

**HITACHI**

PART NO. EM1NC-EN3-1

# Operator's Manual

# ZAXIS

## 14-3

## 16-3

## 18-3

## 27-3

## Hydraulic Excavator

ZX14-3 • ZX16-3 • ZX18-3 • ZX27-3 HYDRAULIC EXCAVATOR OPERATOR'S MANUAL

 **Hitachi Construction Machinery Co., Ltd.**

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

PRINTED IN THE NETHERLANDS (ACI) 2009, 12

EM1NC-EN3-1

Serial No.

ZX14-3	001001	and up
ZX16-3	003001	and up
ZX18-3	005001	and up
ZX27-3	007001	and up

## 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<sup>2</sup>, 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.

**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 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.

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.

**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.

# INDEX

MACHINE NUMBERS

SAFETY

SAFETY SIGNS

COMPONENTS NAME

OPERATOR'S STATION

BREAK-IN

OPERATING ENGINE

DRIVING MACHINE

OPERATING MACHINE

TRANSPORTING

MAINTENANCE

CONSUMABLE PARTS LIST

MAINTENANCE UNDER SPECIAL ENVIRONMENTAL CONDITIONS

STORAGE

TROUBLESHOOTING

SPECIFICATIONS

OPTIONAL ATTACHMENT AND DEVICE

INDEX



# CONTENTS

<b>MACHINE NUMBERS</b> .....	1
<b>SAFETY</b> .....	S-1
Recognize Safety Information .....	S-1
Understand Signal Words.....	S-1
Follow Safety Instructions.....	S-2
Prepare for Emergencies.....	S-2
Wear Protective Clothing.....	S-3
Protect Against Noise .....	S-3
Inspect Machine .....	S-3
Tidy Up Inside Operator's Space .....	S-4
Use Handrails and Steps .....	S-4
Never Ride Attachment.....	S-4
Adjust Operator's Seat.....	S-5
Ensure Safety Before Rising from or Leaving Operator's Seat.....	S-5
Fasten Your Seat Belt.....	S-5
Move and Operate Machine Safely.....	S-6
Operate Only from Operator's Seat .....	S-7
Jump Starting .....	S-7
Keep Riders Off Machine .....	S-7
Precautions for Operations .....	S-8
Investigate Job Site Beforehand .....	S-9
Equipment of OPG .....	S-10
Provide Signals for Jobs Involving Multiple Machines .....	S-10
Confirm Direction of Machine to be Driven .....	S-10
Drive Machine Safely.....	S-11
Avoid Injury from Rollaway Accidents.....	S-13
Avoid Injury from Back-over and Swing Accidents.....	S-14
Keep Personnel Clear from Working Area .....	S-15
Never Position Bucket Over Anyone .....	S-15
Avoid Undercutting.....	S-15
Avoid Tipping.....	S-16
Never Undercut a High Bank.....	S-16
Dig with Caution.....	S-17
Operate with Caution .....	S-17
Avoid Power Lines.....	S-17
Precautions for Lightning.....	S-18
Do Not Use for Craning Operations.....	S-18
Protect Against Flying Debris .....	S-18
Park Machine Safely.....	S-19
Handle Fluids Safely—Avoid Fires.....	S-19
Safety Transporting .....	S-20
Practice Safe Maintenance.....	S-21
Warn Others of Service Work .....	S-22
Support Machine Properly.....	S-22
Stay Clear of Moving Parts .....	S-23
Prevent Parts from Flying .....	S-23
Store Attachments Safely .....	S-24
Prevent Burns.....	S-24
Replace Rubber Hoses Periodically.....	S-25
Avoid High-pressure Fluids.....	S-25
Prevent Fires.....	S-26
Evacuating in Case of Fire.....	S-27
Beware of Exhaust Fumes.....	S-28
Beware of Asbestos and Silicon Dust and Other Contamination .....	S-28
Precautions for Welding and Grinding .....	S-29
Avoid Heating Near Pressurized Fluid Lines .....	S-29
Avoid Applying Heat to Lines Containing Flammable Fluids.....	S-29
Remove Paint Before Welding or Heating .....	S-30
Prevent Battery Explosions .....	S-30
Handle Chemical Products Safely.....	S-31
Dispose of Waste Properly.....	S-31
<b>SAFETY SIGNS</b> .....	S-33
<b>COMPONENTS NAME</b> .....	1-1
<b>OPERATOR'S STATION</b> .....	1-3
Pedals, Levers and Monitor Panel.....	1-3
Switch Panel.....	1-4
Key Switch .....	1-5
Monitor Panel .....	1-6
Alternator Indicator.....	1-6
Fuel Level Indicator .....	1-6
Preheat Indicator.....	1-6
Overheat Indicator .....	1-6
Engine Oil Pressure Indicator.....	1-7
Hour Meter .....	1-7
Fuel Gauge (ZX14-3, 16-3, 18-3) .....	1-7
Fuel Gauge (ZX27-3) .....	1-7
Coolant Temperature Gauge (ZX27-3) .....	1-7
Coolant Temperature Indicator.....	1-7
Cab Heater Operation (Cab Equipped Machines) .....	1-8
Heater Operation .....	1-8
Blower Operation.....	1-8
Defroster Operation.....	1-8
Radio (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-9
AM/FM Radio Operation (Cab Equipped Machine, When Genuine Radio is Installed).....	1-10
Part Name and Function .....	1-10
Radio Operation .....	1-11
Tuning Procedure .....	1-11
Station Presetting Procedure.....	1-12
Deletion of Preset Memory .....	1-12
Clock Setting Procedure.....	1-12
Opening/Closing Cab Front Window (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-13
Opening/Closing Cab Front Window (ZX27-3).....	1-14
Emergency Exit (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-15
Emergency Exit (ZX27-3) .....	1-16
Adjusting Operator's Seat .....	1-17
Seat Fore-Aft Adjustment .....	1-17
Tool and Operator's Manual Box.....	1-18
Seat Belt .....	1-19
Cab Light (Cab Equipped Machines) .....	1-20
Cab Door Release Lever (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-21
Cab Door Release Button (ZX27-3) .....	1-21

# CONTENTS

<b>BREAK-IN</b> .....	2-1	Securing Machine to Trailer for Transportation.....	6-3
Breaking in New Machine .....	2-1	Unloading .....	6-4
<b>OPERATING ENGINE</b> .....	3-1	Lifting Machine with Crane .....	6-5
Before Starting Engine .....	3-1	<b>MAINTENANCE</b> .....	7-1
Starting Engine .....	3-2	Procedures .....	7-1
Check Machine After Starting Engine.....	3-5	Prepare Machine for Inspection/Maintenance.....	7-2
Using Booster Battery .....	3-6	Opening/Closing Engine Access Covers .....	7-3
Stopping Engine .....	3-7	Opening/Closing Tank Covers (ZX27-3) .....	7-4
<b>DRIVING MACHINE</b> .....	4-1	Opening/Closing Right Side Covers (ZX27-3) .....	7-5
Travel Levers .....	4-1	Daily Inspection .....	7-6
Travel Mode Switch (ZX16-3, 18-3, 27-3).....	4-3	Periodic Replacement of Parts.....	7-8
Traveling on Soft Ground .....	4-4	Maintenance Guide .....	7-9
Raise One Track Using Boom and Arm .....	4-4	Brand Names of Recommended	
Towing Machine .....	4-5	Oil and Lubricants.....	7-12
Driving in Water or on Soft Ground.....	4-6	A. Greasing.....	7-15
Parking and Stopping on Slopes .....	4-7	Front Joint Pins (Incl. Swing Post Joint Pins) .....	7-15
Parking on Slopes.....	4-7	Bucket and Link Pins .....	7-18
<b>OPERATING MACHINE</b> .....	5-1	Blade Pins (ZX27-3).....	7-18
Control Lever (ISO Excavator Pattern).....	5-1	Swing Bearing .....	7-19
Boom-Swing Pedal.....	5-2	Swing Internal Gear .....	7-20
Auxiliary Pedal .....	5-3	Control Lever Universal Joint.....	7-20
Blade Lever .....	5-4	B. Engine .....	7-21
Precautions for Blade Operation.....	5-5	Engine Oil .....	7-21
Blade and Track Width		Change Engine Oil / Replace Engine Oil Filter .....	7-22
Control Lever Operation (ZX18-3).....	5-6	C. Transmission.....	7-24
Extending / Retracting Blade Width		Travel Reduction Gear .....	7-24
(ZX18-3).....	5-7	D. Hydraulic System.....	7-27
Pilot Control Shut-Off Lever .....	5-8	Check Hydraulic Oil Level .....	7-28
Warming Up Operation.....	5-10	Drain Hydraulic Oil Tank Sump .....	7-29
Warming Up in Cold Weather .....	5-10	Change Hydraulic Oil .....	7-30
Operating Backhoe.....	5-11	Clean Suction Filter .....	7-33
Grading Operation.....	5-12	Replace Full Flow Filter .....	7-34
Avoid Driving Bucket Teeth into Ground.....	5-12	Replace Pilot Filter .....	7-35
Avoid Abusive Operation .....	5-12	Check Hoses and Lines .....	7-37
Avoid Striking with Bucket.....	5-13	E. Fuel System .....	7-44
Avoid Excavation Using Upperstructure and/or		Check Water Separator .....	7-45
Boom Swing Power .....	5-13	Drain Fuel Tank Sump .....	7-46
Use Correct Track Shoe.....	5-13	Replace Fuel Filter.....	7-47
Avoid Other Than Specified Machine Operations .....	5-14	Check Fuel Hoses .....	7-48
Precautions for Using Bucket Hook .....	5-15	F. Air Cleaner.....	7-49
Boom Cylinder May Hit Blade .....	5-15	Clean Air Cleaner Element .....	7-49
Avoid Hitting Blade with Bucket.....	5-16	Replace Air Cleaner Element.....	7-49
Avoid Colliding Blade Against Rocks.....	5-16	G. Cooling System .....	7-51
Avoid Colliding Boom Cylinder with Track .....	5-16	Check Coolant Level .....	7-53
Using Rubber Crawler.....	5-17	Check and Adjust Fan Belt Tension.....	7-53
Pipings for Breaker and Crusher.....	5-19	Change Coolant.....	7-56
Precautions for Breaker Operation.....	5-20	Clean Radiator.....	7-58
Precautions for Crusher Operation .....	5-23	Clean Air Conditioner Condenser .....	7-58
Precautions for After Operating Machine.....	5-24	H. Electrical System.....	7-59
Emergency Boom Lowering Procedure .....	5-25	Battery.....	7-59
<b>TRANSPORTING</b> .....	6-1	Replacing Fuses .....	7-63
Transporting by Road .....	6-1	I. Miscellaneous.....	7-64
Trailer Loading/Unloading .....	6-1	Check Bucket Teeth for Looseness and/or Wear .....	7-64
Loading .....	6-2	Replace Bucket.....	7-66
		Adjust Track Sag (Rubber Crawler) and Check for	
		Damage .....	7-67

---

---

# CONTENTS

---

---

Replace Rubber Track.....	7-69
Check Track Sag (Steel Crawler) (Optional) (ZX27-3 Only) .....	7-71
Check and Replace Seat Belt.....	7-74
Clean Cab Floor (Cab Equipped Machines) .....	7-75
Check Injection Nozzle .....	7-76
Adjust Valve Clearance.....	7-76
Measure Engine Compression Pressure.....	7-76
Check Starter and Alternator .....	7-76
Check Radiator Cap.....	7-76
Check Crankcase Breather .....	7-76
Check Tightening Torque of Bolts and Nuts.....	7-77
<b>CONSUMABLE PARTS LIST</b> .....	8-1
<b>MAINTENANCE UNDER SPECIAL ENVIRONMENTAL CONDITIONS</b> .....	9-1
<b>STORAGE</b> .....	10-1
Storing Machine.....	10-1
Removing Machine from Storage .....	10-2
<b>TROUBLESHOOTING</b> .....	11-1
Impossible to Start Engine.....	11-1
Engine.....	11-2
Electrical System.....	11-5
Mode Selection .....	11-6
Control Levers.....	11-7
Hydraulic System.....	11-7
<b>SPECIFICATIONS</b> .....	12-1
Specifications ZX14-3.....	12-1
Working Ranges ZX14-3.....	12-2
Bucket Types and Applications ZX14-3.....	12-3
Specifications ZX16-3.....	12-4
Working Ranges ZX16-3.....	12-5
Bucket Types and Applications ZX16-3 .....	12-6
Specifications ZX18-3.....	12-7
Working Ranges ZX18-3.....	12-8
Bucket Types and Applications ZX18-3.....	12-9
Specifications ZX27-3.....	12-10
Working Ranges ZX27-3.....	12-11
Bucket Types and Applications ZX27-3.....	12-12
Noise Level Results (2000/14/CE, art. VI).....	12-13
Vibration Level.....	12-13
Special Specification .....	12-14
<b>OPTIONAL ATTACHMENT AND DEVICE</b> .....	13-1
Ignition Block System (Optional) .....	13-1
<b>INDEX</b> .....	14-1

---





# MACHINE NUMBERS

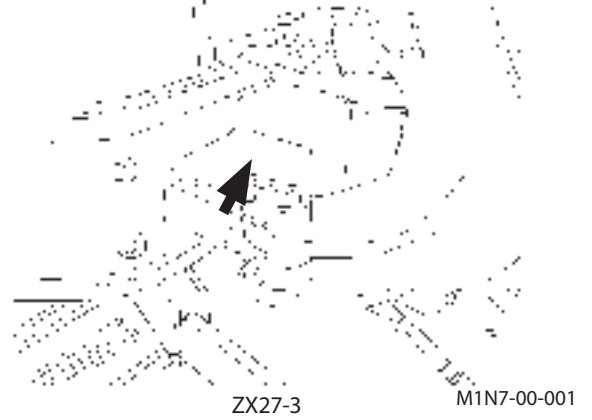
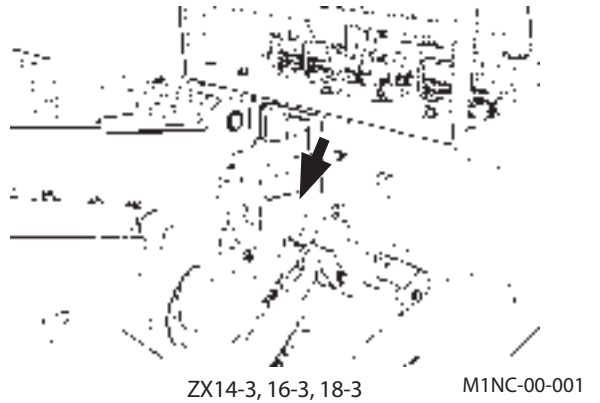
The manufacturing Nos. explained in this group is the individual number (serial No.) given to each machine and hydraulic components. These numbers are requested when inquiring any information on the machine and/or components. Fill these serial Nos. in the blank spaces in this group to immediately make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

## Machine

MODEL/TYPE: \_\_\_\_\_

PRODUCT IDENTIFICATION NUMBER:

\_\_\_\_\_



## Product Identification Number

PRODUCT IDENTIFICATION NUMBER:

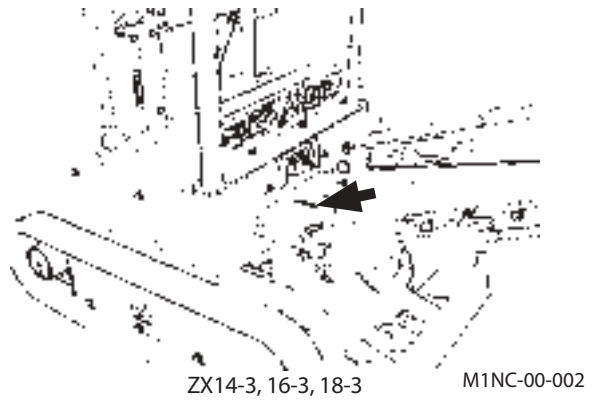
\_\_\_\_\_

 NOTE:

\*HCM1NC00X00001001\*

Marks to indicate the start and end of the PIN

PRODUCT IDENTIFICATION NUMBER (PIN)

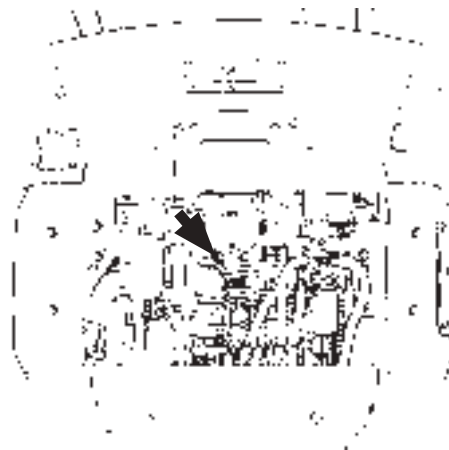


# MACHINE NUMBERS

## Engine

TYPE: \_\_\_\_\_

MFG. NO.: \_\_\_\_\_



ZX14-3, 16-3, 18-3

M1NC-00-003



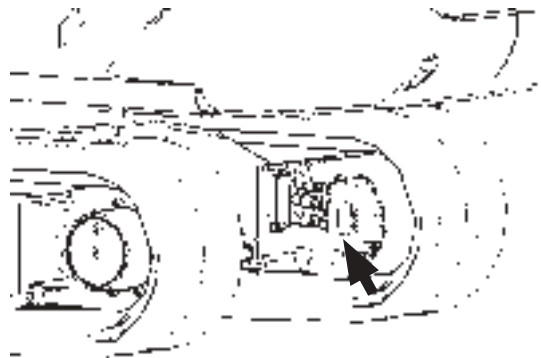
ZX27-3

M1NC-00-015

## Travel Motor

TYPE: \_\_\_\_\_

MFG. NO.: \_\_\_\_\_



M1NC-00-004

## Swing Motor

TYPE: \_\_\_\_\_

MFG. NO.: \_\_\_\_\_



M1NC-00-005

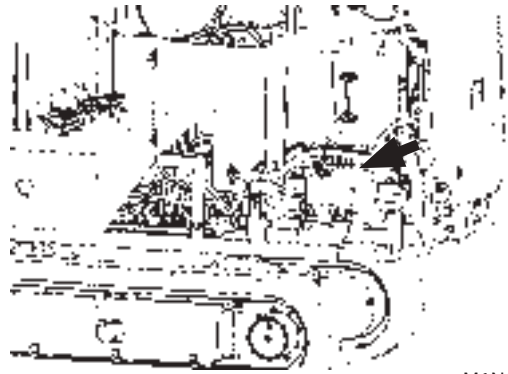
# MACHINE NUMBERS

---

## Hydraulic Pump

TYPE: \_\_\_\_\_

MFG. NO.: \_\_\_\_\_



ZX14-3, 16-3, 18-3

M1NC-00-006



ZX27-3

M1NC-00-016



## SAFETY

---


### 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

## SAFETY

---

### 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 to use it properly.
  - To ensure that a fire extinguisher can be always used when necessary, check and service the fire extinguisher at the recommended intervals as specified in the fire extinguisher manual.
- Establish emergency procedure guidelines to cope with fires and accidents.
- Keep emergency numbers for doctors, ambulance service, hospital, and fire department posted near your telephone.



SA-437

## SAFETY

---

### Wear Protective Clothing

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

You may need:

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

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

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



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 "Before Starting Engine" section in the operator's manual.



SA-435

## SAFETY

---

### Tidy Up Inside Operator's Space

- Always keep inside the operator's space clean by observing instructions below, to prevent any personal accidents from occurring.
- Remove mud and/or oily material from the shoe soles before entering the operator's space. If pedals are operated without removing mud or oily matter, the foot may slip off the pedal, possibly creating a hazardous situation.
- Do not leave parts and/or tools around the operator's seat.
- Avoid storing transparent bottles in the cab. Do not attach any transparent type window decorations on the windowpanes as they may focus sunlight, possibly starting a fire.
- 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.
- Do not leave cigarette lighters in the cab. If the temperature in the cab increases, the lighter may explode.

---

### Use Handrails and Steps

- Falling is one of the major causes of personal injury.
  - When you get on and off the machine, always use the crawler instead of the step for safety. Also get on and off from the position of the crawler that can secure your feet space enough.
  - 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.



## SAFETY

---

### Adjust Operator's Seat

- A poorly adjusted seat for either the operator or the work at hand may quickly fatigue the operator leading to misoperation 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 either side window or to adjust the seat position, be sure to first lower the front attachment to the ground and then move the pilot control shut-off lever to the LOCK position. Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes into 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

## SAFETY

---

### 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. Check that all lights are operable before operating the machine. If any faulty illumination is present, immediately repair it.



SA-1291

## SAFETY

---

### 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.



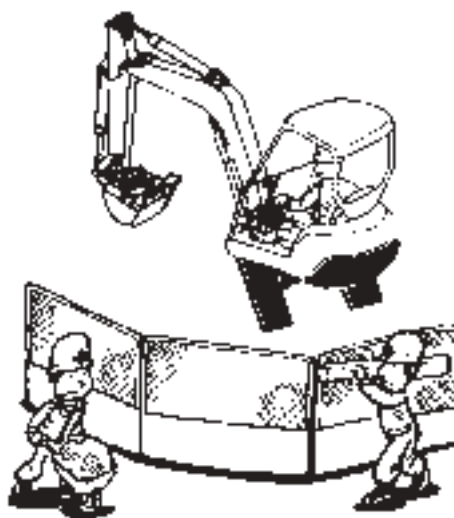
SA-1292

## SAFETY

---

### Precautions for Operations

- ⚠ WARNING: Thoroughly make certain safety at the work site before starting operations. Especially always observe the following points.**
- **Be sure to install the overhead cab guard before operating the machine in areas where the possibility of falling stones or debris exists.**
  - **If operation on soft ground is required, sufficiently reinforce the ground beforehand.**
- Be sure to wear close fitting clothing and required safety items, such as a helmet, 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 into 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

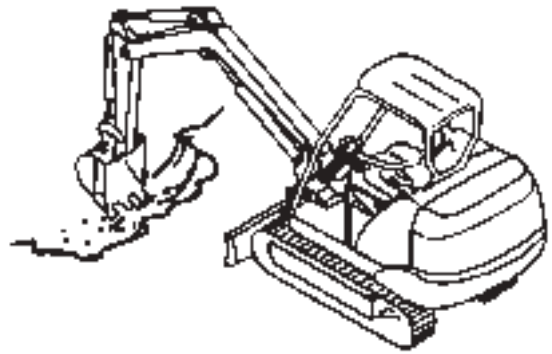
## SAFETY

### 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 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

## SAFETY

---

### 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 manufacturer'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 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

---

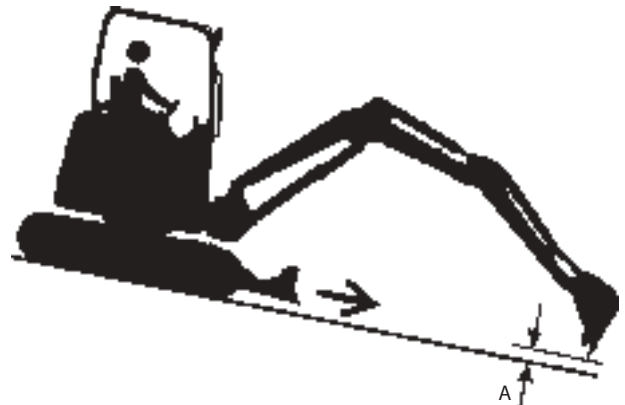
## SAFETY

### Drive Machine Safely

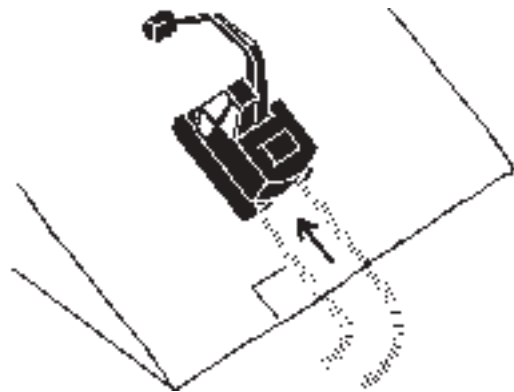
- Use a signal person when traveling the machine along road shoulders or in congested areas.
- Driving the machine in the incorrect direction may result in serious injury or death and/or severe damage to property.
- Before driving the machine, always confirm that the travel pedals/levers direction corresponds 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 (B) degrees or steeper slopes.  
B : ZX14-3, 16-3, 18-3 : 25°  
ZX27-3 : 30°
  - 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.



SA-1295

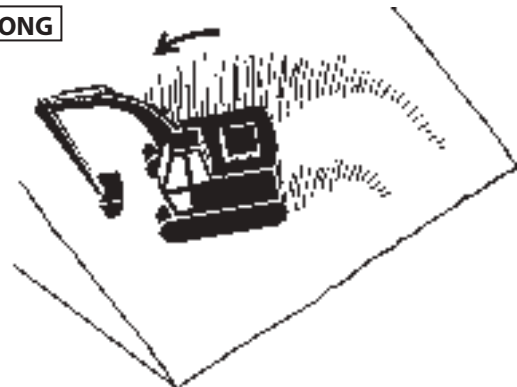


SA-1296




SA-441

**WRONG**



SA-590

## SAFETY

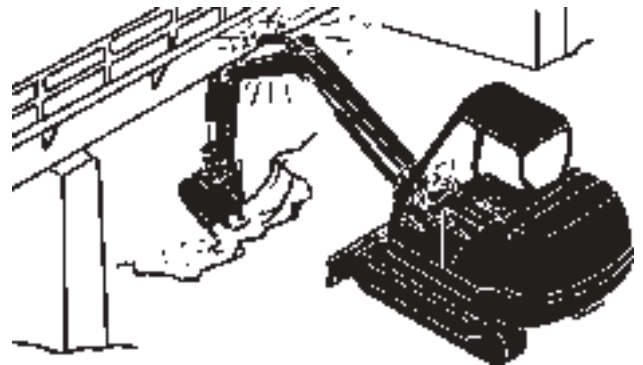
- Traveling down a slope in the fast mode requires a longer time to stop the machine.  
When traveling down a slope, place engine control lever (1) in the TURTLE  position.
- Use a signal person when moving, swinging or operating the machine in congested areas. Coordinate hand signals before starting the machine.
- Before moving machine, determine which way to move travel pedals/levers for the direction you want to go. When the travel motors are in the rear, pushing down on the front of the travel pedals or pushing the levers forward moves the machine forward, towards the idlers.
- Select a travel route that is as flat as possible. Steer the machine as straight as possible, making small gradual changes in direction.
- Before traveling on them, check the strengths of bridges and road shoulders, and reinforce if necessary.
- Do not make contact with electric wires or bridges.
- When crossing a river, measure the depth of the river using the bucket, and cross slowly. Do not cross the river when the depth of the river is deeper than the upper edge of the upper roller.
- When traveling on rough terrain, reduce engine speed. Select slow travel speed. Slower speed will reduce possible damage to the machine.
- Avoid operations that may damage the track and undercarriage components.
- 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.



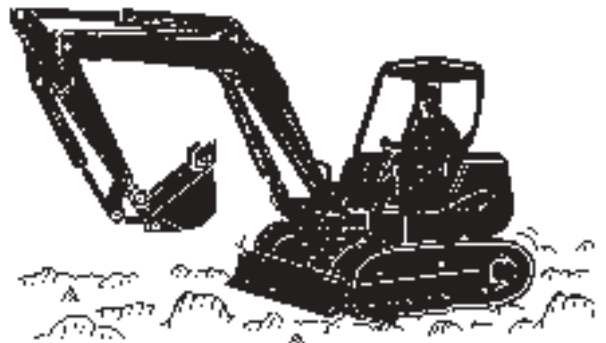
M1NC-00-007



M104-05-008



SA-673



M586-05-002



## SAFETY

---

### 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

## SAFETY

---

### 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 signalman 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



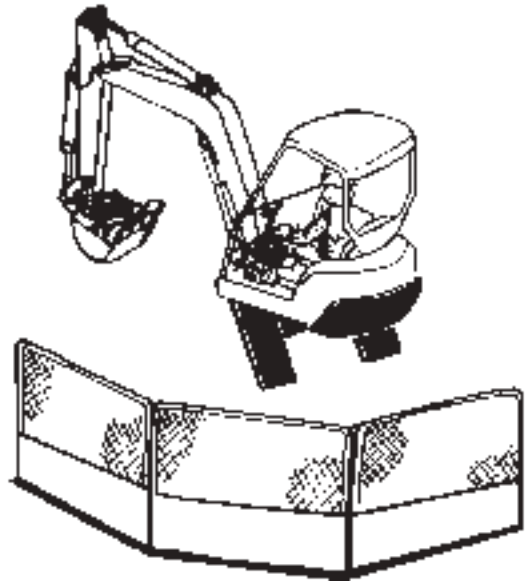
SA-384

## SAFETY

---

### Keep Personnel Clear from Working Area

- If a person is present near the operating machine, the person may come into 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

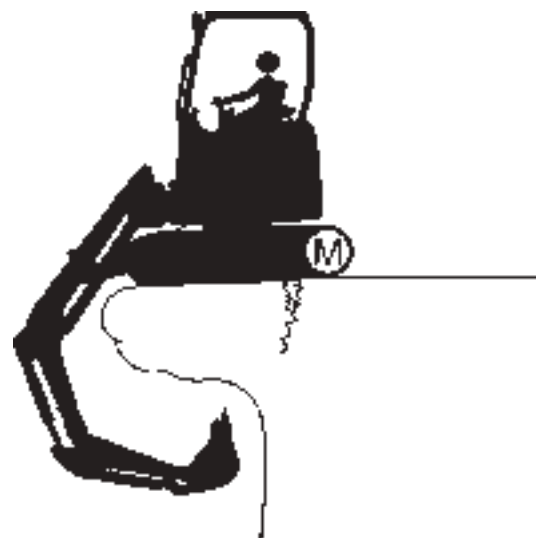
- Never lift, move, or swing bucket above anyone or a truck cab. Serious injury or machine damage may result due to bucket load spill or due to collision with the bucket.
- Never allow the bucket to pass over anyone to avoid personal injury or death.



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

## SAFETY

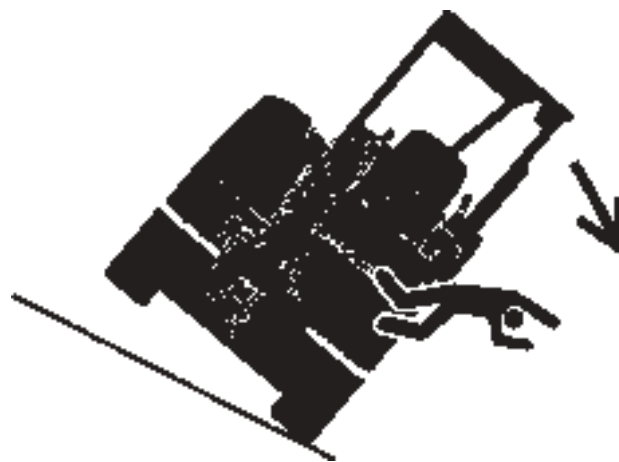
---

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



SA-1301

---

### Never Undercut a High Bank

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



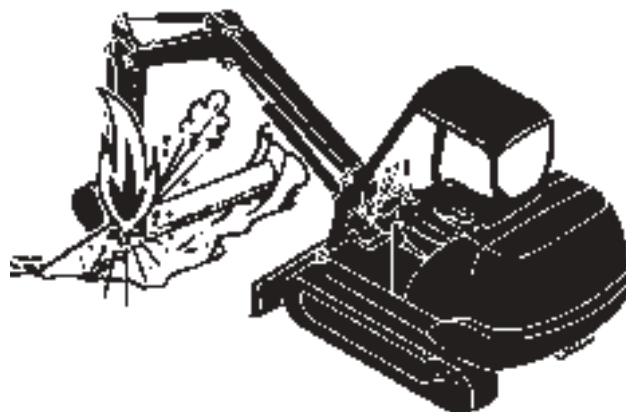
SA-1302

## SAFETY

---

### Dig with Caution

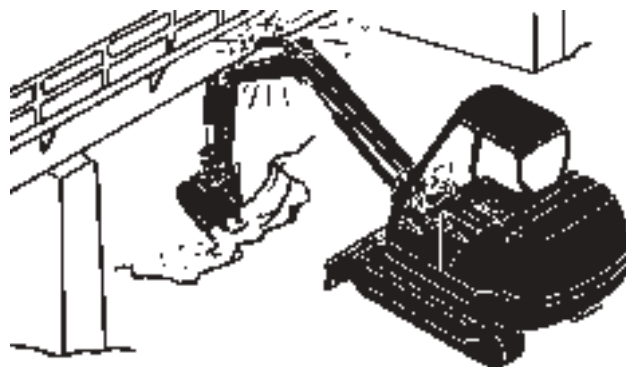
- Accidental severing of underground cables or gas lines may cause an explosion and/or fire, possibly resulting in serious injury or death.
- Before digging check the location of cables, gas lines, and water lines.
- Keep the minimum distance required, by law, from cables, gas lines, and water lines.
- 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

## SAFETY

---

### Precautions for Lightning

- 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.



SA-1805

---

### Do Not Use for Craning Operations

- NEVER use the machine for craning operations. If the machine is used for craning operations, the machine may tip over and/or lifted load may fall, possibly resulting in serious injury or death.
- This machine has been exclusively designed to engage in excavation and loading works.
- This machine is not equipped with any of the necessary safety devices that could allow the machine to be used for craning operation.



SA-014

---

### Protect Against Flying Debris

- 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.



SA-432

## SAFETY

---

### 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 lock lever to the LOCK position.
  - 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.



SA-018



SA-019

## SAFETY

---

### 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. Slowly drive the machine.
    6. 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, change traveling direction, and begin to drive again.
    7. The top end of the ramp where it meets the flatbed is a sudden bump. Take care when traveling over it.
    8. Wedge the front and rear of the tracks. Securely fasten the machine to the trailer bed with chain or cables.
    9. Do not operate any levers besides the travel levers when driving up or down the ramp.
    10. Prevent possible injury from machine tipping while the upperstructure is rotating.
    11. Keep the arm tucked under and rotate the upperstructure slowly for best stability.



SA-1307

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



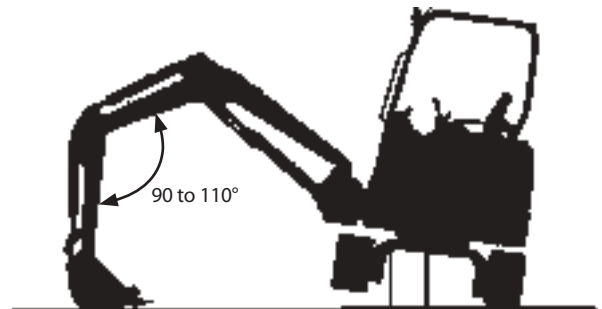
## SAFETY

### 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 running, 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

## SAFETY

---

- 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.



SA-037

---

### 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

## SAFETY

---

### 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.
- 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.



SA-344

## SAFETY

---

### Store Attachments Safely

- Stored attachments such as buckets, hydraulic hammers, and blades can fall and cause serious injury or death.
- Securely store attachments and implements to prevent falling 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-025

## SAFETY

### 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

## SAFETY

---

### 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 pressurized container.
- Do not store oily cloths. They are liable to catch fire.
- Do not wind easy-to-absorb-oil asbestos or glass wool around high-temperature parts such as a muffler or exhaust pipe.

## SAFETY

---

### 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

## SAFETY

---

### 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



## SAFETY

---

### Precautions for Welding and Grinding

- Welding may generate gas and/or small fires.
  - Be sure to perform welding in a well ventilated and prepared area. Store flammable objects in a safe place before starting welding.
  - Only qualified personnel should perform welding. Never allow an unqualified person to perform welding.
- Grinding on the machine may create 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.



SA-818

### Avoid Heating Near Pressurized Fluid Lines

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



SA-030

### 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.

## SAFETY

---

### Remove Paint Before Welding or Heating

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.
  - 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.



SA-029

---

### Prevent Battery Explosions

- Battery gas can explode.
  - Keep sparks, lighted matches, and flame away from the top of battery.
  - Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
  - Do not charge a frozen battery; it may explode. Warm the battery to 16 °C (60 °F) first.
  - Do not continue to use or charge the battery when the electrolyte level is lower than specified. Explosion of the battery may result.
  - When a terminal become 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 continuously with water for about 15 minutes. Seek medical attention immediately.
  - Be sure to wear eye protection when checking electrolyte specific gravity.



SA-032

## SAFETY

---

### 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 ordering it at your authorized dealer.



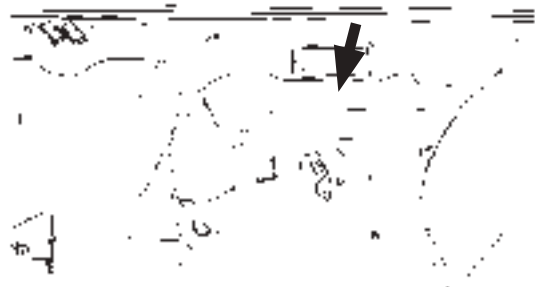
SS4420332

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



ZX14-3, 16-3, 18-3

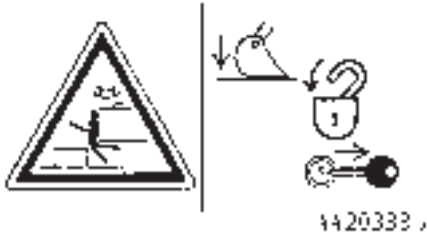
M1NC-00-008



ZX27-3

M1NC-00-017

## SAFETY SIGNS



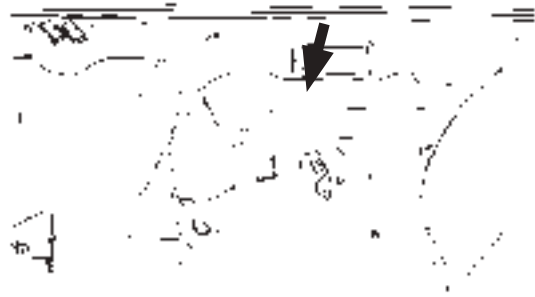
SS4420333

- 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.



ZX14-3, 16-3, 18-3

M1NC-00-008



ZX27-3

M1NC-00-017



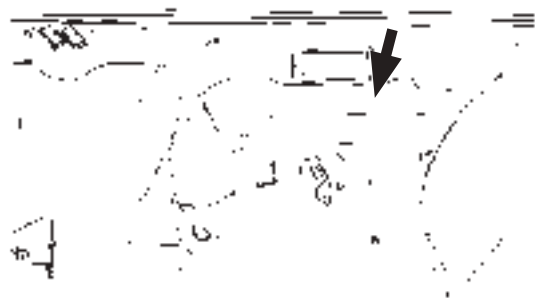
SS-1613

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



ZX14-3, 16-3, 18-3

M1NC-00-008



ZX27-3

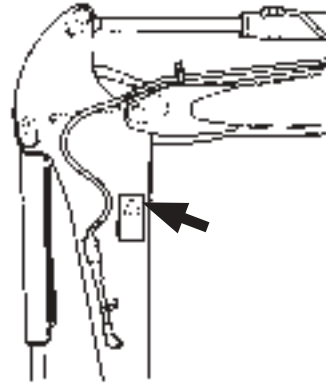
M1NC-00-017

## SAFETY SIGNS

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



SS-1702

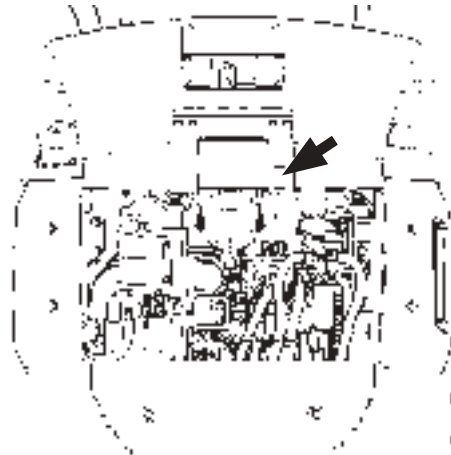


SS-1494

- 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.

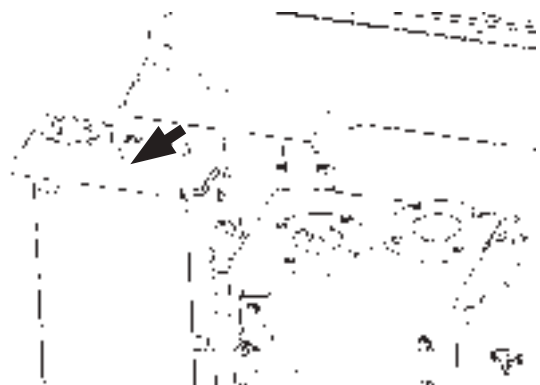


SS-1703



ZX14-3, 16-3, 18-3

M1NC-00-009



ZX27-3

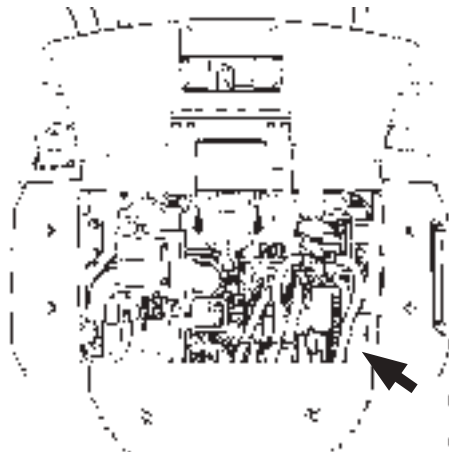
M1NC-00-018

## SAFETY SIGNS

- 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



ZX14-3, 16-3, 18-3

M1NC-00-009



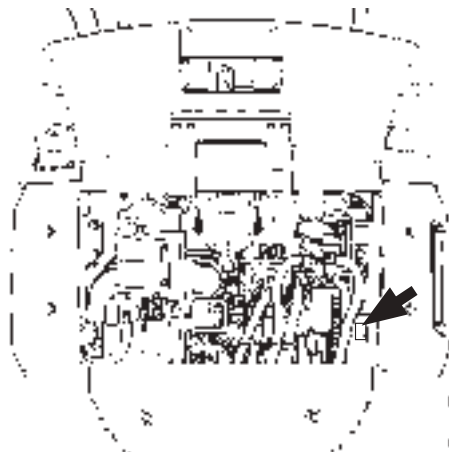
ZX27-3

M1NC-00-019

- 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



ZX14-3, 16-3, 18-3

M1NC-00-009



ZX27-3

M1NC-00-019

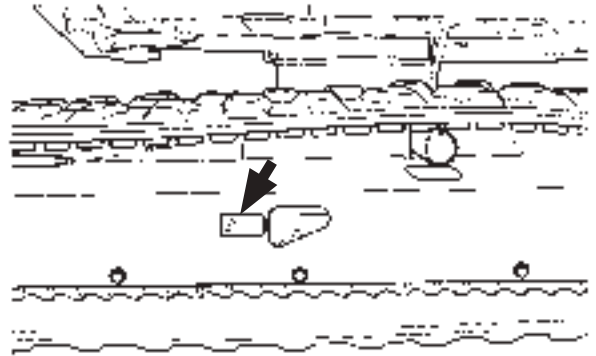


## SAFETY SIGNS



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.

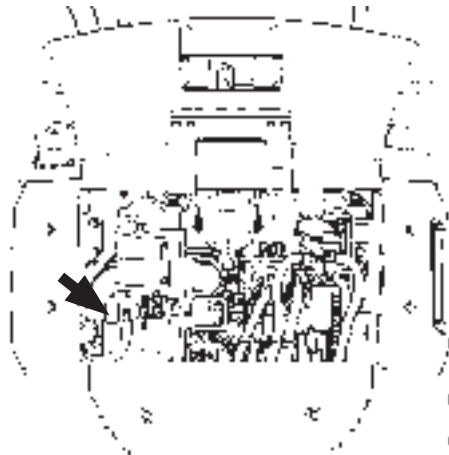


SS-1495

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

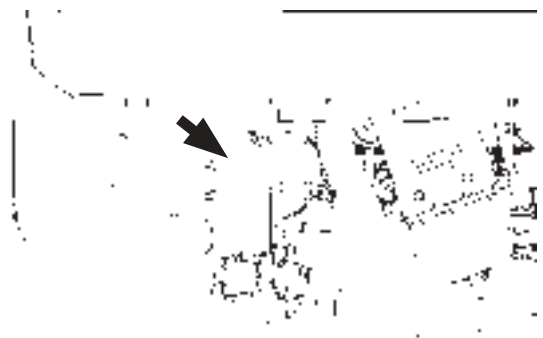


SS4392289



ZX14-3, 16-3, 18-3

M1NC-00-009



ZX27-3

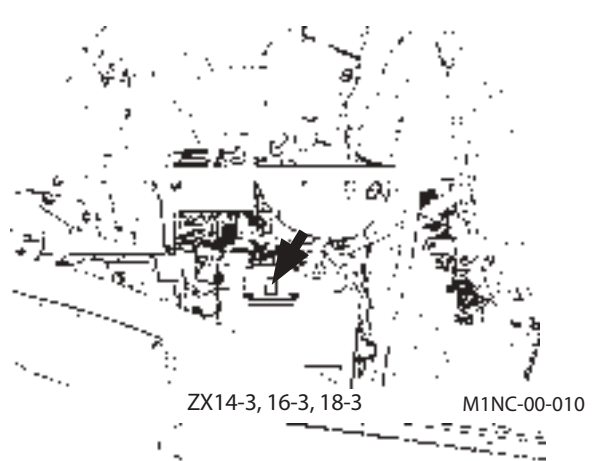
M1NC-00-020

## SAFETY SIGNS

- 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



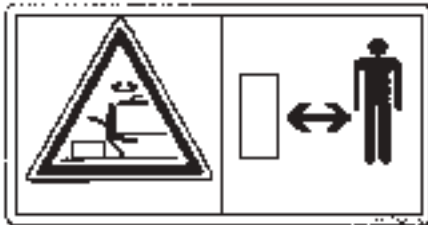
ZX14-3, 16-3, 18-3

M1NC-00-010



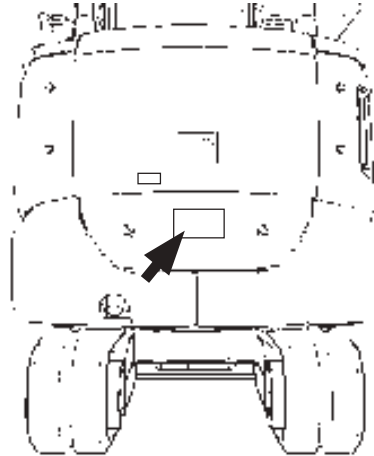
ZX27-3

M1NC-00-018



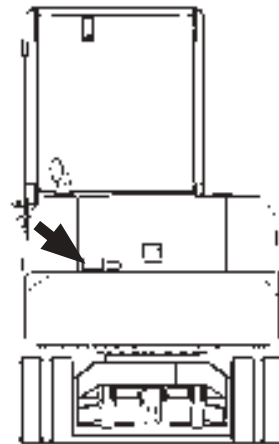
SS-1714

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



ZX14-3, 16-3, 18-3

M1NC-00-011



ZX27-3

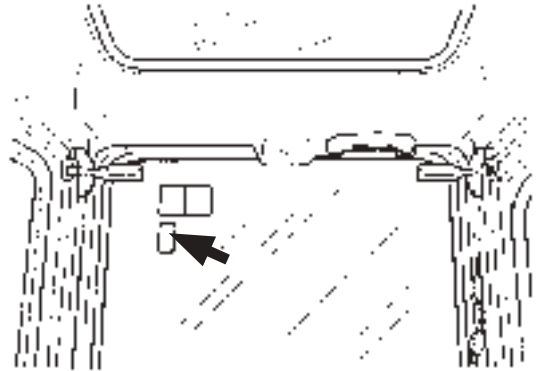
M1NC-00-021

## SAFETY SIGNS

- 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

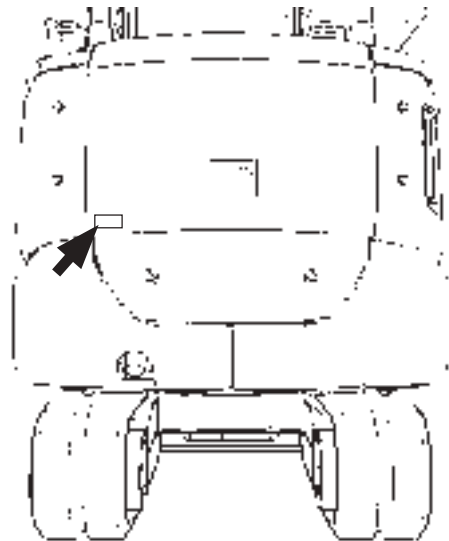


SS-2641



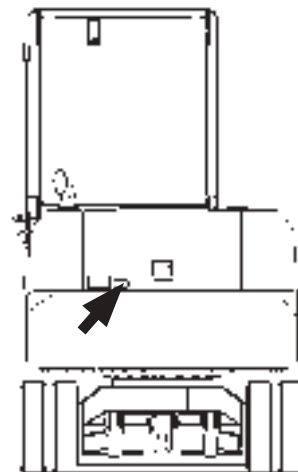
SS-1719

- 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.



ZX14-3, 16-3, 18-3

M1NC-00-011



ZX27-3

M1NC-00-021

# SAFETY SIGNS

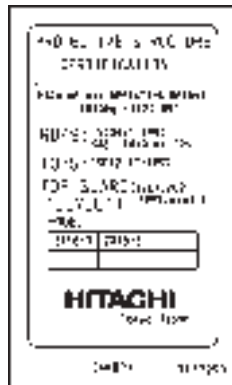
## ROPS/TOPS/TOP GUARD Canopy and Cab

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



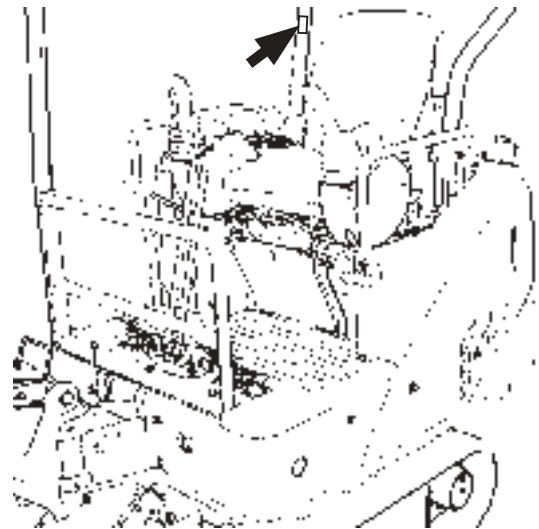
ZX14-3

SS3115731



ZX16-3, 18-3

SS3117290



ROPS Canopy  
ZX14-3, 16-3, 18-3

M1NC-01-013



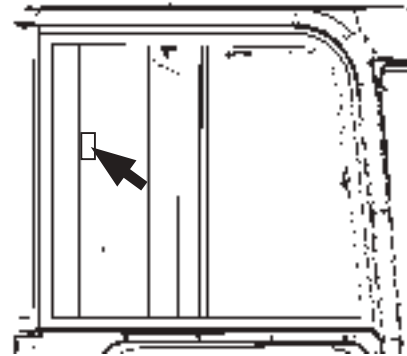
ZX14-3

SS3116740



ZX16-3, 18-3

SS3117293



ROPS Cab  
ZX14-3, 16-3, 18-3

M1MS-00-004



ZX14-3

SS3116078



ZX16-3, 18-3

SS3117804



TOPS Canopy  
ZX14-3, 16-3, 18-3

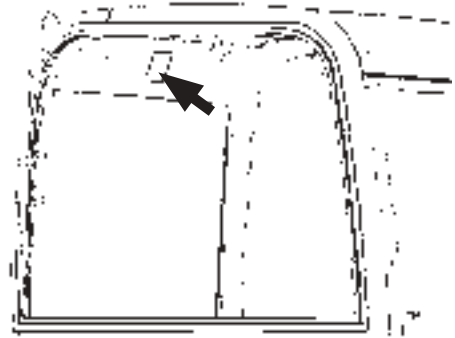
M1NC-00-014

# SAFETY SIGNS



ZX27-3

SS3118030



ROPS Cab  
ZX27-3

M1NC-00-022

# SAFETY SIGNS

---

---

## MEMO

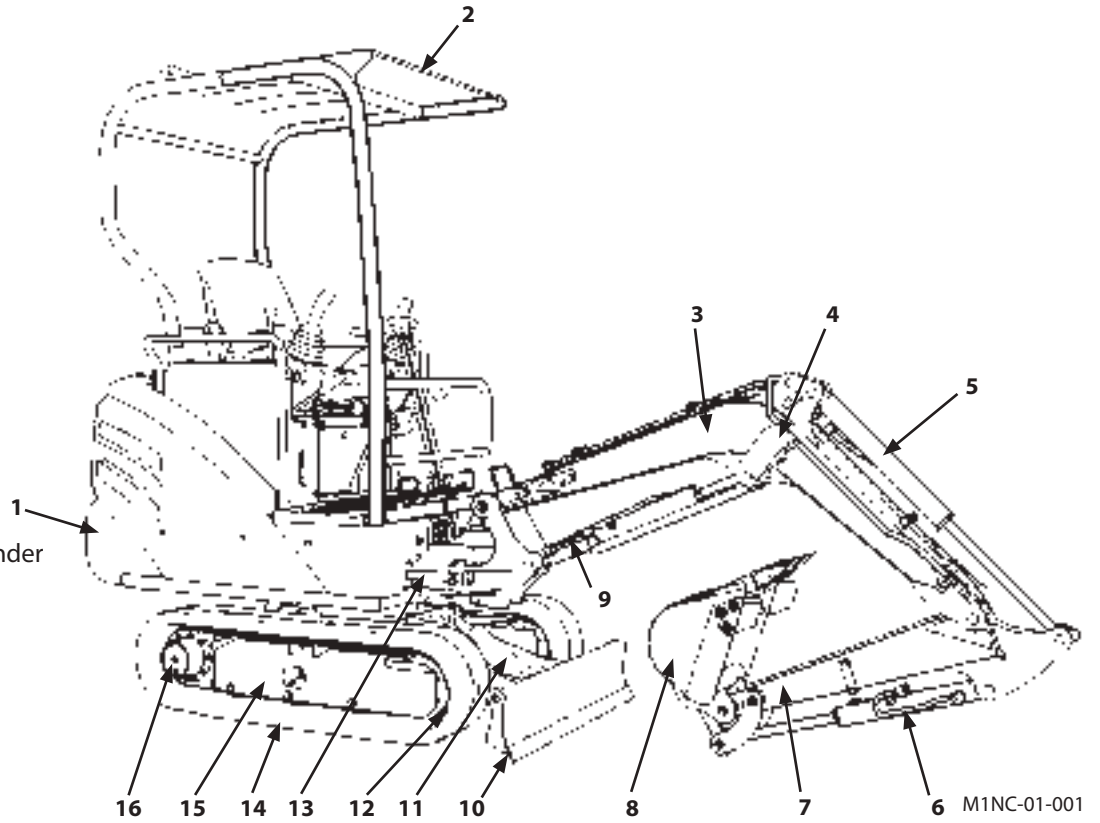
A series of horizontal dotted lines for writing a memo.

## COMPONENTS NAME

### Components Name

#### ZX14-3, 16-3, 18-3

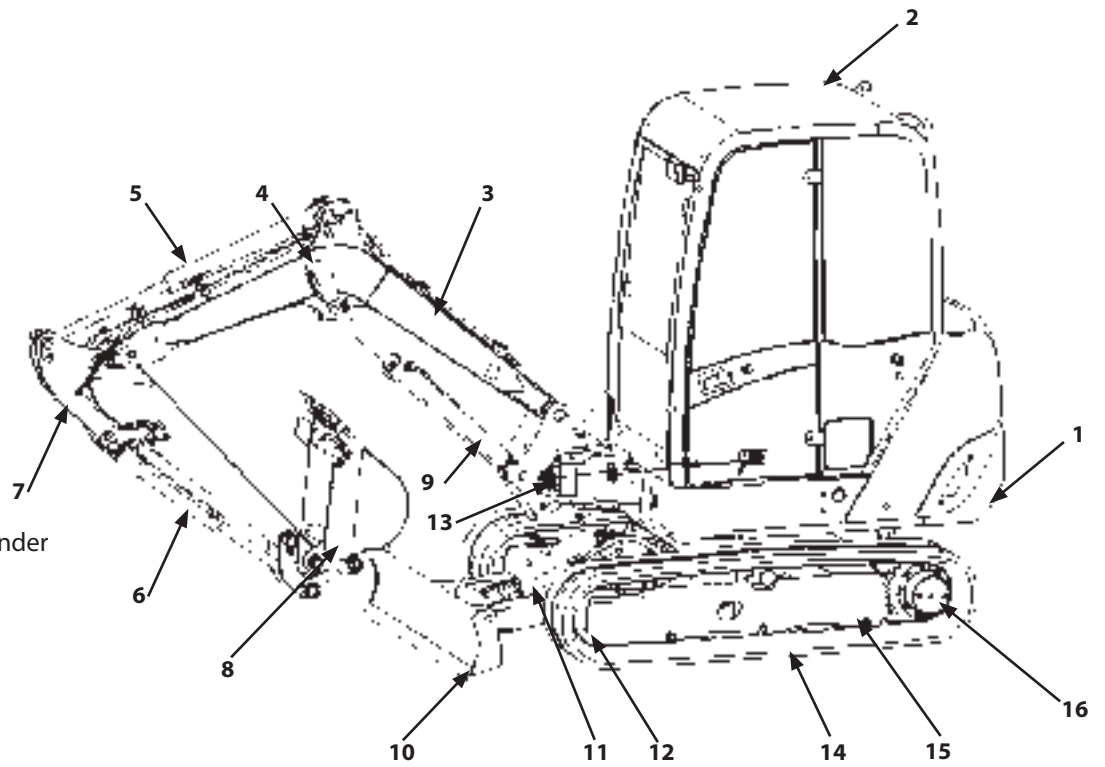
- 1- Counterweight
- 2- Canopy
- 3- Boom
- 4- Work Light
- 5- Arm Cylinder
- 6- Bucket Cylinder
- 7- Arm
- 8- Bucket
- 9- Boom Cylinder
- 10- Blade
- 11- Blade Cylinder
- 12- Front Idler
- 13- Boom-Swing Cylinder
- 14- Track Shoe
- 15- Track Frame
- 16- Travel Device



## COMPONENTS NAME

### ZX27-3

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



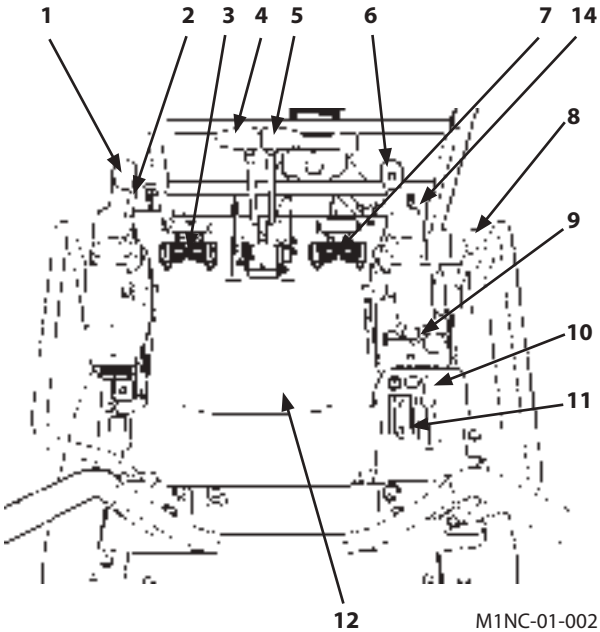
M1NC-01-019



# OPERATOR'S STATION

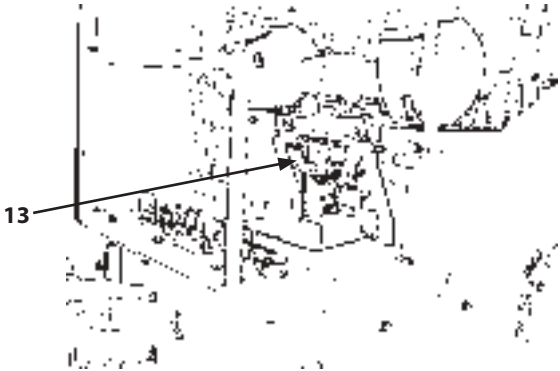
## Pedals, Levers and Monitor Panel

- 1- Left Control Lever
- 2- Pilot Control Shut-Off Lever
- 3- Attachment Pedal
- 4- Left Travel Lever
- 5- Right Travel Lever
- 6- Right Control Lever / Horn Switch
- 7- Boom-Swing Pedal
- 8- Blade Lever
- 9- Key Switch
- 10- Engine Control Lever
- 11- Monitor Panel
- 12- Operator's Seat
- 13- Fuse Box
- 14- Pilot Control Shut-Off Lever (Canopy Spec Only)



M1NC-01-002

**NOTE:** *The typical machine model is illustrated to the right. Some portions may differ on other models.*



ZX14-3, 16-3, 18-3

M1NC-01-003



ZX27-3

M1NC-01-020

# OPERATOR'S STATION

## Switch Panel

### 5- Work Light Switch

Press the switch (5) to turn work lights (10) located on the boom ON, and External electrical outlet (11) on.

### 6- Track-width Control Switch (ZX18-3)

### 7- Travel Mode Indicator (ZX16-3, 18-3, 27-3)

### 8- Heater Control Panel (Cab equipped machine)

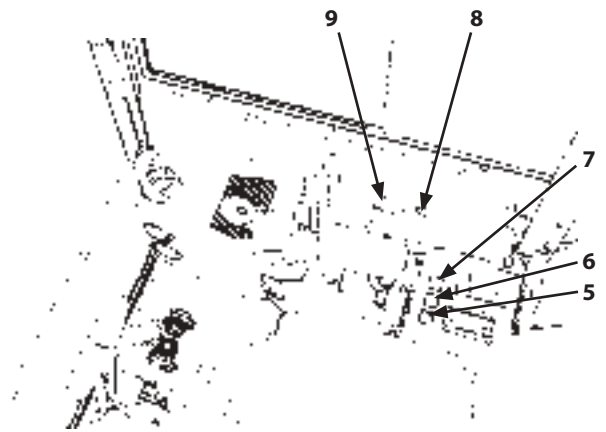
### 9- Wiper Switch (Cab equipped machine)

Three-operation positions are provided on this switch.

OFF: Both the wiper and washer do not operate.

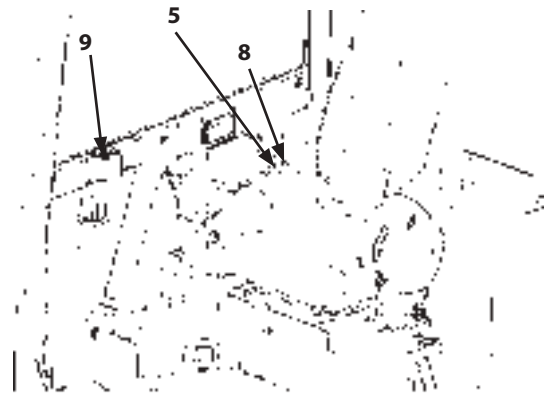
Center: The wiper operates.

WASHER: The washer operates together with the wiper.



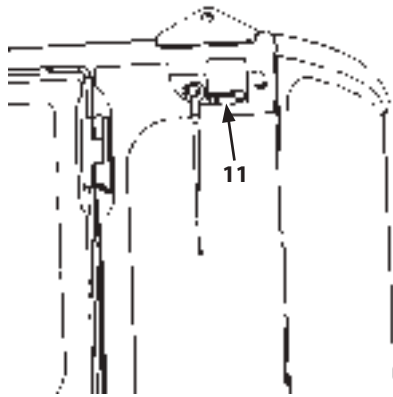
ZX14-3, 16-3, 18-3

M1NC-01-004



ZX27-3

M1NC-01-021



ZX14-3, 16-3, 18-3

M1NC-01-024



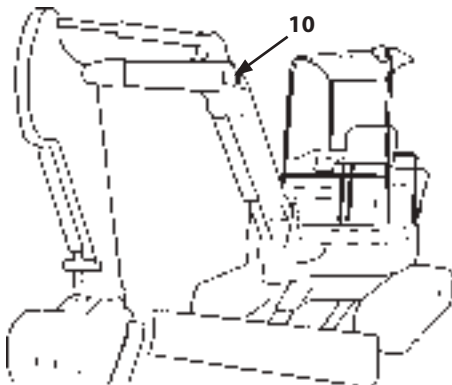
ZX27-3

M1NC-01-025



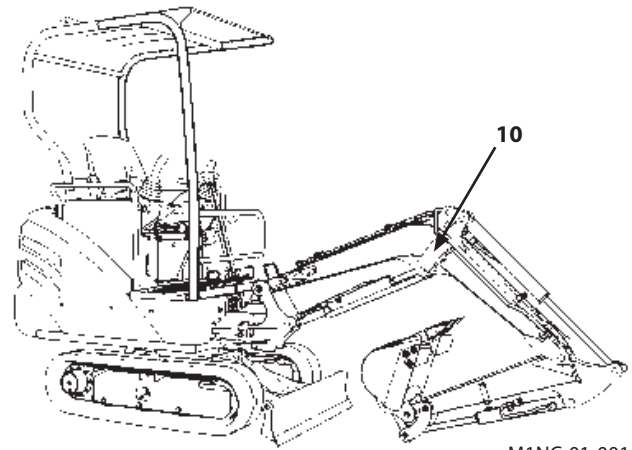
ZX27-3

M1NC-01-022



ZX27-3

M1M7-01-025



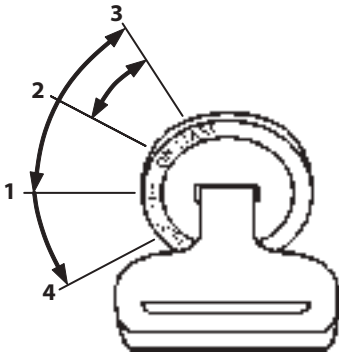
ZX14-3, 16-3, 18-3

M1NC-01-001

# OPERATOR'S STATION

## Key Switch

- 1- OFF (Engine OFF)
- 2- ON (ZX14-3, 16-3, 18-3 : Engine ON, ZX27-3 : Engine ON, Preheat)
- 3- START (Engine Start)
- 4- HEAT (Engine Preheat) (ZX14-3, 16-3, 18-3)

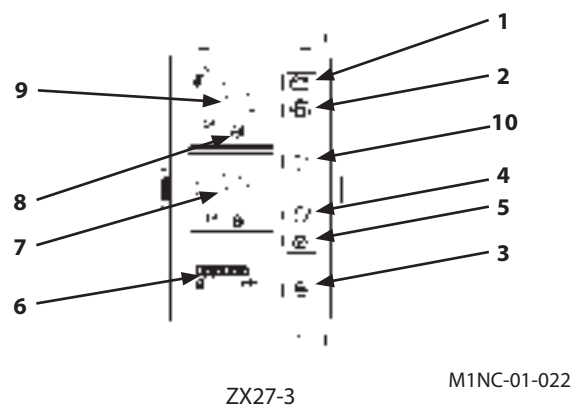
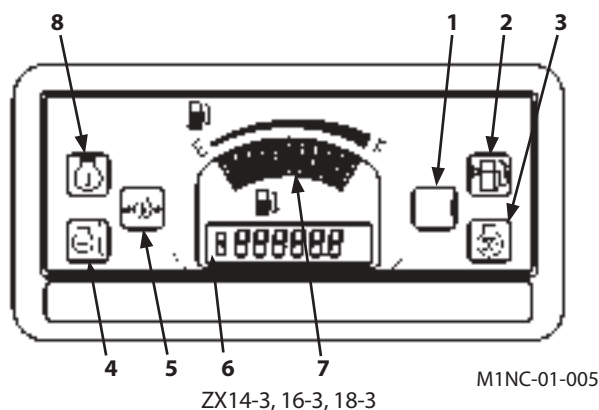


M1M7-01-007

## OPERATOR'S STATION

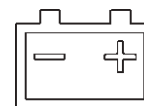
### Monitor Panel

- 1- Alternator Indicator
- 2- Fuel Level Indicator
- 3- Preheat Indicator
- 4- Overheat Indicator
- 5- Engine Oil Pressure Indicator
- 6- Hour Meter
- 7- Fuel Gauge
- 8- Coolant Temperature Indicator
- 9- Coolant Temperature Gauge (ZX27-3)
- 10- Travel Mode Indicator (ZX27-3)



### 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

### Fuel Level Indicator

When the fuel level indicator lights while the machine is operating on level ground, the remaining fuel amount in the fuel tank is 3.6 L (1.0 US gal). Refill the fuel as soon as possible.



M178-01-034

### Preheat Indicator

When the key switch is turned to the HEAT position, orange indicator will light. Light will turn off after approx. 3 seconds have passed.



M178-01-041

### Overheat Indicator

If the coolant temperature rises extremely high, this indicator lights. 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

## OPERATOR'S STATION

### 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

### 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).



M1NC-01-006

### Fuel Gauge (ZX14-3, 16-3, 18-3)

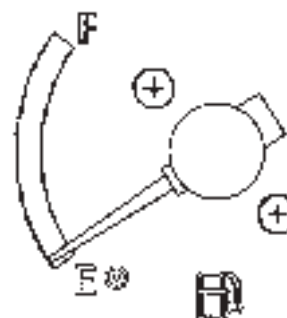
The gauge segment position indicates the fuel level. Refill the fuel before only the E-marked segment comes ON.



M1NC-01-007

### Fuel Gauge (ZX27-3)

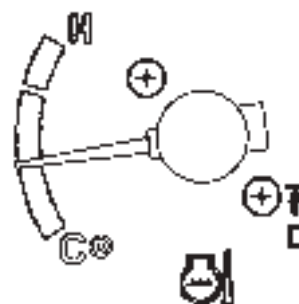
The gauge needle position indicates the fuel level. When the needle reaches the E-point in the white range, the remaining fuel is approximately 10 liters.



M1MW-01-007

### Coolant Temperature Gauge (ZX27-3)

The gauge needle position indicates the engine coolant temperature. Coolant temperature is normal when the needle stays in white zone while operating.



M1MW-01-008

### Coolant Temperature Indicator

When the key switch is turned to the ON position, the indicator will light when the engine coolant temperature is low.



M1NC-01-008

## OPERATOR'S STATION

### Cab Heater Operation (Cab Equipped Machines)

#### Heater Operation

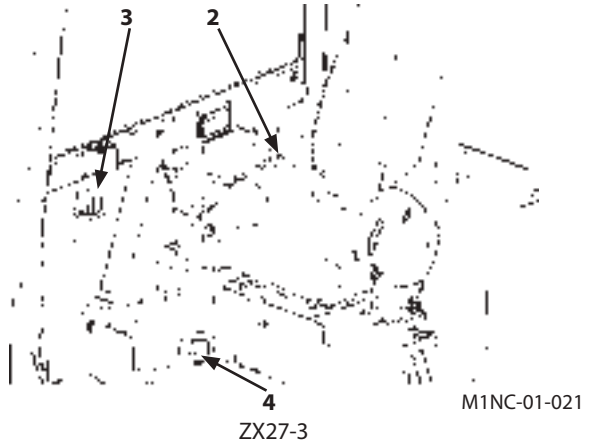
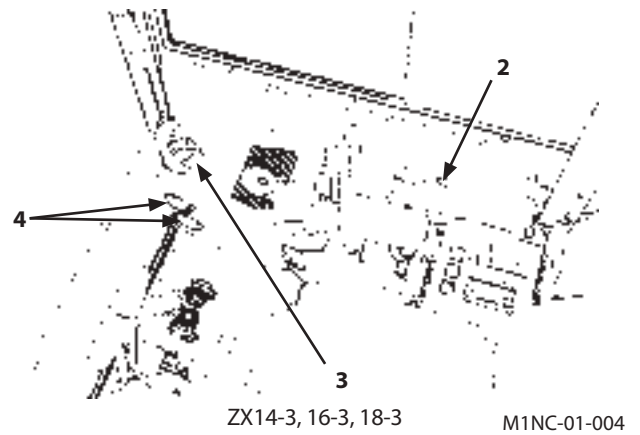
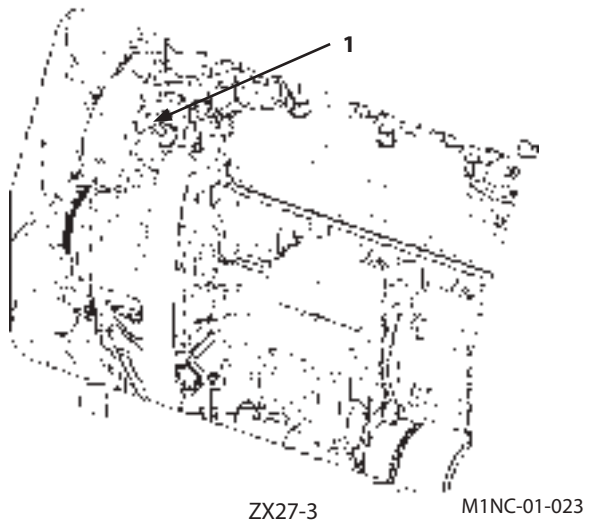
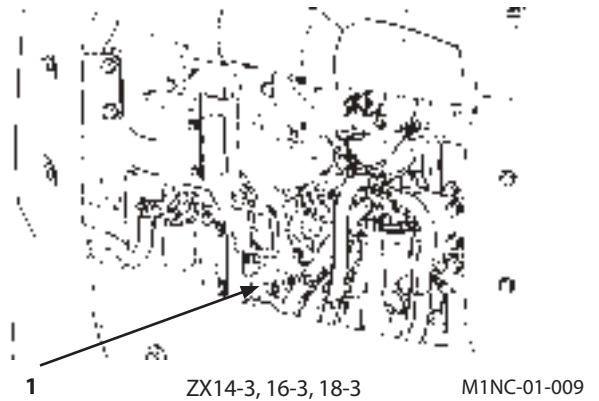
Turn heater cock (1) in the engine compartment counterclockwise. Adjust air flow by turning heater adjust knob (2) located at the right- rear in the operator's station.

#### Blower Operation

Turn heater cock (1) in the engine compartment clockwise to close it. Adjust air flow following the same method as mentioned in the Heater Operation.

#### Defroster Operation

Adjust air flow by operating heater adjust knob (2). Remove clouding on the window pane by directing air flow from air vent (3) and (4) toward the window pane.

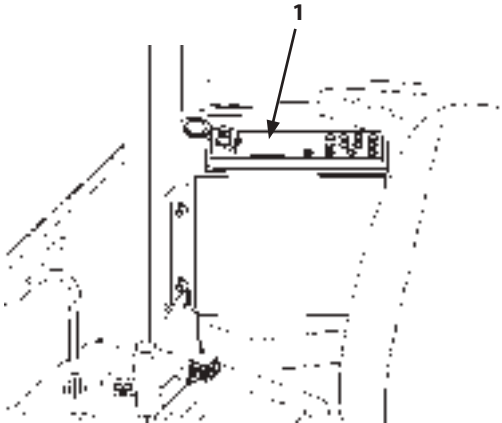


**OPERATOR'S STATION**

---

**Radio (ZX14-3, 16-3, 18-3 Cab Equipped  
Machines)**

1- Radio/Clock



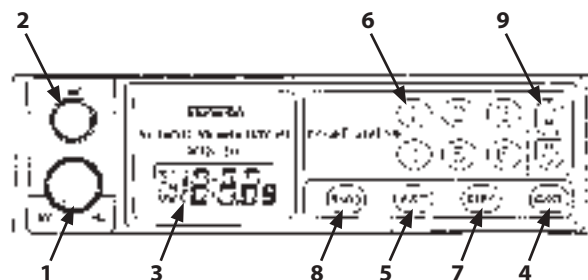
M1MS-01-014

## OPERATOR'S STATION

### AM/FM Radio Operation (Cab Equipped Machine, When Genuine Radio is Installed)

#### Part Name and Function

- 1- Power Switch/Volume Control Knob  
Rotate the knob to the right to supply electric power (a click sound will be heard when the unit is turned ON). Rotate the knob further to turn up the volume. Rotate the knob in the reverse direction to turn down the volume and the unit OFF.
- 2- Tone Control Knob  
Rotate the knob to the right to intensify the treble.  
Rotate the knob to the left to reduce the treble.
- 3- Display  
Time, receiving radio wave frequency, or operation mode is displayed.
- 4- Clock Button  
Press this button to display the time. Repress this button to display the receiving radio wave frequency.
- 5- Auto-Store/ Scan Preset Button (AST)  
Press this button to receive the preset frequency station for every 5 seconds sequentially. While you receive the station you wish to listen to, press this button again to receive the station under normal state (scan is interrupted). Press and hold this button for 2 seconds to automatically store the station.
- 6- Station Preset Buttons (1 to 6)  
One FM and MW (AM) station per button can be preset using these respective buttons.
- 7- Seek Button  
Press this button to automatically seek the next receivable station. When a station is received, the auto-seeking function is deactivated.
- 8- Band Button  
Select FM or MW (AM) by pressing this button. The display indicates the receiving station frequency.
- 9- Tuning Button  
Tap the TUNE  $\wedge$  button to increase the frequency. Tap the TUNE  $\nabla$  button to decrease the frequency. Tap and hold the button to change the frequency continuously.



M1M7-01-011

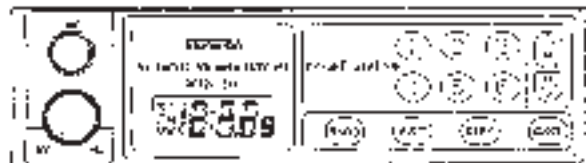


## OPERATOR'S STATION

---

### Radio Operation

1. Turn the key switch to the ACC or ON position to switch the radio ON.
2. Select either MW (AM) or FM by operating the band button.
3. Select the station desired to listen using the preset or tuning button.
4. Adjust the volume and tone according to your preference.
5. When turning the radio OFF, rotate the VOL knob to the left until a click sound is heard.



M1M7-01-011

### Tuning Procedure

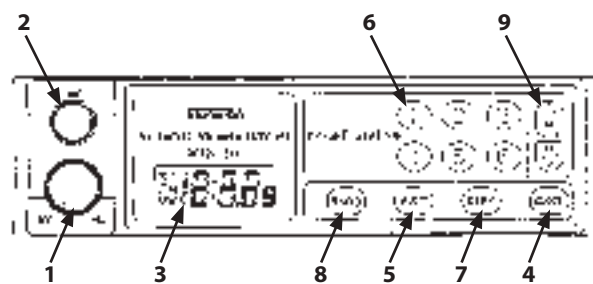
1. Tap the TUNE  $\wedge$  button to increase the frequency. Tap the TUNE  $\vee$  button to decrease the frequency. Tap and hold the button to change the frequency continuously.
2. Automatic Tuning

Press this button to automatically move the frequency up and to seek a receivable station. When a station is received, the auto-seeking function is deactivated so that the received frequency station is tuned in.

## OPERATOR'S STATION

### Station Presetting Procedure

1. Select MW (AM) or FM by pressing BAND button (8).  
Select a station by pressing either TUNE button (9) or SEEK button (7).
2. Continuously press one of PRESET button (6) by which you desire to preset the station for more than 2 seconds. When presetting is complete, the preset button No. is indicated on the display.
3. Repeat the above same procedure steps (1) and (2) to preset other stations with other PRESET buttons (6).

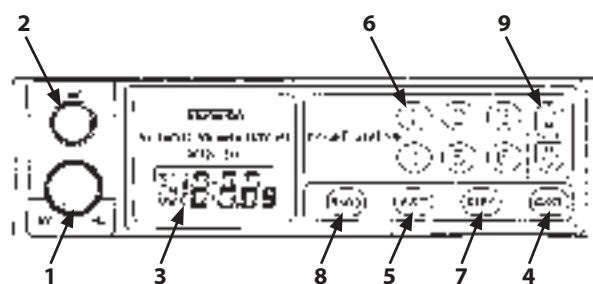


M1M7-01-011

**NOTE:** After presetting is complete, if the preset button is pressed again and held for more than 2 seconds, the preset station is changed.

- Auto-Storing  
Press and hold the AST button for more than 2 seconds 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-store 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.



M1M7-01-011

- Preset Scanning  
Press and release the AST button in 2 seconds with the radio switch ON, preset station frequencies are received one by one for 5 seconds. Press the button again to resume normal radio operation.

### Deletion of Preset Memory

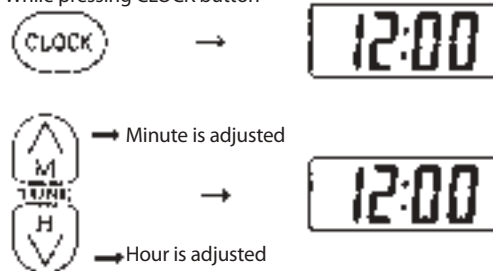
If the battery power is disconnected such as when the machine is serviced or the radio is removed, the preset memory in the preset buttons will be deleted. Repeat the preset operation again.

### Clock Setting Procedure

In case the frequency is indicated on the display, press the CLOCK button to display the time.

While pressing the CLOCK button, press TUNE ^ M button to change the minute display. While pressing the CLOCK button, press TUNE v H button to change the hour display. Release the CLOCK button to resume the original mode.

While pressing CLOCK button



M1M7-01-012

## OPERATOR'S STATION

### Opening/Closing Cab Front Window (ZX14-3, 16-3, 18-3 Cab Equipped Machines)

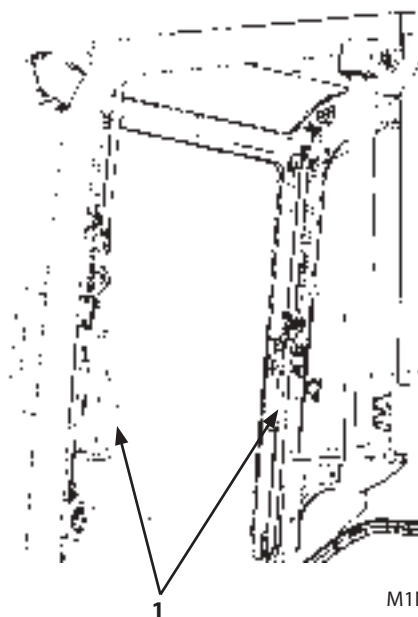


#### CAUTION:

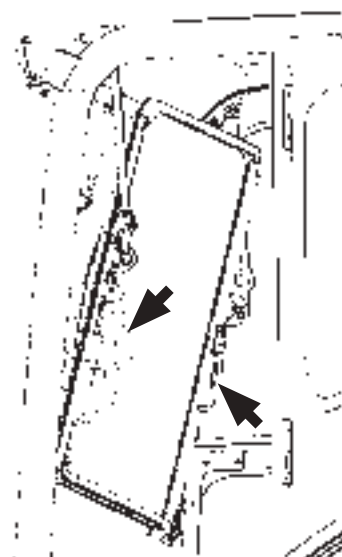
- When closing the front window, slowly lower the window. Be alert not to pinch your fingers.
- After opening the front window, check that both side lock levers are securely engaged in the window frame.

#### Opening:

1. Hold the handles (1) (in two places) on the front window and disengage lock lever (2).
2. Hold the handles (in two places) on the front window frame and raise the window until the lock lever (2) engages with the window frame.



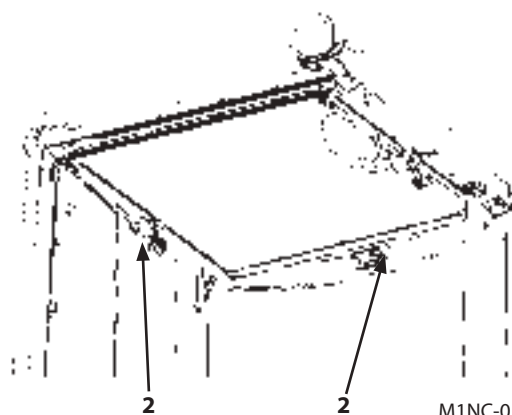
M1NC-01-010



M1NC-01-011

#### Closing:

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



M1NC-01-012

## OPERATOR'S STATION

---

### Opening/Closing Cab Front Window (ZX27-3)

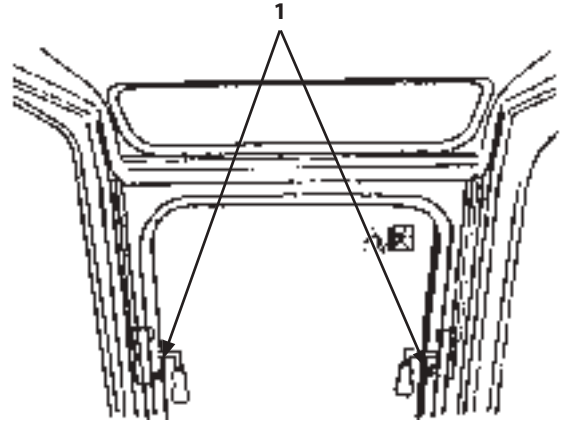
**⚠ CAUTION: The front window comes down forcefully. Close the front window only when sitting on the operator's seat. Guide the front window down slowly.**

#### Opening:

1. Push in lock switches (1) to unlock the front window.
2. Pull the front window up and back until slide lock switches (1) fall into boss holes and Lock.

#### Closing:

3. To close the front window, perform procedures shown in steps (1) to (2) in reverse. These are:
  - a. Push in lock switches (1), to unlock the front window
  - b. Pull the front window down slowly
  - c. Be sure that the front window is locked




M1LN-01-007

## OPERATOR'S STATION

### Emergency Exit (ZX14-3, 16-3, 18-3 Cab Equipped Machines)


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

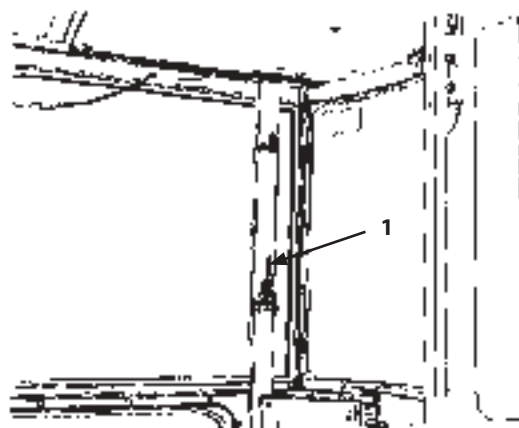
1. When required to escape from the cab when the door is difficult or impossible to open in an emergency, open the front window.

 **NOTE:** Refer to the descriptions in *Opening/Closing Cab Front Window* for the opening method of the front window.

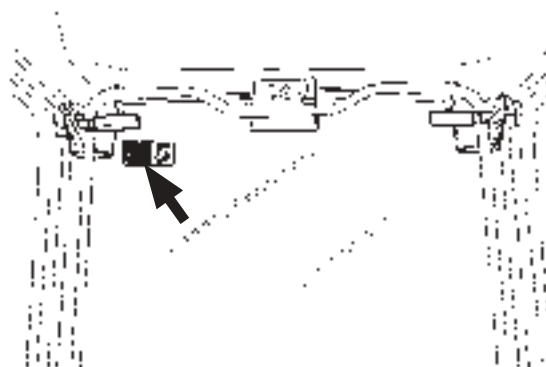
 **CAUTION: Take care not to be injured with pieces of broken glass.**

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 decal is affixed on the front and rear window.

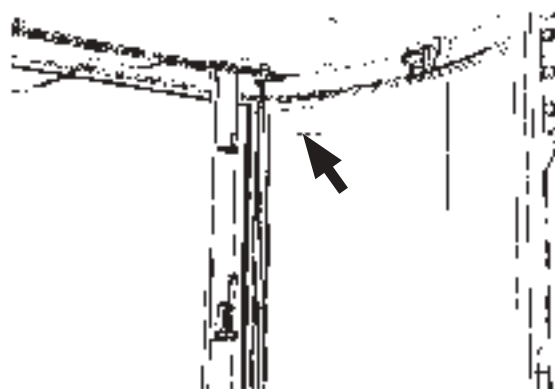


M1MS-01-015



Front

M1MW-01-015



Rear


M1MS-01-016

## OPERATOR'S STATION

### Emergency Exit (ZX27-3)

If the operator's cab door should not open in an emergency, escape in the following methods:

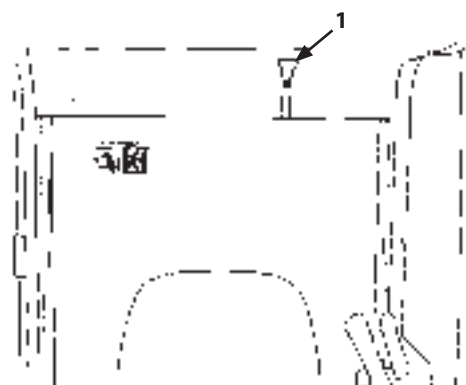
1. Open the front window. Escape through the window.

 **NOTE:** Refer to the descriptions in *Opening/Closing Cab Front Window* for the opening method of the front window.

 **CAUTION:** Be sure to wear safety glasses before breaking the window glass.

2. If the front window is difficult to open, break the front window glass using emergency evacuation tool (1). Then, escape through the broken window.
3. If the front window is not available for escaping, break the rear window glass using emergency evacuation tool (1). Then, escape through the broken window.

 **NOTE:** The emergency exit decals are affixed to the front and rear windows.

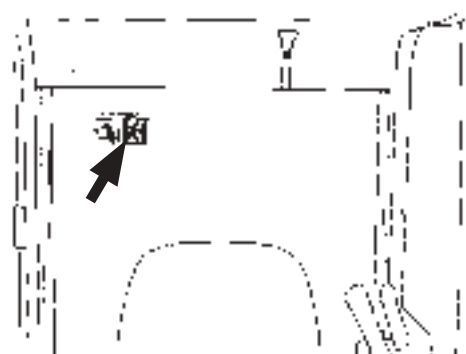


M1LS-01-008



Front Window

SS-2470



Rear Window

M1LS-01-008

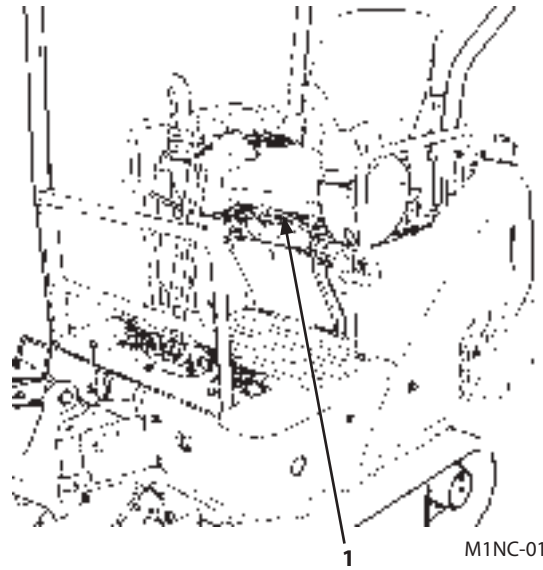
## OPERATOR'S STATION

---

### 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 10 mm (ZX14-3, 16-3, 18-3: 14 steps to 140 mm in total / ZX27-3: 12 steps to 120 mm in total).



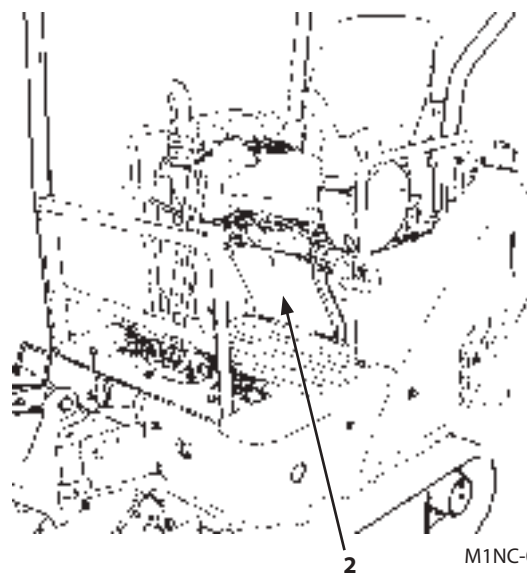
M1NC-01-013

## OPERATOR'S STATION

### Tool and Operator's Manual Box

- ZX14-3, 16-3, 18-3

Tool and operator's manual box (2) is located under the operator's seat.



ZX14-3, 16-3, 18-3

M1NC-01-013

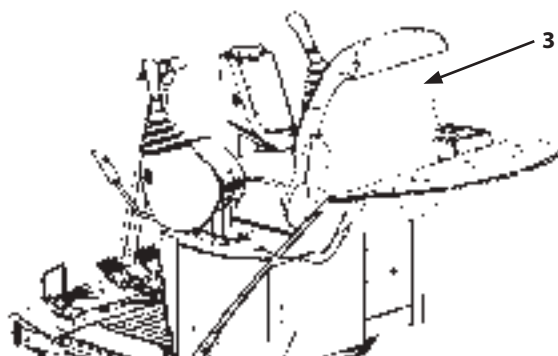
- ZX27-3

Tool box (2) 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.



ZX27-3

M1NC-07-035



ZX27-3

M1M7-01-018



## OPERATOR'S STATION

### Seat Belt

**⚠ WARNING: Be sure to use the seat belt when operating the machine.**

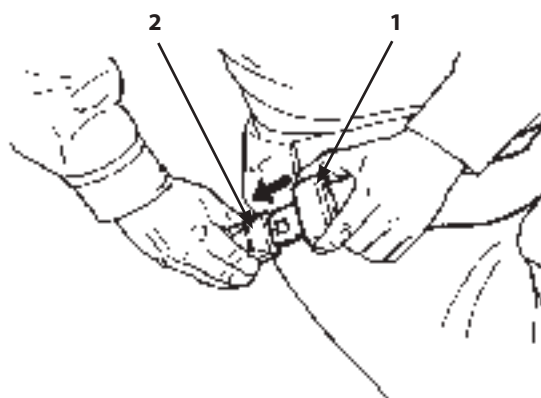
**Before operating the machine, be sure to examine seat belt (1), buckle (2), or attaching hardware. Replace seat belt (1), buckle (2), or attaching hardware if they are damaged, or worn.**

**Replace seat belt (1) every three years, regardless of appearance.**

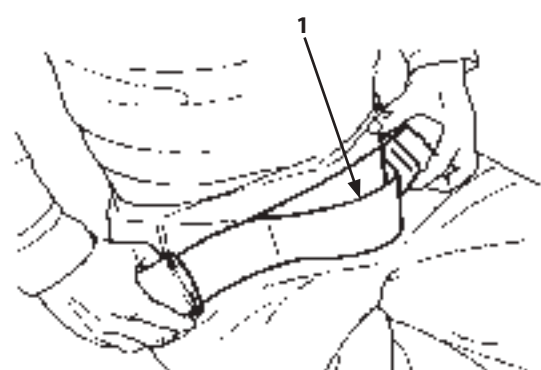
1. Confirm that seat belt (1) is not twisted and securely insert the end of seat belt (1) into buckle (2).

Lightly pull on the belt to confirm that the buckle latches securely.

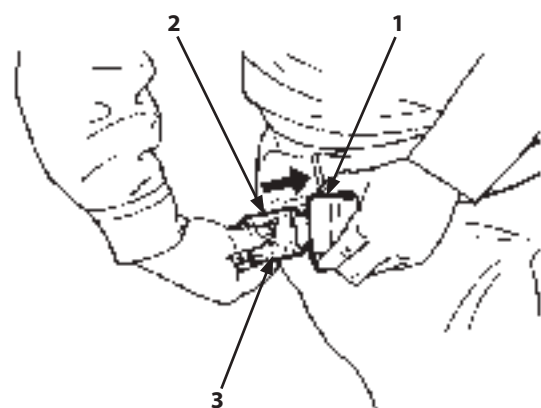
2. Adjust tightness of the seat belt (1) so that the belt is snug but comfortable.
3. Push button (3) on buckle (2) to unfasten seat belt (1).



M1NC-01-014



M1NC-01-015

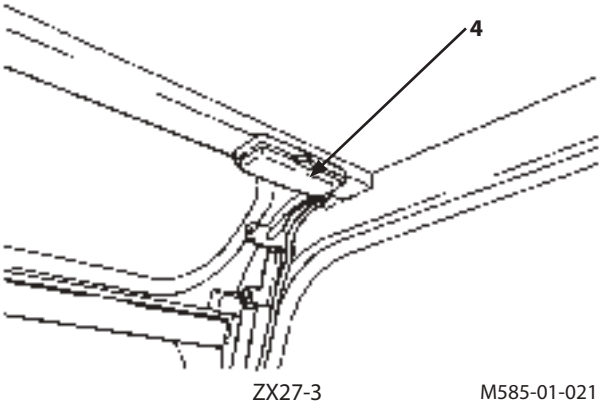
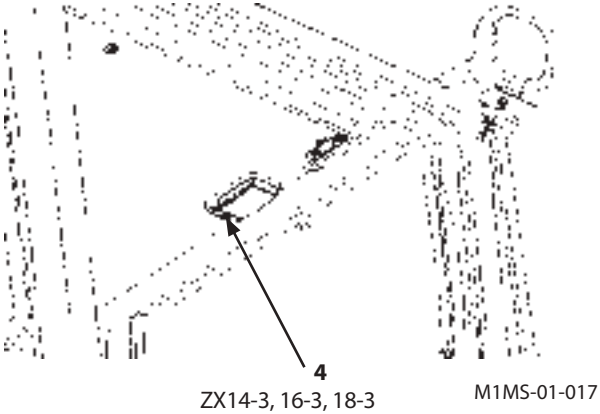


M1NC-01-016

# OPERATOR'S STATION

## 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.)

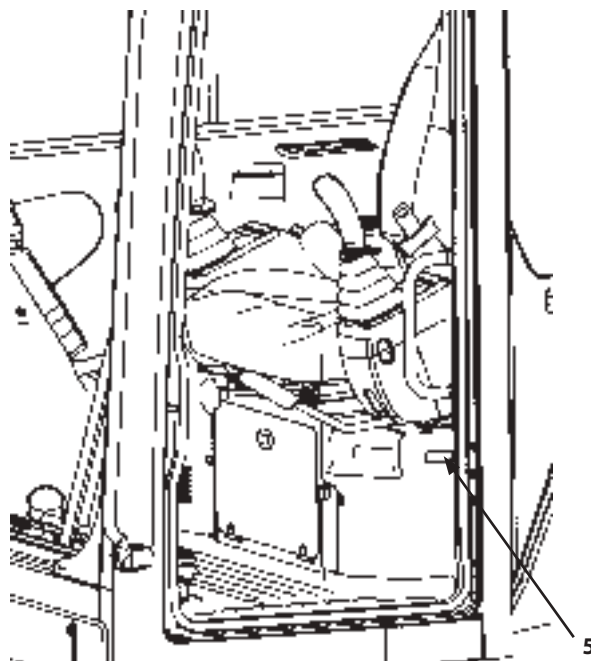


## OPERATOR'S STATION

### Cab Door Release Lever (ZX14-3, 16-3, 18-3 Cab Equipped Machines)

**CAUTION:** Open the cab door all the way until the latch on the side of the cab securely locks.

To unlock the door, push down on lever (5) located on the left side of the operator's seat.



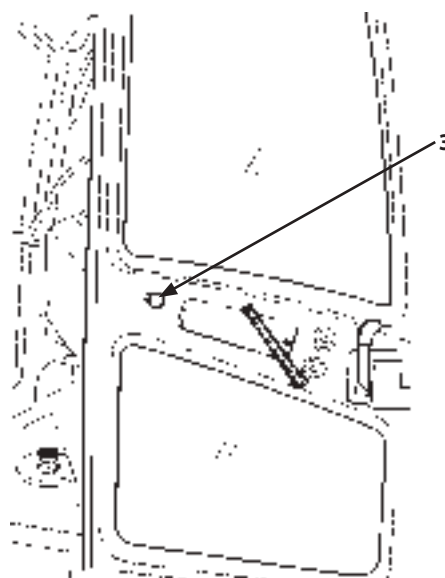
ZX14-3, 16-3, 18-3

M1M0-01-006

### Cab Door Release Button (ZX27-3)

**CAUTION:** Open the cab door all the way until the latch on the side of the cab securely locks.

Pull button (3) to unlock the door.



ZX27-3

M1LN-01-004



## BREAK-IN

---

### 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.



## OPERATING ENGINE


### Before Starting Engine

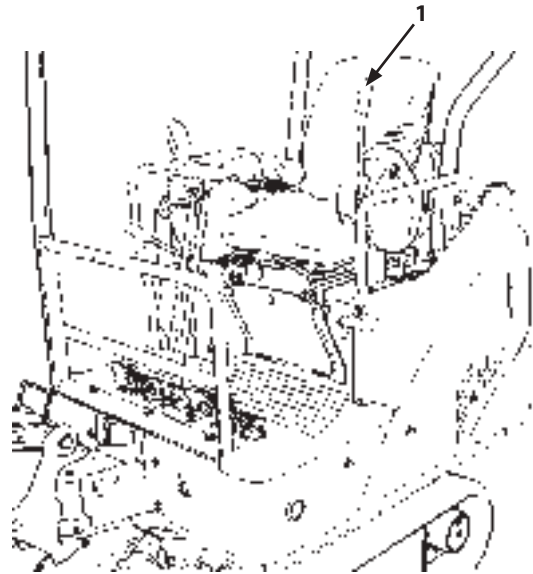
1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Confirm that all control levers are placed in neutral.
3. Check indicator bulbs as follows:

Turn key switch to the ON position. All indicator lights and warning lamps will come on. They will stay on for approximately 3 seconds, except for alternator (3) and engine oil pressure (4) indicator, which will continue to stay on further.

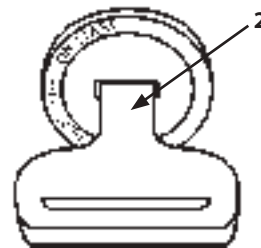
**IMPORTANT:** The monitor panel indicates the machine's operating conditions. If the machine is operated with an indicator bulb or a warning lamp burned out, the alarm will not be displayed even if any abnormality occurs on the machine. Accordingly, in case any of the indicator bulbs or the warning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

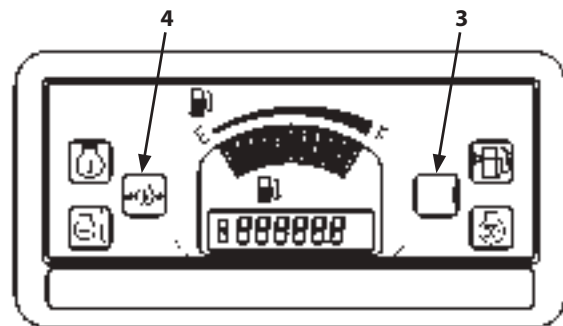
 **NOTE:** The monitor surfaces are resin. Wipe the surface only with a damp cloth when dusty to keep them clean. Never use an organic solvent.



M1NC-05-004

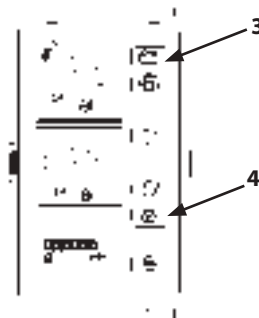


M1M7-01-007



ZX14-3, 16-3, 18-3

M1NC-01-005



ZX27-3

M1NC-01-022

# OPERATING ENGINE


## Starting Engine

### Starting in Ordinary Temperature

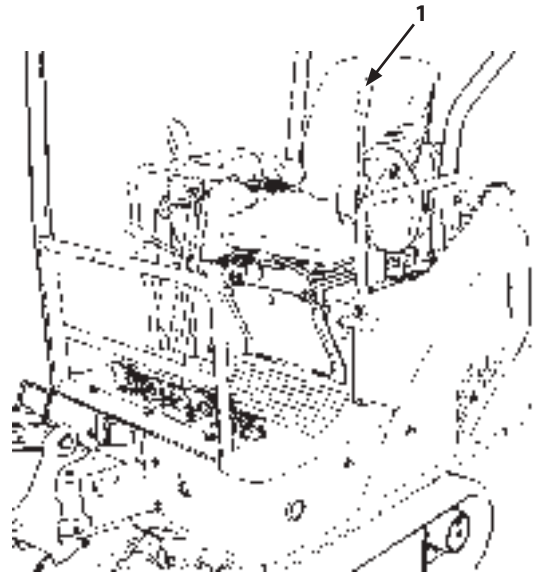
1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Turn engine control lever (3) to the slow idle position.
3. Sound the horn to alert bystanders.
4. Turn key switch (2) to rotate the starter. The engine will be started.

**IMPORTANT:** Prevent starter damage and/or battery over discharge. Never run the starter for more than 10 or 15 seconds at a time (ZX14-3, 16-3, 18-3: 15 seconds, ZX27-3 : 10 seconds). If the engine fails to start, return the key switch to OFF. Wait for more than 30 seconds, then try again.

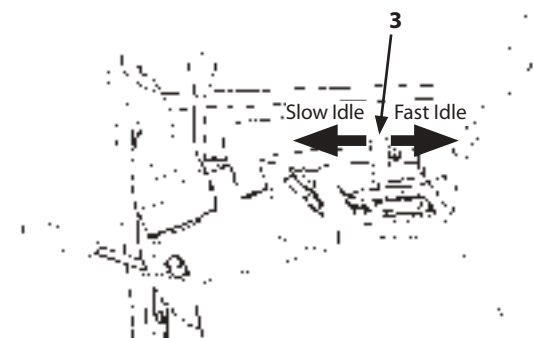
5. Release key switch (2) immediately after the engine has started. It will automatically return to the ON position.

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

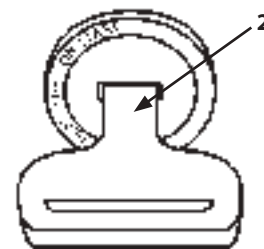
**IMPORTANT:** Avoid operating key switch (2) with stained hands or gloves.



M1NC-05-004



M1NC-00-007



M1M7-01-007




## OPERATING ENGINE

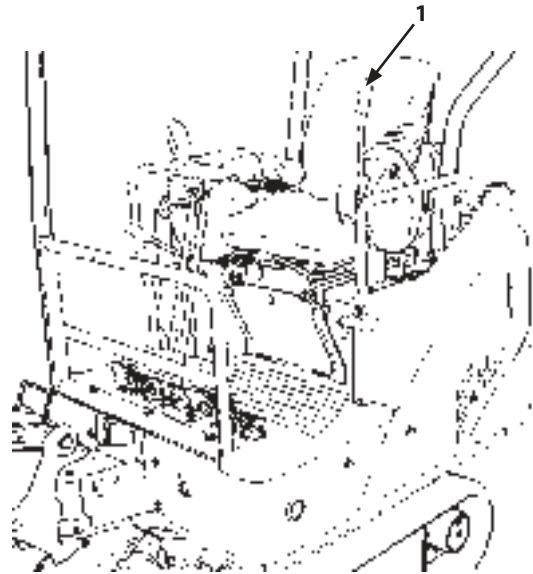
### Starting in Cold Weather ZX14-3, 16-3, 18-3

1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Turn 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. 3 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.

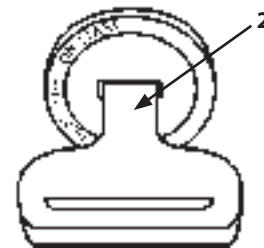
**IMPORTANT:** Prevent starter damage and/or battery over discharge. Never run the starter for more than 15 seconds at a time. If the engine fails to start, return the key switch to OFF. Wait for more than 30 seconds, then try again.

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

 **NOTE:** Set the engine control lever 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.



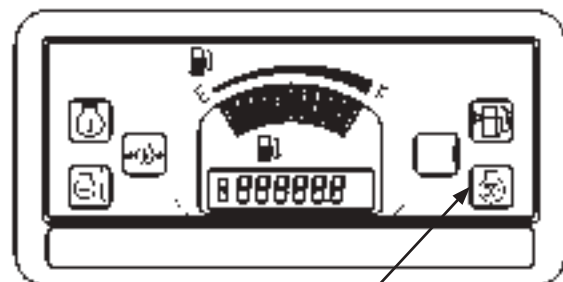
M1NC-05-004



M1M7-01-007



M1NC-00-007



4

M1NC-01-005


## OPERATING ENGINE

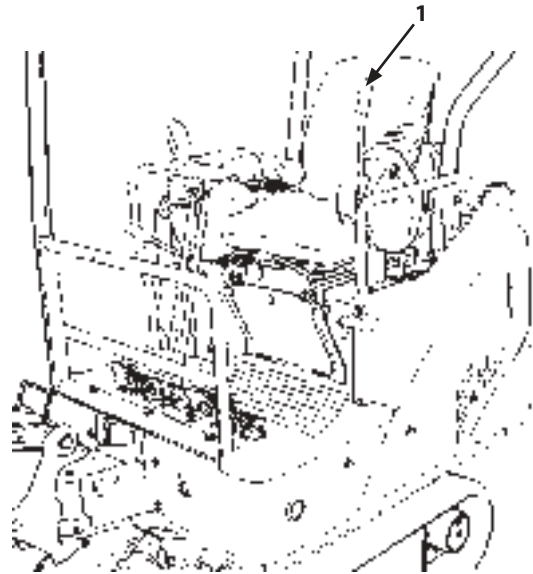
### ZX27-3

1. Check that pilot control shut-off lever (1) is in the LOCK position.
2. Turn engine control lever (3) to around the middle between the slow and fast idle positions.
3. Turn the key switch (2) to ON position. The preheat indicator (4) will light.
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.

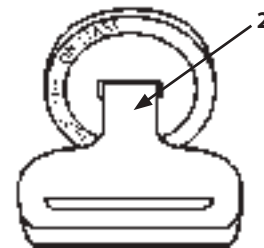
**IMPORTANT:** Prevent starter damage and/or battery over discharge. Never run the starter for more than 10 seconds at a time. If the engine fails to start, return the key switch to OFF. Wait for more than 30 seconds, then try again.

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

 **NOTE:** This machine is equipped with Auto Glow System. Sensing the coolant temperature, the duration of preheating is automatically set. Be sure to wait until the preheat indicator goes off with the key switch turned to the ON position, as specified above. When atmospheric temperature is low, it is possible to operate the starter motor for within 15 seconds at a time.



M1NC-05-004



M1M7-01-007



M1NC-00-007



M1NC-01-022

## OPERATING ENGINE

### 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 (1) is OFF.


In case alternator indicator (1) stays ON, immediately stop the engine. Then, check the alternator and/or battery system for any abnormality.

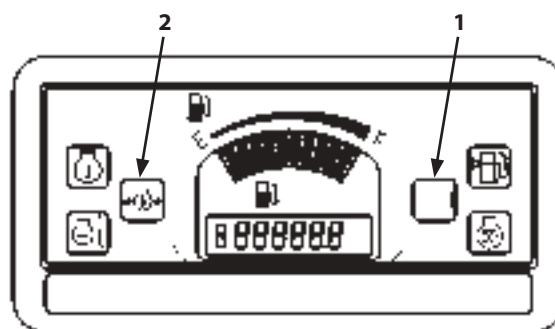
2. Check that engine oil pressure indicator (2) is OFF.

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.

#### Check Engine Noise and Exhaust Gas

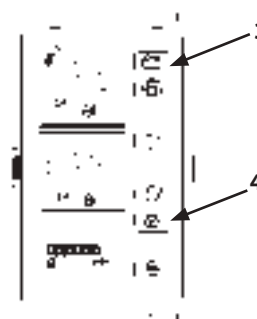
Check that engine noise and exhaust gas are normal.

 **NOTE:** Checking exhaust gas (With no load, after warming up)  
Colorless or faint blue..... normal (complete combustion)  
Black ..... abnormal (incomplete combustion)  
White ..... abnormal (burning oil or coolant leakage into cylinder)



ZX14-3, 16-3, 18-3

M1NC-01-005



ZX27-3

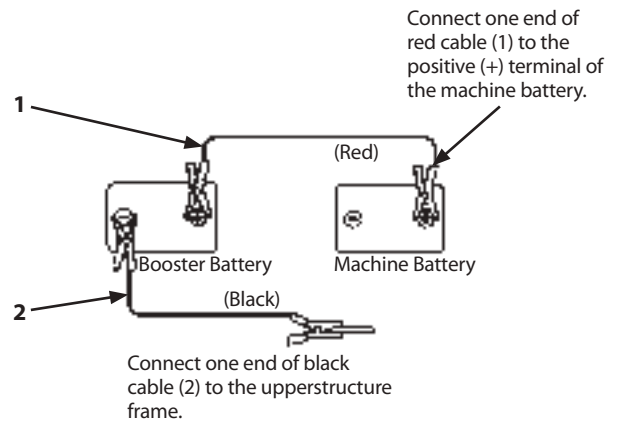
M1NC-01-022

## OPERATING ENGINE

### 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 the capacity enough to start this machine.



M503-03-002

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

#### 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 the black cable (2) to the negative (-) terminal of the booster battery, connect the other end to upperstructure frame 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.

#### Disconnecting Booster Cables

1. Disconnect black booster negative (-) cable (2) from upperstructure frame 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.

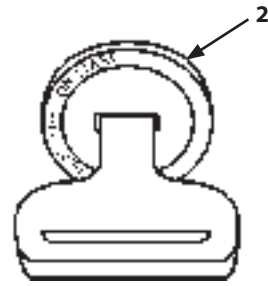
## OPERATING ENGINE

---

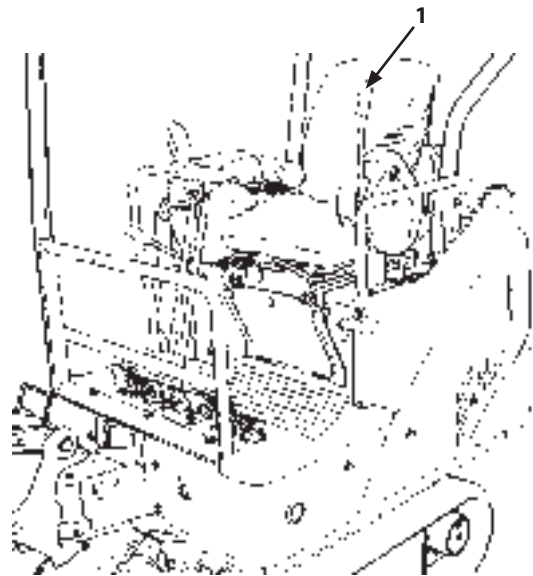
### Stopping Engine

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 lever to the slow idle position and keep the engine running at slow idle speed for 5 minutes.
3. Turn the key switch (2) OFF to stop the engine.
4. Pull up pilot control shut-off lever (1) to the LOCK position.



M1M7-01-007



M1NC-05-004

**OPERATING ENGINE**

**MEMO**

Dotted lines for writing.

# DRIVING MACHINE

## Travel Levers

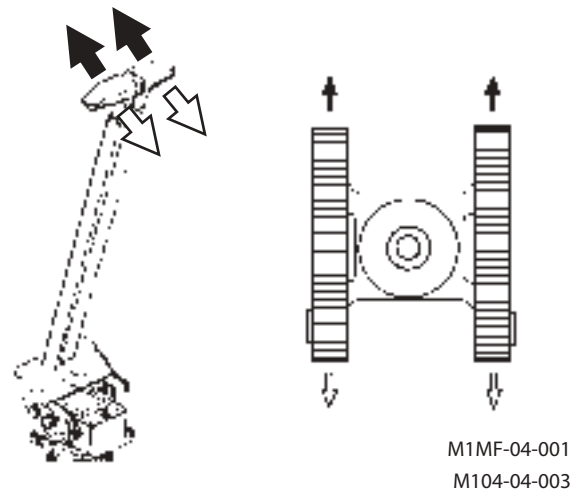
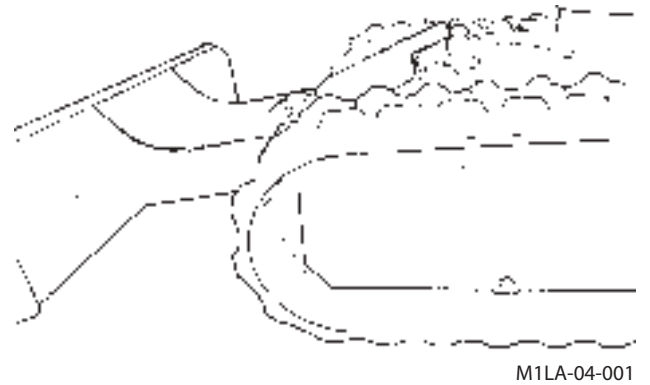
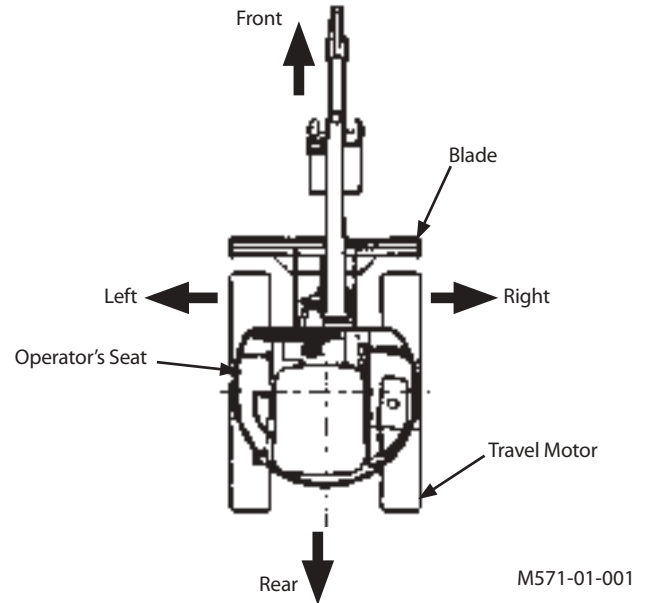
Travel operation can be performed with the mechanical levers.

**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 lever's 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), the travel lever will become heavy to operate. This is caused by increase in oil viscosity which is not abnormal.

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

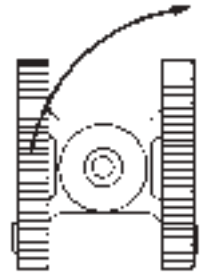
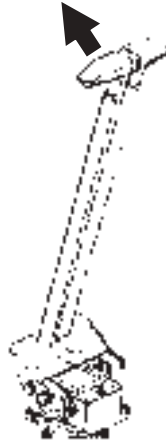
- Ascending/Descending Slopes  
The machine gradeability is ZX14-3, 16-3, 18-3: 25° (47%)  
ZX27-3: 30° (58%). Slowly operate the travel levers when descending a slope. When the travel levers are placed in neutral, the travel brakes are automatically applied to stop the machine.



Forward/Reverse Travel Direction

## DRIVING MACHINE

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



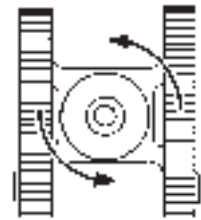
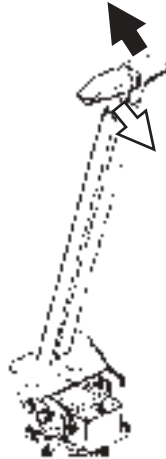
M1MF-04-001  
M104-04-005

Pivot Turn

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



**CAUTION:** 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 into contact with the surrounding objects.



M1MF-04-001  
M104-04-007


Spin Turn

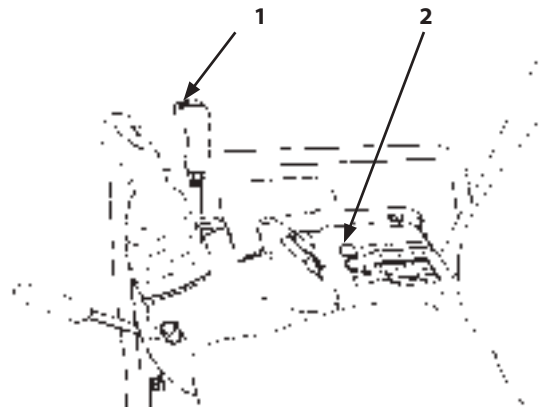


## DRIVING MACHINE

### Travel Mode Switch (ZX16-3, 18-3, 27-3)

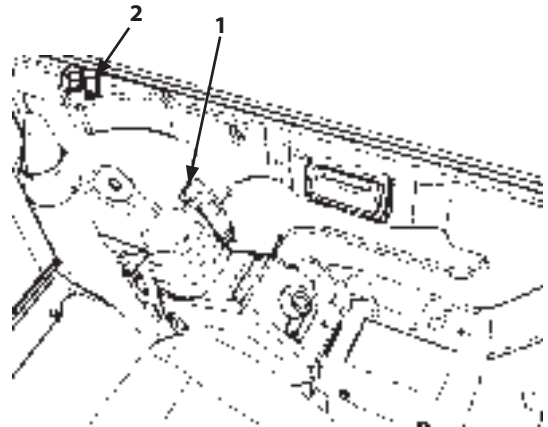
**⚠ WARNING:** Shifting the travel speed mode from the slow to the fast while traveling a down slope is very dangerous. Be sure to shift the travel mode to the fast mode while traveling a down slope only after returning the travel levers to neutral.

Press switch (1) once at the top of the blade lever grip to select the fast travel mode. Check that indicator (2) with the  mark comes ON at this time. When switch (1) is pressed again, the slow travel mode is selected and indicator (2) goes OFF. In case the engine is stopped when the fast travel mode is selected and when the engine is restarted, the slow travel mode is automatically selected.



M1NC-04-002

ZX16-3, 18-3



M1NC-01-026

ZX27-3



ZX27-3

M1NC-01-022

## DRIVING MACHINE

### 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 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 into 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.

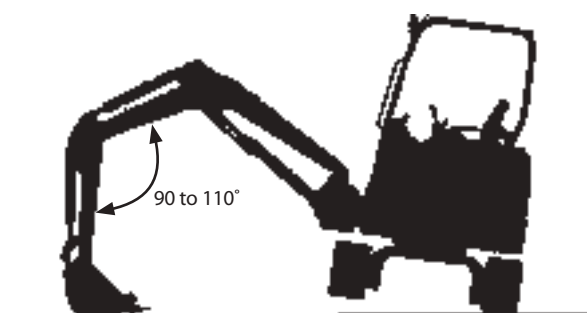


M1M7-04-005

### 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.



M1M7-04-005

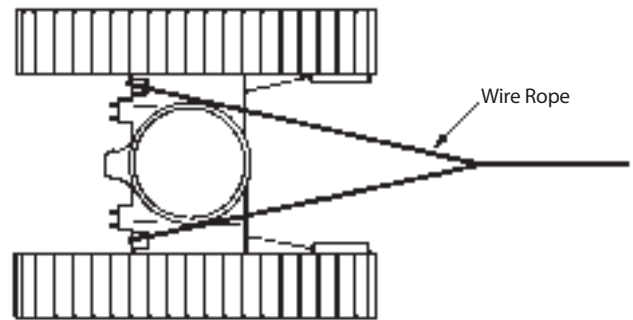
## DRIVING MACHINE

---

### 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 if the frame.

**IMPORTANT:** Do not tow the machine using the light-weight part towing holes provided on the blade. Damage to the towing holes may result.



M585-05-035

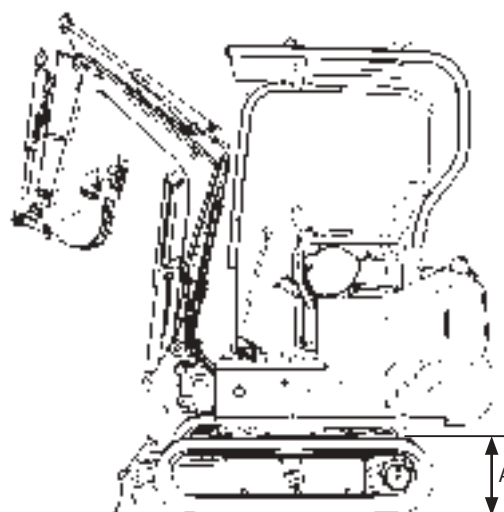
## DRIVING MACHINE

### 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.

Operable Water Depth (A)	
ZX14-3, 16-3, 18-3	370 mm
ZX27-3	465 mm

2. The machine may enter deeper areas gradually. Check the machine's position often. Reposition the machine if necessary.



M1NC-04-001

**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.

## DRIVING MACHINE

### Parking and Stopping on Slopes

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

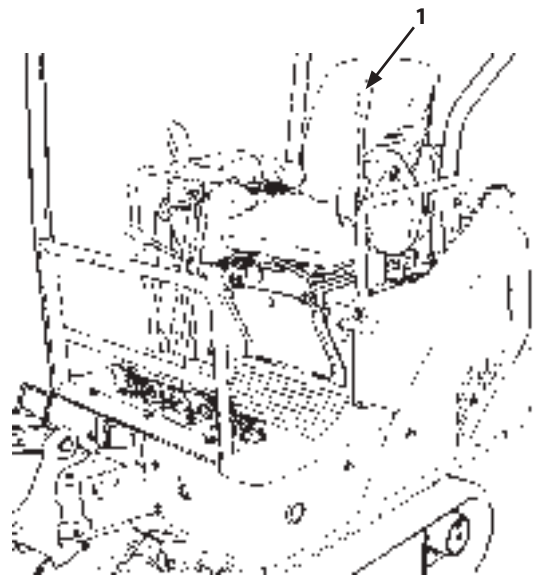
If parking and/or stopping on slopes is unavoidable, lower both the bucket and the blade to the ground, and place all levers in the neutral position. Also, put blocks at the downhill end of the tracks.



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 switch.
4. Pull pilot control shut-off lever (1) into the fully LOCK position.
5. Close the window and door, if a cab is provided.  
Be sure to lock all the cab doors and windows.



M1NC-05-004

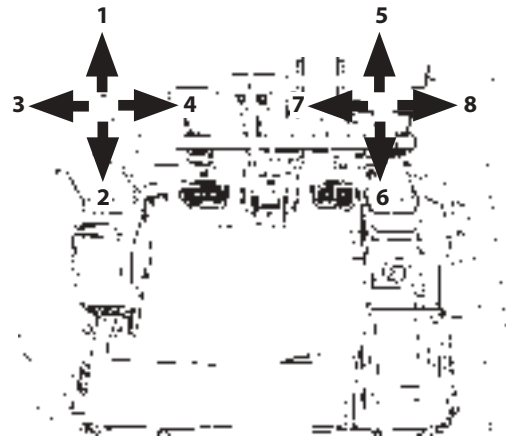


## OPERATING MACHINE

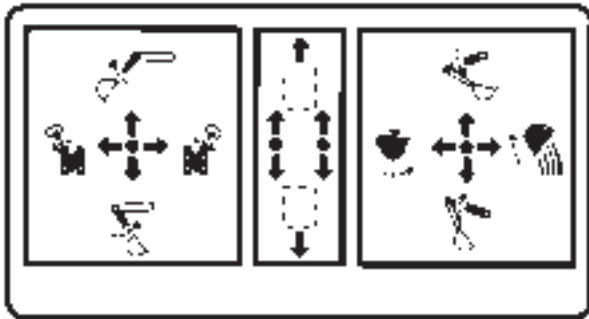
### Control Lever (ISO Excavator Pattern)

**⚠ WARNING:** Be sure to check the location and function of each control lever before operating. The upperstructure 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.



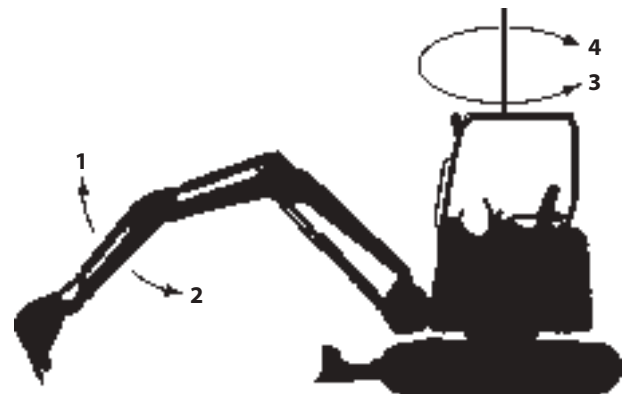
M1M5-05-003



M588-05-050

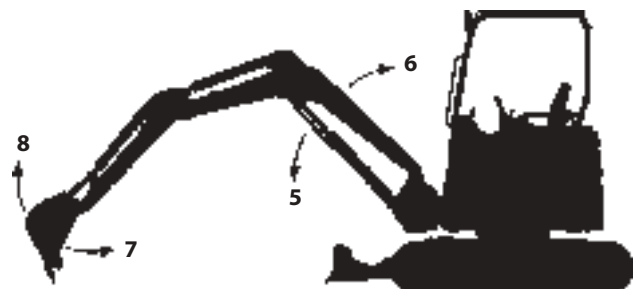
When a control lever is released, it automatically returns to neutral, stopping the function in that position.

- 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

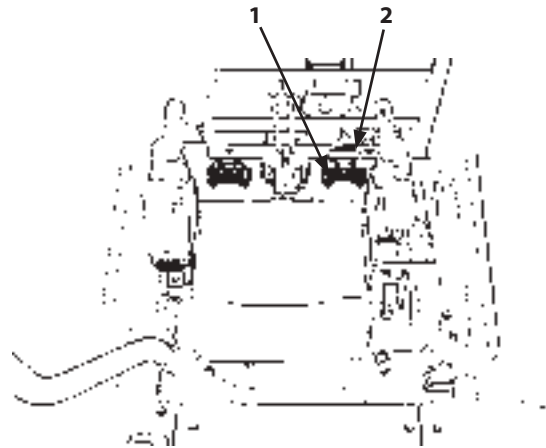
## OPERATING MACHINE

### Boom-Swing Pedal

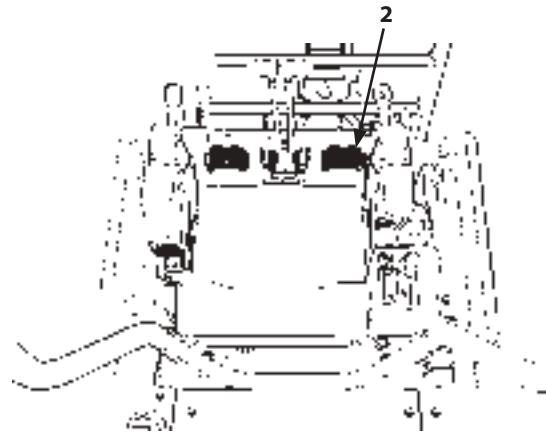
Use the boom swing function to efficiently operate the machine when excavating grooves along roadsides or near walls. The boom swing operation is performed using boom-swing pedal (1) located at the operator's right foot as illustrated to the right.

#### 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 the pedal to swing right.
3. Turn cover (2) backward over boom-swing pedal (1) when boom-swing operation is no longer required.

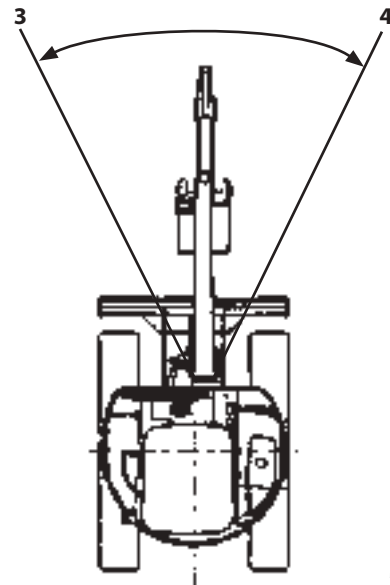


M1NC-05-001



M1NC-05-002

- 3- Swing Left
- 4- Swing Right



M571-01-001



## OPERATING MACHINE

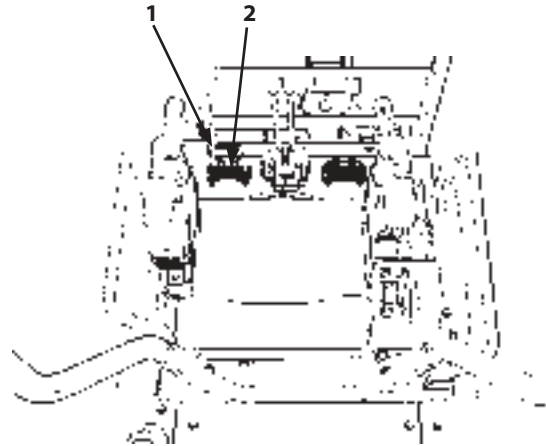
---

### Auxiliary Pedal

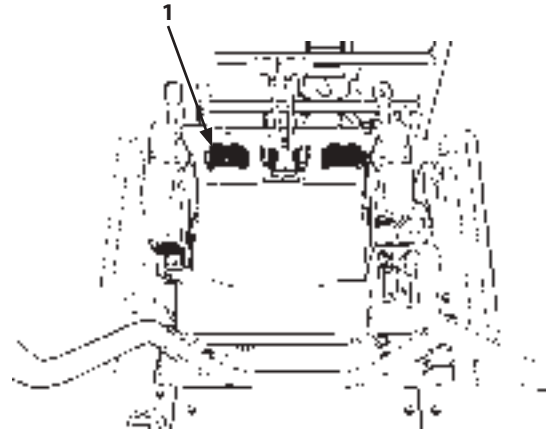
Use the auxiliary pedal (2) located at the operator's left front, as illustrated to the right, to operate hydraulic breaker, crusher, etc.

#### Operation

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



M1NC-05-003



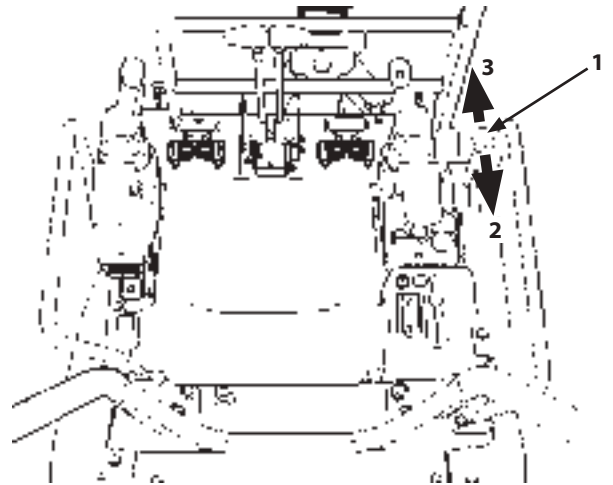
M1NC-05-002

## OPERATING MACHINE

### Blade Lever

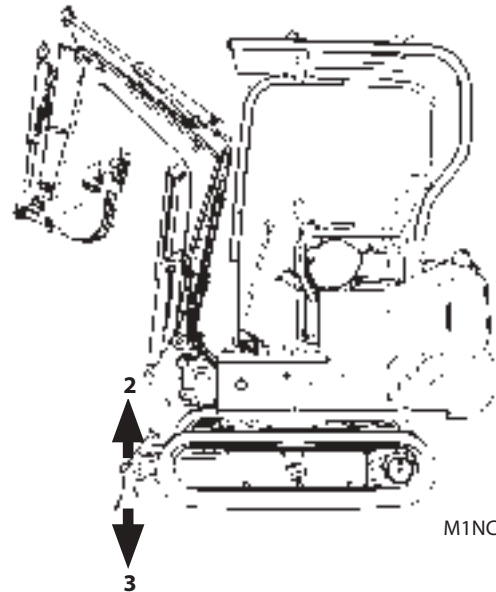
Use blade lever (1) on the operator's right to raise and lower the blade.

When the lever is released, it automatically returns to neutral, holding the blade in the present position until the lever is operated again.



M1NC-01-002

- 2- Blade Raise
- 3- Blade Lower



M1NC-04-001

## OPERATING MACHINE

---

### 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 into contact with the blade.



M586-05-016



M586-05-017

## OPERATING MACHINE

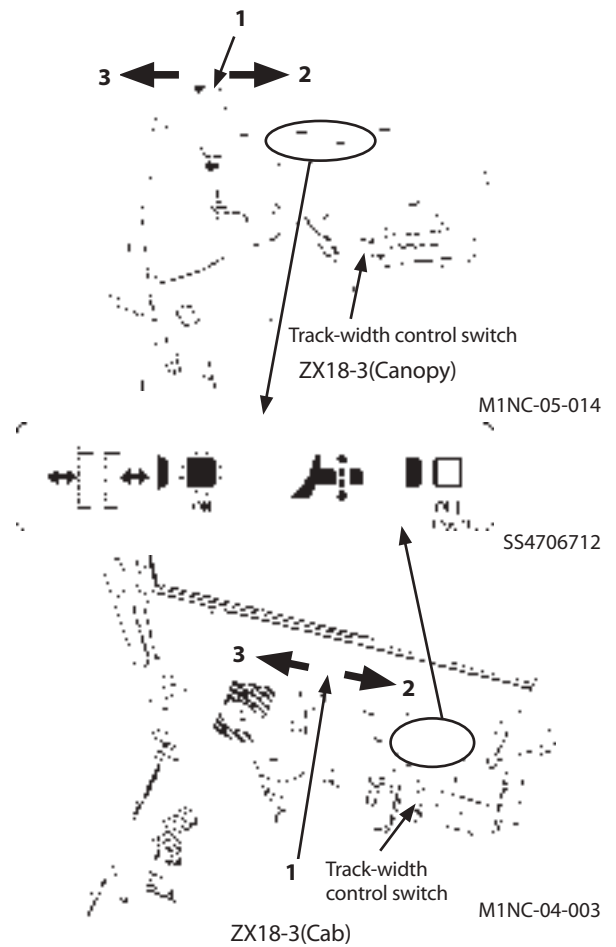
### Blade and Track Width Control Lever Operation (ZX18-3)



**CAUTION:**

- Be sure to set the track width to either 1280 mm (fully extended) or 970 mm (fully retracted). If the machine is operated with the track width set to a dimension other than 1280 mm or 970 mm, the track width will not be secured so that the machine upper structure will move unstably.
- Never attempt to adjust the track width on a slope. Failure to follow these instructions will cause the machine to turn over or skid, possibly resulting in personal injury.

- IMPORTANT:**
- Check the sliding surfaces on the track frame for any accumulated debris. If any debris such as soil has accumulated, remove the accumulated debris and clean the surfaces.
  - Check the ground surface under the machine. In case the surface is not flat or if any protruding obstructions exist, move the machine to a flat surface area or remove the obstruction before adjusting the track width.
  - Do not use the track width control function to move or tow any objects. Machine failure or damage may result.



**Blade (When the track-width control switch is OFF:)**

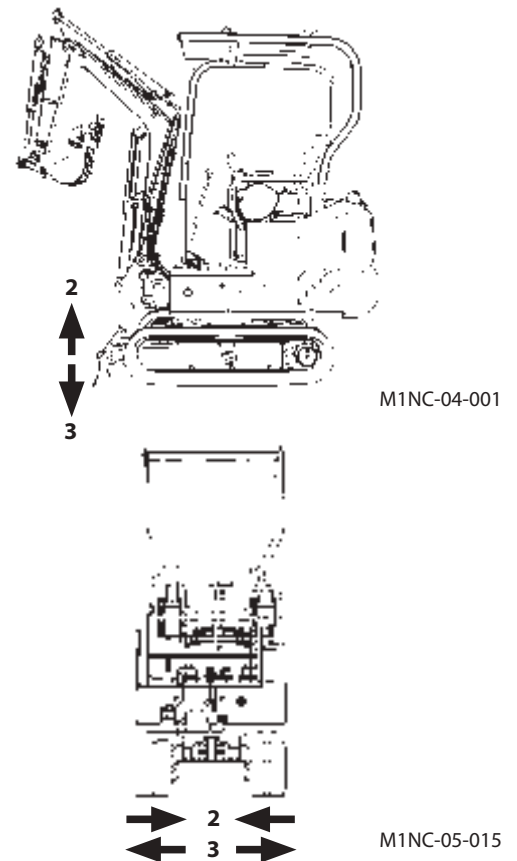
Use lever (1) to raise and lower the blade.  
 When the lever is released, it automatically returns to its neutral position, keeping the blade in its position until the lever is operated again.

(2) Blade raise  
 (3) Blade lower

**Track width (When the track-width control switch is ON:)**

Use lever (1) to change the width of the track (under carriage).  
 When the lever is released, it automatically returns to its neutral position, keeping the width in its position until the lever is operated again.

(2) Narrow width  
 (3) Extend width



## OPERATING MACHINE

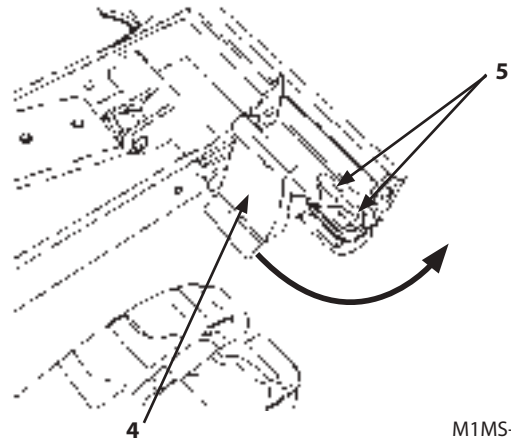
### Extending / Retracting Blade Width (ZX18-3)

Change the blade width in accordance with the side frame extension / retraction.

When working with the blade contact to ground, there are some cases that it is difficult to remove the pins. Work after raising the blade, and stopping the engine.

#### When Extending the Blade Width:

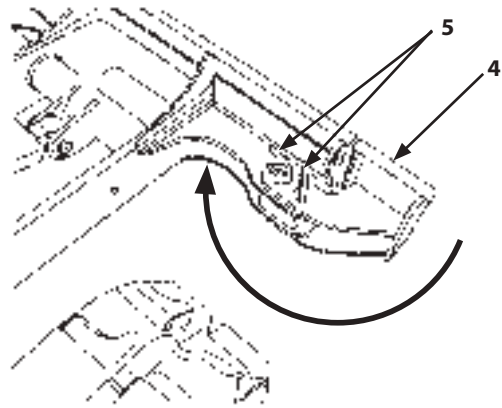
1. Remove blade pins (5).
2. Turn over the extension blade (4) and align the two pin holes.
3. Install blade pins (5).
4. Extend the left side following steps 1 to 3 above.



M1MS-05-008

#### When Retracting the Blade Width:

1. Remove blade pins (5).
2. Turn over the extension blade (4) so that the cutting edge side may turn to the track shoe side. Align the two pin holes.
3. Install blade pins (5).
4. Retract the left side following steps 1 to 3 above.



M1MS-05-009

## OPERATING MACHINE

### Pilot Control Shut-Off Lever

The pilot control shut-off lever is a device to prevent the machine from being unexpectedly operated even if the control levers are 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.

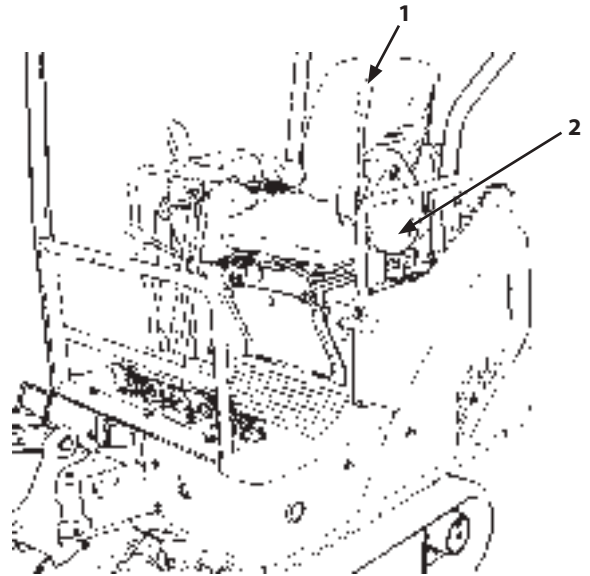


#### WARNING:

- To deactivate control lever 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 levers (3) to reactivate control lever (3) 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 the pilot control shut-off lever to the LOCK position before exiting the machine after each shift.

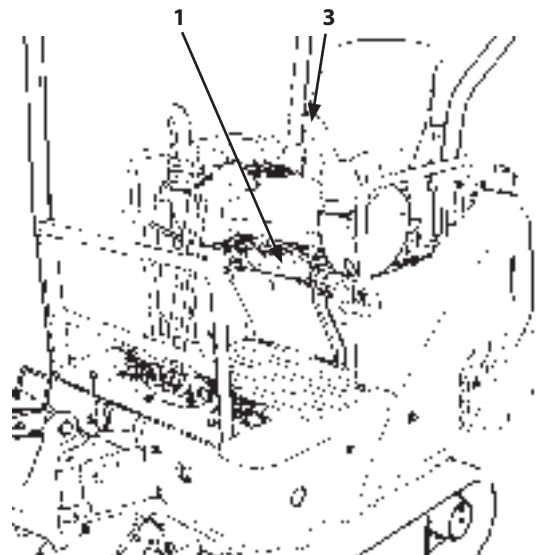
#### Before Leaving the Machine:

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 control lever (3) function, be sure to pull pilot control shut-off lever (1) and raise console (2) to the fully locked position.



Lock Position

M1NC-05-004



Unlock Position

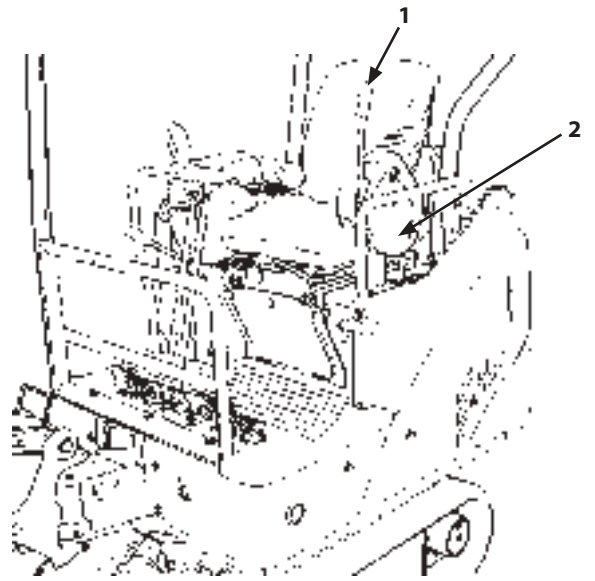
M1NC-01-013

## OPERATING MACHINE

### Before Starting Operation:

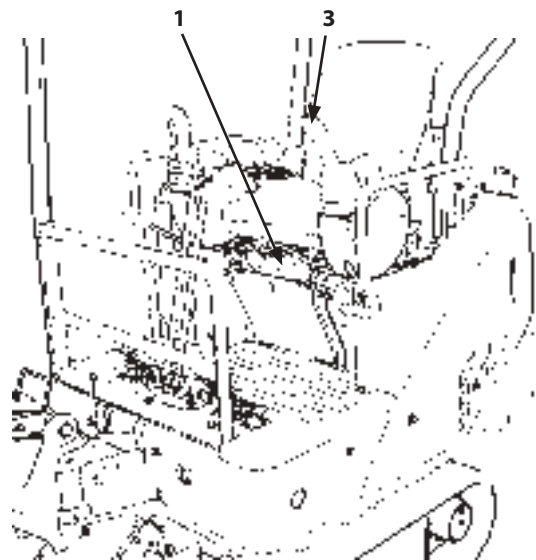
**⚠ WARNING:** Never attempt to lower the raised console (to reactivate the pilot control shut-off function) by holding and pushing down control lever (3) and/or console (2). Always lower the console using pilot control shut-off lever (1).

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 the pilot control shut-off lever to the UNLOCK position, check that no actuator moves when all control levers and pedals are in neutral before starting operation. If any actuator moves after moving the pilot control shut-off lever 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.



Lock Position

M1NC-05-004



Unlock Position

M1NC-01-013

## OPERATING MACHINE

---

### 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<sup>-1</sup> (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.



## OPERATING MACHINE

---

### 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 into 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 into 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.**

## OPERATING MACHINE

### 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.

**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.



M1M7-05-012

#### 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.

### 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.



WRONG



WRONG

M1M7-05-013

## OPERATING MACHINE

---

### 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.



WRONG

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 on rough terrain with scattered rocks, gravel or boulders. Failure to do so may cause breakages of rubber crawlers, or damage to track parts such as rollers. 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

## OPERATING MACHINE

---

### **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 into 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 load lifted 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 load lifted. The lifted load may sway, possibly creating a hazardous situation.

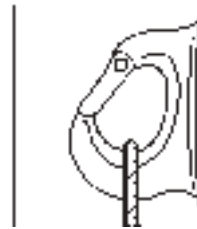
## OPERATING MACHINE

### Precautions for Using Bucket Hook

**⚠ WARNING:** Even though a hook equipped with a wire rope guide is used, wire rope may come off the bucket hook if the machine is improperly operated.

During lifting work of objects such as steel planks, steel building materials, or electric concrete masts, when the lifted object is lowered to the ground, the wire rope may come off the bucket hook. To prevent wire rope from coming off the hook, never allow the wire rope to slacken by operating the front attachment as slowly as possible.

Do not allow anyone to enter below the lifted load or in the vicinity of the lifted load. Control the bucket angle so that the bucket hook mounting face remains vertical as illustrated to the right.



SA-525

### 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



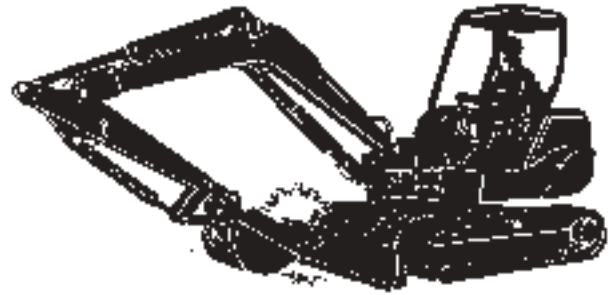
M586-05-017

## OPERATING MACHINE

---

### 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

## OPERATING MACHINE

### 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:

#### 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.

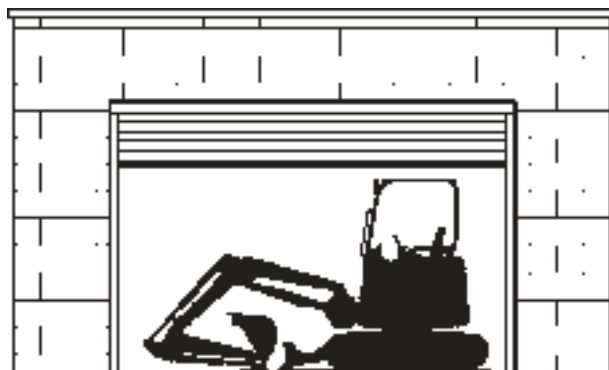


M1M7-05-015

#### 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 more 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

## OPERATING MACHINE

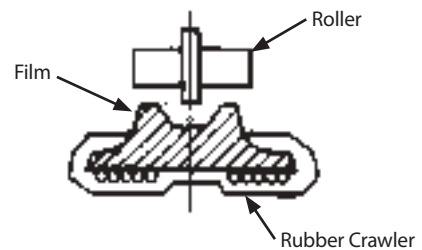
---

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.



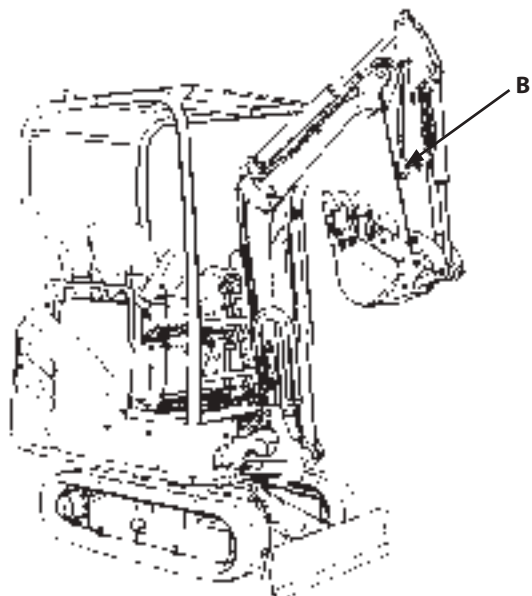
M503-05-040



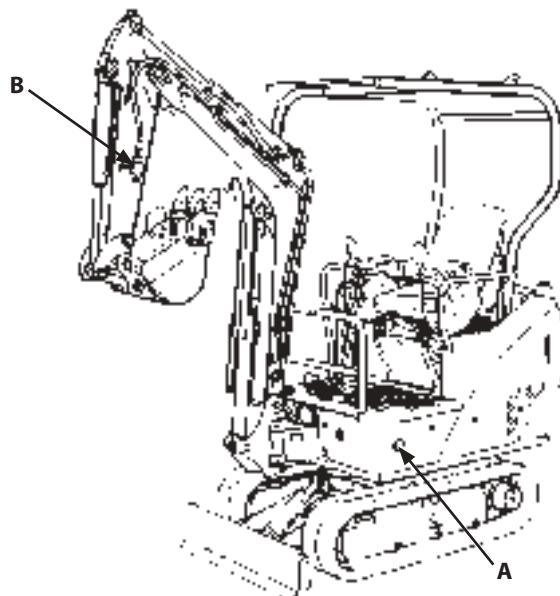
# OPERATING MACHINE

## Pipings for Breaker and Crusher

### Operational Procedures for Stop Valves and Selection Valve.



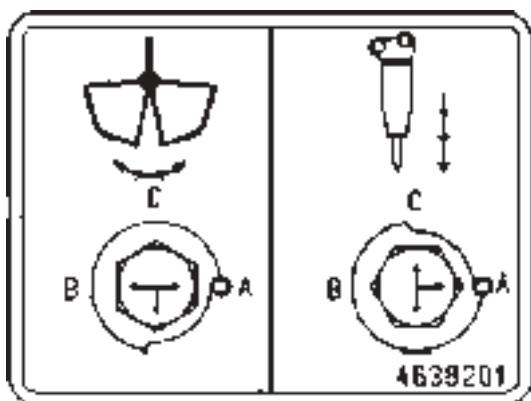
M1NC-05-005



M1NC-05-006

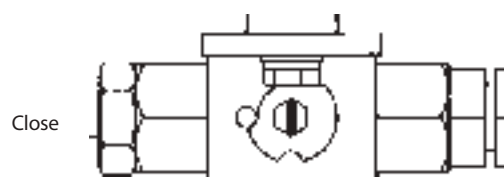
A-Selection valve  
Operate the selection valve after removing rubber cap.

B-Stop valve (Optional)

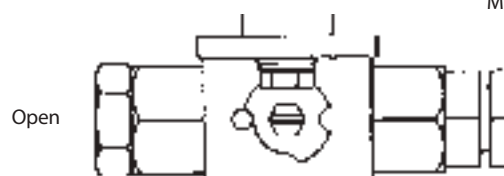


ZX14-3, 16-3, 18-3

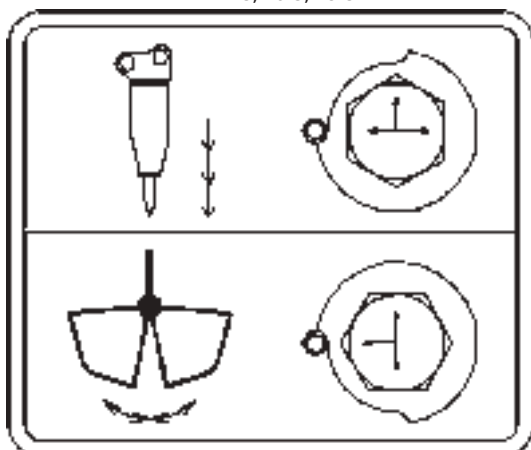
M1M0-05-006



M1M0-05-009



M1M0-05-010



ZX27-3

M1NC-05-010

#### Stop Valves B

Close : When not using attachment or is detached.

Open : When using attachment

## OPERATING MACHINE

### Precautions for Breaker Operation

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 to 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.

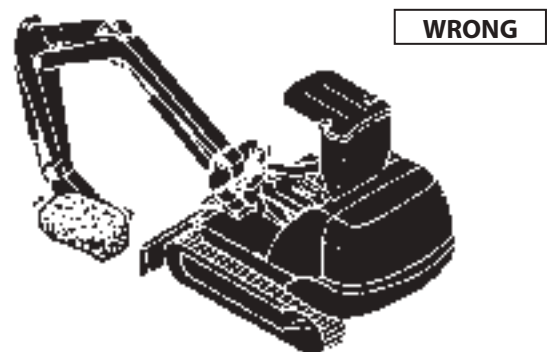
#### Precautions for Hydraulic Breaker Operation

**⚠ 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 hazardous situation. Take protective measures against danger of machine tipping over and/or scattering of hard materials and observe the precautions described below to ensure safe operation.

1. Avoid crashing the breaker onto hard materials.

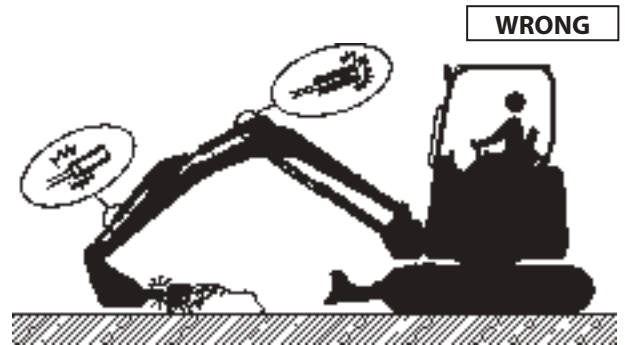
The breaker is heavier than the bucket, causing the lowering speed of the breaker to become faster. If breaking hard materials by crashing the breaker onto hard materials is attempted, damage to the front attachment and/or the upperstructure may result due to accelerated crashing reaction force.

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.



## OPERATING MACHINE

- 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 from the stroke end can be given before the cylinder piston comes into contact with the cylinder head or bottom. Failure to do so may result in damage to the hydraulic cylinders, arm and/or boom.



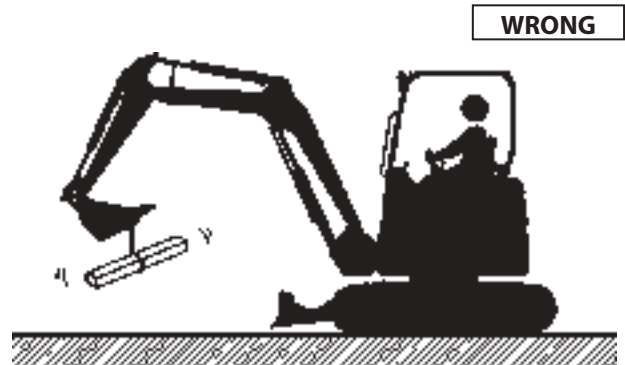
M1M7-05-021

- 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.



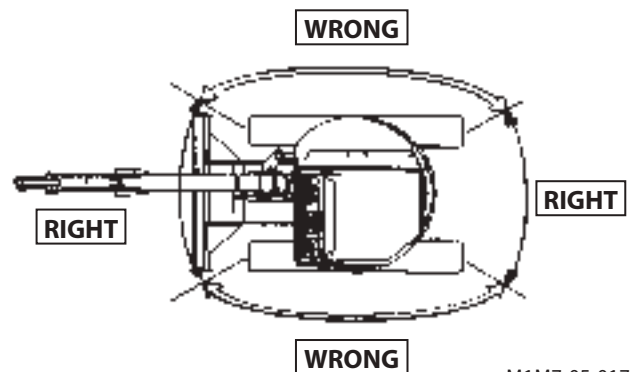
M104-05-059

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



M1M7-05-022

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



M1M7-05-017

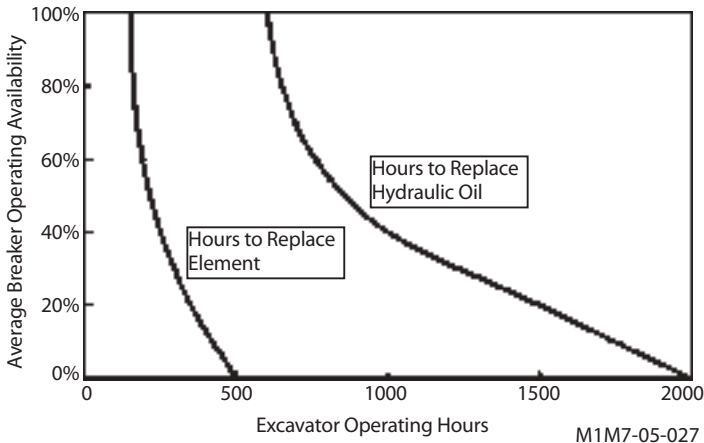
## OPERATING MACHINE

7. Do not allow the breaker chisel to come into contact with the boom when rolling in the arm and the breaker.
8. Change hydraulic oil and replace the full flow filter element at the 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 as shown in the table below to especially extend the service life of the hydraulic pump. (Refer to the Hydraulic System group in the Inspection and Maintenance chapter.)



M1M7-05-023

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.

## OPERATING MACHINE

### Precautions for Crusher Operation

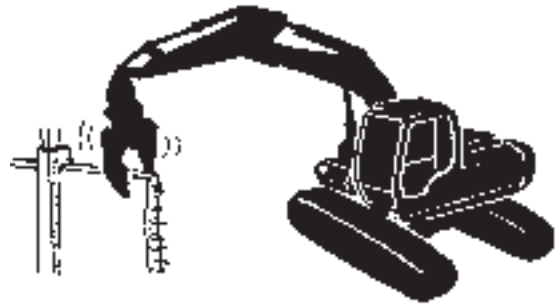
Before installing a hydraulic crusher on the machine, machine stability, and the hydraulic pressure and flow rate to operate the hydraulic crusher must be checked. Consult your authorized dealer for selection of the hydraulic crusher model to be installed. Refer to the Crusher Operation Manual for operation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



M107-05-046

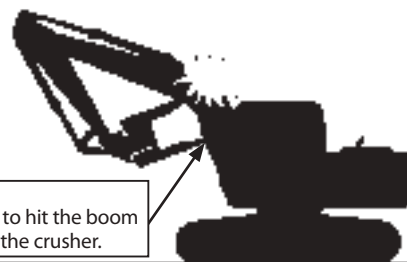
### Precautions for Hydraulic Crusher Operation

**! 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 hazardous situation. Take protective measures to prevent machine tipping over and/or 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 tipping over of the machine.
  - 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.



Watch Out!  
Take care not to hit the boom and cab with the crusher.

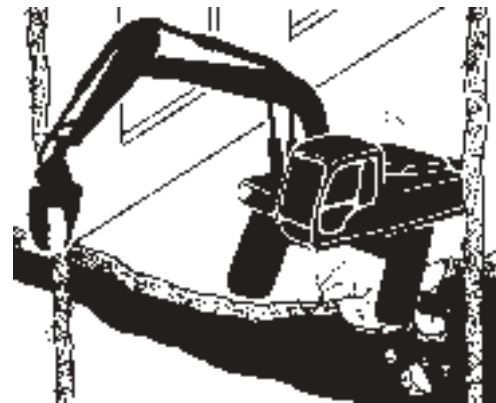
M1G6-05-009

## OPERATING MACHINE

- When crushing objects in high positions such as a ceiling, carefully operate the machine so that falling objects do not come into contact with the machine.
- Before operating the machine on a floor of structures, check that the strength of the floor is 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 beside 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 grounds.
- 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 mentioned in Step 1, 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 section.)
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 an easy-to-see place.



M1M7-05-024

# OPERATING MACHINE

## Emergency Boom Lowering Procedure

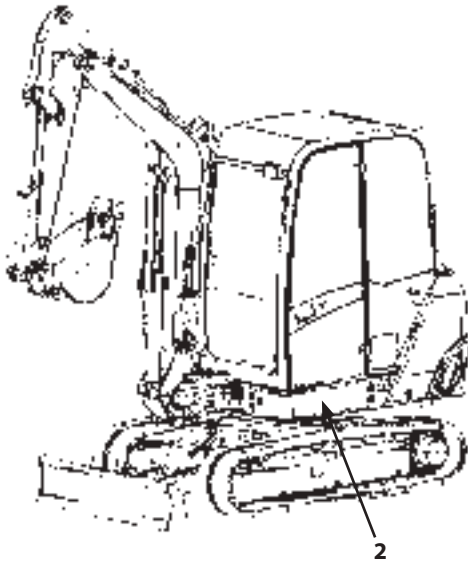
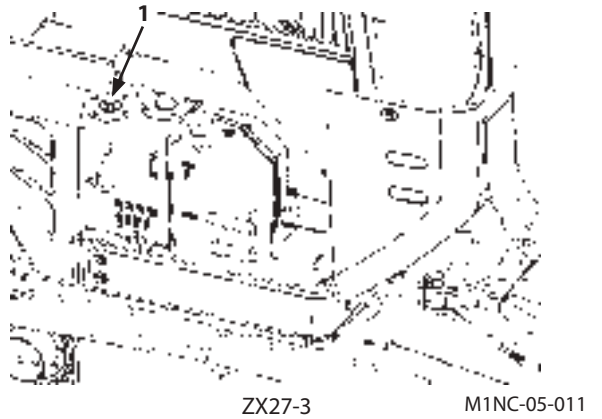
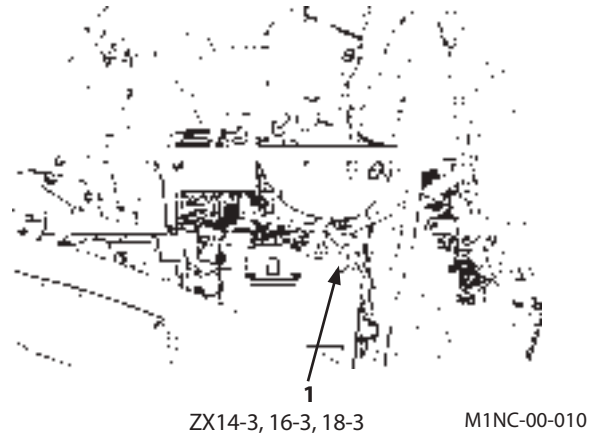
**⚠ WARNING: Prevent personal injury. Confirm that no one is under the front attachment before starting the procedure below.**

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 (open) 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.

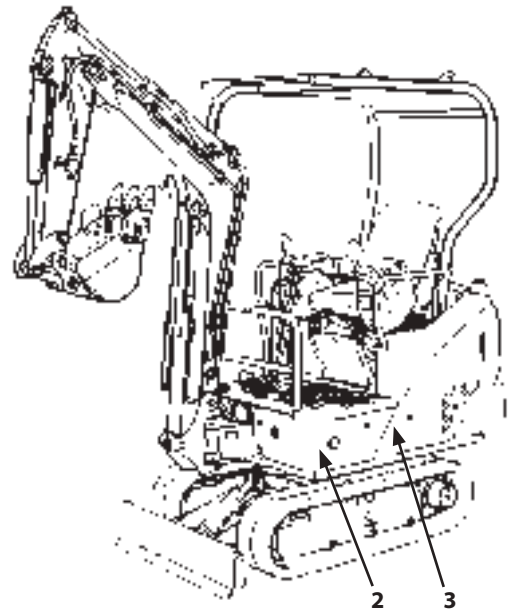
**⚠ WARNING: Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.**

2. Remove cover (2) and cover (3).



ZX27-3

M1NC-05-012



ZX14-3, 16-3, 18-3

M1NC-05-006

## OPERATING MACHINE

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 (4) slowly by checking the movement of boom.
2. After checking that boom is lowered completely, tighten the overload relief valve (4).

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



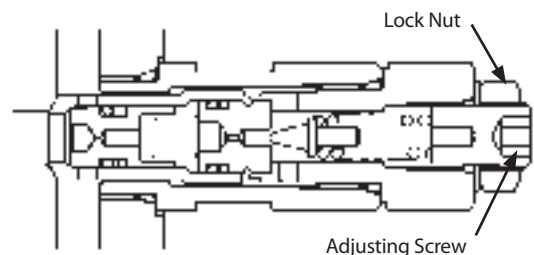
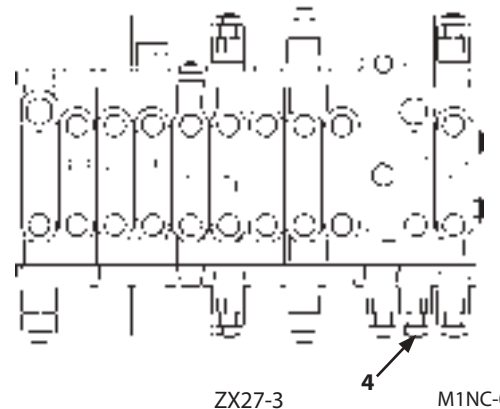
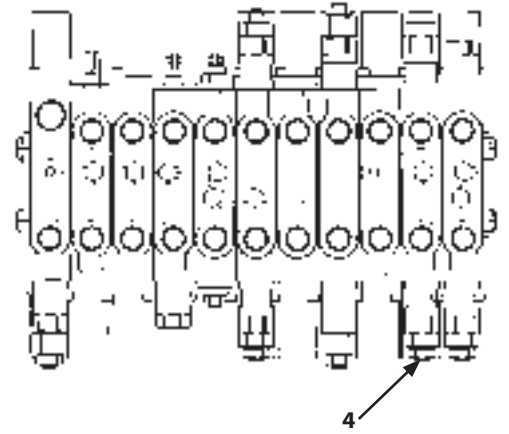
### If the Front Attachment is Loaded

1. Put the matching marks on lock nut in overload relief valve (4) 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.
3. After checking that the boom is lowered completely, align the matching marks and tighten the lock nut.

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



M1NC-05-009



# TRANSPORTING

---

## 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 inclination of less than 15 degrees.
4. Loading docks must be sufficient in length, width, and strength. Inclination 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 into contact with the ramps or loading docks.

## TRANSPORTING

### Loading



**WARNING:**

- Always travel the machine slowly.
- 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.
- Use 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 flatbed.
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 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.



**CAUTION: During cold weather season, be sure to sufficiently warm up the machine before loading or unloading the machine.**



Less than 15°

M1M7-06-001

## TRANSPORTING

### Securing Machine to Trailer for Transportation

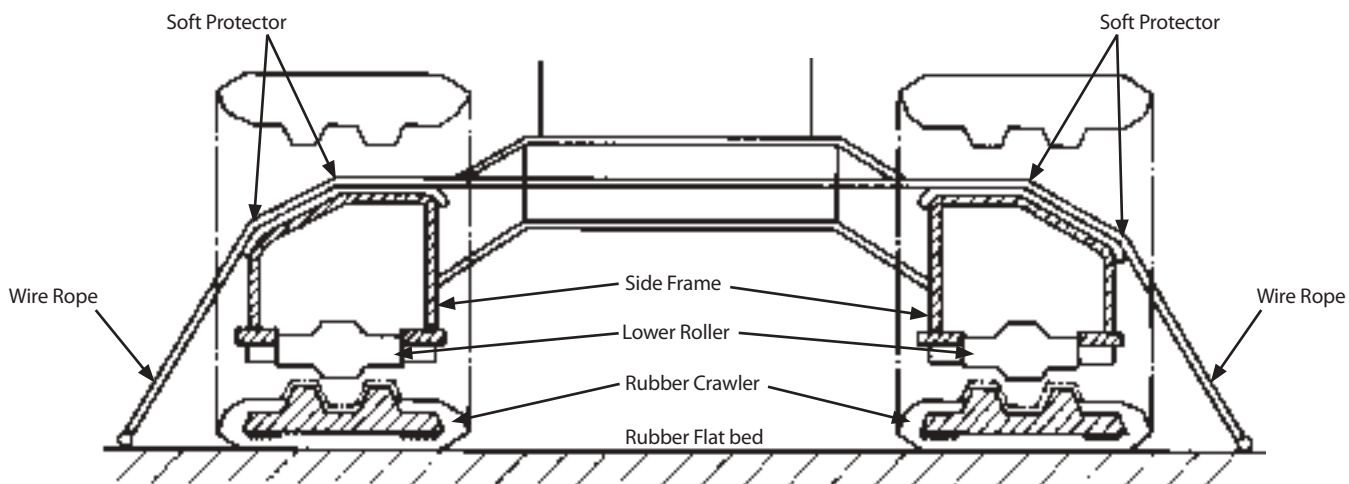
**⚠ WARNING: Securely tighten the machine to the flatbed with wire ropes.**

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


## TRANSPORTING

---

### Unloading



**WARNING:**

- Always travel the machine slowly.
- Press the travel mode switch 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.
- Use 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 the good machine 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 into 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.

## TRANSPORTING

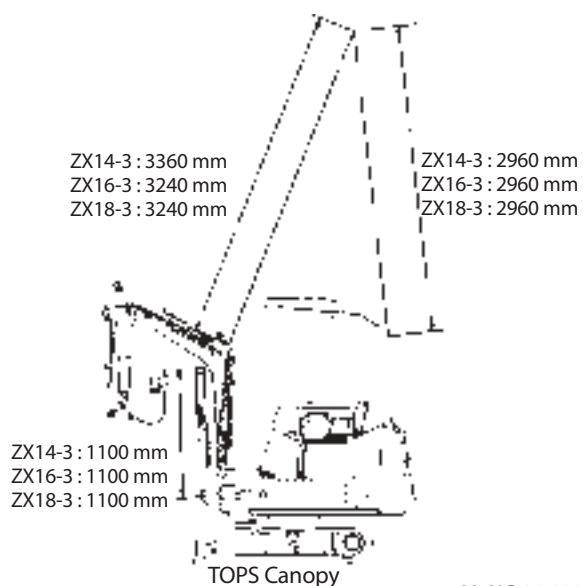
### Lifting Machine with Crane



**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 front. (ZX27-3 only: Fully retract the blade cylinder.)
2. Fully extend the boom, arm and bucket cylinders, as illustrated to the right. Pull the pilot control shut-off lever to LOCK position.
3. Position the boom straight ahead of the upperstructure. Apply the boom swing pedal lock.
4. Attach shackles to the boom and canopy (cab) hooks. Securely thread wire ropes through the shackles.
5. 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.

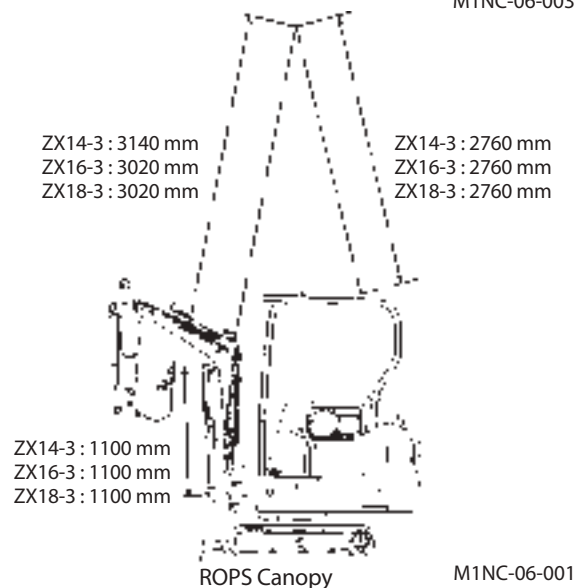


ZX14-3 : 3360 mm  
 ZX16-3 : 3240 mm  
 ZX18-3 : 3240 mm

ZX14-3 : 2960 mm  
 ZX16-3 : 2960 mm  
 ZX18-3 : 2960 mm

ZX14-3 : 1100 mm  
 ZX16-3 : 1100 mm  
 ZX18-3 : 1100 mm

M1NC-06-003

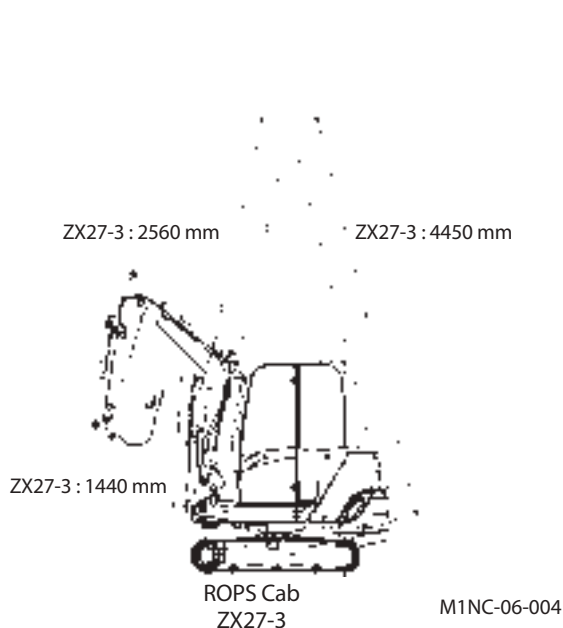


ZX14-3 : 3140 mm  
 ZX16-3 : 3020 mm  
 ZX18-3 : 3020 mm

ZX14-3 : 2760 mm  
 ZX16-3 : 2760 mm  
 ZX18-3 : 2760 mm

ZX14-3 : 1100 mm  
 ZX16-3 : 1100 mm  
 ZX18-3 : 1100 mm

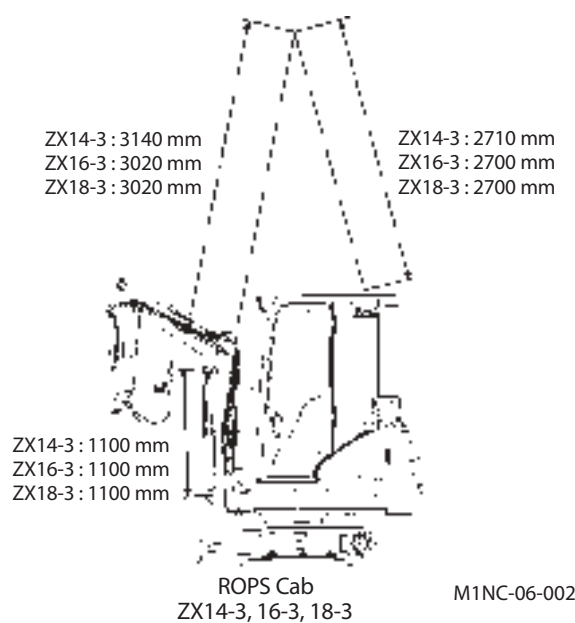
M1NC-06-001



ZX27-3 : 2560 mm      ZX27-3 : 4450 mm

ZX27-3 : 1440 mm

M1NC-06-004



ZX14-3 : 3140 mm  
 ZX16-3 : 3020 mm  
 ZX18-3 : 3020 mm

ZX14-3 : 2710 mm  
 ZX16-3 : 2700 mm  
 ZX18-3 : 2700 mm

ZX14-3 : 1100 mm  
 ZX16-3 : 1100 mm  
 ZX18-3 : 1100 mm

M1NC-06-002



## MAINTENANCE

---

### Procedures

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

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 do so may result in serious injury or death and/or machine breakdown.**
  - **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.**



SA-435

## MAINTENANCE

---

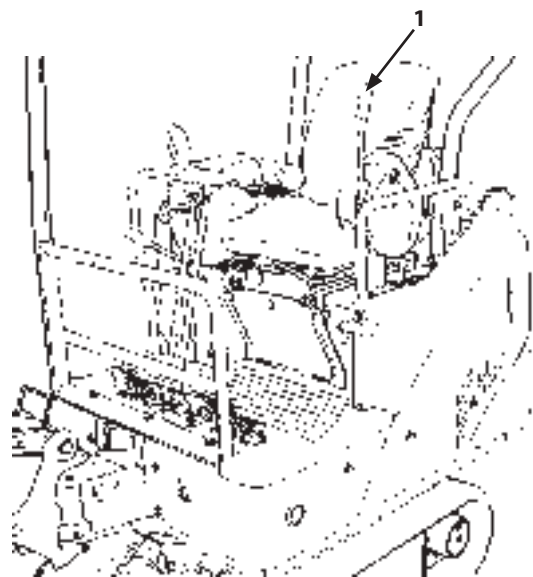
### Prepare Machine for Inspection/Maintenance

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. Run the engine at slow idle speed without load for approx. 5 minutes to cool down the engine.
4. Turn the key switch OFF. Remove the key from the 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.
5. Be sure to place pilot control shut-off lever (1) in the LOCK position.
6. Attach a "Do Not Operate" tag to an easy-to-see place such as the cab door or one of the control levers.



M1M7-05-024



M1NC-05-004



## MAINTENANCE

### Opening/Closing Engine Access Covers



#### WARNING:

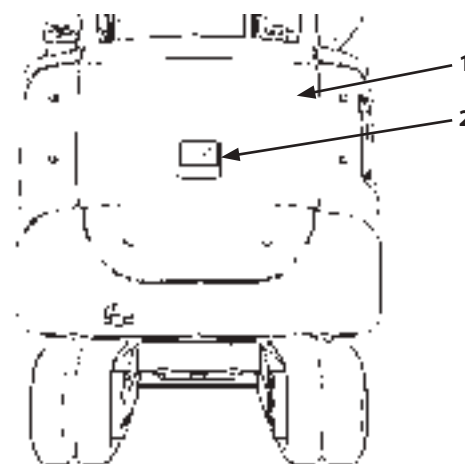
- Do not keep the engine access covers open when the machine is parked on a slope, or while the wind is blowing hard. The engine access covers may close accidentally, possibly resulting in personal injury.
- When opening/closing the engine access covers, take care not to allow your fingers to become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

Pull up latch (2) to open cover (1).

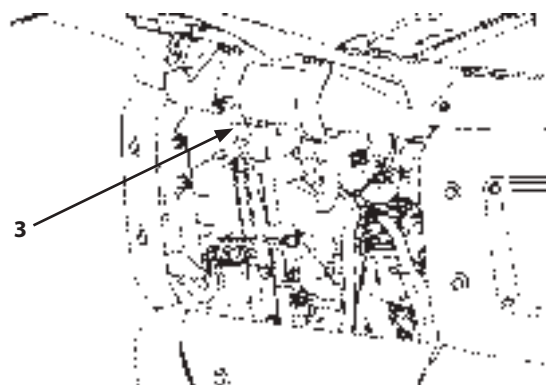
After checking that stopper (3) is placed in LOCK position (4), remove your hand from the cover. Cover (1) will be locked in place.

When closing cover (1), while raising cover (1), push stopper (3) at the arrowed position ⇒.

Then, lower cover (1) further to completely close it.

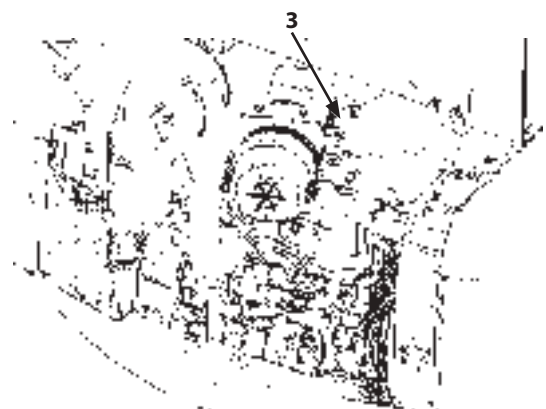


M1NC-07-001



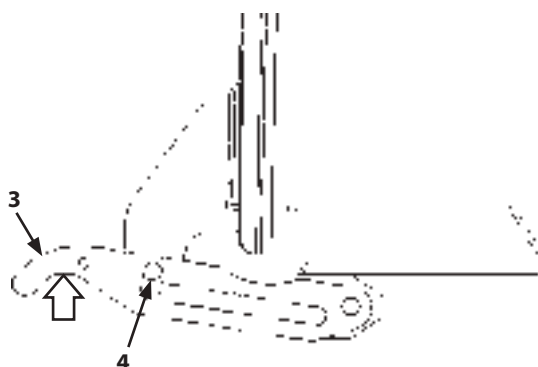
ZX14-3, 16-3, 18-3

M1NC-01-017



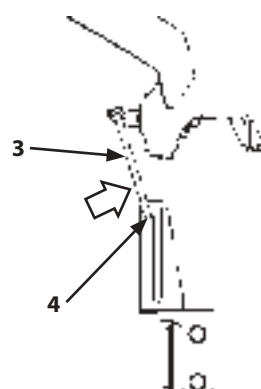
ZX27-3

M1NC-07-024



ZX27-3

M1NC-07-025



ZX14-3, 16-3, 18-3

M1NC-01-018

## MAINTENANCE

### Opening/Closing Tank Covers (ZX27-3)



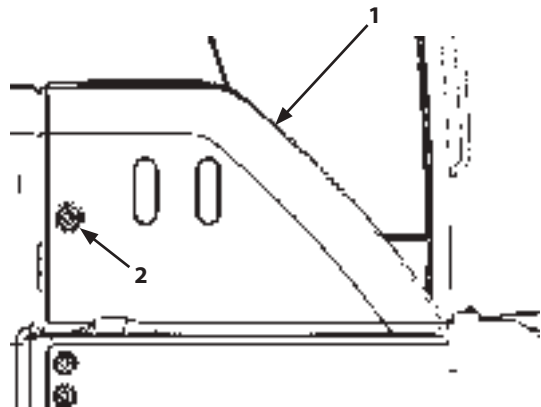
**WARNING:**

- 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.

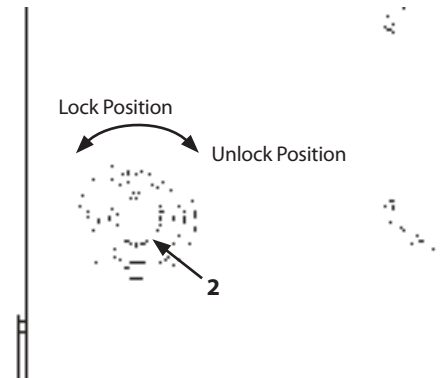
1. Turn key (2) to the right to open cover (1). Cover (1) will be stopped opening with wire (3).



**WARNING: After closing cover (1), check that it is locked securely.**



M1NC-07-038



M1NC-07-039



M1NC-05-011

## MAINTENANCE

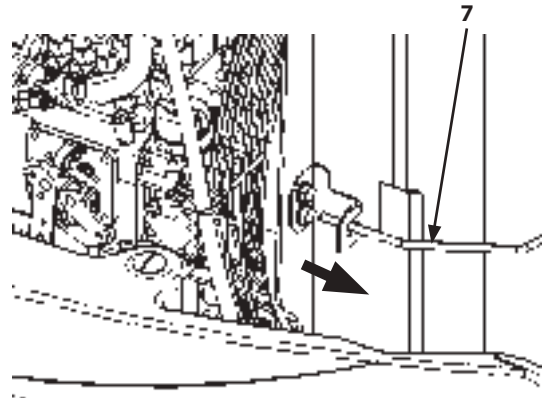
### Opening/Closing Right Side Covers (ZX27-3)



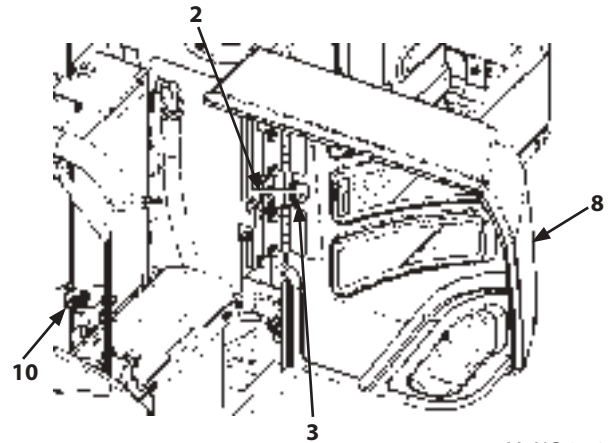
#### CAUTION:

- Do not keep right side cover (8) open when the machine is parked on a slope, or while the wind is blowing hard. The right side cover may close accidentally, possibly resulting in personal injury.
- When opening or closing the access covers, take extra care not to catch fingers between the base machine and the access covers.
- When the cover is kept open, do not forcibly push the cover. The hinge parts may be deformed so that the door may not return to the original position.

1. Push rod (7) on the side of the radiator to release right side cover (8).
2. After opening right cover (8), be sure to insert rod (2) into cover lock hole (3) to hold the cover.
3. Compress cover (8) until catch (10) clicks.



M1NC-07-040

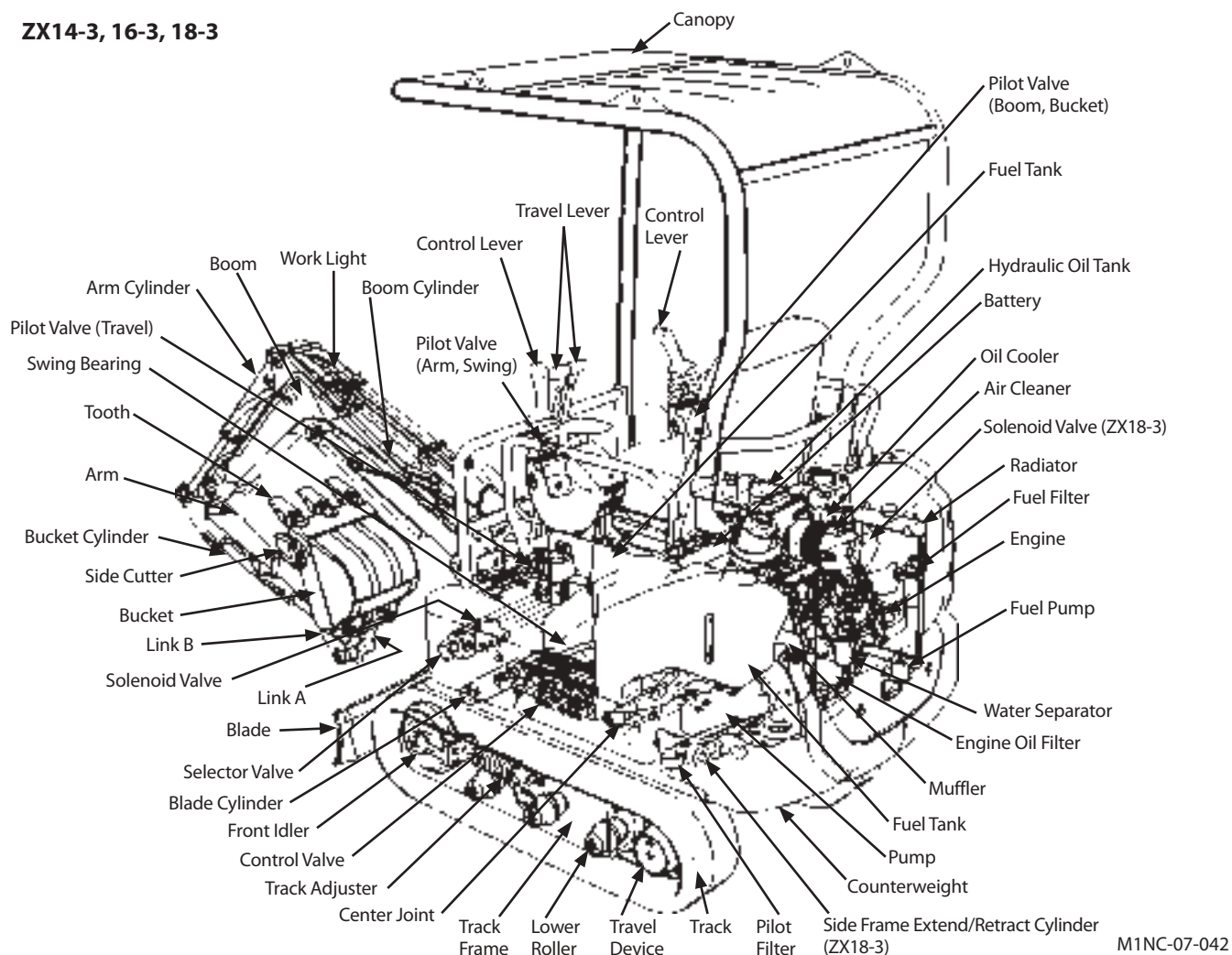


M1NC-07-041

# MAINTENANCE

## Daily Inspection

**ZX14-3, 16-3, 18-3**



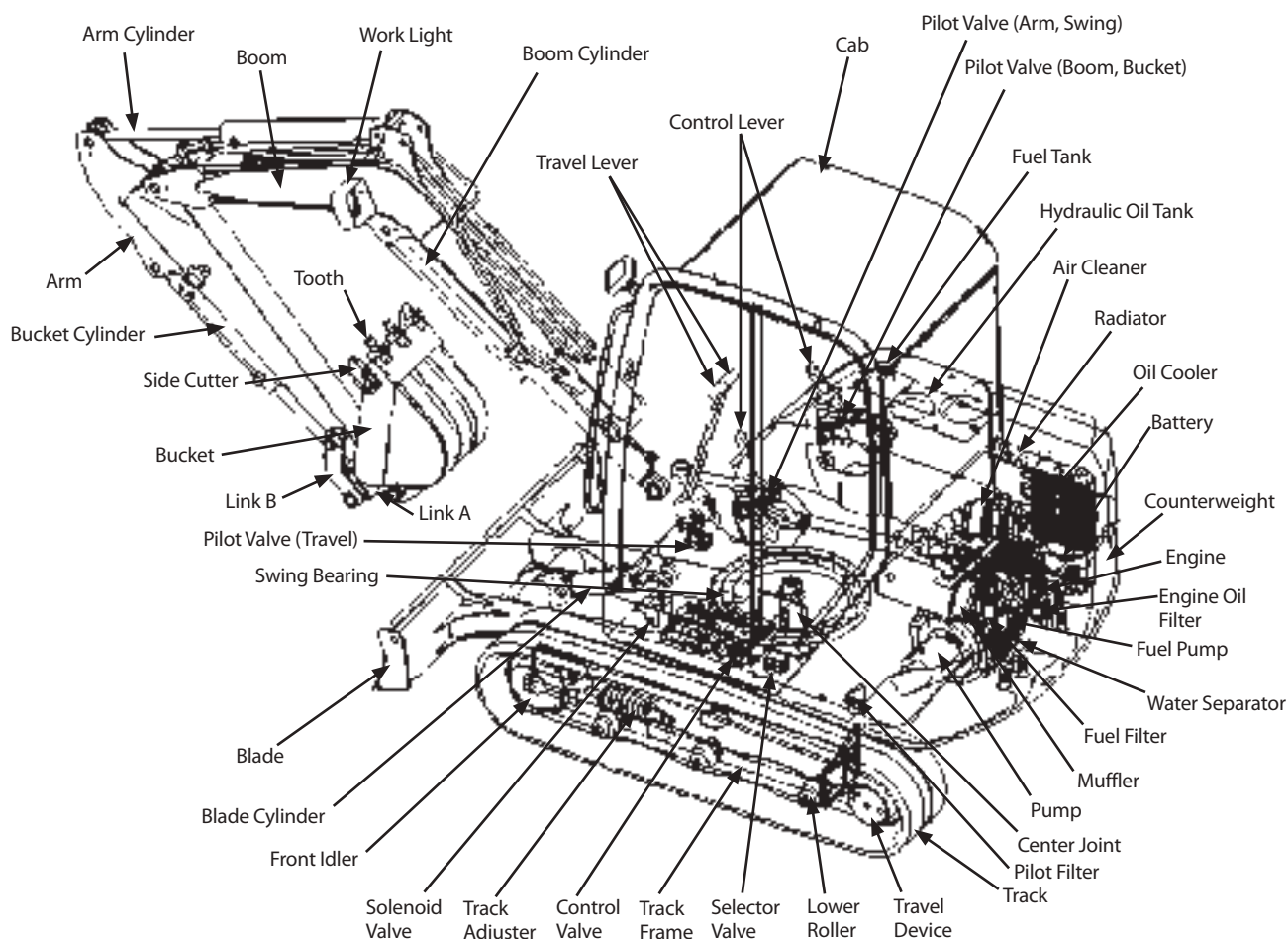
M1NC-07-042

	Checkpoint		Checkpoint
Engine	<ol style="list-style-type: none"> <li>1. Quantity and contamination of engine oil and coolant</li> <li>2. Ease of engine starting, exhaust gas color, abnormal noises</li> <li>3. Oil and coolant leaks. Damage to hoses and pipes</li> <li>4. Clogging of or damage to radiator/oil cooler</li> <li>5. Loose or missing nuts and bolts</li> </ol>	Undercarriage	<ol style="list-style-type: none"> <li>1. Loose track sag, and wear on or damage to track components and structures</li> <li>2. Wear on lower rollers, front idlers, and oil leaks</li> <li>3. Oil leaks from travel devices</li> <li>4. Loose or missing nuts and bolts</li> </ol>
Upperstructure	<ol style="list-style-type: none"> <li>1. Fuel level, leak, and contamination of foreign material</li> <li>2. Hydraulic oil level, leaks, and contamination of foreign material</li> <li>3. Control lever stroke, lever play, operating force</li> <li>4. Lock lever function or not.</li> <li>5. Operating condition of hydraulic components, damage to and oil leaks in hoses and pipes</li> <li>6. Damage to or deformation of components and structures, abnormal noises</li> <li>7. Loose or missing nuts and bolts</li> </ol>	Front Attachment	<ol style="list-style-type: none"> <li>1. Damage to or oil leak from cylinders, hoses, and pipes</li> <li>2. Damage to or wear on bucket and blade</li> <li>3. Loose, worn or missing bucket teeth</li> <li>4. Lubrication at greasing points</li> <li>5. Damage to lock pins, stoppers, fastener rings and lock bolts for front joint pins</li> <li>6. Loose or missing nuts and bolts</li> </ol>
		Miscellaneous	<ol style="list-style-type: none"> <li>1. Malfunction of gauges, switches, lights, buzzer</li> <li>2. Deformation of or damage to canopy</li> <li>3. Abnormalities in machine appearance</li> </ol>

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

# MAINTENANCE

**ZX27-3**



M1NC-07-026

	Checkpoint		Checkpoint
Engine	<ol style="list-style-type: none"> <li>1. Quantity and contamination of engine oil and coolant</li> <li>2. Ease of engine starting, exhaust gas color, abnormal noises</li> <li>3. Oil and coolant leaks. Damage to hoses and pipes</li> <li>4. Clogging of or damage to radiator/oil cooler</li> <li>5. Loose or missing nuts and bolts</li> </ol>	Undercarriage	<ol style="list-style-type: none"> <li>1. Loose track sag, and wear on or damage to track components and structures</li> <li>2. Wear on lower rollers, front idlers, and oil leaks</li> <li>3. Oil leaks from travel devices</li> <li>4. Loose or missing nuts and bolts</li> </ol>
Upperstructure	<ol style="list-style-type: none"> <li>1. Fuel level, leak, and contamination of foreign material</li> <li>2. Hydraulic oil level, leaks, and contamination of foreign material</li> <li>3. Control lever stroke, lever play, operating force</li> <li>4. Lock lever function or not.</li> <li>5. Operating condition of hydraulic components, damage to and oil leaks in hoses and pipes</li> <li>6. Damage to or deformation of components and structures, abnormal noises</li> <li>7. Loose or missing nuts and bolts</li> </ol>	Front Attachment	<ol style="list-style-type: none"> <li>1. Damage to or oil leak from cylinders, hoses, and pipes</li> <li>2. Damage to or wear on bucket and blade</li> <li>3. Loose, worn or missing bucket teeth</li> <li>4. Lubrication at greasing points</li> <li>5. Damage to lock pins, stoppers, fastener rings and lock bolts for front joint pins</li> <li>6. Loose or missing nuts and bolts</li> </ol>
		Miscellaneous	<ol style="list-style-type: none"> <li>1. Malfunction of gauges, switches, lights, buzzer</li> <li>2. Deformation of or damage to canopy</li> <li>3. Abnormalities in machine appearance</li> </ol>


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

## MAINTENANCE

### 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 recommended to be periodically replaced. 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.

Periodic Replacement Parts		Replacement Interval	
Engine	Fuel hose (Fuel tank to filter)	Every 2 years	
	Fuel hose (Fuel tank to injection pump)		
	Heater hose (Heater to engine)		
	Engine rubber vibration insulator	Every 5 years or 3000 hours, whichever comes first	
	Pump coupling		
Hydraulic System	Base Machine	Pump suction hose	Every 2 years
		Pump delivery hose	
		Swing hose	
		Auxiliary hose	
		Oil cooler hose (C/V to oil cooler)	
	Front Attachment	Boom cylinder line hose	
		Arm cylinder line hose	
		Bucket cylinder line hose	
		Pilot hose	
Seat Belt		Every 3 years	


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

## MAINTENANCE

### Maintenance Guide

#### A. Greasing (See Page 7-15)

Parts	Quantity	Interval (hours)						
		8	50	100	250	500	1000	2000
1. Front Joint Pins (Incl. around the swing post)	9	★		★★				
2. Bucket and Link Pins	5	★						
3. Blade Pins (ZX27-3 Only)	4							
4. Swing Bearing	1							
5. Swing Internal Gear	1							
6. Control Lever Universal Joint	2							

-  **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 7-21)

Parts	Quantity	Intervals (hours)						
		8	50	100	250	500	1000	2000
1. Engine oil	Oil Level Check	-						
Change	ZX14-3, 16-3, 18-3	3.1 L			★			
	ZX27-3	6.2 L			★			
2. Replacement of 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 7-24)

Parts	Quantity	Interval (hours)						
		8	50	100	250	500	1000	2000
1. Travel Reduction Gear	Oil Level Check	-						
Change	ZX14-3, 16-3, 18-3	0.25 L ×2						
	ZX27-3	0.5 L ×2						

#### D. Hydraulic System (See Page 7-27)

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	ZX14-3, 16-3, 18-3	30 L					★	★
	ZX27-3	56 L					★	★
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 oils used.  
See recommended oil chart.  
★★ For the first time only.

## MAINTENANCE

### E. Fuel System (See Page 7-44)

Fuel tank capacity: ZX14-3, 16-3, 18-3: 22 L, ZX27-3: 47 L

Parts	Quantity	Interval (hours)						
		8	50	100	250	500	1000	2000
1. Check Water Separator	1							
2. Drain Fuel Tank Sump	1	As needed						
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 7-49)

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


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

### G. Cooling System (See Page 7-51)

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	ZX14-3, 16-3, 18-3	2.8 L	Twice a year (in spring and autumn)						
	ZX27-3	5.3 L							
4. Clean Radiator Core	Outside	1				★			
	Interior	1	When changing coolant						

 **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, alkaline water, hard water or natural water. Be sure to use genuine Hitachi long life coolant (LLC). In case genuine Hitachi long life coolant is not available, use other long life coolant conforming to one of the specifications below.

- JIS K-2234
- SAE J814
- SAE J1034
- ASTM D3306



## MAINTENANCE

### H. Electrical System (See Page 7-59)

### I. Miscellaneous (See Page 7-64)

Parts	Quantity	Interval (hours)							
		8	50	100	250	500	1000	1500	2000
1. Check Bucket Teeth	-								
2. Replace Bucket	1	As required							
3. Check Track Sag (rubber crawler) and Damage	2								
4. Replace Rubber Crawler	2	As required							
5. Check Track Sag (steel crawler) (Optional) (ZX27-3 Only)	2								
6. Check and Replace Seat Belt	1		Every 3 years (Replace)						
7. Clean Cab Floor	-	As required							
8. Check Injection Nozzle	Cleaning	-						◆	
	Confirming Operation	-						◆	
9. Adjust Valve Clearance	-						◆		
10. Measure Engine Compression Pressure	-						◆		
11. Check Starter and Alternator	-						◆		
12. Check Radiator Cap	-								◆
13. Check Crankcase Breather	-							◆	
14. 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.

## MAINTENANCE

### Brand Names of Recommended Oil and Lubricants

#### Grease

		Grease
Air Temp	Manufacturer	-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 (ZX14-3, ZX16-3 and ZX18-3) or kubota engine oil (ZX27-3) 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	Air Temp	Engine Crank Case		
		-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	★ Higher Royal CF class 10W30	Higher Royal CF class 15W40		CF class
Kubota (JOMO)	★ Delstar FX10W-30	Delstar FX15W-40	DH-1	CF class

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

## MAINTENANCE

---

### Fuel Oil


**IMPORTANT:** Use only diesel fuel with quality specified in each country standard shown as follows. 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.

Japan .....JIS K-2204  
Europe .....EN-590  
North America ....ASTM D-975  
Russia .....GOST-R52368  
China .....GB252

## MAINTENANCE

### Gear Oil

Gear Oil	
Air Temp	-20 to 40 °C (-6 to 104 °F)
Manufacturer	
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	-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)
Manufacturer				
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	

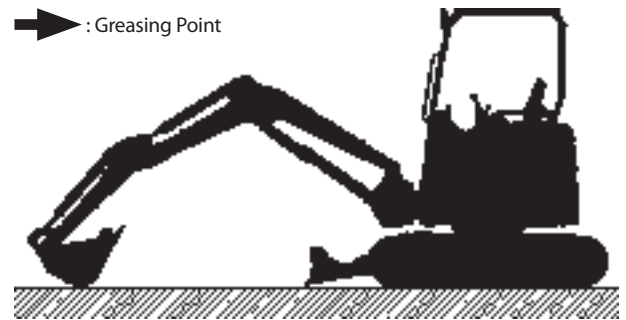
 **NOTE:** The machine shipped from the factory is filled with oil marked ★.

# MAINTENANCE

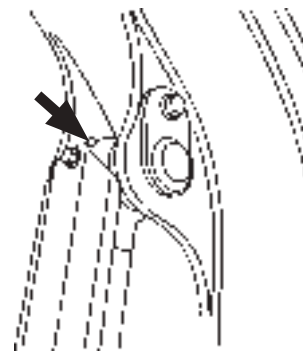
## A. Greasing

### 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.
  - 2.1 Boom cylinder rod end

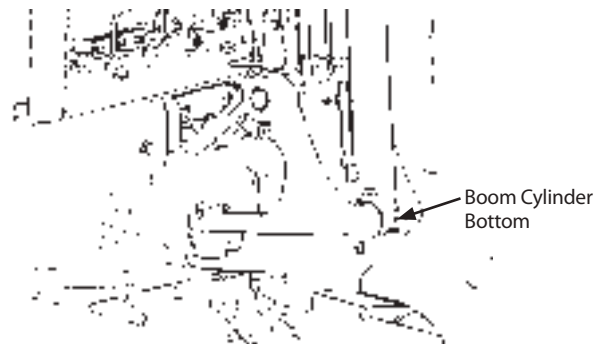


M1M7-05-024



M1M7-07-020

- 2.2 Boom cylinder bottom



M1NC-07-004

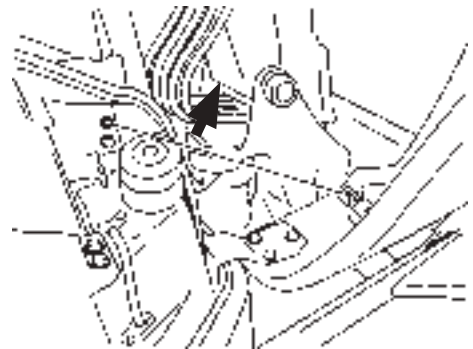
# MAINTENANCE

## 2.3 Boom foot



ZX14-3, 16-3, 18-3

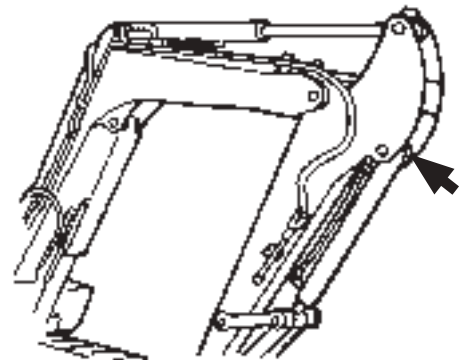
M1NC-07-004



ZX27-3

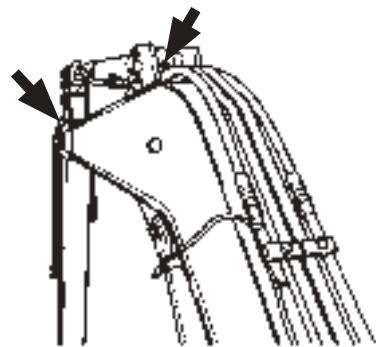
M1M7-07-022

## 2.4 Arm cylinder rod end and bucket cylinder bottom



M571-07-006

## 2.5 Boom and arm joint pin, and arm cylinder bottom



M585-07-046

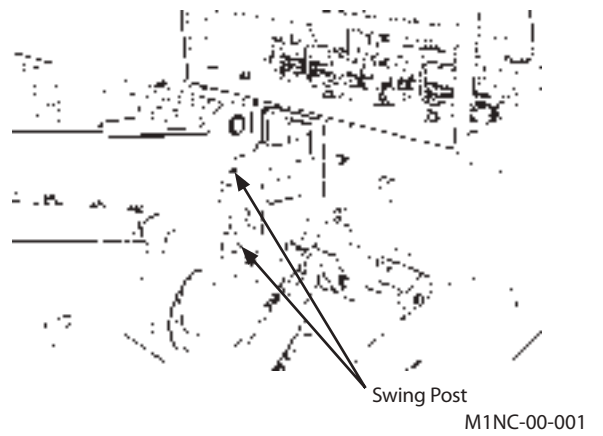
## MAINTENANCE

---

### 2.6 Swing cylinder



### 2.7 Swing post

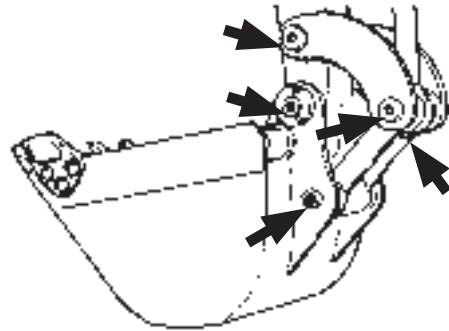


## MAINTENANCE

### 2 Bucket and Link Pins

--- every 100 hours

Grease all submerged pins after operating in water.

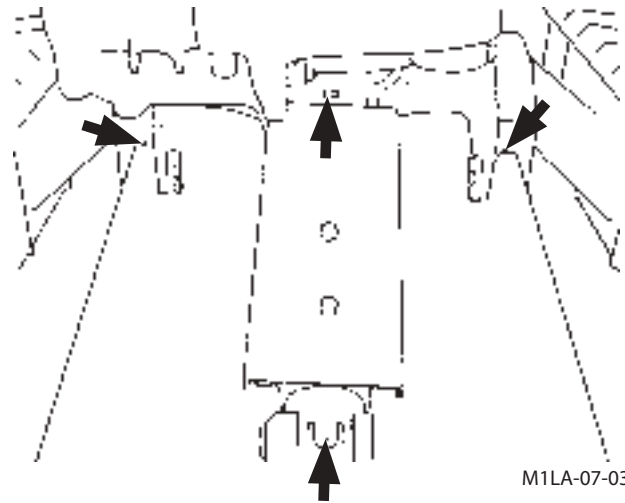


M503-07-092

### 3 Blade Pins (ZX27-3)

--- 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 pin-boss 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.



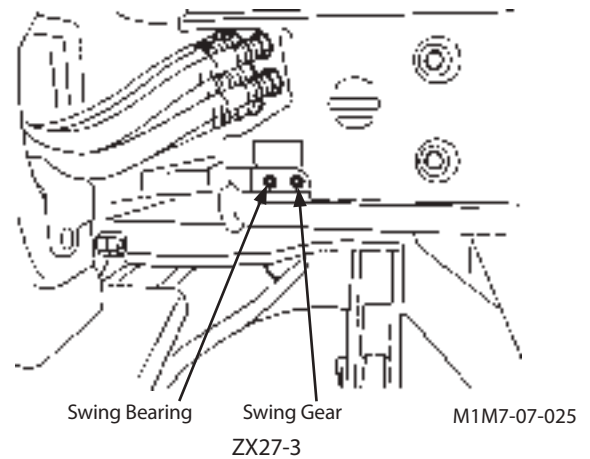
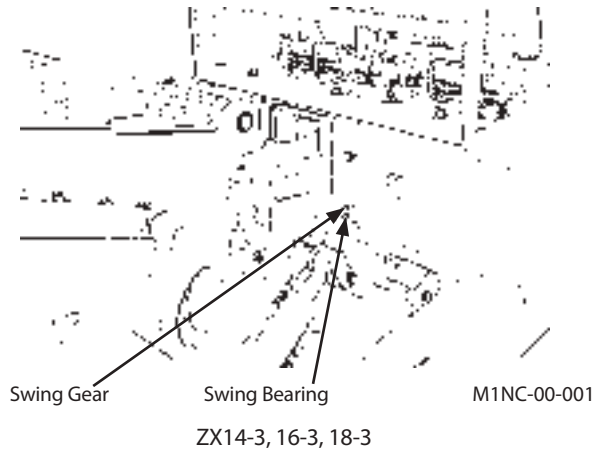
## MAINTENANCE

### 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 fittings

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. Lower the bucket and blade to the ground.
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.



## MAINTENANCE

### 5 Swing Internal Gear --- every 500 hours

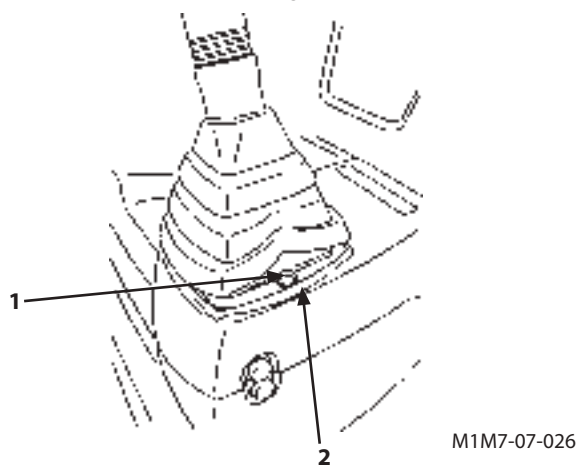
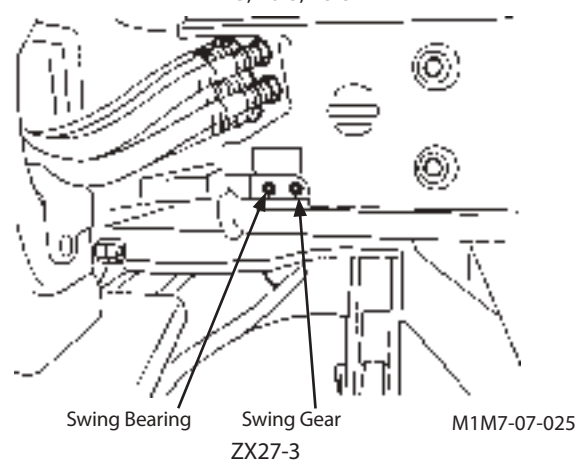
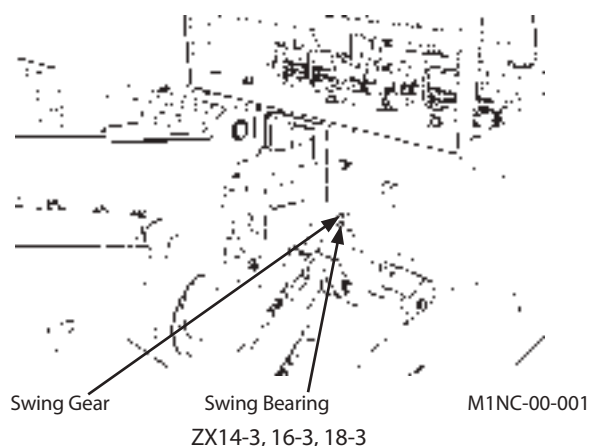
**⚠ WARNING:** Before lubricating the swing bearing, lower the bucket and the blade to the ground, stop the engine, and place the pilot control shut-off lever to the LOCK position. Lubrication and rotation of the upperstructure must be done by one person only. Be sure to check that no personnel are present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

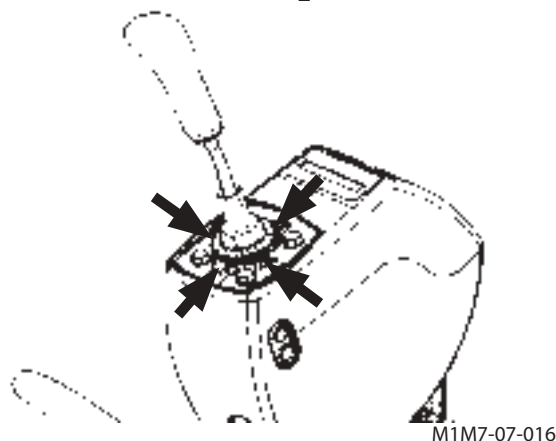
2. Apply grease via grease fittings by the quantity shown in the table.
3. In order to apply grease evenly to the swing gear, raise the bucket approximately 200 mm (8 in) above the ground. While swinging the upperstructure at approximately 90° intervals until one full turn is made, add grease at each interval.

	Greasing Quantity	Total Grease Capacity
ZX14-3, 16-3, 18-3	0.2 L (0.21 US qt)	0.6 L (0.63 US qt)
ZX27-3	0.2 L (0.21 US qt)	3.0 to 3.3 L (3.2 to 3.5 US qt)



### 6 Control Lever Universal Joint --- every 500 hours or yearly

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.



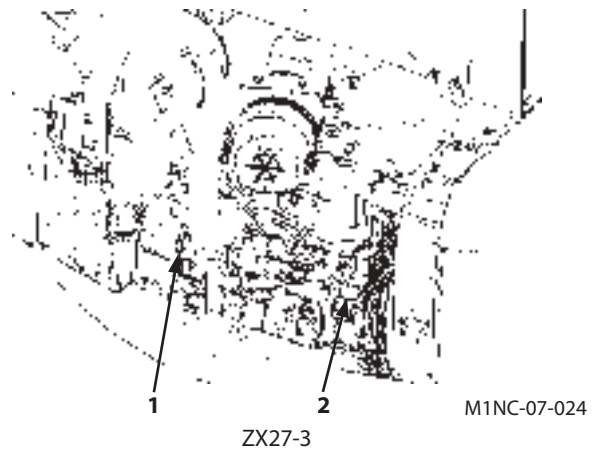
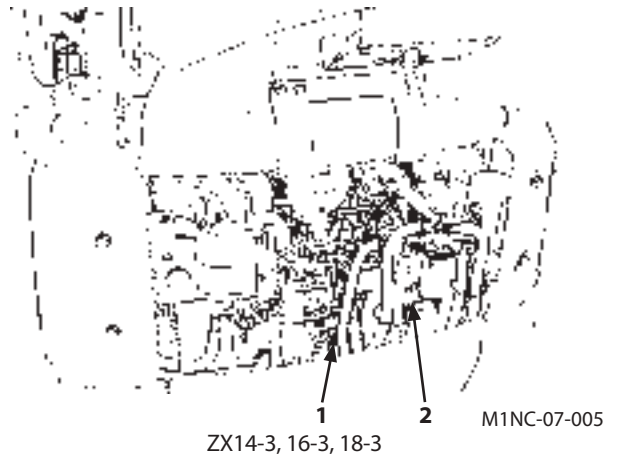
## MAINTENANCE

### B. Engine

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

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

**IMPORTANT:** A closed breather system is employed on this machine. Do not add engine oil more than the specified level. Failure to do so may result in exhaust of white smoke from the muffler, engine over speed and/or damage to the engine inside.



## MAINTENANCE

**1** Change Engine Oil / Replace Engine Oil Filter

--- every 250 hours

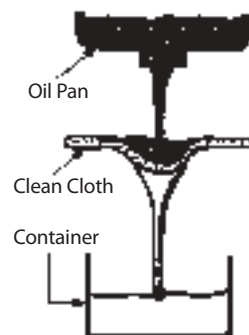
**2**

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

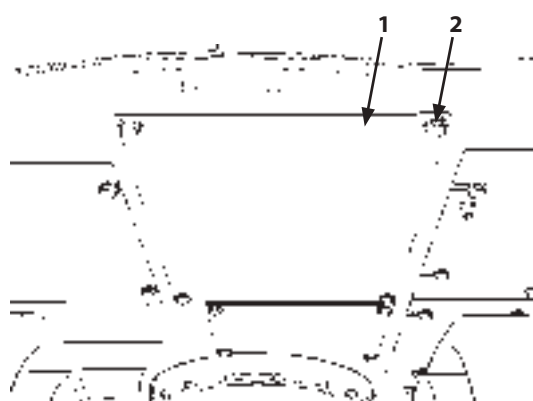
1. Prepare a 10-liter (2.6 US gal) container to receive the drain oil.
2. Loosen bolt (2) to remove undercover (1).
3. Remove drain plug (4) from engine oil pan (3) to drain the oil.
4. Allow oil to drain through a clean cloth to check if any debris such as small pieces of metal are present on the cloth.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

Wrench size : 17 mm

Tightening torque : 30 N·m (3 kgf·m, 22 lbf·ft)

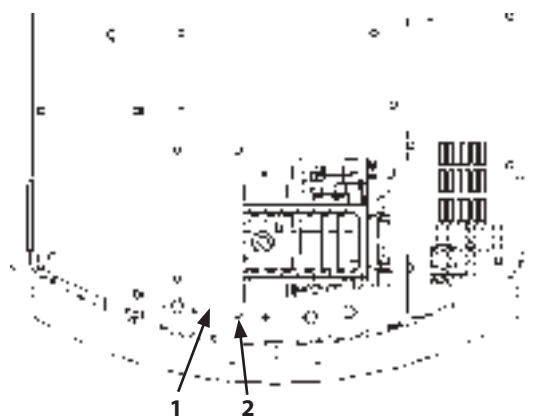


M104-07-010



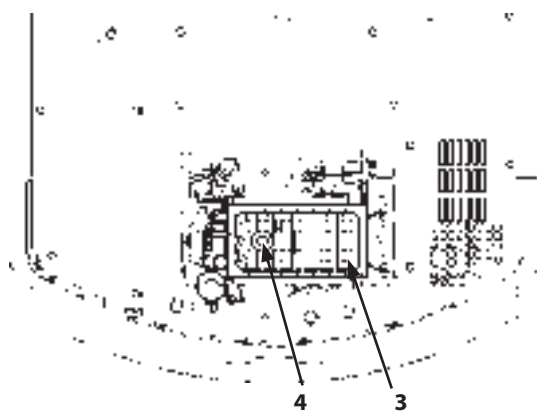
ZX14-3, 16-3, 18-3

M1NC-07-006



ZX27-3

M1NC-07-027



ZX27-3

M1NC-07-028



ZX14-3, 16-3, 18-3


M1NC-07-007

## MAINTENANCE

6. Remove oil filter (5) from the engine by turning it counterclockwise using a filter wrench.
7. Coat the gasket of new filter (5) with engine oil. Turn the filter clockwise by hand until the gasket touches the sealing surface.
8. Tighten oil filter (5) 3/4 turns more using the filter wrench. Take care that oil filter (5) may become deformed if excessively tightened.

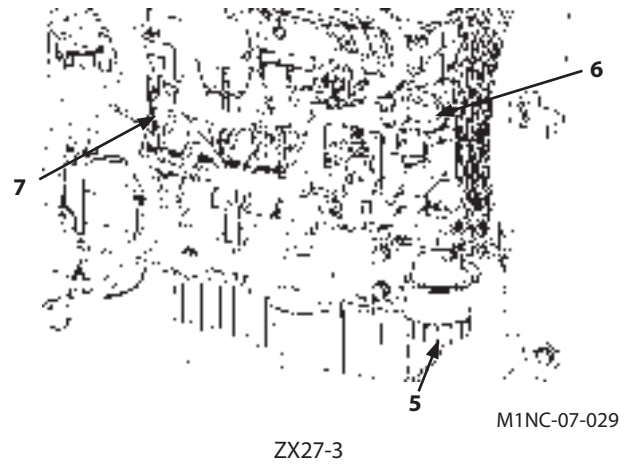
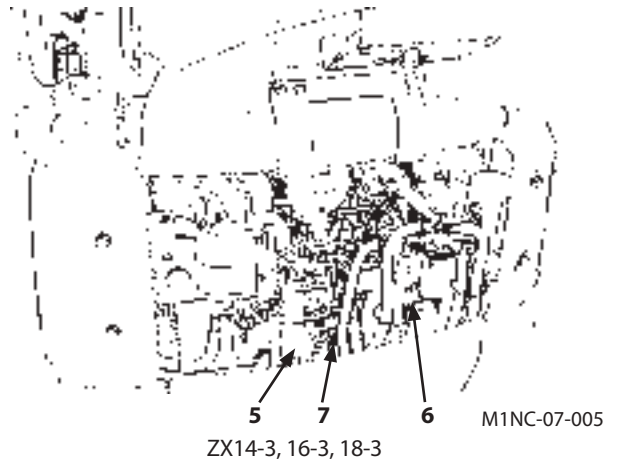
Tightening torque: 20 to 24 N·m (2.0 to 2.4 kgf·m, 14.5 to 17 lbf·ft)

9. Remove oil filler cap (6). Refill the engine.

 **NOTE:** Refer to the recommended oil and grease chart on page 7-9 for the brand names of oils.

10. Check that oil level is between the upper and lower limit marks on the dipstick (7). Start the engine.
11. Check that no oil is leaking from the sealing joints.
12. Run the engine at slow idle for 5 minutes. Stop the engine. About 15 minutes later, recheck the oil level. Add as needed.
13. Tighten bolt (2) to install undercover.

**IMPORTANT:** Do not re-use the engine oil filter (5). Be sure to use only genuine engine oil filter (5). Failure to use genuine parts or replace oil filter (5) may damage the engine.



## MAINTENANCE

### C. Transmission

#### 1 Travel Reduction Gear



#### WARNING:

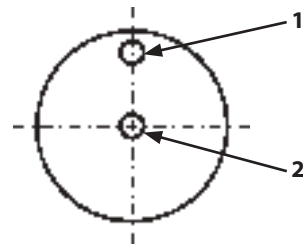
- Each component of the travel reduction gear may be hot immediately after operation. Allow components to cool before starting to work on them.
- The travel reduction gear may be pressurized. Be sure to release the internal pressure by slowly loosen the air bleed plug two to three turns before removing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

#### Check Oil Level --- every 250 hours

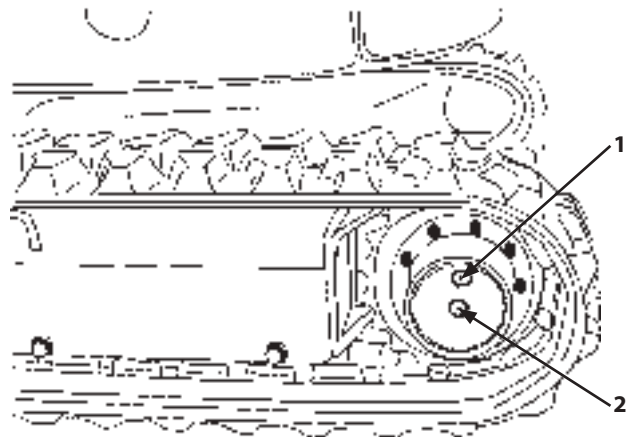
1. Park the machine on a level surface.
2. Rotate the travel motor until plugs are positioned as illustrated on the right. Stop the engine.
3. Slowly loosen plug (1) to release pressure.
4. Remove plugs (1 and 2). Check that oil flows out of the thread hole for plug (2). If no oil flows out, add oil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

Tightening torque:  $35 \pm 5$  N·m

( $3.5 \pm 0.5$  kgf·m,  $25.3 \pm 3.6$  lbf·ft)



M577-07-013



M577-07-012

## MAINTENANCE

### Change Gear Oil --- every 1000 hours


#### ZX14-3, 16-3, 18-3

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. Remove drain plug (2) and plug (1) to drain oil.
4. After draining oil completely, clean plug (1). Install plug (1).

Tightening torque:  $35 \pm 5$  N·m

( $3.5 \pm 0.5$  kgf·m,  $25.3 \pm 3.6$  lbf·ft)

5. Supply oil through the thread hole for plug (2).

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

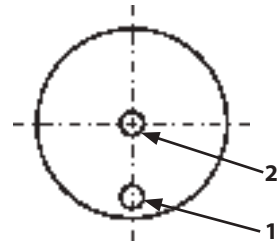
6. Add oil until oil flows out of the tread hole for plug (2).

Oil Quantity: 0.25 L (0.26 US qt)

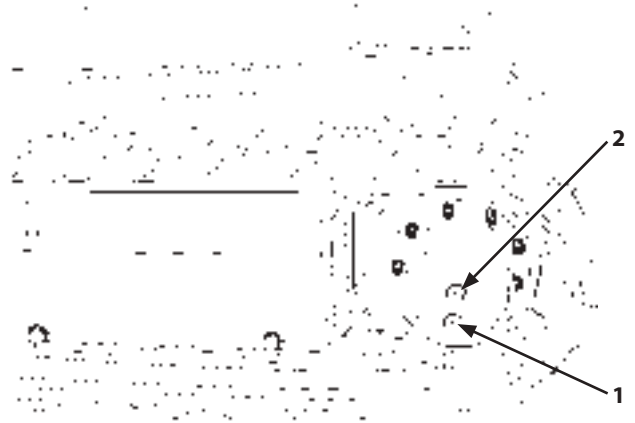
7. After cleaning plugs (2), reinstall the plugs.

Tightening torque:  $35 \pm 5$  N·m

( $3.5 \pm 0.5$  kgf·m,  $25.3 \pm 3.6$  lbf·ft)



M577-07-014



M577-07-015

## MAINTENANCE


### ZX27-3

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:  $35 \pm 5 \text{ N}\cdot\text{m}$

( $3.5 \pm 0.5 \text{ kgf}\cdot\text{m}$ ,  $25.3 \pm 3.6 \text{ lbf}\cdot\text{ft}$ )

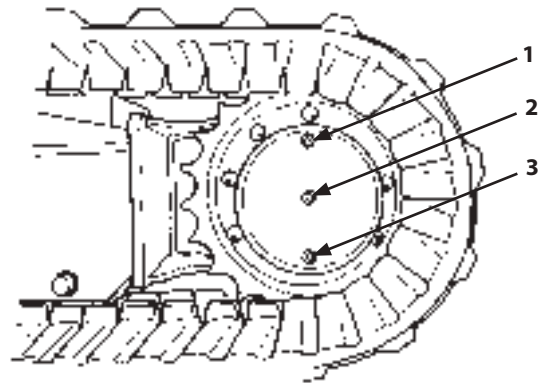
6. Supply oil through the thread hole for plug (1).

 **NOTE:** Refer to the recommended oil and grease chart on page 7-10 for the brand names of oils.

7. Remove plug (2). Add oil until oil flows out of the tread hole for plug (2).
8. After cleaning plugs (1 and 2), wrap the threads of the plugs with sealing-type tape. Reinstall the plugs.

Tightening torque:  $35 \pm 5 \text{ N}\cdot\text{m}$

( $3.5 \pm 0.5 \text{ kgf}\cdot\text{m}$ ,  $25.3 \pm 3.6 \text{ lbf}\cdot\text{ft}$ )



M585-07-080



## MAINTENANCE

---

### D. Hydraulic System

#### Inspection and Maintenance of Hydraulic Equipment



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

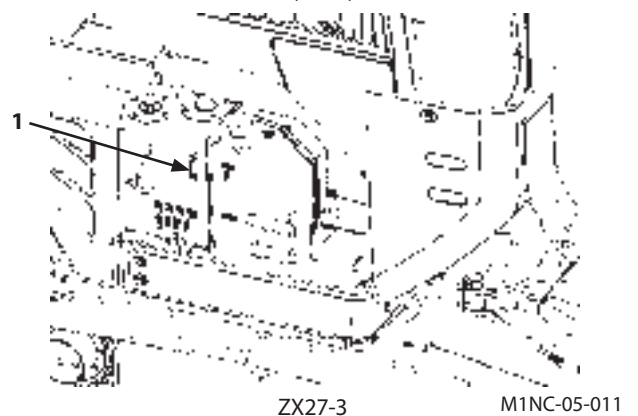
- IMPORTANT:**
- Take special care to keep seal surfaces of hydraulic components free from dirt and to avoid damaging them.
  - Wash hoses, pipes, tank and their surrounding areas with a washing liquid and thoroughly wipe it out before reconnecting them.
  - Only use O-rings that are free of damage or 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. Be sure to park the machine on a level, solid surface.
  2. Lower the bucket and blade to the ground and stop the engine.

## MAINTENANCE

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.

### **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 the gauge.



## MAINTENANCE

### 2 Drain Hydraulic Oil Tank Sump

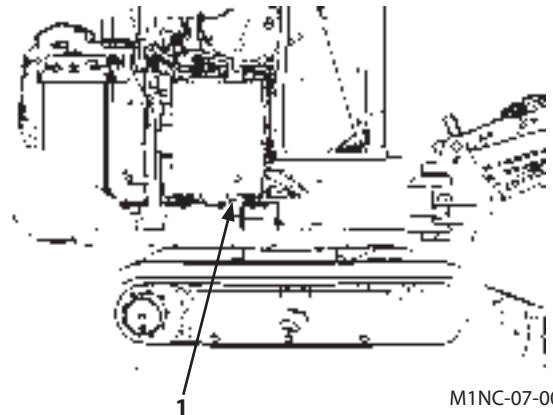
--- every 250 hours

**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.



M1M7-05-024



M1NC-07-008

## MAINTENANCE

3

### Change Hydraulic Oil

--- every 1000 hours or 2000 hours



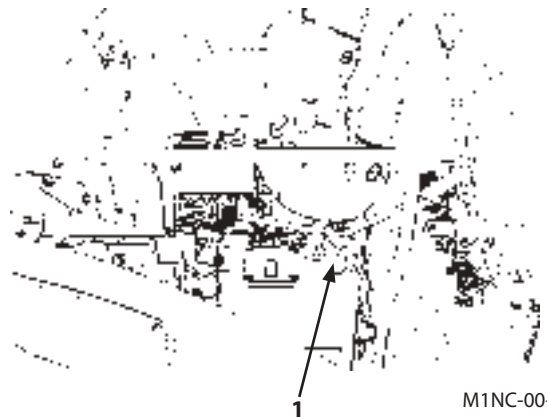
**WARNING:** Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature oil to spray, possibly causing severe burns.

**IMPORTANT:** When changing hydraulic oil, take care not to allow foreign matter such as dirt, water or soil to enter the hydraulic 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. Open the right side cover. 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 approximately 40 liter (11 US gal). Drain oil using a suction pump.

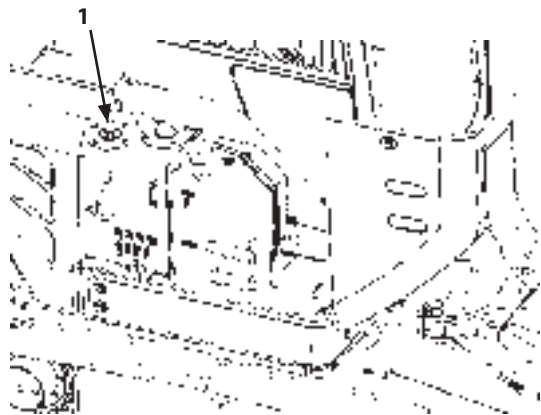


M1M7-05-024



M1NC-00-010

ZX14-3, 16-3, 18-3



ZX27-3

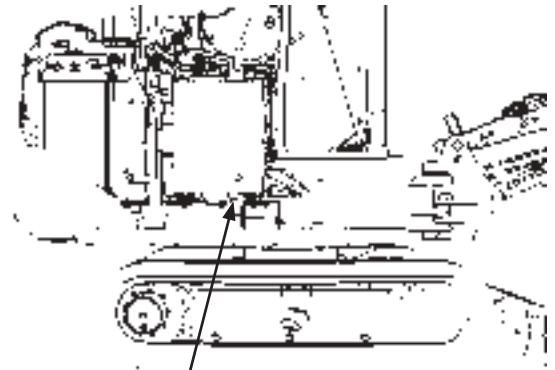
M1NC-05-011

## MAINTENANCE

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.

Wrench size : 12 mm (PT3/8 Square Head Plug)

Tightening torque : 50 N·m (5 kgf·m, 36 lbf·ft)



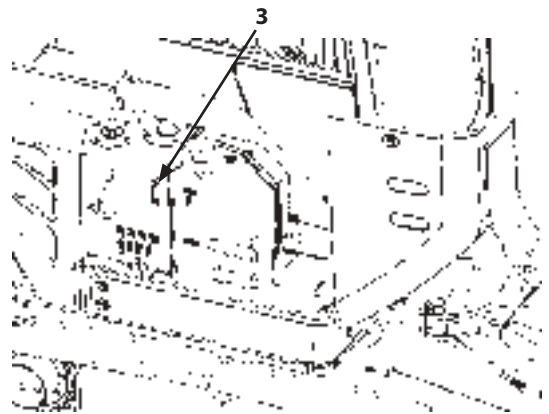
M1NC-07-008

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).



ZX14-3, 16-3, 18-3

M1NC-00-002



ZX27-3

M1NC-05-011

## MAINTENANCE

### 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 the pump casing, that can be filled with clean hydraulic oil, with as much as possible. Retighten the filler plug after refilling oil.

Wrench size : 6 mm (G1/4 Hexagonal socket plug)

Tightening torque : 36 to 41 N·m

(3.6 to 4.1 kgf·m, 25.8 to 29.5 lbf·ft)

2. Add hydraulic oil to the hydraulic oil tank to the specified level.
3. Check all line connections for any oil leaks. Set the engine control dial in the slow idle position.
4. Start the engine. Wait 5 to 10 seconds. Stop the engine.
5. Check the hydraulic oil level at the level gauge (1) located on the side of the hydraulic oil tank. Add hydraulic oil if necessary.
6. Restart the engine. Confirm that hydraulic oil level in the hydraulic oil tank is sufficient. Run the engine for approximately 1 minute.
7. This is the end of the hydraulic pump air bleeding procedure.

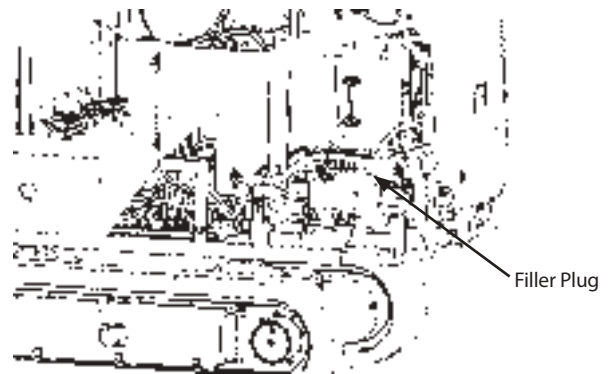
 **NOTE:** If the hydraulic pump is left empty overnight or longer, be sure to fill the pump with clean hydraulic oil before performing the air bleeding procedure above.

### 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.



M1NC-00-002



M1NC-00-006

## MAINTENANCE

### 4 Clean Suction Filter --- when changing hydraulic oil

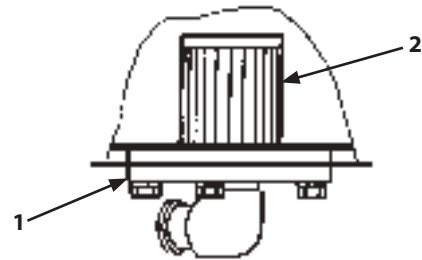
The suction filter is located on the bottom side in the hydraulic oil tank. Clean the suction filter when changing hydraulic oil.

#### ZX14-3, 16-3, 18-3

1. After draining hydraulic oil, remove suction filter (2) together with cover (1).
2. Clean the hydraulic oil tank interior and the suction filter (2).
3. Install suction filter (2) together with cover (1) to the hydraulic oil tank.
4. Bleed air from the hydraulic system.  
(Refer to 7-27 "Bleed Air from Hydraulic System")

Wrench size : 13 mm

Tightening torque : 20 N·m (2 kgf·m, 15 lbt·ft)



ZX14-3, 16-3, 18-3

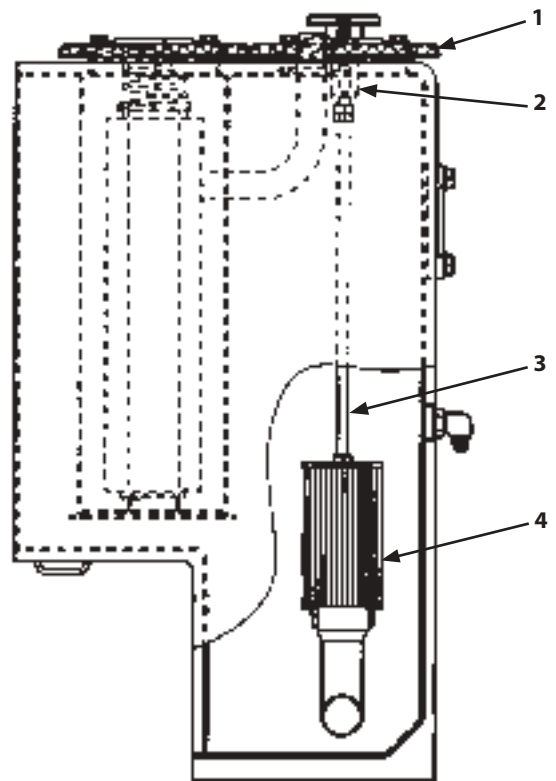
M503-07-027

#### ZX27-3

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, 7.5 lbt·ft)



ZX27-3

M1M7-07-002

## MAINTENANCE

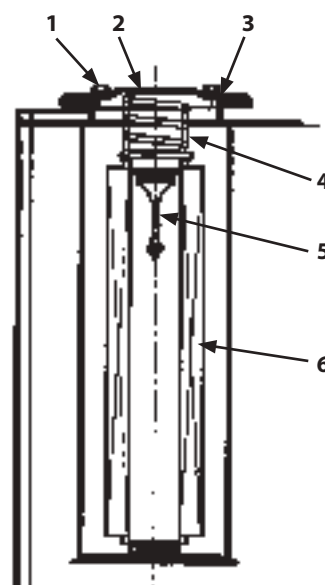
### 5 Replace Full Flow Filter --- every 500 hours (first time after 250 hours)

**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.

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 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.
  7. Install new element (6), and O-ring (3) in the hydraulic oil tank.
  8. Install cover (2) with four bolts (1).
- Wrench size : 13 mm
- Tightening torque :
- ZX14-3, 16-3, 18-3 : 20 N·m (2 kgf·m, 15 lbt·ft)
- ZX27-3 : 10 N·m (1 kgf·m, 7.5 lbt·ft)
9. After replacing the element, bleed air from the pump. Check the oil level in the hydraulic oil tank. (Refer to 7-27 "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 the element at the specified interval to keep hydraulic oil clean and extend the service life of hydraulic components.



M1M7-05-024



M1MS-07-001



## MAINTENANCE

### 6 Replace Pilot Filter --- 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 the hydraulic oil tank cap to release the air pressure from the hydraulic oil tank.

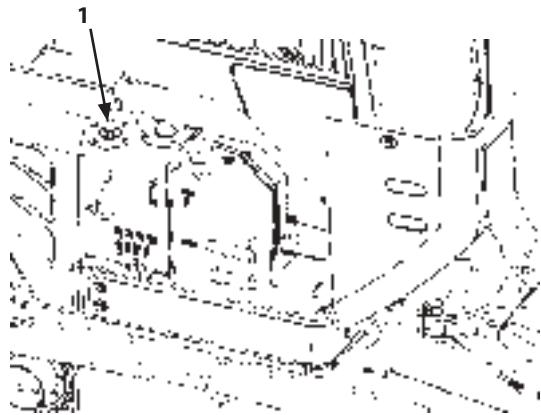


M1M7-05-024



M1NC-00-010

ZX14-3, 16-3, 18-3



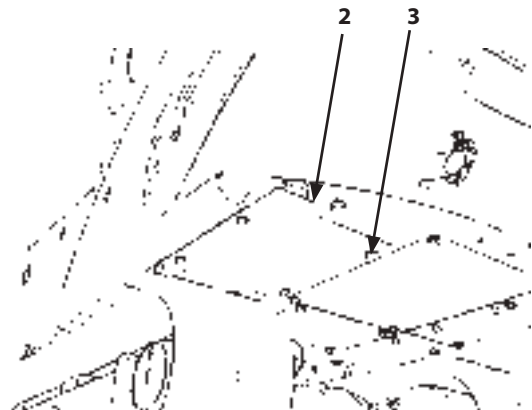
ZX27-3

M1NC-05-011

3. Remove bolts (3) to remove under cover (2) from the rear left bottom side of the base machine.

Wrench size : 17 mm

Tightening torque : 50 N·m (5 kgf·m, 36 lbt·ft)



M1NC-07-009

## MAINTENANCE

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 filter head (4) while rotating filter element (7) taking care not to damage the filter element.
9. Take care not allow dust and/or water enter the filter case.
10. Install case (6) into head cover (5) while rotating the case clockwise.

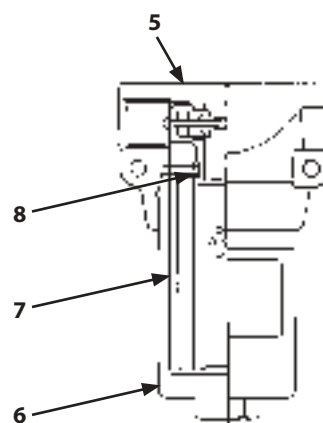
Wrench size : 17 mm

Tightening torque : 25 to 35 N·m  
(2.5 to 3.5 kgf·m, 18 to 26 lbf·ft)

11. After replacing the filter element, 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 gauge (9) in the hydraulic oil tank. Add oil as needed.
13. Install under cover (2) with bolts (3).
14. Tighten the hydraulic oil tank cap.



M1NC-07-010

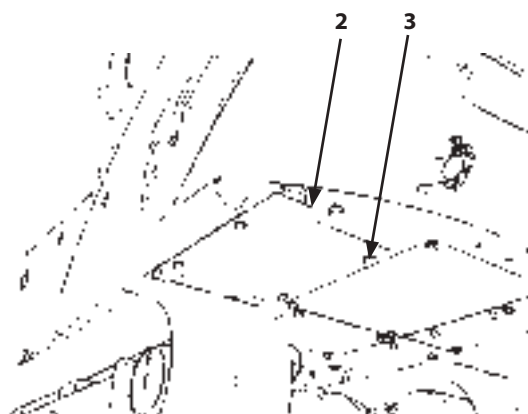


M503-07-031

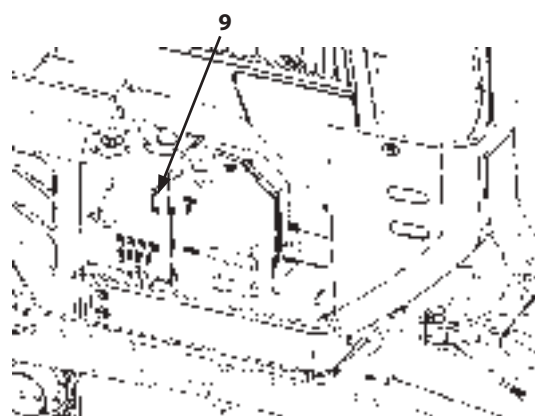


M1NC-00-002

ZX14-3, 16-3, 18-3



M1NC-07-009



ZX27-3

M1NC-05-011

## MAINTENANCE

### 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 into 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.

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.



SA-031



SA-292

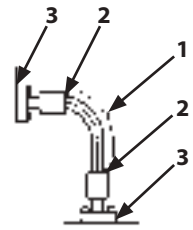


SA-044

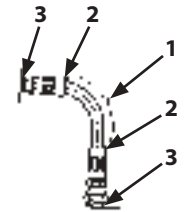
## MAINTENANCE

### Hoses

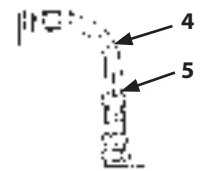
Interval (Hours)	Check Point	Abnormality	Remedy
Daily	Hose surface	Oil leak (1)	Replace
	Hose end	Oil leak (2)	Replace
	Hose connection	Oil leak (3)	Retighten or replace hose or O-ring
Every 250 hours	Hose surface	Oil leak (4)	Replace
	Hose end	Oil leak (5)	Replace
	Hose surface	Exposed reinforcement (6)	Replace
	Hose surface	Blister (7)	Replace
	Hose	Acute bend (8), Collapse (9)	Replace
	Hose and hose fitting	Deformation or Corrosion (10)	Replace



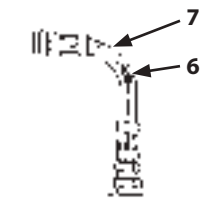
M137-07-008



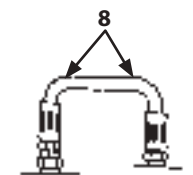
M115-07-145



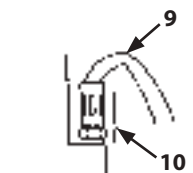
M115-07-146



M115-07-147



M115-07-148

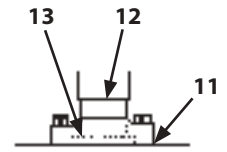


M115-07-149

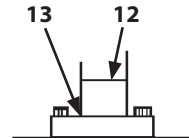
## MAINTENANCE

### 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	Crack (12)	Replace
	On flange type fitting	Omission	Replace
		Deformation	Replace
	Clamp	Loose	Retighten



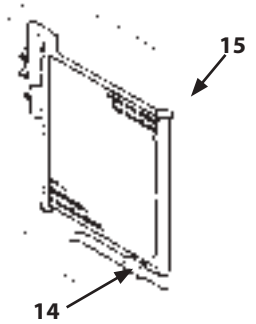
M137-07-001



M137-07-007

### 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



M155-07-049

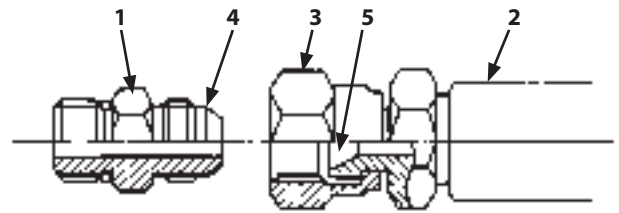
## MAINTENANCE

### Hose Fitting

- Metal Face Seal Fittings  
 (Width Across Flats of Union Nut: 17, 19, 22, and 27 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.



M202-07-051

#### Tightening Torque

Tighten adapter (1) and nut (3) to the torque values shown  
 in the table below.

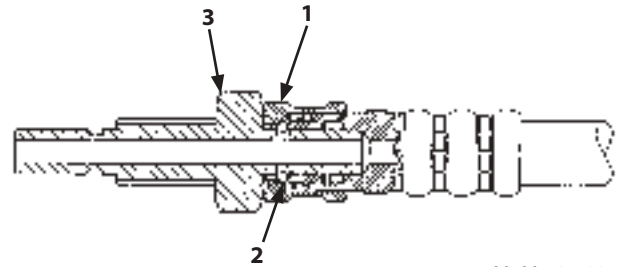
Width across flats (mm)		±10%					
		17	19	22	27	36	41
Tightening torque	N·m	24.5	29.5	39	64	180	210
	(kgf·m)	(2.5)	(3)	(4)	(6.5)	(18)	(21)
	(lbf·ft)	(18)	(21.5)	(29)	(47)	(133)	(155)

## MAINTENANCE

---

### 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.
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.



M1M7-07-006

- 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.**

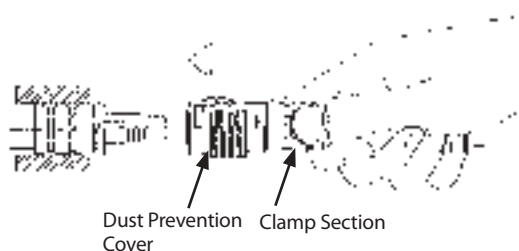
## MAINTENANCE

### 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 disconnect.



**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-07-014

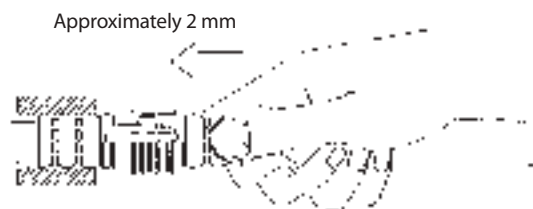


M1LA-07-015

### 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



## MAINTENANCE

 **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.

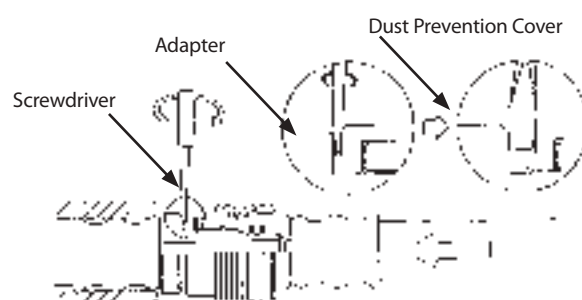
### Using Screwdriver

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.



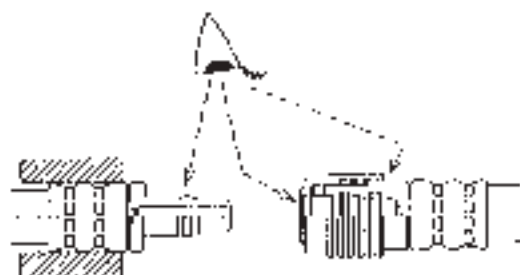
M1LA-07-021



M1LA-07-022

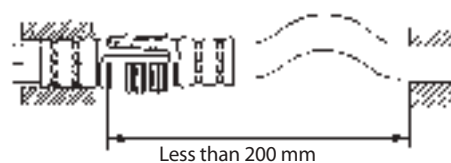
### 3. Precautions for Re-using Coupler

- 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

**WRONG**



M1LE-07-006

# MAINTENANCE

## 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:

ZX14-3, 16-3, 18-3: 22 L (5.8 US gal)

ZX27-3: 47 L (12.4 US gal)

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

2. After refilling fuel, reinstall the fuel tank cap (3).

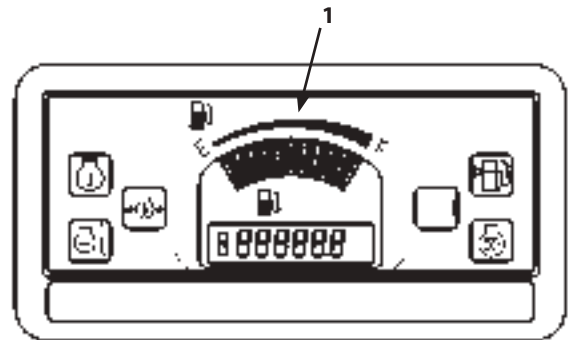
Be sure to lock the fuel tank cap (3) with the key to prevent the cap from being lost as well as to prevent vandalism.

### Bleed Air from Fuel System

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

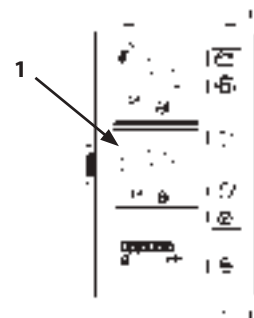
Automatic bleeding device is provided on this machine.

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.



ZX14-3, 16-3, 18-3

M1NC-01-005



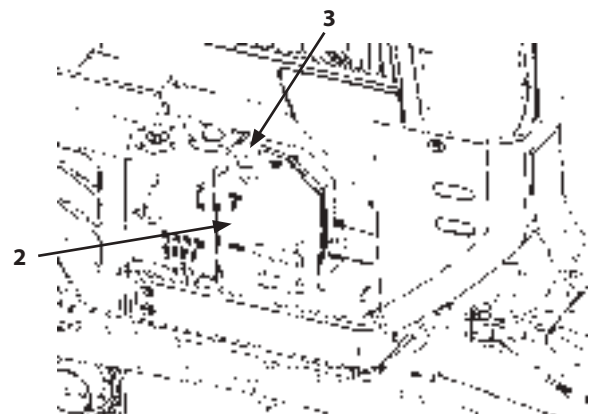
ZX27-3

M1NC-01-022



ZX14-3, 16-3, 18-3

M1NC-07-011



ZX27-3

M1NC-05-011

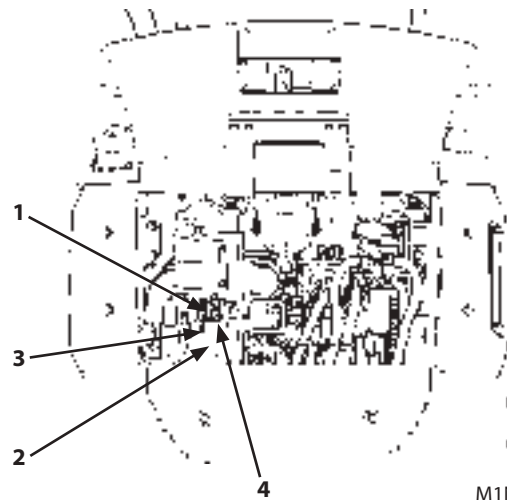
## MAINTENANCE

### **1** Check Water Separator --- daily

When water is accumulated in water separator (1), loosen transparent filter case to drain water and sediment.

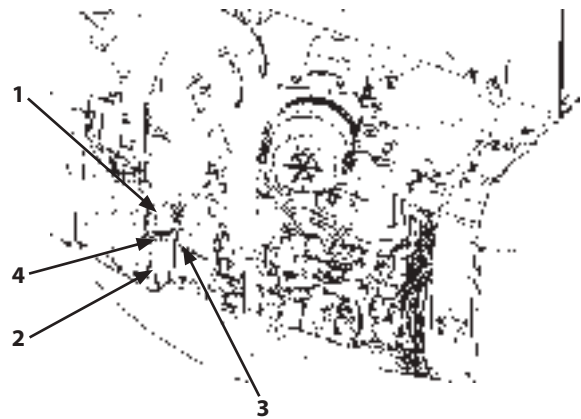
#### **Draining Procedures**

1. Close fuel cock (3).
2. Loosen retaining ring (4) of water separator (1).  
Remove filter cup (2) to drain water.
3. Cleaning filter cup (2) and filter, when draining water.  
After cleaning, install filter cup (2) to water separator (1).  
Securely tighten retaining ring (4).
4. Open fuel cock (3).
5. Turn the key switch ON and hold for 10 to 15 seconds.
6. Start the engine and check the fuel system for fuel leaks.



ZX14-3, 16-3, 18-3

M1NC-00-009



ZX27-3

M1NC-07-024

## MAINTENANCE

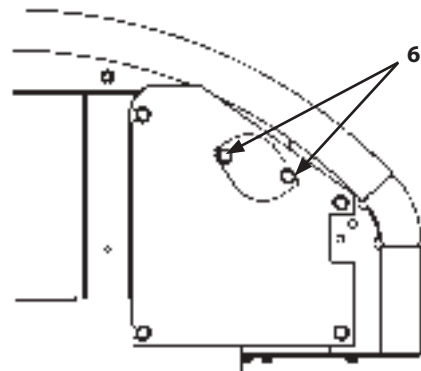
### 2 Drain Fuel Tank Sump --- as required

1. Park the machine on solid level surface.  
Loosen bolt (6) to remove left cover (5).
2. Open drain valve (7) for several seconds to drain water and sediment. Close drain valve.
3. Retighten bolt (6) to install left cover (5).



M1NC-07-012

ZX14-3, 16-3, 18-3



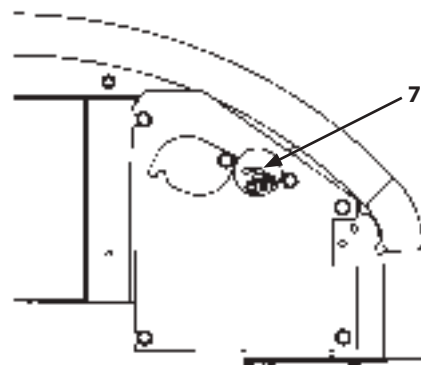
ZX27-3

M1MF-07-032



M1NC-07-013

ZX14-3, 16-3, 18-3



ZX27-3

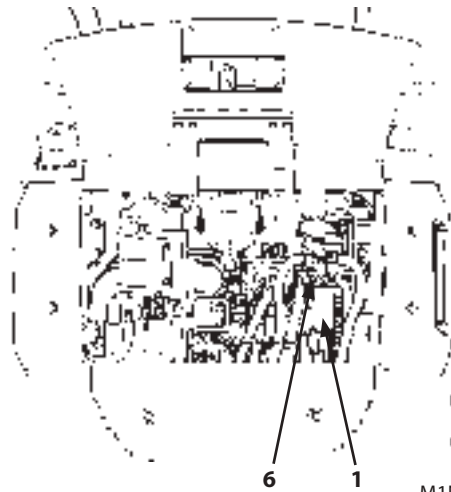
M1MF-07-033

## MAINTENANCE

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

1. Close fuel cock (6).
2. Loosen ring nut (3) of fuel filter (1) and remove filter cap (4).
3. Clean filter cap (4).
4. Install new filter element (2), filter cap (4) and retighten ring nut (3) securely.
5. Open fuel cock (6).
6. Loosen plug (5) to bleed air.
7. Tighten plug (5) when fuel flows from the plug hole.
8. Turn the key switch ON and hold for 10 to 15 seconds to engage automatic bleeding.
9. Start the engine and check for fuel leakage.

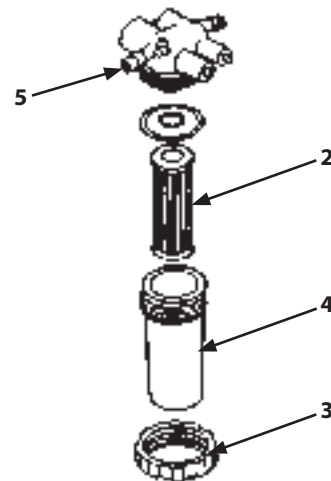
**IMPORTANT:** Be sure to use only genuine fuel filter. Failure to use genuine parts or replace fuel filter, the engine may be damaged.



M1NC-00-009



M1NC-07-024



M503-07-038

## MAINTENANCE

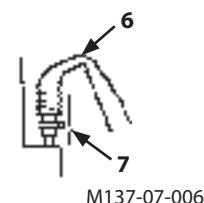
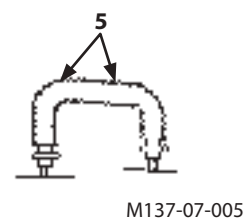
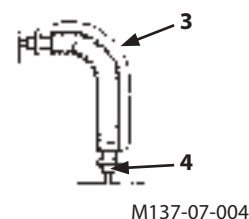
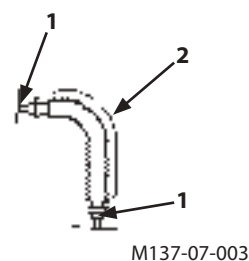
- 4** Check Fuel Hoses  
 --- daily  
 --- every 250 hours

- WARNING:**
- Escaping fuel may cause fire. Check for kinked hoses, or hoses that rub against each other and/or come into 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	Rubbed marks (2)	Replace
	Hose surface	Crack (2)	Replace
Every 250 hours	Soutache braid	Crack (3)	Replace
	Hose surface	Crack (4)	Replace
	Hose fittings	Crack (4)	Replace
	Hose	Acute bend (5)	Replace
	Hose	Collapse (6)	Replace
	Hose ends and fittings	Corrosion (7)	Replace



## MAINTENANCE

### F. Air Cleaner

- 1** Clean Air Cleaner Element  
--- every 250 hours  
Replace Air Cleaner Element  
--- after cleaning 6 times or 1 year

Clean and replace air cleaner element.

ZX14-3, 16-3, 18-3

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

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

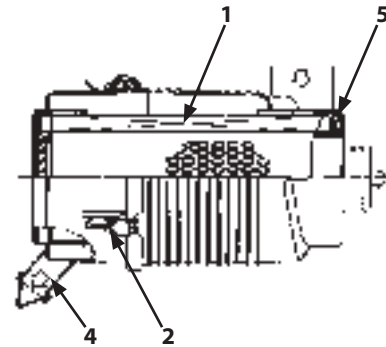
2. Loosen two clamps (2) to remove cover (3) and element (1).

**CAUTION:** Wear safety glasses or goggles when using compressed air pressure [less than 0.2 MPa (2 kgf/cm<sup>2</sup>, 29 psi)].

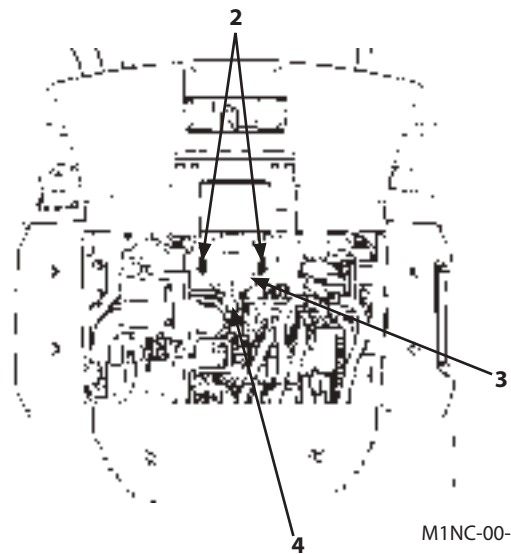
**IMPORTANT:**

- 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 the element to collide against other object.

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



M555-07-023



M1NC-00-009

## MAINTENANCE

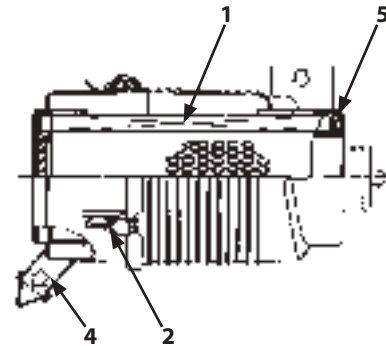
### ZX27-3

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

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

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

**CAUTION:** Wear safety glasses or goggles when using compressed air pressure [less than 0.2 MPa (2 kgf/cm<sup>2</sup>, 29 psi)].

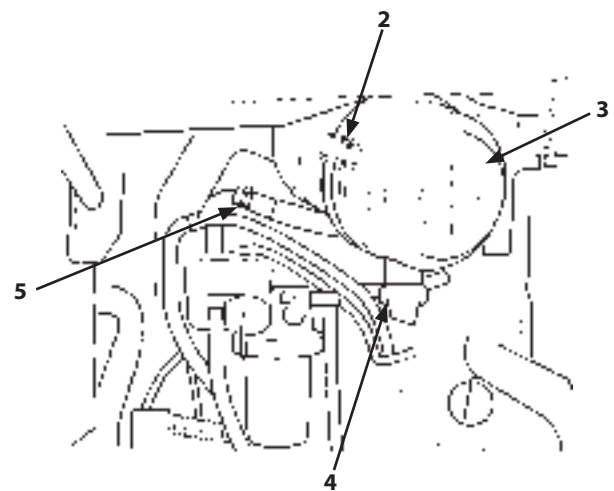


M555-07-023

**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, don't hit element (1) or force the element to collide against other object.

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



ZX27-3


M1M7-07-041



## MAINTENANCE

---

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

**IMPORTANT:** In case genuine Hitachi long life coolant is not available, use other long life coolant conforming to one of the specifications below.

- JIS K-2234
- SAE J814
- SAE J1034
- ASTM D3306

**Never use mixed brands of long life coolant (LLC).**

#### 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 (°F)	-10 (14)	-15 (5)	-20 (-4)	-25 (-13)	-30 (-22)

## MAINTENANCE

---

### 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.

## MAINTENANCE

### 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 the cap slowly to the stop after the coolant becomes cool. Release all pressure before removing the cap.

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

### 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:

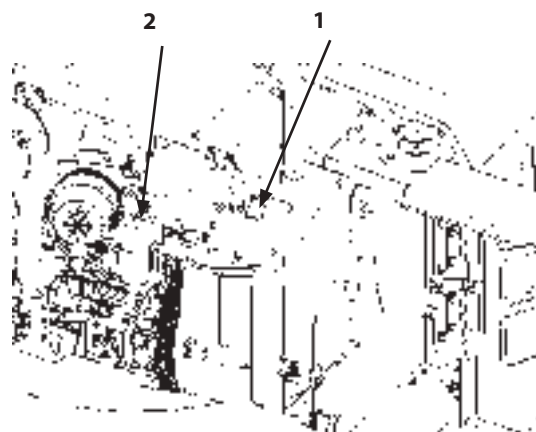
Check fan belt tension by depressing the fan belt mid-point with the force [approx. 98 N (10 kgf, 22 lbf)] of thumb. Deflection must be 7 to 9 mm at a mid point between fan pulley (1) and alternator (2).

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



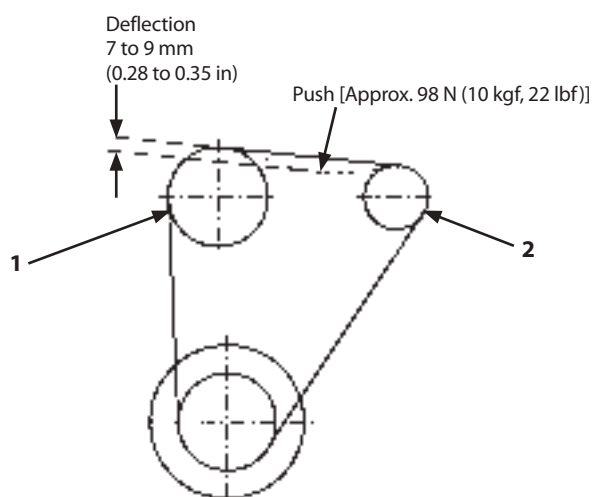
ZX14-3, 16-3, 18-3

M1NC-07-005



ZX27-3

M1NC-07-030



M589-07-014

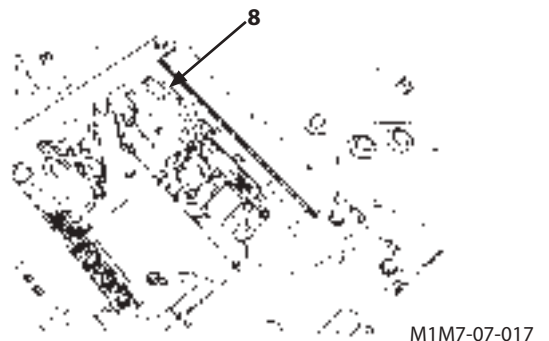
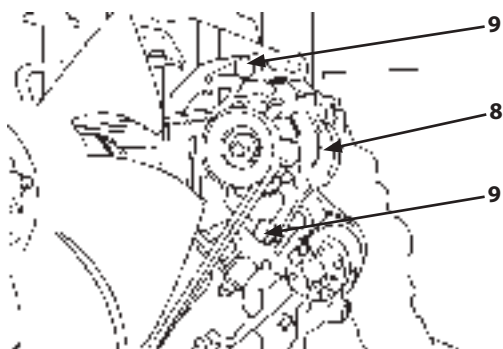
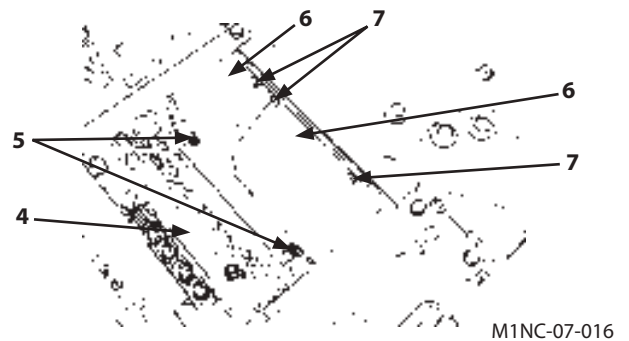
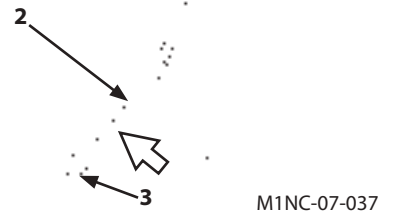
## MAINTENANCE

### Adjustment of Fan Belt Tension

#### ZX14-3, 16-3, 18-3

1. Remove bolt (1) from the back of the seat backrest and then, incline the backrest forward until the end of lock (2) comes in lock position (3).
2. Loosen nuts (5) to remove battery (4).
3. Loosen bolts (7) to remove covers (6).
4. Loosen mounting bolts (9) of alternator (8).
5. Move alternator (8) to correctly adjust the fan belt tension.
6. Securely tighten bolts (9).
7. Install covers (6) and battery (5) in the reverse order of above steps (3 and 2).
8. While pushing the backrest forward, detach lock (2) from lock position (3) as illustrated with arrow ←.
9. Return the backrest to the original position.

**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.

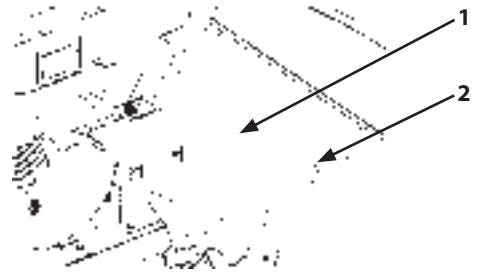


## MAINTENANCE

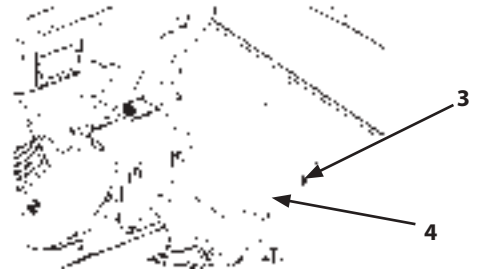
### ZX27-3

1. Loosen nut (2) to remove cover (2).
2. Loosen bolt (3) to remove cover (4).
3. Loosen mounting bolts (6) of alternator (5).
4. Move alternator (5) to correctly adjust the fan belt tension.
5. Securely tighten bolts (6).
6. Install cover (4) and (1) in the reverse order of above steps (2 and 3).

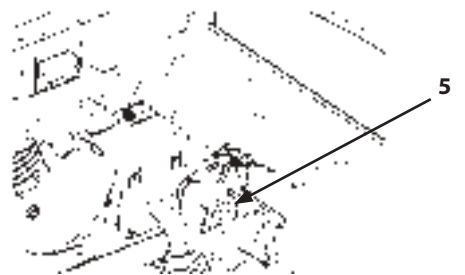
**IMPORTANT:** When a new belt is installed, the new belt is difficult to be correctly seated from the beginning. Be sure to readjust the tension after operating the engine for 3 to 5 minutes at slow idle speed.



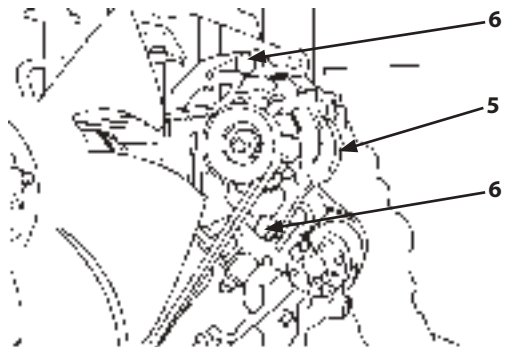
M1NC-07-031



M1NC-07-032




M1NC-07-033




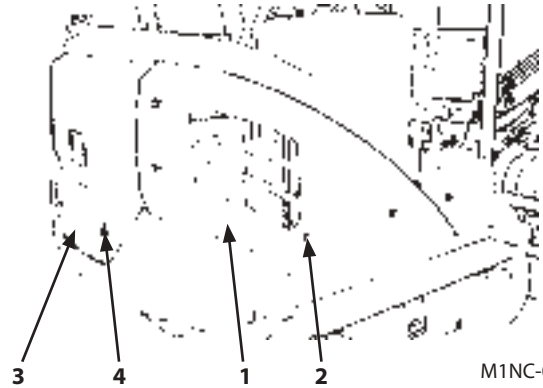
M1M7-07-047

## MAINTENANCE

### 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.



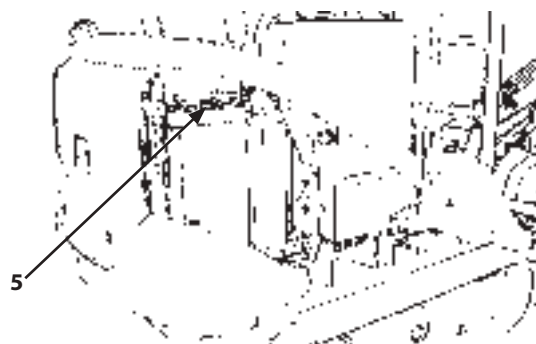
M1NC-07-018

#### Procedure of Coolant Change

1. Loosen bolt (2) to remove right cover (1).
2. Loosen bolt (4) to remove cover (3) under the engine cover.

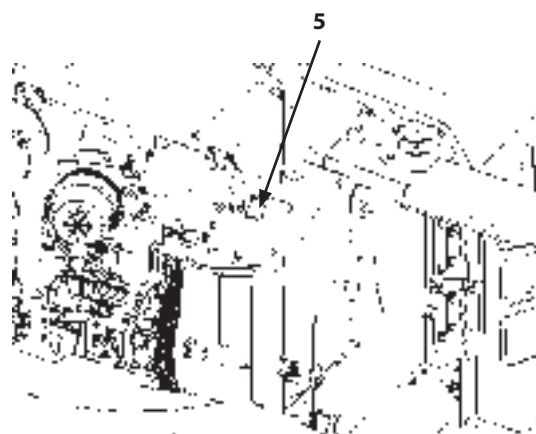
## MAINTENANCE

3. Remove the radiator cap (5). Open drain cock (6) on the radiator and open drain valve (7) on the water jacket to drain the coolant completely. Drain impurities such as water scale at the same time.
4. Close radiator drain cock (6) and drain valve (7) on the water jacket. Fill the radiator with fresh water and a radiator cleaning agent. Start the engine and run it at a speed slightly higher than slow idle to raise the coolant temperature until indicator goes OFF. Then, run the engine further for about ten minutes.
5. Stop the engine and open radiator drain cock (6) to allow the coolant to drain. Flush out the cooling system with fresh water, until draining water becomes clear. This helps remove water scale.
6. Close radiator drain cock (6). 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.
7. After adding coolant, operate the engine for several minutes. Check the coolant level again, and add coolant if necessary.
8. Close radiator cap (5).
9. Tighten bolt (4) to install cover (3) under the engine cover.
10. Tighten bolt (2) to install right cover (1).



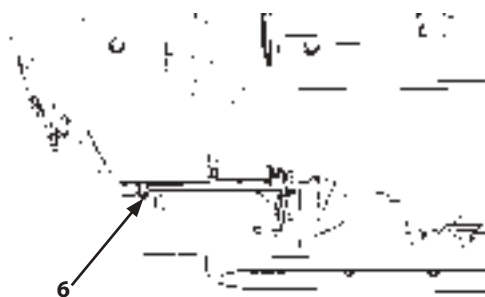
ZX14-3, 16-3, 18-3

M1NC-07-019



ZX27-3

M1NC-07-030



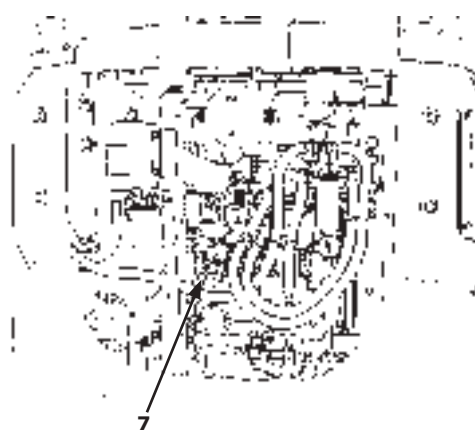
ZX14-3, 16-3, 18-3

M1NC-07-020



ZX27-3

M1NC-07-034



ZX14-3, 16-3, 18-3

M1NC-07-021

## MAINTENANCE

---

### **4** Clean Radiator --- every 500 hours

 **WARNING:** Always wear safety glasses or goggles when using compressed air [less than 0.2 MPa (2 kgf/cm<sup>2</sup>, 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<sup>2</sup>, 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 parallel. 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.



# MAINTENANCE

## H. Electrical System

- IMPORTANT:**
- Improper radio communication equipment and associated parts, and/or improper installation of radio communication equipment effects the machine's electronic parts, causing involuntary movement of the machine. Also, improper installation of electrical equipment(s) 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.

- ✎ 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.



SA-036

# MAINTENANCE

## Electrolyte Level Check

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:

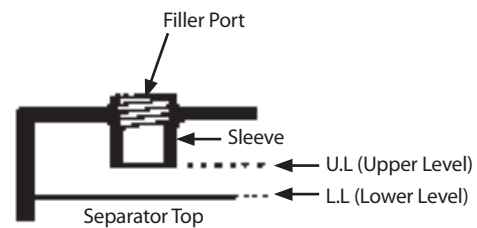
After removing the filler plug from the top of the battery, check the electrolyte level by viewing through the filler port. It is difficult to judge the accurate electrolyte level in this case. Check if the electrolyte surface touches the bottom end of the sleeve or not according to the right illustrations. 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

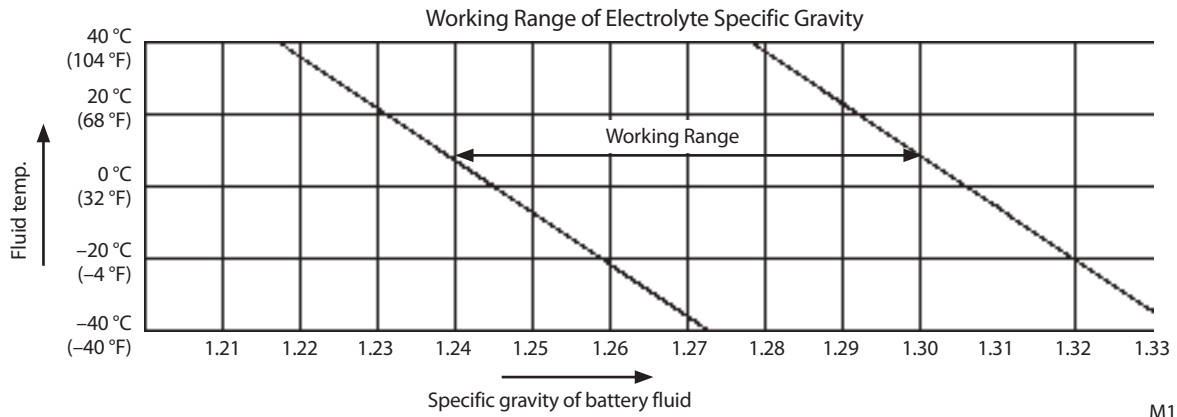



M409-07-072

## MAINTENANCE

### Check Electrolyte Specific Gravity

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.



 **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.

## MAINTENANCE

### 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.



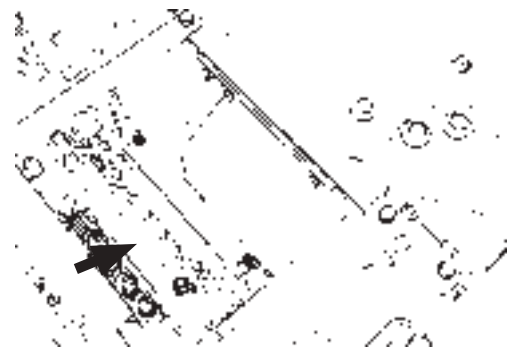
**CAUTION: Do not keep anything left on the battery. Failure to do so may cause the machine to catch fire.**



SA-032



SA-036

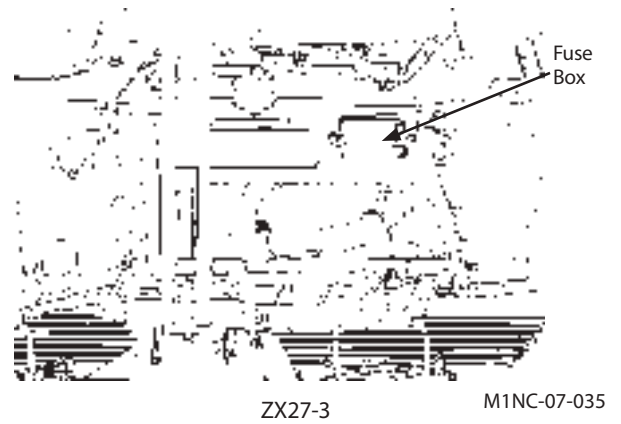
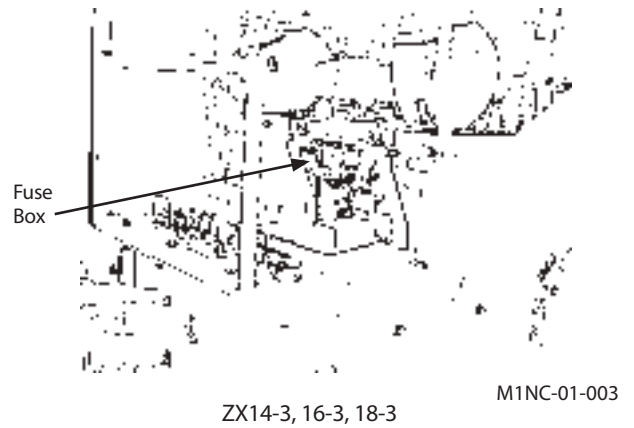


M1NC-07-016

# MAINTENANCE

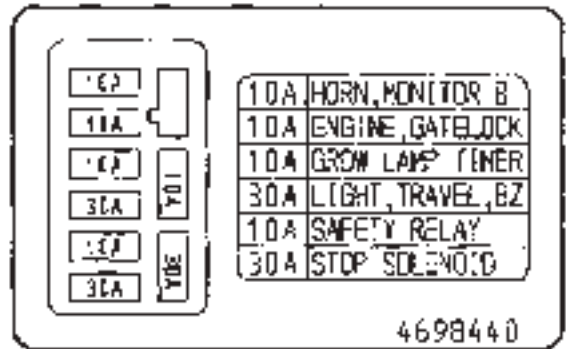
## 2 Replacing Fuses

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.



### ZX14-3, 16-3, 18-3

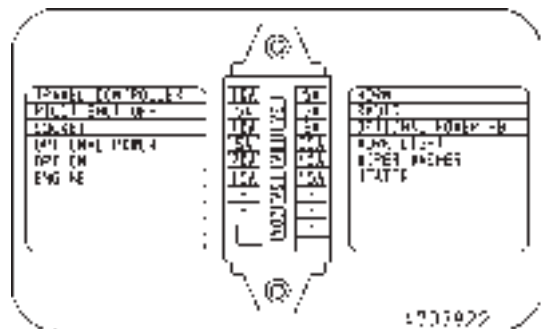
10A	HORN, MONITOR B
10A	ENGINE, GATELOCK
10A	GLOW LAMP TIMER
30A	LIGHT, TRAVEL, BUZZER
10A	SAFETY RELAY
30A	STOP SOLENOID



ZX14-3, 16-3, 18-3

### ZX27-3

10A	TRAVEL CONTROLLER	5A	HORN
5A	PILOT SHUT OFF	5A	RADIO
10A	SOCKET	5A	OPTIONAL POWER +B
5A	OPTIONAL POWER	20A	WORK LIGHT
20A	OPTION	10A	WIPER WASHER
15A	ENGINE	15A	HEATER



ZX27-3

# MAINTENANCE

## I. Miscellaneous

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

Check the bucket teeth for wear and looseness

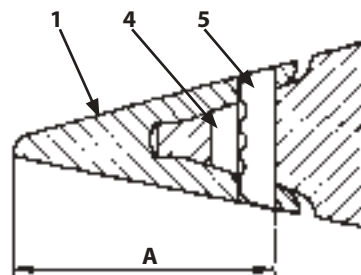
Replace teeth (1) if tooth wear exceeds the service limit shown below.

Dimension A in mm (in.)

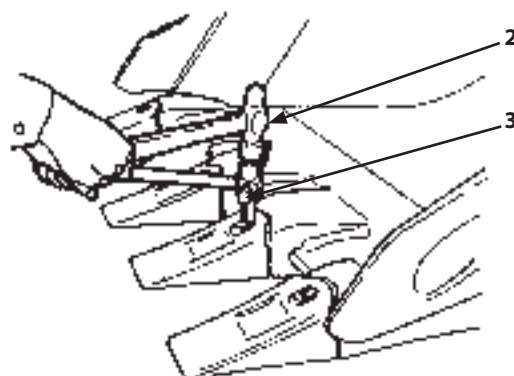
New	Limit of Use
128 (5.0")	65 (2.6")

**⚠ WARNING: Guard against injury from flying pieces of metal. Use safety equipment such as a helmet and safety glasses.**

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 if necessary. Short locking pins (5) and damaged rubber pin locks (4) must be replaced with new ones.



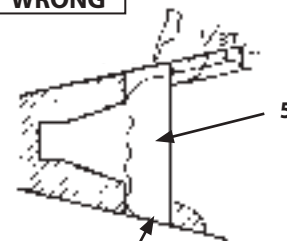
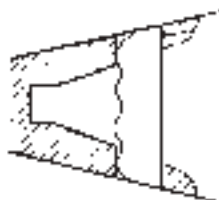
M104-07-056



M589-07-017

**RIGHT**

**WRONG**

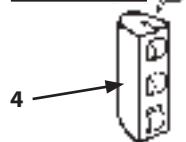


Level the bottom surfaces.  
Lock pin length is too short.

M104-07-118  
M104-07-058

**WRONG**

**WRONG**



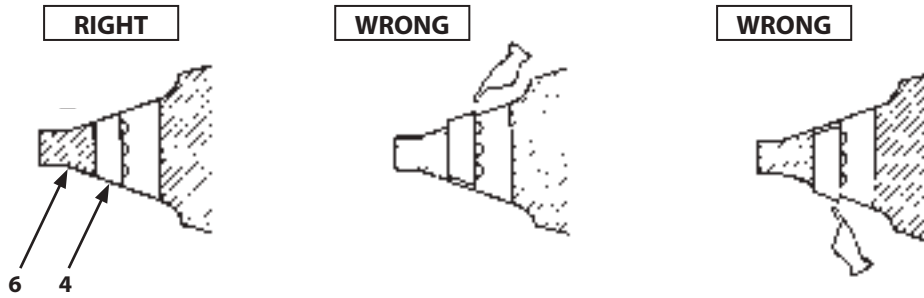
Steel balls almost come off due to damage to the lock rubber.

Steel balls can be depressed by finger force.

M104-07-059

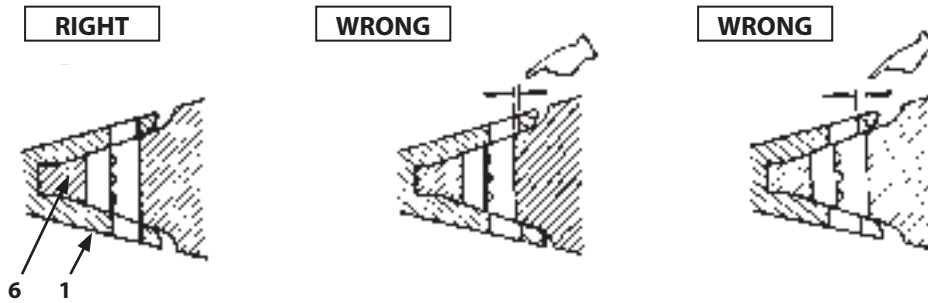
## MAINTENANCE

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



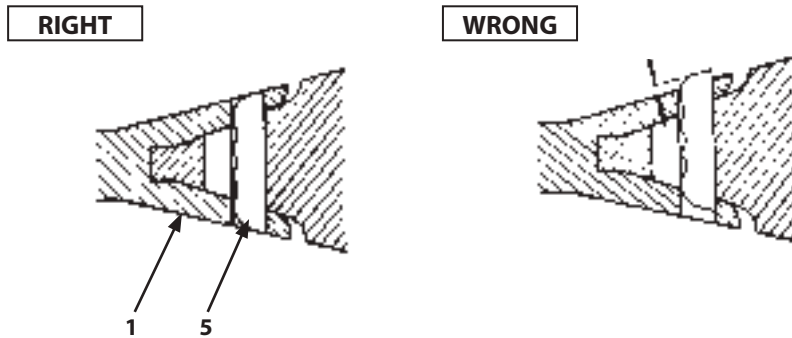
M104-07-060

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



M104-07-061

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



M104-07-062

## MAINTENANCE

### 2 Replace Bucket

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

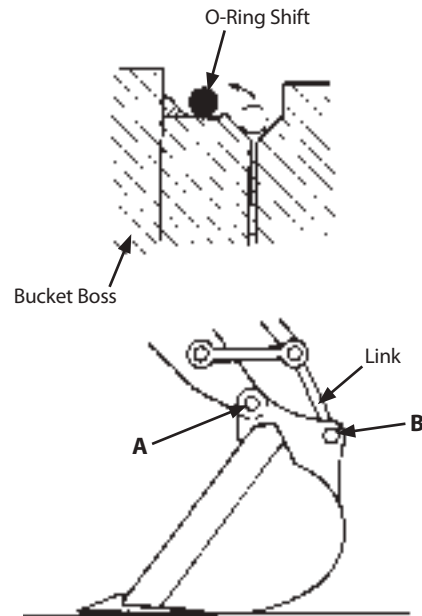
Select a spacious job site with good footing. Start working only after ensuring the safety of other personnel around the machine. Avoid quick operation of the front attachment. Give the highest priority to safety when engaging in teamwork by strictly exchanging safety signs.

#### 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



## MAINTENANCE

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

--- daily

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)

#### Adjusting Track Sag

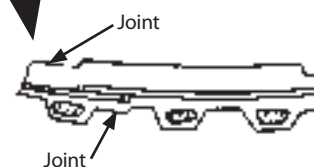
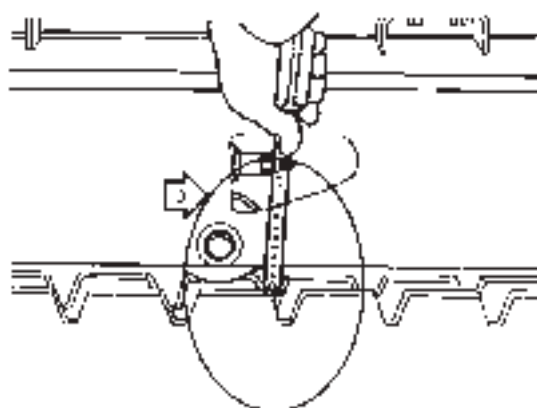
1. If track sag is not within specifications, loosen or tighten the track following the procedures shown on the next page.
2. Before adjusting track sag, lower the bucket to the ground to raise one track off the ground. Be sure to place blocks under machine frame to support the machine.
3. After adjusting 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.

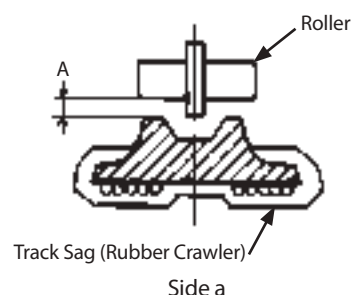


M1M7-04-006



M588-07-055

M102-07-075



M503-05-050

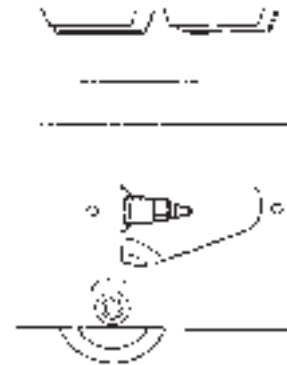
## MAINTENANCE

### Loosen Track (Rubber Crawler)

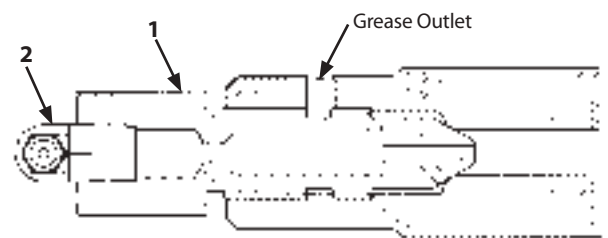
**⚠ WARNING:** Do not loosen valve (1) too quickly or too much as high-pressure grease in the adjusting cylinder may spout out. Loosen carefully, keeping body parts and face away from valve (1). Never loosen grease fitting (2).

**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 the valve 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 88 N·m (9 kgf·m, 65 lbf·ft).



M1LA-07-012

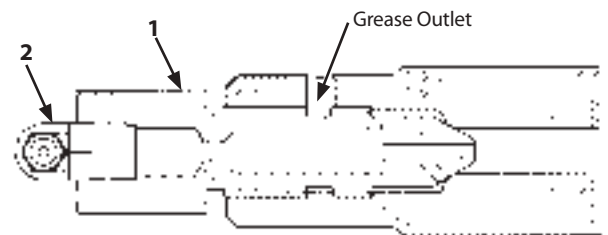


M1LA-07-036

### 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

## MAINTENANCE

### 4 Replace Rubber Track

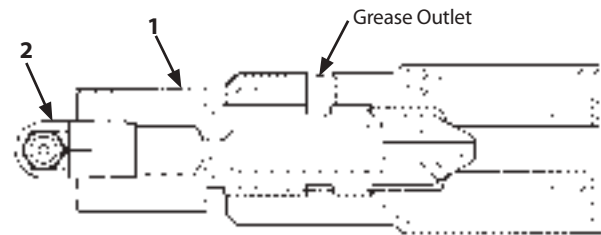


#### WARNING:

- 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 idler will become free to remove. If the front idler 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

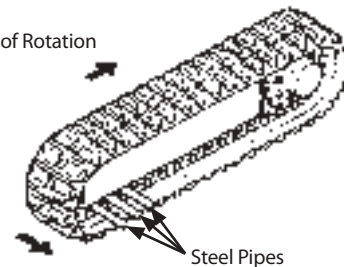


M1LA-07-036

#### Removing Rubber Track

1. Lower the bucket 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.

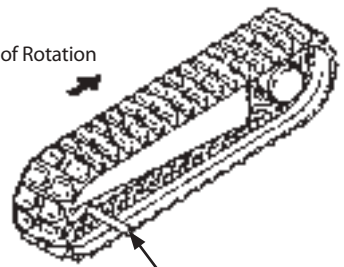
Direction of Rotation



Steel Pipes

M503-07-062

Direction of Rotation



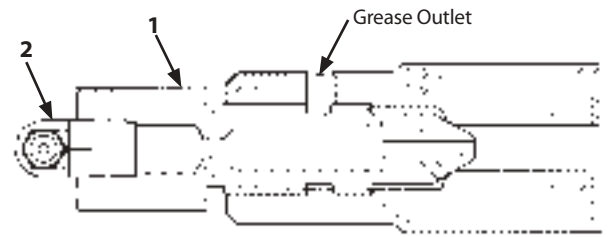
Steel Pipes

M503-07-063

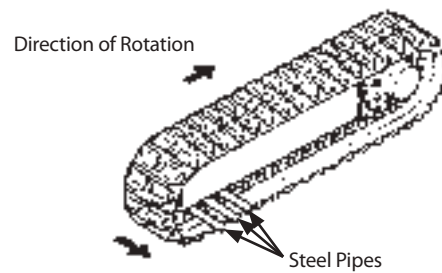
## MAINTENANCE

### Installing Rubber Track

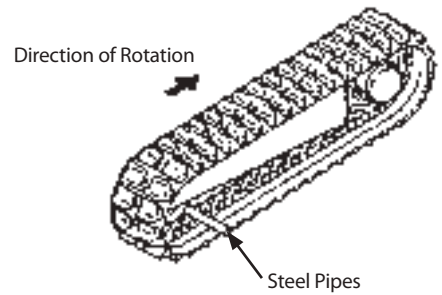
1. Lower the bucket to raise one track off ground. Place blocks under machine frame to support the machine.
2. Slowly turn valve (1) counterclockwise to allow grease to escape from the grease outlet.
3. Engage the rubber track with the sprocket and position the other end of the rubber track on the front 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 7-67.)
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

## MAINTENANCE

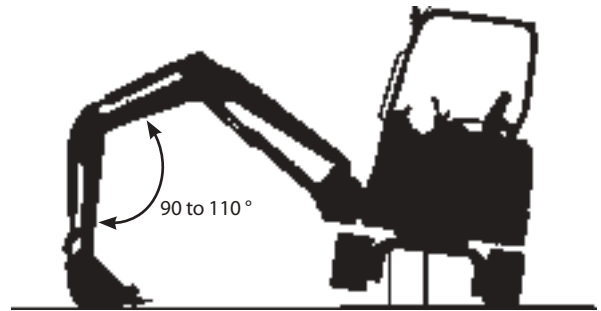
### 5 Check Track Sag (Steel Crawler) (Optional) (ZX27-3 Only)

--- every 50 working hours

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


#### Check Track Sag

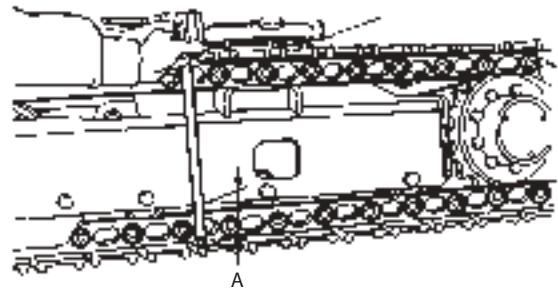
As illustrated to the right, raise the one side track, which sag is measured, off the ground. Place blocks under machine frame to support the machine.



M1M7-04-006

	Dimension	
Track Sag Specifications A in mm (in)	ZX27-3	110 to 130 (4.3 to 5.1)

-  **NOTE:** 1. Check track sag after thoroughly removing soil stuck on track area by pressure washing.
2. 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.



M588-07-062

#### 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.

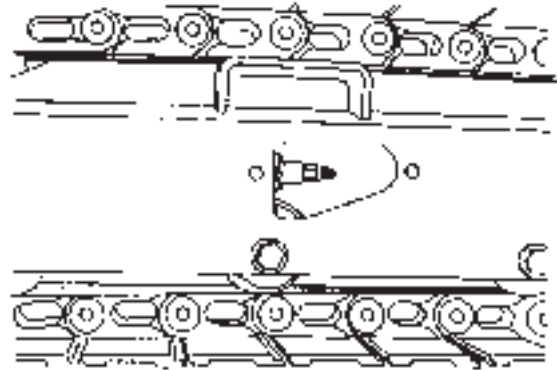
## MAINTENANCE

### Loosen Track (Steel Crawler)

**CAUTION:** 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 the valve further.
3. If grease does not drain smoothly, raise the track to be loosed off the ground and slowly rotate the track.
4. When proper track sag is obtained, turn valve (1) clockwise and tighten it to 88 N·m (9 kgf·m, 65 lbf·ft).

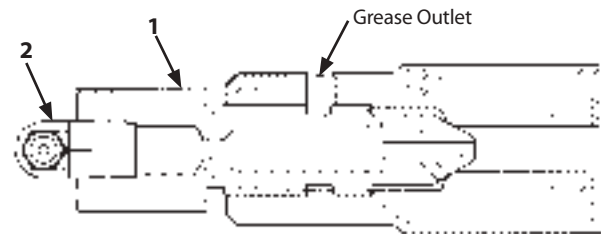


M1LA-07-013

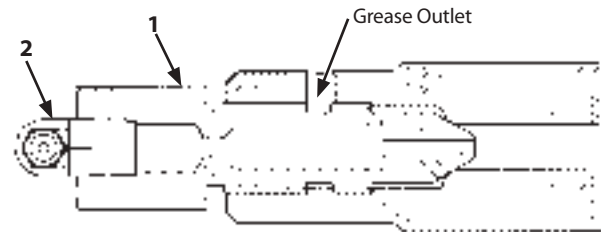
### Tighten Track (Steel Crawler)

**CAUTION:** 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 nearest Hitachi 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



M1LA-07-036

## MAINTENANCE

---

### Converting the Track



**WARNING:**

- **Consult your nearest 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 nearest authorized dealer for covering the track. Change the track adjuster whenever converting the steel or rubber track.

## MAINTENANCE

---

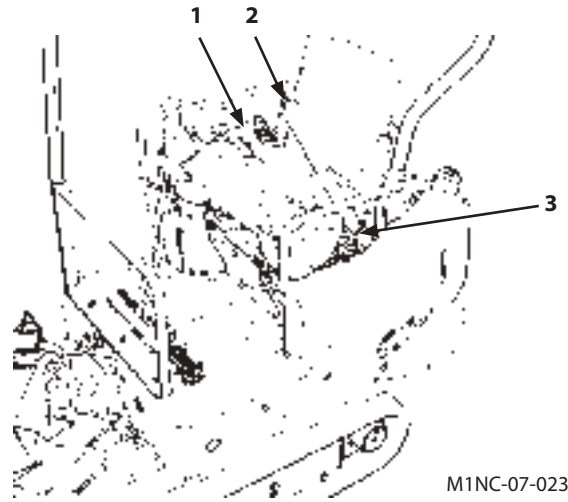
### **5** Check and Replace Seat Belt

**Check --- daily**

**Replace --- every 3 years**

Prior to operating the machine, thoroughly examine belt (1), buckle (2) and attached 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.



M1NC-07-023



## MAINTENANCE

### 6 Clean Cab Floor (Cab Equipped Machines)

--- as necessary

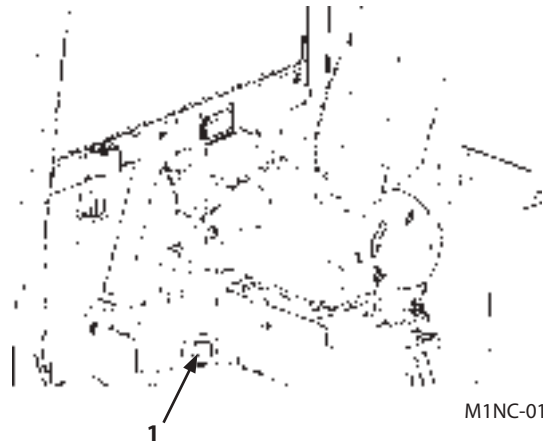
**IMPORTANT:** Only the cab floor can be washed with water. Take care not to splash other parts of the cab with water. Do not increase the water pressure speed by squeezing the hose end. Never use steam to clean the cab floor. Always clean the cab floor only after closing ducts (1 and 2) to prevent water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

1. Park the machine on a level surface. Lower the bucket to the floor. 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 bust 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. If water permeation is recognized, run the blower at the maximum speed for several minutes until water drops disappear. Turn the heater OFF at this time.



ZX14-3, 16-3, 18-3

M1NC-01-004



ZX27-3

M1NC-01-021

## MAINTENANCE

---

- 7** **Check Injection Nozzle**  
**Cleaning --- every 1500 hours**  
**Confirming Operation --- every 1500 hours**

Consult your authorized dealer for inspection and repair.

- 8** **Adjust Valve Clearance**  
**--- every 1000 hours**

Consult your authorized dealer for inspection and repair.

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

Consult your authorized dealer for inspection and repair.

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

Consult your authorized dealer for inspection and repair.

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

Consult your authorized dealer for inspection and repair.

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

Consult your authorized dealer for inspection and repair.

## MAINTENANCE

### 13 Check Tightening Torque of Bolts and Nuts --- 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.

#### ZX14-3, 16-3, 18-3

No.	Descriptions		Bolt Dia. mm	Q'ty	Wrench Size mm	Torque		
						N·m	(kgf·m)	(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.	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)
					27	95	(9.5)	(69)
		1-1/16-12UNF		36	180	(18)	(129)	
5.	Pump mounting bolt		12	2	19	90	(9)	(65)
6.	Pump cover mounting bolt		10	8	17	50	(5)	(36)
7.	Control valve mounting bolt		10	4	17	50	(5)	(36)
	Control valve base mounting bolt		10	4	17	50	(5)	(36)
8.	Swing device mounting bolt		12	4	19	90	(9)	(65)
9.	Battery mounting nut		6	4	10	5	(0.5)	(3.5)
10.	Canopy mounting bolt		10	3	17	50	(5)	(36)
			12	4	19	90	(9)	(65)
11.	Cab mounting bolt		12	4	19	90	(9)	(65)
			16	4	24	210	(21)	(152)
12.	Swing bearing mounting bolt	Upperstructure	10	16	17	50	(5)	(36)
		Undercarriage	10	18	17	50	(5)	(36)
13.	Travel device mounting bolt		10	16	8 (Socket)	65	(6.5)	(47)
14.	Sprocket mounting bolt		10	18	8 (Socket)	65	(6.5)	(47)
15.	Lower roller mounting bolt		14	12	22	180	(18)	(130)
16.	Cover mounting bolt		6		10	5	(0.5)	(3.5)
			8		13	10	(1)	(7)
			10		17	50	(5)	(36)
17.	Counterweight mounting bolt		14	4	30	400	(41)	(297)
18.	Front pin lock plate bolts		8		13	20	(2)	(14)
			10		17	50	(5)	(36)
			12		19	90	(9)	(65)
			14		22	140	(14)	(101)
			16		24	210	(21)	(152)

- 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.

## MAINTENANCE










### ZX27-3

No.	Descriptions		Bolt Dia. mm	Q'ty	Wrench Size mm	Torque		
						N·m	(kgf·m)	(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.	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	95	(9.5)	(69)
		1-1/16-12UNF		36	180	(18)	(129)	
5.	Pump mounting bolt		12	2	19	90	(9)	(65)
6.	Pump cover mounting bolt		10	6	17	50	(5)	(36)
7.	Control valve mounting bolt		10	4	17	50	(5)	(36)
	Control valve base mounting bolt		10	4	17	50	(5)	(36)
8.	Swing device mounting bolt		14	6	22	140	(14)	(101)
9.	Battery mounting nut		6	4	10	5	(0.5)	(3.5)
10.	Cab mounting bolt		16	4	24	210	(21)	(152)
11.	Swing bearing mounting bolt	Upperstructure	12	23	19	90	(9)	(65)
		Undercarriage	12	20	19	90	(9)	(65)
12.	Travel device mounting bolt		12	22	19	90	(9)	(65)
13.	Sprocket mounting bolt		12	22	19	127	(13)	(94)
14.	Upper roller		16	2	24	210	(21)	(152)
15.	Lower roller mounting bolt		14	12	22	245	(25)	(181)
16.	Cover mounting bolt		6		10	5	(0.5)	(3.5)
			8		13	10	(1)	(7)
			10		17	50	(5)	(36)
17.	Counterweight mounting bolt		22	3	32	540	(55)	(398)
18.	Front pin lock plate bolts		8		13	20	(2)	(14)
			10		17	50	(5)	(36)
			12		19	90	(9)	(65)
			14		22	140	(14)	(101)
			16		24	210	(21)	(152)

- 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.

## MAINTENANCE

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)	(65)	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)




## CONSUMABLE PARTS LIST

### Consumable Parts List

Filter Element	ZX14-3, 16-3, 18-3	ZX27-3
	Parts No.	Parts No.
Full Flow Filter	4454705	4129280
Hydraulic Oil Suction Filter	4479355	4617512
Pilot Filter	4294130	4294130
Engine Oil Filter	4661289	4294838
Fuel Filter	4667073	4388458
Water Separator	4667074	4418776
Air Cleaner Element	4383875	4417516
Fan Belt	4661283	4453824

Bucket Parts		ZX14-3, 16-3, 18-3		ZX27-3	
		Parts No.	Quantity	Parts No.	Quantity
Tooth	Tooth	4339865	3	4339865	3
	Lock Pin	4339868	3	4339868	3
	Lock Rubber	4339867	3	4339867	3
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	4275463	(4)	4275533	(4)	
Shim	4354264	2	4354260	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

### 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.	



## 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.

## STORAGE

---


### Removing Machine from Storage

 **CAUTION:** 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 break down. Operate the travel, swing and digging functions, 2 to 3 cycles each to lubricate the sliding surfaces.**

## TROUBLESHOOTING

### Impossible to Start Engine

	Problem	Cause	Solution
<b>Engine will not start</b>	<b>Starter does not rotate or is not powerful</b>	Discharged battery	Charge or replace battery.
		Disconnected, loose, or corroded battery terminals	After repairing the corroded area, securely tighten the connectors.
		Lowered pilot control shut-off lever.	Pull pilot control shut-off lever up.
		Disconnected, loose, or corroded starter ground line terminals.	After repairing the corroded area, securely tighten the connectors.
		Faulty pilot control shut-off lever electrical system	See your authorized dealer.
		Too high engine oil viscosity	Change engine oil with appropriate viscosity.
		Faulty starter and/or electrical system	See your authorized dealer.
	<b>Starter rotates</b>	No fuel	After checking that no fuel is leaking, refill fuel.
		Air in the fuel system	Bleed air.
		Clogged fuel filter	After draining water, replace the element.
		Frozen fuel	Warm the fuel pump with hot water or wait until the atmospheric temperature rises.
		Faulty injection pump	See your authorized dealer.
		Faulty engine control system	See your authorized dealer.
Faulty preheat system		See your authorized dealer.	
<b>Even though the engine is started, the engine stalls soon</b>	Too low idle speed	See your authorized dealer.	
	Clogged fuel filter	After draining water, replace the element.	
	Faulty engine control system	See your authorized dealer.	
	Clogged air cleaner	Clean or replace the element.	
	Faulty injection pump	See your authorized dealer.	
<b>Engine runs irregularly</b>	Faulty fuel system	See your authorized dealer.	
	Water or air in the fuel system	Drain water or bleed air.	
	Faulty engine control system	See your authorized dealer.	

## TROUBLESHOOTING

### Engine

Problem	Cause	Solution
<b>Engine Not Developing Full Power</b>	Air filters plugged	Replace filter elements.
	Fuel line restricted	Repair or replace fuel line.
	Contaminated fuel	Drain fuel tank and clean outlet screen. Refill.
	Fuel filters plugged	Change filters.
	Plugged vent in fuel tank cap	Clean or install new cap.
	Injection nozzles dirty or malfunctioning	See your authorized dealer.
	Injection pump linkage adjustment	See your authorized dealer.
	Wrong fuel	Use correct fuel.
	Wrong oil	Use correct oil.
	Turbocharger failure	See your authorized dealer.
	Injection pump out of timing	See your authorized dealer.
	Exhaust restriction	Remove muffler and run engine.
	Engine is too hot or cold	See below.
	Engine failure	See your authorized dealer.
	Valve clearance	Check and adjust valves.
Intake or exhaust system leakage	See your authorized dealer.	
<b>Engine Overheats</b>	Low coolant level	Add coolant.
	Thermostat	See your authorized dealer.
	Engine overloaded	Check hydraulic relief valves.
	Radiator cap faulty	Install new cap.
	Radiator core or oil cooler core plugged	Clean radiator and oil cooler.
	Radiator screen plugged	Clean screen.
	Injection pump out of timing	See your authorized dealer.
	Fan damaged	Replace fan.
	Air cleaner plugged	Clean air cleaner.
	Alternator and fan belt loose	Tighten or install new belt.
	Pulley grooves worn	Replace pulleys.
	Cooling system passages dirty	Flush cooling system.
	Temperature gauge or sending unit	See your authorized dealer.

## TROUBLESHOOTING

### Engine

Problem	Cause	Solution
<b>Coolant Temperature Too Low</b>	Thermostat	See your authorized dealer.
	Temperature gauge or sending unit	See your authorized dealer.
<b>Low Engine Oil Pressure</b>	Engine oil pump or pump drive	See your authorized dealer.
	Low oil level	Add oil.
	Engine oil pressure regulation valve	See your authorized dealer.
	Plugged oil pump intake screen	See your authorized dealer.
	Plugged oil filter	Install a new oil filter.
	Oil leaks	Check for leaks.
	Oil diluted with fuel or coolant	See your authorized dealer.
	Engine temperature too high	Check cooling system.
	Wrong oil	Drain oil. Use correct oil.
<b>Engine Uses Too Much Oil</b>	Wrong oil	Drain oil. Use correct oil.
	Oil leaks	Check engine oil drain plug.
	Engine temperature too high	Check cooling system.
	Plugged air cleaner	Clean element or install new element.
	Internal engine component wear	See your authorized dealer.
<b>Engine Uses Too Much Fuel</b>	Plugged or dirty air intake system	Clean air intake system.
	Wrong fuel	Use correct fuel.
	Fuel injection nozzles	See your authorized dealer.
	Injection pump out of time	See your authorized dealer.
<b>Excessive Black or Gray Exhaust Smoke</b>	Wrong fuel	Drain tank. Use correct fuel.
	Plugged or dirty air intake or exhaust system	Clean air intake and exhaust system.
	Injection pump out of timing	See your authorized dealer.
	Injection nozzles dirty or faulty	See your authorized dealer.
	Basic engine failures	See your authorized dealer.
<b>Exhaust Gas is White</b>	Wrong fuel	Drain tank. Use correct fuel.
	Cold engine	Run engine until warm.
	Thermostat faulty or too "cool"	See your authorized dealer.
	Injection pump out of time	See your authorized dealer.
	Coolant leakage into engine cylinder	See your authorized dealer.

## TROUBLESHOOTING

### Engine

Problem	Cause	Solution
<b>Nothing Works</b>	Battery	Recharge or replace.
<b>Battery Undercharged</b>	Loose or corroded connections	Clean and tighten or replace battery.
	Alternator belt loose	Tighten or install new belt.
	Alternator not charging	See your authorized dealer.
	Fuse	Replace fuse.
	Key switch failure	Replace key switch.
<b>Starting Motor Will Not Turn</b>	Battery undercharged or dead	Recharge or replace battery.
	Battery cables making poor connections	Clean connections.
	Fusible link	Replace fusible link.
	Key switch	See your authorized dealer.
	Start relay	See your authorized dealer.
	Starter solenoid	See your authorized dealer.
	Starter	Repair or replace start motor.
	Starter pinion jammed in flywheel gear	Repair or replace starter.
	Major engine failure	See your authorized dealer.
<b>Starter Solenoid Chatters</b>	Poor connections at battery or starter	Clean connections.
	Low battery charge	Recharge or replace battery.
	Starter solenoid "hold-in" windings open	See your authorized dealer.
<b>Starter Motor Turns but Will Not Crank Engine</b>	Starter pinion gear not engaging flywheel ring gear	See your authorized dealer.
	Pinion shift mechanism jammed or malfunctioning	See your authorized dealer.
	Pinion gear teeth broken	See your authorized dealer.
	Flywheel gear teeth broken	See your authorized dealer.
<b>Engine Cranks Slowly</b>	Battery cables damaged or broken internally	Inspect and replace cables.
	Battery or starter cable connections loose or corroded	Clean and tighten connections.



## TROUBLESHOOTING

### Electrical System

Problem	Cause	Solution
<b>Engine Cranks Slowly</b>	Battery discharged or will not hold a charge	Replace battery.
	Starter "dragging"	See your authorized dealer.
	Low battery voltage	Recharge or replace battery.
<b>Starter Motor Continues to Run After Engine Starts</b>	Start relay stuck	See your authorized dealer.
	Starter solenoid stuck	See your authorized dealer.
	Starter not disengaging	See your authorized dealer.
	Key switch	See your authorized dealer.
<b>Charging Indicator Light On-Engine Running</b>	Loose or glazed alternator belt	Check belt. Replace if glazed, tighten if loose.
	Engine rpm low	Adjust rpm to specification.
	Excessive electrical load from added accessories	Remove accessories or install higher output alternator.
	Loose or corroded electrical connections on battery, ground strap, starter, or alternator	Inspect, clean, or tighten electrical connections.
	Battery voltage low	Change or replace battery.
	Alternator or regulator	See your authorized dealer.
	Indicator circuit	See your authorized dealer.
<b>Noisy Alternator</b>	Worn drive belt	Replace belt.
	Worn pulleys	Replace pulleys and belt.
	Pulley misaligned	Adjust alternator mount.
	Alternator bearing	Loosen alternator belts. Turn pulley by hand. If any roughness is felt, repair alternator.
<b>No Monitor Panel Indicators Work</b>	Fuse	Replace fuse.
	Wiring harness	See your authorized dealer.
<b>Individual Light in Monitor Panel is Not Working</b>	Bulb	Replace bulb.
	Fuse	Replace fuse.
	Wiring harness	See your authorized dealer.

## TROUBLESHOOTING

### Electrical System

Problem	Cause	Solution
<b>No Indicators in Gauge Panel Operate</b>	Circuit board	See your authorized dealer.
	Wiring harness	See your authorized dealer.
	Fuse	Replace fuse.
<b>Indicator Light in Gauge Panel is Inoperative</b>	Bulb	Replace bulb.
	Fuse	Replace fuse.
	Sender	Do sender check.
	Wiring harness failure	See your authorized dealer.
<b>Coolant Temperature Gauge Does Not Work</b>	Fuse	Replace fuse.
	Gauge	See your authorized dealer.
	Gauge sender	Do coolant temperature gauge sender check.
	Wiring harness	See your authorized dealer.
<b>Fuel Gauge Does Not Work</b>	Fuse	Replace fuse.
	Gauge	See your authorized dealer.
	Wiring harness	See your authorized dealer.

### Mode Selection

Problem	Cause	Solution
<b>Fast/Slow Travel Speed Does Not Function</b>	Travel mode switches	See your authorized dealer.
	Solenoid valve unit	See your authorized dealer.
	Damaged travel motor	See your authorized dealer.

## TROUBLESHOOTING

### Control Levers

Problem	Cause	Solution
<b>Moves Hard</b>	Corroded joint	See your authorized dealer.
	Worn out pusher	See your authorized dealer.
<b>Does Nothing</b>	Worn out pusher	See your authorized dealer.
	Pilot valve	See your authorized dealer.
<b>Does Not Return to Neutral</b>	Pilot valve	See your authorized dealer.
<b>Too Much Play</b>	Worn out pivot joint	See your authorized dealer.
<b>Lever is Not Vertical In Neutral</b>	Pilot valve	See your authorized dealer.

### Hydraulic System

Problem	Cause	Solution
<b>Hydraulic Functions are Slow</b>	Low oil level	Fill reservoir to full mark.
	Cold oil	Push hydraulic warm up switch.
	Wrong oil	Drain tank. Use correct oil.
	Engine speed too low	Increase speed or see your authorized dealer.
	Pilot circuit	See your authorized dealer.
	Worn pump	See your authorized dealer.
	Restricted pump suction line	See your authorized dealer.
<b>Hydraulic Oil Overheats</b>	Wrong oil	Use correct oil.
	Air leak in pump suction line	See your authorized dealer.
	Oil lines restricted	See your authorized dealer.
	Low oil level	Fill reservoir to full mark.
	Plugged filters	Install new filters.
	Worn pump	See your authorized dealer.
	Plugged radiator or oil cooler	Clean and straighten fins.
	Oil cooler bypass	See your authorized dealer.

## TROUBLESHOOTING

### Hydraulic System

Problem	Cause	Solution
<b>Hydraulic Oil Overheats</b>	Relief valve	See your authorized dealer.
	Contaminated oil	Drain oil and refill.
	Travel motors	See your authorized dealer.
	Improperly adjusted hydraulic components	See your authorized dealer.
<b>Oil Foams</b>	Air leak in line from reservoir to pump	Repair leak or see your authorized dealer.
	Kinks or dents in oil lines	Check lines.
	Wrong oil	Use correct oil.
	Water in oil	Change oil.
	High or low oil level	Correct level.
<b>Low or No Oil Pressure</b>	Wrong oil	Use correct oil.
	Improperly adjusted hydraulic components	See your authorized dealer.
	No oil in system	Fill with correct oil.
	Worn cylinder packings	See your authorized dealer.
	Relief valve	See your authorized dealer.
<b>No Hydraulic Functions (Noise from Pumps)</b>	Hydraulic pump	See your authorized dealer.
	Decreased set-pressure of main relief valve in control valve	See your authorized dealer.
	Lack of hydraulic oil	Add oil.
	Damaged suction line or hose	See your authorized dealer.
	Clogged suction filter	Clean.
	Sucked air from oil suction port	Tighten.
<b>Hydraulic Cylinders Operate but Cannot Lift Load</b>	Hydraulic pump worn	See your authorized dealer.
	Main relief valve pressure low	See your authorized dealer.
	Hydraulic oil level low	Add oil.
	Suction screen plugged	Clean strainer and system.
	Pump suction line leaking	Inspect suction line.

## TROUBLESHOOTING

### Hydraulic System

Problem	Cause	Solution
<b>One Control Lever Does Not Work</b>	Relief valve pressure low	See your authorized dealer.
	Tube or hose damaged	Repair or replace.
	Hydraulic fittings loose	Tighten.
	Damaged O-rings in fittings	Install new O-ring.
	Hydraulic Pump	See your authorized dealer.
	Pilot valve	See your authorized dealer.
	Pilot lines	Repair or replace.
<b>One Cylinder Does Not Work</b>	Control valve spool damaged or contaminated with dirt	See your authorized dealer.
	Hydraulic lines damaged	Repair or replace.
	Fittings loose	Tighten.
	O-ring in fitting damaged	Install new O-ring.
	Pilot valve	See your authorized dealer.
	Pilot lines	Repair or replace.
<b>One Cylinder Does Not Work or Has Little Power</b>	Piston seals leaking	See your authorized dealer.
	Cylinder rod damaged	See your authorized dealer.
	Pilot lines	Repair or replace.
	Pilot valve	See your authorized dealer.
	Failed wiring harness	See your authorized dealer.
<b>Both Travel Motors Do Not Work</b>	Center joint failure	See your authorized dealer.
<b>One Travel Motor Does Not Work</b>	Travel motor	See your authorized dealer.
	Parking brake not releasing	See your authorized dealer.
	Pilot valve	See your authorized dealer.
	Pilot lines	Repair or replace.
<b>Travel is Not Smooth</b>	Track adjustment	Adjust tension.
	Track idler or rollers damaged	See your authorized dealer.
	Track frame bent	See your authorized dealer.

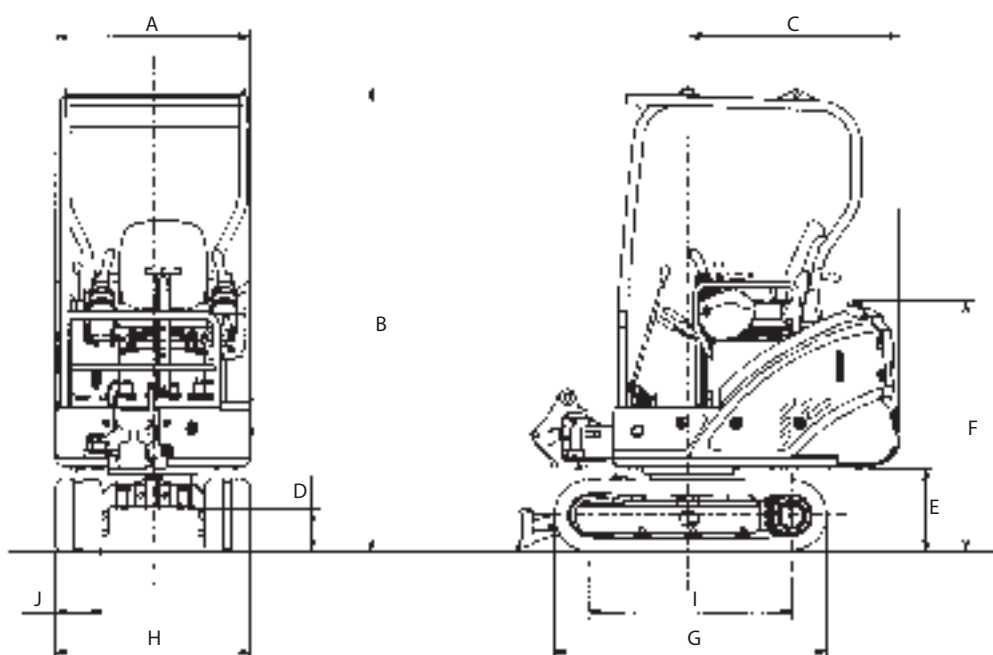
## TROUBLESHOOTING

### Hydraulic System

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
<b>Travel is Not Smooth</b>	Rocks or mud "jammed" in track frame	Remove and repair.
	Travel brake not releasing	See your authorized dealer.
<b>Swing Does Not Work</b>	Swing motor	See your authorized dealer.
	Pilot valve	See your authorized dealer.
<b>Swing is Not Smooth</b>	Swing gear	See your authorized dealer.
	Swing bearing	See your authorized dealer.
	Lack of grease	Apply grease.
<b>Engine Stops When Travel or/ and Control Lever Moved</b>	Failure of connector contact	Repair or replace.
	Failed wiring harness	See your authorized dealer.
	Failed Main controller	See your authorized dealer.

## SPECIFICATIONS

### Specifications ZX14-3



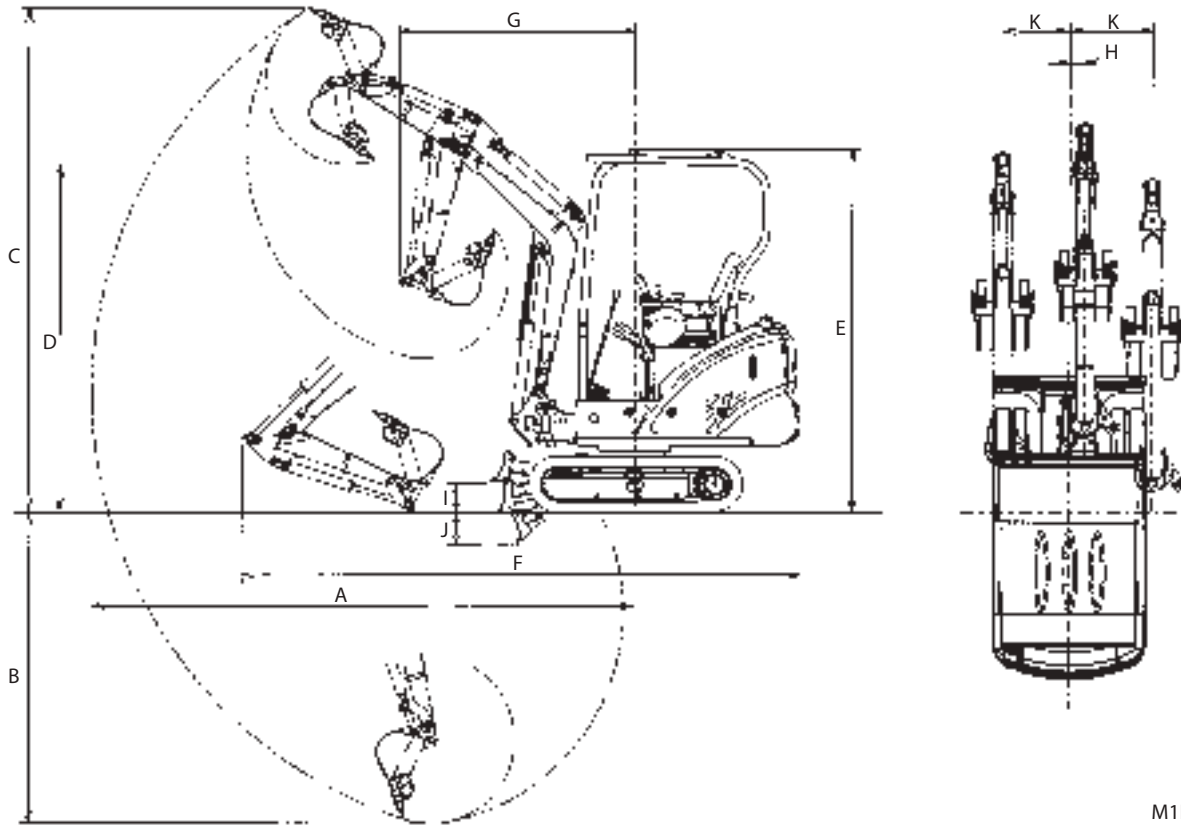
M1NC-12-001

Model		ZX14-3		
Type		ROPS Canopy	TOPS Canopy	ROPS Cab
Type of Front-End Attachment	–	Boom Swing Type		
Bucket Capacity (Heaped)	m <sup>3</sup> (yd <sup>3</sup> )	0.04 (0.052)		
Operating Weight	kg (lb)	1460 (3220)	1460 (3220)	1570 (3460)
Base Machine Weight	kg (lb)	1080 (2380)	1080 (2380)	1190 (2620)
Engine		Yanmar 3TNV70 10.7 kW/2400 min <sup>-1</sup> (14.5 PS/2400 rpm)		
A: Overall Width	mm (ft-in)	980 (3'3")		1040 (3'5")
B: Overall Height	mm (ft-in)	2340 (7'8")		2380 (7'10")
C: Rear-End Swing Radius	mm (ft-in)	1060 (3'6")		
D: Minimum Ground Clearance	mm (ft-in)	235 (9")		
E: Counterweight Clearance	mm (ft-in)	420 (1'5")		
F: Engine Cover Height	mm (ft-in)	1270 (4'2")		
G: Undercarriage Length	mm (ft-in)	1370 (4'6")		
H: Undercarriage Width	mm (ft-in)	980 (3'3")		
I : Sprocket Center to Idler Center	mm (ft-in)	1020 (3'4")		
J: Track Shoe Width	mm (ft-in)	230 (9")		
Ground Pressure	kPa (kgf/cm <sup>2</sup> , psi)	27.2 (0.28, 4.0)		29.3 (0.30, 4.3)
Swing Speed	min <sup>-1</sup> (rpm)	9.4		
Travel Speed	km/h (mph)	2.1 (1.3)		
Gradeability		30° (tanθ=0.58)		

NOTE: The dimensions do not include the height of the shoe lug.

## SPECIFICATIONS

### Working Ranges ZX14-3



M1NC-12-002

Model		ZX14-3				
Type of Front-End Attachment		0.84 m (2 ft 9 in) Arm			1.04 m (3 ft 5 in) Arm	
Type		ROPS Canopy	TOPS Canopy	ROPS Cab	ROPS Canopy	TOPS Canopy ROPS Cab
A: Maximum Digging Reach	mm (ft-in)	3490 (11'5")			3670 (12'1")	
B: Maximum Digging Depth	mm (ft-in)	1930 (6'4")			2120 (7'0")	
C: Maximum Cutting Height	mm (ft-in)	3220 (10'7")			3320 (10'11")	
D: Maximum Dumping Height	mm (ft-in)	2220 (7'3")			2320 (7'7")	
E: Transport Height (Rubber Crawler)	mm (ft-in)	2340 (7'8")		2380 (7'8")	2340 (7'8")	2380 (7'8")
F: Overall Transport Length	mm (ft-in)	3580 (11'9")			3600 (11'10")	
G: Minimum Swing Radius	mm (ft-in)	1530 (5'0")			1580 (5'0")	
H: Boom-Swing Pivot Offset Distance	mm (ft-in)	100 (4")			100 (4")	
I: Blade Bottom Highest Position (Above Ground Level)	mm (ft-in)	195 (8")			195 (8")	
J: Blade Bottom Lowest Position (Above Ground Level)	mm (ft-in)	205 (8")			205 (8")	
K: Offset Distance	mm (ft-in)	L 360 (1'2") / R 565 (1'10")			L 360 (1'2") / R 565 (1'10")	
Maximum Boom-Swing Angle	Degree	L 80° / R 50°			L 80° / R 50°	


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



## SPECIFICATIONS

### Bucket Types and Applications ZX14-3

Bucket	Bucket Capacity m <sup>3</sup> (yd <sup>3</sup> ) ISO (Heaped)	Bucket Width		Front-End Attachment	
		(With Side Cutter) mm (in)	(Without Side Cutter) mm (in)	0.84 m (2'9") Arm	1.04 m (3'5") Arm
Hoe Bucket	0.02 (0.026)	300 (12")	250 (10")	●	●
	0.035 (0.046)	350 (14")	300 (12")	●	●
	0.04 (0.052)	400 (16")	350 (14")	●	○
	0.044 (0.058)	450 (18")	400 (16")	○	○
	0.05 (0.065)	500 (20")	450 (18")	○	□

 NOTE: (1) Symbols in the above table have the following meanings.

- : General excavating
- : Light duty excavating
- : Loading work

(2) 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<sup>3</sup> as a standard.*

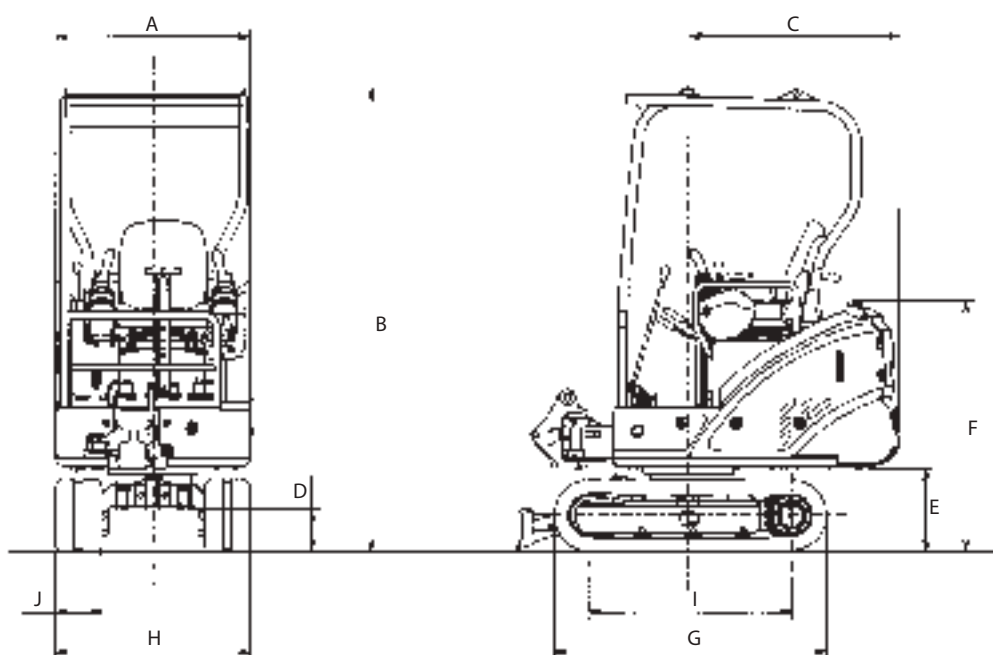
*Loading work :*

*For loading operation of dried, loosened earth and sand.*

*Their bulk density shall be less than 1100 kg/m<sup>3</sup> as a standard.*

## SPECIFICATIONS

### Specifications ZX16-3



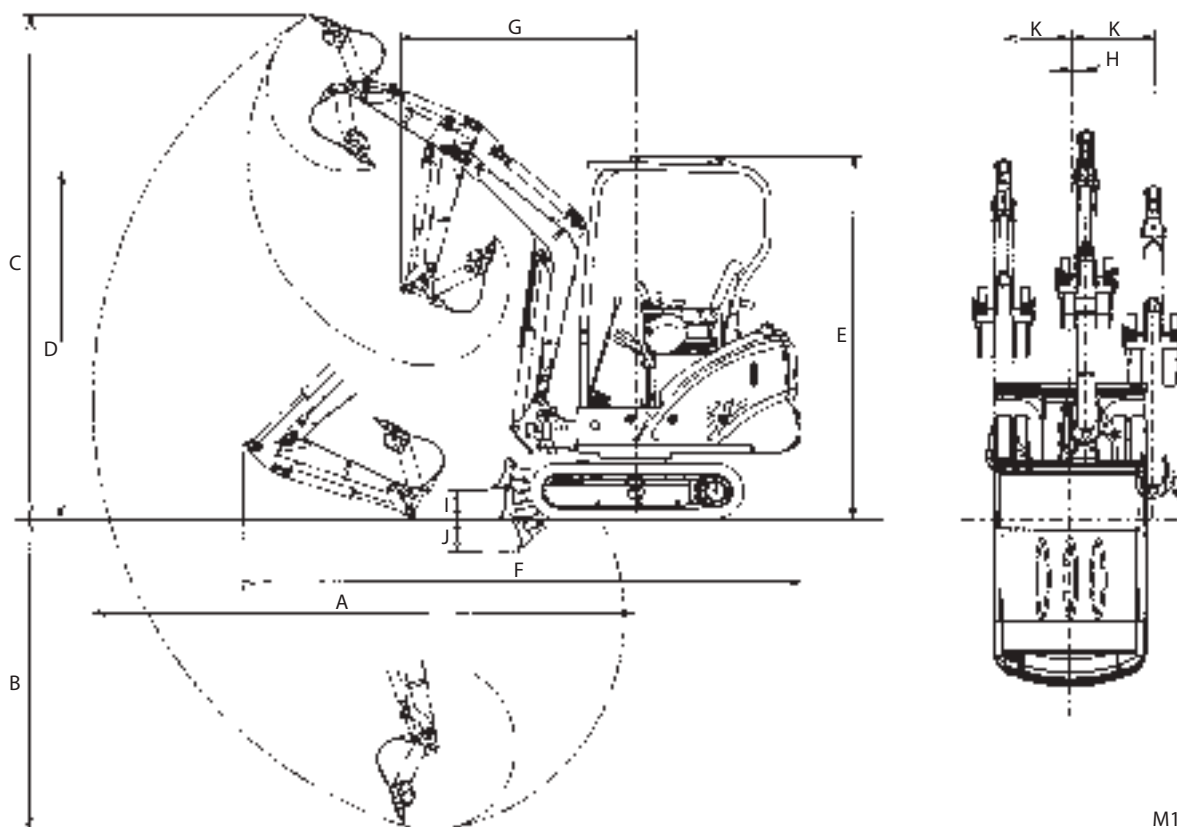
M1NC-12-001

Model		ZX16-3		
Type		ROPS Canopy	TOPS Canopy	ROPS Cab
Type of Front-End Attachment	–	Boom Swing Type		
Bucket Capacity (Heaped)	m <sup>3</sup> (yd <sup>3</sup> )	0.044 (0.058)		
Operating Weight	kg (lb)	1600 (5'3")	1600 (5'3")	1710 (5'7")
Base Machine Weight	kg (lb)	1170 (3'10")	1170 (3'10")	1280 (4'2")
Engine		Yanmar 3TNV70 10.7 kW/2400 min <sup>-1</sup> (14.5 PS/2400 rpm)		
A: Overall Width	mm (ft-in)	980 (3'3")		1040 (3'5")
B: Overall Height	mm (ft-in)	2340 (7'8")		2380 (7'10")
C: Rear-End Swing Radius	mm (ft-in)	1060 (3'6")		
D: Minimum Ground Clearance	mm (ft-in)	235 (9")		
E: Counterweight Clearance	mm (ft-in)	420 (1'5")		
F: Engine Cover Height	mm (ft-in)	1270 (4'2")		
G: Undercarriage Length	mm (ft-in)	1470 (4'10")		
H: Undercarriage Width	mm (ft-in)	980 (3'3")		
I : Sprocket Center to Idler Center	mm (ft-in)	1110 (3'8")		
J: Track Shoe Width	mm (ft-in)	230 (9")		
Ground Pressure	kPa (kgf/cm <sup>2</sup> , psi)	27.6 (0.28, 4.0)		29.5 (0.30, 4.3)
Swing Speed	min <sup>-1</sup> (rpm)	8.9		
Travel Speed	km/h (mph)	4.2/2.4 (2.6/1.5)		
Gradeability		30° (tanθ=0.58)		

NOTE: The dimensions do not include the height of the shoe lug.

## SPECIFICATIONS

### Working Ranges ZX16-3



M1NC-12-002


Model		ZX16-3					
Type of Front-End Attachment		0.93 m (3 ft 1 in) Arm			1.13 m (3 ft 9 in) Arm		
Type		ROPS Canopy	TOPS Canopy	ROPS Cab	ROPS Canopy	TOPS Canopy	ROPS Cab
A : Maximum Digging Reach	mm (ft-in)	3790 (12'5")			3970 (13'0")		
B : Maximum Digging Depth	mm (ft-in)	2160 (7'1")			2370 (7'9")		
C : Maximum Cutting Height	mm (ft-in)	3560 (11'9")			3660 (12'0")		
D : Maximum Dumping Height	mm (ft-in)	2530 (8'4")			2630 (8'8")		
E : Transport Height (Rubber Crawler)	mm (ft-in)	2340 (7'8")		2380 (7'8")	2340 (7'8")		2380 (7'8")
F : Overall Transport Length	mm (ft-in)	3750 (12'4")		3790 (12'5")	3600 (11'10")		3790 (12'5")
G : Minimum Swing Radius	mm (ft-in)	1500 (4'11")			1590 (5'3")		
H : Boom-Swing Pivot Offset Distance	mm (ft-in)	100 (4")			100 (4")		
I : Blade Bottom Highest Position (Above Ground Level)	mm (ft-in)	195 (8")			195 (8")		
J : Blade Bottom Lowest Position (Above Ground Level)	mm (ft-in)	205 (8")			205 (8")		
K : Offset Distance	mm (ft-in)	L 360 (1'2") / R 565 (1'10")			L 360 (1'2") / R 565 (1'10")		
Maximum Boom-Swing Angle	Degree	L 80° / R 50°			L 80° / R 50°		

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

## SPECIFICATIONS

### Bucket Types and Applications ZX16-3

Bucket	Bucket Capacity m <sup>3</sup> (yd <sup>3</sup> ) ISO (Heaped)	Bucket Width		Front-End Attachment	
		(With Side Cutter) mm (in)	(Without Side Cutter) mm (in)	0.93 m (3 ft 1 in) Arm	1.13 m (3 ft 9 in) Arm
Hoe Bucket	0.02 (0.026)	300 (12")	250 (10")	●	●
	0.035 (0.046)	350 (14")	300 (12")	●	●
	0.04 (0.052)	400 (16")	350 (14")	●	●
	0.044 (0.058)	450 (18")	400 (16")	●	○
	0.05 (0.065)	500 (20")	450 (18")	○	□

 NOTE: (1) Symbols in the above table have the following meanings.

- : General excavating
- : Light duty excavating
- : Loading work

(2) 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<sup>3</sup> as a standard.*

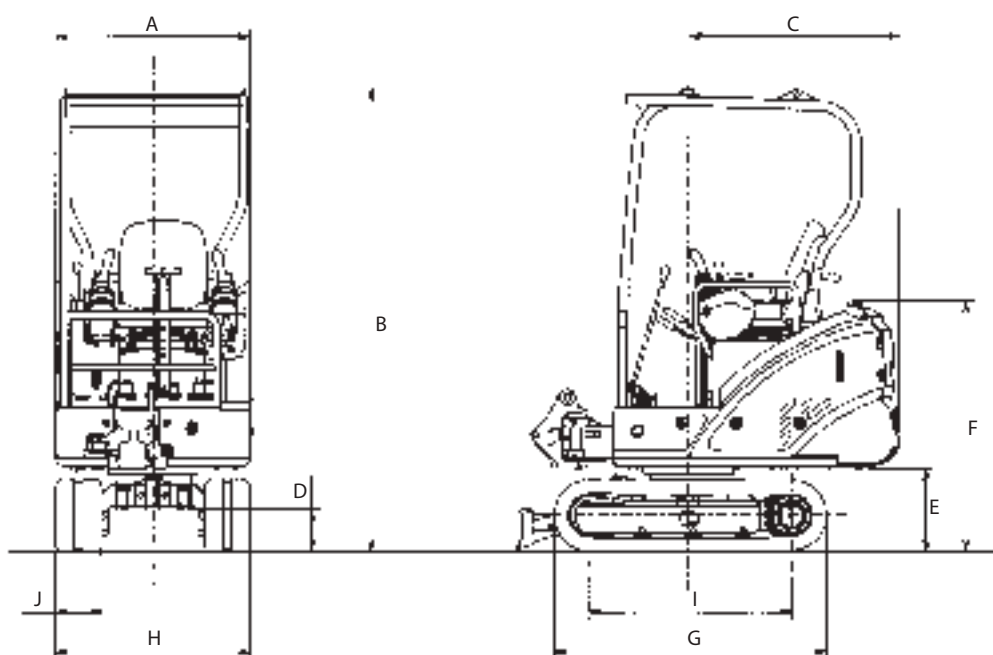
*Loading work :*

*For loading operation of dried, loosened earth and sand.*

*Their bulk density shall be less than 1100 kg/m<sup>3</sup> as a standard.*

## SPECIFICATIONS

### Specifications ZX18-3



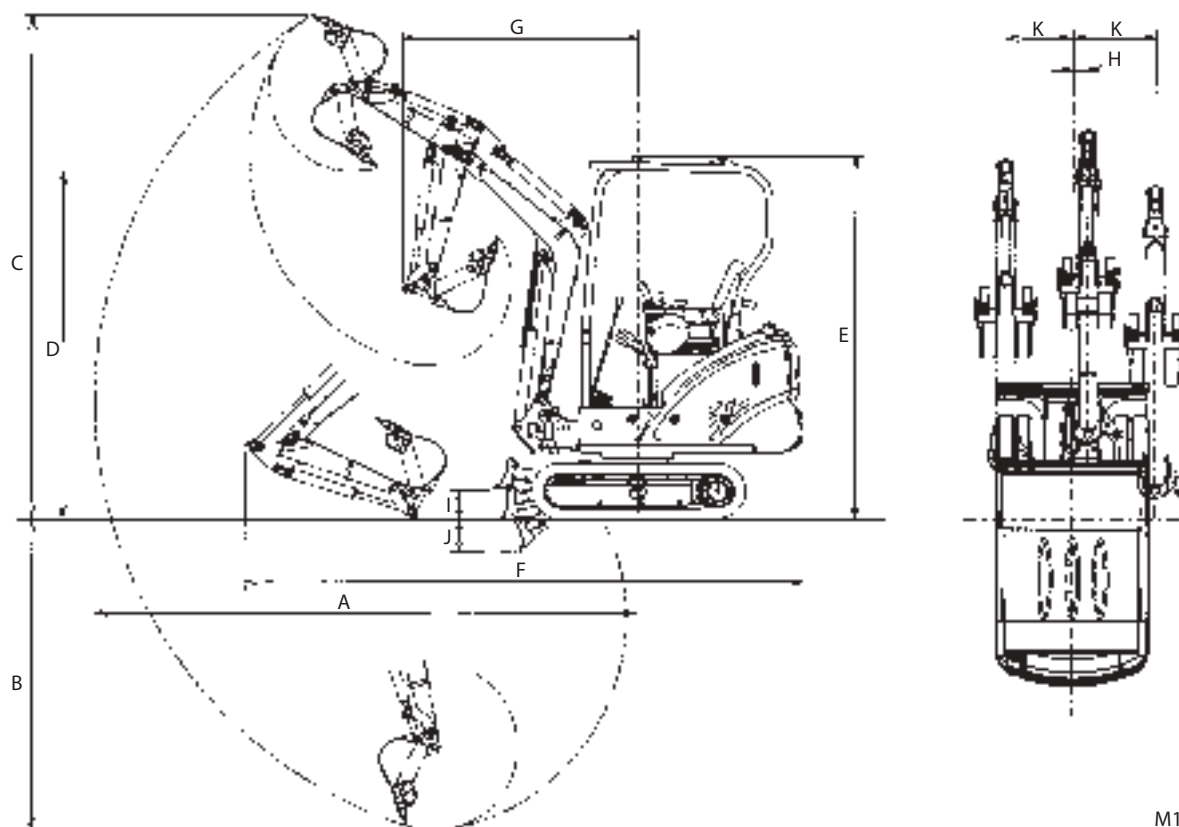
M1NC-12-001

Model		ZX18-3		
Type		ROPS Canopy	TOPS Canopy	ROPS Cab
Type of Front-End Attachment	–	Boom Swing Type		
Bucket Capacity (Heaped)	m <sup>3</sup> (yd <sup>3</sup> )	0.044 (0.058)		
Operating Weight	kg (lb)	1770 (3900)	1770 (3900)	1880 (4150)
Base Machine Weight	kg (lb)	1310 (2890)	1310 (2890)	1420 (3130)
Engine		Yanmar 3TNV70 10.7 kW/2400 min <sup>-1</sup> (14.5 PS/2400 rpm)		
A : Overall Width	mm (ft-in)	980 (3'3")		1040 (3'5")
B : Overall Height	mm (ft-in)	2340 (7'8")		2380 (7'10")
C : Rear-End Swing Radius	mm (ft-in)	1060 (3'6")		
D : Minimum Ground Clearance	mm (ft-in)	165 (7")		
E : Counterweight Clearance	mm (ft-in)	420 (1'5")		
F : Engine Cover Height	mm (ft-in)	1270 (4'2")		
G : Undercarriage Length	mm (ft-in)	1570 (5'2")		
H : Undercarriage Width	mm (ft-in)	980 (3'3")		
I : Sprocket Center to Idler Center	mm (ft-in)	1210 (4'0")		
J : Track Shoe Width	mm (ft-in)	230 (9")		
Ground Pressure	kPa (kgf/cm <sup>2</sup> , psi)	28.2 (0.29, 4.1)		30.0 (0.31, 4.4)
Swing Speed	min <sup>-1</sup> (rpm)	8.9		
Travel Speed	km/h (mph)	4.2/2.4 (2.6/1.5)		
Gradeability		30° (tanθ=0.58)		

NOTE: The dimensions do not include the height of the shoe lug.

## SPECIFICATIONS

### Working Ranges ZX18-3



M1NC-12-002


Model		ZX18-3					
Type of Front-End Attachment		0.93 m (3 ft 1 in) Arm			1.13 m (3 ft 9 in) Arm		
Type		ROPS Canopy	TOPS Canopy	ROPS Cab	ROPS Canopy	TOPS Canopy	ROPS Cab
A : Maximum Digging Reach	mm (ft-in)	3790 (12'5")			3970 (13'0")		
B : Maximum Digging Depth	mm (ft-in)	2160 (7'1")			2370 (7'9")		
C : Maximum Cutting Height	mm (ft-in)	3560 (11'9")			3660 (12'0")		
D : Maximum Dumping Height	mm (ft-in)	2530 (8'4")			2630 (8'8")		
E : Transport Height (Rubber Crawler)	mm (ft-in)	2340 (7'8")		2380 (7'8")	2340 (7'8")		2380 (7'8")
F : Overall Transport Length	mm (ft-in)	3750 (12'4")		3790 (12'5")	3600 (11'10")		3790 (12'5")
G : Minimum Swing Radius	mm (ft-in)	1500 (4'11")			1590 (5'3")		
H : Boom-Swing Pivot Offset Distance	mm (ft-in)	100 (4")			100 (4")		
I : Blade Bottom Highest Position (Above Ground Level)	mm (ft-in)	245 (10")			245 (10")		
J : Blade Bottom Lowest Position (Above Ground Level)	mm (ft-in)	225 (9")			225 (9")		
K : Offset Distance	mm (ft-in)	L 360 (1'2") / R 565 (1'10")			L 360 (1'2") / R 565 (1'10")		
Maximum Boom-Swing Angle	Degree	L 80° / R 50°			L 80° / R 50°		

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

## SPECIFICATIONS

### Bucket Types and Applications ZX18-3

Bucket	Bucket Capacity m <sup>3</sup> (yd <sup>3</sup> ) ISO (Heaped)	Bucket Width		Front-End Attachment	
		(With Side Cutter) mm (in)	(Without Side Cutter) mm (in)	0.93 m (3 ft 1 in) Arm	1.13 m (3 ft 9 in) Arm
Hoe Bucket	0.02 (0.026)	300 (12")	250 (10")	●	●
	0.035 (0.046)	350 (14")	300 (12")	●	●
	0.04 (0.052)	400 (16")	350 (14")	●	●
	0.044 (0.058)	450 (18")	400 (16")	●	○
	0.05 (0.065)	500 (20")	450 (18")	○	□

 NOTE: (1) Symbols in the above table have the following meanings.

- : General excavating
- : Light duty excavating
- : Loading work

(2) 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<sup>3</sup> as a standard.*

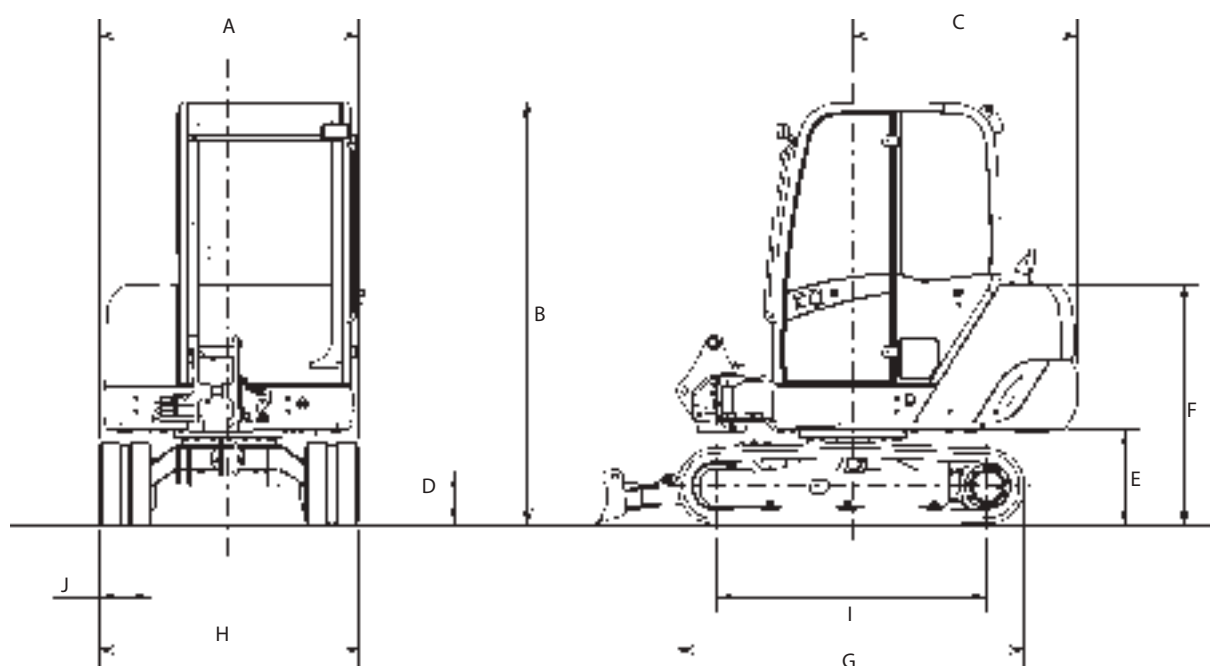
*Loading work :*

*For loading operation of dried, loosened earth and sand.*

*Their bulk density shall be less than 1100 kg/m<sup>3</sup> as a standard.*

## SPECIFICATIONS

### Specifications ZX27-3



M1NC-12-004

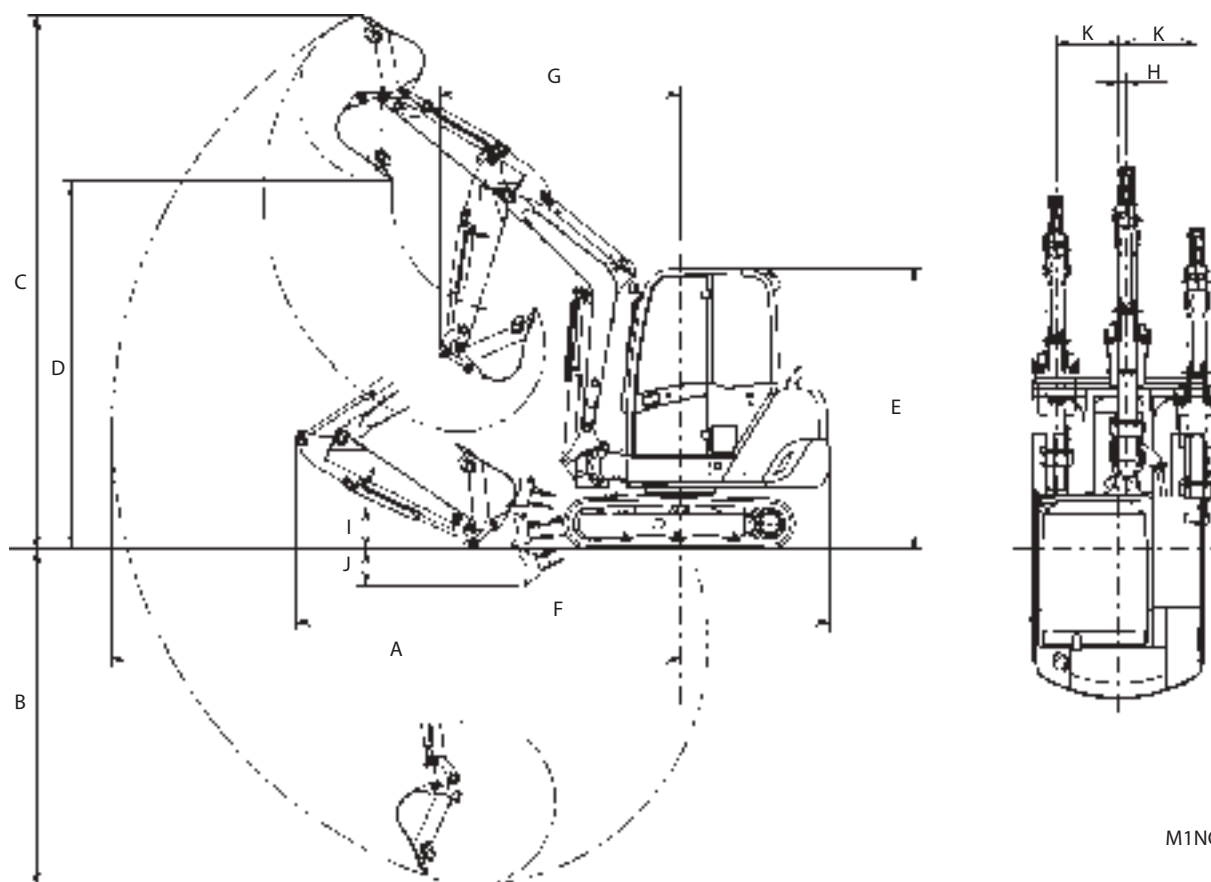
Model		ZX27-3
Type		ROPS Cab
Type of Front-End Attachment	–	Boom Swing Type
Bucket Capacity (Heaped)	m <sup>3</sup> (yd <sup>3</sup> )	0.065 (0.085)
Operating Weight	kg (lb)	2780 (6130)
Base Machine Weight	kg (lb)	2000 (4410)
Engine		Kubota V1505 19.1 kW/2300 min <sup>-1</sup> (26.0 PS/2300 rpm)
A: Overall Width	mm (ft-in)	1400 (4'7")
B: Overall Height	mm (ft-in)	2390 (7'10")
C: Rear-End Swing Radius	mm (ft-in)	1270 (4'2")
D: Minimum Ground Clearance	mm (ft-in)	300 (1'0")
E: Counterweight Clearance	mm (ft-in)	538 (1'9")
F: Engine Cover Height	mm (ft-in)	1360 (4'6")
G: Undercarriage Length	mm (ft-in)	1960 (6'5")
H: Undercarriage Width	mm (ft-in)	1470 (4'10")
I: Sprocket Center to Idler Center	mm (ft-in)	1530 (5'0")
J: Track Shoe Width	mm (ft-in)	300 (1'0")
Ground Pressure	kPa (kgf/cm <sup>2</sup> , psi)	27 (0.28, 3.9)
Swing Speed	min <sup>-1</sup> (rpm)	9.4
Travel Speed (fast/slow)	km/h (mph)	4.4/2.8 (2.7/1.7)
Gradeability		30° (tanθ=0.58)

NOTE: The dimensions do not include the height of the shoe lug.



## SPECIFICATIONS

### Working Ranges ZX27-3



M1NC-12-005


Model	ZX27-3	
Type of Front-End Attachment	1.17 m (3 ft 10 in) Arm	1.35 m (4 ft 5 in) Arm
Type	ROPS Cab	ROPS Cab
A : Maximum Digging Reach	mm (ft-in) 4660 (15'4")	4830 (15'10")
B : Maximum Digging Depth	mm (ft-in) 2680 (8'10")	2860 (9'5")
C : Maximum Cutting Height	mm (ft-in) 4440 (14'7")	4550 (14'11")
D : Maximum Dumping Height	mm (ft-in) 3020 (9'11")	3140 (10'4")
E : Transport Height (Rubber Crawler)	mm (ft-in) 2390 (7'10")	2390 (7'10")
F : Overall Transport Length	mm (ft-in) 4520 (14'10")	4540 (14'11")
G : Minimum Swing Radius	mm (ft-in) 2030 (6'8")	2050 (6'9")
H : Boom-Swing Pivot Offset Distance	mm (ft-in) 70 (3")	70 (3")
I : Blade Bottom Highest Position (above ground level)	mm (ft-in) 360 (1'2")	360 (1'2")
J : Blade Bottom Lowest Position (above ground level)	mm (ft-in) 310 (1'0")	310 (1'0")
K : Offset Distance	mm (ft-in) L 500 (1'8") / R 655 (2'2")	L 500 (1'8") / R 655 (2'2")
Maximum Boom-Swing Angle	Degree L 71° / R 57°	L 71° / R 57°

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

## SPECIFICATIONS

### Bucket Types and Applications ZX27-3

Bucket	Bucket Capacity m <sup>3</sup> (yd <sup>3</sup> ) ISO (Heaped)	Bucket Width mm		Front-End Attachment	
		(With side cutter) mm (in)	(Without side cutter) mm (in)	0.93 m (3 ft 10 in) Arm	1.13 m (4 ft 5 in) Arm
Hoe Bucket	0.04 (0.052)	300 (12")	250 (10")	●	●
	0.055 (0.072)	350 (14")	300 (12")	●	●
	0.065 (0.085)	400 (16")	350 (14")	●	●
	0.080 (0.105)	450 (18")	400 (16")	●	○
	0.090 (0.118)	500 (20")	450 (18")	○	□
	0.100 (0.131)	550 (22")	500 (20")	□	□

 NOTE: (1) Symbols in the above table have the following meanings.

- : General excavating
- : Light duty excavating
- : Loading work

(2) 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<sup>3</sup> as a standard.*

*Loading work :*

*For loading operation of dried, loosened earth and sand.*

*Their bulk density shall be less than 1100 kg/m<sup>3</sup> as a standard.*

## SPECIFICATIONS

---

### Noise Level Results (2000/14/CE, art. VI)

ZX14-3, 16-3, 18-3

Canopy		Cab	
LWA (dBA)	LPA (dBA)	LWA (dBA)	LPA (dBA)
93	78	93	78

ZX27-3

Cab	
LWA (dBA)	LPA (dBA)
94	80


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  $2.5 \text{ m/s}^2$ .

Entire body: The acceleration to which the operator's entire body will be exposed is lower than  $0.5 \text{ m/s}^2$ .

 **NOTE:** *The acceleration is measured in accordance with ISO 2631/1; ISO 5349 and SAE J1166.  
Dozer blade on ground.*

## SPECIFICATIONS

### Special Specification

**⚠ WARNING: The standard machine is not suitable for craning (hooking) or object handling (hydraulic breaker, grapple, etc.) and therefore it is not allowed to do so.**  
**An attachment on the market may cause serious trouble, failure or danger because of unsuitability for the machine.**

But an attachment may be possible for use with following conditions, if its specification and suitability for the machine (hydraulic system, stability strength, heat balance, etc.) has been evaluated by test or actual results.  
 Consult your dealer for more detail.

#### (1) Allowable Lift Capacity (Standard Bucket)

Model	Arm	Allowable Lift Capacity at Hook on Bucket
ZX14-3	0.84 m	40 kg (90 lb)
	1.04 m	35 kg (80 lb)
ZX16-3	0.93 m	40 kg (90 lb)
	1.13 m	35 kg (80 lb)
ZX18-3	0.93 m	40 kg (90 lb)
	1.13 m	35 kg (80 lb)
ZX27-3	1.17 m	90 kg (200 lb)
	1.35 m	75 kg (165 lb)

#### (2) Allowable Object Handling Capacity (Without Bucket)

Model	Arm	Allowable Object Handling Capacity	Max. Pressure	Max. Flow
ZX14-3	0.84 m	105 kg (230 lb)	19.1 MPa (195 kgf/cm <sup>2</sup> )	28 L/min (7.4 US gal/min)
	1.04 m	95 kg (210 lb)	19.1 MPa (195 kgf/cm <sup>2</sup> )	28 L/min (7.4 US gal/min)
ZX16-3	0.93 m	105 kg (230 lb)	20.6 MPa (210 kgf/cm <sup>2</sup> )	32 L/min (8.4 US gal/min)
	1.13 m	95 kg (210 lb)	20.6 MPa (210 kgf/cm <sup>2</sup> )	32 L/min (8.4 US gal/min)
ZX18-3	0.93 m	105 kg (230 lb)	20.6 MPa (210 kgf/cm <sup>2</sup> )	32 L/min (8.4 US gal/min)
	1.13 m	95 kg (210 lb)	20.6 MPa (210 kgf/cm <sup>2</sup> )	32 L/min (8.4 US gal/min)
ZX27-3	1.17 m	185 kg (410 lb)	22.6 MPa (230 kgf/cm <sup>2</sup> )	50 L/min (13.2 US gal/min)
	1.35 m	160 kg (350 lb)	22.6 MPa (230 kgf/cm <sup>2</sup> )	50 L/min (13.2 US gal/min)

## OPTIONAL ATTACHMENT AND DEVICE

---

### 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.

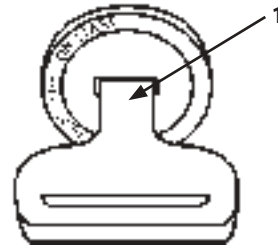
## OPTIONAL ATTACHMENT AND DEVICE

### 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.

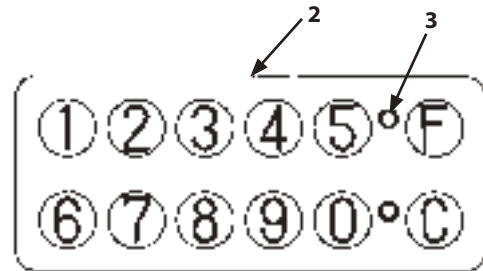
### Unlocking

- Turn the key switch (1) ON, and when all the numeric keys (2) are lit, input the password. When the buzzer sounds and the unlocking indicator (3) (green LED) is lit, unlocking is done, and the engine can be started.



M1M7-01-007

**IMPORTANT:** Inputting by the numeric keys (2) must be made within 15 seconds after they are lit. Later than that, all the numeric keys are unlit, and inputting is not accepted any longer. On that occasion, redo from the beginning by turning the key switch (1) OFF once.



M1M7-OP1-01-001

### Locking

- After the 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 the numeric keys (1 – 9, 0, F, or C). Besides, while the delayed locking timer is working, the unlocking indicator (3) keeps flickering.

## OPTIONAL ATTACHMENT AND DEVICE

### Numeric Keypad

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, the indicator 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, the indicator (6) is lit when the 1st and 3rd digits are inputted.

3. Numeric keys (2) (1 – 9 and 0)

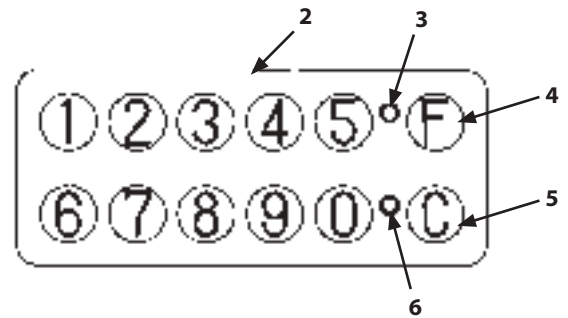
Used for inputting the password and making various other kinds of setting.

4. Key F (4)

Used for function setting.

5. Key C (5)

Used primarily for canceling input. Besides, at the time of numeral change, indication of the changed numerals is possible for confirmation sake.

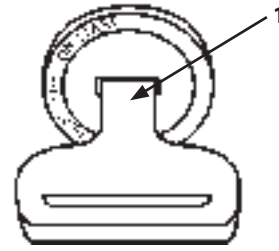


M1M7-OP1-01-001

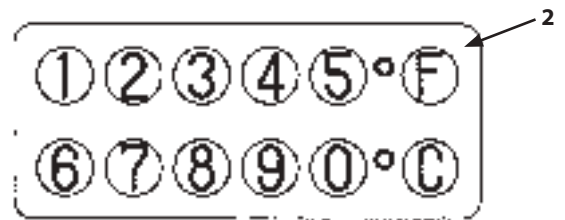
## OPTIONAL ATTACHMENT AND DEVICE

### Unlocking

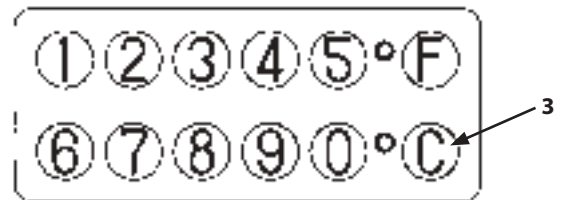
1. Turn the key switch (1) ON. Then, all the numeric keys (2) are lit.
2. Input the 1st digit of the four-digit password.
3. Similarly, input the 2nd digit.
4. Similarly, input the 3rd digit.
5. Similarly, input the 4th digit.
6. If the inputted numerals coincide with those of the password, the buzzer sounds twice, and unlocking is done. In this condition, when the key switch (1) is turned ON, the engine can be started.




M1M7-01-007



M1M7-OP1-01-002



M1M7-OP1-01-003

 **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 the key switch (1) OFF.*

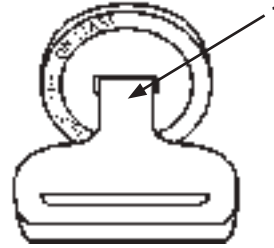


## OPTIONAL ATTACHMENT AND DEVICE

### Method of Changing Password

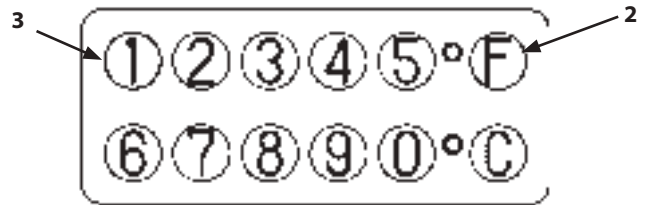
Cancel the registered password, and set a new password.

1. Turn the 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. The 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)



M1M7-01-007

When properly inputted, the 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.



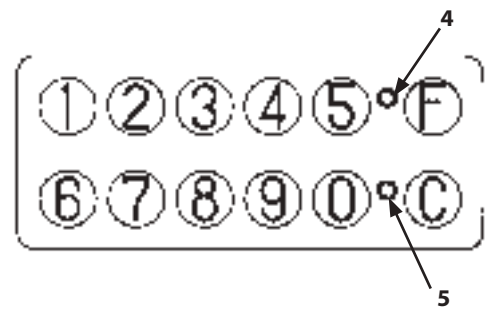
M1M7-OP1-01-004

**(IMPORTANT: Registration is not made at this stage.)**

In case the buzzer sounds eight times, and the two indicators (4) and (5) alternately flicker, the input is mistaken. Redo beginning with Item 3.

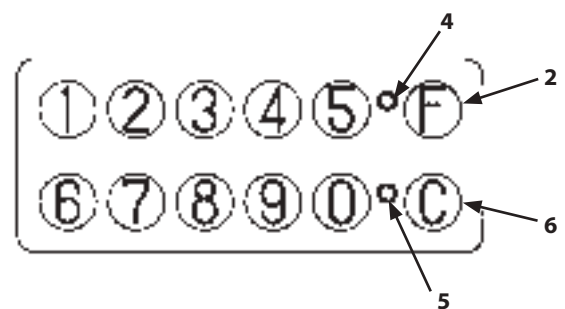
7. Push Key F (2) for more than two seconds. The buzzer sounds three times, and the password is registered.

This completes registration. The password is effective from the next input.



M1M7-OP1-01-005

**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 the key switch (1) OFF.



M1M7-OP1-01-005


## OPTIONAL ATTACHMENT AND DEVICE

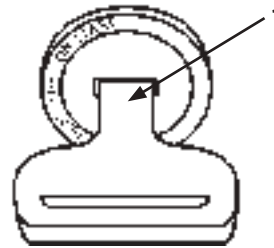
### Changing Delayed Locking Timer Setting

Change the delayed locking timer setting.

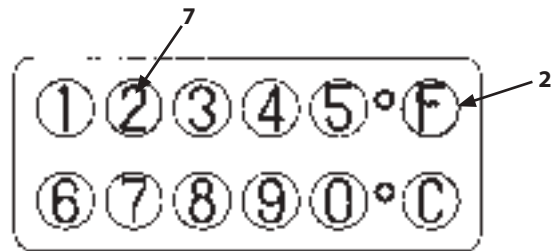
1. Turn the key switch (1) ON.
2. Unlock the numeric keys.
3. Push Key F (2) and Key (7) simultaneously for more than two seconds.
4. Two indicators (4) and (5) flicker simultaneously, and the buzzer sounds.
5. Input the numeric keys corresponding to the delayed locking timer setting.  
"List of Timer 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 minute  
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.

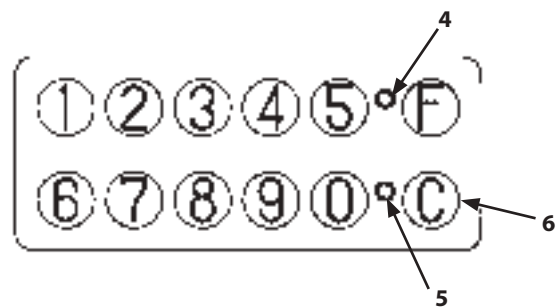
 **NOTE:** In case setting needs to be stopped in the midst, input Key C (6), or turn the key switch (1) OFF.



M1M7-01-007



M1M7-OP1-01-006



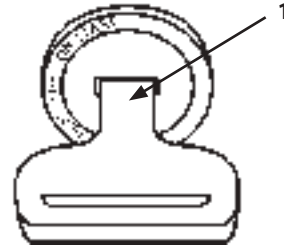
M1M7-OP1-01-005

## OPTIONAL ATTACHMENT AND DEVICE

---

### 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 the key switch (1) is turned OFF. From then on, warning by the horn or the buzzer is given unless the right password is inputted.



M1M7-01-007

### 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



## INDEX

<b>A</b>	
Adjust Operator's Seat .....	5-5
Adjust Track Sag (Rubber Crawler) and Check for Damage .....	7-67
Adjust Valve Clearance .....	7-76
Adjusting Operator's Seat .....	1-17
Air Cleaner .....	7-49
Alternator Indicator .....	1-6
AM/FM Radio Operation (Cab Equipped Machine, When Genuine Radio is Installed) .....	1-10
Auxiliary Pedal .....	5-3
Avoid Abusive Operation .....	5-12
Avoid Applying Heat to Lines Containing Flammable Fluids .....	5-29
Avoid Colliding Blade Against Rocks .....	5-16
Avoid Colliding Boom Cylinder with Track .....	5-16
Avoid Driving Bucket Teeth into Ground .....	5-12
Avoid Excavation Using Upperstructure and/or Boom Swing Power .....	5-13
Avoid Heating Near Pressurized Fluid Lines .....	5-29
Avoid High-pressure Fluids .....	5-25
Avoid Hitting Blade with Bucket .....	5-16
Avoid Injury from Back-over and Swing Accidents .....	5-14
Avoid Injury from Rollaway Accidents .....	5-13
Avoid Other Than Specified Machine Operations .....	5-14
Avoid Power Lines .....	5-17
Avoid Striking with Bucket .....	5-13
Avoid Tipping .....	5-16
Avoid Undercutting .....	5-15
<b>B</b>	
Battery .....	7-59
Before Starting Engine .....	3-1
Beware of Asbestos and Silicon Dust and Other Contamination .....	5-28
Beware of Exhaust Fumes .....	5-28
Blade and Track Width Control Lever Operation (ZX18-3) .....	5-6
Blade Lever .....	5-4
Blade Pins (ZX27-3) .....	7-18
Blower Operation .....	1-8
Boom Cylinder May Hit Blade .....	5-15
Boom-Swing Pedal .....	5-2
Brand Names of Recommended Oil and Lubricants .....	7-12
BREAK-IN .....	2-1
Breaking in New Machine .....	2-1
Bucket and Link Pins .....	7-18
Bucket Types and Applications ZX14-3 .....	12-3
Bucket Types and Applications ZX16-3 .....	12-6
Bucket Types and Applications ZX18-3 .....	12-9
Bucket Types and Applications ZX27-3 .....	12-12
<b>C</b>	
Cab Door Release Button (ZX27-3) .....	1-21
Cab Door Release Lever (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-21
Cab Heater Operation (Cab Equipped Machines) .....	1-8
Cab Light (Cab Equipped Machines) .....	1-20
Change Coolant .....	7-56
Change Engine Oil / Replace Engine Oil Filter .....	7-22
Change Hydraulic Oil .....	7-30
Check and Adjust Fan Belt Tension .....	7-53
Check and Replace Seat Belt .....	7-74
Check Bucket Teeth for Looseness and/or Wear .....	7-64
Check Coolant Level .....	7-53
Check Crankcase Breather .....	7-76
Check Fuel Hoses .....	7-48
Check Hoses and Lines .....	7-37
Check Hydraulic Oil Level .....	7-28
Check Injection Nozzle .....	7-76
Check Machine After Starting Engine .....	3-5
Check Radiator Cap .....	7-76
Check Starter and Alternator .....	7-76
Check Tightening Torque of Bolts and Nuts .....	7-77
Check Track Sag (Steel Crawler) (Optional) (ZX27-3 Only) .....	7-71
Check Water Separator .....	7-45
Clean Air Cleaner Element .....	7-49
Clean Air Conditioner Condenser .....	7-58
Clean Cab Floor (Cab Equipped Machines) .....	7-75
Clean Radiator .....	7-58
Clean Suction Filter .....	7-33
Clock Setting Procedure .....	1-12
COMPONENTS NAME .....	1-1
Confirm Direction of Machine to be Driven .....	5-10
CONSUMABLE PARTS LIST .....	8-1
Control Lever (ISO Excavator Pattern) .....	5-1
Control Lever Universal Joint .....	7-20
Control Levers .....	11-7
Coolant Temperature Gauge (ZX27-3) .....	1-7
Coolant Temperature Indicator .....	1-7
Cooling System .....	7-51
<b>D</b>	
Daily Inspection .....	7-6
Defroster Operation .....	1-8
Deletion of Preset Memory .....	1-12
Dig with Caution .....	5-17
Dispose of Waste Properly .....	5-31
Do Not Use for Craning Operations .....	5-18
Drain Fuel Tank Sump .....	7-46
Drain Hydraulic Oil Tank Sump .....	7-29
Drive Machine Safely .....	5-11
Driving in Water or on Soft Ground .....	4-6
DRIVING MACHINE .....	4-1
<b>E</b>	
Electrical System .....	7-59,11-5
Emergency Boom Lowering Procedure .....	5-25
Emergency Exit (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-15
Emergency Exit (ZX27-3) .....	1-16
Engine .....	7-21,11-2
Engine Oil .....	7-21

# INDEX

Engine Oil Pressure Indicator .....	1-7	Never Ride Attachment.....	S-4
Ensure Safety Before Rising from or Leaving Operator's Seat.....	S-5	Never Undercut a High Bank.....	S-16
Equipment of OPG .....	S-10	Noise Level Results (2000/14/CE, art. VI) .....	12-13
Evacuating in Case of Fire.....	S-27	<b>O</b>	
Extending / Retracting Blade Width (ZX18-3) .....	5-7	Opening/Closing Cab Front Window (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-13
<b>F</b>		Opening/Closing Cab Front Window (ZX27-3) .....	1-14
Fasten Your Seat Belt .....	S-5	Opening/Closing Engine Access Covers .....	7-3
Follow Safety Instructions.....	S-2	Opening/Closing Right Side Covers (ZX27-3) .....	7-5
Front Joint Pins (Incl. Swing Post Joint Pins).....	7-15	Opening/Closing Tank Covers (ZX27-3) .....	7-4
Fuel Gauge (ZX14-3, 16-3, 18-3).....	1-7	Operate Only from Operator's Seat .....	S-7
Fuel Gauge (ZX27-3).....	1-7	Operate with Caution .....	S-17
Fuel Level Indicator.....	1-6	Operating Backhoe.....	5-11
Fuel System.....	7-44	OPERATING ENGINE .....	3-1
<b>G</b>		OPERATING MACHINE .....	5-1
Grading Operation.....	5-12	OPERATOR'S STATION .....	1-3
Greasing.....	7-15	OPTIONAL ATTACHMENT AND DEVICE .....	13-1
<b>H</b>		Overheat Indicator.....	1-6
Handle Chemical Products Safely.....	S-31	<b>P</b>	
Handle Fluids Safely—Avoid Fires.....	S-19	Park Machine Safely.....	S-19
Heater Operation.....	1-8	Parking and Stopping on Slopes .....	4-7
Hour Meter.....	1-7	Parking on Slopes.....	4-7
Hydraulic System.....	7-27, 11-7	Part Name and Function.....	1-10
<b>I</b>		Pedals, Levers and Monitor Panel.....	1-3
Ignition Block System (Optional) .....	13-1	Periodic Replacement of Parts.....	7-8
Impossible to Start Engine.....	11-1	Pilot Control Shut-Off Lever .....	5-8
Inspect Machine .....	S-3	Pipings for Breaker and Crusher.....	5-19
Investigate Job Site Beforehand .....	S-9	Practice Safe Maintenance.....	S-21
<b>J</b>		Precautions for After Operating Machine.....	5-24
Jump Starting .....	S-7	Precautions for Blade Operation.....	5-5
<b>K</b>		Precautions for Breaker Operation.....	5-20
Keep Personnel Clear from Working Area .....	S-15	Precautions for Crusher Operation .....	5-23
Keep Riders Off Machine .....	S-7	Precautions for Lightning.....	S-18
Key Switch.....	1-5	Precautions for Operations.....	S-8
<b>L</b>		Precautions for Using Bucket Hook .....	5-15
Lifting Machine with Crane .....	6-5	Precautions for Welding and Grinding .....	S-29
Loading .....	6-2	Preheat Indicator .....	1-6
<b>M</b>		Prepare for Emergencies.....	S-2
MACHINE NUMBERS .....	1	Prepare Machine for Inspection/Maintenance.....	7-2
MAINTENANCE .....	7-1	Prevent Battery Explosions .....	S-30
Maintenance Guide .....	7-9	Prevent Burns.....	S-24
MAINTENANCE UNDER SPECIAL ENVIRONMENTAL CONDITIONS .....	9-1	Prevent Fires.....	S-26
Measure Engine Compression Pressure.....	7-76	Prevent Parts from Flying .....	S-23
Miscellaneous.....	7-64	Procedures .....	7-1
Mode Selection .....	11-6	Protect Against Flying Debris .....	S-18
Monitor Panel .....	1-6	Protect Against Noise .....	S-3
Move and Operate Machine Safely.....	S-6	Provide Signals for Jobs Involving Multiple Machines .....	S-10
<b>N</b>		<b>R</b>	
Never Position Bucket Over Anyone .....	S-15	Radio (ZX14-3, 16-3, 18-3 Cab Equipped Machines) .....	1-9
		Radio Operation.....	1-11
		Raise One Track Using Boom and Arm .....	4-4
		Recognize Safety Information .....	S-1
		Remove Paint Before Welding or Heating .....	S-30
		Removing Machine from Storage .....	10-2

## INDEX

---

Replace Air Cleaner Element .....	7-49	<b>V</b>	
Replace Bucket .....	7-66	Vibration Level.....	12-13
Replace Fuel Filter .....	7-47	<b>W</b>	
Replace Full Flow Filter .....	7-34	Warming Up in Cold Weather .....	5-10
Replace Pilot Filter .....	7-35	Warming Up Operation.....	5-10
Replace Rubber Hoses Periodically.....	5-25	Warn Others of Service Work .....	5-22
Replace Rubber Track.....	7-69	Wear Protective Clothing.....	5-3
Replacing Fuses .....	7-63	Working Ranges ZX14-3.....	12-2
<b>S</b>		Working Ranges ZX16-3.....	12-5
SAFETY .....	S-1	Working Ranges ZX18-3.....	12-8
SAFETY SIGNS .....	S-33	Working Ranges ZX27-3.....	12-11
Safety Transporting .....	S-20		
Seat Belt.....	1-19		
Seat Fore-Aft Adjustment.....	1-17		
Securing Machine to Trailer for Transportation.....	6-3		
Special Specification .....	12-14		
SPECIFICATIONS .....	12-1		
Specifications ZX14-3.....	12-1		
Specifications ZX16-3.....	12-4		
Specifications ZX18-3.....	12-7		
Specifications ZX27-3.....	12-10		
Starting Engine .....	3-2		
Station Presetting Procedure .....	1-12		
Stay Clear of Moving Parts .....	S-23		
Stopping Engine .....	3-7		
STORAGE .....	10-1		
Store Attachments Safely .....	S-24		
Storing Machine.....	10-1		
Support Machine Properly.....	S-22		
Swing Bearing .....	7-19		
Swing Internal Gear .....	7-20		
Switch Panel.....	1-4		
<b>T</b>			
Tidy Up Inside Operator's Space .....	S-4		
Tool and Operator's Manual Box.....	1-18		
Towing Machine .....	4-5		
Trailer Loading/Unloading.....	6-1		
Transmission .....	7-24		
TRANSPORTING .....	6-1		
Transporting by Road .....	6-1		
Travel Levers .....	4-1		
Travel Mode Switch (ZX16-3, 18-3, 27-3).....	4-3		
Travel Reduction Gear .....	7-24		
Traveling on Soft Ground .....	4-4		
TROUBLESHOOTING .....	11-1		
Tuning Procedure.....	1-11		
<b>U</b>			
Understand Signal Words.....	S-1		
Unloading .....	6-4		
Use Correct Track Shoe.....	5-13		
Use Handrails and Steps .....	S-4		
Using Booster Battery .....	3-6		
Using Rubber Crawler.....	5-17		





## 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 ZX14-3/ZX16-3/ZX18-3/ZX27-3**

**Operator's Manual (Original Instruction)**

Manual part number : EM1NC-EN3-1

Hitachi Construction Machinery (Europe) N.V.  
Address : Siciliëweg 5, 1045 AT, Amsterdam, The Netherlands  
URL : <http://www.hitachi-c-m.com>

