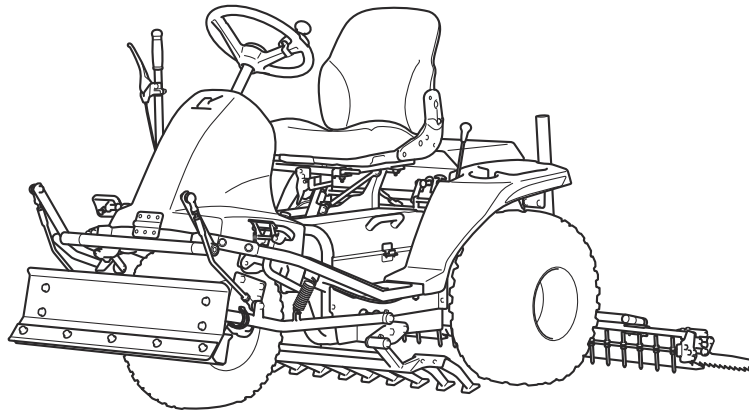


SP160EB

Electric Bunker Rake

Owner's Operating Manual



Serial No. SP160EB : 10422-

"Required reading"

Read this manual before using the machine.

BARONESS[®]
Quality on Demand

Original Instructions Ver.2.3

SP160EB

Regulations

EU Regulations

(For EU)

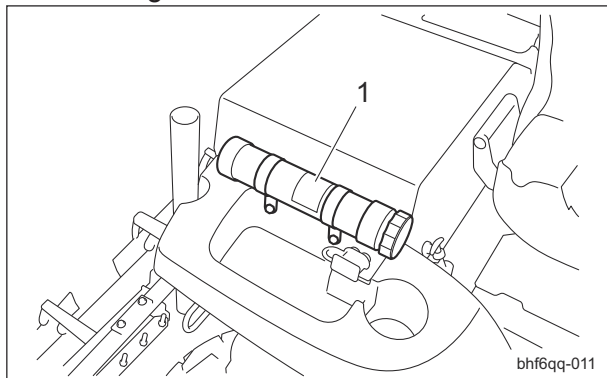
This product complies with all relevant EU Regulations.

For more information, please refer to the Declaration of Conformity attached.

Thank you for purchasing the Baroness product. This manual describes the proper handling, adjustment, and inspection of your product. We hope you will use the product safely, and take advantage of its best performance.

Keeping The Owner's Operating Manual

Keep this Owner's Operating Manual in the box on the rear right side of the seat.



Keeping The Owner's Operating Manual_001

1	Box
---	-----

QR Code

(*QR Code is a registered trademark of DENSO WAVE INCORPORATED.)

A QR code label is affixed on the machine.



QR Code_001

1	QR code label
---	---------------

Scan the QR code with your smartphone for easy access to Baroness Manual Reference Service where you can browse Owner's Operating Manual and Parts Catalog.
<https://doc.baroness-international.com/manuals/SP160EB>



QR Code_002

Read this manual carefully to ensure that you thoroughly understand how to properly operate and maintain the product, and to avoid causing injury to yourself or others.

The operator is responsible for operating the product properly and safely.

Maintenance service for this machine should be performed by a mechanic with expertise.

If you have any questions concerning maintenance or genuine parts, please contact a Baroness dealer or Kyoisha.

When making inquiries about your product, please specify the model and serial number.

When loaning or transferring the product, please also provide this manual together with the product.

Kyoisha Co., Ltd.

Warning Symbols

This manual uses the following warning symbols for handling precautions that are important for your safety.

 696cq5-001	Warning symbol
--	----------------

This symbol indicates the articles regarding “Danger,” “Warning,” or “Caution.” Those articles describe important safety precautions and so read them carefully to understand completely before operating the machine.

Failure to adequately follow these safety precautions may cause an accident.

 **Danger**

This symbol indicates that serious injury or death will occur if the warning is ignored.

 **Warning**

This symbol indicates that serious injury or death may occur if the warning is ignored.

 **Caution**

This symbol indicates that injury or damage to property may occur if the warning is ignored.

Important

This symbol indicates precautions on the mechanism of the machine.

Precautionary Statement

Caution

The information described in this manual is subject to change for improvement without prior notice.

When replacing parts, be sure to use genuine Baroness parts or parts designated by Kyoisha.

Note that the Baroness product warranty may not apply to defects caused by the use of parts from other companies.

Prior to use, carefully read the following manuals to thoroughly understand the contents for safe and correct operation.

- Baroness Owner's Operating Manual
- The Battery's Owner's Manual
- The Charger's Owner's Manual

Purpose

This product is intended for leveling bunkers at golf courses.

Do not use this product in any other way than its intended purpose, and do not modify the product.

Operating this product for other purposes and modifying it may be very dangerous and may cause damage to the machine.

In addition, this product is not authorized for operation as a special motor vehicle. Do not operate it on public roads.

Introduction

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Safety

Failure to adequately follow these safety precautions may cause an accident resulting in injury or death.

Danger

This product is designed to ensure safe operation and has been tested and inspected thoroughly before shipment from the factory. The product is equipped with safety devices to prevent accidents.

However, whether the product demonstrates its original performance level depends on the manner in which it is operated and handled, as well as the manner in which it is managed on a daily basis.

Inappropriate use or management of the product may result in injury or death.

Observe the following safety instructions to ensure safe operation.

Safe Operating Practices

Training

1. Read this manual and other training material carefully.
Be familiar with the controls, safety signs, and the proper use of the equipment.

2. If the operator or mechanic can not read the language used in this manual, it is the owner's responsibility to explain this material to them.

3. All operators and mechanics should seek and obtain professional and practical instruction.

The owner is responsible for training the users.

Such instruction should emphasize:

- [1] The need for care and concentration when working with ride-on machines.

- [2] Control of a ride-on machine sliding on a slope will not be regained by the application of the brake.

The main reasons for loss of control are

- Insufficient wheel grip
- Being driven too fast
- Inadequate braking
- The type of machine is unsuitable for its task
- Lack of awareness of the effect of ground conditions, especially slopes
- Incorrect hitching and load distribution

4. Never allow children or people unfamiliar with these instructions to use or service the machine.

Local regulations may restrict the age of the operator.

5. The owner/user can prevent and is responsible for accidents or injuries occurring to themselves, other people, or property.
6. Keep in mind that the owner, operator, and mechanic are responsible for accidents or hazards occurring to other people or their property.
7. You can find additional safety information where needed throughout this manual.
8. Determine the left and right sides of the machine from the normal operating position.

Preparation

1. Evaluate the terrain to determine what accessories and attachments are needed to properly and safely perform the job.
Only use accessories and attachments approved by the manufacturer.
2. While operating, always wear substantial footwear, long trousers, hard hat, safety glasses, mask, and ear protection.
Long hair, loose clothing, or jewelry may get tangled in moving parts.
Do not operate the equipment when barefoot or wearing open sandals.
3. Inspect the area where the equipment is to be used and remove all objects such as rocks, toys and wire which can be thrown by the machine.
4. Keep children out of the operating area and under the watchful care of a responsible adult other than the operator.
5. Check that operator's presence controls, safety switches and shields are attached and functioning properly.
Do not operate unless they are functioning properly.
6. If the brake operation is faulty, be sure to adjust or repair them before operating the machine.

Operation

1. Do not operate the machine under the influence of alcohol or drugs.

2. Before attempting to power up, disengage all attachments, shift into neutral, and engage the parking brake.
Only power up from the operator's position.
3. Never operate the machine with damaged guards, shields, or without safety protective devices in place.
Be sure all interlocks are attached, adjusted properly, and functioning properly.
4. Do not carry passengers.
5. Never operate while people, especially children, or pets are nearby.
6. Only operate in good light, keeping away from holes and hidden hazards.
7. Do not operate the machine when there is the risk of lightning.
8. Do not stop or start suddenly.
9. Look behind and down before backing up to be sure of a clear path.
10. Slow down and use caution when making turns and crossing roads and sidewalks.
11. Use care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.
12. Do not take your eyes off the road ahead.
Do not operate the machine with no hands.
13. Remember there is no such thing as a safe slope.
Travel on grass slopes requires particular care.
To guard against overturning, follow these instructions.
 - [1] Do not stop or start suddenly when going up or downhill.
 - [2] Engage clutch slowly, always keep machine in gear, especially when traveling downhill.
 - [3] Machine speeds should be kept low on slopes and during turns.
 - [4] Stay alert for humps and hollows and other hidden hazards.
14. Never use the machine on a slope with an angle of gradient that is greater than that specified or in a place where there is a danger of the machine slipping.
15. Do the following before leaving the operator's position.
 - [1] Stop on level ground.
 - [2] Set the parking brake.
 - [3] Power down.

- [4] Remove the switch key.
16. Power down in the following conditions.
 - [1] Before making height or depth adjustment unless adjustment can be made from the operator's position.
 - [2] Before checking, cleaning or working on the machine.
 - [3] After striking a foreign object or if an abnormal vibration occurs.
Inspect the machine for damage and make repairs before restarting and operating the equipment.
17. Take care when loading or unloading the machine into a trailer or a truck.
Load or unload the machine in a flat and safe place.
Before loading or unloading, set the parking brake on the truck or trailer, stop the engine, and chock the wheels.
When transporting the machine on a truck or a trailer, set the parking brake, power down, and fasten the machine to the truck with a rope or other suitable restraining device that has sufficient strength.
When using a running board, select one with sufficient strength, length, and width and that will not cause the machine to slip.

Maintenance

1. Never allow untrained personnel to service machine.
2. Implement the following work before adjusting, cleaning or repairing.
 - [1] Stop the machine on level ground.
 - [2] Set the parking brake.
 - [3] Power down.
 - [4] Remove the switch key.
 - [5] Wait for all movement to stop.
3. To reduce the fire hazard, keep battery compartment, attachments and drives free of grass, leaves, or excessive grease.
Clean up oil.
4. Appropriately manage and correctly use the tools necessary for servicing or adjusting the machine.
5. Disconnect battery before making any repairs.
Disconnect the negative terminal first and the positive last.
Reconnect positive first and negative last.

Safety

6. Use jack stands to support components when required.
7. Keep hands and feet away from moving parts.
8. Make sure that parts such as wires are not touching each other and that their covers have not come off.
9. Keep all parts in good working condition and all hardware tightened.
Replace all worn or damaged decals.
10. Keep all nuts, bolts and screws tight to be sure the equipment is in safe working condition.
11. Carefully release pressure from components with stored energy.
12. Charge batteries in an open well ventilated area, away from spark and flames.
Unplug charger before connecting or disconnecting from battery.
Wear protective clothing and use insulated tools.

Storage

1. Do not store the machine indoors where there is a flame or a spark.

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About Waste Disposal Page 2-2

Disposal

Recycle and Waste Disposal

About Recycle

Recycling battery etc. is recommended for environmental conservation and economical use of resources.

It may be required by local laws.

About Waste Disposal

Make sure that waste generated when servicing or repairing the machine is disposed of in accordance with local regulations. (e.g. waste oil, antifreeze, rubber products, and wires etc.)

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SpecificationsPage 3-2

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Product Overview

Specifications

Specifications

Model			SP160EB	
Name			Electric Bunker Rake	
Dimensions	Total length	with Rake	200 cm	78.74 in
		with Rake and Blade	230 cm	90.55 in
	Total width		190 cm	74.80 in
	Total height	Steering wheel	124 cm	48.82 in
Weight	Machine (empty fuel tank)	with Rake	491 kg	1,082.45 lb
	Blade		25 kg	55.11 lb
	Cultivator		19 kg	41.89 lb
	Finishing brush		10.6 kg	23.37 lb
Minimum turning radius			339 cm	133.46 in
Motor	Model		MPUX250-0245FP1	
	Type		AC motor	
	Rated output		2.5 kW (3.40 PS)/2,000 rpm	
	Maximum rpm		2,400 rpm	
Transmission oil capacity			2.0 dm ³ (2.0 L)	0.53 U.S.gal.
Operating width	Rake		190 cm	74.80 in
	Blade		80 cm	31.50 in
	Cultivator		116 cm	45.67 in
	Finishing brush		195 cm	76.77 in
Operating height			-	
Drive	Traveling		Mechanical	
	Operating		-	
Speed (HST)			-	
Speed (Mechanical)	Forward	Low	0 - 7.5 km/h	0 - 4.66 mph
		High	0 - 15.0 km/h	0 - 9.32 mph
	Reverse	Low	0 - 2.5 km/h	0 - 1.55 mph
		High	0 - 5.0 km/h	0 - 3.11 mph
Efficiency			-	
Maximum inclination for operation			15 degrees	
Tire size	Front wheel		PD21 x 11.00 - 10	
	Rear wheel		22 x 11.00 - 8	
Tire pneumatic pressure	Front wheel		70 kPa (0.7 kgf/cm ²)	10 psi
	Rear wheel		40 kPa (0.4 kgf/cm ²)	6 psi
Battery			Trojan Battery T-890 Deep-Cycle Flooded/Wet Lead-Acid Battery 8V x 6	

* The factory default maximum motor rpm is 2,400 rpm.

Sound Pressure Level

Sound Pressure Level

This machine was confirmed to have a continuous A-weighted sound pressure level of 64 dB by measuring identical machines in accordance with the procedure specified in ISO5395-1:2013.

Sound Power Level

Sound Power Level

This machine was confirmed to have a sound power level of 82 dB by measuring identical machines in accordance with the procedure specified in ISO5395-1:2013.

Vibration Level

Hand-Arm Vibration

This machine was confirmed not to exceed a vibration level of 2.5 m/s^2 to hands and arms by measuring identical machines in accordance with the procedure specified in ISO 5395-1:2013.

Uncertainty $K = 0.1 \text{ m/s}^2$

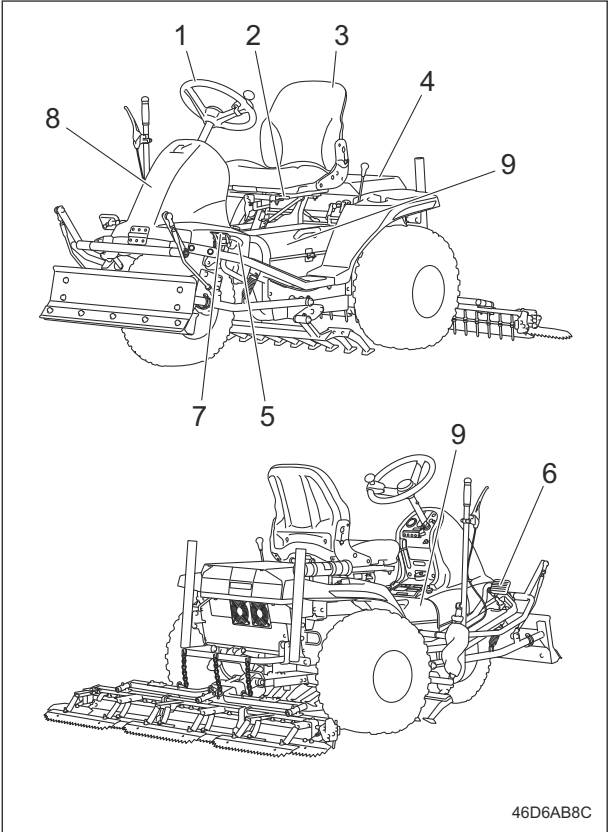
Whole Body Vibration

This machine was confirmed not to exceed a vibration level of 0.5 m/s^2 to the whole body by measuring identical machines in accordance with the procedure specified in ISO 5395-1:2013.

Uncertainty $K = 0.2 \text{ m/s}^2$

Names of Each Section

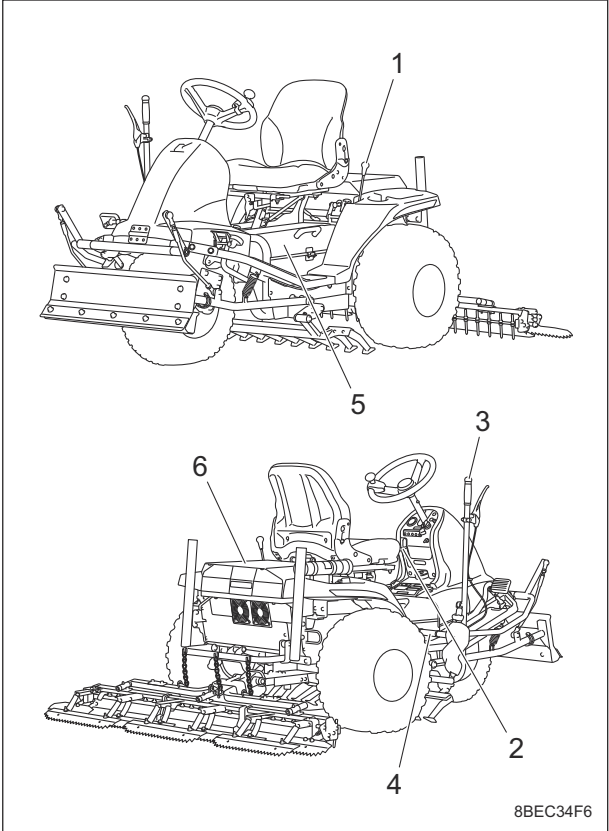
Overall view A



Names of Each Section_001

1	Steering wheel
2	Seat lever
3	Seat
4	Driver platform
5	Brake pedal
6	Traveling pedal
7	Locking pedal
8	Front cover
9	Battery cover

Overall view B

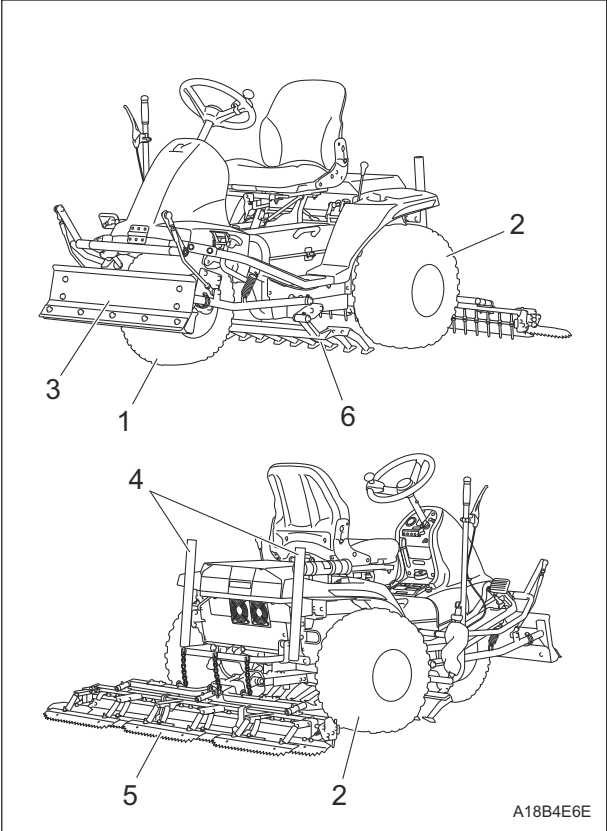


Names of Each Section_002

1	Shift lever
2	Tilt lever
3	Cultivator lever (Option)
4	Blade lever (Option)
5	Battery
6	Cooling fins

Product Overview

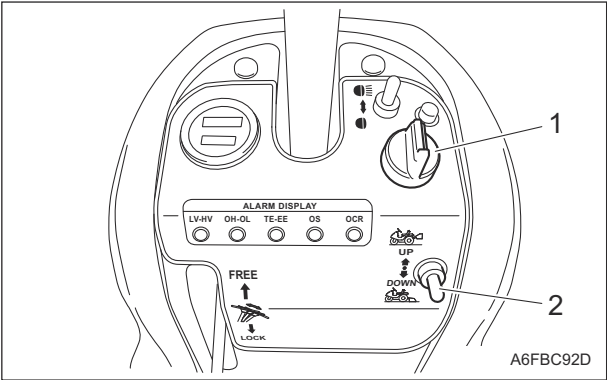
Overall view C



Names of Each Section_003

1	Front tire
2	Rear tire
3	Blade (Option)
4	Broom holder
5	Rake
6	Cultivator (Option)

Operation panel



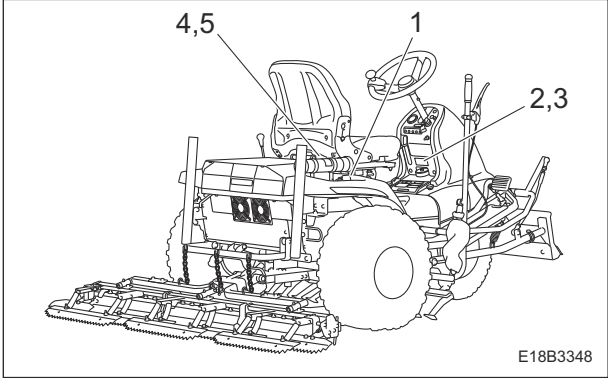
Names of Each Section_004

1	Key switch
2	Up/Down switch lever

Regulation Decals

Positions of Regulation Decals

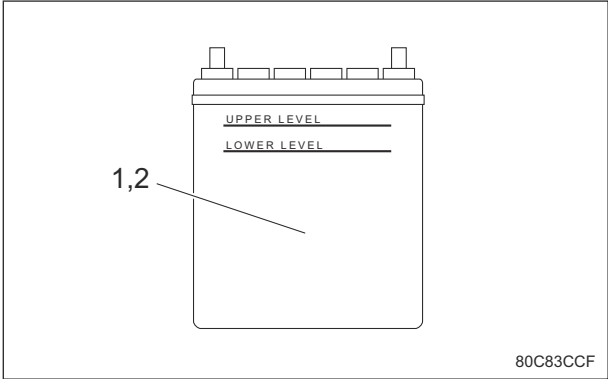
Main vehicle



Positions of Regulation Decals_001

1	Serial number plate
2	Specification decal
3	UKCA mark (#10416 - 10426)
4	Year of manufacture decal
5	ISED compliance decal (#10427-)

Battery



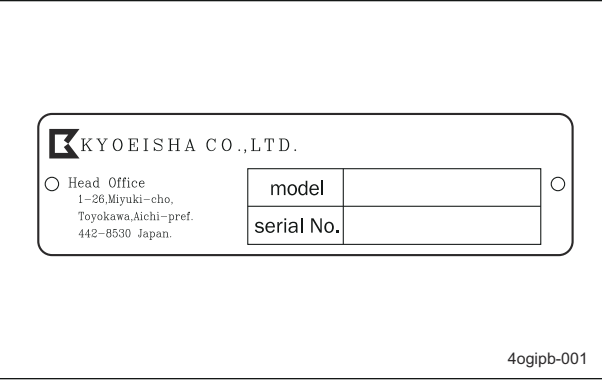
Positions of Regulation Decals_002

1	Battery capacity decal
2	Recycle decal

Description of Regulation Decals

Serial Number Plate

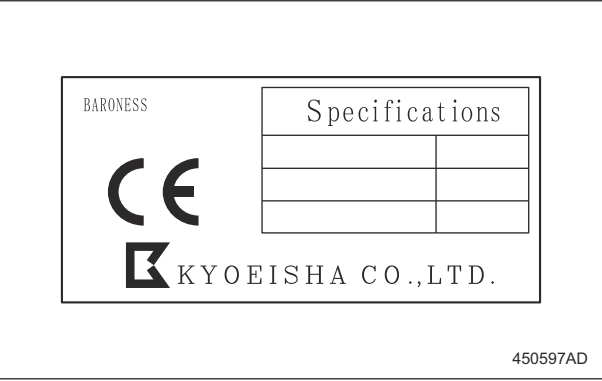
The serial number plate indicates the model and serial number of the machine.



Serial Number Plate_001

Specification Decal

(For EU)
The Specification decal indicates the model and weight, etc.



Specification Decal_001

UKCA Mark

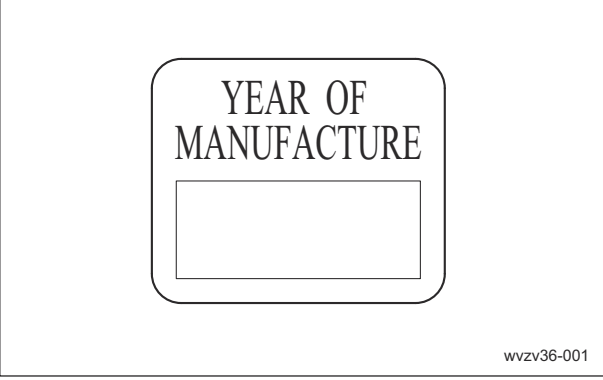
(For UK)
UKCA mark indicates that the machine sold in the UK complies with the UK requirements.



UKCA Mark_001

Year of Manufacture Decal

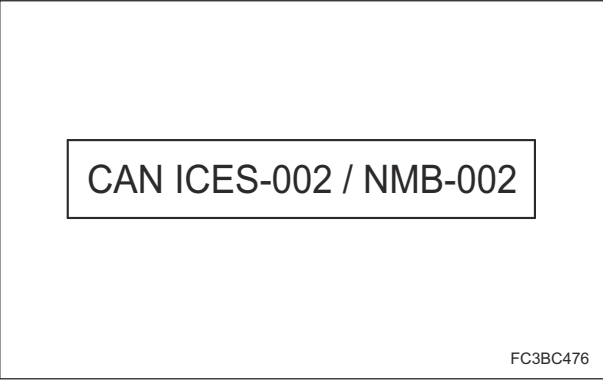
(For EU)
The year of manufacture decal indicates the year when this machine was manufactured.



Year of Manufacture Decal_001

ISED Compliance Decal

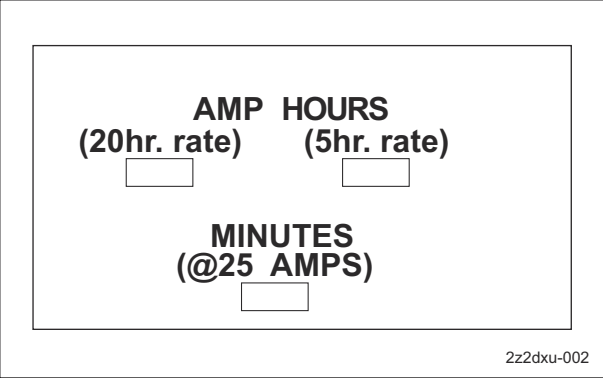
(For Canada)
The ISED compliance decal indicates that the product marketed in Canada meets Canadian standard.



ISED Compliance Decal_001

Battery Capacity Decal

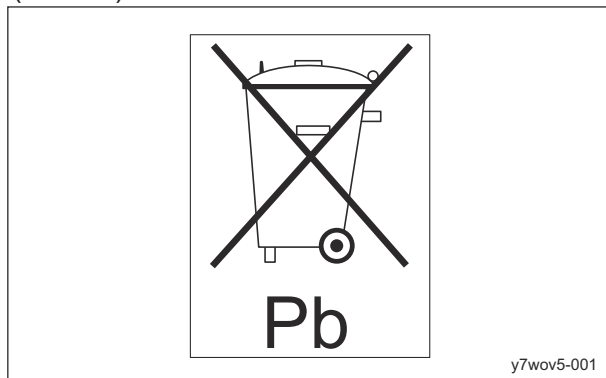
(For Europe)
The battery capacity decal indicates the capacity by 20HR and CCA.



Battery Capacity Decal_001

Recycle Decal

Recycle Decal illustrates Recycle Mark in accordance with local regulation.
(For EU)



Recycle Decal_001

(For USA)



Recycle Decal_002

Safety Signs and Instruction Signs

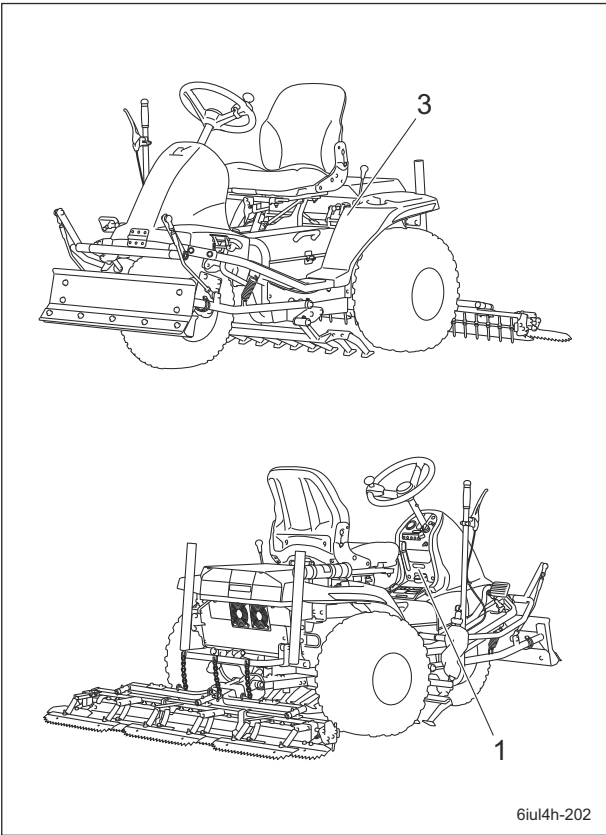
About Safety Signs and Instruction Signs

Important

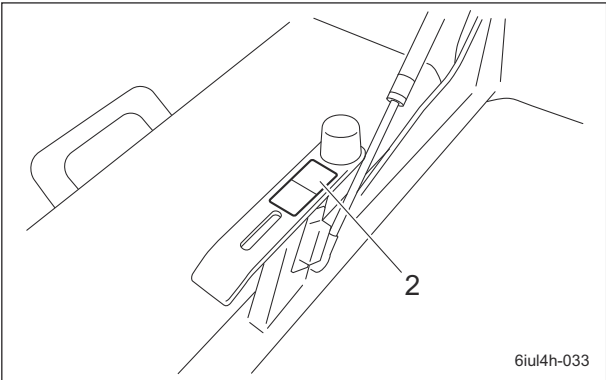
Safety decals and instruction decals are attached to this product. Make sure that they are preserved in their entirety. If they are damaged, become dirty, or peel off, replace them with new ones.

Part numbers for decals that need to be replaced are listed in the parts catalog. Order them from a Baroness dealer or Kyoeisha.

Positions of Safety Decals and Instruction Decals



Positions of Safety Decals and Instruction Decals_001



Positions of Safety Decals and Instruction Decals_002

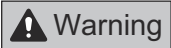
1	Warning decal
2	Caution for getting pinched decal
3	Speed instruction decal

Description of Safety Decals and Instruction Decals

Warning Decal

SP160EB0103Z0
DECAL, WARNING

1.



Read the Owner's Operating Manual.

2.



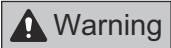
Thrown objects - Be sure that people around the machine keep a safe distance away.

3.

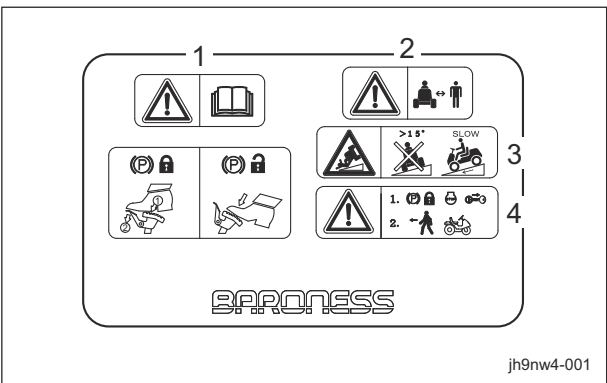


Rollover - Do not work on slopes of 15 degrees or more.
When you descend a slope, drive at low speed.

4.



Apply the parking brake, power down, and then remove the key before leaving the machine.



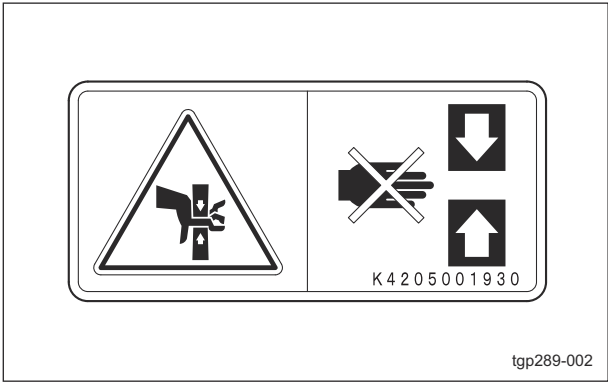
Warning Decal_001

Caution for Getting Pinched Decal

K4205001930
DECAL, CAUTION GETTING CAUGHT
HANDS/FEET



May get pinched - There is a risk of being pinched.



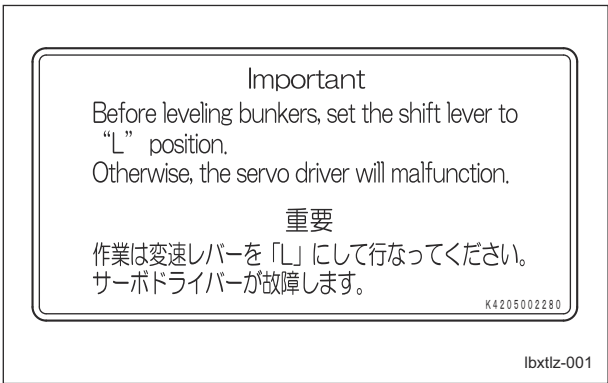
Caution for Getting Pinched Decal_001

Speed Instruction Decal

K4205002280
Decal, Speed Instruction



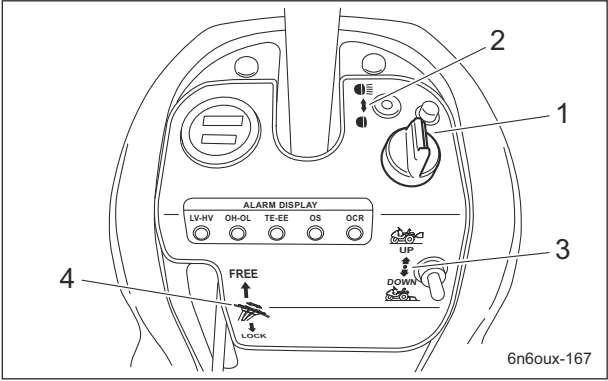
Before leveling bunkers, set the shift lever to "L (Low speed)" position.
Otherwise, the servo driver will malfunction.



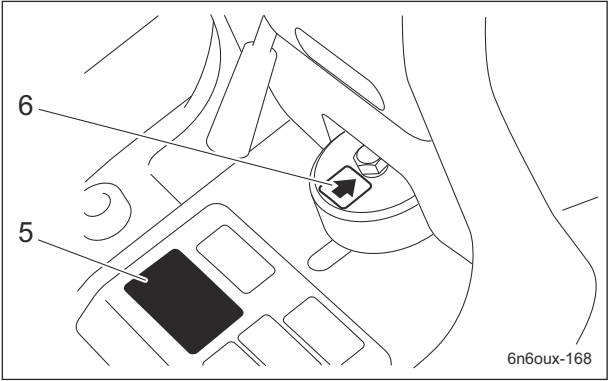
Speed Instruction Decal_001

Operation Decals

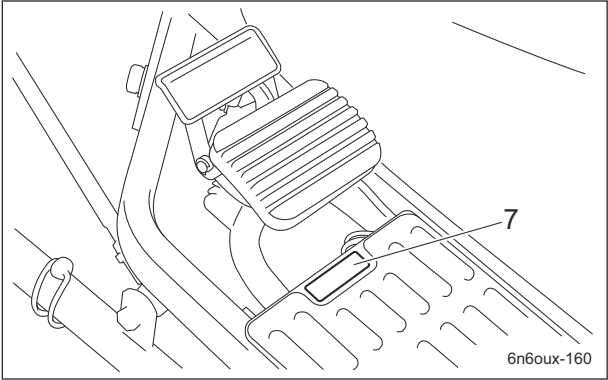
Positions of Operation Decals



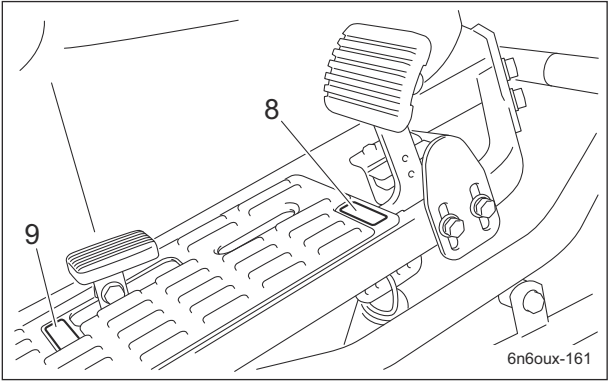
Positions of Operation Decals_001



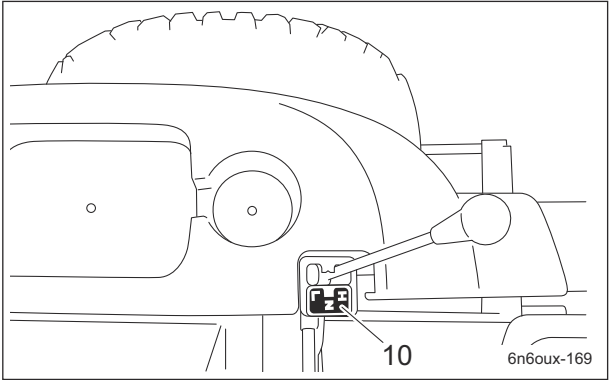
Positions of Operation Decals_002



Positions of Operation Decals_003



Positions of Operation Decals_004



Positions of Operation Decals_005

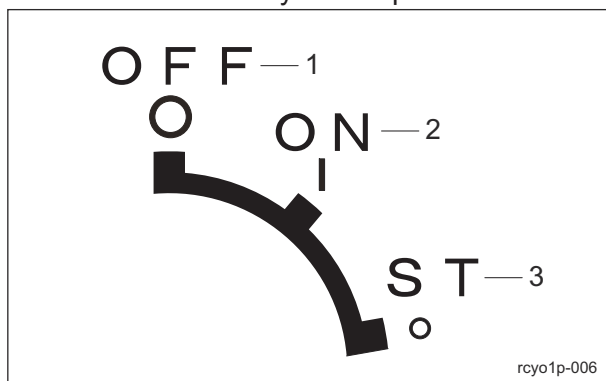
1	Key switch mark
2	Light switch mark
3	Rake up/down mark
4	Tilt steering mark
5	Parking brake mark
6	Front wheel mark
7	BRAKE decal
8	FORWARD decal
9	BACKWARD decal
10	Indicating shift decal

Description of Operation Decals

Key Switch Mark

Key switch mark

This indicates the key switch positions.



Key Switch Mark_001

1	OFF
2	ON
3	START

Light Switch Mark

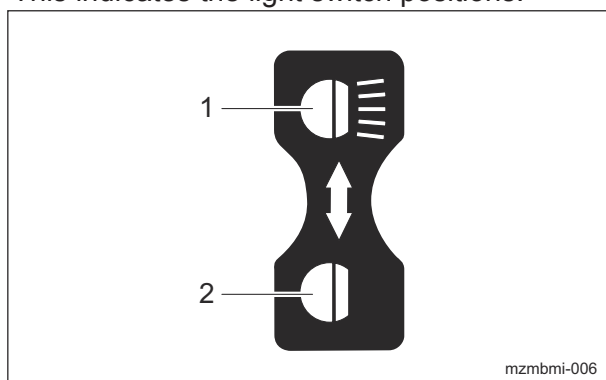
Note:

Depending on the specifications, this function may not be available.

K4203001410

STICKER, LIGHT SWITCH

This indicates the light switch positions.



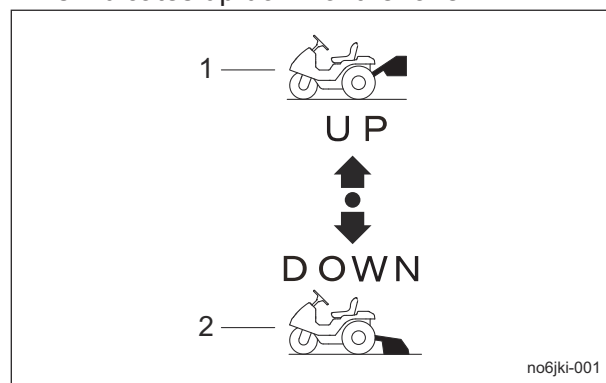
Light Switch Mark_001

1	ON
2	OFF

Rake Up/Down Mark

Rake up/down mark

This indicates up/down of the rake.



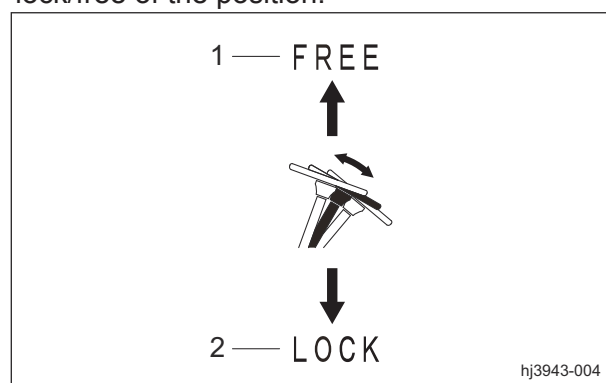
Rake Up/Down Mark_001

1	UP
2	DOWN

Tilt Steering Mark

Tilt steering mark

This indicates the direction of tilt steering and lock/free of the position.

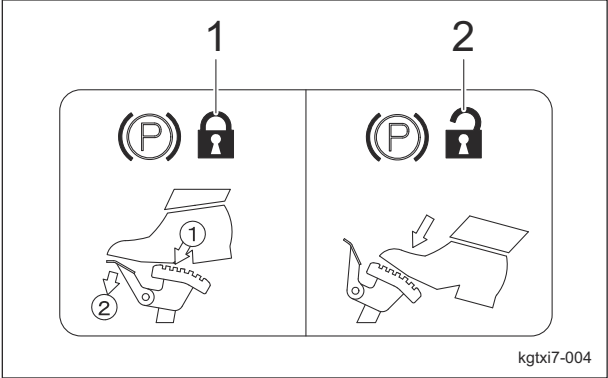


Tilt Steering Mark_001

1	FREE
2	LOCK

Parking Brake Mark

Parking brake mark
This indicates lock/release of the parking brake.

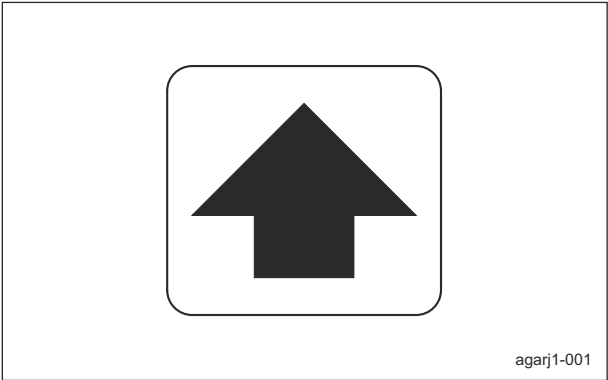


Parking Brake Mark_001

1	Lock
2	Release

Front Wheel Mark

K4209001180
DECAL, ARROW POINT
This indicates the front wheel direction.



Front Wheel Mark_001

BRAKE Decal

K4203001450
Decal, BRAKE
This indicates brake.



BRAKE Decal_001

FORWARD Decal

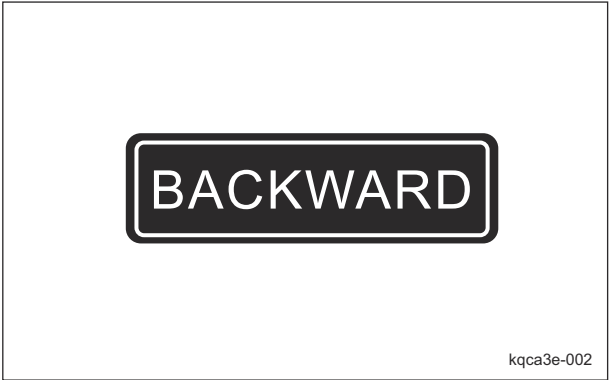
K4203001430
Decal, FORWARD
This indicates forward travel.



FORWARD Decal_001

BACKWARD Decal

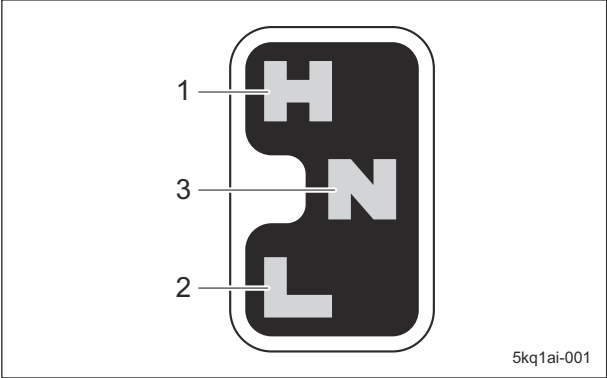
K4203001440
Decal, BACKWARD
This indicates backward travel.



BACKWARD Decal_001

Indicating Shift Decal

SP160E-0131Z0
DECAL, INDICATING SHIFT
This indicates the positions of the shift lever.



Indicating Shift Decal_001

1	High speed
2	Low speed
3	Neutral

Product Overview

Description of Functions

Light Switch Page 4-2

Up/Down Switch Lever Page 4-2

Shift Lever Page 4-2

Traveling Pedal Page 4-3

Brake Pedal Page 4-3

Instruments on The Operation

Panel Page 4-4

 Battery Remaining Charge Gauge Page 4-4

 Alarm Display Panel Page 4-5

Safety Mechanisms Page 4-7

Warning Mechanisms Page 4-7

Travel Safety Device Page 4-7

 Malfunction Detection Page 4-8

Protection Device (OCR) Page 4-10

Description of Functions

Light Switch

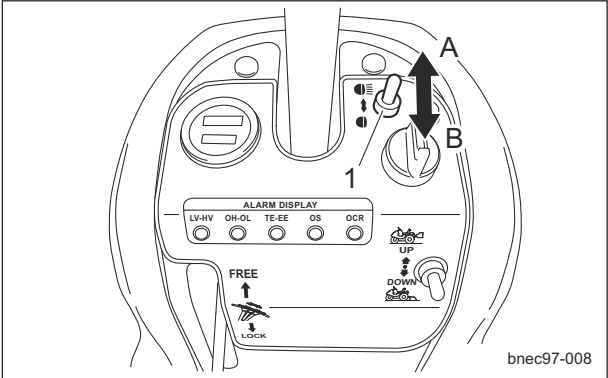
Note:
Depending on the specifications, this function may not be available.

Caution

The lights provide auxiliary lighting.
Do not operate the machine at night or under poor visibility.

The light switch is located in the operation panel.
When the switch is set to the "ON" position, the lights turn on. When it is set to the "OFF" position, the lights turn off.

Note:
The lights do not turn on when the key switch is set to the "OFF" position.



Light Switch_001

1	Light switch
A	ON
B	OFF

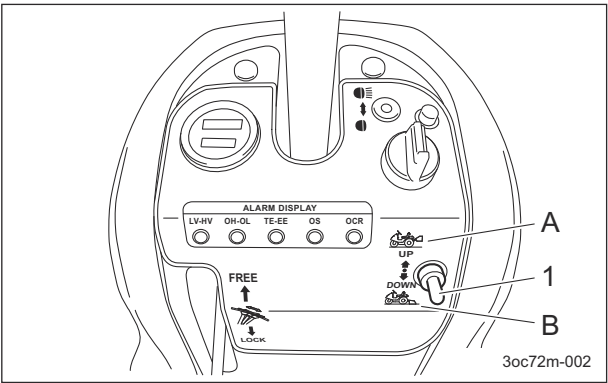
Up/Down Switch Lever

Important

The rake cannot be raised or lowered when the driver platform is open or not correctly closed.

The up/down switch lever is used for operating the rake.

- Shift the up/down switch lever to the "UP" position to raise the rake and automatically stop it at its highest position.
- Shift the up/down switch lever to the "DOWN" position to lower the rake and automatically stop it at its lowest position.
- Shift the up/down switch lever to the neutral position to stop the rake.



Up/Down Switch Lever_001

1	Up/down switch lever
A	UP
B	DOWN

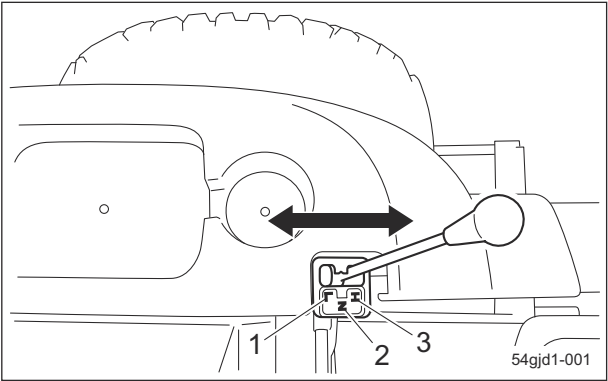
Shift Lever

Caution

When moving the shift lever, make sure to stop the machine completely on a level surface.

The shift lever is located to the left of the seat. It can be set to the three levels "Low speed", "Neutral" and "High speed". Set the lever to the position appropriate for traveling or your work requirements.

Low speed (L):	When leveling the bunker When using the blade When using the cultivator When traveling on steep uphill
Neutral (N):	When towing this machine When servicing this machine
High speed (H):	When traveling



Shift Lever_001

Description of Functions

1	Low speed
2	Neutral
3	High speed

Traveling Pedal

Warning

Do NOT start to move or stop the machine abruptly.
Doing so is very dangerous and may cause damage.

Warning

Do not release the parking brake with your foot left on the traveling pedal.
The machine may suddenly accelerate.

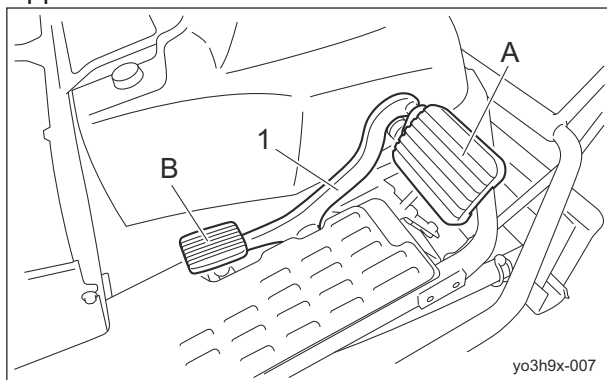
The traveling pedal is located in the right foot area.

When the forward side is depressed, the machine travels forward. When the reverse side is depressed, the machine travels backward. The speed changes in accordance with how much the pedal is depressed.

When you take your foot off the pedal, the machine stops automatically.

Note:

The machine cannot travel if the parking brake is applied.



Traveling Pedal_001

1	Traveling pedal
A	Forward
B	Backward

Brake Pedal

Caution

When leaving the driver's seat, park the machine on a stable, flat surface and be sure to apply the parking brake.

Caution

Do not park on a slope.

Important

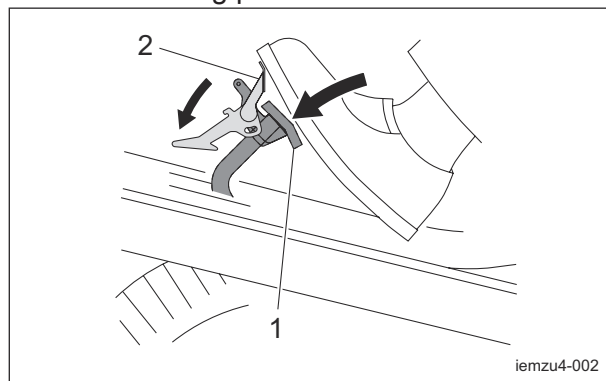
To keep stopping on a slope, be sure to apply the parking brake.
Keeping stopping without braking eats electricity of the battery.

The brake pedal is located in the left foot area.

To stop the machine, depress the brake pedal all the way firmly.

When parking, firmly depress the brake pedal and lock it with the locking pedal.

To release it, firmly depress the brake pedal and release the locking pedal.

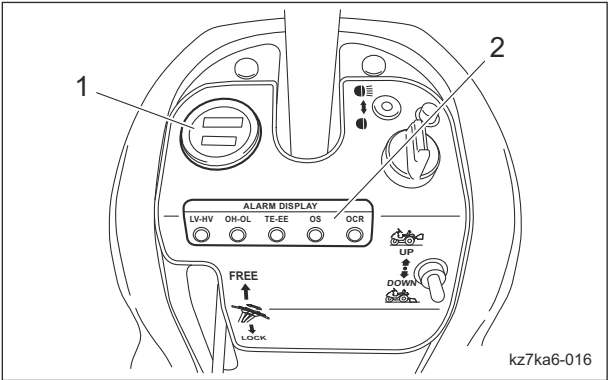


Brake Pedal_001

1	Brake pedal
2	Locking pedal

Description of Functions

Instruments on The Operation Panel



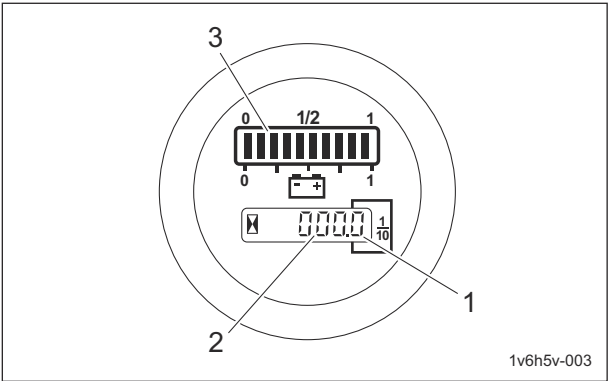
Instruments on The Operation Panel_001

1	Battery remaining charge gauge
2	Alarm display

Battery Remaining Charge Gauge

Battery Remaining Charge

Battery remaining charge is displayed in the upper gauge of the battery remaining charge gauge.



Battery Remaining Charge_001

1	1/10 wheel
2	Hour wheel
3	Battery remaining charge

When the battery is fully charged, the LED indicating lamp on the right end lights up and moves to the left as the battery becomes discharged.

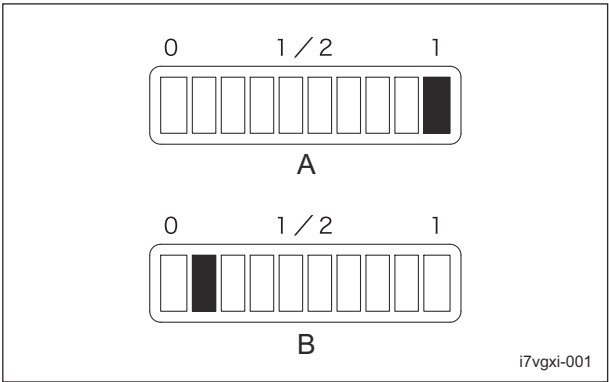
When the second LED indicating lamp from the left lights up, it is time to recharge the battery.

If you continue to operate the machine in this condition, the battery remaining charge will become insufficient and a buzzer will sound. "Alarm Display Panel" (Page 4-5)

When the second LED indicating lamp from the left lights up, immediately recharge the battery.

"Charging of Battery" (Page 6-8)

* The machine up-time per charge differs greatly depending on the course configuration, number of bunkers and operations performed.

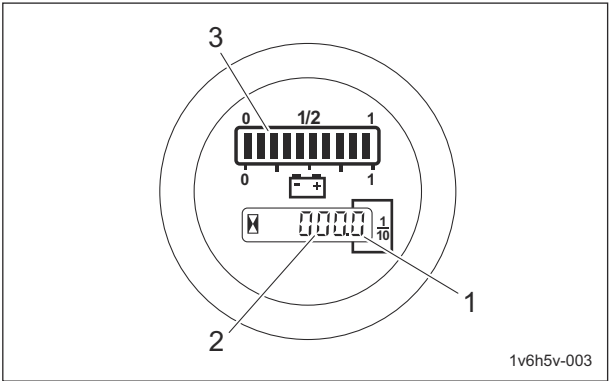


Battery Remaining Charge_002

A	Fully charged
B	Time to recharge

Hour Meter

The accumulated operation time is displayed in the lower gauge of the battery remaining charge gauge in the operation panel. Every six minutes of operation will increase the number at the first digit by one. Every one hour of operation will increase the number at the next digit by one.



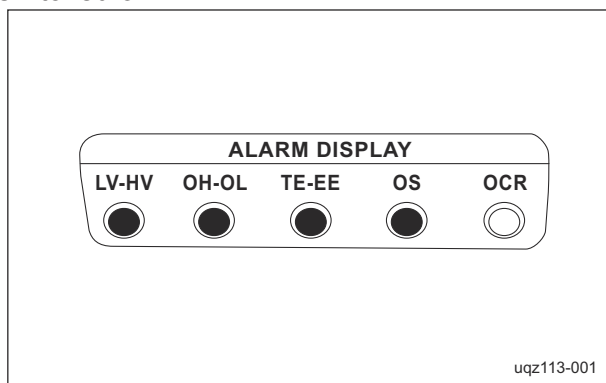
Hour Meter_001

1	1/10 wheel
2	Hour wheel
3	Battery charge remaining

Alarm Display Panel

The alarm display panel is located in the operation panel.

Red (orange for OCR) LEDs light up when a malfunction is detected in the travel electrical control system or when the machine is switched off.



Alarm Display Panel_001

Description of Functions

Code	Name of error	Details of error	Cause	Remedy
LV	Low voltage	Control input voltage drops to 36 V or less for 30 seconds	- Insufficient battery remaining charge - Faulty battery charging - End of battery life	- Recharge the battery. - Check the charger connections. - Measure the specific weight of the battery to diagnose it.
HV	High voltage	Control input voltage rises to 70 V or more	Machine abruptly stopped while traveling downhill continuously for 2 to 3 minutes or more	Do not stop the machine abruptly while traveling downhill continuously for 2 to 3 minutes or more.
OH	Overheating	- Temperature of cooling fins for servo drive increases to 80 °C (176 °F) or more - Temperature of motor increases to 130 °C (266 °F) or more	- Drive cooling fan not rotating - Dirty cooling fins - Traveling with the brake dragging	- Replace the drive cooling fan. - Clean the cooling fins. - Adjust the brake.
OL	Overload	Load greater than rated torque applied to motor	- High-load operations using blade or cultivator performed at high speed - Traveling at high speed on a steep upward slope - Traveling with the brake dragging	- Perform high-load operations at low speed. - Travel at low speed on a steep upward slope. - Adjust the brake.
TE	Transistor error	- Current greater than specified value fed to transistor - Transistor temperature exceeds specified value - Transistor control voltage less than specified value	- High-load operations using blade or cultivator performed at high speed - Traveling at high speed on a steep upward slope - Traveling with the brake dragging	- Perform high-load operations at low speed. - Travel at low speed on a steep upward slope. - Adjust the brake.
EE	Encoder error	Error occurred in encoder signal from motor	- Loose encoder connector - Broken or shorted encoder cable	- Correctly connect the encoder connector. - Replace the encoder cable.
OS	Overspeed	Motor rpm exceeds specified value	Traveling at high speed on a steep downward slope after LV occurs	Travel at low speed on a steep downward slope after LV occurs.
OCR	Overcurrent relay	Overcurrent fed to circuits of travel safety device	- Faulty adjustment of limit switches in travel safety device - Damage to limit switches in travel safety device	- Adjust the limit switches in the travel safety device. - Replace the limit switches in the travel safety device.

Safety Mechanisms

This machine is equipped with a safety function for switching on the machine.
When switching on the machine, the safety function prevents the machine from being switched on unless all of the following three conditions are met.

- An operator is sitting on the seat.
- The parking brake is applied.
- The traveling pedal is set to the neutral position.

Warning Mechanisms

This machine features a warning mechanism to indicate when the operator leaves the seat without applying the parking brake or when a malfunction is detected in the travel control system.

1. If the operator leaves the seat without applying the parking brake in power-on state, a buzzer will sound. (intermittent tone)
 - * When the parking brake is applied, the buzzer will stop.
2. If any of the following malfunctions are detected in the travel control system, a buzzer will sound. (continuous tone)
 - [1] LV (low voltage)
 - [2] HV (high voltage)
 - [3] OH (overheating)
 - [4] OL (overload)
 - [5] TE (transistor error)
 - [6] EE (encoder error)
 - [7] OS (overspeed)

* Stop the machine, apply the parking brake, and then turn the key switch to the "OFF" position.
When the key switch is turned to the "ON" position after a while, the buzzer will stop.
If the buzzer continues to sound, check which red LED in the alarm display panel is lit.
"Alarm Display Panel" (Page 4-5)

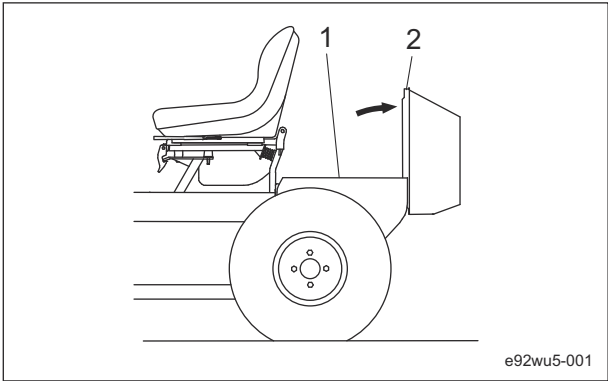
Travel Safety Device

Warning

It may result in an unexpected accident, if the machine enters a free-run state.
For fear that the travel safety device malfunctions and the brake is not automatically applied, immediately depress the brake pedal to stop the machine when the buzzer sounds.
When switching off the machine, make sure that the parking brake is applied.

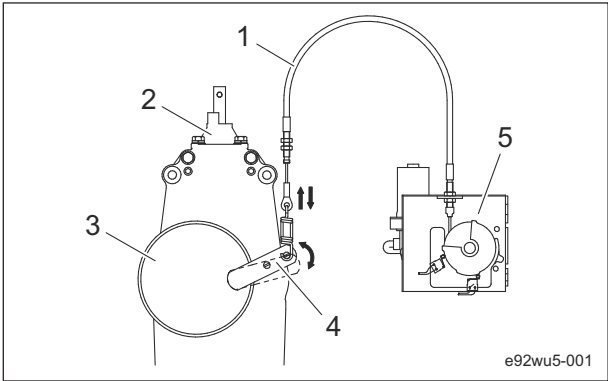
The travel safety device is installed under the driver platform.

1. When the travel safety device is activated, the brake wire is automatically pulled to stop the machine.



Travel Safety Device_001

1	Travel safety device
2	Driver platform

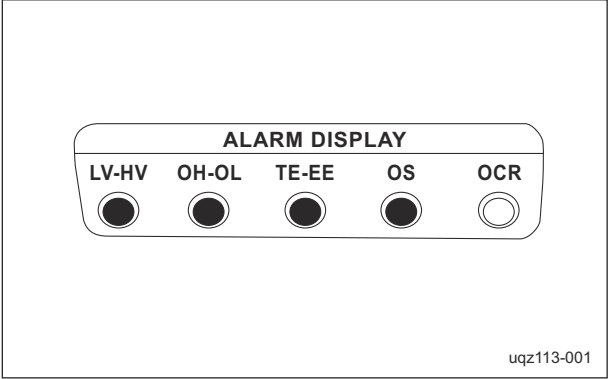


Travel Safety Device_002

1	Brake wire
2	Transmission
3	Brake
4	Brake lever
5	Travel safety device

Description of Functions

2. The travel safety device is activated when a malfunction is detected in the travel electrical control system and a red LED in the operation panel lights up or when the machine is switched off.



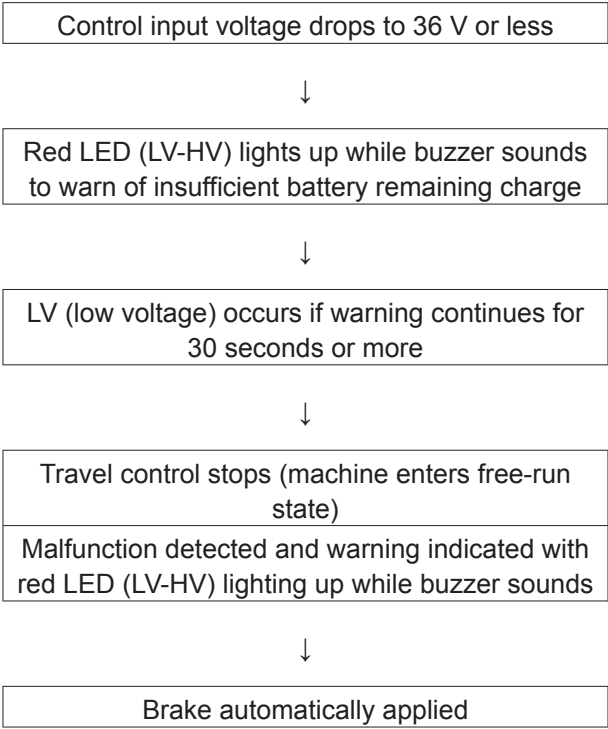
Travel Safety Device_003

Malfunction Detection

LV

1. If the normal control input voltage of 48 V drops to 36 V or less due to the load, a red LED (LV-HV) in the alarm display panel lights up while the buzzer sounds to warn that the battery remaining charge is insufficient.
Immediately recharge the battery.
2. If the load is removed and the voltage is restored, the buzzer stops.
The voltage drop due to the load increases if the battery remaining charge has become insufficient.

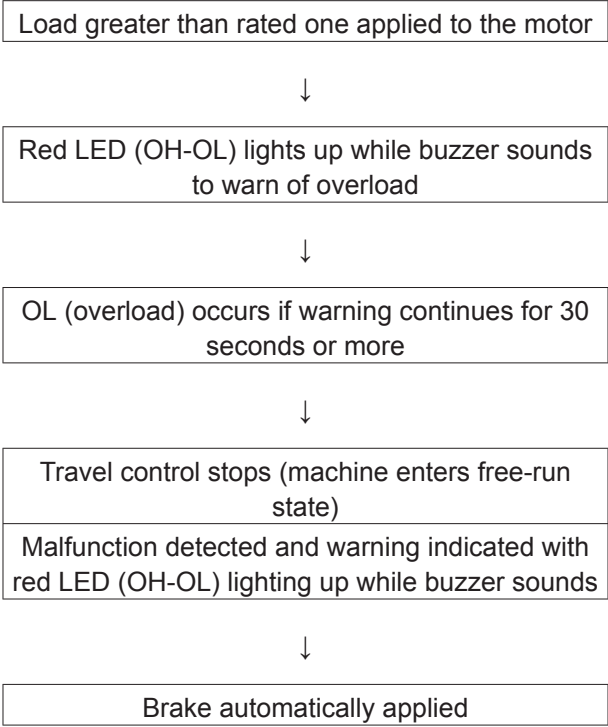
3. A malfunction is detected if the warning continues for 30 seconds or more and, in addition to the red LED (LV-HV) lighting up and the buzzer sounding, the travel safety device automatically applies the brake since the machine enters a free-run state.



Description of Functions

OL

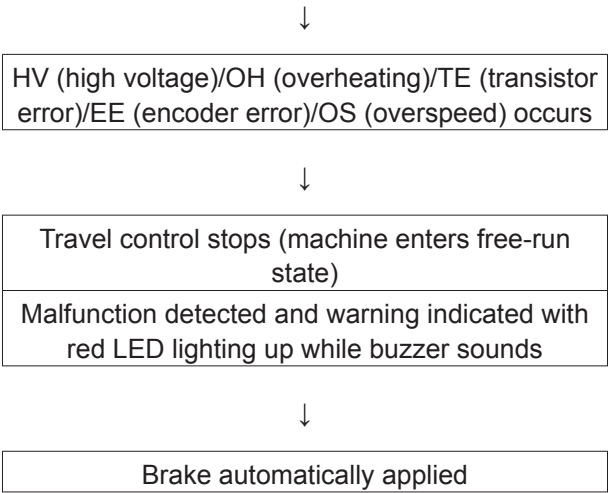
- 1. If a load greater than rated one is applied to the motor, the red LED (OH-OL) in the alarm display panel lights up and the buzzer sounds to warn that the load applied to the motor is too large.
Travel at low speed.
- 2. If the load is reduced to no more than rated one, the buzzer stops.
- 3. If the warning continues for 30 seconds or more and a malfunction is detected, in addition to the red LED (OH-OL) lighting up and the buzzer sounding, the travel safety device automatically applies the brake since the machine enters a free-run state.



HV/OH/TE/EE/OS

- 1. In addition to the red LED lighting up and the buzzer sounding to warn of the malfunction, the travel safety device automatically applies the brake since the machine enters a free-run state.

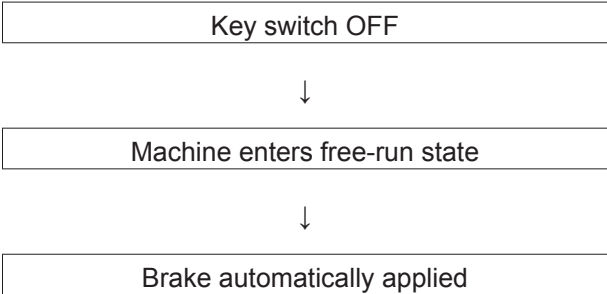
HV	Control input voltage rises to 70 V or more
OH	· Temperature of cooling fins for servo drive increases to 80 °C (176 °F) or more · Temperature of inside of motor increases to 130 °C (266 °F) or more
TE	Current greater than specified value fed to transistor
EE	Error occurred in encoder signal from motor
OS	Motor rpm exceeds specified value



Description of Functions

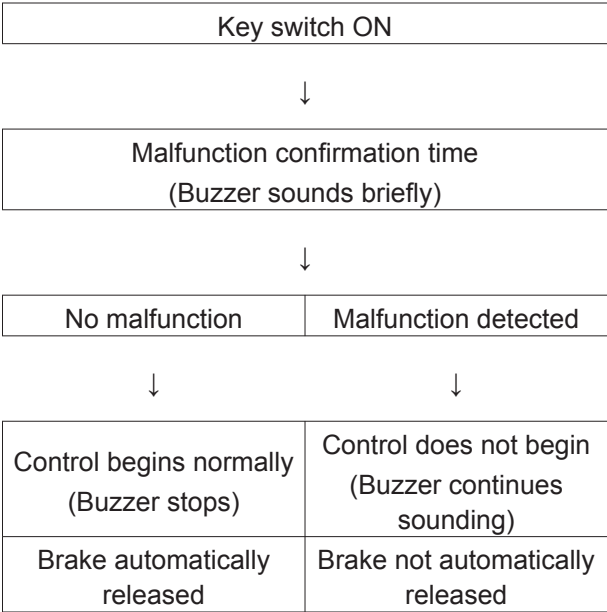
Key Switch OFF

- 1. Since the machine enters a free-run state, the travel safety device automatically applies the brake.



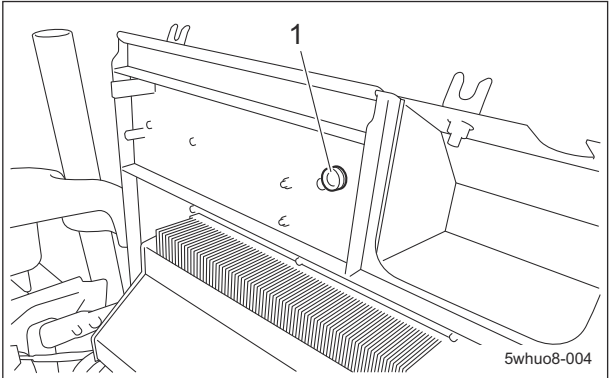
Key Switch ON

- 1. If no malfunction is detected in the travel electrical control system, the travel safety device automatically releases the brake.
- 2. If a malfunction is detected, the brake is not automatically released.



Protection Device (OCR)

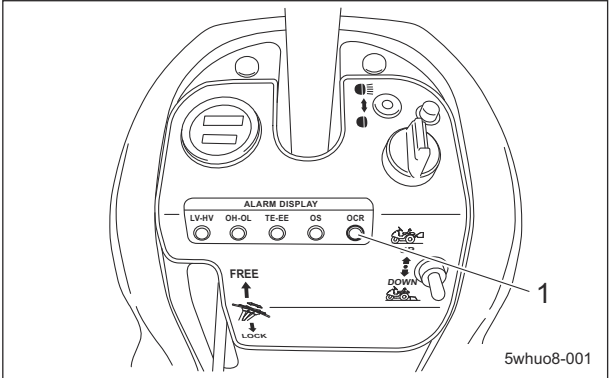
If an overcurrent is fed to the circuits of the safety device, the current is interrupted by the OCR (overcurrent relay) to protect the safety device circuitry.
The OCR is located on the bottom of the driver platform.



Protection Device (OCR)_001

1	OCR
---	-----

- 1. If the OCR is activated, the machine does not travel, even if the traveling pedal is depressed, and the OCR LED (orange) lights up.



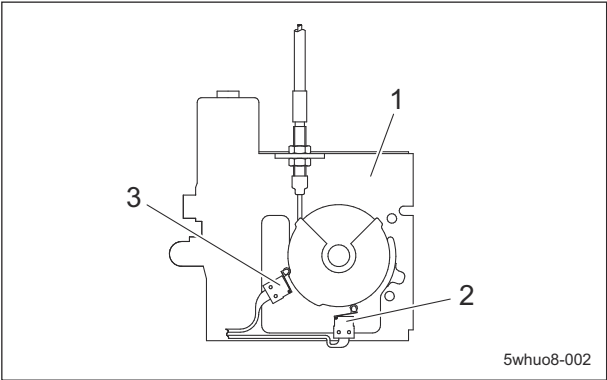
Protection Device (OCR)_002

1	OCR LED
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Important

Before performing maintenance on the electrical system, be sure to disconnect the negative terminal of the battery.

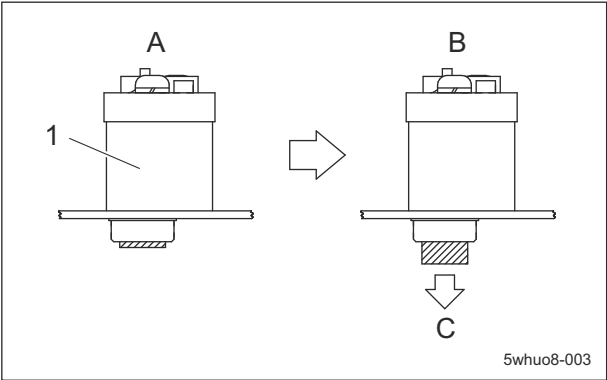
2. If the OCR LED lights up, the following troubles may have occurred.
- Inappropriate positions of the limit switches.
 - Current surge in the safety device circuit due to a damage.
- Adjust the limit switches in the safety device and check for the cause such as damage.



Protection Device (OCR)_003

1	Safety device
2	Limit switch B
3	Limit switch A

3. Press the OCR button to reset the safety device and turn off the OCR LED.



Protection Device (OCR)_004

1	OCR
A	Normal
B	OCR activated
C	Button pops out

Description of Functions

Handling Instructions

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Opening and Closing of Front Cover	Page 5-2
Opening and Closing of Driver Platform	Page 5-2
Opening and Closing of Seat Platform	Page 5-2
Opening and Closing of Battery Cover	Page 5-3

Inspection before Use Page 5-3

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Inspection of Tires	Page 5-6
Inspection of Shift Lever Fulcrum	Page 5-6
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Inspection of Brake Pedal	Page 5-6
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Inspection of Cooling Fins	Page 5-8
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Mounting and Dismounting Page 5-11

Procedure to Mount/Dismount	Page 5-11
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Procedure to Switch On/Off Machine Page 5-11

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Move Page 5-13

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Cleaning after Use Page 5-16

Cleaning of Battery	Page 5-16
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Short-Term Storage	Page 5-17
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Handling Instructions

Operations before Service

The following sections describe the preparatory works required before performing the services including inspection, adjustment, cleaning, maintenance and repair.

Opening and Closing of Front Cover

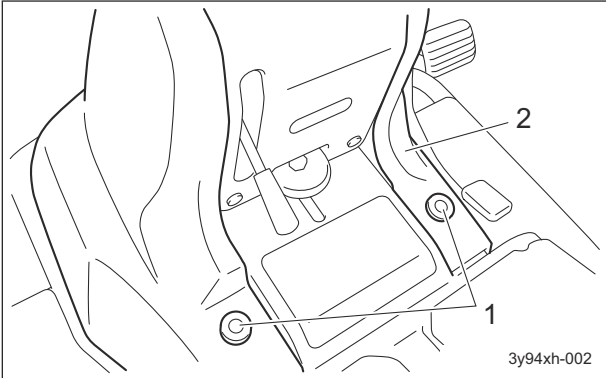
Caution

Do not open the front cover in strong winds.

Caution

When closing the front cover, be careful not to pinch your hands.

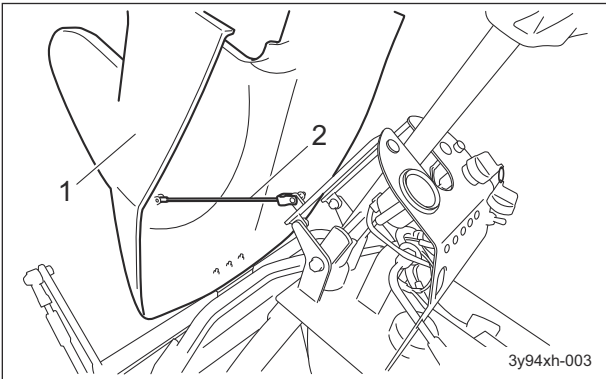
- 1. Remove the dimple knobs.



Opening and Closing of Front Cover_001

1	Dimple knobs
2	Front cover

- 2. Open the front cover, and then tilt it forward until the wire is fully extended.



Opening and Closing of Front Cover_002

1	Front cover
2	Wire

- 3. Close the front cover slowly.
- 4. Install the dimple knobs.

Opening and Closing of Driver Platform

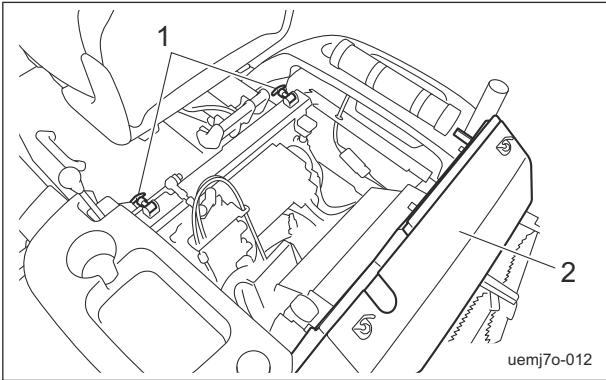
Caution

Opening and Closing of Do not open the driver platform in strong winds.

Caution

When closing the driver platform, be careful not to pinch your hands.

- 1. Lower the rake.
- 2. Release the rubber catches, and then fully open the driver platform.



Opening and Closing of Driver Platform_001

1	Rubber catch
2	Driver platform

- 3. When closing the driver platform, slowly lower it while securely supporting it, and then firmly secure the rubber catches.

Note:
When the driver platform is opened, a safety switch is activated and the rake cannot be raised or lowered.

Opening and Closing of Seat Platform

Caution

Do not open the seat platform in strong winds.

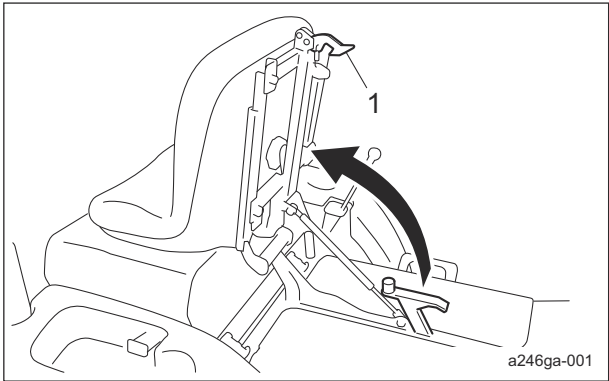
Caution

When closing the seat platform, be careful not to pinch your hands.

- 1. With the seat lever, bring the seat to the frontmost position.
- 2. Lightly press down the seat, and then release the seat platform fastener.

Handling Instructions

3. Open the seat platform.



Opening and Closing of Seat Platform_001

1	Seat platform fastener
---	------------------------

4. Close the seat platform slowly.
5. Make sure that the seat platform fastener is applied.

Opening and Closing of Battery Cover



Caution

Do not open the battery cover in strong winds.

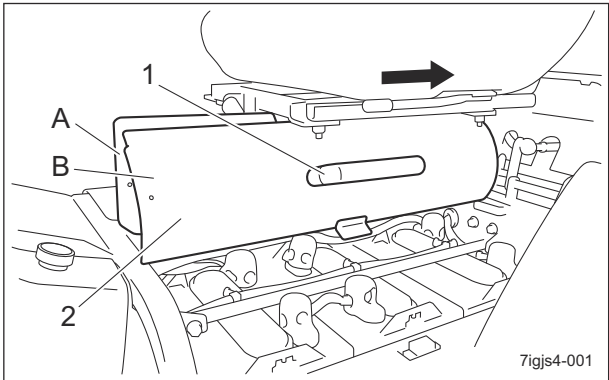


Caution

When closing the battery cover, be careful not to pinch your hands.

The battery covers can be opened in order to recharge the battery and perform maintenance.

1. Open the battery covers.
[1] Open the seat platform.
[2] Grip the handle and pull up the battery covers to stick the cover A to the magnet.
[3] Slide the cover B in the direction of the arrow to remove it.



Opening and Closing of Battery Cover_001

1	Handle
2	Battery cover
A	Cover A
B	Cover B

2. Close the battery covers.
[1] Grip the handle and close the battery covers to stick the cover B to the magnet.
[2] Close the seat platform.

Inspection before Use

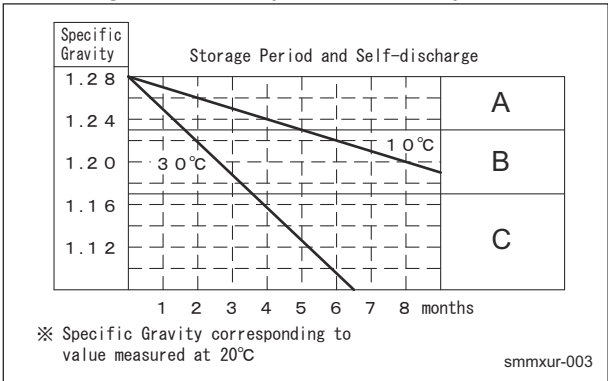
The purpose of the machine inspection is to:

- Prevent accidents
- Prevent damage to the machine
- Maintain machine performance

Detecting machine malfunctions early helps prevent unexpected problems from occurring. If you detect any abnormalities with the machine, immediately perform maintenance or repairs.

Battery Characteristics

1. Long-term storage of battery
The battery will discharge, even while it is not used. (Self-discharge)
The rate of discharge is affected by ambient temperature.
When storing the battery for an extended period of time, periodically measure the specific weight of the battery fluid, and recharge the battery as necessary.

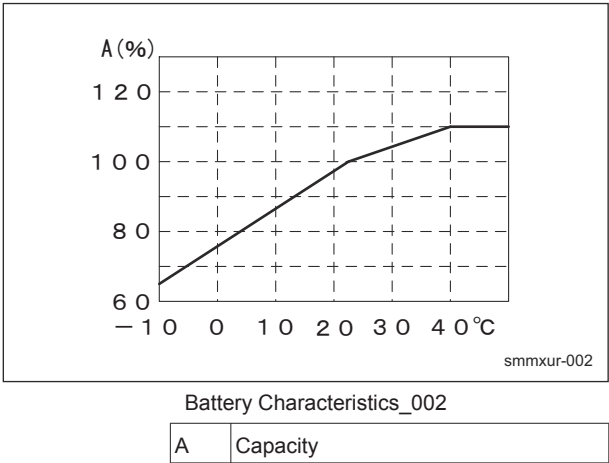


Battery Characteristics_001

A	No immediate recharging necessary
B	Immediate recharging necessary
C	Immediate recharging necessary (Range where the capacity cannot be fully restored)

Handling Instructions

2. Variations in battery up-time according to variations in capacity due to temperature. The battery up-time is affected by temperature and the number of years of use. The battery capacity is greatly affected by temperature. Since capacity decreases as the temperature decreases, battery up-time will be reduced.



Inspection of Battery

**Danger**

Keep fire away while inspecting or charging the battery.
The battery may explode.

**Danger**

Do not allow the battery fluid level to become lower than the minimum level.
The battery may explode if it is used or charged while the battery plate is exposed.

- Battery inspection items are described below.
1. Inspecting the exterior
- Visually inspect the exterior of the battery, and check that there are no cracks, splits, missing sections, or abnormal deformation in the battery case, and that there is no electrolyte leaking.
- If abnormalities are found, immediately replace the battery.

2. Cleaning the exterior

**Warning**

Do not clean the battery with a dry cloth. Cleaning the battery with a dry cloth may cause it to catch fire or explode due to static electricity.

Use a wet cloth for cleaning.

Inspect the vent plugs or vent holes on the side of the battery, and if they are blocked by dirt wash them with water to remove the blockage.

Continuing to use the battery with the vent holes blocked may cause the battery to rupture from increased internal pressure due to gases generated inside the battery.

3. Inspecting the mounting bracket
- Inspect whether the battery is secured firmly with the mounting bracket.
- If the bracket is loose, tighten the mounting bracket nuts until the battery is secured firmly.
- An improperly mounted battery may cause damage to the battery case or electrolyte leaks due to the battery moving with vibrations while traveling.
4. Inspecting the cable terminals
- If the connection between the battery terminals and vehicle's cable terminals are loose, tighten the nuts until the cable terminals are secured firmly.
- Insufficiently tightened terminals may result in poor battery charging, damage to the terminals due to poor contacts, or an explosion.
- If the terminals are corroded, rub them clean with a wire brush or fine grit sandpaper, and lightly apply anti-rust grease.

Handling Instructions

5. Inspecting the electrolyte level and refilling

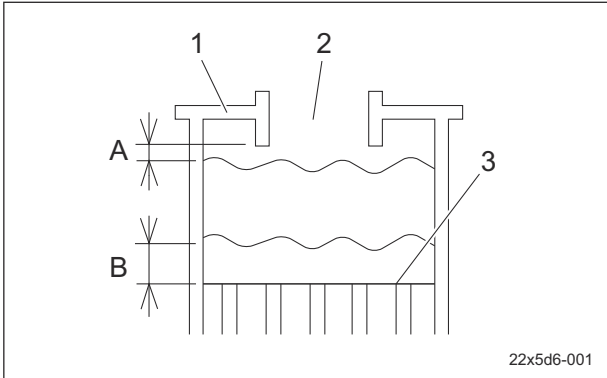
Danger

Do not allow the battery fluid level to become lower than the minimum level.
The battery may explode if it is used or charged while the battery plate is exposed.

Warning

When refilling, do not fill purified water above the maximum level.
Doing so may result in electrolyte leaks.

Make sure that the battery fluid level is between the maximum level and the minimum level.
Refill with purified water up to the maximum level if the level is lower than halfway between the maximum level and the minimum level.



Inspection of Battery_001

1	Battery case
2	Purified water filling port
3	Battery plates
A	Maximum level 2 - 5 mm (0.079 - 0.197 in.)
B	Minimum level 10 mm (0.394 in.)

Inspection of Battery Remaining Charge

Important

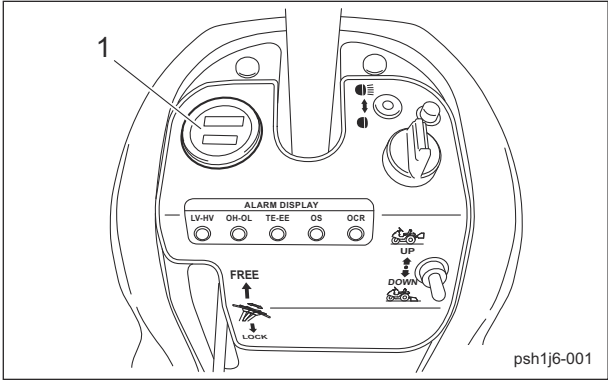
When the second LED indicating lamp from the left of the battery remaining charge gauge lights up, immediately stop operation and recharge the battery.

Important

If a buzzer sounds, indicating an insufficient battery remaining charge, while the second or further LED indicating lamp from the left of the battery remaining charge gauge lights up, the battery may have deteriorated.
Replace the battery.
"Replacement of Battery" (Page 6-16)

Turn the key switch to the "ON" position.
When the battery is fully charged, the LED indicating lamp on the right end lights up and moves to the left as the battery becomes discharged.
When the second LED indicating lamp from the left lights up, it is time to recharge the battery.
If you continue to operate the machine in this condition, the battery remaining charge will become insufficient and a buzzer will sound.
"Alarm Display Panel" (Page 4-5)
When the second LED indicating lamp from the left lights up, immediately recharge the battery.
"Charging of Battery" (Page 6-8)

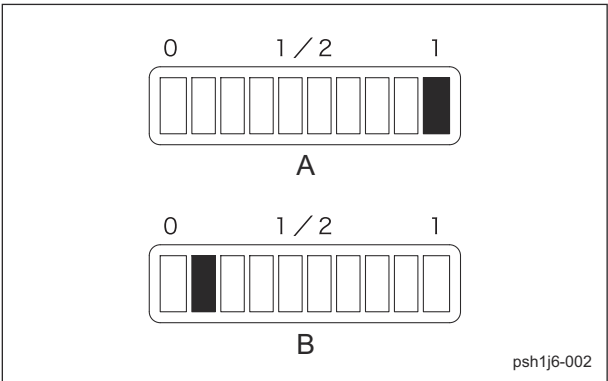
* The machine up-time per charge differs greatly depending on the course configuration, number of bunkers and operations performed.



Inspection of Battery Remaining Charge_001

1	Battery remaining charge gauge
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Handling Instructions



Inspection of Battery Remaining Charge_002

A	Fully charged
B	Time to recharge

Inspection of Tires

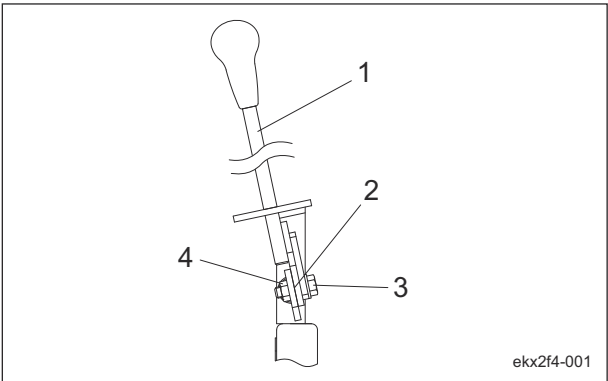
1. Check the pneumatic pressure of the tires.
2. Make sure that there are no cracks, damage or abnormal wear.

Tire size	Pneumatic pressure	
Front wheel (PD21 x 11.00 - 10)	70 kPa (0.7 kgf/cm ²)	10 psi
Rear wheel (22 x 11.00 - 8)	40 kPa (0.4 kgf/cm ²)	6 psi

Inspection of Shift Lever Fulcrum

The shift lever fulcrum may begin to rattle due to frequent use and may no longer be able to perform shift operations correctly.

1. Make sure that the shift lever fulcrum does not rattle.
2. Make sure that there is no wear of the shift lever fulcrum bolt.
3. Make sure that the plate of the shift lever fulcrum is not bent.



Inspection of Shift Lever Fulcrum_001

1	Shift lever
2	Shift lever fulcrum
3	Bolt
4	Nut

Inspection of Traveling Pedal

1. Make sure that there is no play in the pedal.
2. Make sure that the pedal moves smoothly.
3. Make sure that there is no abnormal sound when the pedal is depressed.

Inspection of Brake Pedal

1. Make sure that there is no play in the pedal.
2. Make sure that the pedal moves smoothly.
3. Make sure that there is no abnormal sound when the pedal is depressed.
4. Make sure that the pedal does not touch the floorboard when the pedal is depressed.

Inspection of Parking Brake

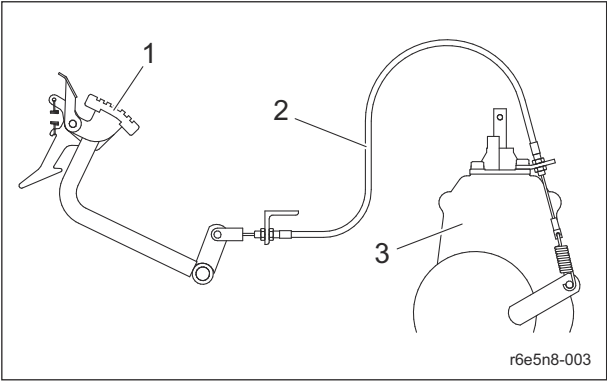
Important

If the operator leaves the seat without applying the parking brake in power-on state, a buzzer will sound. (intermittent tone)
When the parking brake is applied, the buzzer will stop.

1. Park the machine on a level surface.
2. Switch on the machine.
"Procedure to Switch On Machine" (Page 5-11)
3. Set the transmission shift lever to the "Neutral" position.
"Shift Lever" (Page 4-2)
4. Check that the parking brake is applied.
5. Push the main vehicle back and forth to check that the brake is applied effectively.
6. Release the parking brake.
"Brake Pedal" (Page 4-3)

Handling Instructions

7. Push the main vehicle back and forth to check that the brake is not dragging.



Inspection of Parking Brake 001

1	Brake pedal
2	Parking brake wire
3	Transmission

Inspection of Travel Safety Device Brake

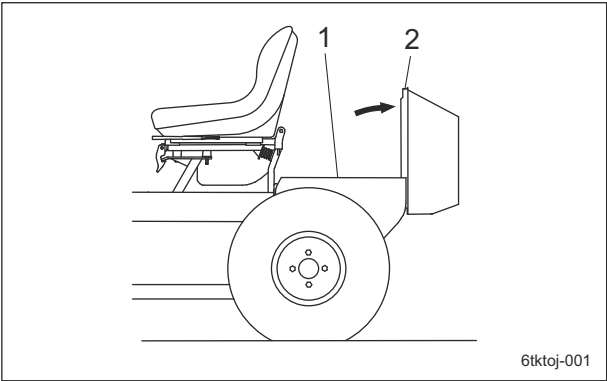
Important

If the operator leaves the seat without applying the parking brake in power-on state, a buzzer will sound. (intermittent tone)
When the parking brake is applied, the buzzer will stop.

The safety device is installed under the driver platform.

Before using the machine, check that the safety device operates correctly.

1. Park the machine on a level surface.
2. Switch on the machine.
3. Lower the rake.
4. Open the driver platform.

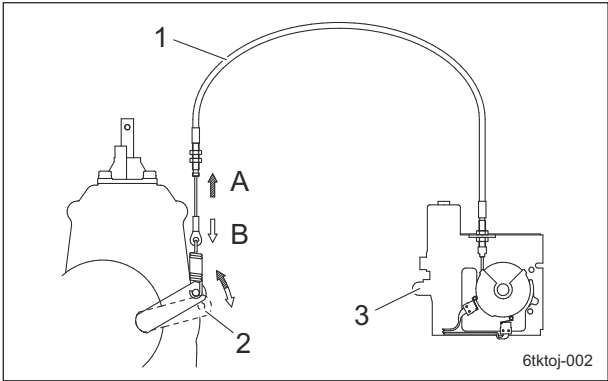


Inspection of Travel Safety Device Brake_001

1	Safety device
2	Driver platform

5. Release the parking brake.

6. Set the transmission shift lever to the "Neutral" position.
7. Check that the safety device brake wire is automatically pulled by activation of the safety device under the driver platform when the key switch is turned to the "OFF" position.
8. Apply the parking brake.
9. Check that the brake is automatically released by activation of the safety device when the key switch is turned to the "ST" position to switch on the machine.



Inspection of Travel Safety Device Brake_002

1	Safety device brake wire
2	Brake lever
3	Safety device
A	Key switch at "OFF" position: Brake wire automatically pulled
B	Key switch at "ON" position: Brake automatically released

10. Slowly turn the key switch back from the "ST" position to the "ON" position.
11. Close the driver platform.
12. Raise the rake.
13. Release the parking brake.
14. Push the main vehicle back and forth to check that the brake is not dragging.
15. Turn the key switch to the "OFF" position.
16. Push the main vehicle back and forth to check that the brake is applied effectively.

Handling Instructions

Inspection of Covers

Warning

If you have removed a protective cover during inspection, be sure to securely install it in its original position.

If a protective cover remains removed, foreign objects may fly off, and the operator or the mechanic can be injured.

1. Make sure that there is no wear or deterioration of protective covers.
2. Make sure that there is no damage to protective covers.
3. Make sure that there is no interference with moving parts due to deformation of protective covers.
4. Make sure that protective covers are installed in their appropriate positions.

Inspection of Wire

1. Make sure that the wire is not cracked or damaged.
2. Make sure that the wire is not worn.
3. Make sure that the wire is not crushed.
4. Make sure that the wire is not bent.
5. Make sure that the wire is not corroded or rusted.

Inspection of Steering Wheel

1. Make sure that there is no play in the steering wheel.
2. Make sure that the steering wheel can be turned smoothly without abnormal noise, etc.
3. Make sure that the steering chain is not overtightened and is not loose.
4. Make sure that there are no cracks, damage or abnormal wear in the steering chain.

Inspection of Safety Device

Repair the machine before operation whenever there is any abnormality.

1. Interlock system
Make sure that the interlock system operates correctly.
"Safety Mechanisms" (Page 4-7)

2. ROPS

(If the machine is equipped with ROPS and a seat belt)

Make sure that the ROPS is not damaged or broken.

3. Seat belt

(If the machine is equipped with ROPS and a seat belt)

Make sure that the seat belt is not damaged or broken.

Inspection of Liquid Leakage

Important

After approximately 50 hours of operation, some tightened portions may be loosened and liquid such as oil may leak.
Be sure to retighten the parts.

Important

If liquid leakage found, repair it before operation.
Ignoring leakage will cause further trouble.

1. Check the bottom of the machine for leakage of liquid such as oil, water, etc.
2. Locate the leakage and identify the type of liquid.

Inspection of Cooling Fins

1. Make sure that there is no damage to the cooling fins.
2. Make sure that the cooling fins are not dirty.

Inspection of Bolts and Nuts

Important

The bolts and nuts may be loosened at the earlier stage of the use.
Be sure to retighten or replace before operating the machine whenever there is any abnormality.

1. Check the bolts and nuts for looseness and coming off.
2. Check the bolts and nuts for cracks and damages.
3. Check the bolts and nuts for rust.
4. Check around the bolts and nuts for traces of rust fluid.
5. Check for unequal bolt length.

Handling Instructions

- 6. Check the bolts and nuts for stripped threads and abrasion.

Inspection of Pilot Lamps

- 1. Check the pilot lamps are clean.
- 2. Check the pilot lamps are not damaged.

Inspection of Rake



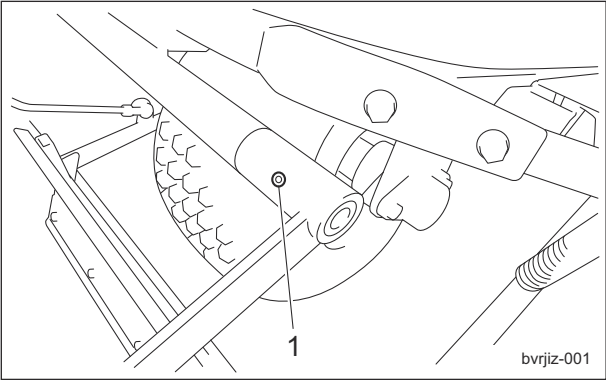
Wear gloves when touching a fork prong bar.

- 1. Make sure that the rake pipe is not bent.
- 2. Make sure that the cross-link chain is not twisted or worn.
- 3. Make sure that the rake shaft is not worn.
- 4. Make sure that the center shaft of the fulcrum swing fitting is not worn.
- 5. Make sure that a spring pin is not missing from the rake shaft.
- 6. Make sure that a hardened flat-head pin on the rake hanging arm is not worn.
- 7. Make sure that the plate springs are not cracked or bent.
- 8. Make sure that a spring pin is not missing from the rake fulcrum fitting.
- 9. Make sure that the rake mounting bracket is not bent.
- 10. Make sure that the smoother plate is not bent, cracked or unevenly worn.
- 11. Make sure that the warp board is not bent, cracked or worn.
- 12. Make sure that the fork prong bar is not bent or worn.

Inspection of Blade

Note:
Depending on the specifications, this function may not be available.

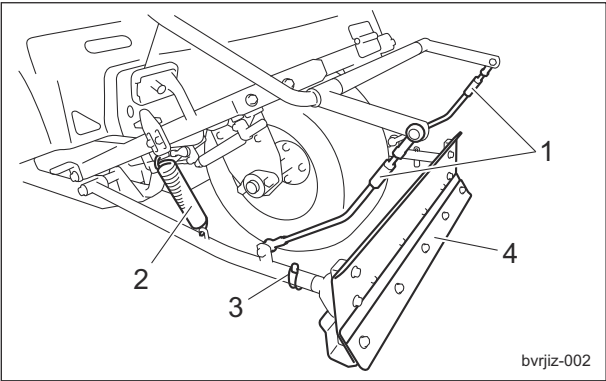
- 1. Make sure that the spring pin is not missing from the lever arm.



Inspection of Blade_001

1	Spring pin
---	------------

- 2. Make sure that the connecting shaft is not bent.
- 3. Make sure that the hook spring is not bent or stretched.
- 4. Make sure that a delta pin is not missing.
- 5. Make sure that the small blade is not bent, cracked or worn.



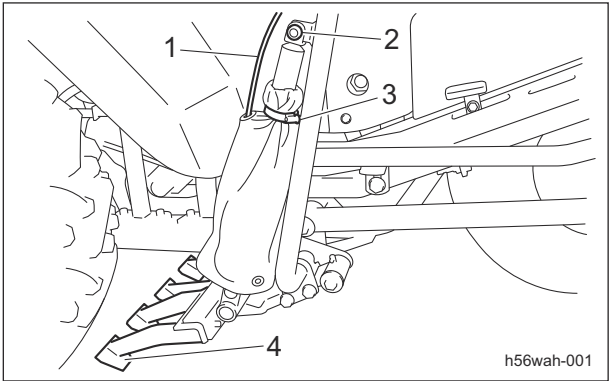
Inspection of Blade_002

1	Connecting shaft
2	Hook spring
3	Delta pin
4	Small blade

Handling Instructions

Inspection of Cultivator

- Note:
Depending on the specifications, this function may not be available.
- 1. Make sure that the cultivator wire is not broken.
 - 2. Make sure that the free lock pin is not missing.
 - 3. Make sure that the parker clamp is not loose.
 - 4. Make sure that the trapezoidal cultivator fitting is not worn.



Inspection of Cultivator_001

1	Cultivator wire
2	Free lock pin
3	Parker clamp
4	Trapezoidal cultivator fitting

Inspection of Finishing Brush

- Note:
Depending on the specifications, this function may not be available.
- 1. Make sure that the brush mounting frame is not bent.
 - 2. Make sure that the brush is not bent or excessively worn.

Adjustment before Work

Adjustment of Steering Wheel Position

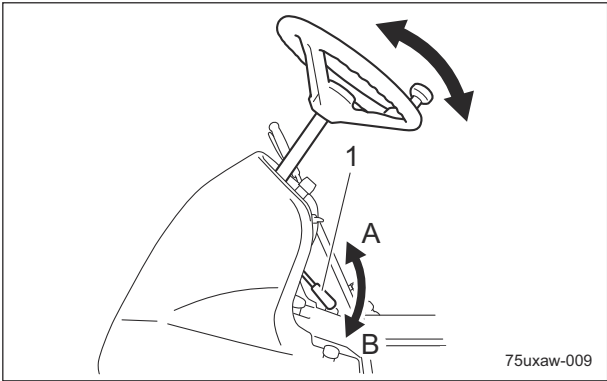
 **Warning**

Since it is dangerous, do not adjust while traveling.

 Caution

Be sure the steering wheel position is securely locked.
It may result in an unexpected accident if it becomes loose while traveling.

The steering wheel position can be adjusted up or down with the tilt lever.
Adjust the position according to the operator's body size.
Shift the tilt lever to the "FREE" position, move the steering wheel to the position that suits your work requirements, and then shift the tilt lever to the "LOCK" position to secure it.
The tilt lever is located to the left of the driver's seat.



Adjustment of Steering Wheel Position_001

1	Tilt lever
A	FREE
B	LOCK

Handling Instructions

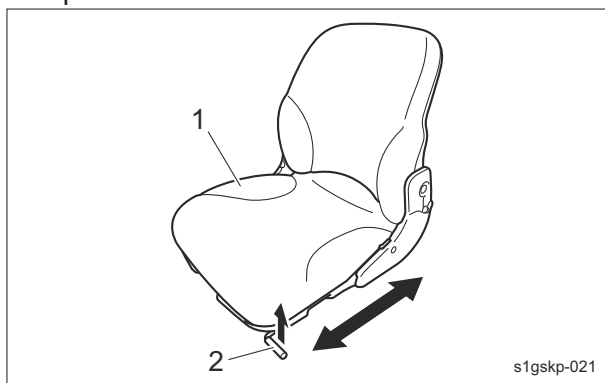
Adjustment of Seat Position

⚠ Warning

Since it is dangerous, do not adjust while traveling.

Use the seat adjustment lever to adjust the seat position back and forth.
Adjust the position according to the operator's body size.

The adjustment lever is located beneath the front part of the seat.



Adjustment of Seat Position_001

1	Seat
2	Adjuster lever

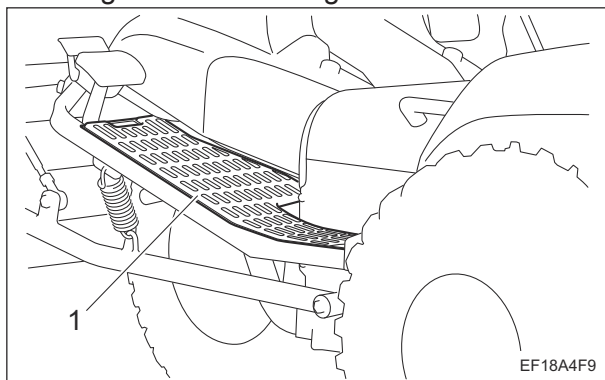
Mounting and Dismounting

Procedure to Mount/Dismount

⚠ Caution

Do not step on the tire when mounting/dismounting.

Place your foot on the step on the frame when mounting and dismounting the machine.



Procedure to Mount/Dismount_001

1	Step
---	------

Procedure to Switch On/Off Machine

Procedure to Switch On Machine

⚠ Warning

The machine may enter a free-run (neutral) state for electrical or mechanical reasons. Depress the brake pedal to stop the machine.

- If the machine entered a free-run state for electrical reasons, the travel safety device will be activated and the brake will be automatically applied.

However, depending on the circumstances, the machine may not be stopped. In that case, depress the brake pedal to stop the machine.

These are the cases of free-run state for electrical reasons.

1. When the red LEDs in the alarm display panel light up.
2. When the buzzer notifies.
3. When the machine is switched off.

- If the machine entered a free-run state for mechanical reasons, depress the brake pedal to stop the machine.

This is the case of free-run state for mechanical reasons.

1. When the shift lever is set to the "Neutral" position.

⚠ Warning

Before switching on the machine, make sure that there are no other people or obstacles around the machine.

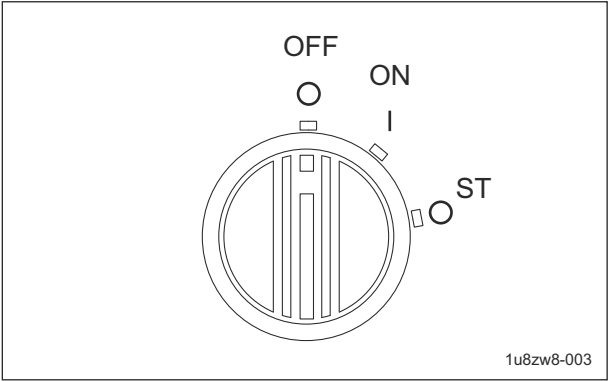
⚠ Caution

Make sure that the covers are correctly installed and are not damaged.

1. Sit on the seat.
2. Make sure that the parking brake is applied.
3. Make sure that the traveling pedal is in the neutral position.

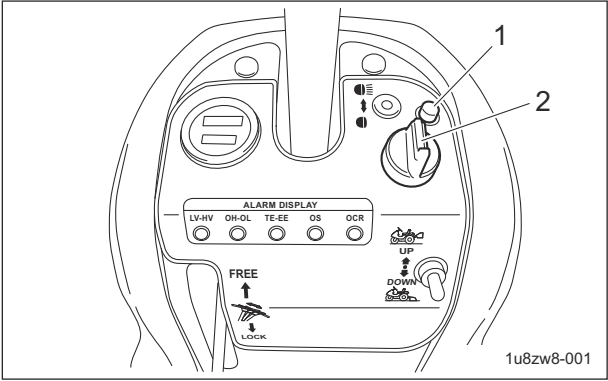
Handling Instructions

4. Turn the key switch to the "ST" position to switch on the machine.



Procedure to Switch On Machine_001

Note:
When the machine is switched on, the buzzer sounds briefly and the red LED lights up.



Procedure to Switch On Machine_002

1	Red LED
2	Key switch

5. Slowly turn the key switch back to the "ON" position.

Procedure to Switch Off Machine

Warning

Make sure that the parking brake is applied before switching off the machine.
The machine may jerk.

Important

If the operator leaves the seat without applying the parking brake in power-on state, a buzzer will sound. (intermittent tone)
When the parking brake is applied, the buzzer will stop.

1. Raise the rake.

2. If the blade and cultivator installed, raise them.
3. Set the traveling pedal to neutral.
4. Stop the machine on level ground, and then apply the parking brake.
5. Turn the key switch to the "OFF" position.

Parking and Stopping

Leaving the machine

Caution

If the brakes are not sufficiently effective, use the wheel stoppers to secure the machine.

Caution

Never park the machine on a slope.

1. Park the machine on level ground.
2. Apply the parking brake.
3. Switch off the machine.
4. Remove the ignition key.
5. Leave the machine.

Handling Instructions

Move

Precautions during Travel

 Warning

It may result in an unexpected accident if the machine enters a free-run state.
For fear that the travel safety device malfunctions and the brake is not automatically applied, immediately depress the brake pedal to stop the machine when the buzzer sounds.
When switching off the machine, make sure that the parking brake is applied.

 Warning

When you descend a slope, drive at low speed and avoid abrupt steering.

 Caution

Under any circumstances drive the machine at such a speed that you can stop it immediately for emergencies.

 Caution

Before moving the shift lever, make sure to stop the machine completely on a level surface.

Important

Before traveling, make sure that the output plug of the charger is disconnected from the connector on the main vehicle.

Traveling Procedure

1. Switch on the machine.
"Procedure to Switch On Machine" (Page 5-11)
2. Make sure that the rake is raised.
3. Make sure that the blade and cultivator are raised if they installed.
4. Release the parking brake.
5. Set the shift lever to the "Low speed" position or the "High speed" position.
6. Slowly depress the traveling pedal.
7. The machine starts traveling.

8. When you take your foot off the traveling pedal, the machine stops slowly.

Operations

Precautions during Work

 Warning

Do not start to move or stop the machine abruptly.

 Warning

It may result in an unexpected accident if the machine enters a free-run state.
For fear that the travel safety device malfunctions and the brake is not automatically applied, immediately depress the brake pedal to stop the machine when the buzzer sounds.
When switching off the machine, make sure that the parking brake is applied.

 Caution

Before starting operations, check that the area where the operations are to be performed is safe.

 Caution

Do not enter or leave a bunker via a steep slope or extremely uneven ground.

 Caution

Before moving the shift lever, make sure to stop the machine completely on a level surface.

Important

Set the shift lever to the "Low speed" position during operations.
Otherwise, the servo driver will malfunction.

Important

Do not back up with the rake, cultivator or finishing brush lowered.

Handling Instructions

Rake

Important

Performing operations at high speed may leave undulations on bunker surfaces or tire tracks.

Important

The rake up/down lever cannot be operated when the driver platform is open or has not be correctly closed.

1. Switch on the machine.
"Procedure to Switch On Machine" (Page 5-11)
2. Set the shift lever to the "Low speed" position.
3. Make sure that the rake is raised.
4. Make sure that the blade and cultivator are raised if installed.
5. Release the parking brake.
6. Enter the bunker.
7. Depress the traveling pedal to start traveling.
8. At the bunker area where the operation is to be started, lower the rake.
9. At the bunker area where the operation is to be stopped, raise the rake.
10. Leave the bunker.
11. If tire tracks remain, use the broom to remove them.

Blade

Note:
Depending on the specifications, this function may not be available.

Caution

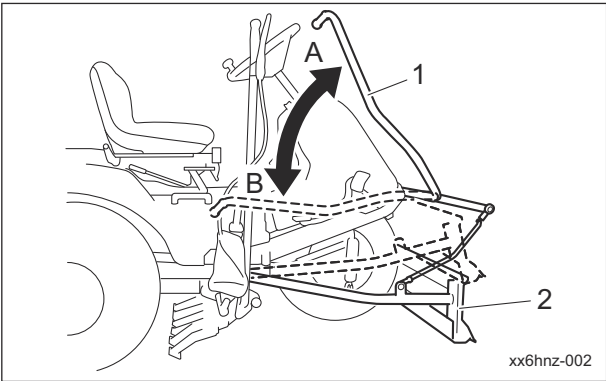
If the blade is raised, do not touch the lifting lever.

Caution

When getting on and off the machine, watch out the blade lever lest you should get your foot caught on it and fall.

1. Switch on the machine.
"Procedure to Switch On Machine" (Page 5-11)

2. Set the shift lever to the "Low speed" position.
3. Make sure that the rake is raised.
4. Make sure that the blade is raised.
5. Make sure that the cultivator is raised if installed.
6. Release the parking brake.
7. Enter the bunker.
8. Depress the traveling pedal to start traveling.
9. At the bunker area where the operation is to be started, repeatedly perform the following operations.
 - Move the blade lever forward to lower the blade, and then hold the blade lever in place while traveling to lift the sand.
 - Move the blade lever toward you to raise the blade.



Blade_002

1	Blade lever
2	Blade
A	Raise blade lever (blade lowered)
B	Lower blade lever (blade raised)

10. At the bunker area where the operation is to be stopped, raise the blade.
11. Leave the bunker.
12. If tire tracks remain, use the broom to remove them.

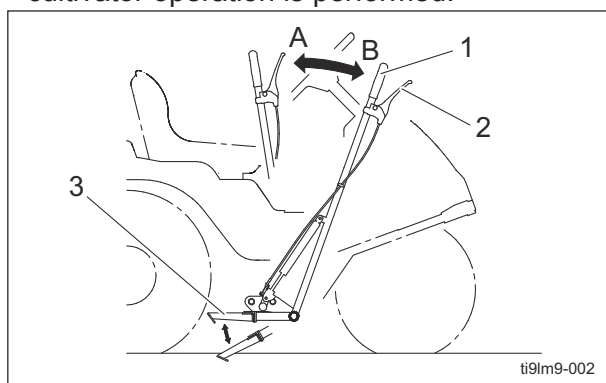
Cultivator

Note:
Depending on the specifications, this function may not be available.

1. Switch on the machine.
"Procedure to Switch On Machine" (Page 5-11)
2. Set the shift lever to the "Low speed" position.
3. Make sure that the rake is raised.

Handling Instructions

4. Make sure that the cultivator is raised.
5. Make sure that the blade is raised if installed.
6. Release the parking brake.
7. Enter the bunker.
8. At the bunker area where the operation is to be started, lower the rake.
9. Depress the traveling pedal to start traveling.
10. At the bunker area where the operation is to be started, squeeze the clutch lever and pull the cultivator lever toward you.
11. After lowering the cultivator board to the desired depth, release the clutch lever, and level with the rake at the same time that the cultivator operation is performed.



Cultivator_002

1	Cultivator lever
2	Clutch lever
3	Cultivator board
A	Pull (lowered)
B	Push (raised)

12. At the bunker area where the operation is to be stopped, raise the cultivator.
13. Raise the rake.
14. Leave the bunker.
15. If tire tracks remain, use the broom to remove them.

Finishing Brush

Note:

Depending on the specifications, this function may not be available.

1. Switch on the machine.
"Procedure to Switch On Machine" (Page 5-11)
2. Set the shift lever to the "Low speed" position.
3. Make sure that the rake is raised.

4. Make sure that the blade and cultivator are raised if installed.
5. Release the parking brake.
6. Depress the traveling pedal to start traveling.
7. Enter the bunker.
8. Stop the machine and apply the parking brake.
9. Adjust the height of the brush from the ground according to the bunker conditions.
10. Release the parking brake.
11. Depress the traveling pedal to start traveling.
12. At the bunker area where the operation is to be started, lower the rake.
The finishing brush is lowered at the same time.
13. At the bunker area where the operation is to be stopped, raise the rake.
The finishing brush is raised at the same time.
14. Leave the bunker.
15. If tire tracks remain, use the broom to remove them.

Handling Instructions

Transporting

Transporting Procedure

When loading the machine into a trailer or a truck to transport it, drive the machine in reverse.

When unloading, drive the machine forward.

Loading :

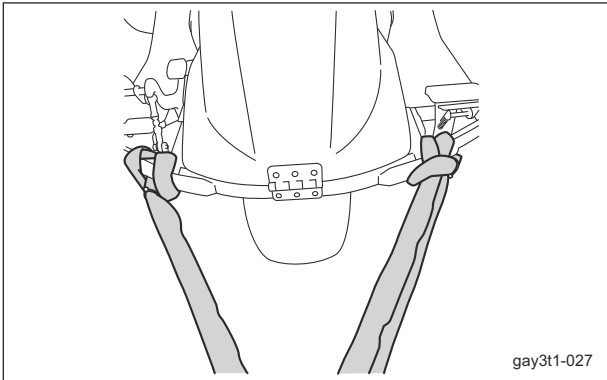
- 1. Apply the machine parking brake.
- 2. Lower all the attachments.
- 3. Switch off the machine.
- 4. Be sure to fasten the machine with ropes, etc.

Note :

For fastening the machine with ropes, use the following positions.

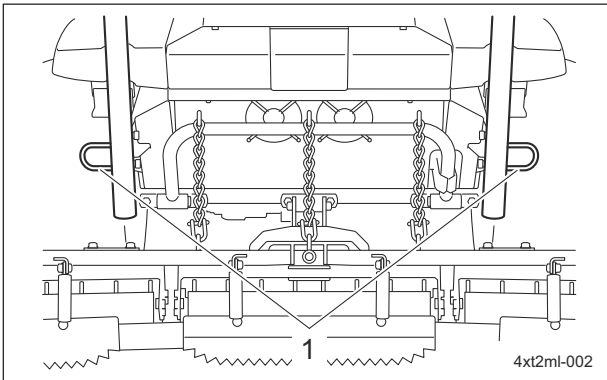
Use the right and left tow hooks for rear part of the machine.

Front part of machine



Transporting Procedure_001

Rear part of machine



Transporting Procedure_002

1	Tow hook
---	----------

Unloading :

- 1. Release roping.
- 2. Switch on the machine.
- 3. Raise all the attachments.
- 4. Release the machine parking brake.

Cleaning after Use

The purpose of the machine cleaning is to:

- Prevent accidents
- Prevent damage to the machine
- Maintain machine performance

Properly clean the machine to maintain its functionality and performance.

If you detect any abnormalities with the machine, immediately perform maintenance or repairs.

Cleaning of Battery

Danger

Do not clean the battery with a dry cloth. Cleaning the battery with a dry cloth may cause it to catch fire or explode due to static electricity.

- 1. Clean up the dirt and dust on the upper side of battery with a cloth damped with water, or wash off with water.
- 2. If there is corrosion or dirt on the terminals, wash off with water or hot water and then apply a thin coating of grease.

Cleaning of Cooling Fins

Important

Do not allow water to come into contact with electrical components during cleaning. It will cause malfunction of the machine.

Important

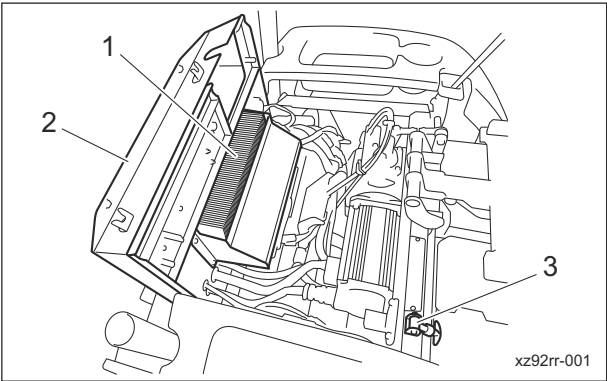
Unclean cooling fins will cause overheating or malfunction to the servo driver or motor.

Important

Do not use fluid such as water and high-pressure air to clean the cooling fins. Also, do not use solid objects such as a spatula or screwdriver. Clean them with low-pressure air. Otherwise, the fins may be damaged, possibly resulting in reduced cooling performance.

If the cooling fins have been contaminated with dust, be sure to clean them. Especially after operating the machine in a dusty environment, it is important to remove dust as soon as possible.

- 1. Open the driver platform.
- 2. Carefully clean the cooling fins with low-pressure compressed air.



Cleaning of Cooling Fins_001

1	Cooling fins
2	Driver platform
3	Rubber catch

- 3. Close the driver platform, and then firmly secure the rubber catch.

Storage

Short-Term Storage

Short-term storage means that the machine is temporarily stored (within 1 month) without use.

Follow the instructions below for short-term storage of the machine.

- 1. Cleaning
 - Remove dirt, grass clippings, oil stains etc. completely from the main vehicle and engine.
- 2. Storage location
 - Cover the machine and store it in a dry place where it will not be exposed to rain.
 - Store it in well-ventilated indoor space, away from heat, moisture and direct sunlight.

Handling Instructions

Precautions for Maintenance	Page 6-2	Storage	Page 6-21
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About Jacking Up The Machine	Page 6-3		
Jack-Up Points	Page 6-3		
Inspection and Cleaning	Page 6-4		
Inspection of Steering Chain	Page 6-4		
Inspection of Battery Fluid	Page 6-4		
Inspection of Battery Cable	Page 6-5		
Measuring Battery Specific Weight	Page 6-5		
Inspection of Electrical Wiring	Page 6-5		
Inspection of Wheel Mounting Bolt	Page 6-5		
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Supply of Battery Fluid	Page 6-7		
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Replacement	Page 6-15		
Change of Transmission Oil	Page 6-15		
Replacement of Battery	Page 6-16		
Replacement of Tires	Page 6-17		
Replacement of Fork Prong Bar	Page 6-18		
Change of Smoother Plate	Page 6-18		
Replacement of Small Blade	Page 6-19		
Replacement of The Cultivator Fitting	Page 6-19		
Replacement of Finishing Brush	Page 6-20		

Maintenance

Precautions for Maintenance

Warning

The chapter "Maintenance" in this manual describes practical measures which should be performed by a mechanic with expertise. The owner should instruct the mechanic with expertise to perform maintenance service for this machine.

Caution

First, learn well the operations you plan to perform.

Important

Use tools appropriate for each operation.

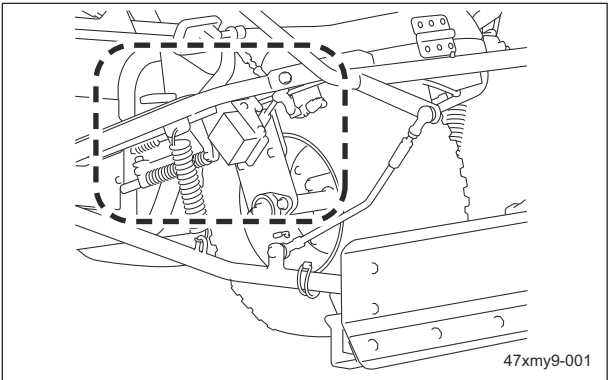
Important

Use Baroness genuine parts for replacement and accessories.
Our product warranty may be void if you use non-genuine parts for replacement or accessories.

Precautions for Electric Devices

This machine employs precision electric devices.
For maintenance, exercise care in the following points.

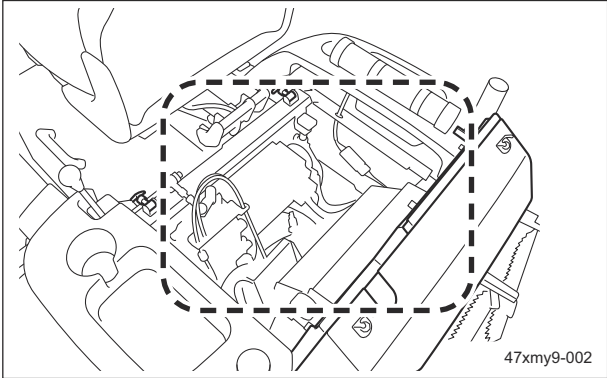
- 1. Do not use high-pressure washing with fluid such as water in the traveling pedal area.



Precautions for Electric Devices_001

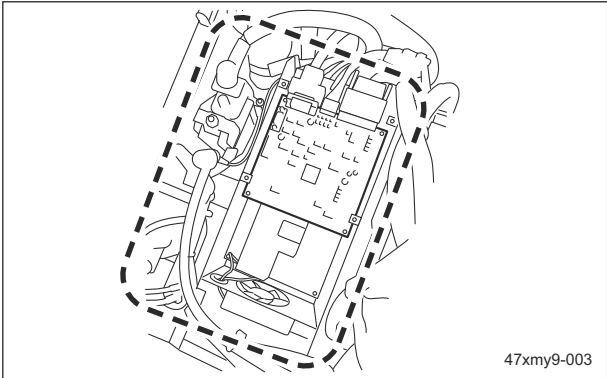
- 2. Do not use fluid such as water and high-pressure air to clean the electric devices behind the seat.

Clean them with low-pressure air or a dry cloth each time after using the machine.
Inside the driver platform



Precautions for Electric Devices_002

Inside the servo driver



Precautions for Electric Devices_003

Jacking Up The Machine

About Jacking Up The Machine

Warning

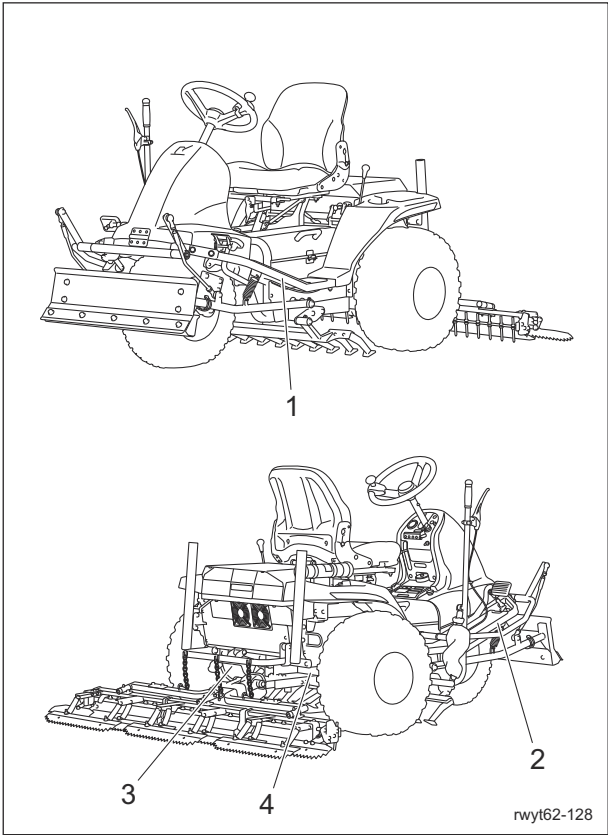
When replacing a tire or beginning any other maintenance or repairs, be sure to chock the wheels to prevent the machine from moving. Before jacking up the machine, park it on a hard, flat surface such as a concrete floor and remove any obstacles that could prevent you from performing the work safely. When necessary, use an appropriate chain block, hoist, or jack. Support the machine securely with jack stands or appropriate blocks. Failure to do so may cause the machine to move or fall, resulting in injury or death.

Important

Only place a jack under the jack-up points specified. Placing a jack at any other point will result in damage to the frame or other parts.

Use the jack-up points identified in this manual when jacking up the machine.

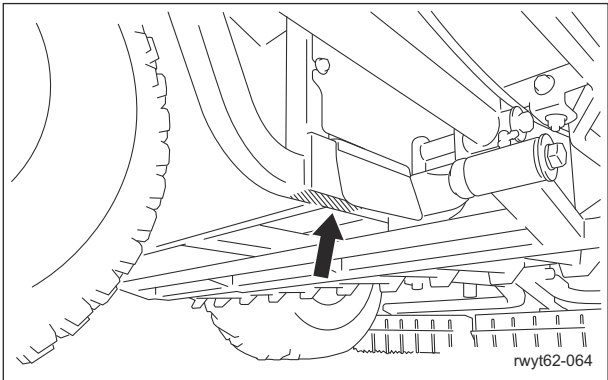
Jack-Up Points



Jack-Up Points_001

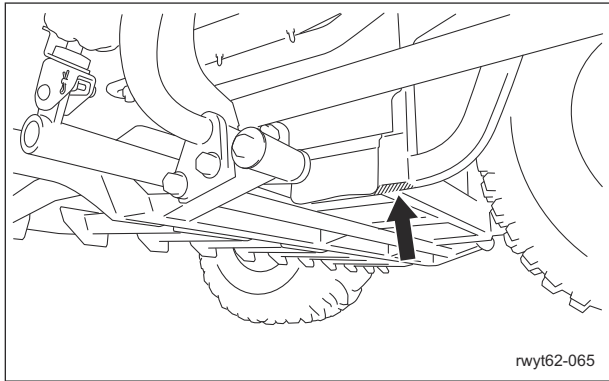
	Jack-up Points
1	Front left frame
2	Front right frame
3	Rear left frame
4	Rear right frame

1. Front left frame



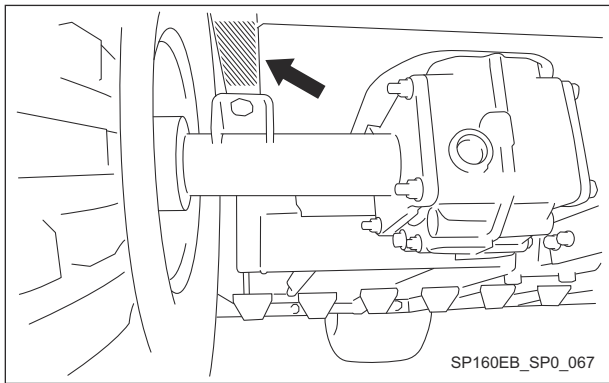
Jack-Up Points_002

2. Front right frame



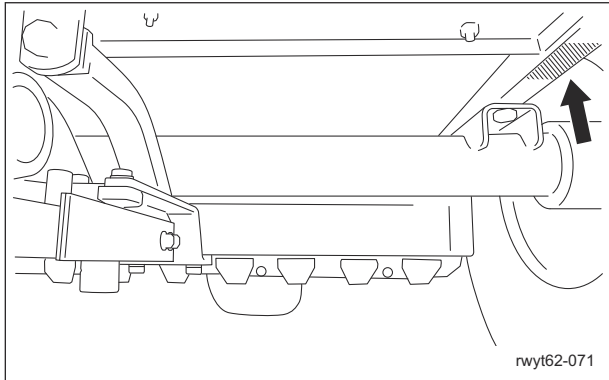
Jack-Up Points_003

3. Rear left frame



Jack-Up Points_004

4. Rear right frame



Jack-Up Points_005

Inspection and Cleaning

Inspect and clean the machine with the goals of the followings.

- Accident prevention
- Failure prevention
- Performance retention

Make efforts for early detection of the machine failure and prevention of the sudden occurrence of trouble.

Perform maintenance and repair works immediately if any abnormality is found in the machine.

Inspection of Steering Chain

Excessive play with a loose steering chain may stretch the chain further while you may feel a heavy steering wheel with an excessively tight chain and the chain and wheel may wear prematurely.

1. Make sure that the steering chain is not overtightened and is not loose.
2. Make sure that there are no cracks, damage or abnormal wear.

Inspection of Battery Fluid

! Danger

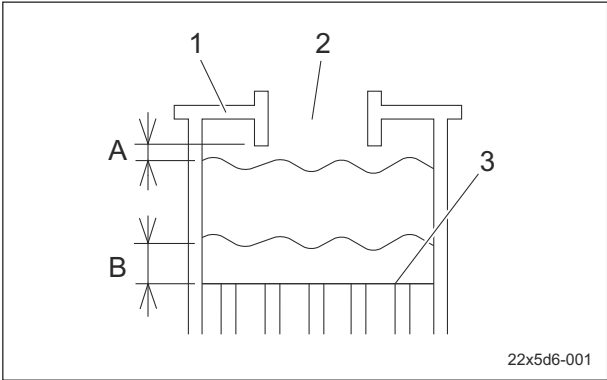
Do not allow the battery fluid level to become lower than the minimum level.
The battery may explode if it is used or charged while the battery plate is exposed.

! Warning

When refilling, do not fill purified water above the maximum level.
Doing so may result in electrolyte leaks.

Make sure that the battery fluid level is between the maximum level and the minimum level.

Refill with purified water up to the maximum level if the level is lower than halfway between the maximum level and the minimum level.



Inspection of Battery Fluid_001

1	Battery case
2	Purified water filling port
3	Battery plates
A	Maximum level 2 - 5 mm (0.079 - 0.197 in)
B	Minimum level 10 mm (0.394 in)

Inspection of Battery Cable

Warning

Loose or corroding terminals may result in an insufficient charge, burnt terminal connectors, or the battery catching fire or exploding.

1. Make sure that there is no abnormality such as corrosion of the terminals and cables.
If there is corrosion in the terminals, brush it off, and then lightly apply grease.
2. Make sure that the terminal nuts are not loose.
If they are loose, firmly tighten the nuts.

Measuring Battery Specific Weight

Danger

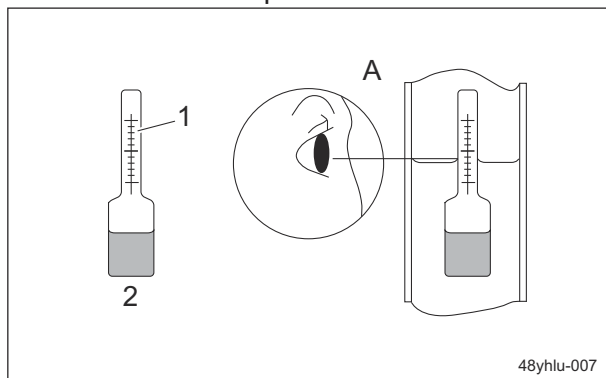
Be careful not to let your skin, eyes or clothes, etc., come into contact with the battery fluid and not to swallow the fluid accidentally. Should your skin or clothes come into contact with the battery fluid, immediately wash them with water.

Danger

When measuring the specific weight, wear protective garments, safety glasses and gloves, etc.

Measure the specific weight to determine the battery condition.

1. Stand the outside cylinder of the hydrometer vertically, and draw up the battery fluid with the dropper.
2. Make sure that there are no bubbles on the float when it is floating, and then look horizontally at the scale to read the value in contact with the top surface of the fluid.



Measuring Battery Specific Weight_001

1	Scale
2	Float
A	Reading the hydrometer

Note:

1. The specific weight is affected by temperature. Convert the hydrometer reading to the specific weight at 20 °C (68 °F).
 2. Correct specific weight = Hydrometer reading + 0.0007 x (Temperature when measured - 20)
 - The remaining capacity of the battery is approximately 100% when the specific weight is 1.28.
 - The battery can be considered to have reached the end of its life when there is a variation of 0.05 or more in the specific weight of each cell.
- "Battery Characteristics" (Page 5-3)

Inspection of Electrical Wiring

Important

Electrical short circuit will cause fire, electrical leakage and malfunction of electrical equipments.

1. Make sure that there is no defacement in wires and terminals.
2. Make sure that there is no deterioration or damage in wires and terminals.
3. Make sure that there is no looseness in wiring connections.
4. Make sure that there is no poor terminal connection.

Inspection of Wheel Mounting Bolt

Important

Tighten the wheel mounting bolts on the specified torque by using a torque wrench.

1. Check the wheel mounting bolts and wheel nuts for looseness and coming off.
2. Check the wheel mounting bolts and wheel nuts for cracks and damages.
3. Check the wheel mounting bolts and wheel nuts for rust.
4. Check around the wheel mounting bolts and wheel nuts for traces of rust fluid.

Maintenance

- 5. Check the wheel mounting bolts for unequal bolt length.
- 6. Check the wheel mounting bolts and wheel nuts for stripped threads and abrasion.

Cleaning inside The Driver Platform

Important

Do not allow water to come into contact with electrical components during cleaning. It will cause malfunction of the machine.

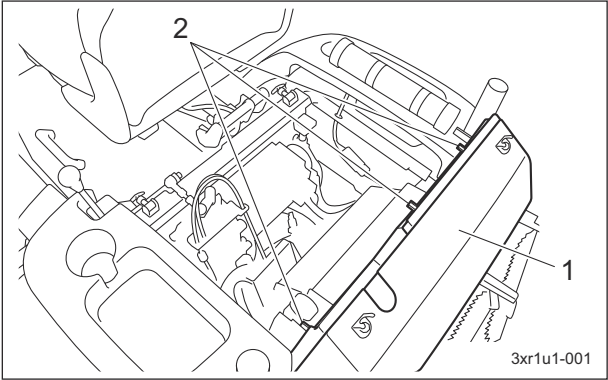
Important

Do not use fluid such as water and high-pressure air for cleaning inside the driver platform.
Do not use a wet cloth nor high-pressure air. It will cause malfunction of the machine.

Be sure to remove dust attached inside the driver platform.
Especially after operating the machine in a dusty environment, it is important to remove dust as soon as possible.

1. Follow the steps below to remove the driver cover.

- [1] Open the driver platform.
- [2] Remove the long nuts A.

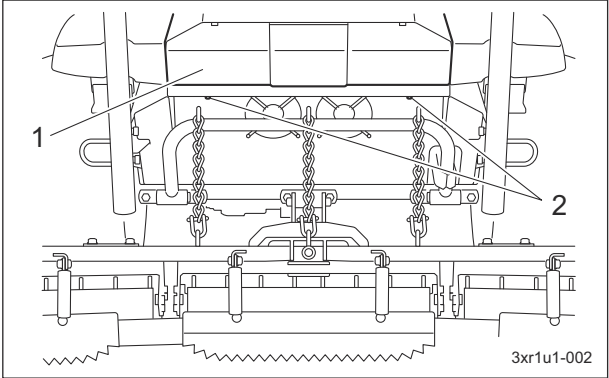


Cleaning inside The Driver Platform_001

1	Driver cover
2	Long nut A

- [3] Close the driver platform.
- [4] Remove the long nuts B.

- [5] Remove the driver cover.

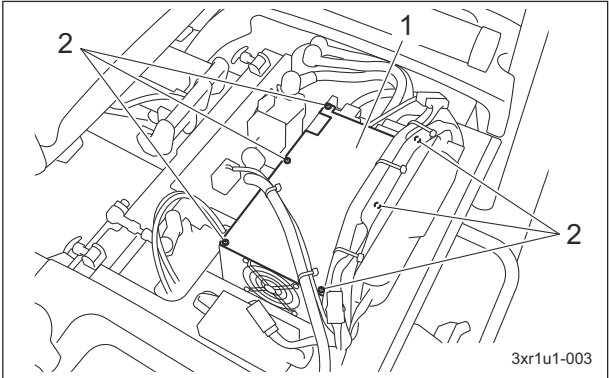


Cleaning inside The Driver Platform_002

1	Driver cover
2	Long nut B

- 2. Clean the inside of the driver platform with low-pressure air.
- 3. Follow the steps below to remove the servo driver cover.

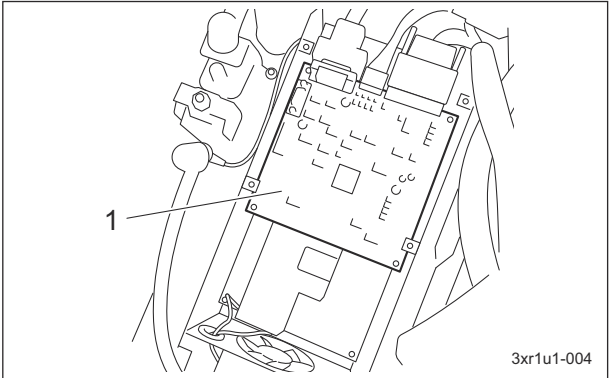
- [1] Remove the screws.
- [2] Remove the servo driver cover.



Cleaning inside The Driver Platform_003

1	Servo driver cover
2	Screw

4. If sandy dust accumulates on the circuit board inside the servo driver, remove it carefully with low-pressure air.

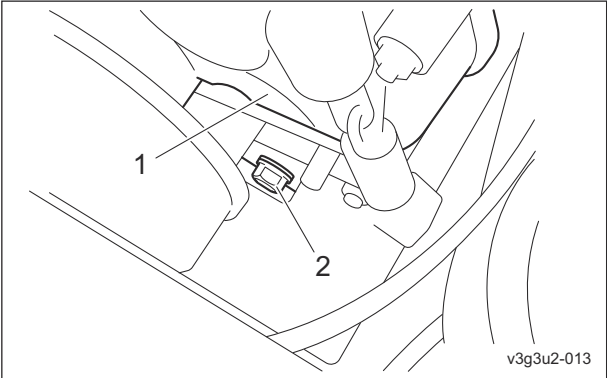


Cleaning inside The Driver Platform_004

1	Circuit board
---	---------------

Inspection of Transmission Oil

- 1. Place the machine so that its frame will be level, and then make sure that the transmission oil level is at the oil level plug at any time.
The oil level plug is located on the left side of the transmission.
- 2. Check underneath the machine for oil leakage.



Inspection of Transmission Oil_001

1	Transmission
2	Oil level plug

Supplying Fluids

Supply of Battery Fluid

Danger

If battery fluid comes into contact with eyes, it may result in blindness. Immediately flush with plenty of water and take medical care from an ophthalmologist.

Danger

Do not drink battery fluid.
If battery fluid enters the mouth or is swallowed, it may result in burns inside the mouth. Immediately and repeatedly gargle with plenty of water, then drink plenty of water, and take medical care.

Danger

When you supply battery fluid, wear protective garments, safety glasses and gloves, etc.

Danger

Do not allow the battery fluid level to become lower than the minimum level.
The battery may explode if it is used or charged while the battery fluid level is at the minimum level.

Warning

If battery fluid adheres to the skin or clothing, it may cause burns or damage clothing. Immediately flush with plenty of water, then wash thoroughly with soap.

Warning

When refilling, do not fill purified water above the maximum level.
Doing so may result in electrolyte leaks.

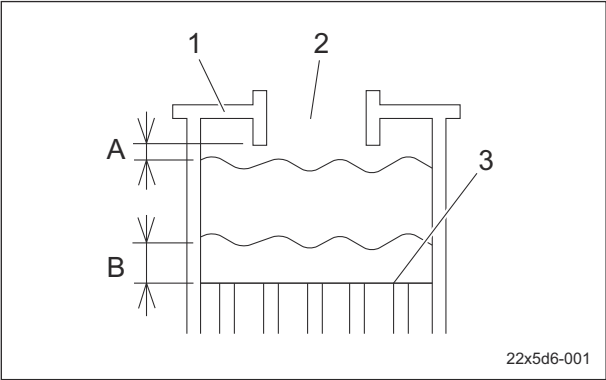
Important

If battery fluid adheres to the vehicle, it may cause corrosion.
Wipe it off with a cloth dampened with water, and then flush with water.

Important

To prevent battery fluid overflow, add purified water after charging.

If the battery fluid level is lower than halfway between the maximum level and minimum level, add purified water up to the maximum level.



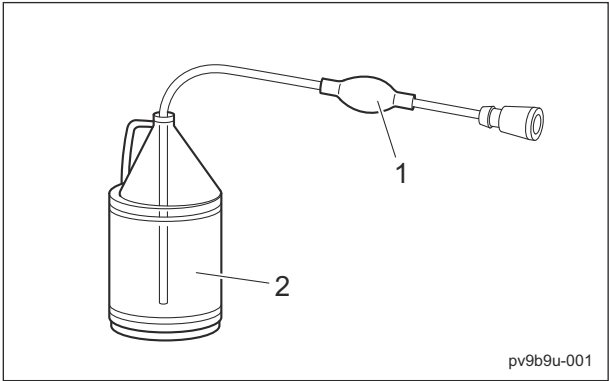
Supply of Battery Fluid_001

1	Battery case
2	Purified water filling port
3	Battery plates
A	Maximum level 2 - 5 mm (0.079 - 0.197 in)
B	Minimum level 10 mm (0.394 in)

Combined Supply of Battery Fluid

Note:
Depending on the specifications, this function may not be available.
Using a battery filling system, the battery can be reliably filled in a short period of time.

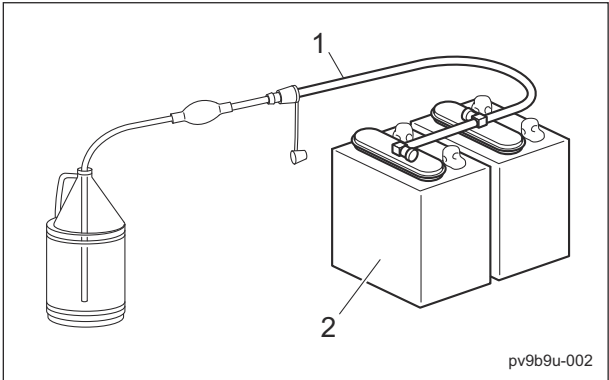
1. Insert the end of the hose on the hand pump into a container of distilled water.



Combined Supply of Battery Fluid_001

1	Hand pump
2	Distilled water

2. Connect the other end of the hose on the hand pump to the water supply hose on the battery.



Combined Supply of Battery Fluid_002

1	Water supply hose
2	Battery

3. Squeeze the hand pump to supply distilled water to the battery.

4. When the hand pump becomes hard to squeeze, refilling is finished.

5. Remove the hose of the hand pump and the water supply hose on the battery.

Charging of Battery

Danger

While charging, explosive gas (hydrogen gas) is generated. Charge batteries in a well-ventilated area, where they will not get wet, for example, from rain.

Danger

The battery may explode if it is charged while a battery plate is exposed.

Danger

While charging, do not disconnect or connect the plugs of the charger and not allow a tool to cause a short circuit.
The battery may explode.

Important

Charge the battery with the charger included with the machine.

Important

Leaving the battery discharged will shorten its life.

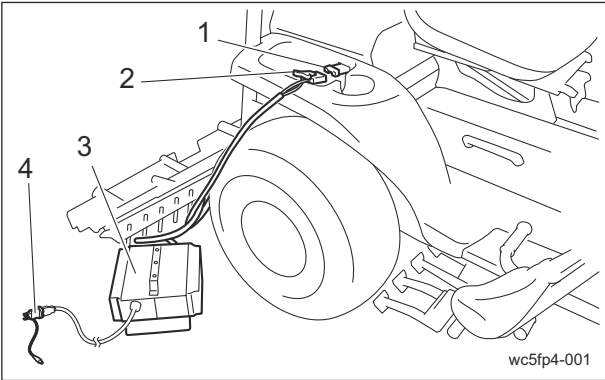
Important

Before driving the machine, make sure that the output plug of the charger is disconnected from the connector on the main vehicle.

Charging procedures

1. Apply the parking brake, and then turn the key switch to the "OFF" position.
2. Open the battery cover.
"Opening and Closing of Seat Platform" (Page 5-2) "Opening and Closing of Battery Cover" (Page 5-3)
3. Inspect the battery.
"Inspection of Battery" (Page 5-4)
If the battery plate is exposed, supply battery fluid up to the minimum level.

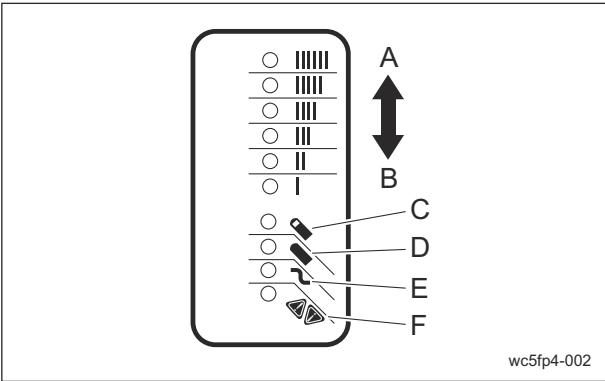
4. Remove the water-proof cap from the connector on the main vehicle, and then plug in the output plug of the charger.



Charging of Battery_001

1	Connector on main vehicle
2	Output plug
3	Charger
4	Input plug

5. Insert the input plug into the power supply outlet (AC85 – 265 V, 45 – 65 Hz).
6. The LEDs will quickly flash from the top to the bottom, and then charging begins after approximately 10 seconds.
7. When charging is finished, the "AC On" LED on the charger flashes (or lights up) and the "100% Charge" LED lights up. (The "AC On" LED flashes when the input voltage is 100 V and lights up when it is 200 V.)

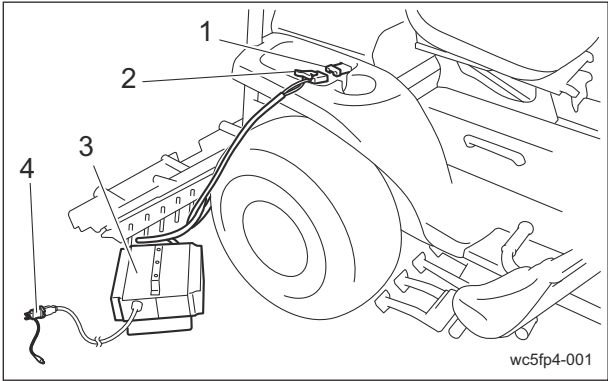


Charging of Battery_002

A	High charging current
B	Low charging current
C	80% Charge
D	100% Charge
E	AC On
F	Fault

8. Disconnect the input plug of the charger from the power supply outlet.

9. Disconnect the output plug of the charger from the connector on the main vehicle.
10. Install the water-proof cap onto the connector on the main vehicle.



Charging of Battery_003

1	Connector on main vehicle
2	Output plug
3	Charger
4	Input plug

Supply of Transmission Oil

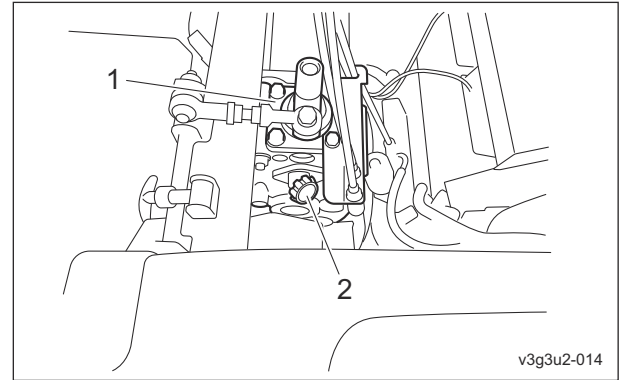
Important

Do not mix different types of transmission oil.

Important

Be sure to pour automobile gear oil that is classified as SAE Viscosity Grade #90 into the transmission.

- 1. Remove the oil filler cap.
- 2. Supply transmission oil through the oil filling port.



Supply of Transmission Oil_001

1	Transmission
2	Oil filler cap

- 3. Check the oil level again 10 to 20 minutes after replenishment.
- 4. Check underneath the machine for oil leakage.

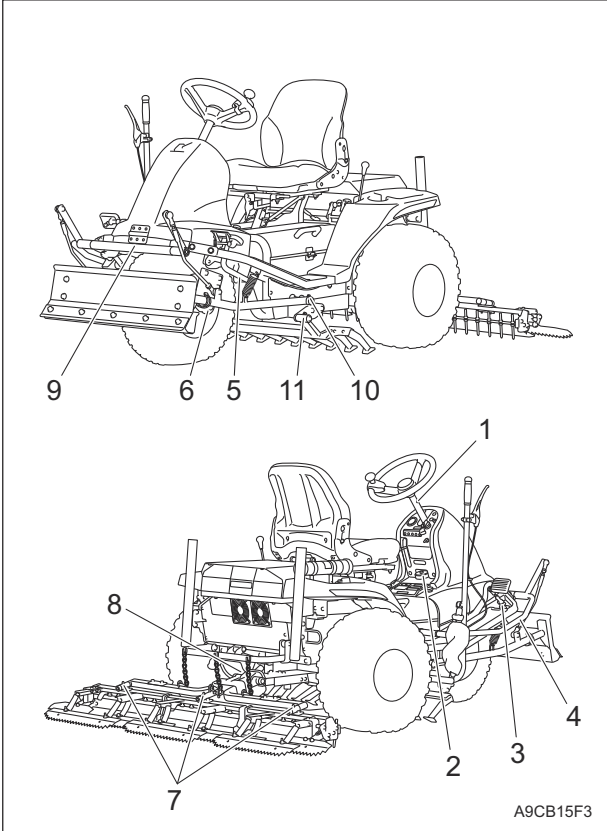
Greasing

About Greasing

Since there may be adhesion or damage due to lack of grease on moving parts, they must be greased.
Add urea-based No. 2 grease in accordance with the Maintenance Schedule.
Other locations where the specified grease or lubricant is used are indicated in "Greasing Points".
Add grease using the specified grease or lubricant.

Greasing Points

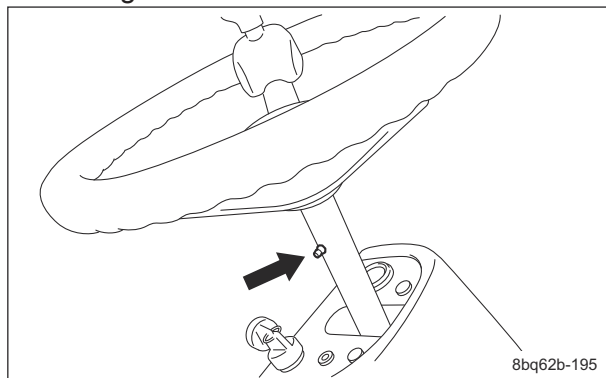
Grease nipples are installed in the following locations.
Add grease every 50 hours of operation.



Greasing Points_001

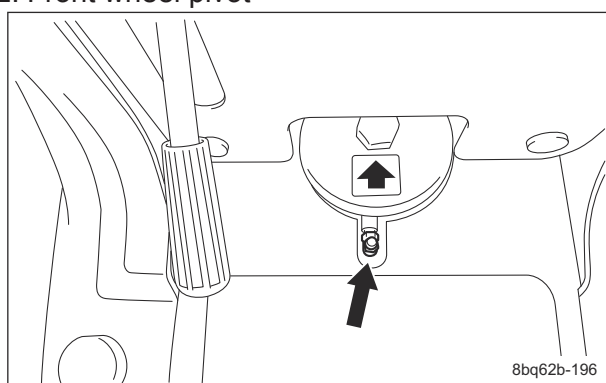
	Location	No. of Greasing Points
1	Steering wheel frame	1
2	Front wheel pivot	1
3	Traveling pedal fulcrum	1
4	Neutral lever fulcrum	1
5	Brake pedal fulcrum	1
6	Front wheel shaft rhombic flange unit	2
7	Rake frame fulcrum	3
8	Rake fulcrum	1
9	Blade lever fulcrum	1
10	Blade arm fulcrum	2
11	Cultivator lever fulcrum	2

1. Steering wheel frame



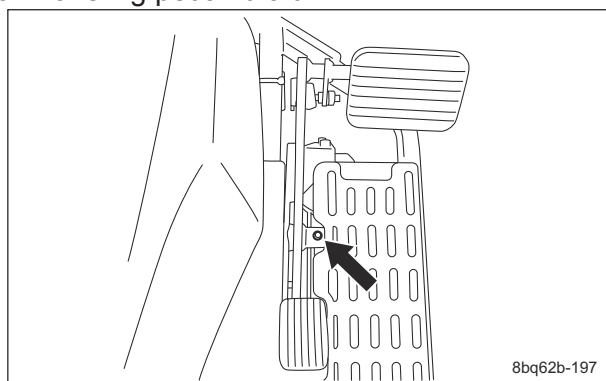
Greasing Points_002

2. Front wheel pivot



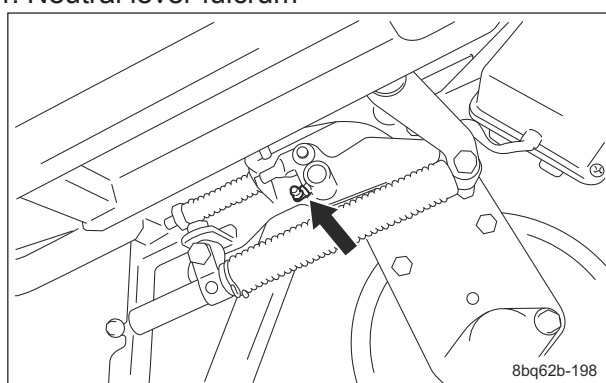
Greasing Points_003

3. Traveling pedal fulcrum



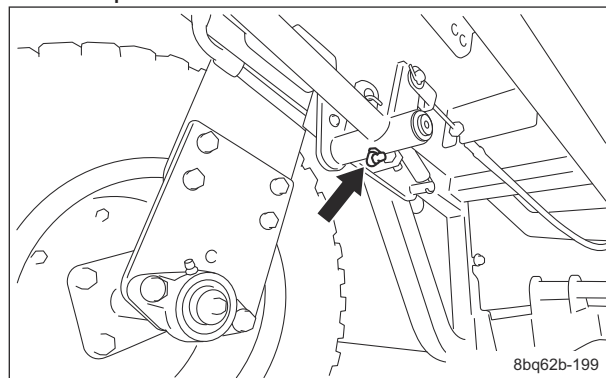
Greasing Points_004

4. Neutral lever fulcrum



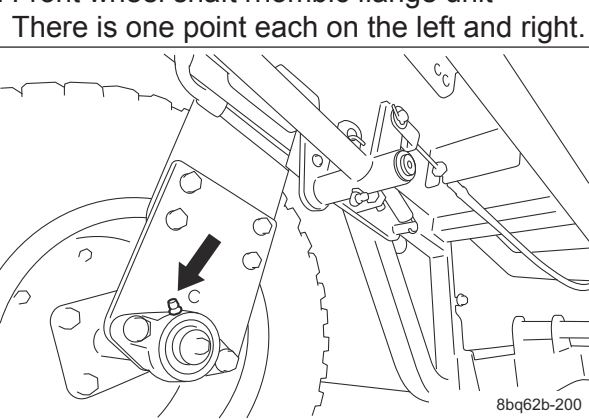
Greasing Points_005

5. Brake pedal fulcrum



Greasing Points_006

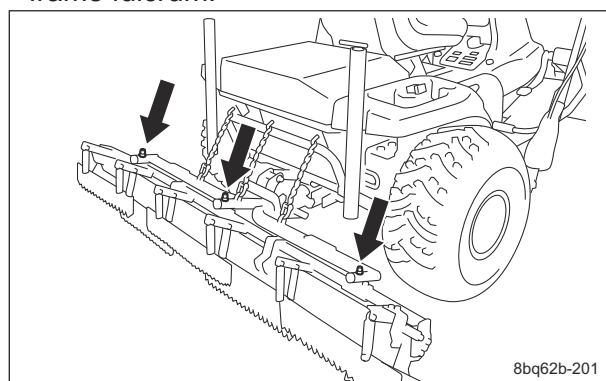
6. Front wheel shaft rhombic flange unit



Greasing Points_007

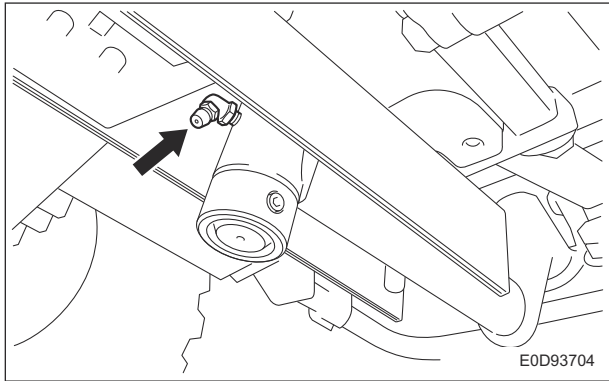
7. Rake frame fulcrum

There is one greasing point on each rake frame fulcrum.



Greasing Points_008

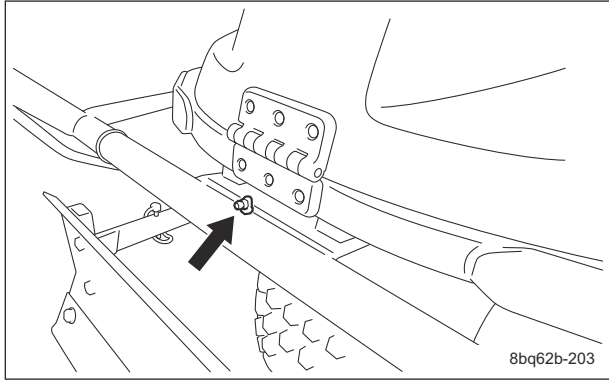
8. Rake fulcrum



Greasing Points_009

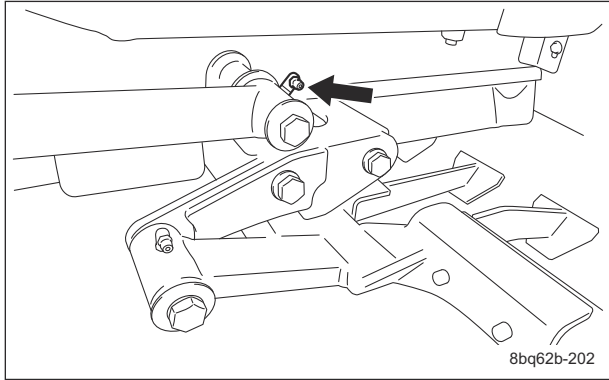
9. Blade lever fulcrum

There is one point each on the left and right.



Greasing Points_011

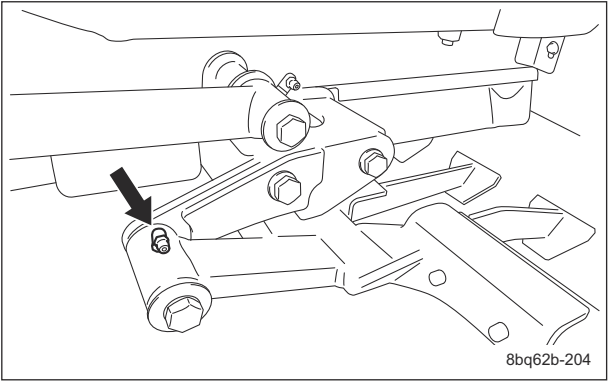
10. Blade arm fulcrum



Greasing Points_012

11. Cultivator lever fulcrum

There is one point each on the left and right.



Greasing Points_011

Adjustment

Adjustment of Shift Lever Fulcrum

The shift lever fulcrum may begin to rattle due to frequent use and may no longer be able to perform shift operations correctly. Follow the steps below to adjust the shift lever fulcrum.

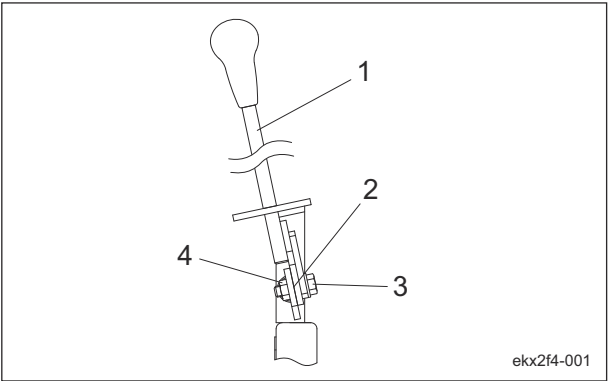
Important

Before adjusting the shift lever fulcrum, be sure to set the key switch to the "OFF" position.

Important

When adjusting the shift lever fulcrum, make sure that shift lever operation remains smooth.

1. Loosen the nut.



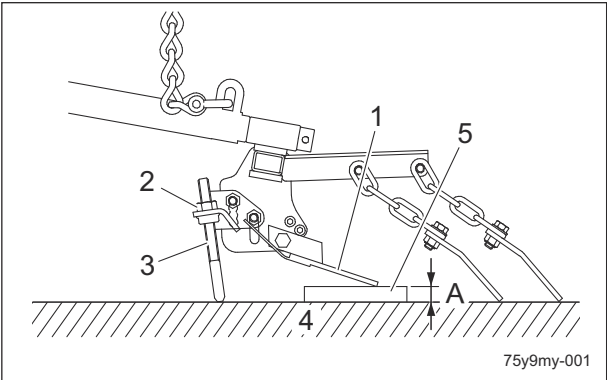
Adjustment of Shift Lever Fulcrum_001

1	Shift lever
2	Shift lever fulcrum
3	Bolt
4	Nut

- 2. Tighten the bolt until the shift lever fulcrum does not rattle.
- 3. Tighten the nut to secure the bolt.

Adjustment of Rake

- 1. Adjust the fork prong bar.
The working depth of fork prong bar can be adjusted with the nut.
- [1] On a level surface, lower the rake, and then drive the machine forward about approximately 20 cm (7.87 in).
- [2] Place a wooden board with a thickness of about 15 mm (0.59 in) under the warp board.
- [3] Adjust the fork prong bar to a position where the rake load is applied to the wooden board and the tip of the fork prong bar lightly touches the ground, and then lock it in place with the nut.

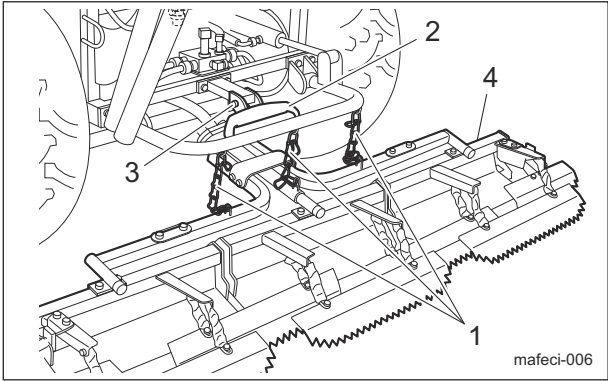


Adjustment of Rake_001

1	Warp board
2	Nut
3	Fork prong bar
4	Flat concrete surface
5	Wooden board
A	15 mm (0.59 in)

- 2. Adjust the rake height.
The height of raised rake can be adjusted by the link of the cross link chains.
As a standard, 8 links of chain are used.
- [1] Lower the rake on a level surface.
- [2] Loosen the nut.
- [3] Reduce the number of chain link.
- [4] Raise the rake.
- [5] Adjust the rake stopper so that it lightly touches the rake, and then tighten the nut.

- [6] Raise and lower the rake to check that it lightly touches the rake stopper.



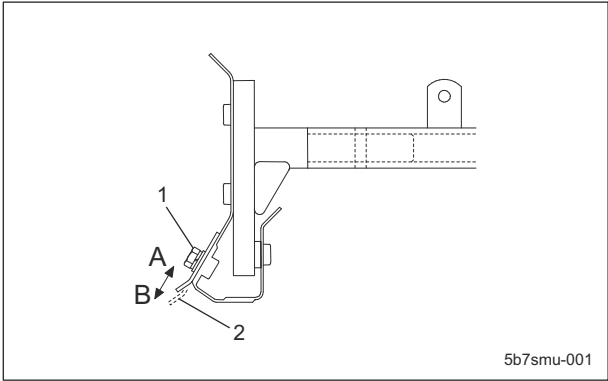
Adjustment of Rake_002

1	Cross-link chains
2	Rake stopper
3	Nut
4	Rake

Adjustment of Blade

Note:
Depending on the specifications, this function may not be available.
The blade can be adjusted with the bolt.

- 1. Loosen the bolt, and then move the small blade to the desired position.
 - [1] Toward A to take a thin layer from the surface of the sand
 - [2] Toward B to take a thick layer from the surface of the sand
- 2. Tighten the bolt.



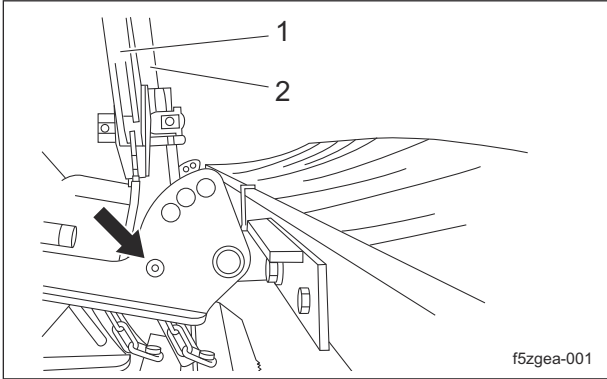
Adjustment of Blade_001

1	Bolt
2	Small blade

Adjustment of Finishing Brush

Note:
Depending on the specifications, this function may not be available.
The height of the finishing brush can be adjusted by moving the right and left movable arms while gripping the right and left clutch levers.
Return the clutch levers after adjusting the height of the brush on the ground according to the bunker conditions.
The mounting height can be adjusted to one of four levels.

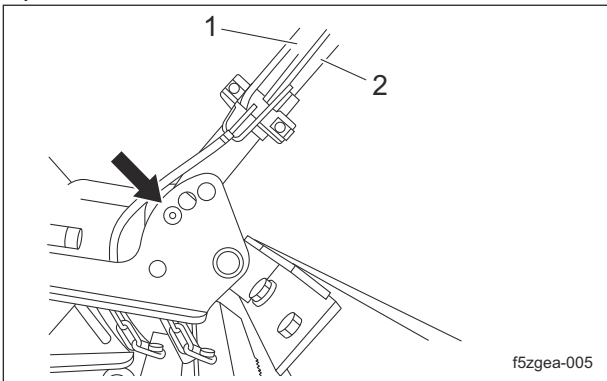
1. When traveling, adjust to the lowest position.



Adjustment of Finishing Brush_001

1	Clutch lever
2	Movable arm

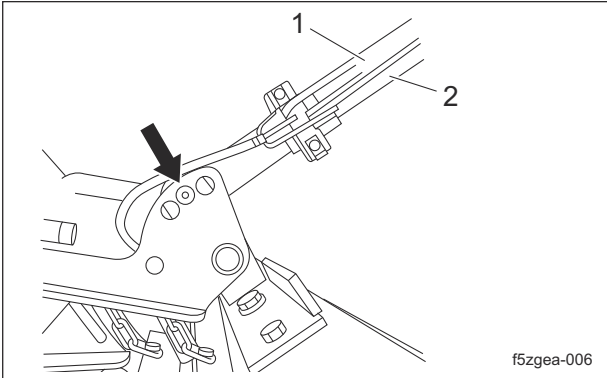
2. When used for light finishing, adjust to the position second from the bottom.



Adjustment of Finishing Brush_002

1	Clutch lever
2	Movable arm

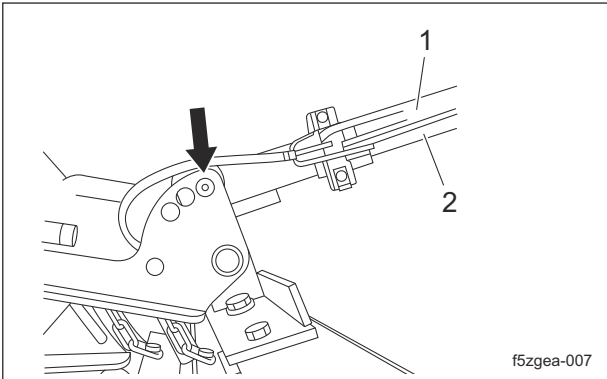
3. When used for normal finishing, adjust to the position third from the bottom.



Adjustment of Finishing Brush_003

1	Clutch lever
2	Movable arm

4. When used for heavy finishing, adjust to the highest position.



Adjustment of Finishing Brush_004

1	Clutch lever
2	Movable arm

Replacement

Change of Transmission Oil

Caution

Be careful with hot oil, which could cause burns if it contacts your skin.

Important

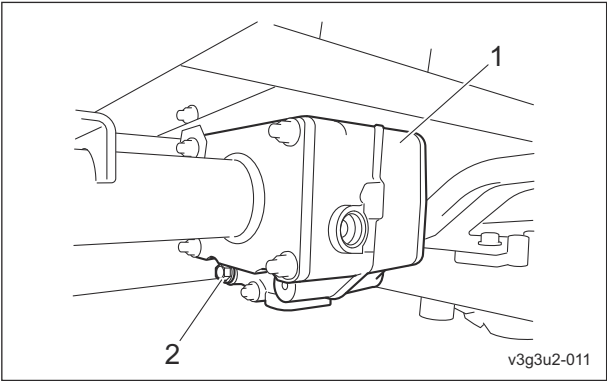
When you change the transmission oil, be sure to drain it into a bowl and discard it in accordance with regional laws and regulations.

Important

Be sure to pour automobile gear oil that is classified as SAE Viscosity Grade #90 into the transmission.

Change the transmission oil in accordance with the Maintenance Schedule.

- 1. Move the machine onto a level surface, and then switch off the machine.
"Procedure to Switch Off Machine" (Page 5-12)
- 2. Remove the drain plug while the transmission oil is warm, and then drain the oil into a container.
- 3. Install the drain plug in the transmission.

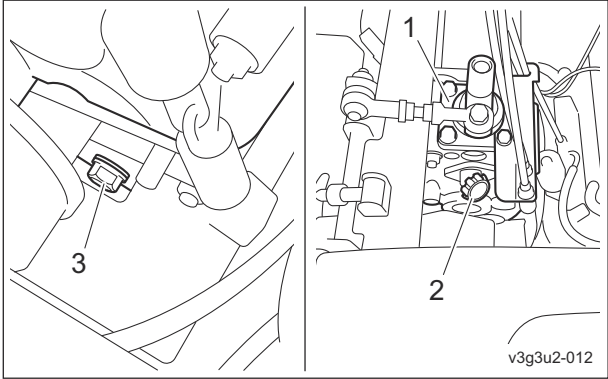


Change of Transmission Oil_001

1	Transmission
2	Drain plug

- 4. Remove the oil filler cap and oil level plug.
- 5. Supply new transmission oil through the oil filling port.
Transmission oil quantity is 2.0 dm³(2.0 L).
"Supply of Transmission Oil" (Page 6-10)

- 6. Make sure that the transmission oil level is filled up to the tip of the oil level opening.
"Inspection of Transmission Oil" (Page 6-7)
- 7. Install the oil filler cap and oil level plug.



Change of Transmission Oil_002

1	Transmission
2	Oil filler cap
3	Oil level plug

- 8. Check underneath the machine for oil leakage.

Maintenance

Replacement of Battery

When replacing the battery, observe the following precautions.

Danger

Keep away from fire while replacing the battery.
The battery may explode.
Perform the operation in a well-ventilated area, where parts will not get wet, for example, from rain.

Danger

Do not short-circuit the battery.
The battery will short-circuit not only if the positive and negative terminals come into contact with a metal tool but also if the positive terminal comes into contact with any metal part (for example, the main vehicle).

Danger

When the battery terminals are connected to the vehicle's cable terminals, securely tighten the nuts.
Inadequate tightening may result in a fire or explosion.

Warning

When connecting the vehicle's cable terminals to the battery, do not reverse the connections to the positive and negative terminals.
Firmly secure the battery with the mounting bracket.
Inadequate securing may result in battery damage, leaking fluid or a fire or explosion.

Warning

Do not modify the battery terminals.
Do not obstruct the battery's vent plug or side exhaust holes with the connected cables, etc.
Do not connect electrical devices directly to the battery.

Caution

Do not allow flexible polyvinyl chloride etc. including plasticizers to come into contact with the battery.
Position the battery so that it is level while being handled, and install it level in the mounting bracket.
If terminal covers and heat shield plates are installed on the battery, install them in their original positions after replacing the battery.

Caution

The battery is a heavy weight.
Exercise care in leakage and injury due to overturn or drop during moving, unpacking, removal and installation.

Important

Select a battery with terminals (positive and negative) at the same positions.
Forcing connections to a battery with terminals at different positions will damage the cables.

Important

When placing the battery in the machine, never carry it by its terminals.
This will cause faulty terminal connections due to deformed terminals or fluid leakage from around the terminals.

Important

Use a replacement battery of the same size as the original one.

Important

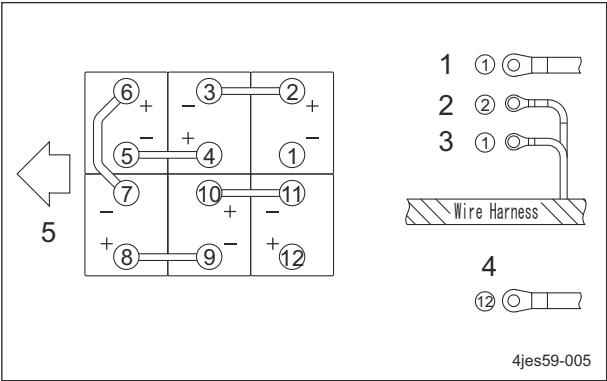
When replacing the battery, be sure to replace it with a new one.

Important

Be careful with the used battery since it may retain power.

Follow the steps below to replace the battery.
1. Switch off the machine and remove the key.

2. Disconnect the battery cable.
Refer to the figure and disconnect the battery cable in the appropriate order.
Disconnect the wires in order, from (negative) terminal ① to terminal ⑫.
3. Use the included battery handle to replace the battery.
4. For installing the battery, reverse the removing procedure.



Replacement of Battery_001

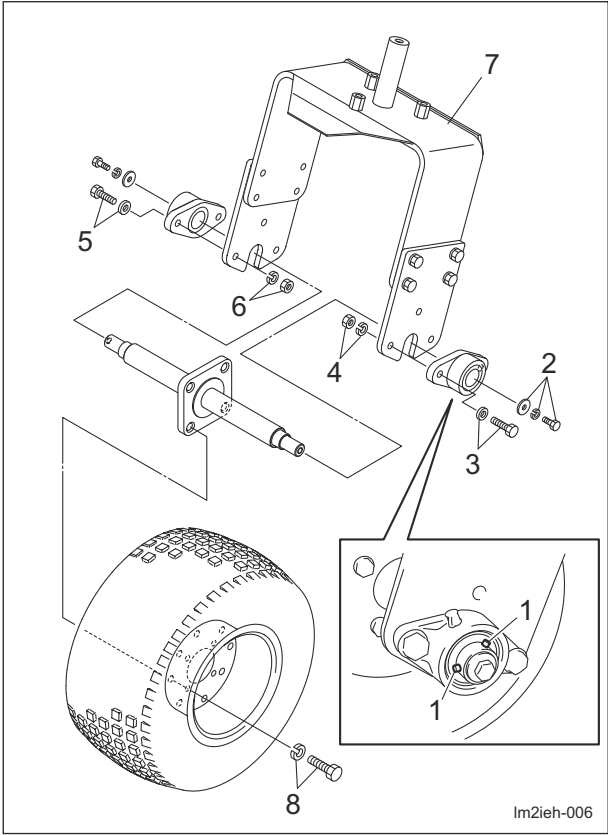
1	Negative wire (black)
2	Positive wire (red/green)
3	Negative wire (black)
4	Positive wire (red)
5	Front

Replacement of Tires

Replacement of Front Tire

1. Removing front tire
Follow the steps below to remove the front tire.
- [1] Securely place the jack beneath the jack-up points of the front left/right frame area, and then raise it until the tire lifts off the ground.
"Jack-Up Points" (Page 6-3)
- [2] Loosen the lock bolts for the left rhombic flange unit.
- [3] Remove bolt A.
- [4] Remove bolt B and nut B, and then remove the left rhombic flange unit.
- [5] Remove bolt C and nut C, and then remove the right rhombic flange unit.
- [6] Remove the front wheel arm.

- [7] Remove the wheel mounting bolt, and then remove the tire.



Replacement of Front Tire_001

1	Lock bolt
2	Bolt A
3	Bolt B
4	Nut B
5	Bolt C
6	Nut C
7	Front wheel arm
8	Wheel mounting bolt

2. Installing front tire

Important

Tighten the bolts in the tightening order (diagonally).

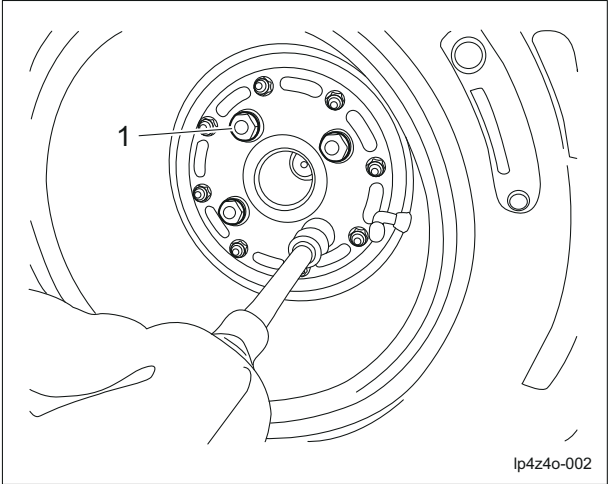
Important

Tighten the wheel mounting bolts on the specified torque by using a torque wrench.

For installing the front tire, reverse the removing procedure.

Replacement of Rear Tires

1. Removing rear tires
- Follow the steps below to remove the rear tires:
- [1] Loosen the bolts.



Rear Tires_001

1	Bolt
---	------

- [2] Securely place the jack beneath the jack-up point of the rear left/right frame area, and then raise it until the tire lifts off the ground.
- "Jack-Up Points" (Page 6-3)
- [3] Remove the bolts.
- [4] Remove the tire from the wheel mounting seat.

2. Installing rear tires

Important

Tighten the bolts in the tightening order (crosswise).

Important

Tighten the wheel mounting bolts on the specified torque by using a torque wrench.

For installing the rear tires, reverse the removing procedure.

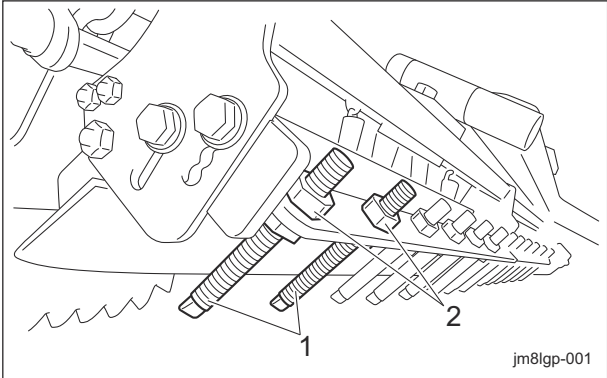
Replacement of Fork Prong Bar

Caution

Wear gloves when touching a fork prong bar.

When wear of the fork prong bar results in no margin for tightening the nut on the fork prong bar, replace the fork prong bar.

1. Loosen the nut, and then replace the fork prong bar.



Change of Fork Prong Bar_001

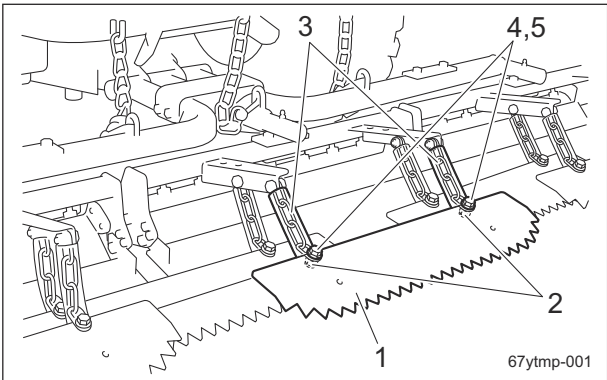
1	Fork prong bar
2	Nut

2. Adjust the fork prong bar.
- "Adjustment of Rake" (Page 6-13)
3. Tighten the nut.

Change of Smoother Plate

Replace the smoother plates if smoothing ability decreased due to the plates wear.

1. Remove the nuts with friction ring, bolts and washers.



Change of Smoother Plate_001

1	Smoother plate
2	Nut with friction ring
3	Chain
4	Bolt
5	Washer

2. Replace the smoother plates.

3. Install the bolts, washers and nuts with friction ring.

Important

If the chain completely fixed with the nuts with friction ring, the smoother plates cannot level out very well.

4. Tighten the nuts with friction ring so that the chain can move.

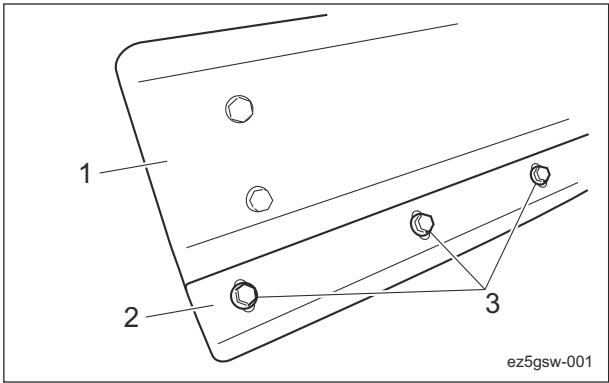
Replacement of Small Blade

Note:

Depending on the specifications, this function may not be available.

When wear of the small blade causes a reduction in the amount of sand that is lifted up, replace the small blade.

1. Loosen the bolts installing the small blade, and then replace the small blade.



Change of Small Blade_001

1	Blade
2	Small blade
3	Bolt

2. Adjust the small blade.
"Adjustment of Blade" (Page 6-13)
3. Tighten the bolts.

Replacement of The Cultivator Fitting

Note:

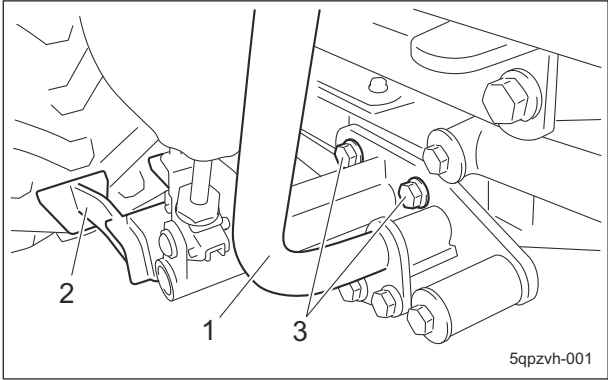
Depending on the specifications, this function may not be available.

Caution

When removing the cultivator, be careful not to pinch your hands.

When wear of the trapezoidal cultivator fitting disables unhardening the sand, replace the trapezoidal cultivator fitting.

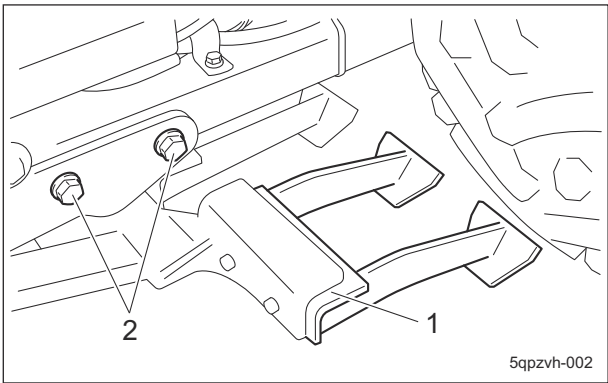
1. Remove the bolts at the bottom of the machine on the right side.



Change of The Cultivator Fitting_001

1	Lever pipe
2	Trapezoidal cultivator fitting
3	Bolt

2. Remove the bolts at the bottom of the machine on the left side.



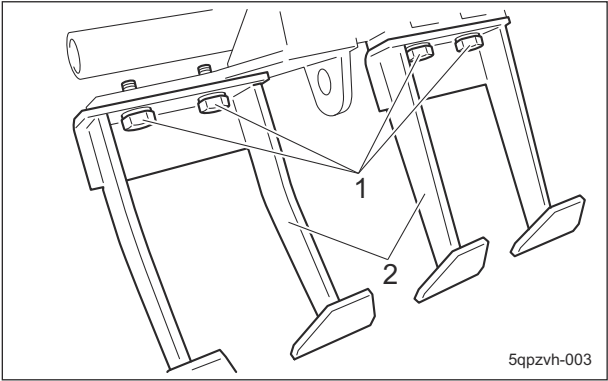
Change of The Cultivator Fitting_002

1	Cultivator
2	Bolt

3. Pull out the cultivator from the bottom of the machine.

Maintenance

4. Remove the bolts, and then replace the trapezoidal cultivator fittings.



Change of The Cultivator Fitting_003

1	Bolt
2	Trapezoidal cultivator fitting

5. Tighten the bolts for the trapezoidal cultivator fitting.

 **Caution**

When installing the cultivator, pay attention to its falling.

6. Install the cultivator to the machine with bolts.

Replacement of Finishing Brush

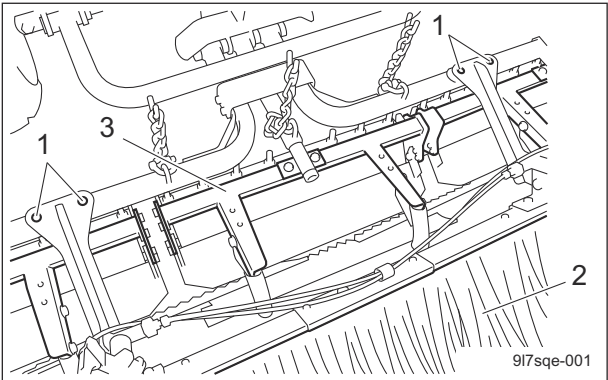
Note:
Depending on the specifications, this function may not be available.

 **Caution**

Be careful since the finishing brush is heavy.

When wear of the finishing brush results in rake tracks remaining, replace the finishing brush.

1. Remove the bolts from the rake, and then remove the finishing brush.



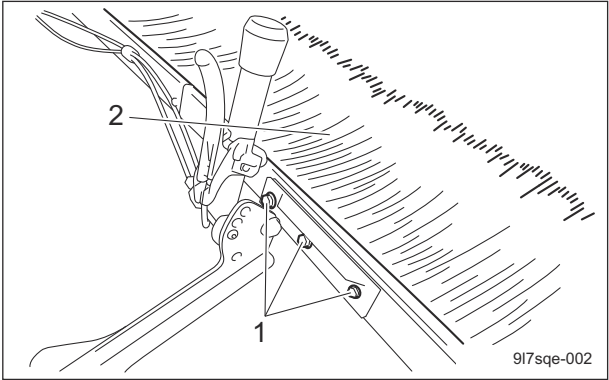
Change of Finishing Brush_001

1	Bolt
2	Finishing brush
3	Rake

 **Caution**

Place the finishing brush on level surface.

2. Remove the bolts, and then replace the finishing brush.



Change of Finishing Brush_002

1	Bolt
2	Finishing brush

3. Tighten the bolts.

Storage

Long-Term Storage

Follow the instructions below for long-term storage of the machine.

1. Cleaning

- Remove dirt, grass clippings, oil stains etc. completely from the main vehicle and engine.

2. Greasing and lubricating

- Supply oil and apply grease to appropriate parts.

3. Battery

- Remove the negative battery wire.
- Recharge the battery every three months so it will not discharge excessively.

4. Tire pneumatic pressure

- Set the tire air pressure slightly higher than normal, and then place the machine on a board to avoid humidity.

5. Storage location

- Cover the machine and store it in a dry place where it will not be exposed to rain.
- Store it in well-ventilated indoor space, away from heat, moisture and direct sunlight.

Maintenance

Precautions for Repair Page 7-2

Adjustment Page 7-2

Adjustment of Steering Chain Page 7-2

Adjustment of Traveling Pedal Page 7-2

Adjustment of Brake Page 7-3

Replacement Page 7-4

Change of Brake Wire Page 7-4

Replacement of Battery Cable Page 7-6

Replacement of Fuse Page 7-7

TowingPage 7-8

Towing The Machine in An
EmergencyPage 7-8

Precautions for Repair

Warning

The chapter "Repair" in this manual describes practical measures which should be performed by a mechanic with expertise. The owner should instruct the mechanic with expertise to perform repair service for this machine.

Caution

First, learn well the operations you plan to perform.

Important

Use tools appropriate for each operation.

Important

Use Baroness genuine parts for replacement and accessories. Our product warranty may be void if you use non-genuine parts for replacement or accessories.

Adjustment

Adjustment of Steering Chain

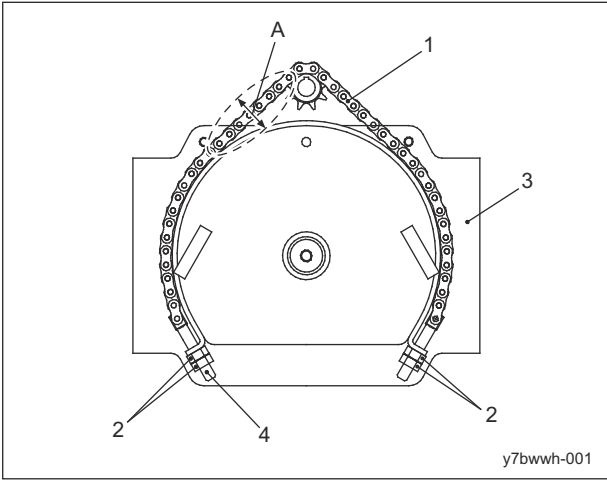
Excessive play with a loose steering chain may stretch the chain further while you may feel a heavy steering wheel with an excessively tight chain and the chain and wheel may wear prematurely.

Important

Make sure that the steering chain has the specified amount of slack.

1. Open the front cover.

2. With the nuts on each end of the steering chain, adjust the chain tension so that there is approximately 5 mm (0.20 in) of slack.



Adjustment of Steering Chain_001

1	Steering chain
2	Nut
3	Front wheel arm
4	Adjustment screw
A	5 mm (0.20 in)

3. After making adjustments, firmly secure the nuts.

Adjustment of Traveling Pedal

Important

Do not adjust the traveling pedal. Traveling at 15.0 km/h or more will damage the machine.

The traveling pedal is set a factory default forward speed of 15.0 km/h and reverse speed of 5.0 km/h.

Adjustment of Brake

⚠ Caution

Make sure that the brake wire is not cracked or damaged.

⚠ Caution

Perform the adjustment with the machine switched off.

Important

If the brake is not sufficiently effective, adjust the brake wire.

Adjust the brake by tightening the brake wire adjustment bolt.

Adjustment of Parking Brake Wire

Important

Adjust the play of the brake lever so that it is as small as possible and the brakes do not drag when the lever is released.

When the parking brake wire is stretched, the play of the brake pedal may become large, the braking effectiveness may become worse and the brake pedal may unexpectedly lock. If the brake is not sufficiently effective when the brake pedal is depressed, adjust the parking brake wire.

1. Park the machine on a level surface.
2. Release the parking brake.
3. Loosen the travel safety device brake wire.
4. Adjust the parking brake by tightening the adjustment bolt on the transmission side.

[1] Loosen the lock nut B.

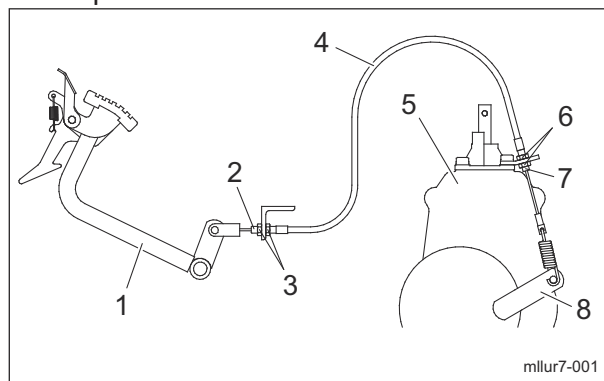
[2] Adjust the parking brake wire with the adjustment bolt B.

- If the brake lever play is too large, the braking power will be decreased and the brake pedal will be soft.
- If the brake lever play is too small, the braking power will be increased and the brake pedal will be hard.

[3] Firmly secure the adjustment bolt B with the lock nut B.

Note:

If adjustment with the adjustment bolt on the transmission side is not completed, adjust by tightening the adjustment bolt on the pedal side.



Adjustment of Parking Brake Wire_001

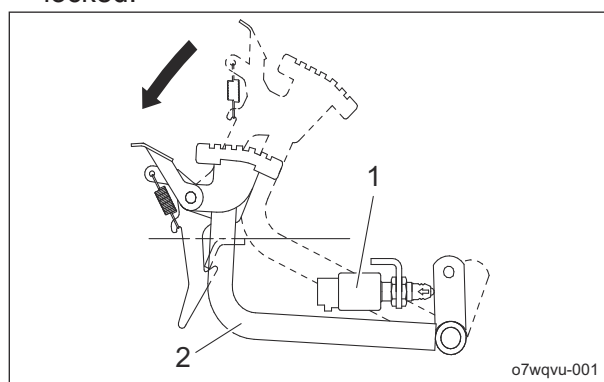
1	Brake pedal
2	Adjustment bolt A
3	Lock nut A
4	Parking brake wire
5	Transmission
6	Lock nut B
7	Adjustment bolt B
8	Brake lever

5. Inspect the parking brake.

"Inspection of Parking Brake" (Page 5-6)

Adjustment of Parking Brake Switch

1. Adjust the parking brake switch position so that the switch is pressed to produce a clicking sound when the brake pedal is locked.

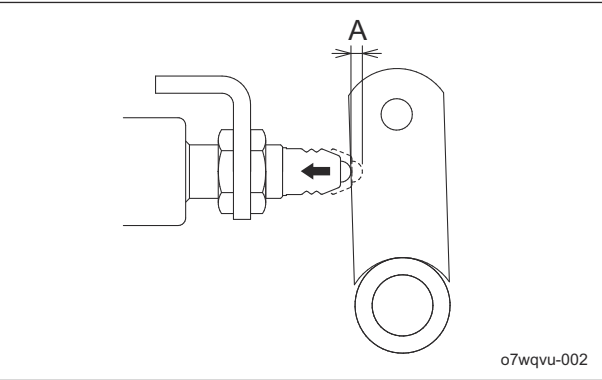


Adjustment of Parking Brake Switch_001

1	Parking brake switch
2	Brake pedal

Repair

2. Adjust the parking brake switch position so that the switch stroke is 6.0 mm (0.24 in.) or less when the brake pedal is locked.



Adjustment of Parking Brake Switch_002

A	6.0 mm (0.24 in.) or less
---	---------------------------

Note:

The following occur when the parking brake switch is pressed.

- The machine does not travel, even if the traveling pedal is depressed.
- The buzzer will not sound when the operator leaves the seat.

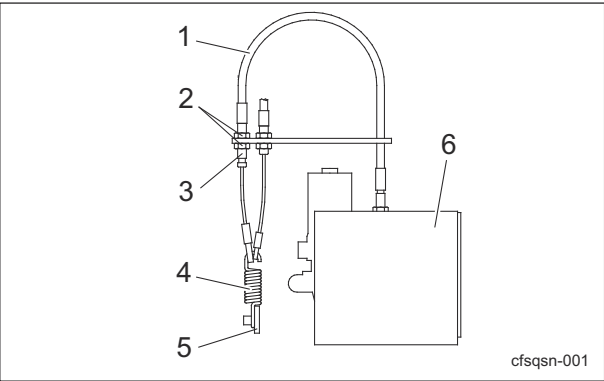
Adjustment of Travel Safety Device Brake

Important

Before adjusting the travel safety device brake, complete the adjustment of the parking brake.

1. Park the machine on a level surface.
2. Release the parking brake.
3. Loosen the lock nut.
4. Adjust the travel safety device brake wire with the adjustment bolt.
Adjust the travel safety device brake wire so that its play is as small as possible and the brakes do not drag when the brake is released.

5. Firmly tighten the lock nut.



Adjustment of Travel Safety Device Brake_001

1	Travel safety device brake wire
2	Lock nut
3	Adjustment bolt
4	Hook spring
5	Brake lever
6	Safety device

6. Inspect the travel safety device brake.
"Inspection of Travel Safety Device Brake"
(Page 5-7)

Replacement

Change of Brake Wire

Caution

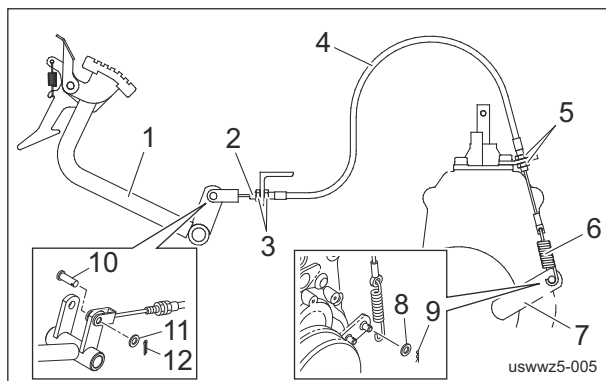
If there are cracks, damage or other defects in the brake wire, replace it immediately.

Important

The brake wire of travel safety device is unexchangeable.
Replace a whole travel safety device brake Assy.

1. Apply the parking brake.
2. Lower the rake.
3. Switch off the machine.
4. Chock the wheels.
5. Release the parking brake.
6. Open the driver platform.

7. Remove the cotter pin and washer from the brake lever.



Change of Brake Wire_001

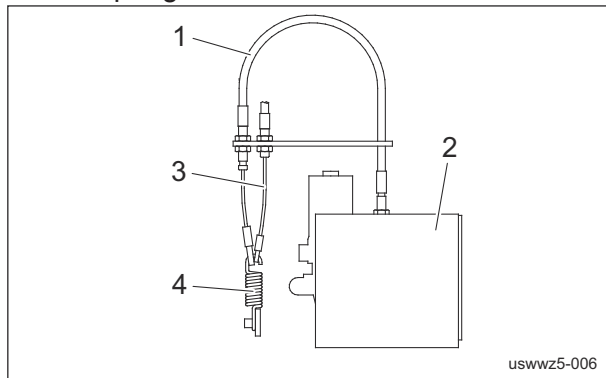
1	Brake pedal
2	Adjustment bolt A
3	Lock nut A
4	Parking brake wire
5	Lock nut B
6	Hook spring
7	Brake lever
8	Washer
9	Cotter pin
10	Pin
11	Washer
12	Cotter pin

8. Remove the hook spring from the brake lever.

Important

Do not remove the brake wire of travel safety device.

9. Remove only the parking brake wire from the hook spring.



Change of Brake Wire_002

1	Travel safety device brake wire
2	Safety device
3	Parking brake wire
4	Hook spring

10. Remove the cotter pin and washer, and then pull out the pin.
11. Loosen the lock nut A and lock nut B.
12. Remove the parking brake wire.
13. Install a new parking brake wire.
14. Tighten the lock nut A at the level where the longest thread part of the adjustment bolt A projects toward the brake pedal.
15. Attach the parking brake wire to the hook spring.
16. Attach the hook spring to the brake lever.
17. Attach the washer and cotter pin to the brake lever.
18. Adjust the parking brake.

Replacement of Battery Cable

When replacing the battery cable, observe the following precautions.

**Danger**

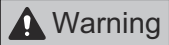
Keep away from fire while replacing the battery cable.
The battery may explode.
Perform the operation in a well-ventilated area, where parts will not get wet, for example, from rain.

**Danger**

Do not short-circuit the battery.
The battery will short-circuit not only if the positive and negative terminals come into contact with a metal tool but also if the positive terminal comes into contact with any metal part (for example, the main vehicle).

**Danger**

When the battery terminals are connected to the vehicle's cable terminals, securely tighten the nuts.
Inadequate tightening may result in a fire or explosion.

**Warning**

When connecting the vehicle's cable terminals to the battery, do not reverse the connections to the positive and negative terminals.

**Warning**

Do not obstruct the battery's vent plug or side exhaust holes with the connected cables, etc.

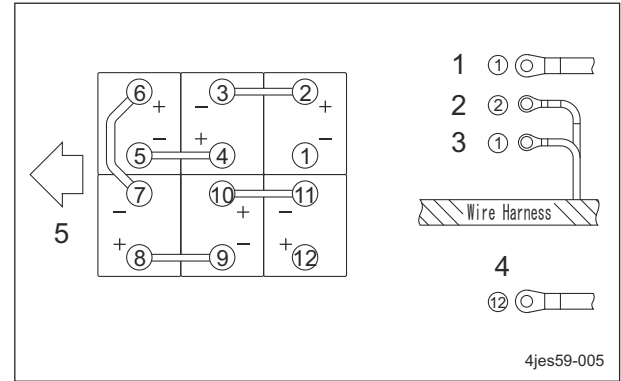
**Caution**

If terminal covers and heat shield plates are installed on the battery, install them in their original positions after replacing the battery.

Follow the steps below to replace the battery cable.

1. Switch off the machine and remove the key.

2. Disconnect the battery cable.
Refer to the figure and disconnect the battery cable in the appropriate order.
Disconnect the wires in order, from (negative) terminal ① to terminal ⑫.
3. For installing the battery cable, reverse the removing procedure.



Replacement of Battery Cable_001

1	Negative wire (black)
2	Positive wire (red/green)
3	Negative wire (black)
4	Positive wire (red)
5	Front

Replacement of Fuse

Important

When performing maintenance on the electrical system, be sure to remove the negative battery wire.

Important

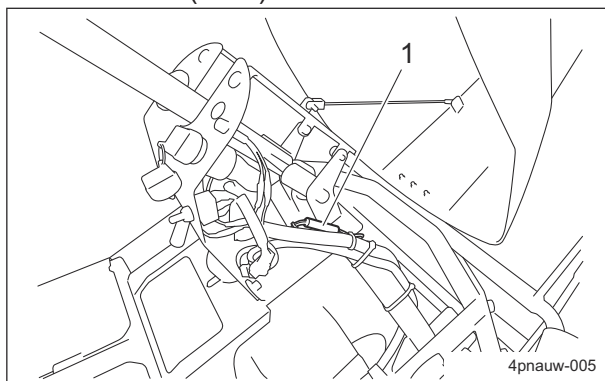
If a fuse blows, a short may have occurred within the electrical circuit. Check for the cause, such as faulty terminal connections, damaged wiring or terminals, or incorrect wiring.

Important

For fuse replacement, clean the fuse mounting area with use of compressed air before mounting the fuse.

Fuses

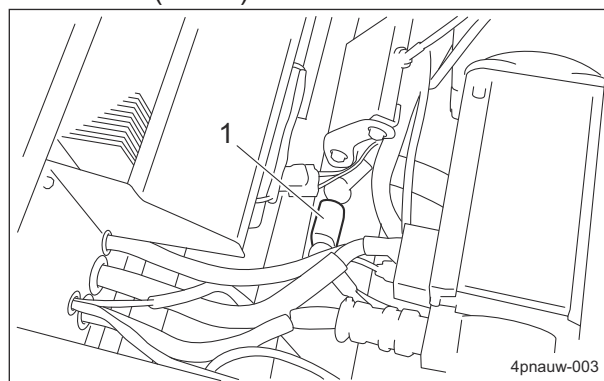
1. The fuse holder is located inside the front cover.
Glass fuse (30 A)



Fuses_001

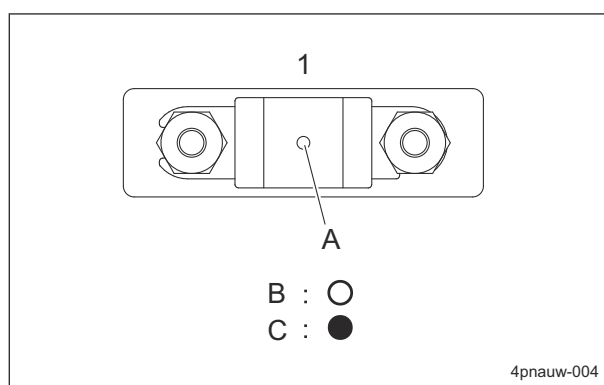
1	Fuse holder
---	-------------

2. Open the driver platform to access the fuse.
Check the blown fuse indicator.
BF fuse (325 A)



Fuses_002

1	BF fuse
---	---------



Fuses_003

1	BF fuse
A	Blown fuse indicator
B	Before fuse is blown
C	After fuse is blown

Towing

Towing The Machine in An Emergency

 **Caution**

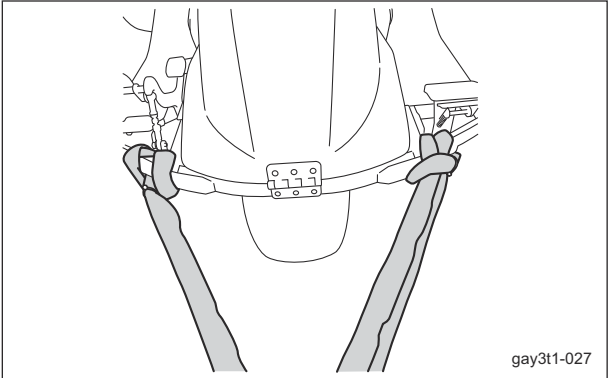
When towing the machine, travel at a speed no more than 3.0 km/h.

 **Caution**

If the travel safety device brake wire is removed from the hook spring on the transmission brake lever, the brakes will no longer operate and the machine will enter a free-run (neutral) state. After repairs are completed, be sure to attach the travel safety device brake wire to the hook spring.

If the machine does not travel due to activation of the safety device, etc., you can move it by towing or pushing it.

- 1. Apply the parking brake.
- 2. Lower the rake.
- 3. Switch off the machine.
- 4. Chock the wheels.
- 5. Secure the machine with ropes.



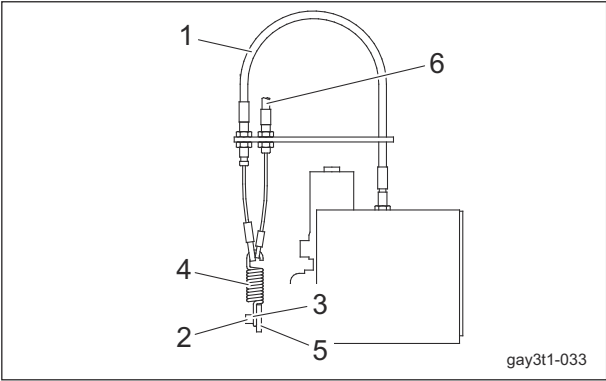
Towing The Machine in An Emergency_001

- 6. Release the parking brake.
- 7. Open the driver platform.
- 8. Remove the cotter pin and washer from the transmission brake lever.
- 9. Remove the hook spring from the transmission brake lever.

Important

Do not remove the parking brake wire.

- 10. Remove only the travel safety device brake wire from the hook spring.



Towing The Machine in An Emergency_002

1	Travel safety device brake wire
2	Cotter pin
3	Washer
4	Hook spring
5	Brake lever
6	Parking brake wire

- 11. Attach the hook spring to the transmission brake lever.
- 12. Attach the cotter pin and washer to the transmission brake lever.
- 13. Close the driver platform.
- 14. Apply the parking brake.
- 15. Switch on the machine.
- 16. Raise the rake.
- 17. Raise the blade and cultivator if installed.
- 18. Switch off the machine.
- 19. Remove the wheel stoppers.
- 20. Set the shift lever to the "Neutral" position.
- 21. Release the parking brake

 **Warning**

While towing, always keep your foot on the brake pedal and depress the brake pedal at any time to stop.

- 22. Tow the machine slowly.

Appended Table

Tightening TorquesPage 8-2

 Standard Tightening TorquesPage 8-2

 Principal Tightening Torques Page 8-4

Daily Check List Page 8-5

Maintenance Schedule Page 8-6

List of Adjusted Values Page 8-6

Appended Table

Appended Table

Tightening Torques

Important

Refer to the Tightening Torque table.
Note that the Baroness product warranty may not apply to defects caused by incorrect or overtorque tightening, etc.

Standard Tightening Torques

Bolts and Nuts

Important

A number of bolts are used in each part of this machine.
Be sure to re-tighten the bolts and nuts, because they may be loosened at the earlier stage of the use.

- As to the bolts and nuts without any special instruction, tighten them in appropriate tightening torque with proper tool.
Too much tightening may cause the looseness or damage of the screw.
- The strength of tightening is determined by types of screws, strength, the friction of thread face or base face and others.
The table below is for the galvanized or parkerized bolts.
In case that the strength of internal thread is weak, it is not applied.
- Do not use rusty or sand attached "screw."
Otherwise, it may cause insufficient tightening even if you apply the specified tightening torque.
The friction of the screw face becomes higher and the tightening torque is canceled out by the friction, therefore sufficient tightening cannot be applied.
- If "screw" is wet by water or oil, do not tighten it with normal tightening torque.
If the screw is wet, the torque coefficient will get smaller and it may result in too much tightening.
Too much tightening may cause looseness by the screw stretched or result in damage.
- Do not use a bolt experienced too much burden.
- Using the impact wrench requires the skill.
Do exercise as much as possible for steady tightening.

Appended Table

Nominal diameter	General bolt		
	Strength classification 4.8		
	 tib3yb-001		
	N-m	kgf-cm	lb-in
M5	3 - 5	30.59 - 50.99	26.55 - 44.26
M6	7 - 9	71.38 - 91.77	61.96 - 79.66
M8	14 - 19	142.76 - 193.74	123.91 - 168.17
M10	29 - 38	295.71 - 387.49	256.68 - 336.34
M12	52 - 67	530.24 - 683.20	460.25 - 593.02
M14	70 - 94	713.79 - 958.52	619.57 - 831.99
M16	88 - 112	897.34 - 1142.06	778.89 - 991.31
M18	116 - 144	1,182.85 - 1,468.37	1,026.72 - 1,274.54
M20	147 - 183	1,498.96 - 1,866.05	1,301.10 - 1,619.73
M22	295	3,008.12	2,611.05
M24	370	3,772.89	3,274.87
M27	550	5,608.35	4,868.05
M30	740	7,545.78	6,549.74

Appended Table

Nominal diameter	Heat-treated bolt					
	Strength classification 8.8			Strength classification 10.9		
	 tib3yb-002			 tib3yb-003		
	N-m	kgf-cm	lb-in	N-m	kgf-cm	lb-in
M5	5 - 7	50.99 - 71.38	44.26 - 61.96	7 - 10	71.38 - 101.97	61.96 - 88.51
M6	8 - 11	81.58 - 112.17	70.81 - 97.36	14 - 18	142.76 - 183.55	123.91 - 159.32
M8	23 - 29	234.53 - 295.71	203.57 - 256.68	28 - 38	285.52 - 387.49	247.83 - 336.34
M10	45 - 57	458.87 - 581.23	398.30 - 504.51	58 - 76	591.43 - 774.97	513.36 - 672.68
M12	67 - 85	683.20 - 866.75	593.02 - 752.34	104 - 134	1,060.49 - 1,366.40	920.50 - 1186.03
M14	106 - 134	1,080.88 - 1,366.40	938.21 - 1,186.03	140 - 188	1,427.58 - 1,917.04	1,239.14 - 1,663.99
M16	152 - 188	1,549.94 - 1,917.04	1,345.35 - 1,663.99	210 - 260	2,141.37 - 2,651.22	1,858.71 - 2,301.26
M18	200 - 240	2,039.40 - 2,447.28	1,770.20 - 2,124.24	280 - 340	2,855.16 - 3,466.98	2,478.28 - 3,009.34
M20	245 - 295	2,498.27 - 3,008.12	2,168.50 - 2,611.05	370 - 450	3,772.89 - 4,588.65	3,274.87 - 3,982.95
M22	-	-	-	530	5,404.41	4,691.03
M24	-	-	-	670	6,831.99	5,930.17
M27	-	-	-	1,000	10,197.00	8,851.00
M30	-	-	-	1,340	13,663.98	11,860.34

Note:

The same values are applied to "fine screw thread."

Appended Table

Principal Tightening Torques

Tightening Torque by Model

SP160EB

Tighten the following bolts and nuts at the torque specified in the table.

For thread locking adhesive, apply a middle strength thread locker (ThreeBond 1322 or equivalent anaerobic adhesives).

Location		Code	Part name	Tightening torque			Thread locking adhesive
				N-m	kgf-cm	lb-in	
Chain wheel		K0010100202	BOLT, HT M10-20	29 -38	295.71 - 387.49	256.68 - 336.34	-
Front wheel I	Front wheel bracket	K0000100252	BOLT, M10-25	29 -38	295.71 - 387.49	256.68 - 336.34	-
	Wheel bearing	K0000100352	BOLT, M10-35	29 -38	295.71 - 387.49	256.68 - 336.34	-
	Wheel	K0011120352	BOLT, HT P1.5 M12-35	67 - 85	683.20 - 866.75	593.02 - 752.34	-
	Rhombic flange unit	K0661204010	BEARING, BALL W/ RHOMBIC UCFL204L2	-	-	-	M6 set screw
Rear wheel I	Wheel mounting base	K0160000042	NUT, SPECIAL P1.5 M20	147 - 183	1,498.96 - 1,866.05	1,301.10 - 1,619.73	-
	Wheel	K0011120252	BOLT, HT P1.5 M12-25	67 - 85	683.20 - 866.75	593.02 - 752.34	-
Servomotor		K001A080251	BOLT, 13T W/HEX HOLE M8-25	14 - 19	142.76 - 193.74	123.91 - 168.17	-
Electrolytic capacitor		K0000050122	BOLT, M5-12	3	30.59	26.55	-
Proximity switch NO V-out		K0100050002	NUT, M5	2.5	25.49	22.13	-
Battery terminal		K3610000460	WIRE, BATTERY (+) 360	14	142.76	123.91	-
		K3610000470	WIRE, BATTERY (+) 95	14	142.76	123.91	-
		K3610000510	WIRE, BATTERY (+) 650	14	142.76	123.91	-
		K3611000480	WIRE, TO EARTH 1020	14	142.76	123.91	-

Note:

The maximum allowable tightening torque for the mounting bolt of the electrolytic capacitor is 3.23 N-m.

Appended Table

Daily Check List

SP160EB

● . . . Inspect, adjust, supply, clean (first time)

○ . . . Inspect, adjust, supply, clean

▲ . . . Replace (first time)

△ . . . Replace

Maintenance Item		Before Work	After Work	Remarks
Main vehicle	Check battery	○		
	Check battery remaining charge	○		
	Check tire	○		
	Check shift lever fulcrum	○		
	Check traveling pedal	○		
	Check brake pedal	○		
	Check parking brake	○		
	Check travel safety device brake	○		
	Check cover	○		
	Check wire	○		
	Check steering wheel	○		
	Check interlock system	○		
	Check oil or water leaks	○		
	Check machine exterior	○		
	Check cooling fins	○		
	Check bolts and nuts	○		
	Check pilot lamp	○		
	Check light	○		
	Check rake	○		
	Check blade	○		
	Check cultivator	○		
	Check finishing brush	○		
	Clean exterior of battery		○	
	Clean cooling fins		○	
	Clean exterior of battery		○	

Appended Table

Appended Table

Maintenance Schedule

SP160EB

● . . . Inspect, adjust, supply, clean (first time)

○ . . . Inspect, adjust, supply, clean

▲ . . . Replace (first time)

△ . . . Replace

Maintenance Item			Before Work	Every Week	Every 25 hrs.	Every 50 hrs.	Every 100 hrs.	Every 250 hrs.	Every year	Every 2 years	Every 4 years	When Required	Remarks
Main vehicle		Check steering chain	○										
	*1	Check battery fluid		○									
		Check battery cable		○									
	*1	Measure battery specific weight			○								
		Check electrical wiring				●	○						
		Check wheel mounting bolts				●	○						
		Clean driver platform inside						○					
		Check transmission oil										○	When oil leak found
		Grease				○							
		Adjust shift lever fulcrum							○				
		Replace transmission oil				▲		△					
	*1	Replace battery								△			
		Replace brake cable										△	
		Replace battery cable										△	

· *1:Refer to the Battery's Owner's Manual.

· The values for consumables are not guaranteed.

List of Adjusted Values

Steering chain		Approximately 5 mm (0.20 in.)	Steering chain slack
Rake	Fork depth (standard)	15 mm (0.59 in.)	
Blade	Arm stopper	23 mm (0.91 in.)	
	Raised height	200 mm (7.87 in.)	
	Exposed length of screw shaft from spherical joint	65 mm (2.56 in.)	
	Exposed length of threaded end of connecting shaft	20 mm (0.79 in.)	
	Installation depth of spherical joint	15 mm (0.59 in.)	

Records

Daily Check Records Page 9-2

Maintenance RecordsPage 9-4

Records

Daily Check Records

SP160EB
Use this table freely for your records of the daily check.

Model		Serial Number									
Items											
Main vehicle	Check battery										
	Check battery remaining charge										
	Check tire										
	Check shift lever fulcrum										
	Check traveling pedal										
	Check brake pedal										
	Check parking brake										
	Check travel safety device brake										
	Check cover										
	Check wire										
	Check steering wheel										
	Check interlock system										

Items											
Main vehicle	Check oil or water leaks										
	Check machine exterior										
	Check cooling fins										
	Check bolts and nuts										
	Check pilot lamp										
	Check light										
	Check rake										
	Check blade										
	Check cultivator										
	Check finishing brush										
	Clean exterior of battery										
	Clean cooling fins										
	Clean exterior of battery										

Records

Maintenance Records

SP160EB
Use this table freely for your records of the maintenance.

Model		Serial Number									
Items											
Main vehicle	Check steering chain										
	Check battery fluid										
	Check battery cable										
	Measure battery specific weight										
	Check electrical wiring										
	Check wheel mounting bolts										
	Clean driver platform inside										
	Check transmission oil										
	Grease										
	Adjust shift lever fulcrum										
	Replace transmission oil										
	Replace battery										

Records

Items											
Main vehicle	Replace brake cable										
	Replace battery cable										

Records

Records

BARONESS[®]
Q u a l i t y o n D e m a n d

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