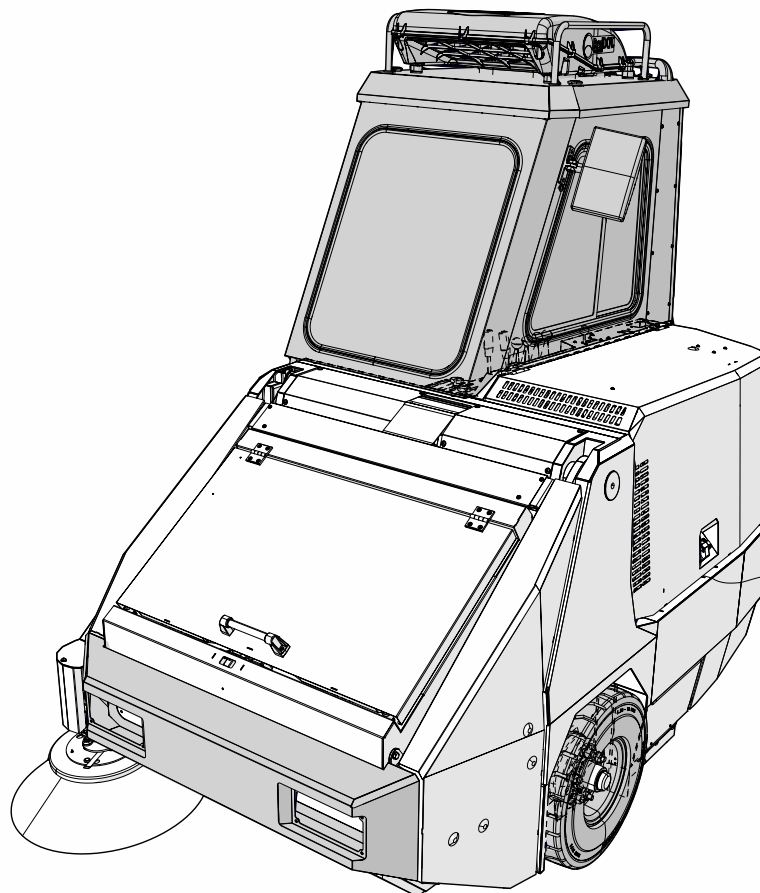


RD160 E3/E4

Ride-On-Sweeper
Diesel



Operator's Manual

Read this manual completely and understand the instructions before operating the machine.
"English Version"

TABLE OF CONTENTS



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IMPORTANT NOTE:

Roots Multiclean Ltd. (RMCL) is not liable for any legal claims that may arise as a direct or indirect result of the contents of this manual.

Roots Multiclean Ltd.
R.K.G. Industrial Estate, Ganapathy,
Coimbatore - 641 006, India.

MACHINE DATA

Please fill at the time of installation for future reference:

Model No. - _____

Serial No. - _____

Engine No. - _____

Accessories - _____

Installation Date - _____

P/N: 557440088-00, Rev-A, 07/2018

Prepared by KM, NPM TD Dept.





PREFACE

Dear Customer,

We are pleased with you having chosen the **Rhino RD160 E3/E4** for your cleaning requirements. Backed by our industry expertise that spans across two decades, we assure you that the machine comes with ROOTS promise of quality, efficiency and performance.

We advise you to carefully read through the instructions prior to the operation of the machine. This manual contains detailed instructions for the proper operation of the machine, along with important information regarding its handling, care, maintenance and service needs.

We are sure that you will find the machine and its performance to your utmost satisfaction. Once again, we thank you for choosing us as a trusted partner for your cleaning requirements.

Usage, Handling & Modification

Use of the product beyond the specified scope of functioning is deemed improper and the manufacturer cannot be held liable for any damages which may arise due to this.

This machine may be used only by persons who are trained or are familiar with the machine and are aware of the possible hazards involved. The appropriate Accident Prevention Regulations as well as applicable general regulations pertaining to Safety and Health at the work place must be adhered to by the user.

Modifications made to machine without the manufacturer's consent will relieve the manufacturer of responsibility and any possible liability for consequential damage.

Notes on Warranty

Refer the Warranty manual supplied along with the machine.

Acceptance of the Machine

On arrival of the machine at the shipping address, please check for any damage that may have occurred as a result of transit. In the event of any such damage, the purchaser is bound by responsibility to send a claim letter to the concerned authorized dealer with a copy of the invoice. The letter should be sent within 24 hours of receipt of the machine.

NOTE:

ILLUSTRATIONS SHOWN IN THIS MANUAL ARE FOR REPRESENTATIVE PURPOSE ONLY. ACTUAL PRODUCT MAY VARY.

ROOTS reserves the right to change the product or contents of this manual without prior information.

For Engine, Battery, Motors, Blowers or other OEM components related information kindly refer to their manufacturers manual supplied along with the machine for instructions regarding usage, maintenance and service.

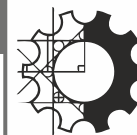


Prior to first operation, read the manual carefully and strictly comply with the instructions contained.

The Operator's Manual is an integral part of the machine and must not be misplaced.



TECHNICAL SPECIFICATION



SWEEPING PERFORMANCE

- With One Side Broom - 17325 m²/hr@10.5Km/hr
- With Two Side Brooms - 21000 m²/hr@10.5Km/hr
- Sweeping Speed - 8 to 11 Km/hr

(Theoretical)



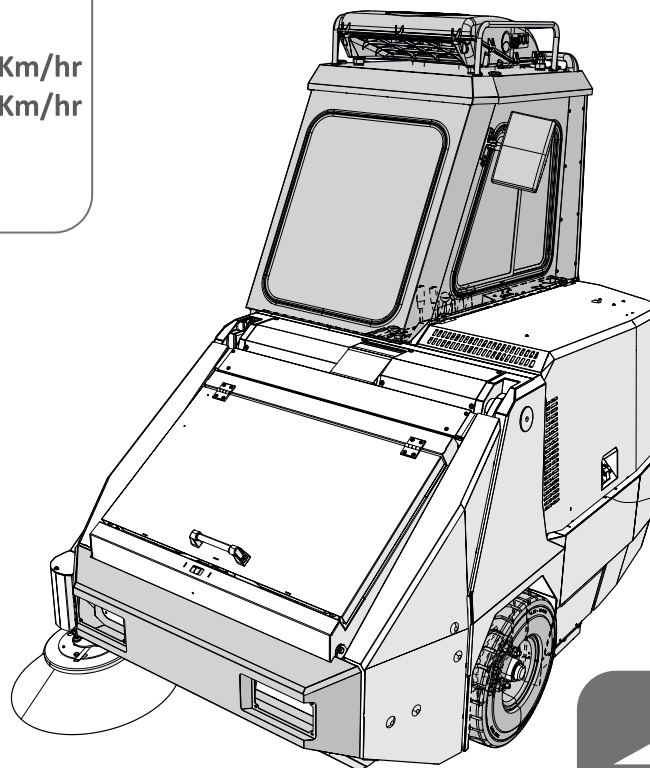
SWEEPING WIDTH

- Without Side Broom - 1220 mm
- With One Side Broom - 1650 mm
- With Two Side Brooms - 2000 mm



MAIN & SIDE BROOM

- Main Broom Length - 1220 mm
- Main Broom Diameter - 360 mm
- Broom Type - V-Shape
- Bristle Type - PROEX & WIRE
- Side Broom Diameter - 660 mm



GRADABILITY

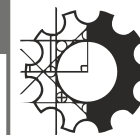
Max - 20 %



WEIGHT

Unladen weight - 1800 kg
(Without packing)

TECHNICAL SPECIFICATION



HOPPER

Hopper Volume - 640 liters
(Theoretical)
Dump Height - 1400 mm
Lift Capacity - 600 kg



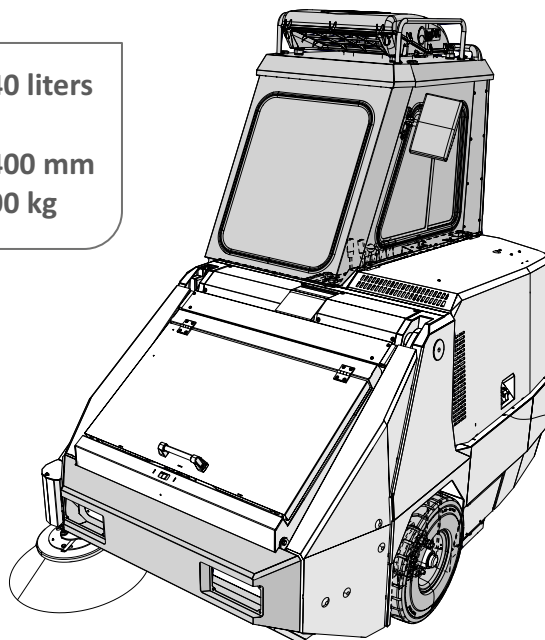
FILTER

Filter Area - 12 m²
No. of Filters - 2



TANKS

Diesel Tank - 40 liters
Hydraulic Tank - 40 liters



ENGINE E4

Manufacturer - Kubota
Model - V1505-E4B-RTS-1
Displacement - 1498 cc
No. of Cylinders - 4
Horsepower - 18.5kW/24.8HP



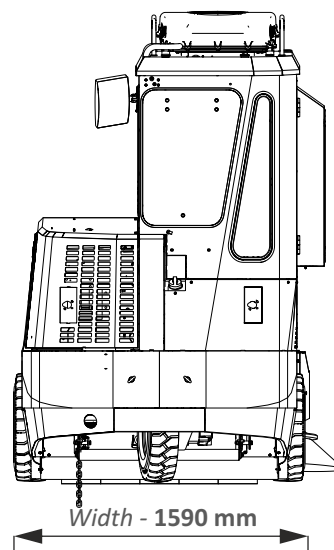
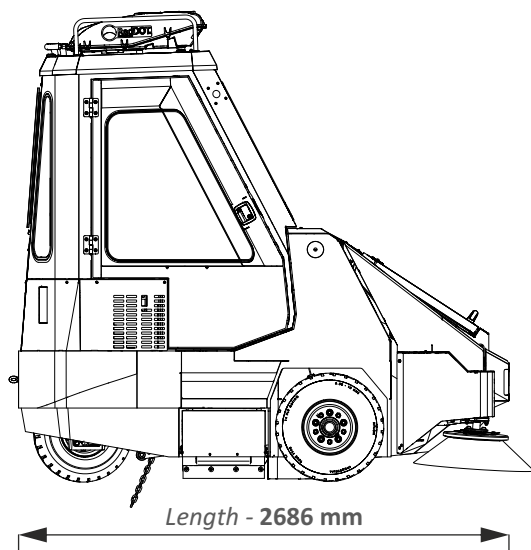
ENGINE E3

Manufacturer - Kubota
Model - V1505-E3B-EU-Z1
Displacement - 1498 cc
No. of Cylinders - 4
Horsepower - 26.5kW/35.5HP



BATTERY

Battery - 12V, 80Ah



Height - 2555 mm (AC cabin)
Height - 2400 mm (Non AC Cabin)
Height - 1616 mm (Open Top)
Height - 2320 mm (Overhead Guard)



SUPPORT

AFTER SALES SUPPORT

CUSTOMER SUPPORT SYSTEM (CSS)

RMCL has a dedicated CSS Team to ensure prompt after sales service support. One call solution for all your complaints/concerns. Register your complaint or concern through the below toll free number for hassle free support. The customer support executive registers your complaint/concern and will keep you updated on the progress.

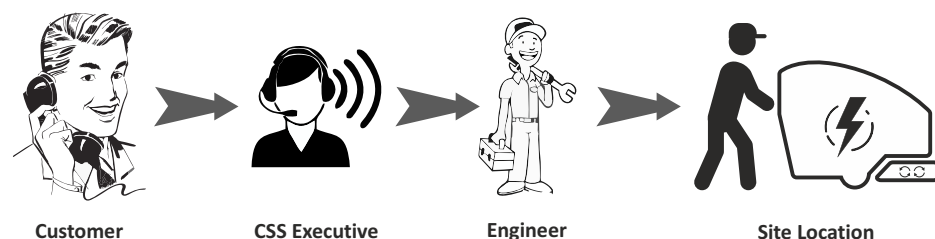
Toll Free Number:

1800 41 99 77 9

Our timings (Monday to Saturday):

8:00 am to 7:00 pm

Customer Support System Process



Our Address:

Roots Multiclean Ltd.

R.K.G. Industrial Estate, Ganapathy, Coimbatore - 641 006, India.

Phone: +91 (422) 4330 330, E-mail: rmclsales@rootsemail.com

Web: rootsmulticlean.in

Toll Free: **1800 41 99 77 9**

ANNUAL MAINTENANCE CONTRACT (AMC)

AMC or Annual Maintenance Contract is a professional and timely maintenance cover offered by RMCL to its customers. AMC takes care of scheduled and preventive maintenance services. Equipment under AMC qualifies for four scheduled visits and to a maximum of twelve unscheduled visits during the contract.

Advantages of AMC:

- ☒ Pan India network presence.
- ☒ Maximum equipment uptime.
- ☒ Focus on your business while we take care of your equipment.
- ☒ Well trained engineers to take care of the equipment.
- ☒ System driven scheduled periodic maintenance.
- ☒ Genuine spare parts.
- ☒ Toll free number assistance for breakdown.



AMC



SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS

GENERAL SAFETY SYMBOLS



**Read
manual**

Prior to first operation, read the manual carefully and strictly comply with the instructions contained.



**Caution
(the machine)**

Important information on handling the machine in order to maintain operability.



**Ecological hazard
(the environment)**

Due to use of substances representing an inherent danger to health of environment.



**Safety Provisions
(persons & goods)**

Safety provisions in dangerous situation caused by misuse inaccurate adherence of instruction or prescribed work routine.

SAFETY INSTRUCTIONS

Application

- The machine with working equipment must be checked to ensure that it is in proper working order and is operating safely prior to use. Otherwise, the machine must not be used.
- The machine is not suitable for sweeping dust which endangers health, unless expressly specified otherwise. Please follow the safety instructions in the operating manual.
- Never sweep explosive liquids, combustible gases, explosive dusts as well as undiluted acids and solvents! This includes petrol, paint thinner or heating oil which can generate explosive fumes or mixtures upon contact with the suction air. Acetone, undiluted acids and solvents must also be avoided as they can harm the materials on the machine.
- Do not sweep any burning or glowing objects.
- The machine should not be used in sub-zero temperatures.
- If the machine is used in hazardous areas (e.g. filling stations) the corresponding safety provisions must be observed.
- The machine may only be operated on the surfaces approved by the company or its authorised representatives.
- Protect the machine from frost.



SAFETY INSTRUCTIONS



Operation

- This machine is not intended for use by persons (including children) with limited physical, sensoric or mental capacities or lack of experience and/or skills, unless such persons are accompanied and supervised by a person in charge of their safety or if they received precise instructions on the use of this machine.
- Children should be supervised to prevent them from playing with the machine.
- The operator must use the machine properly. The person must consider the local conditions and must pay attention to third parties, in particular children, when working with the machine.
- Never leave the machine unattended so long as the engine is running. The operator may leave the machine only when the engine has come to a standstill, the machine has been protected against accidental movement, and the parking brake has been applied.
- For devices fitted with ignition key, remove the ignition key to prevent accidental or unauthorized use.
- Prior to starting work, the operator must ensure that all protective devices are properly installed and function correctly.
- The operator of the machine is liable for accidents with other individuals or their property.
- Ensure that the operator wears tight-fitting clothes. Wear sturdy shoes and avoid wearing loose-fitting clothes.
- Check the immediate vicinity prior to starting (e.g. children). Ensure sufficient visibility!
- The machine may only be used by persons who have been instructed in handling the machine or have proven qualification and expertise in operating the machine or have been explicitly assigned the task of handling the machine.
- Do not open the hood when the engine is running.
- On sloped surfaces, the sloping angle and the driving direction should not exceed the values given in the Operating Instructions.

Transport

- The engine is to be brought to a standstill and the machine is to be fastened properly during transportation.

Maintenance

- Maintenance work may only be carried out by approved customer service outlets or experts in this field who are familiar with the respective safety regulations.
- Please observe the local safety regulations regarding portable commercially used machines.
- Always use appropriate gloves while working on the device.
- First switch off the machine and remove the ignition key before performing any cleaning or maintenance tasks on the machine, replacing parts or switching over to another function.
- Always disconnect the battery when working on the electrics.
- Do not clean the machines with a high-pressure water jet (danger of short circuits or other damage).

Spare Parts & Accessories

- To avoid risks, all repairs and replacement of spare parts may only be carried out by the authorised customer service personnel.
- Only use accessories and spare parts which have been approved by the manufacturer. The exclusive use of original accessories and original spare parts ensures that the machines can be operated safely and trouble free.

SAFETY INSTRUCTIONS

Machines With Diesel Engine

Read the operating instructions of the engine manufacturer before start-up and follow the safety instructions carefully.

Risk of explosion!

- Only fill up fuel while the engine is turned off.
- Only use the fuel specified in the Operations Manual.
- Do not refuel the machine in enclosed spaces.
- Smoking and open flames are strictly prohibited.
- Ensure that no fuel reaches the hot open surfaces.

Risk of injury!

- Do not close the exhaust.
- Do not bend over the exhaust or touch it (risk of burns).
- Allow the machine sufficient time to cool down before carrying out any maintenance and repair work.
- Ensure that there is adequate ventilation or provision for diverting the exhaust gas while operating the machine in closed rooms (risk of poisoning).
- Exhaust gases are poisonous and hazardous to health, do not inhale them.

Pneumatic Tires Equipped Machines

- In machines with screwed wheel rims: Please check and confirm that all the screws of the rim are tightened before correcting the tyre filling pressure.
- Check the pressure reducer on the compressor for the correct setting before correcting the tyre pressure.
- Do not exceed maximum tyre pressure.



DO NOT SWEEP OR VACUUM CORROSIVE/BATTERY FLUIDS/EXPLOSIVE/FLAMMABLE/MAGNETIC/RADIOACTIVE/BIOHAZARD MATERIALS.



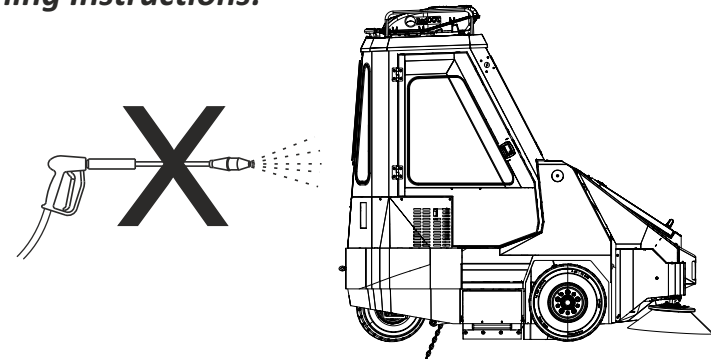
DO NOT SWEEP



Wear Safety Gear as necessary.



Cleaning Instructions:



WARNING: DO NOT CLEAN THE MACHINE WITH A HIGH PRESSURE CLEANER. RISK OF DAMAGING THE ELECTRICAL PARTS OR RISK OF SHORT CIRCUIT!

SAFETY INSTRUCTIONS

SYMBOLS & HAZARDS PICTORIAL DEFINITIONS



				
Read Manual	Information	General Warning	Caution	Toxic Hazard
				
Recycle/Do Not Throw In Garbage	Environmental Hazard	Battery: Recycle	No Fire/Matches	No Smoking
				
No Passengers	Do Not Throw In Garbage	Hand Crush Hazard	Static Electricity Hazard	Hot Surface
				
Do Not Start Tag	Rotating Belt Hazard	Wear Overalls	Wear Gloves	Wear Safety Shoes

SAFETY INSTRUCTIONS

SYMBOLS & HAZARDS PICTORIAL DEFINITIONS



Wear Safety Glasses



Wear Safety Helmet



Wear Ear Muff



Wear Respirator

SAFETY INSTRUCTIONS



ENVIRONMENTAL RESPONSIBILITY



The packaging material can be recycled. Please do not place the packaging into the ordinary refuse for disposal, but arrange for the proper recycling.

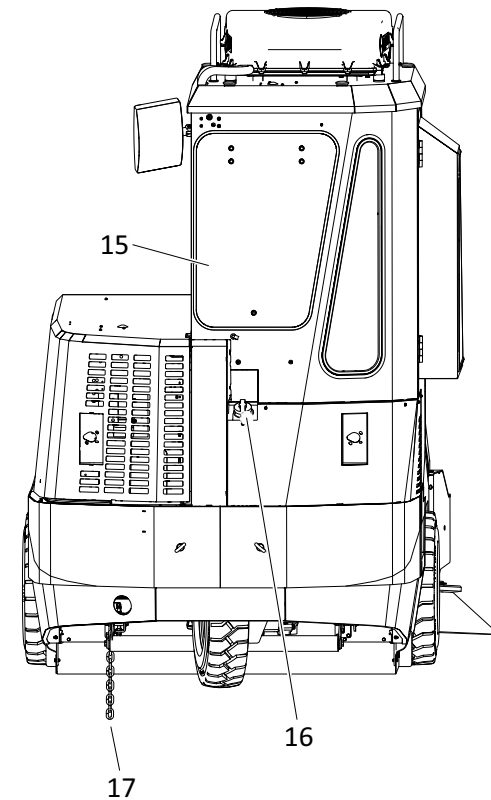
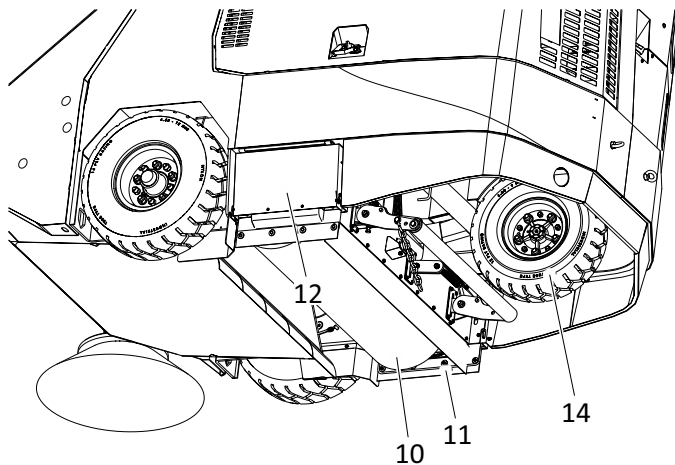
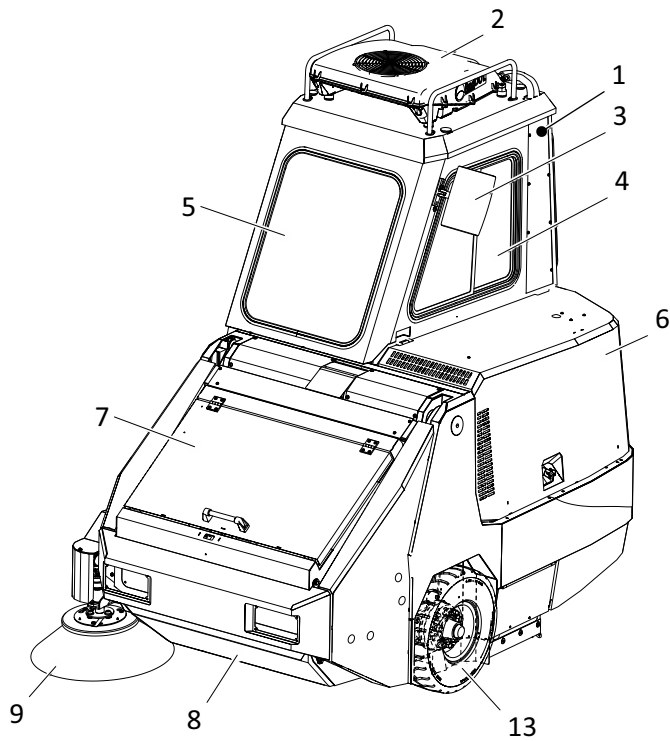


Old machines contain materials that can be recycled. Please arrange for the proper recycling of old machines. Batteries and actuators contain substances that must not enter the environment. Please dispose of your old machines, batteries and actuators using appropriate collection systems.



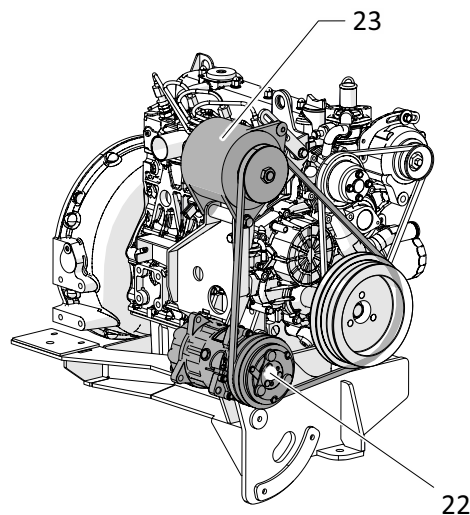
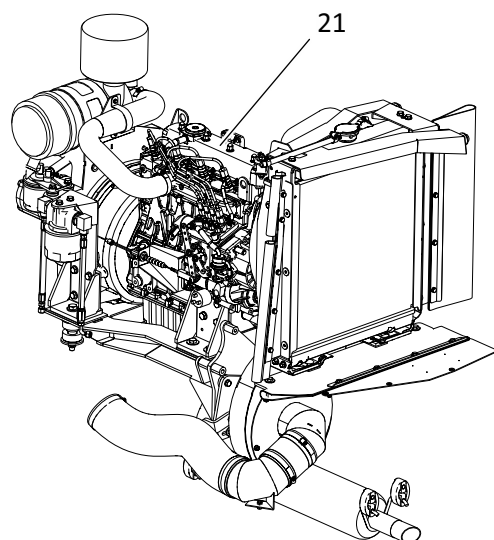
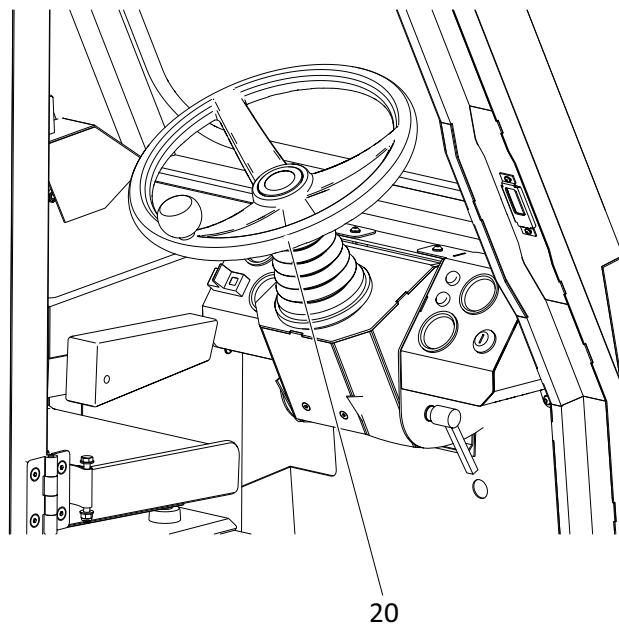
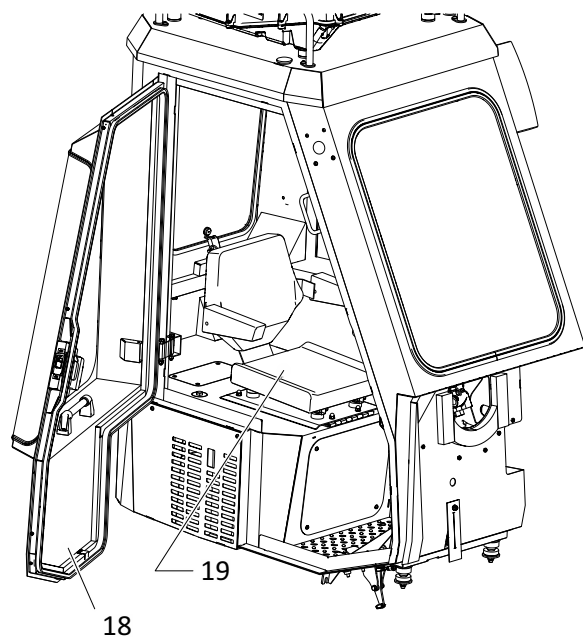
KNOW YOUR MACHINE

KNOW YOUR MACHINE



- 1. Operator cabin
- 2. Air conditioning unit
- 3. Rear view mirror
- 4. Sliding window
- 5. Front glass
- 6. Engine hood
- 7. Filter chamber
- 8. Hopper
- 9. Side broom

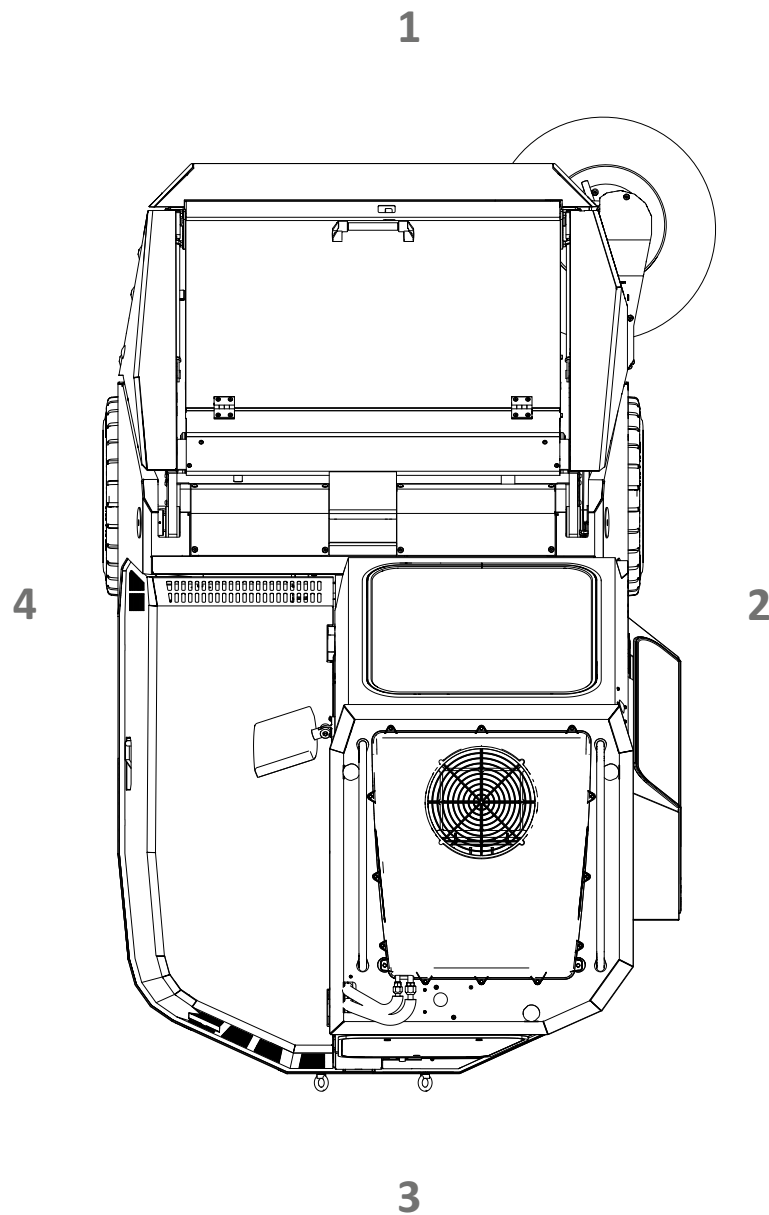
- 10. Main broom
- 11. Main broom door RH
- 12. Main broom door LH
- 13. Front wheels w/brake
- 14. Rear wheel
- 15. Emergency exit window
- 16. Fuel filler port w/cap
- 17. Anti static drag chain



- 18. Cabin door with lock
- 19. Operator seat with armrest
- 20. Steering wheel & dashboard
- 21. Engine
- 22. Air conditioning system compressor
- 23. Additional alternator for air conditioning system.

KNOW YOUR MACHINE

Operator Orientation:

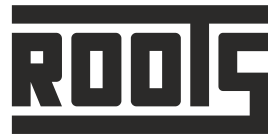


- 1. Front of the machine
- 2. Right of the machine
- 3. Rear of the machine
- 4. Left of the machine

KNOW YOUR MACHINE - DECALS



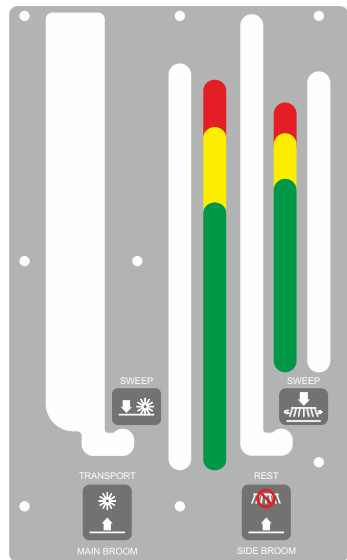
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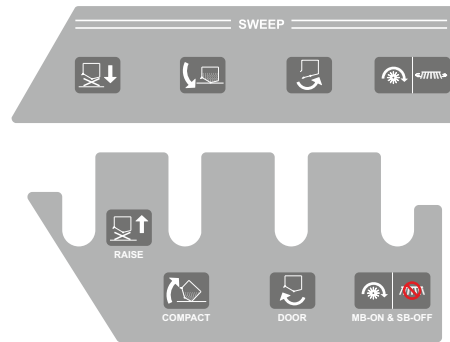
(2)

RD 160

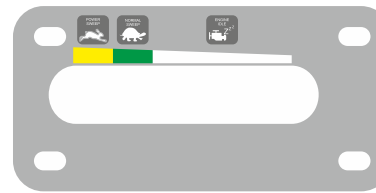
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(7)



(4)



(6)



(5)



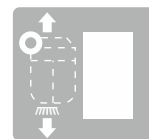
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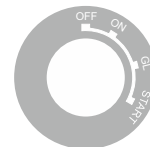
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(10)



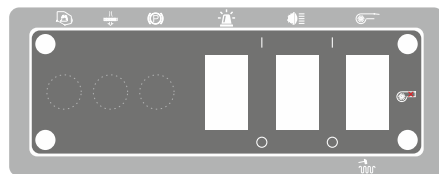
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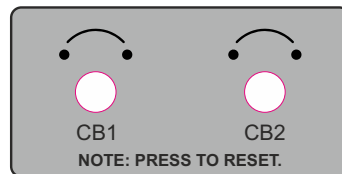
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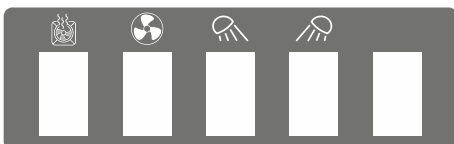
(13)



(14)



(15)



(16)

1. Product category sticker
2. Manufacturer's logo sticker
3. Product name sticker
4. Hopper control sticker
5. Horn sticker
6. Throttle lever sticker
7. Main/Side broom operational sticker
8. Ignition coil/Hydraulic oil filter clog indicator
9. Battery charging sticker
10. Turn signal indicator sticker
11. Side brush actuator switch sticker *(If equipped)*
12. Ignition key sticker
13. Charging indicator sticker - AC cabin
14. Switch panel sticker
15. Circuit breaker reset sticker
16. Overhead switch box sticker

KNOW YOUR MACHINE - DECALS



(1)



(2)



(3)



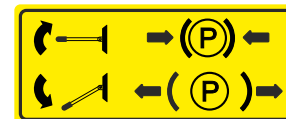
(4)



(5)



(6)



(7)

MAINTENANCE SCHEDULE	
For detailed instructions refer the instruction manual	
DAILY	1. Main & side broom, 2. Air intake system, 3. Coolant system, 4. Engine, 5. Brake, 6. Hopper, 7. Hydraulic system, 8. Wheels and tires, 9. Miscellaneous.
WEEKLY	1. Rear wheel, 2. Hopper actuators
EVERY 50 HOURS	1. Main broom, 2. Hydraulic system, 3. Wheels and tires
EVERY 100 HOURS	1. Engine, 2. Coolant system, 3. Hydraulic system, 4. Hopper.
EVERY 200 HOURS	1. Engine, 2. Air intake system, 3. Battery, 4. Lubrication points, 5. Miscellaneous
EVERY 400 HOURS	1. Engine, 2. Brake cylinder
EVERY 500 HOURS	1. Coolant system, 2. Side broom.
EVERY 800 HOURS	1. Hydraulic system, 2. Wheels and tires

(8)

NOTICE

USE DESIGNATED FUSES ONLY

10 A	10 A	10 A	20 A	25 A	10 A
F1	F2	F3	F4	F5	F6
40 A	20 A	5 A	20 A	20 A	10 A
F7	F8	F9	F10	F11	F12

(OPS)

30A (NC)

DPDT RELAY
(OPTIONAL)

(GP)

30A (NO)

(EOS)

30A (NC)

(VM)

30A (NO)

(SU.B)

30A (NC)

(L)

30A (NO)

(HR)

30A (NC)

(H)

30A (NO)

(AUX)

30A (NO)

FLASHER

DPDT RELAY

(9)

1. Machine safety sticker
2. Hopper lift arm safety warning sticker
3. Rotating belt keep away safety sticker
4. Diesel fuel safety sticker
5. Rotating belt keep away safety sticker
6. Battery location warning sticker
7. Parking brake safety sticker
8. Maintenance schedule sticker
9. Electrical fuses/relay location sticker

KNOW YOUR MACHINE - DECALS



(1)



(2)



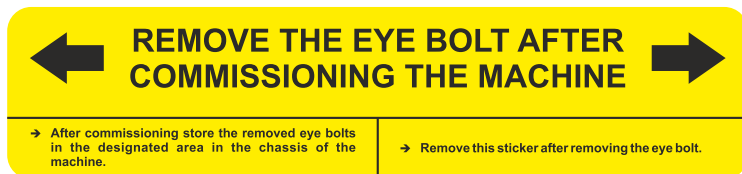
(3)



(4)



(5)



(6)

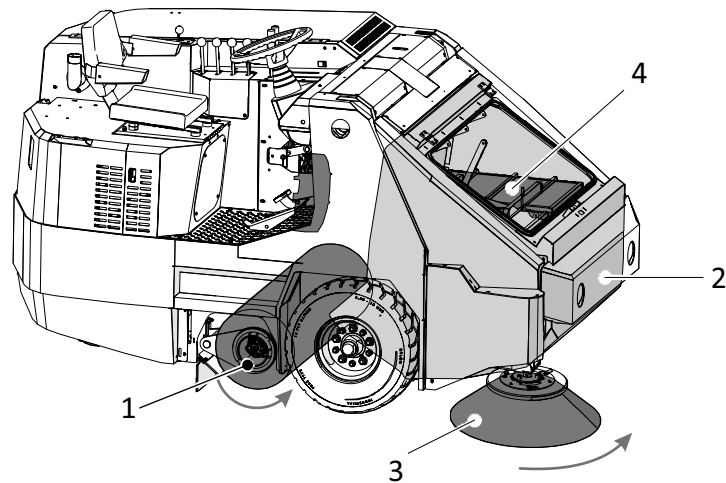
1. Yellow/Black stripe safety sticker
2. Yellow/Black stripe safety sticker
3. Yellow/Black stripe safety sticker
4. Grease point sticker
5. Safety stopper sticker
6. Commissioning instruction sticker



WORKING PRINCIPLE

WORKING PRINCIPLE

Working Principle



Working principle:

- The rotating main broom (1) throws the debris directly into the hopper (2).
- The side broom (3) sweeps the edges and corners and moves the debris to the path of the main broom.
- The fine dust from the swept debris is sucked by a centrifugal fan through a filter (4).

USEFUL TIPS:

- ✓ Never sweep long packing straps, ropes, threads, twines or wires as it could get entangled with the main and side broom and damage its mechanism.
- ✓ Make sure the area to be swept is dry.
- ✓ Position the machine in the direction that the wind blows the dust away from the machine.
- ✓ For optimum cleaning results, match the driving speed with the area to be swept.
- ✓ Switch off suction fan if sweeping in a damp area as it may damage the filter.
- ✓ Clean the dust filter at regular intervals depending on the intensity of the dust.
- ✓ When sweeping on a bad road make sure that the main broom is in float mode.
- ✓ Plan to sweep in long runs with minimal stopping or starting.
- ✓ Allow at least 5 inches of broom path overlap to ensure complete coverage of the area that is being swept.
- ✓ Avoid making sharp turns, bumping into posts or scraping the sides of the machine.





INITIAL SET-UP

OPERATOR RESPONSIBILITY

OPERATOR RESPONSIBILITY

The operator's responsibility is to take care of the machine's daily maintenance and routine checkups to keep the machine in good working condition.

The operator must also inform the supervisor when scheduled maintenance of the machine is to be carried out.

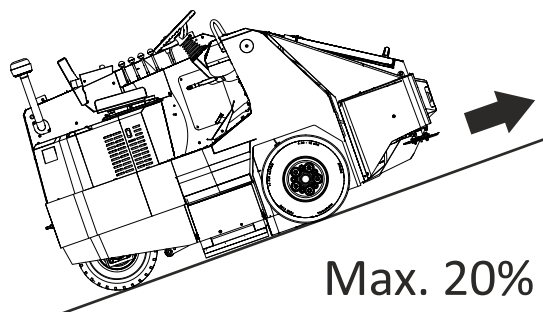
CAUTION



Read this manual completely and understand before operating this machine. Also ensure that the persons who are going to operate this machine have also read and understood the contents of this manual.

*Do not use this machine to collect any hazardous debris.
Do not use this machine as a transport equipment.*

WARNING: *Do not use this machine on surfaces exceeding a maximum of the given value for the gradient or slope.*



ENVIRONMENTAL RESPONSIBILITY



The packaging material can be recycled. Please do not place the packaging into the ordinary refuse for disposal, but arrange for the proper recycling.

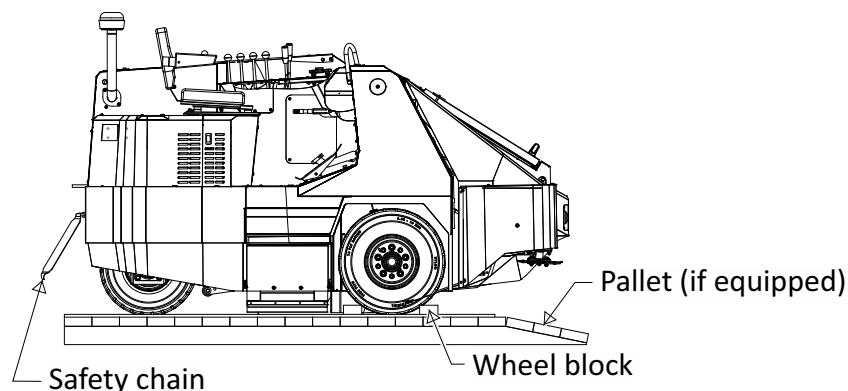


Old machines contain materials that can be recycled. Please arrange for the proper recycling of old machines. Batteries and actuators contain substances that must not enter the environment. Please dispose of your old machines, batteries and actuators using appropriate collection systems.



INITIAL SET-UP

UNLOADING



To unload the machine follow the procedure as follows:

- Position the transport truck near a ramp.
- Remove the protective cover.
- Remove the strap belts and chains that secure the machine.
- Remove the wheel blocks.
- Drive to unload the machine from the pallet (if equipped).

 **CAUTION:** Owner's personnel are not allowed to unpack the machine.

 **WARNING:** The ramp's minimum load bearing capacity should be three tonnes. Risk of damage, Risk of injury.

- Do not use a forklift.
- Observe carefully when loading in a ramp: Ground clearance should be 70 mm.
- Risk/Danger of tipping over if gradient is too high.
- Do not unload the machine on an inclined ramp or platform.
- Do not unload the machine on wet areas.
- Use appropriate tools and safety devices.



Upon Unloading

- Check the machine for any transit damage such as dents, paint damage, scratches, leaks, etc.
- Check coolant level in the radiator.
- Check the engine oil level.
- Check the hydraulic oil level.
- Check the Main and Side Broom for damage.
- Connect the battery leads.
- Remove the eye bolts and store them in the machine for future use, also remove the eye bolt sticker and dispose it off after commissioning the machine.

If the coolant, oil, fuel levels are low top them up with the recommended grades.



WARNING:

- Do not smoke while refueling or topping up fluids.
- Do not refuel or top up near open flames/fire.
- Do not refuel or top up near a hot surface.



WARNING:

- Do not let fuel or oil to leak into the environment.



USE ONLY DIESEL FUEL.
DO NOT ADD ANY ADDITIVES.

- Check the machine's invoice against the machine for the required accessories and serial number.

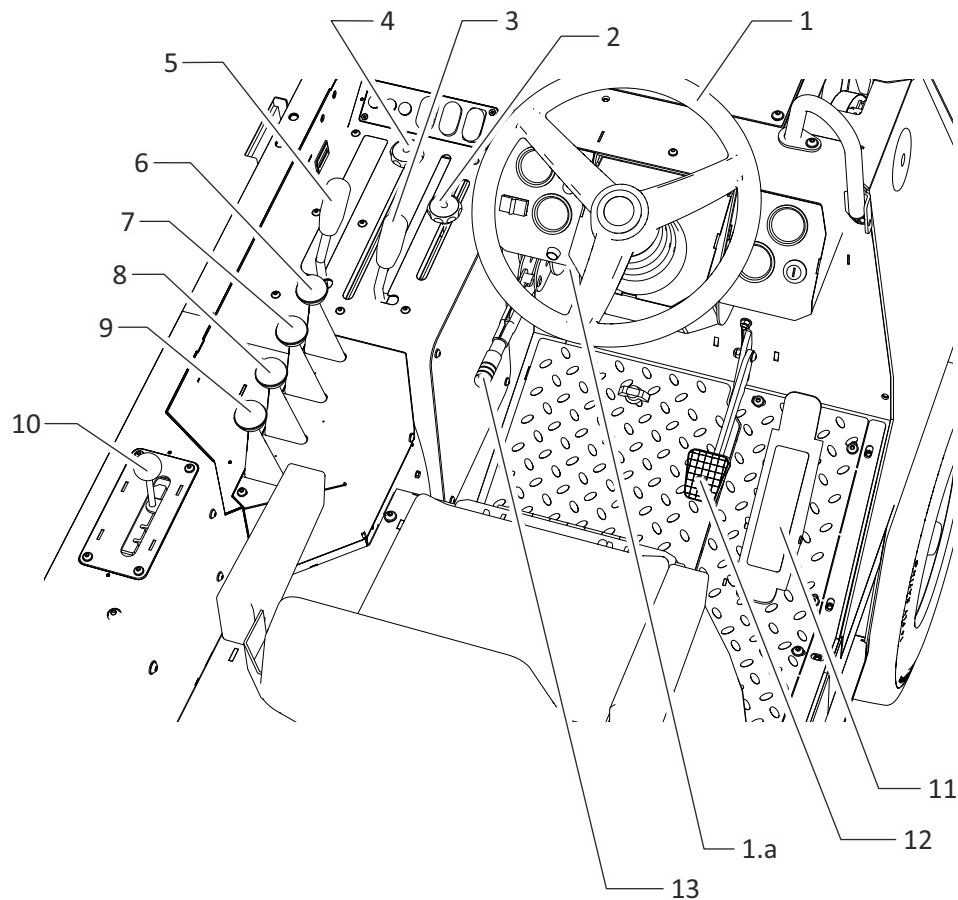




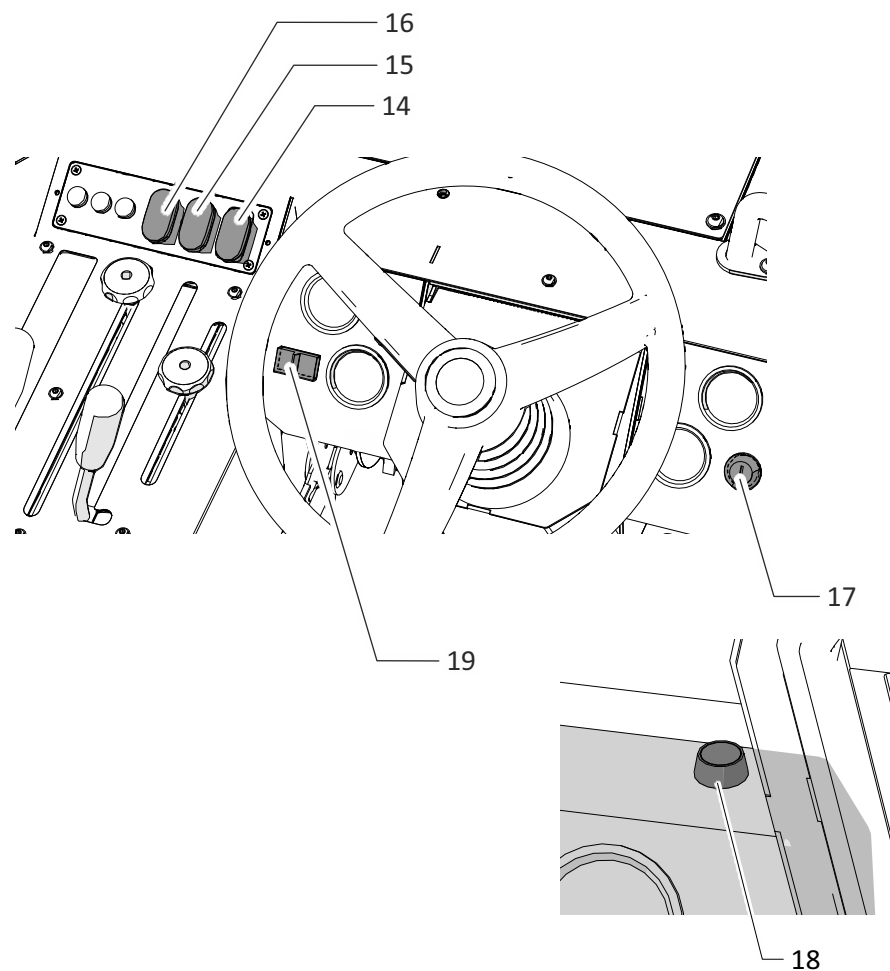
CONTROLS

CONTROLLING AND INDICATING ELEMENTS

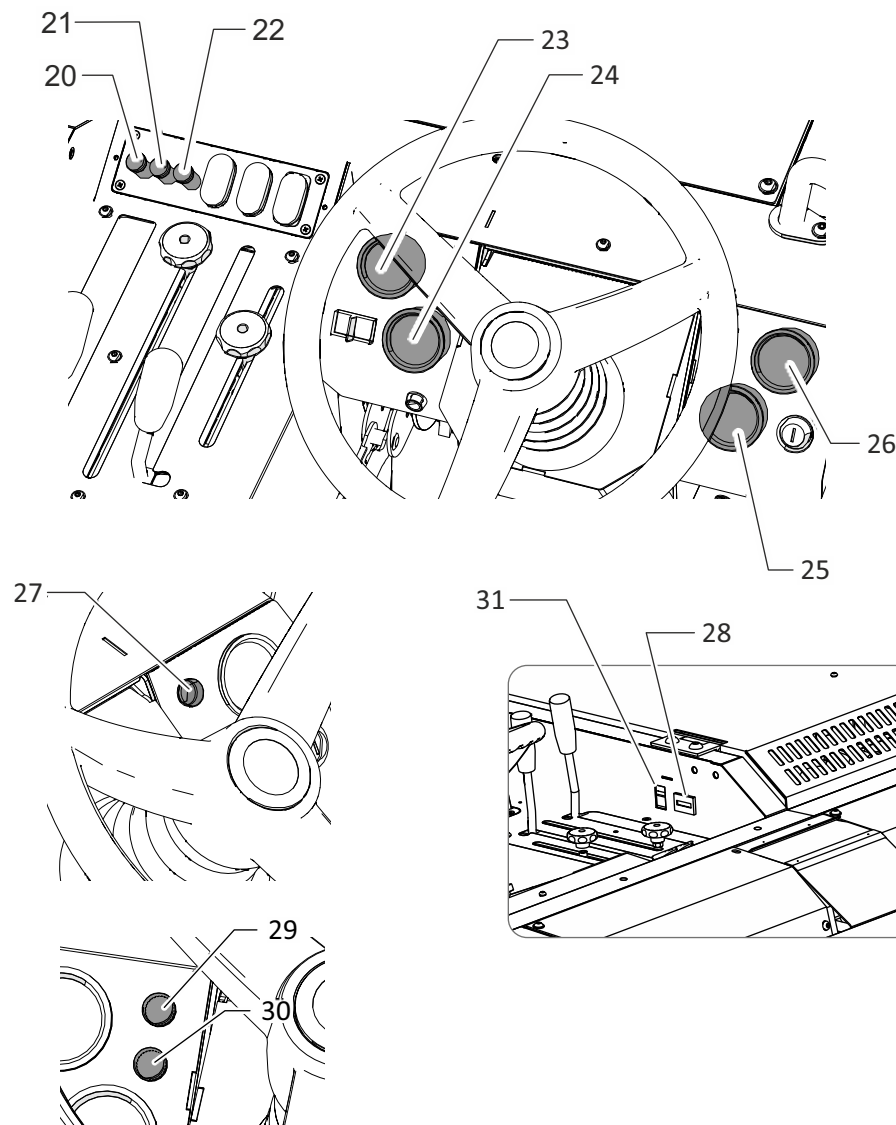
Control Elements



Switches



CONTROLS

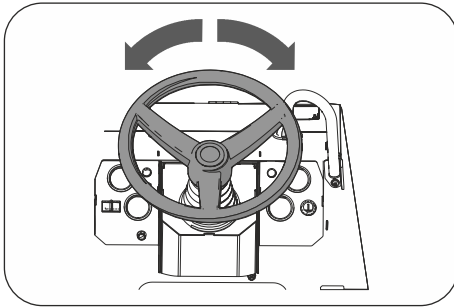


1. Steering wheel
- 1.a. Steering tilt adjustment lever
2. Side broom adjustment knob
3. Side broom raise/lower lever
4. Main broom adjustment knob
5. Main broom raise/lower lever
6. Main & Side broom on/off lever
7. Hopper door open/close lever
8. Debris Compact System (DCS) activate lever
9. Hopper raise/lower lever
10. Throttle adjustment lever
11. Direction control pedal
12. Brake pedal
13. Parking brake lever
14. Vacuum By-Pass/Filter vibrator on/off switch
15. Headlamp switch
16. Warning beacon lamp on/off switch (if equipped)
17. Ignition key switch for engine
18. Horn switch
19. Turn signal indicator switch
20. Fire in hopper indicating lamp (if equipped)
21. Filter clog indicating lamp (if equipped)
22. Parking brake engaged indicating lamp (if equipped)
23. Coolant temperature indicating gauge
24. Engine oil pressure indicating gauge
25. Fuel level indicating gauge
26. Battery charge indicating gauge
27. Additional alternator for air conditioner system indicator lamp (if equipped)
28. Hour meter
29. Glow plug indicating lamp
30. Hydraulic oil filter clog indicating lamp
31. LH side brush actuator switch (if equipped)

CONTROLS

CONTROLLING AND INDICATING ELEMENTS

1. Steering Wheel:

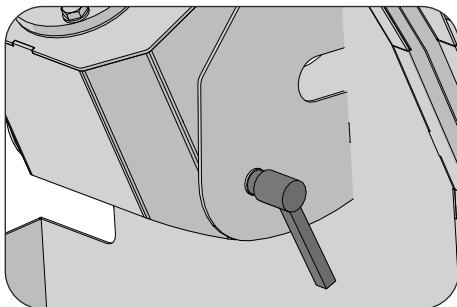


The steering wheel controls the machine's direction. The machine is very responsive to the steering wheel movements. The *ROOTS* logo on the steering wheel indicates whether the rear steerable wheel is straight or not.

LEFT - Turn the steering wheel to the left.

RIGHT - Turn the steering wheel to the right.

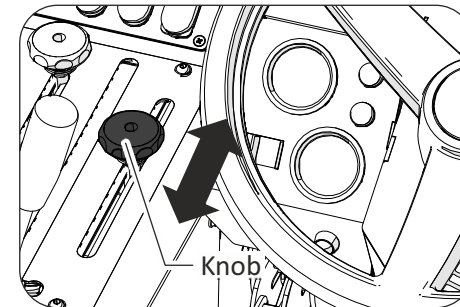
1.a. Steering Wheel Adjustment Lever:



The steering wheel tilt lever controls the angle of the steering wheel.

To adjust: Rotate the lever towards the operator, adjust the angle and push the lever back to secure.

2. Side Broom Adjustment Knob:



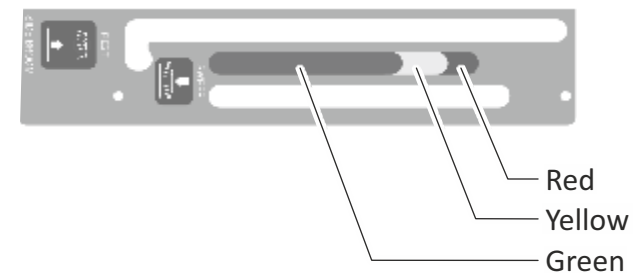
Rotate the knob counter-clockwise to release the mechanism, move the knob to the desired position, rotate clockwise to secure the position.

The purpose of this knob is to adjust the brush pressure to achieve the required cleaning intensity and also to compensate for the brush wear.

GREEN - Optimum broom available

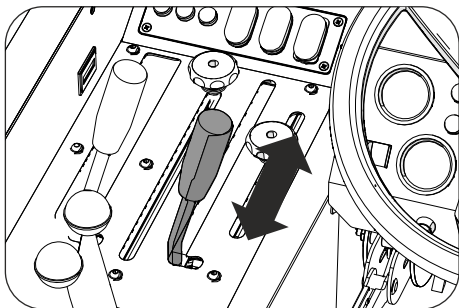
YELLOW - Broom nearing end of its life cycle

RED - Broom completely worn out - replace with new recommended spare broom.



CONTROLS

3. Side Broom Raise/Lower Lever:



The side broom can be stowed and deployed via a lever on the operator's console.

Lever position forward - To deploy (lower) the side broom, used during sweeping on curbs or edges.

SWEEP

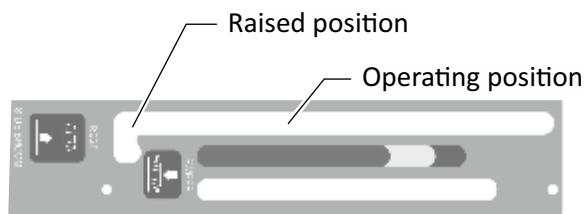


Lever position backward - To store (raise) the side broom when not in use.

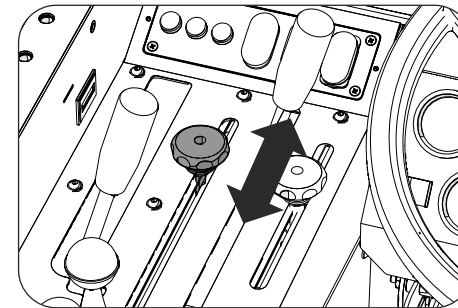
REST



SIDE BROOM



4. Main Broom Adjustment Knob:



Rotate the knob counter-clockwise to release the mechanism, move the knob to the desired position, rotate clockwise to secure the position.

The purpose of this knob is to adjust the brush pressure to achieve the required cleaning intensity and also to compensate for the brush wear.

GREEN - Optimum broom available

YELLOW - Broom nearing end of its life cycle

RED - Broom completely worn out - replace with new recommended spare broom.

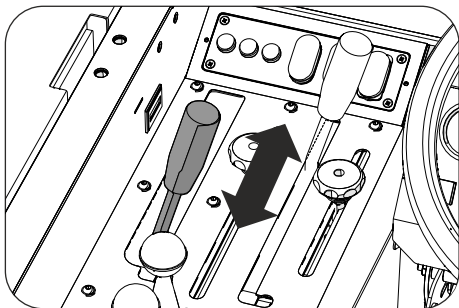


Red
Yellow
Green



CONTROLS

5. Main Broom Raise/Lower Lever:



The main broom can be stowed and deployed via a lever on the operator's console.

Lever position forward - To deploy (lower) the main broom push the lever.

SWEEP



Lever position backward - To store (raise) the main broom pull the lever.

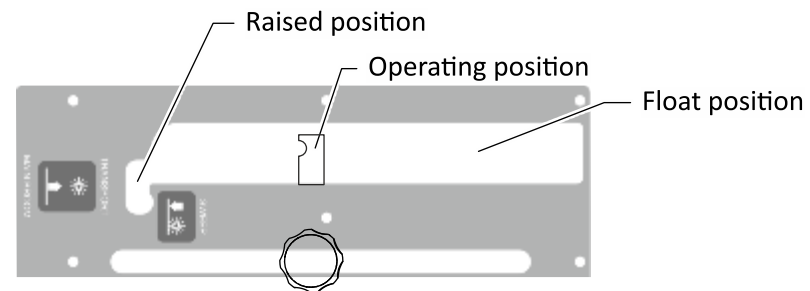
TRANSPORT



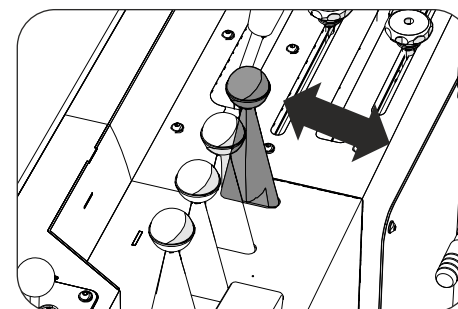
MAIN BROOM

Float position - In this position the main broom floats above the sweeping surface to sweep over the uneven surfaces.

Note: Do not use this mode for a longer period of time as the brush wears out in a faster rate.



6. Main Broom & Side Broom On/Off Lever:



The main broom and side broom On/Off are controlled via a lever on the operator console.

Lever position leftward - Both main and side brooms will rotate.



Lever position rightward - Only main broom will rotate. Side broom will be deactivated.

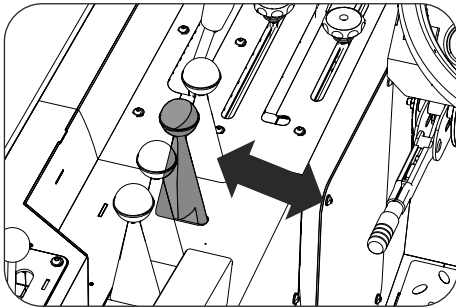


MB-ON & SB-OFF



CONTROLS

7. Hopper Door Open/Close Lever:



The hopper door open/close are controlled via a lever on the operator console.

Lever position leftward - Hopper door open.



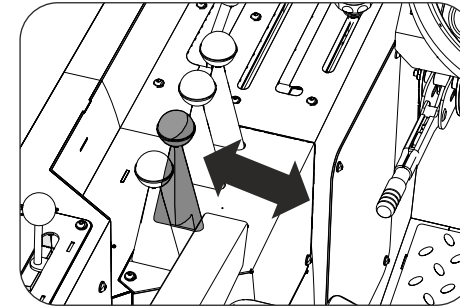
Lever position rightward - Hopper door closed.



DOOR

Note: Hopper door automatically opens during sweeping operation. Activating main broom opens the door and switching it off closes the door automatically.

8. Debris Compact System (DCS) Lever:



The debris compact system functions are controlled via a lever on the operator console. This DCS move the debris lying near the entrance of the door to the inner end of the hopper.

Lever position leftward - DCS compact mode.



Lever position rightward - DCS Off (Return to sweep mode).

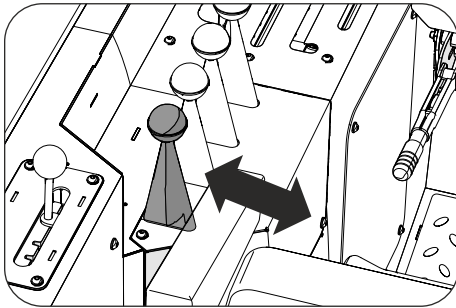


COMPACT



CONTROLS

9. Hopper Raise/Lower Lever:



The hopper raising and lowering are controlled via a lever on the operator console.

Lever position leftward - Hopper lowers.

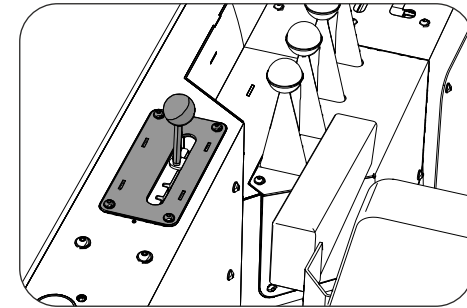


Lever position rightward - Hopper raises.



RAISE

10. Throttle Lever:



The engine speed can be controlled via a throttle lever assembly located in the operator's console. The lever is notched to set the required engine speed during the machine's operation.

The lever positions are as follows:



Used for engine/machine idle condition.



Used for normal driving and sweeping requirements.

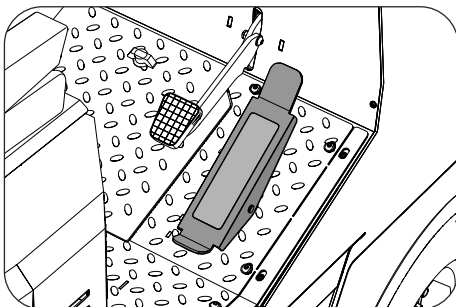


Used for driving on gradients or to sweep at a faster rate.

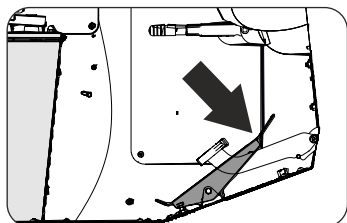


CONTROLS

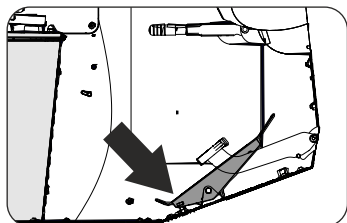
11. Direction Control Pedal:



The directional pedal controls direction of travel and the propelling speed of the machine. You change the speed of the machine with the pressure of your foot; the harder you press the faster the machine travels.

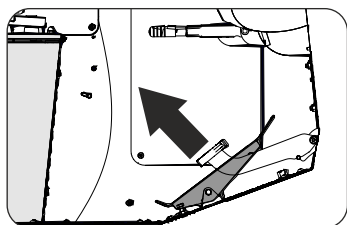


Forward: Gently press the top of the directional pedal with the toe of your foot.



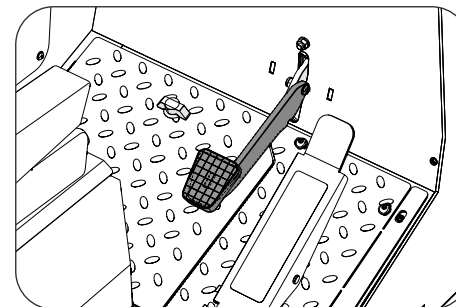
Reverse: Press the bottom of the directional pedal with the heel of your foot.

Note: It is normal by design to see the machine achieve lower speed during reversing than forward.

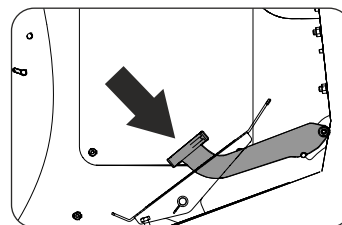


Neutral: Take your foot off the directional pedal and it will return to the neutral position.

12. Brake Pedal:



The brake pedal is used to slow or stop the machine. The brakes are located at the front wheels of the machine.



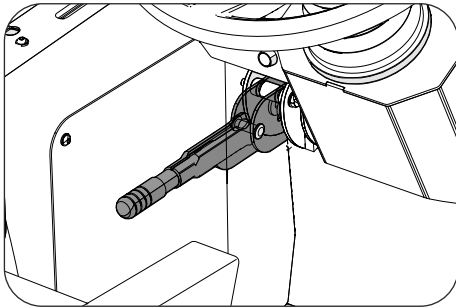
To Stop: Take your foot off the directional control pedal and let it return to the neutral position. Step on the brake pedal.

Note: For normal slowing down of the machine or coming to a stop gently, there is no need to use the brake pedal. Only in case of emergency or during climbing up or down a gradient (ramps, etc.) pressing the brake pedal may be required.

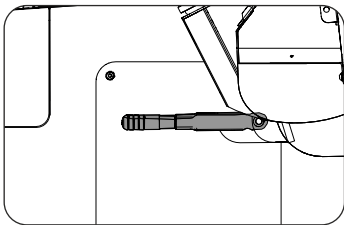


CONTROLS

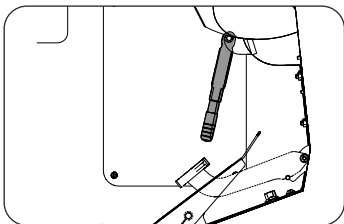
13. Parking Brake Lever:



The parking brake is used to hold the vehicle stationary when being parked after use. The parking brake lever is located below the steering column towards the left hand side.



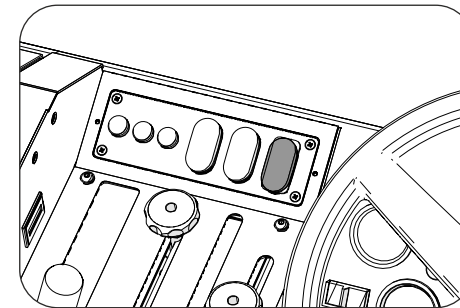
To Set: Pull the parking brake lever up.



To Release: Push the parking brake lever down.

Note: Parking brake is intended for use only after the machine has come to a complete stop. Do not use it on a moving machine unless it is an emergency.

14. Vacuum By-Pass/Filter Vibrator Switch:



The vacuum by-pass switch is used to activate the by-pass feature of the sweep mechanism to prevent any fluids entering the filters, which may cause damage.

The filter shaker switch is used to activate the vibrator motors to shake off fine dust which are held within the filter, this feature improves the filtration capacity of the filters. Shutting the vacuum by-pass during shaking improves the cleaning effectiveness.

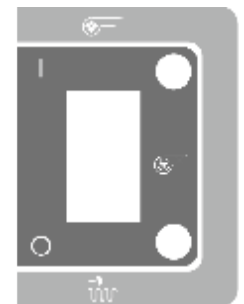
Switch position up: Vacuum by-pass On



Switch position neutral: Vacuum by-pass Off

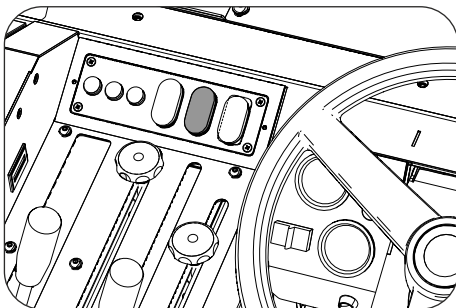


Switch position down: Filter shaker On



CONTROLS

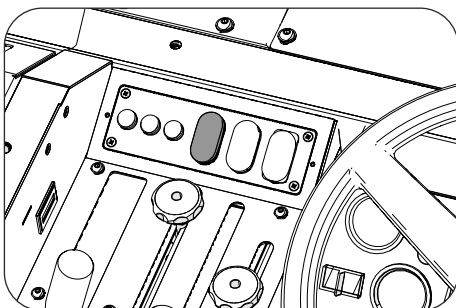
15. Headlamp Switch:



The headlamp switch is used to activate the headlamps and the taillamps of the machine.



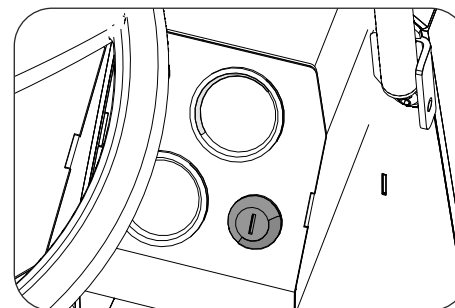
16. Warning Beacon Lamp Switch (if equipped):



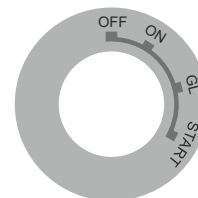
The warning beacon lamp switch is used to activate the warning beacon lamps (if equipped) which are used to warn others that the machine is in operation.



17. Ignition Key Switch for Engine Start/Stop:



The ignition key switch starts and stops the machine's engine. It is located at the right hand side of the steering wheel in the operator's console.



OFF - Engine & Electrical's are in Off condition.

ON - Electrical systems are powered up.

PRE-HEAT (GL) - Engine pre-heating begins.

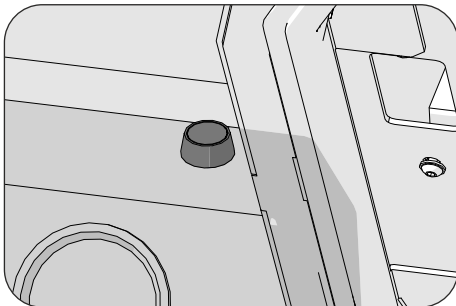
START - Engine starts. Release the key as soon as the engine starts.

Preheat (GL): Turn the key clockwise. The glow plug light will come on. Hold the key in this position for 15 to 30 seconds (till the light goes off), depending on weather conditions. Colder weather requires longer time.



CONTROLS

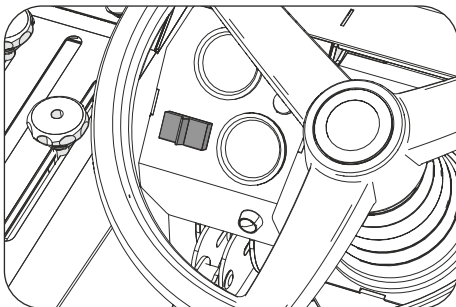
18. Horn Switch:



The horn switch is used to activate the horn. Push the switch to honk once.



19. Turn Signal Indicator Switch (if equipped):



The turn signal indicator switch is used to activate the indicator lamps located at the front and rear of the machine while turning to left or right. The blinking is indicated in the switch itself.

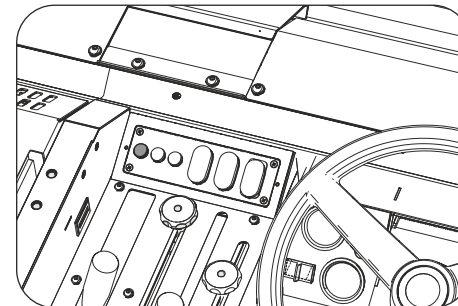


Left: Slide the switch to the left.

Right: Slide the switch to the right.

Note: There is no self cancellation feature and the operator has to switch off the indicator manually.

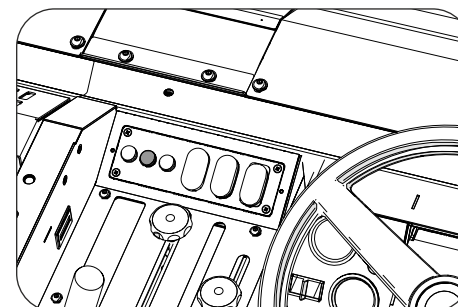
20. Fire In Hopper Indicator Lamp (if equipped):



The fire in hopper lamp glows when a fire is present inside the hopper.

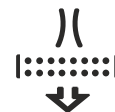


21. Filter Clog Indicator Lamp (if equipped):



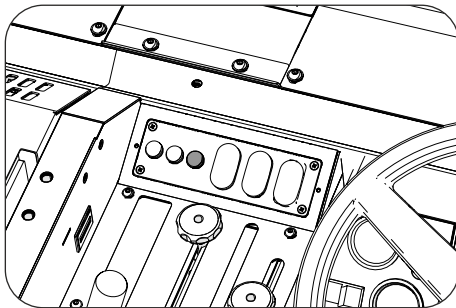
The filter clog lamp glows when the filters are clogged with dust.

Note: Activate the filter vibrator to clear off the dust.



CONTROLS

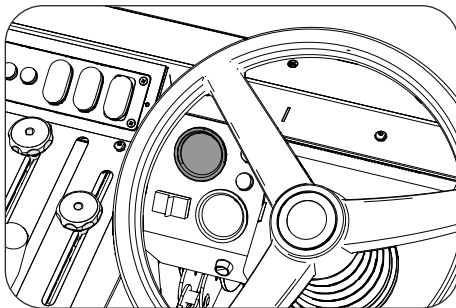
22. Parking Brake Indicator Lamp (if equipped):



The parking brake lamp glows when the parking brake is engaged to park the machine.



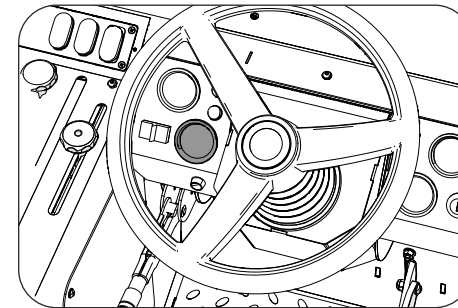
23. Engine Coolant Temperature Gauge:



The gauge shows the temperature value of the coolant. The engine will automatically shut down if the coolant temperature is more than the permitted value. Check the problem and have it corrected immediately.



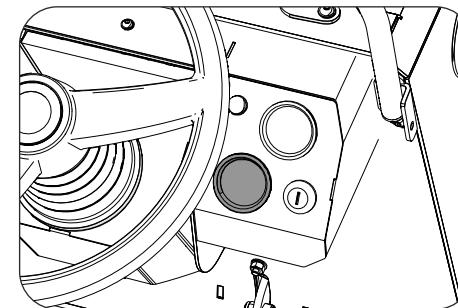
24. Engine Oil Pressure Gauge:



The engine oil pressure gauge is used to inform the operator that the engine oil pressure is higher/lower than the required operating parameter. The engine will automatically shut down if the oil pressure is lower than the permitted value. Check for the cause and correct it.



25. Fuel Gauge:



The fuel level gauge indicates how much fuel is in the tank. As the fuel tank empties, the needle moves towards the red zone of the gauge. The fuel tank is empty when the needle points at the RED marker.

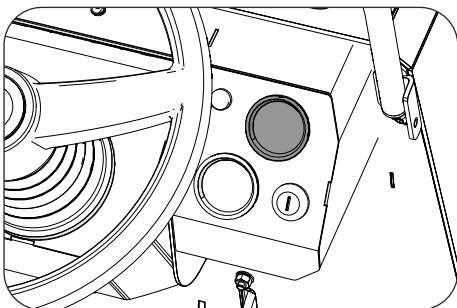


CONTROLS



WARNING: Do not let the fuel tank empty completely. Air can enter the fuel system. The fuel system will need bleeding before the next engine start.

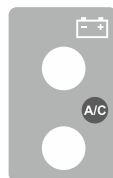
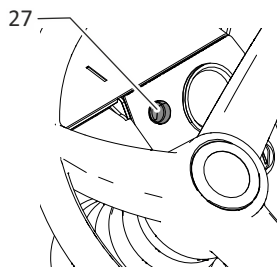
26. Battery Charging Gauge:



The ampere gauge shows the performance of the alternator. The needle will indicate -30 if the alternator is not generating enough power and the needle will indicate +30 if any of the on-board electrical equipment is drawing power.

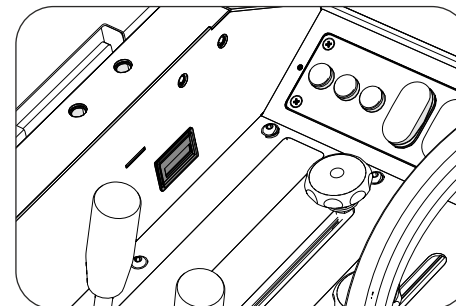


27. Additional alternator for air conditioner system indicator lamp (if equipped):



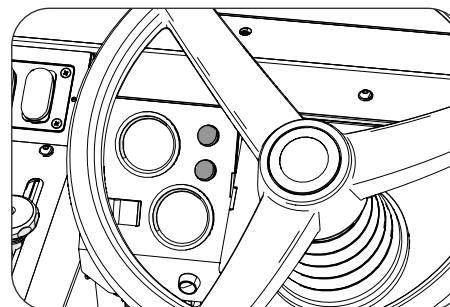
The Battery charge indicating lamp is located on the dashboard, it glows green when the engine is starting.

28. Hourmeter:



The hourmeter records the number of hours the machine has been operated. Use this information to determine machine maintenance intervals.

29,30. Glow Plug & Filter Clog Indicator Lamp:

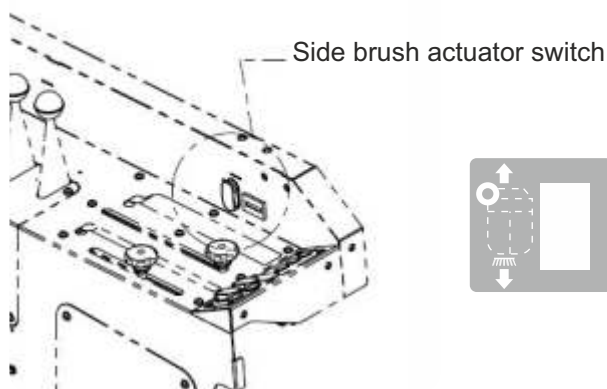


The engine pre-heating lamp is located on the dashboard, it glows green when the engine is pre-heating. Also a filter clog indicator lamp is located in the same console to tell the operator that the hydraulic oil return line filter is clogged.



CONTROLS

31. LH side brush actuator switch (*If equipped*)

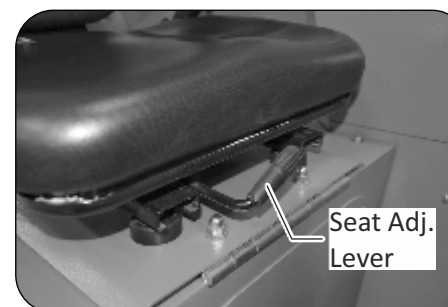


The switch is located on the dashboard near by hour meter , it is used to raise/lower the left hand side broom.

Operator Seat:



The operator seat can be adjusted forward or backward to suite the user's height. It has two foldable armrests and a seat belt (*if equipped*).



Pull the lever to slide the seat in forward or backward direction.

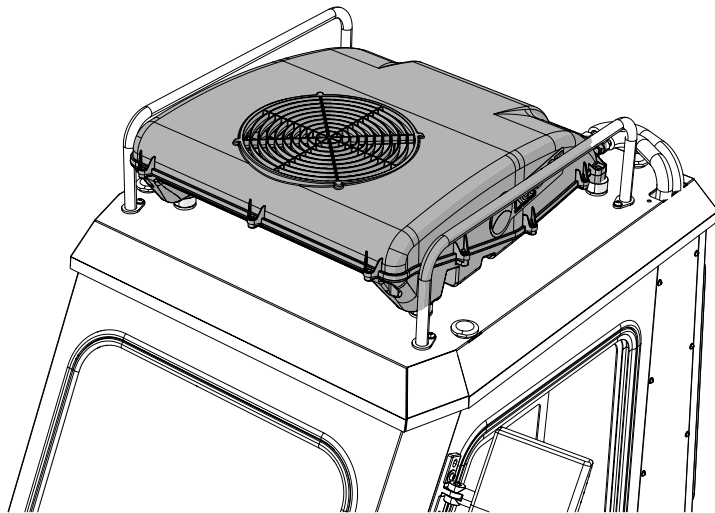


WARNING: Do not adjust the seat while the machine is in motion.



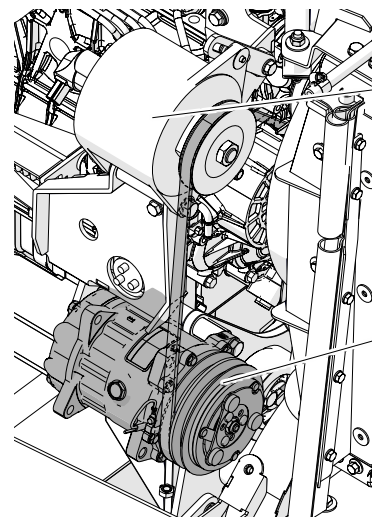
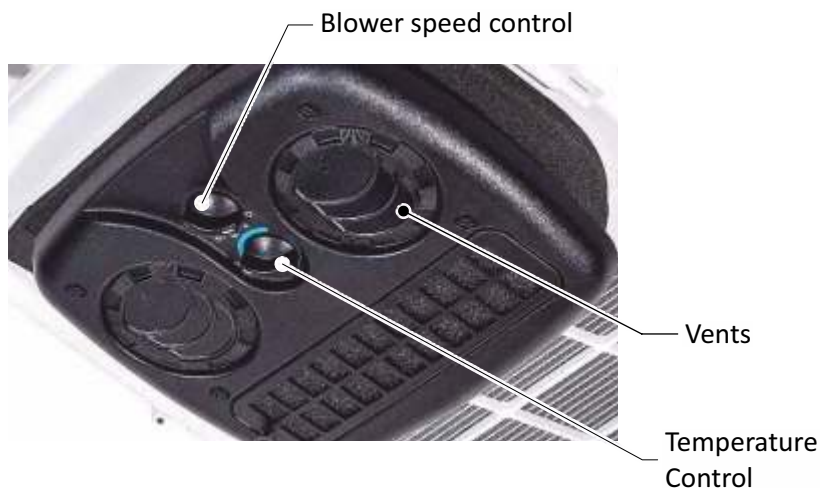
CONTROLS

Air Conditioning System (if equipped)



The air conditioning system (if equipped) is used to keep the operator comfortable in hot climate.

The vents and controls are located in the roof inside the operator's cabin.



Additional alternator
for air conditioner unit.

Air conditioner compressor

Air conditioning system controls:



Fan Off



Fan Low Speed



Fan Medium Speed



Fan High Speed



WARNING

- ➔ Switch off the blower fan and compressor before stopping the engine.
- ➔ Do not use the air conditioning system when the machine is in idle engine speed.



Temperature Control Knob:

Rotate clockwise to switch On and to increase temperature.

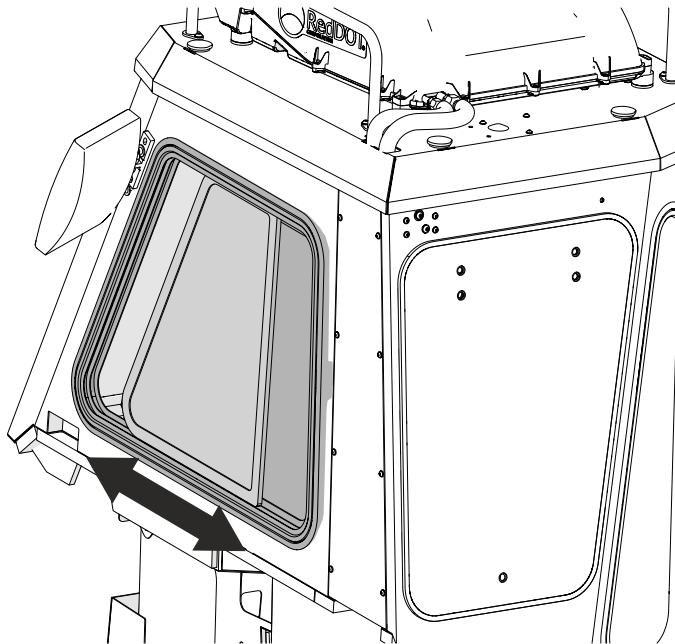
Rotate anti-clockwise to switch Off and to decrease temperature.



CONTROLS

Cabin Features

Sliding Window



The cabin features a sliding window to add convenience to the operator. To open the window release the lock and slide the window sector backwards. To close the window sector, push the window forward till it locks.

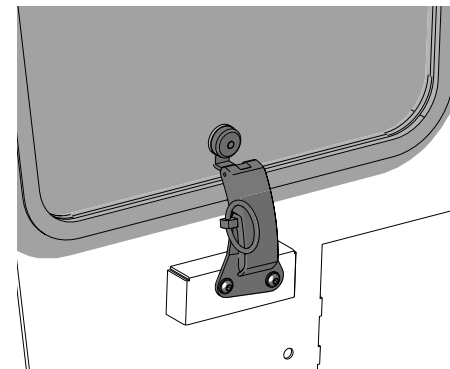
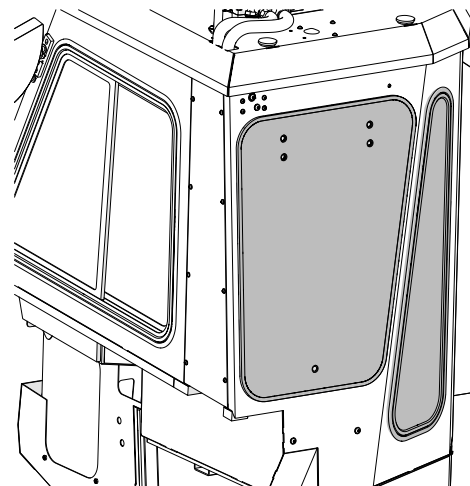
The adjust the rear view mirror open the sliding window.

Note: Keep the sliding window closed when the air conditioning system is running.



**Do not open the window and let people sit while operating the machine.
Risk of injury.**

Rear Emergency Exit & Rear Window



The cabin features a Emergency Exit Window located at the rear of the cabin. During normal operation of the machine this window is kept closed and is secured by a safety toggle lock.

In case of an emergency pull the toggle lock upwards, remove the retaining linch pin and push the window outwards.

Note: Check the toggle lock for functionality during maintenance intervals. If damaged replace the lock unit.

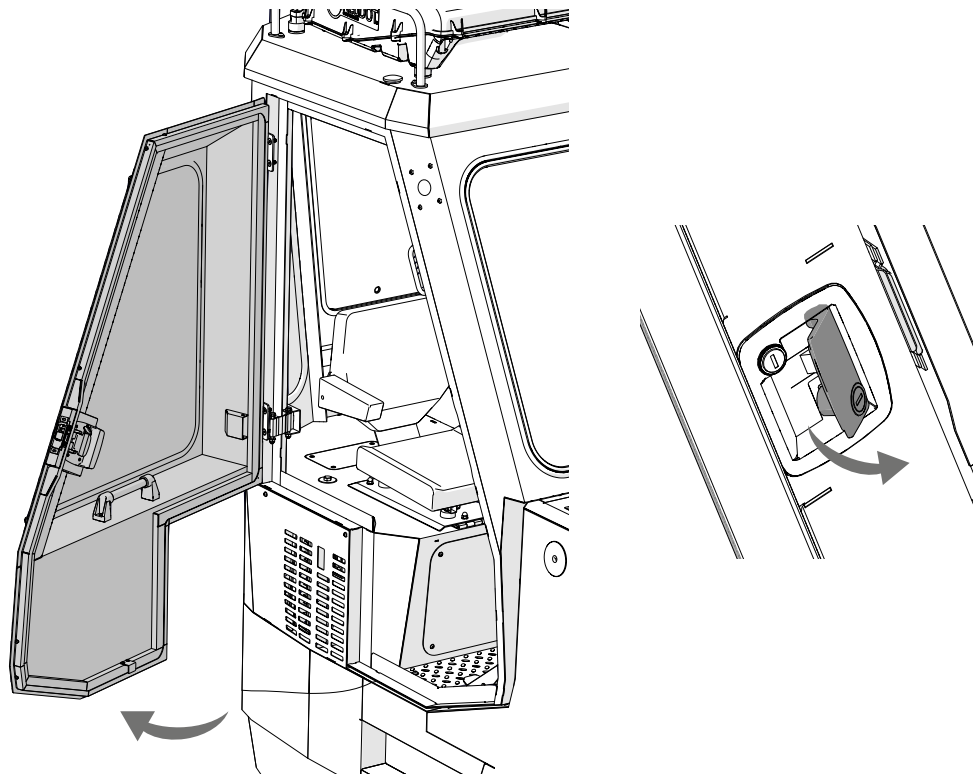


Do not play with the toggle lock unit.



CONTROLS

Main Cabin Door

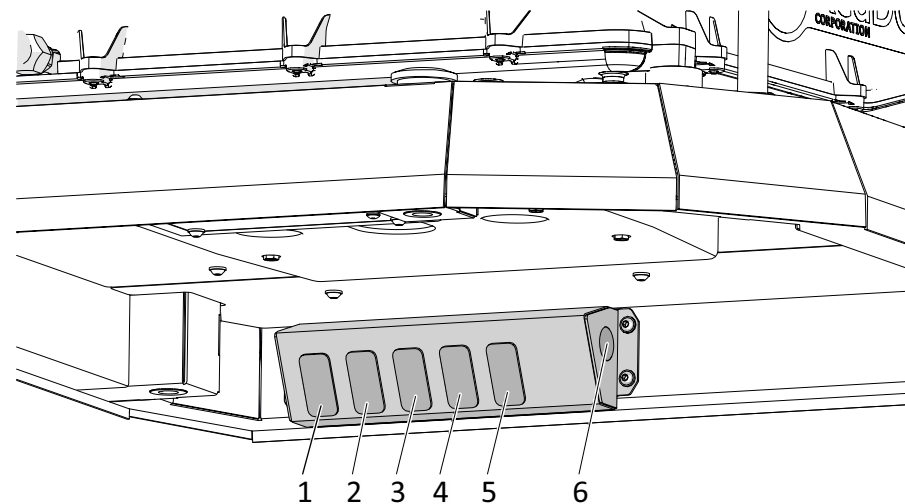


The main cabin door opens outwards. It has a lock mechanism to secure the door when the machine is in operation. It has a bubble glass to help the operator look at the sides during sweeping.

The door can be locked when the machine is not in use.

Note: Keep the door closed during sweeping, to prevent dust & debris entry into the cabin.

Cabin Overhead Switches (if equipped)



The overhead panel houses the switches for the ventilator fan and auxiliary work lamps. The control panel is also equipped with a 12V power socket.

Note:

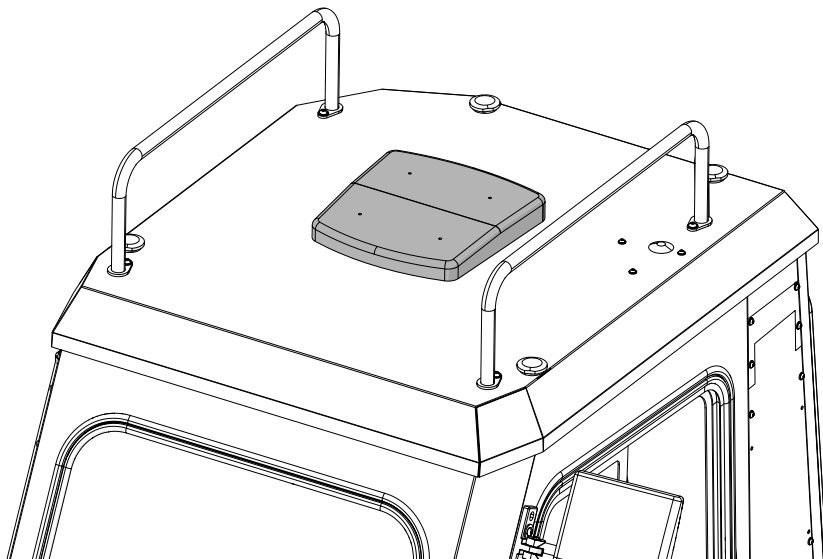
Keep the switches on Off position when not in use.

Do not use the power socket to connect high power electrical equipments.

- 1 - Ventilation fan switch
- 2 - Cabin fan switch
- 3. Work lamp rear switch
- 4. Work lamp front switch
- 5. Dummy
- 6. Power socket with cap

CONTROLS

Ventilator Fan (if equipped)



The roof mounted ventilator fan is used to circulate fresh air into the cabin. When using the fan always ensure that the sliding window and rear windows are open.





MACHINE OPERATION

MACHINE OPERATION



Machine Operation:

It is the operator's responsibility to be knowledgeable of all potential operating hazards and to take every reasonable precaution to ensure safety of oneself, others, animals, and property.

This section of the Operator's Manual is designed to familiarize, instruct, and educate safe and proper machine use to the operator. The operator must be familiar with the machine operation and all associated safety practices before operating.

Proper operation of the machine, as detailed in this manual, will help ensure years of safe and satisfactory use of the machine. **READ, UNDERSTAND, and FOLLOW** the safety messages. Serious injury or death may occur unless care is taken to follow the warnings and instructions stated in the safety messages. Always use good common sense to avoid hazards.



WARNING

Do not operate a damaged or malfunctioning machine. Risk of equipment failure or cause of injury or death or damage to property.

Operator Requirements:

Only qualified people are allowed to operate the machine. A qualified operator has to read and understand the owner's manual and should comply with its procedures. If any part of the operation and safe use of this equipment is not completely understood, consult an authorized dealer for a complete explanation.

If the operator cannot read the manuals for himself or does not completely understand the operation of the equipment, it is the responsibility of the supervisor to read and explain the manuals, safety practices, and operating instructions to the operator.

Employer Responsibilities:

- Train the employee to operate the machine in a safe way.
- Permit only qualified personnel to operate and service the machine.
- Instruct all operators to maintain the shields and guards in its proper working condition at all times.
- Ensure that the operators use approved Personal Protective Equipment at all times or whenever required.
- Forbid the operators to carry additional people on the truck or the machine.
- Ensure that nobody including the operator modifies or alters the machine or any of its function, doing so may cause fatal injury or death or it may damage the machine itself.
- Ensure that children do not operate the machine.

Before Starting The Machine:

Before operating the machine, ensure that the equipment is working properly and that you are prepared for sweeping operations by checking the Pre-operative checklist and testing the machine functions.

MACHINE OPERATION

Pre-Operative Checklist:

For the machine:

- ✓ Check the engine oil level.
- ✓ Check the engine coolant level.
- ✓ Check the radiator and oil cooler fins for debris.
- ✓ Check the hydraulic oil level.
- ✓ Check the air filter indicator.
- ✓ Check the seals and skirts for wear and damage.
- ✓ Check the condition of the main/side brooms. Remove any straps, bands, ropes or other debris wrapped around them.
- ✓ Check the sweeping pattern.
- ✓ Check the hopper dust filter for blocks or damage.
- ✓ Check the hopper seals and gaskets for wear and damage.
- ✓ Check the brakes and steering for proper operation.
- ✓ Check the fuel level.
- ✓ Check if the debris hopper is empty.
- ✓ Check the air pressure if equipped with pneumatic tires.
- ✓ Check for proper function of all electrical systems.
- ✓ Check the brake oil level.
- ✓ Check the tension of the belts.

Worksite:

- Visually inspect the worksite before starting sweeping operation.
- Ensure that the operator is aware of the type of material to be collected.
- Ensure that there are no flammable materials in the vicinity of the machine during the sweeping operation.

Start-Up Test:

By identifying any problems before traveling to the worksite, you'll save unnecessary travel time and will be able to make repairs more easily with the proper tools.



WARNING

Never operate the machine in a closed building or without adequate ventilation. The exhaust fumes can be hazardous to your health.

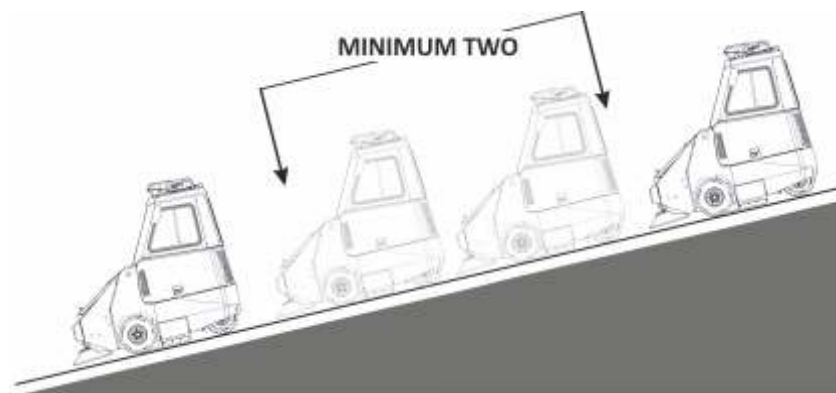
Driving in/around worksite:

Always follow the rules and regulations of the worksite while driving the machine.

While traveling the worksite road, always maintain a safe speed for the haul road conditions and grades. Never allow the machine to coast.

Pay attention to worksite road conditions to avoid rocks, holes, or other obstacles. Such obstacles not only present hazards to safe operation, but can needlessly damage tyres if not avoided.

Always maintain a safe distance behind the machine ahead, particularly on downgrades. A good rule-of-thumb to follow is to allow two (2) machine-lengths between machines for each 10 km/h of travel speed under normal operating conditions. Under adverse conditions, allow more room for safe operation. Such regulations would be established for the safety of everyone on the job.



MACHINE OPERATION

When approaching downgrades, select the proper speed and use the brakes as required to maintain safe descent speed without over-speeding the engine or gaining excess travel speed.

STARTING THE MACHINE

Before starting the machine:



If applicable use the above safety devices:

1. Safety Eyewear
2. Safety Helmet
3. Earmuff
4. Safety Reflecting Jacket/Overalls
5. Safety Shoes
6. Safety Gloves
7. Dust Mask



WARNING:

- ✖ Do not smoke while refueling or topping up fluids.
- ✖ Do not refuel or top up near open flames/fire.
- ✖ Do not refuel or top up near a hot surface.



WARNING:

Do not let fuel or oil to leak into the environment. Risk of contamination!

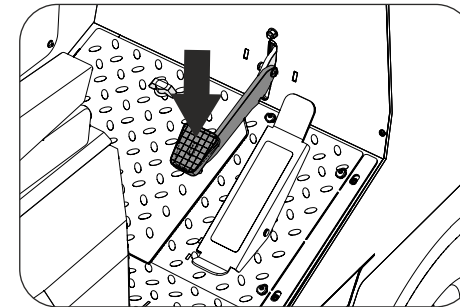


Avoid static electricity when fueling. Avoid death or serious injury from fire or explosion.

DRIVING THE MACHINE

Starting:

1. Sit in operator seat, adjust seat position (if required) ensure parking brake is applied, check if the direction control pedal is in neutral position.

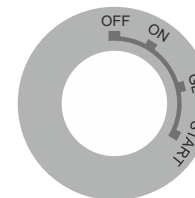


2. Throttle should be in *idle* position.



Idle engine speed

3. Turn the ignition key to GL position to initiate engine pre-heating, wait till the glow plug lamp goes off, then continue starting the engine.



NOTE: If the engine does not start after 10 seconds, release key, wait for 1 minute and repeat the procedure again.

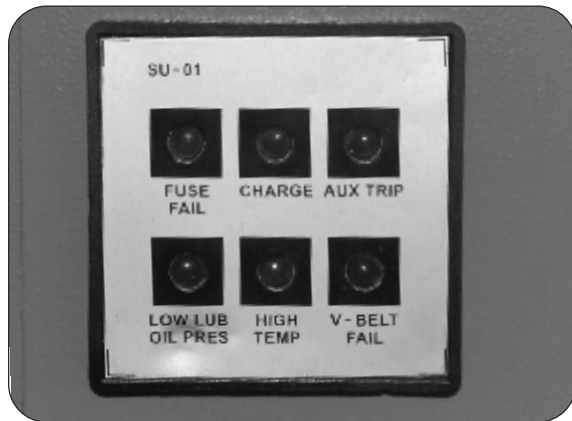


WARNING: This machine emits toxic gases. Severe respiratory damage can be caused. Provide sufficient ventilation.



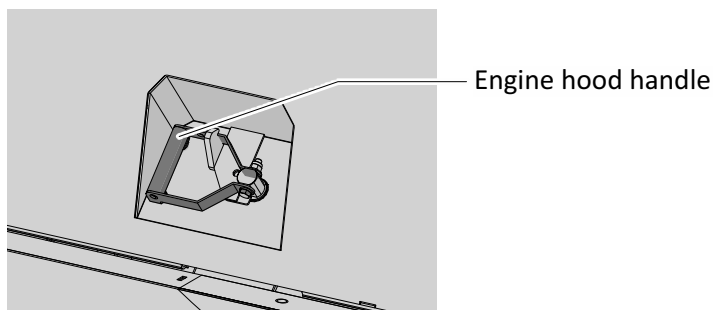
MACHINE OPERATION

ECU Panel



NOTE: If engine does not start in the first crank, do not continue cranking, open hood and check for any indication on the ECU panel. Switch off key and try again. If the problem persists contact an authorized service center.

Release the below mentioned engine hood handle to open the engine hood.



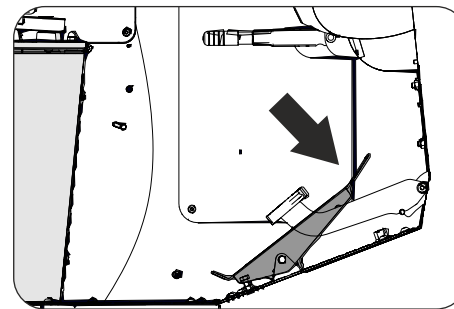
4. Throttle should be in *normal sweep* position.



Medium engine speed

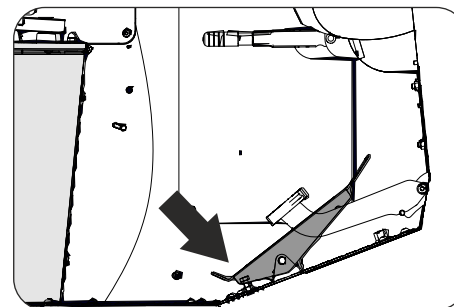
Driving:

5. Press the directional control pedal forward to propel the machine in the forward direction.



CAUTION: Ensure that the parking brake is disengaged before driving the machine.

6. Press the directional control pedal backward to propel the machine in the reverse direction.



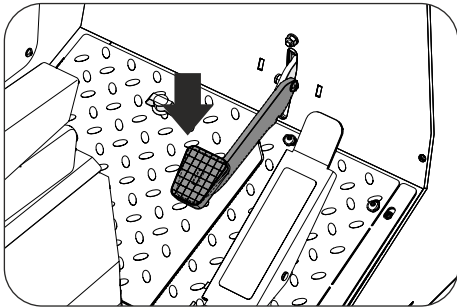
7. The speed of the machine varies with the pressure in which the directional control pedal is pressed.

MACHINE OPERATION

Slowing & Stopping:

8. When the foot is taken off the pedal the machine will slow down and will coast to a stop.

To stop or slow the machine quickly press the brake pedal downwards and release when stopped.



WARNING: Do not press the brake pedal simultaneously while the directional control pedal is operated. It will cause damage to the hydrostatic drive system.

Driving On Inclined Surfaces:

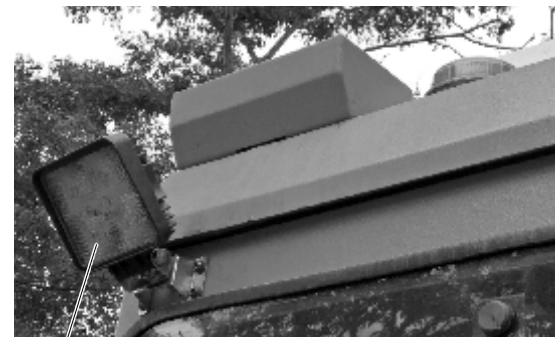
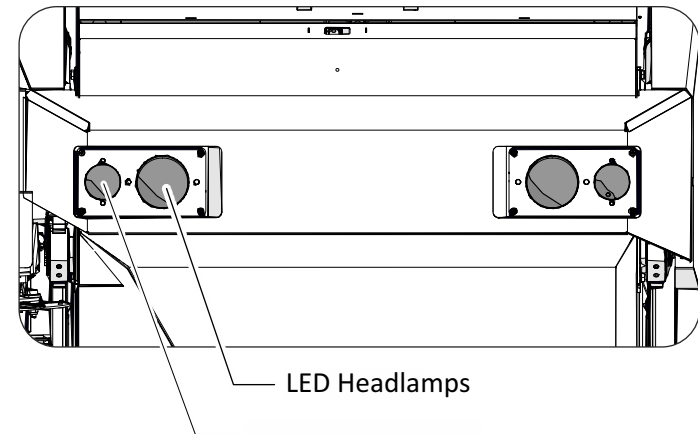
- ☞ Drive slowly on downhill/uphill, on turns, wet grounds, ramps.
- ☞ Do not make sharp turns: machine might tip over.
- ☞ Do not adjust the driver seat while driving the machine.
- ☞ Do not drive with the hopper in raised position.
- ☞ Do not park the machine in slopes.
- ☞ Do not jack the machine in slopes.
- ☞ Do not go on a steep downhill with a filled hopper.

CAUTION: Exercise caution for oncoming vehicles and other equipments and stationary objects, people or animals.

Driving With Headlamps & Optional Work Lamps:

9. Use the headlamps to provide illumination in dark or low lit areas. Use the directional indicators while turning the machine in transport mode.

- Optional work lamps provide extra illumination on the corners/rear of the machine, they work in conjunction with the headlamps.



Rear work lamp



Front work lamp

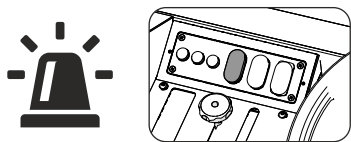


MACHINE OPERATION

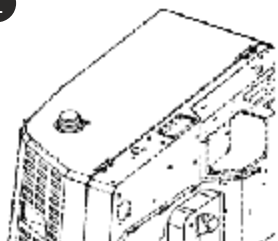


NOTE: Switch Off the headlamps and work lamps when not in use. Risk of battery drain.

10. Always use the rotating warning beacon lamps (if equipped) when driving/operating the machine to warn others in the vicinity of the machine.



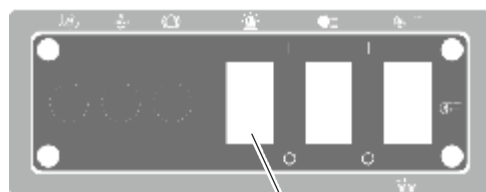
1



2



1. Beacon lamp placement without OHG.
2. Beacon lamp placement with OHG.



Beacon lamp switch

Push the switch downwards to switch on the beacon lamp.

MACHINE OPERATION

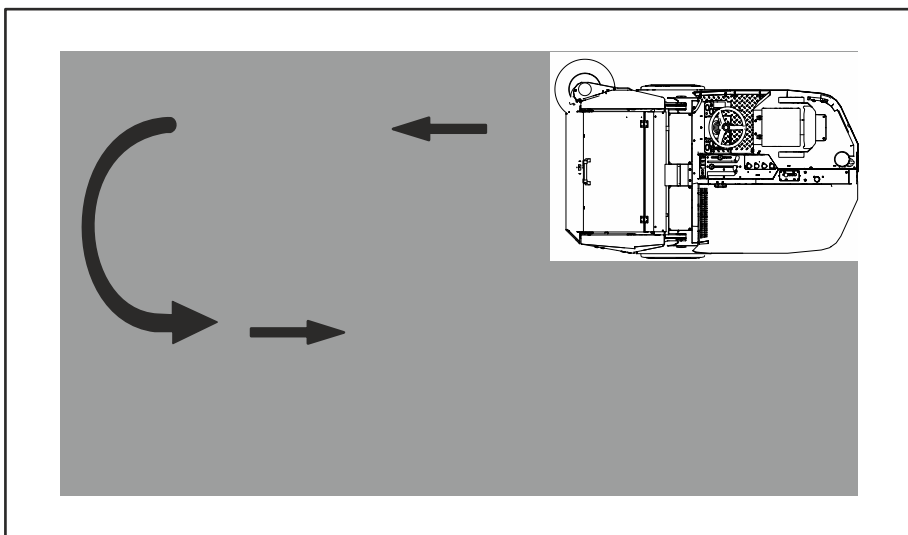
SWEEPING

Pick up oversized debris before sweeping. Flatten or remove bulky cartons from aisles before sweeping. Pick up pieces of wire, ropes, string, etc., which could become entangled in brooms.

Plan the sweeping in advance. Try to work in long runs with minimum stopping and starting. Sweep debris from very narrow aisles into main aisles ahead of time. Do an entire floor or section at one time. Sweep in a straight path as possible.

Avoid bumping into power and lamp posts or scraping the sides of the sweeper.

Avoid turning the steering wheel too sharply when the machine is in motion. The machine is very responsive to the movement of the steering wheel. Avoid sudden turns, except in emergencies.



Start Of Sweeping:

1. Set throttle positions as required.

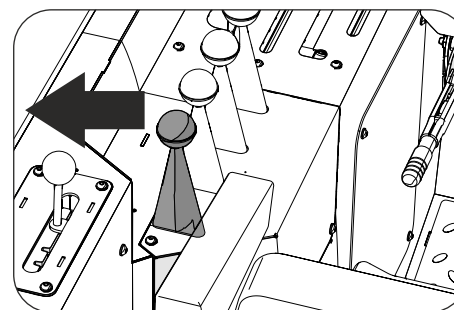


Medium engine speed - For normal flat surfaces.



Higher engine speed - For sweeping on inclined surfaces.

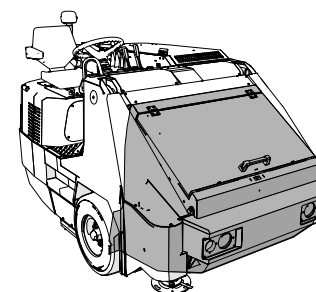
2. Hopper should be completely lowered.



Lever position leftward - Hopper lowers.

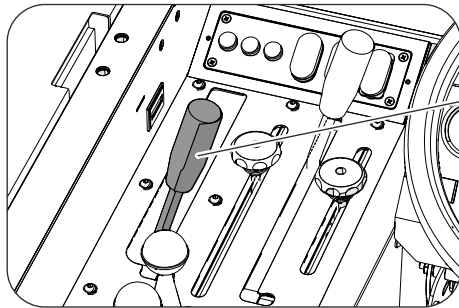


Ensure that the panel filters are clean and dry and are locked securely in their position to prevent any leakage of dust during sweeping.



MACHINE OPERATION

3. Lower the main broom and side brooms.

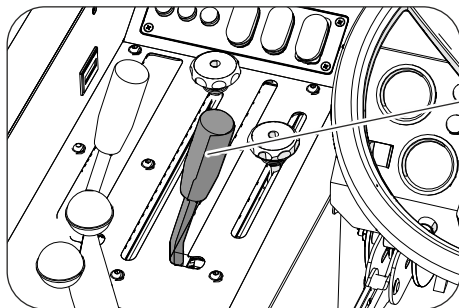


Main broom lever

SWEEP

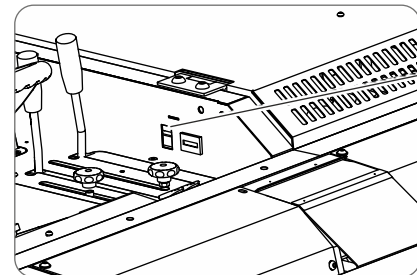


Release the lever from the notch and push it forward to lower the main broom.



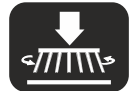
RH Side broom lever

SWEEP



LH Side broom actuator switch

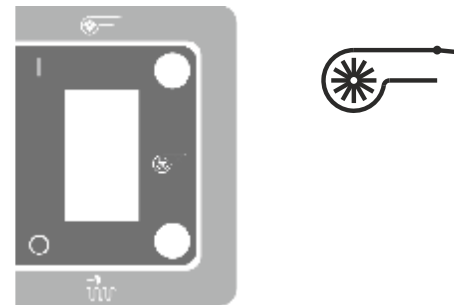
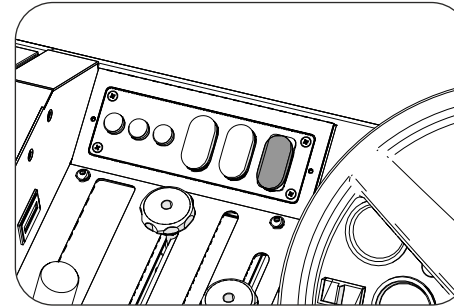
SWEEP



Release the lever from the notch and push it forward and switch on the LH side broom switch to lower the side brooms if edge cleaning is required.

Note: In highly dusty areas, it is advisable not to use the side brooms to avoid dust flying which will hamper visibility to the operator.

4. Ensure vacuum suction is switched On.



Push the switch upwards to activate the vacuum suction. The vacuum suction is used to suppress the dust cloud during sweeping. Switch off the vacuum suction when sweeping a wet surface is being swept.

5. Sweep as needed.

Do not sweep or vacuum:

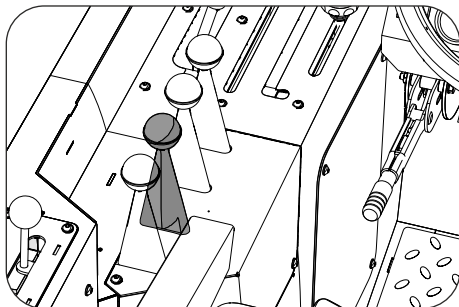
Corrosive/Battery Fluids/Explosive/Flammable

Magnetic/Radioactive/Biohazard materials.

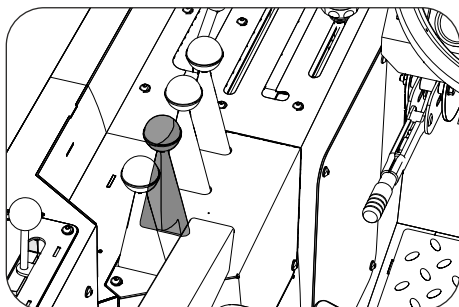


MACHINE OPERATION

6. Activate the *Debris Compact System (DCS)* lever to move the debris from the rear entrance towards the deep inside of the hopper (compact mode).

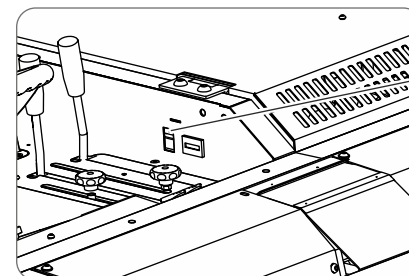
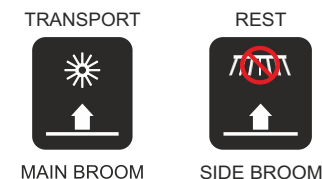
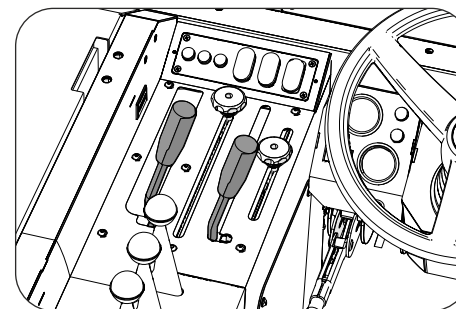


7. Return the hopper to its normal position to continue sweeping (return to sweep mode).



End Of Sweeping:

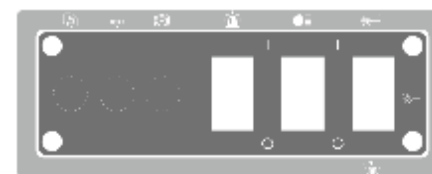
1. Switch Off main broom and side broom.
2. Raise the main broom and side brooms.



LH Side broom actuator switch

Switch off the LH side brush actuator switch.

3. Activate the filter shaker to shake off remaining debris and dust from the panel filter.



NOTE: The filter shaker switch is of a momentary type: hold down till required, release to switch off.

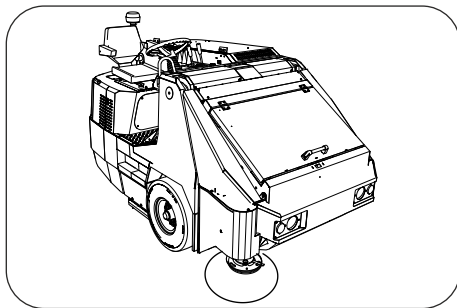
NOTE: If a timer kit is installed in the machine the filter shaker will operate for 10 seconds and shut itself off automatically, upon the switch being pressed once.



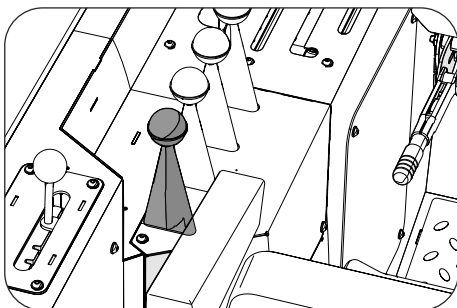
MACHINE OPERATION

Emptying The Debris Hopper:

1. Drive the machine at a slow speed to the desired dumping area.



2. Raise the hopper to its dumping position.



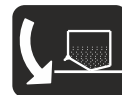
RAISE



WARNING: Do not stand under a raised hopper.



3. Ensure that the hopper is in normal sweep position.



4. Open the hopper door to commence dumping of debris.



5. Close the door and lower the hopper completely.

6. Reduce throttle position to idle.



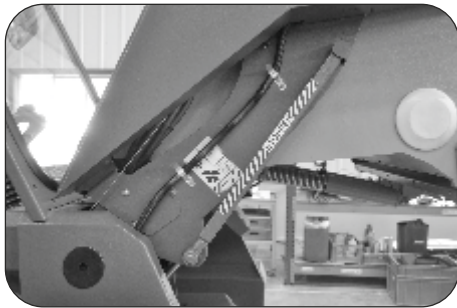
7. Switch off engine and remove key.

8. Engage parking brake.



MACHINE OPERATION

Engaging The Hopper Safety Stopper



The safety stopper is a device used to prevent the hopper from falling down while cleaning or during maintenance works.

1. Engage parking brake.
2. Start the engine.
3. Lift hopper up completely.
4. Release the safety stopper from its retaining position.
5. Place the safety stopper in the slot provided in the chassis.
6. Lower the hopper till its locks in position.
7. Switch off the engine and remove key.



WARNING: DO NOT STAND UNDER A RAISED HOPPER WITHOUT THE SAFETY STOPPER DEPLOYED.



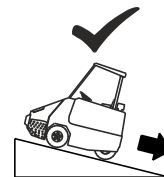
Safety stopper engaged

Disengaging The Hopper Safety Stopper

1. Engage parking brake.
2. Start the engine.
3. Raise hopper up completely.
4. Release the safety stopper from the locked position.
5. Place the safety stopper back in its storage position.
6. Lower the hopper.
7. Switch off the engine and remove key.

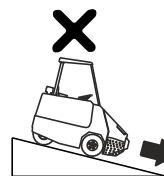
IMPORTANT SAFETY INFORMATION

ALWAYS

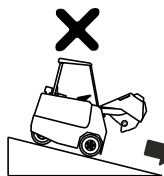


While sweeping or passing a ramp, always drive the machine with its front side facing uphill.

NEVER



Never drive the machine downhill with a full hopper, there is a chance of losing traction and stability leading to risk of accidents.



Driving downhill with a raised hopper is very dangerous and may cause the machine to tip over leading to loss of life or damage to the machine/environment.



MACHINE OPERATION

CLEANING THE DUST FILTERS

The machine is equipped with two dust filters to filter out fine dust during the sweeping operation. The dust filters have to be cleaned periodically to maintain its optimum cleaning performance.

⚠ WARNING: ENSURE THAT THE ENGINE IS SHUT DOWN BEFORE CLEANING THE DUST FILTERS

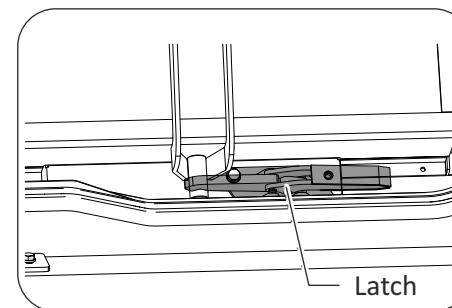
1. Open the filter hopper door: Use the lever to open the hopper filter chamber door.



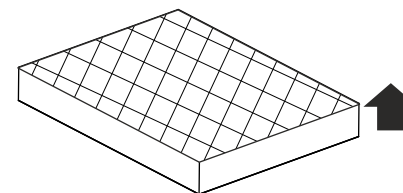
The filter vibrator assembly is attached to the door which in turn lifts upwards when the door is opened revealing the filter panels below.

☞ CAUTION: Filter chamber door, care should be taken while opening or closing. Pinch hazard.

2. Use the latches to remove the filter holders and then to remove the filters.



3. Clean the filters using compressed air.



⚠ DANGER
Inhalation hazard.
Do not breath in dust particles.

When placing the filter back ensure that the filter pocket face upwards.



Do not use more than 6 psi of pressure.



Do not contaminate the environment, use an appropriate cleaning chamber to dispose the dust.



IF THE FILTERS HAVE BEEN WASHED WITH CLEAN WATER, ENSURE THAT THEY ARE COMPLETELY DRY BEFORE USING IT AGAIN.

Always wear eye and nose protection when doing so.



Do not smoke.





MAINTENANCE

General Maintenance

This section describes the maintenance of the machine under the following sections:

- Engine & blower room access doors
- Hopper inspection panels
- Filter chamber access panels
- Suction port hatch
- Working on top of the hopper
- Cleaning/Replacement of suction cartridge filters
- Replacement of filter bags
- Replacement of seals
- Maintenance of tipping cylinders
- Maintenance of drive belts
- Maintenance of diesel engine
- Maintenance of blower
- Maintenance of truck
- Lubrication
- Hydraulic system
- Pneumatic system
- Electrical system



WARNING

- ***Maintenance and/or repair operations must be done by skilled and authorized personnel; all operations on the electrical and pneumatic devices are to be performed by specialized personnel only.***
- ***Read this manual thoroughly before performing any repair or maintenance operations.***
- ***For repair and/or maintenance of high reach areas of the machine, use a suitable work lift or working platforms.***
- ***Use genuine Roots spare parts ONLY which are specifically designed for the machine.***
- ***USE suitable PPE at all times when working or servicing the machine.***



IMPORTANT!

- ***ALWAYS SWITCH OFF ENGINE AND REMOVE KEY BEFORE PERFORMING ANY MAINTENANCE OR REPAIR WORK.***



MAINTENANCE



SAFETY PRECAUTIONS

Do not allow unauthorized personnel to service or maintain this machine. Study the Operator's Manual and Maintenance Manual before starting, operating or servicing this machine. Always follow procedures and safety precautions detailed in the Maintenance Manual.

Always attach a 'DO NOT START' or similar warning sign to ignition switch or a control before cleaning, lubricating or servicing the machine.

Never allow anyone to work on the machine while it is moving. Make sure no one is on the machine before working on it.

Do not work under or near unblocked or unsupported hopper. Always use the hopper safety prop.

Do not work under or near any unblocked or unsupported linkage, part or truck.

Always relieve pressure before servicing any pressurized system.

When changing oil in the engine, transmission and hydraulic systems, or removing hydraulic lines, remember that the oil may be hot and can cause burns to unprotected skin.




When working on or around exhaust components, remember that the components may be hot and can cause burns to unprotected skin.

Always deflate tyre before attempting to remove any embedded objects or removing the tyre and rim assembly from the machine.

WARNING

Escaping fluids under pressure can penetrate skin.

When working around battery area, keep all flames and sparks away from batteries.

 WARNING	
	
<p>Injection Hazard. Escaping fluid under pressure can penetrate skin, causing serious injury.</p>	<p>Relieve pressure before disconnecting hydraulic lines. Keep away from leaks and pin holes. Use a piece of cardboard to search for leaks. Do Not use hand.</p> <p>Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this type of injury or it may cause gangrene.</p>



MAINTENANCE

PREVENTIVE MAINTENANCE

Preventive Maintenance Instructions

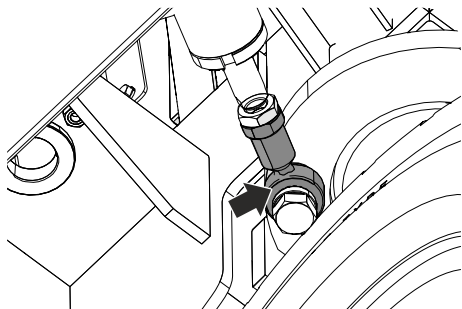
LUBRICATION

Engine:

Kindly refer the *Kubota Diesel Engine Operator's Manual* supplied along with this machine for service and maintenance of the engine.

Rear Wheel Actuator

The rear wheel actuator pivots the rear wheel. The actuator has a grease fitting to lubricate the bearings.



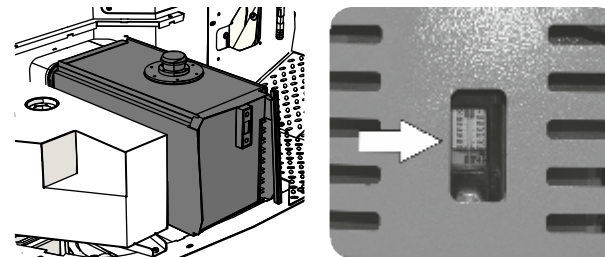
HYDRAULICS

Hydraulic Oil Tank

The hydraulic oil tank is located below the operator seat.

The hydraulic pump is located in the engine bay attached to the engine.

The hydraulic oil tank has a cap with a breather assembly.



Check the hydraulic oil level at operating temperature every 100 hours of operation.

Ensure that the hopper is in completely lowered position.

The sight gauge is marked with FULL (black line) and ADD (red line) levels to indicate the level of hydraulic oil in the tank.

WARNING:



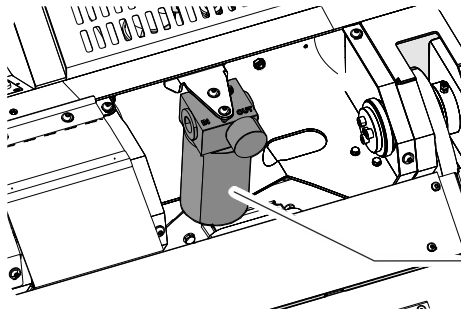
Do not overfill the hydraulic oil.

Do not operate machine with low level of hydraulic oil. Damage to the system may occur.

MAINTENANCE



The hydraulic tank has a built in filter system to remove any dirt or debris from the oil. The return line hydraulic oil filter is located ahead of the operators cab.



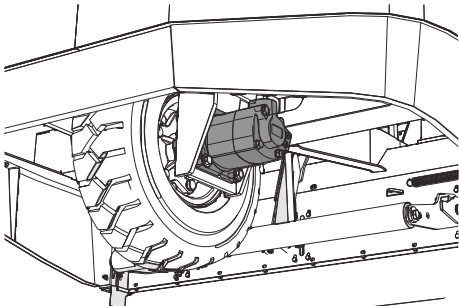
Return Line Filter

Hydraulic Hoses

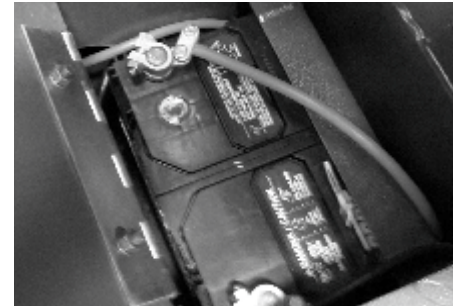
Check the hydraulic hoses for wear or damage. Pressurized hydraulic oil escaping from a small hole in the hose may lead to severe injury. Seek medical help if any injury has been caused by pressurized hydraulic oil. If any oil leak has been detected contact after sales service.

Hydraulic Traction Motor

The hydraulic drive motor should be checked for leaks. Repair the hose fittings or other parts if any damage is noted. Refusing to do so may damage the motor.

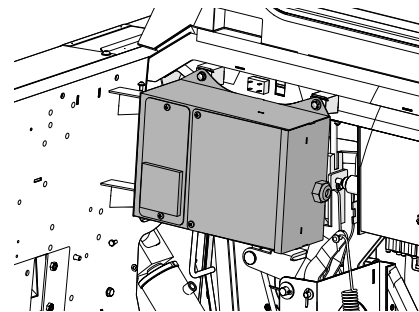


Battery



The battery is located under the foot well of the operators cab. Turn the lock to access the battery door. The battery used for this machine is a maintenance free type. Do not try to open the plugs. Do not top up the battery with water. Clean the battery and check the connections.

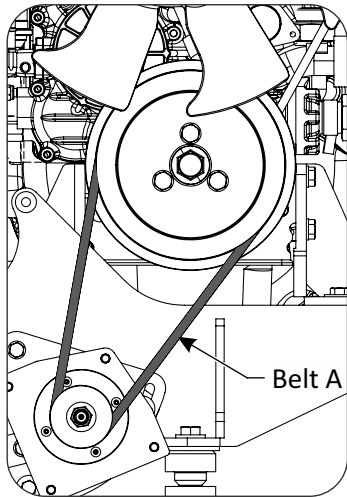
Electrical System



The electrical system of the machine has safety fuses to prevent any overloading or short circuit. Check the fuses.

MAINTENANCE

Belts



The engine fan belt is driven by the engine crankshaft pulley which also drives the alternator pulley have to be checked for wear and tear. The belts also have to be checked for the correct tension setting.

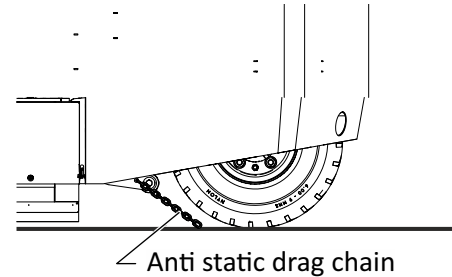
⚠ WARNING: Rotating belt and fan. Keep away.

Belt tensions

Belt A - 5 to 7 mm at a load of 2 kgf .

Check and adjust belt tension.

Anti Static Drag Chain



A static drag chain prevents the buildup of static electricity in the machine. The chain is attached to the machine by a rear main brush skirt retaining bolt. Make sure the chain is touching the floor at all times.

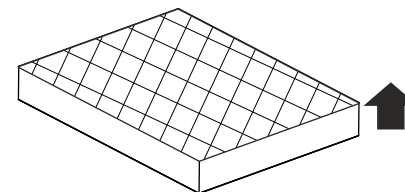
To Replace The Dust Filters

Before leaving the machine: park on a level surface, stop engine, engage parking brake and remove key.

1. Open the hood of the filter chamber using the latch.
2. Operate the toggle clamps to remove the filter holder.
3. Remove the old filter.
4. Replace with a new filter.
5. Secure the new filter by locking the toggle clamps.



CAUTION: Do not drop the filter down.



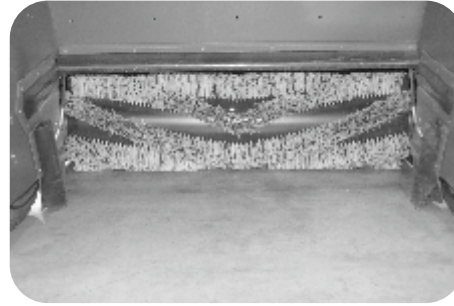
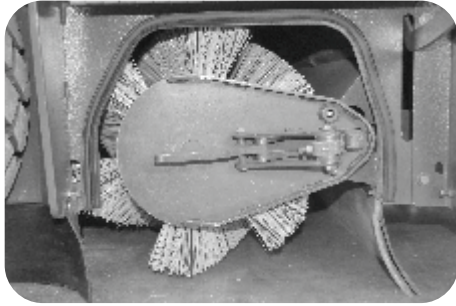
When placing the filter back ensure that the filter pocket face upwards.



MAINTENANCE

BROOMS

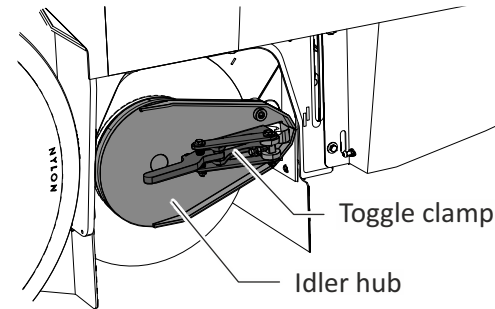
Main Broom



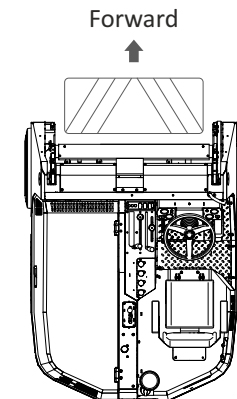
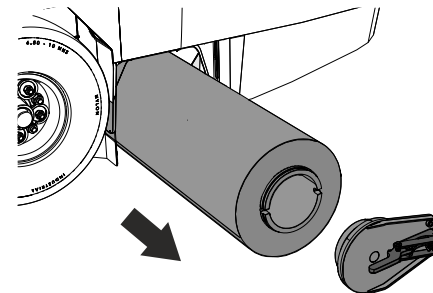
- The main broom used in the machine is of a cylindrical type and spans the width of the machine.
- The main broom sweeps the debris into the hopper.
- Check the main broom everyday for wear or damage.
- Remove any wires, ropes or strings from the main broom to avoid damage to the main broom, drive hub or other drive components.
- Adjust the main broom pressure by using the knob on the operators cab.
- Replace the broom if worn out/damaged or it no longer sweeps effectively.

To replace the main broom:

1. Park the machine on a flat surface.
2. Engage parking brake.
3. Raise the main broom.
4. Stop the engine.
5. Remove key.
6. Open the left side door of the broom compartment.



7. Remove the idler hub by operating the toggle clamp. (*Pull the toggle clamp towards the user*).
8. Grasp the main broom and pull it outward. **Wear safety gloves when handling the main broom.**



9. Place the new broom or the existing rotated end-to-end broom on the floor near the broom chamber access door.
10. Slide the main broom into its chamber till it engages on to the drive hub.
11. Now slide the idle side hub back in its position and secure it with the toggle clamp.
12. Close the broom chamber door.



MAINTENANCE



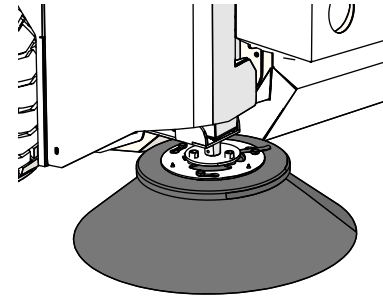
Main broom pattern checking and adjusting

1. Apply white chalk on to a smooth surface.
2. Raise the side broom and main broom and position the main broom over the chalked surface.
3. Apply parking brake.
4. Start the main broom.
5. Lower the main broom for 15 seconds.
6. Raise the main broom
7. Stop the main broom.
8. Move machine out of the test area.
9. Check the width of the pattern. A proper broom pattern will have a width of 50 mm (2 inches).



 **NOTE:** Use only brooms recommended by the manufacturer.

Side Broom



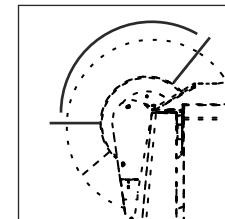
The side broom sweeps debris from the edges/corners to the path of the main broom.

Check the side broom everyday for wear or damage.

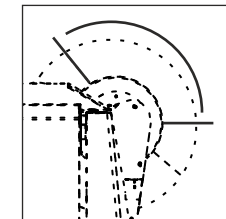
Remove any ropes, strings or wires found in the side broom or its drive hub.

Check the pattern of the **RIGHT** side broom everyday. It should be at 10 o'clock to 3 o'clock position when the broom rotates.

Check the pattern of the **LEFT** side broom everyday. It should be at 9 o'clock to 2 o'clock position when the broom rotates.



Left Side Broom



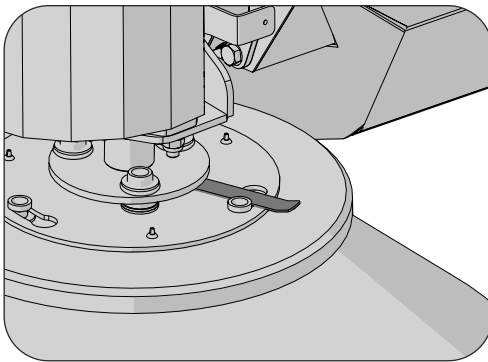
Right Side Broom

Replace worn out or damaged broom when it can no longer perform.

MAINTENANCE

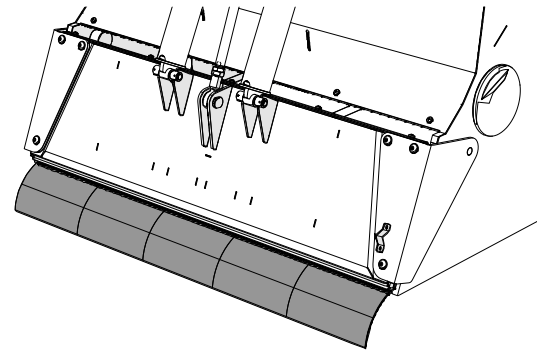
To replace the side broom:

1. Park the machine on a flat surface.
2. Engage parking brake.
3. Stop the engine.
4. Rotate the side broom by hand till the lift bar is visible. Wear safety gloves.
5. Lift the bar to disengage the side broom from its drive plate.
6. Slide a new broom onto the drive plate by aligning the three drive pins to the slot on the drive plate.
7. Push the broom till it snaps on to the retaining bar.



 **NOTE:** Use only brooms recommended by the manufacturer.

Dirt Hopper Aprons



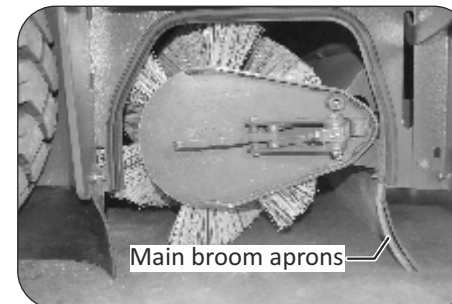
The dirt hopper aprons are located at the bottom rear of the hopper. The aprons float over the debris to direct it into the hopper.

These aprons are prone to wear due to friction.

Inspect these aprons everyday, replace if it is damaged to it no longer contacts the floor.

The dumping door aprons are segmented ones. Inspect them for wear or damage and replace if necessary.

Main broom chamber aprons

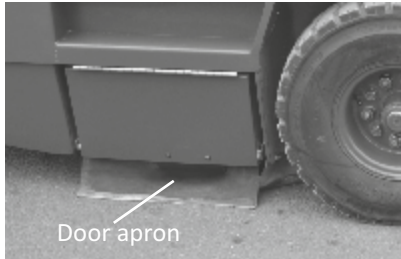


The broom chamber aprons are located on the bottom side of each door and at the rear of the main broom around the chassis.

Each of these aprons will be in contact with the floor at all times.

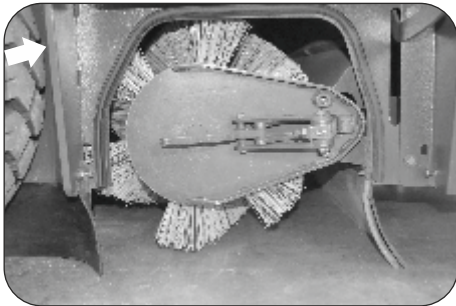
Check the aprons for wear or damage and adjust them if necessary.

MAINTENANCE



NOTE: Tire pressure will affect the apron clearance, maintain correct tire pressure at all times.

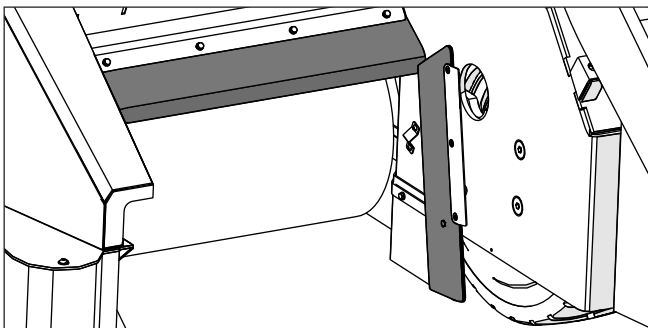
Broom door seals



The broom door seals are located on both sides of the main broom doors on the chassis.

Check the seals for wear or damage and replace if necessary.

Dirt hopper seals



The dust hopper seals are located on both sides and bottom part of the chassis area that come in contact of the dust hopper as shown in figure.

Check the seals for wear or damage and replace if necessary.

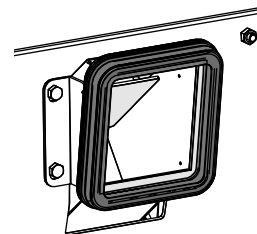
Hopper filter door seals



The hopper filter door seals are located in the hopper. They seal the hopper when the door is closed.

Check the seals for wear or damage and replace if necessary.

Hopper vacuum fan seal



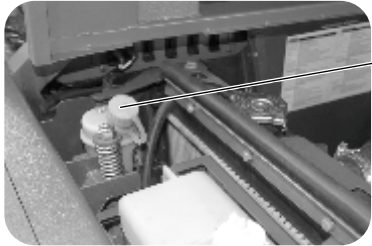
The hopper vacuum fan seal is located on the inlet bracket.

Check the seals for wear or damage and replace if necessary.

MAINTENANCE

TIRES AND BRAKES

Brakes



Master Reservoir

The hydraulic brakes are located on the front wheels which are of a drum type with self adjustment. The master reservoir is located in the engine bay.

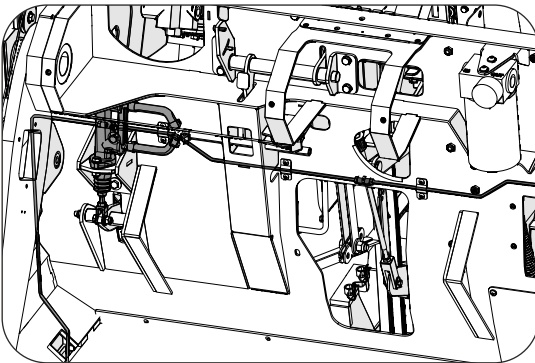


Use only approved brake fluid.



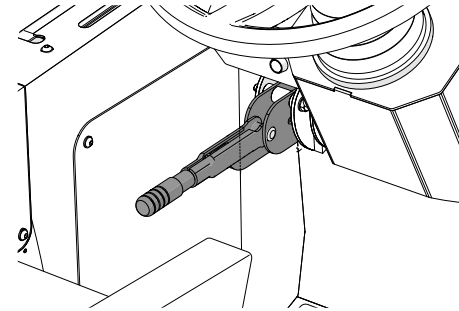
Do not spill brake fluid into the environment.

Brake fluid lines



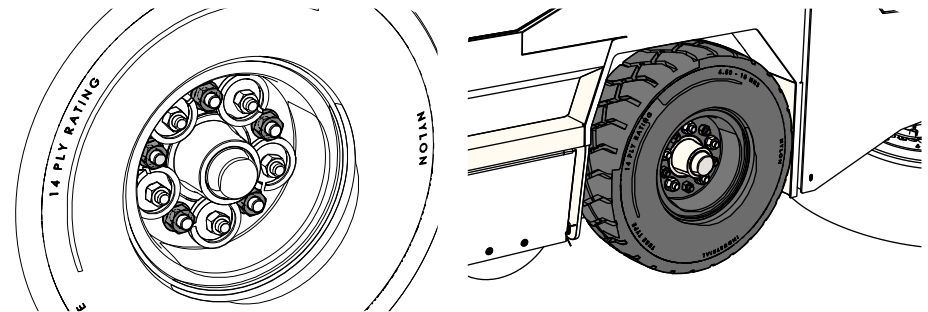
The brake fluid lines are located at the front of the machine chassis which supply brake fluid to the front brakes activated via a brake pedal cylinder. Check the fluid lines and brake pedal cylinder, replace seals if necessary, replace fluid lines if damaged.

Parking brake



Check and adjust the parking brake if it becomes easy to set, machines rolls after engaging brake.

Wheels and Tires



Ensure that the wheel bolts of front and rear wheel are tight at all times.

For pneumatic tyres equipped machine:

The proper tire pressure is 100 psi at the front and 80 psi at the rear.



MAINTENANCE

PUSHING, TRANSPORTING AND TOWING THE MACHINE

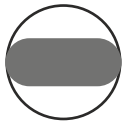
Pushing or towing the machine



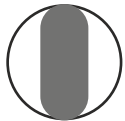
If the machine becomes disabled, it can be pushed from the front or rear of the machine.

The drive pump has a by-pass valve to prevent damage to the hydraulic system when it is being pushed or towed. For pushing or towing the machine, rotate the bypass valve plunger from horizontal position to vertical position.

Do not push or tow the machine at a high speed.



Tow off



Tow on



Do not push or tow the machine for a long distance without activating the by-pass valve.

TRANSPORTING THE MACHINE

Transporting the machine by truck:

1. Position the truck at the loading platform.
2. Drive the machine onto a loading platform which supports the weight of the machine.
3. Ensure that the truck is clean.
4. Ensure that the dirt hopper is empty and clean.
5. Drive the machine into the truck slowly.
6. After positioning machine in its desired position: turn off engine and engage the parking brake.
7. Place appropriate wheel blocks to prevent the machine from any movement.
8. Tie down the machine using industrial lashing straps until the machine is completely secure and no movement is found.
9. Ensure that the fuel tank is empty.
10. Remove key from the ignition.
11. Cover the machine using an industrial tarpaulin cover to protect it from the elements.



Ensure that the truck is on a level ground before loading the machine.



MAINTENANCE

Transporting the machine by using a crane:

1. Position the truck on a flat surface.
2. Ensure that the truck is clean.
3. Drive the machine to the area of loading.
4. Ensure that the dirt hopper is empty and clean.
5. After positioning machine in its desired position: turn off engine and engage the parking brake.
6. Tie industrial grade lifting belts to the tie down points provided in the machine. Ensure it is secure.
7. Carefully lift and place the machine onto the truck.
8. Place appropriate wheel blocks to prevent the machine from any movement.
9. Tie down the machine using industrial lashing straps until the machine is completely secure and no movement is found.
10. Ensure that the fuel tank is empty.
11. Remove key from the ignition.
12. Cover the machine using an industrial tarpaulin cover to protect it from the elements.



Ensure that the truck is on a level ground before loading the machine.

JACKING THE MACHINE



Always park the machine on a flat dry surface before jacking.

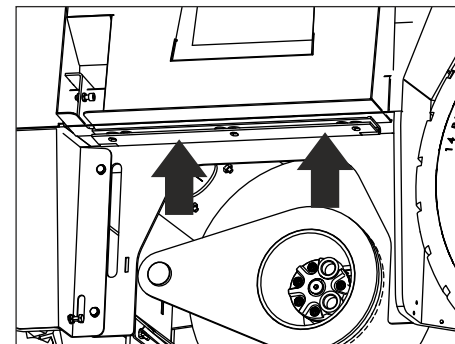
Ensure that the hopper is empty before jacking the machine.

The machine should be jacked up only using its designated jacking points, failure to do will cause damage/injury to machine or operator.

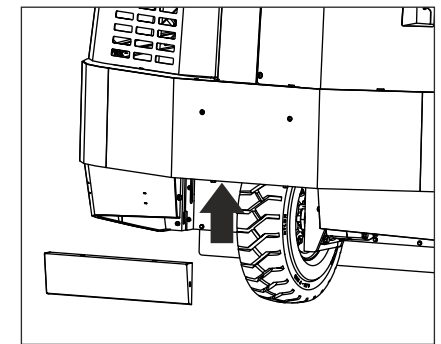
Use a jack which will support the weight of the machine.

Use jack stands to support the weight of the machine if hoisted up for a longer period of time.

The front jacking points are at the flat bottom portion of the machine which can be accessed by opening the broom chamber door.



Front



Rear

The rear jacking point is located at the middle of the rear bumper, to access it remove the rear skirt portion as in fig. Below, place a suitable jack. Use a jack stand if required.



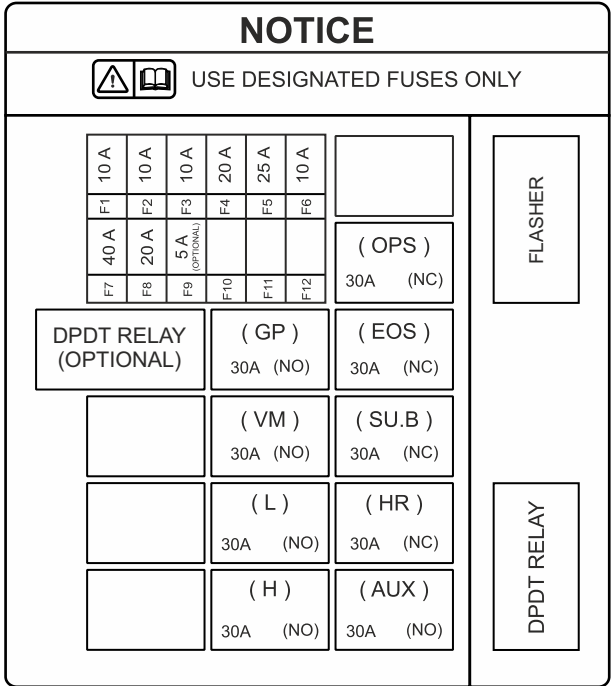
When servicing or changing tires, block the tires before jacking.



MAINTENANCE

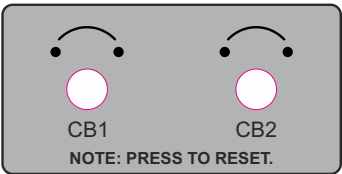
ELECTRICAL MAINTENANCE

Fuse Details



- GP** - **Glow Plug**
- EOS** - **Engine Off Solenoid**
- VM** - **Vibrator Motor**
- SU.B** - **Vacuum By-Pass**
- L** - **Lamps**
- HR** - **Hour Meter**
- H** - **Horn**
- AUX** - **Auxiliary Controls**
- OPS** - **Operator Presence Switch (Optional)**

Circuit breaker for AC unit (if equipped)



Two circuit breakers are located inside the operator's cabin on the roof console.

The circuit breaker should be reset by pressing if it has been tripped to continue working.



MAINTENANCE



MAINTENANCE TABLE

INTERVAL	MAINTENANCE AREA	THINGS TO CHECK
Daily	Main & Side Broom	Inspect brooms for wear and damage, remove strings and debris from bristles and drive assembly if found.
	Air intake system	Empty & clean dust cup of pre-cleaner, Check the air filter clog indicator.
	Coolant system	Check coolant level and top up as needed.
	Engine	Refer Kubota engine owner's manual, Check water separator visually.
	Brake	Check brake oil level and top up as needed.
	Hopper	Inspect the hopper aprons for wear or damage and replace as needed.
		Shake and clean hopper dust filters, replace as needed.
	Hydraulic system	Check hydraulic oil level and top up as needed.
	Wheels and tires	Visually inspect for deflation, wear and damage. Repair or replace as needed.
	Miscellaneous	Check belts for wear, Check the hydraulic hoses and fittings visually for any leaks or damage.
50 Hours	Main Broom	Rotate end-to-end.
		Inspect broom chamber seals and aprons for wear and damage, adjust or replace as needed.
		Perform main broom adjustment test and adjust as needed.
	Hydraulic system	Check functioning of directional control pedal and adjust as needed.
		Blow out hydraulic oil cooler fins with compressed air. (If so equipped)
	Wheels and tires	Check and tighten front & rear wheel nuts to 200 Nm torque. (For the first time only).
100 Hours	Engine	Refer Kubota engine owner's manual.
	Coolant system	Inspect radiator fins and clean as needed.
	Hydraulic system	Check functioning of directional control pedal and adjust if needed.
		Check oil level and top up as needed.
		Blow out hydraulic oil cooler fins with compressed air. (If so equipped)
	Hopper	Inspect hopper side structure and door seals for wear or damage. Adjust or replace as needed.
		Inspect filter frame seals for damages. Adjust or replace as needed.

MAINTENANCE



INTERVAL	MAINTENANCE AREA	THINGS TO CHECK
200 Hours	Engine	Refer Kubota engine owner's manual.
	Air intake system	Clean air filter. NOTE: Clean more often in dusty conditions.
		Replace air filter.
	Battery	Check water level, clean and tighten battery cable connection.
	Lubrication points	Steering Cylinder (2 fittings) Lubrication type - grease
		Door Cylinder (2 fittings) Lubrication type – grease
		Hood Latches & Hinges - Lubrication type - oil
	Miscellaneous	Check anti-static drag chain on main broom counter weight for damage or excessive wear. Make sure the chain is touching the ground at all times.
400 Hours	Engine	Refer Kubota engine owner's manual.
	Brake cylinder	Check brake oil line, oil level and top up if needed.
500 Hours	Coolant system	Drain and flush the coolant system and top up as needed.
	Side broom	Check side broom lift cable, replace if needed.
800 Hours	Hydraulic system	Clean hydraulic oil strainer and breather cap.
		Replace hydraulic oil and filter.
	Wheels and tires	Check & tighten front and rear wheel nuts. (Torque to 200 Nm)
		Check & tighten wheel motor nuts. (Torque to 640 Nm)



TROUBLESHOOTING



Problem	Cause	Remedy
Engine	Refer the engine manual supplied with the machine.	
Machine creeps in neutral	Directional control pedal return spring is out of adjustment	Adjust pedal spring
Brooms do not turn or turn very slowly	Hydraulic system problem:	Refer Hydraulic System problems in this section
	Broom motor	
	Broom control valve	
	Gear pump	
	Relief valve	
Little or no vacuum in broom compartment	Filters clogged	Clean or replace filters
	Impeller failure	Check and repair
Machine moves slowly or does not move at all	Parking brake is engaged	Disengage parking brake
	Directional control pedal is jammed, or not adjusted properly	Clean the pedal, adjust linkage
	Tires skidding from contact with slippery surfaces	Clean tires
	Wheels jammed	Clear jam
	Low hydraulic oil level	Top up hydraulic oil
	Damaged or worn drive motor	Replace damaged part
Poor dust control	Debris or duct in impeller inlet	Clean the inlet
	Broom aprons or seals worn	Replace aprons
	Apron clearance from floor exceeds 1/8"	Adjust clearance
	Dust filters clogged	Clean dust filters
	Filter seals worn	Replace seals
	Poor seal with vacuum gasket	Check and adjust
Machine leaves debris	Dirt hopper is full	Empty hopper
	Broom(s) out of adjustment	Adjust them
	Broom bristles worn	Replace broom(s)
	Broom drive performance poor	Check drive system
	Dirt hopper flaps are damaged or missing	Adjust or replace
	Dirt hopper misaligned	Check alignment
	Dust filters clogged	Clean filters

TROUBLESHOOTING



Problem	Cause	Remedy
Dirt hopper does not raise or lower	Hydraulic system problem:	Refer Hydraulic System problems in this section
	Control valve	
	Gear pump	
	Lift cylinder	
	Relief valve	
Dirt hopper lift cylinder failure	Line to cylinder leak	Tighten fittings or replace hose
	Piston seals leaking	Replace seals
	Bent piston rod	Replace cylinder rod
Dirt hopper does not rotate or rotates slowly	Dirt hopper load too heavy	Dump frequently
	Hydraulic system problem:	Refer Hydraulic System problems in this section
	Control valve	
	Gear pump	
	Lift cylinder	
	Relief valve	
Hydraulic control valve failure	Foreign matter in spool bore	Remove spool and clean
	Valve seals leaking	Replace seals
	O-Ring damaged	Replace O-Ring
	Relief valve stuck	Replace relief valve
Hydraulic motor failure	Motor leaking	Replace seals/gaskets
	Output shaft malfunction	Replace output shaft
Hydraulic gear pump failure	Pump leak	Replace seals or pump
	Gears worn out	Rebuild pump
Hydraulic gear pump failure	Relief valve stuck	Clean or replace
	Low oil supply	Top up oil
	Clogged oil filter	Clean filter
	Incorrect oil	Use recommended oil
	Damage due to entry of air into the hydraulic system	Maintain correct level in hydraulic tank. Keep all hose fittings tight.

TROUBLESHOOTING



Problem	Cause	Remedy
Hydraulic variable displacement pump failure	Pump leaking	Replace seals/gaskets
	Relief valve(s) stuck	Clean or replace
	Drive coupling malfunction	Replace coupling
	Pump gears worn or damaged	Replace gears or pump
	Damage due to entry of air into the hydraulic system	Maintain correct level in hydraulic tank. Keep all hose fittings tight.
Hydraulic system noisy	Air in system	Maintain correct level in hydraulic tank. Keep all hose fittings tight.
	Relief valve dirty or damaged	Clean or replace
	Loose suction line	Tighten fittings
	Clogged filter or pump inlet	Clean or replace filter or line
	Internal pump or motor damaged	Check and repair



DO'S & DON'TS



Do's

- ✓ Always use the machine only on a level flat surface.
- ✓ Use the machine to collect only dry debris.
- ✓ Check the machine visually for any damage before the start of the shift.
- ✓ Check the machine visually for any fluid leak before the start of the shift.
- ✓ The operator must have read the user manual completely before operating the machine.
- ✓ The operator must be always cautious while driving the machine.
- ✓ The warning beacon must be switched ON before driving the machine (if equipped).
- ✓ Always use the turn signal indicators before negotiating a turn.
- ✓ Always have an eye on the gauges for any abnormal warnings.
- ✓ Use the headlamps while operating the machine at night or during the day with poor visibility during fog.
- ✓ Check the air pressure in the pneumatic tyres to avoid tyre and brush wear.
- ✓ Use the filter shaker at regular intervals for efficient filtration of dust.
- ✓ Use the side brooms only during sweeping corners or curbs.
- ✓ Store the machine only in a covered garage.
- ✓ Only authorized service engineers should perform maintenance tasks on the machine.
- ✓ Always use only genuine spares.

Don'ts

- ✗ Do not drive the machine in bad roads.
- ✗ Do not leave the ignition key in the machine when not in use or during service.
- ✗ Do not collect hazardous materials.
- ✗ Do not use the machine to transport people.
- ✗ Do not use the machine to transport goods.
- ✗ Do not use the machine as a platform to access overhead areas.
- ✗ Do not use the machine to push/pull other equipments.
- ✗ Do not drive the machine with the foot on the brake pedal.
- ✗ Do not drive the machine with the hopper raised.
- ✗ Do not drive the machine with low diesel fuel or low hydraulic fluid.
- ✗ Do not transport the machine with the main broom lowered.
- ✗ Do not operate the machine with a wet filter.
- ✗ Do not make sudden and sharp turns.
- ✗ Do not operate the machine on a gradient or slope higher than that of the recommended value.

OPERATOR NOTES



A large rectangular area with horizontal dotted lines, intended for handwritten operator notes.



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