

# Operation Manual

## Maruyama Boom Sprayer

**BSA-950LM**


**Be sure to read before use.**

## Introduction

Thank you for purchasing a Maruyama product. This Operation Manual explains the correct handling of the product and how you can easily inspect and care for it, so that you can carry out your work safely and comfortably using the machine.

Before using the product, read this manual carefully and understand the contents fully so that the product will continue to demonstrate excellent performance.


After reading this manual, keep it in a safe place and reference it every time you have a question. Please note that information contained in this manual may not exactly match the product you purchased due to specification changes of the product, etc.

If you have any feedback on this product, please contact the Maruyama dealer or sales office near you.


### ■ Scope of Use


- This product is designed primarily for spraying chemicals over paddy fields and crop fields. Maruyama shall assume no responsibility for any accident caused by using the product outside the foregoing scope of use or accident arising from an unauthorized modification or disassembly.


### ■ Precautions

- The precautions contained in this manual and warning labels bearing  you see on the machine provide important items that may cause injury if neglected. Read these precautions and labels carefully and be sure to follow the instructions.

In this Operation Manual, particularly important handling precautions are denoted as follows:

 **Danger** --- Failure to follow this instruction will lead to death or serious injury.

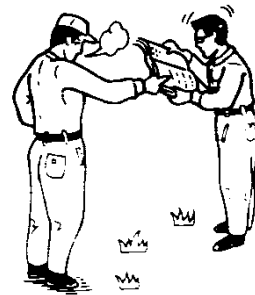
 **Warning** --- Failure to follow this instruction may lead to death or serious injury.

 **Caution** --- Failure to follow this instruction may lead to injury.

**Caution** --- Failure to follow this instruction may lead to machine damage.

### ■ Lending the Machine to a Third Party

- Pass this Operation Manual/Safety Manual together with the machine and instruct the user to carefully read these manuals to understand the contents and get the hang of handling the machine, so that your friendly gesture will not turn into a tragedy. Same thing goes with your family. In particular, spend time explaining the prohibited items.



■ International Units

- This Operation Manual uses the units based on the new measuring system. Carefully read the table below to understand the conversion values before use.

**Conversion Table**

Item	Unit indication under new measuring system	Conversion	Conventional unit indication	Remarks
Area	[m <sup>2</sup> ] (square meters) [a] (are) [ha] (hectare)	10000 [m <sup>2</sup> ] = 1 [ha] = 100 [a] = 10 tanbu = 3,000 tsubo	[a] (are) [ha] (hectare) Tsubo, chobu, hanpo	*[1]
Rotational speed	[rpm] (revolutions per minute) [min <sup>-1</sup> ] (per minute)	1 [min <sup>-1</sup> ] = 1 [rpm]	[rpm]	*[2]
Force	[N] (Newton)	9.8 [N] = 1 [kgf]	[kgf] (weight kilogram)	
Moment of force	[N·m] (Newton meter)	9.8 [N·m] = 1 [kgf·m]	[kgf·m]	
Pressure	[Pa] (Pascal)	0.98 [MPa] = 10 [kgf/cm <sup>2</sup> ] 9.8 [Pa] = 1 [mmH <sub>2</sub> O]	[kgf/cm <sup>2</sup> ] [mmH <sub>2</sub> O]	
Work ratio/ drive power	[W] (watt)	735.5 [W] = 1 [PS] 9.8 [W] = 1 [kgf·m/s]	[PS] [kgf·m/s]	

\* Notes



[1] [a] and [ha] may be used to indicate land areas.

[2] The number of revolutions per unit time is indicated as “rotational speed” not as “revolutions.”

## Specifications

In this Operation Manual, products of different specifications are indicated as follows. Confirm the specification of the product you purchased to make sure you are referring to the correct product.

## Table of Contents

1.  For Safe Work.....	4
2. Name of Each Part.....	6
3. Main Specifications .....	8
4.  Handling of Warning Labels .....	9
5. Name and Function of Each Device.....	11
6. How to Travel/Transport.....	19
7. Pest Control Work .....	22
8. Maintenance.....	29
9. Piping Diagram.....	40
10. Causes of Failures and Remedial Actions .....	41

The precautions you must observe to ensure safe work are explained below.

Other precautions are found in the main text, accompanied by ▲ **Danger**, ▲ **Warning**, ▲ **Caution** and **Caution**.

Use this machine at an inclination angle of within 5° except when entering a field or installing the machine on a truck.

## (1) Overview

Carefully read the "Operation Manual (and operation manual of each option installed)," "Safety Manual" and instruction of the agrichemical used, to carry out work correctly and safely.

### Caution

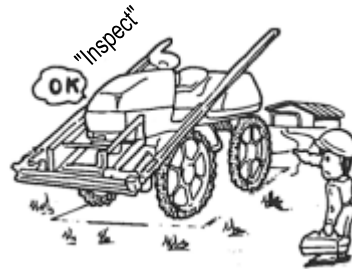
- If the machine is to be parked or stored, do not place anything underneath the booms. The booms may drop down and damage the item underneath them

- [1] When carrying out work, be sure to wear protective gears appropriate for each work (helmet, mask and gloves) and proper clothes.
- [2] Before inspecting/servicing or repairing the machine, stop the engine on flat ground, apply the parking brake and remove the ignition key. Failure to do so may cause the machine to suddenly move, resulting in an accident.
- [3] Keep non-operators (especially children) away from the area where pest control work is performed. Failure to do so may lead to an accident.
- [4] Exercise due caution not to pollute water supply systems, rivers, ponds, lakes, etc.
- [5] Never refuel near a fire source as it may cause fire. Refueling while smoking is strictly prohibited.



## (2) Items to Note before Operation

- [1] Carefully read the Operation Manual and become familiar with the machine operation.
- [2] Apply the parking brake on flat ground and be sure to perform startup inspection to prevent problems during pest control work.  
Maintenance, P. \*\*
- [3] Wipe clean all spilled fuel or oil. If not, fire may occur.
- [4] Dust, fuel or mud attached or deposited on the wires, muffler and engine area may cause fire, so inspect and clean these areas before starting the day's work.



## (3) Starting the Engine

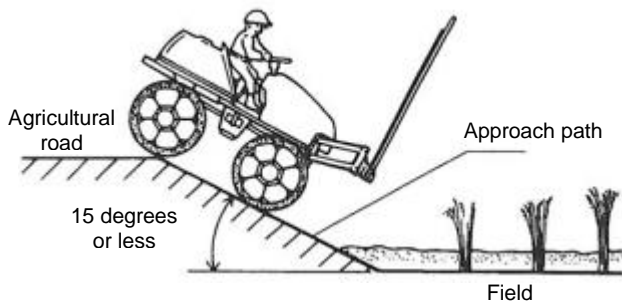
- [1] If the machine is operated indoors, exhaust gas will pollute the air and may cause gas poisoning. Open the windows and doors and provide sufficient exhaust ventilation.
- [2] Before starting the engine, look around carefully and give a cue to others indicating that the machine "will start moving."

#### (4) Traveling

- [1] This machine cannot travel on local road and must be carried on a truck, etc., to the field.
- [2] This machine can carry only one person. No one except for the driver can ride the machine. Any consequence of the machine carrying a person or persons other than the driver will be the responsibility of the user.
- [3] Do not drive at high speed, take off suddenly, accelerate rapidly, apply emergency braking or make a sharp turn unless necessary.
- [4] Do not carry a load exceeding the maximum payload (reagent tank filled with water and attachments installed). Excessive loading will not only lead to machine damage, but it may also cause an accident.

#### (5) Entering/Exiting a Field (Refer to P. \*\*.)

- [1] Enter the field at low speed by orienting the machine vertically to the furrows.
- [2] If there are large height gaps or the approach path is soft, be sure to use footboards as you enter/exit the field. Failure to do so may cause the machine to tip over, creating a very dangerous situation.
- [3] Maintain the approach path so that the inclination angle of approach to the field is kept within 15 degrees.

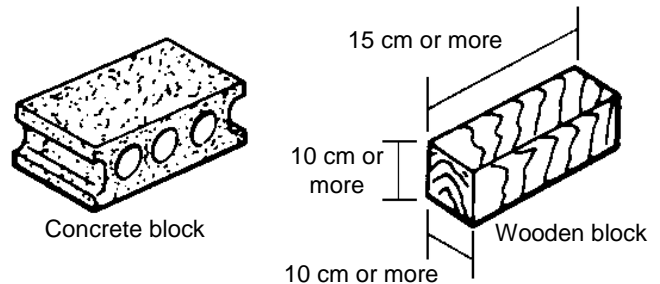


#### (6) Loading/Unloading to/from a Truck (Refer to P. \*\*.)

- [1] When loading the machine to a truck, empty the reagent tank and drive the machine head in. When unloading the machine, drive the machine slowly in reverse.
- [2] Use a truck whose payload is 2,000 kg or more.
- [3] Move the machine slowly using anti-slip footboards of sufficient strength, length and width (30 cm or more).
- [4] Securely hook the footboards by leaving no height gap or misalignment on the load-carrying platform.
- [5] If the engine of the machine stalls during loading or unloading, immediately step on the brake pedal and then gradually release the brake to lower the machine onto the road.
- [6] Choose flat ground and load/unload the machine in the presence of/with guidance from the assistant.

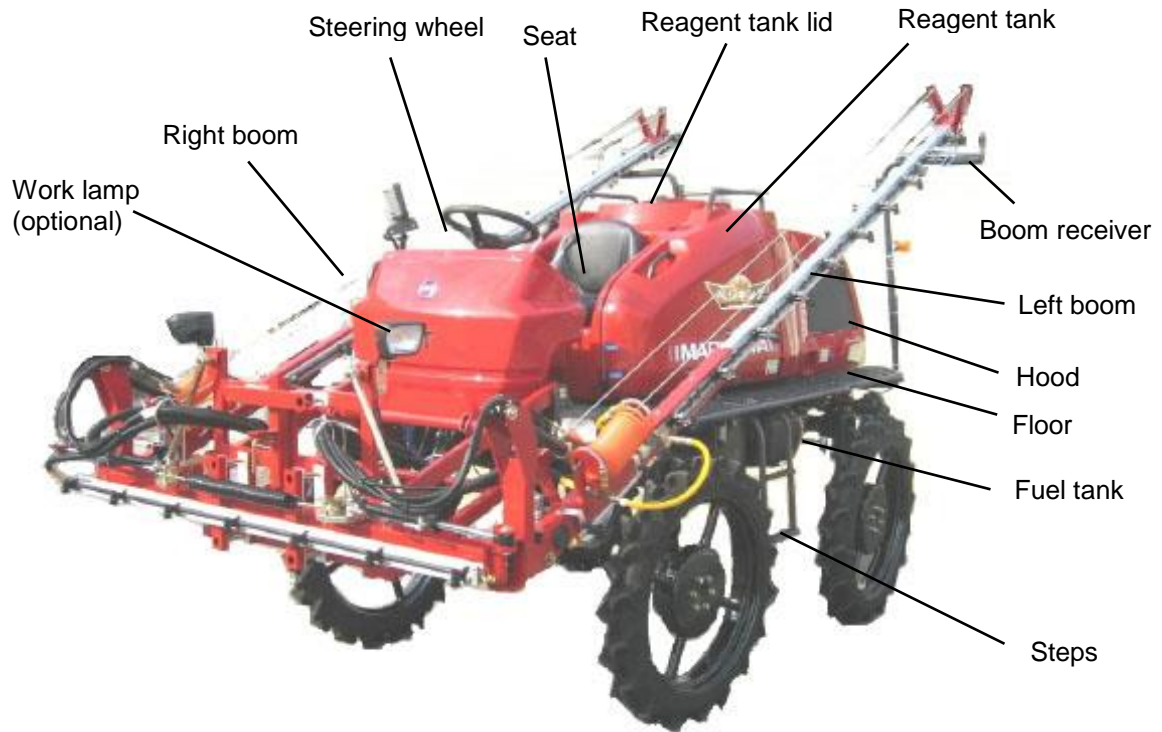
#### (7) Chocking the Tires

Prepare concrete blocks, wooden blocks or other objects that can be used to chock the tires so that the machine can be parked safely.

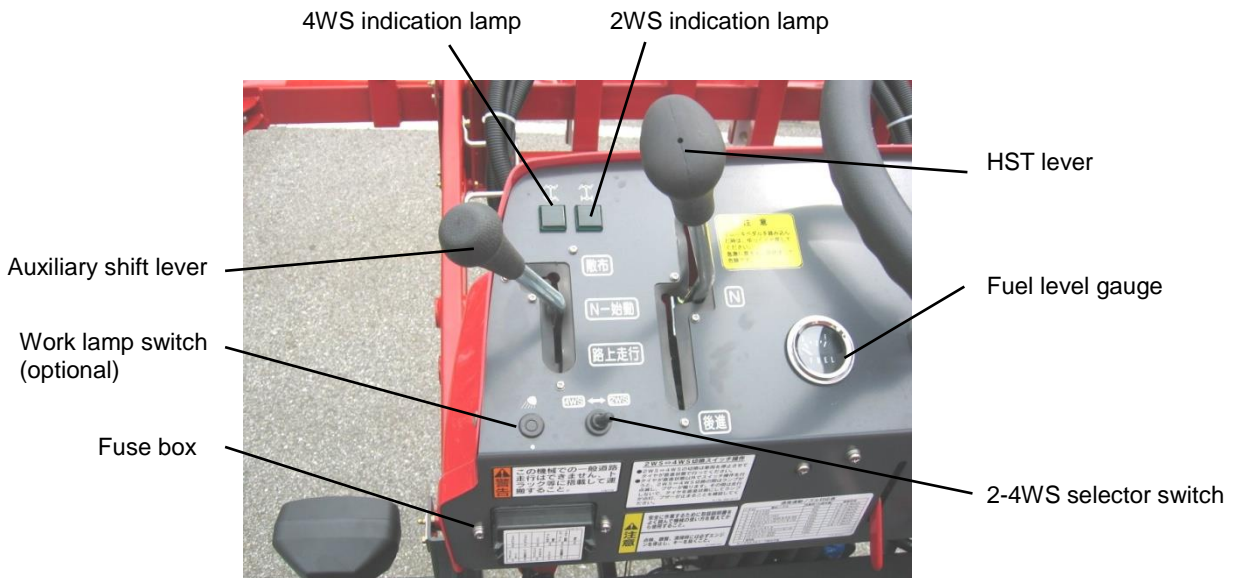


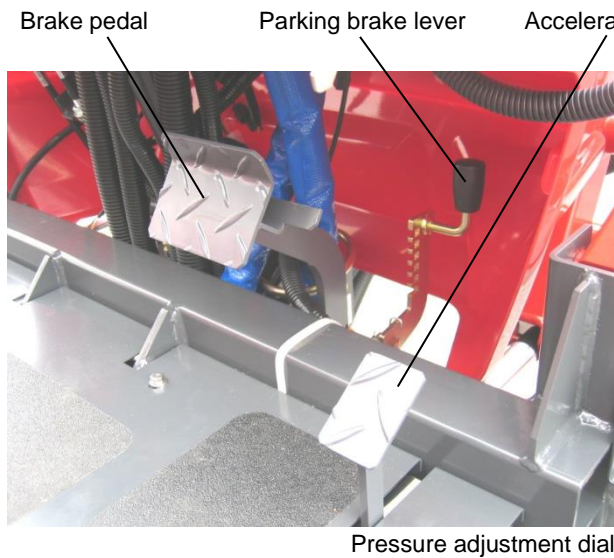
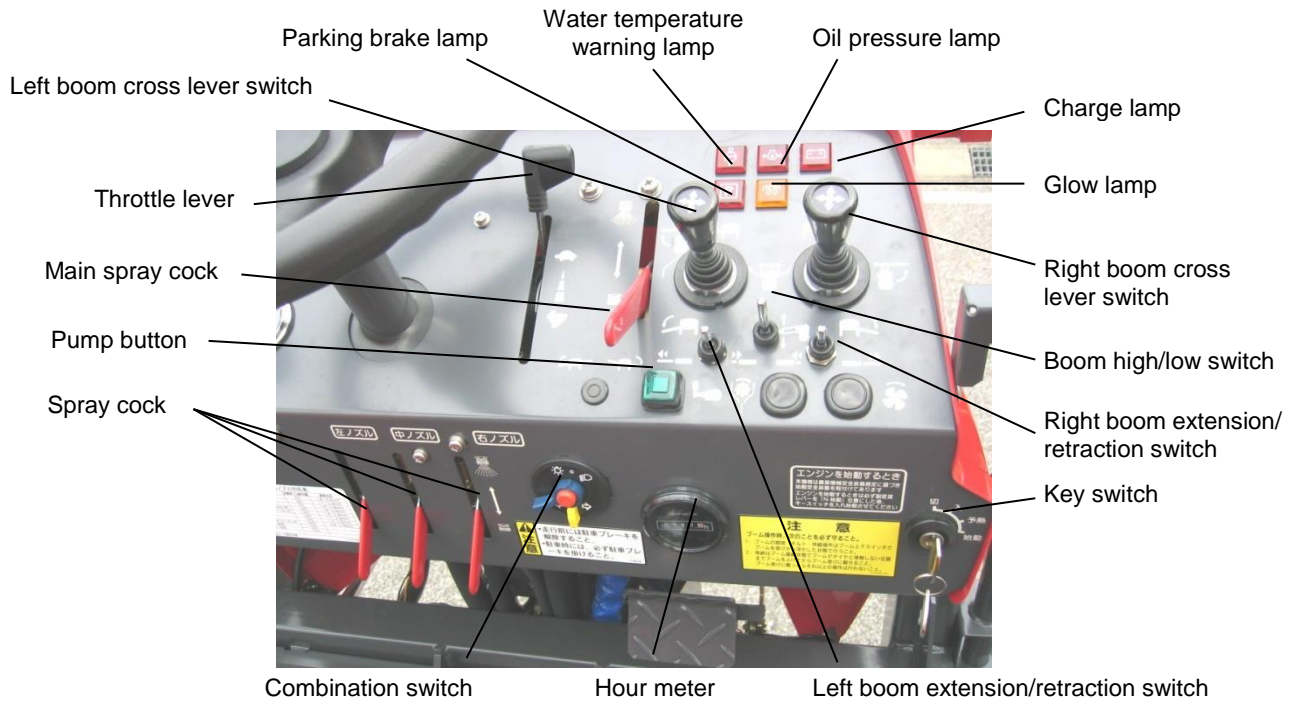
## 2 Name of Each Part

### (1) External View



### (2) Driving Devices





● Standard accessories

Name	Part number	Quantity	Remarks
Operation Manual	K38546	1	BSA-950LM
Hook	869758	2	

### 3 Main Specifications

Name			BSA-950
Category			LM
Machine dimensions *1	Overall length	(mm)	3940
	Overall width	(mm)	2150
	Overall height	(mm)	2400
	Wheelbase	(mm)	1500
	Tread	(mm)	1500
	Effective ground clearance	(mm)	800 (axle hosing)
	Minimum ground clearance	(mm)	710 (fuel tank)
Mass		(kg)	1195
Engine	Name		D1105
	Type		Water-cooled 4-cycle, 3-cylinder standing diesel engine
	Total displacement	(cm <sup>3</sup> )	1123
	Rated output	(kW(PS))/(min <sup>-1</sup> )	15.4(20.9)/2600
	Fuel tank capacity	(L)	20
	Starting method		Cell starter
Traveling gears	Type		4WD·4WS (with 2-4WS selector)
	Steering system		Full hydraulic power steering
	Shift gears		HST (variable shift), 2 auxiliary shift gears
	Traveling speed	(km/h)	Moving: 0 to 11 / Spraying: 0 to 4.0
	Clutch		Dry-type single plate type (interlocked with the brake pedal)
	Brake (also used as parking brake)		Wet, multi-disk, mechanical type
	Tires (front/rear)		120/90-26 6PR (Air pressure: 300 kPa)
	Battery		55B24R
Reagent tank capacity		(L)	850 (900 max.)
Agitation method		Propeller (mechanical type)	
Spray pump	Name		MS1000F
	Type		Lateral quintuple piston type
	Rotational speed	(rpm)	1250
	Water absorption	(L/min)	100
	Pressure (max.)	(MPa)	1.0 to 2.5
Pest control devices	Boom device type		Slide (powered) or open/close and up/down/high/low movements (hydraulic power)
	Horizontal control unit		Trapezoid link hoist type
	Nozzle type		Ceramic cone nozzle $\varnothing$ 1.6 Kirinashi nozzle N-KA-8R
	Number of nozzles	(pcs)	53 (2 WAY NOZZLE)
	Number of divisions		3
	Spray width	(m)	15.9
Ground clearance of nozzle		(mm)	465 to1305

\*1. The dimensions assume that the booms are stored on the boom receivers.

\*2.  $\varnothing$ 1.6 ceramic cone Kirinashi nozzle (N-KA-8R)



## 4 ⚠ Handling of Warning Labels

\* Warning labels are attached to this machine. Carefully read these labels and understand the contents before commencing work. Peruse the following information provided on the labels.

### ⚠ Warning

- Constantly remove soiling and mud over the labels so that the information provided on them remains clearly visible.
- Replace damaged warning labels with new ones.
- If a part on which a warning label is attached has been replaced, be sure to attach a new label on the new part at the same location.



[1]

[2]

[3]

[4]

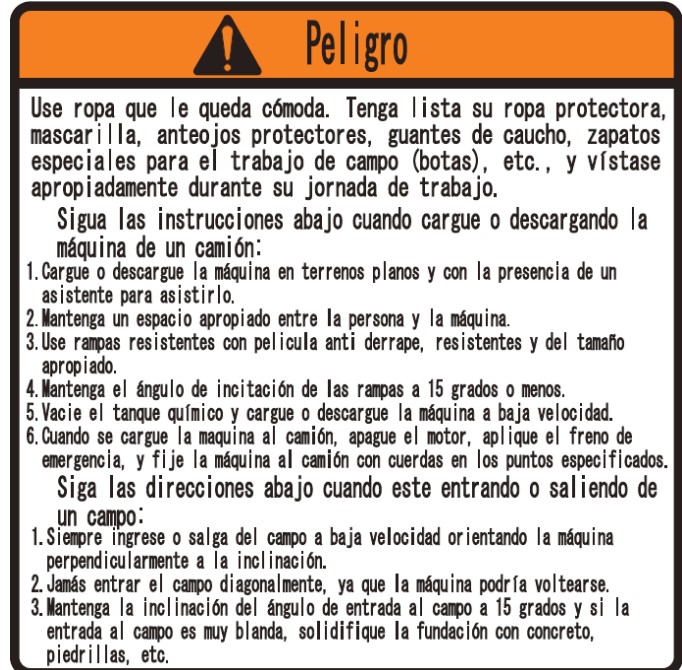


[5]

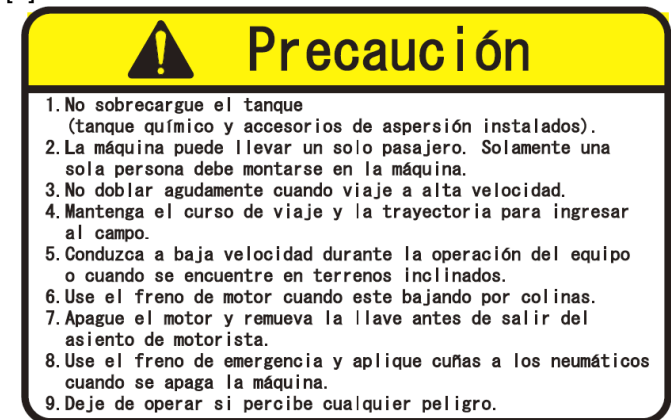
[1] Part No. 880263



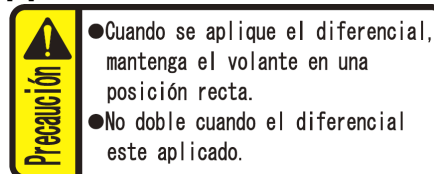
[2] Part No. 880271



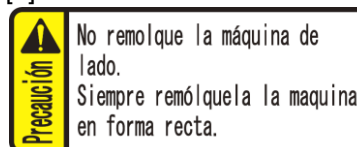
[3] Part No. 880258



[4] Part No. 880260



[5] Part No. 880259





[6] [7] [8] [9]




[10] [11] [13] [12]

[6] Part No. 880264

<b>⚠ Precaución</b>	
<b>⚠ No Introducir Fuego!</b>	Use aceite Diesel. Apague el motor antes de rellenar el tanque.
	

[7] Part No. 880268

<b>⚠ Peligro</b>		No use ni recargue la batería cuando el nivel de fluido este bajo, ya que esto puede causar que le pila se parta. (Explote).
<b>⚠ Precaución</b>		Desligue el terminal negativo del cabo de la pila antes de cargar o inspeccionar/ajustar la pila.

[6] Part No. 866073



[9] Part No. 880270

<b>⚠ Peligro</b>	<ul style="list-style-type: none"> <li>● Jamás cargue directamente de ninguna fuente de agua potable, lagos o lagunas utilizadas para acuicultura.</li> <li>● Desarrollar un plan de aspersión y mezcle la cantidad justa de químicos para evitar sobrantes.</li> </ul>
<b>⚠ Precaución</b>	<p>Maneje con mucha precaución los agentes químicos.</p> <p>Lea cuidadosamente el manual de utilización de los agentes químicos y aplíquelos correctamente.</p>

[10] Part No. 880261

<b>⚠ Peligro</b>	Esta máquina no puede ser conducida por la calle y se debe cargar en camión, etc.
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[11] Part No. 880269

<b>⚠ Precaución</b>	<p>Lea cuidadosamente el manual del operador y asegúrese de conocer el contorno de la máquina para ejecutar una operación segura.</p> <p>Apague el motor y remueva la llave antes de llevar a cabo una inspección, ajuste, o limpieza de la máquina.</p>
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[12] Part No. 880265

<b>⚠ Precaución</b>	<ul style="list-style-type: none"> <li>● Desenganche el freno de emergencia antes de manejar.</li> <li>● Aplique el freno de emergencia cuando se estacione.</li> </ul>
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[13] Part No. 869745

<b>⚠ Peligro</b>
Para evitar accidentes resultando en herida grave o muerte, no utilice maquinaria en terreno desigual o pendientes mayores a 15 grados.

## 5 Name and Function of Each Device

### ■ Relating to Engine Operation



Key switch

#### (1) Key Switch

- “OFF” --- The engine is stopped.  
Current does not flow. The ignition key is inserted and removed in this position.
- “ON” --- The engine is turning.  
Current flows to each electrical component.
- “GL” --- The glow lamp turns on. When the hand is released in this position, the switch will automatically return to the “ON” position.
- “ST” --- The cell motor turns to start the engine.  
When the engine has started, immediately release the hand. When the hand is released, the switch will automatically return to the “ON” position.

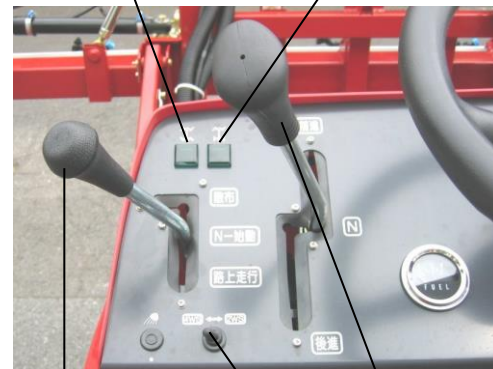
● Because of the starting safety device, the engine will not start unless the auxiliary shift lever is put in the “N – Start” position.

#### (2) Throttle Lever

Pull the throttle lever toward you to turn the engine at high speed, or tilt it forward for low speed operation. When traveling on the machine, use the accelerator pedal to adjust the engine speed.

### ■ Relating to Traveling Operation

4WS indication lamp      2WS indication lamp



Auxiliary shift lever

HST lever

2-4WS selector switch

#### (1) HST Lever

Tilt the lever forward from the “N” position to move forward, or tilt it rearward to move in reverse. The more you tilt the lever, the higher the machine speed becomes.

#### (2) Auxiliary Shift Lever

There are two shift gears: one for high speed and the other for low speed. To start the engine, put the auxiliary shift lever in the “N – Start” position.

### Caution

- To perform auxiliary shift operation, put the HST lever in the “N” position and be sure to stop the machine. If the auxiliary shift lever is operated before the machine stops completely, the auxiliary transmission may be damaged.

(3) 2-4 WS Selector Switch

While the lamp is on, the selected steering state is indicated. Move the selector switch to the opposite side to switch the steering state. While the selector is being switched, the lamp will blink and the buzzer will sound.

**⚠ Caution**

Strictly adhere to the instructions below when operating the 4WS selector switch in order to prevent collision, fall or tip-over.

1. When operating the switch, be sure to park the machine on a flat ground first. Operating the switch while traveling may distract the driver, causing a collision or tip-over.
2. Set the steering wheel in the straight forward position before operating the switch.
3. If the switch is operated with the tires not set in the straight forward position, the lamp will blink and the buzzer will sound while the 2WS and 4WS switches are being toggled. When the switch is being toggled, do not travel, but set the tires in the straight forward position, and confirm that the lamp turns on and the buzzer stops.
4. Use 2WS while traveling.
5. If you operate the steering wheel as if the 2WS switch is selected after it is switched to 4WS, it is dangerous as a greater than anticipated change in the posture may occur. Before starting to move or travel, confirm the steering state selected.

2WS: The machine can travel in a stable condition at high speed, etc. This makes it easier to pull the vehicle over to the side.

4WS: This steers the rear wheels, making it possible to make tight turns.

(4) Differential Lock Pedal

Differential lock pedal



The differential lock device allows the front and rear tires on the left and right to be driven at the same speed. This is useful in preventing slips. The differential lock is actuated when the differential lock pedal is depressed, and cancelled when the pedal is released.

Use this function in the following situations:

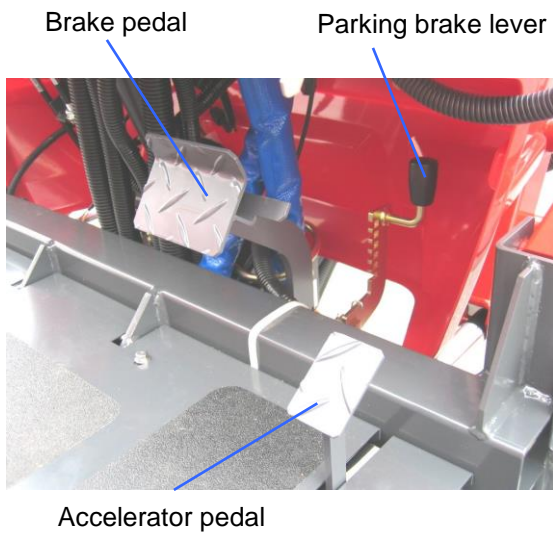
- [1] The wheels on one side slip when going up/down an agricultural road or going over a furrow and the machine cannot move straight.
- [2] The machine gets into an area of soft ground in the field and encounters difficulty traveling due to slipping wheels.

**⚠ Caution**

- Before actuating the differential lock, be sure to adjust the steering wheel to the straight-moving position. Also remember not to turn while the differential lock is actuated. The machine may not turn in the intended direction.

**Caution**

- Be sure to cancel the differential lock before turning. If the machine is turned forcibly with the differential lock on, the drivetrain may be damaged.



(5) Brake Pedal  
Stepping on this brake applies brake to the machine.

**Reference**

- **Stepping on the brake pedal disengages the clutch and applies the brake. To apply brake, step on the brake pedal all the way down.**

(6) Parking Brake  
Depress the brake pedal fully and hook the parking brake lever to the brake pedal. To release the brake, depress the brake pedal fully once again.

**Caution**

- **Before leaving the machine, stop the engine and be sure to apply the parking brake, remove the ignition key, and chock the tires.**

(7) Accelerator Pedal  
While traveling, use the accelerator pedal to adjust the engine speed. Step on the accelerator pedal to raise the engine speed, or release it to run the engine idle. It is interlocked with the throttle lever, and when the throttle lever is pulled, the pedal will be automatically set to the position where it is stepped on.

(8) Power Steering Wheel  
This hydraulic steering wheel is used to turn the machine or change its course.

**Caution**

- **Avoid static steering (turning the steering wheel when the machine is not traveling), because it will cause the tires, rims, etc., to wear quickly.**

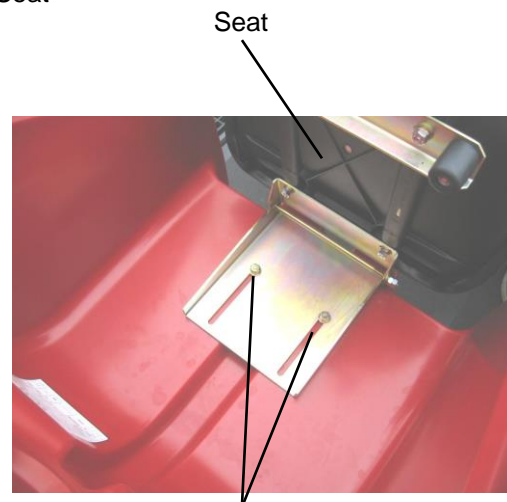
(9) Speedometer



The traveling speed (km/h) is indicated.

\* If the tires are slipping in a field, etc., the actual traveling speed may differ from what is indicated by the speedometer.

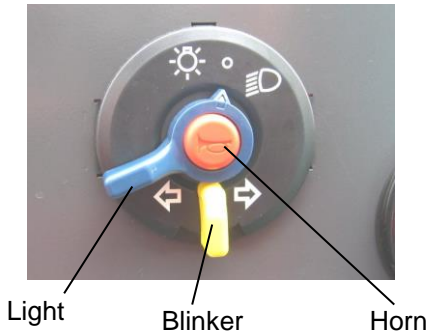
(10) Seat



Hexagonal bolts

You can loosen the hexagonal bolts to slide the seat forward and backward. Once the seat position has been adjusted, securely tighten the hexagonal bolts.

(11) Combination Switch



With the key switch in the "ON" position, the light can be turned on, the blinker can be operated, and the horn can be sounded.

**Caution**

- If the light is turned on for a long period of time with the engine stopped, the battery level may decrease and the engine may not start.

(12) Work Lamp Switch (Optional)

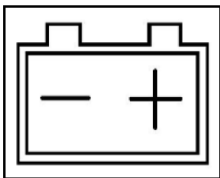
With the key switch in the "ON" position, move the switch upward to turn the work lamp on, and move it downward to turn the lamp off.

Work lamp switch



(13) Warning Lamp

- Charge lamp (charge warning lamp)

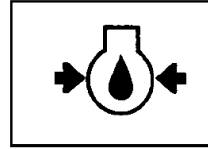


This lamp turns on to warn when a charge system error is detected while the engine is turning.

**Caution**

- If this lamp turns on, stop the engine and inspect the fan belt. If the belt is normal, have the machine inspected by the Maruyama dealer near you.

- Oil pressure lamp (oil pressure warning lamp)

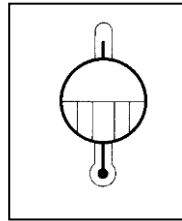


This lamp turns on to warn when the pressure of oil lubricating the engine interior drops while the engine is turning.

**Caution**

- If this lamp turns on while the engine is turning, immediately stop the machine in a safe place and stop the engine, and contact the Maruyama dealer near you.
- Continuing to travel on the machine despite the lamp remaining on may damage the engine.
- The oil pressure warning lamp does not indicate insufficiency of oil. Check the oil amount using the oil level gauge. Checking/adding engine oil: P. \*\*

- Water Temperature Warning Lamp



This lamp turns on to warn when the engine is overheated.

**Caution**

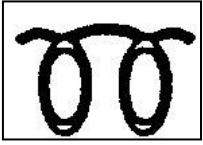
- Never remove the radiator cap immediately after the engine has stopped or while the engine is turning, because it will cause burns. Wait for the water temperature to drop, and then put a piece of cloth, etc., over the radiator cap and remove the cap slowly.

**Caution**

- If this lamp turns on, move the machine to a well-ventilated place and keep the engine idle. When the water temperature warning lamp turns off, stop the engine and check if the engine oil or cooling water level is low, check the fan belt tension, and also check the radiator core and air cleaner for clogging. If the lamp turns on frequently, have the machine inspected by the Maruyama dealer near you.

(14) Monitor Lamp  
(operation status check indicator lamp)

- Glow lamp (preheating indication)



This lamp turns on if the key switch is in the "GL" position when starting the engine. It turns off once preheating is complete.

- Parking brake lamp



This is a warning lamp to prevent the parking brake lever from not being reset. It turns on when the parking brake lever is still engaged with the brake pedal when the key switch is in the "ON" position.

■ Relating to Pest Control

(1) Pressure Adjustment Dial

Adjust the discharge pressure of the spray pump. While monitoring the pressure gauge, turn the pressure adjustment dial to a desired pressure.

Pressure adjustment dial



(2) Pressure Gauge

The pressure adjusted with the pressure adjustment dial is indicated.



Pressure gauge



Spray cocks Main spray cock

(3) Main Spray Cock

Raising the lever causes the reagent to be sprayed from the boom nozzle. Spraying can be stopped at once from the left, center and right boom nozzles.

(4) Spray Cocks

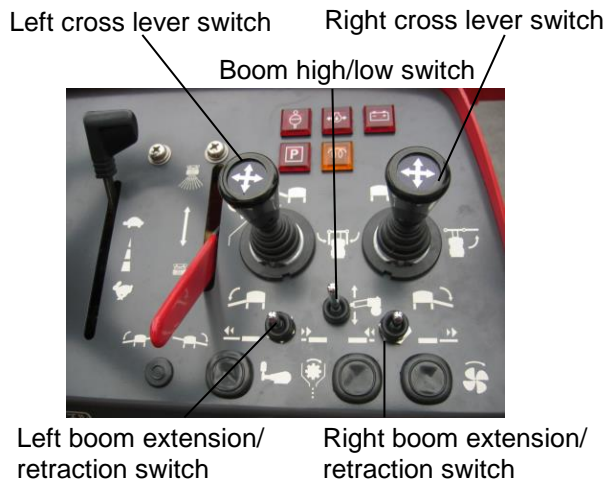
Raising the lever causes reagent to be sprayed from the boom nozzle. A desired spray location can be selected from among the left, center and right bottom nozzles.

(5) Spray Pump Switch

Pressing the pump button turns the spray pump and the agitator.



Spray pump switch



(6) Boom High/Low Switch

Turn this switch up/down to adjust the height of the entire boom.

(7) Cross Lever Switch

Operating the lever up and down tilts the boom. Moving the lever to the left and right opens/closes the boom. The left and right levers can be operated independently to perform these operations.

(8) Boom Extension/Retraction Switch

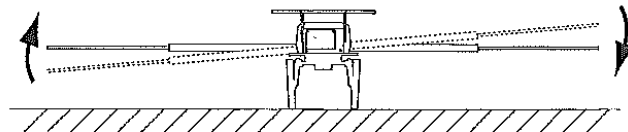
Operating the switch to the left and right extends/retracts the boom. The left and right levers can be operated independently to perform these operations.

**Caution**

- If the steering wheel is turned with the booms stored at the lowest position, the tires will come in contact with the booms and damage them. Raise and store the booms at the position where the tires do not come in contact with the booms when the machine travels.
- Do not operate the booms while they are secured on the boom receivers with ropes, etc. because doing so may damage the booms.
- The switch can be operated with a small force. Do not apply an excessive force on the switch.

(9) Horizontal Control Unit

This maintains the booms in parallel to the field on an uneven field, while keeping the boom shaking to the minimum. While traveling on an incline or if the left and right boom lengths are different, tilt the booms to keep the booms in parallel to the field.

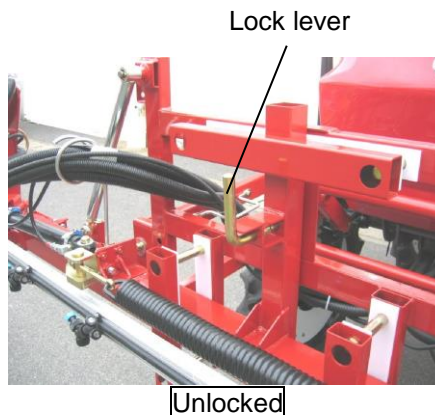


**Reference**

- The control unit may not be able to sufficiently control the machine on an extremely uneven field.
- The unit cannot control the machine sufficiently if the incline of the path exceeds 3° suddenly.
- The unit does not perform the control function if the boom on one side or both booms are closed.

● Horizontal control unit lock mechanism

To store the booms securely, lock the horizontal control unit while traveling. With the booms open, match the left and right boom lengths. Next, while pulling the lock lever, turn it in the direction so that it faces down towards the opposite side, slowly release one hand from the lever to lock the unit. To unlock the unit, perform the same operation in reverse order. If a boom on one side is retracted or the left and right boom lengths are not the same, the booms will tilt toward the side on which the boom is longer.

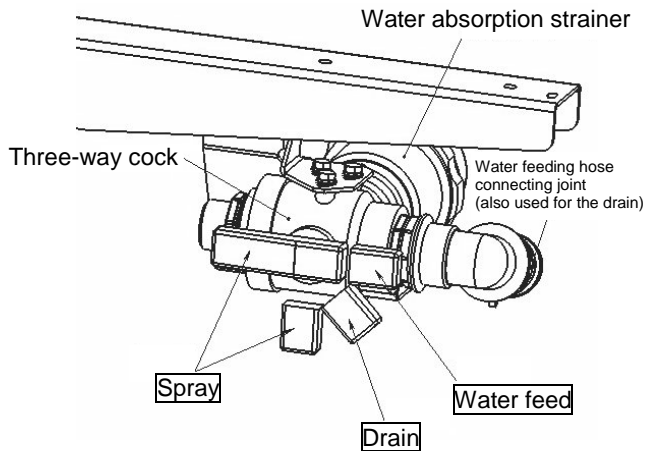




**Caution**

- The horizontal control unit should be locked only when the machine travels.
- Spraying with the horizontal control unit still locked may damage the frames or booms. Be sure to unlock the horizontal control unit when spraying.

## (10) Water Absorption Strainer/Discharge Strainer/Water Filter Net

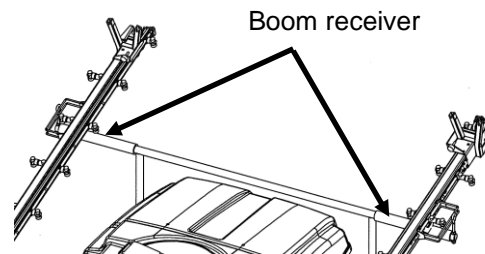
**Caution**

- The water absorption strainer, the discharge strainer, and the water filter net all filter dust, etc., so be sure to clean them after work.

- [1] Keep the three-way cock in the "Spray" position during spraying or while the jet pump (optional) is used.
- [2] When cleaning the water absorption strainer, keep the three-way cock in the "Water feed" position if the reagent tank contains reagent.
- [3] To discharge the remaining liquid from the reagent tank, first put the three-way cock in the "Drain" position. After draining the liquid, put it in the "Spray" position, remove the cap on the water absorption strainer, and discharge the remaining liquid from the strainer.
- [4] Open the cock located at the bottom of the discharge strainer to discharge the soiled liquid from inside the strainer. If the strainer is very dirty, remove the discharge strainer and clean the net inside.

## (11) Boom Receiver

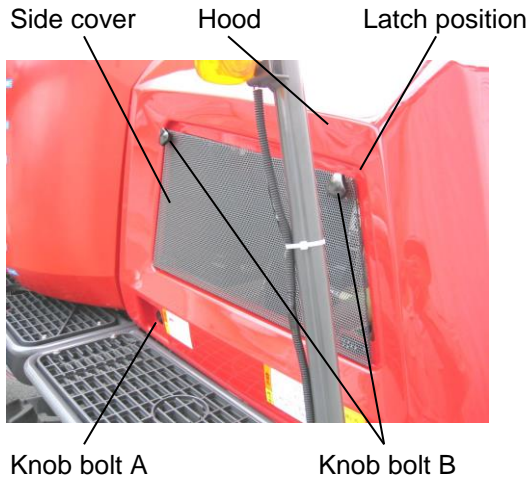
Keep the left and right booms on the boom receivers while traveling or during transport.

**Caution**

- Do not operate the booms while the booms are secured on the boom receivers with ropes, etc., because doing so may damage the booms.

■ Other

(1) How to Install/Remove the Side Cover and the Hood



- [1] To remove the hood, remove the two knob bolts A on the left and right, and hold it at the left and right latch positions to pull it out.
- [2] To remove the side cover, loosen the four knob bolts B on the left and right, and pull it toward you.
- [3] Perform the same steps in the reverse order to install the cover or hood.

**⚠ Caution**

- Never open the hood or the side cover while the engine is turning. Since the rotating parts are exposed, injury accidents may occur.
- Do not touch the muffler while hot. It may cause burns.
- After installing the side cover, be sure to tighten the knob bolts strongly. If the knob bolts are not tightened sufficiently, they may detach and fall during transport, causing accidents.

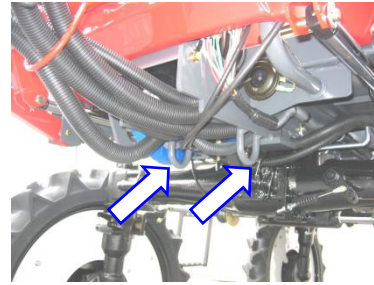
(2) Tires

The wheelbase can be adjusted by reversing the tires or adding spacers (optional).

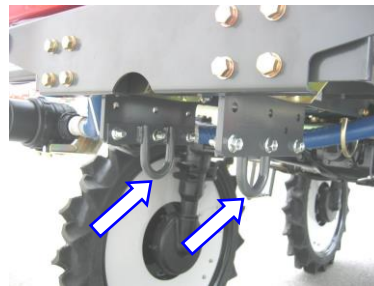
**⚠ Caution**

- Never use spacers other than those provided as options.

(3) Towing Hooks  
[Front of Frame]



[Rear of Frame]



If the machine gets stuck in a field, use these hooks to pull the machine forward/backward. When doing this, keep the booms at the top positions.

**⚠ Warning**

- Do not use the towing hooks to tow other machine, etc. It may cause the machine to tip over.

**⚠ Caution**

- Never pull the towing hooks sideways. The hooks may detach easily and also cause the machine to tip over.

**Caution**

- Never pass ropes, etc., over the boom devices and pull the ropes. The machine will be damaged.

## 6 How to Travel/Transport

### ■ How to Start/Stop the Engine

#### (1) How to Start

#### ⚠ Warning

- To ensure safety, apply the parking brake, put the auxiliary shift lever in the “N – Start” position and put the HST lever in the “N” position before starting the engine.
- Provide sufficient ventilation when starting the engine indoors. Failure to do so may cause exhaust gas poisoning.

#### ⚠ Caution

- Before starting the engine, check the surrounding areas to ensure safety and also confirm that the cover is closed.

#### Caution

- Once the engine is started, do not apply load but simply warm up the engine for approx. 5 minutes so as to spread oil to each metal area fully. Take note that, if load is applied immediately after the engine is started, breakdown may occur due to seizure, damage, etc.

Start the engine from the driver seat after giving a cue to people around the machine and also checking the surroundings to ensure safety.

- [1] Apply the parking brake.
- [2] Put the HST lever in the “N” position and auxiliary shift lever in the “N – Start” position.
- [3] Insert the ignition key in the key switch.
- [4] Tilt the throttle lever forward for “low speed” operation.
- [5] Turn the key switch to the “GL” position and keep it in this position until the glow lamp turns off.
- [6] Turn the key switch key to the “ST” position. Once the engine has started, release the switch. The key switch will automatically return to the “ON” position.
- [7] Check each warning lamp to confirm that the engine is normal. If any warning lamp is on, immediately stop the engine and take an appropriate measure. If you hear abnormal noise different from what you hear every day, stop the engine and investigate the cause. If the cause cannot be identified, contact your Maruyama dealer.
- [8] Return the throttle lever to the “low speed” side, and warm up the engine for 5 minutes before commencing work.

#### ⚠ Warning

- Warm up the engine outdoors to prevent exhaust gas poisoning.

#### ⚠ Caution

- Be sure to apply the parking brake and keep your eyes on the machine while the engine is warming up.
- If the engine does not start with the first try on a cold day, etc., repeat preheating and try starting the engine. Do not turn the cell motor for more than 10 to 15 seconds. Before restarting the engine, wait for 30 seconds to restore the battery voltage.
- Do not turn the key switch to the “ST” position while the engine is turning.
- The engine is still cold immediately after the start, so do not rev up the engine or raise the engine speed unnecessarily. It may cause breakdown.
- Check the exhaust condition for abnormality and if any abnormality is found, immediately stop the engine and change fuel or oil, or contact your Maruyama dealer.

#### (2) How to Stop

- [1] Push the throttle lever forward to lower the engine speed.
- [2] Let the engine operate at the low speed for approx. 5 minutes to cool down.
- [3] Turn the key switch to the “OFF” position.

#### (3) Break-In Operation

#### Caution

- How the machine is handled when new (during initial 50 hours) affects the life and performance of the machine. In particular, pay attention to the items specified below during this period.

- [1] Fully warm up the engine before commencing work.
- [2] Change oils according the Oil Change Table after initial 50 hours of operation. (Refer to P. \*\*.)

## ■ How to Travel

### **Warning**

- This machine cannot travel on local road and must be carried on a truck, etc., to a field.

### **Caution**

- When taking off, check the surroundings to ensure safety.
- Before leaving the machine, be sure to apply the parking brake, stop the engine and remove the ignition key. Otherwise, an unexpected person may touch the machine when no one is around and cause an accident.
- The brake pedal is also used for the traveling clutch. If the auxiliary shift lever is in a position other than “N” and the HST lever is set to the forward or rearward position, it is dangerous to release the pedal suddenly as the machine may take off suddenly. Be sure to slowly release the pedal.

#### (1) Taking Off

- [1] Put the HST lever in the “N” position and auxiliary shift lever in the required position.
- [2] Release the parking brake.
- [3] Gradually tilt the HST lever in the required position to take off.

### **Caution**

- When moving rearward, thorough check not only the rear, but also the left and right and be careful not to let the booms contact people or obstacles.
- Operate the HST lever slowly. Quick operation may cause the machine to take off or stop suddenly, creating a dangerous situation.
- While traveling, do not keep your foot on the brake pedal. Doing so may shorten the service life of the clutch.

#### (2) How to Travel

### **Caution**

- Do not carry anyone other than the driver, or objects.
- Wear a helmet to ensure safety.
- Exercise due caution and lower the speed when going through a narrow agricultural land or on a road with shoulders, Trim weeds to expose the road shoulders.
- Adjust the traveling speed using the HST lever, the throttle lever, and the accelerator pedal.
- Drive according to the traffic rules even on private roads or on agricultural land.

### **Caution**

- When traveling, be sure to store the booms on the boom receivers. If the booms are floating on the boom receivers, the booms will be damaged as a result of traveling.

#### (3) How to Stop

- [1] Slowly return the HST lever to the “N” position to stop the machine.
- [2] Tilt the throttle lever forward to lower the engine speed.

### **Caution**

- Before leaving the machine, remove the ignition key to ensure safety.
- If you step on the brake pedal to stop the machine while traveling at high speed, be sure to return the HST lever to the “N” position. Releasing the brake pedal without returning the HST lever to “N” may cause the machine to jump out suddenly.

#### (4) Auxiliary Shift Operation

- [1] Stop the machine fully.
- [2] Shift the auxiliary shift lever to the required position.

### **Caution**

- Do not perform shift operation while traveling. It may cause breakdown.

#### (5) How to Park

- [1] Apply the parking brake.
- [2] Stop the engine.
- [3] Set the fuel cock to “Close.”
- [4] Chock the wheels.

### **Caution**

- When parking, stop the engine, apply both the parking brake and chocks, and be sure to remove the ignition key.

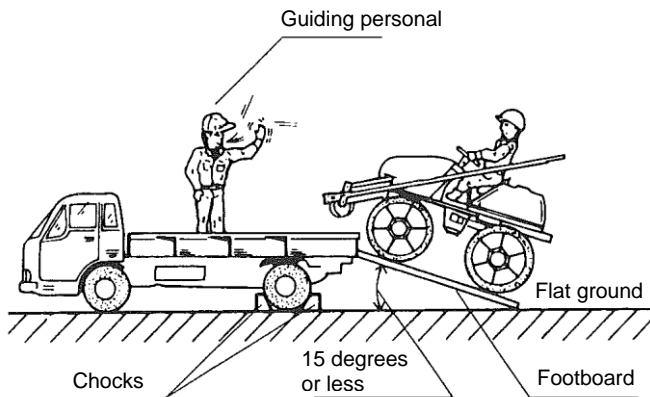
### ■ **▲ How to Load/Unload to/from a Truck**

Loading/unloading the machine to/from a truck involves great danger. Observe the following instructions and exercise due caution to safety when loading/unloading the machine to/from a truck.

### **▲ Warning**

- To load/unload the machine, select flat ground where the footboards will not tilt due to the weight of the machine in the presence of/with guidance from the assistant. Also, keep people away from the machine.
- The guiding person must not stand immediately in front of or at the back of the machine.
- Load/unload the machine when the reagent tank is empty.
- Use anti-slip, hook-type footboards of sufficient strength, length and width.
- Securely hook the footboards by leaving no height gap or misalignment on the load-carrying platform.
- Suddenly turning the steering wheel or operating the HST lever while traveling over footboards may derail the wheels and cause the machine to fall from the footboards. To change the direction, first return to the ground or onto the load-carrying platform, change the direction, and then resume going up/down the footboards.
- To load/unload, be sure to set the machine to 2WS. Operating the machine in 4WS may cause the machine to fall and is very dangerous.

Length	At least four times the load-carrying platform of the machine
Width	30 cm or more
Quantity	2 pcs
Strength	Each board should be able to withstand at least 750 kg of mass.



- [1] Use a truck whose maximum payload is 2,000 kg or more.
- [2] Put the shift lever on the truck in the “1st” or “R” position, pull the parking brake, and apply chocks.
- [3] Stop right before the footboards, and make sure that the front and rear tires on both left and right are in parallel with the footboards, aligning the center of each to the center of the footboards. Then, load/unload the machine at a right angle to the slope.
- [4] Empty the reagent tank, and drive forward to load the machine and drive rearward to unload. While on the footboards, check the positions of the wheels and the footboards, and move at a very low speed by tilting the HST lever forward slightly with the auxiliary shift lever in the spray position.
- [5] If the engine of the machine stalls during loading or unloading, immediately step on the brake pedal and then gradually release the brake to lower the machine onto the road.
- [6] Once the machine has been loaded onto the truck, apply the parking brake.
- [7] During transport, secure the booms to the boom receivers with ropes, etc., to prevent the booms from opening.
- [8] Pass ropes at the front and rear towing hooks to secure the machine.
- [9] Be sure to close the gate of the truck.

### **Caution**

- If ropes are passed at positions other than the towing hooks, the machine may be damaged.
- When securing the machine to the truck, do not tighten the wire ropes with an excessive load exceeding 4900 N (500 kg)..
- Do not operate the booms while they are secured to the boom receivers with ropes, etc., because the booms may be damaged.

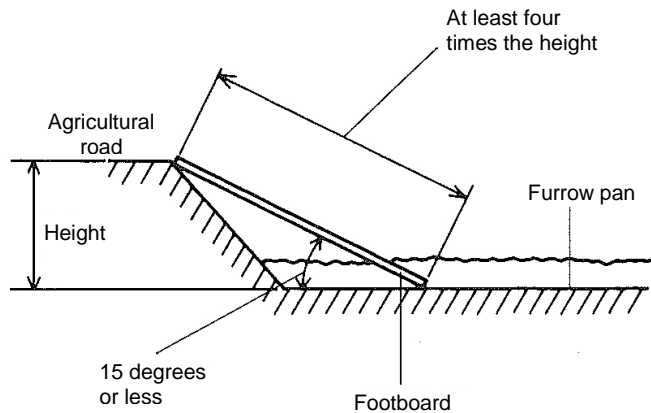
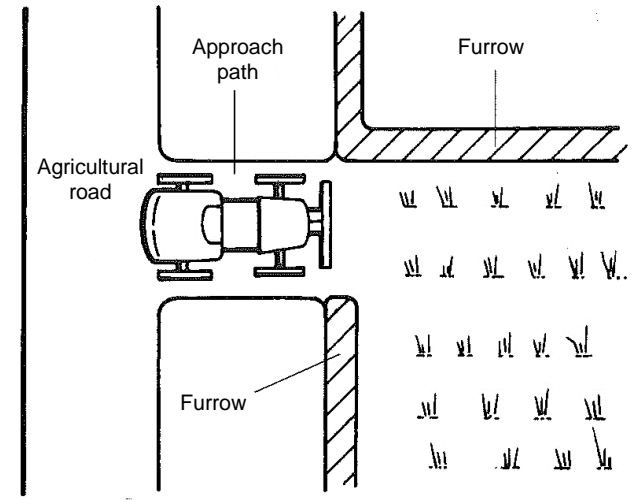
## 7 Pest Control Work

### ▲ How to Enter/Exit a Field

Pay due attention when entering a field from road.

#### ▲ Warning

- Enter/exit a field at a very slow speed by tilting the HST lever forward slightly, with the auxiliary shift lever in the spray position. When entering, also orient the machine perpendicular to the furrows. If the machine is diagonal, it may tilt sideways and tip over, causing an accident.
- Maintain the approach path so that the inclination angle of approach to the field is kept within 15 degrees.
- If the approach path to the field is soft, or the inclination angle is 15 degrees or more, be sure to use footboards to keep the inclination angle within 15 degrees.
- \* If the length of the approach path is at least four times the height of the road from the field, the inclination angle is within 15 degrees.
- When going over a furrow, be sure to approach by orienting the machine perpendicular to the furrow and use footboards whenever possible. Move slowly with the auxiliary shift lever in the spray position.

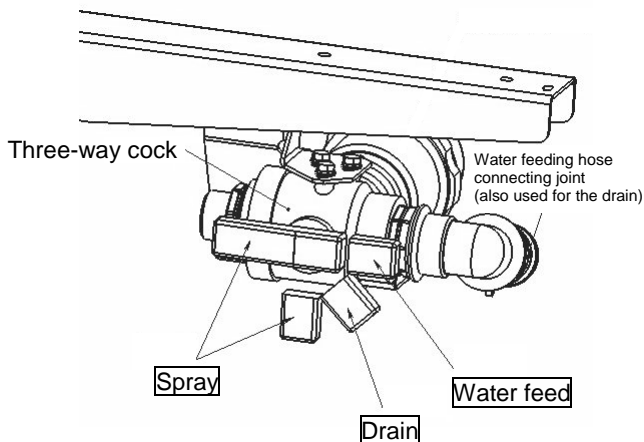


## ■ How to Feed Water

### ⚠ Warning

- **Never feed water directly from a drinking water source or any lake or pond used for aquatic farming.**

- (1) Move the three-way cock in the “Spray” position and add the required amount of water in the reagent tank.  
\* If no water supply facility is available, a spray pump water feeding hose or a jet pump (optional) would be useful.
- (2) How to Operate the Spray Pump Water Feeding Hose



- [1] Connect the spray pump water feeding hose.



- [2] Open the lid of the reagent tank.
- [3] Throw the strainer end of the spray pump water feeding hose into the water source.
- [4] Press the spray pump switch and confirm that the water inside the reagent tank is circulating. At this point, set the throttle lever in the idling position.
- [5] Set the three-way cock in the “Water feed” position.
- [6] Once the water feeding begins, pull the throttle lever fully to set the engine to a normal speed.

- [7] Using the reagent tank water gauge as the guideline, when the tank is filled with the required amount of water for spraying, return the throttle lever to the idling position, set the three-way cock to the “Spray” position, and then press the spray pump button to stop the water feeding.
- [8] Disconnect the spray pump water feeding hose.

### Caution

- **Be sure to add priming water when feeding water. If the idling lasts too long while feeding water, the spray pump may be damaged.**

### Supplement

- **Use all of the reagent in the tank first before adding water. When feeding water when the reagent tank still has residual liquid, use a jet pump (optional) or another water feeding device.**
- **Exercise caution as a small amount of residual water will come out from the pipe when disconnecting the spray pump water feeding hose.**

- (3) How to Operate the Jet Pump
- [1] Prime around 20 L of water into the reagent tank.
- [2] Connect the pipe from the jet pump and open the cock.
- [3] Throw the strainer end of the jet pump into the water source and insert the opposite end to the water inlet of the reagent tank.
- [4] Close the spray cock fully.
- [5] Put the throttle lever in the idling position and press the spray pump switch.
- [6] Pull the throttle lever and set the engine to the medium speed.
- [7] Confirm that all spray cocks are closed, and raise the main spray cock lever to increase the pressure.
- [8] Operate the pressure adjustment dial to set the spray pressure to 2 to 2.5 MPa.
- [9] Once the required amount for spraying has been added, close the jet pump cock.
- [10] Lower the main spray cock lever, return the throttle lever to the idling position, press the spray pump switch to stop the pump, and disconnect the jet pump.

## ■ Reagent Preparation and Handling

### (1) Reagent Preparation

- [1] Before preparing the reagent, check the spray condition with water.  
(Refer to P. \*\*.)
- [2] Prepare only the required amount using a dedicated container.
- [3] Dissolve the water-dispersible powder well with a small amount of water and then add the diluted powder.
- [4] Confirm that the main spray cock and spray cock are in the "Closed" position and the liquid feed valve is "Open," and then press the spray pump switch. The spray pump will actuate and agitation will start in the reagent tank at the same time.
- [5] Put the reagent in the reagent tank by making sure it does not spill out of the tank, and agitate the reagent fully.

### **Caution**

- The spray pump and jet agitation are interlocked. Once the spray pump stops, jet agitation also stops. Do not stop the spray pump while reagent remains in the tank, because chemical damage may occur.

### **Caution**

- Carefully read the operation manual of the applicable reagent and use the reagent correctly.
- Be sure to use the water filter net and when the spraying is over, clean the net together with the water absorption strainer/discharge strainer.



## ■ Spray Inspection

### (1) Opening the Spray Cock and Checking the Spray Condition

- [1] Inspect the nozzle for clogging due to dust, etc.
- [2] Check the open/close condition of the main spray cock and each spray cock (left nozzle, center nozzle and right nozzle).

- Long hours of use causes the nozzle plate to wear and discharge flow rate to increase. When this happens, replace the nozzle plate.
- Types and quantities of standard factory-set nozzles [Other than J or L type]

Left boom	Ceramic cone nozzle ( $\varnothing 1.6$ )	Kirinashi nozzle N-KA-8R	23 pcs
Center boom			7 pcs
Right boom			23 pcs
Total			53 pcs

- Table of nozzle discharge flow rates (per nozzle)  
Ceramic cone nozzle (L/min)

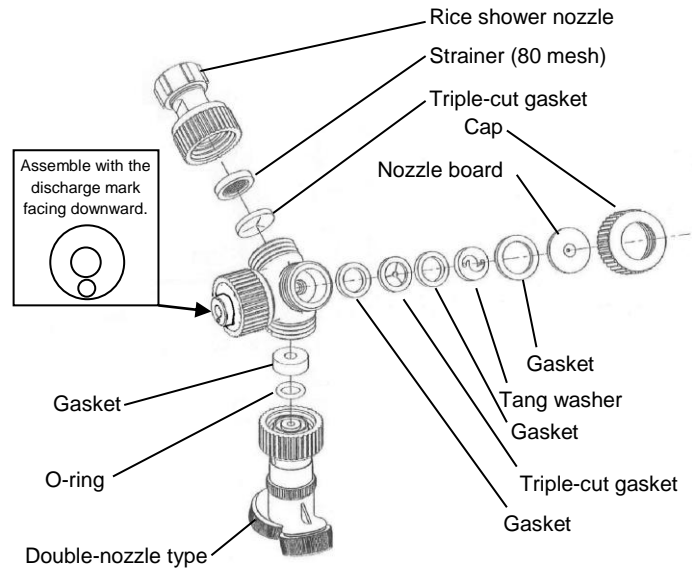
	1.0 MPa	1.5 MPa	2.0 MPa
$\varnothing 1.0$	0.53	0.66	0.77
$\varnothing 1.1$	0.60	0.73	0.85
$\varnothing 1.2$	0.66	0.82	0.96
$\varnothing 1.3$	0.73	0.89	1.05
$\varnothing 1.4$	0.78	0.98	1.12
$\varnothing 1.5$	0.86	1.09	1.28
$\varnothing 1.6$	0.96	1.20	1.39

### ⚠ Caution

- Be sure to use water when inspecting the spray condition.

### Caution

- Do not switch between the two-way and three-way switch nozzles while spraying. Doing so may damage the switch nozzle.
- Turn the two- or three-way switch nozzle to the right to toggle.



The figure above illustrates an optional three-way switch nozzle type.

## ■ Spray Plan

### **Warning**

- **Make the spray planning so that there won't be any chemical left.**

### **(1) Spray Planning**

In spray planning, determine the spray amount per unit area (spray amount per 10 a) first, and then select the spray speed and obtain the nozzle pressure. The nozzle pressure can be obtained using quick calculation diagrams.

### **(2) How to Use the Quick Calculation Diagrams**

You can use the quick calculation diagrams to obtain the nozzle pressure with ease.

“Example”

- [1] Spray speed: 2.7 km/h
- [2] Spray amount: 100 L per 10 a
- [3] Use a standard cone (ceramic) Ø1.6 nozzle.
- [4] From the quick calculation diagrams, the nozzle pressure is obtained as 1.6 (MPa).

### **Supplement**

**The quick calculation diagram assumes a tire slip factor of 10% for the boom sprayer, taking the nozzle loss rate, etc. into account. Depending on the conditions of the field, however, the tire slip factor of the boom sprayer may change. In this case, the slip factor must be corrected.**

Depending on the state of the field, the tire slip factor may vary and the spray speed may deviate, in which case the nozzle spray amount must be set according to these different slip factor/spray speed.

For more accurate spraying measure the actual slip factor in the field.

### ● Rough guide for slip factor

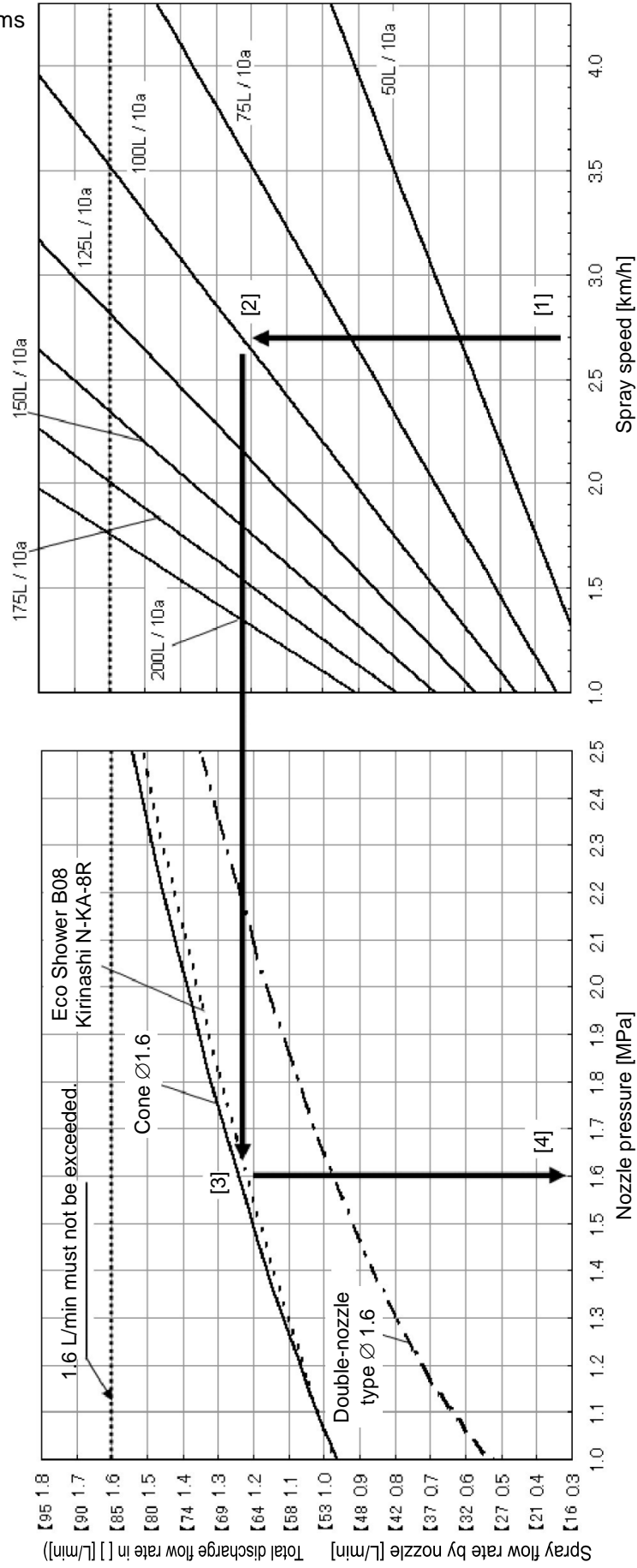
- 5% --- General crop field where the depth to the furrow pan is approx. 10 cm
- 10% --- Field where the depth to the furrow pan is approx. 15 to 20 cm (where a ride-on rice planting machine can be used without problems)
- 15% --- Field where the depth to the furrow pan is approx. 20 to 25 cm

\* Take note that the machine may not be able to travel in a field where the depth to the furrow pan is 25 cm or more. Also remember that the machine can travel more smoothly when the field is filled with water.

### **Caution**

- **When spraying in a field of a higher slip factor (greater depth to the furrow pan), reduce the amount of water added to the tank.**
- **Adjust the nozzle pressure within a range of 1.0 to 2.5 MPa.**

Quick Calculation Diagrams



## ■ Spray Method

### **Warning**

- **Wear clothes that properly fit your body. Prepare protective clothes, pest control mask, protective glasses, rubber gloves, work shoes, etc., and dress safely during work.**

- [1] Spray safely using a method appropriate for the terrain and field condition.
- [2] The person performing spraying should wear protective gears for agrichemical spraying (such as a pest control mask, protective glasses, boots, rubber gloves, work uniform and helmet) to prevent the reagent from coming in direct contact with the body.
- [3] Whenever possible, spray early in the morning or in the event when there is no wind.
- [4] Do not enter the areas where agrichemical has already been sprayed.
- [5] Keep only the required amount of spray agent in the reagent tank to prevent leftovers.
- [6] Check the applicable spray amount, spray pressure and traveling speed beforehand.
- [7] Remove obstacles from the traveling path beforehand and make preparations to ensure safe traveling, and provide wide enough turning areas so that the machine can turn without problems.

## ■ Spraying

- [1] Press the spray pump switch to operate the spray pump. The agitator will turn at the same time.
- [2] Pull the throttle lever fully to set the engine to a normal speed.
- [3] Check if the reagent has been agitated fully.
- [4] Adjust the pressure using the pressure adjustment dial. Since the pressure when the spray cock fully closed is different from the pressure during spraying, adjust the pressure once again to a desired level during spraying.
- [5] Open the booms. Extend/retract the booms and align the spraying width with the ground.
- [6] Put the auxiliary shift lever in the spray position.
- [7] Open the spray cock and slowly tilt the HST lever in the moving direction until a desired speed is achieved. Thereafter, open/close the spray cock to switch between spraying and stopped modes.
- [8] When the spraying is over, lower the engine speed and press the spray pump button to stop the spray pump.

## ■ After Spraying

- [1] Remove the cap on the water absorption strainer and collect the remaining liquid.
- [2] Open the reagent tank lid and remove the water filter net, and wash the net together with the water absorption strainer.
- [3] Install the water absorption strainer/water filter net once again, add around 100 L of freshwater in the reagent tank, close the reagent tank lid, and operate the spray pump.
- [4] Spray freshwater from the nozzle to perform cleaning of pipe interior.
- [5] When the reagent tank becomes empty, run the spray pump idle for approx. 30 seconds with the engine running at low speed, to drain water from the tank.
- [6] Stop the main spray cock, idle the spray pump for 30 seconds with the engine running at a low speed to discharge the water from inside.
- [7] Remove the water absorption strainer and collect the remaining liquid.

### **Caution**

- **Do not perform cleaning while the tank lid is open. The reagent may splash and scatter.**

## 8 Maintenance

### ■ Maintenance and Inspection (Inspection and Servicing Methods)

So that this machine can be used safely, perform the necessary periodic servicing based on the methods explained here.

The inspection and servicing methods are divided into “Startup inspection” and “Period inspection.” Applicable methods are explained under each grouping.

#### ⚠ Caution

- Before performing inspection and servicing, be sure to stop the engine, apply the parking brake, remove the ignition key, and disconnect the negative terminal end of the battery cable from the battery.
- If any inspection or servicing item requires the engine to remain running, do not perform such item on your own, but always contact the service personnel at your Maruyama dealer instead.
- Dispose of the battery, oils, coolant, etc., properly after consulting your Maruyama dealer, etc. Disposing of such items on land or in river may be punishable by law.

#### Periodic Inspection Standards

1. The applicable inspection timing is indicated by ○.
2. The timing of initial inspection is indicated by \*.

Inspection item			Inspection timing				Judgment criterion
			Start of work	Every 6 months	Every 12 months	Hours	
Steering operation	Steering wheel handle	Play, looseness, rattling	○	○	○	*50	
		Operating feel	○	○	○	*50	
	Rods and arms	Looseness, rattling, damage		○	○	*50	
	Knuckle	Rattling of joint			○		
	Steering device	Wheel, alignment			○		Toe-in: 0 mm
	Steering wheel	Looseness, rattling, damage		○	○	*50	
	Power steering	Clogging of oil filter			○		
Hose damage, amount of oil		○	○	○			
Brake	Brake pedal (also used as clutch)	Catching by parking brake lever	○	○	○		
		Brake effect	○	○	○	*50	
		Activation of clutch	○	○	○		
	Rods and cables	Looseness/rattling and damage		○	○		
Running gears	Wheel	Tire pressure	○	○	○	*50	300 kPa
		Tire cracks and damage	○	○	○		
		Abnormal wear of tire	○	○	○		
		Metal pieces, stones and other foreign matters on tire	○	○	○		
		Cracks, rattling		○	○		
		Looseness of bolt		○	○	*50	Wheel bolt tightening torque: 100 N·m
		Rim damage		○	○		
		Rattling of wheel bearing			○		

Periodic Inspection Standards

1. The applicable inspection timing is indicated by ○.
2. The timing of initial inspection is indicated by \*.

Inspection item		Inspection timing				Judgment criterion	
		Start of work	Every 6 months	Every 12 months	Hours		
Drivetrain	HST	Leakage of oil	○	○	○		
	Auxiliary transmission	Rattling of operating mechanism		○	○		
		Leakage of oil	○	○	○		
	Propeller shaft	Looseness of link		○	○	*50	
		Rattling of spline			○	*50	
		Rattling of bearing			○	*50	
		Run-out of propeller shaft			○	*50	
	Differential	Leakage of oil	○	○	○		
V belt and ribbed belt	Looseness and damage of belt	○	○	○	*50		
Hydraulics	Oil tank	Amount and leakage of oil	○	○	○		
	Oil cooler	Clogging of cooling fan	○	○	○		
		Leakage of oil	○	○	○		
	Hydraulic valve Note 1	Leakage of oil	○	○	○		
	Hydraulic cylinder Note 1	Leakage of oil	○	○	○		
	Filter	Clogging			○		
Piping	Looseness of joint and leakage of oil	○	○	○			
Motor	Starting device	Degree of pinion meshing			○		
	Charge device	Charge action		○	○		
	Battery	Fluid level		○	○	*50	Fully charged: 1.260 (20°C) Fully discharged: 1.060 (20°C)
		Specific gravity of fluid			○		
	Electrical wirings	Loose and damaged connection parts		○	○		
	Main body	Ease of starting and abnormality	○	○	○		
		Condition at low speed and during acceleration		○	○		
		Exhaust condition	○	○	○		
		Condition of air cleaner element	○	○	○		Replace every year.
		Compressive pressure			○		
		Valve gap			○		0.1 mm to 0.2 mm
	Lubrication device	Leakage of oil	○	○	○		
		Dirtiness and amount of oil	○	○	○	*35	Replace every 100 hours.
		Clogging of oil filter			○	*35	Replace every 150 hours.
	Fuel device	Leakage of fuel		○	○		
		Fuel strainer		○	○	*25	Replace every 400 hours.
Fuel line cracks/damage		○	○	○			
Cooling device	Leakage of water	○	○	○			
	Amount of water	○	○	○			
	Function of radiator cap		○	○		Open/close pressure: 90 kPa	
	Looseness and damage of fan belt	○	○	○	100	Deflection when the center of the belt is pushed with a force of 100 N: 7 mm	

Periodic Inspection Standards

1. The applicable inspection timing is indicated by ○.
2. The timing of initial inspection is indicated by \*.

Inspection item		Inspection timing				Judgment criterion
		Start of work	Every 6 months	Every 12 months	Hours	
Agitator	Confirm that it rotates smoothly.	○	○	○		
	Damage of the flexible shaft		○	○		
Lighting device/warning device/measuring instrument	Operation	○	○	○		
	Soiling and damage		○	○		
Exhaust pipe and muffler	Looseness and damage of mount		○	○		
	Muffler function			○		
Machine frame and body	Looseness and damage	○		○		
Location where abnormality was found during operation the day before	Confirm that the applicable location is free from abnormality.	○				
Other	Lubrication condition at each part of chassis		○	○		
Other items	Fuel tank	○		○		
	Water absorption strainer	○ Note1				Clean.
	Line strainer	○ Note1				Clean.
	Tank water filter net	○ Note1				Clean.
	Nozzle	○		○		Inspect for clogging and wear, and replace.
	Boom	○		○		Operating condition
	Floor	○	○	○		Cracks, fissures
	Each fastening part	○	○			Tighten securely.

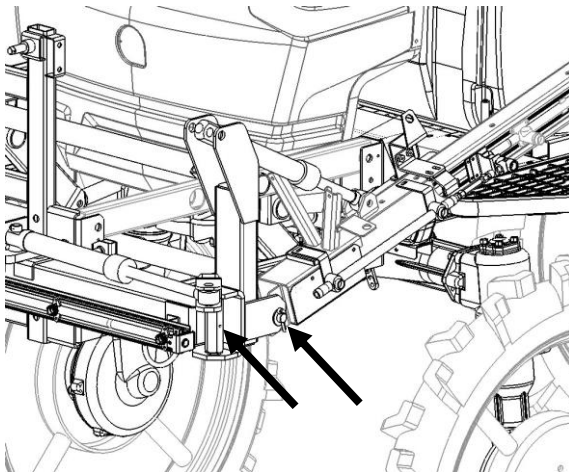
Note 1. Clean after every operation.

## ■ Oil Change Table

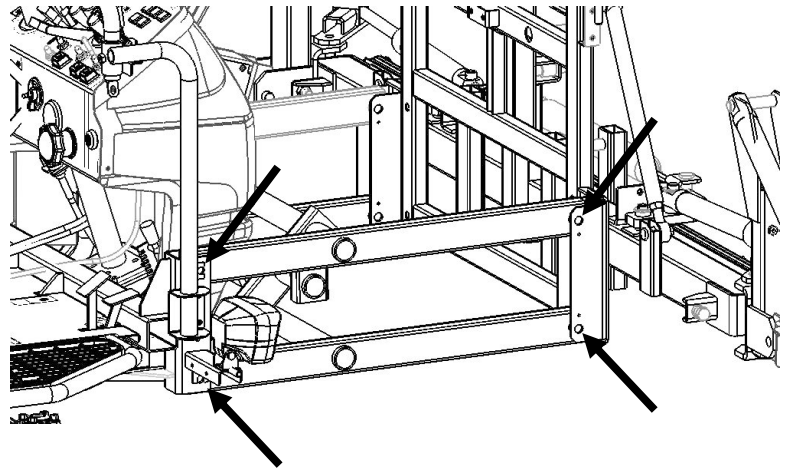
No.	Item	Applicable oil	Volume	Initial change (hours)	Periodic change and adding (after every specified hours)
1	Fuel	Diesel oil	20 L	-	-
2	Engine oil	SAE10W-30 API CF grade or better	3.0 L	50	Every 100 hours or every year
3	Oil tank	Hydraulic oil (wear resistance) VG46 (ISO)	18 L		200
4	Auxiliary transmission oil	Gear oil SAE 90	0.8 L		600
5	Front/rear differential oil		1.0 L		100
6	Spray pump, crank case	SAE10W-30 API SJ grade or better	0.6 L	-	Every 100 hours or every year
7	Spray pump, cylinder base metal		3 to 5 drips	-	Every 100 hours or every year
8	Boom shaft receiver		2 to 3 drips	At start of work	At start of work
9	Each wire				
10	Boom lift & open/close shaft (Refer to the following.)	Chassis grease	Appropriate amount	20	20
11	Radiator	LLC	4.9 L	-	600

## ● Greasing locations

Boom opening/closing/tilting shafts  
(four locations on left and right)



Boom lift shafts  
(eight locations on left and right)





## ■ Inspection Procedures

### (1) Engine Oil

[Check] With the machine horizontal, pull out the oil gauge, wipe the tip with a clean cloth and put back the gauge, and pull it out again to check the oil level. If oil is at the LOWER level or below, add oil to the specified level.  
(Check the oil level before the engine is started or at least 5 minute after the engine has stopped.)

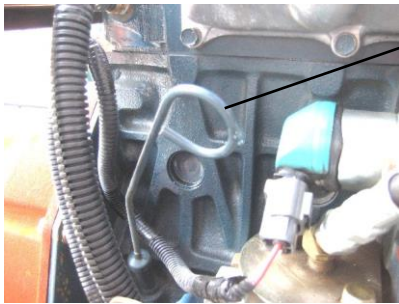
[Change] Remove the drain plug, drain oil, and fill new engine oil.

[Engine oil] SAE10W-30 API CF grade  
for diesel engine

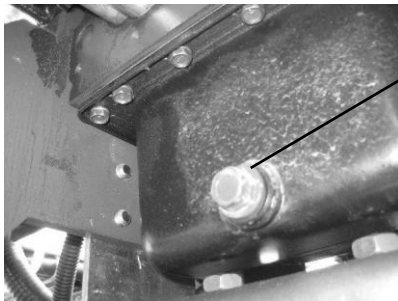
[Amount of oil] 3.0 L

[When to change] Initial change: 50 hours  
Periodic change: Every 100 hours

Used oil can be drained easily when the engine is hot.



Oil gauge



Drain plug

## ⚠ Caution

- When draining oil, exercise caution not to get burned. Do not touch any of the parts directly with your hand.

- Oil filter cartridge

**Replace every 150 hours (or after 50 hours initially).**

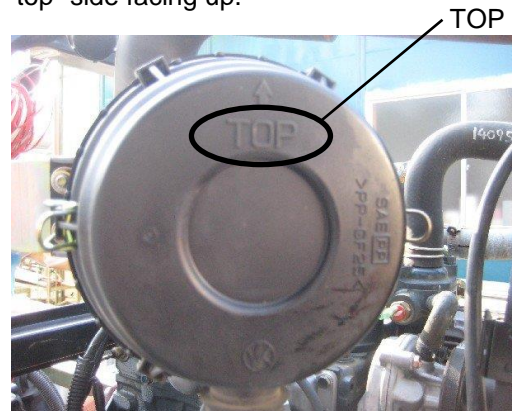
- The oil filter is of cartridge type, so remove the entire case with a filter wrench and replace it with a new one.
- After the new oil filter has been assembled, operate the engine to check for leakage of oil.
- After the oil change, stop the engine after (5 minutes of) idling, wait for 10 to 20 minutes and then check the oil level. If there is not enough oil, add oil.

### (2) Air Cleaner

## ⚠ Caution

- Be sure to remove and clean the air cleaner element before operating the machine.

- To clean the element, spray air (0.7 MPa or less) onto the inner side of the element or shake the element gently to remove dust.
- Replace the element once a year.
- When installing the cup, be sure to assemble with the "top" side facing up.



TOP

(3) Inspecting the Fuel System

■ **Fuel Tank**

Check if the tank contains enough diesel oil.  
If not, add diesel oil.  
(Tank capacity: Approx. 20 L)

**Drain water from the tank from the fuel filler port or fuel filter every 100 hours.**

Add fuel before the fuel tank becomes empty and should the fuel tank become empty, immediately add fuel and bleed air.

■ **Bleeding Air**

- [1] Fill the fuel tank with diesel oil.
- [2] Loosen fuel filter screw A and bleed air trapped between the fuel tank and fuel filter.
- [3] When only fuel starts to come out from the screw, tighten screw A.
- [4] Next, loosen screw B and bleed air trapped between the fuel filter and the solenoid pump in the same manner, and then tighten screw B.
- [5] Turn the key switch to "ON." Operate the solenoid pump for approx. 10 seconds in this condition to bleed air trapped between the solenoid pump and engine.

⚠ **Caution**

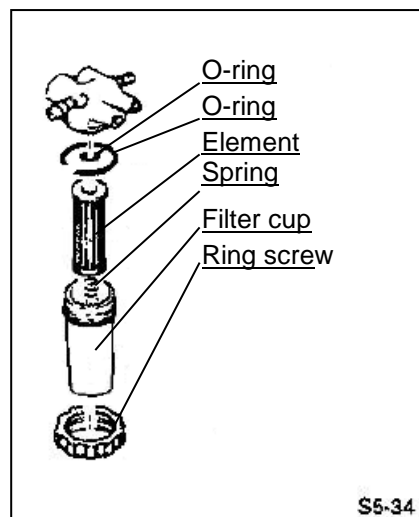
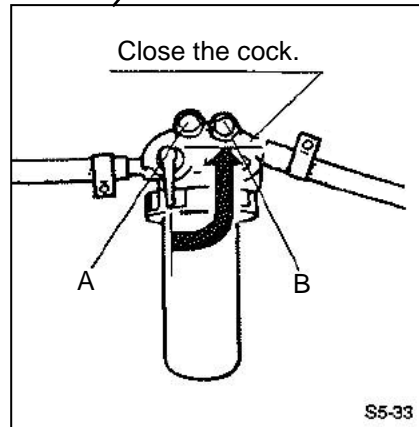
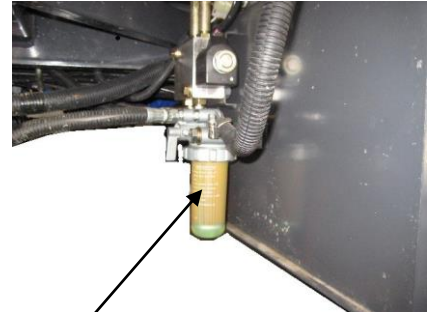
- When bleeding air, put clothes underneath and wipe off any spilled fuel.
- Stop the engine during refueling.

■ **Fuel Filter**

**Clean the fuel filter every 100 hours or so of operation, and replace the element every 400 hours.**

The cleaning method is as follows:

- [1] Close the fuel filter cock.
- [2] Remove the ring screw and take out the filter cup.
- [3] Rinse the element in diesel oil. Also clean the inside of the filter cup with diesel oil.
- [4] After the cleaning, assemble the filter cup correctly as before by paying attention not to let dust or dirt attach to the element.
- [5] Open the cock.
- [6] Bleed air.



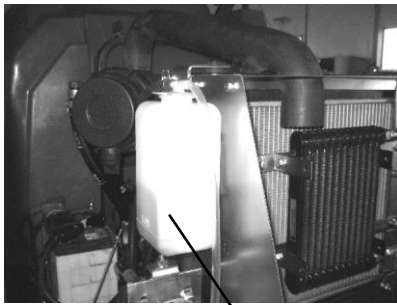
#### (4) Inspecting the Cooling System

##### **⚠ Caution**

- If the radiator cap is removed while the engine is hot, hot water gushes out. Wait for the engine to cool and remove the radiator carefully by putting a cloth over it.

##### [1] Cooling water level

Check the cooling water level based on the amount in the reserve tank. The level is normal if between "FULL" and "LOW". If cooling water is low, add to the "FULL" level. After cooling water has been added, press the top lid and make sure the lid is securely latched.



Reserve tank

- \* Do not open the radiator cap except when checking and changing cooling water.
- \* Long-life coolant that does not freeze until -20°C has been charged at the factory prior to shipment. Adjust the concentration of coolant according to the outside air temperature.

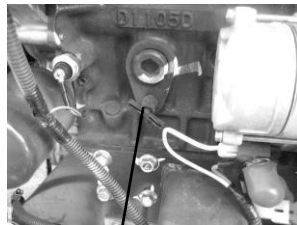
-10°C or above	30%
-10 to -25°C	40%

##### [2] Cleaning the inside of the radiator

Open the drain plug and drain cooling water fully. Thereafter, clean the inside with tap water until the flushed water no longer contains rust.



Radiator drain



Cooling water drain on the engine side

#### (5) Changing the Transmission Oil

Remove the plug on the oil check port and drain plug at the bottom of the transmission, and drain oil. At this time, open the oil filler port also.

Open the oil check port to bleed air from inside the transmission when adding oil.

[Type of oil] Gear oil SAE 90

When changing the oil for the first time, first drain the oil, and then remove the speed detection sensor, and thoroughly clean the tip of the sensor to remove the iron powder adhered on it.

[Amount of oil] Approx. 0.8 L

[When to change] Initial change: 50 hours

Periodic change: Every 600 hours

Oil check port



Speed detection sensor

Drain plug



Oil filler port

##### **⚠ Caution**

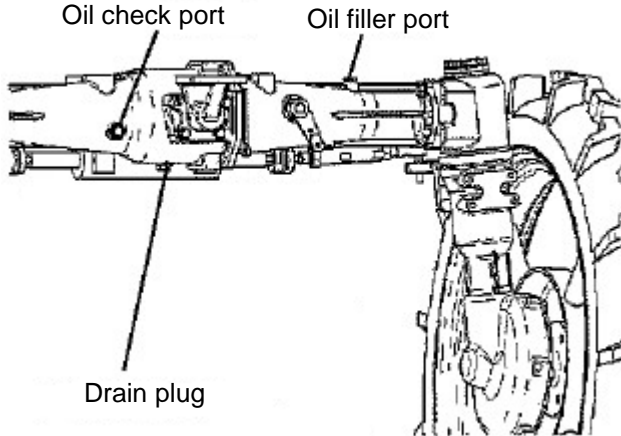
- After oil has been added, confirm that the drain plug and oil check port plug are securely tightened, and firmly tighten the oil filler cap to prevent loosening.

(6) Changing the Front/Rear Differential Oil

Remove the drain plug and plug on the oil check port to drain oil.

Add oil from the oil filler port until oil overflows from the oil check port.

- [Type of oil] Gear oil SAE 90
- [Amount of oil] Approx. 1.0 L
- [When to change] Initial change: 50 hours  
Periodic change: Every 600 hours

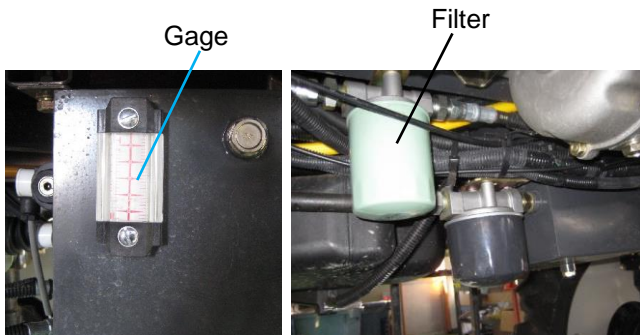
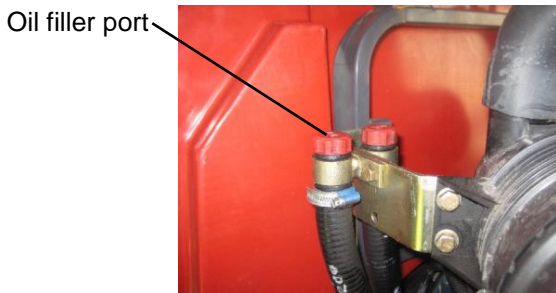


(7) Checking the Oil Level in the Hydraulic Oil Tank

Check the oil level using the gauge provided on the side face of the oil tank. The oil surface changes based on the boom position. Check the level when the booms are at the lowest position. Add more oil if the level is low.

When changing oil, replace the filter also.

- [Type of oil] Hydraulic oil (wear resistant) VG46
- [Amount of oil] Approx. 18 L
- [When to change] Initial change: 50 hours  
Periodic change: Every 200 hours



(8) Inspecting the Spray Pump

Oil in the crank case

Check if the oil level reaches the top of the level gauge. If not, add more oil.

- [Type of oil] SAE 10W-30SJ grade or above
- [Amount of oil] Approx. 0.6 L
- [When to change] Initial change: 50 hours  
Periodic change: Every 100 hours

(9) Greasing

Refer to the Oil Change Table (P. \*\*).

(10) Adjusting the Belt Tension

Adjust the belt tension based on the table below. Press the center of the belt with the amount of force indicated in the table, and adjust to the deflection indicated.

Drive part	Belt type	Amount of force to press the center of belt (N)	Deflection (mm)
Engine ⇒ Electromagnetic clutch (counter)	PK975	30	5
Counter ⇒ Spray pump	LA43	16	5
Counter ⇒ Agitator	PCLA20	10	2.5

(11) Inspecting the Tires and Wheels

- Inspect each tire for wear, cracks, low air pressure or any other abnormality.
  - If the air pressure is excessively low, adjust it to the appropriate level. If there is a significant enough crack or wear, replace the part with a new one.
- Standard air pressure for front/rear wheels: 300 kPa

**Caution**

● If the tire air pressure is too high, the tires tend to wear out more easily. On the other hand, if the air pressure is too low, a flat tire may occur more easily and the fuel efficiency may decline.

- Inspect each wheel for cracks or looseness.

(12) Inspecting the Battery

**Warning**

- Do not use or charge the battery when the battery fluid level is low, because the battery may rupture (explode) or ignite.

**Caution**

- When inspecting the battery terminals, do not let the terminals get short-circuited.
- When disconnecting the battery cable, be sure to disconnect the negative terminal end first.
- Battery fluid is very corrosive, so do not spill the fluid. If battery fluid attached to your hand, clothes or any metal part, rinse the affected area thoroughly with water.

◆ Maintenance-free battery

The battery without top cap is a maintenance-free battery.

- [1] Look at the charge indicator vertically.
- [2] If the charge indicator is clear or yellow, gently tap the battery to remove air bubbles and then check again.
- [3] Take an appropriate action according to the table below based on the indicator color.

Color	Charge state	Action
Green	Normal	The battery can be used.
Black	Insufficient	Auxiliary charge is required.
Clear	Not enough fluid	Replace the battery if the engine does not start.

\* There is no need to inspect the battery at the start of work.

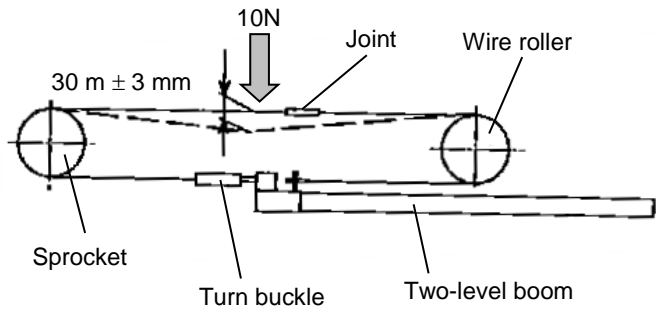
◆ Conventional battery

- [1] Check if the battery fluid level is between “UPPER” and “LOWER”. If the level is low, add distilled water to the “UPPER” level.
- [2] After distilled water has been added, securely tighten the cap.
- [3] Inspect the battery terminals and if loose, securely tighten the terminals. If white powder is attached to the terminals, clean with hot water and tighten the terminals, and then apply a small amount of grease on the terminals.

**Caution**

- Do not continue using the machine once the electrolyte level in the battery has dropped to or below the lower limit (LOWER level) indicated on the side face of the battery. Deterioration of each part of the battery cell will be promoted.

(13) Adjusting the Chain Wire for Boom Extension/Retraction and Adding Oil



**Caution**

- Apply grease to the entire surface of the boom extension/retraction chain wire once every year to prevent rust.

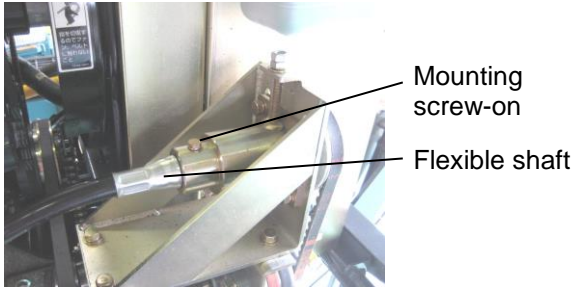
- When adjusting the boom extension/retraction chain wire or adding oil, please contact the Maruyama dealer near you.

If the boom extension/retraction wire is stretched out, adjust the chain tension.

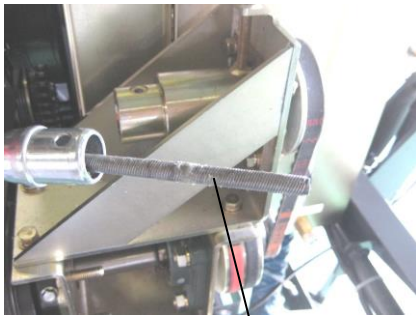
With the boom fully extended, rotate the turn buckle to adjust. (If used with the boom not fully extended, the wire may be disengaged.) {The target condition is to have the boom body not touch the chain when it is extended until it touches the stopper.}

(14) Inspecting the Agitator

- [1] Press the spray pump switch to actuate the spray pump and the agitator, and inspect if the agitator blades are rotating smoothly.
- [2] Remove the screw mounting the flexible shaft to remove the shaft.



- [3] Pull out the inner wire from the flexible shaft and inspect for any damage. If it is damaged, replace it with a new one.

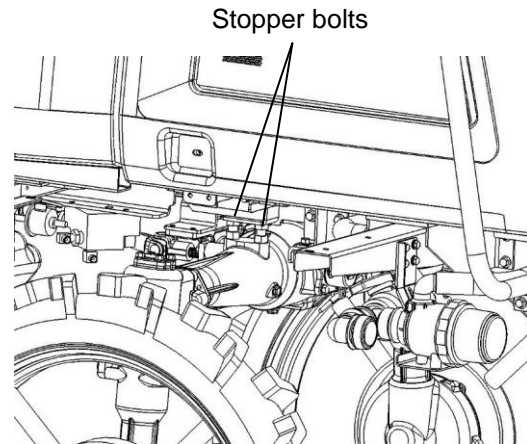


Inner wire

- [4] Apply grease to the entire surface of the inner wire and assemble it back to the original position.

(15) Inspecting the Rear Axle Stopper Bolts

If the machine body tilts significantly when the driver gets on board or gets off, request to have the rear axle stopper bolts adjusted at the sales dealer where the machine was purchased.



(16) Inspecting the Floor

Inspect the floor for cracks, fissures or any other abnormality. If any abnormality is found, submit a request for replacement to the sales dealer where the machine was purchased.

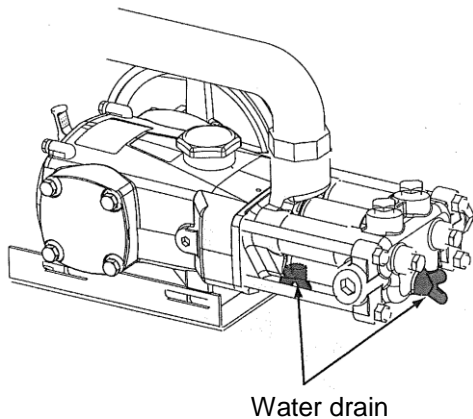


Floor

## ■ Method for Long-term Storage

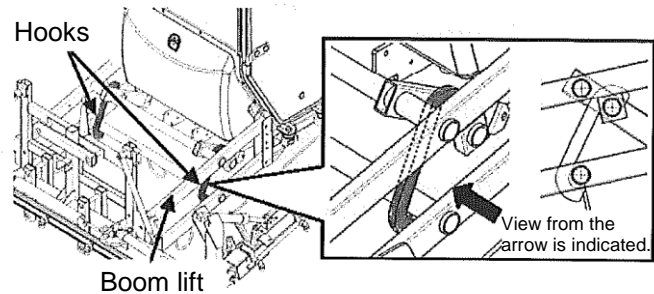
If the machine is not used for a long period of time, follow the care procedure below:

- (1) Run through all maintenance and inspection items.
- (2) Service problem locations, if any.
- (3) Inspect the bolt and nut in each part and tighten them if loose.
- (4) Rotate the spray pump at a low speed using clean water to clean the inside of the tank, pipe and the nozzle, and circulate the water for three to four minutes. To prevent damage from freezing, drain the liquid from inside the spray pump and the pipe by idling the pump and by removing the water drains (two positions).



- (5) Remove the nozzle cap and drain water remaining inside the nozzle.
- (6) Clean the exterior of the machine.
- (7) Change engine oil with new oil and operate the engine for around 5 minutes to spread oil to each part.
- (8) Be sure to keep the throttle lever in the "Low speed" position.
- (9) Fill up the fuel tank with fuel (diesel oil).
- (10) Use sandpaper, etc., to remove rust from areas where paint has peeled, and apply a fresh coat of paint.
- (11) Keep each cock in the "Open" position.

- (12) To prevent any damage on the parts by naturally dropped boom lift, attach the hooks to the boom lift as shown based on the procedure below.
  - [1] Close the booms on both sides, adjust the boom lift so that it is in a parallel position, and store the booms in the boom receivers.
  - [2] Stop the engine.
  - [3] Latch the hook onto the pipe of the boom lift (at two positions on left and right).



### Caution

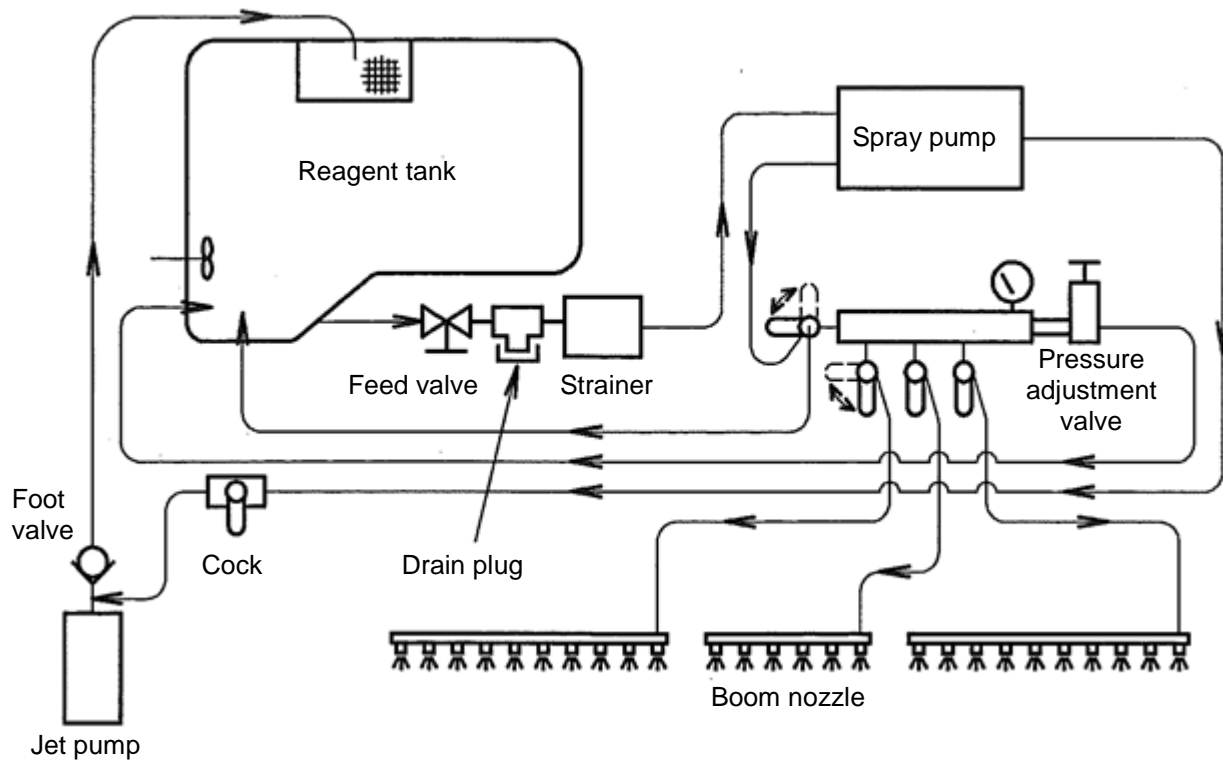
- Do not place anything underneath the booms when storing the machine for a long period of time.
- Remove the hooks when using the machine (at two locations on left and right). If the hooks cannot be disengaged due to the lowered boom lift, start the engine and raise the boom lift to the parallel position, and then stop the engine and disengage the hooks.
- Store the hooks carefully in a safe location to avoid losing them.

- (13) Disconnect the battery cable or remove and store the battery in a dark, dry place.
- (14) The battery will self-discharge during storage, so perform auxiliary charge once every month.
- (15) Select a dry place for storage and cover the machine with a sheet, etc., to prevent attachment of dust, etc.

### Caution

- To prevent the clutch plate from becoming adhered, be sure to store the machine with the brake pedal engaged onto the parking brake lever.

## 9 Piping Diagram



Each arrow in the piping diagram indicates the flow direction of water or reagent.



## 10 Causes of Failures and Remedial Actions

### ⚠ Caution

- If the machine malfunctions, be sure to stop the engine, apply the parking brake and remove the ignition key and then diagnose the problem by referring to the table below.

	Phenomenon	Cause	Action
Engine	The starter does not turn when the key switch is turned.	The auxiliary shift lever is not in the "Start" position.	Put the auxiliary shift lever in the "Start" position and then turn the key switch to the "ST" position.
		Loose or disconnected wire terminal, or loose, disconnected or corroded battery terminal	Retighten or reconnect the terminals. Clean and securely tighten the terminals. Apply grease to prevent rusting.
		Blown fuse	Replace the fuse with new one.
		Low battery voltage	Add battery fluid and charge the battery. Replace the battery.
		Faulty key switch	Contact the dealer where you purchased your machine from.
		Faulty cell motor	Contact the dealer where you purchased your machine from.
		Faulty switch	Contact the dealer where you purchased your machine from.
	The starter turns, but the engine does not start.	No fuel. Air is mixed into fuel.	Add fuel to the fuel tank and bleed air.
		Fuel does not flow.	Contact the dealer where you purchased your machine from.
		The battery is almost flat and does not provide enough rotational force to turn the engine.	Charge the battery. If the battery does not charge, replace it with new one.
	Engine revolutions are irregular.	Air has entered the fuel system.	Bleed air.
		Water is mixed into fuel.	Drain fuel from the fuel tank/fuel filter and add new fuel.
Clogged fuel injection nozzle		Contact the dealer where you purchased your machine from.	
Clogged fuel filter		Contact the dealer where you purchased your machine from.	
Engine related	Insufficient engine output	Insufficient fuel	Inspect the fuel system (for entry of air).
		Clogged air cleaner	Contact the dealer where you purchased your machine from.
		Insufficient compression	Contact the dealer where you purchased your machine from.
		Deterioration of fuel injection state	Contact the dealer where you purchased your machine from.
		Inappropriate intake/exhaust valve gap	Contact the dealer where you purchased your machine from.
	Undesirable exhaust color	Low-grade fuel	Change to high-grade fuel.
		Too much engine oil	Adjust the amount of oil to the specified level.
		Deterioration of fuel injection state	Contact the dealer where you purchased your machine from.
	The engine overheated (the water temperature warning lamp turned on).	Insufficient cooling water or leakage of water	Contact the dealer where you purchased your machine from.
		Loose fan belt	Contact the dealer where you purchased your machine from.
		Insufficient engine oil	Add oil to the specified level.
		Low engine oil viscosity	Change to oil of appropriate viscosity.
		Faulty pressure switch	Contact the dealer where you purchased your machine from.
		Faulty oil lamp	Contact the dealer where you purchased your machine from.
	The glow lamp does not turn on.	Blown fuse	Replace the fuse with new one.
The charge lamp turned on during operation.	Faulty regulator	Contact the dealer where you purchased your machine from.	
	Loose or damaged fan belt	Contact the dealer where you purchased your machine from.	

	Phenomenon	Cause	Action
Electrical related	A lamp does not turn on.	Blown bulb	Replace the bulb with new one.
		Blown fuse	Replace the fuse with new one.
		Loose or disconnected wire terminal	Reconnect and retighten after inspection.
		Faulty switch	Contact the dealer where you purchased your machine from.
	The speed is not indicated.	Loose or disconnected wire terminal	Reconnect and retighten after inspection.
Faulty speed sensor		Contact the dealer where you purchased your machine from.	
Pedal related	The clutch does not disengage.	Faulty switch	Contact the dealer where you purchased your machine from.
		Loose or disconnected wire terminal	Reconnect and retighten after inspection.
	Poor brake effect	Improperly adjusted brake wire	Contact the dealer where you purchased your machine from.
	The differential locks only on one side of front and rear wheels.	Improperly adjusted differential lock wire	Contact the dealer where you purchased your machine from.
Lever related	The engine speed drops.	Improperly adjusted throttle lever	Contact the dealer where you purchased your machine from.
	Gears disengage.	Improperly adjusted shift cable	Contact the dealer where you purchased your machine from.
	The HST lever returns.	Faulty lever retention mechanism	Contact the dealer where you purchased your machine from.
	The engine does not stop when the HST lever is in the N (Stop) position.	Improperly adjusted cable system	Contact the dealer where you purchased your machine from.
Steering wheel related	The steering wheel is heavy.	Insufficient tire pressure	Adjust the pressure to the reference level.
		Hydraulic device malfunction	Contact the dealer where you purchased your machine from.
	Steering control is lost.	Uneven pressures of tires	Adjust the pressures of all tires evenly.
		Poor straight-rolling property of tire	Contact the dealer where you purchased your machine from.
	2-4WS setting cannot be switched.	Loose or disconnected wire terminal	Reconnect and retighten after inspection.
		Hydraulic valve failure	Contact the dealer where you purchased your machine from.
Faulty control unit		Contact the dealer where you purchased your machine from.	
	Faulty neutral sensor	Contact the dealer where you purchased your machine from.	
Spray device related	The spray amount is small. The pressure does not rise.	No reagent in the tank	Add the required amount of reagent.
		Closed suction valve	Open the valve.
		Low engine speed	Operate the throttle lever to raise the speed.
		Pressure adjustment valve malfunction	Contact the dealer where you purchased your machine from.
		Clogged water absorption strainer	Clean.
		Slipped spray pump belt	Contact the dealer where you purchased your machine from.
		Worn piston gasket, discharge valve or suction valve of the spray pump	Replace the affected part with new one.
		Damaged metal joint gasket of the suction hose or spray hose, or damaged hose	Replace the affected part with new one.
		Worn nozzle	Replace the affected part with new one.
		Clogged nozzle	Clean.
	Poor spray state	Improper nozzle attachment angle	Adjust the angle.
		Worn or cracked nozzle	Replace the affected part with new one.
Clogged nozzle		Clean.	

Phenomenon		Cause	Action
Spray device related	Poor spray state	Insufficiently tightened nozzle cap	Tighten additionally.
		Automatic nozzle failure	Adjust the angle or replace the nozzle.
		Clogged strainer	Clean the line strainer and the nozzle strainer.
		Damaged metal joint gasket of the suction hose or spray hose, or damaged hose	Replace the affected part with new one.
Agitator	Poor agitation performance	Loose or damaged belt	Contact the dealer where you purchased your machine from.
		Damaged flexible shaft	Contact the dealer where you purchased your machine from.
		Damaged agitator blades	Contact the dealer where you purchased your machine from.
Boom device	The boom does not operate.	Loose or detached wire terminal	Reconnect and retighten after inspection.
		Faulty hydraulic device	Contact the dealer where you purchased your machine from.
	Improper slide condition	Loose or disconnected wire terminal	Contact the dealer where you purchased your machine from.
		Excessively tight or loose extension/retraction chain and wire	Contact the dealer where you purchased your machine from.
		Loose mounting wire	Contact the dealer where you purchased your machine from.
		Bent or deformed boom	Contact the dealer where you purchased your machine from.
Extension/retraction motor failure	Contact the dealer where you purchased your machine from.		

## Appendix

### ● Quick Reference Table for Reagent Tank

Input amount of reagent (g)

Dilution factor (times)	Amount of water in reagent tank (L)		
	300	400	500
150	2000	2667	3333
300	1000	1333	1667
500	600	800	1000
800	375	500	625
1000	300	400	500
1500	200	267	333
2000	150	200	250

- List of Key Consumables

Location of use	Item name	Part number	Quantity used	Remarks
Engine	Filter comp (air cleaner)	405149	1	Kubota T0270-16320
	Oil filter	592739	1	Kubota 16271-32092
Fuel piping	Filter assembly	196770	1	Kubota
	Element assembly	413045	1	Kubota 1G313-43560
Hydraulic piping	Oil filter	682443	1	AB04S-150
	Return filter	862052	1	TAISEI CS-04
Harness	Slow-blow fuse	685844	1	40A
Fuse box	Fuse 30A	641496	4	
	Fuse 15A	185012	-	
	Fuse 10A	641262	4	
	Fuse 5A	191738	3	
Combination lamp	Bulb	595551	3	
Glow lamp	Bulb	581116	1	
Parking brake lamps	Bulb	581116	1	
Head lights	Bulb	-	2	H3 12V 35W
Blinker	Bulb	626906	2	12V 15W
Spray pump	Water absorption valve	027944	5	
	Piston gasket set	115420	5	
	Water absorption valve collar	125924	5	
	Water absorption valve stopper	027947	5	
	Nylon nut	115598	5	
	Seal gasket	100015	5	
Pressure adjustment valve	Sleeve	117252	1	
	Piston gasket	022442	1	
	Valve seat	117251	1	

## Service and Warranty

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### ■ Warranty Card

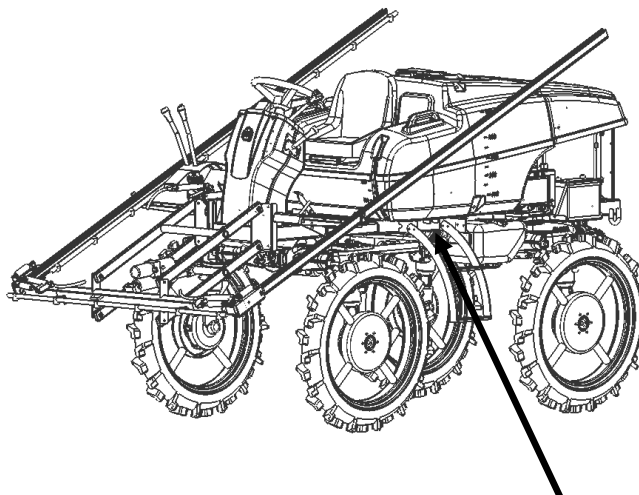
The customer must present the warranty card to receive warranty repair during the warranty period. After you have read the information provided on the warranty card, keep the warranty card in a safe place.


#### **Warning**

- Do not modify the machine as it may create dangerous situations. Please note that the manufacturer's warranty will become void if the machine is modified or used wrongly or for any purpose different from the correct purpose of use as described in the Operation Manual.

### ■ After Service

- If a problem is found during the startup inspection or use, proper servicing must be carried out immediately. Contact the dealer where you purchased your machine from.
- Provide the following information to the dealer:
  - Model
  - Category
  - Serial number
  - Description of failure  
Explain in detail what happened when such-and-such was operated in which way in which condition.



Agricultural machine type:	Dynamic sprayer (ride-on type)
Model	*****
Category	*****
Serial number	*****
Manufactured by	 <b>MARUYAMA MFG. CO., INC.</b> 4-15 Uchikanda 3-Chome, Chiyoda-Ku, Tokyo

- So that it can be used safely, this product must be operated correctly and serviced periodically. Have your machine inspected and serviced at least once a year by the dealer where you purchased your machine from.  
This servicing is chargeable.

### ■ Supply Period of Spare Parts

Spare parts for this product will be supplied for 9 years after the discontinuation of this product. Even during the supply period, we may consult you on the delivery schedule and other supply conditions of special parts. As a rule, supply of spare parts will cease at the end of the above supply period. Even after the expiration of the supply period, we may be able to supply certain parts, upon request, based on the delivery schedule and price to be negotiated.

If you have any question or inquiry regarding this product, consult first the dealer where you purchased your machine from.

You can also call the following toll-free number from anywhere in Japan.

Maruyama Support Center

Toll-free number **0120-898-114**

Lines are open from 9:00 to 17:00 (excluding Saturday, Sunday and public holidays)

So that we can accurately assess the situation, have the following information ready when you contact us regarding your product:

- [1] Product model and serial number
- [2] Date of purchase
- [3] Dealer



**MARUYAMA MFG. CO., INC.**

4-15 Uchikanda 3-Chome, Chiyoda-Ku, Tokyo 101-0047 Japan TEL (03) 3252-2281 (Sales Main)

The part number of this Operation Manual is \*\*\*\*\*.

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