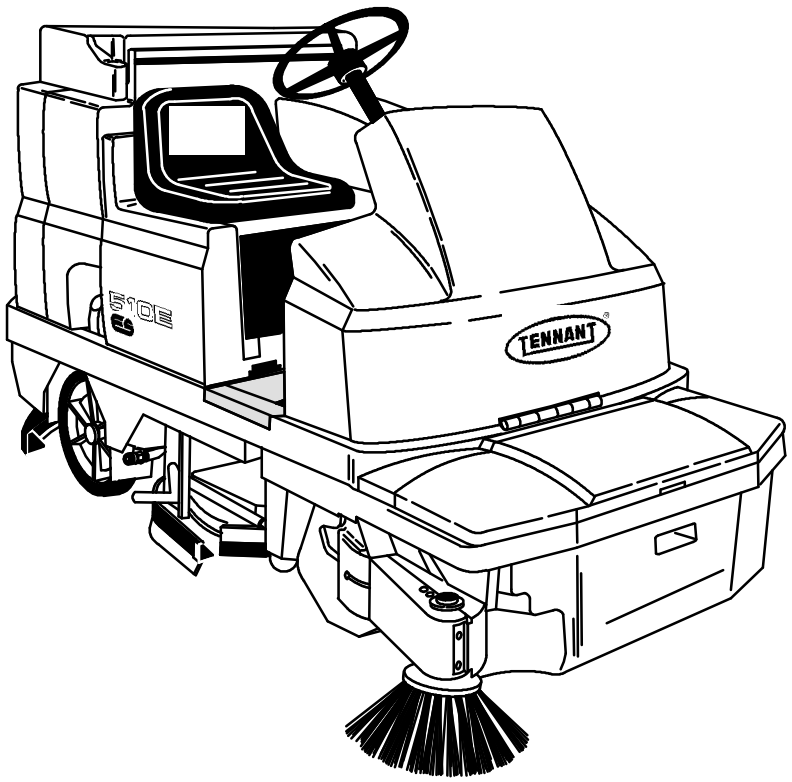
510E

(Operator Manual)



MM239
Rev. 09 (3-95)

This manual is furnished with each new TENNANT Model 510E. It provides necessary operating and preventive maintenance instructions. Read this manual completely and understand the machine before operating or servicing it.

This manual covers all machine variations and standard accessories. The instruction portion of the manual consists of the Specification, Operation, Maintenance, and Appendix sections. The parts portion consists of the Standard Parts; Options; Breakdowns; and Cross Reference sections.

All right side and left side references to the machine are determined by facing the direction of forward travel. All hardware considered to be of a common nature or locally available has been omitted from the parts sections. Be aware that this machine may contain metric hardware. Make sure you use equivalent hardware when replacement becomes necessary.

This machine will provide excellent service. However, the best results will be obtained at minimum costs if:

- The machine is operated with reasonable care.
- The machine is maintained regularly – per the maintenance instructions provided.
- The machine is maintained with TENNANT supplied or equivalent parts.

Parts and supplies may be ordered by phone or mail from any TENNANT parts and service center, distributor, or from any of the TENNANT subsidiaries. Before ordering parts or supplies, be sure to have your machine model number and serial number handy. Fill out the data block below for future reference. The telephone numbers, telex numbers, mailing addresses, and locations of those outlets are listed in the Customer Documents section of the manual.

MACHINE DATA

Please fill out at time of installation.

Machine Serial Number – _____

Engine Serial Number – _____

Sales Representative – _____

Customer Number – _____

Date of Installation – _____

Manual Number – MM239

Revision: 09

Published: 3–95

SAFETY PRECAUTIONS

The following symbols are used throughout this manual as indicated in their description:

WARNING: To warn of hazards or unsafe practices which could result in severe personal injury or death.

FOR SAFETY: To identify actions which must be followed for safe operation of equipment.

The machine is suited for scrubbing disposable debris. Do not use the machine other than described in this manual. The machine is not designed for use on public roads.

The following information signals potentially dangerous conditions to the operator or equipment:

FOR SAFETY:

1. **Do Not Operate Machine:**
   - **Unless Trained And Authorized.**
   - **Unless Operation Manual Is Read And Understood.**
   - **In Flammable Or Explosive Areas Unless Designed For Use In Those Areas.**
   - **In Areas With Possible Falling Objects Unless Equipped With Overhead Guard.**

2. **Before Starting Machine:**
   - **Make Sure All Safety Devices Are In Place And Operate Properly.**
   - **Check Brakes And Steering For Proper Operation.**

3. **When Starting Machine:**
   - **Keep Foot On Brake And Directional Pedal In Neutral.**

4. **When Using Machine:**
   - **Use Brakes To Stop Machine.**
   - **Go Slow On Inclines And Slippery Surfaces.**
   - **Use Care When Reversing Machine.**
   - **Do Not Carry Riders On Machine.**
   - **Always Follow Safety And Traffic Rules.**
   - **Report Machine Damage Or Faulty Operation Immediately.**

5. **Before Leaving Or Servicing Machine:**
   - **Stop On Level Surface.**
   - **Set Parking Brake.**
   - **Turn Off Machine And Remove Key.**

6. **When Servicing Machine:**
   - **Avoid Moving Parts. Do Not Wear Loose Jackets, Shirts, Or Sleeves.**
   - **Block Machine Tires Before Jacking Machine Up.**
   - **Jack Machine Up At Designated Locations Only. Block Machine Up With Jack Stands.**
   - **Use Hoist Or Jack Of Adequate Capacity To Lift Machine.**
   - **Wear Eye And Ear Protection When Using Pressurized Air Or Water.**
   - **Disconnect Battery Connections Before Working On Machine.**
   - **Avoid Contact With Battery Acid.**
   - **Use TENNANT Supplied Or Approved Replacement Parts.**

WARNING: Batteries Emit Hydrogen Gas. Explosion Or Fire Can Result. Keep Sparks And Open Flame Away. Keep Covers Open When Charging.

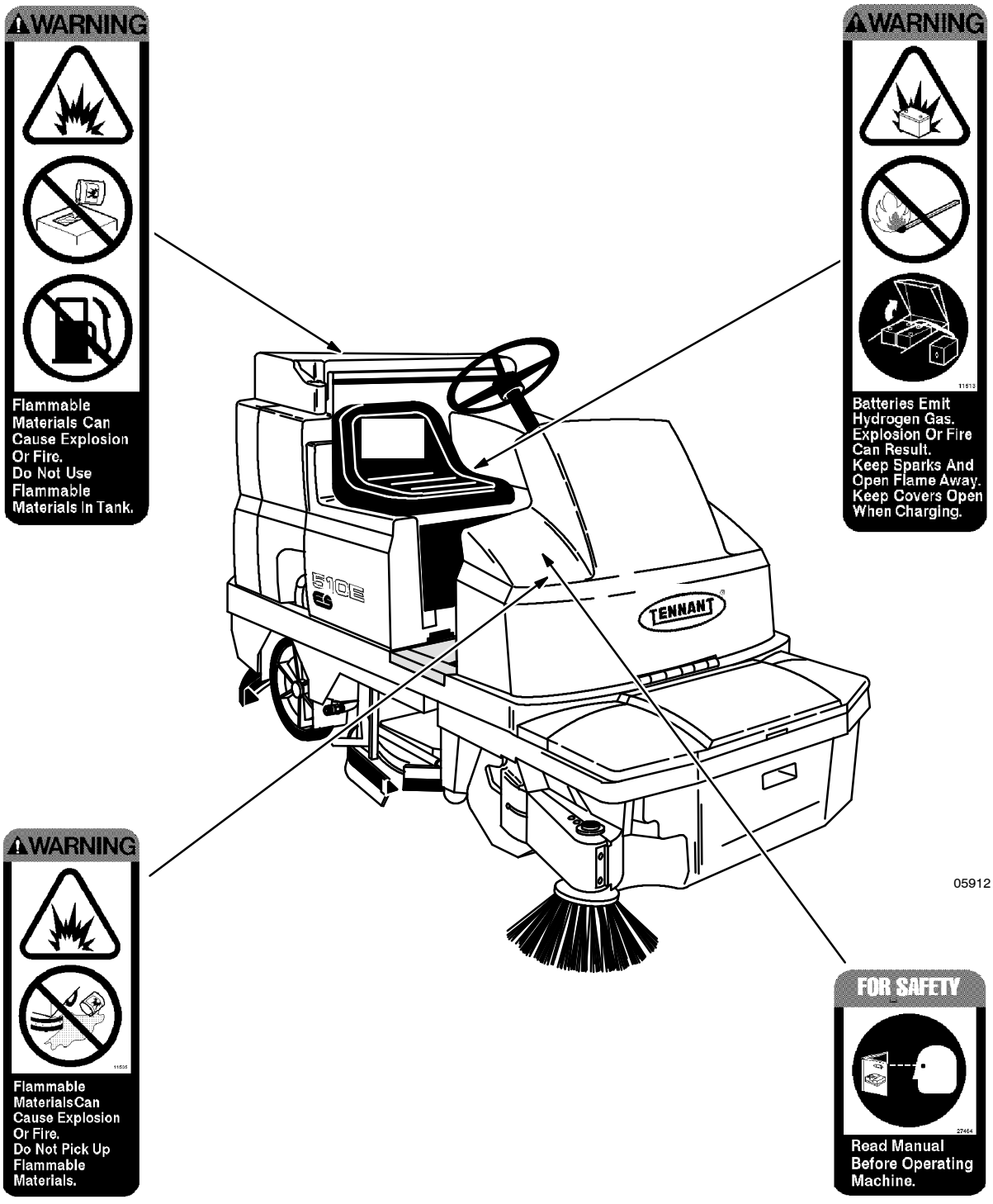
WARNING: Flammable Materials Can Cause An Explosion Or Fire. Do Not Use Flammable Materials In Tank(s).

WARNING: Flammable Materials Or Reactive Metals Can Cause Explosion Or Fire. Do Not Pick Up.

The following safety labels are mounted on the machine in the locations indicated. If these, or any labels become damaged or illegible, install a new label in its place.

CLEANING SOLUTION LABEL - LOCATED ON TANKS COVER.

BATTERY CHARGING LABEL - LOCATED ON LINTEL.



FLAMMABLE SPILLS LABEL - LOCATED ON MOTOR COVER PANEL.

FOR SAFETY LABEL - LOCATED ON MOTOR COVER PANEL.

CONTENTS

SECTION 1

CONTENTS

MACHINE SPECIFICATIONS

POWER TYPE

Electric propelling motor – nominal voltage 36 VDC, 2 hp (1.5 kW) @ 2000 rpm
Electric vacuum fan motor (2) – nominal voltage 36 VDC, 0.85 hp (0.63 kW) @ 14,000 rpm
Electric brush drive motor (2) – nominal voltage 36 VDC, 1 hp (0.75 kW) @ 2200 rpm
Electric heavy duty brush drive motor (option) (2) – nominal voltage 36 VDC, 1.5 hp (1.12 kW) @ 2200 rpm
Electric Pre-Sweep™ motor (option) – nominal voltage 36 VDC, 0.8 hp (0.60 kW) @ 320 rpm
Batteries (3) – 12 V, 380 A/h @ 6 hour rate
(1) 36 V, 570 A/h @ 6 hour rate
Battery charger (option) – 36 VDC 120 A, 208–240–480 VAC, 60 Hz, 1 ph
36 VDC 120 A, 208–240–480 VAC, 60 Hz, 3 ph
36 VDC 120 A, 208–240–480 VAC, 50 Hz, 1 ph
36 VDC 120 A, 208–240–480 VAC, 50 Hz, 3 ph
36 VDC 75 A, 208–240–480 VAC, 50 Hz, 3 ph
36 VDC 75 A, 208–240–480 VAC, 60 Hz, 1 ph
36 VDC 75 A, 208–240–480 VAC, 60 Hz, 3 ph
36 VDC 50 A, 240 VAC, 60 Hz, 1 ph
36 VDC 50 A, 230 VAC, 50 Hz, 1 ph
36 VDC 45 A, 200 VAC, 50 & 60 Hz, 1 ph

POWER TRAIN

Propelling – electric motor to gearbox driven
Scrub brushes – electric motor to gearbox driven
Vacuum fan – electric motor direct driven
Pre-Sweep™ brushes (option) – electric motor belt driven

STEERING

Type – front wheel controlled, universal joint to gear and chain
Power source – manual

BRAKING SYSTEM

Service brakes – mechanical drum brakes (2), 1 per rear wheel, linkage actuated
Parking brake – utilizes service brakes, linkage actuated

SUSPENSION SYSTEM

Front – 16.25 x 6 solid tire (1)
Rear – 16 x 3.5 solid tire (2)

SYSTEM FLUID CAPACITIES

Gearbox grease capacity, propelling – 2.7 qt (2.6 L)
Solution tank capacity – 55 gal (210 L)
Recovery tank capacity – 50 gal (190 L)
Tank capacity with ES™ option – 80 gal (303 L)

GENERAL MACHINE DIMENSIONS - CAPACITIES

Length – 83 in (2110 mm)
Length with Pre-Sweep™ – 97 in (2465 mm)
Width – 42 in (1065 mm)
Width with edge scrub – 47 in (1195 mm)
Height – 57 in (1450 mm)
Height with overhead guard – 80 in (2030 mm)
Track – rear 34.8 in (885 mm)
Wheel base – 42.8 in (1085 mm)

Scrub brush diameter – 20 in (510 mm)
Pre-Sweep™ main brush (option) diameter – 8 in (205 mm)
Pre-Sweep™ main brush (option) length – 36 in (915 mm)
Pre-Sweep™ side brush (option) diameter – 13 in (330 mm)

Scrubbing path width – 40 in (1015 mm)

Pre-Sweep™ hopper capacity – 0.75 cu ft (0.02 m^3) 75 lb (34 kg)

Rear squeegee path width – 47.5 in (1210 mm)

MACHINE WEIGHTS

GVWR – 4600 lb (2087 kg)

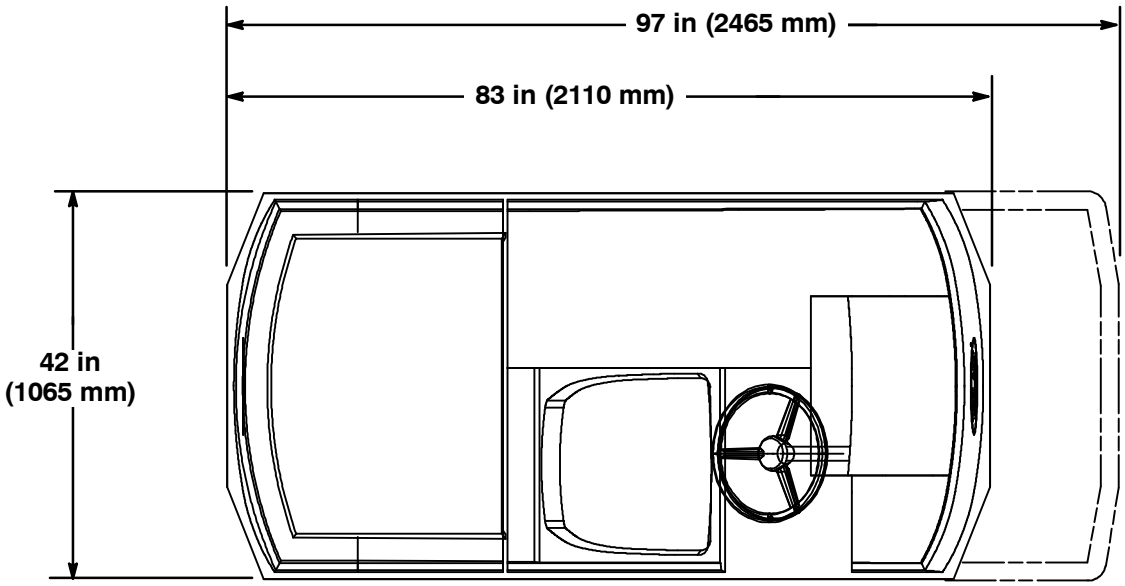
GENERAL MACHINE PERFORMANCE

Maximum forward speed – 5 mph (8 km/h)
Maximum reverse speed – 3 mph (4.8 km/h)

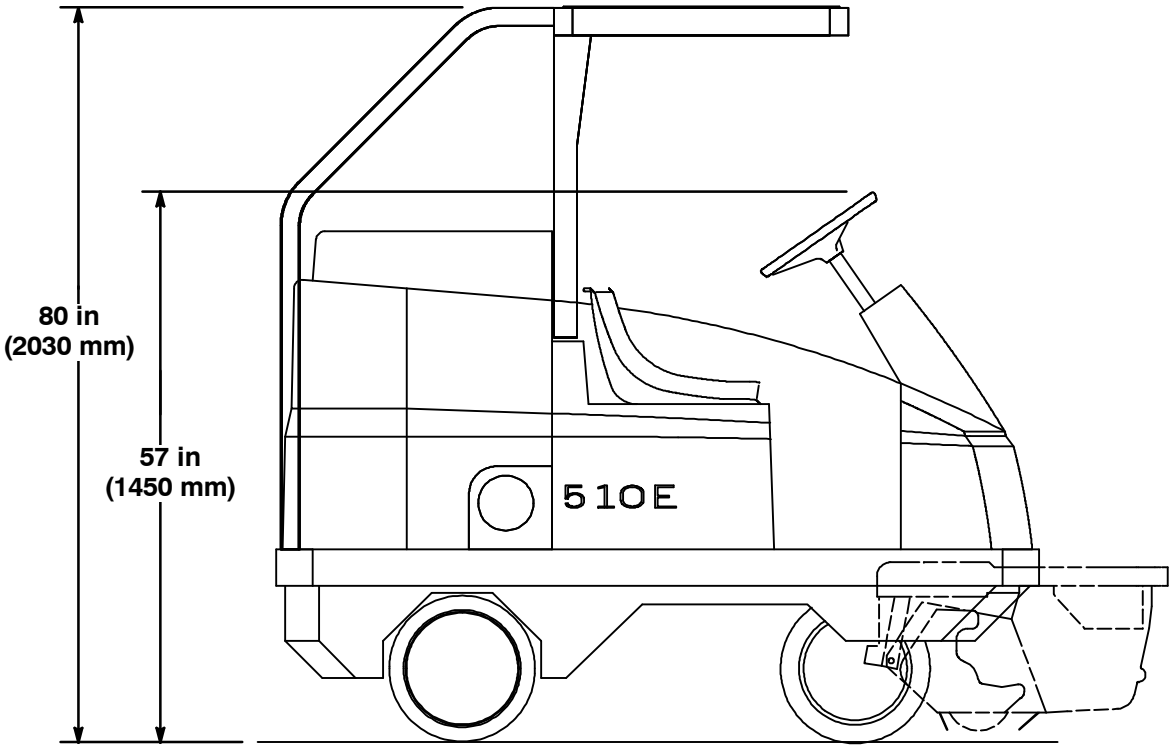
Aisle turnaround width – 90 in (2290 mm)
Aisle turnaround width with Pre-Sweep™ – 104 in (2640 mm)

Maximum rated ramp climb with empty tanks – 8.5°
Maximum rated ramp descent angle with empty tanks – 8.5°
Maximum rated ramp climb with full tanks – 5.7°
Maximum rated ramp descent angle with full tanks – 5.7°

MACHINE DIMENSIONS



TOP VIEW



SIDE VIEW

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SECTION 2

CONTENTS

PREPARATION FOR OPERATION

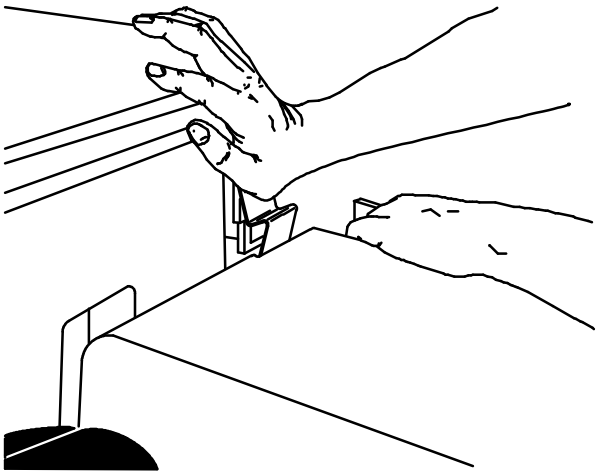
AFTER UNCRATING AND BEFORE OPERATING MACHINE:

1. Check the machine for shipping damage.

2. Read this manual carefully before operating or serving the machine.

FOR SAFETY: Do Not Operate Machine, Unless Operation Manual Is Read And Understood.

3. Open the machine cover.



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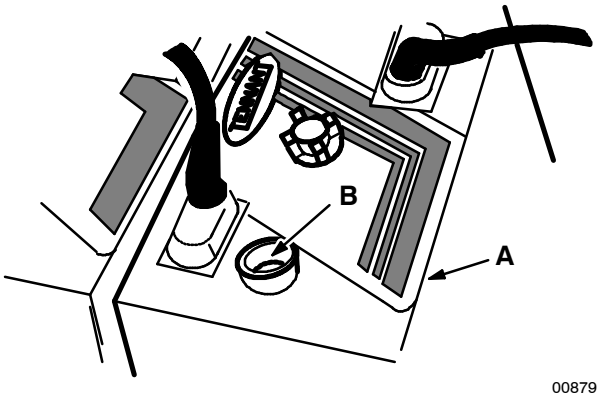
OPENING MACHINE COVER

4. Check the batteries electrolyte level as described in *BATTERIES* in the *MAINTENANCE section.*



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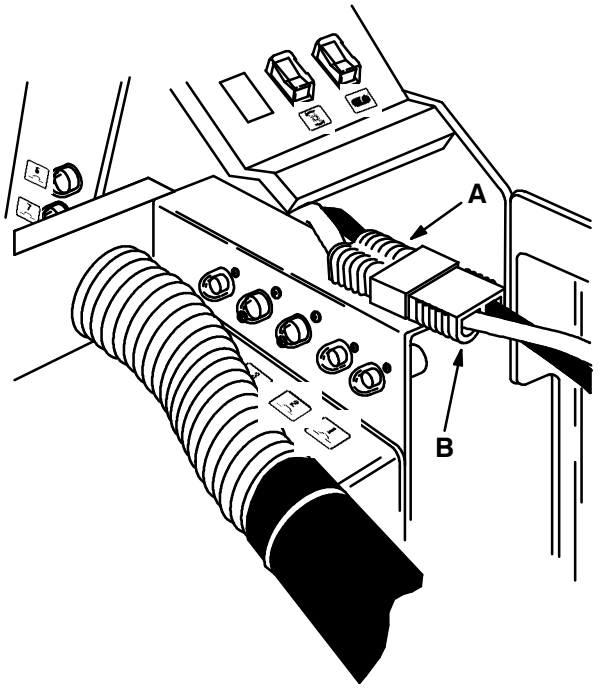
CHECKING BATTERY ELECTROLYTE LEVEL

A. Battery
B. Electrolyte Indicator Ring

FOR SAFETY: When Servicing Machine, Avoid Contact With Battery Acid.

5. Check the battery specific gravity to determine the state of charge as described in *BATTERIES* in the *MAINTENANCE* section. Charge the batteries if necessary.

6. Connect the battery connector to the machine connector.



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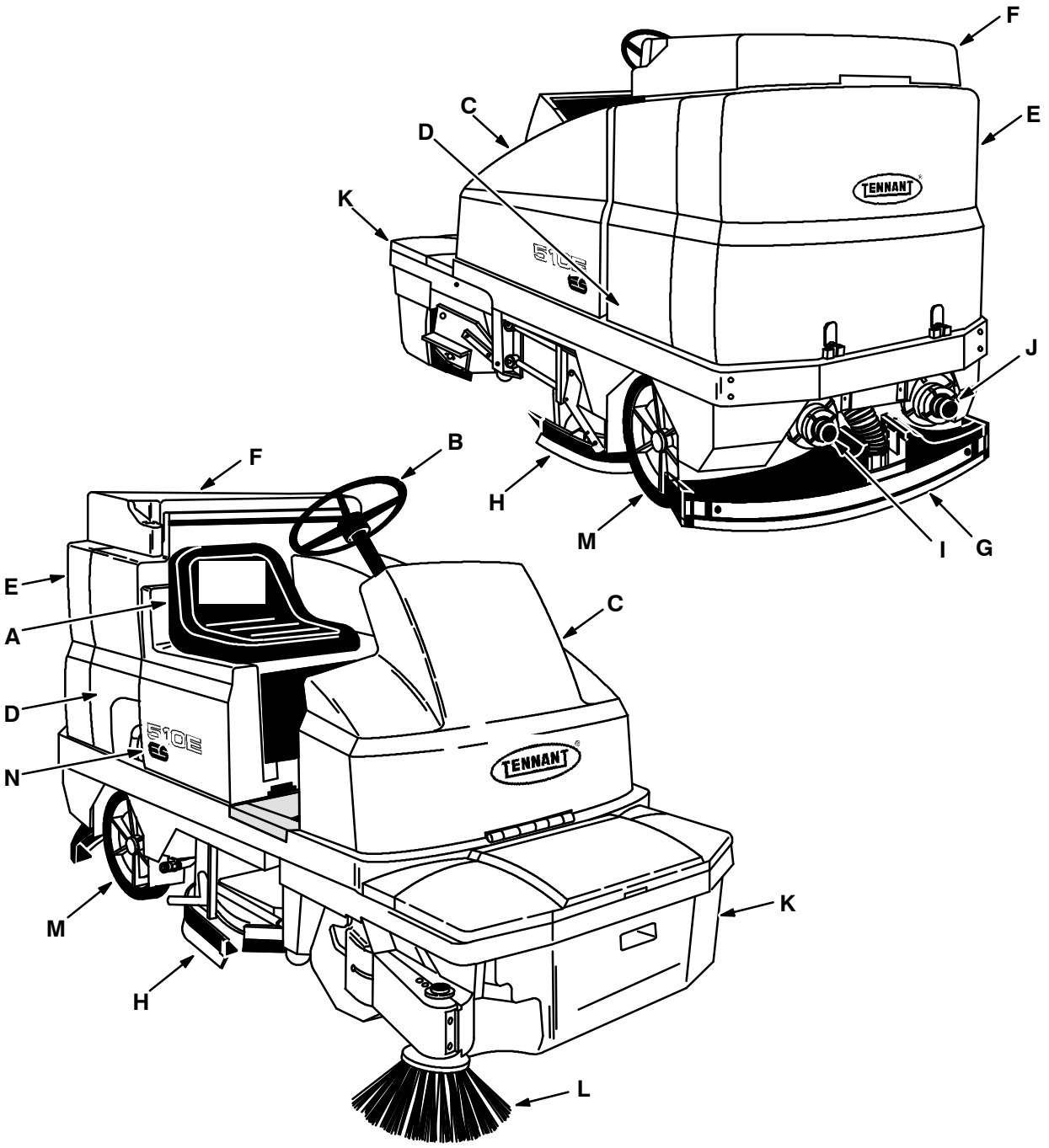
MACHINE TO BATTERY CONNECTOR

A. Machine Connector
B. Battery Connector

7. Install the scrub brushes as described in *SCRUB BRUSHES* in the *MAINTENANCE* section.

8. Pre-Sweep™ machines: Install the Pre-Sweep™ assembly as described in *TO MOUNT PRE-SWEEP™ ASSEMBLY.*

OPERATION OF CONTROLS



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MACHINE COMPONENTS

A. Operator Seat
B. Steering Wheel
C. Machine Cover
D. Recovery Tank
E. Solution Tank
F. Tanks Cover
G. Rear Squeegee
H. Side Squeegee
I. Solution Tank Drain
J. Recovery Tank Drain
K. Pre-Sweep™ Assembly
L. Side Brush
M. Rear Wheel
N. Seat Support

HOW IT WORKS

The Model 510E is a rider scrubber. The machine is propelled by a electric motor via the front wheel. The machine is steered with the steering wheel and is very responsive.

The main scrubbing components include a solution tank, two disc-type brushes, rear and side squeegees, a vacuum fan, and a recovery tank.

Water and detergent solution flows from the solution tank through the water control valve to the scrub brushes. The rotating scrub brushes scrub the floor. As the machine moves forward, the squeegees collect the dirty solution and channel it into the vacuum of the squeegee pick-up hose. The pick-up hose deposits the dirty solution in the recovery tank.

Machines with the ES™ option filter the dirty solution in the recovery tank and return it to the solution tank.

INSTRUMENT PANEL SYMBOLS

These symbols are used to identify controls and displays on the machine:

 Headlights

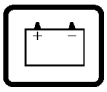
 Revolving Light

 Brushes On (Pre-Sweep™)

 ES™

 Horn

 Key Switch

 Battery Charging System

 Scrub Brush Edge Clean

 Down Pressure

 Scrub Brush Down

 Scrub Brush Shut Down

 Squeegee Down

 Scrub Brush Down and On

 Vacuum Clogged

 Recovery Tank Full

 Solution Flow

 Hour Meter

 Circuit Breaker #1

 Circuit Breaker #2

 Circuit Breaker #3

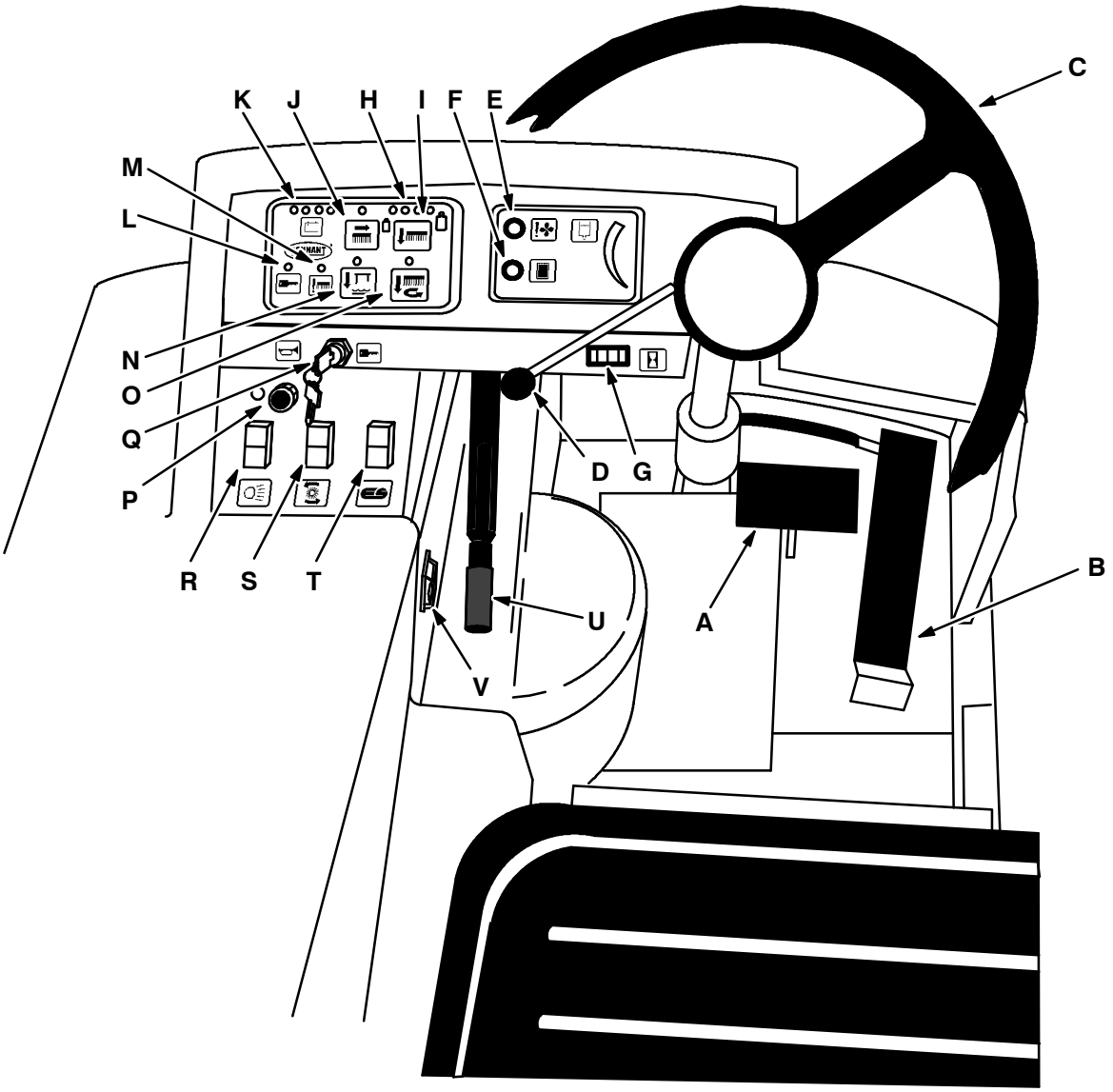
 Circuit Breaker #4

 Circuit Breaker #5

 Circuit Breaker #6

 Circuit Breaker #7

 Circuit Breaker #8



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CONTROLS AND INSTRUMENTS

A. Brake Pedal
B. Directional Pedal
C. Steering Wheel
D. Solution Flow Lever
E. Clogged Vacuum Indicator
F. Recovery Tank Full Indicator
G. Hour Meter
H. Brush Pressure Indicator
I. Brush Pressure Switch
J. Edge Scrub Switch
K. Battery Discharge Indicator
L. Electrical Power Indicator
M. Brush Circuit Breaker Indicator
N. Rear Squeegee and Vacuum Fan Switch
O. Scrub Brush Switch
P. Horn Button
Q. Key-Operated On-Off Switch
R. Operating Lights Switch/Revolving Light Switch
S. Pre-Sweep™ Switch
T. ES™ Switch
U. Parking Brake
V. Power Wand Switch

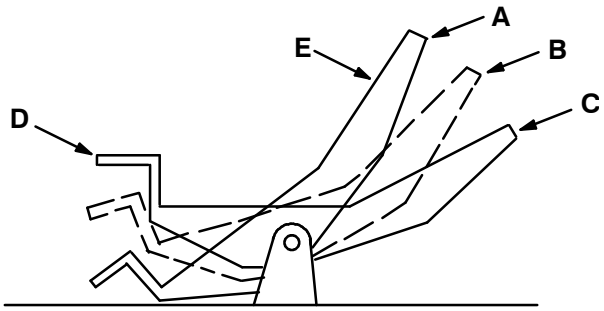
BRAKE PEDAL

The brake pedal operates the brakes on the two rear wheels.

To stop the machine, return the direction control pedal to neutral, then apply pressure to the brake pedal.

DIRECTIONAL PEDAL

The directional pedal controls the propelling drive. The pedal is used to select the direction of travel and the speed of the machine.



DIRECTIONAL PEDAL POSITIONS

A. "Reverse" Position
B. "Neutral" Position
C. "Forward" Position
D. "Heel" Portion
E. "Toe" Portion

Gradually press the "toe" portion of the pedal for forward travel or the "heel" portion for reverse travel. Regulate the machine speed by varying the pressure on the pedal.

The machine will coast for a short distance before changing direction when it is moving and the directional pedal is reversed. Use the brakes to stop the machine.

FOR SAFETY: When Using Machine, Use Brakes To Stop Machine.

STEERING WHEEL

The steering wheel controls the front drive wheel. The machine is very responsive to the movement of the steering wheel. The operator should use care until he or she becomes experienced in guiding the machine.

SOLUTION FLOW LEVER

The solution flow lever controls the flow of solution to the floor. To start the solution flow, push the lever slightly up. To increase the solution flow to maximum, push the lever all the way up.

To stop the solution flow to the floor, pull the lever all the way down.

CLOGGED VACUUM INDICATOR

The clogged vacuum indicator lights when the vacuum system is obstructed and the vacuum is no longer picking solution from the floor.

When the clogged vacuum indicator lights, check the vacuum system hoses for obstructions starting at the rear squeegee pick-up hose.

RECOVERY TANK FULL INDICATOR

The recovery tank full indicator lights when the recovery tank is full.

HOUR METER

The hour meter records the number of hours the machine has operated. This information is useful in determining when to service the machine.

BRUSH PRESSURE INDICATOR AND SWITCH

The brush pressure indicator shows the brush pressure selection. The brush pressure switch controls how aggressive the brushes are scrubbing the floor.

The brush pressure switch has four positions. Under normal conditions, the brush pressure should be set in the light zone. Under heavy grime conditions, the brush pressure should be set in the heavy zones. Travel speed and floor conditions will affect the scrubbing performance.

To change the brush pressure, touch the brush pressure switch. Each time the switch is touched, it will increase brush pressure until it reaches the maximum setting. Then it will return to the minimum setting as shown on the pressure indicator.

EDGE SCRUB SWITCH

The edge scrub switch extends the scrub head to the right to allow close edge scrubbing.

To operate the edge scrub, press the edge scrub switch during normal scrubbing. To turn off the edge scrub, press the edge scrub switch again.

BATTERY DISCHARGE INDICATOR

The battery discharge indicator indicates the charge level of the batteries. It displays the charge level when the scrub brushes are operating.

The display should be on the 1 mark of the gauge when the batteries are fully charged. As the batteries discharge, the display will move near the 0 mark. For best life, the batteries should be recharged when the display nears the 0 mark. If the light near the 0 mark starts to blink, the batteries are fully discharged. At this point, the brushes will automatically raise to limit current draw and to alert the operator of the battery condition. Further operation of the machine could damage the machine or the batteries.

When the machine is left overnight with less than a full charge, the display may at first indicate a full charge. It is reading the surface charge level – not the true charge level. After running the machine a few minutes, the indicator will give the correct charge level.

NOTE: Do not charge the batteries more often than is necessary to prolong the life of the batteries. Do not allow the batteries to become completely discharged as this will also damage the batteries. See BATTERIES in the MAINTENANCE section.

ELECTRICAL POWER INDICATOR

The electrical power indicator lights when the key-operated switch is turned on and the machine has electrical power.

BRUSH CIRCUIT BREAKER INDICATOR

The brush circuit breaker indicator lights when one or both of the two brush motor circuit breakers have tripped. When the circuit breakers are tripped, the brushes will stop rotating and the scrub head will raise. The circuit breaker(s) must be reset before resuming scrubbing.

REAR SQUEEGEE AND VACUUM FAN SWITCH

The rear squeegee and vacuum fan switch, along with the direction of machine travel, control the position of the rear squeegee, and turns on the vacuum fan.

To start the vacuum fan and lower the rear squeegee, press the rear squeegee and vacuum fan switch.

When the machine travels backward, the rear squeegee lifts. This prevents the rear squeegee from being damaged when backing the machine. The rear squeegee will lower again when the machine travels forward.

To raise the rear squeegee and stop the vacuum fan, press the rear squeegee and vacuum fan switch again.

SCRUB BRUSH SWITCH

The scrub brush switch controls the scrub head position and scrub brush rotation.

To lower the scrub head and start the scrub brushes rotating, press the scrub brush switch. When the machine travels forward, the scrub head will lower and the scrub brushes will start rotating. If the machine is stopped for more than 6 seconds, the scrub head raises to prevent scrub brush wear. When the machine travels in reverse, the scrub head raises. Once the machine starts traveling forward the scrub brushes start rotating and the scrub head will lower.

To raise the scrub head and stop the scrub brushes, press the scrub brush switch again.

HORN BUTTON

The horn button operates the horn. To sound the horn, press the horn button.

KEY-OPERATED ON-OFF SWITCH

The key-operated on-off switch controls all machine power. To allow the machine to operate, turn the key clockwise. To turn the machine off, turn the key counter-clockwise.

OPERATING LIGHTS SWITCH

The operating lights switch  is present on machines equipped with the operating lights option. The switch operates the headlights and taillights; and revolving light if equipped with revolving light option. To turn the operating lights on, place the switch in the top position. To turn the operating lights off, place the switch in the bottom position.

REVOLVING LIGHT SWITCH

The revolving light switch  is present on machines equipped with the revolving light option. To turn the revolving light on, place the switch in the top position. To turn the revolving light off, place the switch in the bottom position.

PRE-SWEEP™ SWITCH

The Pre-Sweep™ switch  is present on machines equipped with the Pre-Sweep™ option. The switch operates the Pre-Sweep™ assembly.

To lower the Pre-Sweep™ and turn the brushes on, press and hold the bottom portion of the switch until the the Pre-Sweep™ lowers to the floor and the actuator ratchets. To raise the Pre-Sweep™ and turn off the brushes, press the top of the switch and hold it until the actuator ratchets, 3 to 4 seconds.

ES™ SWITCH

The ES™ switch  controls the extended scrubbing solution system on machines equipped with the ES™ option.

The machine will start with the ES™ system on. The ES™ pump may not start right away. The pump will start as the recovery tank fills up with solution.

To start the ES™ system, place the switch in the top position. The green light on the switch will light. To stop the ES™ system, place the switch in the bottom position.

PARKING BRAKE LEVER

The parking brake lever operates the rear wheel brakes.

To set the parking brake, pull the handle up. To release the parking brake, push the handle down.

POWER WAND SWITCH

The power wand switch controls the solution to the power wand option.

To start the solution flow to the power wand, press the top or **ON** position of the switch. To stop the solution flow to the power wand, press the bottom or **OFF** position of the switch.

CIRCUIT BREAKERS

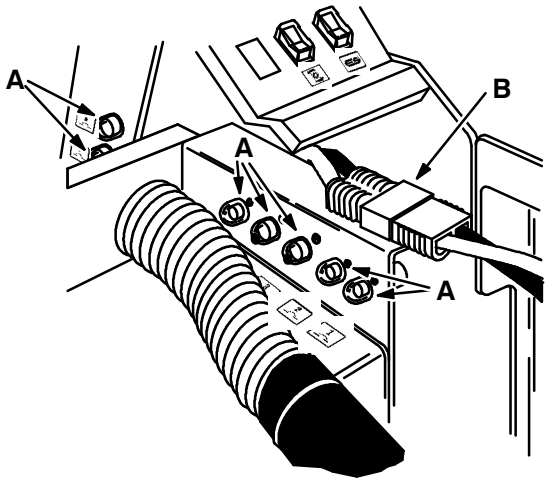
The circuit breakers are resetable circuit protection devices designed to stop the flow of current in the event of a circuit overload. Once tripped, circuit breakers must be manually reset, after it cools, by pressing the reset button. If the overload which caused the circuit breaker to trip is still present in the circuit, the circuit breaker will continue to stop current flow until the overload is corrected.

The fuse is a one-time circuit protection device designed to stop the flow of current in the event of a circuit overload. Never substitute higher value fuses then those specified in this manual.

The circuit breakers are located to the left of the operator's compartment near the machine and battery connectors. The fuse is located in the control box.

The following chart shows the various circuit breakers, and the electrical components they protect.

PROTECTIVE DEVICE PROTECTED	RATING	CIRCUIT
CB-1	20 A	Vacuum fan motor
CB-2	20 A	Vacuum fan motor
CB-3	40 A	Scrub brush motor
	50 A	Heavy Duty scrub brush motor (option)
CB-4	40 A	Scrub brush motor
	50 A	Heavy Duty scrub brush motor (option)
CB-5	30 A	Pre-Sweep™ (option)
CB-6	10 A	Control Circuit
CB-7	10 A	Horn
CB-8	15 A	Revolving and operating lights (option/ES™)
FU-1	100 A	Propelling



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CIRCUIT BREAKERS

A. Circuit Breakers
B. Machine and Battery Connectors

MACHINE OPERATION

NORMAL SCRUBBING OPERATION

A normal scrubbing operation consists of eight typical operations; pre-start checklist, starting machine, filling solution tank, scrubbing, draining and cleaning recovery tank, post operation checklist – machine on, stopping machine, and post operation checklist – machine off.

PRE-START CHECKLIST lists the things to check before starting the machine.

TO START THE MACHINE lists the steps required to start the machine.

TO FILL SOLUTION TANK lists the steps required to fill the solution tank.

TO SCRUB lists the things to keep in mind before and during the scrubbing operation.

TO DRAIN AND CLEAN RECOVERY TANK lists the steps required to empty and clean the recovery tank.

POST OPERATION CHECKLIST – MACHINE ON lists the things to check before turning off the machine.

TO STOP MACHINE lists the steps required to stop the machine.

POST OPERATIONAL CHECKLIST – MACHINE OFF lists the things to check after turning off the machine.

PRE-START CHECKLIST

Check under the machine for leaks.

Check the brakes and controls for proper operation.

Check the service records to determine service requirements.

TO START MACHINE

NOTE: Before starting machine, go through the pre-start checks.

1. The machine operator must be in the operator's seat with the directional pedal in the "neutral" position and with a foot on the brake pedal or with the parking brake set.

FOR SAFETY: Before Starting Machine Make Sure All Safety Devices Are In Place And Operate Properly.

2. Turn the key-operated on-off switch clockwise to turn on the machine.

3. Release the machine parking brake.

4. Drive the machine to the solution filling site.

TO FILL SOLUTION TANK

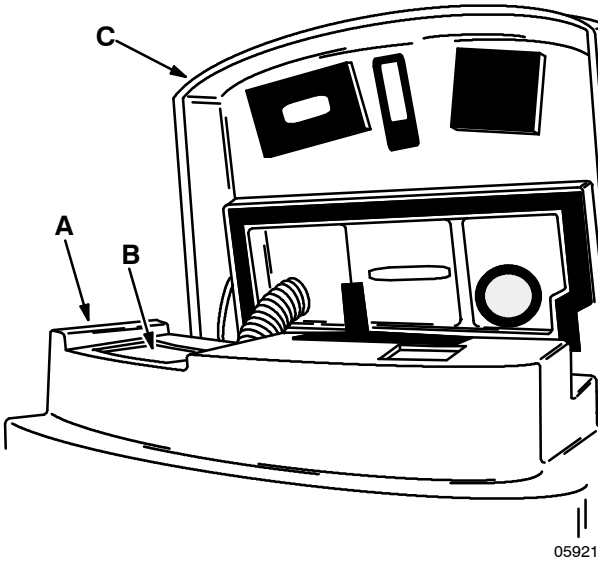
1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Pull the solution flow lever all the way down to shut off the solution flow to the floor.

3. Lift open the tanks cover.

4. Pour the required amount of detergent into the solution tank. Fill the solution tank with water to 3 in (75 mm) below the tank opening. The water must not be hotter than 130° F (54° C) or tank damage may occur.

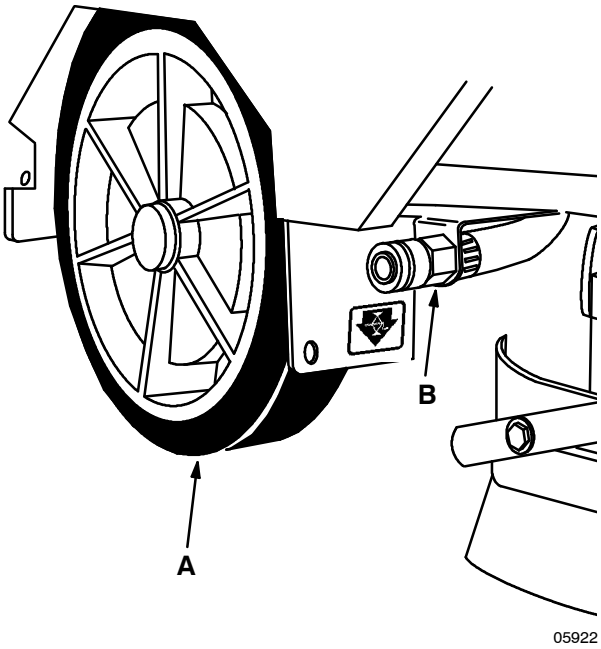


SOLUTION TANK

A. Solution Tank
B. Solution Tank Fill Opening
C. Tanks Cover

ES™ machines: Connect a hose from the water source to the auto-fill connections on the machine. Turn the machine on and turn on the water source. The auto-fill will automatically fill the tanks to the proper level for ES™ operation. The ES™ tanks can also be filled manually. Fill the solution tank with water to 3 in (75 mm) below tank opening, and the recovery tank half full.

NOTE: When using the auto-fill feature on the ES™ machine, both tanks should be empty to prevent overflow of the recovery tank.



ES™ AUTO-FILL

A. Rear Tire
B. ES™ Auto-Fill

NOTE: Floor conditions, water condition, amount of soilage, type of soilage, brush action, and squeegee action all play an important role in determining the type and concentration of detergent to be used. For specific recommendations, call your TENNANT representative.

WARNING: Flammable Materials Can Cause An Explosion Or Fire. Do Not Use Flammable Materials In Tank(s).

5. Close the tanks cover.

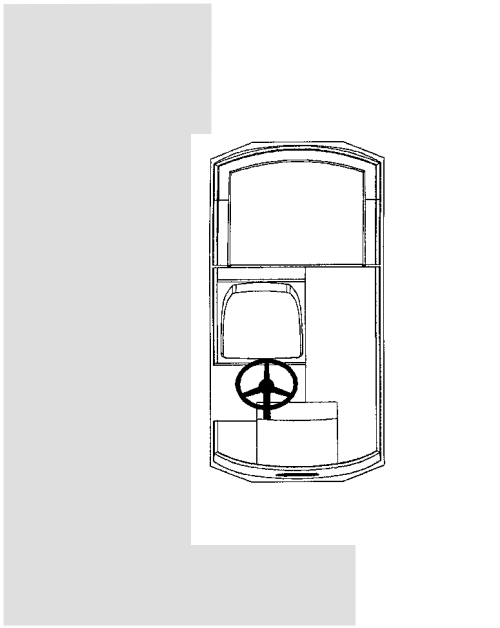
TO SCRUB

Plan the scrubbing in advance. Try to arrange long runs with minimum stopping and starting. Do an entire floor or section at one time. When scrubbing dead end aisles, start at the end and scrub your way out of them.

Pick up oversize debris before scrubbing. Remove bulky debris from aisles before scrubbing. Pick up pieces of wire, twine, string, etc., which could become entangled in the scrub brushes.

Do not turn steering wheel too sharply when the machine is in motion. It is very responsive to the movement of the steering wheel. Avoid sudden turns, except in emergencies.

Try to scrub as straight a path as possible. Stop solution flow to the floor before making turns to minimize solution loss. Avoid bumping into posts or scraping the sides of the machine. Allow a few inches overlap of scrub path.



05923

OVERLAPPING SCRUBBING PATHS

Adjust the machine speed, scrub brush pressure, and solution flow as required. Use minimum scrub brush pressure and solution flow required for the best scrubbing results.

When the recovery tank is almost full, the recovery tank full indicator will light. The recovery tank will have to be drained and cleaned as described in *TO DRAIN AND CLEAN RECOVERY TANK*. Then refill the solution tank with clean water and detergent and continue scrubbing.

1. Turn the key-operated on-off switch clockwise to turn the machine on.

2. Release the machine parking brake.

3. Drive the machine to the area to be scrubbed.

4. Press the rear squeegee and vacuum fan switch to lower the rear squeegee and start the vacuum fan.

5. Press the scrub brush switch to lower the scrub head and start the scrub brushes rotating.

6. Pre-Sweep™ machines: Press the Pre-Sweep™ switch to start the Pre-Sweep™ assembly.

7. Move the solution flow lever up to start the solution flow.

   ES™ machines: Place the ES™ switch in the bottom position to stop the ES™ pump and to turn off the extended scrubbing solution system, if wanted.

8. To scrub close to edges, press the edge scrub switch. The scrub head will move to the right to allow edge scrubbing.

9. Scrub as required.

⚠ WARNING: Flammable Materials Or Reactive Metals Can Cause Explosion Or Fire. Do Not Pick Up.

TO DRAIN AND CLEAN RECOVERY TANK

1. Move the solution lever all the way down to stop the solution flow to the floor.

2. Press the scrub brush switch to raise the scrub head and stop the brushes.

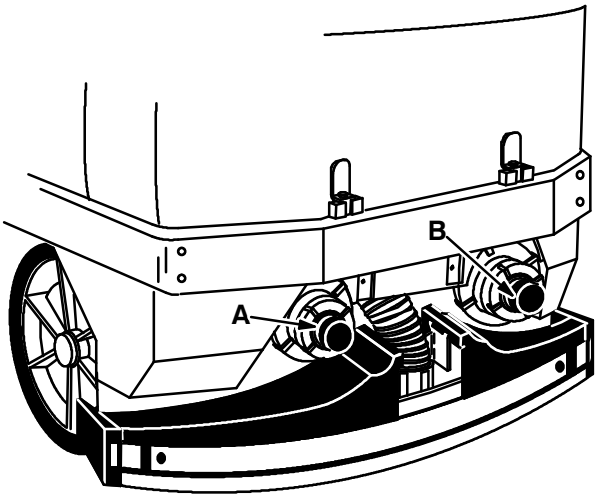
3. Press the rear squeegee and vacuum fan switch to raise the rear squeegee and stop the vacuum fan.

4. Stop the machine next to a floor drain.

5. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

6. To drain the recovery tank, unscrew the drain hose cap from the access cap of the recovery tank drain.

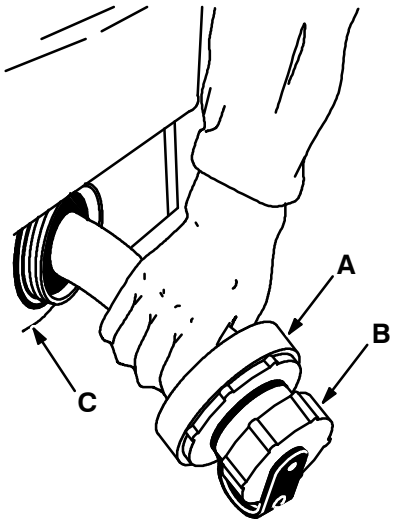


05940

TANK DRAINS

A. Solution Tank Drain
B. Recovery Tank Drain

7. Pull out and place the drain hoses next to the floor drain. Remove the drain cap from the hose. Stand back, the solution rushes out of the drain hoses.

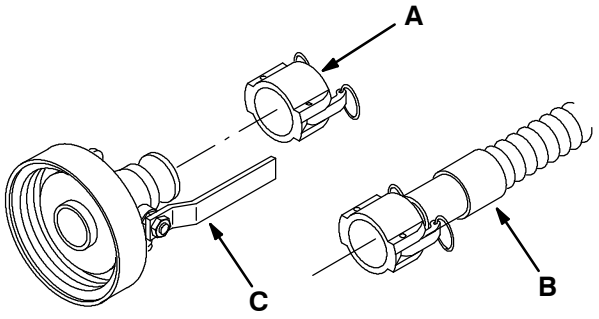


05914

DRAINING RECOVERY TANK

A. Drain Hose Cap
B. Drain Cap
C. Access Cap

For machines with the positive drain cap option, remove the dust cap. Connect the drain hose and open the drain valve.



10199

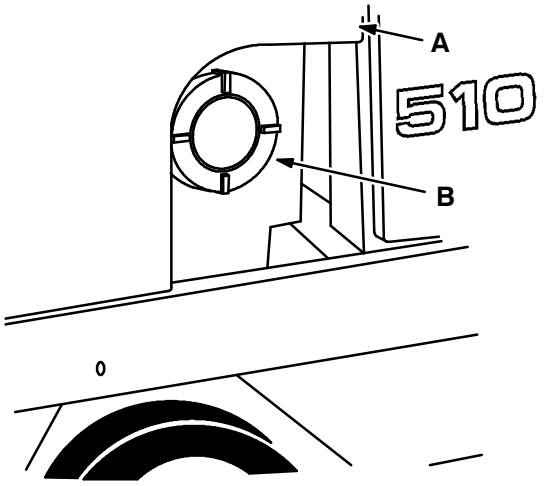
DRAINING TANK

A. Dust Cap
B. Drain Hose
C. Drain Valve

8. Open the tanks cover.

9. Spray the inside of the recovery tank with clean water. Do not use water hotter than 130° F (54° C) or use steam to clean the tank because damage may occur. The recovery tank has two access caps, one on the side of the machine and one at each tank drain.

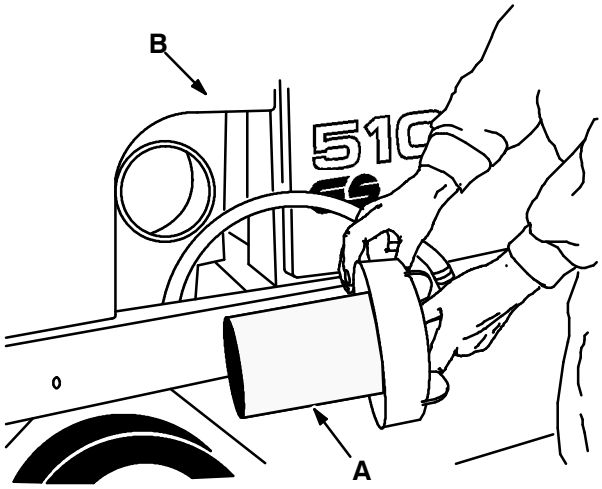
ES™ machines: Remove the ES™ outlet filter from the recovery tank and clean. Replace the ES™ outlet filter into the recovery tank. Then add enough water to the tank to cover the outlet filter and operate the ES™ pump to the flush the ES™ system.



05926

RECOVERY TANK ACCESS CAP

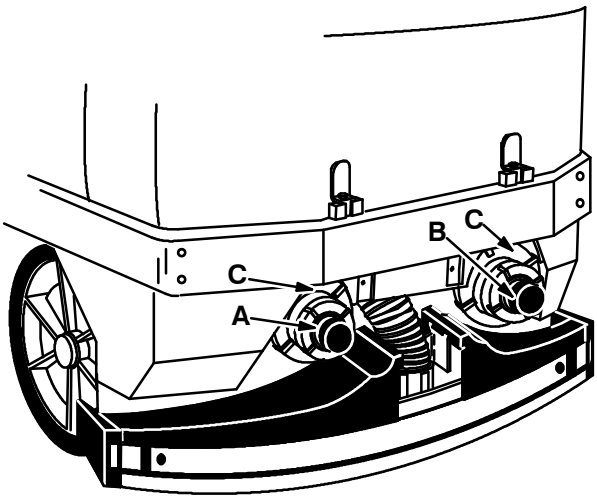
A. Recovery Tank
B. Access Cap



05925

ES™ OUTLET FILTER

A. ES™ Outlet Filter
B. Recovery Tank

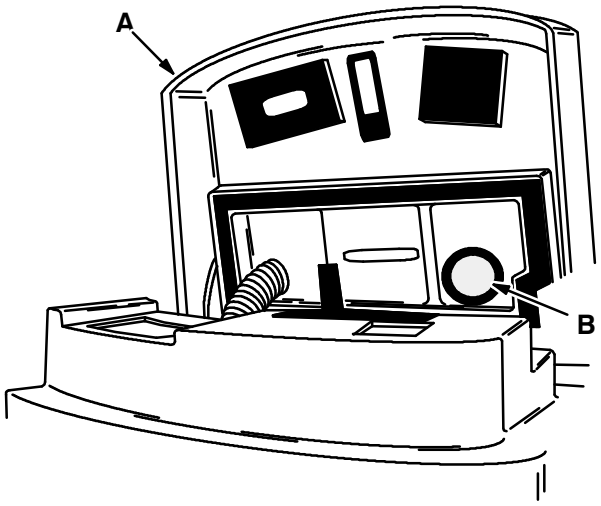


05940

TANK ACCESS CAPS

A. Solution Tank Drain
B. Recovery Tank Drain
C. Access Cap

10. Remove the vacuum outlet screen from the tanks cover. Clean the vacuum outlet screen and place it back in the tanks cover.



VACUUM OUTLET SCREEN

A. Tanks Cover
B. Vacuum Outlet Screen

11. Lower the tanks cover.

12. Replace the drain hoses and drain caps.

    For machines with the positive drain cap option, close the drain valve. Remove the drain hose and attach the dust cap.

POST OPERATION CHECKLIST - MACHINE ON

Check the squeegees for proper deflection.

TO STOP MACHINE

1. Move the solution flow lever all the way down to stop solution flow to the floor.

   ES™ machines: Place the ES™ switch in the bottom position to turn off the ES™ system.

2. Press the scrub brush switch to raise the scrub head and turn off the brushes.

3. Press the rear squeegee and vacuum fan switch to raise the rear squeegee and turn off the vacuum fan.

4. Pre-Sweep™ machines: Press and hold the top portion of the Pre-Sweep™ switch to raise the Pre-Sweep™ and turn off the brushes.

5. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

POST OPERATION CHECKLIST - MACHINE OFF

Check for wire or string tangled on the scrub brushes.

Check the squeegees for wear or damage.

Drain and clean the recovery tank.

ES™ machines: Drain and clean the solution tank.

Pre-Sweep™ machines: Remove and clean the debris hopper. Get assistance to remove and dump heavily loaded debris hopper. Remove hopper liner, if used, and replace it with a new one. Place the debris hopper back into the Pre-Sweep™ assembly.

Check the vacuum hoses for debris or obstructions.

Check for leaks.

DOUBLE SCRUBBING OPERATION

Double scrubbing is a method of removing heavy accumulations of soilage, dirt, wax, or spills. It involves making two passes over the area to be cleaned.

To double scrub, make a single pass over the surface being cleaned with the squeegees up and the vacuum system off. This dispenses solution and allows the brushes to scrub the debris loose. Allow the solution to soak on the floor for 15 to 20 minutes. Then make a second scrubbing pass in the normal scrubbing manner with the squeegees down.

The side squeegees are held up mechanically during double scrubbing.

TO RAISE SIDE SQUEEGEES

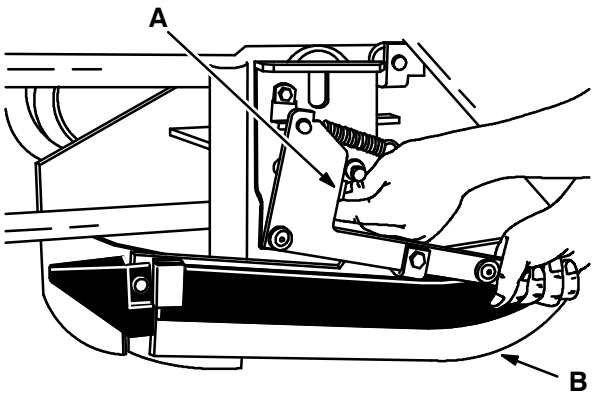
1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Lift the side squeegee up.

3. Turn the squeegee stop towards the front of the machine and hold in place.

4. Lower the side squeegee against the stop.



RAISING SIDE SQUEEGEE

A. Squeegee Stop
B. Side Squeegee

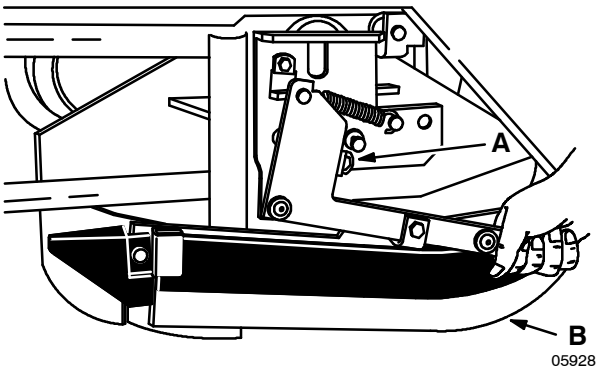
5. Repeat with the side squeegee on the other side of the scrub head.

TO LOWER SIDE SQUEEGEES

1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Lift the side squeegee. The stop will roll out of the way.



LOWERING SIDE SQUEEGEE

A. Squeegee Stop
B. Side Squeegee

3. Lower the side squeegee to the floor.

4. Repeat with the side squeegee on the other side of the scrub head.

OPERATION ON GRADES

Drive the machine slowly on grades. Use the brake pedal to control the machine speed.

FOR SAFETY: When Using Machine, Go Slow On Grades And Slippery Surfaces.

The maximum rated climb and descent angles with empty tanks is 8.5°. The maximum rated climb and descent angles with full tanks is 5.7°.

MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Trailing water – poor or no water pickup.	Worn rear squeegee blades.	Rotate or replace squeegee blades.
	Rear squeegee out of adjustment.	Adjust rear squeegee.
	Side squeegees raised.	Lower side squeegees.
	Worn side squeegee blades.	Replace side squeegee blades.
	Hopper not adjusted properly.	Adjust hopper floor clearance.
	Side squeegees out of adjustment.	Adjust side squeegees.
	Too much solution flow to floor.	Reduce solution flow to floor.
	Vacuum hose clogged.	Flush vacuum hoses.
	Recovery tank full.	Drain recovery tank.
	Float stuck shutting off vacuum.	Clean float.
	Debris caught on rear squeegee.	Remove debris.
	Foam filling recovery tank.	Empty recovery tank; use less or change detergent.
	Vacuum hose to rear squeegee disconnected or damaged.	Reconnect or replace vacuum hose.
	Vacuum fan to recovery tank hose damaged.	Replace hose.
Little or no solution flow to the floor.	Solution tank empty.	Fill solution tank.
	Solution control linkage broken or out of adjustment.	Replace and/or adjust cable.
	Solution supply lines plugged.	Flush solution supply lines.
	ES™ switch off.	Turn ES™ switch on.
Poor scrubbing performance.	Debris caught on scrub brushes.	Remove debris.
	Improper detergent or brushes used.	Check with TENNANT representative for advice.
	Worn scrub brushes.	Replace scrub brushes.
ES™ system does not fill solution tank.	Clogged solution pump or lines.	Flush ES™ system.
	ES™ float switch(es) stuck.	Clean switch floats of debris.
	Clogged ES™ outlet filter.	Clean filter.
	Water levels too low in tanks.	Add water.

OPTIONS OPERATION

VACUUM WAND

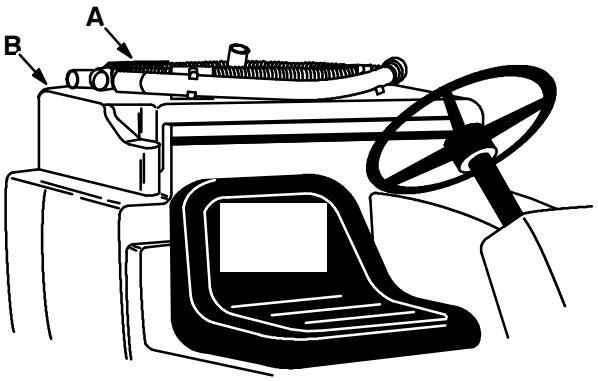
The vacuum wand option gives the machine the added flexibility of picking up spills not normally accessible by the machine. A 90 in (2285 mm) long hose utilizes the machine vacuum system.

TO OPERATE THE VACUUM WAND

1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Remove the vacuum wand equipment from the tanks cover.

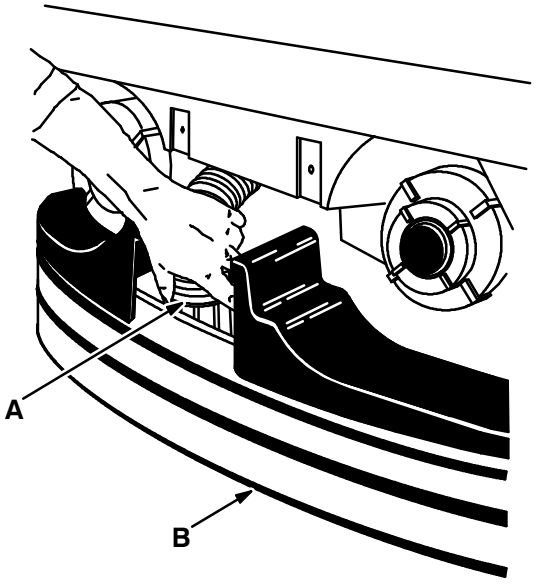


05929

VACUUM WAND EQUIPMENT

A. Vacuum Wand Equipment
B. Tanks Cover

3. Pull the squeegee vacuum hose off the rear squeegee assembly.



05930

DISCONNECTING SQUEEGEE SUCTION HOSE

A. Squeegee Suction Hose
B. Rear Squeegee Assembly

4. Push the vacuum wand hose onto the squeegee vacuum hose and attach hose retainer.
5. Assemble the vacuum wand and hose.
6. Turn on the machine.
7. Press the rear squeegee and vacuum fan switch to turn on the vacuum.
8. Vacuum as required.
9. When finished, press the rear squeegee and vacuum fan switch again to turn off the vacuum.
10. Remove the vacuum wand hose from the squeegee vacuum hose.
11. Reconnect the squeegee vacuum hose to the rear squeegee assembly.
12. Clean and rinse the vacuum wand equipment.
13. Replace the vacuum wand equipment in its storage location on top of the tanks cover.

POWER WAND

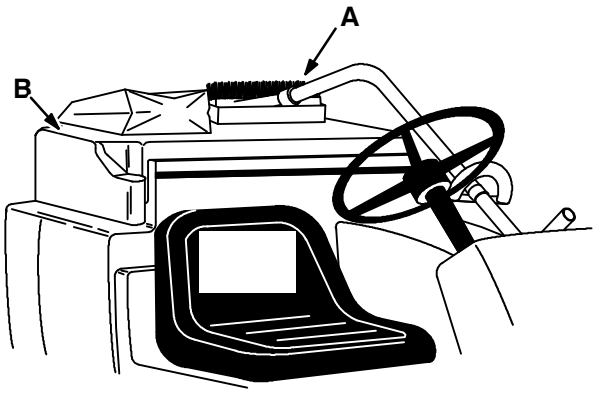
The power wand uses the vacuum system and solution system of the machine. The wand allows scrubbing of floors which are out of reach by the machine.

TO OPERATE THE POWER WAND

1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Remove the power wand equipment from the tanks cover.

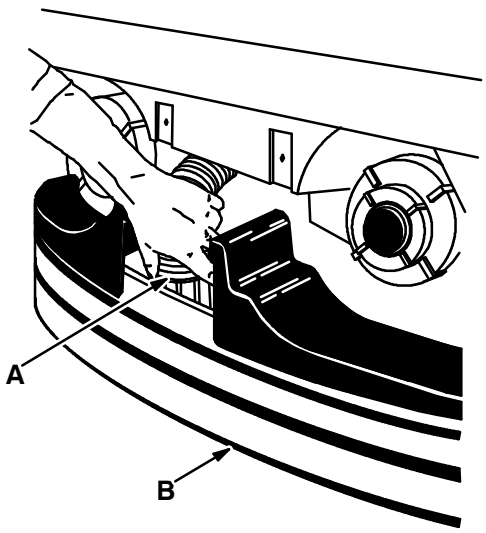


08067

POWER WAND EQUIPMENT

A. Power Wand Equipment
B. Tanks Cover

3. Pull the squeegee vacuum hose off the rear squeegee assembly.



05930

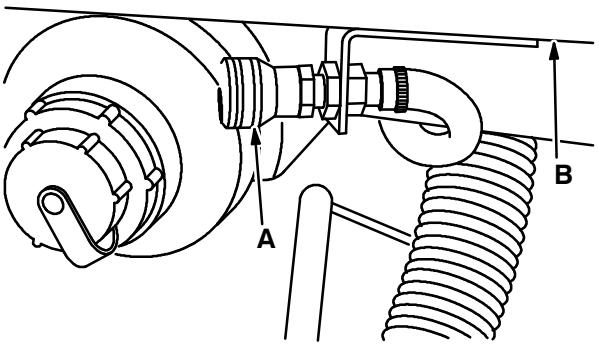
DISCONNECTING SQUEEGEE SUCTION HOSE

A. Squeegee Suction Hose
B. Rear Squeegee Assembly

4. Attach the adapter to the end of the power wand vacuum hose if not already connected.

5. Push the power wand vacuum hose onto the squeegee vacuum hose.

6. Attach the solution hose to the quick-disconnect on the machine.

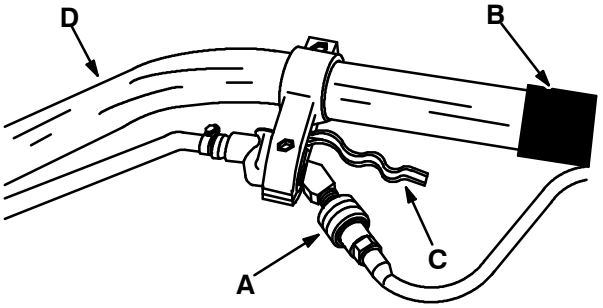


08068

SOLUTION QUICK-DISCONNECT

A. Quick-disconnect
B. Rear Bumper

7. Attach the other ends of the solution and vacuum hoses to the power wand tool in the same way.



06598

CONNECTING ATTACHMENT

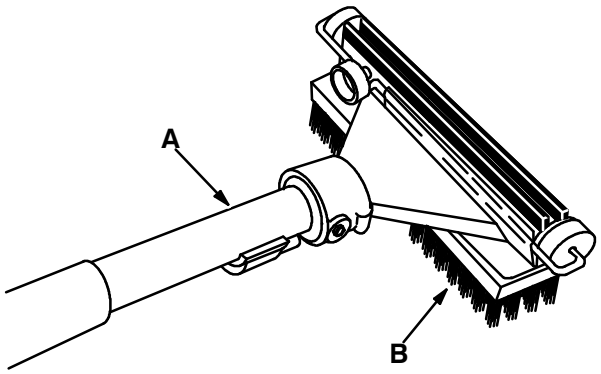
A. Solution Hose Quick-Disconnect
B. Vacuum Hose
C. Valve Handle
D. Selected Attachment

8. Turn on the machine.

9. Press the rear squeegee and vacuum fan switch to turn on the vacuum.

10. Start the solution flow to the power wand by putting the power wand switch in the **ON** position.

11. Squeeze the solution lever on the power wand to spray solution on the floor. Scrub the floor with the brush side of the cleaning tool.

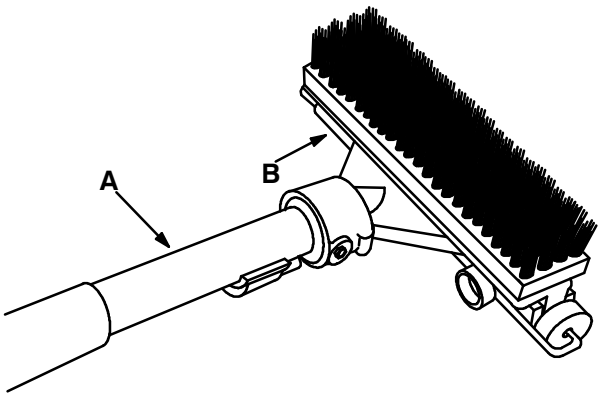


06601

HARD FLOOR WAND

A. Cleaning Tool
B. Brush

12. Vacuum the solution by turning the cleaning tool so the squeegee side is down.



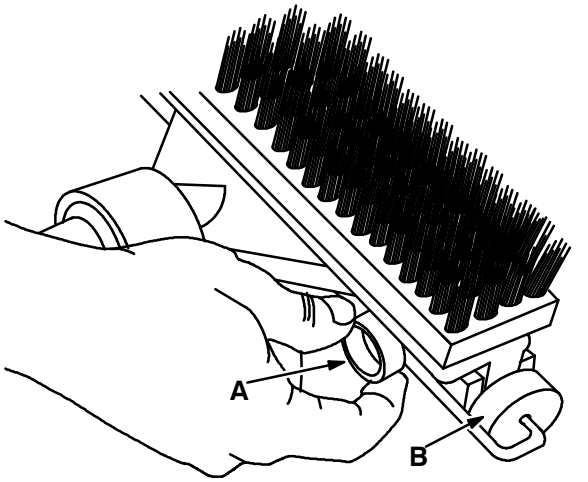
06602

HARD FLOOR WAND

A. Cleaning Tool
B. Squeegee

If the hard floor wand is difficult to push or does not pickup the solution very well, adjust the roller wheels on the tool by turning the black adjustment knob.

NOTE: The wheels are properly adjusted when the squeegee blades deflect slightly while the tool is pushed back and forth.



06604

ADJUSTING ROLLER WHEELS

A. Adjustment Knob
B. Roller Wheels

13. When finished, stop the solution flow to the power wand by putting the power wand switch in the **OFF** position.

14. Press the rear squeegee and vacuum fan switch again to turn off the vacuum.

15. Disconnect the solution hose from the machine quick-disconnect.

16. Remove the power wand vacuum hose from the squeegee vacuum hose.

17. Reconnect the squeegee vacuum hose to the rear squeegee assembly.

18. Disconnect the vacuum and solution hoses from the power wand.

19. Replace the power wand equipment in its storage location on top of the tanks cover.

PRE-SWEEP™

The Pre-Sweep™ assembly gives the machine added ability to pick up debris. The assembly is mounted to the front of the machine. The assembly contains a main brush and side brush which sweep debris into a debris hopper. Periodically empty the debris hopper as it fills with debris.

The machine may be operated with or without the Pre-Sweep assembly. Refer to *PRE-SWEEP™* in the *MAINTENANCE* section for maintenance and adjustments.

TO REPLACE THE PRE-SWEEP™ DEBRIS HOPPER LINER

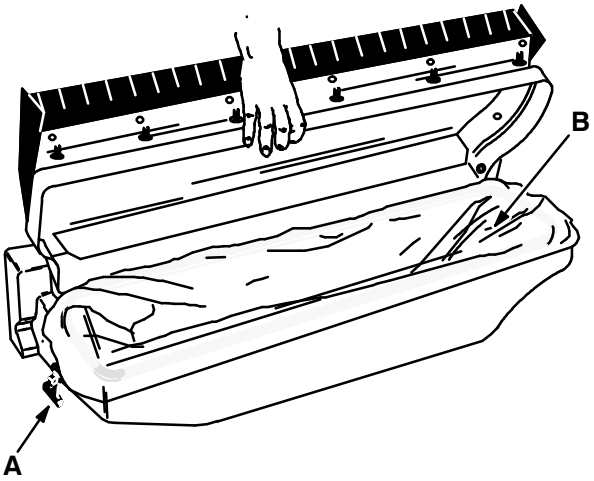
1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Remove the Pre-Sweep™ debris hopper from the Pre-Sweep™ assembly.

3. Empty the debris hopper.

4. Open the debris hopper by pulling the pull catch on both ends of the hopper.



05932

DEBRIS HOPPER

A. Pull Catch
B. Hopper Liner

5. Remove the used hopper liner.

6. Place the new liner in the debris hopper.

7. Close the debris hopper and secure with the two pull catches.

8. Place the debris hopper back into the Pre-Sweep™ assembly.

TO REMOVE PRE-SWEEP™ ASSEMBLY

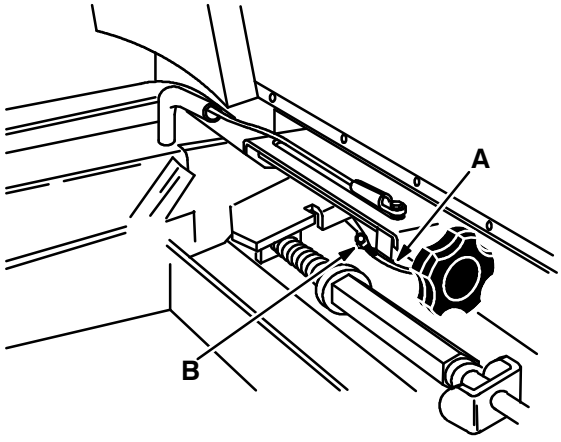
1. Raise Pre-Sweep™ assembly.

2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Remove the debris hopper from the Pre-Sweep™ assembly.

4. Disconnect the machine wires from the Pre-Sweep™ switch located under the brush adjustment knobs. Disconnect the machine wire harness from the Pre-Sweep™ electric motor and the Pre-Sweep™ actuator.

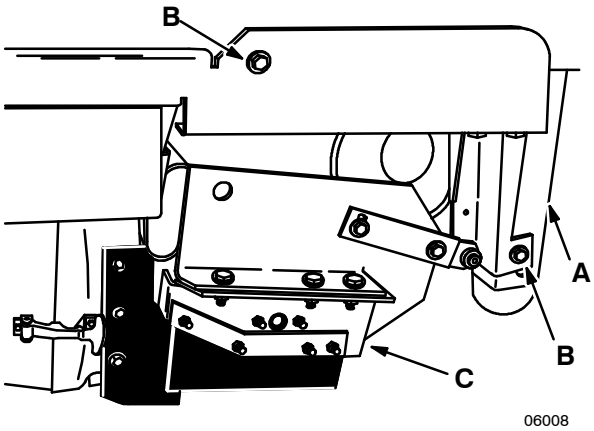


PRE-SWEEP™ SWITCH WIRE

A. Machine Wire
B. Switch

5. Roll the Pre-Sweep™ dolly under the Pre-Sweep™ assembly.

6. Remove the hardware mounting the Pre-Sweep™ to the machine frame. There are six bolts mounting the Pre-Sweep™; two on each side of the machine and two in the front under the Pre-Sweep™ access cover.



SIDE MOUNTING HARDWARE

A. Main Frame
B. Hardware
C. Pre-Sweep™

7. Roll the Pre-Sweep™ assembly away from the machine.

TO MOUNT PRE-SWEEP™ ASSEMBLY

1. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Roll the Pre-Sweep™ assembly and dolly in front of the machine.

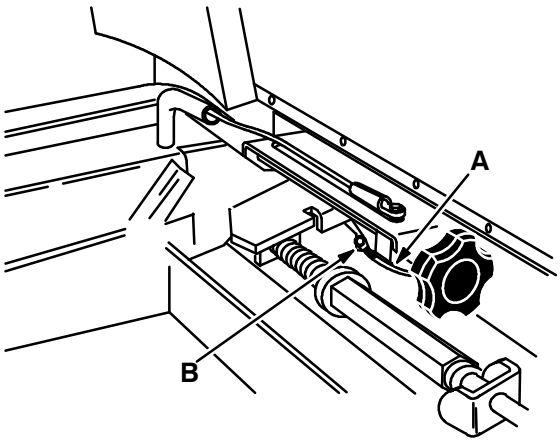
3. Move the Pre-Sweep™ assembly in place so the mounting holes line up in front and on both sides of the machine.

4. Insert and tighten the mounting hardware.

5. Roll the dolly away from the Pre-Sweep™ assembly.

6. Open the Pre-Sweep™ cover. Connect the machine wire harness to the Pre-Sweep™ electric motor and actuator.

7. Connect the machine wire harness to the Pre-Sweep™ switch. Connect wire 76A orange to the normal closed terminal, and wire 13Z black to the common terminal.



PRE-SWEEP™ SWITCH WIRE

A. Machine Wire
B. Switch

8. Turn on the machine and check the Pre-Sweep™ for proper operation.

9. Check the main brush and side brush patterns as described in *TO CHECK AND ADJUST PRE-SWEEP™ MAIN BRUSH PATTERN* and *TO REPLACE PRE-SWEEP™ SIDE BRUSH* in the *MAINTENANCE* section.

TRANSPORTING MACHINE

PUSHING OR TOWING

The machine may be pushed or towed up to 4 mph (6 km/h) by the machine frame. Use care when attaching towing cables or chains to avoid damaging the machine.

MACHINE JACKING

The machine may be jacked up for service at the designated locations. Use a jack of adequate capacity and good working condition. Always stop the machine on a flat, level surface and block the tires before jacking up the machine.

The front jacking location is the main frame just in front of the scrub head. The rear jacking locations are the main frame just in front of the rear tires.

TO JACK UP MACHINE

1. Empty the solution and recovery tanks.

   Pre-Sweep™ machines: Empty the debris hopper.

2. Turn the machine off and set the machine parking brake.

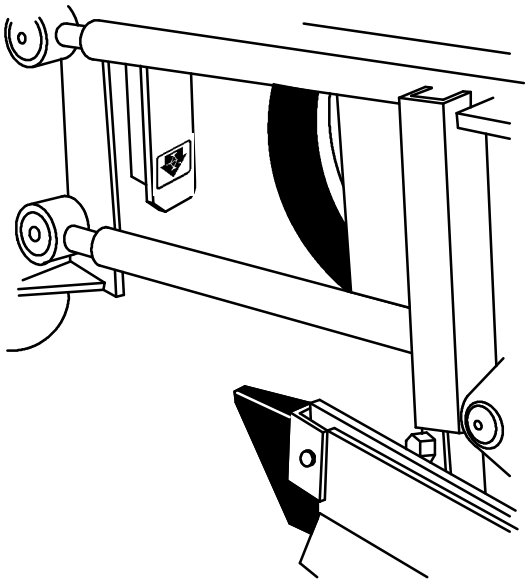
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Block the tires, which are not being jacked up, in order to secure the machine position.

FOR SAFETY: When Servicing Machine, Block Machine Tires Before Jacking Machine Up.

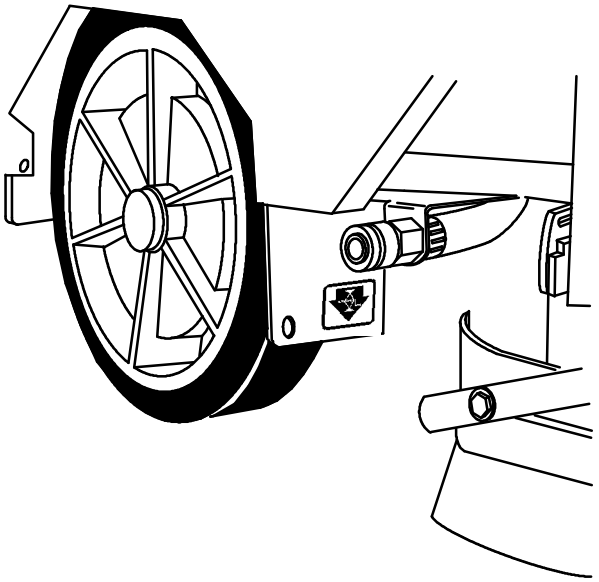
4. Use a jack of adequate capacity to raise the machine. Jack up the machine only at the designated locations.

FOR SAFETY: When Servicing Machine, Use Hoist Or Jack Of Adequate Capacity To Lift Machine.



05931

FRONT JACKING LOCATION



05922

REAR JACKING LOCATION

5. Block machine up with jack stands or similar devices next to the designated jacking locations to secure the machine.

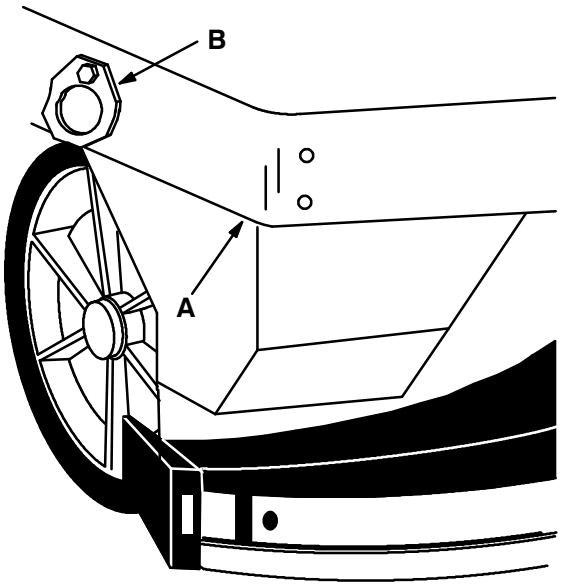
FOR SAFETY: When Servicing Machine, Jack Machine Up At Designated Locations Only. Block Machine Up With Jack Stands.

6. Lower the machine onto the jack stands.
7. Check to make sure the machine is secure.
8. Service the machine as required.
9. When finished servicing the machine, raise the machine off the jack stands.
10. Remove the jack stands from under the machine.
11. Lower the machine.
12. Remove the blocks from the tires.

MACHINE TIE DOWNS

The machine may be tied down at each corner of the main frame using the tie down brackets supplied in the demo kit.

When transporting the machine on a trailer or in a truck, be sure to set the machine parking brake and block the machine tires to prevent the machine from rolling.



MACHINE TIE DOWNS

A. Machine Frame
B. Tie Down

MACHINE STORAGE

STORING MACHINE

When storing the machine for extended periods of time, the following procedures must be followed to lessen the chance of rust sludge, or other undesirable deposits from forming.

1. Drain and clean the solution and recovery tanks.

   ES™ machines: Run clean water through the solution system and the ES™ solution pump.

   Pre-Sweep™ machines: Empty and clean the debris hopper, or remove hopper liner and replace it with a new one. Raise the Pre-Sweep™ assembly.

2. Raise the rear squeegee and the scrub head.

3. Park the machine in a cool, dry area.

4. Remove or charge the batteries every three months.

SECTION 3

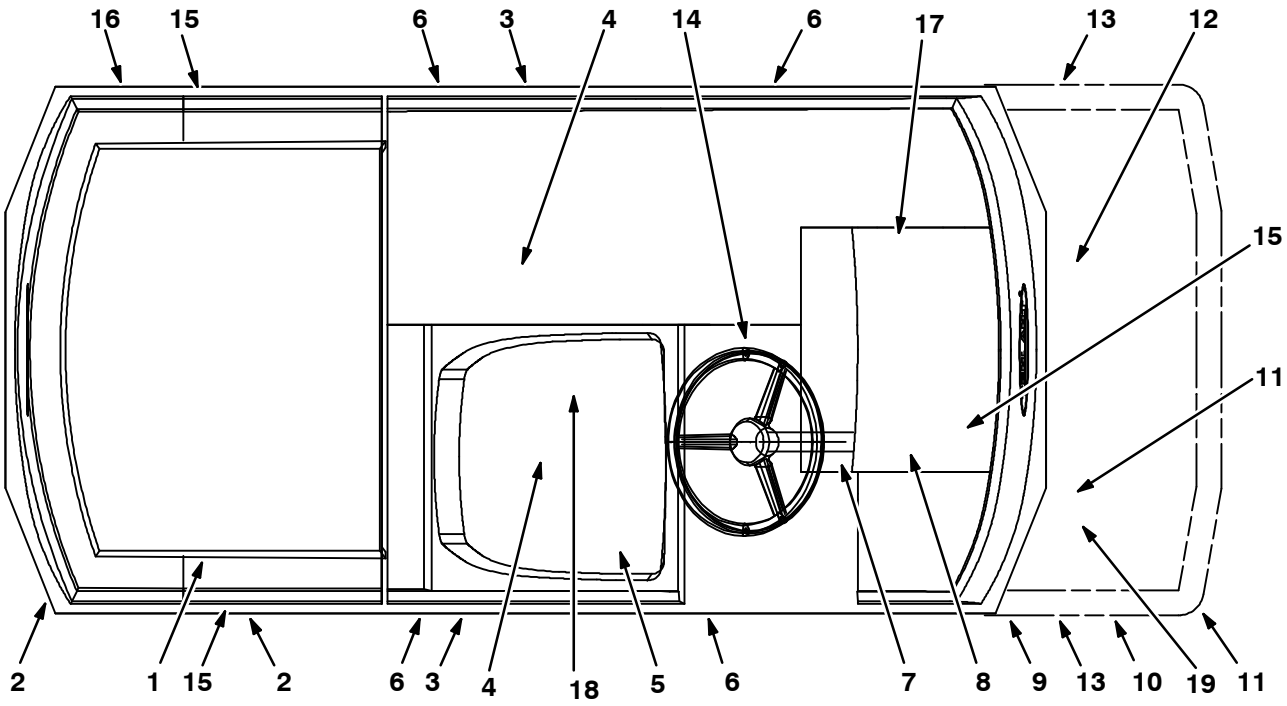
CONTENTS

RECOMMENDED FIRST 50-HOUR MACHINE INSPECTION

After the first 50 hours of operation, the following procedures are recommended:

1. Check the specific gravity of the batteries as described in *BATTERIES*.
2. Check the rear squeegee deflection as described in *TO LEVEL REAR SQUEEGEE* and *TO ADJUST REAR SQUEEGEE DEFLECTION*.
3. Check the battery cable connections.
4. Check steering gear chain tension as described in *STEERING GEAR CHAIN*.
5. Change the propelling gearbox lubricant and the drain and fill-level plug seals.
6. Pre-Sweep™ machines: Check the side brush belt tension as described in *PRE-SWEEP™ SIDE BRUSH DRIVE BELT*.
7. Perform all 50-hour lubrication and maintenance procedures listed in the *MAINTENANCE CHART*.

MAINTENANCE CHART



05424

Interval	Key	Description	Procedure	Lubricant	No. of Service Points
Daily	16	Rear Squeegee	Check for damage, wear and adjustment	–	1
	3	Side Squeegees	Check for damage and wear	–	2
	4	Scrub brushes	Check for damage and wear	–	2
	1	Recovery tank	Clean	–	1
	2	ES™ solution tank	Clean and flush	–	1
	11	Pre-Sweep™ brushes	Check for damage and wear	–	2
	12	Pre-Sweep™ debris hopper	Clean	–	1
20 Hours	5	Scrub head floor skirts	Check for damage and wear	–	5
	12	Pre-Sweep™	Check skirts and seals for damage and wear	–	
80 Hours	5	Scrub head floor skirts	Check adjustment	–	5
	13	Pre-Sweep™ side skirts	Check for damage and wear	–	2
100 Hours	15	Tires	Check for damage	–	3
	8	Propelling gearbox	Check lubricant level	GL	1

Interval	Key	Description	Procedure	Lubricant	No. of Service Points
200 Hours	8	Front wheel support bearing	Lubricate	SPL	2
	6	Scrub head parallel arm pivot points	Lubricate	SPL	8
	14	Parking brake	Check adjustment	–	1
	7	Steering gear chain	Check tension	–	1
400 Hours	10	Pre-Sweep™ side brush drive belt	Check tension	–	1
			Check for damage and wear	–	1
	9	Pre-Sweep™ main brush drive belt	Check for damage and wear	–	1
	17	Vacuum fan motor	Check motor brushes	–	2
1000 Hours	8	Propelling gearbox	Change gear lubricant	GL	1
			Change fill-level plug seals	–	1
	18	Brush drive motors	Check motor brushes	–	2
	8	Propelling motor	Check motor brushes	–	1
	19	Brush drive motor, Pre-Sweep™	Check motor brushes	–	1

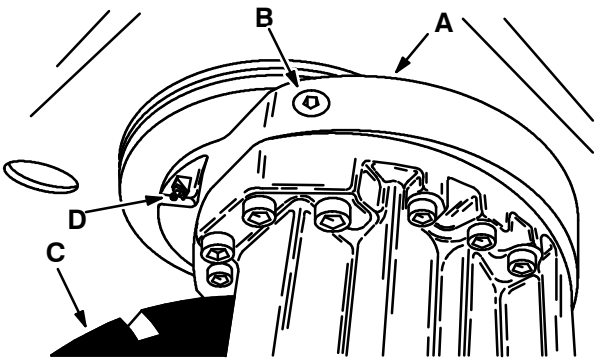
SPL – Special lubricant, Lubriplate EMB grease (TENNANT Part No. 01433–1)
GL – SAE 90 Gear weight lubricant

NOTE: More frequent intervals may be required in extremely dusty conditions.

LUBRICATION

PROPELLING GEARBOX

The propelling gearbox transfers power from the propelling motor to the front wheel. It is lubricated with SAE 90 weight gear lubricant. Check the lubricant level after every 100 hours of operation. Change the gear lubricant and the drain and fill-level plug seals after the first 50 hours of operation, and then after every 1000 hours of operation.



PROPELLING GEARBOX

A. Gearbox
B. Fill-Level Plug
C. Front Wheel
D. Support Bearing Grease Fitting

FRONT WHEEL SUPPORT BEARING

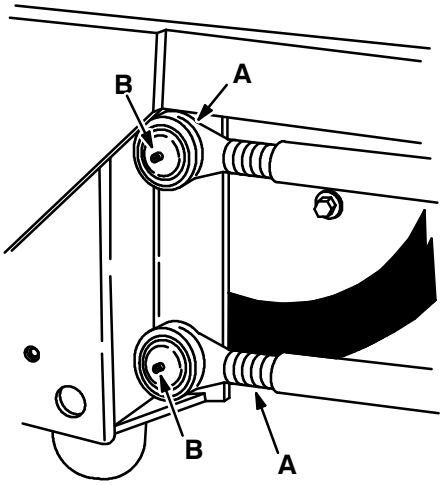
The front wheel support bearing allows the gearbox and front wheel assembly to rotate freely. Raise the machine so the front wheel is off the ground. Fill one grease fitting with Lubriplate EMB grease (TENNANT Part No. 01433–1) while rotating the gearbox from stop to stop. Fill the second grease fitting while rotating the gearbox back to the original position. The bearing cavity is full when grease comes out of the fittings or out of the top seal. Apply the lubricant after every 200 hours of operation, or after steam cleaning the gearbox area.

FOR SAFETY: When Servicing Machine, Block Machine Tires Before Jacking Machine Up.

FOR SAFETY: When Servicing Machine, Jack Machine Up At Designated Locations Only. Block Machine Up With Jack Stands.

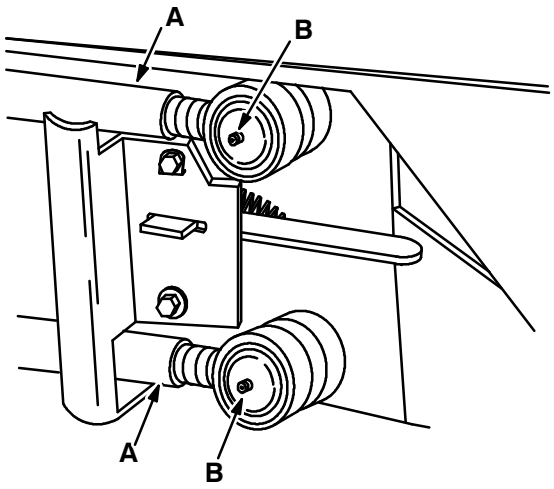
SCRUB HEAD PARALLEL ARMS

The scrub head parallel arms keep the scrub head parallel with the machine frame. The parallel arms have four pivot points on each side of the machine. Lubricate the pivot points with a grease gun containing Lubriplate EMB grease (TENNANT Part No. 01433–1) after every 200 hours of operation.



FRONT PIVOT POINTS

A. Scrub Head Parallel Arm
B. Grease Fitting



REAR PIVOT POINTS

A. Scrub Head Parallel Arm
B. Grease Fitting

ELECTRICAL SYSTEM

BATTERIES

The batteries provide all of the energy used by the machine. The standard batteries are rated at 380 A/h at a 6-hour rate. The heavy duty batteries are available as an option. They are rated at 570 A/h at a 6-hour rate. The batteries require regular maintenance to keep them operating their best.

Periodically clean the top surface and the terminals and check for loose connections. Use a strong solution of baking soda and water. Brush the solution sparingly over the battery top, terminals, and cable clamps. Do not allow any baking soda solution to enter the battery. Use a wire brush to clean the terminal posts and the cable connectors. After cleaning, apply a coating of clear petroleum jelly to the terminals and the cable connectors, Keep the tops of the batteries clean and dry.

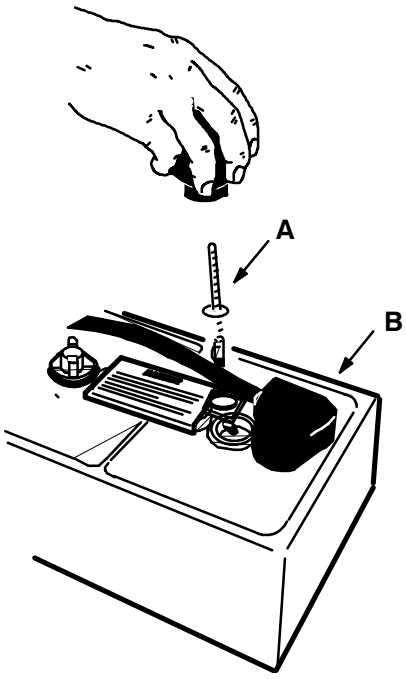
Check the electrolyte level in each battery cell before and after charging the batteries. Never add acid to the batteries, only distilled water. Do not overfill. Keep vent plugs firmly in place at all times, except when adding water or taking hydrometer readings.

FOR SAFETY: When Servicing Machine, Avoid Contact With Battery Acid.

Do not operate the machine if the batteries are in poor condition or have a charge level below 25%, specific gravity below 1.177. Do not allow the batteries to remain in discharged condition for any length of time.

Keep all metallic objects off the top of the batteries, as they may cause a short circuit. Replace worn or damaged wires.

The machine batteries are unique in that they hold their power of long periods of time, but they can only be recharged a certain number of times. To get the most life from the batteries, charge them when their charge level is below 25%. To determine the charge level, check the batteries specific gravity with a hydrometer.



04380

CHECKING BATTERY SPECIFIC GRAVITY

A. Hydrometer
B. Battery

If one or more battery cells tests lower than the other battery cells, (0.050 or more) the cell is damaged, shorted, or is about to fail.

NOTE: Do not take readings immediately after adding water - if the water and acid are not thoroughly mixed, the readings may not be accurate. Check the hydrometer readings against the following chart:

Specific Gravity at 80° F (27° C)	Battery Condition
1.290	100% charged
1.252	75% charged
1.215	50% charged
1.177	25% charged
1.110	Discharged

NOTE: If the readings are taken when the battery electrolyte is any temperature other than 80° F (27° C), the reading must be temperature corrected.

To determine the corrected specific gravity reading when the temperature of the battery electrolyte is other than 80° F (27° C):

Add to the specific gravity reading 0.004 (4 points) for each 10° F (6° C) above 80° F (27° C).

Subtract from the specific gravity reading 0.004 (4 points) for each 10° F (6° C) below 80° F (27° C).

Eight to twelve hours is generally enough time to charge a discharged set of batteries. If the batteries are not fully discharged, charge for a period of time that is proportionally less than what is required for a fully discharged set of batteries, ie; half discharged batteries need four to six hours of charging time.

Do not expose the battery charger to water. Do not touch uninsulated battery terminals or unnecessarily expose any portion of your body to the batteries when making electrical connections.

TO CHARGE BATTERIES

1. Stop the machine on a flat, dry surface next to the charger and set the machine parking brake.

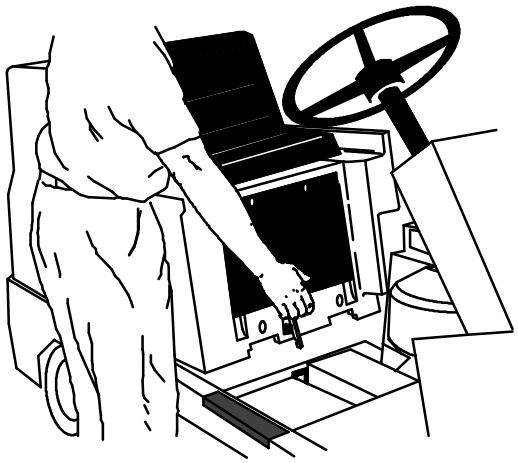
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Turn the key-operated on-off switch counter-clockwise to turn off the machine.

3. Lift open the machine cover.

WARNING: Batteries Emit Hydrogen Gas. Explosion Or Fire Can Result. Keep Sparks And Open Flame Away. Keep Covers Open When Charging.

4. Remove the seat support.



05916

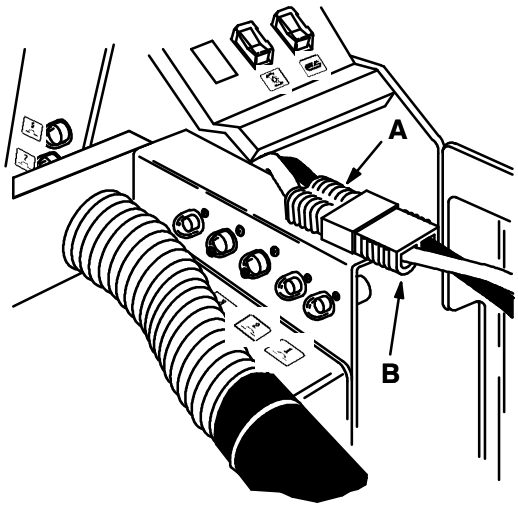
REMOVING SEAT SUPPORT

5. Check the electrolyte level in the batteries.

   Before charging, add just enough distilled water to cover the plates. Then, after charging is completed, add enough water to bring the level up to the indicator ring. If the water level is topped off before charging, normal expansion of the electrolyte may cause an overflow, resulting in loss of acid balance and damage to the machine.

6. Replace the battery caps and leave them in place while charging.

7. Unplug the battery connector from the machine connector.



05920

MACHINE AND BATTERY CONNECTORS

A. Machine Connector
B. Battery Connector

8. Plug the charger connector into the battery connector.

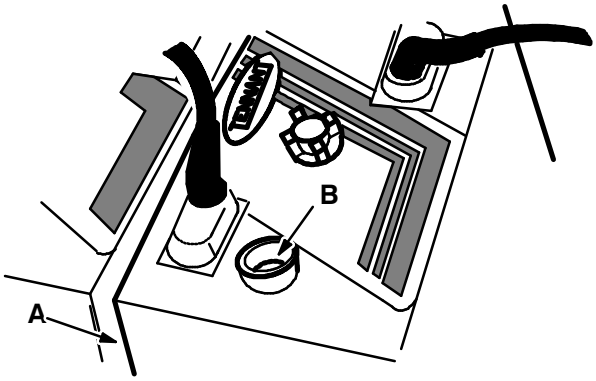
   The charger gauge will indicate the charger is operating. The charger will turn off when the batteries are fully charged.

9. After the charger is off, or has been turned off, unplug the charger connector from the battery connector on the machine.

NOTE: Make sure the battery charger is off before unplugging the charger connector from the battery connector.

10. Reconnect the machine connector to the battery connector.

11. Check the electrolyte level of the batteries; it should be up to the indicator ring.



00879

ELECTROLYTE INDICATOR RING

A. Battery
B. Indicator Ring

12. Replace the seat support.

13. Close the machine cover.

TO REPLACE 380 A/h BATTERIES

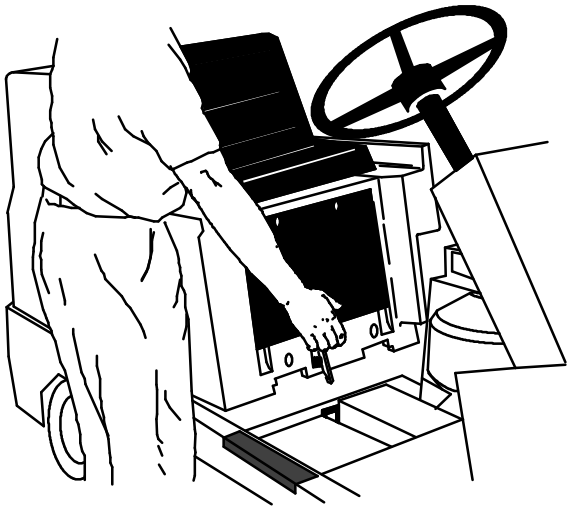
1. Stop the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Turn the key-operated on-off switch counter-clockwise to turn off the machine.

3. Lift open the machine cover.

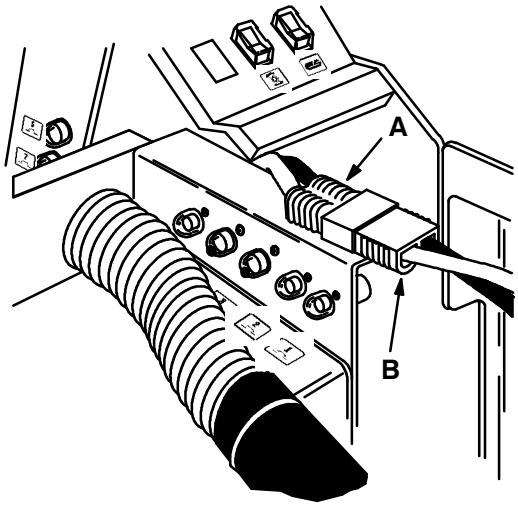
4. Remove the seat support.



05916

REMOVING SEAT SUPPORT

5. Unplug the battery connector from the machine connector.



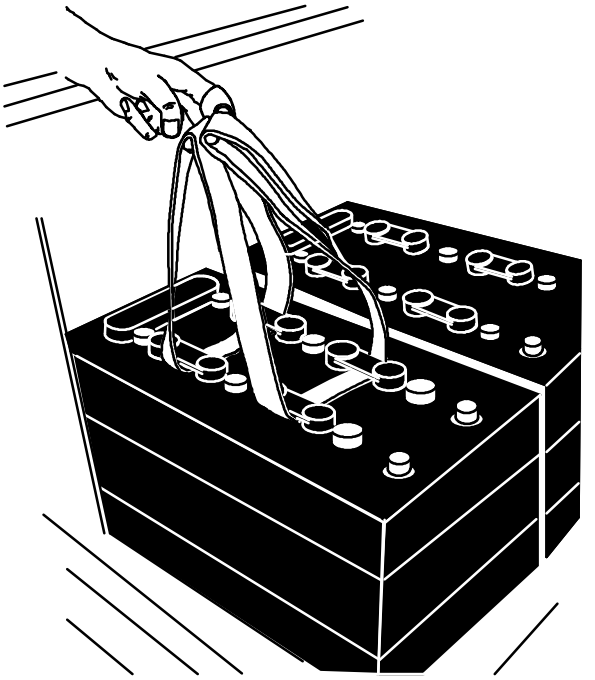
05920

MACHINE AND BATTERY CONNECTORS

A. Machine Connector
B. Battery Connector

6. Disconnect and remove the battery cables from the batteries.

7. Insert the lifting strap into the battery to be removed on machines below serial number 002330. Attach the host to the batteries on machine serial number 002330 and above.



INSERTING LIFTING STRAP
(For machines below serial number 002330)

8. Hoist the battery out of the machine.

9. Remove the remaining batteries that need to be removed using the lifting strap for hoisting.

10. Attach the host to the batteries to lift the new batteries into the machine.

11. Connect the battery cables to the batteries.

12. Check the charge level of the new batteries as described in *BATTERIES*. Charge the batteries if necessary.

13. Connect the battery connector to the machine connector.

14. Replace the seat support.

15. Close the machine cover.

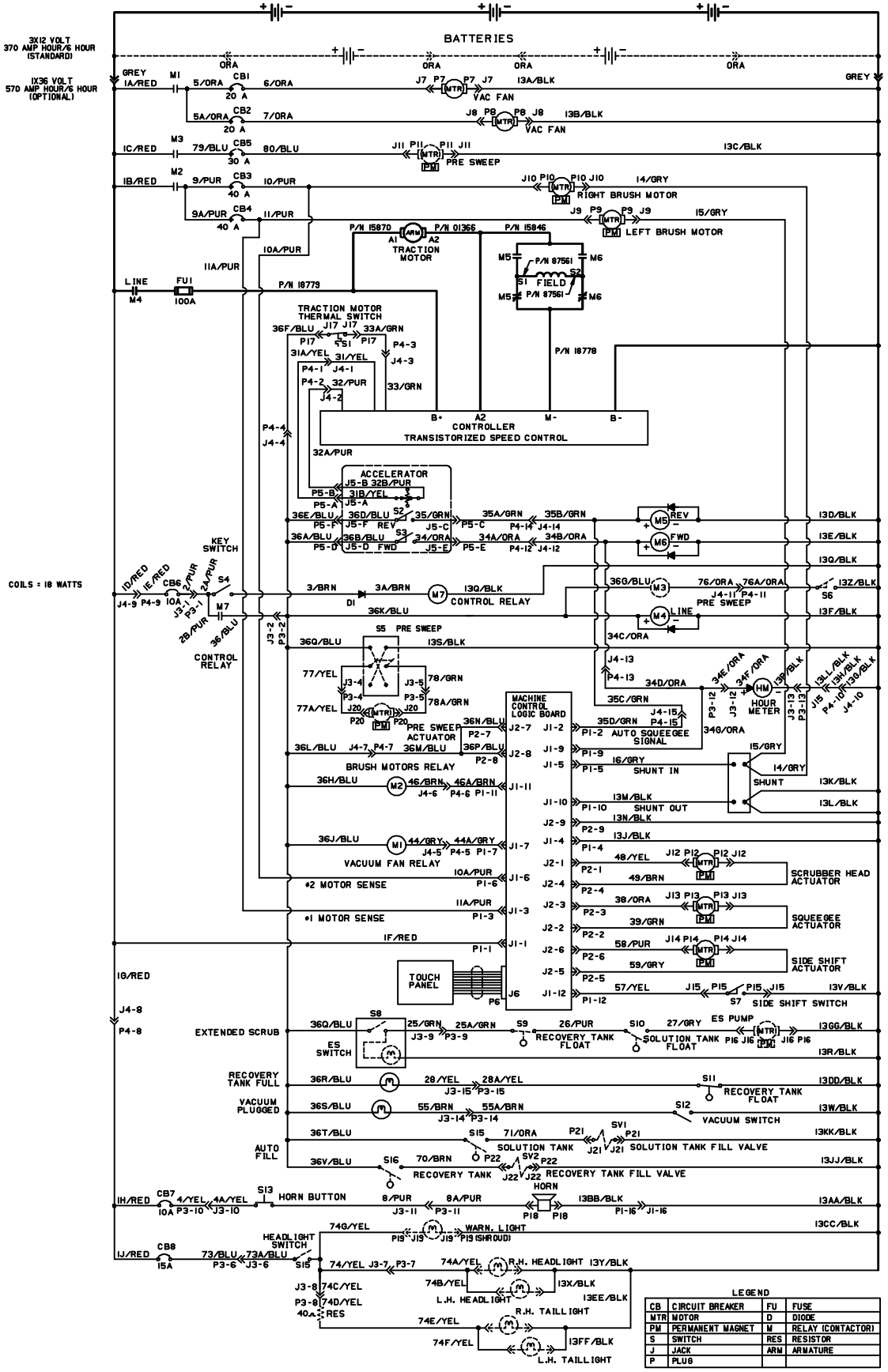
ELECTRIC MOTORS

The carbon brushes on the vacuum fan motors should be inspected every 400 hours of machine operation, and the brush drive motors and propelling motor every 1000 hours of operation.

PROPELLING CIRCUIT

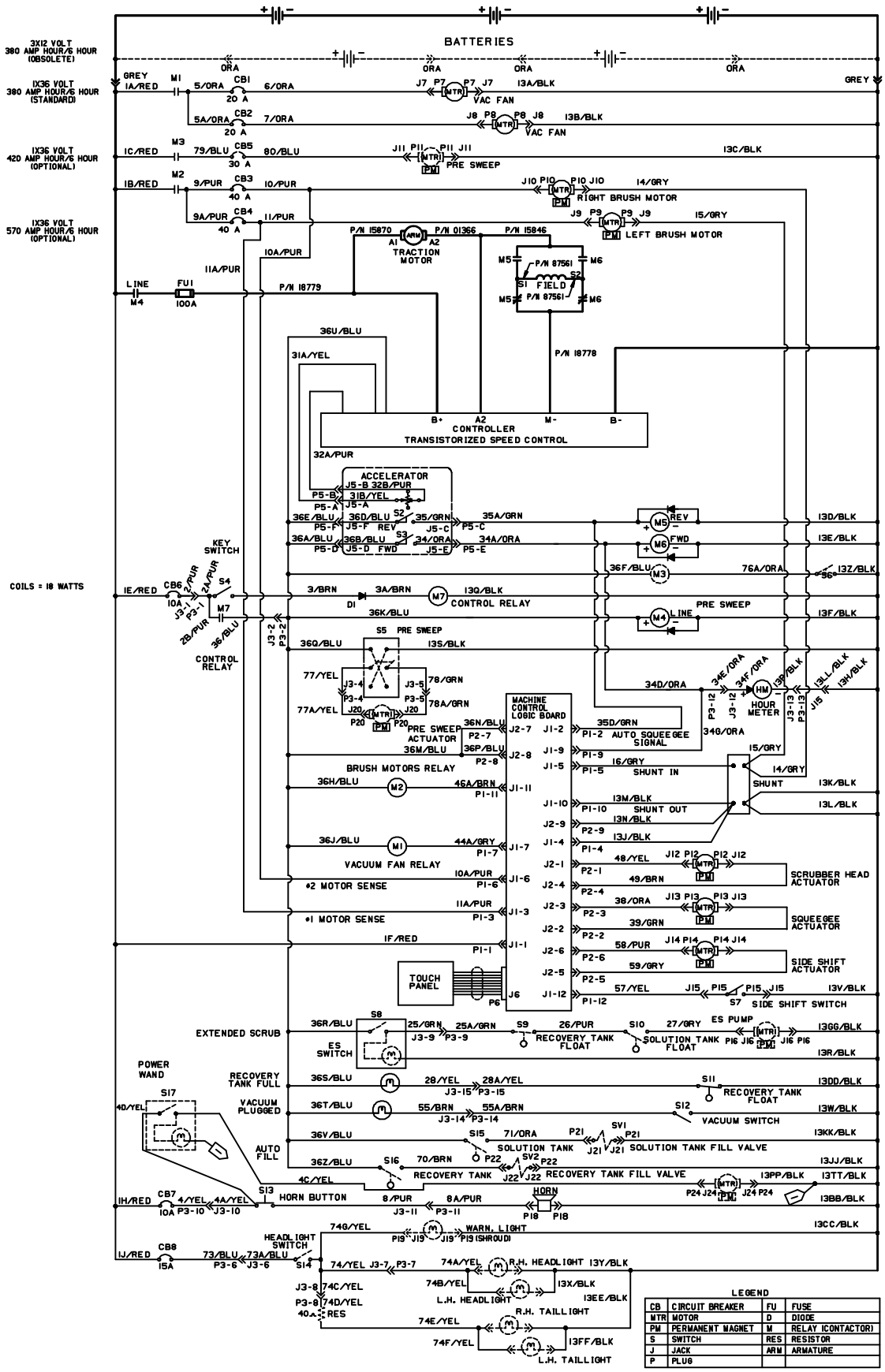
The propelling circuit is transistorized controller. It controls the forward and reverse speed of the machine and is located in the controller panel. The circuit is not user serviceable – only trained personnel should be allowed to work on it. Do not steam clean or spray the panel with water as it may damage the electrical system.

NOTE: A static discharge grounding strap should be used when servicing the electronic circuitry.



05420

ELECTRICAL SCHEMATIC
(For machines below serial number 001840)



06083

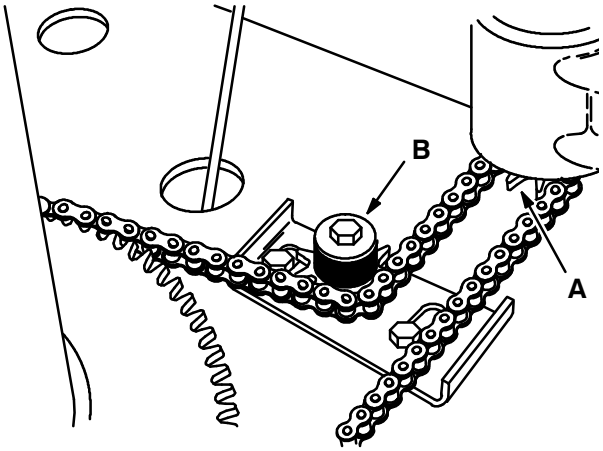
ELECTRICAL SCHEMATIC
(For machines serial number 001840 and above)

BELTS AND CHAINS

STEERING GEAR CHAIN

The steering gear chain controls the machine steering. The tension of the chain should be checked after the first 50 hours of operation and every 200 hours there after. The deflection should be 0.12 to 0.25 in (3 to 6 mm) between the steering sprocket and the idler sprocket when the steering wheel is turned the tightest position either direction.

To adjust the chain tension, loosen the idler sprocket mounting bracket hardware. Move the idler sprocket and mounting bracket until the proper deflection is measured. Tighten the idler sprocket mounting bracket hardware.



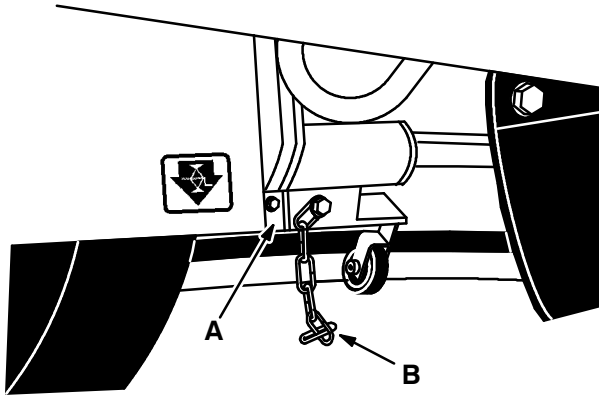
05935

STEERING GEAR CHAIN

A. Steering Sprocket
B. Idler Sprocket

STATIC DRAG CHAIN

The static drag chain prevents the buildup of static electricity in the machine. It is attached to the rear squeegee linkage. Make sure the chain is making contact with the floor at all times.



05936

STATIC DRAG CHAIN

A. Rear Squeegee Linkage
B. Static Drag Chain

SCRUB HEAD

SCRUB HEAD

The scrub head houses the two disc type scrub brushes, and their drive and lift mechanisms. The scrub head is factory adjusted and the measurement should not be changed unless scrub head parts are damaged or are replaced. The scrub head has three adjustments – side-to-side centering, edge scrub switch, and down pressure.

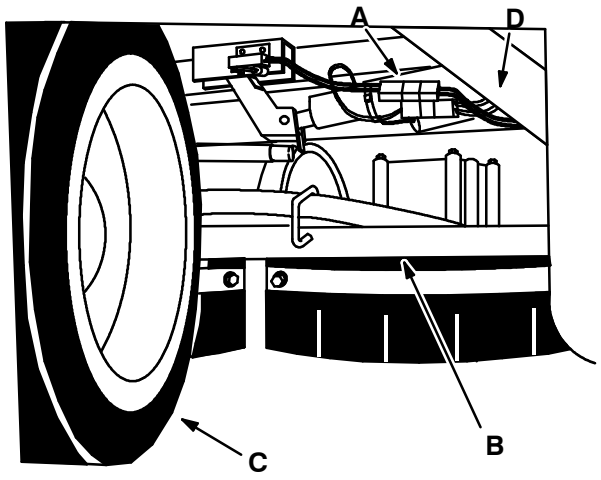
TO CENTER SCRUB HEAD

NOTE: The scrub head is factory adjusted and the measurement should not be changed unless scrub head parts are damaged or are replaced.

1. Stop the machine on a smooth, level floor.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Place a straight edge up against the main frame and the edge of the scrub head on both sides of the machine to measure for centering from side to side. Side-to-side centering should measure equal on both sides of the machine within 0.25 in (6 mm).
4. To adjust the centering, loosen the edge scrub actuator bracket mounting hardware.



EDGE SCRUB ACTUATOR

A. Edge Scrub Actuator
B. Scrub Head
C. Front Wheel
D. Actuator Mounting Bracket

5. Loosen the hardware mounting the side stop bracket on the left-hand side of the scrub head just inside the left-hand rear wheel pocket.
6. Move the scrub head either direction to center the scrub head.
7. Check the centering measurement.
8. Readjust the scrub head centering until the head is centered within 0.25 in (6 mm) from side to side.
9. Tighten the edge scrub actuator mounting bracket hardware.
10. Adjust the side stop bracket so its plastic bumper touches the machine frame. Tighten the bracket mounting hardware.
11. Check the edge scrub switch adjustment as described in *TO ADJUST EDGE SCRUB SWITCH*.

TO ADJUST EDGE SCRUB SWITCH

NOTE: The scrub head is factory adjusted and the measurement should not be changed unless scrub head parts are damaged or are replaced.

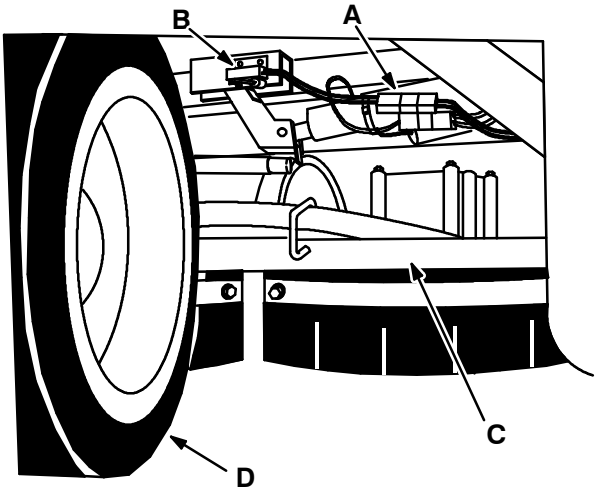
1. Stop the machine on a smooth, level floor.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. With someone in the operator seat to turn the machine on and operate the edge scrub switch, watch the action stroke of the edge scrub actuator and edge scrub switch.

   The edge scrub switch must activate 0.06 to 0.12 in (2 to 3 mm) before the end of the retraction stroke of the edge scrub actuator.

4. If necessary, adjust the switch until the switch is activated at the proper measurement.



05937

EDGE SCRUB SWITCH

A. Edge Scrub Actuator
B. Edge Scrub Switch
C. Scrub Head
D. Front Wheel

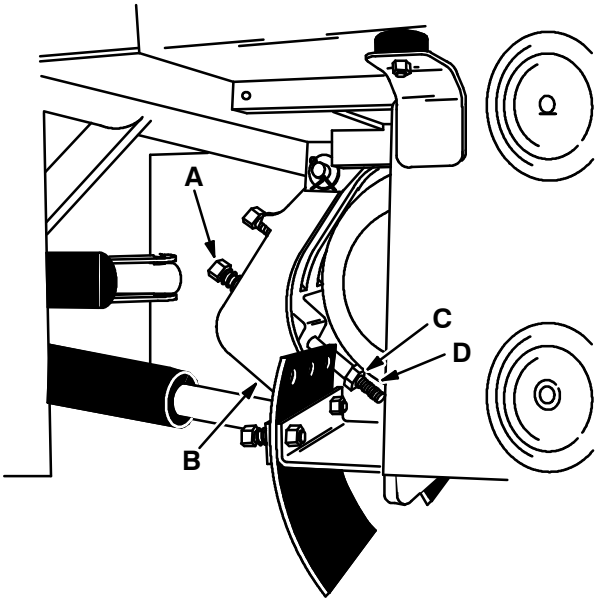
TO ADJUST SCRUB HEAD DOWN PRESSURE

NOTE: The scrub head is factory adjusted and the measurement should not be changed unless scrub head parts are damaged or are replaced.

1. Stop the machine on a smooth, level floor.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Measure the length of thread of the down pressure adjustment bolt beyond the nut. The proper length of thread is 0.94 in (25 mm).
4. If the thread length is not the proper measurement, turn the down pressure adjustment bolt until the proper measurement is reached.



06017

DOWN PRESSURE ADJUSTMENT BOLT

A. Down Pressure Adjustment Bolt
B. Scrub Head
C. Nut
D. Length of Thread

5. Readjust scrub head floor skirts if necessary. See *SCRUB HEAD FLOOR SKIRTS*.

SCRUB BRUSHES

Two disc-type scrub brushes scrub the floor. Each scrub brush is driven by its own electric motor through a gearbox to a drive hub. A spring lock clip holds the scrub brush onto the drive hub.

There are many variations of brushes and cleaning pads to choose from. There is a brush or cleaning pad available for almost any application. Scrub brushes are ready for use when they are equipped with a brush drive plate and a spring clip.

The scrub brushes should be checked daily for tangled wire or string wear damage. The scrub brushes should be replaced if large portions of the brush bristles are missing or if the remaining brush bristle measure 0.25 in (6 mm) or less in length.

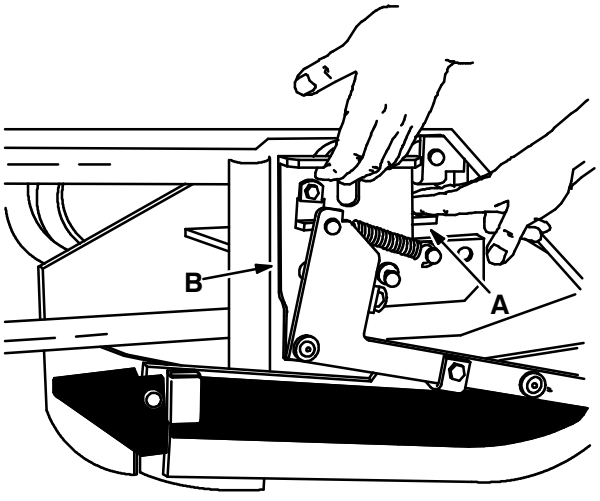
NOTE: Be sure to replace the scrub brushes in sets. Otherwise one scrub brush will be more aggressive than the other.

TO REPLACE SCRUB BRUSHES

1. With the scrub head raised, turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Push back on the side squeegee release lever. Pull up on the side squeegee assembly and remove it from the scrub head.

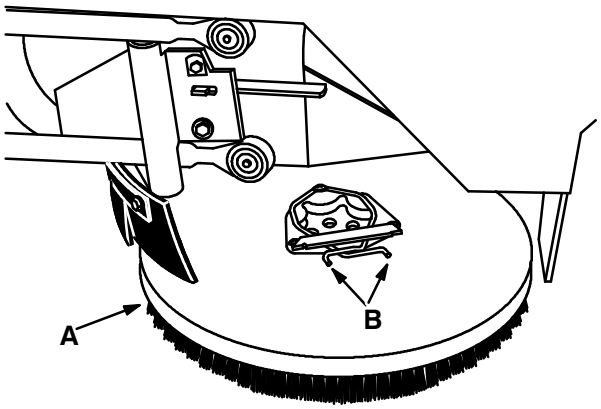


05938

REMOVING SIDE SQUEEGEE

A. Side Squeegee Release Lever
B. Squeegee Assembly

3. Press the brush spring clip ends together with your thumb and index finger to remove the scrub brush.



05939

REMOVING SCRUB BRUSH

A. Scrub Brush
B. Brush Spring Clip

4. Slide the new scrub brush under the scrub brush drive assembly.

5. Line up the scrub brush drive socket with the drive plug.

6. Press the brush spring clip together and lift the scrub brush onto the drive plug. Release the spring clip when the brush is in place.

7. Push back on the side squeegee release lever. Slide the side squeegee assembly onto the scrub head.

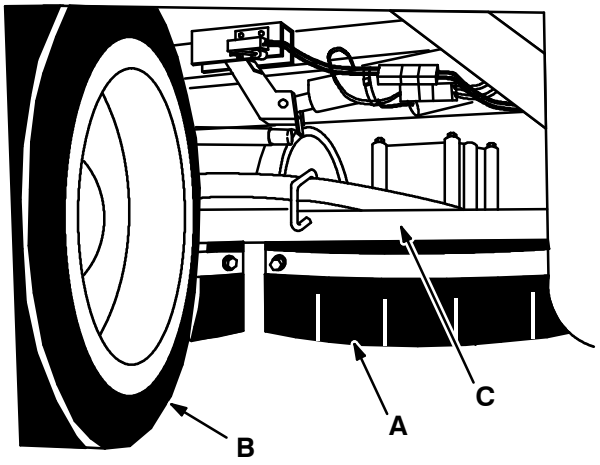
8. Repeat for the other brush on the other side of the machine.

9. Check the scrub head front and rear skirt adjustments as described in *SCRUB HEAD FLOOR SKIRTS*.

SCRUB HEAD FLOOR SKIRTS

The scrub head floor skirts control water spray from the brushes. The skirts are located in front and rear of the scrub head. Check these skirts for wear and damage after every 20 hours of operation.

The skirts should clear the floor by 0 to 0.25 in (0 to 6 mm) when the scrub head is down. Check the floor skirt adjustment after every 80 hours of operation.



05937

SCRUB HEAD FLOOR SKIRTS

A. Floor Skirt
B. Front Wheel
C. Scrub Head

The three rear scrub head floor skirts can be adjusted by pulling the skirt up or down without loosening the retainer hardware.

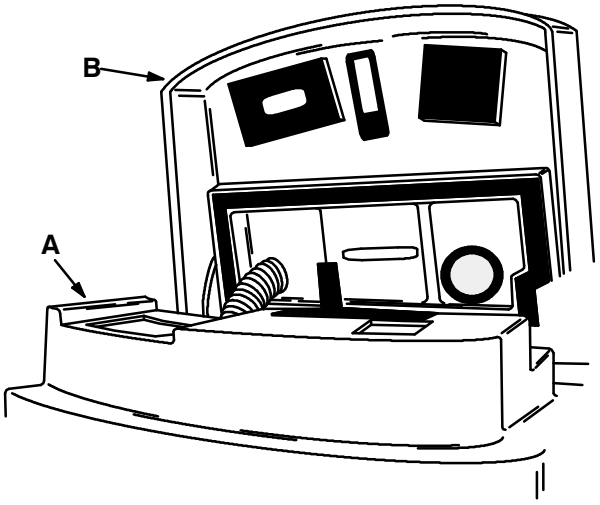
The front two scrub head floor skirts need the retainer hardware loosened to move the skirt up of down. Tighten the retainer hardware enough to hold the skirt in place firmly.

SOLUTION AND RECOVERY TANKS

SOLUTION TANK

The solution tank supplies the brushes with a water and detergent solution. The solution tank is located behind the recovery tank.

Access to the solution tank is through the opening at the top of the tank, reached by lifting up the tanks cover.

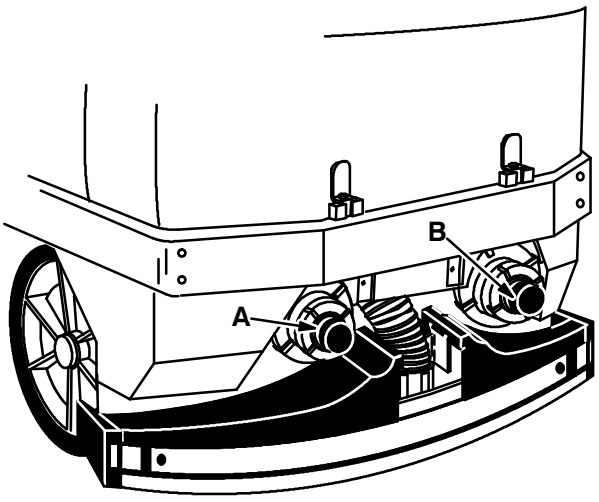


05921

SOLUTION TANK

A. Solution Tank
B. Tanks Cover

The solution tank requires no regular maintenance. If detergent cakes on the bottom of the tank, remove the deposits with a strong blast of warm water. Do not use water hotter than 130° F (54° C) or use steam to clean the tank because damage may occur. A tank drain hose has been provided to allow the tank to be drained for cleaning.



05940

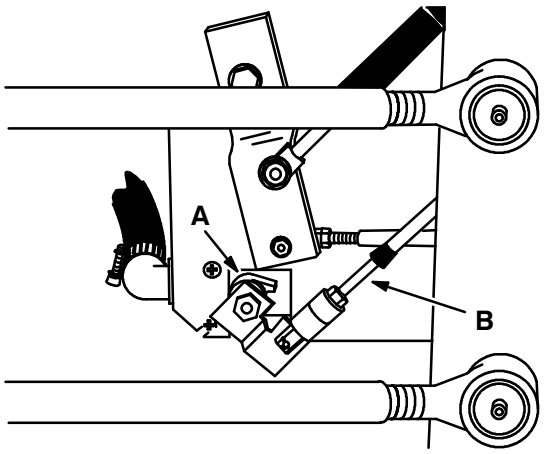
SOLUTION TANK DRAIN

A. Solution Tank Drain
B. Recovery Tank Drain

SOLUTION VALVE

The solution valve controls the flow of solution to the scrub brushes. The valve linkage should provide the valve with fully open to fully closed positions.

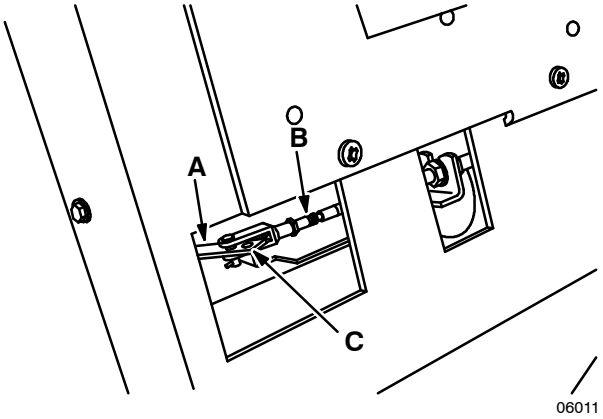
The solution control cable can be adjusted at the solution lever or valve ends of the cable. To adjust the cable at the solution lever end, open the machine cover. To adjust the cable at the solution valve end of the cable, locate the valve by the scrub head.



05941

SOLUTION VALVE

A. Solution Valve
B. Solution Cable



SOLUTION LEVER

A. Solution Lever
B. Solution Cable
C. ES™ Rough Floor Mounting Hole

ES™ machines: The solution lever has two mounting holes for the solution cable clevis. In the factory, the cable for an ES™ machine is mounted on the inside hole. On the ES™ machine, the cable clevis can be moved to the outside hole for greater solution flow to the floor. This mounting position would be for rough floor conditions only.

RECOVERY TANK

The recovery tank stores water solution picked up by the machine squeegees and the vacuum fan. The recovery tank on standard machines is located in front of the solution tank.

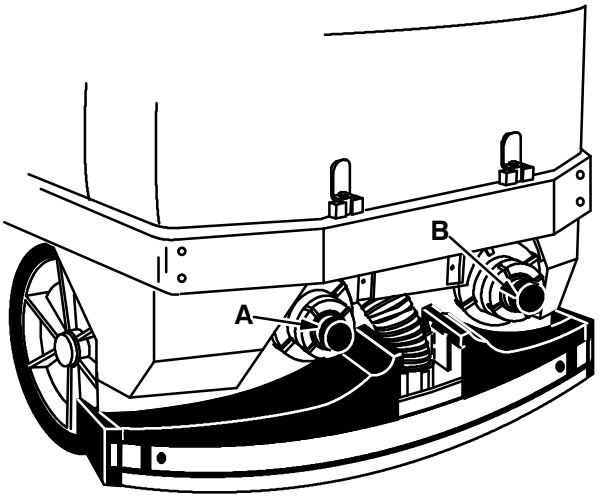
The recovery tank should be drained and cleaned after the solution tank is empty and whenever the float stops the vacuum fan or the recovery tank full lamp lights.

TO DRAIN AND CLEAN RECOVERY TANK

1. Move the solution lever all the way down to stop the solution flow to the floor.
2. Press the scrub brush switch to raise the scrub head and stop the brushes.
3. Press the rear squeegee and vacuum fan switch to raise the rear squeegee and stop the vacuum fan.
4. Stop the machine next to a floor drain.
5. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

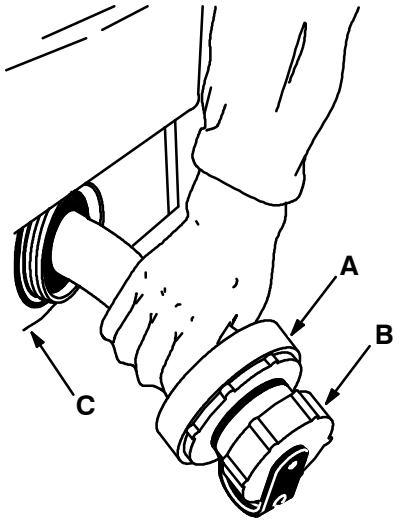
6. To drain the recovery tank, unscrew the drain hose cap from the access cap of the recovery tank drain.



TANK DRAINS

A. Solution Tank Drain
B. Recovery Tank Drain

7. Pull out and place the drain hoses next to the floor drain. Remove the drain cap from the hose. Stand back, the solution rushes out of the drain hose.

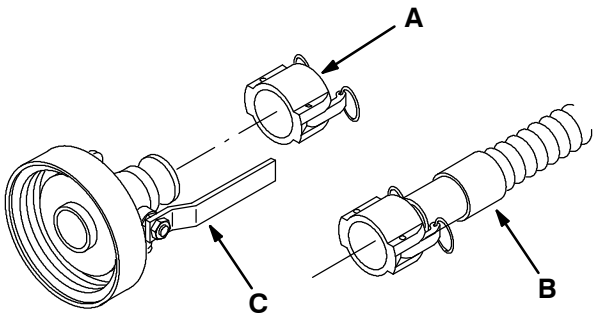


05914

DRAINING RECOVERY TANK

A. Drain Hose Cap
B. Drain Cap
C. Access Cap

For machines with the positive drain cap option, remove the dust cap. Connect the drain hose and open the drain valve.



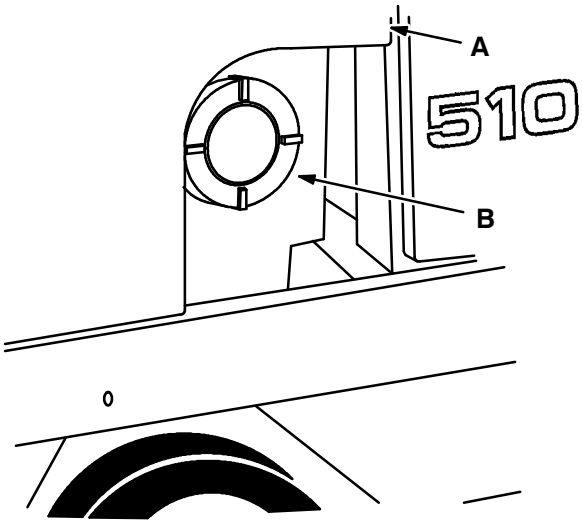
10199

DRAINING TANK

A. Dust Cap
B. Drain Hose
C. Drain Valve

8. Open the tanks cover.

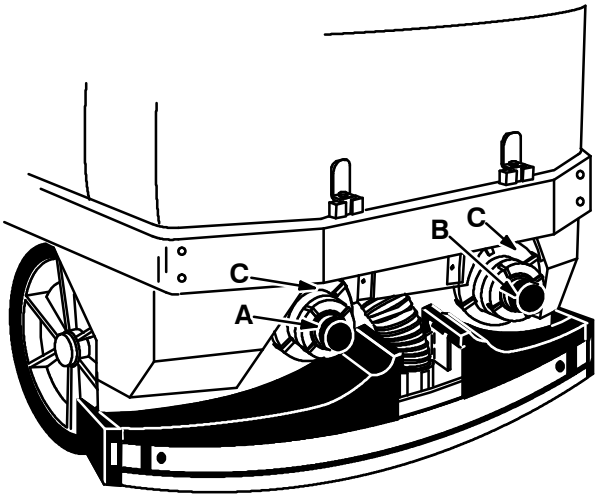
9. Spray the inside of the recovery tank with clean water. Do not use water hotter than 130° F (54° C) or use steam to clean the tank because damage may occur. The recovery tank has two access caps, one on the side of the machine and one at each tank drain.



05926

RECOVERY TANK ACCESS CAP

A. Recovery Tank
B. Access Cap



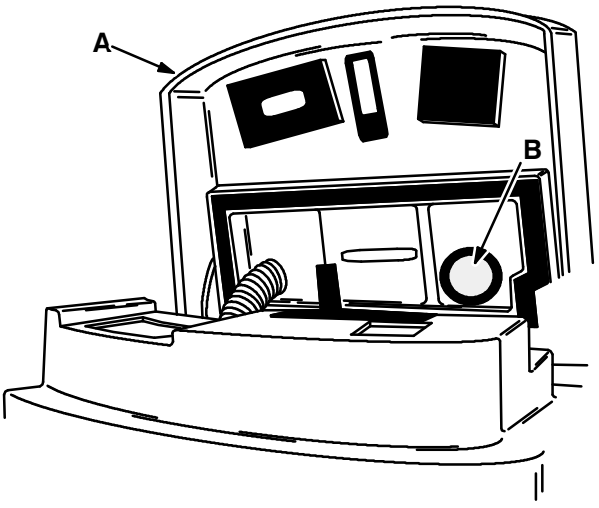
05940

TANK ACCESS CAPS

A. Solution Tank Drain
B. Recovery Tank Drain
C. Access Cap

Pre-Sweep™ machines: Remove and clean out the debris hopper, or remove hopper liner and replace it with a new one. Place the hopper back into the Pre-Sweep™ assembly.

10. Remove the vacuum outlet screen from the tanks cover. Clean the vacuum outlet screen and place it back in the tanks cover.



05921

VACUUM OUTLET SCREEN

A. Tanks Cover
B. Vacuum Outlet Screen

11. Lower the tanks cover.

12. Replace the drain hoses and drain caps.

    For machines with the positive drain cap option, close the drain valve. Remove the drain hose and attach the dust cap.

ES™ SOLUTION TANKS

The ES™ machine solution tanks supply the scrub brushes with a water and cleaning solution mixture. The tanks also store water picked up by the machine squeegees and the vacuum fan.

Access to the ES™ solution tanks is through the opening at the top of the tanks, reached by lifting up the tanks cover.

The ES™ solution tanks should be drained and cleaned after every work shift.

TO DRAIN AND CLEAN ES™ SOLUTION TANKS

1. Move the solution lever all the way down to stop the solution flow to the floor.

2. Press the scrub brush switch to raise the scrub head and stop the brushes.

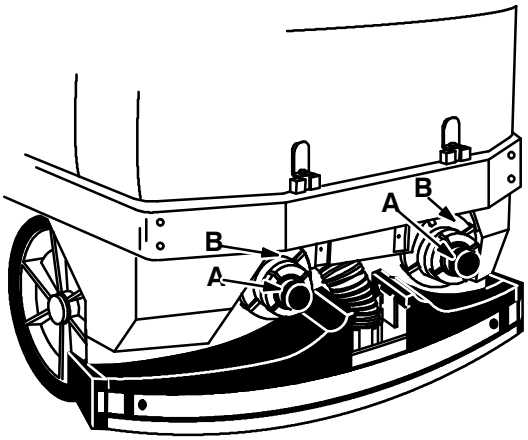
3. Press the rear squeegee and vacuum fan switch to raise the rear squeegee and stop the vacuum fan.

4. Stop the machine next to a floor drain.

5. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

6. Unscrew the drain hose cap from the access caps of the solution tank drains.

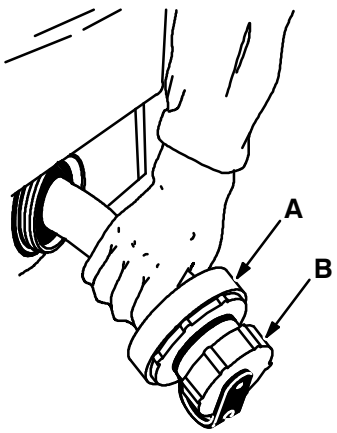


05940

TANK DRAINS

A. Solution Tank Drain
B. Access Cap

7. Pull out and place the drain hoses next to the floor drain. Remove the drain cap from the end of the drain hose. Stand back, the solution rushes out of the drain hoses.

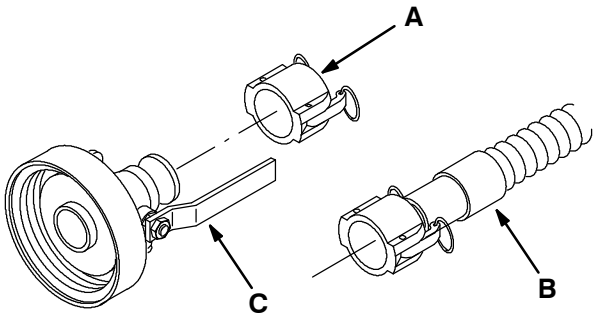


05914

DRAINING SOLUTION TANKS

A. Drain Hose Cap
B. Drain Cap

For machines with the positive drain cap option, remove the dust cap. Connect the drain hose and open the drain valve.

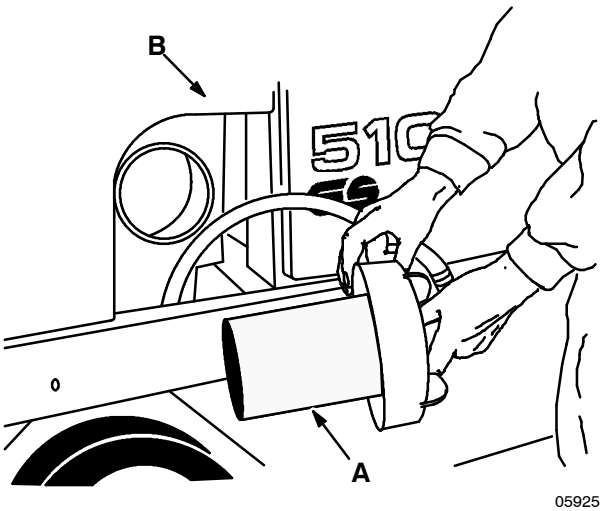


DRAINING TANK

A. Dust Cap
B. Drain Hose
C. Drain Valve

8. Open the tanks cover.

9. Spray the inside of the solution tanks with clean water. Do not use water hotter than 130° F (54° C) or use steam to clean the tank because damage may occur. Remove the ES™ outlet filter from the solution tank and clean. Place the ES™ outlet filter back into the solution tank. Then add enough water to the tank to cover the outlet filter, and operate the ES™ pump to flush the ES™ system. The ES™ solution tanks have access caps at each tank drain.

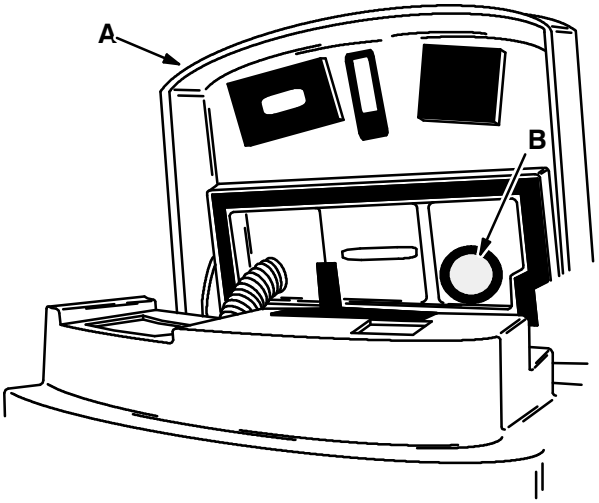


ES™ OUTLET FILTER

A. ES™ Outlet Filter
B. Solution Tank

Pre-Sweep™ machines: Remove and clean out the debris hopper, or remove hopper liner and replace it with a new one. Place the hopper back into the Pre-Sweep™ assembly.

10. Remove the vacuum outlet screen from the tanks cover. Clean the vacuum outlet screen and place it back in the tanks cover.



VACUUM OUTLET SCREEN

A. Tanks Cover
B. Vacuum Outlet Screen

11. Lower the tanks cover.

12. Replace the drain hoses and drain caps.

    For machines with the positive drain cap option, close the drain valve. Remove the drain hose and attach the dust cap.

SQUEEGEES

SIDE SQUEEGEES

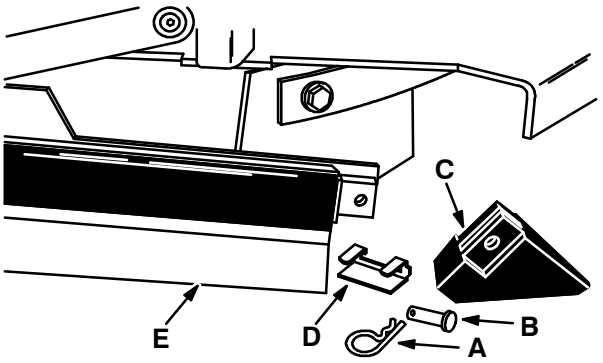
The side squeegees control water spray and channel water into the path of the rear squeegee. Check the side squeegees for damage and wear daily. Replace the side squeegee blades whenever they become damaged or lose their shape or resiliency. Replace the squeegee deflectors whenever they become worn.

TO REPLACE SIDE SQUEEGEE BLADES

1. Raise the scrub head.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key

3. Remove the cotter pin, clevis pin, deflector, and the retainer bracket from the front of the side squeegee.



05942

SIDE SQUEEGEE

A. Cotter Pin
B. Clevis Pin
C. Deflector
D. Retainer Bracket
E. Side Squeegee

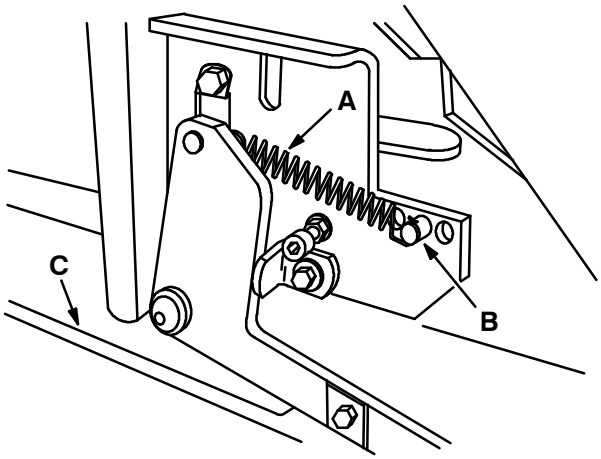
4. Pull the squeegee blade off the front of the squeegee frame.
5. Slide the new squeegee blade onto the frame.

NOTE: Lubricating the squeegee frame where the squeegee makes contact will make for easier squeegee installation.

6. Replace the retainer bracket, deflector, clevis pin, and cotter pin.
7. Repeat for the side squeegee on the other side of the scrub head.

SIDE SQUEEGEE ADJUSTMENT

The side squeegee has one adjustment – height. To change the height adjustment, disconnect the squeegee spring from the clevis pin and move the clevis pin to a different hole location. The factory setting is in the middle hole location.



05918

SIDE SQUEEGEE HEIGHT ADJUSTMENT

A. Squeegee Spring
B. Clevis Pin
C. Side Squeegee

REAR SQUEEGEE

The rear squeegee assembly channels water into the vacuum fan suction. The front squeegee blade channels the water, and rear blade wipes the floor. Check the rear squeegee assembly for damage, wear, and adjustment daily.

Rotate or replace either squeegee blade if its leading edge is torn or worn half-way through the thickness of the blade.

Each blade has four wiping edges. To use them all, start with one wiping edge. To use the next wiping edge, rotate the squeegee end-for-end. To use the next wiping edge, rotate the top edges down, bottom edges up. To use the last edge, rotate the squeegee end-for-end.

TO REPLACE OR ROTATE REAR SQUEEGEE BLADE

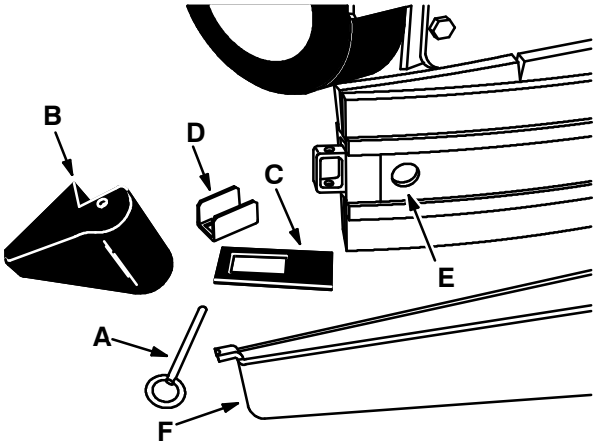
1. Raise the rear squeegee.

2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Remove the ringed pin, deflector, gasket, retainer bracket, and retainer strip from the end of the squeegee.

4. Pull off the squeegee assembly cover.



REAR SQUEEGEE

A. Ringed Pin
B. Deflector
C. Gasket
D. Retainer Bracket
E. Retainer Strip
F. Squeegee Assembly Cover

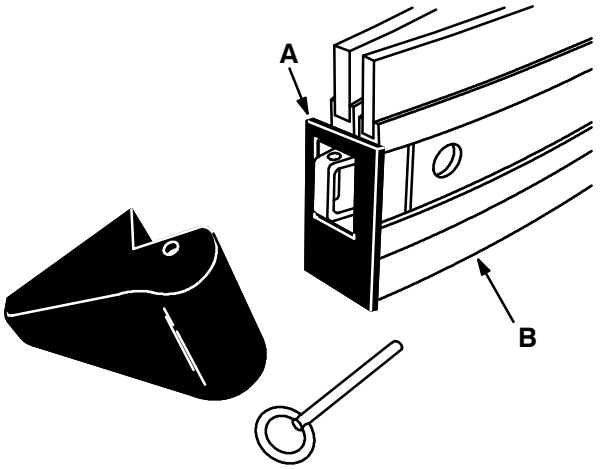
5. Pull the squeegee blade off the squeegee frame.

6. Replace or rotate the squeegee to allow a new edge to face the front of the machine.

7. Slide the squeegee blade onto the squeegee frame.

NOTE: Lubricating the squeegee frame where the squeegee makes contact will make for easier squeegee installation.

8. Slip the retainer strip into the squeegee blade. Slip the retainer bracket on the end of the squeegee frame. Place the squeegee gasket on the end of the squeegee frame with the long end down and back.



05945

SQUEEGEE GASKET

A. Gasket
B. Squeegee

9. Replace the squeegee assembly cover.

10. Replace the deflector and the ringed pin.

11. Adjust the rear squeegee as described in *TO LEVEL REAR SQUEEGEE* and *TO ADJUST REAR SQUEEGEE DEFLECTION*.

TO LEVEL REAR SQUEEGEE

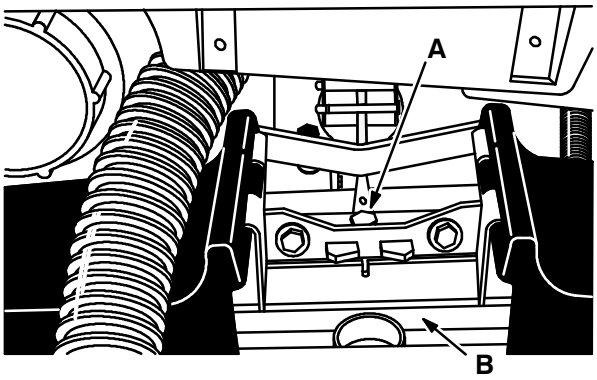
1. On a smooth, level surface, lower the rear squeegee and move the machine forward.

2. With the squeegee lowered, set the machine parking brake while the machine is moving forward slowly, and turn off the machine.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Observe the level of the squeegee for even curl along the length of the blade.

4. To decrease the curl of the squeegee blade at the ends of the squeegee, turn the leveling adjustment screw clockwise. To increase the curl at the ends of the squeegee assembly, turn the leveling adjustment screw counter-clockwise.



05946

REAR SQUEEGEE LEVELING

A. Leveling Adjustment Screw
B. Rear Squeegee Assembly

5. Turn on the machine, release the machine parking brake.

6. Move the machine forward with the rear squeegee lowered. Set the machine parking brake while the machine is moving forward slowly, and turn off the machine.

7. Observe the level of the squeegee. Readjust if necessary until an even curl is achieved along the length of the squeegee.

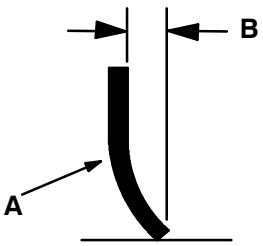
TO ADJUST REAR SQUEEGEE DEFLECTION
(For machines below serial number 001724)

1. On a smooth, level surface, lower the rear squeegee and move the machine forward.

2. With the squeegee lowered, set the machine parking brake while the machine is moving forward slowly, and turn off the machine.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Observe the amount of squeegee deflection. It should deflect 0.50 to 0.75 in (13 to 20 mm) across its entire width of the squeegee.

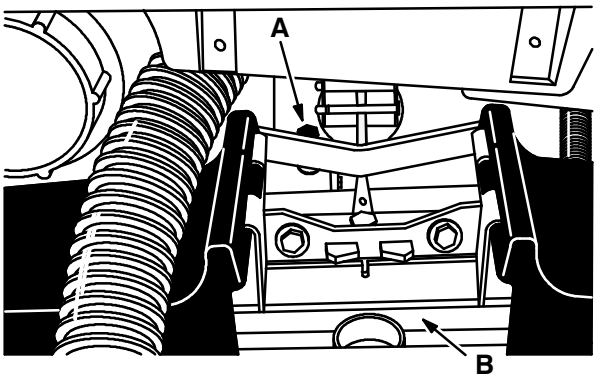


03719

SQUEEGEE DEFLECTION

A. Squeegee
B. Deflection

4. To adjust the squeegee deflection, turn the nut on the squeegee height adjustment screw. To decrease the deflection, turn the nut clockwise. To increase the deflection, turn the nut counter-clockwise.



05946

REAR SQUEEGEE DEFLECTION

A. Squeegee Height Adjustment Screw
B. Rear Squeegee Assembly

5. Turn on the machine, release the machine parking brake.

6. Move the machine forward with the rear squeegee lowered. Set the machine parking brake while the machine is moving forward slowly, and turn off the machine.

7. Observe the deflection of the squeegee. Readjust if necessary until the suggested deflection is reached.

TO ADJUST REAR SQUEEGEE DEFLECTION
(For machines serial number 001724 and 002669)

The squeegee deflection on these machines is set at the factory. To adjust the leveling of the squeegee tip, see *TO LEVEL REAR SQUEEGEE.*

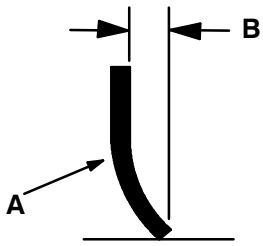
TO ADJUST REAR SQUEEGEE DEFLECTION
(For machines serial number 002670 and above)

1. On a smooth, level surface, lower the rear squeegee and move the machine forward.

2. With the squeegee lowered, set the machine parking brake while the machine is moving forward slowly, and turn off the machine.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Observe the amount of squeegee deflection. It should deflect 0.50 to 0.75 in (13 to 20 mm) across its entire width of the squeegee.

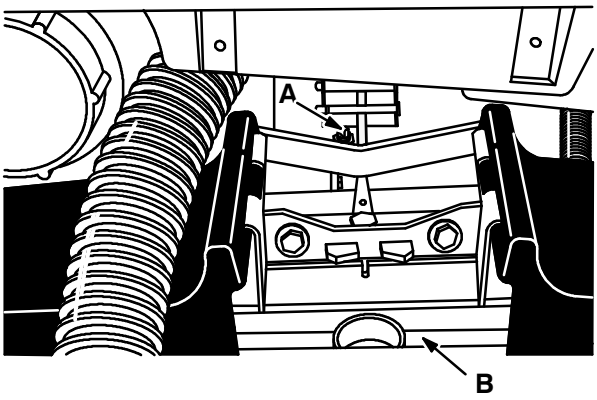


03719

SQUEEGEE DEFLECTION

A. Squeegee
B. Deflection

4. To adjust the squeegee deflection, loosen the caster jam nut. Turn the caster shaft using the flats. To decrease the deflection, turn the nut clockwise. To increase the deflection, turn the nut counter-clockwise. Tighten the jam nut.



REAR SQUEEGEE DEFLECTION

A. Caster Shaft
B. Rear Squeegee Assembly

5. Turn on the machine, release the machine parking brake.

6. Move the machine forward with the rear squeegee lowered. Set the machine parking brake while the machine is moving forward slowly, and turn off the machine.

7. Observe the deflection of the squeegee. Readjust if necessary until the suggested deflection is reached.

BRAKES AND TIRES

SERVICE BRAKES

The foot brake and the parking brake operate the linkage which controls the brakes on the rear wheels.

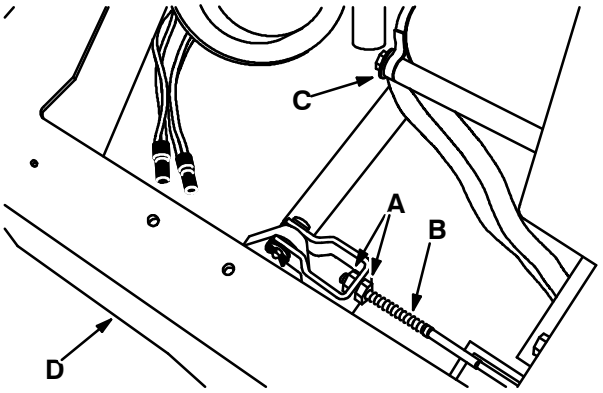
The parking brake should be adjusted after every 200 hour of operation or whenever it becomes very easy to engage.

To adjust the parking brake, turn the knurled knob on the end of the parking brake lever counter-clockwise.

The foot pedal should not travel more than 1 in (25 mm) to engage the brake. Check the brake adjustment after every 200 hours of operation.

1. Park the machine on a level surface. Turn off the machine and block the machine tires.

2. Loosen the adjustment nuts. Adjust the brake cable with one nut and lock in place with the other nut.



BRAKE ADJUSTMENT

A. Adjustment Nuts
B. Brake Cable
C. Vacuum Fan Motor
D. Machine Frame

3. Adjust the brake cable so that the brake pedal travels no more than 1 in (25 mm) to fully engage the brakes. Readjust the brake cable if necessary.

4. Remove the blocks from the machine tires.

TIRES

All of the machine tires are solid. They should be inspected for wear after every 100 hours of operations.

OPTIONS

PRE-SWEEP™

The Pre-Sweep™ allows the machine to pick up small debris. Maintenance of the Pre-Sweep™ assembly includes; adjustment of the brush patterns, and replacement of seals and skirts as they become worn.

PRE-SWEEP™ MAIN BRUSH

The Pre-Sweep™ main brush is tubular and spans the width of the Pre-Sweep™ assembly, sweeping small debris into the debris hopper. The brush should be inspected daily for wear and damage. Remove any string or wire found tangled on the brush, brush drive hub, or brush idler.

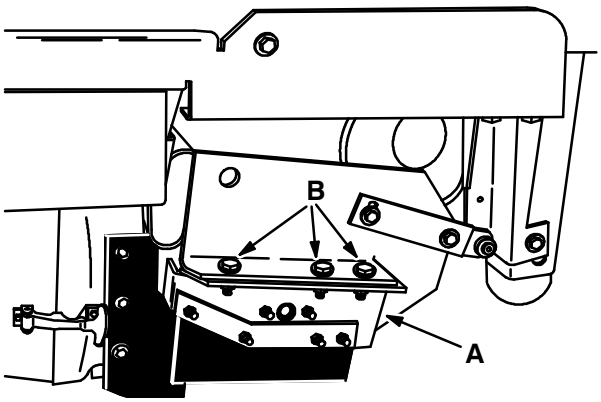
Check the main brush pattern every time a new brush is installed. The brush should be replaced whenever the bristles measure 0.50 in (13 mm) or less in length.

TO REPLACE PRE-SWEEP™ MAIN BRUSH

1. Raise the Pre-Sweep™ assembly.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Pull out the debris hopper.
4. Remove the hardware mounting the brush idler plate to the Pre-Sweep™ assembly.

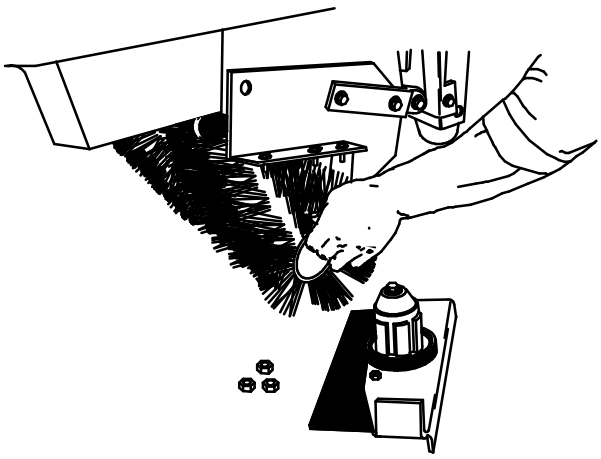


06008

BRUSH IDLER PLATE

A. Brush Idler Plate
B. Mounting Hardware

5. Pull the idler plate off the brush.
6. Remove the brush.



06009

REMOVING MAIN BRUSH

7. Line up the drive end of the new brush with the drive plug.
8. Line up the idler plug on the idler plate with the idler end of the new brush.
9. Install the idler plate to the Pre-Sweep™ assembly with the mounting hardware.
10. Place the debris hopper back into the Pre-Sweep™ assembly.
11. Check the brush pattern as described in *TO CHECK AND ADJUST PRE-SWEEP™ MAIN BRUSH PATTERN*.

TO CHECK AND ADJUST PRE-SWEEP™ MAIN BRUSH PATTERN

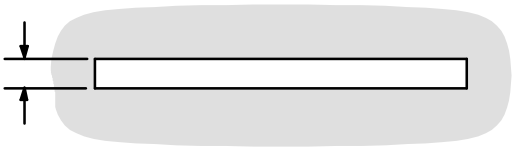
1. Apply chalk, or some other material that will not blow away easily, to a smooth, level floor.

2. Turn on the machine. With the Pre-Sweep™ assembly raised, park the Pre-Sweep™ assembly over the chalked area.

3. With a foot on the brake to keep the machine from moving, lower the Pre-Sweep™ assembly to the floor for 15 to 20 seconds. Raise the Pre-Sweep™ assembly and back the machine away from the test area.

NOTE: If no chalk or other material is available, allow the brush to spin on the floor for two minutes.

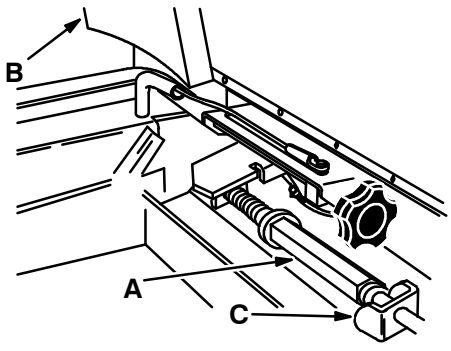
4. Look at the main brush pattern made. The pattern should measure evenly 1.00 to 2.00 in (25 to 50 mm) across the length of the brush.



00582

EVEN MAIN BRUSH PATTERN WIDTH

5. To adjust the pattern width, loosen the locknut and turn the main brush height adjustment rod. To increase the brush pattern width, turn the adjustment rod down moving it towards the locknut. To decrease the brush pattern width, turn the adjustment rod up moving it away from the locknut.

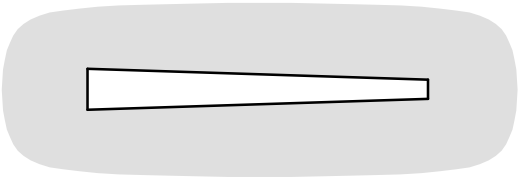


06010

MAIN BRUSH HEIGHT ADJUSTMENT KNOB

A. Main Brush Height Adjustment Rod
B. Pre-Sweep™ Cover
C. Lock Nut

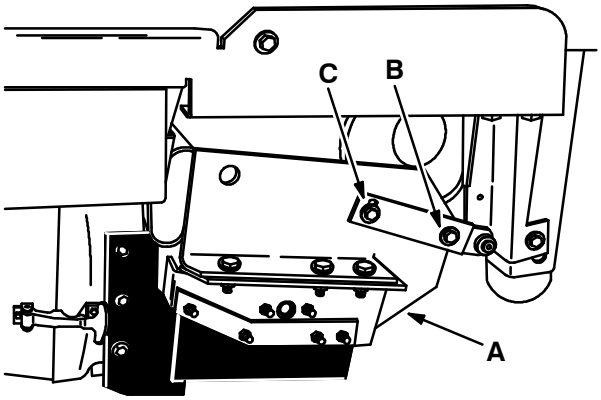
6. If the brush pattern is tapered more than 0.50 in (13 mm) from one end of the pattern to the other, the main brush needs to be leveled.



00601

TAPERED MAIN BRUSH PATTERN

To level the main brush, loosen the brush pivot and taper adjustment screws. Move the brush idler end up if the drive end is narrower than the idler end. Move the brush idler end down if the drive end is wider than the idler end.



06008

MAIN BRUSH LEVELING

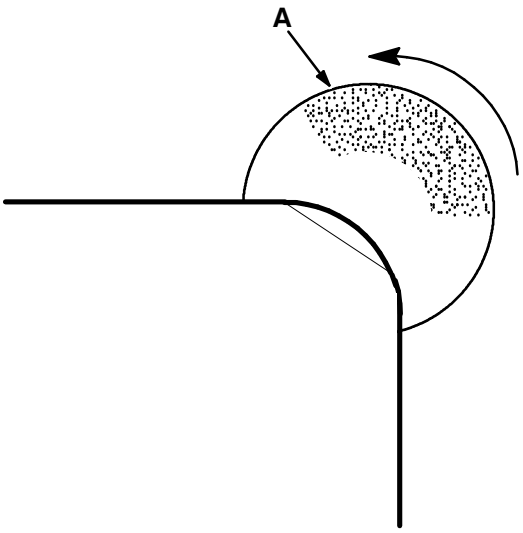
A. Brush Idler End
B. Brush Pivot Screw
C. Taper Adjustment Screw

7. Check the brush pattern again, readjust if necessary.

PRE-SWEEP™ SIDE BRUSH

The Pre-Sweep™ side brush sweeps debris into the path of the main brush. The brush should be inspected daily for wear or damage. Remove any string or wire found tangled on the side brush or side brush drive hub.

The side brush pattern should be checked periodically. One-third of the side brush bristles should contact the floor when the brush is in motion. The side brush pattern adjustment is made by turning the side brush height adjustment knob.



SIDE BRUSH PATTERN

A. Contact Area

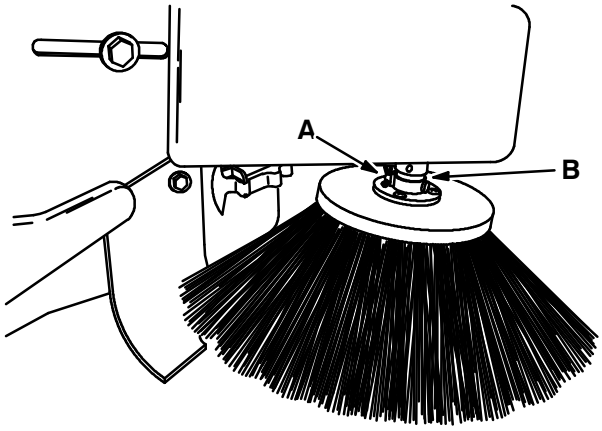
The side brush should be replaced when the remaining brush bristle measures 1 in (25 mm) or less in length.

TO REPLACE PRE-SWEEP™ SIDE BRUSH

1. Raise the Pre-Sweep™ assembly.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

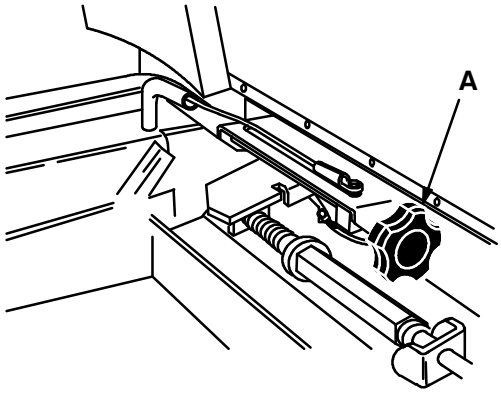
3. Remove the retaining hardware mounting the side brush to the side brush drive shaft.



SIDE BRUSH

A. Retaining Hardware
B. Side Brush Drive Shaft

4. Slide the side brush off the side brush drive shaft.
5. Slide the new side brush onto the side brush drive shaft.
6. Mount the new side brush to the drive shaft with the mounting hardware.
7. Check the side brush pattern. Adjust the side brush with the side brush height adjustment knob.

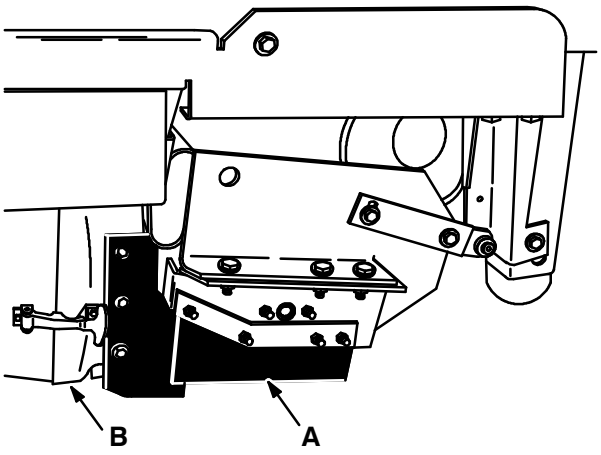


SIDE BRUSH HEIGHT ADJUST KNOB

A. Side Brush Height Adjustment Knob

PRE-SWEEP™ BRUSH SIDE SKIRTS

The Pre-Sweep™ brush side skirts are located on both sides of the Pre-Sweep™ assembly. Check the side skirts after every 20 hours of operation for damage or wear.

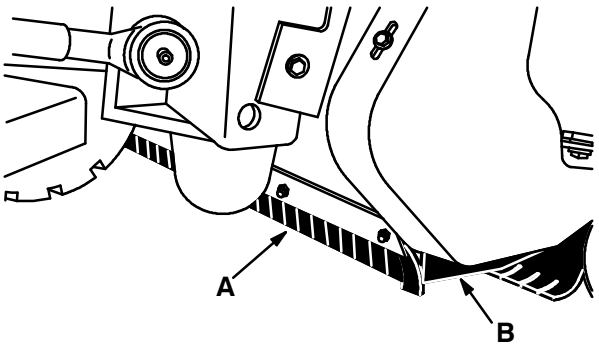


BRUSH SIDE SKIRT

A. Brush Side Skirt
B. Debris Hopper

PRE-SWEEP™ REAR SKIRT

The Pre-Sweep™ rear skirt helps keep debris away from the scrub brushes. The skirt is located behind the Pre-Sweep™ main brush. Check the rear skirt after every 20 hours of operation for damage and wear.



REAR SKIRT

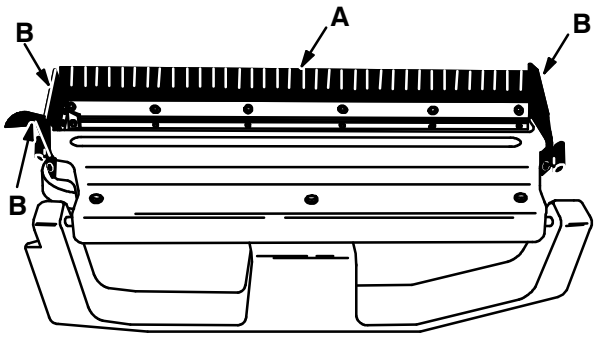
A. Rear Skirt
B. Brush Side Skirt

DEBRIS HOPPER SLIT SKIRT

The debris hopper slit skirt helps direct debris into the debris hopper. The skirt is located at the bottom rear of the debris hopper. The rear lip of the slit should always lie flat and contact the floor. Check the skirt after every 20 hours of operation for damage or wear.

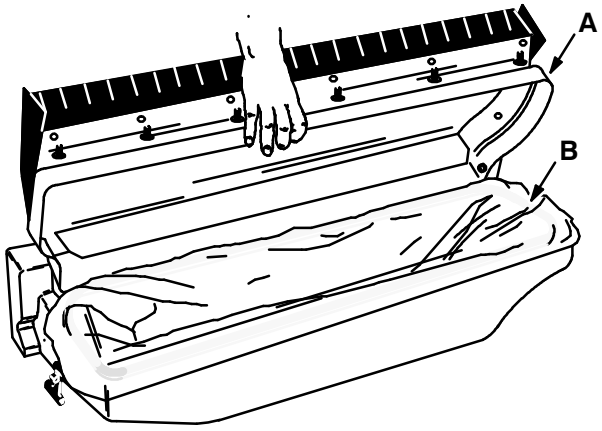
PRE-SWEEP™ DEBRIS HOPPER SEALS

There are several seals to seal the debris hopper. One seal is located on the Pre-Sweep™ frame where the debris hopper comes in contact with the frame. There are also two seals located on the sides of the debris hopper, and one seal for the hopper door. Check these seals after every 20 hours of operation for damage or wear.



PRE-SWEEP™ DEBRIS HOPPER

A. Hopper Slit Skirt
B. Hopper Seal



PRE-SWEEP™ HOPPER SEAL

A. Hopper Door
B. Hopper Seal

PRE-SWEEP™ MAIN BRUSH DRIVE BELT

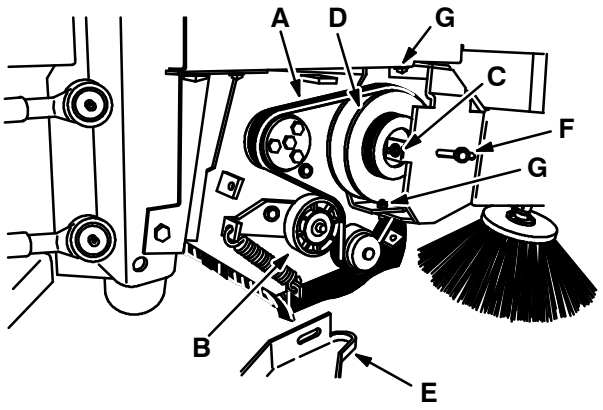
The Pre-Sweep™ main brush drive belt transfer power from the Pre-Sweep™ electric motor to the main brush. The belt is automatically tensioned by a spring loaded idler. The belt should be checked after every 400 hours of operation for wear.

TO REPLACE THE MAIN BRUSH DRIVE BELT

1. Raise the Pre-Sweep™ assembly.
2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Remove the main brush belt cover.
4. Loosen the idler mounting screw and the tension adjustment nut on the side brush arm.

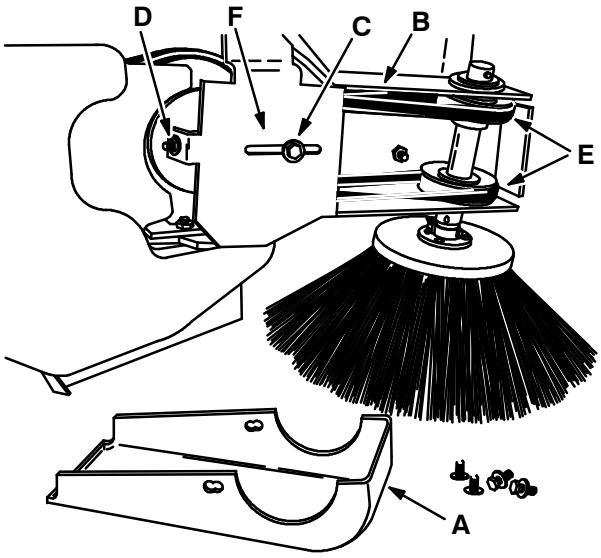


06016

MAIN BRUSH BELT

A. Main Brush Belt
B. Belt Idler
C. Tension Adjustment Nut
D. Drive Sheave
E. Belt Cover
F. Idler Mounting Screw
G. Mounting Hardware

5. Remove the side brush belt from the drive sheave.
6. Remove the hardware mounting the side brush arm.
7. Pivot the side brush arm out of the way to be able to slip the main brush belt off the drive sheave.
8. Pull down on belt idler to release the tension on the main brush belt. Slip the old belt off the sheaves.
9. Pull the belt idler down. Place the new belt on the sheaves.
10. Pivot the side brush arm back into place and mount with the mounting hardware.
11. Remove the side brush belt cover. Place the side brush belt back on the sheaves.



06015

SIDE BRUSH BELT

A. Side Brush Belt Cover
B. Side Brush Belt
C. Idler Mounting Screw
D. Tension Adjustment Nut
E. Drive Shaft Sheave
F. Idler Sheave

12. Tension the side brush belt with the tension adjustment nut so the belt deflects 0.19 in (5 mm) from a force of 2.7 to 3.8 lb (1.2 to 1.7 kg) applied at midpoint between the idler sheave and the drive shaft sheaves.
13. Tighten the idler mounting screw.
14. Place the side brush belt cover back on the side brush arm and mount with the existing hardware.
15. Mount the main brush belt cover with the existing hardware.

PRE-SWEEP™ SIDE BRUSH DRIVE BELT

The Pre-Sweep™ side brush drive belt transfer power from the Pre-Sweep™ electric motor to the side brush. The belt tension should be checked after the first 50 hours operation. Inspect the belt for wear and check the tension every 400 hours of operation. The belt is properly tensioned when the belt deflects 0.19 in (5 mm) from a force of 2.7 to 3.8 lb (1.2 to 1.7 kg) applied at midpoint between idler sheave and drive shaft sheaves.

TO REPLACE AND ADJUST THE SIDE BRUSH BELT

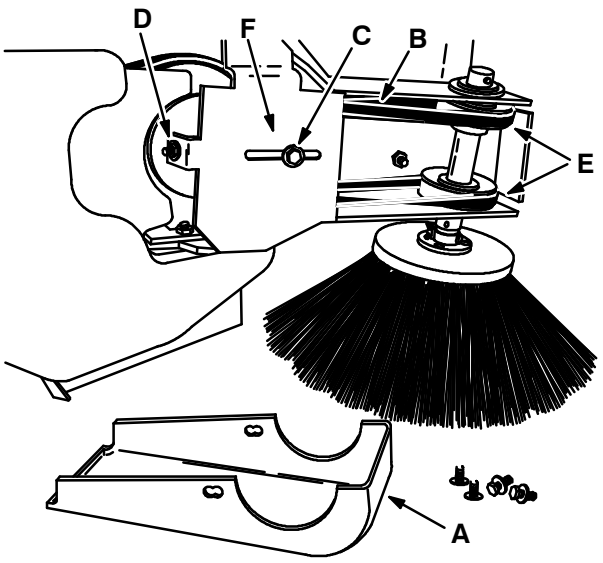
1. Raise the Pre-Sweep™ assembly.

2. Turn off the machine and set the machine parking brake.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Remove the side brush belt cover.

4. Loosen the idler mounting screw and tension adjustment nut.



SIDE BRUSH BELT

A. Side Brush Belt Cover
B. Side Brush Belt
C. Idler Mounting Screw
D. Tension Adjustment Nut
E. Drive Shaft Sheave
F. Idler Sheave

5. Remove the old side brush belt.

6. Place the new belt on the sheaves. Adjust the tension with the tension adjustment nut so the belt deflects 0.19 in (5 mm) from a force of 2.7 to 3.8 lb (1.2 to 1.7 kg) applied at midpoint between the idler sheave and the drive shaft sheaves.

7. Tighten the idler mounting screw.

8. Place the side brush belt cover back on the side brush arm and mount with the existing hardware.

SECTION 4

CONTENTS

HARDWARE INFORMATION

The following charts state standard plated hardware tightening ranges for normal assembly applications. Decrease the specified torque by 20% when using a thread lubricant. Do not substitute lower grade hardware for higher grade hardware. If higher grade hardware than specified is substituted, tighten only to the specified hardware torque value to avoid damaging the threads of the part being threaded into, as when threading into speed nuts or weldments.

STANDARD BOLT TORQUE CHART

Thread Size	SAE Grade 5 Torque ft lb (Nm)	SAE Grade 8 Torque ft lb (Nm)
0.25 in	7–10 (9–14)	10–13 (14–38)
0.31 in	15–20 (20–27)	20–26 (27–35)
0.38 in	27–35 (37–47)	36–47 (49–64)
0.44 in	43–56 (58–76)	53–76 (72–103)
0.50 in	65–85 (88–115)	89–116 (121–157)
0.62 in	130–170 (176–231)	117–265 (159–359)
0.75 in	215–280 (291–380)	313–407 (424–552)
1.00 in	500–650 (678–881)	757–984 (1026–1334)

NOTE: Decrease torque by 20% when using a thread lubricant.

METRIC BOLT TORQUE CHART

Thread Size	Class 8.8 Torque ft lb (Nm)	Class 10.9 Torque ft lb (Nm)
M4	2 (3)	3 (4)
M5	4 (5)	6 (8)
M6	7 (9)	10 (14)
M8	18 (24)	25 (34)
M10	32 (43)	47 (64)
M12	58 (79)	83 (112)
M14	94 (127)	133 (180)
M16	144 (195)	196 (265)
M20	260 (352)	336 (455)
M24	470 (637)	664 (900)

NOTE: Decrease torque by 20% when using a thread lubricant.

Exceptions to the above chart:

Check the machine for exceptions!

BOLT IDENTIFICATION

Identification Grade Marking	Specification and Grade
	SAE–Grade 5
	SAE–Grade 8
	ISO–Grade 8.8
	ISO–Grade 10.9

01395

THREAD SEALANT AND LOCKING COMPOUNDS

Thread sealants and locking compounds may be used on this machine. They include the following:

Locktite 515 sealant – gasket forming material. TENNANT Part No. 75567,15 oz (440 ml) cartridge.

Locktite 242 blue – medium strength thread locking compound. TENNANT Part No. 32676, 0.5 ml tube.

Locktite 271 red – high strength thread locking compound. TENNANT Part No. 19857, 0.5 ml tube.