into housing (31).


14. Install O-ring (12) to pilot housing (24). Install pilot housing (24) to pilot housing (28) with socket bolts (23) (2 used).

 : 8 mm


 : 49 to 54 N·m  
(5 to 5.4 kgf·m, 36 to 40 lbf·ft)


15. Install O-ring (12) to pilot housing (25). Install pilot housing (25) to housing (31) with socket bolts (11) (2 used).

 : 8 mm


 : 49 to 54 N·m  
(5 to 5.4 kgf·m, 36 to 40 lbf·ft)


16. Install O-rings (12) (2 used) onto pilot housings (38) (2 used). Install pilot housings (38) (2 used) to housing (31) with socket bolts (11) (4 used).

 : 8 mm

 : 49 to 54 N·m  
(5 to 5.4 kgf·m, 36 to 40 lbf·ft)

17. Install relief valves (34, 35) to housing (31).


 : 27 mm


 : 235 to 264 N·m  
(24 to 27 kgf·m, 173 to 195 lbf·ft)




**CAUTION: As the set pressure of the relief valve setting differs, check the identification code.**


18. Install relief valve (29) to housing (31).

 : 32 mm


 : 83 to 88 N·m  
(8.5 to 9 kgf·m, 61 to 65 lbf·ft)


19. Install poppet (15) and spring (14) into housing (31). Install O-ring (4) to plug (13). Install plug (13) into housing (31).

 : 36 mm

 : 275 to 300 N·m  
(28 to 31 kgf·m, 205 to 225 lbf·ft)

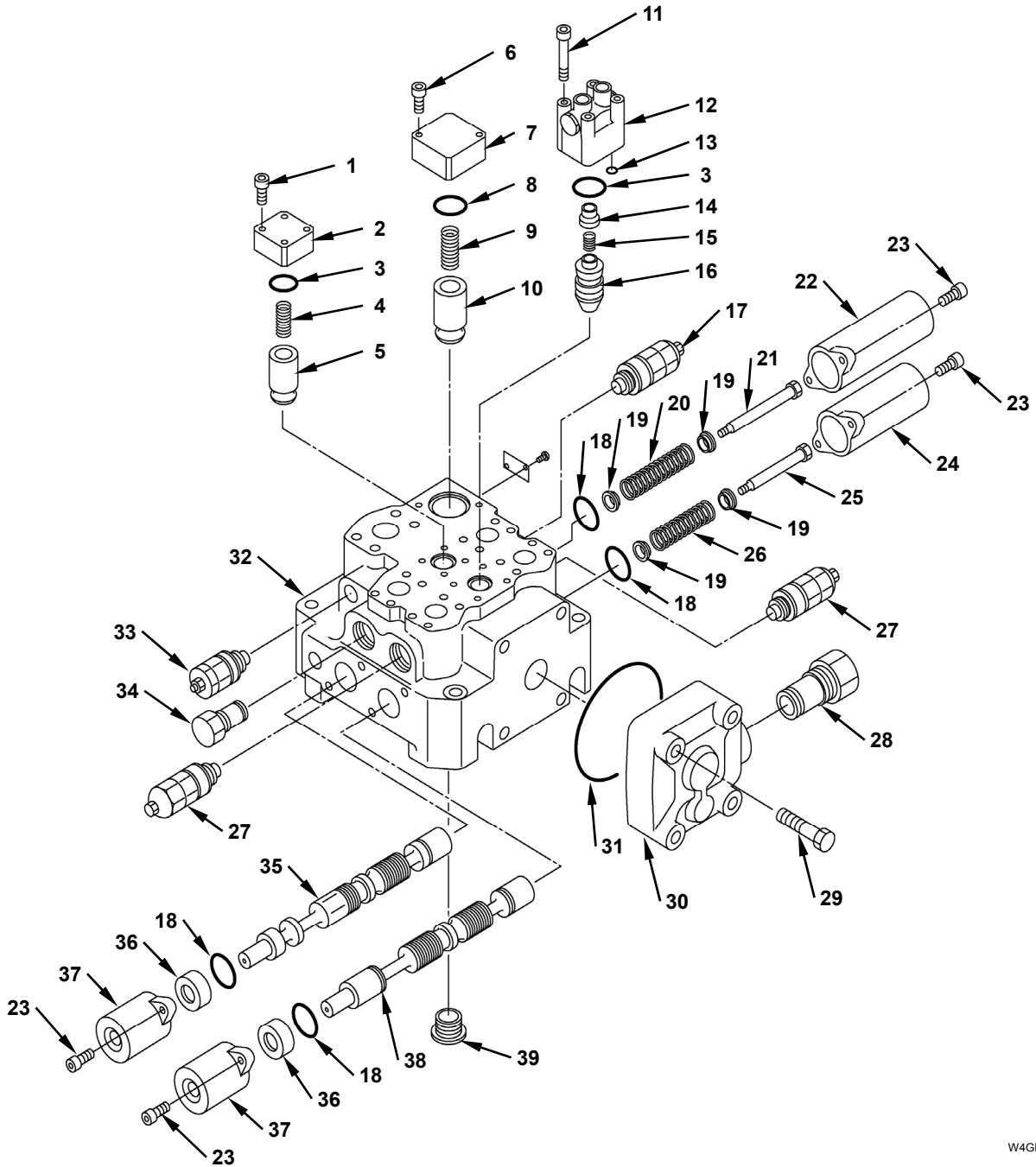
20. Install plug (10) into housing (31).

 : 17 mm

 : 175 to 205 N·m  
(18 to 21 kgf·m, 131 to 152 lbf·ft)

# BODY (UPPERSTRUCTURE) / Control Valve

## DISASSEMBLY OF CONTROL VALVE (ZW250)



W4GB-02-05-005

- |                          |                           |                            |                      |
|--------------------------|---------------------------|----------------------------|----------------------|
| 1 - Socket Bolt (4 Used) | 11 - Socket Bolt (4 Used) | 21 - Spool End             | 31 - O-Ring          |
| 2 - Flange               | 12 - Body                 | 22 - Cap                   | 32 - Housing         |
| 3 - O-Ring (2 Used)      | 13 - O-Ring               | 23 - Socket Bolt (8 Used)  | 33 - Relief Valve    |
| 4 - Spring               | 14 - Spacer               | 24 - Cap                   | 34 - Anti-Void Valve |
| 5 - Poppet               | 15 - Spring               | 25 - Spool End             | 35 - Spool           |
| 6 - Socket Bolt (4 Used) | 16 - Poppet               | 26 - Spring                | 36 - Spacer (2 Used) |
| 7 - Flange               | 17 - Relief Valve         | 27 - Relief Valve (2 Used) | 37 - Cap (2 Used)    |
| 8 - O-Ring               | 18 - O-Ring (4 Used)      | 28 - Relief Valve          | 38 - Spool           |
| 9 - Spring               | 19 - Spring Seat (4 Used) | 29 - Bolt (4 Used)         | 39 - Plug            |
| 10 - Poppet              | 20 - Spring               | 30 - Housing               |                      |


## BODY (UPPERSTRUCTURE) / Control Valve

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### Disassembly of Control Valve (ZW250)

- Put the matching marks on the spools for assembling.

1. Remove socket bolts (23) (4 used) from caps (22, 24). Remove caps (22, 24) from housing (32).

 : 5 mm


2. Remove O-rings (18) (2 used) from housing (1).




**CAUTION: Turn and remove spools (35, 38) slowly. If the spools stick even a little, try again instead of pulling roughly. Put the matching marks on spools (35, 38) corresponding to the matching marks on housing (32) in order not to be confused.**

3. Remove the spools (35, 38) assemblies from housing (32).


4. Remove the relief valve (28) assembly from housing (30).

 : 38 mm


5. Remove the relief valve (27) assemblies (2 used) from housing (32).

 : 32 mm


6. Remove the relief valve (33) assembly from housing (32).

 : 38 mm


7. Remove the relief valve (17) assembly from housing (32).

 : 32 mm


8. Remove the anti-void valve (34) assembly from housing (32).

 : 32 mm


9. Remove socket bolts (1) (4 used) from flange (2). Remove flange (2), spring (4), poppet (5), and O-ring (3) from housing (32).

 : 5 mm


10. Remove socket bolts (11) (4 used) from body (12). Remove body (12), spacer (14), spring (15), poppet (16), and O-rings (3, 13) from housing (32).

 : 5 mm


11. Remove socket bolts (6) (2 used) from flange (7). Remove flange (7), spring (9), poppet (10), and O-ring (8) from housing (32).

 : 5 mm

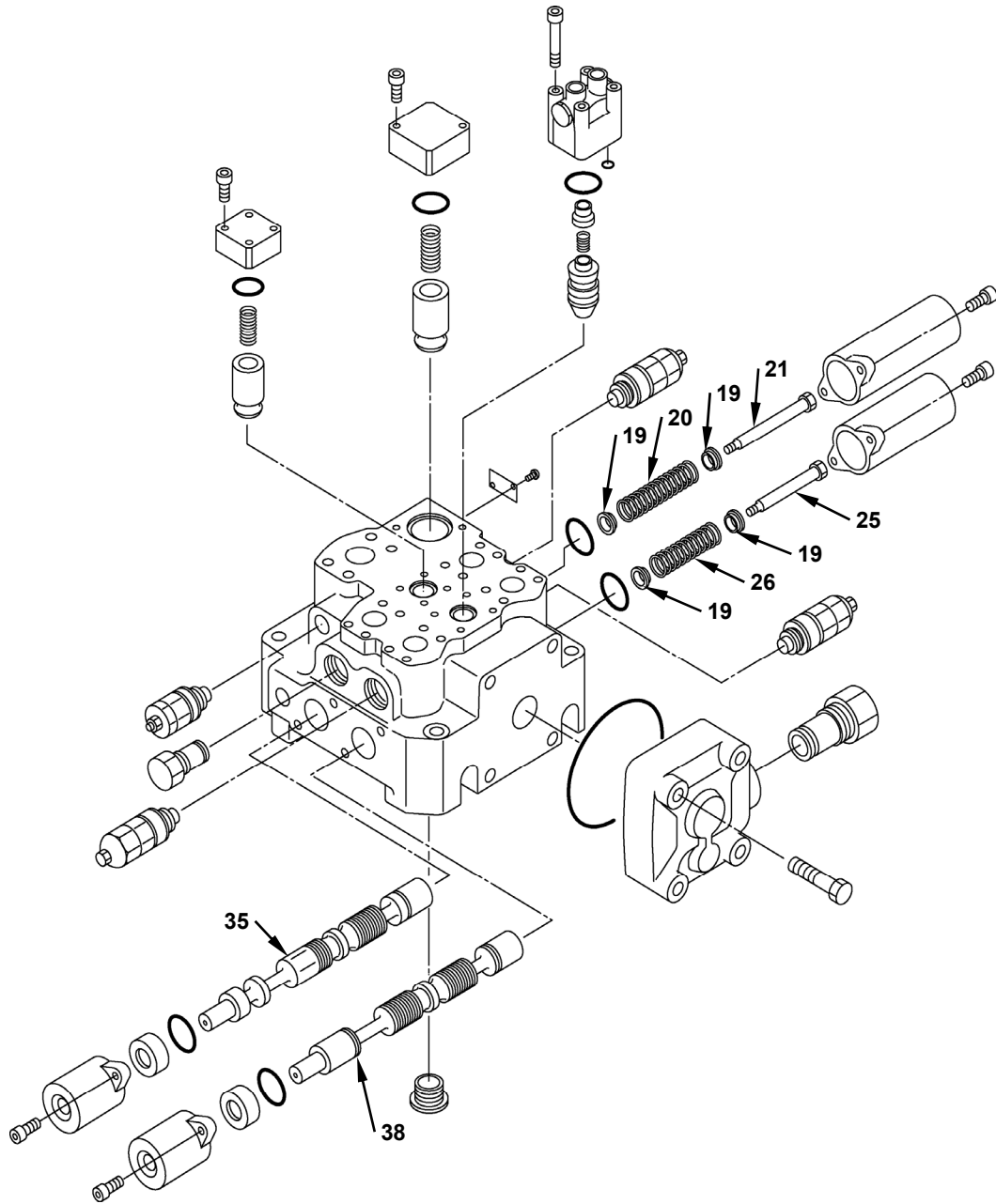
12. Remove socket bolts (29) (4 used) from housing (30). Remove cover (30) and O-ring (31) from housing (32).

 : 12 mm

13. Remove socket bolts (23) (4 used) from covers (37) (2 used). Remove caps (37) (2 used), spacers (36) (2 used), and O-rings (18) (2 used) from housing (32).

 : 5 mm

# BODY (UPPERSTRUCTURE) / Control Valve



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## BODY (UPPERSTRUCTURE) / Control Valve

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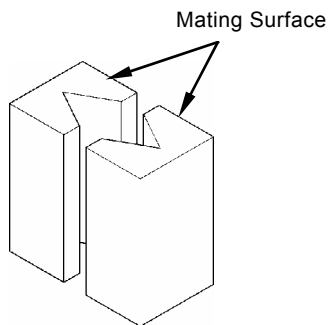
**CAUTION:** Check that the mating surface of wooden piece to the spool is free of metal chips. Secure the spool assembly at the position to spring (20).

14. Secure the spool (35) assembly in a vise by using wooden pieces as illustrated. Remove spool end (21), spring seat (19), spring (20) and spring seat (19) from spool (35).

 : 10 mm

15. Secure the spool (38) assembly in a vise by using wooden pieces as illustrated. Remove spool end (25), spring seat (19), spring (26) and spring seat (19) from spool (38).

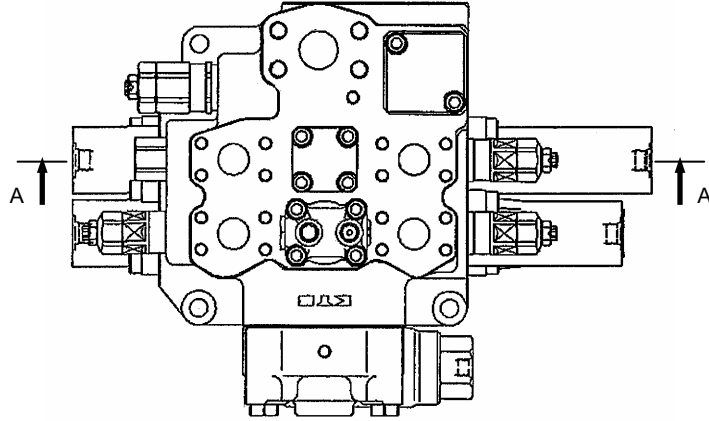
 : 10 mm



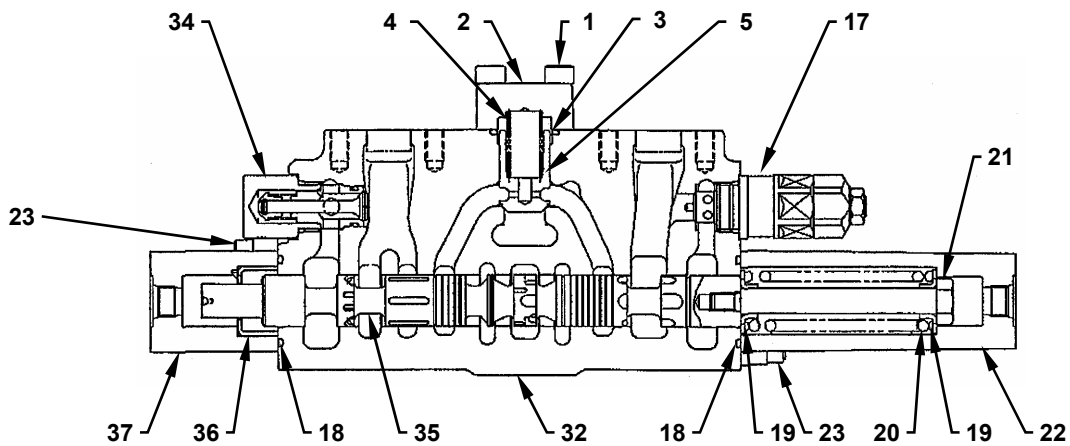
W4GB-02-05-002

# BODY (UPPERSTRUCTURE) / Control Valve

## ASSEMBLY OF CONTROL VALVE (ZW250)



W4GB-02-05-007



W4GB-02-05-008

Section A-A

- |                          |                           |                           |             |
|--------------------------|---------------------------|---------------------------|-------------|
| 1 - Socket Bolt (4 Used) | 17 - Relief Valve         | 22 - Cap                  | 36 - Spacer |
| 2 - Flange               | 18 - O-Ring (2 Used)      | 23 - Socket Bolt (4 Used) | 37 - Cap    |
| 3 - O-Ring               | 19 - Spring Seat (2 Used) | 32 - Housing              |             |
| 4 - Spring               | 20 - Spring               | 34 - Anti-Void Valve      |             |
| 5 - Poppet               | 21 - Spool End            | 35 - Spool                |             |


## BODY (UPPERSTRUCTURE) / Control Valve


### Assembly of Control Valve (ZW250)



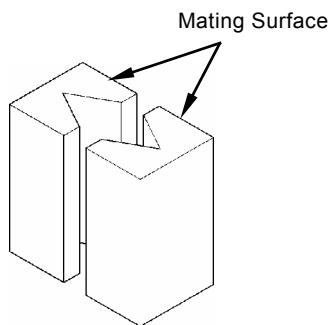
**CAUTION:** Check that the mating surface of wooden piece to the spool is free of metal chips. Secure the spool assembly at the position close to spring (20).

1. Clamp spool (35) in a vise by using wooden pieces as illustrated. Install spring seat (19), spring (20) and spring seat (19) to spool (35) with spool end (21).

 : 10 mm

 : 9.8 to 11.8 N·m


(1 to 1.2 kgf·m, 7.2 to 8.7 lbf·ft)




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2. Apply hydraulic oil onto the polishing part of the spool (35) assembly. Slowly and carefully insert the spool (35) assembly into the hole on housing (32).

3. Install O-ring (18) to the groove on the cap (22) mounting position in housing (32). Install cap (22) to housing (32) with socket bolts (23) (2 used).


 : 5 mm


 : 39 to 44.1 N·m

(4 to 4.45 kgf·m, 29 to 32.5 lbf·ft)

4. Install O-ring (18) to the groove on the cap (37) mounting position in housing (32).


5. Install spacer (36) to spool (35). Align the projection part of spacer (36) and the hollow inside cap (37). Secure cap (37) to housing (32) with socket bolts (23) (2 used).


 : 5 mm

 : 39 to 44.1 N·m

(4 to 4.45 kgf·m, 29 to 32.5 lbf·ft)


6. Install poppet (5), spring (4) and O-ring (3) to housing (32). Install flange (2) to housing (32) with socket bolts (1) (4 used).


 : 5 mm

 : 58 to 64 N·m

(6 to 6.5 kgf·m, 43 to 47 lbf·ft)


7. Install anti-void valve (34) to housing (32).


 : 32 mm

 : 78 to 88 N·m

(8 to 9 kgf·m, 57.5 to 65 lbf·ft)

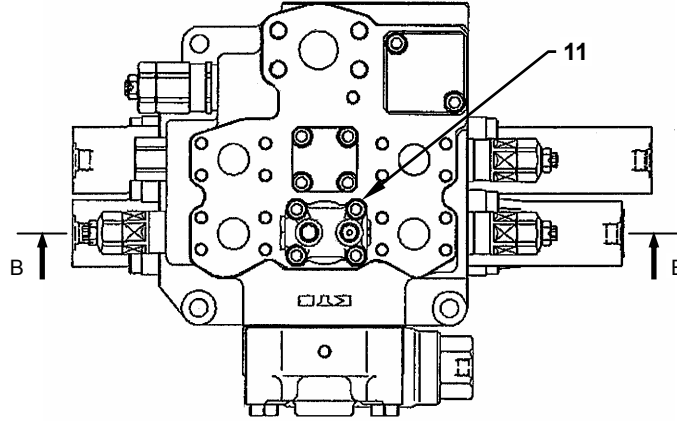
8. Install relief valve (17) to housing (32).

 : 32 mm

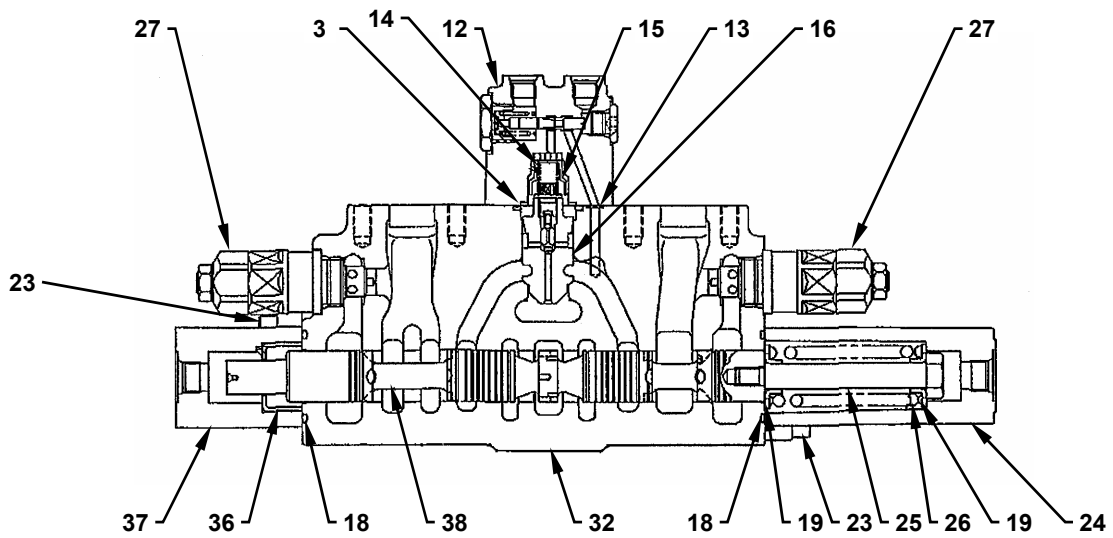
 : 78 to 88 N·m

(8 to 9 kgf·m, 57.5 to 65 lbf·ft)

# BODY (UPPERSTRUCTURE) / Control Valve



W4GB-02-05-007



W4GB-02-05-009

Section B-B

- |                           |                           |                            |             |
|---------------------------|---------------------------|----------------------------|-------------|
| 3 - O-Ring                | 15 - Spring               | 24 - Cap                   | 36 - Spacer |
| 11 - Socket Bolt (4 Used) | 16 - Poppet               | 25 - Spool End             | 37 - Cap    |
| 12 - Body                 | 18 - O-Ring (2 Used)      | 26 - Spring                | 38 - Spool  |
| 13 - O-Ring               | 19 - Spring Seat (2 Used) | 27 - Relief Valve (2 Used) |             |
| 14 - Spacer               | 23 - Socket Bolt (4 Used) | 32 - Housing               |             |


## BODY (UPPERSTRUCTURE) / Control Valve


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**CAUTION:** Check that the mating surface of wooden piece to the spool is free of metal chips. Secure the spool at the position close to spring (26).


9. Clamp spool (38) in a vise by using wooden pieces as illustrated. Install pring seat (19), spring (26) and spring seat (19) to spool (38) with spool end (25).


 : 10 mm

 : 9.8 to 11.8 N·m  
(1 to 1.2 kgf·m, 7.2 to 8.7 lbf·ft)

10. Apply hydraulic oil onto the polishing part of the spool (38) assembly. Slowly and carefully insert the spool (38) assembly into the hole on housing (32).


11. Install O-ring (18) to the groove on the cap (24) mounting position in housing (32). Install cap (24) to housing (32) with socket bolts (23) (2 used).


 : 5 mm

 : 39 to 44.1 N·m  
(4 to 4.45 kgf·m, 29 to 32.5 lbf·ft)


12. Install O-ring (18) to the groove on the cap (37) mounting position in housing (32).


13. Install spacer (36) to spool (38). Align the projection part of spacer (36) and the hollow inside cap (37). Secure cap (37) to housing (32) with socket bolts (23) (2 used).

 : 5 mm


 : 39 to 44.1 N·m  
(4 to 4.45 kgf·m, 29 to 32.5 lbf·ft)


14. Install poppet (16), spring (15), spacer (14) and O-rings (3, 13) to housing (32). Install body (12) to housing (32) with socket bolts (11) (4 used).

 : 5 mm

 : 58 to 64 N·m  
(6 to 6.5 kgf·m, 43 to 47 lbf·ft)

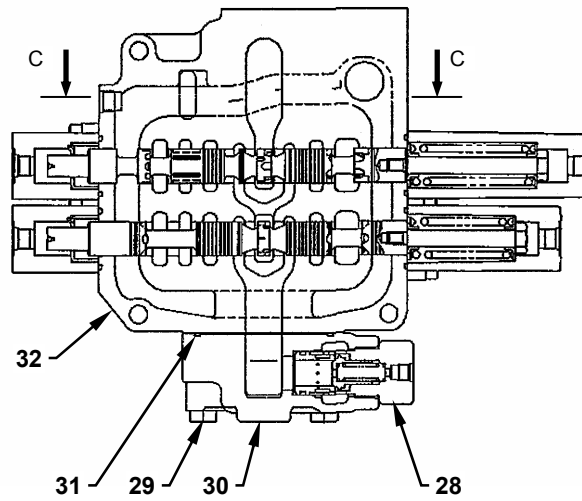
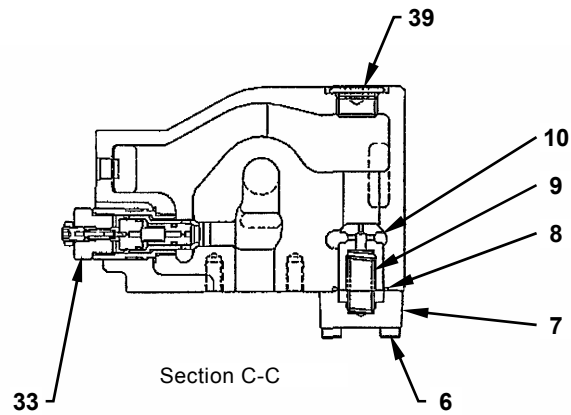
15. Install relief valves (27) (2 used) to housing (32).

 : 32 mm

 : 78 to 88 N·m  
(8 to 9 kgf·m, 57.5 to 65 lbf·ft)

## BODY (UPPERSTRUCTURE) / Control Valve

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W4GB-02-05-010


- |                 |                   |                    |                   |
|-----------------|-------------------|--------------------|-------------------|
| 6 - Socket Bolt | 9 - Spring        | 29 - Bolt (4 Used) | 32 - Housing      |
| 7 - Flange      | 10 - Poppet       | 30 - Housing       | 33 - Relief Valve |
| 8 - O-Ring      | 28 - Relief Valve | 31 - O-Ring        | 39 - Plug         |

## BODY (UPPERSTRUCTURE) / Control Valve


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16. Install O-ring (31) to housing (32). Install housing (30) to housing (32) with bolts (44) (4 used).

 : 12 mm


 : 145 to 159 N·m  
(14.8 to 16.2 kgf·m, 107 to 117 lbf·ft)


17. Install relief valve (28) to housing (30).

 : 38 mm


 : 103 to 113 N·m  
(10.5 to 11.5 kgf·m, 76 to 83 lbf·ft)


18. Install relief valve (33) to housing (32).

 : 38 mm


 : 78 to 88 N·m  
(8 to 9 kgf·m, 57.5 to 65 lbf·ft)


19. Install O-ring (8) to the groove on the flange (7) mounting position in housing (32). Install poppet (10), spring (9) and flange (7) to housing (32). Install flange (7) to housing (32) with socket bolts (6) (2 used).

 : 5 mm

 : 58 to 64 N·m  
(6 to 6.5 kgf·m, 43 to 47 lbf·ft)

20. Install plug (39) to housing (32).

 : 5 mm

 : 80 to 86 N·m  
(8.2 to 8.8 kgf·m, 58 to 63 lbf·ft)

## **BODY (UPPERSTRUCTURE) / Control Valve**

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(Blank)

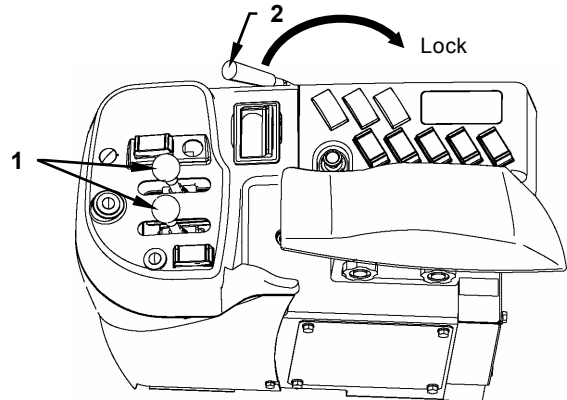


## BODY (UPPERSTRUCTURE) / Pilot Valve

### REMOVAL AND INSTALLATION OF PILOT VALVE

**CAUTION:** Before doing any work, lower the lift arm, lower the bucket on the ground. Pull control lever lock (1) backward and set in the Lock state. Release the remaining pressure by operating the control lever.


**CAUTION:** Bleed air from the hydraulic oil tank before doing any work. (Refer to BLEED AIR FROM HYDRAULIC OIL TANK on W1-4-1.)

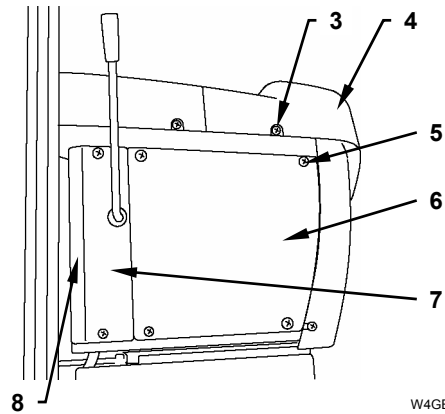


M4GB-01-050

#### Removal

1. Remove screws (5) (6 used) from covers (6, 7). Remove cover (6), covers (7) (2 used) from bracket (8).
2. Remove grips (1) (2 used) of the control lever. (In case of the multi-function lever, loosen the nut in the boot and remove the lever or the boot.)
3. Disconnect the connector connected to pilot valve (9) and upper cover (4).
4. Remove screws (3) (4 used) from upper cover (4). Remove upper cover (4) from bracket (8).
5. Disconnect hoses (12) (6 used) from pilot valve (9). Cap the open ends. Attach an identification tag onto the disconnected hose for assembling.

 : 19 mm, 22 mm





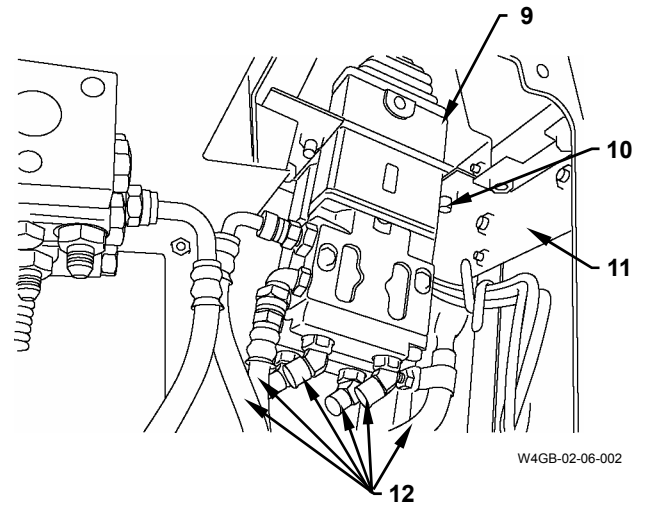
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## BODY (UPPERSTRUCTURE) / Pilot Valve

**IMPORTANT:** Put the matching marks on pilot valve (9) and mounting bracket (11) for assembling.










6. Remove bolts (10) (2 used) from pilot valve (9).  
Remove pilot valve (9) from bracket (11).

 : 8 mm  
 : 13 mm, 17 mm

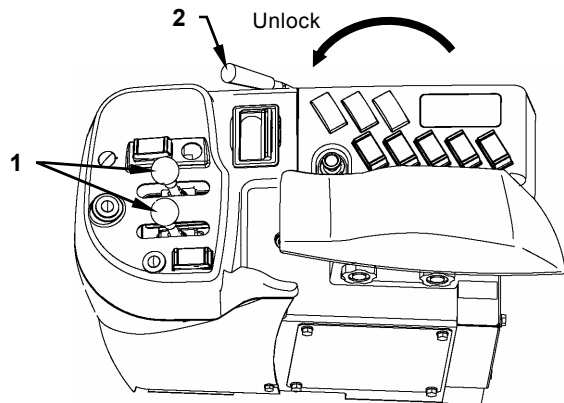
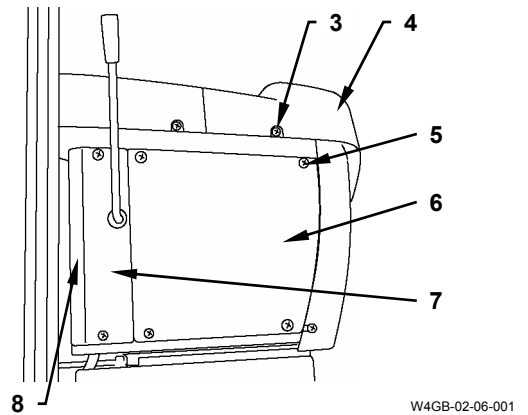
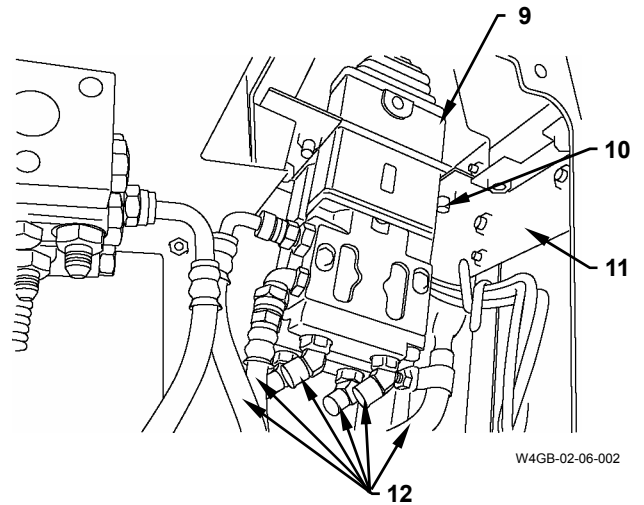


## BODY (UPPERSTRUCTURE) / Pilot Valve

### Installation

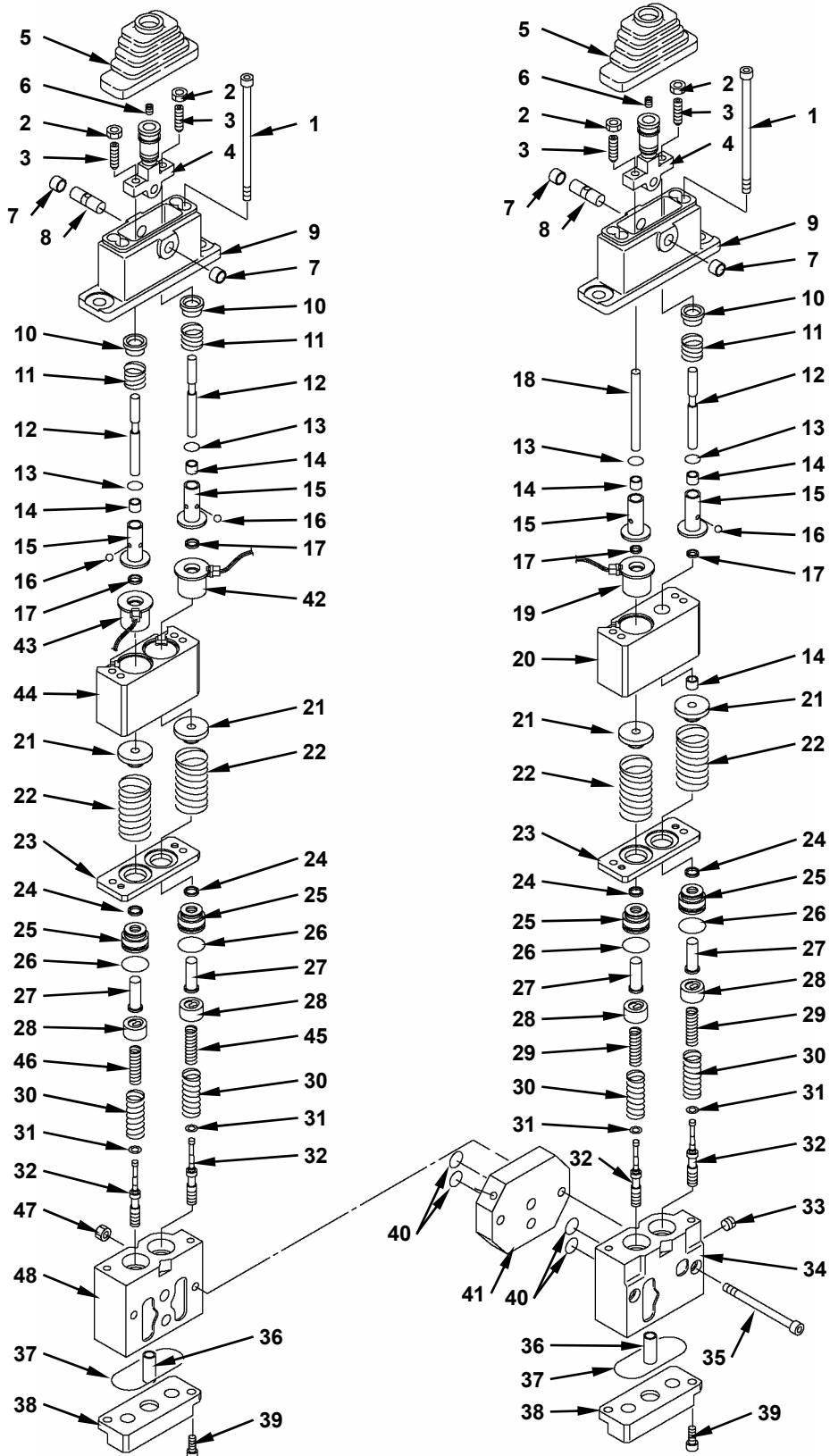
1. Align the matching marks and insert pilot valve (9) into bracket (11).
2. Install pilot valve (9) to bracket (11) with bolts (10) (2 used).
  -  : 8 mm
  -  : 49 N·m (5 kgf·m, 36 lbf·ft)
  -  : 13 mm, 17 mm
  -  : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)
  -  : 17 mm
  -  : 49 N·m (5 kgf·m, 36 lbf·ft)
3. Connect hoses (12) (6 used) onto pilot valve (9).
  -  : 19 mm
  -  : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)
  -  : 22 mm
  -  : 39 N·m (4 kgf·m, 28.5 lbf·ft)
4. Install upper cover (4) to bracket (8) with screws (3) (4 used).
5. Connect the connector to pilot valve (9) and upper cover (4).
6. Install grips (1) (2 used) of the control lever.  
(In case of the multi-function lever, install the lever and the boot.)
7. Install cover (6) and covers (7) (2 used) to bracket (8) with screws (5) (6 used).

**IMPORTANT:** After completing the work, check the hydraulic oil level. Start the engine. Push the control lever lock forward and set in the Unlock state. Check for any oil leakage at each connection.



# BODY (UPPERSTRUCTURE) / Pilot Valve

## DISASSEMBLY OF STANDARD PILOT VALVE FOR FRONT ATTACHMENT



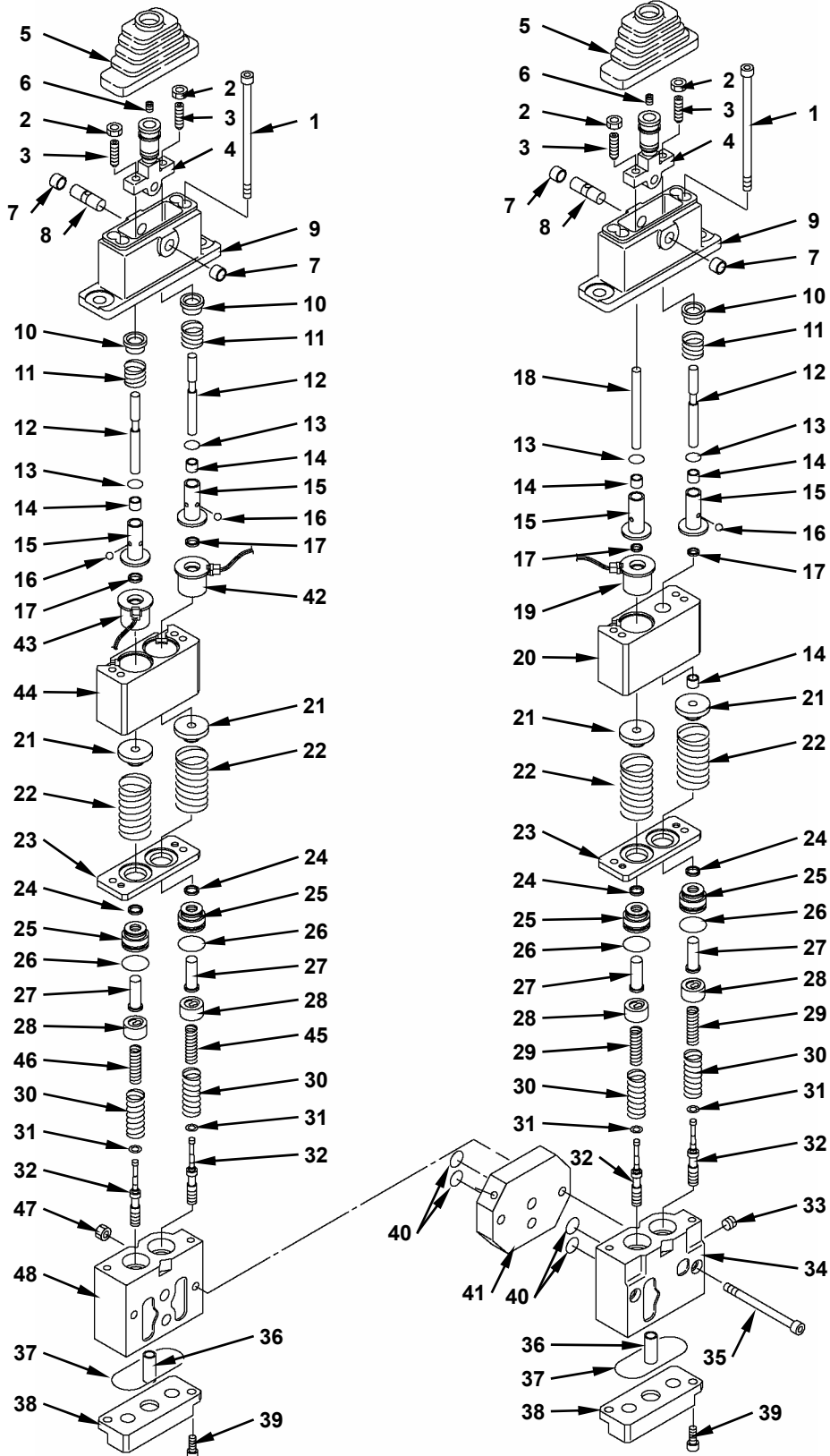
W4GB-02-06-011

## BODY (UPPERSTRUCTURE) / Pilot Valve

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1 - Socket Bolt (4 Used)	13 - O-Ring (4 Used)	25 - Plug (4 Used)	37 - O-Ring (2 Used)
2 - Lock Nut (4 Used)	14 - Bushing (4 Used)	26 - O-Ring (4 Used)	38 - Port Plate (2 Used)
3 - Screw (4 Used)	15 - Detent Bushing (4 Used)	27 - Push Rod (4 Used)	39 - Socket Bolt (4 Used)
4 - Lever (2 Used)	16 - Steel Ball (12 Used)	28 - Spring Seat (4 Used)	40 - O-Ring (4 Used)
5 - Boot (2 Used)	17 - Scraper (4 Used)	29 - Spring (2 Used)	41 - Sub Plate
6 - Lock Plug (2 Used)	18 - Push Rod	30 - Spring (4 Used)	42 - Solenoid
7 - Bushing (4 Used)	19 - Solenoid	31 - Washer (4 Used)	43 - Solenoid
8 - Cam Shaft (2 Used)	20 - Detent Casing	32 - Spool (4 Used)	44 - Detent Casing
9 - Cover (2 Used)	21 - Spring Guide (4 Used)	33 - Plug	45 - Spring
10 - Detent Ring (3 Used)	22 - Spring (4 Used)	34 - Casing	46 - Spring
11 - Spring (3 Used)	23 - Plate (2 Used)	35 - Socket Bolt (2 Used)	47 - Nut (2 Used)
12 - Push Rod (3 Used)	24 - Seal (4 Used)	36 - Bushing (2 Used)	48 - Casing

# BODY (UPPERSTRUCTURE) / Pilot Valve



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## BODY (UPPERSTRUCTURE) / Pilot Valve

---

### Disassembly of Standard Pilot Valve for Front Attachment

**IMPORTANT: Plug each port.**


1. Clean the valve assembly by using hydraulic oil.
2. Secure the casing (34, 48) parts of the valve assembly in a vise by using a buffer plate.  
Remove boots (5) (2 used) from covers (9) (2 used).
3. Remove socket bolts (1) (4 used) from the deeper hole on covers (9) (2 used).  
 : 5 mm
4. Remove the cover (9) assemblies (2 used) from casings (34, 48).

 **NOTE:** Record the positions casings (34, 48), detent casings (20, 44), covers (9) (2 used) and port plates (38) (2 used).


**IMPORTANT: Prevent push rods (27) (4 used) and plugs (25) (4 used) from flying out by spring (30) when disassembling.**

5. Set a screwdriver at the groove on plugs (25) (4 used). Remove plugs (25) (4 used) from casings (34, 48) while holding push rod (27) by using cloth.
6. Remove push rods (27) (4 used), the spring seat (28) assemblies (4 used) and springs (30) (4 used) from casings (34, 48) respectively.

7. When disassembling the spring seat (28) assemblies (4 used), push spring seats (28) (4 used) and compress springs (29) (2 used) and springs (45, 46). Slide and remove spring seats (28) (4 used) from spools (32) (4 used) through the larger hole.

 **NOTE:** Do not damage the surface of spool (32). Do not push spring seats (28) (4 used) for 6 mm (0.24 in) or more.


8. Separate springs (29) (2 used), springs (45, 46) and washers (28) (4 used) from spools (32) (4 used).

 **NOTE:** Record the install to position spools (32) (4 used), spring (30) (2 used), springs (45, 46), and washers (28) (4 used).

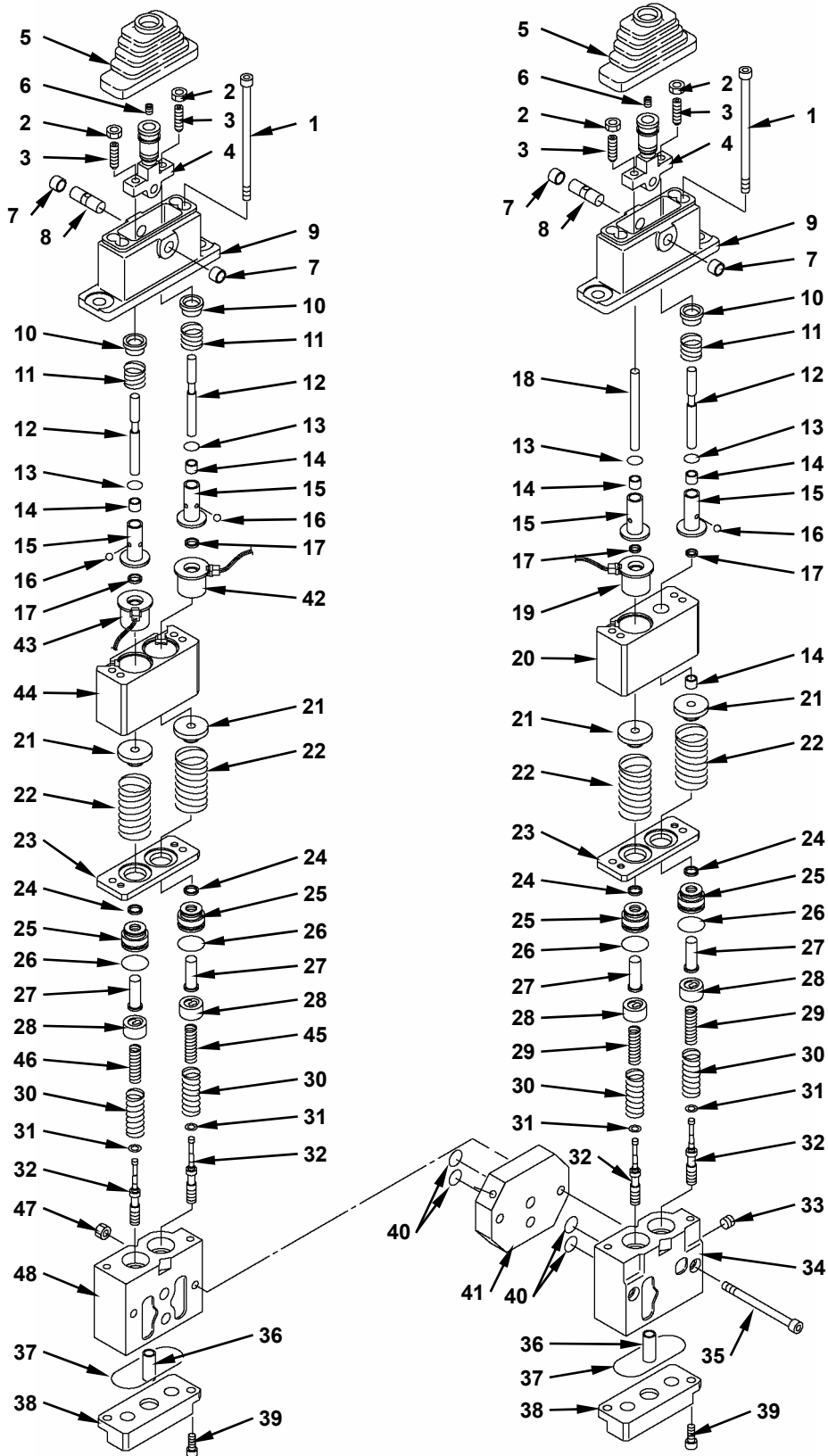
9. Remove push rods (27) (4 used) from plugs (25) (4 used).

10. Remove O-rings (26) (4 used) from plugs (25) (4 used).

11. Remove seals (24) (4 used) from plugs (25) (4 used).

 **NOTE:** Remove seals (24) (4 used) by using a small screwdriver. Do not damage the inner surface of plug (25).

# BODY (UPPERSTRUCTURE) / Pilot Valve




W4GB-02-06-011



## BODY (UPPERSTRUCTURE) / Pilot Valve


12. Remove socket bolts (35) (2 used) and nuts (47) (2 used) from casings (34, 48). Separate casings (34, 48) and sub plate (41).

 : 6 mm

13. Remove O-rings (40) (2 used) from sub plate (41).


14. Remove O-rings (40) (2 used) from casing (34).

15. Secure casings (34, 48) in a vise. Remove socket bolts (39) (4 used) from port plates (38) (2 used).


 : 6 mm

16. Remove port plates (38) (2 used) and O-rings (37) (2 used) from casings (34, 48).

17. Secure plates (23) (2 used) in a vise. Remove socket bolts (1) (4 used) from the shallower hole on cover (9).


 : 5 mm

18. Remove covers (9) (2 used) and detent casings (20, 44) from plates (23) (2 used).


 **NOTE:** As spring guides (21) (4 used) is installed to detent casings (20, 24) by grease, do not drop spring guides (21) (4 used).

19. Remove springs (22) (4 used) and spring guides (21) (4 used) from plates (23) (2 used).


20. Remove detent casings (20, 44) from covers (9) (2 used).

 **NOTE:** Do not push rod (18) which is inserted into detent bushing (15) without steel balls (16) (3 used).

21. Remove solenoids (19, 42, 43) from detent casing (20, 44).

 **NOTE:** When removing solenoids (19, 42, 43) do not pull a lead wire.


22. Remove lock plugs (6) (2 used) from levers (4) (2 used).

 : 3 mm

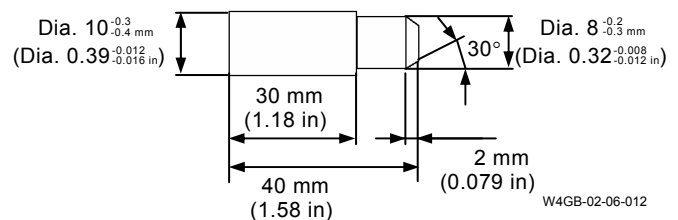
23. Remove camshafts (8) (2 used) from covers (9) (2 used).

24. Remove levers (4) (2 used) from covers (9) (2 used).

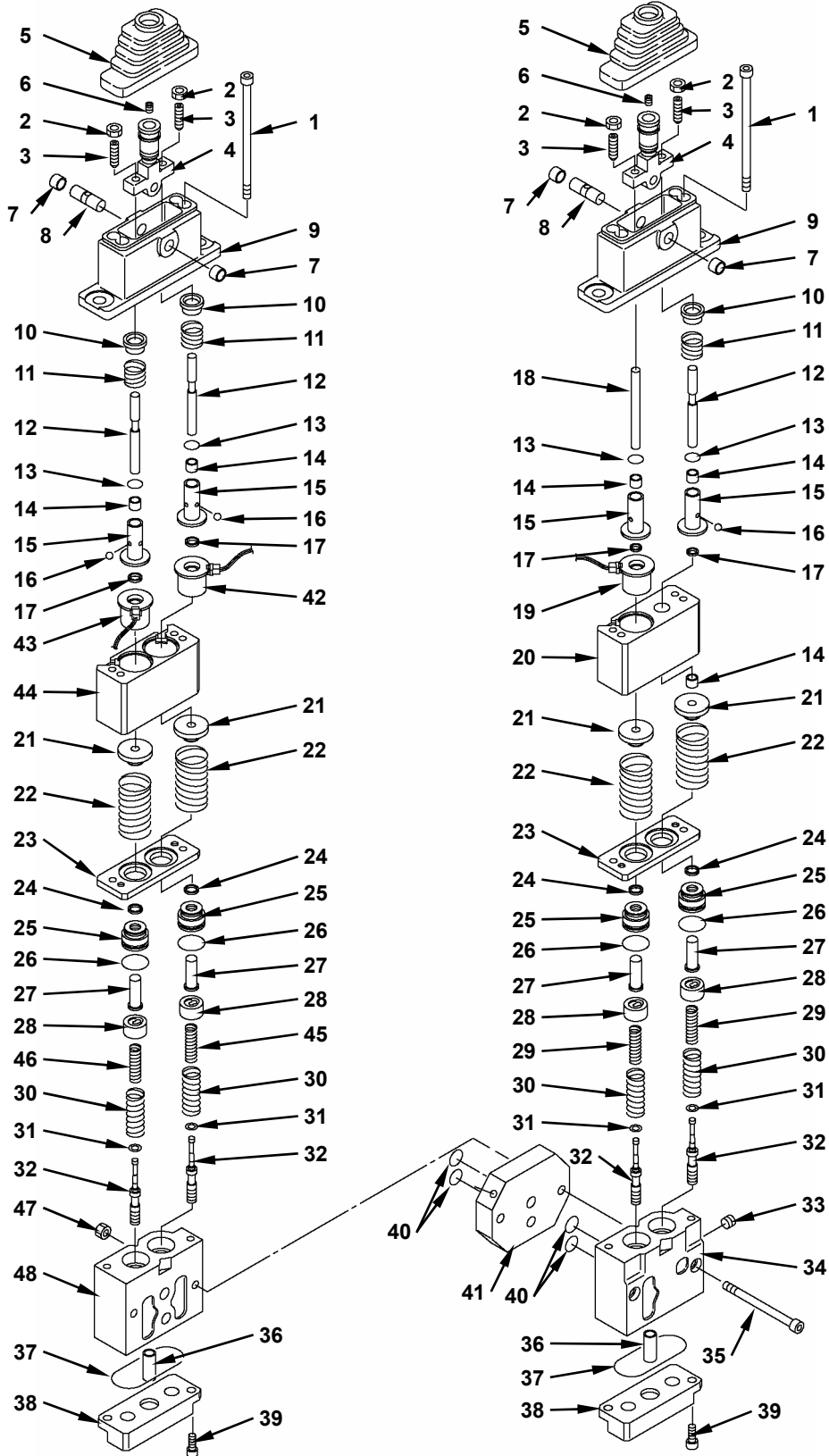
25. Remove nuts (2) (4 used) and screws (3) (4 used) from levers (4) (2 used).

 : 13 mm

26. Remove an assembly of detent bushings (15) (4 used), push rods (12) (3 used), push rod (18) and bushings (14) (4 used) from the mounting side by using the special tool.



# BODY (UPPERSTRUCTURE) / Pilot Valve



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## BODY (UPPERSTRUCTURE) / Pilot Valve

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27. Remove O-rings (13) (4 used) from covers (9) (2 used).


[A port without a detent]

28. Remove push rod (18) from detent bushing (15).


 *NOTE: Record the combination of detent bushing (15) and push rod (18).*

[A port with a detent]

29. Hold detent rings (10) (3 used) and compress springs (11) (3 used). Remove steel balls (16) (12 used).


 *NOTE: Prevent steel ball (16) from falling off.*

30. Remove push rods (12) (3 used) from detent bushing (15).

 *NOTE: Record the combination of detent bushing (15) and push rod (12).*

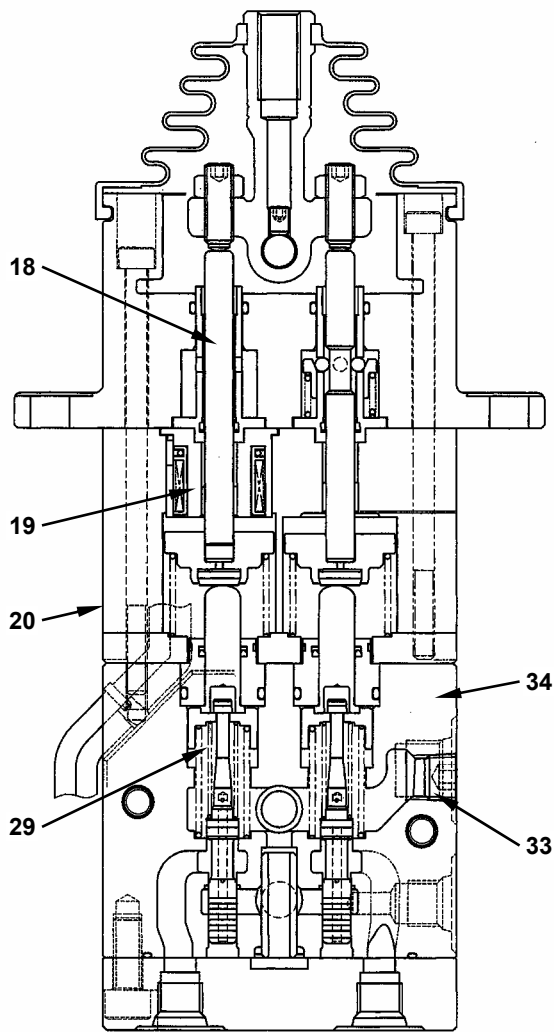
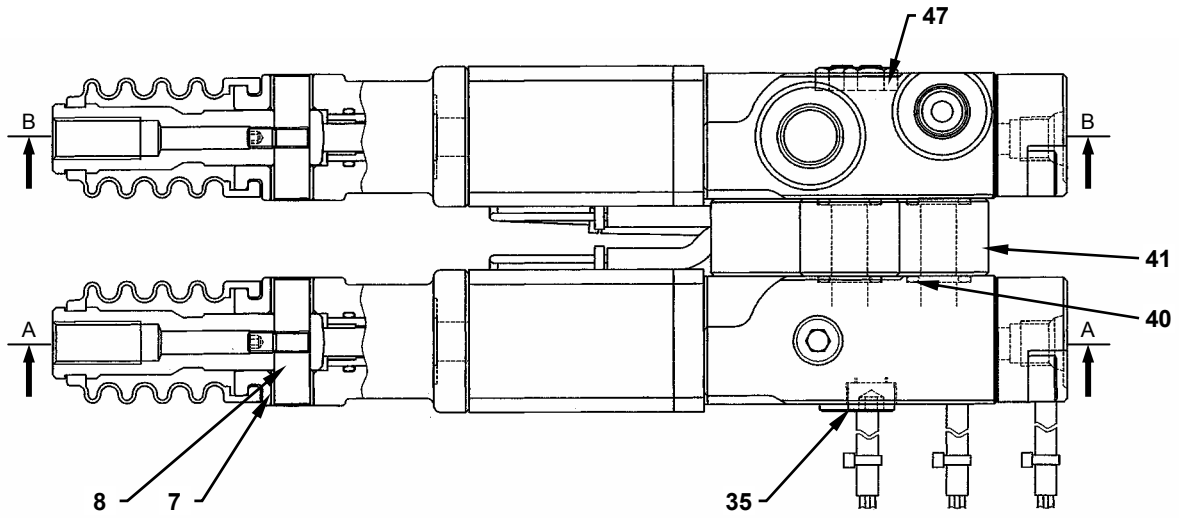
31. Remove detent rings (10) (3 used) and springs (11) (3 used) from detent bushings (15) (3 used).

32. Remove scrapers (17) (4 used) from detent bushings (15) (4 used).

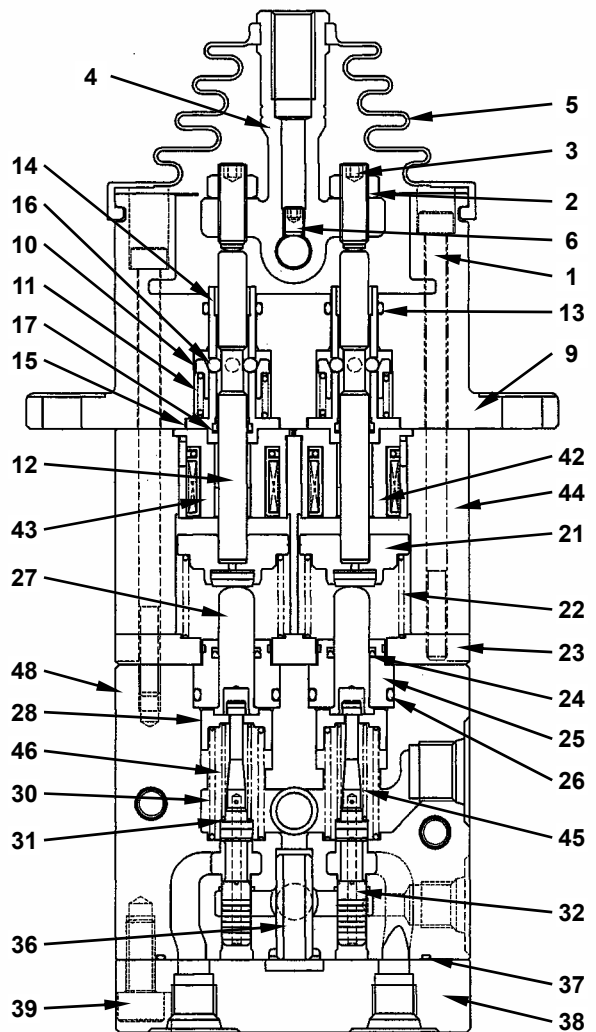
 *NOTE: Do not damage the inner surface of detent bushing (15) when removing scraper (17).*

# BODY (UPPERSTRUCTURE) / Pilot Valve

## ASSEMBLY OF STANDARD PILOT VALVE FOR FRONT ATTACHMENT



Section A-A



Section B-B

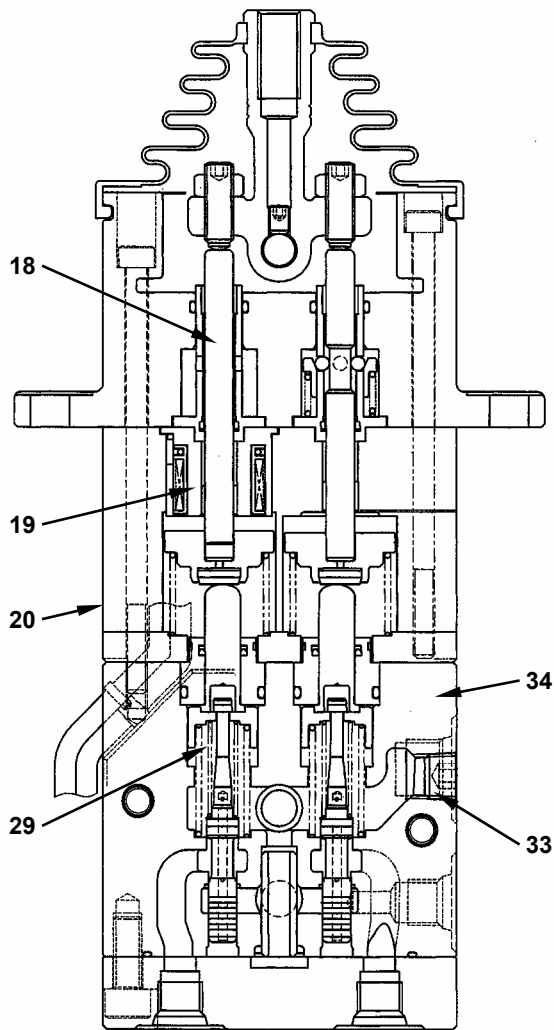
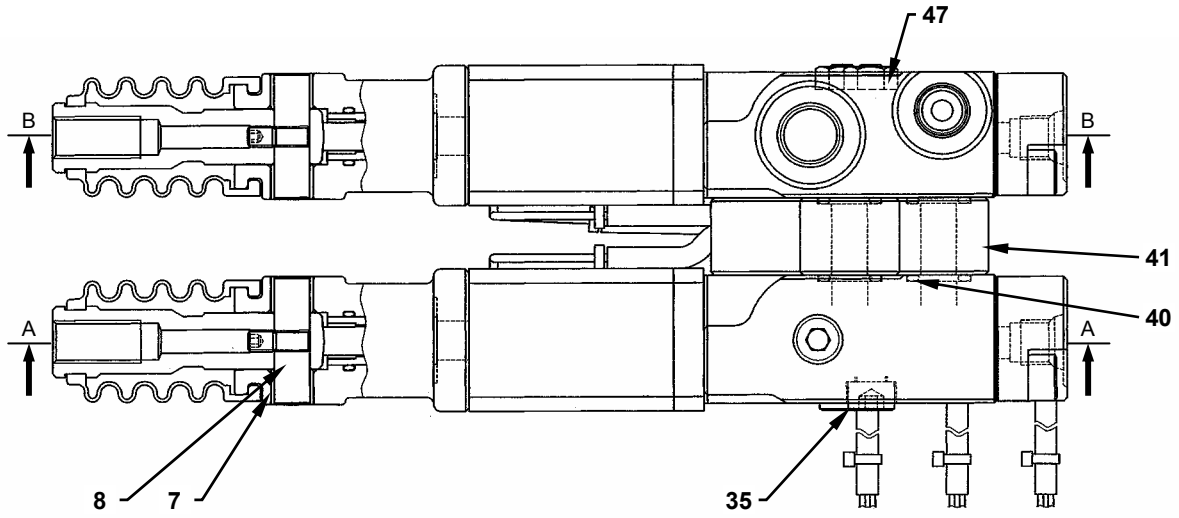
W4GB-02-06-013

## BODY (UPPERSTRUCTURE) / Pilot Valve

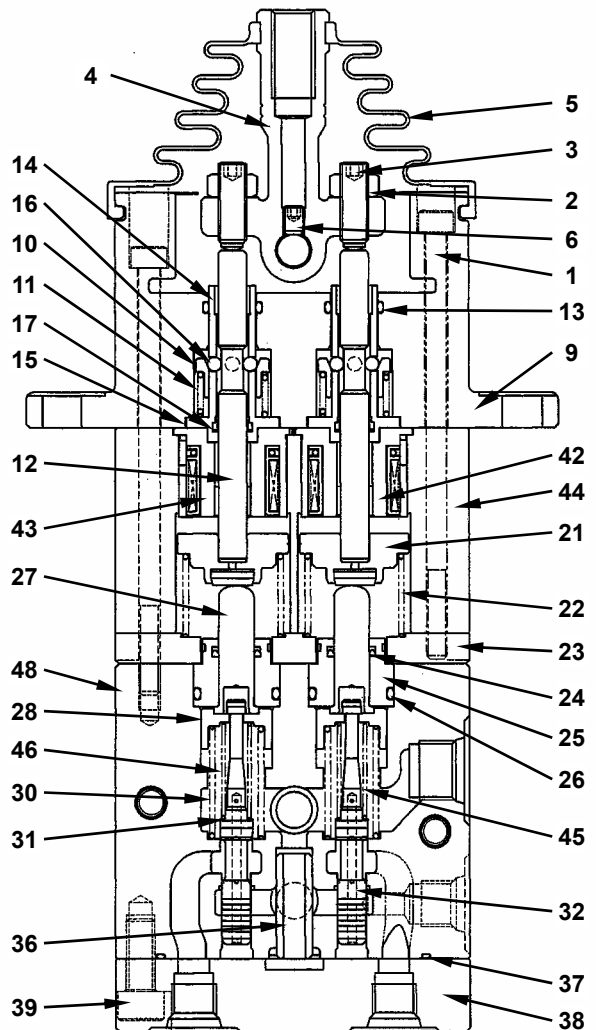
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1 - Socket Bolt (4 Used)	13 - O-Ring (4 Used)	25 - Plug (4 Used)	37 - O-Ring (2 Used)
2 - Lock Nut (4 Used)	14 - Bushing (4 Used)	26 - O-Ring (4 Used)	38 - Port Plate (2 Used)
3 - Screw (4 Used)	15 - Detent Bushing (4 Used)	27 - Push Rod (4 Used)	39 - Socket Bolt (4 Used)
4 - Lever (2 Used)	16 - Steel Ball (12 Used)	28 - Spring Seat (4 Used)	40 - O-Ring (4 Used)
5 - Boot (2 Used)	17 - Scraper (4 Used)	29 - Spring (2 Used)	41 - Sub Plate
6 - Lock Plug (2 Used)	18 - Push Rod	30 - Spring (4 Used)	42 - Solenoid
7 - Bushing (4 Used)	19 - Solenoid	31 - Washer (4 Used)	43 - Solenoid
8 - Cam Shaft (2 Used)	20 - Detent Casing	32 - Spool (4 Used)	44 - Detent Casing
9 - Cover (2 Used)	21 - Spring Guide (4 Used)	33 - Plug	45 - Spring
10 - Detent Ring (3 Used)	22 - Spring (4 Used)	34 - Casing	46 - Spring
11 - Spring (3 Used)	23 - Plate (2 Used)	35 - Socket Bolt (2 Used)	47 - Nut (2 Used)
12 - Push Rod (3 Used)	24 - Seal (4 Used)	36 - Bushing (2 Used)	48 - Casing

# BODY (UPPERSTRUCTURE) / Pilot Valve



Section A-A




Section B-B

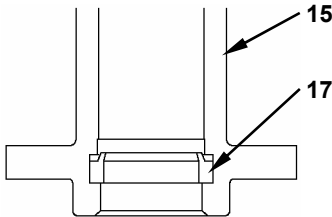
W4GB-02-06-013

## BODY (UPPERSTRUCTURE) / Pilot Valve

### Assembly of Standard Pilot Valve for Front Attachment

1. Apply grease onto scrapers (17) (4 used). Install scrapers (17) (4 used) to detent bushings (15) (4 used).

 **NOTE:** Check the install direction to scrapers (17) (4 used).




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2. Apply grease onto the sliding parts of detent bushings (15) (3 used) and detent rings (10) (3 used).  
Install detent rings (10) (3 used) and springs (11) (3 used) to detent bushings (15) (3 used).

[A port with a detent]

3. Install push rods (12) (3 used) to detent bushings (15) (3 used). (Check the up and down directions of the rod.)

 **CAUTION:** Prevent detent rings (10) (3 used) from flying out by springs (11) (3 used).

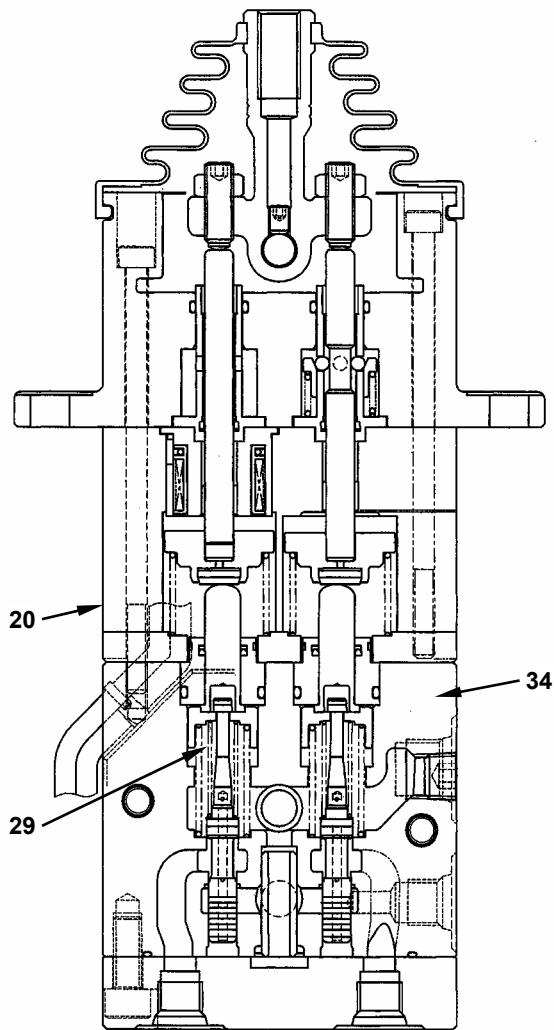
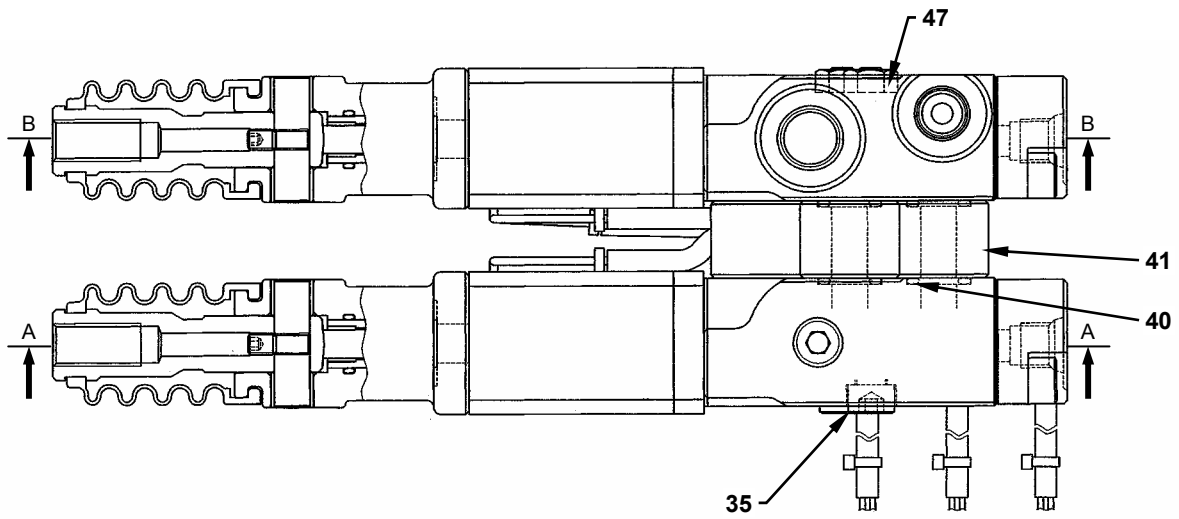
4. Hold detent rings (10) (3 used) and compress springs (11) (3 used). Install steel balls (16) (12 used).

 **NOTE:** Apply grease onto steel balls (16) (12 used). Grease prevents steel balls (16) (12 used) from falling off. Thus, the installation is carried out easily.  
Adjust the positions of push rods (12) (3 used) so that the steel balls (16) (12 used) can be inserted into the constriction part of push rods (12) (3 used).

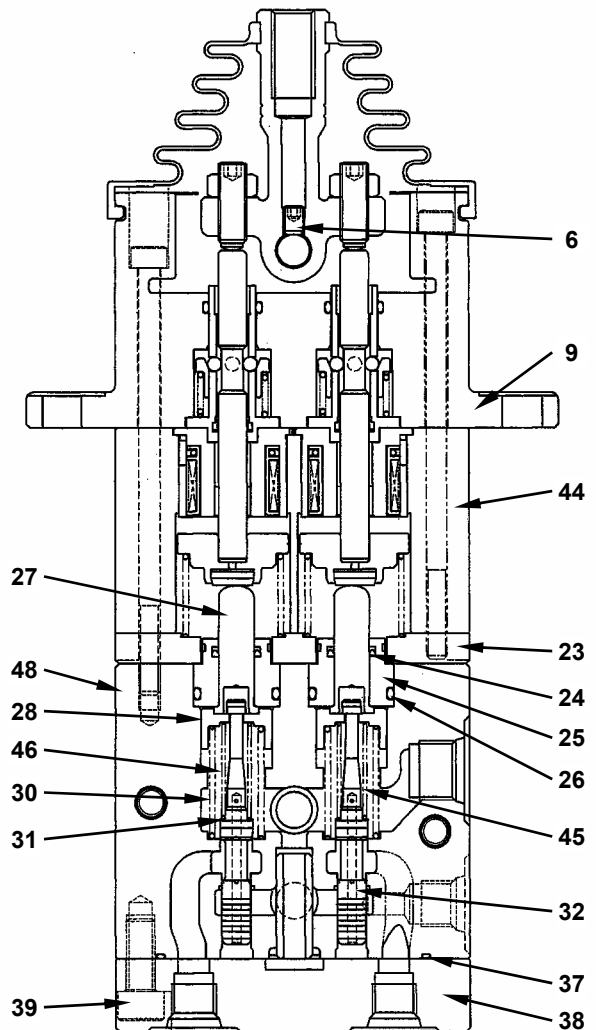
[A port without a detent]

5. Install push rod (18) to detent bushing (15). (Check the up and down directions of the rod.)
6. Install O-rings (13) (4 used) to covers (9) (2 used).
7. Install detent bushings (15) (4 used) to cover (9) (2 used) at the original position.
8. Temporarily tighten screws (3) (4 used) and nuts (2) (4 used) temporarily to levers (4) (2 used).
9. Apply grease onto the top and bottom sides of push rods (12) (3 used) and push rod (18), the sliding part at the side surfaces of levers (4) (2 used) and the sliding parts of cam shafts (8) (2 used).  
Secure covers (9) (2 used) in a vise. Install levers (4) (2 used) and cam shafts (8) (2 used) to covers (9) (2 used).

# BODY (UPPERSTRUCTURE) / Pilot Valve



Section A-A




Section B-B


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## BODY (UPPERSTRUCTURE) / Pilot Valve

10. Apply LOCTITE #241 onto lock plugs (6) (2 used).  
Install lock plugs (6) (2 used) to lever (4).


 : 3 mm

 : 6.9 N·m (0.7 kgf·m, 5.1 lbf·ft)


11. Install solenoids (19, 42, 43) to detent casings (20, 44) at the original position.

 **NOTE:** Insert the rubber bushing for the wire hole into the groove on the detent case.

12. Install detent casings (20, 44) to push rods (12) (3 used) and push rod (18) of cover (9).


 **NOTE:** Check the install direction detent casings (20, 44).


13. Apply grease onto the attached surface of spring guides (21) (4 used). Install springs (22) (4 used) and the attached the plate to plates (23) (2 used) at the original position.

 **CAUTION:** Prevent springs (22) (4 used) flying out when installing covers (9) (2 used).

14. Install covers (9) (2 used) and detent casings (20, 44) to plates (23) (2 used). Insert and temporarily tighten socket bolts (1) (4 used) into the shallower hole on covers (9) (2 used).


15. Secure plates (23) (2 used) in a vise. Tighten socket bolts (1) (4 used) to the specified torque. Spray rust proof oil inside the spring chambers in detent casings (20, 44).


 : 5 mm

 : 8.8 N·m (0.9 kgf·m, 6.5 lbf·ft)

16. Install O-rings (37) (2 used) to casings (34, 48).

17. Install port plates (38) (2 used) to casings (34, 48) with socket bolts (39) (4 used).

 : 6 mm


 : 20.5 N·m (2.1 kgf·m, 15 lbf·ft)


18. Install O-rings (40) (2 used) to sub plate (41).


19. Install O-rings (40) (2 used) to casing (34).

20. Temporarily install casings (34, 48) and sub plate (41) with socket bolts (35) (2 used) and nuts (47) (2 used).

Secure the casing (34, 48) parts in a vise. Tighten socket bolts (35) (2 used).

 : 6 mm

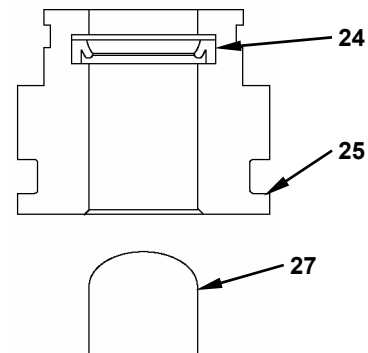
 : 20.5 N·m (2.1 kgf·m, 15 lbf·ft)

 **NOTE:** Check the mating direction of casings (34, 48) and sub plate (41).

21. Install O-rings (26) (4 used) to plugs (25) (4 used).

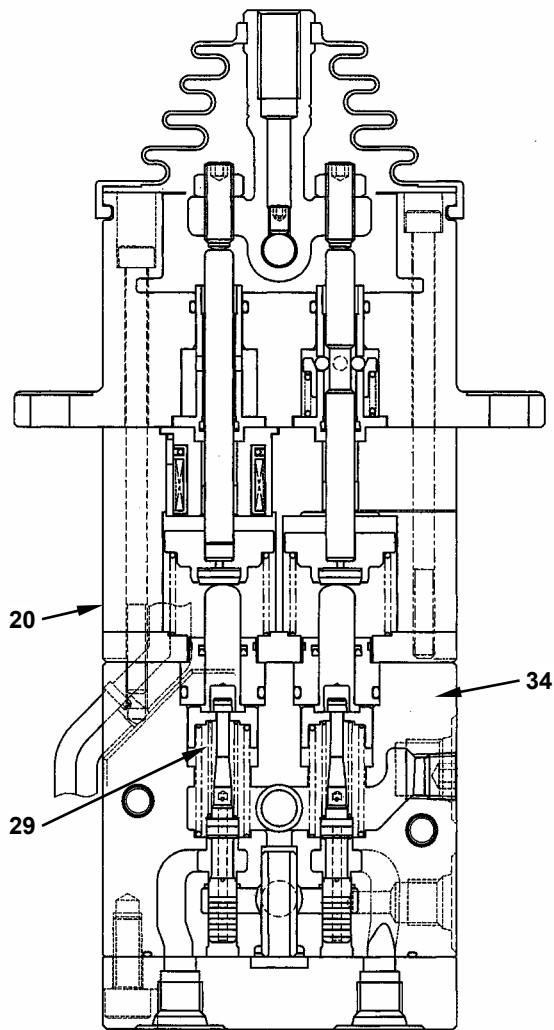
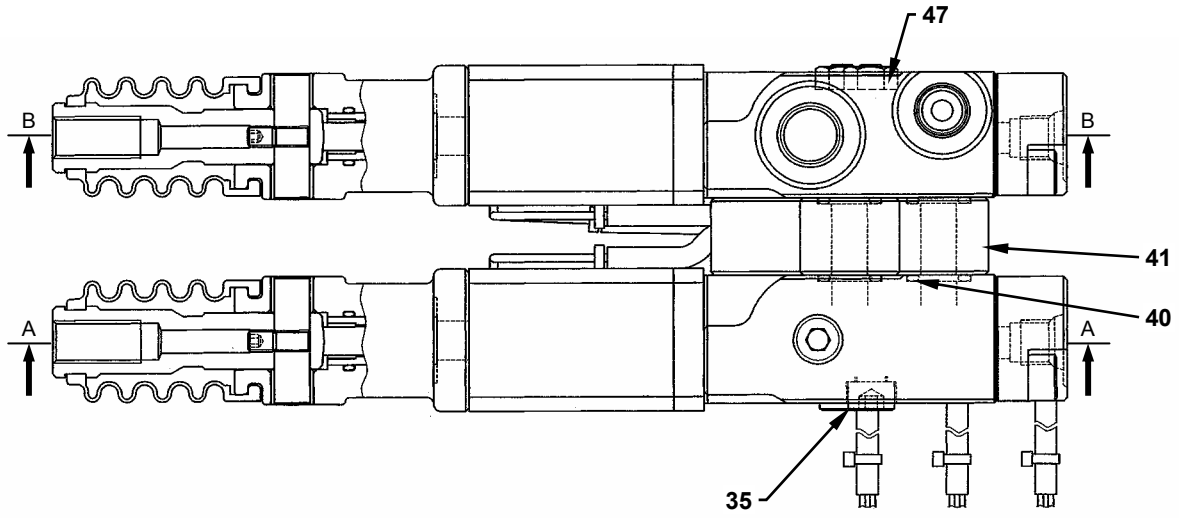
22. Install seals (24) (4 used) to plugs (25) (4 used).

 **NOTE:** Check the direction to install seal (24).

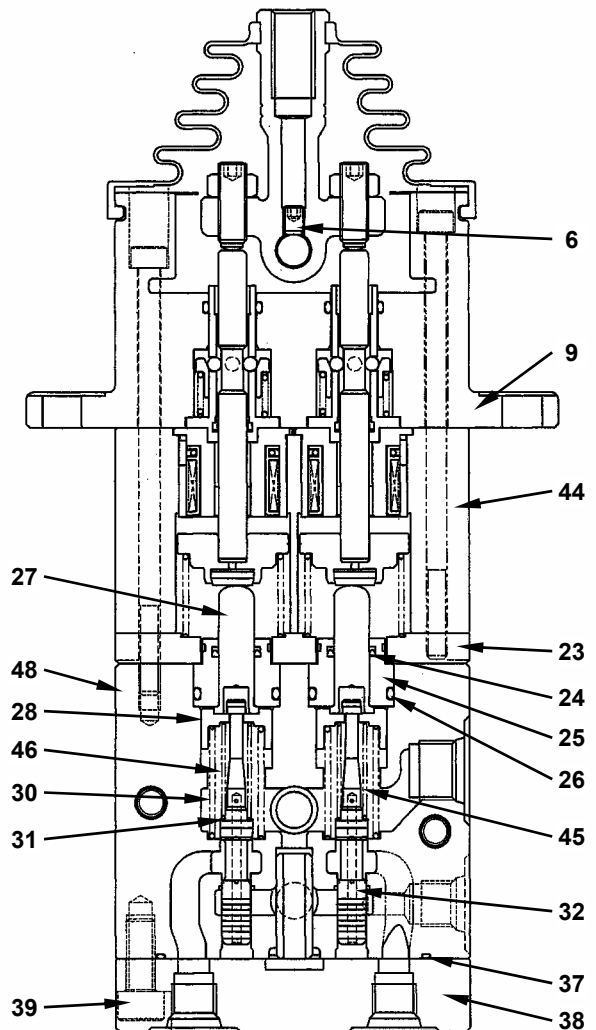


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# BODY (UPPERSTRUCTURE) / Pilot Valve



Section A-A



Section B-B

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## BODY (UPPERSTRUCTURE) / Pilot Valve

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23. Install push rods (27) (4 used) to the plug (25) assemblies (4 used).

24. Install springs (29) (2 used), springs (45, 46) and washers (31) (4 used) to spools (32) (4 used) at the original position.


25. Insert spools (32) (4 used) through the larger hole on spring seats (28) (4 used). Push spring seats (28) (4 used) and compress springs (29) (2 used) and springs (45, 46). Slide and install spring seats (28) (4 used) to spools (32) (4 used).


 **NOTE:** Do not push spring seats (28) (4 used) for 6 mm (0.24 in) or more.


26. Install springs (30) (4 used) to casings (34, 48). Install the spool (32) assemblies (4 used) and the plug (25) assemblies (4 used) to casing (34, 48). Apply grease onto the top of push rods (27) (4 used).

 **NOTE:** Do not hit the lower ends of spools (32) (4 used) against casings (34, 48) strongly.

27. Install covers (9) (2 used) and the detent casing (20, 44) assemblies to casings (34, 48). Insert and tighten socket bolts (1) (4 used) into the deeper hole on covers (9) (2 used).

 : 5 mm

 : 8.8 N·m (0.9 kgf·m, 6.5 lbf·ft)


 **NOTE:** Check the positions to install cover (9) and the detent casing (20, 44) assemblies to casing (34).




**CAUTION:** When push rods (12) (3 used) and push rod (18) is pushed too much by using screws (3) (4 used), looseness may occur at the neutral position. This may cause sudden machine movement when starting the engine.

28. Adjust the heights of screws (3) (4 used). Set levers (4) (2 used) in the vertical position to the upper surface of cover (9). By rotating lever (4) clockwise and counterclockwise, check that no looseness occurs at the neutral position. Tighten screws (3) (4 used) with nuts (2) (4 used).


 : 13 mm

 : 16.7 N·m (1.7 kgf·m, 12.5 lbf·ft)

 **NOTE:** If clearance exists, it may cause looseness in the angle at beginning of control lever (4) operation. Check that no looseness found after tightening nut (2).

29. Spray rust proof oil onto the inner components of boot (5).

Insert the upper end of boot (5) into the groove on lever (4). Insert the lower end into the groove on cover (9).

 **NOTE:** Waterproof degradation may occur unless boot (5) is correctly inserted into the groove.

## BODY (UPPERSTRUCTURE) / Pilot Valve

### MAINTENANCE STANDARD


1. Spool (32) diameter

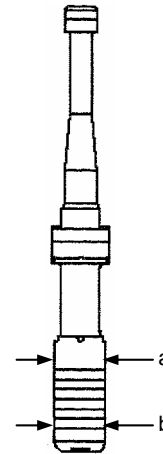
Difference between diameter of non-sliding part (a) and sliding part (b)

a-b Unit: mm (in)

Allowable Limit

0.01 (0.0004)

 **NOTE:** In case the value is beyond the allowable limit, replace the pilot valve assembly.



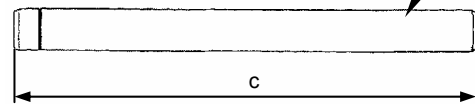
2. Push Rods (12, 18, 27) length

Unit: mm (in)

	Standard	Allowable Limit
c	87.7 (3.45)	86.7 (3.41)
d	36 (1.42)	36 (1.42)

W4GB-02-06-016

12, 18




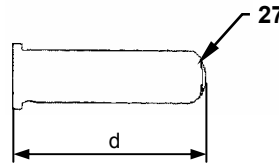
W4GB-02-06-017

3. Bushing (14) inner diameter

e Unit: mm (in)

	Standard	Allowable Limit
e	8 (0.32)	8.5 (0.34)

 **NOTE:** When the bushing in the sub assembly of solenoid is worn away, replace the solenoid valve assembly.



4. Looseness in the control part

When looseness on the upper end of lever (4) is 2 mm (0.08 in) or more due to the wear of screw (3), cam shaft (8) or DU bushing (7), replace the solenoid valve assembly.

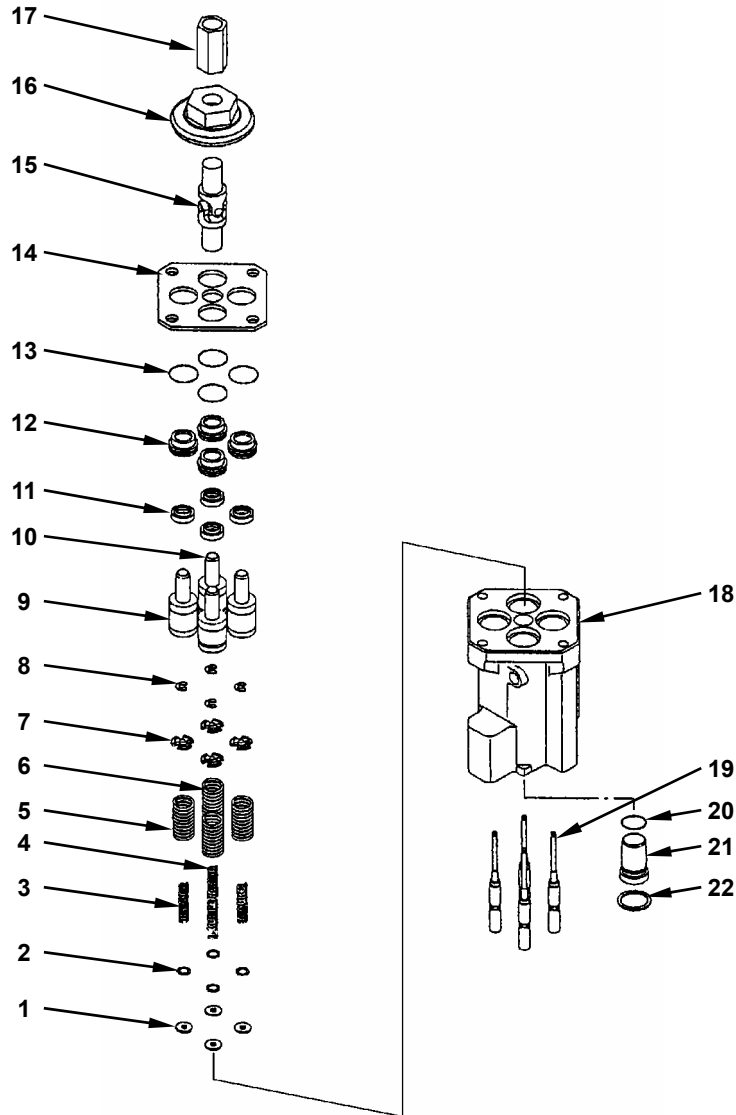
## **BODY (UPPERSTRUCTURE) / Pilot Valve**

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## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

### DISASSEMBLY OF JOY-STICK TYPE PILOT VALVE FOR ADDITIONAL CIRCUIT (OPTIONAL)



W178-02-07-064

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

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## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

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### Disassembly of Joy-Stick Type Pilot Valve for Additional Circuit (Optional)

**IMPORTANT:** Casing (18) is made of aluminium. Too strong a force can deform or damage them. Be careful while handling them.


**IMPORTANT:** Spool (19) has been selected to match the hole of casing (18). The dimensions of balance springs A (3), B (4) and return springs A (5), B (6) as well as those of pushers A (9), B (10) are slightly different. Clearly identify port numbers disassembled parts. Port numbers are stamped on the outer surface of casing (18).

**IMPORTANT:** Do not remove screw joint (17) while securing casing (18) in a vise. The strong torque may act on screw joint (17).


1. Secure screw joint (17) in a vise. Rotate cam (16) by using a spanner. Remove screw joint (17).


 : 19 mm 32 mm

2. Secure the flat surface of casing (18) in a vise lightly. Remove cam (16) from universal joint (15).

 : 32 mm

3. Attach a spanner onto the upper part of universal joint (15). Remove universal joint (15).

 : 17 mm

 **NOTE:** Universal joint (15) is secured on casing (18) by using LOCTITE #262.

4. Remove plate (14).

**IMPORTANT:** Do not damage the surface of sleeve (12). Insert a soft rubber buffer between sleeve (12) and the tool. Oil seal (11) cannot be removed from sleeve (12).

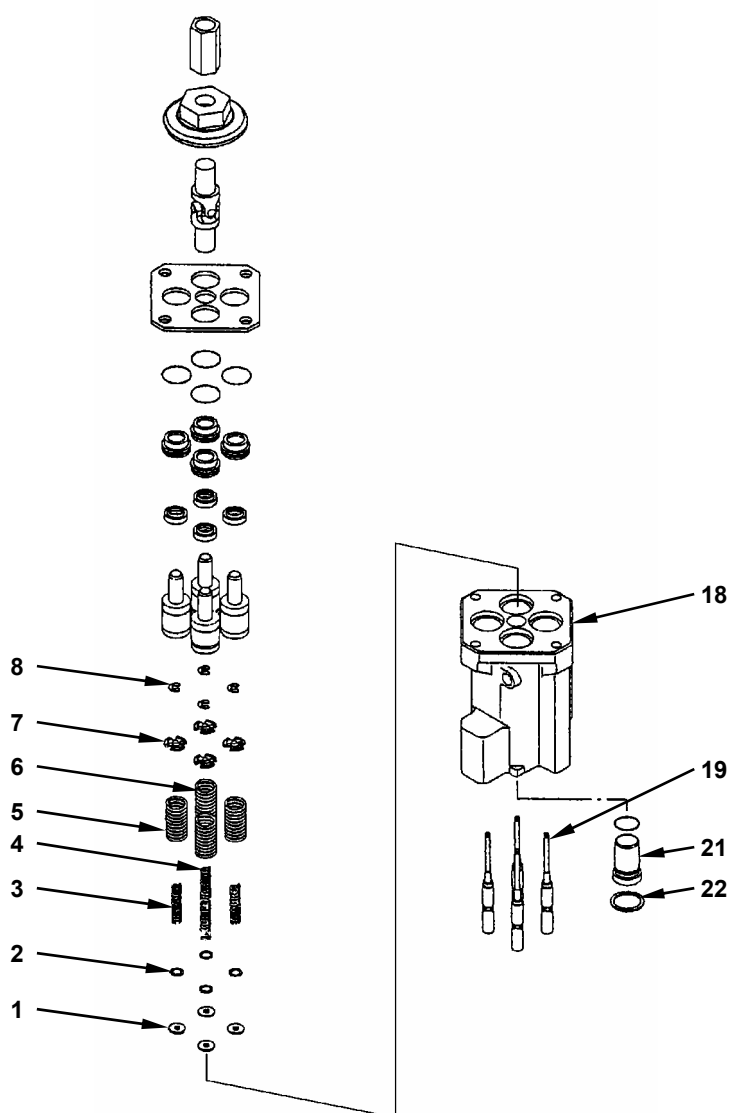
Sleeve (12) and oil seal (11) must be replaced as an assembly.

5. Remove sleeve (12) upward by clipping the side of sleeve (12) by using a pair of pliers.

**IMPORTANT:** The dimensions of pushers (9, 10) for ports (1, 3) and ports (2, 4) are different. Clearly identify port numbers of disassembled parts.

6. Remove pushers (9, 10) from casing (18).

# BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve




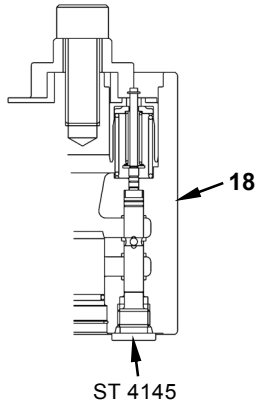
W178-02-07-064




## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

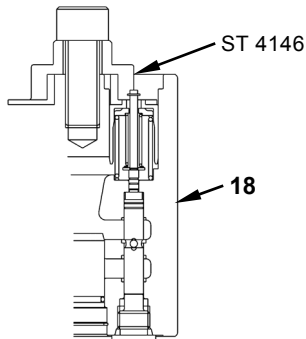
7. Prevent the spool from lowering when compressing the spring. Install special tool (ST 4145) to the port hole on casing (18) as illustrated.

 : 6 mm



8. Install special tool (ST 4146) to the pusher hole on casing (18). Push the special tool and compress the spring. Tighten special tool (ST 4146) by using the socket bolt (M14, Pitch 2.0 mm). Remove retaining rings (8) (4 used) from spools (19) (4 used) by using a screwdriver.

 : 12 mm



**IMPORTANT:** The quantity of shims (2) has been determined for each port during the performance testing at the factory. Do not lose shim (2). Keep shim (2) carefully in order to install the shim to the original port when assembling.

9. Remove special tool (ST 4146). Remove spring guides (7) (4 used), return springs A (5) (2 used), return springs B (6) (2 used), balance springs A (3) (2 used) and balance springs B (4) (2 used) from spools (19) (4 used).

10. Remove shim (2) and spacers (1) (4 used) from spools (19) (4 used).

**IMPORTANT:** Spool (19) has been selected to match the hole of casing (18). Replace spool (19) and casing (18) as an assembly.

11. Remove special tool (ST 4145) from casing (18). Slowly rotate and remove spool (19) from casing (18).

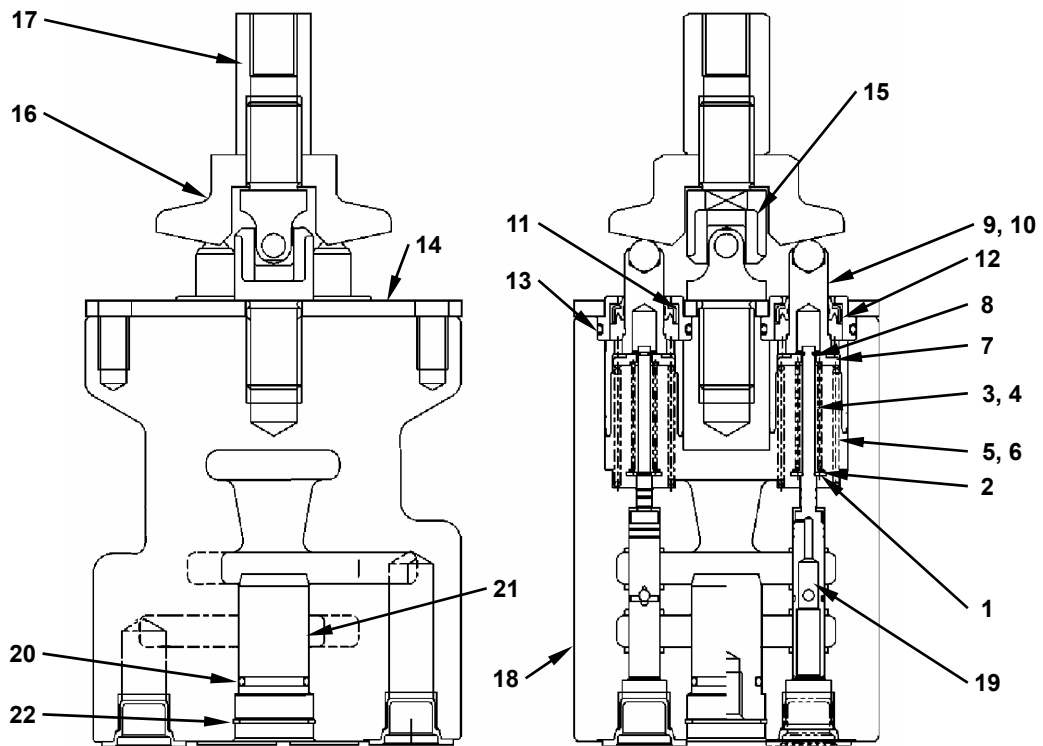
**IMPORTANT:** Retaining ring (22) may come off while disassembling. Prevent retaining ring (22) from fall inside casing (18). If retaining ring (22) falls inside casing (18), remove retaining ring (22) completely. Removed retaining ring (22) cannot be reused.

12. Remove retaining ring (22) from casing (18) by using a screwdriver. Install the bolt (M8, Pitch 1.25 mm) to plug (21). Remove plug (21) from casing (18).

 : 13 mm

## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

### ASSEMBLY OF JOY-STICK TYPE PILOT VALVE FOR ADDITIONAL CIRCUIT (OPTIONAL)




W1V1-02-07-001

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

## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

### Assembly of Joy-Stick Type Pilot Valve for Additional Circuit (Optional)


**IMPORTANT:** The pilot valve is susceptible hydraulic component to contamination. Keep the parts clean when assembling.

 **NOTE:** The table below shows the relation between each port and component. Do not confuse them when assembling.

Port No.	Spool (19)	Shim (2)	Pushers A, B (9, 10)
1	Same to the original one	Same to the foriginal one	Outer grooves (3 used)
2			Without outer groove
3			Outer grooves (3 used)
4			Without outer groove

Port No.	Return Springs (5, 6)	Balance Springs A, B (3, 4)
1	Short	Short
2	Long	Long
3	Short	Short
4	Long	Long

1. Check the port hole number and insert spools (19) (4 used) into the original port. Install the thinner end of spool (19) into the port hole on casing (18) while slowly rotating.


 **NOTE:** Spool (19) has been selected to match the port hole. Spool (19) and casing (18) must be replaced as an assembly.

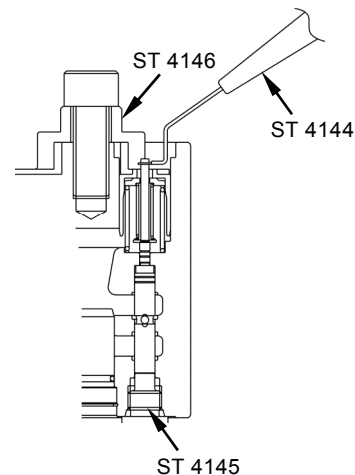
2. Install special tool (ST 4145) to the port hole on casing (18) in order to prevent spool (19) from lowering when pushing the spring.

 : 6 mm

**IMPORTANT:** Refer to the table on the left in order to carry out assembling correctly.

3. Install spacers (1) (4 used), shim (2) and balance springs (3, 4) (2 used for each) to spools (19) (4 used). Install return springs (5, 6) (2 used for each) to casing (18).
4. Install spring guides (7) (4 used) to return springs (5, 6) (2 used for each) with the protrusion facing upward.
5. Install special tool (ST 4146) to the pusher (9,10) hole on casing (18). Push special tool (ST 4146) and compress the spring. Tighten special tool (ST 4146) by using the bolt (M14, Pitch 2.0 mm).

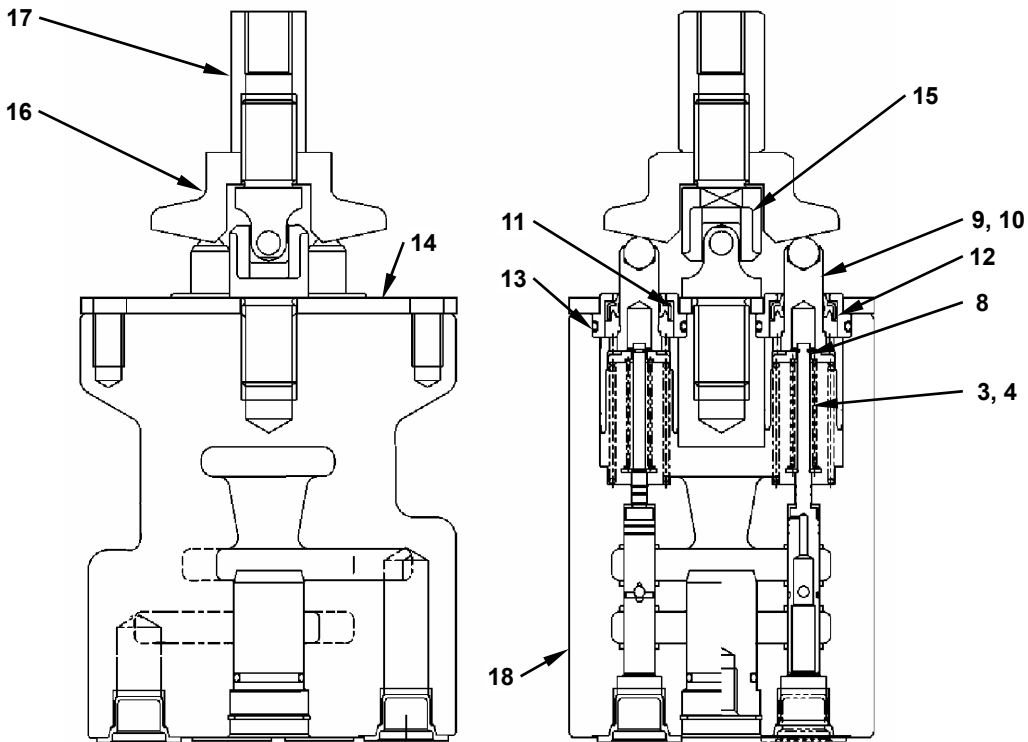
 : 12 mm



W178-02-07-049

6. Install retaining ring (8) to ring holder (ST 4144).

**BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve**



W1V1-02-07-001

## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

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7. Install retaining rings (8) (4 used) attached to ring holder (ST 4144) to the groove on the head of spool (21) extended from special tool (ST 4146).


**IMPORTANT: Check the mounting positions of pushers (9, 10) (2 used for each).**

8. Install pushers (9, 10) (2 used for each).  
Remove pushers (9, 10) (2 used for each) after pushing several times by hand. Check if retaining ring (8) falls off or balance springs (3, 4) (2 used for each) are located correctly.  
After checking, install pushers (9, 10) (2 used for each) to casing (18).

9. Apply grease onto the ball part at the ends of pushers (9, 10) (2 used for each).

10. Apply grease onto the joint part of universal joint (15).

11. Apply grease onto the inner surface of oil seals (11) (4 used).


 **NOTE:** Sleeve (12) and oil seal (11) must be replaced as an assembly.


12. Install oil seals (11) (4 used) to sleeves (12) (4 used). Push the sleeve (12) assemblies (4 used) by hand until O-ring (13) is inserted into the hole on sleeves (12) (4 used).

13. Secure casing (18) in a vise lightly.

**IMPORTANT: Align the bolt hole on plate (14) with the screw hole on casing (18).**

14. Apply LOCTITE #262 onto the screw part of universal joint (15). Place plate (14) on casing (18). Install universal joint (15).


 : 17 mm


 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)

**IMPORTANT: Check the tightness of cam (16).**

15. Install cam (16) to universal joint (15). The clearance between cam (16) and pushers (9, 10) (2 used for each) should be 0 to 0.2 mm (0 to 0.008 in).

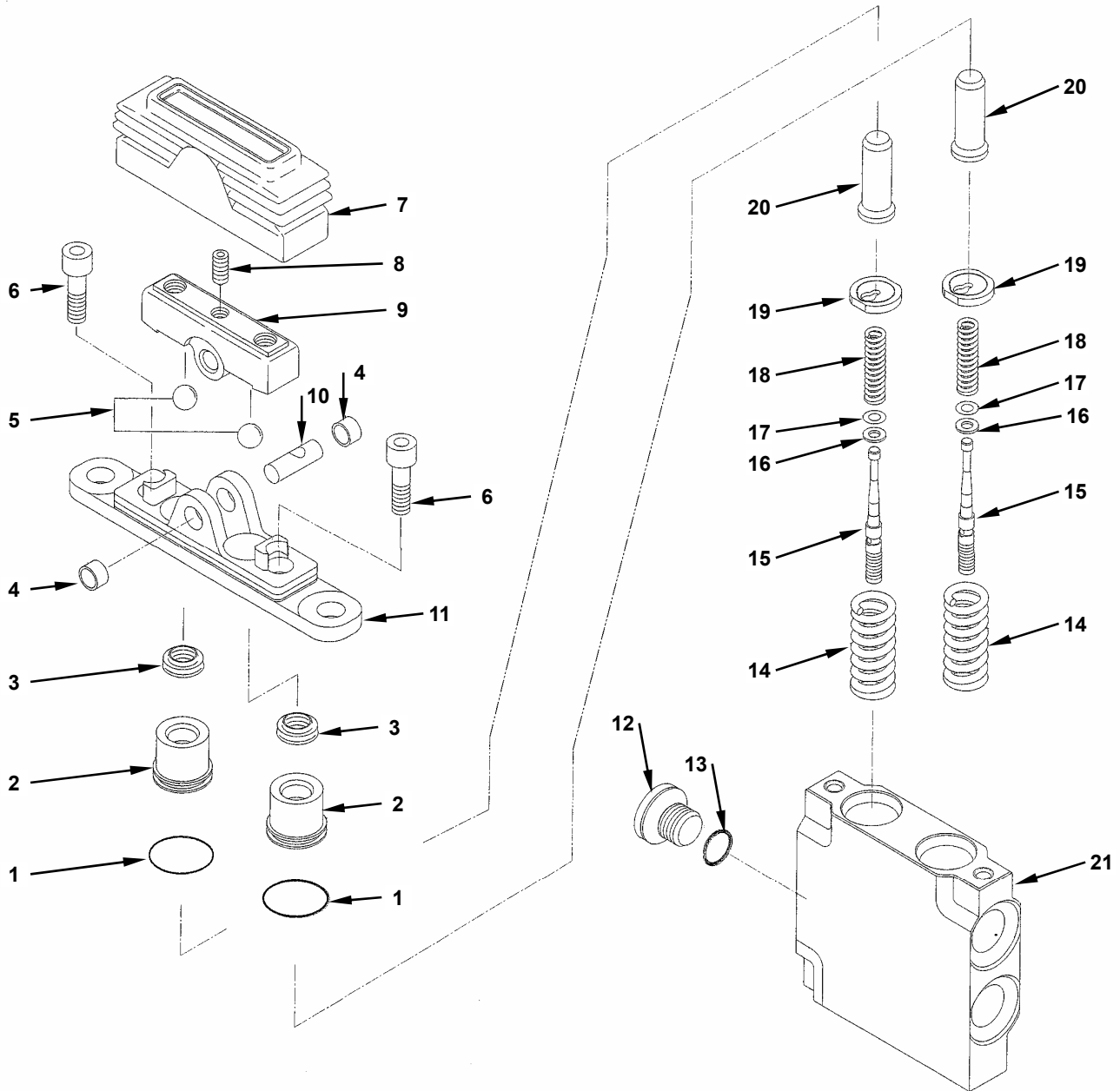
16. Secure cam (16) by using a spanner. Tighten screw joint (17) by using a spanner.

 : 19 mm, 32 mm

 : 68.4 N·m (6.98 kgf·m, 50 lbf·ft)

## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

### DISASSEMBLY OF 2-WAY LEVER TYPE PILOT VALVE FOR ADDITIONAL CIRCUIT (OPTIONAL)



W1LA-02-06-001

- |                          |               |                      |                            |
|--------------------------|---------------|----------------------|----------------------------|
| 1 - O-Ring (2 Used)      | 7 - Boot      | 12 - Plug            | 17 - Shim (2 Used)         |
| 2 - Bushing (2 Used)     | 8 - Set Screw | 13 - O-Ring          | 18 - Spring (2 Used)       |
| 3 - Packing (2 Used)     | 9 - Cam       | 14 - Spring (2 Used) | 19 - Spring Guide (2 Used) |
| 4 - Bushing (2 Used)     | 10 - Pin      | 15 - Spool (2 Used)  | 20 - Pusher (2 Used)       |
| 5 - Steel Ball (2 Used)  | 11 - Cover    | 16 - Washer (2 Used) | 21 - Casing                |
| 6 - Socket Bolt (2 Used) |               |                      |                            |

## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve


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### Disassembly of 2-Way Lever Type Pilot Valve for Additional Circuit

- Thoroughly read and understand Cautions on Disassemble and Assemble on W1-1-1 before starting any disassembling work.
- As spool (15) has been selected to match the hole of casing (21), they can not be replaced in units of single component.
- Clearly identify the port number of the disassembled.

### **IMPORTANT: Put the matching marks on cam (9), pin (10), cover (11) and casing (21) before disassembling.**

1. Secure the pilot valve in a vise. Remove boot (7) from cover (11).
2. Remove set screw (8) from cam (9). Remove pin (10). Remove cam (9) from cover (11).

 **NOTE:** *LOCTITE is applied onto the set screw (8) part.*

 **NOTE:** *Steel ball (5) cannot be disassembled from cam (9).*

3. Loosen and remove socket bolts (6) (2 used) alternately. Remove cover (11) from casing (21).
4. Remove the pusher (20) assemblies (2 used) from casing (21).
5. Remove bushings (2) (2 used) from the pusher (20) assembly. Remove O-rings (1) (2 used) and packings (3) (2 used) from bushings (2) (2 used).

### **IMPORTANT: Clearly identify the port number in order not to confuse.**

6. Remove the spool (15) assemblies (2 used) and springs (14) (2 used) from casing (21).

7. Remove spring guides (19) (2 used), springs (18) (2 used), washers (16) (2 used) and shims (17) (2 used) from the spool (15) assemblies (2 used).

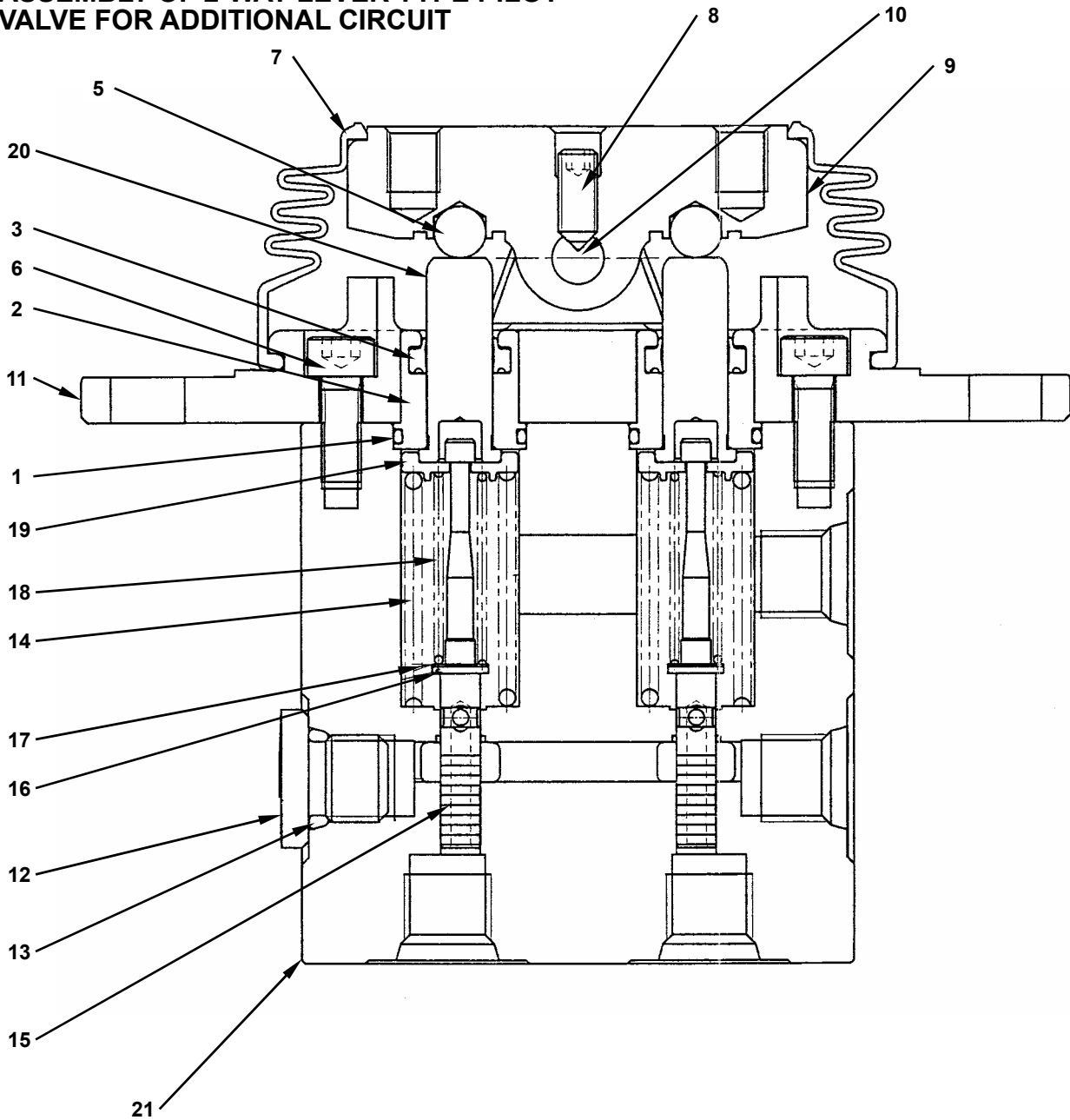
**IMPORTANT: As the spool (15) assemblies (2 used) are adjusted by the pressure of shim (17), do not disassemble the spool (15) assemblies. If disassembling the spool (15) assemblies, record the quantity and thickness of shim (17) as they differ.**

**IMPORTANT: Do not remove bushing (4) from cover (11) unless it is damaged.**

8. Remove bushings (4) (2 used) from cover (11).

## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

### ASSEMBLY OF 2-WAY LEVER TYPE PILOT VALVE FOR ADDITIONAL CIRCUIT



W1LA-02-06-002

- |                          |               |                      |                            |
|--------------------------|---------------|----------------------|----------------------------|
| 1 - O-Ring (2 Used)      | 7 - Boot      | 12 - Plug            | 17 - Shim (2 Used)         |
| 2 - Bushing (2 Used)     | 8 - Set Screw | 13 - O-Ring          | 18 - Spring (2 Used)       |
| 3 - Packing (2 Used)     | 9 - Cam       | 14 - Spring (2 Used) | 19 - Spring Guide (2 Used) |
| 4 - *Bushing (2 Used)    | 10 - Pin      | 15 - Spool (2 Used)  | 20 - Pusher (2 Used)       |
| 5 - Steel Ball (2 Used)  | 11 - Cover    | 16 - Washer (2 Used) | 21 - Casing                |
| 6 - Socket Bolt (2 Used) |               |                      |                            |

**NOTE:** As for the part with mark\*, refer to W2-7-16.



## BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve

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### Assembly of 2-Way Lever Type Pilot Valve for Additional Circuit

- Thoroughly read and understand Cautions on Disassemble and Assemble on W1-1-1 before starting any assembling work.
- Clean all parts by using cleaning fluid and place the parts by port.

1. Install bushings (4) (2 used) to cover (11).

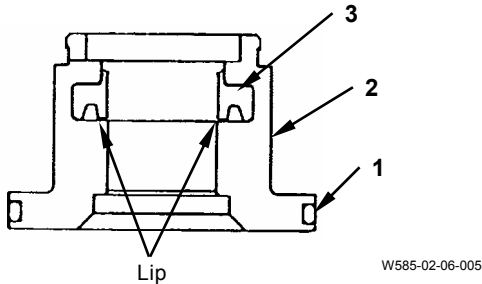
### IMPORTANT: Install shim (17) with the same thickness as it was assembled.

2. Install washers (16) (2 used), shims (17) (2 used), springs (18) (2 used) and spring guides (19) (2 used) to spools (15) (2 used) in this order.

### IMPORTANT: Install the spool (15) assembly into the same hole as it was disassembled.


3. Install springs (14) (2 used) and the spool (15) assemblies (2 used) to casing (21).

4. Install O-rings (1) (2 used) and packings (3) (2 used) to bushings (2) (2 used).




5. Install pushers (20) (2 used) to the bushing (2) assemblies (2 used) and install to casing (21).

6. Secure casing (21) in a vise, and tighten cover (11) with socket bolts (6) (2 used).

 : 23.5 N·m (2.4 kgf·m, 17.5 lbf·ft)

7. Install cam (9) onto cover (11) and secure with pin (10).

8. Apply LOCTITE #241 onto set screw (8). Install set screw (8) to cam (9). Secure pin (10).

 : 4.9 N·m (0.5 kgf·m, 3.7 lbf·ft)

9. Install boot (7) to cover (11).

## **BASE MACHINE (UPPERSTRUCTURE) / Pilot Valve**

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## BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve

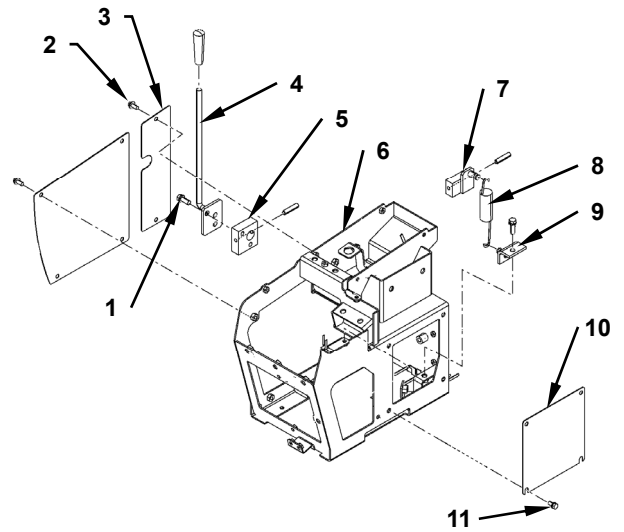
### REMOVAL AND INSTALLATION OF PILOT SHUT-OFF VALVE



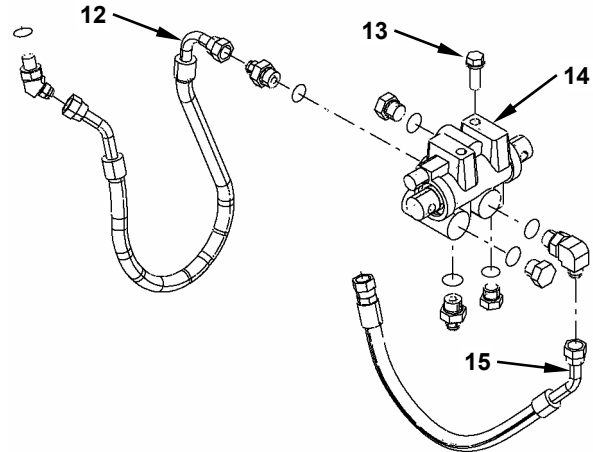
**CAUTION:** Bleed air from the hydraulic oil tank before doing any work. (Refer to **BLEED AIR FROM HYDRAULIC OIL TANK** on W1-4-1.)

#### Removal

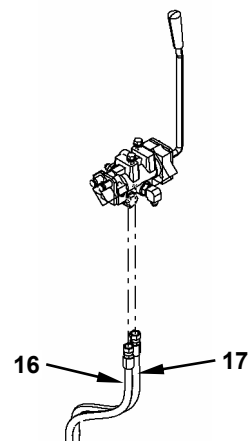
1. Remove screws (2) (2 used) from cover (3).  
Remove cover (3) from bracket (6).
2. Remove sems bolts (11) (4 used) from cover (10).  
Remove cover (10) from bracket (6).  
 : 13 mm
3. Remove spring (8) from block (7) and bracket (9).
4. Remove bolt (1) from lever (4). Remove lever (4) from block (5).  
 : 14 mm
5. Disconnect hoses (12, 15, 16 and 17) from pilot shut-off valve (14). Cap the open ends.  
 : 19 mm, 22 mm
6. Remove bolts (13) (2 used) from the cockpit.  
Remove pilot shut-off valve (14) from the cockpit.  
 : 17 mm



W4GB-02-07-001



W4GB-02-07-002





W4GB-02-07-003

## BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve


### Installation


1. Install pilot shut-off valve (14) to the cockpit with bolts (13) (2 used).


 : 17 mm


 : 50 N·m (5 kgf·m, 36 lbf·ft)

2. Connect hoses (12, 15, 16 and 17) to pilot shut-off valve (14).


 : 19 mm


 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)

 : 22 mm

 : 39 N·m (4 kgf·m, 28.5 lbf·ft)


3. Install lever (4) to block (5) with bolt (1).


 : 14 mm

 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)

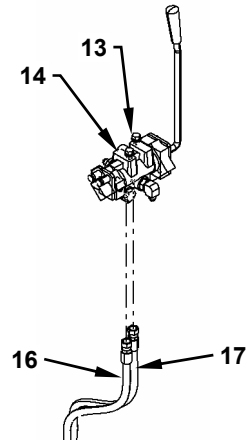
4. Install spring (8) to block (7) and bracket (9).

5. Install cover (10) to bracket (6) with sems bolts (11) (4 used).

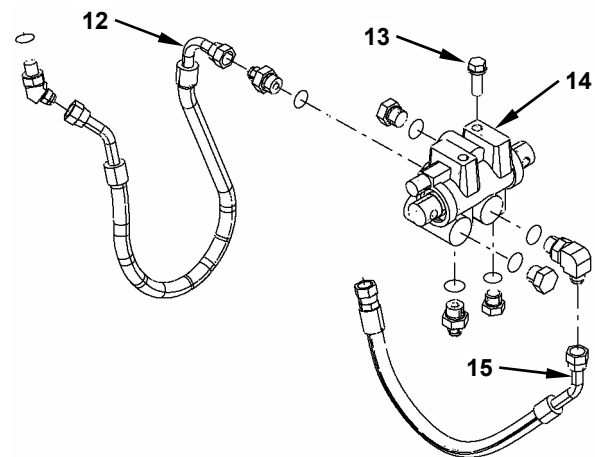
 : 13 mm

 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)

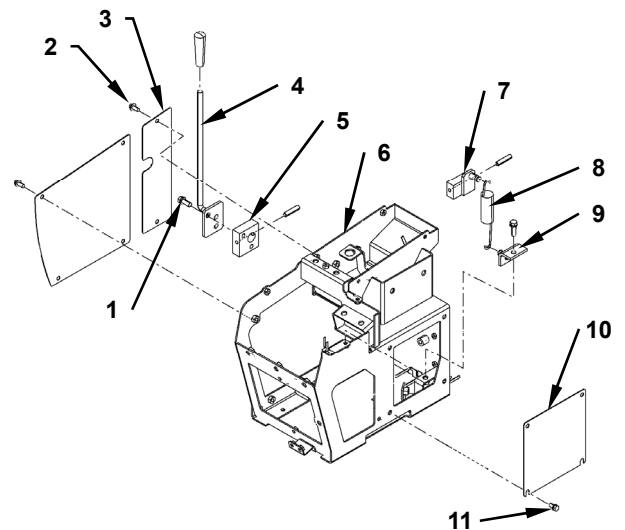
6. Install cover (3) to bracket (6) with screws (2) (2 used).



W4GB-02-07-003



W4GB-02-07-002



W4GB-02-07-001

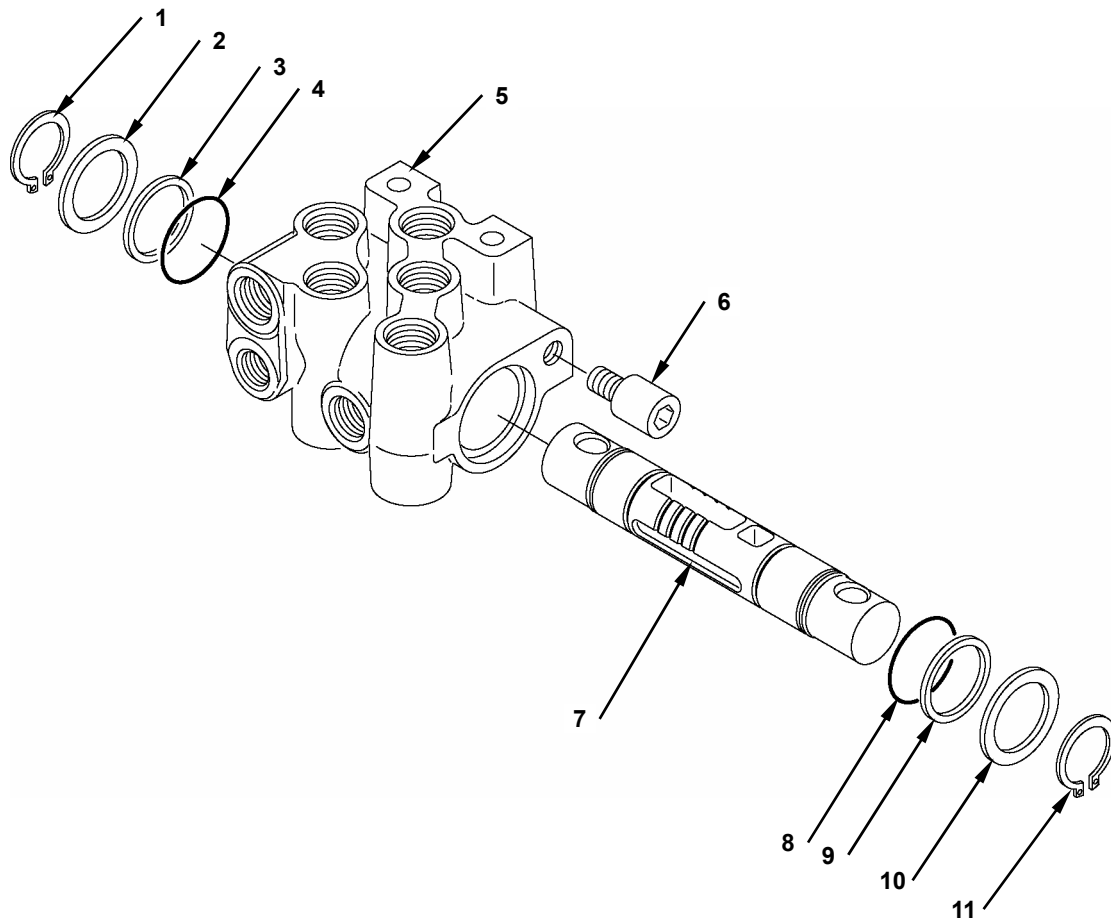
## **BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve**

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## BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve

### DISASSEMBLY OF PILOT SHUT-OFF VALVE



W4GB-02-08-001

1 - Retaining Ring  
2 - Washer  
3 - Backup Ring

4 - O-Ring  
5 - Body  
6 - Socket Bolt

7 - Spool  
8 - O-Ring  
9 - Backup Ring

10 - Washer  
11 - Retaining Ring

## BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve

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### Disassembly of Pilot Shut-Off Valve

1. Remove retaining rings (1, 11) and washer (2) from spool (7). Remove spool (7) to the socket bolts (6) direction from body (5).

 *NOTE: Record the direction to install spool (7).*

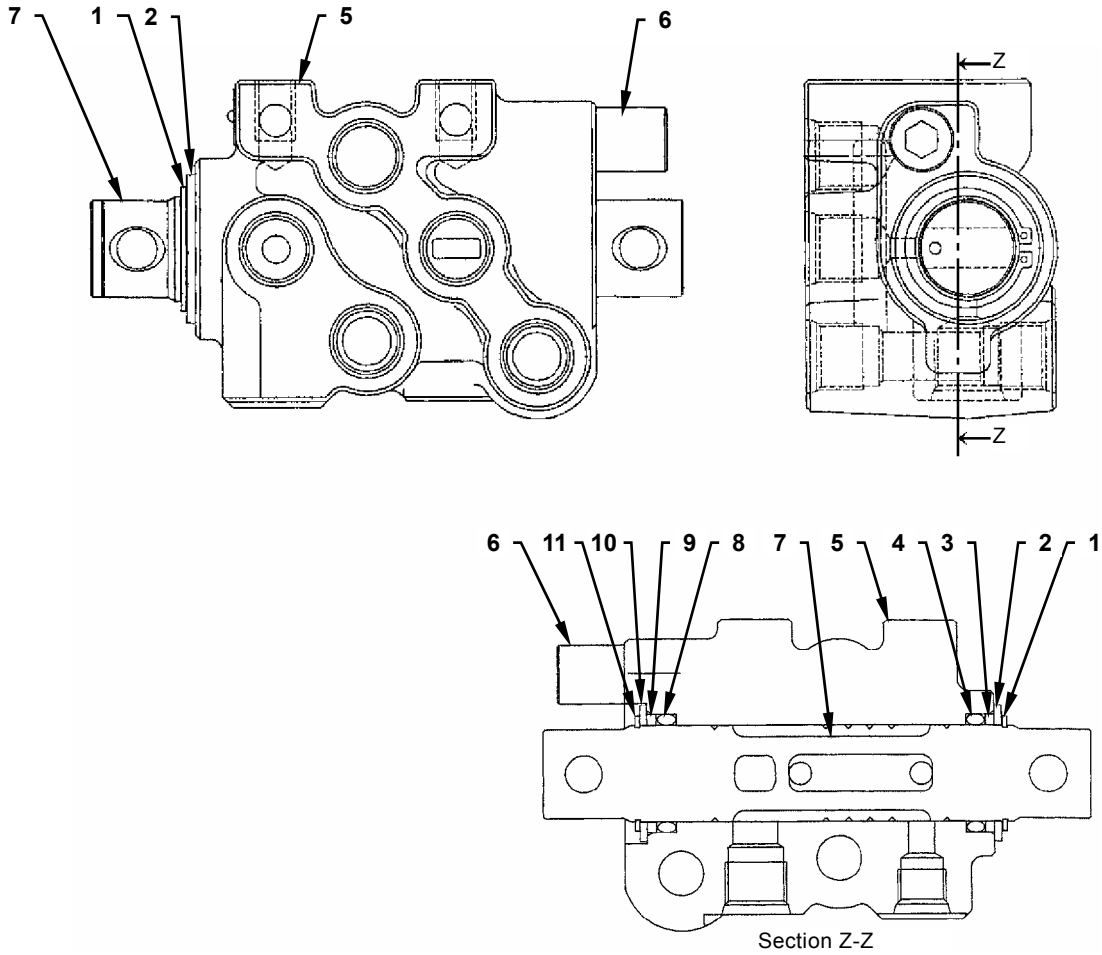
2. Remove washer (10), backup rings (3, 9) and O-rings (4, 8) from body (5).

3. Remove socket bolt (6) from body (5).

 : 6 mm

# BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve

## ASSEMBLY OF PILOT SHUT-OFF VALVE



W4GB-02-08-002



- |                    |                 |                 |                     |
|--------------------|-----------------|-----------------|---------------------|
| 1 - Retaining Ring | 4 - O-Ring      | 7 - Spool       | 10 - Washer         |
| 2 - Washer         | 5 - Body        | 8 - O-Ring      | 11 - Retaining Ring |
| 3 - Backup Ring    | 6 - Socket Bolt | 9 - Backup Ring |                     |



## BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve

---

### Assembly of Pilot Shut-Off Valve

1. Apply LOCTITE #262 onto socket bolt (6). Install socket bolt (6) to body (5).  
 : 6 mm  
 : 29.5 N·m (3.0 kgf·m, 21.5 lbf·ft)
2. Install O-ring (8), backup ring (9) and washer (10) to body (5).
3. Apply hydraulic oil onto spool (7). Rotate and install spool (7) to body (5) from the socket bolt (6) direction. At this time, check the direction to install spool (7).
4. Install O-ring (4), Backup ring (3) and washer (2) to body (5). Install retaining rings (1, 11) to spool (7).

## **BODY (UPPERSTRUCTURE) / Pilot Shut-Off Valve**

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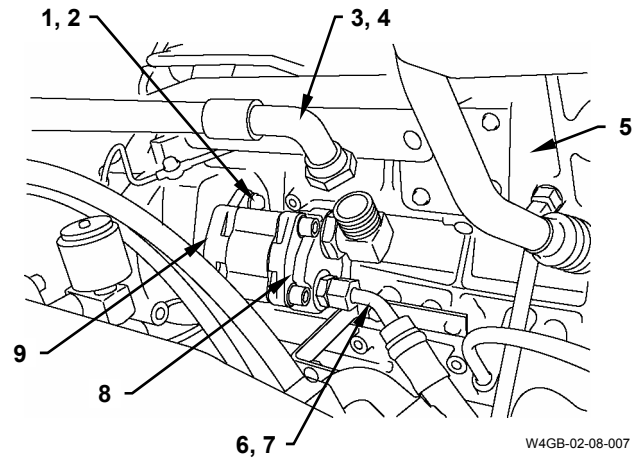
## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

### REMOVAL AND INSTALLATION OF HYDRAULIC FAN PUMP

#### Removal

**CAUTION:** Bleed air from the hydraulic oil tank before doing any work. (Refer to **BLEED AIR FROM HYDRAULIC OIL TANK** on W1-4-1.)


1. Disconnect hose (3) on the suction side from fan pump (8). Remove O-ring (4).  
 : 41 mm
2. Disconnect hose (6) on the delivery side from fan pump (8). Remove O-ring (7).  
 : 27 mm
3. Remove bolts (1) (2 used) and spring washers (2) (2 used) from fan pump (8). Remove fan pump (8) and gasket (9) from engine (5).  
 : 14 mm




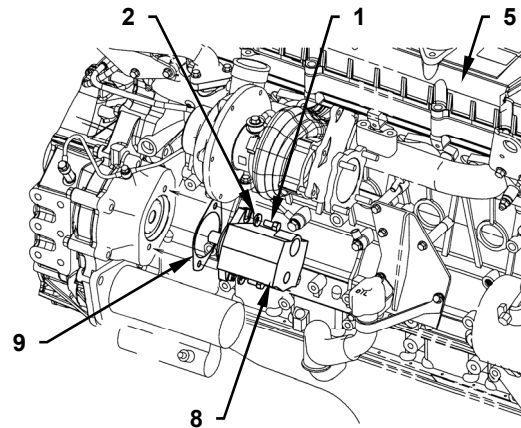
## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

### Installation

1. Install gasket (9) to engine (5). Install fan pump (8) to engine (5) with bolts (1) (2 used) and spring washers (2) (2 used).


 : 14 mm


 : 49 N·m (5 kgf·m, 36 lbf·ft)




W4GB-02-08-006


2. Install O-ring (4) and connect hose (3) to fan pump (8).

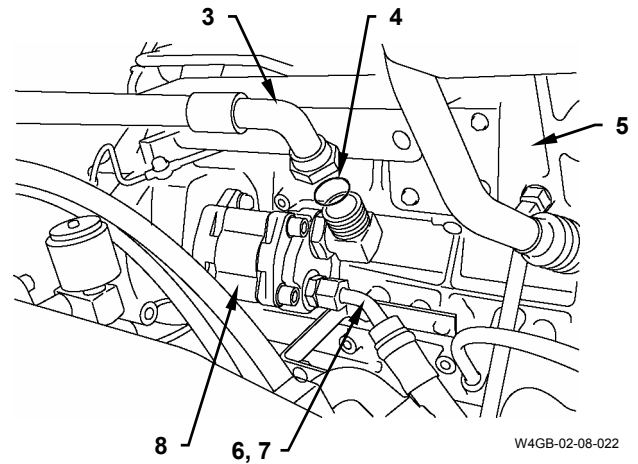
 : 41 mm

 : 205 N·m (21 kgf·m, 151 lbf·ft)

3. Install O-ring (7) and connect hose (6) to fan pump (8).

 : 27 mm

 : 93 N·m (9.5 kgf·m, 68.5 lbf·ft)



W4GB-02-08-022



## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

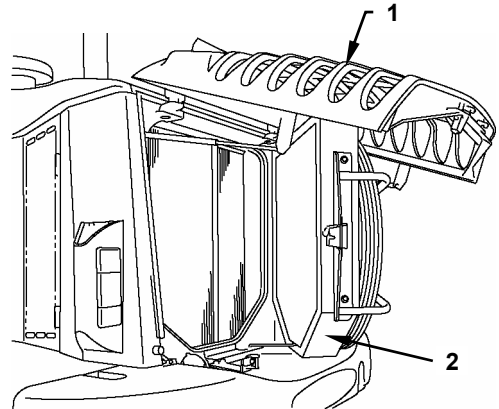
### REMOVAL AND INSTALLATION OF HYDRAULIC FAN MOTOR

#### Removal

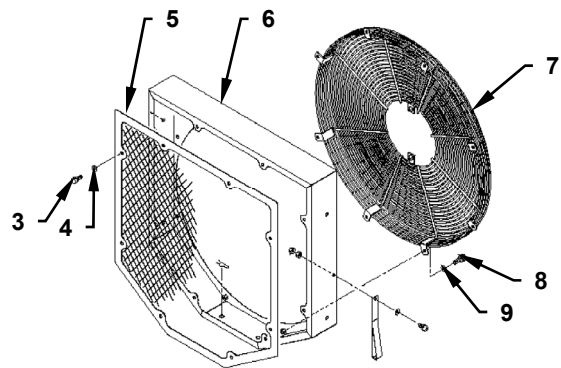


**CAUTION:** Bleed air from the hydraulic oil tank before doing any work. (Refer to **BLEED AIR FROM HYDRAULIC OIL TANK** on W1-4-1.)


1. Open rear grill (1). Remove cooling fan (2) outside.
2. Remove bolts (3) (8 used) and washers (4) (8 used) from guard (5). Remove guard (5) from cover (6).  
 : 14 mm
3. Remove bolts (8) (8 used) and spring washers (9) (8 used) from cover (7). Remove cover (7) from cover (6).  
 : 14 mm

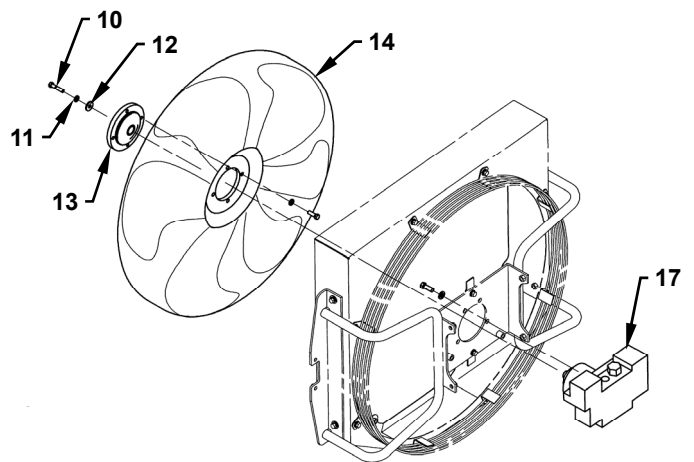


W4GB-02-08-300



W4GB-02-08-301


4. Remove bolt (10), spring washer (11) and washer (12) from retainer (13). Remove the fan (14) assembly from fan motor (17) by using a puller.  
 : 14 mm

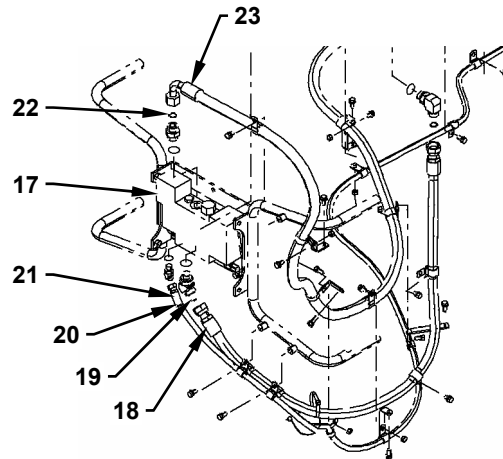


W4GB-02-08-003

## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

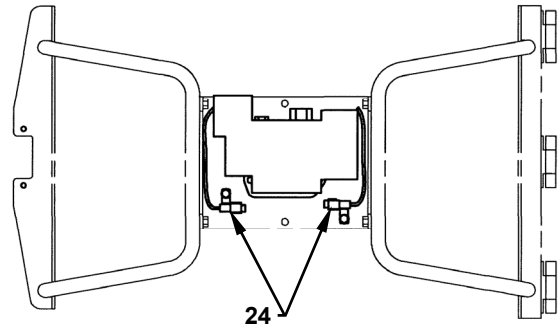
5. Disconnect hoses (18, 21 and 23) from fan motor (17). Cap the open ends. Remove O-rings (19, 20 and 22).

 : 27 mm, 36 mm




W4GB-02-08-004

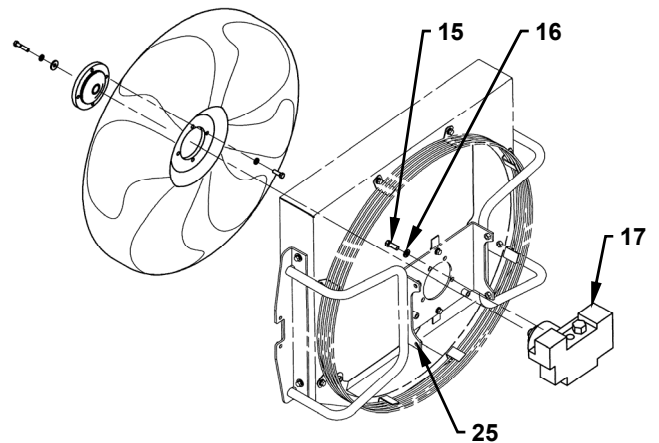
6. Disconnect connectors (24) (2 used).



W4GB-02-08-005

7. Remove bolts (15) (4 used) and washers (16) (4 used) from bracket (25). Remove fan motor (17) from bracket (25).

 : 17 mm





W4GB-02-08-003

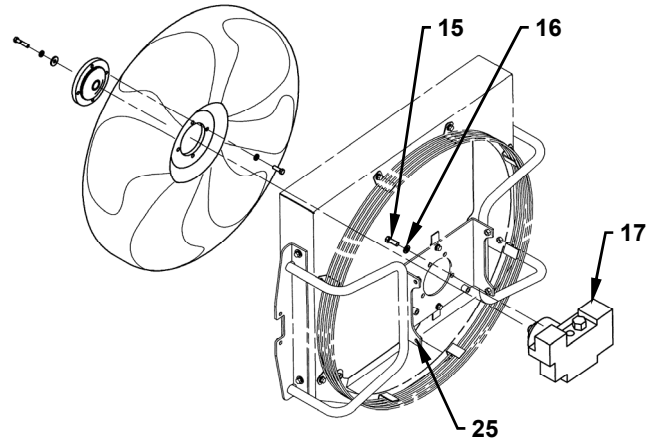
## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

### Installation

1. Install fan motor (17) to bracket (25) with washers (16) (4 used) and bolts (15) (4 used).

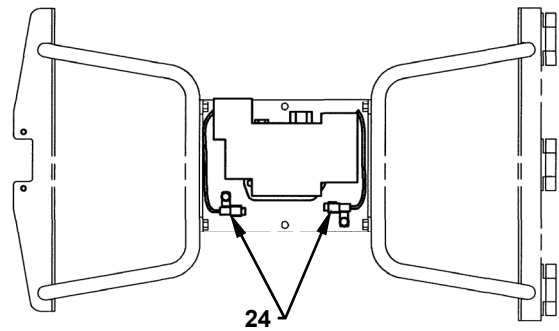
 : 17 mm

 : 49 N·m (5 kgf·m, 36 lbf·ft)





W4GB-02-08-003

2. Connect connectors (24) (2 used).




3. Install O-ring (20) and connect hose (21) to fan motor (17).


 : 27 mm

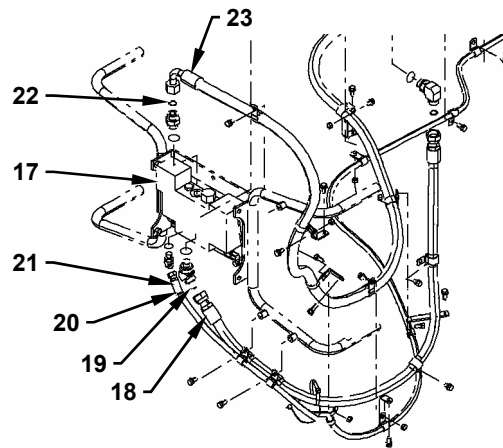
 : 93 N·m (9.5 kgf·m, 68.5 lbf·ft)

**IMPORTANT:** Add hydraulic oil (0.12 to 0.2 L (0.032 to 0.053 US gal.)) through port P of hydraulic pressure fan motor (17) before connecting hose (23).

4. Connect hoses (18, 23) through fan motor (17) and O-rings (19, 22).


 : 36 mm


 : 175 N·m (18 kgf·m, 129 lbf·ft)

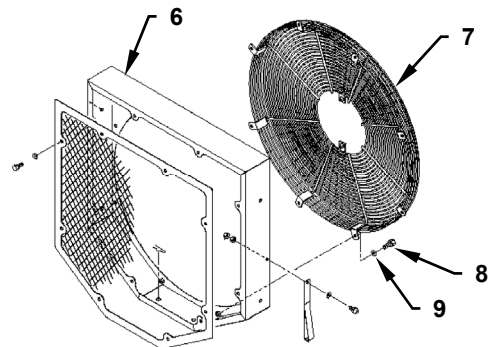


W4GB-02-08-005

5. Install cover (7) to cover (6) with bolts (8) (8 used) and spring washers (9) (8 used).

 : 14 mm

 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)



W4GB-02-08-004


W4GB-02-08-301


## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

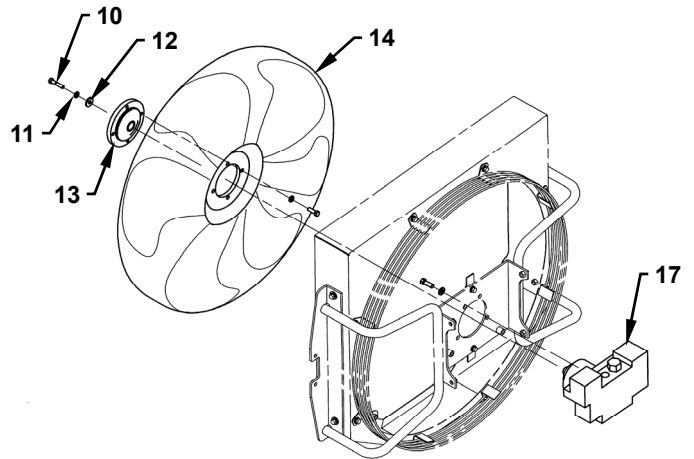


**CAUTION:** Degrease and clean fan motor (17) and the taper part of fan (14) in order to prevent contamination by debris.

6. Install the fan (14) assembly to fan motor (17) with bolt (10), spring washer (11) and washer (12).


 : 14 mm


 : 49 N·m (5 kgf·m, 36 lbf·ft)

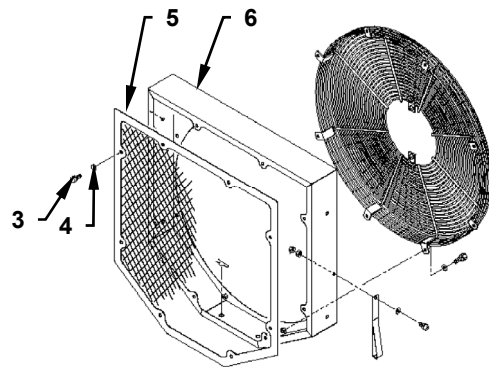


W4GB-02-08-003

7. Install guard (5) to cover (6) with bolts (3) (8 used) and washers (4) (8 used).

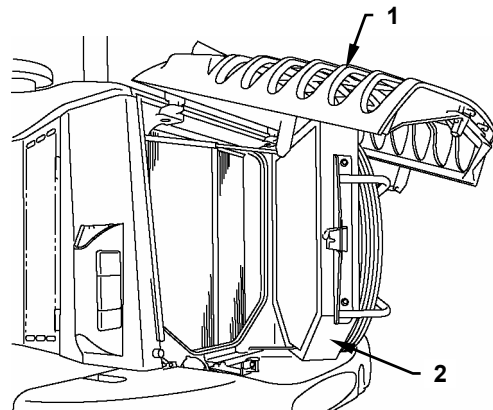
 : 14 mm

 : 49 N·m (5 kgf·m, 36 lbf·ft)



W4GB-02-08-301

8. Shut cooling fan (2) and rear grill (1).



W4GB-02-08-300



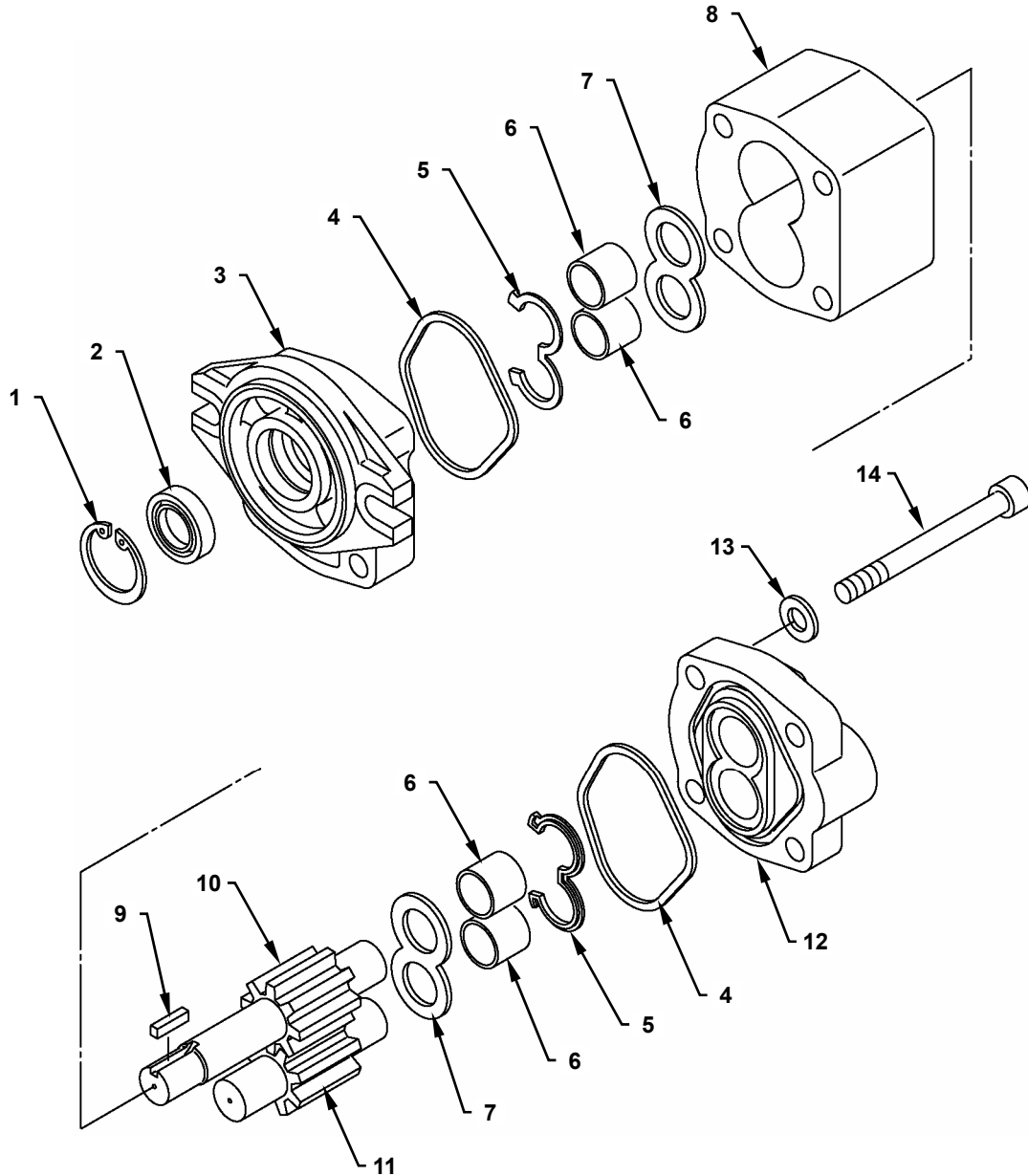
## **BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor**

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# BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

## DISASSEMBLY OF FAN PUMP



W4GB-02-08-011

- 1 - Retaining Ring
- 2 - Oil Seal
- 3 - Front Cover
- 4 - Gasket (2 Used)

- 5 - Gasket (2 Used)
- 6 - Bushing (4 Used)
- 7 - Side Plate (2 Used)
- 8 - Body

- 9 - Key
- 10 - Drive Gear
- 11 - Driven Gear
- 12 - Rear Cover

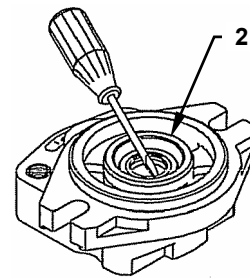
- 13 - Washer (4 Used)
- 14 - Bolt (4 Used)

## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

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### Disassembly of Fan Pump

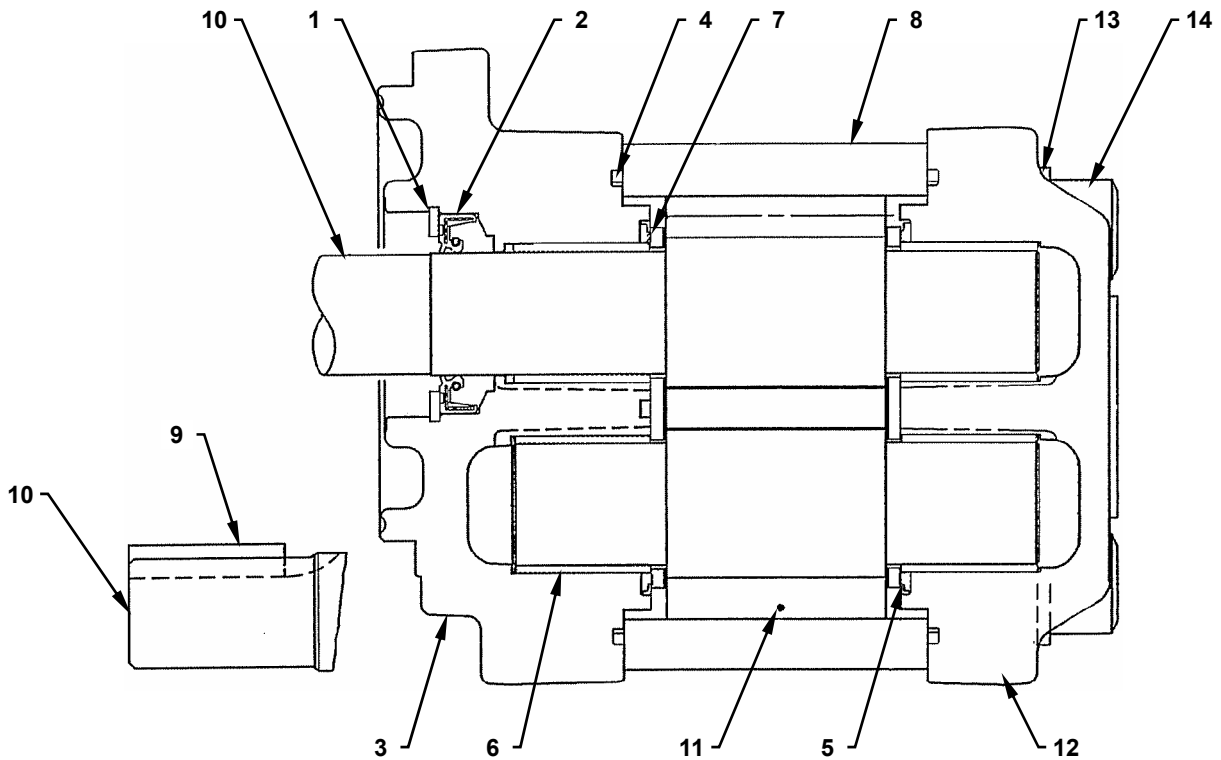
1. Secure the mounting part of front cover (3) in a vise with the rear cover (12) side facing upward.
2. Put the matching marks at the jointed surface between front cover (3) and body (8), and body (8) and rear cover (12) before disassembling.
3. Remove bolts (14) (4 used) and washers (13) (4 used) from rear cover (12). Disassemble rear cover (12) and body (8) in this order.  
┌ : 10 mm
4. Although gaskets (4, 5) and side plate (7) are the same type, the directions to install are different. Therefore, identify the respective position and direction of the parts for assembling.
5. Put the mark on driven gear (11) to identify the direction for assembling as driven gear (11) is symmetrical.
6. Remove retaining ring (1) from oil seal (2). Fasten the screwdriver tip onto the inner side of oil seal (2) and remove oil seal (2). Do not damage the oil seal (2) holes on front cover (3).



W4GB-02-08-012

# BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

## ASSEMBLY OF FAN PUMP



W4GB-02-08-013

- 1 - Retaining Ring
- 2 - Oil Seal
- 3 - Front Cover
- 4 - Gasket (2 Used)

- 5 - Gasket (2 Used)
- 6 - Bushing (4 Used)
- 7 - Side Plate (2 Used)
- 8 - Body

- 9 - Key
- 10 - Drive Gear
- 11 - Driven Gear
- 12 - Rear Cover

- 13 - Washer (4 Used)
- 14 - Bolt (4 Used)

# BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

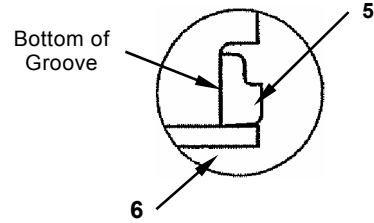
## Assembly of Fan Pump

1. Secure front cover (3) in a vise with the mounting surface of body (8) facing upward.
2. Secure and install gaskets (4, 5) (2 used for each) to the groove by using grease in order to prevent twisting and binding. Install gasket (5) so that the flat surface is located in the bottom of the groove.
3. Install side plate (7) so that the yellow surface faces the gear side and the long pulling-out hole faces the suction side.

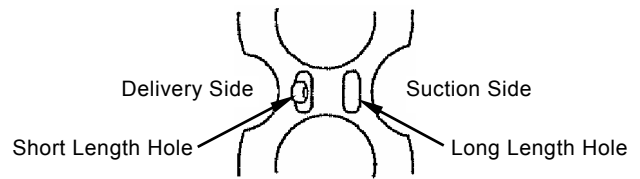


**CAUTION: As drive gear (10) and driven gear (11) have asymmetrical tooth shape, mesh the gears with the small notch and assemble them.**

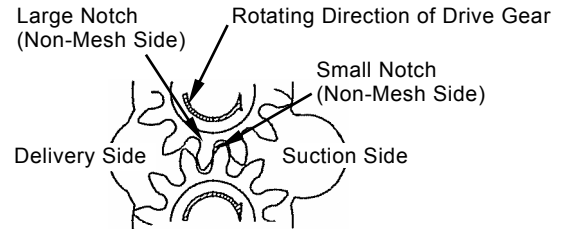
4. Align the matching marks and install body (8) to front cover (3). Install drive gear (10) and driven gear (11).
5. Install side plate (7) and gaskets (4, 5) to the assembled drive gear (10) and driven gear (11).
6. Align the matching marks and install rear cover (12) to body (8). Install rear cover (12) to body (8) with washers (13) (4 used) and bolts (14) (4 used).  
🔧 : 10 mm  
🔩 : 88.2 to 93.1 N·m  
(9.0 to 9.5 kgf·m, 65 to 69 lbf·ft)
7. Turn over the assembled pump with the oil seal (2) side facing upward. Secure front cover (3) in a vise.
8. Apply grease onto the gap between the main lip and the dust lip of oil seal (2).



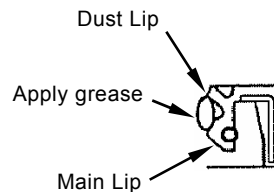
W4GB-02-08-014



W4GB-02-08-015



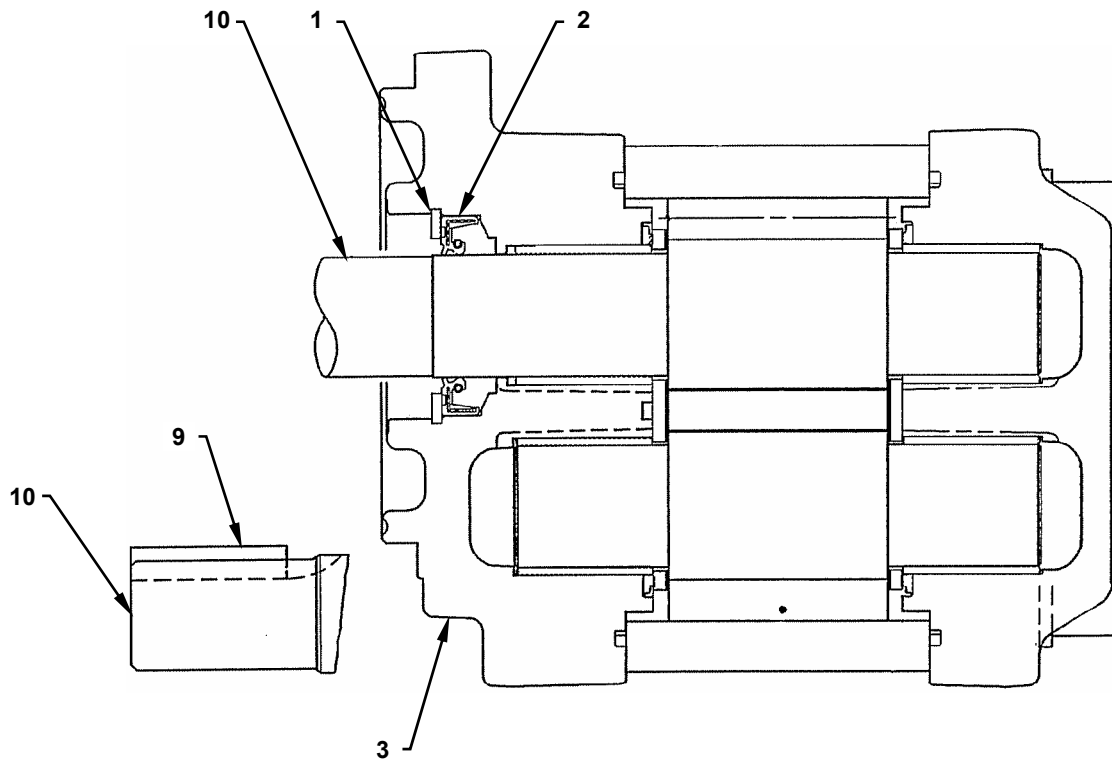
W4GB-02-08-016



W4GB-02-08-017

## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

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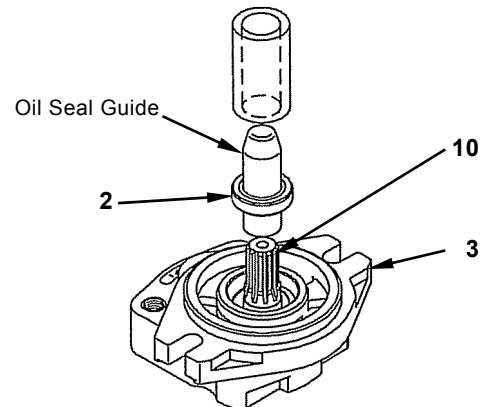


W4GB-02-08-013

## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

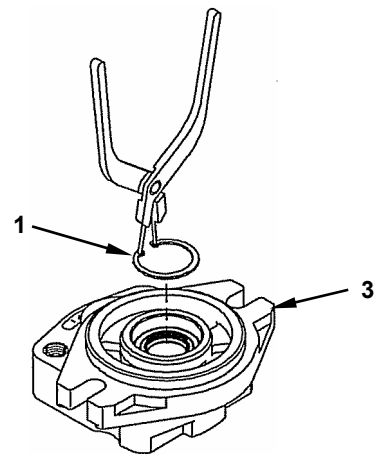
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9. Tap and install oil seal (2) onto front cover (3) until oil seal (2) comes in contact with the bottom of the hole.



W4GB-02-08-018

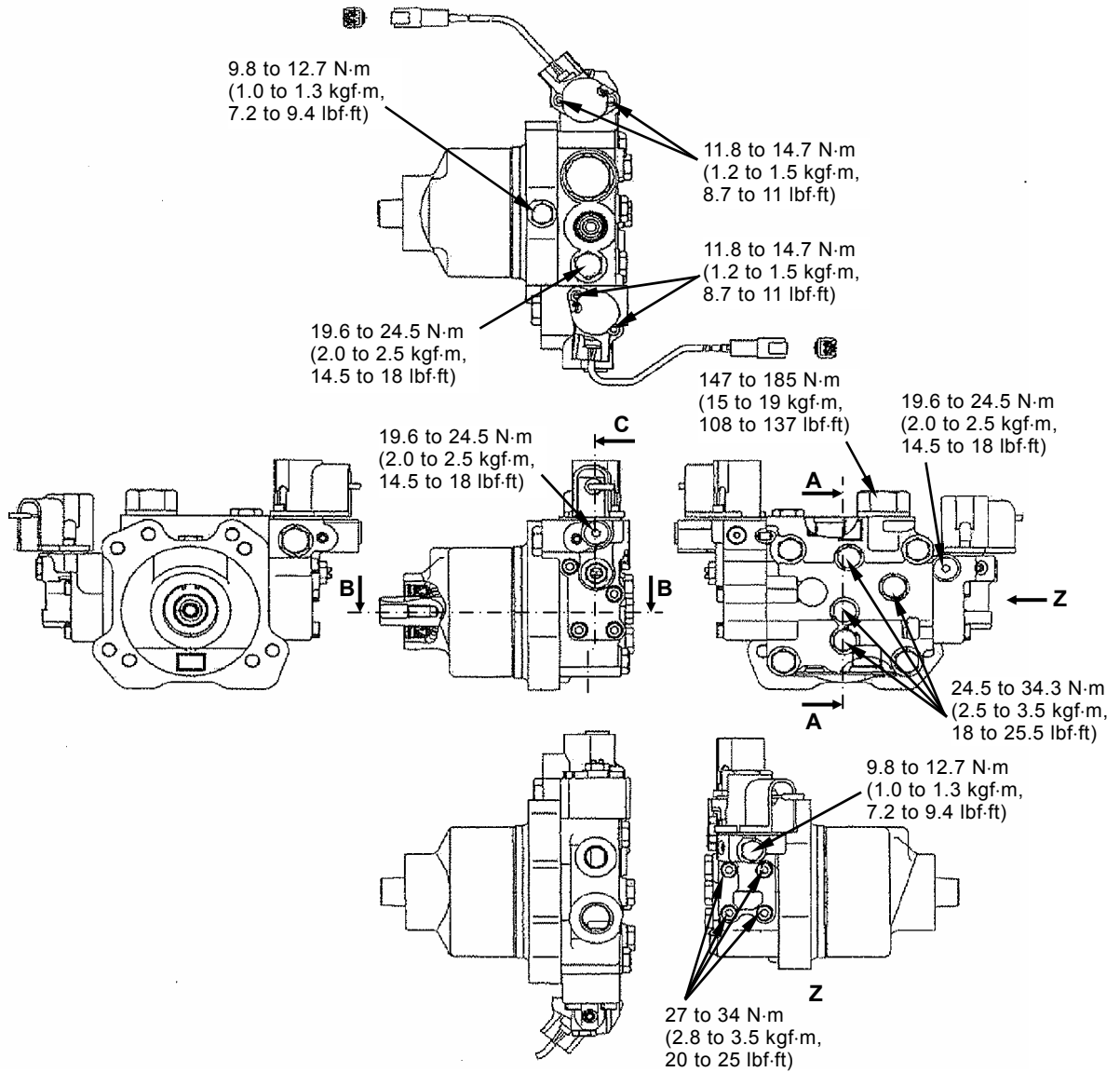
10. Install retaining ring (1) to front cover (3).



W4GB-02-08-019

# BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor

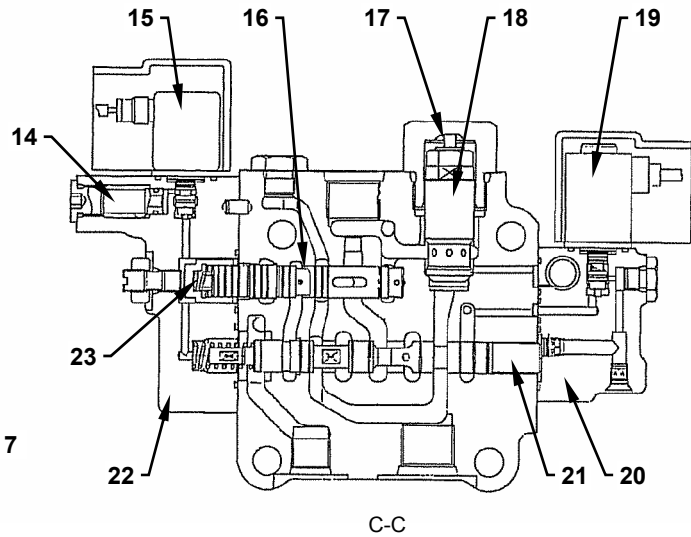
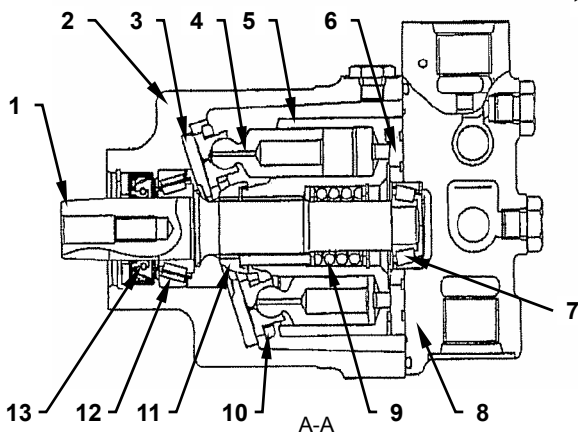
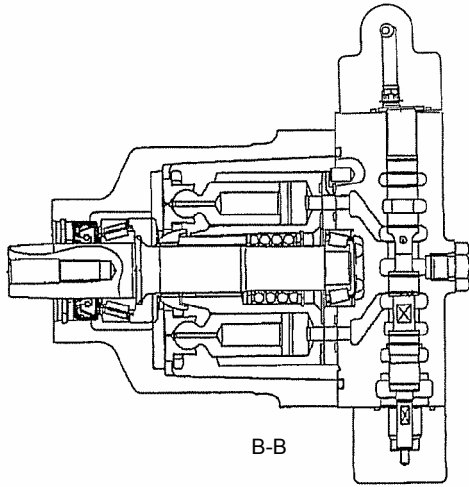
## FAN MOTOR STANDARD



W4GB-02-08-020



## BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor



W4GB-02-08-021

- |                    |                     |  |   |
|--------------------|---------------------|--|---|
| 1 - Shaft          | 7 - Sub Bearing     | 13 - Oil Seal                            | 19 - Reverse Rotation Control Solenoid Valve        |
| 2 - Case           | 8 - End Cover       | 14 - Filter                              | 20 - Forward Reverse Rotation Selection Pilot Valve |
| 3 - Thrust Plate   | 9 - Center Spring   | 15 - Flow Rate Adjustment Solenoid Valve | 21 - Reverse Rotation Spool                         |
| 4 - Piston         | 10 - Retainer Shoe  | 16 - Flow Rate Control Valve             | 22 - Variable Flow Rate Control Pilot Valve         |
| 5 - Cylinder Block | 11 - Retainer Guide | 17 - Spring for Make-Up Safety Valve     | 23 - Spring for Flow Rate Control Valve             |
| 6 - Valve Plate    | 12 - Main Bearing   | 18 - Make-Up Safety Valve                |   |

No.	Item	Evaluation Standard				Remedy	
		Standard		Allowable Limit			
14	Spring for Make-Up Valve	Free length × Outer dia.	Mounting length	Mounting weight	Free length	Replace spring when it is damaged or deformed	
		29.3 × 6.5 mm (1.15 × 0.26 in)	18.2 mm (0.72 in)	3.33 N (0.34 kgf, 0.75 lbf)	-		2.65 N (0.27 kgf, 0.60 lbf)

## **BODY (UPPERSTRUCTURE) / Hydraulic Fan Pump and Motor**

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# SECTION 3 BODY (TRAVEL SYSTEM)



## — CONTENTNS —

### Group 1 Tire

Removal and Installation of Tire..... W3-1-1

### Group 2 Drive Unit

Removal and Installation of Drive Unit..... W3-2-1

Removal of Torque Converter and

Converter Housing ..... W3-2-14

Installation of Torque Converter and

Converter Housing ..... W3-2-16

Removal of Flange (Front, Rear) and

Parking Brake..... W3-2-18

Installation of Flange (Front, Rear) and

Parking Brake..... W3-2-20

Disassembly of Parking Brake ..... W3-2-22

Assembly of Parking Brake..... W3-2-24

Removal of Oil Filter ..... W3-2-26

Installation of Oil Filter ..... W3-2-27

Disassembly of Duct Plate ..... W3-2-28

Assembly of Duct Plate..... W3-2-30

Disassembly of Control Valve ..... W3-2-32

Assembly of Control Valve ..... W3-2-34

Removal of Oil Feeder and Pump ..... W3-2-39

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Assembly of Pump ..... W3-2-41

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Installation of PTO Shaft ..... W3-2-45

Removal of Clutch and Input/Output

Shaft ..... W3-2-46

Installation of Clutch and Input/Output

Shaft ..... W3-2-51

Disassembly of Clutches K1, K2, and K3 . W3-2-58

Assembly of Clutches K1, K2 and K3 ..... W3-2-62

Disassembly of Clutches KR and KV..... W3-2-69

Assembly of Clutches KR and KV ..... W3-2-72

Disassembly of Clutch K4 ..... W3-2-78

Assembly of K4 Clutch ..... W3-2-80

### Group 3 Axle

Removal and Installation of Axle ..... W3-3-1

Disassembly of Axle ..... W3-3-13

Assembly of Axle ..... W3-3-33

### Group 4 Propeller Shaft

Removal and Installation of

Propeller Shaft ..... W3-4-1

### Group 5 Brake Valve

Removal and Installation of Brake Valve..... W3-5-1

Disassembly of Brake Valve ..... W3-5-4

Assembly of Brake Valve ..... W3-5-10

Maintenance Standard ..... W3-5-20

### Group 6 Charging Block

Removal and Installation of

Charging Block ..... W3-6-1

Disassembly of Charging Block..... W3-6-4

Assembly of Charging Block ..... W3-6-9

### Group 7 Steering Pilot Valve

Removal and Installation of

Steering Pilot Valve ..... W3-7-1

Disassembly of Steering Pilot Valve ..... W3-7-4

Assembly of Steering Pilot Valve ..... W3-7-8

### Group 8 Steering Valve

Removal and Installation of

Steering Valve ..... W3-8-1

Disassembly of Steering Valve ..... W3-8-2

Assembly of Steering Valve ..... W3-8-4

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## **Group 9 Steering Cylinder**

Removal and Installation of

Steering Cylinder..... W3-9-1

Disassembly of Steering Cylinder ..... W3-9-6

Assembly of Steering Cylinder ..... W3-9-14

## **Group 10 Parking Brake Solenoid**

Removal and Installation of

Parking Brake Solenoid Valve..... W3-10-1

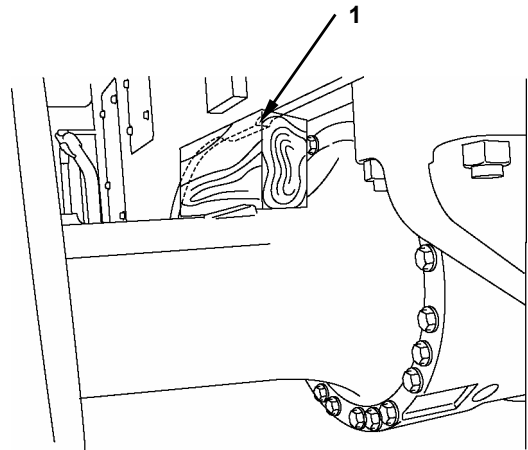
Construction of Solenoid Valve ..... W3-10-3

## BODY (TRAVEL SYSTEM) / Tire

### REMOVAL AND INSTALLATION OF TIRE


#### Removal

1. Secure the front and rear frames with the safety link and the pin.
2. When removing the rear tires, insert wooden block (1) between the rear frame and the rear axle on both left and right sides in order to prevent the cradle from moving.



W4GB-03-01-001

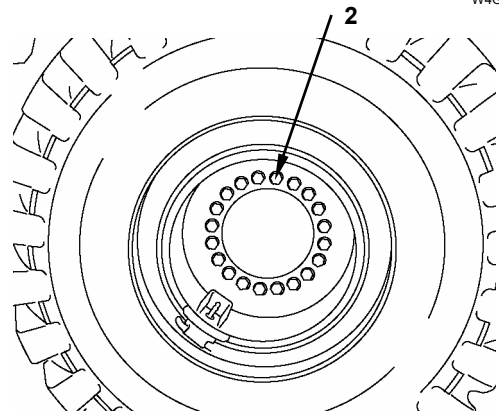
3. Loosen wheel bolts (2) (ZW220: 18 used, ZW250: 20 used) about 1 turn.

 : 36 mm



**CAUTION: Machine weight:**  
ZW220: 17000 kg (37500 lb)  
ZW250: 20000 kg (44500 lb)

4. Raise the machine until the tire to be removed is away a little from the road surface. Support the machine by using the blocks.



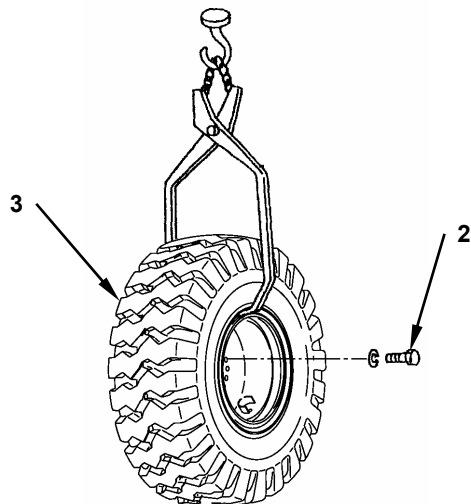
W4GB-03-01-002



**CAUTION: Tire and rim weight: 500 kg (1150 lb)**

5. Install the lifting tool to tire (3). Hoist tire (3) a little.
6. Remove wheel bolts (2) and the washers (ZW220: 18 used, ZW250: 20 used for each). Remove tire (3) from the axle.

**IMPORTANT: Ask the experts for disassembling the tire and the rim.**



W4GB-03-01-003

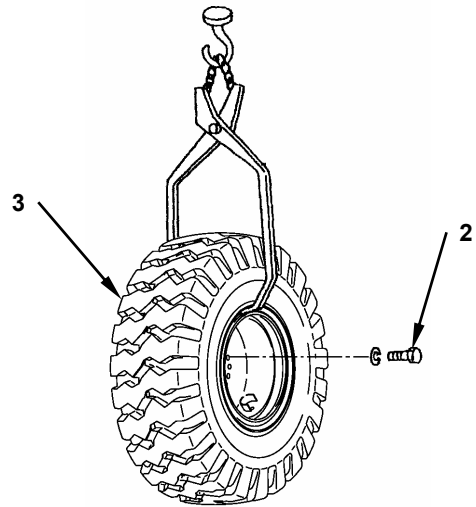
## BODY (TRAVEL SYSTEM) / Tire

### Installation



**CAUTION:** Tire and rim weight: 500 kg (1150 lb)

1. Hoist and install tire (3) to the axle. Face the air valve side of tire (3) outward.
2. Install wheel bolts (2) and the washers (ZW220: 18 used, ZW250: 20 used for each) to the tire (3). Tighten tire (3) lightly.



W4GB-03-01-003

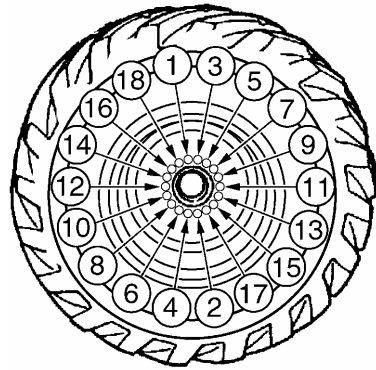
3. Lower the machine. Tighten the wheel bolts to the specified torque in the order as illustrated to the right.



: 36 mm

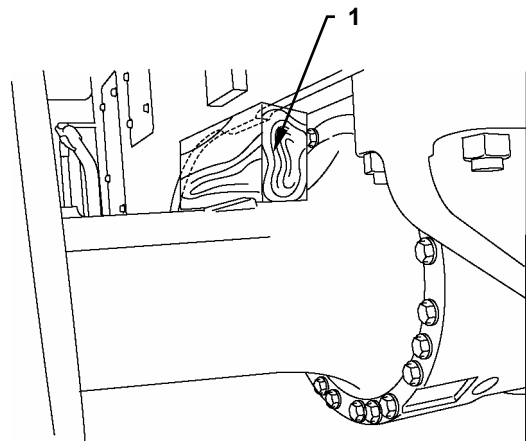


: 890 N·m (91 kgf·m, 660 lbf·ft)



M4GB-07-102

4. Remove wooden block (1) between the rear frame and the rear axle on both left and right sides.



W4GB-03-01-001



## BODY (TRAVEL SYSTEM) / Drive Unit

### REMOVAL AND INSTALLATION OF DRIVE UNIT

#### Removal

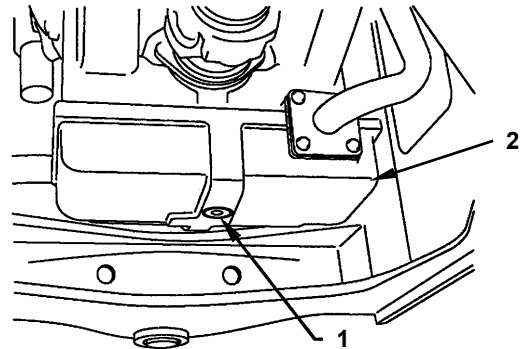
**CAUTION:** Drive unit (4) weight: 1900 kg (4200 lb)

**IMPORTANT:** If drive unit (4) is removed, movement of vehicle becomes difficult.  
Move the machine to a place without obstacles.

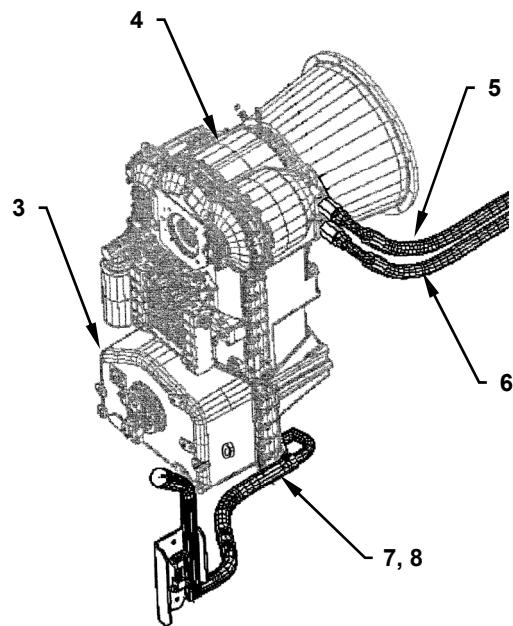
1. Remove cab. (Refer to W2-1.)
2. Remove hood. (Refer to W2-3.)
3. Remove hydraulic oil tank. (Refer to W2-3.)
4. Remove hoses connected to the main pump. (Refer to W2-4.)
5. Remove propeller shaft. (Refer to W3-4.)

**IMPORTANT:** Provide a 50L (13.2 US gal.) container in order to collect oil, and process waste oil appropriately.

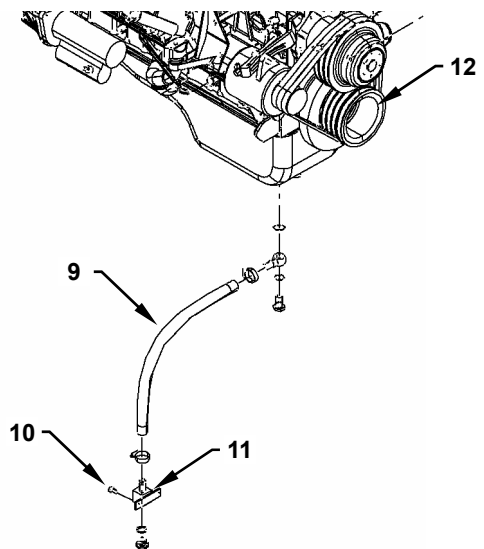
6. Remove drain plug (1) from cover (2) of the drive unit bottom. Drain transmission oil.
7. Disconnect hoses (5, 6) from drive unit (4). Cap the open ends.  
🔧 : 41 mm
8. Loosen hose clamp (8) and remove hose (7) from drive unit (3).
9. Remove bolts (10) (2 used) from block (11). Remove drain hose (9) from the frame.  
🔧 : 14 mm



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W4GB-03-02-180




W4GC-03-02-182


## BODY (TRAVEL SYSTEM) / Drive Unit

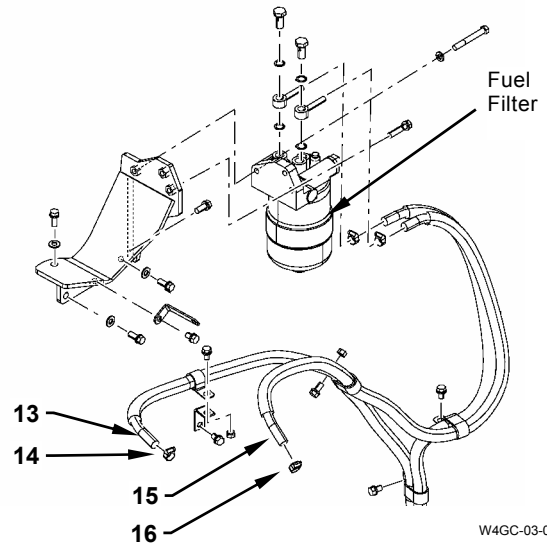
10. Loosen clips (14, 16). Remove hoses (13, 15) from engine (12).

11. Remove engine wire harness and body wire harness from the connector part.

12. Remove harnesses (3 used) from starter.

 : 17 mm

 : 8 mm




13. Loosen drain plug (23). Drain coolant from radiator (24).

14. Loosen hose clamps (17, 19, 20, 22). Remove hoses (18, 21) from engine (12).


15. Loosen hose clamps (29, 31).

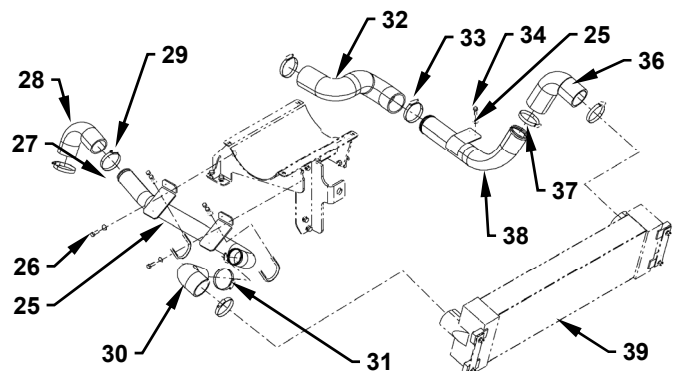
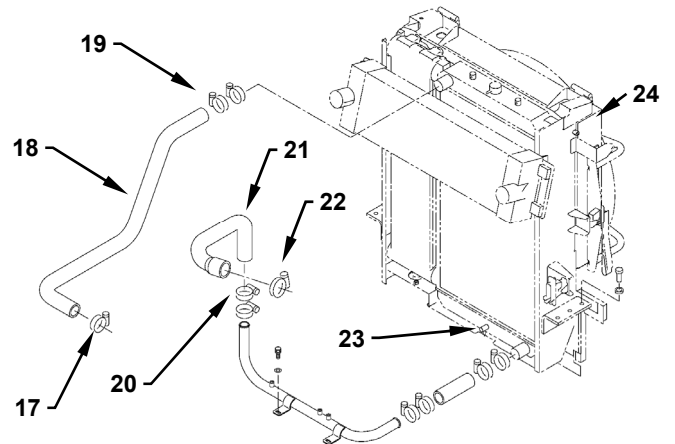
16. Remove bolts (26) (4 used) and washers (27) (4 used) from pipe (25). Remove pipe (25) from engine (12) and intercooler (39).

 : 14 mm

17. Loosen hose clamps (33, 37).

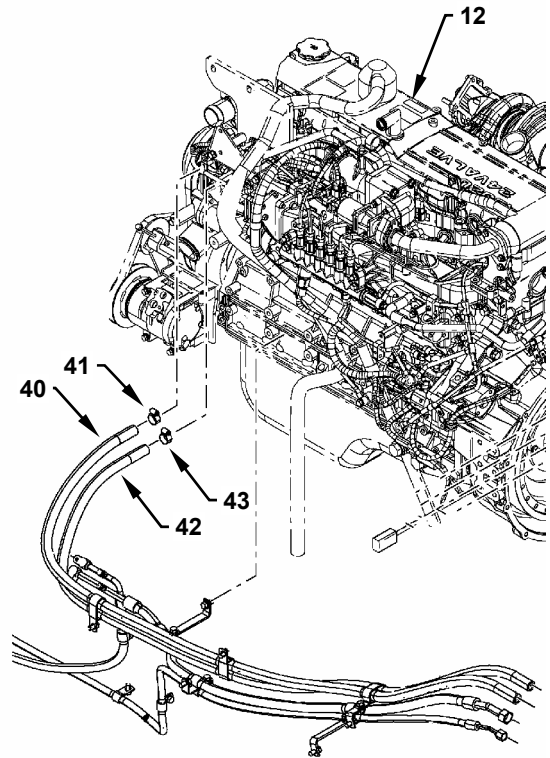
18. Remove bolts (34) (2 used) and washers (35) (2 used) from pipe (26). Remove pipe (38) from engine (12) and intercooler (39).

 : 14 mm




## BODY (TRAVEL SYSTEM) / Drive Unit

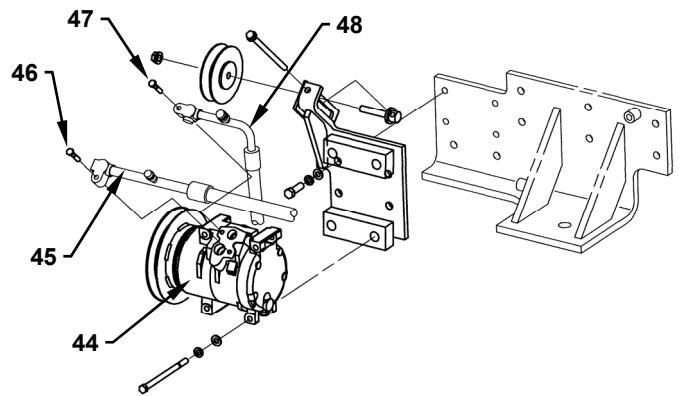
19. Loosen hose clamps (41, 43). Disconnect hoses (40, 42) from engine (12).



W4GC-03-02-186

20. Remove bolts (46, 47). Remove hoses (45, 48) from cooling pump (44).

 : 10 mm



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## BODY (TRAVEL SYSTEM) / Drive Unit




**CAUTION:** Engine (12) weight: 890 kg (2000 lb)


Drive unit (4) weight: 1900 kg (4200 lb)

21. Attach a nylon sling to hoist and hold engine (12) and drive unit (4).


22. Remove bolts (55) (4 used) to washers (58) (8 used), and nuts (59) (4 used) from brackets (54, 63) (2 used for each).

 : 17 mm


23. Remove bolts (62) (4 used), spring washers (61) (4 used), and washers (60) (4 used) from brackets (63) (2 used).

 : 17 mm

24. Remove nuts (49) (4 used), washers (50) (4 used), and plates (51) (4 used) from mounting bolts (57) (4 used).

 : 27 mm

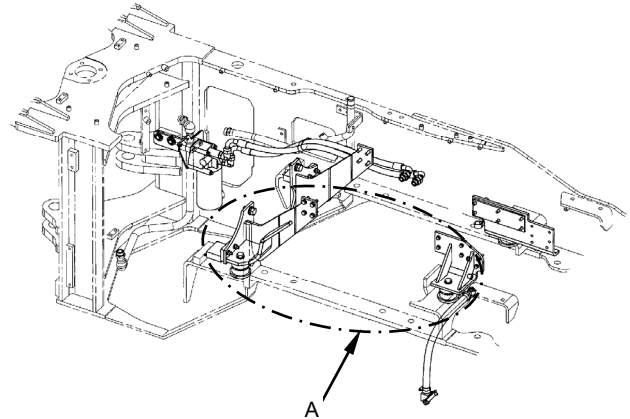
25. Remove mounting bolts (57) (4 used) and washers (56) (4 used) from brackets (63, 64) (2 used for each).

 : 27 mm

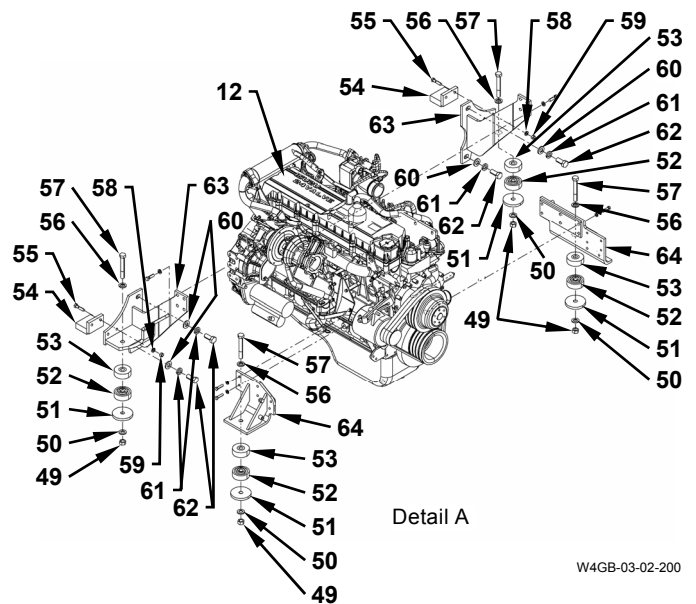
**IMPORTANT:** When hoisting drive unit (4), check if everything is removed. Remove any obstacle.

26. Remove drive unit (4) and engine (12) slowly.

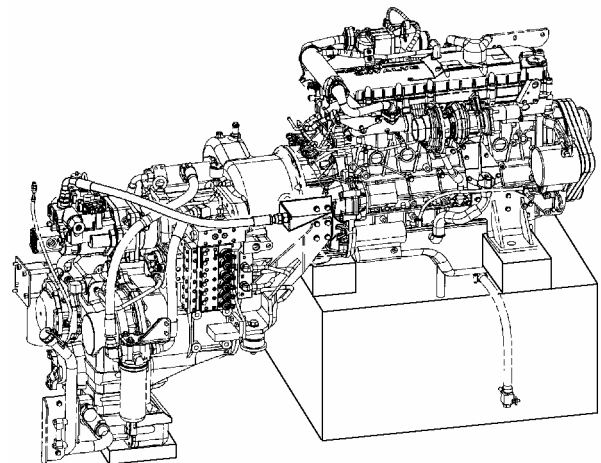
27. Place drive unit (4) on a stable stand.



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W4GB-03-02-200



W4GC-03-02-189


## BODY (TRAVEL SYSTEM) / Drive Unit

28. Remove bolts (67) (4 used) and washers (68) (4 used) from cover (66) of the torque converter housing part. Remove cover (66) from the torque converter housing.


 : 14 mm

**IMPORTANT: Remove the old gasket of the mounting surface.**

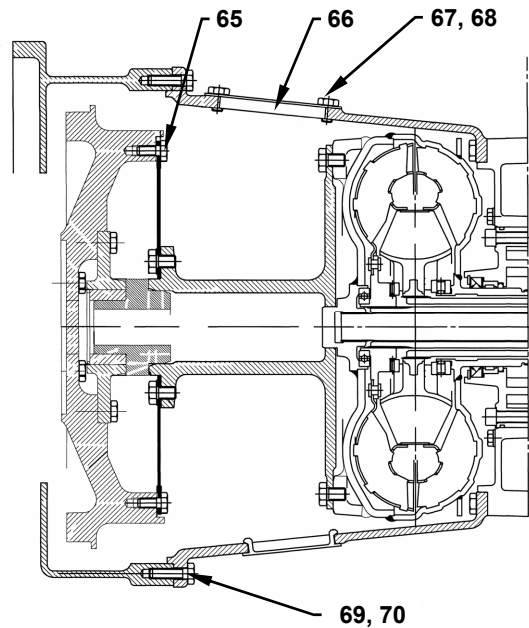
29. Remove flywheel assembly socket bolts (65) (8 used) from torque converter and engine.

 : 14 mm

30. Hoist and hold the drive unit. Remove assembly bolts (69) (12 used) and washers (70) (12 used) from the torque converter housing and the engine flywheel housing.

 : 14 mm

31. Remove drive unit (14) from engine (12).



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## **BODY (TRAVEL SYSTEM) / Drive Unit**

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## BODY (TRAVEL SYSTEM) / Drive Unit

### Installation





**CAUTION: Engine (12) weight: 1050 kg (2350 lb)**

**Drive unit (4) weight: 1900 kg (4200 lb)**

1. Install the gasket on the engine connecting part of the torque converter housing.
2. Hoist drive unit (4) and place it near the engine (12) mounting part.
3. Align and connect the center of torque converter and the hole at the center of flywheel of the engine.


4. Install the flywheel housing of engine (12) and the torque converter housing of drive unit (4) with bolts (69) (12 used) and washers (70) (12 used).


 : 14 mm

 : 41 N·m (4 kgf·m, 30 lbf·ft)


**IMPORTANT: Apply LOCTITE #262 only to the thread part of the bolt indicated in the right figure.**


5. Install the input plate of the torque converter to the flywheel of the engine with socket bolts (65) (8 used).

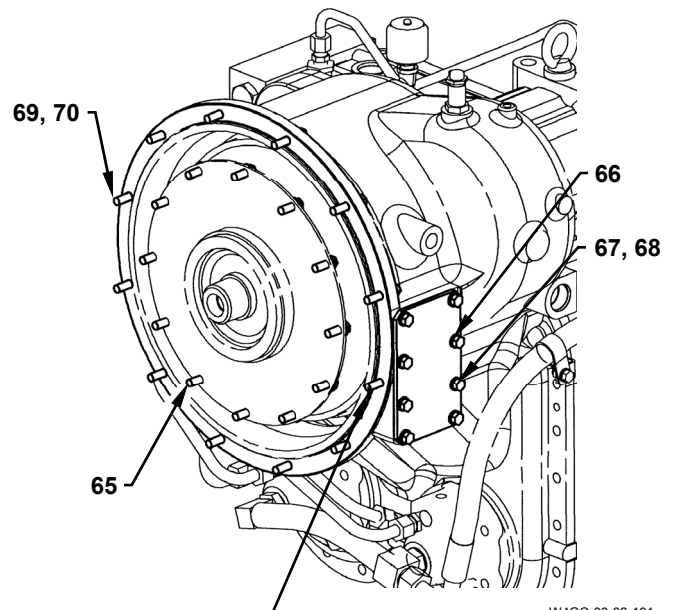
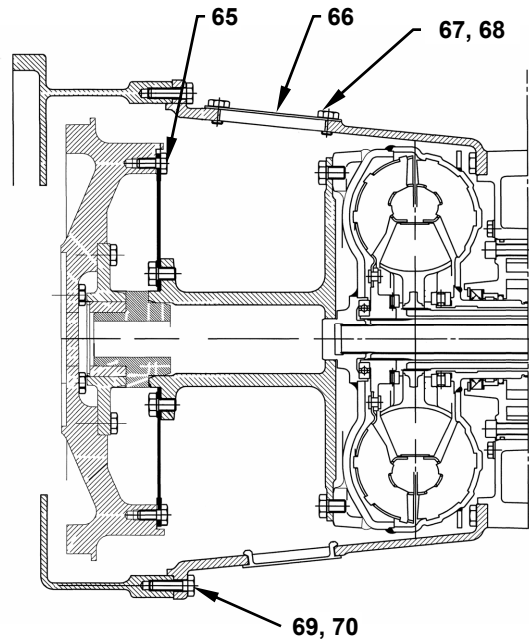
 : 14 mm

 : 30.6 to 45.9 N·m  
(3.1 to 4.7 kgf·m, 22.5 to 34 lbf·ft)

6. Install cover (66) to the torque converter housing with bolts (67) (4 used) and washer (68).

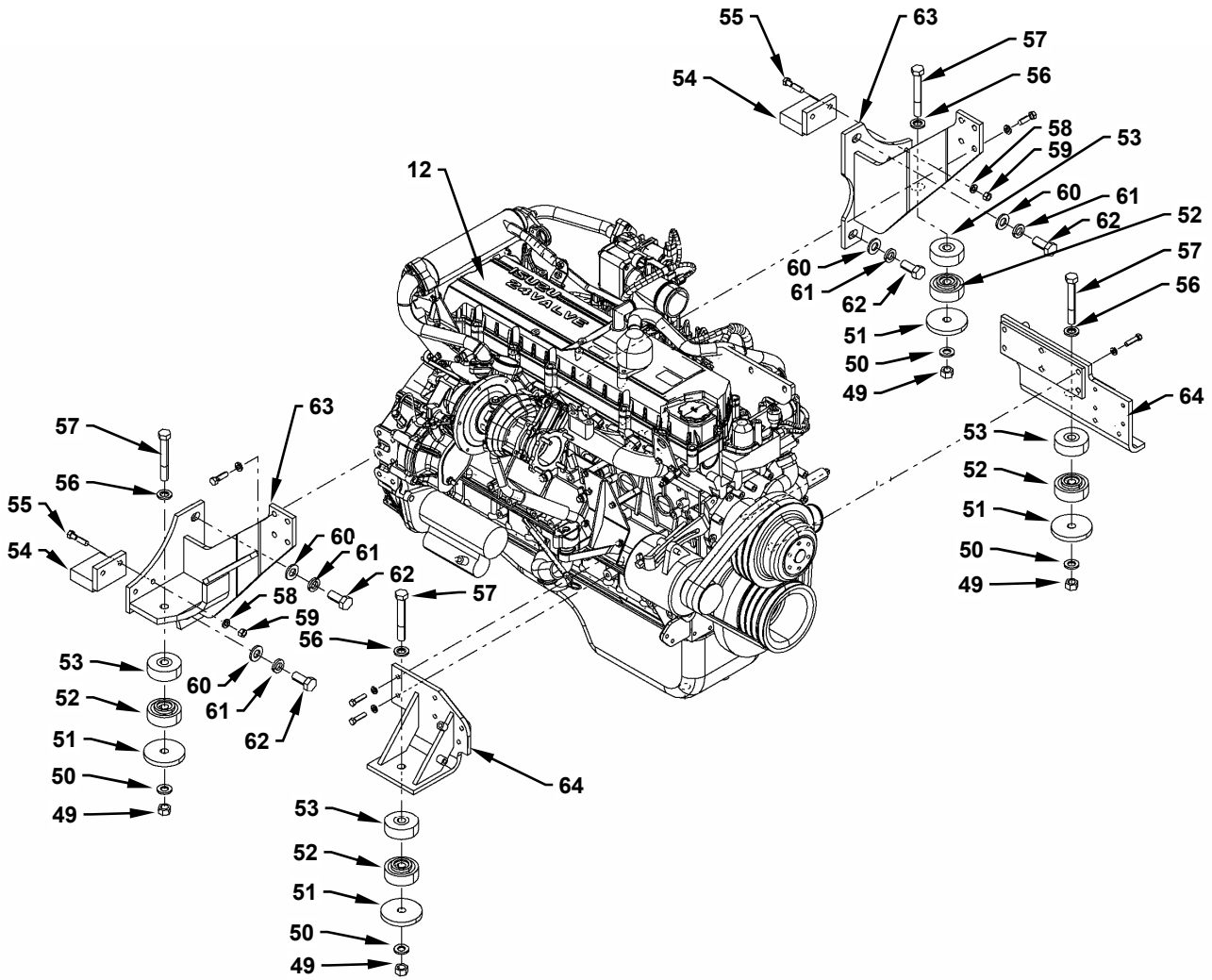
 : 14 mm

 : 41 N·m (4.2 kgf·m, 30 lbf·ft)



Apply LOCTITE #262 onto this bolt only.

# BODY (TRAVEL SYSTEM) / Drive Unit











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## BODY (TRAVEL SYSTEM) / Drive Unit

---

7. Hoist and place drive unit (4) near the drive unit (4) mounting parts of the frame.
8. Align and place the center of holes on rubber (52, 53) and plate (51) for the engine (12) side mounting part.
9. Align and place the center of holes on rubber (52, 53) and plate (51) for the drive unit (4) side mounting part.
10. Insert mounting bolts (57) and washers (56) (4 used each) to each bracket (63, 64) (2 used each). Align the center of the mounting holes at the mounting part and lower the drive unit.
11. Install brackets (63) (2 used) to the frame with bolts (62) (4 used), spring washers (61) (4 used), and washers (60) (4 used).  
 : 17 mm  
 : 81 N·m (8 kgf·m, 59.5 lbf·ft)
12. Install brackets (63) (2 used) to brackets (51) (2 used) with bolts (55) (4 used), washers (58) (4 used), and nuts (59) (4 used).  
 : 17 mm  
 : 81 N·m (8 kgf·m, 59.5 lbf·ft)
13. Install washers (50) (2 used) and nuts (49) (2 used) to mounting bolts (57) (2 used) on the engine (12) side.  
 : 27 mm  
 : 315 N·m (32 kgf·m, 230 lbf·ft)
14. Install rubber (52) (2 used), plates (51) (2 used), washers (50) (2 used), and nuts (49) (2 used) to mounting bolts (57) (2 used) on the drive unit side.  
 : 27 mm  
 : 315 N·m (32 kgf·m, 230 lbf·ft)

## BODY (TRAVEL SYSTEM) / Drive Unit


15. Install hoses (13, 15) to engine (12). Install hoses (13, 15) with hose clamps (14, 16).


16. Tighten drain plug (23).

17. Install hose (18) to engine (12) and radiator (24). Install hose (18) with hose clamps (17, 19).

18. Install hose (21) to engine (12) and radiator (24) piping. Install hose (21) with hose clamps (20, 22).

19. Install pipe (38) to the frame with bolt (34) and washer (35).


 : 14 mm


 : 30 N·m (3 kgf·m, 21.5 lbf·ft)

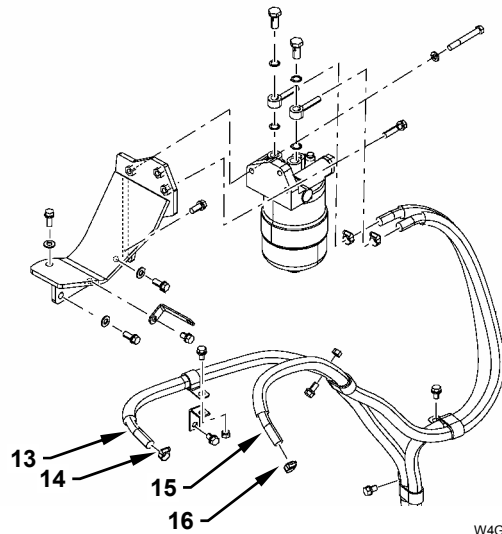
20. Install to hoses (32, 36) to pipe (38). Install hose clamps (33, 37) to hoses (32, 36).

21. Install pipe (25) to hoses (28, 30). Install hose clamps (29, 31) to pipe (25).

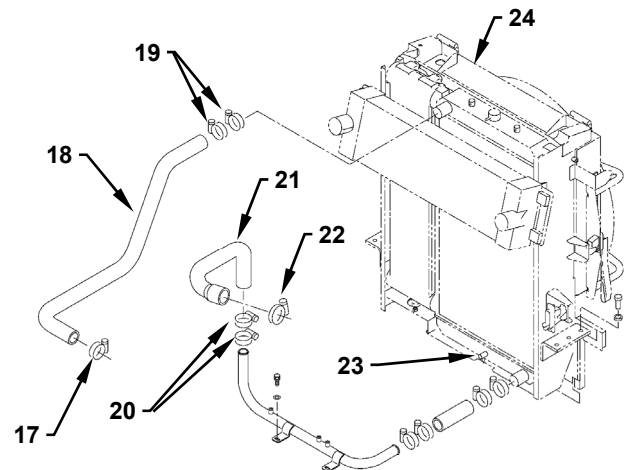
22. Install pipe (25) to the frame with bolts (26) (4 used) and washers (27) (4 used).

 : 14 mm

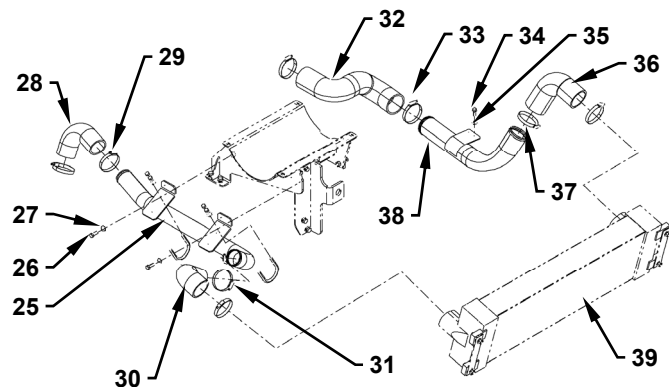
 : 30 N·m (3 kgf·m, 21.5 lbf·ft)



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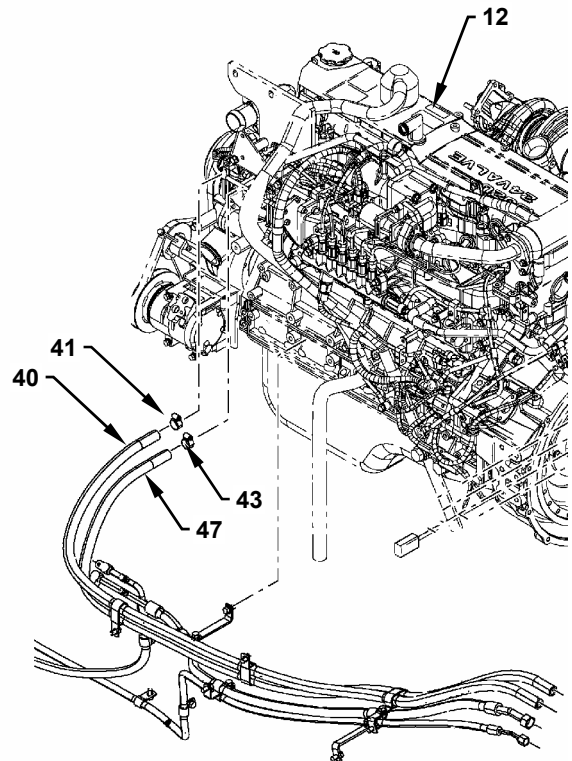
W4GC-03-02-184





W4GC-03-02-185

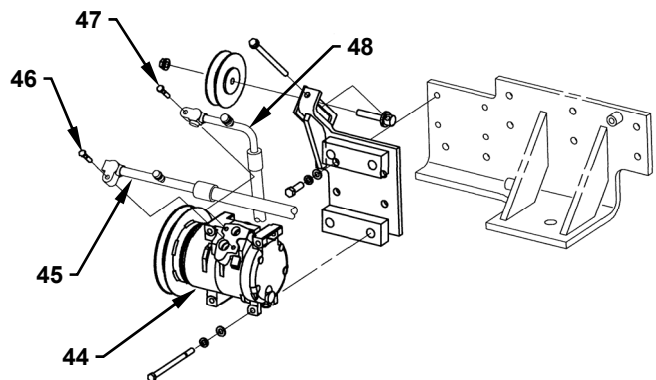
## BODY (TRAVEL SYSTEM) / Drive Unit

23. Connect hoses (40, 47) to engine (12). Secure hoses (40, 47) with hose clamps (41, 43).



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24. Connect hoses (45, 48) to cooling pump (44) with bolts (46, 47).
-  : 10 mm
-  : 7.8 to 11.8 N·m  
(0.8 to 1.2 kgf·m, 5.8 to 8.7 lbf·ft)




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## BODY (TRAVEL SYSTEM) / Drive Unit

25. Connect hoses (5, 6) to drive unit (4) through O-ring.

 : 41 mm

 : 205 N·m (21 kgf·m, 151 lbf·ft)

26. Install hose (7) to drive unit (3). Tighten hose (7) with hose band (8).

27. Connect hoses to main pump. (Refer to W2-4.)

28. Install hydraulic oil tank. (Refer to W2-3.)

29. Install hood. (Refer to W2-3.)


30. Install cab. (Refer to W2-1.)


31. Install propeller shaft. (Refer to W3-4.)

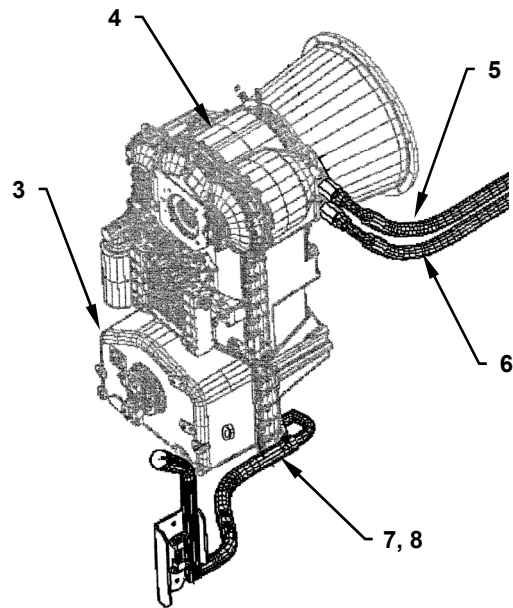
32. Add transmission oil.

Capacity: 25 L (6.6 US gal.).

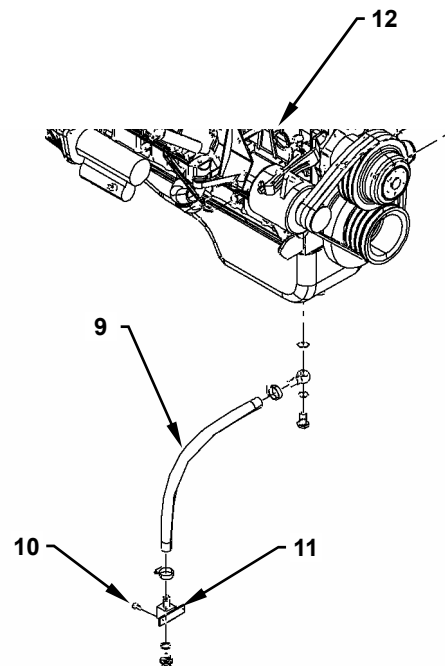
33. Install the block (11) assembly to the frame with bolts (10) (2 used).

 : 14 mm

 : 30 N·m (3 kgf·m, 21.5 lbf·ft)



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W4GC-03-02-182

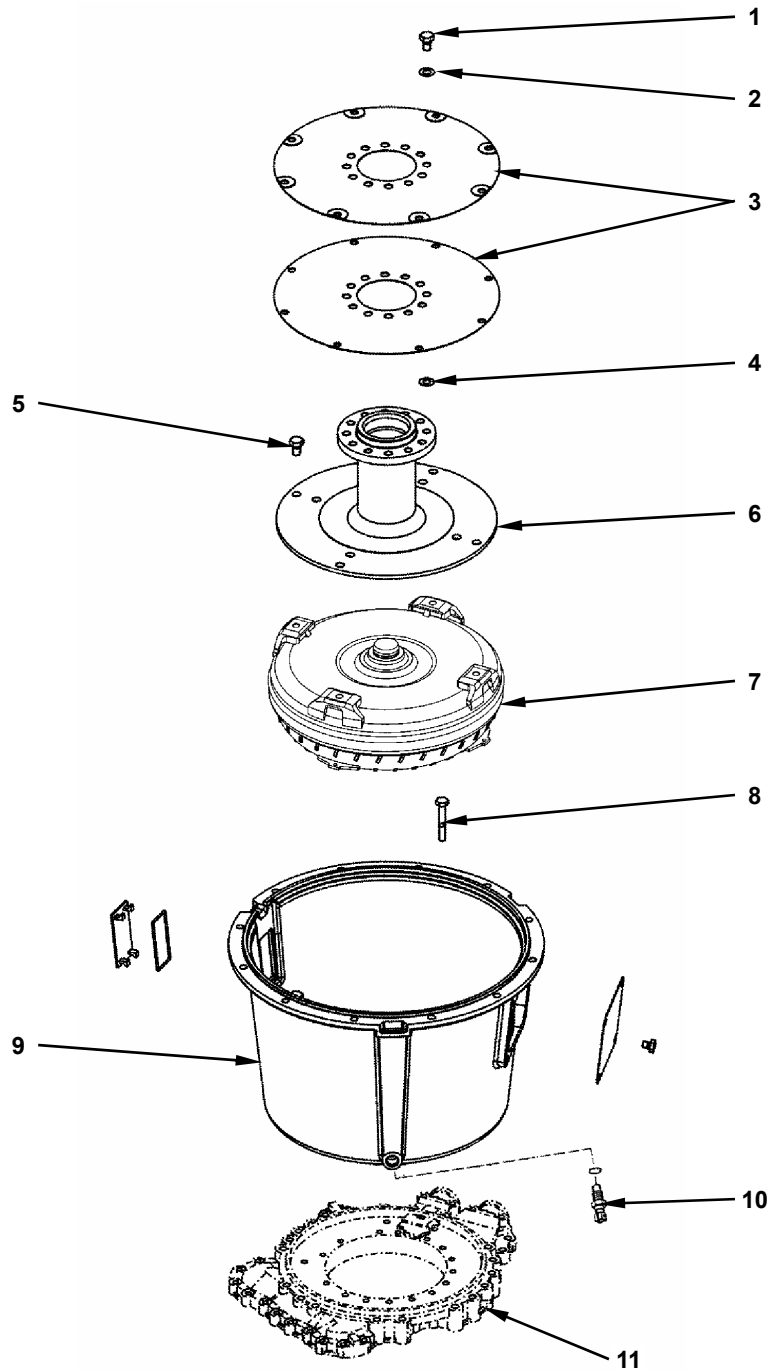
## **BODY (TRAVEL SYSTEM) / Drive Unit**

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## BODY (TRAVEL SYSTEM) / Drive Unit

### REMOVAL OF TORQUE CONVERTER AND CONVERTER HOUSING



W4GB-03-02-003

1 - Bolt (8 Used)  
2 - Washer (8 Used)  
3 - Diaphragm (2 Used)

4 - Shim  
5 - Bolt (4 Used)  
6 - Spacer Ring

7 - Torque Converter  
8 - Bolt (18 Used)  
9 - Converter Housing

10 - Speed Sensor  
11 - Flange

## BODY (TRAVEL SYSTEM) / Drive Unit

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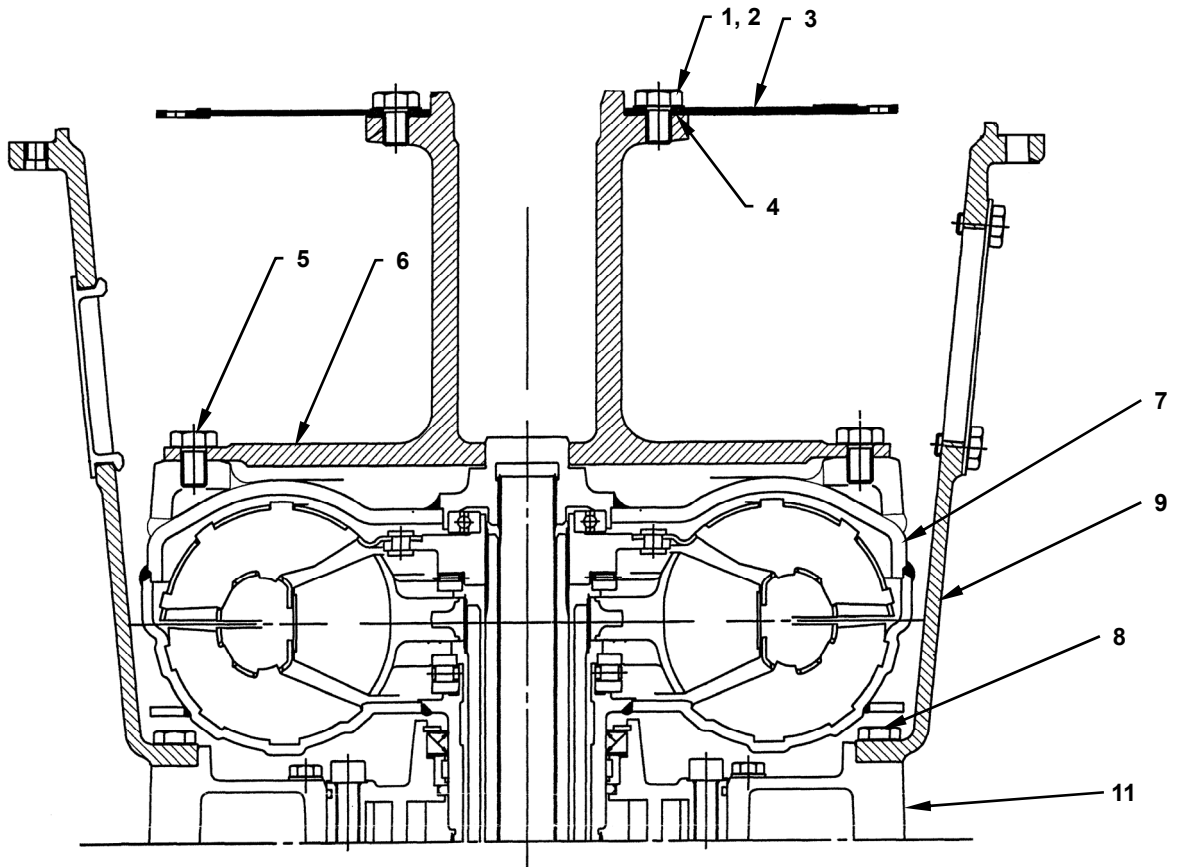


**CAUTION:** When the torque converter side is turned downward with the torque converter assembly installed to the transmission, the torque converter assembly comes off.

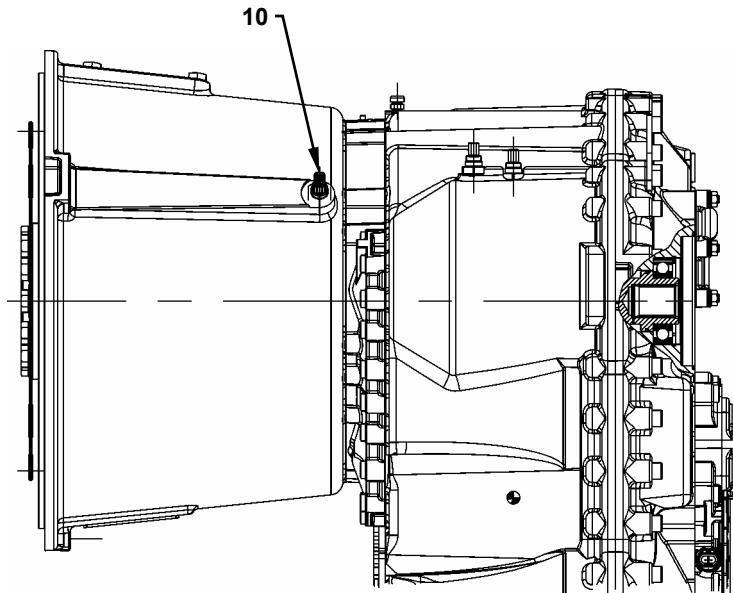
1. Remove bolts (1) (2 used) and washers (2) (2 used) diagonally. Install eyebolts (M12, Pitch 1.25 mm) (2 used) in that position.
2. Remove the torque converter (7) assembly using a lifting gear.
3. Remove bolts (5) (4 used). Remove spacer ring (6) from torque converter (7).
4. Remove bolts (1) (6 used), washers (2) (6 used), and eyebolts (2 used) from diaphragm (3). Remove diaphragms (3) (2 used) and shims (4) (8 used) from spacer ring (6).
5. Remove bolts (8) (18 used) from converter housing (9). Remove converter housing (9) from flange (11).
6. Remove speed sensor (10) from converter housing (9).

## BODY (TRAVEL SYSTEM) / Drive Unit

### INSTALLATION OF TORQUE CONVERTER AND CONVERTER HOUSING



W4GB-03-02-001




W4GB-03-02-002


- |                        |                   |                       |                   |
|------------------------|-------------------|-----------------------|-------------------|
| 1 - Bolt (8 Used)      | 4 - Shim (8 Used) | 7 - Torque Converter  | 10 - Speed Sensor |
| 2 - Washer (8 Used)    | 5 - Bolt (4 Used) | 8 - Bolt (18 Used)    | 11 - Flange       |
| 3 - Diaphragm (2 Used) | 6 - Spacer Ring   | 9 - Converter Housing |                   |




## BODY (TRAVEL SYSTEM) / Drive Unit


1. Install converter housing (1) to flange (11) with bolts (8) (18 used).

 : 14 mm

 : 68 N·m (7 kgf·m, 50 lbf·ft)

2. Apply LOCTITE #262 to bolts (5) (4 used). Install spacer ring (6) to torque converter (7) with bolts (5) (4 used).

 : 17 mm

 : 115 N·m (12 kgf·m, 85 lbf·ft)

3. Install eyebolts (M12, Pitch 1.25 mm) (2 used) to the diagram (3) mounting part of spacer ring (6).

4. Attach a nylon sling onto the eyebolt. Hoist and install torque converter (7) to the transmission.


**IMPORTANT:** Check the engagement of the spline of the turbine shaft and the spline of the turbine wheel inside torque converter (7).


Check the engagement of the spline of the pump wheel boss part and the spline of the drive gear of the charging pump.

**IMPORTANT:** Check in the arrow part that the pickup disc is in the center of the speed sensor (10) mounting hole of converter housing (9).

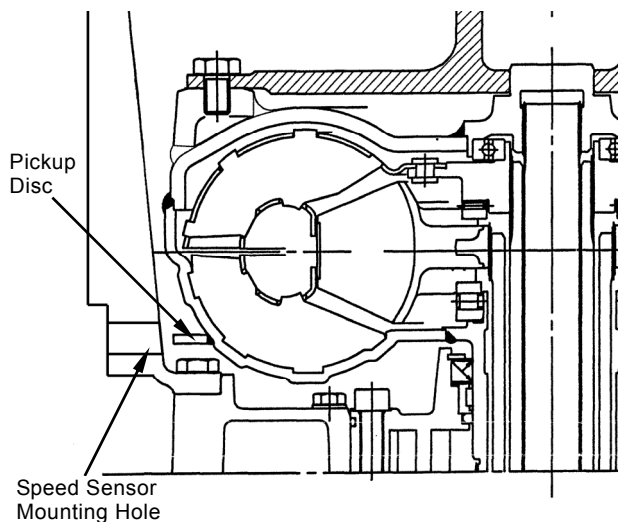
**IMPORTANT:** Apply grease to the lip part in order not to damage the oil roll of the charging pump with the spline part of the pump wheel boss part.

5. Remove eyebolts (2 used) from spacer ring (6). Install shims (4) (8 used), diaphragms (3) (2 used) to spacer ring (6) with bolts (1) (8 used) and washers (2) (8 used).

 : 17 mm

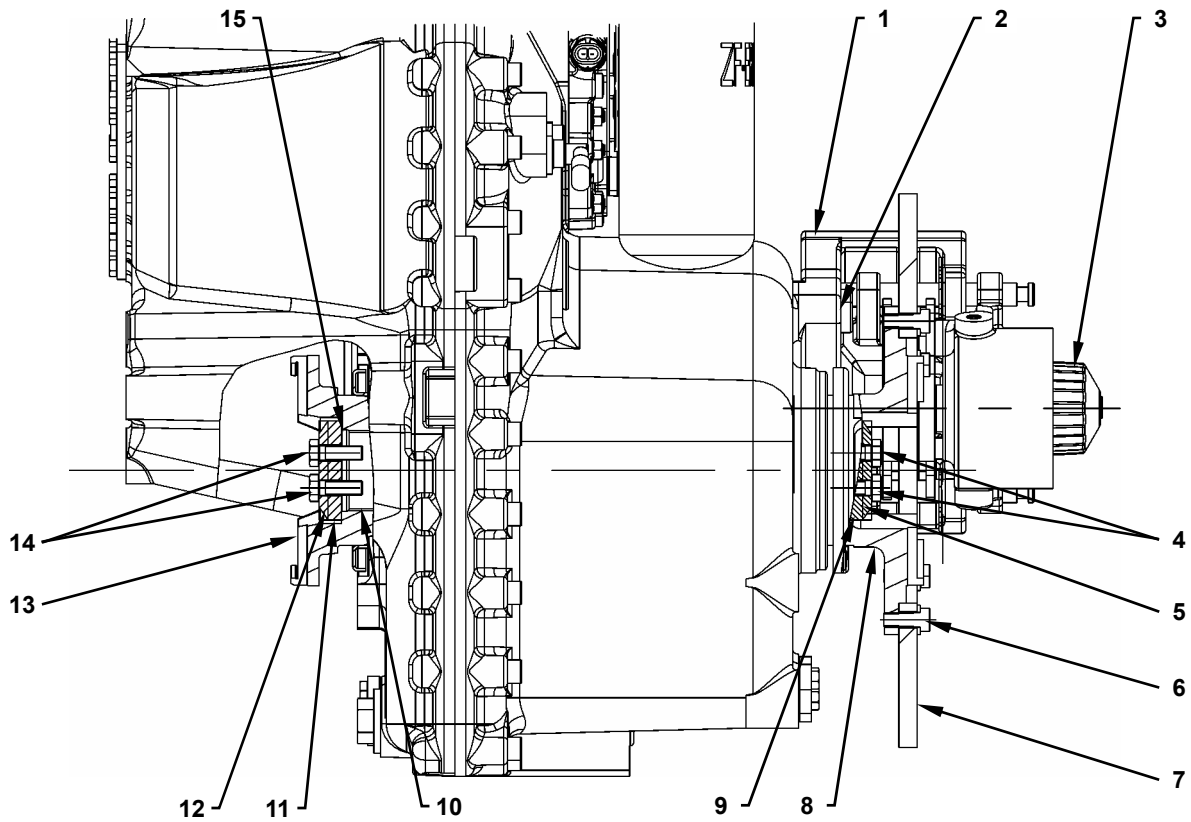
 : 115 N·m (12 kgf·m, 85 lbf·ft)

6. Install speed sensor (10) to converter housing (9).



## BODY (TRAVEL SYSTEM) / Drive Unit

### REMOVAL OF FLANGE (FRONT, REAR) AND PARKING BRAKE



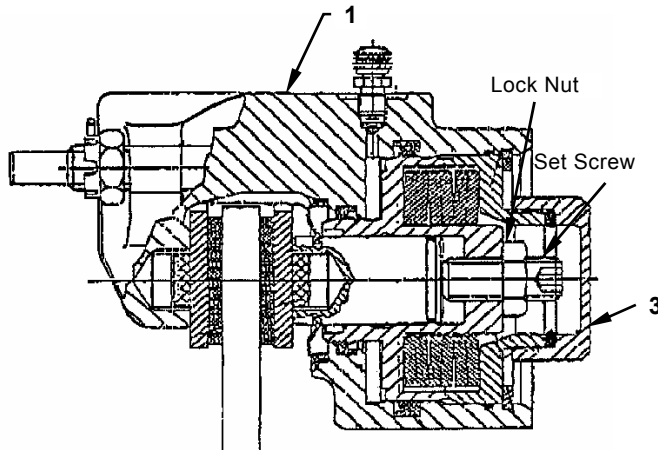
W4GB-03-02-005

- |                        |                       |                   |                       |
|------------------------|-----------------------|-------------------|-----------------------|
| 1 - Parking Brake      | 5 - Tab Washer        | 9 - Washer        | 13 - Rear Side Flange |
| 2 - Cap Bolts (4 Used) | 6 - Bolt (6 Used)     | 10 - Output Shaft | 14 - Bolt (2 Used)    |
| 3 - Cap                | 7 - Brake Disc        | 11 - Washer       | 15 - O-Ring           |
| 4 - Bolt (2 Used)      | 8 - Front Side Flange | 12 - Tab Washer   |                       |

## BODY (TRAVEL SYSTEM) / Drive Unit

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1. Remove cap (3) from parking brake (1).
2. Loosen the hexagon nut indicated in the following figure. Turn the setscrew to the left and release the brake.

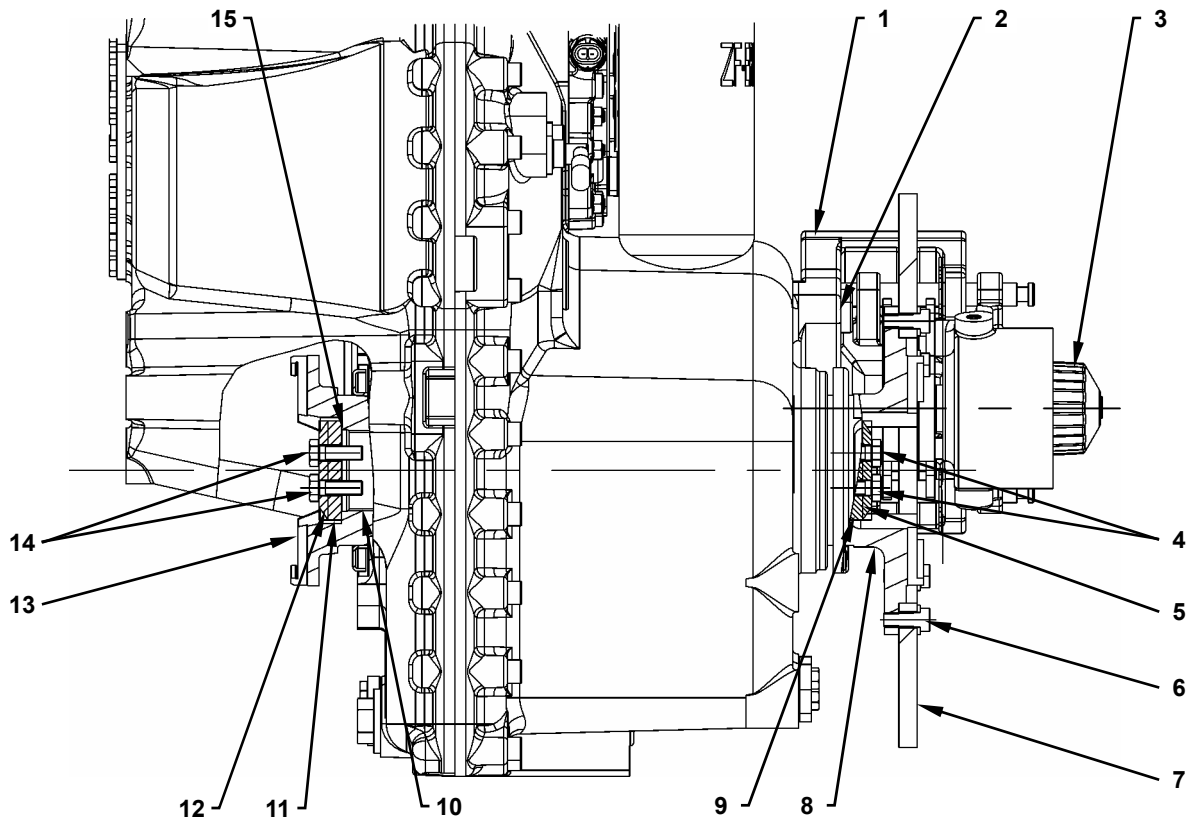


W4GB-03-02-006

3. Remove cap bolts (2) (4 used) from parking brake (1).  
Remove parking brake (1) from output shaft (10).  
┌ : 12 mm
4. Remove bolts (6) (6 used) from brake disc (7).  
Remove brake disc (7) from front side flange (8).  
⌘ : 17 mm
5. Remove bolts (4) from tab washers (5) (2 used).  
Remove tab washer (5), washer (9), and front side flange (8) from output shaft (10).  
⌘ : 17 mm
6. Remove bolts (14) (2 used) from washer (11).  
Remove tab washer (12), washer (11), and rear side flange (13) from output shaft (10).  
⌘ : 17 mm

## BODY (TRAVEL SYSTEM) / Drive Unit

### INSTALLATION OF FLANGE (FRONT, REAR) AND PARKING BRAKE





W4GB-03-02-005

- |                        |                       |                   |                       |
|------------------------|-----------------------|-------------------|-----------------------|
| 1 - Parking Brake      | 5 - Tab Washer        | 9 - Washer        | 13 - Rear Side Flange |
| 2 - Cap Bolts (4 Used) | 6 - Bolt (6 Used)     | 10 - Output Shaft | 14 - Bolt (2 Used)    |
| 3 - Cap                | 7 - Brake Disc        | 11 - Washer       | 15 - O-Ring (2 Used)  |
| 4 - Bolt (2 Used)      | 8 - Front Side Flange | 12 - Tab Washer   |                       |


## BODY (TRAVEL SYSTEM) / Drive Unit


1. Install rear side flange (13) to output shaft (10). Install rear side flange (13) to output shaft (10) with bolts (14) (2 used) through O-ring (15), washer (11), and tab washer (12).

 : 17 mm


 : 46 N·m (5 kgf·m, 34 lbf·ft)


2. Install front side flange (8) to output shaft (10) with bolts (4) (2 used) through O-ring (15), washer (9), and tab washer (5).

 : 17 mm

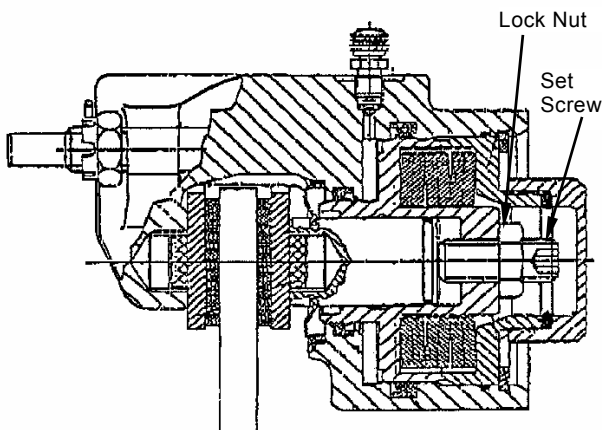
 : 46 N·m (5 kgf·m, 34 lbf·ft)

3. Install brake disc (7) to front side flange (8) with bolts (6) (6 used).

 : 17 mm


 : 46 N·m (5 kgf·m, 34 lbf·ft)


4. Check that the setscrew of the parking brake is fully loosen as indicated in the following figure.



W4GB-03-02-006

5. Place the brake pad of parking brake (1) so that brake disc (7) is inserted between them. Install with cap bolts (2) (4 used).

 : 12 mm

 : 185 N·m (19 kgf·m, 136 lbf·ft)

6. Install cap (3) to parking brake (1). Adjustment of parking brake (1) is performed with the transmission installed to the vehicle as follows.

### Adjustment of parking brake

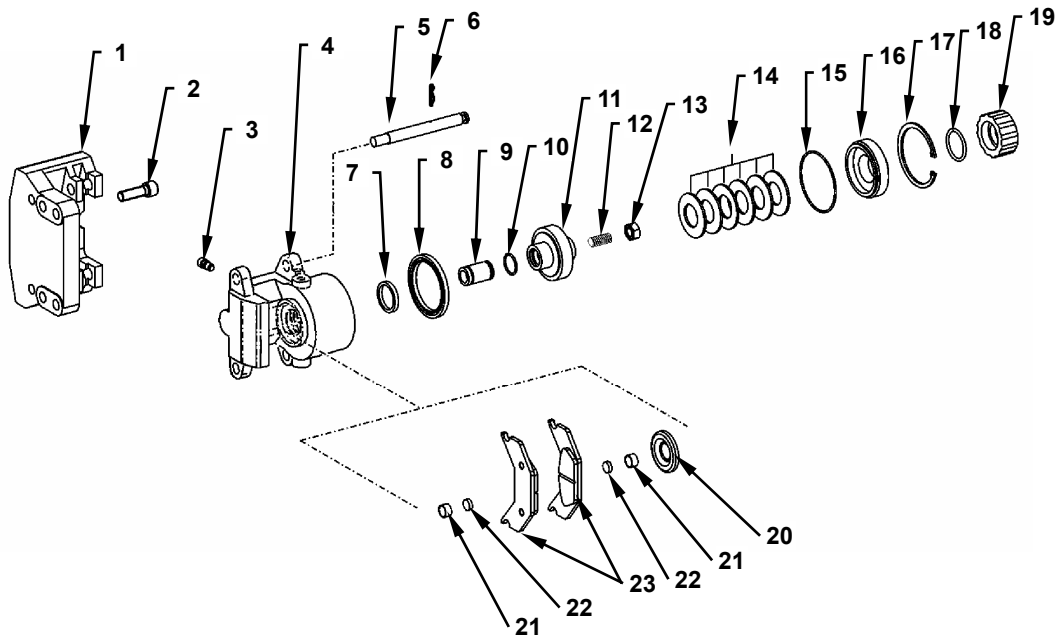


**CAUTION: Adjustment of the parking brake is performed after checking that the release hydraulic pressure is normal.**

- Add release hydraulic pressure and check that the brake pads (2 used) move.
- Turn setscrew to the right and return about 1/4 to 1/2 turn from the point where resistance is felt.
- Secure the setscrew with a lock nut and install cap (3).

## BODY (TRAVEL SYSTEM) / Drive Unit

### DISASSEMBLY OF PARKING BRAKE





W4GB-03-02-007

- |                  |                  |                          |                              |
|------------------|------------------|--------------------------|------------------------------|
| 1 - Anchor Plate | 7 - U-Ring       | 13 - Nut                 | 19 - Screw Cap               |
| 2 - Cap Screw    | 8 - U-Ring       | 14 - Cup Spring (6 Used) | 20 - Dust Cap                |
| 3 - Breather     | 9 - Pressure Pin | 15 - O-Ring              | 21 - Clearance Ring (2 Used) |
| 4 - Housing      | 10 - O-Ring      | 16 - Pressure Ring       | 22 - Magnet (2 Used)         |
| 5 - Pin (2 Used) | 11 - Piston      | 17 - Retaining Ring      | 23 - Brake Pad (2 Used)      |
| 6 - Cotter Pin   | 12 - Set Screw   | 18 - O-Ring              |                              |

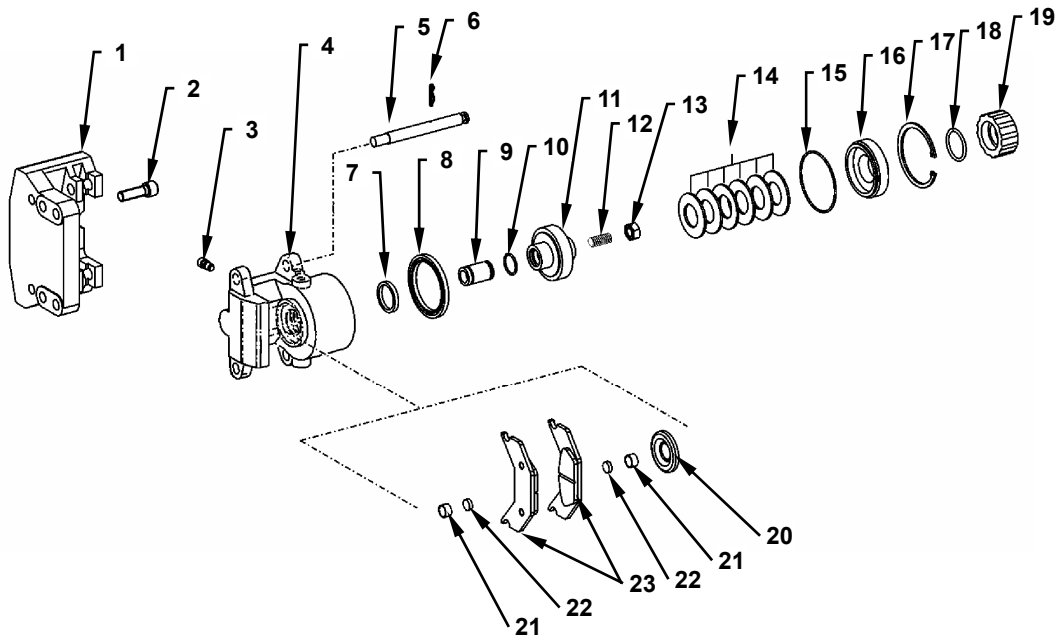
## BODY (TRAVEL SYSTEM) / Drive Unit

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1. Remove screw cap (19) from piston (11). Loosen nut (13).  
 : 24 mm
2. Remove set screw (12) from piston (11).
3. Remove cotter pins (6) (2 used) from pins (5) (2 used). Remove pins (5) (2 used) from anchor plate (1). Remove housing (4) and brake pads (23) (2 used) at the same time.
4. Remove magnets (22) (2 used) and clearance ring (21) from pressure pin (9) and the facing housing side.
5. Remove pressure pin (9) with dust cap (20) and O-ring (10) from housing (4).
6. Remove snap ring (17) from housing (4). Remove pressure ring (16), cup spring (14), and piston (11).
7. Remove U-Rings (7, 8) from housing (4).
8. Remove breather (3) from housing (4).  
 : 13 mm

## BODY (TRAVEL SYSTEM) / Drive Unit

### ASSEMBLY OF PARKING BRAKE





W4GB-03-02-007

- |                  |                  |                          |                              |
|------------------|------------------|--------------------------|------------------------------|
| 1 - Anchor Plate | 7 - U-Ring       | 13 - Nut                 | 19 - Screw Cap               |
| 2 - Cap Screw    | 8 - U-Ring       | 14 - Cup Spring (6 Used) | 20 - Dust Cap                |
| 3 - Breather     | 9 - Pressure Pin | 15 - O-Ring              | 21 - Clearance Ring (2 Used) |
| 4 - Housing      | 10 - O-Ring      | 16 - Pressure Ring       | 22 - Magnet (2 Used)         |
| 5 - Pin (2 Used) | 11 - Piston      | 17 - Retaining Ring      | 23 - Brake Pad (2 Used)      |
| 6 - Cotter Pin   | 12 - Set Screw   | 18 - O-Ring              |                              |



## BODY (TRAVEL SYSTEM) / Drive Unit

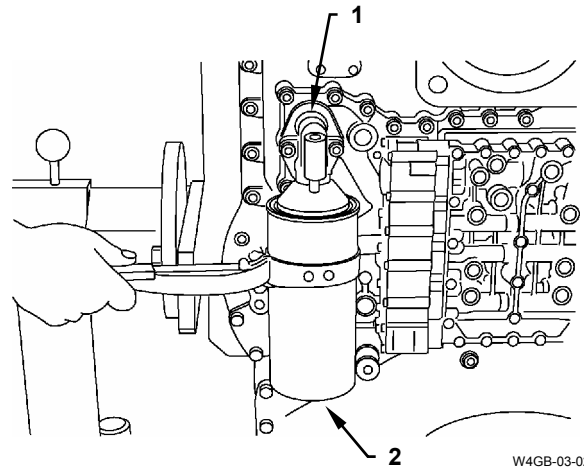
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1. Install U-Rings (7, 8) to housing (4).
2. Apply oil to the lip part of U-ring (7, 8). Install piston (11) to housing (4).
3. Install O-ring (15) to housing (4).
4. Install cup springs (14) (6 used) to piston (11).
5. Apply a thin layer of grease to the outer circle of the pressure ring (16). Install pressure ring (16) to housing (4). Secure pressure ring (16) with snap ring (17).
6. Install O-ring (10) and dust cap (20) to pressure pin (9). Install the pressure pin (9) assembly to housing (4).
7. Install clearance ring (21) and magnet (22) to pressure pin (9). Install clearance ring (21) and magnet (22) to the facing housing side.
8. Install breather (3) to housing (4).  
 : 13 mm  
 : 16 N·m (1.5 kgf·m, 11.5 lbf·ft)
9. Align the holes of housing (4) and anchor plate (1), and insert one pin (5).
10. Place brake pad (23) on the housing and then insert the other pin (5) to assemble. Install cotter pin (6) to each pin (5).
11. Install set screw (12) to piston (11) by turning the set screw 3 times. Install nut (13) temporarily to set screw (12).


## BODY (TRAVEL SYSTEM) / Drive Unit

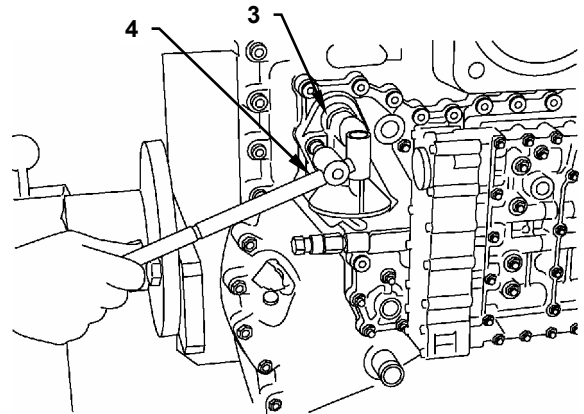
### REMOVAL OF OIL FILTER

1. Remove oil filter (2) from filter head (1) using a filter wrench.



2. Remove socket bolts (4) (2 used) from filter head (1). Remove filter head (1) from duct plate (3).

 : Torx TX40

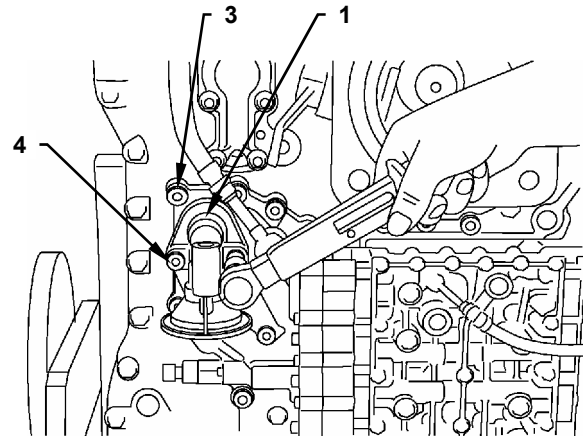


## BODY (TRAVEL SYSTEM) / Drive Unit

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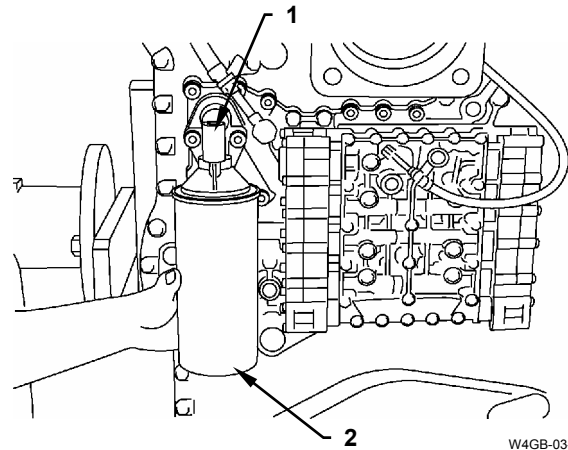
### INSTALLATION OF OIL FILTER

1. Install filter head (1) to duct plate (3) with socket bolts (4) (2 used).



W4GB-03-02-010

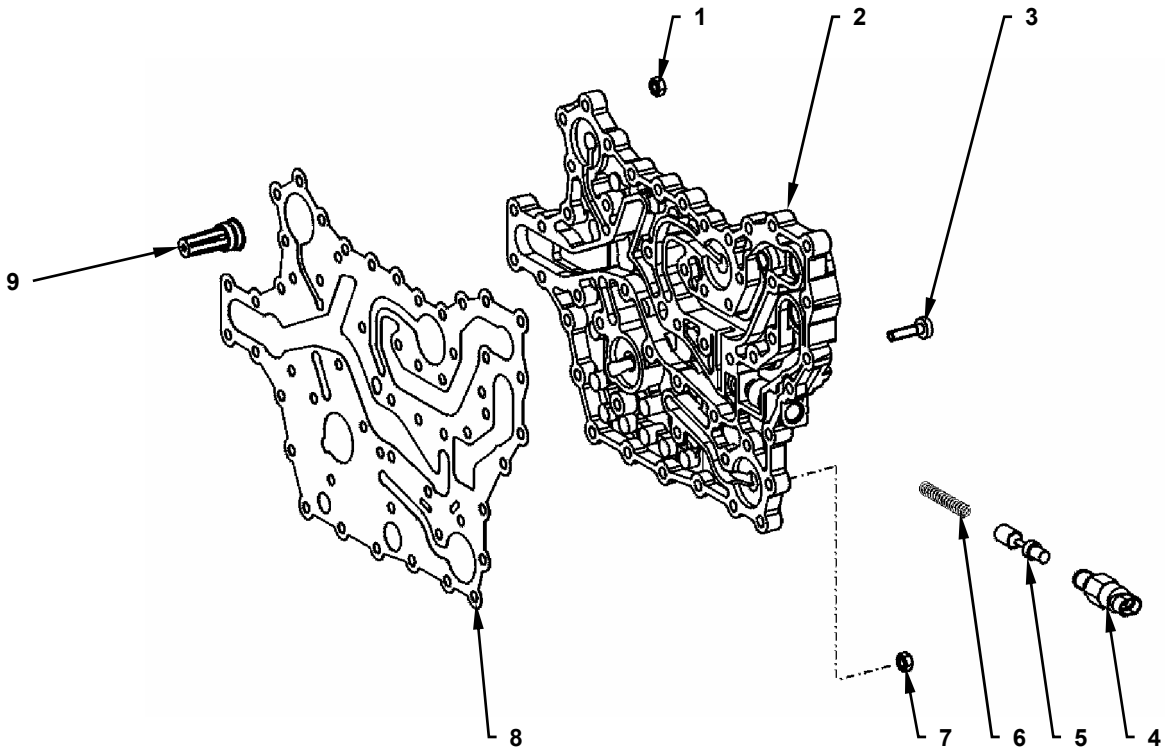
2. Apply oil onto the sealing surface of filter (2).  
Tighten filter (2) by hand to filter head (1).



W4GB-03-02-011


# BODY (TRAVEL SYSTEM) / Drive Unit

## DISASSEMBLY OF DUCT PLATE



W4GB-03-02-012


- |                         |            |                  |                           |
|-------------------------|------------|------------------|---------------------------|
| 1 - Nut (14 Used)       | 4 - Switch | 7 - Nut          | 10 - Transmission Housing |
| 2 - Duct Plate          | 5 - Piston | 8 - Gasket       |                           |
| 3 - Cap Screw (36 Used) | 6 - Spring | 9 - Relief Valve |                           |

 NOTE: Refer to W3-2-31 for item 10.

## BODY (TRAVEL SYSTEM) / Drive Unit

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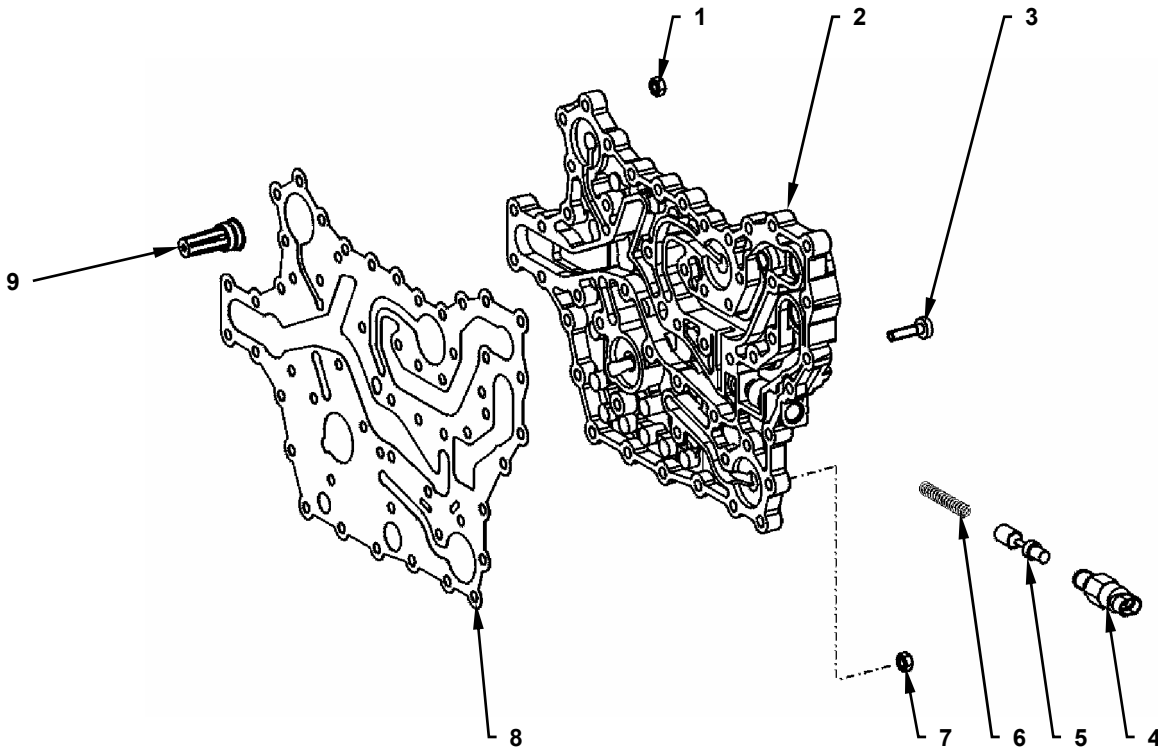
1. Remove switch (4) from duct plate (2). Remove piston (5) and spring (6) from the inner part of duct plate (2).

 : 22 mm

2. Remove nut (1) and cap screws (3) (36 used) from duct plate (2). Remove duct plate (2) and gasket (8) from transmission housing (10).
3. Remove relief valve (9) from transmission housing (10).


# BODY (TRAVEL SYSTEM) / Drive Unit

## ASSEMBLY OF DUCT PLATE



W4GB-03-02-012


- |                         |            |                  |                           |
|-------------------------|------------|------------------|---------------------------|
| 1 - Nut (14 Used)       | 4 - Switch | 7 - Nut          | 10 - Transmission Housing |
| 2 - Duct Plate          | 5 - Piston | 8 - Gasket       |                           |
| 3 - Cap Screw (36 Used) | 6 - Spring | 9 - Relief Valve |                           |


 NOTE: Refer to W3-2-31 for item 10.

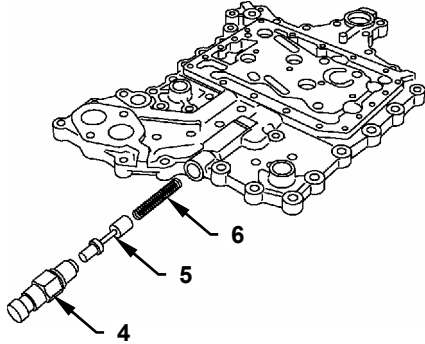
## BODY (TRAVEL SYSTEM) / Drive Unit

### Assembly of Duct Plate

1. Install spring (6) and piston (5) to duct plate (2).  
Apply grease to the O-ring of switch (4), and install it to duct plate (2).

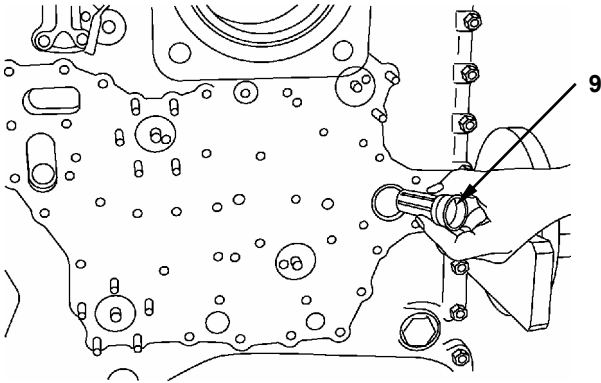
 : 22 mm

 : 30 N·m (3 kgf·m, 21.5 lbf·ft)



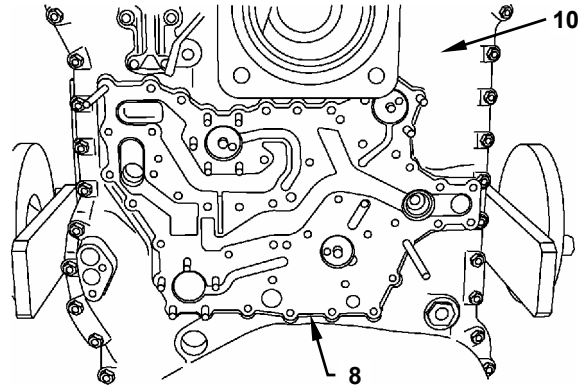
W4GB-03-02-013

2. Install relief valve (9) to transmission housing (10).




W4GB-03-02-014

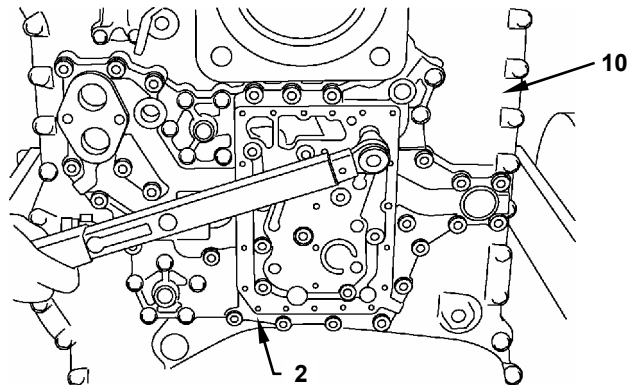
3. Affix gasket (8) to transmission housing (10) with grease.



W4GB-03-02-015

4. Install duct plate (2) to transmission housing (10) with nuts (1) (14 used) and capscrews (3) (36 used).

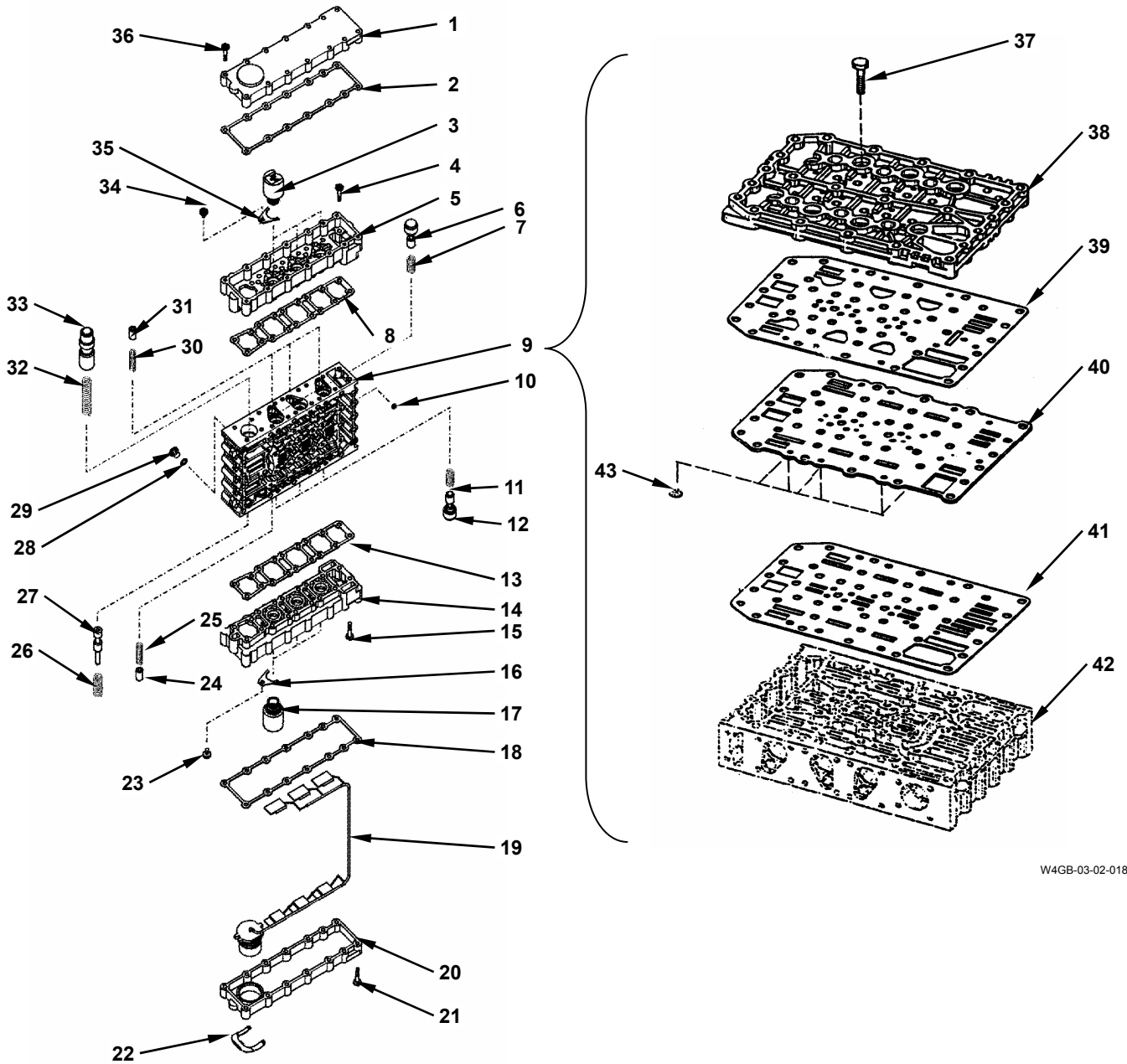
 : 23 N·m (2.3 kgf·m, 17 lbf·ft)



W4GB-03-02-016

# BODY (TRAVEL SYSTEM) / Drive Unit

## DISASSEMBLY OF CONTROL VALVE



W4GB-03-02-018




W4GB-03-02-017

- |                                 |                                  |                         |                            |
|---------------------------------|----------------------------------|-------------------------|----------------------------|
| 1 - Cover                       | 12 - Piston (3 Used)             | 23 - Cap Screw (3 Used) | 34 - Cap Screw (3 Used)    |
| 2 - Gasket                      | 13 - Gasket                      | 24 - Piston (3 Used)    | 35 - Fixing Plate (3 Used) |
| 3 - Pressure Regulator (3 Used) | 14 - Housing Cover               | 25 - Spring (3 Used)    | 36 - Torque Bolt (14 Used) |
| 4 - Cap Screw (18 Used)         | 15 - Cap Screw (18 Used)         | 26 - Spring             | 37 - Cap Screw             |
| 5 - Housing cover               | 16 - Fixing Plate (3 Used)       | 27 - Piston             | 38 - Duct Plate            |
| 6 - Piston (3 Used)             | 17 - Pressure Regulator (3 Used) | 28 - O-Ring             | 39 - Gasket                |
| 7 - Spring (3 Used)             | 18 - Gasket                      | 29 - Plug               | 40 - Middle Sheet          |
| 8 - Gasket                      | 19 - Wire Harness                | 30 - Spring (3 Used)    | 41 - Gasket                |
| 9 - Valve Block Assembly        | 20 - Cover                       | 31 - Piston (3 Used)    | 42 - Housing               |
| 10 - Orifice (6 Used)           | 21 - Cap Screw (14 Used)         | 32 - Spring             | 43 - Screen                |
| 11 - Spring (3 Used)            | 22 - Retaining Clamp             | 33 - Control Piston     |                            |



## BODY (TRAVEL SYSTEM) / Drive Unit

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1. Put matching marks on the wire harness (19) mounting part of valve block assembly (9).
2. Remove duct plate (38), gasket (39), middle sheet (40), and gasket (41) from housing (42).
3. Remove retaining clamp (22) of the connector part from cover (20).
4. Remove cap screws (21) (14 used) from cover (20). Remove cover (20) and gasket (18) from housing cover (14).  
 : Torx TX27
5. Remove torque bolts (36) (14 used) from cover (1). Remove cover (1) and gasket (2) from housing cover (5).  
 : Torx TX27
6. Remove wire harness (19) from housing cover (14).
7. Remove cap screws (23) (3 used) from fixing plates (16) (3 used). Remove fixing plates (16) (3 used) and pressure regulators (17) (3 used) from housing cover (14).
8. Remove cap screws (15) (18 used) from housing cover (14). Remove housing cover (14) and gasket (18) from housing (42).  
 : Torx TX27
9. Remove pistons (12, 24) (3 used for each), springs (11, 25) (3 used for each), spring (26), and piston (27) from housing (42).
10. Remove cap screws (4) (18 used) from housing cover (5). Remove housing (5) and gasket (8) from housing (42).
11. Remove pistons (6) (3 used), (31) (3 used), springs (7, 30) (3 used for each), control piston (33), and spring (32) from housing assembly (9).
12. Remove cap screw (37) from dust plate (38). Remove dust plate (38), gasket (39), middle sheet (40), and gasket (41) from housing (42).

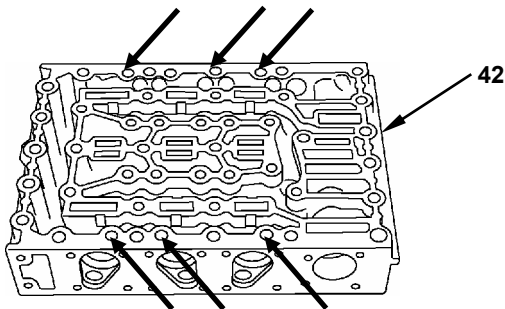
## BODY (TRAVEL SYSTEM) / Drive Unit

### ASSEMBLY OF CONTROL VALVE

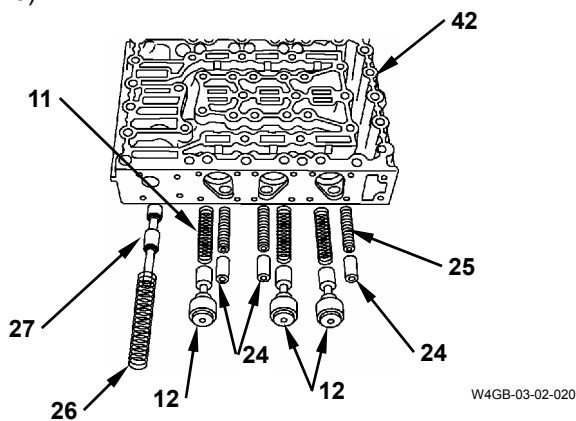
**IMPORTANT:** Check all disassembled parts and replace any defective parts if necessary.

Check that each piston moves smoothly in the fit location of housing. Replace defective pistons. Apply oil to pistons before assembling.

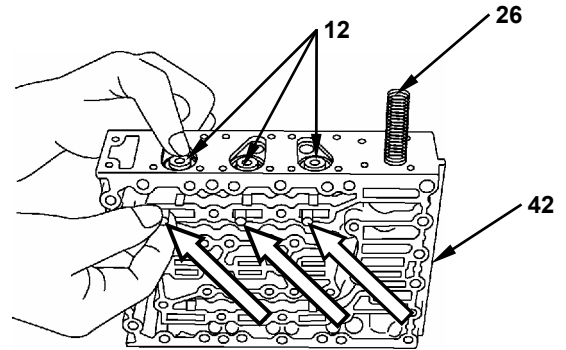
1. When installing the orifice, turn the hollow of orifices (10) (6 used) upwards, and install it to housing (42) at the position indicated by the arrow.



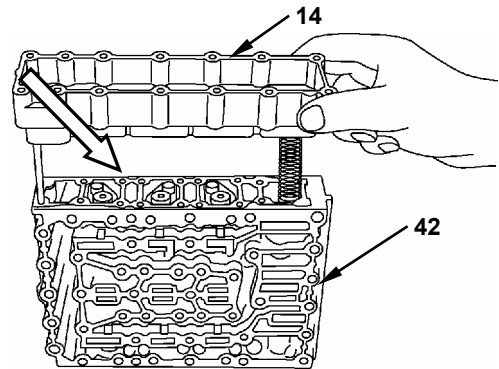
2. Place the housing (42) in the direction shown in the following figure. Install pistons (24) (3 used), pistons (12) (3 used), and piston (27) to housing (42) with springs (25) (3 used), (11) (3 used), and (26).



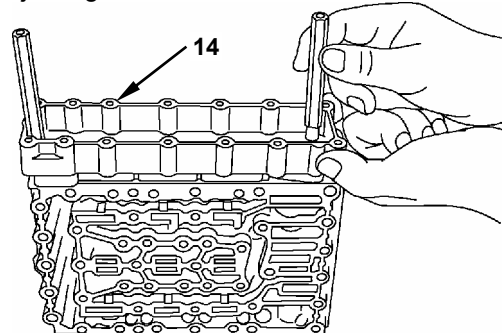
3. Push piston (12) (3 used) and secure them to housing (42) with pins (3 used) of dia. 5 mm. Install spring (26) to housing (42).



4. Install guide screws (2 used) to housing (42). Use them as guides to install gasket (13) and housing cover (14) to housing (42).

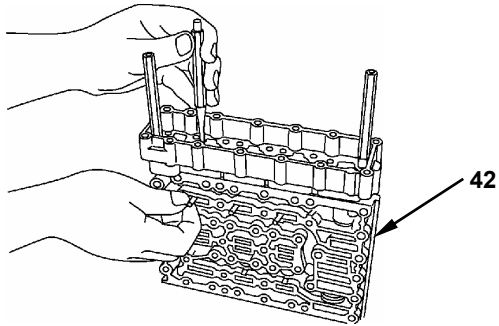


5. Hold housing cover (14) with the nut part of the adjusting screw.



## BODY (TRAVEL SYSTEM) / Drive Unit


6. Push pistons (12) (3 used) and remove pins (3 used) for securing the piston from housing (42).

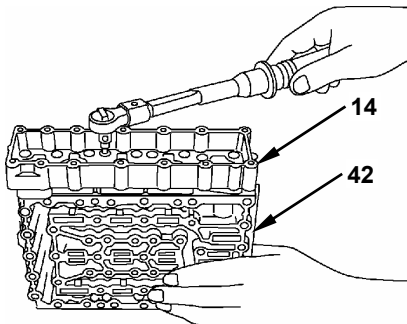


W4GB-03-02-024

7. Install housing cover (14) to housing (42) with cap screws (15) (18 used). Remove the adjusting screw.

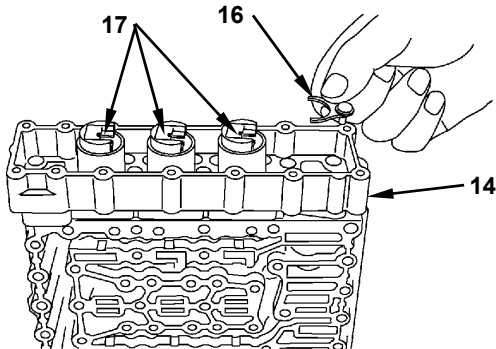
 : Torx TX27

 : 5.5 N·m (0.56 kgf·m, 4.1 lbf·ft)



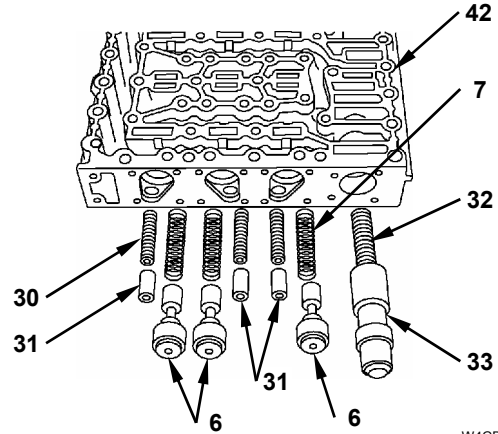
W4GB-03-02-025

8. Install pressure regulators (17) (3 used) to housing cover (14) in the direction indicated in the figure. Secure pressure regulator (17) (3 used) to housing cover (14) with fixing plates (16) (3 used). Turn the claws of fixing plate (16) (3 used) downward.



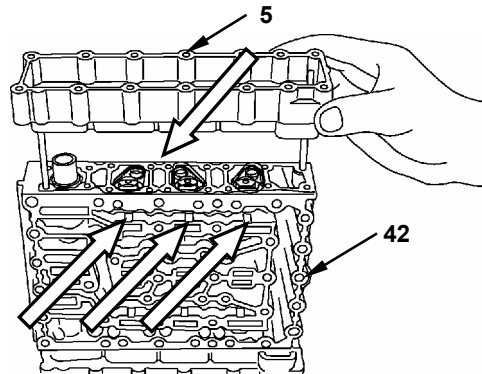
W4GB-03-02-026

9. Install pistons (31) (3 used), pistons (6) (3 used), and piston (33) to the opposite side of housing (42) with springs (30) (3 used), (7) (3 used), and (32).



W4GB-03-02-027


10. Push pistons (6) (3 used) into housing (42). Secure with pins (3 used) of dia. 5 mm. Install the adjuster screw and use it as a guide to install gasket (8) and housing cover (5) to housing (42).



W4GB-03-02-028

## BODY (TRAVEL SYSTEM) / Drive Unit


11. Hold housing cover (5) with the nut part of the adjusting screw. Install housing cover (5) to housing (42) with cap screws (4) (10 used).

 : Torx TX27

12. Push pistons (6) (3 used) and remove the pins (3 used) for securing the pistons.


13. Remove the adjusting screw from housing cover (5). Install cap screws (4) (2 used) in that position.

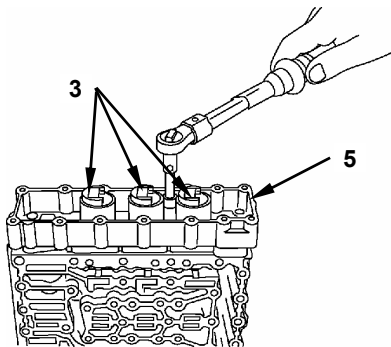
 : Torx TX27

 : 5.5 N·m (0.56 kgf·m, 4.1 lbf·ft)

14. Install pressure regulators (3) (3 used) to housing cover (5) in the direction indicated in the figure. Install fixing plates (35) (3 used) and screws (34) (3 used). Turn claws of fixing plates (35) (3 used) downward.

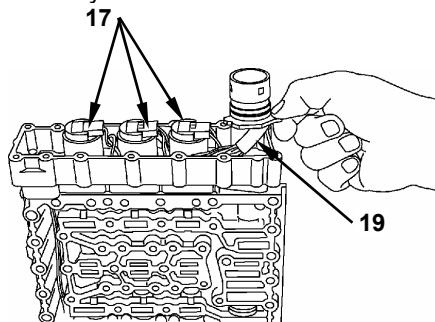
 : Torx TX27

 : 5.5 N·m (0.56 kgf·m, 4.1 lbf·ft)



W4GB-03-02-029


15. Place and connect wire harness (19) to pressure regulator (17). Align the position of the socket with the matching marks applied at the time of disassembly.




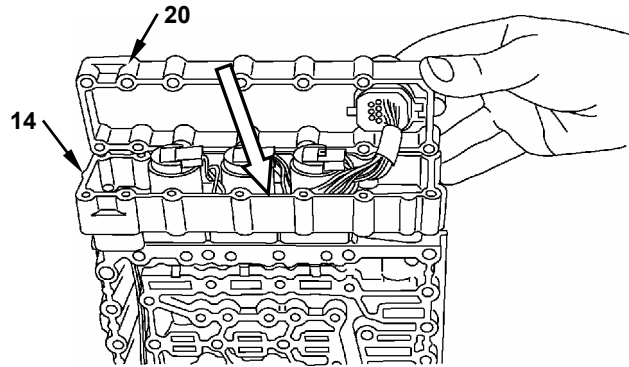
W4GB-03-02-030

16. Install gasket (18) to housing cover (14). Align the pin of the socket with the groove on cover (20), and install cover (20) to housing cover (14).

Secure cover (20) to housing cover (14) with cap screws (21) (14 used).

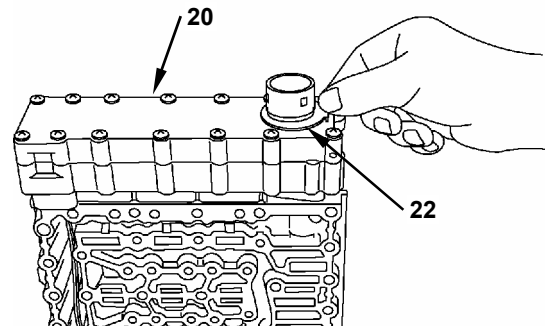
 : Torx TX27

 : 5.5 N·m (0.56 kgf·m, 4.1 lbf·ft)



W4GB-03-02-031

17. Secure the socket to cover (20) with retaining clamp (22).



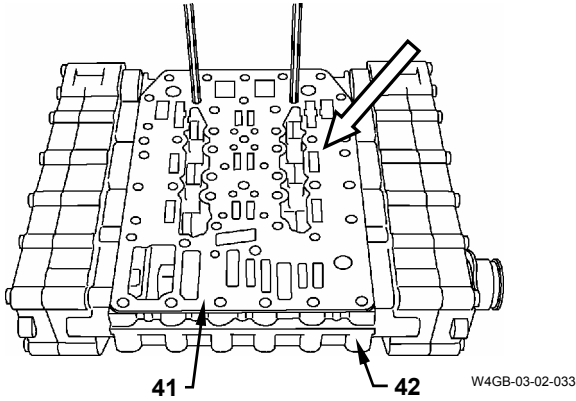
W4GB-03-02-032

18. Install cover (1) on the opposite side in the same procedure.

## BODY (TRAVEL SYSTEM) / Drive Unit

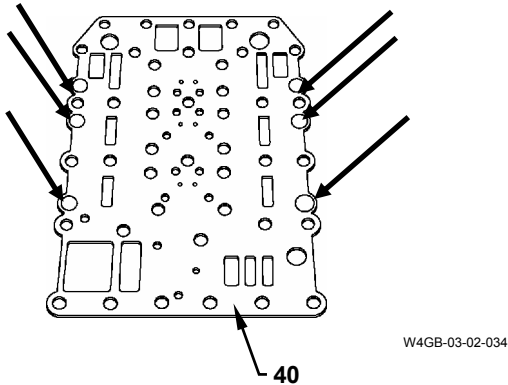
19. Install adjusting screws (2 used) to housing (42).  
Install gasket (41) to housing (42).

**IMPORTANT:** As there are 2 kinds of gaskets, check with the figure.

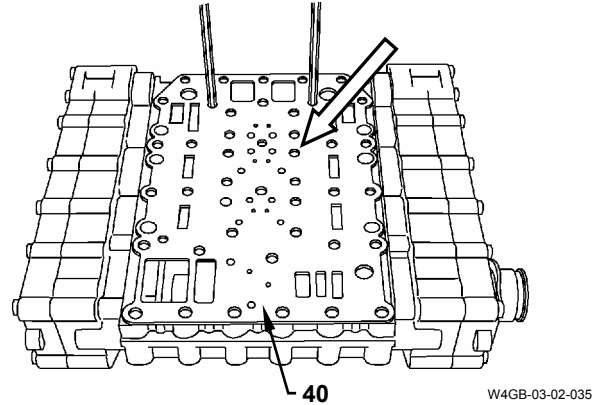


20. Install screens (43) (6 used) to the position indicated by the arrows on middle sheet (40).

**IMPORTANT:** Install screens (43) (6 used) in the direction facing the duct plate side.

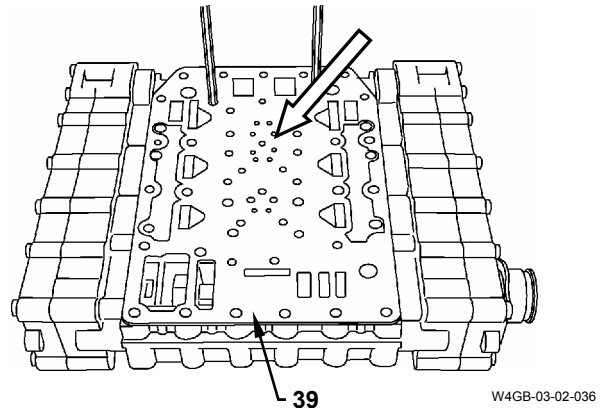


21. Place middle sheet (40) on top of gasket (41).  
Turn screens (43) (6 used) to the duct plate (38) side.



22. Install gasket (39) to middle sheet (40).


**IMPORTANT:** As there are 2 kinds of gaskets check with the figure.




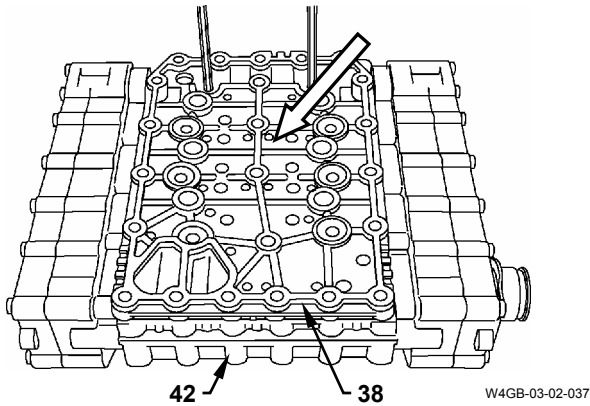
## BODY (TRAVEL SYSTEM) / Drive Unit

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23. Install duct plate (38) to housing (42) with cap screw (37).


 : Torx TX27

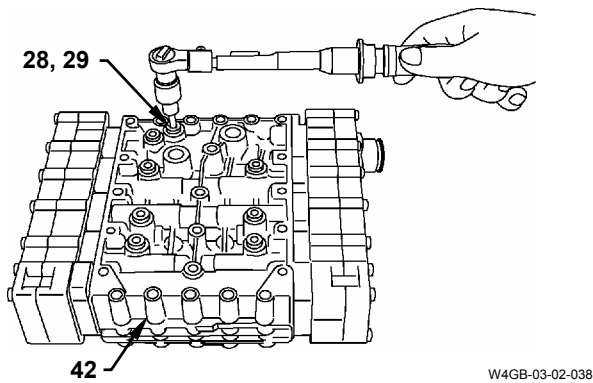
 : 11 N·m (1.1 kgf·m, 8.1 lbf·ft)



24. Install O-ring (28) to plug (29). Install plug (29) to housing (42).

 : 5 mm

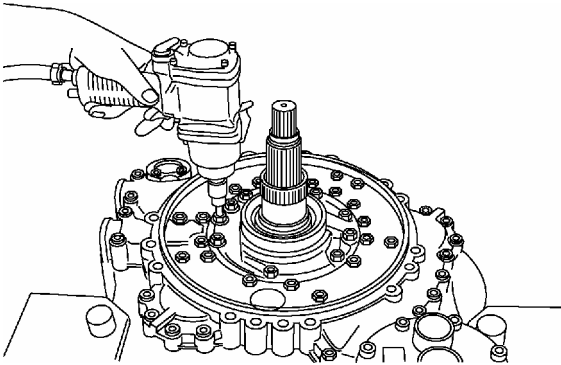
 : 6 N·m (0.61 kgf·m, 4.4 lbf·ft)



## BODY (TRAVEL SYSTEM) / Drive Unit

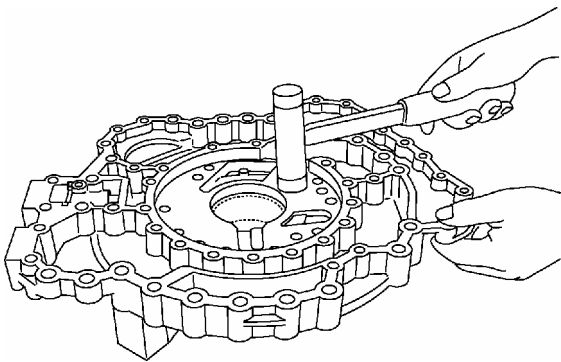
### REMOVAL OF OIL FEEDER AND PUMP

1. Remove the mounting bolts of the oil feeder and the pump. Remove oil feeder and pump at the same time. Remove the gasket between them.



W4GB-03-02-039

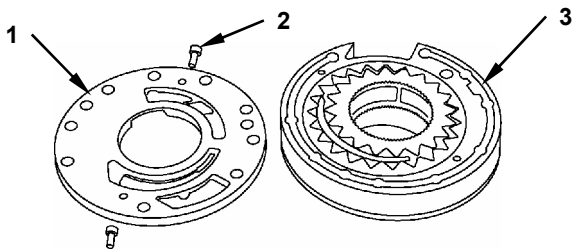
2. Remove the pump from the oil feeder.



W4GB-03-02-040

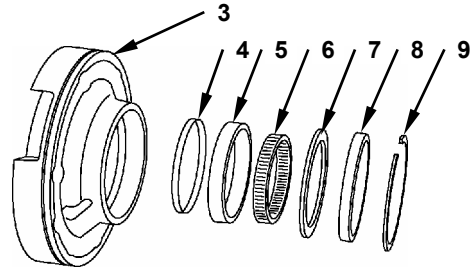
3. Remove screws (2) (2 used) from pump housing (3). Remove cam disc (1) from pump housing (3).

**IMPORTANT:** If any damage is found in pump housing (3) or cam disc (1), replace them with the pump assembly.



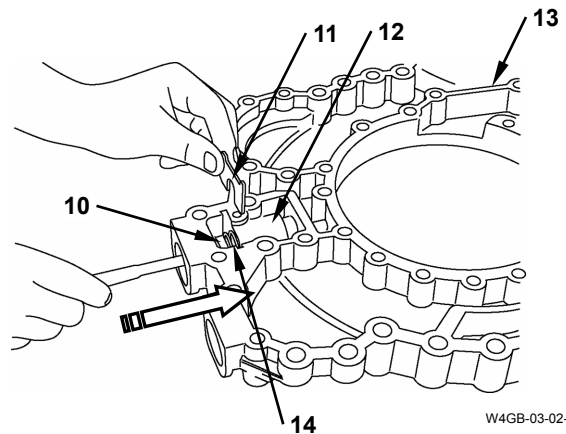
W4GB-03-02-041

4. Remove snap ring (9), seal (8), support shim (7), bearing inner (6), bearing outer (5), and ring (4) from pump housing (3).



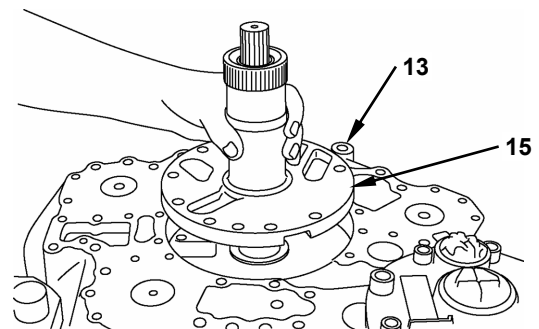
W4GB-03-02-042

5. Push pressure plate (10) of oil feeder with a dia. 6 mm bolt, and remove tab washer (11). Remove pressure plate (10), spring (14), and piston (12) from oil feeder housing (13).



W4GB-03-02-043

6. Remove stator shaft (15) from oil feeder housing (13).

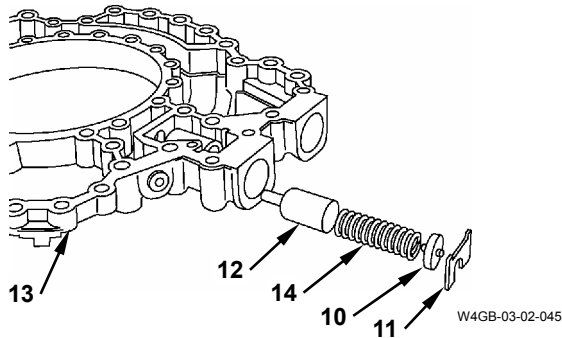


W4GB-03-02-044

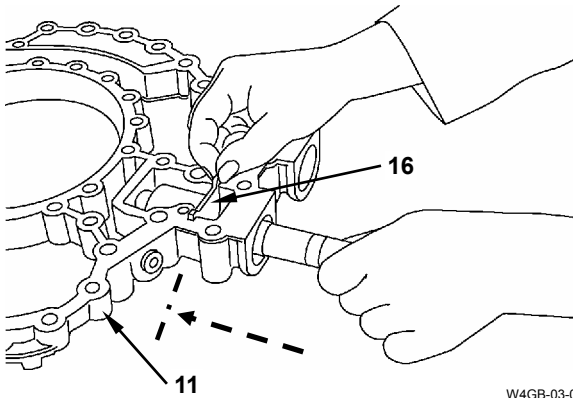
## BODY (TRAVEL SYSTEM) / Drive Unit

### ASSEMBLY OF OIL FEEDER

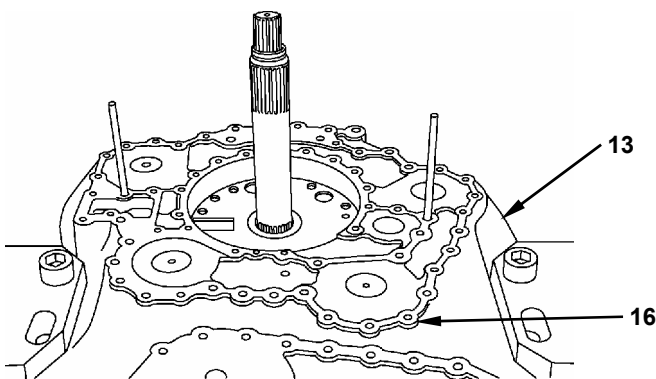
1. Install piston (12), spring (14), and pressure plate (10) in this order to oil feeder housing (13).



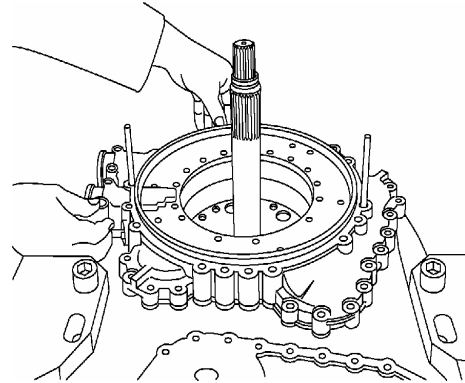
2. Push pressure plate (10) with a dia. 6 mm bolt. Secure pressure plate (10) with tab washer (11).



3. Install the guide screws (2 used) to oil feeder housing (13). Apply a little grease to gasket (16).

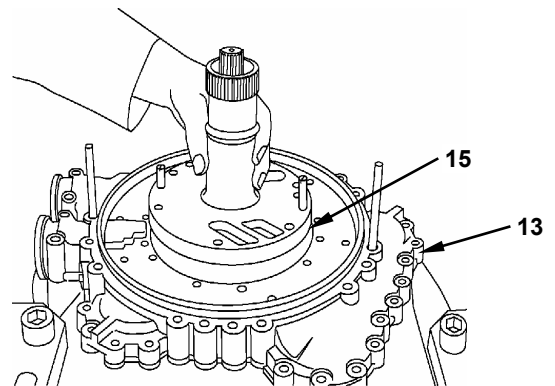


4. Place the oil feeder.



5. Install the guide screws to the oil feeder. Install stator shaft (15) to oil feeder housing (13).

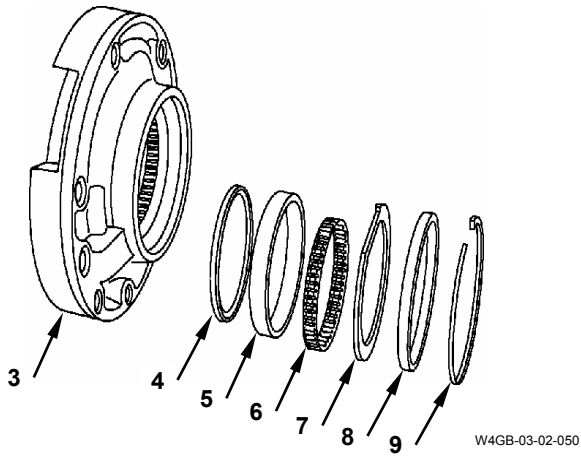
**IMPORTANT: Install stator shaft (15) carefully in order not to incline.**



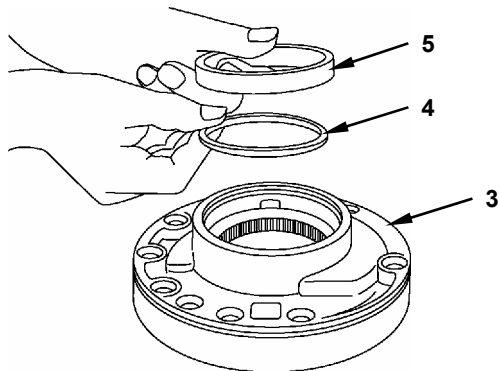


## BODY (TRAVEL SYSTEM) / Drive Unit

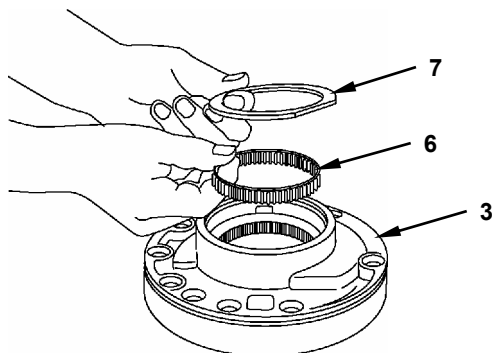
### ASSEMBLY OF PUMP



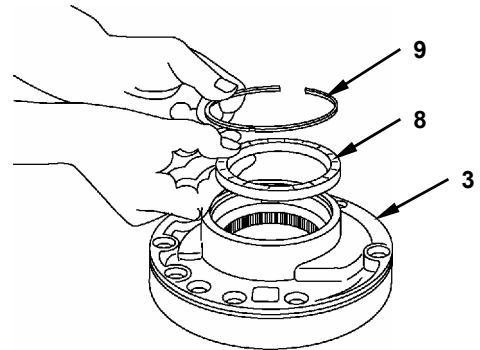
1. Install ring (4) and bearing outer (5) to pump housing (3).



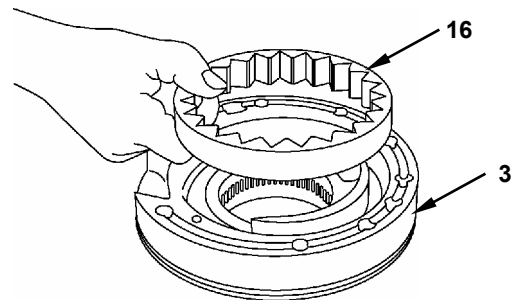
2. Install bearing inner (6) and support shim (7) to pump housing (3).



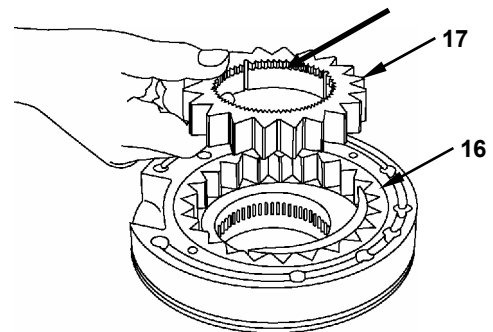
3. Install seal (8) with the lip part facing downward to pump housing (3). Secure seal (8) with snap ring (9).



4. Turn the chamfered side downward and install outer rotor (16) to pump housing (3).



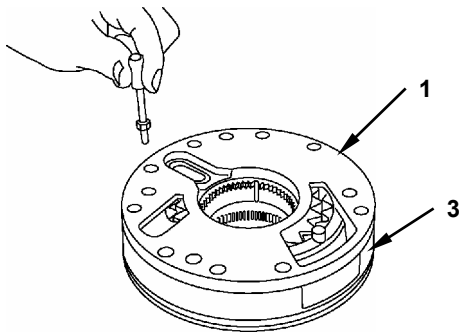
5. Turn the spline part upwards and install outer rotor (16) to inner rotor (17).



## BODY (TRAVEL SYSTEM) / Drive Unit

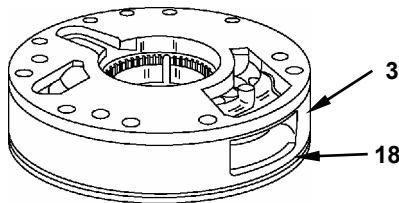
6. Align cam disc (1) with pump housing (3). Tighten the cap screws (2 used) by hand and return 1/2 turn from the position where resistance is felt.

**IMPORTANT: Do not tighten the cap screw. Refer to the figure for the mounting location and direction.**



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7. Install O-ring (18) to pump housing (3). Apply oil to O-ring (18).

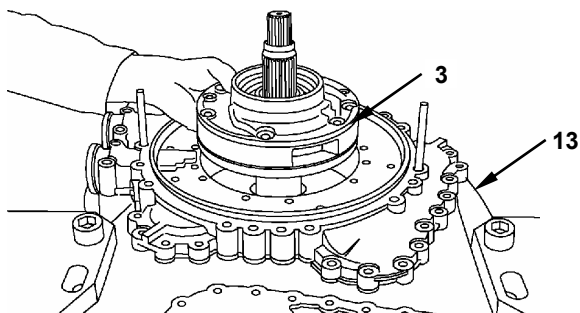


W4GB-03-02-057

8. Install the temporary assembled pump with cap screws (3 used).

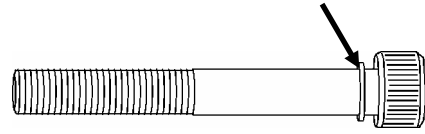
**IMPORTANT: Install the pump carefully in order not to incline.**

9. Install the pump housing (3) assembly to oil feeder housing (13). Remove the cap screws (3 used) again.




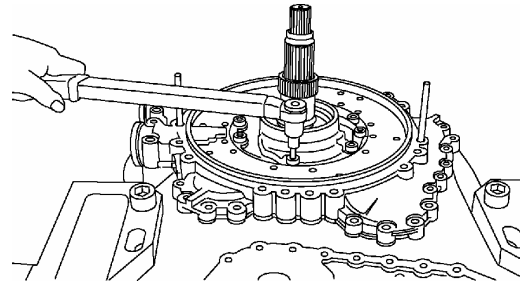
W4GB-03-02-058

10. Install oil applied new O-ring to the cap screw.











W4GB-03-02-059

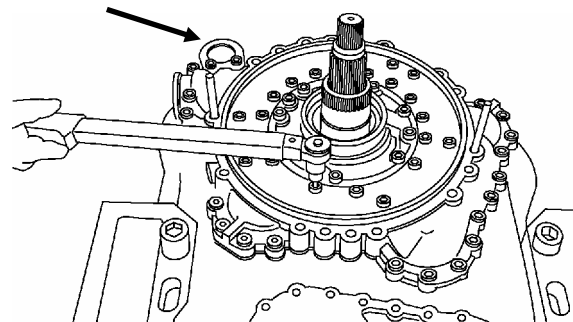
11. Install the pump with the cap screws.  
 : 46 N·m (4.7 kgf·m, 34 lbf·ft)



W4GB-03-02-060

12. Install oil feeder housing (13) with the cap screws. Place the fixing plate to the arrow part.

-  : 6 mm  
 M8 × 45 mm (21 used)  
 : 23 N·m (2.3 kgf·m, 17 lbf·ft)  
 : 6 mm  
 M8 × 30 mm (15 used)  
 : 23 N·m (2.3 kgf·m, 17 lbf·ft)  
 : 6 mm  
 M8 × 60 mm (4 used)  
 : 23 N·m (2.3 kgf·m, 17 lbf·ft)  
 : 6 mm  
 M8 × 40 mm (2 used)  
 : 34 N·m (3.5 kgf·m, 25 lbf·ft)



W4GB-03-02-061

## BODY (TRAVEL SYSTEM) / Drive Unit

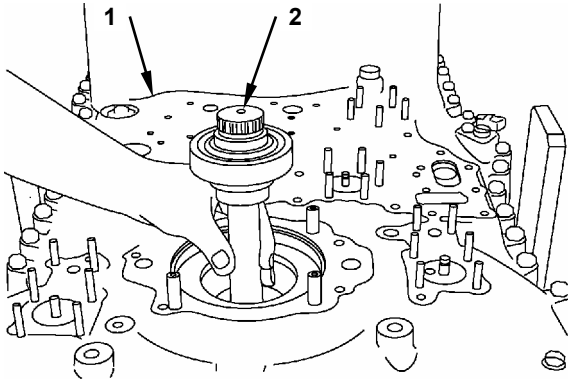
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## BODY (TRAVEL SYSTEM) / Drive Unit

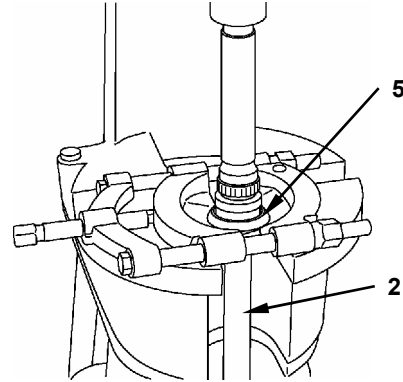
### REMOVAL OF PTO SHAFT

1. Remove the retaining ring from housing (1). Remove the PTO shaft (2) assembly from housing (1).



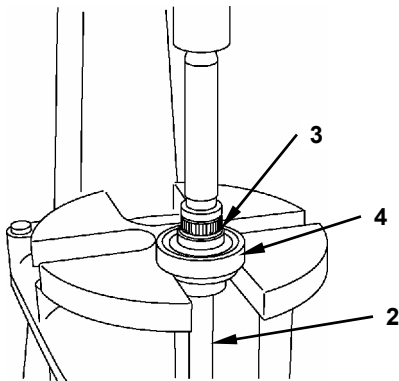
W4GB-03-02-062

3. Remove taper roller bearing (5) from PTO shaft (2).



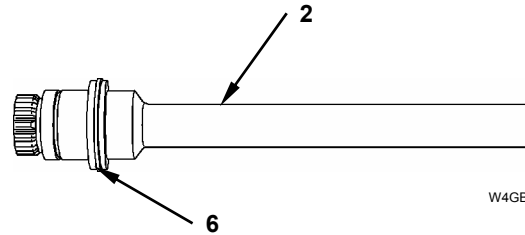
W4GB-03-02-064

2. Remove retaining ring (3) from PTO shaft (2). Remove ball bearing (4) from shaft (1) using a press.



W4GB-03-02-063

4. Remove piston ring (6) from PTO shaft (2).

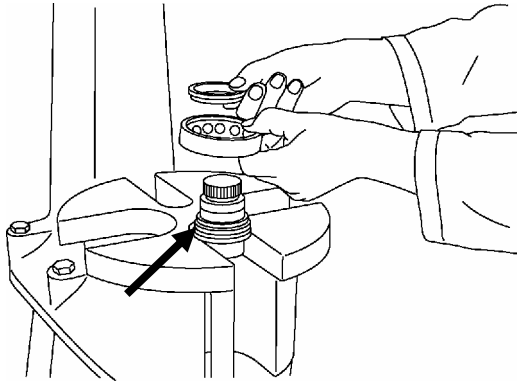


W4GB-03-02-065

## BODY (TRAVEL SYSTEM) / Drive Unit

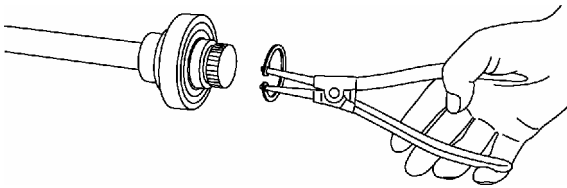
### INSTALLATION OF PTO SHAFT

1. Press lower part inner ring (arrow) of bearing (5) to PTO shaft (2), and install the outer ring. Then, install upper part inner ring.



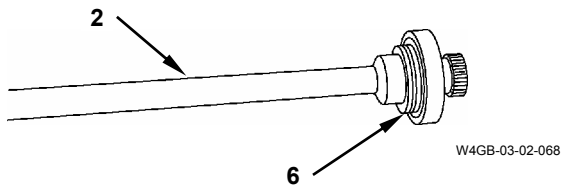
W4GB-03-02-066

2. Choose the thickness of the retaining ring so that the clearance of shaft orientation of ball bearing (4) will be 0 to 0.5 mm (0 to 0.02 in). Install retaining ring (3) to PTO shaft (2).



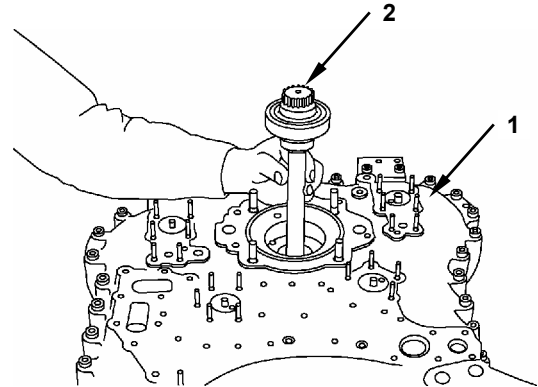
W4GB-03-02-067

3. Install piston ring (6) to PTO shaft (2).



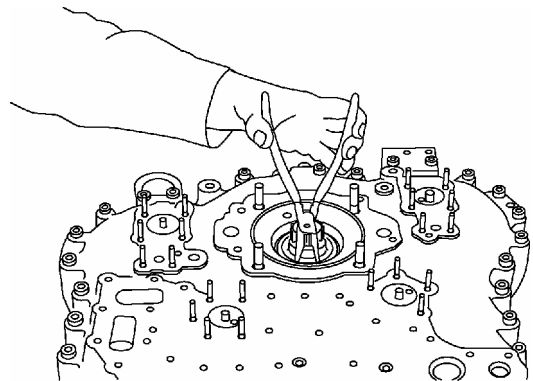
W4GB-03-02-068

4. Apply grease to piston ring (6). Install the PTO shaft (2) assembly to housing (1).



W4GB-03-02-069

5. Install the retaining ring to PTO shaft (2).



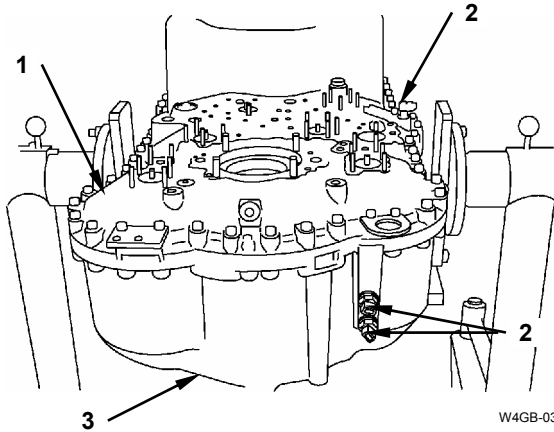
W4GB-03-02-070

## BODY (TRAVEL SYSTEM) / Drive Unit

### REMOVAL OF CLUTCH AND INPUT/OUTPUT SHAFT

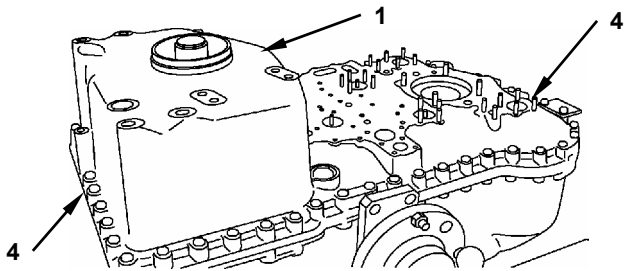
#### Removal of Housing Cover

1. Remove speed sensors (2) (3 used) from housing cover (1) and housing (3).



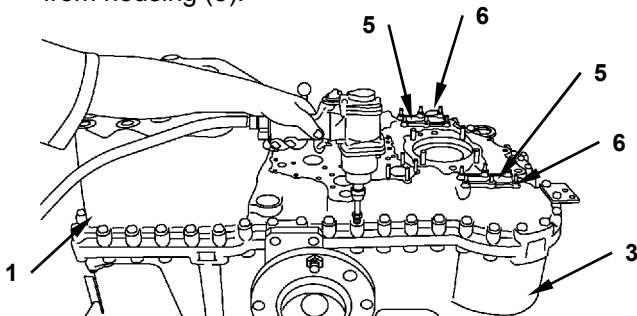
W4GB-03-02-071

2. Remove positioning dowel pins (4) (2 used) from housing cover (1).



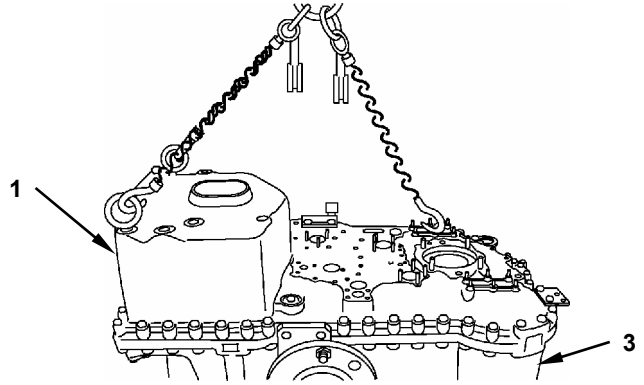
W4GB-03-02-072

3. Remove nuts (6) (12 used) from manifold covers (5) (2 used). Remove manifold covers (5) (2 used) from housing cover (1). Remove the socket bolt from housing cover (1). Remove housing cover (1) from housing (3).



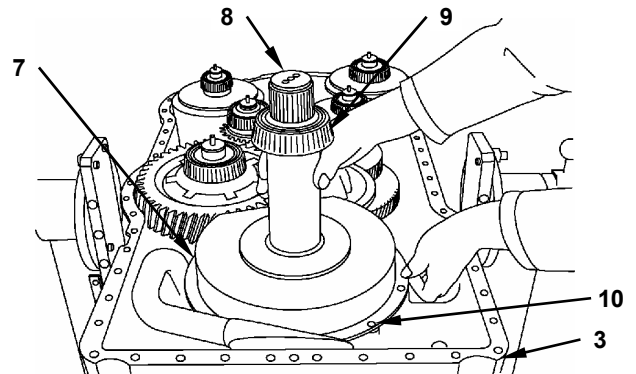
W4GB-03-02-073

4. Install eye bolts (M20, Pitch 2.5 mm) (2 used) to housing cover (1) as shown in the figure. Hoist and remove housing cover (1) from housing (3).



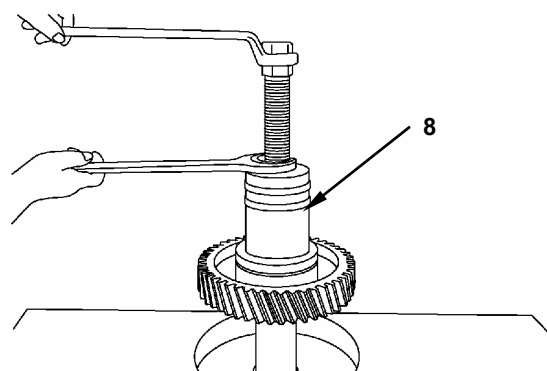
W4GB-03-02-074

5. Remove cap screws (10) (8 used) from screen sheet (7). Remove the output shaft (8) assembly from housing (3).



W4GB-03-02-075

6. Remove taper roller bearings (9) (2 used) from both sides of output shaft (8).



W4GB-03-02-076

## BODY (TRAVEL SYSTEM) / Drive Unit

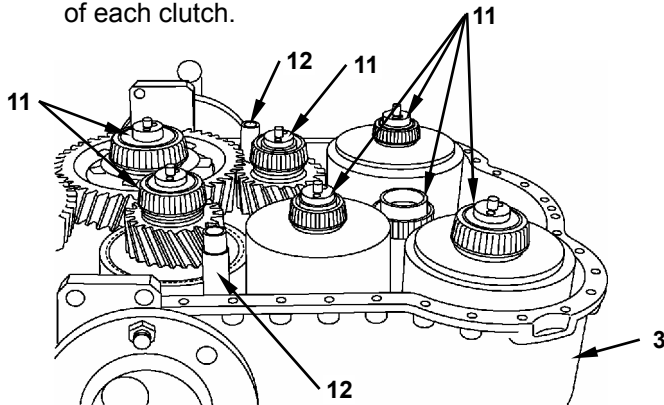
### Removal of Clutch

**IMPORTANT: A special tool is required for removal of clutch.**

**ZF No: 5870 260 010**

**Name: Handle**

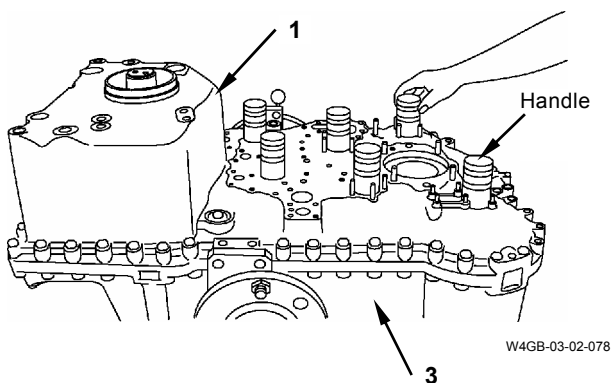
7. Remove oil pipes (12) (2 used) from housing (3) and piston rings (11) (7 used) from shafts (7 used) of each clutch.



W4GB-03-02-077

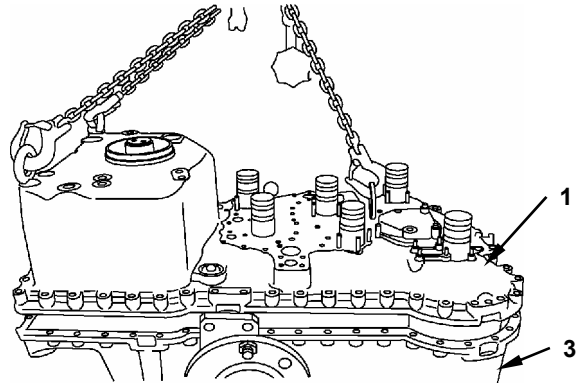
8. Install housing cover (1) to housing (3) again. Check that both sides match completely and install the handle to the shaft of all clutches.

**IMPORTANT: Flat washer and nut (M10) can be used for the handle as used in the figure.**



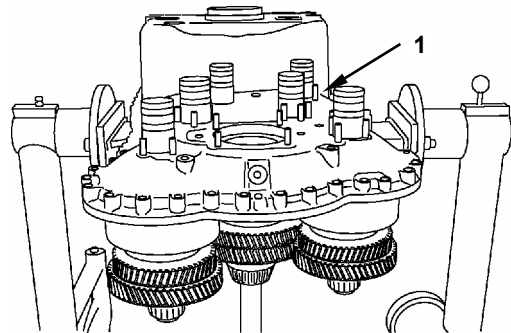
W4GB-03-02-078

9. Hoist and remove the housing cover (1) assembly from housing (3) with the clutch.



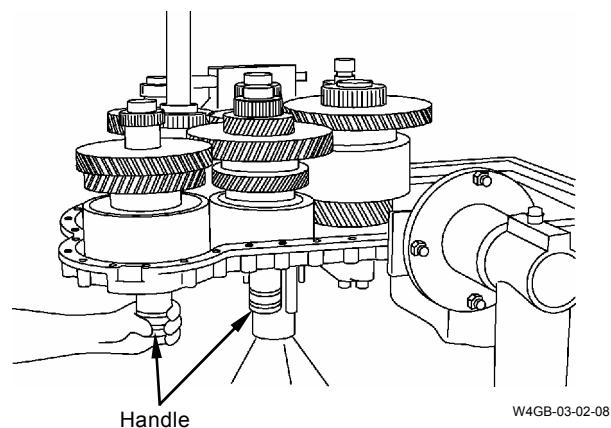
W4GB-03-02-079

10. Install the housing cover (1) assembly to the maintenance stand.



W4GB-03-02-080

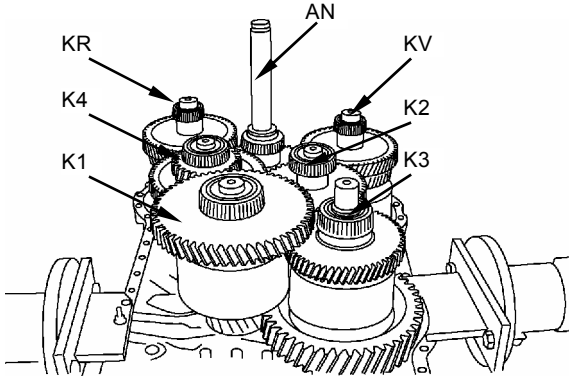
11. Reverse the housing cover (1) assembly and remove all handles.



W4GB-03-02-081

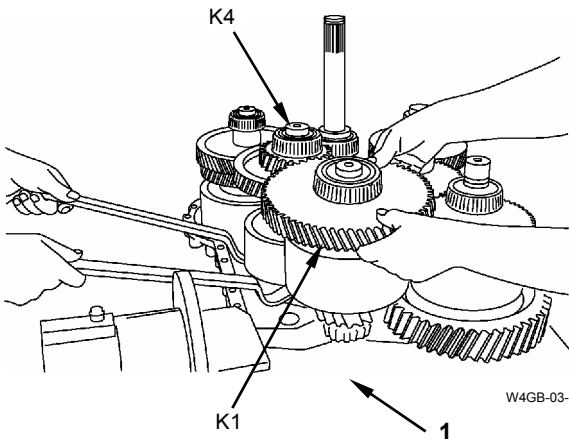
## BODY (TRAVEL SYSTEM) / Drive Unit

12. The following figure shows the configuration of the clutches left in the housing cover (1). The numbers at the shaft end of the clutches correspond to the types of clutches. Record the numbers in order to be clear about the fitting positions of clutches when assembling.



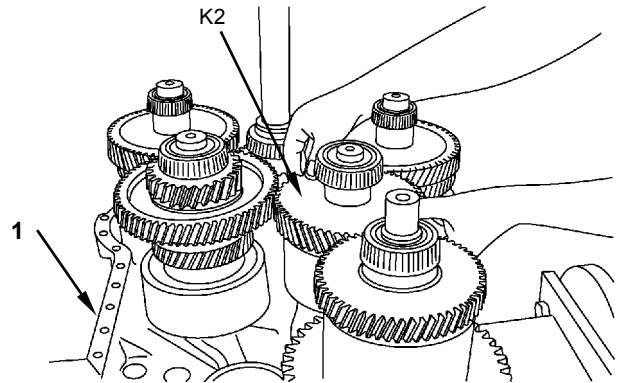
W4GB-03-02-082

13. Raise clutch (K4) a little from housing cover (1) and hold it. Remove clutch (K1) from housing cover (1). Return clutch (K4).



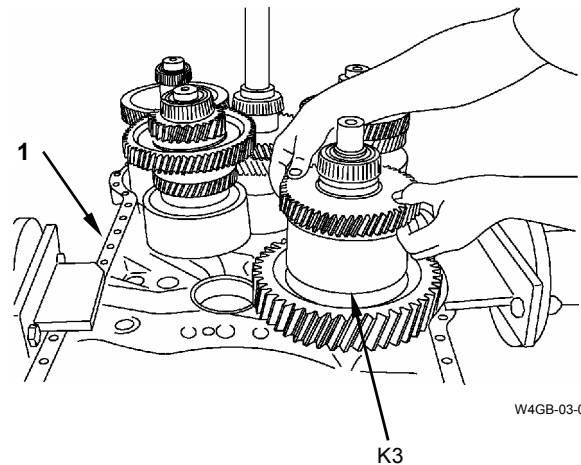
W4GB-03-02-083

14. Remove clutch (K2) from housing cover (1).



W4GB-03-02-084

15. Remove clutch (K3) from housing cover (1).

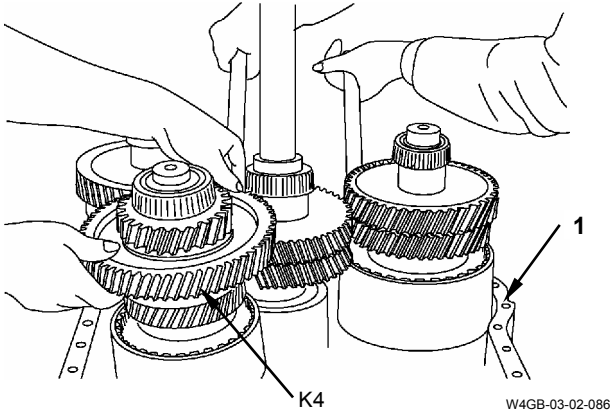


W4GB-03-02-085

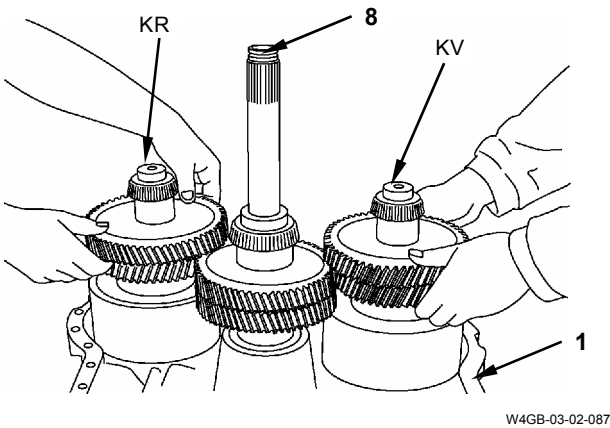


## BODY (TRAVEL SYSTEM) / Drive Unit

16. Raise clutches (KV) and (KR) a little from housing cover (1) at the same time and hold them. Remove clutch (K4) from housing cover (1).

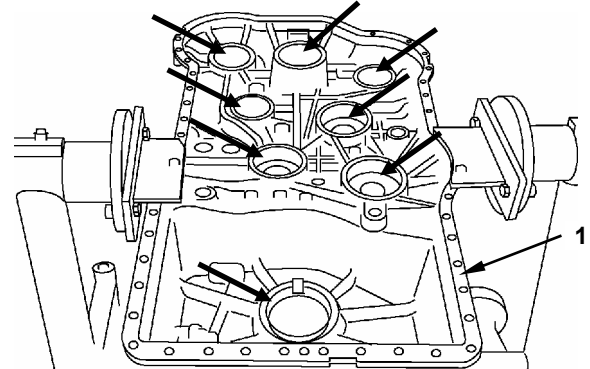


17. Raise clutch (KV), clutch (KR) and clutch shaft (8) (AN) at the same time and remove them from housing cover (1).



18. Remove outer rings (8 used) of the taper roller bearing from housing cover (1).

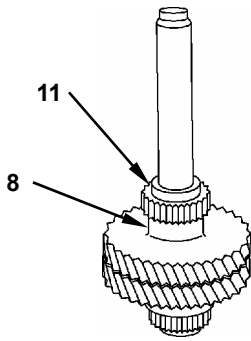
**IMPORTANT:** Do not change any combinations of the outer ring and the inner ring of the taper roller bearing used for each clutch and clutch shaft. Put matching marks on the outer rings and the inner rings.



## BODY (TRAVEL SYSTEM) / Drive Unit

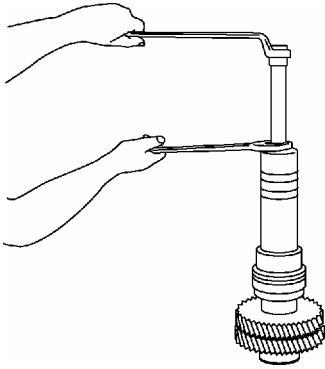
### Disassembly of Clutch Shaft (8) (AN)

19. Remove piston ring (11) from shaft (8).



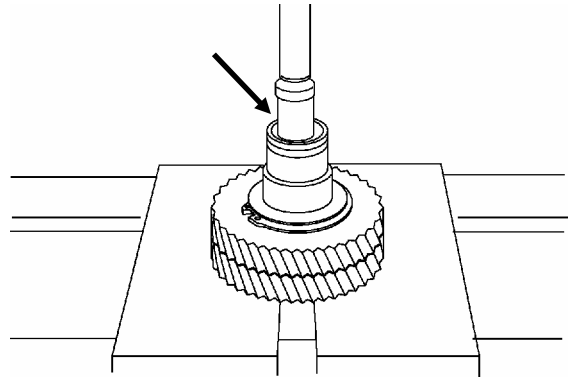
W4GB-03-02-089

20. Remove the taper roller bearing of clutch shaft (8) on both sides.



W4GB-03-02-090

**IMPORTANT:** As the movement of the turbine shaft is secured in the shaft direction with the internal snap ring, it can not be removed in the usual manner. Use a press when removing, but either or both shafts will be damaged.



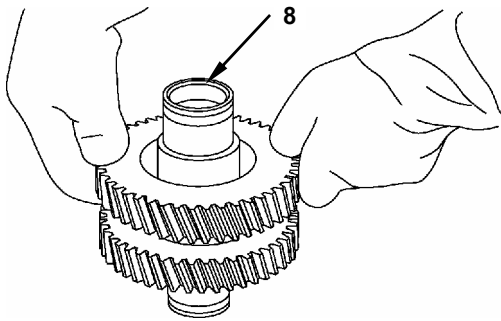
W4GB-03-02-091

## BODY (TRAVEL SYSTEM) / Drive Unit

### INSTALLATION OF CLUTCH AND INPUT/OUTPUT SHAFT

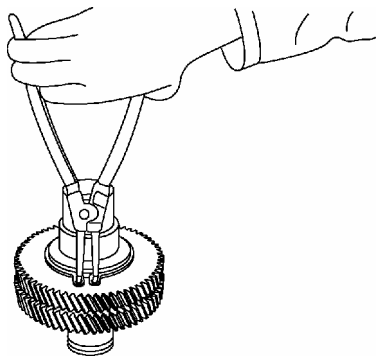
#### Assembly of Clutch Shaft (8)

1. Cool clutch shaft (8) to about  $-80\text{ }^{\circ}\text{C}$  ( $-47\text{ }^{\circ}\text{F}$ ). Heat the input gear (AN) to about  $+120\text{ }^{\circ}\text{C}$  ( $248\text{ }^{\circ}\text{F}$ ) and install in to clutch shaft (8).



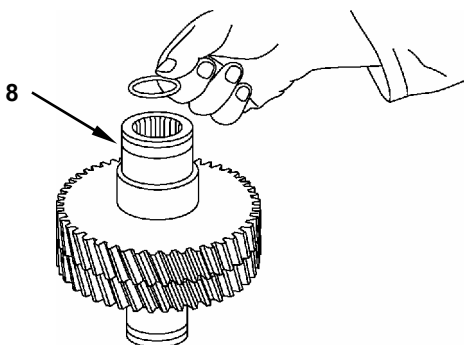
W4GB-03-02-092

2. Install the retaining ring to clutch shaft (8). Secure input gear (AN) to clutch shaft (8).



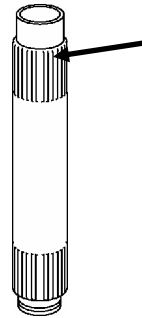
W4GB-03-02-093

3. Install O-ring to clutch shaft (8) inner side.



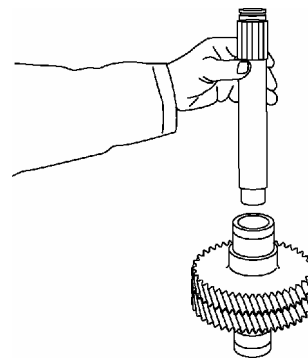
W4GB-03-02-094

4. Install O-ring to the turbine shaft.



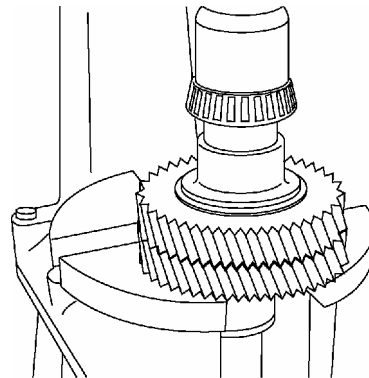
W4GB-03-02-095

5. Install the turbine shaft to input gear (AN).



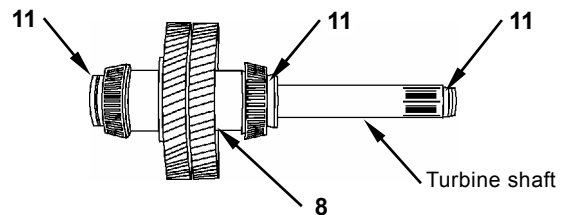
W4GB-03-02-096

6. Press and install the inner ring of the taper roller bearing to both ends of input gear (AN).



W4GB-03-02-097

7. Install piston ring (11) to the arrow part of clutch shaft (8) and the turbine shaft.



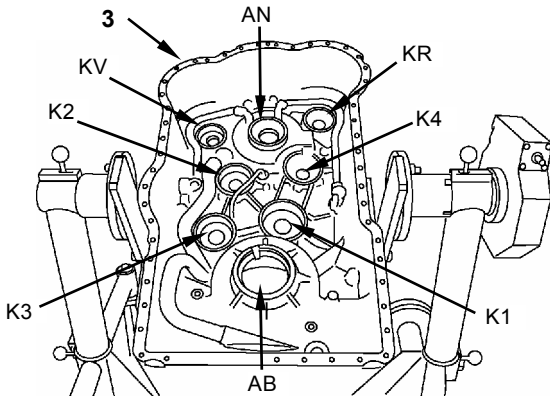
W4GB-03-02-098

## BODY (TRAVEL SYSTEM) / Drive Unit

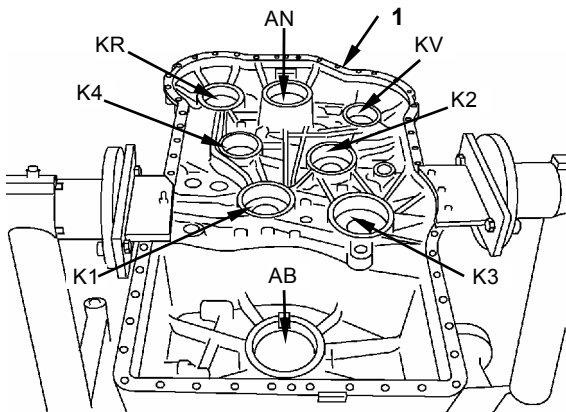
### Installation of Clutch Shaft and Each Clutch

8. Install the outer ring corresponding to the taper roller bearing of each clutch shaft end to housing (3) and housing cover (1).

**IMPORTANT:** Refer to the figure for the mounting locations. Do not change the combinations of the outer rings and the inner rings of bearings.

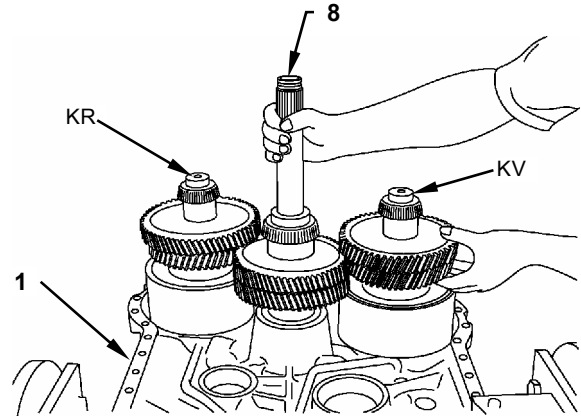


W4GB-03-02-099



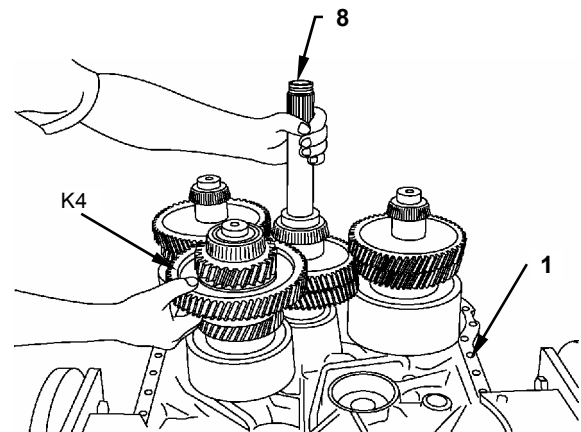
W4GB-03-02-100

9. Install clutch (KR), clutch shaft (8), and clutch (KV) to housing cover (1) at the same time.



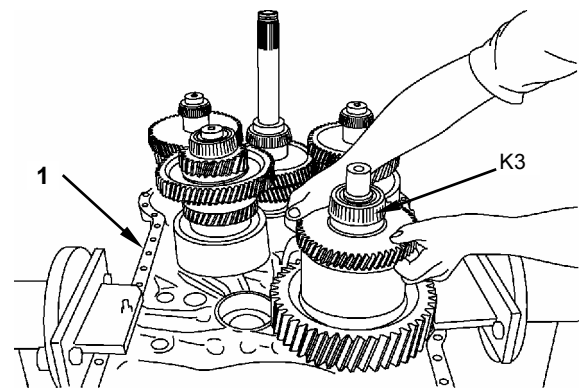
W4GB-03-02-101

10. Raise clutch shaft (8) a little and install clutch (K4) to housing cover (1).



W4GB-03-02-102

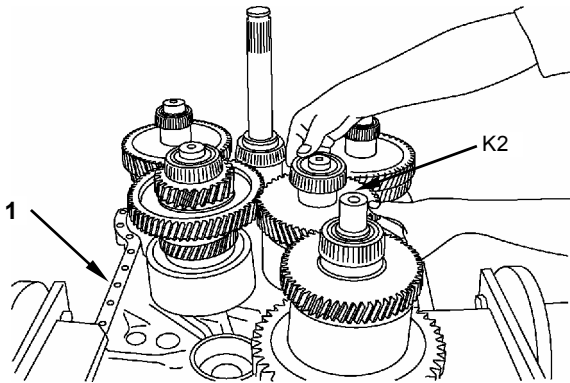
11. Install clutch (K3) to housing cover (1).



W4GB-03-02-103

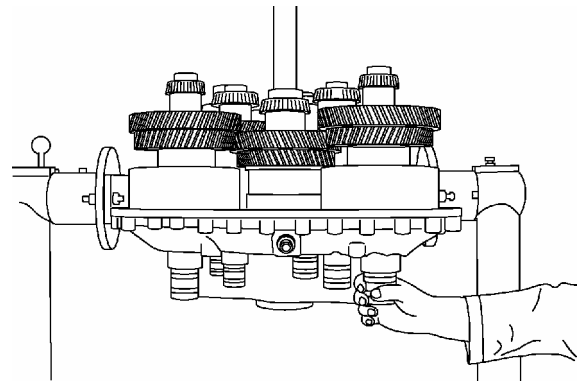
## BODY (TRAVEL SYSTEM) / Drive Unit

12. Place clutch (K2) to housing cover (1).



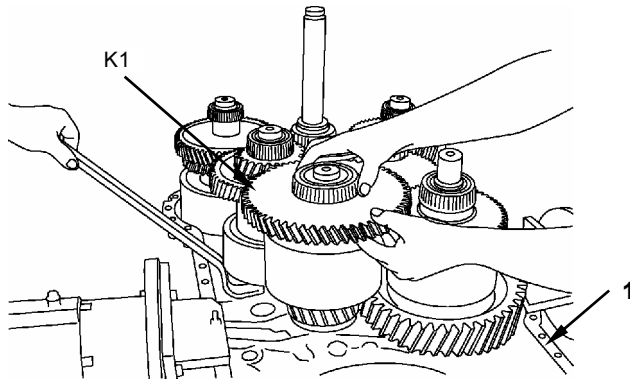
W4GB-03-02-104

15. Install the handle for securing to each clutch shaft.



W4GB-03-02-107

13. Raise clutch (K4) a little and place clutch (K1) to housing cover (1).

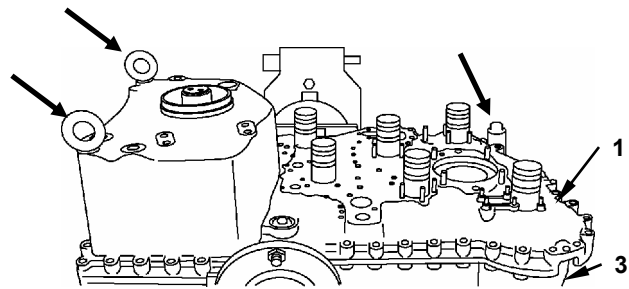


W4GB-03-02-105

16. Turn housing cover (1) 180 degrees and install eyebolt and eyenut to the arrow part.

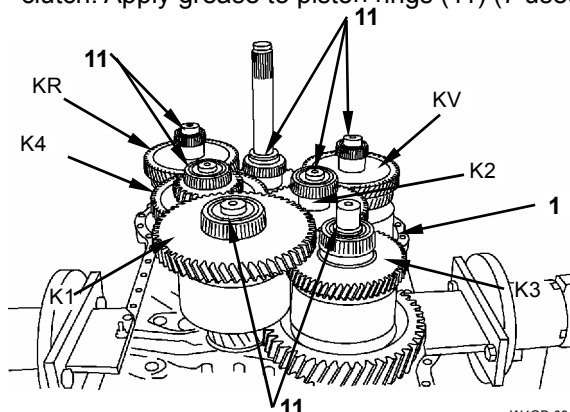
Eyebolt: M20 (2 used)

Eyenut: M12 (1 used)



W4GB-03-02-108

14. Check that each gear engages securely and that each clutch is installed in the right position. Install piston rings (11) (7 used) to the arrow part of each clutch. Apply grease to piston rings (11) (7 used).



W4GB-03-02-106

17. Remove housing cover (1) from the maintenance stand. Install housing (3) to maintenance stand.

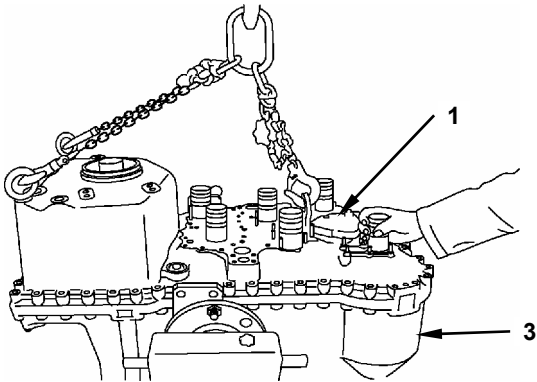
18. Install housing cover (1) with the installed clutch carefully to housing (3).

19. Check that the housing cover (1) is correctly installed to housing (1).

## BODY (TRAVEL SYSTEM) / Drive Unit

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20. Remove the handle for securing each clutch and remove housing cover (1) from housing (3).

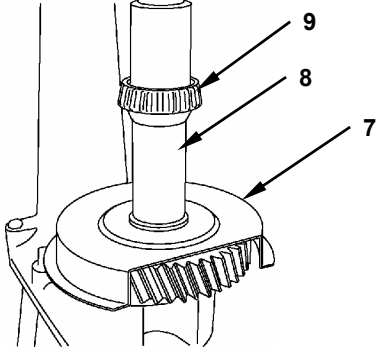


W4GB-03-02-109

## BODY (TRAVEL SYSTEM) / Drive Unit

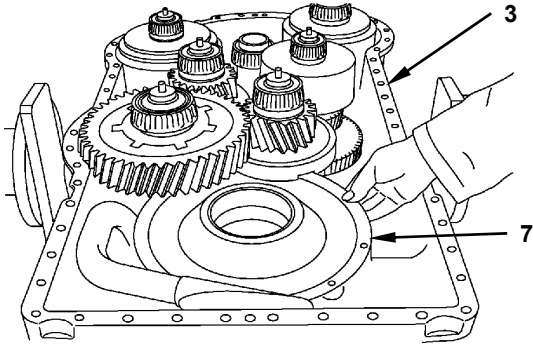
### Installation of Output Shaft (8)

21. Install screen sheet (7) through output shaft (8) and install inner ring to bearing (9).




W4GB-03-02-110

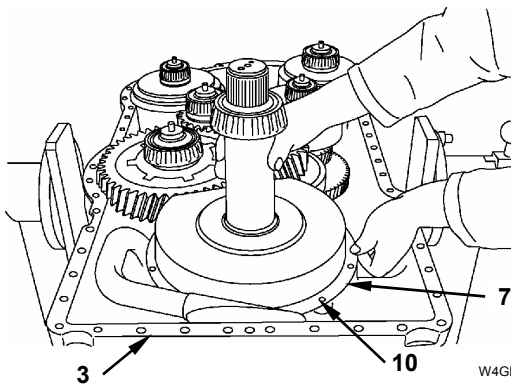
22. Place screen sheet (7) to housing (3).



W4GB-03-02-111

23. Install output shaft (8). Align the holes of each screen sheet (7), and install it to housing (3) with capscrews (10) (8 used).

 : 23 N·m (2.3 kgf·m, 17 lbf·ft)

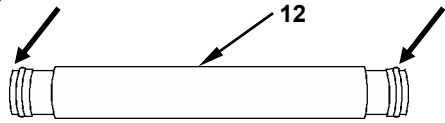


W4GB-03-02-112

## BODY (TRAVEL SYSTEM) / Drive Unit

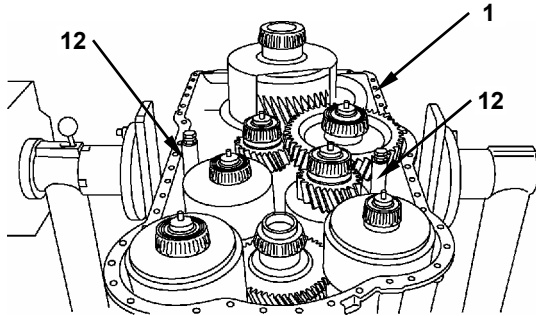
### Installation of Housing Cover

24. Install O-rings to both ends of oil pipes (12) (2 used).



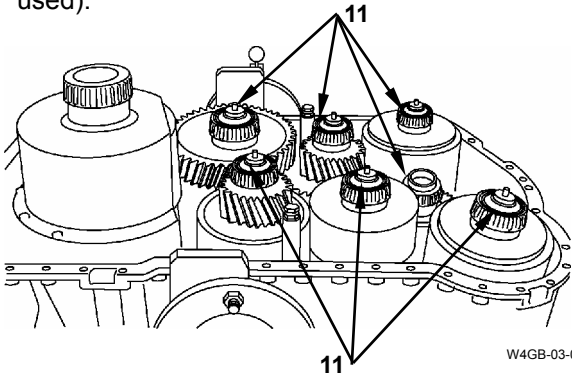
W4GB-03-02-113

25. Install oil pipes (12) (2 used) to housing cover (1).



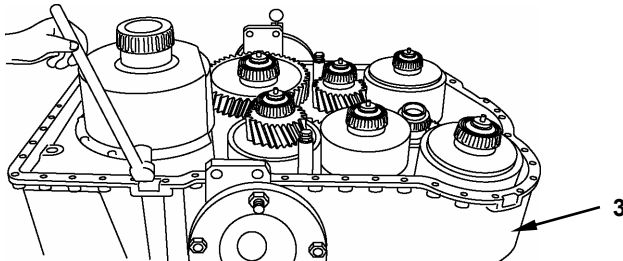
W4GB-03-02-114

26. Install piston rings (11) (7 used) to the shaft end of each clutch. Apply grease to piston rings (11) (7 used).



W4GB-03-02-115

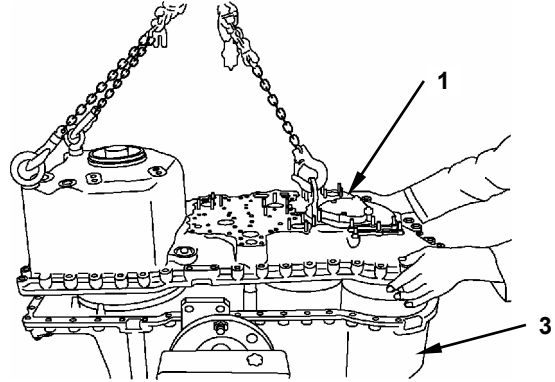
27. Apply Form-In-Place Gasket (LOCTITE #574) to the cover mating face of housing (3).



W4GB-03-02-116

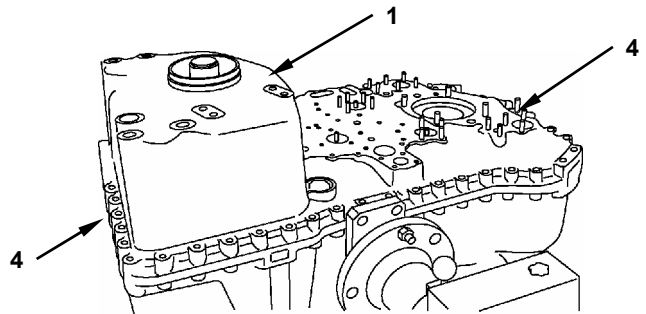
28. Install housing cover (1) to housing (3) carefully.

**IMPORTANT:** Check the positions of the holes of housing cover (1) and oil pipes (12) (2 used) when installation.



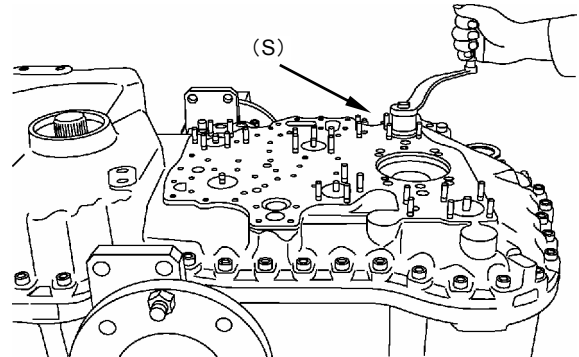
W4GB-03-02-117

29. Install dowel pins (4) (2 used) to housing cover (1).



W4GB-03-02-118

30. Install the driver to the shaft part of clutch (KV), and check that it turns. Check all clutches, and if any abnormality is found, disassemble again, trace and correct the reason.




W4GB-03-02-119




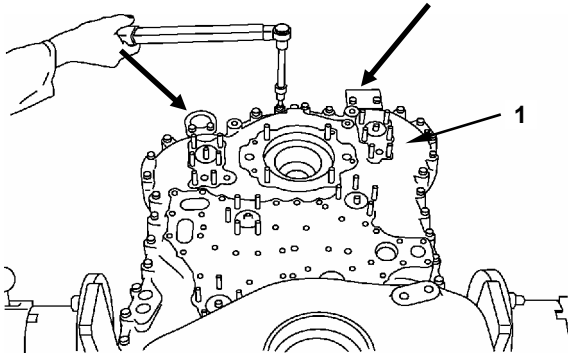
## BODY (TRAVEL SYSTEM) / Drive Unit

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31. Install housing cover (1) to housing (3) with socket bolts.

 : 14 mm

 : 46 N·m (4.7 kgf·m, 34 lbf·ft)

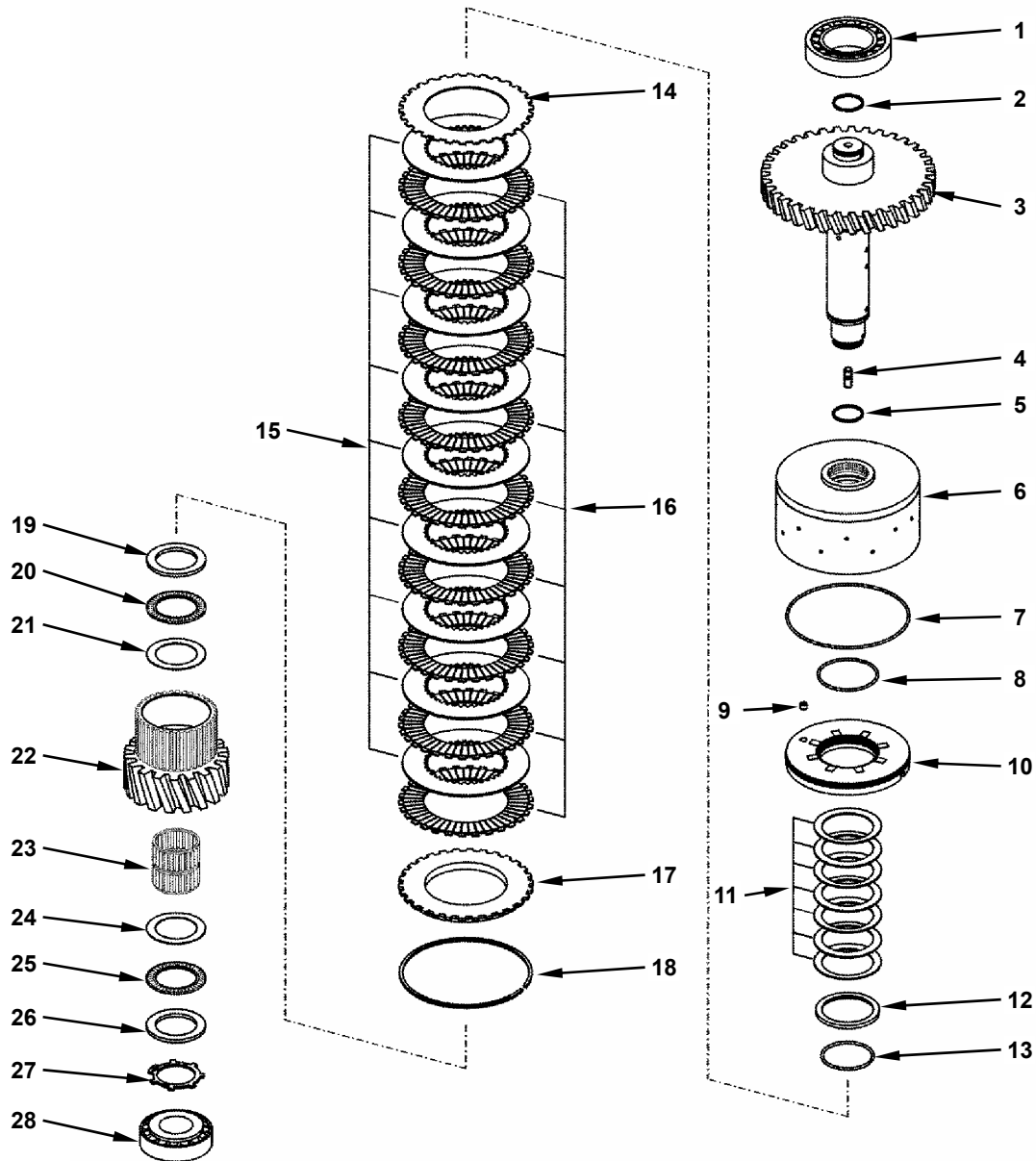


W4GB-03-02-120

## BODY (TRAVEL SYSTEM) / Drive Unit

### DISASSEMBLY OF CLUTCHES K1, K2 AND K3

#### Disassembly of Clutch K1

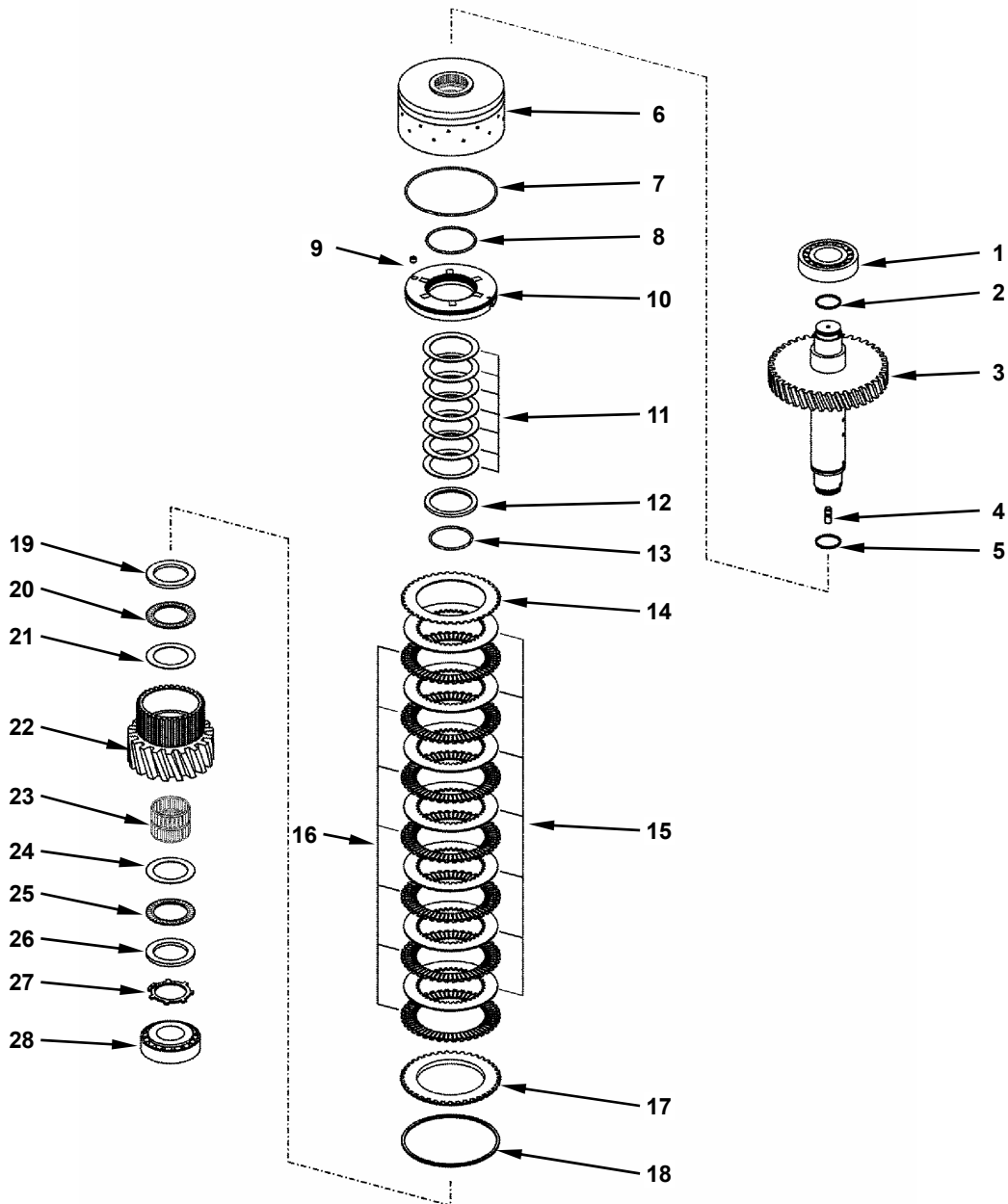


W4GB-03-02-121

- |                          |                          |                                 |                            |
|--------------------------|--------------------------|---------------------------------|----------------------------|
| 1 - Taper Roller Bearing | 8 - O-Ring               | 15 - Inner Clutch Disc (9 Used) | 22 - Idler                 |
| 2 - Piston Ring          | 9 - Valve                | 16 - Outer Clutch Disc (9 Used) | 23 - Needle Cage           |
| 3 - Shaft                | 10 - Piston              | 17 - End Shim                   | 24 - Auxiliary Washer      |
| 4 - Stud                 | 11 - Cup Spring (7 Used) | 18 - Snap Ring                  | 25 - Auxiliary Needle Cage |
| 5 - Piston Ring          | 12 - Guide Ring          | 19 - Running Disc               | 26 - Running Disc          |
| 6 - Disc Carrier         | 13 - Snap Ring           | 20 - Auxiliary Needle Cage      | 27 - Retaining Ring        |
| 7 - O-Ring               | 14 - Disc                | 21 - Auxiliary Washer           | 28 - Taper Roller Bearing  |

## BODY (TRAVEL SYSTEM) / Drive Unit

### Disassembly of Clutch K2

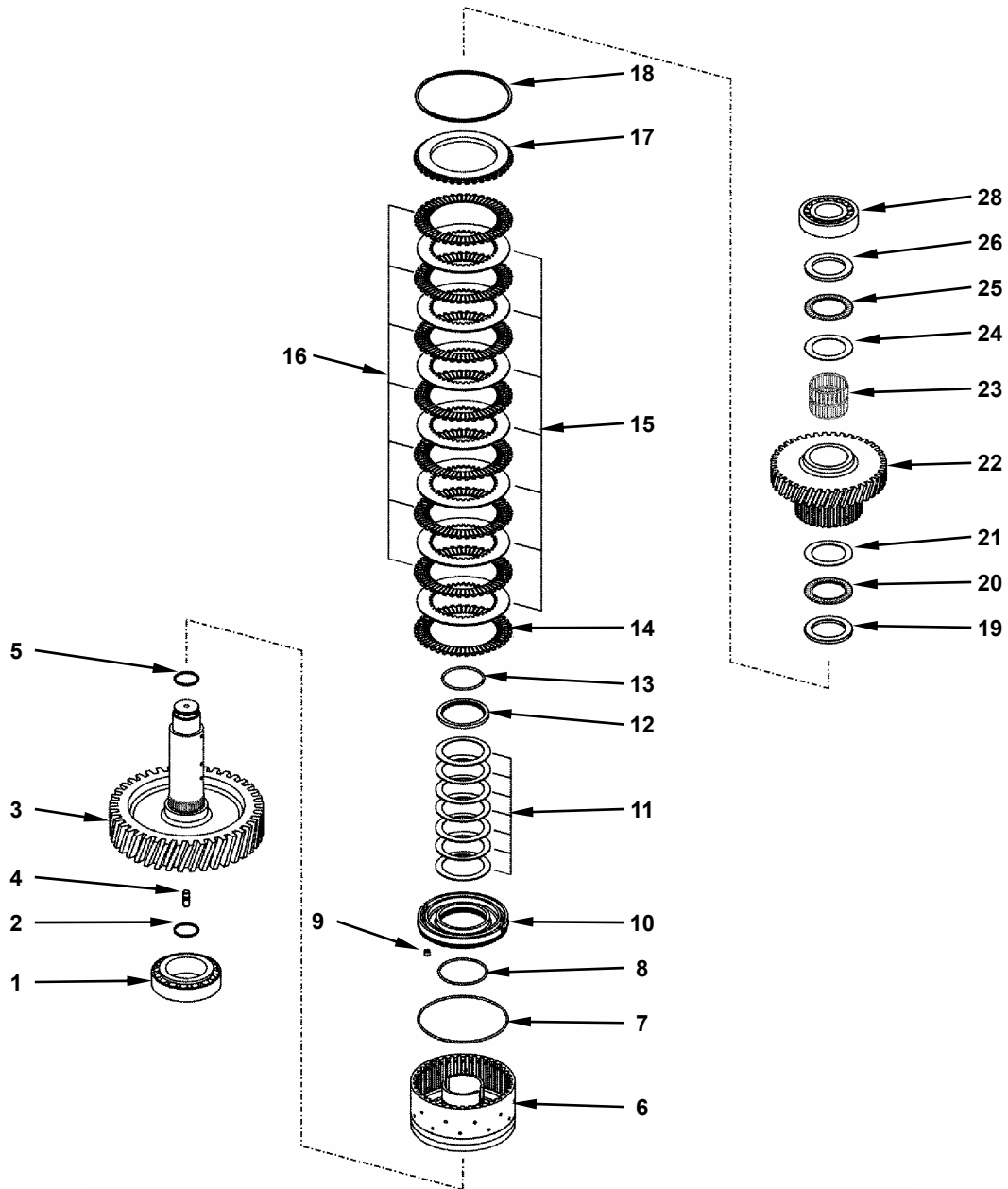


W4GB-03-02-122

- |                          |                          |                                 |                            |
|--------------------------|--------------------------|---------------------------------|----------------------------|
| 1 - Taper Roller Bearing | 8 - O-Ring               | 15 - Inner Clutch Disc (7 Used) | 22 - Idler                 |
| 2 - Piston Ring          | 9 - Valve                | 16 - Outer Clutch Disc (7 Used) | 23 - Needle Cage           |
| 3 - Shaft                | 10 - Piston              | 17 - End Shim                   | 24 - Auxiliary Washer      |
| 4 - Stud                 | 11 - Cup Spring (7 Used) | 18 - Snap Ring                  | 25 - Auxiliary Needle Cage |
| 5 - Piston Ring          | 12 - Guide Ring          | 19 - Running Disc               | 26 - Running Disc          |
| 6 - Disc Carrier         | 13 - Snap Ring           | 20 - Auxiliary Needle Cage      | 27 - Retaining Ring        |
| 7 - O-Ring               | 14 - Disc                | 21 - Auxiliary Washer           | 28 - Taper Roller Bearing  |

# BODY (TRAVEL SYSTEM) / Drive Unit

## Disassembly of Clutch K3



W4GB-03-02-123

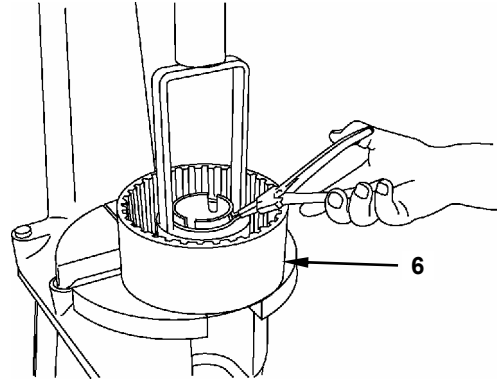
- |                          |                          |                                 |                            |
|--------------------------|--------------------------|---------------------------------|----------------------------|
| 1 - Taper Roller Bearing | 8 - O-Ring               | 15 - Inner Clutch Disc (7 Used) | 22 - Idler                 |
| 2 - Piston Ring          | 9 - Valve                | 16 - Outer Clutch Disc (7 Used) | 23 - Needle Cage           |
| 3 - Shaft                | 10 - Piston              | 17 - End Shim                   | 24 - Auxiliary Washer      |
| 4 - Stud                 | 11 - Cup Spring (7 Used) | 18 - Snap Ring                  | 25 - Auxiliary Needle Cage |
| 5 - Piston Ring          | 12 - Guide Ring          | 19 - Running Disc               | 26 - Running Disc          |
| 6 - Disc Carrier         | 13 - Snap Ring           | 20 - Auxiliary Needle Cage      | 28 - Taper Roller Bearing  |
| 7 - O-Ring               | 14 - Disc                | 21 - Auxiliary Washer           |                            |

## BODY (TRAVEL SYSTEM) / Drive Unit

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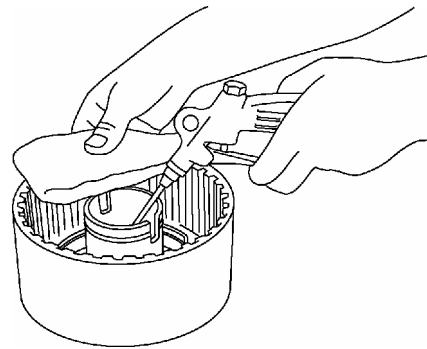
1. Remove piston rings (5, 2) from shaft (3).
2. Remove taper roller bearings (1, 28) from shaft (3). Remove stud (4) from shaft (3).
3. Remove running disc (26), auxiliary needle cage (25), and auxiliary washer (24) from disc carrier (6). For (K1) and (K2), remove retaining ring (27) first.
4. Remove idler (22) from disc carrier (6).
5. Remove needle cage (23), auxiliary washer (21), auxiliary needle cage (20), and running disc (19) from idler (22).
6. Remove disc carrier (6) from the shaft.
7. Remove snap ring (18) from disc carrier (6). Remove shim (17), outer clutch discs (16) (9 used), inner clutch discs (15) (9 used), and disc (14) (1 used) from disc carrier (6).

8. Compress spring (11) and remove snap ring (13) from disc carrier (6). Release the compression of the spring and remove guide ring (12) and cup springs (11) (7 used) from disc carrier (6).



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9. Supply low pressure air through the oil hole of disc carrier (6), and remove piston (10).



W4GB-03-02-125

10. Remove O-rings (7, 8) from the piston (10) bore part and the outer part.

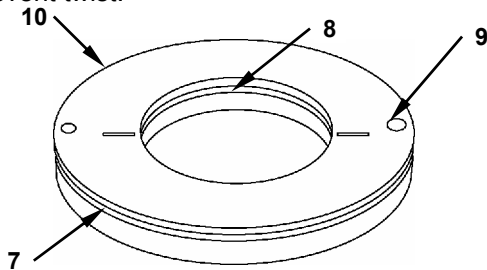
## BODY (TRAVEL SYSTEM) / Drive Unit

### ASSEMBLY OF CLUTCHES K1, K2 AND K3

#### Assembly of K1, K2 and K3

**IMPORTANT:** As clutches K1, K2, and K3 are similar, clutch K3 is explained as an example in this section.  
Refer to W3-2-63 and W3-2-64.

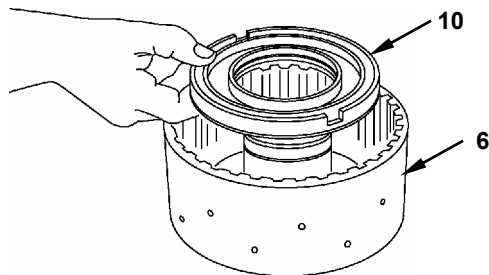
1. Install O-ring (8) to the bore of piston (10). Install O-ring (7) to the outer diameter of piston (10). Apply oil to O-ring when installing in order to prevent twist.



W4GB-03-02-126

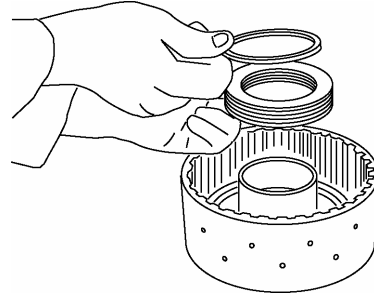
**IMPORTANT:** Check that the ball part of the valve (9) on piston (10) is not clogged.

2. Install piston (10) to disc carrier (6). Refer to the figure for the direction of the piston.



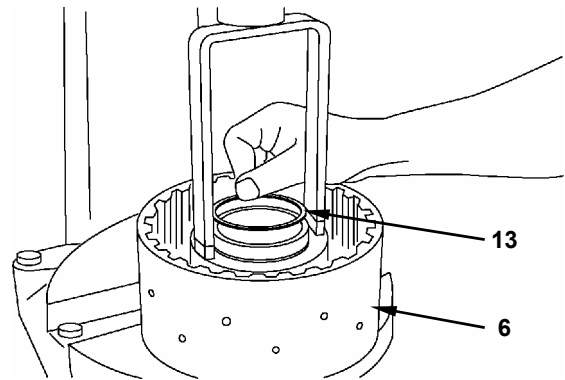
W4GB-03-02-127

3. Install cup springs (11) (7 used) and guide ring (12) to disc carrier (6).



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4. Compress cup spring (11) using an assembly tool. Secure cup spring (11) to disc carrier (6) with snap ring (13).

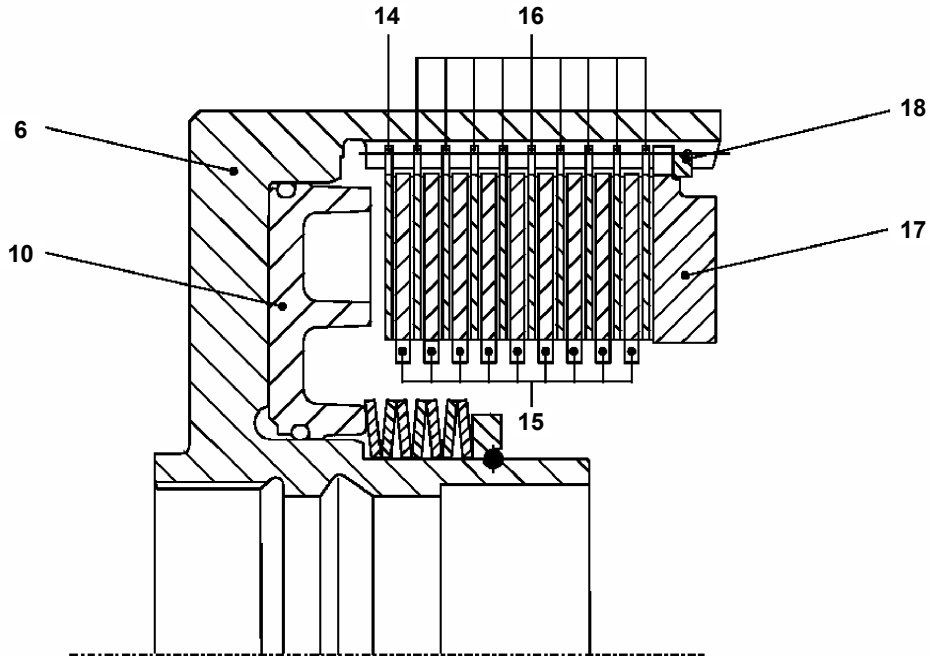


W4GB-03-02-129

## BODY (TRAVEL SYSTEM) / Drive Unit

### Clutch Disc Assembly Scheme (K1)

The following figure indicates the clutch disc configuration of clutch (K1).  
Refer to the next page for (K2) and (K3).



W4GB-03-02-130

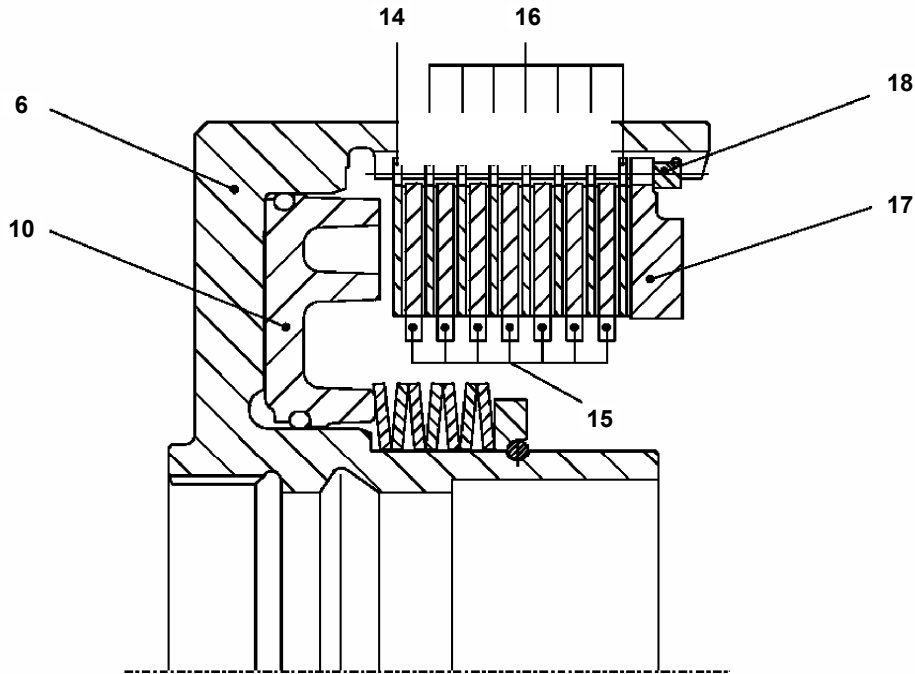
**IMPORTANT:** Turn the disc (14) side without coating to the piston side. Choose snap ring (18) so that disc clearance corresponds to the requirements on the next page.

Item number	Parts Name	Q'ty	Remarks
6	Disc Carrier	1	
10	Piston	1	
14	Disc	1	One side coating
16	Outer Clutch Disc	9	Two side coating
15	Inner Clutch Disc	9	
18	Snap Ring	1	Thickness: 2.1 to 4.2 mm (0.083 to 0.17 in)
17	End Shim	1	
Number of effective faying surfaces: 18			
Disc clearance: 2.4 to 2.6 mm (0.094 to 0.1 in)			

## BODY (TRAVEL SYSTEM) / Drive Unit

### Clutch Disc Assembly Scheme (K2 and K3)

The following figure indicates the clutch disc configuration for clutches(K2) and (K3). Both clutch discs (K2) and (K3) are the same.



W4GB-03-02-131

**IMPORTANT:** Turn the disc (14) side without coating to the piston side. Choose snap ring (18) so that disc clearance corresponds to the requirements on the next page.

Item number	Parts Name	Q'ty	Remarks
6	Disc Carrier	1	
10	Piston	1	
14	Disc	1	One side coating
16	Outer Clutch Disc	7	Two side coating
15	Inner Clutch Disc	7	
18	Snap Ring	1	Thickness: 2.1 to 4.2 mm (0.083 to 0.17 in)
17	End Shim	1	

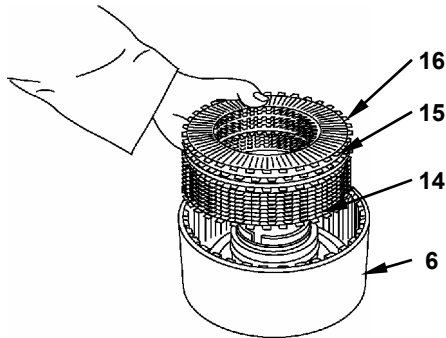
Number of effective faying surfaces: 14

Disc clearance: 1.8 to 2.0 mm (0.071 to 0.079 in)



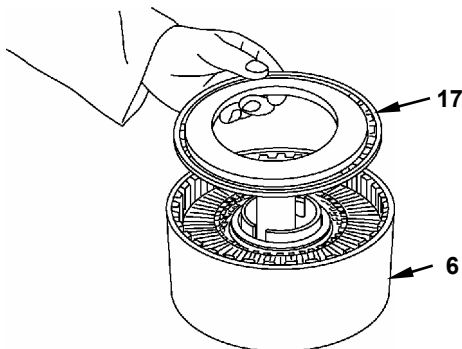
## BODY (TRAVEL SYSTEM) / Drive Unit

5. Install clutch discs (15, 16) and disc (14) to disc carrier (6). Do not apply oil to the disc in order to set the disc clearance correctly. Refer to W3-2-64 for the order of discs.



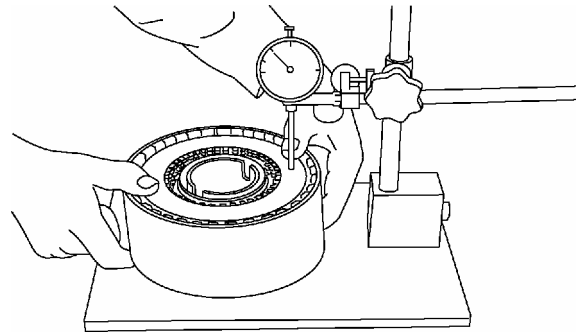
W4GB-03-02-132

6. Install end shim (17) to disc carrier (6). Secure end shim (17) with snap ring (18).  
Snap ring thickness: 3.15 mm (0.12 in) (standard value)



W4GB-03-02-133

7. Set dial gauge to the shim (17) part. Set the gauge to 0 (zero) when pressure of about 100 N (10 kgf, 22.5 lbf) is applied to shim. Then, write down the value of the dial gauge when the end shim is raised upwards. If the value is different from that indicated in the previous page, replace snap ring (18) with snap ring (18) of different thickness.



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8. After disc clearance adjustment, remove the disc. Apply oil to the disc and assemble again.
9. Apply LOCTITE #262 onto the thread part of the orifice and install it to the shaft.


**IMPORTANT: Install the orifice only to clutch (K1). Do not install it to (K2) and (K3).**

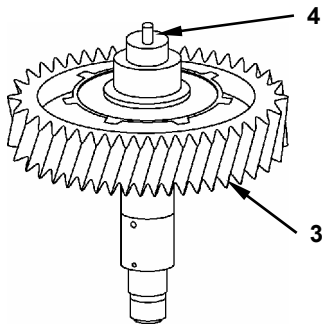
## BODY (TRAVEL SYSTEM) / Drive Unit

10. Install stud (4) to the shaft (3) side.

**IMPORTANT:** Install stud (4) to shaft (3) after installing and locking M10 nuts (2 used) to the stud (4) upper part. Remove M10 nuts (2 used) from stud (4) after installing stud (4) installation.

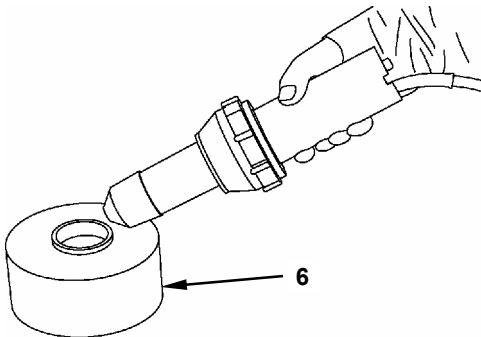
 : 14 mm

 : 17 N·m (1.7 kgf·m, 12.5 lbf·ft)



W4GB-03-02-135

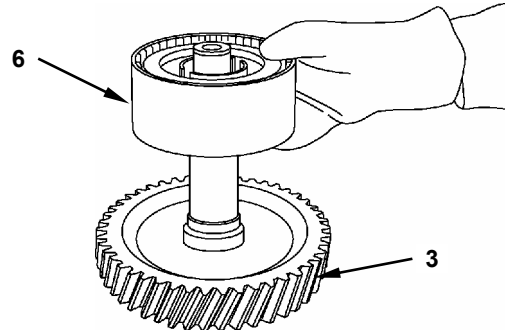
11. Heat the center section of disc carrier (6) to about 120 °C (248 °F)



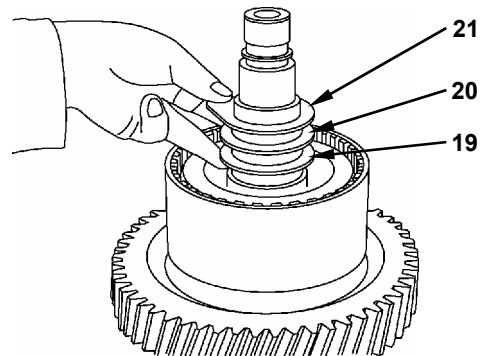
W4GB-03-02-136

12. Install disc carrier (6) to shaft (3).

 **CAUTION:** Wear fireproof gloves.

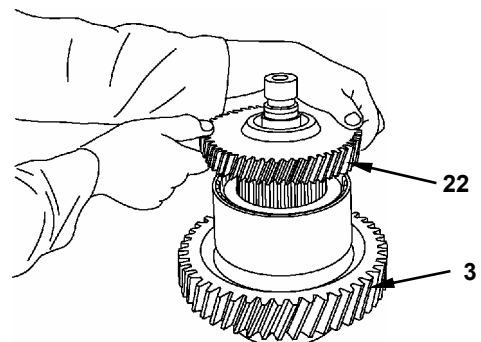


13. Install running disc (19), auxiliary needle cage (20), and auxiliary washer (21) to shaft (3). Face the chamfered side of running disc (19) to the auxiliary needle cage (25) side.



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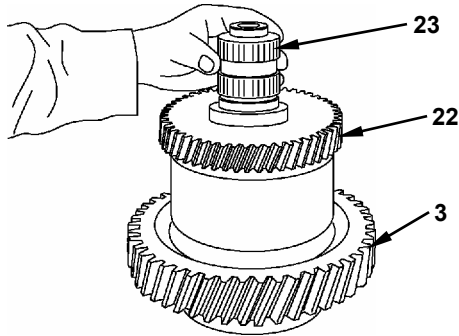
14. In order to engage the spline of idler (22) and the gear teeth of inner clutch disc (15) to shaft (3), install the idler by turning it right and left.



W4GB-03-02-139

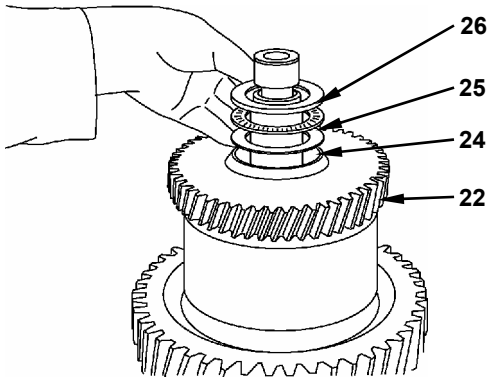
## BODY (TRAVEL SYSTEM) / Drive Unit

15. Install needle cage (23) to idler (22).



W4GB-03-02-140

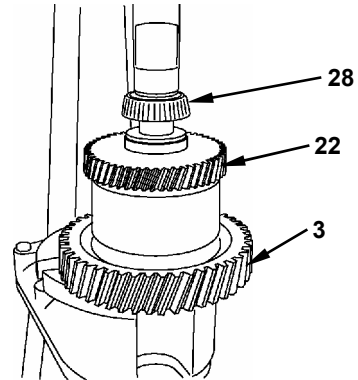
16. Install auxiliary washer (24), auxiliary needle cage (25), and running disc (26) to idler (22). Face the chamfered side of running disc (26) to the auxiliary needle cage (25) side.



W4GB-03-02-141

**IMPORTANT:** If the installation was done correctly, the level difference of the upper surface of running disc (26) and shaft (3) are the same. If the running disc (26) is higher, check the engagement of idler (22) and inner clutch disc (15).

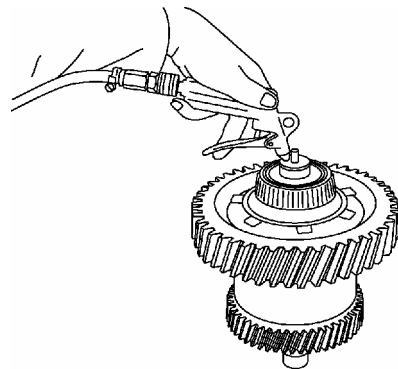
17. Install the inner rings of taper roller bearings (1) and (28) to both ends of shaft (3).



W4GB-03-02-142

18. Supply low pressure air and check the operation of the clutch.

**IMPORTANT:** Check the operation of the clutch by sound.



W4GB-03-02-143

## **BODY (TRAVEL SYSTEM) / Drive Unit**

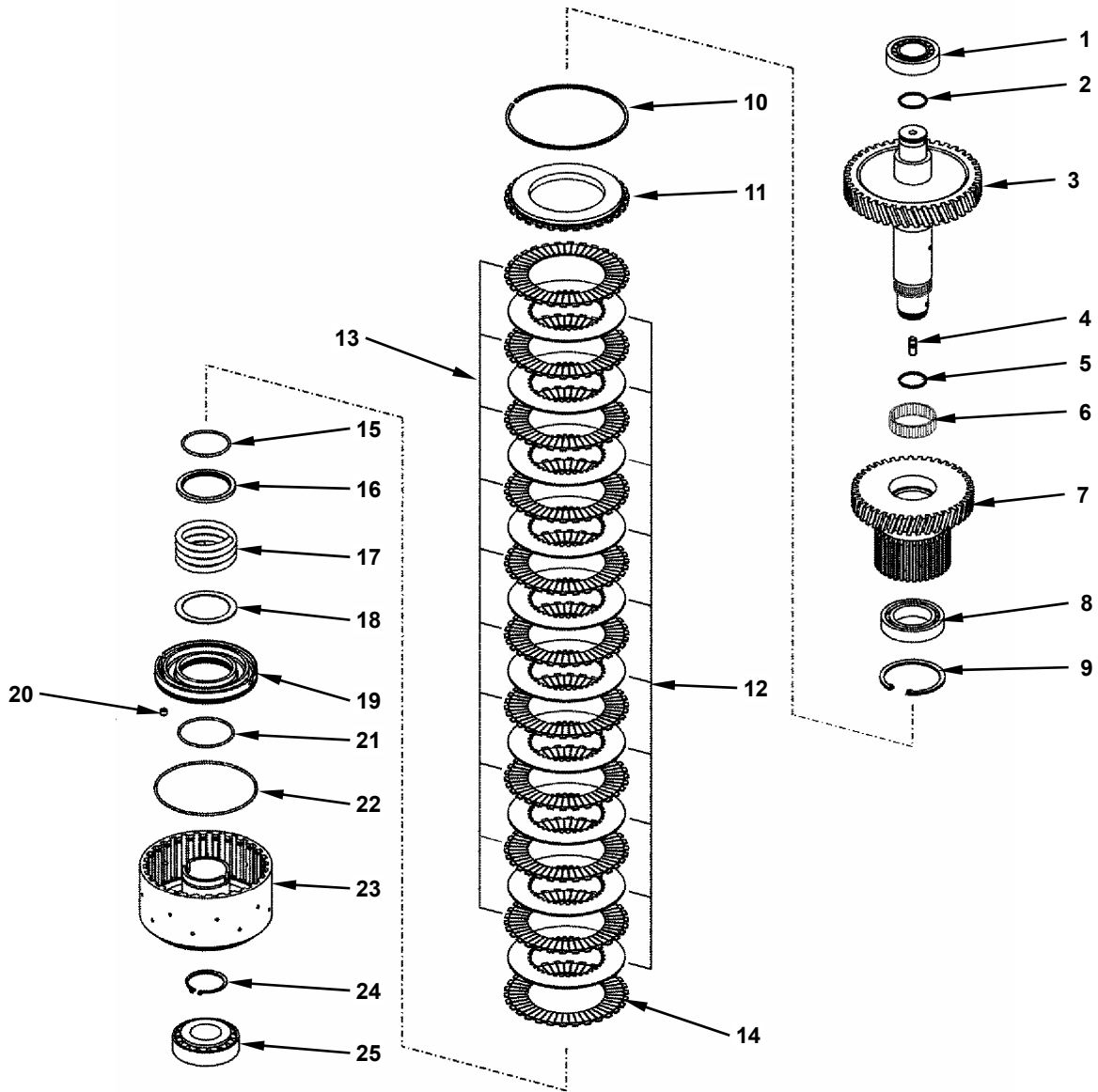
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## BODY (TRAVEL SYSTEM) / Drive Unit

### DISASSEMBLY OF CLUTCHES KR AND KV

#### Disassembly of clutch KR

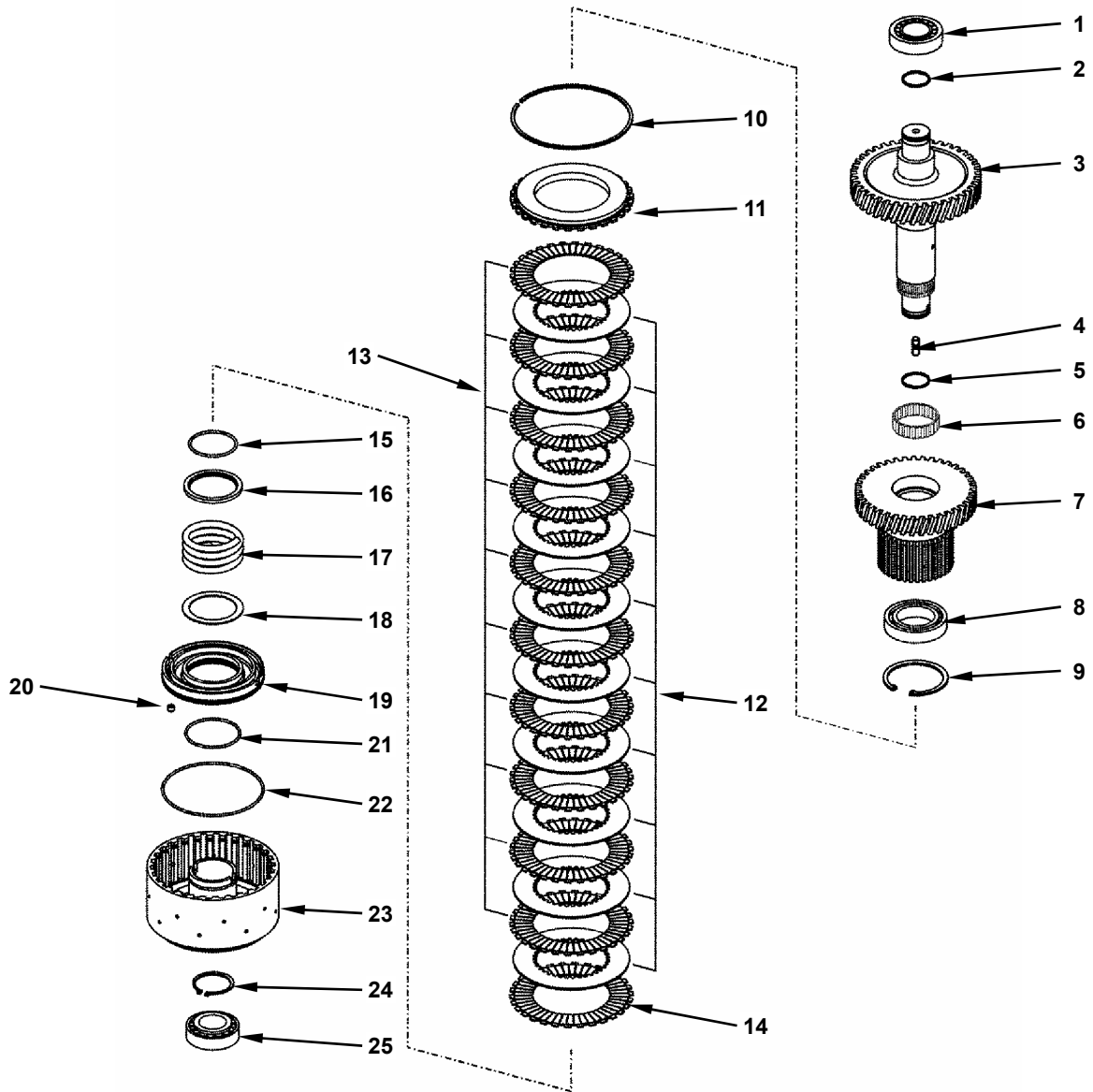


W4GB-03-02-144

- |                          |                                  |                  |                           |
|--------------------------|----------------------------------|------------------|---------------------------|
| 1 - Taper Roller Bearing | 8 - Ball Bearing                 | 15 - Snap Ring   | 22 - O-Ring               |
| 2 - Piston Ring          | 9 - Snap Ring                    | 16 - Guide Ring  | 23 - Disc Carrier         |
| 3 - Shaft                | 10 - Snap Ring                   | 17 - Coil Spring | 24 - Snap Ring            |
| 4 - Stud                 | 11 - End shim                    | 18 - Washer      | 25 - Taper Roller Bearing |
| 5 - Piston Ring          | 12 - Inner Clutch Disc (10 Used) | 19 - Piston      |                           |
| 6 - Needle Cage          | 13 - Outer Clutch Disc (10 Used) | 20 - Valve       |                           |
| 7 - Idler                | 14 - Disc                        | 21 - O-Ring      |                           |

# BODY (TRAVEL SYSTEM) / Drive Unit

## Disassembly of Clutch KV



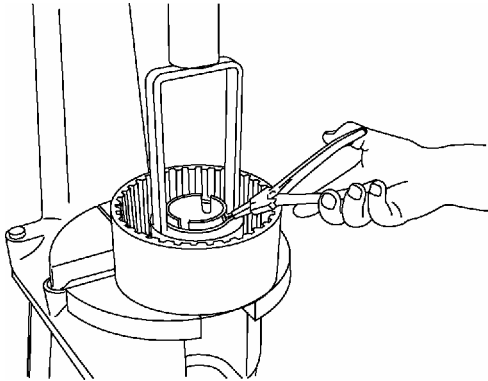
W4GB-03-02-145

- |                          |                                  |                  |                           |
|--------------------------|----------------------------------|------------------|---------------------------|
| 1 - Taper Roller Bearing | 8 - Taper Roller Bearing         | 15 - Snap Ring   | 22 - O-Ring               |
| 2 - Piston Ring          | 9 - Snap Ring                    | 16 - Guide Ring  | 23 - Disc Carrier         |
| 3 - Shaft                | 10 - Snap Ring                   | 17 - Coil Spring | 24 - Snap Ring            |
| 4 - Stud                 | 11 - End Shim                    | 18 - Washer      | 25 - Taper Roller Bearing |
| 5 - Piston Ring          | 12 - Inner Clutch Disc (10 Used) | 19 - Piston      |                           |
| 6 - Needle Cage          | 13 - Outer Clutch Disc (10 Used) | 20 - Valve       |                           |
| 7 - Idler                | 14 - Disc                        | 21 - O-Ring      |                           |

## BODY (TRAVEL SYSTEM) / Drive Unit

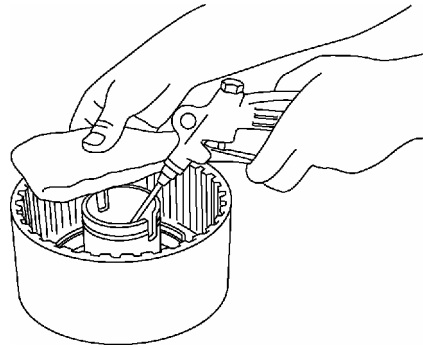
---

1. Remove piston rings (5, 2) from shaft (3).
2. Remove taper roller bearings (25, 1) from shaft (3). Remove stud (4) from shaft (3).
3. Remove snap ring (24) from shaft (3). Remove disc carrier (23) from shaft (3).
4. Remove idler (7) from shaft (3) using a press.
5. Remove needle cage (6) from shaft (3).
6. Remove snap ring (9) from idler (7). Remove ball bearing (8) from idler (7).
7. Remove snap ring (10) from disc carrier (23). Remove end shim (11), outer clutch discs (13) (10 used), inner clutch discs (12) (10 used), and disc (14) from disc carrier (23).
8. Compress spring (17) and remove snap ring (15) from disc carrier (23). Release the compression of the spring and remove guide ring (16) and coil spring (17) from disc carrier (23).



W4GB-03-02-124

9. Supply low pressure air through the oil hole of disc carrier (23), and remove piston (19).



W4GB-03-02-125

10. Remove O-rings (21, 22) from piston (10) bore part and the outer part.

## BODY (TRAVEL SYSTEM) / Drive Unit

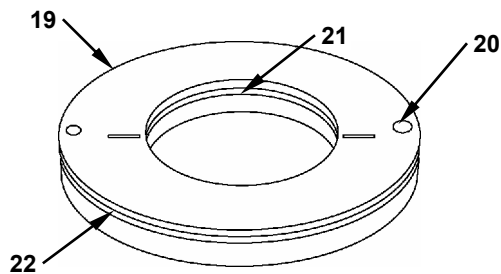
### ASSEMBLY OF CLUTCHES KR AND KV

#### Assemble

**IMPORTANT:** As clutches KR and KV are similar, clutch KV is explained as an example in this section. Refer to W3-2-73.

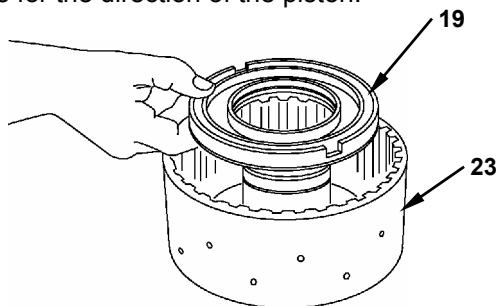
**IMPORTANT:** Check that the ball part of the piston valve (20) is not clogged.

1. Install O-ring (21) to the bore of piston (19). Install O-ring (22) to the outer diameter of piston (19). Prevent O-ring from twisting by applying oil before installing



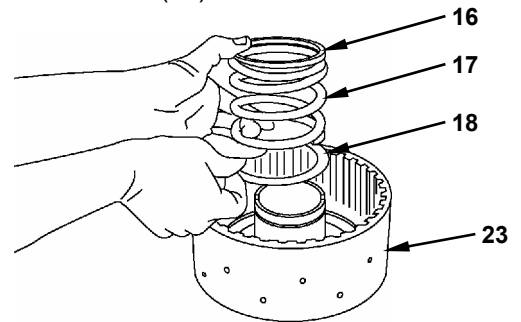
W4GB-03-02-126

2. Install piston (19) to disc carrier (23). Refer to the figure for the direction of the piston.



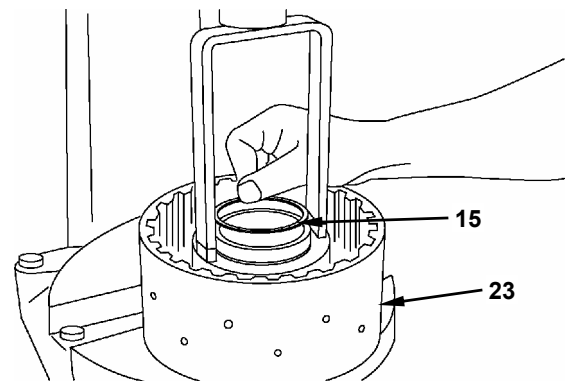
W4GB-03-02-127

3. Install washer (18), coil spring (17) and guide ring (16) to disc carrier (23).



W4GB-03-02-146

4. Compress coil spring (17) by using an assembly tool. Secure guide ring (16) to disc carrier (23) with snap ring (15).



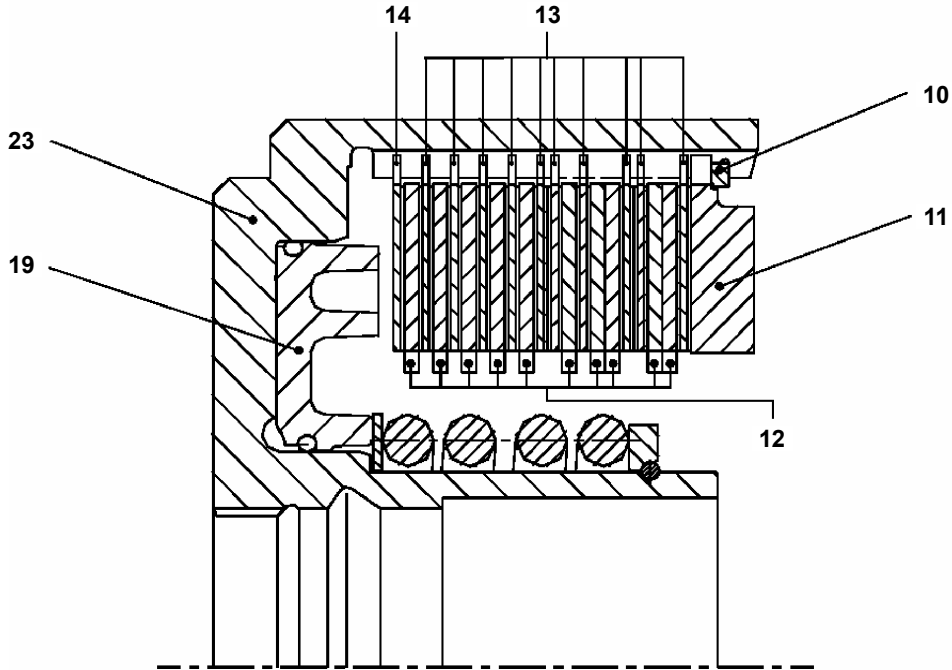
W4GB-03-02-129



## BODY (TRAVEL SYSTEM) / Drive Unit

### Clutch Disc Assembly Scheme (KV, KR)

The following figure indicates the clutch disc configuration of clutches KV and KR.  
Both clutch discs KV and KR are the same.



W4GB-03-02-147

**IMPORTANT:** Turn the disk (14) side without coating to the piston side. Choose snap ring (10) so that disc clearance corresponds to the requirements on the next page.

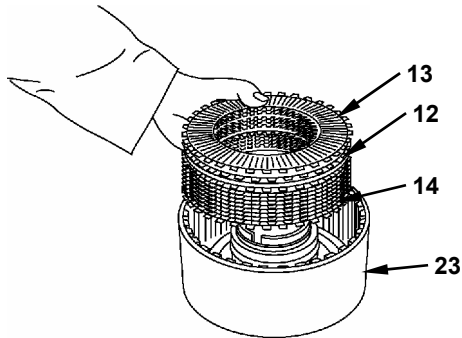
Item number	Parts Name	Q'ty	Remarks
23	Disc Carrier	1	
19	Piston	1	
14	Disc	1	One side coating
13	Outer Clutch Disc	10	Two side coating
12	Inner Clutch Disc	10	
10	Snap Ring	1	Thickness: 2.1 to 4.2 mm (0.083 to 0.17 in)
11	End Shim	1	

Number of effective faying surfaces: 16

Disc clearance: 2.7 to 2.9 mm (0.11 to 0.12 in)

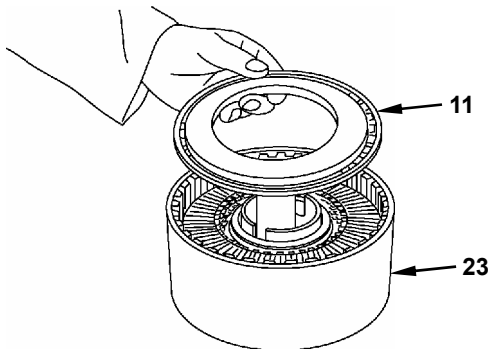
## BODY (TRAVEL SYSTEM) / Drive Unit

5. Install clutch discs (12) (10 used), (13) (10 used) and disc (14) to disc carrier (23). Do not apply oil to the disc in order to set the disc clearance correctly. Refer to W3-2-73 for the order of discs.



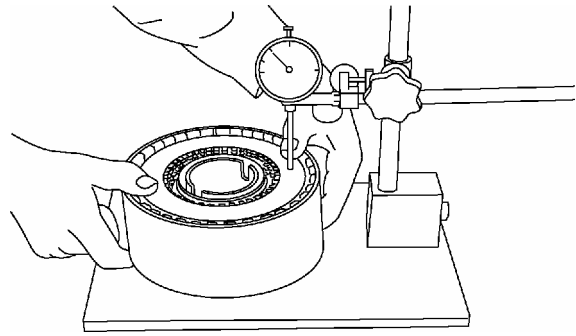
W4GB-03-02-132

6. Install end shim (11) to disc carrier (23). Secure end shim (11) with snap ring (10). Snap ring thickness: 2.65 mm (0.1 in) (standard value)



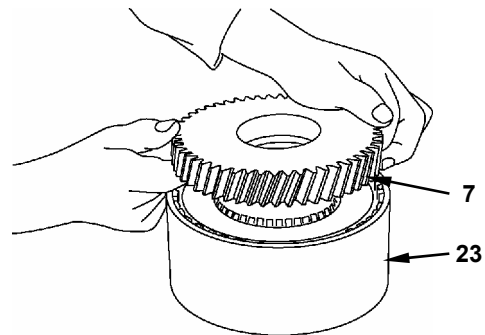
W4GB-03-02-133

7. Set dial gauge to the end shim (11) part. Set the gauge to 0 (zero) when pressure of about 100 N (10 kgf, 22.5 lbf) is applied to end shim. Then, write down the value of the dial gauge when end shim is raised upwards. If the value is different from the indicated in the previous page, replace snap ring (10) with snap ring (10) of different thickness.



W4GB-03-02-134

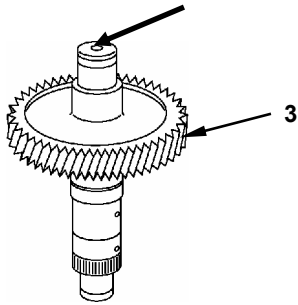
8. After disc clearance adjustment, remove the disc. Apply oil to the disc and assemble again.
9. Turn idler (7) right and left in order to engage in to inner discs (12) (10 used). This operation is done in order to align the inner disc (12) and outer disc (13). After aligning, remove idler (7).



W4GB-03-02-148

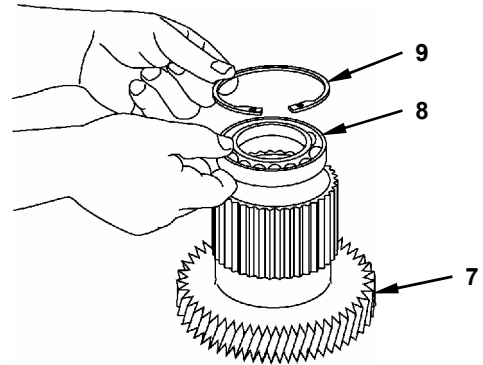
## BODY (TRAVEL SYSTEM) / Drive Unit

10. Apply LOCTITE #262 onto the thread part of the orifice. Install the orifice to shaft (3).



W4GB-03-02-149


12. Install ball bearing (8) to idler (7). Secure ball bearing (8) to shaft (3) with snap ring (9).




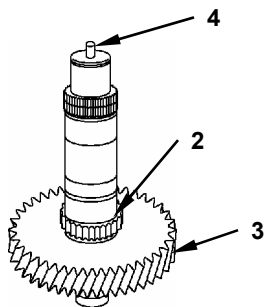
W4GB-03-02-151

11. Install stud (4) and needle cage (6) to shaft (3).

**IMPORTANT:** Install stud (4) to shaft (3) after installing and locking M10 nuts (2 used) to the stud (4) upper part. Remove M10 nuts (2 used) from stud (4) after installing stud (4).

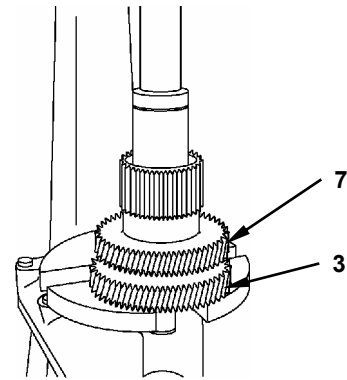
 : 14 mm

 : 17 N·m (1.7 kgf·m, 12.5 lbf·ft)



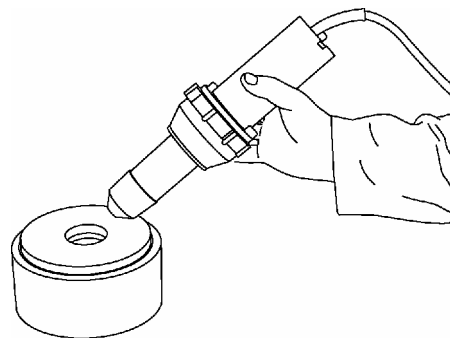
W4GB-03-02-150

13. Install idler (7) into shaft (3).



W4GB-03-02-152

14. Heat center section of disc carrier (23) to about 120 °C (248 °F).



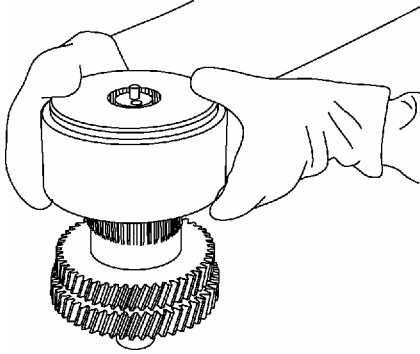
W4GB-03-02-153

## BODY (TRAVEL SYSTEM) / Drive Unit



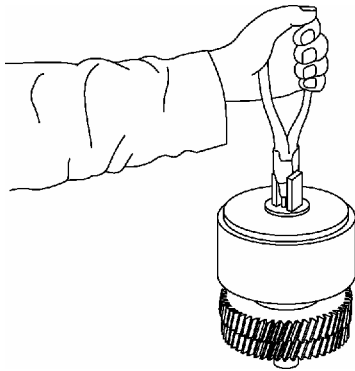
**CAUTION:** Wear fireproof gloves.

15. Install disc carrier (23) to shaft (3). Install carefully so that the gear teeth of idler (7) and the inner disc engage.



W4GB-03-02-154

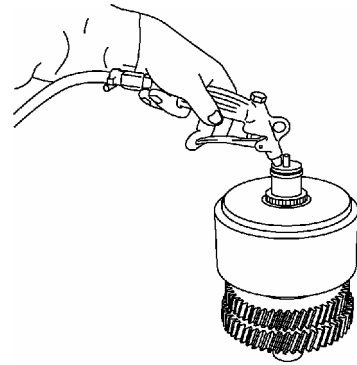
16. Install retaining ring (24) to shaft (3).



W4GB-03-02-155

17. Supply low pressure air and check the operation of the clutch.

**IMPORTANT:** Check the operation of the clutch by sound.



W4GB-03-02-156

18. Press and install the inner ring of taper roller bearing (1) to both ends of shaft (3).

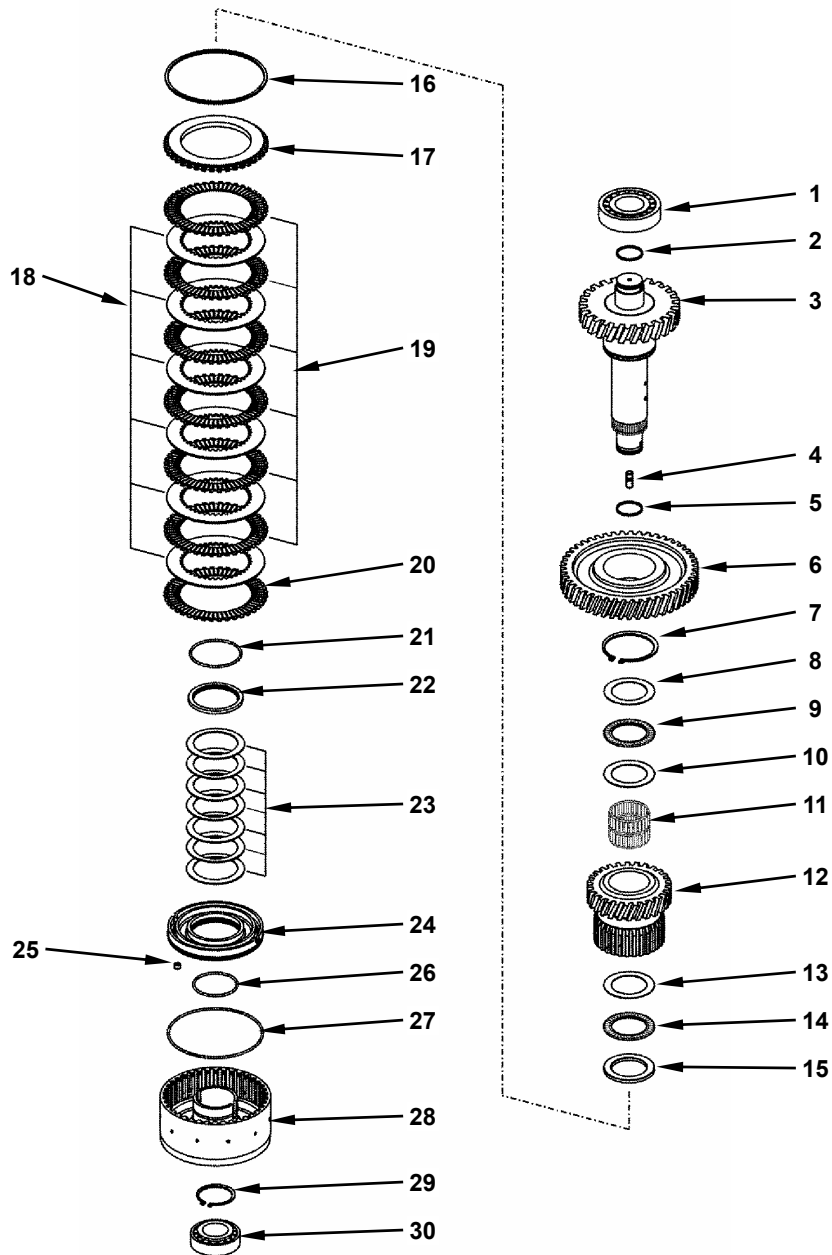
## **BODY (TRAVEL SYSTEM) / Drive Unit**

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## BODY (TRAVEL SYSTEM) / Drive Unit

### DISASSEMBLY OF CLUTCH K4



W4GB-03-02-157

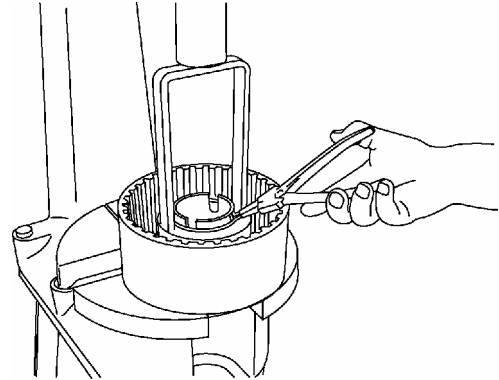
- |                          |                            |                                 |                           |
|--------------------------|----------------------------|---------------------------------|---------------------------|
| 1 - Taper Roller Bearing | 9 - Auxiliary Needle Cage  | 17 - End Shim                   | 25 - Valve                |
| 2 - Piston Ring          | 10 - Auxiliary Washer      | 18 - Inner Clutch Disc (6 Used) | 26 - O-Ring               |
| 3 - Shaft                | 11 - Needle Cage           | 19 - Outer Clutch Disc (6 Used) | 27 - O-Ring               |
| 4 - Stud                 | 12 - Idler                 | 20 - Disc                       | 28 - Disc Carrier         |
| 5 - Piston Ring          | 13 - Auxiliary Washer      | 21 - Snap Ring                  | 29 - Snap Ring            |
| 6 - Gear                 | 14 - Auxiliary Needle Cage | 22 - Guide Ring                 | 30 - Taper Roller Bearing |
| 7 - Snap Ring            | 15 - Running Disc          | 23 - Cup Spring (7 Used)        |                           |
| 8 - Auxiliary Washer     | 16 - Snap Ring             | 24 - Piston                     |                           |

## BODY (TRAVEL SYSTEM) / Drive Unit

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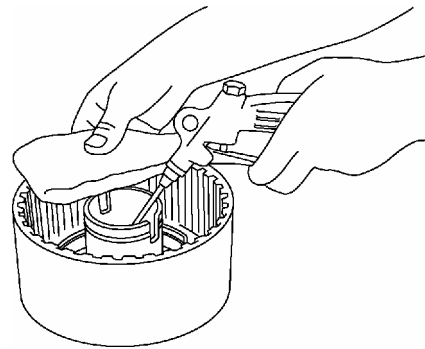
1. Remove piston rings (2, 5) from shaft (3).
2. Remove taper roller bearings (30, 1) from shaft (3). Remove stud (4) from shaft (3).
3. Remove snap ring (29) from shaft (3). Remove disc carrier (28) from shaft (3).
4. Remove running disc (15), auxiliary needle cage (14), and auxiliary washer (13) from idler (12).
5. Remove idler (12) from shaft (3).
6. Remove needle cage (11), auxiliary washer (10), auxiliary needle cage (9), and auxiliary washer (8) from shaft (3).
7. Remove snap ring (7) from shaft (3). Remove gear (6) from shaft (3).
8. Remove snap ring (16) from disc carrier (28). Remove end shim (17), outer clutch discs (19) (6 used), inner clutch discs (18) (6 used), and disc (20) from disc carrier (28).

9. Compress spring (23) and remove snap ring (21) from disc carrier (28). Release the compression of the spring and remove guide ring (22) and cup springs (23) (7 used) from disc carrier (28).



W4GB-03-02-124

10. Supply low pressure air through the oil hole of disk carrier (28), and remove piston (24).



W4GB-03-02-125

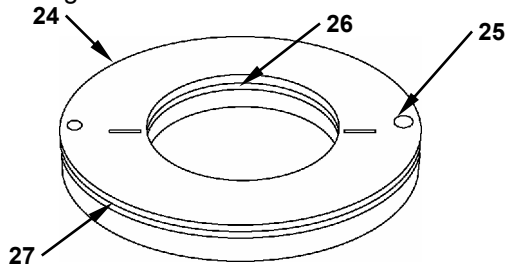
11. Remove O-rings (26, 27) from piston (24) bore part and the outer part.

## BODY (TRAVEL SYSTEM) / Drive Unit

### ASSEMBLY OF K4 CLUTCH

#### Assemble

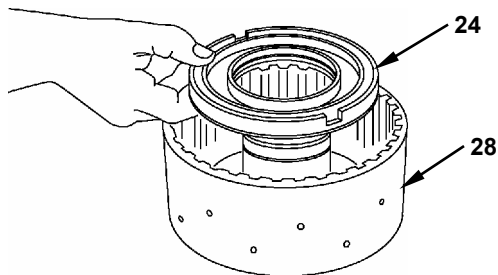
1. Install O-ring (26) to the bore of piston (24). Install O-ring (27) to the outer diameter of piston (24). Prevent O-ring from twisting by applying oil before installing.



W4GB-03-02-126

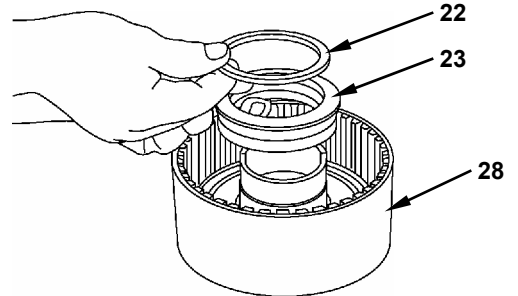
**IMPORTANT: Check that the ball part of the piston valve (25) is not clogged.**

2. Install piston (24) to disc carrier (28). Refer to the figure for the direction of the piston.



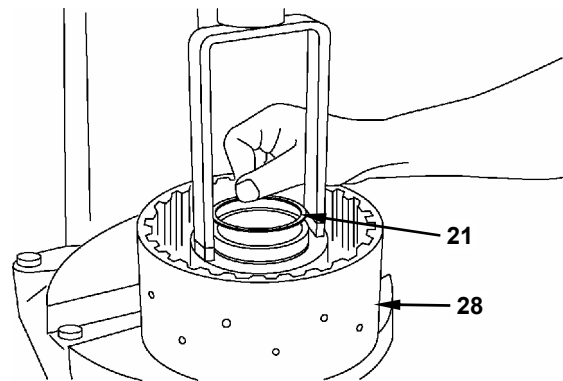
W4GB-03-02-127

3. Install cup springs (23) (7 used) and guide ring (22) to disc carrier (28).



W4GB-03-02-158

4. Compress cup spring (23) by using an assembly tool. Secure guide ring (22) to disc carrier (28) with snap ring (21).



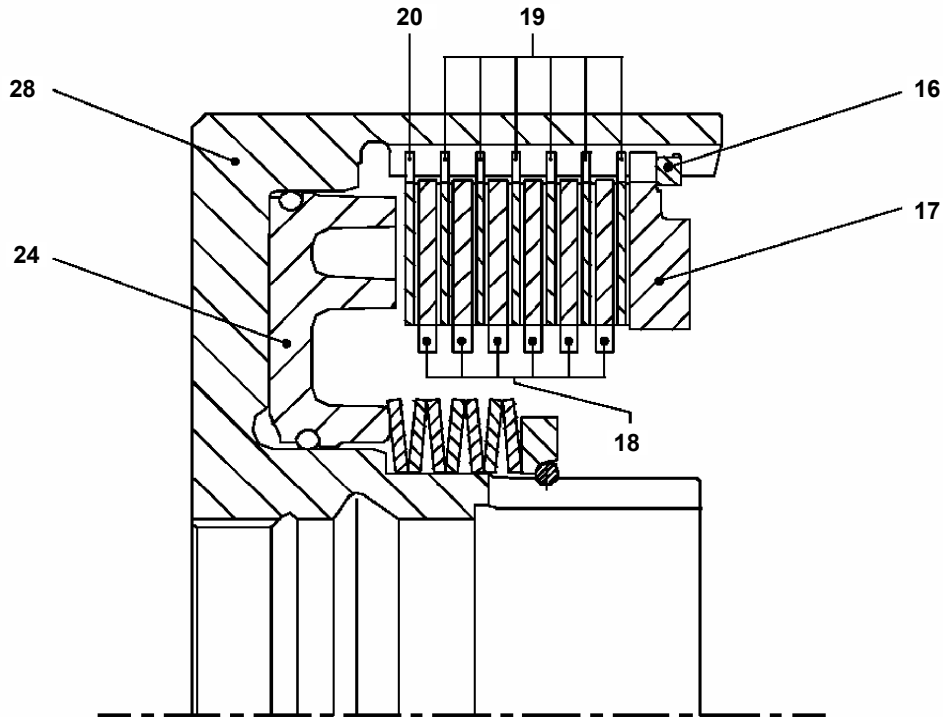
W4GB-03-02-129



## BODY (TRAVEL SYSTEM) / Drive Unit

### Clutch Disc Assembly Scheme (K4)

The following figure indicates the clutch disc configuration of clutch (K4).



W4GB-03-02-159

**IMPORTANT:** Turn the disc (20) side without coating to the piston side. Choose snap ring (16) so that disc clearance corresponds to the requirements on the next page.

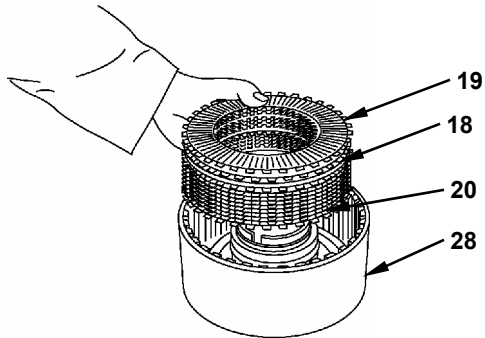
Item number	Parts Name	Q'ty	Remarks
28	Disc Carrier	1	
24	Piston	1	
20	Disc	1	One side coating
19	Outer Clutch Disc	6	Two side coating
18	Inner Clutch Disc	6	
16	Snap Ring	1	Thickness: 2.1 to 4.2 mm (0.083 to 0.17 in)
17	End Shim	1	

Number of effective faying surfaces: 12

Disc clearance: 1.4 to 1.6 mm (0.055 to 0.063 in)

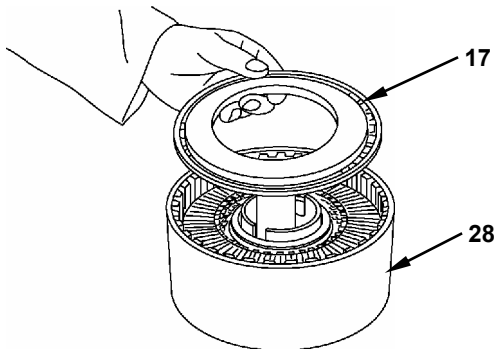
## BODY (TRAVEL SYSTEM) / Drive Unit

5. Install clutch discs (18) (6 used), (19) (6 used) and disc (20) to disc carrier (28). Do not apply oil to the disc in order to set the disc clearance correctly. Refer to W3-2-80 for the order of discs.



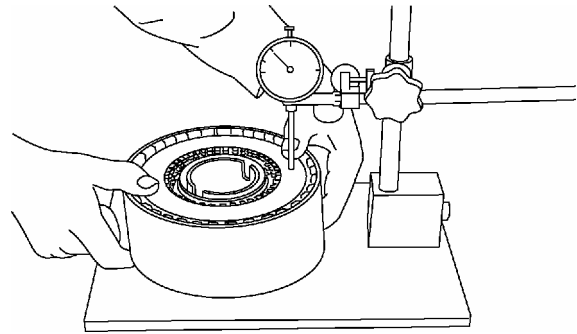
W4GB-03-02-132

6. Install end shim (17) to disc carrier (28). Secure end shim (17) with snap ring (16). Snap ring thickness: 3.35 mm (0.13 in) (standard value)



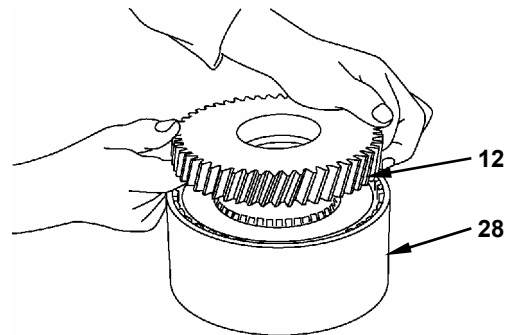
W4GB-03-02-133

7. Set dial gauge to the shim (17) part. Set the gauge to 0 (zero) when pressure of about 100 N (10 kgf, 22.5 lbf) is applied to shim. Then, write down the value of the dial gauge when end shim is raised upwards. If the value is different from that indicated in the previous page, replace snap ring (16) with snap ring (16) of different thickness.



W4GB-03-02-134

8. After disc clearance adjustment, remove the disc. Apply oil to the disc, and assemble again.
9. Turn idler (12) to right and left in order to engage inner discs (18) (6 used). This operation is done in order to align inner disc (18) and outer disc (19). After aligning, remove idler (12).

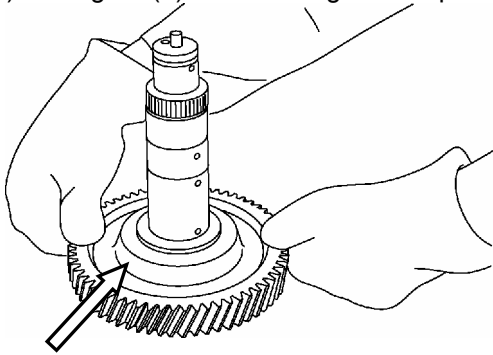


W4GB-03-02-148

## BODY (TRAVEL SYSTEM) / Drive Unit

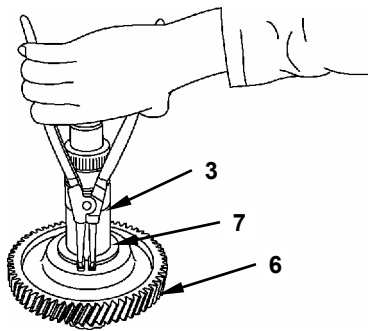
**CAUTION:** Wear fireproof gloves.

10. Cool shaft (3) to about  $-80\text{ }^{\circ}\text{C}$  ( $-47\text{ }^{\circ}\text{F}$ ). Heat gear (6) to about  $+120\text{ }^{\circ}\text{C}$  ( $248\text{ }^{\circ}\text{F}$ ) and install it to shaft (3). Turn gear (6) with the longer hub upwards.



W4GB-03-02-160



11. Install snap ring (7) on shaft (3).

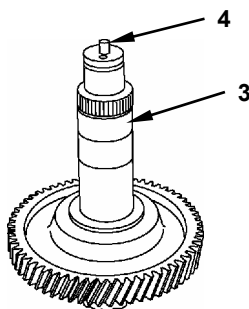


W4GB-03-02-161

12. Install stud (4) to shaft (3).

**IMPORTANT:** Install stud (4) to shaft (3) after installing and locking M10 nuts (2 used) to the stud (4) upper part. Remove M10 nuts (2 used) from stud (4) after installing stud (4).

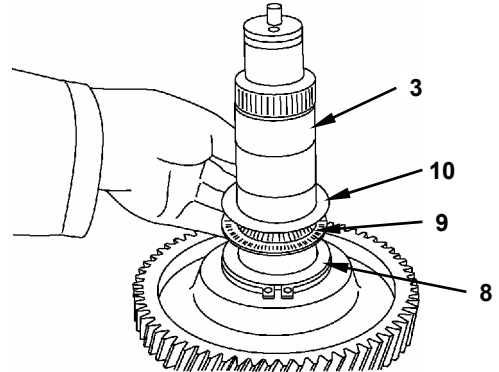
 : 14 mm  
 : 17 N·m (1.7 kgf·m, 12.5 lbf·ft)



W4GB-03-02-162

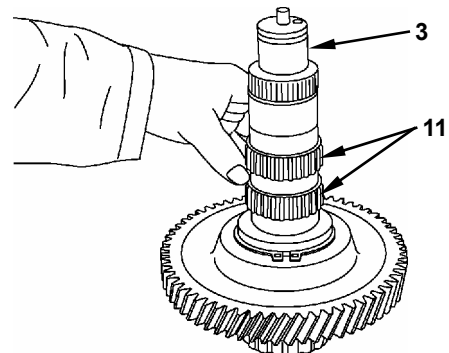
**IMPORTANT:** Upper and lower auxiliary washers (8, 10) are the same.

13. Install auxiliary washer (8), auxiliary needle cage (9), and auxiliary washer (10) to shaft (3).



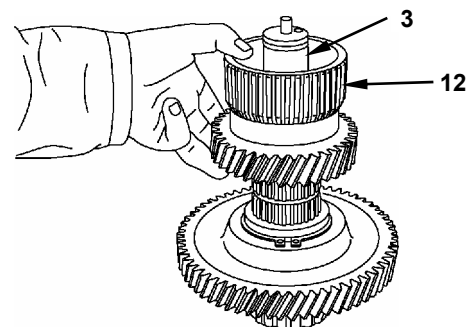
W4GB-03-02-163

14. Install auxiliary needle cage (11) to shaft (3).



W4GB-03-02-164

15. Install idler (12) to shaft (3).

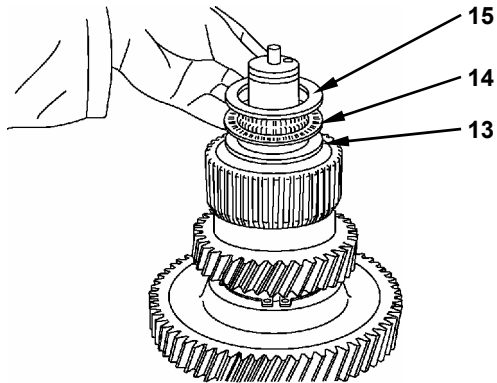


W4GB-03-02-165

## BODY (TRAVEL SYSTEM) / Drive Unit

**IMPORTANT:** Turn the chamfered side of running disc (15) to the auxiliary needle cage (14) side.

16. Install auxiliary washer (13), auxiliary needle cage (14), and running disc (15) to idler (12).

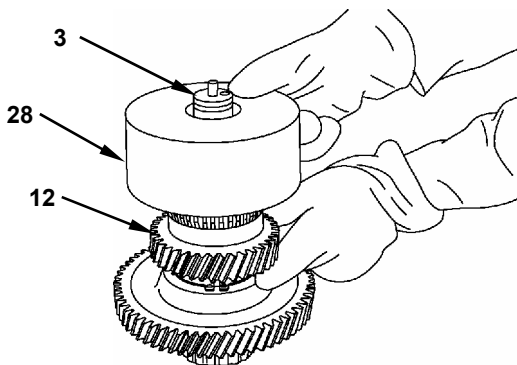


W4GB-03-02-166



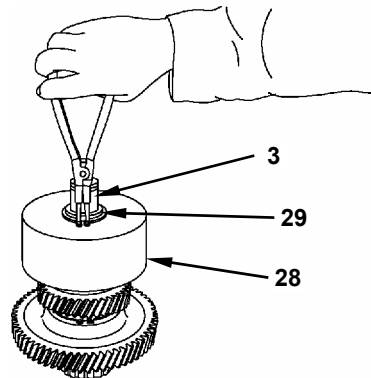
**CAUTION:** Wear fireproof gloves.

17. Heat the hole part of disc carrier (28) to about 120 °C (248 °F). Engage the spline of idler (12) and the gear teeth of inner clutch discs (18) (6 used), and install to shaft (3).



W4GB-03-02-167

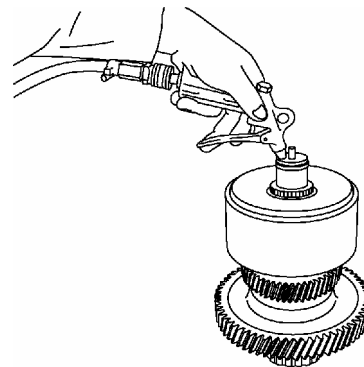
18. Install retaining ring (29) to shaft (3).



W4GB-03-02-168

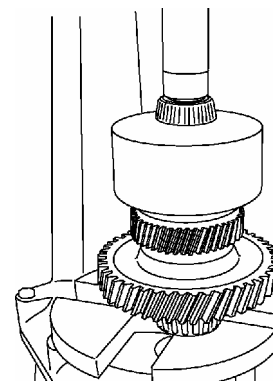
19. Supply low pressure air and check the operation of the clutch.

**IMPORTANT:** When assembled correctly, the sound of operation can be heard.



W4GB-03-02-169

20. Install the inner rings of taper roller bearings (1) and (30) to both ends of shaft (3).



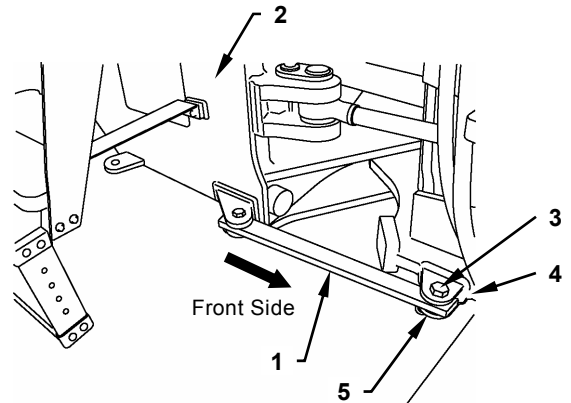
W4GB-03-02-170

## BODY (TRAVEL SYSTEM) / Axle

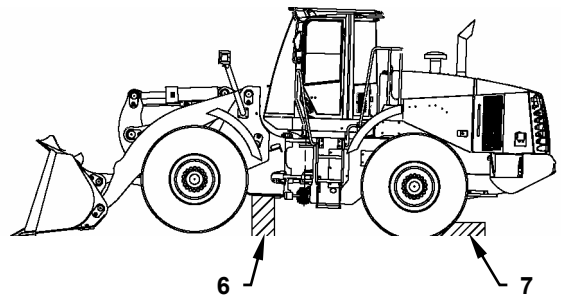
### REMOVAL AND INSTALLATION OF AXLE

#### Removal of Front Axle

1. Set lock bar (1) to front frame (4) side with pin (3). Secure front frame (4) and rear frame (2) with beta pin (5).



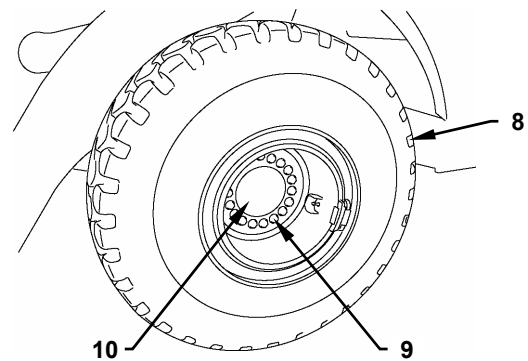
2. Set hydraulic jack to the both sides of front frame (4). Raise the front frame (4) side. Insert holder (6) under front frame (4). Set bumping post (7) at the rear wheel. Lower the bucket end to the ground and stop the engine.



**CAUTION:** Machine weight:  
ZW220: 17300 kg (38100 lb)  
ZW250: 19600 kg (43200 lb)

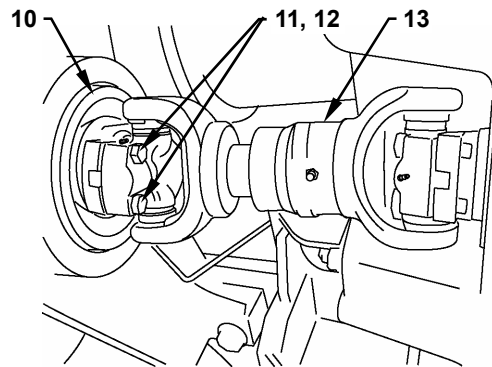
**IMPOTANT:** As accumulator is installed in the brake hydraulic circuit, step the brake pedal 50 times or more, and release pressure.

3. Remove bolt (9) from front axle (10). Remove tires (8) (2 used) from front axle (10). (Refer to W3-1.)



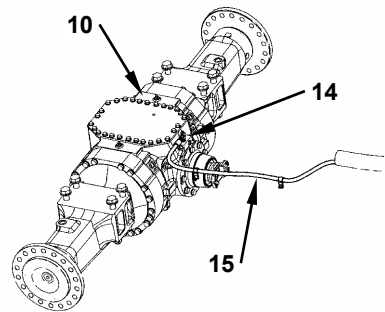
## BODY (TRAVEL SYSTEM) / Axle

4. Remove bolts (11) (4 used) and washers (12) (4 used) from propeller shaft (13). Remove propeller shaft (13) from front axle (10). (Refer to W3-4.)



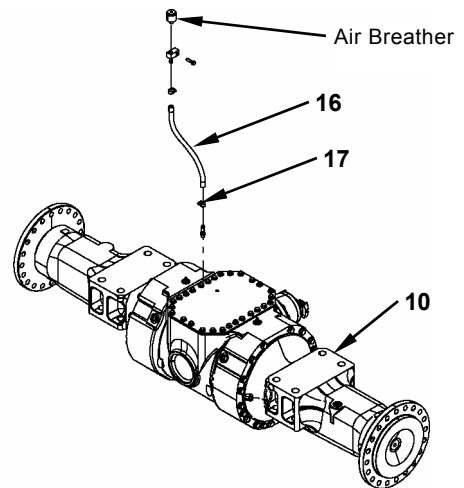
M4GB-07-017

5. Remove brake hose (15) from block (14) attached with front axle (10).  
🔧 : 19 mm, 22 mm



W4GB-03-03-102

6. Remove clip (17) attached with hose (16) for air breathers.



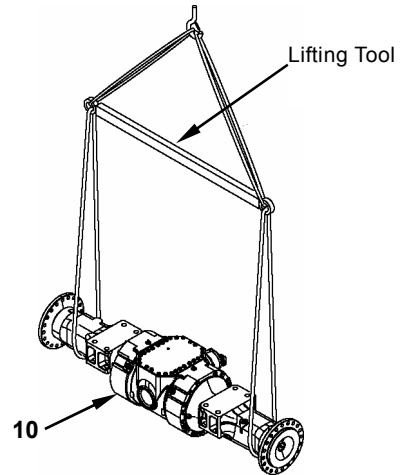
W4GB-03-03-103

## BODY (TRAVEL SYSTEM) / Axle

7. Hoist and hold front axle (10).




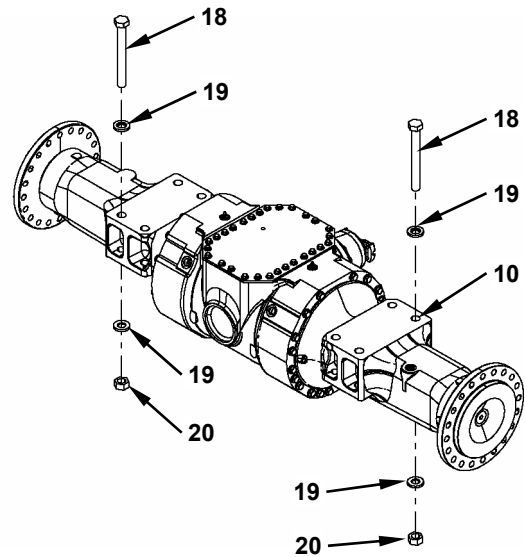
**CAUTION:** Front axle (10) weight:  
ZW220: 1020 kg (2250 lb)  
ZW250: 1190 kg (2650 lb)



W4GB-03-03-104

8. Remove nuts (20) (8 used), washers (19) (16 used), and bolts (18) (8 used) from front axle (10) and front frame (4).

 : 27 mm

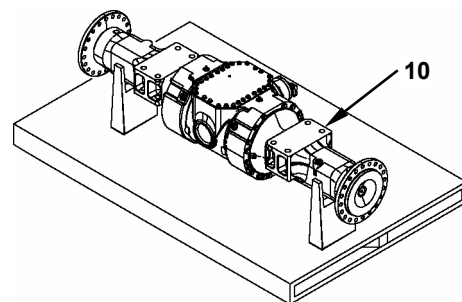


W4GB-03-03-105

9. Slowly lower front axle (10) from front frame (4). Place front axle (10) onto a holder. Withdraw front axle (10) from the machine.



**IMPOTANT:** When removing the front axle for a long time, Place the axle holding part of front frame onto a holder and stabilize the machine.

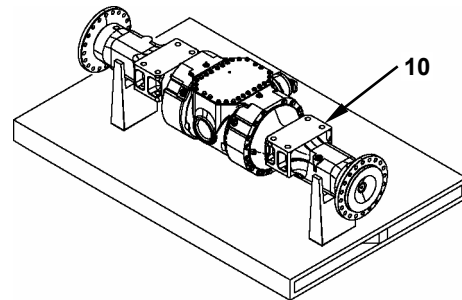


W4GB-03-03-106

## BODY (TRAVEL SYSTEM) / Axle

### Installation of Front Axle

1. Place front axle (10) on a holder. Push front axle (10) to the mounting position of front frame (4).

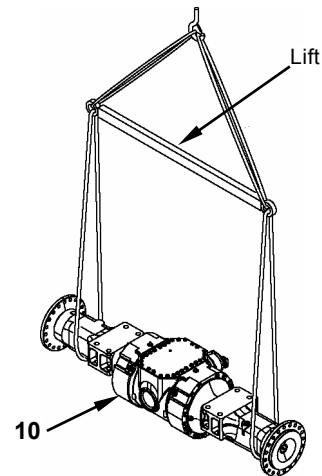


W4GB-03-03-106




**CAUTION: Front axle (10) weight:**  
ZW220: 1020 kg (2250 lb)  
ZW250: 1190 kg (2650 lb)

2. Hoist front axle (10) to the mounting position of front frame (4) using lifting tool.




W4GB-03-03-104


3. Install front axle (10) to front frame (4) with bolts (18) (8 used), washers (19) (16 used), and nuts (20) (8 used).

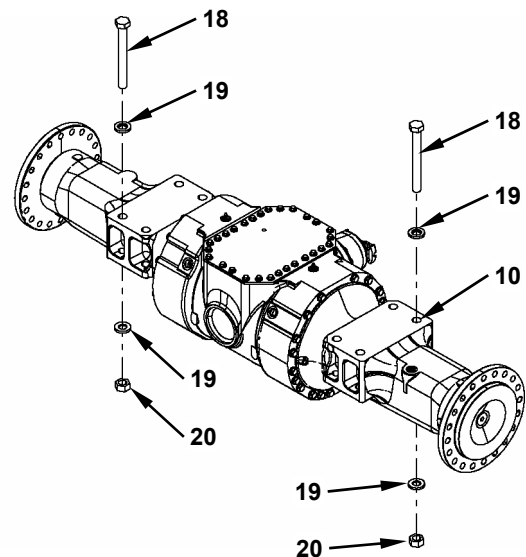
 : 27 mm

ZW220

 : 1130 N·m (113 kgf·m, 830 lbf·ft)

ZW250

 : 1580 N·m (158 kgf·m, 1170 lbf·ft)

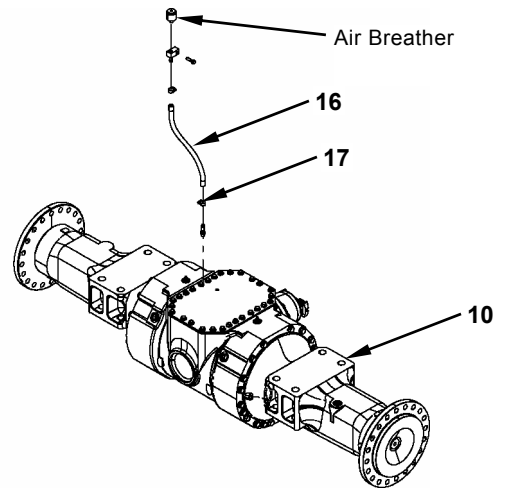


W4GB-03-03-105







## BODY (TRAVEL SYSTEM) / Axle

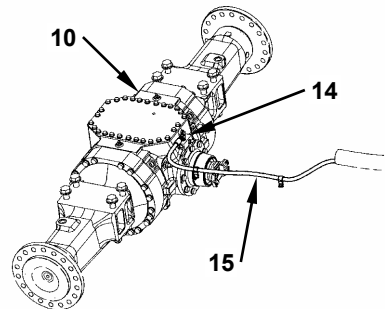
4. Install hose (16) for air breather to front axle (10) with clip (17).



W4GB-03-03-103

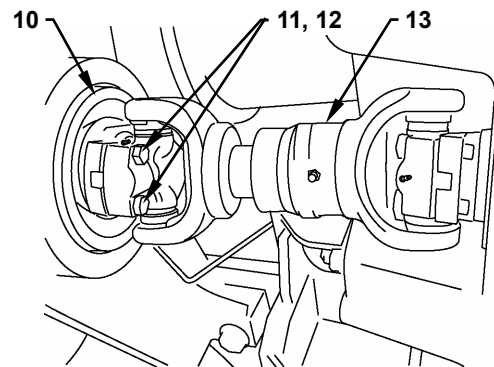
5. Install brake hose (15) to block (14) attached to the front axle (10).

-  : 19 mm
-  : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)
-  : 22 mm
-  : 39 N·m (4 kgf·m, 28.5 lbf·ft)



W4GB-03-03-102

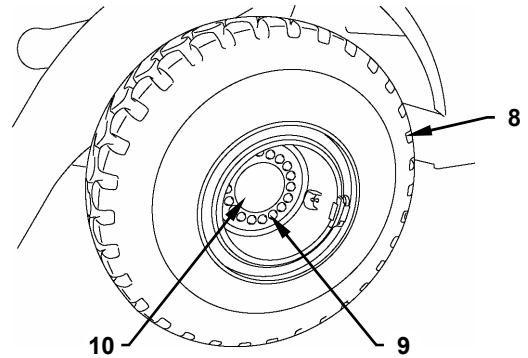
6. Install propeller shaft (13) to front axle (10) with bolts (11) (4 used) and washers (12) (4 used). (Refer to W3-4.)



M4GB-07-017

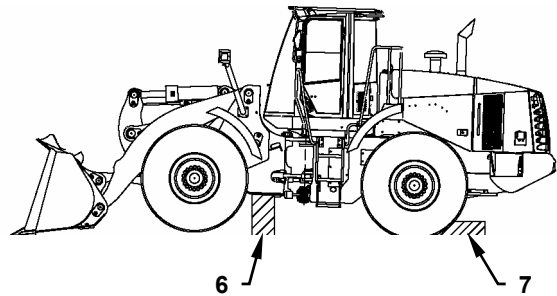
## BODY (TRAVEL SYSTEM) / Axle

7. Install front tire (8) to front axle (10) with bolt (9).  
(Refer to W3-1.)



M4GB-07-127

8. Start the engine and check for any oil leaks at brake hose connections. Bleed any air pressure in the brake lines. (Refer to Technical Manual T5-6) Raise the bucket, set hydraulic jack under the both sides of front frame. Raise the front frame side and remove holder (6) and bumping post (7) at the rear wheel.

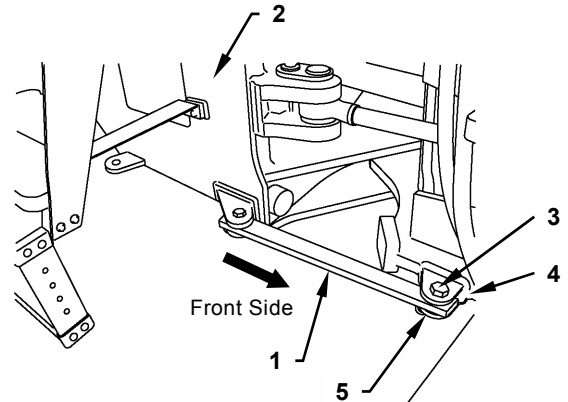


W4GB-03-03-101



**CAUTION: Machine Weight:**  
**ZW220: 17300 kg (38100 lb)**  
**ZW250: 19600 kg (43200 lb)**

9. Remove beta pin (5) from pin (3). Remove pin (3) from front frame (4). Remove lock lever (1) from front frame (4). Secure lock lever (1) to rear frame (2) with pin (3) and beta pin (5).

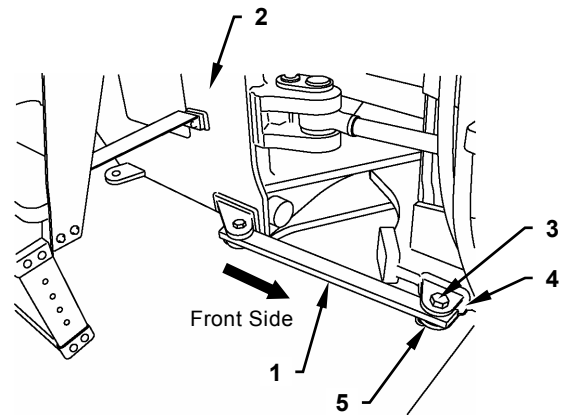


M4GB-01-136

## BODY (TRAVEL SYSTEM) / Axle

### Removal of Rear Axle

1. Set lock bar (1) to front frame (4) side with pin (3). Secure front frame (4) and rear frame (2) with beta pin (5).

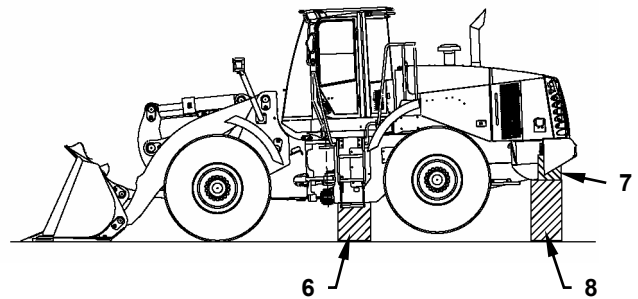


M4GB-01-136

2. Set hydraulic jack under the both sides of rear frame (2). Raise rear frame (2) and set holder (6) under it. Check the slack of anchor bolt of counter weight. Place V type pedestal (7) and pedestal (8) so that the machine weight does not apply. Lower the bucket end to the ground and stop the engine.



**CAUTION: Machine Weight:**  
ZW220: 17300 kg (38100 lb)  
ZW250: 19600 kg (43200 lb)

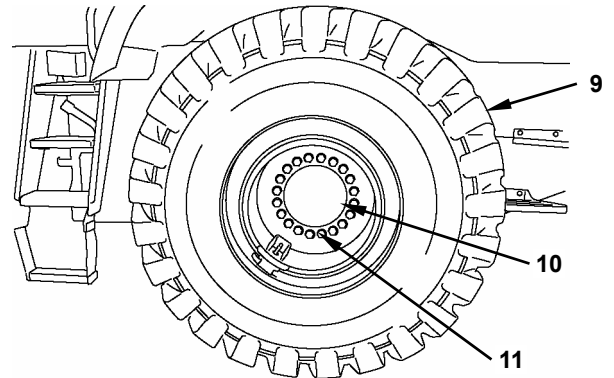


W4GB-03-03-107



**IMPOTANT: As accumulator is installed in the brake hydraulic circuit, step on the brake pedal 50 times or more, and release pressure.**

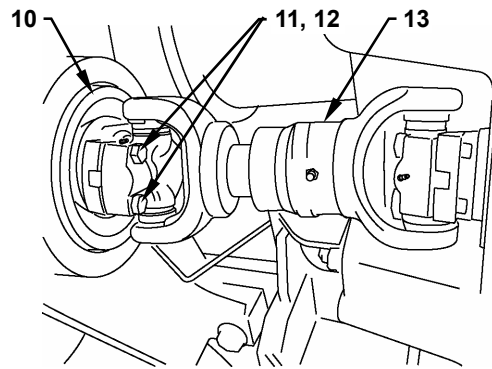
1. Remove bolt (11) from rear axle (10). Remove tires (9) (2 used) from rear axle (10). (Refer to W3-1.)



W4GB-03-03-108


## BODY (TRAVEL SYSTEM) / Axle

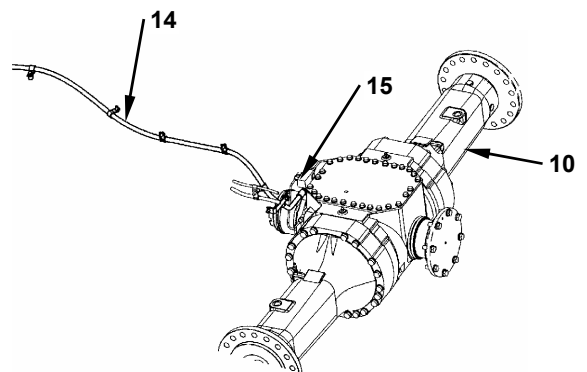
2. Remove bolts (11) (4 used) and washers (12) (4 used) from propeller shaft (13). Remove propeller shaft (13) from rear axle (10). (Refer to W3-4.)



M4GB-07-017

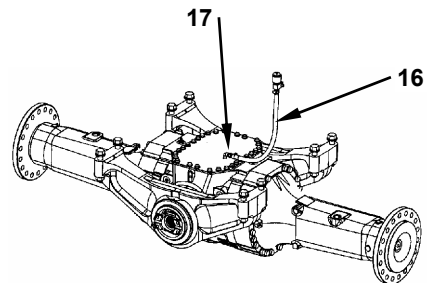
3. Remove brake hose (14) for from block (15) attached to rear axle (10).

 : 19 mm, 22 mm



W4GB-03-03-109

4. Remove clip (17) attached to hose (16) for air breathers.



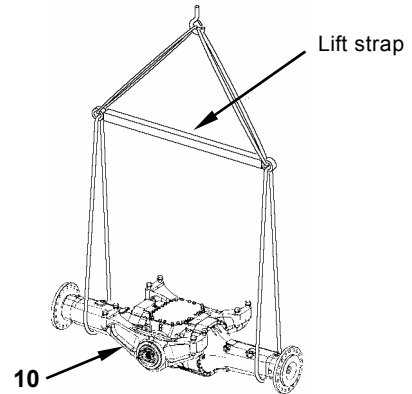
W4GB-03-03-110

## BODY (TRAVEL SYSTEM) / Axle

5. Hoist and hold rear axle (10).




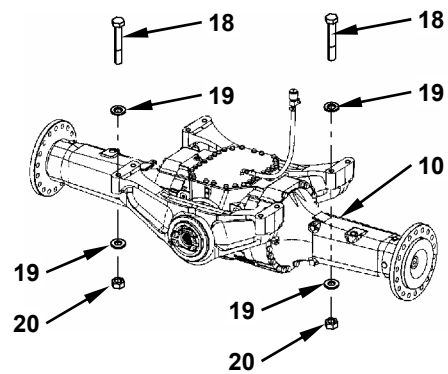
**CAUTION: Rear axle (10) weight:**  
ZW220: 1150 kg (2550 lb)  
ZW250: 1360 kg (3000 lb)



W4GB-03-03-111

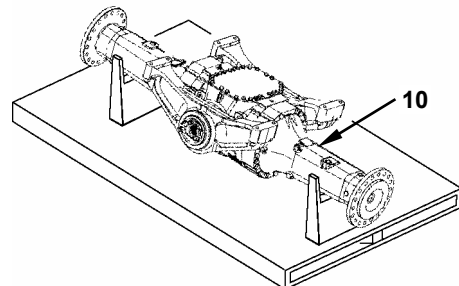
6. Remove nuts (20) (8 used), washers (19) (16 used), and bolts (18) (8 used) from rear axle (10) and rear frame (2).

 : 27 mm



W4GB-03-03-112

7. Slowly lower rear axle (10) from rear frame (2). Place rear axle (10) onto a holder and withdraw from the machine .

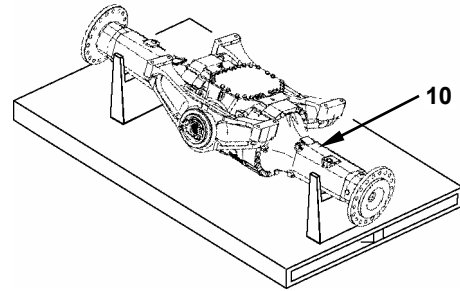


W4GB-03-03-113

## BODY (TRAVEL SYSTEM) / Axle

### Installation of Rear Axle

1. Place rear axle (10) onto a holder and push it into the mounting position of front frame (2).

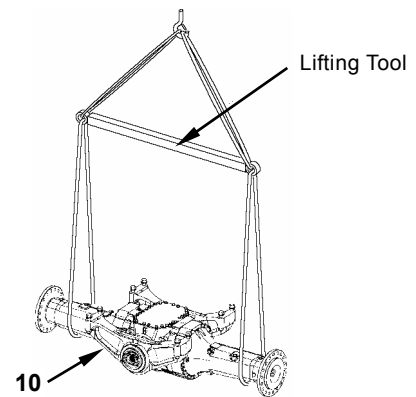


W4GB-03-03-113




**CAUTION: Rear axle (10) weight:**  
ZW220: 1150 kg (2550 lb)  
ZW250: 1360 kg (3000 lb)


2. Hoist rear axle (10) to the mounting position of rear frame (2) using lifting tool.

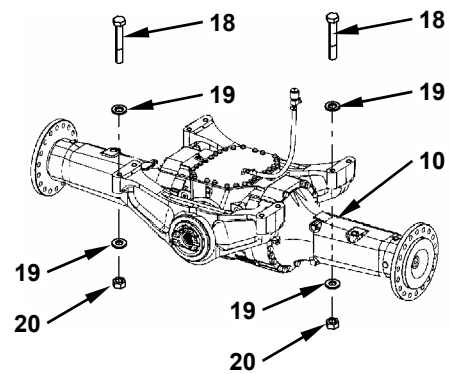


W4GB-03-03-111

3. Install rear axle (10) to rear frame (2) with bolts (18) (8 used), washers (19) (16 used), and nuts (20) (8 used).

 : 27 mm

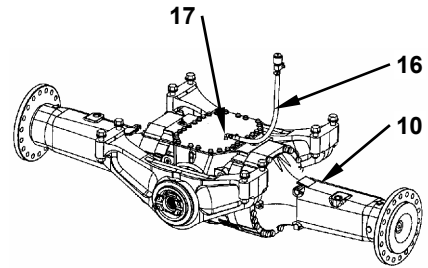
 : 1130 N·m (115 kgf·m, 830 lbf·ft)



W4GB-03-03-112


## BODY (TRAVEL SYSTEM) / Axle


4. Install hose (16) for air breathers to rear axle (10) with clip (17).





W4GB-03-03-110

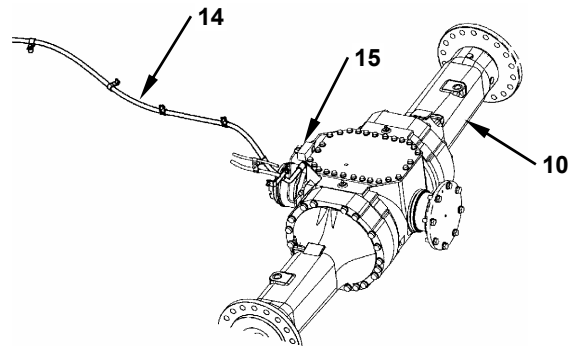
5. Install brake hose (14) for to block (15) attached to rear axle (10).

 : 19 mm

 : 29.5 N·m (3 kgf·m, 21.5 lbf·ft)

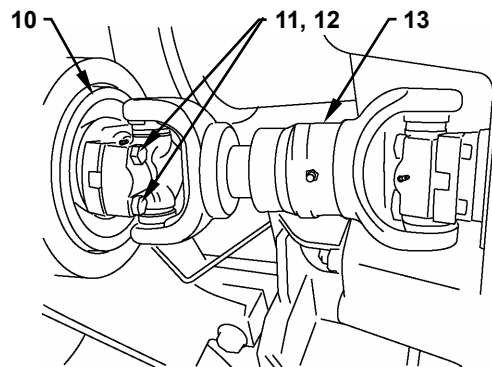
 : 22 mm

 : 39 N·m (4 kgf·m, 28.5 lbf·ft)



W4GB-03-03-109

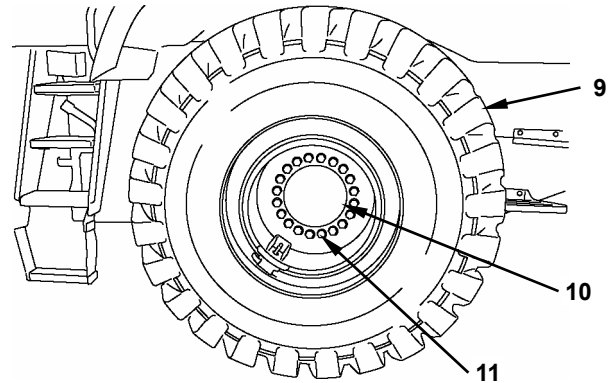
6. Install propeller shaft (13) to rear axle (10) with bolts (11) (4 used) and washers (12) (4 used). (Refer to W3-4.)



M4GB-07-017

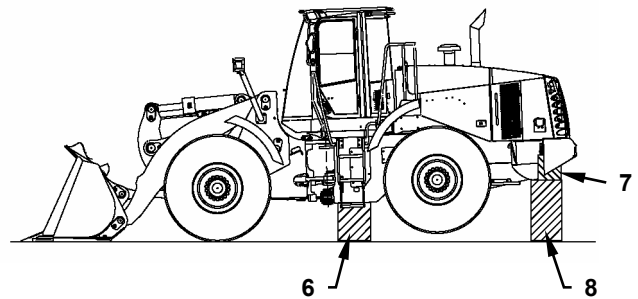
## BODY (TRAVEL SYSTEM) / Axle

7. Install rear tire (9) to rear axle (10) with bolt (11).  
(Refer to W3-1.)



W4GB-03-03-108

8. Start the engine. Check for any oil leaks at brake hose connections. Bleed any air pressure in the brake lines. (Refer to Technical Manual T5-6) Raise the bucket. Set hydraulic jack under the both sides of rear frame. Raise the rear frame side and remove holders (6, 7, 8).

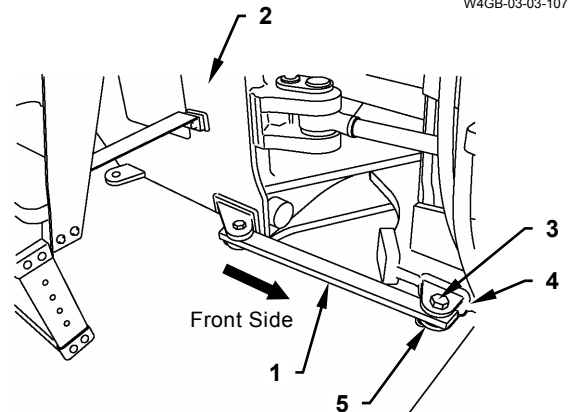


W4GB-03-03-107



**CAUTION: Machine Weight:**  
**ZW220: 17300 kg (38100 lb)**  
**ZW250: 19600 kg (43200 lb)**

9. Remove beta pin (5) from pin (3). Remove pin (3) from front frame (4). Remove lock lever (1) from front frame (4). Secure lock lever (1) to rear frame (2) with pin (3) and beta pin (5).

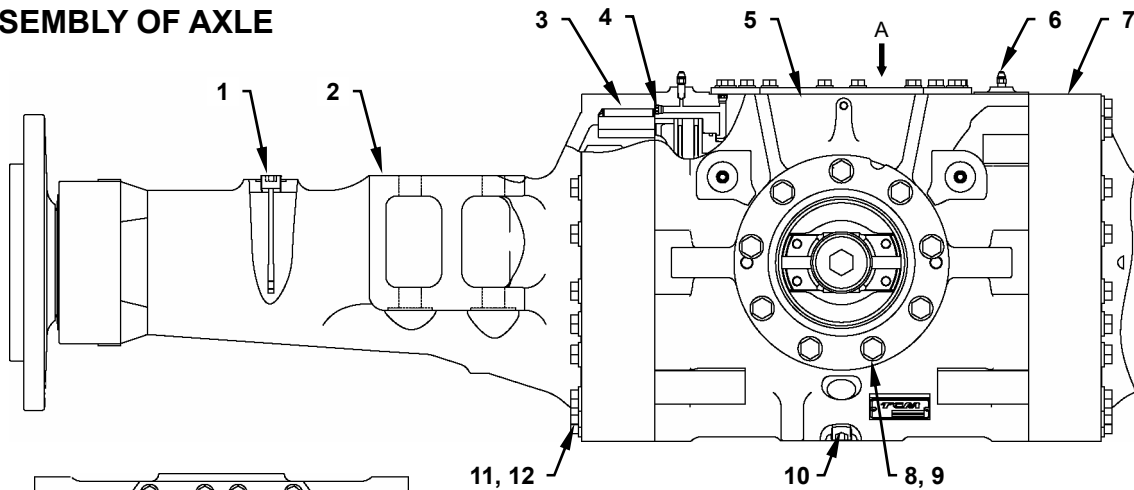


M4GB-01-136

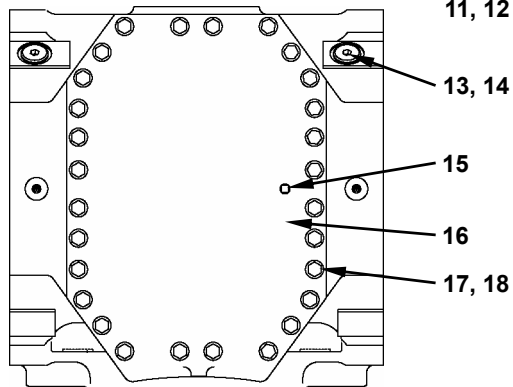


# BODY (TRAVEL SYSTEM) / Axle

## DISASSEMBLY OF AXLE



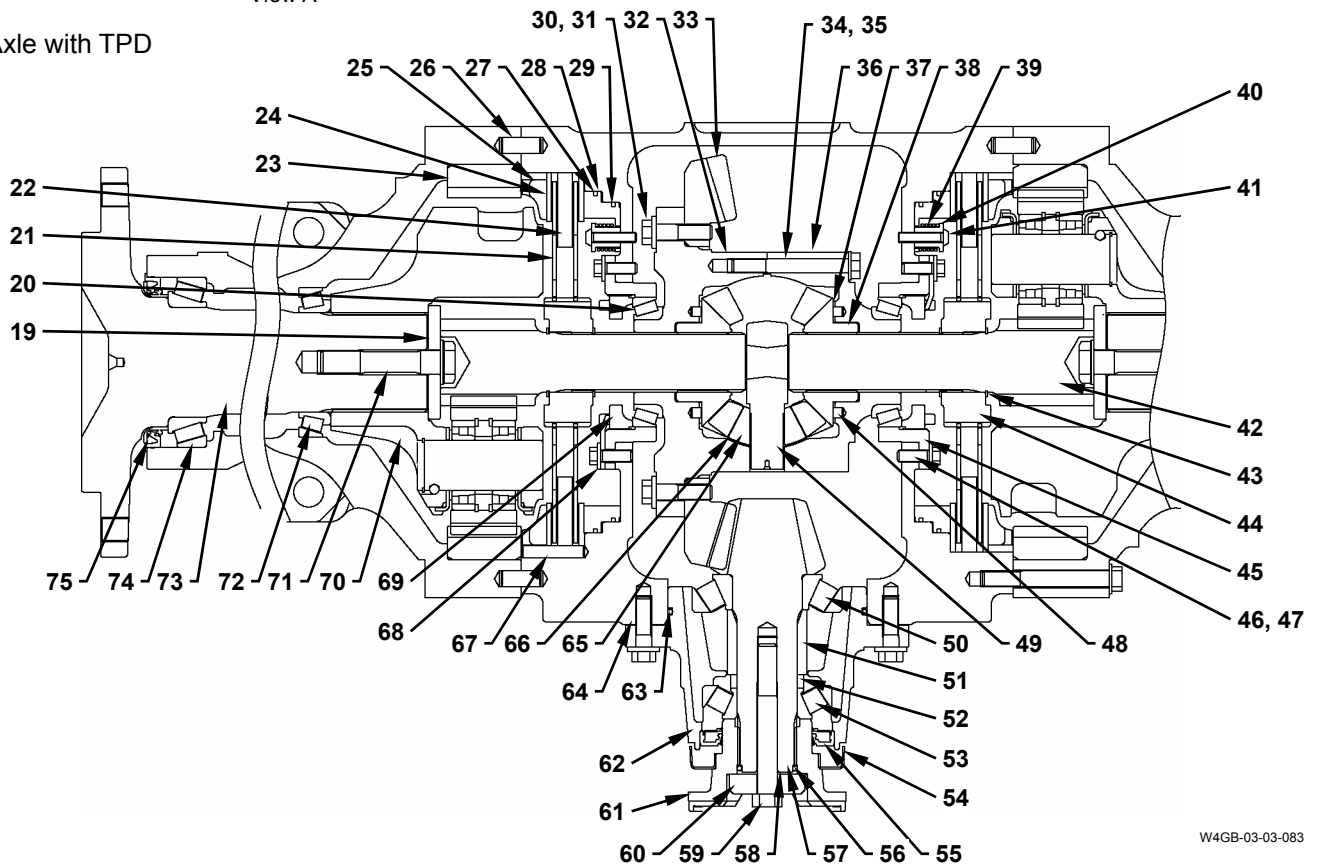
W4GB-03-03-001



View A

W4GB-03-03-082

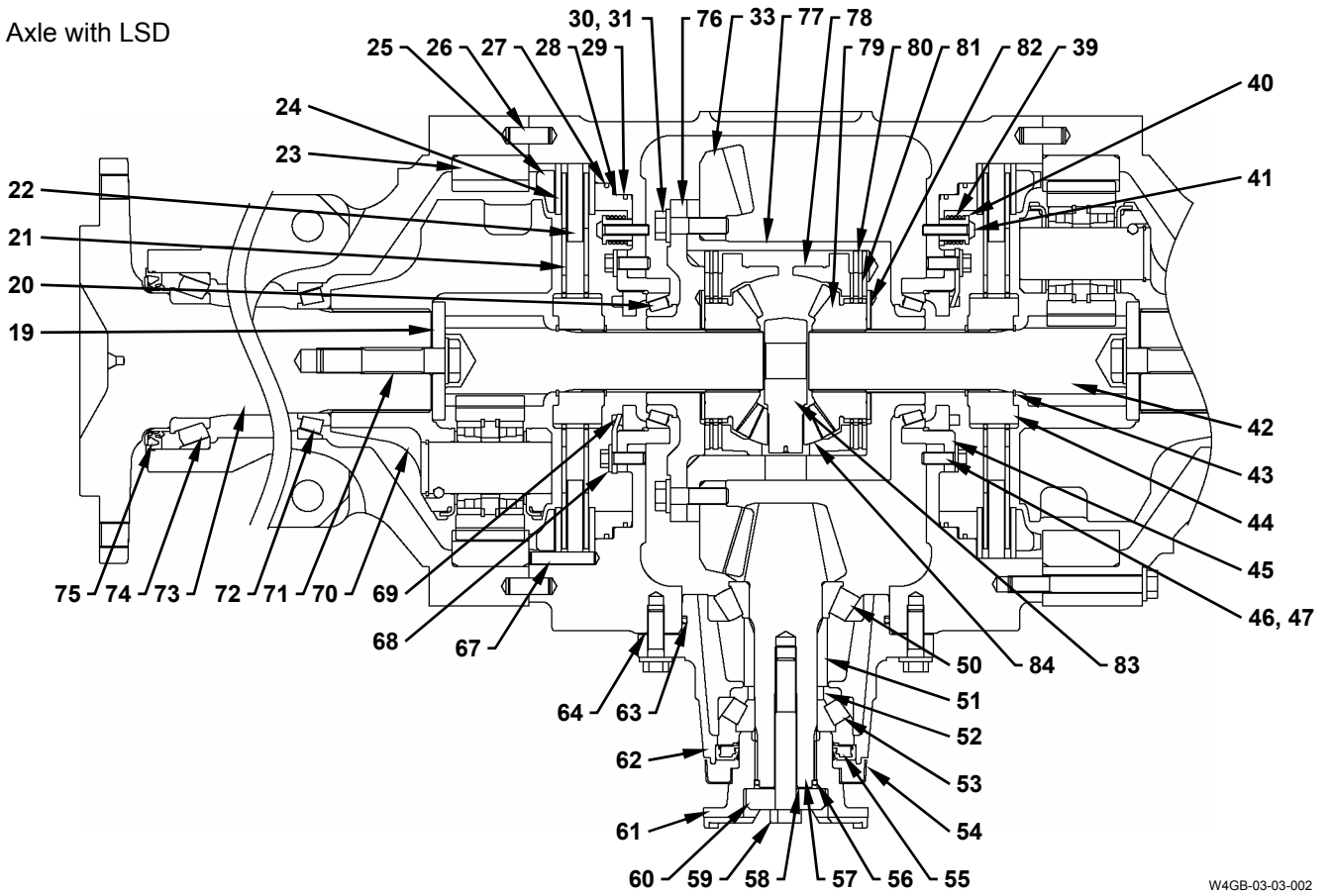
- Axle with TPD



W4GB-03-03-083

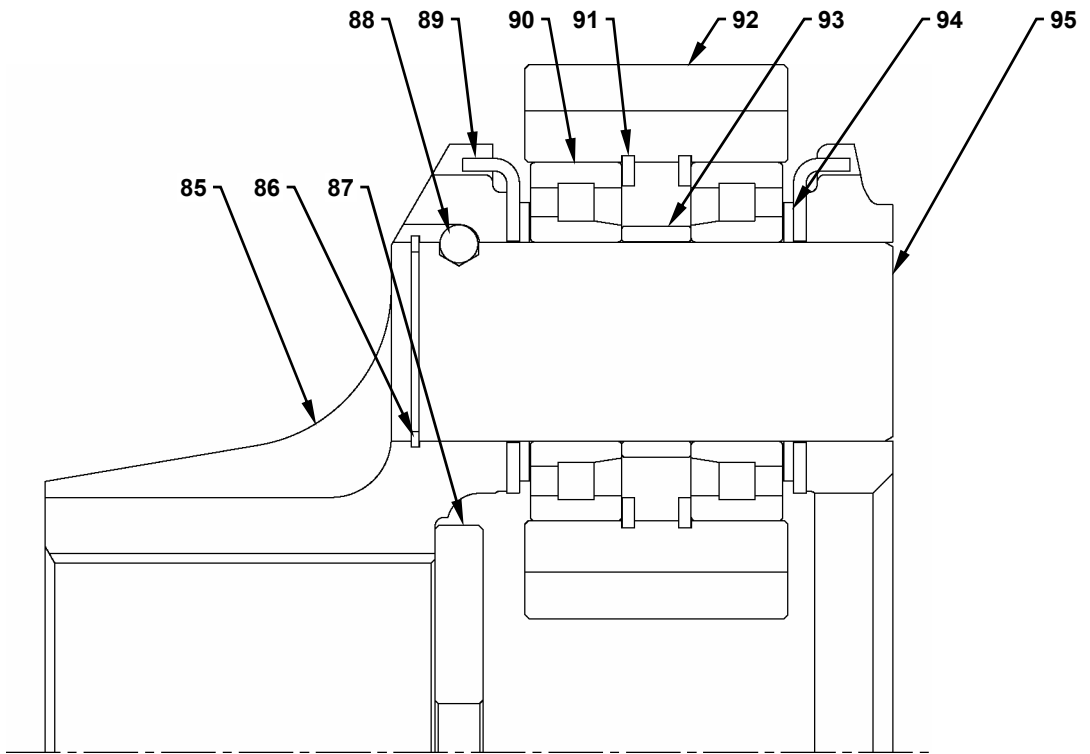
## BODY (TRAVEL SYSTEM) / Axle

- Axle with LSD



W4GB-03-03-002

- Planet Carrier Assembly (70)



W4GB-03-03-003

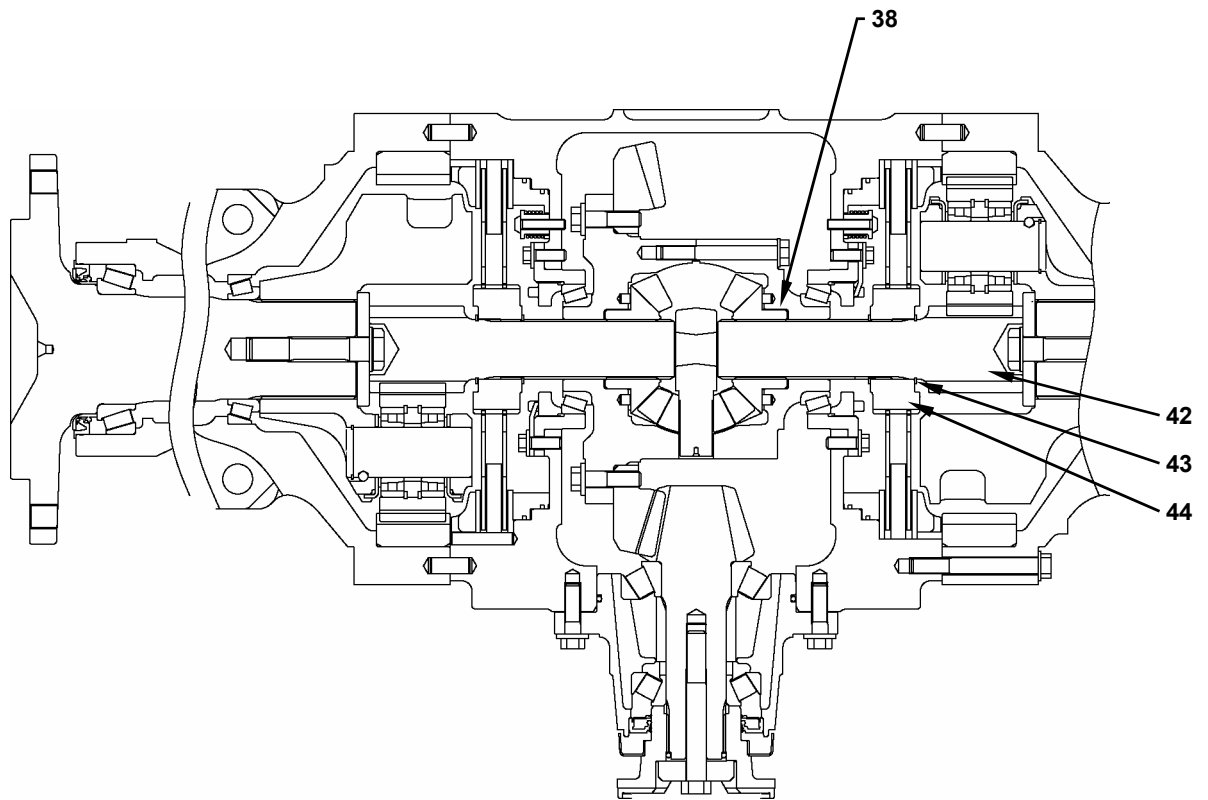
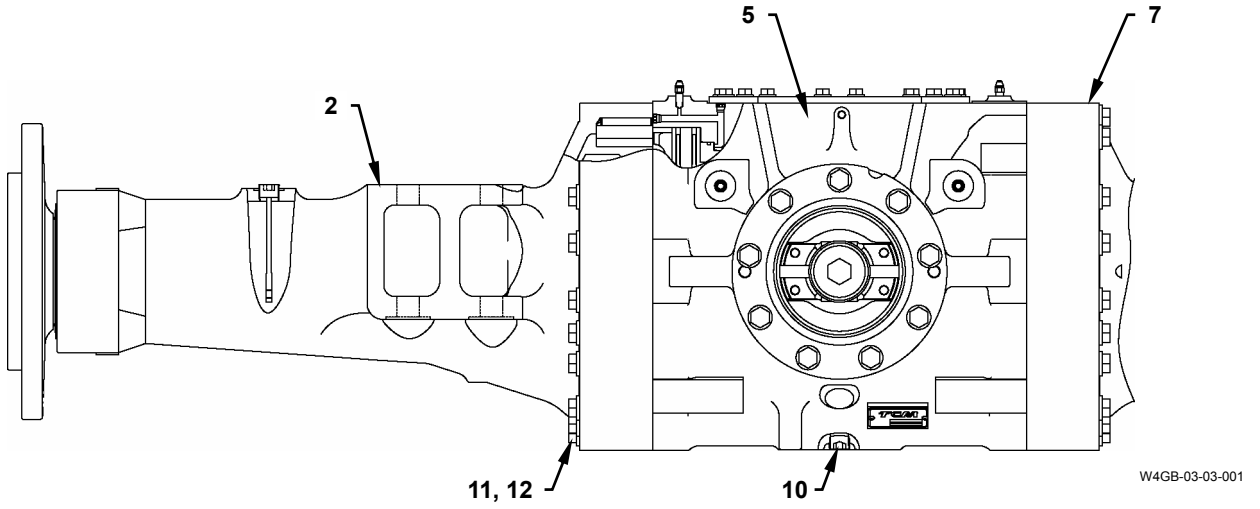
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## BODY (TRAVEL SYSTEM) / Axle

---

1 - Level Gauge	25 - End Plate (2 Used)	49 - Spider	73 - Axle Shaft (2 Used)
2 - Axle Tube	26 - Pin (2 Used)	50 - Bearing	74 - Bearing (2 Used)
3 - Pin (4 Used)	27 - D-Ring	51 - Spacer	75 - Oil Seal (2 Used)
4 - Plug	28 - Brake Piston	52 - Spacer	76 - Case A
5 - Differential Gear Body	29 - D-Ring	53 - Bearing	77 - Case B
6 - Bleeder Valve (2 Used)	30 - Bolt (20 Used)	54 - Dust Cover	78 - Pressure Ring
7 - Axle Tube	31 - Washer (20 Used)	55 - Oil Seal	79 - Side Gear
8 - Bolt (9 Used)	32 - Flange Half Case	56 - O-Ring	80 - Plate (2 Used)
9 - Washer (9 Used)	33 - Ring Gear	57 - Pinion Gear	81 - Disc (2 Used)
10 - Drain Plug	34 - Bolt (12 Used)	58 - Shim	82 - Plate
11 - Bolt (44 Used)	35 - Washer (12 Used)	59 - Bolt	83 - Spider
12 - Washer (44 Used)	36 - Plain Half Case	60 - Washer	84 - Pinion Gear
13 - Plug	37 - Thrust Washer	61 - Flange	85 - Planet Carrier
14 - O-Ring	38 - Side Gear (2 Used)	62 - Bearing Cage	86 - Retaining Ring
15 - Plug	39 - Spring (8 Used)	63 - O-Ring	87 - Retainer Plate (2 Used)
16 - Cover	40 - Adapter (8 Used)	64 - Shim	88 - Steel Ball (6 Used)
17 - Bolt (28 Used)	41 - Button Bolt (8 Used)	65 - Pinion Gear	89 - Thrust Washer (12 Used)
18 - Washer (28 Used)	42 - Shaft (2 Used)	66 - Thrust Washer	90 - Bearing (12 Used)
19 - Shim	43 - Retaining Ring (4 Used)	67 - Pin (8 Used)	91 - Retaining Ring (12 Used)
20 - Bearing (2 Used)	44 - Disc Hub (2 Used)	68 - Lock Plate (2 Used)	92 - Planetary Gear (6 Used)
21 - Brake Disc (4 Used)	45 - Bearing Retainer (2 Used)	69 - Adjusting Nut (2 Used)	93 - Collar (6 Used)
22 - Brake Ring (2 Used)	46 - Bolt	70 - Planet Carrier Assembly	94 - Thrust Bearing (12 Used)
23 - Ring Gear (2 Used)	47 - Washer	71 - Bolt (2 Used)	95 - Planet Shaft (6 Used)
24 - Brake Ring (2 Used)	48 - Dowel Pin	72 - Bearing (2 Used)	

# BODY (TRAVEL SYSTEM) / Axle



## BODY (TRAVEL SYSTEM) / Axle

### Disassembly of Axle

**CAUTION:** Axle assembly weight:

**ZW220**

TPD Front: 1020 kg (2250 lb)

TPD Rear: 960 kg (2250 lb)

LSD Front: 1020 kg (2300 lb)

LSD Rear: 965 kg (2150 lb)

**ZW250**

TPD Front: 1180 kg (2600 lb)


TPD Rear: 1120 kg (2600 lb)

LSD Front: 1190 kg (2620 lb)

LSD Rear: 1130 kg (2490 lb)

### Removal of Axle Tube (2, 7)


1. Remove drain plug (10) from differential gear body (5). Drain gear oil from differential gear body (5).

 : 14 mm

Gear oil quantity: 32 L (8.45 US gal.) (ZW220)

40 L (10.6 US gal.) (ZW250)

2. Remove bolts (11) (20 used) (on one side) and washer (12) (20 used) from axle tube (2).

 : 24 mm

3. Temporarily hoist axle tube (2) being removed. Place a stand at the opposite side of axle tube (7) so that to prevent the axle tube from lowering.

**CAUTION:** Axle tube (2) weight:

**ZW220**

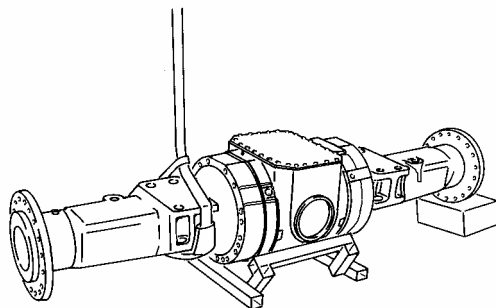
Front: 301 kg (665 lb)

Rear: 270 kg (600 lb)

**ZW250**

Front: 374 kg (825 lb)

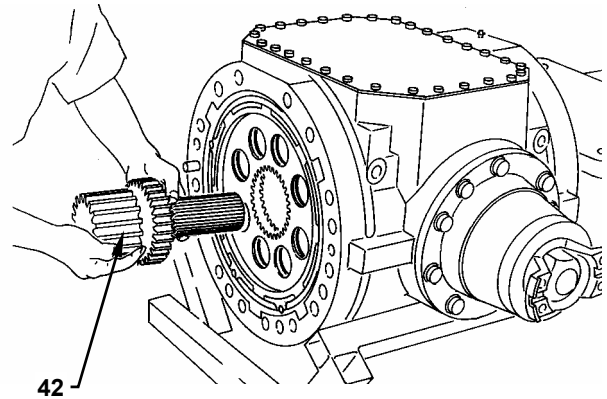
Rear: 329 kg (730 lb)



W4GB-03-03-004

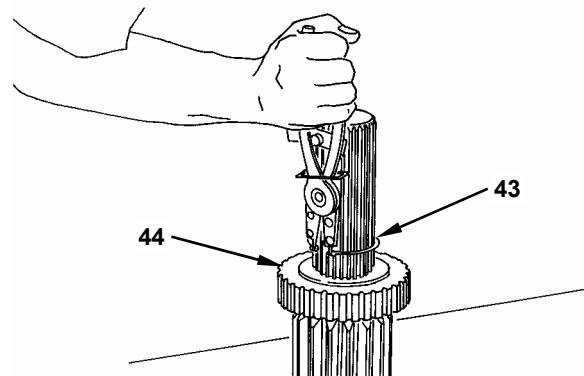
4. Remove axle tube (2) from differential gear body (5). If mating surface is sticking, detach by using a plastic hammer.

5. Remove shaft (42) assembly from side gear (38).



W4GB-03-03-005

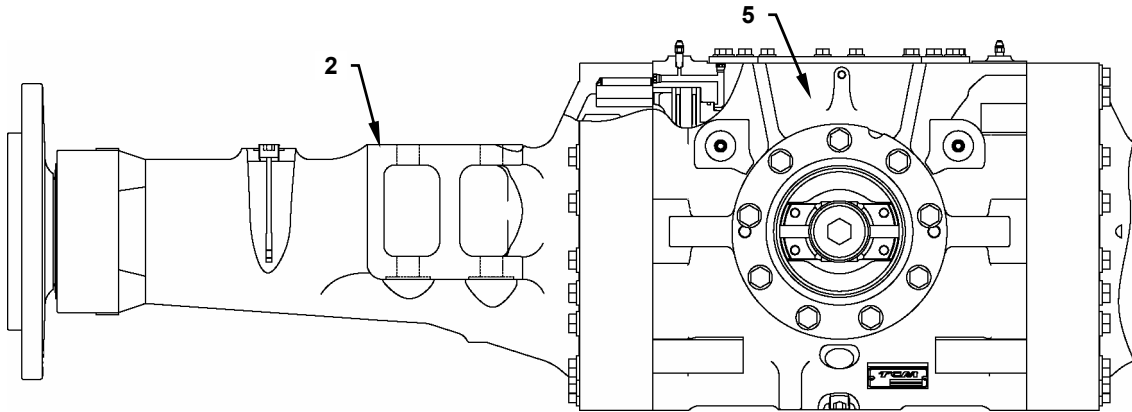
6. Remove retaining ring (43) from shaft (42) assembly. Remove disc hub (44) from the spline part of shaft (42).



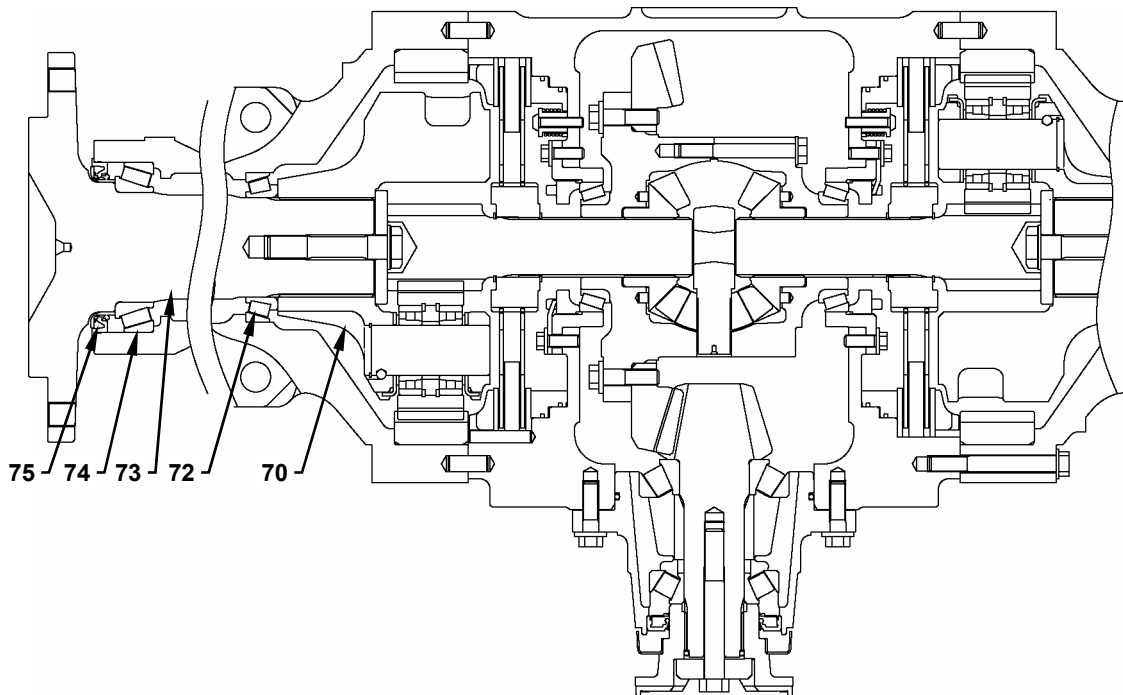
W4GB-03-03-006

7. Remove axle tube (7) on the opposite side and shaft (42) assembly in the same way.

# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-001





W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

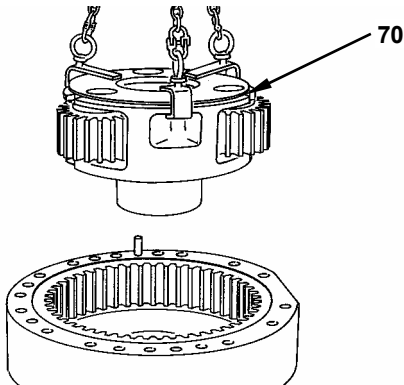
### Disassembly of Axle Tube

8. Place axle tube (2) with the differential gear mounting side up. Secure axle shaft (73) to the plate.


 : 36 mm

 **CAUTION:** Planet carrier assembly (70) weight:  
ZW220: 57 kg (130 lb)  
ZW250: 78 kg (175 lb)

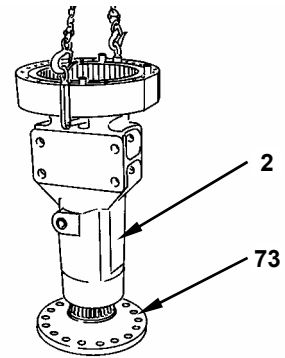
9. Remove planet carrier assembly (70) from axle shaft (73) spline by using a crowbar.



W4GB-03-03-007

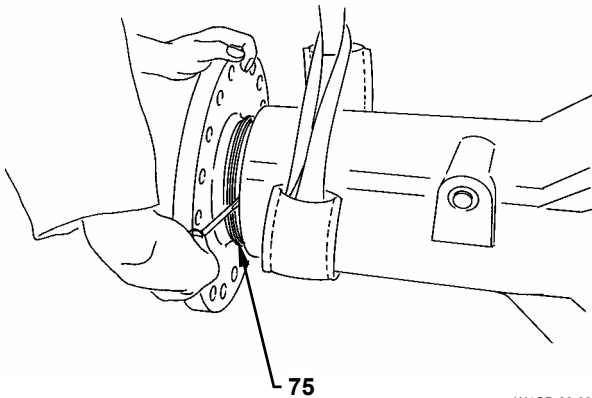
 **CAUTION:** Axle tube (2) weight:  
ZW220  
Front: 160 kg (355 lb)  
Rear: 127 kg (280 lb)  
ZW250  
Front: 190 kg (420 lb)  
Rear: 145 kg (320 lb)

12. Place the axle tube (2) with differential gear body (5) side up. Hoist tube (2). Drop down and remove axle shaft (73).



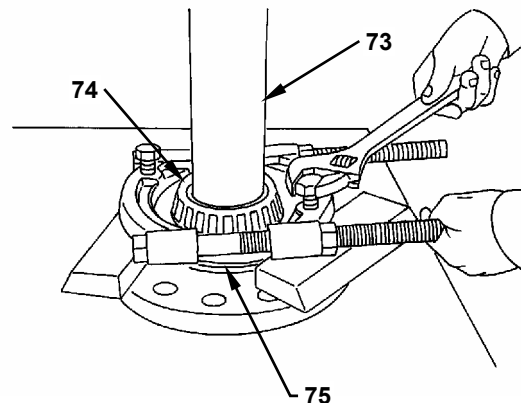
W4GB-03-03-009

10. Place axle tube (2) horizontally. Remove oil seal (75) from axle tube (2).



W4GB-03-03-008

13. Remove bearing (74) inner parts and oil seal (75) from axle shaft (73) as shown in the figure by using the special tool for removing bearing (separator).

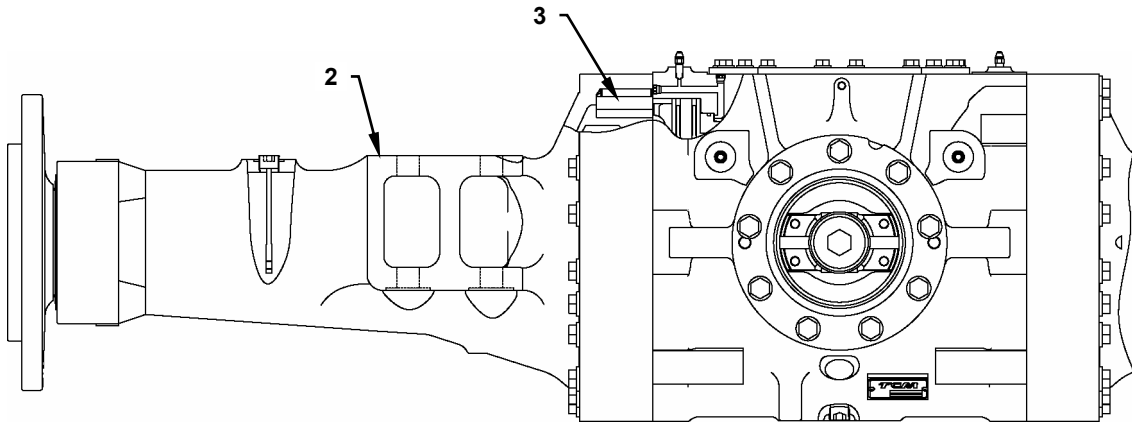


W4GB-03-03-010

11. Remove bearing (72) inner parts from axle tube (2).

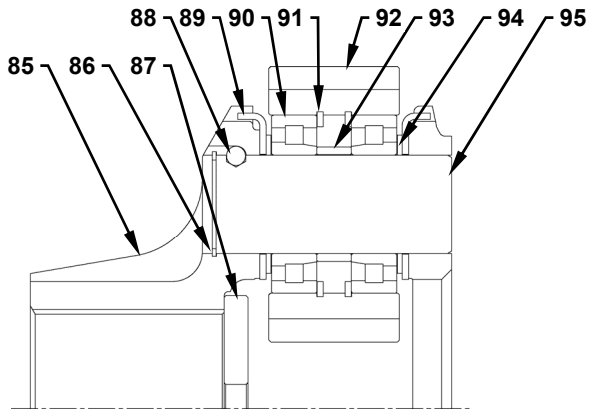
14. Remove the outer part of bearings (72, 74) on the differential gear side and wheel side from axle tube (2). Tap the outer part of bearing evenly and remove the outer part of bearing.

# BODY (TRAVEL SYSTEM) / Axle

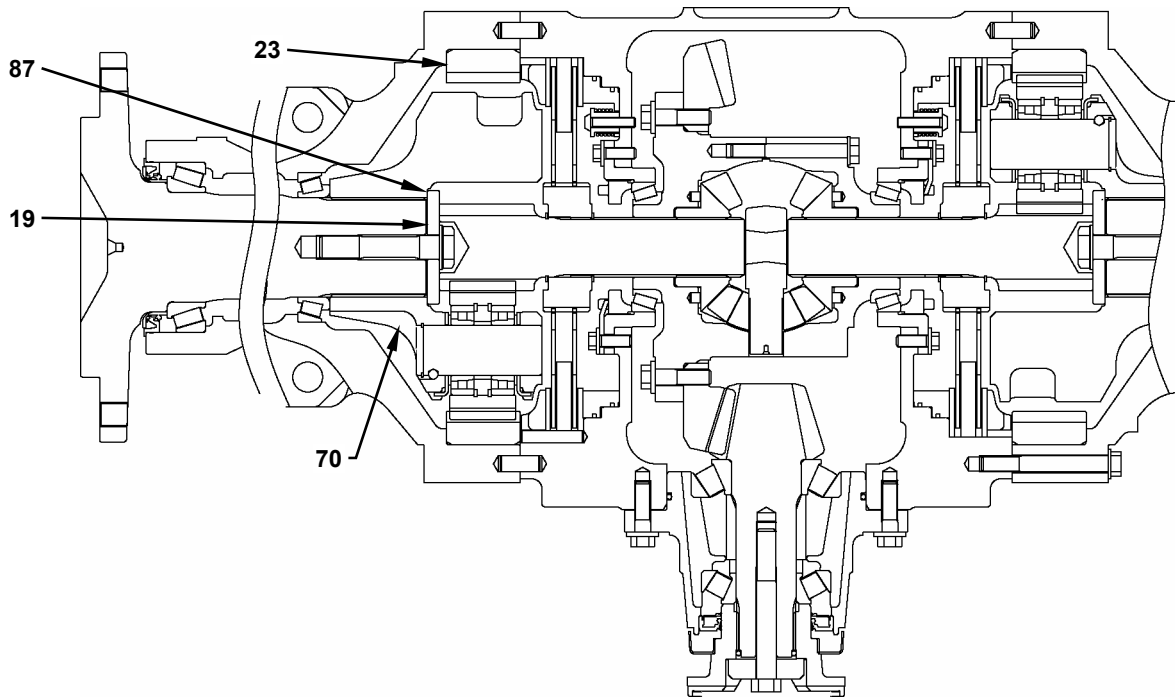


W4GB-03-03-001

## • Planet Carrier Assembly (70)



W4GB-03-03-003

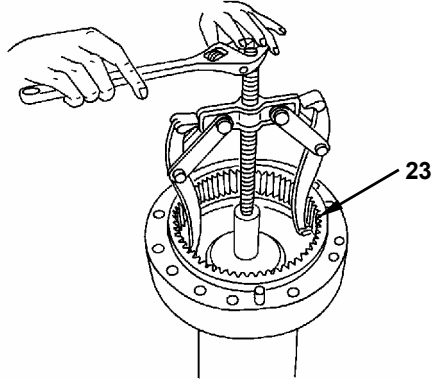


W4GB-03-03-083



## BODY (TRAVEL SYSTEM) / Axle

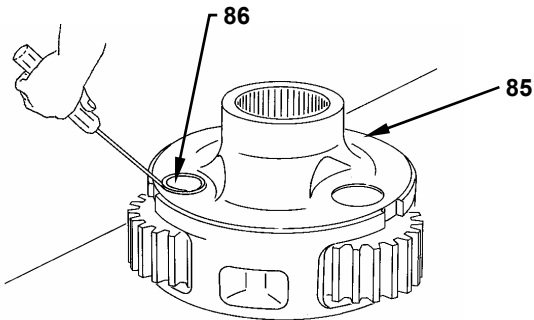
15. Remove ring wheel (23) from axle tube (2) with using gear puller. Insert a plate in axle tube (2) and support the shaft of gear puller. Do not lose stopper pins (3) (4 used).



W4GB-03-03-011

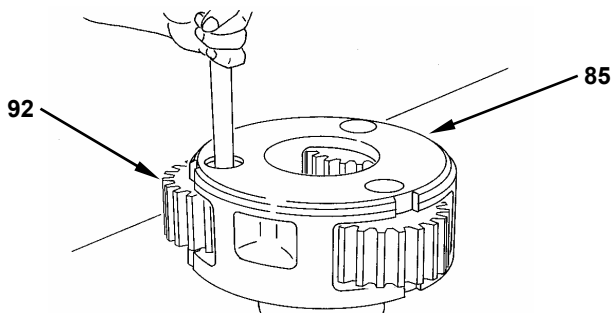
### Disassembly of Planet Carrier Assembly (70)

16. Remove retaining ring (86) from planet carrier (85).




W4GB-03-03-012

17. Tap and remove the planet shaft (95) from opposite side of planet carrier (85). Do not lose the steel balls (88) in the planet shaft (95).

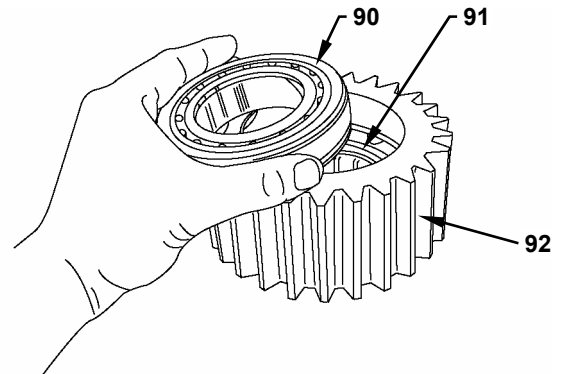


W4GB-03-03-013

18. Remove the planet gear (92) assembly, thrust bearings (94) (2 used) for clearance adjustment, and thrust washers (89) (2 used).

 **NOTE:** If reusing thrust bearings (94) for clearance adjustment, mark them for assembling.

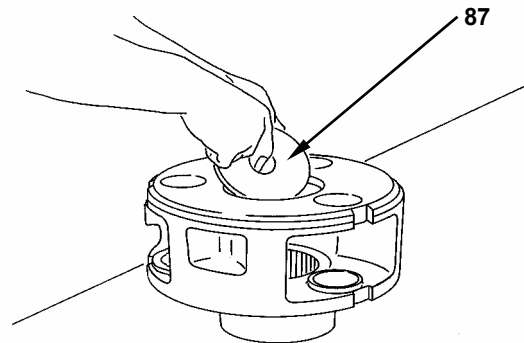
19. Remove bearings (90) (2 used) and collar (93) from planet gear (92). Remove retaining rings (91) (2 used).



W4GB-03-03-014

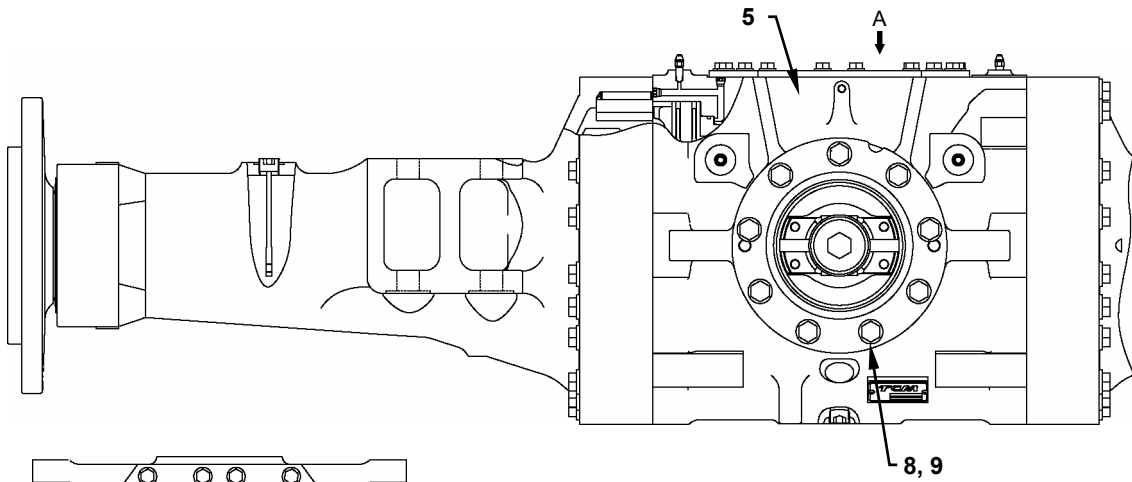
20. Disassemble other 2 planet shafts (95) in the same way.

21. Remove retainer plate (87) from inside of planet carrier (85). Remove shim (19) if installed.

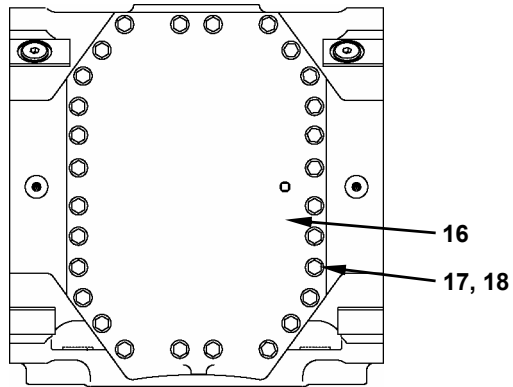


W4GB-03-03-015

# BODY (TRAVEL SYSTEM) / Axle

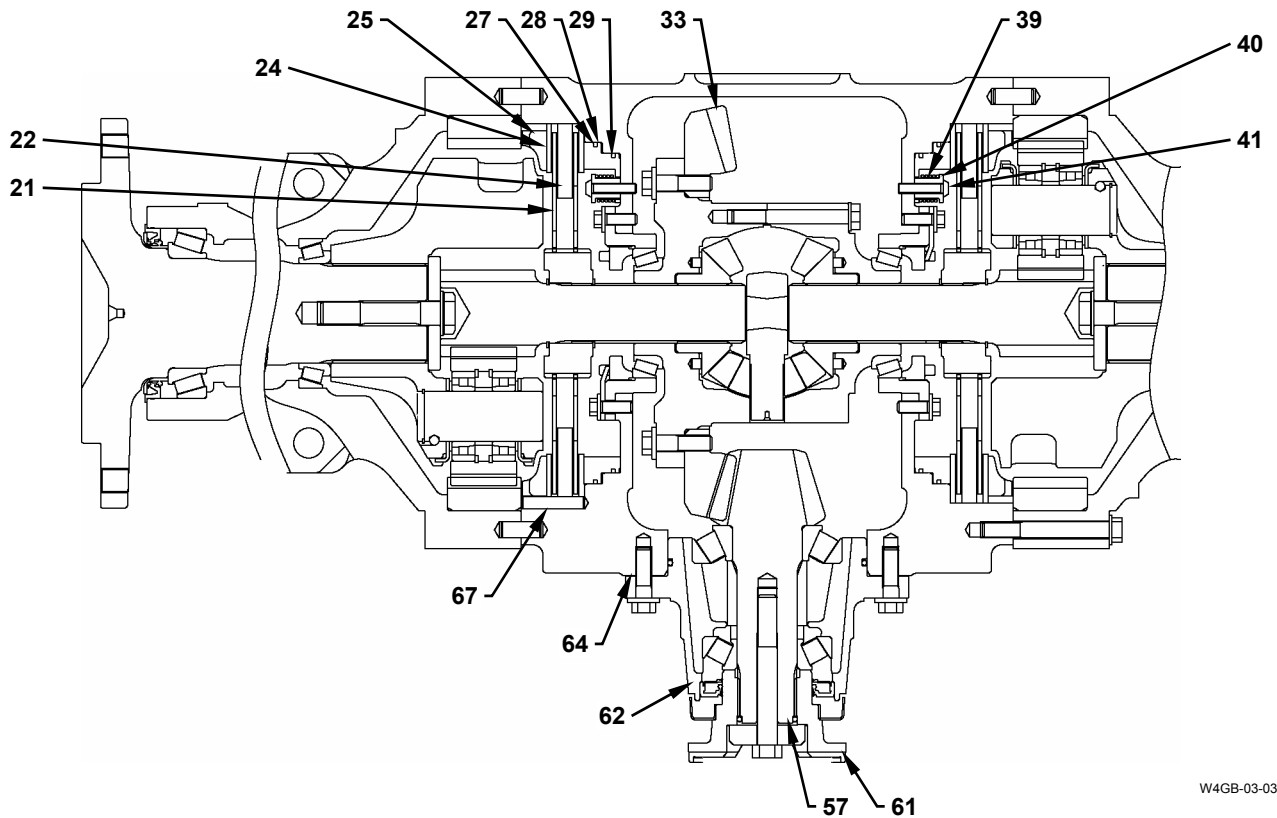


W4GB-03-03-001



View A

W4GB-03-03-082




W4GB-03-03-083

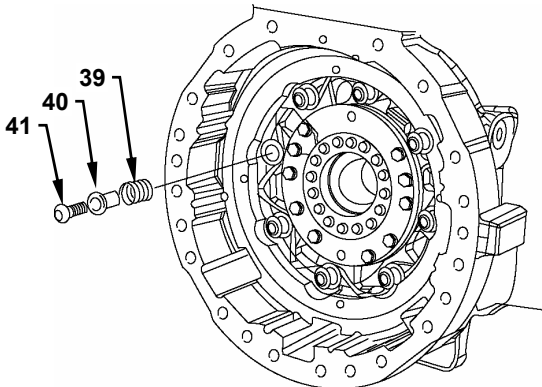
## BODY (TRAVEL SYSTEM) / Axle

### Removal of Brake

22. Remove end plate (25), brake ring (24), brake disc (21), brake ring (22), brake disc (21), and brake ring (24) from the inside of differential gear body (5) in this order. Remove pins (67) (8 used) from differential gear body (5).

23. Remove button bolts (41) (8 used), adapters (40) (8 used), and springs (39) (8 used) from brake piston (28).

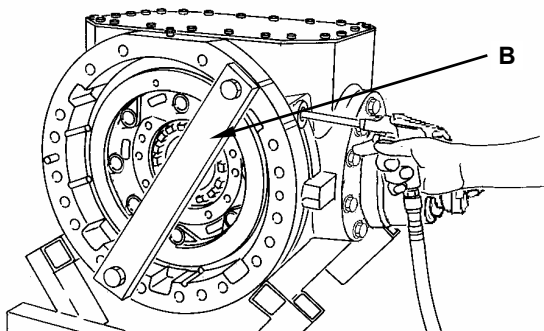
 : 6 mm



W4GB-03-03-016

24. Install piston fly off prevention stopper (B) by using the tube mounting side of differential gear body (5).

25. Supply compressed air from the hydraulic pressure port slowly, and remove piston (28) from differential gear body (5).




W4GB-03-03-017

26. Remove D-rings (27, 29) from the large diameter part and small diameter part of brake piston (28).

27. Remove brake on the opposite side in the same way.


### Removal of Bearing Cage (62) Assembly

28. Remove bolts (17) (28 used) and washers (18) (28 used) from cover (16). Remove cover (16) from differential gear body (5).

 : 19 mm

29. Record gear teeth contact state and backlash of ring gear (33).

30. Remove bolt (8) and washer (9) from bearing cage (62).


 : 24 mm

Quantity of bolts and washers:

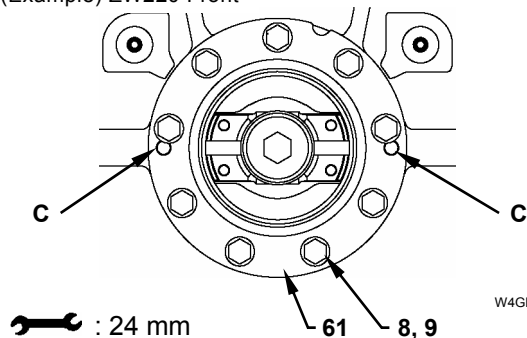
ZW220 Front/Rear: 9 used/10 used

ZW250 Front/Rear: 13 used /14 used

31. Install the removed bolts (8) (2 used) to the thread part (C) for pullers of bearing cage (62). Tighten bolts (8) (2 used) evenly and detach the bearing surface. Remove bearing cage (62) and pinion gear (57) as an assembly.

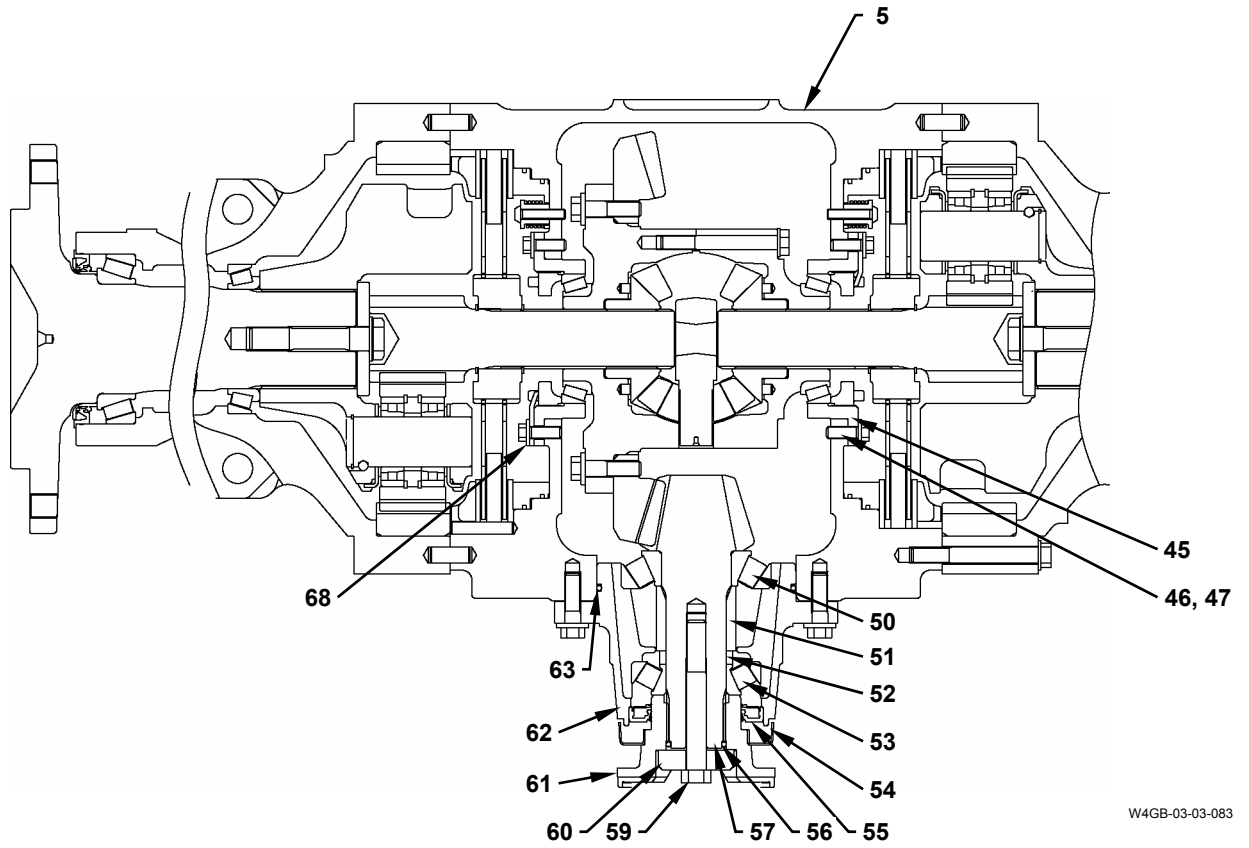
 **NOTE:** Half shim (64) is installed between differential gear body (5) and bearing cage (62), be careful at the time of removal.

(Example) ZW220 Front



W4GB-03-03-018

# BODY (TRAVEL SYSTEM) / Axle




W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

### Disassembly of Bearing Cage (62) Assembly

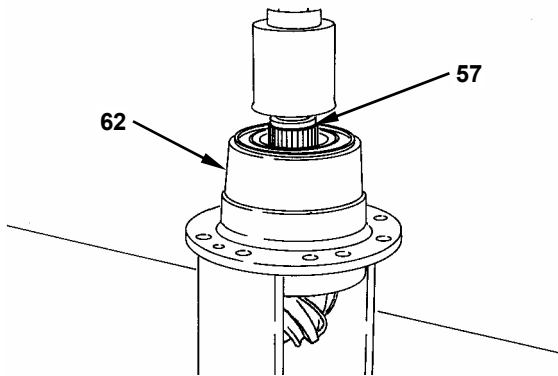
32. Place bearing cage (62) onto a holder with the flange (60) side facing upward. Remove bolt (59) and washer (60) from flange (61) by using a nut runner.

 : 30 mm

33. Remove bolt (59). Remove washer (60) and O-ring (56).

34. Remove flange (61) from pinion gear (57). Remove dust cover (54) from flange (61).

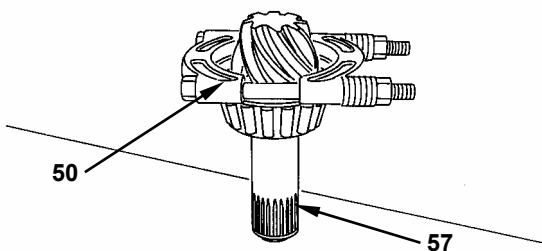
35. Remove pinion gear (57) from bearing cage (62) by using a press.



W4GB-03-03-019

36. Remove spacers (51, 52) from pinion gear (57).

37. Remove inner of bearing (50) from pinion gear (57) by using a separator.



W4GB-03-03-020

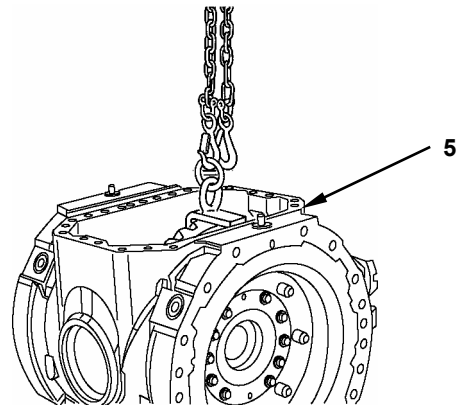
38. Remove oil seal (55) from bearing cage (62).

39. Remove inner from bearing (53).

40. Tap each periphery evenly and lightly and remove the outer of bearings (50, 53) which remained inside bearing cage (62).

41. Remove O-ring (63) from outer-diameter part of bearing cage (62).


42. Remove bolts (17) (28 used) and cover (16). Hoist differential gear body (5) with a hoist temporarily.



W4GB-03-03-021

43. Remove bolt (46) and washer (47) from bearing retainer (45).

Remove the attached lock plate (68).

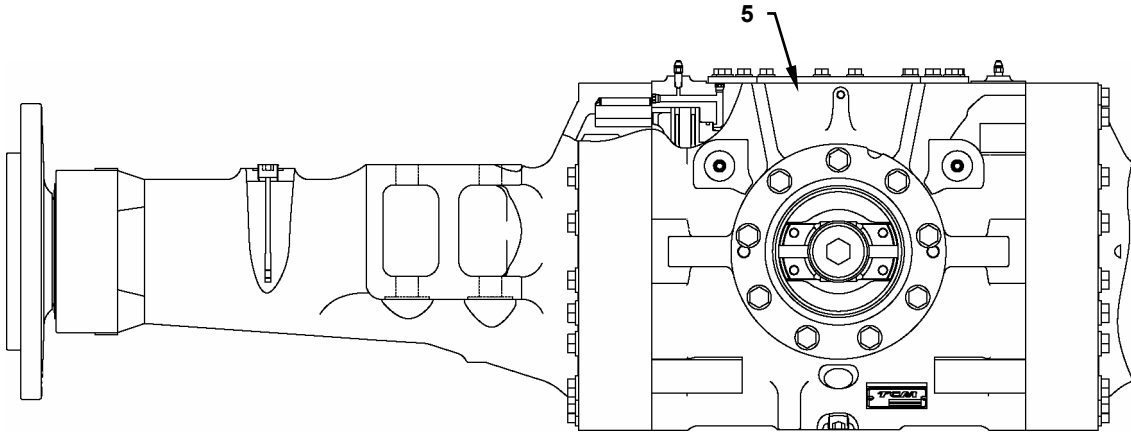
 : 19 mm

Number of Bearing Retainer Installation Bolts (46):

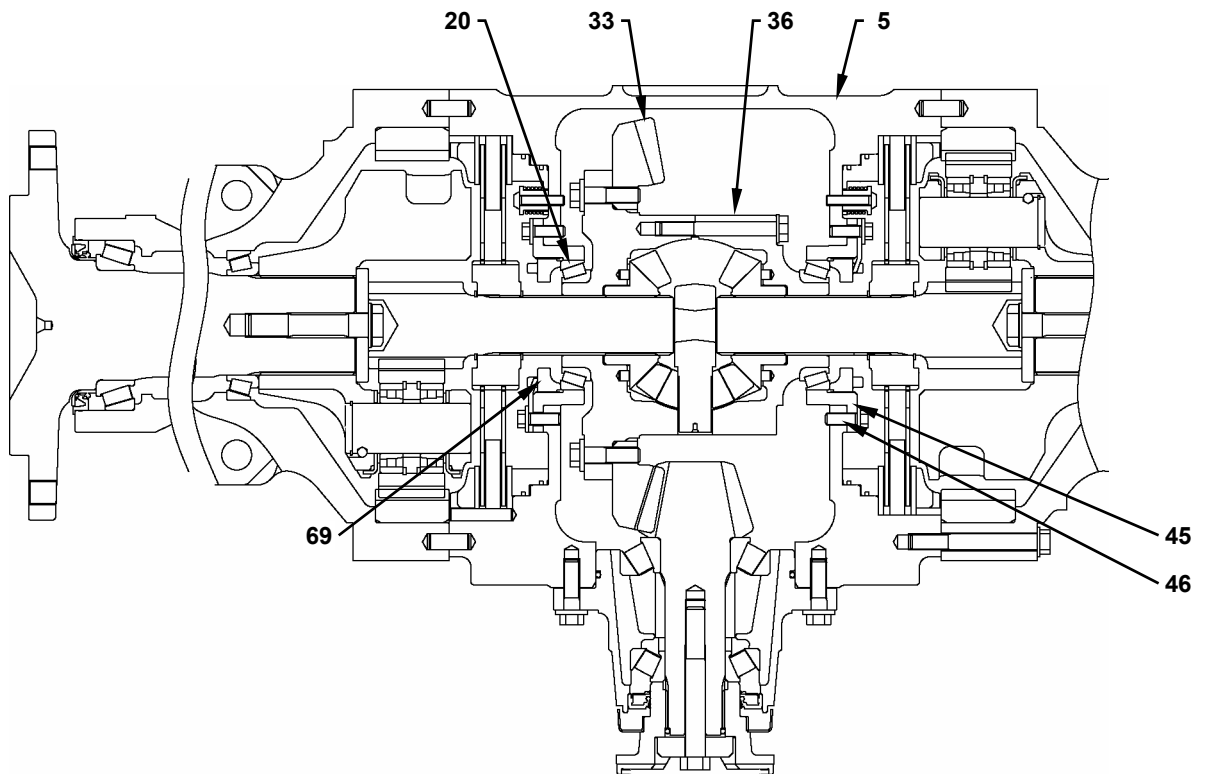
ZW220: 10 used

ZW250: 12 used

# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-001

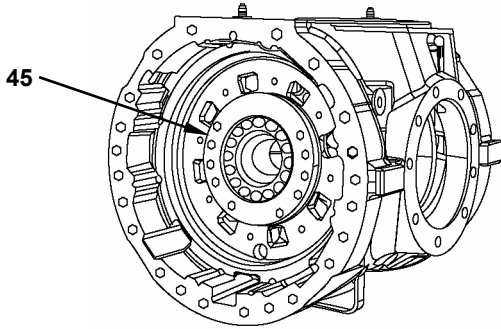


W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

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44. Install bolts (46) (2 used) in the screw hole on pullers of bearing retainer (45) and tighten evenly. Remove bearing retainer (45) from plain half case (36).



W4GB-03-03-022

45. Remove adjust nut (69) from bearing retainer (45). Remove the outer of bearing (20) from opposite side.
46. Remove bearing retainer (45) on the opposite side in the same way.
47. Remove ring gear (33) and the differential assembly from differential gear body (5).



**CAUTION: Differential assembly weight:**

**ZW220**

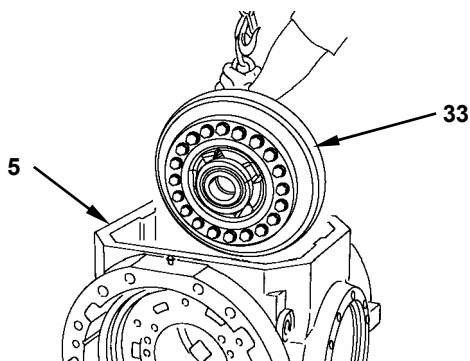
**TPD: 83 kg (185 lb)**

**LSD: 88 kg (195 lb)**

**ZW250**

**TPD: 91 kg (205 lb)**

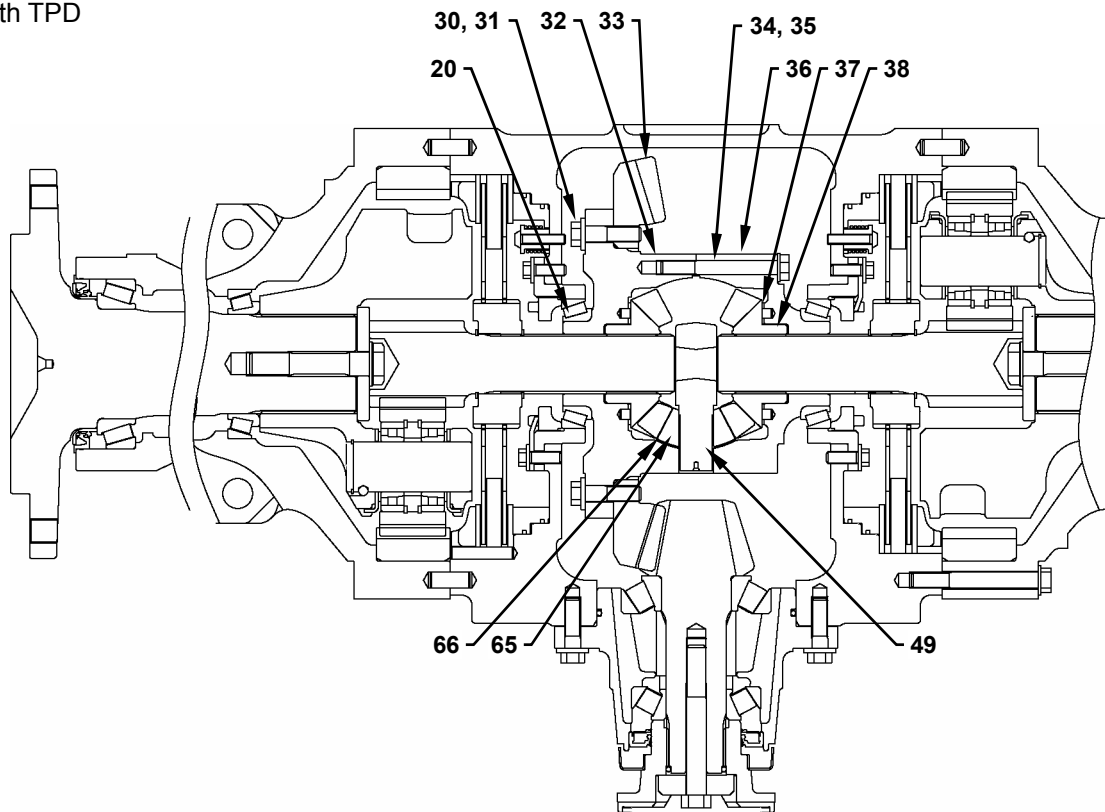
**LSD: 97 kg (215 lb)**



W4GB-03-03-023

## BODY (TRAVEL SYSTEM) / Axle

- Axle with TPD




W4GB-03-03-083

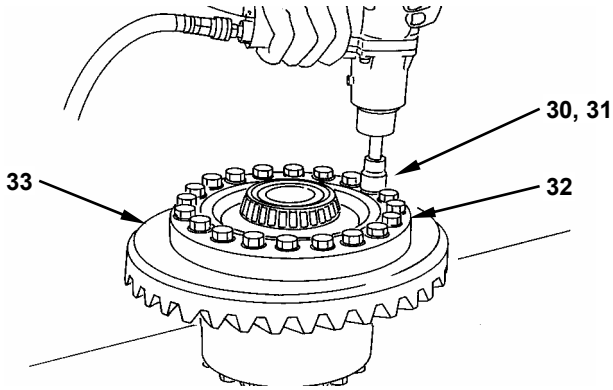


## BODY (TRAVEL SYSTEM) / Axle

### Disassembly of Differential Case (axle with TPD only)


48. Remove bolts (30) (20 used) and washers (31) (20 used) from flange half case (32). Remove ring wheel (33) from flange half case (32).

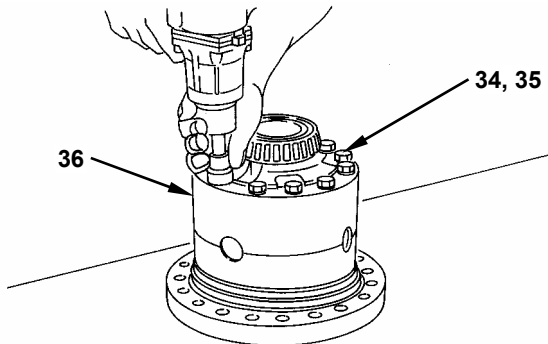
 : 24 mm



W4GB-03-03-024


49. Reverse the case and remove bolts (34) (12 used) and washers (35) (12 used) from plain half case (36).

 : 22 mm

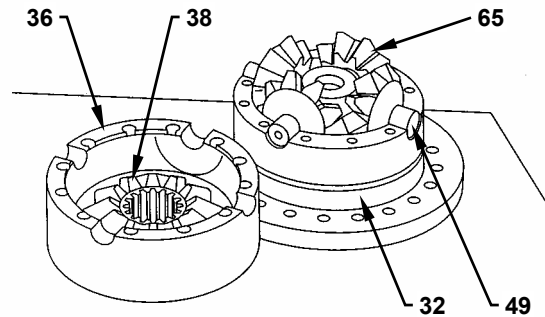


W4GB-03-03-025

50. Tap the center of spider (49) lightly and remove plain half case (32).

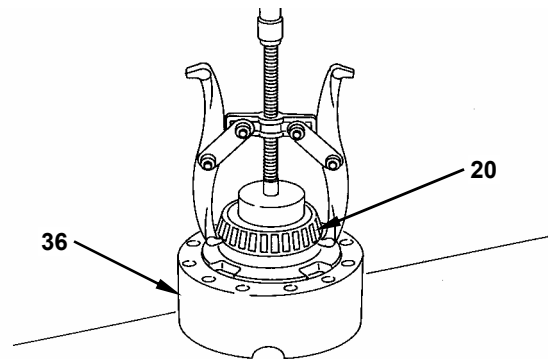
 **NOTE:** Put matching marks on plain half case (32) before separating for reassembling.

51. Remove side gears (38) (2 used), spider (49), pinion gears (65) (4 used), thrust washers (37) (2 used) for guide gears, and thrust washers (66) (4 used) for pinion gears from the inner part of plain half cases (32, 36).



W4GB-03-03-026

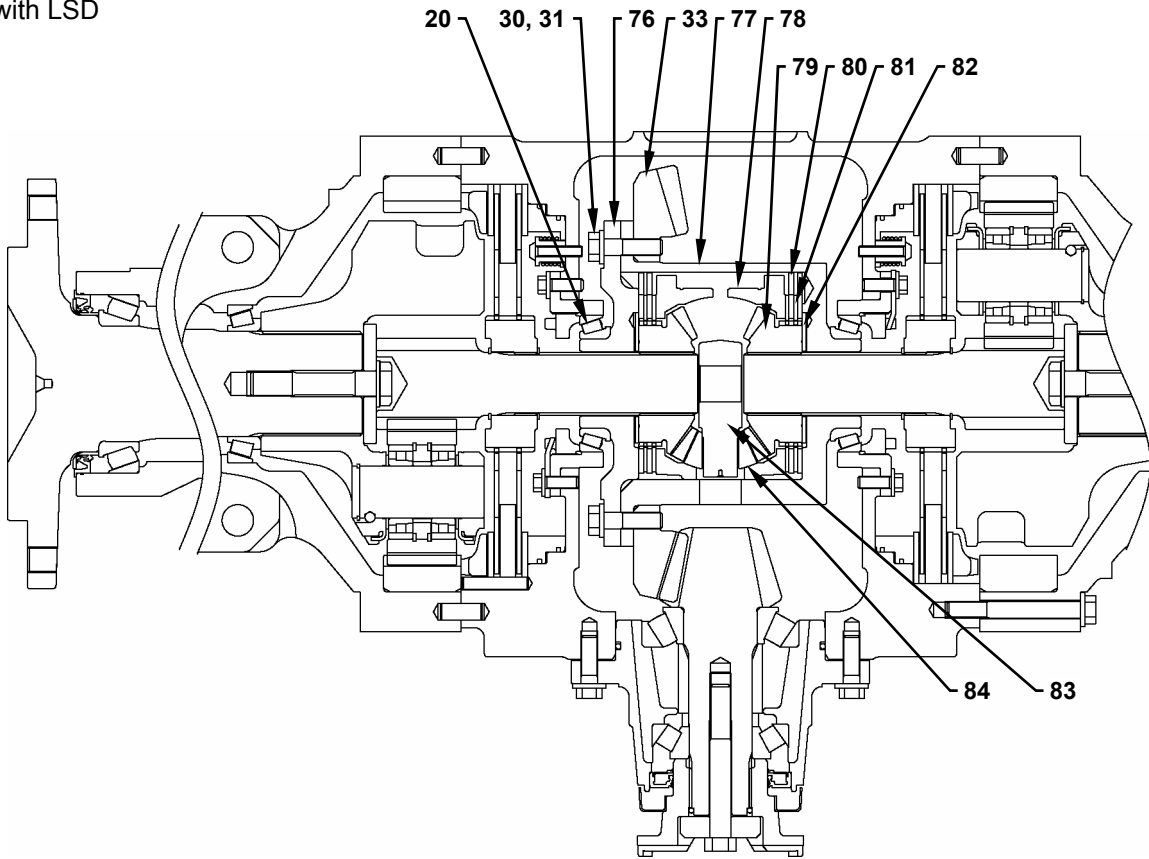
52. Remove inner of bearing (20) from plain half case (36) and flange half case (32) by using a bearing puller.



W4GB-03-03-027

## BODY (TRAVEL SYSTEM) / Axle

- Axle with LSD




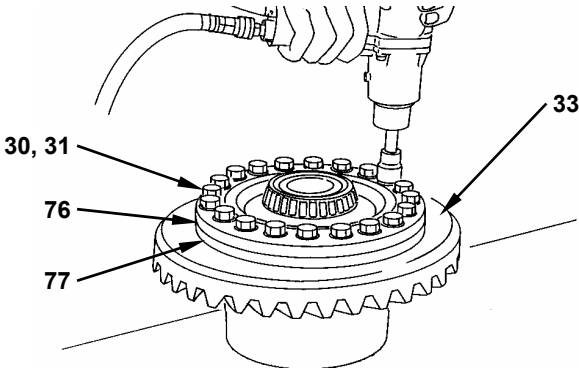
W4GB-03-03-002

## BODY (TRAVEL SYSTEM) / Axle

### Disassembly of Differential Case (axle with LSD only)


53. Remove bolts (30) (20 used) and washers (31) (20 used) from case A (76). Remove ring gear (33) from case A (76).

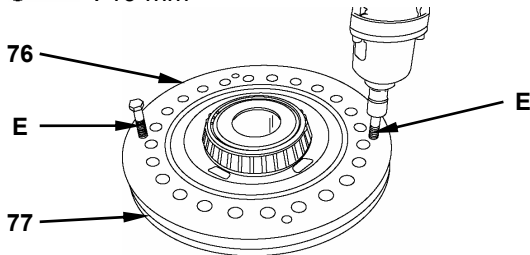
 : 24 mm



W4GB-03-03-028

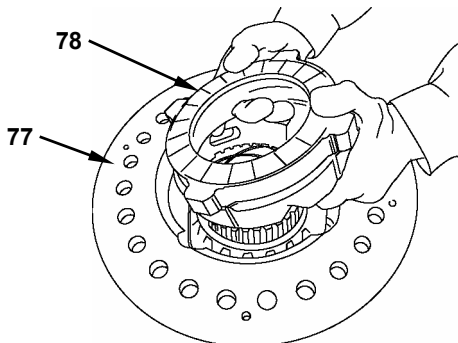
54. Install bolts to the thread part (E) for pullers (M12 x 1.25 mm) (2 places) in case A (76). Tighten evenly and remove cases A (76) and B (77).

 : 19 mm



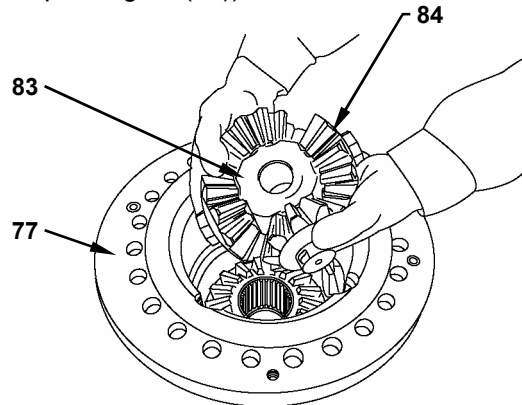
W4GB-03-03-029

55. Remove plate (82), plates (80) (2 used), disc (81) (2 used), pressure ring (78), and side gear (79) from the inner part of case B (77). (Illustration shows the removal of pressure ring (87))



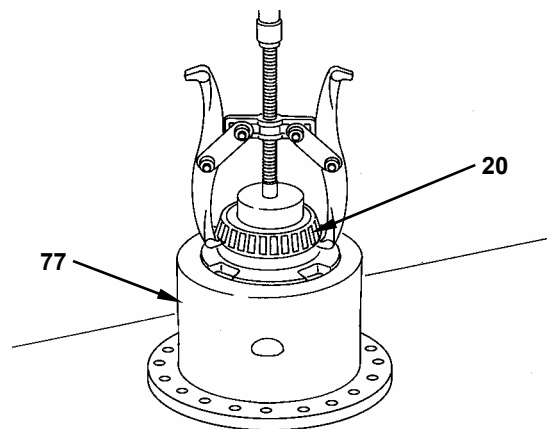
W4GB-03-03-030

56. Remove spider (83) and pinion gears (84) (4 used) from the inner part of case B (77). Remove remained side gears (79) pressure ring (78), discs (81) (2 used), plates (80) (2 used), and plates (82). (Illustration shows the removal of spider (83) and pinion gear (84))



W4GB-03-03-031

57. Remove inner of bearings (20) (2 used) from case B (77) and case A (76) by using a bearing puller.



W4GB-03-03-032

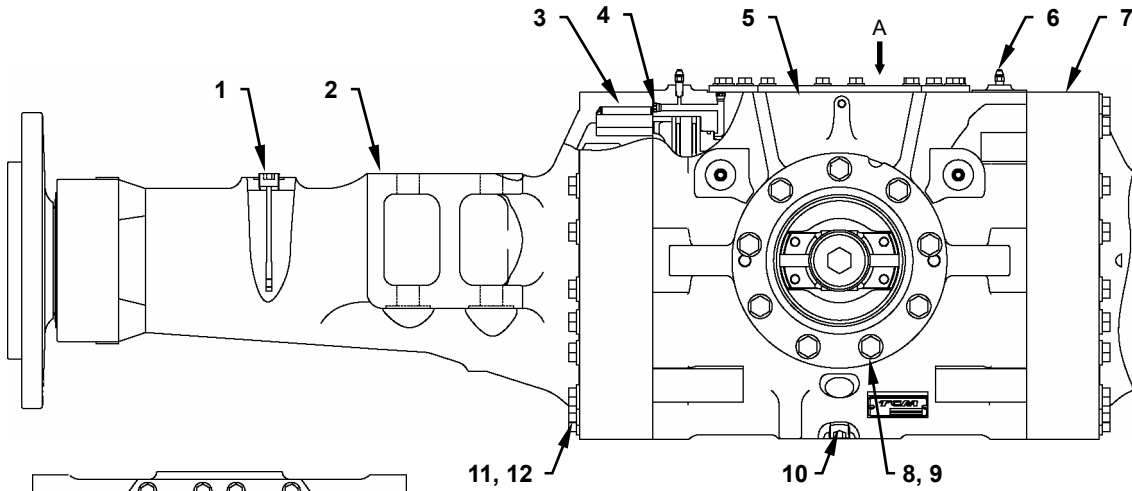
## BODY (TRAVEL SYSTEM) / Axle

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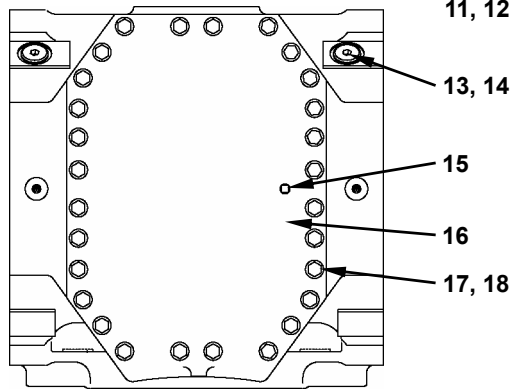
(Blank)

# BODY (TRAVEL SYSTEM) / Axle

## ASSEMBLY OF AXLE



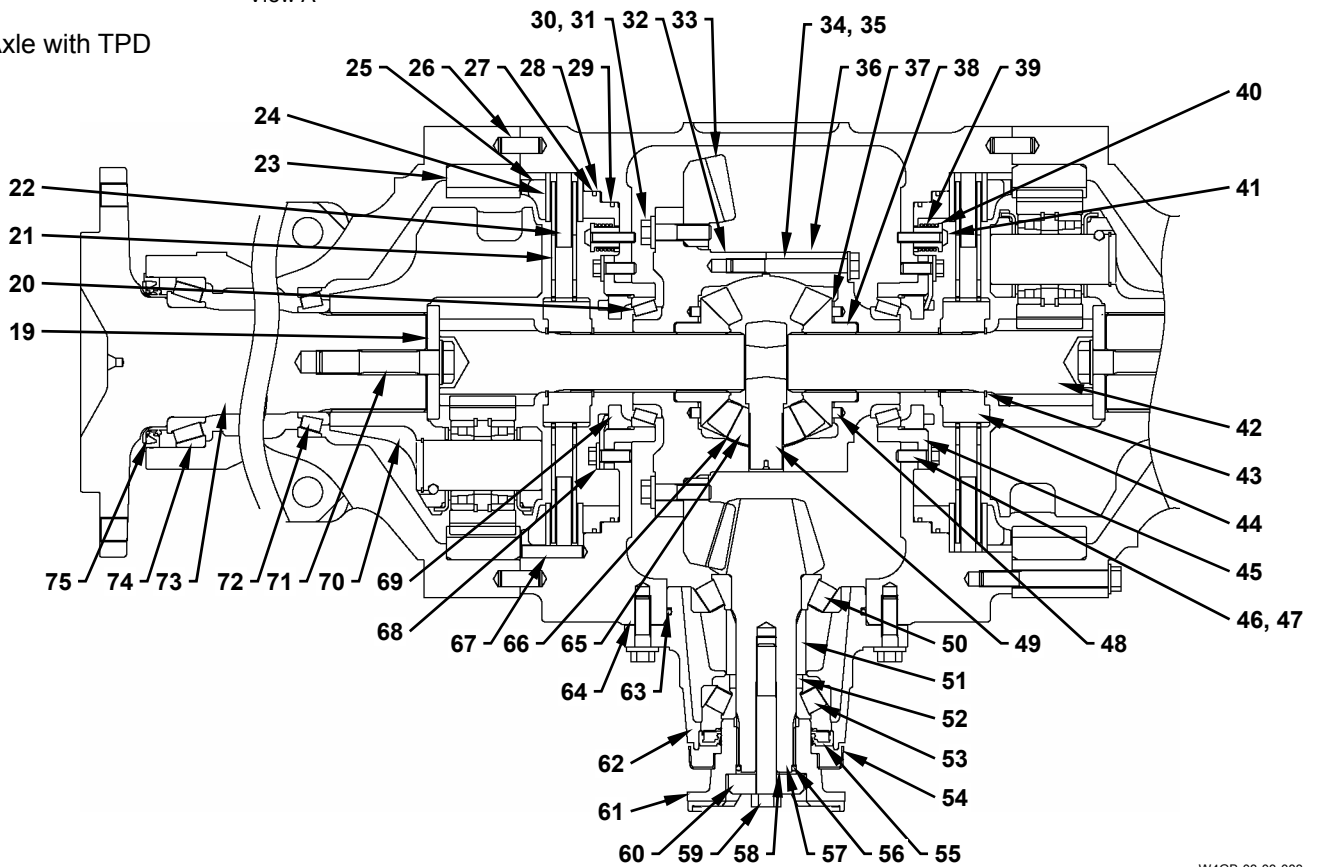
W4GB-03-03-001



View A

W4GB-03-03-082

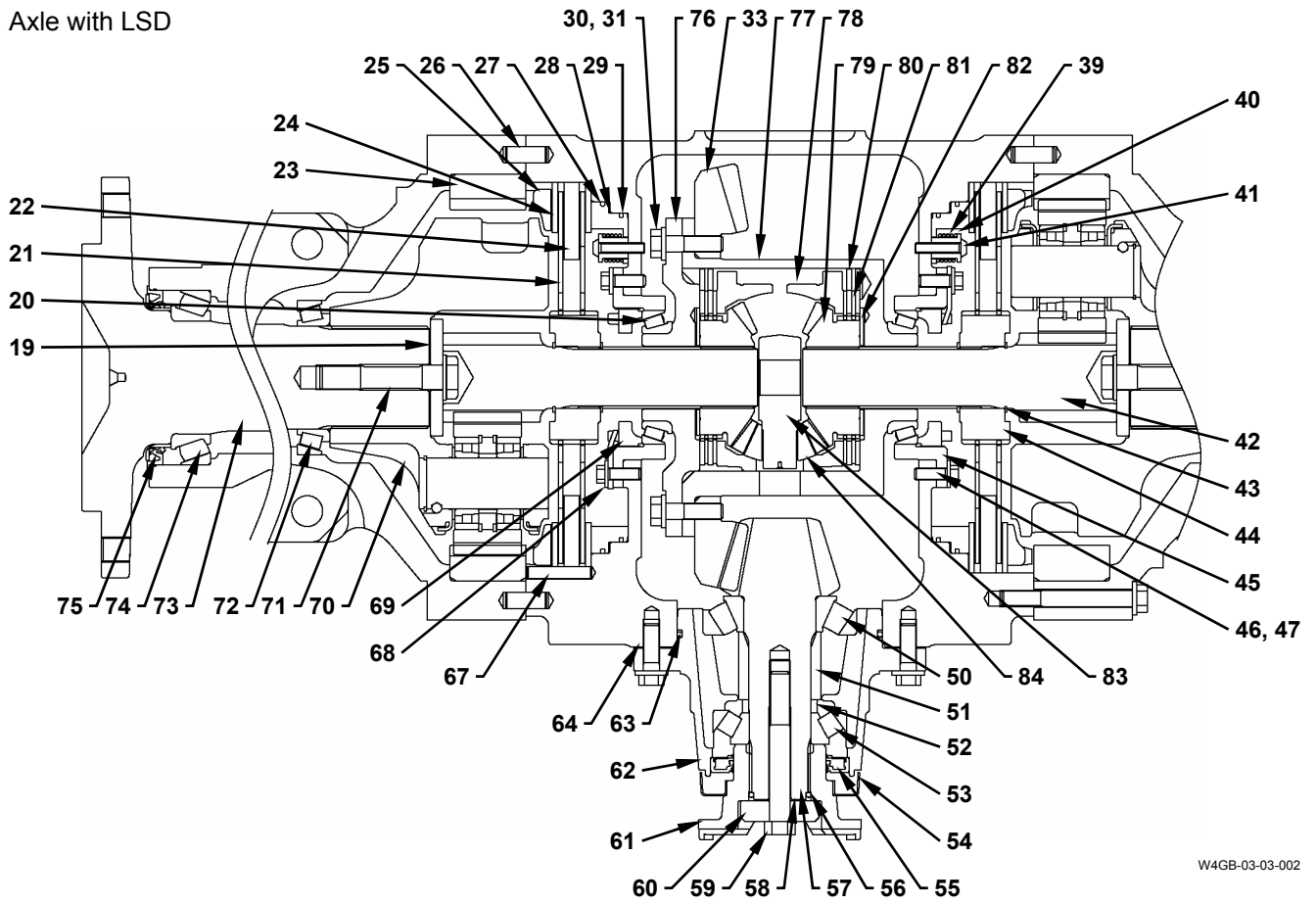
• Axle with TPD



W4GB-03-03-083

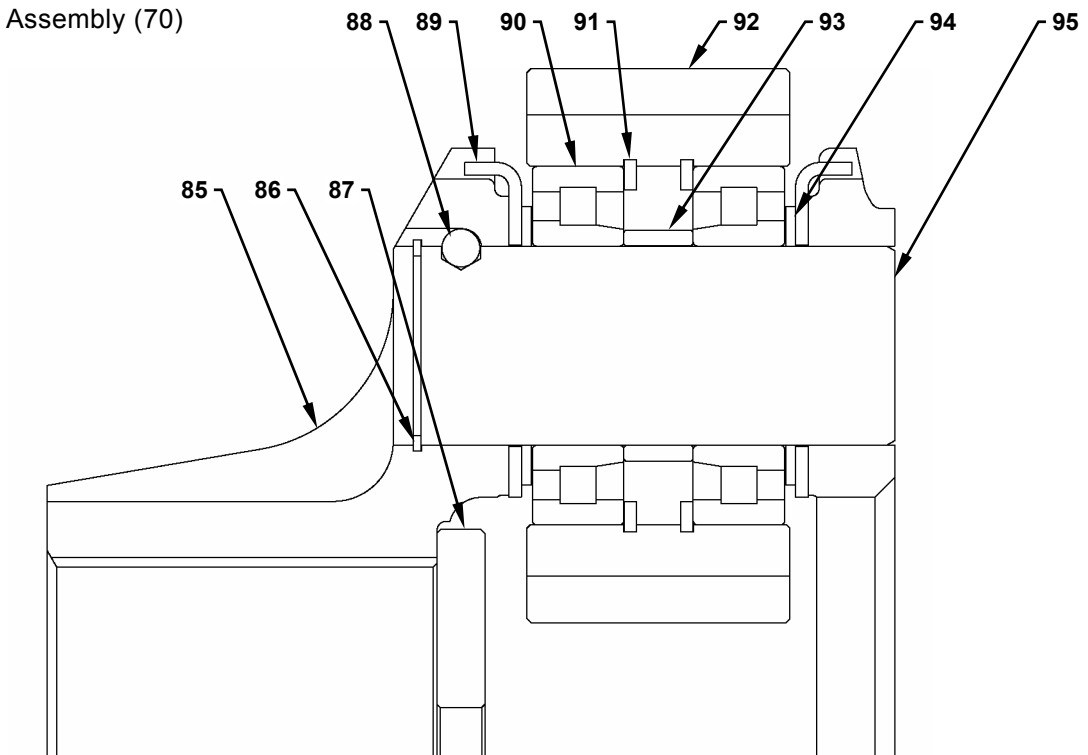
# BODY (TRAVEL SYSTEM) / Axle

- Axle with LSD



W4GB-03-03-002

- Planet Carrier Assembly (70)



W4GB-03-03-003

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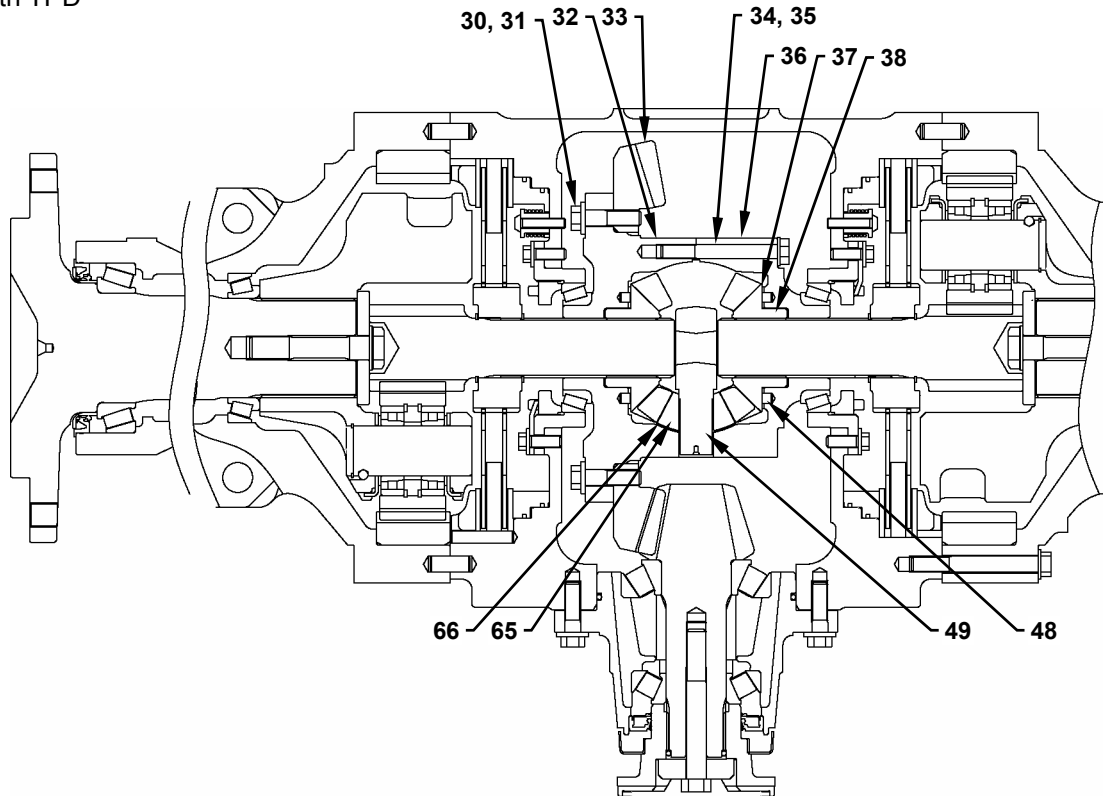
## BODY (TRAVEL SYSTEM) / Axle

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1 - Level Gauge	25 - End Plate (2 Used)	49 - Spider	73 - Axle Shaft (2 Used)
2 - Axle Tube	26 - Pin (2 Used)	50 - Bearing	74 - Bearing (2 Used)
3 - Pin (4 Used)	27 - D-Ring	51 - Spacer	75 - Oil Seal (2 Used)
4 - Plug	28 - Brake Piston	52 - Spacer	76 - Case A
5 - Differential Gear Body	29 - D-Ring	53 - Bearing	77 - Case B
6 - Bleeder Valve (2 Used)	30 - Bolt (20 Used)	54 - Dust Cover	78 - Pressure Ring
7 - Axle Tube	31 - Washer (20 Used)	55 - Oil Seal	79 - Side Gear
8 - Bolt (9 Used)	32 - Flange Half Case	56 - O-Ring	80 - Plate (2 Used)
9 - Washer (9 Used)	33 - Ring Gear	57 - Pinion Gear	81 - Disc (2 Used)
10 - Drain Plug	34 - Bolt (12 Used)	58 - Shim	82 - Plate
11 - Bolt (44 Used)	35 - Washer (12 Used)	59 - Bolt	83 - Spider
12 - Washer (44 Used)	36 - Plain Half Case	60 - Washer	84 - Pinion Gear
13 - Plug	37 - Thrust Washer	61 - Flange	85 - Planet Carrier
14 - O-Ring	38 - Side Gear (2 Used)	62 - Bearing Cage	86 - Retaining Ring
15 - Plug	39 - Spring (8 Used)	63 - O-Ring	87 - Retainer Plate (2 Used)
16 - Cover	40 - Adapter (8 Used)	64 - Shim	88 - Steel Ball (6 Used)
17 - Bolt (28 Used)	41 - Button Bolt (8 Used)	65 - Pinion Gear	89 - Thrust Washer (12 Used)
18 - Washer (28 Used)	42 - Shaft (2 Used)	66 - Thrust Washer	90 - Bearing (12 Used)
19 - Shim	43 - Retaining Ring (4 Used)	67 - Pin (8 Used)	91 - Retaining Ring (12 Used)
20 - Bearing (2 Used)	44 - Disc hub (2 Used)	68 - Lock Plate (2 Used)	92 - Planetary Gear (6 Used)
21 - Brake Disc (4 Used)	45 - Bearing Retainer (2 Used)	69 - Adjusting Nut (2 Used)	93 - Collar (6 Used)
22 - Brake Ring (2 Used)	46 - Bolt	70 - Planet Carrier Assembly	94 - Thrust Bearing (12 Used)
23 - Ring Gear (2 Used)	47 - Washer	71 - Bolt (2 Used)	95 - Planet Shaft (6 Used)
24 - Brake Ring (2 Used)	48 - Dowel Pin	72 - Bearing (2 Used)	

## BODY (TRAVEL SYSTEM) / Axle

- Axle with TPD



W4GB-03-03-083

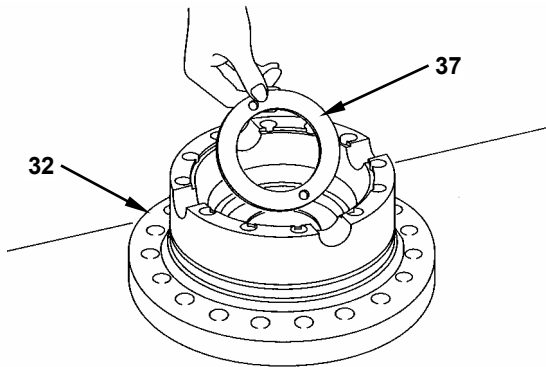


## BODY (TRAVEL SYSTEM) / Axle

### Assembly of Axle


#### Assembly of Differential Case (Axle with TPD only)

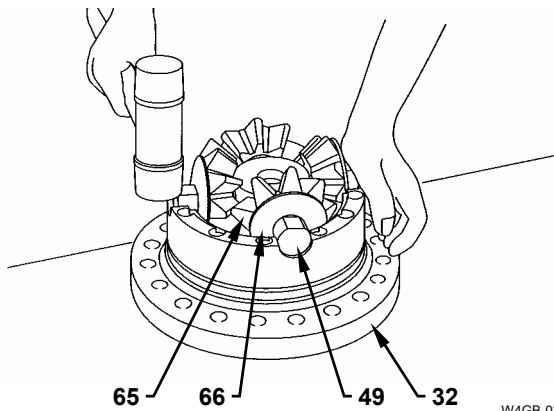
1. Install inner of bearing (20) to flange half case (32) by using a press or a plastic hammer.
2. Reverse flange half case (32). After checking dowel pins (48) (2 used), align the hole positions (2 places) of thrust washers (37) and dowel pins (48), and install to flange half case (32).



W4GB-03-03-033

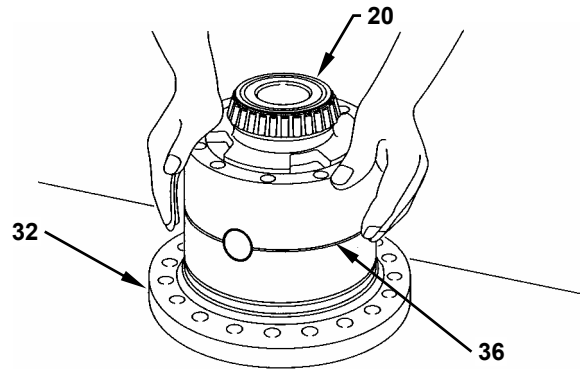
3. Install side gear (38) to flange half case (32). Engage the side gear with the spider (49) with pinion gears (65) (4 used), and thrust washers (66) (4 used).

 **NOTE:** Install spider (49) to the installation hole of flange half case (32) by using a plastic hammer.





W4GB-03-03-034

4. Place the plain half case (36) on a workbench. Install inner of bearing (20) into plain half case (36) by using a press or a plastic hammer.
5. Reverse plain half case (36). Check dowel pins (48) (2 used). Apply grease and install thrust washer onto plain half case (36).
6. Align side gear (38) to pinion gear (65) of flange half case (32). Align the marks and install plain half case (36) by tapping with plastic hammer lightly, until each case side contacts each other.



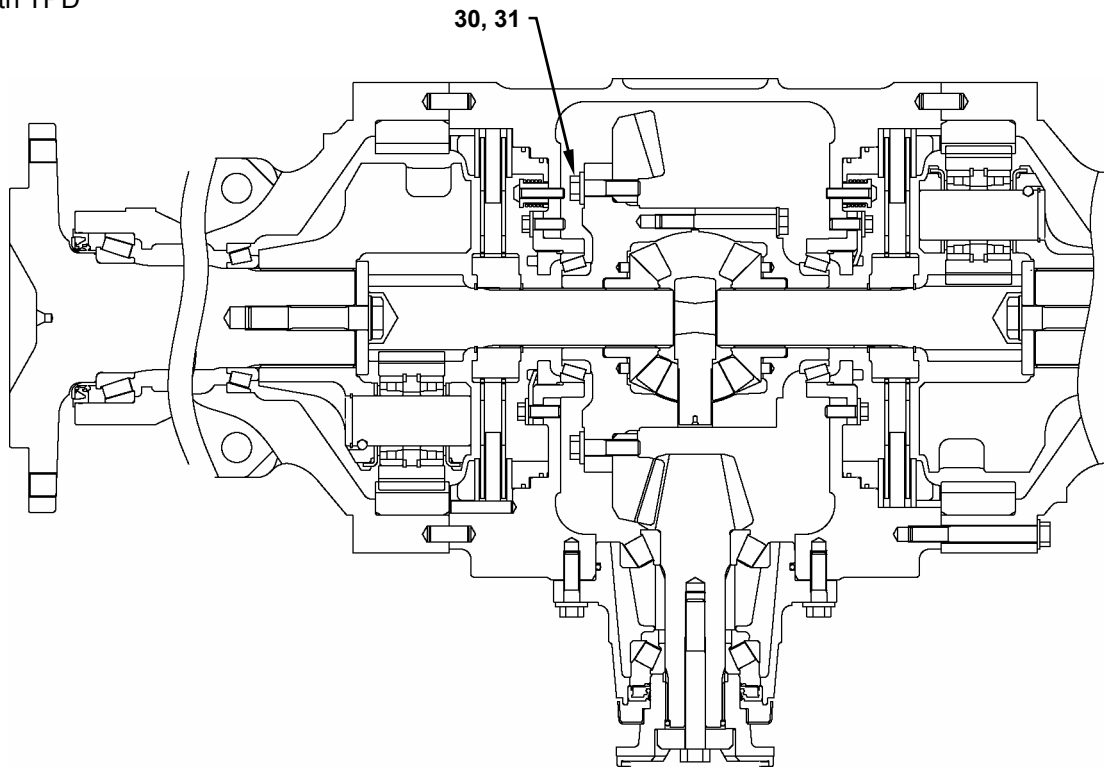
W4GB-03-03-035

7. Apply LOCTITE #262 onto thread parts of bolts (34)(12 used). Secure plain half case (36) to flange half case (32) in diagonal order with bolts (34) (12 used) and washers (35) (12 used).  
 : 22 mm  
 : 147 N·m (15 kgf·m, 110 lbf·ft)

## BODY (TRAVEL SYSTEM) / Axle

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- Axle with TPD

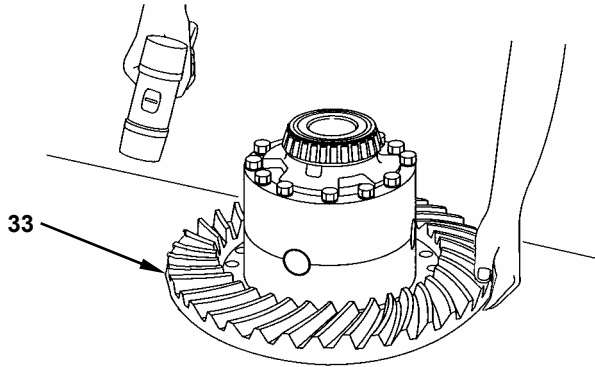


W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle


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
8. Install ring gear (33) to flange half case (32) with the gear side upward. Contact ring gear (33) to flange face of case by using a plastic hammer. Temporary tighten bolts (30) (2 used) with washers (31) (2 used) from the bottom side.

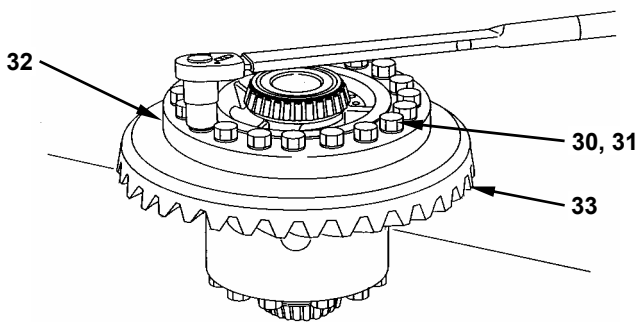


W4GB-03-03-036

9. Reverse flange half case (32) assembly. Apply LOCTITE #262 to bolts (30) (20 used) thread part. Secure ring gear (33) to flange half case (32) with bolts (30) (20 used) and washers (31) (20 used).

 : 24 mm

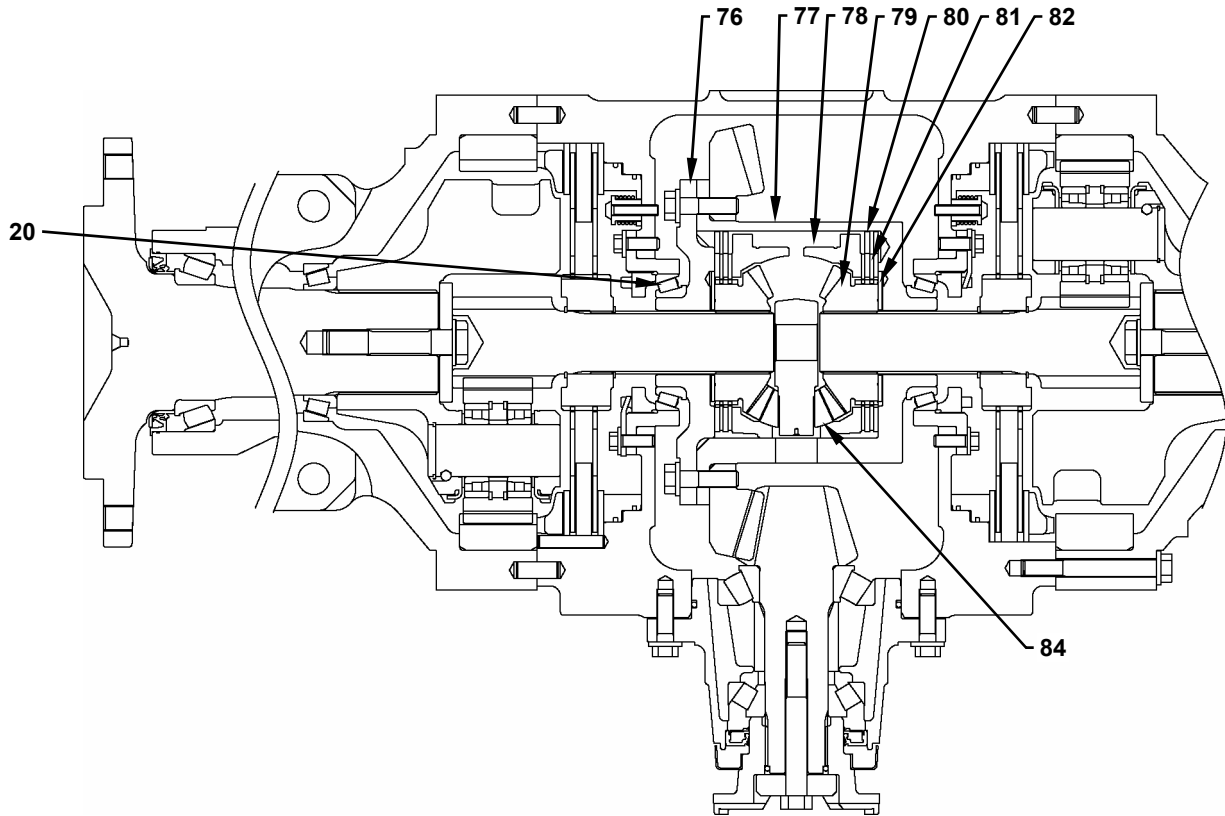
 : 225 N·m (23 kgf·m, 165 lbf·ft)



W4GB-03-03-037

## BODY (TRAVEL SYSTEM) / Axle

- Axle with LSD




W4GB-03-03-002

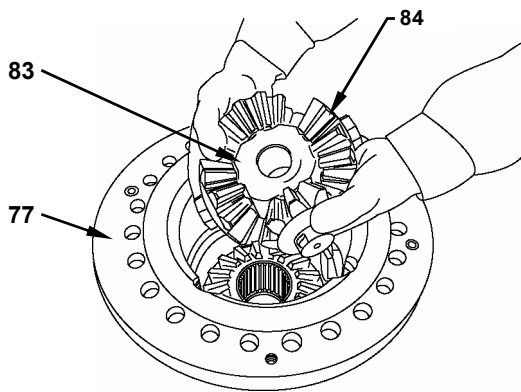
## BODY (TRAVEL SYSTEM) / Axle

### Assembly of Differential Case (Axle with LSD only)

1. Install the cone part of bearing (20) to case A (76) and case B (77) by using a press or a plastic hammer.
2. Install plate (82), plate (80), disc (81), plate (80), disc (81), and pressure ring (78) to case B (77) in this order. (Install plate (82) with the groove side facing side gear (79)) Align and install side gear (79) to the gear part of disc (81).

 **NOTE:** Engage pinion gear (84) to side gear (79) by using a plastic hammer.

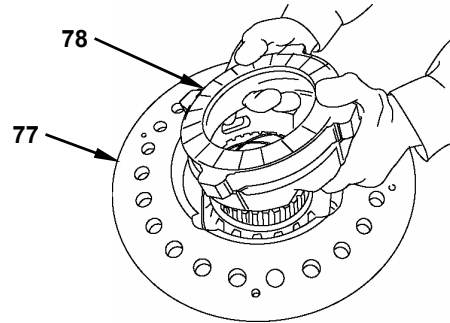
3. Engage and install the spider (83) assembly with pinion gears (84) (4 used) to side gear (79).



W4GB-03-03-031

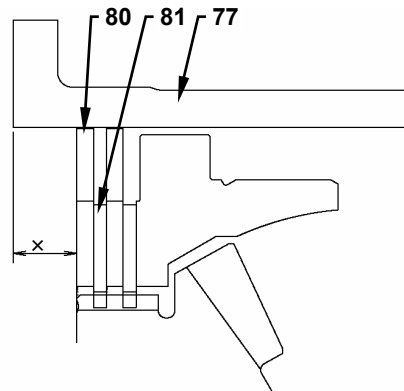
4. Engage and install side gear (79) to pinion gear (84).

5. Install pressure ring (78) to case B (77). Install disc (81), plate (80), disc (81), and plate (80) in this order. Engage and install disc (81) to the spline of side gear (79).



W4GB-03-03-030

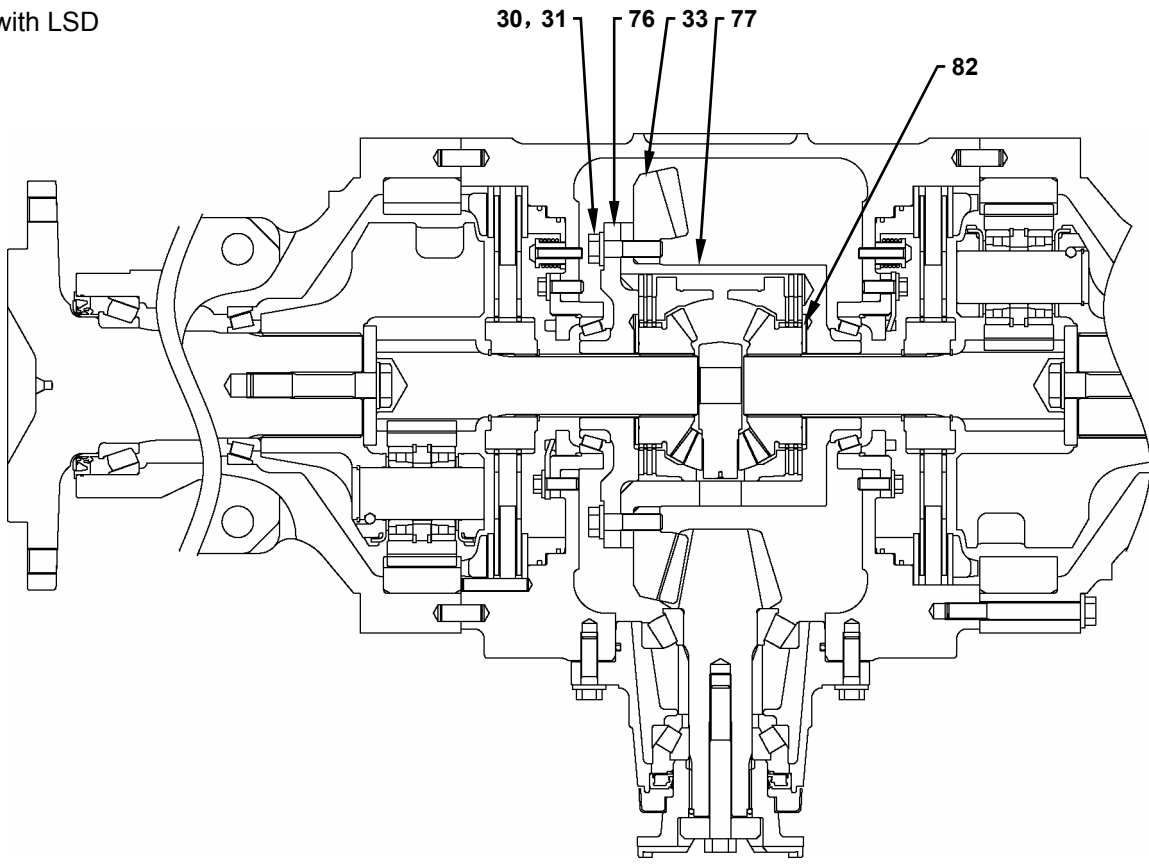
6. Install discs (81) (2 used) and plate (80) (2 used) into case B (77). Measure the level difference (x) between plate (80) and case B (77). If the level difference (x) is more than 18.3 mm (0.72 in), replace the last inserted plate (80) with a 5mm (0.2 in) thick plate (80). (Standard: 4.5 mm (0.18 in))



W4GB-03-03-038

## BODY (TRAVEL SYSTEM) / Axle

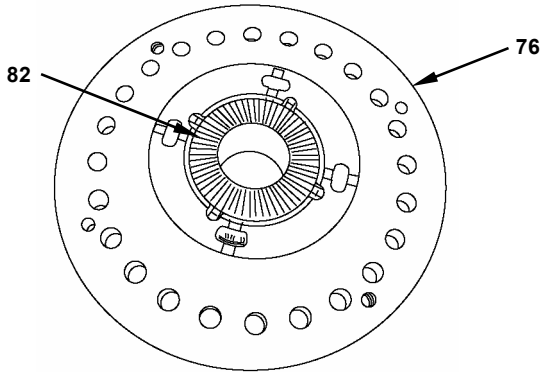
- Axle with LSD



W4GB-03-03-002


## BODY (TRAVEL SYSTEM) / Axle

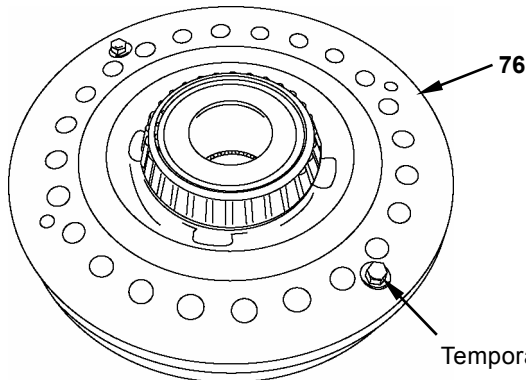
7. Install plate (82) to case A (76). Apply grease onto plate (82) so that it does not fall when reversing case A (76). (Install plate (82) with the groove side facing side gear (79))



W4GB-03-03-039

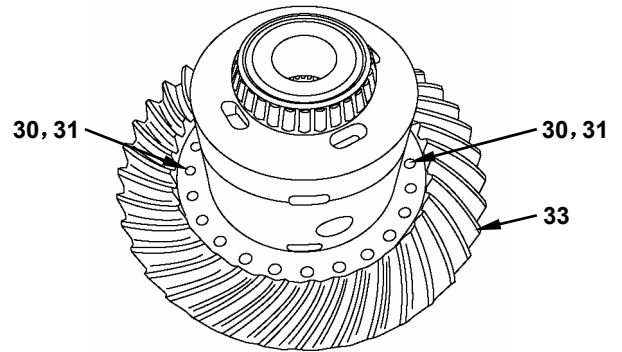
8. Reverse case A (76). Install case A (76) to case B (77). At this time, temporarily install case B (77) to case A (76) by using the hole (M10, Pitch 1.5 mm) of case A (76). (2 places)

 : 17 mm




W4GB-03-03-040


9. Reverse the temporarily assembled differential case. Turn ring gear (33) to make the gear side face upward, install it tightly to the flange surface of the differential case by using a plastic hammer, and then temporarily tighten it with installation bolts (30) (2 used) and washers (31) (2 used) from beneath.

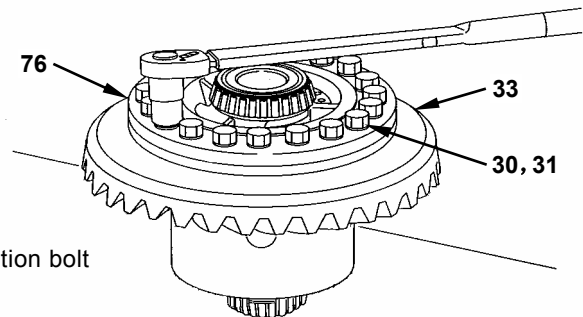


W4GB-03-03-041

10. Apply LOCTITE #262 to bolts (30) (2 used). Turn over ring gear (33) assembly. Secure ring gear (33) to case A (76) and case B (77) with bolts (30) (20 used) and washers (31) (20 used).

 : 24 mm

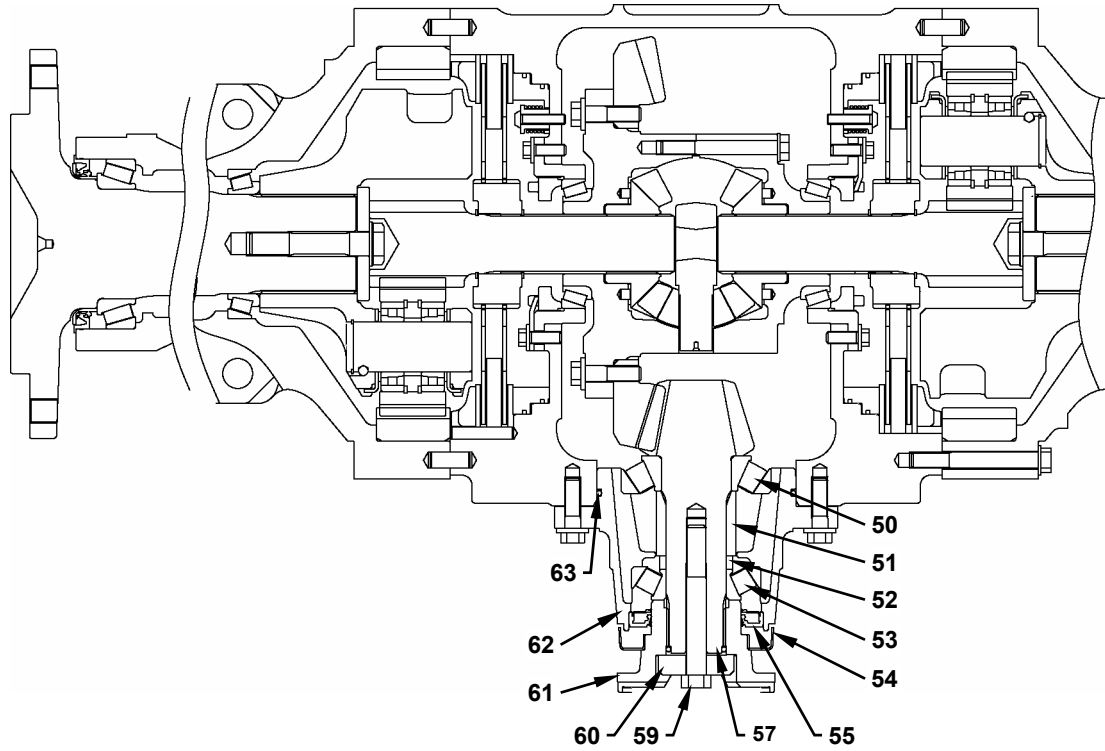
 : 225 N·m (23 kgf·m, 165 lbf·ft)



W4GB-03-03-042

# BODY (TRAVEL SYSTEM) / Axle

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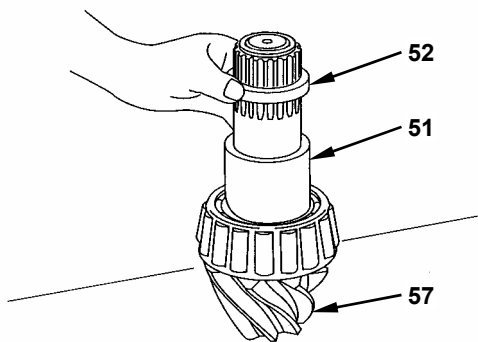
W4GB-03-03-083



## BODY (TRAVEL SYSTEM) / Axle

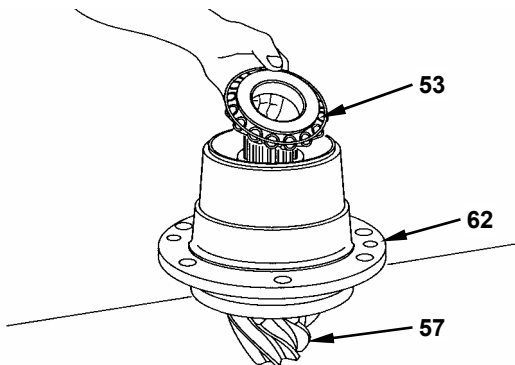
### Bearing cage

11. Install the outers of bearings (50, 53) to the inner part of bearing cage (62) by using a press.
12. Apply grease onto O-ring (63). Install O-ring (63) to the groove on the outer surface of bearing cage (62).
13. Press the inner of bearing (50) to pinion gear (57).
14. Install spacers (51, 52) to pinion gear (57) in this order.





W4GB-03-03-043



15. Cover pinion gear (57) with bearing cage (62). Install inner of bearing (53) to pinion gear (57).

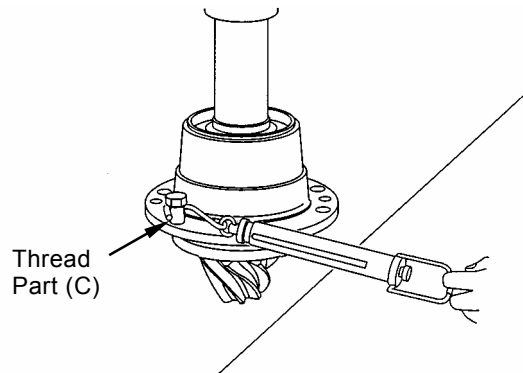


W4GB-03-03-044

16. After installing the bearing, apply load to the bearing (53) inner with a hydraulic press etc. Measure the rotation resistance with a spring balance. Use the thread part for pullers (C) for measurement. Use a press which can provide about 93 kN (9500 kgf, 21000 lbf).  
 : 24 mm

 **NOTE:** Instead of loading with a press, rotation resistance can also be measured by temporarily installing flange (61) and washer (60) with bolt (59).

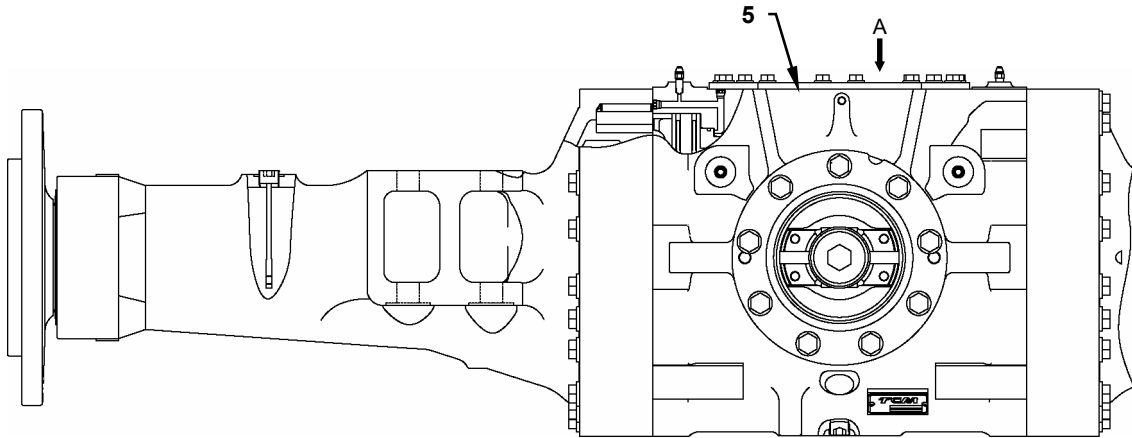
-  : 30 mm
-  : 324 N·m (33 kgf·m, 235 lbf·ft)



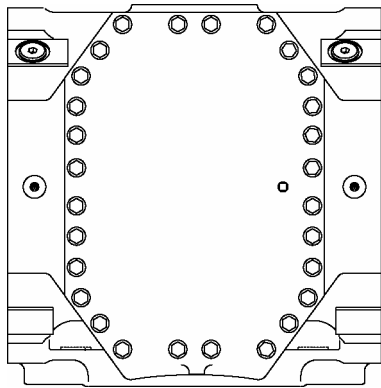
W4GB-03-03-045

17. If the rotation resistance is lower than the standard value, remove pinion gear (57), grind and adjust spacer (52).
  - Rotation resistance standard value
  - ZW220:  
15.7 to 27.4 N (1.6 to 2.8 kgf, 3.53 to 6.17 lbf)
  - ZW250:  
14.7 to 26.5 N (1.5 to 2.7 kgf, 3.31 to 5.96 lbf)
18. Apply a film of LOCTITE #262 to the periphery part of oil seal (55). Install oil seal (55) to bearing cage (62).
19. Apply grease to the lip part in oil seal (55).

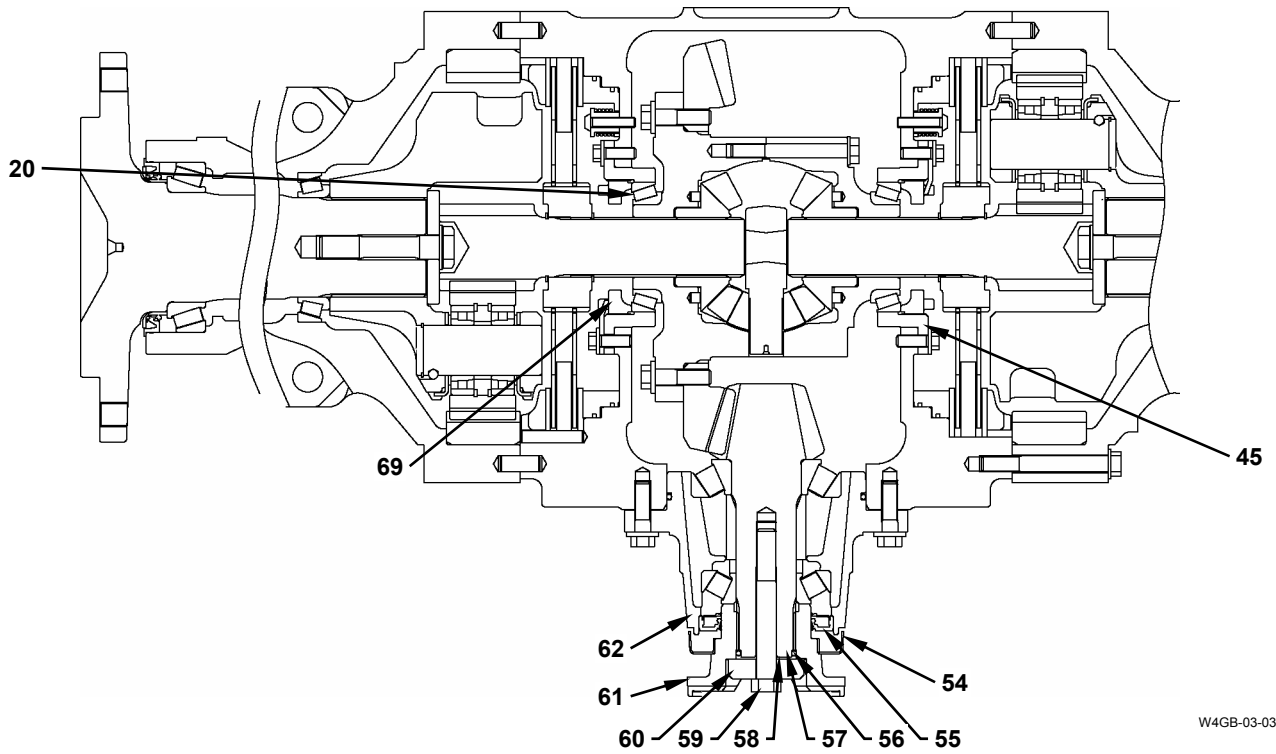
# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-001



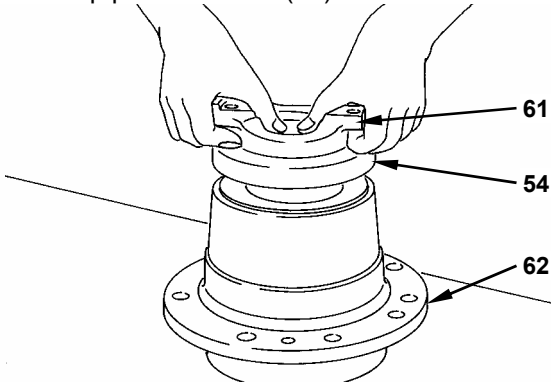
W4GB-03-03-082



W4GB-03-03-083

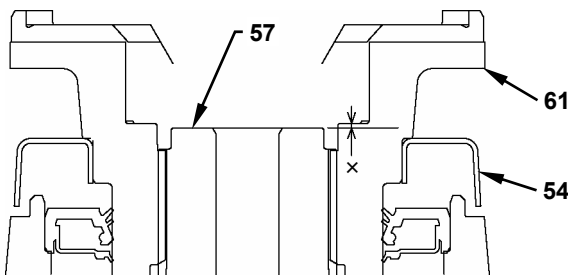
## BODY (TRAVEL SYSTEM) / Axle

20. Install dust cover (54) to flange (61). Align and install flange (61) to the spline of pinion gear (57). Turn flange (61) and fix any deformations on the seal-lip part of oil seal (55).



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21. Measure the distance (x) between flange (61) and end of pinion gear (57). Adjust with shim (58) so that this level difference (x) is 0.05 to 0.1 mm (0.002 to 0.004 in).




W4GB-03-03-081

22. Insert O-ring (56) into the groove between flange (61) and pinion gear (57). Install washer (60) to flange (61).

23. Apply LOCTITE #262 to the thread part of bolt (59). Secure flange (61) to pinion gear (57) with bolt (59) and washer (60) by using a nut runner. After tightening, check that pinion gear (57) turns smoothly.

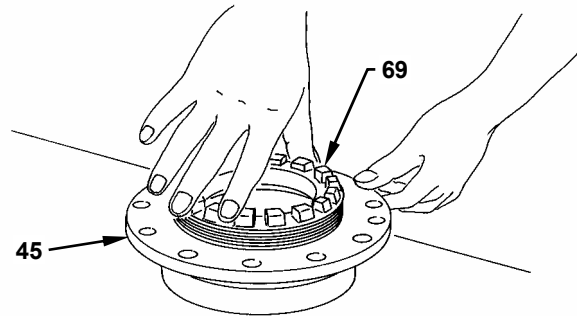
 : 30 mm

 : 680 N·m (69 kgf·m, 500 lbf·ft)

### Installation of Differential Case

24. Install bearing retainers (45) (2 used) to the bearing (20) outer.

25. Install adjust nut (69) until it touches the bearing (20) outer.



W4GB-03-03-047

26. Hoist the assembled differential case, align it with the ring gear (33) notch position of differential gear body (5). Install it to differential gear body.



#### CAUTION: Differential assembly weight:

ZW220

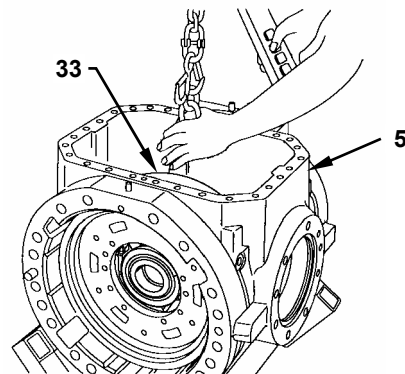
TPD: 83 kg (185 lb)

LSD: 88 kg (195 lb)

ZW250

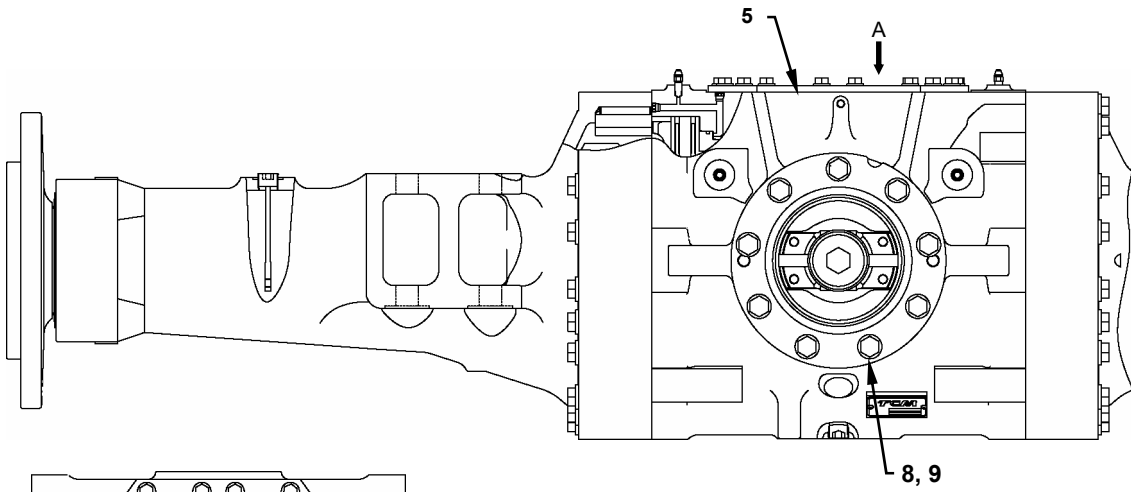
TPD: 91 kg (205 lb)

LSD: 97 kg (215 lb)

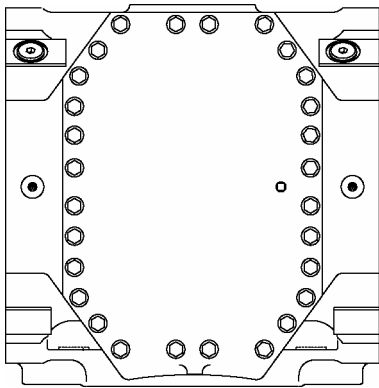


W4GB-03-03-048

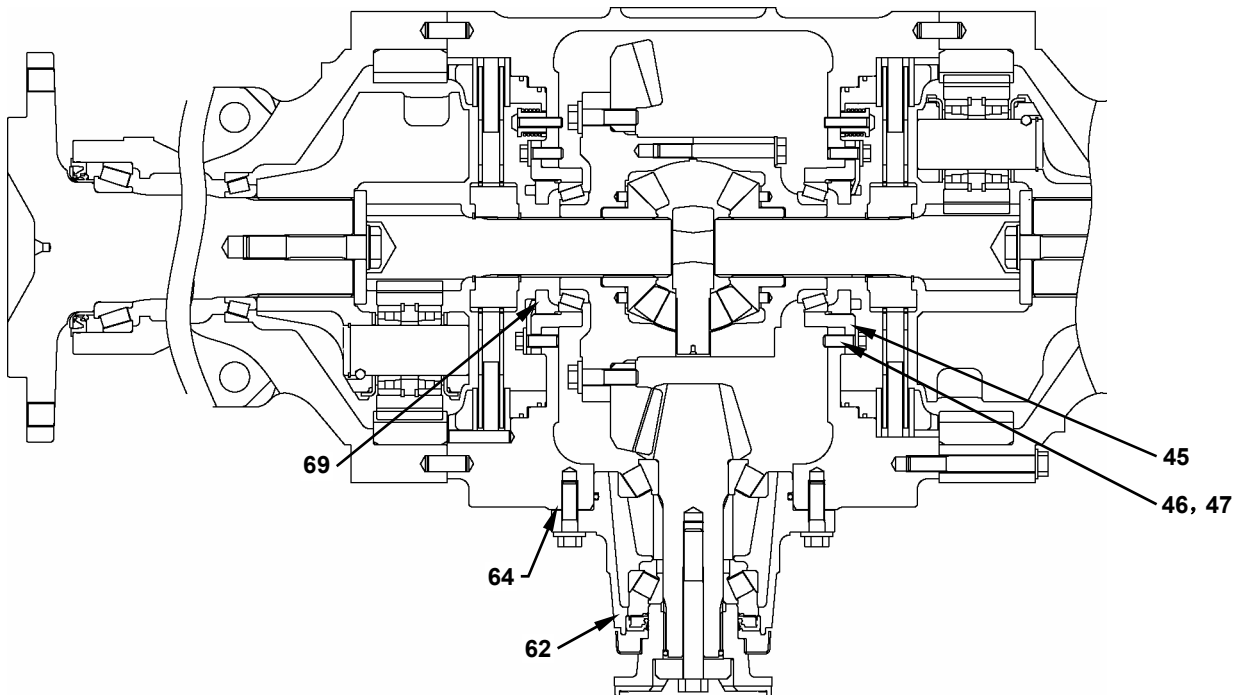
# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-001



W4GB-03-03-082



W4GB-03-03-083


## BODY (TRAVEL SYSTEM) / Axle


27. Apply LOCTITE #262 to bolt (46). Install bearing nuts (45) (2 used) on right and left of differential gear body (5). Support the hoisted differential case and secure bearing nuts (45) (2 used) to differential gear body (5) with bolt (46) and washer (47).

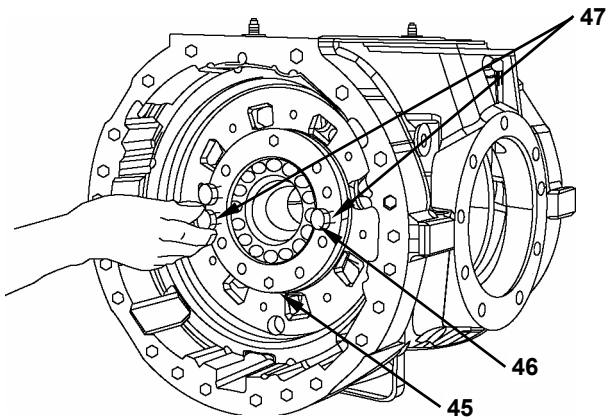
- Number of installation bolts

ZW220:10 used

ZW250:12 used

 : 19 mm

 : 98 N·m (10 kgf·m, 72 lbf·ft)



W4GB-03-03-049

### Installation of Bearing Cage

28. Put shim (64) between bearing cage (62) and differential gear body (5). Install bearing cage (62) assembly to differential gear body (5).

29. Apply LOCTITE #262 to bolt (8).

Secure bearing cage (62) assembly to differential gear body (5) with bolt (8) and washer (9).


- Number of bolts


ZW220 Front : 9 used

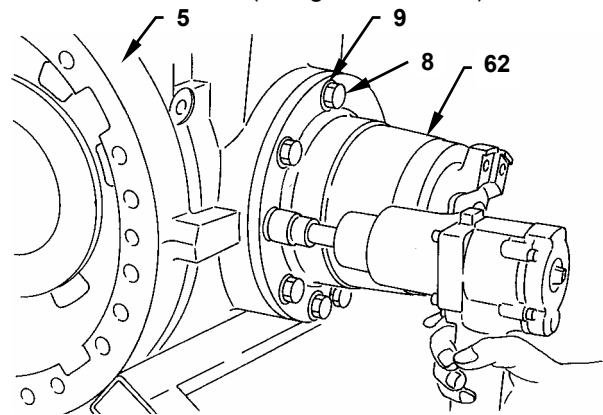
Rear : 10 used

ZW250 Front : 13 used

Rear : 14 used


 : 24 mm

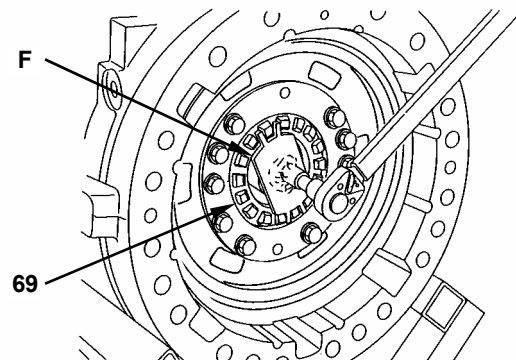
 : 225 N·m (23 kgf·m, 165 lbf·ft)



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30. Tighten adjust nut (69) on both sides by using a special tool (F).

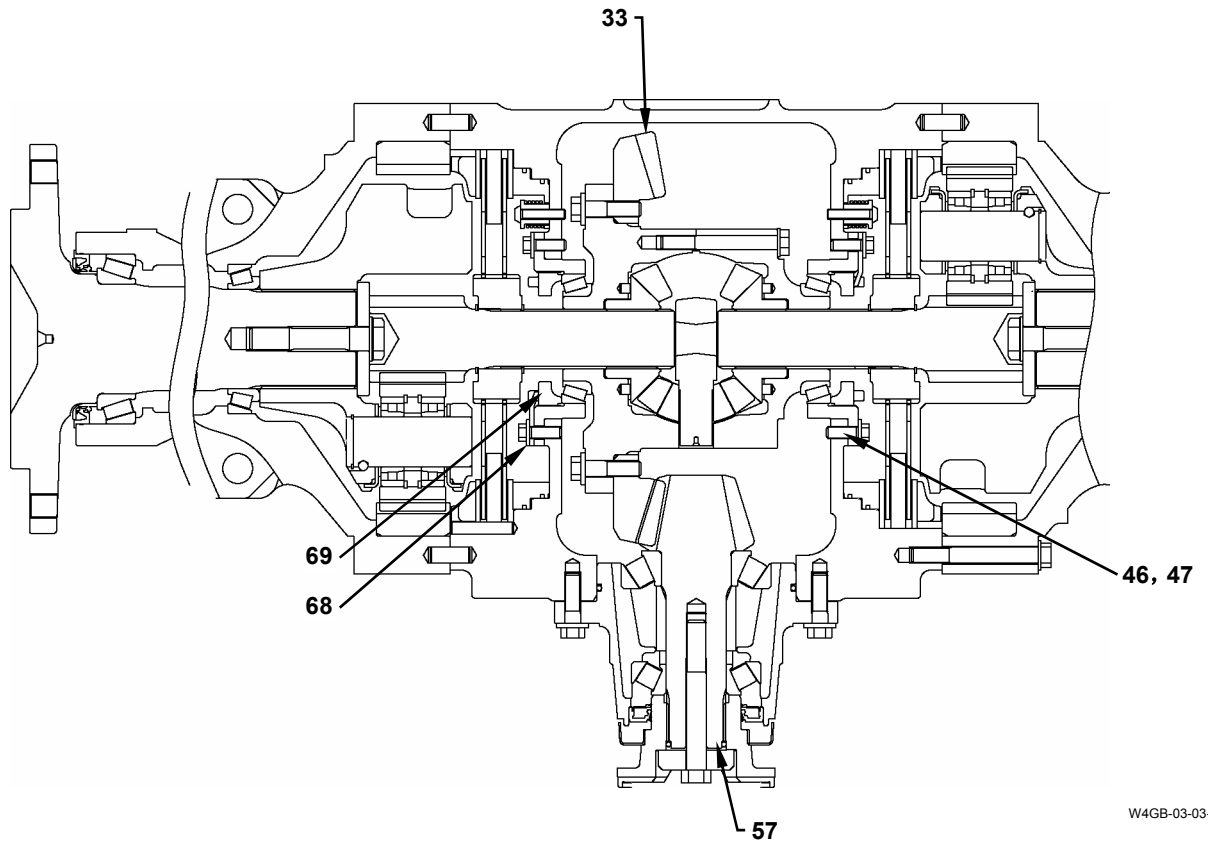
 : 120 N·m (12 kgf·m, 87 lbf·ft)



W4GB-03-03-051

# BODY (TRAVEL SYSTEM) / Axle

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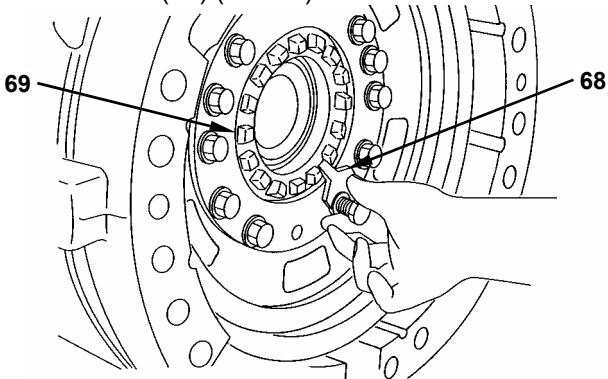


W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

### Ring gear backlash and ring gear teeth engagement adjustment.

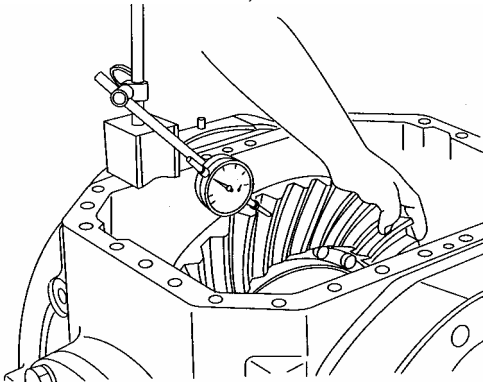
31. After adjustment, secure nuts (69) (2 used) with lock plates (68) (2 used), bolts (46) (2 used), and washers (47) (2 used).



W4GB-03-03-052

32. Set a dial indicator onto the tooth outer end of ring gear (33).

33. Secure pinion gear (57), turn ring gear (33) forward and backward, and measure backlash.



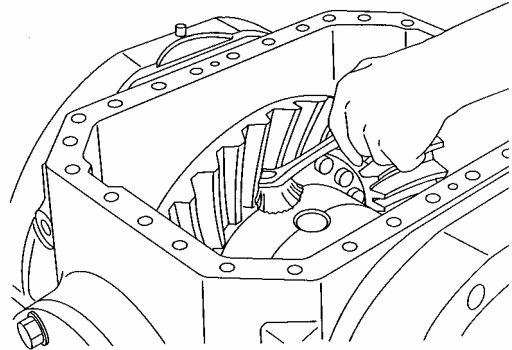
W4GB-03-03-053

34. If backlash is bigger than the standard value, loosen adjust nut (69) at the side of plain half case, tighten the adjust nut at the side of flange half case, and move ring gear (33) to pinion gear (57).

If backlash is small, adjust by contrary way.

- Ring gear (33) backlash  
ZW220: 0.25 to 0.38 mm (0.01 to 0.015 in)  
ZW250: 0.31 to 0.40 mm (0.012 to 0.016 in)

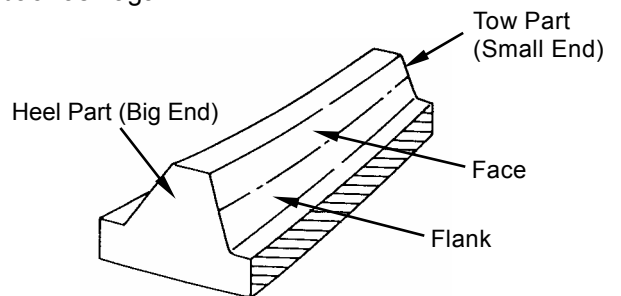
35. Apply a film of red lead primer onto 3 to 4 teeth of ring gear (33). Turn ring gear (33) forward and backward by hand, and check engagement of teeth.



W4GB-03-03-054

36. For engagement of teeth adjustment refer to following steps of a to e.

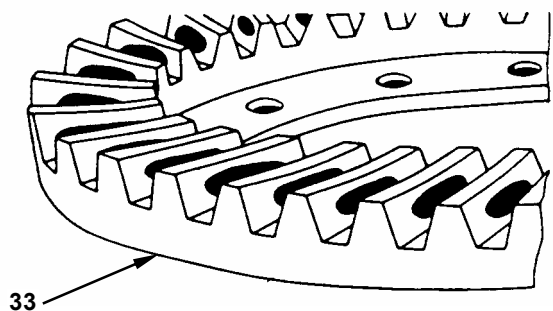
After adjusting the teeth engagement, check backlash again.



W4GB-03-03-055

#### a. Normal engagement

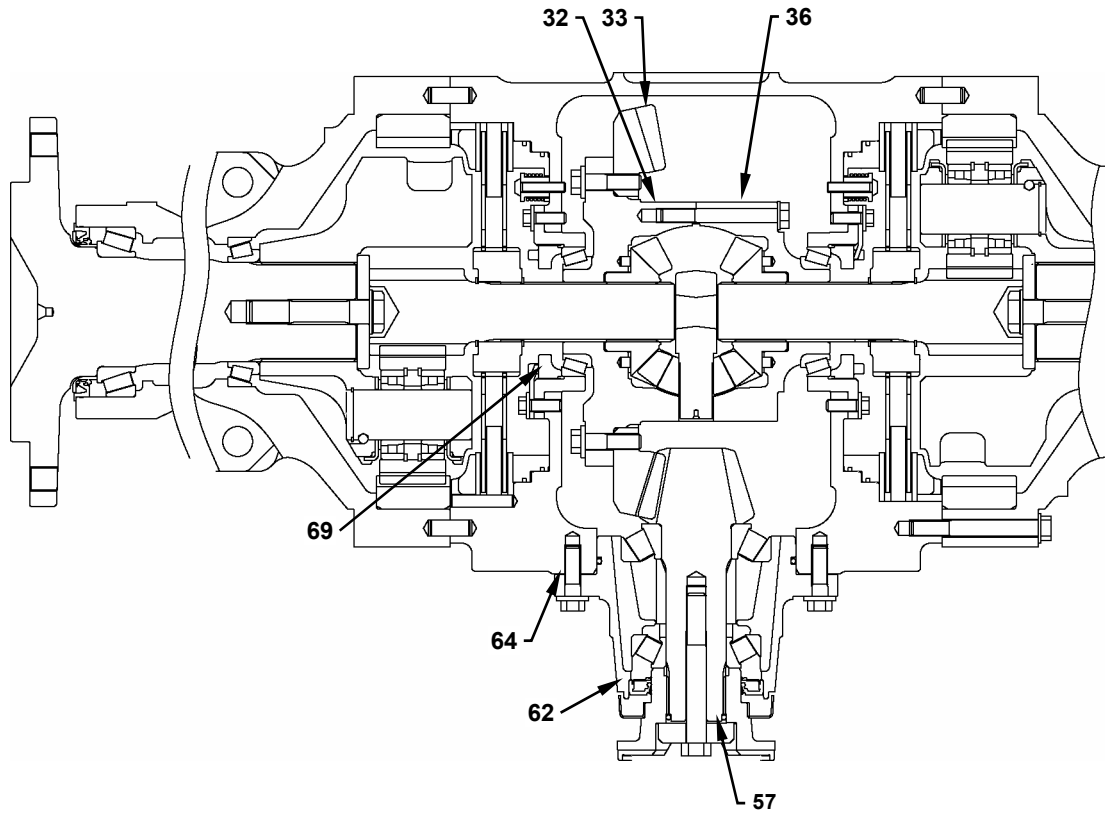
The engagement of the tooth face begins from the tow part and covers about 80% of the tooth length toward the heel part. The following steps of b to e show the checking method for the convexity of the teeth. Please be careful since the engagement is reverse for the concave side.



W4GB-03-03-056

# BODY (TRAVEL SYSTEM) / Axle

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W4GB-03-03-083

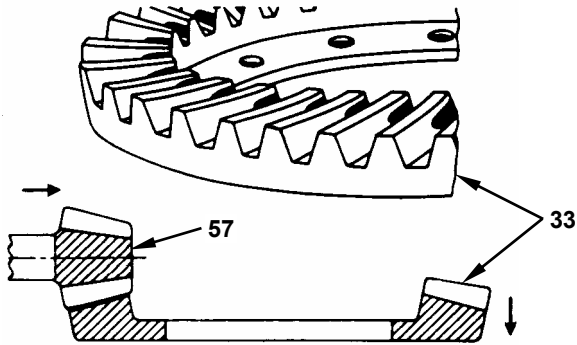


## BODY (TRAVEL SYSTEM) / Axle

### b. Contact of tow part

To adjust, loosen adjust nut (69) at the side of flange half case (32), tighten adjust nut (69) at the side of plain half case (36), and set apart ring gear (33) from pinion gear (57).

Thin out the thickness of shim (64) of bearing cage (62), and bring pinion gear (57) close to ring gear (33).

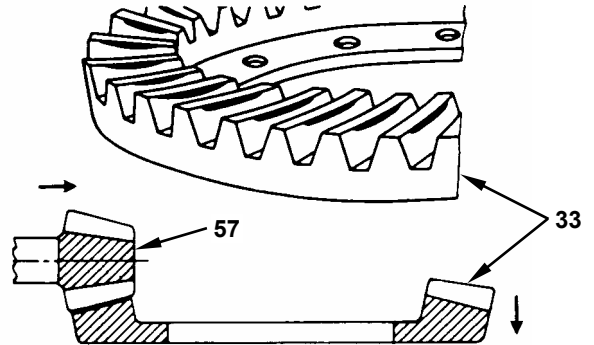


W4GB-03-03-057

### d. Contact of face part

To adjust, thin out the thickness of shim (64) of bearing cage (62), and bring pinion gear (57) close to ring gear (33).

Loosen adjust nut (69) at the side of flange half case (32), tighten adjust nut (69) at the side of plain half case (36), and set apart ring gear (33) from pinion gear (57).

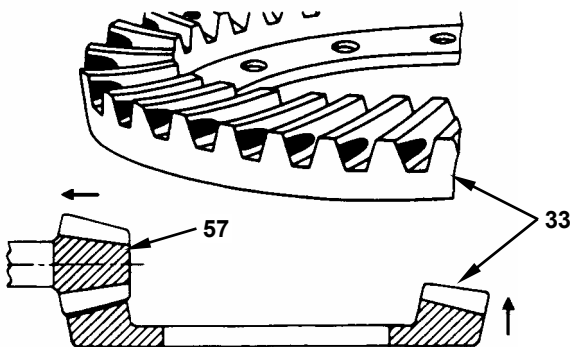


W4GB-03-03-059

### c. Contact of heel part

To adjust, loosen adjust nut (69) at the side of plain half case (36), tighten adjust nut (69) at the side of flange half case (32), and bring ring gear (33) close to pinion gear (57).

Thicken the thickness of shim (64) of bearing cage (62), and set apart pinion gear (57) from ring gear (33).

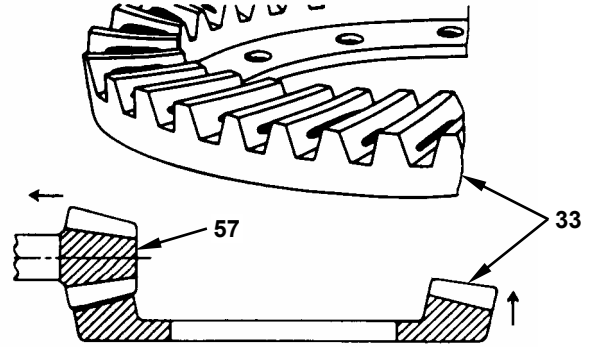


W4GB-03-03-058

### e. Contact of flank part

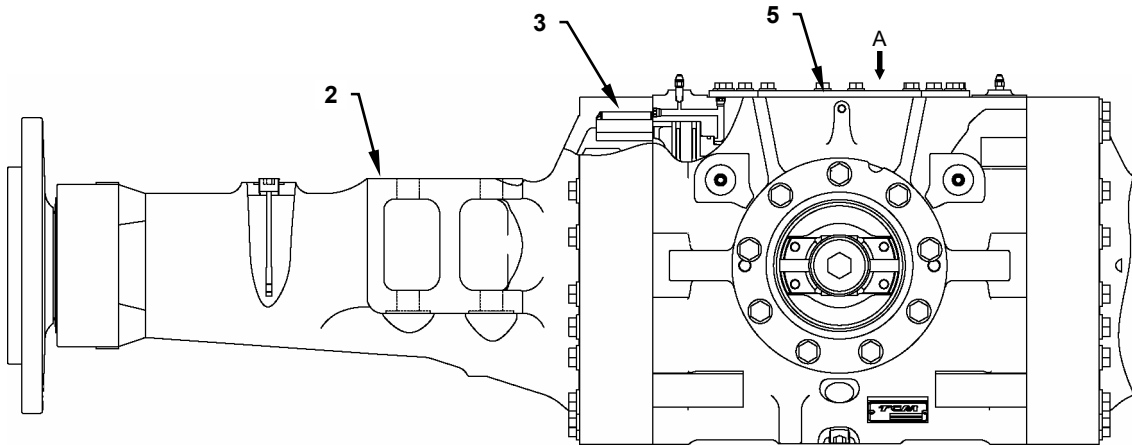
To adjust, thicken the thickness of shim (64) of bearing cage (62), and set apart pinion gear (57) from ring gear (33).

Loosen adjust nut (69) at the side of plain half case (36), tighten adjust nut (69) at the side of flange half case (32), and bring ring gear (33) close to pinion gear (57).

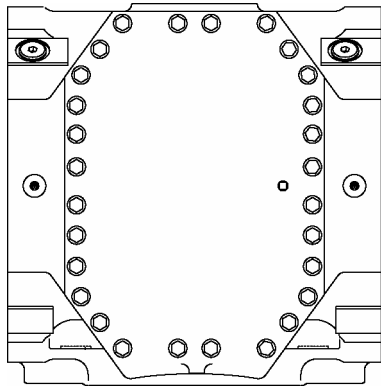


W4GB-03-03-060

# BODY (TRAVEL SYSTEM) / Axle

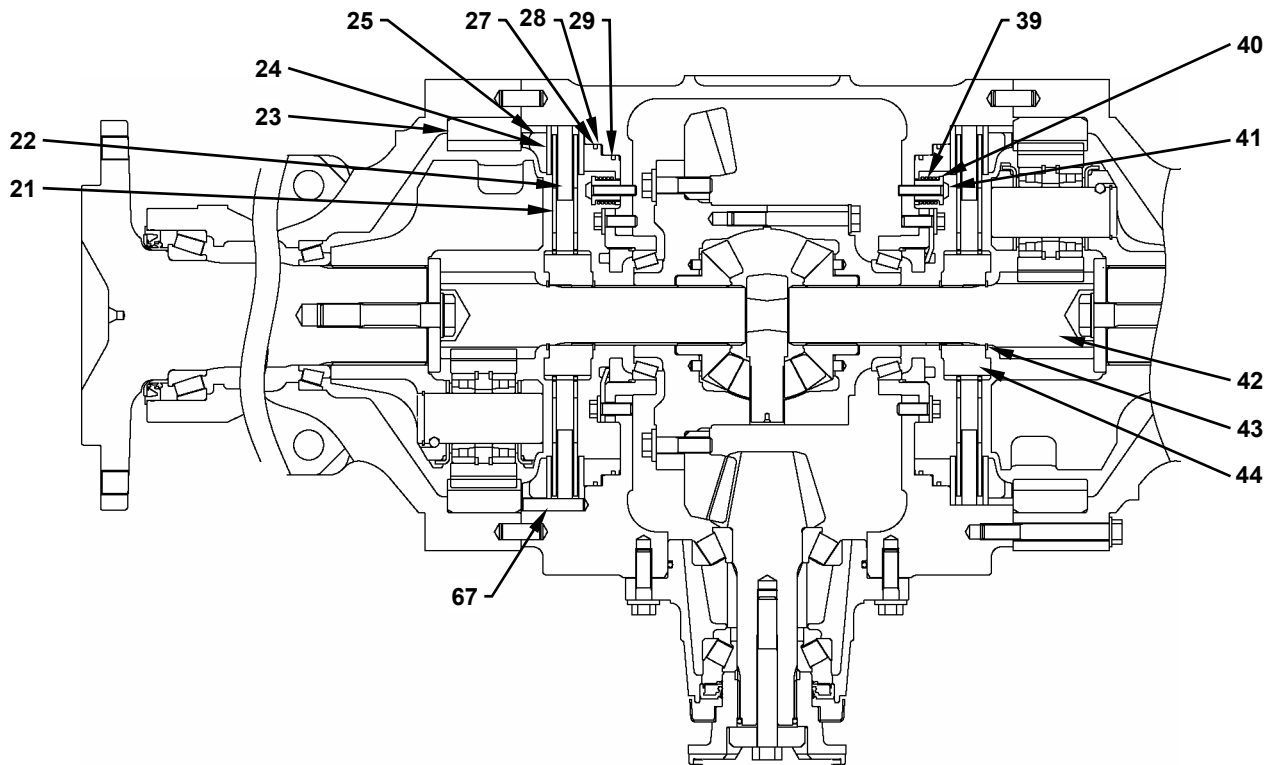


W4GB-03-03-001



View A

W4GB-03-03-082



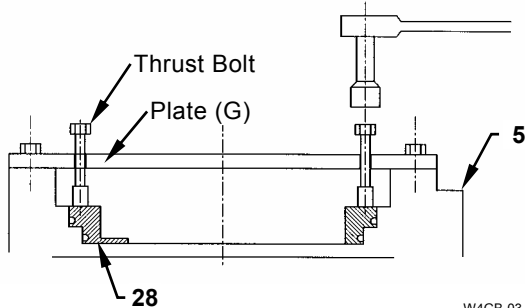
W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

### Installation of Brake


37. Install D-rings (27, 29) onto the outer groove of brake piston (28). After installation apply grease onto D-rings (27, 29).


38. Install brake piston (27) to differential gear body (5) by using special tool (G).

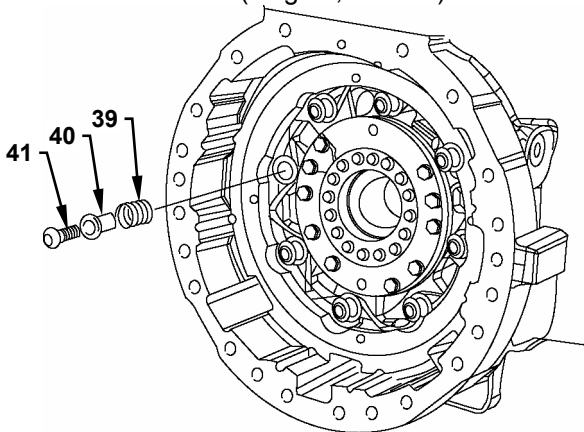


W4GB-03-03-061

39. Apply LOCTITE #262 to button bolt (41). Install springs (39) (8 used), adapters (40) (8 used), and button bolt (41) (8 used) in differential gear body (5) through the piston hole of brake (28).

 : 6 mm

 : 49 N·m (5 kgf·m, 36 lbf·ft)

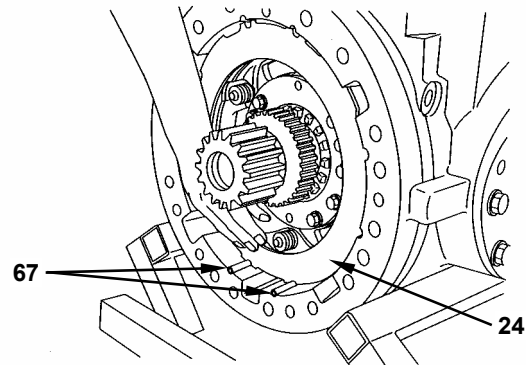


W4GB-03-03-016

40. Install retaining ring (43), disc hub (44), and retaining ring (43) to shaft (42) in this order. Install disc hub (44) with the side with lug directed to small spline.

41. Install the shaft (42) with installed disc hub (44) to the spline of side gear (38) of differential gear body (5).

42. Install 2 pieces of stopper pins (67) (8 used) to the lower part of differential gear body (5). Install brake ring (24) aligning with the stopper pins.



W4GB-03-03-062

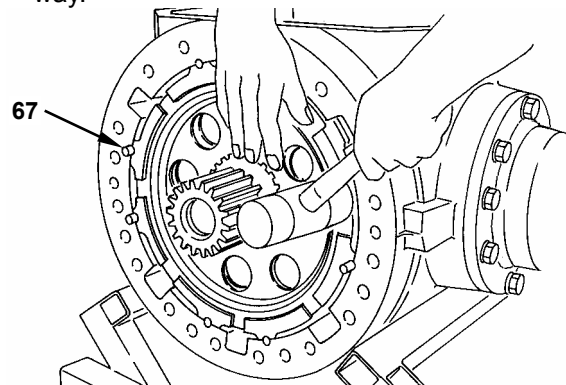
43. Install brake disc (21) in the spline of disc hub (44), and then install brake ring (22).

44. Install the 2nd brake disc (21) so that the open holes are aligned with the 1st brake disc (21).

45. Install brake ring (24) and end plate (25) in this order.

46. Install the other pins (67) (6 used) by using a plastic hammer.

47. Install brake on the opposite side in the same way.

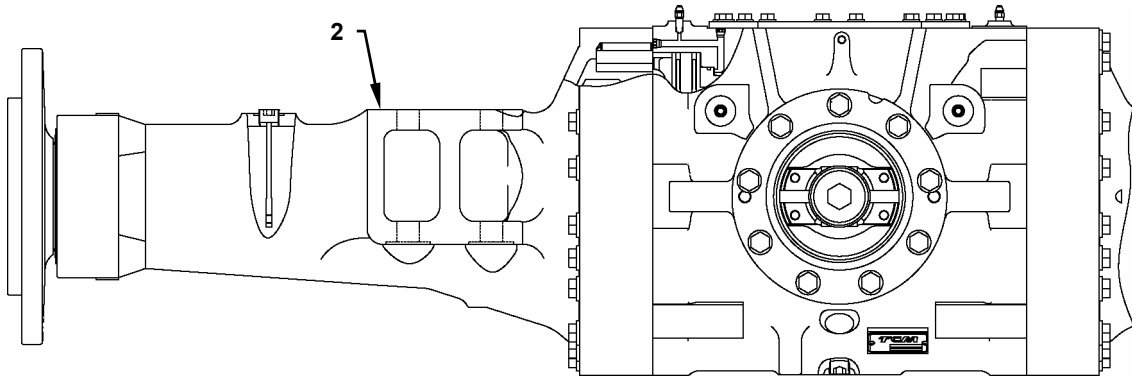


W4GB-03-03-063

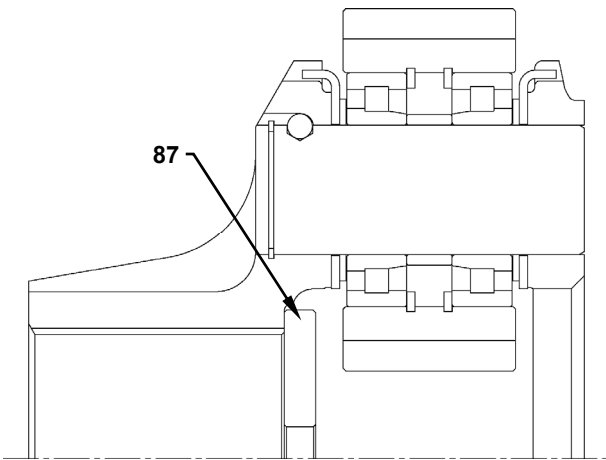
### Assembly of Axle Tube

48. When replacing ring gears (23), press and install ring gear (23) in axle tube (2) by using a press or a plastic hammer, and secure with pins (3) (4 used).

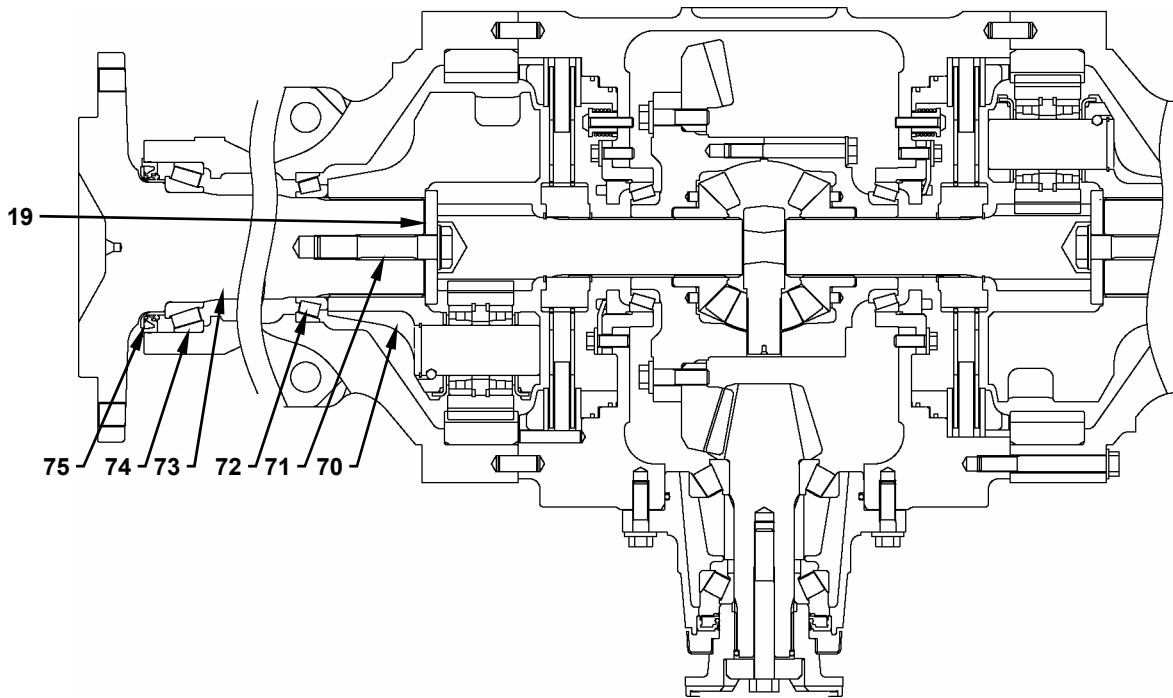
# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-001



W4GB-03-03-003



W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

49. Place axle tube (2) with the wheel side ward up. Install outer and inner of bearing (74) to axle tube (2).
50. Install oil seal (75) to axle tube (2). Apply grease to the lip part in oil seal (75).

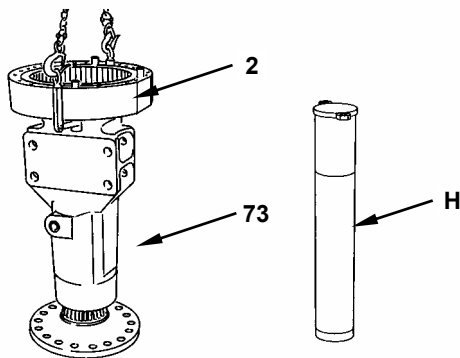


W4GB-03-03-064



**CAUTION: Axle tube (2) weight:**  
**ZW220**  
**Front: 162kg (360 lb)**  
**Rear: 132kg (295 lb)**  
**ZW250**  
**Front: 196kg (435 lb)**  
**Rear: 151kg (335 lb)**

51. Turn over axle tube (2), hoist with the differential gear side upward. Install to the raised axle shaft (73).



W4GB-03-03-065

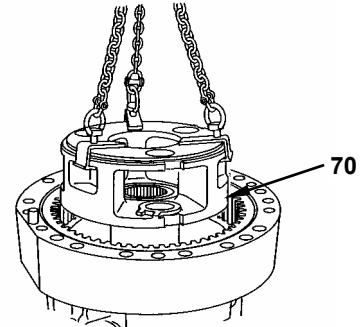
52. Cover axle shaft (73) with tube special tool (H). Install wheel side of oil seal (75) and bearing (74) to the shaft.
53. Install the bearing (72) outer to axle tube (2).

### Preload adjustment of axle shaft bearing (shim adjustment)




**CAUTION: Planet carrier (85) weight:**  
**ZW220: 35 kg (80 lb)**  
**ZW250: 46 kg (105 lb)**

54. In order to adjust preload, install planet carrier (85) without installing the gear to the spline part of axle shaft (73).




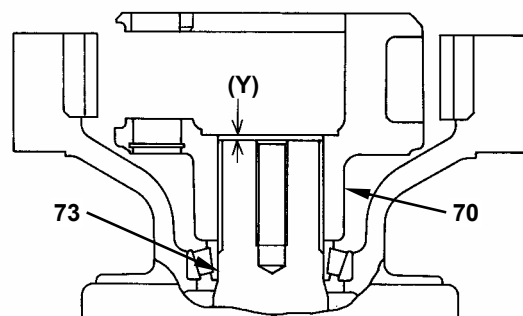
W4GB-03-03-066

55. Insert retainer plate (87) into planet carrier (70). Tighten bolt (71) with the torque of 49 N·m (5 kgf·m, 36 lbf·ft), install the inner part of bearing (72) of axle shaft (73). Turn and insert axle tube (2).

 : 36 mm

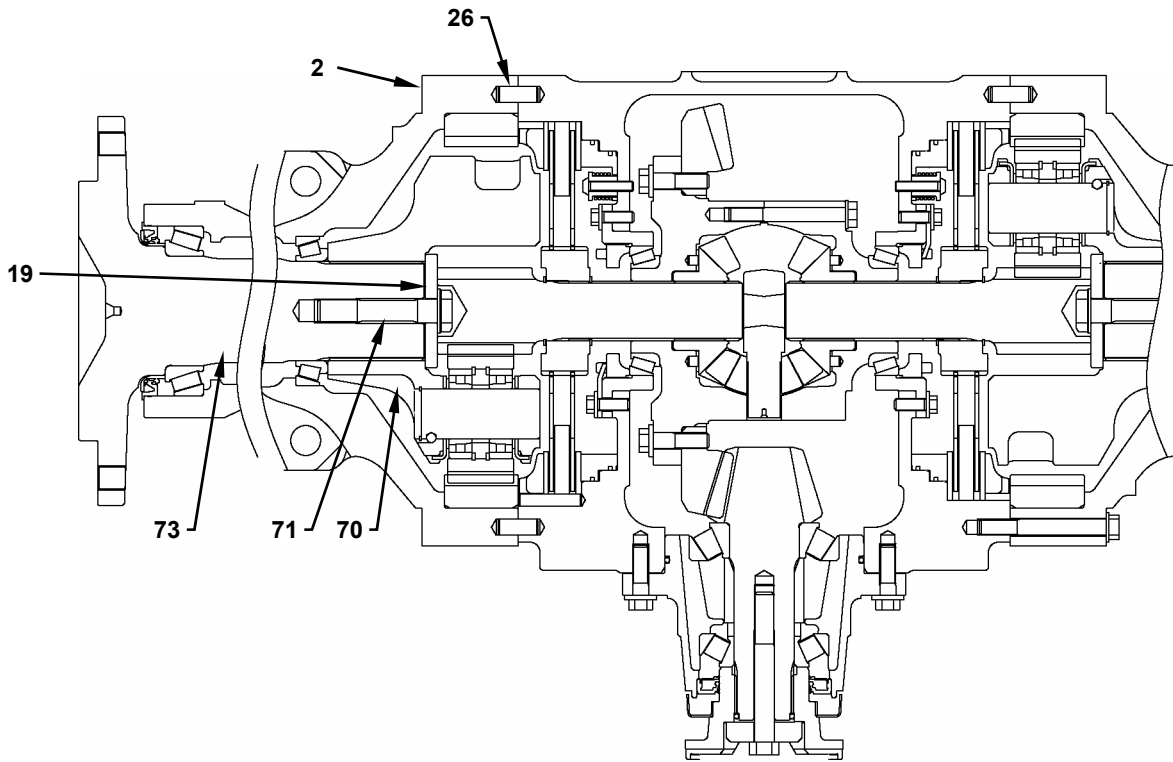
56. Loosen bolt (71), remove retainer plate (87), and measure the level difference (Y) between axle shaft (73) end and planet carrier (70). Select shim (19) that is 0.03 to 0.10 mm (0.001 to 0.004 in) thicker than the level difference (Y).

 : 36 mm



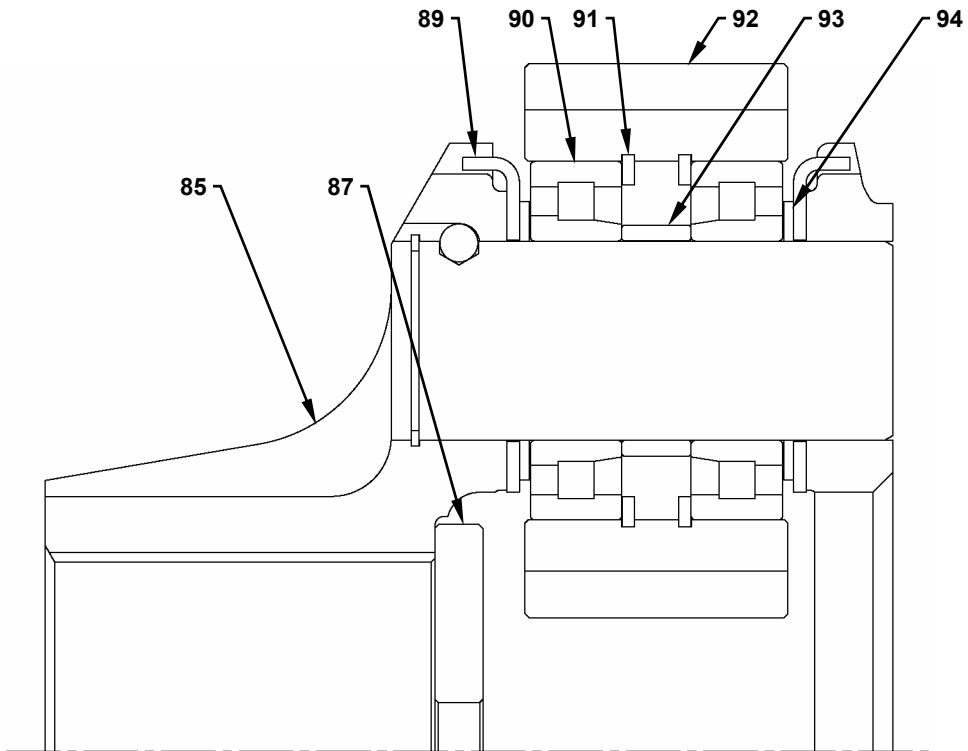
W4GB-03-03-067

# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-083


## • Planet Carrier Assembly (70)




W4GB-03-03-003

## BODY (TRAVEL SYSTEM) / Axle

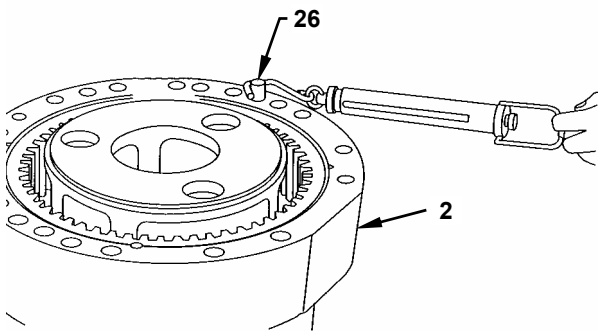
57. Install the selected shim (19) and retainer plate (87) to the end of axle shaft (73). Secure retainer plate (87) to axle shaft (73) with bolt (71).

 : 36 mm

 : 49 N·m (5 kgf·m, 36 lbf·ft)


58. Attach spring balance to dowel pin (26) of axle tube (2). Pull the top of installation pitch circle and measure rotation resistance of bearing.

If measured values are out of 20 to 39 N (2 to 4 kgf, 4.5 to 8.78 lbf), perform shim adjustment again. If the value is small, reduce the thickness of shim. If the value is big, increase the thickness of shim.



W4GB-03-03-068

59. When the thickness of shim (19) is determined, loosen retainer plate (87) installation bolt (71) and remove the temporary attached planet carrier (85).

 : 36 mm



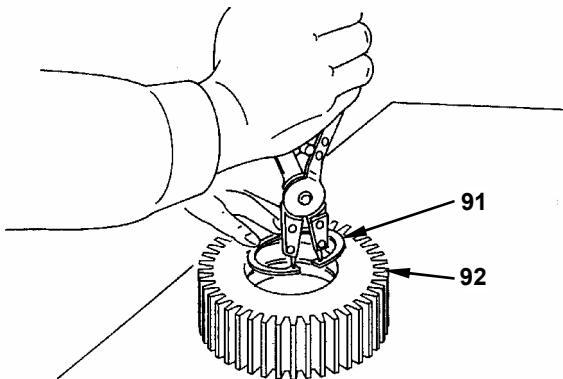
**CAUTION: Planet carrier (85) weight:**

ZW220: 35 kg (80 lb)

ZW250: 46 kg (105 lb)

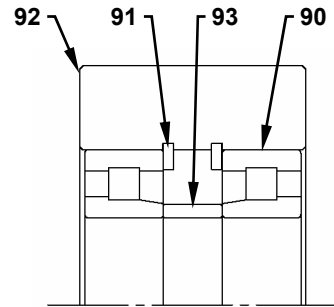
### Assembly and Installation of Planet Carrier Assembly (70)

60. Install retaining rings (91) (2 used) to planet gear (92).



W4GB-03-03-069

61. Install the outer part of bearing (90) (2 used) from the both sides of planet gear (92). Insert collar (93) into the center of planet gear (92), and install the inner part of bearing (90) from both sides. When installing outer part, do not press retaining ring (91) too strong.

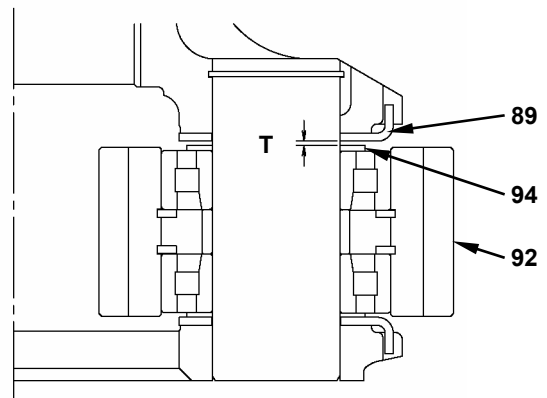


W4GB-03-03-070

62. Install thrust washers (89) (2 used) to planet carrier (85). Set stoppers of thrust washers (89) to the groove of planet carrier (85) periphery part.

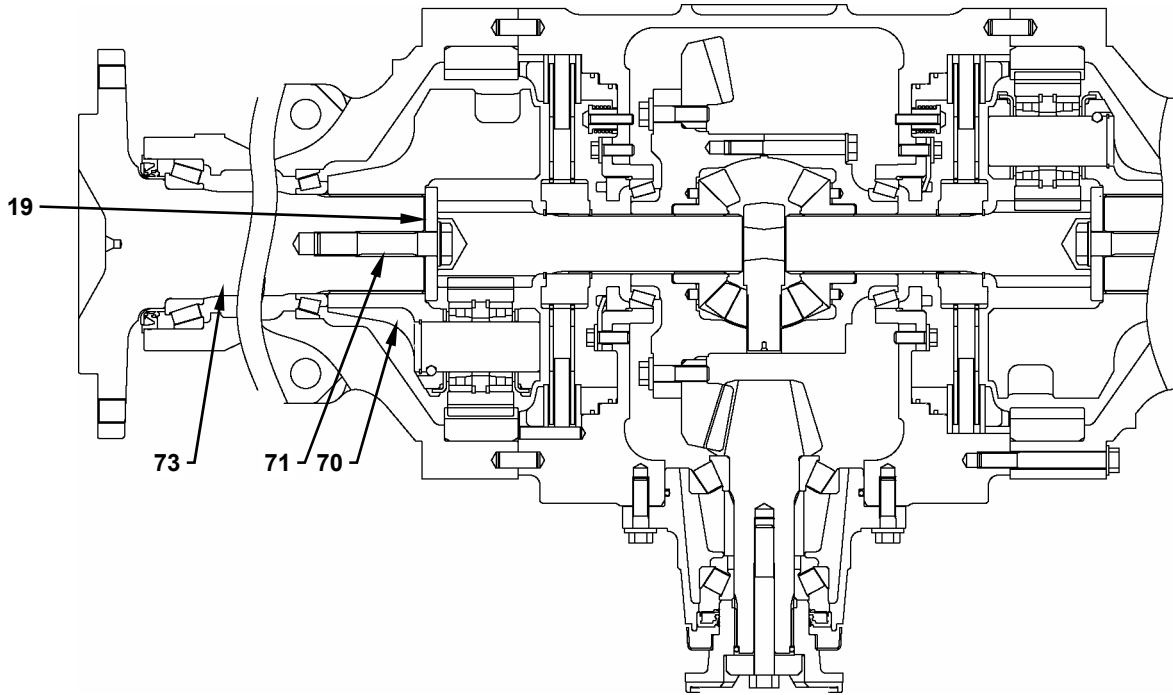
63. Install thrust bearings (94) (2 used) for clearance adjustment and planet gear (92) in between thrust washers (89).

Adjust the thickness of thrust bearing (94) so that the clearance (T) is less than 0.5 mm (0.02 in). (Thickness of 2 mm (0.079 in), 2.5 mm (0.098 in), and 3 mm (0.12 in).)



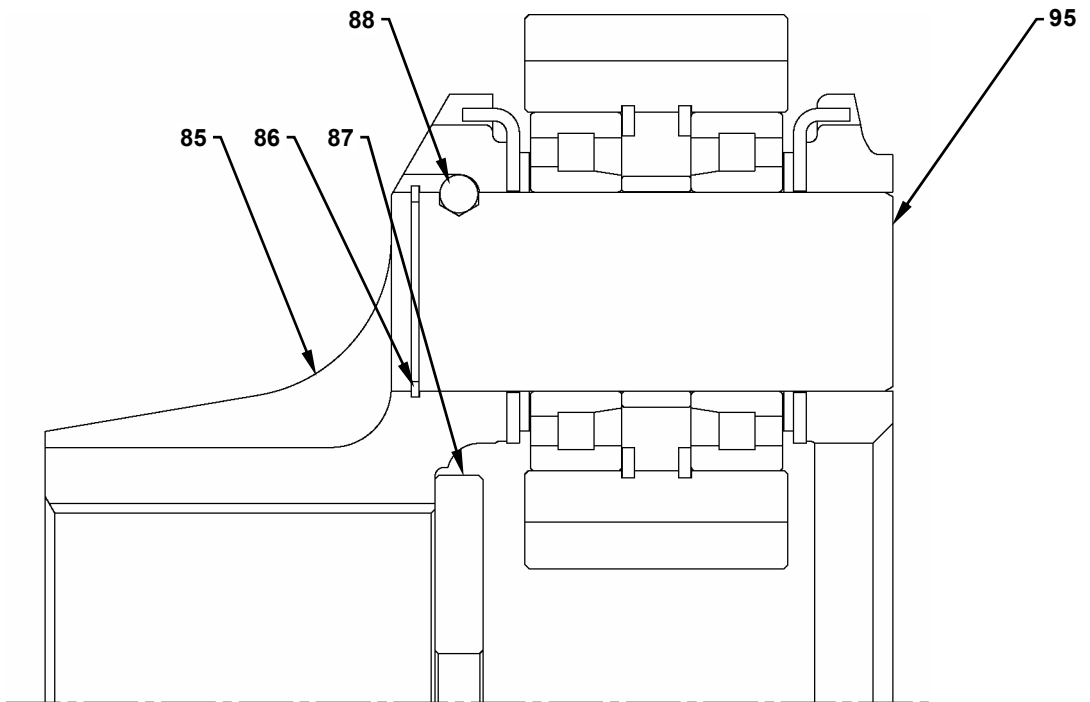
W4GB-03-03-071

# BODY (TRAVEL SYSTEM) / Axle



W4GB-03-03-083

- Planet Carrier Assembly (70)

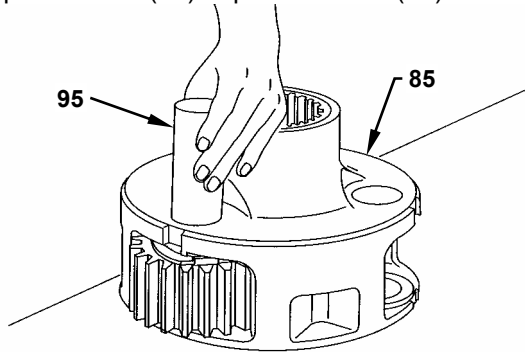


W4GB-03-03-003



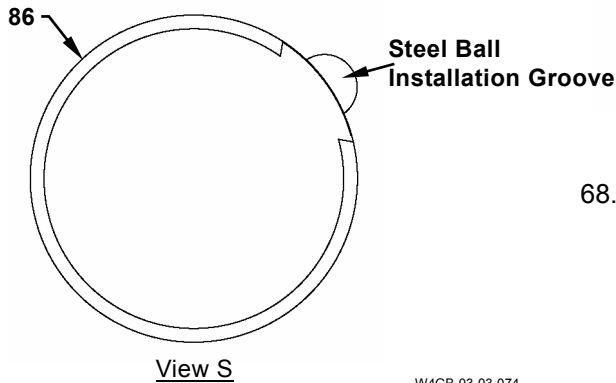
## BODY (TRAVEL SYSTEM) / Axle

64. Install steel ball (88) to planet shaft (95). Install planet shaft (95) to planet carrier (85).



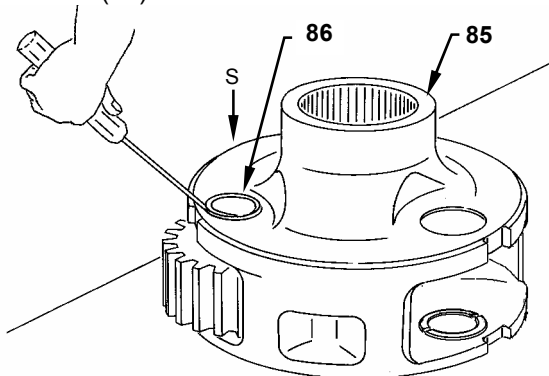
W4GB-03-03-072

- IMPORTANT:** Align the notch of retaining ring (86) and the position of steel ball (88) installation groove.



W4GB-03-03-074

65. Install retaining ring (86) to the groove on planet carrier (85).

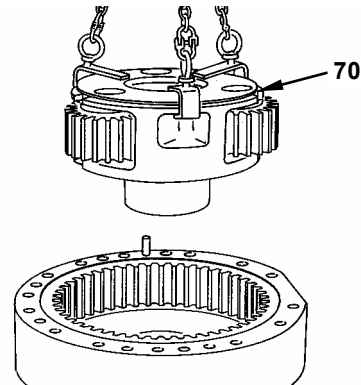


W4GB-03-03-073

66. Install retainer plate (87) to planet carrier (85). Install the other and 2 planet gears (92) to planet carrier (85) in the same way.


- CAUTION:** Planet carrier assembly (70) weight:  
 ZW220: 57 kg (130 lb)  
 ZW250: 78 kg (175 lb)

67. Put shim (19) selected by page W3-3-57 on axle shaft (73), and install the assembled planet carrier assembly (70).




W4GB-03-03-007


68. Apply LOCTITE #262 to bolt (71). Secure retainer plate (87) and planet carrier assembly (70) to axle shaft (73) with bolt (71). Attach the other one in the same way.

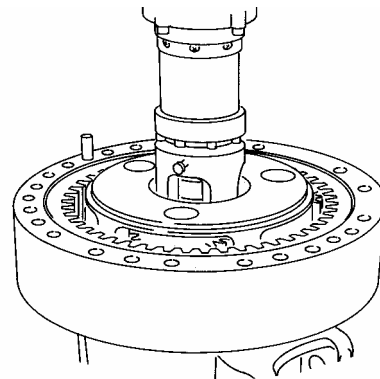
 : 36 mm

ZW220

 : 1090 N·m (111 kgf·m, 800 lbf·ft)

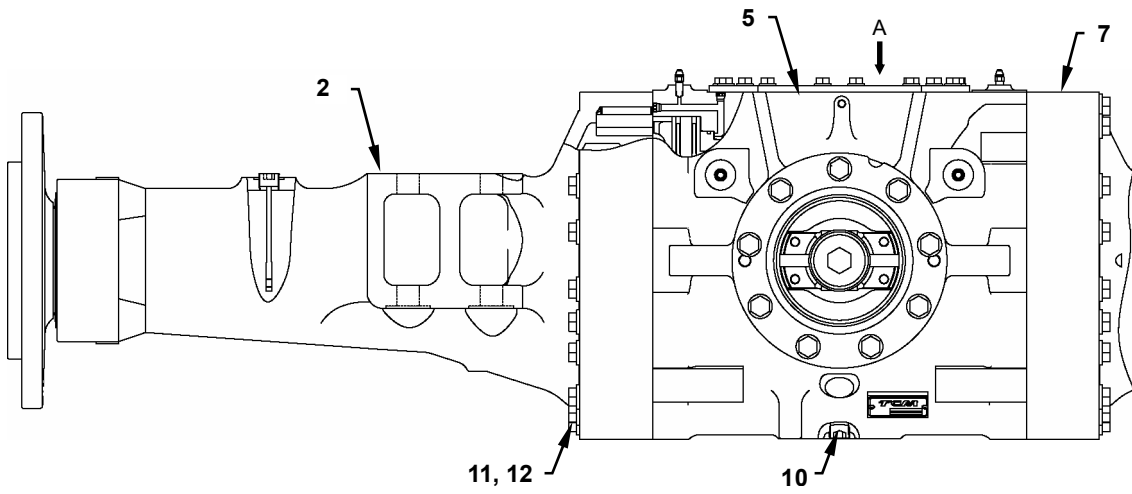
ZW250

 : 1590 N·m (162 kgf·m, 1170 lbf·ft)

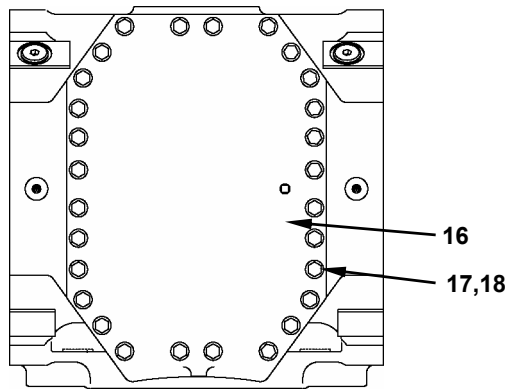


W4GB-03-03-075

# BODY (TRAVEL SYSTEM) / Axle

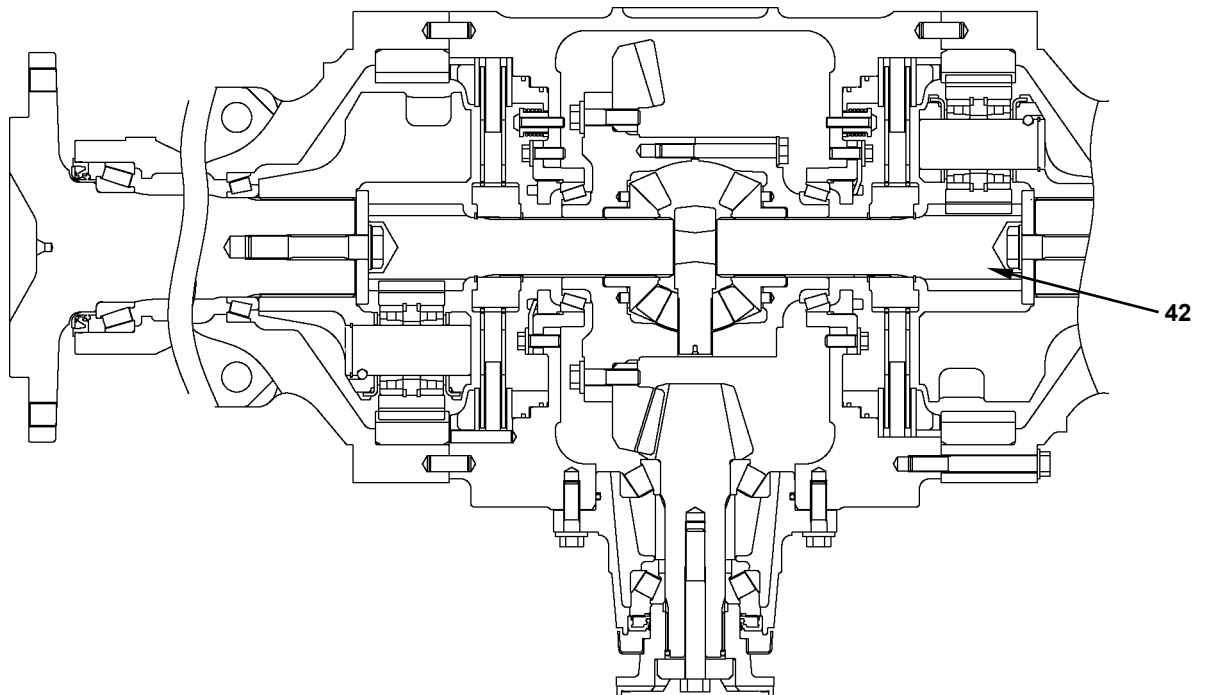


W4GB-03-03-001



View A

W4GB-03-03-082

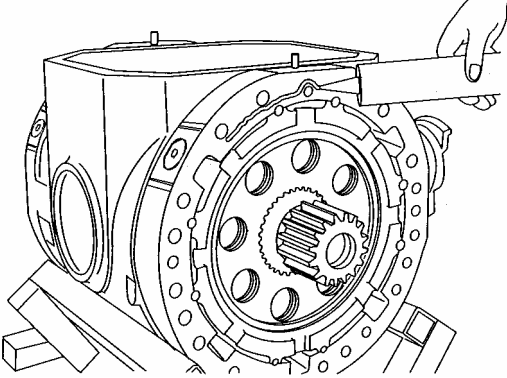


W4GB-03-03-083

## BODY (TRAVEL SYSTEM) / Axle

### Installation of Axle Tube

69. Apply LOCTITE FMD-127 to the mating surface of axle tube (2) and differential gear body (5). Apply LOCTITE so that there is no bead missed on the inside of the line of bolt holes. Bead width is 2 to 3 mm (0.079 to 0.12 in).



W4GB-03-03-076



**CAUTION: Axle tube (2) weight:**

**ZW220**

**Front: 301 kg (665 lb)**

**Rear: 270 kg (600 lb)**


**ZW250**


**Front: 374 kg (825 lb)**

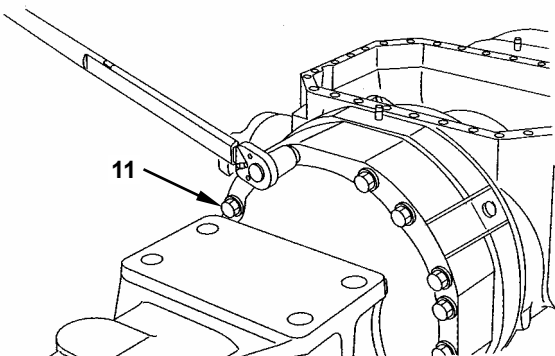
**Rear: 329 kg (730 lb)**

70. Apply LOCTITE #262 to bolt (11). Hoist axle tube (2) assembly horizontally, align shaft (42) of differential gear body (5) and bolt hole, and install differential gear body (5). Install the axle tube (2) assembly to differential gear body (5) with bolts (11) (20 used) and washers (12) (20 used).

Install the axle tube (7) assembly on the opposite side in the same way.

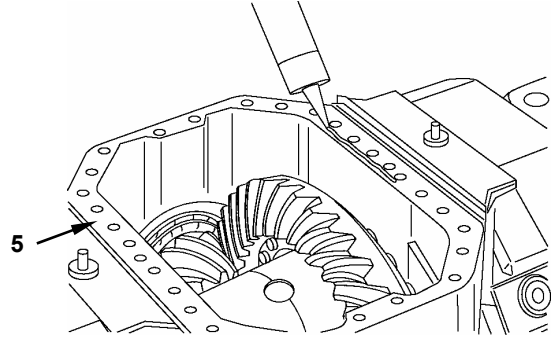
 : 24 mm

 : 225 N·m (23 kgf·m, 165 lbf·ft)




W4GB-03-03-077

71. Apply LOCTITE FMD-127 to cover (16) installation side of differential gear body (5). Apply LOCTITE so that there is no pause on bead inside bolt hole.

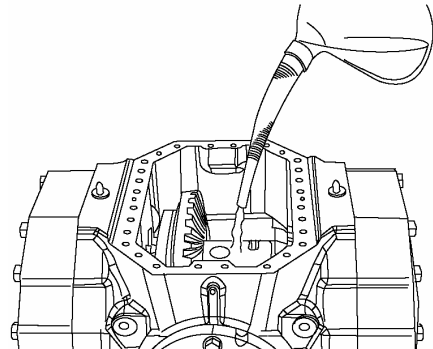


W4GB-03-03-078

72. Apply LOCTITE #572 to drain plug (10). Install drain plug (10) to differential gear body (5). Add oil to differential gear body (5).


 : 14 mm


- Oil quantity ZW220: 32 L (8.45 US gal.)  
ZW250: 40 L (10.6 US gal.)

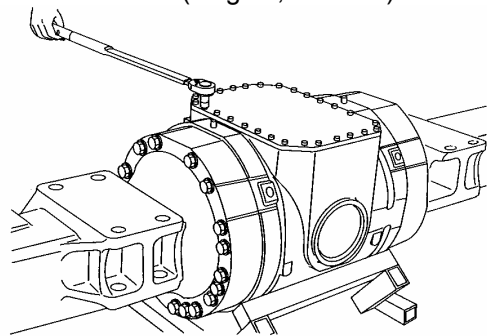


W4GB-03-03-079

73. Install cover (16) to differential gear body (5) with bolts (17) (28 used) and washers (18) (28 used).

 : 19 mm

 : 9.8 N·m (1 kgf·m, 7.2 lbf·ft)



W4GB-03-03-080

## BODY (TRAVEL SYSTEM) / Axle

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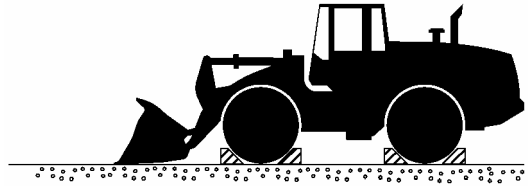
(Blank)

## BODY (TRAVEL SYSTEM) / Propeller Shaft

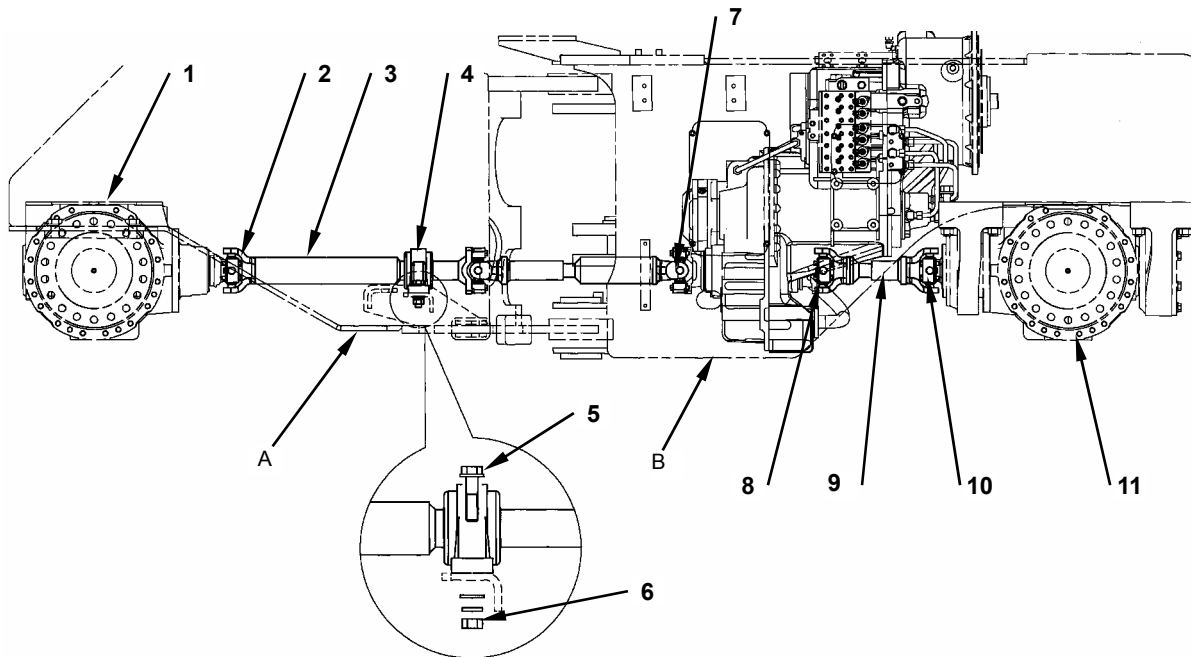
### REMOVAL AND INSTALLATION OF PROPELLER SHAFT

#### Preparation

1. Park the machine on a solid, level surface. Lower the bucket horizontally onto the ground.
2. Place a wooden block at the front and the rear of the axle and secure the machine.



W4GB-03-04-001



W4GB-03-04-002

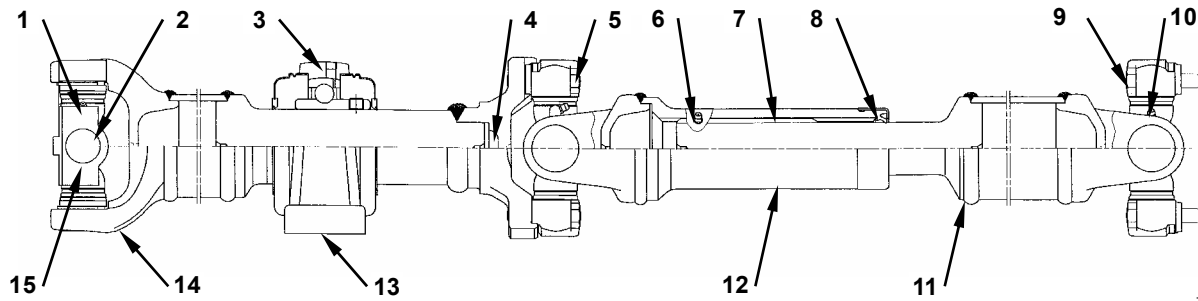
- 1 - Front Axle
- 2 - Bolt
- 3 - Propeller Shaft
- 4 - Support Bearing
- 5 - Bolt
- 6 - Nut

- 7 - Bolt
- 8 - Bolt
- 9 - Propeller Shaft
- 10 - Bolt
- 11 - Rear Axle

- A - Lower Part of Front Frame (Position of Stand)
- B - Lower Part of Rear Frame (Position of Stand)

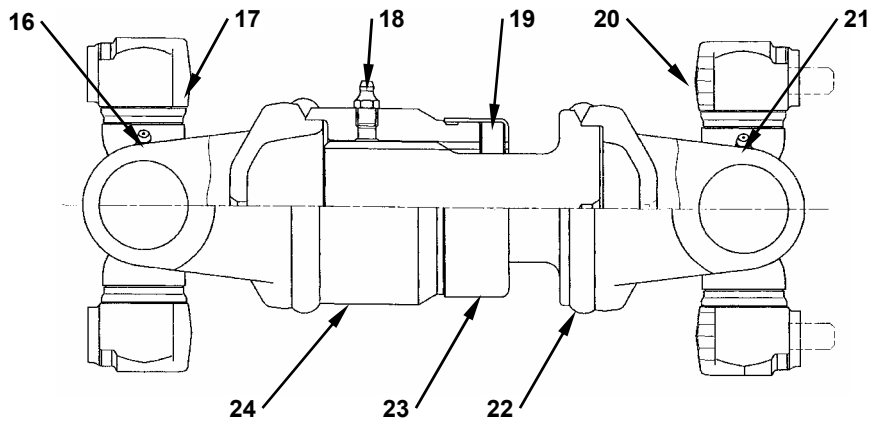
## BODY (TRAVEL SYSTEM) / Propeller Shaft

Front Axle to Transmission



T4GB-03-12-003

Transmission to Rear Axle



T4GB-03-12-004

- |                     |                     |                     |                      |
|---------------------|---------------------|---------------------|----------------------|
| 1 - Grease Fitting  | 7 - Propeller Shaft | 13 - Bolt (2 Used)  | 19 - Spline Seal     |
| 2 - Bolt (4 Used)   | 8 - Spline Seal     | 14 - Fork           | 20 - Bolt            |
| 3 - Support Bearing | 9 - Bolt (4 Used)   | 15 - Spider         | 21 - Grease Fitting  |
| 4 - Bolt            | 10 - Grease Fitting | 16 - Grease Fitting | 22 - Stub Yoke       |
| 5 - Bolt            | 11 - Stub Yoke      | 17 - Bolt           | 23 - Slip Yoke       |
| 6 - Grease Fitting  | 12 - Slip Yoke      | 18 - Grease Fitting | 24 - Propeller Shaft |

## BODY (TRAVEL SYSTEM) / Propeller Shaft

---


### Removal (between front axle and transmission)

**IMPORTANT:** Remove grease fitting (6) so that the internal grease can be drained.


1. Remove grease fitting (6).

**IMPORTANT:** Propeller shaft (7) can not be removed alone. When removing propeller shaft (7) alone, spline seal (8) may be damaged. Remove propeller shaft (7) and fork (14) as an assembly.

2. Remove bolts (2, 9) (4 used for each).

 : 17 mm

3. Remove bolts (13) (2 used) from support bearing (3).

 : 30 mm



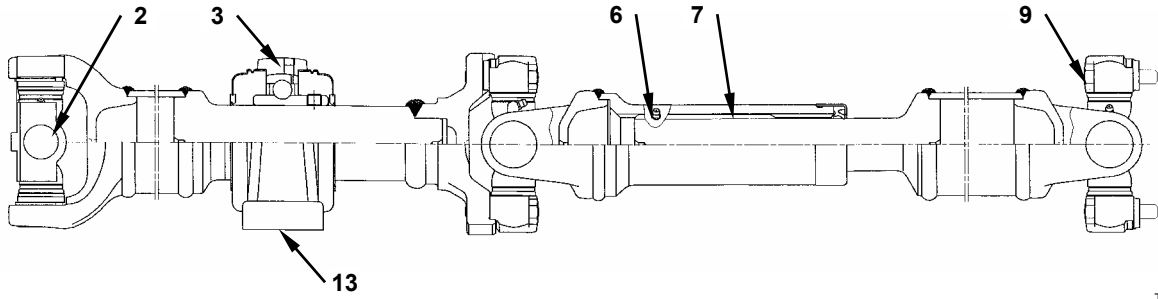
**CAUTION:** The propeller shaft (7) assembly weight: 49 kg (110 lb)

4. Remove propeller shaft (7) from the body.

# BODY (TRAVEL SYSTEM) / Propeller Shaft

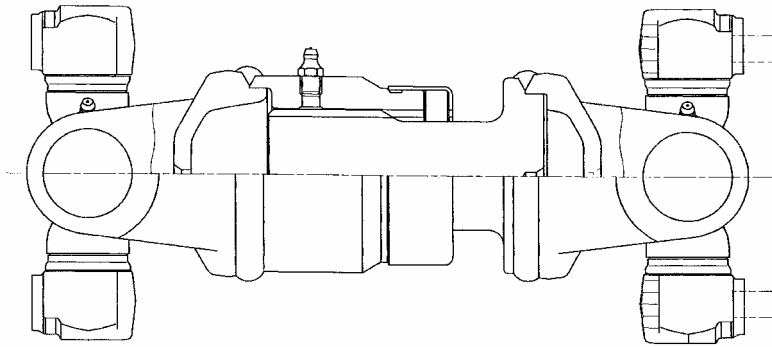
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Front Axle to Transmission



T4GB-03-12-003

Transmission to Rear Axle



T4GB-03-12-004



## BODY (TRAVEL SYSTEM) / Propeller Shaft

---


### Installation (between front axle and transmission)


1. Install propeller shaft (7) to the body.

**IMPORTANT:** Apply LOCTITE #262 to the mounting bolts except for support bearing (4).


**IMPORTANT:** Align the flanges of propeller shafts (7) at the front and the rear. Install propeller shaft (7) so that grease fittings (6) of propeller shafts (7) at the front and the rear are on the same side. At this time, raise the body so that the tire can be rotated. (Refer to W3-4-1.)


2. Install support bearing (4) to the body with bolts (13) (2 used).

 : 30 mm

 : 195 to 215 N·m  
(20 to 22 kgf·m, 145 to 159 lbf·ft)

3. Install bolts (2, 9) (4 used for each).

 : 17 mm

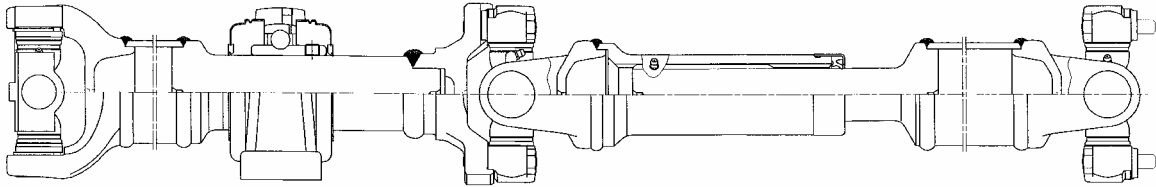
 : 143 N·m (15 kgf·m, 105 lbf·ft)

4. Install grease fitting (6). Apply grease.

# BODY (TRAVEL SYSTEM) / Propeller Shaft

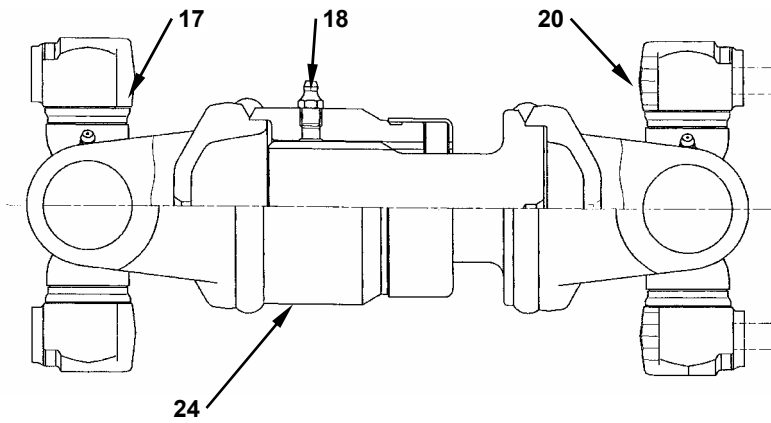
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Front Axle to Transmission



T4GB-03-12-003

Transmission to Rear Axle



T4GB-03-12-004


## BODY (TRAVEL SYSTEM) / Propeller Shaft

---

Removal (between transmission and rear axle)

**IMPORTANT:** Remove grease fitting (18) so that the internal grease can be drained.

1. Remove grease fitting (18).
2. Remove propeller shaft installation bolts (17, 20)  
(8 used for each).

 : 17 mm



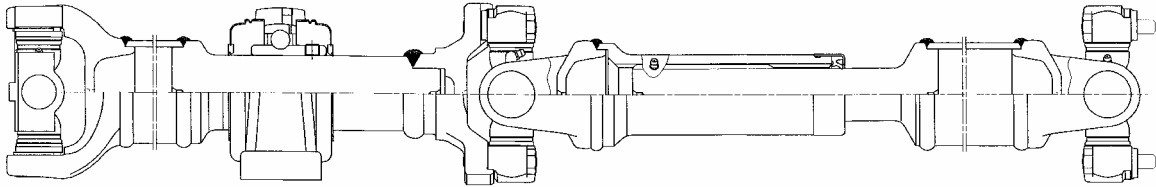
**CAUTION:** The propeller shaft (24) assembly weight: 16 kg (35.5 lb)

3. Remove propeller shaft (24) from the body.

# BODY (TRAVEL SYSTEM) / Propeller Shaft

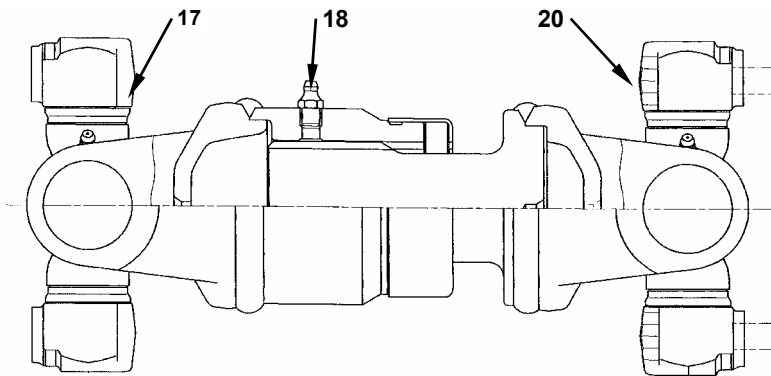
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Front Axle to Transmission



T4GB-03-12-003

Transmission to Rear Axle



T4GB-03-12-004

## BODY (TRAVEL SYSTEM) / Propeller Shaft

---

### Installation (between transmission and ar axle)


1. Install propeller shaft (24) to the body.


**IMPORTANT:** Apply **LOCTITE #262** to the mounting bolts.

**IMPORTANT:** Align the flanges of propeller shafts (24) at the front and the rear. Install propeller shaft (24) so that grease fittings (18) of propeller shafts (24) at the front and the rear are on the same side. At this time, raise the body so that the tire can be rotated. (Refer to W3-4-1.)

**IMPORTANT:** Install propeller shaft (7) with the spline shaft side facing to the transmission side.

2. Install bolts (17, 20) (4 used for each).

 : 17 mm

 : 143 N·m (15 kgf·m, 105 lbf·ft)

3. Install grease fitting (18). Apply grease.

## **BODY (TRAVEL SYSTEM) / Propeller Shaft**

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## BODY (TRAVEL SYSTEM) / Brake Valve


### REMOVAL AND INSTALLATION OF BRAKE VALVE

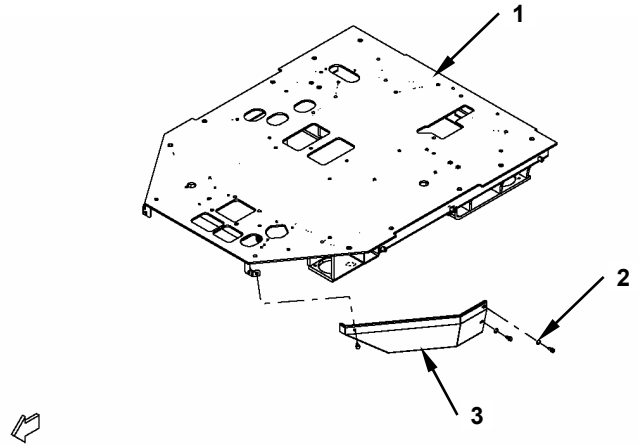


**CAUTION:** Before doing any work, stop the engine and depress/release the brake pedal about 80 times in order to release the pressure in the service brake circuit. (The pedal can be depressed lightly when the pressure is released.)

#### Removal


1. Remove sems bolts (13) (3 used) from cover (3). Remove cover (3) from cockpit (1).

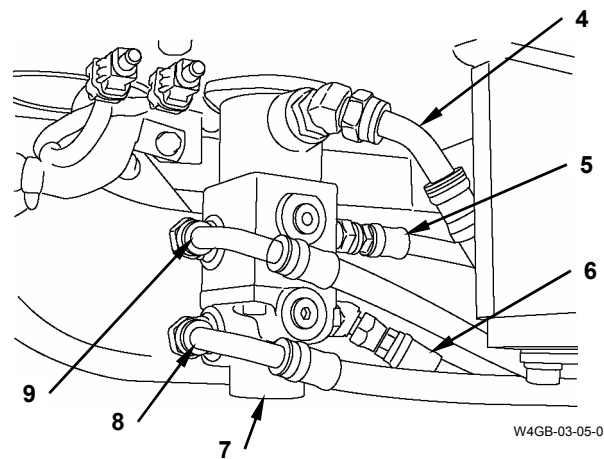
 : 17 mm



W4GB-03-05-013


2. Disconnect hoses (4 to 6, 8 and 9) from brake valve (7). Cap the open ends. Attach an identification tag onto the disconnected hoses for assembling.

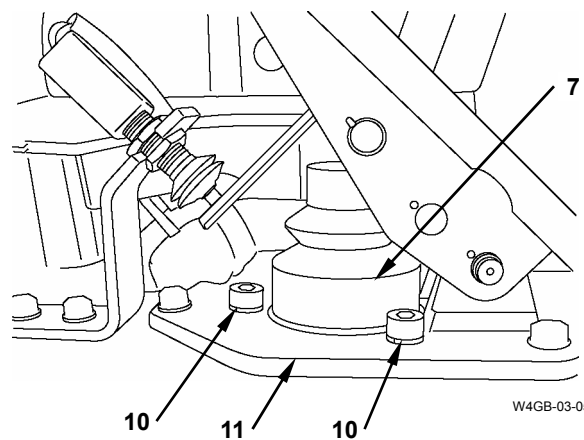
 : 22 mm, 27 mm



W4GB-03-05-011

3. Remove socket bolts (10) (3 used) from mounting plate (11). Remove brake valve (7) from mounting plate (11).

 : 6 mm





W4GB-03-05-012





## BODY (TRAVEL SYSTEM) / Brake Valve

### Installation

1. Install brake valve (7) to mounting plate (11) with socket bolts (10) (3 used).

 : 6 mm  
 : 19.5 to 25.5 N·m  
(2 to 2.6 kgf·m, 14.5 to 19 lbf·ft)



2. Connect hoses (4 to 6, 8 and 9) to brake valve (7).

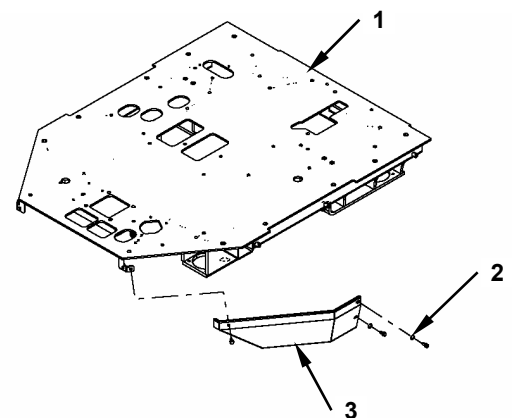
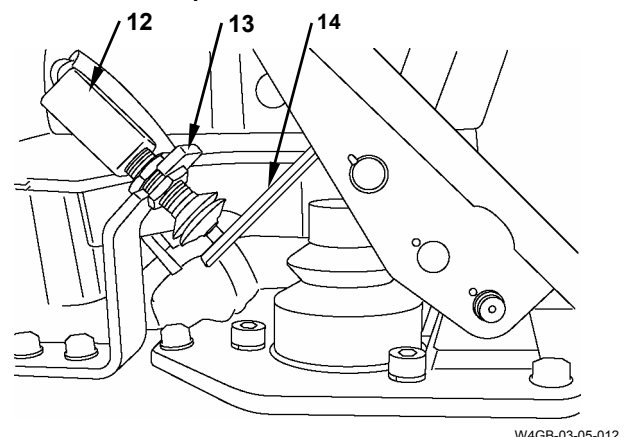
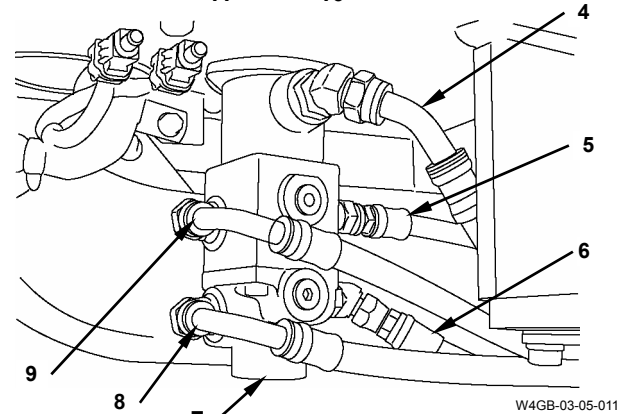
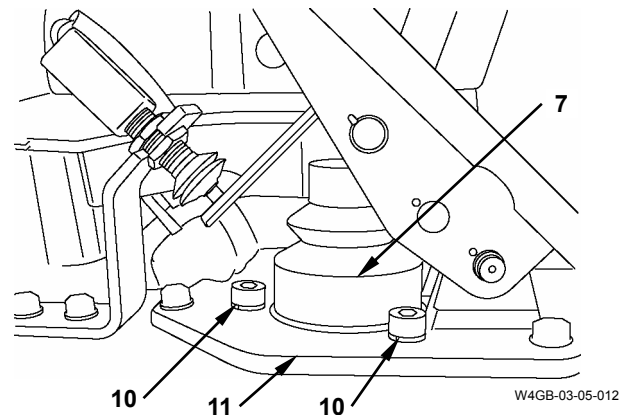
 : 22 mm  
 : 39 N·m (4 kgf·m, 28.5 lbf·ft)  
 : 27 mm  
 : 93 N·m (9.5 kgf·m, 68.5 lbf·ft)

3. After installing brake valve (7), adjust the position of brake stop lamp switch (12) in the following.

- With brake stop lamp switch (12) disconnected and the pedal released, adjust the mounting position of bracket (14) of the pedal so that bracket (14) of the pedal is parallel to the mounting position of brake stop lamp switch (12).
- Push the end of brake stop lamp switch (12) onto bracket (14) to 4 to 5 mm (0.16 to 0.2 in). Secure brake stop lamp switch (12). (At this time, check that the pedal can be returned completely when releasing the pedal. Check the sound “tick, tick” when brake stop lamp switch (12) is operated.)

4. Install cover (3) to cockpit (1) with sems bolts (2) (3 used).

 : 17 mm  
 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)





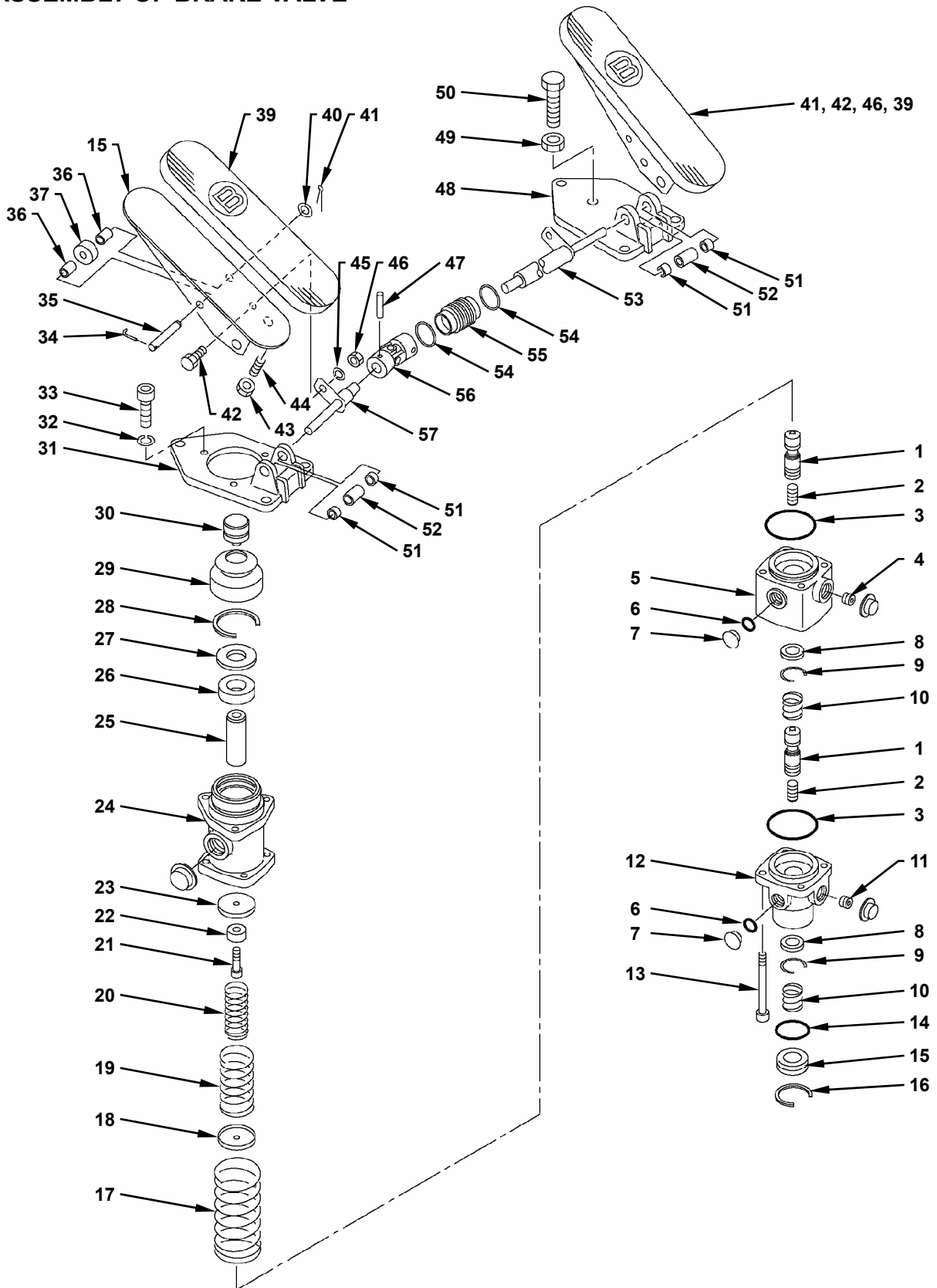
## **BODY (TRAVEL SYSTEM) / Brake Valve**

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# BODY (TRAVEL SYSTEM) / Brake Valve

## DISASSEMBLY OF BRAKE VALVE



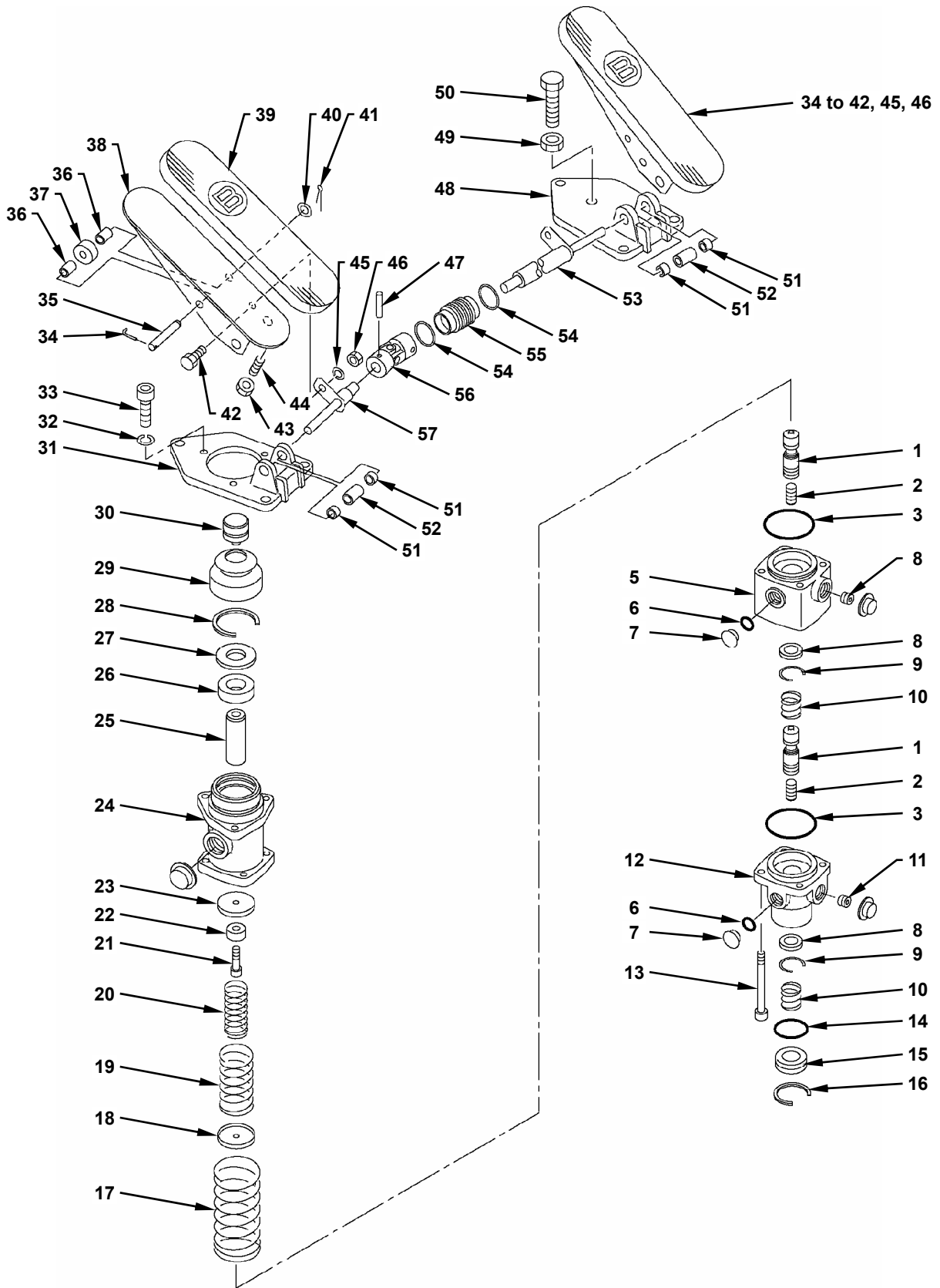
W4GB-03-05-001

## BODY (TRAVEL SYSTEM) / Brake Valve

---

1 - Spool (2 Used)	16 - C-Ring	31 - Mounting Plate	46 - Nut (2 Used)
2 - Plunger (2 Used)	17 - Spring	32 - Washer (3 Used)	47 - Pin (2 Used)
3 - O-Ring (2 Used)	18 - Spring Seat	33 - Bolt (3 Used)	48 - Mounting Plate
4 - Orifice	19 - Spring	34 - L Pin (2 Used)	49 - Nut
5 - Body	20 - Spring	35 - Pedal Pin (2 Used)	50 - Bolt
6 - Plug (2 Used)	21 - Socket Bolt	36 - Collar (4 Used)	51 - Bushing (4 Used)
7 - O-Ring (2 Used)	22 - Retainer	37 - Roller (2 Used)	52 - Collar (2 Used)
8 - Spring Seat (2 Used)	23 - Spring Seat	38 - Pedal (2 Used)	53 - Pedal Shaft
9 - Retaining Ring (2 Used)	24 - Cover	39 - Pedal Cover (2 Used)	54 - Retaining Ring (2 Used)
10 - Spring (2 Used)	25 - Input Spool	40 - Washer	55 - Boot
11 - Orifice	26 - Oil Seal	41 - Pin (2 Used)	56 - Joint
12 - Body	27 - Stopper	42 - Bolt (2 Used)	57 - Shaft (2 Used)
13 - Socket Bolt (4 Used)	28 - C-Ring	43 - Nut	
14 - O-Ring	29 - Dust Cover	44 - Screw	
15 - Plug	30 - Seat	45 - Washer (2 Used)	

# BODY (TRAVEL SYSTEM) / Brake Valve







W4GB-03-05-001

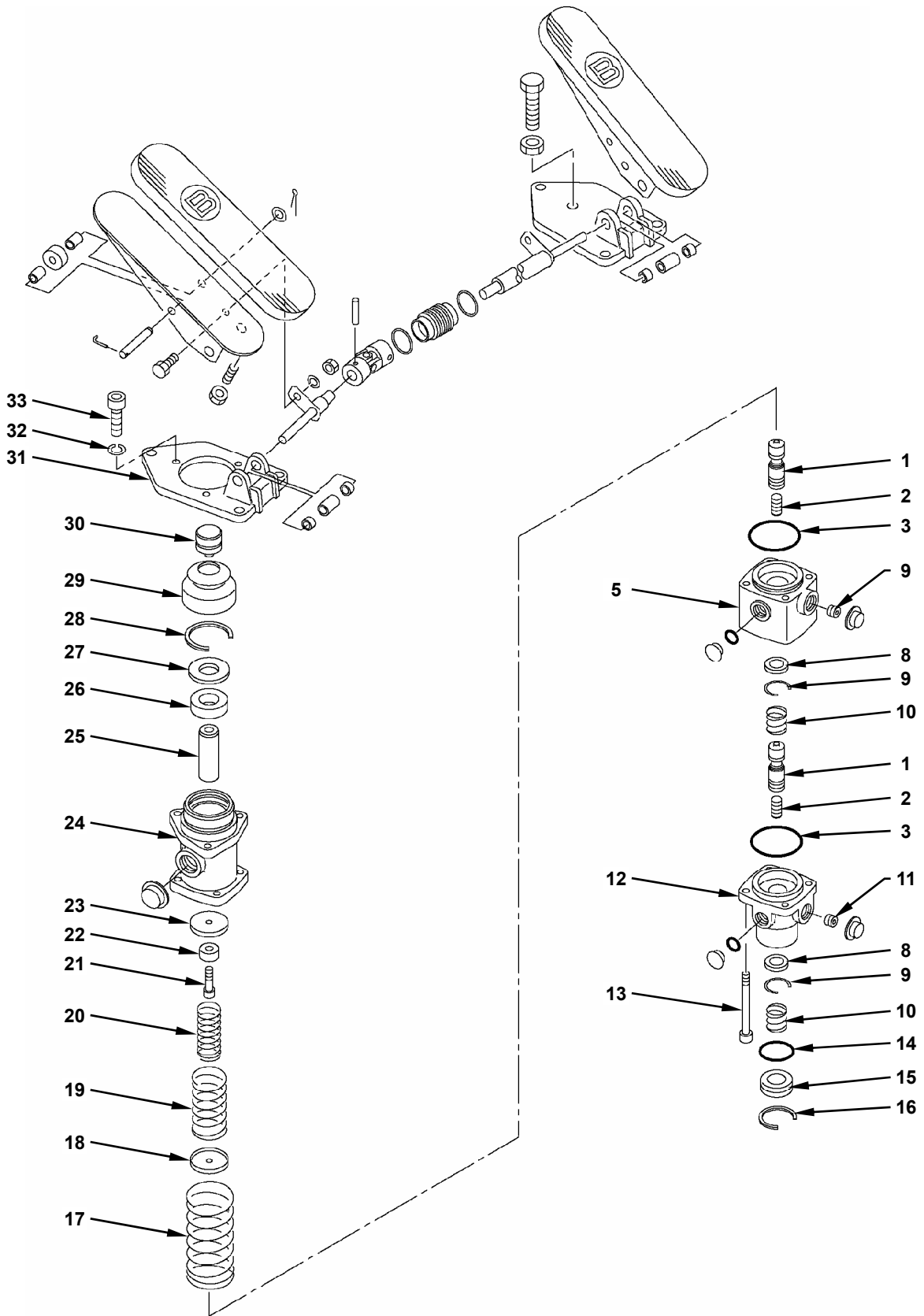
## BODY (TRAVEL SYSTEM) / Brake Valve

---

### Disassembly of Brake Valve

1. Remove pedal cover (39) from pedal (38) at the right side. Remove nut (46) and washer (45) from bolt (42). Remove bolt (42) from pedal (38).  
 : 14 mm
2. Remove pedal (38), pedal collar (52), bushing (51) (2 used) and mounting plate (48) from shaft (53).
3. Remove pin (41) from pin (35). Remove roller (37), collars (36) (2 used), pedal pin (35), L pin (34) and washer (40) from pedal (38).
4. Loosen nut (49) on mounting plate (48). Remove bolt (50) from mounting plate (48).  
 : 19 mm
5. Remove pedal cover (39) from pedal (38) at the left side. Remove nut (46) and washer (45) from bolt (42). Remove bolt (42) from pedal (38).  
 : 14 mm
6. Loosen nut (43). Remove screw (44) from pedal (38).  
 : 12 mm
7. Remove shaft (57), pedal (38) and pedal collar (52) from mounting plate (31).
8. Remove pin (41) from pin (35). Remove roller (37), collars (36) (2 used), pedal pin (35), L pin (34) and washer (40) from pedal (38).
9. Remove retaining rings (45) (2 used) from boot (55). Remove boot (55) from joint (56).
10. Remove pins (47) (2 used) from joint (56) by using a press. Remove shafts (53, 57) from joint (56).





# BODY (TRAVEL SYSTEM) / Brake Valve



W4GB-03-05-001

## BODY (TRAVEL SYSTEM) / Brake Valve

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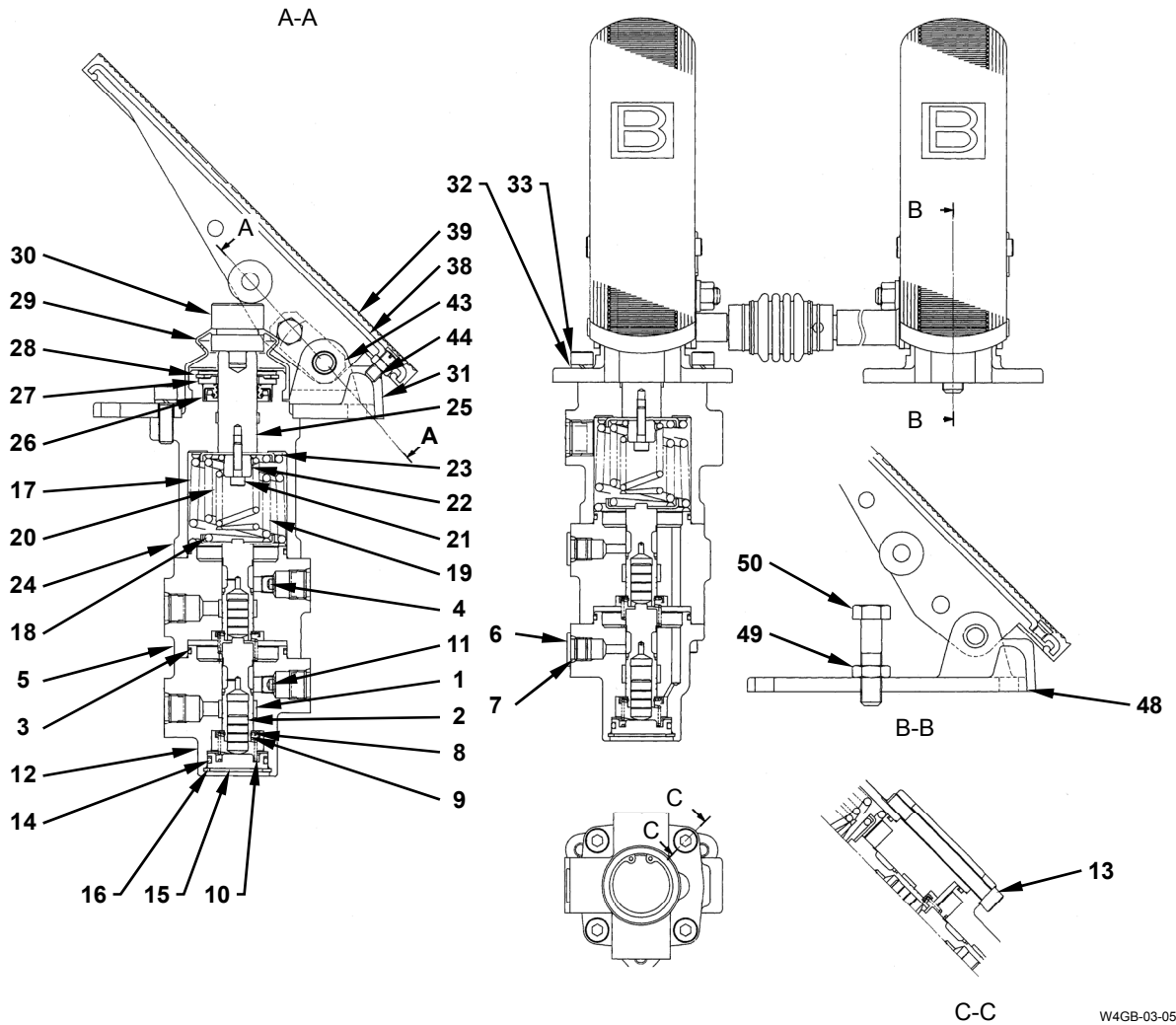
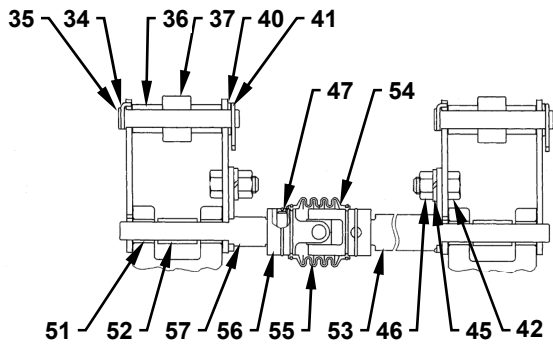
11. Remove socket bolts (33) (3 used) and spring washers (32) (3 used) from mounting plate (31). Remove mounting plate (31) from cover (24).  
 : 6 mm
12. Remove dust cover (29) and seat (30) from input spool (25).
13. Remove socket bolts (13) (4 used) from body (12). Separate into bodies (12, 5) and cover (24). Remove springs (10, 19, 17) and spring seat (18) from bodies (12, 5).  
 : 6 mm
14. Place body (12) on a workbench with the body (5) side facing down ward. Remove C-ring (16), plug (15) and spring (10) from body (12). Remove O-ring (14) from plug (15).
15. Remove spools (1) (2 used) carefully from each bodies (12, 5). Remove plungers (2) (2 used), retaining rings (9) (2 used), spring seats (8) (2 used), orifices (4, 13) and O-rings (3) (2 used).  
 : 5 mm
16. Remove input spool (25) with the spring carefully attached from cover (24).
17. Place cover (24) on a workpench with the body (4) side facing downword. Remove C-ring (28) from cover (24). Remove stopper (27) and oil seal (26) from cover (24).
18. Remove socket bolt (21) from input spool (25). Remove retainer (22), spring (20) and spring seat (23) from cover (14).  
 : 4 mm



**CAUTION:** Use a protective layer in order not to damage the outer diameter of input spool (25) when loosening a bolt While securing camp input spool (25) in a vise.

# BODY (TRAVEL SYSTEM) / Brake Valve

## ASSEMBLY OF BRAKE VALVE



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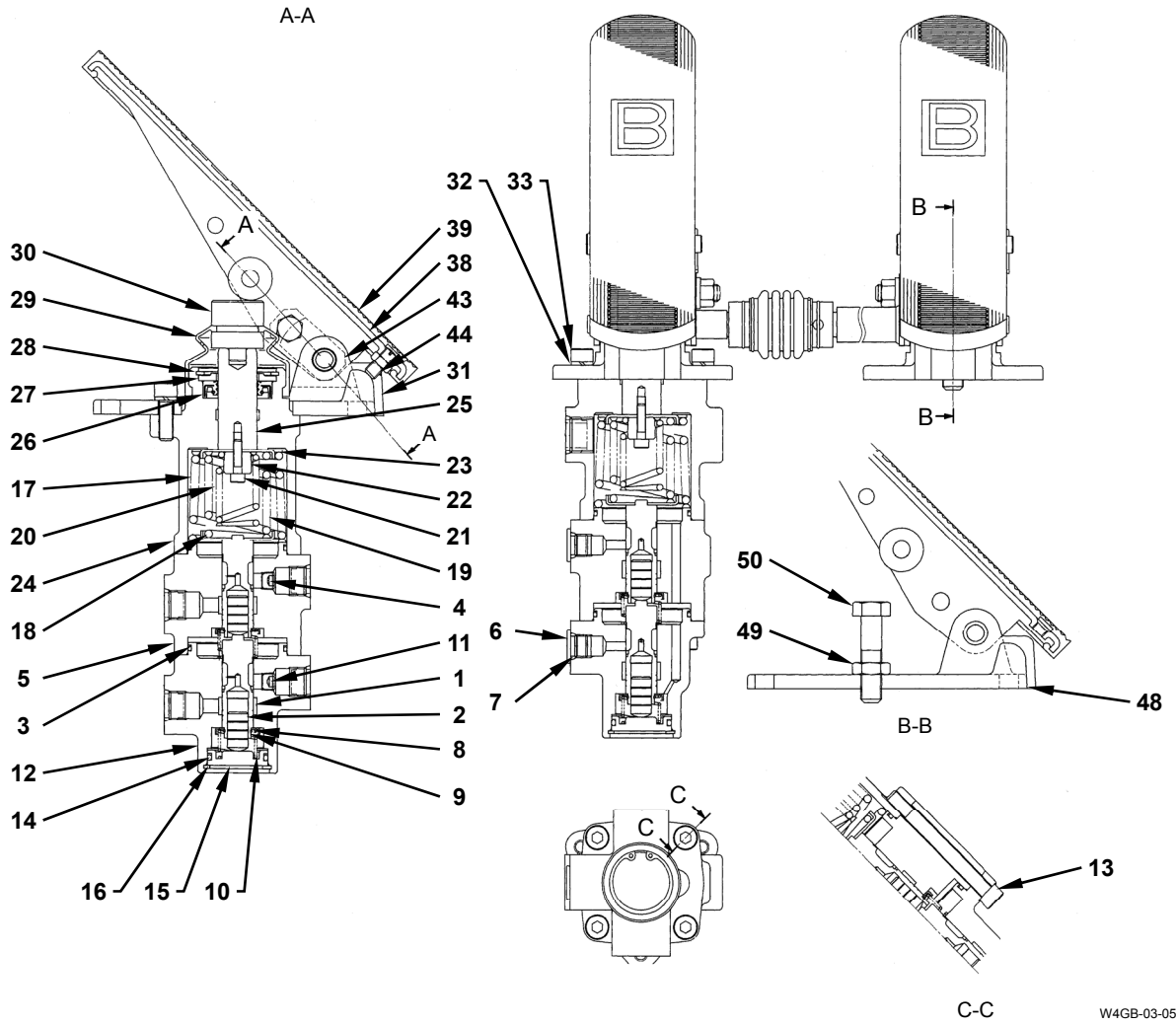
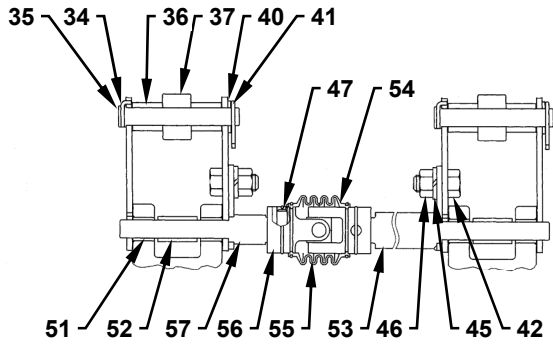


## BODY (TRAVEL SYSTEM) / Brake Valve

---

1 - Spool (2 Used)	16 - C-Ring	31 - Mounting Plate	46 - Nut (2 Used)
2 - Plunger (2 Used)	17 - Spring	32 - Washer (3 Used)	47 - Pin (2 Used)
3 - O-Ring (2 Used)	18 - Spring Seat	33 - Bolt (3 Used)	48 - Mounting Plate
4 - Orifice	19 - Spring	34 - L Pin (2 Used)	49 - Nut
5 - Body	20 - Spring	35 - Pedal Pin (2 Used)	50 - Bolt
6 - Plug (2 Used)	21 - Socket Bolt	36 - Collar (4 Used)	51 - Bushing (4 Used)
7 - O-Ring (2 Used)	22 - Retainer	37 - Roller (2 Used)	52 - Pedal Collar (2 Used)
8 - Spring Seat (2 Used)	23 - Spring Seat	38 - Pedal (2 Used)	53 - Shaft
9 - Retaining Ring (2 Used)	24 - Cover	39 - Pedal Cover (2 Used)	54 - Retaining Ring (2 Used)
10 - Spring (2 Used)	25 - Input Spool	40 - Washer (2 Used)	55 - Boot
11 - Orifice	26 - Oil Seal	41 - Pin (2 Used)	56 - Joint
12 - Body	27 - Stopper	42 - Bolt (2 Used)	57 - Shaft
13 - Socket Bolt (4 Used)	28 - C-Ring	43 - Nut	
14 - O-Ring	29 - Dust Cover	44 - Screw	
15 - Plug	30 - Seat	45 - Washer (2 Used)	

# BODY (TRAVEL SYSTEM) / Brake Valve





W4GB-03-05-002

## BODY (TRAVEL SYSTEM) / Brake Valve

### Assembly of Brake Valve

1. Install orifice (11) to body (12). Install orifice (4) to body (5).

 : 5 mm

 : 9.8 to 14.7 N·m  
(1 to 1.5 kgf·m, 7.2 to 11 lbf·ft)

2. Install spring seats (8) (2 used) and retaining rings (9) (2 used) to spools (1) (2 used).
3. Install plungers (2) (2 used) to spools (1) (2 used).
4. Install spools (1) (2 used) to bodies (5, 12) respectively.
5. Install O-ring (14) to plug (15).

**IMPORTANT: Check that spring (10) is completely installed in the hole on of spring seat (8) and plug (15).**

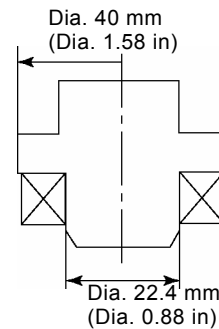
6. Install spring (10), plug (15) and C-ring (16) to body (12).
7. Install O-rings (3) (2 used) to bodies (5, 12).

8. Insert socket bolts (13) (4 used) into body (12). Place body (12) on a horizontal stand. Insert spring (10) into spool (1).

9. Check the direction of the ports. Insert body (5) into socket bolts (13) (4 used). Install body (5) to body (12).

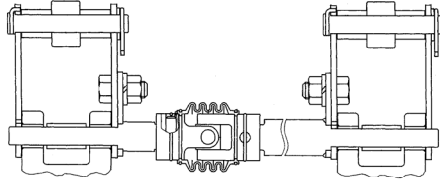
**IMPORTANT: Apply grease onto the lip inner surface, the peripheral surface of oil seal (26) and the inner surface of the oil seal (26) mounting groove, Install oil seal (26).**

10. Install oil seal (26) to cover (24) with stopper (27) and C-ring (28).

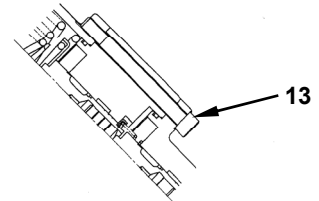
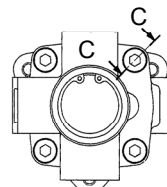
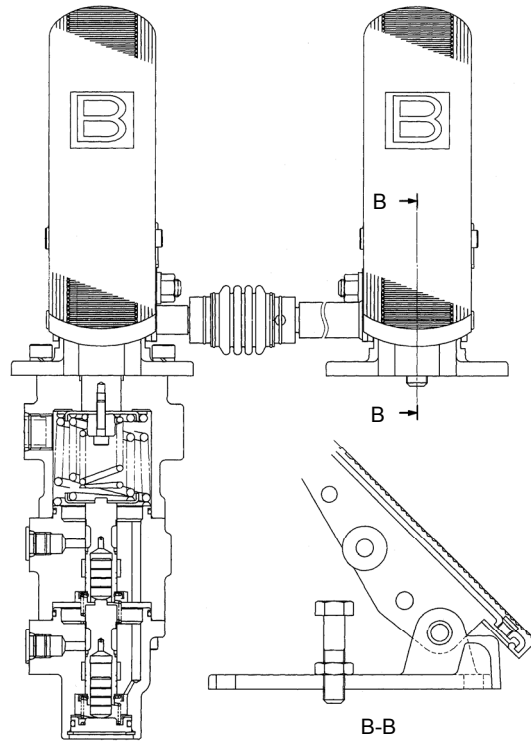
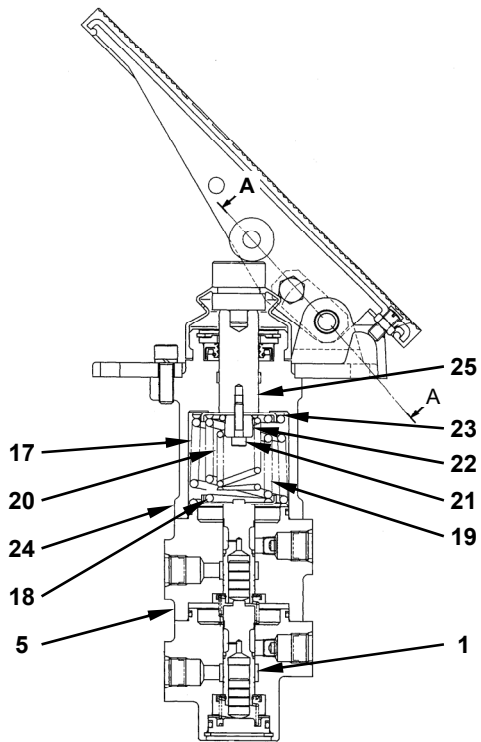


W4GB-03-05-003

# BODY (TRAVEL SYSTEM) / Brake Valve



A-A



C-C


W4GB-03-05-002


## BODY (TRAVEL SYSTEM) / Brake Valve

---

**IMPORTANT:** Use a protective layer. In order not to damage the outer diameter of input spool (25) when tightening a socket bolt while securing input spool (25) in a vise.

11. Install spring seat (23), spring (20) and retainer (22) to input spool (25) with socket bolt (21).  
At this time, install spring (20) with the small diameter side facing to the retainer (22) side.

 : 4 mm


 : 6.9 to 8.8 N·m  
(0.7 to 0.9 kgf·m, 5.1 to 6.5 lbf·ft)


12. Apply grease onto the periphery of input spool (25). Insert input spool (25) into cover (24).

**IMPORTANT:** Check that spool (1) is installed in the hole of spring seat (18) completely.

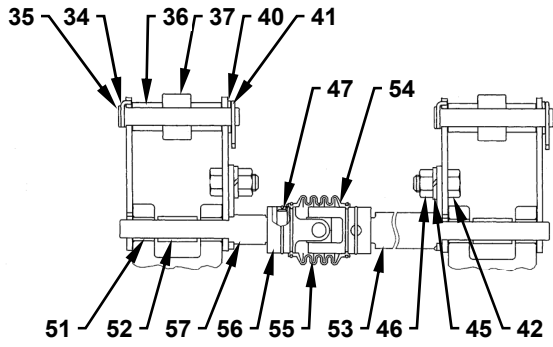
Install spring (19) into the hole on of spring seats (18, 23) completely.  
Install spring (17) into the hole on spring seat (23) and body (5) completely.

13. Install springs (19, 17) and spring seat (18) to cover (24). Check the direction of the port. Install cover (24) to body (12) with socket bolts (13) (4 used).

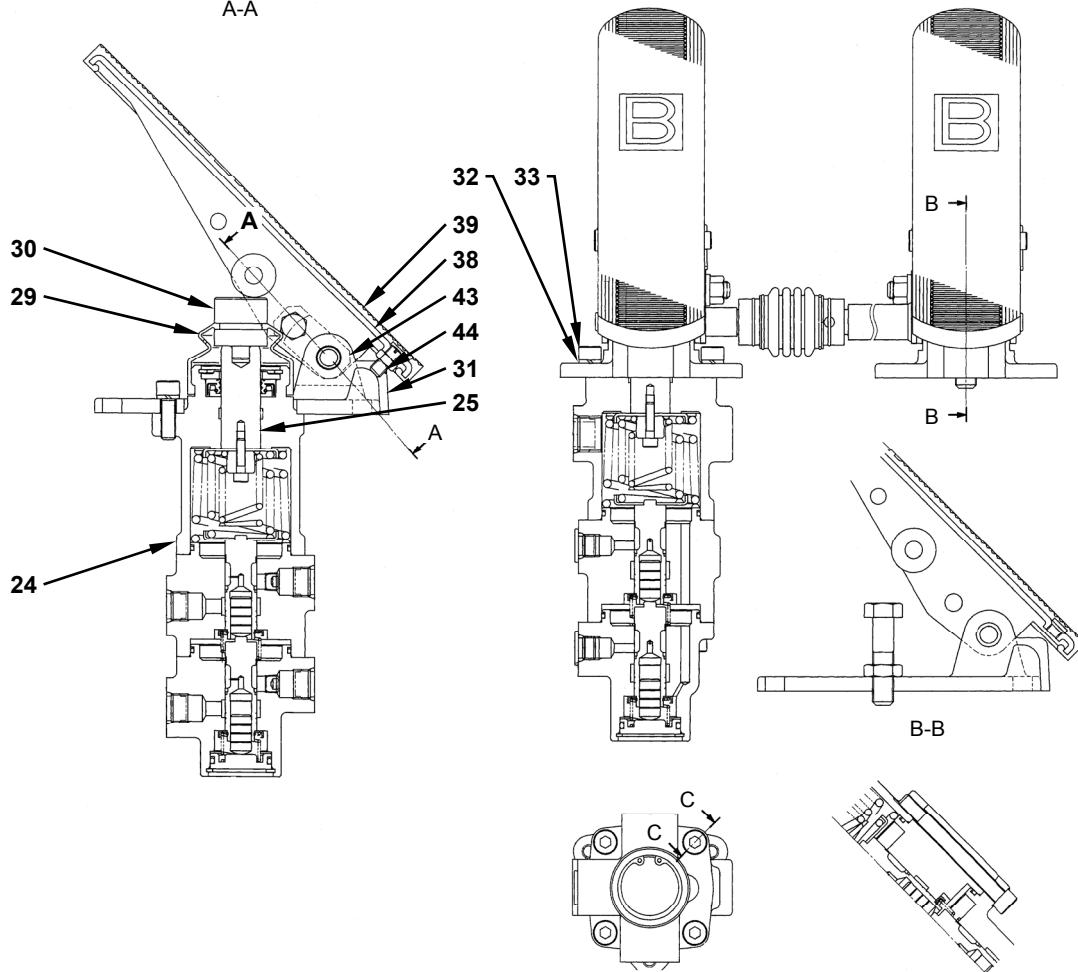
 : 6 mm

 : 19.5 to 25.5 N·m  
(2 to 2.6 kgf·m, 14.5 to 19 lbf·ft)

# BODY (TRAVEL SYSTEM) / Brake Valve



A-A









B-B

C-C

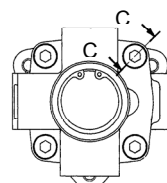
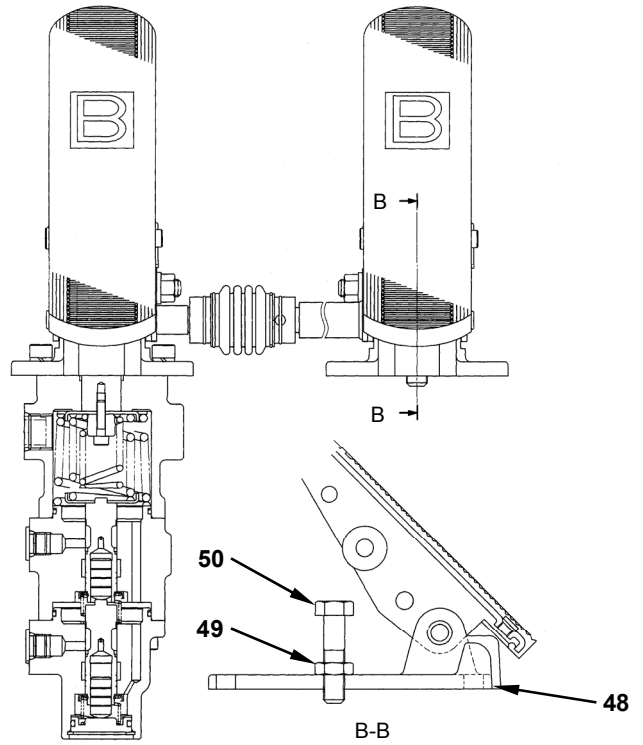
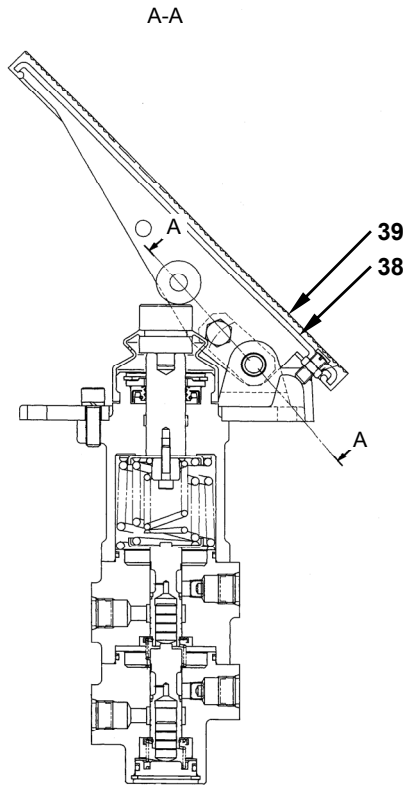
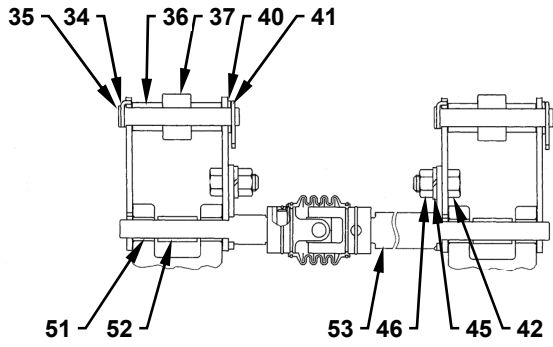
W4GB-03-05-002

## BODY (TRAVEL SYSTEM) / Brake Valve

---

14. Install dust cover (29) and seat (30) to input spool (25).
15. Install mounting plate (31) to cover (24) with socket bolts (33) (3 used) and washers (32) (3 used).
  -  : 6 mm
  -  : 19.6 to 25.5 N·m  
(2 to 2.6 kgf·m, 14.5 to 19 lbf·ft)
16. Insert shafts (53, 57) into joint (56). Install pins (47) (2 used) by using a press. Secure shafts (53, 57) to joint (56). Install retaining rings (54) (2 used) to pins (49) (2 used).
17. Apply molybdenum disulfide grease onto joint (56). Install boot (55) to joint (56). Secure boot (55) with retaining rings (54) (2 used).
18. Install roller (37), collars (36) (2 used), pedal pin (35), L pin (34), washer (40) and pin (41) to pedal at the left side. At this time, apply grease onto the inner surface of roller and the outer surface of pedal pin (35).
19. Install mounting plate (31), pedal collar (52) and bushings (51) (2 used) to pedal (38) at the left side with shaft (57). Install with bolt (42), washer (45) and nut (46). At this time, apply grease onto inner surface of bushing (51) and outer surface of shaft (57).
  -  : 14 mm
  -  : 29.5 to 34.5 N·m  
(3 to 3.5 kgf·m, 22 to 25 lbf·ft)
20. Temporarily install screw (44) and nut (43) to pedal (38) at the left side.
21. Adjust the clearance between seat (30) and roller (37) within 0.5 mm (0.02 in) by using screw (44) of pedal (38) at the left side. Tighten nut (43). At this time, apply grease onto the contact surfaces of seat (30) and roller (37).
  -  : 12 mm
  -  : 7.9 to 12 N·m  
(0.8 to 1.2 kgf·m, 5.8 to 8.7 lbf·ft)
22. Install pedal cover (39) to pedal (38) at the left side.

# BODY (TRAVEL SYSTEM) / Brake Valve



C-C

W4GB-03-05-002





## BODY (TRAVEL SYSTEM) / Brake Valve

---

23. Install roller (37), collars (36) (2 used), pedal pin (35), L pin (34), washer (40) and pin (41) to pedal (38) at the right side in the same way as step 18. Apply grease onto the inner surface of roller (37) and the outer surface of pedal pin (35).


24. Install pedal (38) at the right side, mounting plate (48), pedal collar (52) and bushings (51) (2 used) to right pedal (38) with shaft (53). Install with bolt (42), washer (45) and nut (46). At this time, apply grease onto the inner surface of bushing (51) and the outer surface of shaft (53).


 : 14 mm

 : 29.5 to 34.5 N·m  
(3 to 3.5 kgf·m, 22 to 25 lbf·ft)

25. Install pedal covers (39) (2 used) to pedals (38) (2 used) at the left side.

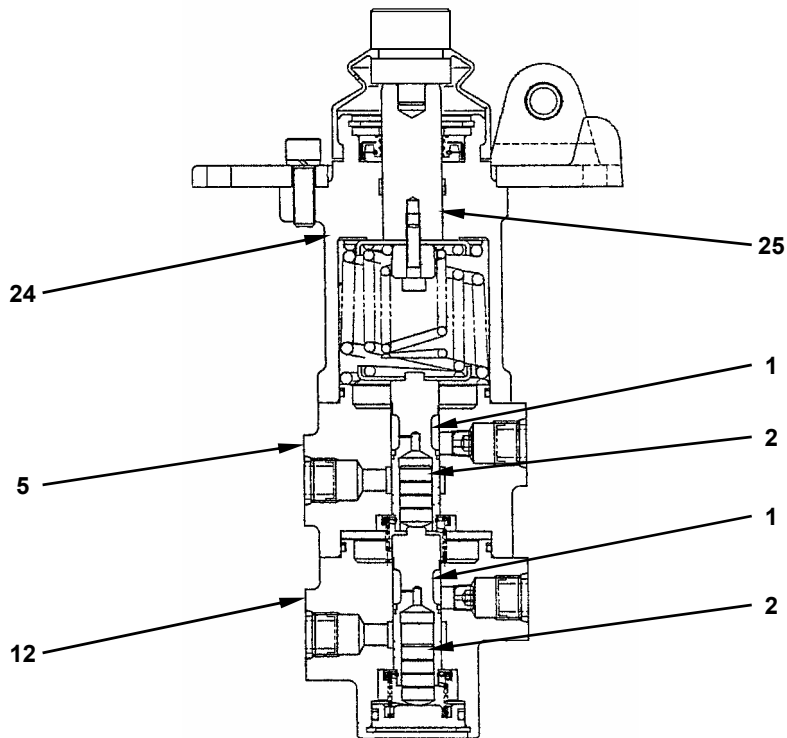
26. Install bolt (50) and nut (49) to mounting plate (48). Fully stroke pedal (38) at the left side. Adjust the clearance between bolt (50) and roller (37) within 1.7 to 2.0 mm (0.067 to 0.079 in) by using bolt (50). Tighten nut (49).

 : 19 mm

 : 44 to 59 N·m  
(4.5 to 6.0 kgf·m, 32.5 to 43 lbf·ft)

## BODY (TRAVEL SYSTEM) / Brake Valve

### MAINTENANCE STANDARD



W4GB-03-05-004

1. Clearance between input spool (25) and cover (24)  
Unit: mm (in)

Standard	Allowable limit
0.020 to 0.086	0.096

2. Clearance between spool (1) and bodies (5, 12)  
Unit: mm

Standard	Allowable limit
0.005 to 0.012	0.014

3. Clearance between plunger (2) and spool (1)  
Unit: mm

Standard	Allowable limit
0.005 to 0.018	0.020

NOTE: 1mm = 0.039 in


## BODY (TRAVEL SYSTEM) / Charging Block

### REMOVAL AND INSTALLATION OF CHARGING BLOCK


**CAUTION:** Before doing any work, stop the engine, and depress the brake pedal about 80 times in order to release the brake pressure. Move the control lever in all directions several times and release the pilot pressure. Turn the steering wheel to the right and left end 2 to 3 times in order to release the steering pilot pressure.

#### Removal


1. Remove sems bolts (3) (5 used) from covers (2, 4). Remove covers (2, 4) from cockpit (1).

 : 17 mm

2. Disconnect hydraulic hoses (6, 7, 11, 12, 15, 18, 19, 20, 21) (10 used) and remove pressure sensors (9, 14) (2 used) from charging block (10). Cap the open ends. Attach identification tags onto the removed hoses for assembling.


 : 17 mm, 22 mm, 27 mm

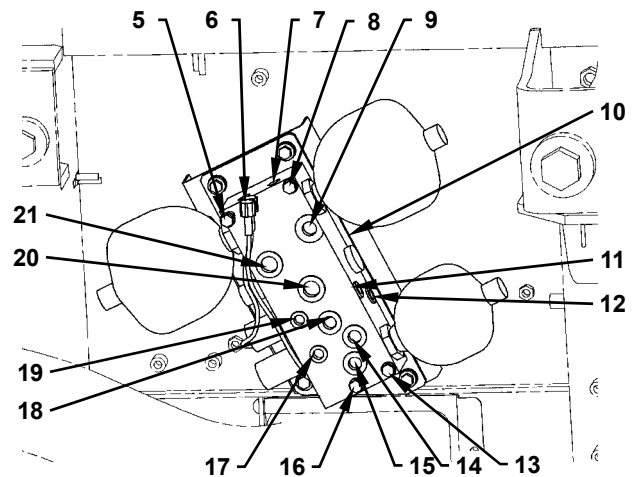
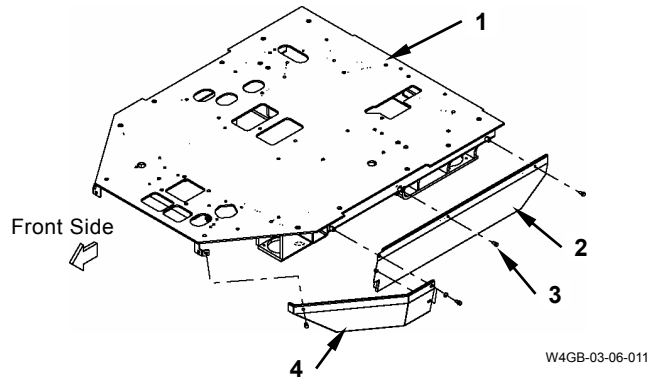
Pressure Sensor

 : 24 mm, 27 mm

**CAUTION:** Charging block (10) weight: 30 kg (67 lb)

3. Remove bolts (5, 8, 13, 16) (4 used) from charging block (10). Remove charging block (10) from cockpit (1).

 : 17 mm





## BODY (TRAVEL SYSTEM) / Charging Block

### Installation


**CAUTION:** Charging block (10) weight: 30 kg (67 lb)


1. Align charging block (10) with the installation hole of cockpit (1) by using a forklift. Install charging block (10) to cockpit (1) with bolts (5, 8, 13, 16) (4 used). As the overall length of installation bolt (14) is long, operate carefully.


 : 17 mm


 : 50 N·m (5 kgf·m, 36 lbf·ft)


2. Connect hoses (6, 7, 11, 15, 18, 19, 20, 21) and install pressure sensors (9, 14) to charging block (10).


 : 17 mm

 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)


 : 22 mm


 : 39 N·m (4 kgf·m, 29 lbf·ft)


 : 27 mm


 : 78 N·m (8 kgf·m, 58 lbf·ft)

#### Pressure Sensor


 : 24 mm


 : 39.2 N·m (4 kgf·m, 29 lbf·ft)

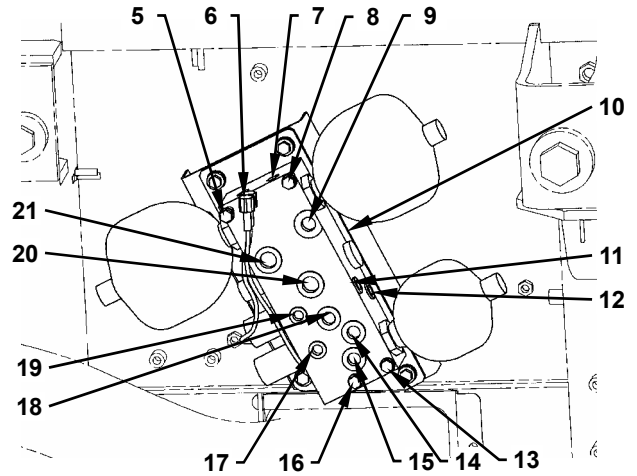
 : 27 mm

 : 78 N·m (8 kgf·m, 58 lbf·ft)

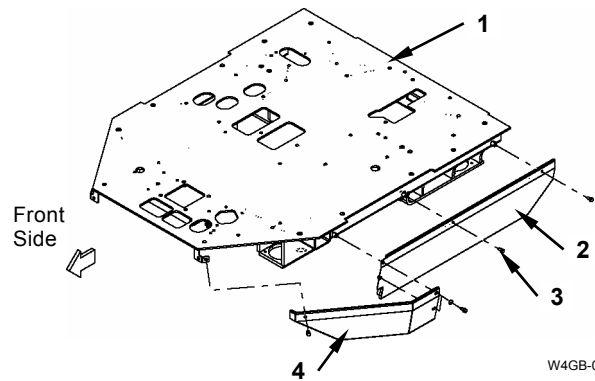
3. Install covers (2, 4) to cockpit (1) with sems bolts (3) (5 used).

 : 17 mm

 : 50 N·m (5 kgf·m, 36 lbf·ft)



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W4GB-03-06-011

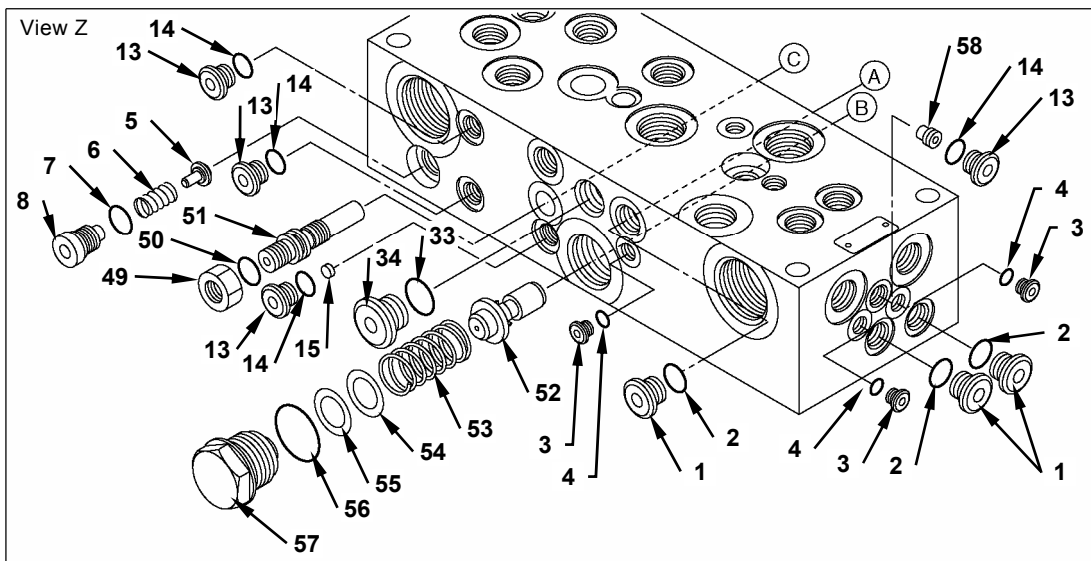
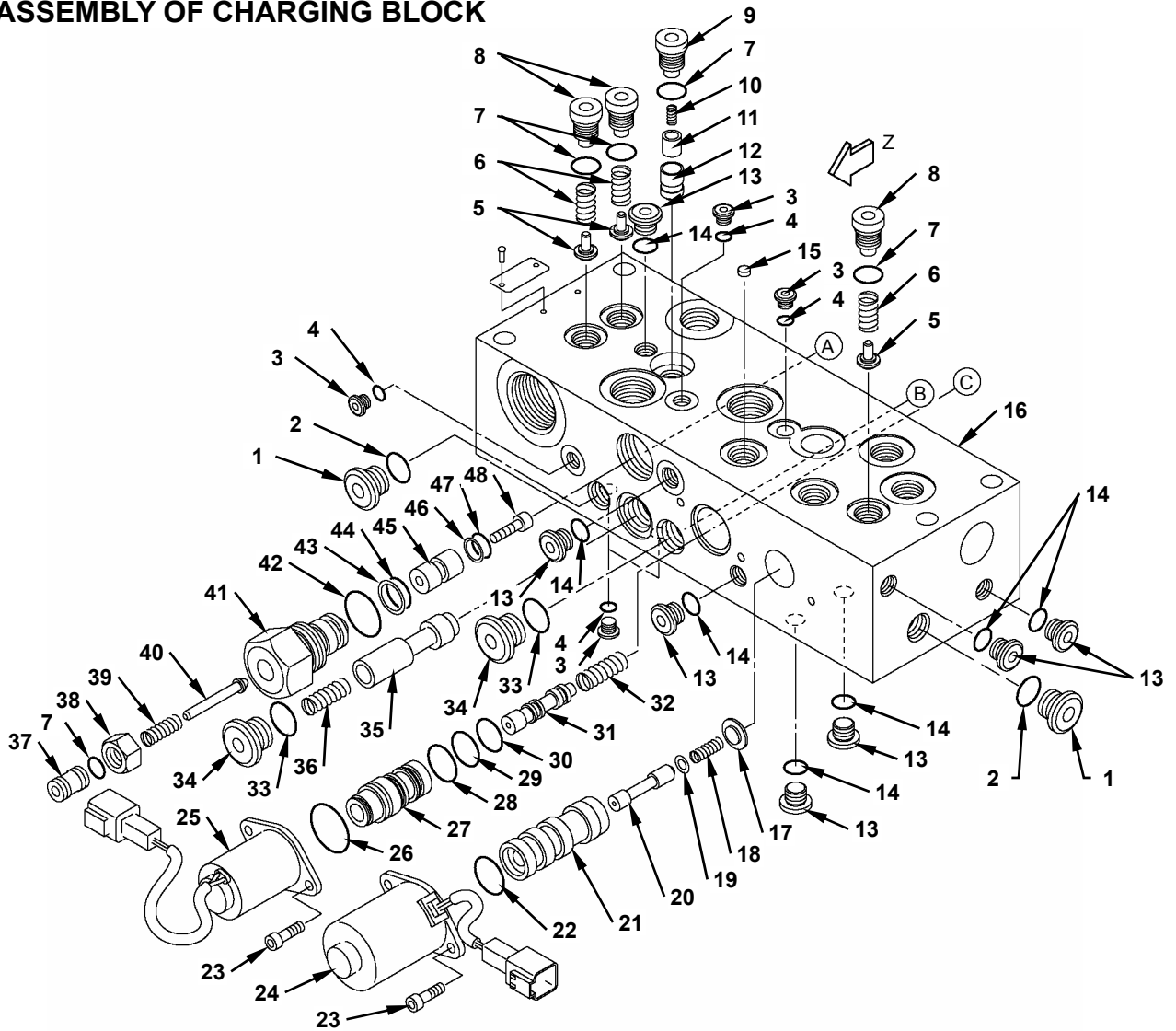
## **BODY (TRAVEL SYSTEM) / Charging Block**

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# BODY (TRAVEL SYSTEM) / Charging Block

## DISASSEMBLY OF CHARGING BLOCK



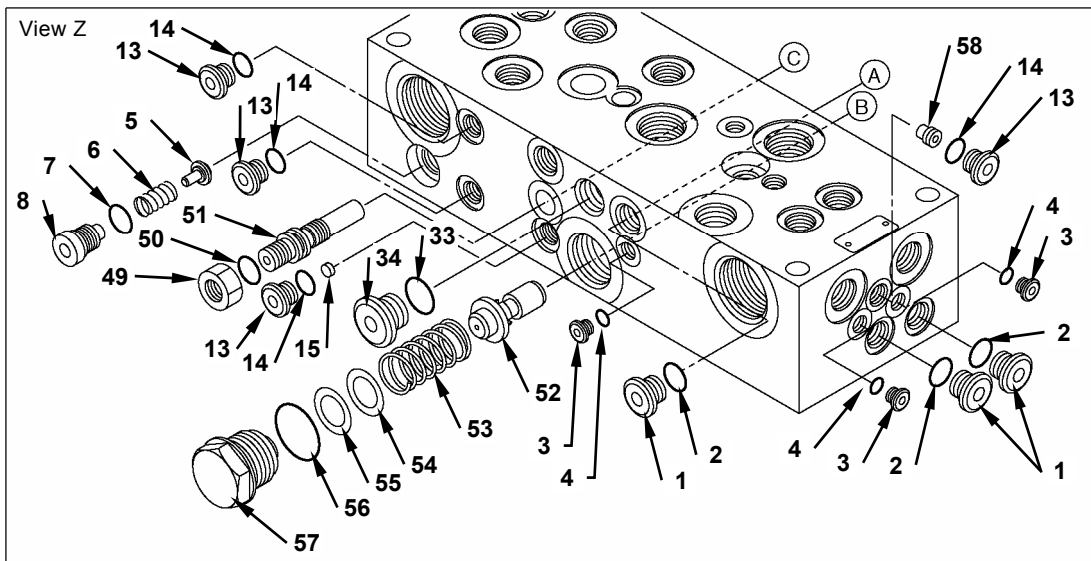
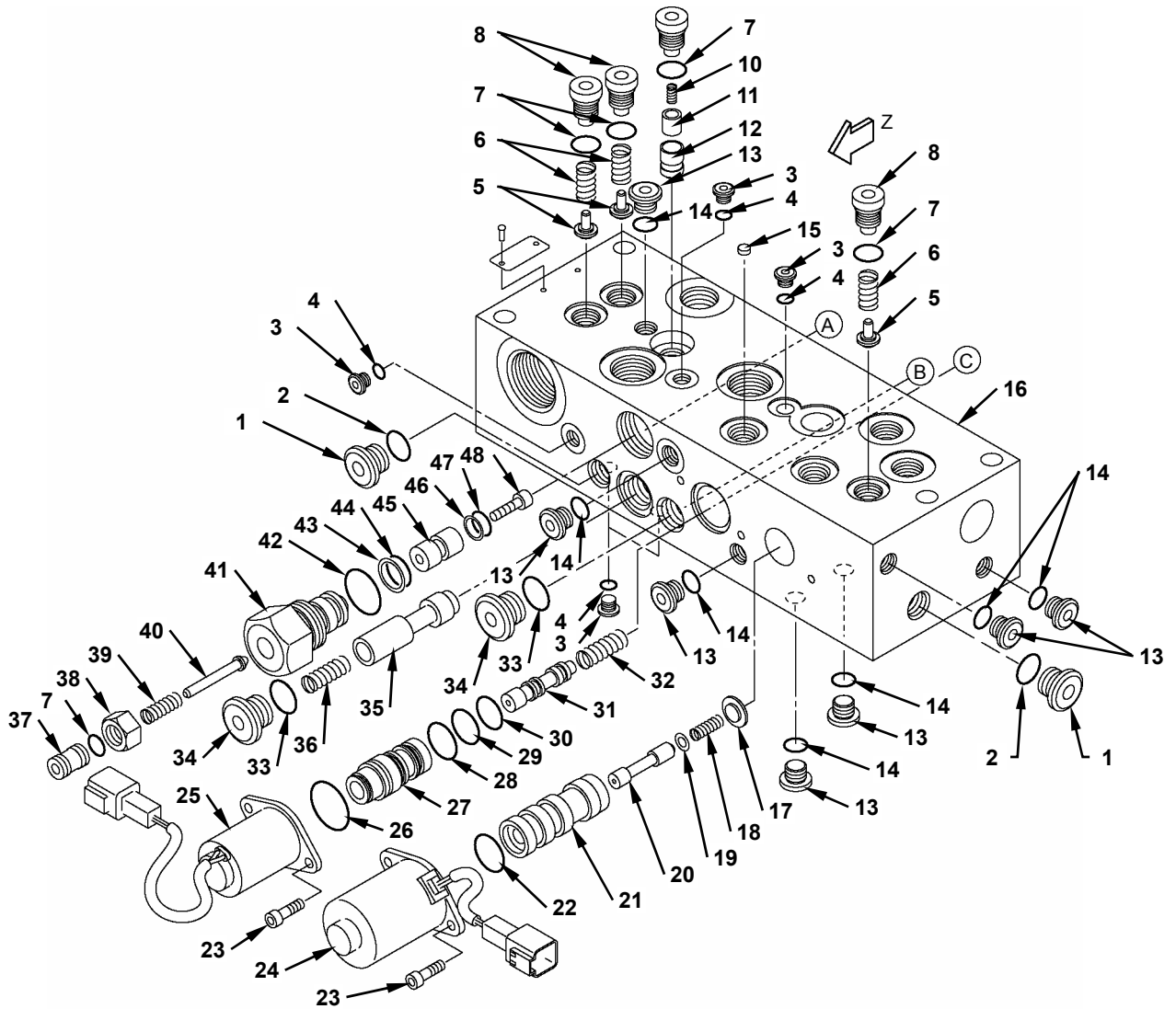
W4GB-03-06-001

## BODY (TRAVEL SYSTEM) / Charging Block

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1 - Plug (5 Used)	16 - Body	31 - Spool	46 - Backup Ring
2 - O-Ring (5 Used)	17 - Stopper	32 - Spring	47 - O-Ring
3 - Plug (7 Used)	18 - Spring	33 - O-Ring (3 Used)	48 - Piston
4 - O-Ring (7 Used)	19 - Washer	34 - Plug (3 Used)	49 - Nut
5 - Plunger (4 Used)	20 - Spool	35 - Plunger	50 - O-Ring
6 - Spring (4 Used)	21 - Sleeve	36 - Spring	51 - Adjusting Screw
7 - O-Ring (5 Used)	22 - O-Ring	37 - Screw	52 - Poppet
8 - Plug (4 Used)	23 - Socket Bolt (4 Used)	38 - Nut	53 - Spring
9 - Plug	24 - Solenoid	39 - Spring	54 - Shim
10 - Spring	25 - Solenoid	40 - Needle Valve	55 - Shim
11 - Plunger	26 - O-Ring	41 - Body	56 - O-Ring
12 - Sleeve	27 - Sleeve	42 - O-Ring	57 - Plug
13 - Plug (11 Used)	28 - O-Ring	43 - Backup Ring	58 - Orifice
14 - O-Ring (11 Used)	29 - O-Ring	44 - O-Ring	
15 - Filter	30 - O-Ring	45 - Sleeve	

# BODY (TRAVEL SYSTEM) / Charging Block



W4GB-03-06-001




## BODY (TRAVEL SYSTEM) / Charging Block


---

### Disassembly of Charging Block


1. Remove plug (9), O-ring (7), spring (10), poppet (11), and sleeve (12) from body (16).

 : 6 mm


2. Remove plugs (13) (7 used) and O-rings (14) (7 used), and orifice (58) from body (16).

 : 5 mm


3. Remove plugs (8) (3 used), O-rings (7) (3 used), springs (6) (3 used), and poppets (5) (3 used) from body (16).


 : 6 mm

4. Remove plugs (34) (2 used), O-rings (33) (2 used), spring (36), plunger (35) from body (16).


 : 8 mm

5. Remove relief valve assembly (7, 37 to 48) from body (16).


 : 32 mm

 **NOTE:** Set pressure changes if relief valve assembly (7, 37 to 48) is disassembled. Do not disassemble if unnecessary.


6. Remove plug (57), O-ring (56), shims (54, 55), spring (53), and poppet (52) from body (16). Record the number of shims.

 : 30 mm


7. Remove socket bolts (23) (2 used) from body (16). Remove solenoid (25), O-ring (26), sleeve (27), and O-rings (28, 29, 30) from body (16). Remove spool (31) and spring (32) from body (16).

 : 4 mm


8. Remove nut (49), O-rings (50), and spool (51) from body (16).

 : 17 mm

9. Remove socket bolt (23) from body (16). Remove solenoid (24), O-ring (22), and sleeve (21) assembly from body (16). Remove spool (20) from sleeve (21). As stopper (17) is pressed fit in sleeve (21), spring (18) and washer (19) cannot be disassembled.

 : 4 mm

10. Remove plugs (3) (4 used) and O-rings (4) (4 used) from body (16).

 : 3 mm

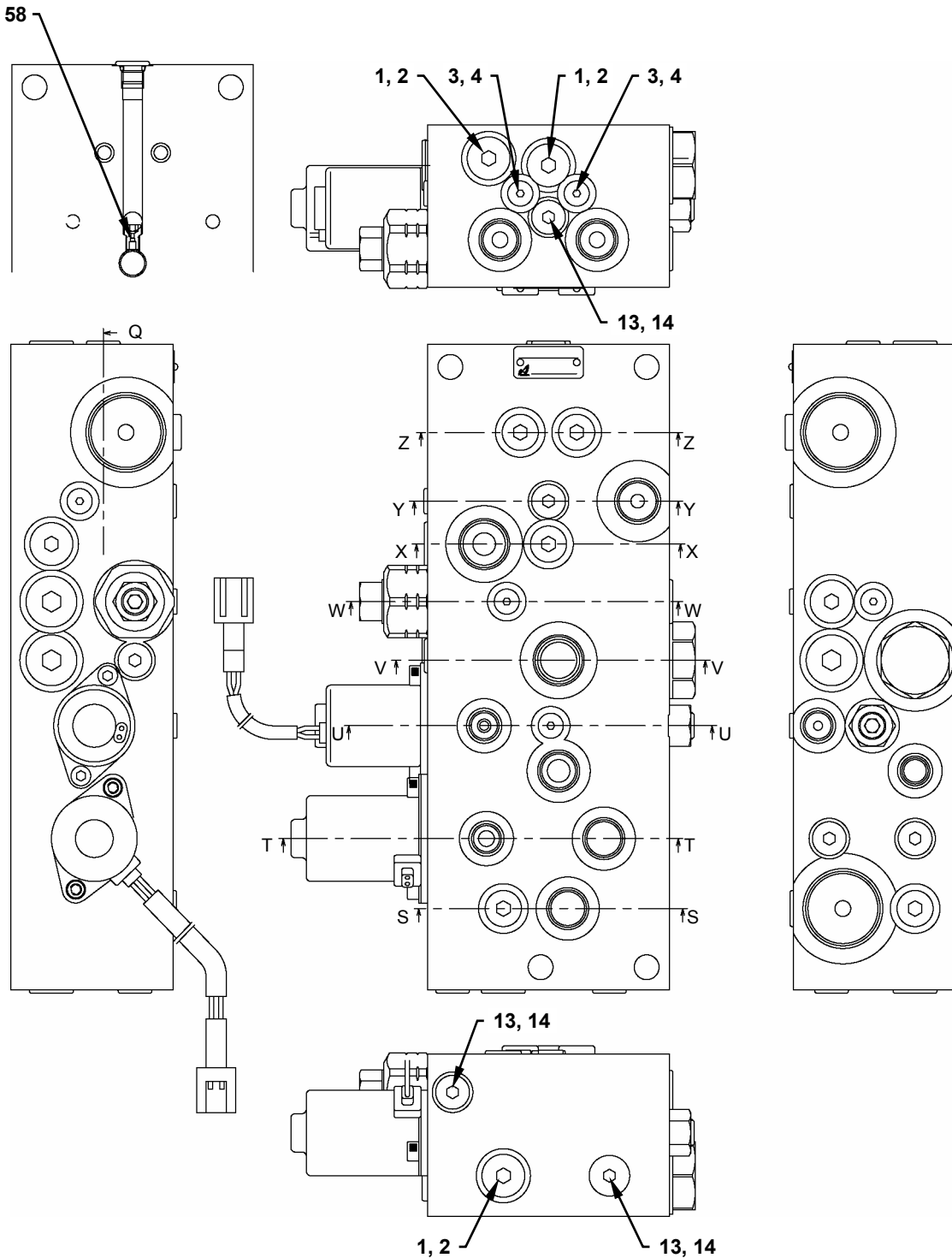
## **BODY (TRAVEL SYSTEM) / Charging Block**

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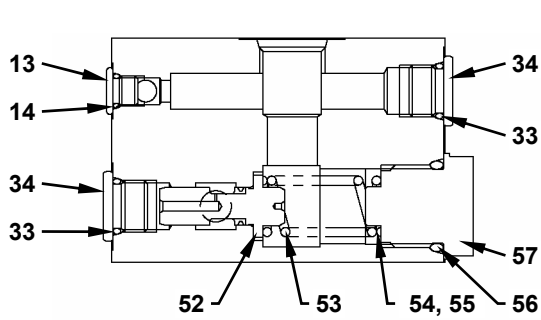
# BODY (TRAVEL SYSTEM) / Charging Block

## ASSEMBLY OF CHARGING BLOCK

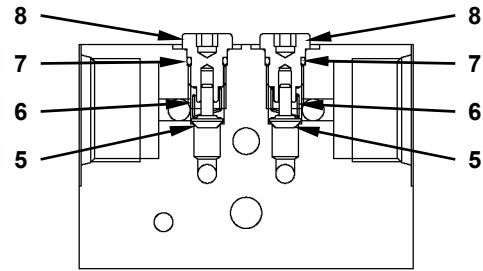


W4GB-03-06-002

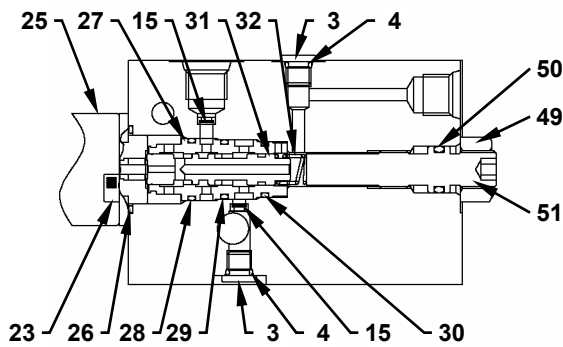
# BODY (TRAVEL SYSTEM) / Charging Block



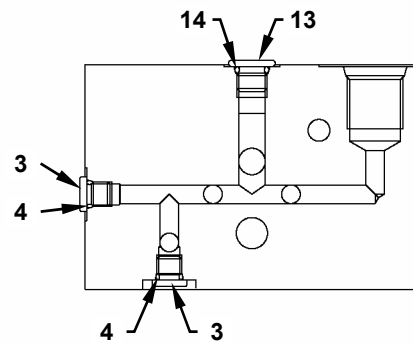
Section V-V



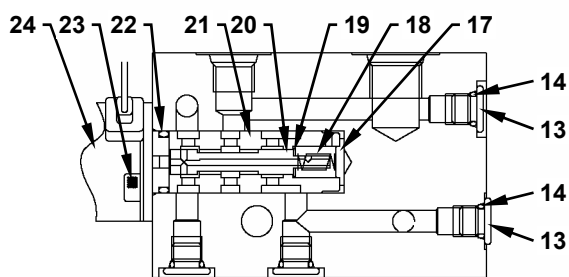
Section Z-Z



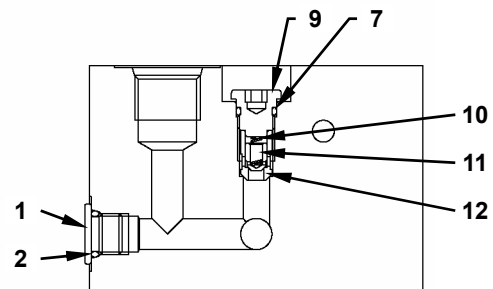
Section U-U



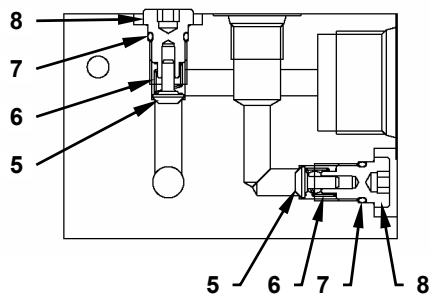
Section Y-Y



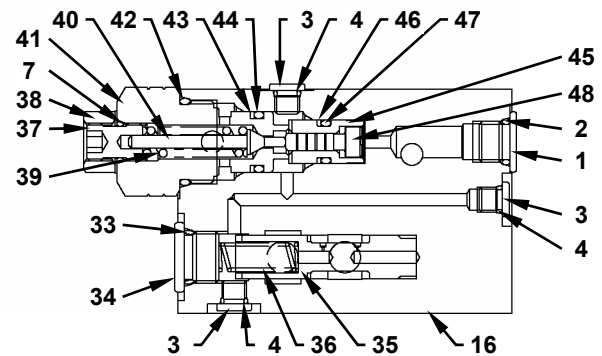
Section T-T



Section X-X



Section S-S



Section W-W

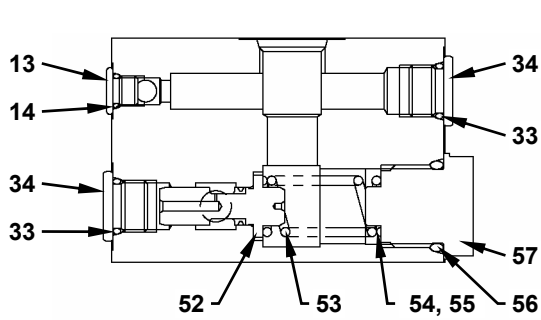
W4GB-03-06-003

## BODY (TRAVEL SYSTEM) / Charging Block

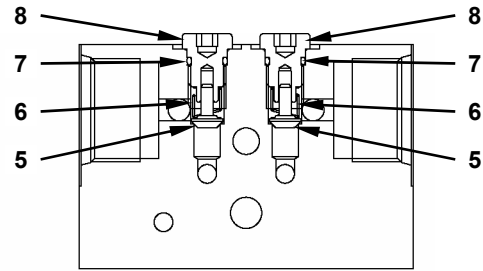
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1 - Plug (5 Used)	16 - Body	31 - Spool	46 - Backup Ring
2 - O-Ring (5 Used)	17 - Stopper	32 - Spring	47 - O-Ring
3 - Plug (7 Used)	18 - Spring	33 - O-Ring (3 Used)	48 - Piston
4 - O-Ring (7 Used)	19 - Washer	34 - Plug (3 Used)	49 - Nut
5 - Plunger (4 Used)	20 - Spool	35 - Plunger	50 - O-Ring
6 - Spring (4 Used)	21 - Sleeve	36 - Spring	51 - Adjusting Screw
7 - O-Ring (5 Used)	22 - O-Ring	37 - Screw	52 - Poppet
8 - Plug (4 Used)	23 - Socket Bolt (4 Used)	38 - Nut	53 - Spring
9 - Plug	24 - Solenoid	39 - Spring	54 - Shim
10 - Spring	25 - Solenoid	40 - Needle valve	55 - Shim
11 - Plunger	26 - O-Ring	41 - Body	56 - O-Ring
12 - Sleeve	27 - Sleeve	42 - O-Ring	57 - Plug
13 - Plug (11 Used)	28 - O-Ring	43 - Backup Ring	58 - Orifice
14 - O-Ring (11 Used)	29 - O-Ring	44 - O-Ring	
15 - Filter	30 - O-Ring	45 - Sleeve	

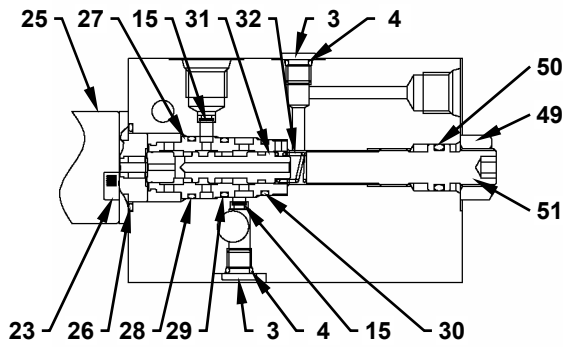
# BODY (TRAVEL SYSTEM) / Charging Block



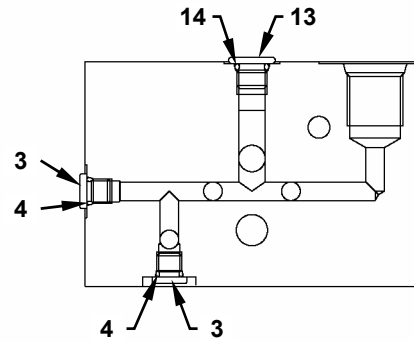
Section V-V



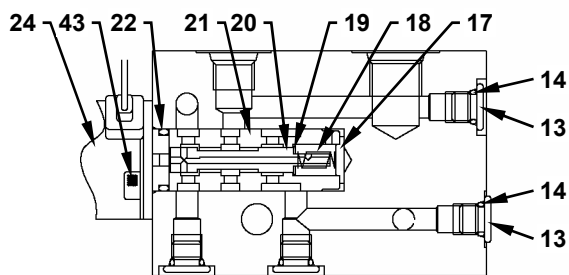
Section Z-Z



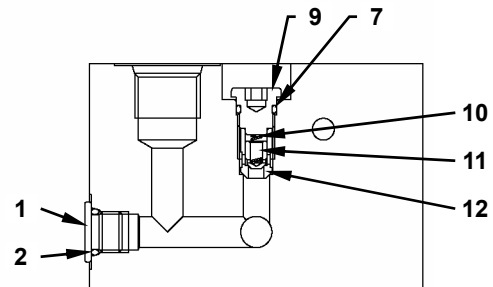
Section U-U



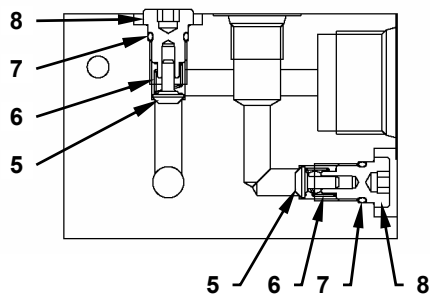
Section Y-Y



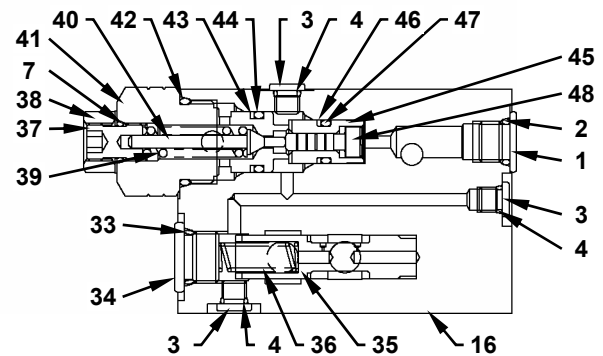
Section T-T



Section X-X



Section S-S



Section W-W

W4GB-03-06-003


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## BODY (TRAVEL SYSTEM) / Charging Block

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### Assembly of Charging Block


1. Install O-rings (7) (2 used) to plugs (8) (2 used). Install poppets (5) (2 used) and springs (6) (2 used) to body (16). Install plugs (11) (2 used) to body (16).


 : 6 mm

 : 21.5 N·m (2.2 kgf·m, 15.5 lbf·ft)

2. Install spool (20) to sleeve (21). Install sleeve (21) to body (16).

Install O-ring (22) to solenoid (24). Install solenoid (23) to body (16) with socket bolts (23) (2 used).


 : 4 mm


 : 3.9 N·m (0.4 kgf·m, 2.9 lbf·ft)


3. Install O-ring (50) to adjuster screw (51). Install adjuster screw (51) to body (16), and lock with nut (49).


Install O-rings (56, 57, 58) to sleeve (27). Install spool (31) to sleeve (27).

Install spring (32), the sleeve (27) assembly, O-ring (26), and solenoid (25) to body (16) in this order. Install solenoid (25) to body (16) with socket bolts (23) (2 used).


 : 17 mm


 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)

 : 4 mm


 : 3.9 N·m (0.4 kgf·m, 2.9 lbf·ft)


4. Install O-ring (56) to plug (57). Install poppet (52), spring (53), shims (54, 55), and plug (57) to body (16).

 : 30 mm

 : 98 N·m (10 kgf·m, 72 lbf·ft)

5. Install plunger (35) and spring (36) to body (16). Install plugs (34) (2 used) with installed O-rings (33) (2 used) to body (16).

 : 8 mm


 : 49 N·m (5 kgf·m, 36 lbf·ft)

6. Install O-ring (47) and backup ring (46) to sleeve (45).

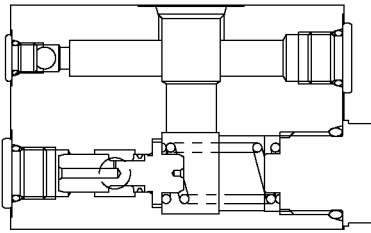
Install O-rings (42, 44) and backup ring (43) to the body (41) assembly.

Install piston (48), sleeve (45), and the body (41) assembly to body (16).

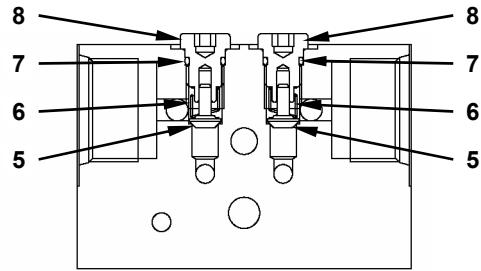
Body (41): 32 mm

 : 59 N·m (6 kgf·m, 43 lbf·ft)

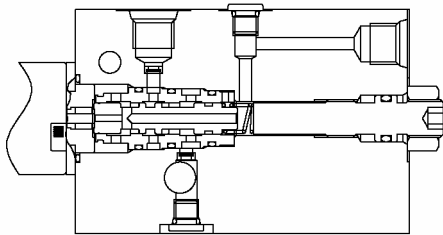
# BODY (TRAVEL SYSTEM) / Charging Block



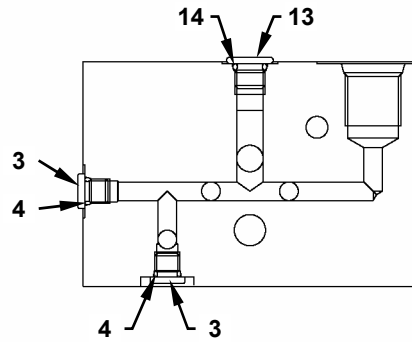
Section V-V



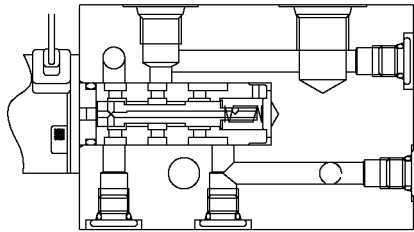
Section Z-Z



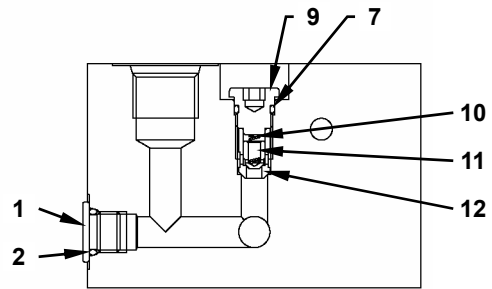
Section U-U



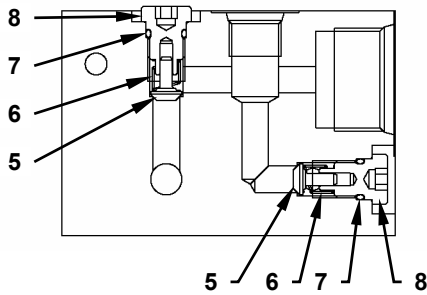
Section Y-Y



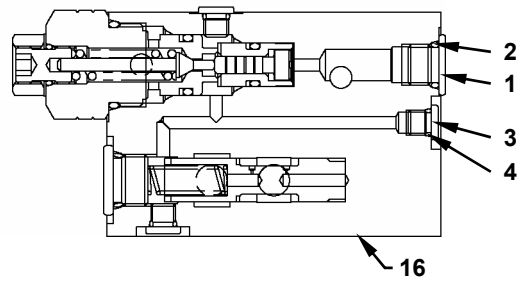
Section T-T



Section X-X



Section S-S



Section W-W


W4GB-03-06-003




## BODY (TRAVEL SYSTEM) / Charging Block


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7. Install O-rings (7) (2 used) to plugs (8) (2 used).  
Install poppets (5) (2 used), springs (6) (2 used),  
and plugs (8) (2 used) to body (16).


 : 6 mm


 : 21 N·m (2.14 kgf·m, 15.5 lbf·ft)

8. Apply LOCTITE #242 to the thread part of orifice  
(58). Install orifice (58) to body (16).  
Install O-rings (14) (11 used) to plugs (13) (11  
used). Install plugs (13) (11 used) to body (16).

 : 4 mm


 : 5.9 N·m (0.6 kgf·m, 4.4 lbf·ft)

 : 5 mm

 : 98 N·m (10 kgf·m, 72 lbf·ft)


9. Install O-ring (7) to plug (9). Install sleeve (12),  
poppet (11), spring (10), and plug (9) to body (16).


 : 6 mm


 : 21.0 N·m (2.14 kgf·m, 15.5 lbf·ft)

10. Install O-rings (4) (7 used) to plugs (3) (7 used).  
Install O-rings (2) (5 used) to plugs (1) (5 used).  
Install plugs (3) (7 used) and plugs (1) (5 used)  
to body (16).

 : 3 mm

 : 4.9 N·m (0.5 kgf·m, 3.6 lbf·ft)

 : 6 mm

 : 26.5 N·m (2.7 kgf·m, 19.5 lbf·ft)

**BODY (TRAVEL SYSTEM) / Charging Block**

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## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

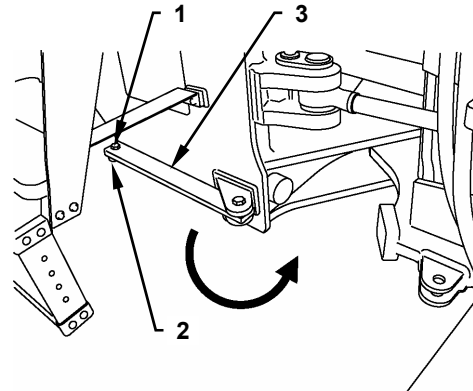
### REMOVAL AND INSTALLATION OF STEERING PILOT VALVE



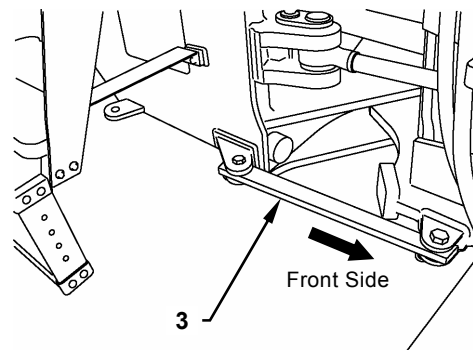
**CAUTION:** In order to release the hydraulic pressure of steering pilot hydraulic circuit, stop the engine and turn the steering wheel to the right and left several times. Turn the steering wheel until it becomes heavy.

#### Preparation:

1. Park the machine on a level and solid ground. Lower the bucket to the ground.
2. Stop the engine and release the hydraulic pressure.
3. Align articulation lock bar (3) and the hole on the front frame. Secure the frame with set pin (1) and beta pin (2).



M4GB-01-135




M4GB-01-136


## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

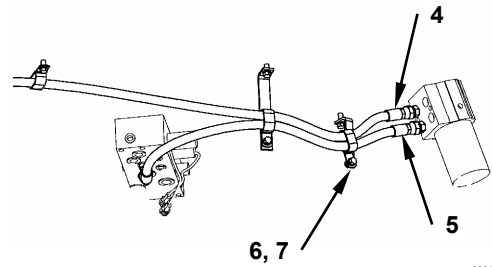
### Removal

1. Remove semi bolts (7) (4 used) from clamps (6) (2 used).

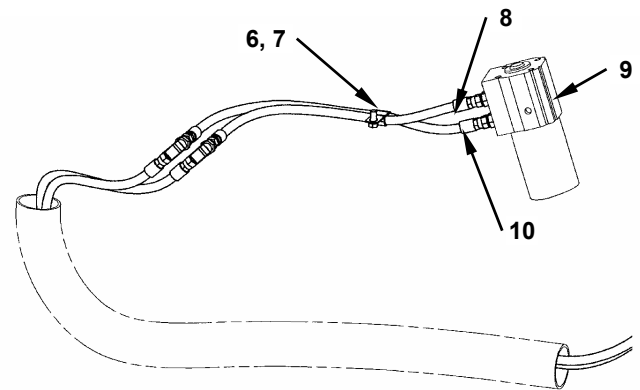
 : 14 mm

2. Disconnect hoses (4, 5, 8, 10) from steering pilot valve (9). Cap the open ends. Attach identification tags onto the removed hoses for assembling.

 : 22 mm, 27 mm




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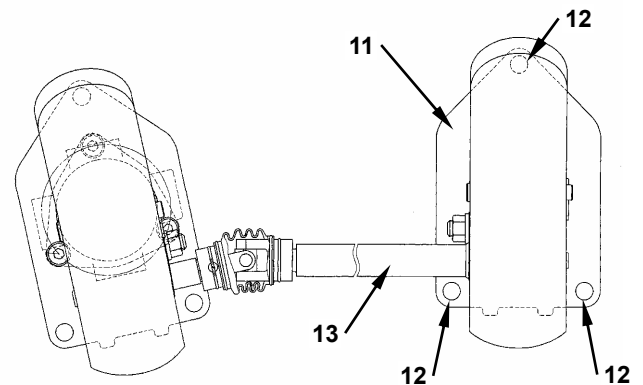
W4GB-03-07-012

3. Remove bolts (12) (3 used) from mounting plate (11) on the right brake pedal.

 : 12 mm

4. Float the right brake pedal and mounting plate (11).


5. Bend shaft (13) forward and move mounting plate (11) to the near side.

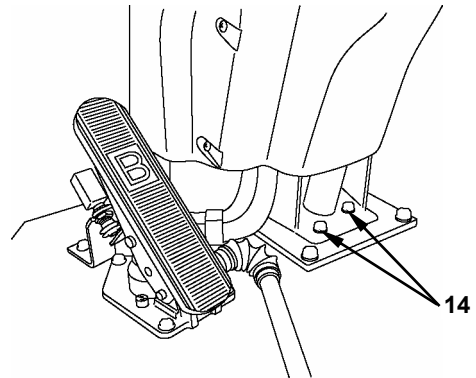


W4GB-03-07-013

## BODY (TRAVEL SYSTEM) / Steering Pilot Valve


6. Remove bolts (14) (4 used) from the lower part of the steering wheel column. Remove steering pilot valve (9) from the hand column.


 : 14 mm




### Installation


1. Install steering pilot valve (9) to the steering wheel column with bolts (14) (4 used).

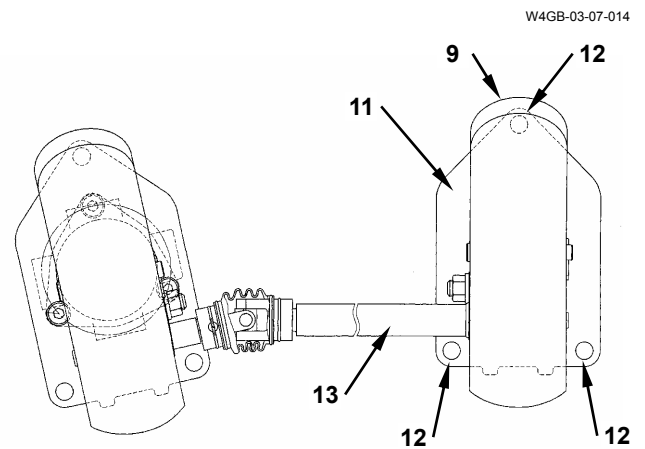
 : 14 mm

 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)


2. Align mounting plate (11) and the hole of steering pilot valve (9). Secure mounting plate (11) with bolts (12) (3 used).


 : 12 mm


 : 9.5 N·m (1 kgf·m, 7 lbf·ft)




3. Connect hydraulic hoses (4, 5, 8, 10) to steering pilot valve (9).


 : 22 mm


 : 39 N·m (4 kgf·m, 29 lbf·ft)

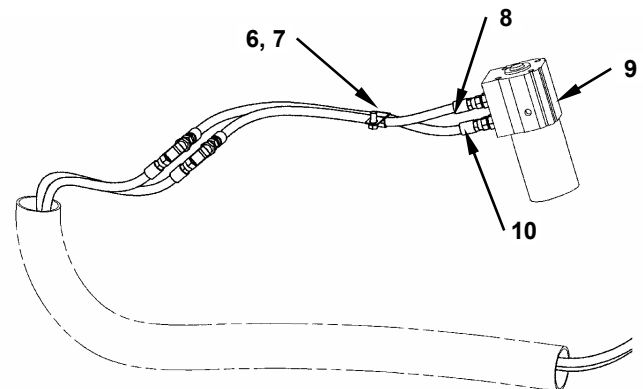
 : 27 mm

 : 93 N·m (10 kgf·m, 69 lbf·ft)

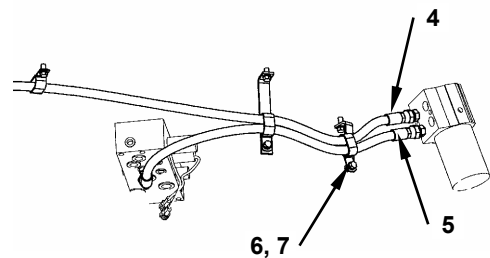
4. Secure hoses (4, 5, 8, 10) with clamps (6) (2 used) and bolts (7) (4 used).

 : 14 mm

 : 19.5 N·m (2 kgf·m, 14.5 lbf·ft)



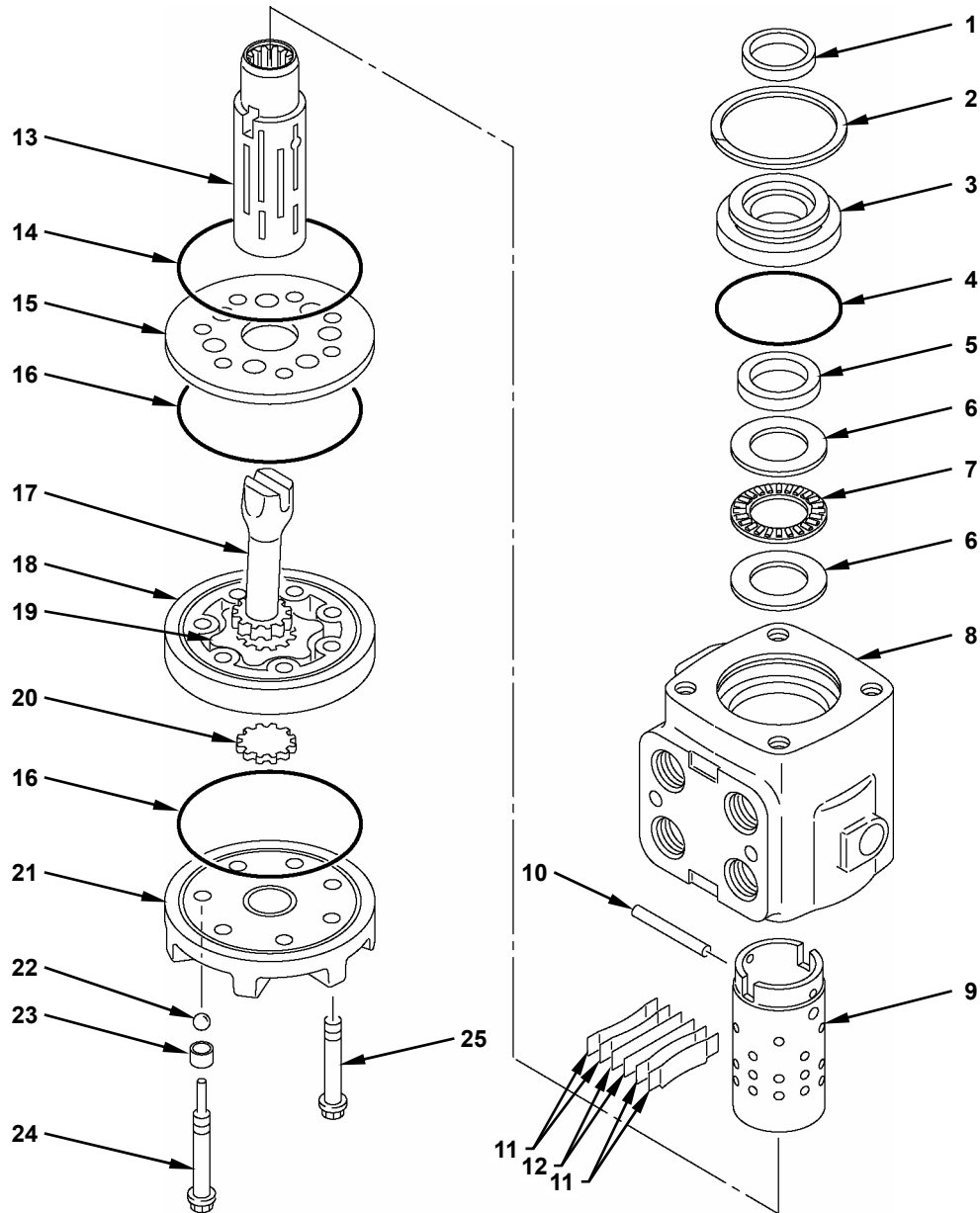
W4GB-03-07-012



W4GB-03-07-011

## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

### DISASSEMBLY OF STEERING PILOT VALVE



W4GB-03-07-001

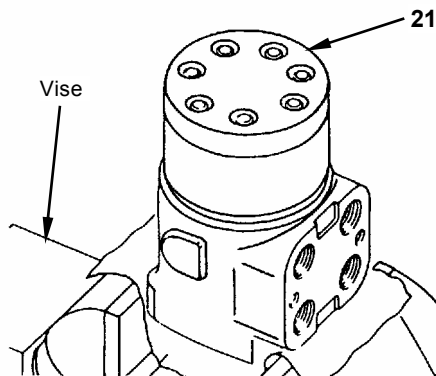
- |                           |                             |                      |                     |
|---------------------------|-----------------------------|----------------------|---------------------|
| 1 - Dust Seal             | 8 - Housing                 | 15 - Plate           | 22 - Ball           |
| 2 - Retaining Ring        | 9 - Sleeve                  | 16 - O-Ring (2 Used) | 23 - Screw          |
| 3 - Bushing               | 10 - Pin                    | 17 - Drive           | 24 - Screw          |
| 4 - O-Ring                | 11 - Center Spring (4 Used) | 18 - Rotor           | 25 - Screw (6 Used) |
| 5 - Seal                  | 12 - Flat Spring (2 Used)   | 19 - Star            |                     |
| 6 - Bearing Race (2 Used) | 13 - Spool                  | 20 - Spacer          |                     |
| 7 - Thrust Needle         | 14 - O-Ring                 | 21 - Cap             |                     |

## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

### Disassembly of Steering Pilot Valve


**IMPORTANT:** Attach a cloth to the open end of a vise and hold the valve slightly. Do not hold too strong.

1. Turn the cap (21) side upwards and secure the steering pilot valve in the vise.




W202-02-14-002

2. Remove screws (25) (6 used) and (24) from cap (21). Remove cap (21) from housing (8). Remove O-ring (16) from cap (21).

 : 5/16 inch


3. Remove rotor (18) from housing (8). Remove O-ring (16) and spacer (20) from rotor (18).

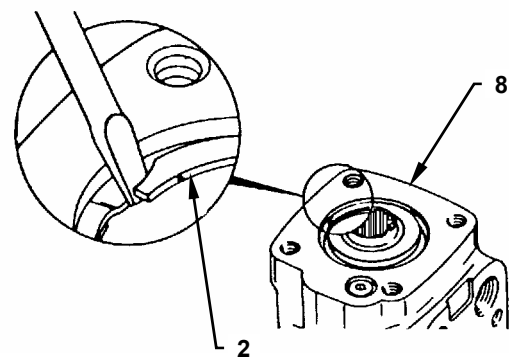
 **NOTE:** When removing rotor (18), do not drop star (19) in rotor (18).

4. Remove drive (17) and plate (15) from housing (8). Remove O-rings (16, 14) from the housing (8) assembly. Remove screw (23) from housing (8) by using a minus driver.

**IMPORTANT:** As the retaining ring (2) may fly out from housing (8), always wear safety glasses.

5. Remove the steering valve from the vise. Turn over housing (8) and remove ball (22). Place the steering valve on a clean cloth in order not to damage the finished side. Remove retaining ring (2) from housing (8) by using a minus driver.

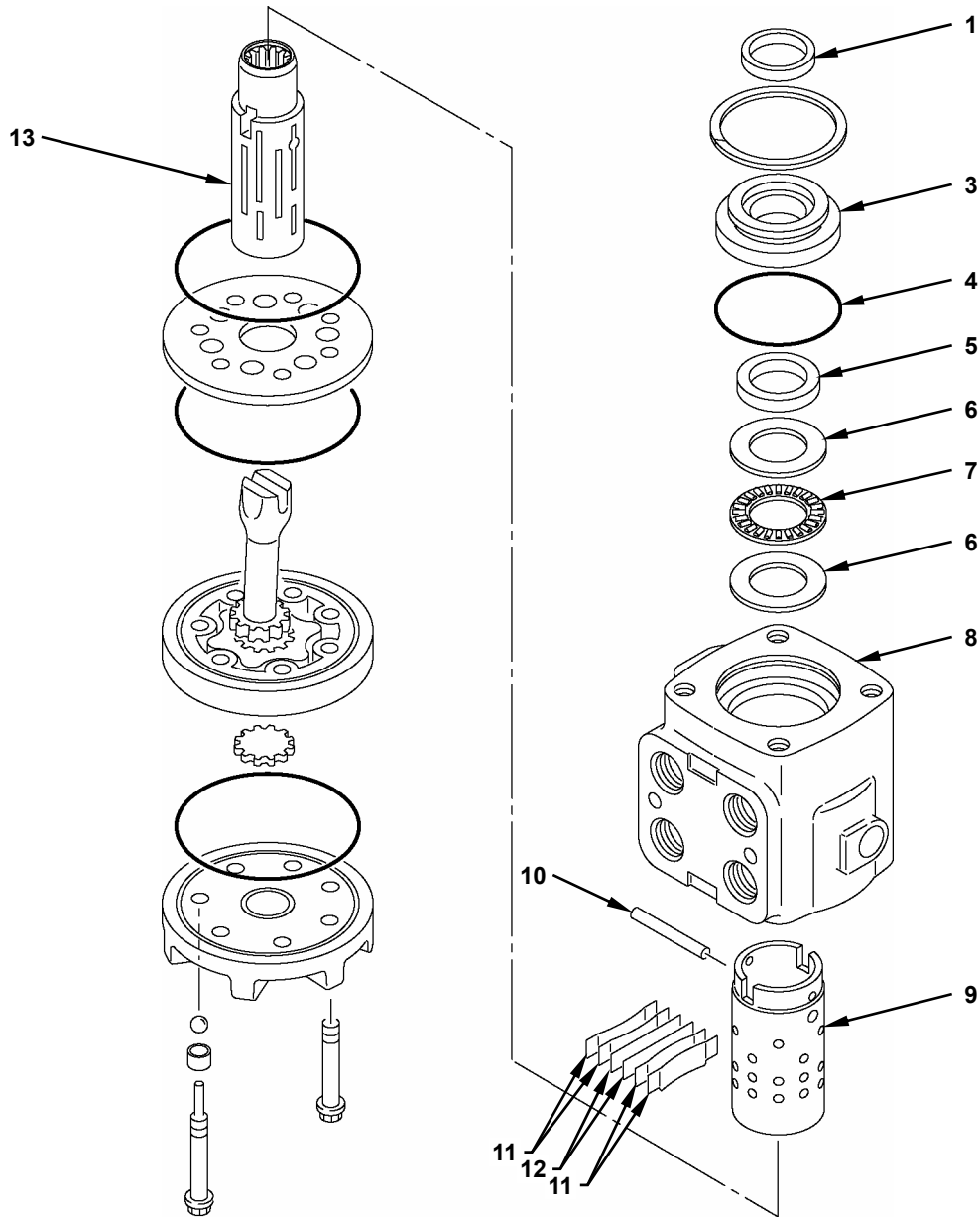
 **NOTE:** Do not drop or lose the ball. Check the position of the holes where the ball was placed.



W202-02-14-006

6. Turn spool (13) and sleeve (9) and set pin (10) horizontally. Push spool (13) and spool (9) from the cap (21) side, and remove bushing (3) from the steering valve.

# BODY (TRAVEL SYSTEM) / Steering Pilot Valve




W4GB-03-07-001




## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

7. Remove seal (5) and dust seal (1) from bushing (3).


 **NOTE:** When removing seal (5), do not damage bushing (3).

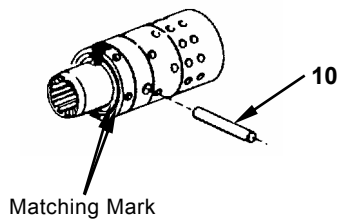
8. Remove bearing races (6) (2 used) and thrust needle (7) from spool (13).

9. Remove spool (13) and the sleeve (9) assembly from housing (8).

 **NOTE:** Turn slowly and remove the sleeve (9) assembly from housing (8), so that sleeve (9) does not bind housing (8).

10. Remove pin (10) from the sleeve (9) assembly.

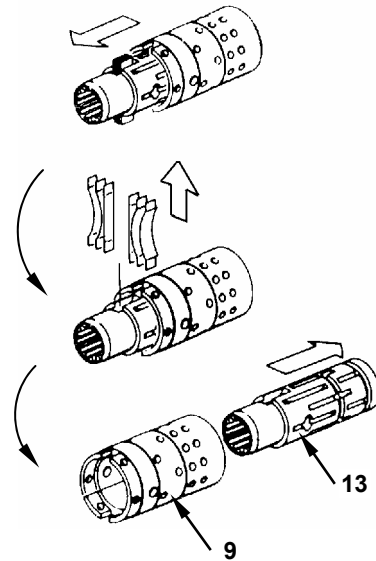
 **NOTE:** Before removing pin (10), put matching marks on spool (9) assembly with an oil-based pen.



W202-02-14-021

11. Push spool (13) of sleeve (9) forward slightly. Remove center springs (11) (4 used), flat springs (12) (2 used) from spool (13).

**IMPORTANT:** As the spring may fly out, always wear safety glasses.



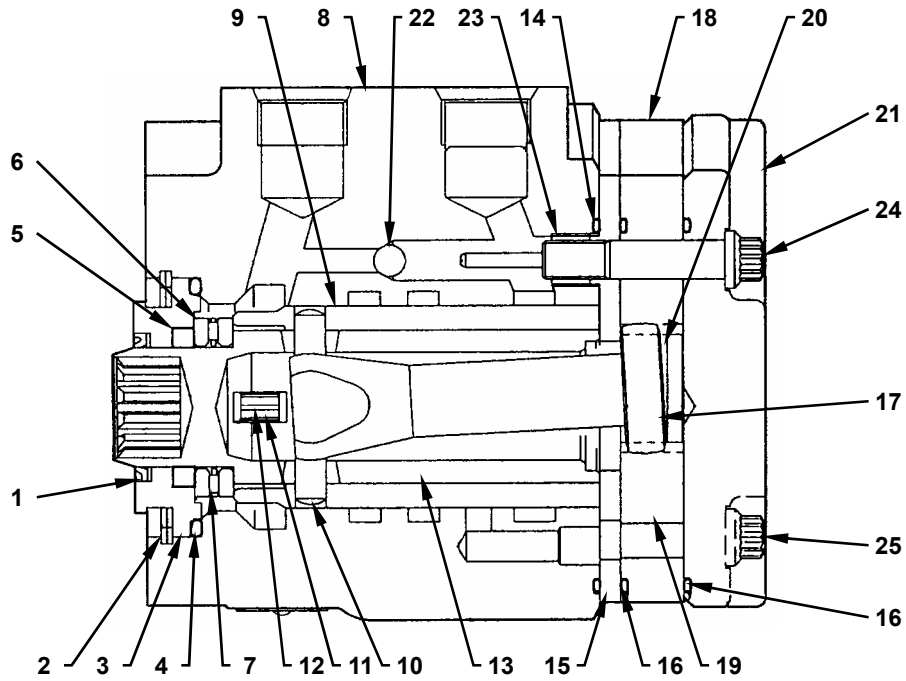
W4GB-03-07-002

12. Slowly turn and remove sleeve (9) from spool (13).

13. Remove O-Ring (4) from housing (8).

# BODY (TRAVEL SYSTEM) / Steering Pilot Valve

## ASSEMBLY OF STEERING PILOT VALVE



T1F3-03-07-002

- |                           |                             |                      |                     |
|---------------------------|-----------------------------|----------------------|---------------------|
| 1 - Dust Seal             | 8 - Housing                 | 15 - Plate           | 22 - Ball           |
| 2 - Retaining Ring        | 9 - Sleeve                  | 16 - O-Ring (2 Used) | 23 - Screw          |
| 3 - Bushing               | 10 - Pin                    | 17 - Drive           | 24 - Screw          |
| 4 - O-Ring                | 11 - Center Spring (4 Used) | 18 - Rotor           | 25 - Screw (6 Used) |
| 5 - Seal                  | 12 - Flat Spring (2 Used)   | 19 - Star            |                     |
| 6 - Bearing Race (2 Used) | 13 - Spool                  | 20 - Spacer          |                     |
| 7 - Thrust Needle         | 14 - O-Ring                 | 21 - Cap             |                     |

## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

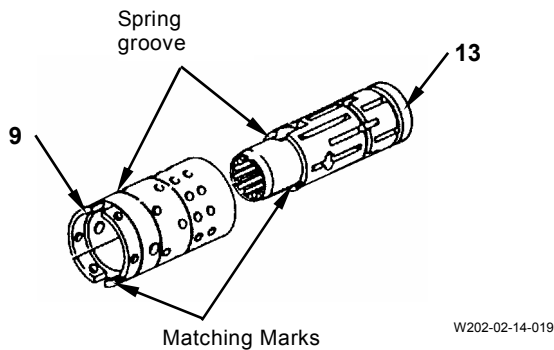
### Assembly of Steering Pilot Valve

#### Precautions for Assembling

- Check all parts. If there are scratches or rough sides, polish by an oil stone and make the sides smooth.

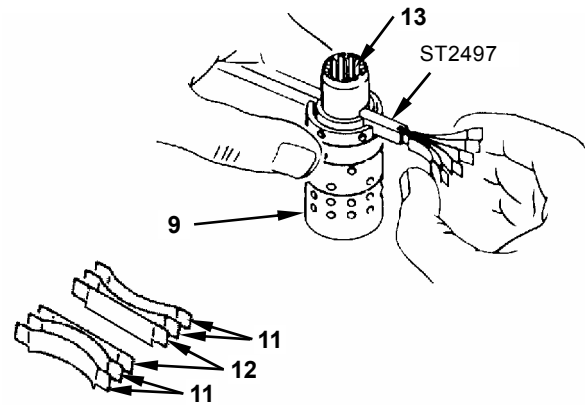
#### IMPORTANT: Turn spool (13) and sleeve (9) to the side with the same spring groove.

1. Turn and install spool (13) to sleeve (9). Align the matching marks on sleeve (9) and spool (13).

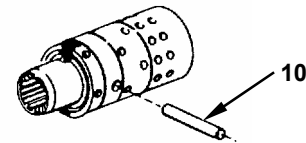


2. Align the spring groove positions of spool (13) and sleeve (9), and place them on a flat plate. Align 2 center springs (11) back to back, and 2 flat springs (12) in the center, and install them to a special tool (ST 2497). Install center springs (11) (4 used) and flat springs (12) (2 used) to the spring grooves of spool (13) and sleeve (9) by using a special tool.

**IMPORTANT:** As the spring may fly out, always wear safety glasses.



3. Install pins (10) in the holes of spool (13) and sleeve (9). Align the ends of the pins and the outer diameter surface of the sleeve.



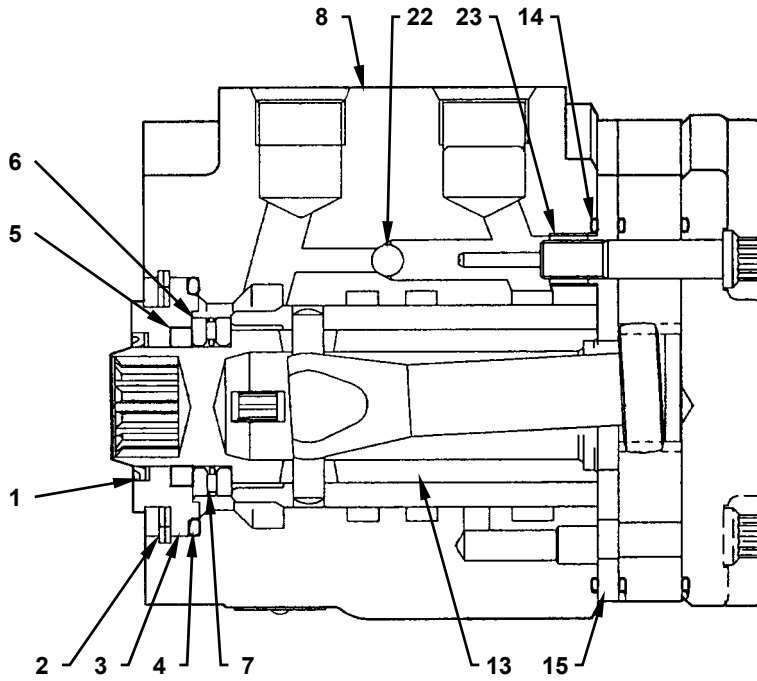
4. Install the sleeve (9) assembly from the cap (21) side of housing (8).

**NOTE:** When installing the sleeve (9) assembly, prevent binding.

Keeping the pin horizontal, turn the pin right and left little by little. Insert the pin until the ends behind the sleeve (9) assembly and housing (8) come to the same position.

# BODY (TRAVEL SYSTEM) / Steering Pilot Valve

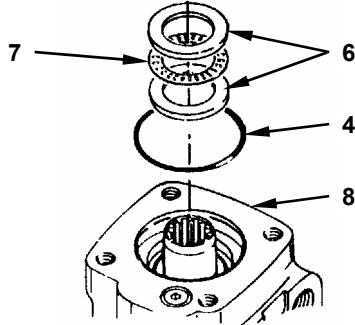
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T1F3-03-07-002


## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

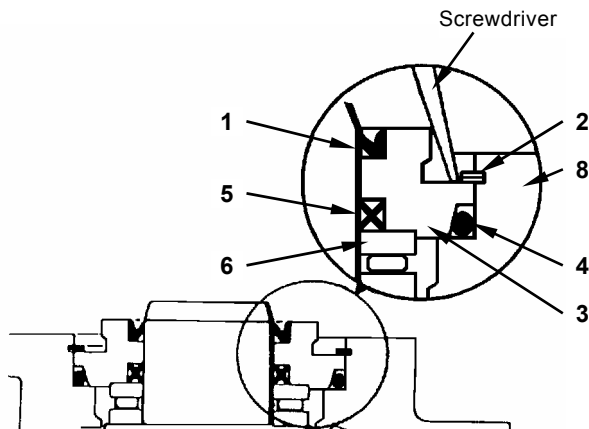
5. Install O-ring (4), bearing races (6) (2 used) and thrust needle (7) to housing (8).



W202-02-14-023


6. Install dust seal (1) and seal (5) to bushing (3).  
7. Tap slightly with a plastic hammer and install bushing (3) to spool (13).

 **NOTE:** Check that bushing (3) and bearing race (6) is contacting each other horizontally.



W212-02-14-002


8. Install retaining ring (2) to housing (8).

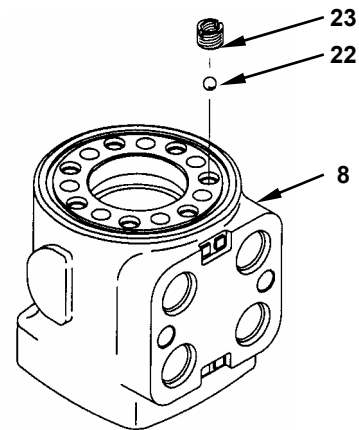
 **NOTE:** After installing retaining ring (2), extend the bore of retaining ring (2) with a minus driver so that it enters the groove on housing (8) correctly.

**IMPORTANT:** As retaining ring (2) may fly out from housing (8), always wear safety glasses.

9. Secure housing (8) into a vise lightly.

10. Install O-ring (14) to housing (8). Install ball (22) and screw (23) to housing (8) at the position indicated in the following figure. Place plate (15) on housing (8). Align the positions of the bolt hole and the tap hole of housing (8).

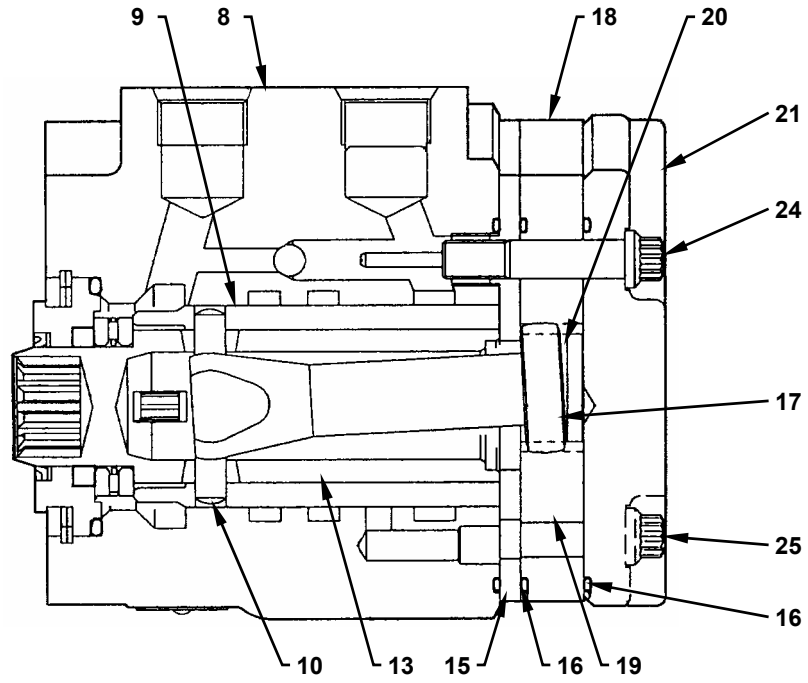
 **NOTE:** Do not drop or lose ball (22).



W487-03-08-004

## BODY (TRAVEL SYSTEM) / Steering Pilot Valve

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T1F3-03-07-002



## **BODY (TRAVEL SYSTEM) / Steering Pilot Valve**

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## BODY (TRAVEL SYSTEM) / Steering Valve


### REMOVAL AND INSTALLATION OF STEERING VALVE

**CAUTION:** Bleed air in the hydraulic oil tank before doing any work. Run the vacuum pump continuously while working.


**CAUTION:** Hang articulation lock bar. Operate the steering wheel right and left several times, and release any pressure in the circuit.

#### Removal

1. Remove hoses (1, 2, 4, 5, 7, 10, 11, 12) from steering valve (8). Cap the open ends. Attach identification tags onto the removed hoses for assembling.


 : 17 mm, 22 mm, 27 mm, 36 mm


2. Remove bolts (15) (2 used), bolt (16), and washers (14) (3 used) from steering valve (8). Remove steering valve (8) from bracket (13).

 : 17 mm


#### Installation


1. Install steering valve (8) to bracket (13) with bolts (15) (2 used), bolt (16), and washers (14) (3 used).


 : 17 mm


 : 39 N·m (4 kgf·m, 29 lbf·ft)


2. Connect hoses (1, 2, 7, 11, 12) to steering valve (8).


 : 17 mm

 : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)


 : 22 mm


 : 39 N·m (4 kgf·m, 29 lbf·ft)


 : 27 mm


 : 78 N·m (8 kgf·m, 58 lbf·ft)

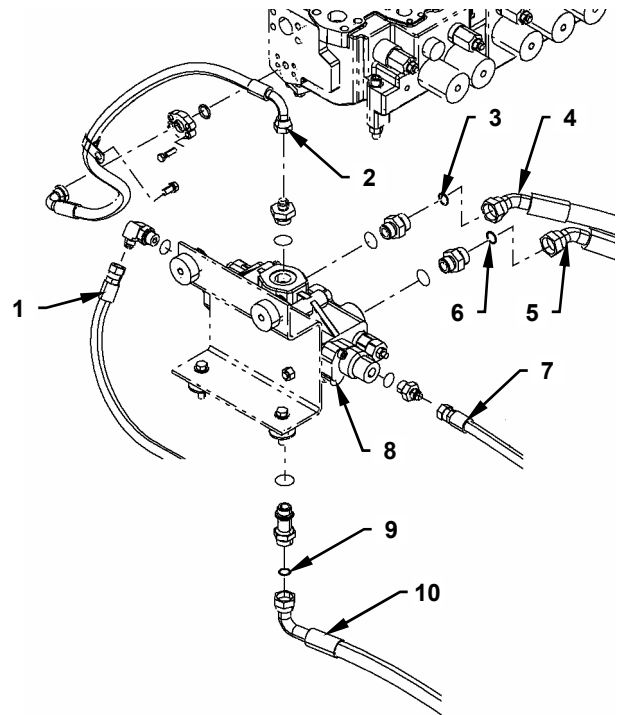
3. Connect hoses (4, 5, 10) to steering valve (8) by O-rings (3, 6, 9).

 : 27 mm

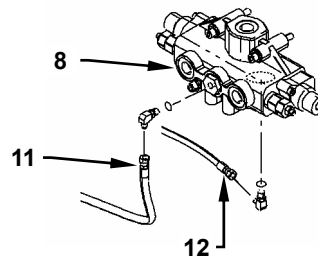
 : 93 N·m (9.5 kgf·m, 69 lbf·ft)

 : 36 mm

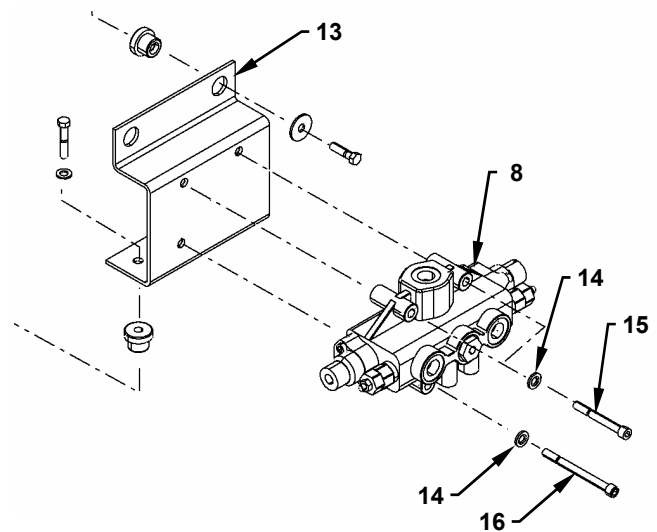
 : 175 N·m (18 kgf·m, 130 lbf·ft)



W4GB-03-08-005



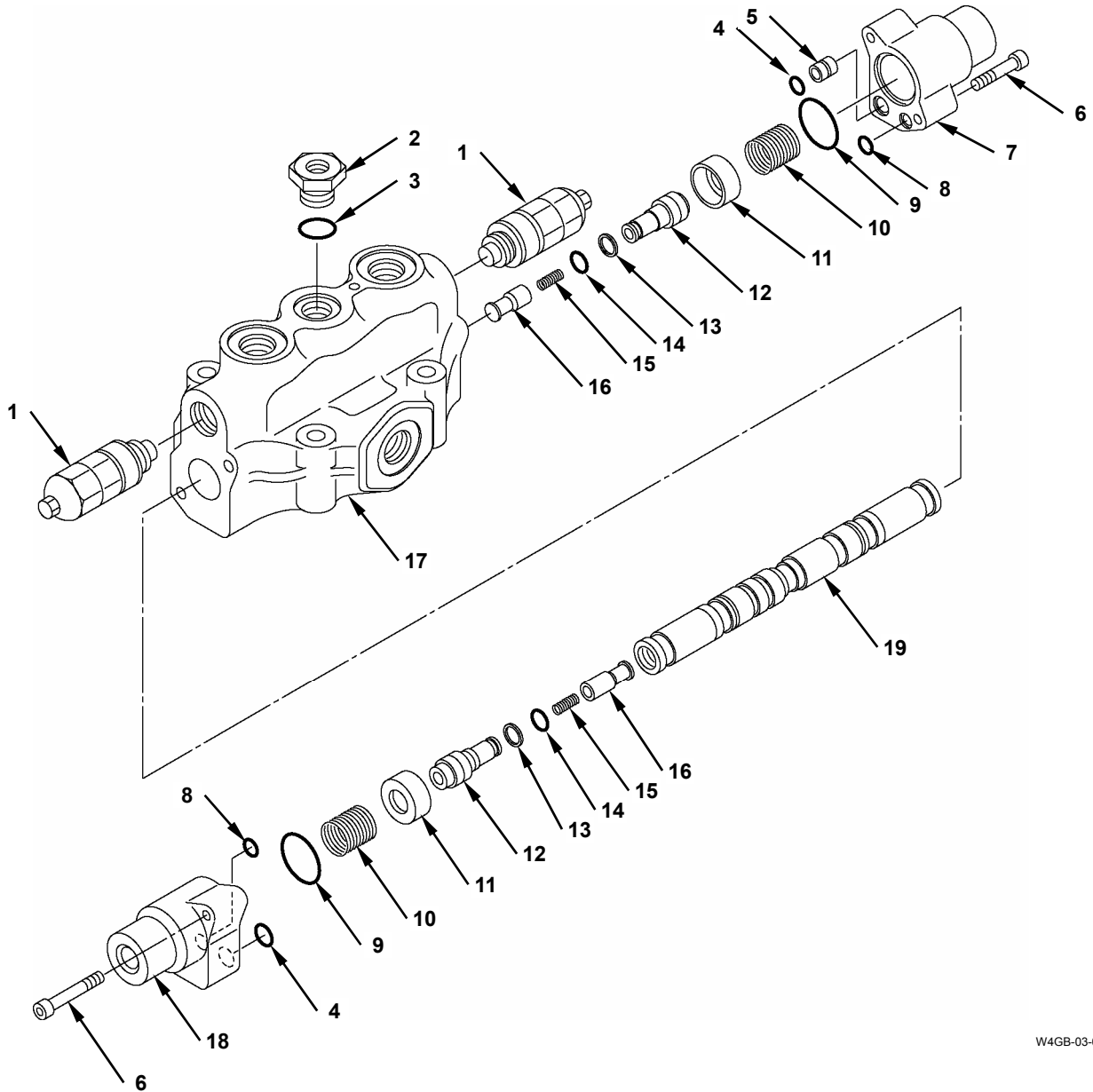
W4GB-03-08-006



W4GB-03-08-007

# BODY (TRAVEL SYSTEM) / Steering Valve

## DISASSEMBLY OF STEERING VALVE



W4GB-03-08-001


- |                           |                          |                           |                      |
|---------------------------|--------------------------|---------------------------|----------------------|
| 1 - Relief Valve (2 Used) | 6 - Socket Bolt (4 Used) | 11 - Spring Seat (2 Used) | 16 - Poppet (2 Used) |
| 2 - Plug                  | 7 - Cap Assembly         | 12 - Capscrew (2 Used)    | 17 - Valve Housing   |
| 3 - O-Ring                | 8 - O-Ring (2 Used)      | 13 - Backup Ring (2 Used) | 18 - Cap             |
| 4 - O-Ring (2 Used)       | 9 - O-Ring (2 Used)      | 14 - O-Ring (2 Used)      | 19 - Spool           |
| 5 - Sleeve Assembly       | 10 - Spring (2 Used)     | 15 - Spring (2 Used)      |                      |

## BODY (TRAVEL SYSTEM) / Steering Valve


### Disassembly of Steering Valve

**IMPORTANT: Do not disassemble as the overload relief valve (1) is set to the set pressure.**

1. Remove overload relief valves (1) (2 used) from bubble housing (17). Attach identification tags for the assembling position of each removed parts.

 : 32 mm


2. Remove plug (2) from valve housing (17). Remove O-ring (3) from plug (2).

 : 36 mm

**IMPORTANT: When removing cap (18) and cap assembly (7), prevent spring (10) from flying out. As the steel ball is pressed fit in cap assembly (7), replace the assembly.**

**As sleeve assembly (5) is installed by crimping the filter, replace the assembly.**


3. Remove socket bolts (6) (4 used) from cap (18) and cap assembly (7). Remove springs (10) (2 used) and spring seats (11) (2 used) from valve housing (17). Remove O-rings (9, 8, 4) from cap (18). Remove O-rings (9, 8, 4) and sleeve assembly (5) from cap assembly (7).

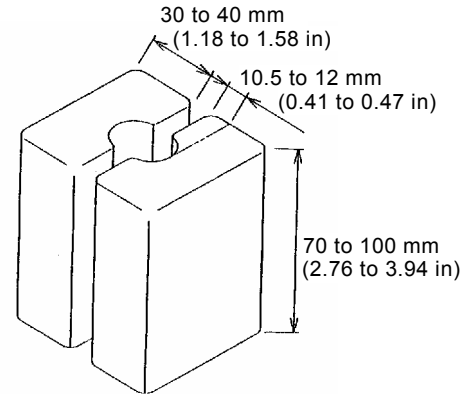
 : 6 mm

**IMPORTANT: Do not dent, scratch, or crack spool (19) when removing. Put matching marks in order to prevent mistakes of the direction to insert when reassembling.**

4. Turn and remove spool (19) from valve housing (17) as a sub-assembly.

5. Insert the spool (19) assembly into a batten (refer to the figure below) in order to prevent the outer surface of the assembly from damage. Secure them in a vise. Remove capscrews (12) (2 used), springs (15) (2 used), and poppets (16) (2 used) from the spool (19) assembly.

 : 17 mm

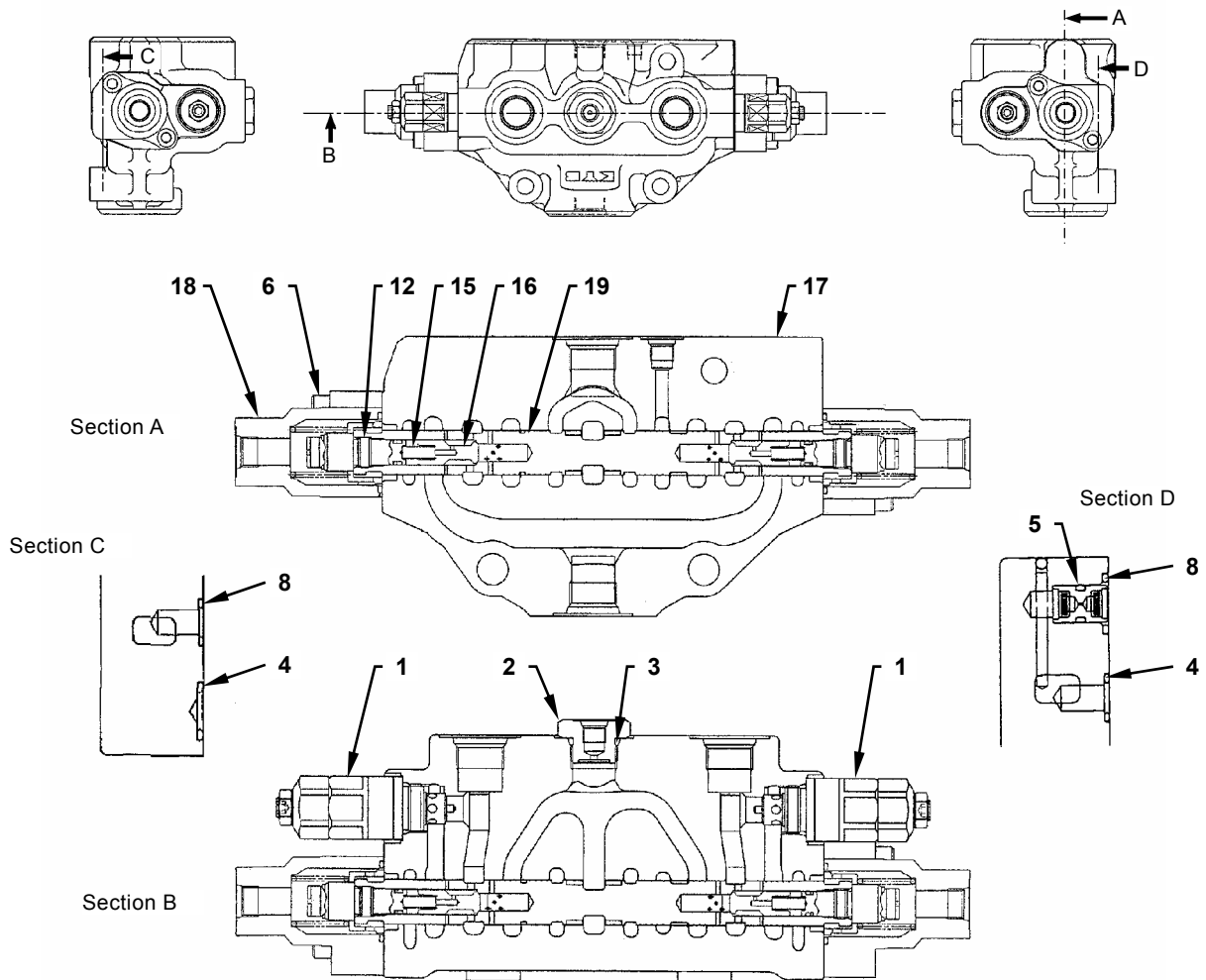


W4GB-03-08-002

6. Remove O-rings (14) (2 used) and backup rings (13) (2 used) from capscrews (12) (2 used).

# BODY (TRAVEL SYSTEM) / Steering Valve

## ASSEMBLY OF STEERING VALVE











W4GB-03-08-003

- |                           |                          |                           |                      |
|---------------------------|--------------------------|---------------------------|----------------------|
| 1 - Relief Valve (2 Used) | 6 - Socket Bolt (4 Used) | 11 - Spring Seat (2 Used) | 16 - Poppet (2 Used) |
| 2 - Plug                  | 7 - Cap Assembly         | 12 - Capscrew (2 Used)    | 17 - Valve Housing   |
| 3 - O-Ring                | 8 - O-Ring (2 Used)      | 13 - Backup Ring (2 Used) | 18 - Cap             |
| 4 - O-Ring (2 Used)       | 9 - O-Ring (2 Used)      | 14 - O-Ring (2 Used)      | 19 - Spool           |
| 5 - Sleeve assembly       | 10 - Spring (2 Used)     | 15 - Spring (2 Used)      |                      |

## BODY (TRAVEL SYSTEM) / Steering Valve

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### Assembly of Steering Valve

- Excessive torque at the time of bolting will cause deformation of the spool and operational failure.
  - Apply hydraulic oil to the thread part of the bolts.
1. Install backup rings (13) (2 used) and O-rings (14) (2 used) to capscrews (12) (2 used).
  2. Secure spool (19) with the batten (refer to W3-8-3) used at the time of disassembling in a vise. Install poppets (16) (2 used) and springs (15) (2 used) to spool (19), and install capscrews (12) (2 used) (both ends).
    -  : 17 mm
    -  : 39 to 41 N·m  
(4 to 4.2 kgf·m, 29 to 30.5 lbf·ft)
  3. Install O-ring (3) to plug (2). Install plug (2) to valve housing (17).
    -  : 36 mm
    -  : 205 to 225 N·m  
(21 to 23 kgf·m, 152 to 167 lbf·ft)
  4. Install overload relief valves (1) (2 used) to valve housing (17).
    -  : 32 mm
    -  : 78 to 88 N·m (8 to 9 kgf·m, 58 to 65 lbf·ft)
  5. Turn and insert the spool (19) assembly in valve housing (1) in the same direction as before disassembling. Turn slowly and check that there is no seizure.
  6. Install O-ring (4) to sleeve assembly (5). Install sleeve assembly (5) to cap assembly (7).
  7. Install O-rings (9) (2 used), (8) (2 used), and (4) (2 used) to cap (18) and cap assembly (7). Install cap (18) and cap assembly (7) to valve housing (17) with socket bolts (9) (4 used) together with springs (10) (2 used) and spring seats (11) (2 used).
    -  : 6 mm
    -  : 39 to 44 N·m  
(4 to 4.5 kgf·m, 29 to 33 lbf·ft)

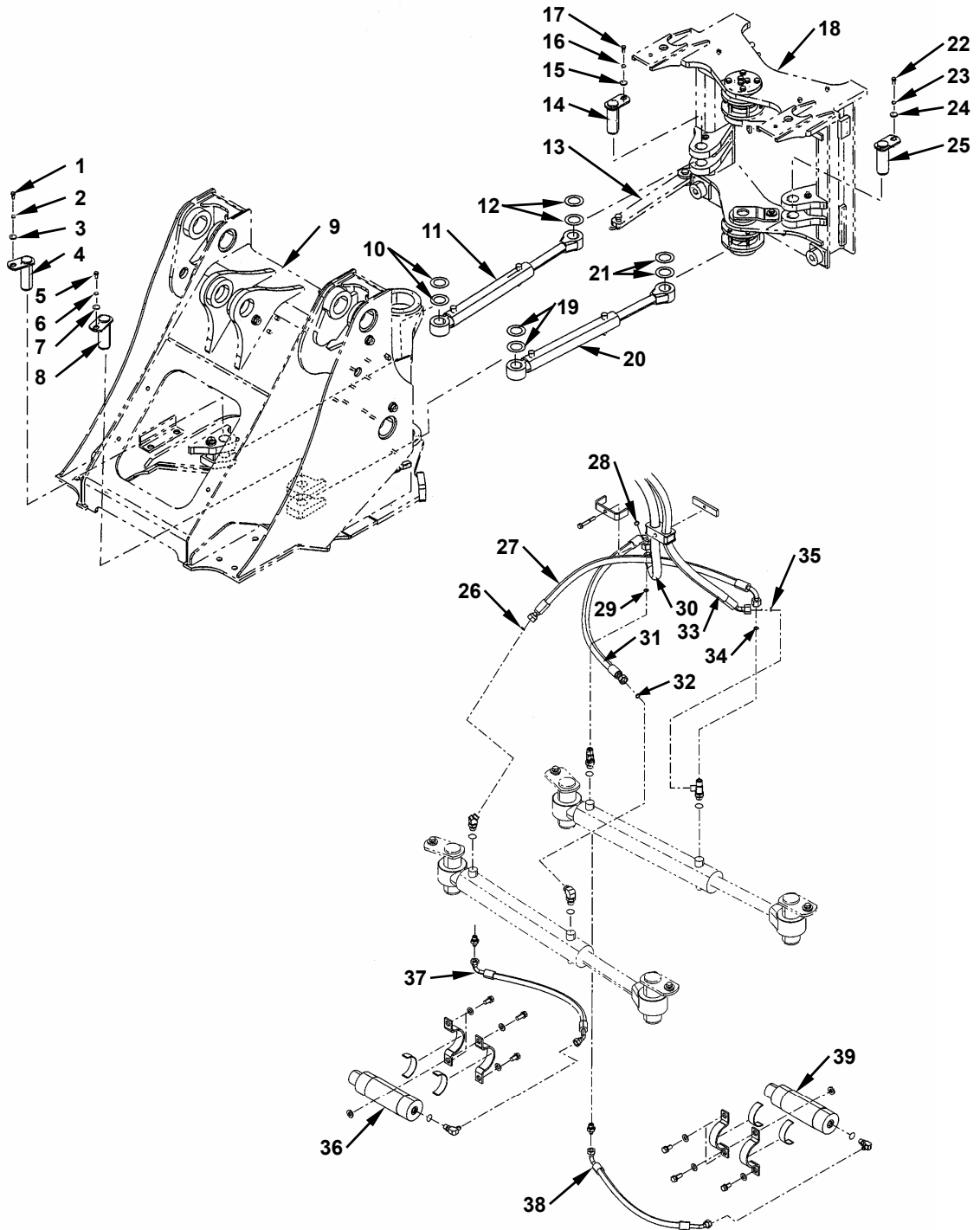
## **BODY (TRAVEL SYSTEM) / Steering Valve**

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# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-020



## BODY (TRAVEL SYSTEM) / Steering Cylinder

### Removal



**CAUTION:** Steering cylinder (11, 20) weight:

ZW220: 32 kg (71 lb)

ZW250: 36 kg (80 lb)

ZW310: 36 kg (80 lb)

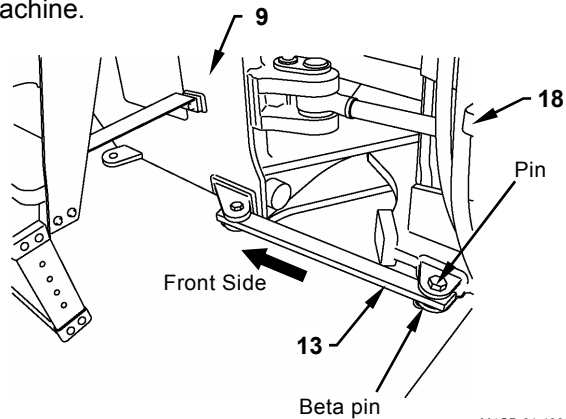


**CAUTION:** Before disconnecting each hose, operate the steering wheel right and left several times, and release any pressure in the circuit.

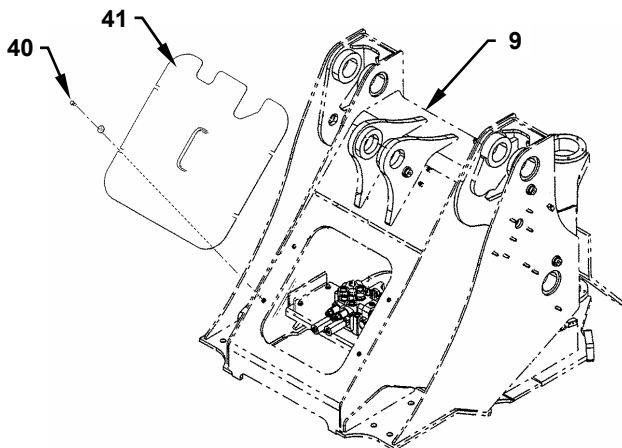


**CAUTION:** Before disconnecting each hose, bleed any air pressure in the hydraulic oil tank, and minimize the quantity of oil which flows out from the hose.


1. Keep the machine in straight travel position. Connect front frame (9) and rear frame (18) with articulation lock bar (13) on the right side of the machine.




2. Remove sems bolts (40) (4 used) from cover (41). Remove cover (41) from front frame (9).




3. Disconnect hoses (27, 31, 33, 38) from steering cylinders (11, 20). Cap the open ends.

 : 14 mm, 17 mm, 19 mm, 22 mm, 27 mm, 36 mm


4. Disconnect lubrication pipes (2 used) from pins (4, 8).

 : 14 mm

5. Remove bolts (1, 5) and washers (2, 3, 6, 7) from pins (4, 8). Remove pins (4, 8) from front frame (9).

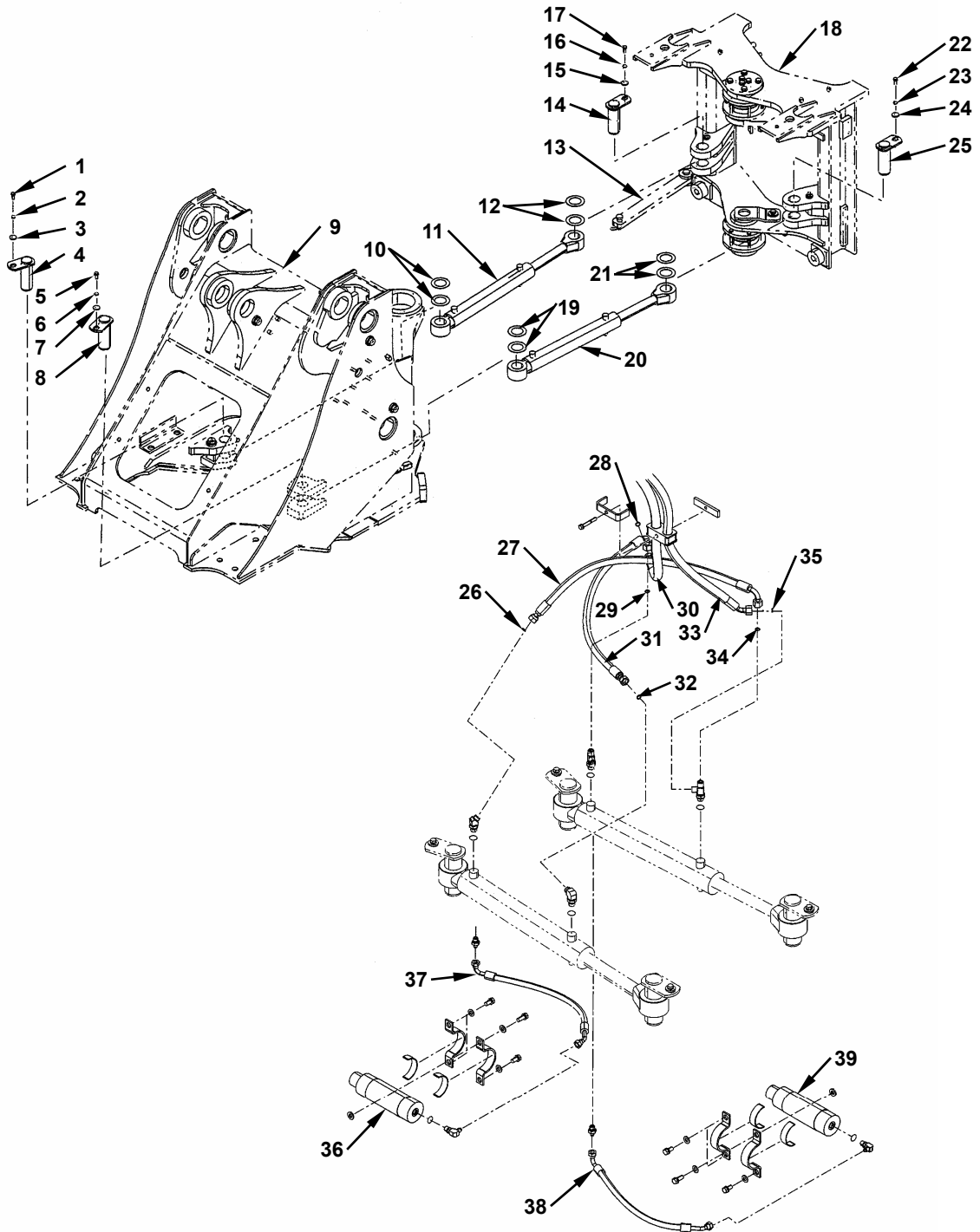
 : 17 mm

6. Attach a nylon sling in order to hoist and hold steering cylinder (11, 20). Remove bolts (17, 22) and washers (15, 16, 23, 24) from pins (14, 25). Remove pins (14, 25) from rear frame (18).

 : 17 mm

7. Remove steering cylinders (11, 20) from rear frame (18).

# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-020

## BODY (TRAVEL SYSTEM) / Steering Cylinder

### Installation



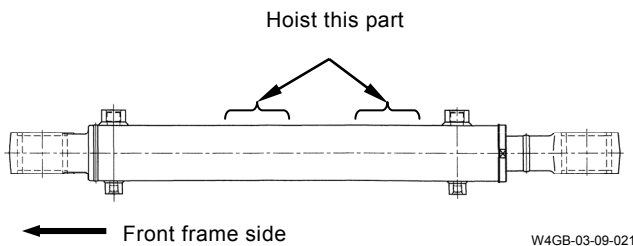
**CAUTION: Steering cylinder (11, 20) weight:**

**ZW220: 32 kg (71 lb)**

**ZW250: 36 kg (80 lb)**

**ZW310: 36 kg (80 lb)**

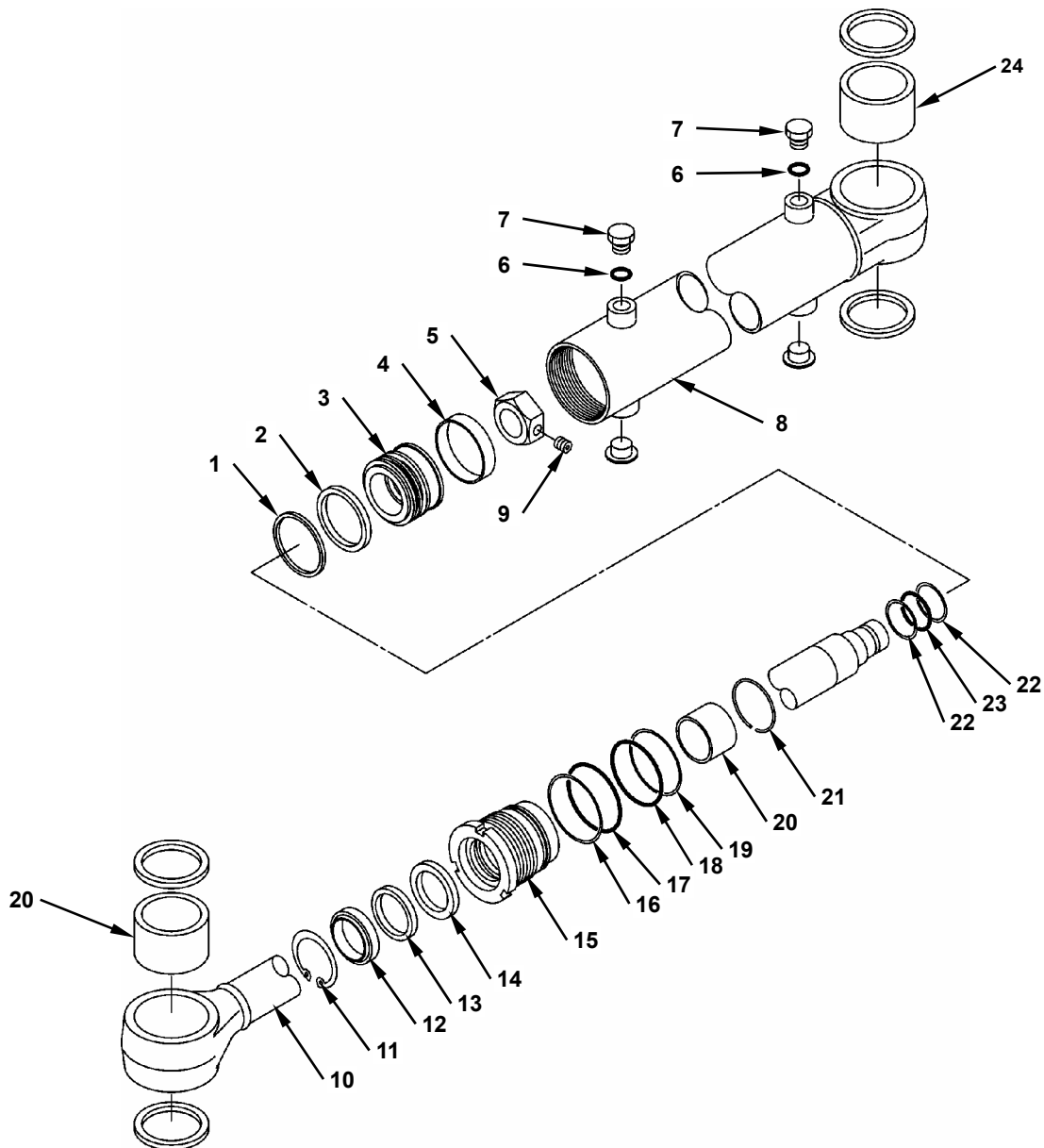
1. Attach a nylon sling on steering cylinders (11, 20), and hoist by the direction as indicated in the following figure. Align the steering cylinder (11, 20) bottom side with the installation hole of front frame (9).



2. Install spacers (10, 19) between the top surface of the steering cylinder (11, 20) bottom side and the mounting brackets.
3. Install pins (4, 8). Secure pins (4, 8) to front frame (9) with washers (2, 3, 6, 7) and bolts (1, 5).  
🔧 : 17 mm  
🔩 : 50 N·m (5 kgf·m, 36 lbf·ft)
4. Release the hoisted steering cylinder (11, 20) and push the rod side of steering cylinders (11, 20) into rear frame (18).
5. Align the hole at the rear frame (18) side with the pin hole at the steering cylinder (11, 20) rod side. Install spacers (12, 21) in the top surface of the steering cylinder (11, 20) rod side.
6. Install pins (14, 25). Secure pins (14, 25) to rear frame (18) with washers (15, 16, 23, 24) and bolts (17, 22).  
🔧 : 17 mm
7. Connect lubrication pipe to pin (4, 8) at steering cylinder (11, 20).  
🔧 : 14 mm
8. Connect hose (27) to the rod side of steering cylinder (11) through O-ring (34).  
🔧 : 27 mm  
🔩 : 93 N·m (10 kgf·m, 69 lbf·ft)
9. Connect hose (33) to the rod side of cylinder through O-ring (35).  
🔧 : 27 mm  
🔩 : 93 N·m (10 kgf·m, 69 lbf·ft)
10. Connect hose (31) to the bottom side of steering cylinder (20) through O-ring (29).  
🔧 : 27 mm  
🔩 : 93 N·m (10 kgf·m, 69 lbf·ft)
11. Connect hose (30) to the bottom side of steering cylinder (20) through O-ring (28).  
🔧 : 27 mm  
🔩 : 93 N·m (10 kgf·m, 69 lbf·ft)
12. Connect hoses (37, 38) from accumulator (39) to the bottom side of steering cylinder (11, 20).  
🔧 : 22 mm  
🔩 : 69 N·m (7 kgf·m, 51 lbf·ft)

## BODY (TRAVEL SYSTEM) / Steering Cylinder

### DISASSEMBLY OF STEERING CYLINDER



W4GB-03-09-001

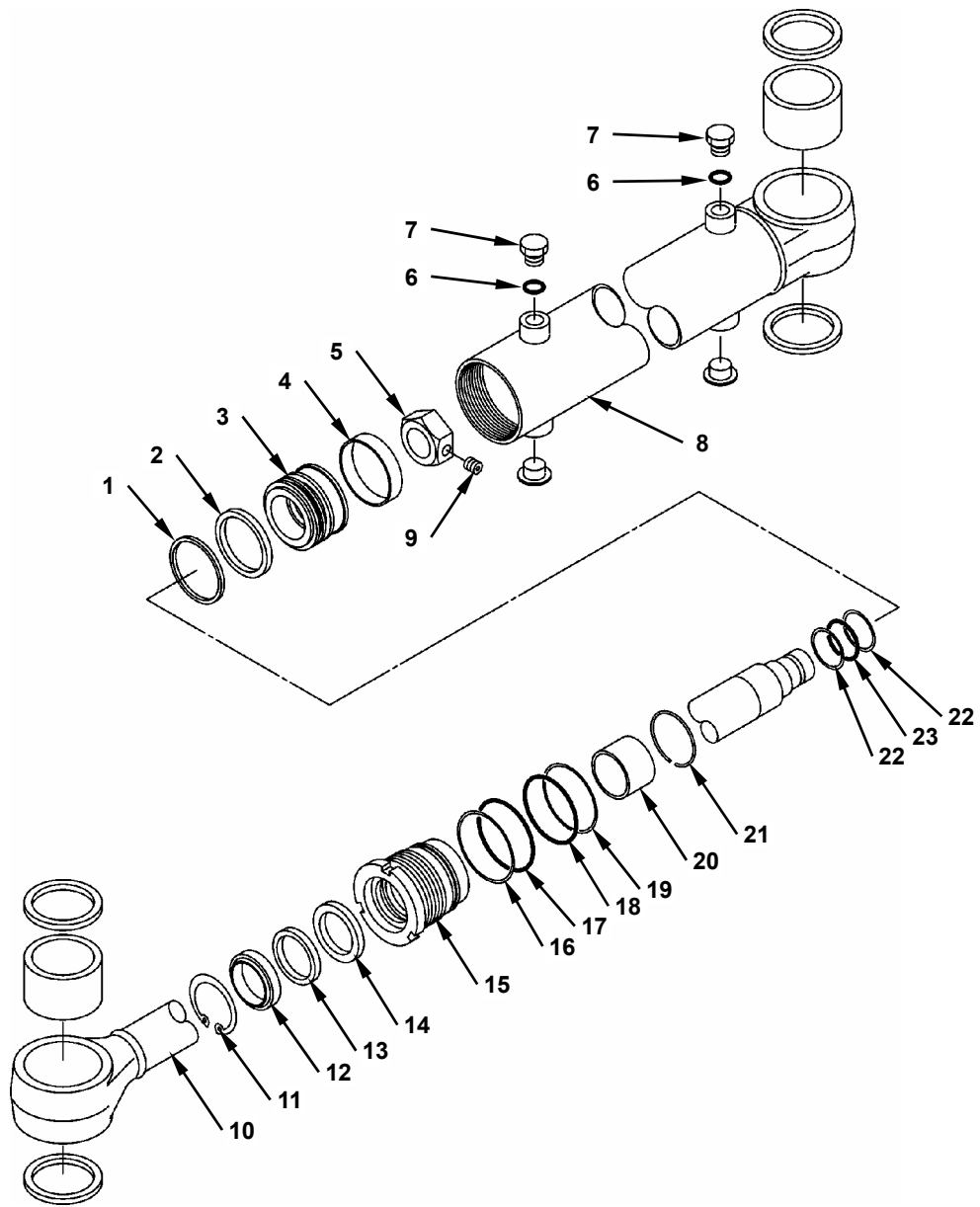
- |                        |                     |                  |                           |
|------------------------|---------------------|------------------|---------------------------|
| 1 - Dust Ring (2 Used) | 7 - Plug (2 Used)   | 13 - U-Packing   | 19 - Backup Ring (2 Used) |
| 2 - Packing            | 8 - Cylinder Tube   | 14 - Buffer Seal | 20 - Rod Bushing          |
| 3 - Piston             | 9 - Set Screw       | 15 - Rod Cover   | 21 - Retaining Ring       |
| 4 - Wear Ring          | 10 - Piston Rod     | 16 - Lock Washer | 22 - Backup Ring (2 Used) |
| 5 - Piston Nut         | 11 - Retaining Ring | 17 - O-Ring      | 23 - O-Ring               |
| 6 - O-Ring (2 Used)    | 12 - Dust Seal      | 18 - O-Ring      | 24 - Pin Bushing          |

## **BODY (TRAVEL SYSTEM) / Steering Cylinder**

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# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-001

## BODY (TRAVEL SYSTEM) / Steering Cylinder

### Disassembly of Steering Cylinder



**CAUTION: Steering cylinder weight:**  
ZW220: 32 kg (71 lb)  
ZW250: 36 kg (80 lb)

1. Secure the steering cylinder assembly on the workbench. Use the parallel surface as a fixing position and secure the head cover (tail end) part, so that it does not move.

**IMPORTANT: Do not secure by using the port part of cylinder tube (8).  
Using processed wooden block with V-groove is recommended.**

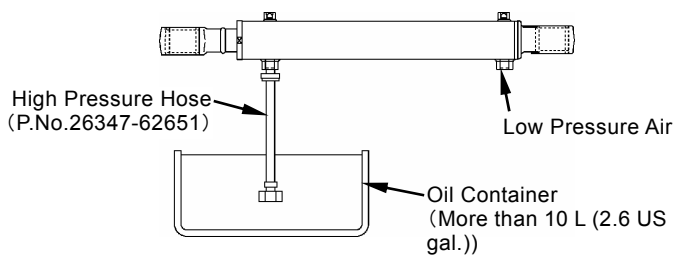


W4GB-03-09-002



**CAUTION: Supply air with low pressure in order to adjust the rod (10) extending speed. Check that there are no co-workers and obstacles in the direction in which rod (10) is extended.**

2. Temporary connect the high pressure hose to the piston rod (10) side port. Route one side to the oil reservoir container. Supply air with low pressure from the bottom side of cylinder tube (8), and discharge oil from the rod cover (15) side.



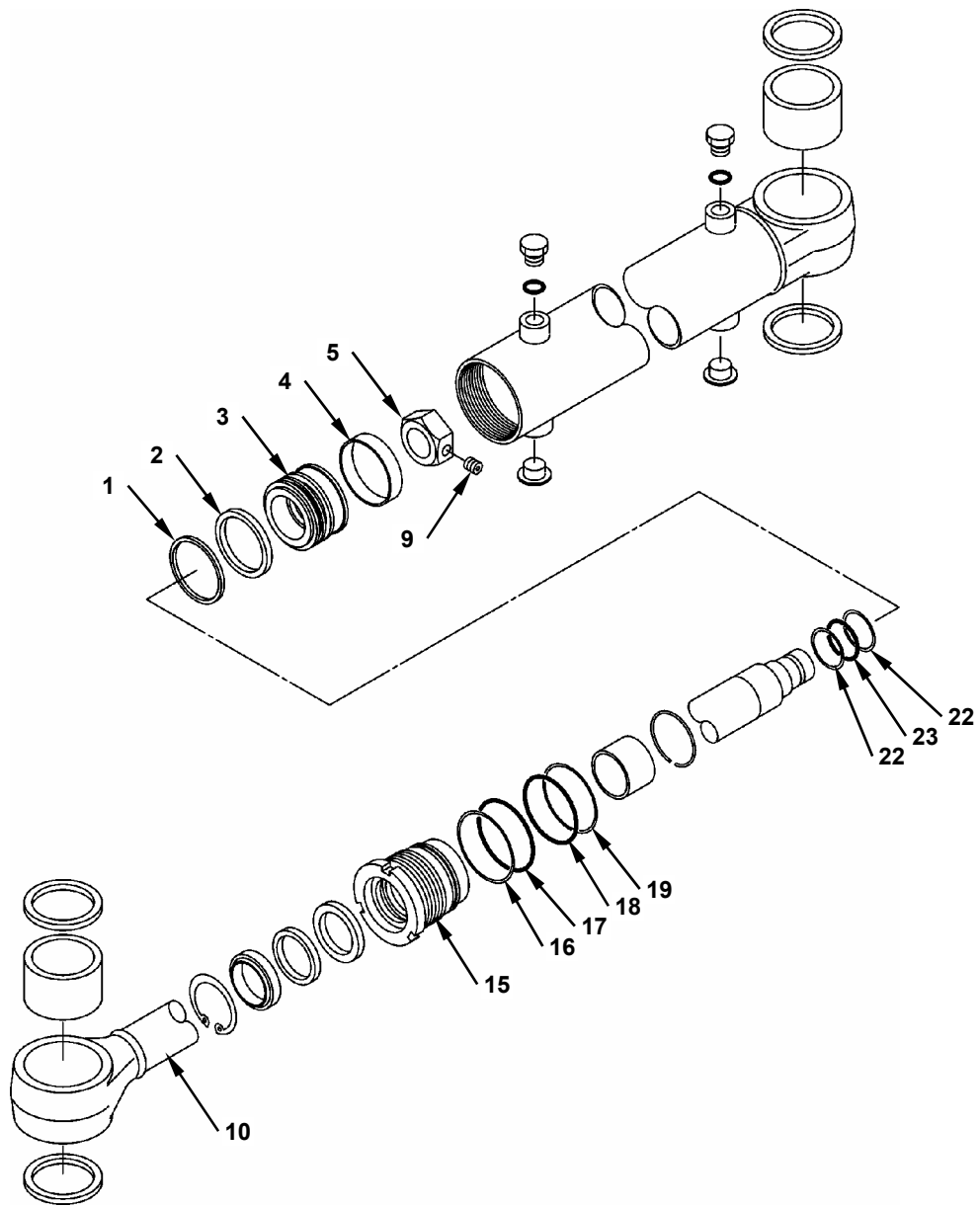
W4GB-03-09-003

3. Support extended rod (10) with a crane or a wooden block so that it is aligned with cylinder tube (8) in a straight line.
4. Reform the bending part of the lock washer on rod cover (15) to a flat surface.
5. Attach a R spanner to the notched groove of rod cover (15). Remove rod cover (15) from cylinder tube (8).  
R spanner: For dia. 84 mm
6. Support piston rod (10) with a crane. Slowly remove the piston rod (10) assembly from cylinder tube (8) by swaying it vertically and horizontally.

**IMPORTANT: Securing the chrome plating part of rod (10) is strictly prohibited.  
Secure the rod head part only.**

7. Secure the piston rod (10) assembly by using the parallel surface of the rod head in order to prevent it from moving.

# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-001




## BODY (TRAVEL SYSTEM) / Steering Cylinder

**IMPORTANT:** As set screw (9) is caulked at the piston nut (5) side (2 places), remove the set screw slowly by applying oil to the thread part and repeating "loosen and tighten."

**IMPORTANT:** Cutting of packing (2) is performed by putting piston (3) on a stable stand of V-block shape. Do not damage the seal groove by a cutting tool.

8. Remove set screw (9) from piston nut (5).

 : 4 mm

9. Remove piston nut (5) from piston rod (10) by using a special tool.

Special tool: Refer to W3-9-22

10. Install pins to the piston (3) ends (2 places). Remove piston (3) from piston rod (10) by using a special tool.

Pin size: dia. 8 mm, length 25 mm

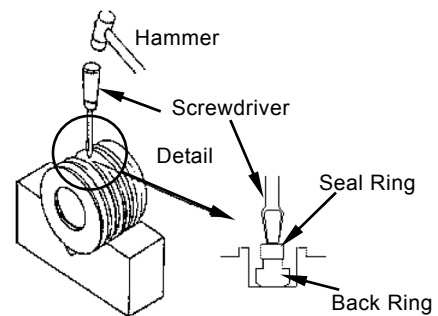
Special tool: Refer to W3-9-25

11. Remove rod cover (15) from piston rod (10).

12. Remove wear ring (4) and dust ring (1) from piston (3).

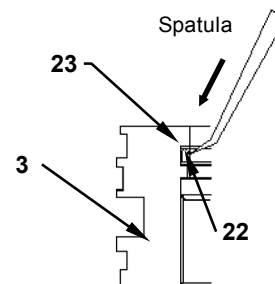
13. Widen and remove the back rings on both sides of packing (2) from piston (3).

Cut off and remove the seal ring and the backup ring of the packing (2) center section, as indicated in the figure.



W4GB-04-02-004

14. Remove O-ring (23) of the piston (3) bore part and backup rings (22) (2 used) by using a spatula.

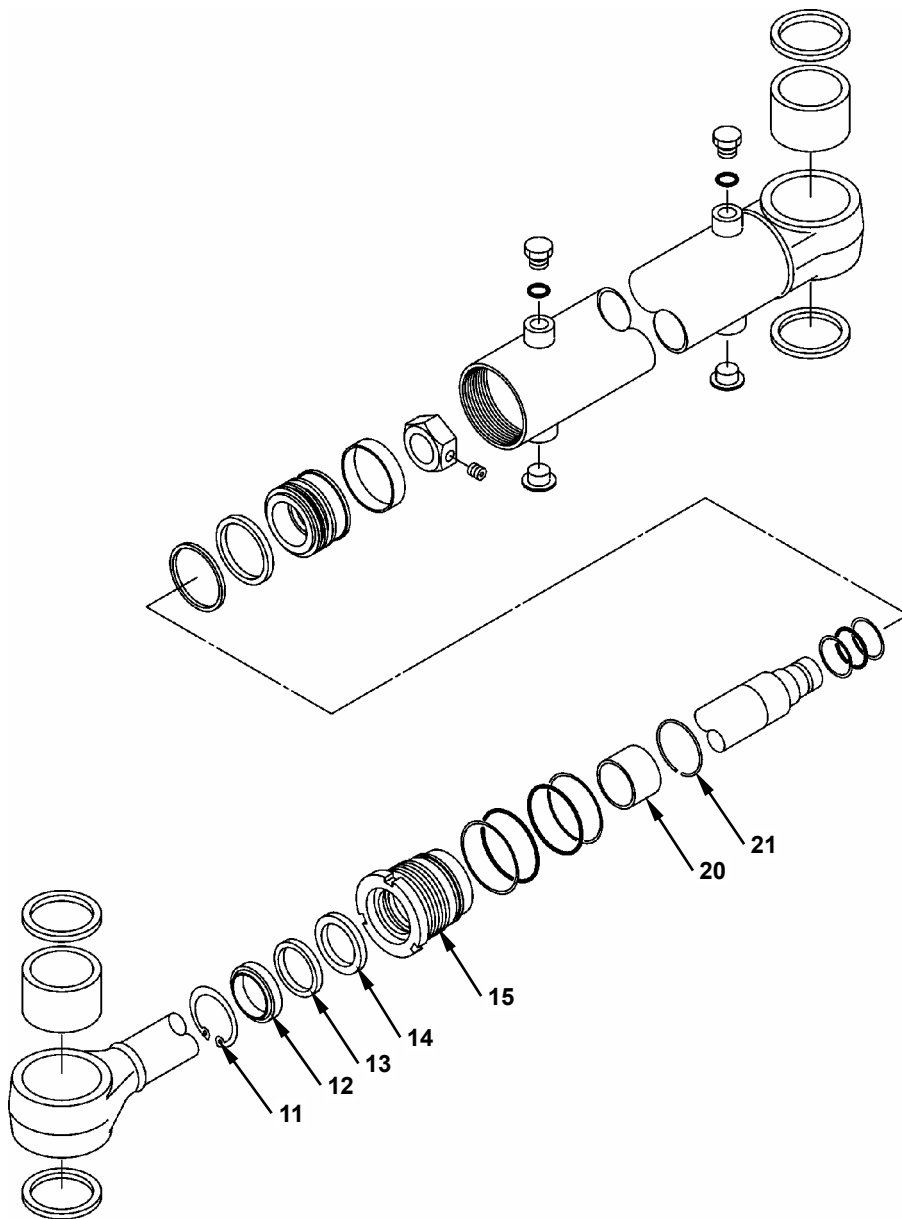


W4GB-04-02-005

15. Place rod cover (15) on the workbench covered with cloth of antislip band.

16. Remove O-ring (18) backup ring (19), O-ring (17), and lock washer (16) from the outer circumference of rod cover (15).

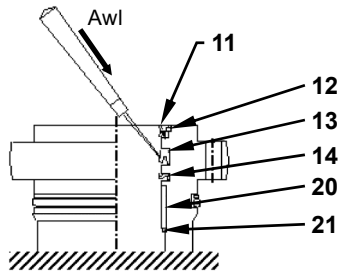
# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-001

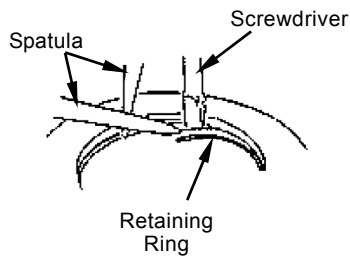
## BODY (TRAVEL SYSTEM) / Steering Cylinder

17. Pierce U-packing (13) and buffer seal (14) with a pointed awl, pull inward, and remove from head cover (15).



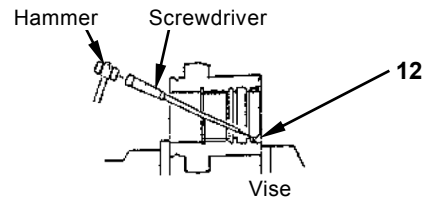
W4GB-04-02-007

18. Remove retaining ring (11) from head cover (15).



W4GB-04-02-008

19. Remove dust seal (12) from head cover (15).



W4GB-04-02-009

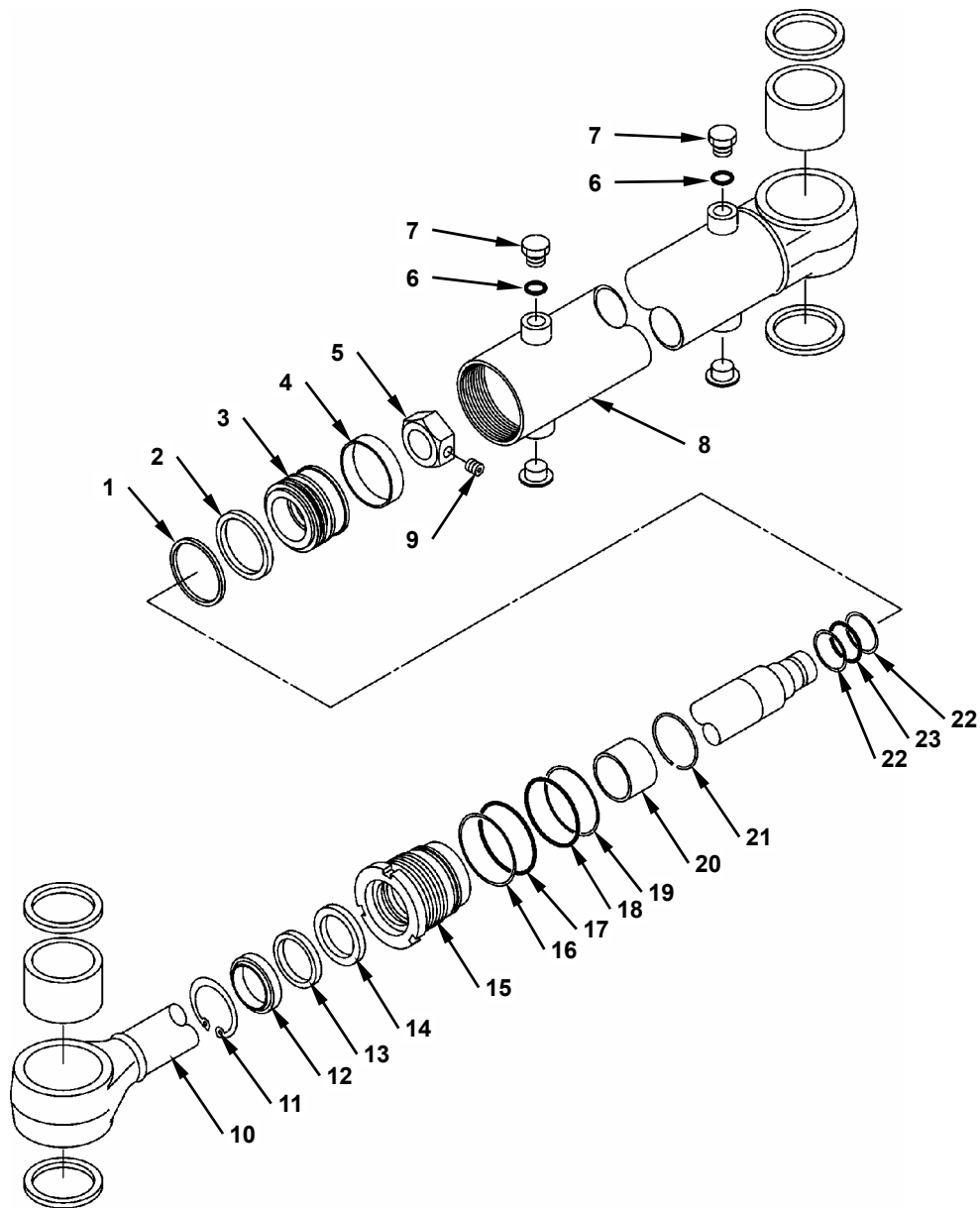
20. As rod bushing (20) is compressed in rod cover (15), removing is difficult.

If replacement of the damaged or worn bushing is needed, carry out from the following procedures.

- Remove retaining ring (21).
- Install rod cover (15) to turning machine and align correctly.
- Cut off the bushing until it becomes thin. Remove bushing (20) by using a screwdriver.

# BODY (TRAVEL SYSTEM) / Steering Cylinder

## ASSEMBLY OF STEERING CYLINDER



W4GB-03-09-001

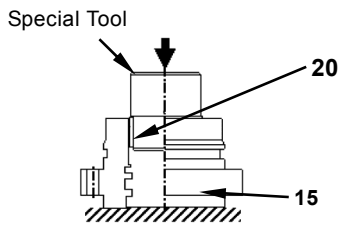
- |                        |                     |                  |                           |
|------------------------|---------------------|------------------|---------------------------|
| 1 - Dust Ring (2 Used) | 7 - Plug (2 Used)   | 13 - U-Packing   | 19 - Backup Ring (2 Used) |
| 2 - Packing            | 8 - Cylinder Tube   | 14 - Buffer Seal | 20 - Rod Bushing          |
| 3 - Piston             | 9 - Set Screw       | 15 - Rod Cover   | 21 - Retaining Ring       |
| 4 - Wear Ring          | 10 - Piston Rod     | 16 - Lock Washer | 22 - Backup Ring (2 Used) |
| 5 - Piston Nut         | 11 - Retaining Ring | 17 - O-Ring      | 23 - O-Ring               |
| 6 - O-Ring (2 Used)    | 12 - Dust Seal      | 18 - O-Ring      |                           |

## BODY (TRAVEL SYSTEM) / Steering Cylinder

### Assembly of Steering Cylinder

**IMPORTANT:** Align rod bushing (20) to the center of installation hole straightly. Apply oil to the inner surface of installation hole. Install rod bushing (20) by using a press. Clean Oil may come out when installing the rod bushing.

1. Install rod bushing (20) into rod cover (15) by using a press and a special tool.  
Special tool: Refer to W3-9-24



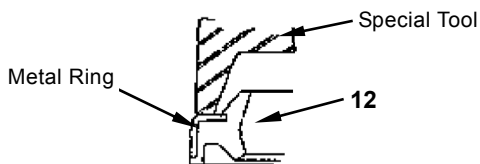
W4GB-04-02-012

2. Install retaining ring (21) to rod cover (15). Check that it has been installed steadily.

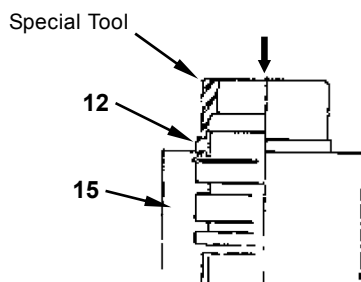
**IMPORTANT:** Align dust seal (12) to the center of installation hole straightly .

Place the special tool onto the metal ring of dust seal (12) evenly.

Apply film of hydraulic oil onto the inner surface of hole before installing dust seal (12). Clean hydraulic fluid after press fitting.



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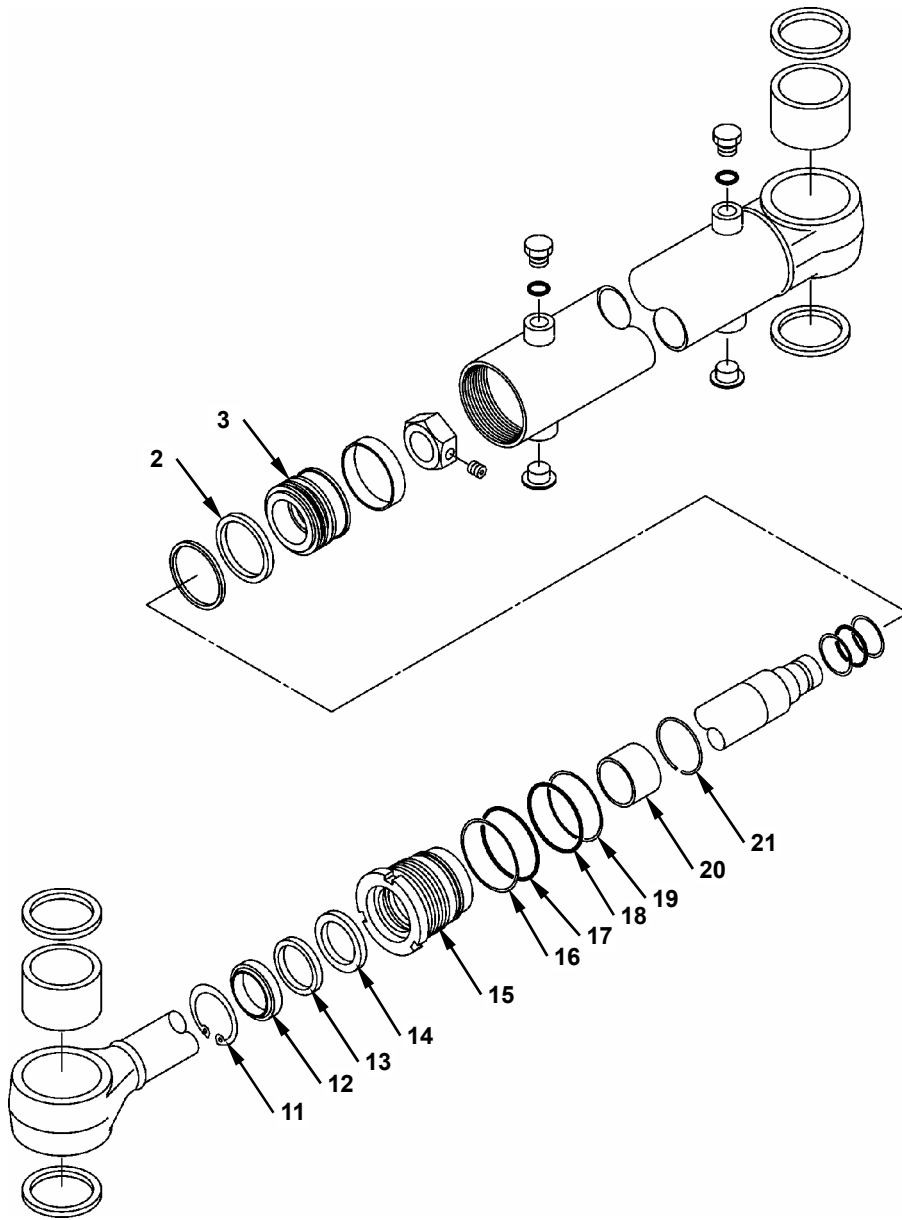


W4GB-04-02-013

3. Use a special tool and press fit dust seal (12) to rod cover (15) by tapping with a hammer.  
Special tool: Refer to W3-9-25

4. Install retaining ring (11) to rod cover (15). Check that it has been installed steadily.

# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-001

## BODY (TRAVEL SYSTEM) / Steering Cylinder

5. Install U-packing (13) and buffer seal (14) to the inner side of rod cover (15).

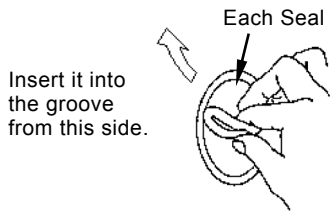
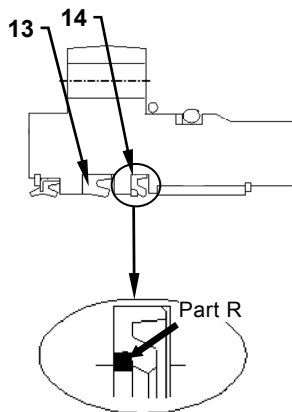


Illustration of Seal Deformation

W4GB-04-02-015



Backup Ring for Buffer Seal Mounting Direction Detail

W4GB-04-02-016

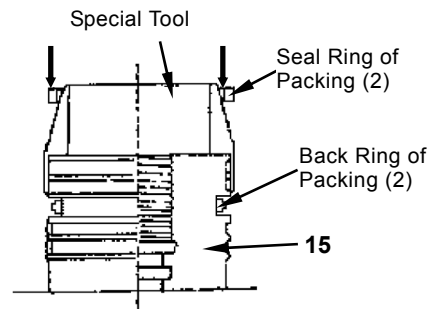
W4GB-04-02-017

6. Install O-ring (18) and backup ring (19) onto the outer race of rod cover (15).
7. Install lock washer (16) and O-ring (17) to the flange part of rod cover (15).

8. Install special tool to piston (3). Install the back ring of packing (2) to piston (3).

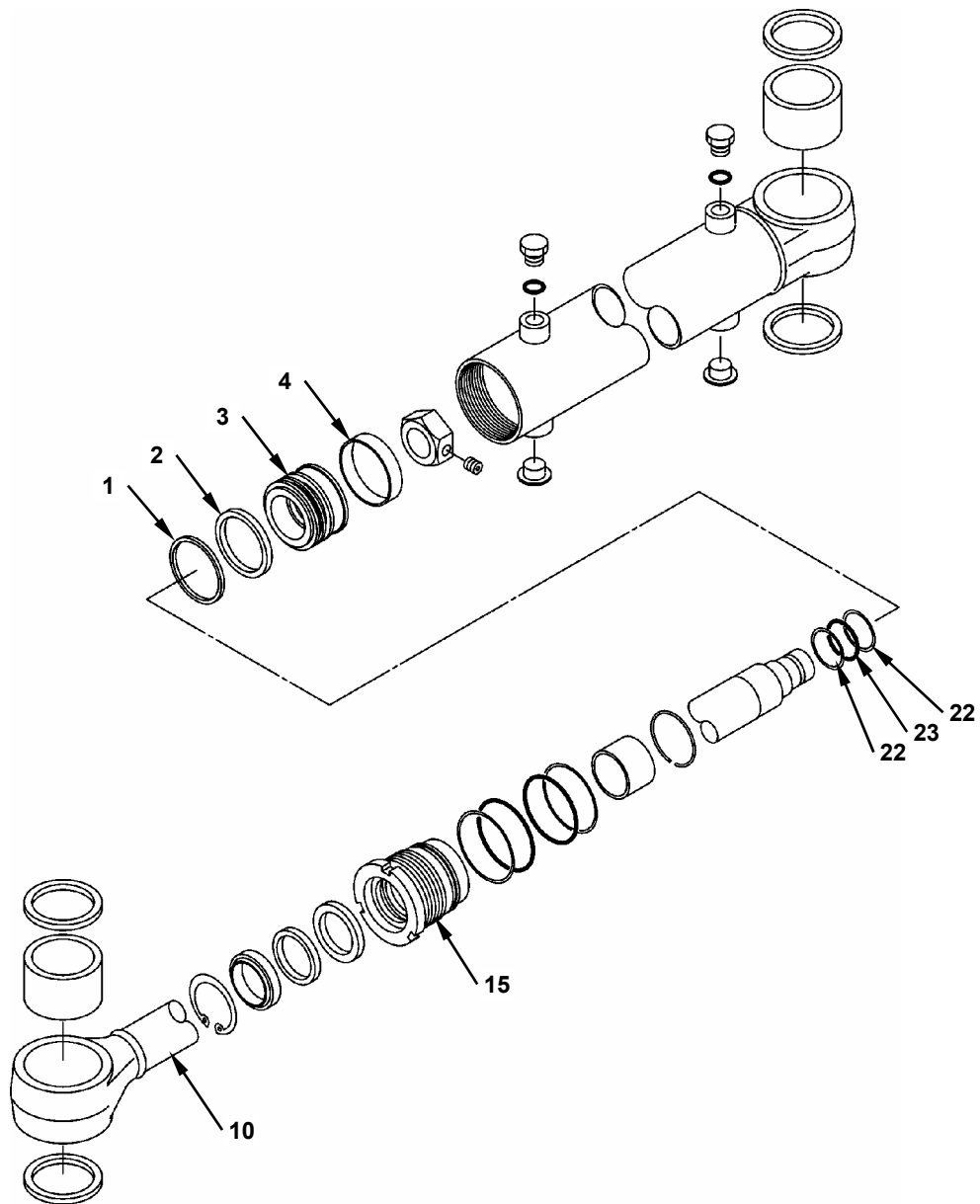
**IMPORTANT: Heat the seal ring of packing (2) with oil heated by an electric heater. Avoid direct heat by using fire.**

9. Heat seal ring of packing (2) to 150 to 180 °C (302 to 356 °F), and install it in the seal groove of piston (3) quickly. (Special tool: Refer to W3-9-23)



W4GB-04-02-018

# BODY (TRAVEL SYSTEM) / Steering Cylinder

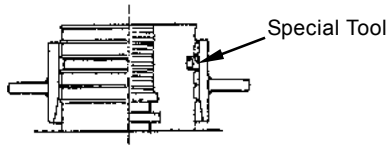


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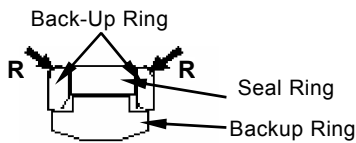
## BODY (TRAVEL SYSTEM) / Steering Cylinder

10. Adjust the seal ring of packing (2) by using special tool. (Special tool: Refer to W3-9-23)



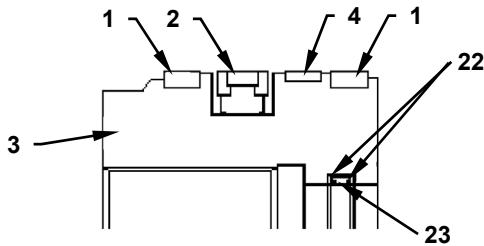
W4GB-04-02-019

11. Install the Backup ring of packing (2) to the both sides of seal ring on packing (2).



Direction of Piston Seal Component Parts W4GB-04-02-020

12. Install O-ring (23) and backup rings (22) (2 used) to the inner side of piston (3).



W4GB-04-02-021

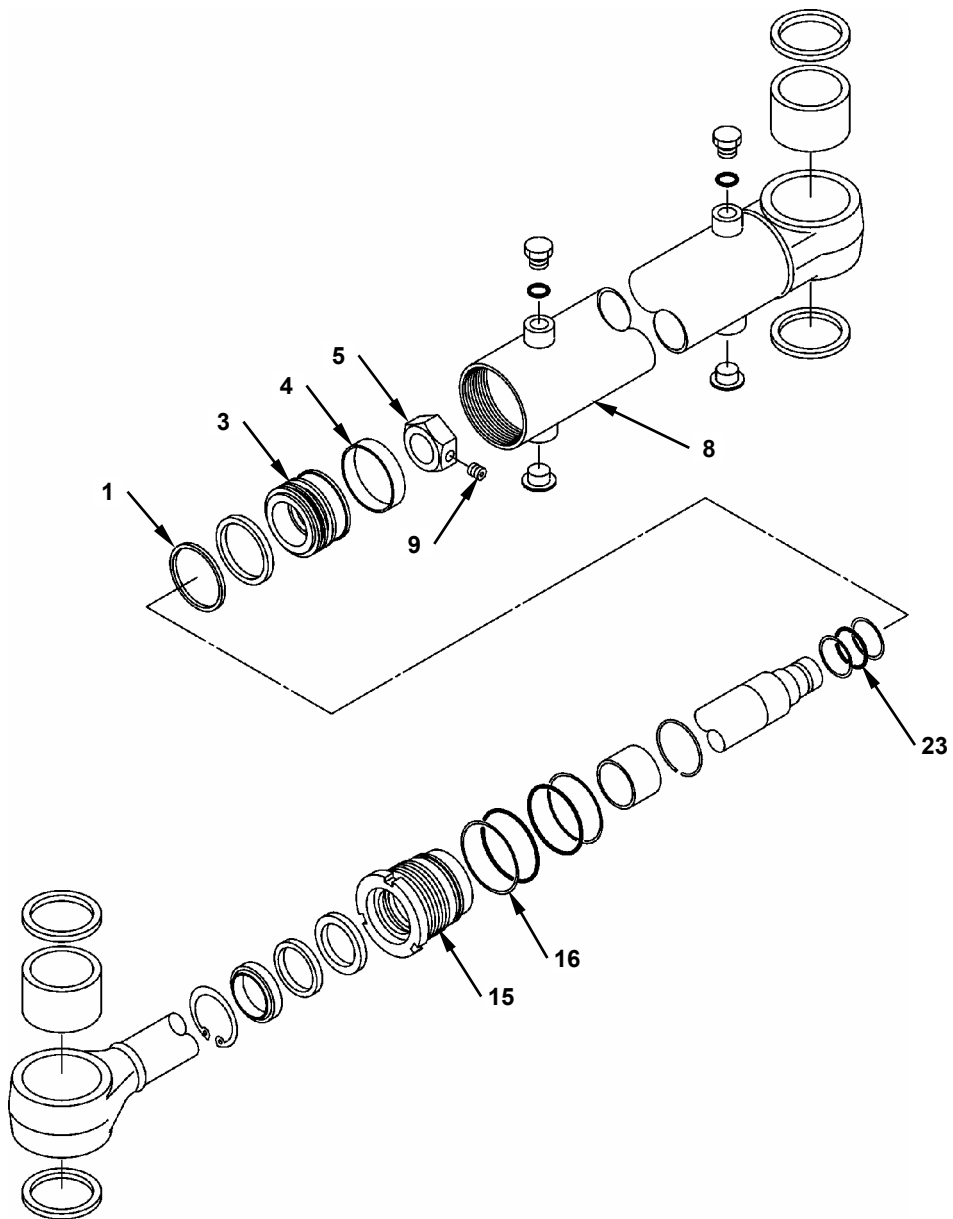
- IMPORTANT:** Wear ring (4) and dust ring (1) are not used until the installation to the cylinder tube (8).  
The figure shows final assembly stage of the piston.

13. Secure piston rod (10) onto a workbench.

**IMPORTANT:** Apply a film of hydraulic oil to special tool and piston rod (10) surface and protect seals.  
Special tool for rod insertion. Refer to W3-9-20.

14. Install rod cover (15) to piston rod (10) by using special tool for rod cover (15) insertion.

# BODY (TRAVEL SYSTEM) / Steering Cylinder



W4GB-03-09-001

## BODY (TRAVEL SYSTEM) / Steering Cylinder


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**IMPORTANT: Apply a film of hydraulic oil to O-ring (23) and thread part of piston (3) bore part.**

**Remove pin after tightening.**


15. Install the pin to the thread hole in the end of piston (3). Install piston (3) to piston rod (10) by using a special tool.

Pin size: Dia. 8 mm, length 25 mm (2 used)

 : 490±49 N·m (50±5 kgf·m, 360±36 lbf·ft)


**IMPORTANT: Apply a film of hydraulic oil onto the thread part of piston nut (5).**


16. Install piston nut (5) by using a special tool.

 : 490±49 N·m (50±5 kgf·m, 360±36 lbf·ft)

**IMPORTANT: Wipe out extruded LOCTITE. Caulk screw holes (2 places) diagonally by using a center punch.**

17. Apply LOCTITE #242 onto the thread part of setscrew (9). Install setscrew (9) to piston nut (5).

 : 4 mm

 : 15±2 N·m (1.5±0.2 kgf·m, 11±1.1 lbf·ft)

18. Place cylinder tube (8) horizontally on a workbench. Secure it by using the parallel surface of cylinder tube (8).


**IMPORTANT: Check if wear ring (4) and dust ring (1) (2 used) are properly seated. Work carefully so that seals do not seize.**

19. Install wear ring (4) and dust ring (1) (2 used) to surface of piston (3). Apply a film of hydraulic oil to the outer piston (3).

20. Hoist the center of gravity part of piston rod (10). Install piston (3) into cylinder tube (8), by moving rod (10) around.

21. Apply a film of hydraulic oil to the thread part of rod cover (15). Install rod cover (15) to cylinder tube (8).

Hook wrench: dia. 84 mm

 : 490±49 N·m (50±5 kgf·m, 360±36 lbf·ft)

22. Bend and secure lock washer (16) of notch of rod cover (15).

## BODY (TRAVEL SYSTEM) / Steering Cylinder

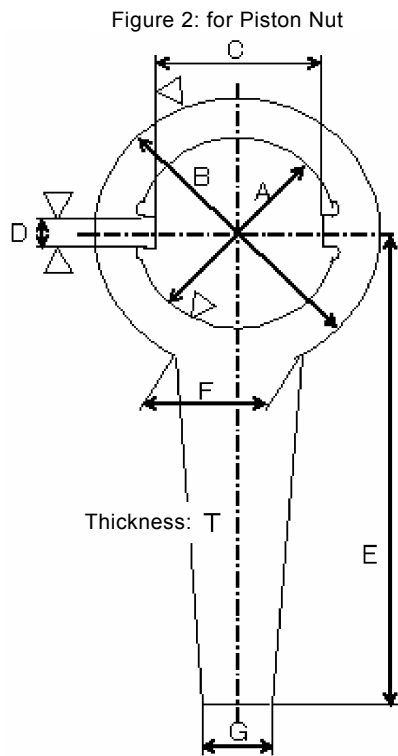
### Special wrench

- For piston nut (5): Refer to figure 2 + table 3
- For piston nut (3): Refer to figure 3 + table 3

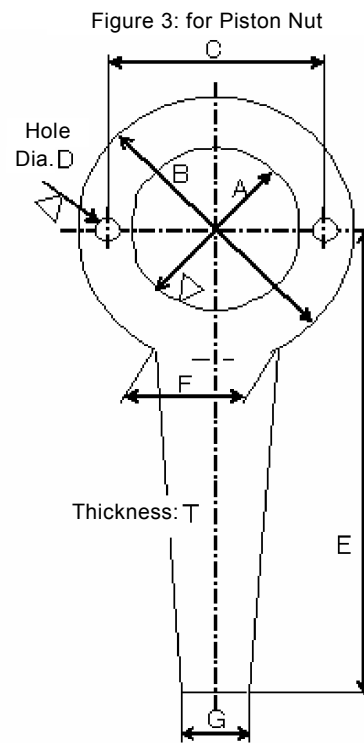
Unit: mm

	Cylinder	A	B	C	D	E	F	G	T	
For piston nut	ZW220 buckets	103	163	93	11	300	70	40	12 to 15	
	ZW250 buckets	113	173	103						
	ZW220 lift arm	99	159	89						
	ZW250 lift arm									
	ZW220, ZW250, Steering	63	113	53	11	250	50	30		Combined bolt
For piston	ZW220 buckets	90	170	130	14	300	70	40	12 to 15	M12×25 (2 used)
	ZW250 buckets									
	ZW220 lift arm	74	126	96	12					M10×20 (2 used)
	ZW250 lift arm									
	ZW220, ZW250, Steering	38	82	52	8.1	250	50	30		pin dia. 8×25

Table 3



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## BODY (TRAVEL SYSTEM) / Steering Cylinder

Special instrument for packing (2) seal ring attachment and reform.

- For special tool for seal ring attachment: Refer to figure 4 + table 4
- For special tool for seal ring reform: Refer to figure 5 + table 4

Unit: mm

	Cylinder	A	B	C	D	E	F	G
For attachment	ZW220 bucket	163±0.1	166±0.1	155	145	18	63	86
	ZW250 bucket							
	ZW220 lift arm	128±0.1	131±0.1	120	110	24	63	92
	ZW250 lift arm							
		ZW220, ZW250, Steering	68±0.1	71±0.1	60	50	15	63
For reform	ZW220 bucket	175	185	167±0.1	46	75	10 to 15	100
	ZW250 bucket							
	ZW220 lift arm	140	150	132±0.1	34	60	10 to 15	100
	ZW250 lift arm							
		ZW220, ZW250, Steering	78	88	72±0.1	34	60	10 to 15

Table 4

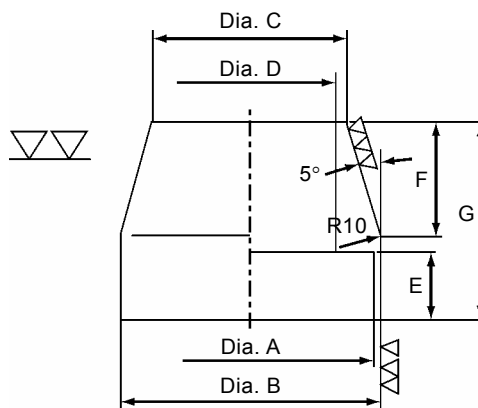


Figure 4: Special Tool for Piston Seal Attaching

W4GB-03-09-006

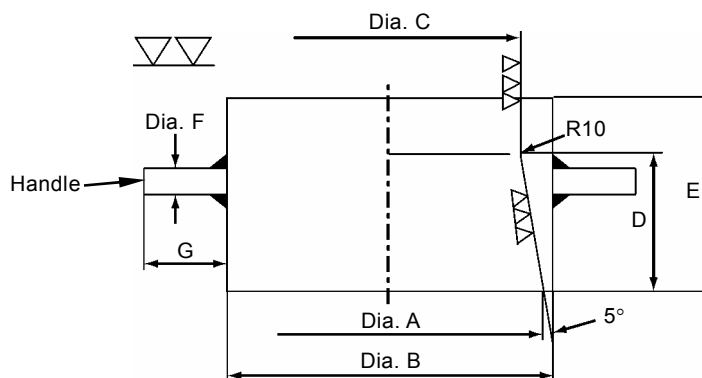


Figure 5: Special Tool for Piston Seal Reforming

W4GB-03-09-007

## BODY (TRAVEL SYSTEM) / Steering Cylinder

5. For special tool for press fitting of pin push (24): Refer to figure 6 + table 5

Unit: mm

Cylinder	Dia. A	Dia. B	Dia. C	Dia. D	E	F	G	H	I
ZW220 bucket	99.5 0 to -0.1	114.5±0.1	135	115	6.5±0.1	55	20	10	85
ZW250 bucket									
ZW220 lift arm	99.5 0 to -0.1	114.5±0.1	135	115	6.5±0.1	55	20	10	85
ZW250 lift arm									85
ZW220, ZW250, Steering	59.5 0 to 0.1	74.5±0.1	90	75	5±0.1				85

Table 5

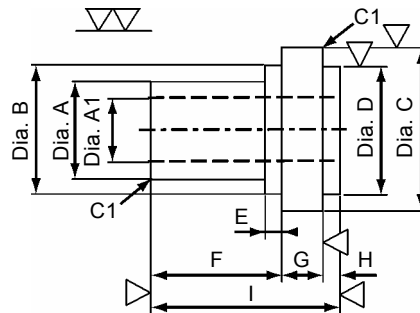


Figure 6: Special Tool for Press Fitting of Pin Bushing

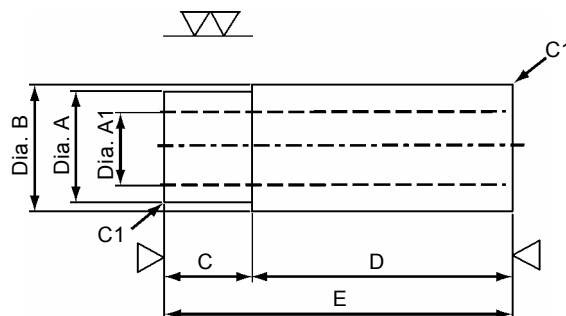
W4GB-03-09-008

6. Special tool for press fitting of rod bushing (20): Refer to figure 7 + table 6

Unit: mm

Cylinder	A	B	C	D	E
ZW220 bucket	95 0 to 0.1	99.8±0.1	30	40	70
ZW250 bucket	100 0 to 0.1	104.8±0.1			
ZW220 lift arm	85 0 to 0.1	89.8±0.1	30	20	50
ZW250 lift arm					
ZW220, ZW250, Steering	45 0 to 0.1	49.8±0.1	25	25	50

Table 6



Bore: dia. A, = dia. A-20  
(There may not be a hole of dia. A)

Figure 7: Special Tool for Press Fitting of Rod Bushing

W4GB-03-09-009

## BODY (TRAVEL SYSTEM) / Steering Cylinder

7. For special tool for press fitting of dust seal (12): Refer to figure 8 + table 7

Unit: mm

Cylinder	A	B	C	D	E	F	G	H	I	J
ZW220 bucket	100	103	108	128	80	5	5	15	5	25
ZW250 bucket	105	108	113	133						
ZW220 lift arm	90	93	98	118	80	5	5	15	5	25
ZW250 lift arm										
ZW220, ZW250, Steering	49	52	56	76	60	5	3.5	15	5	23.5

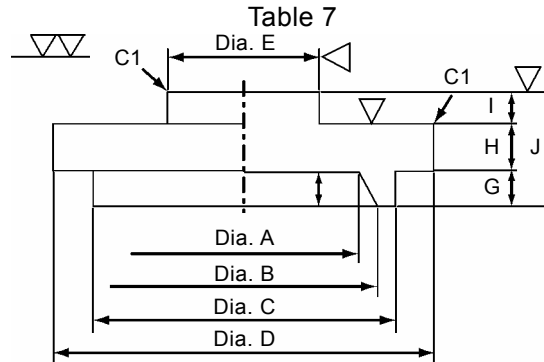


Figure 8: Special Tool for Press Fitting of Dust Seal

W4GB-03-09-010

8. Special tool for press fitting of rod cover (15): Refer to figure 9 + table 8

Unit: mm

Cylinder	A	B	C	D	E	F	G
ZW220 bucket	75.5	90	90.3±0.1	95 <sub>0 to 0.1</sub>	62	28.5	125
ZW250 bucket	85.5	95	95.3±0.1	100 <sub>0 to 0.1</sub>			
ZW220 lift arm	70.5	80	80.3±0.1	85 <sub>0 to 0.1</sub>	42	28.5	90
ZW250 lift arm							
ZW220, ZW250, Steering	35.5	40	42.3±0.1	45 <sub>0 to 0.1</sub>	31		80

Table 8

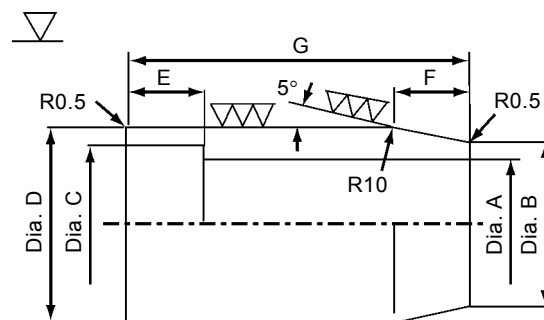


Figure 9: Special Tool for Press Fitting of Rod Cover

W4GB-03-09-011

## **BODY (TRAVEL SYSTEM) / Steering Cylinder**

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## BODY (TRAVEL SYSTEM) / Parking Brake Solenoid

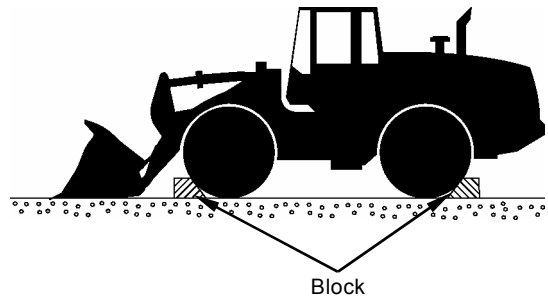
### REMOVAL AND INSTALLATION OF PARKING BRAKE SOLENOID VALVE

**CAUTION:** Bleed air from the hydraulic oil tank before doing any work. (Refer to BLEED AIR FROM HYDRAULIC OIL TANK on W1-4-1.)

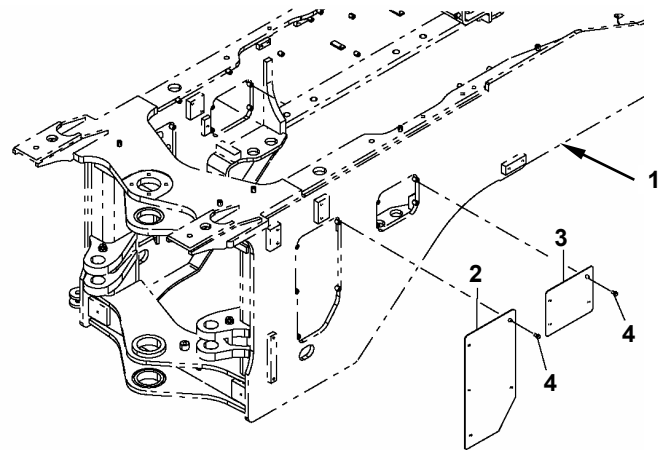
**CAUTION:** Secure front and rear tires with blocks so that the body does not move. Do not stand in front and rear of the body.

#### Removal

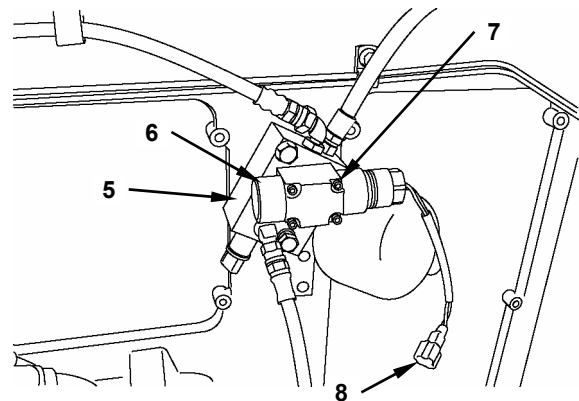
1. Release service brake pressure by stopping the engine and pumping the brake pedal until it becomes light.
2. Without starting the engine, turn the key switch ON→OFF. While the 10 seconds of the main power shutdown, push the brake switch ON↔OFF repeatedly about 100 times and release service brake pressure.
3. Remove sems bolts (4) (9 used) from covers (2, 3). Remove covers (2, 3) from rear frame (1).  
 : 14 mm
4. Disconnect connector (8). Remove socket bolts (7) (4 used) from solenoid valve (6). Remove solenoid valve (6) from block (5).  
 : 4 mm



T4GB-04-05-017



W4GB-03-10-001





W4GB-03-10-002

## BODY (TRAVEL SYSTEM) / Parking Brake Solenoid


### Installation


1. Install solenoid valve (6) to block (5) with socket bolts (7) (4 used). Connect connector (8).

 : 4 mm

 : 5 N·m (0.5 kgf·m, 4 lbf·ft)

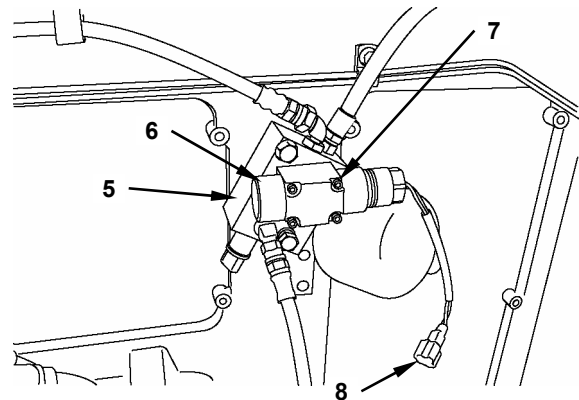
2. Install covers (2, 3) to rear frame (1) with semi bolts (4) (9 used).

 : 14 mm

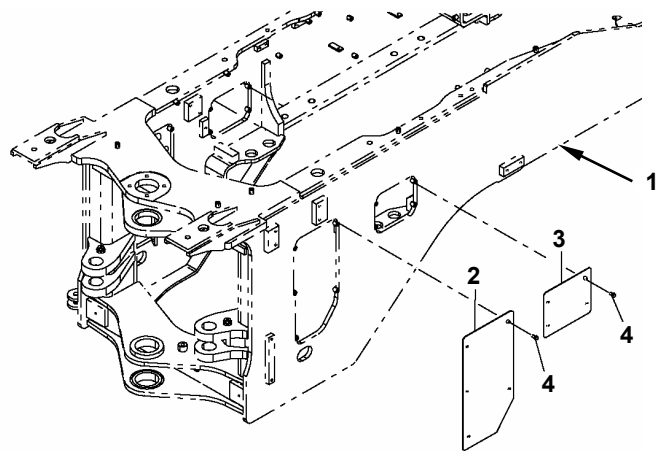
 : 20 N·m (2 kgf·m, 15 lbf·ft)



**CAUTION: Bleed air from service brake circuit after installation. (Refer to T5-6 troubleshooting B)**



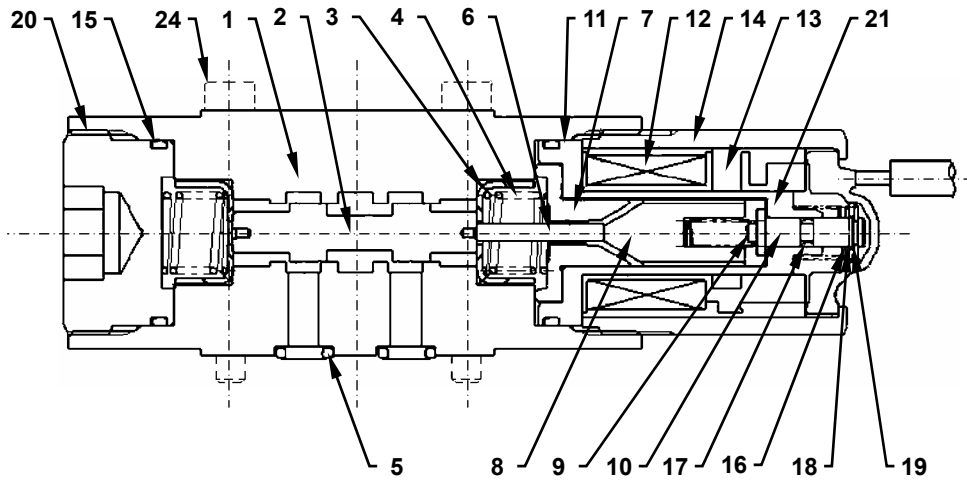
W4GB-03-10-002



W4GB-03-10-001

## BODY (TRAVEL SYSTEM) / Parking Brake Solenoid

### CONSTRUCTION OF SOLENOID VALVE



W4GB-03-10-003

**IMPORTANT:** The solenoid valve is susceptible to contamination. Clean each part before assembly.  
**IMPORTANT:** Apply adhesive (LOCTITE #242) to the thread part of screw (14).

Item	Part Name	Quantity	Wrench Size (mm)	Tightening Torque		
				N·m	(kgf·m)	(lbf·ft)
01	Housing	1				
02	Spool	1				
03	Spring Seat	2				
04	Spring	2				
05	O-Ring	4				
06	Rod	1				
07	Stopper	1				
08	Plunger	1				
09	Spring	1				
10	Rod	1				
11	Inner Housing	1				
12	Coil	1				
13	Spacer	1				
14	Screw	1	: 32	30 to 39	(3 to 4)	(22 to 29)
15	O-Ring	2				
16	Spring	1				
17	O-Ring	1				
18	Washer	1				
19	Retaining Ring	1				
20	Plug	1	: 14	30 to 39	(3 to 4)	(22 to 29)
21	Pipe	1				
24	Socket Bolt	4				

## **BODY (TRAVEL SYSTEM) / Parking Brake Solenoid**

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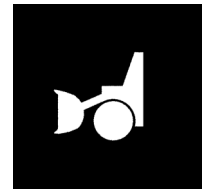




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# SECTION 4 FRONT ATTACHMENT



## — CONTENTS —

### **Group 1 Front Attachment**

Removal and Installation of  
Front Attachment..... W4-1-1

### **Group 2 Cylinder**

Removal and Installation of Cylinder  
(Lift Cylinder) ..... W4-2-1

Removal and Installation of Cylinder  
(Bucket Cylinder) ..... W4-2-6

Disassembly of Bucket Cylinder ..... W4-2-10

Assembly of Bucket Cylinder ..... W4-2-18

Disassembly of Lift Cylinder ..... W4-2-28

Assembly of Lift Cylinder ..... W4-2-36

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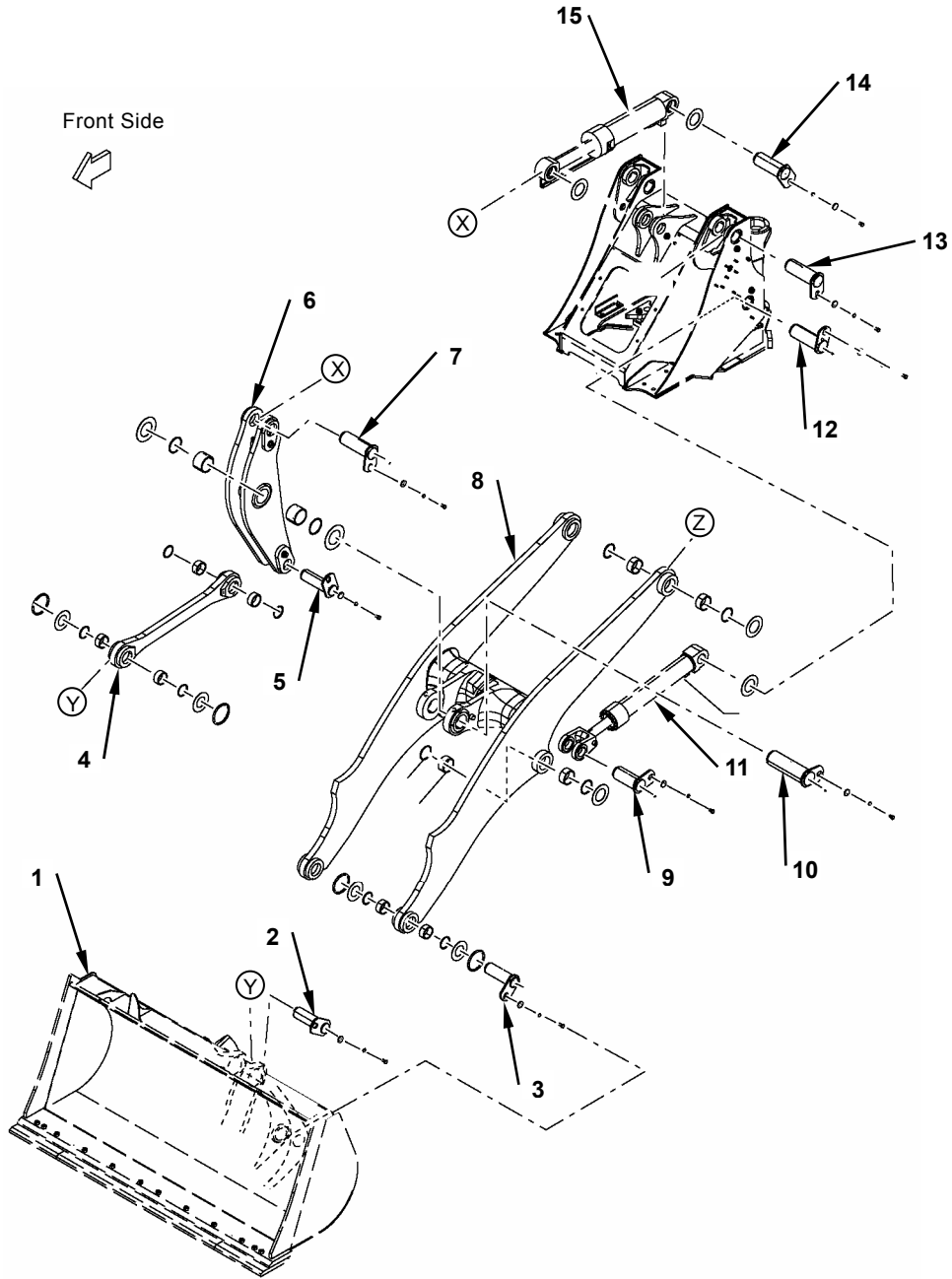
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# FRONT ATTACHMENT / Front Attachment

## REMOVAL AND INSTALLATION OF FRONT ATTACHMENT



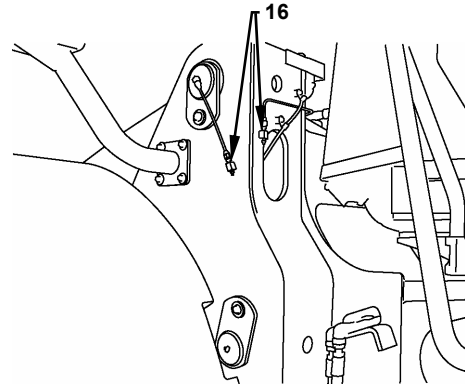
W4GB-04-01-001

- |                  |                |                                 |                      |
|------------------|----------------|---------------------------------|----------------------|
| 1 - Bucket       | 5 - Pin        | 9 - Pin (2 Used)                | 13 - Pin             |
| 2 - Pin          | 6 - Bell crank | 10 - Pin                        | 14 - Pin             |
| 3 - Pin (2 Used) | 7 - Pin        | 11 - Lift Arm Cylinder (2 Used) | 15 - Bucket Cylinder |
| 4 - Bucket Link  | 8 - Lift Arm   | 12 - Pin                        |                      |

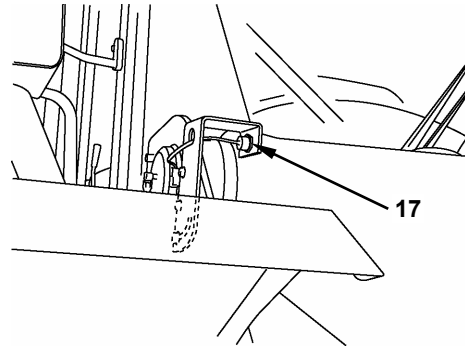
## FRONT ATTACHMENT / Front Attachment

### Preparation:

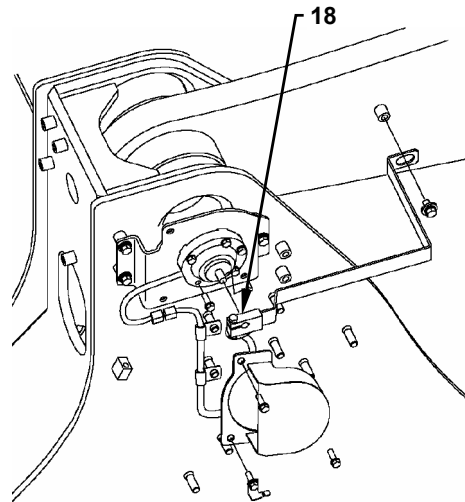
- Remove remote piping (16) of the grease fitting in the front attachment.
- Remove lift arm proximity switch (17).
- Remove angle sensor (18) from the body with the lift arm auto leveler.
- Remove the electrical harness of the proximity switch and the lift arm auto leveler.



W4GB-04-01-020



W4GB-04-01-021



W4GB-04-01-019


## FRONT ATTACHMENT / Front Attachment

### Removal

**CAUTION:** When a hammer is used, metal fragments may fly off and result in personal injury. Wear protection goggle and hard hats.


**IMPORTANT:** Stop the engine with the bucket contacting horizontally with the solid and level ground. Put a wheel stopper on the front tire.

1. Move the bucket lever forward/backward and release the remaining pressure in bucket cylinder (15).
2. Release the remaining pressure in lift arm cylinder (11) in the same way.
3. Remove the set bolt for the pin between bucket (1) and bucket link (4). Remove pin (2) from bucket (1).

 : 24 mm

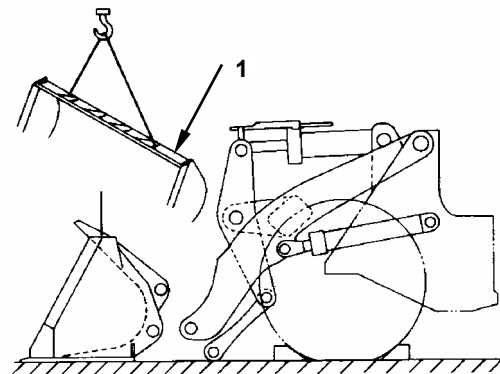
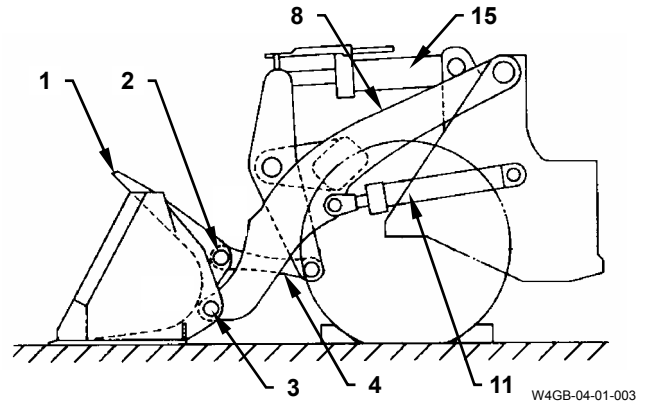
**NOTE:** When removing left and right joint pins (3), remove one pin with the other pin removing half and then remove the other pin.

4. Remove the set bolts (2 used) for the pin between bucket (1) and lift arm (8). Remove left and right pins (3) from bucket (1).

 : 24 mm

**CAUTION: Bucket (1) weight:**  
ZW220: 1500 kg (3400 lb)  
(3.1 m<sup>3</sup> (4.06 yd<sup>3</sup>) bolt on cutting edges)  
ZW250: 1800 kg (4000 lb)  
(3.4 m<sup>3</sup> (4.45 yd<sup>3</sup>) bolt on cutting edges)


5. Attach a wire rope onto the spill guard of bucket (1) and hoist the bucket.



## FRONT ATTACHMENT / Front Attachment

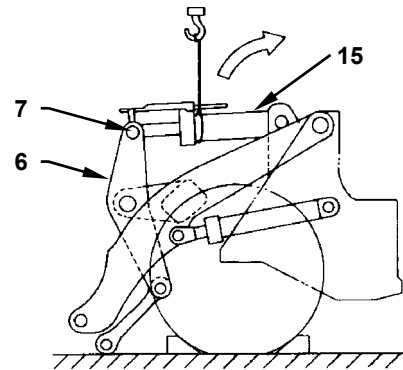
6. Attach a nylon sling onto the cap part of bucket cylinder (15). Hoist and hold bucket cylinder (15).

7. Remove the set bolt for the pin between the bucket cylinder (15) rod and bellcrank (6). Remove pin (7) from the bellcrank.

 : 24 mm


8. Lay down bucket cylinder (15) to the cab side.


9. Insert pin (7) into the upper pinhole on bellcrank (6). Attach a wire rope onto the pin. Hoist and hold the bellcrank.

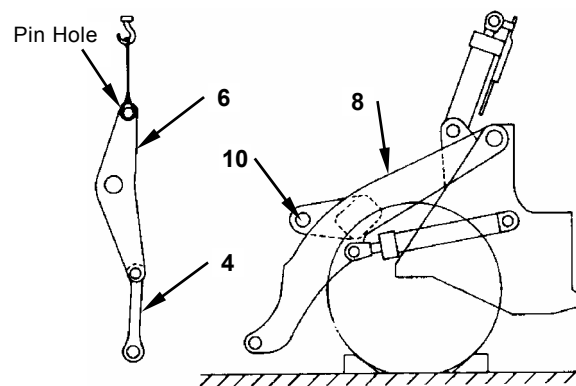


W4GB-04-01-005

10. Remove the set bolt for the pin between lift arm (8) and the bellcrank (6). Remove pin (10) from bellcrank (6).

 : 24 mm

 **CAUTION: Bellcrank (6) weight:**  
ZW220 : 300 kg (670 lb)  
ZW250 : 330 kg (730 lb)  
**Bucket link (4) weight:**  
ZW220 : 60 kg (140 lb)  
ZW250 : 70 kg (150 lb)




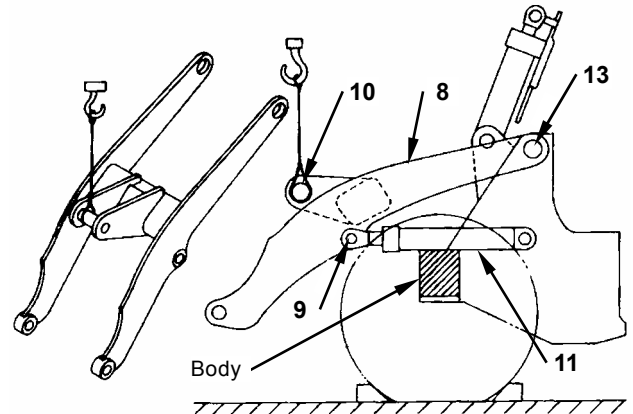
W4GB-04-01-006

11. Hoist bellcrank (6) with bucket link (4). Remove them from the lift arm (8).

## FRONT ATTACHMENT / Front Attachment


12. Insert pin (10) into the pin hole on lift arm (8) for supporting the bellcrank. Attach a wire rope on pin (10).
13. Hoist lift arm (8) in order to raise lift arm cylinder (11) to a horizontal position.
14. Place the body under horizontal lift arm cylinder (11). Lower lift arm cylinders (left and right) (11) on the body.


 **NOTE:** When removing left and right joint pins (9), remove one pin with the other pin removing half and then remove the other pin.




W4GB-04-01-007

15. Remove the set bolt for pin (9) between lift arm (8) and lift arm cylinder (11). Remove left and right pins (9) from lift arm (8).

 : 24 mm

 **CAUTION: Lift Arm (8) weight:**  
**ZW220: 1150 kg (2600 lb)**  
**ZW250: 1400 kg (3100 lb)**

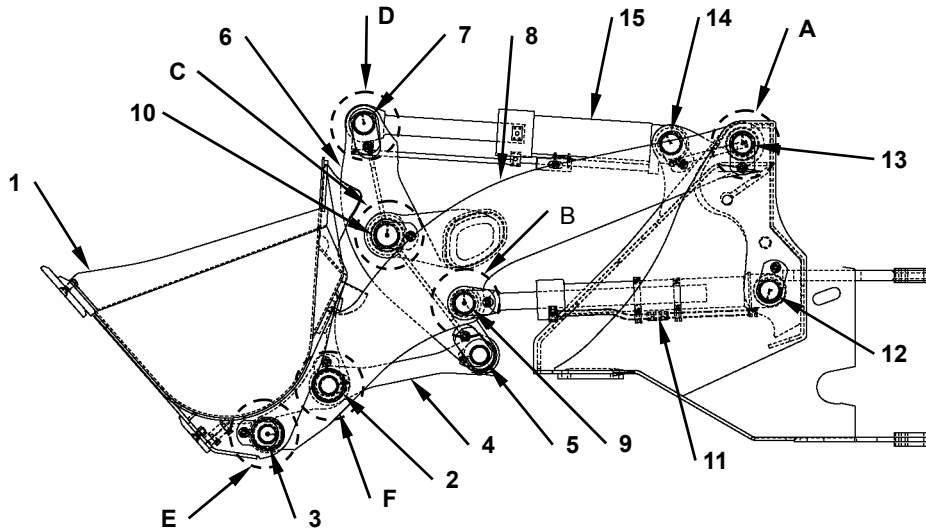
16. Remove the set bolt for pin (13) of lift arm (8) from the front frame. Remove left and right pins (13) from lift arm (8).

 : 24 mm

17. Attach a wire rope onto lift arm (8). Hoist and remove lift arm (8) from the front frame.

# FRONT ATTACHMENT / Front Attachment

## Installation



W4GB-04-01-008

- |                  |               |                                 |                      |
|------------------|---------------|---------------------------------|----------------------|
| 1 - Bucket       | 5 - Pin       | 9 - Pin (2 Used)                | 13 - Pin             |
| 2 - Pin          | 6 - Bellcrank | 10 - Pin                        | 14 - Pin             |
| 3 - Pin (2 Used) | 7 - Pin       | 11 - Lift Arm Cylinder (2 Used) | 15 - Bucket Cylinder |
| 4 - Bucket Link  | 8 - Lift Arm  | 12 - Pin                        |                      |

**CAUTION:** When a hammer is used, metal fragments may fly off and result in personal injury. Wear protection goggle and hard hats.

**IMPORTANT:** Before installing all pins and bushings, check ID, OD, wear, and damage. If any damage is found, replace the part. (Refer to Section 4 OPERATIONAL PERFORMANCE TEST/Adjustment in Technical Manual)

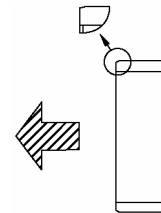
**IMPORTANT:** Check pin holes and bosses. If wear or damage is found, replace boss.

**IMPORTANT:** If any deformation or bending or crack is found in lift arm (8), bellcrank (6), bucket link (4), and bucket (1), replace the part.

**IMPORTANT:** When inserting the pin, apply grease onto the inner surfaces of bushing and dust seal.

Apply rust prevention oil onto the inner surface of boss.

**IMPORTANT:** Insert bushing as shown in the following figure.



W4GB-04-01-018

**CAUTION:** Align the pin holes by using a bar. Do not insert your fingers into the hole.

## FRONT ATTACHMENT / Front Attachment

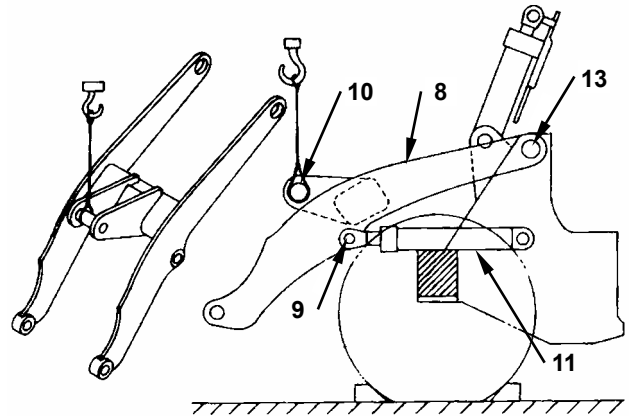


**CAUTION: Lift Arm (8) weight:**

**ZW220 : 1150 kg (2600 lb)**

**ZW250 : 1400 kg (3100 lb)**

1. Hoist and place lift arm (8) onto the mounting position on the front frame.





W4GB-04-01-007

2. The connection part between front frame and lift arm: A

Press fit bushing (21) into the center of the boss. Apply grease onto the lip part of seal (20). Press fit seal (20) into both side of the bushing.

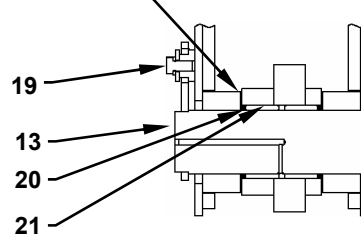
Apply grease and insert pin (13). Install the spring washer, washer and bolt (19).

 : 24 mm

 : 87 N·m (9 kgf·m, 64 lbf·ft)

(The connection part between front frame and lift arm pin: A)

Spacer (Maximum clearance is 1.5 mm (0.06 in) or less)




W4GB-04-01-009


3. Hoist and place lift arm (8) onto the mounting position on lift arm cylinder (11).

4. The connection part between lift arm and lift arm cylinder: B

Press fit bushing (24) into the center of the boss. Apply grease onto the lip part of dust seal (23). Press fit dust seal (23) into both side of the bushing.

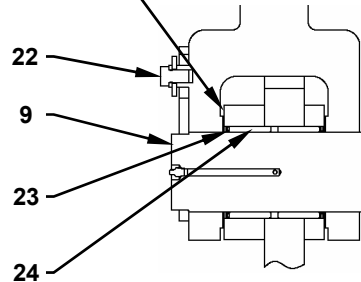
Apply grease and insert pin (9). Install the spring washer, washer and bolt (22).

 : 24 mm

 : 87 N·m (9 kgf·m, 64 lbf·ft)

(The connection part between lift arm and lift arm cylinder: B)

Spacer (Maximum clearance is 1.5 mm (0.06 in) or less)



W4GB-04-01-010

## FRONT ATTACHMENT / Front Attachment



**CAUTION: Bellcrank (6) weight:**

**ZW220: 300 kg (665 lb)**

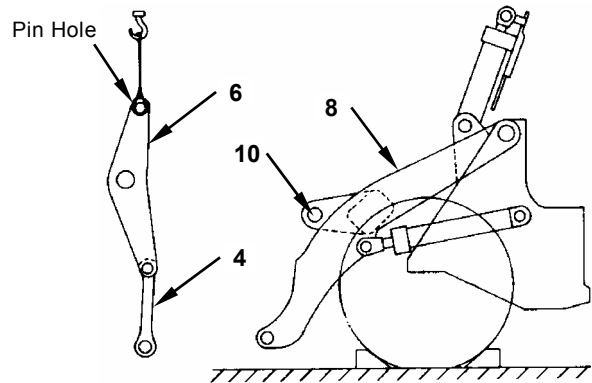
**ZW250: 330 kg (730 lb)**

**Bucket link (4) weight:**

**ZW220: 60 kg (135 lb)**

**ZW250: 70 kg (150 lb)**

5. Hoist and place bellcrank (6) and the bucket link (4) sub-assy onto the mounting position on lift arm (8).




W4GB-04-01-006


6. The connection part between lift arm and bellcrank pin: C

Press fit bushing (27) into the center of the boss.

Apply grease onto the lip part of dust seal (26). Press fit dust seal (26) into both side of the bushing.

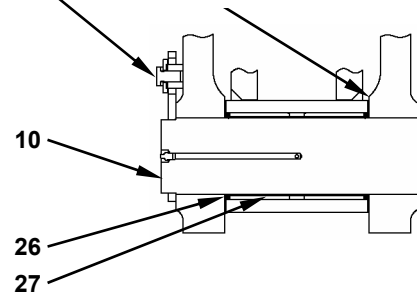
Apply grease and insert pin (10). Install the spring washer, washer and bolt (25).

 : 24 mm

 : 87 N·m (9 kgf·m, 64 lbf·ft)

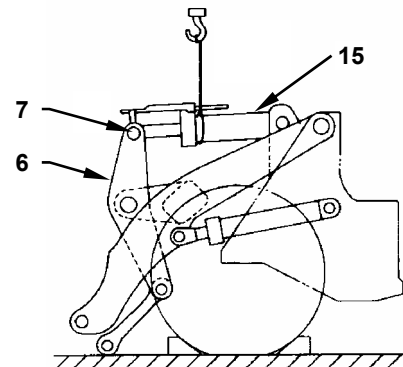
(The connection part between lift arm and bellcrank pin: C)

25 Spacer (Maximum clearance is 1.5 mm (0.06 in) or less)



W4GB-04-01-011

7. Attach a nylon sling to the cap part of bucket cylinder (15). Hoist and place the bucket cylinder onto the mounting position on bellcrank (6).





W4GB-04-01-005

8. The connection part between bellcrank and bucket cylinder: D

Press fit bushing (30) into the center of the boss. Apply grease onto the lip part of dust seal (29). Press fit dust seal (29) into the both side of the bushing.

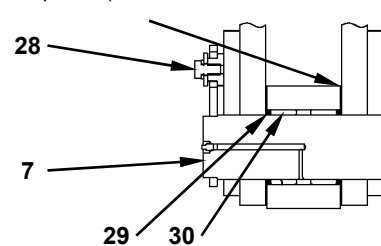
Apply grease and insert pin (7). Install the spring washer, washer and bolt (28).

 : 24 mm

 : 87 N·m (9 kgf·m, 64 lbf·ft)

(The connection part between bellcrank and bucket cylinder: D)

Spacer (Maximum clearance is 1.5 mm (0.06 in) or less)



W4GB-04-01-012



## FRONT ATTACHMENT / Front Attachment

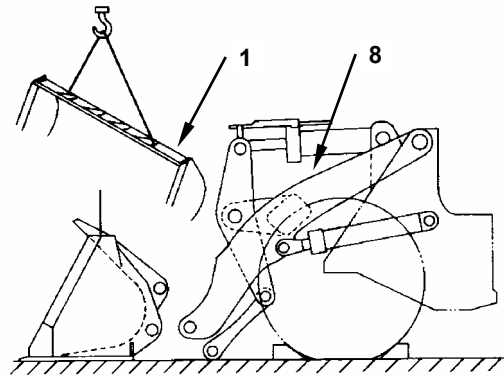


**CAUTION: Bucket (1) weight:**

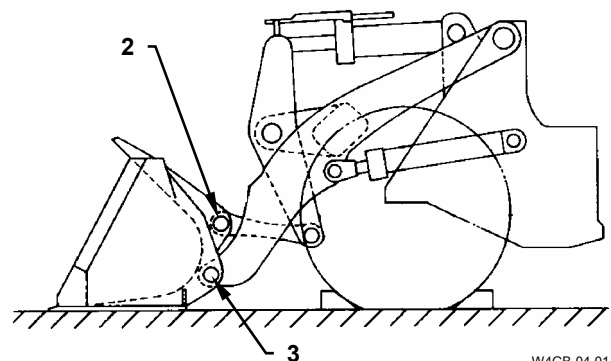
**ZW220 : 1500 kg (3350 lb)**  
**(3.1 m<sup>3</sup> (4.06 yd<sup>3</sup>) bolt on cutting edges)**

**ZW250 : 1800 kg (4000 lb)**  
**(3.4 m<sup>3</sup> (4.45 yd<sup>3</sup>) bolt on cutting edges)**

9. Attach a nylon sling to the spill guard part of bucket (1). Hoist, and place the bucket onto the mounting position on lift arm (8).



W4GB-04-01-004





W4GB-04-01-003

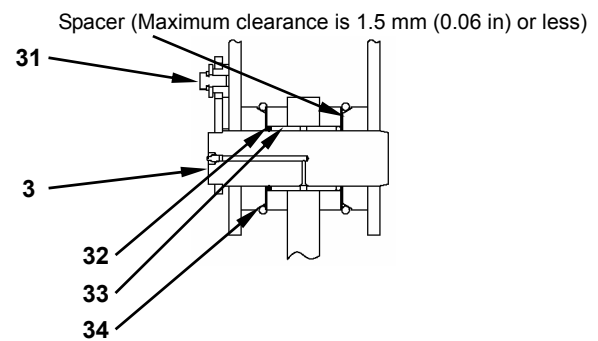
(The connection part between bucket and lift arm: E)

10. The connection part between bucket and lift arm:  
 E

Press fit bushing (33) into the center of the boss. Apply grease onto the lip part of dust seal (32). Press fit dust seal (32) with O-ring (34) into both side of the bushing. Apply grease and insert pin (3). Install the spring washer, washer and bolt (31).

 : 24 mm


 : 87 N·m (9 kgf·m, 64 lbf·ft)




W4GB-04-01-013

11. The connection part between bucket and bucket link:  
 F

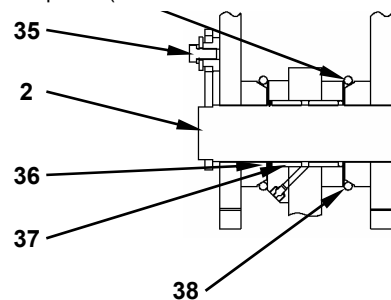
Press fit bushing (37) into the center of the boss. Apply grease onto the lip part of dust seal (36). Press fit dust seal (36) with O-ring (38) into both side of bushing. Apply grease and insert pin (2). Install the spring washer, washer and bolt (35).

 : 24 mm

 : 87 N·m (9 kgf·m, 64 lbf·ft)

(The connection part between bucket and bucket link: F)

Spacer (Maximum clearance is 1.5 mm (0.06 in) or less)



W4GB-04-01-014


## FRONT ATTACHMENT / Front Attachment


### 12. The connection part between bucket link and bellcrank

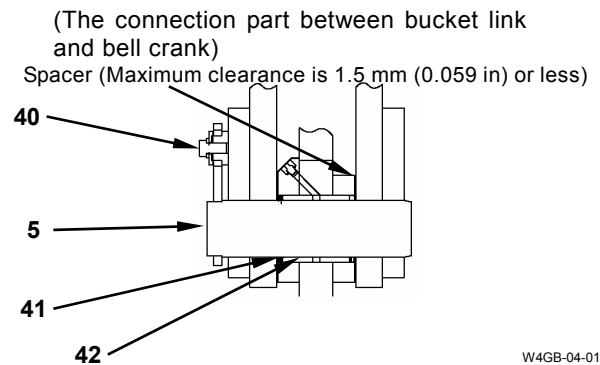
The connection part between front frame and bucket cylinder

The connection part between front frame and lift arm cylinder

Press fit bushings (42, 45, 48) into the center of the boss. Apply grease onto the lip part of dust seals (41, 44, 47). Press fit dust seals (41, 44, 47) into both sides of the bushing. Apply grease and insert pins (5, 12, 14). Install the spring washer, washer and bolts (40, 43, 46).

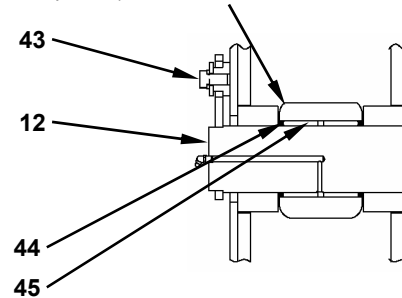
 : 24 mm

 : 87 N·m (9 kgf·m, 64 lbf·ft)

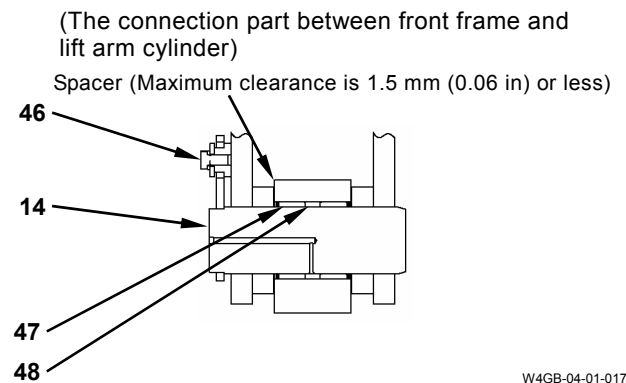


(The connection part between front frame and bucket cylinder)

Spacer (Maximum clearance is 1.5 mm (0.06 in) or less)



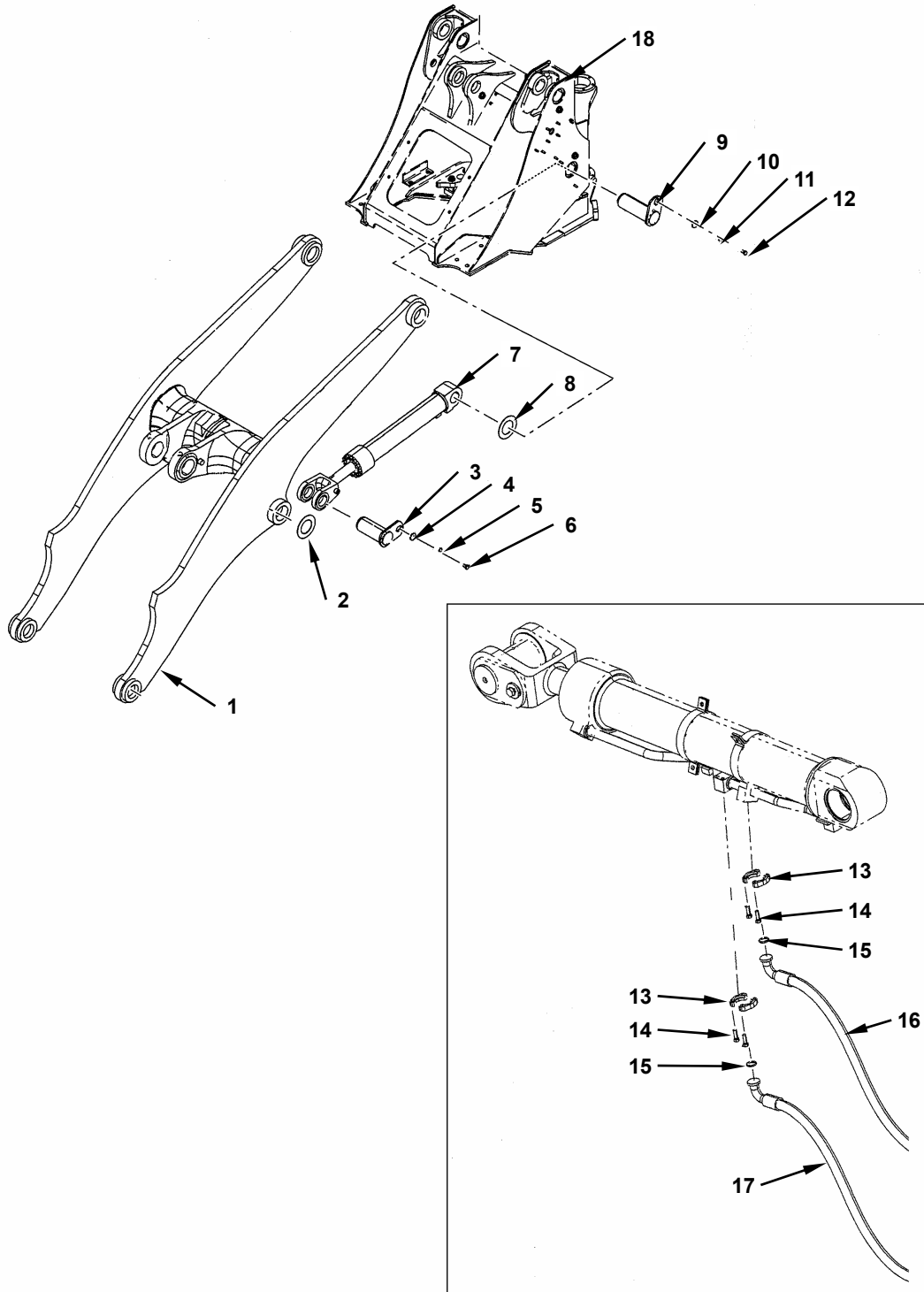
### 13. After installation, grease up from each grease fitting. Install the remote piping of the removed grease fitting, the electrical harness, and the switch.



# FRONT ATTACHMENT / Cylinder

## REMOVAL AND INSTALLATION OF CYLINDER

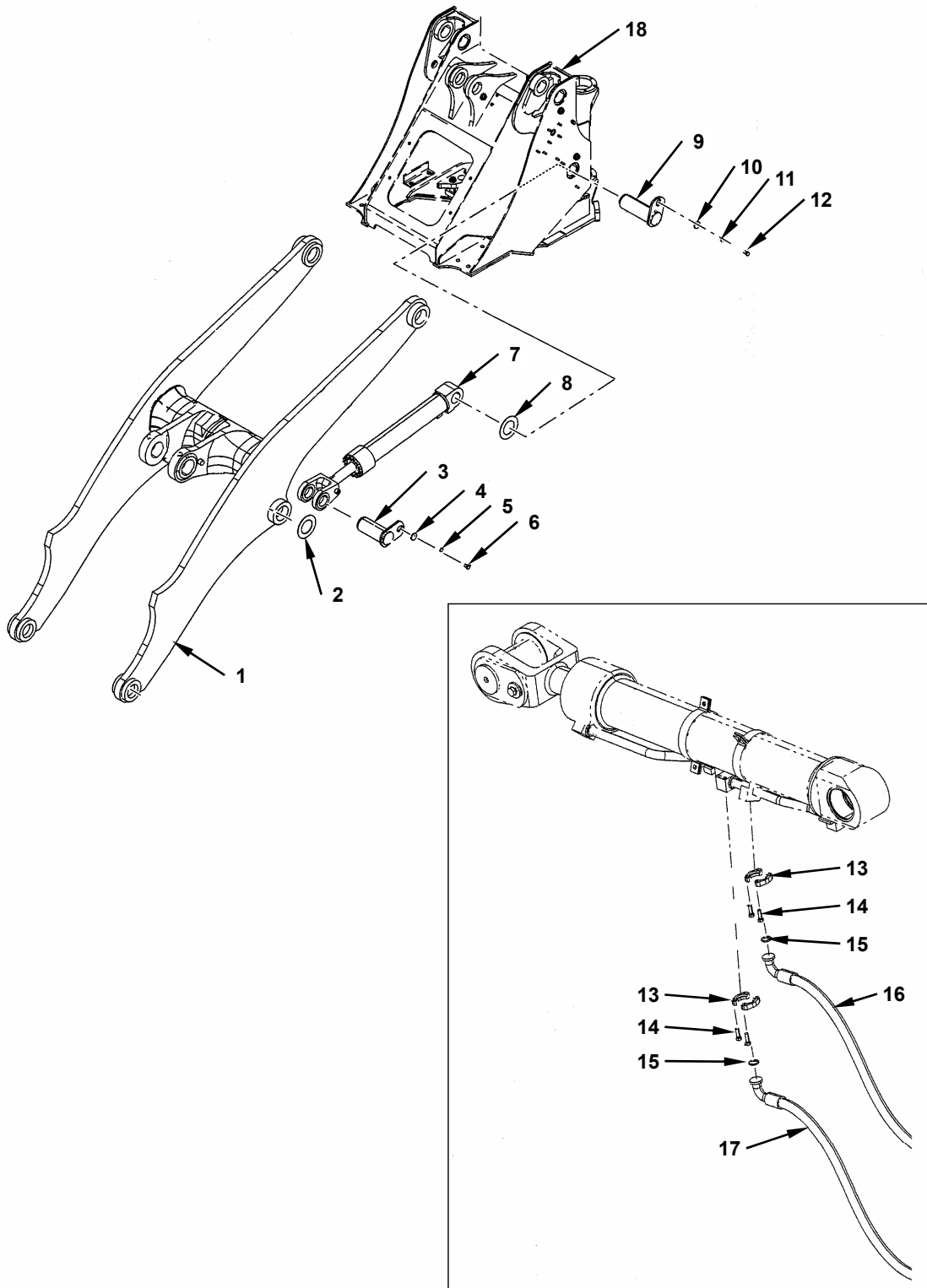
### Lift Cylinder



- |                            |                            |                             |                    |
|----------------------------|----------------------------|-----------------------------|--------------------|
| 1 - Boom                   | 6 - Bolt (2 Used)          | 11 - Spring Washer (2 Used) | 16 - Hose (2 Used) |
| 2 - Spacer (2 Used)        | 7 - Lift Cylinder (2 Used) | 12 - Bolt (2 Used)          | 17 - Hose (2 Used) |
| 3 - Pin (2 Used)           | 8 - Spacer (2 Used)        | 13 - Split Flange (8 Used)  | 18 - Front Frame   |
| 4 - Washer (2 Used)        | 9 - Pin (2 Used)           | 14 - Socket Bolt (16 Used)  |                    |
| 5 - Spring Washer (2 Used) | 10 - Washer (2 Used)       | 15 - O-Ring (4 Used)        |                    |

W4GB-04-02-031

# FRONT ATTACHMENT / Cylinder



W4GB-04-02-031

## FRONT ATTACHMENT / Cylinder

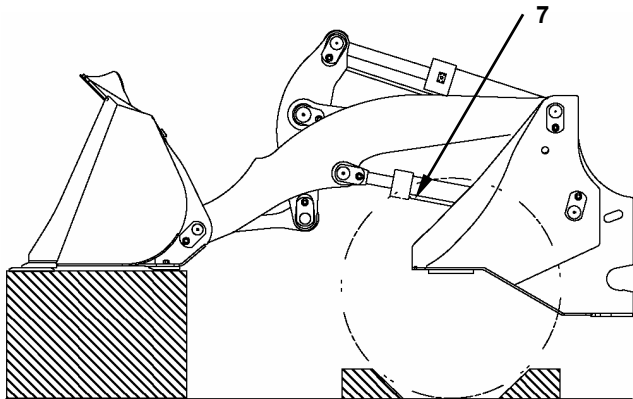
### Removal and Installation of Lift Cylinder

#### Removal

**CAUTION:** Bleed air from hydraulic oil tank before doing any work (Refer to **BLEED AIR FROM HYDRAULIC OIL TANK** on W1-4-1.).


**CAUTION:** Lift cylinder (7) weight:  
ZW220: 170 kg (370 lb)  
ZW250: 190 kg (420 lb)

1. Place and hold the bucket on the support with a height of 500 to 800 mm. (20 to 32 in)
2. Put the wheel stopper and stop the engine.
3. Attach a nylon sling onto the rod side and the bottom side of lift cylinders (7) (2 used). Lift and hold the lift cylinder.




W4GB-04-02-032


4. Remove socket bolts (14) (16 used) from split flanges (13) (8 used). Remove split flanges (13) (8 used) and O-rings (15) (4 used) from lift cylinders (7) (2 used). Remove hoses (16 and 17) (2 used for each) from lift cylinders (7) (2 used). Cap the open ends.

 : 14 mm

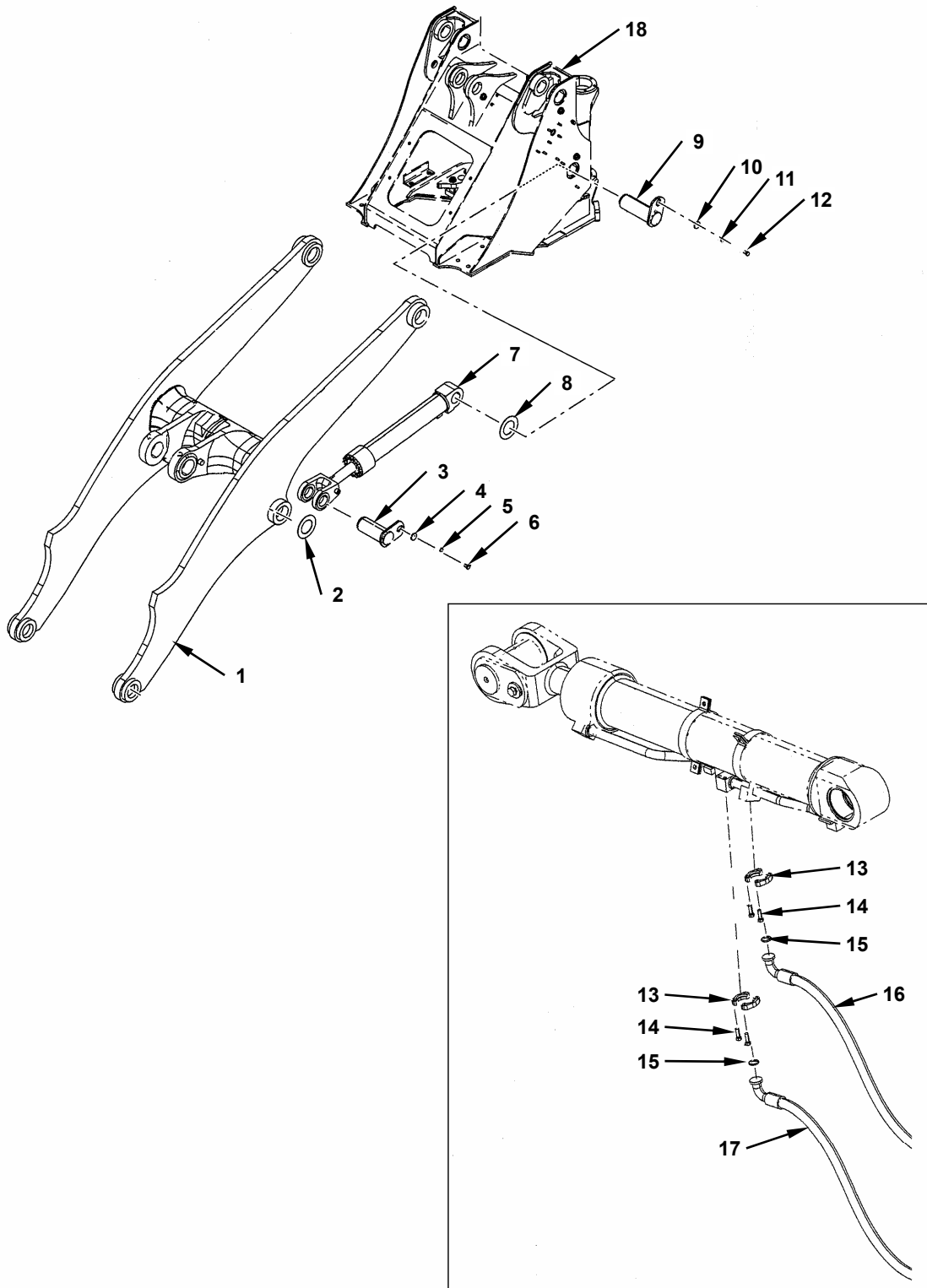
**IMPORTANT:** Place oil pan directly below the connection part of the hose.

5. Remove bolts (6) (2 used), spring washers (5) (2 used) and washers (4) (2 used) from pins (3) (2 used).

 : 24 mm

6. Remove pins (3) (2 used) from lift cylinder (7).
  7. Remove bolts (12) (2 used), spring washers (11) (2 used) and washers (10) (2 used) from pins (9) (2 used).
-  : 24 mm
8. Remove pins (9) (2 used) from front frame (18).
  9. Remove lift cylinders (7) (2 used) and spacers (2 and 8) (2 used for each) from boom (1) and front frame (18).

# FRONT ATTACHMENT / Cylinder



W4GB-04-02-031

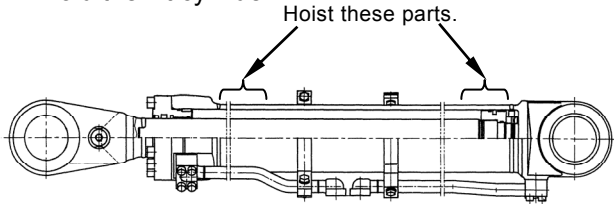
## FRONT ATTACHMENT / Cylinder

### Installation



**CAUTION: Lift cylinder (7) weight:**  
**ZW220: 170 kg (370 lb)**  
**ZW250: 190 kg (420 lb)**



1. Attach a nylon sling onto the rod side and the bottom side of lift cylinders (7) (2 used). Lift and hold the lift cylinder.




W4GB-04-02-033


2. Align the bottom side of lift cylinders (7) (2 used) with the mounting hole on front frame (18).

**IMPORTANT: Spacer (8) thickness: 2.3 mm (0.091 in)**


3. Align the hole on the bottom side of lift cylinders (7) (2 used) with the pin hole on front frame (18). Install spacers (8) (2 used).
4. Apply a film of grease on the outer side of pins (9) (2 used). Install pins (9) (2 used) and lock the bottom sides of lift cylinders (7) (2 used) on front frame (18).
5. Lock pins (9) (2 used) on front frame (18) with washers (10) (2 used), spring washers (11) (2 used) and bolts (12) (2 used).  
 : 24 mm  
 : 210 N·m (22 kgf·m, 155 lbf·ft)


6. Install O-rings (15) (2 used) to hoses (16) (2 used). Connect hoses (16) (2 used) to lift cylinders (7) (2 used) with split flanges (13) (4 used) and socket bolts (14) (8 used).

 : 14 mm

 : 210 N·m (22 kgf·m, 155 lbf·ft)

7. Install O-rings (15) (2 used) to hoses (17) (2 used). Connect hoses (17) (2 used) to lift cylinders (7) (2 used) with split flanges (13) (4 used) and socket bolts (14) (8 used).


 : 14 mm


 : 210 N·m (22 kgf·m, 155 lbf·ft)

8. Start the engine and extend the piston rods of lift cylinders (7) (2 used). Align the lift cylinders with the pin holes of boom (1).

**IMPORTANT: Spacer (2) thickness: 2.3 mm (0.091 in)**

9. Insert spacers (2) (2 used) between boom (1) and the rod ends. Apply a film of grease on the outer side of pins (3) (2 used). Install pins (3) (2 used) to lift cylinders (7) (2 used).
10. Lock pins (3) (2 used) on lift cylinders (7) (2 used) with washers (4) (2 used), spring washers (5) (2 used) and bolts (6) (2 used).

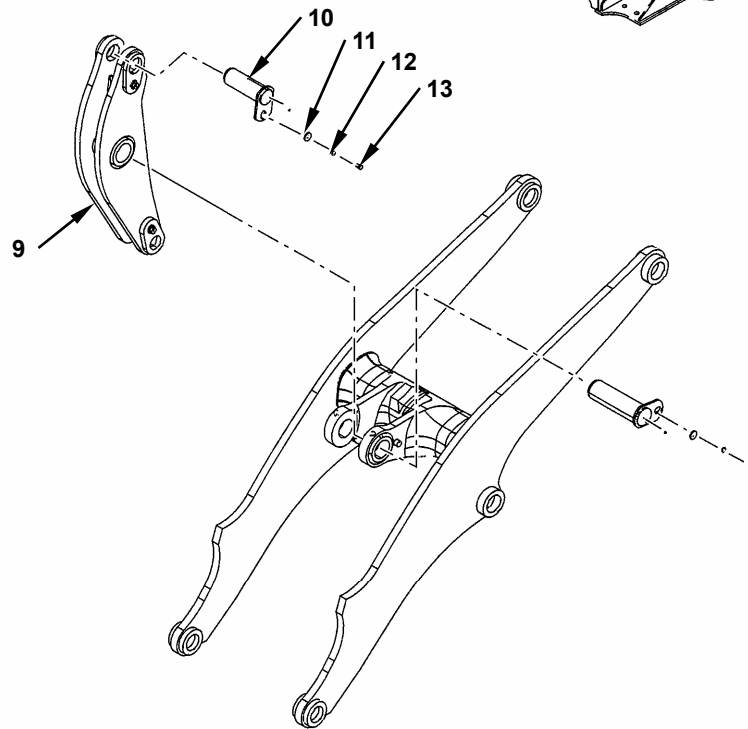
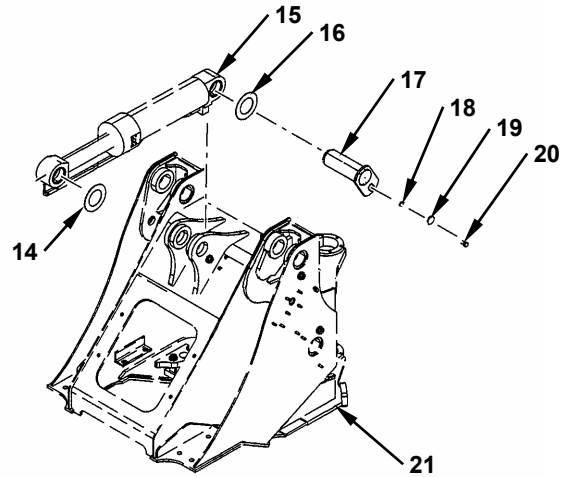
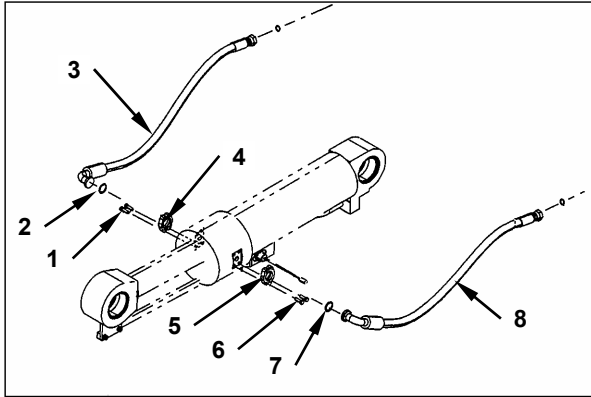
 : 24 mm

 : 210 N·m (22 kgf·m, 155 lbf·ft)

# FRONT ATTACHMENT / Cylinder

## REMOVAL AND INSTALLATION OF CYLINDER

### Bucket Cylinder



W4GB-04-02-034

- 1 - Socket Bolt (4 Used)
- 2 - O-Ring
- 3 - Hose
- 4 - Split Flange (2 Used)
- 5 - Split Flange (2 Used)
- 6 - Socket Bolt (4 Used)

- 7 - O-Ring
- 8 - Hose
- 9 - Bellcrank
- 10 - Pin
- 11 - Washer

- 12 - Spring Washer
- 13 - Bolt
- 14 - Spacer
- 15 - Bucket Cylinder
- 16 - Spacer

- 17 - Pin
- 18 - Washer
- 19 - Spring Washer
- 20 - Bolt
- 21 - Front Frame



## FRONT ATTACHMENT / Cylinder

### Removal and Installation of Bucket Cylinder


#### Removal

**CAUTION:** Bleed air from hydraulic oil tank before doing any work (Refer to **BLEED AIR FROM HYDRAULIC OIL TANK** on W1-4-1.).

**CAUTION:** Bucket cylinder (15) weight:  
ZW220: 170 kg (380 lb)  
ZW250: 180 kg (400 lb)


1. Place and hold the bucket on the support with a height of 500 to 800 mm (20 to 32 in).
2. Put the wheel stopper and stop the engine.
3. Attach a nylon sling onto the rod side and the bottom side of bucket cylinder (15). Lift and hold the bucket cylinder.

5. Remove bolt (13), spring washer (12), and washer (11) from pin (10).

 : 24 mm

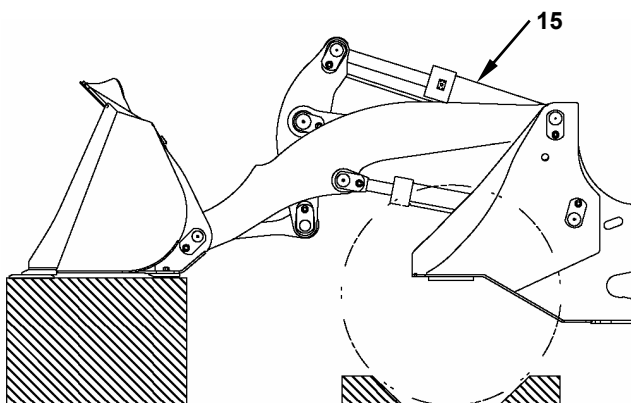
6. Remove pin (10) from bellcrank (9).

7. Remove bolt (20), spring washer (19), and washer (18) from pin (17).

 : 24 mm


8. Remove pin (17) from front frame (21).

9. Remove bucket cylinder (15) and spacers (14 and 16) from bellcrank (9) and front frame (21).



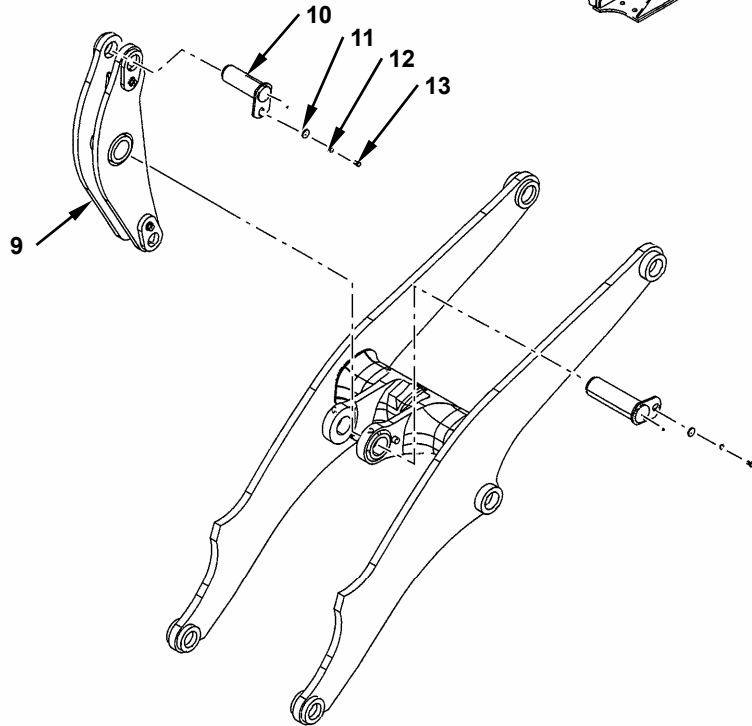
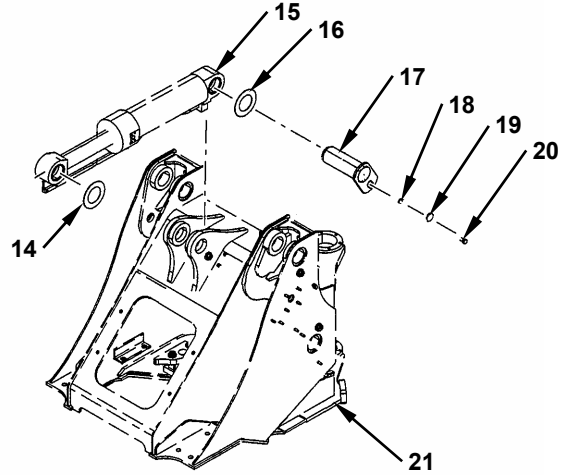
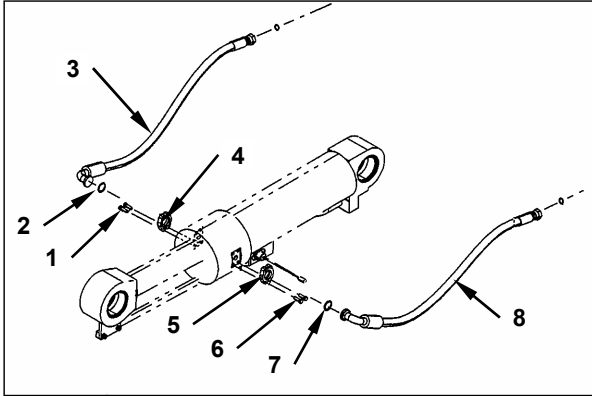
W4GB-04-02-032

4. Remove socket bolts (1, 6) (8 used) from split flanges (4, 5) (2 used for each). Remove split flanges (4, 5) (2 used for each), O-rings (2, 7), and hoses (3, 8) from bucket cylinder (15). Cap the open ends.

 : 14 mm

**IMPORTANT:** Place the oil pan directly below the connection part of the hose.

# FRONT ATTACHMENT / Cylinder



W4GB-04-02-034

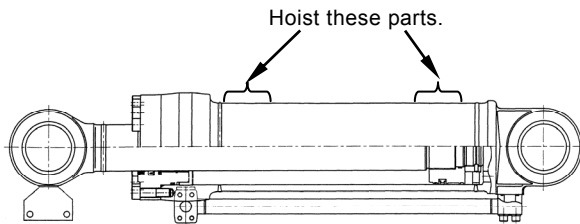
## FRONT ATTACHMENT / Cylinder

### Installation



**CAUTION: Bucket cylinder (15) weight:**  
**ZW220: 170 kg (380 lb)**  
**ZW250: 180 kg (400 lb)**



1. Attach a nylon sling onto the rod side and the bottom side of bucket cylinder (15). Lift and hold the bucket cylinder.




W4GB-04-02-035


2. Align the bottom side of bucket cylinder (15) with the mounting hole on front frame (21).

**IMPORTANT: Spacer (16) thickness: 2.3 mm (0.091 in)**


3. Align the hole on the bottom side of bucket cylinder (15) with the pin hole on front frame (21). Install spacer (16).
4. Apply a film of grease on the outer side of pins (17). Install pins (17) and lock the bottom sides of bucket cylinders (15) on front frame (21).
5. Lock pin (17) on front frame (21) with washer (18), spring washer (19), and bolt (20).  
 : 24 mm  
 : 210 N·m (22 kgf·m, 155 lbf·ft)


6. Install O-ring (7) to hose (8). Connect hose (8) to bucket cylinder (15) with split flanges (5) (2 used) and socket bolts (6) (4 used).

 : 14 mm

 : 210 N·m (22 kgf·m, 155 lbf·ft)



7. Install O-ring (2) to hose (3). Connect hose (3) to bucket cylinder (15) with split flanges (4) (2 used) and socket bolts (1) (4 used).

 : 14 mm

 : 210 N·m (22 kgf·m, 155 lbf·ft)

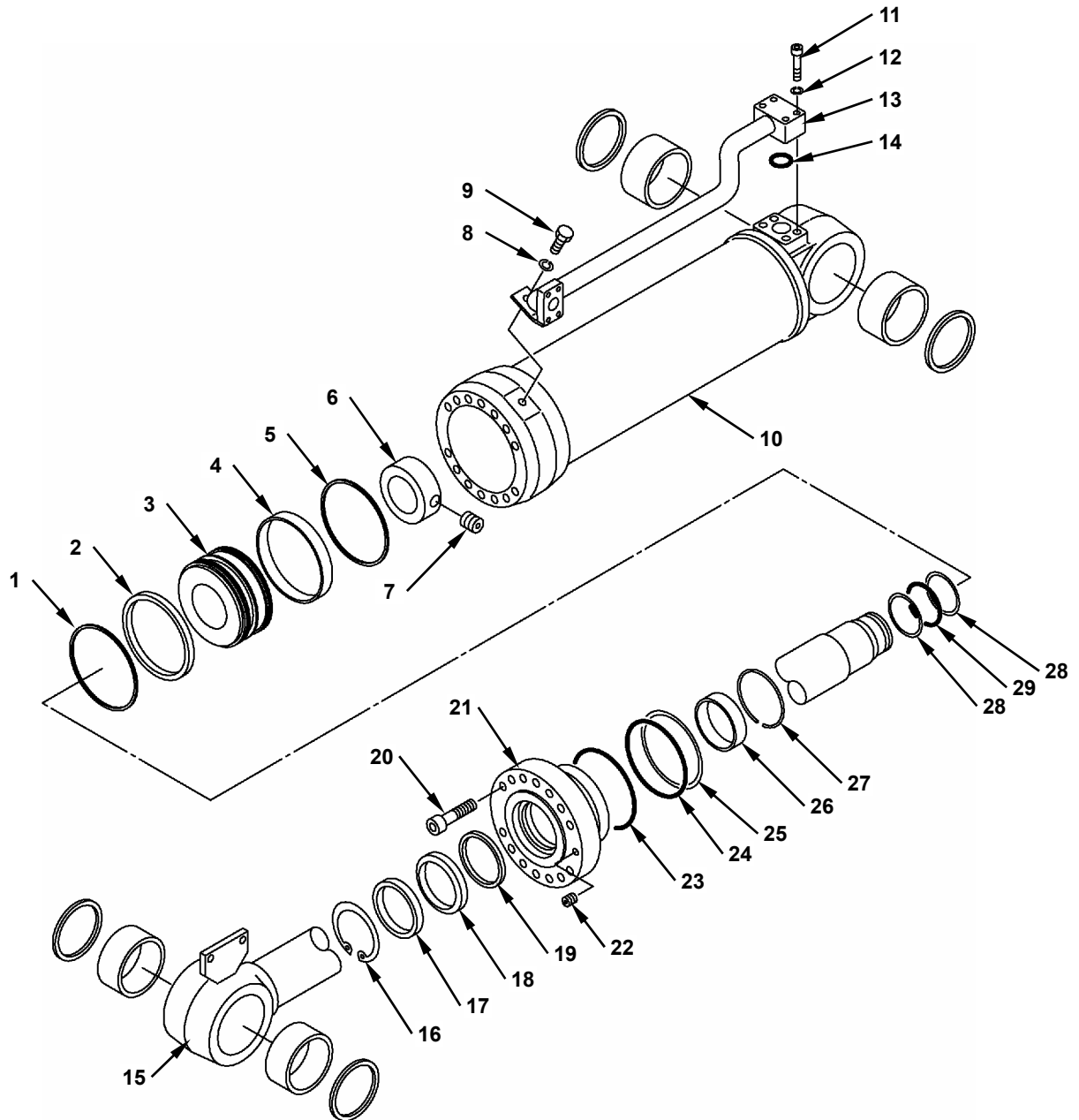
8. Start the engine and extend the piston rods of bucket cylinders (15). Align the bucket cylinders with the pin holes of bellcrank (9).

**IMPORTANT: Spacer (14) thickness: 2.3 mm (0.091 in)**

9. Insert spacers (14) between bellcrank (9) and the rod ends. Apply a film of grease on the outer side of pin (10). Install pin (10) to bellcrank (9).
10. Lock pin (10) on bellcrank (9) with washer (11), spring washer (12), and bolt (13).  
 : 24 mm  
 : 210 N·m (22 kgf·m, 155 lbf·ft)

# FRONT ATTACHMENT / Cylinder

## DISASSEMBLY OF BUCKET CYLINDER



W4GB-04-02-001

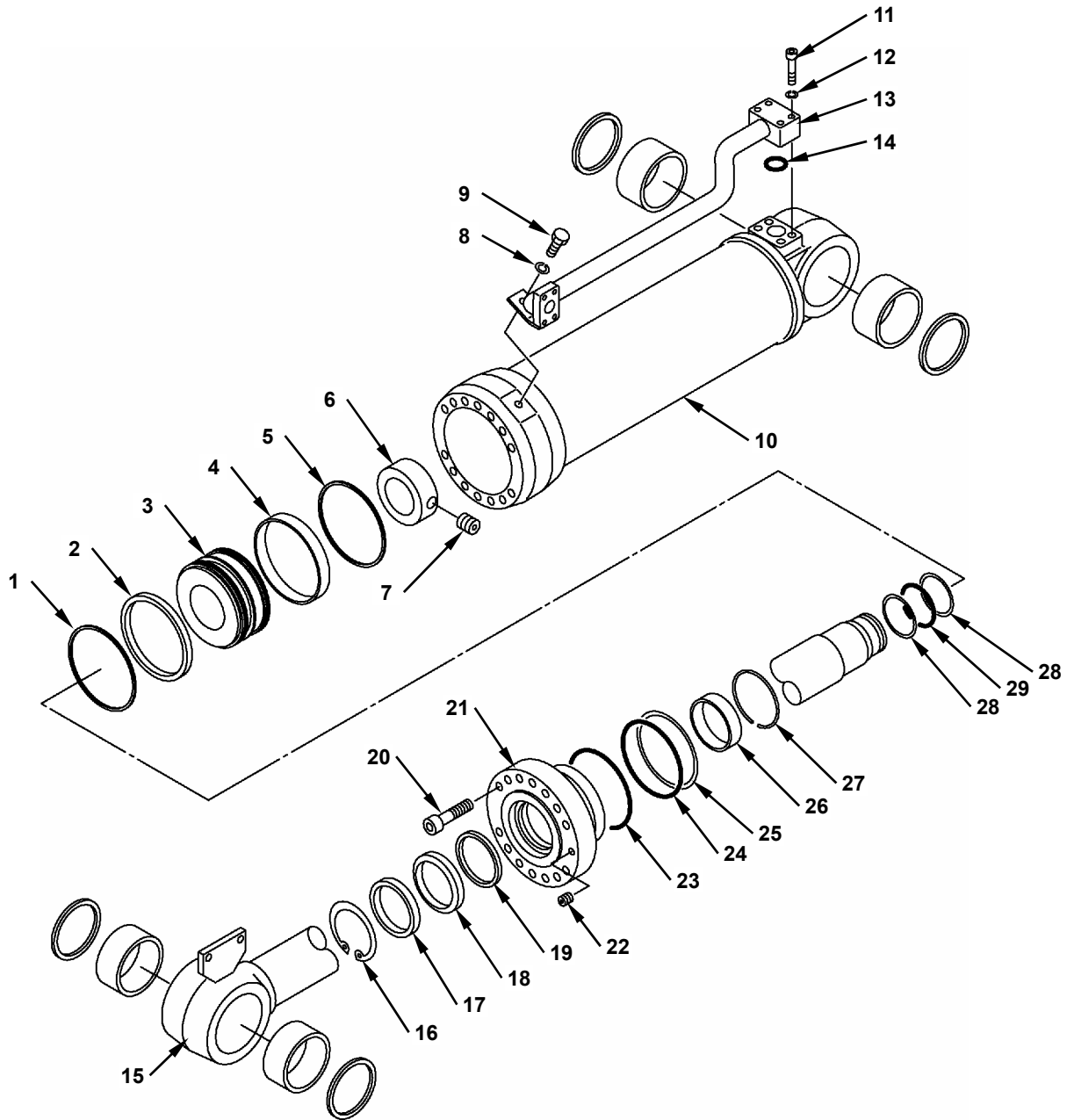
- |                   |                             |                            |                           |
|-------------------|-----------------------------|----------------------------|---------------------------|
| 1 - O-Ring        | 9 - Bolt                    | 16 - Retaining Ring        | 23 - O-Ring               |
| 2 - Packing       | 10 - Cylinder Tube          | 17 - Dust Seal             | 24 - O-Ring               |
| 3 - Piston        | 11 - Socket Bolt (4 Used)   | 18 - U-packing             | 25 - Backup Ring          |
| 4 - Wear Ring     | 12 - Spring Washer (4 Used) | 19 - Buffer Seal           | 26 - Rod Bushing          |
| 5 - O-Ring        | 13 - Pipe                   | 20 - Socket Bolt (14 Used) | 27 - Retaining Ring       |
| 6 - Piston Nut    | 14 - O-Ring                 | 21 - Rod Cover             | 28 - Backup Ring (2 Used) |
| 7 - Set Screw     | 15 - Piston Rod             | 22 - Set Screw             | 29 - O-Ring               |
| 8 - Spring Washer |                             |                            |                           |

## FRONT ATTACHMENT / Cylinder

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# FRONT ATTACHMENT / Cylinder



W4GB-04-02-001

# FRONT ATTACHMENT / Cylinder

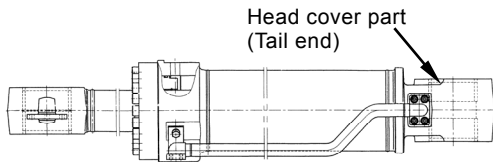
## Disassembly of Bucket Cylinder



**CAUTION: Bucket cylinder weight:**  
ZW220: 170 kg (380 lb)  
ZW250: 180 kg (400 lb)

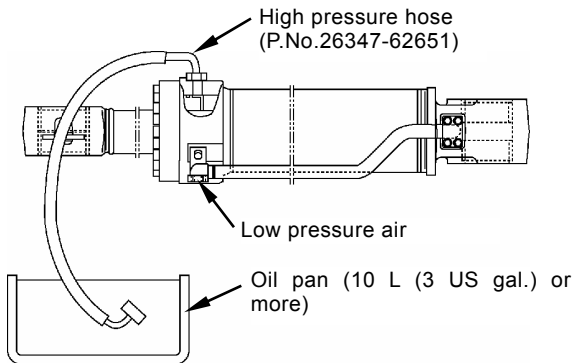
1. Secure the cylinder assembly on a workbench. Lock position is the head cover (tail end) part of cylinder tube (10). Secure the parallel surface of the cylinder assembly.

**IMPORTANT: Do not secure with cylinder tube (10) or pipe (13). Use a wooden block with V-groove.**



W4GB-04-02-002

2. Temporary connect the high pressure hose to the port of the piston rod (15) side. Put one end of the hose in the oil pan.  
Supply low pressure air from pipe (13) and drain the oil of the rodcover (21) side.



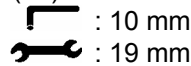
W4GB-04-02-003



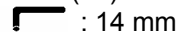
**CAUTION: Supply low pressure air slowly and adjust the extension speed of piston rod (15). Prevent personal injury by making sure all area is clear and that co-workers are out of the extension direction of piston rod (15).**

3. Adjust the extended piston rod (15) position by a crane or a wooden block in order to align the extended piston rod and cylinder tube (10).

4. Remove socket bolts (11) (4 used) and (9) from pipe (13). Remove pipe (13) from cylinder tube (10).



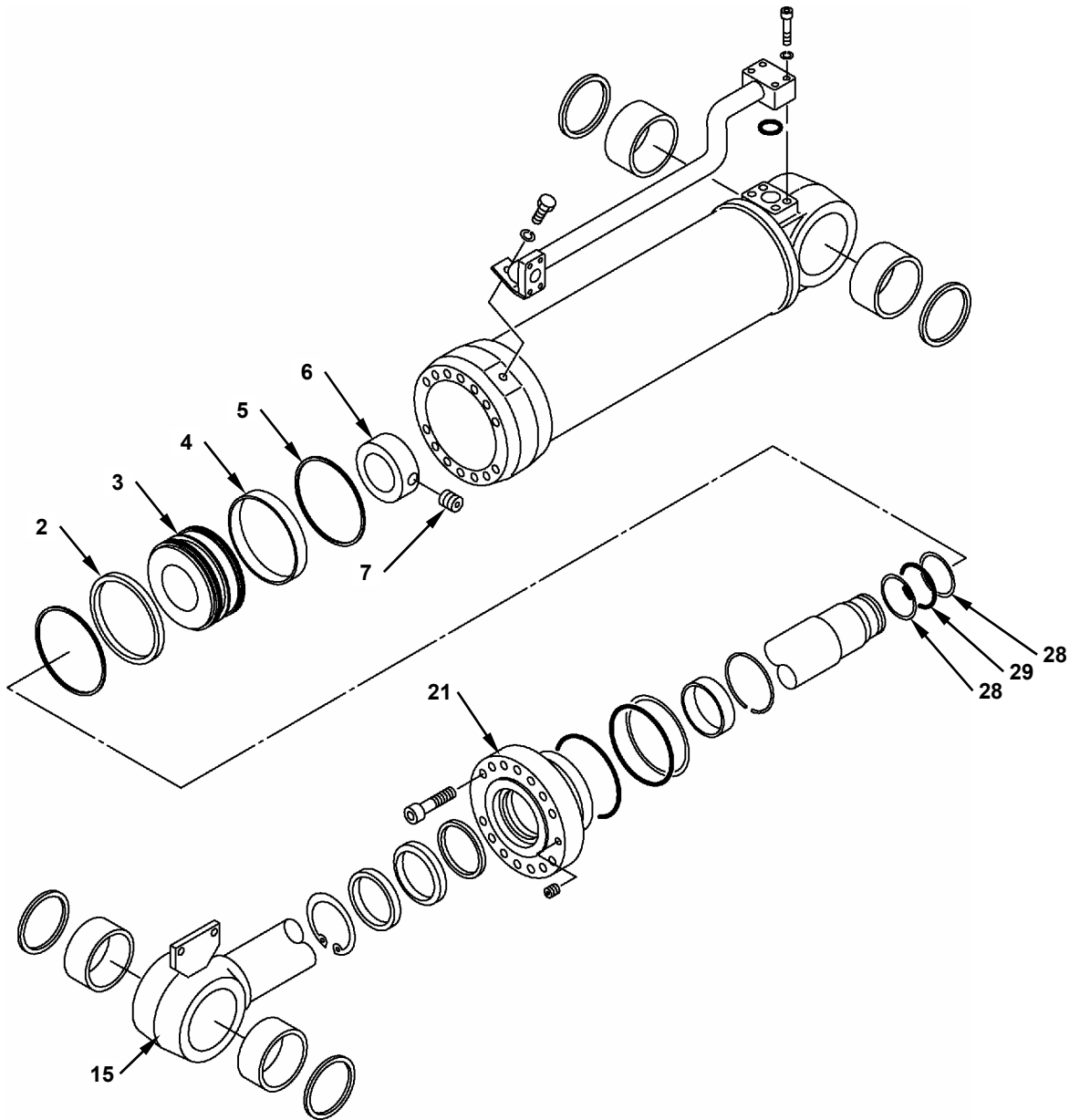
5. Remove socket bolts (20) (14 used) from rod cover (21).



**IMPORTANT: Prevent the surface of piston rod (15) from damage by using a cloth.**

6. Screw set screw (22) in the flange part of rod cover (21) in order to make clearance between the mating surface of the flange. Insert a screwdriver in the clearance and expand it. Remove rod cover (21) from cylinder tube (10).
7. Attach a nylon sling onto piston rod (15). Hoist and hold piston rod (15). Remove piston rod (15) slowly from cylinder tube (10) by moving around.

# FRONT ATTACHMENT / Cylinder



W4GB-04-02-001



## FRONT ATTACHMENT / Cylinder

- Secure the parallel surface of the piston rod (15) assembly.

**IMPORTANT: Do not secure the chromium plated surface of piston rod (15). Secure the rod head part.**

- Remove set screw (7) from piston nut (6).

**IMPORTANT: As set screw (7) is caulked at the piston nut (6) side (2 places), remove set screw (7) slowly by applying oil to the thread part and repeating "loosening and screwing."**

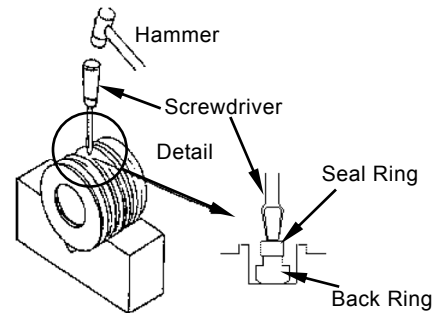
- Remove piston nut (6) from piston rod (15) by using a special tool.  
Special tool: Refer to W3-9-22.

- Install bolts (M12, Pitch 1.75 mm) to the end of piston nut (6) (2 places). Remove piston nut from piston rod (15) by using a special tool.  
Special tool: Refer to W3-9-22.

- Remove piston rod (15) from rod cover (21).

- Remove wear ring (4) and O-ring (5) from piston (3).

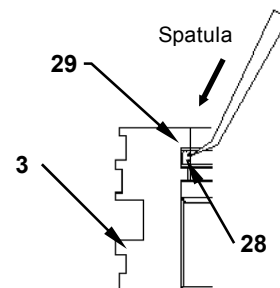
- Spread and remove the back ring on both sides of packing (2) from piston (3).  
Cut and remove center packing (2) (seal ring and back ring) as shown in the following figure.



W4GB-04-02-004

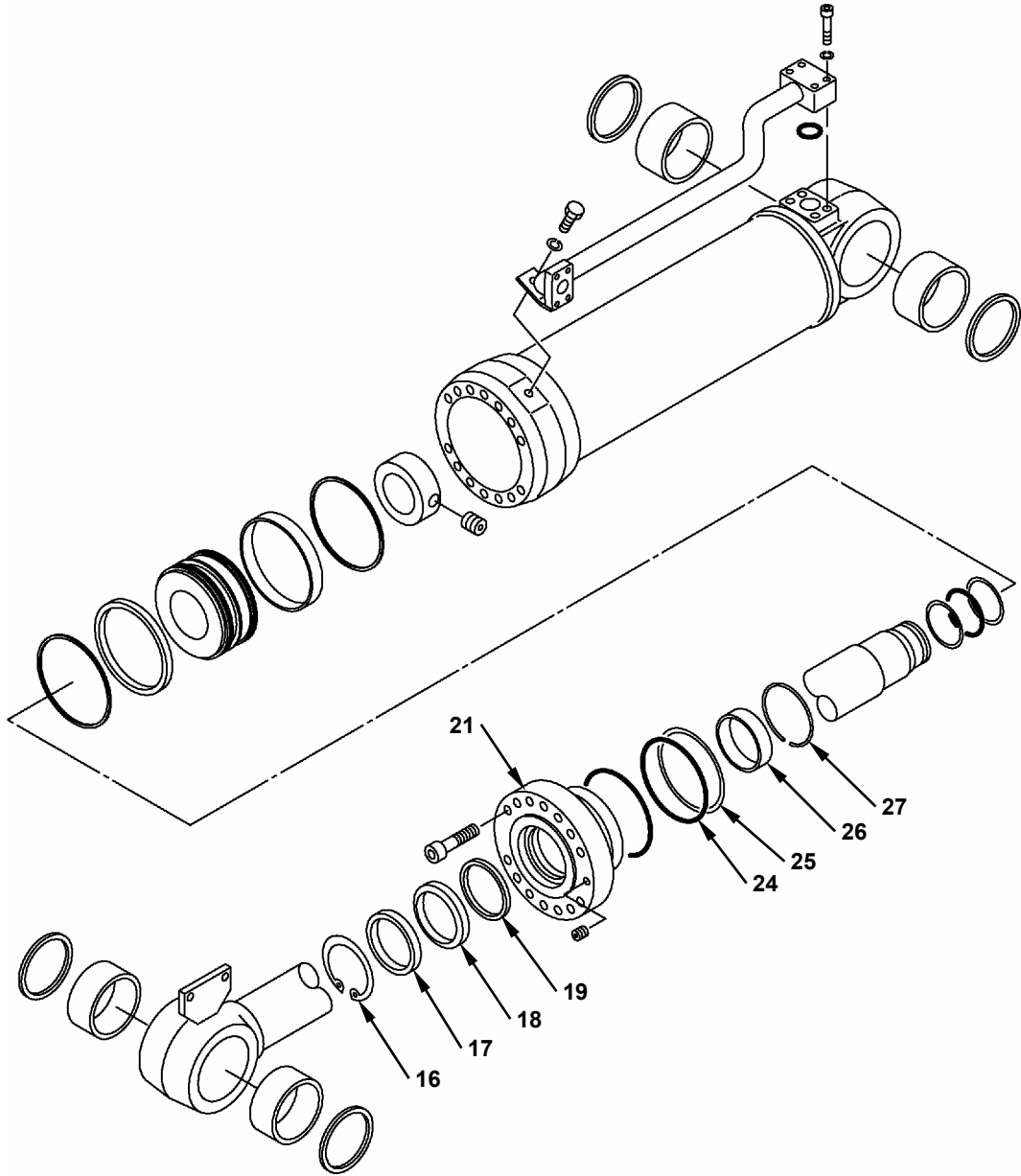
**IMPORTANT: When cutting packing (2), place piston (3) on a stable V block. Do not damage the seal groove by a cut-off tool.**

- Remove O-ring (29) and backup rings (28) (2 used) in the ID of piston (3) by using a spatula.



W4GB-04-02-005

# FRONT ATTACHMENT / Cylinder

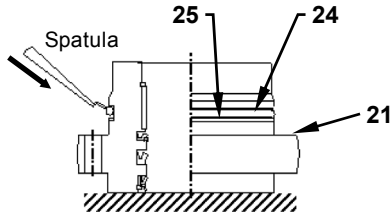


W4GB-04-02-001

## FRONT ATTACHMENT / Cylinder

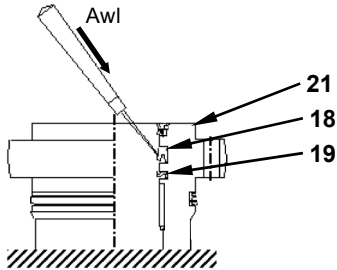
16. Place rod cover (21) on a workbench, covered with a rag for slip resistance.

17. Remove O-ring (24) and backup ring (25) from rod cover (21).



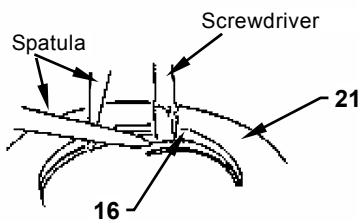
W4GB-04-02-006

18. Puncture and remove U-packing (18) and buffer seal (19) with an awl from rod cover (21).



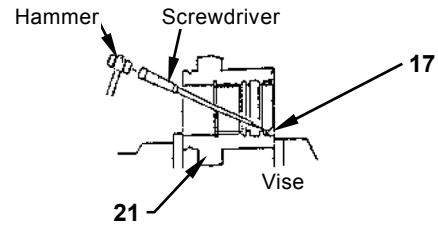
W4GB-04-02-007

19. Remove retaining ring (16) from rod cover (21).



W4GB-04-02-008

20. Remove dust seal (17) from rod cover (21).



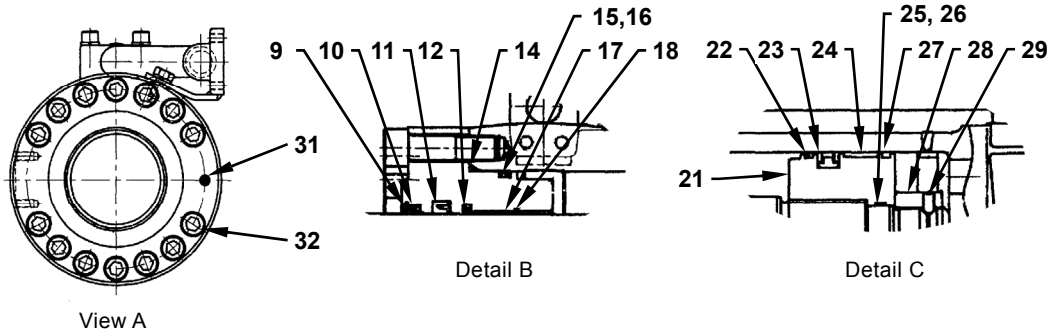
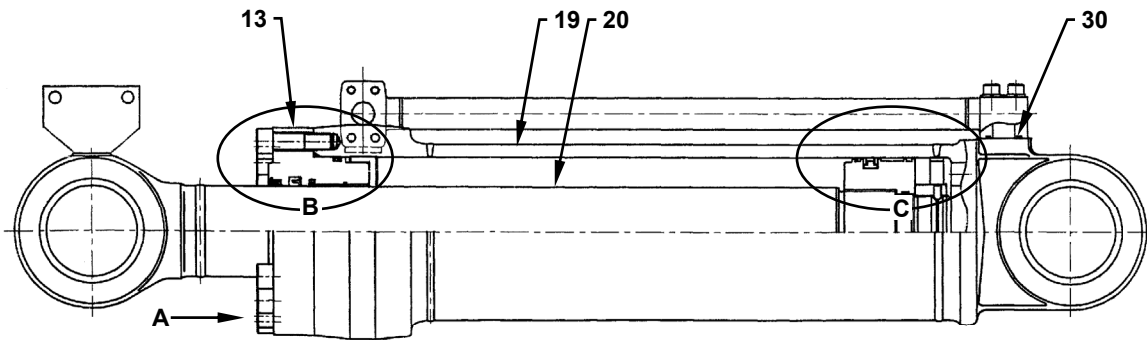
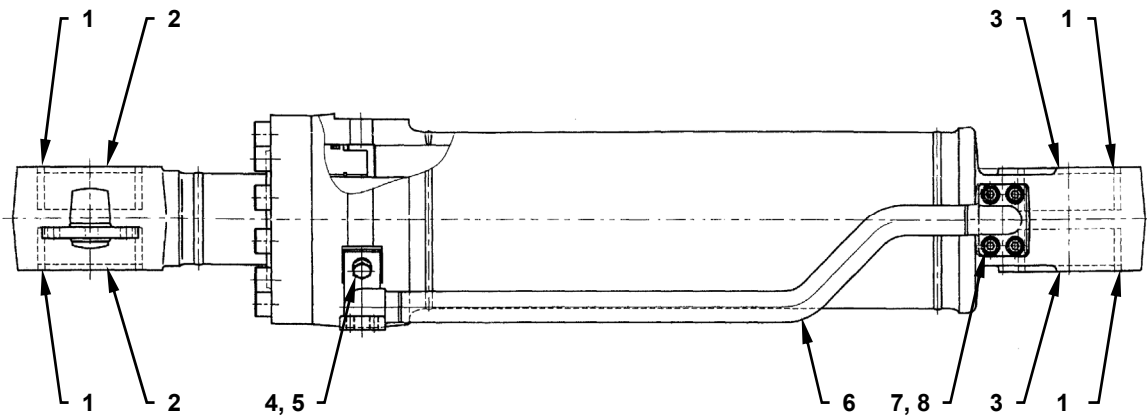
W4GB-04-02-009

21. It is difficult to remove press fitted rod bushing (26) from rod cover (21). Replace the damaged or worn rod bushing (26) as follows.

- Remove retaining ring (27) from rod cover (21).
- Install rod cover (21) on a lathe. Do the centering correctly.
- Cut rod bushing (26) until the thickness is thin enough. Deform and remove rod bushing (26) by using a needle-nosed screwdriver.

# FRONT ATTACHMENT / Cylinder

## ASSEMBLY OF BUCKET CYLINDER



W4GB-04-02-025

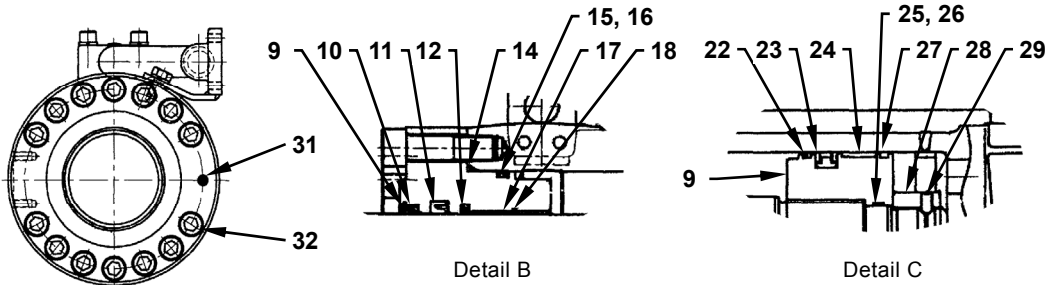
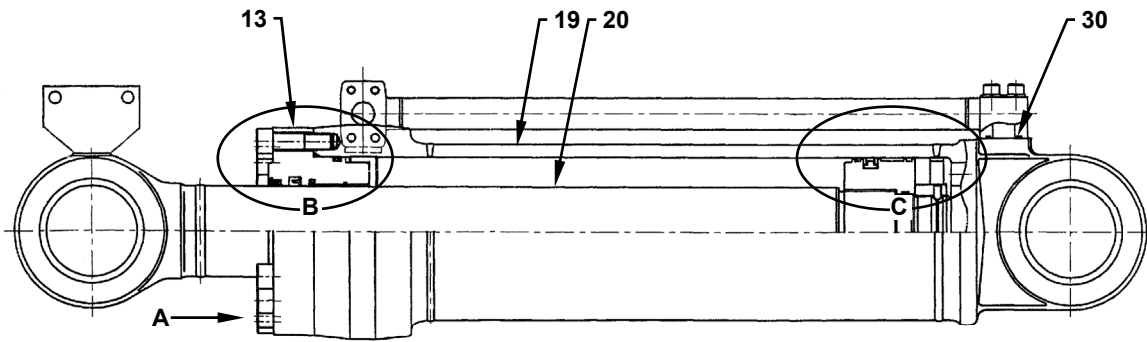
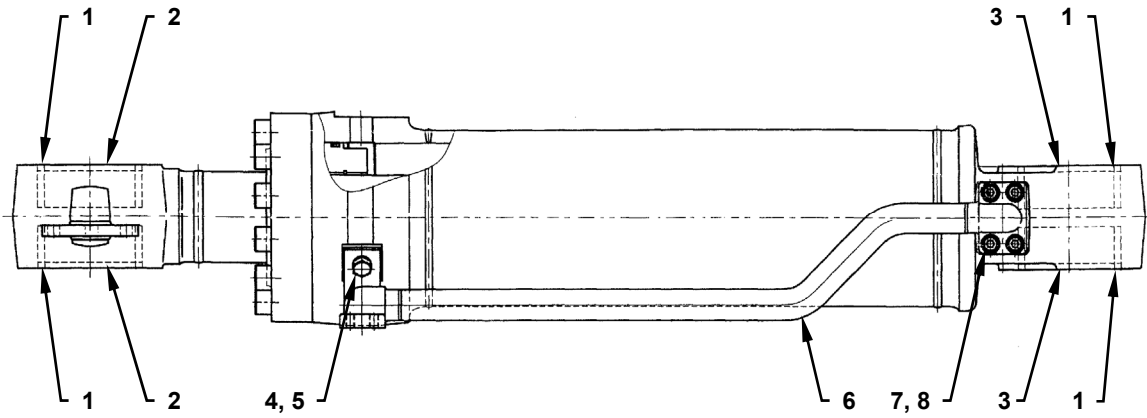
- |                   |                    |                     |                  |
|-------------------|--------------------|---------------------|------------------|
| 1 - Wiper         | 9 - Retaining Ring | 17 - Rod Bushing    | 25 - O-Ring      |
| 2 - Bushing       | 10 - Dust Seal     | 18 - Retaining Ring | 26 - Backup Ring |
| 3 - Bushing       | 11 - U-packing     | 19 - Cylinder Tube  | 27 - O-Ring      |
| 4 - Bolt          | 12 - Buffer Seal   | 20 - Rod            | 28 - Piston Nut  |
| 5 - Spring Washer | 13 - Rod Cover     | 21 - Piston         | 29 - Set Screw   |
| 6 - Pipe          | 14 - O-Ring        | 22 - O-Ring         | 30 - O-Ring      |
| 7 - Socket Bolt   | 15 - O-Ring        | 23 - Packing        | 31 - Set Screw   |
| 8 - Spring Washer | 16 - Backup Ring   | 24 - Wear Ring      | 32 - Socket Bolt |

## FRONT ATTACHMENT / Cylinder

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# FRONT ATTACHMENT / Cylinder



View A

Detail B

Detail C

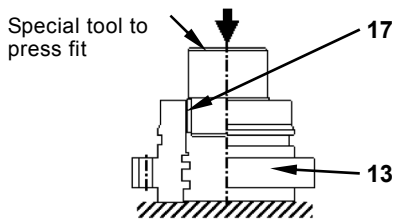
W4GB-04-02-025

## FRONT ATTACHMENT / Cylinder

### Assembly of Bucket Cylinder

1. Press fit rod bushing (17) by using a special tool.  
Special tool: Refer to W3-9-24.

**IMPORTANT:** Align rod bushing (17) with the center of the mounting hole and place vertically. Apply oil to the inner surface of the mounting hole and press fit rod bushing (17). After press fitting, clean again and remove metal powder.



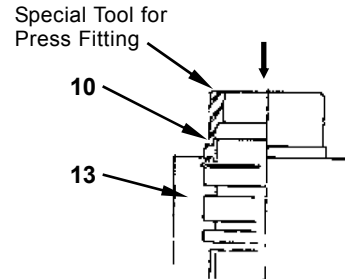
W4GB-04-02-012

2. Install retaining ring (18).

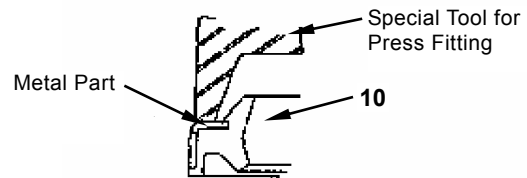
**IMPORTANT:** Check that rod bushing and retaining ring are installed completely.

3. Press fit dust seal (10) by using a special tool and a hammer.  
Special tool: Refer to W3-9-25.

**IMPORTANT:** Align dust seal (10) with the mounting hole and place vertically. Evenly contact the special tool with the metal part of dust seal (10). Before press fitting, apply oil to the inner surface of the hole. After press fitting, clean again and remove metal powder.



W4GB-04-02-013

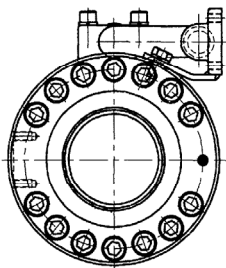
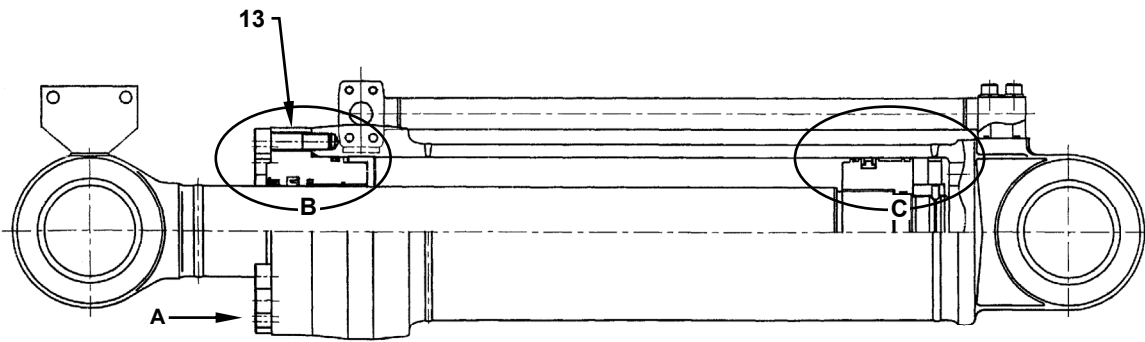
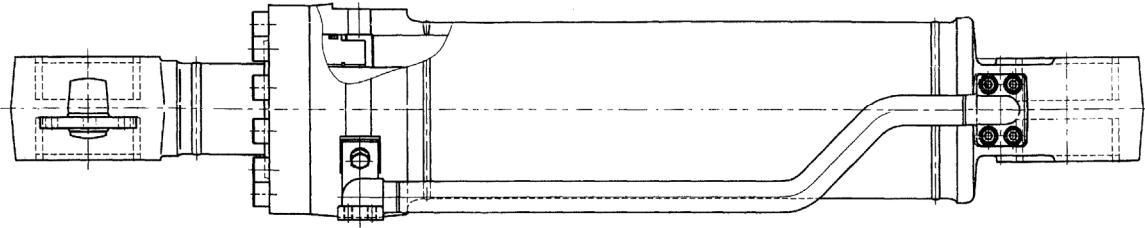


W4GB-04-02-014

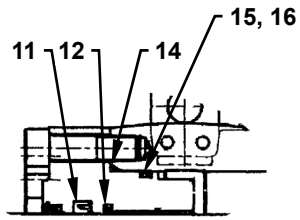
4. Install retaining ring (9).

**IMPORTANT:** Check that rod bushing and retaining ring are installed completely.

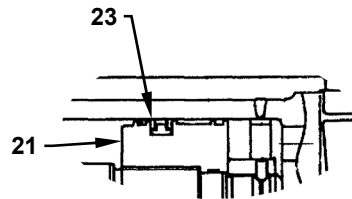
# FRONT ATTACHMENT / Cylinder



View A



Detail B



Detail C

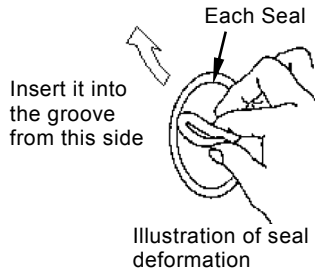
W4GB-04-02-025



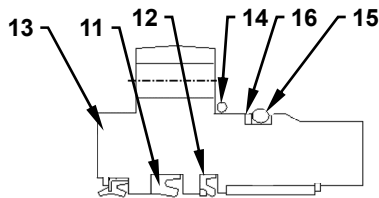
## FRONT ATTACHMENT / Cylinder

5. Install U-packing (11) and buffer seal (12) inside rod cover (13).

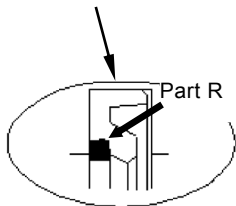
Refer to the the mounting direction and instructions in the following figure.



W4GB-04-02-015



W4GB-04-02-016



Backup ring for buffer seal  
Mounting direction detail

W4GB-04-02-017

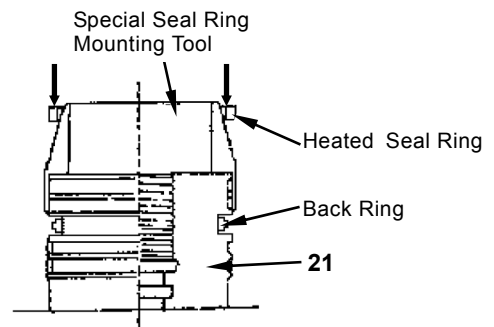
6. Install O-ring (15) and backup ring (16) to the outer side of rod cover (13).

7. Install O-ring (14) to the flange part of rod cover (13).

### Assemble Piston

1. After installing the special tool for inserting seal ring to piston (21), install the back ring of packing (23).

2. Heat the seal ring of packing (23) to 150 to 180 °C (302 to 365 °F). Quickly install the seal ring in the seal groove of piston (21).  
Special tool: Refer to W3-9-23.

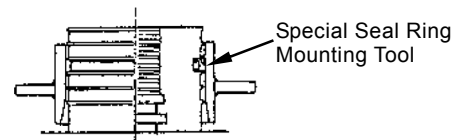


W4GB-04-02-018

**IMPORTANT: Heat seal ring in the oil heated by an electric air heater. Avoid direct-heating by fire.**

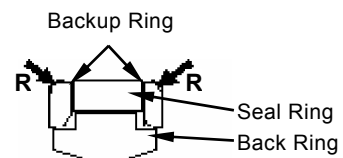
3. Adjust the extended seal ring to the previous shape by a special tool.

Special tool: Refer to W3-9-23.



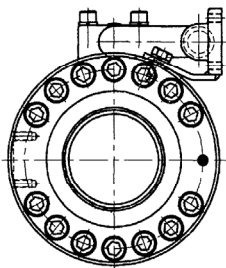
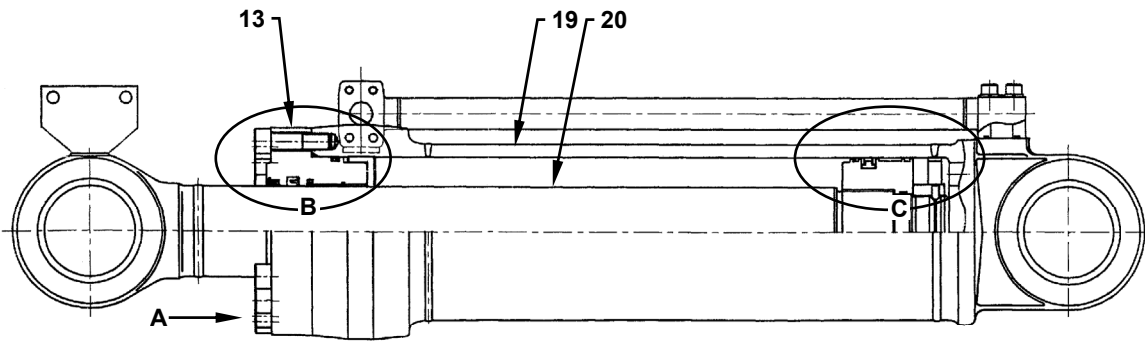
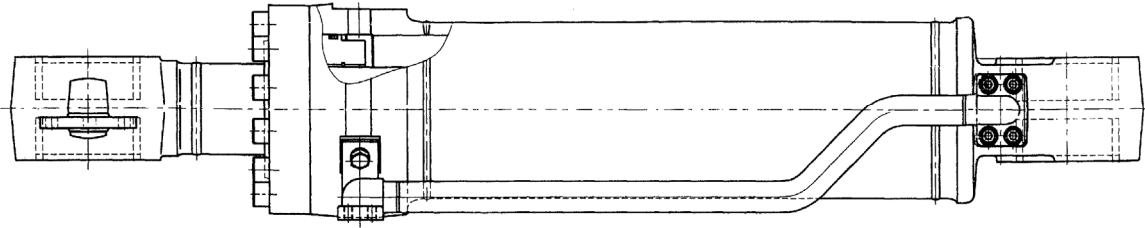
W4GB-04-02-019

4. Install backup ring to both sides of the seal ring on packing (23).

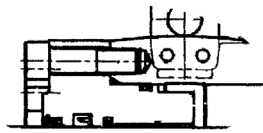


Direction of Packing (23) Components W4GB-04-02-020

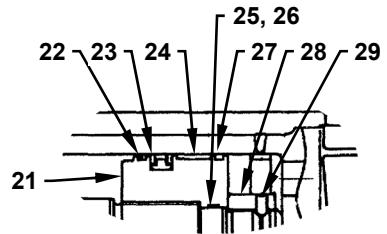
# FRONT ATTACHMENT / Cylinder



View A



Detail B



Detail C

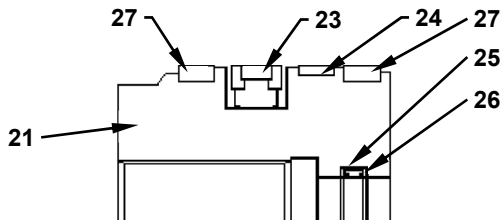
W4GB-04-02-025

## FRONT ATTACHMENT / Cylinder

5. Install O-ring (25) and backup ring (26) to the piston ID part.

**IMPORTANT: Keep wear ring (24) and O-rings (22 and 27) until the installation to cylinder tube (19).**

**The following figure shows the final assembly diagram of the piston.**



W4GB-04-02-021


6. Secure rod (20) on a workbench.
7. Install rod cover (13) to rod (20) by using a special tool for installing rod cover.

**IMPORTANT: Apply a film of oil to the special tool and the surface of the rod to protect the seals.**

**Refer to W3-9-23 for the special tool for installing the rod.**

8. Install the bolt to the screw hole at the end of piston (21). Install piston (21) to rod (20) by using a special tool.


Bolt size: M12, Length 25 mm (2 used)

 : 981±98 N·m (100±10 kgf·m, 720±72 lbf·ft)

**IMPORTANT: Apply a film of oil to O-ring (25) and the thread part on the ID part of piston (21).**


**Refer to W3-9-22 for special tool. After tightening the bolt, remove the bolt.**


9. Install piston nut (28) by using a special tool.

 : 1860±186 N·m  
(190±19 kgf·m, 1370±137 lbf·ft)

**IMPORTANT: Apply a film of oil to the thread part of piston nut (28).**

10. Apply LOCTITE #242 to the thread part of set screw (29). Install set screw (29) to piston nut (28).

 : 4 mm

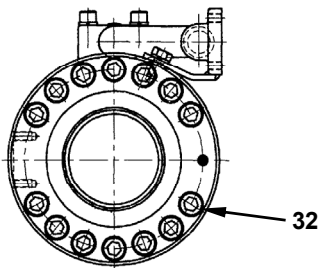
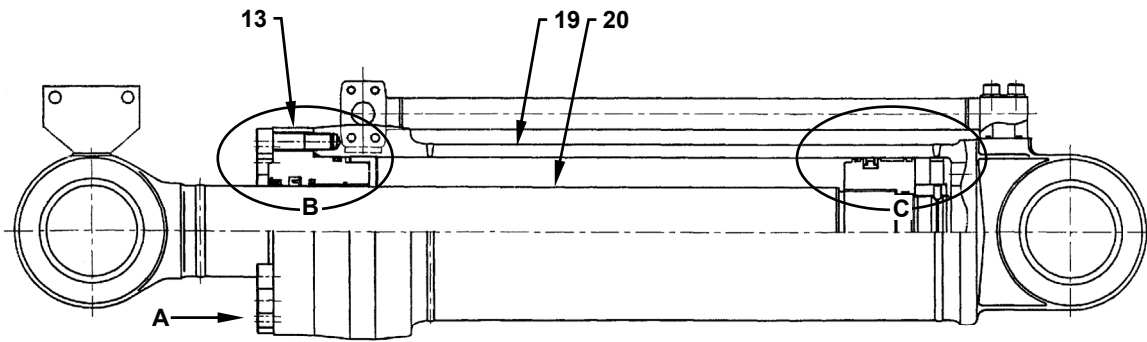
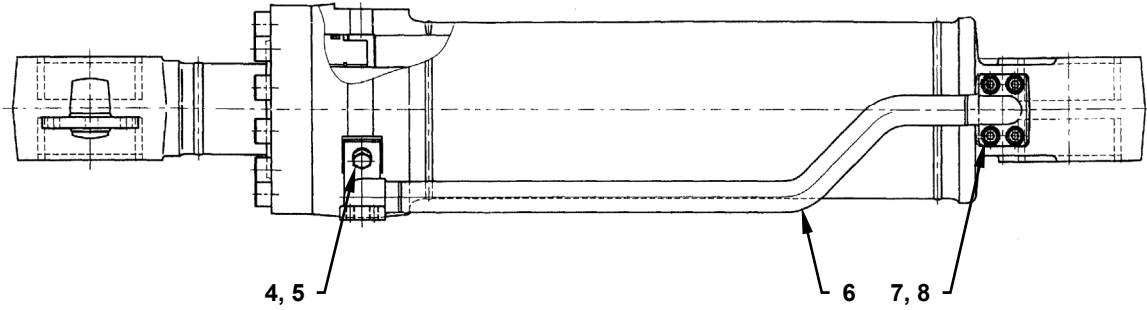
 : 15±1.5 N·m (1.5±0.15 kgf·m, 11±1.1 lbf·ft)

**IMPORTANT: Wipe out extruded LOCTITE. Caulk screw hole (2 places) diagonally by using a center punch.**

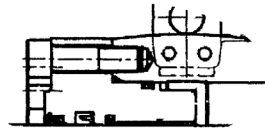
11. Place cylinder tube (19) on a workbench horizontally. Secure the parallel surface of the head cover.
12. Install wear ring (24) and O-rings (22 and 27) in the outer surface of piston (21). Apply a film of oil.
13. Lift at the center of gravity of rod (20). Insert piston (21) into cylinder tube (19) by moving around rod (20).

**IMPORTANT: As seals get pinched, prevent wear ring (24) and O-ring from falling off.**

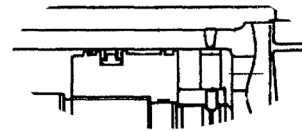
# FRONT ATTACHMENT / Cylinder



View A



Detail B




Detail C


W4GB-04-02-025

## FRONT ATTACHMENT / Cylinder

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14. Align rod cover (13) with the screw hole of flange part in cylinder tube (19) and tighten the bolt. Apply LOCTITE #242 onto the thread part of socket bolt (32).


 : 14 mm


 : 470 to 520 N·m  
(48 to 53 kgf·m, 350 to 380 lbf·ft)


**IMPORTANT: Use a cloth in order to prevent damage from the surface of rod (20).**


15. Supply low pressure air to the port in the rod side of cylinder tube (19) to retract rod (20).

16. Install pipe (6) with socket bolt (7), spring washer (8), and bolt (4).

 : 10 mm

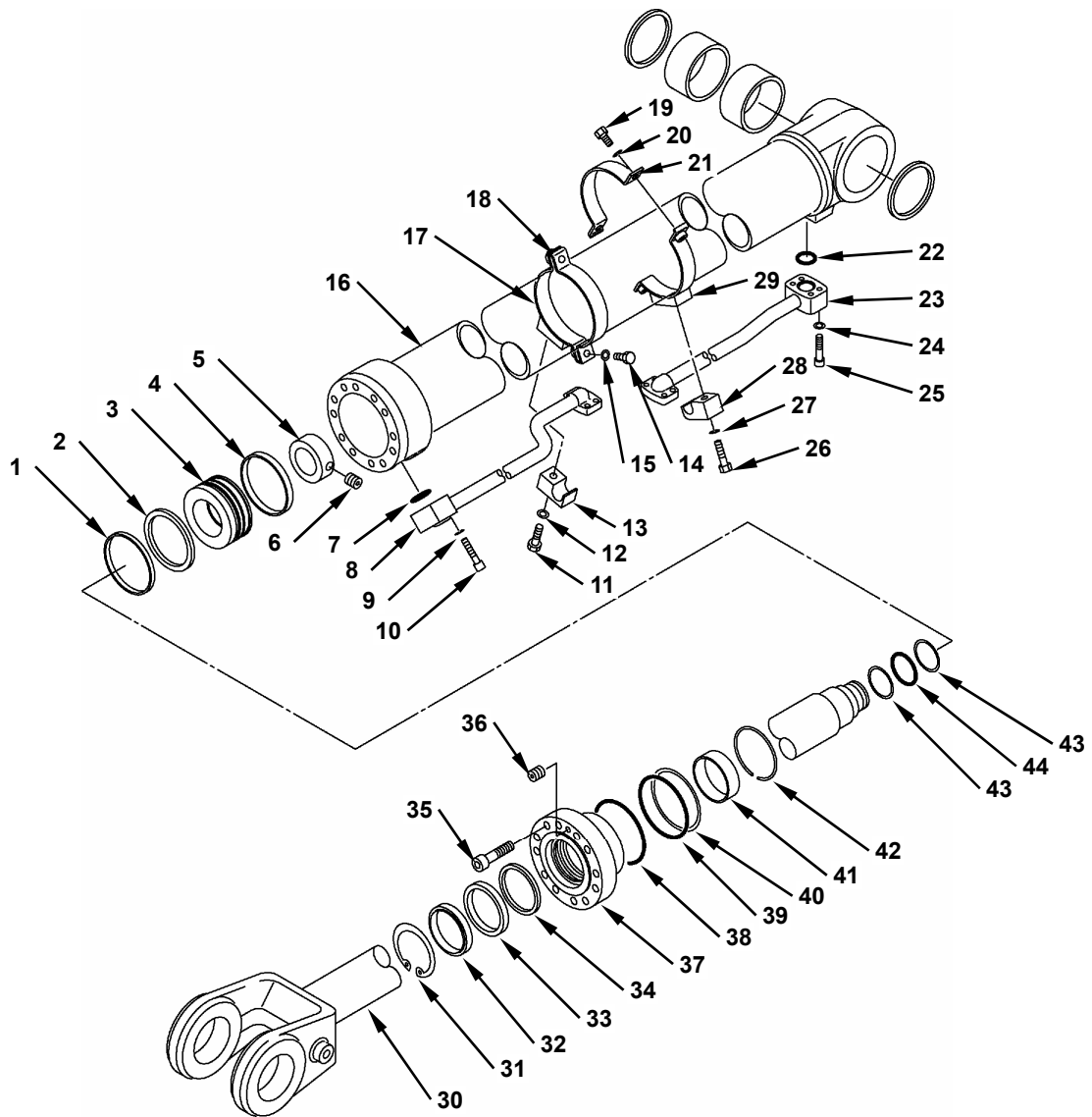
 : 108 to 115 N·m  
(11 to 12 kgf·m, 80 to 86 lbf·ft)

 : 17 mm

 : 54 to 59 N·m  
(5.5 to 6 kgf·m, 40 to 44 lbf·ft)

# FRONT ATTACHMENT / Cylinder

## DISASSEMBLY OF LIFT CYLINDER



W4GB-04-02-022

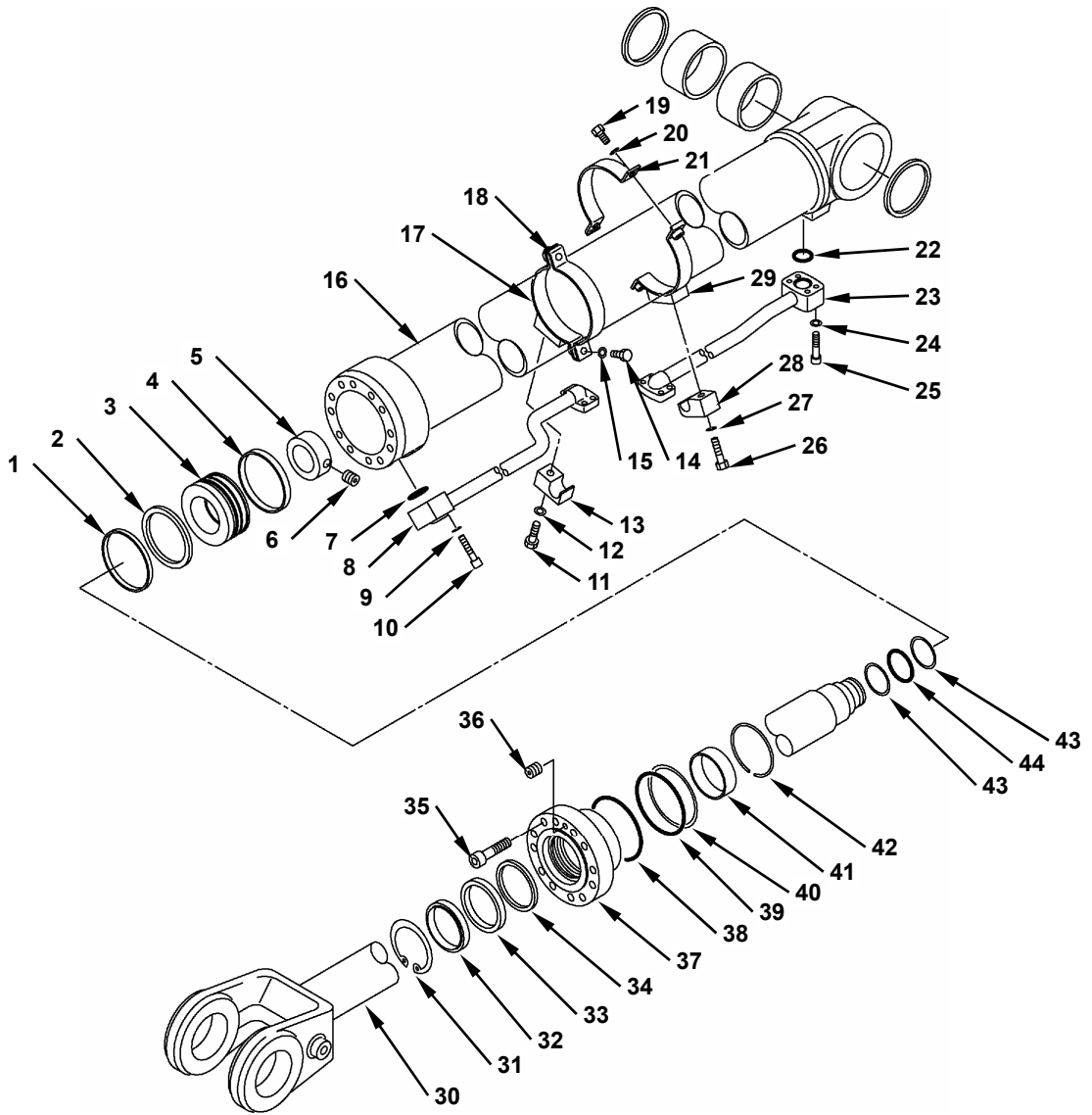
- |                   |                    |                     |                            |
|-------------------|--------------------|---------------------|----------------------------|
| 1 - Dust Ring     | 12 - Spring Washer | 23 - Pipe           | 34 - Buffer Seal           |
| 2 - Packing       | 13 - Clamp         | 24 - Spring Washer  | 35 - Socket Bolt (12 Used) |
| 3 - Piston        | 14 - Bolt          | 25 - Socket Bolt    | 36 - Set Screw             |
| 4 - Wear Ring     | 15 - Spring Washer | 26 - Bolt           | 37 - Rod Cover             |
| 5 - Piston Nut    | 16 - Cylinder Tube | 27 - Spring Washer  | 38 - O-Ring                |
| 6 - Set Screw     | 17 - Pipe Band     | 28 - Pipe Cramp     | 39 - O-Ring                |
| 7 - O-Ring        | 18 - Pipe Band     | 29 - Pipe Band      | 40 - Backup Ring           |
| 8 - Pipe          | 19 - Bolt          | 30 - Piston Rod     | 41 - Rod Bushing           |
| 9 - Spring Washer | 20 - Spring Washer | 31 - Retaining Ring | 42 - Retaining Ring        |
| 10 - Socket Bolt  | 21 - Pipe Band     | 32 - Dust Seal      | 43 - Backup Ring           |
| 11 - Bolt         | 22 - O-Ring        | 33 - U-packing      | 44 - O-Ring                |

## FRONT ATTACHMENT / Cylinder

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# FRONT ATTACHMENT / Cylinder



W4GB-04-02-022



## FRONT ATTACHMENT / Cylinder

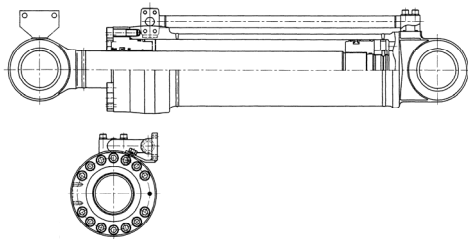
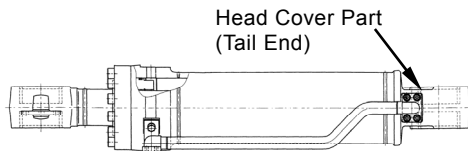
### Disassembly of Lift Cylinder



**CAUTION:** Lift cylinder weight:  
**ZW220: 170 kg (370 lb)**  
**ZW250: 190 kg (420 lb)**

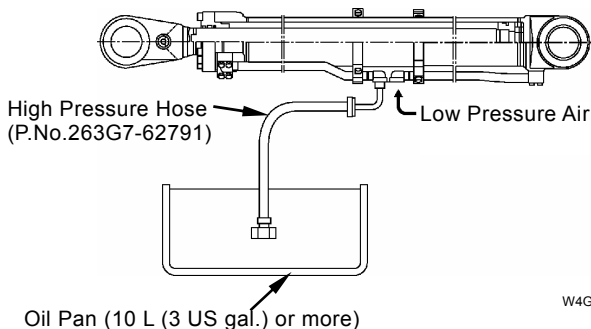
1. Secure the cylinder assembly on a workbench. Lock position is the head cover (tail end) part. Secure the parallel surface of the cylinder assembly.

**IMPORTANT:** Do not secure cylinder tube (16) or pipes (8, 23).  
**Use a wooden block with V-groove.**



W4GB-04-02-023

2. Temporary connect the high pressure hose to the port of the piston rod (30) side. Put one end of the hose in the oil pan.  
 Supply low pressure air from pipe (23) and drain the oil of the rod cover (37) side.



W4GB-04-02-024



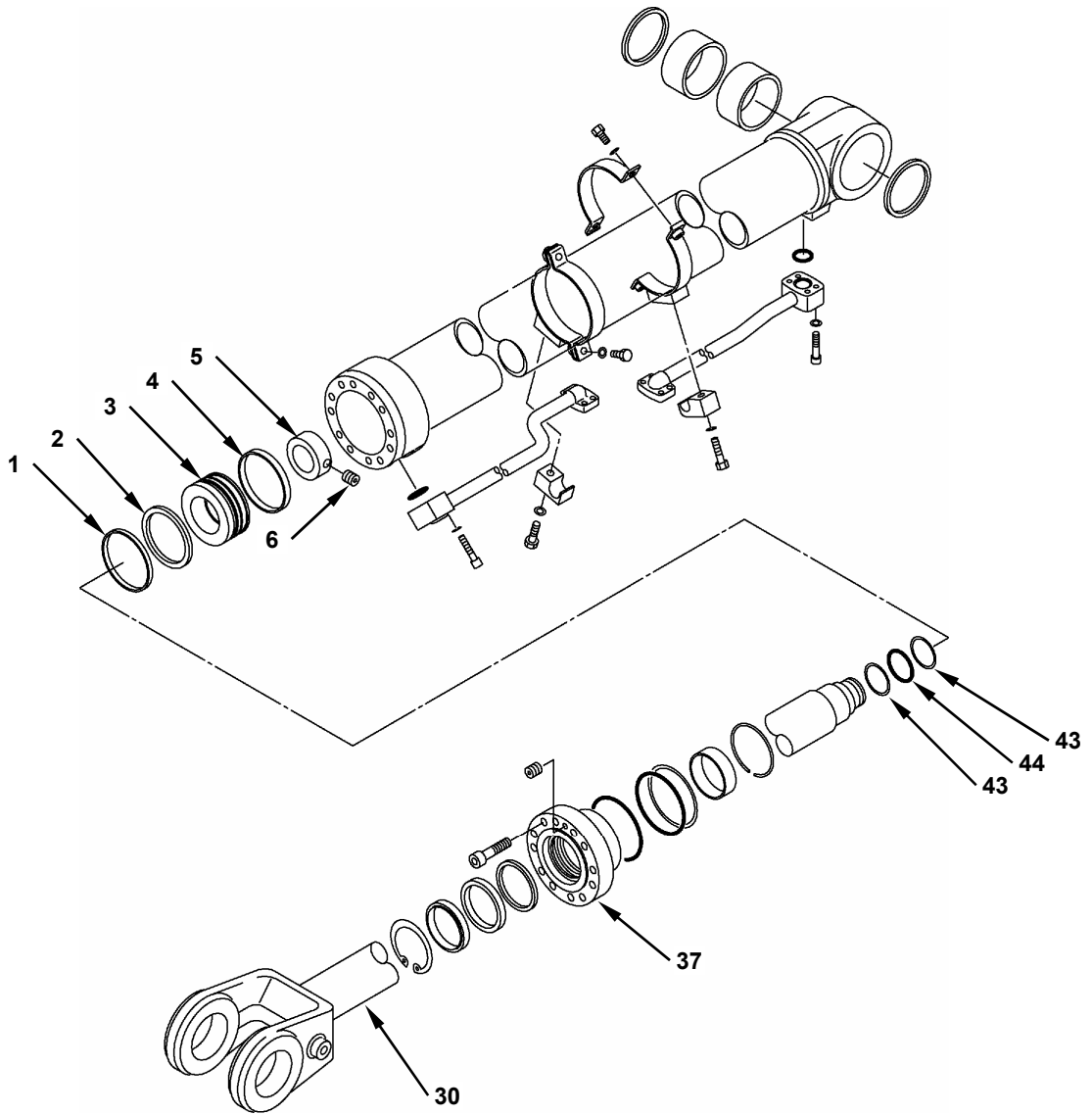
**CAUTION:** Supply low pressure air slowly to adjust the extension speed of piston rod (30). Prevent personal injury by making sure all area is clear and that co-workers are out of the extension direction of piston rod (30).

3. Adjust the extended piston rod (30) position by a crane or a wooden block in order to align the extended piston rod with cylinder tube (16).
4. Remove socket bolts (10, 25) (4 used for each) from pipes (8, 23). Remove bolts (11, 26) and spring washers (12, 27) from clamps (13, 28). Remove clamps (13, 28) and pipes (8, 23) from cylinder tube (16).  
 : 8 mm  
 : 19 mm, 17 mm
5. Remove socket bolts (35) (12 used) from rod cover (37).  
 : 14 mm

**IMPORTANT:** Prevent damage from the surface of rod cloth.

6. Screw by using a set screw (36) in the flange of rod cover (37) in order to make clearance between the mating surface of the flange. Insert a screwdriver in the clearance, and expand the clearance. Remove rod cover (37) from cylinder tube (16).  
 : 6 mm
7. Attach a nylon sling onto piston rod (30). Hoist and hold piston rod (30). Slowly remove the piston rod (30) assembly from cylinder tube (16) by moving around piston rod (30).

# FRONT ATTACHMENT / Cylinder



W4GB-04-02-022

## FRONT ATTACHMENT / Cylinder

- Secure the parallel surface of the piston rod (30) assembly.

**IMPORTANT: Do not secure the chromium plated surface of piston rod (30). Secure the rod head part.**

- Remove set screw (6) from piston nut (5).  
: 4 mm

**IMPORTANT: As set screw (6) is caulked at the piston nut (5) side (2 places), remove set screw (6) slowly by applying oil to the thread part and repeating "loosening and screwing."**

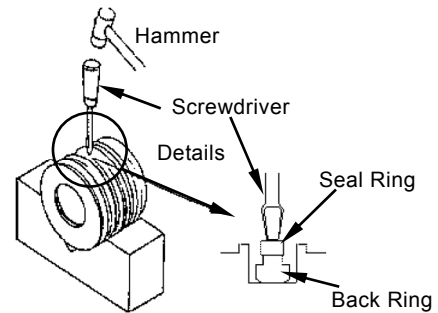
- Remove piston nut (5) from piston rod (30) by using a special tool.  
Special tool: Refer to W3-9-22.

- Install bolts (M10, Pitch 1.5 mm) to the end of piston (3) (2 places). Remove piston (3) from piston rod (30) by using a special tool.  
Special tool: Refer to W3-9-22.

- Remove rod cover (37) from piston rod (30).

- Remove wear ring (4) and dust ring (1) from piston (3).

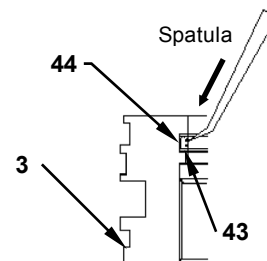
- Spread and remove backup ring on both sides of packing (2) from piston (3). Cut and remove the center packing (2) (seal ring and back ring) as shown in the following figure.



W4GB-04-02-004

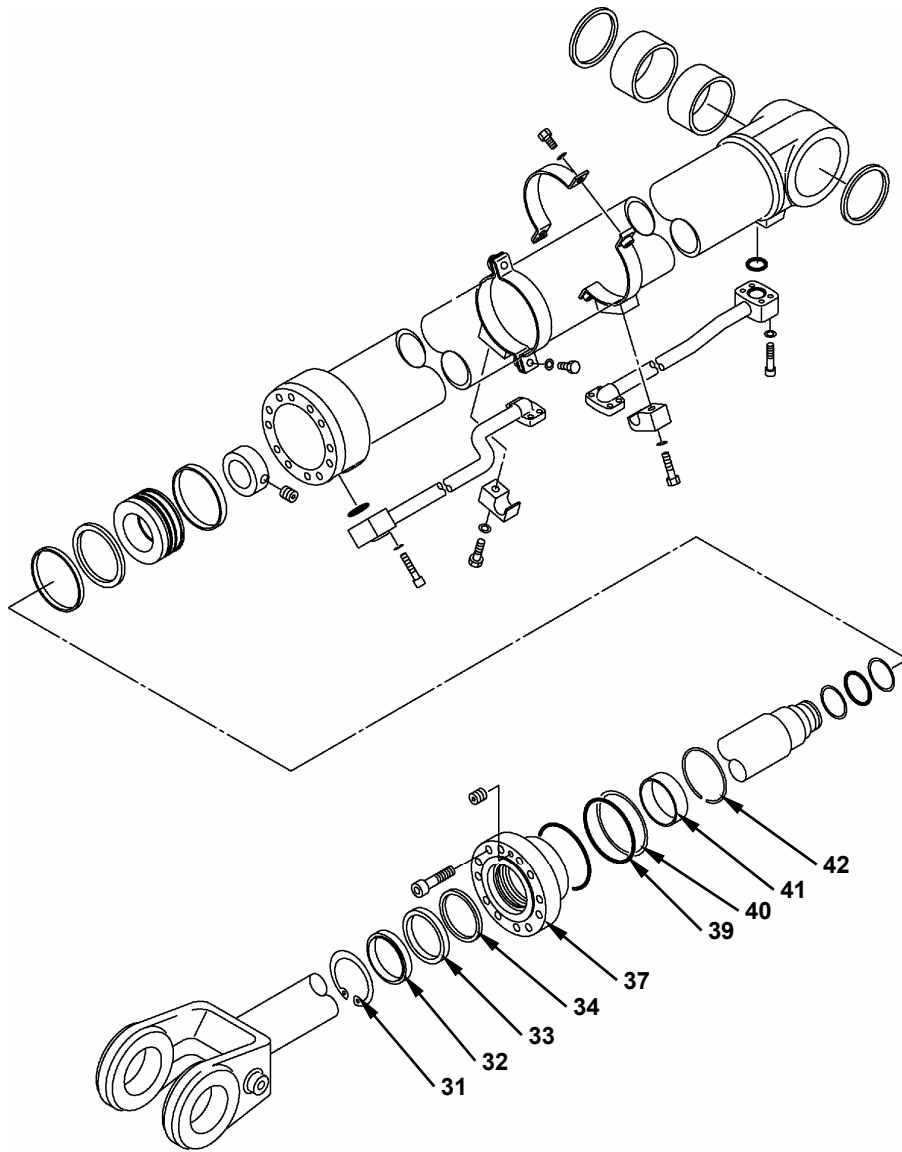
**IMPORTANT: When cutting packing (2), place piston (3) on the stable V block. Do not damage the seal groove by a cut-off tool.**

- Remove O-ring (44) and backup rings (43) (2 used) in the ID of piston (3) by using a spatula.



W4GB-04-02-005

# FRONT ATTACHMENT / Cylinder

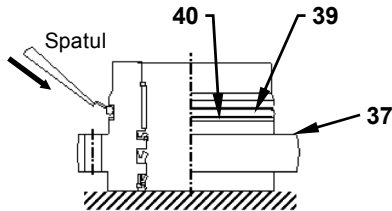


W4GB-04-02-022

## FRONT ATTACHMENT / Cylinder

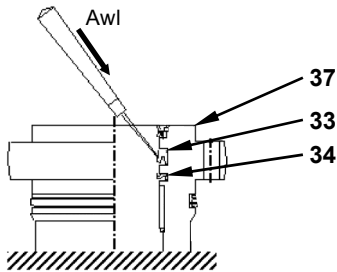
16. Place rod cover (37) on a workbench, covered with a rag for slip resistance.

17. Remove O-ring (39) and backup ring (40) from rod cover (37).



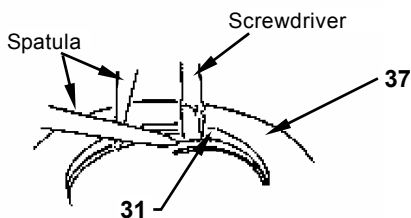
W4GB-04-02-006

18. Puncture and remove U-packing (33) and buffer seal (34) with an awl from rod cover (37).



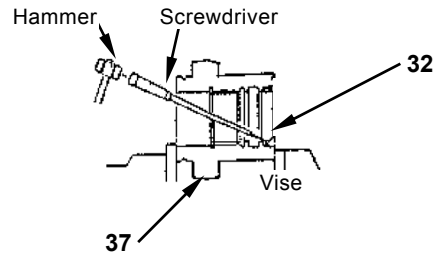
W4GB-04-02-007

19. Remove retaining ring (31) from rod cover (37).



W4GB-04-02-008

20. Remove dust seal (32) from rod cover (37).



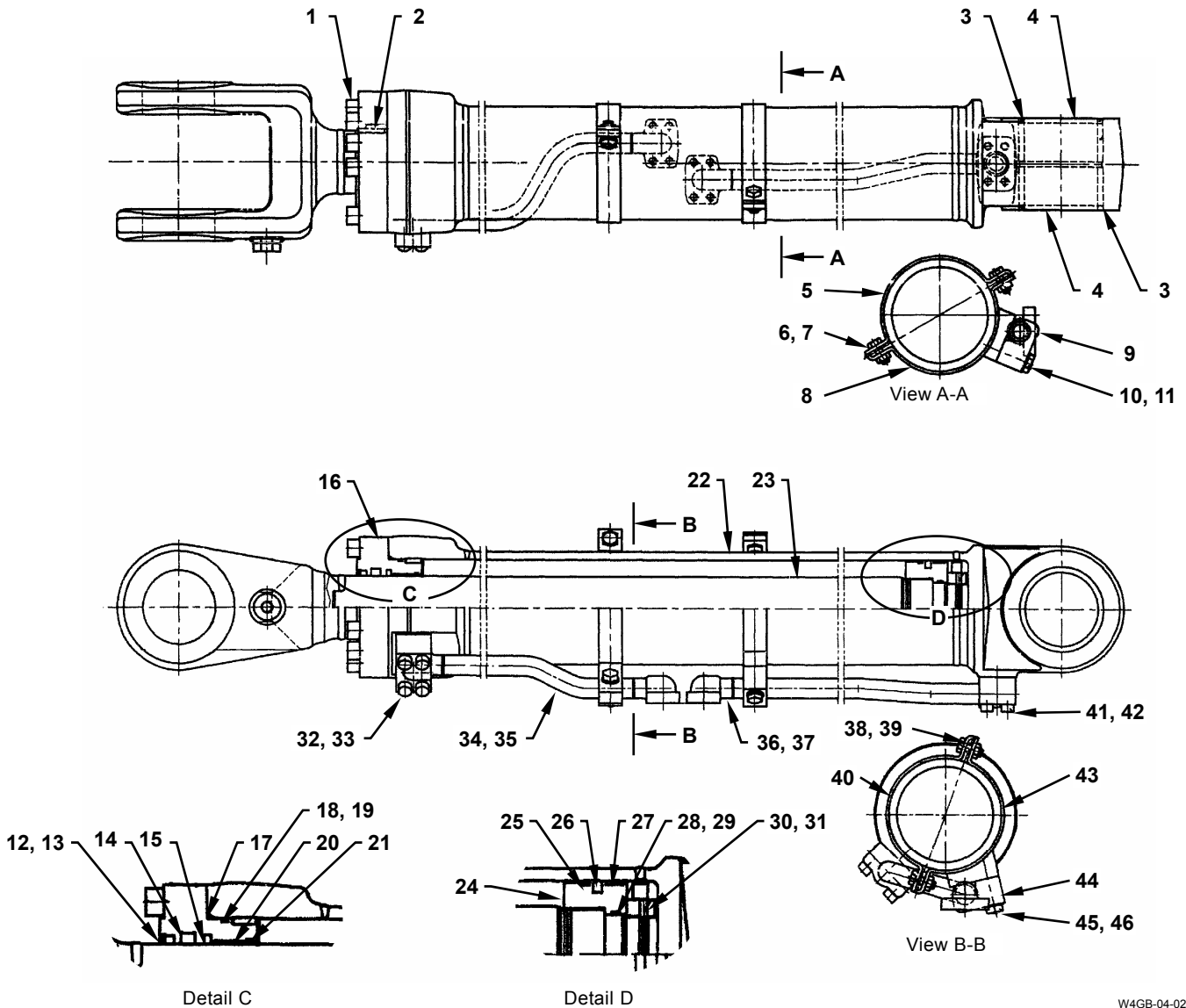
W4GB-04-02-009

21. It is difficult to remove press fitted rod bushing (41) from rod cover (37). Replace the damaged or worn rod bushing (41) as follows.

- Remove retaining ring (42) from rod cover (37).
- Install rod cover (37) on a lathe. Do the centering correctly.
- Cut rod bushing (41) until the thickness is thin enough. Deform and remove rod bushing (41) by using a needle-nosed screwdriver.

# FRONT ATTACHMENT / Cylinder

## ASSEMBLY OF LIFT CYLINDER



W4GB-04-02-026

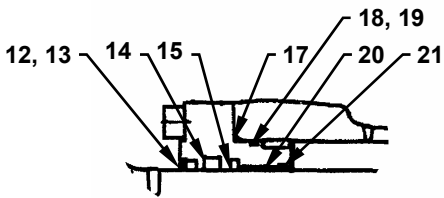
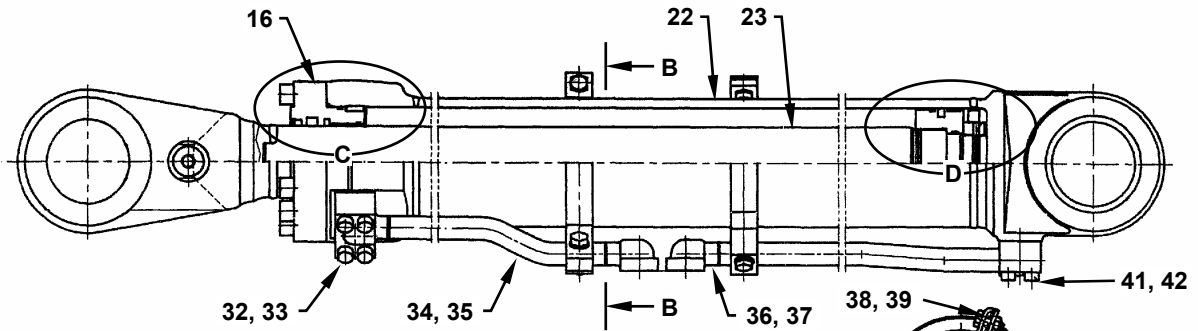
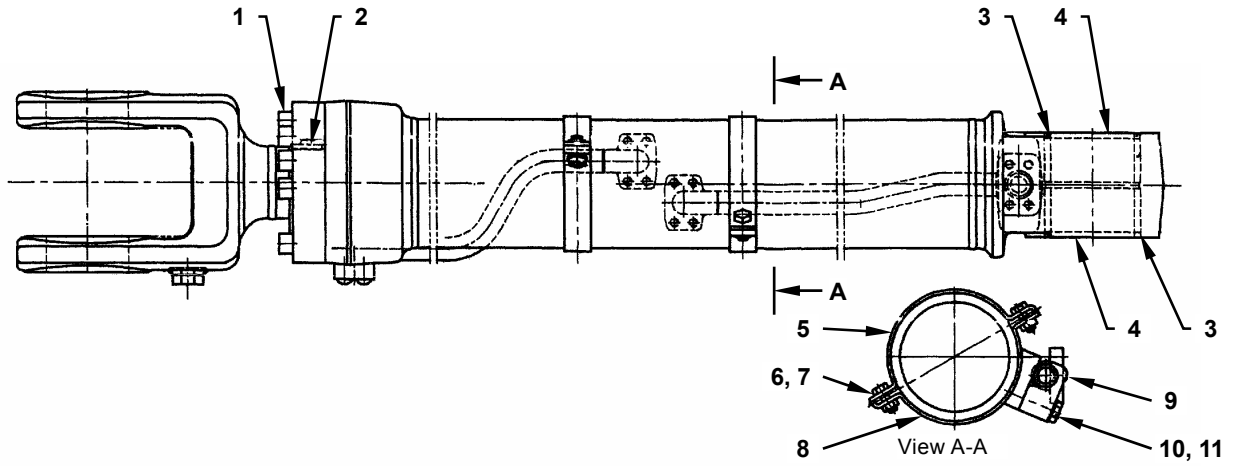
- |                           |                     |                    |                     |
|---------------------------|---------------------|--------------------|---------------------|
| 1 - Socket Bolt (12 Used) | 13 - Retaining Ring | 25 - Dust Ring     | 37 - O-Ring         |
| 2 - Set Screw             | 14 - U-Packing      | 26 - Packing       | 38 - Spring Washer  |
| 3 - Pin Wiper             | 15 - Buffer Seal    | 27 - Wear Ring     | 39 - Hexagon Wrench |
| 4 - Pin Bushing           | 16 - Rod Cover      | 28 - O-Ring        | 40 - Pipe Band      |
| 5 - Pipe Band             | 17 - O-Ring         | 29 - Backup Ring   | 41 - Spring Washer  |
| 6 - Hexagon Wrench        | 18 - O-Ring         | 30 - Piston Nut    | 42 - Socket Bolt    |
| 7 - Spring Washer         | 19 - Backup Ring    | 31 - Set Screw     | 43 - Pipe Band      |
| 8 - Pipe Band             | 20 - Rod Bushing    | 32 - Spring Washer | 44 - Pipe Cramp     |
| 9 - Pipe Cramp            | 21 - Retaining Ring | 33 - Socket Bolt   | 45 - Spring Washer  |
| 10 - Hexagon Wrench       | 22 - Cylinder Tube  | 34 - Pipe          | 46 - Hexagon Wrench |
| 11 - Spring Washer        | 23 - Rod            | 35 - O-Ring        |                     |
| 12 - Dust Seal            | 24 - Piston         | 36 - Pipe          |                     |

## FRONT ATTACHMENT / Cylinder

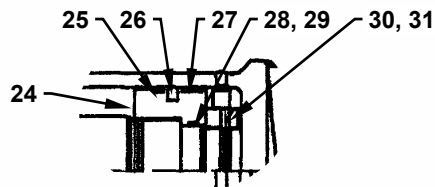
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# FRONT ATTACHMENT / Cylinder



Detail C



Detail D

W4GB-04-02-026

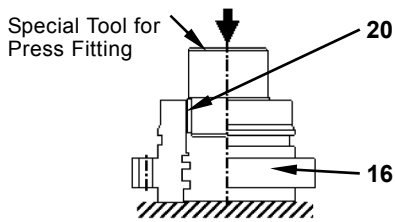


## FRONT ATTACHMENT / Cylinder

### Assembly of Lift Cylinder

1. Press fit rod bushing (20) by using a special tool.  
Special tool: Refer to W3-9-24.

**IMPORTANT:** Align rod bushing (20) with the mounting hole and place vertically. Apply oil to the inner surface of the mounting hole and press fit rod bushing (20). After press fitting, clean again and remove metal powder.



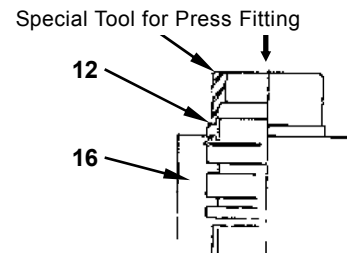
W4GB-04-02-012

2. Install retaining ring (21).

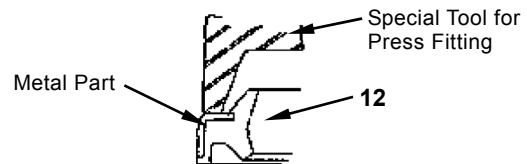
**IMPORTANT:** Check that rod bushing and retaining ring are installed completely.

3. Press fit dust seal (12) by using a special tool and a hammer.  
Special tool: Refer to W3-9-25.

**IMPORTANT:** Align dust seal (12) with the mounting hole and place vertically. Evenly contact a special tool with the metal part of dust seal (12). Before press fitting, apply oil to the inner surface of the hole. After press fitting, clean again and remove metal powder.



W4GB-04-02-013

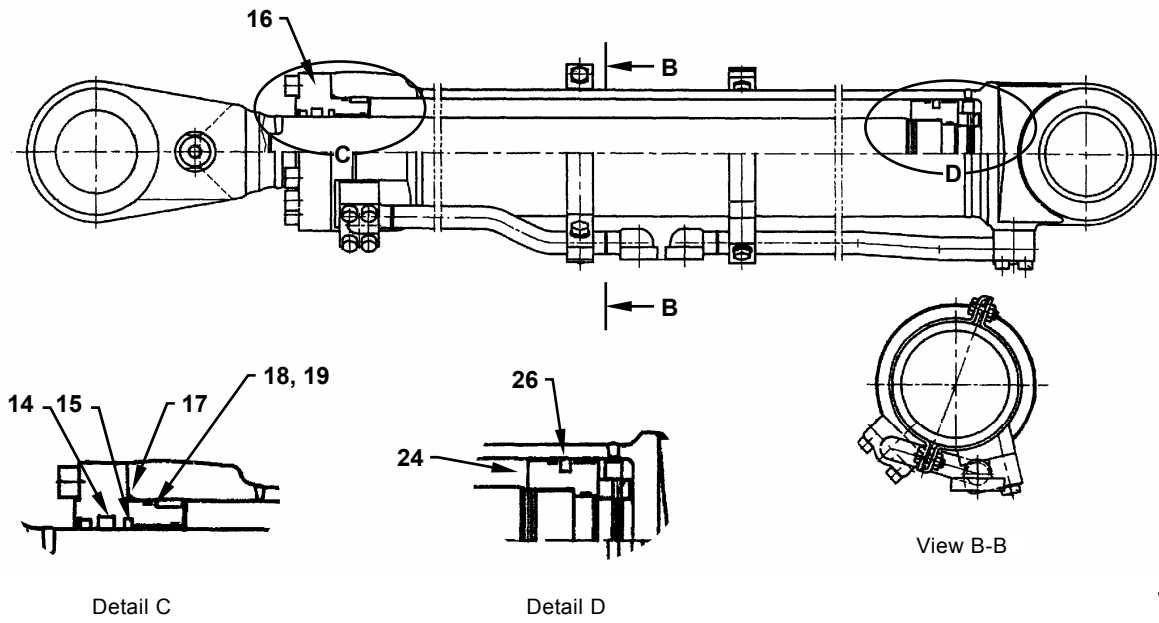
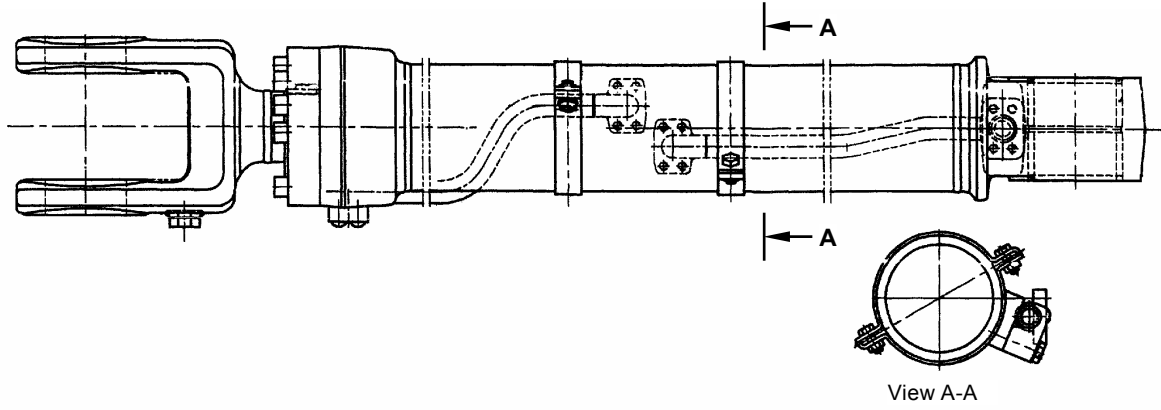


W4GB-04-02-014

4. Install retaining ring (13).

**IMPORTANT:** Check that rod bushing and retaining ring are installed completely.

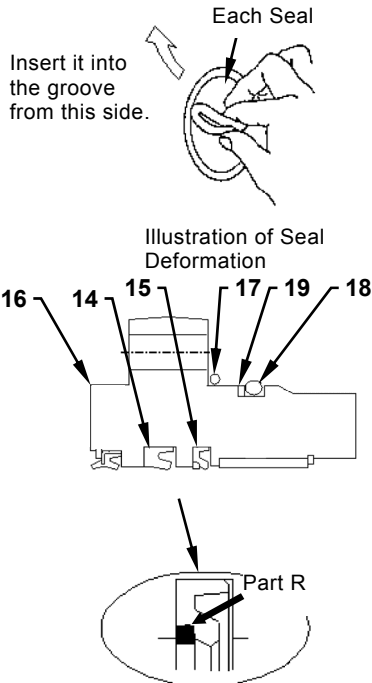
# FRONT ATTACHMENT / Cylinder



W4GB-04-02-026

# FRONT ATTACHMENT / Cylinder

- Install U-packing (14) and buffer seal (15) inside rod cover (16). Refer to the the mounting direction and instructions in the following figure.



W4GB-04-02-015

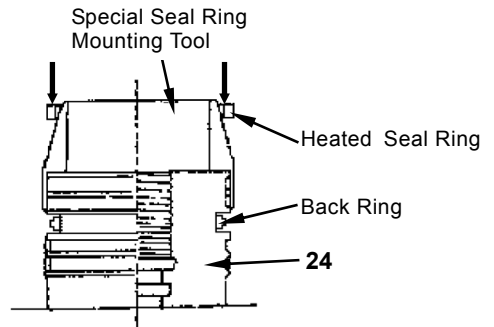
W4GB-04-02-016

W4GB-04-02-017

- Install O-ring (18) and backup ring (19) to the outer side of rod cover (16).
- Install O-ring (17) to the flange part of rod cover (16).

## Assembly of Piston

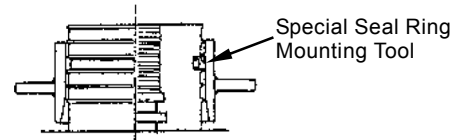
- After installing the special tool for inserting seal ring to piston (24), install the back ring of packing (26).
- Heat the seal ring of packing (26) to 150 to 180 °C (300 to 370 °F). Quickly install the seal ring to the seal groove of piston (24).  
Special tool: Refer to W3-9-23.



W4GB-04-02-018

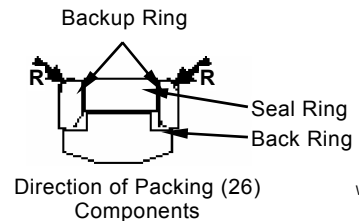
**IMPORTANT: Heat seal ring in the oil heated by an electric air heater. Avoid direct-heating by fire.**

- Adjust the extended seal ring to the previous shape by a special tool.  
Special tool: Refer to W3-9-23.



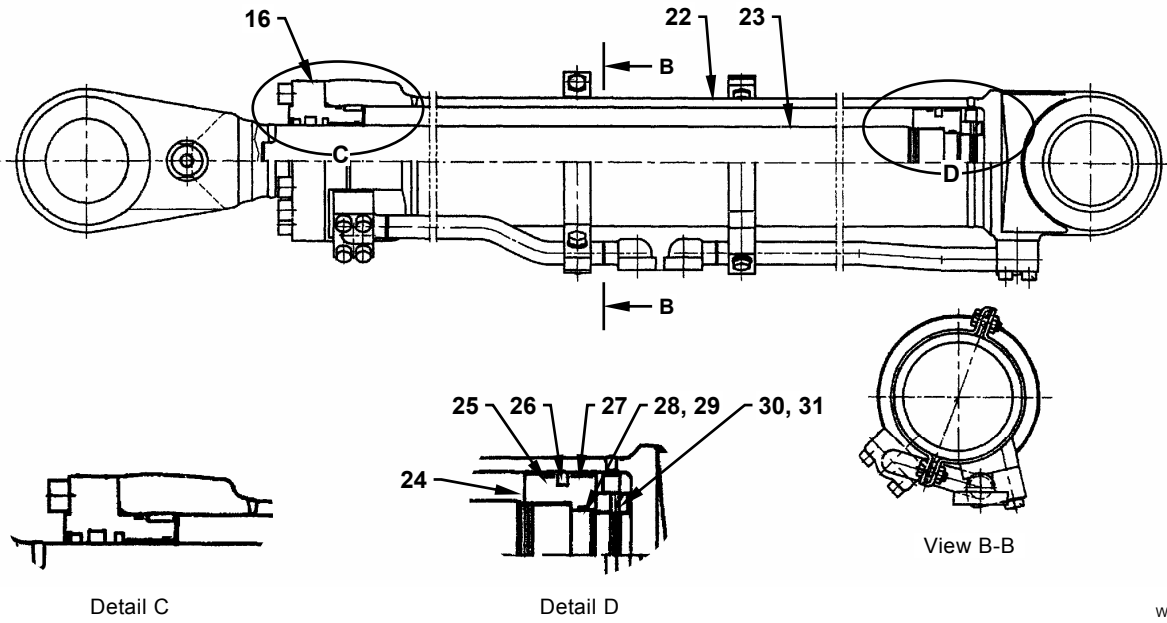
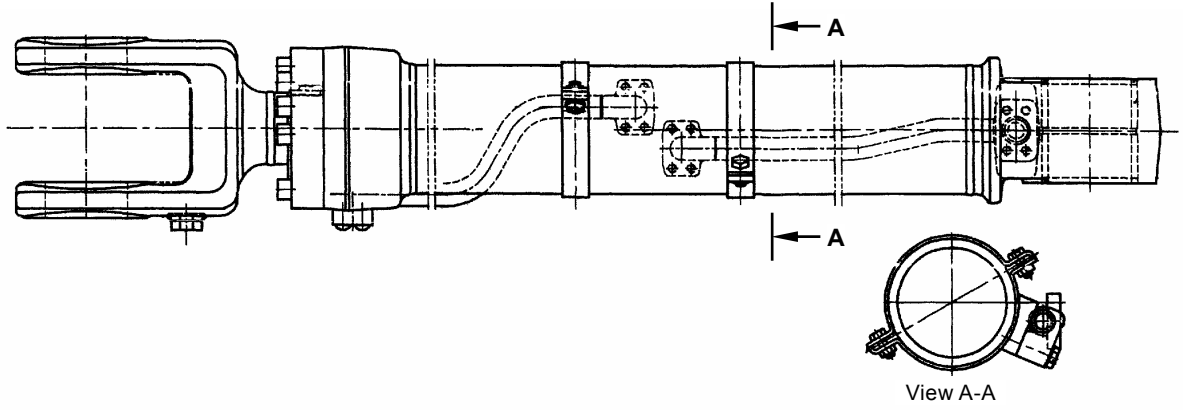
W4GB-04-02-019

- Install the backup ring to both sides of the seal ring on packing (26).



W4GB-04-02-020

# FRONT ATTACHMENT / Cylinder



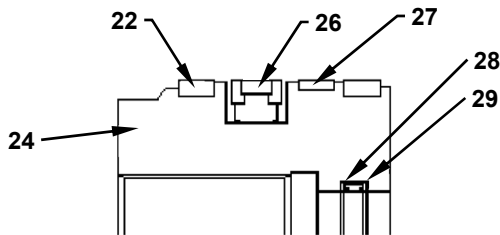
W4GB-04-02-026

## FRONT ATTACHMENT / Cylinder

5. Install O-ring (28) and backup ring (29) to the piston ID part.

**IMPORTANT: Keep wear ring (27) and dust ring (25) until the installation to cylinder tube (22).**

**The following figure shows the final assembly diagram of the piston.**




W4GB-04-02-021

6. Secure rod (23) on a workbench.
7. Install rod cover (16) to rod (23) by using a special tool for installing rod cover.

**IMPORTANT: Apply a film of oil to the special tool and the surface of the rod to protect the seals.**  
**Refer to W3-9-25 for the special tool for installing the rod.**

8. Install the bolt to the screw hole at the end of piston (24). Install piston (24) to rod (23) by using a special tool.


Bolt size: M10, Length 20 mm (2 used)

 : 980±98 N·m  
(100±10 kgf·m, 720±72 lbf·ft)

**IMPORTANT: Apply a film of oil to O-ring (28) and the thread part on the ID part of piston (24).**


**Refer to W3-9-22 for special tool.**  
**After tightening the bolt, remove the bolt.**


9. Install piston nut (30) by using a special tool.

 : 1860±186 N·m  
(190±19 kgf·m, 1370±137 lbf·ft)

**IMPORTANT: Apply a film of oil to the thread part of piston nut (30).**

10. Apply LOCTITE #242 to the thread part of set screw (31). Install set screw (31) to piston nut (30).

 : 4 mm

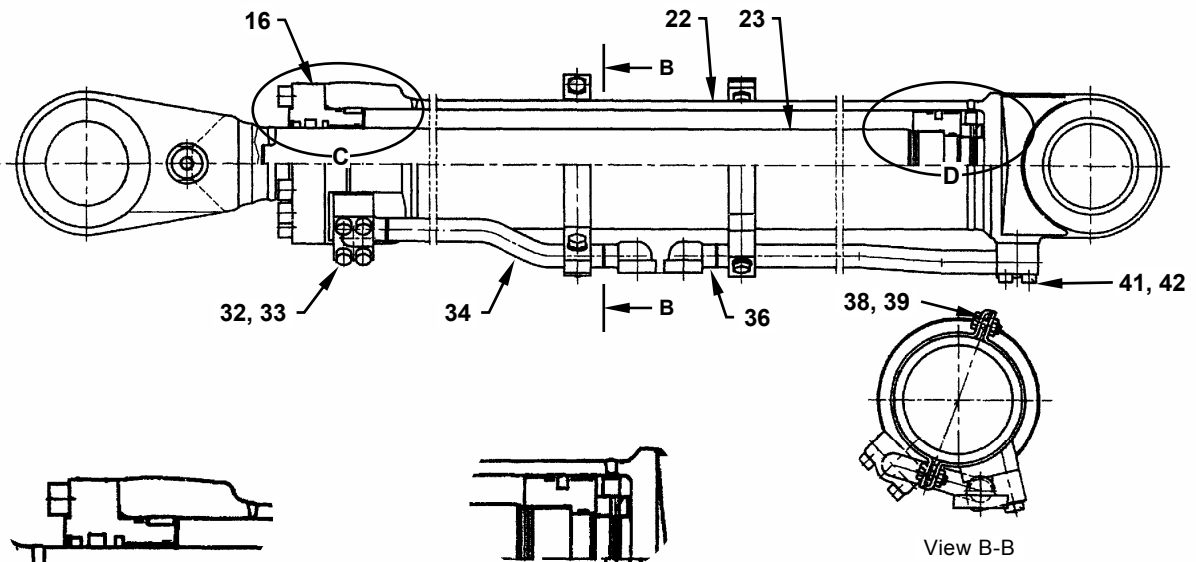
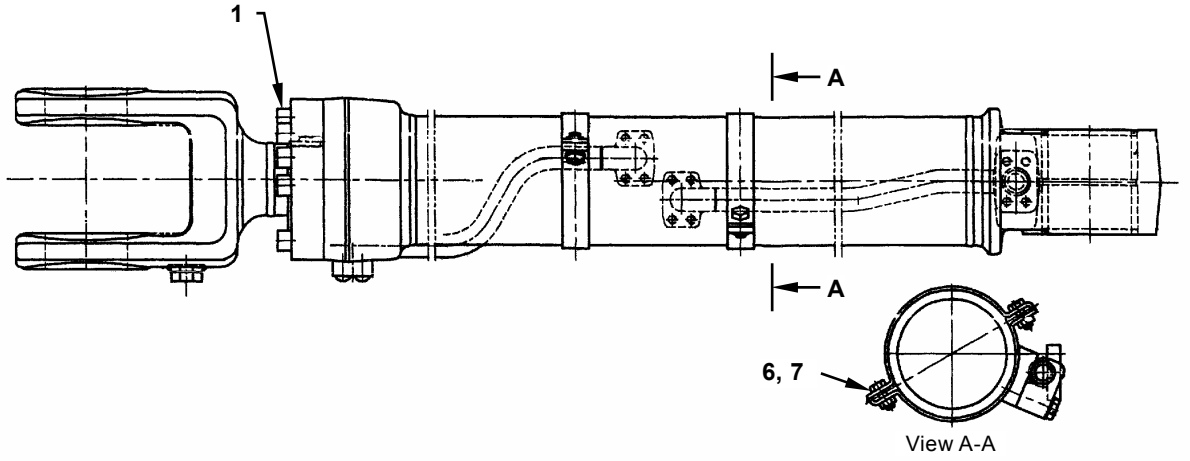
 : 15±1.5 N·m (1.5±0.15 kgf·m, 11±1.1 lbf·ft)

**IMPORTANT: Wipe out extruded LOCTITE. Caulk screw hole (2 places) diagonally by using a center punch.**

11. Place cylinder tube (22) on a workbench horizontally. Secure the parallel surface of the head cover.
12. Install wear ring (27) and dust ring (25) in the outer surface of piston (24). Apply a film of oil.
13. Lift at the center of gravity of rod (23). Insert piston (24) into cylinder tube (22) by moving around rod (23).

**IMPORTANT: As seals get pinched prevent wear ring (27) and dust ring (25) from falling off causing pinching of the seals.**

# FRONT ATTACHMENT / Cylinder



Detail C





Detail D

W4GB-04-02-026

## FRONT ATTACHMENT / Cylinder

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


14. Align rod cover (16) with the screw hole of the flange part in cylinder tube (22) and tighten them with socket bolts (1) (12 used).

 : 14 mm  
 : 470 to 520 N·m  
(50 to 55 kgf·m, 350 to 380 lbf·ft)

**IMPORTANT: Use a cloth in order to prevent damage from the surface of the rod.**

15. Supply low pressure air to the port in the rod (23) side of cylinder tube (22) and retract rod (23).

16. Install pipes (34 and 36) with socket bolts (33 and 42), spring washers (32 and 41), bolts (6 and 39), and spring washers (7, 38).

 : 8 mm  
 : 110 to 120 N·m  
(11 to 12 kgf·m, 80 to 85 lbf·ft)  
 : 17 mm, 19 mm  
 : 55 to 60 N·m  
(5.5 to 6 kgf·m, 40 to 45 lbf·ft)

## FRONT ATTACHMENT / Cylinder

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