PART NO. EM1NE-EN1-4

HITACHI

Operator's Manual

ZAXIS

29U-3
33U-3
38U-3
48U-3
52U-3

Hydraulic Excavator

Serial No.

ZX29U-3	020270	and up
ZX33U-3	020639	and up
ZX38U-3	020171	and up
ZX48U-3	020310	and up
ZX52U-3	020215	and up

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

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ZX29U-3 • 33U-3 • 38U-3 • 48U-3 • 52U-3 HYDRAULIC EXCAVATOR OPERATOR'S MANUAL

EM1NE-EN1-4

INTRODUCTION

Read this manual carefully to learn how to operate and service your machine correctly. Failure to do so could result in personal injury or equipment damage.

This standard specification machine can be operated under the following conditions without being modified.
Atmospheric Temperature: –20 °C to 40 °C (–4 °F to 104 °F)
Altitude: 0 m to 1500 m (0 ft to 4900 ft)

In case the machine is used under conditions other than described above, consult your authorized dealer.

This manual should be considered a permanent part of your machine and should remain with the machine when you sell it.

This machine is of metric design. Measurements in this manual are metric. Use only metric hardware and tools as specified.

- SI Units (International System of Units) are used in this manual.
  For reference MKS system units and English units are also indicated in parentheses after the SI units.
  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

Right-hand and left-hand sides are determined by facing in the direction of forward travel.

Write product identification numbers in the Machine Numbers section. Accurately record all the numbers to help in tracing the machine should it be stolen. Your dealer also needs these numbers when you order parts. If this manual is kept on the machine, also file the identification numbers in a secure place off the machine.

Use only diesel fuel with quality specified in JIS K-2204, EN-590, ASTM D-975, GOST R52368 or GB252.
Failure to use diesel fuel with quality as specified above may allow the engine to emit exhaust gas which cleanness can not conform to the requests in various relevant regulations. In addition, serious damage to the engine may result. Consult with your authorized dealer for detailed information.

Warranty is provided as a part of Hitachi's support program for customers who operate and maintain their equipment as described in this manual. The warranty is explained on the warranty certificate which you should have received from your dealer.

This warranty provides you the assurance that Hitachi will back its products where defects appear within the warranty period. In some circumstances, Hitachi also provides field improvements, often without charge to the customer, even if the product is out of warranty. **Should the equipment be abused, or modified to change its performance beyond the original factory specifications, the warranty will become void and field improvements may be denied.** Setting fuel delivery above specifications or otherwise overpowering machines will result in such action.

Only qualified, experienced operators officially licensed (according to local law) should be allowed to operate the machine. Moreover, only officially licensed personnel should be allowed to inspect and service the machine.

PRIOR TO OPERATING THIS MACHINE, INCLUDING SATELLITE COMMUNICATION SYSTEM, IN A COUNTRY OTHER THAN A COUNTRY OF ITS INTENDED USE, IT MAY BE NECESSARY TO MAKE MODIFICATIONS TO IT SO THAT IT COMPLIES WITH THE LOCAL REGULATORY STANDARDS (INCLUDING SAFETY STANDARDS) AND LEGAL REQUIREMENTS OF THAT PARTICULAR COUNTRY. PLEASE DO NOT EXPORT OR OPERATE THIS MACHINE OUTSIDE OF THE COUNTRY OF ITS INTENDED USE UNTIL SUCH COMPLIANCE HAS BEEN CONFIRMED.
PLEASE CONTACT HITACHI CONSTRUCTION MACHINERY CO., LTD. OR ANY OF OUR AUTHORIZED DISTRIBUTOR OR DEALER IF YOU HAVE ANY QUESTIONS CONCERNING COMPLIANCE.

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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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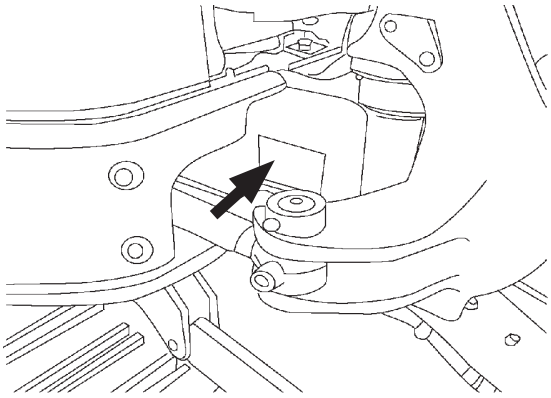
MEMO

MACHINE NUMBERS

The manufacturing Nos. explained in this group is the individual number (serial No.) given to each machine and hydraulic components. These numbers are requested when inquiring any information on the machine and/or components. Fill these serial Nos. in the blank spaces in this group to immediately make them available upon request.



M1M7-00-001

Machine

MODEL/TYPE:_____

PRODUCT IDENTIFICATION NUMBER:

_____

Product Identification Number

PRODUCT IDENTIFICATION NUMBER:

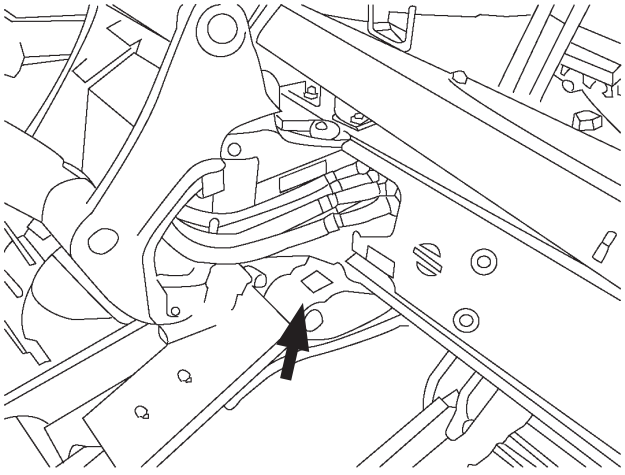
_____

NOTE:

HCM1NE00X00020001

Marks to indicate the start and end of the PIN

PRODUCT IDENTIFICATION NUMBER (PIN)

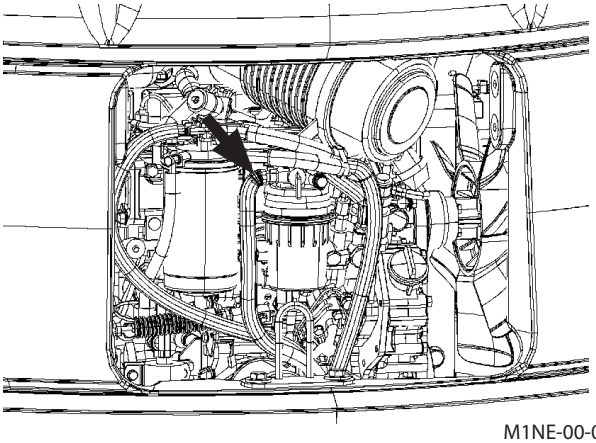


M1M7-00-002

Engine

TYPE:_____

MFG. NO.:_____

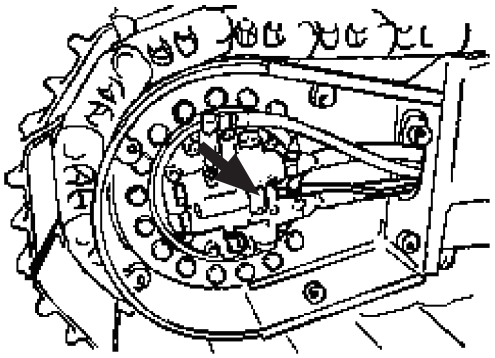


M1NE-00-001

Travel Motor

TYPE:_____

MFG. NO.:_____

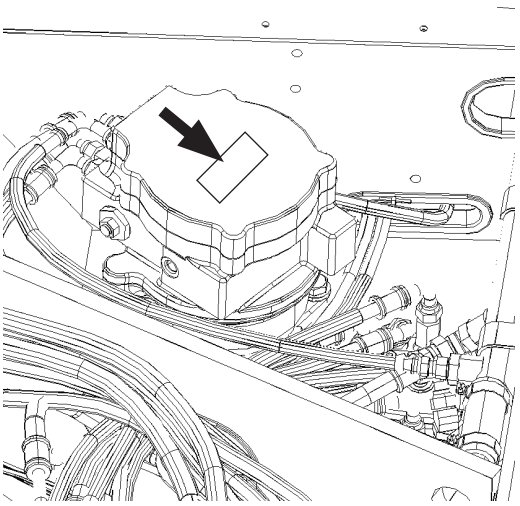


M1M0-00-004

Swing Motor

TYPE:_____

MFG. NO.:_____

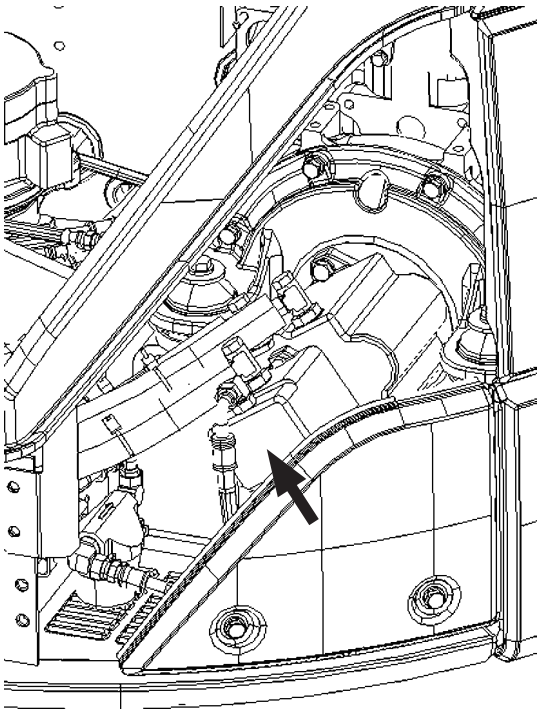


M1NE-00-002

Hydraulic Pump

TYPE:_____

MFG. NO.:_____



M1NE-00-003

Recognize Safety Information

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

SA-688

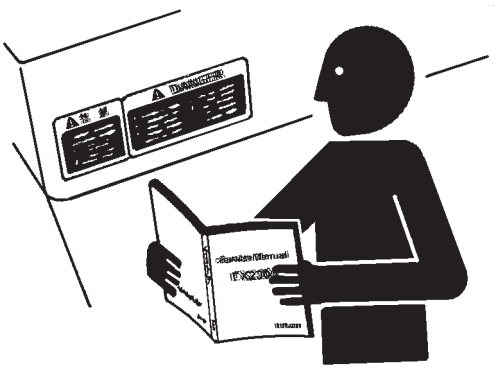
Understand Signal Words

- 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 do not 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.

SA-1223

Follow Safety Instructions

- Carefully read and follow all safety signs on the machine as well as all safety messages in this manual.
- Safety signs must be installed, maintained and replaced if damaged.
  - If a safety sign or this 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).
- Allow only properly trained, qualified, authorized personnel to operate the machine.
- Learn how to correctly operate and service the machine.
- Keep your machine in proper working condition.
- Always operate the machine within the specification.
  - Unauthorized modifications of the machine may impair the functions and/or safety and affect machine life and the warranty will become void.
- 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 possible hazardous situation you may encounter. If you have any questions concerning safety, you should first consult your supervisor and/or your authorized dealer before operating or performing maintenance work on the machine.



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 and 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 any fire or accidents which may occur.
  - Keep emergency numbers for doctors, ambulance service, hospitals, and fire department posted near your telephone.

SA-437

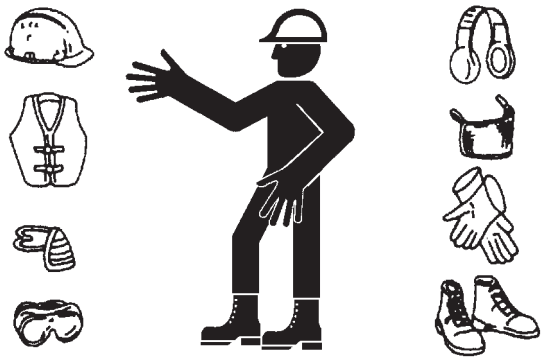
Wear Protective Clothing

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

  You may need:
  - A hard hat
  - Safety belt
  - 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.



SA-438

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.

SA-434

Inspect Machine

- If any abnormality is found, be sure to repair it immediately before operating the machine.
  - In the walk-around inspection, be sure to cover all points described in the “Daily Inspection” section in the operator’s manual.

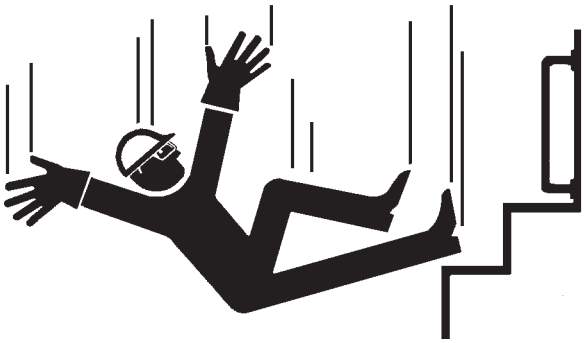
SA-435

Tidy Up Inside Operator's Space

- Always keep inside the cab clean by observing instructions below, to prevent any personal accidents from occurring.
  - Before entering the cab, thoroughly remove all dirt and/or oil such as mud, grease, soil or stones that may mess up the cab 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 mess up around the operator's seat with parts, tools, soil, stones, obstacles that may fold up or turn over, cans or lunch box. The levers or pedals become inoperable if obstacle jams in operation stroke of the travel levers/pedals, pilot control shut-off lever or control levers, which may result in serious injury or death.
  - Avoid storing transparent bottles in the cab. Do not attach any transparent type window decorations on the windowpanes as they may focus sunlight, possibily starting a fire.
  - Do not wear radio or music headphones and do not use a cell phone while traveling or operating the machine.
  - Never allow hazardous materials such as combustible and/or explosive material in the operator's space.
  - After using the ashtray, always cover it to extinguish the match and/or tobacco.
  - Do not leave cigarette lighters in the cab. If the temperature in the cab increases, the lighter may explode.
  - Use proper floor mat dedicated to the machine. If another floor mat is used, it may be displaced and contact with the travel pedals during operation, resulting in serious injury or death.

Use Handrails and Steps

- Falling is one of the major causes of personal injury.
  - When you get on and off the machine, always face the machine.
  - Maintain a three-point contact with the steps and handrails.
  - Do not use any controls as handholds.
  - Never jump on or off the machine. Never mount or dismount a moving machine.
  - In case adhered slippery material such as oil, grease, or mud is present on steps, handrails, or platforms, thoroughly remove such material.



SA-439

Never Ride Attachment

- Never allow anyone to ride attachments or the load. This is an extremely dangerous practice.

Adjust the Operator's Seat

- A poorly adjusted seat for either the operator or the work at hand may quickly fatigue the operator leading to mis-operation of the machine.
  - The seat should be adjusted whenever the operator for the machine changes.
  - The operator should be able to fully depress the pedals and to correctly operate the control levers with his back firmly against the seat back.
  - If not, readjust the seat forward or backward, and check again.

SA-378

Ensure Safety Before Rising From or Leaving Operator's Seat

- Before rising from the operator's seat to open/close cab front 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.

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.
  - Be sure to remain seated with the seat belt securely fastened whenever operating the machine.
  - 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. Replace the seat belt at least once every 3 years regardless of appearance.

SA-237

Move and Operate Machine Safely

- Always be aware that there is a potential danger around the machine while operating the machine.
  - Take extra care not to run over bystanders. Confirm the location of bystanders before moving, swinging, or operating the machine.
  - Always keep the travel alarm and horn in working condition (if equipped).
  - Before starting to move or operate the machine, sound the travel alarm and horn to alert bystanders.
  - Use a signal person when moving, swinging, or operating the machine in congested areas. Locate the signal person so that the operator can always witness the signal person.
  - Coordinate the meanings of all safety signs, hand signals and marks before starting the machine. Appoint a person who is responsible to make a signal and/or guidance.
  - Never allow any persons or obstacles to enter the machine operation areas.
  - Use appropriate illumination.

SA-1291

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 tracks or on ground.
  - Do not start engine by shorting across starter terminals. A hazardous situation may be created and/or possible damage to the machine may result.
  - Before starting the engine, confirm that all control levers are in neutral.

SA-444

Jump Starting

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

SA-032

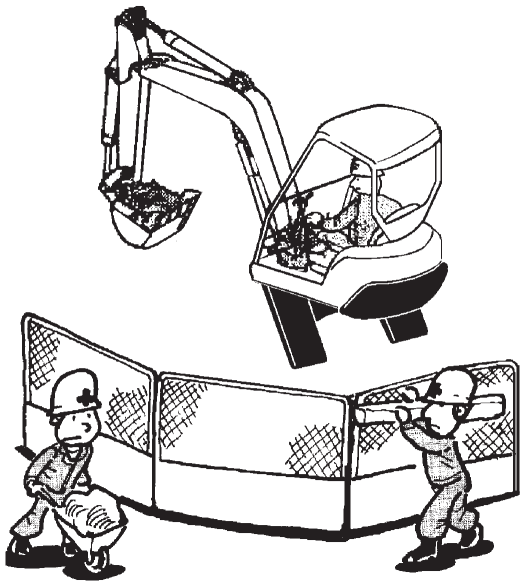
Keep Riders Off Machine

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

SA-1292

Precautions for Operations

- Thoroughly make certain safety at the work site before starting operations. Especially always observe the following points.
  - Be sure to wear close fitting clothing and required safety items, such as a hard hat, when operating the machine.
  - Keep all bystanders and unnecessary objects out of and away from the machine working areas. Always beware of the surroundings while operating the machine. Take care not to allow the rear part of the upperstructure to come in contact with objects when swinging the machine in a small area.
  - When loading a dump truck, bring the bucket from the rear side of the dump truck to avoid moving the bucket over the dump truck cab or over any co-workers.

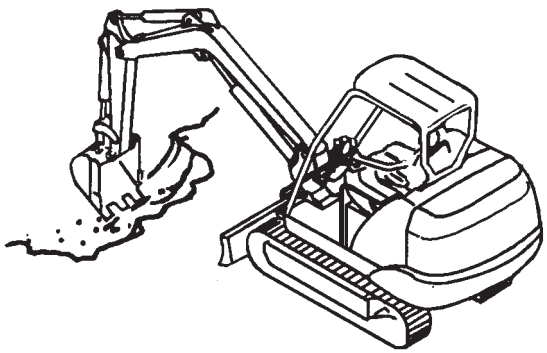


M586-12-012

Investigate Job Site Beforehand

- When working at the edge of an excavation or on a road shoulder, the machine could tip over due to collapse of the ground, 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.
  - Never allow bystanders to enter the working area such as swing radius or traveling range.
  - When the footing is weak, reinforce the ground before starting work.
  - When working on frozen ground, be extremely alert. As ambient temperatures rise, footing may become loose and slippery.
  - When operating the machine near open flame, sparks, and/or dead grass, a fire may easily break out. Use special care not to cause a fire.
- Make sure the work site ground has sufficient strength to firmly support the machine. When working close to an excavation or on road shoulders, operate the machine with the tracks positioned perpendicular to the cliff face with travel motors at the rear and with the blade at the front, so that the machine can more easily evacuate if the cliff face collapses.
- If working at the bottom of a cliff or on a high bank is required, be sure to investigate the area first and confirm that no danger of the cliff or bank collapsing exists. If any possibility of cliff or bank collapsing exists, do not work in that area.
- Soft ground may collapse when operating the machine on it, possibly causing the machine to tip over. When working on a soft ground is required, be sure to reinforce the ground first using large pieces of steel plates strong enough and firm to easily support the machine.
- Note that there is always a possibility of machine tipping over when working on rough terrain or on slopes. Prevent machine tipping over from occurring. Operate the machine slowly to ensure safe operation.

SA-1293



M586-05-021

Equipment of OPG

- In case the machine is operated in areas where the possibility of falling stones or debris exists, equip genuine Hitachi OPG guard. Contact your nearest Hitachi dealer for installation method of the OPG guard. Depending on the specifications applied to your machine, modification of the machine to meet ROPS standards will be possible.
- To maintain unimpaired operator protection and manufacture's protective structure.
  - Damaged ROPS, OPG guard must be replaced, not repaired or revised.
  - Any alternation to the ROPS or OPG guard must be approved by the manufacturer.

ROPS : Roll Over Protective Structure
OPG : Operator Protective Guard

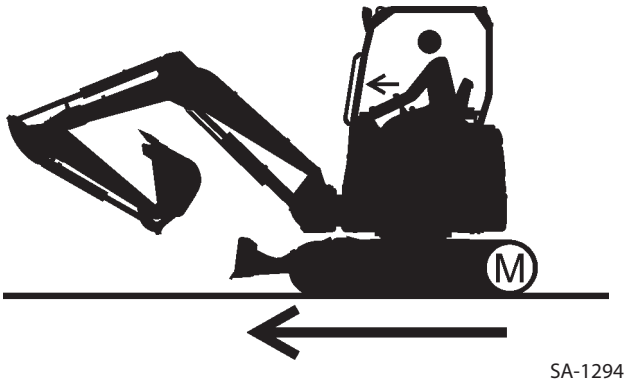
Provide Signals for Jobs Involving Multiple Machines

- In case more than one machine is operated in the same job site, accidental collision between machines may cause serious injury or death.
- For jobs involving multiple 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.

SA-481

Confirm Direction of Machine to be Driven

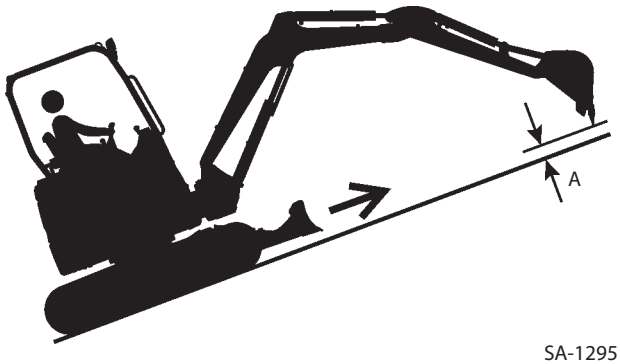
- Incorrect travel pedal/lever operation may result in serious injury or death.
  - Before driving the machine, confirm the position of the undercarriage in relation to the operator's position.
  - If the travel motors are located towards the front of the cab, the machine will move in the reverse direction when travel pedals/levers are operated.



SA-1294

Drive Machine Safely

- Use a signal person when traveling the machine along road shoulders or in congested areas.
- Driving the machine in the incorrect direction may result in serious injury or death and/or severe damage to property.
- Before driving the machine, always confirm that the travel pedals/levers direction corresponds to the direction you wish to drive.
  - Be sure to detour around any obstructions.
  - Avoid traveling over obstructions. Soil, fragments of rocks, and/or metal pieces may scatter around the machine. Do not allow personnel to stay around the machine while traveling.
- Driving on a slope may cause the machine to slip or overturn, possibly resulting in serious injury or death.
  - Never attempt to ascend or descend 30 degrees or steeper slopes.
  - Be sure to fasten the seat belt.
  - When driving up or down a slope, keep the bucket facing the direction of travel, approximately 200 to 300 mm (8 to 12 in) (A) above the ground.
  - If 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 turnover. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.
  - Avoid swinging the upperstructure on slopes. Never attempt to swing the upperstructure downhill. The machine may tip over. If swinging uphill is unavoidable, carefully operate the upperstructure and boom at slow speed.
  - If the engine stalls on a slope, immediately lower the bucket to the ground. Return the control levers to neutral. Then, restart the engine.
  - Be sure to thoroughly warm up the machine before ascending steep slopes. If hydraulic oil has not warmed up sufficiently, sufficient performance may not be obtained.



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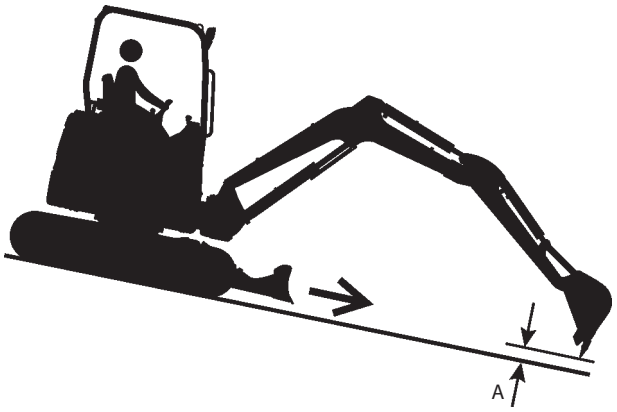

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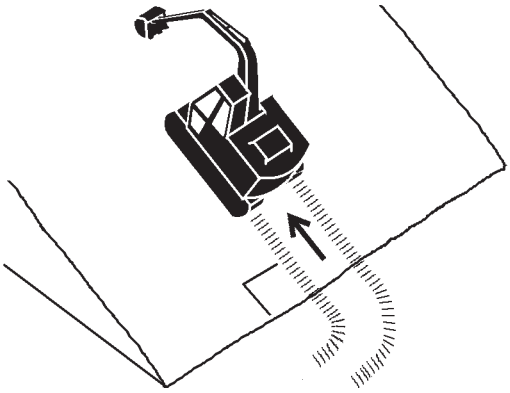

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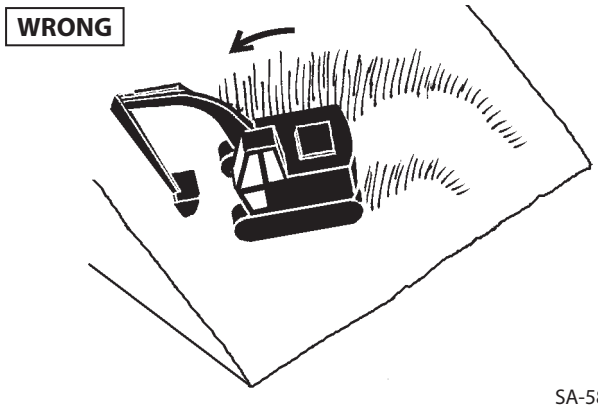
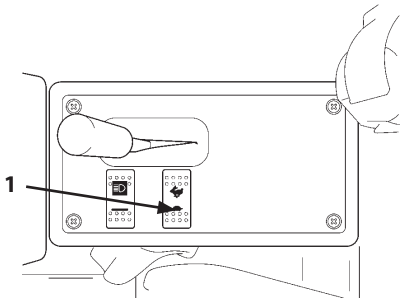


SA-589

- Traveling down a slope in the fast mode requires a longer time to stop the machine. When traveling down a slope, place travel mode switch (1) in the TURTLE position.
- Select a travel route that is as flat as possible. Steer the machine as straight as possible, making small gradual changes repeatedly in direction.
- Check the strengths of bridges and road shoulders before traveling on them, and reinforce if necessary.
- When the machine is equipped with steel shoes, cover the road surface with wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, lay wood plates over the tracks not to allow the machine to ride on only the rails.
- Check that the machine can pass under a bridge and electric lines before driving the machine.
- When crossing a river, drive the machine slowly while measuring the depth of the river using the bucket. Do not cross the river when the depth of the river is deeper than the upper track shoe surface.
- Reduce the engine speed when traveling on rough terrains. Select a slow travel speed. Slower speed will reduce possible damage to the machine.
- Drive the machine so that the travel motors do not come in contact with loose rocks. If the machine crosses over an obstruction, abnormally large loads may be loaded on the machine. Avoid contact with an obstruction while traveling the machine.
- During freezing weather, always clean snow and ice from track shoes before driving the machine on snowy and/or frozen roads, or loading and unloading the machine for transportation, to prevent the machine from slipping.



ZX29U-3 (Canopy)

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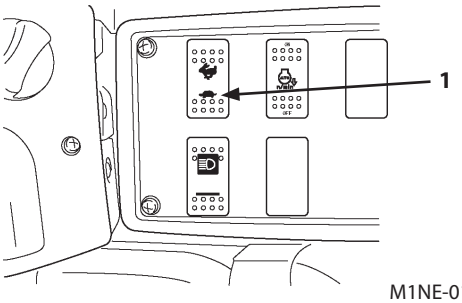

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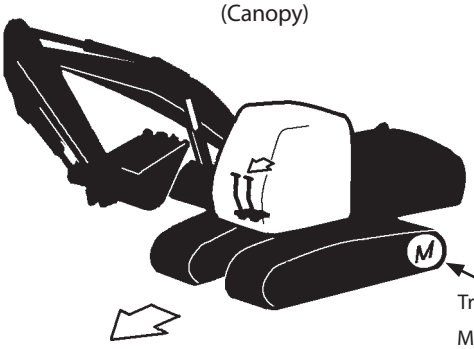
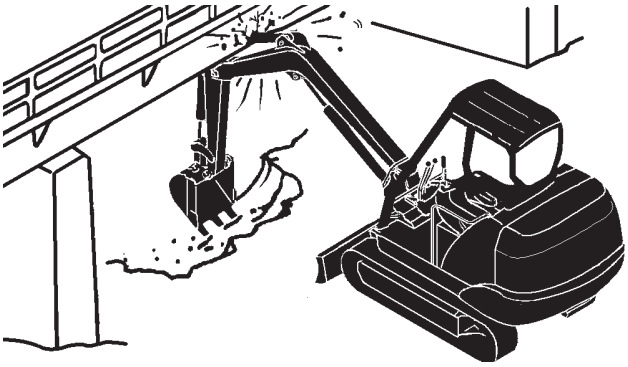
ZX33U-3, 38U-3, 48U-3, 52U-3 (Canopy)

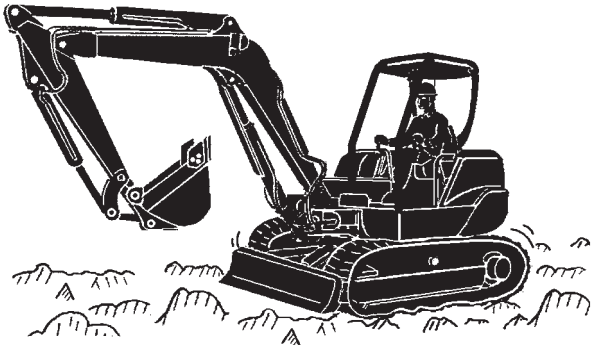


Travel Motor

M104-05-008



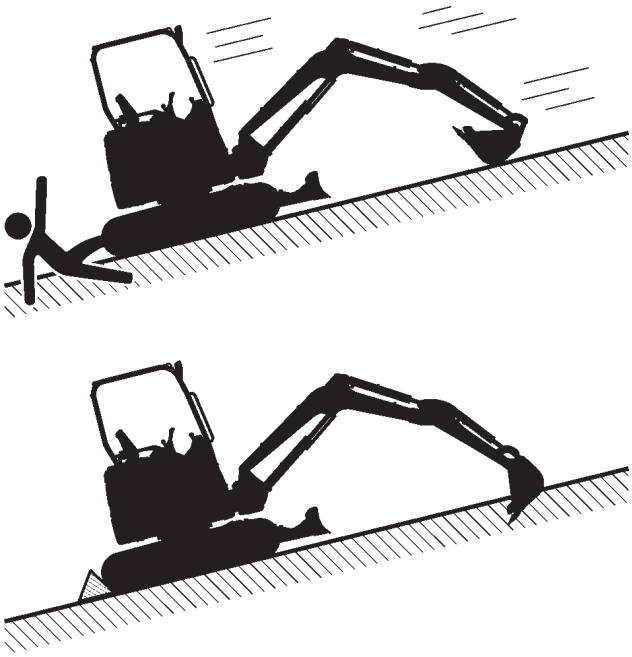
SA-673



M586-05-002

Avoid Injury From Rollaway Accidents

- Death or serious injury may result if you attempt to mount or try to bodily stop a moving machine.
- Park the machine in compliance with the safe parking procedures described on page S-19 to prevent the machine from running away.
  - Block both tracks and lower the bucket to the ground, thrust the bucket teeth into the ground if you must park on a grade.
  - Park at a reasonable distance from other machines.

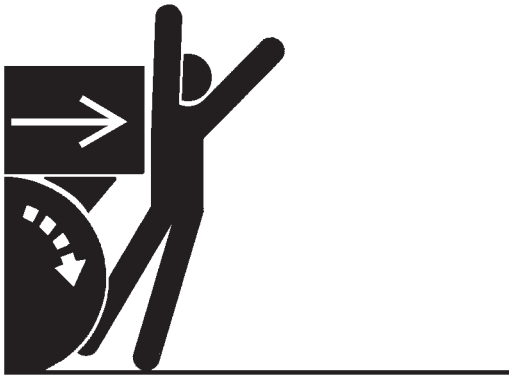


SA-1297

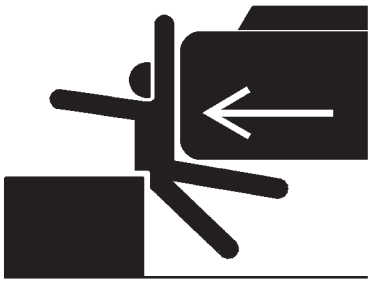
Avoid Injury From Back-over and Swing Accidents

- If any person is present near the machine when backing or swinging the upperstructure, the machine may hit or run over that person, resulting in serious injury or death.

  To avoid back-over and swing accidents:
  - Always look around BEFORE YOU BACK UP AND SWING THE MACHINE. BE SURE THAT ALL BYSTANDERS ARE CLEAR.
  - Keep the travel alarm in working condition (if equipped). ALWAYS BE ALERT FOR BYSTANDERS MOVING INTO THE WORK AREA. USE THE HORN OR OTHER SIGNAL TO WARN BYSTANDERS BEFORE MOVING MACHINE.
  - USE A SIGNAL PERSON WHEN BACKING UP IF YOUR VIEW IS OBSTRUCTED. ALWAYS KEEP THE SIGNAL PERSON IN VIEW.
    Use hand signals, which conform to your local regulations, when work conditions require a signal person.
  - No machine motions shall be made unless signals are clearly understood by both signal person and operator.
  - Learn the meanings of all flags, signs, and markings used on the job and confirm who has the responsibility for signaling.
  - Keep windows, mirrors, and lights clean and in good condition.
  - Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.
  - Read and understand all operating instructions in the operator's manual.



SA-383



SA-384

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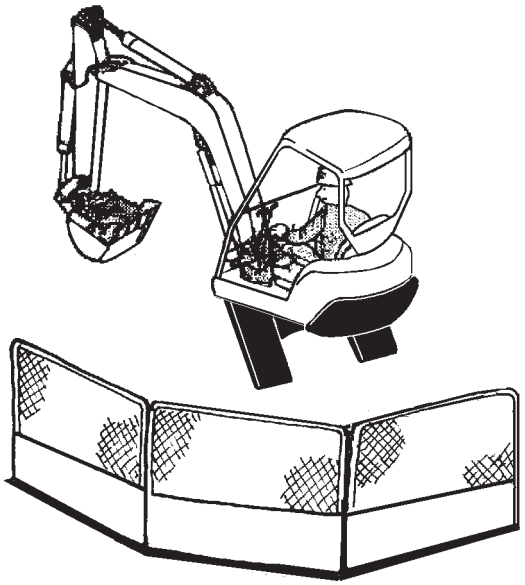
Keep Person Clear From Working Area

- If a person is present near the operating machine, the person may come in contact with the swinging front attachment or counterweight and/or may be crushed against an other object, resulting in serious injury or death.
  - Before operating the machine, set up barriers to the sides and rear area of the bucket swing radius to prevent anyone from entering the work area.
  - Make sure that no personnel other than the signal person or no obstacles are present in the working area before operating the machine.



SA-667

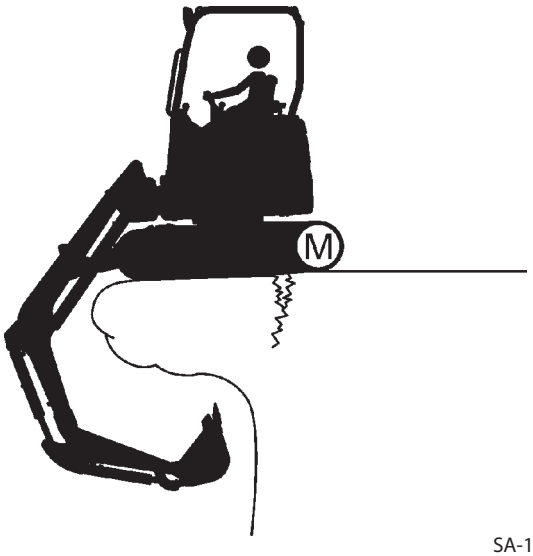
Never Position Bucket Over Anyone

- Never lift, move, or swing bucket above anyone or a truck cab.
  Serious injury or machine damage may result due to bucket load spill or due to collision with the bucket.
  - Never allow the bucket to pass over anyone to avoid personal injury or death.

SA-668

Avoid Undercutting

- In order to retreat from the edge of an excavation if the footing should collapse, always position the undercarriage perpendicular to the edge of the excavation with the travel motors at the rear.
  - If the footing starts to collapse and if retreat is not possible, do not raise the front attachment in a panic. Lowering the front attachment may be safer in most cases.

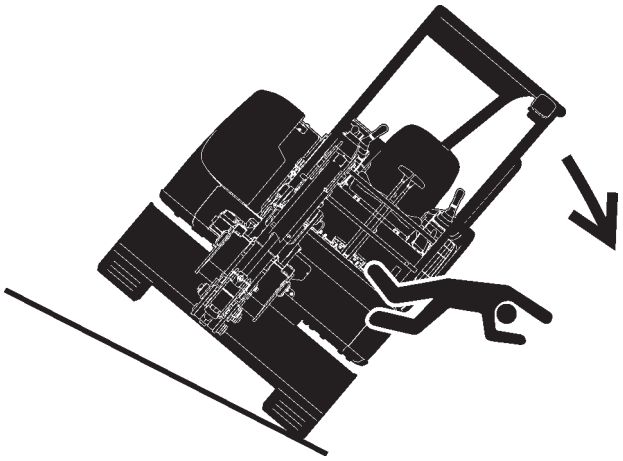


SA-1300

Avoid Tipping

- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.

  To avoid tipping:
- Be extra careful before operating on a grade.
  - Prepare machine operating area flat.
  - Keep the bucket low to the ground and close to the machine.
  - Reduce operating speeds to avoid tipping or slipping.
  - Avoid changing direction when traveling on grades.
  - NEVER attempt to travel across a grade steeper than 15 degrees if crossing the grade is unavoidable.
  - Reduce swing speed as necessary when swinging loads.



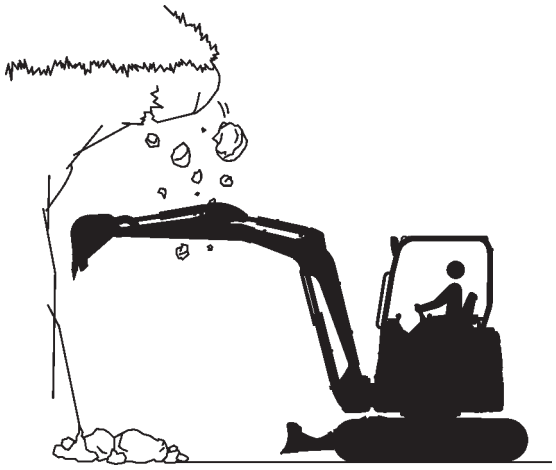
SA-1301

- Be careful when working on frozen ground.
  - Temperature increases will cause the ground to become soft and make ground travel unstable.

025-E01A-0540-4

Never Undercut a High Bank

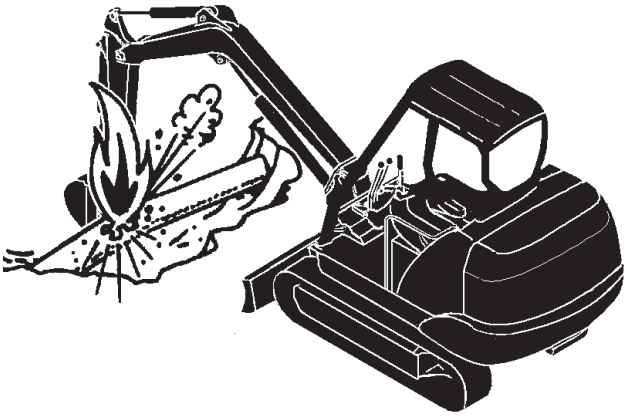
- The edges could collapse or a land slide could occur causing serious injury or death.



SA-1302

Dig With Caution

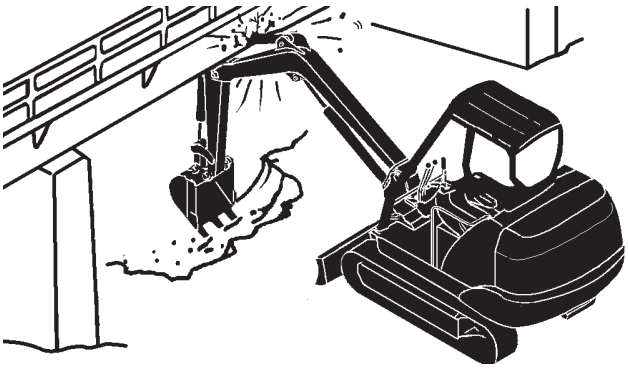
- Accidental severing of underground cables or gas lines may cause an explosion and/or fire, possibly resulting in serious injury or death.
  - Before digging check the location of cables, gas lines, and water lines.
  - Keep the minimum distance required, by law, from cables, gas lines, and water lines.
  - If a fiber optic cable should be accidentally severed, do not look into the end. Doing so may result in serious eye injury.
  - Contact your local “diggers hot line” if available in your area, and/or the utility companies directly.
    Have them mark all underground utilities.



SA-672

Operate With Caution

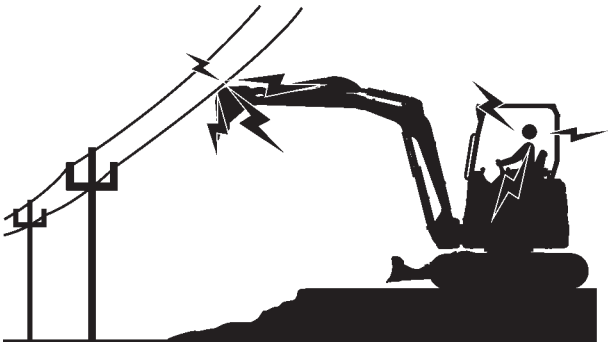
- If the front attachment or any other part of the machine hits against an overhead obstacle, such as a bridge, both the machine and the overhead obstacle will be damaged, and personal injury may result as well.
  - Take care to avoid hitting overhead obstacles with the boom or arm.



SA-673

Avoid Power Lines

- Serious injury or death can result if the machine or front attachments are not kept a safe distance from electric lines.
  - When operating near an electric line, NEVER move any part of the machine or load closer than 3 m (10 ft) plus twice the line insulator length.
  - Check and comply with any local regulations that may apply.
  - Wet ground will expand the area that could cause any person on it to be affected by electric shock. Keep all bystanders or co-workers away from the site.



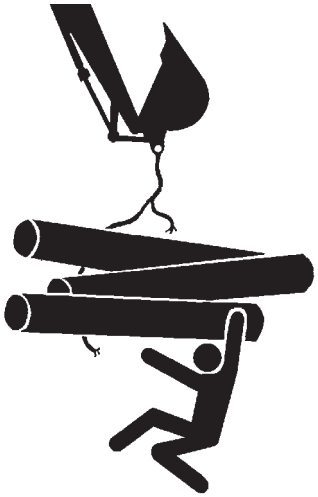
SA-1305

Precautions For Lightning

SA-1805

- 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.

Object Handling

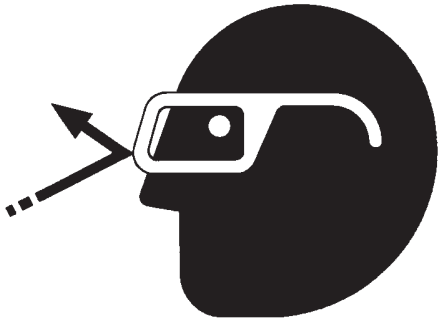


SA-014

- If a lifted load should fall, any person nearby may be struck by the falling load or may be crushed underneath it, resulting in serious injury or death.
  - When using the machine for craning operations, be sure to comply with all local regulations.
  - Do not use damaged chains or frayed cables, sables, slings, or ropes.
  - Before craning, position the upperstructure with the travel motors at the rear.
  - When using the machine for craning operations, always park the machine on a solid and level ground.
  - 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

Protect Against Flying Debris



SA-432

- If flying debris such as soil, rock fragments or metal pieces hit eyes or any other part of the body, serious injury may result.
  - Guard against such injuries when working in a job site where possibility of flying pieces of metal or debris exist, or when removing or installing pins using a hammer; wear goggles or safety glasses.
  - Keep bystanders away from the working area before striking any object.

Park Machine Safely

- Unless the machine is correctly parked, any hazardous situations such as running away of the machine or damage by vandalism may result, causing the machine to operate unsafely when the engine is restarted. Follow instructions described below when parking the machine.
  - Park the machine on solid level surface to prevent the machine from running away.
  - Lower the bucket and/or blade to the ground.
  - Pull the pilot control shut-off lever to the LOCK position.
  - Turn the auto-idle switch OFF. Failure to do so may create a hazardous condition as the engine speed may unexpectedly increase. (Except ZX29U-3)
  - Run the 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.
  - Before leaving the machine, close all windows, roof vent, and cab door. Lock all access doors and compartments.

SA-1306

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 caps.

SA-018

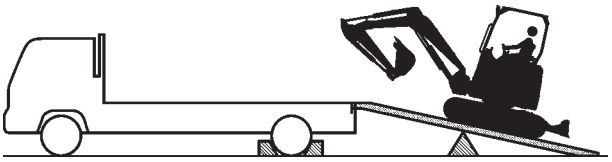
SA-019

Safety Transporting

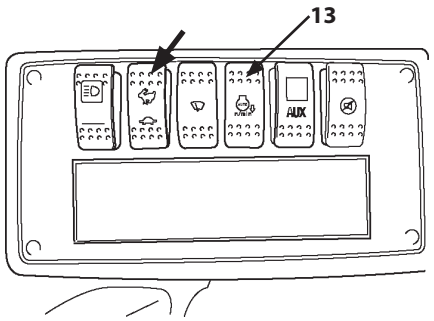
- The danger of tipping is present when loading/unloading the machine onto/from a truck or trailer bed.
  - Be sure to observe local regulations when transporting the machine on public roads.
  - Provide an appropriate truck or trailer for transporting the machine.
  - Be sure to have a signal person.
  - Take the following precautions when loading/unloading the machine.

1. Select firm level ground.
2. Be sure to use a loading dock or ramp strong enough to support the machine weight.
3. Ramps must be sufficient in width, length, and strength. Be sure that the incline of the ramp is less than 15 degrees.
4. Loading docks must be sufficient in width and strength to support the machine and have a gradient of less than 15 degrees.
5. Be sure to turn the auto-idle switch (13) OFF. (Except ZX29U-3)
6. Slowly drive the machine.
7. Avoid steering while driving up or down the ramp as it is extremely dangerous. If steering is unavoidable, first move back to the ground or flatbed, modify traveling direction, and begin to drive again.
8. The top end of the ramp where it meets the flatbed is a sudden bump. Take care when traveling over it.
9. Wedge the front and rear of the tracks. Securely fasten the machine to the trailer bed with chains or cables.
10. Do not operate any levers besides the travel levers when driving up or down the ramp.
11. Prevent possible injury from machine tipping while the upperstructure is rotating.
12. Keep the arm tucked under and rotate the upperstructure slowly for best stability.

Refer to “transporting” chapter in this manual for details.



SA-1307



ZX33U-3, 38U-3 48U-3, 52U-3 (Cab)

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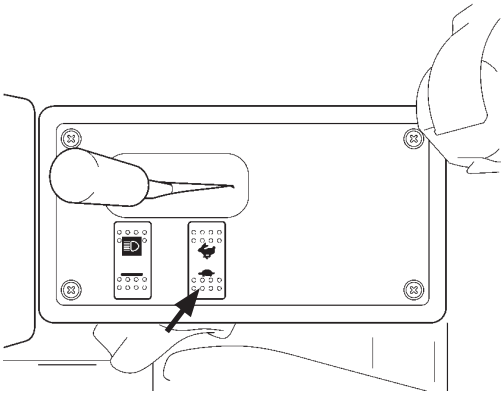
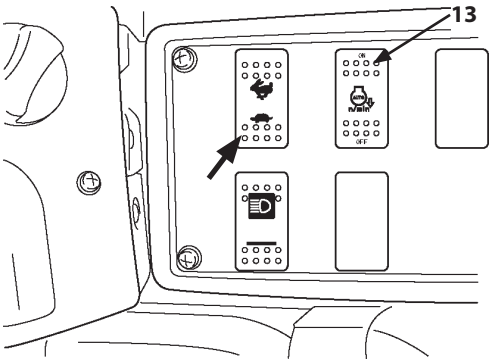


ZX29U-3 (Canopy)

M1M7-01-033



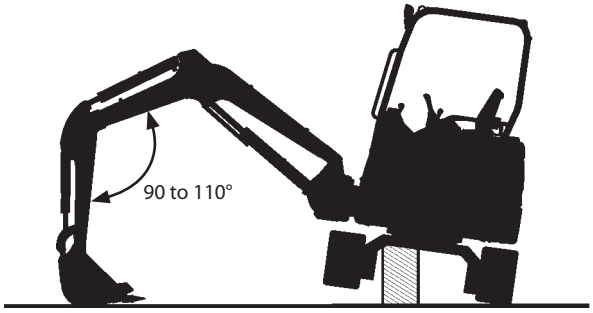
ZX33U-3, 38U-3, 48U-3, 52U-3 (Canopy)

M1NE-01-010

Practice Safe Maintenance

- Inspection/maintenance work may produce hazardous situations by contacting and/or accessing a part of body to a moving, high pressure, and/or high temperature part of the machine. To avoid serious personal injury or death, follow the instructions described below.
  - Thoroughly coordinate the working procedures to be taken hereafter with the co-workers before beginning work such as inspecting/servicing the machine, or replacing the attachment.
  - Safely park the machine in accordance with the instructions for "Park Machine Safely."
  - Keep the work area clean and orderly.
  - Attach a "DO NOT OPERATE" tag in an easy-to-see location such as on a door or a control lever.
  - If moisture permeates into the electrical system, malfunction and/or erroneous movement of the machine may result. Do not clean sensors, cable connectors, and the cab inside using water and/or steam.
  - Wait to begin to work until the engine and hydraulic oil temperatures have cooled down to the safety range.
  - In case inspection/maintenance must be performed with the engine runnning, be sure to appoint an overseer.
  - Never lubricate or service the machine while moving it.
  - Repair the cracked windowpane before servicing the machine. Failure to do so may cause personal injury.
  - When raising the machine above the ground using the front attachment function, maintain the angle between the boom and the arm in the range of 90 to 110°. Never allow anyone to enter under the machine raised with the front attachment function.
  - In case working under the machine raised above the ground is unavoidably required, securely hold the machine with stays or blocks strong enough to support the machine weight.
  - Never work under the raised bucket.
  - Keep all parts in good condition and properly installed.
  - Always use the specified tools correctly.
  - Always use a clean tool.
  - Fix any damage found immediately. Replace worn or broken parts.
  - Remove any buildup of grease, oil, or debris.
  - When cleaning parts, use a non-combustible cleaning solvent. Never use an inflammable fluid such as diesel fuel, or gasoline.

SA-028

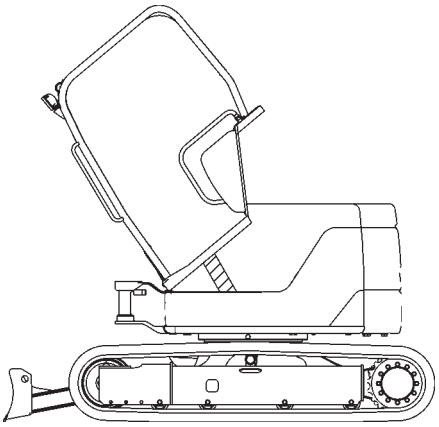


M1M7-04-006

SA-527

- Disconnect battery ground cable (–) before making adjustments to electrical systems or before welding on the machine.
- 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, antifreeze fluid, or window washer fluid may catch fire.
- When the floor tilt mechanism check and/or maintenance is conducted, the operator's station is tilted upward. Before conducting maintenance work, refer to page 7-76 in this manual for the detailed operation procedures and correctly operate the machine.
- When required to work under the floor, support the raised operator's station with the fall prevention bars (red color) to ensure safety.
- When the inspection/maintenance work is complete, tilt the operator's station downward after housing the fall prevention bars. Be sure to slowly lower the operator's station at the time.
- Be careful not to allow the operator's station to tilt down without first stowing the fall prevention bars. Damage to the tilt mechanism may result.

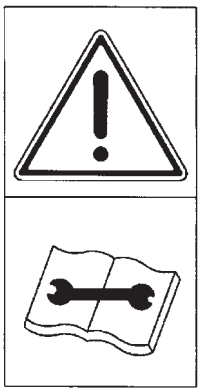
SA-037



M1MW-07-031

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 in an easy-to-see place such as on the cab door or control lever.
  - Never attempt to operate the machine with a "Do Not Operate" tag attached.
  - Make it a rule for the inspection/service person to hold the engine start key during inspection/service work.



SS2045102

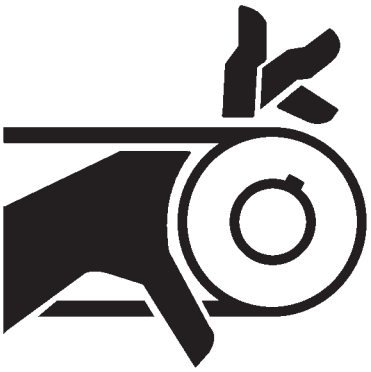
Support Machine Properly

- 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 with stays or blocks strong enough to support the machine and/or attachment weight.

SA-527

Stay Clear of Moving Parts

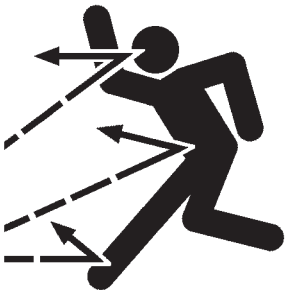
- Contact with moving parts can cause serious injury or death due to amputation or entanglement.
  - To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewelry and hair do not become entangled when working around rotating parts.



SA-026

Prevent Parts From Flying

- Grease in the track adjuster is under high pressure. Failure to follow the precautions below may result in serious injury, blindness, or death.
  - Do not attempt to remove GREASE FITTINGS or VALVE ASSEMBLIES.
  - As pieces of parts may fly off, be sure to keep body and face away from the valve.

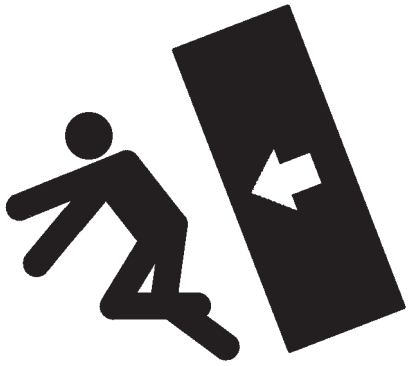


SA-344

- Travel reduction gears are under pressure.
  - As pieces of parts 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 the air release plug to release pressure.

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 accidents.
  - Keep children and bystanders away from storage areas.



SA-034

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 prevent possible injury from hot spraying water, stop the engine. Begin to work after the engine and radiator are sufficiently cooled
  - 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 by slowly removing the cap.

SA-039

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also becomes 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

Replace Rubber Hoses Periodically

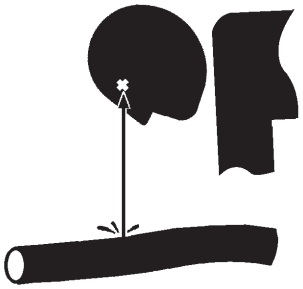
- Rubber hoses that contain flammable fluids such as hydraulic oil or fuel under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by visual inspection alone.
  - Periodically replace the rubber hoses.(Refer to the Periodical Replacement Parts section.)
- 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

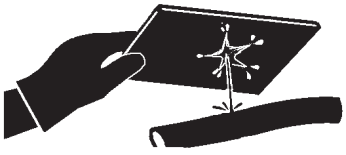
Avoid High-Pressure Fluids

- 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. Make sure that all connectors are completely connected 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.

SA-031



SA-292



SA-044

Prevent Fires

Check for Oil Leaks:

- Fuel, hydraulic oil and lubricant leaks can lead to fires, possibly resulting in personal injury or death.
  - Check for 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, for oil leaks.
  - 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.

Precautions for Handling 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.
  - Do not store flammable fluid near open flames.
  - Do not burn or crush a pressurerized container.
  - Do not store oily cloths. They are liable to catch fire.
  - Do not wind easy-to-absorb-oil material around high-temperature parts such as a muffler or exhaust pipe.

Check Heat Shield Covers around Engine Compartment

- If the engine compartment heat shield cover becomes broken or lost, fire may break out.
  - If the engine compartment heat shield cover becomes broken or lost, repair or replace it before operating the machine.

Check Key Switch:

- If 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 has stopped.
  - If any abnormalities are found, be sure to repair them before operating the machine.

Evacuating in Case of Fire

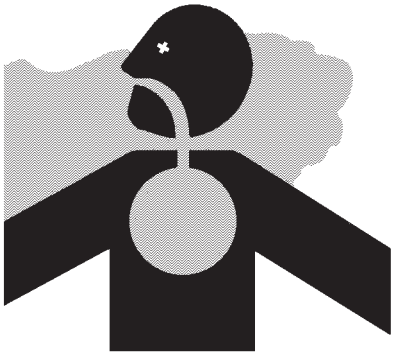
- If fire breaks out during machine operation, evacuate the machine in the following way:
  - Stop the engine by turning the key switch to the OFF position.
  - Use a fire extinguisher if there is time.
  - Exit the machine using handrails and/or steps.
  - In an emergency, if the cab door or front or rear window can not be opened, break the front or rear window panes with the emergency evacuation hammer to escape from the cab.
    Refer to the explanation pages on the Emergency Exit.

SA-393

SS-1510

Beware of Exhaust Fumes

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



SA-016

Beware of Asbestos and Silicon Dust and Other Contamination

- Take care not to inhale dust produced in the work site. Inhalation of asbestos fibers may be the cause of lung cancer.

  Inhalation of silicon dust and other contamination may cause sickness.
  - Depending on the work site conditions, the risk of inhaling asbestos fiber, silicon dust or other contamination may exist.

    Spray water to prevent asbestos, silicon dust or other contamination from airborne. Do not use compressed air.
  - When operating the machine in a work site where asbestos, silicon dust or other contamination might be present, be sure to operate the machine from the upwind side and wear a mask rated to prevent the inhalation of asbestos, silicon dust or other contamination.
  - Keep bystanders out of the work site during operation.
  - Asbestos might be present in imitation parts. Use only genuine Hitachi Parts.

SA-029

Precautions for Welding and Grinding

SA-818

- 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 a fire hazard. 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.

Avoid Heating Near Pressurized Fluid Lines

SA-030

- 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 fire resistant guards to protect hoses or other materials before engaging in welding, soldering, etc.

Avoid Applying Heat to Lines Containing Flammable Fluids

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

Remove Paint Before Welding or Heating

SA-029

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.
  - Remove paint before welding or heating.
  - Avoid potentially toxic fumes and dust.
  - Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.
  - Allow fumes to disperse at least 15 minutes after welding or heating.
  - Use attention to the following points when removing paint.

1. If you sand or grind paint, avoid breathing the dust which is created.
   Wear an approved respirator.
2. If you use solvent or paint stripper, remove stripper with soap and water before welding.
3. Remove solvent or paint stripper containers and other flammable material from area.

Prevent Battery Explosions

SA-032

- 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 the electrolyte level is lower than specified. Explosion of the battery may result.
  - When a terminal becomes loose, it may induce 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. If electrolyte is splashed into eyes, flush your eyes continuosly with water for about 15 minutes. Seek medical attention immediately.
  - Be sure to wear eye protection when checking electrolyte specific gravity.

Precautions for Handling Refrigerant

- If refrigerant is splashed into eyes or spilled onto skin, blindness or a cold contact burn may result.
  - Refer to the precautions described on the refrigerant container for handling refrigerant.
  - Use a recovery and recycling system to avoid venting refrigerant into the atmosphere.
  - Never allow the skin to directly come in contact with refrigerant.

SA-405

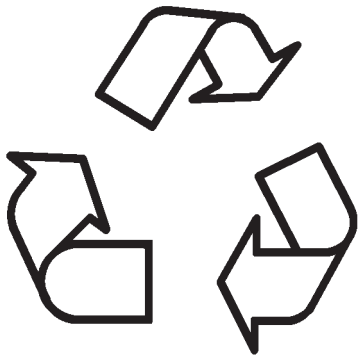
Handle Chemical Products Safely

- Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with your machine include such items as lubricants, electrolyte, 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. Then follow the correct procedures and use recommended equipment.
  - See your authorized dealer for MSDS.

SA-309

Dispose of Waste Properly

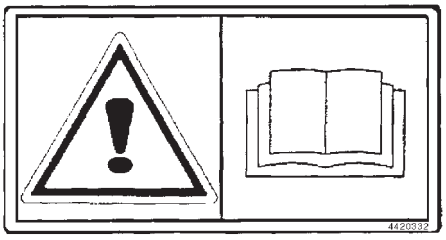
- Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with HITACHI equipment includes such items as oil, fuel, coolant, brake fluid, filters, and battery.
  - When draining fluid, use a leakproof container with a capacity larger than the drained fluid volume to receive it.
  - Do not pour waste onto the ground, down a drain, or into any water source.
  - Inquire on the proper way to dispose of harmful waste such as oil, fuel, coolant, brake fluid, filters, and battery from your local environmental or recycling center.



SA-226

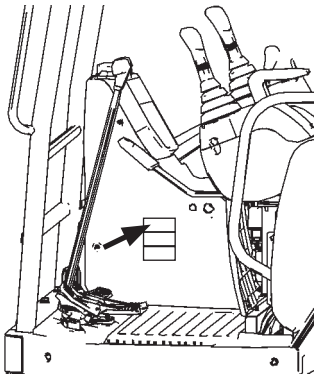
SAFETY SIGNS

All safety signs and their locations affixed on the machine are illustrated in this group. Make sure of the contents described in the safety signs through reading actual ones affixed on the machine to ensure safe machine operation. Always keep the safety signs clean. In case a safety sign is broken or lost, immediately, obtain a new replacement and affix it again in position on the machine. Use the part No. indicated under the right corner of each safety sign illustration when ordring it at your authorized dealer.

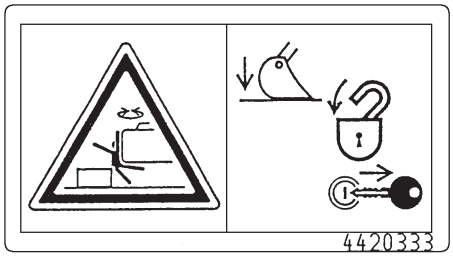


SS4420332

- Always read the Operator's Manual before operating, servicing, disassembling, assembling, and transporting the machine.

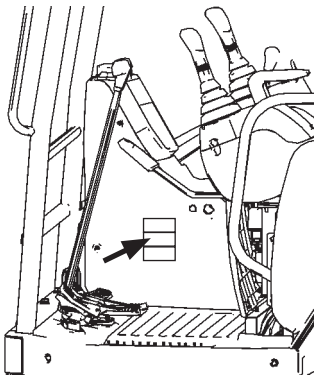


SS-2632

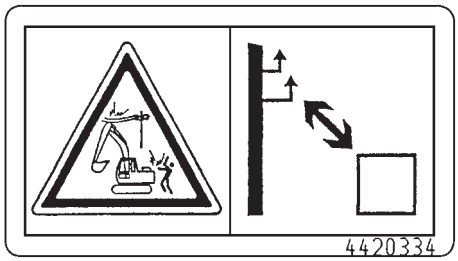


SS4420333

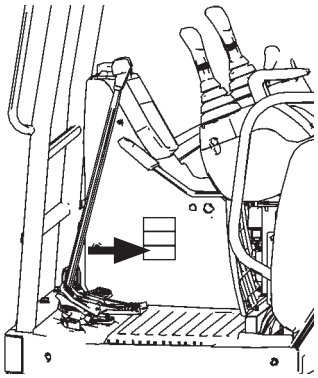
- If the parked machine is unexpectedly moved, serious injury or death due to crushing may result. Be sure to lower the front attachment to the ground, lock the control levers, and remove the engine key before leaving the machine unattended.



SS-2632



SS-1707

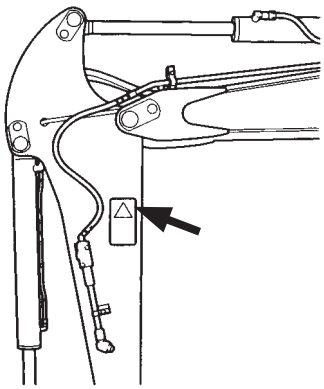


SS-2632

- Electrocution is possible if the machine is operated too close to power lines. Always keep a safe distance from power lines.

- Stand clear of the equipment. If knocked over by the equipment, serious injury may result.

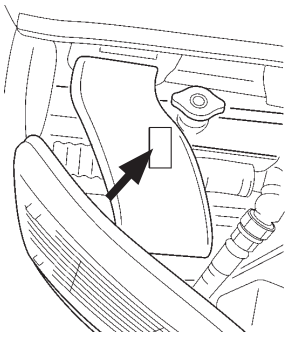
SS-1702



SS-1494

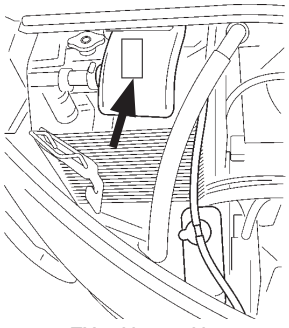
- Hot coolant or oil may spout if the radiator or hydraulic oil cap is removed while the machine temperature is still high, possibly causing a burn. Wait until the machine has cooled to remove the cap.

SS-1703



ZX29U-3, 33U-3, 38U-3

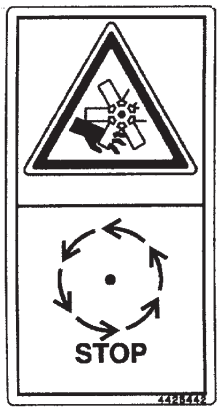
SS-2633



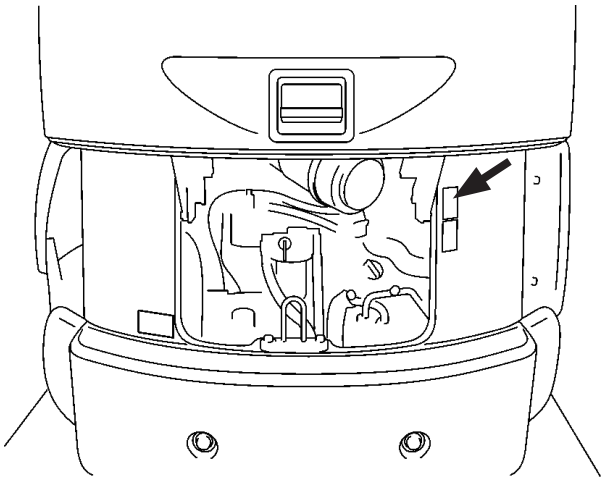
ZX48U-3, 52U-3

SS-2634

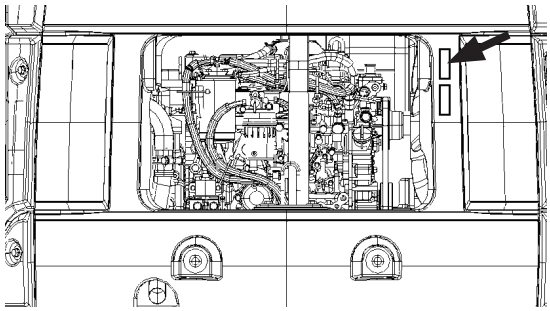
- Sign indicates the hazard of rotating parts, such as fan, etc. that could cause injury by being caught. Turn it off completely before inspection and maintenance.



SS-1704

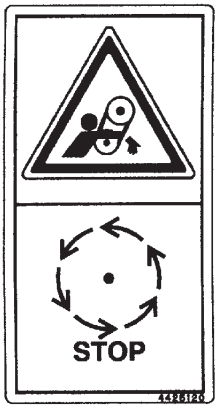


ZX29U-3, 33U-3, 38U-3 SS-3155

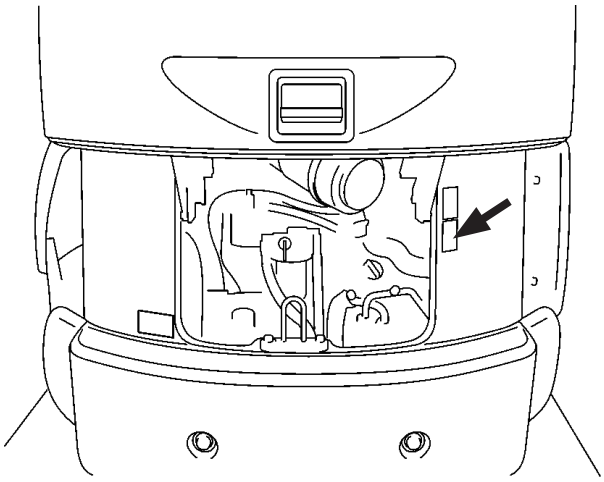


ZX48U-3, 52U-3 SS-3156

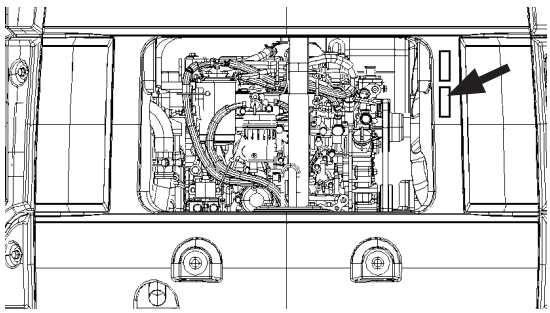
- Sign indicates the hazard of rotating parts, such as belt, etc. that could cause injury by being caught. Turn it off completely before inspection and maintenance.



SS-1705



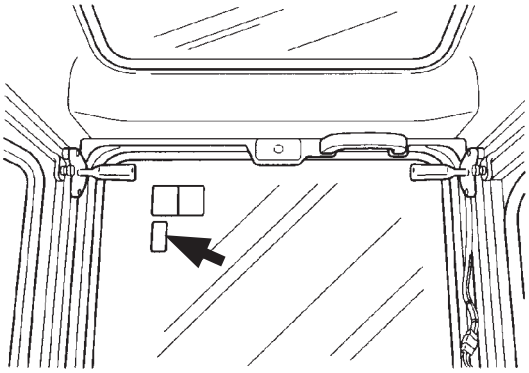
ZX29U-3, 33U-3, 38U-3 SS-3155



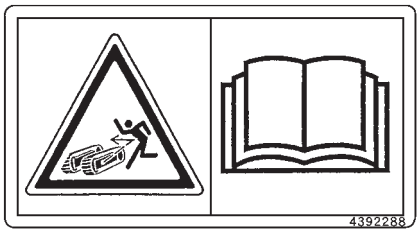
ZX48U-3, 52U-3 SS-3156

- Personal injury may result if the stored front window slips off. Always securely lock the window in the stored position (on the cab equipped machine).

SS-1706

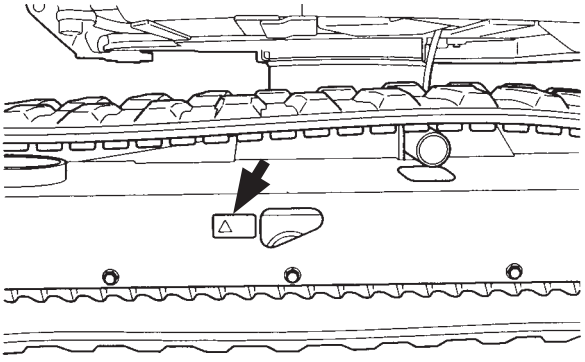


SS-2641



SS-1710

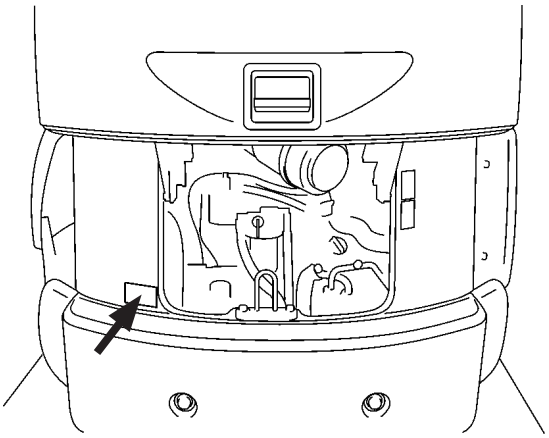
- Serious injury may result if the plug flies off the track adjuster. Read the Operator's Manual before loosening the track, and adjust the track sag following the correct procedure.



SS-1495

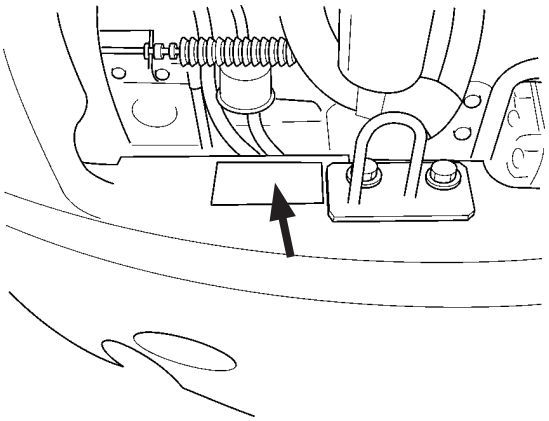
SS-1712

- Possible severe burns. Do not touch the engine components while they are hot.



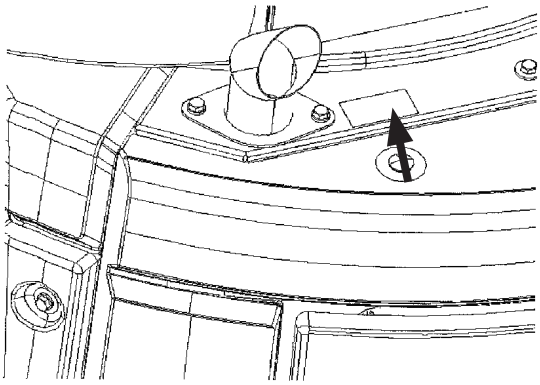
ZX29U-3, 33U-3, 38U-3

SS-3155



SS-2636

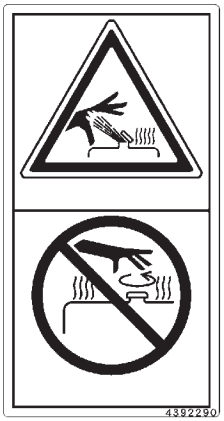
ZX48U-3, 52U-3
Downward Muffler



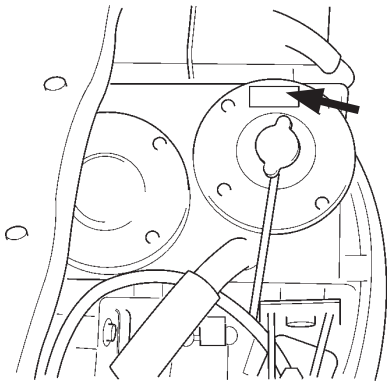
ZX48U-3, 52U-3
Upward Muffler

SS-3157

- Hot coolant or oil may spout if the radiator or hydraulic oil cap is removed while the machine temperature is still high, possibly causing a burn. Wait until the machine has cooled to remove the cap.

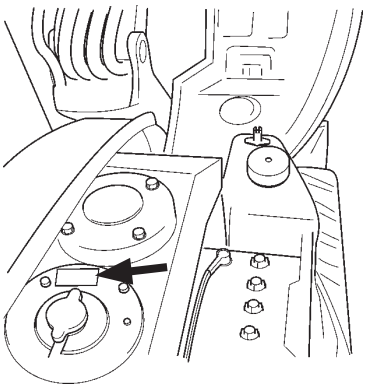


SS-1703



ZX29U-3, 33U-3, 38U-3

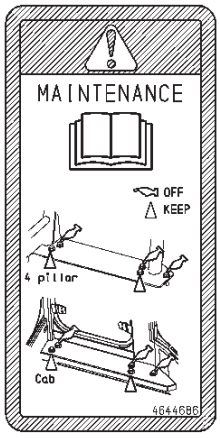
SS-2637



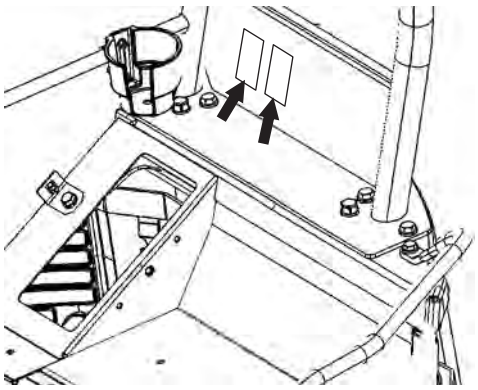
ZX48U-3, 52U-3

SS-2638

- When using the floor tilt mechanism, consult your authorized dealer. If bolts are removed or installed by unauthorized personnel, mismatch to ROPS may occur.
  Remove bolts (not covered with resin caps) in the rear section of the operator's seat.
  Be careful. When bolts are removed, the canopy or the cab may come off the floor.



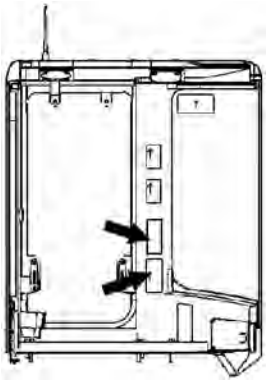
SS4644686



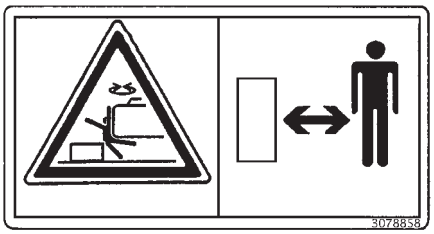
Canopy M1M7-07-063

- When required to work under the floor, securely support the floor opening section with fall prevention bars to ensure safety.
  When the maintenance work is complete, the operator's station is tilted downward. Slowly lower the operator's station after removing the supporters such as fall prevention bars. Failure to remove the supporters such as fall prevention bars may damage the tilt mechanism.

SS4655081

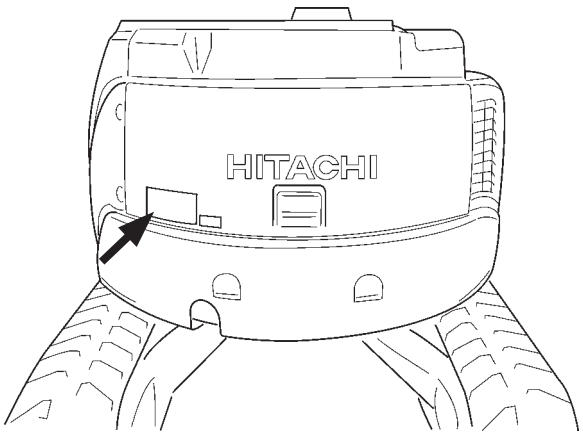


Cab SS-2798

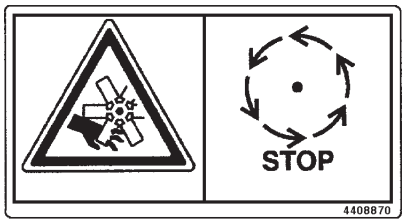


SS-1714

- Personnel in the swing radius may be crushed by the upperstructure when the machine swings. Stand clear of the swing radius.

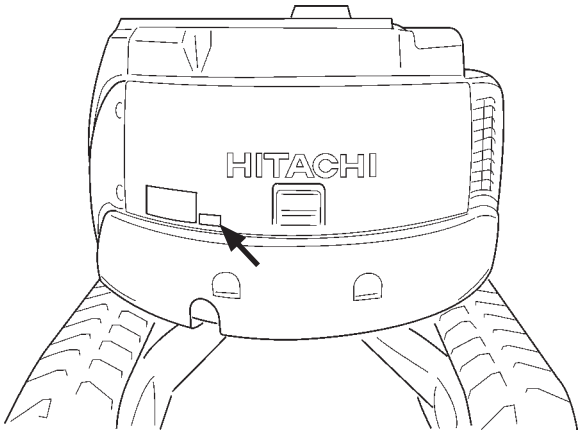


SS-2639



SS-1719

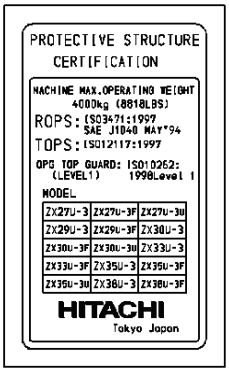
- Sign indicates the hazard of rotating parts, such as fan, etc. that could cause injury by being caught. Turn it off completely before inspection and maintenance.

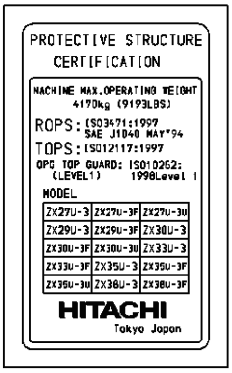


SS-2639

ROPS/TOPS/OPG Top Guard Canopy and Cab

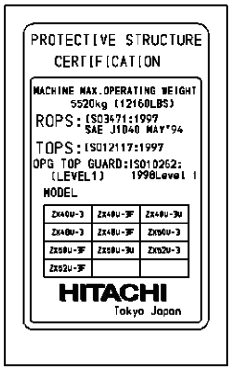
- To maintain unimpaired operator protection and manufacture's protective structure
  - Damaged Roll Over Protective Structure (ROPS), Tip Over Protective Structure (TOPS), OPG TOP GUARD must be replaced, not repaired or revised.
  - Any alternation to the ROPS or TOPS or OPG TOP GUARD must be approved by the manufacturer.

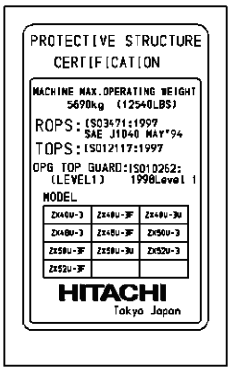




ROPS/ TOPS/OPG TOP GUARD

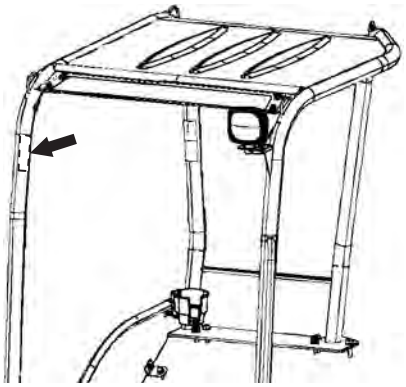
SS3116717
SS3116719





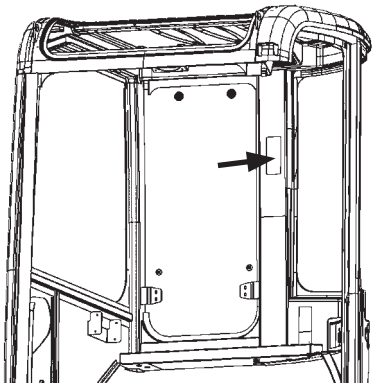
ROPS/ TOPS/OPG TOP GUARD

SS3116697
SS3116704



Canopy

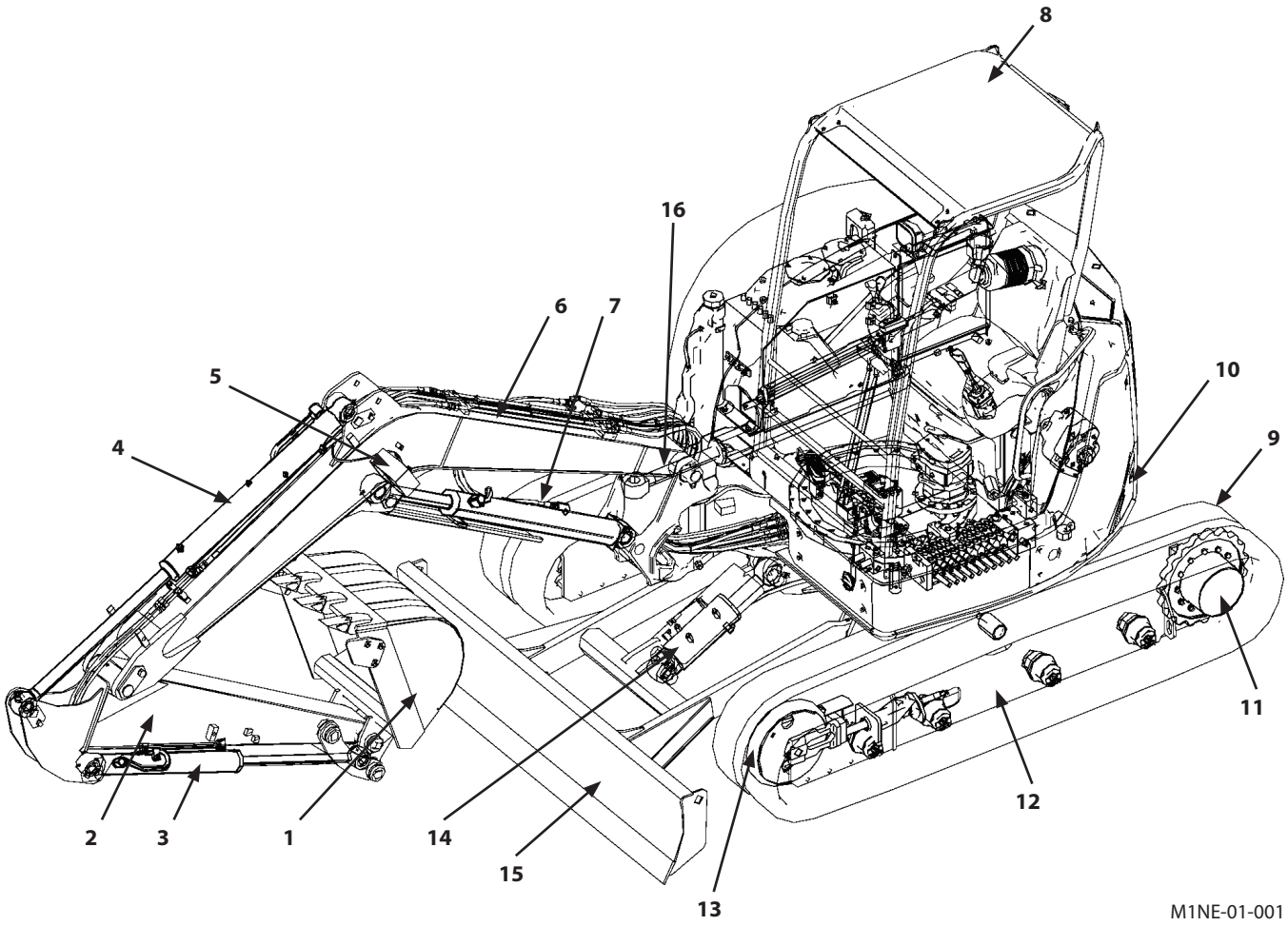
SS-2651



SS-2798

Cab

Components Name

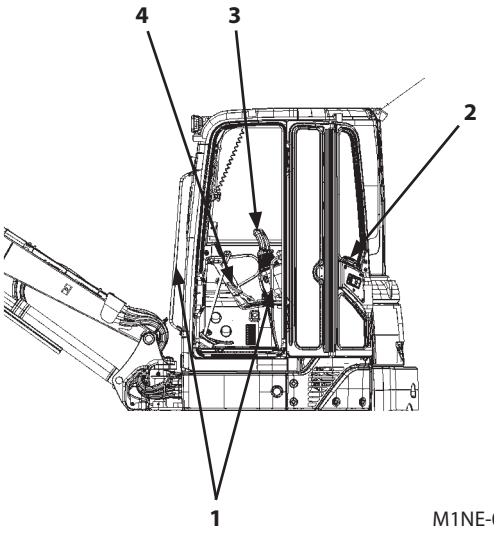


M1NE-01-001

1- Bucket
2- Arm
3- Bucket Cylinder
4- Arm Cylinder
5- Work Light
6- Boom
7- Boom Cylinder
8- Canopy
9- Track Shoe
10- Counterweight
11- Travel Device
12- Track Frame
13- Front Idler
14- Blade Cylinder
15- Blade
16- Boom-Swing Cylinder

Getting ON/OFF the Machine

Foot holds and handrails (1) are provided in and around the machine.
These are used to get on and off the cab safely as well as to do inspection and maintenance of the machine safely.
Never jump on or off the machine as it is very dangerous.



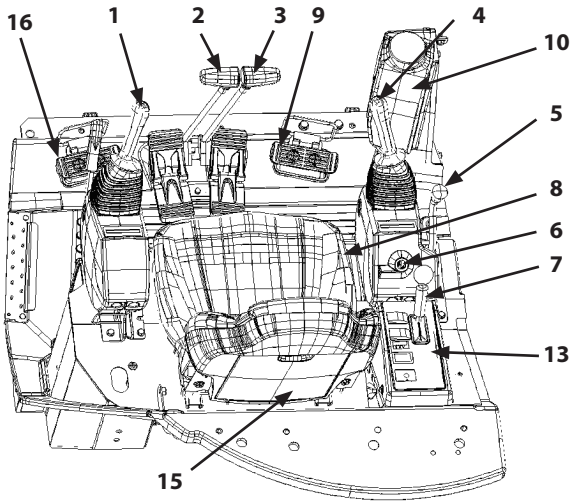
M1NE-01-016

WARNING:

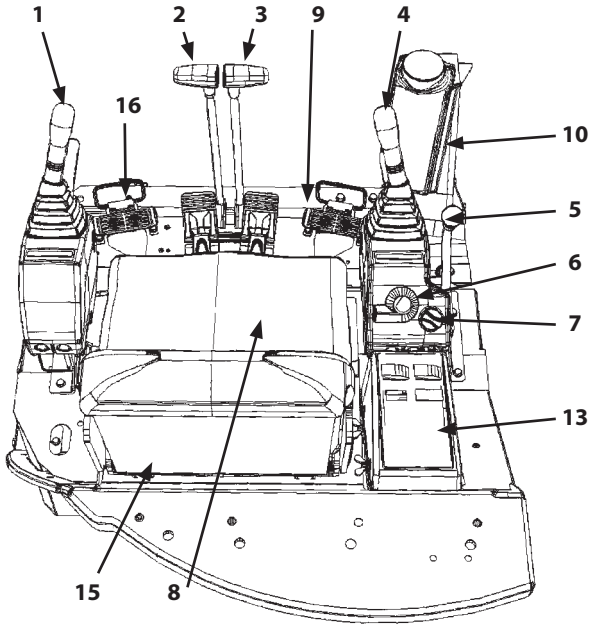
- **Never attach a wire on the foot holds to lift the cab or main body or while transporting the machine on a truck or trailer as it is dangerous.**
- **The door handle (2) is not a handrail. Do not hold the door handle (2) as a handrail when getting on and off the machine.**
- **Do not hold the control levers (3) or pilot control shut-off lever (4) when getting on and off the machine.**

Pedals, Levers and Monitor Panel

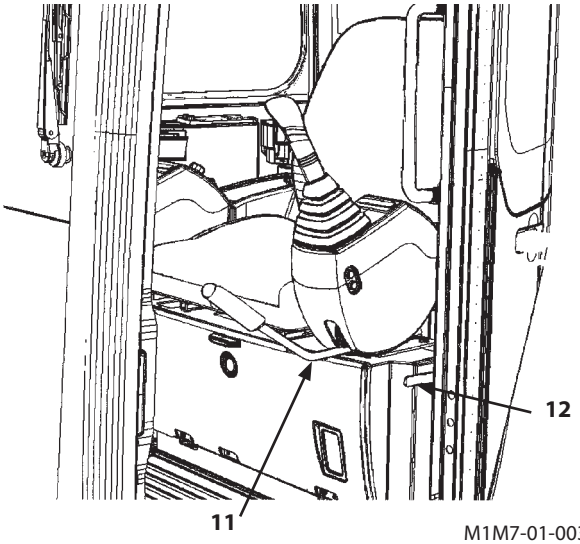
1- Left Control Lever
2- Left Travel Lever
3- Right Travel Lever
4- Right Control Lever / Horn Switch
5- Blade Lever
6- Key Switch
7- Engine Control Dial
(ZX33U-3, 38U-3, 48U-3, 52U-3)
Engine Control Lever
(ZX29U-3)
8- Operator's Seat
9- Boom Swing Pedal
10- Monitor Panel
11- Pilot Control Shut-Off Lever
12- Door Lock Release Lever
(Cab equipped machine)
13- Switch Panel
14- Tool Box
15- Operator's Manual Box
16- Attachment Pedal (Optional)



ZX29U-3 M1NE-01-002



ZX33U-3, 38U-3, 48U-3, 52U-3 M1M7-01-002



M1M7-01-003

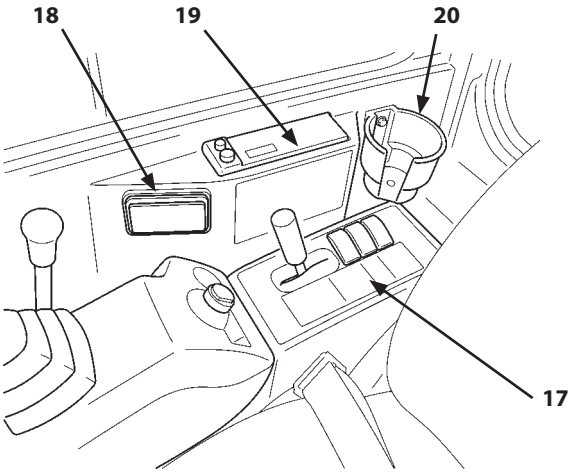
17- Air Conditioner Control Panel
(Cab equipped machine)

18- Ash Tray (Cab equipped machine)

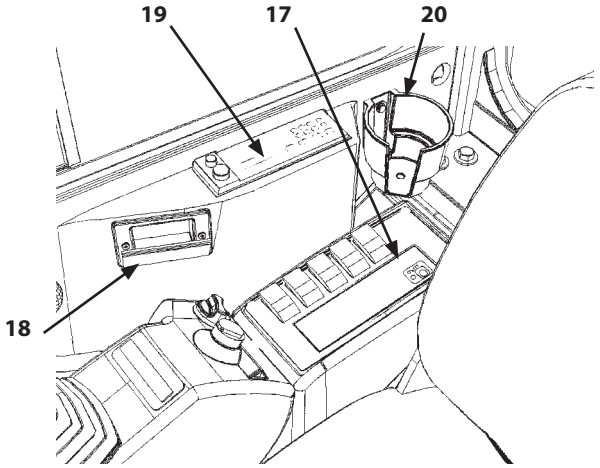
19- Radio (AM/FM, Cab equipped machine)

20- Cup Holder

21- Fuse Box

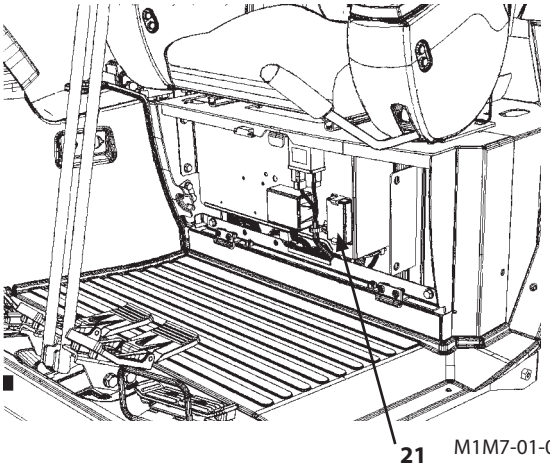


ZX29U-3 M1M7-01-035



M1M7-01-004

ZX33U-3, 38U-3, 48U-3, 52U-3



M1M7-01-005

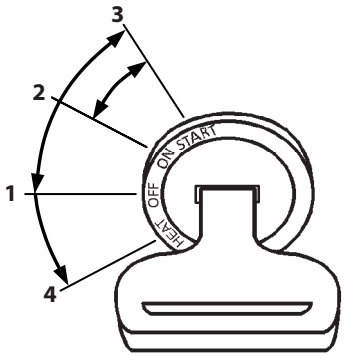
Key Switch

1- OFF (Engine OFF)

2- ON (Engine ON)

3- START (Engine Start)

4- HEAT (Engine Preheat)



M1M7-01-007

Switch Panel

5- Work Light Switch
Press the top side of switch (5) to turn work lights (9) located on the boom and cab roof front ON. Press the bottom side of switch (5) to turn work lights (9) OFF.

6- Travel Mode Switch
Press the rabbit-mark side of switch (6) to select the fast travel mode. However, when the travel load becomes heavy, the slow travel mode will automatically be selected. Press the turtle-mark side of switch (6) to select the slow travel mode.

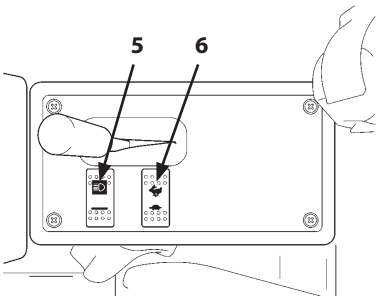
7- Wiper Switch (Cab equipped machine)
Three-operation positions are provided on this switch.

OFF: Both the wiper and washer do not operate.

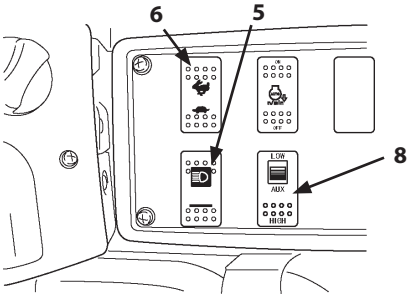
Center: The wiper operates.

WASHER: The washer operates together with the wiper.

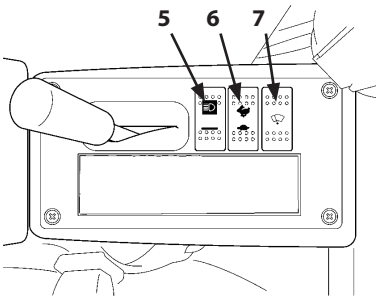
8- Auxiliary Flow Control Switch
(Optional: Except ZX29U-3)
The hydraulic oil flow in the auxiliary pipe line can be controlled.



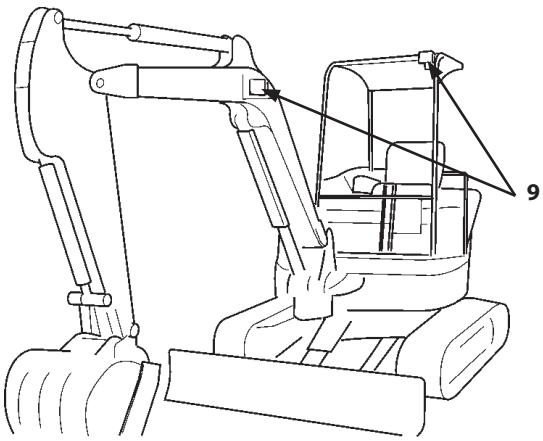
ZX29U-3 (Canopy) M1M7-01-033



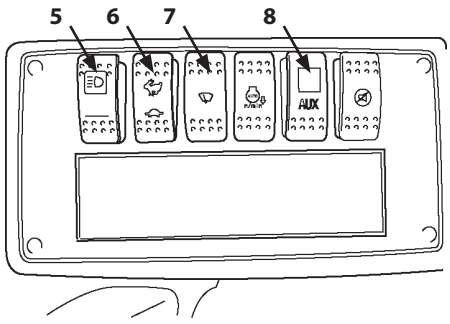
ZX33U-3, 38U-3, 48U-3, 52U-3 (Canopy) M1NE-01-011



ZX29U-3 (Cab) M1NE-01-005



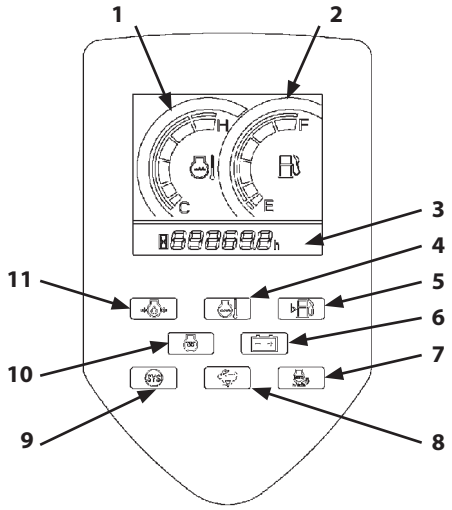
M1M7-01-025



ZX33U-3, 38U-3, 48U-3, 52U-3 (Cab) M1NE-01-009

Monitor Panel

1- Coolant Temperature Gauge
2- Fuel Gauge
3- Hour Meter
4- Overheat Indicator
5- Fuel Level Indicator
6- Alternator Indicator
7- Auto-Idle Indicator (Except ZX29U-3)
8- Fast Travel Mode Indicator
9- System Failure Indicator
10- Preheat Indicator
11- Engine Oil Pressure Indicator



M1NE-01-015

Hour Meter

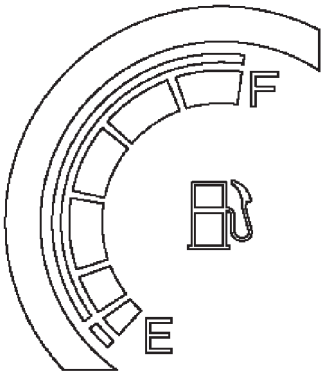
Total (accumulated) machine operation hours counted since the machine started working, are displayed in the unit of HOUR (h). One digit after the decimal point indicates the tenths of an hour (6 minutes).

M1MS-01-027

Fuel Gauge

The segment scale shows the fuel level. Refuel before the segment scale indicates E.

IMPORTANT: In case all segments flash, the machine is abnormal. Immediately, contact your authorized dealer.

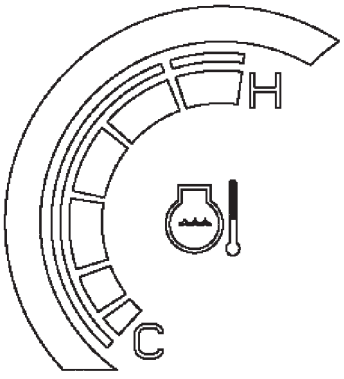


M1MS-01-028

Coolant Temperature Gauge

The segment scale shows the engine coolant temperature. Coolant temperature is normal when the segment scale indicates in the middle segment scale during operation.

NOTE: When the coolant temperature is lower than 20°C, the first segment will flash.



M1MS-01-029

System Failure Indicator

The system failure indicator comes ON or flashes when an abnormality may be present in the engine control system (optional: Except ZX29U-3). If the system failure indicator comes ON or flashes, immediately contact your authorized dealer for repair.

M1M7-01-008

Engine Oil Pressure Indicator

The red indicator will light when the engine oil pressure is low. If the red indicator comes ON, the engine oil pressure warning buzzer will sound at the same time. Immediately stop the engine. Check the engine oil pressure system and the oil level for any abnormality.

M178-01-037

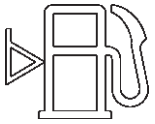
Overheat Indicator

If the coolant temperature rises extremely high, this indicator operates. If the red light comes ON, the buzzer sounds at the same time.
Immediately stop machine operation and reduce engine speed to the slow idle speed to lower the coolant temperature.

M178-01-036

Fuel Level Indicator

When the fuel level indicator comes ON while the machine is operating on level ground, the remaining fuel amount in the fuel tank is as shown in the table below. Refill the fuel as soon as possible.

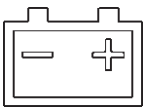


M178-01-034

Model	Remaining Fuel Amount
ZX29U-3, 33U-3, 38U-3	Approximately 6 liters (1.6 US gal)
ZX48U-3, 52U-3	Approximately 11 liters (2.9 US gal)

Alternator Indicator

The red indicator will light when low alternator output is present.
Check the electrical system such as the alternator and/or battery system.



M178-01-038

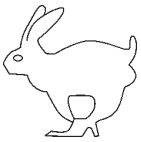
Preheat Indicator

When the key switch is turned to the HEAT position, orange indicator will light. Light will turn off after approx. 15 seconds have passed.

M178-01-041

Fast Travel Mode Indicator

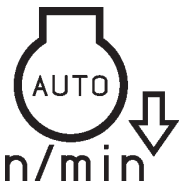
When the rabbit-mark (fast mode) side of the travel mode switch on the switch panel is pressed, the indicator comes ON.



M1M7-01-022

Auto-Idle Indicator (Except ZX29U-3)

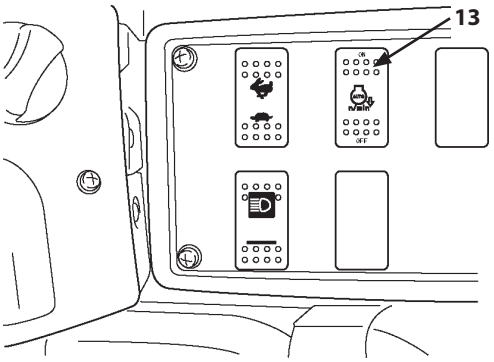
When the auto-idle switch on the switch panel is turned ON, the indicator comes ON.



M1NE-01-014

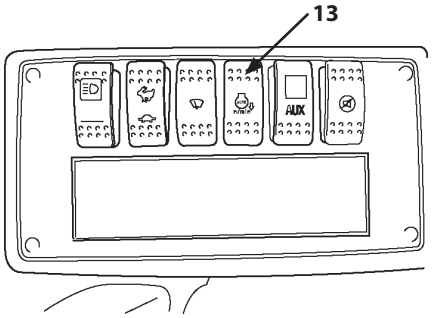
Auto-Idle Switch (Except ZX29U-3)

- Auto-Idle Operation
  When pressing auto-idle switch (13), the engine speed is reduced to the slow idle speed approx. 4 seconds after returning all control levers to neutral. Thereby, the fuel consumption is reduced. When the auto-idle mode is selected, auto-idle indicator (14) on the monitor panel lights.



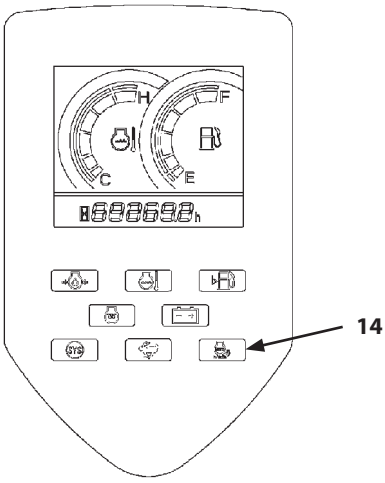
Canopy Equipped Machines

M1NE-01-010



Cab Equipped Machines

M1NE-01-009



M1NE-01-015

Air Conditioner Operation

1- Control Panel

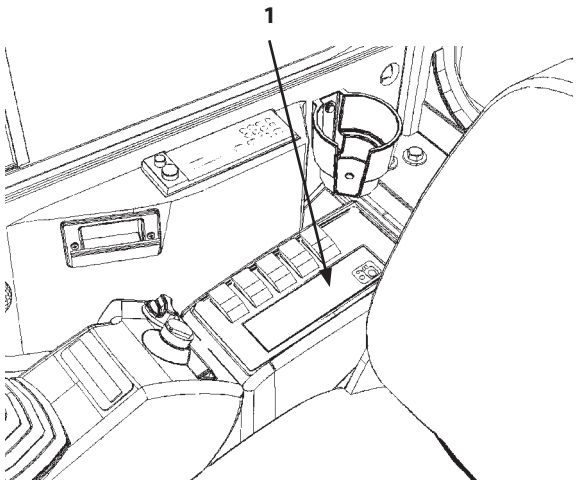
2- Right Front Air Vent (Defroster)

3- Right Front Air Vent

4- Foot Air Vent

NOTE: Control air-flow from right front air vent (2) by rotating the louver in the horizontal direction so that the air vent can be used as a defroster.

5- Air Conditioner Power Switch
Press air conditioner power switch (5) to turn the power ON.



M1M7-01-004

Controller Part Names and Functions

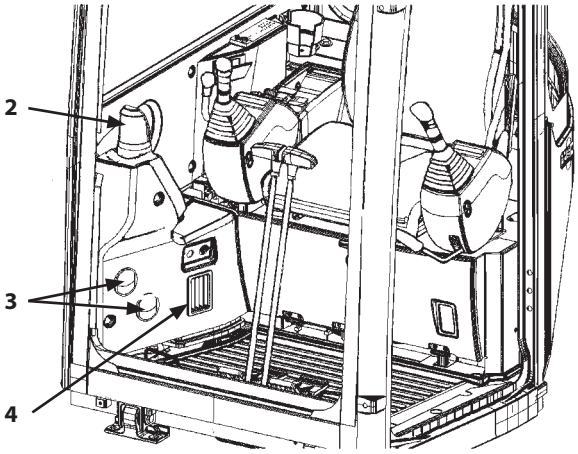
6- Air Conditioner Switch
Press air conditioner switch (6) to turn the air conditioner ON and indicator (11) will light.

7- Mode Switch
The air vent location is selected. Each time mode switch (7) is pressed, mode indicator (10) changes in the order shown below.


Air will blow out from right front air vents (2) and (3).


Air will blow out from right front air vents (2) and (3), and foot air vent (4).

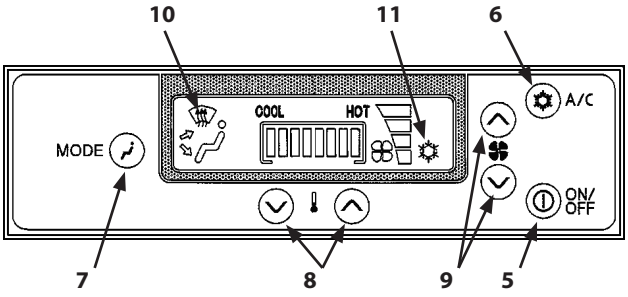

Air will blow out from foot vent (4).



M1M7-01-009

8- Temperature Control Switch
The set temperature decreases each time the switch with ⌄ mark is pressed, and increases each time the switch with ⌃ mark is pressed.

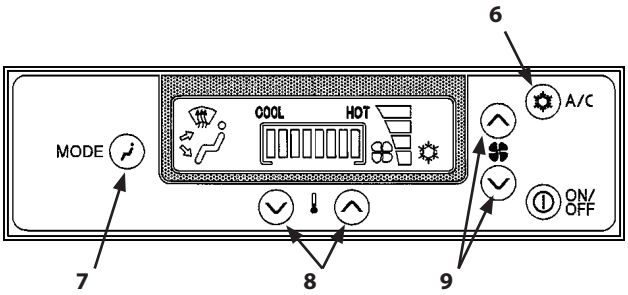
9- Blower Switch
The blower speed can be adjusted in 3 stages from Slow, Medium, and Fast.



M1M7-01-039

Heating Operation

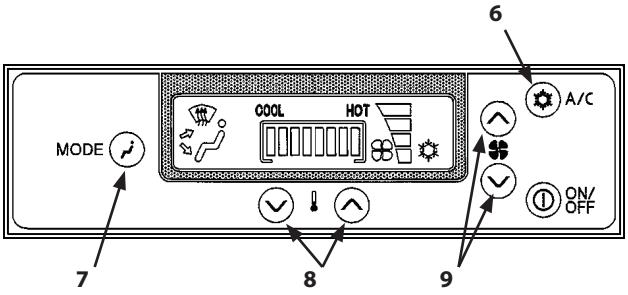
Although warm air will blow out from all three air vents, normally foot air vent (4) is used for heating operation. After selecting foot air vent (4) by operating vent mode switch (7), press temperature control switch (8) to set the temperature indicator toward the right end side. Adjust the inside cab temperature using temperature control switch (8). The blower speed can be adjusted manually using blower switch (9). When air conditioner switch (6) is turned ON during heating operation, air in the cab will be dehumidified.



M1M7-01-039

Cooling Operation

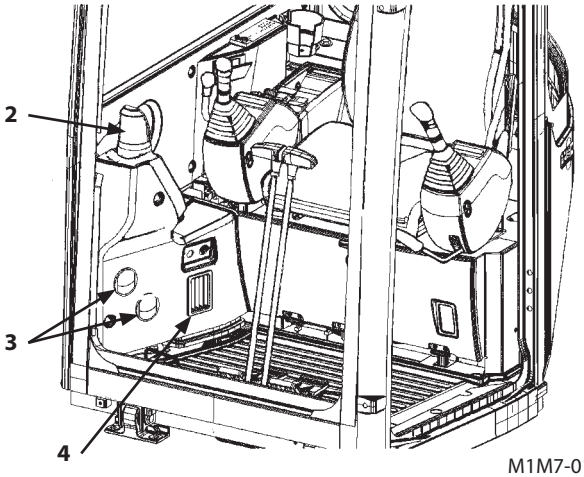
Although cool air will blow out from all three air vents, normally foot air vent (4) is used for cooling operation. After selecting foot air vent (4) by operating vent mode switch (7), press temperature control switch (8) to set the temperature indicator toward the left end side. Adjust the inside cab temperature using temperature control switch (8). The blower speed can be adjusted manually using blower switch (9). When air conditioner switch (6) is turned ON during cooling operation, cool air will also blow out from right front air vents (2) and (3).



M1M7-01-039

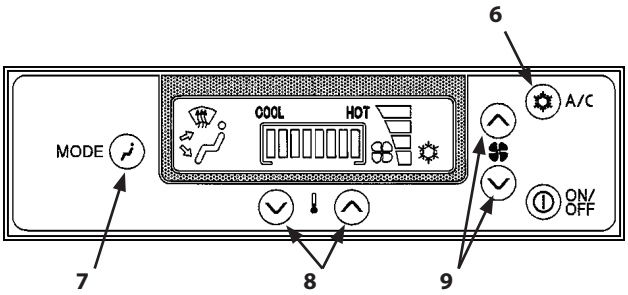
Defroster Operation

Select right front air vents (2) by operating vent mode switch (7). Adjust the louvers on right front air vent (2) as required. The blower speed can be adjusted manually using blower switch (9). Adjust the inside cab temperature using temperature control switch (8). Turn air conditioner switch (6) ON if the windows become clouded, or if dehumidifying in the cab is required.



M1M7-01-009

Tips for Air Conditioner Usage



M1M7-01-039

Rapid Cooling

Temperature in the cab may rise over 80 °C (176 °F) when the machine is exposed to direct sunlight with the cab windows closed. Under this condition, in case temperature in the cab is required to be rapidly cooled, ventilate air from the cab first by opening the windows. After starting the engine, set the temperature control toward the far left end using temperature control switch (8). Select the right front vent mode by mode switch (7). Run the blower at the slow speed position. Turn air conditioner switch (6) ON. After keep the engine running at slightly faster speed (1300 to 1400 min^{-1} [rpm]) for a few minutes, increase the blower speed. When the air temperature in the cab is decreased to the atmosphere temperature, close the windows.

If Windows Become Clouded

The windows will become cloudy if the humidity in the cab becomes high. Operate the air conditioner to keep the windows clear. When the atmosphere is very damp, the outside of the windows may become clouded if the air conditioner is operated for long periods. In this case, stop the air conditioner and/or adjust the air temperature in the cab.

When the air conditioner is not used

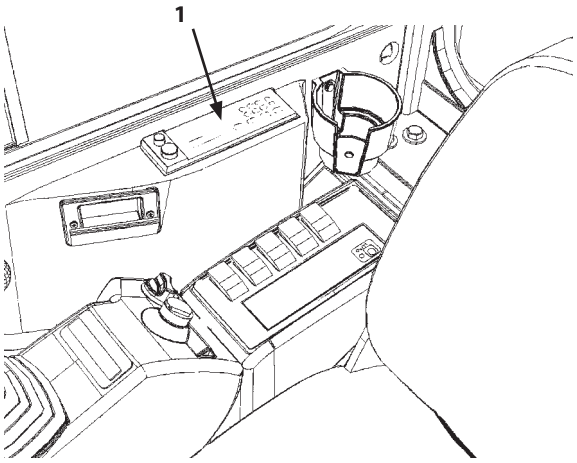
When the air conditioner is not used, to protect each part of the compressor from a lack of lubricant, operate the air conditioner at least once a month for several minutes with the engine running at a slow speed. When the cab temperature is lower than 15 °C (59 °F), the air conditioner may not operate. In this case, warm the cab inside using the heater first to increase the cab temperature.

IMPORTANT:

- **Do not suddenly increase the engine speed, failure to do so possibly results in damage to the compressor.**
- **Keep fire hazards away from the control panel.**
- **Refer to the descriptions in Clean and Replace Air Conditioner Recirculation Filter in the Maintenance chapter for the maintenance of the air conditioner filters.**

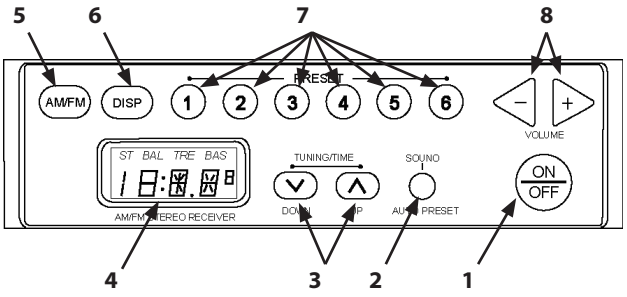
Radio (Cab Equipped Machines)

1- Radio/Clock



M1M7-01-004

AM/FM Radio Operation



M1NE-01-003

Part Name and Function

1- Power Switch
Press this switch ON to supply electric power. Repress this switch to OFF.

2- SOUND Control Switch
Press this switch to adjust the sound (Balance/Bass/ Treble).

3- UP/DOWN Buttons
This button changes the wave frequency, adjusts the step at the sound adjustment and clock setting.

4- Digital Display
Time, receiving radio wave frequency, or operation mode is displayed.

5- AM/FM Switch
Select FM or MW (AM) by pressing this switch. The display indicates the receiving station frequency.

6- DISP (Display) Switch
Press this switch to display the time. Repress this switch to display the receiving radio wave frequency.

7- Station PRESET Buttons (1 to 6)
One FM and MW (AM) station per button can be preset using these respective buttons.

8- VOLUME Control Buttons
Press the (+) button to increase the volume by one step.
Press the (-) button to decrease the volume by one step.

Radio Operation

1. Turn the key switch to the ON position and press radio power switch (1) ON.
2. Select either MW (AM) or FM by operating AM/FM switch (5).
3. Select the station desired to listen using PRESET buttons (7) or UP/DOWN buttons (3).
4. Adjust the volume and tone according to your preference.
5. When turning the radio OFF, repress power switch (1).

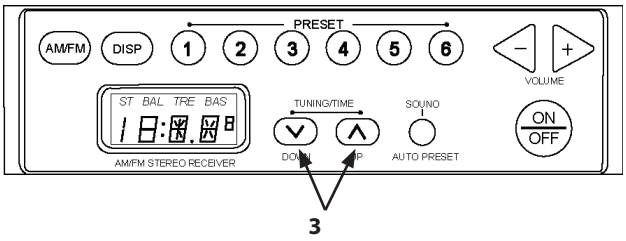
Tuning Procedure

1. Manual Tuning

   Press UP ∧ button (3) to increase the frequency by one step. Press DOWN ∨ button (3) to decrease the frequency by one step.

2. Automatic Tuning (Auto-Seeking)

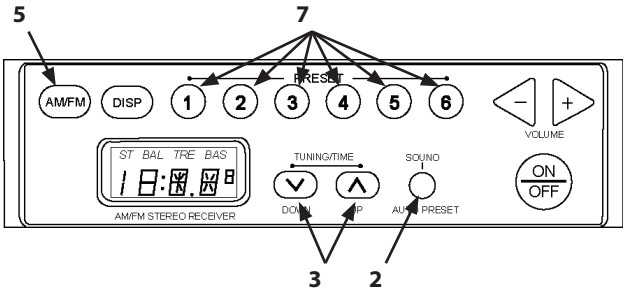
   Press and hold UP ∧ button (3) or DOWN ∨ button (3) to change the frequency up or down continuously. When a station is received, the auto-seeking function is deactivated so that the received frequency station is tuned in.



M1NE-01-003

Station Presetting Procedure

1. Select MW (AM) or FM by pressing AM/FM switch (5). Select a station by pressing either UP ∧ button (3) or DOWN ∨ button (3).
2. Continuously press one of PRESET buttons (7) by which you desire to preset the station. When presetting is complete, the PRESET button No. (1 to 6) is flashed on and off three times, then the frequency indication is indicated on digital display (4).
3. Repeat the above same procedure steps 1 to 2 to preset other stations with other PRESET buttons (7).



M1NE-01-003

- Auto-Presetting
  Press and hold SOUND control switch (2) with the radio switch ON, PRESET buttons (1 to 6) automatically search receivable frequency stations in the selected frequency band (AM or FM) and memorize each station in one button.

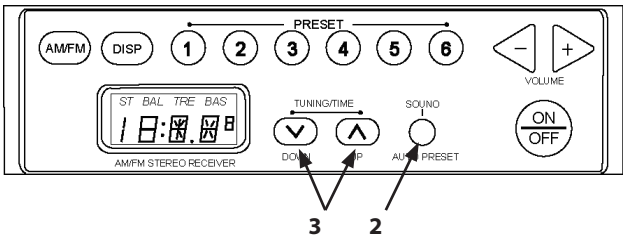
NOTE: When auto-presetting operation is made, the preciously memorized stations are deleted. If it is difficult to set the memory of the desired station to the desired button, conduct preset operation.

Deletion of Preset Memory

If the battery power is disconnected such as when the machine is serviced or the radio is removed, the preset memory in PRESET buttons (7) will be deleted. Repeat the preset operation again.

Sound Adjustment

When SOUND control switch (2) is pressed with the radio switch ON, It will be in the sound adjustment state. Each time SOUND control switch (2) is pressed, the adjustment item can be changed as below.
BAL→TRE →BAS→BAL→TRE →BAS
When SOUND control switch (2) is pressed with the BAS state, the sound adjustment is deactivated.



M1NE-01-003

- Sound Adjustment (Balance Control)

  When UP button (3) is pressed with the BAL state, loudspeaker output is increased from R output by one step. When DOWN button (3) is pressed with the BAL state, loudspeaker output is decreased from L output by one step.

- Sound Adjustment (Treble Control)

  When UP button (3) is pressed with the TRE state, treble level is increased by one step. When DOWN button (3) is pressed with the TRE state, treble level is decreased by one step.

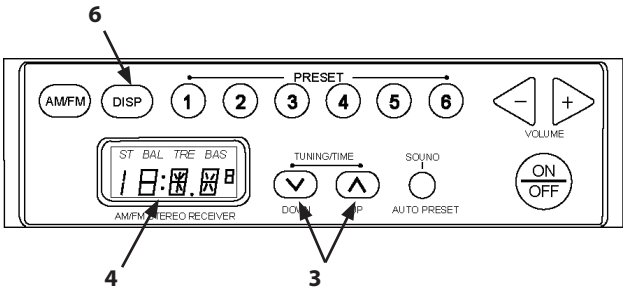
- Sound Adjustment (Bass Control)

  When UP button (3) is pressed with the Bas state, bass level is increased by one step. When DOWN button (3) is pressed with the Bas state, bass level is decreased by one step.

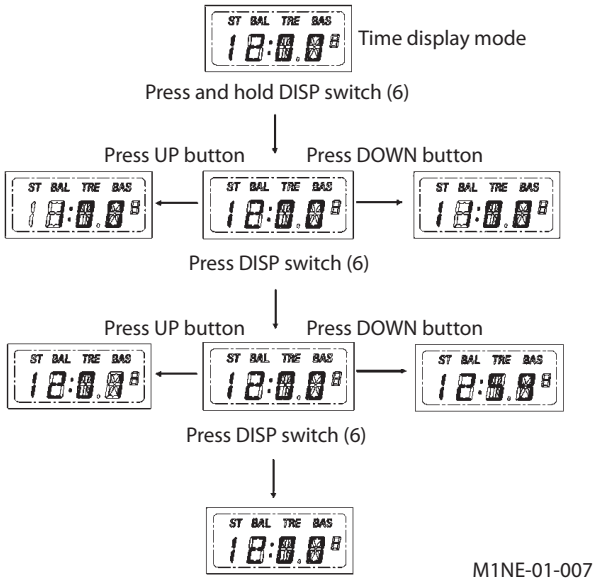
Digital Clock Setting Procedure

NOTE: In order to set the clock, digital display (4) must be in the time display mode.

In case the frequency is indicated on digital display (4), press DISP (display) switch (6) to display the time.
While pressing DISP (display) switch (6), press UP/DOWN buttons (3) to change the hour display. While pressing DISP (display) switch (6), press UP/DOWN buttons (3) to change the minute display. When DISP (display) switch (6) is pressed with the minute display, the clock setting is deactivated.



M1NE-01-003

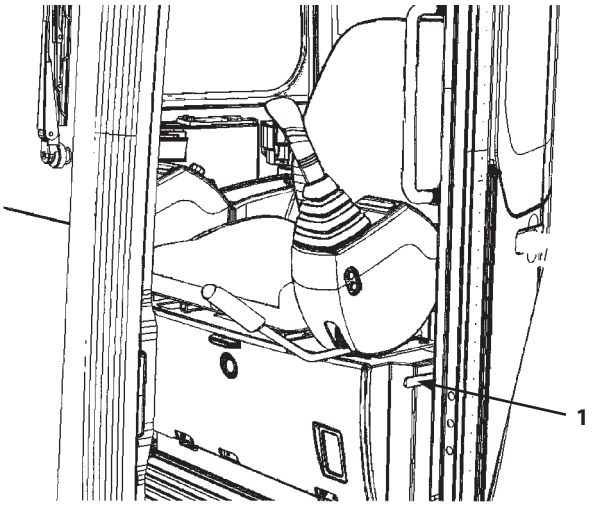


M1NE-01-007

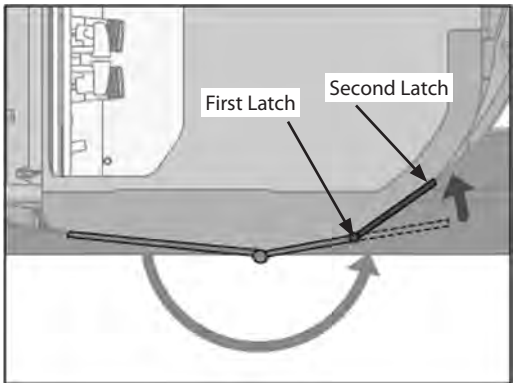
Cab Door Release Lever (Cab-equipped Machines)

CAUTION: Open the cab door all the way until the two latches on the side of the cab securely lock.

To unlock the door, push down on door release lever (1) located on the left side of the operator's seat.



M1M7-01-003

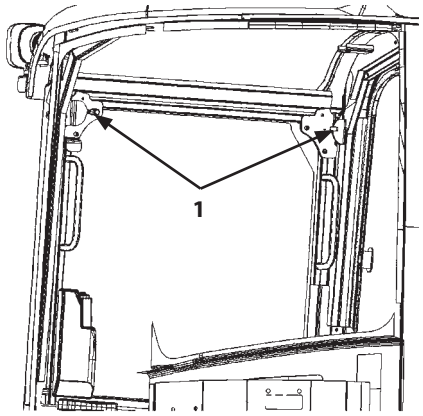


M1M7-01-027

Opening/Closing Cab Front Window (Cab-equipped Machines)

Front Window

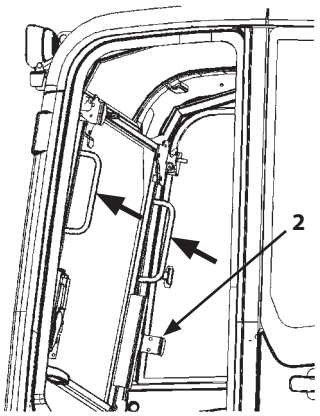
1. Disengage lock levers (1) provided at the upper right and left corner of the front window.
2. Hold the handles (in two places) on the front window frame and raise the window until lock levers (1) engage with the window frame.



M1M7-01-013

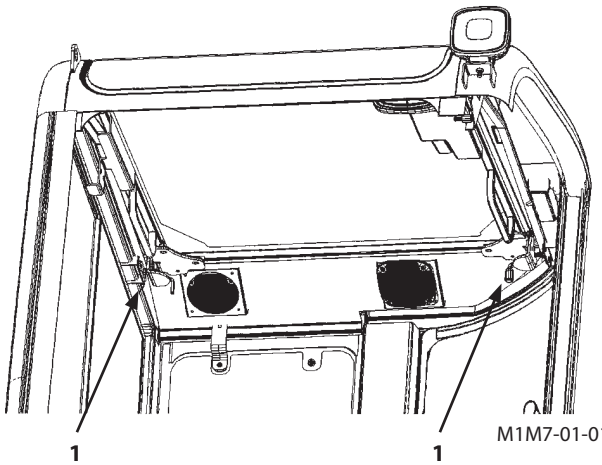
CAUTION:

- **When closing the front window, slowly lower the window. Be alert not to pinch your fingers.**
- **Switch (2) is provided on the front window frame to prevent the wiper from operating when the front window is opened. Before closing the front window, check that the wiper switch is OFF.**
- **After opening the front window, check that both side lock levers (1) are securely engaged in the window frame.**



M1M7-01-014

3. When closing the front window, follow the same steps 1 and 2 above in the reverse order.

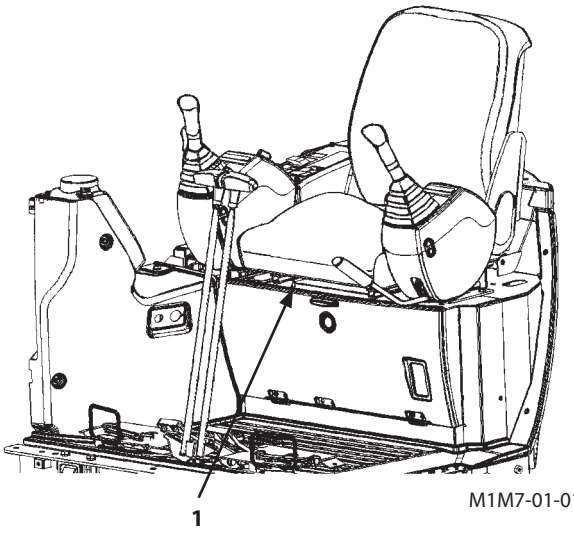


M1M7-01-015

Adjusting Operator's Seat

Seat Fore-Aft Adjustment

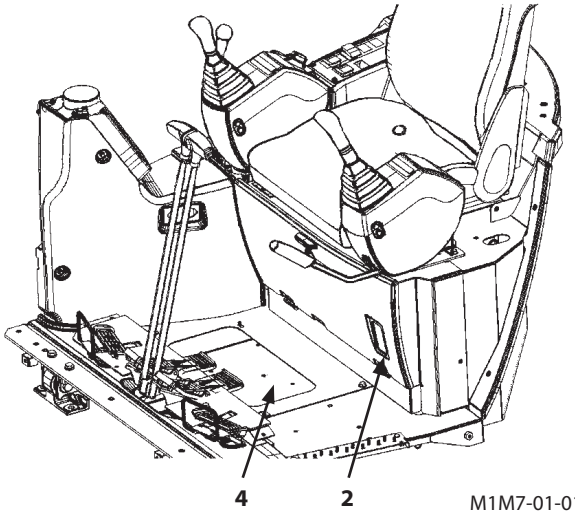
Operate seat fore-aft slide lever (1). Seat fore-aft position can be adjusted at the interval of 20 mm (0.8 in) in 6 steps (120 mm (5 in) in total).



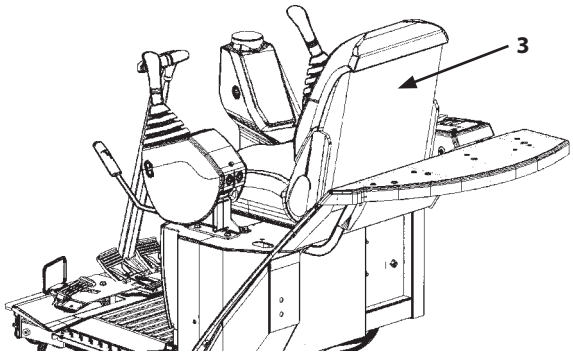
M1M7-01-016

Tool and Operator's Manual Boxes

Tool boxes (2) (4) and operator's manual box (3) are located under the operator's seat, under the floor mat and behind the backrest of the operator's seat respectively.



M1M7-01-017



M1M7-01-018

Emergency Exit (Cab-equipped Machines)

If the operator's cab door can not be opened in an emergency, escape in the following methods.

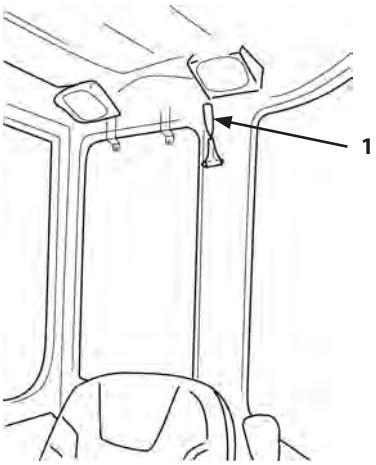
1. When required to escape from the cab when the door is difficult or impossible to open in an emergency, open the front window.

NOTE: Refer to the descriptions in OPENING/CLOSING CAB FRONT WINDOW for the opening method of the front window.

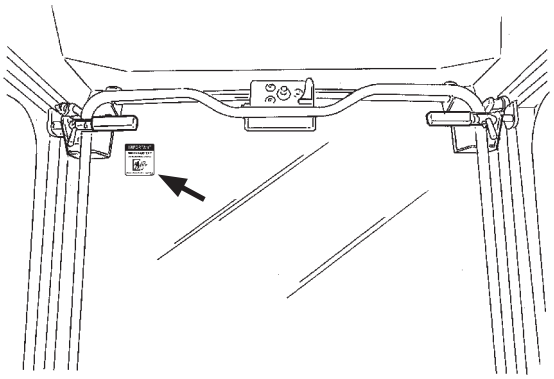
WARNING: Take care not to get injured by broken glass when required to break the windowpane.

2. In case opening the front window is impossible, break the front window glass with emergency evacuation hammer (1) provided on the rear side in the cab to escape through the broken window.
3. If the front window is not available for escaping, break the rear window glass with emergency evacuation hammer (1). Then, escape through the broken window.

NOTE: Emergency exit decals are affixed on the front and left rear windows.

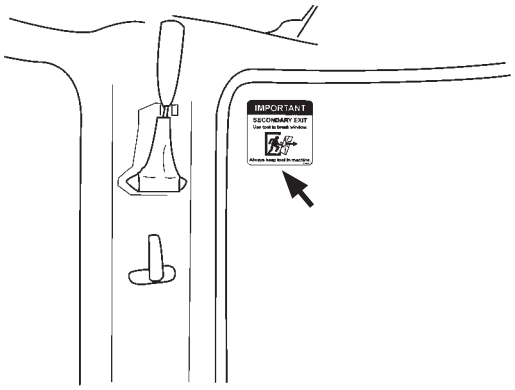


M1M7-01-020



Front

M1M7-01-037

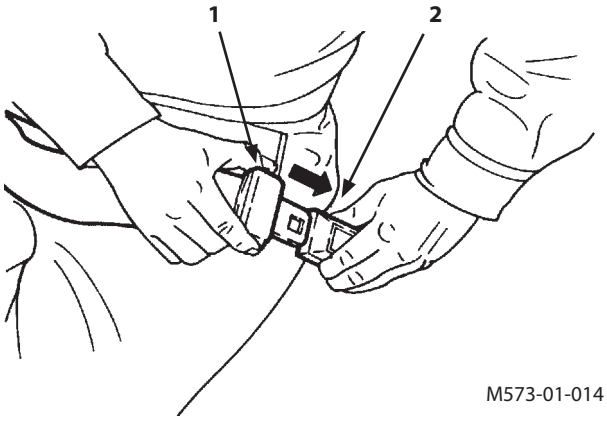


Rear

M1M7-01-038

Seat Belt (Optional)

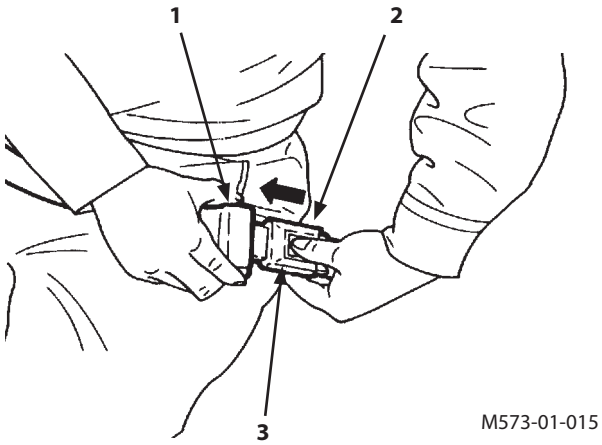
WARNING: Be sure to use seat belt (1) when operating the machine.
Before operating the machine, be sure to examine seat belt (1), buckle (2), or attaching hardware.
Replace seat belt (1), buckle (2), or attaching hardware if they are damaged, or worn.
Replace seat belt (1) every three years, regardless of appearance.



M573-01-014

Seat Belt

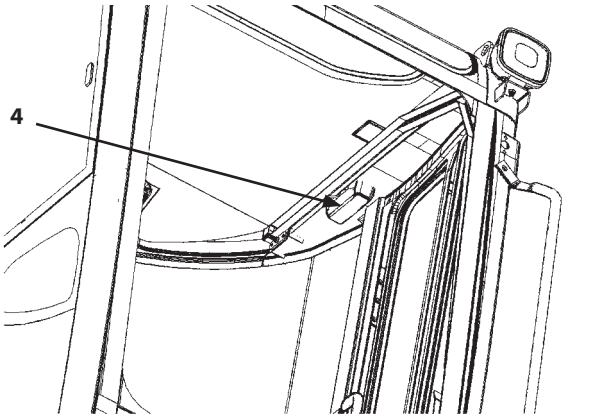
1. Confirm that seat belt (1) is not twisted and securely insert the end of seat belt (1) into buckle (2). Lightly pull on seat belt (1) to confirm that buckle (2) latches securely.
2. Push button (3) on buckle (2) to unfasten seat belt (1).



M573-01-015

Cab Light (Cab-equipped Machines)

Move cab light switch (4) to turn the cab light ON or OFF. (The cab light comes ON only when the key switch is turned ON.)



M1M7-01-021

MEMO

Breaking in New Machine

IMPORTANT: Operating a new machine at full load without first breaking in can cause scratches and/or seizures, consequently affecting the service life of the machine. Thoroughly perform break-in operation.

The service life and performance of the machine can be greatly affected by operation and maintenance of the machine during the initial stage of operation. Perform break-in operation with the engine output less than 80 % of the maximum output for the first 50 hours.

MEMO

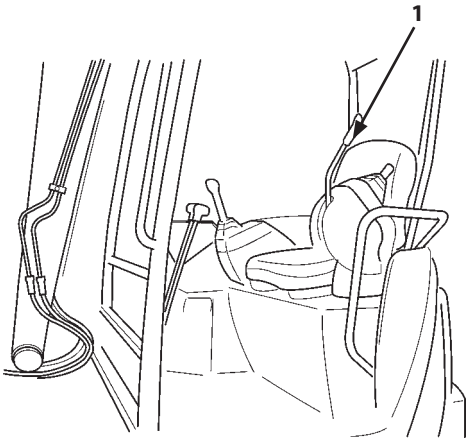
Before Starting Engine

1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Confirm that all control levers are placed in Neutral.
3. Check indicator bulbs as follows:
   Turn key switch (2) to the ON position. All indicator lights and warning lamps will come ON. They will stay on for approximately 2 seconds, except for alternator (3) and engine oil pressure (4) indicator, which will continue to stay on further.

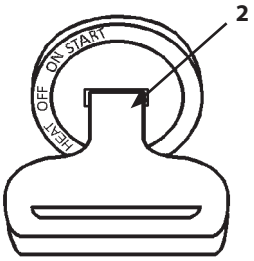
IMPORTANT: The monitor panel indicates the machine operating conditions. If the machine is operated with an indicator bulb or a warning lamp burned out, the alarm will not be displayed even if any abnormality occurs on the machine. Accordingly, in case any of the indicator bulbs or the warning lamps do not come ON, immediately contact your authorized dealer for repair. If any of alternator (3), or engine oil pressure (4) indicator fails to light after indicator light check is completed, the machine may have trouble. Immediately contact your authorized dealer for repair.

4. Adjust the seat position so that all pedals and control levers can be fully stroked to any position when seated in the operator's seat with the operator's back kept in contact with the backrest. Fasten the seat belt.

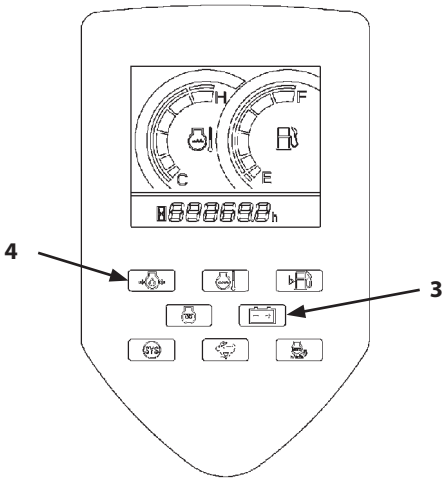
NOTE: The monitor surfaces are resin. Wipe the surface only with a damp cloth when dusty to keep them clean. Never use an organic solvent.



M1M7-03-001



M1M7-01-007



M1NE-01-015

Starting Engine

Starting in Ordinary Temperature

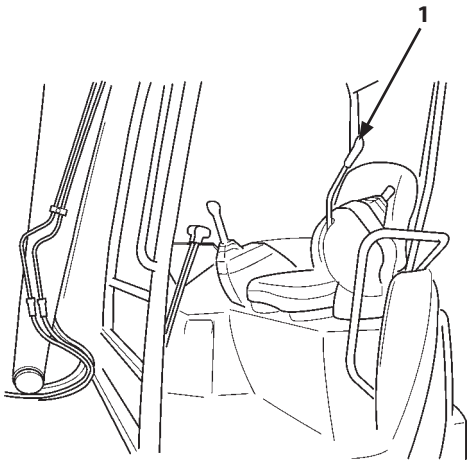
1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Turn engine control dial (3) or engine control lever (3) to the slow idle position.
3. Sound the horn to alert bystanders.
4. Turn key switch (2) to rotate the starter. The engine will be started.

IMPORTANT: Prevent starter damage and/or battery over discharge. Never run the starter for more than 15 seconds at a time. If the engine fails to start, return key switch (2) to OFF. Wait for more than 30 seconds, then try again.

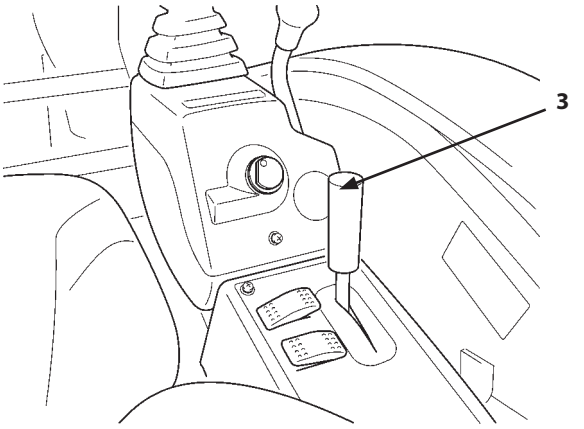
5. Release key switch (2) immediately after the engine has started. It will automatically return to the ON position.

NOTE: The horn sounds even though key switch (2) is turned OFF. The engine does not start unless pilot control shut-off lever (1) is in the LOCK position.

IMPORTANT: Avoid operating key switch (2) with stained hands or gloves.

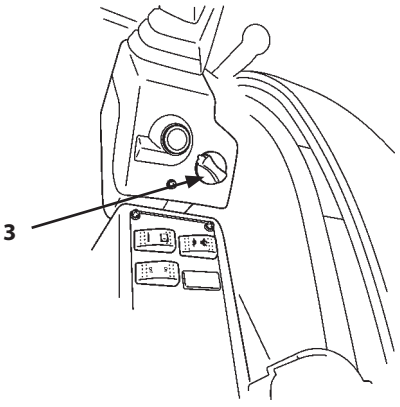


M1M7-03-001



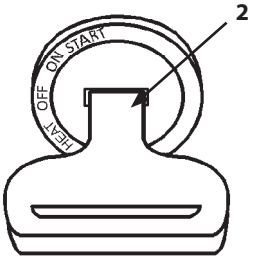
ZX29U-3

M1M7-03-006



ZX33U-3, 38U-3, 48U-3, 52U-3

M1M7-03-002



M1M7-01-007

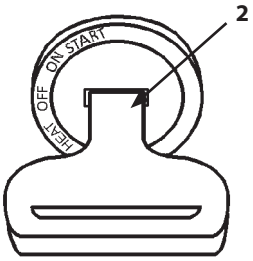
Starting in Cold Weather

1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Turn engine control dial (3) or engine control lever (3) to around the middle between the slow and fast idle positions.
3. Turn key switch (2) to the HEAT position and hold it in that position for approx. 15 seconds until preheat indicator (4) goes OFF.
4. Sound the horn to alert bystanders.
5. As soon as preheat indicator (4) goes OFF, return key switch (2) to the START position to run the starter.

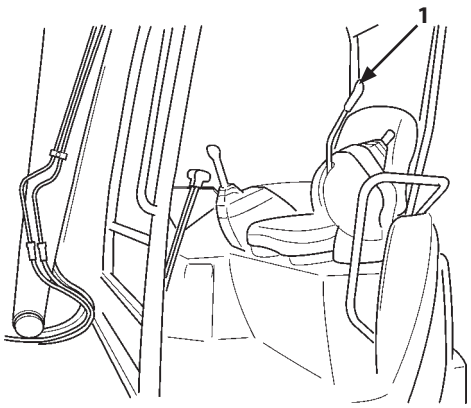
IMPORTANT: Prevent starter damage and/or battery over discharge. Never run the starter for more than 15 seconds at a time. If the engine fails to start, return key switch (2) to OFF. Wait for more than 30 seconds, then try again.

6. Release key switch (2) immediately after the engine has started. It will automatically return to the ON position.

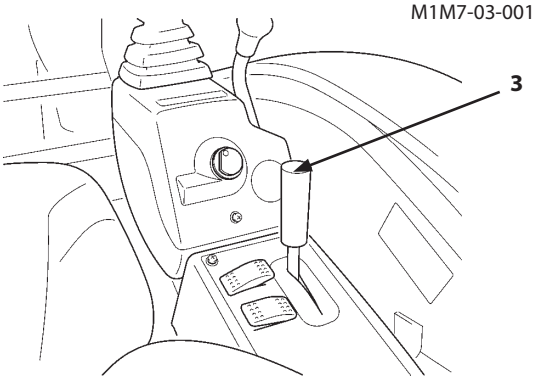
NOTE: Set engine control dial (3) or lever (3) to the fast idle position to start the engine in an extreme cold weather district. After the engine is started, gradually reduce the engine speed and perform warm-up operation at the medium speed range.



M1M7-01-007

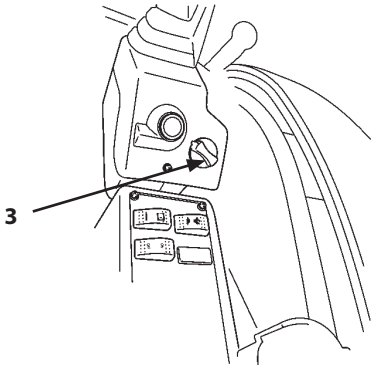


M1M7-03-001



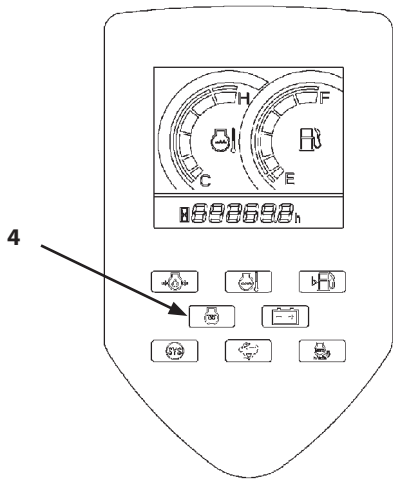
ZX29U-3

M1M7-03-006



ZX33U-3, 38U-3, 48U-3, 52U-3

M1M7-03-002



M1NE-01-015

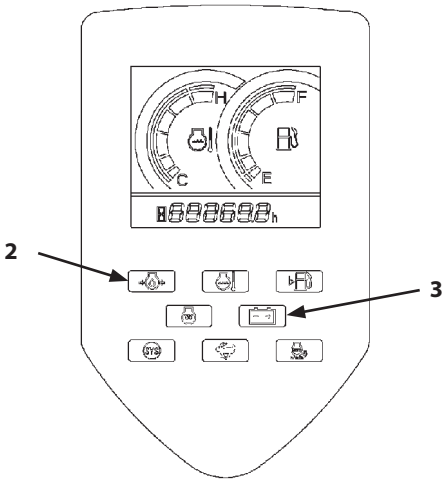
Check Machine After Starting Engine

IMPORTANT: In case any abnormality is found in the monitor, immediately stop the engine. Trace the cause of the problem.

Check Using the Monitor

After the engine has started, check the following points through the monitor.

1. Check that alternator indicator (3) is OFF.
   In case alternator indicator (3) stays ON, immediately stop the engine. Then, check the alternator and/or battery system for any abnormality.
2. Check that engine oil pressure indicator (2) is OFF.
   In case engine oil pressure indicator (2) stays ON, immediately stop the engine. Then, check the engine oil pressure system and/or the oil level for any abnormality.



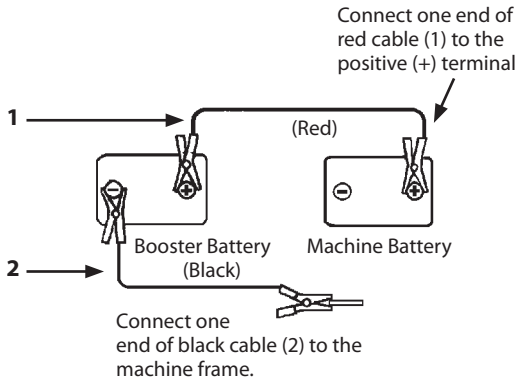
M1NE-01-015

Using Booster Battery

WARNING: An explosive gas is produced while a battery is in use or being charged. Keep flames or sparks away from the battery area. Park the machine and booster battery machine on a dry, firm or concrete surface, not on steel plates. If the machine and/or the booster battery machine are parked on steel plates, dangerous sparks may be unexpectedly created on the machine. Never connect a positive terminal to a negative terminal, as a dangerous short circuit will occur.

IMPORTANT: The machine electrical system is a 12 volt negative (-) ground. Use only 12 volt booster battery with enough capacity to start this machine.

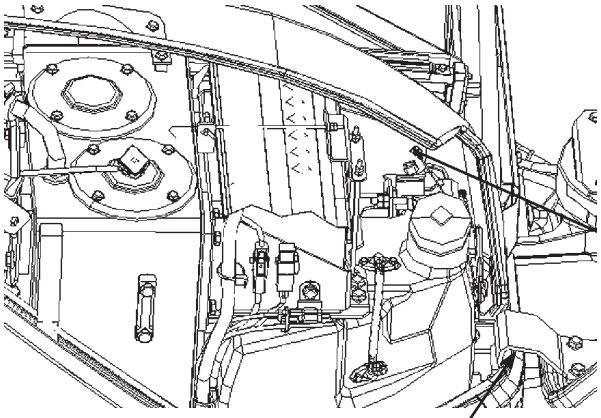
When the machine battery is exhausted, start the engine using a booster battery as shown below.



M503-03-002

Connecting Booster Cables

1. Stop the engine of the booster battery machine.
2. Connect one end of red cable (1) to the positive (+) terminal of the machine battery and the other end to the positive (+) terminal of the booster battery.
3. After connecting one end of black cable (2) to the negative (-) terminal of the booster battery, connect the other end to hydraulic oil tank cover hinge (3) on the machine. Be alert to sparks that may be produced in the last connection to the hydraulic oil tank cover hinge.
4. After securely connecting the booster cables, start the engine of the booster battery machine. Run the engine at a middle speed. Then, start the engine of this machine.
5. After the engine is started, disconnect booster cables (1 and 2) following the procedures below.

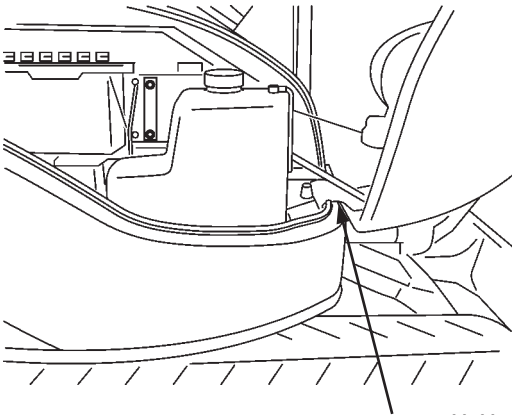


M1M7-03-003

ZX29U-3, 33U-3, 38U-3

Disconnecting Booster Cables

1. Disconnect black booster negative (-) cable (2) from hydraulic oil tank cover hinge (3) first.
2. Disconnect the other end of black booster negative (-) cable (2) from the booster battery.
3. Disconnect red booster positive (+) cable (1) from the booster battery.
4. Disconnect red booster positive (+) cable (1) from the machine battery.



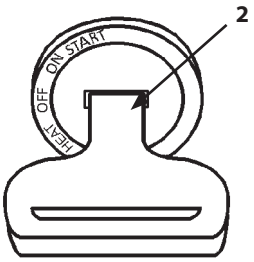
ZX48U-3, 52U-3

M1M7-03-004

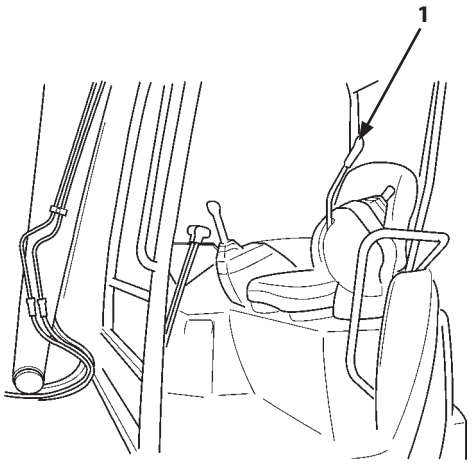
Stopping Engine

Stop the engine following the steps below.

1. Before stopping the engine, lower the bucket and blade to the ground unless specified.
2. Return the engine control dial or the engine control lever to the slow idle position and keep the engine running at slow idle speed for 5 minutes.
3. Turn key switch (2) OFF to stop the engine.
4. Pull up pilot control shut-off lever (1) to the LOCK position.



M1M7-01-007



M1M7-03-001

Travel Levers and Pedals

Travel operation can be performed with either the levers or pedals.

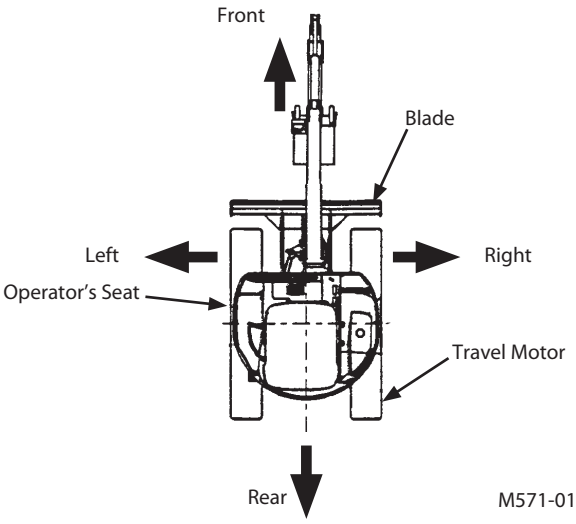
WARNING: In the standard traveling position, the front idlers are located in front of the operator's seat and the travel motors at the rear. If the travel motors are positioned at the front of the machine, when the travel levers or pedals are operated in the direction as illustrated on the operation decals, the travel direction of the machine will be reversed. Be sure to confirm the position of the travel motors before traveling.

NOTE: Travel lever dampers are provided for smooth control. In extremely cold weather (lower than -20 °C (-68 °F)), the travel lever (or pedal) will become heavy to operate. This is caused by increase in oil viscosity which is not abnormal.

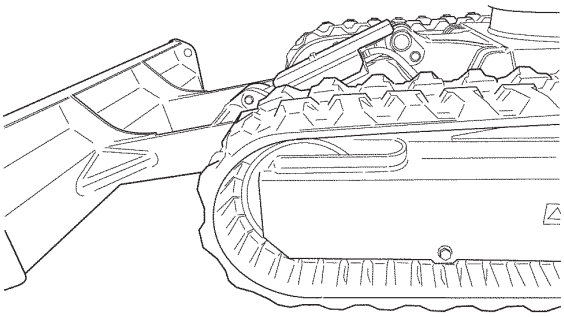
- Forward/Reverse Travel
  Move both levers (or pedals) forward together to travel forward.
  Pull the levers (or pedals) back together to travel in reverse. The travel speed can be controlled by adjusting the lever (or pedal) operating stroke.

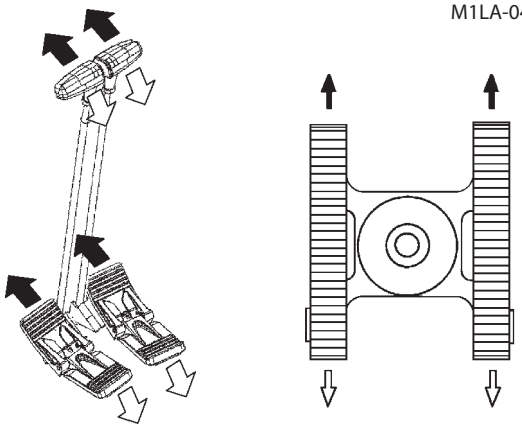
- Ascending/Descending Slopes
  The machine gradeability is 30 ° (58 %). Slowly operate the travel levers (or pedals) when descending a slope. When the travel levers are placed in neutral, the travel brakes are automatically applied to stop the machine.

NOTE: The travel pedal on this machine is a folding type. When traveling the machine using the travel pedals, unfold the pedals.

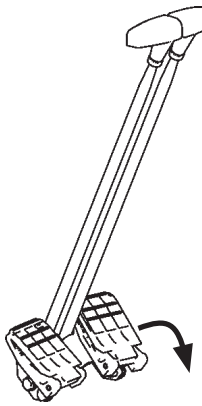


M571-01-001

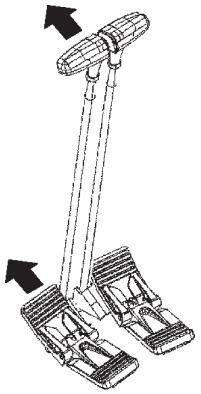

M1LA-04-001

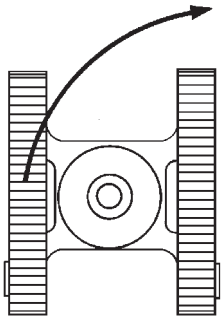

Forward/Reverse Travel Direction
M1M7-04-011

M104-04-003


M1M7-04-010

- Pivot Turn
  Steer the machine by driving only one side crawler. Operate either of the travel levers (or pedals).



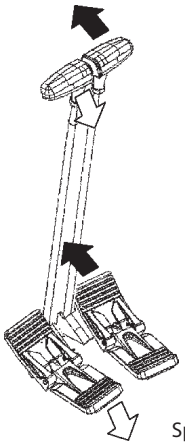


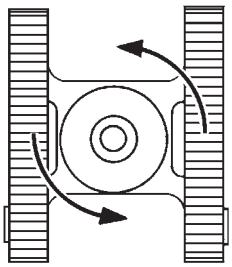
M1M7-04-012
M104-04-005

Pilot Turn

- Spin Turn
  Steer the machine in a position by driving both side crawlers in opposite directions each other. Move one lever (or pedal) forward and pull the other back at the same time.

WARNING: During pivot or spin turn machine operations, the base machine may shake. When turning the machine in a tight area, slowly operate the machine while taking care not to allow the machine to come in contact with the surrounding objects.





M1M7-04-013
M104-04-007

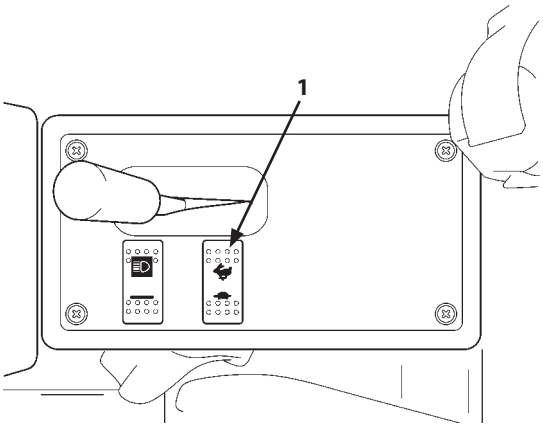
Spin Turn

Travel Mode Switch

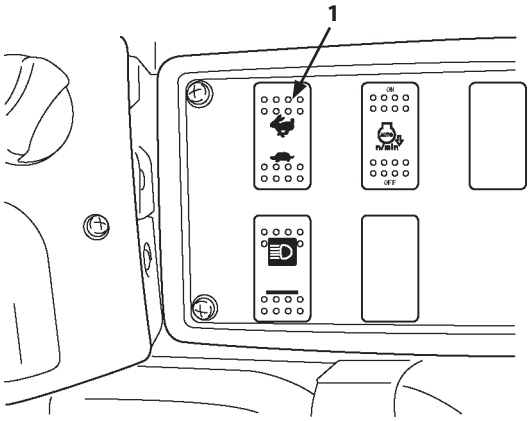
WARNING: Never attempt to shift the travel mode from the slow to fast while descending a slope. Return the travel levers (pedals) to neutral once before shifting the travel mode.

Press the RABBIT mark side on travel mode switch (1) to select the fast travel mode. (The slow travel mode will automatically be selected if the traveling loads increase.)
Press the TURTLE mark side on travel mode switch (1) to select the slow travel mode.

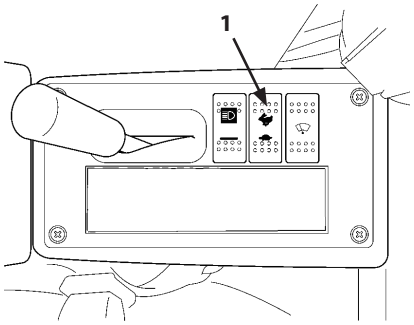
WARNING: In cold weather season, when the machine is traveling with travel mode switch (1) in the fast travel mode position, the slow travel mode may not automatically be selected even if the traveling loads increase. This symptom is not abnormal. Drive the machine after conducting sufficient warm-up operation.



ZX29U-3 (Canopy) M1M7-01-033

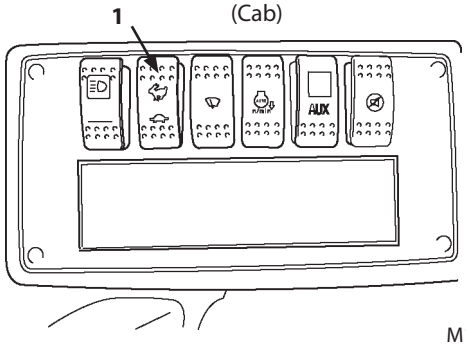


ZX33U-3, 38U-3, 48U-3, 52U-3 (Canopy) M1NE-01-010



M1NE-01-005

ZX29U-3 (Cab)



M1NE-01-009

ZX33U-3, 38U-3, 48U-3, 52U-3 (Cab)

Traveling on Soft Ground

Avoid traveling on soft ground as much as possible. If traveling on a soft ground is unavoidable, carefully operate the machine while observing the following points.

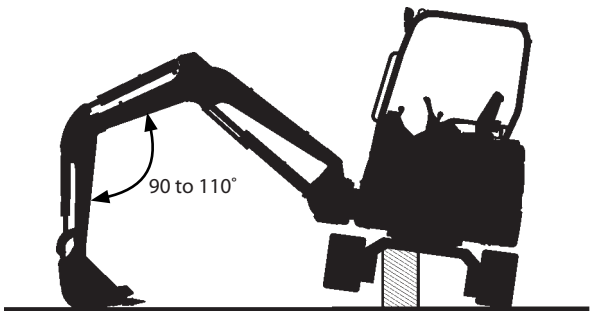
- Drive the machine as far as the machine can move by own propelling power. Towing the machine may become necessary. Do not drive the machine to a deeper location than towing machine is possible.
- In case it becomes impossible for the machine to travel by own propelling power, lower the bucket to the ground. While supporting the machine weight with the boom and the arm, slowly pull the arm to evacuate the machine. Operate the boom, arm, and travel levers simultaneously at this time to prevent the machine from being loaded abnormally.
- If the track frame bottom comes in contact with the ground, or if mud and/or grabbles are tightly packed into the undercarriage, the machine may become impossible to travel. Raise one side track above the ground with the boom and arm extended, remove mud and/or grabbles from the track. Then, evacuate the machine. Rotate the raised track in forward or reverse directions alternately to remove the packed rocks and/or mud from the track.
- Tow the machine with other machine if the machine becomes stuck in soft ground and impossible to evacuate by own propelling power. Refer to the descriptions for TOWING MACHINE on the next page for the correct rope attaching method.

M1M7-04-005

Raise One Track Using Boom and Arm

WARNING: Operate the machine carefully. The machine may slide. Keep the angle between boom and arm 90 to 110° and position the bucket's round side on the ground.

1. Swing the upperstructure 90°.
2. Position the boom and the arm so that the angle between them becomes to 90 to 110°. Push the ground with the round bucket bottom to raise track off ground.
3. Do not raise the track with the boom and the arm when the boom is swung.



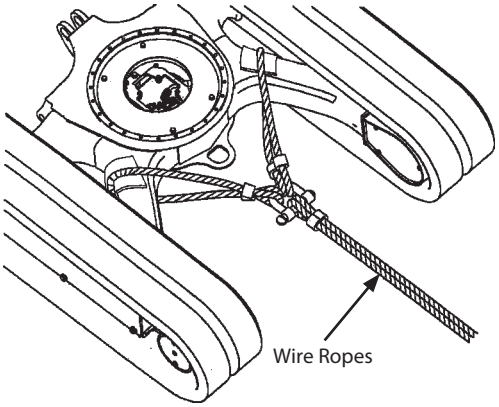
M1M7-04-006

Towing Machine

In case it is difficult for the machine to evacuate from a soft terrain by own propelling power, attach wire ropes as illustrated to the right. Tow the machine using another machine. Be sure to attach the wire ropes around the track frames. To prevent the wire ropes from being damaged, place pieces of soft protective material between the wire ropes and the edge corners of the frame.

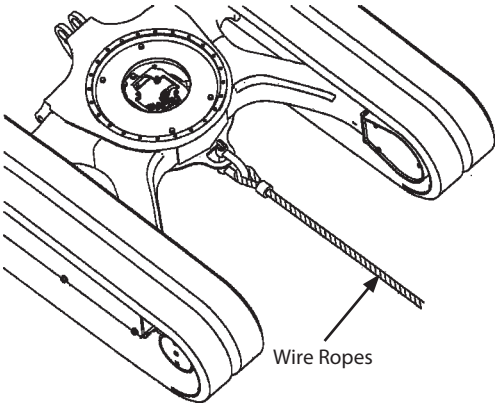
IMPORTANT: **On some machines, a bracket is provided on the track frame to install a shackle for towing a lightweight object. Never attempt to tow the machine using this lightweight object-towing bracket. Breaking the towing bracket may result. Refer to the descriptions on Shackle Bracket Usage on page 5-14 in "Operating the Machine" section for usages of the shackle bracket. In addition, do not tow the machine with the complete machine lifting holes prepared on the blade. The lifting holes may be damaged.**

RIGHT



M1NE-04-001

WRONG

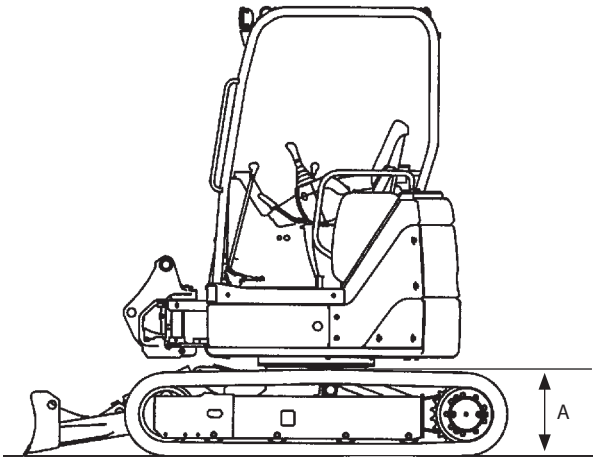


M1NE-04-002

Driving in Water or on Soft Ground

1. If the footing is even and the water slow running, the machine can drive in water up to the upper track shoe surface (A) at the top of the front idler. In case the footing is uneven and the water is flowing fast, be careful not to submerge the swing bearing, swing pinion gears, and/or center joint in water or mud.
2. The machine may enter deeper areas gradually. Check the machine's position often. Reposition the machine if necessary.

IMPORTANT: **If the swing bearing, swing gears and center joint are submerged in water or mud by mistake, premature wearing on parts such as the swing bearing may result. Grease must be changed or overhauling will be required immediately. Stop operating the machine as soon as possible, and contact your authorized dealer.**



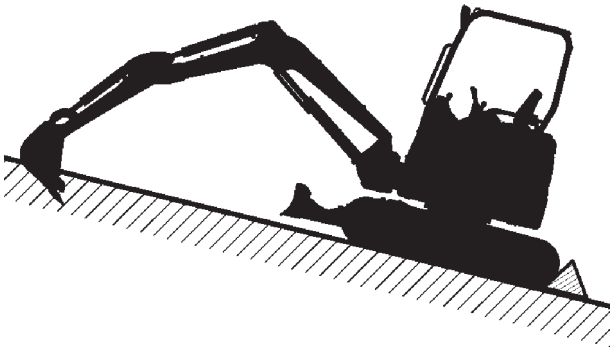
M1M7-04-004

Machine Model	Operable Water Depth (A)
ZX29U-3	480 mm (19 in)
ZX33U-3, 38U-3	485 mm (19 in)
ZX48U-3, 52U-3	545 mm (21 in)

Parking and Stopping on Slopes

WARNING: Parking and/or stopping on slopes is extremely dangerous. Avoid parking and/or stopping the machine on slopes.

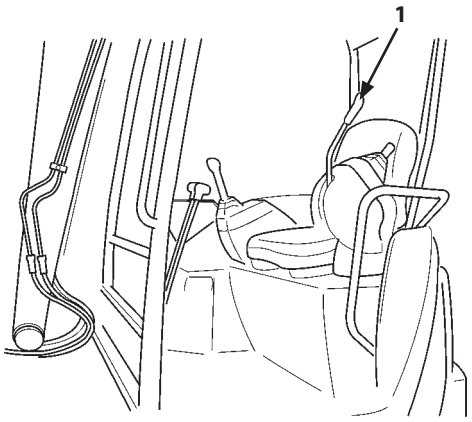
If parking and/or stopping on slopes is unavoidable, lower both the bucket and the blade to the ground, and place all levers in the neutral position. Also, put blocks at the downhill end of the tracks.



M1M7-04-009

Parking on Slopes

1. Park the machine on a level, solid surface. Position the arm vertically and lower the bucket and blade to the ground.
2. Turn the engine control dial or the engine control lever to the slow idle position. Run the engine at the slow idle speed for approx. 5 minutes to cool the engine.
3. Turn the key switch to OFF to stop the engine. Remove the key from the key switch.
4. Pull pilot control shut-off lever (1) into the fully LOCK position.
5. Close the windows and cab door, if a cab is provided. Be sure to lock all the cab door and windows.



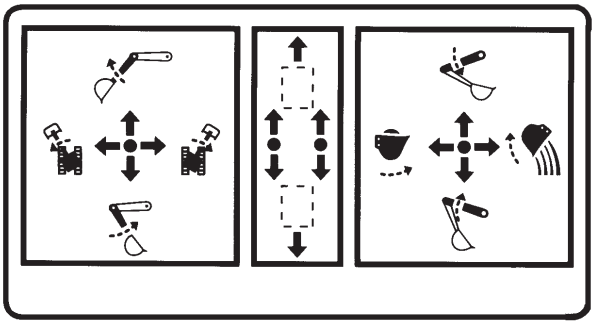
M1M7-03-001

MEMO

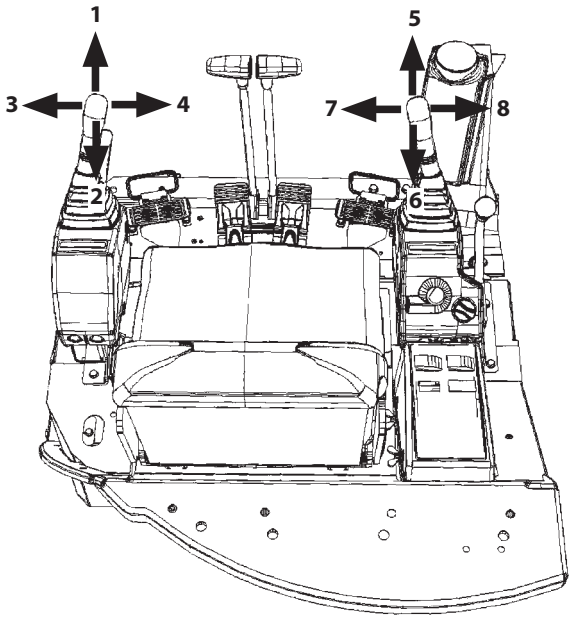
Control Lever (ISO Excavator Pattern)

WARNING: Be sure to check the location and function of each control lever before operating. The upper structure and/or front attachment may unexpectedly move when attempting to turn and look behind the machine as a part of operator's body may come into contact with the control lever(s). Take care not to come into contact with the control levers when turning and looking behind the machine.

Labels showing the lever control pattern are provided on the operator's right. As illustrated below, the labels indicate the ISO Excavator Pattern.



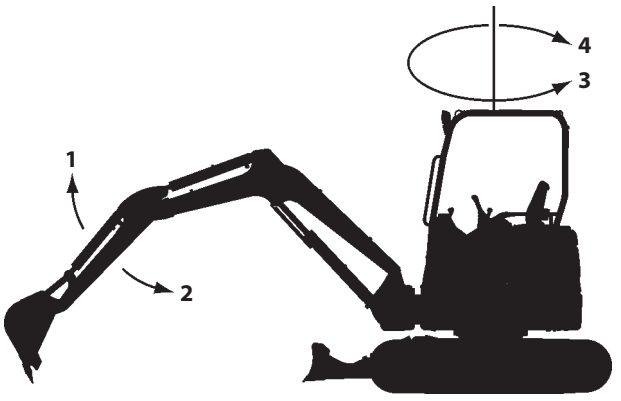
M588-05-050



M1M7-01-002

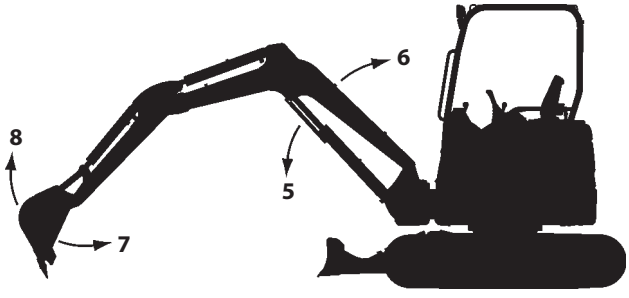
When a control lever is released, it automatically returns to neutral, stopping the function in that position.

1- Arm Roll-Out
2- Arm Roll-In
3- Swing Left
4- Swing Right



M1M7-05-001

5- Boom Lower
6- Boom Raise
7- Bucket Roll-In
8- Bucket Roll-Out



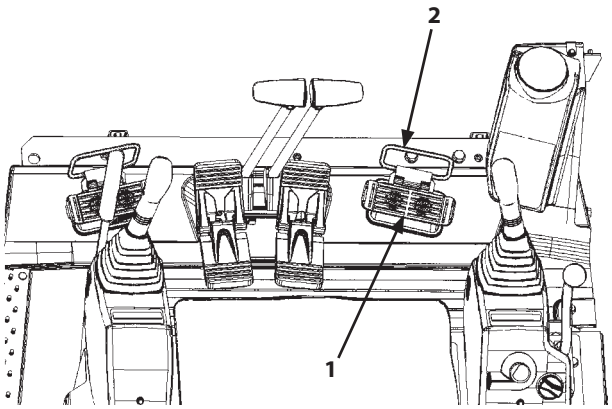
M1M7-05-002

Boom-Swing Pedal

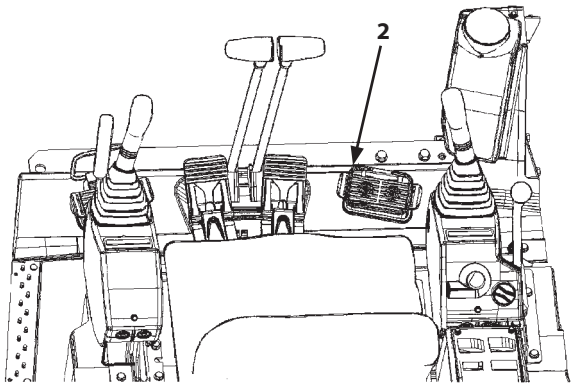
Use the boom swing function to efficiently operate the machine when excavating grooves along roadsides or near walls. The boom swing operation is performed using boom-swing pedal (1) located at the operator's right foot as illustrated to the right.

Boom-Swing Operation

1. Turn cover (2) for boom-swing pedal (1) forward.
2. Step on the left side of boom-swing pedal (1) to swing left. Step on the right side of pedal (1) to swing right.
3. Turn cover (2) backward over boom-swing pedal (1) when boom-swing operation is no longer required.



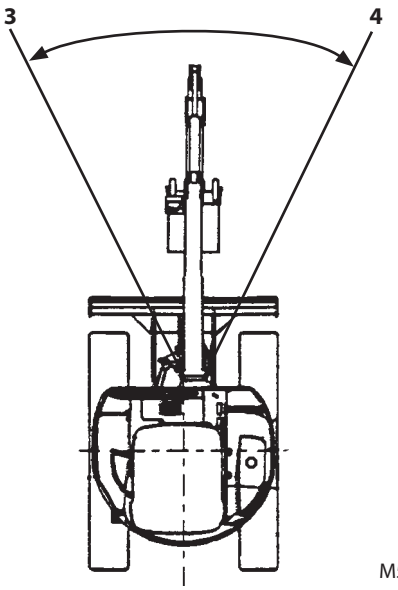
Unlock Position M1M7-05-005



Lock Position M1M7-05-006

3- Swing Left

4- Swing Right



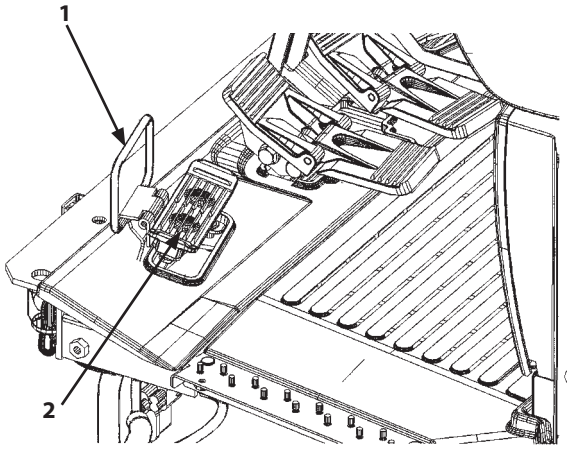
M571-01-001

Auxiliary Pedal

Use auxiliary pedal (2) located at the operator's left front, as illustrated to the right, to operate hydraulic breaker, crusher, etc.

Operation

1. Turn auxiliary pedal cover (1) forward.
2. Step on the right or the left side of auxiliary pedal (2) to operate the front-end attachment such as a hydraulic breaker.
3. When auxiliary pedal (2) is not used, turn cover (1) backward on pedal (2).

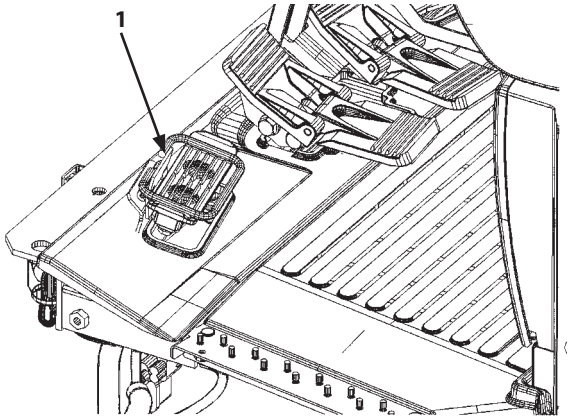


M1M7-05-007

AUX Function Lever Switch (Optional)

WARNING:

- **This switch is provided to operate the attachment installed on this machine. Never attempt to use this switch for other applications and/or to modify the switch performance and/or shape, which may result in serious personal accident or death.**
- **Before operating this switch, be sure to thoroughly read the applied attachment operator's manual and check the movement of each function in a safe location.**
- **Before operating the attachment using this switch, inquire at the corresponding attachment manufacture and the sales company about necessary requirements to appropriately install and/or operate the attachment. Be sure to follow these instructions.**



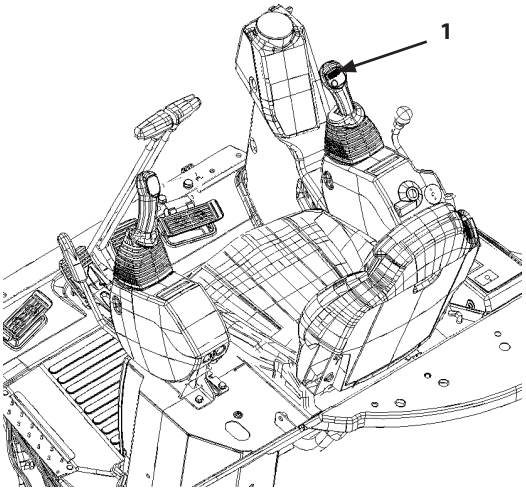
M1M7-05-008

Use switches on right control lever (1) , as illustrated to the right, to operate hydraulic breaker, crusher, etc.

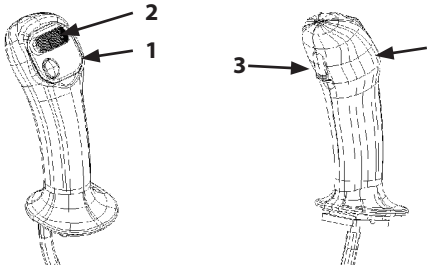
Operation

1. Move slide switch (2) of right control lever (1) to the right side or the left side to operate the front-end attachment such as a hydraulic breaker.
2. When switch (3) of right control lever (1) is pushed, it becomes the same operation when slide switch (2) is moved to the left end side. (This switch (3) operation is convenient for using hydraulic breaker.)

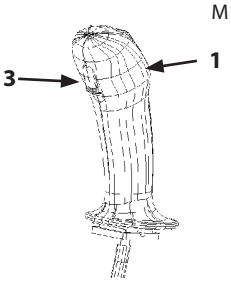
   In case slide switch (2) and switch (3) are pushed simultaneously, switch (3) operation has priority.



M1NE-05-001



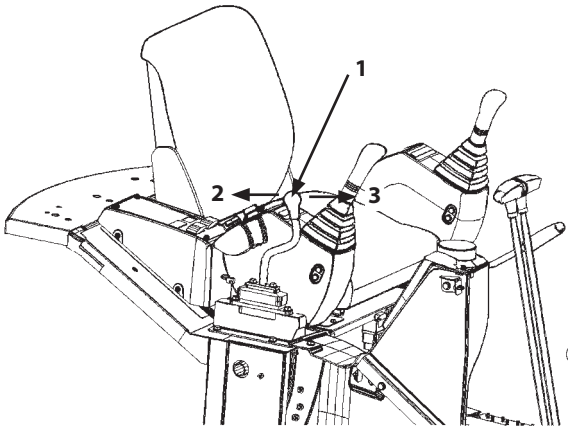
M1NE-05-002



M1NE-05-003

Blade Lever

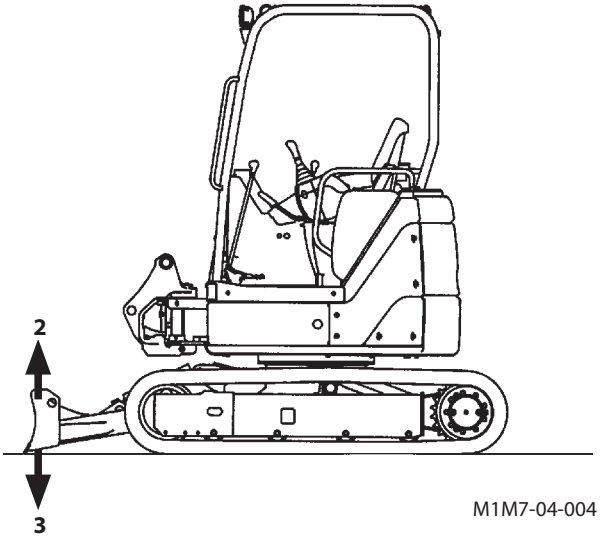
Use blade lever (1) on the operator's right to raise and lower the blade.
When blade lever (1) is released, it automatically returns to neutral, holding the blade in the present position until lever (1) is operated again.



M1M7-05-009

2- Blade Raise

3- Blade Lower

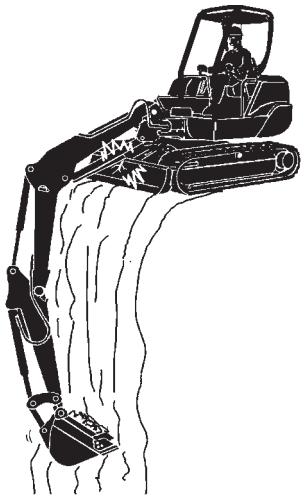


M1M7-04-004

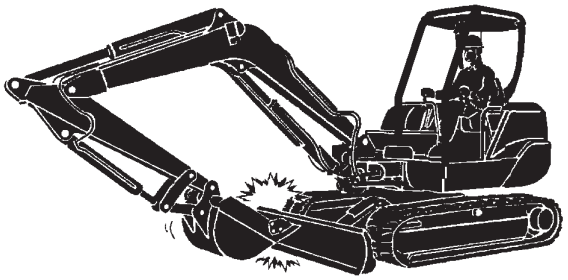
Precautions for Blade Operation

This blade is designed as a light service attachment of the hydraulic excavator. Please keep the following points in mind:

- This blade is designed for bull dozing work only. Do not attempt to dig deeply with the blade. Doing so may damage not only the blade but the undercarriage as well.
- Do not apply concentrated or uneven loads to the blade. Never allow the blade to forcefully collide with a load by running the machine into the load. Failure to do so may result in damage to the blade and the undercarriage.
- When jacking up the machine with this blade, the surface beneath the blade comes under high pressure, increasing the risk of surface collapse. Always be sure that the surface is strong enough to support the weight of the machine before jacking up the machine. Avoid dangerous uneven distribution of weight to the blade by maintaining even contact between the blade and the ground.
- While digging with the blade positioned in the front of the machine, take care not to allow the bucket to come into contact with the blade.
- When digging, take care not to allow the boom cylinder to come in contact with the blade.



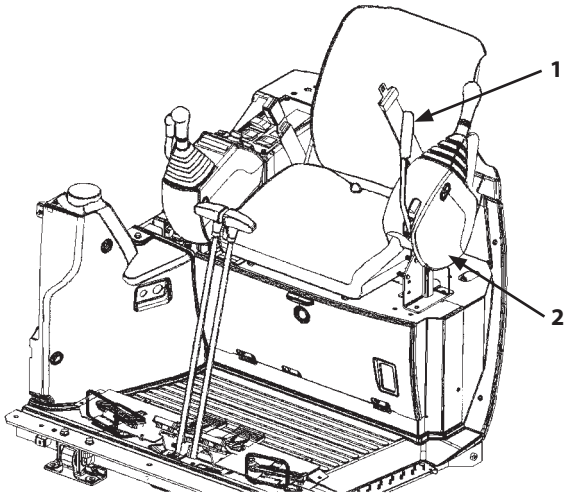
M586-05-016



M586-05-017

Pilot Control Shut-off Lever

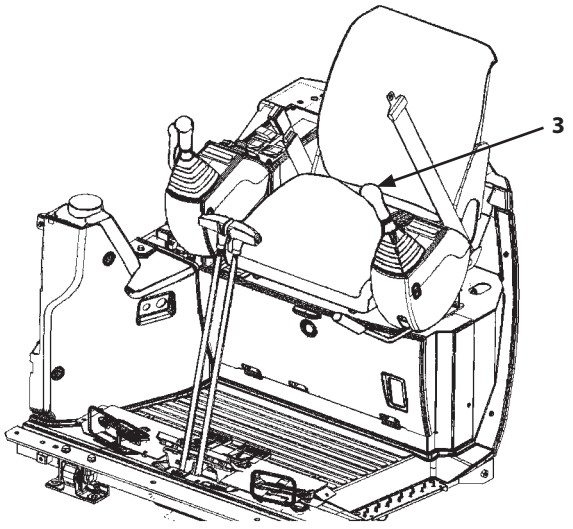
Pilot control shut-off lever (1) is a device to prevent the machine from being unexpectedly operated even if control lever (3) is accidentally moved, such as with a part of the body or when the operator is getting in or out of the operator's station.
Pilot control shut-off lever (1) is linked to console (2) latch mechanism so that console (2) is raised in the LOCK position to aid in entering and exiting the operator's station and for maintenance.



LOCK Position M1M7-05-010

WARNING:

- **To deactivate control lever (3) and pedal functions, be sure to pull pilot control shut-off lever (1) and raise console (2) to the fully locked position. To reactivate control lever (3) function, always hold and push pilot control shut-off lever (1) down. Never attempt to lower raised console (2) or control lever (3) to reactivate all control lever function without holding pilot control shut-off lever (1).**
- **Always stop the engine and pull pilot control shut-off lever (1) to the full LOCK position before exiting the operator's station, even when exiting temporarily.**
- **Be sure to move pilot control shut-off lever (1) to the LOCK position before exiting the machine after each shift.**



UNLOCK Position M1M7-05-011

Pilot Control Shut-off Lever Operation

Before Leaving the Machine:

1. Park the machine on a firm, level surface. Lower the bucket and blade to the ground. Return all control levers to neutral. Stop the engine.
2. To deactivate all control levers function, be sure to pull pilot control shut-off lever (1) and raise console (2) to the fully locked position.

Before Starting Operation:

WARNING: Never attempt to lower raised console (2) (to reactivate the pilot control shut-off function) by holding and pushing down control lever (3) and/or console (2). Always lower console (2) using pilot control shut-off lever (1).

Be sure to hold pilot control shut-off lever (1) in LOCK (raised) position when starting the engine.
Slowly lower pilot control shut-off lever (1) to UNLOCK position before starting operation.
After moving pilot control shut-off lever (1) to the UNLOCK position, check that no activators move when all control levers and pedals are in neutral before starting operation. If any actuator moves after moving pilot control shut-off lever (1) to the UNLOCK position with all control levers and pedals in neutral, the machine may be experiencing trouble. Immediately return pilot control shut-off lever (1) to the LOCK position and stop the engine. Contact your authorized dealer for repair.

Warming Up Operation

The normal operating temperature of hydraulic oil is between 50 and 80 °C (122 and 176 °F). Hydraulic components may be seriously damaged if the machine is operated when the hydraulic oil temperature is below 20 °C (68 °F).
Before starting work, be sure to follow these warm-up procedures until the temperature of the hydraulic oil reaches above 20 °C (68 °F).

Warm-Up Procedures:

1. Run the engine at 100 to 200 min^{-1} (rpm) above slow idle speed for 5 minutes.
2. With the engine speed control lever or the engine speed control dial at the medium position, run the engine for 5 to 10 minutes.
3. Extend and retract each cylinder several times and lightly operate the swing and travel motors to warm them up.

Warming Up in Cold Weather

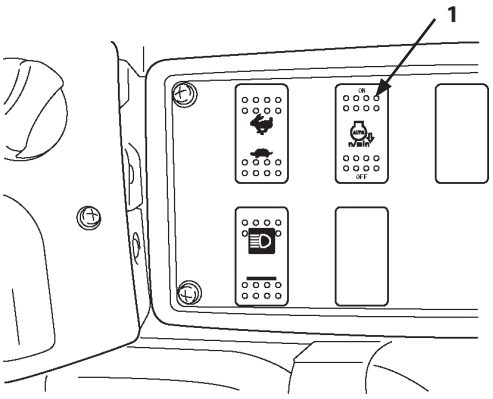
IMPORTANT: In case the hydraulic oil temperature is low, never operate the machine until all actuator speeds become normal after warming up operation.

1. Run the engine at intermediate speed for 5 minutes (longer if the air temperature is extremely low).
2. Do not run the engine at either slow or fast speed during this time.
3. Extend and retract each cylinder several times and lightly operate the swing and travel motors to warm them up.
4. Extend the bucket cylinder to the stroke end. Be sure not to hold the bucket lever in this position for more than 30 seconds.
5. Retract the bucket cylinder to the other stroke end. Be sure not to hold the bucket lever in this position for more than 30 seconds.
6. Repeat steps 4 to 5 until the bucket cylinder cycle time becomes normal.

Auto-Idle Control (Except ZX29U-3)

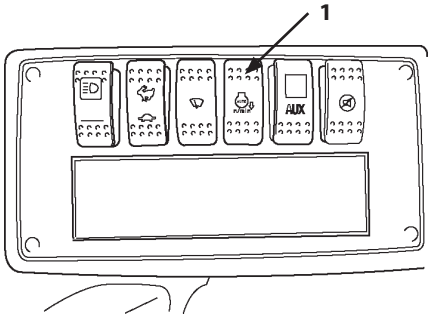
Auto-Idle Function

During operation, approximately 4 seconds after all control levers have been returned to neutral, this system reduces the engine speed to the auto-idle setting until any control lever is operated again to improve fuel consumption. The engine speed immediately increases to the speed set by the engine control dial when any control lever is operated.



Canopy Equipped Machines

M1NE-01-010



Cab Equipped Machines

M1NE-01-009

CAUTION:

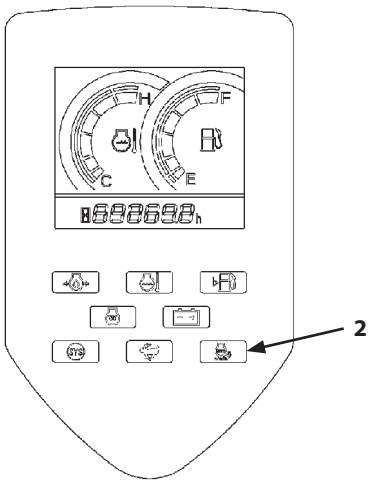
- **Always check if auto-idle indicator (2) is turned ON or OFF before starting operation. When indicator (2) is ON, the auto-idle function will operate.**
- **When any control lever is operated from the neutral position with auto-idle switch (1) turned ON, the engine speed will increase to the speed set by the engine control dial. Therefore, always be aware of engine control dial setting before starting operation to prevent the engine speed from increasing unexpectedly.**
- **When unexpected machine movement could be dangerous, such as when loading/unloading the machine for transportation, or when the machine is engaging in lifting work, turn auto-idle switch (1) OFF to ensure safe operation.**
- **Use the auto-idle function only after warm-up operation is complete. Failure to do so may not reduce the engine speed.**

Note that the auto-idle function can be turned ON or OFF only when the key switch is in the ON position. Check if the auto-idle function is turned ON or OFF with auto-idle indicator (2).

Auto-Idle Switch

ON: Auto-idle indicator (2) ON.
OFF: Auto-idle indicator (2) OFF.

After the key switch is turned OFF when the auto-idle function is activated [with auto-idle indicator (2) ON], when the engine is restarted, auto-idle indicator (2) flashes for 10 seconds and the auto-idle function becomes activated later.



M1NE-01-015

Operating Backhoe

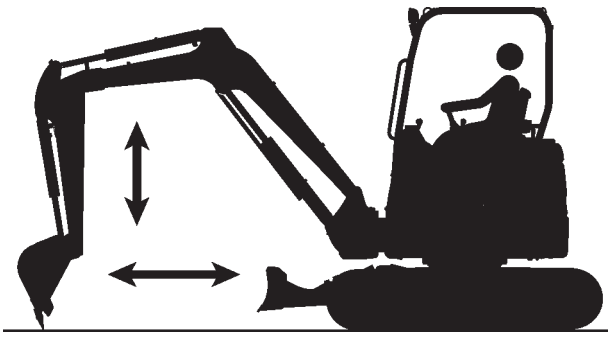
- Select an arm and bucket whose specifications match the working conditions. (Refer to "Bucket Types and Applications" in the specification chapter.)
- Pull the bucket toward the machine using the arm as the main digging force.
- When soil sticks to the bucket, remove it by moving the arm and/or bucket rapidly back and forth a few times.
- While facing the bucket tooth tip toward the direction of excavation as straight as possible, excavate the ground with the teeth penetrating shallowly using the arm and bucket cylinder full strokes.
- Position the tracks parallel to the trench. After digging to the desired depth, move the machine backward to continue the trench.
- Operate each cylinder with a slight allowance left at both stroke ends.

IMPORTANT:

- **Do not dig the ground in the diagonal direction toward the track frame. Failure to do so may cause the bucket teeth to come in contact with the crawler.**
- **When lowering the boom, avoid sudden stops that may create shock load damage to the machine. Always smoothly lower the boom so that shock loads may not be created.**
- **When digging deep below the ground level, be careful not to allow boom cylinder, boom bottom, and/or bucket cylinder hoses to come in contact with the ground.**
- **When digging with the blade positioned towards the front or when digging at an angle, avoid hitting the blade.**
- **When the bucket load is dumped with the boom raised, falling material may hit the base machine and/or the canopy. Always be aware of loads in the bucket during operation.**

Grading Operation

Use the blade for soil refilling and general grading operations after excavation. Grading operation can be also performed by operating the boom, arm, and bucket simultaneously.



M1M7-05-012

IMPORTANT: When grading the ground with the bucket, do not pull or push dirt with the bucket while traveling the machine like a bulldozer. Every part of machine may receive excessively large loads, possibly resulting in damage to the machine.

When grading by operating the boom, arm, and bucket simultaneously:

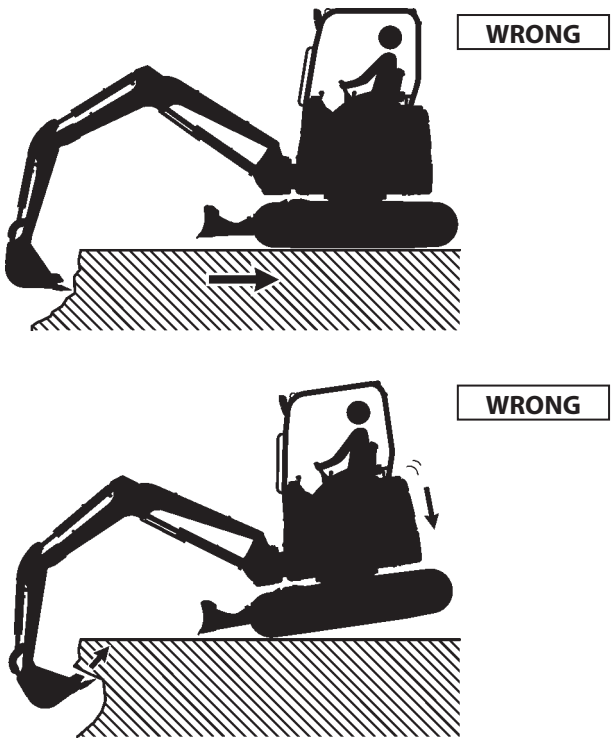
1. When grading from the forward to the backward, slowly roll in the arm while slightly raising the boom. As soon as the arm passes the vertical position, slowly lower the boom so that the bucket can be horizontally moved.
2. When grading from the backward to the forward, operate the arm and bucket rolled back, as shown.

Grading a slope surface can be performed by operating the machine in the same method as mentioned above.

Avoid Driving Bucket Teeth into Ground

WARNING: If the bucket teeth are forcedly driven into the ground, crushed material may spatter, possibly resulting in injury of the operator and/or co-workers around the machine. Furthermore, the service lifetimes of all front attachment parts may be shortened.

If the bucket teeth are forcedly driven into the ground, the service lifetime of all front attachment parts (especially the bucket) may be severely shortened. When excavating tightly fastened gravelly soil, use the bucket digging out force. Operate the boom, arm, and bucket simultaneously so that the bucket teeth can be effectively penetrated into the excavation surface. Carefully operate the machine to prevent crushed material from spattering, possibly resulting in injury to the operator and/or co-workers around the machine.



M1M7-05-013

Avoid Abusive Operation

If digging force is increased by driving the machine while pushing the bucket into the ground, or by raising the rear of the machine to apply the machine weight to the bucket teeth, severe machine damage may result due to excessive overloading.

Avoid Striking With Bucket

WARNING: The bucket bottom is curved. Therefore, hammering or piling work with the bucket is very hazardous. In addition, damage to the bucket and the front attachment parts may result.

Hammering or piling work with the bucket may create hazardous situations. Never attempt to perform hammering or piling work with the bucket. Damage to the bucket and the front attachment parts may also result.

M1M7-05-014

Avoid Excavation Using Upperstructure and/or Boom Swing Power

Never attempt to move rocks or excavate a cliff face by hitting the bucket using upperstructure and/or boom swing power. Damage to the front attachment, or shortening of the service life of the swing systems may result.

Use Correct Track Shoe

Never use rubber crawlers or wide track shoes on rough terrain with scattered rocks, gravel or boulders. Failure to do so may cause breakages of rubber crawlers, shoe bending, looseness of shoe bolts, or damage to track parts such as track links, or rollers. (Refer to the table for Types and Applications of Track Shoes in the specification chapter.) Soil may easily become packed into the crawler during travel operation on sandy ground. If the machine is driven without removing the packed soil from the crawlers, the rubber crawlers will be overloaded, possibly resulting in breakage of the crawlers. Avoid causing the crawlers to become packed with soil by removing soil as often as possible.

M1M7-05-015

Avoid other than Specified Machine Operations

This machine has been exclusively designed for excavation and loading works.

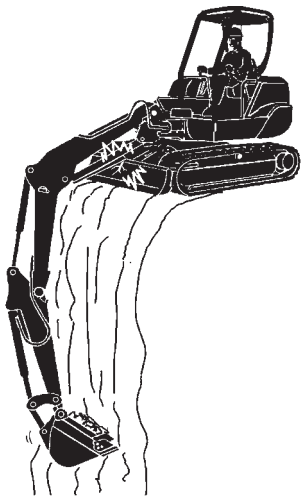
Do not apply this machine to works other than excavation and loading. Do not operate the machine under any conditions beyond these specifications.

Precautions for Lifting Work

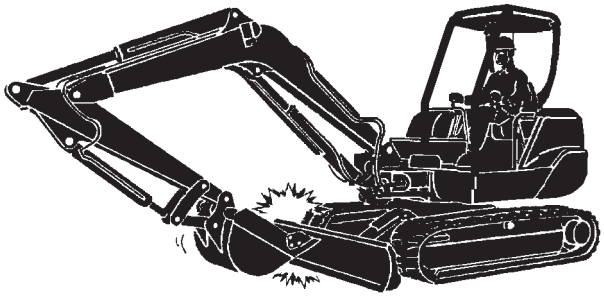
- **Operate the machine on level ground. Operating the machine on a slope may cause the machine to become unstable, possibly resulting in tipping accident.**
- **When lifting a load, carefully swing the machine not to cause the lifted load to come in contact with personnel working near the machine. Reduce the engine speed to slowly swing the machine. Failure to do so may cause the machine to tip over by swing centrifugal force.**
- **If traveling the machine with a lifted load is unavoidable, reduce the engine speed to slowly travel the machine.**
- **Never move the front attachment and/or swing the machine while traveling the machine with a lifted load. The lifted load may sway, possibly creating a hazardous situation.**

Boom Cylinder may Hit Blade

When digging deeply with the blade positioned at the front, the boom cylinder or bucket may accidentally hit the blade, causing damage. Take care to prevent this from happening.



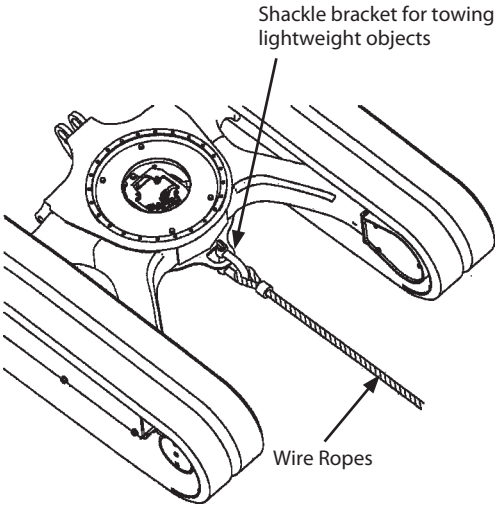
M586-05-016



M586-05-017

Shackle Bracket Usage

On some machines, a bracket is provided on the track frame to install a shackle for towing a lightweight object.



M1NE-04-002

IMPORTANT: Be sure to conform to the restrictions and precautions stated below when towing a light weight object using the shackle bracket provided on the track frame. The track frame and/or the shackle bracket may be damaged otherwise.

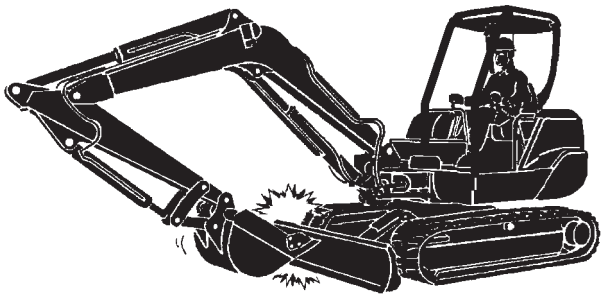
- The maximum drawbar pull is shown below.

  ZX29U-3 : 7800 N (800 kgf)
  ZX33U-3 : 9300 N (950 kgf)
  ZX38U-3 : 9300 N (950 kgf)
  ZX48U-3 : 13200 N (1350 kgf)
  ZX52U-3 : 13200 N (1350 kgf)

- Be sure to use a shackle.
- Keep the tow line horizontal, straight, and parallel to the tracks.
- Select the slow travel mode. Slowly drive the machine when towing.

Avoid Hitting Blade With Bucket

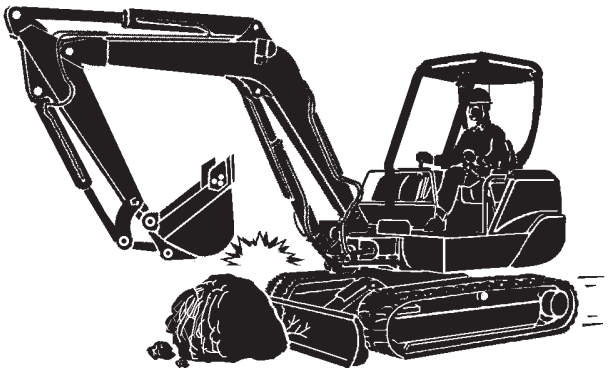
When rolling in the arm in a travel or transportation position, be careful not to hit the blade with the bucket.



M586-05-017

Avoid Colliding Blade Against Rocks

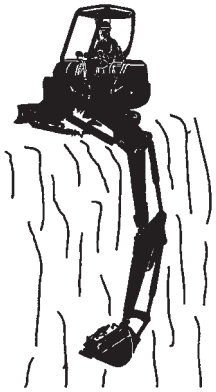
Do not attempt to allow the blade to collide with rocks. Premature damage to the blade and the blade cylinders may result.



M586-05-035

Avoid Colliding Boom Cylinder With Track

When digging deeply with the front attachment positioned at an angle, as illustrated, the boom cylinder may accidentally collide with the track, causing damage. Take extra care to prevent this from happening.



M586-05-018

Precautions for Installing Wide Bucket or Special Type Bucket

If the boom is fully offset to the left and raised on the cab-equipped machine with a bucket wider than shown to the right installed, the bucket will come in contact with the cab. Be sure to install a specially arranged bucket only after consulting your authorized dealer to prevent the cab collision with the bucket.

ZX29U-3 :	600 mm (24 in)
ZX33U-3 :	600 mm (24 in)
ZX38U-3 :	600 mm (24 in)
ZX48U-3 :	650 mm (26 in)
ZX52U-3 :	650 mm (26 in)

Using Rubber Crawler

Rubber crawlers are designed to allow the machine to travel without damaging road surfaces such as paved road surfaces. Avoid damage to the rubber crawlers by following the precautions below:

M1M7-05-015

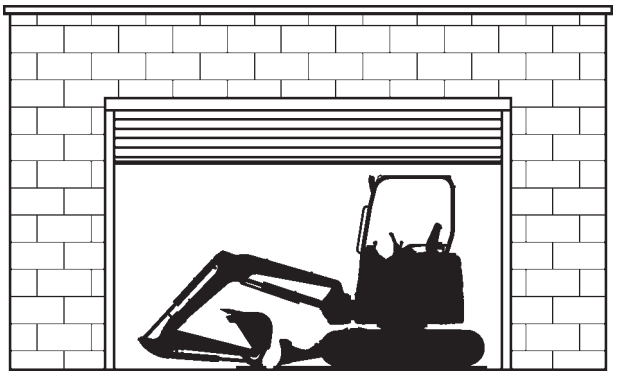
Forbidden Operations

1. Do not operate or steer the machine on or near river-terrace, boulder and boulder mixed ground, crushed-stone ground, uneven hardpan surfaces, stumps, reinforcing bars, scraps, and steel plate edges. Failure to do so may shorten the service life of the rubber crawlers to a great extent.
2. Do not leave engine oil, fuel, and other kinds of lubricants remaining on the rubber crawlers, and avoid traveling on road surface covered with oil to reduce the danger of sliding.
3. Do not travel the machine while raising one side crawler off the ground with the front attachment. Shear or damage to the rubber crawler may result.

Precautions for Using Rubber Crawlers

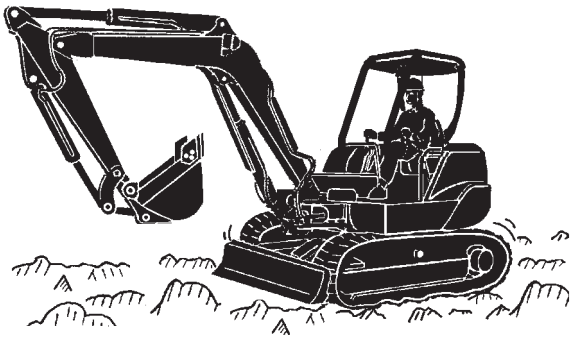
WARNING: The rubber crawler machine is less stable than the steel crawler machine, as the edge of the rubber crawler is easier to deform than steel crawler. Pay attention when operating the machine at an angle to the tracks.

1. Do not store the rubber crawlers in a place where they will be exposed to direct sunlight for a period of more than three months.
2. Avoid unnecessary steering operations on concrete roads, possibly resulting in premature wear of shoe lugs and core metals. Also, avoid operating the machine on high temperature [over 60 °C (140 °F)] road surfaces during asphalt pavement work, possibly causing premature wear of the rubber crawlers as well as damage to the road surface.



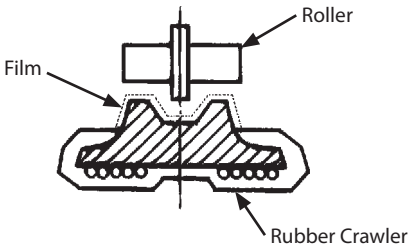
M1M7-05-016

3. Operating the machine with rubber crawlers sagging on uneven surfaces can result in derailment of rubber crawler, possibly causing the rubber crawlers to be damaged.



M586-05-024

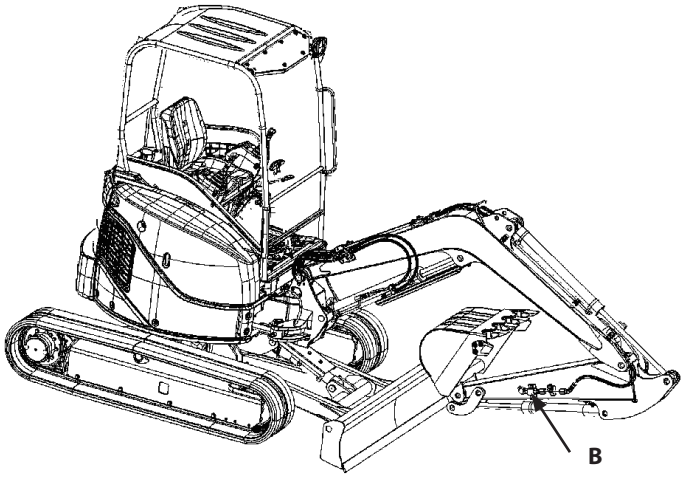
4. When lowering the machine raised above the ground using the front attachment, slowly lower the machine to the ground.
5. The new rubber crawler has a thin rubber film (shown in dotted line) on its roller tread. During operation of a new machine, or immediately after the rubber crawlers are replaced, the rubber film may come off due to contact with the rollers. This is not abnormal. (See the right illustration.)
6. If the rubber crawler is damaged and the rubber crawler core wire rusts, the service lifetime of the rubber crawler will become short. If damaged, the rubber crawler must be repaired. Contact your authorized dealer.



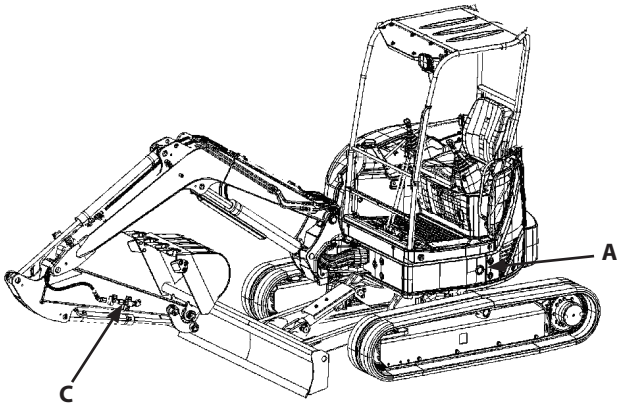
M503-05-040

Piping for Breaker and Crusher

Operational procedures for stop valve and selector valve.

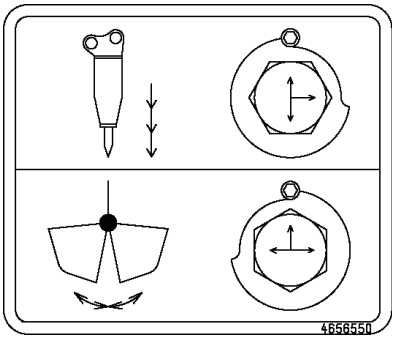


M1NE-05-004



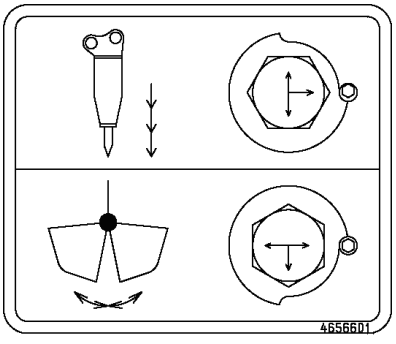
M1NE-05-005

A-Selection valve
Operate the selection valve after removing rubber cap.



ZX29U-3, 33U-3, 38U-3

M1NE-05-007

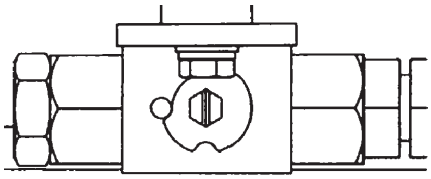


ZX48U-3, 52U-3

M1NE-05-006

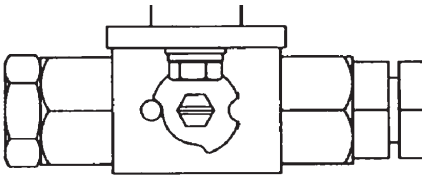
B, C-Stop valve

Close



M1M0-05-009

Open



M1M0-05-010

Stop Valves B, C
Close : When not using attachment or is detached.
Open : When using attachment.

Hydraulic Breaker (Optional)

Before installing a hydraulic breaker to the machine, change in machine stability, hydraulic pressure and flow rate to operate the hydraulic breaker must be checked. Consult your authorized dealer for selection of the hydraulic breaker model to be installed. Refer to the Breaker Operation Manual for operation of the hydraulic breaker. Observe the following instructions to prevent the base machine and the hydraulic breaker from being damaged.

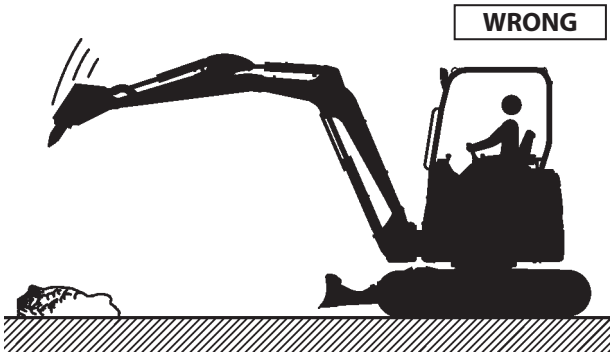
Precautions for Installing Hydraulic Breaker Pipe Lines

- When disconnecting or reconnecting the hydraulic breaker hoses from or to the hydraulic pipe lines at the arm tip, take care not to allow dust to stain or enter the inside of pipes and hoses.
- When the hydraulic breaker is not installed, be sure to put caps or plugs on the arm tip pipe open ends and the hydraulic breaker side hose ends to prevent the hydraulic system from being contaminated by dust. Be careful not to lose the caps and plugs. Always keep the auxiliary parts in the tool box.
- Check that the pipe clamp bolts are tight, and no oil is leaking from the pipe and hose joints before operating the hydraulic breaker.

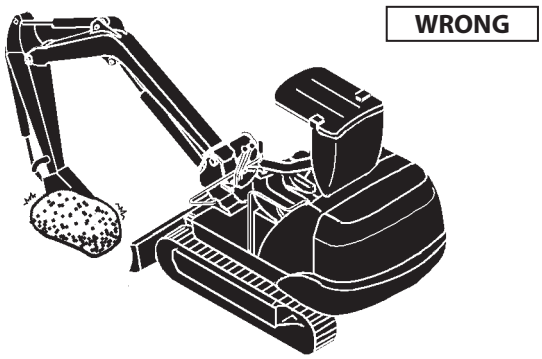
Precautions for Hydraulic Breaker Operation

WARNING: When the hydraulic breaker is installed, machine stability is reduced as the breaker is much heavier than the bucket. In addition, soil, broken pieces of rock or metals may be scattered during breaker operation, potentially creating a hazardous situation. Take protective measures against the danger of the machine tipping over and/or the scattering of hard materials and observe the precautions described below to ensure safe operation.

1. Avoid crashing the breaker onto hard materials. The breaker is heavier than the bucket, causing the lowering speed of the breaker to become faster. If breaking hard materials by crashing the breaker onto hard materials is attempted, damage to the front attachment and/or the upperstructure may result due to accelerated crashing reaction force.
2. Do not move crushed materials using the breaker unit and/or the swing function. Damage to the boom, arm, and/or breaker may result.

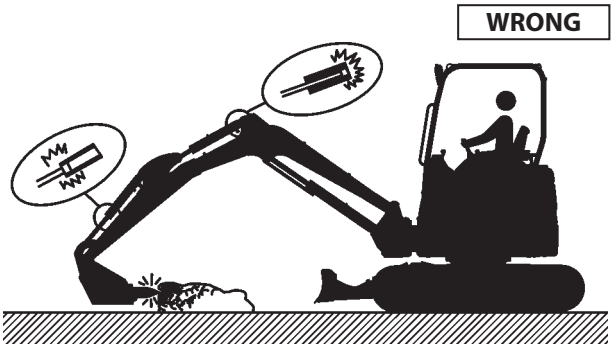


M1M7-05-020



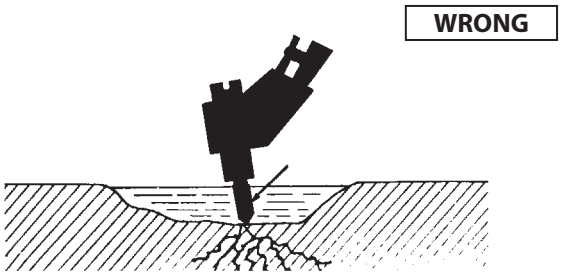
M585-05-020

3. Do not operate the breaker with the hydraulic cylinders fully extended or retracted. When operating the breaker, position each hydraulic cylinder so that an allowance more than 50 mm (2 in) from the stroke end can be given before the cylinder piston comes in contact with the cylinder head or bottom. Failure to do so may result in damage to the hydraulic cylinders, arm and/or boom.



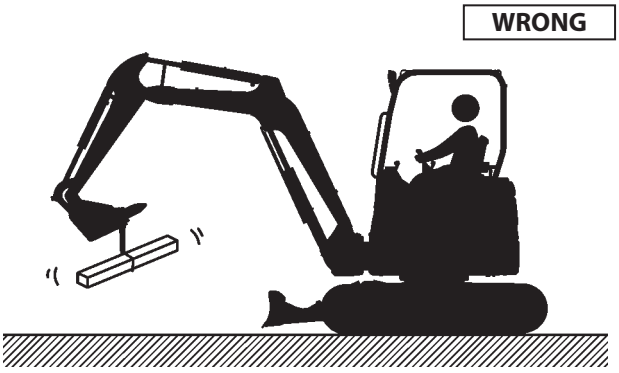
M1M7-05-021

4. Do not operate the breaker in water. Seals may become broken due to rusting of the breaker, possibly allowing rust, dust, and/or water to enter the hydraulic circuit so that damage to the hydraulic components on the base machine may result.



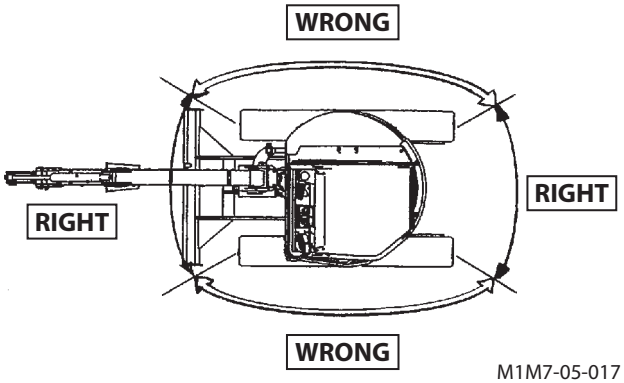
M104-05-059

5. Do not use the breaker to lift objects. Serious accidents may result due to the machine tipping over and/or the lifted load coming off.



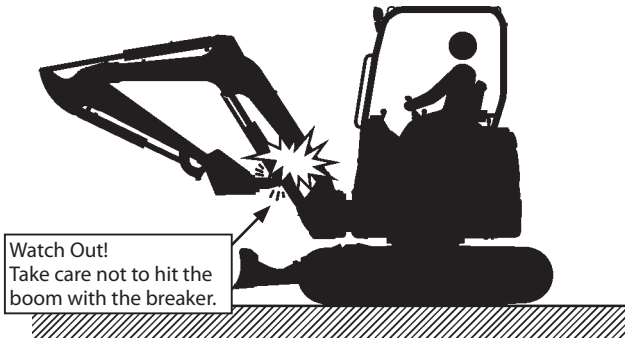
M1M7-05-022

6. Do not operate the breaker over the side of the machine. The machine stability is reduced, possibly resulting in the machine tipping over. In addition, the service lifetime of the undercarriage may become shorter due to receiving more severe breaker operation reaction force.



M1M7-05-017

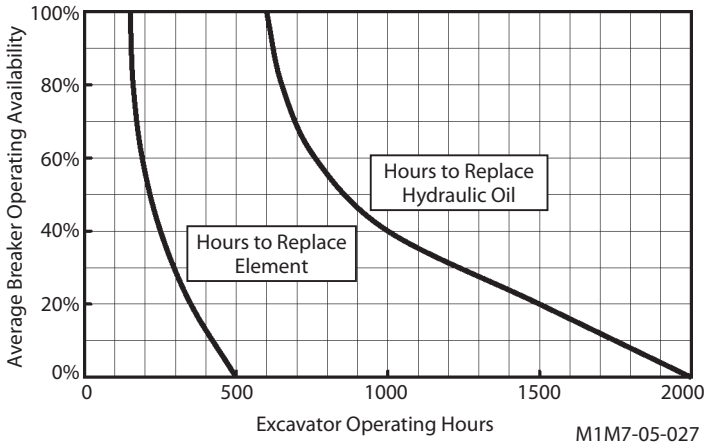
7. Do not allow the breaker chisel to come in contact with the boom when rolling in the arm and the breaker.



M1M7-05-023

8. Change hydraulic oil and replace the full flow filter element at regular intervals. Hydraulic breaker operation subjects hydraulic oil to become contaminated and/or deteriorated more quickly than bucket operation. Failure to perform proper maintenance of hydraulic oil may cause the base machine and/or the breaker to malfunction. Be sure to change hydraulic oil and replace the full flow filter element at the intervals shown in the table below, especially to extend the service life of the hydraulic pump. (Refer to the Hydraulic System group in the Maintenance chapter.)

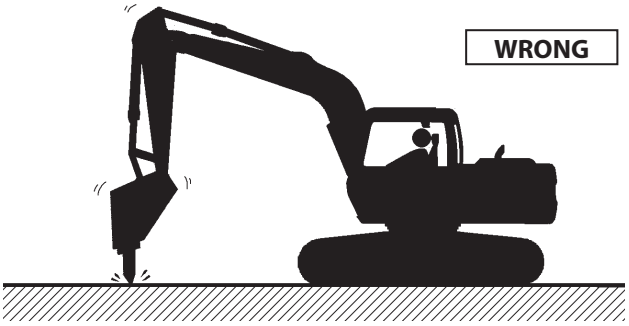
Hydraulic Oil change and Full Flow Filter Element Replacement Intervals (Hours)



M1M7-05-027

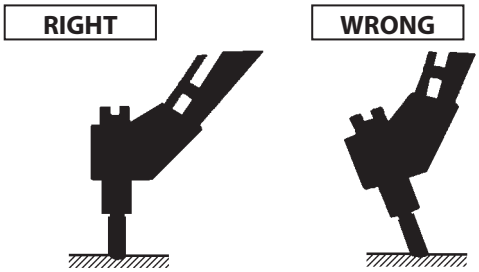
9. Greasing Front Attachment
   When using a hydraulic breaker, grease all lubrication points on the front attachment every 50 hours of operation.

10. Do not operate breaker with the arm positioned vertically. Excessive vibration to the arm cylinder will occur, causing oil leakage.



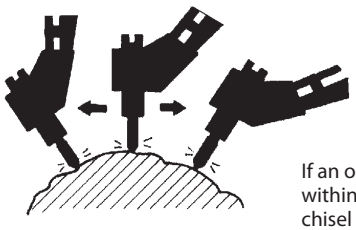
M147-05-013

11. Press the breaker so that the chisel (the axis) is positioned and thrust perpendicular to the object.



M147-05-014

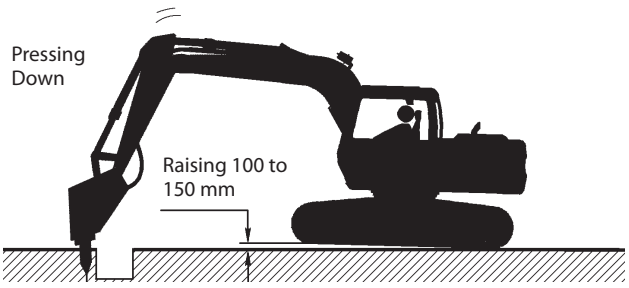
12. Do not operate the breaker continuously longer than one minute. Excessive chisel wear will result. If an object could not be broken within one minute, apply the chisel to other locations, less than one minute for each location.



If an object could not be broken within one minute, apply the chisel to other locations, less than one minute for each location.

M147-05-015

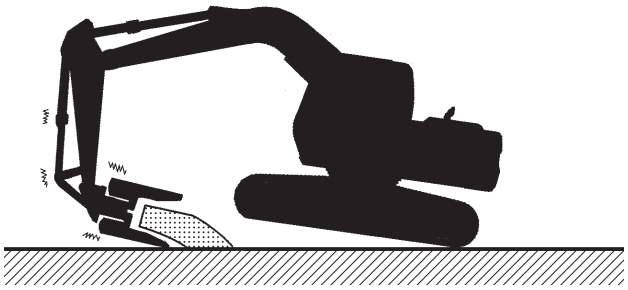
13. Raising the front part of the undercarriage by pressing down the breaker may cause damage to the front attachment. Although raising the front edge of the undercarriage up to 150 mm (6 in) is tolerable, do not practice this method more than necessary. Never raise the front edge of the undercarriage higher than 150 mm (6 in) by pressing the breaker down.



M147-05-016

Crusher Operation (Optional)

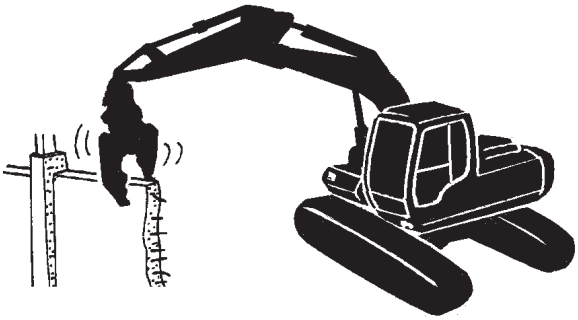
Before installing a hydraulic crusher on the machine, machine stability, and the hydraulic pressure and flow rate to operate the hydraulic crusher must be checked. Consult your authorized dealer for selection of the hydraulic crusher model to be installed. Refer to the Crusher Operation Manual for operation of the hydraulic crusher. Observe the following instructions to prevent the base machine and the hydraulic crusher from being damaged.



M107-05-046

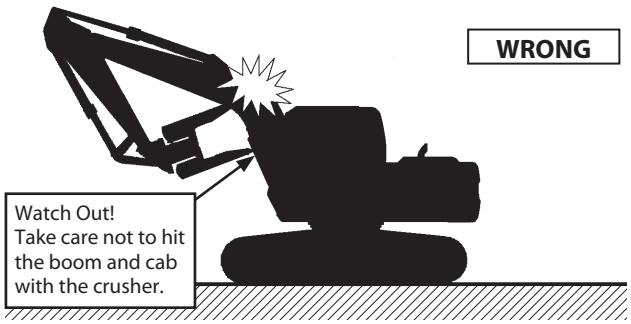
Precautions for Hydraulic Crusher Operation

WARNING: When the hydraulic crusher is used in demolition work, machine stability is reduced as the crusher attachment is much heavier than the bucket. In addition, soil, broken pieces of rock or metals may be scattered during crusher operation, potentially creating a hazardous situation. Take protective measures to prevent the machine tipping over and/or the scattering of hard materials and observe the precautions described below to ensure safe operation.



M107-05-047

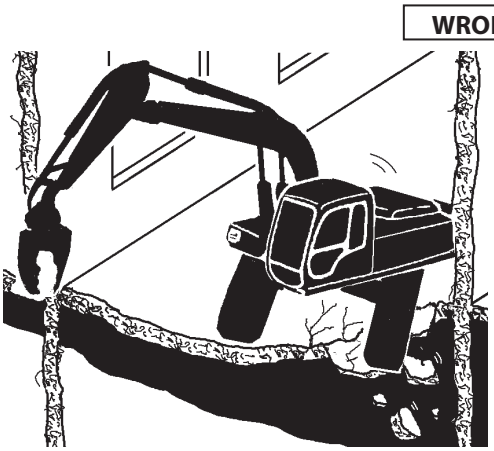
- Do not raise the base machine off the ground with the bucket cylinder fully retracted or extended. Damage to the front attachment may result. In particular, avoid operating the machine with the bucket cylinder fully extended. The bucket cylinder may easily become damaged under this condition. Use extra care to prevent the bucket cylinder from being damaged during demolition work of structure foundations.
- Operate the crusher over the front or rear side of the machine. Operating the breaker over the side of the machine will reduce machine stability, possibly resulting in the machine tipping over.
  - Do not raise the base machine off the ground with the arm cylinder fully extended. The arm cylinder may easily become damaged under this condition.
  - When a heavyweight attachment such as a crusher is installed, avoid quickly starting or stopping the front attachment. Failure to do so may result in damage to the front attachment.
  - Operate the hydraulic excavator carefully to avoid hitting the boom, and cab.



M1G6-05-009

- When crushing objects in high positions such as a ceiling, carefully operate the machine so that falling objects do not come in contact with the machine.
- Before operating the machine on a floor in a building, check that the floor is strong enough to support the machine weight. Depending on type of work the machine is engaged in, crushing reaction force may be added to the floor besides the machine weight.
- Start operation only after the machine is horizontally parked and the footing is stabilized. Never operate the machine positioned on stacks of rubble, or inclined ground.
- Do not move or load crushed materials using the crusher.
- When replacing the crusher with other work tools such as a bucket or breaker, the hydraulic oil may easily become contaminated. Change the hydraulic oil and replace the full flow filter element at the same intervals as applied to the hydraulic breaker.
- Before transporting the machine on a trailer, remove the crusher from the front attachment. Position the bucket cylinder so that the cylinder is not fully extended during transportation. (During transportation, the machine may be raised off the trailer deck floor due to vibration as above-mentioned, possibly resulting in damage to the front attachment.)

M107-05-048



M107-05-049

Precautions for After Operating Machine

1. After operating the machine, move the machine to a level, solid ground where no possibility of falling stones, landslide, or flooding is present. (Refer to the Parking group in the Driving Machine chapter.)
2. Fully refill the fuel.
3. Clean the machine.
4. During cold weather season, remove the coolant from the radiator and the water jacket. Attach “No Coolant” tag in a visible place.

M1M7-05-024

Auxiliary Flow Rate Control (Optional) (Except ZX29U-3)

The maximum and minimum hydraulic flow rate in the auxiliary pipe line can be controlled as follows:

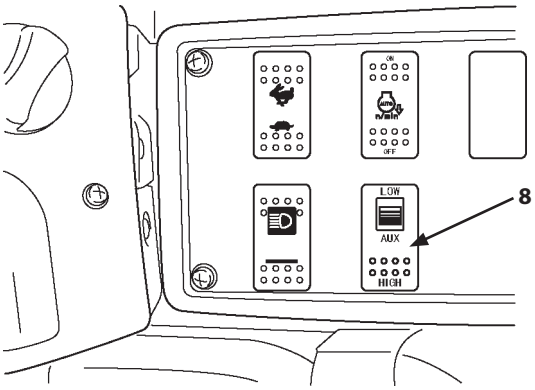
	ZX33U-3 ZX38U-3	ZX48U-3 ZX52U-3	(ref.) ZX29U-3
Minimum Flow Rate	40 L (11 US gal)/min	45 L (12 US gal)/min	—
Maximum Flow Rate	66 L (17 US gal)/min	85 L (22 US gal)/min	53 L (14 US gal)/min

Flow Rate Control Switch (8)

LOW: sets to the minimum flow rate.
HIGH: sets to the maximum flow rate.

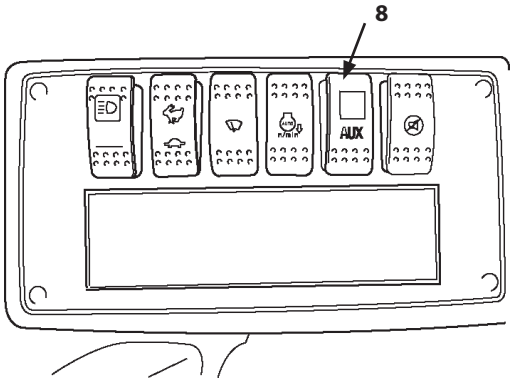
When shifting the flow rate from the LOW to HIGH, operate switch (8) while pulling the lock knob toward the arrow mark.

NOTE: When shifting the flow rate from the HIGH to LOW, no lock knob operation is required.



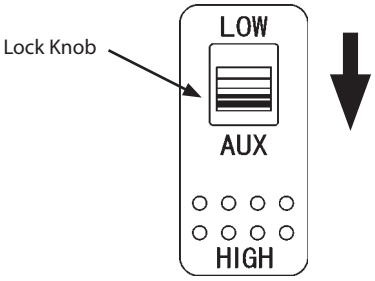
Canopy Equipped Machines

M1NE-01-011



Cab Equipped Machines

M1NE-01-009



M1M7-05-025

Emergency Boom Lowering Procedure

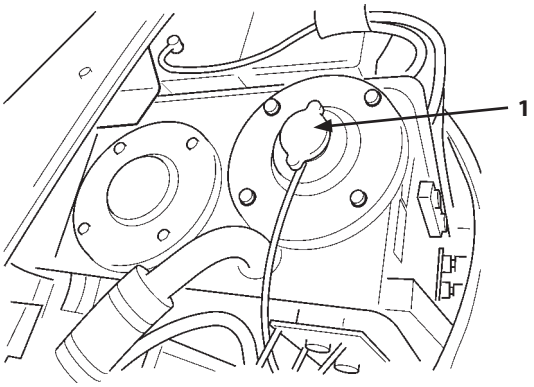
WARNING: Prevent personal injury. Confirm that no one is under the front attachment before starting the procedure below.

If the engine stalls and cannot be restarted, lower the boom to lower the bucket to the ground referring to the emergency boom lowering procedure stated below.

1. Remove the cover above the hydraulic oil tank. Loosen filler cap (1) on the hydraulic oil tank to release air pressure from the hydraulic oil tank.

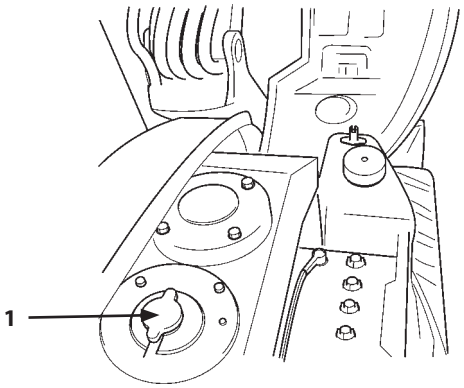
WARNING: Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.

2. Remove bolts (2) from the front and left side of cover (3) to remove cover (3).



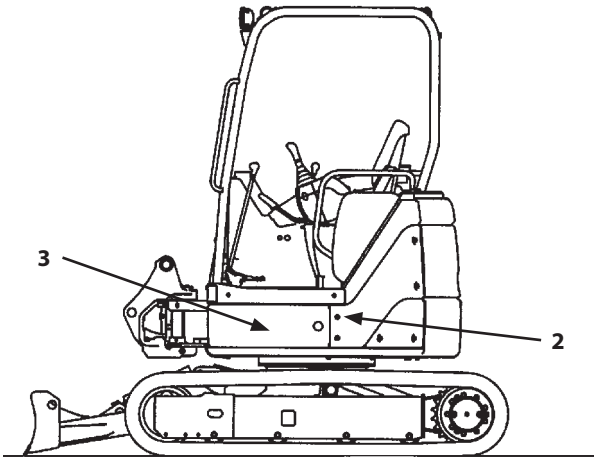
ZX29U-3, 33U-3, 38U-3

M1M7-07-035



ZX48U-3, 52U-3

M1M7-07-036



M1M7-04-004

3. Lower the boom in the following procedures.

If the front attachment is not loaded

WARNING: Loosen overload relief valve slowly. If it is loosened rapidly, the boom may also lower rapidly. Do not loosen it more than 3/4 turns, as the hydraulic oil may spout.

1. Loosen the overload relief valve slowly by checking the movement of boom.

   Tool : 24 mm

   Torque : 60 to 70 N·m
   (6 to 7 kgf·m, 43 to 51 lbf·ft)

2. After checking that the boom is completely lowered, tighten the overload relief valve.

If the front attachment is loaded

1. Put the matching marks on lock nut in overload relief valve and adjusting screw in the boom raise circuit (cylinder bottom side).

WARNING: Loosen the adjusting screw slowly. If it is loosened rapidly, the boom may also lower rapidly.

2. Loosen the lock nut. Loosen adjusting screw slowly by checking the movement of boom.

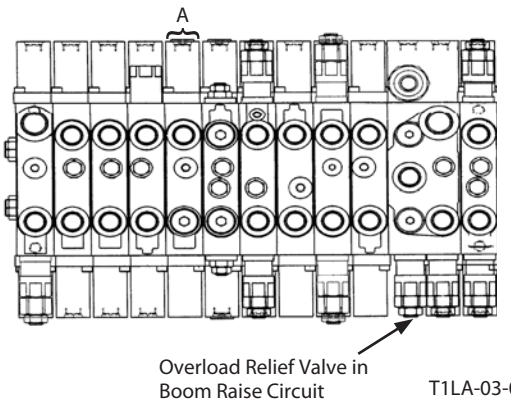
   Tool : 17 mm (Lock Nut)

   Torque : 28 to 32 N·m
   (2.8 to 3.2 kgf·m, 20 to 23 lbf·ft)

3. After checking that the boom is completely lowered, align the matching marks and tighten the lock nut.

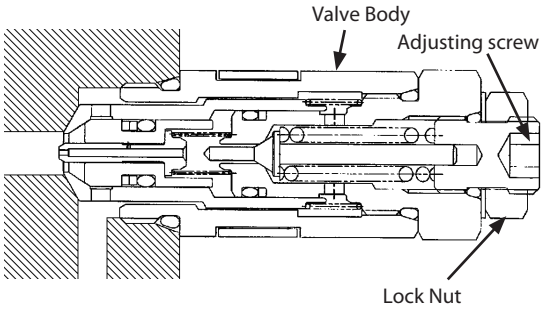
NOTE: Section A is not equipped for ZX29U-3 in right illustration Fig 1.

ZX29U-3, 33U-3, 38U-3



T1LA-03-03-001

Fig. 1



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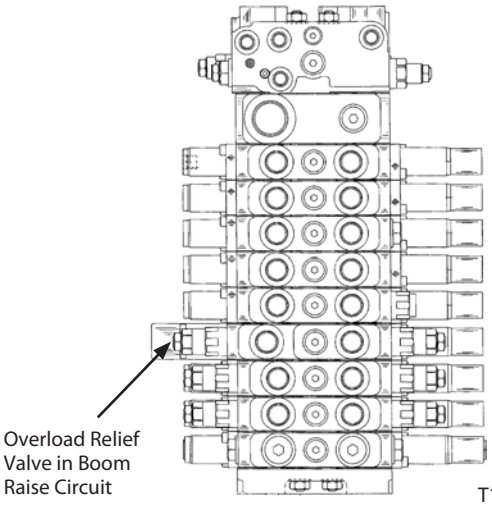
ZX48U-3, 52U-3



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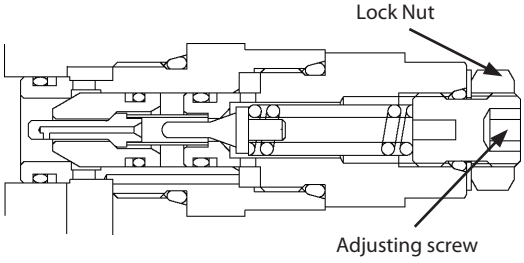


T566-03-03-018

MEMO

Transporting by Road

When transporting the machine on public roads, be sure to first be aware of and then, follow all local regulations.

1. Before transporting the machine on a trailer, check the width, height, length, and weight of the trailer with the machine loaded.
2. Investigate the conditions of the route to be traveled, such as dimensional limits, weight limits, and traffic regulations, beforehand.

   In some cases, disassemble the machine to bring it within dimensional limits, or weight limits of local rules and regulations.

Trailer Loading/Unloading

Always load and unload the machine on a firm level surface.

WARNING: Be sure to use a loading dock or a ramp when loading/unloading the machine.

Ramp/ Loading Dock

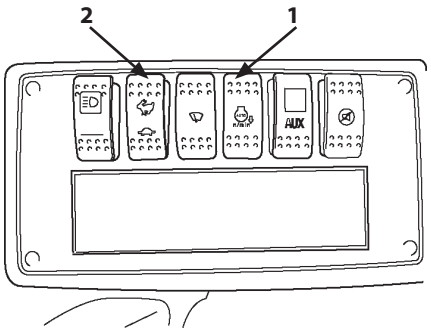
1. Thoroughly clean the ramp and flatbed. Dirty flatbed ramps contaminated with oil, mud, or ice can be slippery and dangerous.
2. Wedge the trailer wheels with blocks so that the trailer does not move.
3. Ramps must be sufficient in length, width, and strength. Secure the ramp with an incline of less than 15 degrees.
4. Loading docks must be sufficient in length, width, and strength. The incline of the loading docks must be less than 15 degrees.
5. When loading/unloading the machine on a trailer, be careful not to allow the blade to come in contact with the ramps or loading docks.

Loading

WARNING:
- **Always turn auto-idle switch (1) OFF. (Except ZX29U-3) Failure to do so may cause the engine speed to suddenly change.**
- **Always travel the machine slowly. Press travel mode switch (2) toward the TURTLE side.**
- **Steering on a ramp may create a danger of tipping over. Never attempt to change travel direction on a ramp, possibly causing the machine to become unstable. If steering is unavoidable, first move back to the ground, modify traveling direction, and begin to drive again.**
- **The top end of the ramp where it meets the flatbed, there is a sudden bump. Slowly drive over it.**
- **Take extra care when rotating the upperstructure on the flatbed to prevent possible injury from machine tipping. Slowly rotate the upperstructure with the arm fully rolled in under the boom to maintain good machine stability.**

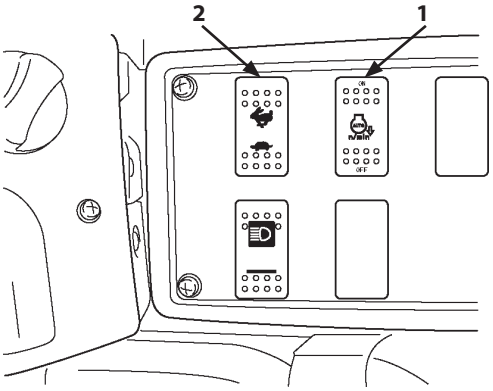
1. Load the machine on the trailer so that the centerline of the machine aligns with the centerline of the flat bed.
2. Drive the machine onto the ramp slowly.
3. Position the bucket above the flatbed. Operate the front attachment so that the angle between the boom and the arm is maintained at 90 to 110°.
4. The machine tips forward when the machine travels over the top end of the ramp. Lower the bucket onto the flatbed before the machine begins to tip forward.
5. After the machine reaches the specified position, slightly lift the bucket up off the flatbed. Slowly rotate the upperstructure 180° while keeping the arm fully rolled in.
6. Lower the bucket on wooden blocks seated on the flatbed.
7. Stop the engine. Remove the key from the key switch.
8. Move the pilot control shut-off lever to the LOCK position.
9. Cover the openings on the machine to prevent wind and/or rain from coming in.

WARNING: In cold weather, be sure to sufficiently warm up the machine before loading or unloading the machine.



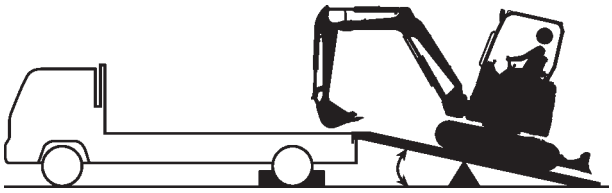
ZX33U-3, 38U-3, 48U-3, 52U-3 (Cab)

M1NE-01-009



ZX33U-3, 38U-3, 48U-3, 52U-3 (Canopy)

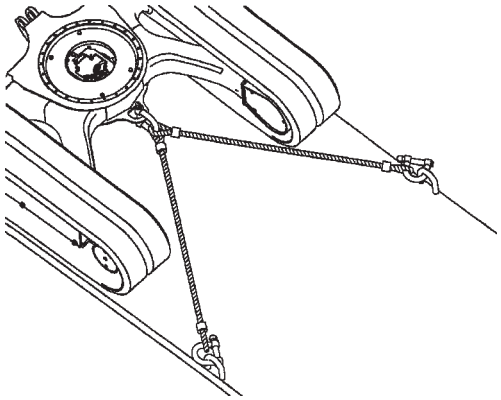
M1NE-01-010



Less than 15 °

M1M7-06-001

Securing Machine to Trailer for Transportation (Machines with Lightweight Object-Towing Bracket Provided)



M1NE-06-001

CAUTION:

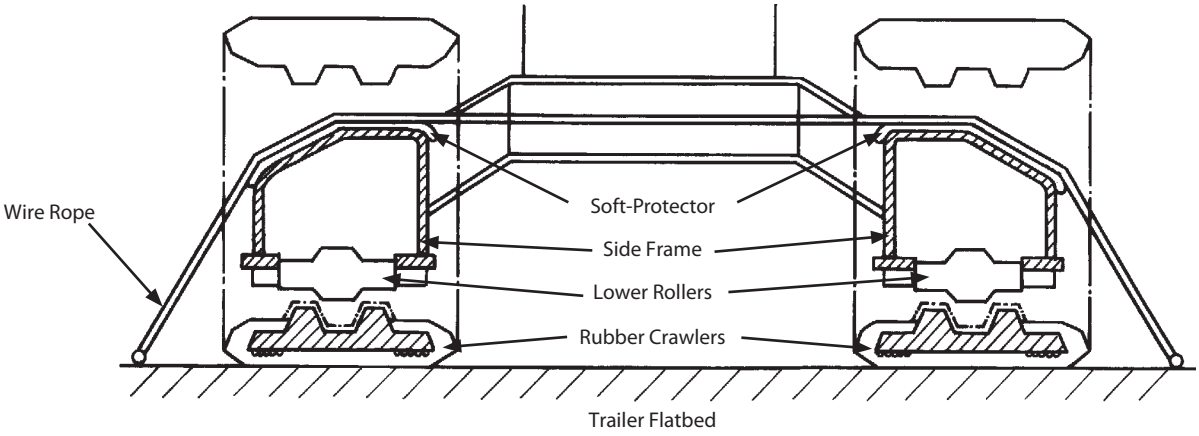
- **Securely tighten the machine to the flatbed with wire ropes.**
- **Tighten the machine using the lightweight object-towing bracket to the trailer flatbed with wire ropes. Be careful not to allow the wire rope to come in contact with the track shoe.**

During transportation, the machine will be moved back and forth or laterally.

1. Wedge the front and rear of the crawlers to secure the machine in position.
2. Securely tighten the base machine and the front attachment to the flatbed with wire ropes.

Transporting the machine equipped with rubber crawlers

When securing the machine to the flatbed, do not directly tighten the rubber crawler with wire ropes. As illustrated below, place soft-protectors against left/right side frame respectively to securely tighten the machine to the flatbed before transporting the machine.



M102-06-003

Securing Machine to Trailer for Transportation (Machines without Lightweight Object-Towing Bracket Provided)

CAUTION:

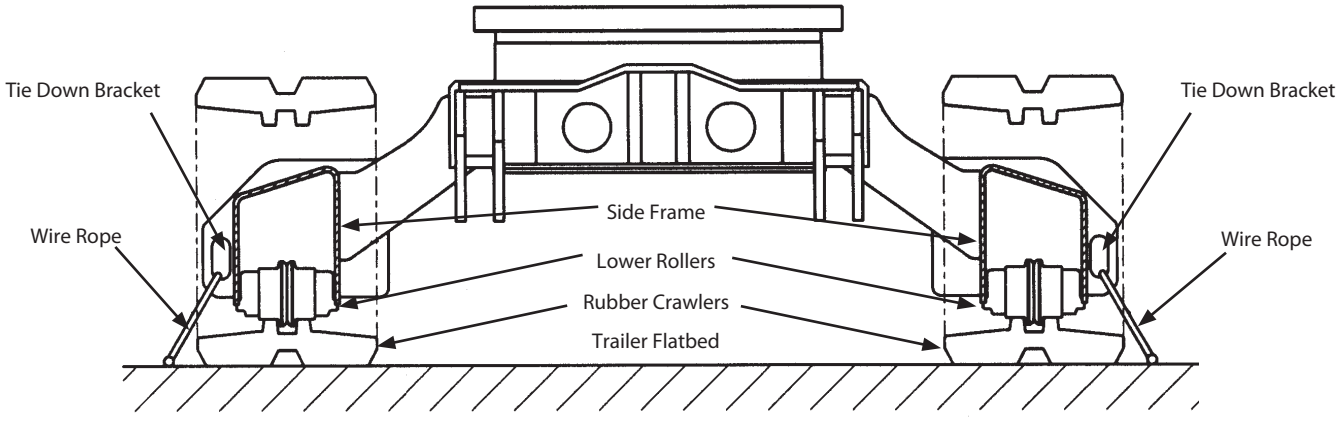
- **Securely tighten the machine to the flatbed with wire ropes.**
- **Tighten the machine using the tie down bracket to the trailer flatbed with wire ropes. Be careful not to allow the wire rope to come in contact with the track shoe.**

During transportation, the machine will be moved back and forth or laterally.

1. Wedge the front and rear of the crawlers to secure the machine in position.
2. Securely tighten the base machine and the front attachment to the flatbed with wire ropes.

Transporting the machine equipped with rubber crawlers

When securing the machine to the flatbed, do not directly tighten the rubber crawler with wire ropes. As illustrated below, attach wire ropes to the tie down brackets to securely tighten the machine to the flatbed before transporting the machine.



M1LA-06-003

Unloading

WARNING:

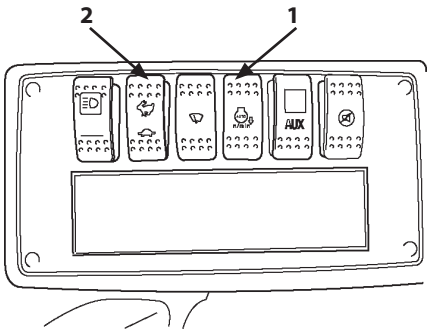
- **Always turn auto-idle switch (1) OFF. (Except ZX29U-3) Failure to do so may cause the engine speed to suddenly change.**
- **Always travel the machine slowly. Press travel mode switch (2) toward the TURTLE side.**
- **Steering on a ramp may create a danger of tipping over. Never attempt to change travel direction on a ramp, possibly causing the machine to become unstable.**
- **The top end of the ramp where it meets the flatbed is a sudden bump. Slowly drive over it.**
- **Take extra care when rotating the upperstructure on the flatbed to prevent possible injury from machine tipping over. Slowly rotate the upperstructure with the arm fully rolled in under the boom to maintain the machine in good stability.**

IMPORTANT: During unloading operation, maintain the angle between the boom and the arm at 90 to 110°. If the machine is unloaded with the arm fully rolled in, damage to the base machine may result.

1. Before moving the machine from the flatbed rear end to the ramp, position the front attachment so that the angle between the boom and the arm becomes into the range of 90 to 110°. While allowing the bucket to be contacted on the ground, slowly move the machine.

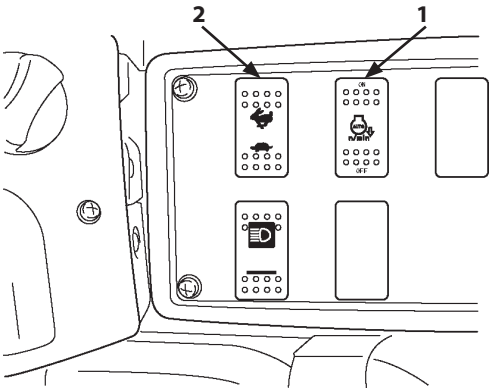
IMPORTANT: When moving the machine over the end of the flatbed onto the ramp, take care not to allow the bucket to come in contact with the ground. Damage to the hydraulic cylinders may result.

2. Do not lift the bucket off the ground until the machine is completely moved onto the ramp.
3. Slowly move the machine forward while raising the boom and arm gradually until the machine is completely off the ramp.



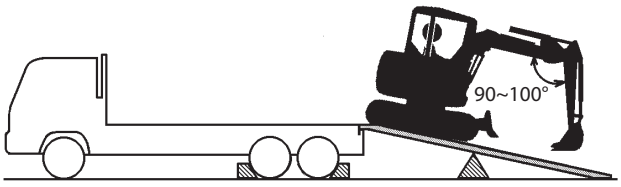
ZX33U-3, 38U-3, 48U-3, 52U-3 (Cab)

M1NE-01-009



ZX33U-3, 38U-3, 48U-3, 52U-3 (Canopy)

M1NE-01-010



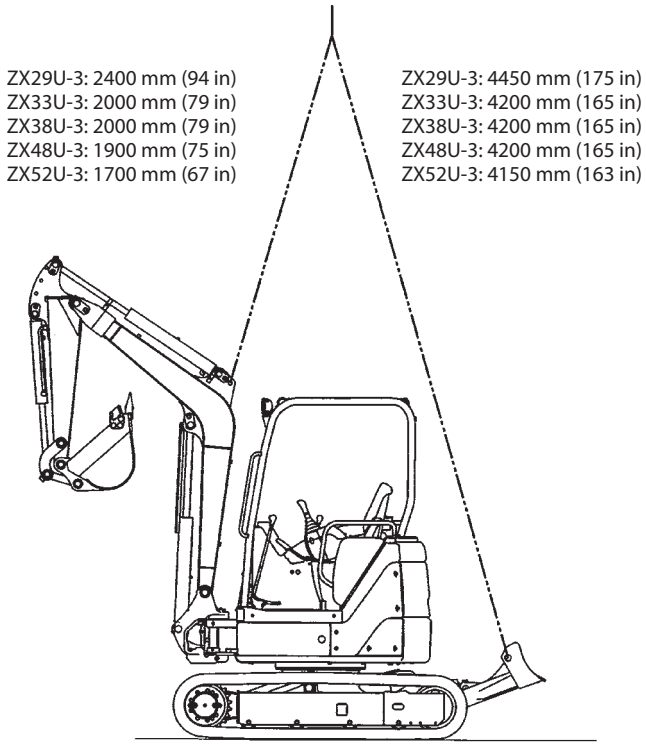
M197-06-003

M197-06-004

Lifting Machine With Crane

WARNING:
- **Do not lift the machine with anyone riding on the machine.**
- **Use wire ropes and shackles strong enough to support the weight of the machine.**
- **Be sure to set the blade position with the engine running. Failure to do so may cause the blade to be moved from the set-position when lifted with a crane.**

1. Swing the upperstructure so the blade is positioned at the rear of the counterweight.
2. Fully retract the blade cylinder.
3. Fully extend the boom, arm and bucket cylinders, as illustrated to the right. Pull the pilot control shut-off lever to LOCK position.
4. Position the boom straight ahead of the upperstructure. Apply the boom swing pedal lock.
5. Attach shackles to the boom and blade hooks. Securely thread wire ropes through the shackles.
6. Slowly lift the machine so that shock loads will not be applied to the machine. Take sufficient care not to lose the balance of the machine.



M1M7-06-002

Procedures

IMPORTANT: Never adjust the setting of the engine governor and/or hydraulic components.

SA-435

Learn how to service your machine correctly. Follow the correct maintenance and inspection procedures shown in this manual.

Inspect machine daily before starting.

- Check controls and instruments.
- Check coolant, fuel and oil levels.
- Check for leaks, kinked, frayed or damaged hoses and lines.
- Walk around machine checking general appearance, noise, heat, etc.
- Check for loose or missing parts.

If there is any problem with your machine, repair it before operating or contact your authorized dealer.

IMPORTANT:

- **Use only recommended fuel and lubricants.**
- **Use only genuine HITACHI parts.**
- **Failure to use recommended fuel, lubricants, and genuine Hitachi parts will result in loss of Hitachi product warranty.**
- **Never adjust engine governor or hydraulic system relief valve.**
- **Protect electrical parts from water and steam.**
- **Never disassemble electrical components such as sensors, etc.**

Check Hour Meter Regularly

- Intervals on the periodic maintenance chart are for operating in normal conditions. If you operate your machine in more adverse conditions, you should service it at SHORTER INTERVALS.
- Lubricate, make service checks and adjustments at intervals shown on periodic maintenance guide table. (see page 7-8)

Use Correct Fuels and Lubricants

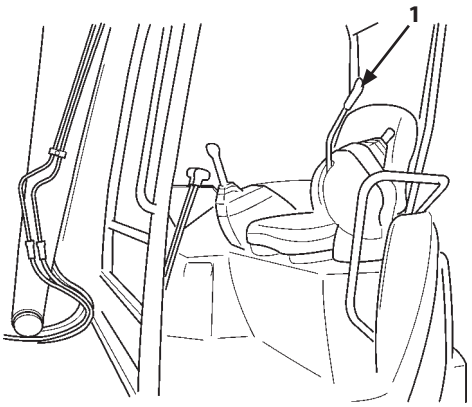
IMPORTANT: Always use recommended fuels and lubricants.
Failure to do so will result in machine damage and loss of Hitachi product warranty.

Prepare Machine for Inspection/Maintenance

Before performing inspection/maintenance of the machine, park the machine as described below unless otherwise specified.

1. Park the machine on a solid level surface.
2. Lower the working tools such as the bucket and/or blade to the ground.
3. Turn the auto-idle switch OFF. (Except ZX29U-3)
4. Run the engine at slow idle speed without load for approx. 5 minutes to cool down the engine.
5. Turn the key switch OFF. Remove the key from the key switch. If inspection/maintenance must be performed with the engine running, be sure to place a lookout to prevent the machine from being operated mistakenly by other personnel.
6. Be sure to place pilot control shut-off lever (1) in the LOCK position.
7. Attach an "Do Not Operate" tag to a visible place such as the cab door or one of the control levers.

M1M7-05-024



M1M7-03-001

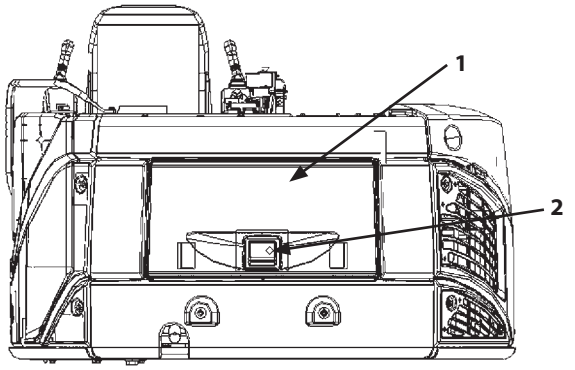
Opening/Closing Engine Access Covers

WARNING:

- **Do not keep the engine access covers open when the machine is parked on a slope, or while the wind is blowing hard. The engine access covers may close accidentally, possibly resulting in personal injury.**
- **When opening/closing the engine access covers, take care not to allow your fingers to be become pinched with the covers.**

Pull up latch (2) to open cover (1). Cover (1) is raised by link mechanism (3). Be sure to fully raise cover (1). After checking that stopper (4) provided on the left link is placed in LOCK position (5), remove your hand from cover (1). Cover (1) will be locked in place.

When closing cover (1), while raising cover (1), push stopper (4) at the arrowed position to disengage the lock. While pushing stopper (4), lower cover (1). When cover (1) is lowered by the 1/4 stroke, leave stopper (4). Then, lower cover (1) further to completely close it. Be sure to completely remove your hand, which is pushing stopper (4), out of cover (1) at this time. Failure to do so may cause your hand to be caught cover (1), possibly resulting in severe injury.



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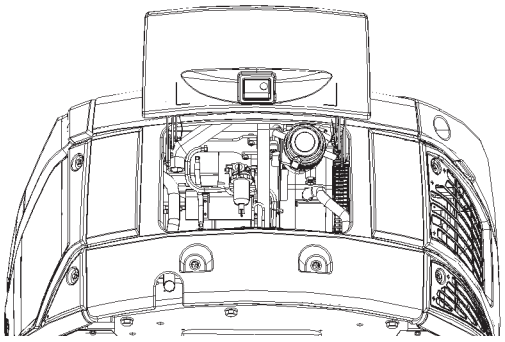
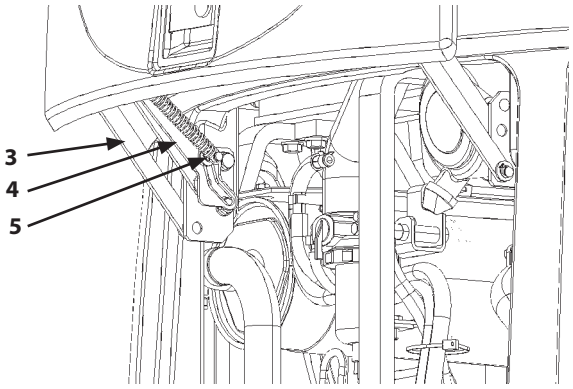
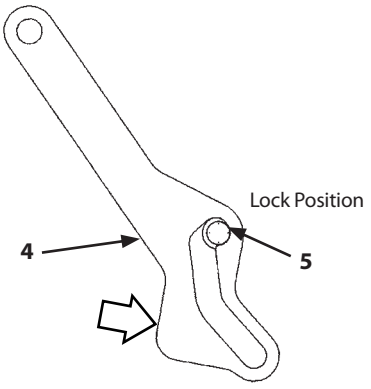


M1M7-07-009



M1M7-07-010



M1M7-07-069

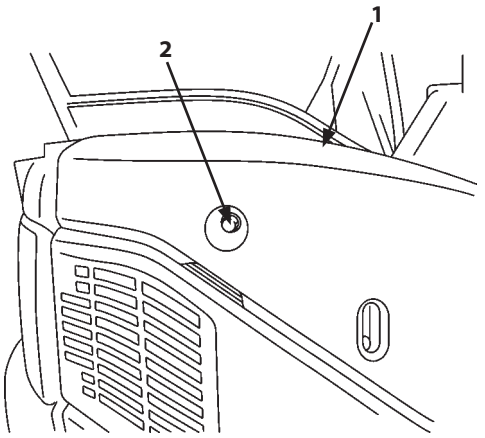
Opening/Closing Tank Covers

WARNING:
- **Do not keep the tank cover open when the machine is parked on a slope, or while the wind is blowing hard. The tank cover may close accidentally, possibly resulting in personal injury.**
- **When opening/closing the tank cover, take care not to allow your fingers to be pinched with the cover.**

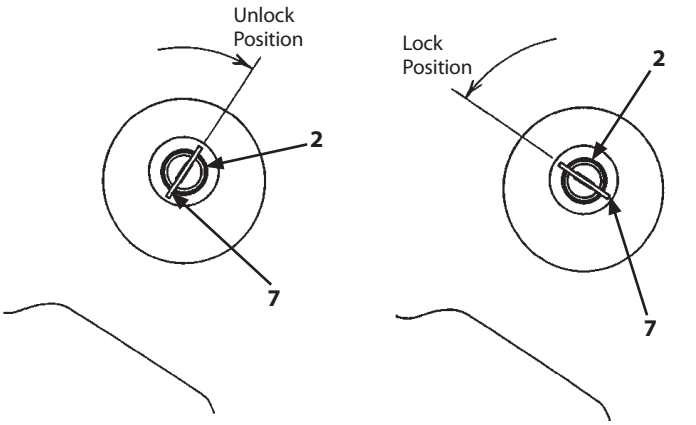
1. Press button (2) and raise cover (1) to open cover (1). Cover (1) will be stopped opening with wire (3).
2. Take stopper (4) out of holder (5). Install stopper (4) into lock hollow (6). Cover (1) is held in position.
3. When closing cover (1), follow the reverse order of the above procedure.

CAUTION: When closing cover (1), confirm that cover (1) securely is locked.

NOTE: Button (2) can be locked with key (7).

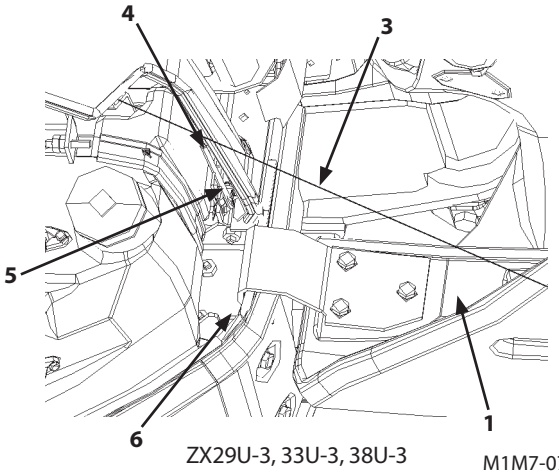


M1M7-07-018



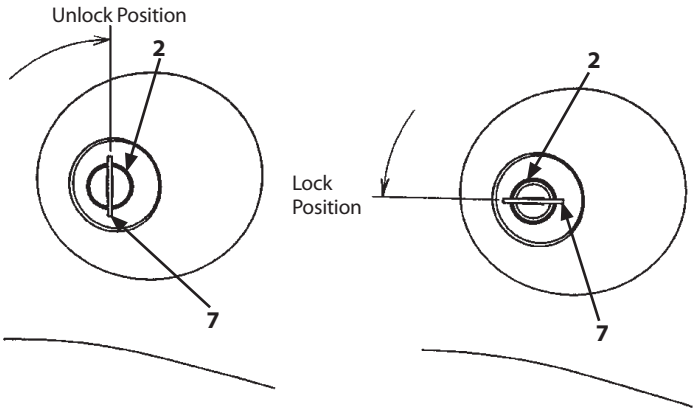
ZX29U-3, 33U-3, 38U-3

M1MF-07-030



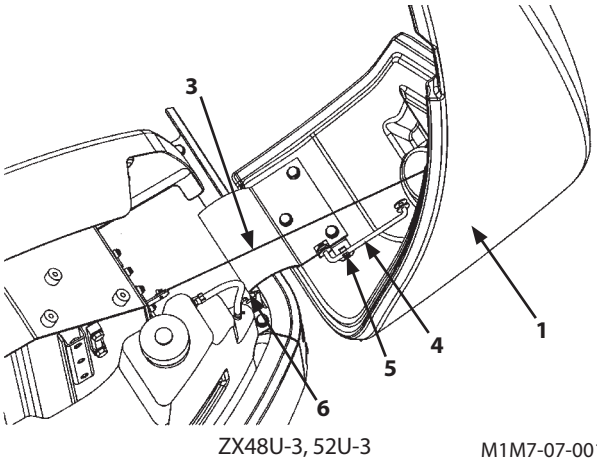
ZX29U-3, 33U-3, 38U-3

M1M7-07-019



ZX48U-3, 52U-3

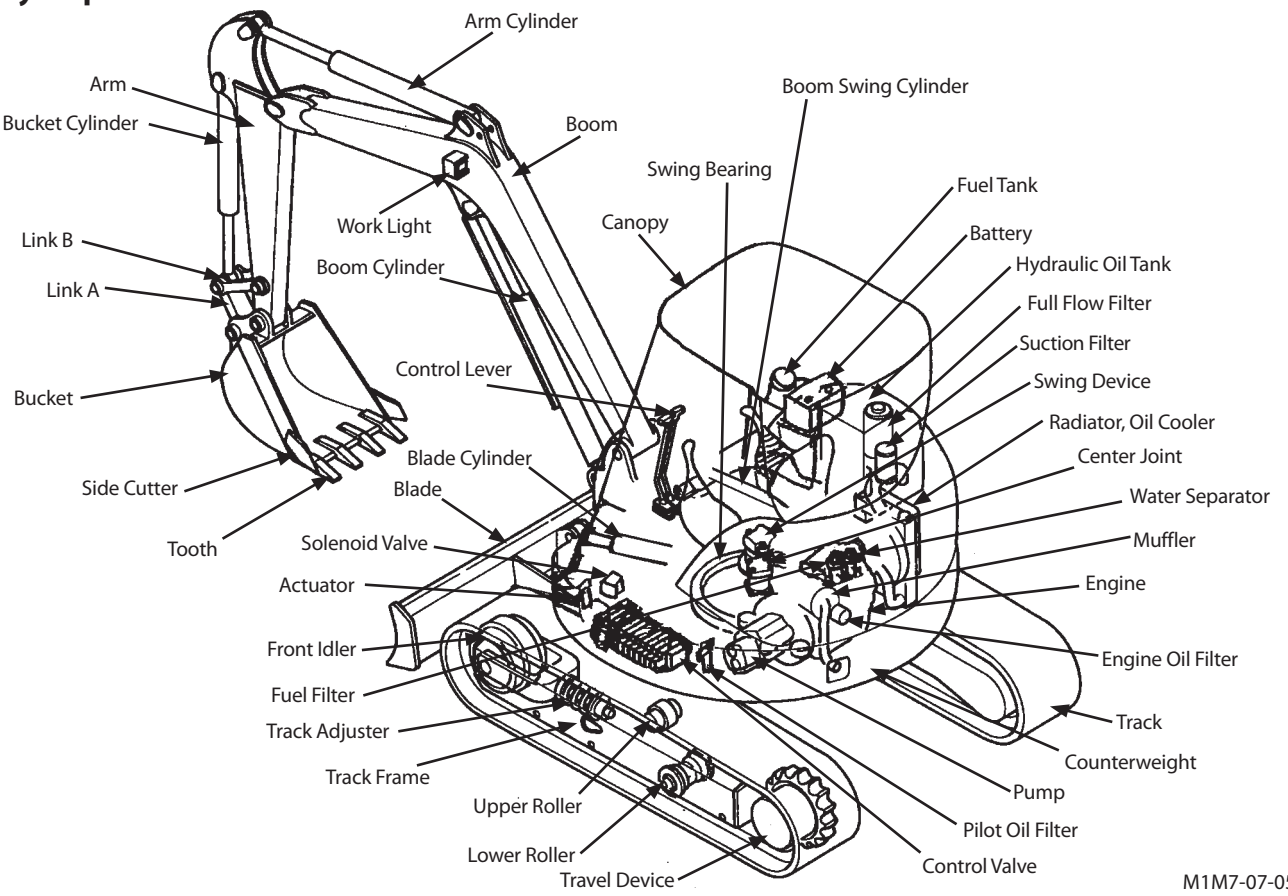
M1MH-07-003



ZX48U-3, 52U-3

M1M7-07-001

Daily Inspection



	Checkpoint
Engine	1. Quantity and contamination of engine oil and coolant 2. Ease of engine starting, exhaust gas color, abnormal noises 3. Oil and coolant leaks. Damage to hoses and pipes 4. Clogging of or damage to radiator/oil cooler 5. Loose or missing nuts and bolts
Upperstructure	1. Fuel level, leak, and contamination of foreign material 2. Hydraulic oil level, leaks, and contamination of foreign material 3. Control lever stroke, lever play, operating force 4. Operating condition of hydraulic components, damage to and oil leaks in hoses and pipes 5. Damage to or deformation of components and structures, abnormal noises 6. Loose or missing nuts and bolts 7. Operating condition of pilot control shut-off lever
Undercarriage	1. Loose track sag, and wear on or damage to track components and structures 2. Wear on upper/lower rollers, front idlers, and oil leaks 3. Oil leaks from travel devices 4. Loose or missing nuts and bolts
Front Attachment	1. Damage to or oil leak from cylinders, hoses, and pipes 2. Damage to or wear on bucket and blade 3. Loose, worn or missing bucket teeth 4. Lubrication at greasing points 5. Damage to lock pins, stoppers, fastener rings and lock bolts for front joint pins 6. Loose or missing nuts and bolts
Miscellaneous	1. Malfunction of gauges, switches, lights, buzzer 2. Deformation of or damage to canopy 3. Abnormalities in machine appearance

NOTE: The operator must perform the daily inspection before operating the machine.

Periodic Replacement of Parts

To ensure safe and long trouble free operation, be sure to conduct periodic inspections of the machine. In addition, the parts as listed below are directly related to safety operation so that they are replaced periodically. These part material properties will change due to aging, or repeated operation may cause deterioration, wear, and/or fatigue of these parts, possibly resulting in serious safety/fire hazards. It is very difficult to gauge the remaining service lifetime of these parts simply by visual inspection alone. For this reason, replace these parts at the intervals shown in the table below. If any of these parts are found to be defective by inspection, immediately replace it regardless of the recommended intervals.
Consult your authorized dealer for correct replacement.

<table>
<tr><th colspan="3">Periodic Replacement Parts</th><th>Replacement Interval</th></tr>
<tr><td colspan="2" rowspan="6">Engine</td><td>Fuel hose (Fuel tank to filter)</td><td rowspan="3">Every 2 years or 4000 hours, whichever comes first</td></tr>
<tr><td>Fuel hose (Fuel tank to injection pump)</td></tr>
<tr><td>Heater hose (Heater to engine)</td></tr>
<tr><td>Engine rubber vibration insulator</td><td rowspan="3">Every 5 years or 3000 hours, whichever comes first</td></tr>
<tr><td>Floor mount rubber</td></tr>
<tr><td>Pump coupling</td></tr>
<tr><td rowspan="10">Hydraulic System</td><td rowspan="5">Base Machine</td><td>Pump suction hose</td><td rowspan="10">Every 2 years or 4000 hours, whichever comes first</td></tr>
<tr><td>Pump delivery hose</td></tr>
<tr><td>Swing hose</td></tr>
<tr><td>Auxiliary hose</td></tr>
<tr><td>Oil cooler hose (C/V to oil cooler)</td></tr>
<tr><td rowspan="5">Front Attachment</td><td>Boom cylinder line hose</td></tr>
<tr><td>Arm cylinder line hose</td></tr>
<tr><td>Bucket cylinder line hose</td></tr>
<tr><td>Pilot hose</td></tr>
<tr><td colspan="2">Seat Belt</td><td>Every 3 years</td></tr>
</table>

NOTE: When replacing a hose, be sure to replace seals, such as O-rings and gaskets, along with the hose.

Maintenance Guide

A. Greasing (See Page 7-13)

Parts	Quantity	Interval (hours)						
		8	50	100	250	500	1000	2000
1. Front Joint Pins (Incl. around the swing post)	9	★		★★			Or every year	
2. Bucket and Link Pins	5	★						
3. Blade Pins	4						Or every year	
4. Swing Bearing	1							
5. Swing Internal Gear	1							
6. Control Lever Universal Joint	2						Or every year	
7. Tilt Mechanism	–							

NOTE: ★ *Grease all submerged pins after operating in water.*
Grease all pins daily during break-in operation for 50 hours.
★★ *Grease all pins every 100 hours only during first time operation up to 500 hours.*

B. Engine (See Page 7-20)

Parts			Quantity	Intervals (hours)						
				8	50	100	250	500	1000	2000
1. Engine oil	Check Oil Level		1							
	Change	ZX29U-3, 33U-3, 38U-3	7.2 L (1.9 US gal)					★		
		ZX48U-3, 52U-3	8.6 L (2.27 US gal)							
2. Replace engine oil filter			1							

NOTE: ★ *The oil life is shortened more than normal under high temperature operating, shorten the maintenance interval.*

C. Transmission (See Page 7-22)

Parts			Quantity	Interval (hours)						
				8	50	100	250	500	1000	2000
1. Travel Reduction Gear	Check Oil Level		2							
	Change	ZX29U-3, 33U-3, 38U-3	0.6 L (0.63 US qt)x2							
		ZX48U-3, 52U-3	0.9 L (0.95 US qt)x2							

D. Hydraulic System (See Page 7-24)

Parts		Quantity	Interval (hours)						
			8	50	100	250	500	1000	2000
1. Check Hydraulic Oil Level		1							
2. Drain Hydraulic Oil Tank Sump		1							
3. Change Hydraulic Oil	ZX29U-3, 33U-3, 38U-3	43 L (11.4 US gal)						★	★
	ZX48U-3, 52U-3	64 L (16.9 US gal)							
4. Clean Suction Filter		1	When changing hydraulic oil						
5. Replace Full Flow Filter Element		1				★★			
6. Replace Pilot Filter Element		1							
7. Check Hoses and Lines	for leaks or looseness	–							
	for cracks, bend, etc.	–							

NOTE: ★ *Hydraulic oil changing intervals differ according to kind of hydraulic oil used.*
See recommended oil chart.
★★ *For the first time only.*

E. Fuel System (See Page 7-41)

Fuel tank capacity: ZX29U-3, 33U-3 and 38U-3: 40L (11 US gal), ZX48U-3 and 52U-3: 70L (18 US gal)

Parts		Quantity	Interval (hours)						
			8	50	100	250	500	1000	2000
1. Check Water Separator		1	■						
2. Drain Fuel Tank Sump		1	As required						
3. Replace Fuel Filter		1					■		
4. Check Fuel Hoses	for leaks, cracks, etc.	–	■						
	for cracks, bend, etc.	–				■			

NOTE: The fuel filter may become clogged earlier than normal due to contaminated fuel. In case the engine power is reduced, or black smoke increases, shorten the intervals of inspection/maintenance.

F. Air Cleaner (See Page 7-45)

Parts		Quantity	Interval (hours)						
			8	50	100	250	500	1000	2000
1. Air Cleaner Element	Clean	1				★	Or clogged		
	Replace	1	After cleaning 6 times or 1 year						

NOTE: ★ Shorten the interval in a dusty work site.

G. Cooling System (See Page 7-46)

Parts		Quantity	Interval (hours)						
			8	50	100	250	500	1000	2000
1. Check Coolant Level		1	■						
2. Check and Adjust Fan Belt Tension		1		★★	■				
3. Change Coolant	ZX29U-3, 33U-3, 38U-3	5.0 L (1.3 US gal)	Twice a year (in spring and autumn) ◇						
	ZX48U-3, 52U-3	6.5 L (1.7 US gal)							
4. Clean Radiator/ Oil Cooler Core	Outside	1					★		
	Interior	1	When changing coolant						
5. Clean Air Conditioner Condenser		–					★		

NOTE: ★ Shorten maintenance interval in dusty work site.

★★ For the first time only.

NOTE: ◇ When genuine Hitachi long life coolant (LLC) is used, replace it every two years (in autumn) or after 2000 operating hours, whichever comes first.

IMPORTANT: Use soft water for the coolant. Avoid using strong acid or alkaline water, hard or natural water. Be sure to use genuine Hitachi long life coolant (LLC). If genuine Hitachi long life coolant (LLC) is not available, use only long life coolant (LLC) with quality specified in JIS K-2234, SAE J814, SAE J1034, ASTM D3306. Always use long life coolant (LLC) mixed with soft water.

H. Electrical System (See Page 7-51)

Parts		Quantity	Interval (hours)						
			8	50	100	250	500	1000	2000
1. Battery	Electrolyte Level Check	1	Every month						
	Check Electrolyte Specific Gravity	1	Every month						
2. Replacing Fuses		–	As required						

I. Miscellaneous (See Page 7-55)

Parts		Quantity	Interval (hours)								
			8	50	100	250	500	1000	1500	2000	3000
1. Check Bucket Teeth		–									
2. Replace Bucket		1	As required								
3. Adjust Track Sag (Rubber Crawler) and Check for Damage		2									
4. Replace Rubber Crawler		2	As required								
5. Check Track Sag (Steel Crawler) (Optional)		2									
6. Check and Replace Seat Belt		–		Every 3 years (Replace)							
7. Check Air Conditioner (Cab Equipped Machine)		–									
8. Clean and Replace Air Conditioner Recirculation Filter.	Clean	–									
	Replace	–	Replace after cleaning approx. 6 times.								
9. Clean Cab Floor		–	As required								
10. Check/Clean/Function Check Injection Nozzle		–							♦		
11. Check and Adjust Value Clearance		–						♦			
12. Check and Adjust Injection Timing		–							♦		
13. Measure Engine Compression Pressure		–						♦			
14. Check Starter and Alternator		–						♦			
15. Check Crankcase breather									♦		
16. Check Radiator Cap		–								♦	
17. Check Tightening Torque of Bolts and Nuts		–		★★							

NOTE: Consult your authorized dealer for inspection/maintenance of items with mark ♦. The recommended oil chart is affixed on the seat base cover.

★★ For the first time only.

Brand Names of Recommended Oil and Lubricants

Grease

Air Temp / Manufacturer	Grease
	–20 to 40 °C (–6 to 104 °F)
Japan Energy	★Resonic EP Grease 2
Nippon Koyu	SEP2
British Petroleum	BP Energrease LS-EP2
Caltex Oil	Multifax EP2
Esso	Beacon EP2
Idemitsu Kosan	Daphne coronex grease EP2
Exxon Mobil	Mobilux EP2
Eneos	Epinoc Grease Ap2
Shell Oil	Shell Alvania EP Grease 2

NOTE: The machine shipped from the factory is filled with oil marked ★.

Engine Oil

IMPORTANT: Use only genuine Hitachi or Yanmar engine oil as shown below or engine oil equivalent to DH-1 specified in JASO or CF class specified in API. Failure to do so may deteriorate the engine performance and/or shorten the engine service life. Please be noted that all engine failures caused by using engine oil other than specified are excluded from Hitachi Warranty Policy. Consult your authorized dealer for the unclear points.

Brand Names of Recommended Engine Oil

Kind of Oil	Engine Oil			
Application	Engine Crank Case			
Air Temp.	–20 to 30 °C (–4 to 86 °F)	–15 to 40 °C (5 to 104 °F)		
Manufacturer			JASO	API
Hitachi	Super wide DH-1 10W-30	Super wide DH-1 15W-40	DH-1	
Yanmar	★ Highper Royal CF class 10W30	Highper Royal CF class 15W40		CF class

NOTE: The machine shipped from the factory is filled with oil marked ★.

Fuel Oil

IMPORTANT: Use only diesel fuel with quality specified in JIS K-2204, ASTM D-975, EN-590, GOST –R52368, GB252 standard. Failure to do so may deteriorate the engine performance and/or shorten the engine service life. Please be noted that all engine failures caused by using fuel oil other than specified are excluded from Hitachi Warranty Policy. Consult your authorized dealer for the unclear points.

Gear Oil

Air Temp / Manufacturer	Gear Oil –20 to 40 °C (–6 to 104 °F)
British Petroleum	BP Gear oil SAE 90 EP
Caltex Oil	Universal Thuban SAE 90
Esso	Esso Gear oil 90
Idemitsu Kosan	Apoll oil gear HE90
Exxon Mobil	Mobilube HD80W-90
Eneos	★ Hypoid gear 90
Shell Oil	Shell Spirax EP 90
Remarks	API GL4 class

NOTE: The machine shipped from the factory is filled with oil marked ★.

Hydraulic Oil

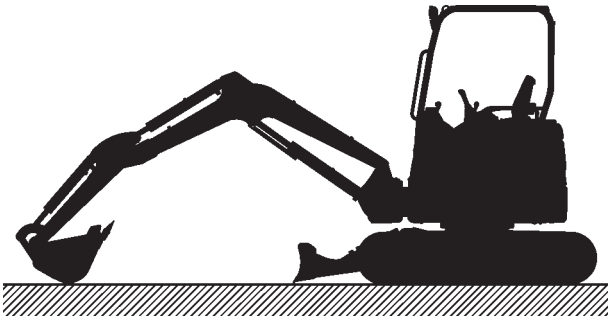
	Hydraulic Oil			
Change Interval	2000 hours		1000 hours	
Air Temp / Manufacturer	–20 to 40 °C (–4 to 104 °F)	–10 to 40 °C (14 to 104 °F)	–20 to 40 °C (–4 to 104 °F)	–10 to 40 °C (14 to 104 °F)
Hitachi	★ Super EX 46 HN		Malti M	
TOTAL			Equivis ZS 46	
Idemitsu Kosan			Dephne Superhydro LW46H	
British Petroleum			Bartran HV46	
Caltex Oil			Rando Oil HD46	
Texaco INC.			Rando Oil HD46	
Chevron U.S.A INC			Chevron AW46	
Esso			NUTO H46	
Mobil Oil				DTE 25
Shell Oil		Tellus Oil S46	Tellus Oil R46	

NOTE: The machine shipped from the factory is filled with oil marked ★.

A. Greasing

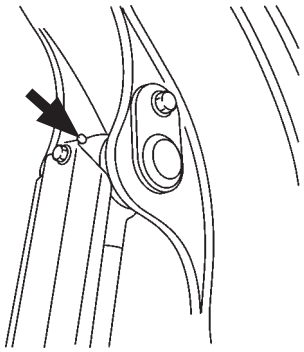
1 **Front Joint Pins (Incl. Swing Post Joint Pins)**
--- every 500 hours or every year
(every 100 hours up to 500 hours of operation)

1. Position machine with the arm cylinder fully retracted and the bucket cylinder fully extended. Lower bucket to the ground (the front attachment inspection position). All greasing points can be lubricated from the ground.
2. Grease all grease fittings illustrated below.



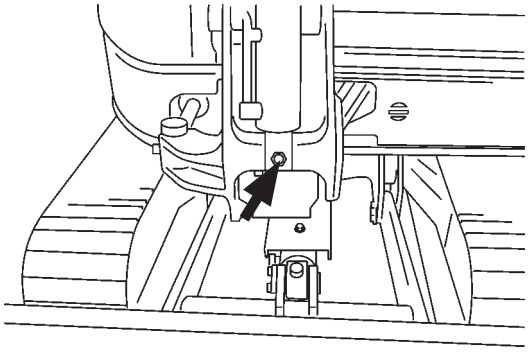
M1M7-05-024

(1) Boom cylinder rod end



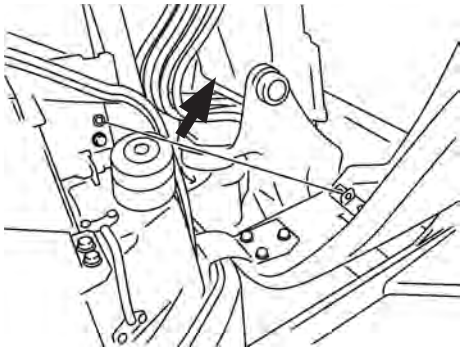
M1M7-07-020

(2) Boom cylinder bottom

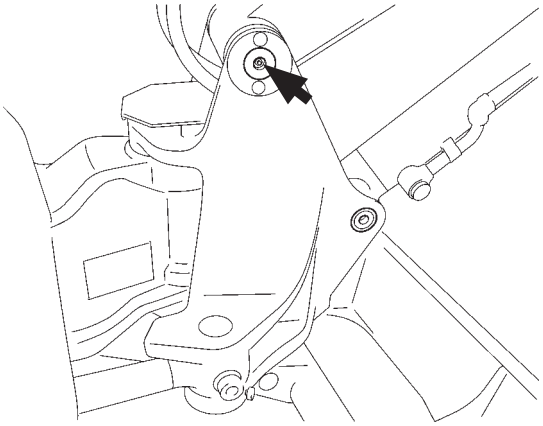


M1M7-07-021

(3) Boom foot

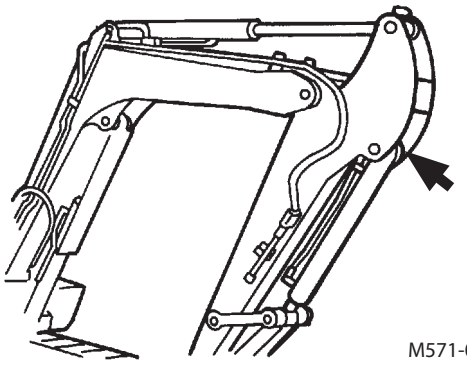


ZX29U-3, 33U-3, 38U-3 M1M7-07-022



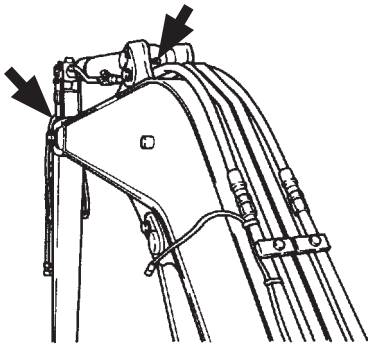
ZX48U-3, 52U-3 M1M7-07-070

(4) Arm cylinder rod end and bucket cylinder bottom



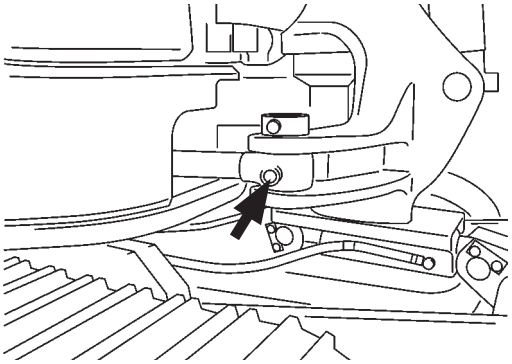
M571-07-006

(5) Boom and arm joint pin, and arm cylinder bottom



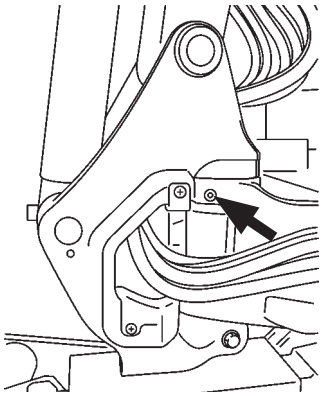
M585-07-046

(6) Swing cylinder



M1M7-07-023

(7) Swing post

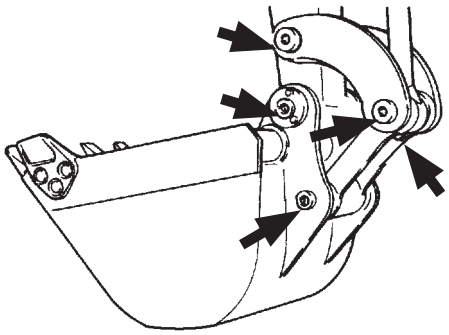


M1M7-07-024

2 **Bucket and Link Pins**

--- every 100 hours

Grease all submerged pins after operating in water.

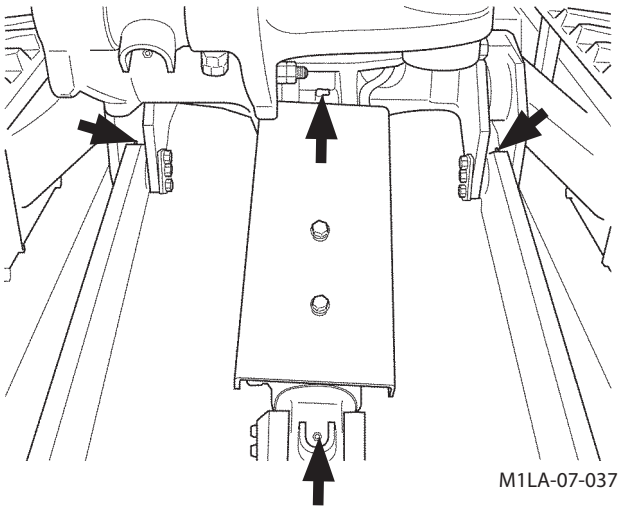


M503-07-092

3 **Blade Pins**

--- every 500 hours or every year

- Blade connecting pin
- Blade cylinder rod end and bottom



M1LA-07-037

Precautions for Front Attachment and Blade Removal

1. When pins are removed to replace the front attachment or blade, do not attempt to clean the bore insides of the bushings.
2. Before installing the front attachment or the blade, apply grease sufficiently to the pinboss ends or the dust seals of the cylinders.
3. Be sure to install at least one shim on both sides of front joint pins.
4. When the swing post is disassembled, coat the pins and the thrust plates with grease before reinstalling them.

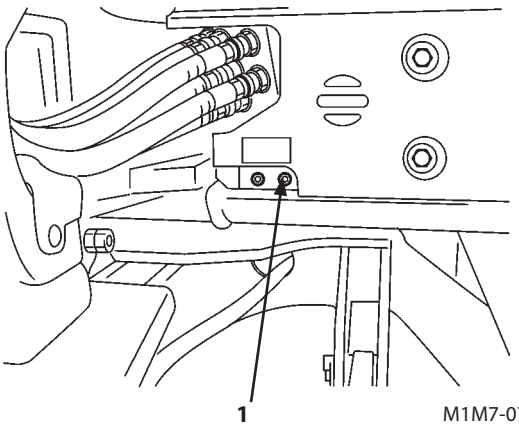
4 **Swing Bearing**

--- every 250 hours

WARNING: Before lubricating the swing bearing, lower the bucket and the blade to the ground, stop the engine, and place the pilot control shut-off lever to the LOCK position. Lubrication and rotation of the upperstructure must be done by one person only. Be sure to check that no personnel are present around the machine before starting to work.

Grease via grease fitting (1).

1. Lower the bucket and the blade to the ground, stop the engine, and place the pilot control shut-off lever to the LOCK position. Add grease with a grease gun by two to three strokes.
2. Raise the bucket approx. 200 mm (8 in) above the ground. While rotating the upperstructure, add grease in 8 places at approximately every 90° interval until the upperstructure has made two turns.



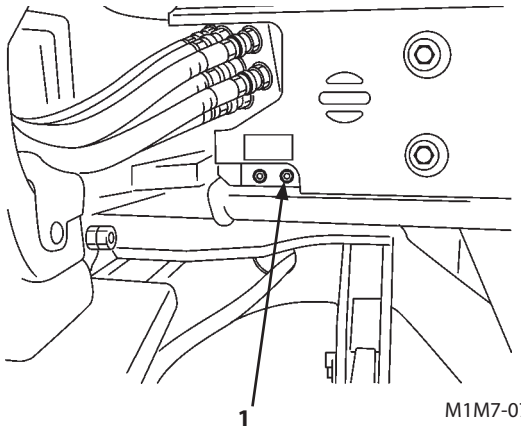
M1M7-07-025

5 **Swing Internal Gear**

--- every 500 hours

WARNING: Before lubricating the swing bearing, lower the bucket and the blade to the ground, stop the engine, and place the pilot control shut-off lever to the LOCK position. Lubrication and rotation of the upperstructure must be done by one person only. Be sure to check that no personnel are present around the machine before starting to work.

1. Remove the cover from the bottom center of the undercarriage.
   Check if grease inside is cloudy due to mixing of water or dirt.
2. Apply grease via grease fitting (1) by the quantity shown in the table.
3. In order to apply grease evenly to the swing gear, raise the bucket approximately 200 mm (8 in) above the ground. While swinging the upperstructure at approximately 90° intervals until one full turn is made, add grease at each interval.



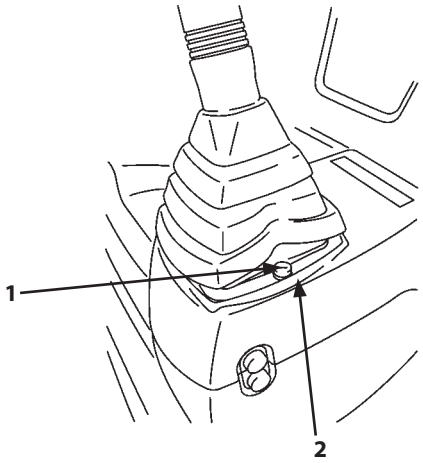
M1M7-07-025

	Greasing Quantity	Total Grease Capacity
ZX29U-3, 33U-3, 38U-3	0.2 L (0.21 US qt)	3.0 to 3.3 L (3.1 to 3.5 US qt)
ZX48U-3 52U-3	0.2 L (0.21 US qt)	3.2 to 3.5 L (3.4 to 3.7 US qt)

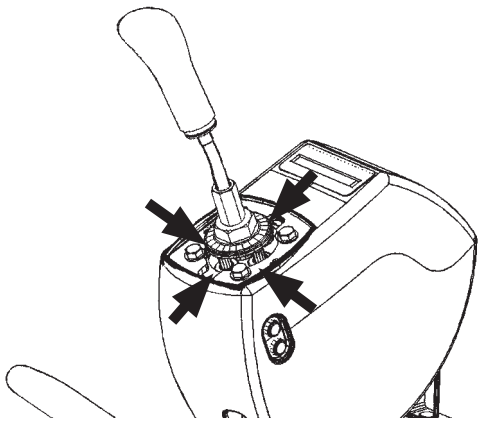
6 **Control Lever Universal Joint**

--- every 500 hours or every year

Pull up the rubber boots under the right and left control levers, remove two screws (1) to remove bracket (2). After moving the rubber boots upward, add grease to the four places of the pilot valve pushers as indicated by arrows.



M1M7-07-026

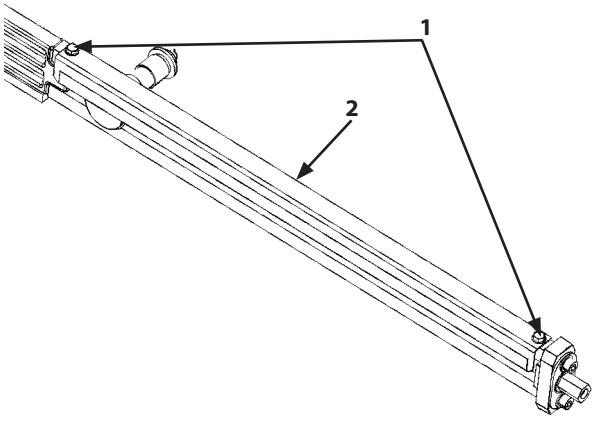


M1M7-07-016

7 Tilt Mechanism

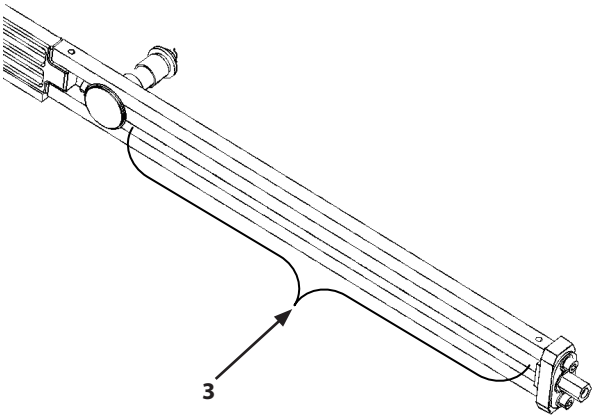
--- every 250 hours

1. Remove bolts (1) from the top of the tilt mechanism and remove cover (2).



M1M7-07-077

2. Coat the full length of operation bolt (3) with grease. Recommended grease: MOLYKOTE EM-30L manufactured by Dow Corning Toray Co., Ltd.

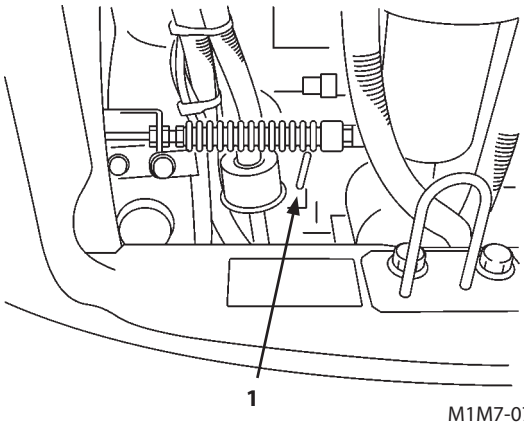


M1M7-07-078

B. Engine

1 **Engine Oil**
--- level check daily
(check before starting the engine)

Check the oil level every day before starting the engine. Oil level must be between the marks on oil level gauge (1). If necessary, add the specified engine oil via oil filler (2). Recheck the oil level after refilling.



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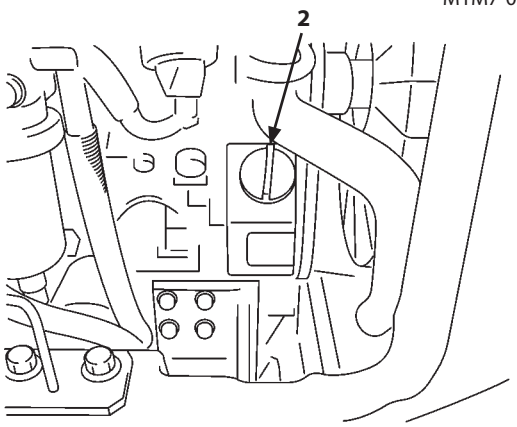


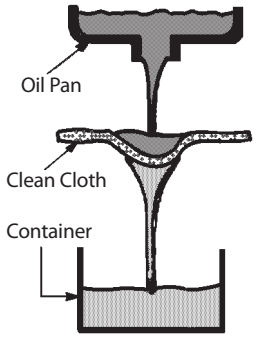
M1M7-07-028

CAUTION: This machine adopts the closed air breather system. Do not over fill. If engine oil is over filled, white exhaust gas may be discharged from the muffler, and the engine rapid rotation and engine internal damage may be caused.

1 **Change Engine Oil**
--- every 500 hours

2 **Replace Engine Oil Filter**
--- every 500 hours

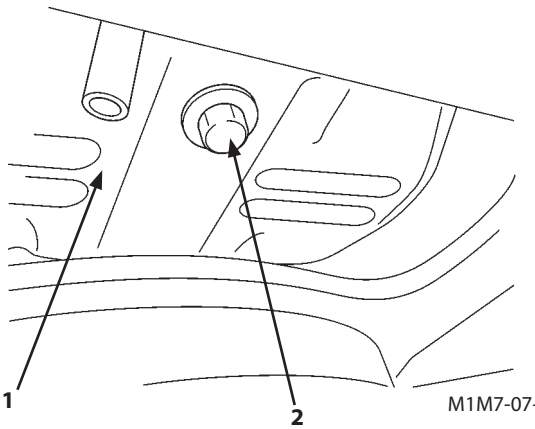
WARNING: Each component of the engine may be hot immediately after operation. Allow components to cool before starting to work on them.



M104-07-010

1. Prepare a 10-liter (2.6 US gal) container to receive the drain oil.
2. Remove drain plug (2) from engine oil pan (1) to drain the oil.
3. Allow oil to drain through a clean cloth to check if any debris such as small pieces of metal are present on the cloth.
4. After all oil has drained, reinstall and tighten drain plug (2).

   Wrench size : 19 mm
   Tightening torque : 90 N·m (9 kgf·m, 65 lbf·ft)



M1M7-07-029

5. Remove oil filter (3) from the engine by turning it counterclockwise using a filter wrench. The oil may spill from filter (3) bottom bracket at this time. Use an empty container to catch the spilled oil.
6. Coat the gasket of new filter (3) with engine oil. Turn filter (3) clockwise by hand until the gasket touches the sealing surface.
7. Tighten oil filter (3) 3/4 turns more using the filter wrench. Take care if oil filter (3) may become deformed if excessively tightened.

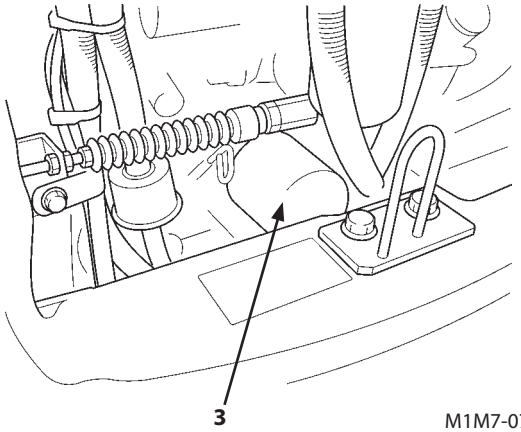
NOTE: Tightening torque: 20 to 24 N·m (2.0 to 2.4 kgf·m, 15 to 17 lbf·ft)

8. Remove oil filler cap (4). Refill the engine oil.

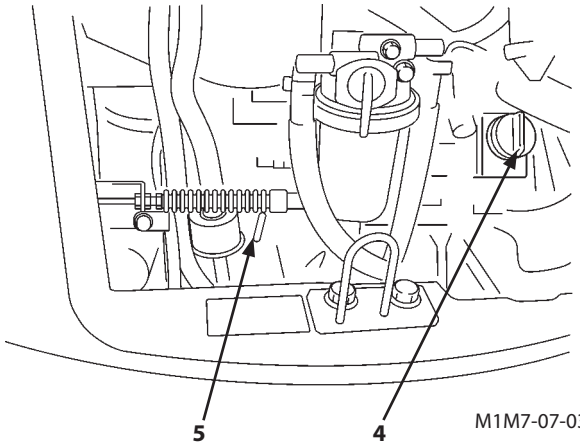
NOTE: Refer to the recommended oil and grease chart on page 7-11 for the brand names of oils.

9. Check that oil level is between the upper and lower limit marks on dipstick (5). Start the engine.
10. Check that no oil is leaking from the sealing joints.
11. Run the engine at slow idle for 5 minutes. Stop the engine. After 15 minutes later, recheck the oil level. Add as needed.

IMPORTANT: Do not re-use engine oil filter (3). Be sure to use only genuine engine oil filter (3). Failure to use genuine parts or replace oil filter (3), may damaged the engine.



M1M7-07-030



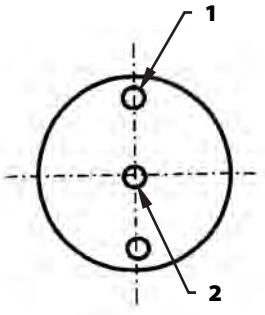
M1M7-07-031

C. Transmission

1 Travel Reduction Gear

WARNING:

- **Each component of the travel reduction gear may be hot immediately after operation. Allow components to cool before starting to work on them.**
- **The travel reduction gear may be pressurized. Be sure to release the internal pressure by slowly loosen air bleed plug (1) two to three turns before removing plug (1). Failure to do so may cause plug (1) and/or gear oil to fly out, possibly resulting in personal injury. Keep body and face away from air bleed plug (1).**



M503-07-015

Check Oil Level --- every 250 hours

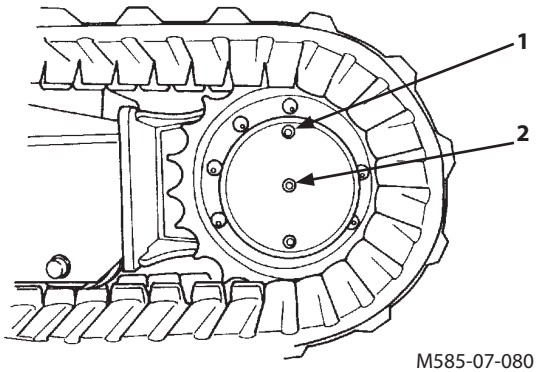
1. Park the machine on a level surface.
2. Rotate the travel motor until plugs are positioned as illustrated on the right. Stop the engine.
3. Slowly loosen plug (1) to release pressure.
4. Remove plugs (1 and 2). Check that oil flows out of the thread hole for plug (2). If no oil flows out, add oil until oil flows out of plug (2) hole.
5. After cleaning plugs (1 and 2), wrap plugs (1 and 2) threads with sealing-type tape. Install plugs (1 and 2).

   ZX29U-3, 33U-3, 38U-3

   Tightening torque: 30 to 40 N·m
   (3 to 4 kgf·m, 22 to 29 lbf·ft).

   ZX48U-3, 52U-3

   Tightening torque: 22 to 24 N·m
   (2.2 to 2.4 kgf·m, 16 to 18 lbf·ft).



M585-07-080

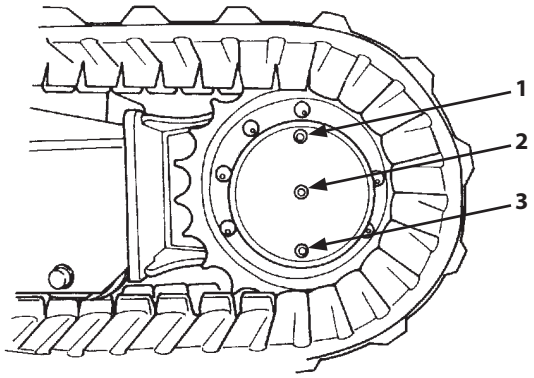
Change Gear Oil --- every 1000 hours

1. Park the machine on a level surface.
2. Rotate the travel motor until plugs are positioned as illustrated on the right. Stop the engine.
3. Slowly loosen plug (1) to release pressure.
4. Remove drain plug (3) and plug (1) to drain oil.
5. After draining oil completely, clean plug (3). Wrap the threads of plug (3) with sealing-type tape. Install plug (3).
   Tightening torque 30 to 40 N·m
   (3 to 4 kgf·m, 22 to 29 lbf·ft).
6. Supply oil through the thread hole for plug (1).

NOTE: Refer to the recommended oil and grease chart on page 7-11 for the brand names of oils.

7. Remove plug (2). Add oil until oil flows out of the tread hole for plug (2).

	Oil Quantity
ZX29U-3, 33U-3, 38U-3	0.6 L (0.63 US qt)
ZX48U-3, 52U-3	0.9 L (0.95 US qt)



M585-07-080

8. After cleaning plugs (1 and 2), wrap the threads of plugs (1and 2) with sealing-type tape. Reinstall plugs (1 and 2).

   ZX29U-3, 33U-3, 38U-3

   Tightening torque 30 to 40 N·m
   (3 to 4 kgf·m, 22 to 29 lbf·ft).

   ZX48U-3, 52U-3

   Tightening torque 22 to 24 N·m
   (2.2 to 2.4 kgf·m, 16 to 18 lbf·ft).

D. Hydraulic System

Inspection and Maintenance of Hydraulic Equipment

WARNING: When inspecting and/or maintaining hydraulic equipment, pay special attention to the following points.

1. Be sure to park the machine on a level, solid surface.
2. Lower the bucket and blade to the ground and stop the engine.
3. Begin servicing hydraulic components only after the components, hydraulic oil and lubricants are completely cooled, and after releasing residual pressure.

3.1 Bleed air pressure from the hydraulic oil tank.

3.2 Each component, hydraulic oil, and lubricant may be hot and/or pressurized immediately after operation. Allow the machine to cool down before beginning inspection or maintenance. Failure to do so may cause burns caused by contact with hot component and/or oil, or injury by contacting flying off of plugs and /or screws. Hydraulic components may be pressurized even when cooled. Keep body parts and face away from plugs or screws and slowly loosen them. Remove plugs and screws only after thoroughly releasing the residual pressure.

3.3 Never attempt to service or inspect the travel and swing motor circuits on slopes. Even after air pressure is released from the hydraulic oil tank, the machine on a slope will create force to pressurize hydraulic oil in the travel and swing circuit by its own weight.

IMPORTANT:

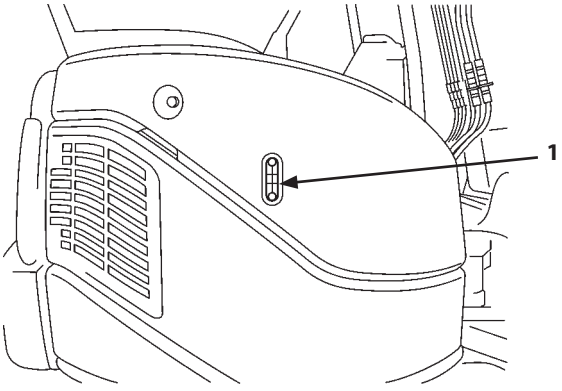
- **Take special care to keep seal surfaces of hydraulic components free from dirt and to avoid damaging them.**
  - **Wash hoses, pipes, tank and their surrounding areas with a washing liquid and thoroughly wipe it out before reconnecting them.**
  - **Only use O-rings that are free of damage or defects. Never carelessly file O-ring seat surfaces. Do not allow high pressure hoses to twist when connecting them. Failure to do so may considerably shorten the service life of the hoses.**
- **Do not use hydraulic oils other than those listed in the table "Brand names of recommended hydraulic oil". When adding hydraulic oil, always use the same brand of oil. Do not mix brands of oil. When selecting to use another brand of oil, be sure to completely replace the oil in the system.**
- **Never run the engine without oil in the hydraulic oil tank.**

1 **Check Hydraulic Oil Level**

--- daily

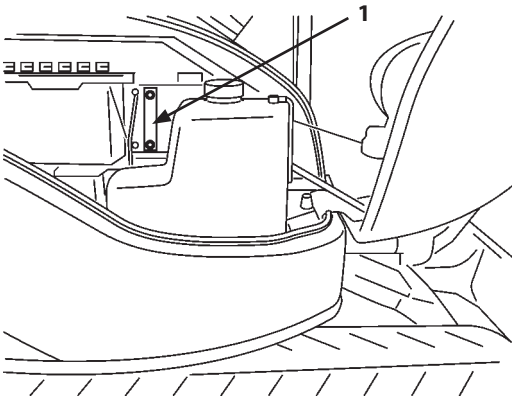
1. Park the machine on a solid level surface. Position the machine with the arm cylinder fully retracted and the bucket cylinder fully extended. Lower the bucket and blade to the ground. Stop the engine.
2. Check oil level gauge (1) on the side of the hydraulic oil tank. Oil must be at the specified level on gauge (1).

M1M7-05-024



ZX29U-3, 33U-3, 38U-3

M1M7-07-032



ZX48U-3, 52U-3

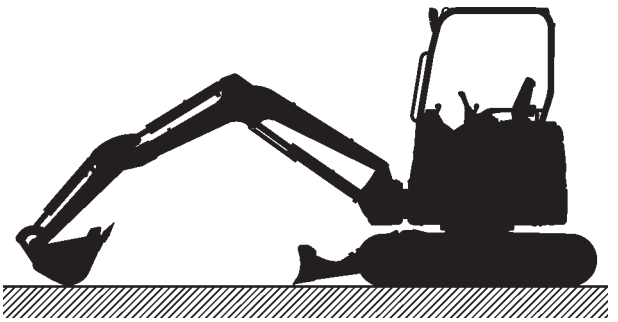
M1M7-03-004

2 **Drain Hydraulic Oil Tank Sump**

--- every 250 hours

WARNING: Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.

1. Park the machine on a solid level surface. Position the machine with the arm cylinder fully retracted and the bucket cylinder fully extended. Lower the bucket and blade to the ground. Stop the engine.
2. Leave the machine without operating the machine until hydraulic oil becomes cool. Then, bleed air pressure from the hydraulic oil tank.
3. Slowly loosen drain plug (1) on the bottom of the hydraulic oil tank to drain water and sediment.



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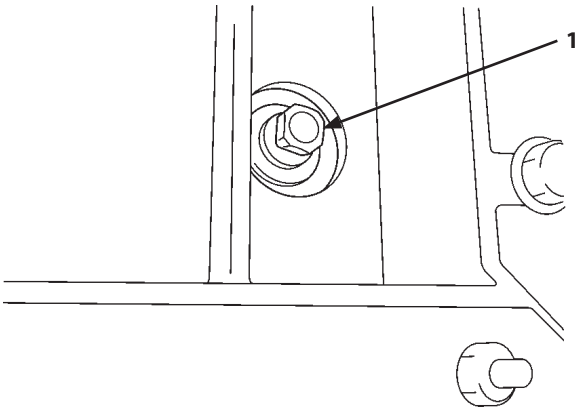


M1M7-07-033

3 **Change Hydraulic Oil**

--- every 1000 hours or 2000 hours

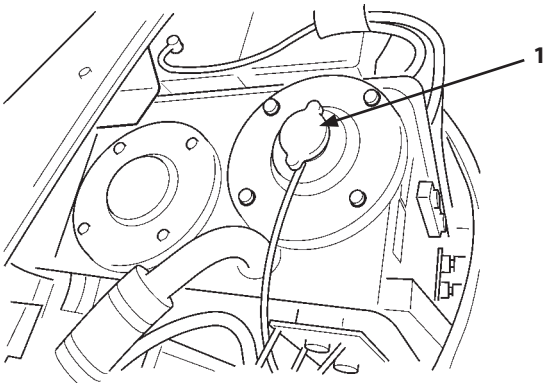
WARNING: Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.

IMPORTANT: When changing hydraulic oil, take care not to allow foreign matter such as dirt, water or soil to enter the hydraulic oil system. Hydraulic oil changing intervals differ according to kind of hydraulic oil used.

1. Park the machine on a solid level surface. Position the machine with the arm cylinder fully retracted and the bucket cylinder fully extended. Lower the bucket and blade to the ground. Stop the engine.
2. Remove the cover above the hydraulic oil tank. Loosen filler cap (1) on the hydraulic oil tank to release air pressure from the hydraulic oil tank.
3. Remove cap (1).
4. Arrange a container with the capacity (A). Drain oil using a suction pump.

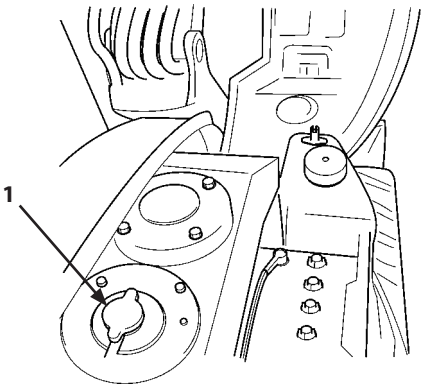
	Oil Quantity (A)
ZX29U-3, 33U-3, 38U-3	50 L (13.2 US gal)
ZX48U-3, 52U-3	70 L (18.5 US gal)

M1M7-05-024



ZX29U-3, 33U-3, 38U-3

M1M7-07-035



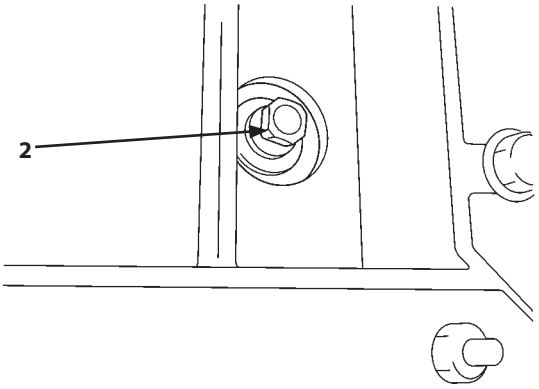
ZX48U-3, 52U-3

M1M7-07-036

5. Slowly loosen drain plug (2) on the bottom of the hydraulic oil tank. Allow oil to drain thoroughly.
6. Clean, install and tighten drain plug (2) to the original position.

   ZX29U-3, 33U-3, 38U-3
   Wrench Size : 12 mm (PT3/8 Square Head Plug)
   Tightening Torque : 50 N·m (5 kgf·m, 36 lbf·ft)

   ZX48U-3 and 52U-3
   Wrench Size : 27 mm (G1/2 Hexagonal Head Plug with O-ring)
   Tightening Torque : 95 N·m (9.5 kgf·m, 70 lbf·ft)
7. Supply hydraulic oil via the filler port on the top of the hydraulic oil tank while checking the oil level with level gauge (3).



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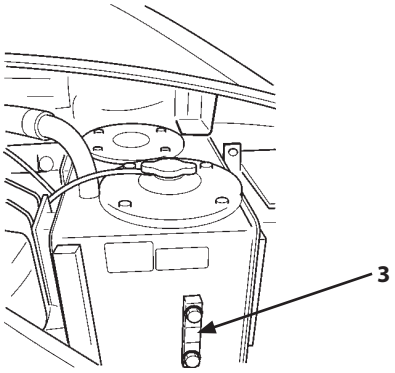
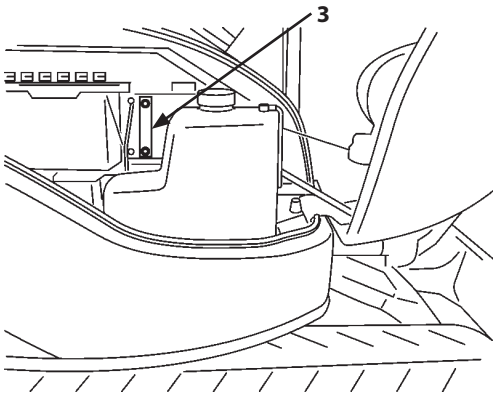


ZX29U-3, 33U-3, 38U-3 M1M7-07-034



ZX48U-3, 52U-3 M1M7-03-004

Bleed Air from Hydraulic System

After changing hydraulic oil, bleed air from the hydraulic system by following the procedure described below.

Bleed Air from Pump

IMPORTANT: If the engine is started when the pump is not filled with hydraulic oil, damage to the pump may result.

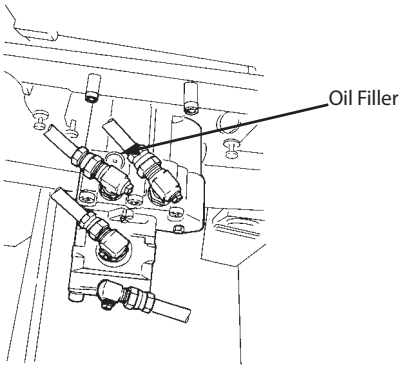
1. Connect all hydraulic lines to the hydraulic pump. Fill any hydraulic components, that can be filled with hydraulic oil, with as much hydraulic oil as possible at this time.
2. Add hydraulic oil to the hydraulic oil tank to the specified level.
3. Loosen air bleed plug slightly. Purge air from the pump casing and suction line. Do not remove as hydraulic oil may spout out. Tighten air bleed plug after purging air.

   Tightening Torque: 30 to 40 N•m (3.0 to 4.0 kgf•m, 22 to 29 lbf•ft)
4. Check all line connections for any oil leaks. Set the engine control dial or lever in the slow idle position.
5. Start the engine. Wait 5 to 10 seconds. Stop the engine.
6. Check the hydraulic oil level at the level gauge located on the side of the hydraulic oil tank. Add hydraulic oil if necessary.
7. Restart the engine. Confirm that hydraulic oil level in the hydraulic oil tank is sufficient. Run the engine for approximately 1 minute.
8. This is the end of the hydraulic pump air bleeding procedure.

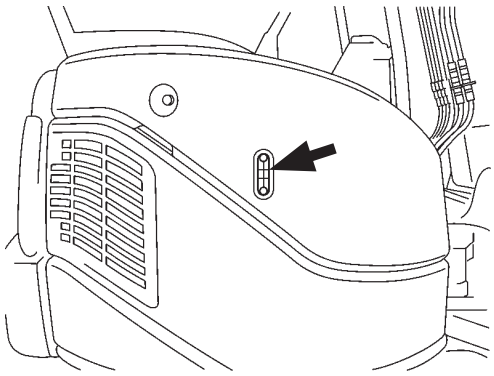
NOTE: If the hydraulic pump is left empty overnight or longer, be sure to fill the pump with clean hydraulic oil before performing the air bleeding procedure above.

Bleed Air From Hydraulic Circuits

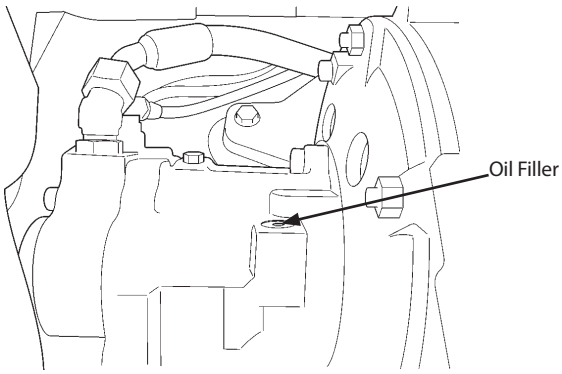
1. After filling hydraulic oil in the hydraulic oil tank, start the engine. Evenly operate each cylinder and swing motor repeatedly for 10 to 15 minutes to purge air from hydraulic system.
2. Position the machine in the hydraulic oil level checking position.
3. Stop the engine. Check hydraulic oil level. Add oil as necessary.



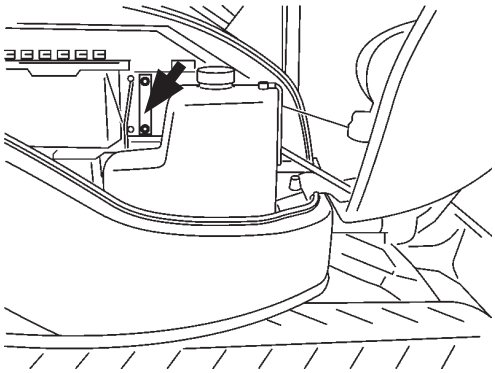
ZX29U-3, 33U-3, 38U-3 M589-07-010



ZX29U-3, 33U-3, 38U-3 M1M7-07-032



ZX48U-3, 52U-3 M1LD-07-006



ZX48U-3, 52U-3 M1M7-03-004

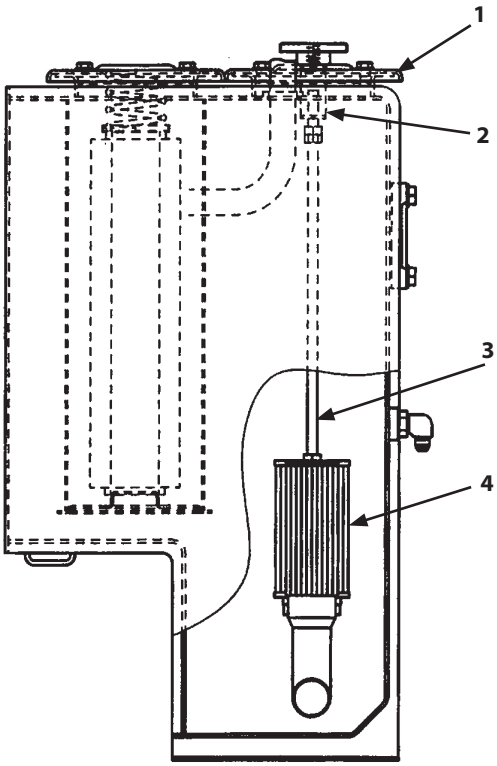
4 Clean Suction Filter

--- when changing hydraulic oil

Suction filter (4) is located on the bottom side in the hydraulic oil tank. Clean suction filter (4) when changing hydraulic oil.

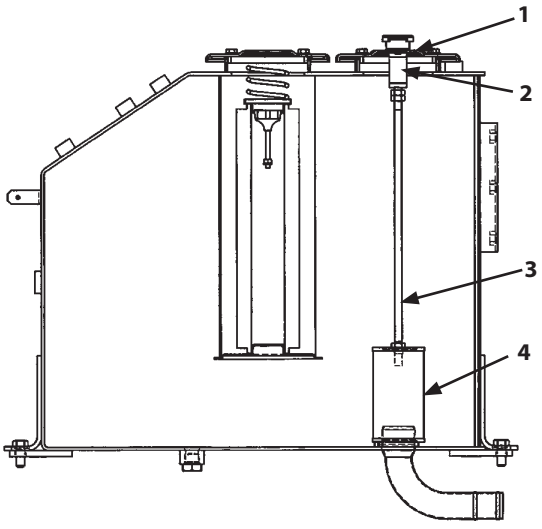
1. After draining hydraulic oil, remove cover (1). Take care not to allow the O-ring to come off cover (1) at this time.
2. Remove suction filter (4) together with rod (3).
3. Clean the hydraulic oil tank interior and suction filter (4).
4. Install suction filter (4) together with rod (3) to the suction pipe.
5. Install cover (1) so that rod (3) is securely inserted into support (2) on cover (1).
6. Secure cover (1) with four bolts.

   Wrench Size : 13 mm
   Tightening Torque : 10 N·m (1 kgf·m, 7.4 lbt·ft)



ZX29U-3, 33U-3, 38U-3

M1M7-07-002



ZX48U-3, 52U-3

M1M7-07-003

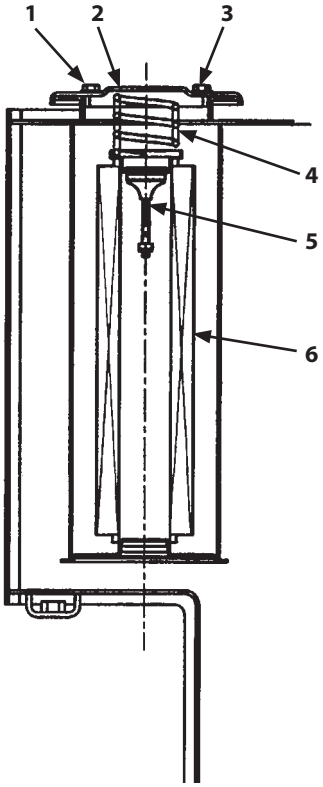
5 **Replace Full Flow Filter Element**

--- every 500 hours (first time after 250 hours)

WARNING: Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.

M1M7-05-024

1. Park the machine on a solid level surface. Position the machine with the arm cylinder fully retracted and the bucket cylinder fully extended. Lower the bucket and blade to the ground. Stop the engine.
2. Before replacing element (6), be sure to loosen the hydraulic oil tank cap to release the air pressure from the hydraulic oil tank.
3. Loosen four bolts (1) to remove cover (2) and O-ring (3). While pressing cover (2) down, slowly remove cover (2) so that spring (4) does not fly out.
4. Remove spring (4), valve (5) and element (6).
5. Take care not to allow water and/or dirt to enter the filter case.
6. Be careful not to damage element (6) and O-ring (3). Do not use a broken element (6).
7. Install new element (6), and O-ring (3) in the hydraulic oil tank
8. Install cover (2) with four bolts (1).
   Tightening torque: 10 N·m (1 kgf·m, 7.4 lbf·ft)
9. After replacing element (6), bleed air from the pump. Check the oil level in the hydraulic oil tank. (Refer to **3** "Bleed Air from Hydraulic System.") If the machine is operated without completely bleeding air from the hydraulic system, damage to the pump may result.
10. Replace element (6) at the specified interval to keep hydraulic oil clean and extend the service life of hydraulic components.



M1M7-07-004

6 **Replace Pilot Filter Element**

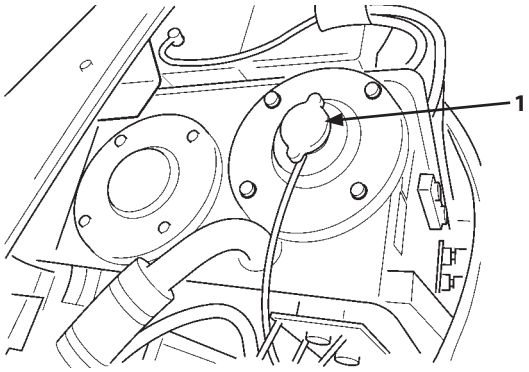
--- every 1000 hours

WARNING: Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.

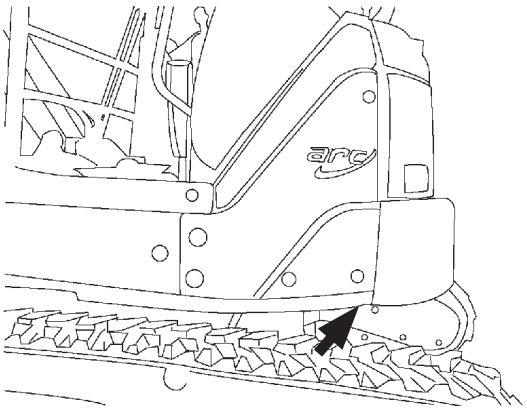
1. Park the machine on a solid level surface. Position the machine with the arm cylinder fully retracted and the bucket cylinder fully extended. Lower the bucket and blade to the ground. Stop the engine.
2. Before replacing the element, be sure to loosen hydraulic oil tank cap (1) to release the air pressure from the hydraulic oil tank.
3. Remove bolts (3) to remove under cover (2) from the rear left bottom side of the base machine.

   Wrench size: 17 mm

M1M7-05-024



M1M7-07-035



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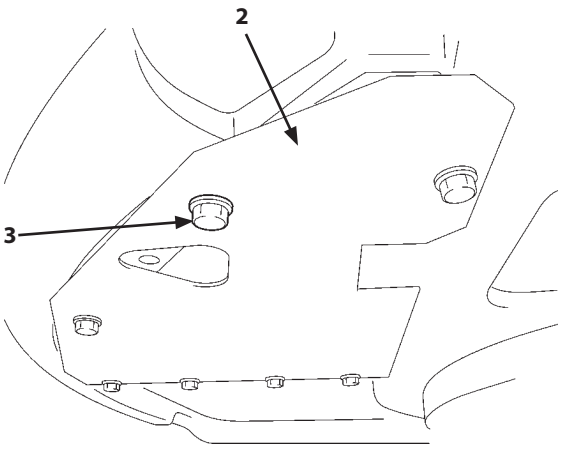
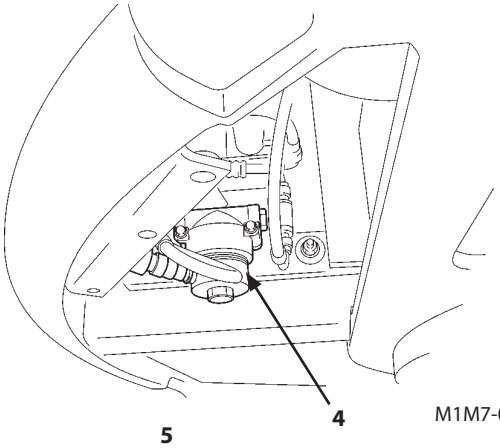
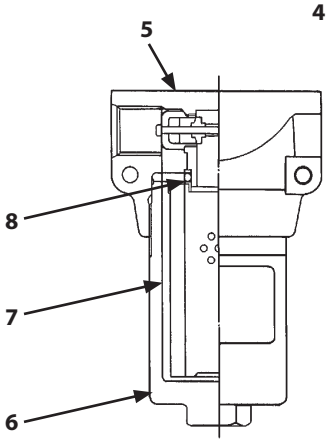


M1M7-07-071

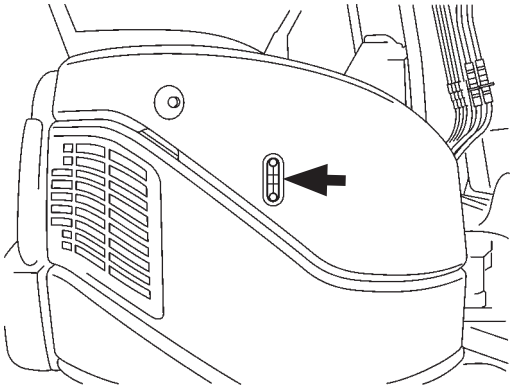
4. Rotate the hexagon section on the bottom of filter case (6) counterclockwise using a tool such as a wrench to remove filter case (6) from head cover (5).
5. While rotating filter element (7), pull to remove filter element (7) downward.
6. Replace O-ring (8) with a new one.
7. Securely install O-ring (8) in the O-ring groove on head cover (5).
8. Coat the seal on new filter element (7) with clean hydraulic oil. Completely install filter element (7) into head cover (5) while rotating filter element (7) taking care not to damage filter element (7).
9. Take care not allow dust and/or water enter filter case (6).
10. Install case (6) into head cover (5) while rotating case (6) clockwise.
    Tightening Torque: 25 to 35 N·m
    (2.5 to 3.5 kgf·m, 18.0 to 26 lbf·ft)
11. After replacing filter element (7), bleed any remaining air from the hydraulic circuit while running the engine at a slow speed for approx. 3 minutes.
12. Check the oil level in the hydraulic oil tank. Add oil as needed.
13. Install under cover (2).
    Wrench size: 17 mm
14. Tighten hydraulic oil tank cap (1).

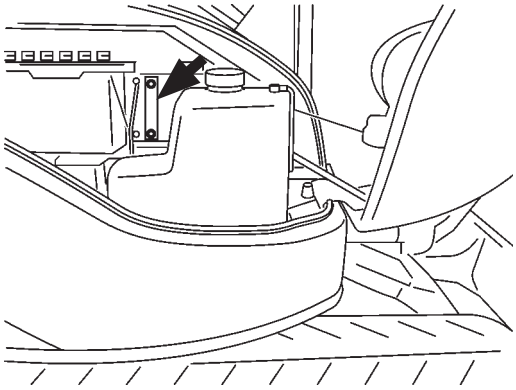


M1M7-07-072



M503-07-031


ZX29U-3, 33U-3, 38U-3 M1M7-07-032

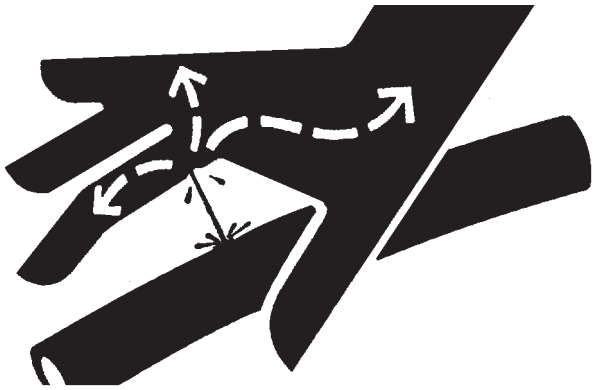

ZX48U-3, 52U-3 M1M7-03-004

7 **Check Hoses and Lines**

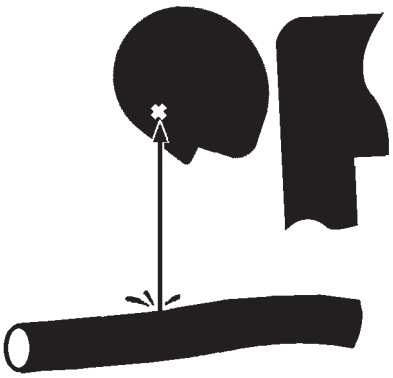
--- daily
--- every 250 hours

WARNING:

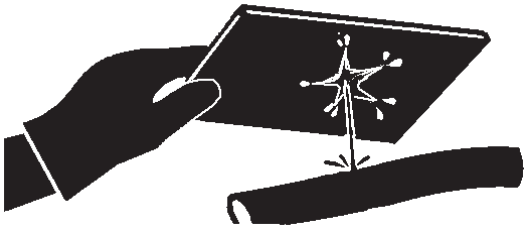
- **Escaping flammable fluid may cause fire. Check for missing or loose clamps, kinked hoses, lines or hoses that rub against each other and/or come in contact with other components, and any oil leaks.**
- **Escaping fluid under pressure can penetrate the skin causing serious injury.**
  To avoid this hazard, search for leaks with a piece of cardboard.
  Take care to protect hands and body from high-pressure fluids.
  If an accident occurs, see a doctor familiar with this type of injury immediately.
- **Repair or replace any missing, loose or damaged clamps, hoses, and lines.**
- **Do not bend or strike high-pressure lines.**
- **Never install bent or damaged hoses or lines.**



SA-031



SA-292

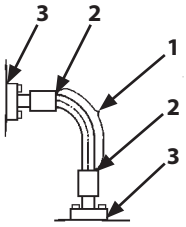


SA-044

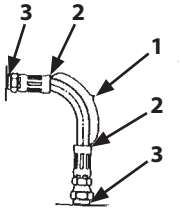
Check hoses and lines for oil leaks and/or damage while referring to the following tables. If any abnormality is found, repair it as instructed in the remedy column.

Hoses

Interval (Hours)	Check Point	Abnormality	Remedy
Daily	Hose surface Hose end Hose connection	Oil leak (1) Oil leak (2) Oil leak (3)	Replace Replace Retighten or replace hose or O-ring



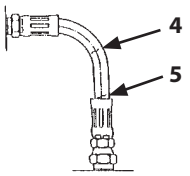
M137-07-008



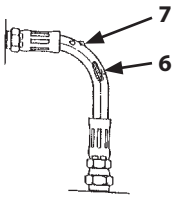
M115-07-145

Hoses

Interval (Hours)	Check Point	Abnormality	Remedy
Every 250 hours	Hose surface	Oil leak (4)	Replace
	Hose end	Oil leak (5)	Replace
	Hose surface	Exposed reinforcement (6)	Replace
	Hose surface	Blister (7)	Replace
	Hose	Acute bend (8), Collapse (9)	Replace
	Hose and hose fitting	Deformation or Corrosion (10)	Replace



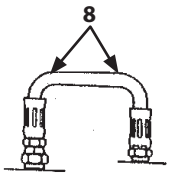
M115-07-146



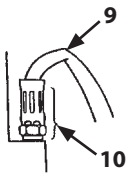
M115-07-147

Lines

Interval (Hours)	Check Point	Abnormality	Remedy
Daily	Flange type fitting mating face and connection bolt	Oil leak (11)	Replace
		Looseness or oil leak (11)	Replace O-ring and/or retighten bolt
	Weld joint surface on flange type fitting	Oil leak (12)	Replace
Every 250 hours	Flange type fitting neck	Crack (13)	Replace
	Weld joint surfaces on flange type fitting	Crack (12)	Replace
	Clamp	Omission, deformation or loose	Replace or Retighten



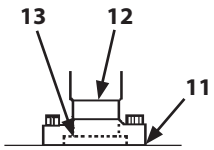
M115-07-148



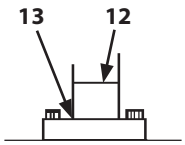
M115-07-149

Oil cooler

Interval (Hours)	Check Point	Abnormality	Remedy
Every 250 hours	Hose and hose connection	Oil leak (14)	Retighten or replace
	Oil cooler	Oil leak (15)	Replace



M137-07-001



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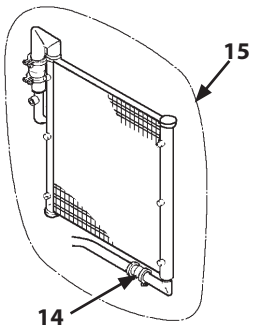


M155-07-049

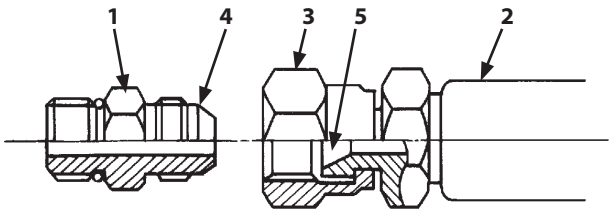
Hose Fitting

- Metal Face Seal Fittings
  (Width Across Flats of Union Nut (3): 17, 19, 22, 27, 36 and 41 mm)

  Fittings are used on smaller size hoses. Metal flare seat (4) on adapter (1) and metal flare (5) on hose (2) ends seal pressure oil.

  Precaution for Application
  Take care not to damage flare seat (4) and flare (5) when disconnecting or connecting them.

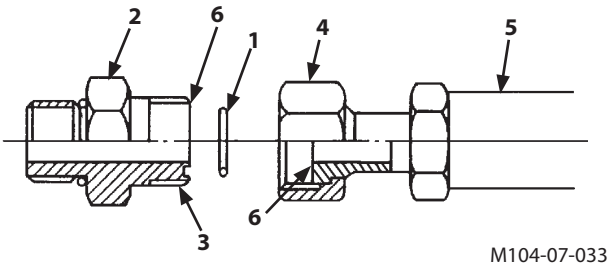
  Tightening Torque
  Tighten adapter (1) and nut (3) to the torque values shown in the table below. ±10%



M202-07-051

Width across flats (mm)		17	19	22	27	36	41
Tightening torque	N·m	25	30	40	65	180	210
	(kgf·m)	(2.5)	(3)	(4)	(6.5)	(18)	(21)
	(lbf·ft)	(18)	(22)	(29)	(47)	(130)	(150)

- **Flat Face O-ring Seal Fitting (ORS Fitting)**
  O-ring (1) is used on end face (6) of adapter (2) to prevent oil leakage between the joints.



M104-07-033

Precautions for Application

1. Replace O-ring (1) with a new one when re-assembling fittings.
2. Before tightening union nut (4), check that O-ring (1) is correctly seated in O-ring groove (3). If union nut (4) is tightened when O-ring (1) is not correctly seated in O-ring groove (3), damage to O-ring (1) and oil leak from fittings may result.
3. Take care not to make dents on O-ring groove (3) of adapter (2) and seal face (6) on hose (5) or valve side when re-assembling fittings. Failure to do so may cause damage to O-ring (1) and oil leak from fittings.
4. If oil leaks from a loose connection of union nut (4), open the connection, replace O-ring (1), and check that O-ring (1) is correctly seated in O-ring groove (3) before re-tightening the connection.

Tightening Torque
Tighten adapter (2) and union nut (4) to the torque values shown in the table below

±10%

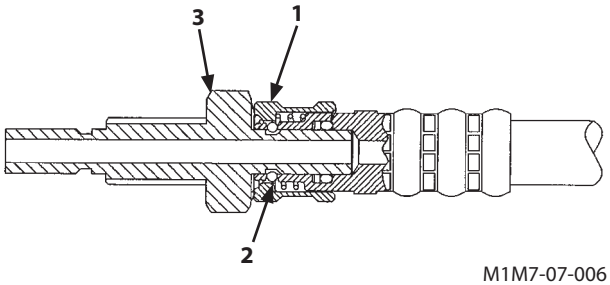
Width across flats (mm)		19	22	24	27	36
Tightening torque	N·m	30	70	80	95	180
	(kgf·m)	(3.0)	(7.0)	(8.0)	(9.5)	(18)
	(lbf·ft)	(22)	(52)	(59)	(70)	(130)

Quick Coupler

1. Connection Procedure

1.1 While pulling and fully turning socket ring (1) counterclockwise, insert socket ring (1) onto plug (3) until the end face of socket ring (1) comes in contact with plug (3).

1.2 Release socket ring (1). Check that socket ring (1) is slightly moved backward by the spring force and that the coupler is held in position with balls (2). Be sure to check that socket ring (1) has been moved back fully to the right original position.



M1M7-07-006

2. Disconnection Procedure

2.1 While pulling and fully turning socket ring (1) counterclockwise, disconnect the coupler. As no check valve is provided in the coupler, take care that oil may flow out of the coupler when the coupler is disconnected.

2.2 After the coupler is disconnected, plug the holes with the exclusively prepared plugs.

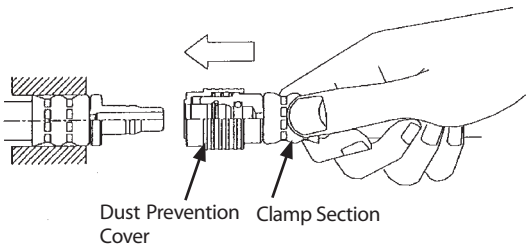
IMPORTANT:

- **Take care not to damage the joint surfaces when disconnecting or connecting the coupler.**
- **Before disconnecting or connecting the coupler, clean the coupler and its surroundings with a cleaning solvent and completely wipe off the cleaning solvent. Use extra care not to allow foreign matter such as dirt to enter the coupler.**
- **Disconnect or connect the coupler in the correct procedure. Confirm by inspection that no oil leak is present after connecting the coupler.**
- **After connecting the coupler, check that socket ring (1) has been moved back fully to the right original position.**

Quick Coupler

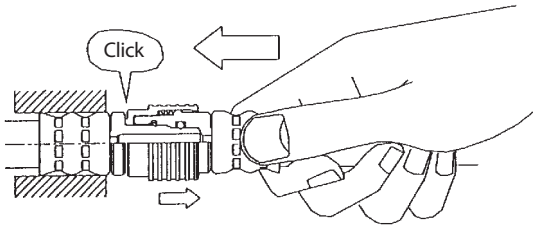
1. Connecting Coupler

   Always grasp the coupler by its clamp section. Push the body straight until the dust prevention cover retracts approx. 2 mm. Then, pull the clamp section straight to make sure that the coupler is properly connected and will not disconnected.



M1LA-07-014

CAUTION: If the coupler is grasped and pushed by the dust prevention cover, or not pushed until the dust prevention cover retracts, incomplete connection of the coupler may result, causing the coupler to disconnect when oil pressure increases. Even if the coupler is incompletely connected, if pulling force is diagonally applied, the coupler may be difficult to disconnect. However, the coupler may be easily disconnected in this case when oil pressure increases. Take care not to diagonally push the coupler. Failure to do so damage to the inner parts, cause oil leak, and/or unexpected coupler disconnection may result.

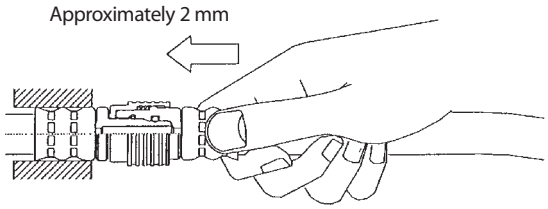


M1LA-07-015

2. Disconnecting Coupler

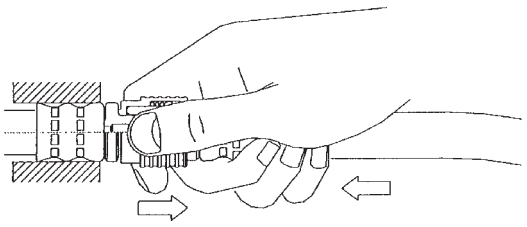
   Be sure to disconnect the coupler only after removing any foreign matter adhered such as soil adhered to the joint with cleaning oil.

- While grasping the clamp section, push the body straight approx. 2 mm.



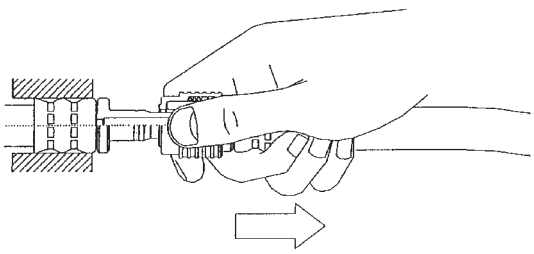
M1LA-07-016

- While pushing the body, pull the dust prevention cover.



M1LA-07-017

- Pull the overall coupler together along with the dust prevention cover to disconnect the coupler.



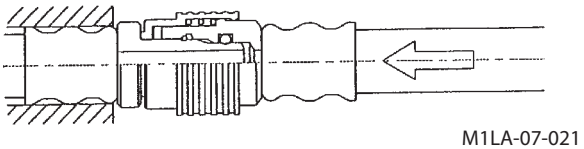
M1LA-07-018

NOTE: When disconnecting a coupler located in a narrow space that is difficult for your hand to enter, use a screwdriver following the procedures as described below.

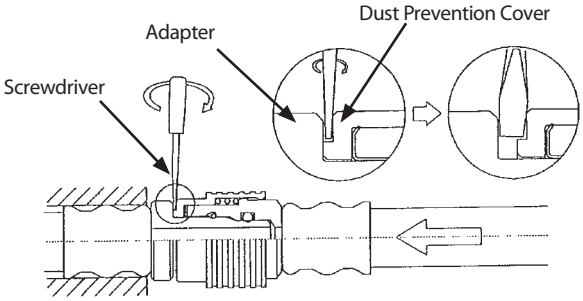
Using Screwdriver

A screwdriver with a tip thickness of less than 1 mm and a tip width of approx. 5 mm is appropriate to this work.

- Slightly push the hose toward the coupler approx. 2 mm.
- While pushing the hose toward the coupler, insert a screwdriver in the position as illustrated to the right. Twist the screwdriver about 90°. After making the gap between the adapter and the dust prevention cover more than 2 mm, pull the hose to disconnect the coupler.



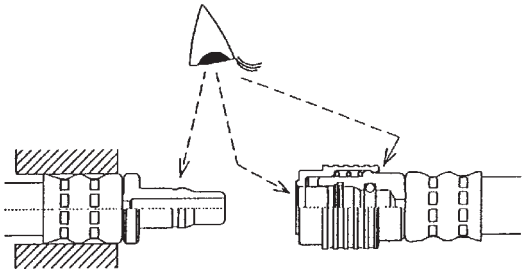
M1LA-07-021



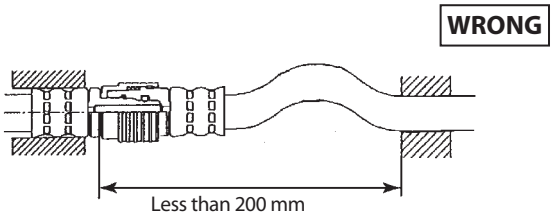
M1LA-07-022

3. Precautions for Re-using Coupler

- Before connecting the coupler, be sure to check the coupler surface for any adhered foreign matter. Clean to remove the foreign matter if any. Adhered foreign matter may cause oil leaks and/or disconnection of the coupler.
- When a hose clamping is required, put a clamp 200 mm away from the joint edge. If the hose is clamped as illustrated to the right, the coupler joint may slide as oil pressure changes, causing oil leaks due to the premature inner parts wear.
- Do not use the coupler as a foot step and do not handle the coupler roughly. If the dust prevention cover is broken, the coupler may become difficult to disconnect.
- Do not paint on the joint surface. The body will be seized with the dust prevention cover so that the coupler cannot be disconnected.



M1LA-07-019



M1LE-07-006

E. Fuel System

WARNING: Fuel is highly flammable. Handle fuel with care. Keep open flame or sparks away from fuel.

Refueling

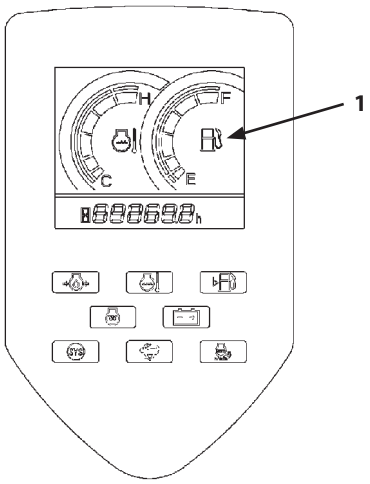
After parking the machine on a level surface, check the fuel level with fuel gauge (1) and level gauge (2). When necessary to add fuel, remove fuel tank cap (3) and refill fuel.

1. To avoid condensation, fill the tank at the end of each day's operation. Take care not to add more fuel than the specified level.

	Fuel Tank Capacity
ZX29U-3, 33U-3, 38U-3	40 L (10.6 US gal)
ZX48U-3, 52U-3	70 L (18.5 US gal)

2. After refilling fuel, close tank cover (4). Be sure to lock cover (4) to prevent vandalism.

IMPORTANT: Take care not to allow water and/or dirt to enter the fuel system when refilling fuel.



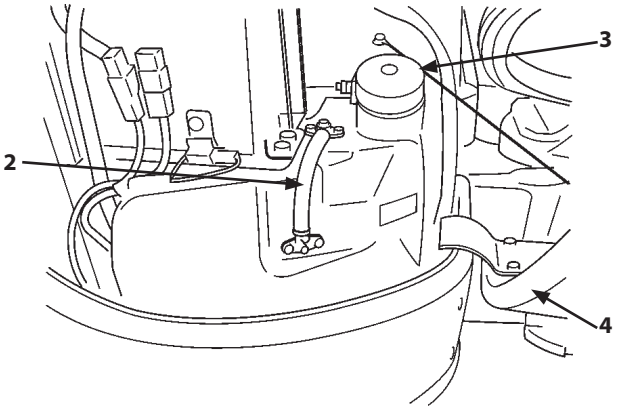
M1NE-01-015

Bleed Air from Fuel System

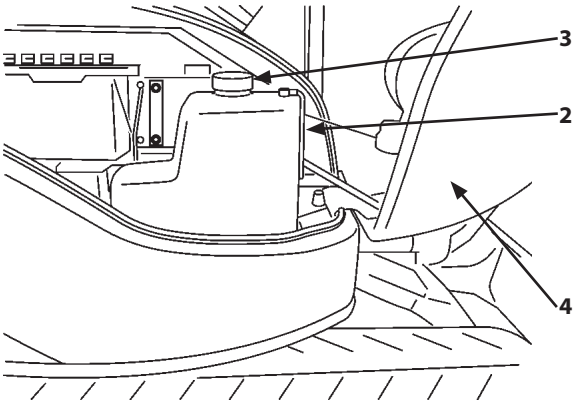
Air in the fuel system will cause the engine to start hard and/or run roughly. Be sure to bleed air from the system after replacing the fuel filter or draining the tank.

Automatic bleeding device is provided on this machine.

1. Confirm that the fuel level is more than one-half of the tank capacity. If the fuel level is lower, automatic bleeding device will not operate. Add fuel.
2. Turn the key switch ON and hold for 10 to 15 seconds.
3. Start the engine and check the fuel system for fuel leaks.



ZX29U-3, 33U-3, 38U-3 M1M7-07-039

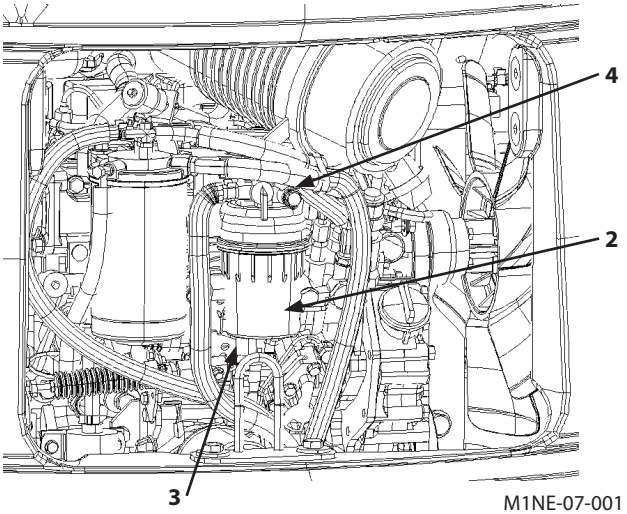


ZX48U-3, 52U-3 M1M7-03-004

1 **Check Water Separator**

--- daily

When water is accumulated in water separator (2), loosen drain plug (3) to drain water and sediments. If water is difficult to drain, loosen air bleed plug (4).

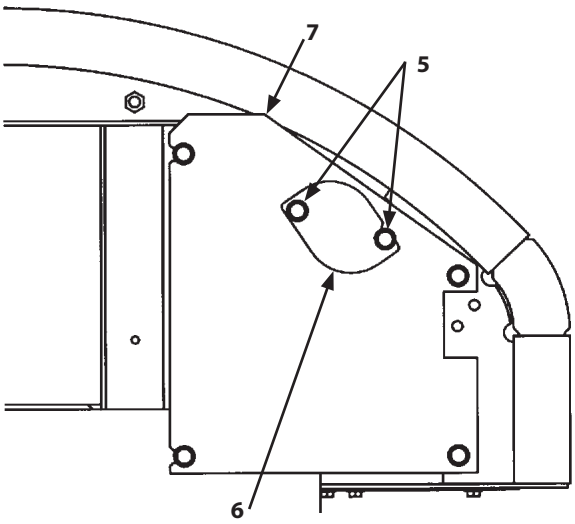


M1NE-07-001

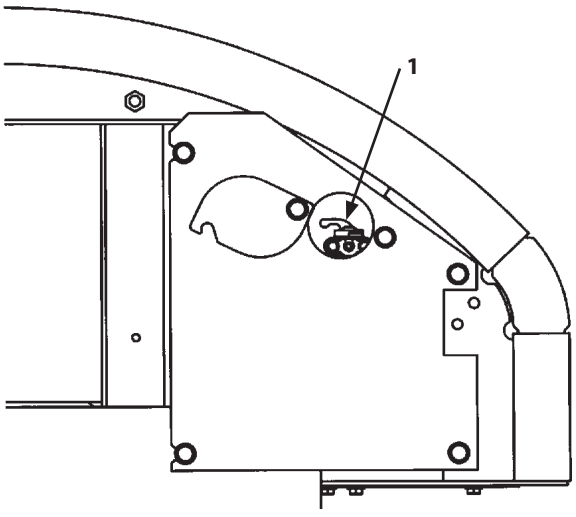
2 **Drain Fuel Tank Sump**

--- as required

Park the machine on a solid level surface. Loosen bolts (5) to remove drain valve cover (6) from right-front cover (7). Rotate drain valve cover (6) to open the checking port. Open drain valve (1) on the bottom of the fuel tank and allow the water and sediments to drain from the fuel tank sump.



M1MF-07-032



M1MF-07-033

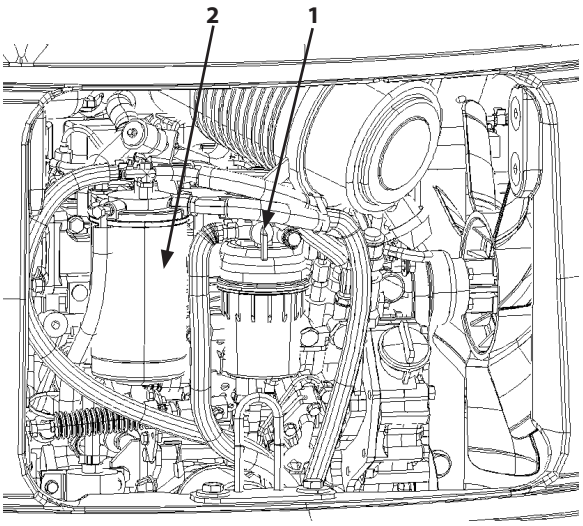
3 **Replace Fuel Filter**
--- every 500 hours

1. Close stop valve (1).
2. Remove fuel filter (2) with a fuel filter wrench.
3. Clean the mounting surface for fuel filter (2).
4. Install new fuel filter (2) while rotating fuel filter (2) clockwise until fuel filter (2) comes in contact with the mounting surface. Tighten fuel filter (2) about 1/2 turns more using the filter wrench.

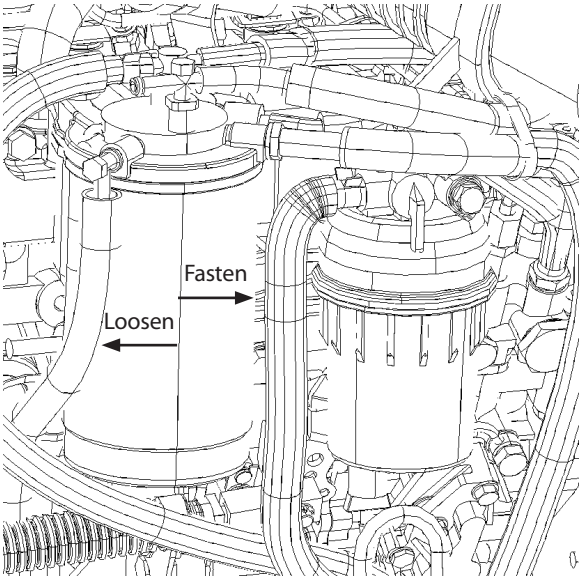
NOTE: Tightening torque: 12 to 16 N·m (1.2 to 1.6 kgf·m, 9 to 12 lbf·ft)

5. Open stop valve (1).
6. Turn the key switch ON and hold for 10 to 15 seconds.
7. Start the engine and check the fuel system for fuel leaks.

IMPORTANT: Be sure to use only genuine fuel filter (2). Failure to use genuine parts or replace fuel filter (2), the engine may be damaged.



M1NE-07-001



M1NE-07-002

4 **Check Fuel Hoses**

--- daily

--- every 250 hours

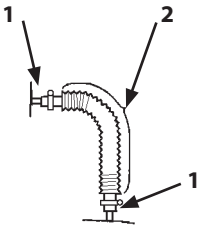
WARNING:

- **Escaping fuel may cause fire. Check for kinked hoses, or hoses that rub against each other and/or come in contact with other components, and any oil leaks.**
- **Repair or replace any loose or damaged hoses.**
- **Never install accurately bent or damaged hoses.**

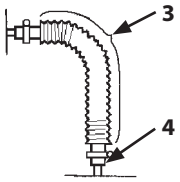
Check hoses for oil leaks and/or damage while referring to the following tables. If any abnormality is found, repair it as instructed in the remedy column.

Hoses

Interval (Hours)	Check Point	Abnormality	Remedy
Daily	Hose fittings	Leak (1)	Retighten or replace
	Soutache braid hose surface	Rubbed marks (2)	Replace
		Crack (2)	Replace
Every 250 hours	Soutache braid hose surface	Crack (3)	Replace
	Hose fittings	Crack (4)	Replace
	Hose	Acute bend (5)	Replace
		Collapse (6)	Replace
	Hose ends and fittings	Corrosion (7)	Replace



M137-07-003



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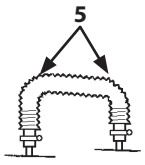

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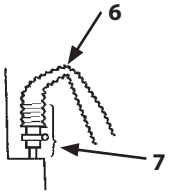


M137-07-006

F. Air Cleaner

1 **Clean Air Cleaner Element**

--- every 250 hours or when the restriction indicator comes ON

Replace Air Cleaner Element

--- after cleaning six times or after one year

Clean and replace air cleaner element (1)

1. Before servicing element (1), be sure to stop the engine.

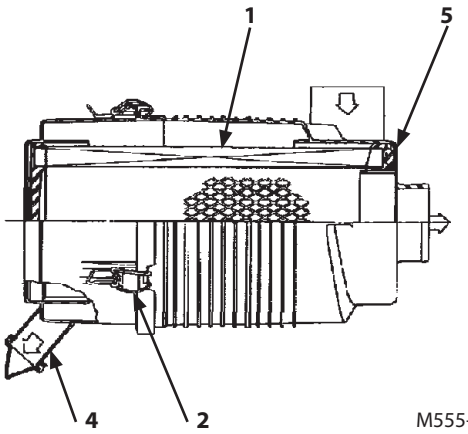
WARNING: Be sure to wear safety glasses or goggles before removing cover (3).

2. Loosen two clamps (2) to remove cover (3) and element (1).

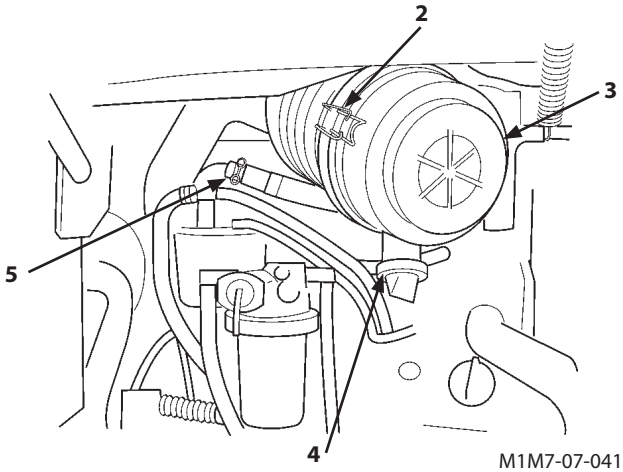
WARNING: Wear safety glasses or goggles when using compressed air pressure [less than 0.2 MPa (2 kgf/cm^2, 29 psi)].

IMPORTANT:
- **Clean cover (3) to prevent dirt or water from entering the air cleaner suction port. If water enters the air cleaner suction port, damage to the engine may result.**
- **When cleaning, do not hit element (1) or force element (1) to collide against other object.**

3. Clean element (1) by blowing compressed air pressure [less than 0.2 MPa (2 kgf/cm^2, 29 psi)] from the inside of element (1). After cleaning, be sure to check element (1) for damage. If any damage is found, replace element (1) with a new one.
4. If restriction indicator (5) comes ON immediately after cleaning element (1) even though cleaning is less than six times, replace element (1) with a new one.
5. When installing cover (3), position cover (3) so that valve (4) faces downward. Then, tighten cover (3) with clamps (2) in the specified position.

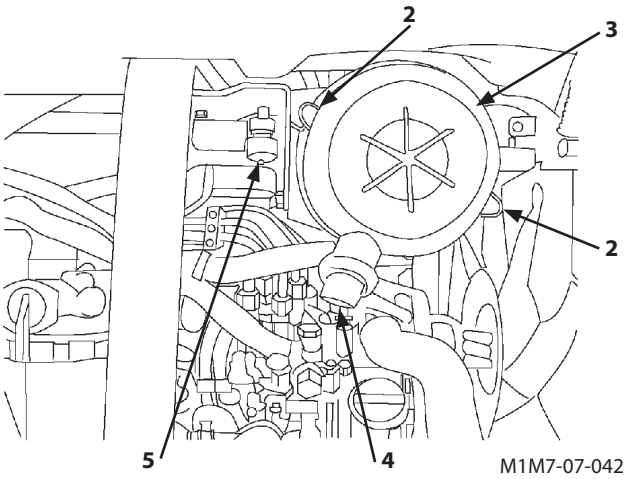


M555-07-023



M1M7-07-041

ZX29U-3, 33U-3, 38U-3



M1M7-07-042

ZX48U-3, 52U-3

G. Cooling System

NOTE: When a new machine is shipped from the Hitachi factory, the cooling system is filled with a mixture of water and genuine Hitachi Long-Life Coolant (LLC).

Coolant

Use fresh soft water which includes fewer impurities for the coolant. Avoid using strong acid, alkaline, hard or natural water. Be sure to use genuine Hitachi long life coolant (LLC).

IMPORTANT: Use soft water for the coolant. Avoid using strong acid or alkaline water, hard or natural water. Be sure to use genuine Hitachi long life coolant (LLC). If genuine Hitachi long life coolant (LLC) is not available, use only long life coolant (LLC) with quality specified in JIS K-2234, SAE J814, SAE J1034, ASTM D3306. Always use long life coolant (LLC) mixed with soft water.

Long Life Coolant (LLC)

LLC has two functions, antifreeze and anti-rust agent. As a general rule, the ratio of antifreeze should range between 30 % and 60 %. If the ratio is below 30 %, the system may develop rust, and if it is above 60 % the engine may overheat.

NOTE: As for Borax Coolant, the mixed ratio, 50 % is recommended for anti-rust.

LLC Mixing Ratio

Mixing ratio	%	30	35	40	45	50
Air temperature	°C	–10	–15	–20	–25	–30
	(°F)	(14)	(5)	(–4)	(–13)	(–22)

Precautions for Handling LLC

WARNING: LLC is poisonous.

1. If ingested, induce vomiting and immediately get emergency medical attention.
2. If antifreeze is accidentally splashed in the eyes, sufficiently flush the eyes with water and get emergency medical attention.
3. When storing antifreeze, be sure to keep it in a clearly marked container with tight closing lid. Always keep antifreeze out of the reach of children.
4. Keep open flame or sparks away from LLC.
5. When disposing LLC, comply with local regulations.

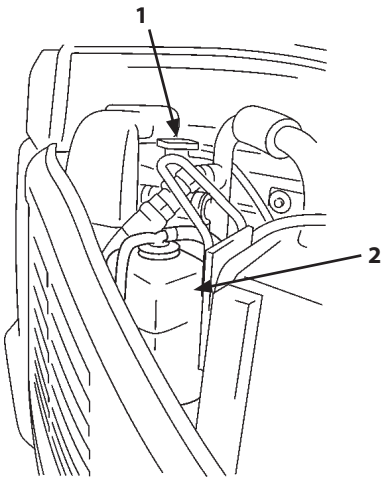
1 **Check Coolant Level**

--- daily

Check that the coolant level is between the FULL and LOW marks on coolant reservoir (2). If the coolant level is below the low mark, remove the reservoir cap and add coolant to coolant reservoir (2).

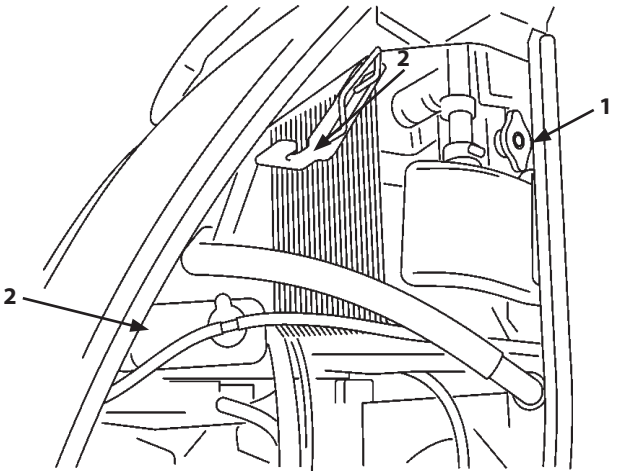
WARNING: Do not loosen radiator filler cap (1) unless the system is cool. Hot steam may escape, possibly causing severe burns. Loosen cap (1) slowly to the stop after the coolant becomes cool. Release all pressure before removing cap (1).

If coolant reservoir (2) is empty, add coolant through radiator cap (1).



M1M7-07-043

ZX29U-3, 33U-3, 38U-3



M1M7-07-044

ZX48U-3, 52U-3

2 **Check and Adjust Fan Belt Tension**

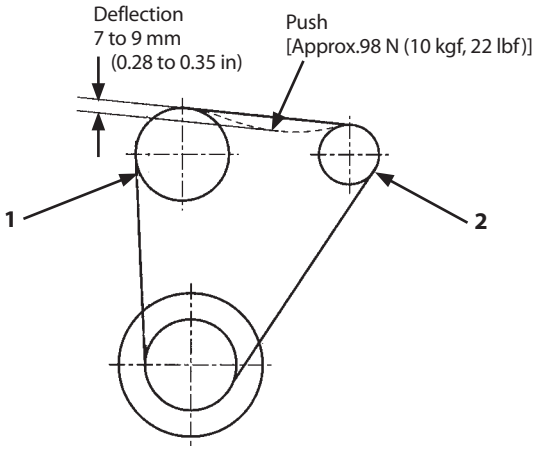
--- every 100 hours (first time after 50 hours)

IMPORTANT: Loose fan belt tension may result in insufficient battery charging, engine overheating as well as a rapid, abnormal belt wear. Belts that are too tight, however, can damage both water pump and alternator bearings, and belts.

Check

Check fan belt tension by depressing the fan belt mid-point with the force [approx. 98 N (10 kgf, 22 lbf)] of thumb. Deflection must be 7 to 9 mm (0.28 to 0.35 in) at a mid point between fan pulley (1) and alternator pulley (2).

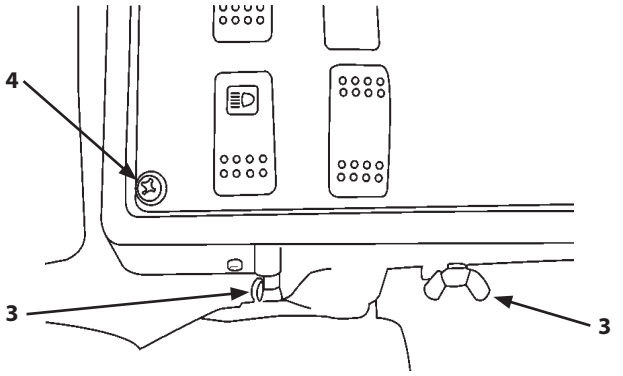
In addition, check the fan belt for any damage. If the belt has any cracks, replace the belt with a new one.



M589-07-014

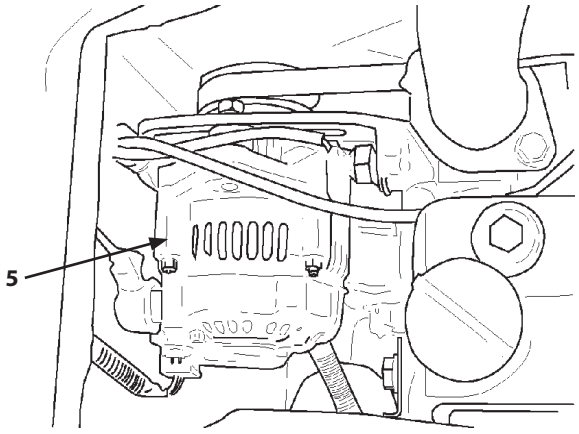
Adjustment of Fan Belt Tension

1. Remove wing bolts (3) from the right side of the seat and switch box (4) to open the inspection door.
2. Loosen mounting bolts (6) of alternator (5).
3. Move alternator (5) to correctly adjust the fan belt tension.
4. Securely tighten bolts (6).

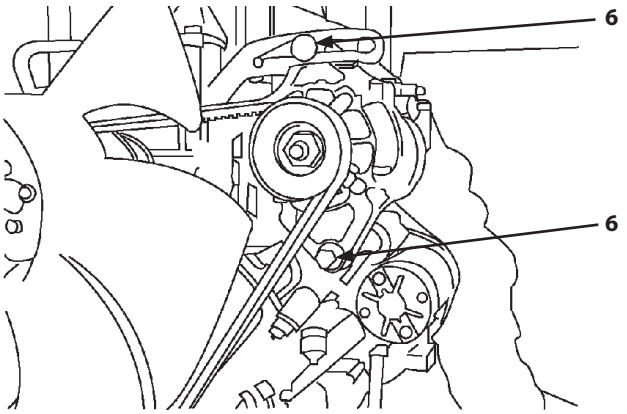


M1M7-07-045

IMPORTANT: When a new belt is installed, the new belt is difficult to be correctly seated from the beginning. Be sure to readjust the tension after operating the engine for 3 to 5 minutes at slow idle speed.



M1M7-07-046



M1M7-07-047

3 **Change Coolant**

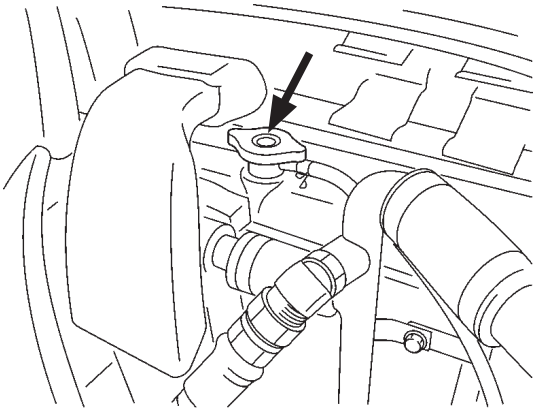
--- twice a year (in spring and autumn)

NOTE: In case genuine Hitachi Long-Life Coolant is used, change the coolant every two years (in autumn every other year), or every 2000 hours, whichever comes first.

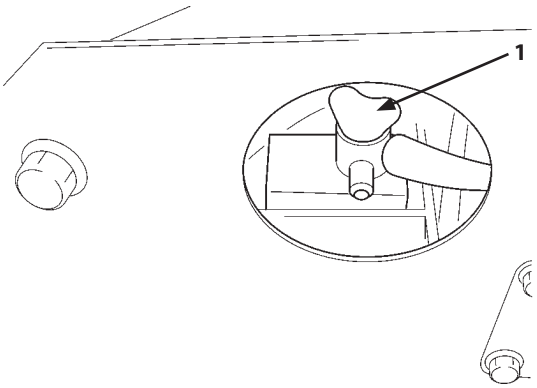
WARNING: Do not loosen the radiator cap unless the system is cool. Hot steam may escape, possibly causing severe burns. Loosen the radiator cap slowly to the stop after the coolant becomes cool. Release all pressure before removing the cap.

Procedure of Coolant Change

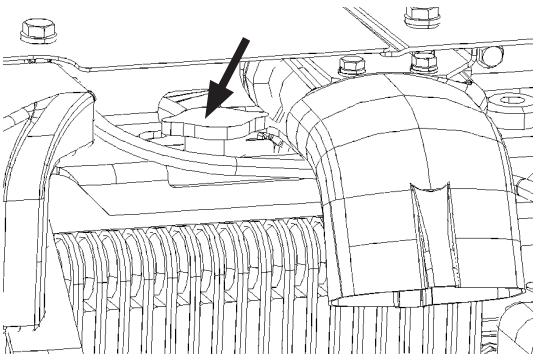
1. Remove the radiator cap. Open drain cock (1) on the radiator and drain the drain valve on the water jacket to allow the coolant to drain completely. Drain impurities such as water scale at the same time.
2. Close radiator drain cock (1) and the drain valve on the water jacket. Fill the radiator with fresh water and a radiator cleaner agent. Start the engine and run it at a speed slightly higher than slow idle to raise the coolant temperature until the first two segments come ON. Then, run the engine further for about ten minutes.
3. Stop the engine and open radiator drain cock (1) to allow the coolant to drain. Flush out the cooling system with fresh water, until draining water becomes clear. This helps remove water scale.
4. Close radiator drain cock (1). Fill the radiator with fresh water and LLC at the specified mixing ratio. When adding coolant, do so slowly to avoid mixing air bubbles in the system. Run the engine to sufficiently bleed the air from the cooling system.
5. After adding coolant, operate the engine for several minutes. Check the coolant level again, and add coolant if necessary.



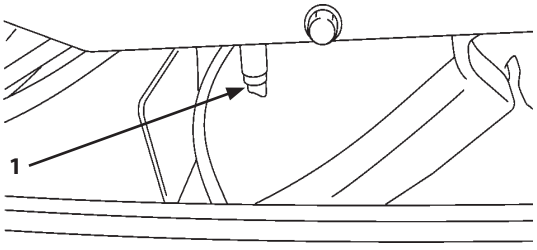
ZX29U-3, 33U-3, 38U-3 M1M7-07-048



ZX29U-3, 33U-3, 38U-3 M1M7-07-049



ZX48U-3, 52U-3 M1NE-07-003



ZX48U-3, 52U-3 M1M7-07-051

4 **Clean Radiator and Oil Cooler Core**

--- every 500 hours

WARNING: Always wear safety glasses or goggles when using compressed air [less than 0.2 MPa (2 kgf/cm^2, 29 psi)] to clean radiator core.

IMPORTANT:

- **Cover air cleaner inlet opening to prevent entry of dust and water while cleaning the radiator.**
- **High-pressure air [less than 0.2 MPa (2 kgf/cm^2, 29 psi)] or water can damage radiator fins. Keep the pressure nozzle 500 mm (19.7 in) or more away from the core face.**

The radiator and the oil cooler are arranged in series. In case dust or dirt should become stuck to the radiator core, clean the radiator with compressed air and/or water to maintain the cooling ability of the cooling system.

5 **Clean Air Conditioner Condenser**

--- every 500 hours

IMPORTANT: When operating the machine in a dusty environment, check the air conditioner condenser every day for dirt and clogging. If clogged, remove, clean and reinstall the air conditioner condenser.

H. Electrical System

IMPORTANT:

- **Improper radio communication equipment and associated parts, and/or improper installation of radio communication equipment effect the machine's electronic parts, causing involuntary movement of the machine. Also, improper installation of electrical equipment may cause machine failure and/or a fire on the machine. Be sure to consult your authorized dealer when installing radio communication equipment or additional electrical parts, or when replacing electrical parts.**
- **Never attempt to disassemble or modify the electrical/electronic components. If replacement is required, consult your authorized dealer.**

1 Battery

WARNING: Battery generates explosive gas during operation or charge. Keep sparks and flames away from battery.

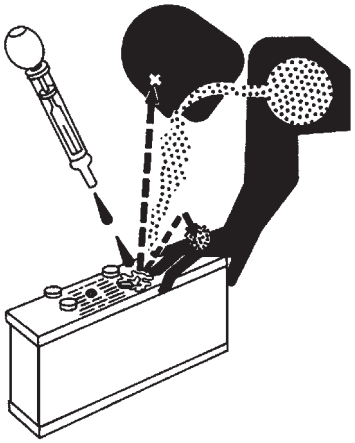
Do not continue to use or charge the battery when the electrolyte level is lower than specified. Explosion of the battery may result.

Charge battery in a well-ventilated area. Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

SA-032

IMPORTANT: If the battery is used with the electrolyte level lower than the specified low level, the battery may deteriorate quickly.

IMPORTANT: Do not refill electrolyte more than the specified upper level. Electrolyte may spill, damaging the painted surfaces and/or corroding other machine parts.



SA-036

NOTE: In case electrolyte is refilled more than the specified upper level line or beyond the bottom end of the sleeve, remove the excess electrolyte until the electrolyte level is down to the bottom end of the sleeve using a pipette. After neutralizing the removed electrolyte with sodium bicarbonate (Baking powder), flush with plenty of water, otherwise, consult the battery manufacturer.

Electrolyte Level Check--- every month

Check the electrolyte level at least once a month.

1. Park the machine on level ground and stop the engine.
2. Check the electrolyte level.

   2.1 When checking the level from the battery side:

   Clean around level check lines with a wet towel. Do not use a dry towel. Static electricity may be developed, causing the battery gas to explode. Check if the electrolyte level is between U.L (Upper level) and L.L (Lower level). In case the electrolyte level is lower than the middle level between the U.L and L.L, immediately refill distilled water or commercial battery fluid. Be sure to refill with distilled water before recharging (operating the machine). After refilling, securely tighten the filler plug.

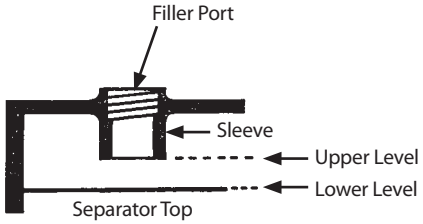
   2.2 When it is impossible to check the level from the battery side or no level check mark is indicated on the side:

   After removing the filler plug from the top of the battery, check the electrolyte level by viewing through the filler port. It is difficult to judge the accurate electrolyte level in this case. Check if the electrolyte surface touches the bottom end of the sleeve or not according to the right illustrations. When the electrolyte surface is lower than the bottom end of the sleeve, refill with distilled water or commercial battery fluid up to the bottom end of the sleeve. After refilling, securely tighten the filler plug.

   2.3 When an indicator is available to check the level, follow its check result.

3. Always keep the vicinity around the battery terminals clean to prevent battery discharge. Check battery terminals for looseness and rust. Coat terminals with grease or petroleum jelly to the terminals to prevent corrosion.

M146-07-109



M146-07-110

Proper

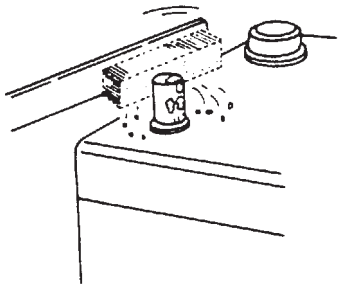
Since the electrolyte surface touches the bottom end of the sleeve, the electrolyte surface is raised due to surface tension so that the electrode ends are seen curved.

M146-07-111

Lower

When the electrolyte surface is lower than the bottom end of the sleeve, the electrode ends are seen straight.

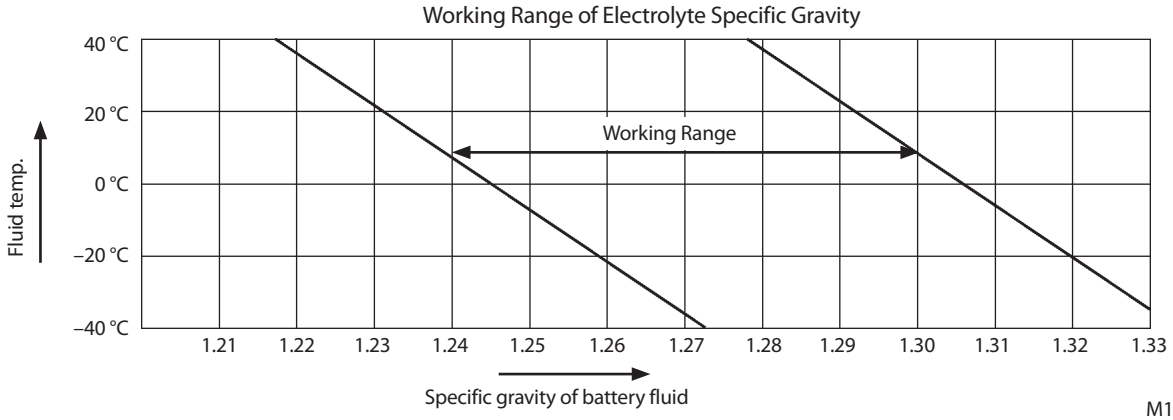
M146-07-112



M409-07-072

Check Electrolyte Specific Gravity--- every month

The specific gravity for electrolyte varies depending on electrolyte temperature. The specific gravity should be kept within the range shown below. Charge the battery if the specific gravity is below the limit.



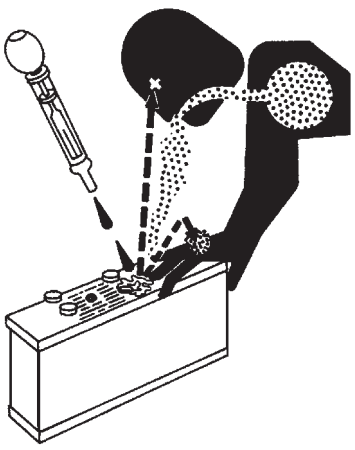
M104-07-054

NOTE: Check the specific gravity of electrolyte after it is cooled to air temperature. As electrolyte temperature changes immediately after operation, correct measurement can be difficult.

Precautions for Handling Battery

- If electrolyte spills on your skin or clothes, immediately flush the spilled skin or clothes with water. Then, sufficiently wash them with soapy water. If electrolyte splashes in eyes, flush your eyes with water for 10 to 15 minutes. Get medical attention immediately.
- Do not use fire hazards such as matches or tobacco, or do not allow sparks to fly near the battery.
- Perform battery maintenance only after turning the key switch OFF and removing the battery caps.
- Touching the battery soon after operation is hazardous. Wait for the battery to cool.
- During charging, battery generate flammable hydrogen gas. Remove the battery from the base machine. Then, charge the battery in a well-ventilated area only after removing the caps.
- When disconnecting the battery terminals, be sure to disconnect the negative (ground) terminal first, and when reconnecting the battery terminals, reconnect the negative (ground) terminal last. If a conductor such as a metal tool is placed between the battery positive terminal and the vehicle frame with the battery negative terminal kept connected to the vehicle frame, electric short circuit may occur, possibly creating a hazardous situation.
- Loosely tightened terminals may cause sparks to fly. Securely tighten the terminals.

SA-032



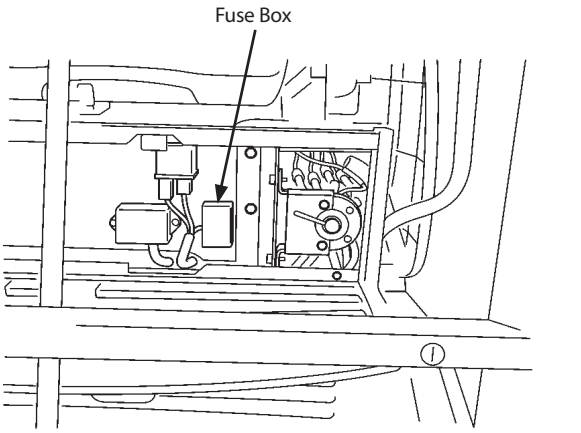
SA-036

2 Replacing Fuses

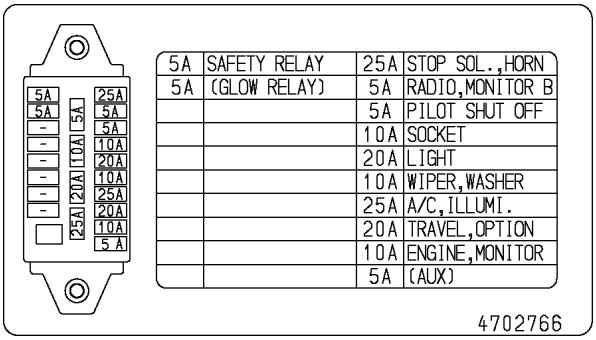
1. If any electrical equipment fails to operate, first check the fuses in the fuse box.
2. One each capacity of spare fuses are provided in the fuse box.

IMPORTANT: Be sure to install fuses with correct amperage ratings to prevent electrical system damage due to overload.

5A	SAFETY RELAY	25A	STOP SOL., HORN
5A	[GLOW RELAY]	5A	RADIO, MONITOR B
		5A	PILOT SHUT OFF
		10A	SOCKET
		20A	LIGHT
		10A	WIPER, WASHER
		25A	A/C, ILLUMI.
		20A	TRAVEL, OPTION
		10A	ENGINE, MONITOR
		5A	[AUX]



M1M7-07-052



M1NE-07-004

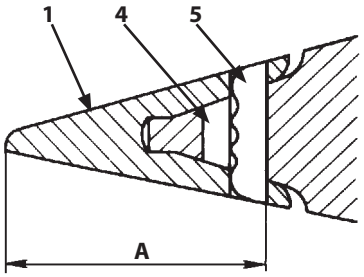
I. Miscellaneous

1 **Check Bucket Teeth for Looseness and/or Wear --- daily**

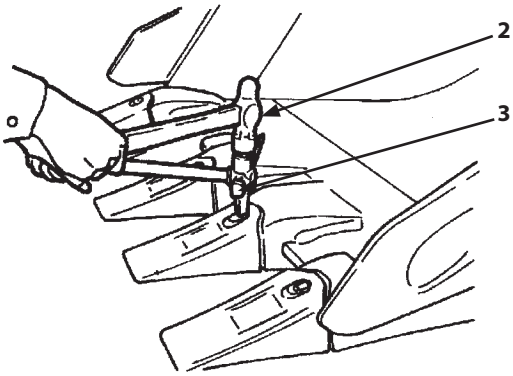
Check bucket teeth (1) for wear and looseness.

Replace teeth (1) if tooth wear exceeds the service limit shown below.

Dimension A in mm (in.)	
New	Limit of Use
128 (5.0″)	65 (2.6″)



M104-07-056

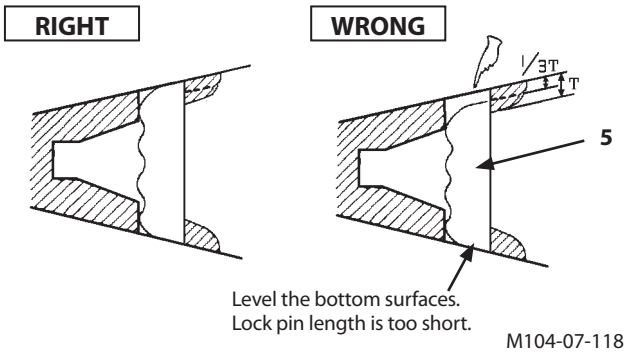


M589-07-017

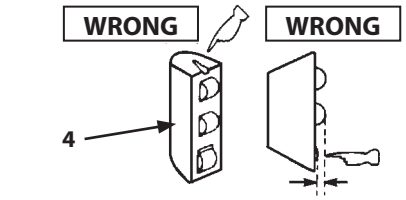
WARNING: Guard against injury from flying pieces of metal. Use safety equipment such as a hard hat and safety glasses.

Procedure of Bucket Teeth Change

1. Use hammer (2) and drift (3) to drive out locking pin (5). Be careful not to damage rubber pin lock (4) while removing locking pin (5).
2. Inspect locking pin (5) and rubber pin lock (4) for any damage, replace it necessary. Short locking Pins (5) and damaged rubber pin lock (4) must be replaced with new ones.

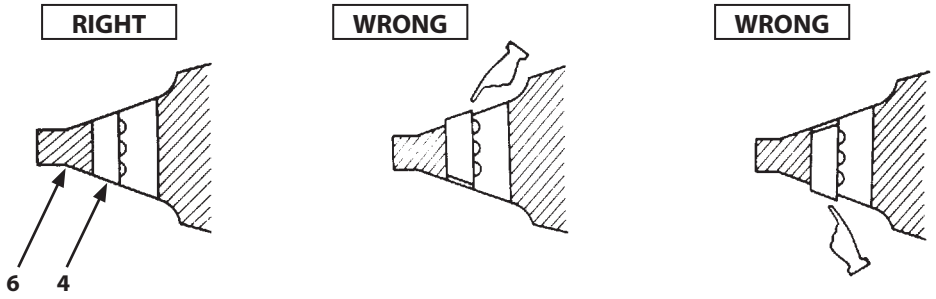


M104-07-118
M104-07-058



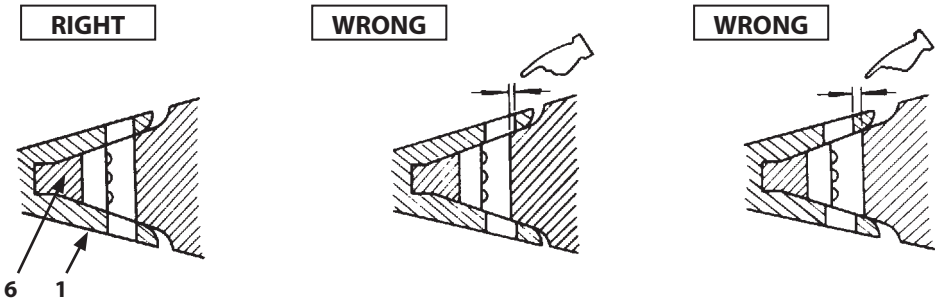
M104-07-059

3. Clean shank (6) surface.
4. Install rubber pin lock (4) into shank (6) hole as shown.



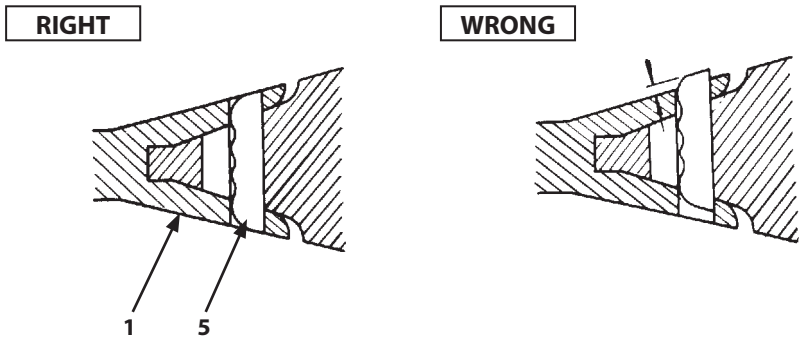
M104-07-060

5. Position new tooth (1) over shank (6).



M104-07-061

6. Drive locking pin (5) fully into the hole as shown.



M104-07-062

2 **Replace Bucket**

--- as required

WARNING: When driving the connecting pins in or out, guard against injury from flying pieces of metal or debris; wear a hard hat, goggles or safety glasses, heavy gloves and safety equipment appropriate for the job.

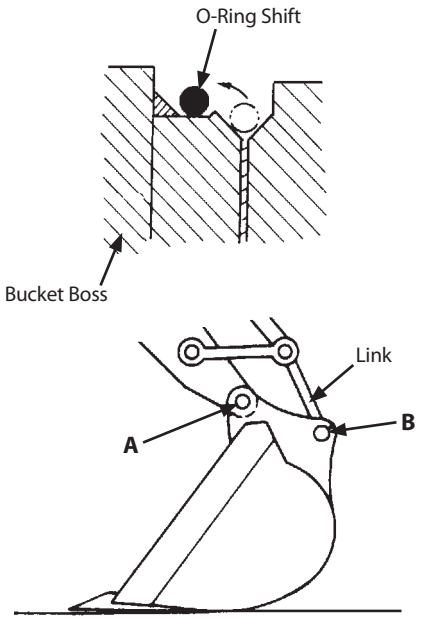
Select a spacious job site with good footing. Start working only after ensuring the safety of other personnel around the machine. Avoid quick operation of the front attachment. Give the highest priority to safety when engaging in teamwork by strictly exchanging safety signs.

Removal

1. Park the machine on a level surface. Lower the bucket to the ground and position it with the flat surface resting on the ground. Be sure the bucket will not roll when the pins are removed.
2. Slide the O-rings out of the specified position to the bucket boss side.
3. Remove bucket pins A and B to separate the arm and bucket.

Installation

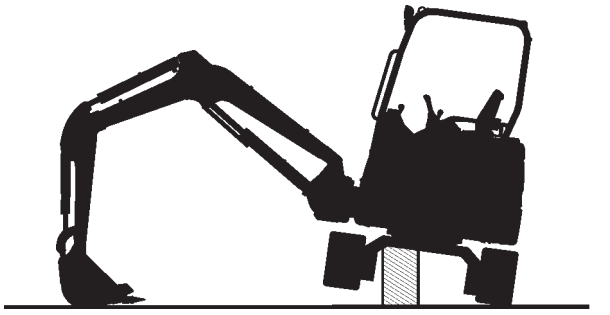
1. Clean the removed pins and pin bores. Apply sufficient grease to the pins and pin bores.
2. Place a new bucket in a stabilized position.
3. Join the arm to hole A and the link to hole B with pins.
4. Securely install the lock washers to all pins.
5. Reinstall the sealing O-ring to the specified position.
6. Apply grease to all pin joints.
7. Start the engine and run it at slow idle. Slowly operate the bucket in both directions to check for any interference in bucket movement.



M104-07-063

3 Adjust Track Sag (Rubber Crawler) and Check for Damage

--- daily



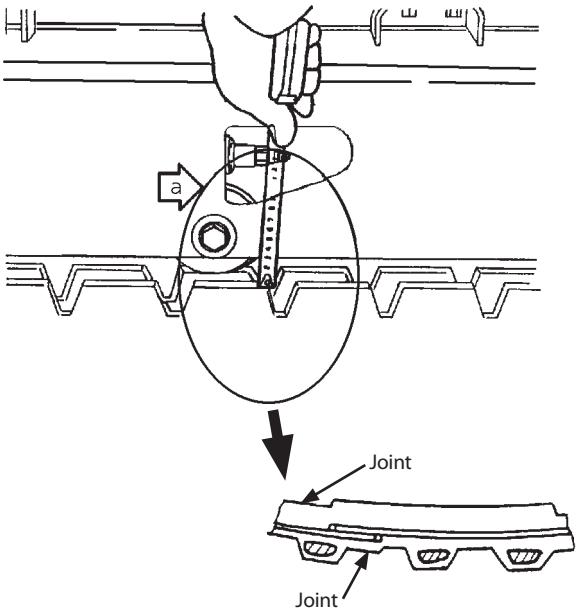
M1M7-04-006

Proper track sag adjustment is necessary to extend the service life of the rubber track and the travel device.

Check Track Sag

As illustrated to the right, raise the one side track which sag is to be measured, off the ground. Place blocks under machine frame to support the machine. Rotate the rubber track so that the track joint is positioned at the upper center of the track. Measure distance (A) from the bottom of the lower roller tread to the inner ridge of the rubber track.

		Dimension
Track Sag Specifications	A in mm (in)	10 to 15 (0.39 to 0.59)



M588-07-055

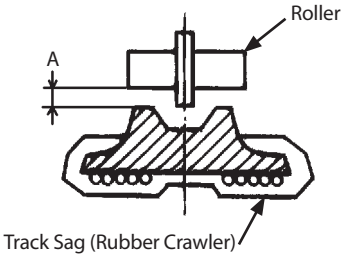
M102-07-075

Adjusting Track Sag

1. If track sag is not within specifications, loosen or tighten the track following the procedures shown on the next page.
2. Before adjusting track sag, lower the bucket and blade to the ground to raise one track off the ground. Be sure to place blocks under machine frame to support the machine.
3. After adjusting track sag of both tracks, run the tracks back and forth several times to equalize the track sag on both side tracks.
4. After doing so, check track sag again. If track sag is not within specifications, repeat adjustment until the correct sag is obtained.

Check Rubber Track for Damage

Check the rubber track for damage. If any, consult your authorized dealer for repair.



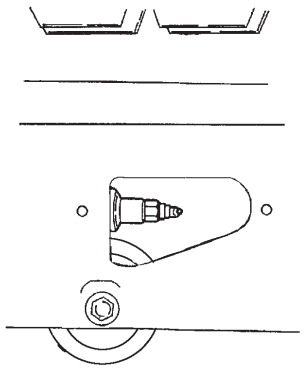
M503-05-050

Loosen Track (Rubber Crawler)

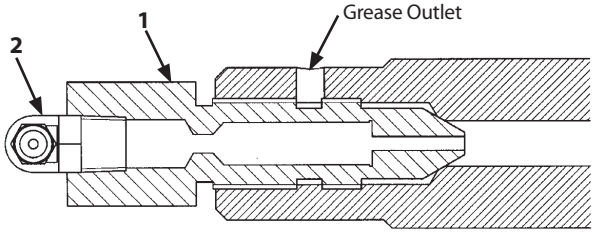
WARNING: Do not loosen valve (1) too quickly or too much as high-pressure grease in the adjusting cylinder may spout out. Loosen carefully, keeping body parts and face away from valve (1). Never loosen grease fitting (2).

IMPORTANT: When gravel or mud is packed around the components in the undercarriage, remove it before loosening valve (1).

1. To loosen track, slowly turn valve (1) counterclockwise using a socket wrench (long socket 19); grease will escape from grease outlet.
2. Between 1 and 1.5 turns of valve (1) are sufficient to loosen track. Never attempt to loosen valve (1) further.
3. If grease does not drain smoothly, raise the track to be loosened off the ground and slowly rotate the track.
4. When proper track sag is obtained, turn valve (1) clockwise and tighten it to 90 N·m (9 kgf·m, 65 lbf·ft).



M1LA-07-012

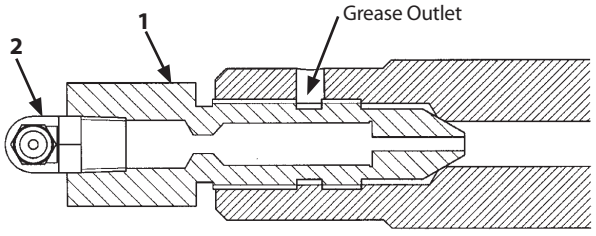


M1LA-07-036

Tighten Track (Rubber Crawler)

WARNING: In case the track sag is not adjustable, this is a very hazardous situation. Since the track adjuster spring is excessively loaded, the grease pressure inside the track adjuster cylinder is very high. Incorrect adjustment or disassembly may result in personal injury and/or death. Immediately consult your authorized dealer for repair.

To tighten track, connect a grease gun to cylinder grease fitting (2) located inside the side frame and add grease until the sag is within specifications.



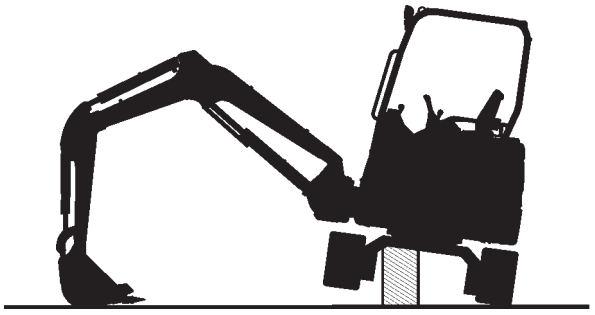
M1LA-07-036

4 **Replace Rubber Crawler**

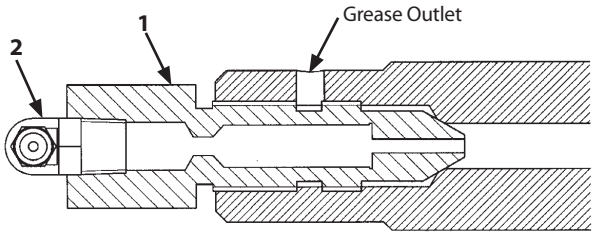
--- as required

WARNING:

- **Do not loosen valve (1) too quickly or too much as high-pressure grease in the adjusting cylinder may spout out. Loosen carefully, keeping body parts and face away from valve (1). Never loosen grease fitting (2).**
- **When removing the rubber track, do not allow anyone to stand in front of the front idler. During this procedure, the high power track adjuster may suddenly release the front idler with extreme force, potentially resulting in personal injury or death.**
- **After the rubber track is removed, the front idle will become free to remove. If the front idle comes off unexpectedly, personal injury and/or death may result. Be sure to remove the rubber track only after taking appropriate measures to prevent the front idler from coming off.**



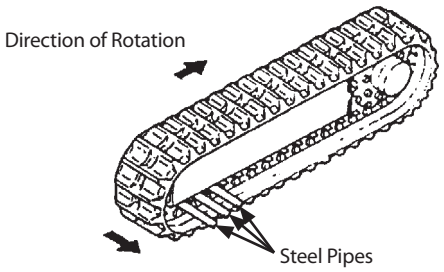
M1M7-04-006



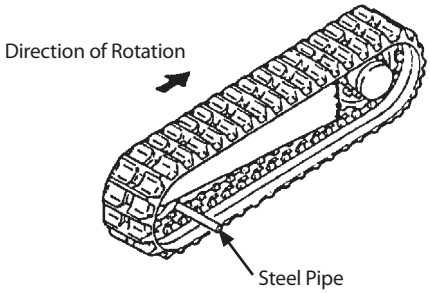
M1LA-07-036

Removing Rubber Crawler

1. Lower the bucket and blade to raise one track off ground, as shown. Place blocks under machine frame to support the machine.
2. Slowly turn valve (1) counterclockwise to allow grease to escape from the grease outlet.
3. Insert two or three steel pipes into the gaps among lower rollers, track frame and rubber track and slowly rotate the track in reverse to lift the rubber track off the idler. Apply horizontal force to pry the rubber track off the idler. Before completely removing the rubber track from the front idler, take an appropriate measure to prevent the front idler from coming off. Then, remove the rubber track.



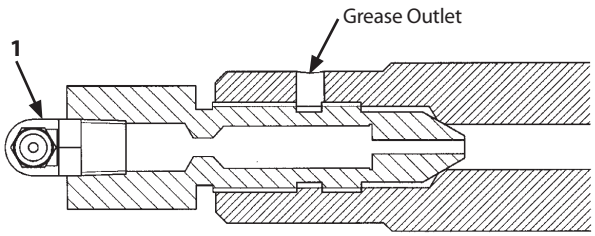
M503-07-062



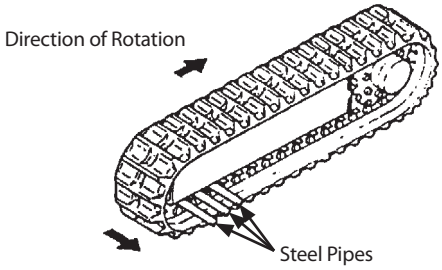
M503-07-063

Installing Rubber Crawler

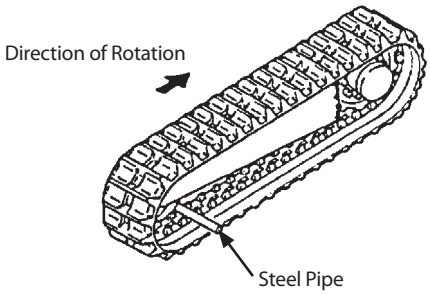
1. Lower the bucket and blade to raise one track off ground. Place blocks under machine frame to support the machine.
2. Slowly turn valve (1) counterclockwise to allow grease to escape from the grease outlet.
3. Engage the rubber track with the sprocket and position the other end of the rubber track on the front idler.
4. While rotating the sprocket in reverse, apply horizontal force to the rubber track to seat it on the idler.
5. Insert a steel pipe into gaps among lower rollers, track frame and rubber track and rotate the rubber track slowly to correctly seat the rubber track on the idler.
6. Confirm that the rubber track is correctly engaged with the sprocket and idler.
7. Adjust track sag. (See page 7-58.)
8. After checking that the rubber track is correctly engaged with the sprocket and idler and the track sag is correctly adjusted, lower the machine to the ground.



M1LA-07-036



M503-07-062



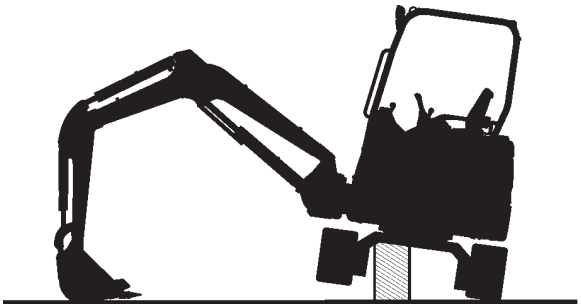
M503-07-063

5 Check Track Sag (Steel Crawler) (Optional) --- every 50 hours

Proper adjustment of track sag is vital to extending the service life of the track and travel device.

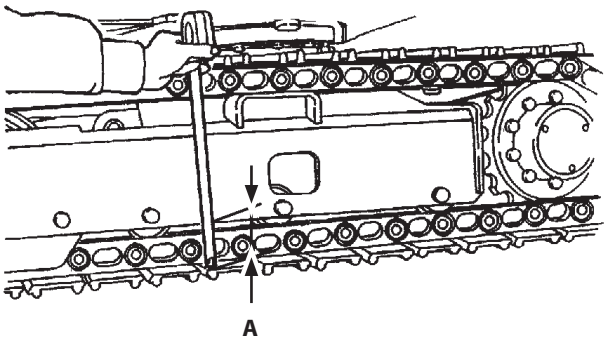
Check Track Sag

As illustrated to the right, raise the one side track, which sag is measured, off the ground. Place blocks under machine frame to support the machine.



M1M7-04-006

	Dimension	
Track Sag Specifications A in mm (in.)	ZX29U-3, 33U-3, 38U-3	120 to 140 (4.7 to 5.5)
	ZX48U-3, 52U-3	140 to 160 (5.5 to 6.3)



M588-07-062

NOTE:
- *Check track sag after thoroughly removing soil stuck on track area by pressure washing.*
- *When operating the machine on ground such as mud or gravel, these materials may easily become packed into the undercarriage, adjust the track sag so that it is slightly loose.*

Adjusting Track Sag

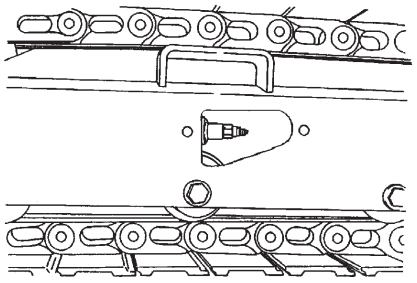
1. If track sag is not within specifications, loosen or tighten the track following the procedures shown on the next page.
2. When adjusting track sag, lower the bucket to the ground to raise one track off the ground. Repeat this procedure to raise the other track. Every time, be sure to place blocks under machine frame to support the machine.
3. After adjusting track sag of both tracks, move the machine back and forth several times to equalize the track sag on both side tracks.
4. After doing so, check track sag again. If track sag is not within specifications, repeat adjustment until the correct sag is obtained.

Loosen Track (Steel Crawler)

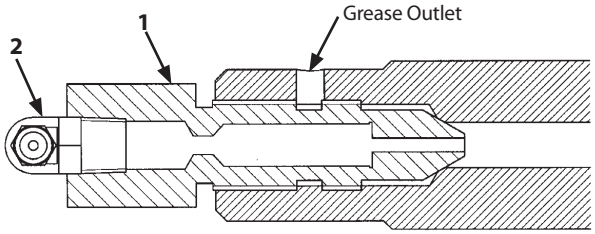
WARNING: Do not loosen valve (1) too quickly or too much as high-pressure grease in the adjusting cylinder may spout out. Loosen carefully, keeping body parts and face away from valve (1). Never loosen grease fitting (2).

IMPORTANT: When gravel or mud is packed around the components in the undercarriage, remove it before loosening valve (1).

1. To loosen track, slowly turn valve (1) counterclockwise using a socket wrench (long socket 19); grease will escape from grease outlet.
2. Between 1 and 1.5 turns of valve (1) are sufficient to loosen track. Never attempt to loosen valve (1) further.
3. If grease does not drain smoothly, raise the track to be loosened off the ground and slowly rotate the track.
4. When proper track sag is obtained, turn valve (1) clockwise and tighten it to 90 N•m (9 kgf•m, 65 lbf•ft).



M1LA-07-013

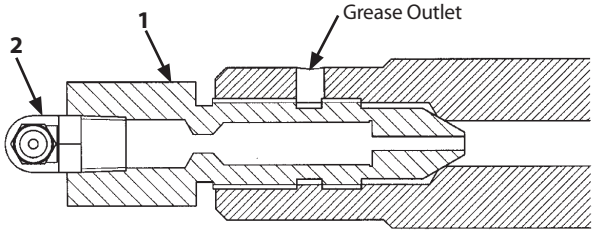


M1LA-07-036

Tighten Track (Steel Crawler)

WARNING: In case the track sag is not adjustable, this is a very hazardous situation. Since the track adjuster spring is excessively loaded, the grease pressure inside the track adjuster cylinder is very high. Incorrect adjustment or disassembly may result in personal injury and/or death. Immediately consult your authorized dealer for repair.

To tighten track, connect a grease gun to cylinder grease fitting (2) located inside the side frame and add grease until the sag is within specifications.



M1LA-07-036

Converting the Track

WARNING:

- **Consult your authorized dealer for converting the track. Extremely strong force is being applied. Do not allow anyone to stand in front of the front idler.**
- **After the rubber track is removed, the front idle will become free to remove. If the front idle comes off unexpectedly, personal injury and/or death may result. Be sure to remove the rubber track only after taking an appropriate measure to prevent the front idler from coming off.**

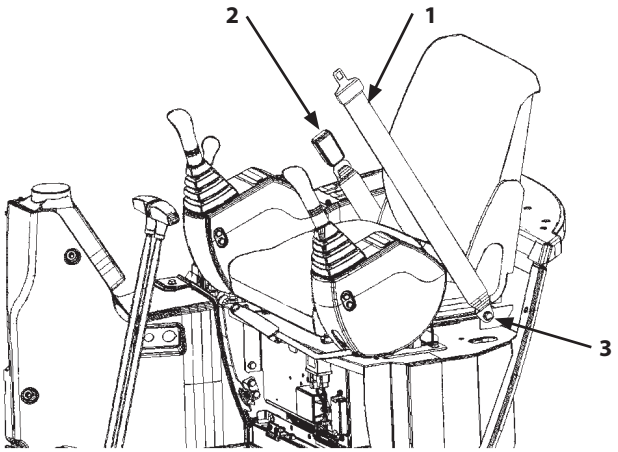
Consult your authorized dealer for converting the track. Change the track adjuster whenever converting the steel or rubber track.

6 **Check and Replace Seat Belt**

Check --- daily

Replacement --- every 3 years

Prior to operating the machine, thoroughly examine belt (1), buckle (2) and attaching hardware (3). If any item is damaged or materially worn, replace the damaged or worn item(s) before operating the machine.
Replace seat belt (1) every three years regardless of its apparent condition.



M1M7-07-012

7 **Check Air Conditioner (Machine with Cab)**

--- daily

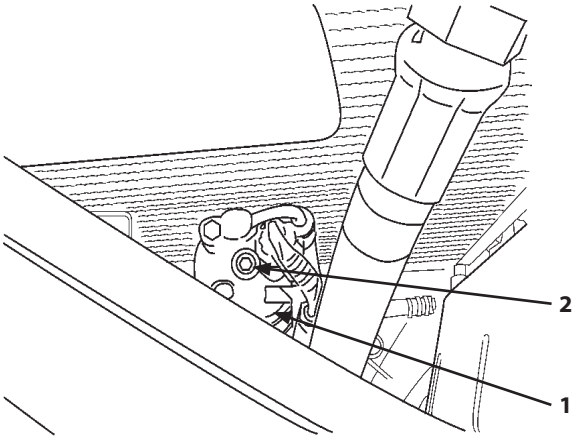
WARNING: If refrigerant splashes into eyes or spills onto skin, blindness or cold contact burn may result. Never loosen the refrigerant circuit parts.

Check for refrigerant leaking from the pipe joints

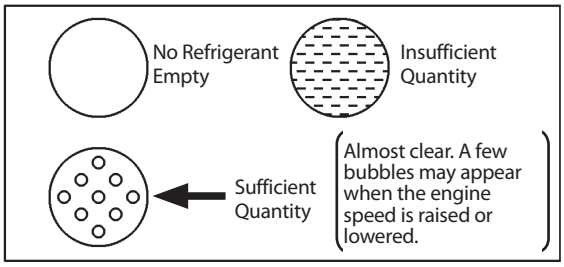
If an oil seepage mark is found at the pipe joints illustrated to the right, the refrigerant is possibly leaking.

Check the refrigerant level

After operating the air conditioner in the cooling mode for 2 to 3 minutes with the engine running at 1500 min^{-1} (rpm), check the refrigerant level through sight glass (inspection window) (2) on receiver dryer (1).
Kind: HFC134a Mass: 0.55±0.05 kg



M1M7-07-057



M107-01-050

Check the condenser

If the condenser surface is contaminated with foreign matter such as dust or dead insects, cooling performance may be reduced. Keep the condenser clean. (Refer to the descriptions for Clean Radiator in MAINTENANCE chapter.)

Check the compressor

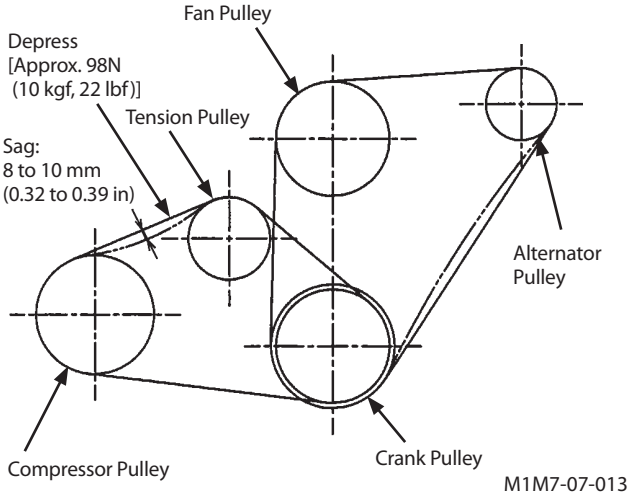
After operating the air conditioner for 5 to 10 minutes, touch both high and low pressure pipe lines with your hands. Normally, the high pressure side should be hot and the low pressure side should be cool.

Check each bolt for looseness

Check that the compressor mounting bolts and all other tightening bolts are securely tightened.

Check the compressor belts and fan belts

Check all belts for looseness and/or wear. Check compressor belt tension by depressing the midpoint between compressor pulley and crank pulley with the thumb. Deflection must be 8 to 10 mm (0.32 to 0.39 in) with a depressing force of approximately 98 N (10 kgf, 22 lbf).

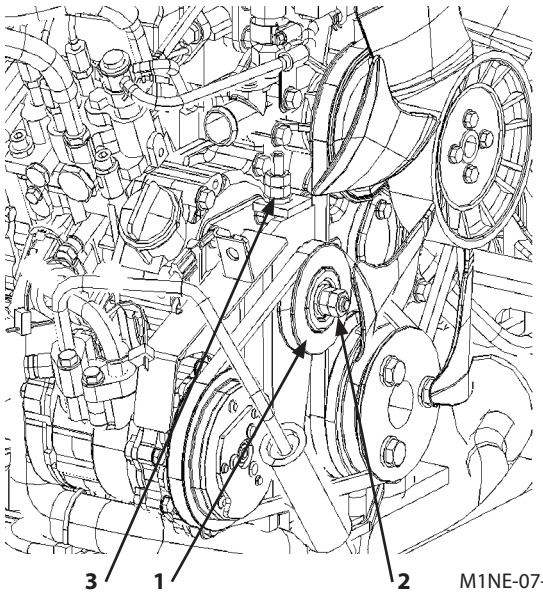


M1M7-07-013

Adjust compressor belt tension

If tension is not within specifications, loosen nut (2). Move tension pulley (1) by adjusting bolt (3) until tension is correct. Tighten nut (2) correctly.
Tightening torque: 41 to 50 N•m (4.1 to 5.0 kgf•m, 30 to 37 lbf•ft)

IMPORTANT: When a new belt is installed, be sure to re-adjust the tension after operating the engine for 3 to 5 minutes at slow idle speed to be sure that the new belt is seated correctly.



M1NE-07-005
Compressor Pulley

8 **Clean and Replace Air Conditioner Recirculation Filter**

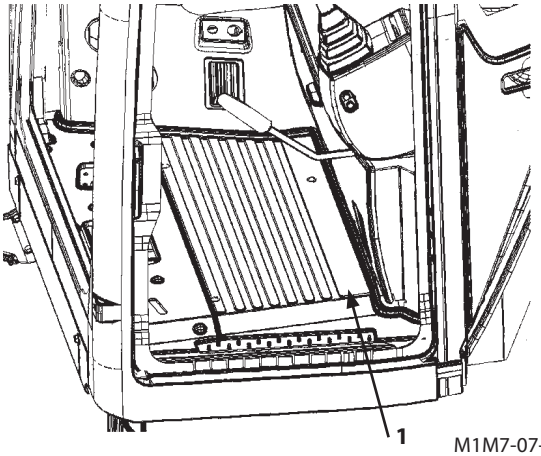
Clean Recirculation Filter --- every 500 hours

Replace Recirculation Filter --- after cleaning approx. 6 times

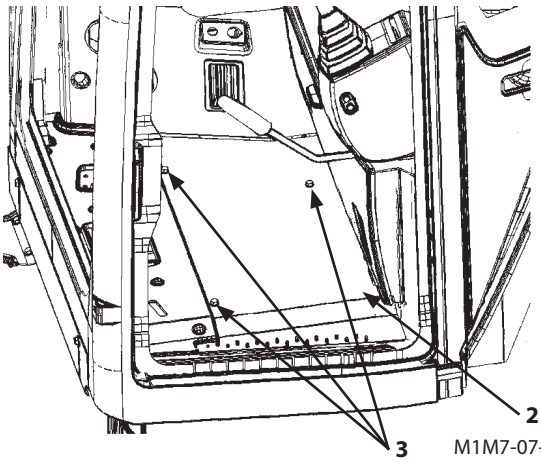
NOTE: The recommended maintenance hour is a reference value. In case the machine is operated in dusty job site, replace the filter at a shorter interval.

Removal of Recirculation Filter

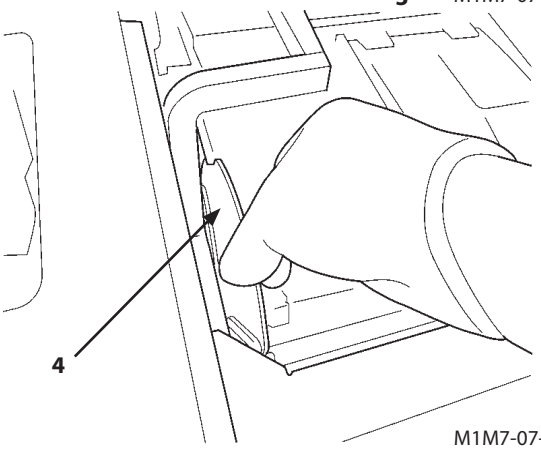
1. Remove floor mat (1). Remove bolts (3) to remove floor plate (2).
2. Grasp and pull the grips of recirculation filters (4, 5, and 6) upright to remove them.



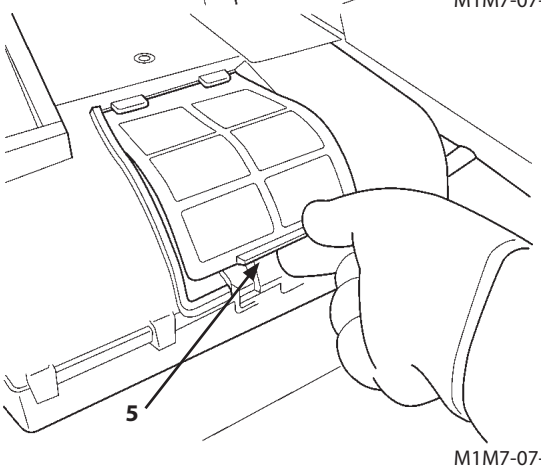
M1M7-07-014



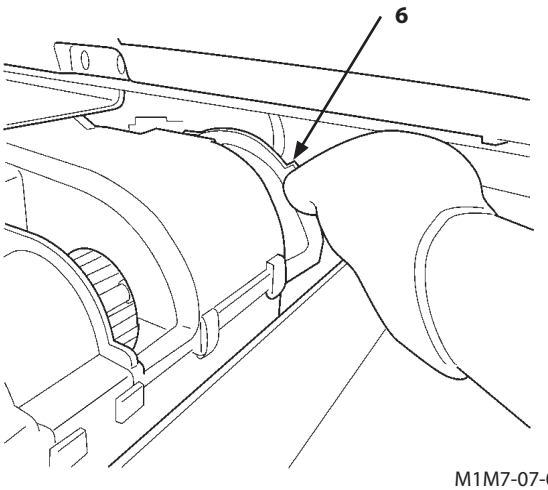
M1M7-07-015



M1M7-07-053



M1M7-07-054



M1M7-07-055

WARNING: Always wear safety glasses or goggles when using compressed air.

Cleaning

Clean the recirculation filter by blowing compressed air or with water.

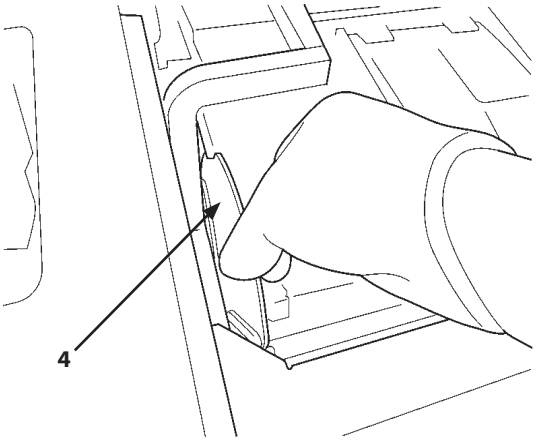
When cleaning the filter with water, follow the procedure below.

1. Clean the filter using tap water.
2. Hold the filter in water with a neutral detergent dissolved for about 5 minutes.
3. Clean the filter again with water.
4. Dry the filter.

Installation

Install the cleaned filters or new filters by following the removal procedure described on the previous page in the reverse order.

- Insert filters (4 and 6) into the grooves on both sides. Install filter (5) into the center duct.



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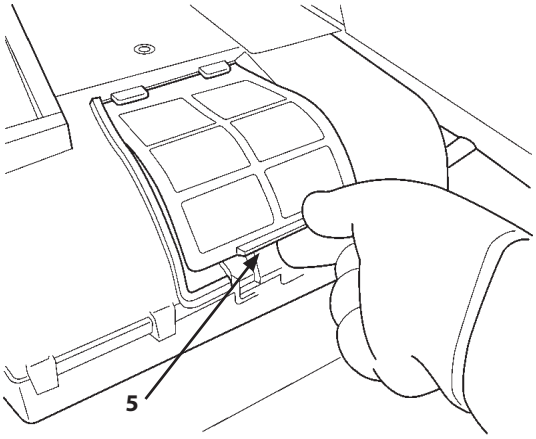

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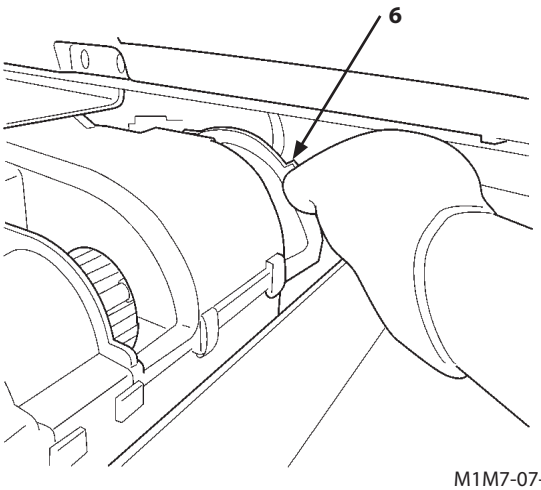
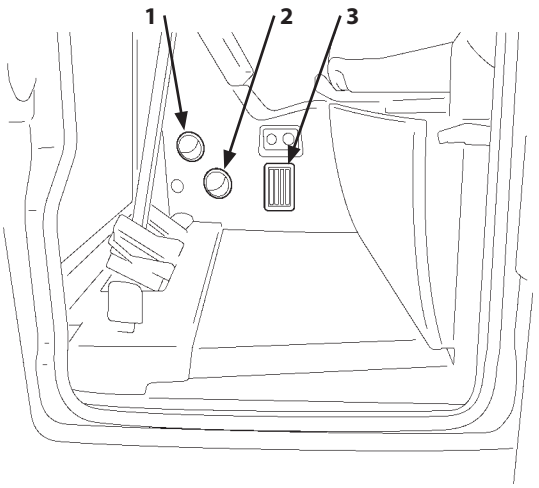


M1M7-07-055

9 **Clean Cab Floor**

--- as required

IMPORTANT: Only the cab floor can be washed with water. Take care not to splash other parts of the cab with water. Do not increase the water pressure speed by squeezing the hose end. Never use steam to clean the cab floor. Always clean the cab floor only after closing ducts (1, 2, and 3) to prevent water from entering the ducts (1, 2, and 3). Failure to do so may result in malfunction of the air conditioner.
If the box located under the seat is splashed with water, failure of the inside electrical parts may result.



M1M7-07-073

1. Park the machine on a level surface. Lower the bucket to the ground. Stop the engine.
2. Sweep the dust out of the cab floor and the pedals with a brush, or use a brush while directing water. (Sweep out the mud and dust with a brush as much as possible before applying water.)
3. When cleaning the floor mat, sweep out the dust and/or water along the grooves on the floor mat.
4. When cleaning the cab floor with the floor mat removed, remove only the rear mat. Then, sweep the dust and/or water through the steps.
5. In case the cab floor becomes seriously stained from using a lot of water when cleaning, check that no water has permeated into the air conditioner unit by removing the floor plates. In addition, clean the circulation air filter. If water permeation is recognized, run the blower at the maximum speed for several minutes until water drops disappear. Turn the air conditioner OFF at this time.

10 **Check, Clean and Function Check Injection Nozzle**
--- every 1500 hours

Consult your authorized dealer for inspection and repair.

11 **Check and Adjust Valve Clearance**
--- every 1000 hours

Consult your authorized dealer for inspection and repair.

12 **Check and Adjust Injection Timing**
--- every 1500 hours

Consult your authorized dealer for inspection and repair.

13 **Measure Engine Compression Pressure**
--- every 1000 hours

Consult your authorized dealer for inspection and repair.

14 **Check Starter and Alternator**
--- every 1000 hours

Consult your authorized dealer for inspection and repair.

15 **Check Crankcase Breather**
--- every 1500 hours

Consult your authorized dealer for inspection and repair.

16 **Check Radiator Cap**
--- every 2000 hours

Consult your authorized dealer for inspection and repair.

17 Check Tightening Torque of Bolts and Nuts (ZX29U-3, 33U-3, 38U-3) --- every 250 hours (first time after 50 hours)

Tighten or retighten all bolts and nuts to the torque values shown in the Table below. In addition, check bolts and nuts for looseness and omission. if any are loose or missing, be sure to retighten or supply new parts. Check tightness after the first 50 hours then every 250 hours.

No.	Descriptions		Bolt Dia. mm	Q'ty	Wrench Size mm	Torque N·m	Torque (kgf·m)	Torque (lbf·ft)
1.	Engine cushion rubber mounting bolt		12	4	19	90	(9)	(65)
2.	Engine bracket mounting bolt (Front)		10	8	17	50	(5)	(36)
3.	Hydraulic oil tank mounting bolt		12	4	19	90	(9)	(65)
4.	Fuel tank mounting nut		10	3	17	20	(2)	(15)
5.	Union joints for hydraulic hoses and pipes	Metal face seal fitting for hydraulic hoses and piping	7/16-20UNF		17	25	(2.5)	(18)
			9/16-18UNF		19	30	(3)	(22)
					22	40	(4)	(29)
			3/4-16UNF		27	65	(6.5)	(47)
			1-1/16-12UNF		36	180	(18)	(129)
			1-5/16-12UNF		41	210	(21)	(151)
		ORS	9/16 UNF		19	30	(3)	(22)
			11/16 UNF		22	70	(7)	(52)
			13/16 UNF		27	95	(9.5)	(69)
6.	Pump mounting bolt		12	2	19	90	(9)	(65)
7.	Pump cover mounting bolt		10	8	17	50	(5)	(36)
8.	Control valve mounting bolt		10	4	17	50	(5)	(36)
	Control valve base mounting bolt		10	4	17	50	(5)	(36)
9.	Swing device mounting bolt		14	6	22	140	(14)	(101)
10.	Battery mounting nut		6	3	10	5	(0.5)	(3.5)
11.	Canopy mounting bolt		12	5	19	90	(9)	(65)
			10	5	17	50	(5)	(36)
12.	Cab mounting bolt		12	5	19	90	(9)	(65)
			10	5	17	50	(5)	(36)
13.	Swing bearing mounting bolt	Upperstructure	12	22	19	110	(11)	(80)
		Undercarriage	12	20	19	110	(11)	(80)
14.	Travel device mounting bolt		12	24	19	110	(11)	(83)
15.	Sprocket mounting bolt		12	24	19	110	(11)	(83)
16.	Upper roller mounting bolt		16	2	24	270	(27)	(199)
17.	Lower roller mounting bolt		14	16	22	180	(18)	(130)
18.	Cover mounting bolt		6		10	5	(0.5)	(3.5)
			8		13	10	(1)	(7)
			10		17	50	(5)	(36)
19.	Counterweight mounting bolt		22	3	32	550	(55)	(398)
20.	Front pin lock plate bolts		10		17	50	(5)	(36)
			12		19	90	(9)	(65)
			14		22	140	(14)	(101)
			16		24	210	(21)	(152)
			18		27	400	(40)	(290)
21.	Side-cutter mounting bolt		14	6	22	180	(18)	(130)
22.	Track roller guard mounting bolt		14	12	22	180	(18)	(130)
23.	Tilt mechanism floor connection pin		10	1	17	50	(5)	(36)
24.	Tilt mechanism support-holding bolt		10	2	17	50	(5)	(36)
25.	Tilt mechanism support connection pin		8	1	13	10	(1)	(7)

IMPORTANT:
- **Before installing, clean the bolt and nut threads to remove soil, rust, and/or dust.**
- **When installing new bolts and/or nuts, apply lubricant (e.g. white zinc B dissolved into spindle oil) to the screw threads.**
- **Tighten bolts and nuts to the specifications. If tightened with excessively high or inadequate torque, missing or breakage of bolts and/or nut may result.**
- **In case the counterweight mounting bolts became loose, consult your authorized dealer for retightening.**

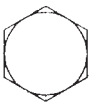
17 Check Tightening Torque of Bolts and Nuts (ZX48U-3, 52U-3) --- every 250 hours (first time after 50 hours)

Tighten or retighten all bolts and nuts to the torque values shown in the Table below. In addition, check bolts and nuts for looseness and missing parts. If any are loose or missing, be sure to retighten or supply new parts. Check tightness after the first 50 hours then every 250 hours.

No.	Descriptions		Bolt Dia. mm	Q'ty	Wrench Size mm	Torque N·m	Torque (kgf·m)	Torque (lbf·ft)
1.	Engine cushion rubber mounting bolt		12	4	19	90	(9)	(65)
2.	Engine bracket mounting bolt (Front)		10	8	17	50	(5)	(36)
3.	Hydraulic oil tank mounting bolt		12	4	19	90	(9)	(65)
4.	Fuel tank mounting nut		10	3	17	20	(2)	(15)
5.	Union joints for hydraulic hoses and pipes	Metal face seal fitting for hydraulic hoses and piping	7/16-20UNF		17	25	(2.5)	(18)
			9/16-18UNF		19	30	(3)	(22)
					22	40	(4)	(29)
			3/4-16UNF		27	65	(6.5)	(47)
			1-1/16-12UNF		36	18	(18)	(129)
			1-5/16-12UNF		41	210	(21)	(151)
		ORS	9/16 UNF		19	30	(3)	(22)
			11/16 UNF		22	70	(7)	(52)
			13/16 UNF		27	95	(9.5)	(69)
6.	Pump mounting bolt		12	2	10 (Socket)	90	(9)	(65)
7.	Pump cover mounting bolt		10	8	17	50	(5)	(36)
8.	Control valve mounting bolt		10	4	17	50	(5)	(36)
	Control valve base mounting bolt		10	4	17	50	(5)	(36)
9.	Swing device mounting bolt		16	8	24	270	(27)	(195)
10.	Battery mounting nut		6	4	10	5	(0.5)	(3.5)
11.	Canopy mounting bolt		12	5	19	90	(9)	(65)
			10	5	17	50	(5)	(36)
12.	Cab mounting bolt		12	5	19	90	(9)	(65)
			10	5	17	50	(5)	(36)
13.	Swing bearing mounting bolt	Upperstructure	12	27	19	110	(11)	(80)
		Undercarriage	12	24	19	110	(11)	(80)
14.	Travel device mounting bolt		14	24	22	180	(18)	(130)
15.	Sprocket mounting bolt		14	24	22	180	(18)	(130)
16.	Upper roller mounting bolt		16	2	24	270	(27)	(199)
17.	Lower roller mounting bolt		16	16	24	270	(27)	(195)
18.	Track shoe bolt		12	312	19	140	(14)	(101)
19.	Cover mounting bolt		6		10	5	(0.5)	(3.5)
			8		13	10	(1)	(7)
			10		17	50	(5)	(36)
20.	Counterweight mounting bolt		24	3	36	950	(95)	(398)
21.	Front pin lock plate bolts		10		17	50	(5)	(36)
			12		19	90	(9)	(65)
			14		22	140	(14)	(101)
			16		24	210	(21)	(152)
			18		27	400	(40)	(290)
22.	Side-cutter mounting bolt		14	6	22	180	(18)	(130)
23.	Track roller guard mounting bolt		16	12	24	270	(27)	(196)
24.	Tilt mechanism floor connection pin		10	1	17	50	(5)	(36)
25.	Tilt mechanism support-holding bolt		10	2	17	50	(5)	(36)
26.	Tilt mechanism support connection pin		8	1	13	10	(1)	(7)

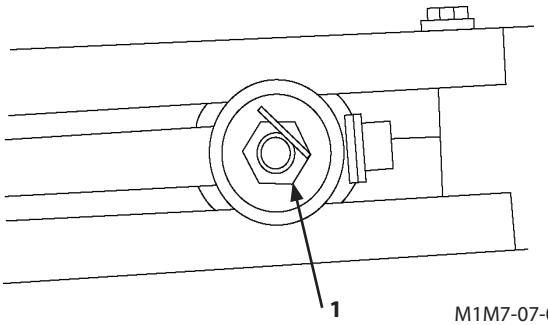
IMPORTANT:
- **Before installing, clean the bolt and nut threads to remove soil, rust, and/or dust.**
- **When installing new bolts and/or nuts, apply lubricant (e.g. white zinc B dissolved into spindle oil) to the screw threads.**
- **Tighten bolts and nuts to the specifications. If tightened with excessively high or low torque, missing or breakage of bolts and/or nut may result.**
- **In case the counterweight mounting bolts became loose, consult your authorized dealer for retightening.**

Tightening Torque Chart

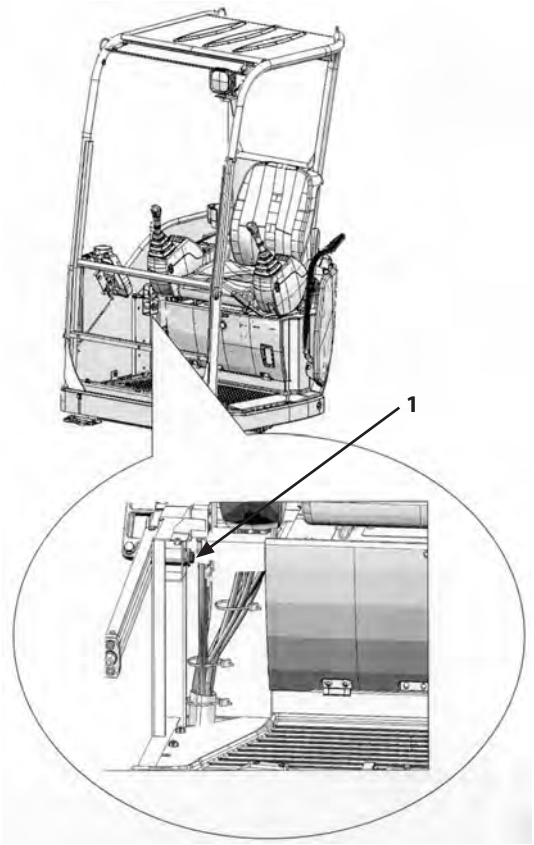
Bolt Dia.	Wrench Size	Hexagon Wrench Size	   M552-07-091			   M552-07-090 Socket Bolt			   M157-07-225		
			N·m	(kgf·m)	(lbf·ft)	N·m	(kgf·m)	(lbf·ft)	N·m	(kgf·m)	(lbf·ft)
M8	13	6	30	(3.0)	(22)	20	(2.0)	(15)	10	(1.0)	(7.4)
M10	17	8	65	(6.5)	(48)	50	(5.0)	(37)	20	(2.0)	(15)
M12	19	10	110	(11)	(81)	90	(9)	(66)	35	(3.5)	(26)
M14	22	12	180	(18)	(135)	140	(14)	(103)	55	(5.5)	(41)
M16	24	14	270	(27)	(200)	210	(21)	(155)	80	(8.0)	(59)
M18	27	14	400	(40)	(295)	300	(30)	(220)	120	(12)	(89)
M20	30	17	550	(55)	(410)	400	(40)	(295)	170	(17)	(125)
M22	32	17	750	(75)	(550)	550	(55)	(410)	220	(22)	(160)
M24	36	19	950	(95)	(700)	700	(70)	(520)	280	(28)	(205)
M27	41	19	1400	(140)	(1030)	1050	(105)	(770)	400	(40)	(295)
M30	46	22	1950	(195)	(1440)	1450	(145)	(1070)	550	(55)	(410)
M33	50	24	2600	(260)	(1920)	1950	(195)	(1440)	750	(75)	(550)
M36	55	27	3200	(320)	(2360)	2450	(245)	(1810)	950	(95)	(700)

Check Tilt Mechanism Fulcrum Bolts for Looseness

1. Check tilt mechanism fulcrum pin nut (1) for looseness every 250 hours. In case nut (1) is found loose, remove the operator's seat access cover on the right side. Then, retighten nut (1) to 50 N·m (5.0 kgf·m, 36 lbf·ft).



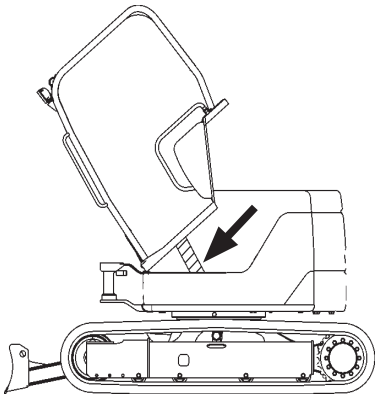
M1M7-07-079



M1M7-07-074

2. Tilt the cab floor forward. Support the floor with a fall prevention bar. Retighten arrowed bolts (3, 4, and 5).

   (3) Tightening torque: 10 N·m (1.0 kgf·m, 7 lbf·ft)
   (4) Tightening torque: 50 N·m (5.0 kgf·m, 36 lbf·ft)
   (5) Tightening torque: 50 N·m (5.0 kgf·m, 36 lbf·ft)



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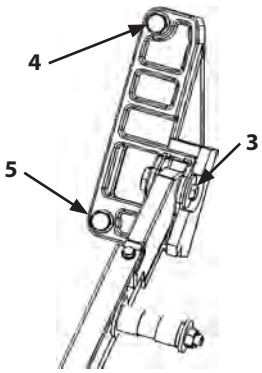
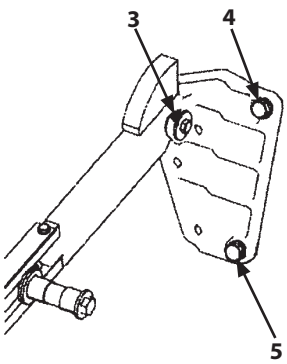


ZX29U-3, 33U-3, 38U-3

M1M7-07-080



ZX48U-3, 52U-3

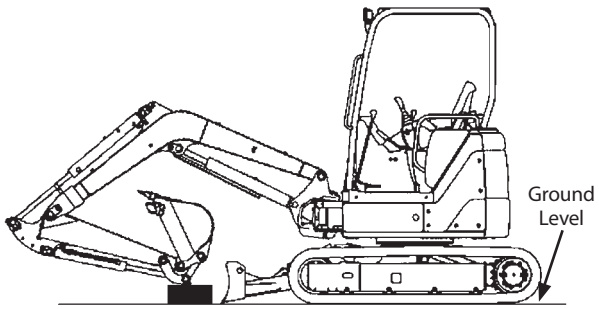
M1MH-07-014

Preparation for Inspection and Maintenance

When the floor tilt mechanism is used:

CAUTION: Do not open or close the floor tilt mechanism in daily inspection. The daily inspection can be performed through the maintenance cover ports.

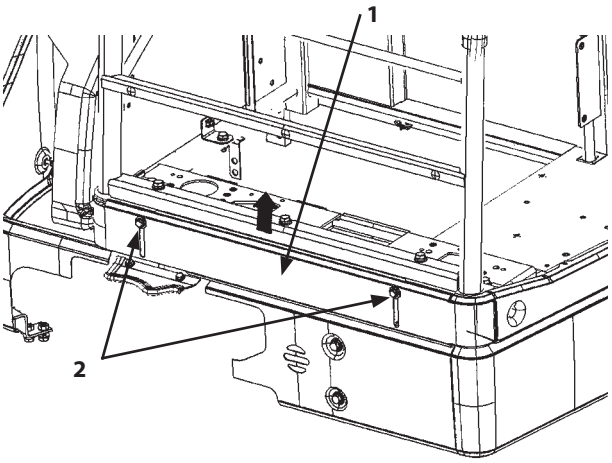
CAUTION: When using the floor tilt mechanism, consult your authorized dealer. If bolts (3) are removed or installed by unauthorized personnel, mismatch to ROPS may occur.



M1M7-07-060

When performing inspection and maintenance using the floor tilt mechanism, park the machine in the following procedure.

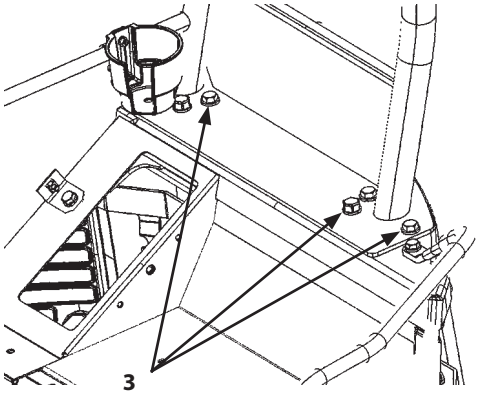
1. After operating the machine, wait for the machine to sufficiently cool.
2. Park the machine on a solid and level surface.
3. Lower the blade on the ground.
4. After rolling the arm and the bucket in, lower the bucket on a wooden block down to the ground.
5. Face the front attachment straightforward toward the machine without swinging the front attachment at this time.
6. Stop the engine. Remove the key from the key switch.
7. Close the cab (optional) door.
8. After loosening two bolts (2) of cover (1) on the front of the base machine, fully slide cover (1) upward. Then, temporarily tighten bolts (2) so that cover (1) does not fall.
9. Remove bolts (3) (not covered with resin caps) in the rear section of the operator's seat.



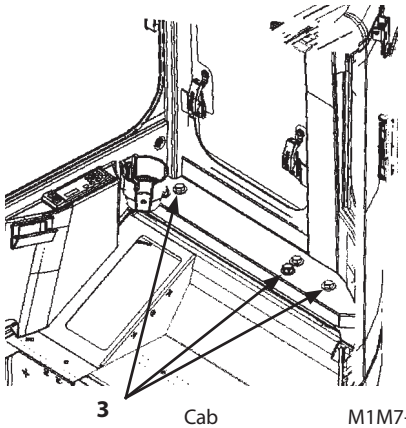
M1M7-07-061

CAUTION: Be careful. When the bolts except bolts (3) are removed, the canopy or the cab may come off the floor.

CAUTION: Be careful that if the floor is tilted upward while raising the front attachment, the canopy or cab (optional) may come in contact with the boom.

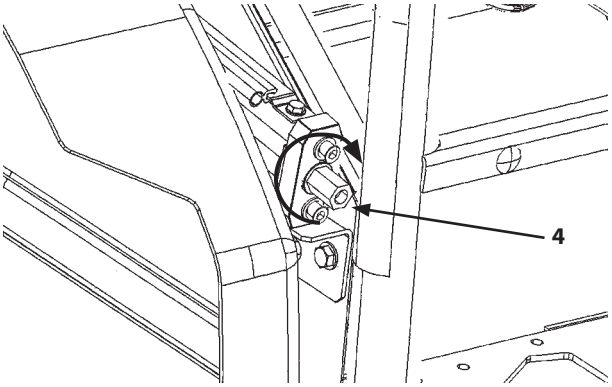


Canopy M1M7-07-063



Cab M1M7-07-064

IMPORTANT: The operation torque of adjusting screw (4) shall be less than 25 N·m (2.5 kgf·m, 18 lbf·ft). In case the operating torque requires more than 25 N·m (2.5 kgf·m, 18 lbf·ft), bolts (3) may not be completely removed yet. Recheck whether all bolts (3) are completely removed.
In case the canopy or cab is tilted without removing bolts (3), adjusting screw (4) may be deformed, cracked or damaged. Then, replace adjusting screw (4).

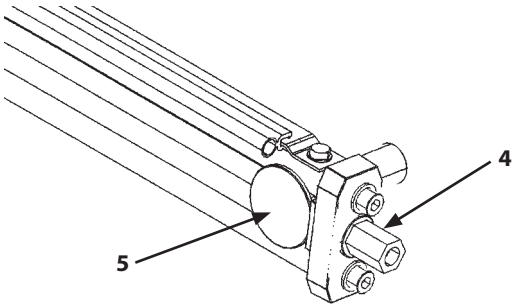


M1M7-07-065

10. Turn adjusting screw (4) to tilt canopy or cab assembly toward the front attachment.

    Wrench size: 17 mm

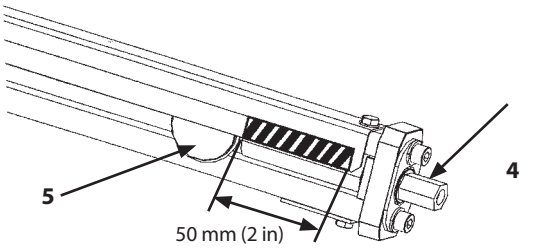
11. Turn adjusting screw (4) clockwise until disc plate (5) on the side of the floor tilt mechanism is moved to the end of the floor tilt mechanism.



Canopy M1M7-07-066

WARNING: In case the cab is mounted, stop tilting the floor before the disc plate reaches the striped area. If the floor is tilted into the striped area, the cab may become unbalanced so that it may fall downward, potentially creating hazardous conditions.

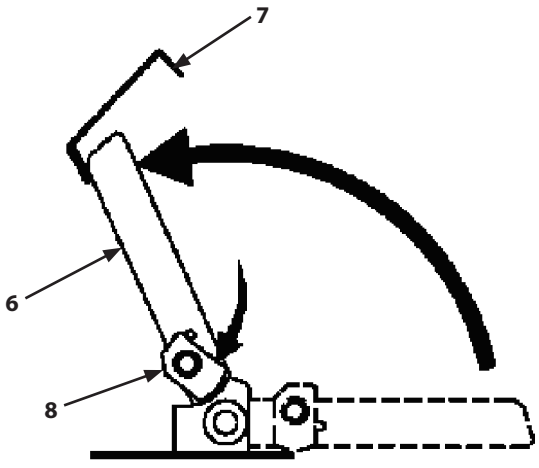
IMPORTANT: Do not tilt the canopy or cab using other than the floor tilt mechanism (such as a crane). Failure to do so may cause damage to the floor tilt mechanism and/or floor.



Cab (Optional) M1MF-07-040

12. Raise fall prevention bar (6) in the arrowed direction until it comes in contact with bracket (7) mounted on the cab floor reverse surface. Lock stopper (8) will automatically turn and retain fall prevention bar (6) in position at this time so that fall prevention bar (6) does not come off.

13. Before starting to work under the tilted cab floor, make sure if fall prevention bar (6) does not come off by jolting fall prevention bar (6) by hand.



M1M7-07-081

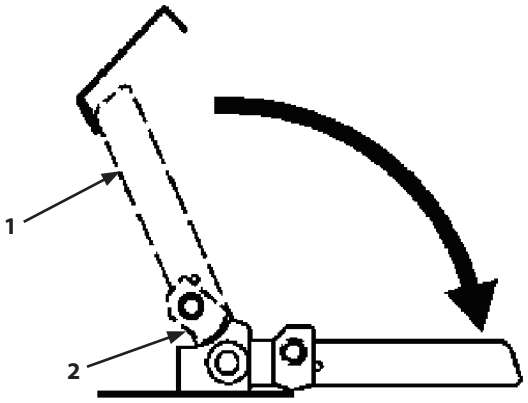
WARNING: Fall prevention bar (6) is a redundant safety device to be functioned in case the floor tilt mechanism fails. Never attempt to work under the tilted cab floor supported with only fall prevention bar (6). Failure to do so may result in a serious personal accident.

Tilting Floor Down

WARNING: Do not quickly lower the floor. If adjusting screw (4) is quickly turned to lower the floor, the floor may severely vibrate, potentially creating hazardous conditions.

1. Before tilting the cab floor down, check if any tools or workshop towels are not left behind on the base machine or in the operator's cab, and fall prevention bar (1) has been stowed in position. When detaching fall prevention bar (1), tilt fall prevention bar (1) in the arrowed reverse direction while picking up lock stopper (2).
2. Slowly turn adjusting screw (4) counterclockwise.

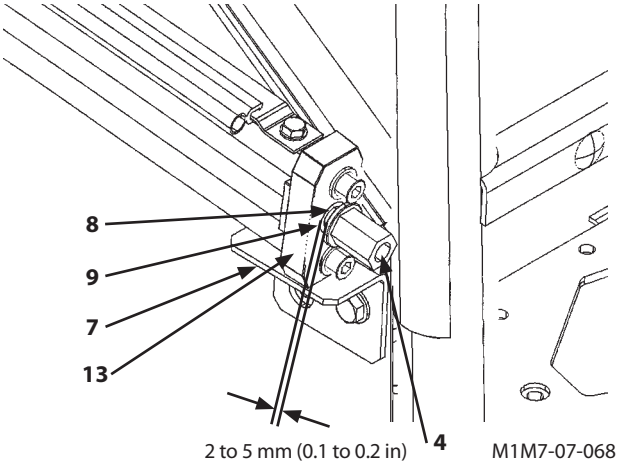
   Wrench size: 17 mm
3. Continue to turn adjusting screw (4) counterclockwise until the edge of bracket (13) comes in contact with bearing bracket (7).



M1M7-07-082

WARNING: If adjusting screw (4) is continuously turned after the floor is completely lowered, when adjusting screw (4) is extended by approx. 15 mm (0.6 in), washer (10) will come in contact with the end face of pin (11) so that adjusting screw (4) will not turn further. Take care that if adjusting screw (4) is forcibly turned further, deformation of washer (10) or missing of bolt (12) may result.

4. When the floor is completely lowered, adjusting screw (4) will be extended. Adjust the clearance between flange (8) of adjusting screw (4) and contact face (9) to 2 to 5 mm (0.1 to 0.2 in).



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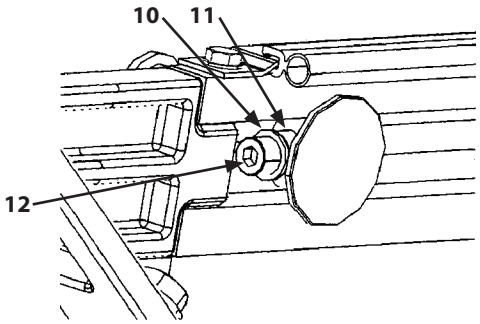

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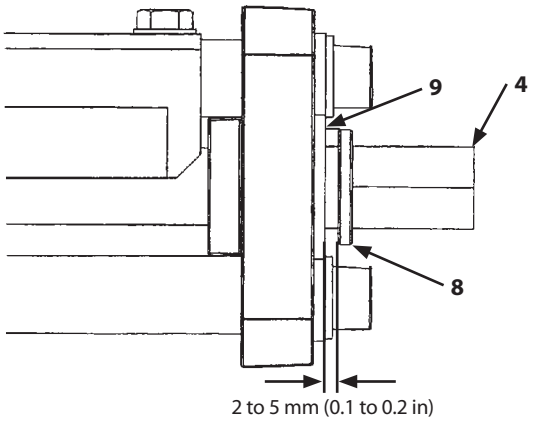


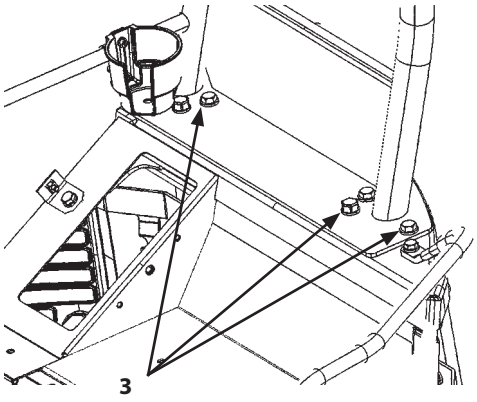
M1M7-07-075

5. Securely install the canopy or cab with three bolts (3).

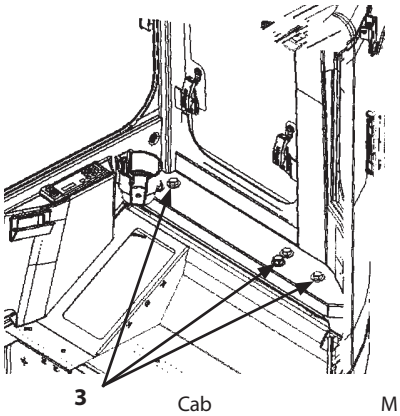
   Wrench size: 19 mm

   Tightening torque: 90 N·m (9 kgf·m, 67 lbf·ft)

CAUTION: Unless bolts (3) are tightened to the specification, the machine will not meet the standard of the Roll-Over Protective Structure (ROPS).



Canopy M1M7-07-063



Cab M1M7-07-064

MEMO

Consumable Parts List

Filter Element (ZX29U-3, 33U-3, 38U-3, 48U-3, 52U-3)

	Part No.
Full Flow Filter	4129280
Hydraulic Oil Suction Filter	4617512
Pilot Filter	4294130
Engine Oil Filter	4665128
Fuel Filter	4668930
Water Separator	4632694
Air Cleaner Element (Outer)	4417516
Air Cleaner Element (Inner) ★	4423981
Air Conditioner Filter	4641220
	4641221
	4641222

NOTE: ★ When double elements are used.

Engine V-Belt Parts

	ZX29U-3, 33U-3, 38U-3	ZX48U-3, 52U-3
	Part No.	Part No.
Engine Fan Belt	4632696	4643185
Engine Compressor Belt	4615852	←

CONSUMABLE PARTS LIST

Bucket Parts (ZX29U-3, 33U-3, 38U-3)

		ZX29U-3		ZX33U-3, 38U-3	
		Part No.	Quantity	Part No.	Quantity
Tooth	Tooth	4339865	3	4339865	4
	Lock Pin	4339868	3	4339868	4
	Lock Rubber	4339867	3	4339867	4
Side Cutter	Side Cutter (R)	4626441	1	4626441	1
	Side Cutter (L)	4626442	1	4626442	1
	Bolt	J921440	6	J921440	6
	Spring Washer	A590914	6	A590914	6
	Nut	J950014	6	J950014	6
O-ring		4275520	(4)	4275533	(4)
Shim		4354262	2	4354260	2

Bucket Parts (ZX48U-3, 52U-3)

		Part No.	Quantity
Tooth	Tooth	4339865	4
	Lock Pin	4339868	4
	Lock Rubber	4339867	4
Side Cutter	Side Cutter (R)	4622021	1
	Side Cutter (L)	4626430	1
	Bolt	4317650	6
	Spring Washer	A590914	6
	Nut	J951014	6
O-ring		4291436	(4)
Shim		4354258	2

NOTE: The quantities shown in the above tables are those required for the one standard bucket. The quantities for an optional bucket may differ. The figures in ( ) in the O-ring columns include the O-ring quantities used at the joints between the arm and the link. Shims are used to adjust the clearance at the joint between the arm and bucket.

Maintenance Under Special Environmental Conditions

Operating Conditions	Precautions for Maintenance	
Muddy Soil, Rainy or Snowy Weather	Before Operation:	Check the tightness of plugs and all drain cocks.
	After Operation:	Clean the machine and check for cracks, damaged, loose or missing bolts and nuts. Lubricate all necessary part without delay.
Near the Ocean	Before Operation:	Check the tightness of plugs and all drain cocks.
	After Operation:	Thoroughly clean the machine with fresh water to wash off salt. Service electrical equipment often to prevent corrosion.
Dusty Atmosphere	Air Cleaner:	Clean the element regularly, at shorter service intervals.
	Radiator:	Clean the oil cooler screen to prevent clogging of the radiator core.
	Fuel System:	Clean the filter element and strainer regularly, at shorter service intervals.
	Electrical Equipment:	Clean them regularly, in particular, the commutator surface of the alternator and starter.
Rocky Ground	Tracks:	Carefully operate while checking for cracks, damage and loose bolts and nuts. Loosen the tracks a little more than usual.
	Front Attachment:	Standard attachment may be damaged when digging rocky ground. Reinforce the bucket before using it, or use a heavy duty bucket.
Freezing Weather	Fuel:	Use high quality fuel suitable for low temperature.
	Lubricant:	Use high quality low viscosity hydraulic oil and engine oil.
	Engine Coolant:	Be sure to use antifreeze.
	Battery:	Fully charge the battery regularly with shorter service intervals. If not charged fully, electrolyte may freeze.
	Tracks:	Keep the tracks clean. Park the machine on a hard surface to prevent the tracks from freezing to the ground.
Falling Stones	Cab:	Provide a cab guard to protect the machine from falling stones when necessary.
High Ground (Altitudes: Higher than 1500 m (4900 ft))	Engine oil:	Change at 1/2 normal service intervals.
	Engine oil filter:	Replace at 1/2 normal service intervals.
	◇ When the machine is operated at the altitudes of 2000 m (6600 ft) or higher, the ignition of the engine may deteriorate, possibly resulting in significant reduction in durability or function. In case the machine is unavoidably operated under these conditions, consult your authorized dealer in advance.	

MEMO

STORAGE

Storing Machine

1. Thoroughly wash the machine to remove dirt, soil and debris from the machine.
2. Inspect the machine. Repair worn or damaged parts. Install new parts if necessary.
3. Clean the primary air cleaner element.
4. Lubricate all grease points.
5. Retract all hydraulic cylinders, if possible. If not, coat exposed cylinder rods with grease.
6. Park the tracks on long stable blocks.
7. Remove the battery and store them in a dry protected place after charging fully. If not removed, disconnect the negative battery cable from the (–) terminal.
8. Add an antirust agent to the coolant. In cold weather, add an antifreeze, or drain the coolant completely. Be sure to attach a "No Water in Radiator" tag on a clearly visible location if the system is drained.
9. Loosen the alternator belt and fan belt.
10. Paint necessary areas to prevent rust.
11. Store the machine in a dry, protected place. If stored outside, cover with a waterproof cover.
12. If the machine is stored for a long time, oil films on sliding surfaces may break down. Operate the travel, swing and digging functions, 2 to 3 cycles each, to lubricate, the sliding surfaces, at least once a month. Be sure to check the coolant level and lubrication conditions before operating.

Removing Machine from Storage

WARNING: Start the engine ONLY in a well-ventilated place.

1. Remove grease from the cylinder rods if coated.
2. Adjust alternator and fan belt tension.
3. Fill the fuel tank. Bleed air from the fuel system. Check all fluid levels.
4. Start the engine.
   Run the engine at half speed for several minutes before beginning full load operation.
5. Operate all hydraulic functions several cycles.
6. Carefully check all systems before operating the machine with a full load.

NOTE: When the machine has been stored for a long time, be sure to perform the following steps as well:

(a) Check the condition of all hoses and connections.

(b) Warm up the engine.

(c) Stop the engine.

(d) Install new fuel filters. Replace the engine oil filter and fill the engine with oil.

IMPORTANT: If the machine is not used for a long time, oil films on sliding surfaces may have broken down. Operate the travel, swing and digging functions, 2 to 3 cycles each to lubricate the sliding surfaces.

Troubleshooting

If any problem is found, troubleshoot to pinpoint the cause and take appropriate action to prevent the problem from occurring again. If the cause cannot be pinpointed, contact your authorized dealer.

WARNING: Never attempt to adjust, disassemble, or repair hydraulic or electrical components by yourself.

1. Engine

Trouble	Cause	Solution
Engine does not start.	Starter does not rotate	If the battery power is low, recharge or replace the battery
		If the starter has failed, repair or replace
		If the connections are loose or corroded, clean and tighten
	Engine is too cold	Preheat the engine or warm up coolant (Pour some hot water into the cooling system)
	Incomplete air bleeding from the fuel system	Thoroughly bleed air
	No fuel in the fuel tank	Refuel
	Fuel filter restriction	Clean or replace the fuel filter
Engine stalls.	No fuel in the fuel tank	Refuel
	Air in the fuel system	Retighten connections and bleed
Low engine oil pressure (Engine oil pressure indicator comes on)	Insufficient engine oil	Add oil
	Oil leak at connections	Repair
	Oil pressure switch failure	Replace
Engine knocks or runs irregularly.	Fuel filter restriction	Clean or replace the filter
	Air in the fuel system	Retighten connections and bleed
	Air cleaner restriction	Clean or replace the element
Engine overheats	Insufficient coolant and/or coolant leak	Add coolant. Repair leak
	Loose fan belt or oil on fan belt	Adjust or replace the fan belt
	Radiator fins are clogged or bent	Clean and/or repair
	Thermostat failure	Replace

2. Electrical System

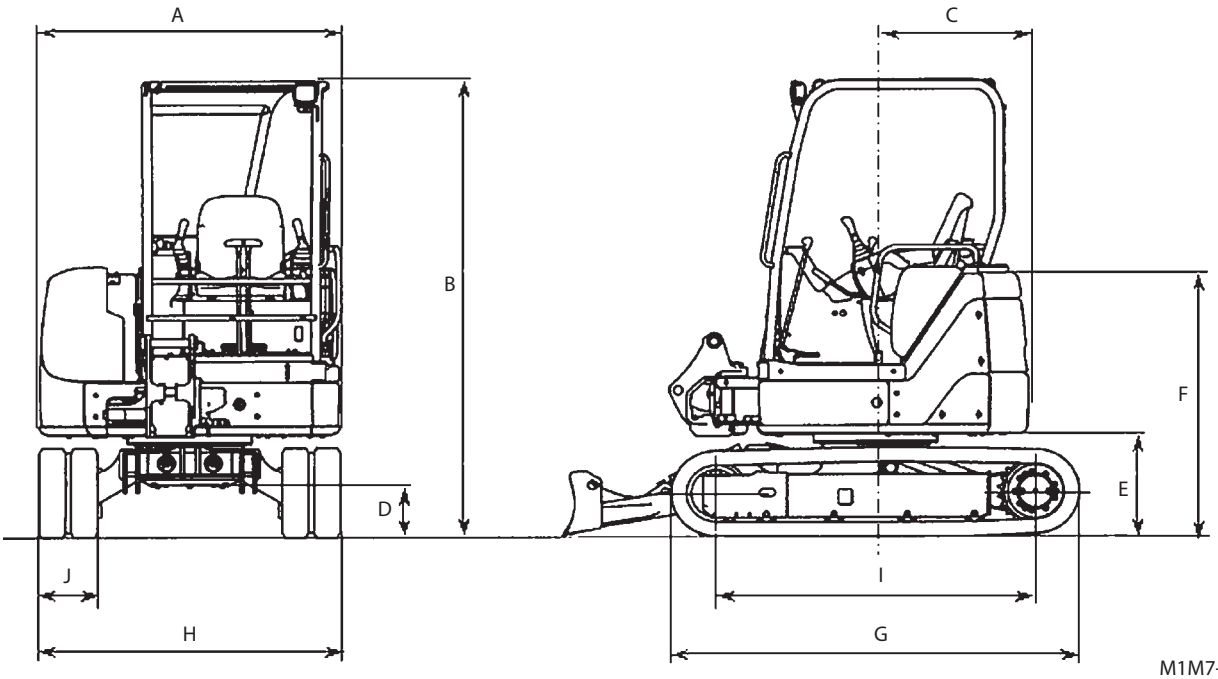
Trouble	Cause	Solution
Starter does not rotate.	Harness failure	Inspect and repair
	Low battery power	Charge the battery
	Loose or corroded battery connections	Clean and tighten
	Key switch failure	Replace
Alternator indicator does not go off after engine is started.	Alternator failure	Replace
	Harness failure	Inspect and repair
Monitor indicators do not come on or gauges do not operate.	Blown fuse	Replace
	Sensor failure	Replace
	Harness failure	Inspect and repair
	Burned indicator bulb(s)	Replace
Travel mode does not shift from fast mode to slow mode and/or vice versa.	Shift switch failure	Replace
	Harness failure	Inspect and repair
	Switch valve failure	Replace

3. Hydraulic System

Trouble	Cause	Solution
Insufficient power: all actuators	Insufficient engine power	Inspect and repair
	Excessively worn hydraulic pump	Replace
	Main relief valve failure	Readjust pressure setting, or replace
	Hydraulic oil is low	Add hydraulic oil
	Suction filter restriction	Clean or replace
Insufficient power: front attachment	Failure or incorrect pressure setting of main or pilot relief valve	Readjust pressure setting, or replace
	Damaged hydraulic cylinder packing	Replace cylinder packing
	Damaged cylinder piston or cylinder tube	Replace cylinder piston, cylinder tube, or the cylinder
Machine does not travel smoothly.	Too tight track (sag)	Adjust track sag
	Foreign matter, such as rocks, stuck in the tracks	Remove foreign matter
	Counterbalance valve failure	Replace
	Travel motor performance drop	Replace
Machine mistracks	Track sag is not equal on both sides	Adjust track sag properly (and equally on both sides)
	Hydraulic pump performance drop	Replace
	Oil leak inside control valve	Replace the control valve
Insufficient swing power or jerky upperstructure swing	Hydraulic pump performance drop	Replace
	Low pressure valve setting	Adjust pressure setting, or replace
	Swing motor performance drop	Replace
	Swing bearing seizure	Lubricate or replace swing bearing
	Foreign matter sticking in brake valve	Clean the brake valve
	Oil leak inside control valve	Replace the control valve

NOTE: Contact your authorized dealer for any inspection, adjustment, repair, and/or replacement as required.

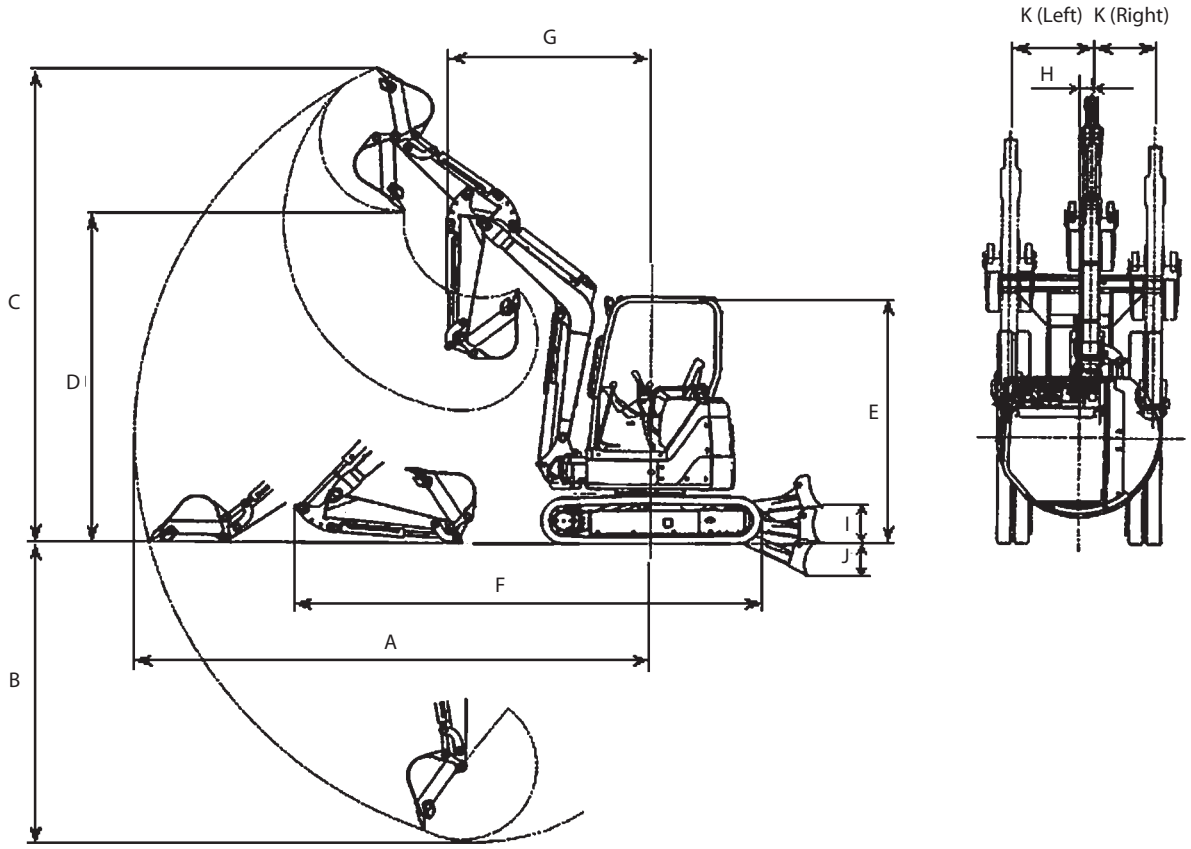
Specifications ZX29U-3



Type		ZX29U-3	
		Canopy	Cab
Type of Front-End Attachment		Boom Swing Type, 1.47 m (4 ft 10 in) Arm	
Bucket Capacity (Heaped)	m^3 (yd^3)	0.08 (0.10)	
Operating Weight	kg (lb)	3060 (6750)	3230 (7120)
Base Machine Weight	kg (lb)	2350 (5180)	2520 (5560)
Engine	kW/min^{-1} (PS/rpm)	Yanmar EDM-3TNV88 19.7/2200 (26.8/2200)	
A: Overall Width	mm (ft•in)	1550 (5'1")	
B: Overall Height	mm (ft•in)	2460 (8'1")	2500 (8'2")
C: Rear-End Swing Radius	mm (ft•in)	865 (2'10")	
D: Minimum Ground Clearance	mm (ft•in)	320 (1'1")	
E: Counterweight Clearance	mm (ft•in)	550 (1'10")	
F: Engine Cover Height	mm (ft•in)	1420 (4'8")	
G: Undercarriage Length	mm (ft•in)	1950 (6'5")	
H: Undercarriage Width	mm (ft•in)	1550 (5'1")	
I: Sprocket Center to Idler Center	mm (ft•in)	1490 (4'11")	
J: Track Shoe Width	mm (ft•in)	300 (1'0") (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	30 (0.31, 4.4)	32 (0.33, 4.6)
Swing Speed	min^{-1} (rpm)	9.1 (9.1)	
Travel Speed (fast/slow)	km/h (mph)	4.5/2.6 (2.8/1.6)	
Gradeability		30° (tan θ = 0.58)	

NOTE: • The specifications include additional counterweight and extra attachment lines.
• The dimensions do not include the height of the shoe lug.

Working Ranges ZX29U-3



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Item	Category	ZX29U-3			
		Canopy		Cab	
		1.17 m Arm	1.47 m Arm	1.17 m Arm	1.47 m Arm
A: Maximum Digging Reach	mm (ft•in)	4670 (15'4")	4920 (16'2")	4670 (15'4")	4920 (16'2")
B: Maximum Digging Depth	mm (ft•in)	2590 (8'6")	2890 (9'6")	2590 (8'6")	2890 (9'6")
C: Maximum Cutting Height	mm (ft•in)	5760 (18'11")	4550 (14'11")	4280 (14'1")	4350 (14'3")
D: Maximum Dumping Height	mm (ft•in)	4080 (13'5")	3300 (10'10")	3030 (9'11")	3120 (10'3")
E: Overall Height (Rubber Crawler)	mm (ft•in)	2460 (8'1")		2500 (8'2")	
F: Overall Length	mm (ft•in)	4200 (13'9")	4280 (14'1")	4200 (13'9")	4280 (14'1")
G: Minimum Swing Radius	mm (ft•in)	1960 (6'5")	2040 (6'8")	2050 (6'9")	2100 (6'11")
H: Boom-Swing Pivot Offset Distance	mm (ft•in)	100 (4")			
I: Blade Bottom Highest Position (above ground level)	mm (ft•in)	360 (1'2")			
J: Blade Bottom Lowest Position (below ground level)	mm (ft•in)	315 (1'0")			
K: Offset Distance	mm (ft•in)	L 705 (2'4") R 640 (2'1")		L 705 (2'4") R 600 (2'0")	
Maximum Boom-Swing Angle		L 72°/R 62°		L 62°/R 62°	

NOTE: • The dimensions do not include the height of the shoe lug.
• L: Left R: Right

Shoe Types and Applications ZX29U-3

ZX29U-3 (Canopy)

Shoe Width		300 mm (1'0") Rubber Shoe	300 mm (1'0") Grouser Shoe	300 mm (1'0") Rubber Pad Shoe	300 mm (1'0") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	3060 (6750)	3150 (6940)	3250 (7160)	3190 (7030)
Minimum Ground Clearance	mm (ft•in)	310 (1'0")	300 (1'0")	340 (1'1")	350 (1'2")
Undercarriage Length	mm (ft•in)	1950 (6'5")	1920 (6'4")	1960 (6'5")	1960 (6'5")
Undercarriage Width	mm (ft•in)	1550 (5'1")	1550 (5'1")	1550 (5'1")	1550 (5'1")
Ground Pressure	kPa (kgf/cm^2, psi)	30 (0.31, 4.4)	32 (0.33, 4.6)	36 (0.37, 5.2)	32 (0.33, 4.6)

ZX29U-3 (Cab)

Shoe Width		300 mm (1'0") Rubber Shoe	300 mm (1'0") Grouser Shoe	300 mm (1'0") Rubber Pad Shoe	300 mm (1'0") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	3230 (7120)	3320 (7320)	3420 (7540)	3360 (7410)
Minimum Ground Clearance	mm (ft•in)	310 (1'0")	300 (1'0")	340 (1'1")	350 (1'2")
Undercarriage Length	mm (ft•in)	1950 (6'5")	1920 (6'4")	1960 (6'5")	1960 (6'5")
Undercarriage Width	mm (ft•in)	1550 (5'1")	1550 (5'1")	1550 (5'1")	1550 (5'1")
Ground Pressure	kPa (kgf/cm^2, psi)	32 (0.33, 4.6)	34 (0.35, 4.9)	38 (0.39, 5.5)	34 (0.35, 4.9)

NOTE • The specifications for the front-end attachment are for 1.47 m (4 ft 10 in) arm with ISO 0.08 m^3 (0.10 yd^3) bucket.
- *Rubber shoe, rubber pad shoe and pad crawler shoe should be used on paved road.*
- *The dimensions do not include the height of the shoe lug.*

Bucket Types and Applications ZX29U-3

Bucket	Bucket Capacity m^3 (yd^3) ISO (Heaped)	Bucket Width mm		Front-End Attachment	
		(With side cutter) mm (in)	(Without side cutter) mm (in)	1.17 m (3'10") Arm	1.47 m (5'0") Arm
Hoe Bucket	0.050 (0.065)	350 (14")	300 (12")	⊙	⊙
	0.060 (0.078)	400 (16")	350 (14")	⊙	⊙
	0.070 (0.092)	450 (18")	400 (16")	⊙	⊙
	0.080 (0.11)	500 (20")	450 (18")	⊙	○
	0.090 (0.12)	550 (22")	500 (20")	○	○
	0.100 (0.13)	600 (24")	550 (22")	○	□

NOTE: • *Symbols in the above table have the following meanings.*
⊙: General excavating
○: Light duty excavating
□: Loading work

• *Hoe bucket is applicable to the following types of work.*

General excavating:

For digging and loading operation of sand, gravel, clay, ordinary earth and so on.

Light duty excavating:

For digging and loading operation of dried, loosened earth, sand, mud and so on.

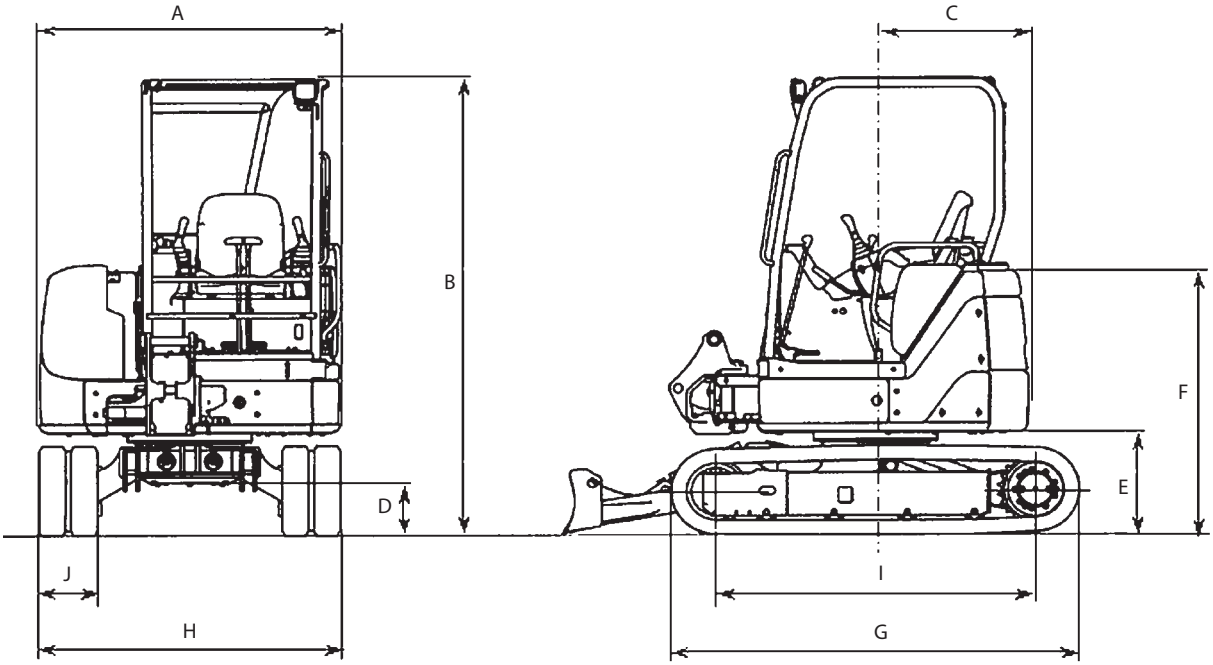
Their bulk density shall be less than 1600 kg/m^3 as a standard.

Loading work:

For loading operation of dried, loosened earth and sand.

Their bulk density shall be less than 1100 kg/m^3 as a standard.

Specifications ZX33U-3

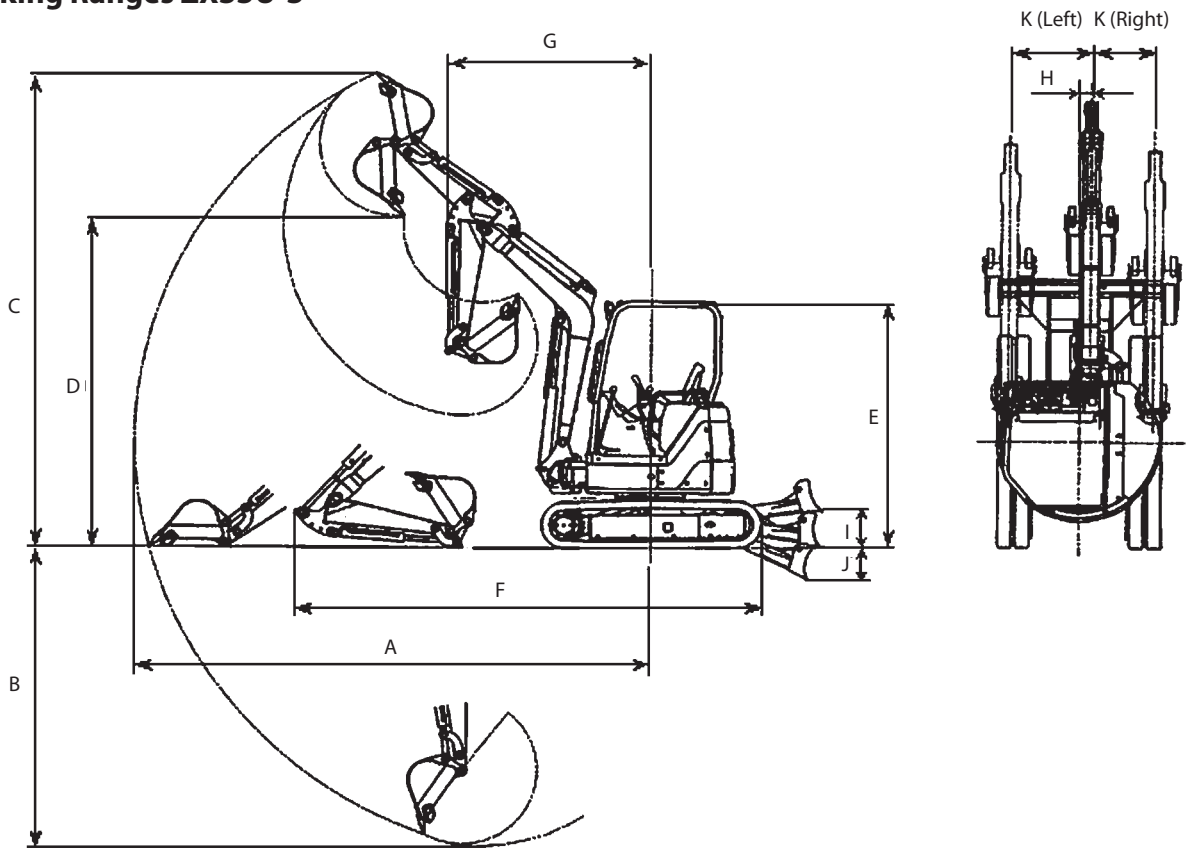


M1M7-12-001

Type		ZX33U-3	
		Canopy	Cab
Type of Front-End Attachment		Boom Swing Type, 1.52 m (5 ft 0 in) Arm	
Bucket Capacity (Heaped)	m^3 (yd^3)	0.09 (0.12)	
Operating Weight	kg (lb)	3300 (7280)	3470 (7650)
Base Machine Weight	kg (lb)	2520 (5560)	2690 (5930)
Engine	kW/min^{-1} (PS/rpm)	Yanmar EDM-3TNV88 21.3/2400 (29.0/2400)	
A: Overall Width	mm (ft•in)	1550 (5'1")	
B: Overall Height	mm (ft•in)	2460 (8'1")	2500 (8'2")
C: Rear-End Swing Radius	mm (ft•in)	865 (2'10")	
D: Minimum Ground Clearance	mm (ft•in)	280 (11")	
E: Counterweight Clearance	mm (ft•in)	550 (1'10")	
F: Engine Cover Height	mm (ft•in)	1420 (4'8")	
G: Undercarriage Length	mm (ft•in)	2100 (6'11")	
H: Undercarriage Width	mm (ft•in)	1550 (5'1")	
I: Sprocket Center to Idler Center	mm (ft•in)	1650 (5'5")	
J: Track Shoe Width	mm (ft•in)	300 (1'0") (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	30 (0.31, 4.4)	31 (0.32, 4.5)
Swing Speed	min^{-1} (rpm)	9.0 (9.0)	
Travel Speed (fast/slow)	km/h (mph)	4.4/2.9 (2.7/1.8)	
Gradeability		30° (tan θ = 0.58)	

NOTE: • The specifications include additional counterweight and extra attachment lines.
• The dimensions do not include the height of the shoe lug.

Working Ranges ZX33U-3



M1M7-12-005

Item	Category	ZX33U-3			
		Canopy		Cab	
		1.17 m Arm	1.52 m Arm	1.17 m Arm	1.52 m Arm
A: Maximum Digging Reach	mm (ft•in)	4890 (16'1")	5170 (17'0")	4890 (16'1")	5170 (17'0")
B: Maximum Digging Depth	mm (ft•in)	2780 (9'1")	3130 (10'3")	2780 (9'1")	3130 (10'3")
C: Maximum Cutting Height	mm (ft•in)	4620 (15'2")	4700 (15'5")	4430 (14'6")	4470 (14'8")
D: Maximum Dumping Height	mm (ft•in)	3210 (10'6")	3310 (10'10")	3040 (10'0")	3100 (10'2")
E: Overall Height (Rubber Crawler)	mm (ft•in)	2460 (8'1")		2500 (8'2")	
F: Overall Length	mm (ft•in)	4450 (14'7")	4560 (15'0")	4450 (14'7")	4560 (15'0")
G: Minimum Swing Radius	mm (ft•in)	1950 (6'5")	2080 (6'10")	2140 (7'0")	2180 (7'2")
H: Boom-Swing Pivot Offset Distance	mm (ft•in)	100 (4")			
I: Blade Bottom Highest Position (above ground level)	mm (ft•in)	360 (1'2")			
J: Blade Bottom Lowest Position (below ground level)	mm (ft•in)	320 (1'1")			
K: Offset Distance	mm (ft•in)	L 705 (2'4") R 640 (2'1")		L 705 (2'4") R 600 (2'0")	
Maximum Boom-Swing Angle		L 72°/R 62°		L 62°/R 62°	

NOTE: • The dimensions do not include the height of the shoe lug.
• L: Left R: Right

Shoe Types and Applications ZX33U-3

ZX33U-3 (Canopy)

Shoe Width		300 mm (1'0") Rubber Shoe	300 mm (1'0") Grouser Shoe	300 mm (1'0") Rubber Pad Shoe	300 mm (1'0") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	3300 (7280)	3410 (7520)	3510 (7740)	3450 (7610)
Minimum Ground Clearance	mm (ft•in)	280 (11")	270 (11")	310 (1'0")	320 (1'1")
Undercarriage Length	mm (ft•in)	2100 (6'11")	2120 (7'0")	2160 (7'1")	2160 (7'1")
Undercarriage Width	mm (ft•in)	1550 (5'1")	1550 (5'1")	1550 (5'1")	1550 (5'1")
Ground Pressure	kPa (kgf/cm^2, psi)	30 (0.31, 4.4)	31 (0.32, 4.5)	35 (0.36, 5.1)	31 (0.32, 4.5)

ZX33U-3 (Cab)

Shoe Width		300 mm (1'0") Rubber Shoe	300 mm (1'0") Grouser Shoe	300 mm (1'0") Rubber Pad Shoe	300 mm (1'0") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	3470 (7650)	3580 (7890)	3680 (8110)	3620 (7980)
Minimum Ground Clearance	mm (ft•in)	280 (11")	270 (11")	310 (1'0")	320 (1'1")
Undercarriage Length	mm (ft•in)	2100 (6'11")	2120 (7'0")	2160 (7'1")	2160 (7'1")
Undercarriage Width	mm (ft•in)	1550 (5'1")	1550 (5'1")	1550 (5'1")	1550 (5'1")
Ground Pressure	kPa (kgf/cm^2, psi)	31 (0.32, 4.5)	32 (0.33, 4.6)	36 (0.37, 5.2)	33 (0.34, 4.8)

NOTE:
- *The specifications for the front-end attachment are for 1.52 m (5 ft 0 in) arm with ISO 0.09 m^3 (0.12 yd3) bucket.*
- *Rubber shoe, rubber pad shoe and pad crawler shoe should be used on paved road.*
- *The dimensions do not include the height of the shoe lug.*

Bucket Types and Applications ZX33U-3

Bucket	Bucket Capacity m^3 (yd^3) ISO (Heaped)	Bucket Width mm		Front-End Attachment	
		(With side cutter) mm (in)	(Without side cutter) mm (in)	1.17 m (3'10") Arm	1.52 m (5'0") Arm
Hoe Bucket	0.040 (0.052)	300 (12")	250 (10")	⊙	⊙
	0.055 (0.072)	350 (14")	300 (12")	⊙	⊙
	0.065 (0.085)	400 (16")	350 (14")	⊙	⊙
	0.080 (0.11)	450 (18")	400 (16")	⊙	⊙
	0.090 (0.12)	500 (20")	450 (18")	⊙	○
	0.100 (0.13)	550 (22")	500 (20")	○	□
	0.110 (0.14)	600 (24")	550 (22")	□	□
	0.130 (0.17)	650 (26")	600 (24")	□	–

NOTE: • *Symbols in the above table have the following meanings.*
⊙: General excavating
○: Light duty excavating
□: Loading work

• *Hoe bucket is applicable to the following types of work.*

General excavating:

For digging and loading operation of sand, gravel, clay, ordinary earth and so on.

Light duty excavating:

For digging and loading operation of dried, loosened earth, sand, mud and so on.

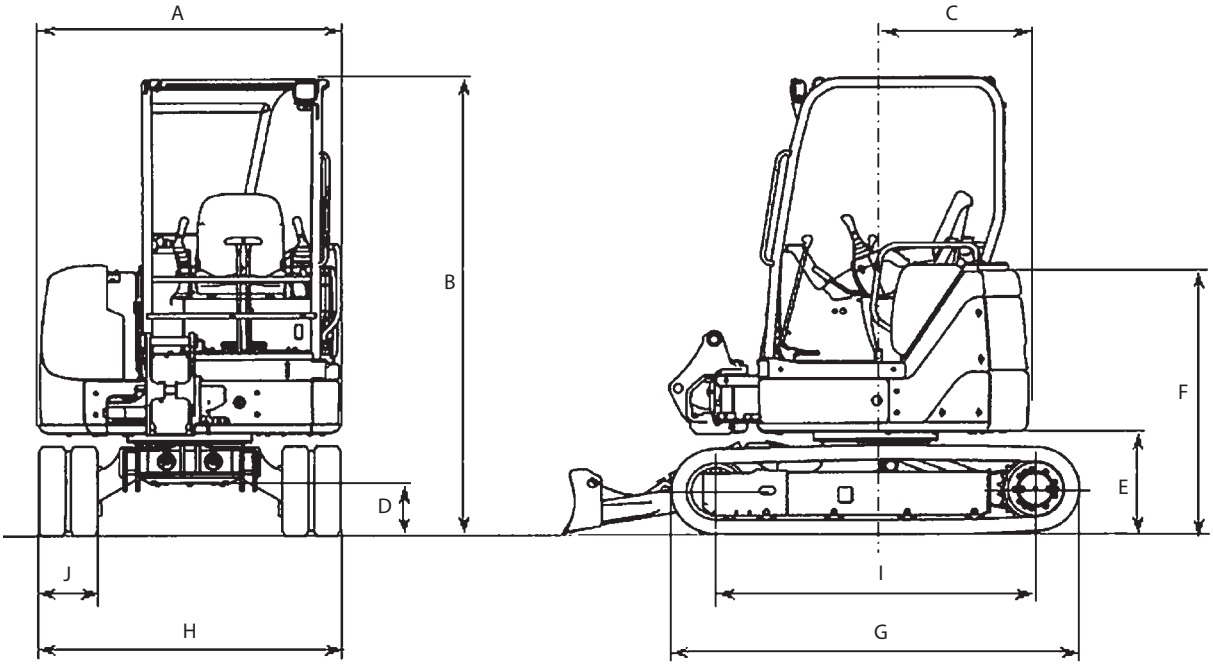
Their bulk density shall be less than 1600 kg/m^3 as a standard.

Loading work:

For loading operation of dried, loosened earth and sand.

Their bulk density shall be less than 1100 kg/m^3 as a standard.

Specifications ZX38U-3

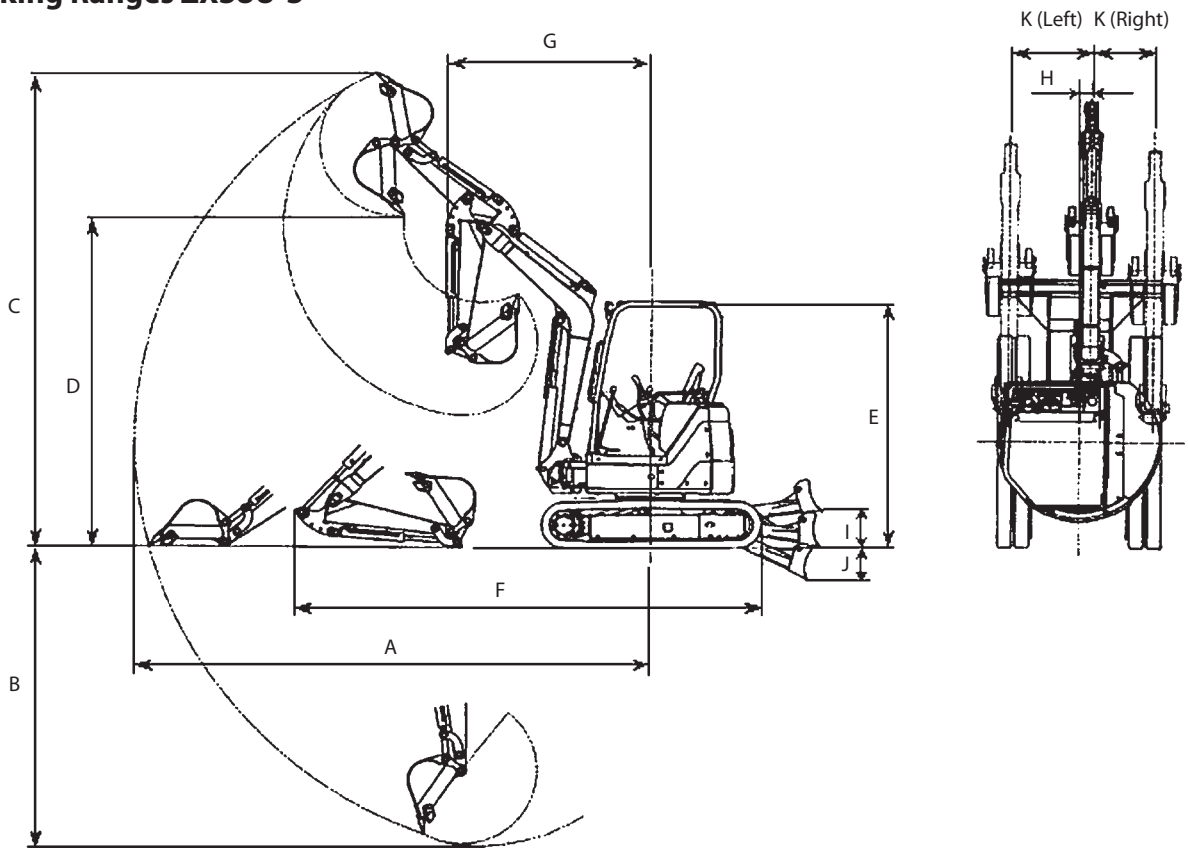


M1M7-12-002

Type		ZX38U-3	
		Canopy	Cab
Type of Front-End Attachment		Boom Swing Type, 1.72 m (5 ft 8 in) Arm	
Bucket Capacity (Heaped)	m^3 (yd^3)	0.11 (0.14)	
Operating Weight	kg (lb)	3790 (8360)	3960 (8730)
Base Machine Weight	kg (lb)	2920 (6440)	3090 (6810)
Engine	kW/min^{-1} (PS/rpm)	Yanmar EDM-3TNV88 21.3/2400 (29.0/2400)	
A: Overall Width	mm (ft•in)	1550 (5'1")	
B: Overall Height	mm (ft•in)	2460 (8'1")	2500 (8'2")
C: Rear-End Swing Radius	mm (ft•in)	960 (3'2")	
D: Minimum Ground Clearance	mm (ft•in)	280 (11")	
E: Counterweight Clearance	mm (ft•in)	550 (1'10")	
F: Engine Cover Height	mm (ft•in)	1420 (4'8")	
G: Undercarriage Length	mm (ft•in)	2100 (6'11")	
H: Undercarriage Width	mm (ft•in)	1740 (5'9")	
I: Sprocket Center to Idler Center	mm (ft•in)	1650 (5'5")	
J: Track Shoe Width	mm (ft•in)	300 (1'0") (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	34 (0.35, 4.9)	36 (0.37, 5.2)
Swing Speed	min^{-1} (rpm)	9.0 (9.0)	
Travel Speed (fast/slow)	km/h (mph)	4.4/2.9 (2.7/1.8)	
Gradeability		30° (tan θ = 0.58)	

NOTE: • The specifications include additional counterweight and extra attachment lines.
• The dimensions do not include the height of the shoe lug.

Working Ranges ZX38U-3



M1M7-12-006

Item	Category	ZX38U-3			
		Canopy		Cab	
		1.32 m Arm	1.72 m Arm	1.32 m Arm	1.72 m Arm
A: Maximum Digging Reach	mm (ft•in)	5210 (17'1")	5520 (18'1")	5210 (17'1")	5520 (18'1")
B: Maximum Digging Depth	mm (ft•in)	3050 (10'0")	3450 (11'4")	3050 (10'0")	3450 (11'4")
C: Maximum Cutting Height	mm (ft•in)	4870 (16'0")	4950 (16'3")	4710 (15'5")	4760 (15'7")
D: Maximum Dumping Height	mm (ft•in)	3470 (11'5")	3570 (11'9")	3320 (10'11")	3390 (11'2")
E: Overall Height (Rubber Crawler)	mm (ft•in)	2460 (8'1")		2500 (8'2")	
F: Overall Length	mm (ft•in)	4650 (15'3")	4780 (15'8")	4650 (15'3")	4780 (15'8")
G: Minimum Swing Radius	mm (ft•in)	2070 (6'10")	2170 (7'1")	2230 (7'4")	2300 (7'7")
H: Boom-Swing Pivot Offset Distance	mm (ft•in)	100 (4")			
I: Blade Bottom Highest Position (above ground level)	mm (ft•in)	370 (1'3")			
J: Blade Bottom Lowest Position (below ground level)	mm (ft•in)	390 (1'3")			
K: Offset Distance	mm (ft•in)	L 705 (2'4") R 640 (2'1")		L 705 (2'4") R 600 (2'0")	
Maximum Boom-Swing Angle		L 72°/R 62°		L 62°/R 62°	

NOTE: • The dimensions do not include the height of the shoe lug.
• L: Left R: Right

Shoe Types and Applications ZX38U-3

ZX38U-3 (Canopy)

Shoe Width		300 mm (1'0") Rubber Shoe	300 mm (1'0") Grouser Shoe	300 mm (1'0") Rubber Pad Shoe	300 mm (1'0") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	3790 (8360)	3900 (8600)	4000 (8820)	3940 (8690)
Minimum Ground Clearance	mm (ft•in)	280 (11")	270 (11")	310 (1'0")	320 (1'1")
Undercarriage Length	mm (ft•in)	2100 (6'11")	2120 (7'0")	2160 (7'1")	2160 (7'1")
Undercarriage Width	mm (ft•in)	1740 (5'9")	1740 (5'9")	1740 (5'9")	1740 (5'9")
Ground Pressure	kPa (kgf/cm^2, psi)	34 (0.35, 4.9)	35 (0.36, 5.1)	39 (0.40, 5.7)	35 (0.36, 5.1)

ZX38U-3 (Cab)

Shoe Width		300 mm (1'0") Rubber Shoe	300 mm (1'0") Grouser Shoe	300 mm (1'0") Rubber Pad Shoe	300 mm (1'0") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	3960 (8730)	4070 (8970)	4170 (9190)	4110 (9060)
Minimum Ground Clearance	mm (ft•in)	280 (11")	270 (11")	310 (1'0")	320 (1'1")
Undercarriage Length	mm (ft•in)	2100 (6'11")	2120 (7'0")	2160 (7'1")	2160 (7'1")
Undercarriage Width	mm (ft•in)	1740 (5'9")	1740 (5'9")	1740 (5'9")	1740 (5'9")
Ground Pressure	kPa (kgf/cm^2, psi)	36 (0.37, 5.2)	37 (0.38, 5.4)	41 (0.42, 5.9)	37 (0.38, 5.4)

NOTE: • *The specifications for the front-end attachment are for 1.72 m (5 ft 8 in) arm with ISO 0.11 m^3 (0.14 yd^3) bucket.*
• *Rubber shoe, rubber pad shoe and pad crawler shoe should be used on paved road.*
• *The dimensions do not include the height of the shoe lug.*

Bucket Types and Applications ZX38U-3

Bucket	Bucket Capacity m^3 (yd^3) ISO (Heaped)	Bucket Width mm		Front-End Attachment	
		(With side cutter) mm (in)	(Without side cutter) mm (in)	1.32 m (4'4") Arm	1.72 m (5'8") Arm
Hoe Bucket	0.040 (0.052)	300 (12")	250 (10")	⊙	⊙
	0.055 (0.072)	350 (14")	300 (12")	⊙	⊙
	0.065 (0.085)	400 (16")	350 (14")	⊙	⊙
	0.080 (0.11)	450 (18")	400 (16")	⊙	⊙
	0.090 (0.12)	500 (20")	450 (18")	⊙	⊙
	0.100 (0.13)	550 (22")	500 (20")	⊙	⊙
	0.110 (0.14)	600 (24")	550 (22")	⊙	○
	0.130 (0.17)	650 (26")	600 (24")	○	□
	0.140 (0.18)	700 (28")	650 (26")	□	–
	0.150 (0.20)	750 (30")	700 (28")	□	–

NOTE: • *Symbols in the above table have the following meanings.*
⊙: General excavating
○: Light duty excavating
□: Loading work

• *Hoe bucket is applicable to the following types of work.*

General excavating:

For digging and loading operation of sand, gravel, clay, ordinary earth and so on.

Light duty excavating:

For digging and loading operation of dried, loosened earth, sand, mud and so on.

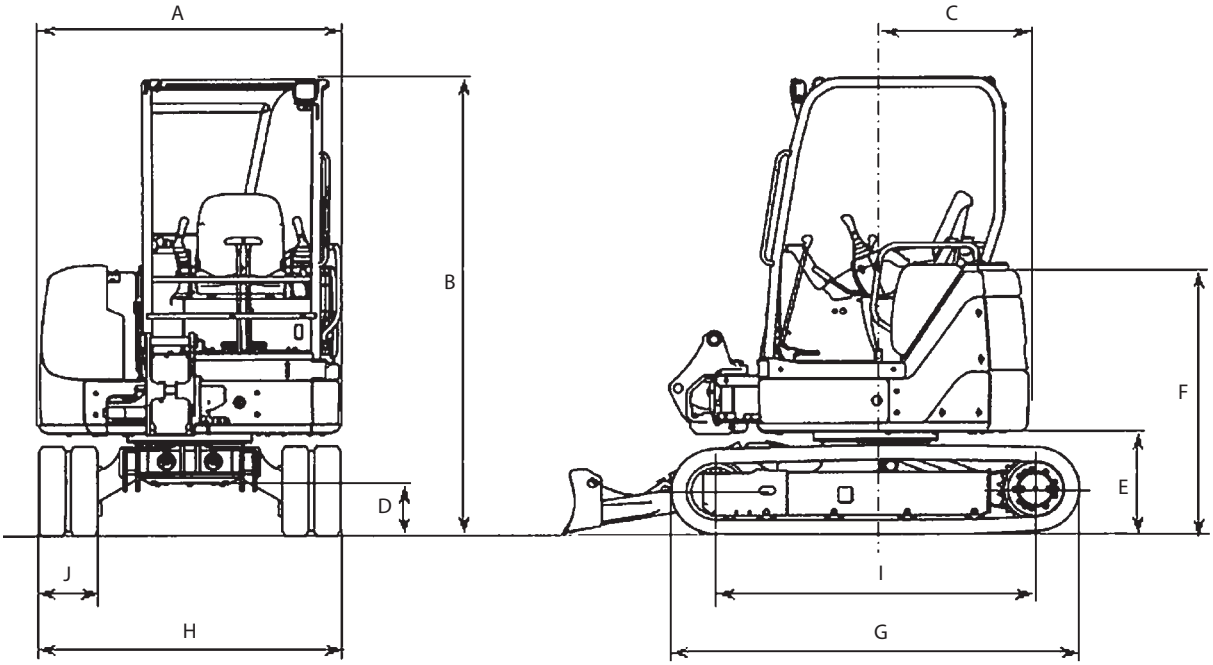
Their bulk density shall be less than 1600 kg/m^3 as a standard.

Loading work:

For loading operation of dried, loosened earth and sand.

Their bulk density shall be less than 1100 kg/m^3 as a standard.

Specifications ZX48U-3

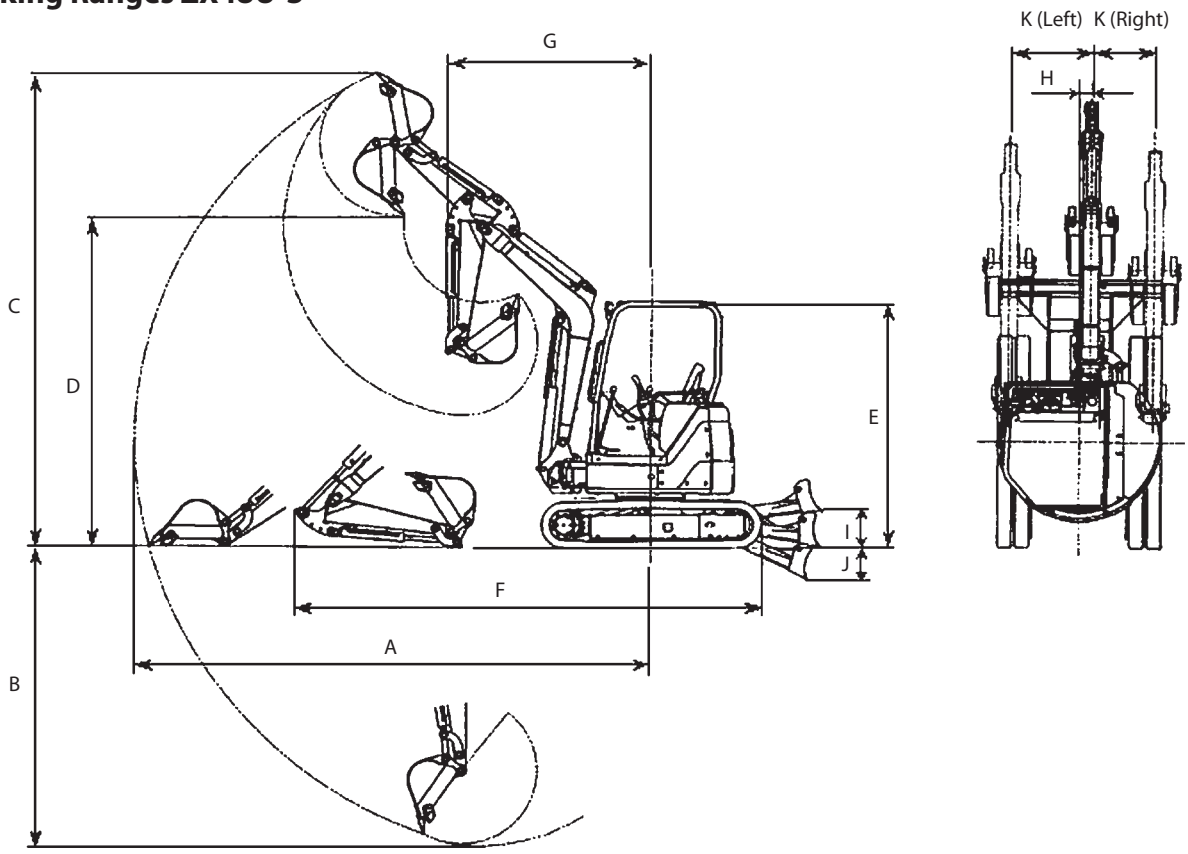


M1M7-12-003

Type		ZX48U-3	
		Canopy	Cab
Type of Front-End Attachment		Boom Swing Type, 1.69 m (5 ft 7 in) Arm	
Bucket Capacity (Heaped)	m^3 (yd^3)	0.14 (0.18)	
Operating Weight	kg (lb)	4850 (10690)	5010 (11050)
Base Machine Weight	kg (lb)	3680 (8110)	3830 (8440)
Engine	kW/min^{-1} (PS/rpm)	Yanmar EDM-4TNV88 28.4/2400 (38.6/2400)	
A: Overall Width	mm (ft•in)	1850 (6'1")	
B: Overall Height	mm (ft•in)	2510 (8'3")	2550 (8'4")
C: Rear-End Swing Radius	mm (ft•in)	1060 (3'6")	
D: Minimum Ground Clearance	mm (ft•in)	340 (1'1")	
E: Counterweight Clearance	mm (ft•in)	610 (2'0")	
F: Engine Cover Height	mm (ft•in)	1510 (4'11")	
G: Undercarriage Length	mm (ft•in)	2500 (8'2")	
H: Undercarriage Width	mm (ft•in)	1960 (6'5")	
I: Sprocket Center to Idler Center	mm (ft•in)	1990 (6'6")	
J: Track Shoe Width	mm (ft•in)	400 (1'4") (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	27 (0.28, 3.9)	28 (0.29, 4.1)
Swing Speed	min^{-1} (rpm)	9.0 (9.0)	
Travel Speed (fast/slow)	km/h (mph)	4.2/2.7 (2.6/1.7)	
Gradeability		30° (tan θ = 0.58)	

NOTE: • The specifications include additional counterweight and extra attachment lines.
• The dimensions do not include the height of the shoe lug.

Working Ranges ZX48U-3



M1M7-12-007

Item	Category	ZX48U-3			
		Canopy		Cab	
		1.38 m Arm	1.69 m Arm	1.38 m Arm	1.69 m Arm
A: Maximum Digging Reach	mm (ft•in)	5740 (18'10")	6030 (19'9")	5740 (18'10")	6030 (19'9")
B: Maximum Digging Depth	mm (ft•in)	3340 (11'0")	3650 (12'0")	3340 (11'0")	3650 (12'0")
C: Maximum Cutting Height	mm (ft•in)	5600 (18'5")	5840 (19'2")	5480 (18'0")	5700 (18'8")
D: Maximum Dumping Height	mm (ft•in)	3920 (12'10")	4160 (13'8")	3810 (12'6")	4040 (13'3")
E: Overall Height (Rubber Crawler)	mm (ft•in)	2510 (8'3")		2550 (8'4")	
F: Overall Length	mm (ft•in)	5340 (17'6")	5380 (17'8")	5340 (17'6")	5380 (17'8")
G: Minimum Swing Radius	mm (ft•in)	2190 (7'2")	2330 (7'8")	2270 (7'5")	2390 (7'10")
H: Boom-Swing Pivot Offset Distance	mm (ft•in)	100 (4")			
I: Blade Bottom Highest Position (above ground level)	mm (ft•in)	430 (1'5")			
J: Blade Bottom Lowest Position (below ground level)	mm (ft•in)	335 (1'1")			
K: Offset Distance	mm (ft•in)	L 795 (2'7") R 760 (2'6")			
Maximum Boom-Swing Angle		L 80°/R 60°			

NOTE: • The dimensions do not include the height of the shoe lug.
• L: Left R: Right

Shoe Types and Applications ZX48U-3

ZX48U-3 (Canopy)

Shoe Width		400 mm (1'4") Rubber Shoe	400 mm (1'4") Grouser Shoe	400 mm (1'4") Rubber Pad Shoe	400 mm (1'4") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	4850 (10690)	4920 (10850)	5120 (11290)	4940 (10890)
Minimum Ground Clearance	mm (ft•in)	340 (1'1")	320 (1'1")	360 (1'2")	360 (1'2")
Undercarriage Length	mm (ft•in)	2500 (8'2")	2480 (8'2")	2530 (8'4")	2530 (8'4")
Undercarriage Width	mm (ft•in)	1960 (6'5")	1960 (6'5")	1960 (6'5")	1960 (6'5")
Ground Pressure	kPa (kgf/cm^2, psi)	27 (0.28, 3.9)	28 (0.29, 4.1)	32 (0.33, 4.6)	28 (0.29, 4.1)

ZX48U-3 (Cab)

Shoe Width		400 mm (1'4") Rubber Shoe	400 mm (1'4") Grouser Shoe	400 mm (1'4") Rubber Pad Shoe	400 mm (1'4") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	5010 (11050)	5080 (11200)	5280 (11640)	5100 (11240)
Minimum Ground Clearance	mm (ft•in)	340 (1'1")	320 (1'1")	360 (1'2")	360 (1'2")
Undercarriage Length	mm (ft•in)	2500 (8'2")	2480 (8'2")	2530 (8'4")	2530 (8'4")
Undercarriage Width	mm (ft•in)	1960 (6'5")	1960 (6'5")	1960 (6'5")	1960 (6'5")
Ground Pressure	kPa (kgf/cm^2, psi)	28 (0.29, 4.1)	29 (0.30, 4.2)	33 (0.34, 4.8)	29 (0.30, 4.2)

NOTE:
- *The specifications for the front-end attachment are for 1.69 m (5 ft 7 in) arm with ISO 0.14 m^3 (0.18 yd^3) bucket.*
- *Rubber shoe, rubber pad shoe and pad crawler shoe should be used on paved road.*
- *The dimensions do not include the height of the shoe lug.*

Bucket Types and Applications ZX48U-3

Bucket	Bucket Capacity m^3 (yd^3) ISO (Heaped)	Bucket Width mm		Front-End Attachment	
		(With side cutter) mm (in)	(Without side cutter) mm (in)	ZX48U-3	
				1.38 m (4'6") Arm	1.69 m (5'7") Arm
Hoe Bucket	0.100 (0.13)	450 (18")	400 (16")	⊙	⊙
	0.110 (0.14)	500 (20")	450 (18")	⊙	⊙
	0.130 (0.17)	550 (22")	500 (20")	⊙	○
	0.140 (0.18)	600 (24")	550 (22")	⊙	□
	0.160 (0.21)	650 (26")	600 (24")	□	□
	0.170 (0.22)	700 (28")	650 (26")	□	□

NOTE: • *Symbols in the above table have the following meanings.*
⊙: *General excavating*
○: *Light duty excavating*
□: *Loading work*

• *Hoe bucket is applicable to the following types of work.*

General excavating:

For digging and loading operation of sand, gravel, clay, ordinary earth and so on.

Light duty excavating:

For digging and loading operation of dried, loosened earth, sand, mud and so on.

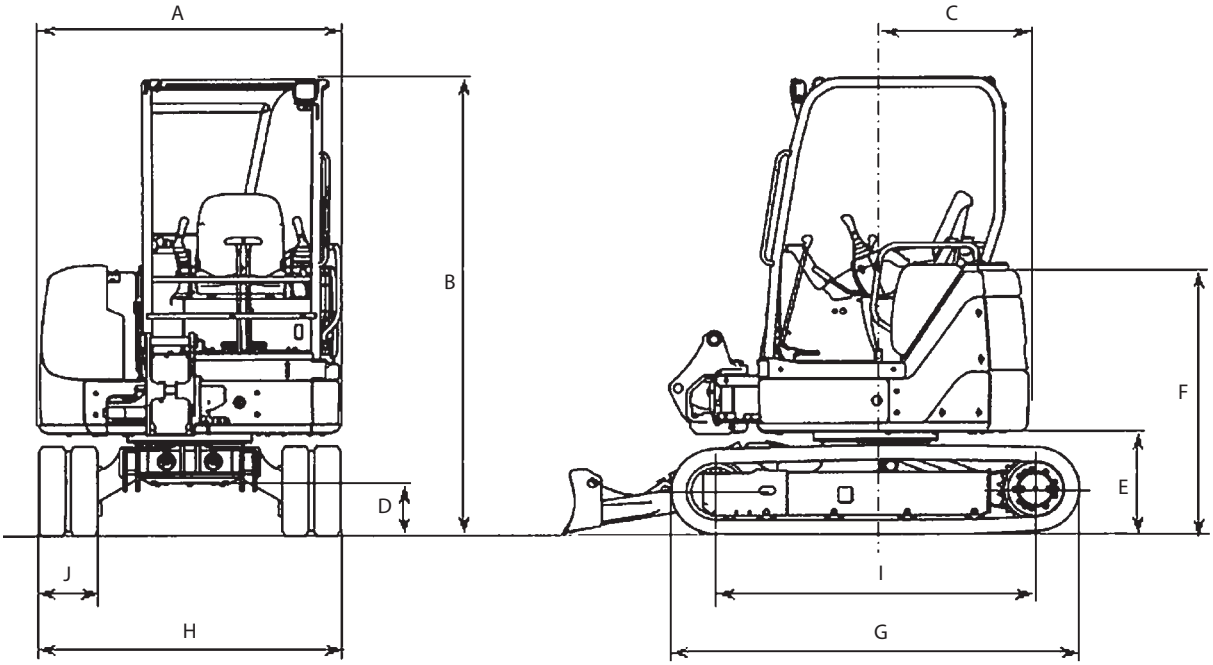
Their bulk density shall be less than 1600 kg/m^3 as a standard.

Loading work:

For loading operation of dried, loosened earth and sand.

Their bulk density shall be less than 1100 kg/m^3 as a standard.

Specifications ZX52U-3

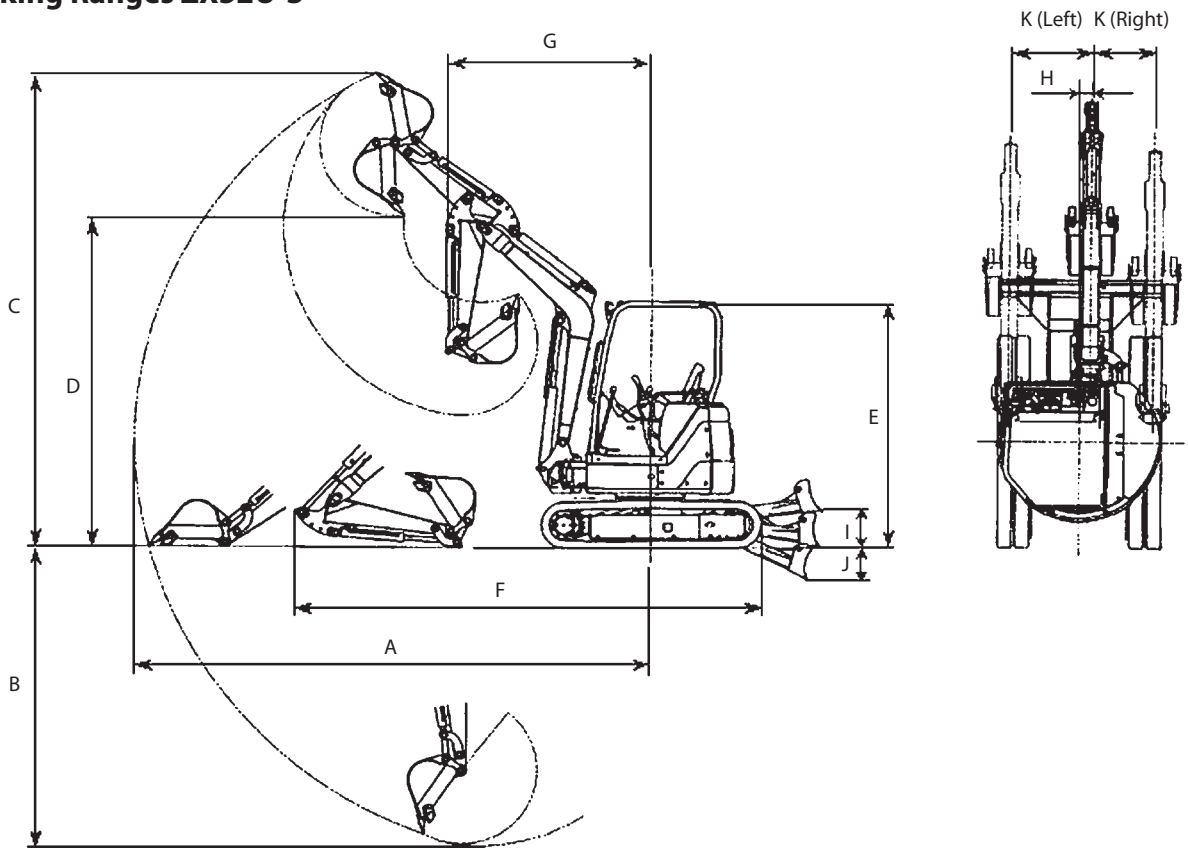


M1M7-12-004

Type		ZX52U-3	
		Canopy	Cab
Type of Front-End Attachment		Boom Swing Type, 1.69 m (5 ft 7 in) Arm	
Bucket Capacity (Heaped)	m^3 (yd^3)	0.16 (0.21)	
Operating Weight	kg (lb)	5180 (11420)	5340 (11770)
Base Machine Weight	kg (lb)	3980 (8770)	4140 (9130)
Engine	kW/min^{-1} (PS/rpm)	Yanmar EDM-4TNV88 28.4/2400 (38.6/2400)	
A: Overall Width	mm (ft•in)	1850 (6'1")	
B: Overall Height	mm (ft•in)	2510 (8'3")	2550 (8'4")
C: Rear-End Swing Radius	mm (ft•in)	1080 (3'7")	
D: Minimum Ground Clearance	mm (ft•in)	340 (1'1")	
E: Counterweight Clearance	mm (ft•in)	610 (2'0")	
F: Engine Cover Height	mm (ft•in)	1510 (4'11")	
G: Undercarriage Length	mm (ft•in)	2500 (8'2")	
H: Undercarriage Width	mm (ft•in)	2000 (6'7")	
I: Sprocket Center to Idler Center	mm (ft•in)	1990 (6'6")	
J: Track Shoe Width	mm (ft•in)	400 (1'4") (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	29 (0.30, 4.2)	30 (0.31, 4.4)
Swing Speed	min^{-1} (rpm)	9.0 (9.0)	
Travel Speed (fast/slow)	km/h (mph)	4.2/2.7 (2.6/1.7)	
Gradeability		30° (tan θ = 0.58)	

NOTE: • The specifications include additional counterweight and extra attachment lines.
• The dimensions do not include the height of the shoe lug.

Working Ranges ZX52U-3



M1M7-12-008

Item	Category	ZX52U-3			
		Canopy		Cab	
		1.38 m Arm	1.69 m Arm	1.38 m Arm	1.69 m Arm
A: Maximum Digging Reach	mm (ft•in)	5940 (19'6")	6240 (20'6")	5940 (19'6")	6240 (20'6")
B: Maximum Digging Depth	mm (ft•in)	3550 (11'8")	3860 (12'8")	3550 (11'8")	3860 (12'8")
C: Maximum Cutting Height	mm (ft•in)	5760 (18'11")	6010 (19'9")	5630 (18'6")	5870 (19'3")
D: Maximum Dumping Height	mm (ft•in)	4080 (13'5")	4330 (14'3")	3960 (13'0")	4200 (13'9")
E: Overall Height (Rubber Crawler)	mm (ft•in)	2510 (8'3")		2550 (8'4")	
F: Overall Length	mm (ft•in)	5460 (17'11")	5520 (18'1")	5460 (17'11")	5520 (18'1")
G: Minimum Swing Radius	mm (ft•in)	2150 (7'1")	2260 (7'5")	2300 (7'7")	2320 (7'7")
H: Boom-Swing Pivot Offset Distance	mm (ft•in)	100 (4")			
I: Blade Bottom Highest Position (above ground level)	mm (ft•in)	430 (1'5")			
J: Blade Bottom Lowest Position (below ground level)	mm (ft•in)	335 (1'1")			
K: Offset Distance	mm (ft•in)	L 795 (2'7") R 760 (2'6")			
Maximum Boom-Swing Angle		L 80°/R 60°			

NOTE: • The dimensions do not include the height of the shoe lug.
• L: Left R: Right

Shoe Types and Applications ZX52U-3

ZX52U-3 (Canopy)

Shoe Width		400 mm (1'4") Rubber Shoe	400 mm (1'4") Grouser Shoe	400 mm (1'4") Rubber Pad Shoe	400 mm (1'4") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	5180 (11420)	5250 (11570)	5450 (12020)	5270 (11620)
Minimum Ground Clearance	mm (ft•in)	340 (1'1")	320 (1'1")	360 (1'2")	360 (1'2")
Undercarriage Length	mm (ft•in)	2500 (8'2")	2480 (8'2")	2530 (8'4")	2530 (8'4")
Undercarriage Width	mm (ft•in)	2000 (6'7")	2000 (6'7")	2000 (6'7")	2000 (6'7")
Ground Pressure	kPa (kgf/cm^2, psi)	29 (0.30, 4.2)	30 (0.31, 4.4)	34 (0.35, 4.9)	30 (0.31, 4.4)

ZX52U-3 (Cab)

Shoe Width		400 mm (1'4") Rubber Shoe	400 mm (1'4") Grouser Shoe	400 mm (1'4") Rubber Pad Shoe	400 mm (1'4") Pad Crawler Shoe
Application		For Paved Road (Standard)	For Ordinary Ground (Option)	For Paved Road (Option)	For Paved Road (Option)
Operating Weight	kg (lb)	5340 (11770)	5410 (11930)	5610 (12370)	5430 (11970)
Minimum Ground Clearance	mm (ft•in)	340 (1'1")	320 (1'1")	360 (1'2")	360 (1'2")
Undercarriage Length	mm (ft•in)	2500 (8'2")	2480 (8'2")	2530 (8'4")	2530 (8'4")
Undercarriage Width	mm (ft•in)	2000 (6'7")	2000 (6'7")	2000 (6'7")	2000 (6'7")
Ground Pressure	kPa (kgf/cm^2, psi)	30 (0.31, 4.4)	31 (0.32, 4.5)	35 (0.36, 5.1)	31 (0.32, 4.5)

NOTE:
- *The specifications for the front-end attachment are for 1.69 m (5 ft 7 in) arm with ISO 0.16 m^3 (0.21 yd^3) bucket.*
- *Rubber shoe, rubber pad shoe and pad crawler shoe should be used on paved road.*
- *The dimensions do not include the height of the shoe lug.*

Bucket Types and Applications ZX52U-3

Bucket	Bucket Capacity m^3 (yd^3) ISO (Heaped)	Bucket Width mm		Front-End Attachment	
		(With side cutter) mm (in)	(Without side cutter) mm (in)	ZX52U-3	
				1.38 m (4'6") Arm	1.69 m (5'7") Arm
Hoe Bucket	0.100 (0.13)	450 (18")	400 (16")	⊙	⊙
	0.110 (0.14)	500 (20")	450 (18")	⊙	⊙
	0.130 (0.17)	550 (22")	500 (20")	⊙	⊙
	0.140 (0.18)	600 (24")	550 (22")	⊙	⊙
	0.160 (0.21)	650 (26")	600 (24")	⊙	○
	0.170 (0.22)	700 (28")	650 (26")	○	□

NOTE: • *Symbols in the above table have the following meanings.*
⊙: General excavating
○: Light duty excavating
□: Loading work

• *Hoe bucket is applicable to the following types of work.*

General excavating:

For digging and loading operation of sand, gravel, clay, ordinary earth and so on.

Light duty excavating:

For digging and loading operation of dried, loosened earth, sand, mud and so on.

Their bulk density shall be less than 1600 kg/m^3 as a standard.

Loading work:

For loading operation of dried, loosened earth and sand.

Their bulk density shall be less than 1100 kg/m^3 as a standard.

Noise Level Results (2000/14/CE, art. VI)

	Cab		Canopy	
	LWA(dBA)	LPA(dBA)	LWA(dBA)	LPA(dBA)
ZX29U-3	94	76	94	–
ZX33U-3	95	79	95	–
ZX38U-3	95	79	95	–
ZX48U-3	96	78	96	–
ZX52U-3	96	78	96	–

LWA=Guaranteed sound power level
LPA=Noise level at operator ear

Vibration Level

Hands/Arms: The acceleration to which the operator's hands and arms will be exposed is lower than 2.5 m/s^2.

Entire body: The acceleration to which the operator's entire body will be exposed is lower than 0.5 m/s^2.

NOTE: The acceleration is measured in accordance with ISO 2631/1; ISO 5349 and SAE J1166.

Dozer blade on ground.

Lifting Capacities

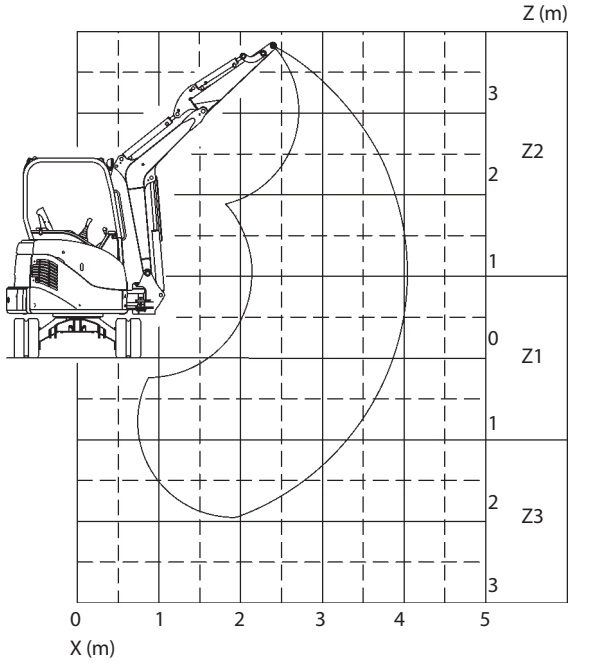
NOTE:
- *Lifting capacity of the ZX series does not exceed 75 % of tipping load with the machine on firm, level ground or 87 % of full hydraulic capacity. (ISO 10567)*
- *Net lifting capacities are equal to the values obtained by deducting the ATT mass from the values described in the table below.*

ZX29U-3

Boom 2.10 m, Counterweight 450 kg*
***Include additional counterweight 190 kg.**

Canopy — Unit; kg

Arm	Z \ X	1	2	3	4		MAX REACH [m]
1.17 m	Z2			560	370	370	4.03
	Z1		960	540		390	3.86
	Z3	1770	970	540		480	3.29
1.47 m	Z2			560	370	330	4.29
	Z1		950	530	360	340	4.12
	Z3	1460	950	530		410	3.61



M1NE-12-001

Cab — Unit; kg

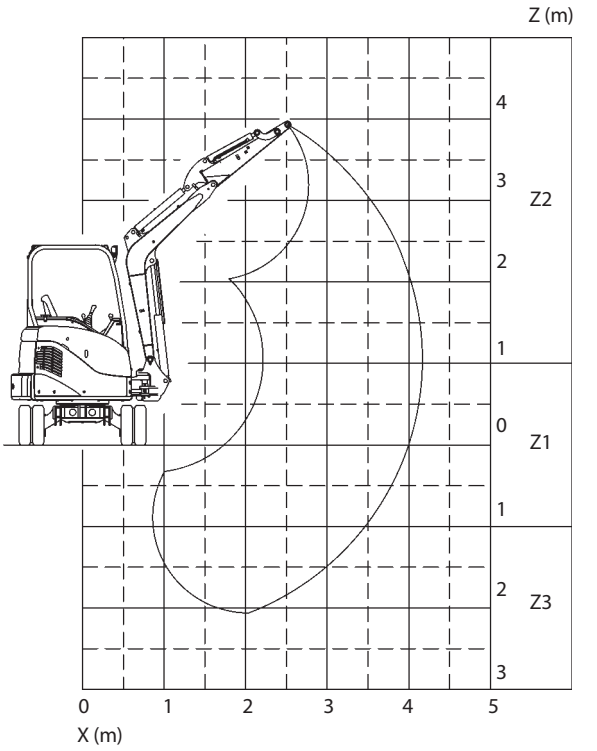
Arm	Z \ X	1	2	3	4		MAX REACH [m]
1.17 m	Z2			590	390	390	4.03
	Z1		1020	570		410	3.86
	Z3	1770	1030	570		510	3.29
1.47 m	Z2			590	390	350	4.29
	Z1		1000	560	380	370	4.12
	Z3	1460	1010	560		440	3.61

ZX33U-3

Boom 2.28 m, Counterweight 570 kg*
***Include additional counterweight 190 kg.**

Canopy Unit; kg

Arm	Z \ X	1	2	3	4		MAX REACH [m]
1.17 m	Z2			630	420	400	4.17
	Z1		1080	600		410	4.00
	Z3	1860	1100	610		500	3.46
1.52 m	Z2			630	410	350	4.45
	Z1		1060	600	400	360	4.29
	Z3	1520	1070	590		430	3.81



M1NE-12-002

Cab Unit; kg

Arm	Z \ X	1	2	3	4		MAX REACH [m]
1.17 m	Z2			660	440	420	4.17
	Z1		1140	630		430	4.00
	Z3	1860	1150	640		530	3.46
1.52 m	Z2			660	440	370	4.45
	Z1		1120	630	420	380	4.29
	Z3	1520	1120	620		450	3.81

ZX38U-3

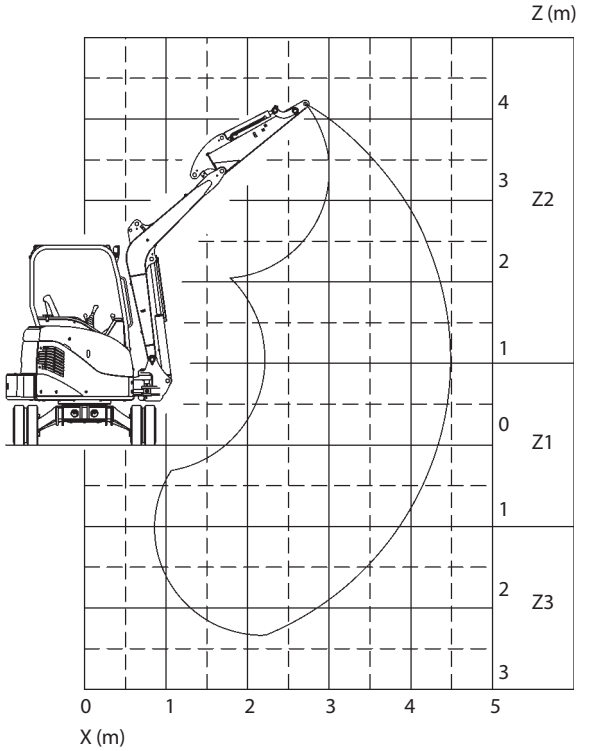
Boom 2.47 m, Counterweight 780 kg*
***Include additional counterweight 230 kg.**

Canopy Unit; kg

Arm	Z \ X	1	2	3	4		MAX REACH [m]
1.32 m	Z2			860	580	490	4.49
	Z1		1390	830	560	510	4.33
	Z3	1870	1550	830		590	3.86
1.72 m	Z2			870	570	440	4.81
	Z1		1510	820	550	450	4.66
	Z3	1540	1510	810	550	510	4.24

Cab Unit; kg

Arm	Z \ X	1	2	3	4		MAX REACH [m]
1.32 m	Z2			910	610	520	4.49
	Z1		1390	880	590	530	4.33
	Z3	1870	1620	870		620	3.86
1.72 m	Z2			910	600	460	4.81
	Z1		1550	860	580	470	4.66
	Z3	1540	1580	850	570	530	4.24



M1NE-12-003

ZX48U-3

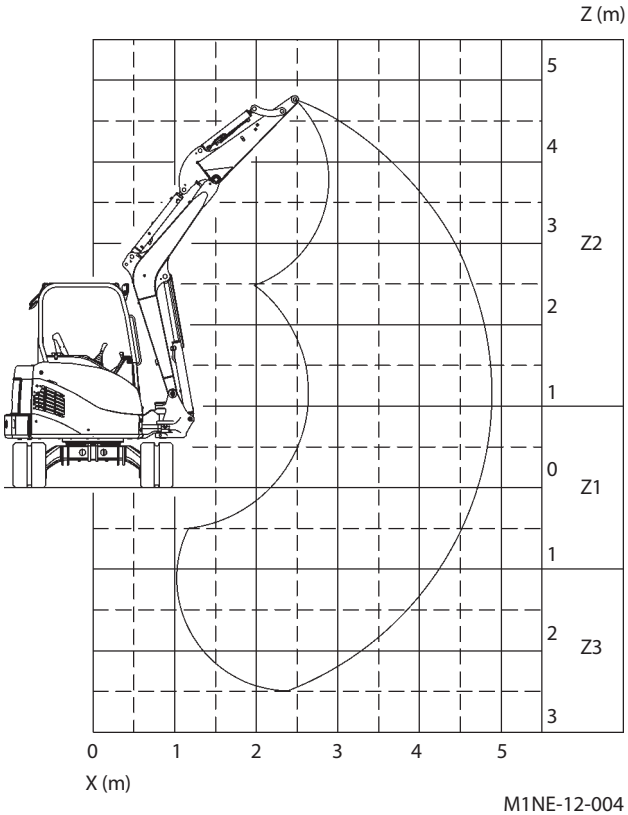
Boom 2.68 m, Counterweight 570 kg*
***Include additional counterweight 220 kg.**

Canopy Unit; kg

Arm	Z \ X	2	3	4	5	MAX REACH [m]	
1.38 m	Z2		1090	730		550	4.89
	Z1		1050	700		570	4.71
	Z3	2040	1050	700		650	4.24
1.69 m	Z2		1090	720	510	490	5.18
	Z1		1030	690	500	500	5.02
	Z3	1980	1020	680		570	4.59

Cab Unit; kg

Arm	Z \ X	2	3	4	5	MAX REACH [m]	
1.38 m	Z2		1120	750		560	4.89
	Z1		1090	730		580	4.71
	Z3	2100	1090	730		680	4.24
1.69 m	Z2		1120	740	530	500	5.18
	Z1		1070	710	520	520	5.02
	Z3	2040	1060	700		590	4.59



M1NE-12-004

ZX52U-3

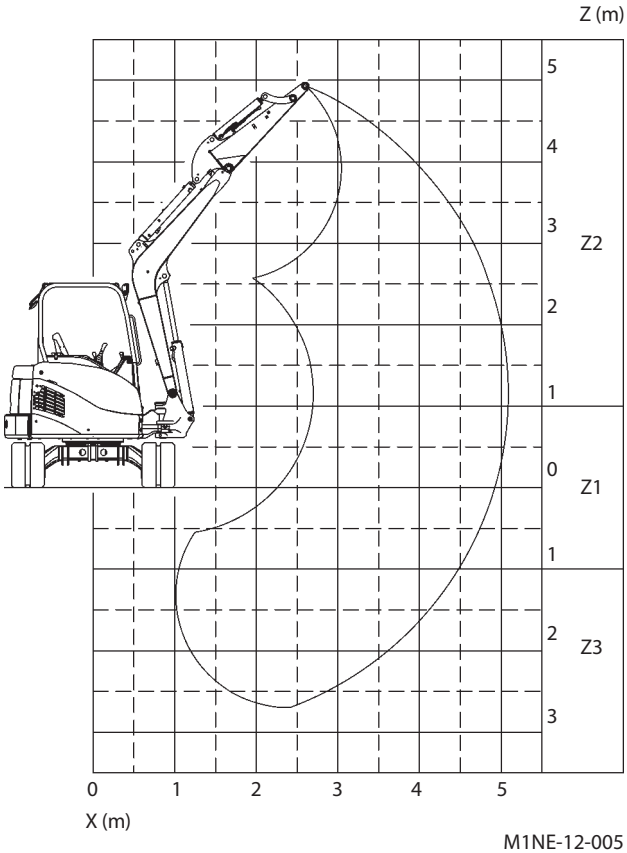
Boom 2.85 m, Counterweight 880 kg*
***Include additional counterweight 220 kg.**

Canopy Unit; kg

Arm	Z \ X	2	3	4	5		MAX REACH [m]
1.38 m	Z2		1280	860	630	610	5.09
	Z1		1250	840		640	4.92
	Z3	2440	1250	840		720	4.48
1.69 m	Z2		1280	850	620	550	5.39
	Z1		1230	820	600	570	5.24
	Z3	2280	1220	810		630	4.83

Cab Unit; kg

Arm	Z \ X	2	3	4	5		MAX REACH [m]
1.38 m	Z2		1320	890	650	630	5.09
	Z1		1280	860		650	4.92
	Z3	2500	1290	860		740	4.48
1.69 m	Z2		1320	880	640	570	5.39
	Z1		1260	840	620	580	5.24
	Z3	2280	1250	840		650	4.83



M1NE-12-005

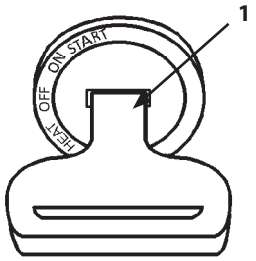
Ignition Block System (Optional)

Precautions for Use

- This system comprises precision machinery, and must be handled fully carefully.
- In this system, the password can be determined at the discretion of the customer, but must be controlled by the customer. It is recommended that the password be changed periodically (for more secured confidentiality). If the password ever escapes the customer's memory, contact your authorized dealer.
- Keep fire off the key-operating portions, and in case the surface is to be cleansed, wipe it with soft cloth.
- In case the machine is not operated for a long period, keep the battery cable removed for avoiding possible running out of the battery.
- In case any problem of machine maintenance is found, do not operate the machine.

Basic Functions

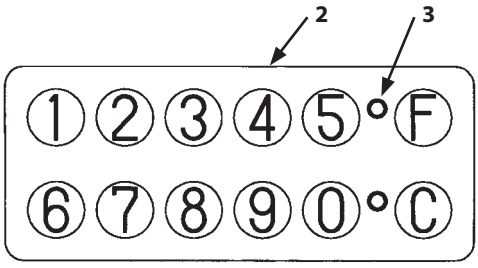
This system enables starting the engine only when the password inputted before the engine start is compared and coincides with the four-digit one determined at the discretion of and by the customer.



M1M7-01-007

Unlocking

- Turn key switch (1) ON, and when all numeric keys (2) are lit, input the password. When the buzzer sounds and unlocking indicator (3) (green LED) is lit, unlocking is done, and the engine can be started.



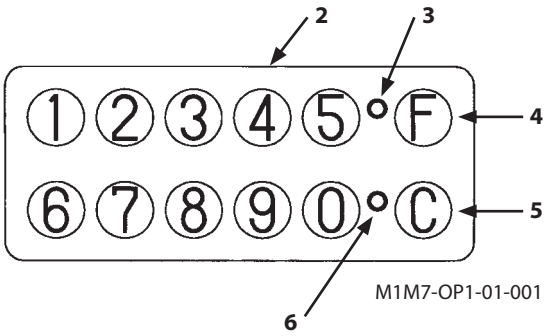
M1M7-OP1-01-001

IMPORTANT: **Inputting by numeric keys (2) must be made within 15 seconds after they are lit. Later than that, all numeric keys (2) are unlit, and inputting is not accepted any longer. On that occasion, redo from the beginning by turning key switch (1) OFF once.**

Locking

- After key switch (1) is turned OFF, when the delayed locking timer setting (random setting) time has passed, locking is made automatically. While the delayed locking timer is working, locking is immediately possible by pushing any of numeric keys (1 – 9, 0, F, or C). Besides, while the delayed locking timer is working, unlocking indicator (3) keeps flickering.

Numeric Keypad



M1M7-OP1-01-001

1. Unlocking indicator (3) (green LED)
   While this indicator (3) is flickering or ON, the engine can be started without inputting the password. In case the password is inputted, indicator (3) is lit when the 2nd digit is inputted.

2. Locking indicator (6) (red LED)
   When locked, indicator (6) slowly flickers. In case the password is inputted, indicator (6) is lit when the 1st and 3rd digits are inputted.

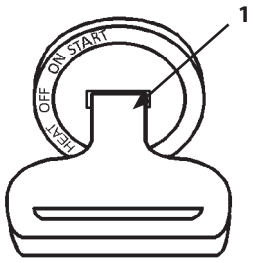
3. Numeric keys (2) (1 – 9 and 0)
   Used for inputting the password and making various other kinds of setting.

4. Key F (4)
   Used for function setting.

5. Key C (5)
   Used primarily for cancelling input. Besides, at the time of numeral change, indication of the changed numerals is possible for confirmation sake.

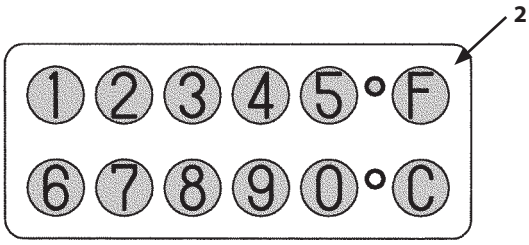
Unlocking

1. Turn key switch (1) ON. Then, all numeric keys (2) are lit.



M1M7-01-007

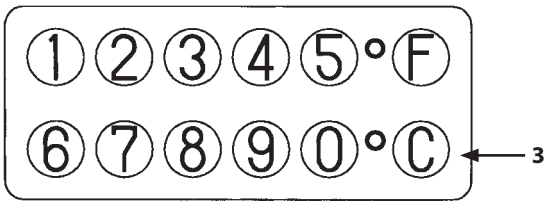
2. Input the 1st digit of the four-digit password.
3. Similarly, input the 2nd digit.
4. Similarly, input the 3rd digit.
5. Similarly, input the 4th digit.



M1M7-OP1-01-002

6. If the inputted numerals coincide with those of the password, the buzzer sounds twice, and unlocking is done. In this condition, when key switch (1) is turned ON, the engine can be started.

NOTE: In case mistaken inputting of the password has been found out, the input can be cancelled by pushing Key C (3). Alternatively, redo from the beginning by turning key switch (1) OFF.



M1M7-OP1-01-003

Method of Changing Password

Cancel the registered password, and set a new password.

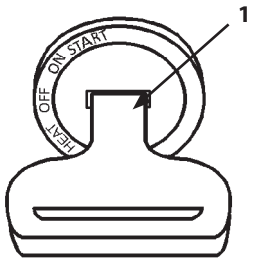
1. Turn key switch (1) ON.

2. Unlock the numeric keys.

3. Push Key F (2) and Key 1 (3) simultaneously for more than 2 seconds.

4. Two indicators (4) and (5) flicker simultaneously, and the buzzer sounds.
5. Input the new 4-digit password. After inputting, two indicators (4) and (5) are lit, and the buzzer sounds twice.
6. Once again, input the password to be newly registered. (the same password as that in Item 5)
   When properly inputted, two indicators (4) and (5) flicker, and the numerals of the new password are lit in turn. After flickering of the new password, if Key C (6) is pushed, indication of the password inputted again can be indicated.
   (IMPORTANT: Registration is not made at this stage.)
   In case the buzzer sounds eight times, and two indicators (4) and (5) alternately flicker, the input is mistaken. Redo beginning with Item 3.
7. Push Key F (2) for more than two seconds. The buzzer sounds three times, and the password is registered. This completes registration. The password is effective from the next input.

NOTE: In case Key C (6) is pushed in the change mode condition, redoing is possible from Item 4. And in case changing the password needs to be cancelled, turn key switch (1) OFF.



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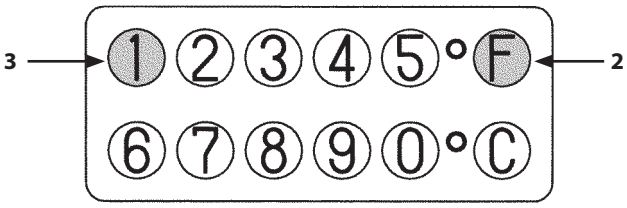

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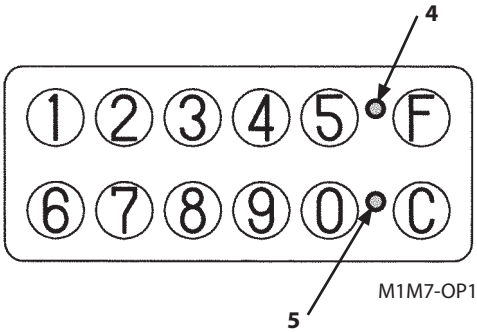

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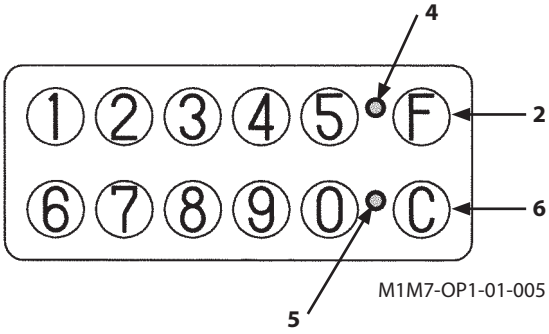


M1M7-OP1-01-005

Changing Delayed Locking Timer Setting

Change the delayed locking timer setting.

1. Turn key switch (1) ON.

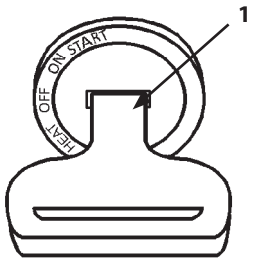
2. Unlock the numeric keys.

3. Push Key F (2) and Key 2 (7) simultaneously for more than two seconds.

4. Two indicators (4) and (5) flicker simultaneously, and the buzzer sounds.

5. Input the numeric keys corresponding to the delayed locking timer setting.
   "List of Timer Setting"
   Key 1: 15 seconds (Preset time for new machine)
   Key 2: 3 minutes
   Key 3: 5 minutes
   Key 4: 10 minutes
   Key 5: 15 minutes
   Key 6: 30 minutes
   Key 7: 60 minutes
   Key 8: 90 minutes
   Key 9: 120 minutes
   Key 0: 0 second

6. Push Key F (2) for more than two seconds. The buzzer sounds three times, and the delayed locking timer setting is registered.
   The above completes the setting.



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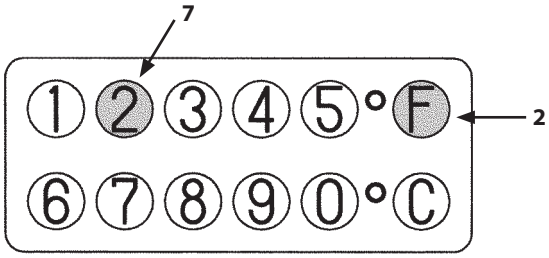

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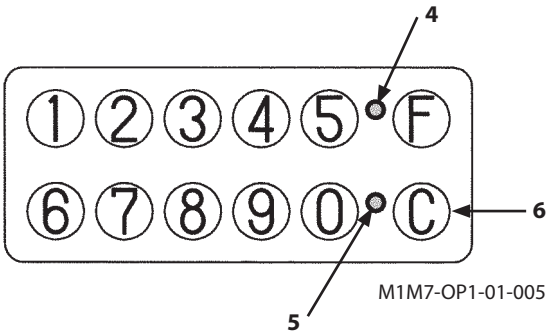
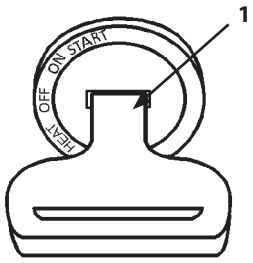


M1M7-OP1-01-005

NOTE: In case setting needs to be stopped in the midst, input Key C (6), or turn key switch (1) OFF.

Alarm Outputting Function

In this system, if wrong passwords are inputted four times consecutively, warning is given by sounding the horn or the buzzer. The warning keeps sounding for a certain period of time even if key switch (1) is turned OFF.
From then on, warning by the horn or the buzzer is given unless the right password is inputted.



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Indication of System Errors

In case two indicators flicker alternately, occurrence of a system error can be considered.
Contact your authorized dealer.

Pre-stored Conditions for New Machine

Pre-stored conditions for new machine are as follows.

(1) Password

0000

(2) Delayed locking timer setting

15 seconds

Additional Counterweight

The mass values of additional counterweights (1) are shown in the table below.

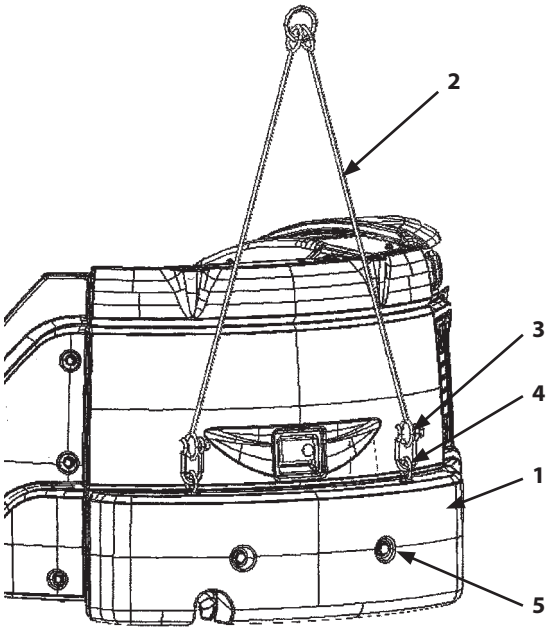
Model	Mass	Overhang from the end of the base machine
ZX29U-3	190 kg (420 lb)	90 mm (3.5 in)
ZX33U-3	190 kg (420 lb)	90 mm (3.5 in)
ZX38U-3	230 kg (510 lb)	90 mm (3.5 in)
ZX48U-3	220 kg (490 lb)	80 mm (3.1 in)
ZX52U-3	220 kg (490 lb)	80 mm (3.1 in)

Removal

Remove additional counterweight (1) by following the procedure below.

1. Suspend additional counterweight (1) using the lifting tools described below so that counterweight (1) does not fall.
   Wire rope (2) × 2 : Breaking load: more than 7 kN
   Pin Shackle (3) × 2 : JIS Nominal size: 8 or more
   Eye bolt (4) × 2 : M20
2. Remove mounting bolts (5).

WARNING: Take care if additional counterweight (1) is eccentrically lifted, lifted counterweight (1) may widely sway. Place removed additional counterweight (1) on a level surface.



M1M7-13-002

Installation

1. Lift additional counterweight (1) using the lifting tools described above. Mount additional counterweight (1) on the standard counterweight. Tighten mounting bolts (5).

   ZX29U-3, 33U-3, 38U-3
   Wrench Size : 24 mm
   Tightening Torque : 270 N•m (27 kgf•m, 195 lbf•ft)

   ZX48U-3, 52U-3
   Wrench Size : 30 mm
   Tightening Torque : 550 N•m (55 kgf•m, 400 lbf•ft)

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MEMO

CONFORMITY

The EC Declaration of Conformity includes the machine without accessory, unless fitted with accessories approved by Hitachi Construction Machinery.
The EC Declaration of Conformity will lose its validity for any modification of the machine without approval.
Hitachi Construction Machinery does not cover conformity of machines fitted with OEM equipment.

Legal Provisions;

The machine fulfills all relevant provisions of the following directives (and their amendments)
2004/108/EC Electromagnetic compatibility
2006/42/EC Machine
2000/14/EC Noise emission

Notified body for 2000/14/EC

SNCH
Société Nationale de Certification et d'Homologation
S.à.r.l. 11, route de Luxembourg L-5230 Sandweiler

Conformity assessment procedure followed;

Annex VI

Manufacturer;

Hitachi Construction Machinery (Europe) N.V.

· Amsterdam
Siciliëweg 5, 1045 AT, Amsterdam, The Netherlands

· Oosterhout
Souvereinstraat 16, 4903 RH, Oosterhout, The Netherlands

The Person who can compile the technical file :
Manager, Quality Assurance Div.
Hitachi Construction Machinery (Europe) N.V.

Hydraulic Excavator ZX29U-3/ZX33U-3/ZX38U-3/ZX48U-3/ZX52U-3

Operator's Manual (Original Instruction)

Manual part number : EM1NE-EN1-4

Hitachi Construction Machinery (Europe) N.V.
Address : Siciliëweg 5, 1045 AT, Amsterdam, The Netherlands
URL : http://www.hitachi-c-m.com