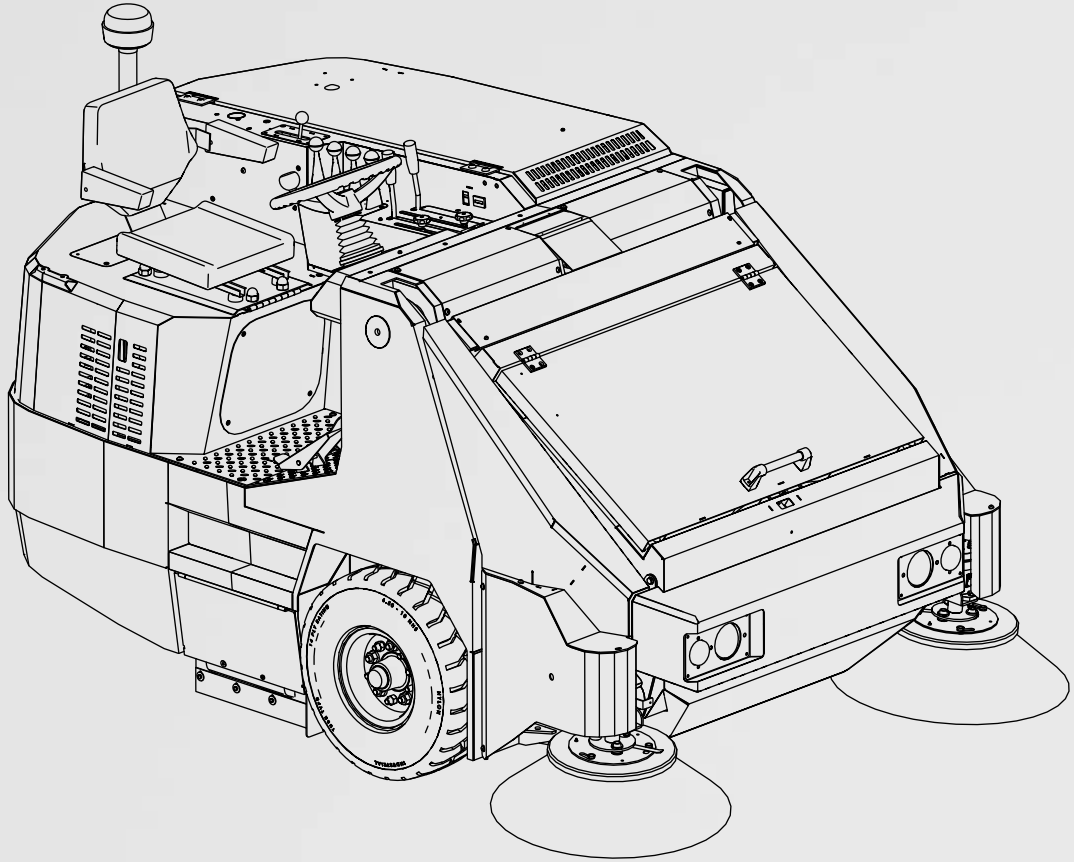
RHINO
POWER SWEEPER

ROOTS

*Ride-On-Sweeper, Diesel*



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

# RD 160

## *OWNER'S MANUAL*

# TABLE OF CONTENTS



**MACHINE DATA**

Please fill at the time of commissioning for future reference:

Model No. - _____

Serial No. - _____

Engine Serial No. - _____

Accessories - _____

Sales Rep. - _____

Sales Rep. contact no. - _____

Installation Date - _____


*Manufacturer's Address:*

**Roots Multiclean Ltd.**
**R.K.G. Industrial Estate, Ganapathy**
**Coimbatore - 641 006, Tamil Nadu, India.**
**Email: rmclsales@rootsemail.com**
**Web: rootsmulticlean.in**



557440045-00
Rev-C, 10/2018
*Prepared by SN NPM TD Dept*

# *INTRODUCTION*

# INTRODUCTION

## *PREFACE*

### *Dear Customer,*

We are pleased with your having chosen the ***RHINO RD 160*** machine for your cleaning requirements. Backed by our industry expertise that spans across two decades, we assure you that the machine comes with our 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 Roots Multiclean Ltd. (RMCL) as a trusted partner for your cleaning requirements and solutions.

### *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 Document 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.

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

*RMCL is not liable for any legal claims that may arise as a direct or indirect result of the contents of this manual.*

### ***SPECIAL NOTES:***

***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 any prior information.***

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

***Prior to first operation, read the manual(s) carefully and strictly comply with the instructions contained.***
***The Owner's Manual is an integral part of the machine and must not be misplaced.***

# *TECHNICAL SPECIFICATION*

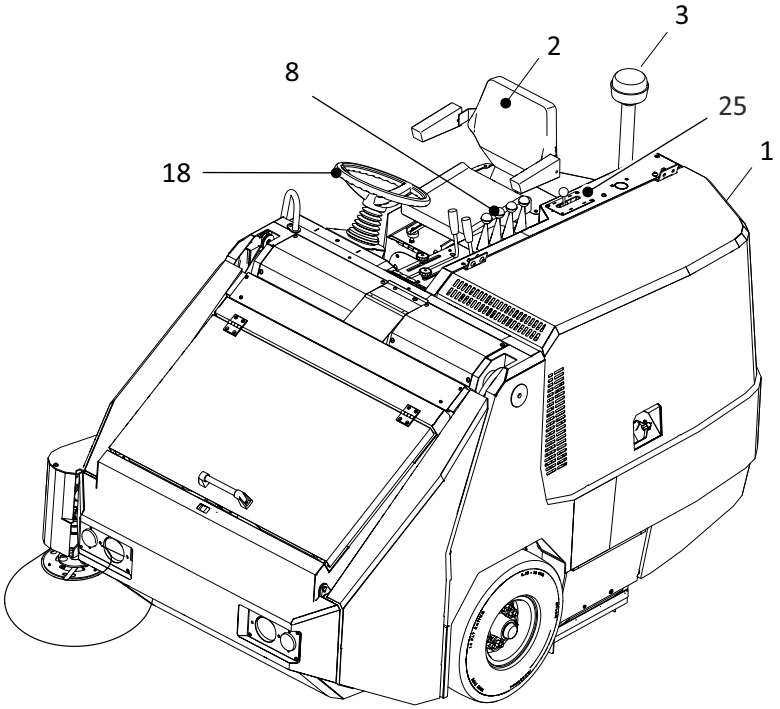
# TECHNICAL SPECIFICATION

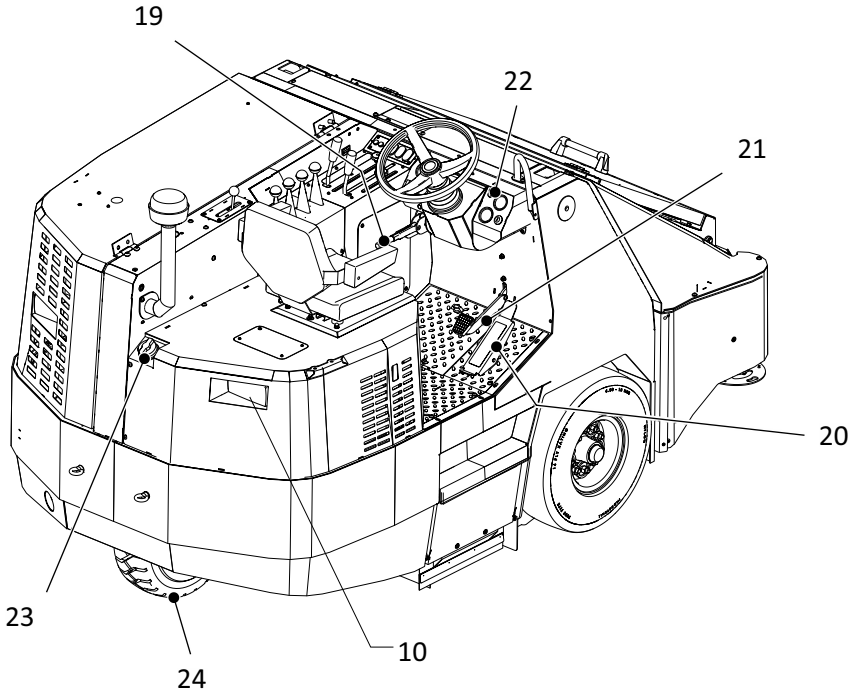
| PARAMETER | UNIT | VALUE |
|---|---|---|
| **MACHINE DIMENSIONS & WEIGHTS** | | |
| LENGTH (Operation / Shipping) | mm | 2686 / 2694 |
| WIDTH (Operation / Shipping) | mm | 1590 / 1905 |
| HEIGHT (Top of air cleaner) | mm | 1665 |
| HEIGHT WITH OVERHEAD GUARD | mm | 2320 |
| HEIGHT (Shipping) | mm | 1842 |
| UNLADEN WEIGHT (with one side brush) | kg | 1865 |
| **MACHINE PERFORMANCE** | | |
| NORMAL SWEEPING SPEED | km/hr | 8 to 11 |
| MAXIMUM GRADABILITY | % | 20 |
| SWEEPING WIDTH WITHOUT SIDE BROOM | mm | 1220 |
| SWEEPING WIDTH WITH ONE SIDE BROOM | mm | 1650 |
| SWEEPING WIDTH WITH TWO SIDE BROOM | mm | 2000 |
| SWEEPING AREA PERFORMANCE WITH ONE SIDE BROOM (THEORETICAL) | $m^2$/hr | 17325 @ 10.5 km/hr |
| SWEEPING AREA PERFORMANCE WITH TWO SIDE BROOM (THEORETICAL) | $m^2$/hr | 21000 @ 10.5 km/hr |
| **FILTER SYSTEM** | | |
| FILTER TYPE | | Polyster Non-woven Fabric |
| NUMBER OF FILTERS | Nos | 2 |
| FILTER SURFACE AREA | $m^2$ | 12 |
| VIBRATOR SYSTEM | | ELECTRIC |
| **MAIN BROOM** | | |
| MAIN BROOM DIAMETER | mm | 360 |
| MAIN BROOM LENGTH | mm | 1220 |
| MAIN BROOM TYPE | | V-Shaped |
| MAIN BROOM BRISTLE TYPE | | PROEX & WIRE |
| **SIDE BROOM** | | |
| SIDE BROOM DIAMETER | mm | 660 |
| SIDE BROOM BRISTLE TYPE | | PP |

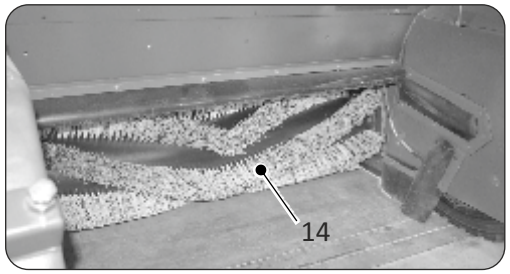
| | | |
|---|---|---|
| **DEBRIS HOPPER** | | |
| HOPPER VOLUME | Liters | 640 |
| MAXIMUM LIFT HEIGHT | mm | 1400 |
| LIFT CAPACITY | kg | 600 |
| **ENGINE** | | |
| MANUFACTURER | | MAHINDRA |
| TYPE | | 275 TU - Diesel |
| COOLING TYPE | | WATER |
| CYLINDER CAPACITY | $cm^3$ | 1892 |
| NUMBER OF CYLINDERS | Nos | 3 |
| MAXIMUM POWER | KW/HP | 28.7 / 39 |
| **FUEL** | | |
| TYPE | | Diesel |
| FUEL TANK CAPACITY | Liters | 40 |
| **STEERING** | | |
| TYPE | | Hydraulic power steering |
| **HYDRAULIC SYSTEM** | | |
| HYDRAULIC RESERVIOUR | Liters | 40 |
| **BRAKING SYSTEM** | | |
| SERVICE BRAKES | | Hydraulic |
| PARKING BRAKE | | Cable/Lever operated |
| **TIRES** | | |
| FRONT - SIZE | | 6.5 X 10 - 14PR |
| REAR - SIZE | | 6.0 X 9 - 12PR |
| **ELECTRICAL SYSTEM** | | |
| BATTERY | V/Ah | 12/80 |
| STARTER TYPE | | ELECTRIC |
| **LUBES** | | |
| GRADE OF FLUID FOR HYDRAULIC SYSTEM | | 15W40 |
| GRADE OF ENGINE OIL | | 15W40 |

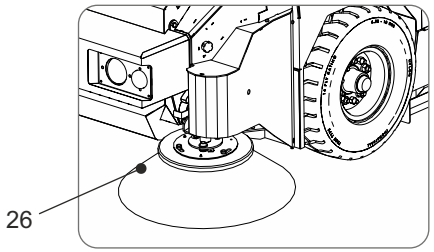
*KNOW YOUR MACHINE*

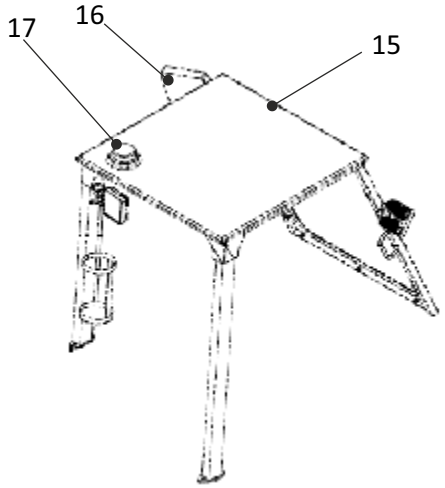
# KNOW YOUR MACHINE



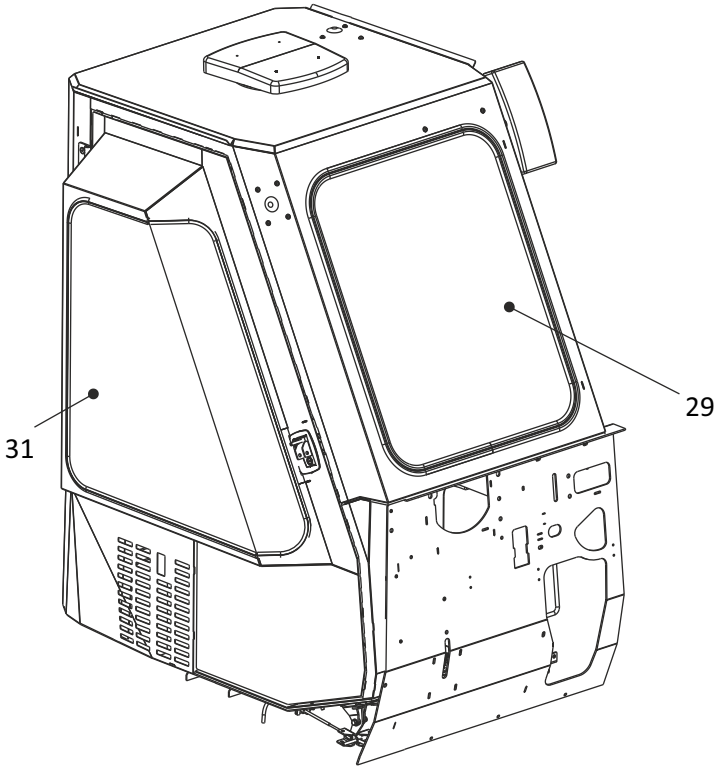



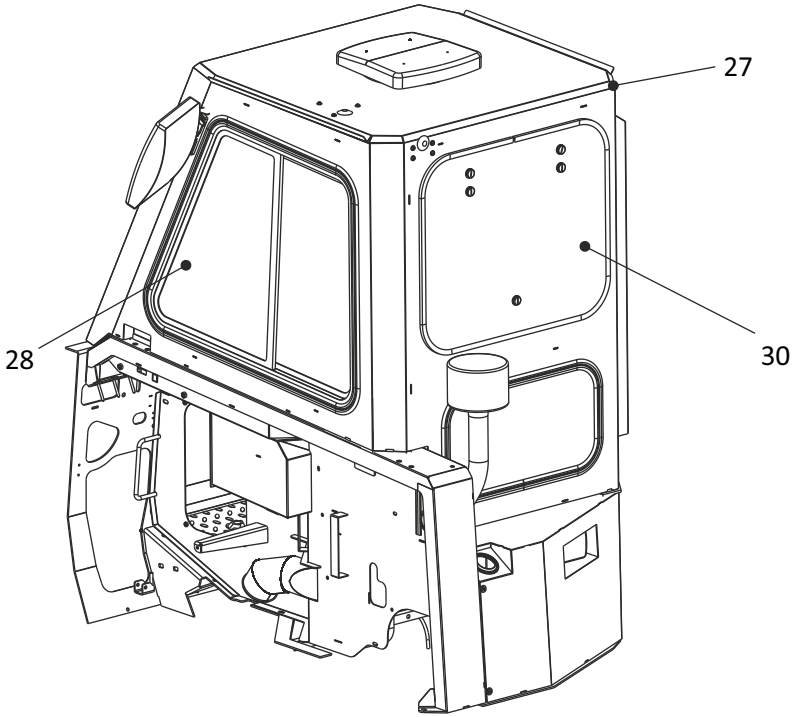



# KNOW YOUR MACHINE




1. Engine hood
2. Operator seat
3. Pre cleaner
4. Left side main broom access door
5. Front wheel
6. Bumper with headlamps
7. Debris hopper with filters and shaker assembly
8. Machine hydraulic controls
9. Right side main broom access door
10. Tail lamps
11. Fuel tank and hydraulic oil tank
12. Electrical access panel
13. Side broom
14. Main broom
15. Overhead guard *(if equipped)*
16. Rear view mirror *(if equipped)*
17. Beacon lamp *(if equipped)*
18. Steering
19. Parking brake
20. Accelerator pedal
21. Brake pedal
22. Dashboard
23. Fuel filler port with cap
24. Rear wheel
25. Throttle lever
26. Side broom LH *(if equipped)*
27. Operator Cabin *(if equipped)*
28. Sliding window *(if equipped)*
29. Front glass *(if equipped)*
30. Emergency exit window *(if equipped)*
31. Cabin door with lock *(if equipped)*

# *SAFETY INSTRUCTIONS*

# SAFETY INSTRUCTIONS

## *SAFETY AND WARNING SYMBOLS*

All paragraphs in this manual referring to you personal safety, the safety of your machine and the environment protection are attributed one of the following warning symbols:

***Safety Provisions*** (persons and goods)

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

***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.*

***Read Manual***

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

## *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.

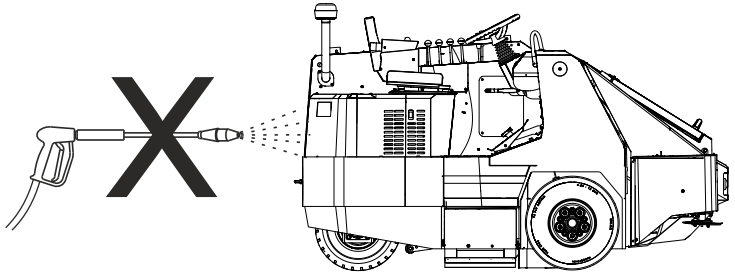
## *Pneumatic Tires Equipped Machines*

- 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.***


*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!*

*STICKERS ON THE MACHINE*

# STICKERS ON THE MACHINE

## *Branding Labels*

RHINO
POWER SWEEPER

*(1)*

ROOTS

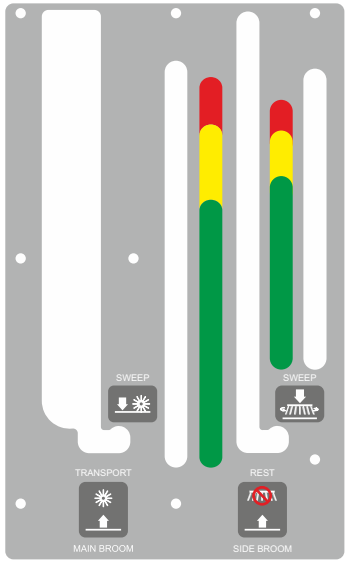
*(2)*

RD 160

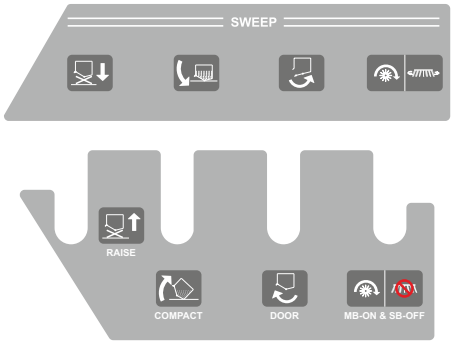
*(3)*

1. Product category sticker
2. Manufacturer's logo sticker
3. Product name sticker

## *Operational Labels*




*(1)*

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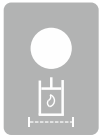
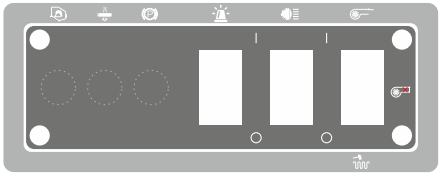


*(3)*

*(4)*

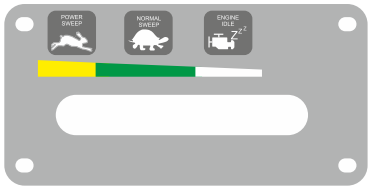
*(5)*



*(6)*

# STICKERS ON THE MACHINE

(7)

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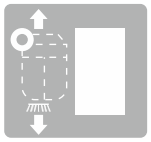


(9)

(10)

1. Main/Side broom indicator sticker
2. Hopper & broom control sticker
3. Hydraulic oil filter clog indicator
4. Battery charging sticker
5. Turn signal indicator sticker
6. Switch panel sticker
7. Horn sticker
8. Throttle lever sticker
9. Side brush actuator switch sticker *(if equipped)*
10. Cabin Switch box sticker

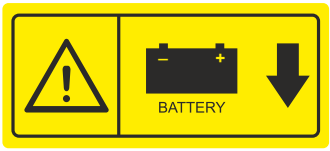
## *Safety Labels*


(1)


(2)


(3)


(4)

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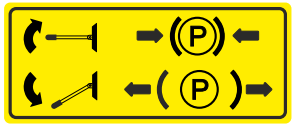
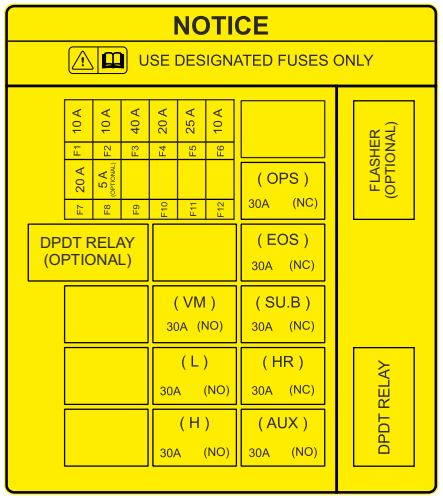



(7)

1. Hopper lift arm safety warning sticker
2. Rotating fan keep away safety sticker
3. Rotating belt keep away safety sticker
4. Diesel fuel safety sticker
5. Battery location warning sticker
6. Machine safety sticker
7. Parking brake safety sticker

# STICKERS ON THE MACHINE

## *Safety Labels*

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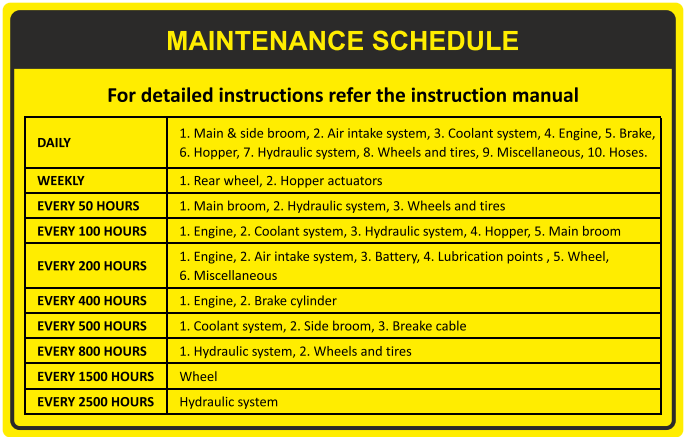



*(9)*

8. Electrical fuses/relay location sticker
9. Maintenance schedule sticker

## *Safety Labels*

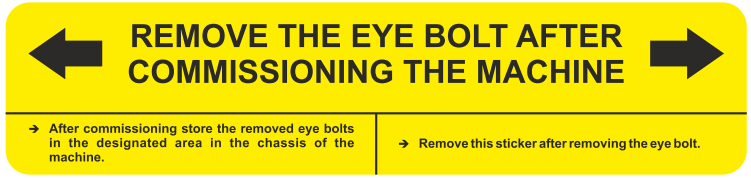
*(10)*

*(11)*

*(12)*


*(13)*


*(14)*




*(15)*

10. Yellow/Black stripe safety sticker
11. Yellow/Black stripe safety sticker
12. Yellow/Black stripe safety sticker
13. Grease point sticker
14. Safety stopper sticker
15. Commissioning instruction sticker

# *MACHINE OPERATION*

# MACHINE OPERATION

## *OPERATOR RESPONSIBILITY*

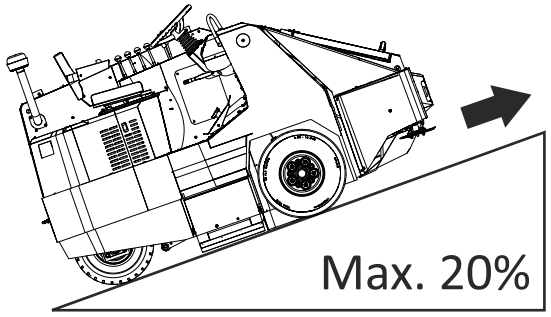
The operator's responsibility is to take care of the machine's daily maintenance and routine checkups to keep the machine in good working condition.
The operator must also inform the supervisor when scheduled maintenance of the machine is to be carried out.

☞ ***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.***

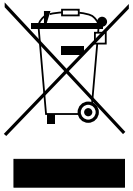
***Do not use this machine to collect any hazardous debris.***
***Do not use this machine as a transport equipment.***

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



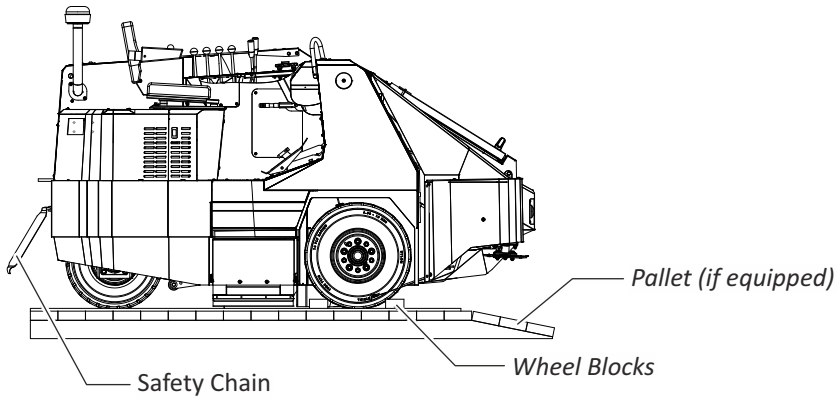

## *ENVIRONMENTAL RESPONSIBILITY*

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.

## *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).
- ➔ Lift the hopper & remove the bush kept on the right side of chassis.

***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 fluid in the tank of hydraulic system.
- 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.
- Remove the hopper bush.

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:***

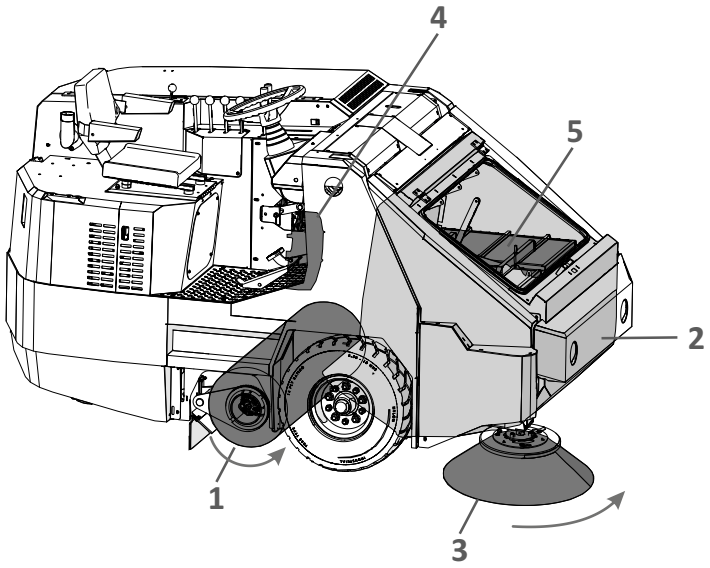
- ➔ *Do not let fuel or oil to leak into the environment.*

***USE ONLY DIESEL FUEL.***
***DO NOT ADD ANY ADDITIVES.***

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

# MACHINE OPERATION

## *WORKING PRINCIPLE*




***Working principle:***

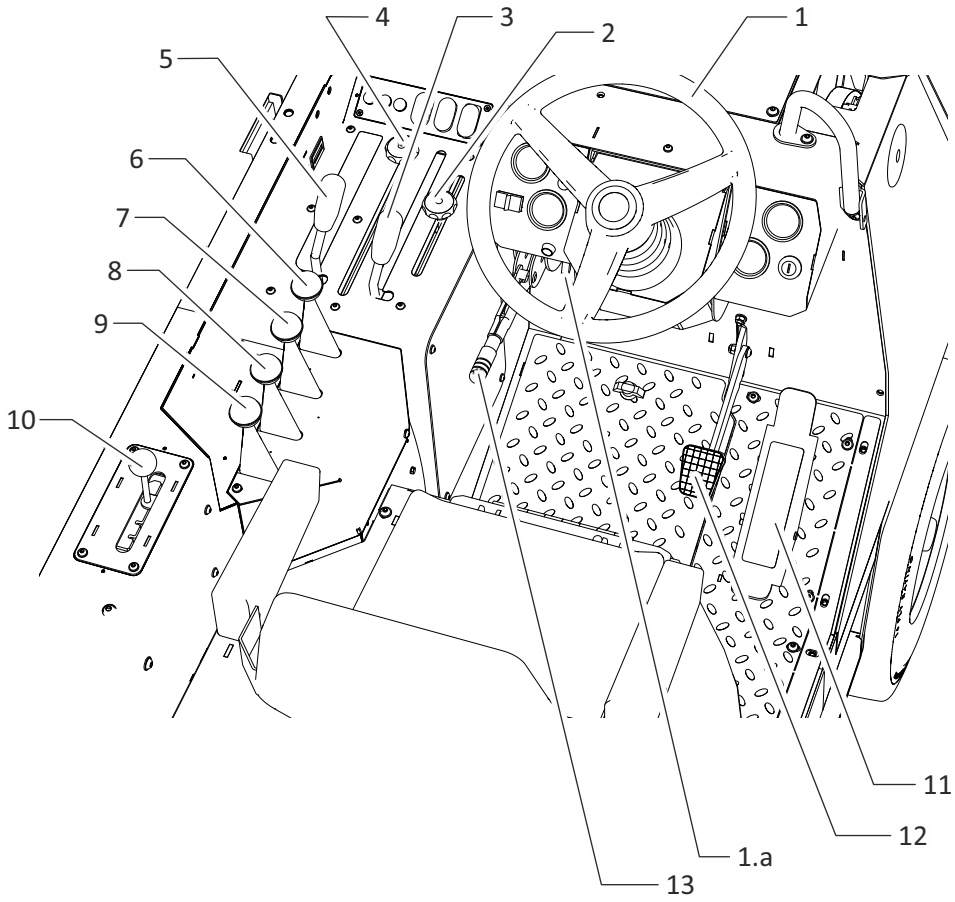
- The rotating main broom (1) throws the debris directly into the hopper (2).
- The side broom (3) sweeps the edges and corners and moves the debris to the path of the main broom.
- The fine dust from the swept debris is sucked by a centrifugal fan (4) through a filter (5).

## *USEFUL TIPS:*

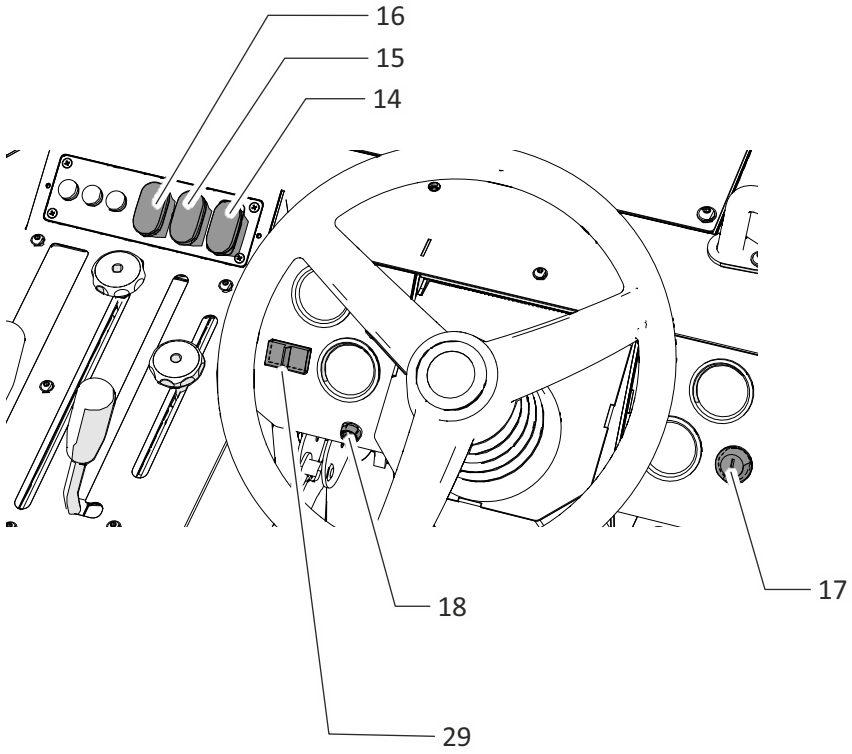
- ✓ Never sweep long packing straps, ropes, threads, twines or wires as it could get entangled with the main and side broom and damage its mechanism.
- ✓ Avoid driving in water logged area.
- ✓ Position the machine in the direction that the wind blows the dust away from the machine.
- ✓ For optimum cleaning results, match the driving speed with the area to be swept.
- ✓ Bypass the vacuum if sweeping in a damp area as it may damage the filter.
- ✓ Clean the dust filter at regular intervals depending upon 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 atleast 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.

## *CONTROLLING AND INDICATING ELEMENTS*

### *Control Elements*

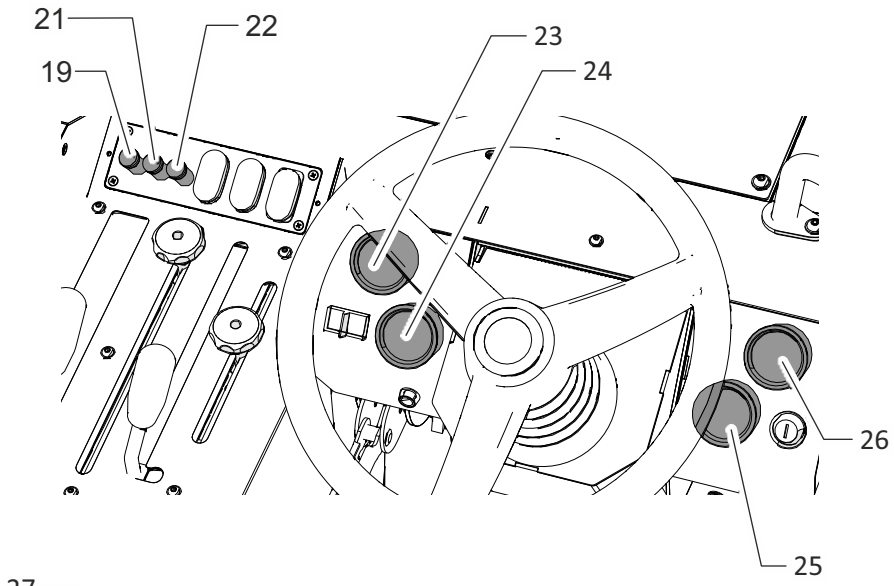


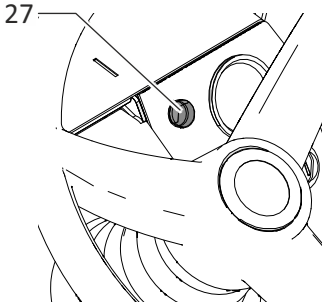

### *Switches*

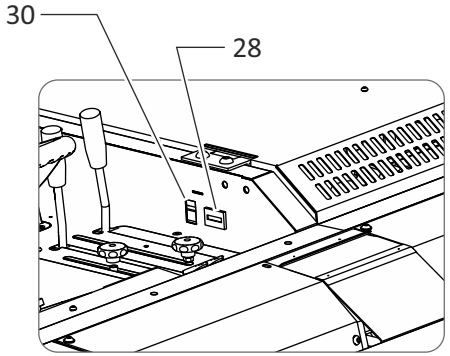


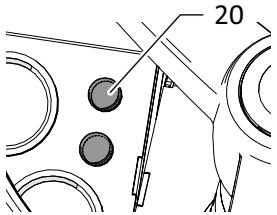
## *CONTROLLING AND INDICATING ELEMENTS*

### *Indicating Gauges and Lamps*



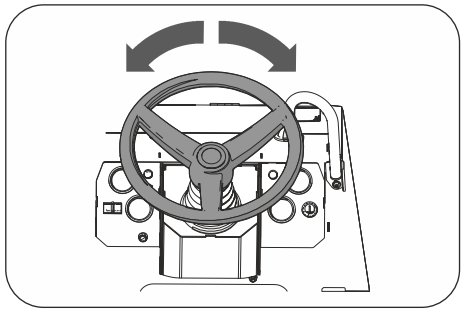




1. **Steering wheel**
1.a. **Steering tilt adjustment lever**
2. **Side broom adjustment knob**
3. **Side broom raise/lower lever**
4. **Main broom adjustment knob**
5. **Main broom raise/lower lever**
6. **Main & Side broom on/off lever**
7. **Hopper door open/close lever**
8. **Debris Compact System (DCS) activate lever**
9. **Hopper raise/lower lever**
10. **Throttle adjustment lever**
11. **Direction control pedal**
12. **Service 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. **Fire in hopper indicating lamp (if equipped)**
20. **Hydraulic oil filter clog indicating lamp**
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. **Battery charge indicating lamp**
28. **Hourmeter**
29. **Turn signal indicator switch**
30. **LH side brush actuator switch** *(if equipped)*

# MACHINE OPERATION

## *CONTROLLING AND INDICATING ELEMENTS*

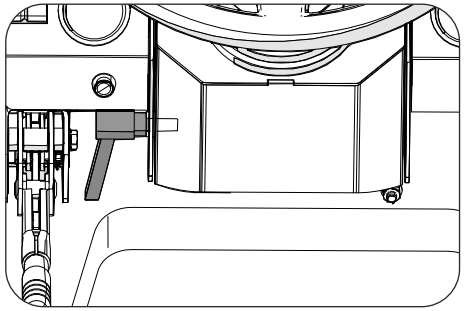
**1. Steering Wheel:**



The steering wheel controls the machine's direction. The machine is very responsive to the steering wheel movements.

***LEFT*** **-** Turn the steering wheel to the left.
***RIGHT*** **-** Turn the steering wheel to the right.

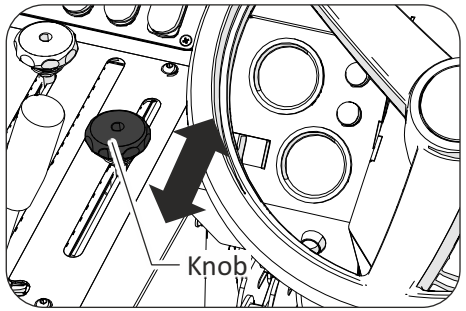
**1.a. Steering Wheel Adjustment Lever:**



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.

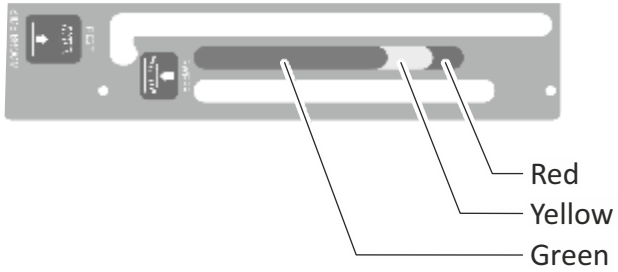
**2. Side Broom Adjustment Knob:**




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

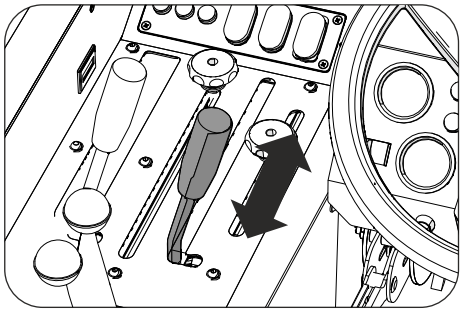
The purpose of this knob is to adjust the brush pressure to achieve the required cleaning intensity and also to compensate for the brush wear.

***GREEN*** **-** Optimum broom available
***YELLOW*** **-** Broom nearing end of its life cycle
***RED*** **-** Broom completely worn out - replace with new recommended spare broom.



## *CONTROLLING AND INDICATING ELEMENTS*

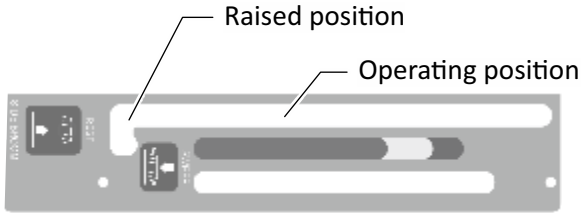
**3. Side Broom Raise/Lower Lever:**



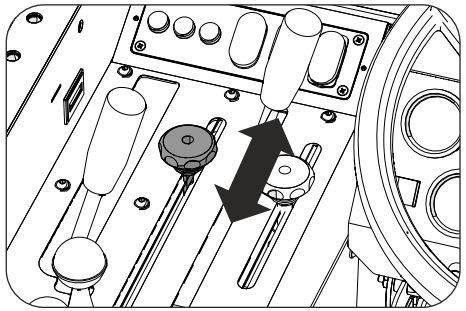
The side broom can be stowed and deployed via a lever on the operator's console.

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


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

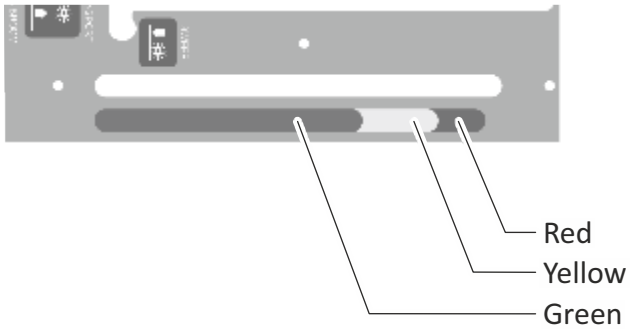

**4. Main Broom Adjustment Knob:**



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

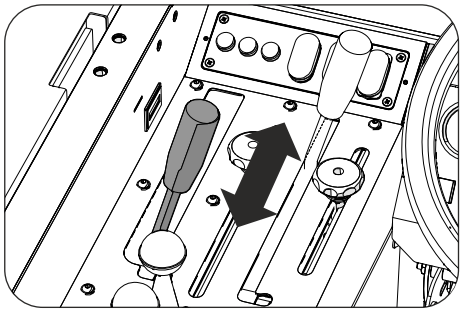
The purpose of this knob is to adjust the brush pressure to achieve the required cleaning intensity and also to compensate for the brush wear.

***GREEN -*** Optimum broom available
***YELLOW -*** Broom nearing end of its life cycle
***RED -*** Broom completely worn out - replace with new recommended spare broom.



## *CONTROLLING AND INDICATING ELEMENTS*

**5. Main Broom Raise/Lower Lever:**



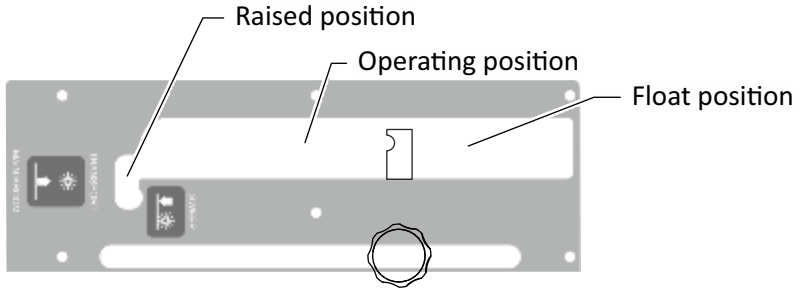
The main broom can be stowed and deployed via a lever on the operator's console.

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

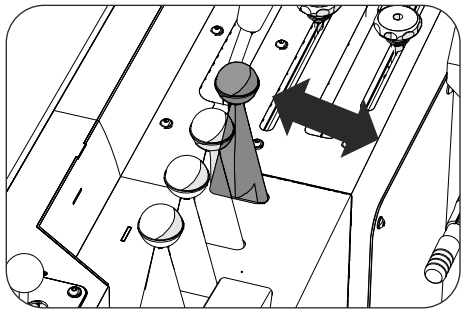

***Lever position backward -*** To store (raise) the main broom pull the lever.


***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:**



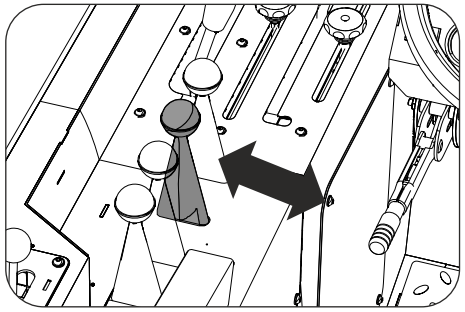
The main broom and side broom On/Off are controlled via a lever on the operator console.

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

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

## *CONTROLLING AND INDICATING ELEMENTS*

**7. Hopper Door Open/Close Lever:**



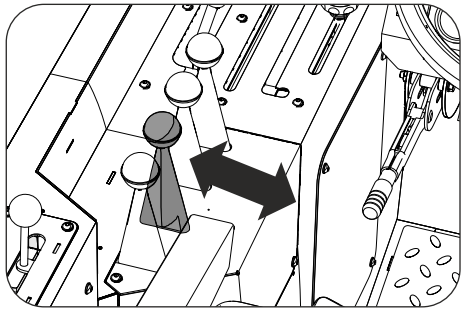
The hopper door open/close are controlled via a lever on the operator console.

***Lever position leftward -*** Hopper door open.

***Lever position rightward -*** Hopper door closed.


***Note:*** *Hopper door automatically opens during sweeping operation. Activating main broom opens the door and deactivating closes the door automatically. To manually operate the hopper door during emptying process use the corresponding levers on the operator's console.*

**8. Debris Compact System (DCS) Lever:**



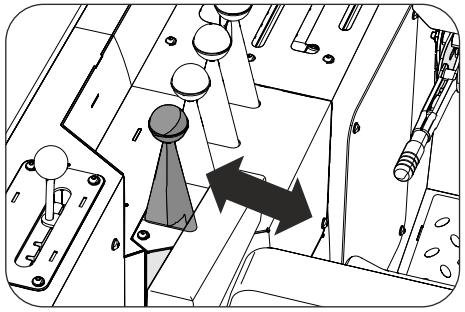
The debris compact system functions are controlled via a lever on the operator console. This DCS move the debris lying near the entrance of the door to the inner end of the hopper.

***Lever position leftward -*** DCS compact mode.


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

## *CONTROLLING AND INDICATING ELEMENTS*

**9. Hopper Raise/Lower Lever:**

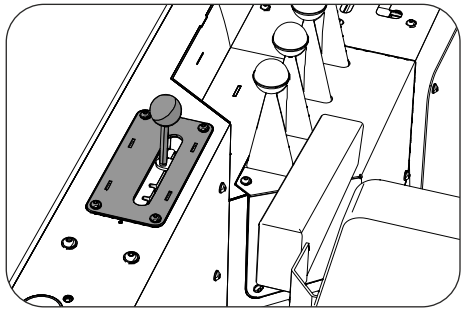


The hopper raising and lowering are controlled via a lever on the operator console.

***Lever position leftward -*** Hopper lowers.

***Lever position rightward -*** Hopper raises.


**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:*

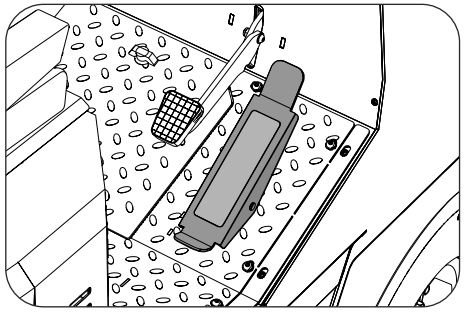

Used for engine/machine idle condition.
(never idle the engine for a long time)


Used for normal driving and sweeping requirements.

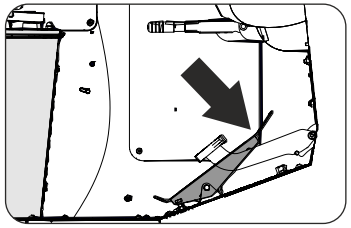

Used for driving on gradients or to sweep at a faster rate or during transport.

## *CONTROLLING AND INDICATING ELEMENTS*

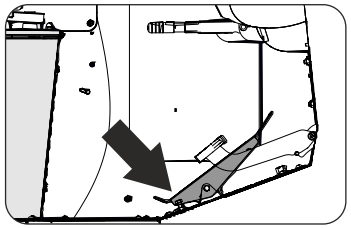
**11. Direction Control Pedal:**



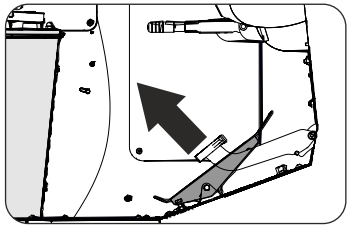
The directional pedal controls direction of travel and the propelling speed of the machine. You change the speed of the machine with the pressure of your foot; the harder you press the faster the machine travels.



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

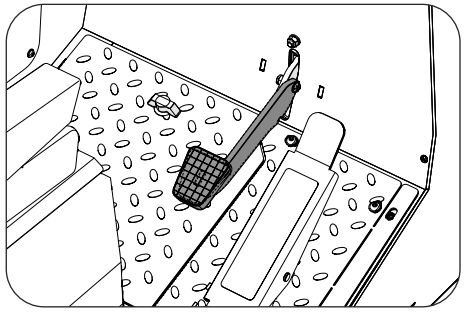


***Reverse:*** Press the bottom of the directional pedal with the heel of your foot.
***Note:*** *It is normal by design to see the machine achieve lower speed during reversing than forward.*

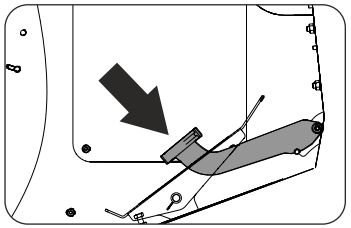


***Neutral:*** Take your foot off the directional pedal and it will return to the neutral position.

**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.

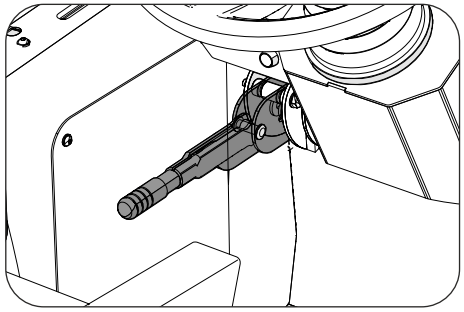


***To Stop:*** Take your foot off the directional control pedal and let it return to the neutral position. Step on the brake pedal.

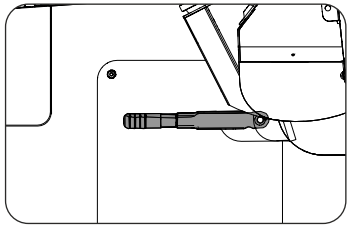
***Note:*** *For normal slowing down of the machine or coming to a stop gently, there is no need to use the brake pedal. Only in case of emergency or during climbing up or down a gradient (ramps, etc.) pressing the brake pedal may be required.*

## *CONTROLLING AND INDICATING ELEMENTS*

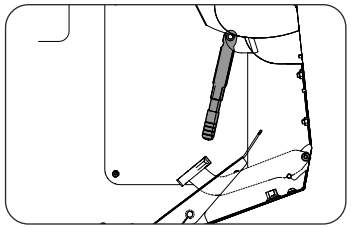
**13. Parking Brake Lever:**



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.



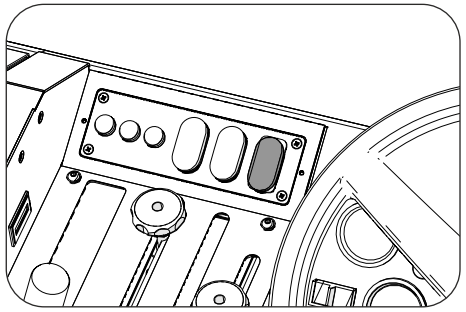
***To Set:*** Pull the parking brake lever up.



***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:**

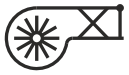


The vacuum by-pass switch is used to activate the by-pass feature of the sweep mechanism to prevent any fluids entering the filters, which may cause damage.

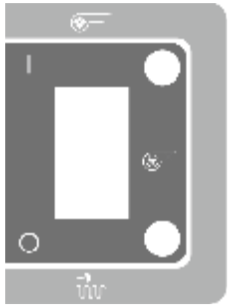
The filter shaker switch is used to activate the vibrator motors to shake off fine dust which are held within the filter, this feature improves the filtration capacity of the filters. Shutting the vacuum by-pass during shaking improves the cleaning effectiveness.

Switch position up: Vacuum On

Switch position neutral: Vacuum bypassed

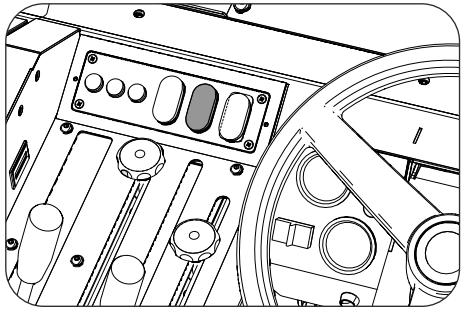


Switch position down: Filter shaker On



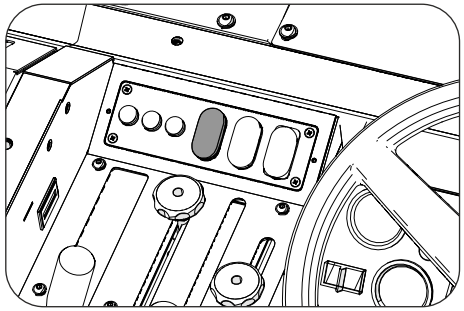
## *CONTROLLING AND INDICATING ELEMENTS*

**15. Headlamp Switch:**



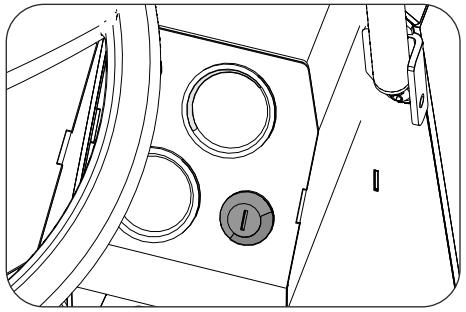
The headlamp switch is used to activate the headlamps, tail lamps & activate the lamp inside the gauges .

**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:**

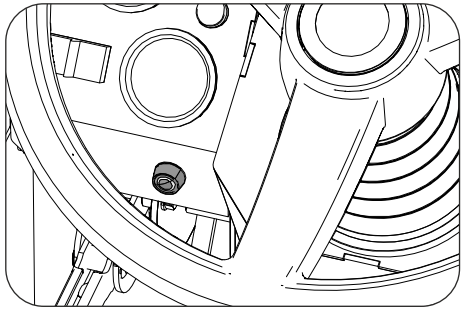


The ignition key switch starts and stops the machine's engine.
It is located at the right hand side of the steering wheel in the operator's console.

***OFF -*** Engine & Electrical's are in Off condition.
***ON -*** Electrical systems are powered up.
***START -*** Engine starts. Release the key as soon as the engine starts.

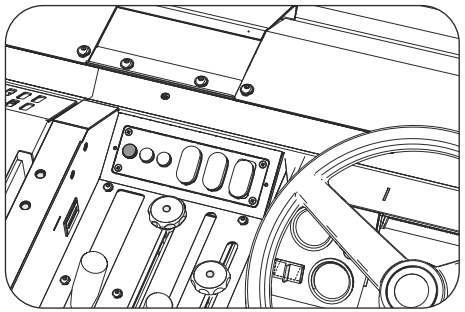
## *CONTROLLING AND INDICATING ELEMENTS*

**18. Horn Switch:**



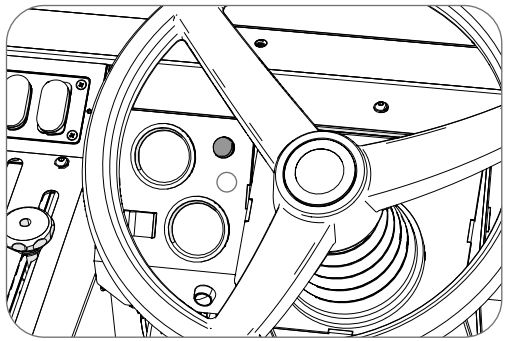
The horn switch is used to activate the horn. Push the switch to honk once.

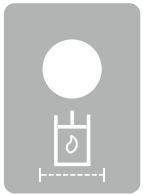
**19. Fire In Hopper Indicator Lamp (if equipped):**



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

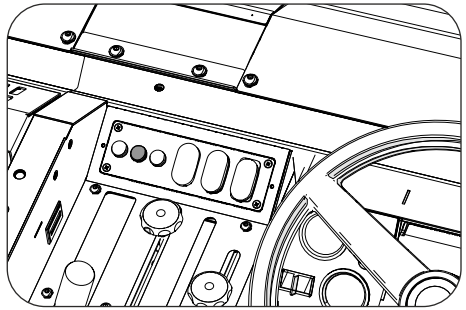
**20. Hydraulic Oil Filter Clog Indicator Lamp:**

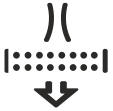




A filter clog indicator lamp is located on the dashboard it glows red to tell the operator that the hydraulic system return line filter is clogged.

**21. Filter Clog Indicator Lamp (if equipped):**





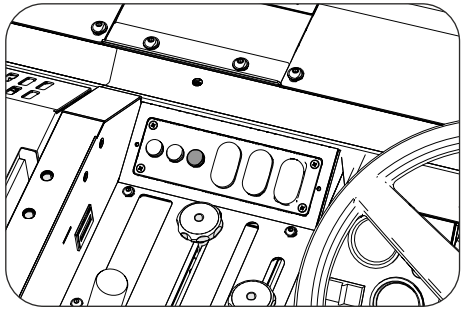
The filter clog lamp glows when the filters are clogged with dust.

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

***Note:*** If the machine is equipped with a timer or the filter clog system, it automatically operates the filter vibrator for a preset time which can be modified by the operator to suit his sweeping requirements.

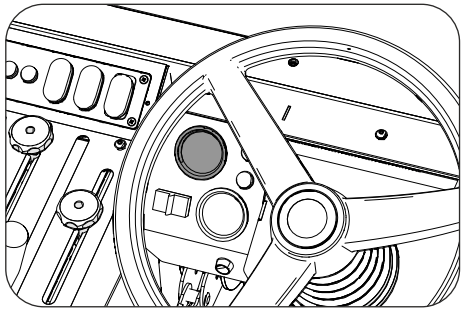
## *CONTROLLING AND INDICATING ELEMENTS*

**22. Parking Brake Indicator Lamp (if equipped):**



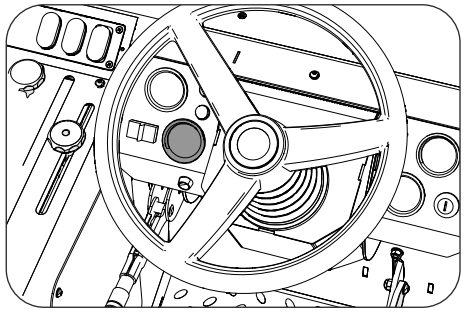
The parking brake lamp glows when the parking brake is engaged to park the machine.

**23. Engine Coolant Temperature Gauge:**



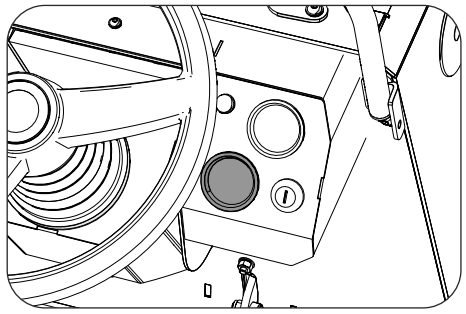
The gauge shows the temperature value of the coolant. The engine will automatically shut down if the coolant temperature is more than the permitted value. Check the problem and have it corrected immediately.

**24. Engine Oil Pressure Gauge:**

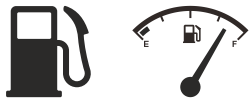


The engine oil pressure gauge is used to inform the operator that the engine oil pressure is lower than the required operating parameter. The engine will automatically shut down if the oil pressure is lower than the permitted value. Check for the cause and correct it then start the engine.

**25. Fuel Gauge:**



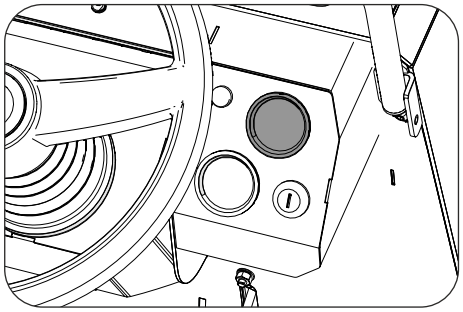
The fuel level gauge indicates how much fuel is in the tank. As the fuel tank empties, the needle moves towards the red zone of the gauge. The fuel tank is empty when the needle points at the RED marker. Always ensure to maintain minimum fuel level to avoid air lock in the fuel system.



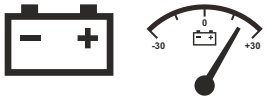
## *CONTROLLING AND INDICATING ELEMENTS*

⚠ ***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.***

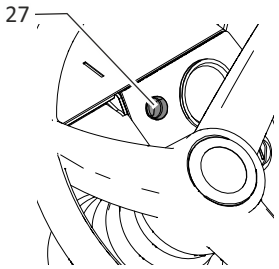
**26. Battery Charging Gauge:**



The ampere gauge shows the performance of the alternator. The needle will indicate -30 to 0 if the alternator is not generating enough power and the needle will indicate 0 to +30 if any of the on-board electrical equipment is drawing power.

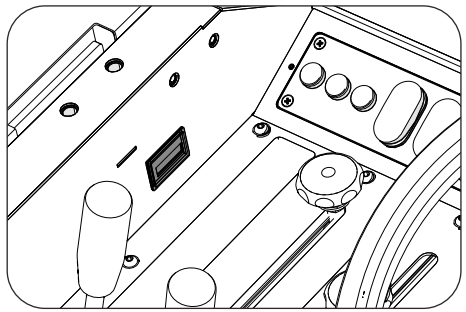



**27. Battery charge indicating lamp:**



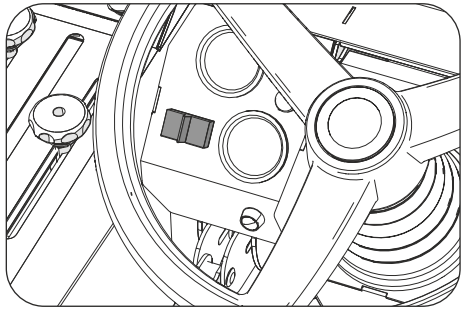

The Battery charge indicating lamp is located on the dashboard, it glows green when the engine is starting.

**28. Hourmeter:**



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

**29. Turn Signal Indicator Switch *(if equipped)*:**



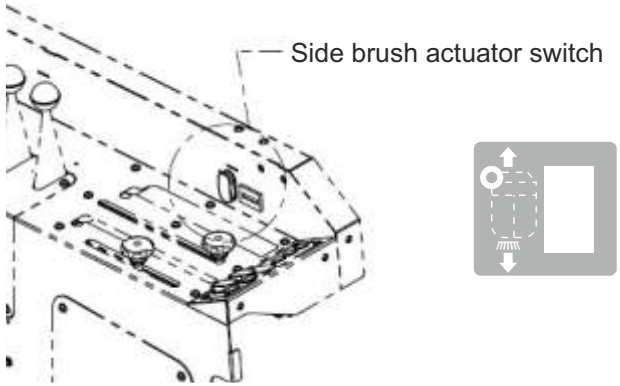
The turn signal indicator switch is used to activate the indicator lamps located at the front and rear of the machine while turning to left or right. The blinking is indicated in the switch itself.

***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.***

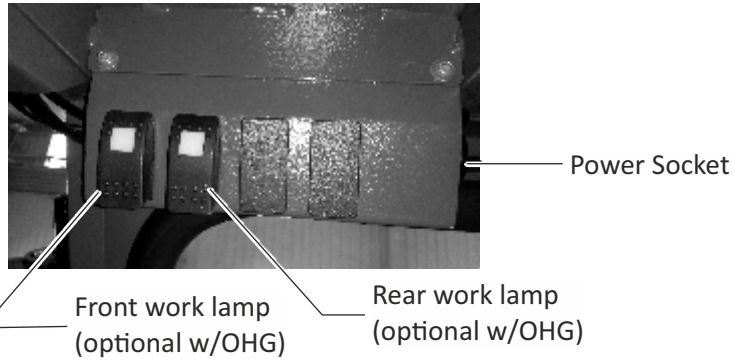
## *CONTROLLING AND INDICATING ELEMENTS*

**30. 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.

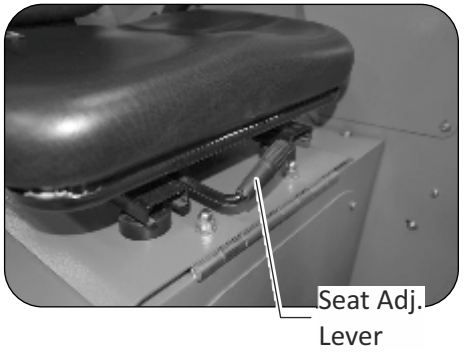
**Work Lamp Switches:**




The work lamp switches and power socket are Located in above the operator seat in left hand side of the over head guard.

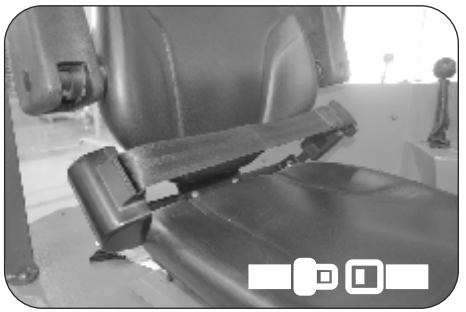
**Operator Seat:**

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.

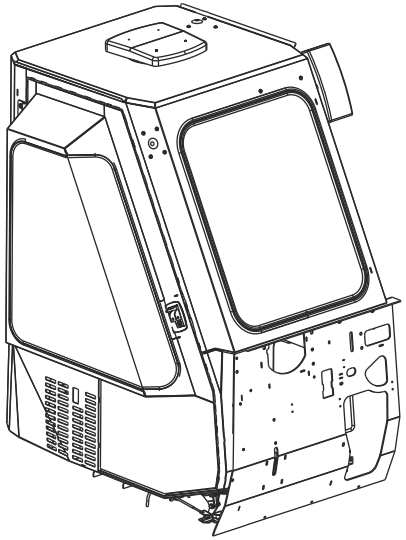
⚠ ***WARNING: Do not adjust the seat while the machine is in motion.***



⚠ ***WARNING: Do not wear or remove the seat belt while the machine is in motion.***

***Note:*** *Optional operator presence switch - Engine shut's off automatically if operator leaves the seat.*

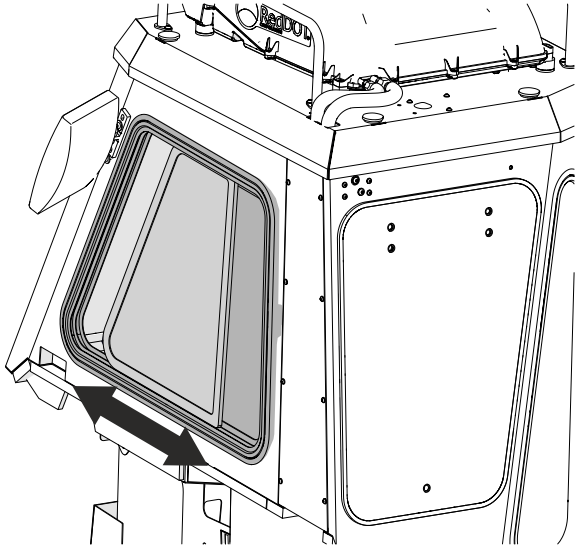
## *CABIN KIT ( If Equipped )*



The cabin system (if equipped) is used to keep the operator comfortable in hot climate, and protect the operator from overhead falling of any debris.

**Cabin Features**

***Sliding Window***

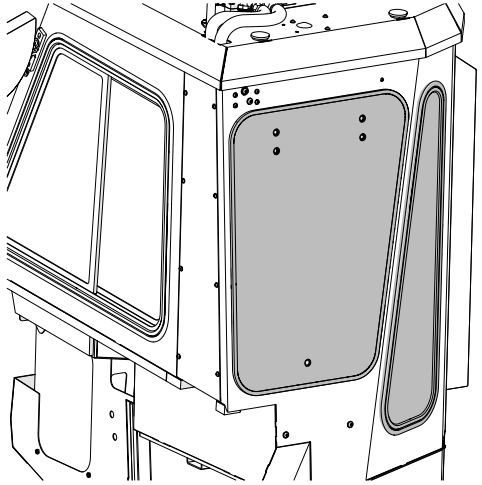


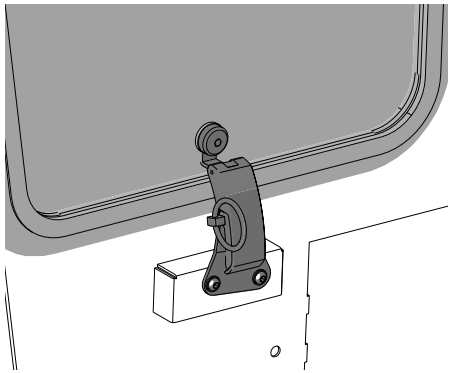
The cabin features a sliding window to add convenience to the operator. To open the window release the lock and slide the window sector backwards. To close the window sector, push the window forward till it locks.
The adjust the rear view mirror open the sliding window.

***WARNING***

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

***Rear Emergency Exit & Rear Window***



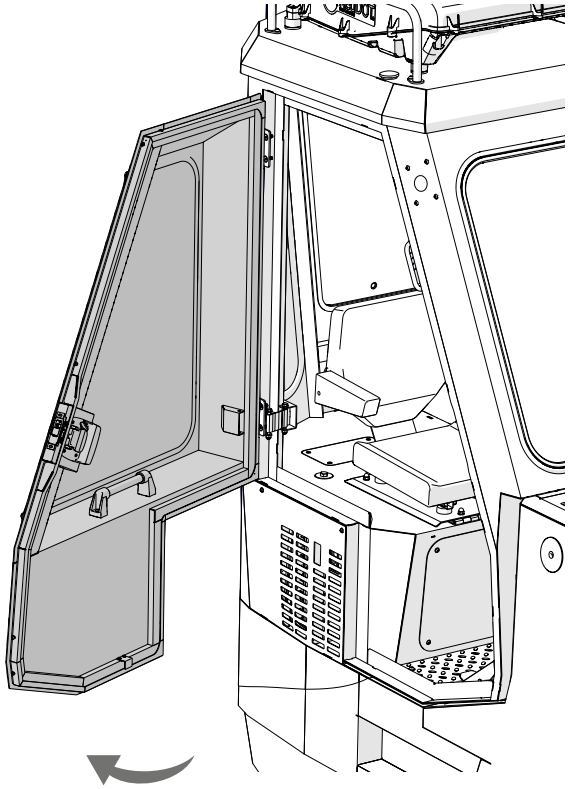


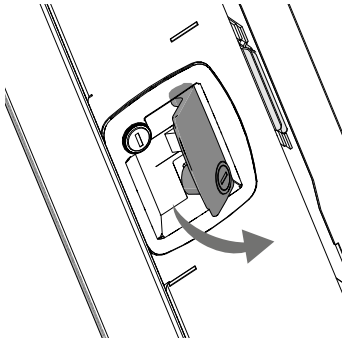
The cabin features a Emergency Exit Window located at the rear of the cabin. During normal operation of the machine this window is kept closed and is secured by a safety toggle lock.
In case of an emergency pull the toggle lock upwards, remove the retaining linch pin and push the window outwards.
***Note:*** Check the toggle lock for functionality during maintenance intervals. If damaged replace the lock unit.

***WARNING***

***Do not play with the toggle lock unit.***

***Main Cabin Door***

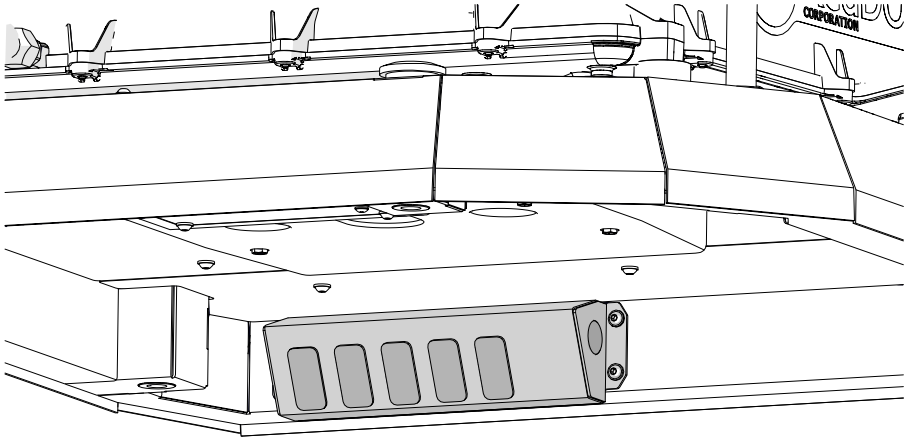




The main cabin door opens outwards. It has a lock mechanism to secure the door when the machine is in operation. It has a bubble glass to help the operator look at the sides during sweeping.
The door can be locked when the machine is not in use.
***Note:*** Keep the door closed during sweeping, to prevent 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

***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

## *INITIAL STARTUP*

***Pre-Operative Checklist***

- ➔ *Check the engine oil level.*
- ➔ *Check the engine coolant level.*
- ➔ *Check the radiator and oil cooler fins for debris.*
- ➔ *Check the hydraulic system 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, threads,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 ,damage and proper sealings.*
- ➔ *Check the brakes and steering for proper operation.*
- ➔ *Check the hand brake 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.*

## *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
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.

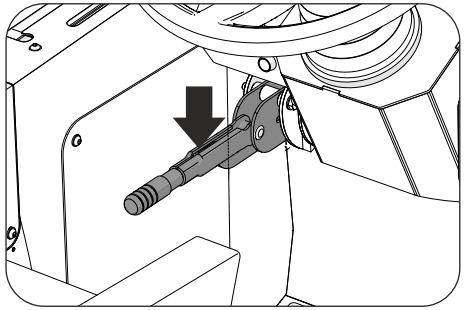
***WARNING:***

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

## *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.

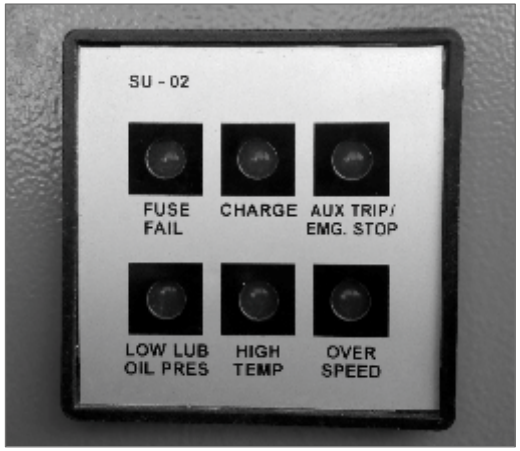

Idle engine speed

3. Turn the ignition key clock wise to get electrical system On and turn clockwise again to start the engine.

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

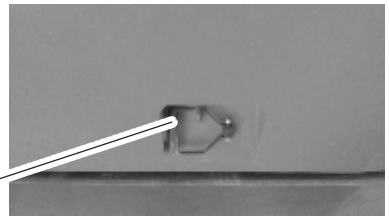
⚠ ***WARNING: This machine emits toxic gases. Severe respiratory damage can be caused. Provide sufficient ventilation.***

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.*



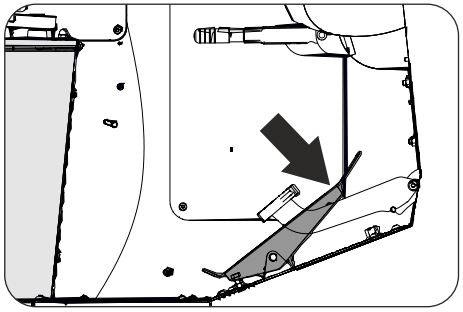

4. Throttle should be in *normal sweep* position.


Medium engine speed

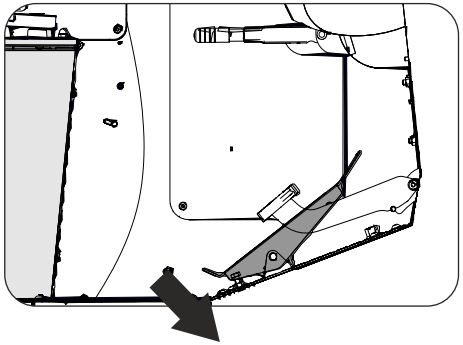
## *DRIVING THE MACHINE*

***Driving:***

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



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



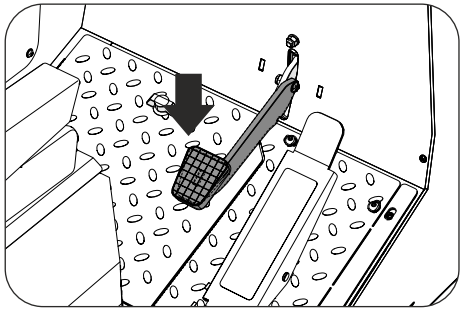
7. The speed of the machine varies with the pressure in which the directional control pedal is pressed.

***Warning : When driving over a ramp, extra caution should be taken, as not to damage the machine, drive slowly over a ramp or a speed breaker.***

***Do not drive fast on a rough patch of road, might damage the machine.***

***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 and the engine.***

***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.
- ☞ Do not drive the machine at puncture condition.
- ☞ Do not Tilt the hopper in inclined surface.

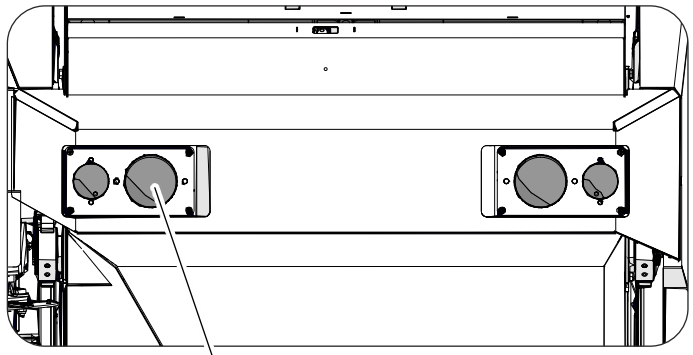
***CAUTION: Exercise caution for oncoming vehicles and other equipments, stationary objects, people or animals.***

## *DRIVING THE MACHINE*

***Driving With Headlamps & Optional Work Lamps:***

9. Use the headlamps to provide illumination in dark or low lit areas.

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

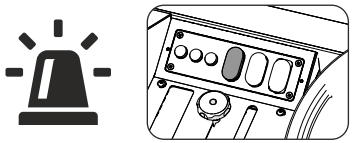


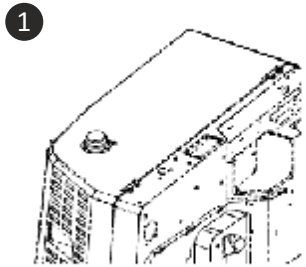


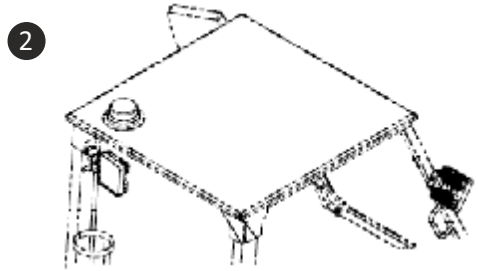

Front/Rear work lamp with OHG (optional)
(Over Head Guard - OHG)

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

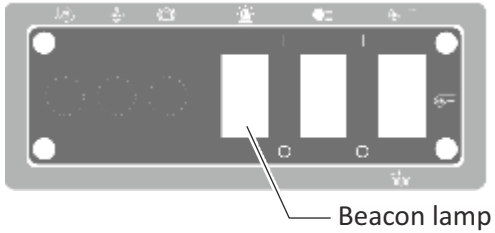
10. Always use the rotating warning beacon lamps (if equipped) when driving/operating the machine to warn others in the vicinity of the machine.






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

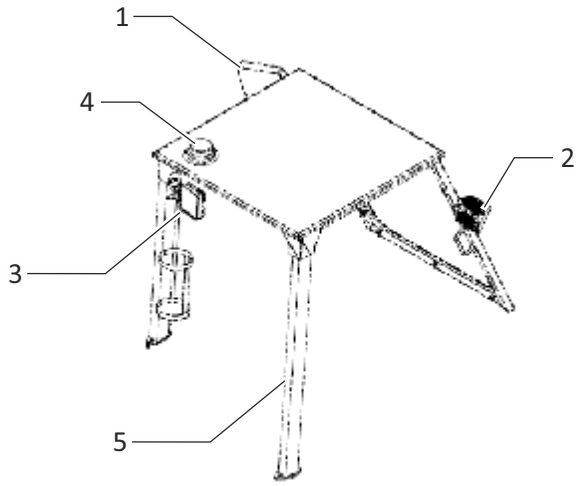



Push the switch downwards to switch on the beacon lamp.

# MACHINE OPERATION

## *DRIVING THE MACHINE*

11. The machine can be equipped with an optional ***Over Head Guard (OHG)*** to protect the operator from overhead falling of any debris.
    The OHG can also be equipped with a Rear view mirror, Warning beacon lamp & Auxiliary LED work lamps.



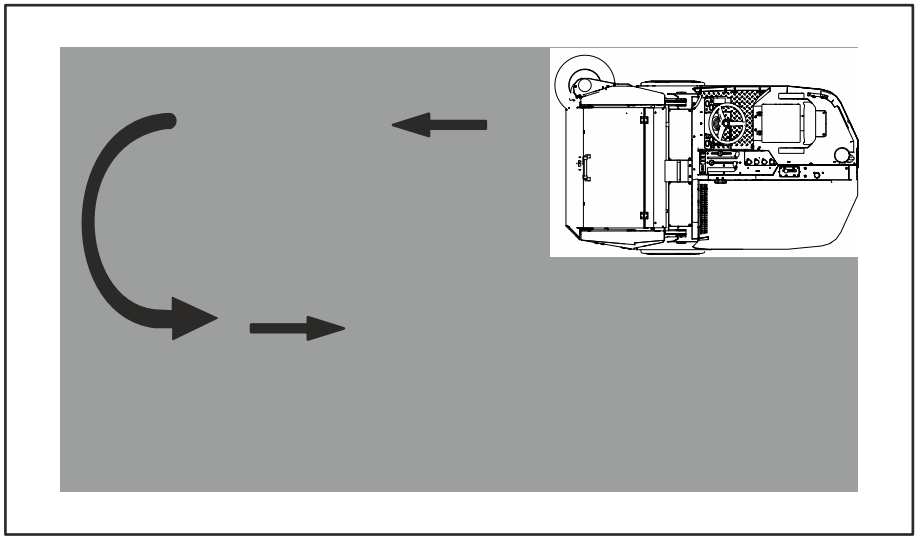

1. Rear view mirror
2. Front optional work lamp
3. Rear optional work lamp
4. Warning beacon lamp
5. Over head guard (OHG)

## *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.



## *SWEEPING*

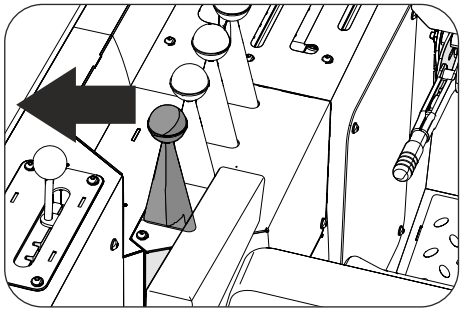
***Start Of Sweeping:***

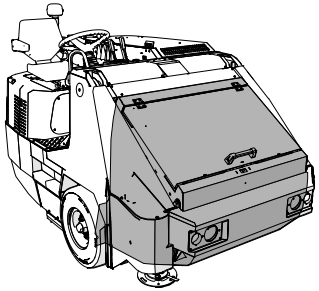
1. Set throttle positions as required.


Medium engine speed - For normal flat surfaces.


Higher engine speed - For sweeping on inclined surfaces.

2. Hopper should be completely lowered.

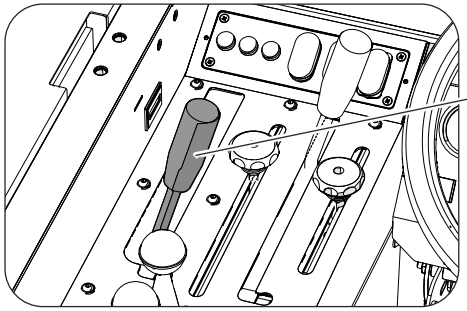




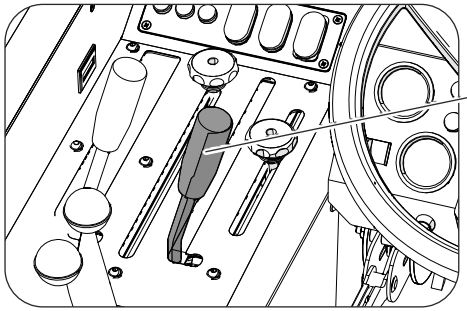
*Lever position leftward* - Hopper lowers.

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

3. Lower the main broom and side broom.




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

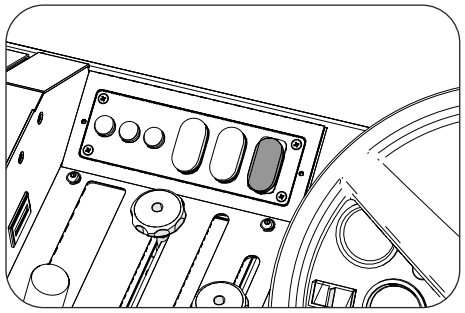


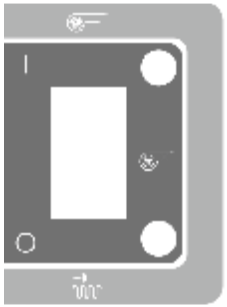

Release the lever from the notch and push it forward to lower the side broom if edge cleaning is required.

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

## *SWEEPING*

4. Ensure vacuum suction is switched On.





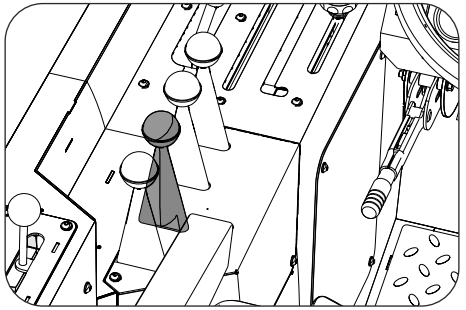
Push the switch upwards to activate the vacuum suction.
The vacuum suction is used to suppress the dust cloud during sweeping.
**Switch off the vacuum suction when sweeping a wet surface.**

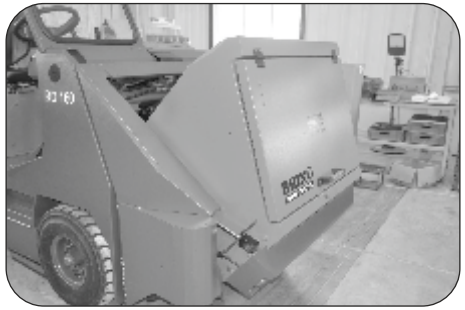
5. Sweep as needed.

***Do not sweep or vacuum:***

***Corrosive/Battery Fluids/Explosive/Flammable***
***Magnetic/Radioactive/Biohazard materials.***

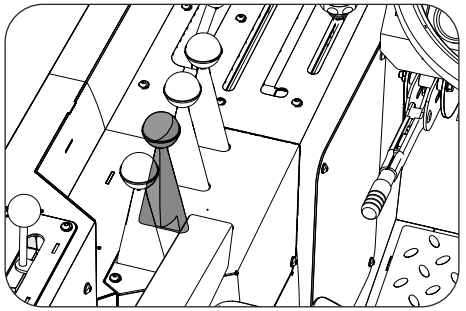
6. Activate the *Debris Compact System (DCS)* lever to move the debris from the rear entrance towards the deep inside of the hopper (compact mode).





**COMPACT**

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



**NORMAL POSITION**

# MACHINE OPERATION

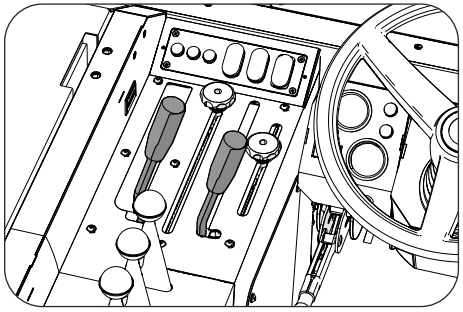
## *SWEEPING*

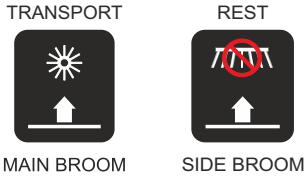
### *End Of Sweeping:*

1. Switch Off main broom and side broom.

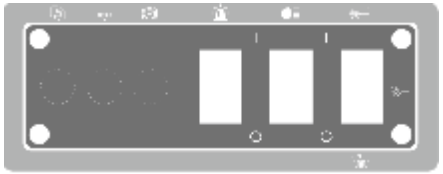
MB-ON & SB-OFF

2. Raise the main broom and side broom.






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

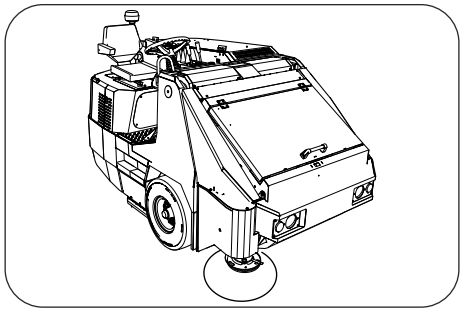


***NOTE:*** The filter shaker switch is of a momentary type: hold down till required, release to switch off.

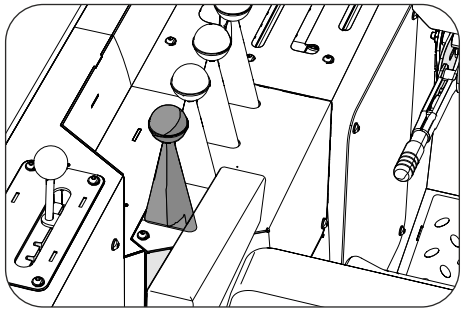
***NOTE:*** If a timer kit is installed in the machine the filter shaker will operate for 10 seconds and shut itself off automatically, upon the switch being pressed once.

### *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

## *SWEEPING*

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

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

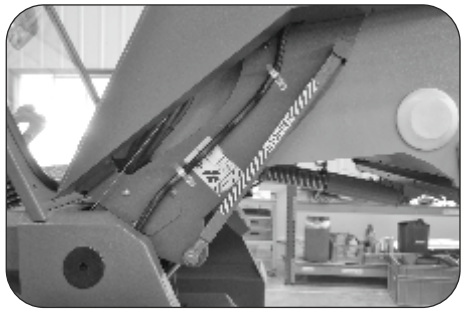
5. Close the door and lower the hopper completely.

6. Reduce throttle position to idle.


7. Engage parking brake.

8. Switch off engine and remove key.

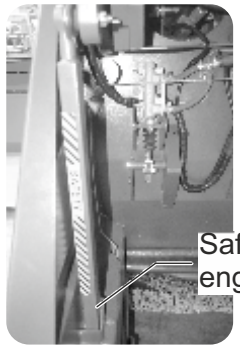
### *Engaging The Hopper Safety Stopper*



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. Engage parking brake.
8. Switch off the engine and remove key.

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



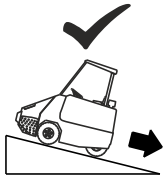
***Disengaging The Hopper Safety Stopper***

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.

---

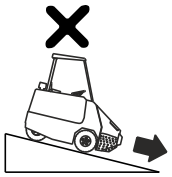
***IMPORTANT SAFETY INFORMATION***

***ALWAYS***

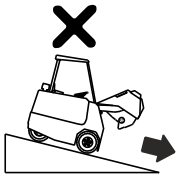


**While sweeping or passing a ramp, always drive the machine with its front side facing uphill.**

***NEVER***



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



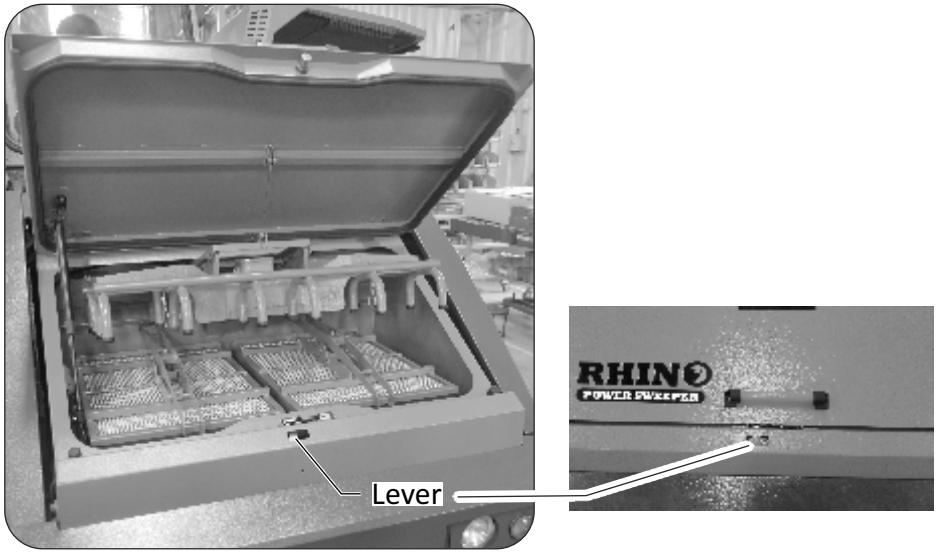
**Driving downhill with a raised hopper is very dangerous and may cause the machine to tip over leading to loss of life or damage to the machine/environment.**

## *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***

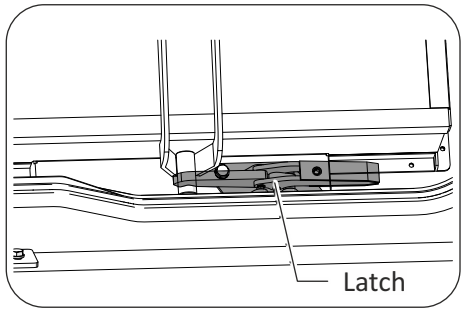
1. Open the filter hopper door: Use the lever to open the hopper filter chamber door.



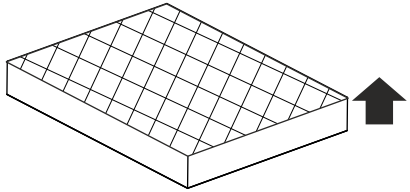

The filter vibrator assembly is attached to the door which in turn lifts upwards when the door is opened revealing the filter panels below.

☞ ***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.



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

☞ Do not use more than 6 psi or 2 bar of pressure.
Do not clean the filter at the bottom side.

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.***

☞ ***DO NOT USE HIGH PRESSURE WATER JET TO CLEAN THE FILTERS.***

***Always wear eye and nose protection when doing so.***

☞ **Do not smoke.**

# *MAINTENANCE*

# MAINTENANCE

## *PREVENTIVE MAINTENANCE*

**Preventive Maintenance Instructions**

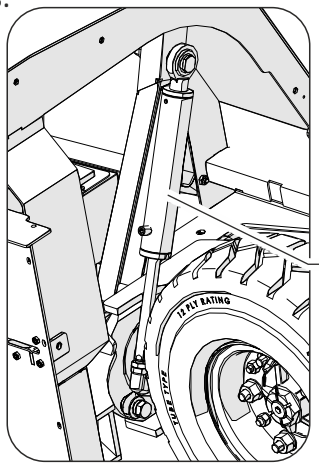
## LUBRICATION

**Engine:**

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

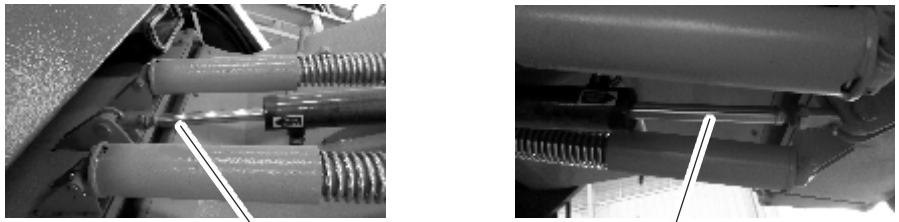
**Rear Wheel Actuator**

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




**Hopper Actuator**

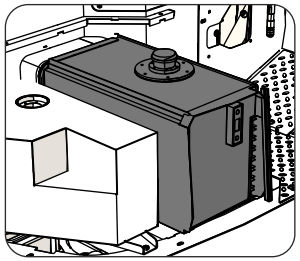
The hopper actuator pivots the hopper. The actuator has a grease fitting to lubricate the bearings.

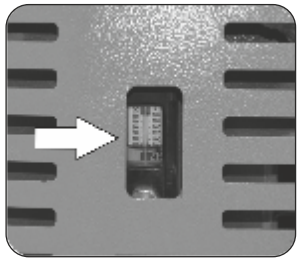


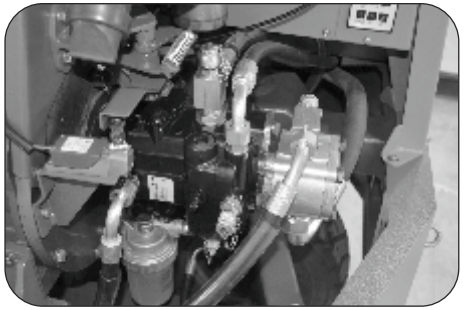

## HYDRAULICS

**Fluid tank for Hydraulic System**

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.







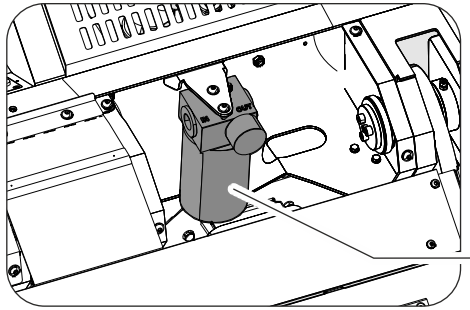
Check the hydraulic oil level at operating temperature every 100 hours of operation.
Ensure that the hopper is in completely lowered position.
The sight gauge is marked with FULL (black line) and ADD (red line) levels to indicate the level of hydraulic oil in the tank.

⚠ ***WARNING:***
***Do not overfill the hydraulic oil tank beyond the limit.***
***Do not operate machine with low level of hydraulic oil. Damage to the hydraulic system may occur.***

# MAINTENANCE

## *PREVENTIVE 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.

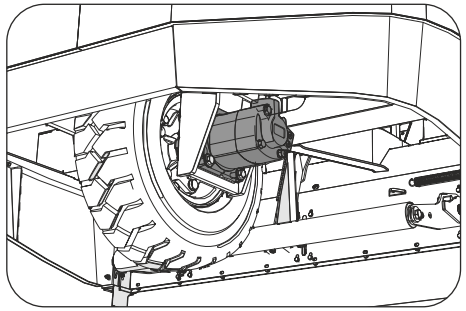



**Hydraulic Hoses**

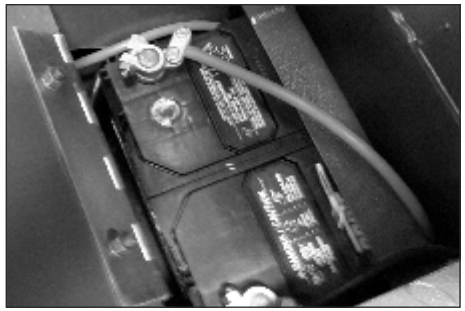
Check the hydraulic hoses for leak,wear or damage.
Pressurized hydraulic oil escaping from a small hole in the hose may lead to severe injury & damage to hydraulic system components.
Seek medical help if any injury has been caused by pressurized hydraulic oil.
If any oil leak has been detected contact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

**Hydraulic Traction Motor**

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

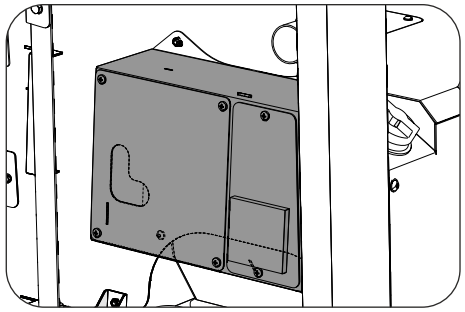


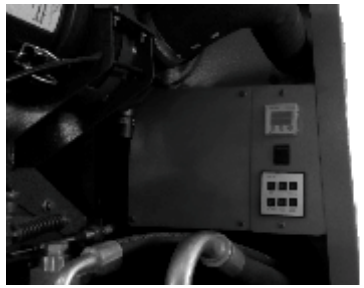
**Battery**



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.
Clean the battery terminals, apply petroleum jelly and tighten the fasteners properly.

**Electrical System**

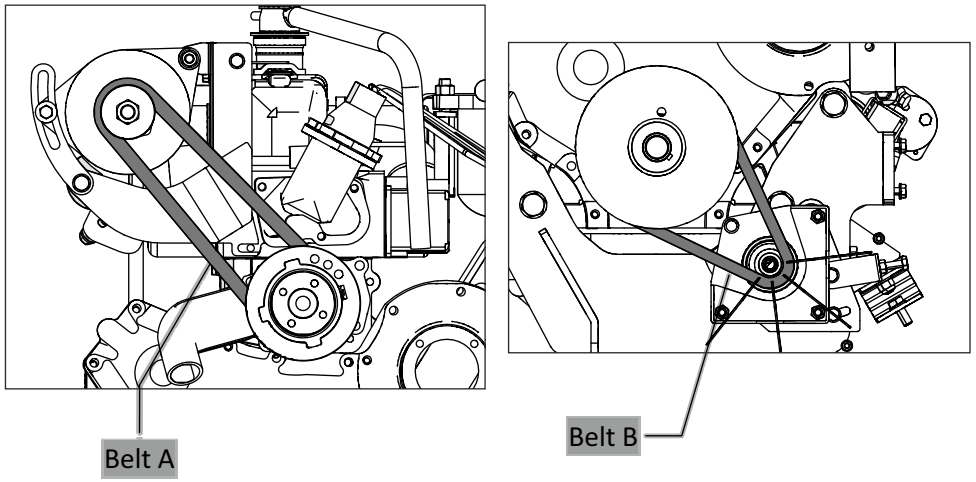




The electrical system of the machine has safety fuses to prevent any overloading or short circuit. Check the fuses.
The electrical system is located within the engine bay of the machine, open the engine hood to view the electrical system.

## *PREVENTIVE MAINTENANCE*

### Belts




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

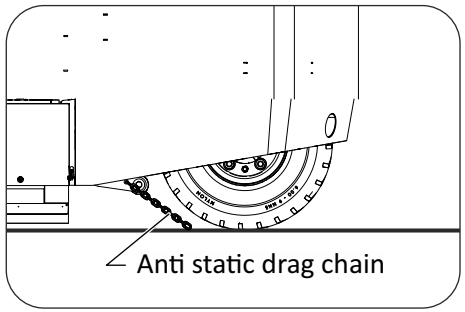
**Belt tensions**

Belt A - 45±5 Hz
Belt B - 75±5 Hz

Check and adjust belt tension.

⚠ ***WARNING: Rotating belt and fan. Keep away.***


### 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.

## *PREVENTIVE MAINTENANCE*

**To replace the dust filters**

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

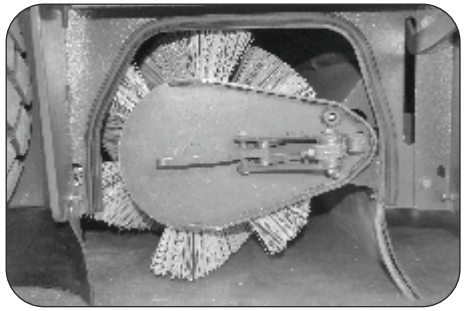
1. Open the hood of the filter chamber using the latch.
2. Operate the toggle clamps to remove the filter holder.
3. Remove the old filter.
4. Replace with a new filter.
5. Secure the new filter by locking the toggle clamps.

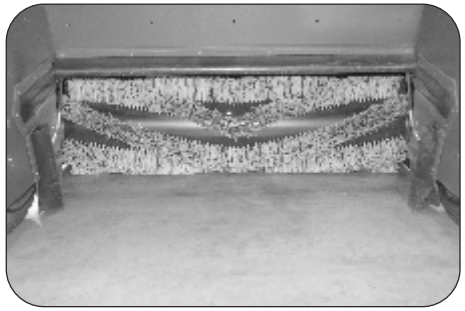
***CAUTION: Do not drop the filter down.***

Filter perforation is facing upwards and proper seated within the chamber as shown in figure.

## BROOMS

**Main Broom**





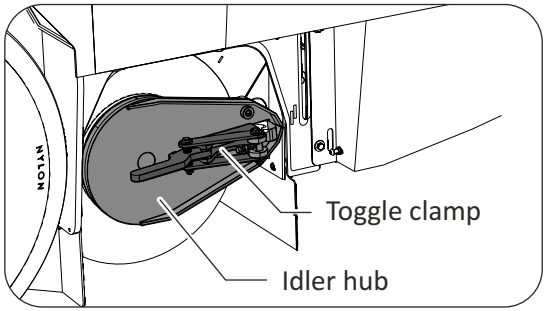
- The main broom used in the machine is of a cylindrical type and spans the width of the machine.
- The main broom sweeps the debris into the hopper.
- Check the main broom everyday for wear or damage.
- Remove any wires, ropes or strings from the main broom to avoid damage to the main broom, drive hub 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:***

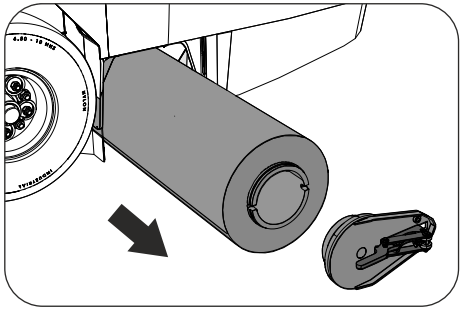
1. Park the machine on a flat surface.
2. Engage parking brake.
3. Raise the main broom.
4. Stop the engine.
5. Remove key.
6. Open the left side door of the broom compartment.

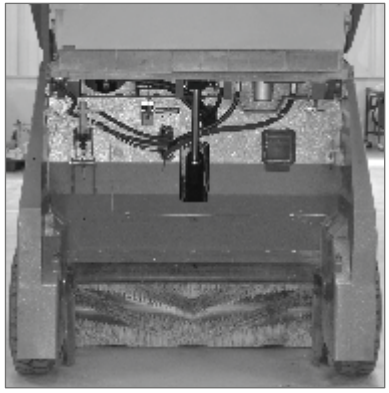
# MAINTENANCE

## *PREVENTIVE MAINTENANCE*




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.**





Forward

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.

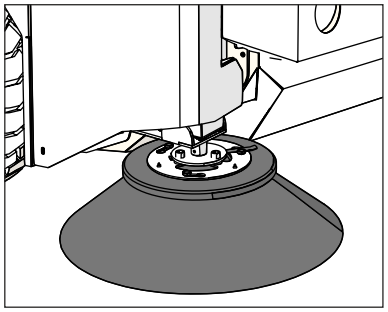
**Main broom pattern checking and adjusting**

1. Apply white chalk powder 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).

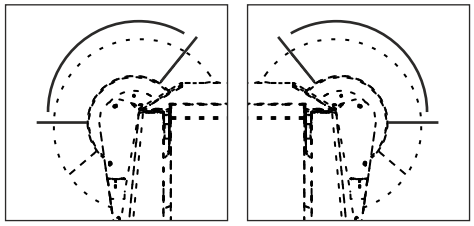

***Note:***
***Use only brooms recommended by the manufacturer.***
***Improper tire pressure will affect the main broom pattern setting, maintain recommended tire pressure at all times.***

## *PREVENTIVE MAINTENANCE*

**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.

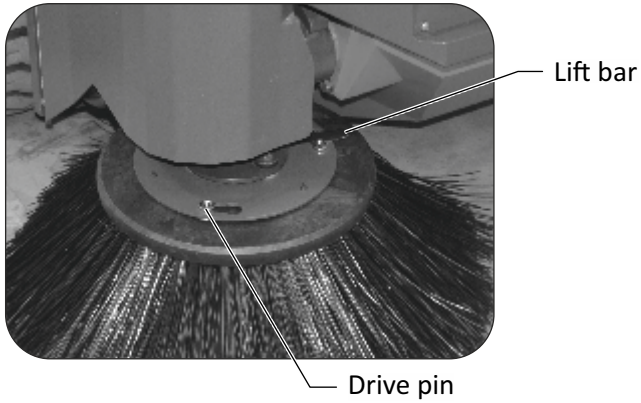


Left Side Broom Right Side Broom

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

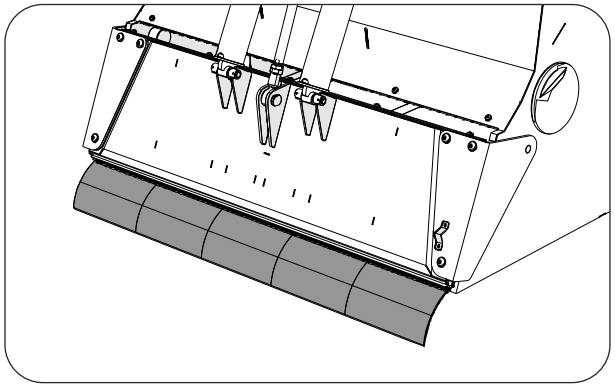
***To replace the side broom:***

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 (worn out/old) from its drive plate.
6. Slide a new side 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.



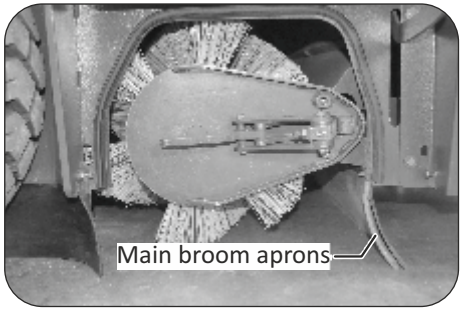

***NOTE: Use only brooms recommended by the manufacturer.***

## *PREVENTIVE MAINTENANCE*

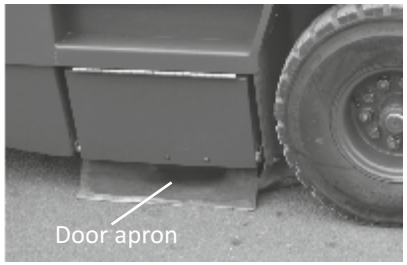


The dirt hopper aprons are located at the bottom rear of the hopper.
The aprons float over the debris to direct it into the hopper.
These aprons are prone to wear due to friction.
Inspect these aprons everyday, replace if it is damaged to it no longer contacts the floor.
The dumping door aprons are segmented ones. Inspect them for wear or damage and replace if necessary.

### Main broom chamber aprons

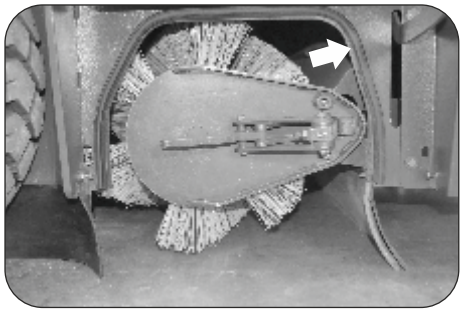



The broom chamber aprons are located on the bottom side of each door and at the rear of the main broom around the chassis.
Each of these aprons will be in contact with the floor at all times.
Check the aprons for wear or damage and adjust them if necessary.



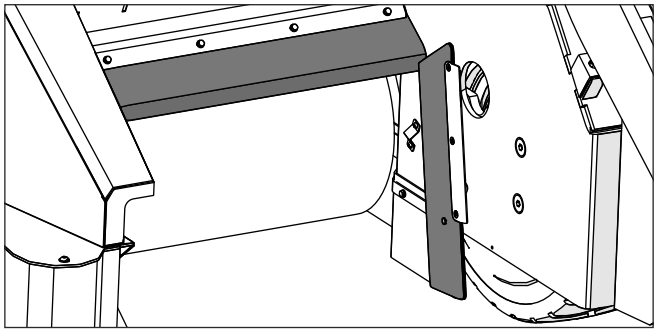

***NOTE: Tire pressure will affect the apron clearance, maintain recommended tire pressure at all times.***

### 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



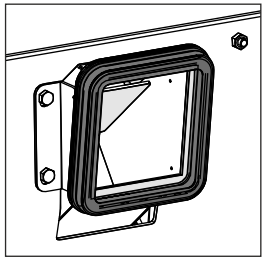
## *PREVENTIVE MAINTENANCE*

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 leak forwear 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.

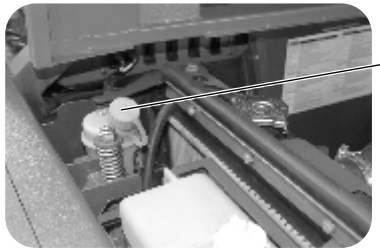
### Hopper vacuum fan seal



The hopper vacuum fan seal is located on the inlet bracket.
Check the seals for wear or damage and replace if necessary.

## TIRES AND BRAKES

### Brakes

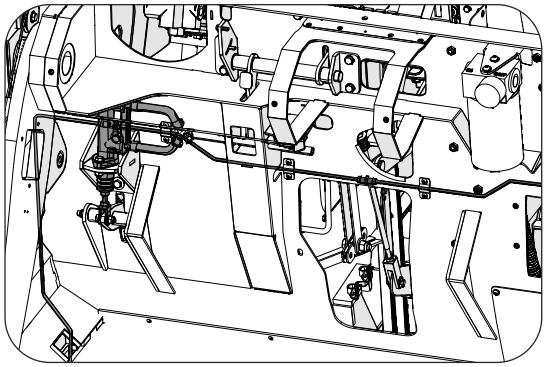



The hydraulic brakes are located on the front wheels which are of a drum type with self adjustment. The master reservoir is located in the engine bay.

***Use only approved brake fluid.***

***Do not spill brake fluid into the environment.***

### Brake fluid lines

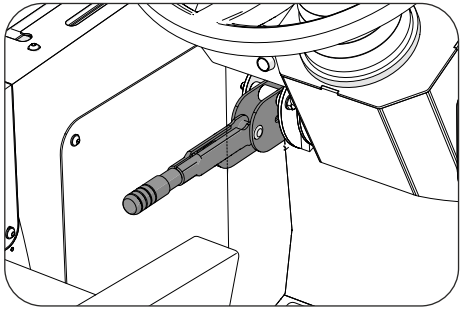


The brake fluid lines are located at the front of the machine chassis which supply brake fluid to the front brakes activated via a brake pedal cylinder. Check the fluid lines and brake pedal cylinder, replace seals if necessary, replace fluid lines if damaged.

# MAINTENANCE

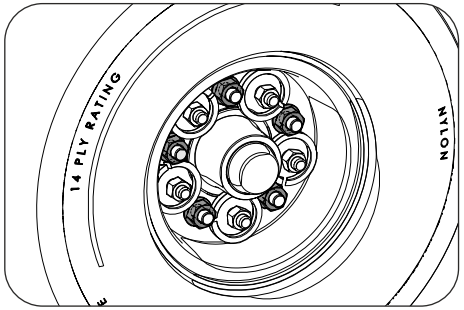
## *PREVENTIVE MAINTENANCE*

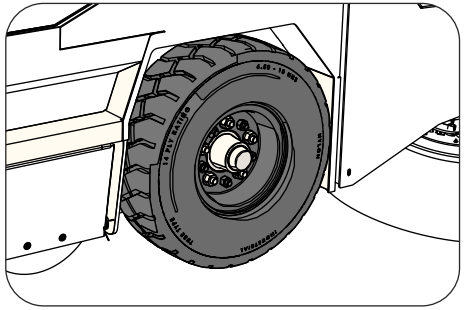
**Parking brake**



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

**Wheels and Tires**



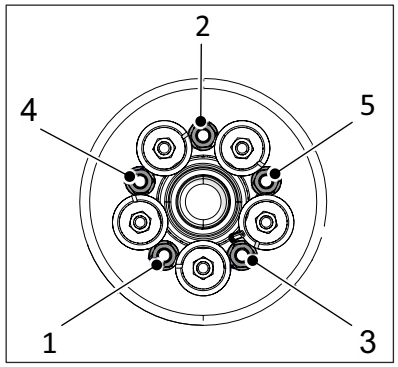



**Wheel motor:**

Torque the shaft nut to 645 Nm plus enough torque to align slotted nut and the shaft hole after the first 50-hours of operation and every 800 hours there after.

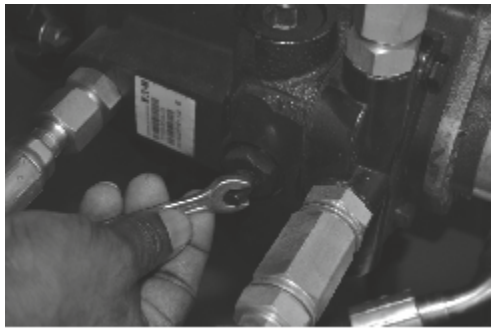
Ensure that the wheel bolts of front and rear wheel are tight at all times.

*For pneumatic tire equipped machine:*
The proper tire pressure is 100 psi at the front and 80 psi at the rear.

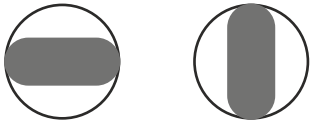



## PUSHING, TRANSPORTING AND TOWING THE MACHINE

**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.***

# MAINTENANCE

## *TRANSPORTING THE MACHINE*

**Transporting the machine**

***Transporting the machine by driving onto a 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.

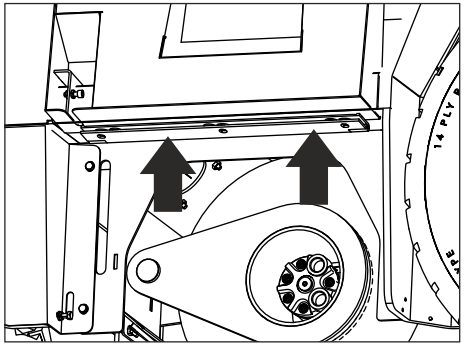
***Ensure that the truck is on a level ground before loading the machine.***

## *PREVENTIVE MAINTENANCE*

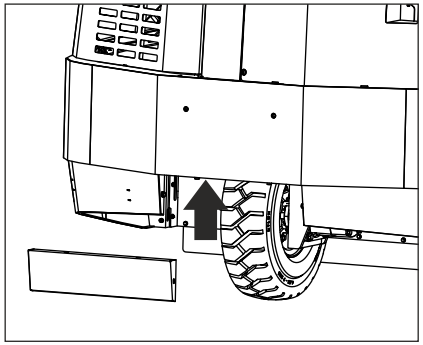
## JACKING THE MACHINE

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 (3Tonnes).
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.

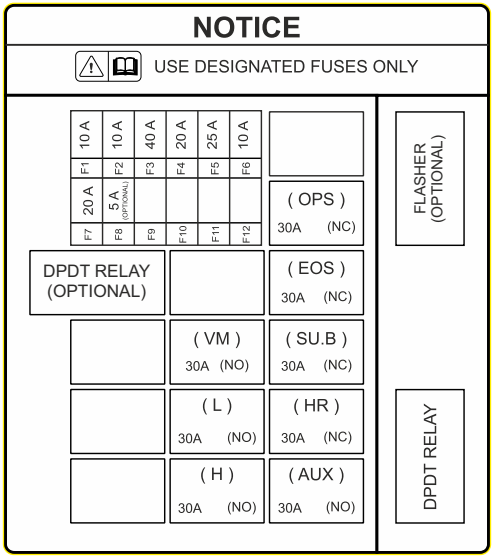
***When servicing or changing tires, block the tires before jacking.***

## STORING THE MACHINE

If the machine has to be stored for a prolonged duration follow the below procedure:

1. Clean the machine completely to remove any dirt.
2. Clean the dust filters and hopper completely.
3. Park the machine in a dry covered place to protect it from the elements.
4. Ensure that the parking brake is engaged.
5. Drain off fuel.
6. Remove ignition key.
7. Place wheel blocks.
8. Cover the machine with an automotive grade cover and secure it.

## ELECTRICAL MAINTENANCE




F1 - 10 AMPS - Dashboard Controls & Ecu Unit
F2 - 10 AMPS - Side Brush, Suction Bypass Relay & Switch
F3 - 40 AMPS - Engine Off Solenoid
F4 - 20 AMPS - Vibrator Motor
F5 - 25 AMPS - Lamps & Horn
F6 - 10 AMPS - Suction Bypass
F7 - 20 AMPS - Optional Accessories
F8 - 5 AMPS - Linear Actuator LH - SB

**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)**

# 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 engine owner's manual, Check water seperator 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. |
| | | Check the air pressure in the tires(for Pneumatic) |
| | **Miscellaneous** | Check belts for wear, Check the hydraulic hoses and fittings visually for any leaks or damage. |
| | **Hoses** | Inspect the air hose from filter to engine for any damage & proper tightness of the hose clamps. |
| Weekly | **Rear wheel & Hopper Actuators** | All purpose grease to be applied for once in a week. |
| 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 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. |
| | **Mainbroom** | Check the mainbroom pattern and readjust if required. |

# MAINTENANCE

## *MAINTENANCE TABLE*

| INTERVAL | MAINTENANCE AREA | THINGS TO CHECK |
|---|---|---|
| 200 Hours | **Engine** | Refer 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 |
| | **Wheel** | check the rear wheel support bearings - Lubrication |
| | **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 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) |
| 1500 Hours | **Wheel** | Check the front and rear wheel nut to maintain the torque 200 Nm. |
| 2500 Hours | **Hydraulic** | Replace the hydraulic oil filter, oil for hydraulic system and suction strainer in hydraulic oil tank. |

# TROUBLESHOOTING

## *TROUBLESHOOTING CHART*

| 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 |
| | Vacuum Bypass switch position | Select Vacuum ON |
| **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

## *TROUBLESHOOTING CHART*

| 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 pistion 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 |
| **Hydralic gear pump failure** | Pump leak | Replace seals or pump |
| | Gears worn out | Rebuild pump |
| **Hydralic gear pump failure** | Relief valve stuck | Clean or repalce |
| | 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

## *TROUBLESHOOTING CHART*

| Problem | Cause | Remedy |
|---|---|---|
| **Hydraulic variable displacement pump failure** | Pump leaking | Replace seals/gaskets |
| | Relief valve(s) stuck | Clean or repalce |
| | 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 repalce |
| | 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'T'S

***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 or leakage 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 broom 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.
- ✓ Apply main broom to float position for uneven surface.
- ✓ By pass the vacuum when operating in wet condition.

***DON'T'S***

- × 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.

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