

Kubota

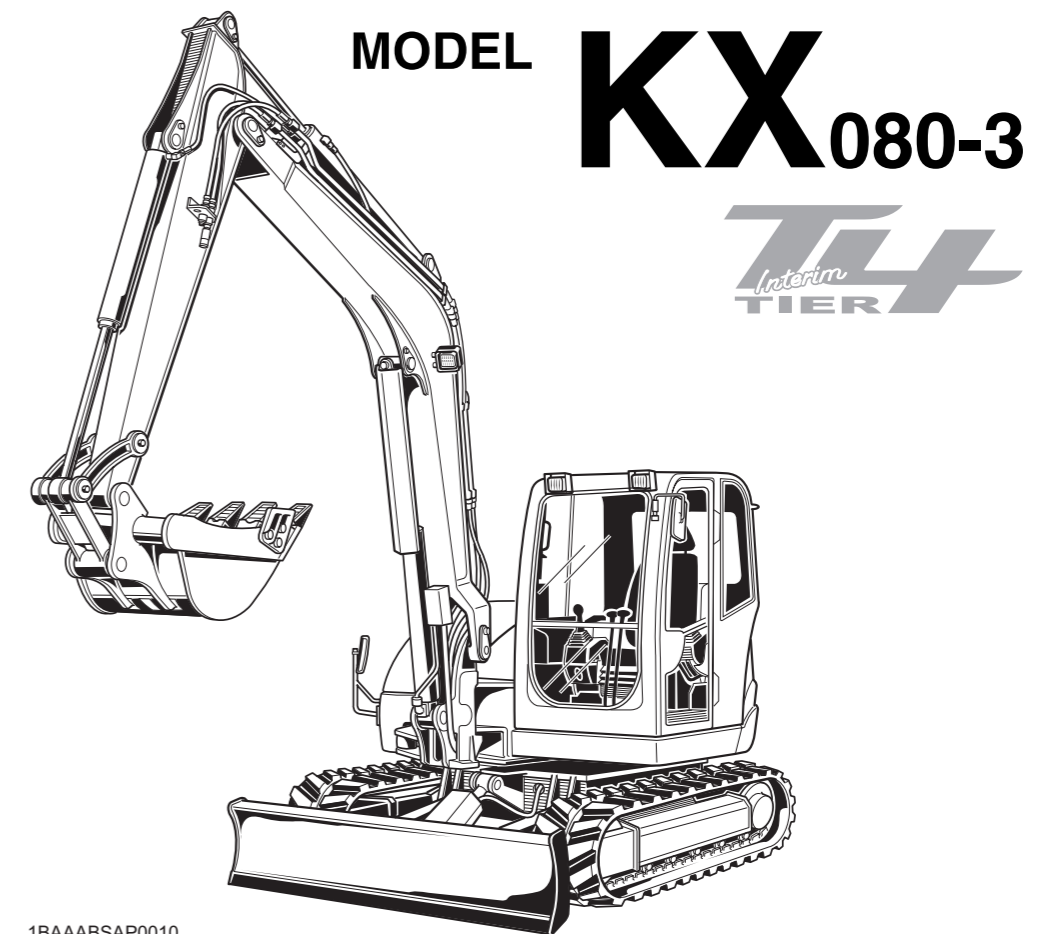
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OPERATOR'S MANUAL

KUBOTA EXCAVATOR



































LIST OF ABBREVIATION

Abbreviations	Description
API	American Petroleum Institute
ASTM	American Society for Testing and Materials, USA
CECE	Committee for European Construction Equipment
DIN	German Institute for Standards, Federal Republic of Germany
EN	European Standard
FRONT	"Front" means the front view towards the boom and dozer
Hi	High speed
ISO	International Standardization Organization
JIS	Japanese Industrial Standard
L	Volume (Liter)
L-min	Liter per minute
Lo	Low speed
MIL	Military Standards
OPG (Top Guard Level I)	Operator Protective Guards of Top Guard Level I
rpm	Revolutions Per Minute
ROPS	Roll-Over Protective Structures
SAE	Society of Automotive Engineers, USA
TPSS	Two Pattern Selection System
AI	Auto Idle

GENERAL SYMBOLS

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

	Safety alert Symbol		Boom swing (left)
	Warning lamp "Fuel level too low"		Boom swing (Right)
	System lamp		Dozer raise
	Warning lamp "Engine Oil pressure"		Dozer lower
	Warning lamp "Battery charge"		Operation direction of control lever
	Warning lamp "Auto Idle (AI) Lamp"		Operation direction of control lever
	Indicator lamp "Glow"		Read operator's manual
	Working light switch		Engine stop control lamp
	Horn		
	Wiper/Washer switch		
	Diesel		
	Hydraulic fluid		
	Gear oil		
	Grease		
	Fast		
	Slow		
	Excavator - Overhead movement toward the front		
	Excavator - Overhead movement toward the rear		
	Boom up		
	Boom down		
	Arm up		
	Arm crowd		
	Bucket crowd		
	Bucket dump		

FOREWORD

You are now the proud owner of a KUBOTA Excavator. This excavator is a product of KUBOTA quality engineering and manufacturing. It is made of fine materials and under a rigid quality control system. It will give you long, satisfactory service. To obtain the best use of your excavator, please read this manual carefully. It will help you become familiar with the operation of the excavator and contains many helpful hints about excavator maintenance. It is KUBOTA's policy to utilize as quickly as possible every advance in our research. The immediate use of new techniques in the manufacture of products may cause some small parts of this manual to be outdated. KUBOTA distributors and dealers will have the most up-to-date information. Please do not hesitate to consult with them.

Please note that there may be some differences between your actual machine and the illustration in the instructions.



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.



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



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



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

IMPORTANT :

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

NOTE :

Gives helpful information.

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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 instructions in detail.

Keep this manual in the storage place. (See "Where to keep Operator's Manual" in "MAINTENANCE" section.)

1. BEFORE OPERATION

1. Make yourself acquainted with the excavator and be aware of its limits. Read the operating instructions carefully before starting the excavator.
2. Obey the danger, warning and caution labels on the machine.
3. For your safety, a ROPS/OPG (Top Guard Level I) with a seat belt is installed by KUBOTA.
 - ROPS: Roll-Over Protective Structure
 - OPG (Top Guard Level I): Operator Protective Guards of Top Guard Level I

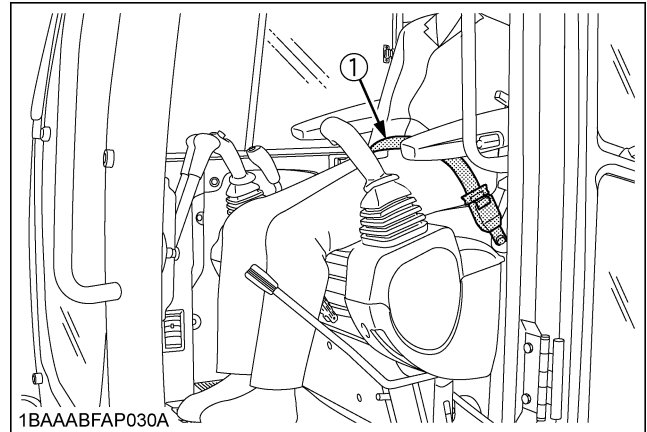
OPG (Top Guard Level I) in accordance with ISO10262 is equivalent in definition to FOPS (Falling Object Protective Structure).

Always use the seat belt when the machine is equipped with a ROPS/OPG (Top Guard Level I) as this combination will reduce the risk of serious injury or death, should the excavator be upset or falling objects occur.

Do not modify any structural members of the ROPS/OPG (Top Guard Level I) by welding, drilling, bending, grinding or cutting, as this may weaken the structure. If any component is damaged, replace it. Do not attempt repairs. If the ROPS/OPG (Top Guard Level I) is loosened or removed for any reason, make sure all parts are reinstalled correctly. Tighten mounting bolts to proper torque.

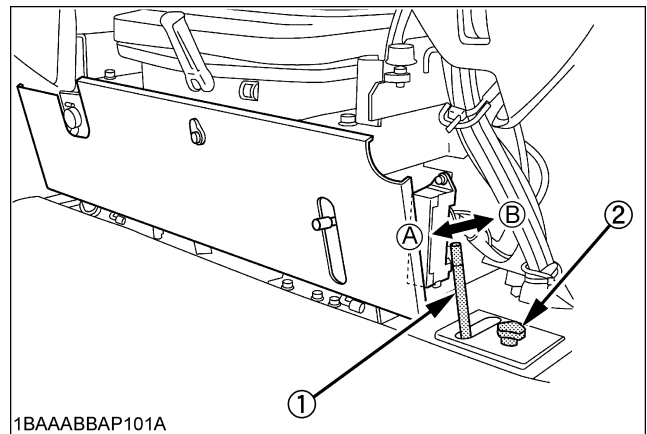
4. ROPS meets requirements of ISO 12117-2.
OPG (Top Guard Level I) meets requirements of OSHA 1926-1003/ISO 10262.

5. The seat belt must be inspected regularly and replaced if damaged.



(1) Seat belt

6. Always sit in the operator's seat when starting engine or operating levers or controls.
7. Study control lever pattern A and pattern B. Then choose the one which is most familiar. Familiarize yourself with the pattern selected by operation slowly at low engine speed.
 - Engage the lever lock to prevent accidental pattern change.

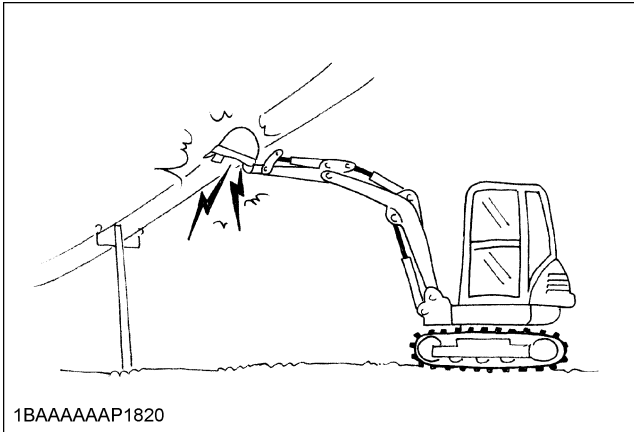


(1) Pattern selector lever
(Two Pattern Selection System: TPSS)
(2) Lever lock knob

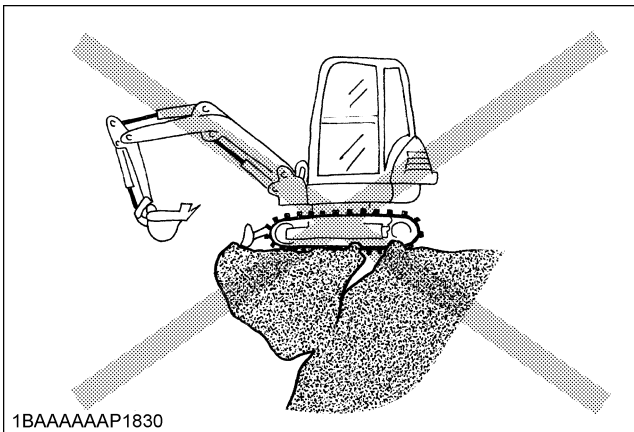
8. Do not operate the excavator while under the influence of alcohol, medication, controlled substances or while fatigued.

▲-2 SAFE OPERATION

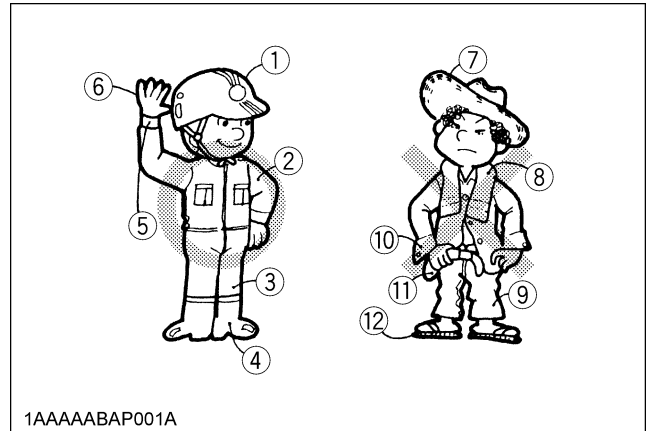
9. Check the surroundings carefully before using the excavator or when attachments are being attached.
 - Pay attention to the overhead clearance with electric wires.



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



- During excavator use, do not allow any persons within the working range.
10. 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 completely understood.
 11. Do not wear baggy, torn or oversized 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.

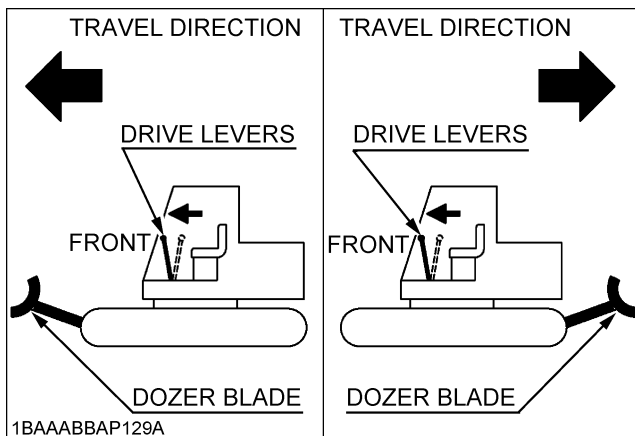


- | | |
|---------------------------|-------------------------------|
| (1) Helmet | (7) Straw hat |
| (2) Clothing fit for work | (8) Towel |
| (3) Tight seams | (9) Baggy trousers |
| (4) Good grip footwear | (10) Loose cuffs of the shirt |
| (5) Well fitting cuffs | (11) Baggy shirt |
| (6) Working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

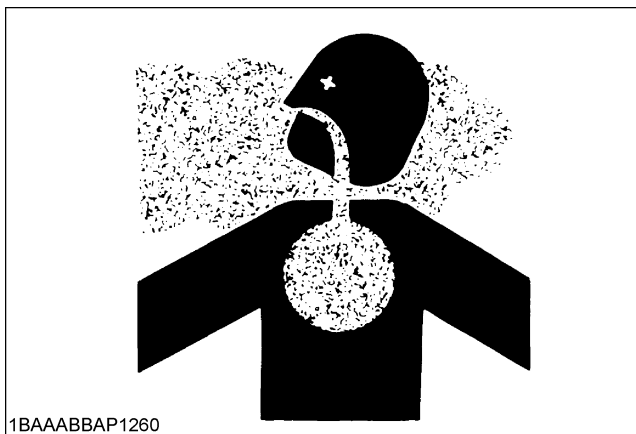
12. Do not allow passengers to ride on any part of the excavator at anytime. The operator must remain in the excavator seat during operation.
13. Check mechanical parts for correct adjustments and wear. Replace worn or damaged parts immediately.
14. Keep your excavator clean. Heavy soiling, grease, dust and grass can cause fires, accidents or injuries.
15. Use only KUBOTA authorized attachments.
16. Before starting the excavator, be absolutely sure that the excavator has been filled with fuel, lubricated, greased and undergone all necessary maintenance.
17. Do not modify the excavator, otherwise it could lead to unforeseen safety problems.
18. Do not hammer anything that is above the operator's seat level. Objects may fall into the operator station of excavator from front.
19. Make sure attachments, particularly those utilizing quick attach systems, are securely mounted.
20. Install the protective guards on the excavator in work area that the objects may fall or come flying. In that case, contact your local KUBOTA dealer.

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 lock levers are in position "Lock" and all control levers and pedals are in their neutral positions and the seat belt is fastened correctly.
4. Make sure that the dozer blade is in front of you. (The dozer must be raised.) If the levers are activated with the dozer blade at the rear, the tracks will move in the opposite direction of the drive levers.



5. Do not operate or idle engine in a non-ventilated area. Carbon monoxide gas is colorless, odorless, and deadly.



6. Keep all safety equipment and covers in place. Replace damaged or missing safety devices.
7. Do not operate the excavator while putting out the hands and the body from the windows. Do not touch the control levers and the pedals from outside the cab during the engine running.

8. Precautions against tipping over. Keep away from steep slopes and embankments. Do not swing the bucket downhill. Lower the dozer during digging. Keep the bucket as low as possible while driving uphill. Turn slowly on slopes (at reduced speed). Do not place the excavator near the edges of trenches and banks, as the earth can give away due to the weight of the excavator.

ALLOWABLE CLIMBING ANGLE : 36 % (20 deg.)
ALLOWABLE ANGLE IN CASE OF CROSSING
SIDEWAY : 27 % (15 deg.)

9. Watch out at all times for the area to which the excavator is being moved. Pay attention to any hindrances.
10. Keep enough distance from trench and bank edges.

◆ Safety for children

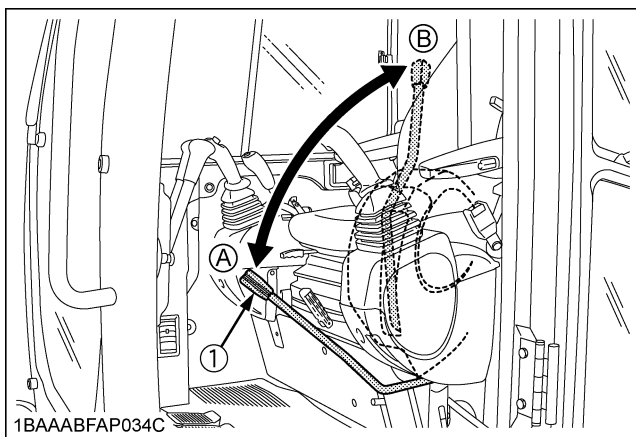
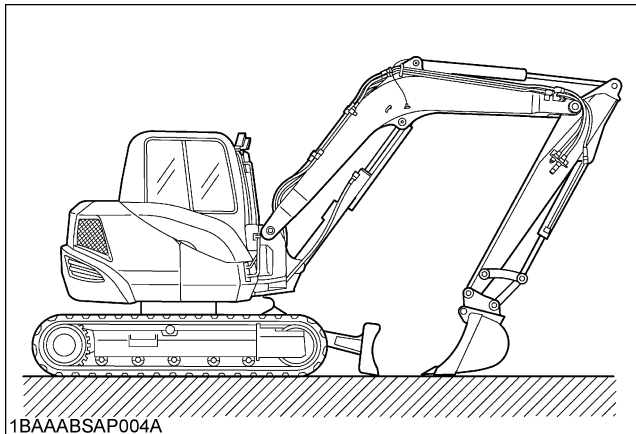
Tragedy can occur if the operator is not alert to the presence of children. Children generally are attracted to machines and the work they do.

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 not a 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 and lock the cab door (if equipped), before you leave.

3. AFTER OPERATION

Before leaving the machine,

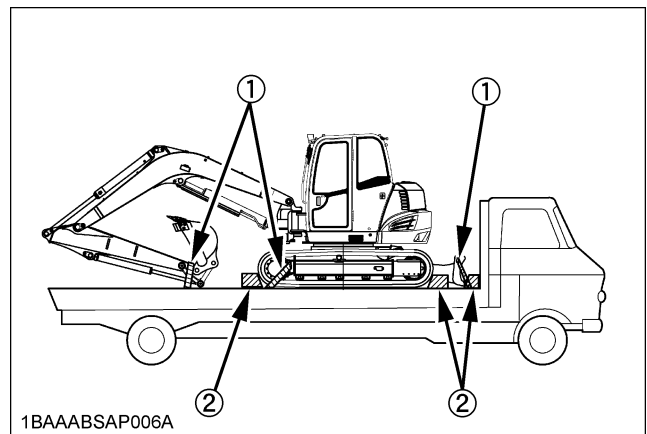
- Park the excavator on a firm, flat and level surface.
- Lower the attachments and the dozer blade to the ground.
- Stop the engine.
- Release pressure trapped in the hydraulic system.
- Lock all control levers.
- Remove the key.



(1) Lock lever for control lever (A) "Unlock"
(B) "Lock"

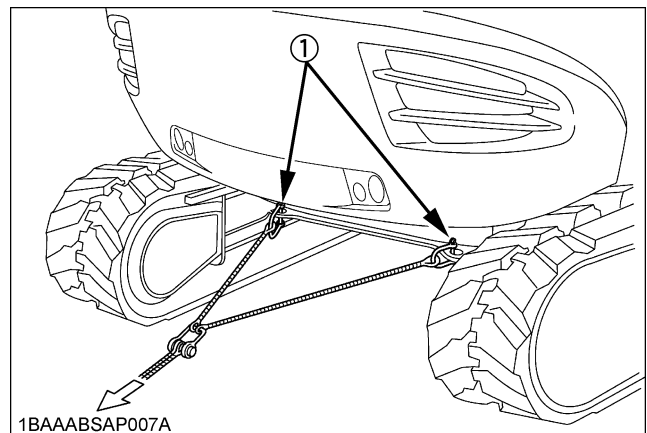
4. SAFE LOADING AND TRANSPORT OF THE EXCAVATOR

1. Observe all regulations concerning the transport of excavators on public roads.
2. Use adequately long and robust ramps when loading on the machine. (for details see "TRANSPORTING THE EXCAVATOR ON A VEHICLE")
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. Lower the attachment on the loading bed and release the pressure from the hydraulic system.
After loading the excavator on the truck, block the tracks with blocks and tie down the excavator.



(1) Wire rope
(2) Block

5. Avoid abrupt braking of the vehicle with the excavator loaded. Sudden braking cause the excavator to move and may cause a serious accident.
6. If the excavator is to tow another machine, make sure the load is smaller than the strength of the hook, tow chain or cable.



(1) Hook

Max. drawbar pull at coupling hook	116.9 kN (26280 lbf, 11920 kgf)
Max. vertical load at coupling hook	12.1 kN (2720 lbf, 1234 kgf)

7. Do not use hooks on the roof of CAB for lifting the excavator.

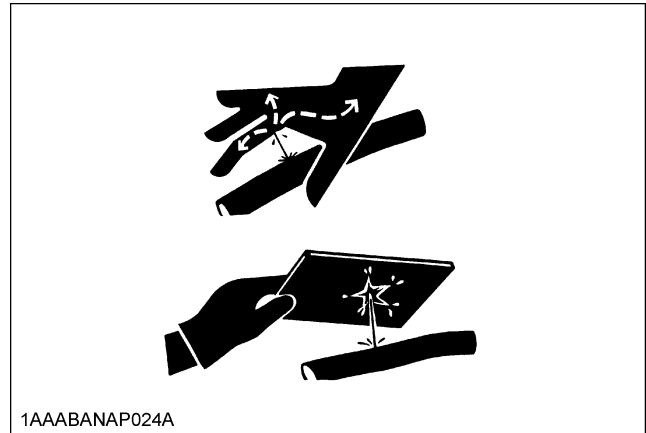
5. MAINTENANCE

Before doing maintenance work on the excavator, place the machine on even solid ground, lower the attachments to the ground, stop the engine, release pressure trapped in the hydraulic system and remove the key. When dismantling hydraulic parts, make sure that the hydraulic oil has cooled down sufficiently to avoid burns.

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

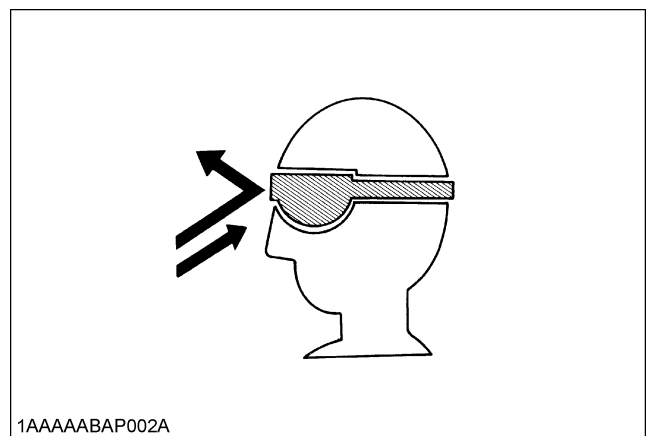
1. Before doing work on the engine, the exhaust system, the radiator and the hydraulics, let the excavator cool down sufficiently.
2. Turn off the engine at all times when filling with fuel. Avoid spilling and over-filling of fuel.
3. Smoking is prohibited while refueling or handling the battery. Keep 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 be prematurely deteriorated, 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 the directions "STARTING WITH AN AUXILIARY BATTERY" in "OPERATION OF THE ENGINE", when starting with an auxiliary battery.
6. Keep a first-aid box and a fire extinguisher at hand at all times.
7. 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.
8. To avoid short-circuiting the battery, always remove the ground cable first and attach the positive cable first.

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 hands for checking for leaks. 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.



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10. To avoid environmental damage from acid and 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 have been drained and washed.
13. Use a face mask or eye protection to protect the eyes and respiratory system against dust and other foreign particles.

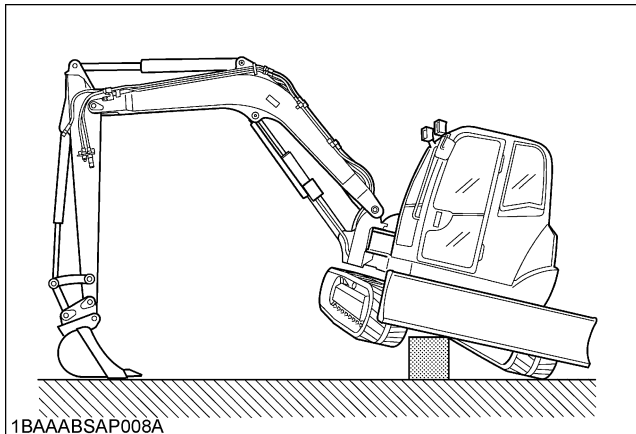


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14. Securely support excavator with stands or suitable blocking before working underneath. For your safety, do not work under any hydraulically supported devices. They can settle, suddenly leak down, or be accidentally lowered.

▲-6 SAFE OPERATION

15. Do not dismantle the spring of the track tensioner. If dismantling is necessary, contact your KUBOTA dealer where the machine was purchased, or competent service shop. The assembly must be done according to the work shop manual of KUBOTA (W.S.M.) for the product involved.
16. When lifting the machine itself with an attachment, place a safety block or safety post to prevent the machine from turning over. Keep the lock lever for attachment control in the "LOCK" position.



17. KUBOTA uses no parts which are lined with asbestos. Do not use these kind of parts even if they are available and can be installed.
18. Fire prevention
Excavator and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcing or sparks.
The following fire prevention guidelines will help to keep your equipment up and running efficiently and keep the risk of fire to a minimum.
 - Blow off all accumulated debris near hot engine exhaust components such as turbocharger and exhaust manifold as well as exhaust pipes and muffler more frequently when working in severe conditions.
 - Clean out all accumulated flammable debris such as leaves, straw, pine needles, branches, bark, small wood chips and any other combustible materials from inside the machine belly pans or lower unit structures as well as from area in proximity to the engine.
 - Inspect all fuel lines and hydraulic hoses for wear or for deterioration. Replace them immediately if they begin to leak.
 - Examine electrical wiring and connectors frequently for damage. Repair any wires that are loose or frayed before operating the machine. Clean all electrical connections and tighten all electrical connections as necessary.

- Inspect the exhaust system daily for any signs of leakage. Check for broken pipes and muffler and also for loose or missing bolts, nuts and clamps. If any exhaust leaks or fractured parts are found, repairs must be completed prior to operation.
- Always keep a multipurpose fire extinguisher on or near the machine. Be familiar with the operation of the fire extinguisher.

6. DANGER, WARNING AND CAUTION LABELS

(1) Part No. RD819-5728-1

CAUTION

TO AVOID PERSONAL INJURY:

1. Read and understand operator's manual before attempting to start or operate the excavator. Read the manual of the attachment to do a correct operation safely when other attachments are installed instead of Kubota specified bucket.
2. Before starting engine, make sure all control levers are in neutral and the operating area is clear of all bystanders.
3. Never allow passengers on any part of the excavator while operating.
4. Know your work area before starting operation.
 - Check underground lines and cables.
 - Stay off slopes too steep for safe operation.
 - Check for hidden holes, obstacles or drop-offs and overhangs.
5. Make sure all shields are in place and securely fastened.
6. Before dismounting from the machine, lower all attachment to the ground, stop the engine and remove the key.
7. Damaged ROPS must be replaced, not repaired or revised.

IMPORTANT

Never use boom, dipper, or bucket to hammer or beat sideways.

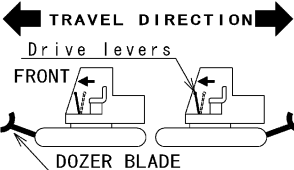
Excavator is not intended for these usages.

1BAAABSAP078E

(2) Part No. RD809-5727-1

WARNING


← TRAVEL DIRECTION →



DOZER BLADE

TO AVOID PERSONAL INJURY OR DEATH:
Before moving the excavator, KNOW THE LOCATION OF THE DOZER BLADE. The excavator will travel in the direction of the dozer blade when drive levers are moved away from the operator.

DO NOT OPERATE WITHOUT ROPS.
YOU COULD BE CRUSHED.



USE SEAT BELT

1BAAABBAP119E

(3) Part No. RD809-5736-1

DANGER

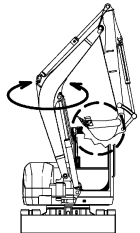


TO AVOID SERIOUS INJURY OR DEATH:
Check overhead clearance with electric wires.

1BAAACDAP243A

(4) Part No. RD809-5738-2

WARNING



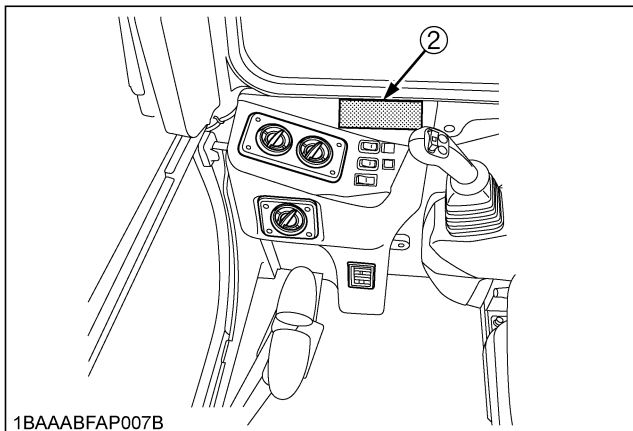
ATTACHMENT IMPACT HAZARD
KEEP ATTACHMENT AWAY FROM CAB AND MACHINE. FAILURE TO DO SO MAY RESULT IN SEVERE INJURIES OR DEATH OR DAMAGE TO THE BOOM/CYLINDER, HYDRAULIC HOSES OR THE CAB.

1BAAAARAP1000

(5) Part No. RD829-5793-1

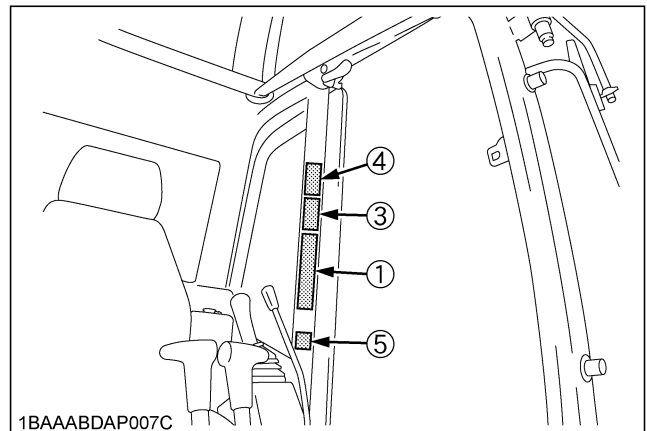



1BAAABFAP092A



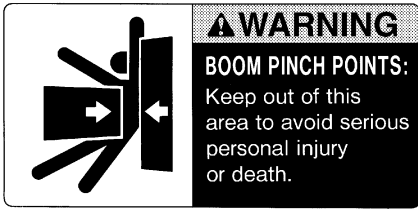
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1BAAABFAP0440

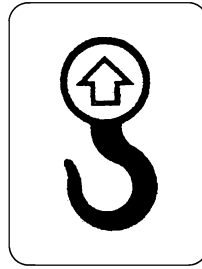


1BAAABDAP007C

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

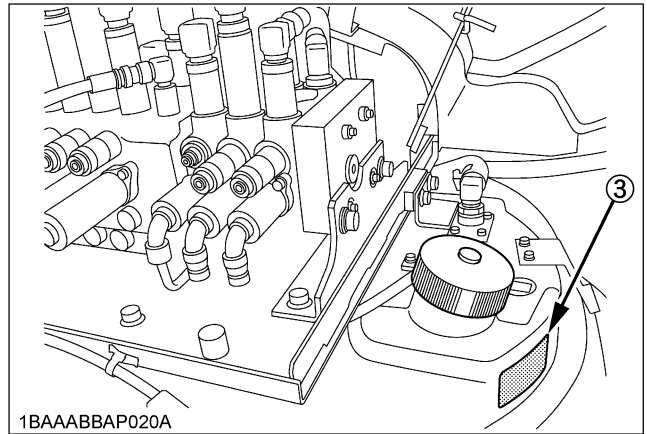
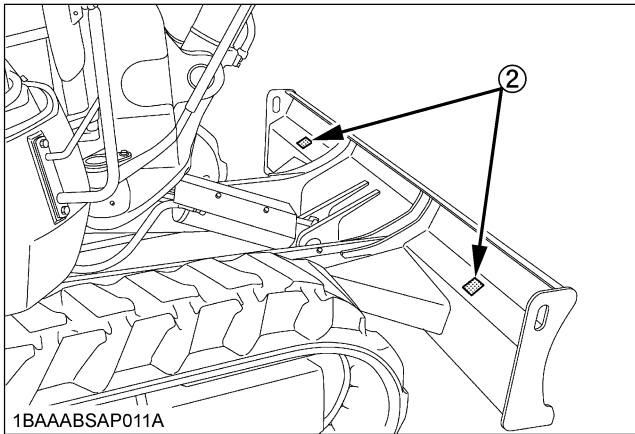
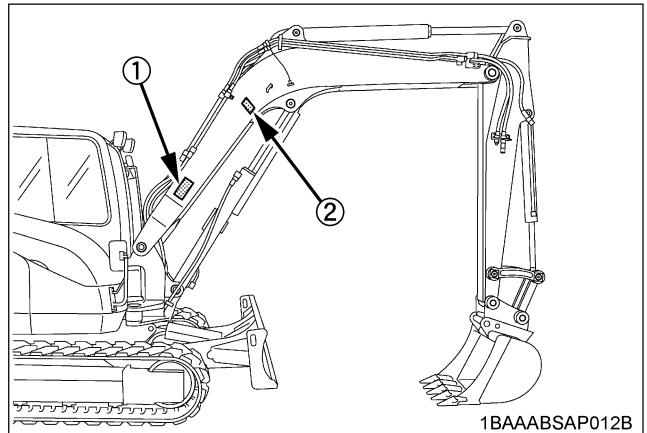
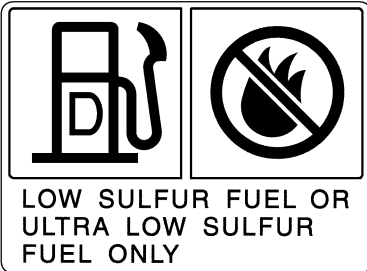


(2) Part No. RC108-5796-1 [Both sides]



(3) Part No. RD148-5736-1

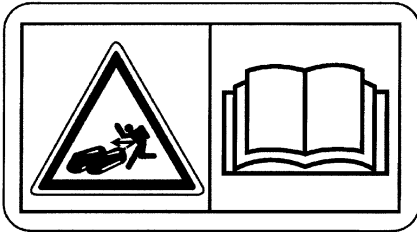
Diesel fuel only No fire



1BAAAABSP0020

(1) Part No. RD809-5795-1

Do not loosen the grease nipple completely or too quickly.



1BAABAMAP0010

(2) Part No. 6C040-5559-1

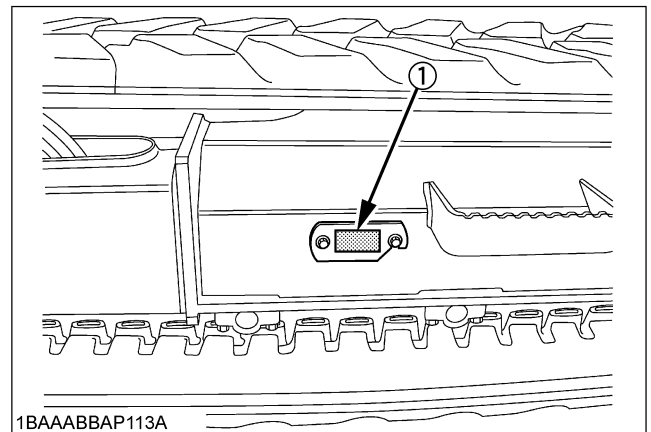
DANGER EXPLOSIVE GASES
Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge or use booster cables or adjust post connections without proper instruction and training.
KEEP VENT CAPS TIGHT AND LEVEL
POISON CAUSES SEVERE BURNS
Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately.
KEEP OUT OF REACH OF CHILDREN

1BAAAAQAP0960

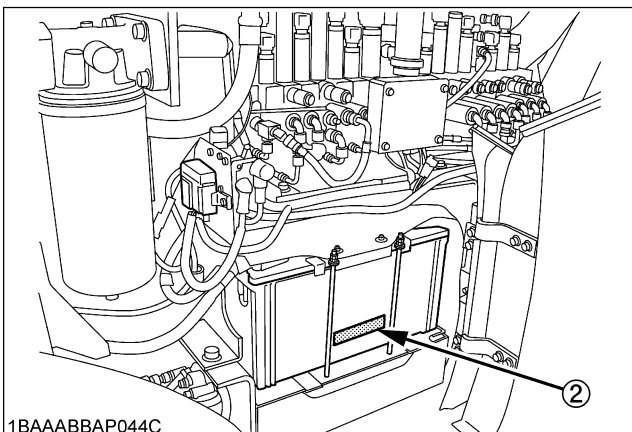
(3) Part No. RC108-5754-1



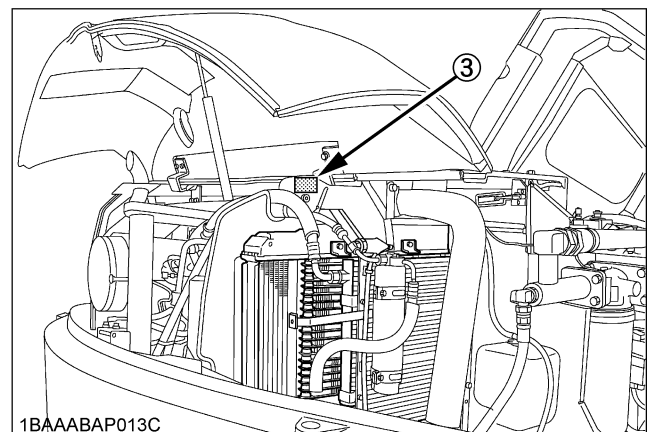
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1BAAABBAP113A



1BAAABBAP044C

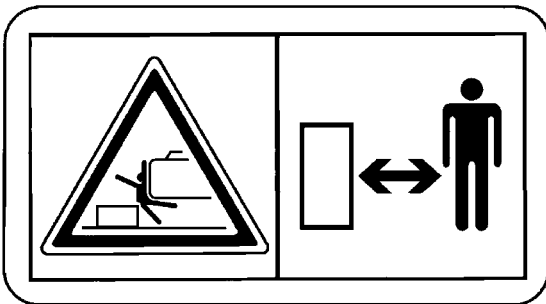


1BAAABAP013C

▲-10 SAFE OPERATION

(1) Part No. RC788-5727-1

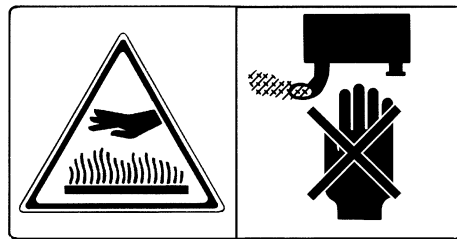
Do not allow any persons within the working range.



1BAAEAJAP069A

(2) Part No. RD809-5745-1

Do not touch hot parts such as exhaust etc.



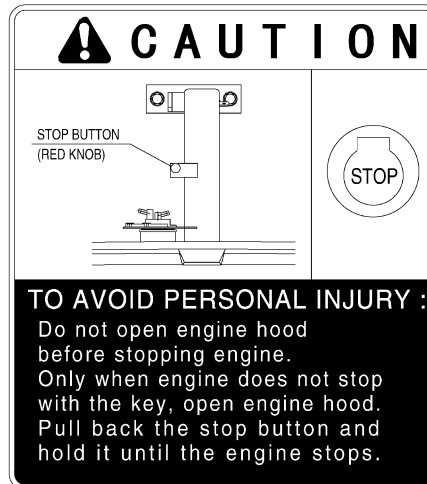
1BAAABBAP073E

(3) Part No. RC108-5714-1

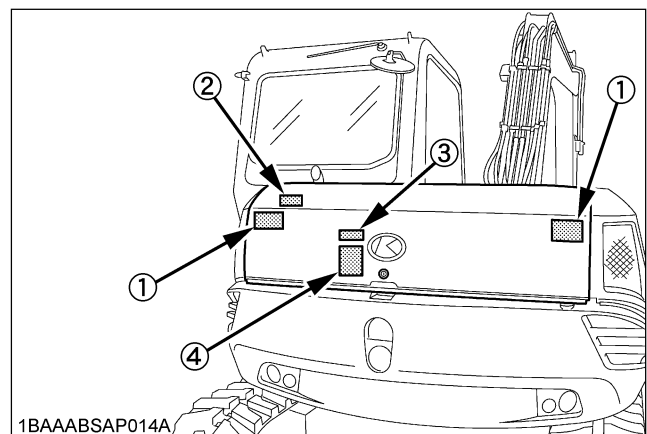


1BAAGAAP0260

(4) Part No. RD809-5737-1



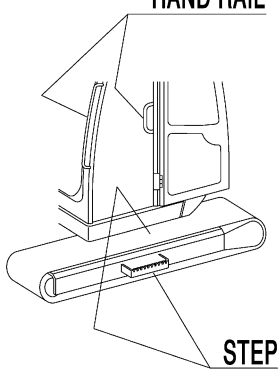
1BAAABBAP123E



1BAAABSAP014A

1BAAABFAP0900

(1) Part No. RD809-5765-1



HAND RAIL

STEP

⚠ CAUTION

TO AVOID PERSONAL INJURY : MOUNT AND DISMOUNT SAFELY WHEN ENTERING OR LEAVING THE OPERATOR'S COMPARTMENT

1. Maintain a three-point contact with the steps and handrails.
2. Face the machine.
4. Never jump on or off the machine.
4. Never attempt to mount or dismount a moving machine.
5. Never use control levers as handles.

1BAABBAP122E

(2) Part No. RD809-5734-1

⚠ CAUTION

TO AVOID PERSONAL INJURY :

1. Study control lever pattern A and pattern B. Then choose the one which is most familiar.
2. Position the pattern selector lever in either pattern A or pattern B.

3. Engage lever lock to prevent accidental pattern change.
4. Familiarize yourself with the pattern selected by operating slowly.

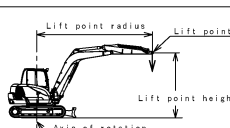
1BAABBAP121E

(3) Part No. RD819-5757-3

⚠ WARNING

TO AVOID PERSONAL INJURY OR DEATH:

- Do not move raised load over people.
- 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.



Lift point radius, Lift point, Lift point height, Axis of rotation

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:
 - i) The load point corresponds to the front bolt part of the arm.
 - ii) The machine positions are i) over-front | Blade down,
 - iii) over-front | Blade up, 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.

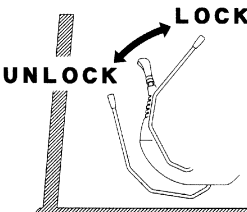
LIFT POINT HEIGHT m/y	LIFTING CAPACITY OVER-FRONT BLADE DOWN Unit: m/kN (kg)					LIFTING CAPACITY OVER-FRONT BLADE UP Unit: m/kN (kg)					LIFTING CAPACITY OVER-SIDE Unit: m/kN (kg)				
	LIFT POINT RADIUS m/y					LIFT POINT RADIUS m/y					LIFT POINT RADIUS m/y				
	MIN	3	4	5	MAX	MIN	3	4	5	MAX	MIN	3	4	5	MAX
+5				14.2					14.2					14.2	
+4				15.2	15.2				15.2	14.2				15.2	15.2
+3	21.0	21.0	18.1	15.2	15.2	21.0	21.0	18.1	15.2	15.2	21.0	21.0	18.1	15.2	15.2
+2	35.0	35.0	30.0	25.0	25.0	35.0	35.0	30.0	25.0	25.0	35.0	35.0	30.0	25.0	25.0
+1	42.0	42.0	35.0	27.0	27.0	42.0	42.0	35.0	27.0	27.0	42.0	42.0	35.0	27.0	27.0
0	42.0	42.0	35.0	27.0	27.0	42.0	42.0	35.0	27.0	27.0	42.0	42.0	35.0	27.0	27.0
-1	42.0	42.0	35.0	27.0	27.0	42.0	42.0	35.0	27.0	27.0	42.0	42.0	35.0	27.0	27.0
-2	27.0	27.0	22.0	17.2	17.2	27.0	27.0	22.0	17.2	17.2	27.0	27.0	22.0	17.2	17.2
-3	15.0	15.0	12.0	9.0	9.0	15.0	15.0	12.0	9.0	9.0	15.0	15.0	12.0	9.0	9.0

Machine with ROPS cabin and rubber crawler, without bucket

1BAAAFAP0860

(4) Part No. RC418-5753-2

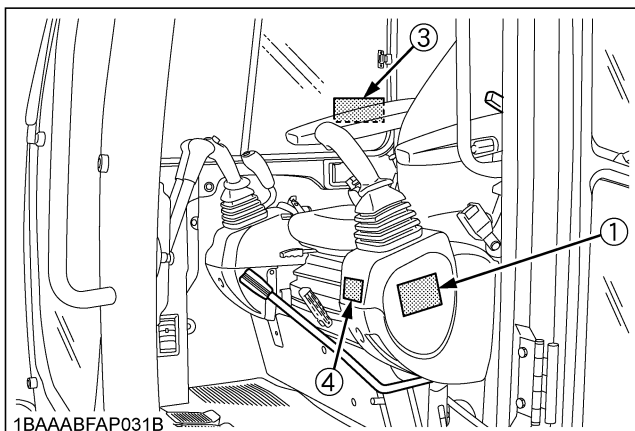
⚠ CAUTION



UNLOCK, LOCK

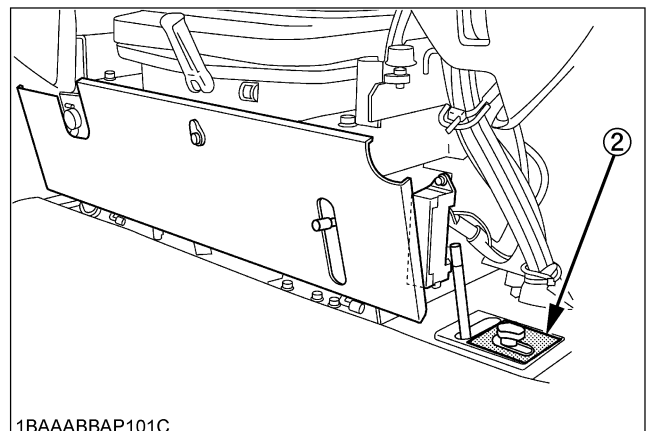
TO AVOID PERSONAL INJURY:
Lock control lever before leaving compartment.

1BAAAARAP0450



1BAAAFAP031B

1BAAAFAP0450

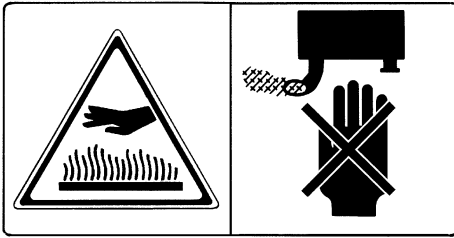


1BAABBAP101C

▲-12 SAFE OPERATION

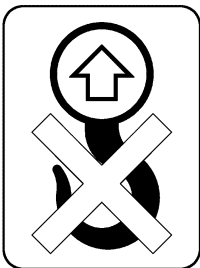
(1) Part No. RD809-5745-1

Do not touch hot parts
such as exhaust etc.



1BAAABBAP073E

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



1BAABAUAP2720

(3) Part No. RC418-5737-3

Keep away from fan
and fan belt.



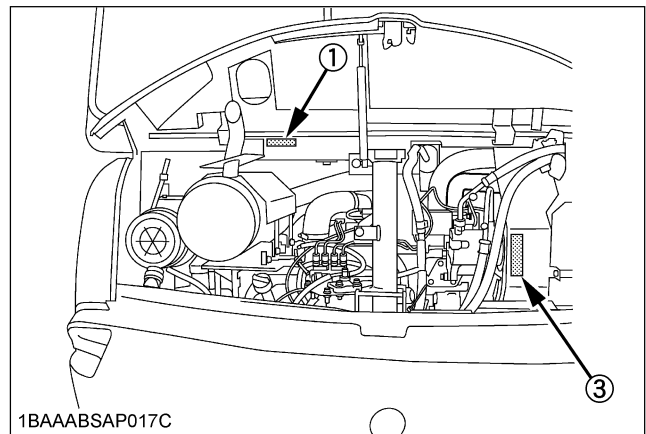
1BAAAQAP0880

(4) Part No. RD809-5724-1

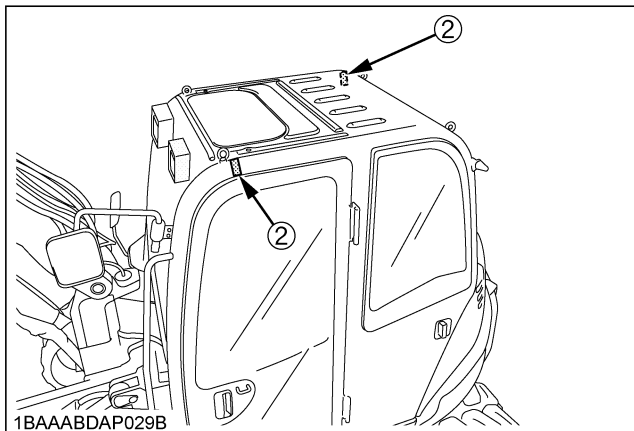
Attention to the
danger of burning.



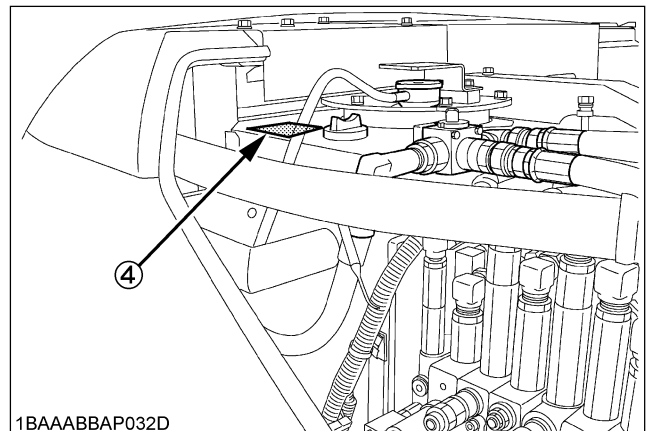
1BAAABBAP1670



1BAAABSAP017C



1BAAABDAP029B



1BAAABBAP032D

1BAAABFAP0910

7. CARE OF DANGER, WARNING AND CAUTION LABELS

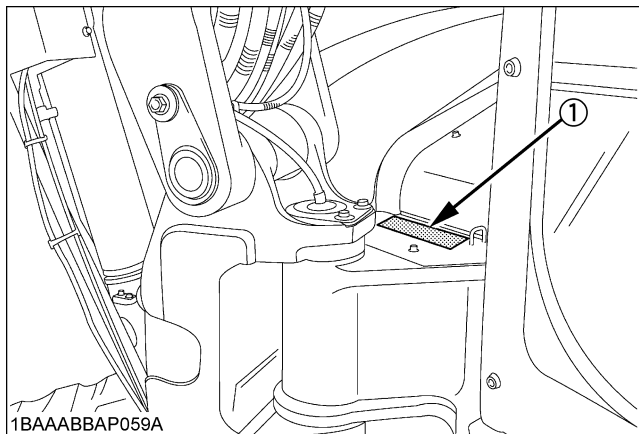
1. Keep danger, warning and caution labels, clean and free from obstructing material.
2. Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing danger, warning and caution labels with new labels from your KUBOTA dealer.
4. If a component with 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

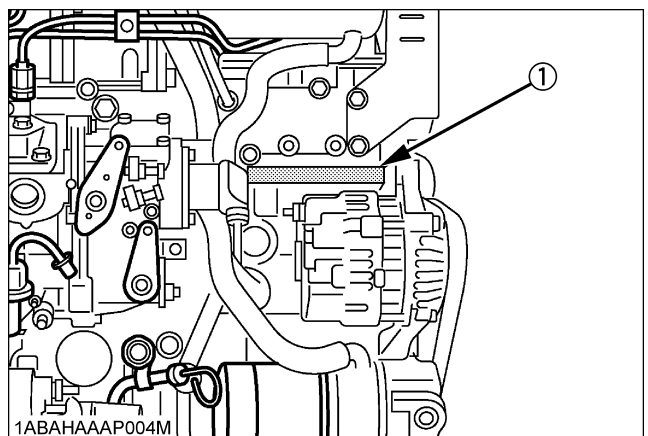
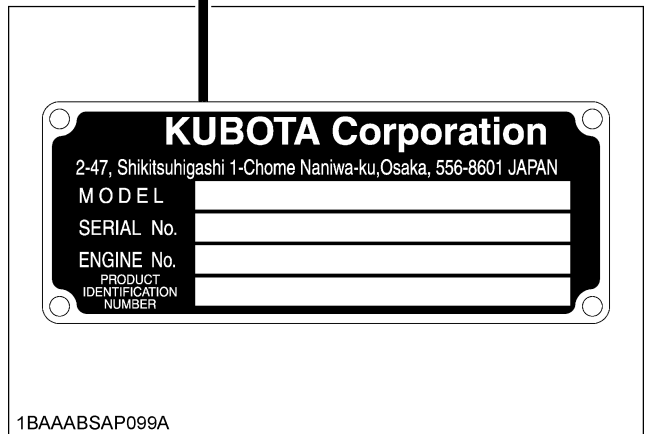
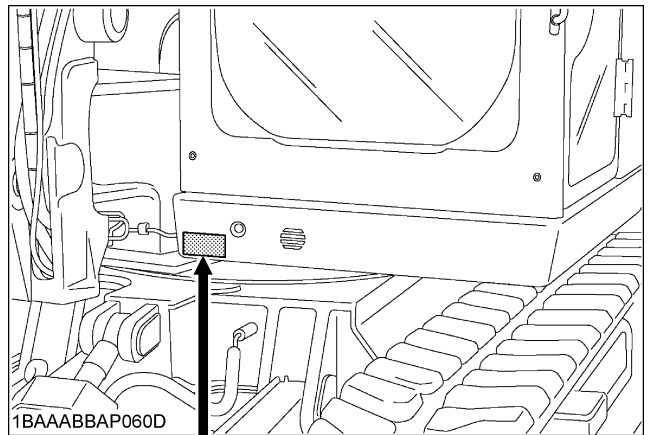
Your KUBOTA dealer is always ready to help so that your excavator offers the best performance. After having carefully read these instructions, you will realize that much of the routine maintenance can be done by yourself. Your KUBOTA dealer is responsible for servicing and the delivery of spare parts. When ordering spare parts from your KUBOTA 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.

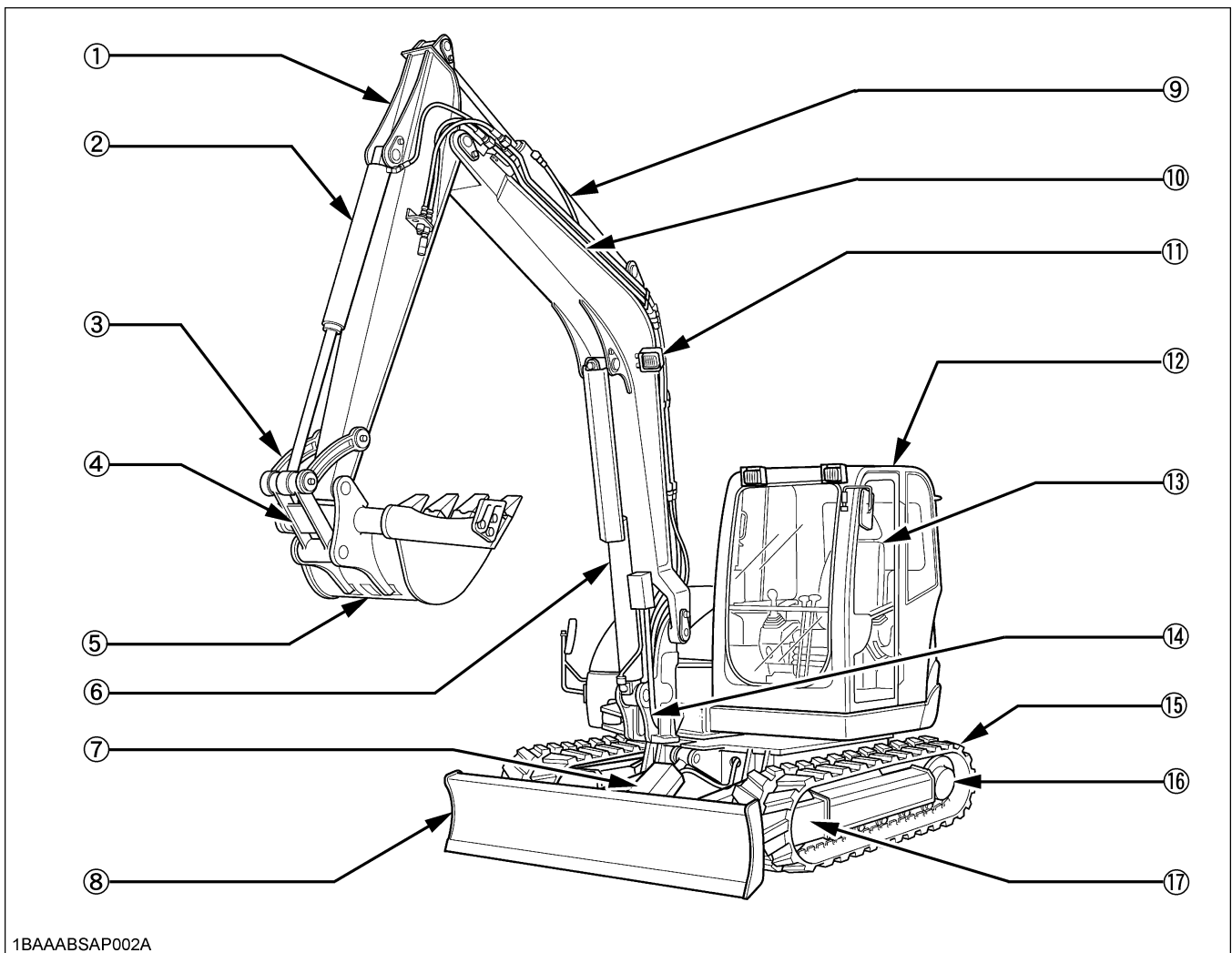
TECHNICAL DATA

		KUBOTA EXCAVATOR			
Model name		KX080-3			
Type		Cabin			
Operating weight (including operator's weight) kg(lbs.)		Rubber tracks	Steel tracks (450 width)	Steel tracks (600 width)	
		8280 (18254)	8330 (18364)	8460 (18475)	
Engine	Type	Water cooled 4 cycle diesel engine with 4 cylinder			
	Model name	KUBOTA V3307DI-T			
	Total displacement	cc	3331		
	Engine power	SAE gross	kW(Hp)		
		SAE net	kW(Hp)		
	Rated speed	rpm	2000		
Performance	Unit swing speed	rpm	9.5		
	Travel speed	Fast	km/h		
		Slow	km/h		
	Ground pressure (With operator)	kPa (kgf/Cm ²)	36.0 (0.367)	36.2 (0.369)	27.6 (0.281)
	Climbing angle	%(deg)	*36 (20)		
Angle in case of crossing slope	%(deg)	*27 (15)			
Dozer	Width x Height	mm	2200 x 500		
Boom swing angle	Left	rad(deg)	1.22 (70)		
	Right	rad(deg)	1.05 (60)		
Pressure connection for attachments	Max. displacement (Theoretical)	L/ min	100		
	Max. pressure	Mpa (kgf/Cm ²)	20.6 (210)		
Fuel tank capacity		L	115		

NOTE :

- Above dimensions are based on the machine with KUBOTA original bucket and 2100 arm.
- 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



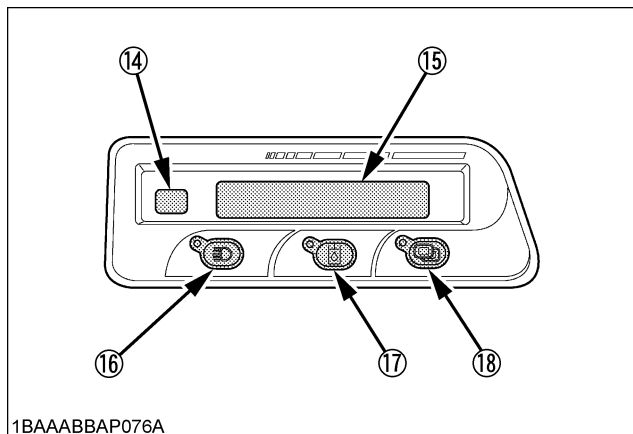
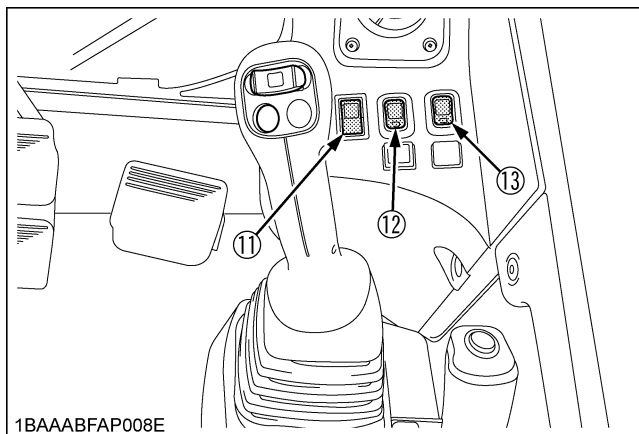
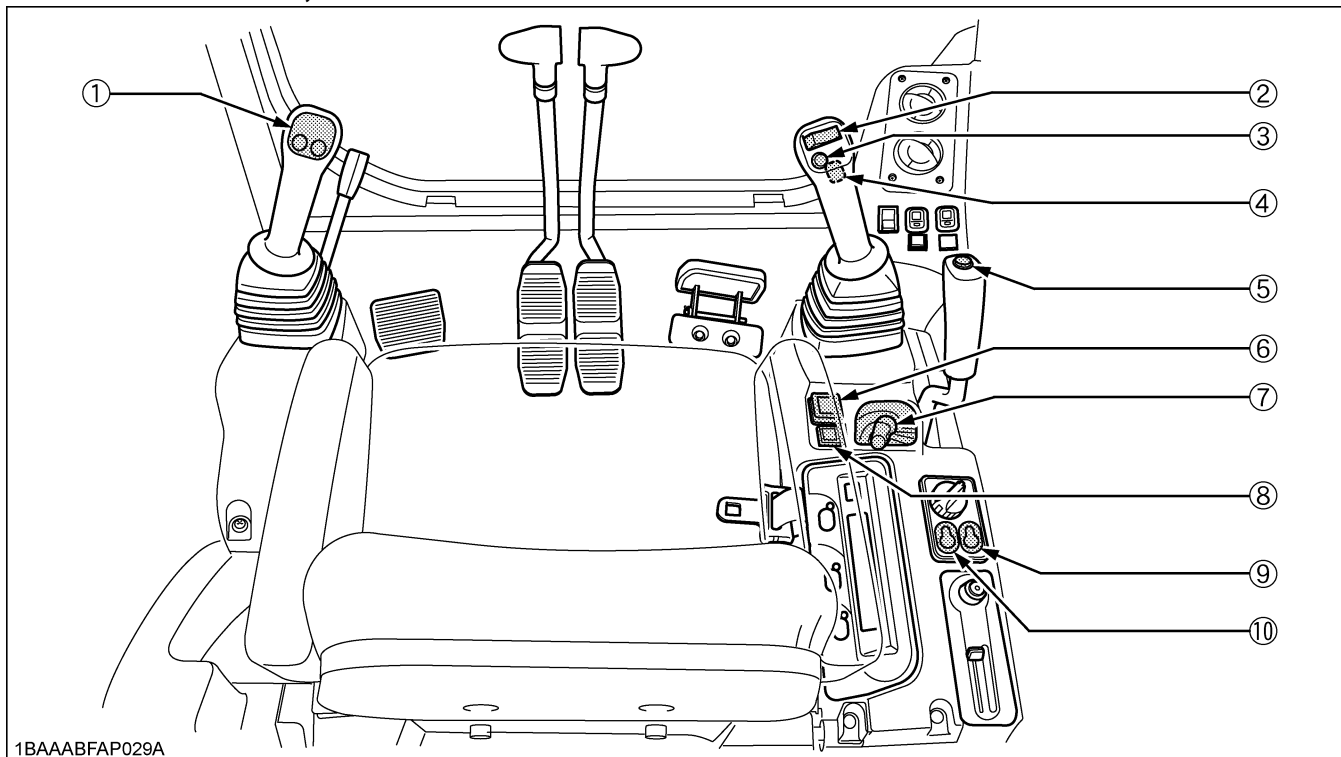
1BAAABSAP002A

DEPICTED CONTENTS

- (1) Arm
- (2) Bucket cylinder
- (3) Bucket link 2 and 3
- (4) Bucket link 1
- (5) Bucket
- (6) Boom cylinder
- (7) Dozer cylinder
- (8) Dozer blade
- (9) Arm cylinder
- (10) Boom
- (11) Working light
- (12) Cabin
- (13) Operator's seat
- (14) Swing bracket
- (15) Track
- (16) Drive sprocket
- (17) Front idler

INSTRUMENT PANEL AND CONTROL ELEMENTS

■ Instrument Panel, Switch

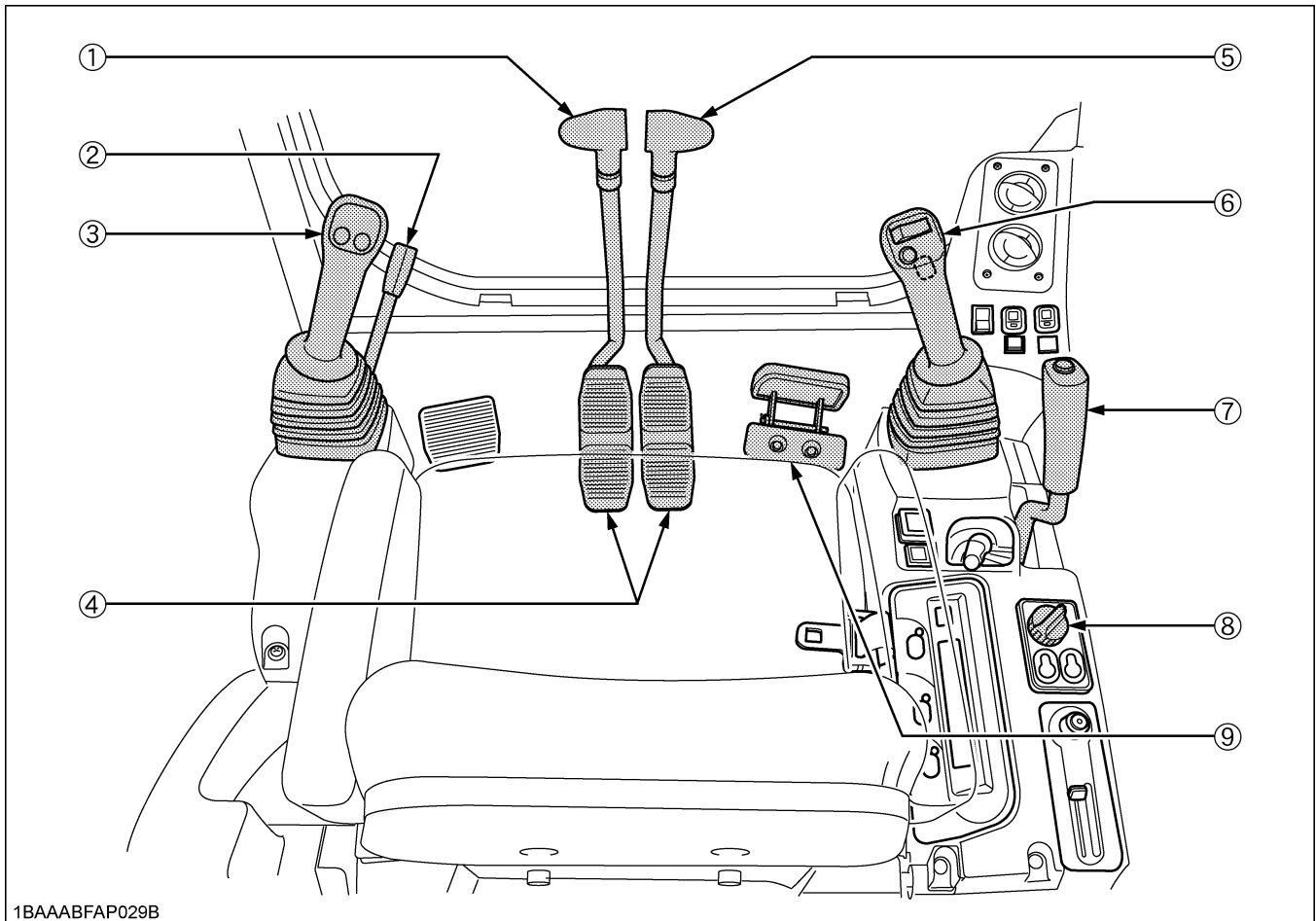


DEPICTED CONTENTS

- (1) Second service port switch
- (2) First service port switch
- (3) Horn switch
- (4) One way hold lock switch
- (5) Travel speed switch
- (6) Beacon light switch
- (7) Starter switch
- (8) Speed indicator light
- (9) Flow volume setting switch

- (10) Switch for Auto idle control
- (11) Wiper / Washer switch
- (12) Cab light switch
- (13) Overload warning switch
- (14) Warning lamp
- (15) LCD display
- (16) Working light switch
- (17) Service port activation switch
- (18) Display selector switch

■ Control Pedals and Levers



1BAAABFAP029B

DEPICTED CONTENTS

- (1) Drive lever (left)
- (2) Lock lever*
- (3) Control lever for front attachments (left)
- (4) Drive pedal
- (5) Drive lever (right)
- (6) Control lever for front attachments (right)
- (7) Dozer control lever
- (8) Throttle potentiometer
- (9) Boom swing pedal

IMPORTANT :

* When the lock lever pulled up prevents inadvertent machine movement.

CHECKS BEFORE START

DAILY CHECKS

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



CAUTION

To avoid personal injury:

- Do maintenance work on the excavator only on level ground with the engine off and the lock lever in the "Lock" position.

Checks

Go around the excavator and check for visual damage and wear.

Check coolant level. (See regular check points in the chapter on maintenance.)

Check fuel level.

Check engine oil level.

Check hydraulic fluid level.

Check air filter for clogging.

Check all grease points.

Check all control lamps, indicators, tachometer and hour meter.

Check the light system.

Check the seat belt and the ROPS / OPG (Top Guard Level I) safety device.

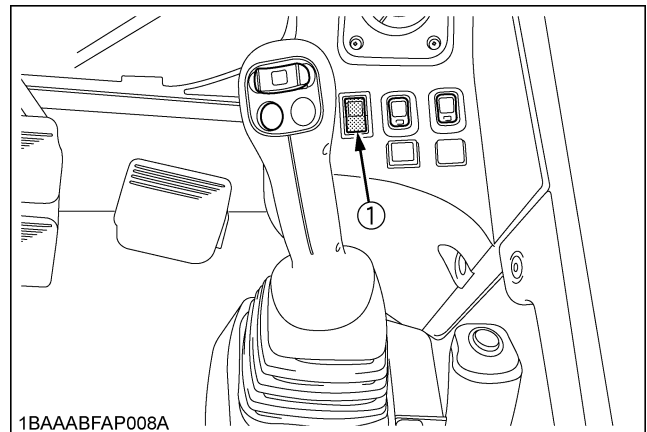
Check the condition of the safety and warning labels.

(See "DANGER, WARNING AND CAUTION LABELS" in "SAFE OPERATION".)

■ Wiper/Washer Switch

To move the wiper, turn on the switch for the wiper when the starter key in position "RUN" (●). A further push on the switch will activate the washer system. Even when the wiper switch is in position "OFF", the washer switch functions if it is pressed.

- Do not activate the washer switch if the tank for the cleaning fluid is empty; the pump can be damaged.
- Do not activate the wiper switch if the window is dry. In this case, make sure that cleaning fluid is applied to the pane before activating the wiper.
- In frosty conditions, make sure that the wiper blade is not frozen to the glass before switching-on. The motor can be damaged if the wiper system is used under such conditions.

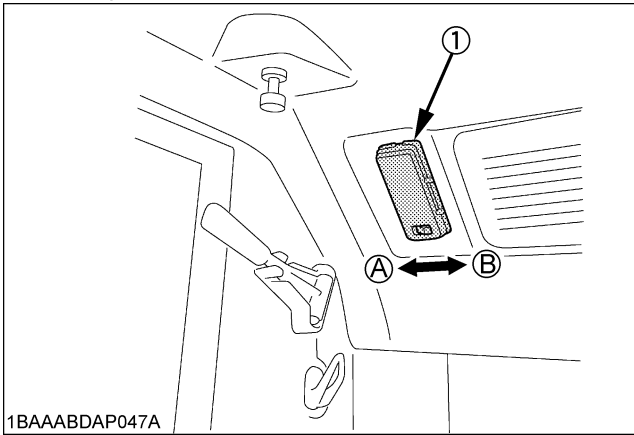


1BAAABFAP008A

(1) Wiper switch

■ Interior Lamp

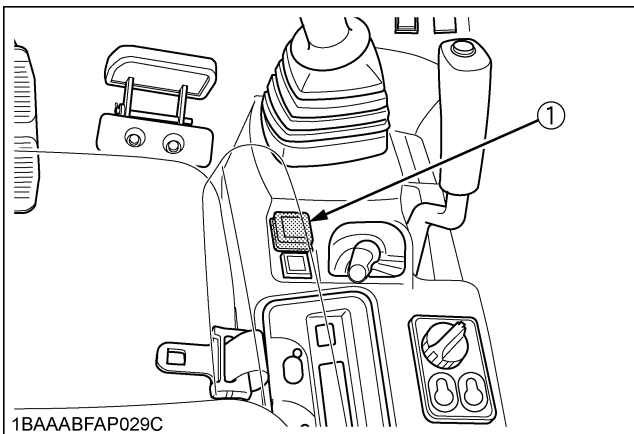
To turn on the interior lamp, set the interior lamp switch to the "ON" positions.



(1) Interior lamp

(A) "ON"
(B) "OFF"

■ Beacon Light Switch



(1) Beacon light switch

It is equipped only with the switch (including the coupler for connecting in a rear left speaker).

Since it isn't equipped with the beacon main part, please install when required.

■ Overload Warning Switch



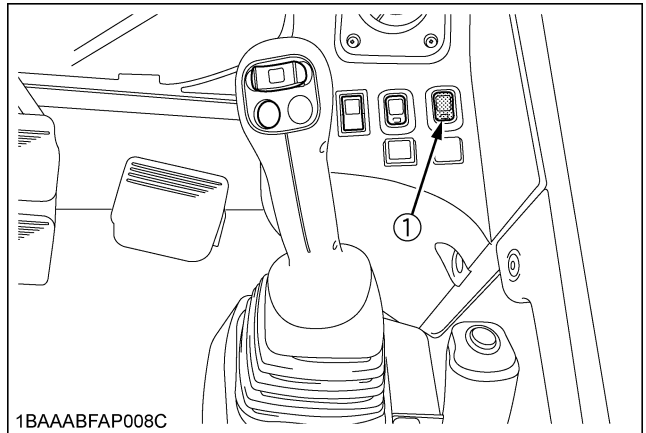
WARNING

To avoid personal injury or death:

- Continuing to apply the load after the overload warning horn sounds could result in the machine tipping over. If the buzzer sounds, stop operating the machine and lighten the load.

When excavator is used in object handling operations, set the overload warning switch to the "ON" position.

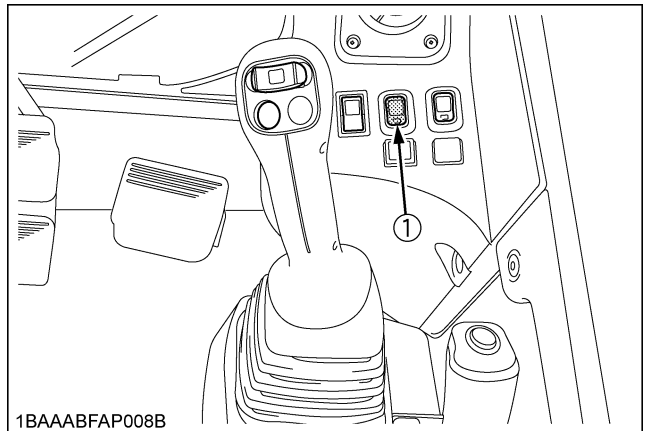
If a weight greater than the machine is designed to lift is lifted, the overload warning device is activated and a buzzer is sounded.



(1) Overload warning switch

■ Cab Light Switch

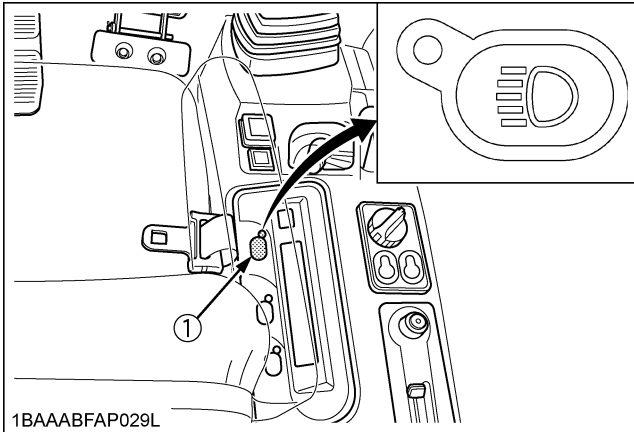
To turn on the cab light, set the starter switch to the "RUN" (●) and then the cab light switch to the "ON" positions, respectively.



(1) Cab light switch

■ Working Light Switch

When the starter switch is in position "RUN", the light(s) will be switched on by pressing the switch.



(1) Working light switch

◆ Night operation



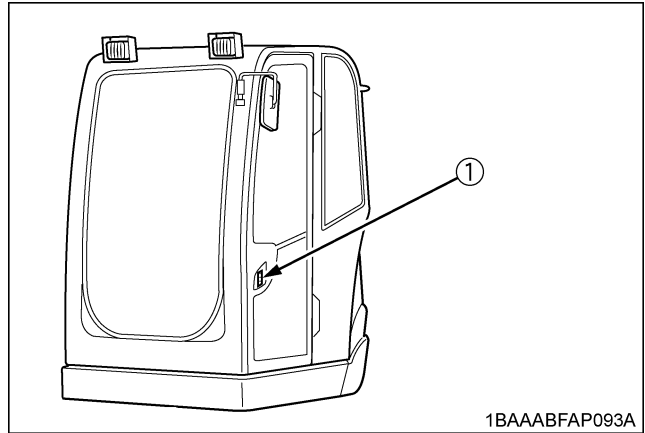
CAUTION

To avoid personal injury:

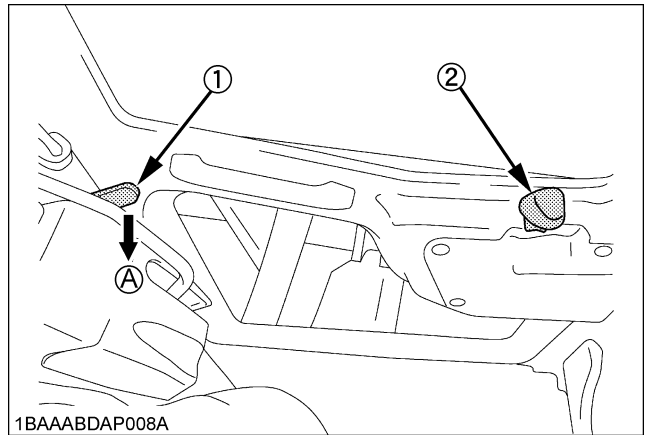
- Visibility is reduced in darkness, therefore the working light alone may not be enough. In which case, prepare additional stationary artificial lighting, observe safety rules as well as special regulations for night work.

■ Opening/Closing of CAB Door

1. Unlock the CAB door and pull the knob. Open the CAB door fully until fixed into place.
2. To close the CAB door, push the release lever down and close the door.



(1) Door knob (outside)



(1) Release lever

(A) Push down

(1) Door knob(inside)

3. When leaving the excavator, always lock the door.

■ Opening/Closing of Front CAB Window



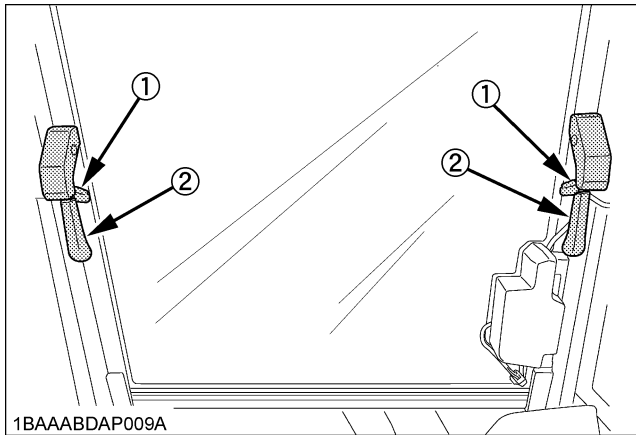
CAUTION

To avoid personal injury:

- Keep hands and feet away from the area between front window and cabin frame. Otherwise the operator risks serious injuries by pinching or crushing.
- Other persons should stay away when opening the window.

To open and close the front window, take the steps below.

1. Push the lock levers beside grip.

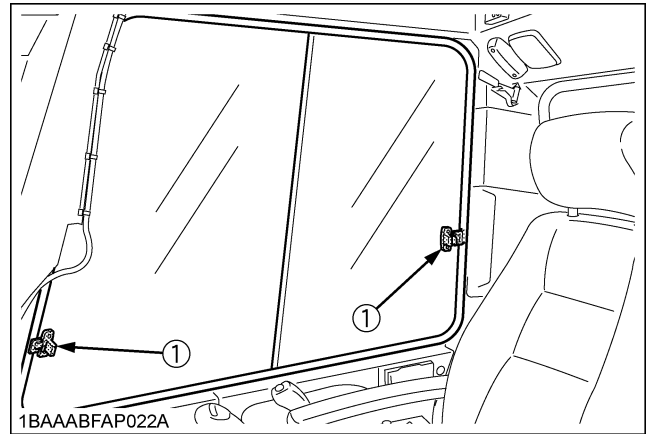


- (1) Lock lever
(2) Grip

2. Hold the grips tightly with both hands. Pull the grip slightly upward and toward yourself to let the windshield slide inward.
3. Pull the windshield all the way to the lock at the back of CAB.
4. To close the window, take the reverse steps 3, 2 and 1.

■ Opening/Closing of Side CAB Window

1. Pull the grip to release the lock and pull side window open to the rear or to the front.
2. To close the side window, slide it forward or backward until the lock snaps in at the window frame.



- (1) Grip

■ Emergency Hammer

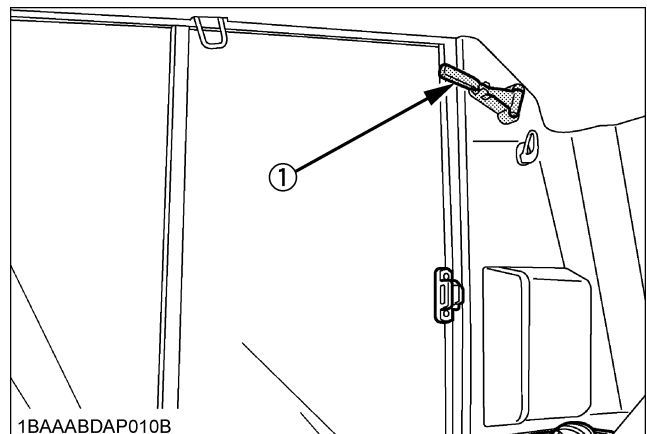


CAUTION

To avoid personal injury:

- When breaking the window pane, close your eyes and cover them with an arm.

Emergency hammer is for breaking window pane to escape urgently away from excavator as a result of window rail locking mechanism failure.

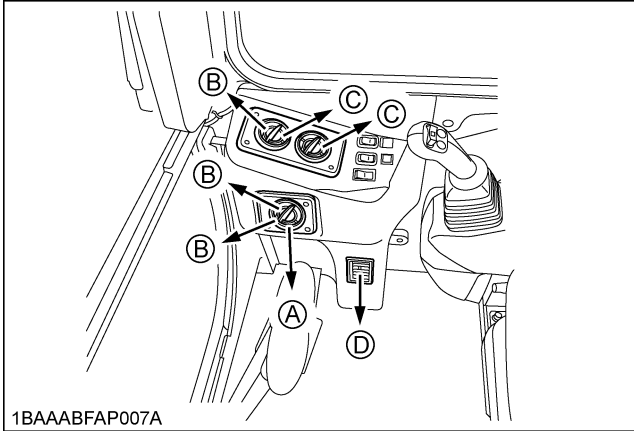


- (1) Emergency hammer

AIR CONDITIONER

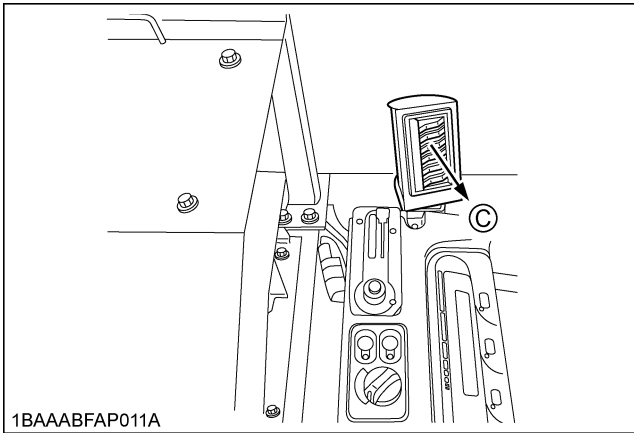
■ Air Flow

Air in the CAB and fresh air introduced into the CAB flow as shown in the figure. Adjust the five air outlet ports to obtain the desired condition.



1BAAABFAP007A

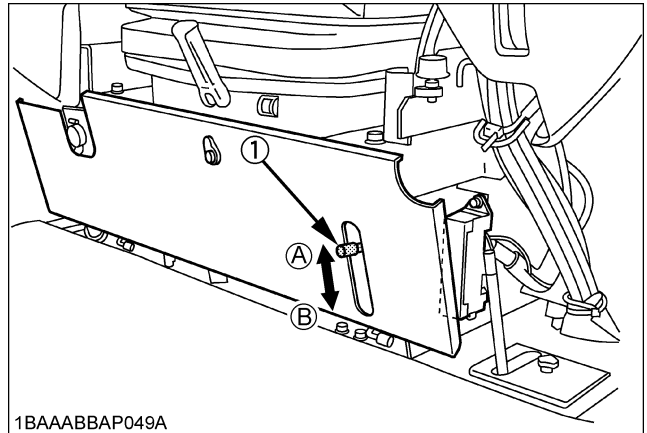
- (A) "DOOR WINDOW"
- (B) "WIND SHIELD"
- (C) "CHEST AREA"
- (D) "FOOT AREA"



1BAAABFAP011A

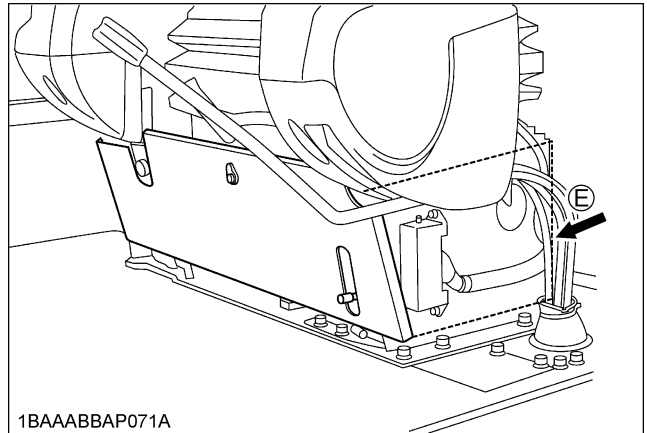
- (C) "CHEST AREA"

Position the inlet selector lever to the desired position.



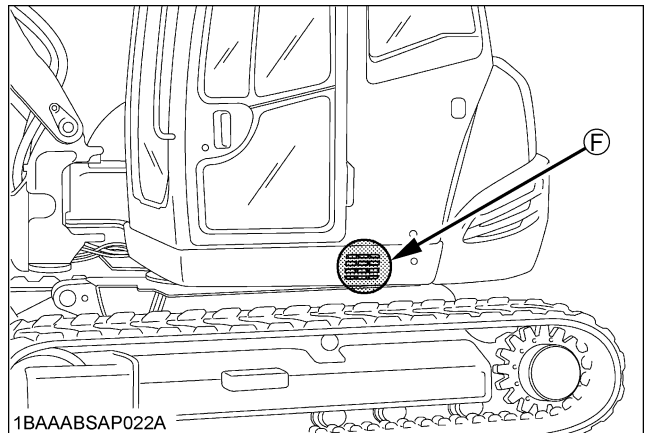
1BAAABBAP049A

- (1) Inlet selector lever (A) "FRESH AIR INLET" position
- (B) "INNER AIR RECIRCULATION" position



1BAAABBAP071A

- (E) "INNER AIR RECIRCULATION"



1BAAABSAP022A

- (F) "FRESH AIR INLET"

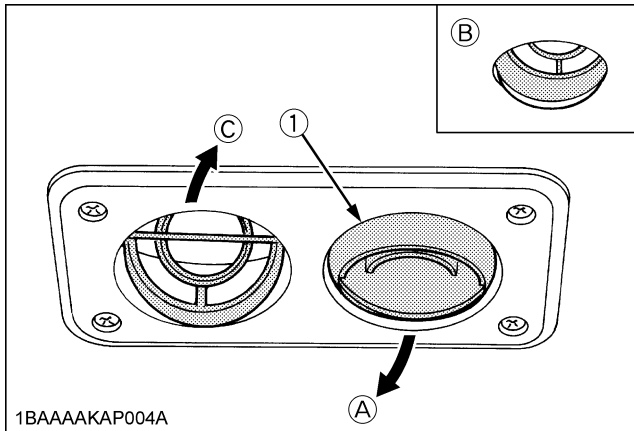
IMPORTANT :

- Do not allow water to enter the fresh air port while washing the excavator.

■ Air Control Vent

◆ Front air outlet

The front air outlets can be independently adjusted as required. To defrost the windshield, rotate the outlets toward the windshield.



- (1) Front air outlet (A) "WINDSHIELD"
 (B) "CLOSED"
 (C) "CHEST AREA"

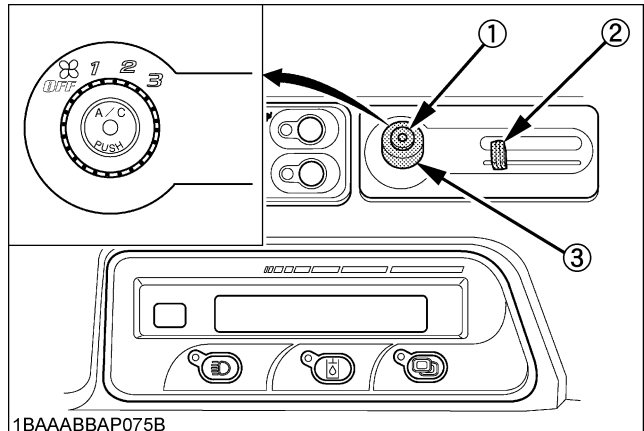


CAUTION

To avoid personal injury;

- Replace the water hoses every two years.
 - Inspect daily.
- Have the excavator repaired immediately if any of the following defects are discovered. (Such defects may cause burns or injury. They may also cause engine failure by serious damage.)
- Scratches, cracks or swelling in water hoses.
 - Water leaks at joints or connecting points.
 - Missing or damaged water hose protective sleeve or grommet.
 - Loose mounting bolt, damaged bracket.
- Do not touch the water hoses or the heater with your hand. You may get burned.
 - If the window fails to defrost in extreme conditions or becomes cloudy when dehumidifying the CAB, remove moisture with soft cloth.
 - Do not block all the air outlets of the air conditioner. A trouble may result.

■ Control Panel



- (1) Air conditioner switch with indicator light
 (2) Temperature control lever
 (3) Blower switch

◆ Air Conditioner Switch with Indicator Light

Push this switch to activate the air conditioner. An indicator light will light up when the switch is set to "ON". Push switch again to turn air conditioner off, in which case the indicator light will be off.

◆ Temperature Control Lever

Set this lever at the desired position to obtain the desired air temperature. Move the lever to the right to obtain cooler air. Move it to the left to obtain warmer air.

◆ Blower Switch

Air volume can be changed in three steps. At the "3" position, the largest air volume is obtained.

■ Operation

◆ Heating

1. Adjust the blower (1/2/3) switch and the temperature control lever to achieve the desired temperature level.

NOTE :

- In summer when the heater is not used, keep the temperature control lever at the "COOL" (rightmost) position. Otherwise, hot air will raise the temperature in the CAB.

◆ Dehumidifying-heating

1. Press and turn on the air-conditioner switch.
2. Turn on the blower (1/2/3) switch.
3. Adjust the temperature control lever to the "COOL" or an intermediate position to achieve the desired temperature level.

NOTE :

- Be sure to close the door while the air conditioner is ON.

◆ Cooling

1. Press and turn on the air-conditioner switch.
2. Turn on the blower (1/2/3) switch.
3. Adjust the temperature control lever to the "COOL" or an intermediate position to achieve the desired temperature level.

NOTE :

- Be sure to close the door while the air conditioner is ON.

◆ Defrosting or demisting

To defrost or demist the windshield, take the following steps.

1. Open the front air outlet and direct it to the windshield.
2. Set the blower switch and the temperature control lever to the "3" and "WARM" (leftmost) positions, respectively.

HANDLING THE SAFETY DEVICES

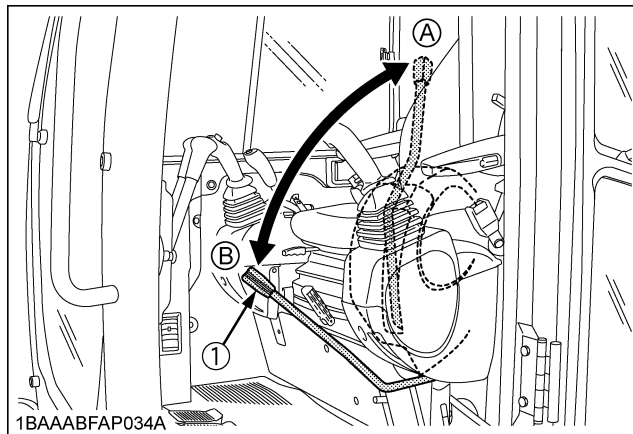
■ Control Lever Lock



CAUTION

- When the excavator is not used or left unattended, be sure to place the lock lever in position "Lock".

The attachment control lever lock is located on the left side.



(1) Lock lever for attachment control

(A) "Lock"

(B) "Unlock"

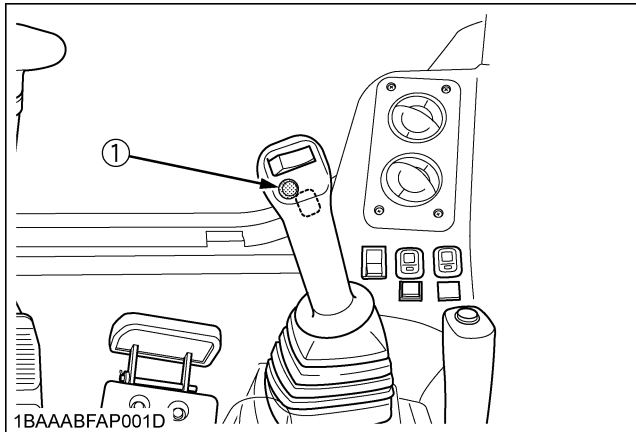
OPERATION OF THE ENGINE



CAUTION

To avoid personal injury:

- Read "SAFE OPERATION" at the beginning of this operator's manual.
- Obey the danger, warning and caution labels on the excavator.
- To avoid the danger of exhaust fume poisoning, do not operate the machine in a closed building without proper ventilation.
- Always start the engine from the operator's seat. Do not start the engine while standing next to the excavator. Before starting the engine, sound the horn to get the attention of persons standing nearby.



(1) Horn switch

IMPORTANT :

- Do not use starting fluid or ether.
- In order not to overload the battery and starter, avoid engaging the starter more than 10 sec.
- When engine does not start in 10 sec., please wait 20 sec. or more, before attempting to restart.

NOTE :

- If you keep the attachment lock lever at "UNLOCK" and try to get the engine started, "Lift up unload lever" appears on the meter panel and the engine cannot be started. Before starting the engine, make sure the attachment lock lever is set at the "LOCK" position.



Lift up
unload lever

1BAAAAQAP0570

- When the engine gets started, the meter may momentarily turn off and a peep may sound. This is not a trouble. The symbol □ may also appear for a short time. This is not a trouble, either.

STARTING THE ENGINE



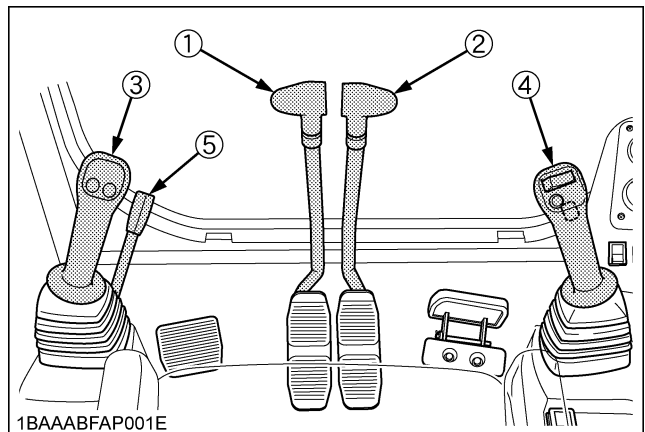
CAUTION

To avoid personal injury:

- The operator should not depend solely on the warning lamps, but should always conduct the routine checks (see "MAINTENANCE").

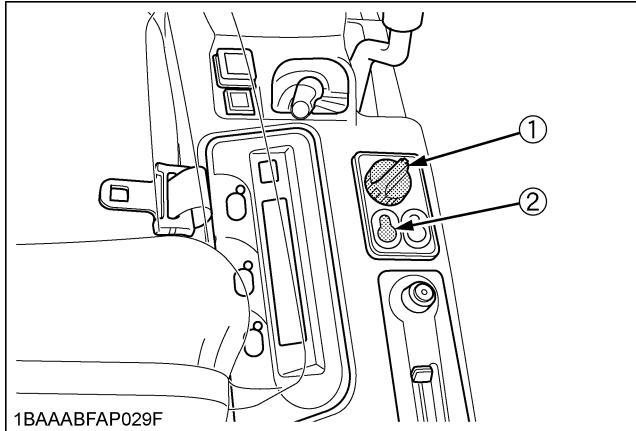
Start the engine in the following manner:

1. Before starting the engine, make sure that all control levers are in the neutral positions.



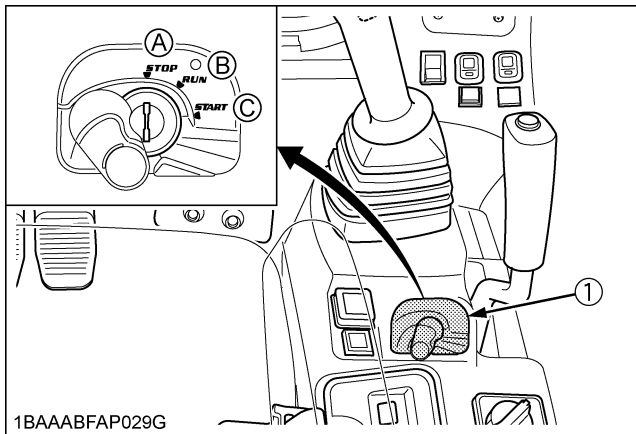
- (1) Drive lever (left)
- (2) Drive lever (right)
- (3) Attachment control lever (left)
- (4) Attachment control lever (right)
- (5) Lock lever

2. Pull the lock lever all the way back. (lock position)
3. Put the throttle potentiometer in the middle between "🐘" and "🐘" symbols. The switch for Auto Idle control is in the OFF position.
(See "AUTO IDLE (AI) OPERATION" in the Excavator operation.)

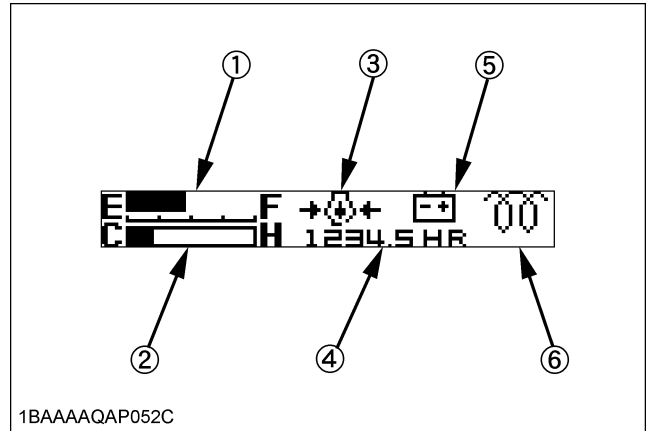


- (1) Throttle potentiometer
- (2) Switch for Auto Idle control

4. Insert the key into the starter switch and turn it to the position "RUN". The LCD display shows the figure below. The glow lamp will light up while the engine is preheated and will go out automatically after preheating is finished.



- (1) Starter switch
- (A) "STOP"
- (B) "RUN"
- (C) "START"



- (1) Fuel gauge
- (2) Water temperature gauge
- (3) Oil lamp
- (4) Hour meter
- (5) Charge lamp
- (6) Glow lamp

5. Turn the key to the position "START" and release after the engine has started.
6. Check if all warning lamps have gone out. Should a warning lamp still be lit up, stop the engine then remove the key and check for the cause.

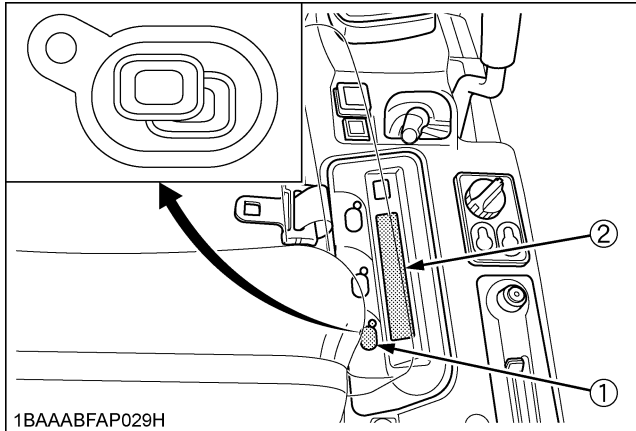
NOTE :

- When the lock levers are in "UNLOCK" position, the engine does not start.

■ Display Selector Switch

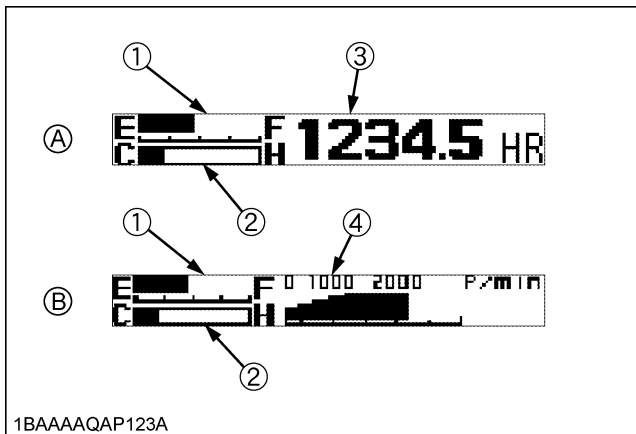
Press the display selector switch while the engine is running. The LCD meter display will change from one indication mode to the other.

Change the two-mode display according to your jobs.



1BAAAABFAP029H

- (1) Display selector switch
- (2) LCD display



1BAAAAQAP123A

- (1) Fuel gauge
- (2) Water temperature gauge
- (3) Hour meter
- (4) Engine tachometer
- (A) "INDICATION MODE 1"
- (B) "INDICATION MODE 2"

NOTE :

- With the starter key at the "STOP" position, press the electronic meter's display selector switch or the working light switch, and the LCD display shows the hour meter, fuel gauge and water temperature gauge for 10 seconds.



1BAAAAQAP0530

■ Charge Lamp

This warning lamp lights up if the charging system fails the engine running. When the starter switch is turned "RUN" with the engine off, the lamp lights up, and when the engine gets started, the lamp goes out. If the lamp stays on with the engine running, stop the engine and check the fan belt.

NOTE :

- If there is disconnection or failure in the charging system when the key is turned to "RUN", the following □ symbol will appear.



1BAAAAQAP0620

■ Oil Lamp

The engine oil pressure warning lamp lights up due to failure of the lubricating system with the engine running. When the starter switch is turned "RUN" with the engine off, this lamp lights up, and when the engine starts, the lamp goes out. If the lamp stays on with the engine running, stop the engine and check the engine oil level.

NOTE :

- If there is disconnection, failure or breakdown in the lubricating system when the key is turned to "RUN", the following □ symbol will appear.



1BAAAAQAP0610

■ Glow Lamp

With the starter key at the "RUN" position, the engine's preheat status is indicated.

NOTE :

- When the starter switch is turned to the "RUN" position, the engine will be preheated for a given period of time and the lamp will turn on.
- The above indication appears momentarily when the engine is started, but it does not mean any trouble. (This is because the oil charge sensor output becomes unstable when the engine is started.)
- The □ symbol appears momentarily as the engine starts. This is not an error.

■ LCD Display for Normal Operation

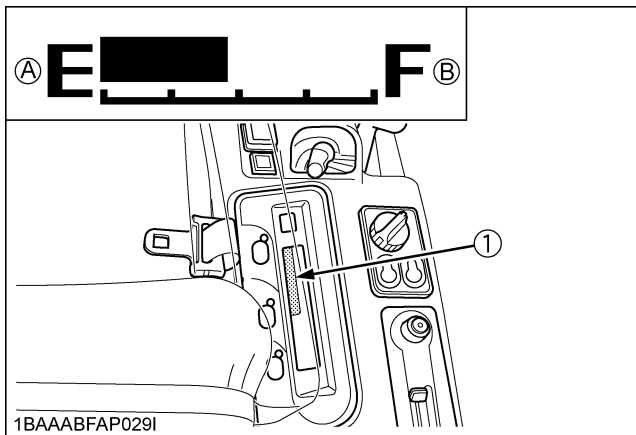
◆ Fuel gauge

CAUTION

To avoid personal injury:

- Before adding fuel, be sure to stop the engine.
- Be sure to keep open flame away from the machine. Otherwise a fire may result.

With the starter key at the "RUN" position, the fuel remaining in the fuel tank is indicated in the block.



(1) Fuel gauge (A) "Empty" (B) "Full"

NOTE :

- If the fuel gauge indicator is near the "E" or the "FUEL" message appears, add fuel as soon as possible. If the indicator is near "E" and the machine runs on a slope, the engine may run out of fuel and get interrupted.

◆ Fuel supply

CAUTION

To avoid personal injury:

- If the fuel is poured too fast, the buzzer may not sound according to the fueling process.
- The moment when the fuel tank is nearly full, the buzzer starts beeping.
- Look into the fuel tank when pouring the fuel. Listen to the buzzer sound for a rough estimate of the fill-up progress.

The following functions are helpful when adding the fuel. The fueling process can be monitored by a buzzer sound.

Procedure

1. Press the work light switch or the display selector switch on the meter with the key OFF. (Keep the key at OFF.)



2. The message shown above appears.
3. Add fuel.
4. The buzzer sound interval changes according to the amount fuel added. As the fuel amount becomes close to full, the buzzer sound changes to continuous beeping.

◆ Water Temperature Gauge

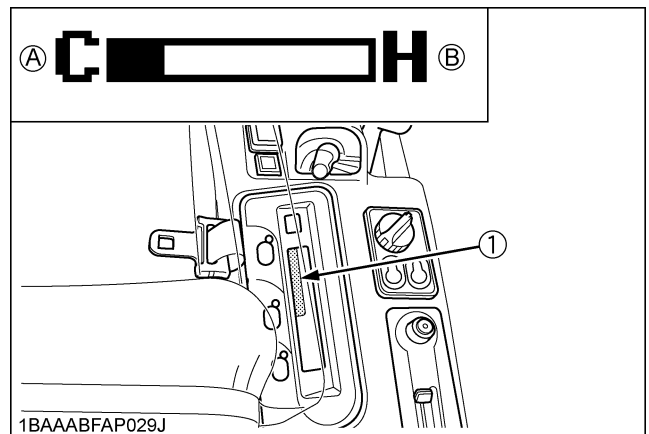
CAUTION

To avoid personal injury:

- Do not open the radiator cap during or just after operation. Hot coolant may gush out and scald you. Wait for the coolant to cool down before opening the cap.

With the starter key at the "RUN" position, the cooling water temperature is indicated. If the water temperature indicator is near "H", take the steps below.

1. Discontinue the job.
2. Reduce engine rpm's to idle and keep it at idle for 5 minutes.
3. Stop the engine and check the following points (1)-(3).
 - (1) Low coolant level or leak
 - (2) Fan belt tension
 - (3) Mud or dust deposits on radiator



(1) Water temperature gauge (A) "WATER TEMP LOW" (B) "WATER TEMP HIGH"

◆ Hour-meter

Indicates the total operating hours of the machine.

How the indicator works

- The meter advances one hour after an hour of operation regardless of the engine rpm.



◆ Engine tachometer

Indicates the current rpm of the engine.



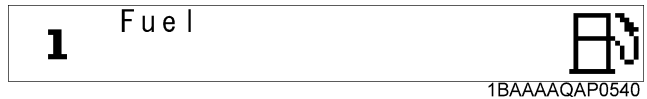
NOTE :

- The LCD display may be illegible when viewed from a certain angle. This is not a display failure.

■ LCD Display for Warning

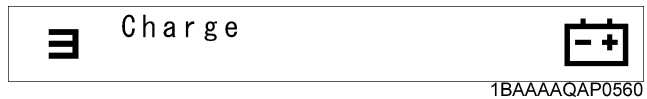
◆ Remaining fuel warning

When the fuel level is very low, the ▲ lamp (yellow) starts flashing and the following message appears in the display.



◆ Battery charge warning

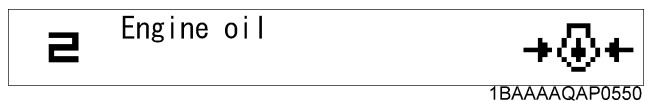
If the charging system fails, the ▲ lamp (red) starts flashing and the following message appears in the display.



◆ Engine oil pressure low warning

When the engine oil pressure drops too low, the ▲ lamp (red) starts flashing and the following message appears in the display.

Immediately stop the engine and check the engine oil level.



■ Warning Lamp

The warning lamp is used to indicate broken wire, short-circuit, fuel shortage and other problems.

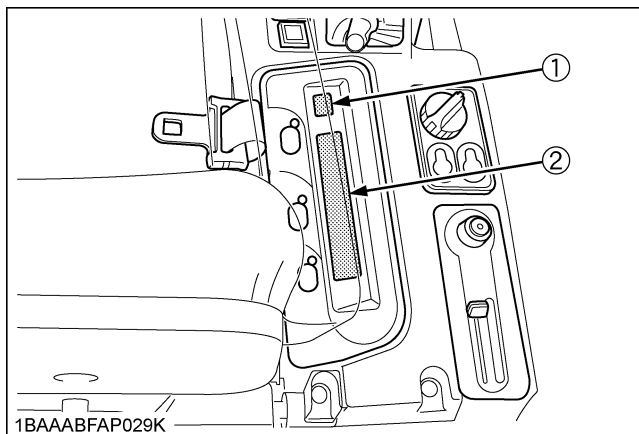
The warning lamp starts flashing in red if any trouble occurs. If the system gets in warning signal, the warning lamp starts flashing in yellow.

IMPORTANT :

- Do not just look at the meter, but also carry out the inspection and correction accordingly.

NOTE :

- The warning lamp starts flashing in red if a serious problem occurs. If the system gets in warning signal, the warning lamp starts flashing in yellow.
- Warnings and errors are displayed and an alarm buzzer beeps.
- Let your KUBOTA dealer inform you of details concerning care and maintenance.



- 1BAAABFAP029K
- (1) Warning lamp (red, yellow)
(2) LCD display

■ Fuel Supply Pump



DANGER

To avoid serious injury or death:

- Do not use the fuel supply pump for gasoline or hydraulic oil. Doing so could result in explosion or damage. Only use the fuel supply pump for diesel fuel.



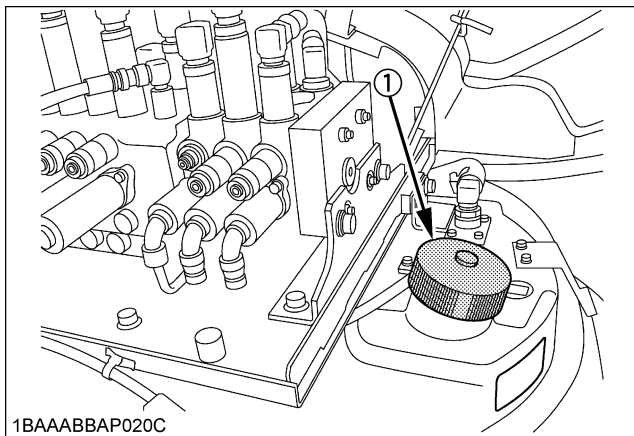
CAUTION

To avoid personal injury:

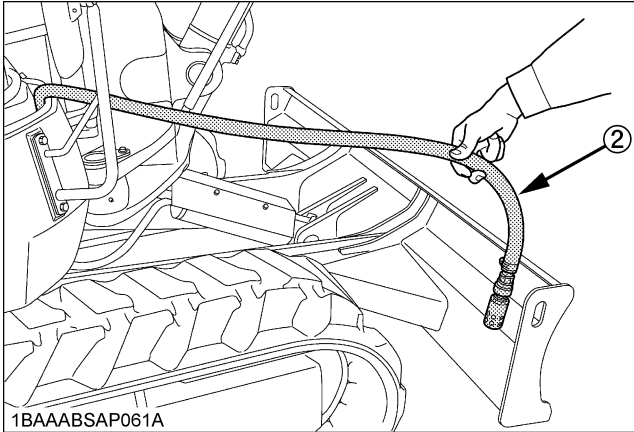
- When the fuel supply pump is used, be sure to open the fuel tank cap.
- Stop the engine and remove the key before fuelling.
- Do not smoke while fuelling.

This device automatically supplies fuel to the fuel tank and stops automatically when the fuel tank is full.

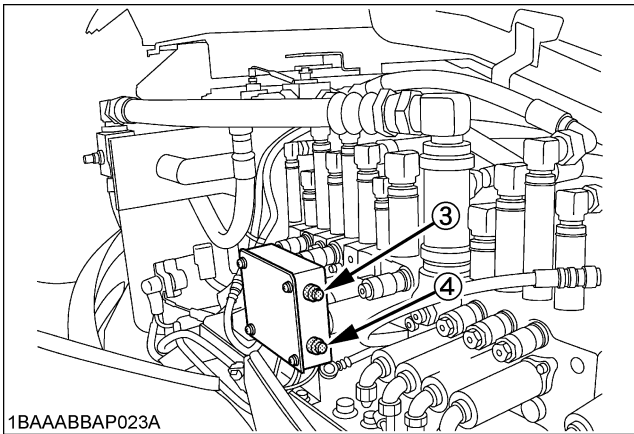
1. Open the tank cover. (See "Opening / Closing of the Fuel Tank Cover" in "MAINTENANCE" section.)
2. Open the fuel tank cap (1).
3. Insert the pump's nozzle (2) in the fuel supply tank.
4. Push the switch (black button (3)). The pump stops automatically once the fuel tank is full. To stop the pump on the way, the switch (red button (4)) is pushed.



- 1BAAABBAP020C
- (1) Fuel tank cap



(2) Pump's nozzle



(3) Switch (black button)

(4) Switch (red button)

■ Checkpoints after Starting the Engine

After starting the engine, but before starting operation, check the following points:

1. Put the throttle potentiometer in the middle between "🐢" and "🐇" symbols and let the engine idle for approx. five minutes. This allows the engine lubricant to warm up and penetrate every part of the engine.

NOTE :

- This idling is usually called "Warm-up".
2. Once the engine has warmed up, check:
 - the warning lamp "Engine oil pressure" has gone out.
 - the warning lamp "Battery charge" goes out when engine speed is increased.
 - the color of the exhaust is normal and no abnormal noises or vibrations are heard or felt.
 - no fluid is leaking from pipes or hoses.

◆ Should any following conditions occur, stop the engine immediately.

- The engine rpm's increases or decreases suddenly.
- Sudden abnormal noises are heard.
- Exhaust is black.
- Warning lamp for engine oil lights up during operation.

IMPORTANT :

- In these cases, the excavator must be checked and serviced by your local the KUBOTA dealer.

STARTING THE ENGINE UNDER COLD CONDITIONS



CAUTION

To avoid personal injury:

- Make sure that the lock lever is in the lock position during warm up.

Start the engine in the following manner;

1. Pull the lock levers all the way back (lock position).
2. Turn the starter switch to the position "RUN" (glow position) and keep until the indicator lamp has gone out.
3. Move the starter switch to the position "START" to crank and start engine.
4. Release the starter switch after the engine has started; it will automatically return to the position "RUN".

IMPORTANT :

- Let the engine warm up after start-up for approx. 10 minutes under no load conditions. If the hydraulic fluid temperature is too low, the operation will be affected. Do not operate the excavator under full load until the engine has sufficiently warmed up.

STOPPING THE ENGINE



WARNING

To avoid personal injury or death:

- Do not keep the bucket or dozer in the lifted position, as a person could accidentally touch the levers and cause serious accidents.

1. After slowing the engine to idle, turn the key to "STOP".
2. Remove the key.

■ Engine Stop Button



CAUTION

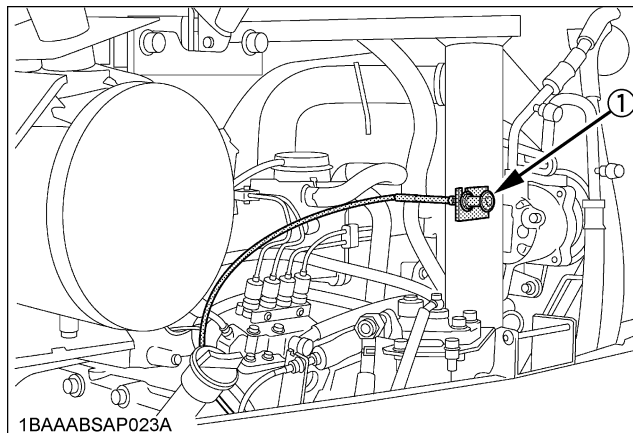
To avoid personal injury:

- Keep hands away from rotating parts.

IMPORTANT :

- Be sure to return the stop button to former position after the engine stops.

The engine stops when the key is turned off. If the engine does not stop, open the engine hood (See "Opening / Closing of the Engine Hood" in "MAINTENANCE" section) and pull back the stop button and hold it until the engine stops.



(1) Stop button

STARTING WITH AN AUXILIARY BATTERY



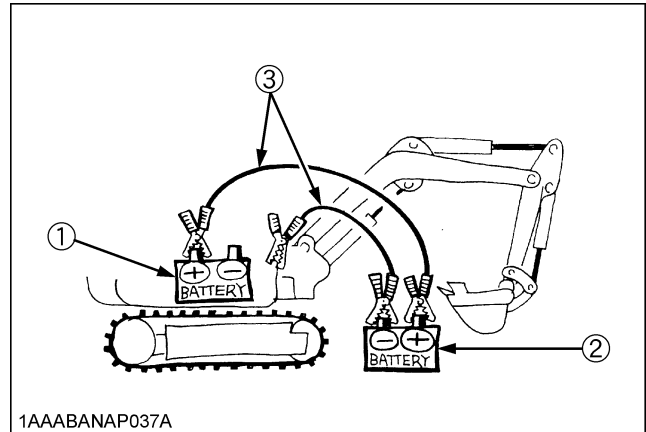
CAUTION

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 machines in the neutral position.
3. Wear eye protection and rubber gloves.
4. Ensure the vent caps are securely in place (if equipped).
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 (-) ground 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 is permissible.

EXCAVATOR OPERATION

RUNNING-IN OF THE NEW EXCAVATOR

The operation and care of the new excavator influences its life span. Your new excavator has been carefully checked and tested before leaving the factory. In spite of this, all movable components must run-in during the first 50 work hours. Do not work with full rpm's and full loads during this period. It is most important to run-in your excavator properly in order to achieve its full performance and longevity. During the running-in, the following points should be adhered to in all cases.

■ Do not Work with Full Engine Rpm's or Full Loads during the First 50 Working Hours

- Let the engine warm up sufficiently in the cold season.
- Do not let the engine rev-up more than necessary.

■ Oil Change in the Run-in Stage

The lubrication oil plays a specific and important role during the run-in phase of the excavator. The numerous movable parts are not yet run-in, so many fine metal particles are generated and cause damage and shorten the life of many components. Pay attention to the oil-change intervals and complete them sooner than later. See "REGULAR CHECKS AND MAINTENANCE WORK" section for more details on the oil-change intervals.

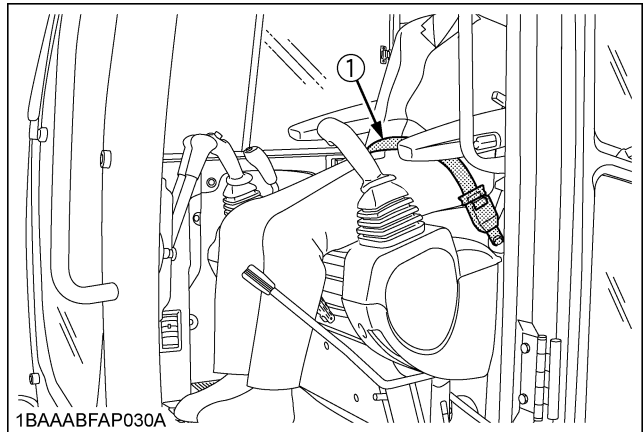
■ Seat Belt



WARNING

To avoid personal injury or death:

- Always use the seat belt with a ROPS/OPG (Top Guard Level I) protection structure. Adjust the seat to the optimal position and buckle up.



(1) Seat belt

STARTING



CAUTION

To avoid personal injury:

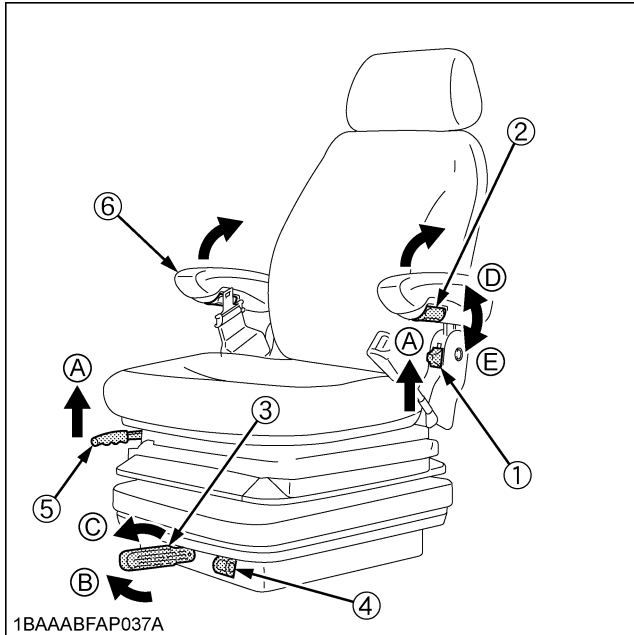
- No persons, other than those who have read and understand this manual and who are familiar with the excavator, should be allowed to use the excavator.
- Do not allow any person other than the operator to ride on the excavator.
- Do not operate the excavator while putting out the hands and the body from the windows.
- Do not touch the control levers and the pedals from outside the cab during the engine running.

■ Adjusting the Operator's Seat

⚠ CAUTION

To avoid personal injury:

- Make sure that the seat is completely secured after each adjustment.



- | | |
|---------------------------------|---------------------------|
| (1) Backrest tilt adjust lever | (A) "UNLOCK" |
| (2) Arm rest angle adjust knob | (B) "TO INCREASE TENSION" |
| (3) Weight adjust lever | (C) "TO DECREASE TENSION" |
| (4) Weight adjustment indicator | (D) "TO INCREASE ANGLE" |
| (5) Travel adjust lever | (E) "TO DECREASE ANGLE" |
| (6) Arm rest | |

◆ Travel adjustment

Pull the travel adjust lever in the direction of [A] and slide the seat backward or forward, as required. The seat will lock in position when the lever is released.

◆ Weight adjustment

Turn the weight adjust lever to achieve the optimum suspension setting.

◆ Tilt adjustment

Pull the backrest tilt adjust lever in the direction of [A] and move the backrest to the desired angle.

◆ Height adjustment

Lift the seat to the desired height of the three available positions. Adjust the seat to the desired position after lifting the seat to the highest position in the case of lowering the seat.

◆ Arm rest

Arm rest may be set at upright position if desired.

◆ Arm rest angle adjustment

Turn the arm rest angle adjust knob to the desired angle.

■ Lock Lever

⚠ CAUTION

To avoid personal injury:

- To avoid injuries, check safety aspects all around the excavator.

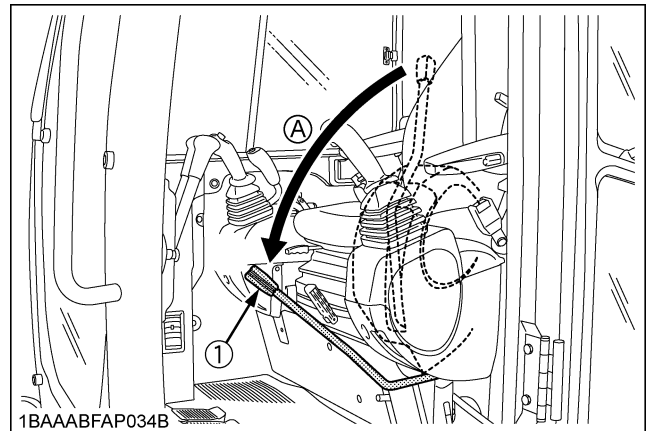
NOTE :

- With the lever lock pulled down, the engine fails to start.

If you try to start the engine with the key with the lock lever down, the following message appears momentarily on the meter display.

E1 Lift up
unload lever

1BAAAAQAP0570



(1) Lock lever (Unload lever) (A) "Unlock"

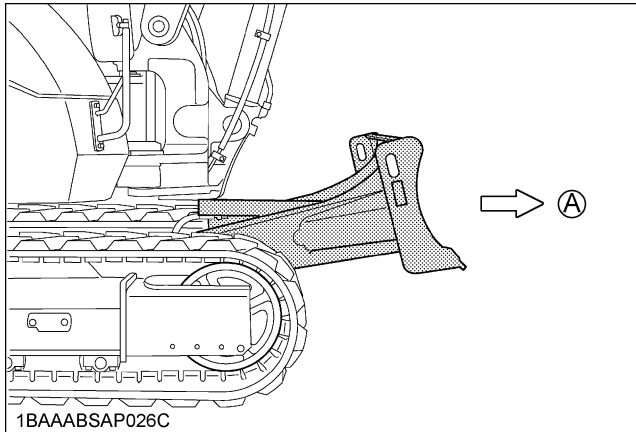
DRIVING



WARNING

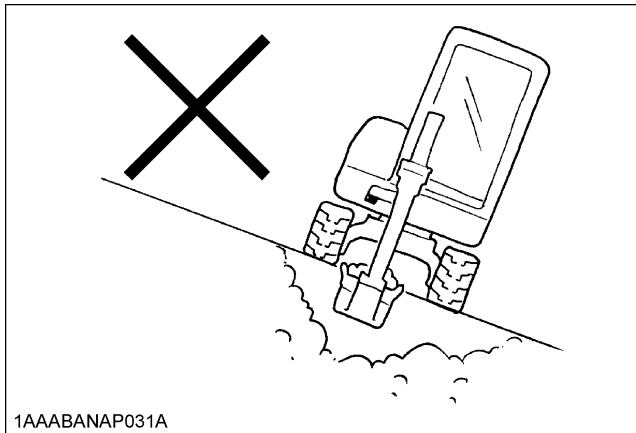
To avoid personal injury or death:

- Before starting the engine, make sure that no one is near the excavator.
- Before operating the excavator, check the track direction. (Front idler and dozer blade to the front of the excavator).

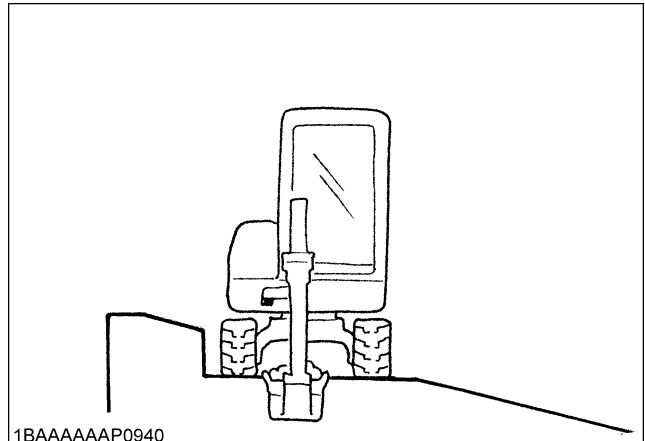


(A) "Front of the excavator"

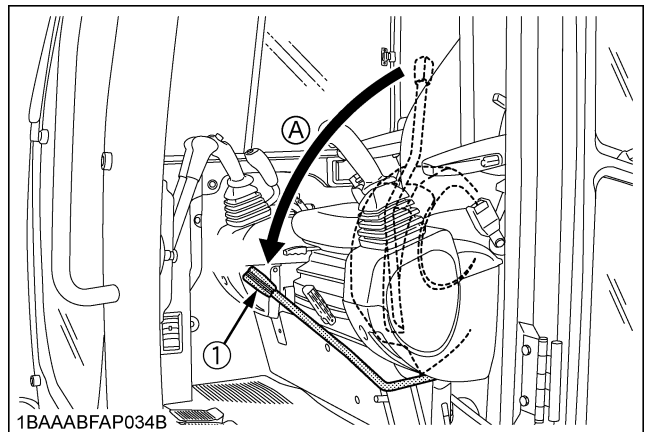
- Use extra caution when traveling across a slope or working sideways on a slope.



- Recommended technique for working on a slope.

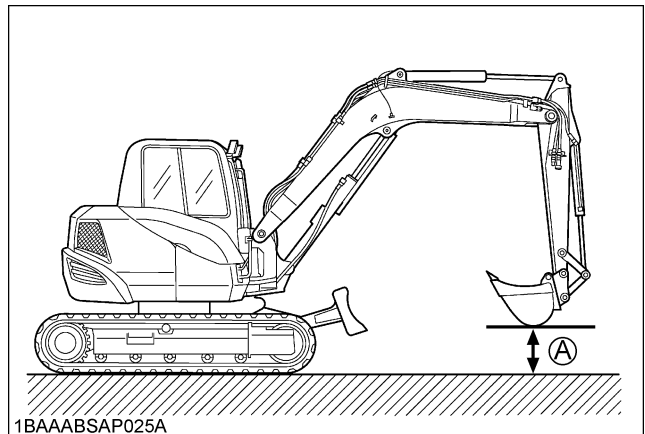


1. Adjust the engine speed from idling to an intermediate speed.
2. Unlock the lock levers and pull in the bucket and hold the bucket about 20 to 40 cm above the ground.



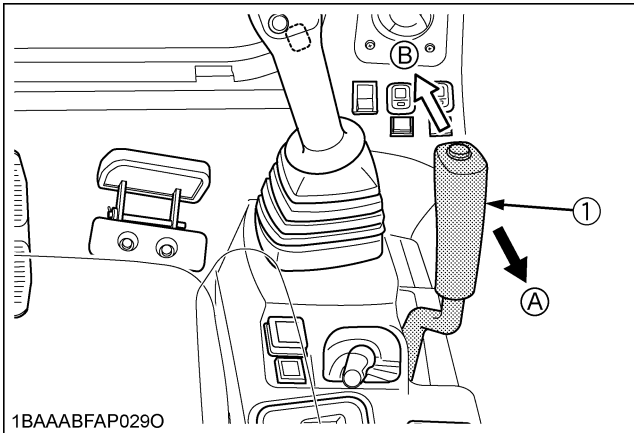
(1) Lock lever

(A) "Unlock"

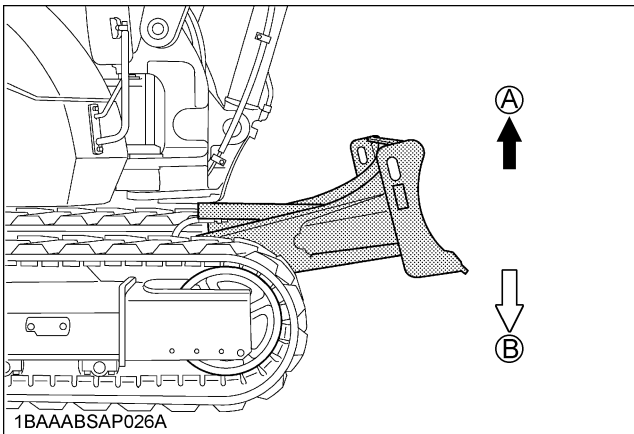


(A) 20 to 40 cm

3. Activate the dozer control lever to raise the dozer.



(1) Dozer control lever (A) "Raise" (B) "Lower"



(A) "Raise" (B) "Lower"

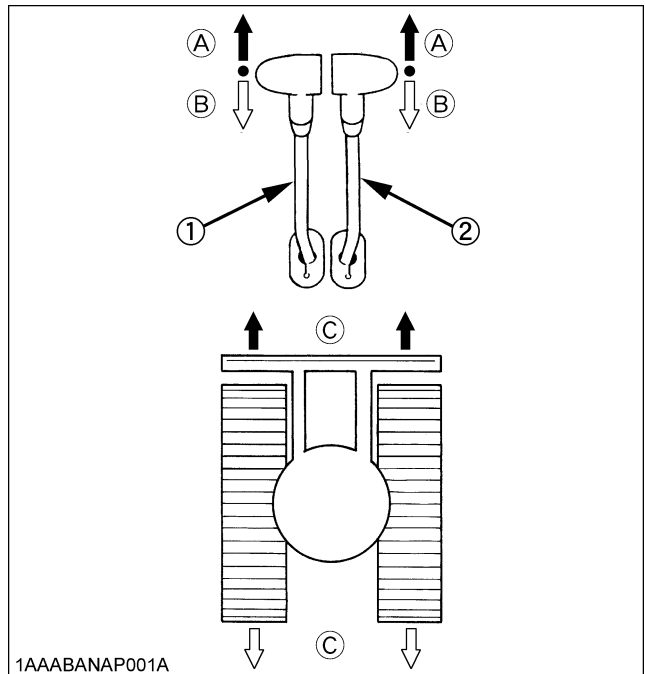
■ Drive Levers(Right,Left)

WARNING

To avoid personal injury or death:

- If the swing frame has been turn 180 deg, i.e. the dozer in relation to the operator's seat is "behind", then the travel direction is opposite to the drive direction of the levers (when activating the drive lever forward, the machine, in relation to the operator's seat, will move backward).

Pushing the drive lever forwards, moves the excavator forwards, and vice-versa. The front of the excavator is the side where the dozer is located; the drive sprocket is in the rear of the excavator.





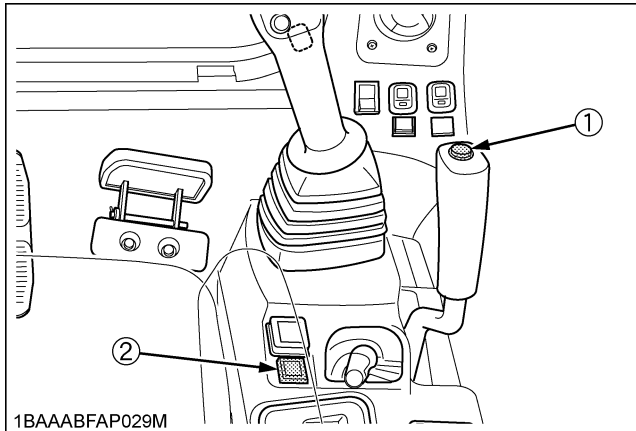
(1) Drive lever (left) (2) Drive lever (right) (A) "Forward" (B) "Backward" (C) "Straight"

■ Travel Speed Switch

Travel speed will increase when this switch is pushed down.

Switching the dual travel speed:

1. Press the travel speed switch. The buzzer beeps twice and the travel speed changes from first speed to second. The  symbol lights up.
2. Press the travel speed switch again, and the buzzer beeps once and the travel speed changes from second speed to first. The  symbol light goes out.



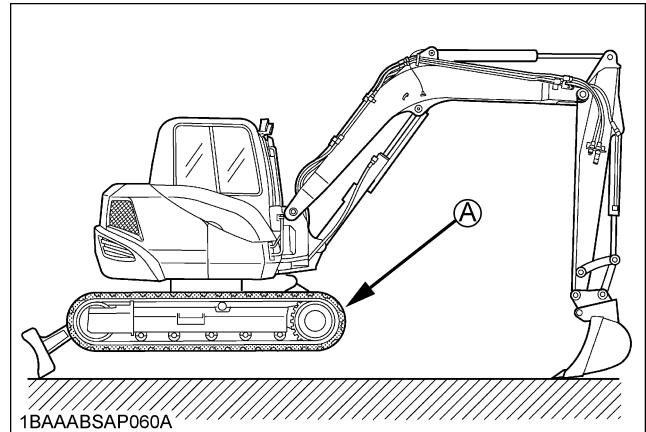
- (1) Travel speed switch
(2) Speed indicator light

NOTE :

- When activating the travel speed switch, it must be pushed down completely.
- Each time the travel speed switch is pressed, the travel speed is switched between first and second.

IMPORTANT :

- It automatically changes into first speed (low speed) when the drive resistance grows while traveling second speed (high speed). Thereafter, when the resistance lightens, it returns to second speed.
- If the tracks are clogged with sand or gravel while working on soft ground, lift up the track with the help of the boom, arm and bucket and let the track rotate to remove the sand and gravel.



(A) "Rotate to remove sand and gravel"



DANGER

To avoid serious injury or death:

- Do not work under the machine in this condition.

TURNS



CAUTION

To avoid personal injury:

- Do not change direction on steep slopes, or the excavator could tip over.
- Before changing direction, beware of people in the work area.

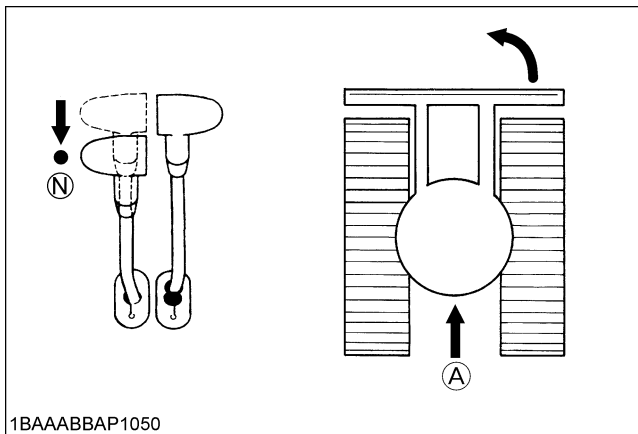
■ Pivot Turn

NOTE :

- Movement as illustrated is done with the dozer blade in front of the operator.

◆ Change of Direction while Travelling

1. While travelling forward, bring the left drive lever into the neutral position; the excavator will turn in the direction of the arrow of the illustration below.

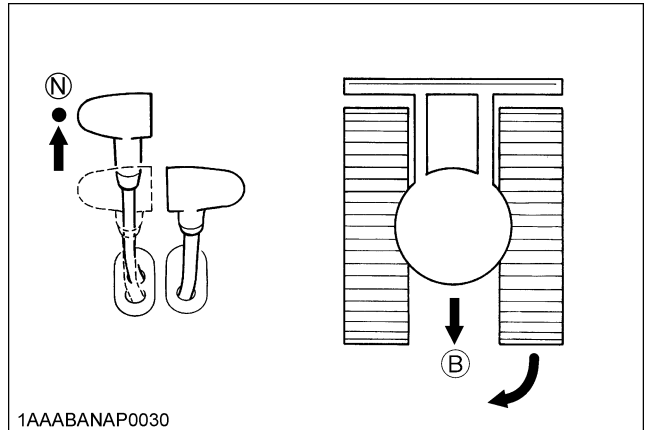


1BAAABBAP1050

(A) "Travelling forward"

(N) "Neutral position"

2. While travelling backward, bring the left drive lever into the neutral position; the excavator will turn in the direction of the arrow of the illustration below.



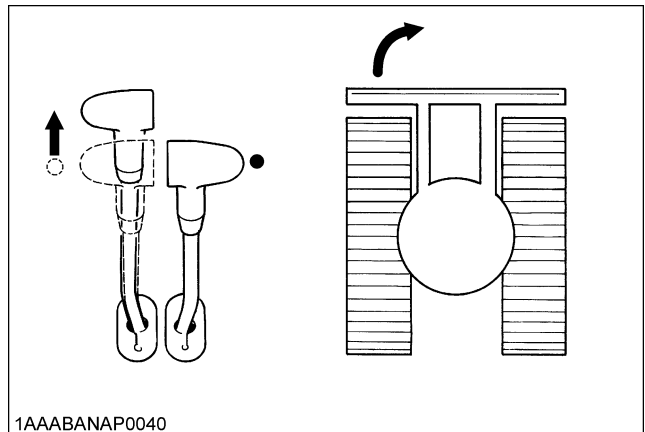
1AAABANAP0030

(B) "Travelling backward"

(N) "Neutral position"

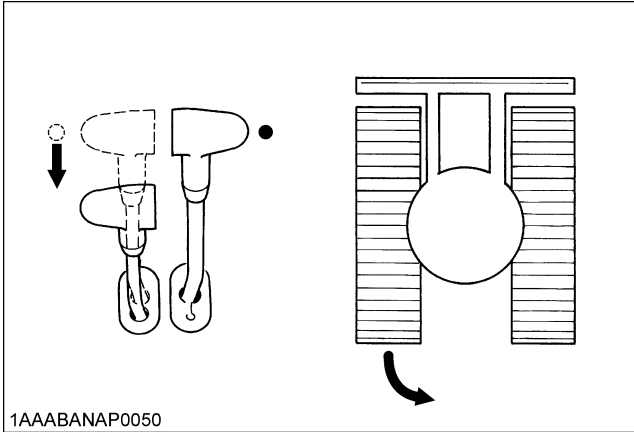
◆ Change of Direction while Stationary

1. Push the left drive lever forward; the excavator will turn in the direction of the arrow of the illustration below.



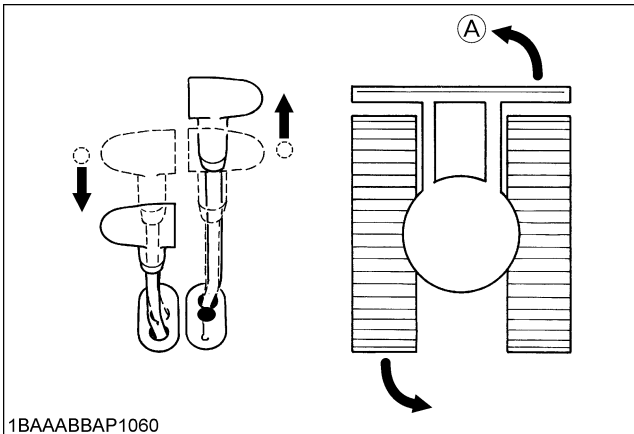
1AAABANAP0040

- Pull the left drive lever backward; the excavator will turn in the direction of the arrow of the illustration below.

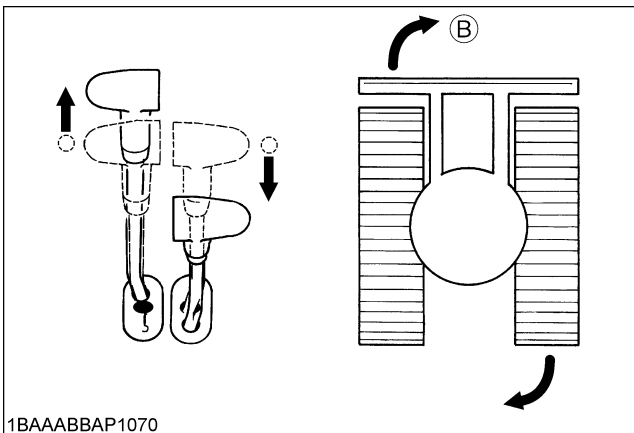


Spin Turn

When both drive levers are activated in the opposite directions, both tracks will rotate with the same speed but in opposite directions. The center of rotation is the center of the excavator.



(A) "Left spin turn"



(B) "Right spin turn"

UP AND DOWNHILL DRIVING



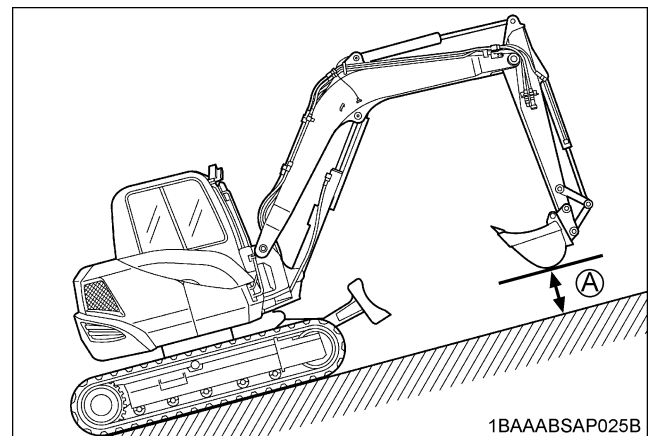
CAUTION

To avoid personal injury:

- When travelling up or down a slope, use extra caution and follow the instructions below.

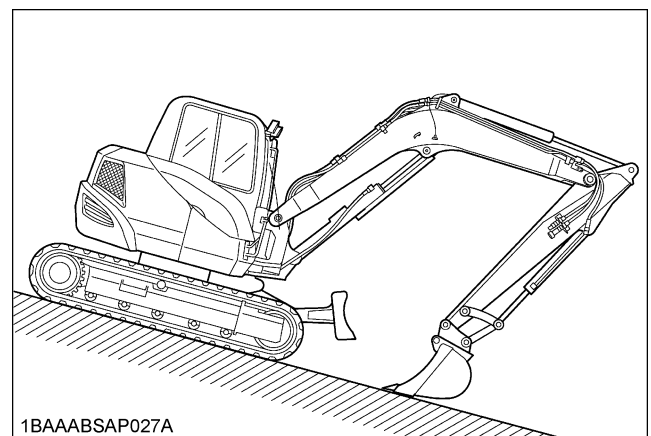
While traveling uphill, keep the lower edge of the bucket approx. 20 to 40 cm above the ground. Although the KUBOTA excavator will not slip easily because of the tracks, it is safer to let the bucket slide over the ground while traveling downhill. Always choose slow speed for uphill and downhill traveling.

[UPHILL TRAVELING]



(A) 20 to 40 cm

[DOWNHILL TRAVELING]



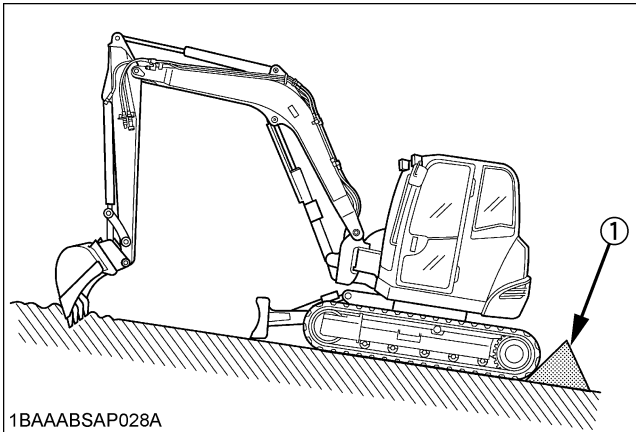
PARKING ON A SLOPE



WARNING

To avoid personal injury or death:

- When the excavator is parked or left unattended on a slope, be sure to put the bucket on the ground and place all control levers in neutral position, then brace the tracks with chocks.

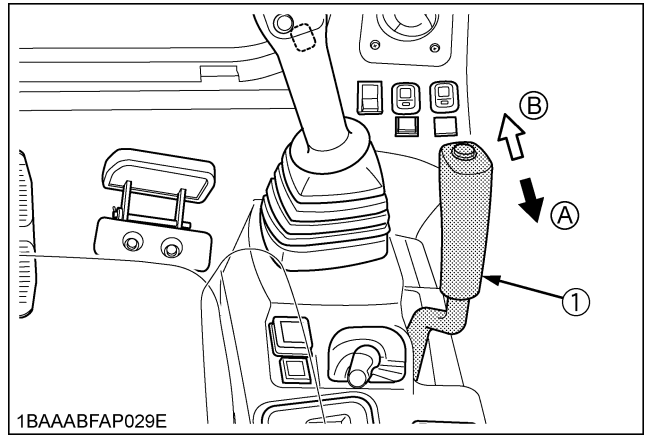


1BAAABSAP028A

(1) Chock

OPERATION OF THE DOZER

1. To raise the dozer, pull back the control lever. To lower the dozer, push the control lever forward.

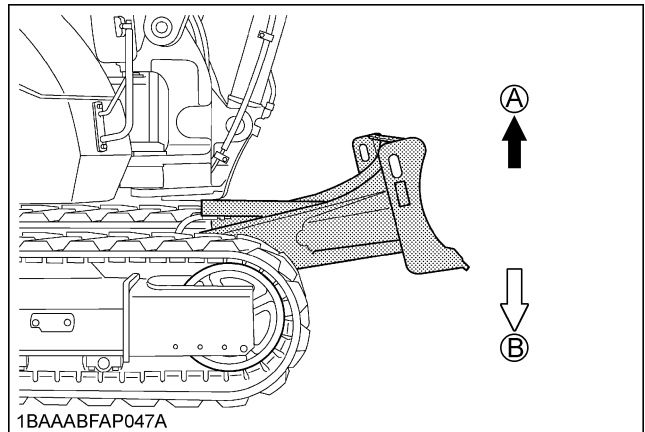


1BAAABFAP029E

(1) Dozer control lever

(A) "Raise"

(B) "Lower"



1BAAABFAP047A

(A) "Raise"

(B) "Lower"

2. While undertaking earth moving work, control both drive levers with the left hand and the dozer control lever with the right hand.

TWO PATTERN SELECTION SYSTEM(TPSS)



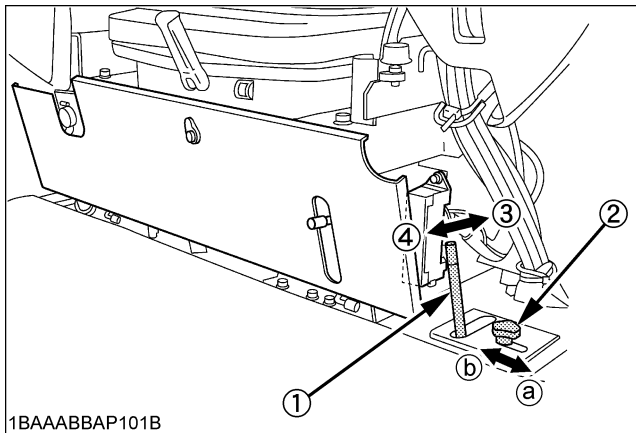
CAUTION

To avoid personal injury:

- Study control lever pattern A and pattern B. Then choose the one which is most familiar.
- Position the pattern selector lever (located on the left side of operator's seat) in either the rear position (pattern A) or the front position (pattern B).
- Engage the lock lever to prevent accidental pattern change.
- Familiarize yourself with the pattern selected by operating slowly.

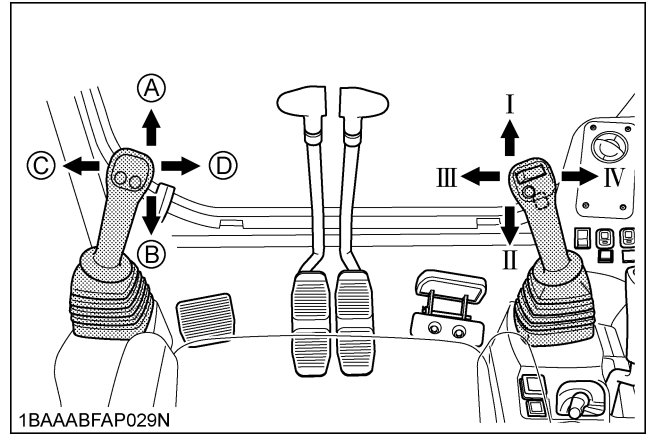
■ Pattern Change

1. Loosen the lever lock knob (2) and slide it to the direction (a), and position the pattern selector lever (1) to the desired position.
2. Slide the lever lock knob (2) to the direction (b) and tighten it.



1BAAABBAP101B

- (1) Pattern selector lever
(Two Pattern Selection System:TPSS)
- (2) Lever lock knob
- (3) Pattern A
- (4) Pattern B



1BAAABFAP029N

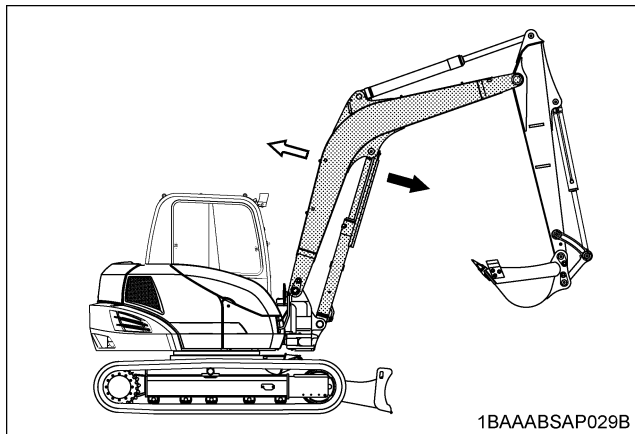
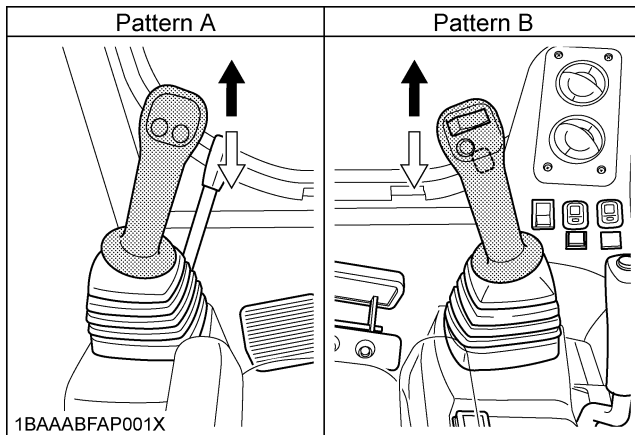
Lever Position		Pattern A	Pattern B
Attachment Control Lever (Left)	A	Boom down	Arm up
	B	Boom up	Arm crowd
	C	Swing left	Swing left
	D	Swing right	Swing right
Attachment Control Lever (Right)	I	Arm up	Boom down
	II	Arm crowd	Boom up
	III	Bucket crowd	Bucket crowd
	IV	Bucket dump	Bucket dump

OPERATION OF THE BOOM

To raise the boom, pull the attachment control lever back. The boom is equipped with a cushion cylinder which helps prevent excavated material in the bucket from falling out. Low hydraulic oil temperature, (e.g. after starting the engine in cold weather) the cushioning function will be effected for a short period of time (approx. 3 to 5 seconds). This condition results from the viscosity of the hydraulic oil and is not a sign of malfunction.

The cushion cylinder will operate normally as the oil warms up.

To lower the boom, push the attachment control lever forward.

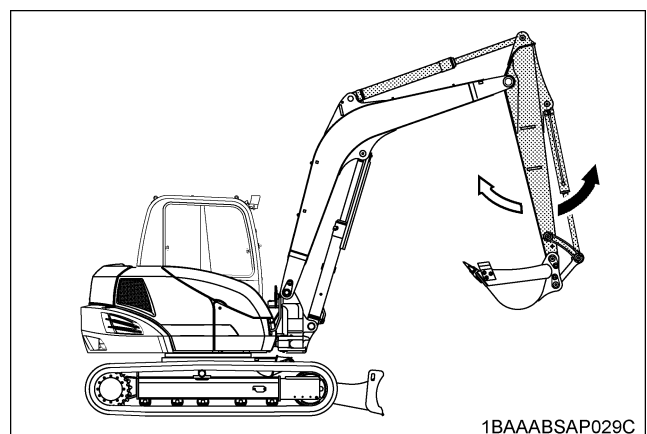
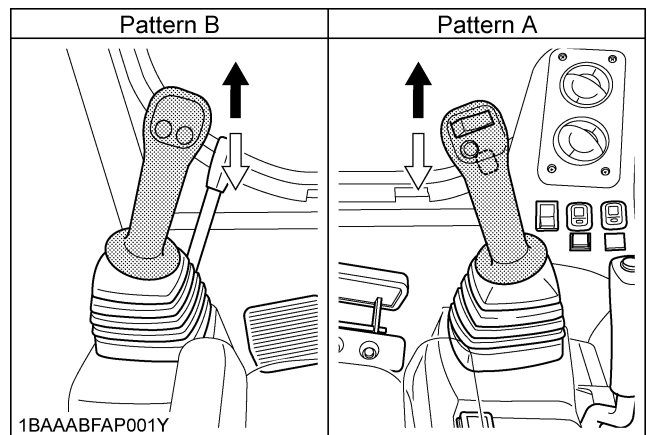


OPERATION OF THE ARM

Pull back the attachment control lever and the arm will be pulled in. To move the arm out, push the control lever towards the front.

NOTE :

- When pulling in the arm, the movement may stop for a short moment when the arm is in its vertical position. This is caused by the combined load of the arm and bucket moving the cylinder piston away from the hydraulic flow causing a delay in the cylinder action, until the flow catches up with cylinder piston. This is a characteristic of the hydraulic system and is no sign of a malfunction.

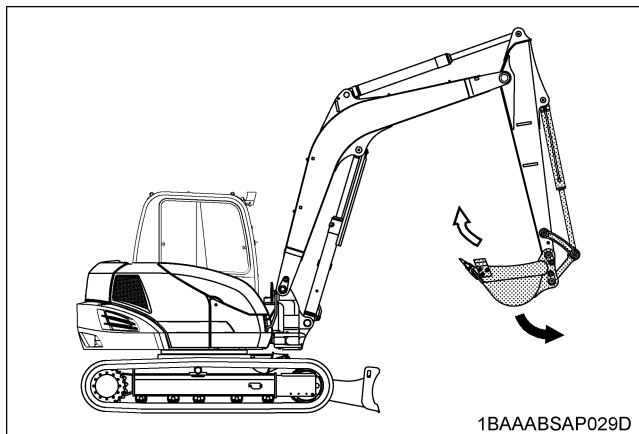
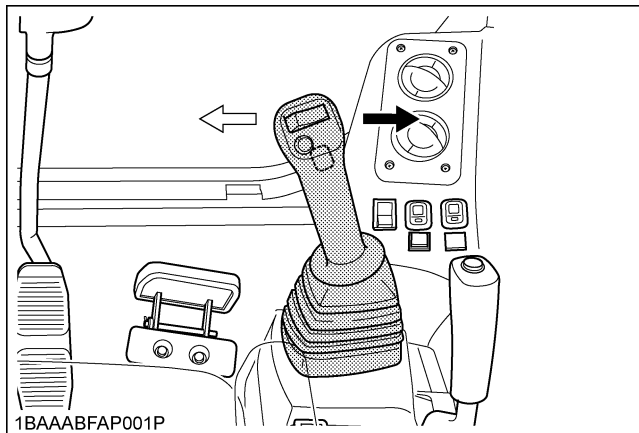


IMPORTANT :

- When lowering the boom, make sure that it does not hit the dozer and that the bucket teeth do not touch the dozer.

OPERATION OF THE 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 empties its contents.



UNIT SWING AND BOOM SWING OPERATION



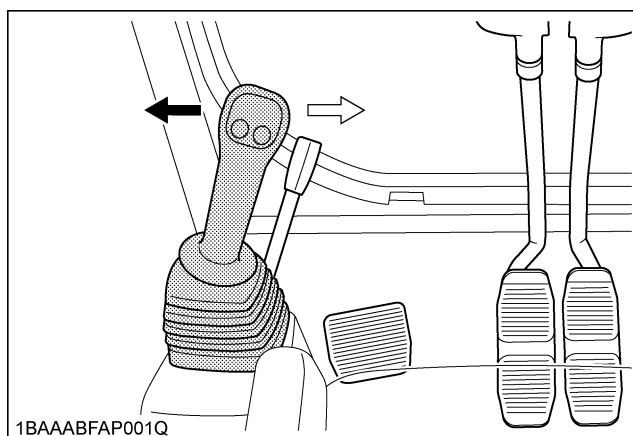
CAUTION

To avoid personal injury:

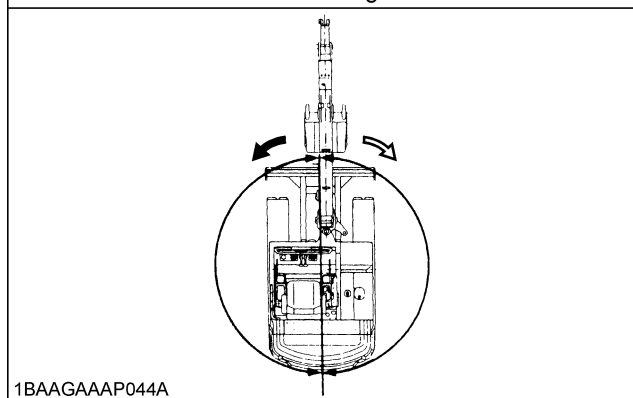
- When working in groups, always let the others know what you are going to do before you do it.
- Keep others away from the machine working area.
- Be sure to lock the boom swing pedal when the boom swing function is not used.

■ Unit Swing Operation

1. Move the control lever to the left and the upper structure will turn to the left.
2. Move the control lever to the right and the upper structure will turn to the right.

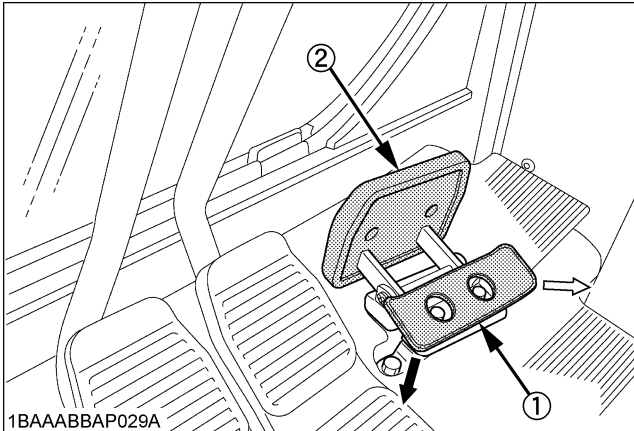


Unit Swing



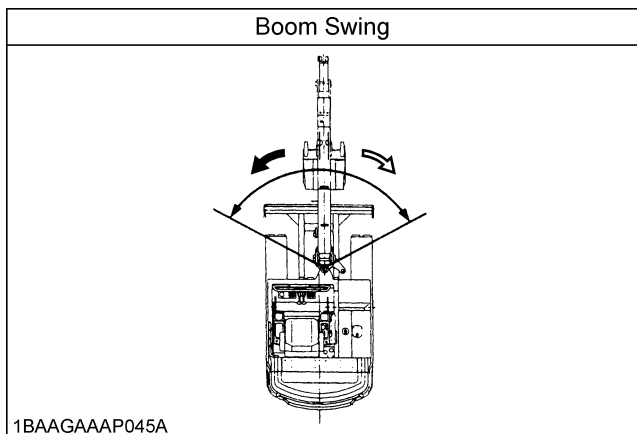
■ Boom Swing Operation

1. Flip the pedal lock up to unlock the pedal.
2. Step on the left side of the pedal to swing the boom to the left.
3. Step on the right side of the pedal to swing the boom to the right.



1BAABBAP029A

- (1) Boom swing pedal
(2) Pedal lock



1BAAGAAP045A

IMPORTANT :

- Do not operate the left attachment control lever abruptly from right to left (or vice versa). Because the low of inertia cause high impact load on the swing gear and the swing motor, shortening the life of the excavator.

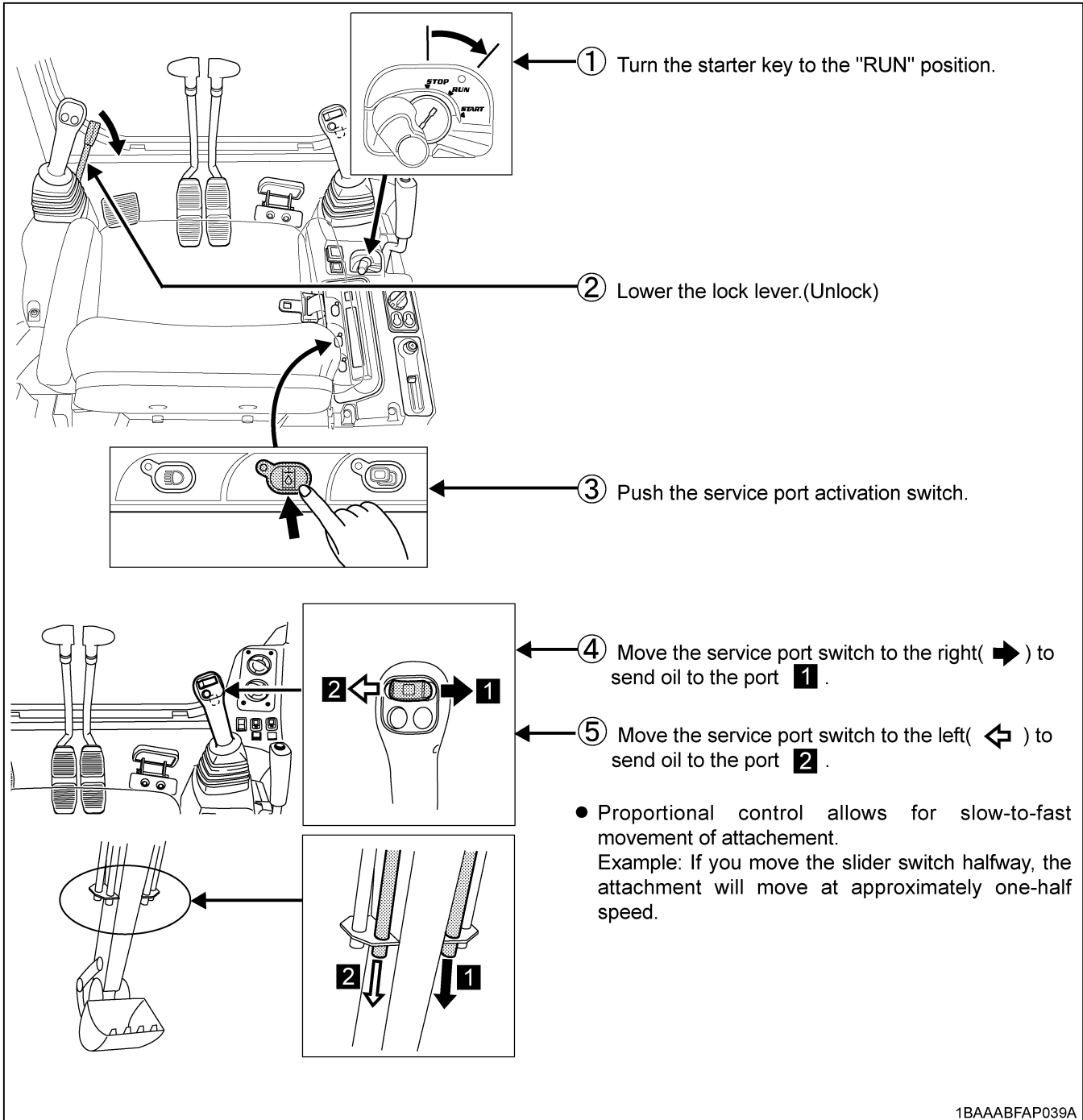
SERVICE PORT OPERATION

NOTE :

- When the lock lever is raised, the service port activation switch is off.
- Let the engine warm up after start-up for approx. 10 minutes under no load conditions.

■ First Service Port Operation

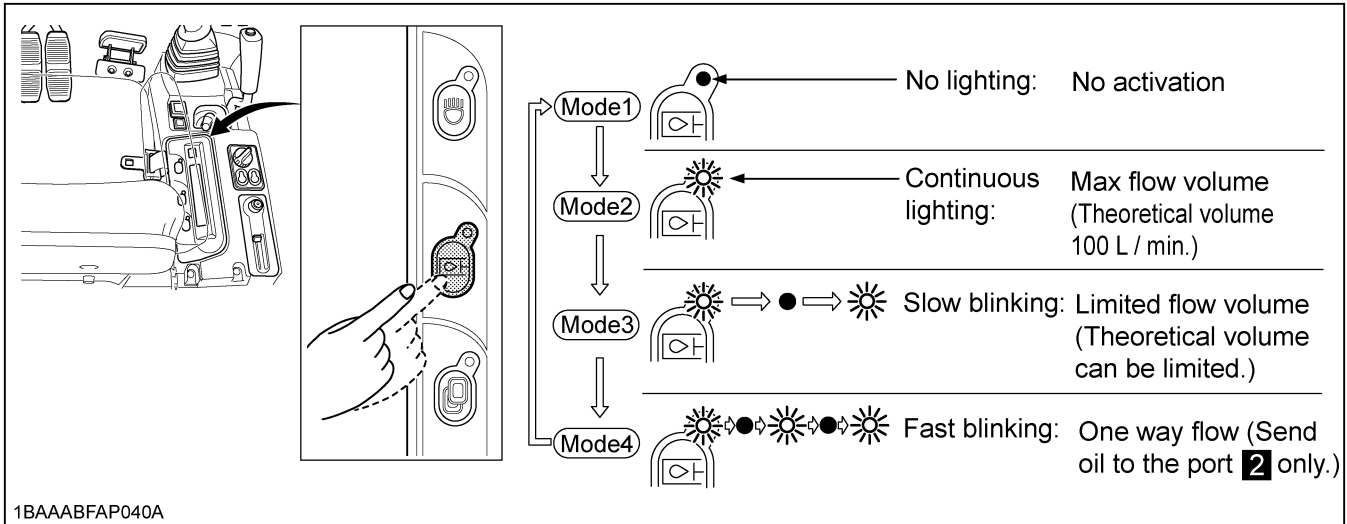
The service port switch is used to operate hydraulic attachment such as hammers.



◆ Usual settings

● Action mode of the first service port operation

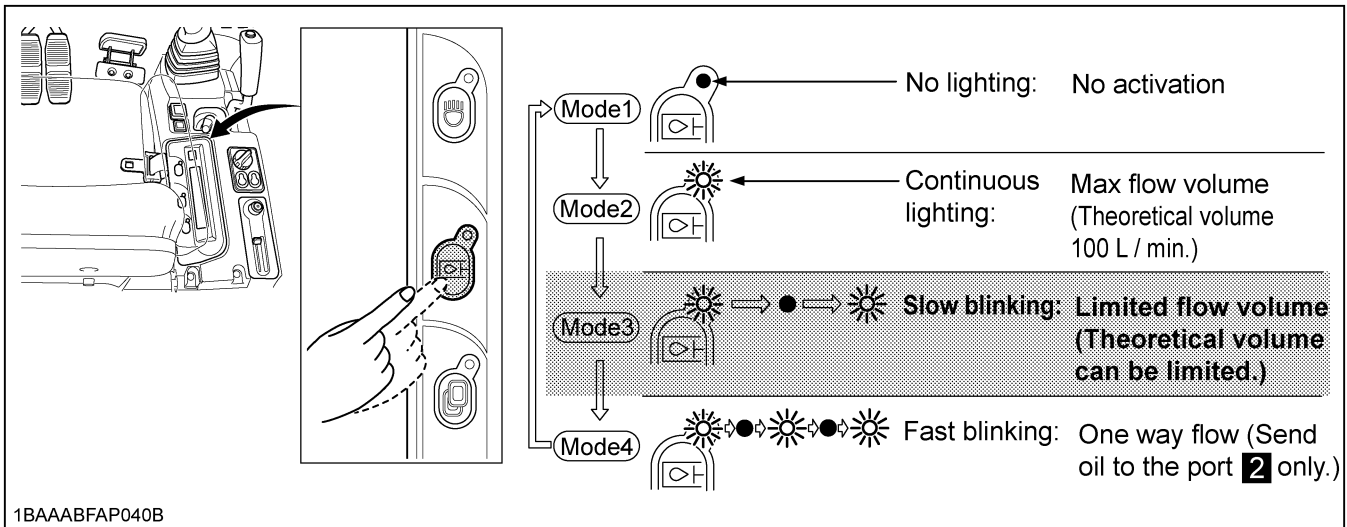
It is possible to select from four action modes of the first service port operation by pushing the service port activation switch. Each time the service port activation switch is pushed, the action mode changes from 1 through 4.



NOTE :

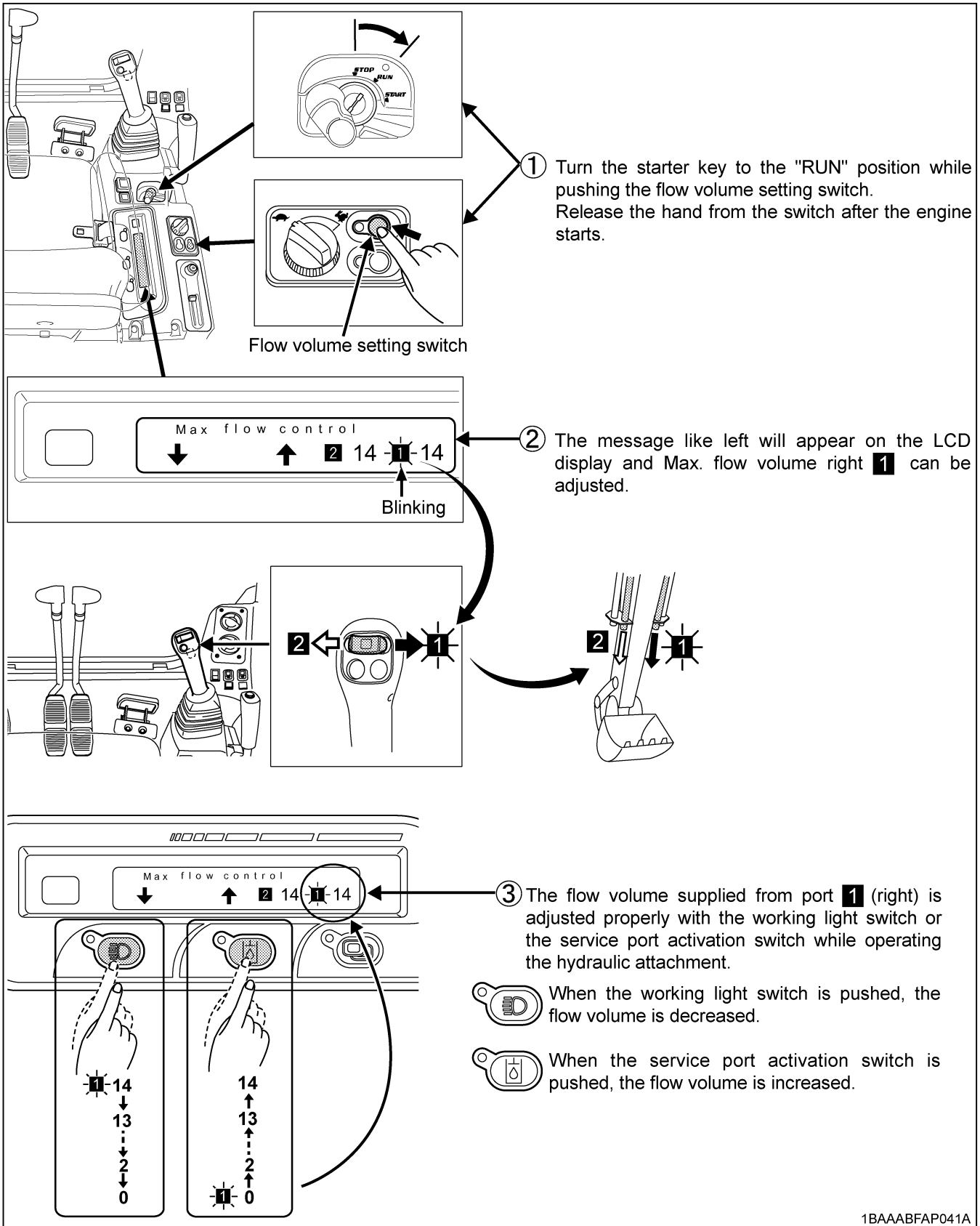
- When turning the starter key to the "RUN" position, the action mode will return to the last action mode used.

◆ Initial setting of limited service port flow volume (Make this setting first.)



● **Setting of limited flow volume**

Max. flow volume right **1** and left **2** can be adjusted in 15 stages independently.



④ After Max. flow volume right **1** is set, push the display selector switch.

⑤ The message like left will appear on the LCD display and Max. flow volume left **2** can be adjusted.

⑥ The flow volume supplied from port **2** (left) is adjusted properly with the working light switch or the service port activation switch while operating the hydraulic attachment.

When the working light switch is pushed, the flow volume is decreased.

When the service port activation switch is pushed, the flow volume is increased.

NOTE:

- When Max. flow volume right **1** is adjusted again, the display selector switch is pushed and the operation of ③ is repeated.

⑦ After Max. flow volume right **1** and left **2** is set, turn the starter key to the "STOP" position once. Then turn the starter key to the "RUN" position again.

1BAAABFAP043A

● Service Port Max. Flow Volume

Max. Flow Volume (Theoretical L/min.)	100
Max. pressure MPa (kgf/cm ²)	20.6 (210)

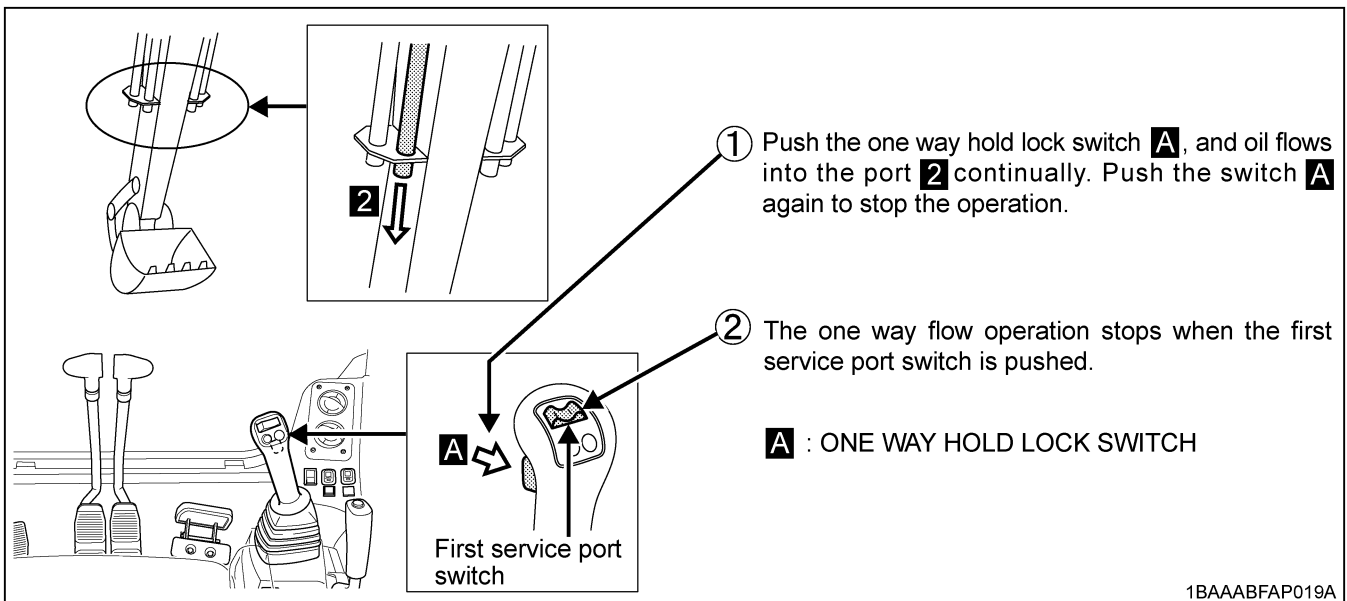
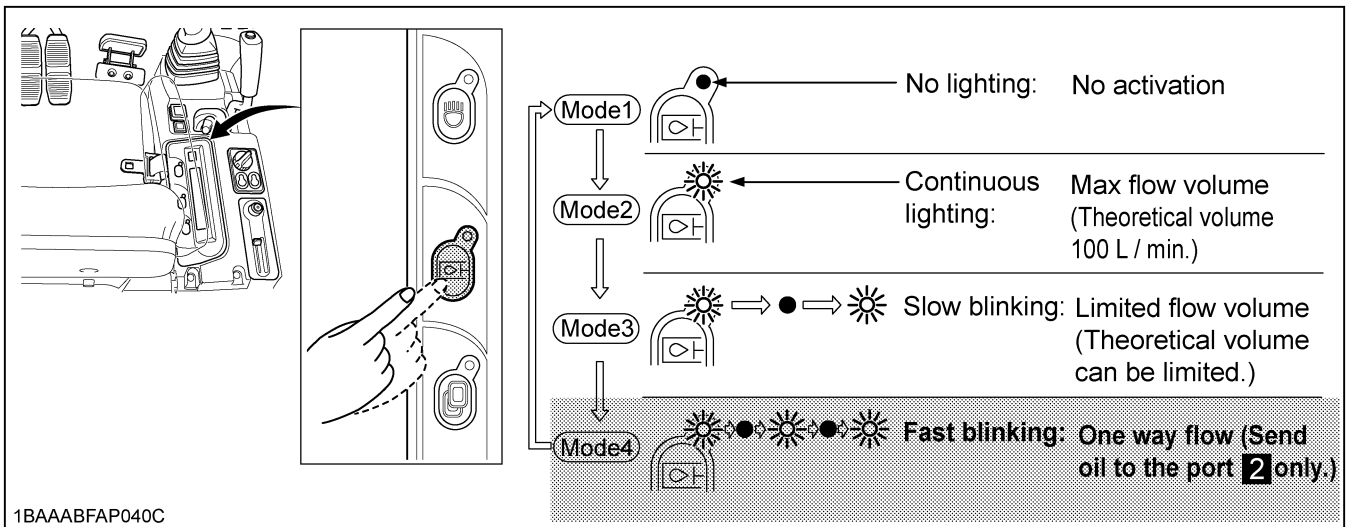
IMPORTANT :

- When the service port is not used for a long period, dirt particles can settle in the lower part of the service port lines. When the plugs on the service port lines are removed to connect attachments, drain approx. 100 cc (3.4 oz) of oil per side before making connections.
For hammer choices, contact your dealer.

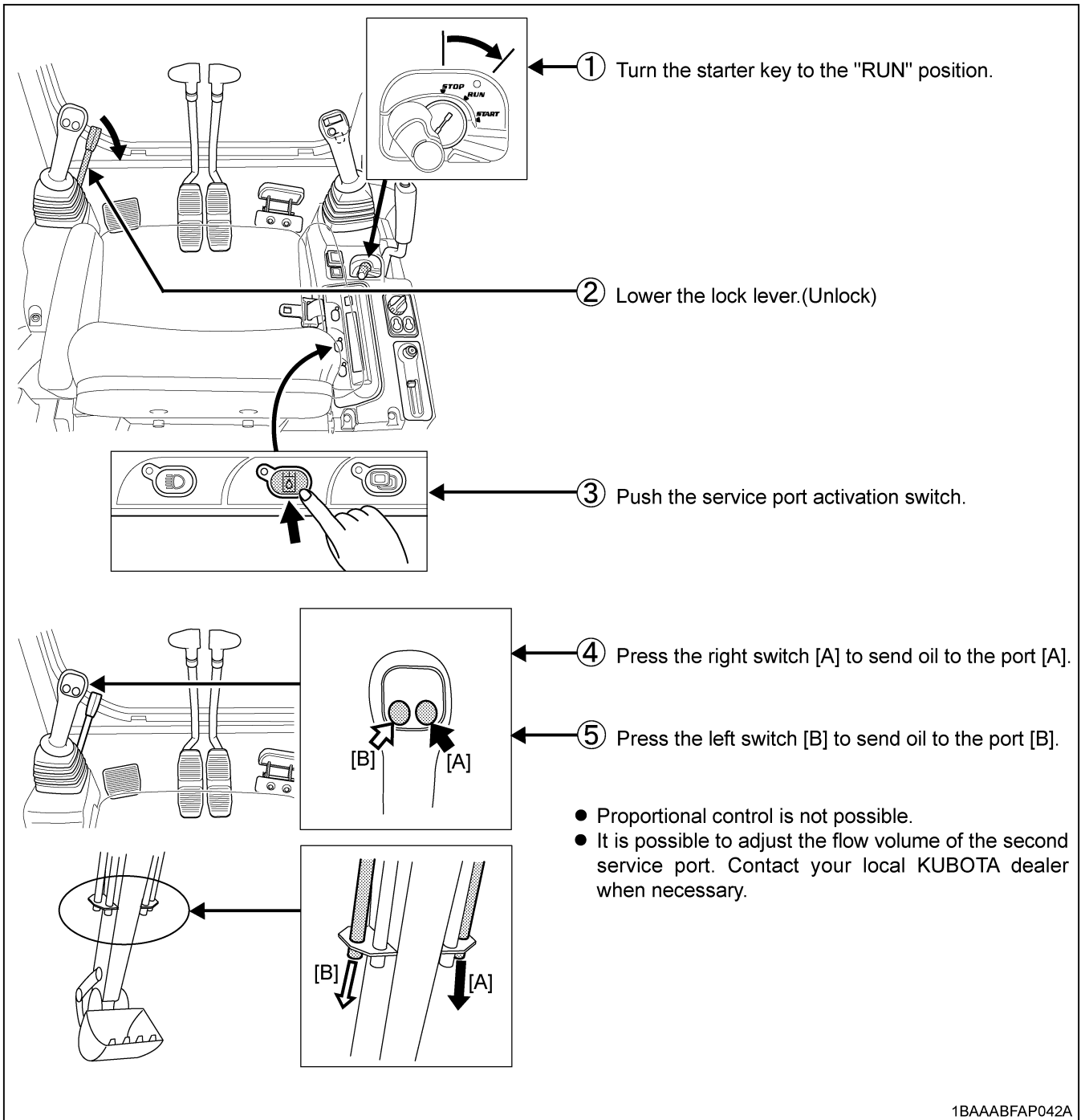
NOTE :

- Suppose that the same attachment is mounted on another machine. Even if the same limit setting is made, the same speed cannot be achieved. Make an optimum setting on each machine.
- The service port speed fluctuates by getting an attachment relieved at the limited flow volume. Determine the limit level with combined operations of attachments in mind.

■ One Way Flow Operation (First Service Port)



■ Second Service Port Operation



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◆ Service Port Max. Flow Volume

Max. Flow Volume (Theoretical L/min.)	67
Max. pressure MPa (kgf/cm ²)	20.6 (210)

IMPORTANT :

- When the service port is not used for a long period, dirt particles can settle in the lower part of the service port lines. When the plugs on the service port lines are removed to connect attachments, drain approx. 100 cc (3.4 oz) of oil per side before making connections.
For hammer choices, contact your dealer.

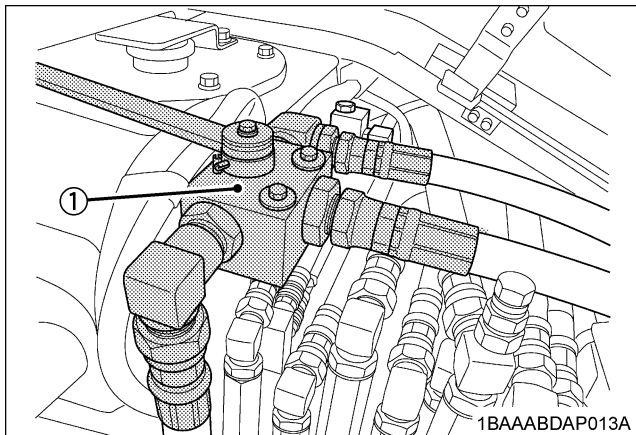
1-way or 2-way CIRCUIT SELECTION VALVE OPERATION

A selection valve which selects 1-way or 2-way circuit of service port has been installed on the hydraulic tank.

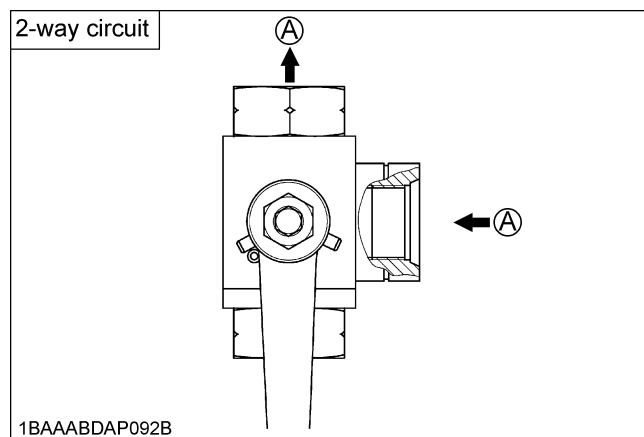
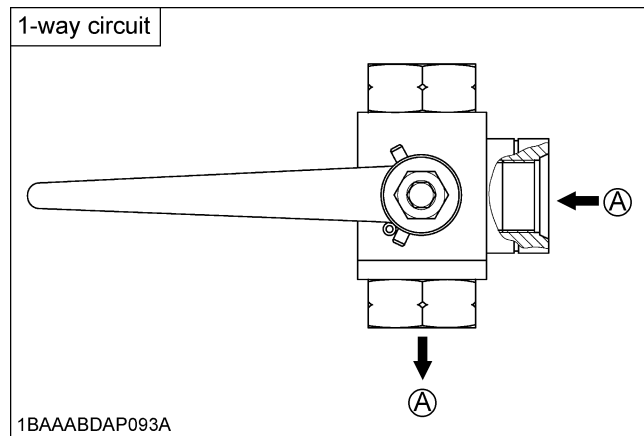
1. When equipment which needs a 1-way circuit will be used, position the arrow, by using the selector lever, on the axis of the selection valve to the 1-way circuit position, to reduce the back pressure.
2. When equipment which needs a 2-way circuit will be used, position the arrow on the axis of the selection valve to the 2-way circuit position.

NOTE :

- 1-way circuit..... HAMMER etc.
- 2-way circuit..... THUMB, TILT BUCKET, AUGER, GRAPPLE etc.



(1) Selection valve



(A) Hydraulic flow



CAUTION

To avoid personal injury:

- Stop the engine before removing/changing the equipment.
- Release pressure in the hydraulic system before removing/changing the equipment. (See "HOW TO RELEASE PRESSURE TRAPPED IN THE HYDRAULIC SYSTEM".)
- Position the selection valve to the correct position (either 1-way or 2-way circuit selection) before mounting the equipment.
- Always select the correct valve position before mounting the equipment (1-way or 2-way circuit selection) to avoid sudden movement of the equipment.

NOTE :

- Leaving the selection valve to 1-way circuit selection and attaching 2-way circuit equipment may cause the equipment to move (drop) suddenly due to its own weight, as the tank line remains open, even with the engine off.

EMERGENCY SHUT-OFF VALVE



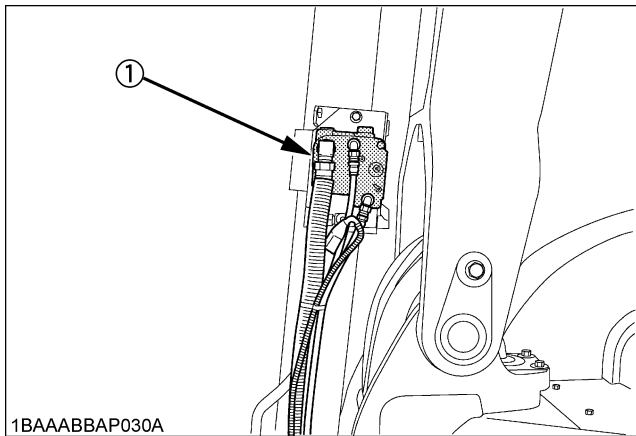
WARNING

To avoid personal injury or death:

- If the boom drops and the emergency shut-off valves are activated, immediately move away from the suspended object.

When the hose of the boom cylinders are ruptured and the boom falls, the emergency shut-off valve is activated and stops the boom part way through the fall.

If the emergency shut-off valves (1) are activated, immediately set the operating lever to the neutral position. Do not move the operating lever to the boom lowering side. Contact a KUBOTA dealer for maintenance.



(1) Emergency shut-off valves

BOOM LOWERING VALVE

Use this valve if the engine fails to get started and the accumulator fails to operate and there is an urgent need to lower the boom.

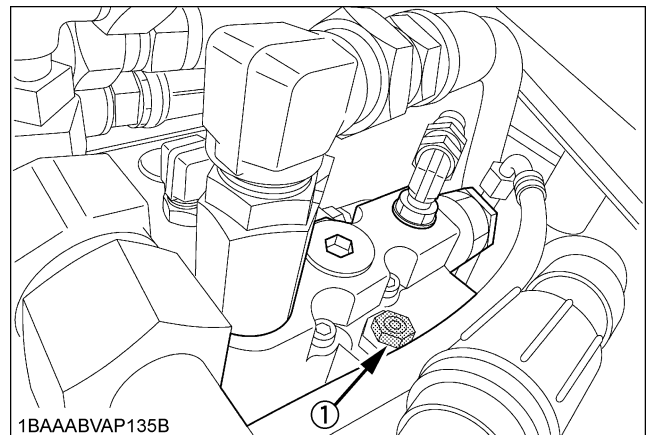


WARNING

To avoid personal injury or death:

- When the engine functions, move the control lever to lower the boom. Never use the boom lowering valve.
- Before starting this job, make sure there is nobody below the boom.
- Loosen the boom lowering valve plug slowly 45-degree turn at a time. Be careful not to loosen it a full turn or more at once because otherwise oil may squirt out accidentally.

1. Make sure that the engine has stopped.
2. Open the fuel tank cover.
3. Loosen the boom lowering valve plug.



(1) Boom lowering valve plug

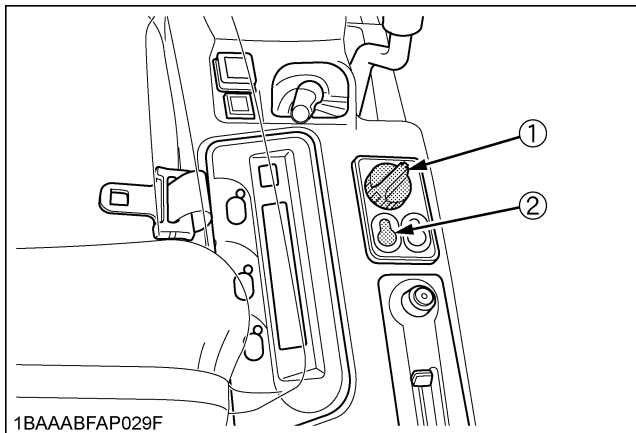
AUTO IDLE (AI) OPERATION

1. Throttle Potentiometer

With this potentiometer the operator can adjust the engine speed when the Auto Idle control is activated.

2. Switch for Auto Idle (AI) Control

With this switch the Auto Idle control is turned on or off. The Auto Idle control allows the engine speed to drop to idle speed when the control levers are left in neutral for longer than four seconds. If the control is activated, the engine speed rises immediately to the preset rpm. If the Auto Idle is not activated the throttle potentiometer can be utilized to control engine speed in a similar way to a conventional throttle control lever.



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- (1) Throttle potentiometer
(2) Switch for Auto Idle control

IMPORTANT :

- It is possible that the Auto Idle may not function until hydraulic oil warms up in the cold weather. Therefore it is not recommended that the Auto Idle be activated until the machine is completely warmed up.

NOTE :

- Before operating the control lever, check the Auto Idle Indicator Lamp.
- When operating in confined spaces or when loading onto a vehicle, turn the Auto Idle switch off (Light off). This is to prevent unwanted engine speed increases when control levers are activated.
- The Auto Idle control, when selected by a switch, provides the operator with a way to control engine speed without a Throttle Potentiometer, simply by not activating any control levers for about four seconds after stopping work, and then to simply restore a preset (by potentiometer) engine speed by activating any control lever to return to work.
- The purpose of system is to reduce fuel consumption, noise and operator fatigue.

IMPORTANT INFORMATION ON EXCAVATOR OPERATION

- Do not try to crush concrete or boulders using side swings with the bucket. Also avoid using side sweeps of the bucket to move earth piles.
- Under all circumstances avoid the following operations:
 - Excavation using the gravitational impact of the machine.
 - Compacting of gravel or soil using the dropping action of the bucket.
 - Excavation using the traveling power of the machine.
- Do not try to drop or shake off soil adhering to the bucket in the manner given in the points below. This can cause damage to the machine. Adhering soil can be shaken off when the bucket is being emptied by moving the bucket out to the maximum stroke of the cylinder. Should this not suffice, swing out the arm as far as possible and operate the bucket back and forth.
- Do not hit the dozer with the boom cylinder! Make sure that the boom cylinder does not hit the dozer when doing deep excavation. If necessary swing around so that the dozer is in the back of the machine.
- Pay attention when pulling in the bucket! When pulling in the bucket (for driving or transportation) avoid hitting the dozer.
- Avoid collisions! When moving the excavator, pay attention that the dozer does not collide with obstructions such as boulders etc.. Such collisions shorten the life of the dozer and the cylinder substantially.
- Support the machine correctly! When stabilizing the machine with the dozer, lower the dozer to engage the full width on the ground.
- If the water or mud level reaches higher than the top of the tracks, the swivel bearing, swivel motor gear and ring gear may be exposed to mud, water and other foreign objects. The excavator must be properly pressure washed after each use.
 - Thoroughly clean the area around the swivel bearing, swivel motor gear and ring gear to remove foreign objects.
 - Inspect the swivel motor oil sump (if equipped) for water contamination. If water is present, refer to operator's manual for lubricant replacement procedure.
 - Refer to operator's manual for proper swivel bearing, swivel motor gear and ring gear lubrication procedures.
 - Reinstall any protective covering if removed earlier.
- Avoid applying excessive load with cylinders fully extended, or the machine easily gets damaged.

HOW TO RELEASE PRESSURE TRAPPED IN THE HYDRAULIC SYSTEM

- Lower the attachments and the dozer blade to the ground.
- Turn the key to "STOP" position and shut off the engine.
- After stopping the engine, turn the key to "RUN" position.
- Release pressure in the hydraulic system by operating levers with lever lock pulled down.
- When the pressure of the service port lines is released, turn on the service port activation switch and move the service port switch to right and left.
- When relieving the residual pressure, do it immediately after the engine has stopped.

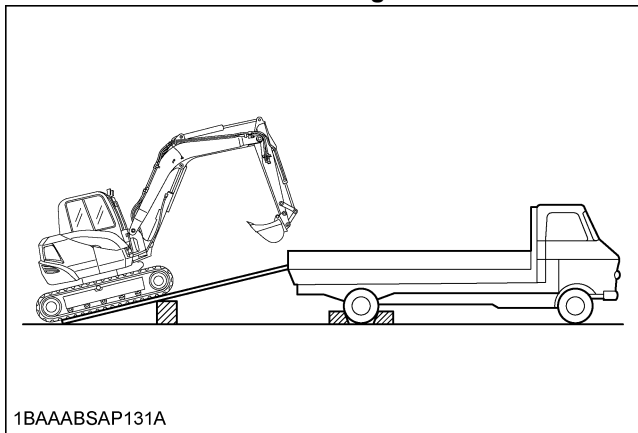
TRANSPORTING THE EXCAVATOR ON A VEHICLE



DANGER

To avoid serious injury or death:

- No directional changes should be made when the excavator is on the ramp. Should a change of direction be necessary, drive off the ramp completely and make the turn.
- When driving forwards or backwards onto the vehicle, or when swinging the upper body, make sure that neither the CAB or the gates of the vehicle will be damaged.



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- When the excavator reaches the point between the ramps and the bed, halt and then move very slowly until the excavator reaches the horizontal position.
- Move the excavator onto the vehicle only with the arm completely pulled in.
- Do not jack up the machine using its boom to load or unload the excavator from the vehicle. Doing this is dangerous. Otherwise the CAB of the vehicle could be damaged when swinging around the upper body.
- Make sure the ramps are of sufficient capacity and securely connected to the vehicle to safely support the machine throughout the loading / unloading operation.

■ Transporting on a truck



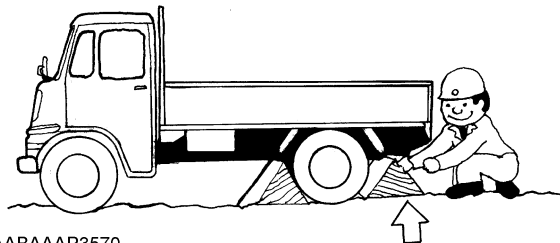
WARNING

To avoid personal injury or death:

- After loading the machine on the truck, lower the bucket and dozer onto the truck bed.

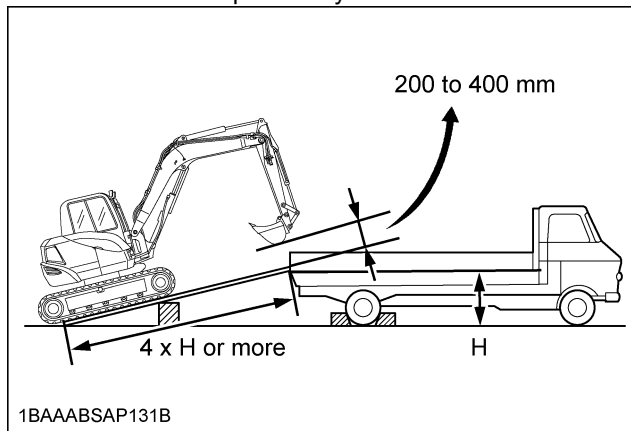
Prepare a platform to load or unload the excavator. Take following steps when using ramps.

1. Apply the parking brakes of the vehicle, and block the drive wheels from both sides.



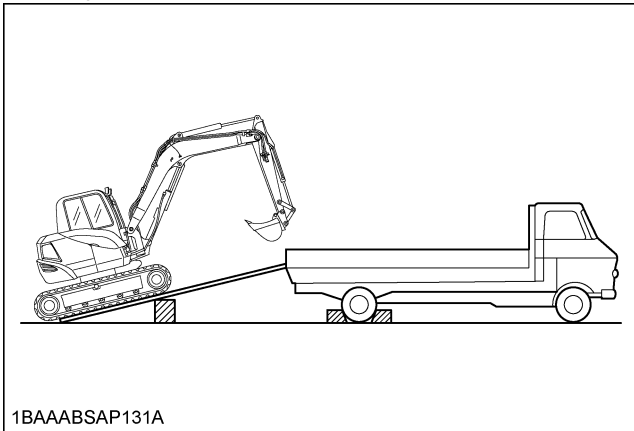
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2. Use mounting brackets secure the ramp properly. Connect the ramps directly to the bed.

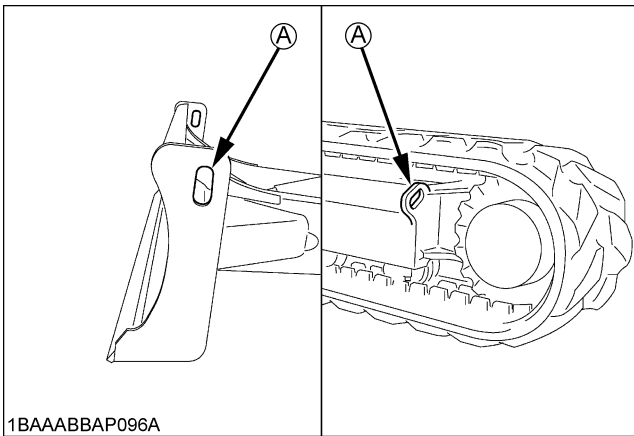


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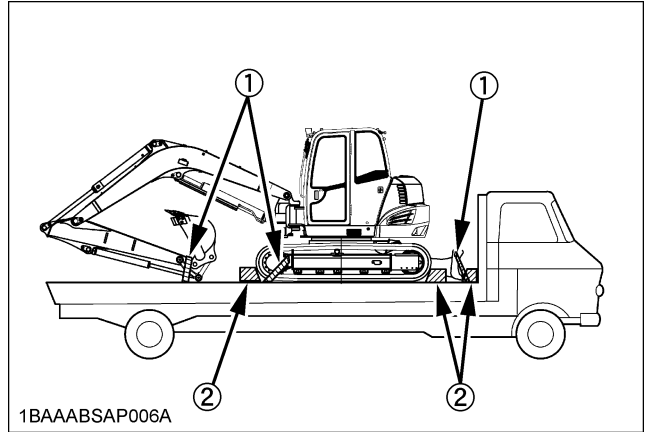
- For additional safety, use blocks or supports under the ramps and the bed.



- Completely align the ramps and the tracks and then drive the excavator slowly up the ramps. After ensuring that the tracks are completely on the bed, swing the upper body around to the back of the vehicle.
- Lower the dozer onto the bed.
- Pull in the bucket and arm completely. Then lower the boom.
- Stop the engine, release pressure trapped in the hydraulic system and remove the key.
- Raise the lock lever.
- Block the tracks with blocks and tie down the excavator.



(A) Tie down point



- (1) Cable or strap
(2) Block

■ Towing the machine

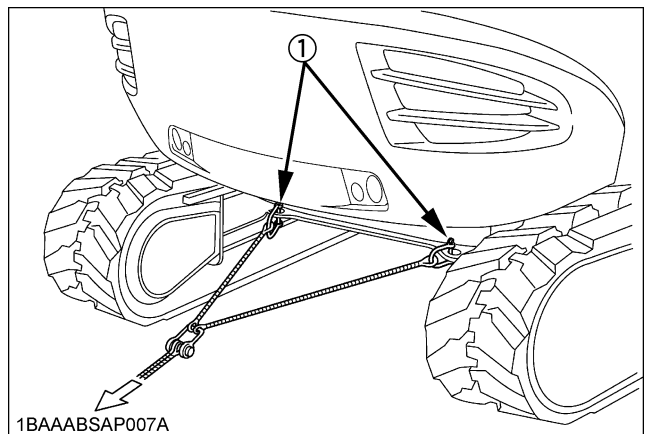


CAUTION

To avoid personal injury:

- Use a shackle and slings (or wires) that are strong enough to tow the machine. Before using them, make sure they are not cracked or damaged.
- A towing is only allowed over a short distance and at walking speed.

- Attach the tow bar or towing rope to the hook on the excavator and to the pulling vehicle. The tow bar should be mounted at a right angle to the vehicles.
- The operator must be seated during the recovery procedure.
- Drive slowly with the tractive vehicle to avoid abrupt loads.



- (1) Hook

LIFTING OF THE EXCAVATOR



DANGER

To avoid serious injury or death:

- The correct instructions for safe handling are described here. Read these instructions carefully before moving the machine. Make sure that the operating personnel read the operator's manual carefully.

■ Basics when Lifting with Cables or Straps

1. The lifting and crane operation is to be undertaken according to the safe operation guidelines described.
2. The equipment used for lifting mentioned in these instructions are only given as reference, the standards concerning strength, control and other details are based on the respective applicable guidelines.

■ Safety Aspects when Lifting with Cables or Straps

Abide by following steps when lifting:

1. Do not lift loads that exceed the maximum load capacity of the crane.
2. Choose correct equipment suitable to the weight, size and form of the load.
3. First assess the center of gravity of the load, position the hook directly over the load and lift the load so that the center of gravity of the load is as low as possible.
4. The steel cables or straps must be fixed in the middle of the hook.
5. The load must be lifted vertically from the ground.
6. Do not enter the working area under suspended loads and do not move the load over people. The load must only be moved in an area where the balance can be easily maintained.

■ Lifting Procedure for the Excavator



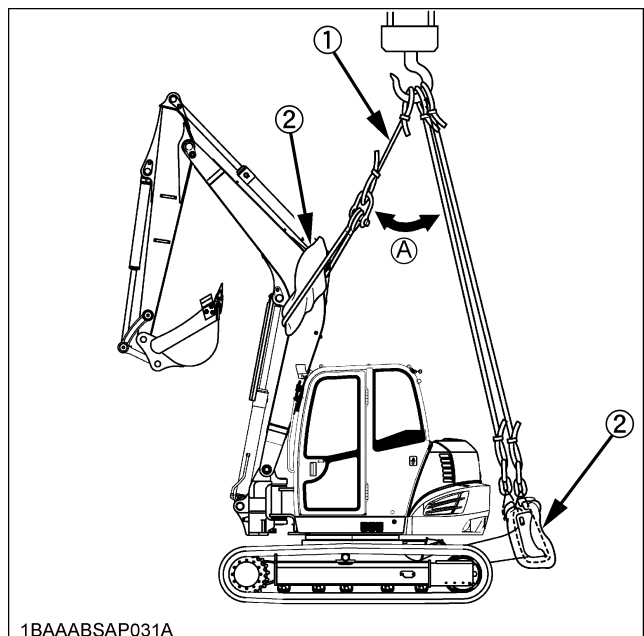
WARNING

To avoid personal injury or death:

- Do not use the hooks on the roof of canopy and CAB for lifting the excavator.
- Never lift the machine with the angle blade placed at an angle.

◆ General guidelines for lifting

1. Lifting position. (see illustration below)
 - (1) Pull in the boom completely towards rear.
 - (2) Pull in the arm completely.
 - (3) Pull in the bucket completely.
 - (4) Adjust the swing angle to the center. (to bring the boom in a position parallel to the machine frame)
 - (5) Swing frame so that dozer blade is to the rear and frame is parallel with tracks.
 - (6) Raise the dozer blade fully.
2. Attaching the steel cables or straps.
 - (1) Always hook the excavator at three points. (one on the boom and left and right of the dozer)
 - (2) Always use a shackle on each lifting hole when attaching the cables or straps.
 - (3) Using protective material at all places where the cables or straps contact the machine.
 - (4) Keep the angle between the front and rear cables or straps within 55° (0.96 rad.).



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- (1) Cable or strap
(2) Protective material

(A) 55° or less

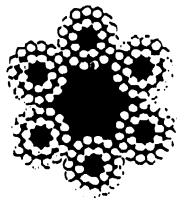
3. Tackle

The weights of the excavators and the recommended tackle for lifting these loads are mentioned in the following table. Choose components having enough strength.

Excavator Weight*	kg	8250
Load / Cable	kN (kgf)	30.7 (3131)
Minimum Wire Diameter (Safety factor=6)	mm	22.4 or more

*Excavator Weight: With CAB, steel tracks.

Steel wire: 6X24



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4. Lifting

- (1) Lift slowly and safely
- (2) Do not enter the excavator area when lifting.
- (3) Lift the excavator horizontally. (Modify cable or strap connections according to needs)

Maximum strength

for example: (JIS G 35 25) - "6X24"

Diameter		zinc-plated	not zinc-plated
14 mm (9/16)	kN (kgf)	89.7 (9147)	96.6 (9850)
16 mm (5/8)	kN (kgf)	117 (11931)	126 (12848)
18 mm (45/64)	kN (kgf)	148 (15092)	160 (16315)
20 mm (3/4)	kN (kgf)	183 (18661)	197 (20088)
22.4 mm (-)	kN (kgf)	230 (23453)	247 (25187)

MAINTENANCE

MAINTENANCE INTERVALS

No.	Check points		Measures	Hour meter indicator										Interval	Ref. page		
				50	100	150	200	250	300	350	400	450					
1	Coolant		check	Daily check											54		
			change												every 2 years	75	
2	Fuel		check	Daily check											54		
3	Engine oil		check	Daily check											55		
			change	●					○					every 250 hrs	67		
4	Hydraulic oil		check	Daily check											56		
			change											every 1000 hrs	72		
5	Grease front attachments	Bucket and bucket link pin	-	Daily check											68		
		Boom swing fulcrum	-		○		○		○		○		every 100 hrs	61			
		Others	-					○					every 250 hrs	68			
6	Radiator and oil cooler / Engine oil cooler		check	Daily check											57		
7	Washer liquid		check	Daily check											58		
8	Engine and electrical wiring		check	Daily check										every year	58		
9	Fuel tank, Water separator		drain	○	○	○	○	○	○	○	○	○	○	every 50 hrs	59,59		
10	Battery condition		check	○	○	○	○	○	○	○	○	○	○	every 50 hrs	60		
11	Greasing swing bearing teeth		-	○	○	○	○	○	○	○	○	○	○	every 50 hrs	61		
12	V-belt tension		check	Daily check											56		
			adjust				○					○		every 200 hrs	62		
13	Radiator hoses and clamps		check				○					○	every 200 hrs	63			
			replace											every 2 years	74		
14	Air filter element	Outer element	clean				○					○	every 200 hrs	63	*2	@	
		Inner element	replace										every 1000 hrs	73	*2		
			replace											every 1000 hrs	73		*2
15	Greasing swing ball bearing		-				○					○	every 200 hrs	64			
16	Fuel filter cartridge		replace										every 500 hrs	70		@	
17	Engine oil filter		replace	●						○			every 250 hrs	68			
18	Drive unit oil		change		●								every 500 hrs	69			
19	Hydraulic return filter cartridge		replace					●					every 500 hrs	70			
20	Hydraulic suction filter element		replace										every 1000 hrs	72			
21	Filter in the pilot hydraulic system		replace										every 1000 hrs	71			
22	Fuel injection nozzle injection pressure		check										every 1500 hrs	74	*4	@	
23	Front idler and track roller oil		change										every 2000 hrs	74			
24	Alternator and starter motor		check										every 2000 hrs	74			
25	Injection pump		check										every 3000 hrs	74	*4	@	
26	Radiator system		rinse										every 2 years	75			
27	Fuel line and Intake air line		check				○					○	every 200 hrs	65		@	
			replace										every 2 years	76	*3		

* 500 thru 1000 continued to the following table.

No.	Check points		Measures	Hour meter indicator							Interval	Ref. page			
				500	550	600	650	700	750	800					1000
1	Coolant		check	Daily check								54			
			change									every 2 years	75		
2	Fuel		check	Daily check								54			
3	Engine oil		check	Daily check								55			
			change		○					○		every 250 hrs	67		
4	Hydraulic oil		check	Daily check								56			
			change								○	every 1000 hrs	72	*1	
5	Grease front attachments	Bucket and bucket link pin / Dozer angle pin and angle cylinder boss	-	Daily check								68			
		Boom swing fulcrum	-	○		○		○		○	○	every 100 hrs	61		
		Others	-	○					○		○	every 250 hrs	68		
6	Radiator and oil cooler / Engine oil cooler		check	Daily check								57			
7	Washer liquid		check	Daily check								58			
8	Engine and electrical wiring		check	Daily check							every year	58			
9	Fuel tank, Water separator		drain	○	○	○	○	○	○	○	○	every 50 hrs	59,59		
10	Battery condition		check	○	○	○	○	○	○	○	○	every 50 hrs	60		
11	Greasing swing bearing teeth		-	○	○	○	○	○	○	○	○	every 50 hrs	61		
12	V-belt tension		check	Daily check								56			
			adjust			○				○	○	every 200 hrs	62		
13	Radiator hoses and clamps		check			○				○	○	every 200 hrs	63		
			replace										every 2 years	74	
14	Air filter element	Outer element	clean			○				○	○	every 200 hrs	63	*2	@
		Inner element	replace								○	every 1000 hrs	73	*2	
			replace									○	every 1000 hrs	73	
15	Greasing swing ball bearing		-			○				○	○	every 200 hrs	64		
16	Fuel filter cartridge		replace	○							○	every 500 hrs	70		@
17	Engine oil filter		replace		○					○		every 250 hrs	68		
18	Drive unit oil		change			○						every 500 hrs	69		
19	Hydraulic return filter cartridge		replace						○			every 500 hrs	70		
20	Hydraulic suction filter element		replace								○	every 1000 hrs	72		
21	Filter in the pilot hydraulic system		replace								○	every 1000 hrs	71		
22	Fuel injection nozzle injection pressure		check									every 1500 hrs	74	*4	@
23	Front idler and track roller oil		change									every 2000 hrs	74		
24	Alternator and starter motor		check									every 2000 hrs	74		
25	Injection pump		check									every 3000 hrs	74	*4	@
26	Radiator system		rinse									every 2 years	75		
27	Fuel line and Intake air line		check			○				○	○	every 200 hrs	65		@
			replace									every 2 years	76	*3	

◆ Air-conditioner

No.	Check points	Measures	Hour meter indicator									Interval	Ref. page			
			50	100	150	200	250	300	350	400	450					
1	Air filter	clean				○					○		every 200 hrs	65	*2	
		replace											every 1000 hrs	-	*2	
2	Air conditioner condenser	clean				○					○		every 200 hrs	66		
3	Air conditioner pipes and hoses	check											every 1 year	74		
		replace											every 2 years	74		
4	Refrigerant (gas)	check											service as required	77		

No.	Check points	Measures	Hour meter indicator								Interval	Ref. page				
			500	550	600	650	700	750	800	1000						
1	Air filter	clean			○						○	○	every 200 hrs	65	*2	
		replace										○	every 1000 hrs	-	*2	
2	Air conditioner condenser	clean			○						○	○	every 200 hrs	66		
3	Air conditioner pipes and hoses	check											every 1 year	74		
		replace											every 2 years	74		
4	Refrigerant (gas)	check											service as required	77		

IMPORTANT :

● First operation

*1 When using a hydraulic hammer, change hydraulic oil and return filter according to the table on "Hydraulic Oil Change (Including Exchange of the Suction Filter in the Hydraulic Tank) under "EVERY 1000 SERVICE HOURS" in the chapter "REGULAR CHECKS AND MAINTENANCE WORK".

*2 Clean and replace the air filter more frequently if used under dusty conditions. When the filter is very dirty from dusty conditions, replace the filter.

*3 Replace only if necessary.

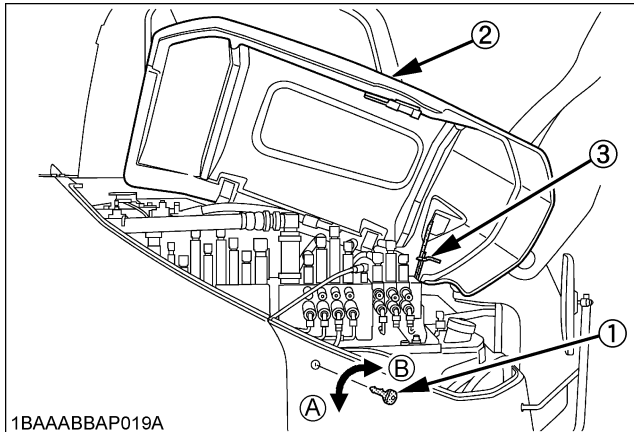
*4 Consult your local KUBOTA Dealer for this service.

- The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA non-road emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction. Please see the Warranty Statement in detail.

OPENING AND CLOSING OF PARTS

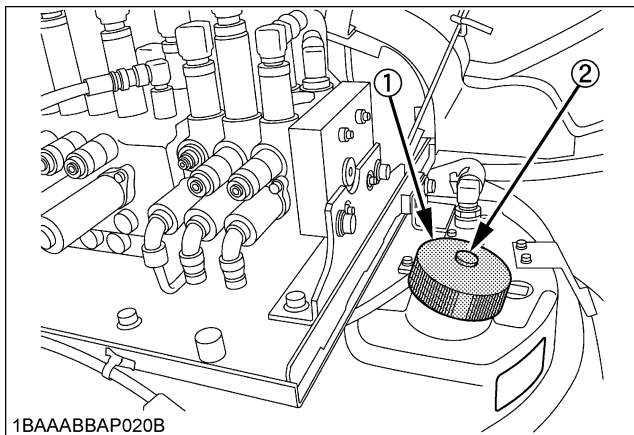
■ Opening/Closing of the Fuel Tank Cover

Insert the key into the key slot and turn it clockwise to unlock it. Then press the button to open the tank cover. To close it, lower the tank cover and push it tightly. Turn the key counterclockwise to lock the tank cover.



- (1) Key
- (2) Tank cover
- (3) Stay

- (A) "LOCK"
- (B) "UNLOCK"



- (1) Fuel tank cap
- (2) Air vent

■ Opening/Closing of the Engine Hood

⚠ CAUTION

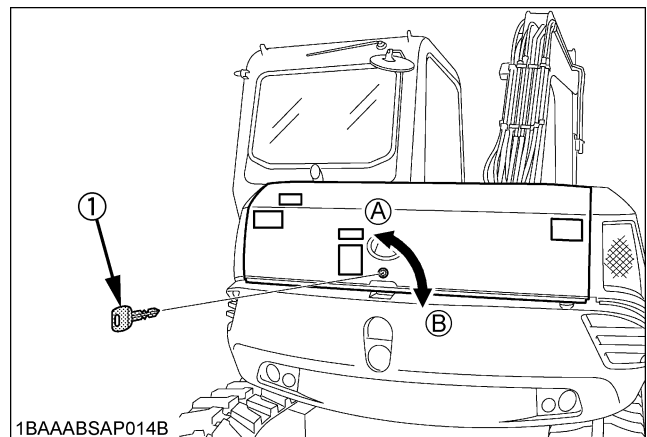
To avoid personal injury:

- Do not open the engine hood with the engine running unless in an emergency.
- Do not touch the exhaust muffler or the exhaust pipe; serious burns can occur.

Insert the key into the key slot and turn it clockwise to unlock it. And press the button to open the hood.

To close the hood, push down it until it locks automatically.

Turn the key counterclockwise to lock the hood.

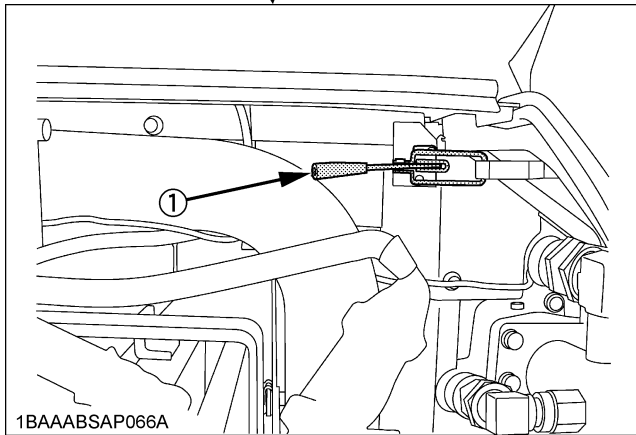
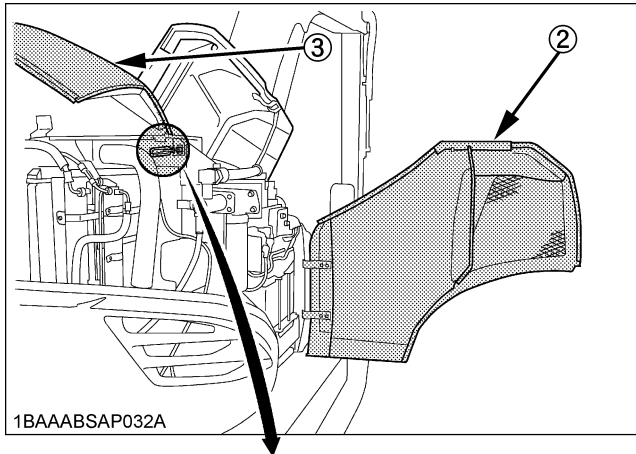


- (1) Key

- (A) "LOCK"
- (B) "UNLOCK"

■Opening/Closing of the Side Cover

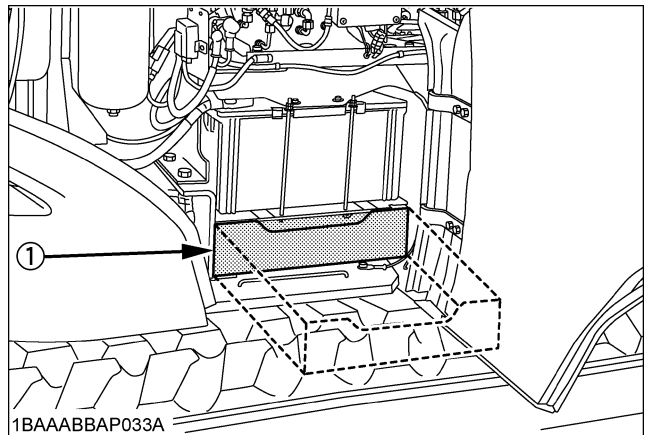
1. Open the engine hood.
2. Raise the catch lever to unlock the side cover.
3. Push the side cover all the way forward, and it will be held by a link.
4. To close it, pull the side cover all the way back, and pull down the catch lever to lock the side cover.



- (1) Catch lever
- (2) Side cover
- (3) Hood

■Where to store the Tool

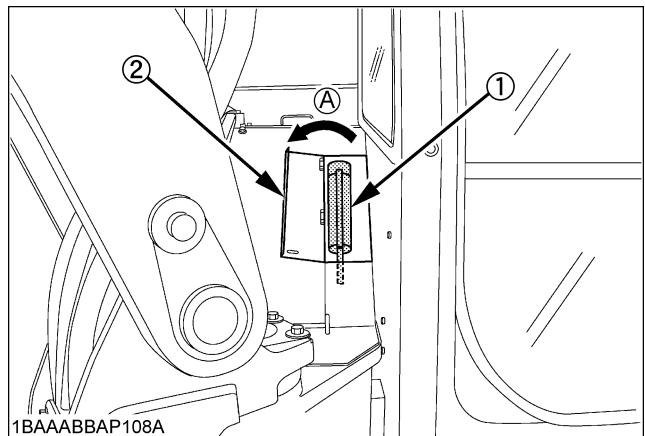
1. Open the side cover.
2. Store the tools in the storage box.



- (1) Box for storage

■Where to store the Grease Gun

1. Open the cover.
2. Store grease gun.

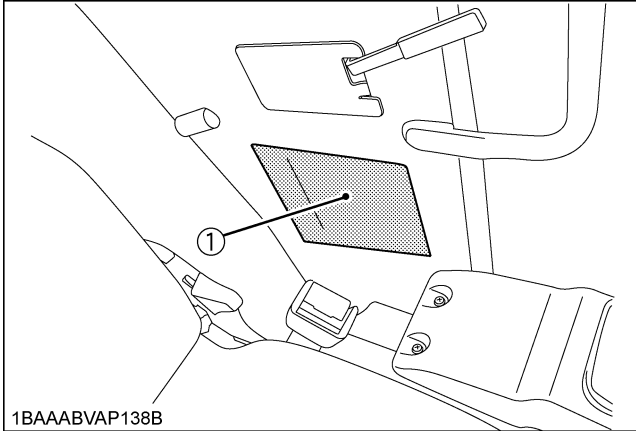


- (1) Grease gun
- (2) Cover

(A) "OPEN"

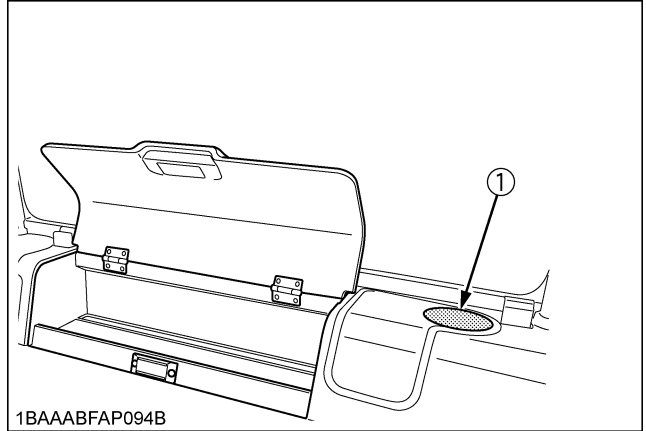
Take note storage direction of greased gun in above illustration.

■ Where to keep Operator's Manual



(1) Operator's manual storage

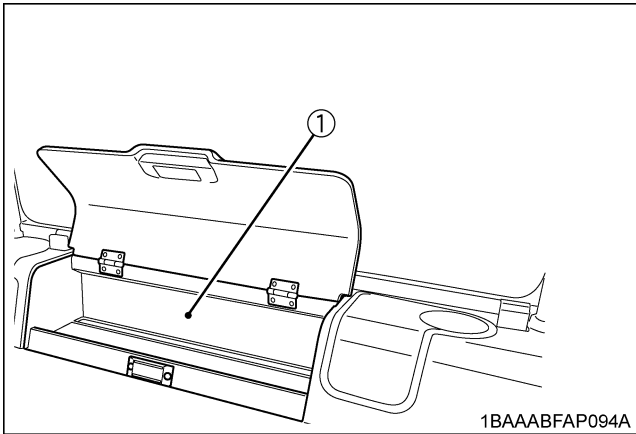
■ Cup Holder



(1) Cup holder

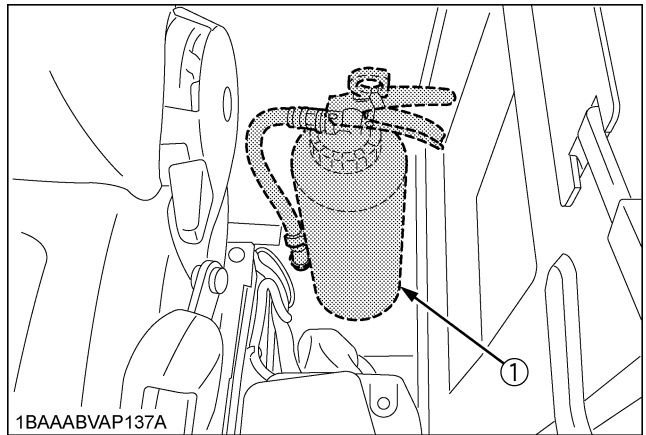
■ Utility Box

1. Open the rear cover.



(1) Utility box

■ Where to Store the Fire Extinguisher



(1) Fire extinguisher

DAILY CHECKS



CAUTION

To avoid personal injury:

- Do not operate the excavator while putting out the hands and the body from the windows.
- Do not touch the control levers and the pedals from outside the cab during the engine running.

For your own safety and to assure the long life of your machine, a careful check should be made before each operation.

■Checking Coolant Level



CAUTION

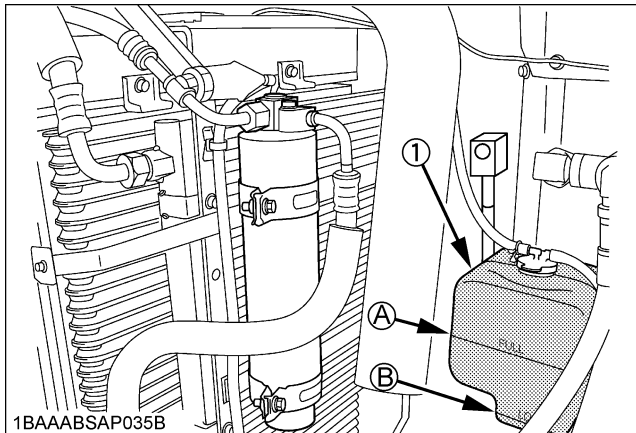
To avoid personal injury:

- Move the excavator to even ground.
- Make sure that the engine is turned off.
- Do not open the radiator cap right after the engine has been stopped; Serious burns can occur from contact with escaping hot coolant fluid.
- Check the coolant level in the recovery tank only after the engine has cooled down.
- Remove the radiator cap only if absolutely necessary.

The radiator has a recovery tank. Should the coolant level in the radiator sink, the water will be automatically be forwarded to the radiator.

Open the side cover. (See "Opening / Closing of the Side Cover" in "OPENING AND CLOSING OF PARTS" section.)

Check the coolant level in the recovery tank and fill up if necessary. The coolant level should be between the marks "FULL" and "LOW".



(1) Recovery tank

(A) "FULL"

(B) "LOW"

IMPORTANT :

- Do not fill the recovery tank over the "FULL" marking.
- Do not fill with dirty or salty water.

■Checking Fuel Level



CAUTION

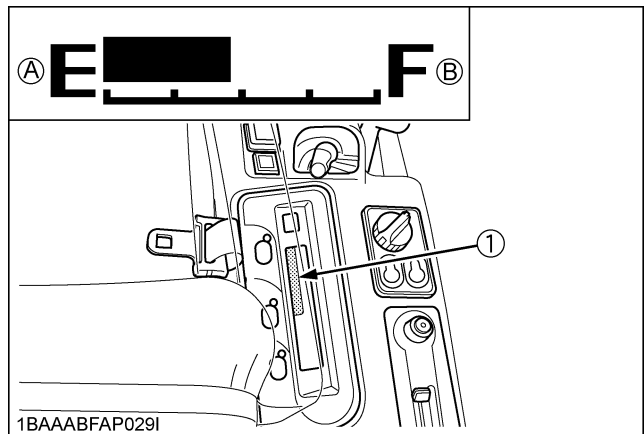
To avoid personal injury:

- Stop the engine and remove the key before fuelling.
- Do not smoke while fuelling.

IMPORTANT :

- When temperatures are over -7°C (20°F), use No.2-D diesel fuel, when temperatures are under -7°C (20°F), use No.1-D diesel fuel or a blend of No.2 and No.1 diesel.
- Make sure that the fuel tank is not run empty. Air will enter the fuel system, and must be purged before restarting.
- See "PURGING OF THE FUEL SYSTEM" in "OTHER ADJUSTMENTS AND REPLACEMENTS"
- To prevent condensation (water) accumulations in the fuel tank, fill the fuel into the tank before parking overnight.

1. Turn the starter key to the position "RUN".
2. Check the fuel level by the fuel level indicator.



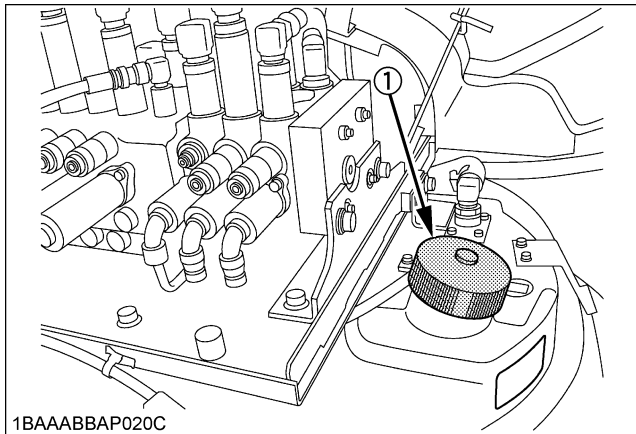
(1) Fuel gauge

(A) "EMPTY"

(B) "FULL"

3. If necessary, open the tank cover with the starter key, open the cap and fill in fuel.

- See "Opening and Closing of the Fuel Tank Cover" and see Fuel supply in the "LCD Display for Usual Operation" section and "Fuel Supply Pump" section.



1BAAABBAP020C

(1) Fuel tank cap

Fuel tank capacity	115 L
--------------------	-------

■ Checking Engine Oil Level



CAUTION

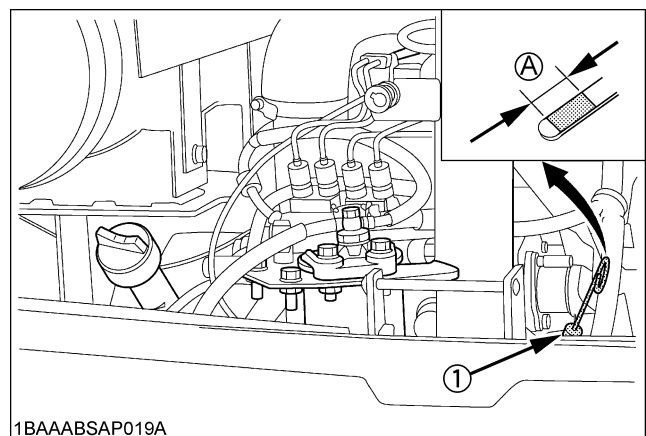
To avoid personal injury:

- Stop the engine and remove the key before checking the oil level.

IMPORTANT :

- Use engine oil with the correct viscosity. (according to the outside temperature)
- After stopping the engine and remove the key, wait five minutes, then check oil level. (Excavator must be on level ground.)

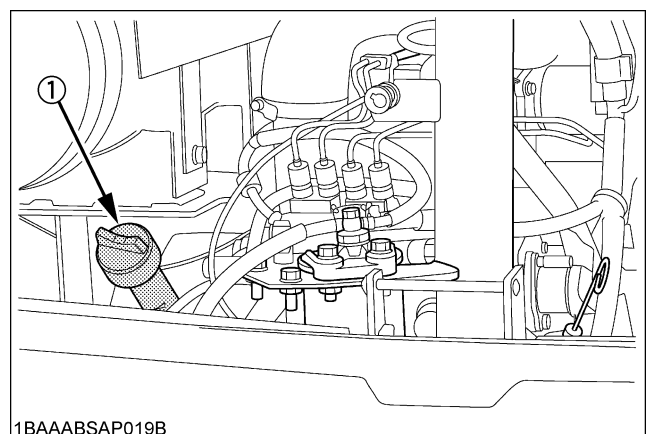
Insert the engine oil dipstick fully into the prepared opening, remove again and check the oil level; if necessary fill with oil. The machine must be on level ground when checking the oil level.



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(1) Engine oil dipstick

(A) Required oil level range



1BAAABSAP019B

(1) Oil filling port

■ Checking Hydraulic Oil Level



CAUTION

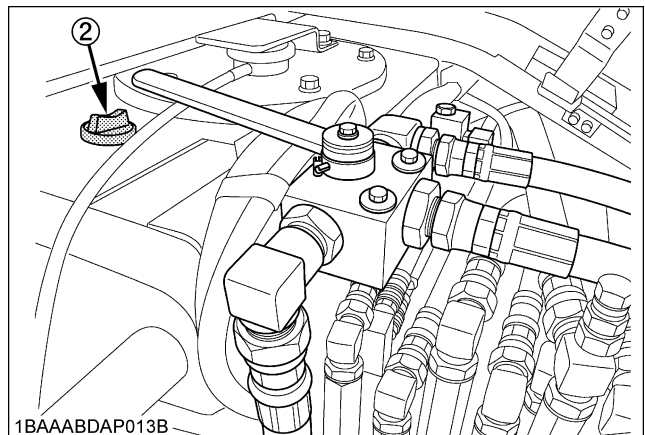
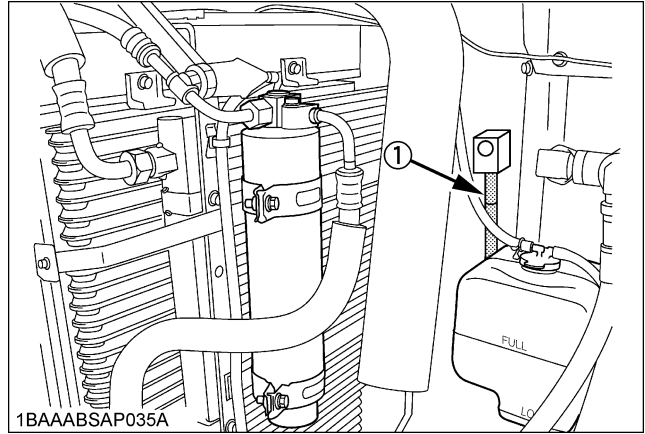
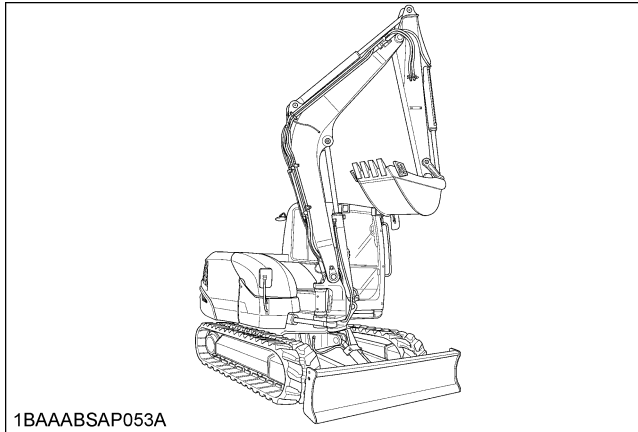
To avoid personal injury:

- Stop the engine and remove the key before checking the oil level.

IMPORTANT :

- Before filling oil, wipe away all sand and dust from around the oil port. Make sure to use an identical type of hydraulic fluid.
- The excavator has been filled with hydraulic fluid before delivery. See "RECOMMENDED OILS". (Do not mix different oils.)

1. Park the excavator on a firm, flat and level surface. Bring the boom to the highest position, pull the arm, the bucket inward and boom swing left end. Then lower the dozer on the ground and stop the engine.



- (1) Gauge
(2) Oil filling plug

2. Check the oil level as to whether it lies on the center of the gauge at normal temperature (10 to 30 °C (50 to 80 °F)).
3. Enough oil is present if the oil level lies near the center of the gauge.
4. Should the oil level be too low, loosen the oil filling plug gradually to release pressure in the tank, then fill up with oil through the oil port.

■ Checking V-belt



CAUTION

To avoid personal injury:

- Stop the engine and remove the key before checking the V-belt.
- Check the V-belt for cracks and proper tension. (See "Adjusting V-belt Tension" in "REGULAR CHECKS AND MAINTENANCE WORK" section.)

■ Greasing Bucket Pin and Bucket Link Pin

⚠ CAUTION

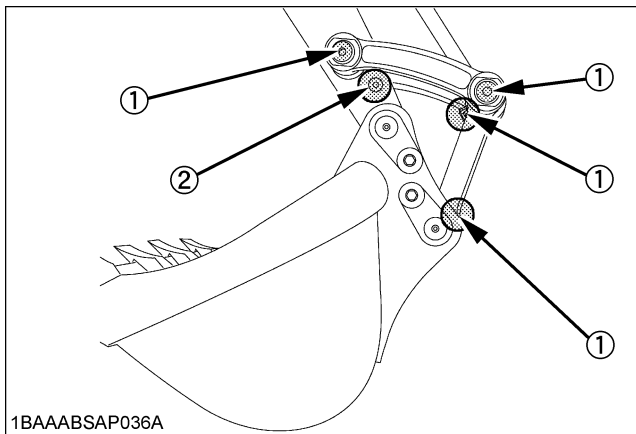
To avoid personal injury:

- First lower all attachments on the ground then stop the engine and remove the key.
- While greasing, take care not to step on the bucket teeth.

IMPORTANT :

- When doing excavation work in water, generously grease the following points. After ending work, grease again.

Grease the marked grease nipples shown by arrows in the illustration below.



- (1) Bucket link pin
- (2) Fixing pin between arm and bucket

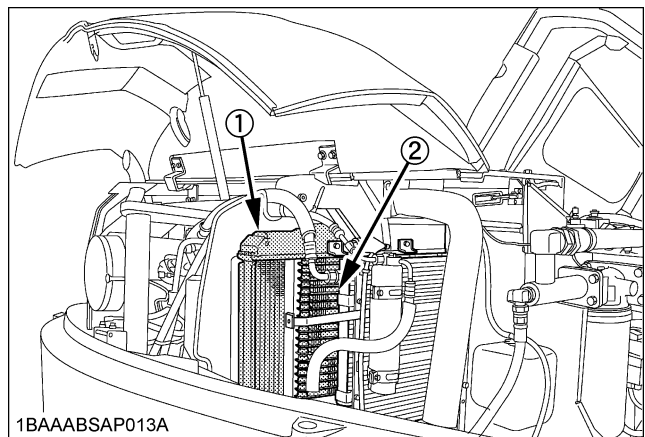
■ Checking Radiator and Oil Cooler

⚠ CAUTION

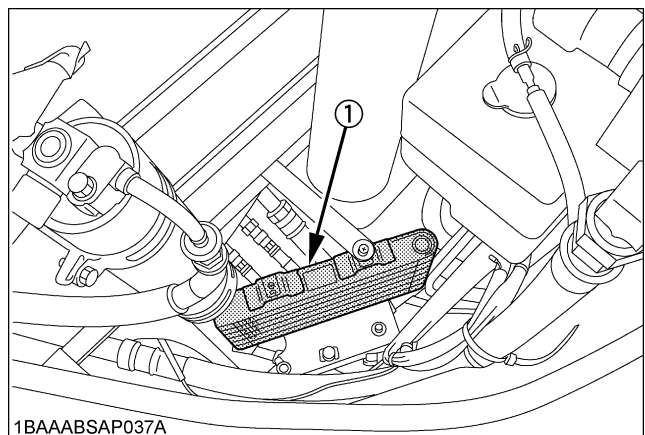
To avoid personal injury:

- Always stop the engine and remove the key before checking the radiator.
- Wear eye protection when cleaning with compressed air.

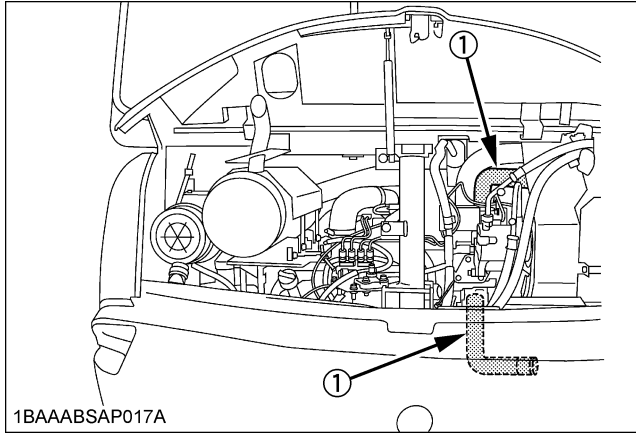
1. Check if the fins and ribs are clogged. If so clean with compressed air or steam.
2. Check the rubber hoses for damage and replace if cracked or old. Check if the hose clamps are tight enough.



- (1) Radiator
- (2) Oil cooler



- (1) Engine oil cooler



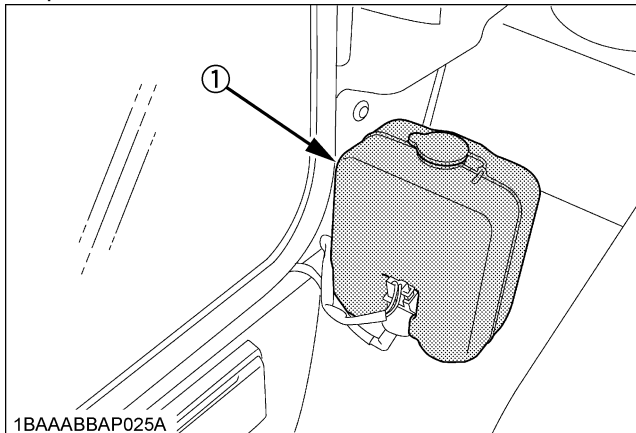
(1) Rubber hoses and clamps

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.
- Pressure of compressed air must be under 205 kPa (2.1 kgf.cm²).

■Checking Washer Liquid

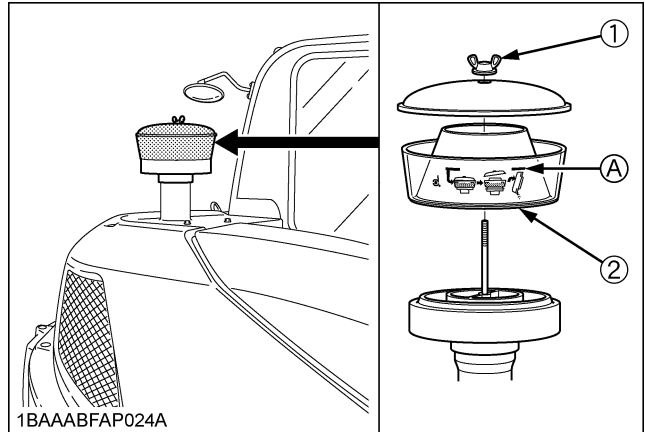
If the windows washer is switched on with the washer liquid tank empty, the motor may be damaged. Always keep the tank filled.



(1) Washer liquid tank

■Cleaning Pre-Cleaner

To clean the pre-cleaner, remove the wing nut and remove the pre-cleaner bowl.



(1) Wing nut

(2) Pre-cleaner bowl

(A) "DUST LEVEL"

■Checking and Cleaning 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. Remove thoroughly. Check the electrical circuitry for disconnections, shorts or loose terminals.

■Washing 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.
- Remove the mud before washing the machine.

REGULAR CHECKS AND MAINTENANCE WORK



CAUTION

To avoid personal injury:

- Do not operate the excavator while putting out the hands and the body from the windows.
- Do not touch the control levers and the pedals from outside the cab during the engine running.

EVERY 50 SERVICE HOURS

■ Draining the Water from the Fuel Tank

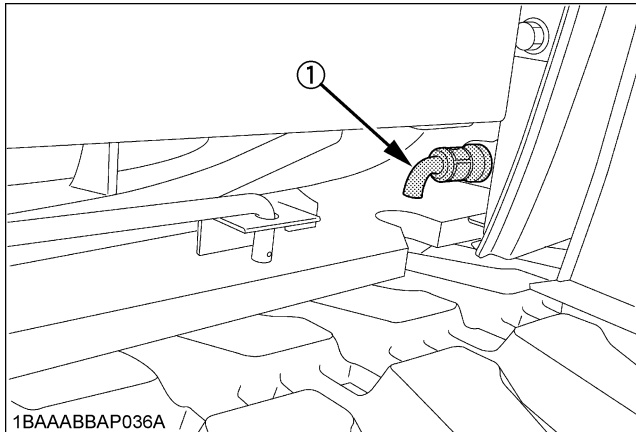


CAUTION

To avoid personal injury:

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

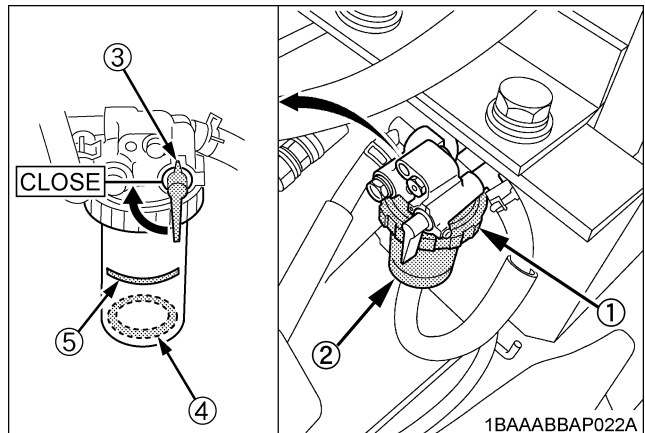
1. Open the side cover.
2. Open the drain cock.



(1) Drain cock

■ Draining Water Separator

1. Open the side cover.
2. When the separated water is entering the sediment cup, the red float moves upwards. When the float reaches the line, close the cock so that no fuel can run out. Now loosen the ring nut, and remove the cup and empty completely.
3. Finally, do not forget to open the cock and close the side cover after the cup has been reinstalled.



- | | |
|--------------|-----------|
| (1) Ring nut | (4) Float |
| (2) Cup | (5) Line |
| (3) Cock | |

■ Battery



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.

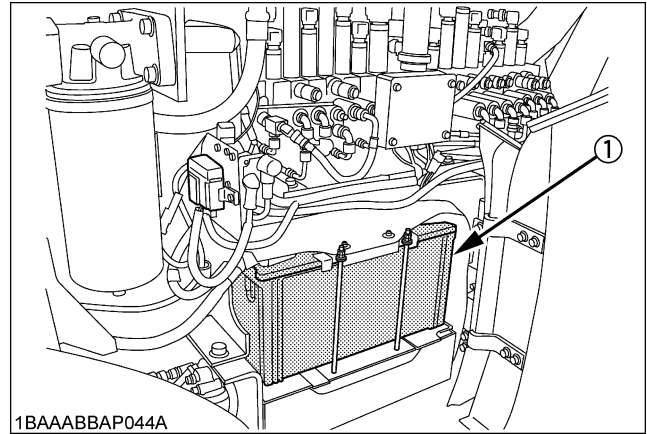


CAUTION

To avoid personal injury:

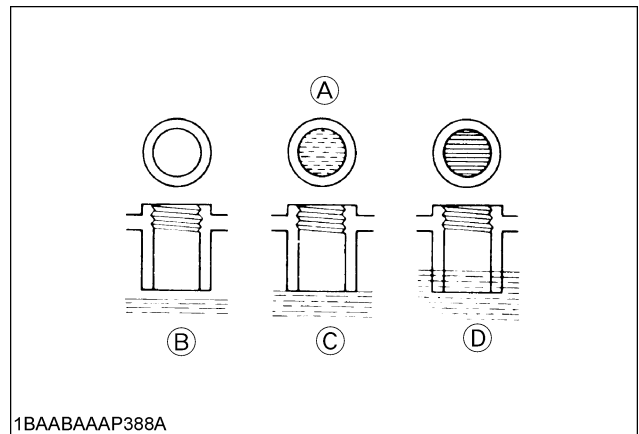
- Never remove the vent caps while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are splattered with it, wash it away completely with water immediately and get medical attention.
- Wear eye protection and rubber gloves when working around the battery.
- Before inspection or dismantling the battery, be sure to turn off the engine and turn the starter switch to the "OFF" position.
- When removing the battery, always disconnect the negative ground cable first. 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.

1. Open the side cover. (See "Opening / Closing of the Side Cover in "MAINTENANCE" section.)
2. Check the battery fluid level and add distilled water if necessary.
3. Should battery fluid be spilt, fill with sulphuric acid solution of the same concentration.
4. Clean the battery caps (ventilation holes).



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(1) Battery



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- (A) Battery fluid level
(B) "Too low"
(C) "Correct"
(D) "Too high"

■ Battery Charging



CAUTION

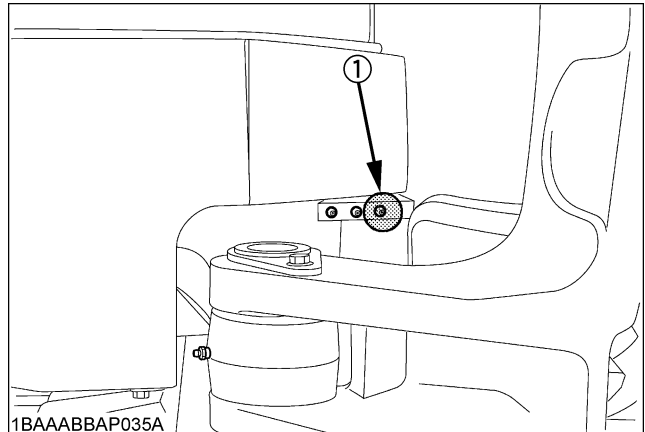
To avoid personal injury:

- 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 spill damages the excavator body.
3. To slowly charge the battery, connect the battery positive terminal to the charger's positive terminal and the negative to the negative one. 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 old battery for a new one, use battery of equal specification.

■ Greasing Swing Bearing Teeth

1. Pump grease with the grease gun through the grease nipple.
2. Grease at each 90° (1.58 rad.) position of the swing frame.
3. Fill with approx. 50g of grease (approx. 20 to 30 pumps with the grease gun at each position). Distribute the grease over the teeth.

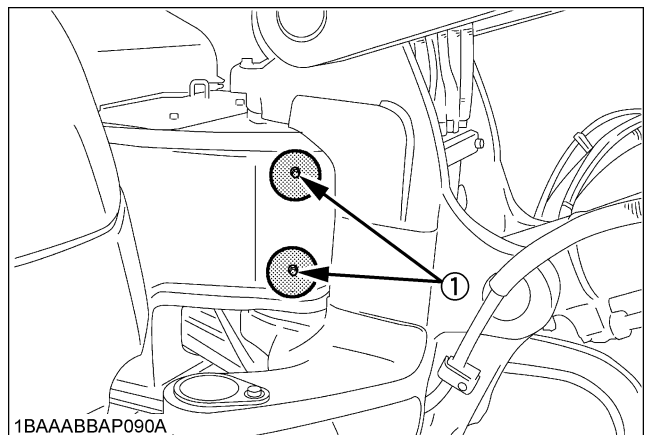


(1) Grease nipple (for swing bearing teeth)

EVERY 100 SERVICE HOURS

■ Greasing Boom Swing Fulcrum

Grease the marked grease nipples shown by arrows in the illustration below.



(1) Boom swing fulcrum

EVERY 200 SERVICE HOURS

Do all 50 and 100 hour servicing at the same time.

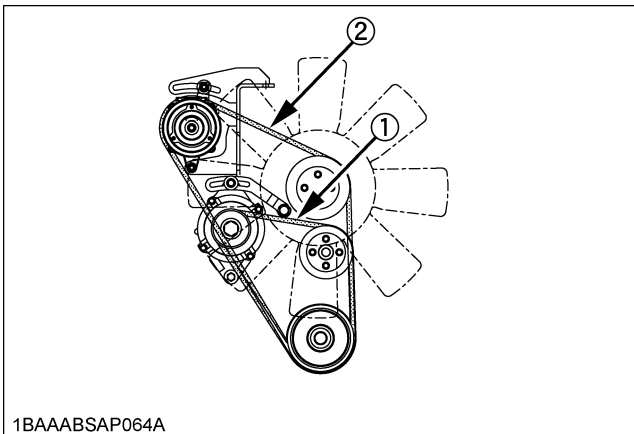
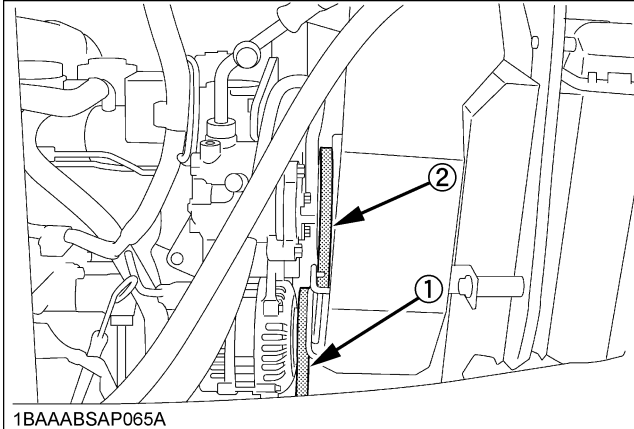
■ Adjusting V-belt Tension



CAUTION

To avoid personal injury:

- First stop the engine and remove the key.
- After servicing, make sure to replace the belt cover in its original position.

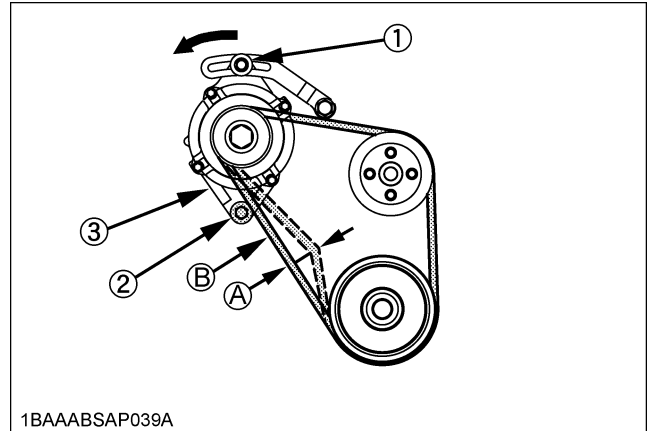


[V-belt]

- (1) Alternator belt
- (2) Fan belt

◆ Checking and adjustment of the alternator belt tension

1. Press the alternator belt down in the middle, with a force of approx. 10 kg. The belt tension is correct if it deflects about 10 mm. If otherwise, loosen bolt (1) and (2) and shift the alternator (3) in the direction shown by the arrow.
2. Replace the alternator belt if worn out, cracked or torn.



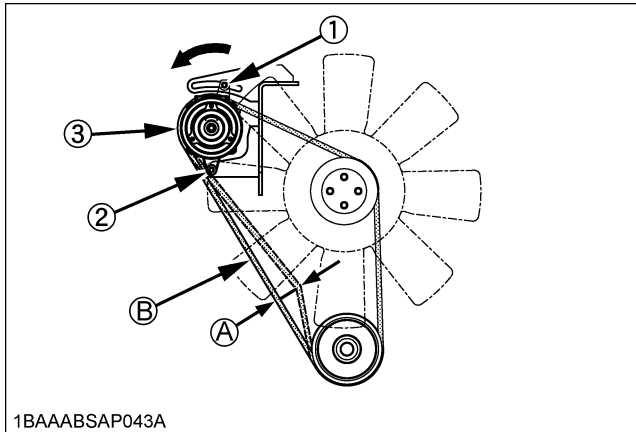
- (1) Bolt
- (2) Bolt
- (3) Alternator
- (A) about 10 mm
- (B) approx. 10 kg

IMPORTANT :

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

◆ **Checking and adjustment of the fan belt tension**

1. Press the fan belt down in the middle, with a force of approx. 10 kg. The belt tension is correct if it deflects about 20 mm. If otherwise, loosen bolt (1) and (2) and shift the air-compressor (3) in the direction shown by the arrow.
2. Replace the fan belt if worn out, cracked or torn.



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- | | |
|--------------------|-------------------|
| (1) Bolt | (A) about 20 mm |
| (2) Bolt | (B) approx. 10 kg |
| (3) Air-compressor | |

IMPORTANT :

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

■ **Checking Radiator Hoses and Clamps**



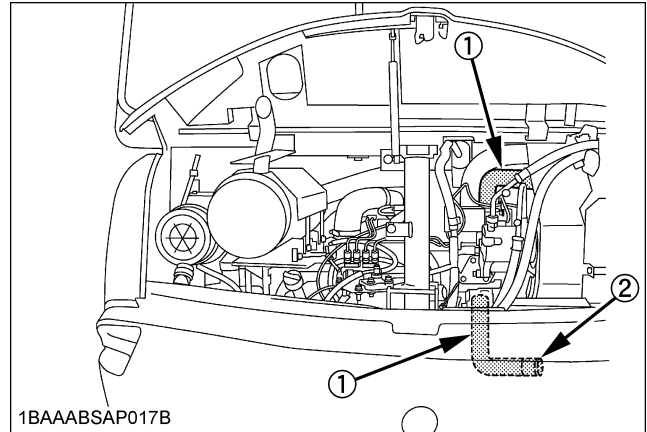
CAUTION

To avoid personal injury:

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

Check the water hoses for proper connection. This check should be carried out every 200 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.



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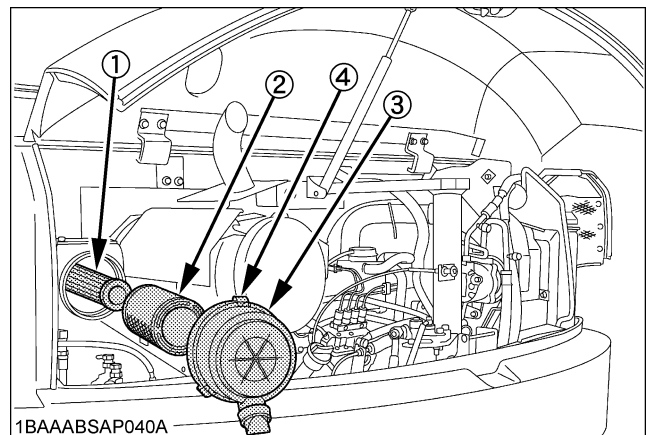
- | | |
|--------------------|-----------------|
| (1) Radiator hoses | (2) Hose clamps |
|--------------------|-----------------|

■ **Inspection and Cleaning Air Filter Element**

Open the engine hood and remove the dust-cover. Take out only outer element, clean the element, case interior and reassemble. During reassembly, take care to install the dust-cover so that its TOP mark (arrow) faces upwards. Do not remove the inner element.

IMPORTANT :

- Should the machine be used in extremely dusty areas, the air filter element must be inspected and cleaned more frequently than in the specified maintenance periods.
- The air filter has a dry element, keep free from oil.
- Do not run the engine without the air filter.



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

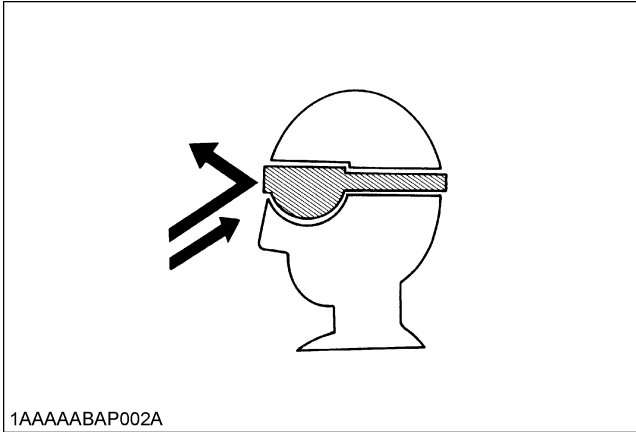
■ Air Filter Maintenance



CAUTION

To avoid personal injury:

- Wear eye protection.

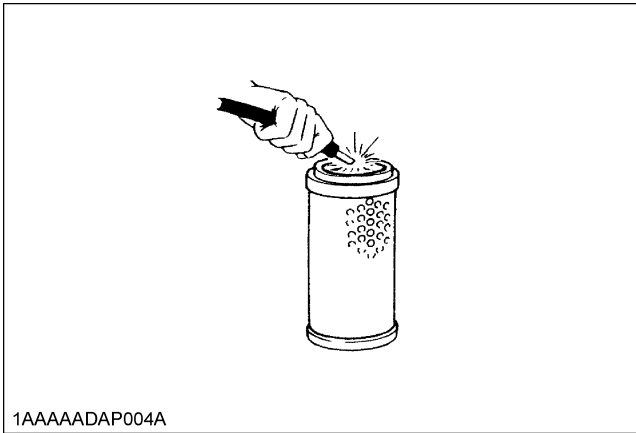


1AAAAABAP002A

The quickest and safest method of maintenance is the exchange of the paper cartridge. Furthermore there are different methods of cleaning the cartridge.

◆ Cleaning with compressed air

Pressure of compressed air must be under 205 kPa (2.1 kgf/cm²), and the cartridge should be blown clean from the inside to the outside until the dust deposits are noticeably reduced.



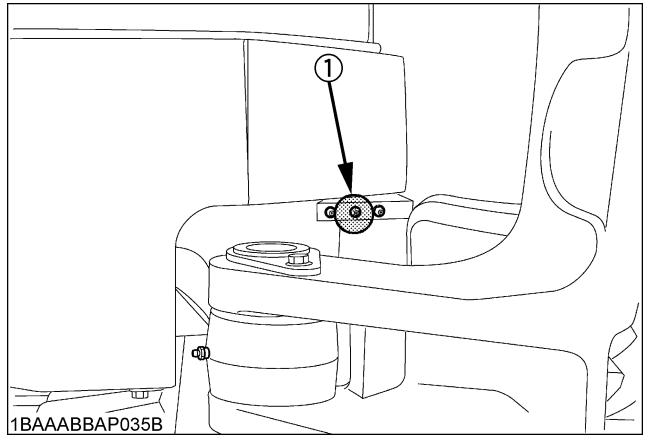
1AAAAADAP004A

IMPORTANT :

- If the air suction is still inadequate, or the color of the exhaust gases is abnormal even after the cleaning, the air filter cartridge must be replaced.

■ Greasing Swing Ball Bearing

1. Grease through the respective grease nipple. (at the central nipple)
2. Grease at each 90° (1.58 rad.) position of the swing frame.
3. Grease at each 90° (1.58 rad.) position of the pitch bearing. Using the grease gun, apply 5 shots at every position. Refer to the "RECOMMENDED OILS" section.

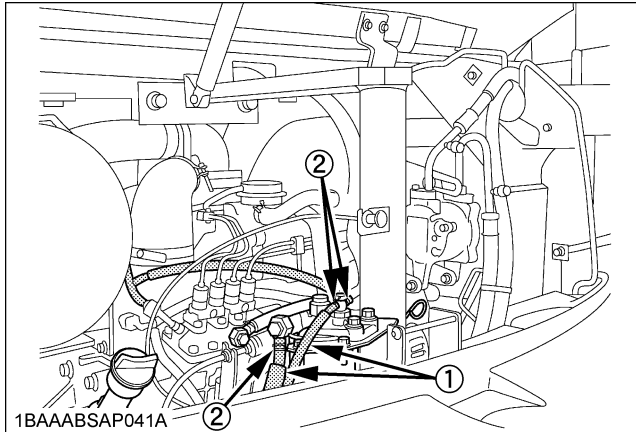


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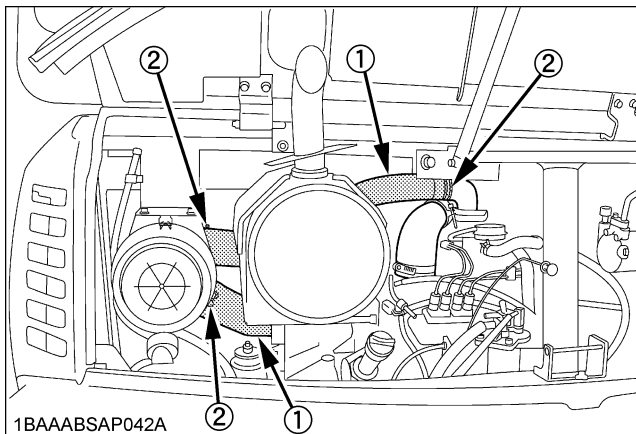
- (1) Grease nipple

■ Checking Fuel Line and Intake Air Line

1. Check to see that all lines and hose clamps are tightened and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.



- (1) Fuel lines
- (2) Clamp bands

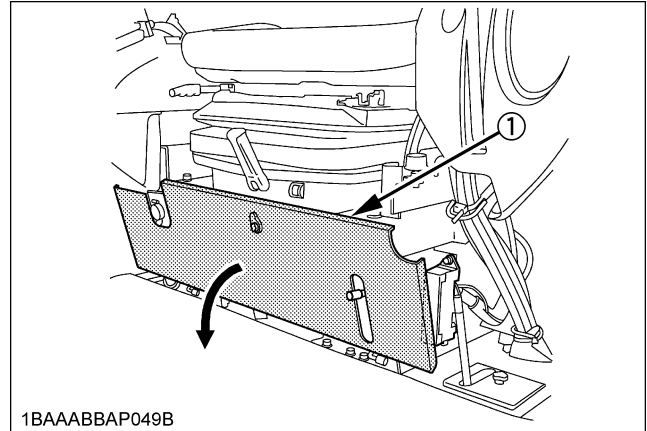


- (1) Hoses
- (2) Hose clamps

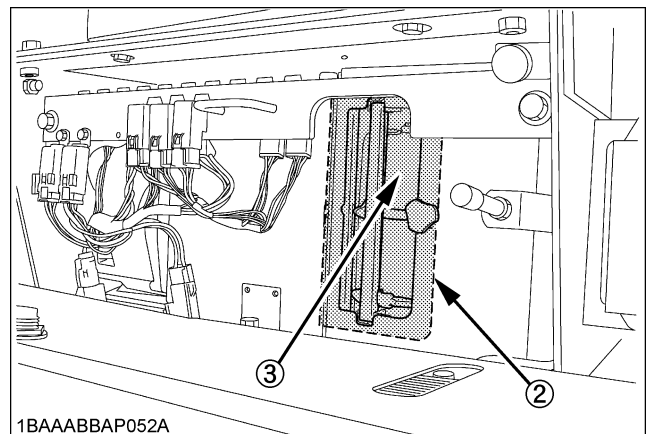
AIR CONDITIONER

■ Cleaning Air Filter

Open the cover and remove the filter cover, remove the air filter.



- (1) Cover



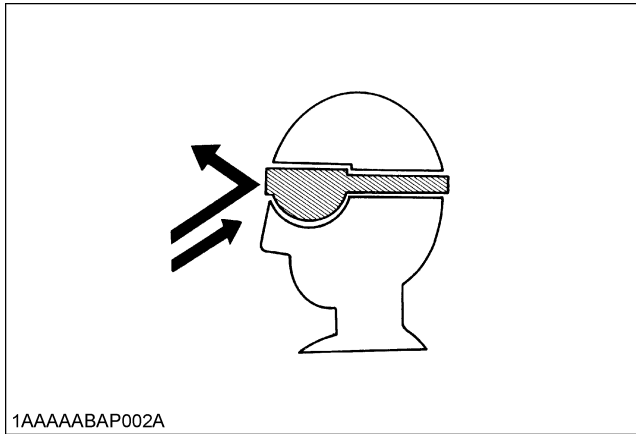
- (2) Filter cover
- (3) Air filter



CAUTION

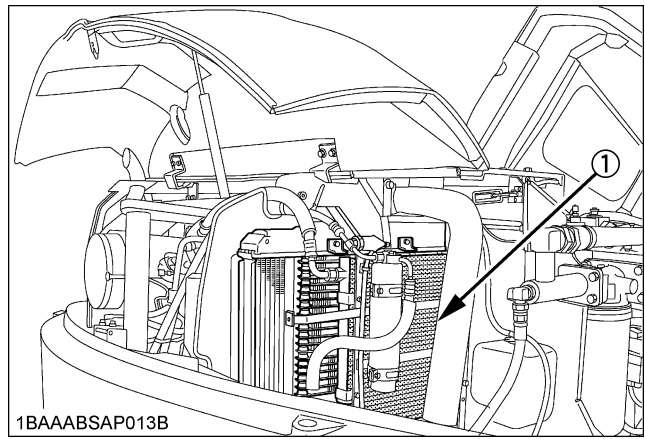
To avoid personal injury:

- Wear eye protection.



Checking Air-Conditioner Condenser

Check air conditioner condenser to be sure it is clean from debris.



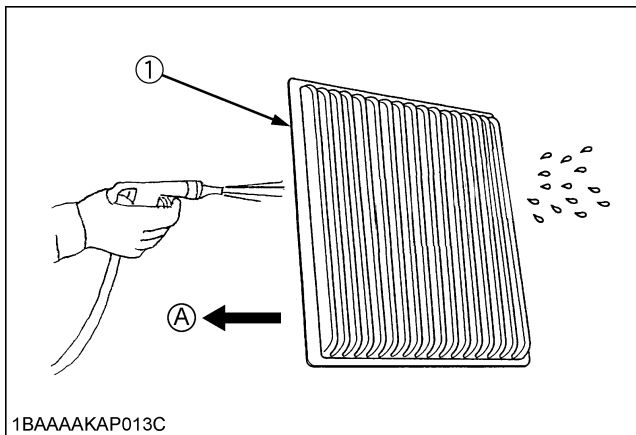
(1) Air conditioner condenser

Cleaning the air filter

- Normal use
Blow air from the opposite direction to the filter's normal air flow.

IMPORTANT :

- Do not hit the filter. If the filter becomes deformed, dust may enter into the air-conditioner, which may cause damage and malfunction.



(1) Filter

(A) "AIR CONDITIONER AIRFLOW"

NOTE :

- Pressure of compressed air must be under 205 kPa (2.1 kgf/cm²).
- If the filter is very dirty, replace the air filter.

EVERY 250 SERVICE HOURS

Do all 50 hour servicing at the same time.

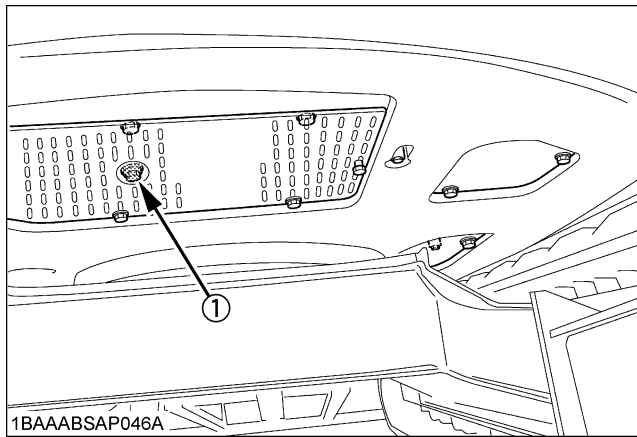
■ Engine Oil Change (First Engine Oil Change after 50 Service Hours)

**CAUTION**

To avoid personal injury:

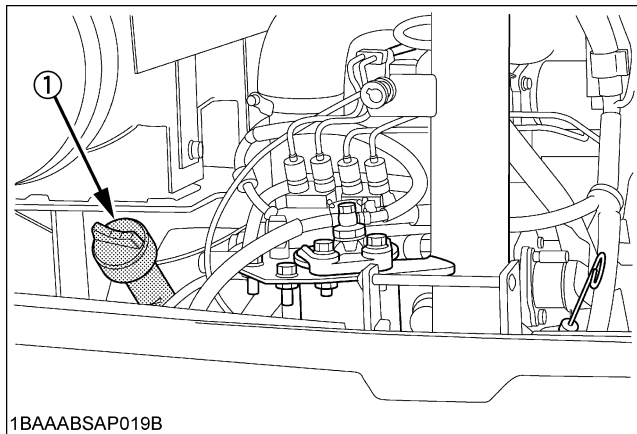
- First stop the engine then remove the key and wait long enough for the oil to cool down.

1. Remove the drain plug on the underside of the engine and drain all oil.
2. Re-tighten the drain plug.

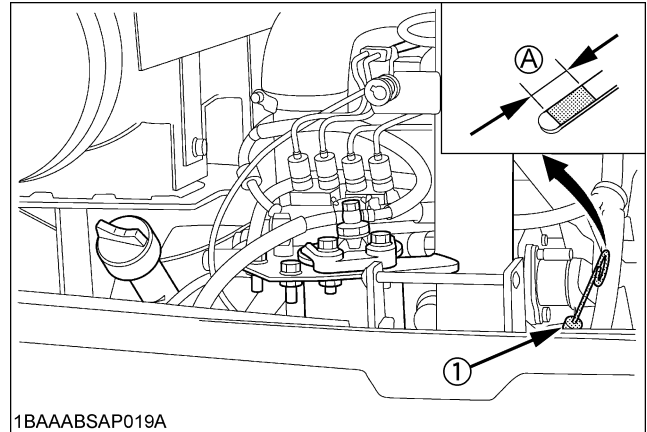


(1) Drain plug

3. Fill up with new oil through the filling port to the specified level.



(1) Oil filling port



(1) Engine oil dipstick (A) Required oil level range

4. Let the engine idle for approx. 5 min. Check the engine oil level. To check the engine oil level, insert the engine oil dipstick completely into the respective port opening and pull out again. If the oil level lies between both markings, no oil must be added.

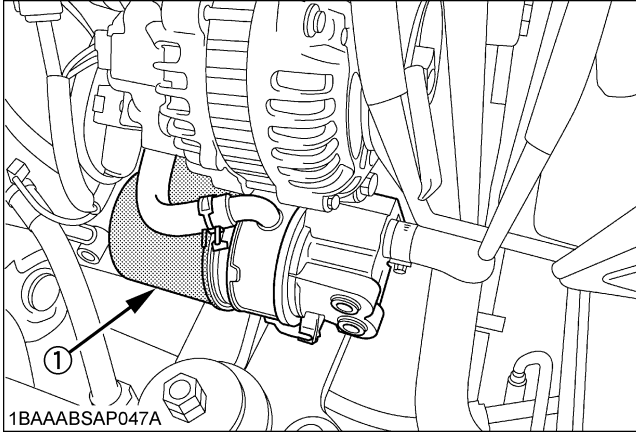
IMPORTANT :

- Regardless of the service hours, an engine oil change is due every 1 year.

Engine oil volumes (with engine oil filter)	10.8 L
------------------------------------------------	--------

■ Replacing Engine Oil Filter

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



(1) Oil filter

3. Oil the O-ring of the new oil filter cartridge lightly. Then tighten the oil filter cartridge 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 lamp does not light up. Then stop the engine and remove the key.
6. The engine oil level is reduced by the amount of the filter capacity after the engine is started. It is necessary to add oil.

IMPORTANT :

- Always check the oil level after having exchanged the filter.

■ Greasing Front Attachments (without Bucket Pin and Boom Swing Fulcrum)

⚠ CAUTION

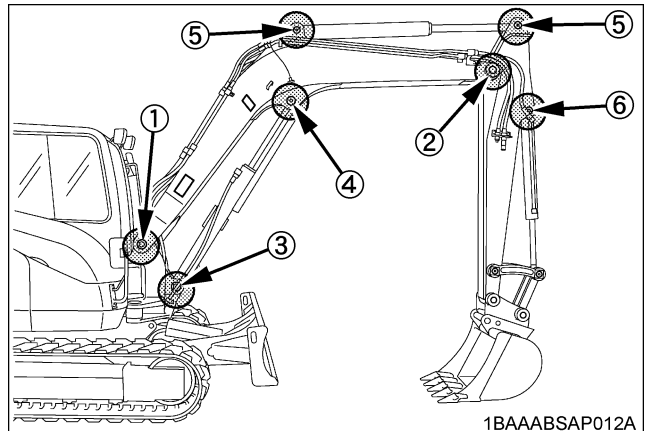
To avoid personal injury:

- First lower all attachments on the ground then stop the engine and remove the key.
- While greasing, take care not to step on the bucket teeth.

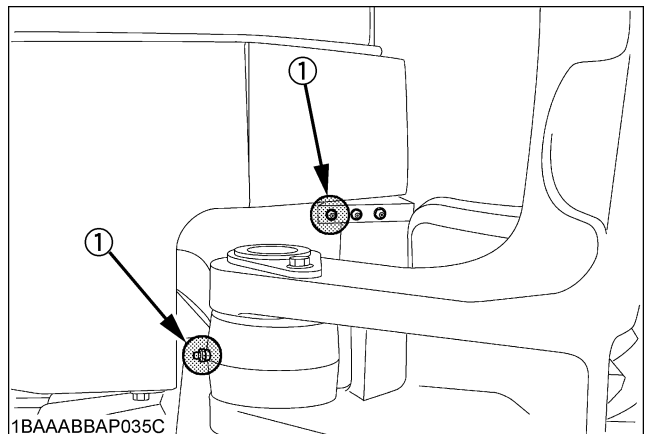
IMPORTANT :

- When doing excavation work in water, generously grease the following points. After ending work, grease again.

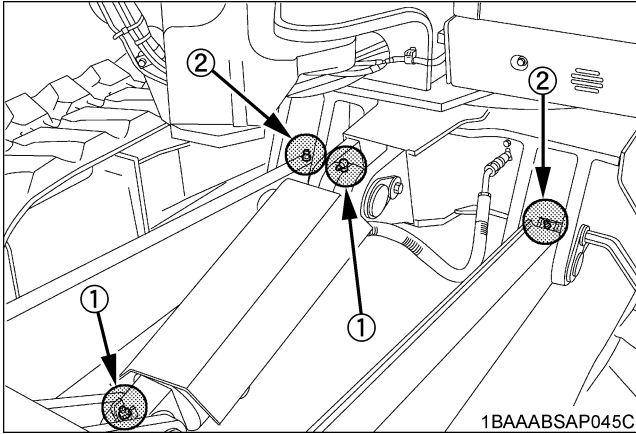
Grease the marked grease nipples shown by arrows in the illustration below.



- (1) Boom bottom linkage
- (2) Arm bottom linkage
- (3) Boom cylinder boss
- (4) Boom cylinder pin
- (5) Arm cylinder pin
- (6) Bucket cylinder pin



(1) Swing cylinder boss



(1) Dozer cylinder boss
(2) Dozer linkage boss

EVERY 500 SERVICE HOURS

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

■ Drive Unit Oil Change (First Oil Change of the 100 hours)



CAUTION

To avoid personal injury:

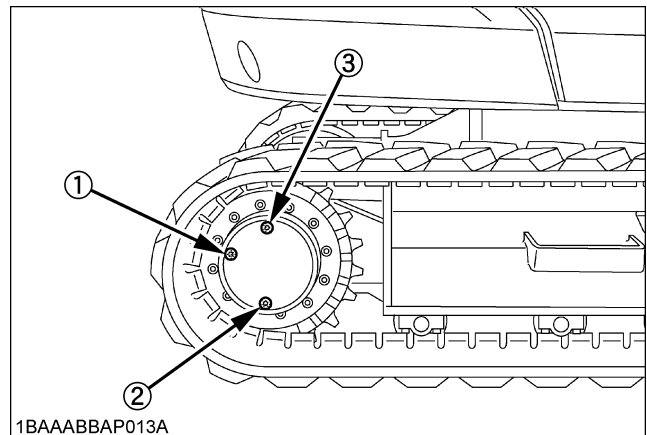
- Lower all attachments to the ground, stop the engine and remove the key before undertaking the oil change.

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.

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
(2) Drain plug
(3) Oil filling port

Gear oil volume	approx. 1.35 L
-----------------	----------------

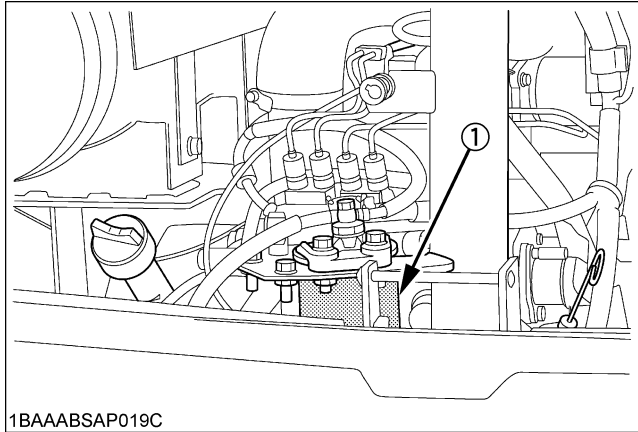
■ Replacing Fuel Filter Cartridge

CAUTION

To avoid personal injury:

- Keep fire away.

1. Remove the filter with the filter wrench.
2. Apply a light film of fuel to the seal of the new filter and turn in tightly by hand.
3. Open the cock of the fuel filter again.



1BAAABSAP019C

(1) Fuel filter cartridge

IMPORTANT :

- After exchange of the filter, the fuel system must be purged of air.

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

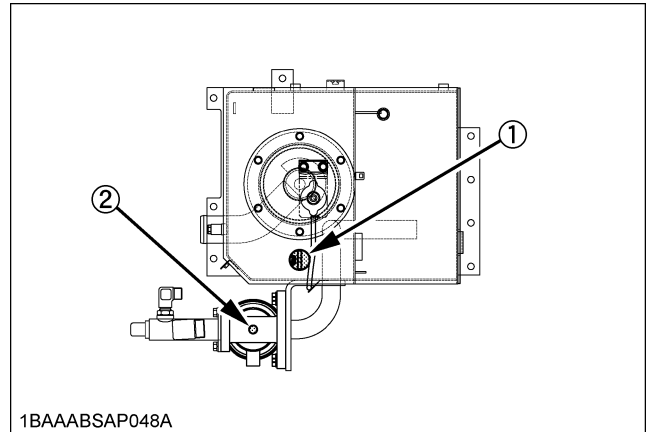
CAUTION

To avoid personal injury:

- Remove the oil filter cartridge only after the oil in the hydraulic tank has cooled down.
- The oil may spurt out if plugs or filters are removed before releasing the pressure in the hydraulic system.

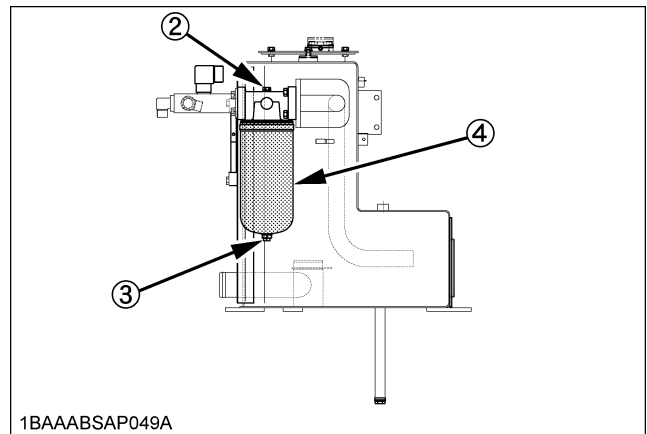
Gradually loosen the oil filling plug on the tank to release the pressure in the tank.

1. Gradually loosen the oil filling plug on the tank to release pressure in the tank.
2. First loosen the air plug, then remove the drain plug to let the oil in cartridge run out.
3. Remove the cartridge with wrench.
4. Apply a light film of oil to the seal of the new cartridge and turn in tightly by hand.
5. Re-tighten the air plug.



1BAAABSAP048A

- (1) Oil filling plug
(2) Air plug



1BAAABSAP049A

- (2) Air plug
(3) Drain plug
(4) Filter cartridge

IMPORTANT :

- Always check the oil level when replacing the filter cartridge.

EVERY 1000 SERVICE HOURS

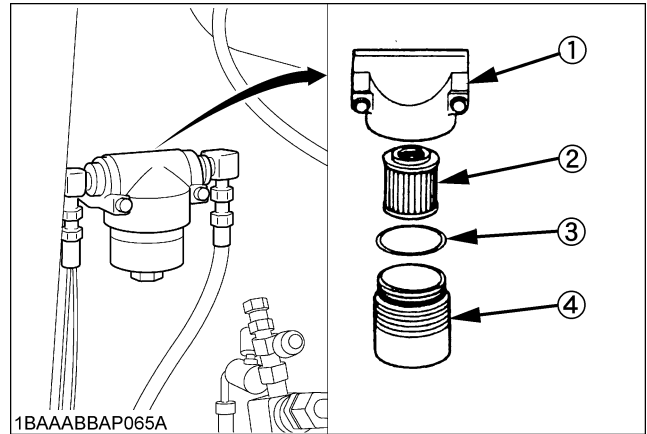
Do all 50, 100, 200, 250 and 500 hour servicing at the same time.

■ Replacing the Hydraulic Pilot Filter Element**CAUTION**

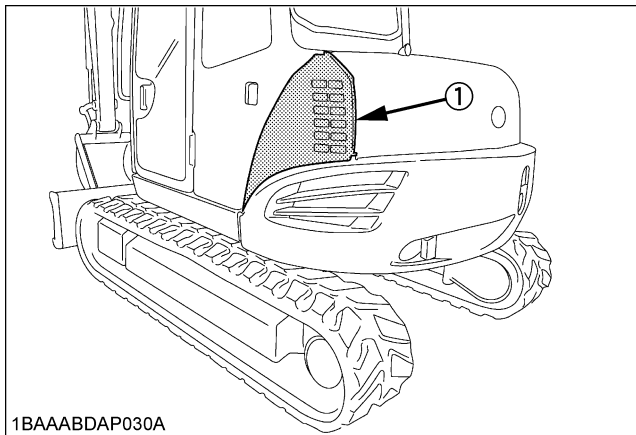
To avoid personal injury:

- Before replacing the element, wait long enough for the hydraulic fluid to cool down.

1. Remove the rear left cover.
2. Gradually loosen the oil filling plug on the tank to release the pressure in the hydraulic system.
3. Remove the pilot filter case from the head cover.
4. Wrench and pull out the element downward.
5. Replace the O-ring with a new one.
6. Apply a light coating of clean hydraulic oil to the O-ring and fit it to the case firmly. Be careful not to scratch the O-ring.
7. Attach the case to the head cover firmly.
8. Let the engine run for approx. 3 minutes.
9. Check the oil level of hydraulic oil tank, then tighten the oil filling plug.



- (1) Head cover
 (2) Element
 (3) O-ring
 (4) Case



- (1) Rear left cover

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

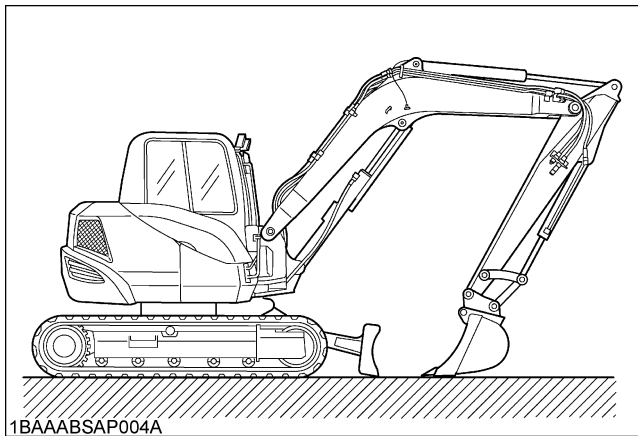


CAUTION

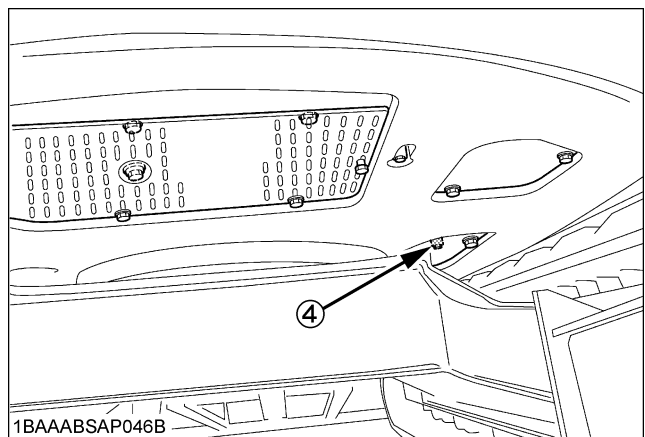
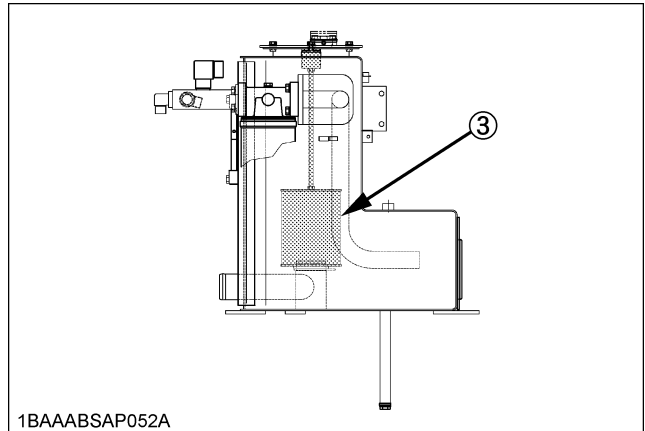
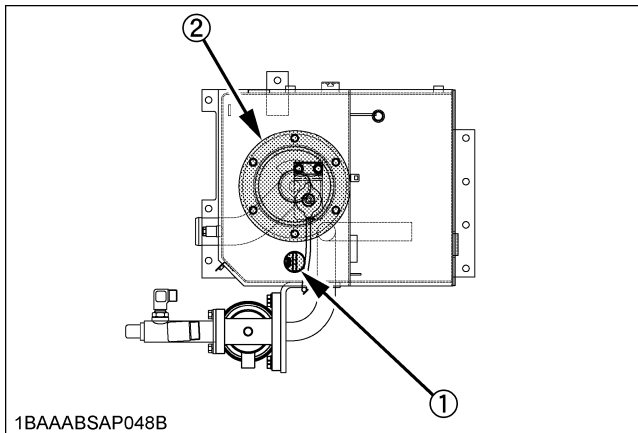
To avoid personal injury:

- Wait long enough for the hydraulic fluid to cool down. Then begin with the change of the hydraulic fluid.
- Use stepladder to work safely when the suction filter is extracted from the oil tank.

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.

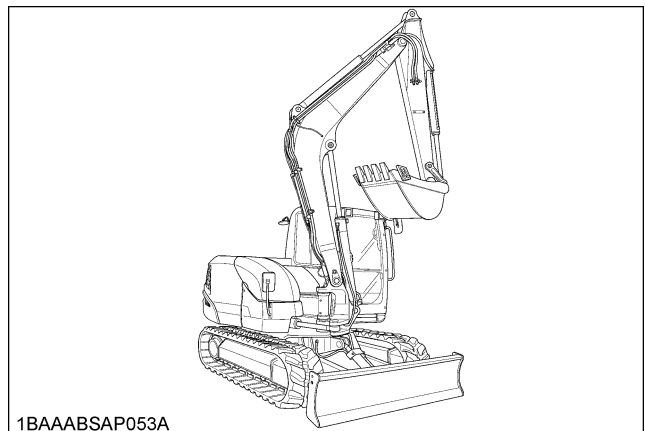


2. Gradually loosen oil filling plug on the tank to release pressure in the tank.
3. Remove the drain plug on the underside of the hydraulic tank and drain the oil.
4. Remove the hydraulic tank cover.
5. Remove and exchange the suction filter.
6. Retighten the drain plug.



- (1) Oil filling plug
- (2) Hydraulic tank cover
- (3) Suction filter
- (4) Drain plug

7. Fill oil through the oil filling opening on the top side of the tank.
8. Let the engine run and operate the boom, arm, bucket and boom swing device. Then bring the boom to the highest position, pull the arm, bucket inward and boom swing left end.



9. Fill oil again up to the center of the gauge.

Hydraulic oil volumes	Hydraulic tank	75 L
	Whole oil volumes	146 L

10. Install the hydraulic tank cover and tighten the oil filling plug.

■ Hydraulic Oil Check with Hydraulic Hammers

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 hammers are used:

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

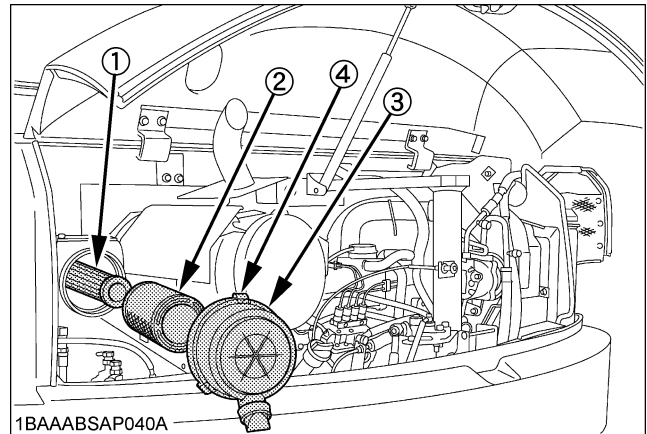
		Hydraulic oil	Return filter cartridge
Normal excavator work		every 1000 Hrs.	every 500 Hrs. (250 Hrs. after first operation)
Hammer work portion	20%	every 800 Hrs.	every 200 Hrs.
	40%	every 400 Hrs.	
	60%	every 300 Hrs.	every 100 Hrs.
	more	every 200 Hrs.	

EVERY 1000 SERVICE HOURS OR ONCE A YEAR

■ Replacing Air Filter Element

Open the engine hood 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) Inner element
- (2) Outer element
- (3) Dust-cover
- (4) Clamps

IMPORTANT :

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

EVERY 1500 SERVICE HOURS

■ Checking Fuel Injection Nozzle(Injection Pressure)

Consult your local KUBOTA Dealer for this service.

EVERY 2000 SERVICE HOURS

Do all 50, 100, 200, 250, 500 and 1000 hour servicing at the same time.

■ Changing Front Idler and Track Roller Oil

NOTE :

- Contact your KUBOTA dealer for details.

■ Checking the Alternator and Starter Motor

NOTE :

- Contact your KUBOTA dealer for details.

EVERY 3000 SERVICE HOURS

■ Checking Injection Pump

Consult your local KUBOTA Dealer for this service.

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 KUBOTA dealer. Never use a fuse other than specified.

■ Checking the Electrical Circuit

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

■ Checking Air-Conditioner Pipes and Hoses



CAUTION

To avoid personal injury:

- Do not touch the air-conditioner hoses or the heater with your hand. You may get burned.

1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once. (Consult your local KUBOTA Dealer for this service.)

BIENNIAL SERVICING



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.

■ Replacing Air-Conditioner Pipes and Hoses



CAUTION

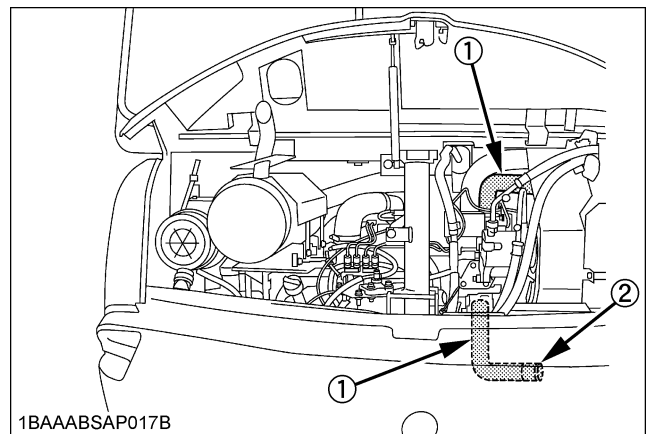
To avoid personal injury:

- Do not touch the water hoses or the heater with your hand. You may get burned.

Replace air-conditioner pipes and hoses every two years. If the hoses or pipes are swollen, hard or cracked, they must be replaced earlier.

■ Replacement of Radiator Hoses and Hose Clamps

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



- (1) Radiator hoses
(2) Hose clamps

■ Changing Radiator Coolant



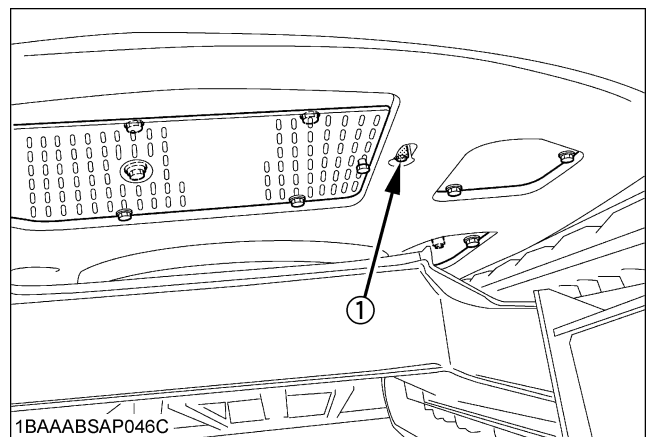
CAUTION

To avoid personal injury:

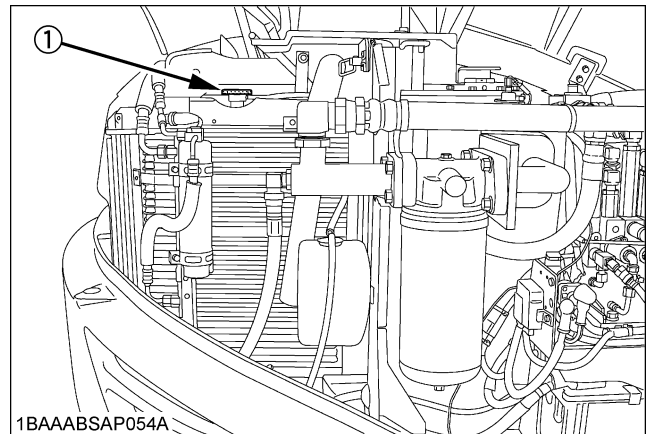
- When using anti-freeze, put on some protection such as rubber gloves. (Anti-freeze contains poison.)
- If you accidentally swallowed anti-freeze, seek medical attention at once.
- When anti-freeze comes in contact with the skin or clothing, wash it off immediately.
- Do not mix different types of Anti-freeze. The mixture can produce chemical reaction causing harmful substances.
- Anti-freeze is extremely flammable and explosive under certain conditions. Keep fire and children away from anti-freeze.
- When draining fluids from the engine, place some container underneath the engine body.
- Do not pour waste onto the grounds, down a drain, or into any water source.
- Also, observe the relevant environmental protection regulations when disposing of anti-freeze.
- If swallowed, anti-freeze is poisonous to people, animals and birds.

Stop the engine, then remove the key and wait until it has cooled down completely.

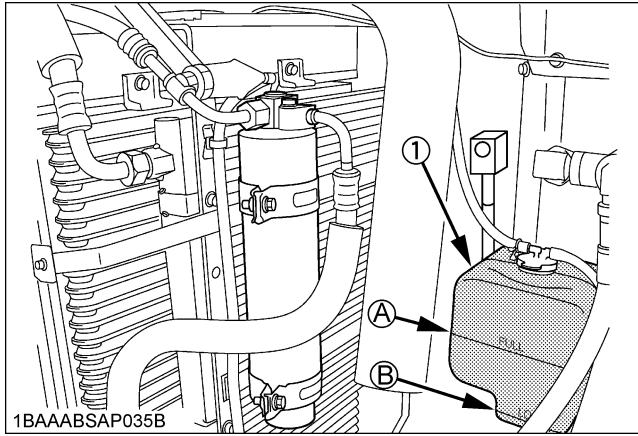
1. Open the drain plug on the bottom of the radiator and drain coolant completely. Should a recovery tank be equipped, disconnect the line from the tank floor and then open the drain cock.
2. To clean, rinse the radiator with water.
3. Close the drain plug, and fill the radiator and the recovery tank with coolant fluid. Let the engine idle for about 5 min. Stop the engine and remove the key.
4. Check the coolant level of recovery tank and add the coolant if necessary.
5. The shipped machine has been filled with 50% anti-freeze solution.



(1) Drain plug



(1) Radiator cap



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

Radiator	10.5 L
Recovery tank	1.3 L

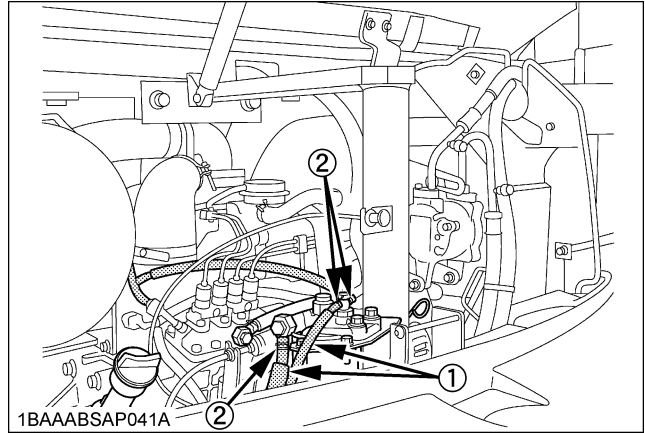
IMPORTANT :

- Do not operate the engine without coolant.
- To fill the radiator system and the recovery tank, 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.

■ Replacing Fuel Hoses and Clamps

Replace the hoses and clamps.

(See "Checking Fuel and Intake Air Line" in "EVERY 200 SERVICE HOURS")

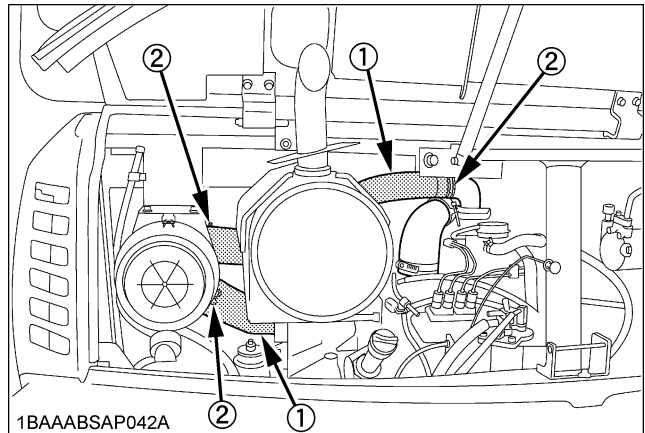


(1) Fuel lines (2) Clamp bands

■ Replacing Intake Air line

Replace the hoses and clamps, if necessary.

(See "Checking Fuel and Intake Air Line" in "EVERY 200 SERVICE HOURS")



(1) Hoses (2) Hose clamps

SERVICING AS REQUIRED

■ Checking Amount of Refrigerant (gas)



WARNING

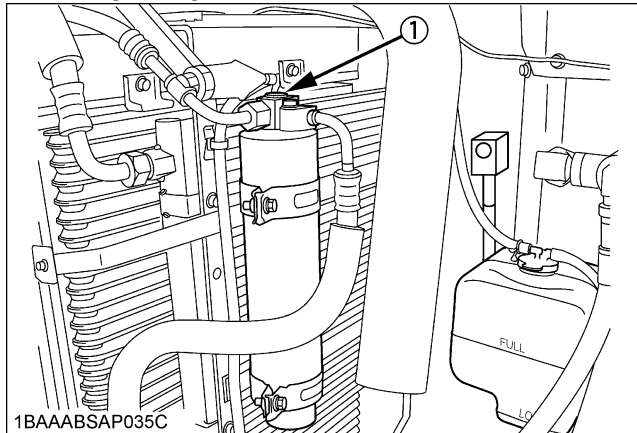
To avoid personal injury:

- Liquid contact with eyes or skin may cause frostbite.
- In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes.
- In contact with a flame, R134a refrigerant gives a toxic gas.
- Do not disconnect any part of the refrigeration circuit of the air conditioning system. Consult your local KUBOTA Dealer for assistance and service.

A shortage of refrigerant impairs the air-conditioner performance. Check the following points. If it is indicated that the amount of refrigerant is extremely low, ask your dealer to inspect and charge.

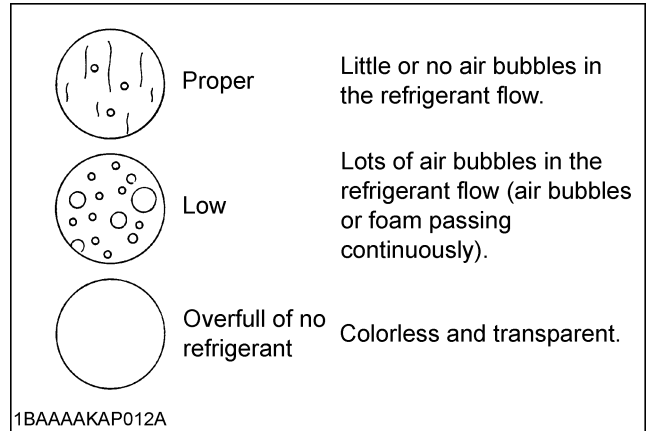
◆ Checking procedure

1. Run the air-conditioner in the following conditions.
 - Engine speed: About 1500 rpm
 - Temperature control lever: Maximum cooling position (rightmost)
 - Fan switch: Highest blow (3)
 - Air-conditioner switch: ON
2. Look into the sight glass to see if the refrigerant is flowing through its circuit.



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(1) Sight glass



1BAAAAP012A

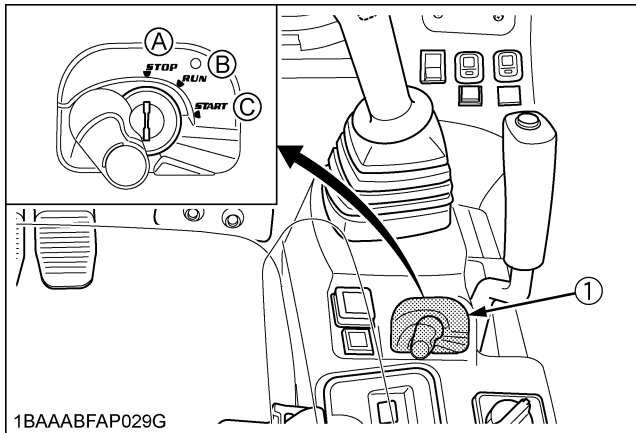
IMPORTANT :

- Charge only with R134a not R12 refrigerant (gas).

OTHER ADJUSTMENTS AND REPLACEMENTS

PURGING OF THE FUEL SYSTEM

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



(1) Starter switch

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

After adjustment is completed:

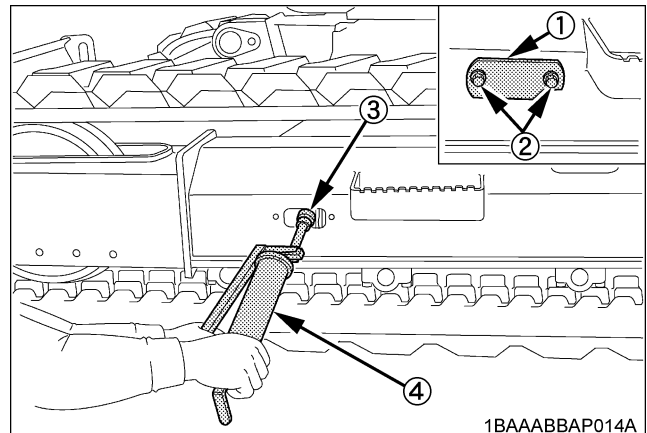
Using the socket wrench, tighten the grease nipple. Tightening torque must be between 98 to 108 N-m.

IMPORTANT :

- If the tracks are too tight, wear is increased.
- If the tracks are too loose, the track pads may collide with the sprocket and 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. Loosen the bolt and remove the cover.
2. Apply grease to the grease nipple.



- (1) Cover
- (2) Bolt
- (3) Grease nipple
- (4) Grease gun

3. Rubber Tracks

Tension the track in the lifted position, so that the distance "A" (clearance between the track roller and the inside surface of the track) see illustration, in this case, if there is a seam mark "∞" on the inside surface of the track, the seam mark "∞" is positioned on the top center between the idler and the sprocket.

Steel Tracks

To check the track tension, the track must be lifted from the ground as shown. The track tension is correct if the clearance between the outer end of the track roller and the track interior surface corresponds to the dimension specified in the table below.



DANGER

To avoid serious injury or death:

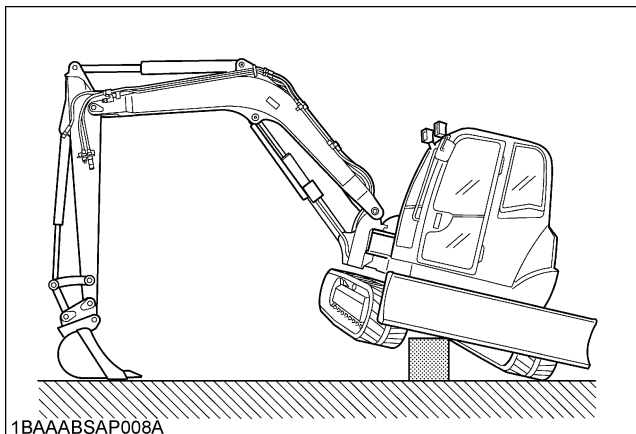
- Do not work under the machine in this condition.
- For your safety do not rely on hydraulically supported devices, they may leak down and suddenly drop or be accidentally lowered.



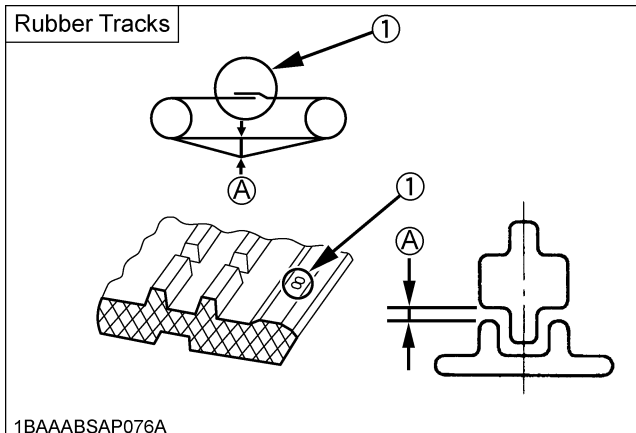
WARNING

To avoid personal injury or death:

- When lifting the machine itself with an attachment, place a safety block or safety post to prevent the machine from turning over. Keep the lock lever for attachment control in the "LOCK" position.



1BAAABSAP008A



1BAAABSAP076A

(1) Seam (Mark "∞")

(A)	25 to 40 mm
-----	-------------

If there is not a seam mark, the adjustment is possible at all positions.

Steel Tracks



1BAAABBAP080C

- (1) Drive sprocket
- (2) Idler

(A)	40 to 55 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 midway between the idler and the sprocket.

If the seam is positioned incorrectly, the tracks will be tensioned too 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 loosen more than 50 mm, readjust them.
 - (2) Check track tension 50 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 reduce 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 as well as increase wear on the tracks.

CHANGING THE BUCKET



CAUTION

To avoid personal injury:

- There are two people required to replace the bucket. One person operates the excavator, and the other one mounts the bucket. The person who mounts the front must command-guide the movements of the front end attachments. The operator should move the front end attachments only according to the commands of the person who mounts the bucket. A continuous intervisibility between both persons is indispensable. If there is no intervisibility, stop working immediately.
- When replacing the bucket, make sure to wear an eye protection, a helmet and protective gloves.
- During attaching and detaching, chippings and burns may occur at the bolts or bushings. These may cause severe injuries.
- Never use your fingers for the alignment of the components (linkage, bucket, arm). The components may sever your fingers by uncontrolled movements.
- Read the manual of the attachment to do a correct operation safely when other attachments are installed instead of Kubota specified bucket.

FUSES



CAUTION

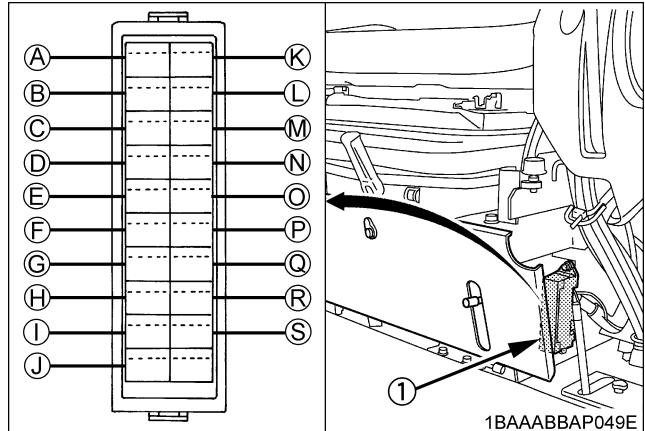
To avoid personal injury:

- When changing fuse, stop the engine and turn the key in position "STOP". Keep the lock lever for attachment control in the "LOCK" position.

■ Replacing Fuses

1. Remove the cover of the fuse box.
2. Replace the burnt out fuse with a fuse having the same capacity.

■ Fuse Capacities and Circuits

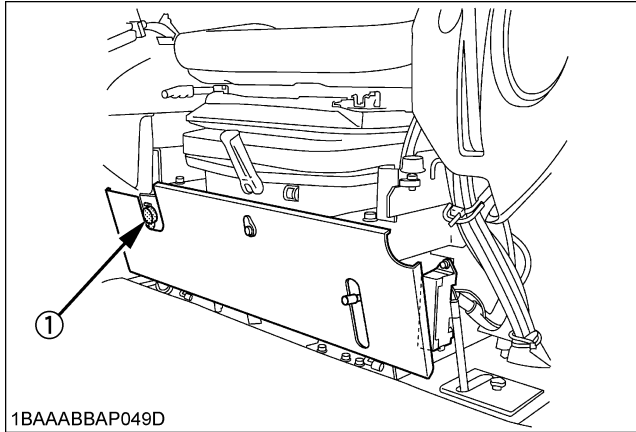


(1) Fuse box

(A)	5A Room Light	(K)	20A Blower Motor (A/C)
(B)	20A Work Light	(L)	15A AI Motor
(C)	5A Meter Sub	(M)	10A Anti-theft Sub
(D)	10A Compressor (A/C)	(N)	10A Alternator
(E)	15A Cigarette Lighter	(O)	5A Lever Lock
(F)	15A Auxiliary	(P)	10A Horn
(G)	15A Wiper / Washer	(Q)	10A Meter Main
(H)	5A Anti-theft Main	(R)	5A Travel Hi-Low
(I)	10A Overload Warning	(S)	5A Relay Source
(J)	10A Starter		

■Auxiliary Electric

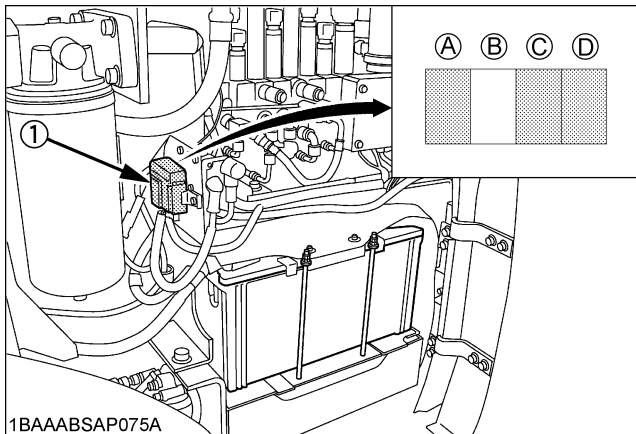
Max power is less than 110 W including the "Beacon".
If you need another auxiliary electric, contact your KUBOTA dealer for details.



(1) Auxiliary electric

■Slow Blow Fuse

Slow blow fuse is provided to protect the electrical circuits.
If the fusible link is blown, check the electrical circuits for trouble and then replace with a new compatible slow blow fuse.

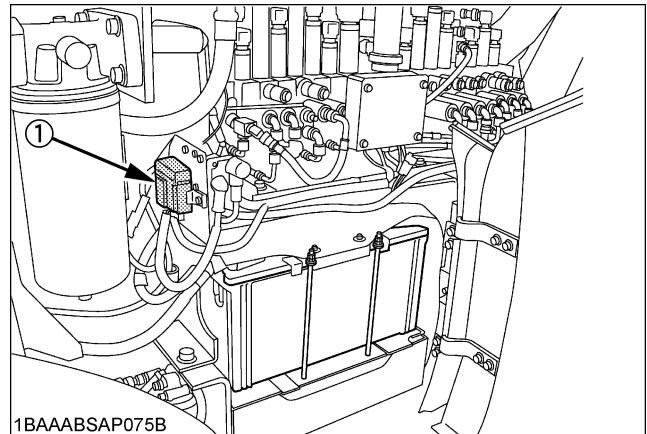


(1) Slow blow fuse

(A)	100A Alternator
(B)	
(C)	30A Fuel Supply Pump
(D)	60A Main Power

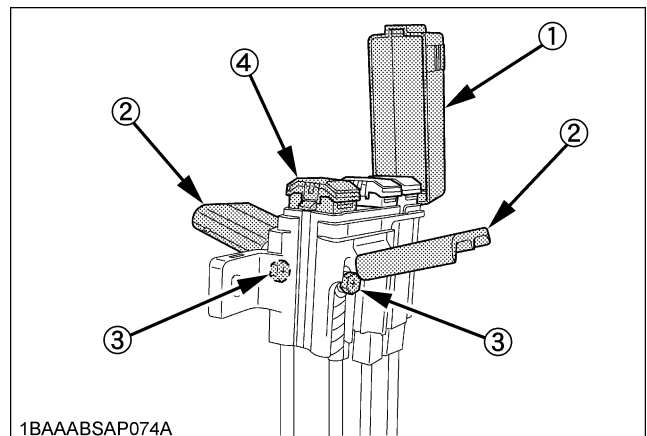
◆ Replacement procedure
[100 Amp. Slow-blow fuse]

1. Disconnect the negative cord of the battery.
2. Remove the slow blow fuse case.



(1) Slow blow fuse case

3. Open the slow blow fuse case cap and cover then remove the bolts and draw out the slow blow fuse (A).



- (1) Slow blow fuse case cap
- (2) Cover
- (3) Bolt
- (4) Slow blow fuse (A)

TROUBLESHOOTING

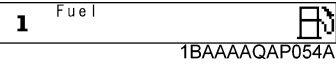
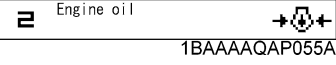
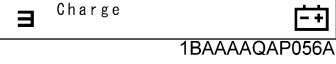
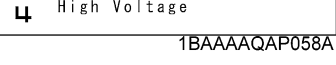
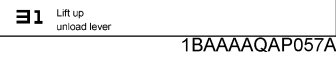
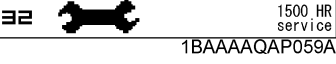
If the excavator does not show the desired performance, or when trouble arises, refer to the table below and undertake appropriate measures.

Trouble		Cause	Countermeasure
Engine	Starting difficulties	Lock levers in "UNLOCK" position	* Bring lock lever into "LOCK" position.
		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 the chapter. "OTHER ADJUSTMENTS AND REPLACEMENTS".)
		Oil viscosity is too high the engine runs sluggishly in winter.	* Pour hot water over the radiator.
		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 V-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.		

Trouble		Cause	Countermeasure
Engine	Water temperature in red zone (Overheating)	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.
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.
	Swing motor and front attachment does not work.	Lock lever in "LOCK" position	* Bring lock lever into "UNLOCK" position.
Drive System	Deviation of drive direction	Blocked through stones	* Remove.
		Track too loose or too tight	* Adjust accordingly.
AI	System indicator light flashes.	Fuse in fuse box defective	* Replace the fuse.

KUBOTA I.C.S. 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
 <p>Fuel 1BAAAAQAP054A</p>	yellow	Fuel running out.	-	Add fuel.
 <p>Engine oil 1BAAAAQAP055A</p>	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.
 <p>Charge 1BAAAAQAP056A</p>	red	Charging line in trouble. Charging failure.	Check the V-belt. (When the belt is in good condition, keep running until the battery becomes dead.)	Immediately contact your local dealer for repair.
 <p>High Voltage 1BAAAAQAP058A</p>	red	24V line engine startup alternator defective.	[Do not start the engine on 24V line. Get it restarted to see if there is the message again.]	If the message does not reappear, no repair is needed. If the message stays on, contact your local dealer for repair.
 <p>Lift up/unload lever 1BAAAAQAP057A</p>	yellow	The engine has been started with the lock lever down.	The engine fails to start.	Pull up the lock lever and start the engine.
 <p>1500 HR service 1BAAAAQAP059A</p>	yellow	The hour meter has reached the specified count-up. Carry out the maintenance job.	-	Carry out the specified maintenance job and reset the warning by a long push of the display selector switch.
No message (warning lamp flashing)	red	Sensor power line short circuited.	The work light lights up.	Immediately contact your local dealer for repair.

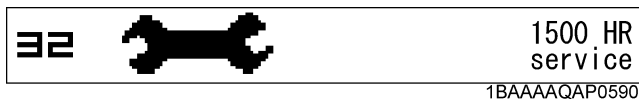
◆ Service hour meter

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	550	600	750	800		1000	
1	Engine oil		change	●			○	○			○		every 250 hrs	
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 250 hrs	
6	Hydraulic return filter cartridge					●				○				every 500 hrs
7	Hydraulic suction filter element											○		every 1000 hrs

● First operation

The message appears. The message shows up as follows.



(The message reappears on the hour meter designated next.)

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 display selector switch of the panel is pushed for more than 3 seconds, the message disappears.

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

OPERATION UNDER COLD WEATHER 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 recovery tank, if the ambient temperature is expected to drop below 0°C (32°F). Mixing ratio of water and anti-freeze depends on the expected ambient temperature. When mixing, stir it up well, and then fill into the radiator.

- Mixing ratio between water and anti-freeze

Ambient Temperature	°C (°F)	-5 (+23)	-10 (+14)	-15 (+5)	-20 (-4)	-25 (-13)	-30 (-22)	-35 (-31)
Antifreeze %		30	30	30	35	40	45	50
Water %		70	70	70	65	60	55	50

IMPORTANT :

- Use permanent anti-freeze or long-life coolant.
- Drain the coolant completely and clean the 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 (32°F) 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



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.
- Bring the excavator on a firm, flat, and level surface. Lower the attachments and dozer blade on the ground.

■ 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 section of the cylinder rods.
4. Remove the battery and store indoors.
5. If it is expected that the temperature will sink below the 0°C (32°F) 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 gets into the air cleaner through its intake and cause engine damage.
Carefully wash and do not splash water over the air cleaner while the engine is running.

■ 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 KUBOTA dealer to replace the following important component 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 worn even before the specified use, it must be repaired or replaced the same way as other parts.

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

For the hydraulic hoses other than the ones to be replaced periodically, inspect them for the following points. If found unusual, tighten them up, replace them.

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

For replacement of the important parts, contact your KUBOTA 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	Used place	Q'ty	Period
1	Fuel hose	Fuel tank - Water separator	1	Every 2 years or 4000 hours
		Water separator - Fuel Pump	1	
		Fuel filter - Fuel pump	1	
		Fuel pump - Fuel nozzle	1	
		Fuel nozzle - Fuel tank	2	
2	Hydraulic hose (suction)	Tank - Pipe, Suction	1	
		Pipe, Suction - Main Pump	1	
3	Hydraulic hose (delivery)	Main pump - Control valve	3	
		Main pump - Pilot filter	1	
		Pilot filter - Unload valve	1	
4	Hydraulic hose (Boom cylinder)	Control valve - Boom cylinder, Shut off valve	2	
5	Hydraulic hose (Arm cylinder)	Control valve - Pipe, Boom	2	
		Pipe, Boom - Arm cylinder	2	
6	Hydraulic hose (Bucket cylinder)	Control valve - Pipe, Boom	2	
		Pipe, Boom - Bucket cylinder	2	
7	Hydraulic hose (Swing cylinder)	Control valve - Swing cylinder	2	
8	Hydraulic hose (Dozer cylinder)	Control valve - Rotary joint	2	
		Rotary joint - Pipe	2	
		Pipe - Dozer cylinder	2	
9	Hydraulic hose (Service port)	Control valve - Pipe, Boom	4	
		Pipe, Boom - Pipe, Boom	4	
		Pipe, Boom - Pipe, Arm	4	
10	Hydraulic hose (Swivel motor)	Control valve - Swivel motor	2	

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

RECOMMENDED OILS

IMPORTANT :

1. Before delivery the hydraulic oil used was Shell Tellus S2M46.
2. Use engine oil API service classification CF or CI-4.
3. Use SAE 90 (API, GL-4/GL-5) as drive unit oil for all seasons.

	Application	Viscosity	Shell	ExxonMobil	MIL-Standard
Engine oil	In winter or by low temperatures	SAE 10W	Shell Rotella T10W Shell Rimula 10W	—	MIL-L-2104C MIL-L-2104D
		SAE 20W	Shell Rotella T20W-2 Shell Rimula 20W-2		
	In summer or by high ambient temperatures	SAE 30	Shell Rotella T30 Shell Rimula 30		
		SAE 40	Shell Rotella T40 Shell Rimula 40		
		SAE 50	Shell Rimula 50		
All-Season engine oil	Multi-purpose	Shell Rotella T15W-40			
Gear oil	In winter or by low temperatures	SAE 75	Shell Oil S8643	Mobilube HD Plus 80W-90	MIL-L-2105C
		SAE 80	Shell Spirax HD80W		
	In summer or by high ambient temperatures	SAE 90	Shell Spirax HD90		
		SAE 140	Shell Spirax HD140		
All-weather gear oil	Multi-purpose	Shell Spirax HD80W Shell Spirax HD85W			
Hydraulic oil	In winter or by low temperatures	ISO 32	Shell Tellus S2M32	Mobil DTE 10 Excel 32	
		ISO 46	Shell Tellus S2M46	Mobil DTE 10 Excel 46	
	In summer or by high ambient temperatures	ISO 68	Shell Tellus S2M68	Mobil DTE 10 Excel 68	
Grease		Shell Alvania EP2	Mobilux EP2		
Fuel			Light oil No. 2-D (ASTM D975)		
Fuel under -5°C			Light oil No. 1-D (ASTM D975)		

NOTE :◆ **Engine Oil:**

- Oil used in the engine should have an American Petroleum Institute (API) service classification and Proper SAE Engine Oil according to the ambient temperatures.

Above 25 °C	SAE 30 or SAE 10W-30, SAE 15W-40
0 °C to 25 °C	SAE 20 or SAE 10W-30, SAE 15W-40
Below 0 °C	SAE 10W or SAE 10W-30, SAE 15W-40

- Refer to the following table for the suitable API classification engine oil according to the engine type (with internal EGR, external EGR or non-EGR) and the fuel.

	except external EGR	with external EGR
Model	---	KX080-3
Fuel used	Engine oil classification (API classification)	
	Oil class of engines except external EGR	Oil class of engines with external EGR
Ultra Low Sulfur Fuel [<0.0015% (15 ppm)]	CF, CF-4, CG-4, CH-4 or CI-4	CF or CI-4 (Class CF-4, CG-4 and CH-4 engine oils cannot be used on EGR type engines)

EGR: Exhaust Gas Re-circulation

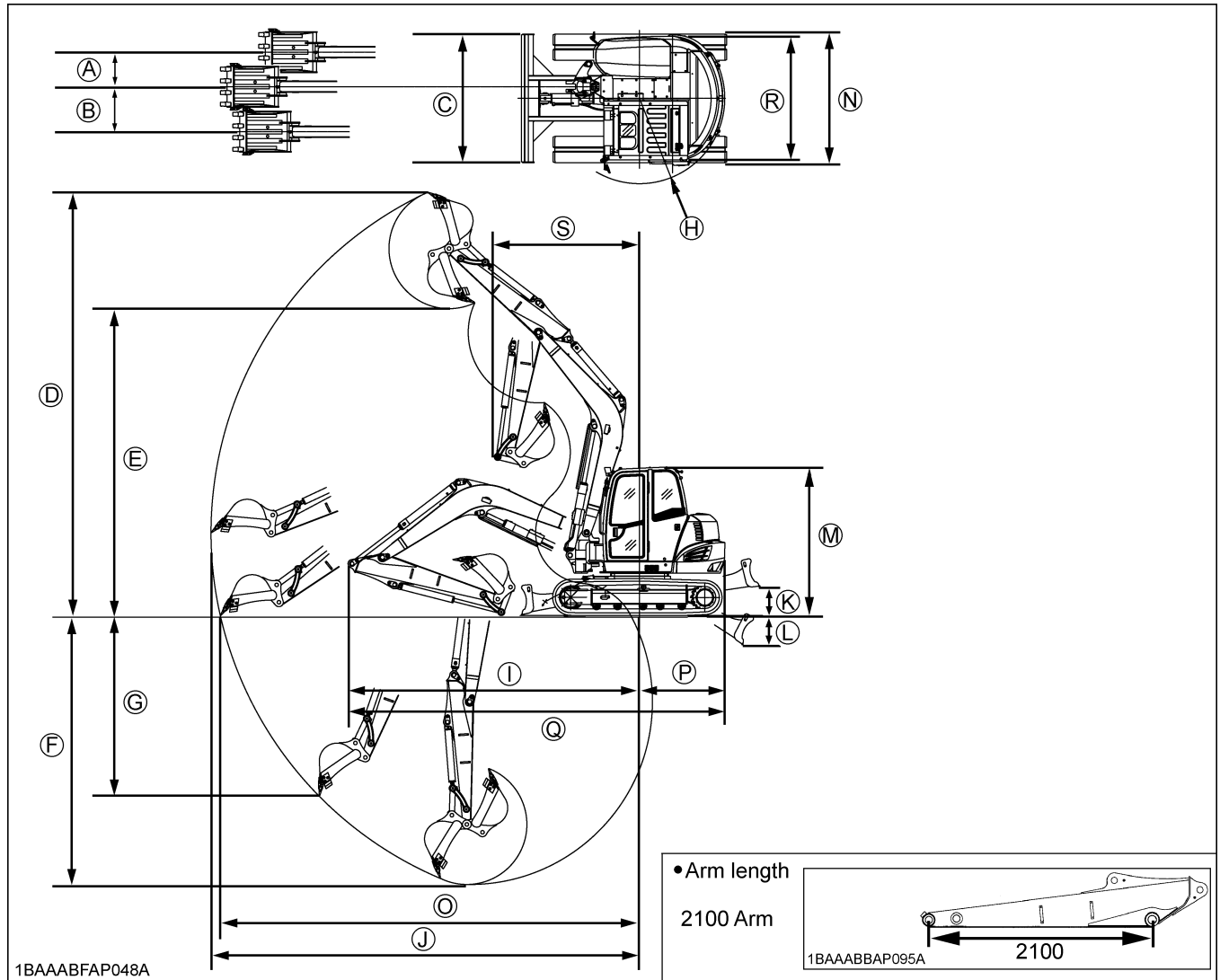
- The CJ-4 engine oil is intended for DPF (Diesel Particulate Filter) type engines, and cannot be used on this machine.

◆ **Fuel:**

- Cetane number of 45 is minimum. Cetane number greater than 50 is preferred, especially for temperatures below -20 °C or elevations above 1500 m .
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.
- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)

APPENDICES

MAIN DIMENSIONS



mm

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
KX080-3	590	770	2200	7240	5250	4600	3090	1460	4990	7330
	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	
KX080-3	500	500	2540	2200	7170	1460	6450	2150	2490	

NOTE :

- Above dimensions are based on the machine with KUBOTA original bucket.
- Above dimensions are based on the machine with rubber track.
- Specifications subject to change without notice.

LIFTING CAPACITY

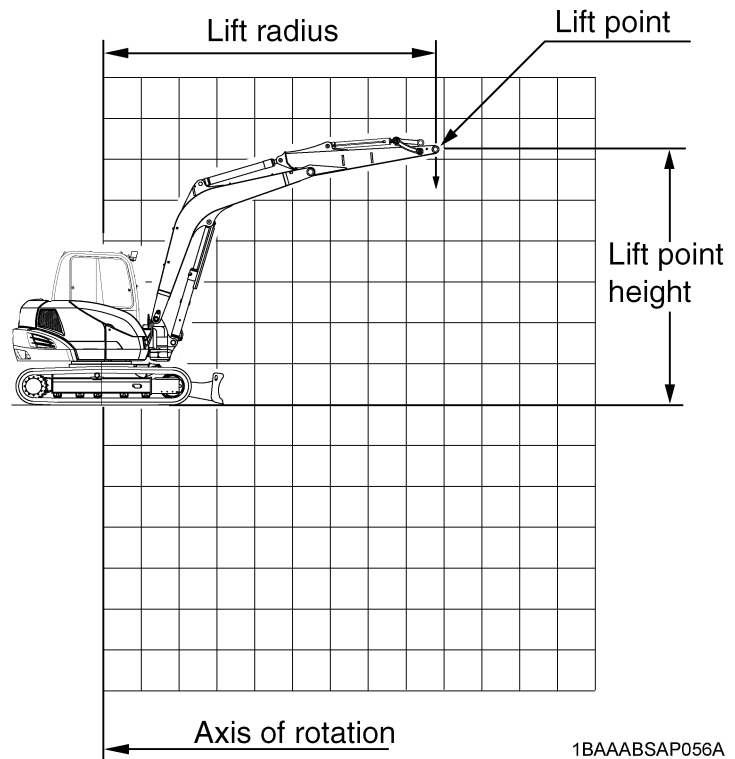
1. The lifting capacities are based on ISO 10567 and do not exceed 75% of the static tilt load of the machine or 87% of the hydraulic lifting capacity of the machine.
 2. The strokes are as follows.
 - (1) The load point corresponds to the front bolt part of the arm.
 - (2) The machine positions are (i) over - front (Blade down), (ii) over - front (Blade up), 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:

- No loads greater than those values mentioned in the lifting capacity tables are to be lifted.
- The values mentioned in the table are valid only on even, hard grounds. When lifting on soft ground, the machine can tip over due to the load being 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.
- Never lift the machine with the angle blade placed at an angle.



KX080-3 2100 ARM
RUBBER TRACKS
STEEL TRACKS (450width)

LIFT POINT HEIGHT (m)	LIFT POINT RADIUS (m)					kN (kg)
	MIN.	3	4	5	MAX.	
+5						
+4			15.2 (1550)	14.2 (1450)	11.3 (1160)	
+3	23.0 (2350)	21.6 (2210)	18.1 (1850)	13.7 (1400)	9.8 (1000)	
+2	35.8 (3660)	30.4 (3110)	19.1 (1950)	13.2 (1350)	9.3 (950)	
+1	27.9 (2850)	27.9 (2850)	17.7 (1810)	12.7 (1300)	8.8 (900)	
0	19.6 (2000)	27.0 (2760)	17.2 (1760)	12.3 (1260)	9.3 (950)	
-1	18.6 (1900)	26.5 (2710)	16.7 (1710)	12.3 (1260)	9.8 (1000)	
-2	27.5 (2810)	27.0 (2760)	16.7 (1710)	12.3 (1260)	11.8 (1210)	
-3	50.5 (5160)	24.0 (2450)	16.2 (1660)			

OVER-FRONT (BLADE UP)

LIFT POINT HEIGHT (m)	LIFT POINT RADIUS (m)					kN (kg)
	MIN.	3	4	5	MAX.	
+5			14.2 (1450)			
+4			15.2 (1550)	15.2 (1550)	15.2 (1550)	
+3	23.0 (2350)	21.6 (2210)	18.1 (1850)	16.2 (1660)	15.2 (1550)	
+2	38.7 (3960)	32.9 (3360)	22.6 (2310)	18.1 (1850)	15.7 (1610)	
+1	27.9 (2850)	40.7 (4160)	26.5 (2710)	20.1 (2060)	15.7 (1610)	
0	19.6 (2000)	42.7 (4370)	28.4 (2900)	21.1 (2160)	16.2 (1660)	
-1	18.6 (1900)	40.2 (4110)	27.9 (2850)	20.6 (2110)	16.7 (1710)	
-2	27.5 (2810)	34.8 (3560)	24.5 (2510)	17.2 (1760)	16.7 (1710)	
-3	50.5 (5160)	24.0 (2450)	16.2 (1660)			

OVER-FRONT (BLADE DOWN)

LIFT POINT HEIGHT (m)	LIFT POINT RADIUS (m)					kN (kg)
	MIN.	3	4	5	MAX.	
+5			14.2 (1450)			
+4			15.2 (1550)	10.8 (1100)	8.8 (900)	
+3	23.0 (2350)	21.6 (2210)	15.2 (1550)	10.8 (1100)	7.8 (800)	
+2	25.5 (2610)	22.1 (2260)	14.2 (1450)	10.3 (1050)	6.9 (710)	
+1	22.6 (2310)	20.1 (2060)	13.2 (1350)	9.8 (1000)	6.9 (710)	
0	19.6 (2000)	19.1 (1950)	12.7 (1300)	9.3 (950)	6.9 (710)	
-1	18.6 (1900)	19.1 (1950)	12.3 (1260)	9.3 (950)	7.4 (760)	
-2	27.5 (2810)	19.1 (1950)	12.3 (1260)	9.3 (950)	8.8 (900)	
-3	50.5 (5160)	19.6 (2000)	12.7 (1300)			

OVER-SIDE

1BAAABFAP0870

KX080-3 2100 ARM
STEEL TRACKS (600width)

LIFT POINT HEIGHT (m)	LIFT POINT RADIUS (m)					kN (kg)
	MIN.	3	4	5	MAX.	
+5			14.2 (1450)			
+4			15.2 (1550)	15.2 (1550)	12.3 (1260)	
+3	23.0 (2350)	21.6 (2210)	18.1 (1850)	15.2 (1550)	10.8 (1100)	
+2	38.7 (3960)	32.9 (3360)	20.6 (2110)	14.7 (1500)	10.3 (1050)	
+1	27.9 (2850)	30.4 (3110)	19.6 (2000)	14.2 (1450)	9.8 (1000)	
0	19.6 (2000)	29.4 (3010)	18.6 (1900)	13.7 (1400)	10.3 (1050)	
-1	18.6 (1900)	29.4 (3010)	18.6 (1900)	13.2 (1350)	11.3 (1160)	
-2	27.5 (2810)	29.4 (3010)	18.6 (1900)	13.2 (1350)	13.2 (1350)	
-3	50.5 (5160)	24.0 (2450)	16.2 (1660)			

OVER-FRONT (BLADE UP)

LIFT POINT HEIGHT (m)	LIFT POINT RADIUS (m)					kN (kg)
	MIN.	3	4	5	MAX.	
+5			14.2 (1450)			
+4			15.2 (1550)	15.2 (1550)	15.2 (1550)	
+3	23.0 (2350)	21.6 (2210)	18.1 (1850)	16.2 (1660)	15.2 (1550)	
+2	38.7 (3960)	32.9 (3360)	22.6 (2310)	18.1 (1850)	15.7 (1610)	
+1	27.9 (2850)	40.7 (4160)	26.5 (2710)	20.1 (2060)	15.7 (1610)	
0	19.6 (2000)	42.7 (4370)	28.4 (2900)	21.1 (2160)	16.2 (1660)	
-1	18.6 (1900)	40.2 (4110)	27.9 (2850)	20.6 (2110)	16.7 (1710)	
-2	27.5 (2810)	34.8 (3560)	24.5 (2510)	17.2 (1760)	16.7 (1710)	
-3	50.5 (5160)	24.0 (2450)	16.2 (1660)			

OVER-FRONT (BLADE DOWN)

LIFT POINT HEIGHT (m)	LIFT POINT RADIUS (m)					kN (kg)
	MIN.	3	4	5	MAX.	
+5			14.2 (1450)			
+4			15.2 (1550)	12.3 (1260)	9.8 (1000)	
+3	23.0 (2350)	21.6 (2210)	16.7 (1710)	11.8 (1210)	8.3 (850)	
+2	27.9 (2850)	24.0 (2450)	15.7 (1610)	11.3 (1160)	7.8 (800)	
+1	24.5 (2510)	22.1 (2260)	14.7 (1500)	10.8 (1100)	7.4 (760)	
0	19.6 (2000)	21.1 (2160)	14.2 (1450)	10.3 (1050)	7.8 (800)	
-1	18.6 (1900)	21.1 (2160)	13.7 (1400)	10.3 (1050)	8.3 (850)	
-2	27.5 (2810)	21.1 (2160)	13.7 (1400)	10.3 (1050)	9.8 (1000)	
-3	50.5 (5160)	21.6 (2210)	14.2 (1450)			

OVER-SIDE