VERSION 07092023

POWER BY

A16SP CRAWLER

EXCAVATOROWNER’S

HANDBOOK

NOTE
PAGE

LIST OF ABBREVIATION

Abbreviations	Description
API	American Petroleum Institute
ASTM	American Society for Testing and Materials, USA
CECE	Committee for European Construction Machinery
DIN	German Institute for Standards, Federal Republic of Germany
EN	European Standard
FOPS	Falling Object Protection System
Front	“Front” means the front view towards the boom and dozer
Hi	High speed
ISO	International Organization for Standardization
JIS	Japanese Industrial Standard
L	Volume (Liter)
Lo	Low speed
L/min	Liter per minute
MIL	Military Standards
ROPS	Roll-over Protective Structures
rpm	Revolutions Per minute
SAE	Society of Automotive Engineering

GENERAL SYMBOLS

The instruments and operation elements have been marked with a series of symbols in order to simplify the operation of your excavator. These symbols are listed below with the respective descriptions.

3 Safety alert Symbol

T Warning lamp “Fuel level too low”

 System lamp

l Warning lamp “Engine Oil pressure”

g Warning lamp “Battery charge”

 Warning lamp “Auto Idle (AI) Lamp”

 Indicator lamp “Glow”

7 Working light switch

5 Horn

Z Wiper/Washer switch

R Diesel

E Hydraulic fluid

W Gear oil

 Grease

j Fast

k Slow

 Excavator - Overhead movement toward the front

 Excavator - Overhead movement toward the rear

æ Boom up

... Boom down

≥ Arm up

o Arm crowd

‘ Bucket crowd

“Bucket dump

” Boom swing (left)

’ Boom swing (Right)

 Dozer raise

 Dozer lower

 Operation direction of control lever

 Operation direction of control lever

V Read operator’s manual

C Engine stop control lamp

 Lock

 Unlock

 Reducing / Increasing track width

FOREWORD

ACHILLES MACHINERY AUSTRALIA

In this Operating Manual, the operation, repair, lubrication, maintenance, adjustment and troubleshooting of A18 hydraulic excavator are introduced so as to provide its operators with basic knowledge for efficient, economical and proper operating of the excavator.

Before operating the excavator, operators must read this Manual carefully and completely so as to guarantee correct and standardized operation. This manual will offer you step-by-step guidance on everyday safety routines.

The Manual only provides you with basic knowledge, operators, however, have to enhance their skills and proficiency and become familiar with the performance of the excavator through practice and experience. It is of utmost importance that every care is taken to ensure safety.

In this Manual, matters concerning techniques by "*".

We are working hard to improve our products, and increase their efficiency by continually improvement. Therefore, illustration may include optional equipment. ACHILLES MACHINERY AUSTRALIA products and specifications are subject to improvements and changes without notice.

Please keep this Manual within easy access in the cab for convenience of use.

3 SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.

3 **DANGER :** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

3 **WARNING :** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

3 **CAUTION :** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT : Indicates that equipment or property damage could result if instructions are not followed.

NOTE : Gives helpful information.

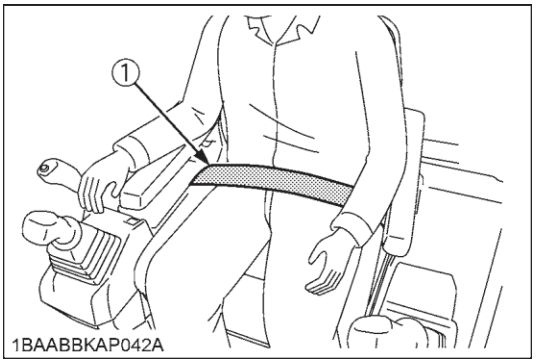
CONTENTS

3 SAFE OPERATION

The best insurance against accidents is to abide by the safety regulations.
Read and understand this section carefully, before operating the excavator.
Every user, however experienced, should carefully read and understand this section and those of the attachments and accessories before taking the excavator into operation. The owner is obliged to inform the operators of these instruction in detail.
Keep this manual in the storage place. (See "Keeping the Operator's Manual" in the BEFORE START section.)

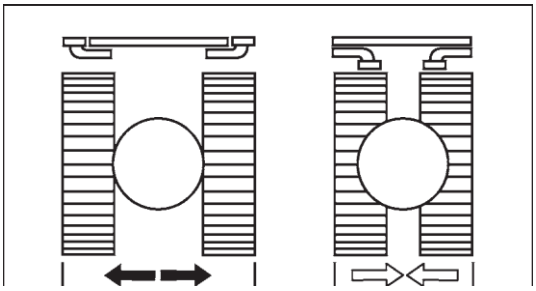
1. BEFORE OPERATION

1. Make yourself acquainted with the excavator and be aware of its limits. Read this operator's manual carefully before starting the excavator.
2. Obey the danger, warning and caution labels on the machine.
3. For your safety, ROPS/FOPS (Roll-Over Protective Structures, Falling Objects Protective Structures.) with a seat belt is installed by ACHILLES. Always use the seat belt when the machine is equipped with a ROPS/FOPS.
   If ROPS is loosened or removed for any reason, make certain all parts are reinstalled correctly. Tighten mounting bolts to proper torque. Do not use the seat belt if there is no ROPS.
   Do not modify structural members of ROPS by welding, drilling, bending, grinding or cutting, as this may weaken the structure. If any component is damaged, replace it. Do not attempt repairs.
4. The seat belt must be inspected regularly and replaced if frayed or damaged.



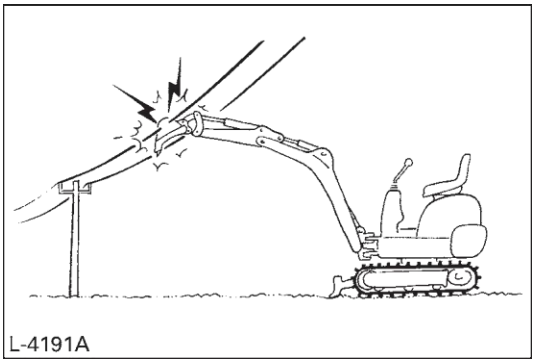
(1) Seat belt

6. Track can be set at the narrow width. (960mm) and the standard width. (1260mm).
   (for details see “OPERATION OF TRACK WIDTH CHANGE AND DOZER”)
   Do not operate in narrow track width 960mm, it makes risk of the excavator tipping over, operate always in standard track width 1260mm, except to pass through narrow space on a even ground.

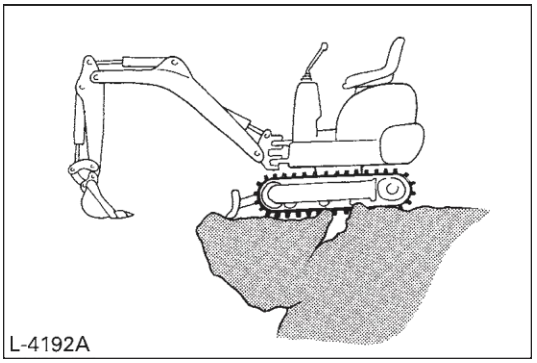


7. Do not use the excavator under the influence of alcohol, medication as well as other substances. Fatigue is also dangerous.
8. Check the surroundings carefully before using the excavator or when attachments are being attached.

- Pay attention to the overhead clearance with electric wires.

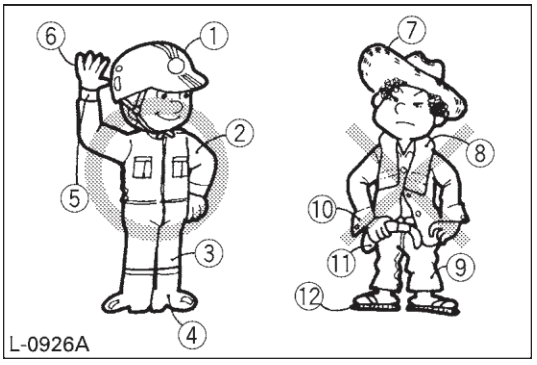


- Check for pipes and buried cables.
- Check for hidden holes, hindrances, soft underground and overhangs.



- During excavator use do not allow any persons within the working range.

9. Do not allow other persons to use the machine before having informed him on the exact operation and work instructions, and be assured that the operator’s manual has been read and understood.
10. Do not wear baggy, torn or too large clothing when working with the excavator. Clothing can get caught in rotating parts or control elements which can cause accidents or injuries. Wear adequate safety clothing, e.g. safety helmet, safety shoes, eye protection, ear protection, working gloves, etc., as necessary and as prescribed by law or statutes.

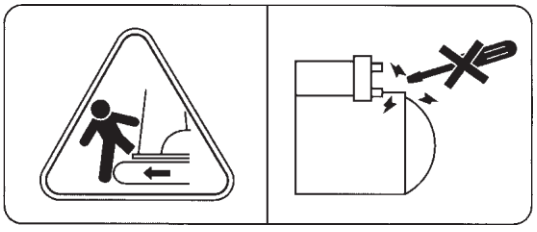


(1) Helmet
(2) Clothing fit for work
(3) Tight seams
(4) Good grip shoe wear
(5) Well-fitting cuffs
(6) Working gloves
(7) Straw hat
(8) Towel
(9) Baggy trousers
(10) Loose cuffs of the shirt
(11) Baggy shirt
(12) Rubber sandals

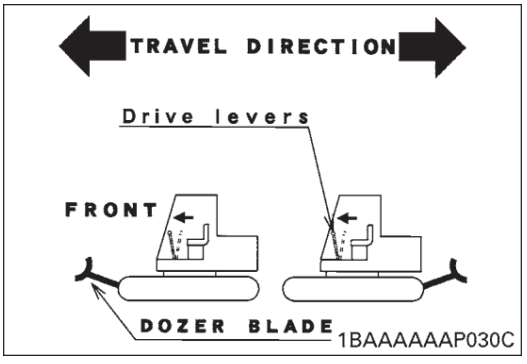
11. Do not allow passengers to get on any part of the excavator seat throughout operation.
12. Check mechanical parts for correct adjustments and wear. Exchange worn or damaged parts immediately.
13. Keep your excavator clean. Heavy soiling, grease, dust and grass can inflame and cause accidents or injuries.
14. Use only ACHILLES authorized attachments.
15. Before starting the excavator, be absolutely sure that the excavator has been filled with fuel, lubricated, greased and undergone other maintenance work.
16. Do not modify the excavator, otherwise it could lead to unforeseen safety problems.
17. Make sure attachments, particularly those utilizing quick attach systems, are securely mounted.

2. STARTING OF THE EXCAVATOR

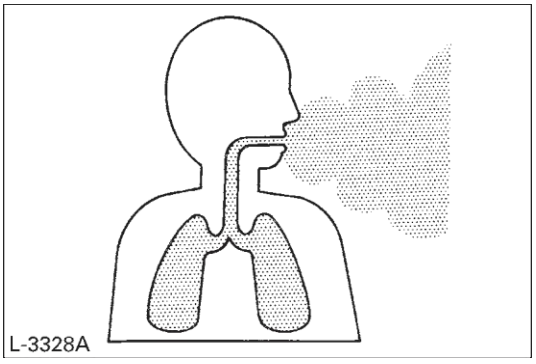
1. Get into and out of the machine safely. Always face the machine. Always use handrails and available steps and keep yourself well balanced. Do not hold any of the control Levers and switches. Do not jump on or off the machine, whether stationary or in motion.
2. Start and control the excavator only from the operator's seat. The driver should not lean out of his seat when the engine is running.
3. Before starting the engine, make sure that all control levers (including auxiliary control levers) are in their neutral positions.
4. Do not start the engine by jumping the starter connections. Do not try to circumvent using the starter switch, otherwise the engine could start suddenly and the excavator could move.



5. Make sure that the dozer is on the front side. (The dozer must be raised.) If the levers are activated with the dozer on the rear end, the driving direction is in the opposite direction of the drive levers.



6. Do not run the engine in closed or badly ventilated rooms. Carbon monoxide is colorless, odorless and deadly.



7. Keep all safety equipment and covers in place. Replace damaged or missing safety device.
8. Precautions against tipping over. In order to secure safe operation, keep away from steep slopes and embankments. Do not swing the bucket downwards. Lower the dozer during digging. Keep the bucket as low as possible while driving upwards. Turn slowly on slopes (do not fast). Do not keep the excavator near the edges of trenches and banks, as the earth can give away due to the weight of the excavator.
9. Watch out at all times where the excavator is being moved to. Keep an eye out for hindrances.
10. Keep enough distance from trench and bank edges.

◆ Safety for children

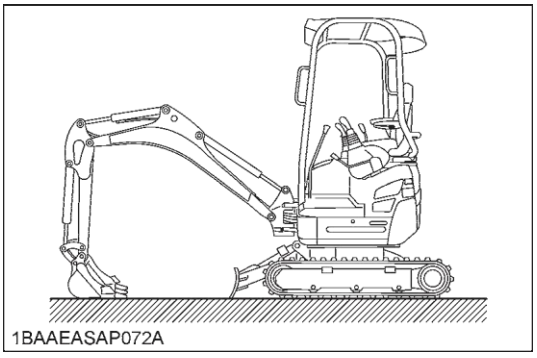
Tragedy can occur if the operator is not alert to the presence of children. Children generally are attached to machines and the work they do.

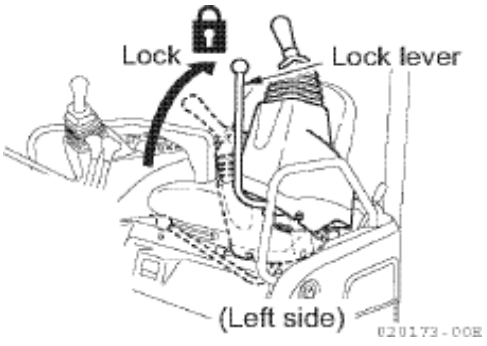
1. Never assume that children will remain where you last saw them.
2. Keep children out of the work area and under the watchful eye of another responsible adult.
3. Be alert and shut your machine down if children enter the work area.
4. Never carry children on your machine. There is no safe place for them to ride. They may fall off and be run over or interfere with your control of the machine.
5. Never allow children to operate the machine even under adult supervision.
6. Never allow children to play on the machine or on the attachments.
7. Use extra caution when backing up. Look behind and down to make sure the area clear before moving.
8. When parking your machine, if at all possible, park on a firm, flat and level surface; if not, park across a slope. Lower the bucket and dozer to the ground, remove the key place the control lock levers in the locked position from the ignition before you leave.

3. AFTER OPERATION

Before leaving the machine,

- Bring the excavator on a firm, flat and level surface.
- Lower the attachments and the dozer blade on the ground.
- Stop the engine.
- Lock all control levers.
- Remove the key.



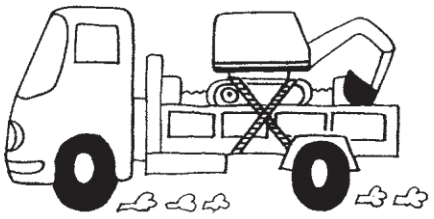


(1) lock lever for control lever (Left side)
(A) “Lock”
(B) “Unlock”

4. SAFE LOADING AND TRANSPORT OF THE EXCAVATOR

1. Observe all regulations concerning the transport of excavators on public roads.
2. Use adequately long and robust ramps when loading on a truck. (For details see “TRANSPORTING THE EXCAVATOR ONATRUCK”)
3. Do not change the running direction and to avoid a tipping over, do not try to swing the attachment crosswise to the loading ramps.
4. After loading of the excavator on a truck, engage the swing lock pin.
   Lower the attachment on the loading plane and release the pressure from the hydraulic system.
   Block the tracks with blocks and wire down the excavator. After loading the excavator on a truck, tie down the undercarriage of the excavator with a strong steel wire on the truck.

(”



L-4200A

5. Do not brake abruptly with the excavator loaded. Mortal accidents could happen.
6. If the excavator is used to tow another machine, the load must be smaller than the strength of the hook.
7. Do not use hooks on the roof of canopy for lifting the excavator.

Max. drawbar pull at coupling hook	32.3 kN (3290 kg)
Max. vertical load at coupling hook	2.7 kN (270 kg)

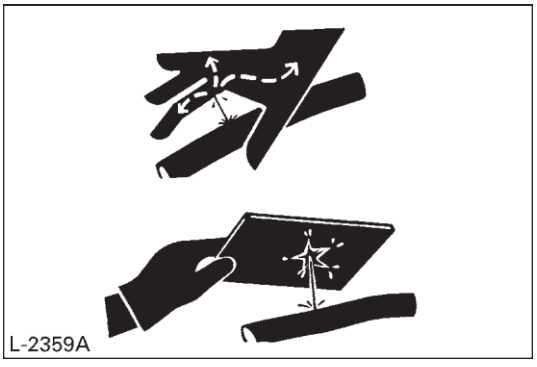
5. MAINTENANCE

Before doing maintenance work on the excavator, place the machine on a firm, flat and level surface, lower the attachments on the ground, stop the engine then remove the key and release the cylinder pressure by actuating the levers. When dismantling hydraulic parts, make sure that the hydraulic oil has cooled down sufficiently to avoid burns.

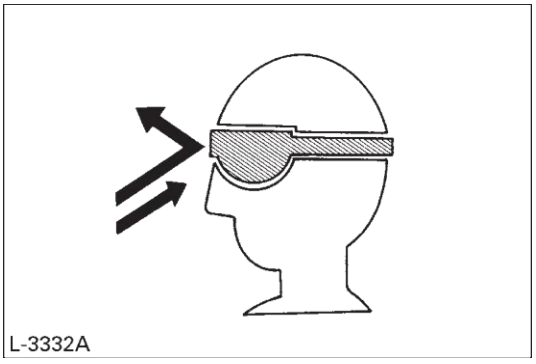
Start maintenance work carefully, e.g., loosen screws slowly so that oil will not squirt out.

1. Before doing work on the engine, the exhaust system, the radiator and the hydraulics, let the excavator cool down sufficiently.
2. Turn off the engine at all times when filling with fuel. Avoid spilling and over-filling of fuel.
3. Smoking is prohibited while tanking and handling the battery! Keep sparks and fire away from the fuel tank and battery. Flammable gases escape from the battery, especially during charging.
4. Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.
5. Read and follow “STARTING WITH AN AUXILIARY BATTERY” in “OPERATION OF THE ENGINE”, when starting with an auxiliary battery.

6. To avoid short-circuiting the battery, always remove the earth cable first and attach the plus cable first.
7. Keep a first-aid box and a fire extinguisher at hand at all times.
8. Do not open the radiator cap before the radiator has cooled down sufficiently. First loosen the cap to the first stop and allow the system enough time to release the remaining pressure. Then loosen the cap completely.
9. Leaking hydraulic fluid has enough pressure to penetrate the skin and cause serious injuries. Leakages from pin holes can be totally invisible. Do not use the bare hand for checking on possible leakages. Always use a piece of wood or cardboard. It is strongly recommended to use a face mask or eye protection. Should injuries occur with leaking hydraulic fluid, contact a doctor immediately. This fluid can cause gangrene or serious allergic reactions.

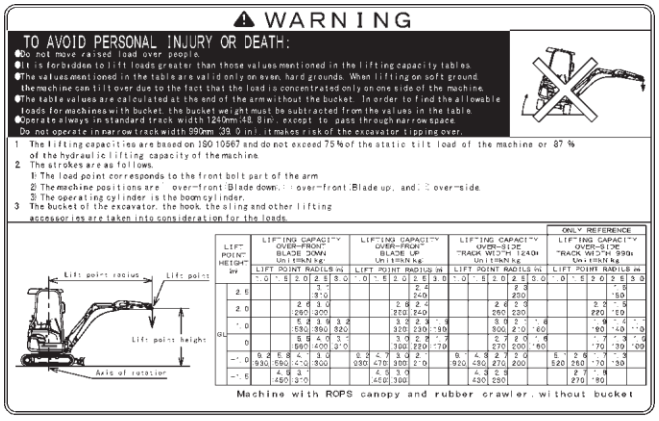

L-2359A

10. To avoid leakage of battery acid which contains heavy metals, do not throw the battery away.
11. Observe all laws and regulations concerning the disposal of used oil, coolants, solvents, hydraulic fluids, battery acids and batteries.
12. To avoid fire, do not heat the hydraulic components (tanks, pipes, hoses, cylinders) before they are drained and washed.
13. Use a face mask or eye protection to protect the eyes and respiratory system against dust and other foreign particles.

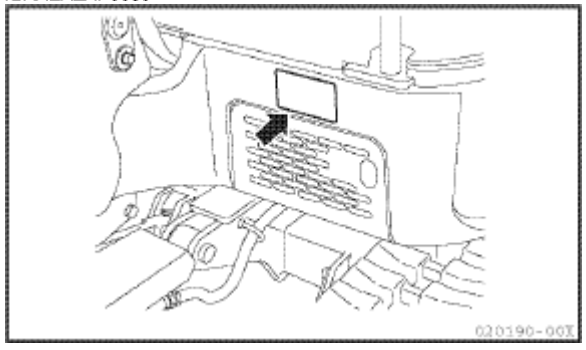

L-3332A

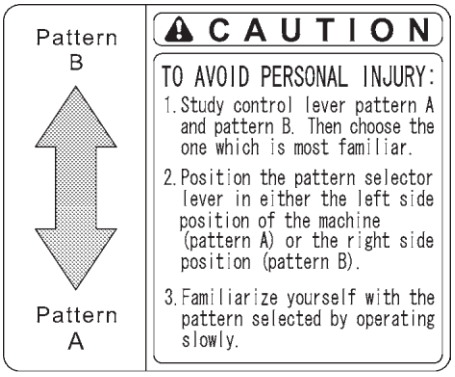
14. Securely support excavator with stands or suitable blocking before working underneath. For your safety, do not work under any hydraulically supported devices. They can settle, suddenly leak down, or be accidentally lowered.
15. Do not crawl under the excavator if the excavator is only supported by the boom and arm or the dozer. The excavator can tip over or lower itself due to hydraulic pressure loss. Always use safety struts or other appropriate supports.
16. ACHILLES uses no parts which are lined with asbestos. Do not use these kinds of parts even if they can be installed.

6. DANGER, WARNING AND CAUTION LABELS



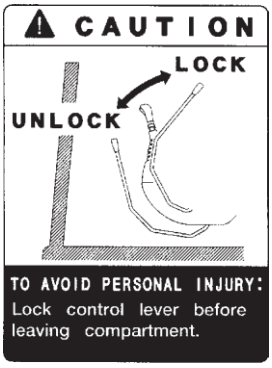
1BAAEAZAP0050





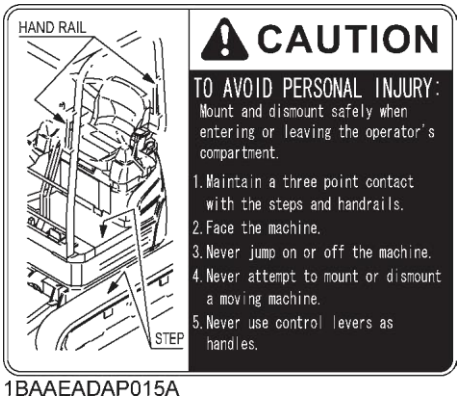
1BAAEADAP014A

(1) Code No. RC418-5753-2



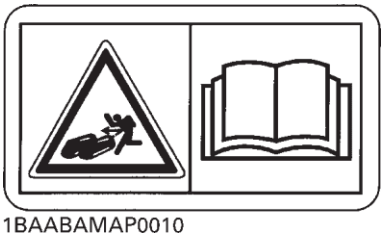
1BAAAARAP0450

(2) Code No. RA228-5762-1

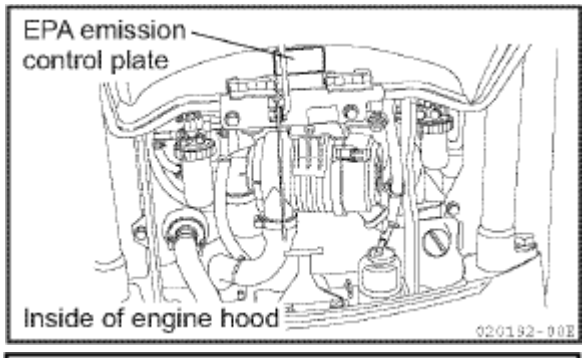


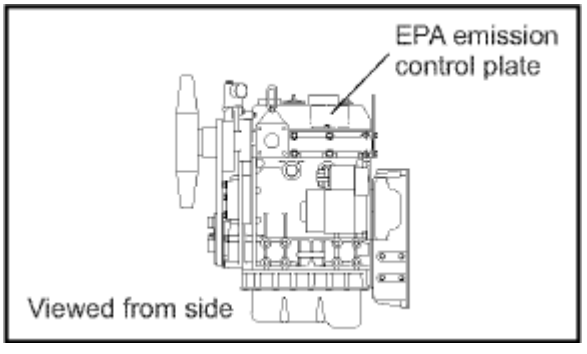
1BAAEADAP015A

(3) Code No. RD517-5795-2



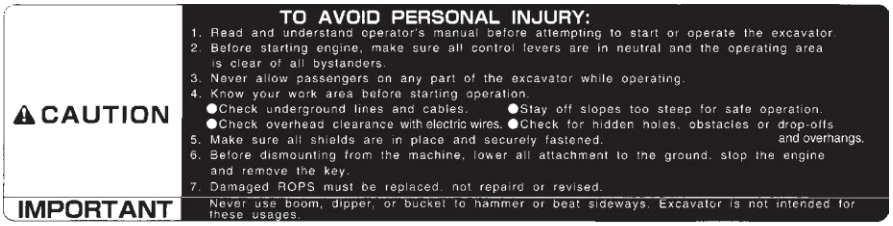
1BAABAMAP0010





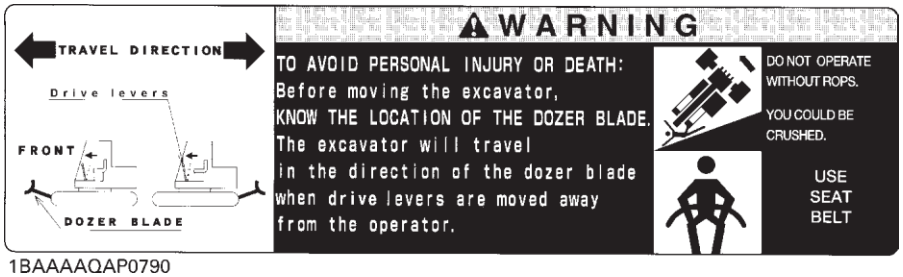
[Both sides]

(1) Code No. RC418-5728-4



1BAAAAQAP0780

(2) Code No. RC418-5727-4

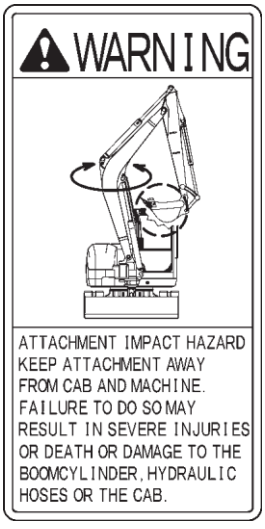


1BAAAAQAP0790

(3) Code No. RD809-5736-1

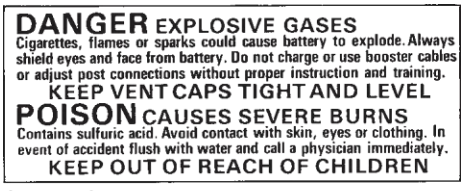
1BAAGAAAP1330

(4) Code No. RD809-5738-2



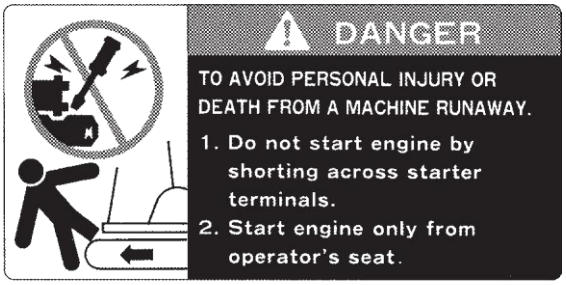
1BAAAARAP1000

(5) Code No. RA228-5751-2



1BAAAAQAP0960

(1) Code No. RC108-5718-1



1BAAAAQAP0910

(2) Code No. RA228-5728-2
[Both sides]

1BAAAAQAP0900

(3) Code No. RD148-5736-1
Diesel fuel only No fire

LOW SULFUR FUEL OR
ULTRA LOW SULFUR
FUEL ONLY

1BAAGAAAP1000

(4) Code No. RA228-5776-1

1BAAEADAP016A

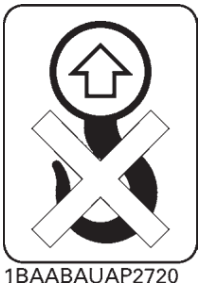
(6) Code No. RC108-5796-1
[Both sides]

1BAAAAQAP0940

(5) Code No. 68328-5735-1 [Both sides]

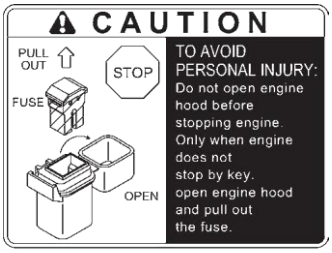
1BAAAAQAP0930

(7) Code No. RB419-5796-2
[Both sides]



1BAABAUAP2720

(1) Code No. RB238-5737-1



1BAAEADAP013A

(2) Code No. RC418-5737-2

1BAAAAQAP0880

(3) Code No. TC030-4958-1

1BAAAAQAP0860

(4) Code No. RC108-5754-1

1BAAAAQAP0890

7. CARE OF DANGER, WARNING AND CAUTION LABELS

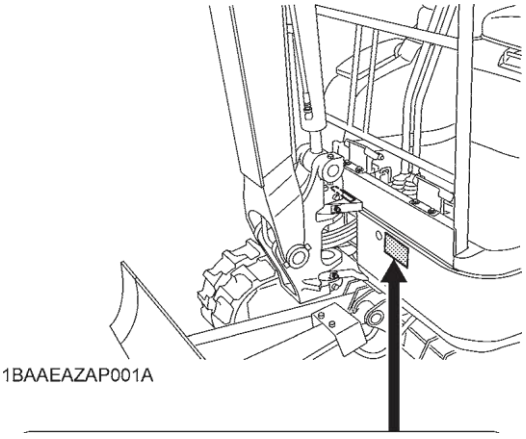
(1) Keep danger, warning and caution labels, clean and free from obstructing material.
(2) Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
(3) Replace damaged or missing danger, warning and caution labels with new labels from your ACHILLES dealer.
(4) If a component with danger, warning and caution label (s) affixed is replaced with new part, make sure new label (s) is (are) attached in the same location (s) as the replaced component.
(5) Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

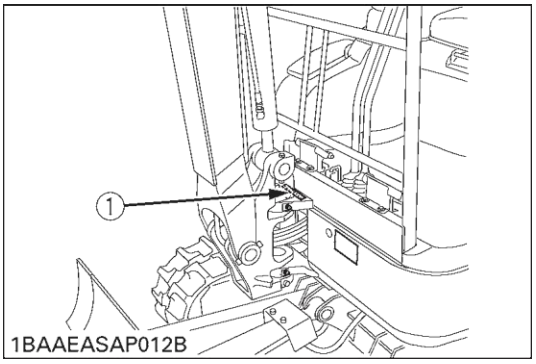
DEALER SERVICE

Your ACHILLES dealer is always ready to help so that your excavator offers the best performance. After having carefully read this manual, you will realize that much of the routine maintenance can be done by yourself. Your ACHILLES dealer is responsible for servicing and the delivery of spare parts. When ordering spare parts from your ACHILLES dealer, always mention the serial number of the excavator and the engine.
Note these numbers right away in the supplied lines.

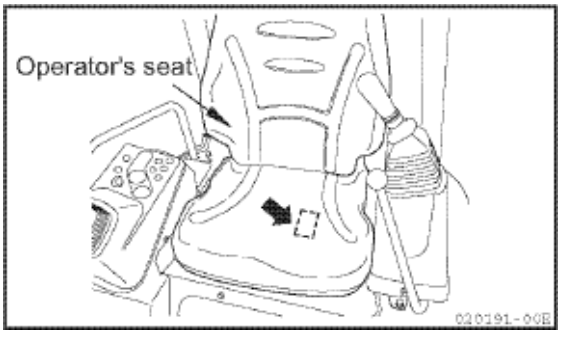
	Model	Serial No.
Excavator	_____	_____
Engine	_____	_____

Dealer's name
(To be filled in through the owner)





(1) Serial No.



(1) Engine serial No.

TECHNICAL DATA

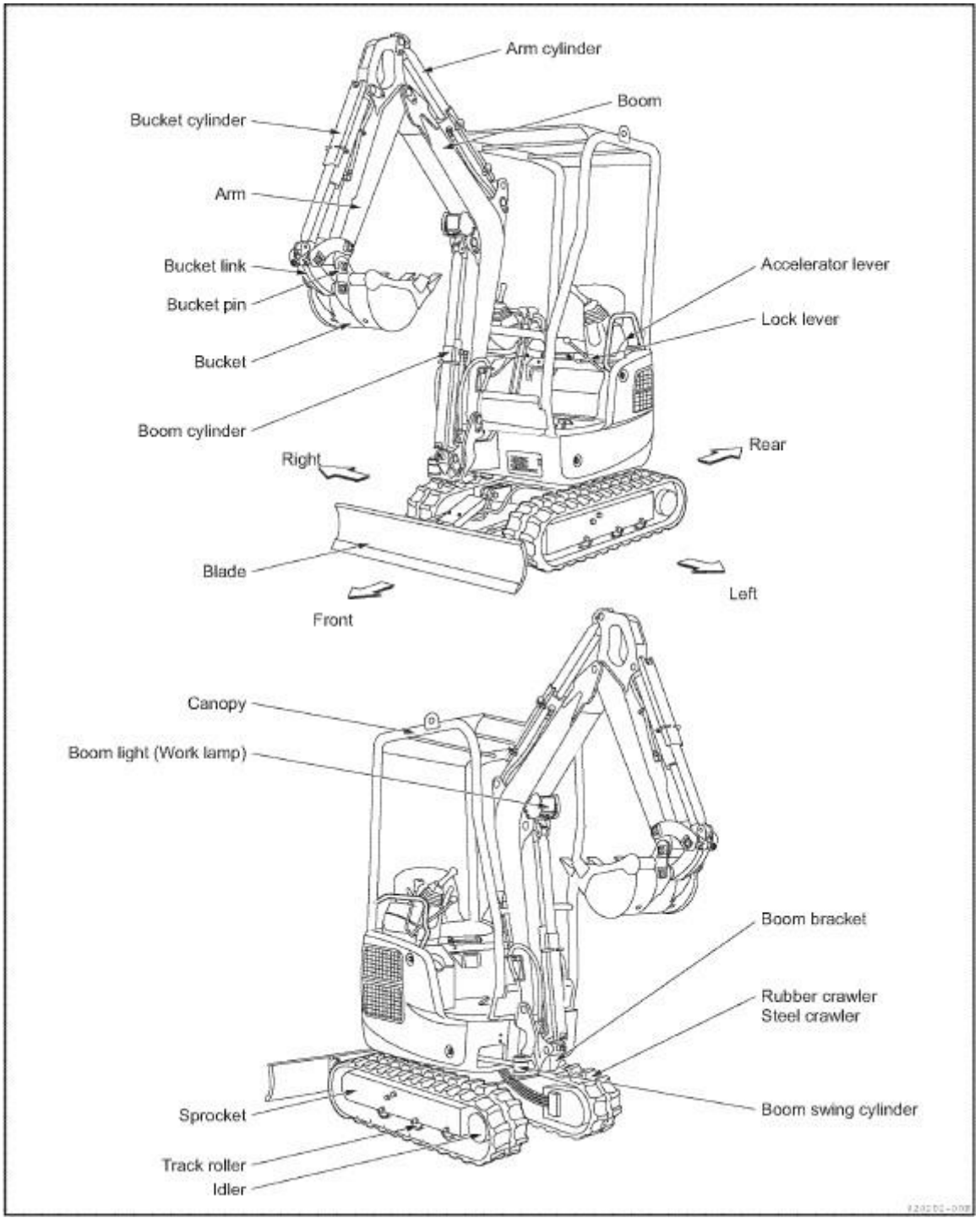
			ACHILLES EXCAVATOR
Model name			A16SP
Type			Canopy
Operating weight (including operator's)		kg	1600
Engine	Type		Water cooled diesel engine with 3 cylinders
	Model name		YANMAR 3TNV70
	Total displacement cc (cu.in)		898 (54.8)
	Engine power SAE gross	kW(Hp)	15.5 (20.8) / 15.2 (20.4)
	Rated speed	rpm	2300
Performance	Unit swing speed	rpm	9.1
	Travel speed	Fast (km/h)	(2.8)
		Slow (km/h)	(1.8)
	Ground pressure (With operator)	psi (kPa) [kgf/cm²]	3.7 26 [0.26]
	Climbing angle	%(deg)	58 (30)
Dozer	Width X Height	(mm)	(960/1260 X 2340)
Boom swing angle		Left deg (rad)	65 (1.13)
		Right deg (rad)	58 (1.01)
Pressure connection for attachments	Max. displacement (Theoretical)	US gal (L)/min	7.13 (25)
	Max. pressure	psi (MPa) [kgf/cm²]	2702 (18.6) [190]
Fuel tank capacity		US gal (L)	5.0 (19)

NOTE:

- Above dimensions are based on the machine with rubber trucks and JPN bucket.
  JPN = made in Japan
- Specifications subject to change without notice.

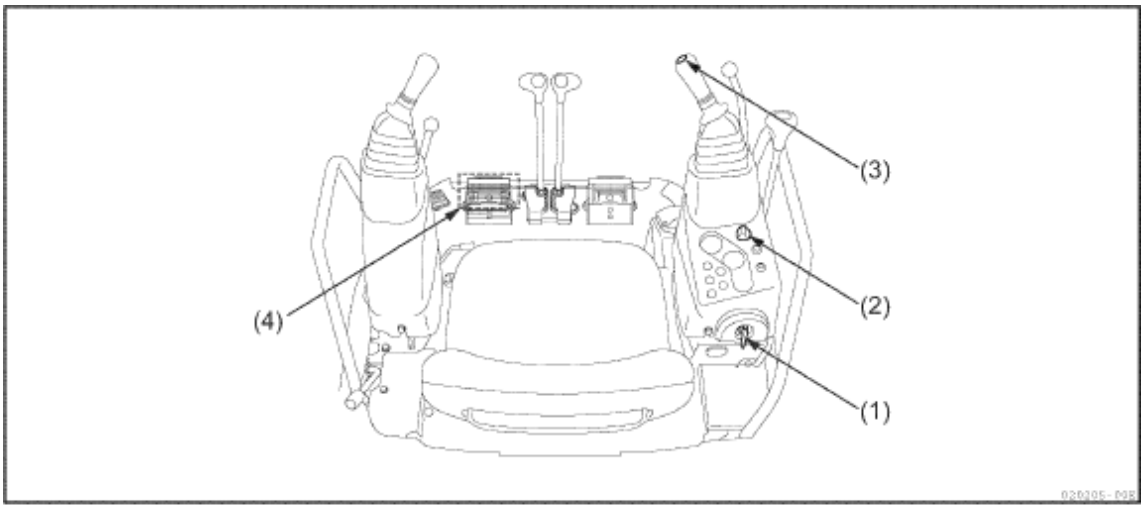
* With unloaded digging bucket.
* Firm compacted soil.
* Operators must exercise extra caution and follow instructions in the operator's manual.
* Worse condition or heavier attachment to the above will decrease climbing angle.

DESCRIPTION OF MACHINE PARTS



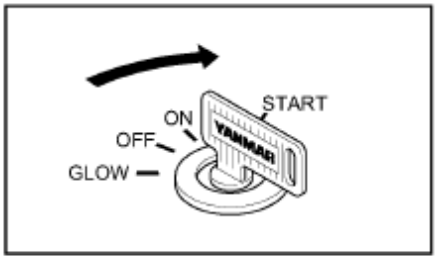
INSTRUMENT PANEL AND CONTROL ELEMENTS

■ Instrument Panel, Switches



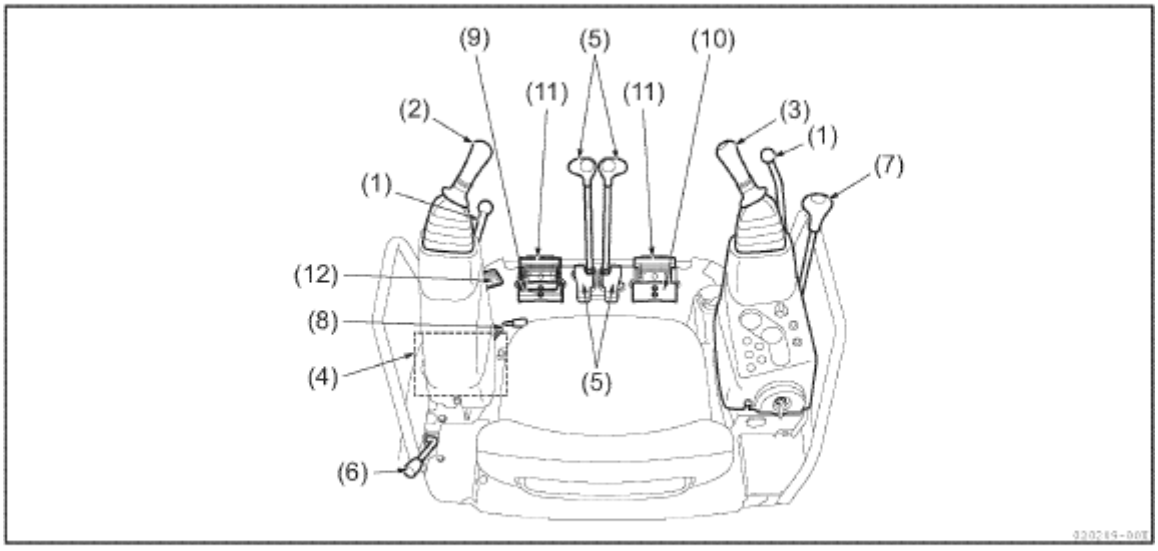
(1) Starter switch

Use this switch to start and stop the engine.



- OFF position
  Turn the starter switch key to "OFF" to stop the engine and disconnect electrical circuit or remove the starter switch key.
- ON position
  Turn the starter switch key to "ON" to connect the electrical fuel solenoid circuit, the electrical charging circuit and the lamp circuit. (Keep the starter switch key in this position while running the engine.)
  When the engine is not running and the starter switch key is in the "ON" position, a buzzer will sound.
  Turn the switch to the "OFF" position to stop the buzzer.
- START position
  Turn the starter switch key to "START" to start the engine. Release the starter switch key after the engine is started and it will return to the "ON" position.
- GLOW position
  Turn the starter switch key to activate the preheating circuit and warm up intake air to make engine starting easier in cold weather. (Set the starter switch key to this position when the outside temperature is low.)

12-3. Control levers and pedals



(1) Lock levers

The lock levers lock the implement operation and the swing operation. When the left lock lever is pulled back, the control lever stand on the left side comes up. However, when the right lock lever is pulled back, the control lever stand on the right side does not come up.

⚠ WARNING

- **When leaving the operator's seat, be sure to place the bucket on the ground and move all lock levers to the lock positions. Keep in mind that if you should touch an unlocked control lever inadvertently, a serious accident could occur.**
- **Be sure to place the lock levers securely in the lock position. If not, they could slip out of the lock position. Thus always make sure that the lock levers are in the lock position as illustrated in the figure at the right.**

- **When pulling the lock levers back, be careful not to touch a control lever.**
- **Remember that if the lock lever is not pulled back fully, the implement will not be locked.**

IMPORTANT

This machine employs the hydraulic locking system. If the lock levers are in the lock position, all the hydraulic cylinders for the boom, arm, bucket, boom swing and P.T.O. as well as the swing motor and travel motors will not operate although the right and left control levers and control pedals are free to move.

BEFORE START

DAILY CHECKS

In order to avoid damage, it is important to check the condition of the excavator before starting.

3 CAUTION

To avoid personal injury:

- **Do maintenance work on the excavator only on even ground with the engine off and the safety devices in the “Lock” position.**

Checks

Walk around the excavator and check for visual damage and wear.
Check coolant level. (See regular checkpoints in “MAINTENANCE”.)
Check fuel level.
Check engine oil level.
Check hydraulic fluid level.Check air filter for clogging.
Check all control lamps, indicators, engine rpm's counter and hour meter.
Check the light system.
Check the seat belt and the Rops/Tops safety device.
Check the condition of the danger, warning and caution labels. (See "DANGER, WARNING AND CAUTION LABELS" in "SAFE OPERATION" .)

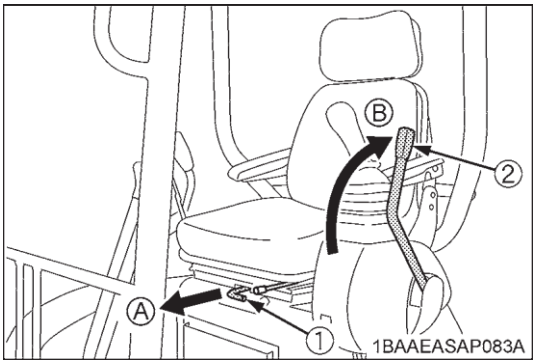
TILTINGTHE SEAT

3 CAUTION

To avoid personal injury:

- **Lock the lever for attachment control when tilting the seat.**

To tilt the seat forward, pull the seat tilting lock lever and tilt the seat forward.



(1) Seat tilting lock lever
(2) Lock lever for “Lock “attachment control
(A) “Tilting forward”
(B)

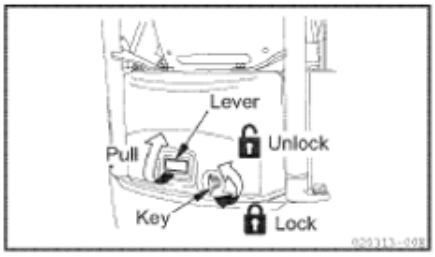
12-4. Engine hood

⚠ WARNING

Do not open the engine hood while the engine is running. Check and service the engine after it has been stopped and temperatures have cooled.

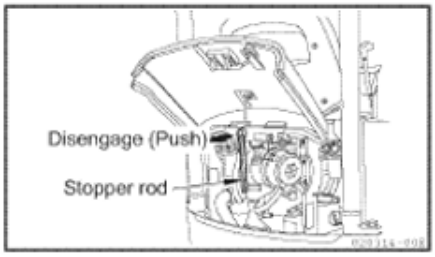
(1) Opening the engine hood

1) Insert the starter switch key and turn it counterclockwise to unlock the engine hood.
2) Pull the engine hood lever to release the engine hood, and it will open.
3) When the engine hood is fully open, lock it in that position with the stopper rod.



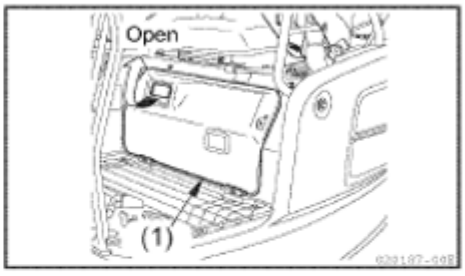
(2) Closing the engine hood

1) Lift the engine hood slightly and pull the stopper rod back to disengage it.
2) Close the engine hood and press it until it clicks shut.
3) Turn the starter switch key clockwise to lock the engine hood.

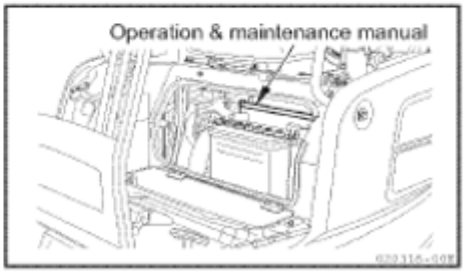


12-5. Storage space for the operation & maintenance manual

The storage space for the operation & maintenance manual is provided under the operator's seat.
Pull the lever up to open the cover (1).



The storage space is behind the battery.
To close the cover, push it until it clicks shut.

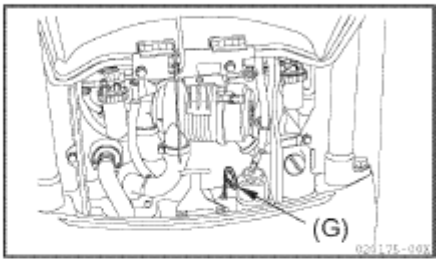


■ Checking and replenishing the engine oil

⚠ WARNING

- **At operating temperature, oil and dipstick areas are hot.**
  Do not allow hot oil or hot components to contact the skin, to prevent bodily injury.
- **Check oil level and replenish oil after engine has cooled down.**

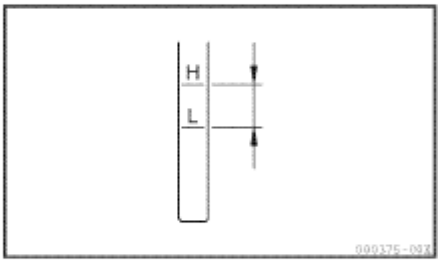
1) Open the engine hood and securely lock it in that position with the stopper rod.



2) Pick up the dipstick (G) and wipe it with a rag to remove oil deposits.

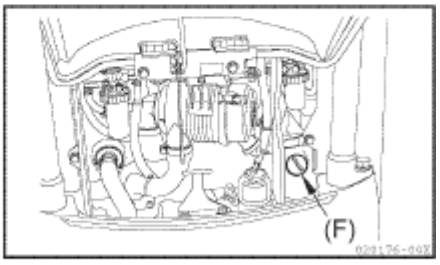
3) Fully insert the dipstick (G) into the dipstick tube, then draw it out.

4) If the dipstick (G) is wet above the midpoint between the H and L marks, the engine oil level is appropriate. If the oil level is below the midpoint between the H and L marks, add engine oil through the oil supply port (F). For the quality of the engine oil to be used, refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range".



5) If the engine oil level is above the H mark, remove the excessive amount of oil through the drain plug (P), then recheck the engine oil level.

6) After verifying that the amount of engine oil is appropriate, securely retighten the oil supply port cap and close the engine hood.

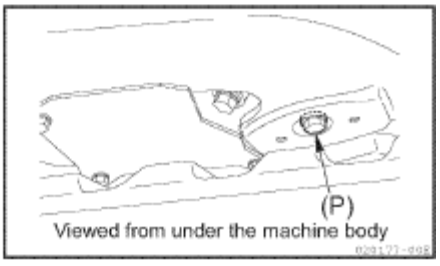


Note :

When checking the engine oil level after starting up the engine, stop the engine and allow more than 15 minutes for the engine to cool down.

If the machine is slanted, reposition the machine to ensure it is level before checking the engine oil level.

Keep in mind that the excess engine oil must not be disposed of on the ground or the road.



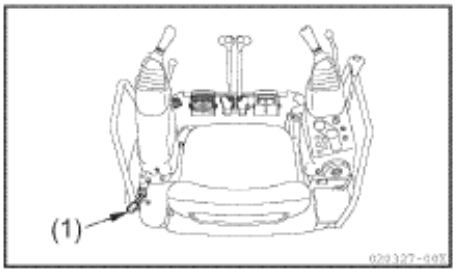
OPERATION OF THE ENGINE

⚠ WARNING

- **Emergency stop.**
  If abnormal operation occurs, turn the starter switch key to the "OFF" position, to shut off the electrical system and the engine. Then ask your dealer to check the machine.
- **Be sure to warm up the engine. If you operate the implement without full warm-up, the machine may not respond or operate properly, especially in cold weather.**

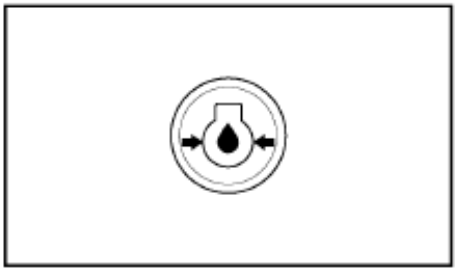
IMPORTANT

- **The proper hydraulic oil temperature is between 122°F and 176°F (50°C and 80°C).**
  If you have to operate the machine at a low hydraulic oil temperature, increase the hydraulic oil temperature to about 68°F (20°C) before operating the implement.
- **In the event that you have to operate any control lever at a temperature lower than 68°F (20°C), operate it gently.**
- **Do not accelerate the engine rapidly until the engine warms up.**

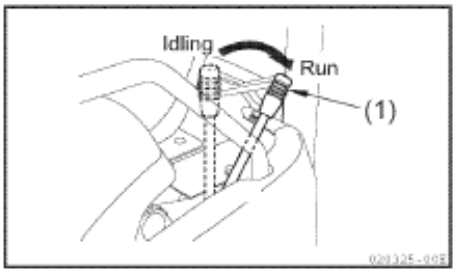


After starting the engine, do not start operating the machine immediately but follow this procedure:

1) Idle the engine, to check that the engine oil pressure alarm lamp is off.



2) Pull the accelerator lever (1) to the midpoint between the "IDLING" and "RUN" positions, and run the engine with no load at medium speed for approximately five minutes.



3) Unlock the lock levers, and lift the bucket from the ground.

4) Operate the bucket and arm control levers slowly to move the bucket and arm cylinders to their stroke ends. Operate the bucket for thirty seconds and the arm for thirty seconds alternately for approximately five minutes to increase the hydraulic oil temperature to 68°F (20°C).

IMPORTANT

When moving the implement, be careful not to bump it against the machine or the ground.

5) After warming up the engine, check that the gauges and the monitor are in the following status. If there is anything abnormal, take corrective action.

- Fuel meter (1), water temperature meter (2) and hourmeter (3) ..... Normal
- Engine oil pressure alarm lamp (4) ..... Off
- Battery charge alarm lamp (5) ..... Off
- Water temperature alarm lamp (6) ..... Off

6) Check the exhaust gas color, the machine noise, and the vibration level for abnormality. If something is abnormal, take corrective action.

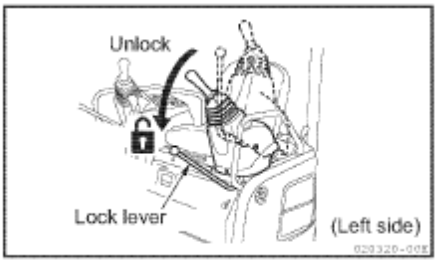
7) Set the lock levers to the "LOCK" position to confirm that the implement cannot be operated and the upperstructure cannot be swung with the left and right control levers.

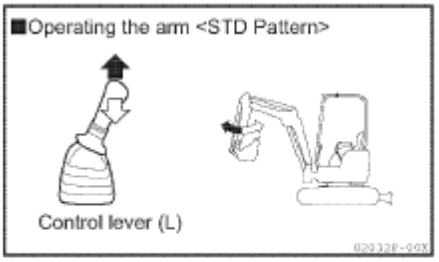
8) Unlock the lock levers and operate the control levers to check that the implement can be operated and the upperstructure can be swung normally. If something is abnormal, take corrective action.

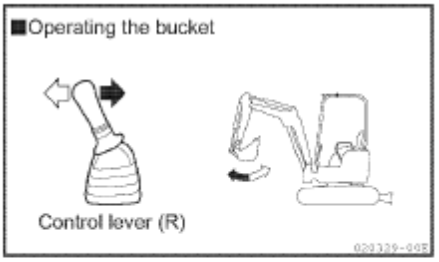
9) Check that the swing brake valve operates normally. If something is abnormal, take corrective action.

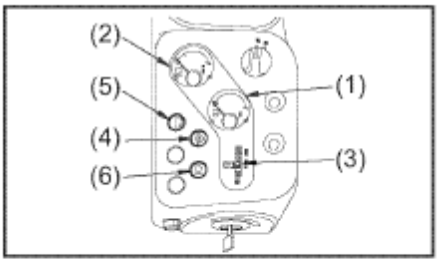
10) Check that no abnormal noise is heard from the hydraulic pump. If any abnormal noise is heard, take corrective action.

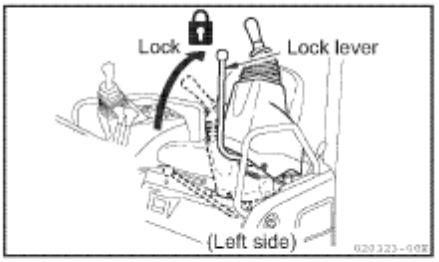
Ask your dealer to resolve any problems identified in steps 1) to 10) above.





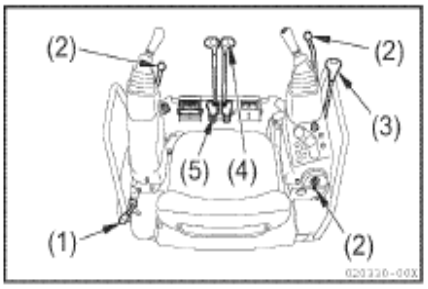




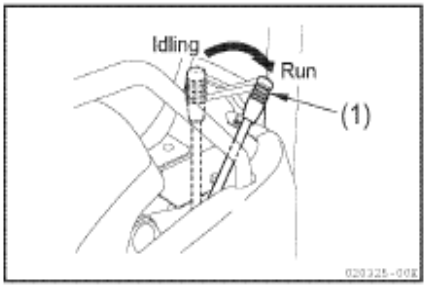


⚠ WARNING

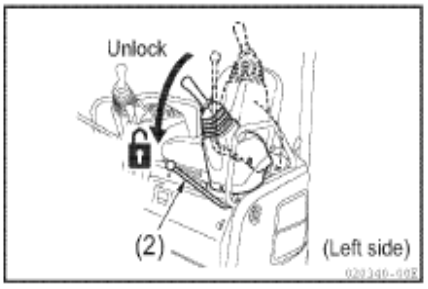
- **Always check the position of the blade before operating the travel levers and pedals.**
  When the blade is in the rear, the travel levers and pedals operate in the reverse of the normal operation.
- **A signal person should be in attendance to give signals at sites which are dangerous or not clearly in view of the operator.**
- **Clear all people from the working area.**
- **Sound the horn before beginning travel, to alert the people near the machine.**
- **Clear obstacles from the path of the machine.**
- **Do not operate the travel levers and pedals rapidly while the engine is running at high speed. Otherwise, the machine may move unexpectedly, causing a serious accident.**



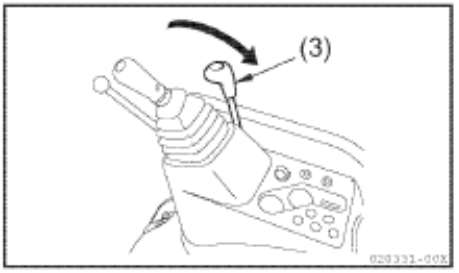
1) Pull the accelerator lever (1) back to the "RUN" position to increase the engine speed.



2) Unlock the lock levers (2), and retract the implement to raise it 16 to 20 in. (40 to 50 cm) above the ground.

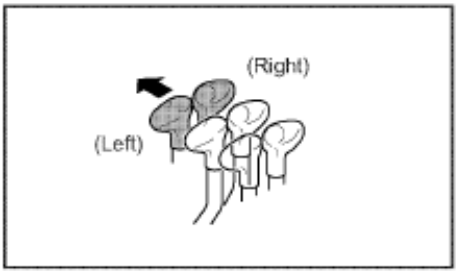


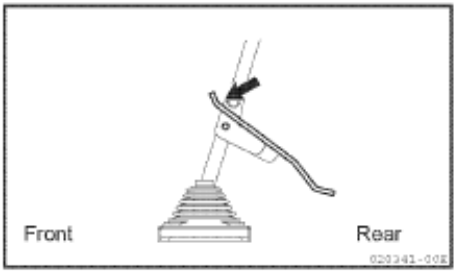
3) Pull back the blade lever (3) to raise the blade.



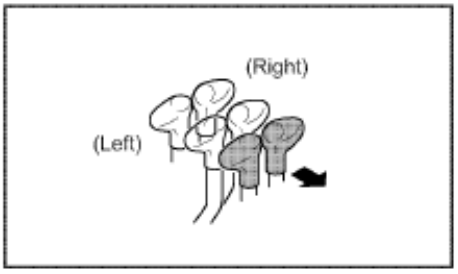
4) Operate the left and right travel levers (4) or pedals (5) as follows:

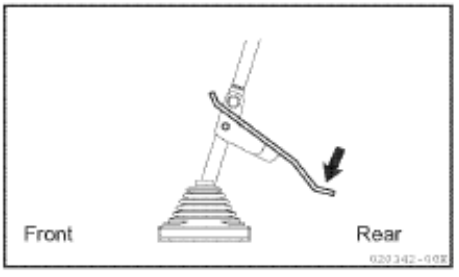
- When the blade is in the front of the machine;
  Slowly push the travel levers (4) forward or step on the front of the pedals (5) to move the machine forward.





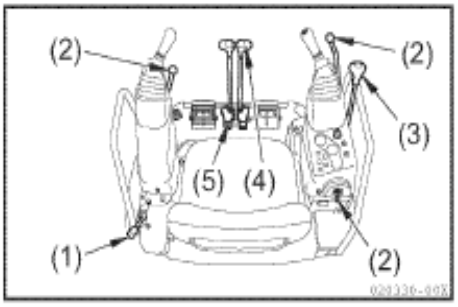
- When the blade is in the rear of the machine;
  Slowly pull the travel levers (4) back or unfold the extension plate to step on it in order to move the machine forward.



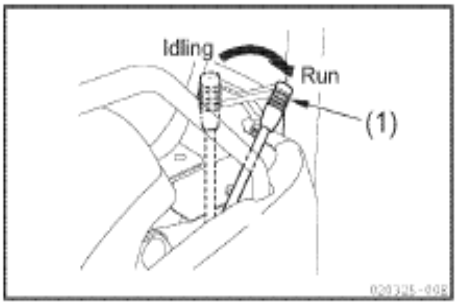


⚠ WARNING

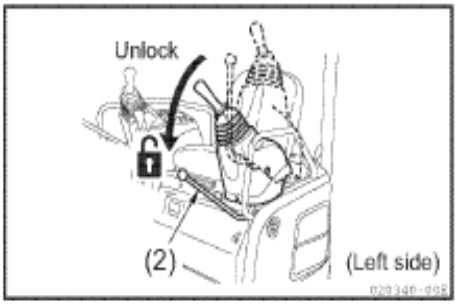
- **Always check the position of the blade before operating the travel levers and pedals.**
  When the blade is in the rear, the travel levers and pedals operate in the reverse of the normal operation.
- **A signal person should be in attendance to give signals at sites which are dangerous or not clearly in view of the operator.**
- **Clear all people from the working area.**
- **Sound the horn before beginning travel, to alert the people near the machine.**
- **Clear obstacles from the path of the machine.**
- **There is a blind spot behind the machine. Make sure that no people are in the blind spot before traveling backwards.**
- **Do not operate the travel levers and pedals rapidly while the engine is running at high speed. Otherwise, the machine may move unexpectedly, causing a serious accident.**



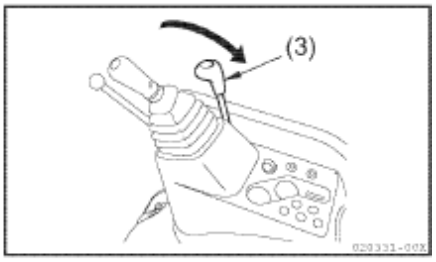
1) Pull the accelerator lever (1) back to the "RUN" position to increase the engine speed.



2) Unlock the lock levers (2), and retract the implement to raise it 16 to 20 in. (40 to 50 cm) above the ground.

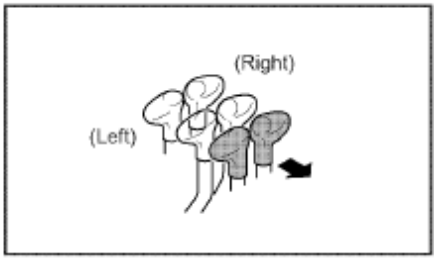


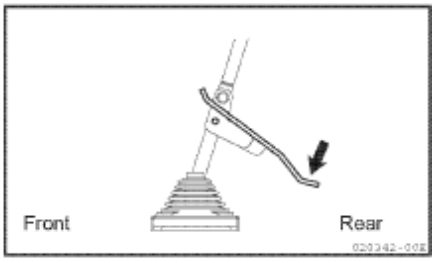
3) Pull back the blade lever (3) to raise the blade.



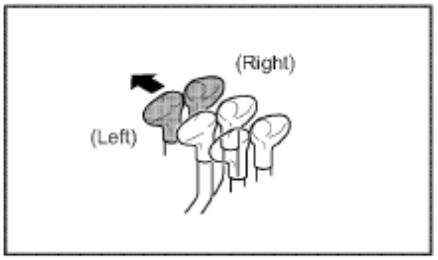
4) Operate the left and right travel levers (4) or pedals (5) as follows:

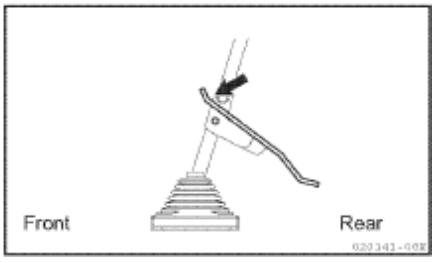
- When the blade is in the front of the machine;
  Slowly pull the travel levers (4) back or unfold the extension plate to step on it in order to move the machine backward.





- When the blade is in the rear of the machine;
  Slowly push the travel levers (4) forward or step on the front of the pedals (5) to move the machine backward.





STARTING WITH AN AUXILIARY BATTERY

3

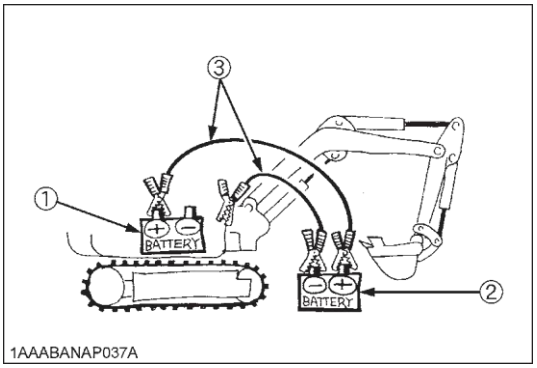
CAUTION

To avoid personal injury:

- **Battery gases can explode. Do not smoke and keep sparks and flames away.**
- **Do not start the engine with an auxiliary battery if excavator battery is frozen.**
- **Do not connect the black jumper cable to the negative (—) terminal of the excavator battery.**

■ Observe Following Guidelines when Starting with an Auxiliary Battery

1. Bring the helping machine with the same battery voltage as near as possible to the machine.
   THE MACHINES MUST NOT COME IN CONTACT WITH EACH OTHER.
2. Bring the levers and pedal of both vehicles in the neutral position and put the lock lever in the “Lock” position.
3. Wear eye protection and rubber gloves.
4. Remove the battery caps from both batteries. (If present)
5. Connect the terminal of the red jumper cable with the plus (+) terminal of the low battery and connect the other end of the cable to the plus (+) terminal of the auxiliary battery.
6. Connect the black negative cable to the minus (—) terminal of the auxiliary battery.
7. Connect the other end of the black cable (coming from the auxiliary battery) to the machine frame as far away as possible from the low battery.
8. Start the engine of the helping machine and let it run for a while. Start the machine with the low battery.
9. Disconnect the jumper cables in the reverse sequence.



(1) Low battery
(2) Auxiliary battery
(3) Jumper cables

IMPORTANT:

- This excavator has a negative (—) earthed 12 Volt starting system.
- Only use the same voltage when using an auxiliary battery.
- Using a higher voltage will cause serious damage to the electrical system. When using an auxiliary battery, only the compatible (same) voltage ispermissible.

EXCAVATOR OPERATION

⚠ WARNING

- **Check the area around the machine for safety and sound the horn before beginning to operate the machine.**
- **The setting of the pattern change lever alters control lever operation. Always chose the pattern (STD VS. OPT) that you prefer to use.**
- **To prevent accidental injury, never operate the Excavator before confirming the setting of the pattern change lever.**
- **Never operate or load excavator bucket with track gauge narrowed to prevent bodily injury.**

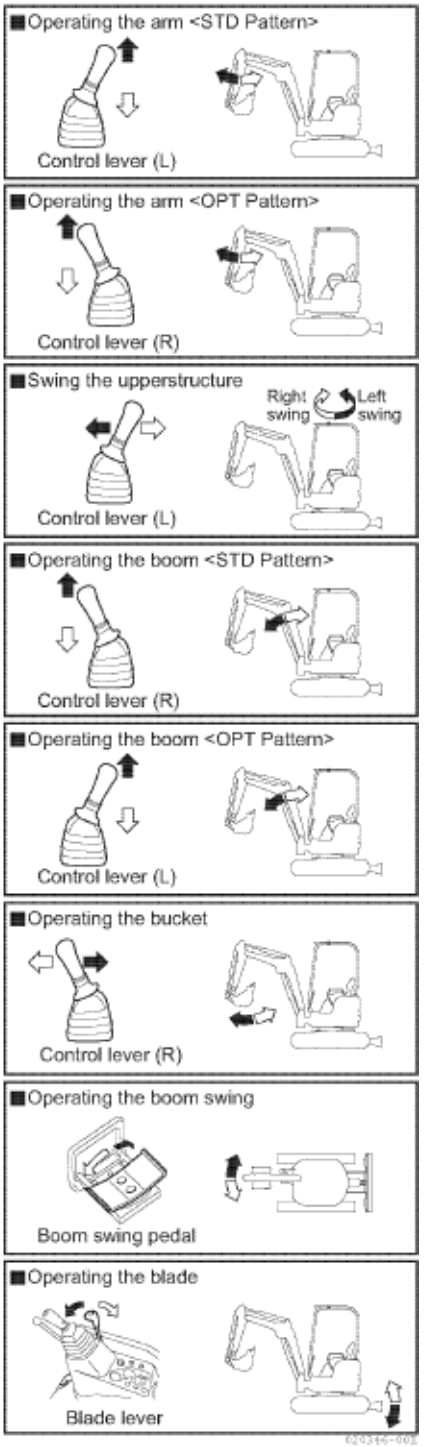
Operate the machine using the right and left control levers, the boom swing pedal and the blade lever.

<STD Pattern>
- Control lever (L) : Operates arm and upperstructure swing.
- Control lever (R) : Operates boom and bucket.

<OPT Pattern>
- Control lever (L) : Operates boom and upperstructure swing.
- Control lever (R) : Operates arm and bucket.

- Boom swing pedal : Operates boom swing.
- Blade lever : Operates blade.

The relationships between the operation of the control levers, the boom swing pedal and the movement of the implement are shown in the illustrations at the right.
On releasing the control levers and the boom swing pedal, they will return to their neutral positions and the implement will stop moving.



13-9. Operating the track gauge change

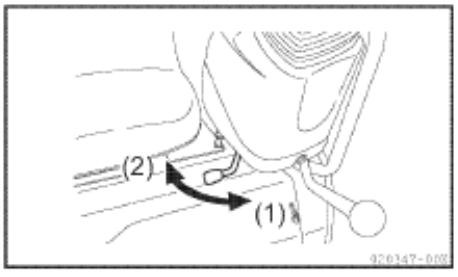
⚠ WARNING

- **Be sure to operate the track gauge change control lever at middle engine speed to avoid hazard.**
- **When operating the track gauge change, the crawlers move widthwise. Be sure to operate it from the operator's seat only to prevent your body from being caught between the crawler and the upperstructure or between the crawler and nearby obstacles.**
- **Never operate the track gauge change control lever when the machine is in motion.**

Do not operate the track gauge change control lever while the machine is traveling.

IMPORTANT

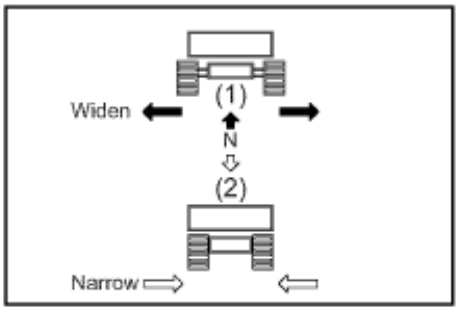
- **Mud or readymixed concrete adhering to the track gauge change system may cause the system an abnormal operation.**
  - **While working, operate the track gauge change system periodically to make it discharge mud or readymixed concrete.**
  - **After working, be sure to operate the track gauge change system to make it discharge mud or readymixed concrete.**
- **If mud adheres to the moving parts for changing the track gauge, widen and narrow the variable track gauge type crawlers to remove it. (Remove mud before it gets hard.)**
- **In cold whether, to prevent the moving parts for changing the track gauge from getting stuck due to frozen mud or water deposits on it, carefully remove them after working.**



13-9-1. Changing the track gauge

1) Park the machine on level ground.
2) Operate the track gauge change control lever until the crawlers stop moving.

(1) Push the lever forward to widen the track gauge.
(2) Pull the lever back to narrow the track gauge.



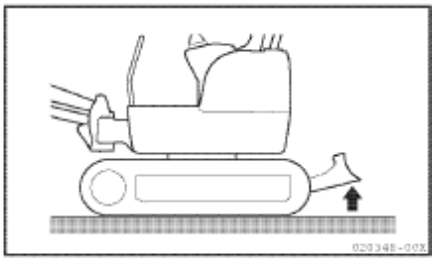
Notes:

- *To set the track gauge back to what it was, follow the above procedure.*
- *Normally operate the machine with the track gauge widened to keep it more stable.*

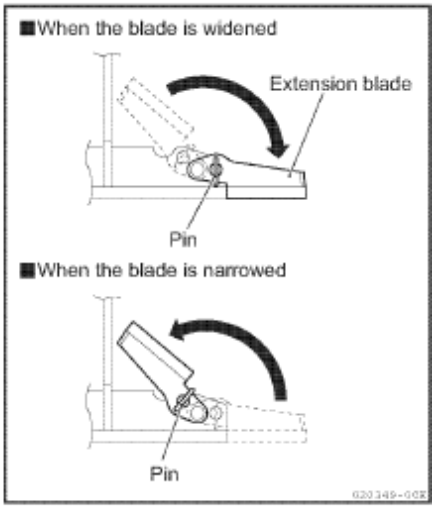
13-9-2. Changing the blade width

The blade width can be adjusted to 37.4 in. or 50.4 in. (950mm or 1280mm) by changing the positions of the pins.

1) Raise the blade to its stroke end.

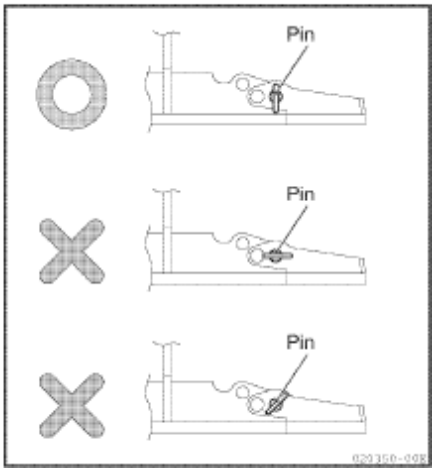


2) Change the positions of the pins as illustrated in the figure at the right and hold the extension blades to change the blade width.



IMPORTANT

Installing the pin improperly may cause the pin to fall off during work.



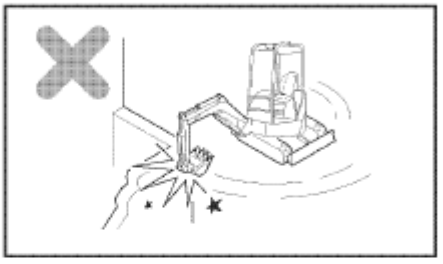
13-10. Precautions for operating the implement

⚠ WARNING

- **Do not operate the control levers while traveling. Stop traveling first and then operate the implement.**
- **Do not operate the implement on any rocky surface.**

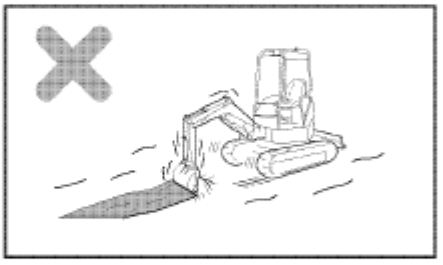
■ Do not use the implement's swing force

Do not level the ground or break down a wall by the use of swing force, and do not dig the bucket teeth into the ground while swinging. Doing these may cause the implement to be damaged.



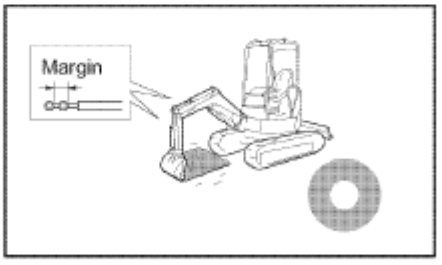
■ Do not use the implement's travel force

Do not excavate the ground by the use of travel force with the bucket teeth in contact with the ground. Doing this may cause excessive force to be imposed on the rear of the machine, shortening the machine life.



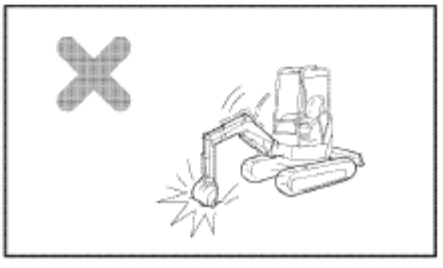
■ Take care not to operate the hydraulic cylinder to the stroke end

Operating the hydraulic cylinder to the stroke end may impose an undue force on the stopper in the hydraulic cylinder, shortening the implement life. Operate with a small safety margin.



■ Do not operate the implement by the using the dropping force of the bucket

Do not excavate the ground by using the dropping force of the bucket as a pickaxe or pile driver. Doing this may cause excessive force to be imposed on the rear of the machine, shortening the machine life and possibly causing a serious accident.

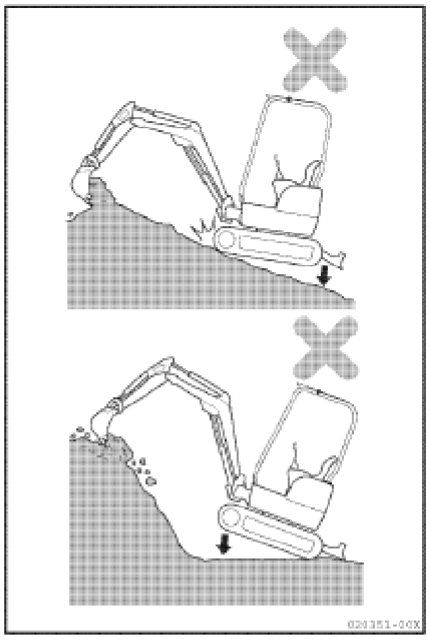


OPERATION OF BUCKET

To dig using the bucket, move the right attachment control lever from the neutral position left. Moving the control lever right, moves the bucket outwards and dumps itscontents.

■ **Do not operate the implement by using the dropping force of the machine**

Do not excavate the ground by using the dropping force of the machine.

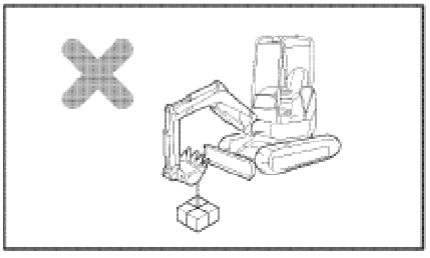


■ **Excavating a hard rock**

It is recommended that a hard rock first be broken into small pieces by other means. Doing so will prevent damage to the machine and will increase economy.

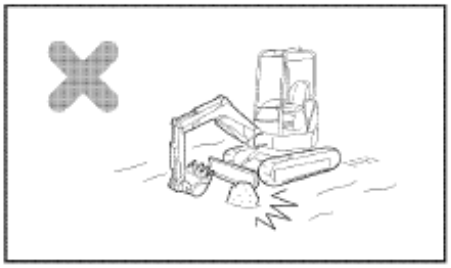
■ **Do not suspend a load unless you use a hooked bucket**

Suspending a load safely requires the use of a hooked bucket. Refer to Section "28. Handling the Hooked Bucket".



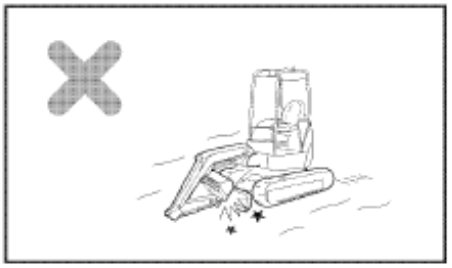
■ **Do not bump the blade against a large rock or boulder**

Never bump the blade against a large rock or boulder. Doing so may cause the blade or the hydraulic cylinder to be damaged.



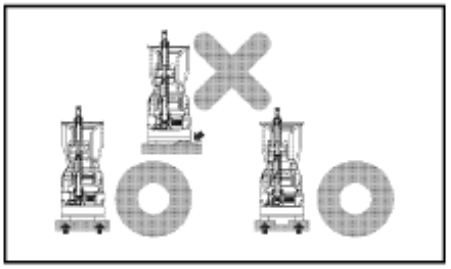
■ **Be careful when retracting the implement**

When retracting the implement for travel or transport, be careful that the bucket and the blade never bump against each other.



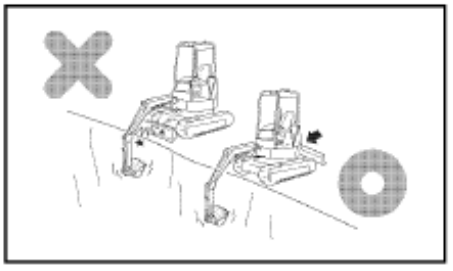
■ **Support the blade on both sides**

When you use the blade as an outrigger, support the blade on both sides.



■ **Be careful not to bump the blade when excavating**

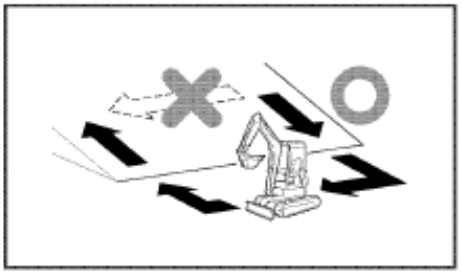
When excavating the ground with the blade in front, never let the blade bump against the boom cylinder.
Place the blade in the rear, when it is not being used.

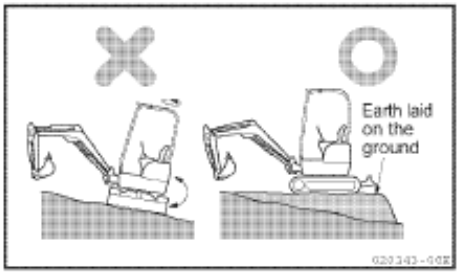


13-12. Precautions for going up and down a slope

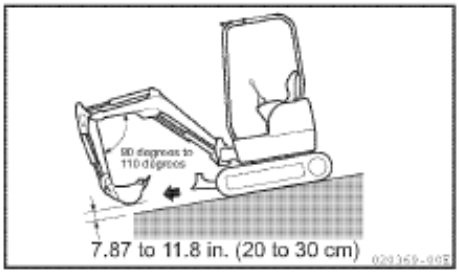
⚠ WARNING

- **When traveling on a slope, place the implement in the direction of travel and raise the bucket 8 to 12 in. (20 to 30 cm) above the ground.**
- **When driving over obstacles such as foot paths, hold the implement close to the ground and drive the machine slowly.**
- **Never turn on or traverse a slope.**
  Descend to flat ground to make a course change.
- **If the machine is starting to slip or you feel that the machine is unstable, place the bucket on the ground and stop the machine at once.**
- **Recognize that the machine may roll over when swinging the upperstructure or operating the implement on a slope.**
  Do not swing the upperstructure toward the downward side of the slope with a load in the bucket.
  If swinging is unavoidable, first lay earth on the slope to maintain the machine as horizontal as possible, then swing the upperstructure.
- **Do not travel on a slope of 20 degrees or more, as the machine may upset.**

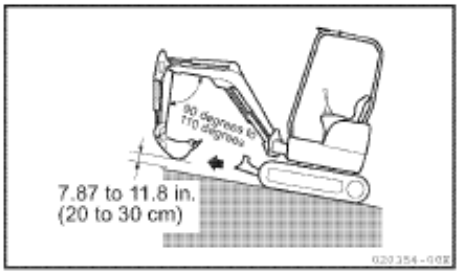




1) Go down slopes at low speed, using the travel levers and accelerator lever to control your speed.
   When going down a slope, drive the machine at low engine speed and position the implement as shown in the figure at the right.
   Also drive the machine with the track gauge widened by operating the track gauge change control lever to keep the machine more stable.



2) When going up a slope, drive the machine with the implement positioned as shown in the figure at the right.
   Also drive the machine with the track gauge widened by operating the track gauge change control lever to keep the machine more stable.



■ Braking when going down a slope

When going down a slope, you can automatically brake the machine by setting the travel levers to the neutral position.

■ When the crawler is slipping

If you cannot go up a slope by operating the travel levers because the crawler is slipping, retract the arm and use the pull-back power of the implement to help you go up the slope.

■ When the engine stops

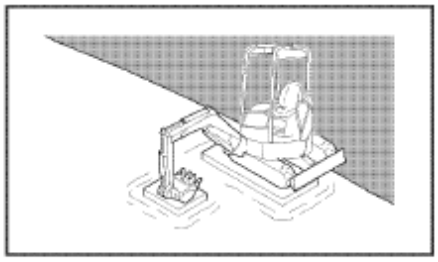
If the engine stops while going up a slope, set the travel levers to the neutral position, stop the machine, and restart the engine.

13-13. Escaping from the mud

Carefully operate the machine not to allow it to get mired in mud. If the machine is mired in mud, the machine can escape as follows:

13-13-1. If only one track is mired in the mud

If only one track is mired in the mud, place the bucket on the muddy side, lift the track above the ground, lay a log or a wood block under the track shoe, and raise the bucket to escape.



IMPORTANT

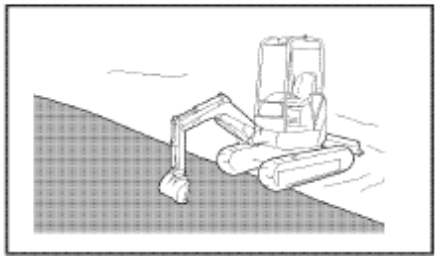
When lifting the machine above the ground with the boom or the arm, press on the ground with the bottom of the bucket. (Do not press on the ground with the bucket teeth.)

In doing this, the angle between the boom and the arm should be 90 degrees to 110 degrees.

The same procedure described above should be utilized when the bucket is in the reverse position.

13-13-2. If both tracks are mired in the mud

If both tracks are mired in the mud, lay a log or a wood block under the track shoes in the same manner as mentioned above, dig the bucket into the solid ground, retract the arm just as when excavating, and push the travel levers forward to escape from the mud.



13-14. Operations using the bucket

You can greatly widen the range of work described here by using optional attachments.

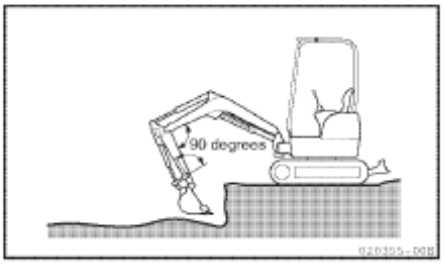
13-14-1. Backhoe operation

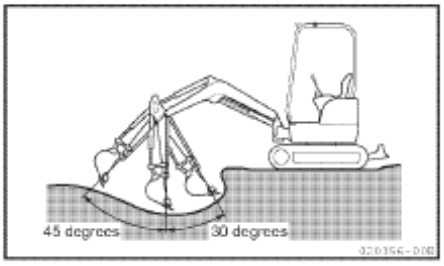
Backhoe operation is suitable for digging the ground below the machine.

Suppose that the machine is operating as illustrated in the figure at the right : a maximum digging force of each cylinder can be obtained when the angle between the bucket cylinder and the bucket arm as well as between the arm cylinder and the arm is maintained at 90 degrees.

When digging, make good use of this angle to increase the operating efficiency.

To excavate the ground efficiently by manipulating the arm, the arm needs to be operated within a range of angles between 45 degrees forward and 30 degrees backwards, as illustrated in the figure at the right. Though the range differs according to the depth of the work, do not move the implement to the cylinder stroke end.

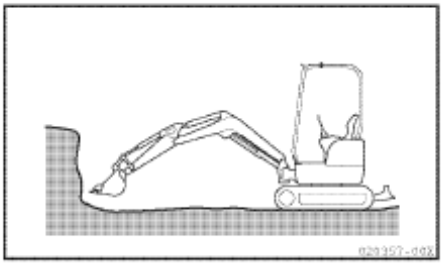




13-14-2. Shoveling

Shoveling is suitable for excavating ground that is higher than the machine bottom.

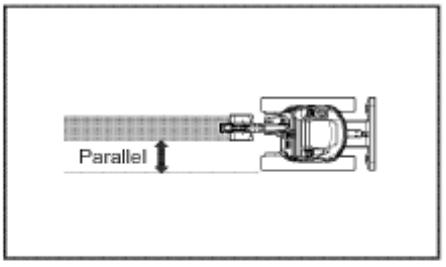
Install the bucket in the reverse position before operating. For the procedure for installing the bucket in the reverse position, Refer to Section "13-16. Reversing the bucket".



13-14-3. Ditching

To increase work efficiency, install a suitable bucket for ditching and position the tracks in parallel with the ditch to be made.

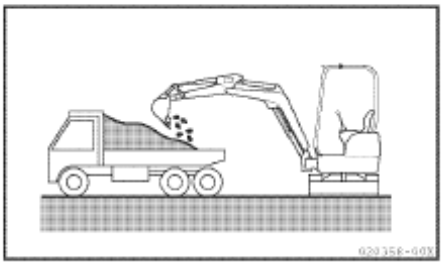
To make a wide ditch, first dig the two sides, and then dig the center.



13-14-4. Loading

To increase work efficiency, locate the dump truck at a position where the swing angle of the machine will be minimized and the operator can clearly view the dump truck.

Load earth from the rear of the dump truck, because it can be loaded more easily and in larger amounts than from the side.



13-15. Replacing the bucket

⚠ WARNING

- **When driving pins into the bucket with a hammer, metal chips may fly. If metal chips should get into your eyes, they can cause serious injury. Use goggles, a hard hat, and gloves for safety when replacing the bucket.**
- **After removing the bucket, place it on solid ground in a stable position.**
- **When aligning the holes for pin A and pin B, be careful not to insert your fingers into those holes to prevent serious injury to your fingers. Visually check the alignment of the holes.**

Work on level ground with good footing. If two or more persons work together, communicate with signals selected beforehand for safety.

■ Replacement procedure

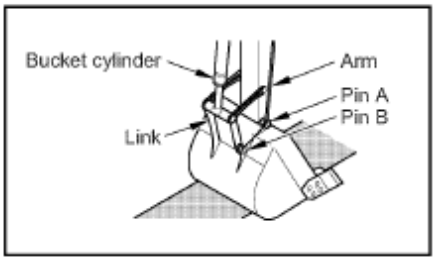
Replace the bucket according to the following procedure:

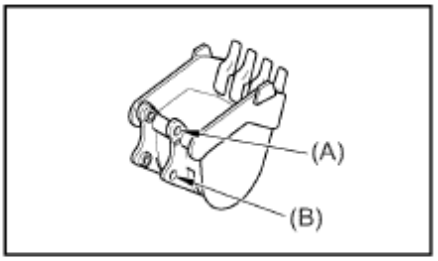
1) Park the machine on level, flat ground, and lower the bucket onto the ground.

2) Stop the engine.

3) Clean around the bucket pin to prevent foreign material from entering the pin holes.

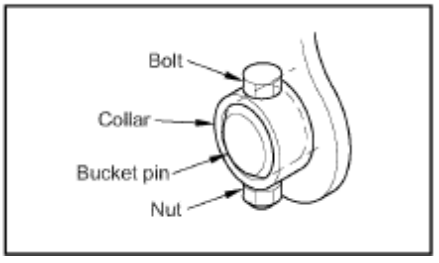
4) Remove pins (A) and (B).





IMPORTANT

- **Keep the pins away from dirt or mud.**
- **The machines have dust seals on either end of the bush. Be careful not to damage them.**



IMPORTANT

- **Check that the O-ring is not damaged. If it is damaged, replace it with a new one.**
- **It is recommend that the O-ring should be replaced when replacing the bucket. (It extends the implement life.)**

5) Connect the arm to (A), and then connect the link to (B).

IMPORTANT

Before mounting the bucket, clean the arm pin hole and grease it.

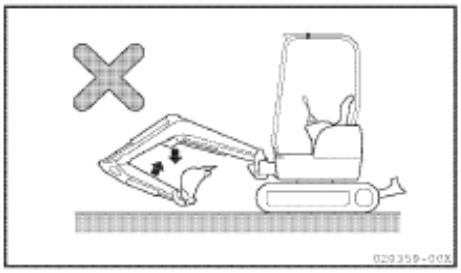
6) Install the collars and bolts into the bucket pins (A) and (B).

7) Grease the connecting parts.

IMPORTANT

When using a reversed bucket, the bucket and the boom cylinder can contact each other when the arm is curled or the boom is lowered beyond the positions indicated in the figure at the right.

Never curl the bucket too much, and never allow it to contact the boom cylinder.



13-16. Reversing the bucket

⚠ WARNING

- **When driving pins into the bucket with a hammer, metal chips may fly. If metal chips should get into your eyes, they can cause serious injury. Use goggles, a hard hat and gloves for safety when reversing the bucket.**
- **After removing the bucket, place it on solid ground in a stable position.**
- **When aligning the holes for pin A and pin B, be careful not to insert your fingers into the holes to prevent serious injury to your fingers. Visually check the alignment of the holes.**

Work on level ground with good footing. If two or more persons work together, communicate with signals selected beforehand for safety.

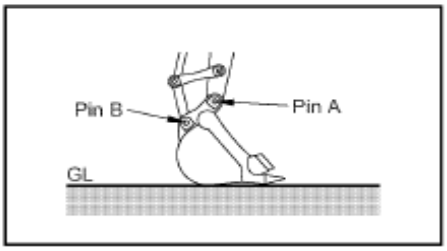
■ Reversing procedure

Reverse the bucket according to the following procedure

1) Park the machine on level, flat ground, and lower the bucket onto the ground.

Note :

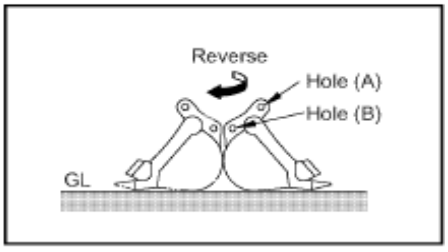
To remove the pins, place the bucket on the ground in such a way that it touches the ground lightly. Lowering the bucket down on the ground by its full weight will increase stresses on the pins and make the pins difficult to remove.

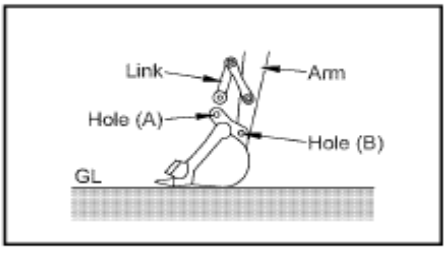


IMPORTANT

Keep the pins away from dirt or mud.

2) Stop the engine.
3) Clean the area around the bucket pins to prevent foreign material from entering the pin holes.
4) Remove pins A and B.
5) Reverse the bucket.
6) Refer to Section "13-15. Replacing the bucket" for installation of the O-ring.
7) Connect the arm to hole (B), and then the link to hole (A). [You can easily align the hole of the link and hole (A) by lifting the bucket slightly.]
8) Install the collars and bolts into the bucket pins A and B.
9) Grease the connecting parts.





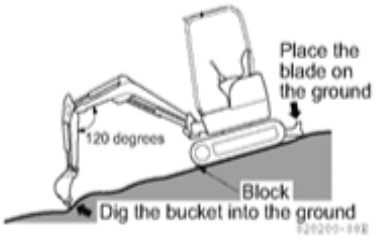
13-17. Parking the machine

⚠ CAUTION

Do not stop the machine suddenly but provide a safety margin.

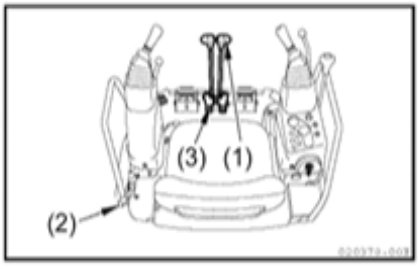
⚠ WARNING

- Park on solid, level ground.
- Do not park on a slope. If it is unavoidable to park on a slope, place solid blocks of wood behind the crawlers, place the blade on the ground, and dig the bucket into the ground.

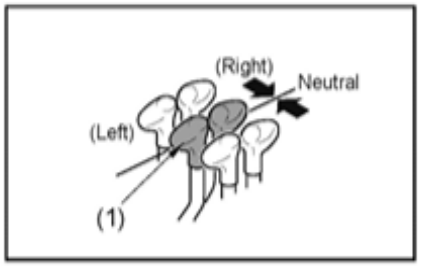


⚠ WARNING

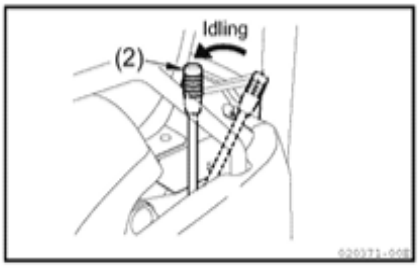
- Do not touch the control levers and pedals accidentally. Otherwise, the implement or the machine may move unexpectedly, causing a serious accident.
- When leaving the operator's seat, be sure to place the lock levers securely in the lock position and remove the starter switch key.



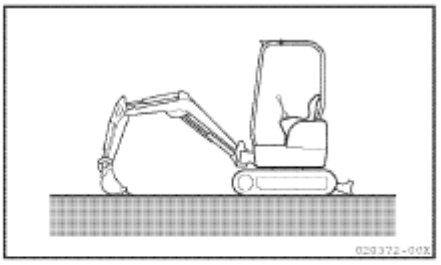
1) Set the left and right travel levers (1) or pedals (3) to the neutral position to stop the machine.



2) Idle the engine with the accelerator lever (2).

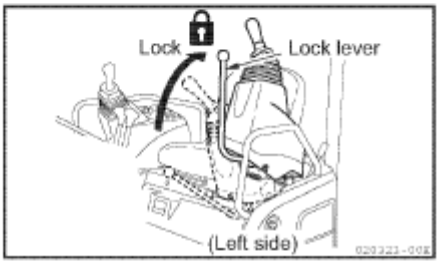


3) Place the bucket on the ground with its bottom surface in contact with the ground.



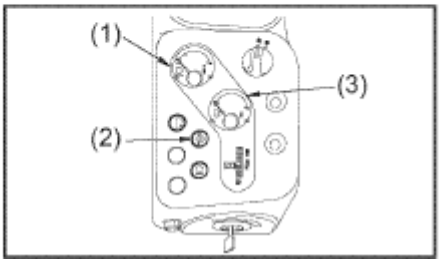
4) Place the blade on the ground.

5) Set the lock lever to the "LOCK" position.



13-18. Inspection requirements after completing operation

Check the monitor for the engine cooling water temperature (1), the engine oil pressure (2), and the residual quantity of fuel (3). Take any actions necessary.

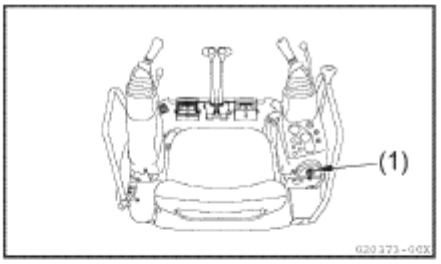


13-19. Stopping the engine

IMPORTANT

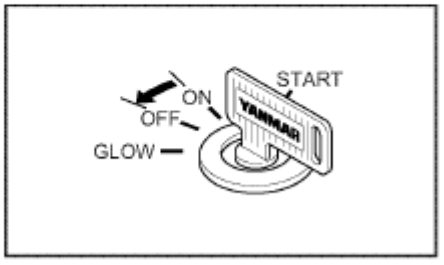
- **Stopping the engine after rotation at high speed may shorten the engine life. Do not stop the engine suddenly except in case of emergency.**
- **If the engine is overheated, do not stop the engine immediately. Gradually lower the engine temperature by rotating the engine at medium rotational speed before stopping the engine.**

1) Idle the engine for approximately five minutes with no load.
   (The engine temperature gradually lowers.)



2) To stop the engine, turn the starter switch key (1) to the "OFF" position.

3) Take the starter switch key out of the starter switch (1).



Note :

The swing motor brake will engage automatically when the engine stops.

13-20. Inspection requirements after stopping the engine

1) Check oil and water for leaks, and visually inspect the implement, the machine, and the undercarriage by walking around them.
   If there are any leaks of oil or water, or any observed abnormality, take corrective action.

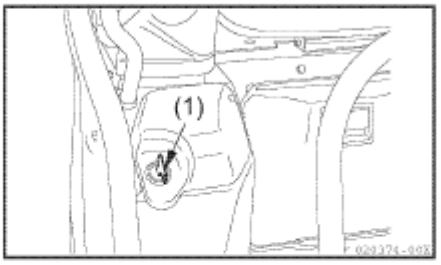
2) Completely fill the fuel tank.

3) Confirm that the engine compartment is free of any foreign matter.
   Combustibles or dust in the engine compartment may cause a fire. Remove them, if any.

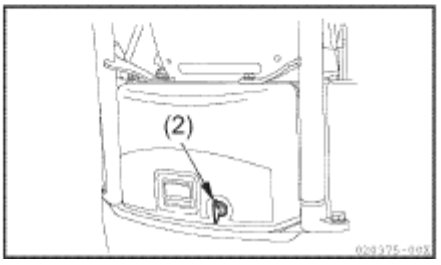
4) Remove mud adhering to the undercarriage of the machine.

13-21. Locking

Make sure that you lock the following :
(1) Cover for fuel supply port
(2) Engine hood

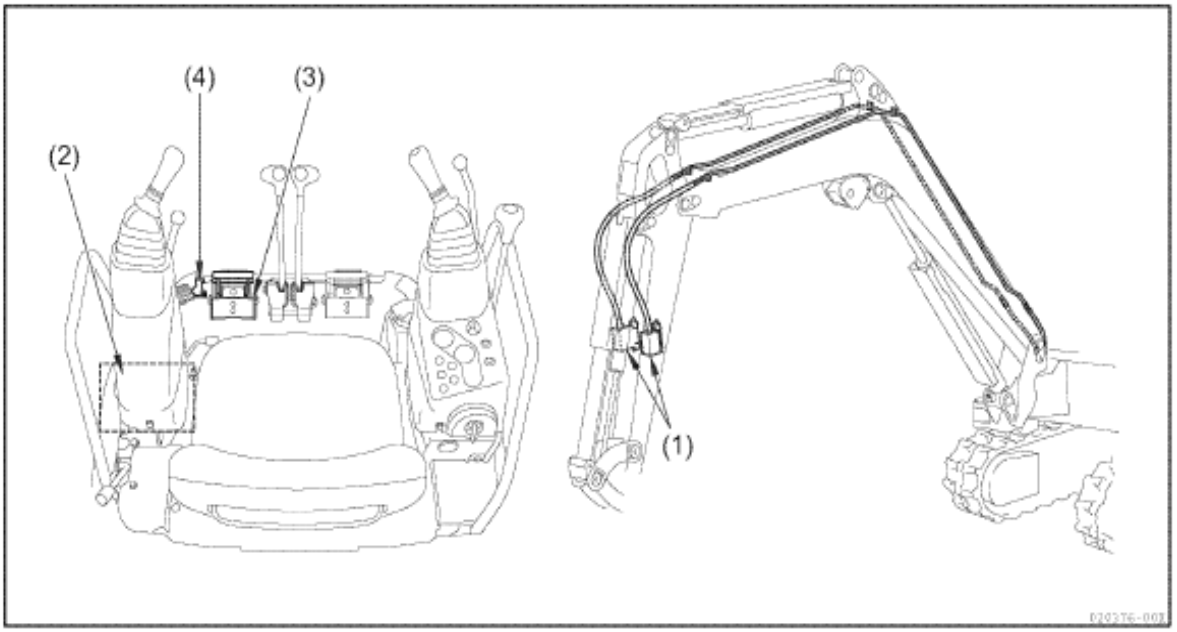


Note :
The starter switch key (1) is used to lock all of the items mentioned above.



13-23. Handling hydraulic P.T.O.

13-23-1. Description of stop valve, P.T.O. selector valve, P.T.O. pedal and pedal lock



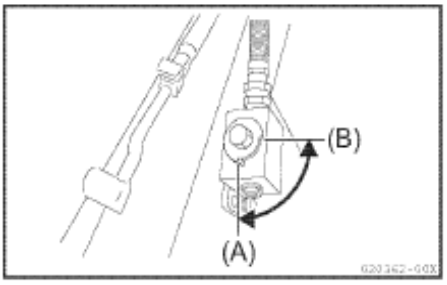
(1) Stop valve

This valve can stop the flow of the hydraulic oil.

(A) Open : The hydraulic oil flows

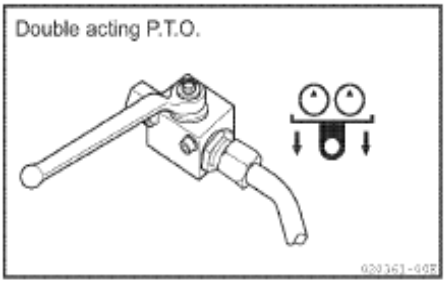
(B) Close: The hydraulic oil stops.

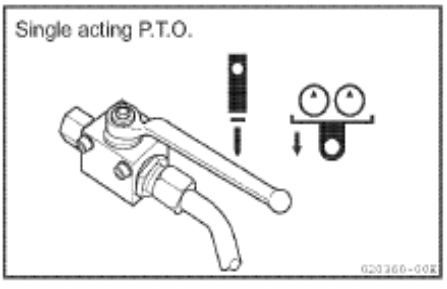
Set this valve at the closed position when removing and installing an attachment.



(2) P.T.O. selector valve

Use this valve to change the oil flow.



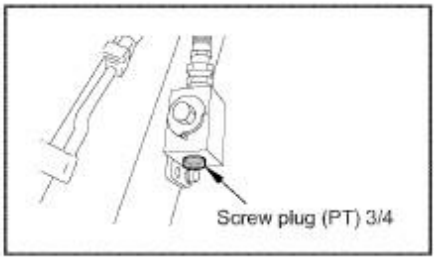


13-23-2. Hydraulic circuit

1) When mounting any attachment, follow the procedure below to connect the circuit.

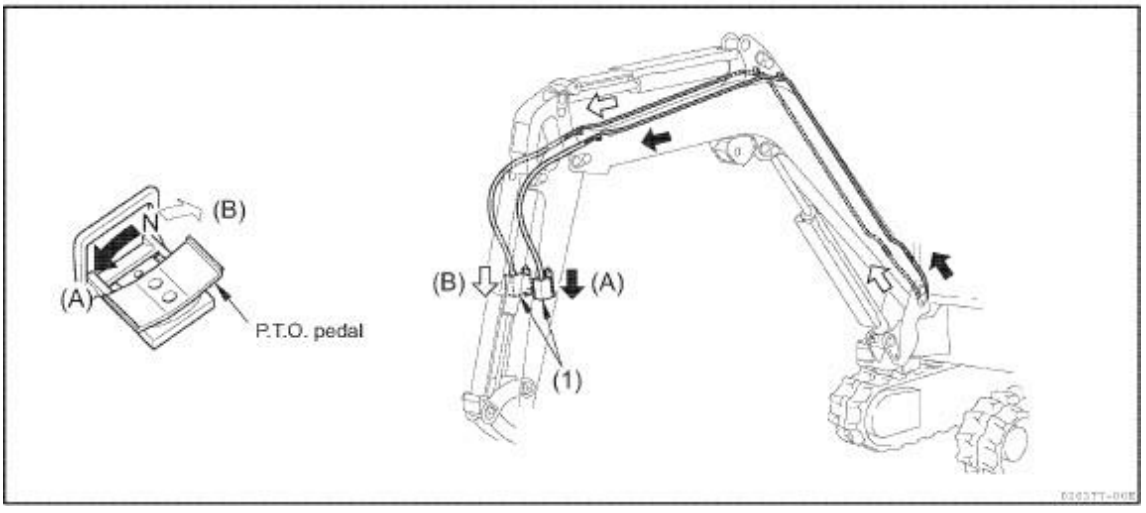
(1) Make sure the stop valves are in the closed position and remove the screw plugs. Take care not to loose or damage the removed parts.

(2) Install the connectors supplied by the manufacturer of the attachment and connect the hoses.

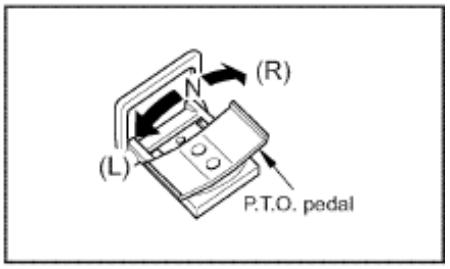


■ **Oil flow system**

The directions of pedal operation and the oil flow system are described in the figure below.



(3) P.T.O. pedal



Use this pedal to operate the attachment.

- Move the P.T.O. pedal to L side for operating the single acting actuator type of attachments, when the P.T.O. selector valve is in the single acting position.
  [Example of the P.T.O. : Breaker]

- Move the P.T.O. pedal to L or R side for operating the double acting actuator type of attachments, when the P.T.O. selector valve is in the double acting position.
  [Example of the P.T.O. : Tilt bucket, Clamshell, etc.]

(4) P.T.O. pedal lock (for attachment control pedal)

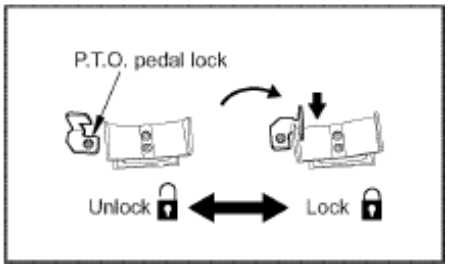
⚠ WARNING

- **Securely look the P.T.O. pedal in the neutral position when the P.T.O operation is not required.**
- **If you touch the P.T.O. pedal carelessly when the P.T.O. pedal is unlocked, it may cause serious bodily injury.**

Use this device to lock the P.T.O. pedal.

- **Hand breaker position**

When the P.T.O. pedal lock is moved to the right with the P.T.O. pedal moved to the left, the P.T.O. pedal is locked. (The lock position when operating the hand breaker, etc.).



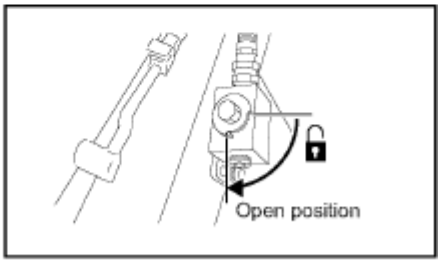
13-23-3. Operating attachment

⚠ WARNING

When changing the hydraulic piping connection, stop the engine and slowly loosen the connection to release the inner pressure.

If you use the oil pressure for other hydraulic devices as the power source, connect the piping by using the following procedure after the engine has stopped.

1) Close the stop valve.
2) Remove the screw plugs.
3) Connect the hose for the hydraulic tool.
4) Open the stop valve.



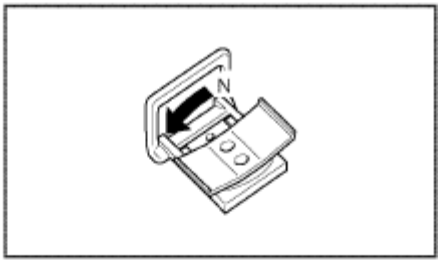
Operate the attachment as follows:

■ **Precautions**

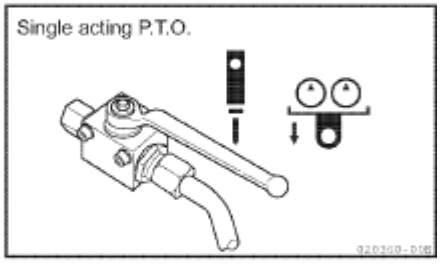
- Make sure the stop valves are in the open position. Refer to Section "13-23-2. Hydraulic circuit" for oil flow system.

1) When using the breaker

The breaker operates when the P.T.O. pedal is moved to the arrowed direction.



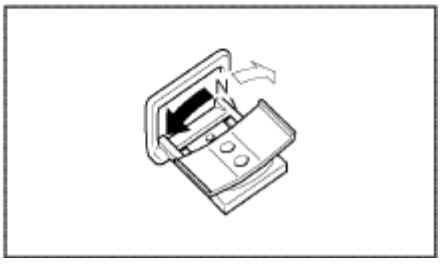
- Make sure the P.T.O. selector valve is in the single acting position. Refer to Section "13-23-1. Description of stop valve, P.T.O. selector valve, P.T.O. pedal and pedal lock".



- Make proper use of the breaker following the handling instructions in the operation manual provided by the manufacturer of the breaker.

2) When using general attachments such as tilt bucket

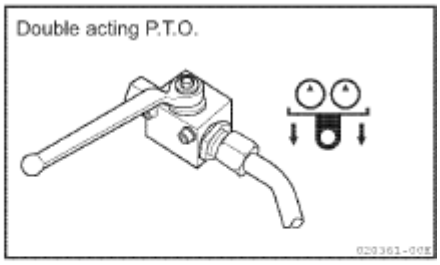
Move the P.T.O. pedal to the right or the left, and the attachment operates.



■ **Precautions**

- Make sure the P.T.O. selector valve is in the double acting position.
  Refer to Section "13-23-1. Description of stop valve, P.T.O. selector valve, P.T.O. pedal and pedal lock".

- Make proper use of the general attachments following the handling instructions in the operation manual provided by the manufacturer of the general attachments.



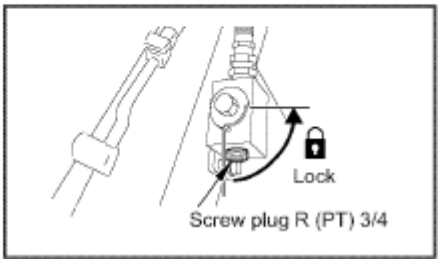
13-23-4. Long-term storage

If the hydraulic tool is not used, do the followings:

- Close the stop valves.

- Disconnect the hoses for the hydraulic tool. Wind the screw plug R (PT) 3/4 with seal tape and tighten them to the stop valve.

Operating the P.T.O. pedal when the breaker or general attachment is not mounted may cause overheating.



14-1. Loading and unloading the machine

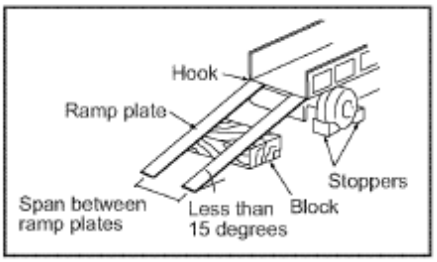
For safety in transporting the machine, comply with all applicable regulations and laws.

⚠ WARNING

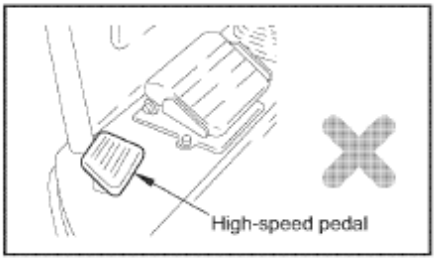
- **Be careful when loading and unloading the machine, because it is a job of high hazard potential.**
- **Load or unload the machine on level, solid ground far away from the shoulder of the road.**
- **Load or unload the machine at a low engine speed.**
- **Load or unload the machine with the track gauge widened to the maximum.**
- **Never operate the track gauge change control lever while loading or unloading the machine.**
- **Use ramp plates of adequate strength having hooks. Check to see that the ramp plates are wide, long, and thick enough to safely sustain the machine so that you can load or unload safely. To prevent the ramp plates from bending too much, support them with blocks.**
- **Securely hook the ramp plates to the deck of the truck so that they will not come off.**
- **Remove mud, grease, and other slippery deposits from the track shoes, and grease, oil, and ice deposits from the ramp plates to prevent the machine from skidding.**
- **Never change the travel direction on the ramp plates. If you need to change the travel direction, go back down the ramp plates, then do this.**
- **Swing slowly when on the truck bed, if it becomes necessary to do so, since the machine's position will be unstable.**

To load or unload the machine, be sure to use the ramp plates and follow the procedures outlined below.

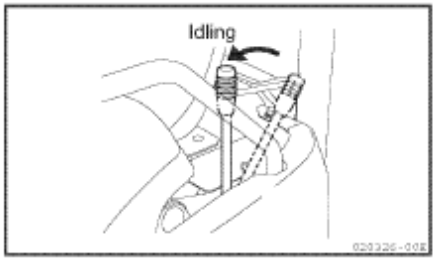
1) Firmly brake the truck and apply wheel stoppers to the tires. Securely install the ramp plates on the bed of the truck in a position where the center of the truck aligns with the center of the machine. Make sure that the left and right ramp plates are at the same level.



The ramp plates should be set at an angle of less than 15 degrees.
Determine the span between the ramp plates on the basis of the centers of the track shoes.
Do not operate the high-speed pedal.



2) Return the accelerator lever to reduce engine speed.



3) Travel toward the ramp plates at a low speed, and load or unload the machine with the implement lowered as close as possible to the deck of the truck.
Do not operate any levers other than the travel levers while driving on the ramp plates.

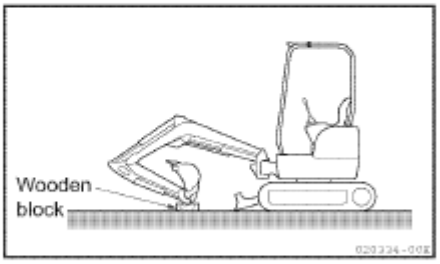
4) Load the machine in a safe position on the truck.

14-2. Precautions for loading the machine

⚠ WARNING

Load or unload the machine on level, solid ground far away from the shoulder of the road.

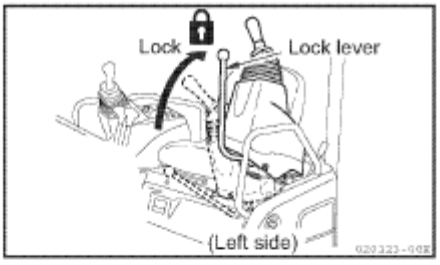
After loading the machine in a safe position on the truck, secure the machine as follows:



1) Place the blade down on the bed of the truck.

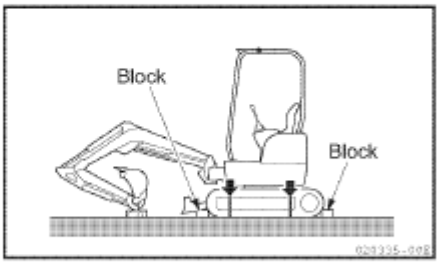
2) Extend the bucket and arm cylinders to the maximum limit, and slowly lower the boom down on a block of wood.

3) Stop the engine to take the starter switch key out of the starter switch.
(The automatic brake locks the swing motor.)



4) Be sure to place the lock levers to the lock position.

5) Provide wooded blocks in the front and back of the crawlers and secure the machine with a chain or a wire rope so that the machine will not move during shipping. In particular, be sure to secure it to prevent sideward motion.



IMPORTANT

To protect the bucket cylinder from being damaged during shipping, place a wooden block under one end of the bucket cylinder to prevent it from directly touching the deck of the truck.

14-3. Precautions for transporting the machine

⚠ WARNING

Select a route for transporting the machine based on the road width and clearance, and the height and weight of the machine.

For safer transportation, comply with all local regulations and laws.

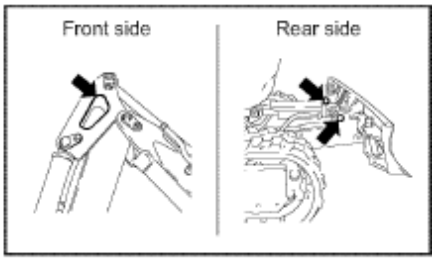
14-4. Suspending the machine

⚠ WARNING

- **Never suspend the machine if any person is on the machine or the implement.**
- **Use wire ropes strong enough for the weight of the machine.**
- **Do not suspend the machine in any way other than that explained on the following page. Failure to suspend the machine as prescribed will throw the machine off balance.**
- **Do not swing the machine being suspended.**
- **When suspending the machine, keep the machine in balance taking note of the center of gravity of the machine.**
- **Never stand near or under the suspended machine.**

For safety in suspending the machine, comply with all applicable regulations.

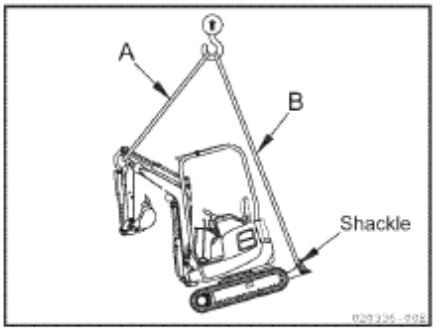
Suspend the machine on level ground as follows:



1) Swing the upperstructure so that the blade is behind the operator's seat.

2) Raise the blade to the highest limit.

3) Extend the hydraulic cylinders of the front implement (except for the boom swing cylinder) to the maximum.

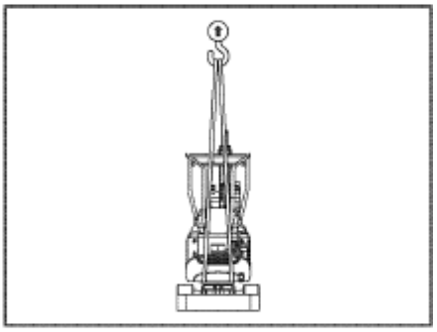


4) Stop the engine, and make sure that nothing is left around the operator's seat before leaving the machine.

5) Put a slingbelt (or a wire rope) through the hole in the arm illustrated in the figure on the right and install shackles in the right and left holes in the side plate of the blade on the rear side, then securely fasten the slingbelt to the shackles.

Note:

The length of sling belt (or wire rope) is as follows :



		A	B
Length	in. (m)	78.7 (2.0)	157.5 (4.0)
Number of sling	belts / machine	1	2

6) Suspend the machine above the ground, wait until the machine is stable and then suspend it slowly.

IMPORTANT

Set each lock lever at the lock position.

Shipping weight:

lbs. (kg)

Machine with rubber crawler
3671.3 (1665)

■ List of periodic inspection and servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items			Daily	Every 50	Every 100	Every 250	Every 500	Every 1000 hrs
General	Check falling off, breakage of parts		◇					
	Check loosened bolts & nuts, retighten		◇					
	Check engine condition		◇					
	Clean		□					
Lube oil	*Swing gear case oil	Check, resupply				◇/○		
		Replace			●1st time			●
	Travel reduction gear oil	Check, resupply				◇/○		
		Replace			●1st time			●
	*Transmission oil	Check, resupply	◇/○					
		Replace			●1st time			●
	*Differential gear oil	Check, resupply			◇/○			
		Replace			●1st time			●
Hydraulic system	Hydraulic oil	Check, resupply	◇/○					
		Replace				●	●	●
	Clean suction filter					□1st time		□
	Replace return filter					● 1st time	●	
	Check for abnormality of hydraulic pump		◇					
Grease	Check grease-up positions, grease		■					
	Greasing the swing gears and the swing bearings			■				
	Greasing the track gauge change cylinder and the link fulcrum			■				
Undercarriage	Check, adjust track tension		◇/□					
	*Check air pressure, wear, flaw in tyres		◇					
Steering equipment	*Check performance, play of steering lever		◇					
	Check performance, play of travel lever		◇					
	*Check performance of speed change lever		◇					
	*Check performance of forward/reverse pedal		◇					
	*Check performance, play of steering wheel		◇					
	*Brake pedal	Stroke	◇					
		Performance	◇					
	*Parking brake	Stroke	◇					
		Performance	◇					
	Check performance of accel. lever		◇					
Electric equipment	Check front & work lights, horn		◇					
	Check hourmeter function		◇					
	Check function of change, oil and pilot lamps		◇					
	Check wire breakage, short-circuits, loosened terminals retighten		◇					
	Check, resupply battery fluid		◇/○					
	Check specific gravity of electrolyte						□As required	
	Check function of OK monitor		◇					

25-3-7. Greasing

IMPORTANT

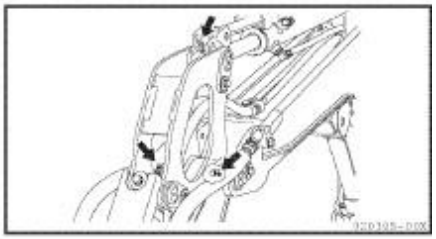
Grease the fittings thoroughly after washing the machine or after operation in rain, on soft ground, or in muddy water.

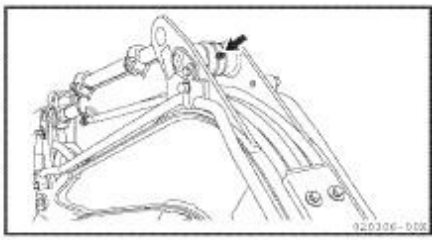
1) Put the bucket and the blade on the ground and stop the engine.

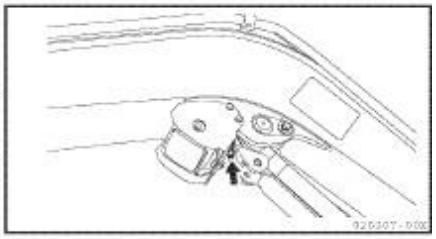
2) Clean the grease nipples indicated by arrows in the figures at the right, and grease them with a grease gun.

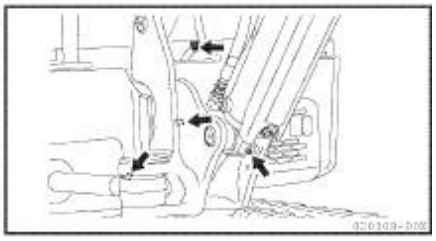
3) After greasing, wipe off any excess that remains.

■ **Implement**

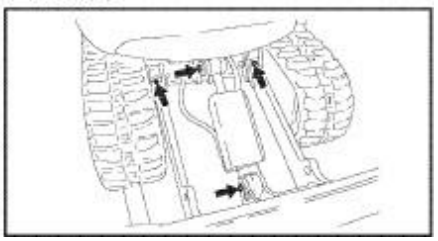








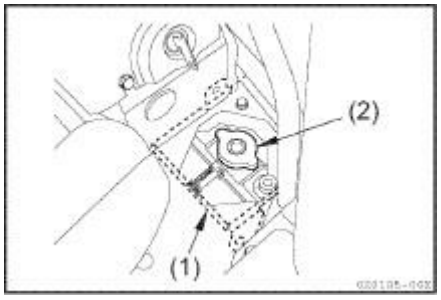
■ **Blade**



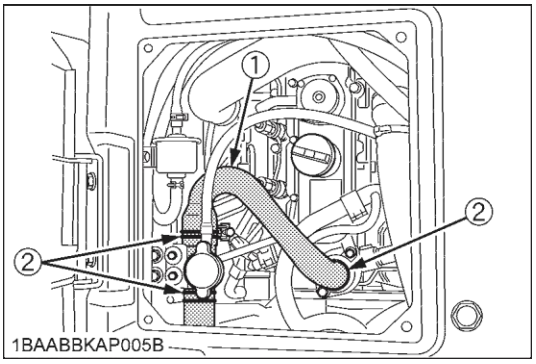
■ Check Radiator and Oil Cooler

CAUTION
To avoid personal injury:
- **Always stop the engine and remove the key before checking the radiator and the oil cooler.**
- **Wear eye protection when cleaning with compressed air.**

1. Check if the fins and ribs are clogged. If so clean with compressed air or steam.
2. Check the rubber hoses for damage and replace if cracked or old. Check if the hose clamps are tight enough.



(1) Radiator
(2) Oil cooler



(1) Rubber hoses
(2) Clamps

IMPORTANT:
- Radiator and oil cooler fins and ribs must be clean in order not to overheat the engine and allow free flow of air through the cooling elements.

■ Cleaning of Engine and Electrical Wiring

CAUTION
To avoid personal injury:
- **Always stop the engine and remove the key before cleaning the wiring, cables and engine.**

Before starting, check whether flammable substances have gathered on the battery, the cables and wiring, the muffler or on the engine. If so, remove thoroughly.

■ Checking the Electrical Circuit

Check the electrical circuitry for disconnections, shorts or loose terminals.

■ Washing the Whole Machine

IMPORTANT:
- Do not wash the excavator with the engine running. Water could enter the air filter and damage the engine.
  Make sure that the air filter is kept dry.

REGULAR CHECKS AND MAINTENANCE WORK

EVERY 50 SERVICE HOURS

■ Battery Charging

CAUTION

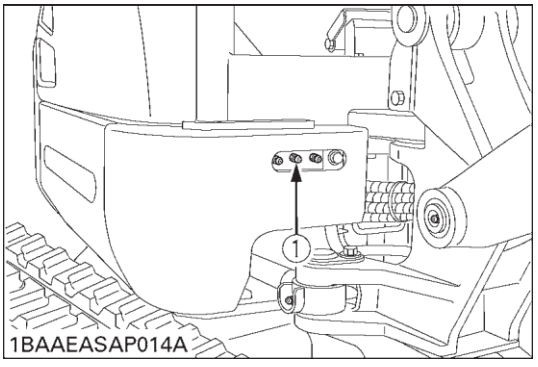
To avoid personal injury:

- **When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.**
- **When charging battery, remove battery vent plugs.**
- **When disconnecting the cable from the battery, start with the negative terminal first. When connecting the cable to the battery, start with the positive terminal first.**
- **Do not check battery charge by placing a metal object across the terminals. Use a voltmeter or hydrometer.**

1. Make sure each electrolyte level is to the bottom of vent wells, if necessary add distilled water in a well-ventilated area.
2. The water in the electrolyte evaporates during recharging. Liquid shortage damages the battery. Excessive liquid spills over and damages the excavator body.
3. To slow charge the battery, connect the battery positive terminal to the charge positive terminal and the negative to the negative, then recharge in the standard fashion.
4. A boost charge is only for emergencies. It will partially charge the battery at a high rate and in a short time.
   When using a boost-charged battery, it is necessary to recharge the battery as early as possible.
   Failure to do this will shorten the battery's service life.
5. When the specific gravity of electrolyte falls between 1.27 and 1.29 charge has completed.
6. When exchanging an old battery for a new one, use a battery of equal specification.

■ Greasing of Swing Bearing Teeth

1. Pump greace with the grease gun through the grease nipple.
2. Grease at each 90º (1.58 rad.) position of the swing frame.
3. Fill with approx. 50g of grease (approx. 20 pumps with the grease gun). Distribute the grease over the teeth.



(1) Grease nipple (for Bearing teeth)

■ Inspection and Cleaning of the Air Filter Element

■ Cleaning procedure for element

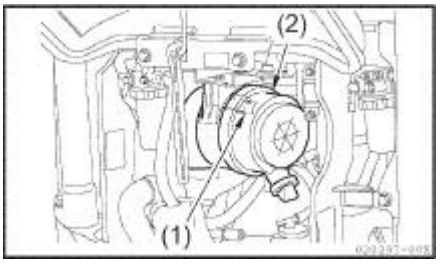
1) Open the engine hood.

2) Remove the clips (1) and remove the dust cup (2).

3) Remove the element (3).
Cover the connector side at the back of the air cleaner body using a clean cloth and tape to prevent dirt from entering.

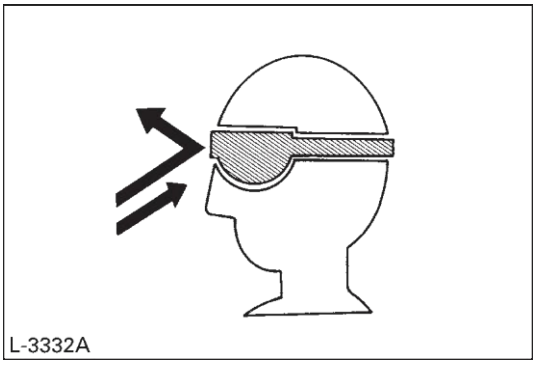
4) Clean the dust cup (2) and the inside of the body.

5) Blow the dry, compressed air [100 PSI (0.7 MPa) or less] from inside the element (3) along the pleats to initially remove the dirt. Then blow compressed air from outside the element (3) along the pleats to remove dirt. Blow compressed air again from inside the element (3), to complete the dirt removal.



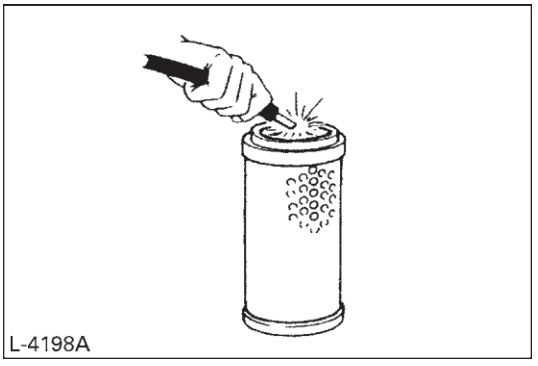
■ 3 Air Filter Maintenance

CAUTION
To avoid personal injury:
- **Wear eye protection.**


L-3332A

◆ Cleaning with compressed air

Pressure of compressed air must be under 30 psi (205 kPa, 2.1 kgf/cm^2) and the cartridge should be blown clean from the inside to the outside until the dust deposits are remarkably reduced.


L-4198A

IMPORTANT:
- If the air suction is still inadequate, or the colour of the exhaust gases is abnormal even after the cleaning, the air filter element must be replaced.

25-6. Maintenance every 200 service hours

Also perform the maintenance every 50 and 100 service hours.

25-6-1. Replacing the engine oil and the engine oil filter

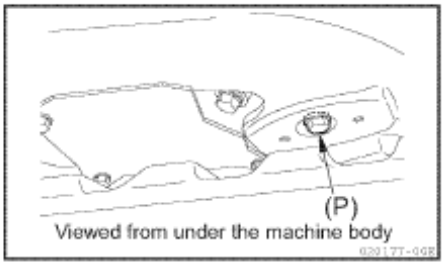
⚠ WARNING

- **Do not replace the oil immediately after the engine stops to prevent bodily injury, because all the components are hot.**
- **Do not allow hot oil or components to contact your skin.**
- **Replace the oil and the filter element after the oil and the components have cooled sufficiently.**

■ **Things to prepare**

- Replacement new oil : 3.2 Qts. (3.0 L)
- Container for waste oil : Capacity of 3.2 Qts. (3.0 L) or more
- Filter wrench for engine oil filter cartridge

1) Swing the upperstructure so that the drain plug (P) on the bottom of the engine is positioned in the middle of the right and left crawlers.



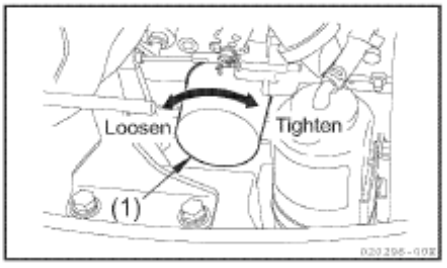
2) Place the container for waste oil under the drain plug (P).

3) Slowly remove the drain plug (P) so that the oil should not splash on you, and drain the waste oil.

4) Check the waste oil, and contact your dealer if any metallic particles or foreign objects are mixed in it.

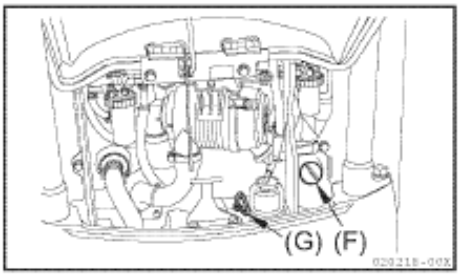
5) Reinstall the drain plug (P).

6) Turn the oil filter cartridge (1) counterclockwise with the filter wrench to remove it.
After removing the oil filter, wait 10 to 15 minutes before replacing it.



7) Wipe the dirt and oil from the filter mount and apply engine oil (or apply grease lightly) to the seal surface of a new oil filter cartridge.

8) When mounting the new filter cartridge, turn it 2/3 of a turn after the seal surface has contacted the filter mount.



9) After replacing the oil filter cartridge, add engine oil up to the upper limit mark on the oil dipstick (G) through the oil supply port (F).
Refer to Section "21. Fueling, Oiling and Greasing Based on Temperature Range" for the fuel to be used.

10) Idle the engine for several minutes and then stop the engine. Then check that the oil level exceeds the mid-point between the upper and lower limit marks on the oil dipstick.
Refer to Section "25-3. Checking before start-up".

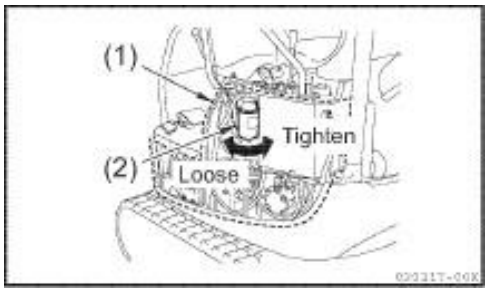
11) Install and tighten the oil supply port cap securely.

Replace the engine oil and the oil filter 6 months after the previous replacement, even if the service hours have not reached 200 service hours.
Also replace them at 200 service hours, even if 6 months have not elapsed since the previous replacement.

■ Replacing Hydraulic Return Filter Element (first replacement after 250 service hours)

CAUTION
To avoid personal injury:
- **Remove the oil filter only after the oil in the hydraulic tank hascooled down.**

Contact your ACHILLES dealer for details.



(1) Return filter

IMPORTANT:
- Always check the oil level when replacing the filter.

IMPORTANT:

- If the engine is run with a loose fan belt, the belt could slip and cause overheating of the engine or insufficient battery charging. Check fan belt tension regularly.
- Should the fan belt break or jump out, the indicator light for battery charge will light up. Stop the engine and remove the key immediately.

■ Checking the Radiator Hoses

3

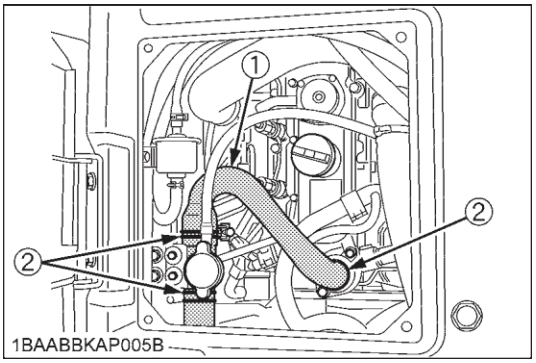
CAUTION

To avoid personal injury:

- **Wait long enough for the radiator coolant to cool down.**

Check the water hoses for proper fixation. This check should be carried out every 250 hours or every 6 months, whichever comes first.

1. Should the hose clamps become loose or water leaks, tighten the hose clamps properly.
2. Should the radiator hoses become swollen, aged or cracked, they must be replaced and the hose clamps tightened again properly.



(1) Radiator hoses
(2) Hose clamps

■ Replacing Engine Oil Filter (First Engine Oil Filter Change after 50 Service Hours)

1. Replace the oil filter cartridge at the same time as doing engine oil change.
2. Remove the cartridge with the supplied filter wrench.

(1) Oil filter cartridge

3. Oil the O-ring of the new oil filter cartridge lightly. Then tighten the oil filtercartridge by hand.
4. Fill engine oil to the specified level.
5. Let the engine run for approx. 5 min. and make sure that the engine oil indicator light does not light up. Then stop the engine and remove the key.
6. The engine oil level will sink parallel to the oil filter capacity after the engine is started. It is necessary to add oil.

IMPORTANT:

- Always check the oil level when replacing the filter.

EVERY 500 SERVICE HOURS

Do all 50-, 100- and 250-hour servicing at thesame time.

■ Drive unit Oil Change (First Oil Change at 100 hours)

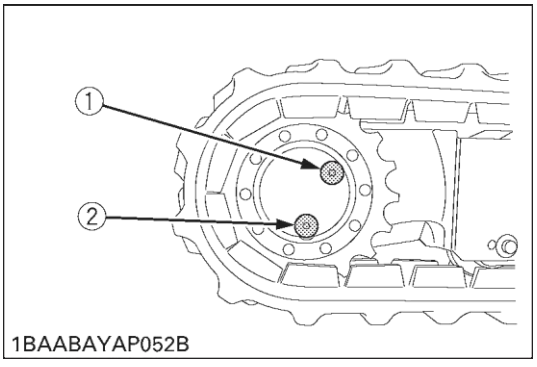
CAUTION
To avoid personal injury:
- **Lower attachments to the ground, stop the engine and remove the key before undertaking the oil change.**

1. Rotate the track so that the drain plug of the drive unit is in the bottom position.
2. Remove the drain plug to let the oil run out. Screw in and tighten the drain plug again and fill with gear oil through the oil check port.
3. Fill oil until it overflows out of the oil check port.

Gear oil volumes	approx. 0.25 L

Oil change
- first oil change after 100 hrs
- then every 500 hrs
- or at least once a year

4. Use prescribed gear oil SAE 90.

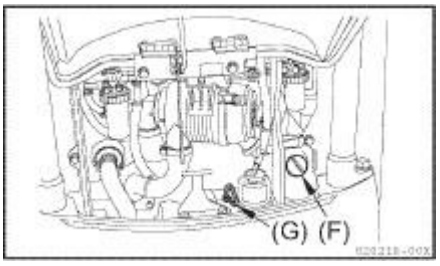


(1) Oil check port (also serves as oil filling port)
(2) Drain plug

■ Replacing of Fuel Filter

CAUTION
To avoid personal injury:
- **Keep fire away.**

1. Close the cock of the water separator. Remove the filter with the supplied fifter wrench.
2. Add fuel to the new filter before installing.
3. Apply a light film of fuel to the seal of the new filter and turn in tightly by hand.



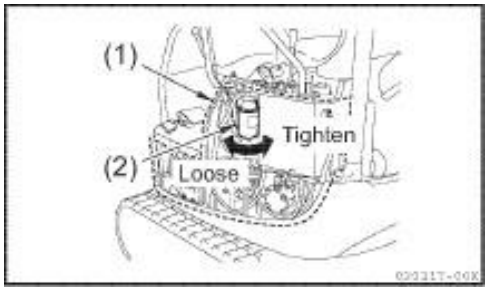
(1) Fuel filter

IMPORTANT:
- After exchange of the filter, the fuel system must purged.

■ Replacing Hydraulic Return Filter Element (first replacement after 250 service hours)

CAUTION
To avoid personal injury:
- **Remove the oil filter only after the oil in the hydraulic tank has cooled down.**

Contact your ACHILLES dealer for details.



(2) Return filter

IMPORTANT:
- Always check the oil level when replacing the filter.

■ Battery Service

DANGER
To avoid the possibility of a battery explosion: For refillable type battery, follow the instructions below.
- **Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.**

CAUTION
To avoid personal injury:
- **Batteries contain sulphonic acid which can cause severe burns. Avoid all contact with skin, eyes or clothing. Antidote**
  - External: Rinse with plenty of water. Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call a physician immediately. Eyes: Rinse with plenty of water for 15 minutes and get prompt medical attention. Keep batteries out of the reach of children.
- **Before inspection or dismounting the battery, be sure to turn of the engine and turn the starter switch to the "OFF" position.**
- **When removing the battery, always disconnect the negative ground cable first. The reverse when installing a battery, always connect the ground cable last. This prevents a possible explosion caused by sparks.**
- **Always wear eye protection when working with the battery.**

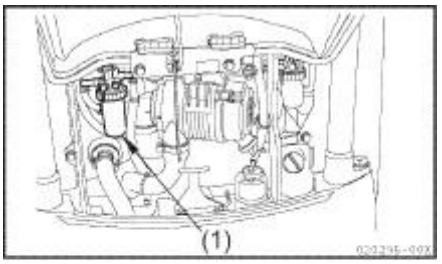
■ Draining water of the Fuel Tank

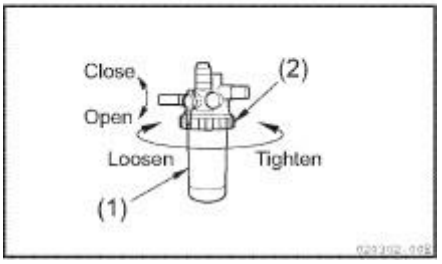
3 **CAUTION**

To avoid personal injury:

- **Before draining water of the fuel tank, be sure to stop the engine and remove the key.**
- **Do not smoke during inspection.**

1. Remove the drain plug on the underside of the body and drain water.





2. Re-tighten the dran plug.

(1) Drain plug

EVERY 1000 SERVICE HOURS

Do all 50, 100-, 200-, 250- and 500-hour servicing at the same time.

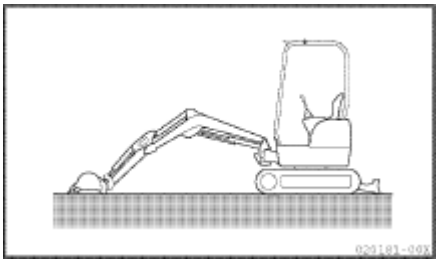
(A) Oil

■ Hydraulic Oil Change (Including Replacing of the Suction Filter in the Hydraulic Tank)

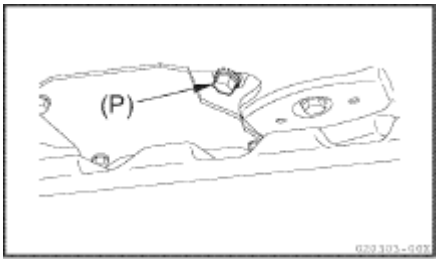
3

CAUTION
To avoid personal injury:
- **Wait long enough for the hydraulic fluid to cool down. Then begin with the change of the hydraulic fluid.**

1. Move the excavator to a level ground and stop the engine. Extend the piston rods of the cylinders halfway out and lower the bucket on the ground.

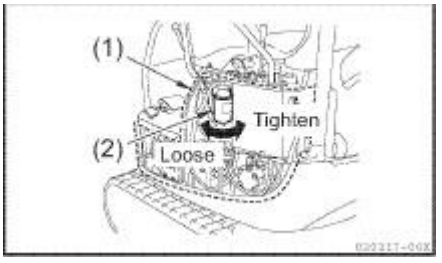


2. Remove the drain plug on the underside of the hydraulic tank and drain the oil.



(1) Drain plug

3. Remove the cover of the hydraulic tank.
4. With a fork wrench or similar, remove and exchange the suction filter.



(1) Cover
(2) Suction filter
(3) Drain plug

5. Retighten the drain plug.
6. Fill oil through the oil filling opening on the top side of the tank.
7. Let the engine run for approx. 5 min. and check the oil level again.

Hydraulic oil volumes	Hydraulic tank	13 L
	Whole oil volumes	21L

■ Hydraulic Oil Check with Hydraulic Breakers

The hydraulic oil change after 1000 operating hours in the operator's manual is based on normal excavator work. Following inspection measures are valid when hydraulic breakers are used:

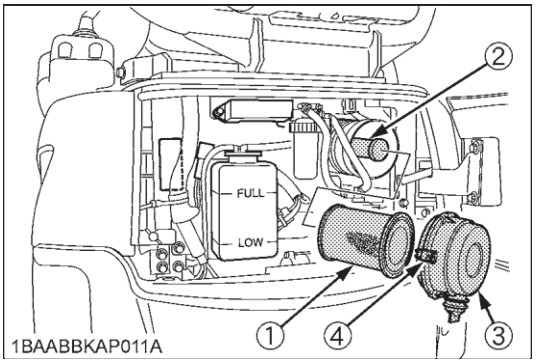
1. Changing and filling up of hydraulic oil
   1) The hydraulic oil must be changed more often when breakers are used because the machine is subject to harder conditions than at normal excavating work.
   2) Use only the recommended oils mentioned in the operator's manual when changing or fill oil.
   3) When filling up oil, do not mix oils of different makes.
2. Changing the return filter and oil
   1) The filter must be changed more often because of contamination resulting from the frequent assembly and disassembly of the hoses.
   2) Use the correct replacement filter.
   3) Oil change according to operating hours.

		Hydraulic oil	Return Filter
Normal excavator work		every 1000 Hrs.	every 500 Hrs. (250Hrs. after first operation)
Breaker work portion	20%	every 250 Hrs.	every 100 Hrs.
	40%	every 200 Hrs.	
	60%	every 100 Hrs.	every 100 Hrs.
	more	every 100 Hrs.	

EVERY 1000 SERVICE HOURS OR ONCE A YEAR

■ Replacing Air Filter Element

Open the engine bonnet and remove the dust-cover.
Remove and replace the outer element and inner element with new elements.
When reassembling, install the dust-cover so that its TOP mark (arrow) faces up-wards.



(1) Outer element
(2) Inner element
(3) Dust-cover
(4) Clamps

IMPORTANT:
- Shorten the replacement period if the machine is used in dusty or sandy areas.

EVERY 2000 SERVICE HOURS

Do all 50, 200, 250, 500 and 1000 hour servicing at the same time.

■ Chang Front Idler and Track Roller Oil

NOTE:
Contact your ACHILLES dealer for details.

■ Check the Dynamo and Starter Motor

NOTE:
Contact your ACHILLES dealer for details.

ANNUAL SERVICING

■ Electrical Wiring and Fuses

Check the terminals periodically for proper connections. Loose wiring or damaged cables can cause improper functioning or short circuiting of the electrical system. Check wiring and replace damaged components immediately. If a fuse blows out soon after having been replaced, contact your nearest ACHILLES dealer. Never use a fuse other thanspecified.

BIENNIAL SERVICING

3

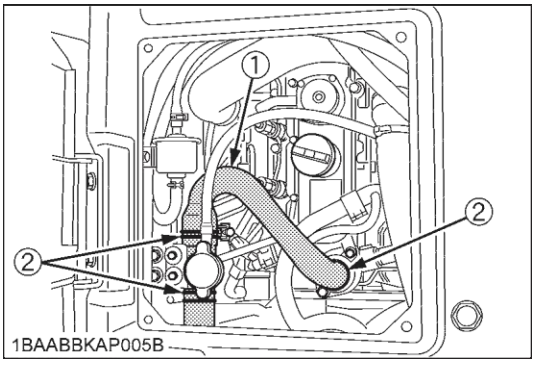
CAUTION

To avoid personal injury:

- **Do not loosen the radiator cap before the radiator has cooled down sufficiently. Then only loosen the cap and allow enough time for the pressure in the system to be released. Now remove the cap completely.**

■ Replacement of Radiator Hoses

Replace radiator hoses and hose clamps ever two years. If the hoses are swollen, hard or cracked, they must be replaced earlier.

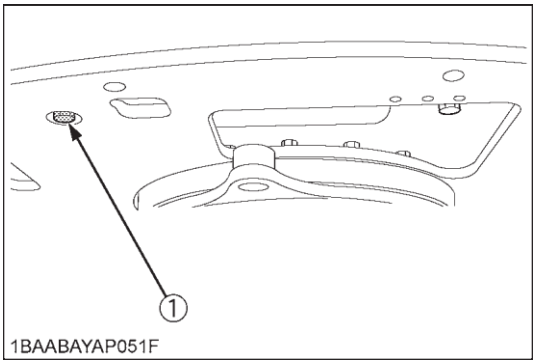


(1) Radiator hoses
(2) Hose clamps

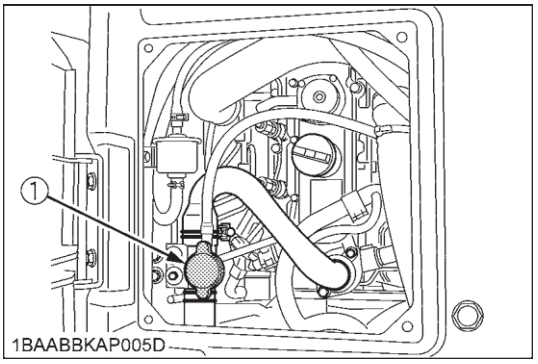
■ Changing Radiator Coolant

(In case of long-life coolant fluid)
Stop the engine then remove the key and wait until it has cooled down completely.

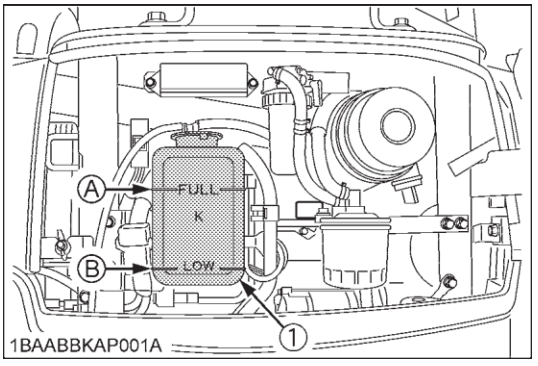
1. Open the drain plug on the bottom of the radiator and drain coolant completely.
2. To clean, rinse the radiator with water.
3. Close the drain plug and fill the radiator and the reserve tank with coolant fluid. Let the engine idle for about 5 min., stop the engine and remove the key then check the coolant level.
4. The machine has been shipped filled with 50% anti-freeze solution.



(1) Drain plug



(1) Radiator cap



(1) Reserve tank
(A) "FULL"
(B) "LOW"

Coolant volumes	approx. 0.71 US gal (2.7 L) (Reserve tank: approx. 0.16 US gal (0.6 L)

IMPORTANT:
- Do not operate the engine without coolant.
- To fill the radiator system use fresh water and anti-freeze fluid.
- When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50%.
- Tighten the radiator cap properly. If the cap is loosely or not properly fitted, overheating of the engine can result due to coolant fluid loss.

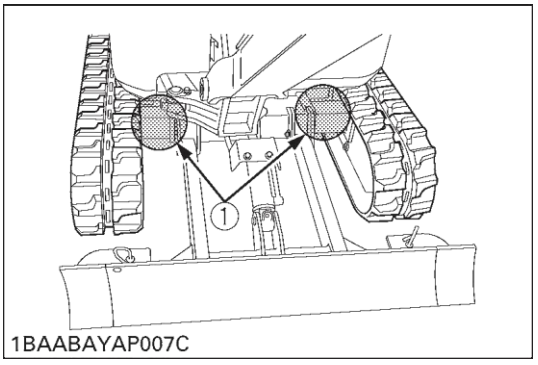
OTHER SERVICING

■ Cleaning the Track Frame Slide Pipes

When the slide pipes of the track frame are clogged or adhered with soil or sand, clean the slide pipes in the following manner according to need.

WARNING
To avoid the personal injury or death:
- **Place the machine on even ground when cleaning the track frame slide pipes.**

1. First lift the machine off the ground using the dozer blade and boom functions.
2. Switch the track width change / dozer select lever to the “Track width change” position.
3. Push the control lever forward, and expand the track width to 49 in. (1240 mm).
4. Remove soil and sand adhered to the slide pipes, then put grease evenly around the pipes. Make sure all 4 slide pipes are greased.
5. Retract and expand the track width repeatedly for a few times by moving the control lever, so that the grease is spread adequately.
6. Switch the track width change / dozer select lever to the “Dozer” position.
7. Place the machine down on the ground carefully by moving the dozer blade and the boom.

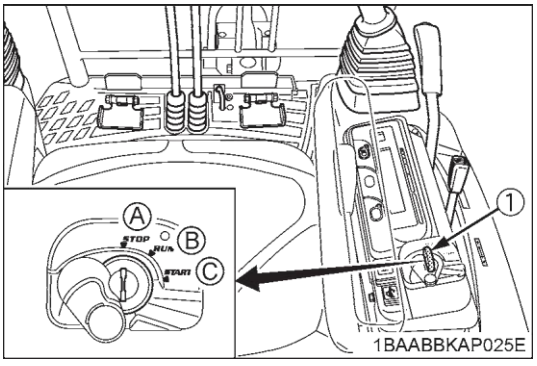


(1) Track frame slide pipes

OTHER ADJUSTMENTS AND REPLACEMENTS

PURGING OF THE FUEL SYSTEM

1. Fill up the excavator with fuel.
2. Turn the starter key to the "RUN" position.
3. The air in the fuel system will automatically be purged within one minute.



(1) Starter key

(A) "STOP"
(B) "RUN"
(C) "START"

IMPORTANT:

- If the purging was insufficient, the engine dies right after starting. In this case repeat steps 2 to 3 again.

ADJUSTMENT OF TRACKS

◆ **To loosen the tracks, follow the following procedure:**

CAUTION

To avoid personal injury:

- **Do not loosen the grease nipple completely or too quickly. Otherwise grease under high pressure in the tension cylinder could squirt out.**
- **Do not crawl under the excavator.**

1. Using a socket wrench, loosen the grease nipple a few turns.
2. When grease oozes out from the thread, rotate the track and loosen the track in the lifted position (see illustration).

After adjustment is completed:

Using the socket wrench, tighten the grease nipple.

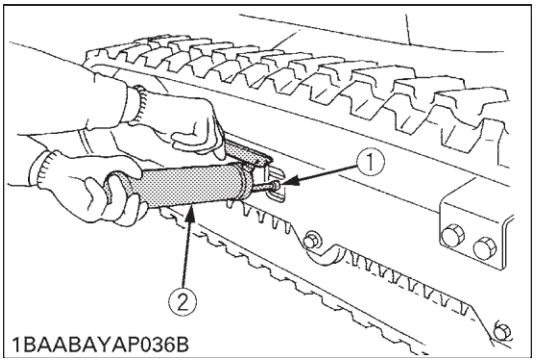
Tightening torque must be between 72 to 80 ft·lbs (98 to 108 N·m, 10 to 11 kgf·m).

IMPORTANT:

- If the tracks are too tight, wear is increased.
- If the tracks are too loose, the track pads may collide with the sprocket, wear is increased.
  The track may dislocate or come off.
- Clean the track after every use.
- Should the track tension be high due to sticking mud, lift the track with the help of the boom, arm and bucket, idle the engine and remove mud from the track by rotating it.

◆**Tension the tracks as specified:**

1. Apply grease (2) to the grease nipple (1).



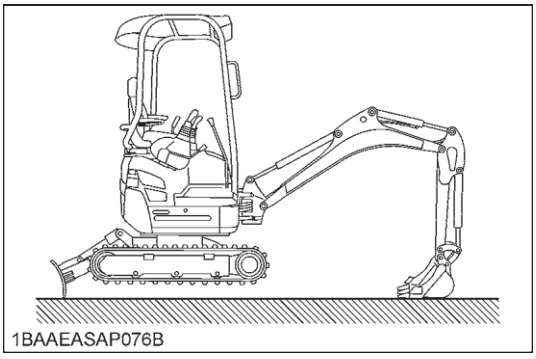
(1) Grease nipple
(2) Grease gun

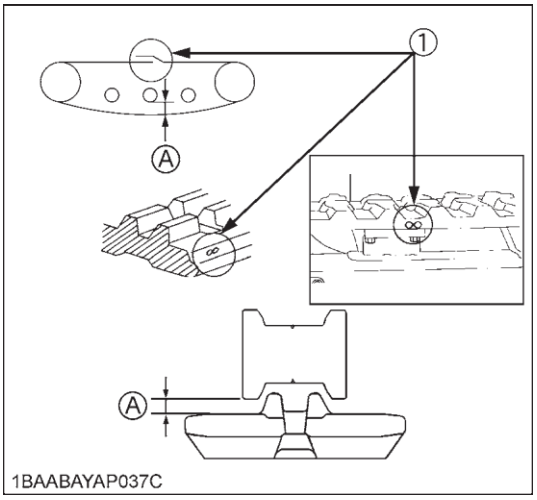
2. Tension the track in the lifted position, so that the distance "A" (clearance between the track roller and the inside surface of the track) is 0.4 to 0.6in. (10 to 15mm) (see illustration). In this case, the track seam is positioned on the top center between the idler and the sprocket.

3 **DANGER**

To avoid serious injury or death:

- **Do not work under the machine in this condition.**
- **For your safety do not rely on hydraulically supported devices, they may leak down and suddenly drop or be accidentally lowered.**





(1) Seam (Mark “oo”) (A) 0.4 to 0.6 in. (10 to 15 mm)

IMPORTANT:

- Make sure that no obstacles, such as stones are caught in the track. Remove such obstacles before adjusting the track tension.
- Track seam
  The ends of the rubber track are joined with a seam. When adjusting the tracks, the seam must be positioned on the top center between the idler and the sprocket.

  If the seam is positioned incorrectly, the tracks will be tensioned to loosely, and a further readjustment will be necessary.

- Rotate the track after adjustment one to two times to check the tension.
- Additionally following points are to be observed when adjusting rubber tracks.
  1) If the track slackens more than 0.98 in. (25mm), readjust them.
  2) Check track tension 30 hours after initial use and readjust if necessary. Check and adjust thereafter every 50 service hours.

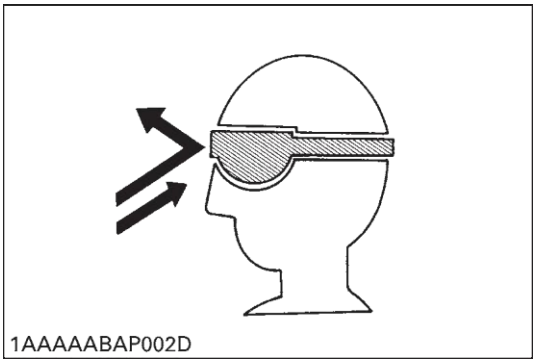
■ Special Information when Using Rubber Tracks

1. When turning, make a slow swing turn. Avoid spin turns to lessen lug wear and entry of dirt.
2. The relief valve may be activated if too much dirt and sand clog the tracks. In this case move the machine for a short distance straight backwards to let the earth and sand fall off, then a turn can be made.
3. Avoid using rubber track on riverbeds, stony underground, ferro-concrete and on iron plates. The rubber can damage aswell as increase wear on the tracks.

EXCHANGE OF BUCKET TEETH AND SIDE CUTTERS [JPN BUCKET VERSION]

■ Bucket Tooth Replacement

3 **CAUTION**
To avoid personal injury:
- **Wear eye protection when changing the tooth points.**



1. Position a screw driver or similar tool above the lock pin and knock out the pin and rubber plug with a hammer.
2. Remove the worn point from the adapter by hitting it with a hammer.
3. Clean the adapter.

■ Replacing the Bucket

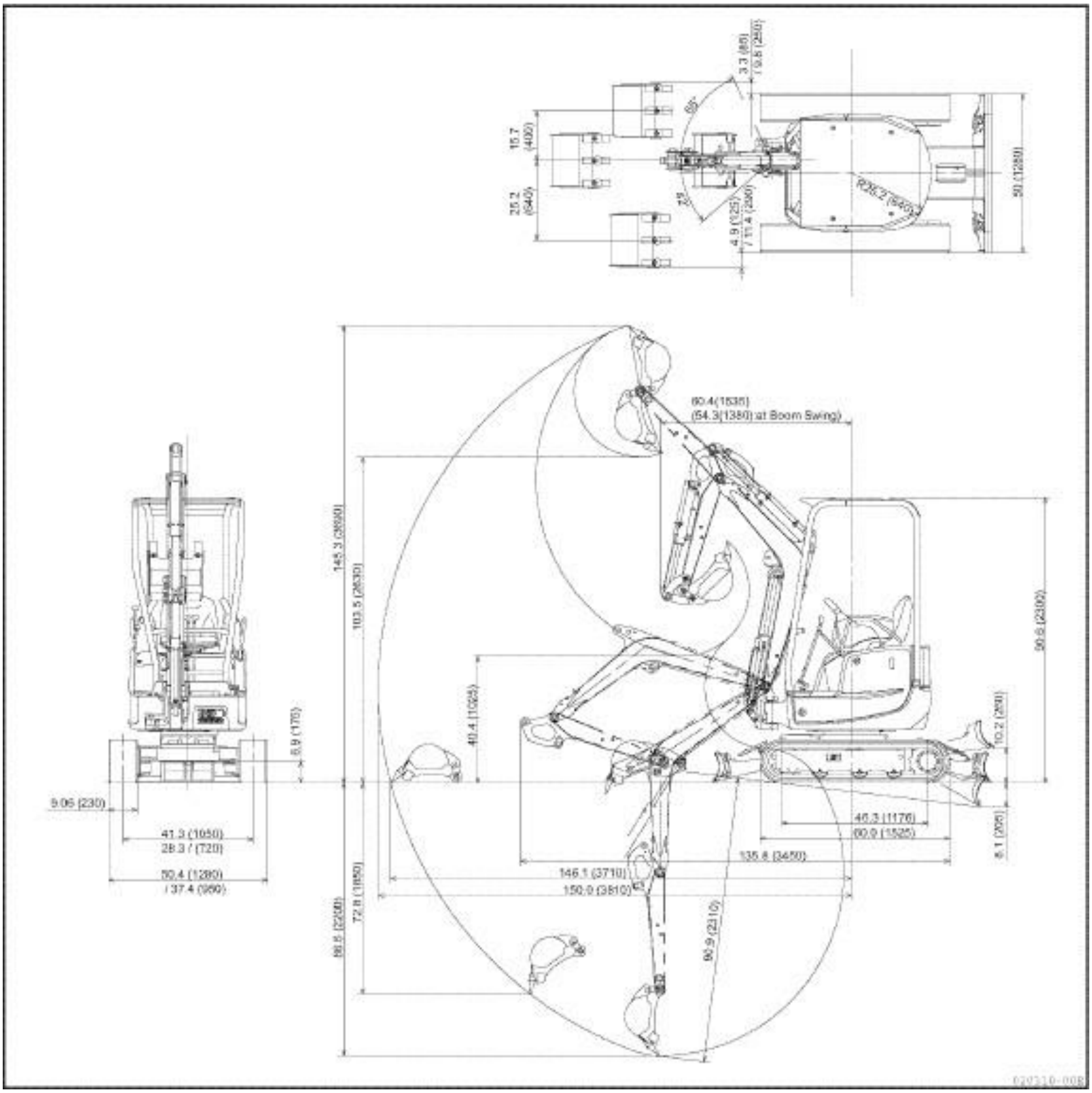
3 **CAUTION**

To avoid personal injury:

- **The bucket can tilt over and cause accidents if in an unstable position.**

  Therefore:

  1) **Only change the bucket if no other persons are in the area.**
  2) **Lower the bucket on an even ground and make sure that it will not tilt when touched.**



60.4(1535)
(54.3(1380) at Boom Swing)
145.3 (3690)
103.5 (2630)
40.4 (1025)
6.9 (170)
9.06 (230)
41.3 (1050)
28.3 / (720)
50.4 (1280)
/ 37.4 (950)
146.1 (3710)
150.0 (3810)
135.8 (3450)
46.3 (1176)
60.0 (1525)
90.6 (2300)
10.2 (260)
8.1 (205)
72.8 (1850)
86.6 (2200)
90.9 (2310)
15.7 (400)
25.2 (640)
50 (1280)
R25.2 (640)

TROUBLESHOOTING

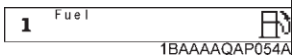
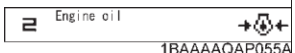
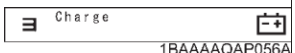
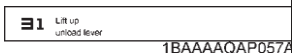
If the excavator does not show the desired performance, or when trouble arises, refer to the table below and undertake appropriate measures.

Trouble		Cause	Countermeasure
Engine	Starting difficulties	Fuel is too viscous	* Check fuel tank and filter * Remove impurities and water * If necessary, replace filter
		Air or water in the fuel system	* Remove water from the fuel tank * Check fuel pipe joint bolts and nuts for looseness * Purging of the fuel system (for fuel filter and injection pump, see "PURGING OF THE FUEL SYSTEM" in "OTHER ADJUSTMENTS AND REPLACEMENTS".)
		Oil viscosity is too high the engine runs sluggishly in winter	* Pour hot water over the radiator * Use oils of different viscosities depending on the ambient temperature. (Use SAE10W, SAE10W-30 or SAE10W-40)
		Battery is almost dead; insufficient compression	* Recharge battery
	Insufficient engine power	Low fuel level	* Check fuel and add if necessary
		Clogged air cleaner	* Clean the air filter element
	Engine suddenly stops	Low fuel level	* Check fuel and add if necessary * Purge the fuel system
	Abnormal exhaust gas color	Poor fuel	* Use high quality fuel
		Too much engine oil	* Drain engine oil to prescribed oil level
	Water temperature in red zone (Overheating)	Defective seal of the water pump	* Replace
		Worn or torn fan belt	* Adjust or replace
		Thermostat is defect	* Replace
		Coolant level too low	* Fill to prescribed level
		Radiator grill or fins are clogged	* Clean
		Coolant is contaminated with rust from the cylinder head or crank case	* Replace coolant fluid and add anti-rust
		Defective radiator cap (Evaporation)	* Replace
		Corroded coolant pipes	* Clean
		Continuous operation under full load	* Reduce load
		Cylinder head gasket is damaged (Coolant loss)	* Replace
		Engine oil level too low	* Fill to prescribed level
		Maladjustment of fuel injection	* Readjust ignition timing
		Use of poor fuel	* Use prescribed fuel

Trouble		Cause	Countermeasure
Hydraulic System	Boom, arm, bucket, drive, swing and dozer power is too low	Hydraulic oil level too low	* Add oil
		Leakages of hoses and / or joints	* Replace hose or joint
Drive System	Deviation of drive direction	Blocked through stones	* Remove
		Track too loose or too tight	* Adjust accordingly

ACHILLES AUSTRALIA NAVIGATION LIST OF MESSAGES

If an error occurs with the machine, one of the following messages appears in the LCD display. In case of a trouble, immediately contact your local dealer for inspection and repair.

Message	Warning lamp Color	Problem or failure (what happened)	Machine behavior (provisional measure)	Correction
 1BAAAAQAP054A	yellow	Fuel running out.	-	Add fuel.
 1BAAAAQAP055A	red	Engine oil circuit error (clogged) or engine oil shortage.	Immediately stop the engine.	The engine may be seized, failing to restart the engine. Immediately contact your local dealer for repair.
 1BAAAAQAP056A	red	Charginglineintrouble. Charging failure.	Check the fan belt. (When the belt is in good condition, keep running until the battery becomes dead.)	Immediately contact your local dealer for repair.
 1BAAAAQAP058A	red	24V line engine startup alternator defective.	[Do not start the engine on 24V line. Get it restarted to seeif there is the message again.]	If the message does not reappear, no repair is needed.If the message stays on, contactyour local dealerfor repair.
 1BAAAAQAP057A	yellow	The engine has been started with the lock lever down.	The engine fails tostart.	Pull up the lock leverandstart the engine.
No message (warning lamp flashing)	red	Sensor powerline short circuited.	The work light lights up.	Immediately contact your local dealer for repair.

◆ **Service hour meter**

When the hour meter has counted up to the hours circled in the maintenance list below, the message appears. The message shows up as follows.

No.	Check points		Measures	Hour meter indicator										Interval
				50	100	250	300	500	550	600	750	800	1000	
1	Engine oil		change					○					○	every 500 hrsor every 1 year
2	Hydraulic oil												○	every 1000 hrs
3	Air filter element	Outer element	replace										○	every 1000 hrs
		Inner element											○	every 1000 hrs
4	Drive unit oil		change		○					○				every 500 hrs
5	Engine oil filter		replace					○					○	every 500 hrsor every 1 year
6	Hydraulic return filter element					○					○			every 500 hrs
7	Hydraulic breather filter element												○	every 1000 hrs
8	Hydraulic suction filter element												○	every 1000 hrs

NOTE:

- The maintenance message disappears automatically in about 10 seconds.
- When the key is turned from OFF to RUN, the maintenance message reappears and disappears again automatically in about 10 seconds.
- When the key is turned from OFF to RUN repeatedly 10 times, the message disappears.

◆ In case the service hour meter replaced due to any trouble with it, the meter is set to ”0”. Contact your ACHILLES dealer for details.

OPERATION UNDER COLDWEATHER CONDITIONS

PREPARATION FOR OPERATION IN COLD WEATHER

1. Replace engine oil and hydraulic oil with those of viscosities suitable for cold weather.
2. In cold weather, battery power drops, and the battery fluid may freeze if the battery is not sufficiently charged. To prevent the battery fluid from freezing, be sure to keep the battery charged at least 75% or more of its capacity after operation. To ease next starting, it is recommended to keep the battery stored in closed or heated rooms. If the battery fluid level is too low, do not add after operation, but add with the engine running before the next operation.
3. Add anti-freeze to coolant in the radiator and reserve tank, if the ambient temperature is expected to drop below 0°C. Mixing ratio of water and anti-freeze depends on the expected ambient temperature.

- Mixing ratio between water and anti-freeze

Ambient Temperature °C	-5	-10	-15	-20	-25	-30	-35
Antifreeze %	30	30	30	35	40	45	50
Water %	70	70	70	65	60	55	50

IMPORTANT:

- Use permanent anti-freeze or longlife coolant.
- Drain the coolant completely and clean inside of the radiator then fill with the water and anti-freeze mixture.
- The anti-freeze acts as an anti-corrosive, it is not necessary to add an additive to the water and anti-freeze mixture.
- See “Coolant check” under “DAILY CHECKS” in “MAINTENANCE” for radiator fill volumes.

PROCEDURE AFTER DONE WORK

Clean the excavator thoroughly after work and wipe dry. Otherwise mud and earth on the tracks could freeze if the temperature drops below the 0°C mark. Operation of the excavator is then not possible. Store the excavator in a dry place; if not possible, store on wooden planks or on mats. If the excavator is kept on damp or muddy ground, the tracks could freeze overnight. Operation of the excavator is then not possible. Furthermore the reduction gear may be damaged.
Additionally, the piston rods of the hydraulic cylinders must be rubbed dry. Otherwise severe damage could occur if dirty water seeps through the seals.

LONG STORAGE

3 **CAUTION**

To avoid personal injury:

- **Do not clean the excavator with the engine running.**
- **To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.**
- **When storing, remove the key from the starter switch to avoid unauthorized persons from operating the excavator and getting injured.**

■ Should the Excavator be Stored for a Longer Period of Time, Observe Following Procedures:

1. The whole excavator should be cleaned thoroughly and in all cases stored indoors. If the excavator has to be kept outdoors, lay out wooden planks on even ground, place the excavator on the planks and cover completely.
2. Do an oil change and grease the excavator.
3. Heavily grease the visible sections of the cylinder rods.
4. Remove the battery and store indoors.
5. If it is expected that the temperature will sink below the 0ºC mark, add anti-freeze or drain coolant completely.

IMPORTANT :

- Wash the excavator after stopping the engine.
  If you wash the excavator while running the engine, splashing water get into the air cleaner through its intake and cause engine trouble.
  Carefully, wash and do not splash water over the air cleaner.

■ Observe Following Procedures when the Machine is to be Operated after Long Storage

1. Wipe off the grease from the hydraulic cylinder rods.
2. Turn on the engine and operate the attachments and the drive mechanisms under no load in order to circulate the hydraulic oil . (If the machine is stored for longer than one month, Do steps (1) and (2) once every month)

Periodic replacement of important component parts

To ensure safety in operation, you are strongly requested to inspect and service the machine at regular intervals. For added safety, ask your ACHILLES dealer to replace the following importantcomponent parts.

These parts are prone to degradation in material or subject to wear and tear with time. It is difficult to judge how much they have been affected at regular inspection. It is therefore necessary to replace them with new ones, whether wear is visible or not after a specified time of use.

If any of them is found to be worn before the specified use. They must be repaired or replaced the same as other parts.

If any of the hose clamps are found deformed or cracked, the hose slumps must also be replaced.

For the hydraulic hoses other than the ones to be replaced periodically, inspect them for the following points. If found loose or very worn, tighten and/or replace the hose.

When replacing the hydraulic hoses, change their O rings and sealing components with new ones.

For replacement of the important parts, contact your ACHILLES dealer.

- At the following periodic inspections, check the fuel hoses and hydraulic hoses as well.

Inspection Interval	Check points
Daily Checks	Oil leak at fuel and hydraulic hose connections and points
Every month	Oil leak at fuel and hydraulic hose connections and points Damages at fuel and hydraulic hose (cracks, chafing)
Every year	Oil leak at fuel and hydraulic hose connections and points Interference, deformation, degradation, twist and other damages (cracks, chafing) of fuel and hydraulic hoses

List of important component parts

No.	Component parts	Q'ty	Period
1	Fuel hose (Fuel tank-Fuel filter)	2	Every 2 years or 4000 hours
2	Fuel hose (Fuel filter-Fuel pump)	2	
3	Fuel hose (Fuel pump-Fuel nozzle)	2	
4	Fuel hose (Fuel nozzle-Fuel tank)	1	
5	Fuel hose (Fuel tank-Fuel drain)	1	
6	Hydraulic hose (Main pump suction)	1	
7	Hydraulic hose (Main pump delivery)	4	
8	Hydraulic hose (Boom cylinder)	2	
9	Hydraulic hose (Arm cylinder)	2	
10	Hydraulic hose (Bucket cylinder)	2	
11	Hydraulic hose (Swing cylinder)	2	
12	Hydraulic hose (Dozer cylinder)	2	
13	Hydraulic hose (Service port)	4	

To prevent serious damage to the hydraulic system, use only a ACHILLES genuine hydraulic hose.

RECOMMENDED OILS

IMPORTANT

1. Before delivery, the hydraulic oil used was an ISO 46 viscosity grade.
2. Use engine oil API service classification CD, CE or CF.
3. Use SAE 90 (API, CLA/GL5) as drive unit oil for all seasons.

	Application	Viscosity	Shell	Mobil	Exxon	MIL-Standard
Engine oil	In winter or by low temperatures	SAE 10W	Shell Rotella T10W Shell Rimula 10W	Mobil Delvac 1310	XD-3 10W XD-3 Extra 10W	MIL-L-2104C MIL-L-2104D
		SAE 20W	Shell Rotella T20W-2 Shell Rimula 20W-20	Mobil Delvac 1320	XD-3 20W-20 XD-3 Extra 20W-20	
	In summer or by high ambient temperatures	SAE 30	Shell Rotella T30 Shell Rimula 30	Mobil Delvac 1330	XD-3 30 XD-3 Extra 30	
		SAE 40	Shell Rotella T40 Shell Rimula 40	Mobil Delvac 1340	XD-3 40 XD-3 Extra 40	
		SAE 50	Shell Rimula 50	Mobil Delvac 1350		
	All-Season engine oil	Multi-purpose	Shell Rotella T15W-40		XD-3 15W-40 XD-3 Extra 15W-40	
Gear oil	In winter or by low temperatures	SAE 75		Mobilube HD80W-90		MIL-L-2105C
			Shell Oil S8643			
		SAE 80		Mobilube HD80W-90		
			Shell Spirax HD80W			
	In summer or by high ambient temperatures	SAE 90		Mobilube 46		MIL-L-2105
			Shell Spirax HD90	Mobilube HD80W-90		MIL-L-2105C
		SAE 140		Mobilube HD85W-140		MIL-L-2105C
			Shell Spirax HD140	Mobilube HD80W-140		MIL-L-2105C
	All-weather gear oil	Multi-purpose	Shell Spirax HD80W Shell Spirax HD85W	Mobilube HD80W-90	GX80W-90	MIL-L-2105C
Hydraulic oil	Common Australia temperatures					
		ISO 46	Shell Tellus T46	Mobil DTE-Oil 15	NUTO H46	
	by high ambient temperatures	ISO 68	Shell Tellus T68	Mobil DTE-Oil 16	NUTO H68	
Grease			Shell Alvania EP2	Mobilux EP2	BEACON Q2	
Fuel			Light oil No. 2-D (ASTM D975)			
Fuel under -5°C			Light oil No. 1-D (ASTM D975)			

LIFTING CAPACITY

1. The lifting capacities are based on ISO 10567 and do not exceed 75% of the static tilt load of the machine or 87% of the hydraulic lifting capacity of the machine.
2. The strokes are as follows.
   1) The load point corresponds to the front bolt part of the arm.
   2) The machine positions are (i) over – front (Blade up), (ii) over – front (Blade down), and (iii) over – side.
   3) The operating cylinder is the boom cylinder.
3. The bucket of the excavator, the hook, the sling and other lifting accessories are taken into consideration for the loads.

Machine conditions:
No bucket, all others according to the standard regulations.

WARNING

To avoid personal injury or death:

- **It is forbidden to lift loads greater than those values mentioned in the lifting capacity tables.**
- **The values mentioned in the table are valid only on even, hard grounds. When lifting on soft ground, the machine 'can tilt over due to the fact that the load is concentrated only on one side of the machine.**
- **The table values are calculated at the end of the arm without the bucket. In order to find the allowable loads for machines with bucket, the bucket weight must be subtracted from the values in the table.**

WARNING

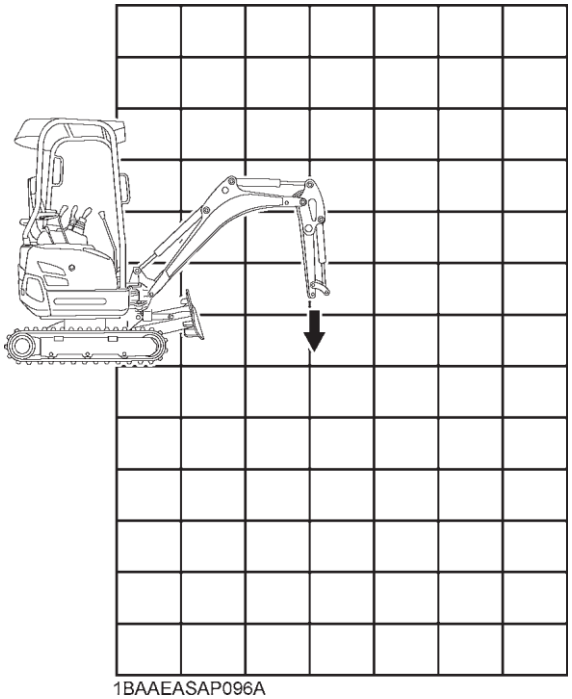
To avoid personal injury or death:

- **In this manual, the machine's lifting capacity is discussed, but it does not mean that it is recommended to use the machine for lifting jobs.**
- **It is specified in item 3.4 of ISO 10567:1992 that the following devices must be additionally installed if a hydraulic excavator with the rated lift load of over 2,205 lbs (1,000 kg) at its minimum lifting radius or the tilting moment of over 29,504 ft-lbs (40,000 N-m, 4,082 kg-m) is used for lifting loads.**

(1) **Lifting hook**

(2) **Acoustic alarm or warning lamp for the operator when the rated load or the corresponding tilting moment has been exceeded.**

(3) **Boom decending control device comforming to ISO 8643:1997**



1BAAEASAP096A

A18SE ROPS
CANOPY
RUBBERTRACK

LIFTING CAPACITY OVER-FRONT BLADE DOWN

Unit=kN (kg)

LIFTING POINT HEIGHT (m)		LIFT POINT RADIUS (m)				
		1.0	1.5	2.0	2.5	3.0
GL	2.5				3.1 (310)	
	2.0			2.6 (260)	3.0 (300)	
	1.5		4.4 (440)	3.8 (380)	3.4 (340)	3.1 (310)
	1.0			5.2 (530)	3.9 (390)	3.2 (320)
	0.5			5.8 (590)	4.1 (410)	3.2 (320)
	0.0			5.5 (560)	4.0 (400)	3.1 (310)
	-0.5	6.1 (620)	6.8 (690)	4.9 (500)	3.6 (360)	2.7 (270)
	-1.0	9.2 (930)	5.8 (590)	4.1 (410)	3.0 (300)	
	-1.5		4.5 (450)	3.1 (310)		

LIFTING CAPACITY OVER-FRONT BLADE UP

Unit=kN (kg)

LIFTING POINT HEIGHT (m)		LIFT POINT RADIUS (m)				
		1.0	1.5	2.0	2.5	3.0
GL	2.5				2.4 (240)	
	2.0			2.6 (260)	2.4 (240)	
	1.5		4.4 (440)	3.4 (340)	2.4 (240)	1.8 (180)
	1.0			3.2 (320)	2.3 (230)	1.8 (180)
	0.5			3.0 (300)	2.2 (220)	1.7 (170)
	0.0			3.0 (300)	2.2 (220)	1.7 (170)
	-0.5	6.1 (620)	4.6 (460)	2.9 (290)	2.1 (210)	1.7 (170)
	-1.0	11.0 (930	5.6 (470)	3.5 (300)	2.5 (210)	
	-1.5		4.5 (450)	3.0 (300)		

LIFTING CAPACITY OVER-SIDE TRACK WIDTH 1280mm

Unit=kN (kg)

LIFTING POINT HEIGHT (m)		LIFT POINT RADIUS (m)				
		1.0	1.5	2.0	2.5	3.0
GL	2.5				2.3 (230)	
	2.0			2.6 (260)	2.3 (230)	
	1.5		4.4 (440)	3.1 (310)	2.2 (220)	1.7 (170)
	1.0			3.0 (300)	2.1 (210)	1.6 (160)
	0.5			2.8 (280)	2.1 (210)	1.6 (160)
	0.0			2.7 (270)	2.0 (200)	1.6 (160)
	-0.5	6.1 (620)	4.2 (420)	2.7 (270)	2.0 (200)	1.6 (160)
	-1.0	9.1 (920)	4.3 (430)	2.7 (270)	2.0 (200)	
	-1.5		4.3 (430)	2.8 (280)		

WARNING

To avoid personal injury or death:

- **Operate always in standard track width 1280mm, except to pass throughnarrow space.**
- **Do not operate in narrow track width 950mm, it makes risk of the excavatortipping over.**

LIFTING CAPACITY OVER-SIDE TRACK WIDTH 39.0 in ONLY REFERENCE

Unit=1000 lbs.

LIFT POINT HEIGHT (ft)		LIFT POINT RADIUS (ft)			
		4	6	8	10
GL	8			0.36	
	6		0.56	0.36	
	4		0.52	0.34	0.24
	2		0.46	0.32	0.23
	0		0.44	0.30	0.22
	-2	0.81	0.44	0.29	
	-4	0.83	0.45	0.30	

LIFTING CAPACITY OVER-SIDETRACK WIDTH 950mm ONLY REFERENCE

Unit=kN (kg)

LIFTING POINT HEIGHT (m)		LIFT POINT RADIUS (m)				
		1.0	1.5	2.0	2.5	3.0
GL	2.5				1.5 (150)	
	2.0			2.2 (220)	1.5 (150)	
	1.5		3.3 (330)	2.1 (210)	1.5 (150)	1.1 (110)
	1.0			1.9 (190)	1.4 (140)	1.1 (110)
	0.5			1.8 (180)	1.3 (130)	1.0 (100)
	0.0			1.7 (170)	1.3 (130)	1.0 (100)
	-0.5	5.1 (520)	2.6 (260)	1.7 (170)	1.3 (130)	1.0 (100)
	-1.0	5.1 (520)	2.6 (260)	1.7 (170)	1.3 (130)	
	-1.5		2.7 (270)	1.8 (180)		