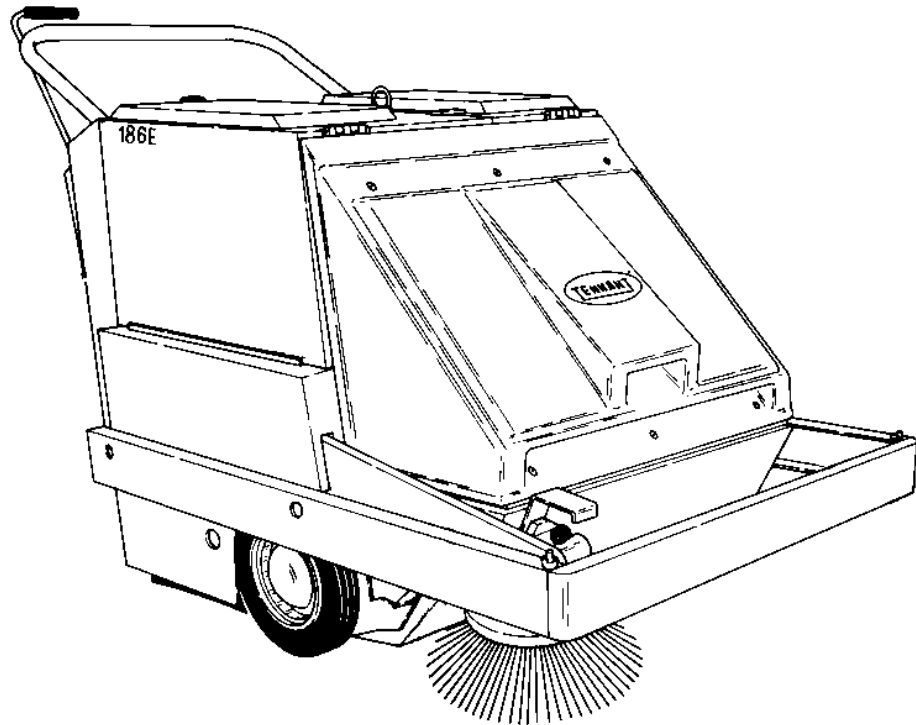


FLOOR EQUIPMENT PARTS.COM



186E

(Operator Manual)



MM160
Rev. 12 (12-95)



This manual is furnished with each new TENNANT Model 186E. 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 options. The instruction portion of the manual consists of the Specification, Operation, Maintenance, and Appendix sections. The parts portion consists of the Standard Parts; EE Parts; Options; Electrical Components; 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 Company supplied or equivalent parts.


Parts and supplies may be ordered by phone or mail from any Tennant Company parts and service center, distributor, or from any of the Tennant Company 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.

MACHINE DATA <i>Please fill out at time of installation.</i>
Machine Serial Number – _____
Engine Serial Number – _____
Sales Representative – _____
Customer Number – _____
Date of Installation – _____
Manual Number – MM160
Revision: 12
Published: 12-95

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SAFETY PRECAUTIONS

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

 **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 following information signals potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Locate all safety devices on the machine. Then, take necessary steps to train machine operating personnel. Report machine damage or faulty operation immediately. Do not use the machine if it is not in proper operating condition.

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.
2. **Before Starting Machine:**
 - Make Sure All Safety Devices Are In Place And Operate Properly.
 - Check Brakes And Steering For Proper Operation.
3. **When Using Machine:**
 - Go Slow On Grades And Slippery Surfaces.
 - Use Care When Backing Machine.
4. **Before Leaving Or Servicing Machine:**
 - Stop On Level Surface.
 - Set Parking Brake.
 - Turn Off Machine And Remove Key.

5. **When Servicing Machine:**
 - Avoid Moving Parts. Do Not Wear Loose Jackets, Shirts, Or Sleeves When Working On Machine.
 - 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 Equivalent Replacement Parts.

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

 **WARNING:** Heavy Hopper. Get Help To Handle.

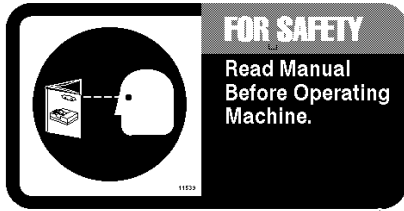
 **WARNING:** Flammable Materials Can Cause An Explosion Or Fire. Do Not Use Flammable Materials In Tank(s).

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

GENERAL INFORMATION

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

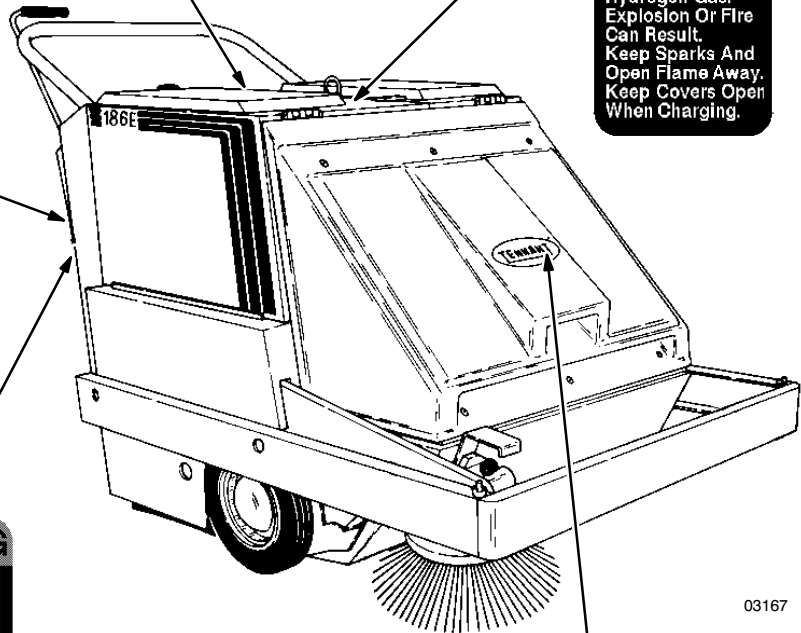
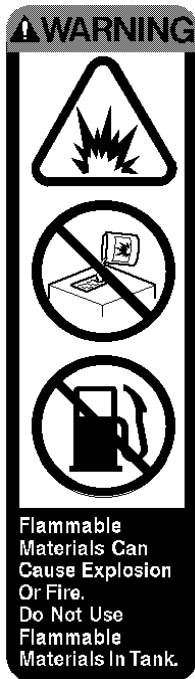
FOR SAFETY LABEL – LOCATED ON THE TOP OF THE SOLUTION TANK.



BATTERY CAUTION LABEL – LOCATED BETWEEN THE BATTERIES.



FLAMMABLE MATERIALS LABEL – LOCATED ON RIGHT SIDE PANEL.



FLAMMABLE MATERIALS LABEL – LOCATED ON RIGHT SIDE PANEL.



BACK STRAIN LABEL – LOCATED ON THE UNDERSIDE OF THE FILTER ASSEMBLY.

CONTENTS

	Page		Page
GENERAL INFORMATION	i	MACHINE OPERATION	2-12
SAFETY PRECAUTIONS	i	NORMAL SWEEPING OPERATION	2-12
SPECIFICATIONS	1-1	PRE-START CHECKLIST	2-12
MACHINE SPECIFICATIONS	1-3	TO START MACHINE	2-12
POWER TYPE	1-3	TO SWEEP	2-12
POWER TRAIN	1-3	TO DUMP HOPPER	2-12
SUSPENSION SYSTEM	1-3	POST OPERATION CHECKLIST –	
SYSTEM FLUID CAPACITIES	1-3	MOTOR OPERATING	2-13
GENERAL MACHINE DIMENSIONS –		TO STOP MACHINE	2-13
CAPACITIES	1-3	POST OPERATION CHECKLIST –	
MACHINE WEIGHTS	1-3	MOTOR STOPPED	2-13
GENERAL MACHINE		NORMAL SCRUBBING OPERATION	2-13
PERFORMANCE	1-3	PRE-START CHECKLIST	2-13
MACHINE DIMENSIONS	1-4	TO START MACHINE	2-14
OPERATION	2-1	TO SCRUB	2-14
PREPARATION FOR OPERATION ...	2-3	TO DRAIN RECOVERY TANK	
AFTER UNCRATING AND BEFORE		AND EMPTY DEBRIS TRAY	2-15
OPERATING MACHINE:	2-3	POST OPERATION CHECKLIST –	
OPERATION OF CONTROLS	2-4	MOTOR OPERATING	2-16
MACHINE COMPONENTS	2-4	TO STOP MACHINE	2-16
INSTRUMENT PANEL SYMBOLS .	2-5	POST OPERATION CHECKLIST –	
CONTROLS AND INSTRUMENTS		MOTOR STOPPED	2-16
(For machines below serial		DOUBLE SCRUBBING OPERATION	2-17
number 006000)	2-6	OPERATION ON GRADES	2-17
CONTROLS AND INSTRUMENTS		VACUUM WAND OPTION	2-17
(For machines serial number		TO OPERATE VACUUM WAND	2-17
006000 and above)	2-7	FILTER BYPASS OPTION	2-18
STATIONARY AND CLUTCH		WATER PICKUP OPTION	2-18
HANDLES	2-8	TO OPERATE THE WATER	
FILTER SHAKER SWITCH	2-8	PICKUP OPTION	2-18
FILTER SHAKER BY-PASS SWITCH	2-8	SCRUB ATTACHMENT	2-18
BATTERY CONDITION GAUGE ...	2-8	TO MOUNT SOLUTION TANK	
VOLTMETER	2-8	AND DEBRIS TRAY	2-19
MAIN BRUSH LEVER	2-9	TO REMOVE SOLUTION TANK	
HOUR METER	2-9	AND DEBRIS TRAY	2-20
KEY-OPERATED ON-OFF SWITCH	2-9	MACHINE TROUBLESHOOTING .	2-21
CIRCUIT BREAKERS AND FUSES	2-9	TRANSPORTING MACHINE	2-22
VACUUM FAN SWITCH	2-9	MACHINE TIE-DOWNS	2-22
CHARGER TIMER	2-9	MACHINE STORAGE	2-23
CHARGER GAUGE	2-10	STORING MACHINE	2-23
VACUUM SHUT-OFF KNOB	2-10		
CHARGER PANEL	2-10		
PARKING BRAKE LEVER	2-10		
SQUEEGEE LEVER	2-10		
SOLUTION LEVER	2-11		
SIDE BRUSH ARM	2-11		
THERMO-SENTRY™	2-11		

GENERAL INFORMATION

	Page		Page
MAINTENANCE	3-1	VACUUM FAN BELT	3-22
RECOMMENDED FIRST 25-HOUR		TO CHECK AND ADJUST VACUUM	
MACHINE INSPECTION	3-3	FAN BELT TENSION	3-22
MAINTENANCE CHART	3-4	TO REPLACE VACUUM	
LUBRICATION	3-6	FAN BELT	3-24
DRIVE CHAINS	3-6	WHEEL DRIVE CHAINS	3-24
BRUSH ARM PIVOTS	3-6	STATIC DRAG CHAIN	3-24
SIDE BRUSH GEAR BOX	3-6	BRUSHES	3-25
REAR CASTER	3-7	MAIN BRUSH	3-25
SELF ADJUSTING SHEAVE	3-7	TO REMOVE MAIN BRUSH ...	3-25
SQUEEGEE PIVOT	3-7	TO INSTALL MAIN BRUSH	3-25
ELECTRICAL SYSTEM	3-8	TO CHECK AND ADJUST MAIN	
BATTERIES	3-8	BRUSH PATTERN	3-25
BATTERY CHARGING	3-9	SIDE BRUSH	3-26
TO CHARGE BATTERIES		TO REMOVE SIDE BRUSH	3-26
(For machines below serial		TO INSTALL SIDE BRUSH	3-27
number 006823)	3-9	TO ADJUST SIDE BRUSH	
TO CHARGE BATTERIES		PATTERN	3-27
(For machines serial number		SKIRTS AND SEALS	3-28
006823 and above)	3-10	HOPPER LIP SKIRT	3-28
ACTIVATING DRY-TYPE		REAR BRUSH SKIRTS	3-28
BATTERIES	3-11	HOPPER TOP SEAL	3-28
TO ACTIVATE DRY-TYPE		MAIN BRUSH COMPARTMENT	
BATTERIES	3-11	SKIRTS	3-28
ELECTRIC MOTOR	3-11	DEBRIS HOPPER AND DUST FILTER	3-29
ELECTRICAL SCHEMATIC, 186E		DEBRIS HOPPER	3-29
(For machines below serial		TO CHECK AND ADJUST HOPPER	
number 004369)	3-12	FLOOR CLEARANCE	3-29
ELECTRICAL SCHEMATIC, 186E		TO ADJUST DUST FILTER TO	
(For machines serial number		HOPPER SEALING	3-30
004369 to 006822)	3-13	DUST FILTER	3-30
ELECTRICAL SCHEMATIC, 186E		TO REMOVE HOPPER DUST	
(For machines serial number		FILTER	3-31
006823 and above)	3-14	VACUUM WAND OPTION	3-32
ELECTRICAL SCHEMATIC, 186EE		VACUUM WAND OPTION	3-32
(For machines below serial		TO REPLACE VACUUM WAND	
number 006823)	3-15	BAG	3-32
ELECTRICAL SCHEMATIC, 186EE		TO CLEAN VACUUM FAN	
(For machines serial number		FILTER	3-32
006823 and above)	3-16	WATER PICKUP OPTION	3-33
BELTS AND CHAINS	3-17	WATER PICKUP OPTION	3-33
PROPELLING BELTS	3-17	VACUUM FAN	3-33
TO CHECK AND ADJUST		RECOVERY TANK	3-33
PROPELLING		TO DRAIN RECOVERY TANK .	3-33
BELTS TENSION	3-17	REAR SQUEEGEE	3-34
TO REPLACE PROPELLING		TO REMOVE SQUEEGEE	
BELTS	3-18	ASSEMBLY	3-34
SIDE BRUSH BELT	3-19	TO INSTALL SQUEEGEE	
TO CHECK AND ADJUST SIDE		ASSEMBLY	3-35
BRUSH BELT TENSION	3-19	TO REPLACE FRONT	
TO REPLACE SIDE BRUSH		SQUEEGEE BLADE	3-35
BELT	3-20	TO REPLACE REAR	
SHORT MAIN BRUSH BELT	3-20	SQUEEGEE BLADE	3-36
TO REPLACE SHORT MAIN		TO ADJUST SQUEEGEE	3-37
BRUSH BELT	3-20		
LONG MAIN BRUSH BELT	3-21		
TO REPLACE LONG MAIN			
BRUSH BELT	3-21		

	Page		Page
SCRUB ATTACHMENT	3-39	EE PARTS	7-1
SCRUB ATTACHMENT	3-39	Fig. 1 – Electrical Components	
SOLUTION TANK	3-39	Group, EE	7-2
SOLUTION DISTRIBUTION		Fig. 2 – Electrical Components	
SYSTEM	3-39	Group, EE	7-4
DEBRIS TRAY	3-40	Fig. 3 – Wire Harnesses Group, EE	7-6
TO CHECK AND ADJUST DEBRIS		Fig. 4 – Wire Harnesses Group, EE	7-8
TRAY FLOOR CLEARANCE	3-40	Fig. 5 – Wire Harnesses Group, EE	7-10
SCRUB BRUSHES	3-40	Fig. 6 – Cover Retainer Group, EE	7-12
RECOVERY TANK	3-41	OPTIONS	8-1
TO DRAIN RECOVERY TANK	3-41	Fig. 1 – Solution Tank Group	8-2
VACUUM FAN	3-41	Fig. 2 – Recovery Tank Group	8-4
REAR SQUEEGEE	3-42	Fig. 3 – Rear Squeegee Lift Group	8-6
TO REMOVE SQUEEGEE		Fig. 4 – Rear Squeegee Group	8-8
ASSEMBLY	3-42	Fig. 5 – Side Scrub Brush Group	8-9
TO INSTALL SQUEEGEE		Fig. 6 – Scrub Vacuum Fan Group	8-10
ASSEMBLY	3-43	Fig. 7 – Filter Bypass Kit	8-11
TO REPLACE FRONT		Fig. 8 – Recovery Tank Group,	
SQUEEGEE BLADE	3-43	Water Pickup	8-12
TO REPLACE REAR		Fig. 9 – Parking Brake Kit	8-14
SQUEEGEE BLADE	3-44	Fig. 10 – Parking Brake Kit	8-15
TO ADJUST SQUEEGEE	3-46	Fig. 11 – Vacuum Wand Group	8-16
APPENDIX	4-1	Fig. 12 – Wand Vacuum Fan Group	8-17
HARDWARE INFORMATION	4-3	Fig. 13 – Vacuum Wand Group	8-18
STANDARD BOLT TORQUE CHART	4-3	Fig. 14 – Battery Kit, Wet	8-19
METRIC BOLT TORQUE CHART	4-3	Fig. 15 – Battery Kit, Dry	8-20
BOLT IDENTIFICATION	4-3	Fig. 16 – Battery Charger and	
THREAD SEALANT AND LOCKING		Timer Group	8-21
COMPOUNDS	4-3	Fig. 17 – Battery Charger and	
HOW TO USE THIS MANUAL	5-1	Timer Group	8-22
IMPORTANT INFORMATION	5-1	Fig. 18 – Battery Charger and	
FINDING A TENNANT PART NUMBER	5-2	Timer Group	8-23
PLACING AN ORDER	5-3	Fig. 19 – Battery Charger Group	8-24
STANDARD PARTS	6-1	Fig. 20 – Fire Extinguisher Kit	8-25
Fig. 1 – Recommended General		Fig. 21 – Battery Gauge Kit	8-26
Maintenance Items	6-2	Fig. 22 – Double Wheel Kit	8-27
Fig. 2 – Replacement Brushes	6-3	Fig. 23 – Dual Caster Group	8-28
Fig. 3 – Main Frame Group	6-4	Fig. 24 – Plastic Hopper Kit	8-29
Fig. 4 – Motor, Sheaves and		Fig. 25 – Fine Particle Filter Kit	8-30
Cover Group	6-6	Fig. 26 – Lift and Tie-Down Kit	8-31
Fig. 5 – Motor, Sheaves and		ELECTRICAL COMPONENTS	9-1
Cover Group	6-8	Fig. 1 – Motor Breakdown	9-2
Fig. 6 – Battery and Charger Group	6-10	CROSS REFERENCE	10-1
Fig. 7 – Brush Drive Group	6-12	PART NUMBER TO PAGE NUMBER	
Fig. 8 – Wheel Drive Group	6-14	CROSS REFERENCE LIST	10-2
Fig. 9 – Hopper Group	6-15		
Fig. 10 – Vacuum Fan Group	6-16		
Fig. 11 – Filter and Shaker Motor Group	6-17		
Fig. 12 – Instrument Panel Group	6-18		
Fig. 13 – Instrument Panel Group	6-19		
Fig. 14 – Label Group	6-20		
Fig. 15 – Label Group	6-21		
Fig. 16 – Wire Harnesses Group	6-22		
Fig. 17 – Wire Harnesses Group	6-24		
Fig. 18 – Wire Harnesses Group	6-26		

SECTION 1**CONTENTS**

	Page
MACHINE SPECIFICATIONS	1-3
POWER TYPE	1-3
POWER TRAIN	1-3
SUSPENSION SYSTEM	1-3
SYSTEM FLUID CAPACITIES	1-3
GENERAL MACHINE DIMENSIONS – CAPACITIES	1-3
MACHINE WEIGHTS	1-3
GENERAL MACHINE PERFORMANCE	1-3
MACHINE DIMENSIONS	1-4

MACHINE SPECIFICATIONS**POWER TYPE**

Electric propelling motor – nominal voltage
24 VDC, 1.0 hp (0.7 kw) @ 2000 rpm, 40 A
Batteries (2) – 12 V, 140 A/h @ 20 hour rate
Battery charger – 24 VDC, 15 A, 120 VAC input
Battery charger – 24 VDC, 15 A, 115/230 VAC

POWER TRAIN

Propelling – belt driven
Differential – belt driven
Drive axle (2) – chain driven
Main brush – belt driven
Side brush – belt driven
Vacuum fan – belt driven
Scrub attachment/vacuum fan water pick-up –
electric motor driven

SUSPENSION SYSTEM

Front – 10 x 2.00 zero pressure tires (2)
Rear – 5 x 1.5 caster (1)

SYSTEM FLUID CAPACITIES

Scrub attachment solution tank – 14.5 gal (55 L)
Scrub attachment recovery tank – 13 gal (50 L)

**GENERAL MACHINE DIMENSIONS –
CAPACITIES**

Length – 58 in (1475 mm)
Width – 36 in (915 mm) less side brush
Height – 38 in (965 mm)
Track – front 31 in (790 mm)
Wheel base – 23.5 in (595 mm)
Main brush – width 26 in (660 mm)
Main brush – diameter 10 in (255 mm)
Side brush – diameter 17 in (430 mm)
Sweeping path width (total) – 34 in (860 mm)
Hopper capacity – 2.8 cu ft (0.08 m³) 150 lb
(68 kg)
Dust filter – 49 sq ft (4.55 m²), pleated panel
filter element

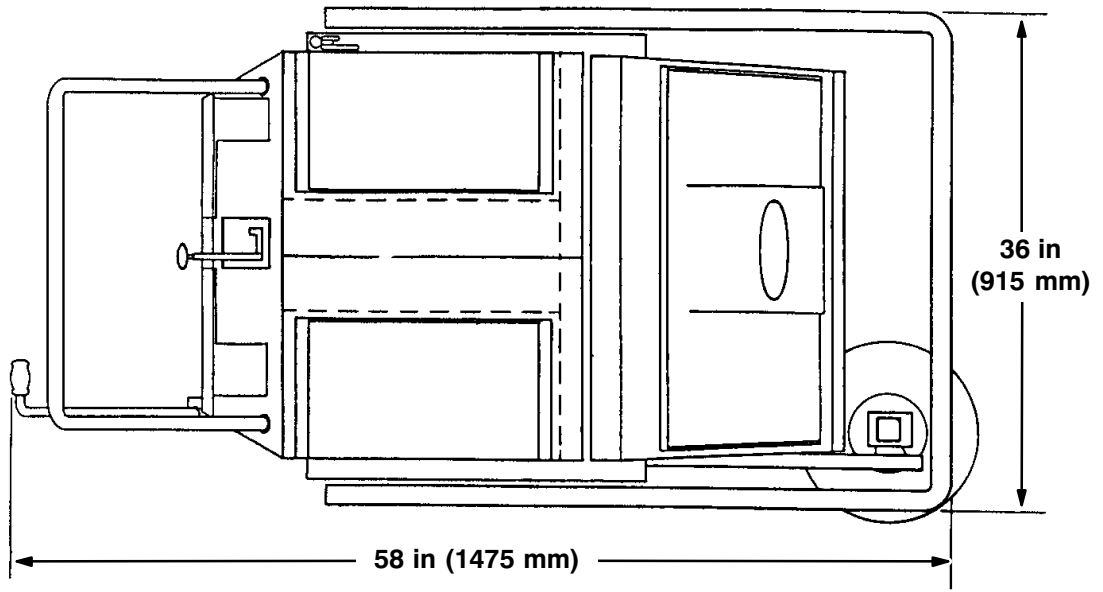
MACHINE WEIGHTS

GVWR – 760 lb (345 kg)

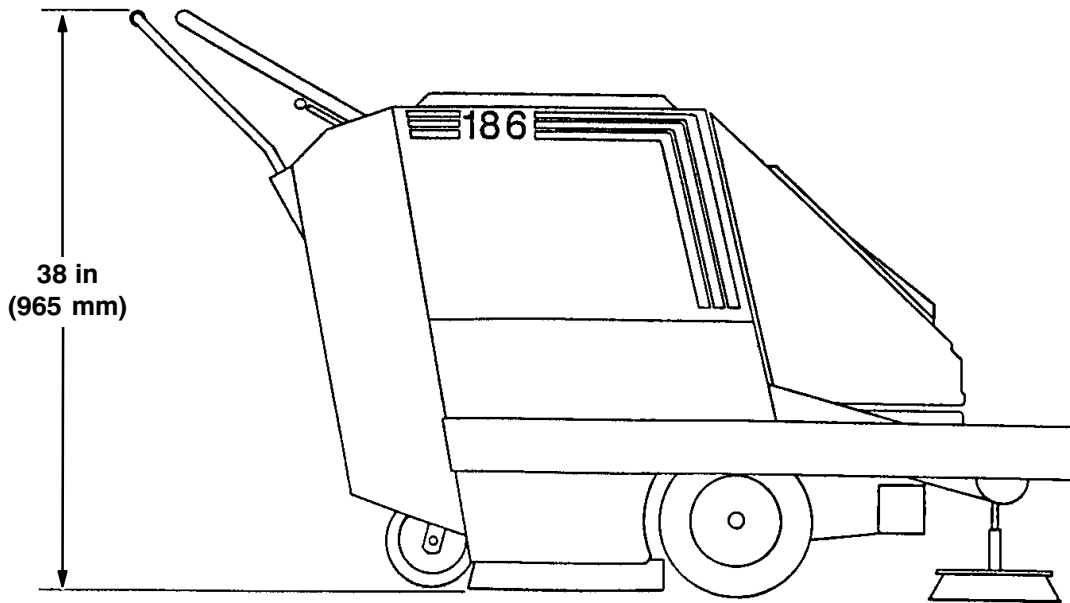
GENERAL MACHINE PERFORMANCE

Maximum forward speed – 2.9 mph (4.7 km/h)
Maximum reverse speed – 2.8 mph (4.5 km/h)
Turning radius – 65 in (1650 mm)

MACHINE DIMENSIONS



TOP VIEW



SIDE VIEW

03131

SECTION 2

CONTENTS

	Page		Page
PREPARATION FOR OPERATION	2-3	NORMAL SCRUBBING OPERATION ..	2-13
AFTER UNCRATING AND BEFORE		PRE-START CHECKLIST	2-13
OPERATING MACHINE:	2-3	TO START MACHINE	2-14
OPERATION OF CONTROLS	2-4	TO SCRUB	2-14
MACHINE COMPONENTS	2-4	TO DRAIN RECOVERY TANK	
INSTRUMENT PANEL SYMBOLS	2-5	AND EMPTY DEBRIS TRAY	2-15
CONTROLS AND INSTRUMENTS		POST OPERATION CHECKLIST –	
(For machines below serial		MOTOR OPERATING	2-16
number 006000)	2-6	TO STOP MACHINE	2-16
CONTROLS AND INSTRUMENTS		POST OPERATION CHECKLIST –	
(For machines serial number		MOTOR STOPPED	2-16
006000 and above)	2-7	DOUBLE SCRUBBING OPERATION ..	2-17
STATIONARY AND CLUTCH HANDLES	2-8	OPERATION ON GRADES	2-17
FILTER SHAKER SWITCH	2-8	VACUUM WAND OPTION	2-17
FILTER SHAKER BY-PASS SWITCH ..	2-8	TO OPERATE VACUUM WAND	2-17
BATTERY CONDITION GAUGE	2-8	FILTER BYPASS OPTION	2-18
VOLTMETER	2-8	WATER PICKUP OPTION	2-18
MAIN BRUSH LEVER	2-9	TO OPERATE THE WATER	
HOUR METER	2-9	PICKUP OPTION	2-18
KEY-OPERATED ON-OFF SWITCH ...	2-9	SCRUB ATTACHMENT	2-18
CIRCUIT BREAKERS AND FUSES	2-9	TO MOUNT SOLUTION TANK AND	
VACUUM FAN SWITCH	2-9	DEBRIS TRAY	2-19
CHARGER TIMER	2-9	TO REMOVE SOLUTION TANK	
CHARGER GAUGE	2-10	AND DEBRIS TRAY	2-20
VACUUM SHUT-OFF KNOB	2-10	MACHINE TROUBLESHOOTING	2-21
CHARGER PANEL	2-10	TRANSPORTING MACHINE	2-22
PARKING BRAKE LEVER	2-10	MACHINE TIE-DOWNS	2-22
SQUEEGEE LEVER	2-10	MACHINE STORAGE	2-23
SOLUTION LEVER	2-11	STORING MACHINE	2-23
SIDE BRUSH ARM	2-11		
THERMO-SENTRY™	2-11		
MACHINE OPERATION	2-12		
NORMAL SWEEPING OPERATION ...	2-12		
PRE-START CHECKLIST	2-12		
TO START MACHINE	2-12		
TO SWEEP	2-12		
TO DUMP HOPPER	2-12		
POST OPERATION CHECKLIST –			
MOTOR OPERATING	2-13		
TO STOP MACHINE	2-13		
POST OPERATION CHECKLIST –			
MOTOR STOPPED	2-13		

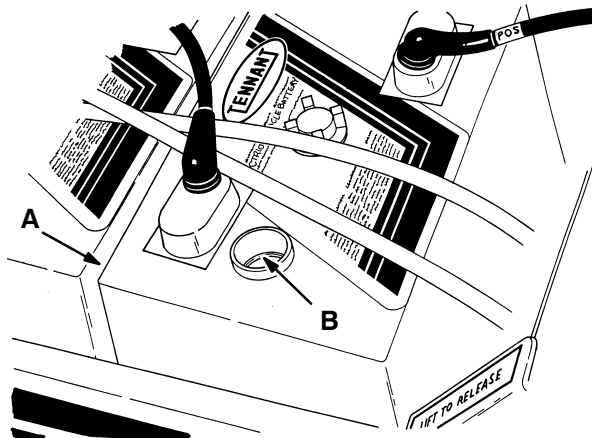
PREPARATION FOR OPERATION

AFTER UNCRATING AND BEFORE OPERATING MACHINE:

1. Check the machine for shipping damage.
2. Read this manual carefully before operating or servicing the machine.

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

3. Check the batteries. If they are of the wet-type, check the electrolyte level. If they are of the dry-type, activate them as described in *ACTIVATING DRY-TYPE BATTERIES* in the *MAINTENANCE* section.



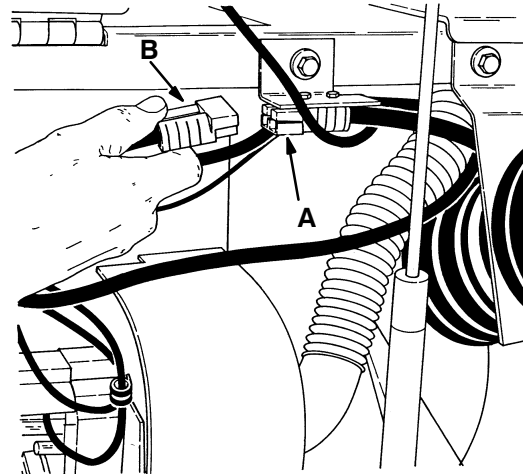
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CHECKING BATTERY ELECTROLYTE LEVEL

- A. Battery
- B. Electrolyte Indicator Ring

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

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



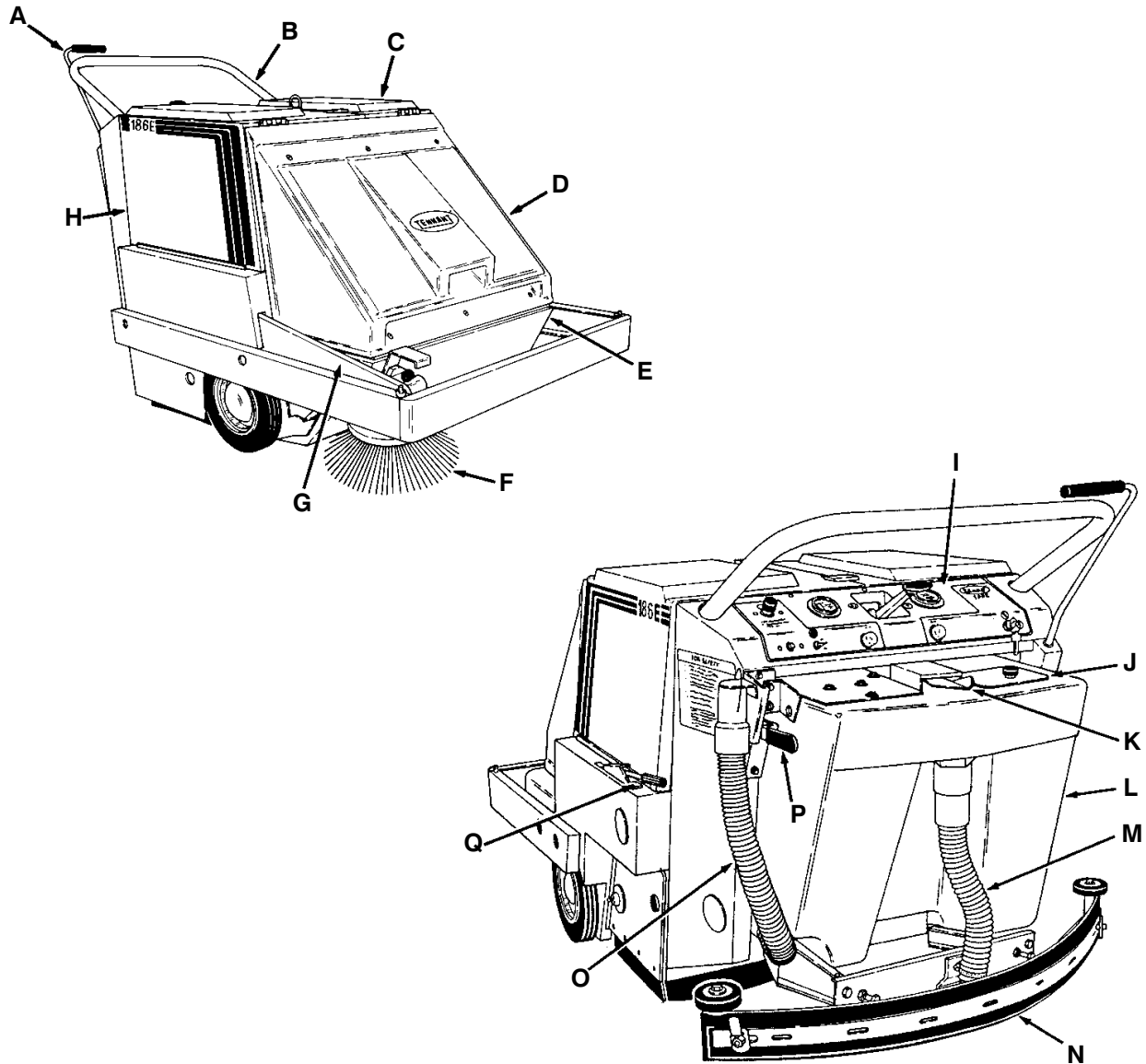
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CONNECTING BATTERIES-TO-MACHINE CONNECTOR

- A. Machine Connector
- B. Batteries Connector

6. Check the main brush adjustment. See *BRUSHES* in the *MAINTENANCE* section.

OPERATION OF CONTROLS



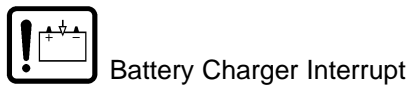
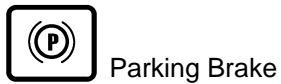
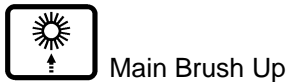
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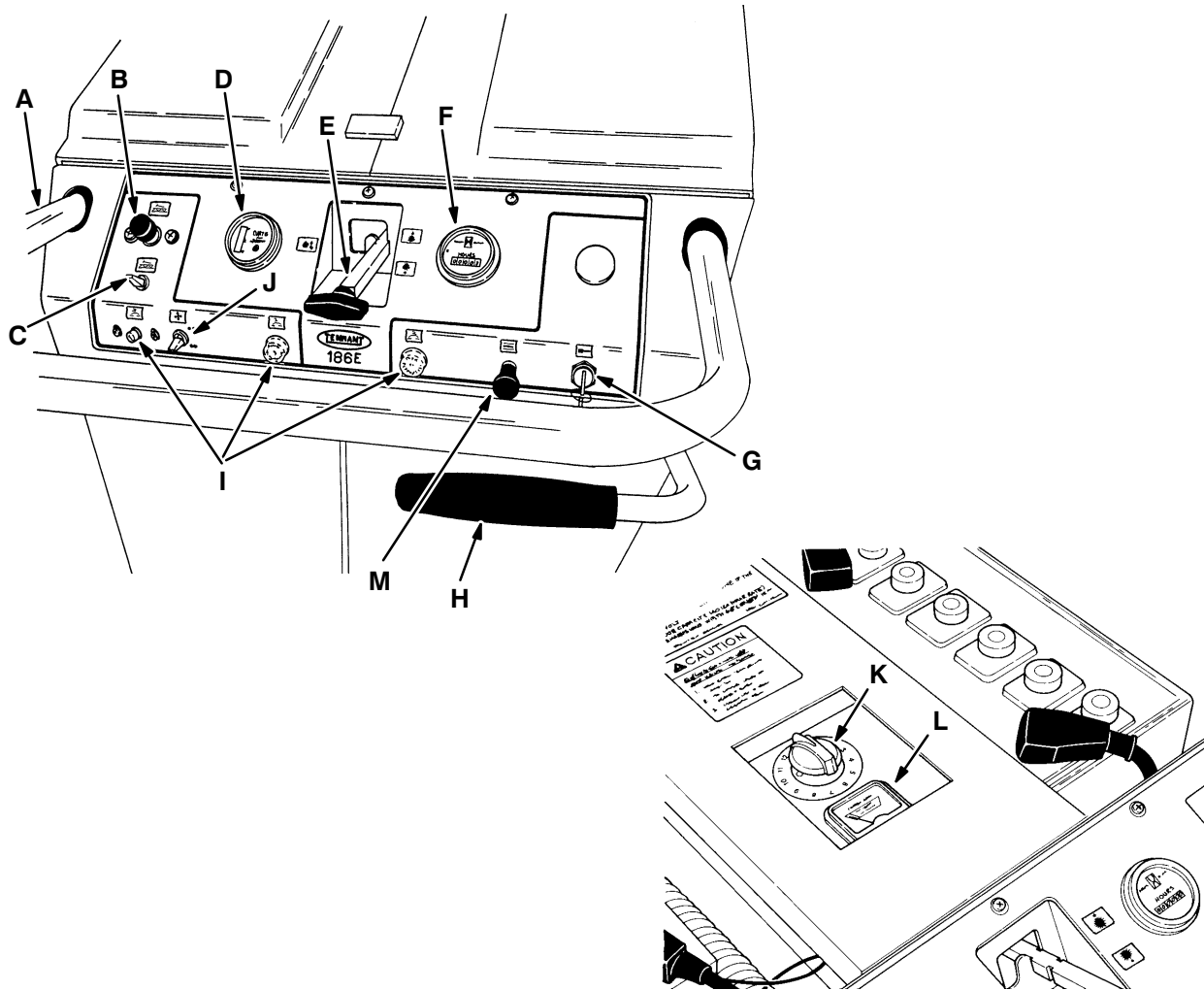
MACHINE COMPONENTS

- | | |
|-----------------------|--------------------------|
| A. Clutch Handle | J. Inspection Door |
| B. Stationary Handle | K. Solution Lever |
| C. Left Access Cover | L. Recovery Tank |
| D. Filter Cover | M. Squeegee Suction Hose |
| E. Hopper | N. Squeegee |
| F. Side Brush | O. Drain Hose |
| G. Side Brush Arm | P. Squeegee Lift Lever |
| H. Right Access Cover | Q. Parking Brake Lever |
| I. Instrument Panel | |

INSTRUMENT PANEL SYMBOLS

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

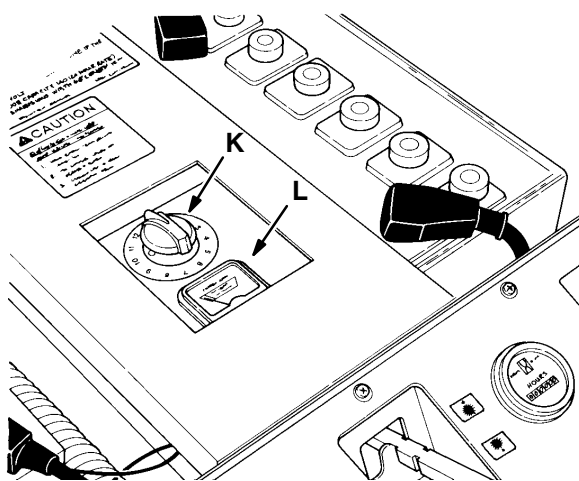
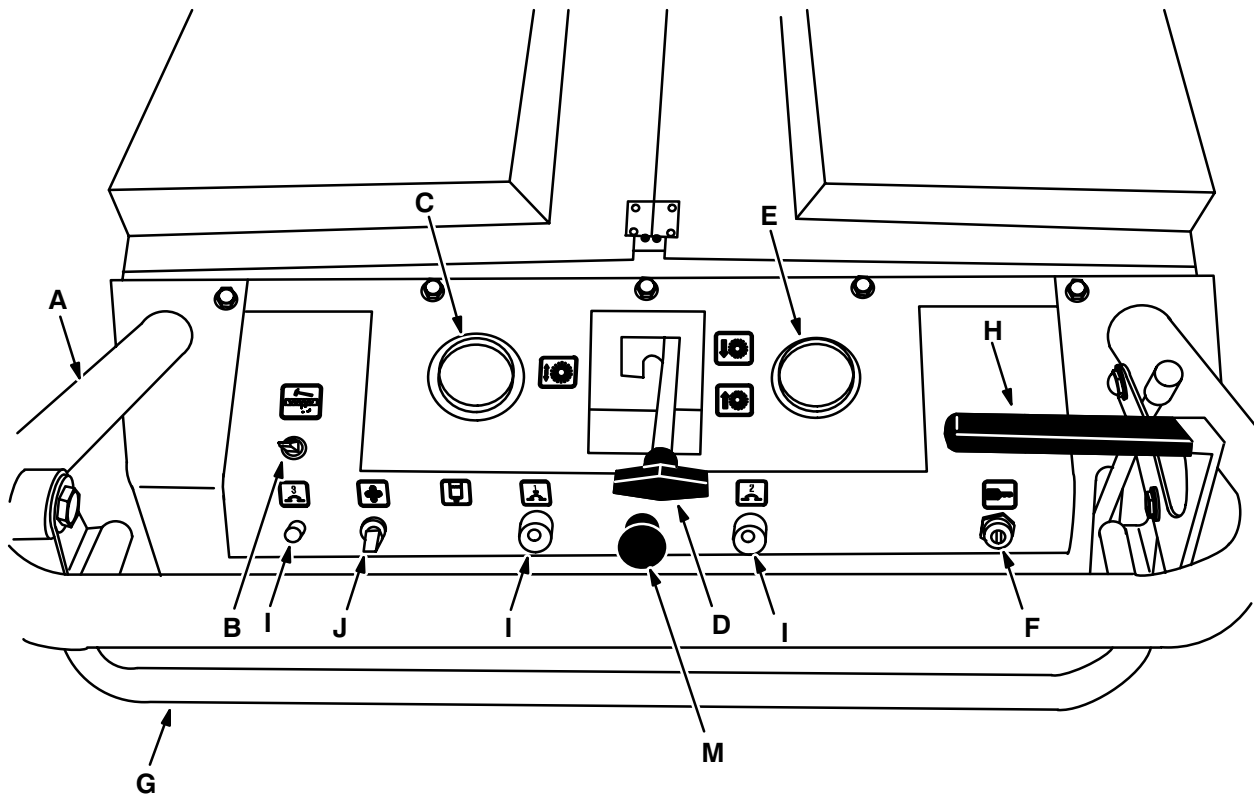




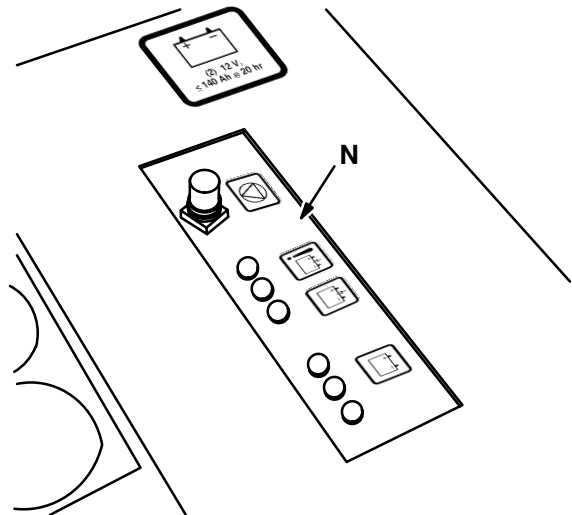
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CONTROLS AND INSTRUMENTS
(For machines below serial number 006000)

- | | |
|----------------------------------------|--------------------------------|
| A. Stationary Handle | H. Clutch Handle |
| B. Filter Shaker Switch | I. Circuit Breakers |
| C. Filter Shaker By-Pass Switch | J. Vacuum Fan Switch |
| D. Battery Condition Gauge | K. Charger Timer |
| E. Main Brush Lever | L. Charger Gauge |
| F. Hour Meter | M. Vacuum Shut-Off Knob |
| G. Key-Operated On-Off Switch | |



For machines serial number 006000 to 006822)



(For machines serial number 006823 and above)

06440
03197
07128

CONTROLS AND INSTRUMENTS
(For machines serial number 006000 and above)

- | | |
|---------------------------------------------|---------------------------------|
| A. Stationary Handle | H. Clutch Reverse Handle |
| B. Filter Shaker By-Pass Switch | I. Circuit Breakers |
| C. Battery Condition Gauge/Voltmeter | J. Vacuum Fan Switch |
| D. Main Brush Lever | K. Charger Timer |
| E. Hour Meter | L. Charger Gauge |
| F. Key-Operated On-Off Switch | M. Vacuum Shut-Off Knob |
| G. Clutch Handle | N. Charger Panel |

STATIONARY AND CLUTCH HANDLES

The stationary and clutch handles control the wheel drive clutch.

To move the machine forward for machines below serial number 006000, press the clutch handle until the desired speed is reached. To stop the machine, release the handle.

To move the machine forward for machines serial number 006000 and above, pull the clutch handle until the desired speed is reached. To stop the machine, release the handle.


To move the machine backward for machines below serial number 006000, pull the clutch handle. To stop the machine, release the handle.

To move the machine backward for machines serial number 006000 and above, press the clutch reverse handle. To stop the machine, release the handle.

FILTER SHAKER SWITCH

The filter shaker switch, for machines before serial number 004369, operates the dust filter shaker motor. The shaker motor shakes the dust out of the dust filter. To shake the filter, press the switch for 15 seconds. Release the switch to stop the filter shaker.

FILTER SHAKER BY-PASS SWITCH

The filter shaker by-pass switch , for machines serial number 004369 and above, controls the automatic filter shaker. When the switch is in the "on" position, the filter shaker motor will shake the dust from the filter for 20 seconds when the machine is turned off. When the switch is in the "off" position, the filter shaker motor will not shake the dust from the filter when the machine is turned off. The switch should be in the "off" position when servicing the machine or when using the scrubber attachment.

BATTERY CONDITION GAUGE




The battery condition gauge is an option on machines below serial number 006823. It indicates the present state of charge of the batteries. The display should be on the F mark of the gauge when the batteries are fully charged. As the batteries discharge, the display will move down near the E mark and flash. The batteries should be recharged when the display gets to the 1/4 mark.

VOLTMETER

The voltmeter indicates the present state of charge of the batteries. The needle should be in the white zone when the batteries are fully charged. As the batteries discharge, the needle will move into the green zone. The batteries should be recharged when the needle consistently stays in the red zone.

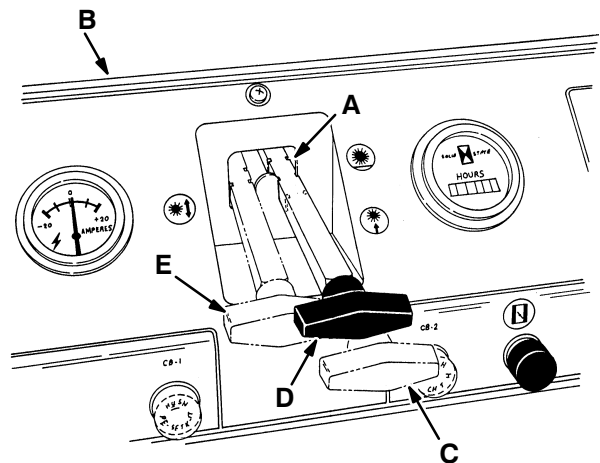
NOTE: Do not charge the batteries more often than is necessary. This will prolong the life of the batteries. Do not allow the batteries to become fully discharged as this will also damage the batteries. See BATTERIES in the MAINTENANCE section.

MAIN BRUSH LEVER

The main brush lever controls the position of the main brush. To raise the main brush, pull the lever up, to the right and back into the  (Main Brush Up) position (lower groove). To lower the main brush on smooth surfaces, push the lever forward and pull it back into the  (Main Brush Down) position (top groove). To lower the main brush on uneven surfaces, push the lever forward, to the left, and release it into the  (Main Brush Free-Float) position.

When parking the machine, always raise the brush to prevent the bristles from taking a set.

To increase main brush contact with the floor, turn the main brush lever to the left. To decrease main brush contact with the floor, turn the lever to the right.



MAIN BRUSH LEVER


03134

- A. Main Brush Lever
- B. Instrument Panel
- C. (Main Brush Up) Position
- D. (Main Brush Down) Position
- E. (Main Brush Free-Float) Position

HOURLY METER

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

KEY-OPERATED ON-OFF SWITCH

The key-operated on-off switch  has two positions: off and on. To turn the machine on, turn the key fully to the right to the on position. To turn off the machine, turn the key to the left to the off position.

CIRCUIT BREAKERS AND FUSES

Circuit breakers are resettable 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 by pressing the circuit breaker button in. 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.


Fuses are 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 than those specified in this manual.

The circuit breakers are located on the instrument panel. The fuse is located behind the hopper on the main frame.

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

PROTECTIVE DEVICE	RATING	CIRCUIT PROTECTED
CB-1	15 A	Shaker Motor
CB-2	15 A	Hour Meter, Thermo-Sentry™
CB-3	17.5 A	Vacuum Fan Motor
FU-1	60 A	Motor

VACUUM FAN SWITCH

The vacuum fan switch  controls the vacuum fan. To start the vacuum fan, flip the switch toggle up. To stop the fan, flip the switch toggle down.

CHARGER TIMER

The charger timer controls the battery charger on machines below serial number 006823. To start the battery charger, turn the timer knob to the number of hours you wish to charge the batteries. The timer will automatically stop the charger.


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

OPERATION

CHARGER GAUGE

The charger gauge indicates the level of charge being passed to the batteries on machines below serial number 006823. The gauge needle should be in the green area when charging and in the black area when done.

VACUUM SHUT-OFF KNOB

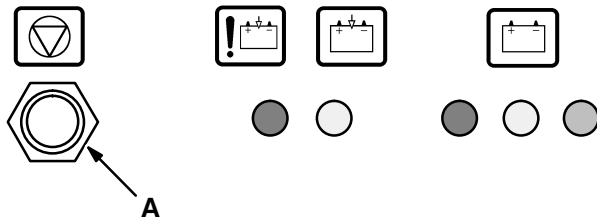
The vacuum shut-off knob  is present on machines with the filter bypass option and vacuum wand option. The knob controls the vacuum to the dust filter. To stop vacuum to the dust filter, pull the knob. To vacuumize the dust filter, push the knob in.

CHARGER PANEL

The charger panel indicates battery charging status on machines serial number 006823 and above. The panel is located next to the vacuum fan housing. The panel shows the status of charging after the charger has been plugged into a wall outlet.

The panel also has an interrupt switch to be used if the charging cycle needs to be stopped.

NOTE: If the charge cycle has to be stopped, press the interrupt switch while unplugging the charger.



CHARGER PANEL

06898

A. Interrupt Switch

PARKING BRAKE LEVER

The parking brake lever  controls the brake on the front wheel.

To set the parking brake for machines below serial numbers 002316, pull the handle back. To release the parking brake, pull the quick-release notch.

To set the parking brake for machines serial number 002316 to 005999, pull the handle up and over the latch bracket. To release the parking brake, pull the handle up, over and away from the latch bracket.

To set the parking brake for machines serial number 006000 and above, step on the lever and release it into the long notch on the left. To release the parking brake, step on the lever and release it into the short notch on the right.

Always park on a level surface, stop the motor, and engage the parking brake before leaving the machine unattended and before working on the machine.

SQUEEGEE LEVER

The squeegee lever is present on machines with the scrub attachment option. It controls the position of the rear squeegee.

To raise the squeegee, lift the lever into the “up” position. To lower the squeegee, lower the lever into the “down” position.

SOLUTION LEVER

The solution lever is present on machines with the scrub attachment option. It controls the flow of solution to the floor.

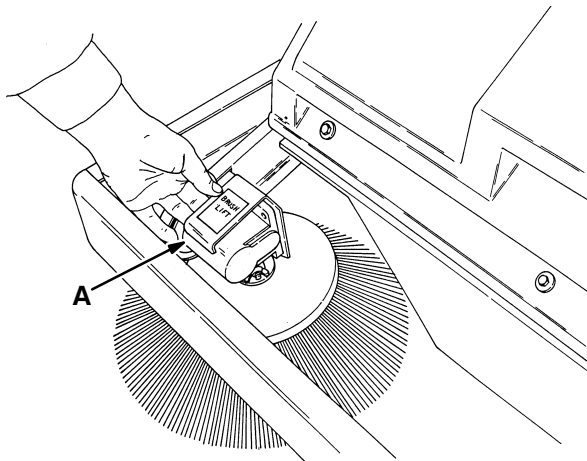
To start solution flow, push the lever to the right near the "on" position. Solution flow increases as the lever is pushed to the right. To stop solution flow, push the lever to the left into the "off" position.

SIDE BRUSH ARM

The side brush arm  controls the position of the side brush.

To raise the side brush, pull the lift arm up and push it back into the raised position. To lower the side brush, pull the arm forward and release it into the down position.

When parking the machine, always raise the brush to prevent the brush bristles from taking a set.



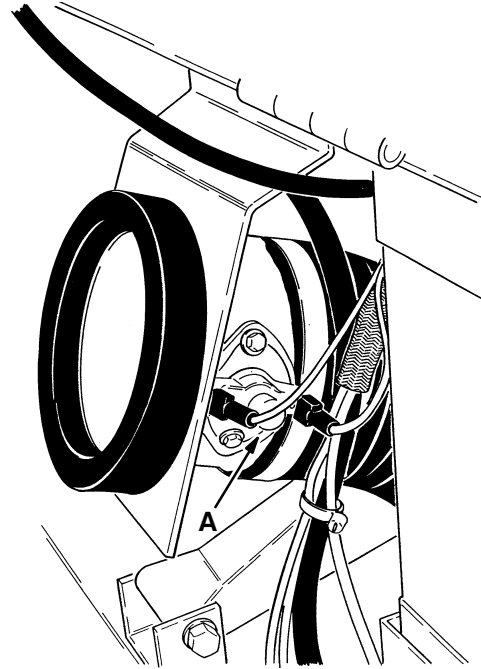
RAISING SIDE BRUSH ARM

A. Side Brush Arm

03135

THERMO-SENTRY™

The Thermo-Sentry™ is a thermostat that senses the temperature of the air drawn into the vacuum fan from the hopper. The thermostat controls a motor shut off switch. In the event of a fire in the hopper, the high air temperature would cause the thermostat to trip, stopping the motor cutting off air flow to the fire. After the thermostat has tripped, it must be manually reset by pressing the reset button on the sensor.



THERMO-SENTRY™

A. Thermo-Sentry™

03152

MACHINE OPERATION

NORMAL SWEEPING OPERATION

A normal sweeping operation consists of seven typical operations: pre-start checklist, starting machine, sweeping, dumping hopper, post operation checklist – motor operating, stopping machine, and post operation checklist – motor stopped.

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

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

TO SWEEP lists things to keep in mind before and during the sweeping operation.

TO DUMP HOPPER lists the steps required to dump the hopper.

POST OPERATION CHECKLIST – MOTOR OPERATING lists things to check before stopping the machine motor.

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

POST OPERATION CHECKLIST – MOTOR STOPPED lists things to check after stopping the machine motor.

PRE-START CHECKLIST

Check under machine for leak spots.

Check controls for proper operation.

Check service records to determine service requirements.

TO START MACHINE

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

1. Turn the on-off switch key to the right.
2. Release the machine parking brake.
3. Drive the machine to the area to be swept.

TO SWEEP

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

Pick up oversize debris before sweeping. Flatten or remove bulky cartons from aisles before sweeping. Pick up pieces of wire, twine, string, etc., which could become entangled in brush or brush plugs. Overlap brush paths.

Sweep as straight a path as possible. Avoid bumping into posts or scraping the sides of the sweeper.

1. Move the main brush lever into the (Main Brush Down) or (Main Brush Free-Float) position.
2. Move the side brush arm into the down position.
3. Sweep as required.

TO DUMP HOPPER

1. Pull the main brush lever into the (Main Brush Up) position.
2. Pull the side brush arm into the raised position.
3. For machines below serial number 004369: Push the filter shaker switch for 15 seconds to shake the dust filter.
4. Slowly drive the machine up to the dump site or dumpster. Turn off the machine.

NOTE: For machines serial number 004369 and above, the filter shaker by-pass switch must be in the "on" position to shake the dust filter when the machine is turned off.

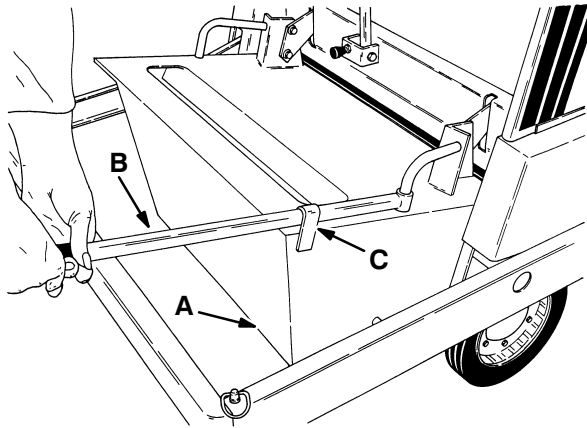
5. Park on level surface.

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

6. Lift the filter cover.

- Swing the dump lever under the hook; Lift the dump lever to dump the hopper.

! WARNING: Heavy Hopper. Get Help To Handle.



DUMPING HOPPER

03142

- A. Hopper**
- B. Dump Lever**
- C. Lever Hook**

- Engage the lever hook to keep the hopper in the "dump" position.
- Slowly back the machine away from the dump site or dumpster.
- Release the lever hook, lower the hopper, and return the dump lever to its storage location.

POST OPERATION CHECKLIST – MOTOR OPERATING

Check brush pattern for width and evenness.

TO STOP MACHINE

- Raise the main brush and side brush.
- Turn the on-off switch key to the left.
Remove the key from the on-off switch.

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

POST OPERATION CHECKLIST – MOTOR STOPPED

Check skirts for damage, wear, and adjustment.

Check for wire or string tangled on brushes.

Check for leaks.

NORMAL SCRUBBING OPERATION

A normal scrubbing operation consists of seven typical operations: pre-start checklist, starting machine, scrubbing, draining recovery tank and emptying debris tray, post operation checklist – motor operating, stopping machine, and post operation checklist – motor stopped.

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

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

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

TO DRAIN RECOVERY TANK AND EMPTY DEBRIS TRAY lists the steps required to empty the debris tray and the recovery tank.

POST OPERATION CHECKLIST – MOTOR OPERATING lists things to check before stopping the machine.

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

POST OPERATION CHECKLIST – MOTOR STOPPED lists things to check after stopping the machine.

PRE-START CHECKLIST

Check under machine for leak spots.

Check brakes and controls for proper operation.

Check service records to determine service requirements.

OPERATION

TO START MACHINE

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

1. Turn the on-off switch key to the right.
2. Release the machine parking brake.
3. Drive the machine to the area to be scrubbed.

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.

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 brush or brush plugs.

Allow a few inches overlap of brush paths.

Try to scrub as straight a path as possible. Avoid bumping into posts or scraping the sides of the machine.

Floor conditions, 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, consult the local Tennant Company Representative.

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

The recovery tank should be drained after the solution tank is empty and whenever the float rises and stops water vacuum. The recovery tank may fill before the solution tank empties if standing water is picked up in addition to the solution put down by the machine.

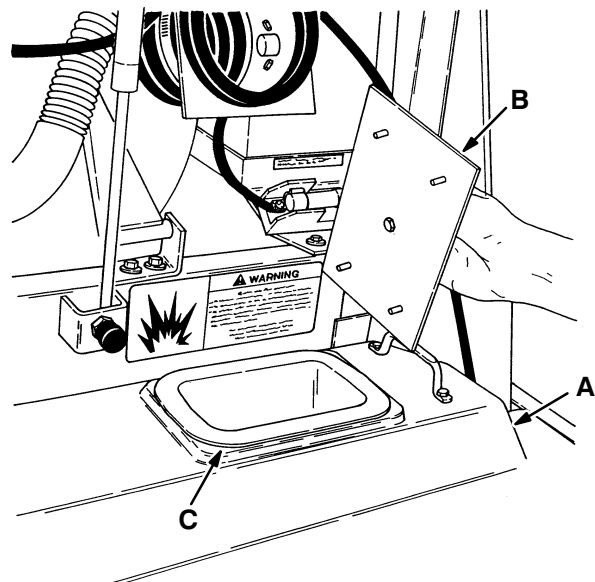
For best scrubbing results, reduce speed to one-half maximum machine speed. Shut off solution flow to floor 5 ft (1525 mm) before making turns. Always raise the rear squeegee before backing machine. Adjust solution flow to floor with solution flow control lever to match floor conditions.

1. Stop the motor before filling solution tanks.

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

NOTE: For machines serial number 004369 and above, the filter shaker by-pass switch should be in the "off" position to prevent the filter shaker from shaking.

2. Open the solution tank cover.



SOLUTION TANK COVER

03150

- A. Solution Tank
- B. Cover
- C. Soap Basket

3. Pour the required amount of detergent into the soap basket. Fill the tank with water to 1 in (25 mm) above the top of the screened portion of the soap basket.

NOTE: The water must not be hotter than 130° F (54° C) or tank damage may occur.

4. Start and drive the machine to the area to be scrubbed.
5. Move the main brush lever into the (Main Brush Down) or (Main Brush Free-Float) position.
6. Move the side brush arm into the down position.
7. Place the solution spreader tube in the down position.
8. Move the solution lever into the on position.
9. Lower the squeegee lever into the down position.
10. Scrub as required. Adjust the solution flow to match floor conditions. When the recovery tank float stops vacuum, return to the solution dump/filling site. Drain the recovery tank, empty the debris tray, and refill the solution tank.

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

TO DRAIN RECOVERY TANK AND EMPTY DEBRIS TRAY

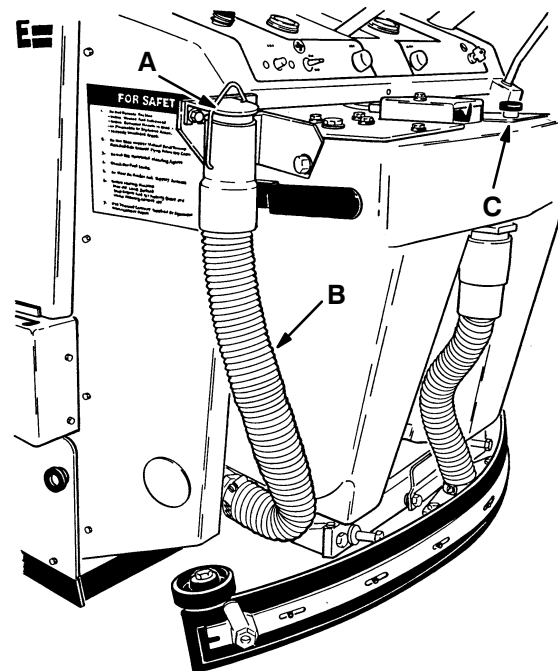
1. Park the machine next to a floor drain. Turn off the machine and vacuum fan switch. Set the machine parking brake.

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

NOTE: For machines serial number 004369 and above, the filter shaker by-pass switch should be in the "off" position to prevent the filter shaker from shaking.

2. Remove the recovery tank drain hose from its retention plug. Lower the hose to the floor drain to drain the tank.

NOTE: The tank will not empty with the vacuum fan operating.



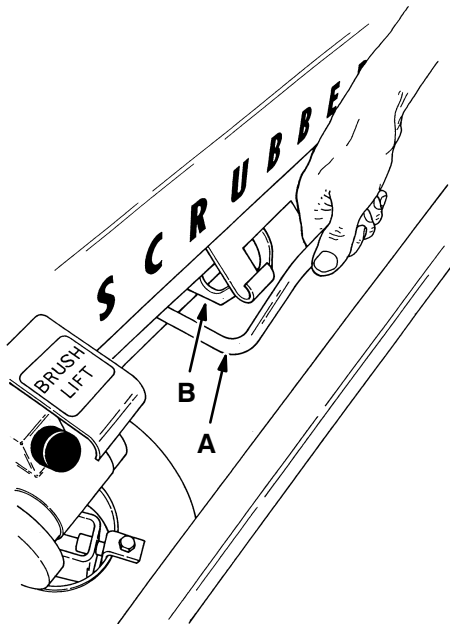
RECOVERY TANK DRAIN HOSE

- A. Plug
- B. Drain Hose
- C. Access Door

03148

OPERATION

3. Replace the hose on the retention plug after the tank is empty.
4. Lift the debris tray handle off its hanger and pull the tray out from under the solution tank. Empty and replace it.



REMOVING DEBRIS TRAY

- A. Handle
- B. Debris Tray

POST OPERATION CHECKLIST – MOTOR OPERATING

Check scrub brush pattern for width and evenness.

Check squeegees for proper deflection.

TO STOP MACHINE

1. Move the solution lever into the off position and place the main brush lever into the (Main Brush Up) position 10 ft (3050 mm) before stopping the machine.
2. Lift the squeegee lever into the up position.
3. Place the solution spreader tube in the up position.
4. Pull the side brush arm into the raised position.
5. Turn the on-off switch key to the left. Remove the key from the on-off switch.

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

NOTE: For machines serial number 004369 and above, the filter shaker by-pass switch should be in the "off" position to prevent the filter shaker from shaking.

03149

POST OPERATION CHECKLIST – MOTOR STOPPED

Check skirts for damage, wear, and adjustment.

Check for wire or string tangled on brushes.

Drain and clean recovery tank.

Check 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 rear squeegee raised. Allow the solution to soak on the floor for 15 to 20 minutes. Then make a second scrubbing pass in the normal manner with the rear squeegee lowered.

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

OPERATION ON GRADES

Drive the machine slowly on grades. The maximum rated climb angle is 8 degrees. The maximum rated descent angle is 6 degrees.

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

VACUUM WAND OPTION

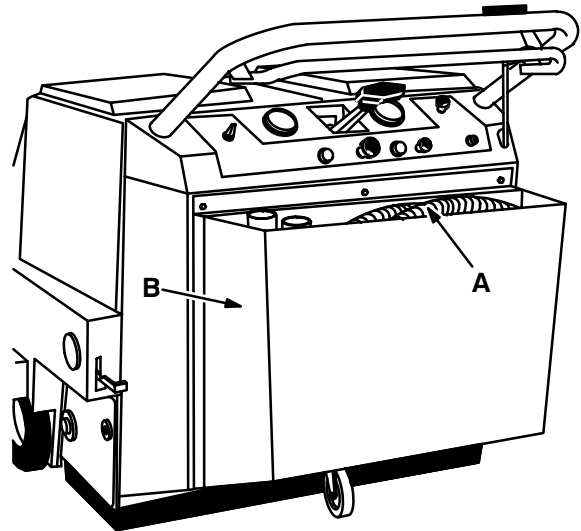
The vacuum wand option gives the machine the added flexibility of picking up debris not accessible to the machine. An 84 in (2135 mm) hose utilizes the machine vacuum system.

TO OPERATE VACUUM WAND

1. Stop the machine close to the area to be cleaned.
2. Raise the main brush and side brush.
3. Turn off the machine and set the machine parking brake.

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

4. Remove the vacuum wand and hose from its storage location.
5. Assemble the vacuum wand to the vacuum hose.



VACUUM WAND

- A. Vacuum Hose**
- B. Storage Bin**

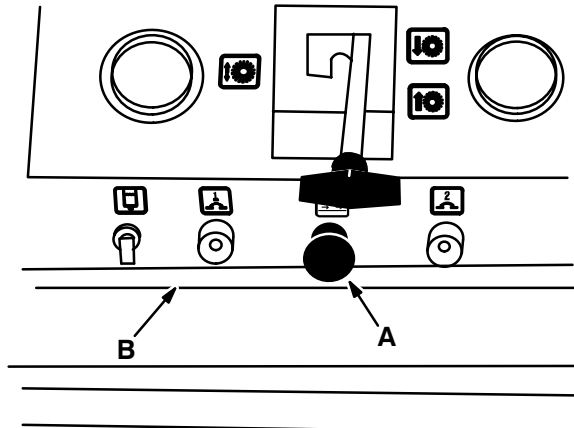
6. Turn on the machine.
7. Turn on the vacuum fan switch.
8. Vacuum the area as required.
9. When finished, turn off the machine and vacuum fan.
10. Disassemble the vacuum wand and hose. Place them in their storage locations.

07127

OPERATION

FILTER BYPASS OPTION

The filter bypass option allows the machine to sweep wet debris without soaking and damaging the dust filter. To operate the filter bypass, pull the vacuum shut-of knob out. To stop the filter bypass, push the vacuum shut-off knob in.

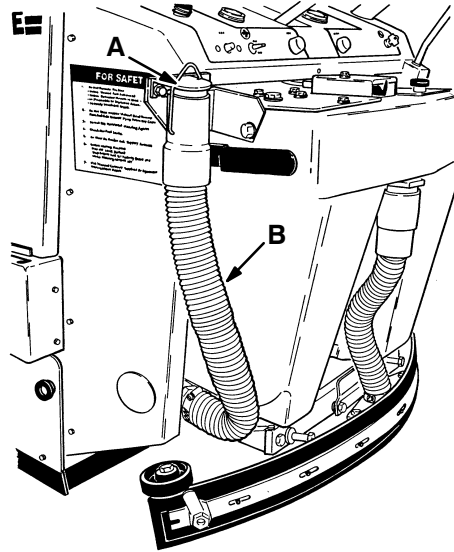


VACUUM SHUT-OFF KNOB

07126

- A. Vacuum Shut-Off Knob
- B. Instrument Panel

NOTE: The tank will not empty with the vacuum fan operating.



RECOVERY TANK DRAIN HOSE

03148

- A. Plug
- B. Drain Hose

WATER PICKUP OPTION

The water pickup option allows machines without the scrub attachment to pick up water from the floor. The kit includes a filter bypass, a vacuum fan motor, a squeegee, and a recovery tank.

TO OPERATE THE WATER PICKUP OPTION

1. Pull out the vacuum shut-off knob.
2. Raise the main brush and side brush.
3. Lower the squeegee lever into the down position.
4. Turn on the vacuum fan motor.
5. Drive the machine over the wet areas.

When the recovery tank float stops vacuum, go to the dump/filling site. Stop the machine and vacuum fan motors. Lower the drain hose to empty the recovery tank. Rinse the recovery tank clean. Replace the hose on the retention plug after the tank is empty.

SCRUB ATTACHMENT

The scrub attachment option gives the machine the added flexibility to scrub floors. It consists of five groups of parts – the solution tank and debris tray, the side and main scrub brushes, the recovery tank, the vacuum fan, and the rear squeegee.

The solution tank, debris tray, and side and main scrub brushes are to be removed when sweeping. The recovery tank, vacuum fan, and rear squeegee may be left on the machine. The rear squeegee must be kept in the “up” position to prevent being damaged however. The solution tank and debris tray takes the place of the sweeping hopper. The side scrub brush takes the place of the side sweep brush. The main sweeping brush is also exchanged for a scrubbing brush in the conversion.

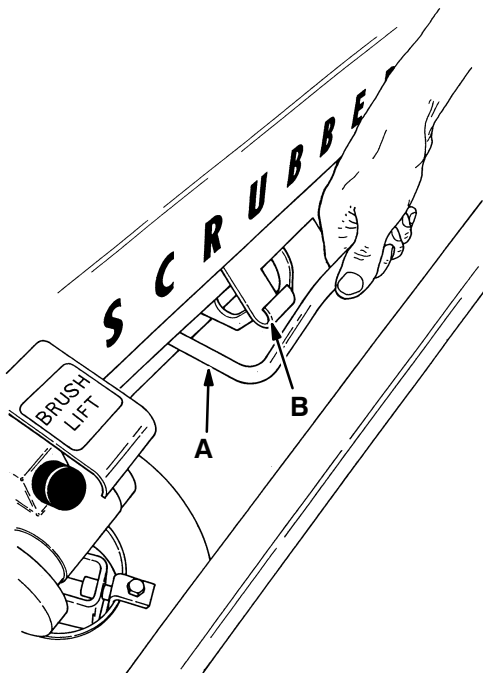
Rear squeegee, vacuum fan, and recovery tank installation are covered in an instruction bulletin. Side scrub brush installation is the same as side sweep brush installation as covered in *BRUSHES* in the *MAINTENANCE* section. Here we will only cover routine solution tank and debris tray installation and removal.

TO MOUNT SOLUTION TANK AND DEBRIS TRAY

1. Stop the motor.

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

2. Raise the filter assembly.
3. Remove the debris hopper.
4. Slide the solution tank into place on the machine. Be sure the tank hanger brackets engage the mounting pins.
5. Slide the debris tray under the solution tank.

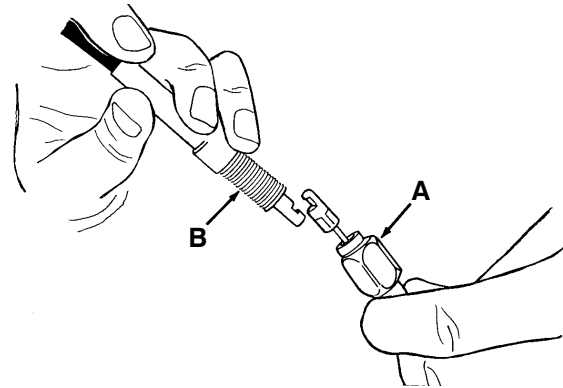


DEBRIS TRAY

- A. Debris Tray**
- B. Handle Hanger**

6. Place the tray handle on its hanger.

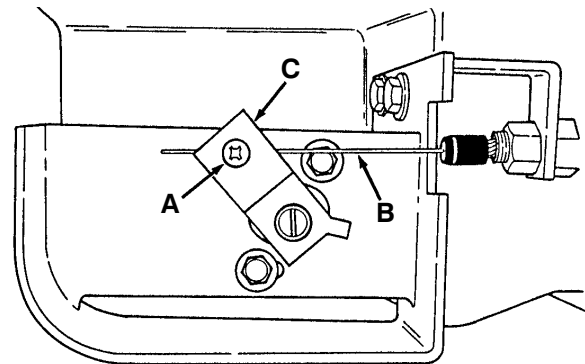
7. Connect the solution cable on the tank to the cable on the machine. Do not twist the cable.



CONNECTING SOLUTION CABLE

- A. Tank Cable**
- B. Machine Cable**

NOTE: If twisting is required to connect the cables, loosen the valve swivel screw and allow the cable to relax. Connect the cables and tighten the swivel screw. Be sure the valve lever does not move when loosening or tightening the swivel screw.

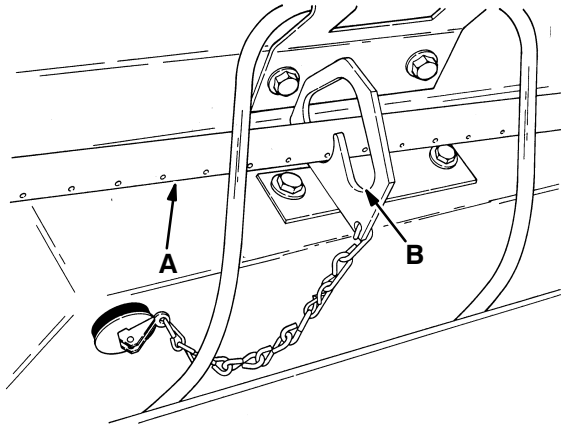


CABLE SWIVEL SCREW

- A. Swivel Screw**
- B. Cable**
- C. Solution Valve Lever**

OPERATION

8. Position the spreader tube in the “lowered” position.



SPREADER TUBE

03160

- A. Spreader Tube
- B. Lowered Position Slot

9. Lower the filter assembly.

TO REMOVE SOLUTION TANK AND DEBRIS TRAY

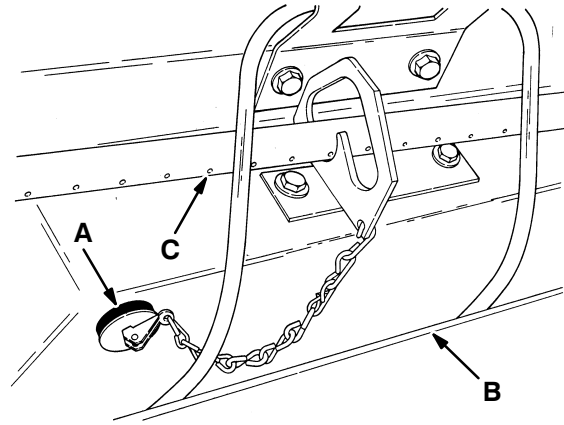
1. Park the machine next to a floor drain. Turn off the machine and vacuum fan. Set the machine parking brake.

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

NOTE: For machines serial number 004369 and above, the filter shaker by-pass switch should be in the “off” position to prevent the filter shaker from shaking.

2. Raise the filter assembly.
3. Position the spreader tube in the “raised” position.

4. Remove the plug on the bottom of the solution tank to drain the solution tank.



DRAIN PLUG

03160

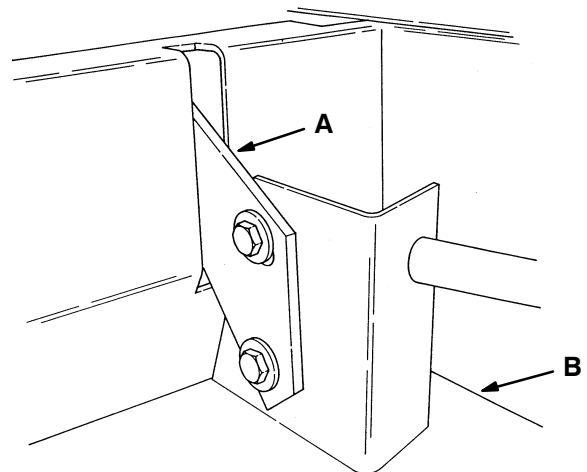
- A. Drain Plug
- B. Solution Tank
- C. Raised Spreader Tube

5. Disconnect the solution cable on the machine from the solution tank cable.

6. Slide the debris tray out from under the solution tank.

7. Remove the solution tank.

8. Slide the debris hopper into place on the machine. Be sure the debris hopper hangers engage the mounting pins.



HOPPER HANGERS

03159

- A. Hanger
- B. Hopper

9. Replace the tank drain plug.

MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Excessive dusting	Dust skirts and seals worn, damaged, not adjusted properly	Replace or adjust skirts or seals
	Dust filter clogged	Shake and/or clean or replace filter
	Vacuum hose damaged	Replace vacuum hose
	Vacuum fan belt slipping or broken	Adjust or replace belt
Poor sweeping performance	Brush bristles worn	Replace brushes
	Brushes not adjusted properly	Adjust brushes
	Debris caught in brush drive mechanism	Free mechanism of debris
	Hopper not adjusted properly	Adjust hopper floor clearance
	Hopper full	Empty hopper
	Hopper floor skirts worn, damaged	Replace skirts
Trailing water – poor blade or no water pickup	Worn rear squeegee	Rotate or replace rear squeegee
	Rear squeegee out of adjustment	Adjust rear squeegee
	Recovery tank inspection cover seal broken	Adjust cover or replace seal
	Vacuum hose clogged	Flush vacuum hoses
	Fan filter clogged	Clean or replace filter
	Recovery tank full	Drain tank
	Float stuck shutting off vacuum	Clean float and float guide
	Debris caught on squeegee	Remove debris
	Debris tray full	Empty tray
	Foam filling recovery tank	Empty recovery tank; change detergent
	Vacuum hose to rear squeegee disconnected or damaged	Reconnect or replace vacuum hose
	Vacuum fan to recovery tank hose damaged	Replace hose
	Vacuum fan belt slipping or broken	Adjust or replace belt
Little or no solution flow to floor	Solution tank empty	Fill solution tank
	Solution control cable broken or out of adjustment	Replace and/or adjust cable
	Solution supply lines and spreader tube clogged	Flush solution supply lines, spreader tube
	Solution tube in “up” position	Place tube in “down” position

OPERATION

MACHINE TROUBLESHOOTING

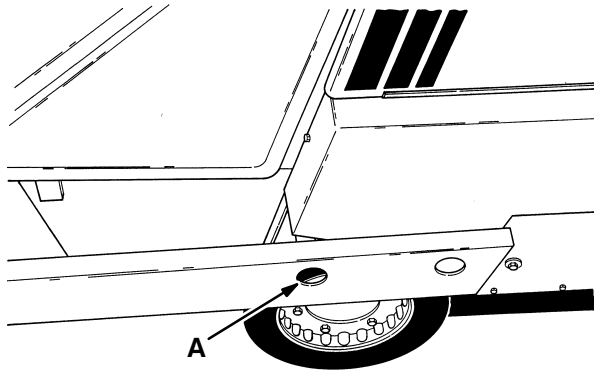
Problem	Cause	Remedy
Poor scrubbing performance	Debris caught on scrub brushes	Remove debris
	Improper detergent or brushes used	Check with TENNANT® representative for advice
	Worn scrub brushes	Replace scrub brushes
	Scrub brushes out of adjustment	Adjust scrub brushes
	Debris tray full	Empty tray

TRANSPORTING MACHINE**MACHINE TIE-DOWNS**

The machine may be tied down at each of the corners on the wrap around bumper.

To tie the machine down, strap around the bumper at the attachment bolts.

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



LEFT SIDE TIE-DOWN LOCATION

03136

A. Tie-Down Location

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. Empty debris hopper.
2. Raise the main brush and side brush.
3. Fully charge the batteries.
4. Disconnect the batteries-to-machine connector.
5. Park the machine in a cool, dry area.

SECTION 3

CONTENTS

	Page		Page
RECOMMENDED FIRST 25-HOUR		VACUUM FAN BELT	3-22
MACHINE INSPECTION	3-3	TO CHECK AND ADJUST VACUUM	
MAINTENANCE CHART	3-4	FAN BELT TENSION	3-22
LUBRICATION	3-6	TO REPLACE VACUUM FAN BELT .	3-24
DRIVE CHAINS	3-6	WHEEL DRIVE CHAINS	3-24
BRUSH ARM PIVOTS	3-6	STATIC DRAG CHAIN	3-24
SIDE BRUSH GEAR BOX	3-6	BRUSHES	3-25
REAR CASTER	3-7	MAIN BRUSH	3-25
SELF ADJUSTING SHEAVE	3-7	TO REMOVE MAIN BRUSH	3-25
SQUEEGEE PIVOT	3-7	TO INSTALL MAIN BRUSH	3-25
ELECTRICAL SYSTEM	3-8	TO CHECK AND ADJUST MAIN	
BATTERIES	3-8	BRUSH PATTERN	3-25
BATTERY CHARGING	3-9	SIDE BRUSH	3-26
TO CHARGE BATTERIES		TO REMOVE SIDE BRUSH	3-26
(For machines below serial		TO INSTALL SIDE BRUSH	3-27
number 006823)	3-9	TO ADJUST SIDE BRUSH PATTERN	3-27
TO CHARGE BATTERIES		SKIRTS AND SEALS	3-28
(For machines serial number		HOPPER LIP SKIRT	3-28
006823 and above)	3-10	REAR BRUSH SKIRTS	3-28
ACTIVATING DRY-TYPE BATTERIES .	3-11	HOPPER TOP SEAL	3-28
TO ACTIVATE DRY-TYPE		MAIN BRUSH COMPARTMENT SKIRTS	3-28
BATTERIES	3-11	DEBRIS HOPPER AND DUST FILTER ...	3-29
ELECTRIC MOTOR	3-11	DEBRIS HOPPER	3-29
ELECTRICAL SCHEMATIC, 186E		TO CHECK AND ADJUST HOPPER	
(For machines below serial number		FLOOR CLEARANCE	3-29
004369)	3-12	TO ADJUST DUST FILTER TO	
ELECTRICAL SCHEMATIC, 186E		HOPPER SEALING	3-30
(For machines serial number		DUST FILTER	3-30
004369 to 006822)	3-13	TO REMOVE HOPPER DUST	
ELECTRICAL SCHEMATIC, 186E		FILTER	3-31
(For machines serial number		VACUUM WAND OPTION	3-32
006823 and above)	3-14	VACUUM WAND OPTION	3-32
ELECTRICAL SCHEMATIC, 186EE		TO REPLACE VACUUM WAND BAG	3-32
(For machines below serial number		TO CLEAN VACUUM FAN FILTER .	3-32
006823)	3-15	WATER PICKUP OPTION	3-33
ELECTRICAL SCHEMATIC, 186EE		WATER PICKUP OPTION	3-33
(For machines serial number		VACUUM FAN	3-33
006823 and above)	3-16	RECOVERY TANK	3-33
BELTS AND CHAINS	3-17	TO DRAIN RECOVERY TANK	3-33
PROPELLING BELTS	3-17	REAR SQUEEGEE	3-34
TO CHECK AND ADJUST		TO REMOVE SQUEEGEE	
PROPELLING BELTS TENSION	3-17	ASSEMBLY	3-34
TO REPLACE PROPELLING BELTS	3-18	TO INSTALL SQUEEGEE	
SIDE BRUSH BELT	3-19	ASSEMBLY	3-35
TO CHECK AND ADJUST SIDE		TO REPLACE FRONT SQUEEGEE	
BRUSH BELT TENSION	3-19	BLADE	3-35
TO REPLACE SIDE BRUSH BELT .	3-20	TO REPLACE REAR SQUEEGEE	
SHORT MAIN BRUSH BELT	3-20	BLADE	3-36
TO REPLACE SHORT MAIN BRUSH		TO ADJUST SQUEEGEE	3-37
BELT	3-20		
LONG MAIN BRUSH BELT	3-21		
TO REPLACE LONG MAIN BRUSH			
BELT	3-21		

MAINTENANCE

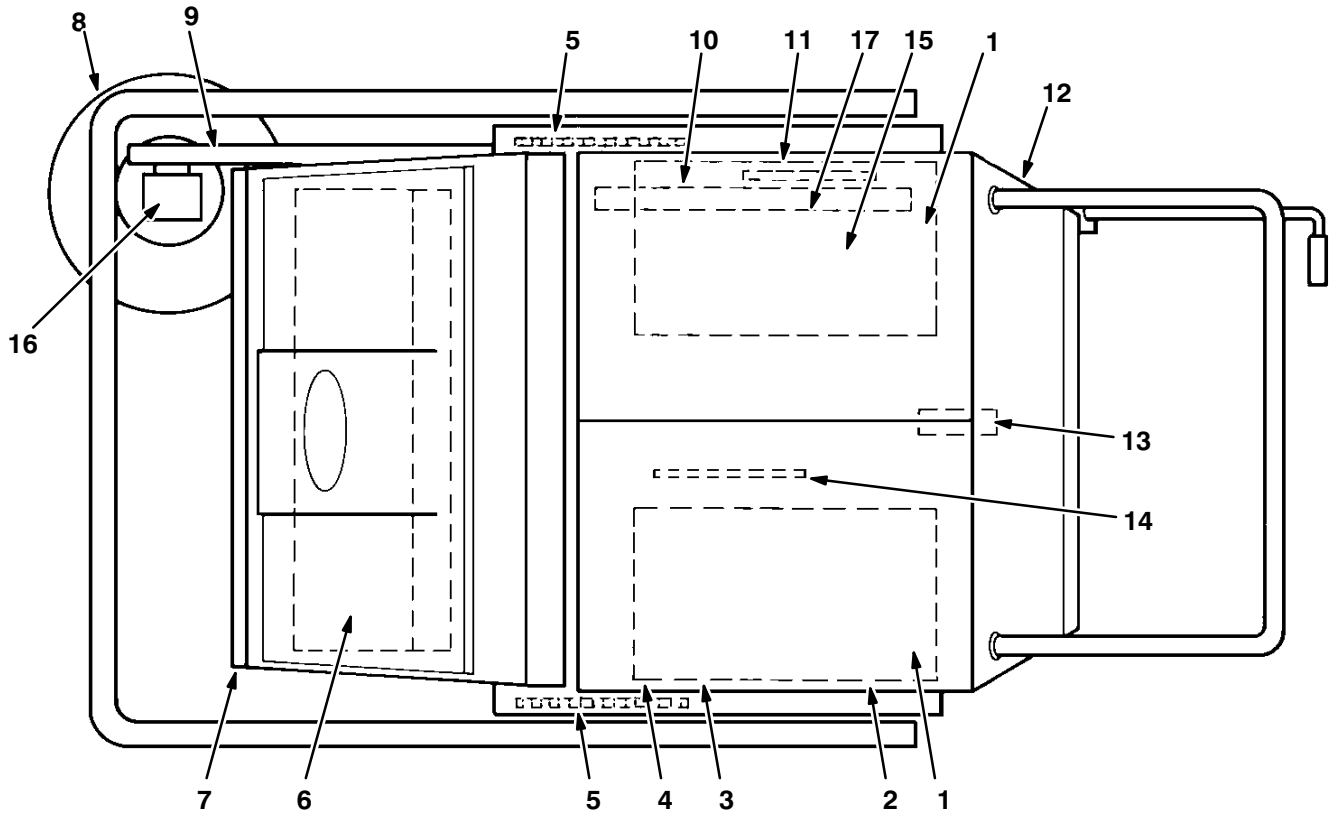
	Page
SCRUB ATTACHMENT	3-39
SCRUB ATTACHMENT	3-39
SOLUTION TANK	3-39
SOLUTION DISTRIBUTION SYSTEM .	3-39
DEBRIS TRAY	3-40
TO CHECK AND ADJUST DEBRIS	
TRAY FLOOR CLEARANCE	3-40
SCRUB BRUSHES	3-40
RECOVERY TANK	3-41
TO DRAIN RECOVERY TANK	3-41
VACUUM FAN	3-41
REAR SQUEEGEE	3-42
TO REMOVE SQUEEGEE	
ASSEMBLY	3-42
TO INSTALL SQUEEGEE	
ASSEMBLY	3-43
TO REPLACE FRONT SQUEEGEE	
BLADE	3-43
TO REPLACE REAR SQUEEGEE	
BLADE	3-44
TO ADJUST SQUEEGEE	3-46

RECOMMENDED FIRST 25-HOUR MACHINE INSPECTION

After the first 25 hours of operation, the following procedures are recommended:

1. Check the brush pattern for correct brush adjustment.
2. Check the floor skirts to floor clearance.
3. Check the side brush and main brush patterns.
4. Check the drive chain tension.

MAINTENANCE CHART



03129

Interval	Key	Description	Procedure	Lubricant	No. of Service Points
Daily	6	Dust filter	Shake	—	1
	2	Brush skirts	Check for damage wear, and floor clearance	—	5
	3	Main brush	Check for damage, wear, and floor clearance	—	1
	8	Side brush	Check for damage and wear	—	1
	7	Hopper	Check for hopper door seal damage and wear	—	3
	—	Scrub attachment	Check rear squeegee for damage, wear, and adjustment	—	1
	—	—	Check scrub brushes for damage, and wear	—	2
25 Hours	12	Scrub attachment	Clean recovery tank Check squeegee for damage, wear and adjustment	—	1
	—	Vacuum wand attachment	Clean vacuum fan filter	—	1
	—	Water pickup option	Clean vacuum fan filter	—	1
	1	Batteries	Check electrolyte level	DW	2

Interval	Key	Description	Procedure	Lubricant	No. of Service Points
50 Hours	14	Vacuum fan belt	Check tension and wear	–	1
	10	Propelling belts	Check tension and wear	–	2
	10	Main brush belts	Check for wear	–	2
	9	Side brush belt	Check tension and wear	–	2
	8	Side brush	Check floor pattern	–	1
	3	Main brush	Check floor pattern	–	1
			Rotate end-for-end	–	1
	4	Brush arm pivot	Lubricate	SPL	2
	13	Rear caster	Lubricate	SPL	2
	12	Scrub attachment	Lubricate squeegee pivot	SPL	1
			Check debris tray floor clearance	–	1
	–		Check scrub brush pattern	–	2
	7	Hopper	Check floor clearance	–	1
100 Hours	5	Drive chains	Check and adjust tension	–	2
			Lubricate	SO	2
	7	Hopper	Clean inside	–	1
			Check floor clearance	–	1
	6	Dust filter	Clean or replace	–	1
	11	Self adjusting sheave	Lubricate	EO	1
	1	Batteries	Clean top surface and terminals	DW	2
17	Differential	Lubricate	SPL	1	
400 Hours	15	Propelling motor	Blow out dust and inspect	–	1
	16	Side brush gear box	Check lubricant level	GL	1

EO – Engine oil

DW – Distilled water

SPL – Special lubricant, Lubriplate EMB grease, TENNANT Part No. 01433–1

SO – Spray lubricant

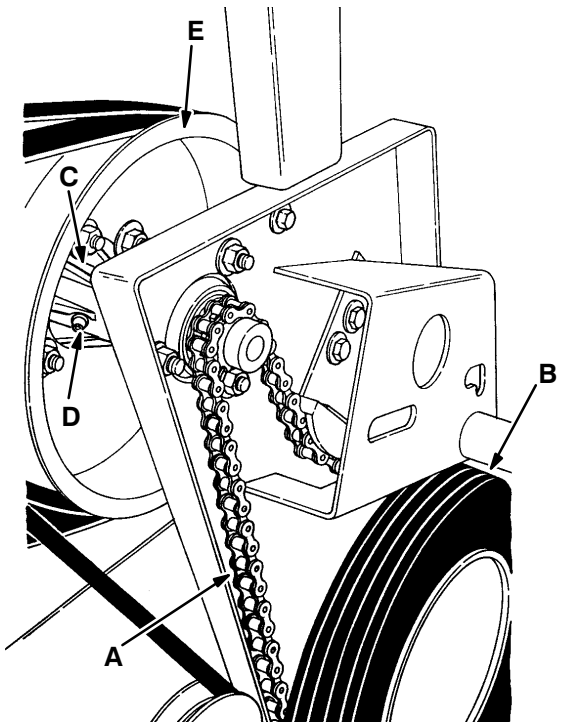
GL – SAE 90 Weight gear lubricant

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

LUBRICATION

DRIVE CHAINS

The two wheel drive chains propel the machine. They should be lubricated with a penetrating-type spray lubricant after every 100 hours of operation.



WHEEL DRIVE CHAIN

03139

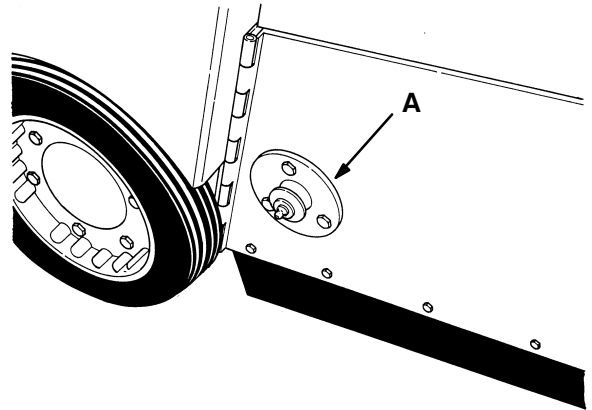
- A. Drive Chain
- B. Tire
- C. Differential
- D. Grease Fitting
- E. Drive Sheave

DIFFERENTIAL

The differential drives the front wheels. The differential has one grease fitting located on the drive shaft inside the drive sheave. Lubricate the differential every 100 hours of operation with Lubriplate EMB grease (TENNANT Part No. 01433-1).

BRUSH ARM PIVOTS

The brush arm pivots on a stub shaft on each side of the machine. Each of the stub shafts are fitted with a grease fitting. Apply Lubriplate EMB grease (TENNANT Part No. 01433-1) to the grease fittings after every 50 hours of operation.



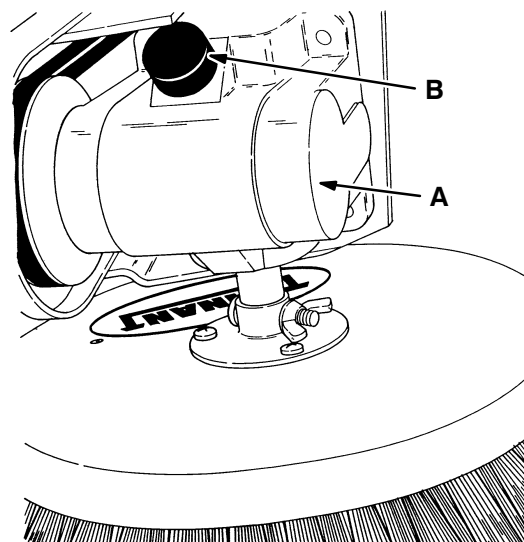
02341

LEFT SIDE BRUSH ARM PIVOT GREASE FITTING

- A. Grease Fitting

SIDE BRUSH GEAR BOX

The side brush gear box drives the side brush. It is lubricated with SAE 90 weight gear lubricant. Check the fluid level after every 400 hours of operation. Remove the breather and fill the gear box to within 0.25 in (6 mm) of the top if needed.



03144

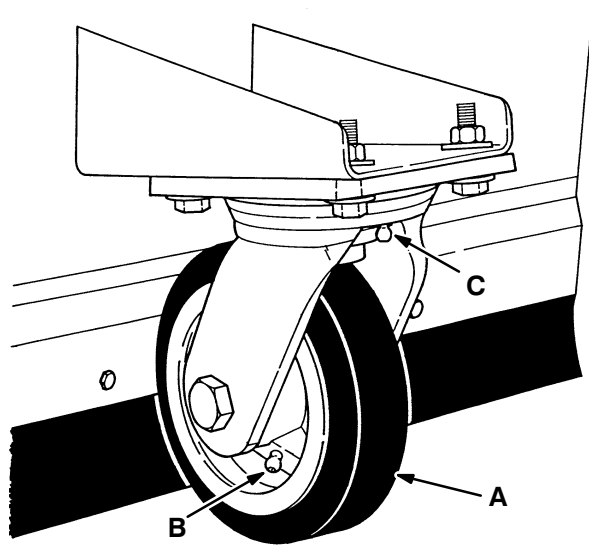
SIDE BRUSH GEAR BOX

- A. Side Brush Gear Box
- B. Breather

REAR CASTER

The rear caster which supports the weight of the rear of the machine. There are two grease fittings on the caster for lubrication purposes. One grease fitting is located on the swivel position of the caster. The other grease fitting, located on the hub portion of the caster, is for lubricating the caster axle.

Apply Lubriplate EMB grease (TENNANT Part No. 01433-1) to each of the grease fittings after every 50 hours of operation. The caster axle is full when grease appears between the caster hub and the caster fork. The caster swivel is full when grease appears through the swivel o-ring.



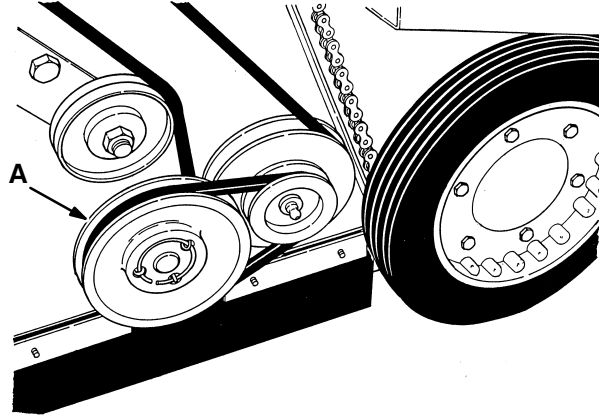
REAR CASTER

- A. Rear Caster
- B. Axle Grease Fitting
- C. Swivel Grease Fitting

03143

SELF ADJUSTING SHEAVE

The self adjusting sheave transfers power from the short main brush belt to the main brush. Lubricate the sheave shaft with SAE 30-weight engine oil after every 100 hours of operation. Avoid getting oil in the belt or sheave belt surfaces.



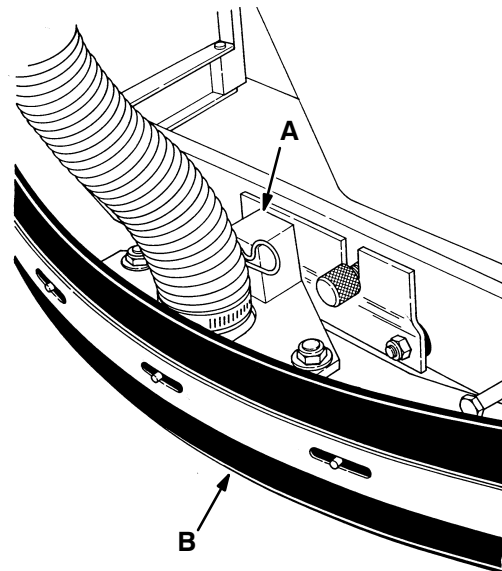
SELF ADJUSTING SHEAVE

- A. Sheave

03141

SQUEEGEE PIVOT

The squeegee pivot allows the rear squeegee to pivot over uneven floor surfaces. Apply Lubriplate EMB grease (TENNANT Part No. 01433-1) to the pivot shaft after every 50 hours of operation.



SQUEEGEE PIVOT

- A. Squeegee Pivot
- B. Squeegee

03166

ELECTRICAL SYSTEM

BATTERIES

The two 12-volt machine batteries provide all of the energy used by the machine. The batteries are rated at 140 Amp/hours at a 20-hour rate. They require regular maintenance to keep them operating their best.

Do not allow batteries to remain in discharged condition for any length of time.

Do not operate machine if batteries are in poor condition or only 25% of the charge is left.

Periodically check the battery cables for loose connections and corrosion.

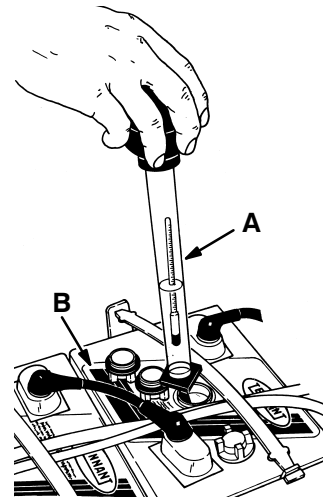
Clean the top surface and the terminals of the batteries after every 100 hours of operation. Use a strong solution of baking soda and water. Brush the solution sparingly over the battery top, terminals, and cable clamps. Do not allow any baking soda solution to enter the battery. Use a wire brush to 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.

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

Check the electrolyte level in each battery cell after every 25 hours of operation. The electrolyte level must always be above the battery plates. Add distilled water to maintain solution at the correct level above the plates, but do not overfill. Never add acid to batteries, only water. 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.

Use a hydrometer to check the electrolyte specific gravity.



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 this chart:

SPECIFIC GRAVITY at 80° F (27° C)	BATTERY CONDITION
1.265	100% charged
1.225	75% charged
1.190	50% charged
1.155	25% charged
1.120	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).

BATTERY CHARGING

The machine batteries are specially made for this machine application. They are unique in that they hold their power for 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 25% of their charge is left.

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 (For machines below serial number 006823)

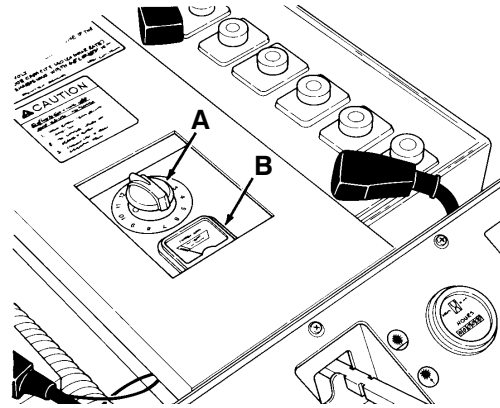
Eight hours is generally enough time to charge a discharged set of 140 A/h batteries. If the batteries are not fully discharged, set the timer for a period of time that is proportionally less than what is required for a fully discharged set of batteries, ie: half discharged batteries need three to four hours of charging time.

1. Stop the machine on a flat, dry surface next to an electrical outlet.
2. Turn the on-off switch to the left.
3. Open the access covers.

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

4. 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 electrolyte up to the indicator mark. 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 acid damage to the machine area around the batteries.
5. Plug the battery charger cord into a wall outlet.
6. Turn the battery charger knob to the number of hours you wish to charge the batteries. The charger gauge will indicate the charger is operating.

NOTE: Do not operate machine when charging batteries or charger will be damaged.

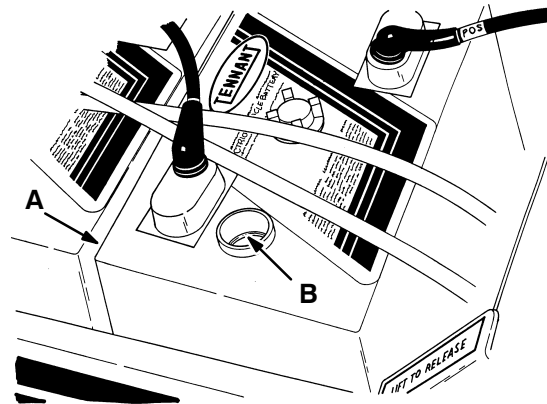


BATTERY CHARGER

03197

- A. Charger Knob**
- B. Charger Gauge**

7. The batteries will be fully charged when the timer reads "off" or the battery specific gravity is 1.260 to 1.280.
8. Turn the timer to "off" position.
9. Unplug the battery charger from the wall outlet.
10. Check the electrolyte level of the batteries; it should be up to the indicator mark.



CHECKING BATTERY ELECTROLYTE LEVEL

00879

- A. Battery**
- B. Electrolyte Indicator Ring**

11. Close the access covers.

MAINTENANCE

TO CHARGE BATTERIES (For machines serial number 006823 and above)

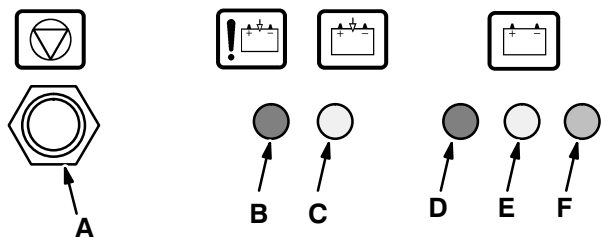
1. Stop the machine on a flat, dry surface next to an electrical outlet.
2. Turn the on-off switch to the left.
3. Remove the access covers.

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

4. 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 electrolyte up to the indicator mark. 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 acid damage to the machine area around the batteries.

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

5. Plug the battery charger into an AC wall outlet. The charger will go through a self diagnostic check. All the indicator lamps on the charger panel will flash showing the diagnostic check is in progress.



CHARGER PANEL

06898

- A. Interrupt Switch
- B. Red No Charge Indicator Lamp
- C. Yellow Charger On Indicator Lamp
- D. Red Incomplete Battery Status Indicator Lamp
- E. Yellow 80% Charge Indicator Lamp
- F. Green Complete Charge Indicator Lamp

NOTE: If the "red no charge indicator lamp" lights when the charger is plugged into a wall outlet, the charger can not charge the battery, meaning there is something wrong with the battery.

When the lamps stop flashing, the "red incomplete battery status indicator lamp" lights. After a short delay, the "yellow charger on indicator lamp" lights showing the charger has turned on.

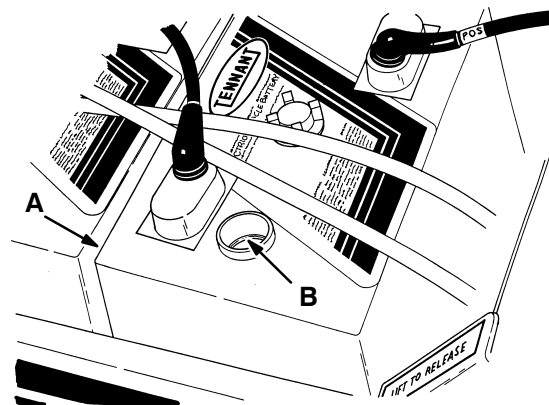
As the battery charges, the "red incomplete battery status indicator lamp" goes out and the "yellow 80% charge indicator lamp" lights.

Finally the "yellow 80% charge indicator lamp" goes out and the green complete charge indicator lamp lights showing the battery is completely charged. After a short time, the "yellow charger on indicator lamp" goes out showing the charger has turned off.

The "green complete charge indicator lamp" will remain on until the charger is unplugged from the wall outlet.

NOTE: If the charge cycle has to be stopped, press the interrupt switch while unplugging the charger from the wall outlet.

6. Unplug the charger from the wall outlet.
7. Check the batteries electrolyte level; it should be up to the indicator mark.



CHECKING BATTERY ELECTROLYTE LEVEL

00879

- A. Battery
- B. Electrolyte Indicator Ring

8. Replace the access covers.

ACTIVATING DRY-TYPE BATTERIES

Some new batteries are supplied in a dry-type form. These batteries need to be activated by filling them with electrolyte before they can be put into service.

TO ACTIVATE DRY-TYPE BATTERIES

1. Extinguish all cigarettes, fire, and spark-producing equipment in the area.



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

2. Remove the batteries from the shipping crate or the machine and place on a level surface.
3. Remove and save the battery vent caps; or if ventless plugs were provided, remove and discard them.
4. Carefully fill each battery cell with battery grade sulfuric acid to 0.38 in (10 mm) above the battery plates.
5. Check the specific gravity of the batteries. Charge the batteries until the specific gravity is 1.260 to 1.280.

6. Add battery acid if necessary to 0.38 in (10 mm) above the battery plates.
7. Insert battery vent caps in the vent holes.
8. Clean the battery posts and cables.
9. Install the batteries in the machine.
10. Connect the battery cables to the batteries. See the *STANDARD PARTS* section for correct cable connections.
11. Fill the batteries with distilled water, if necessary, up to the electrolyte indicator rings. Do not add battery acid to the batteries after inserting the vent caps.

ELECTRIC MOTOR

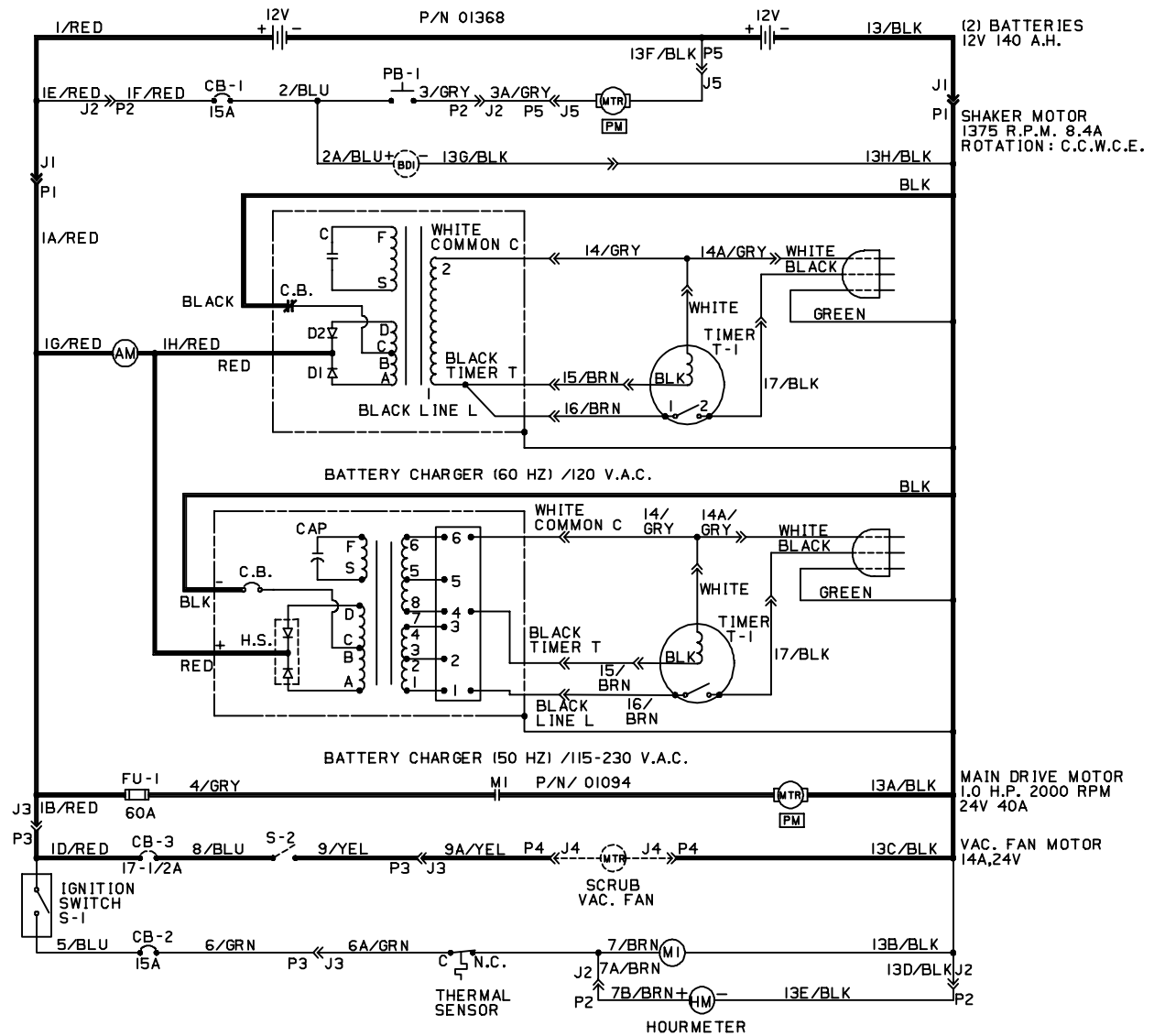
The electric propelling motor is repairable.

Blow out the dust and inspect the motor brushes in the motor after every 400 hours of operation.

If the brushes have been worn to less than 0.38 in (10 mm) in length, replace them.

If the commutator is worn or rough, the motor armature should be removed and serviced.

ELECTRICAL SCHEMATIC, 186E (For machines below serial number 004369)

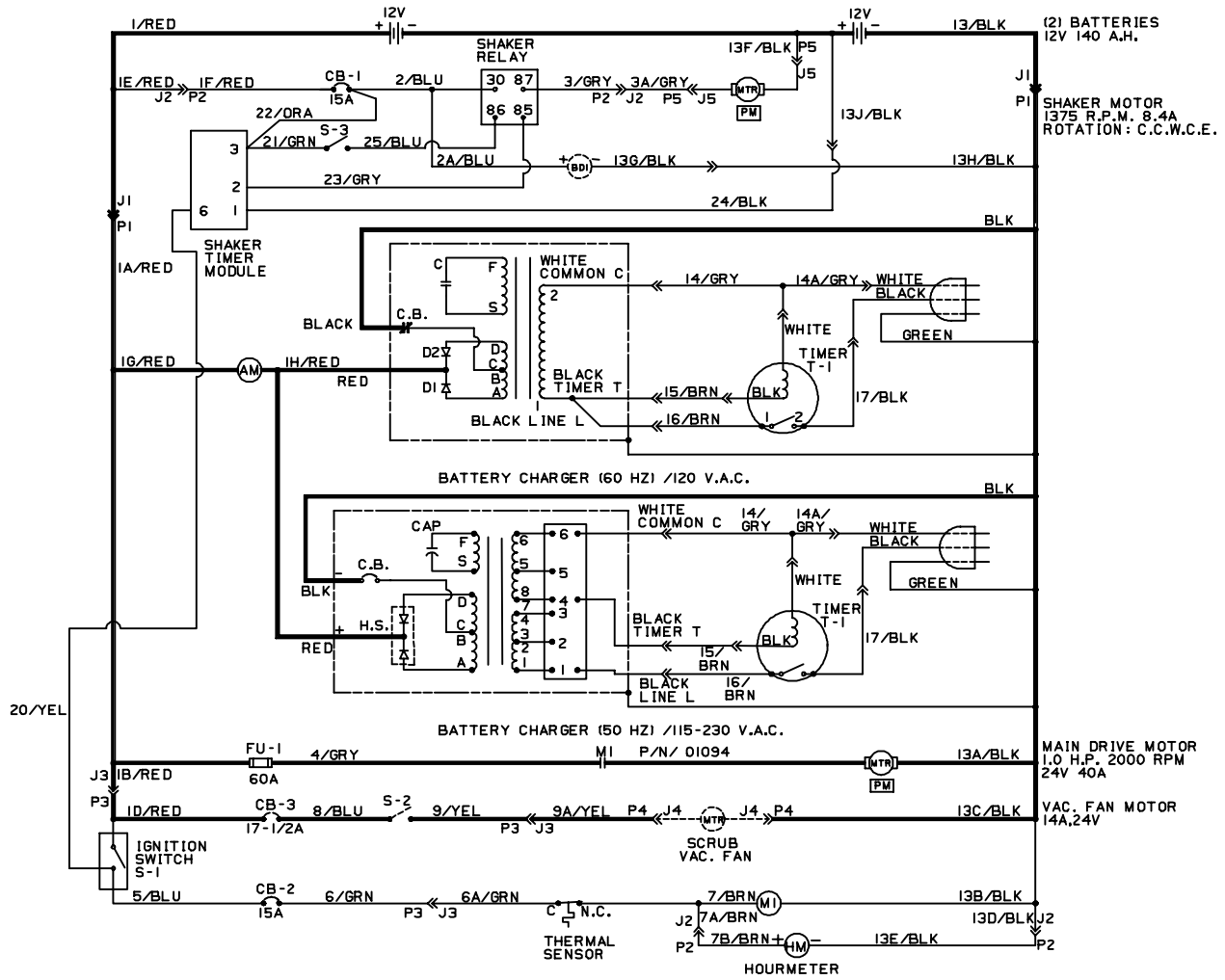


VOLT SUPPLY	CONNECTION	AC LINES ON
112 TO 125	1 TO 4 & 3 TO 6	1 & 6
218 TO 240	3 TO 4	1 & 6

M	POWER RELAY	HM	HOURLMETER
MTR	MOTOR	SV	SOLENOID VALVE
CB	CIRCUIT BREAKER	S	SWITCH
PM	PERMANENT MAGNET	ACC	ACCESSORY
J	JACK-FEM. SOCKET	GND	GROUND CHASSIS
P	PLUG-MALE PIN	C	COMMON
PB	PUSHBUTTON	N.O.	NORMALLY OPEN
VM	VOLTMETER	N.C.	NORMALLY CLOSED
FU	FUSE		

03130

ELECTRICAL SCHEMATIC, 186E
(For machines serial number 004369 to 006822)



VOLTAGE CONNECTION CHART 50 HZ ONLY

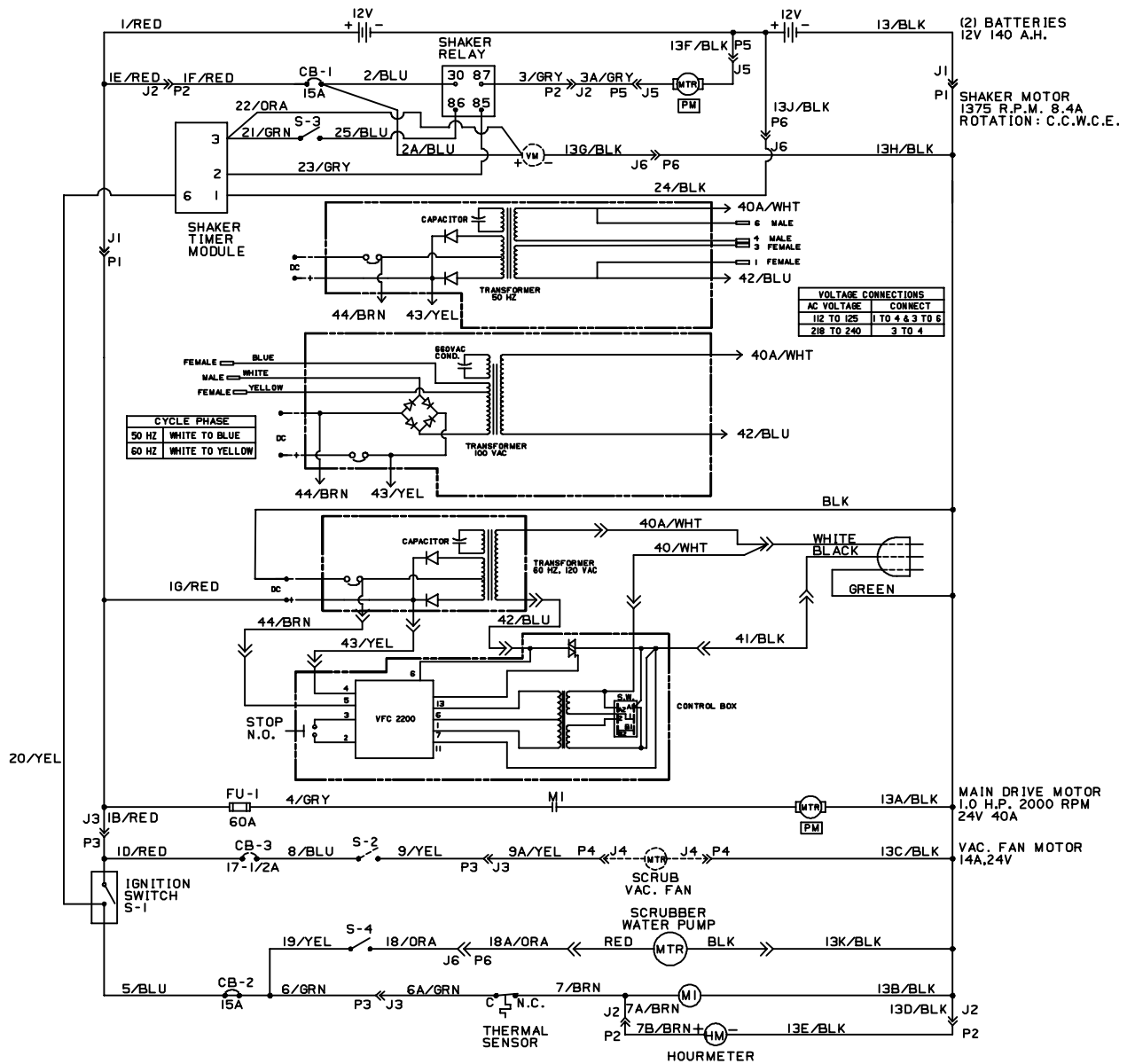
VOLT SUPPLY	CONNECTION	AC LINES ON
112 TO 125	1 TO 4 & 3 TO 6	1 & 6
218 TO 240	3 TO 4	1 & 6

LEGEND

M	POWER RELAY	HM	HOURLMETER
MTR	MOTOR	SR	SHAKER RELAY
CB	CIRCUIT BREAKER	S	SWITCH
PM	PERMANENT MAGNET	D	DIODE
J	JACK-FEM. SOCKET	GND	GROUND CHASSIS
P	PLUG-MALE PIN	C	COMMON
PB	PUSHBUTTON	STM	SHAKER TIMER MODULE
AM	AMMETER	N.C.	NORMALLY CLOSED
FU	FUSE	B.D.I.	BATTERY DISCHARGE INDICATOR

03130

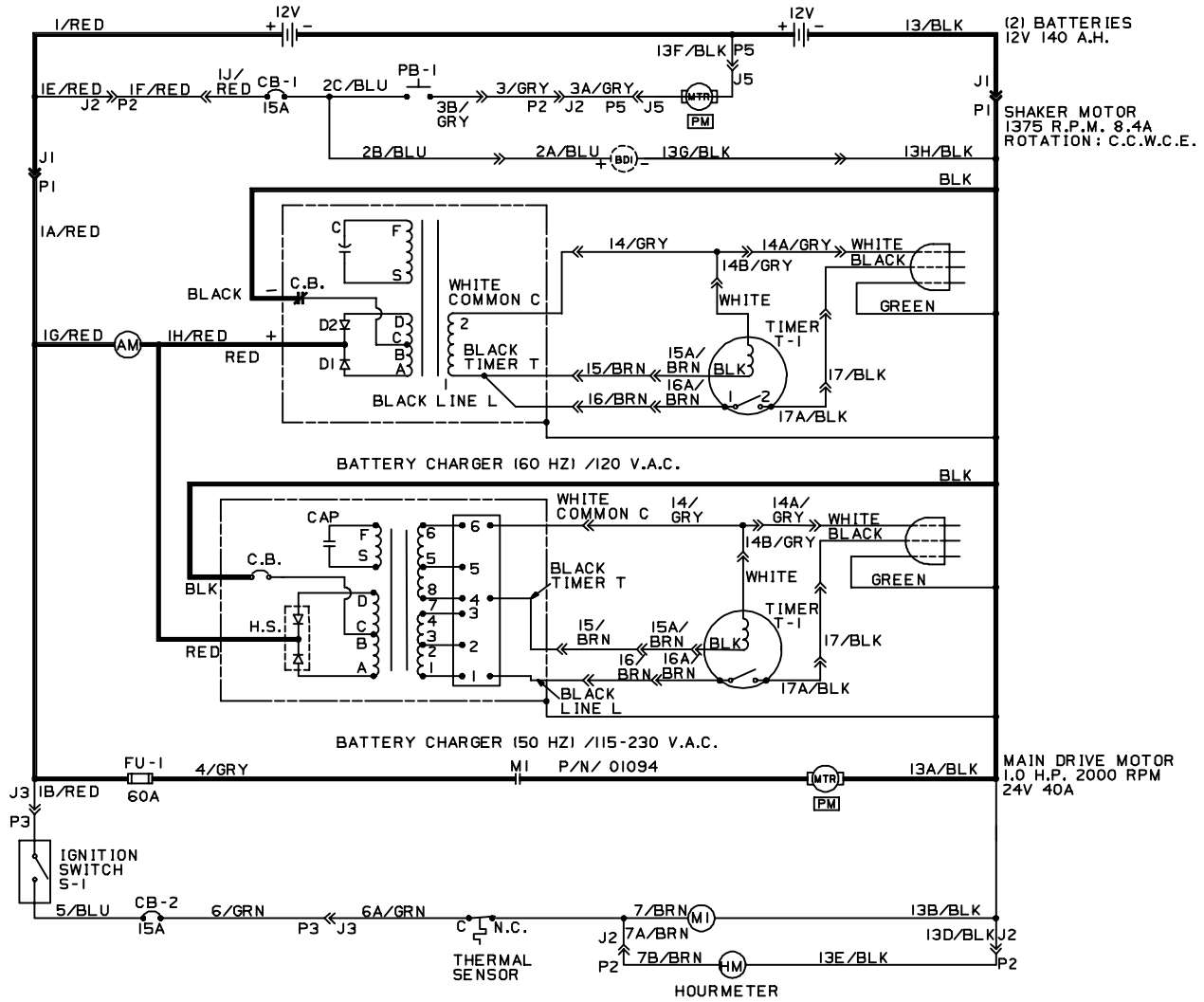
ELECTRICAL SCHEMATIC, 186E (For machines serial number 006823 and above)



LEGEND			
M	POWER RELAY	HM	HOURLMETER
MTR	MOTOR	SR	SHAKER RELAY
CB	CIRCUIT BREAKER	S	SWITCH
PM	PERMANENT MAGNET	D	DIODE
J	JACK-FEM. SOCKET	GND	GROUND CHASSIS
P	PLUG-MALE PIN	C	COMMON
PB	PUSHBUTTON	STM	SHAKER TIMER MODULE
VM	VOLTMETER	N.C.	NORMALLY CLOSED
FU	FUSE		

03130

ELECTRICAL SCHEMATIC, 186EE
(For machines below serial number 006823)

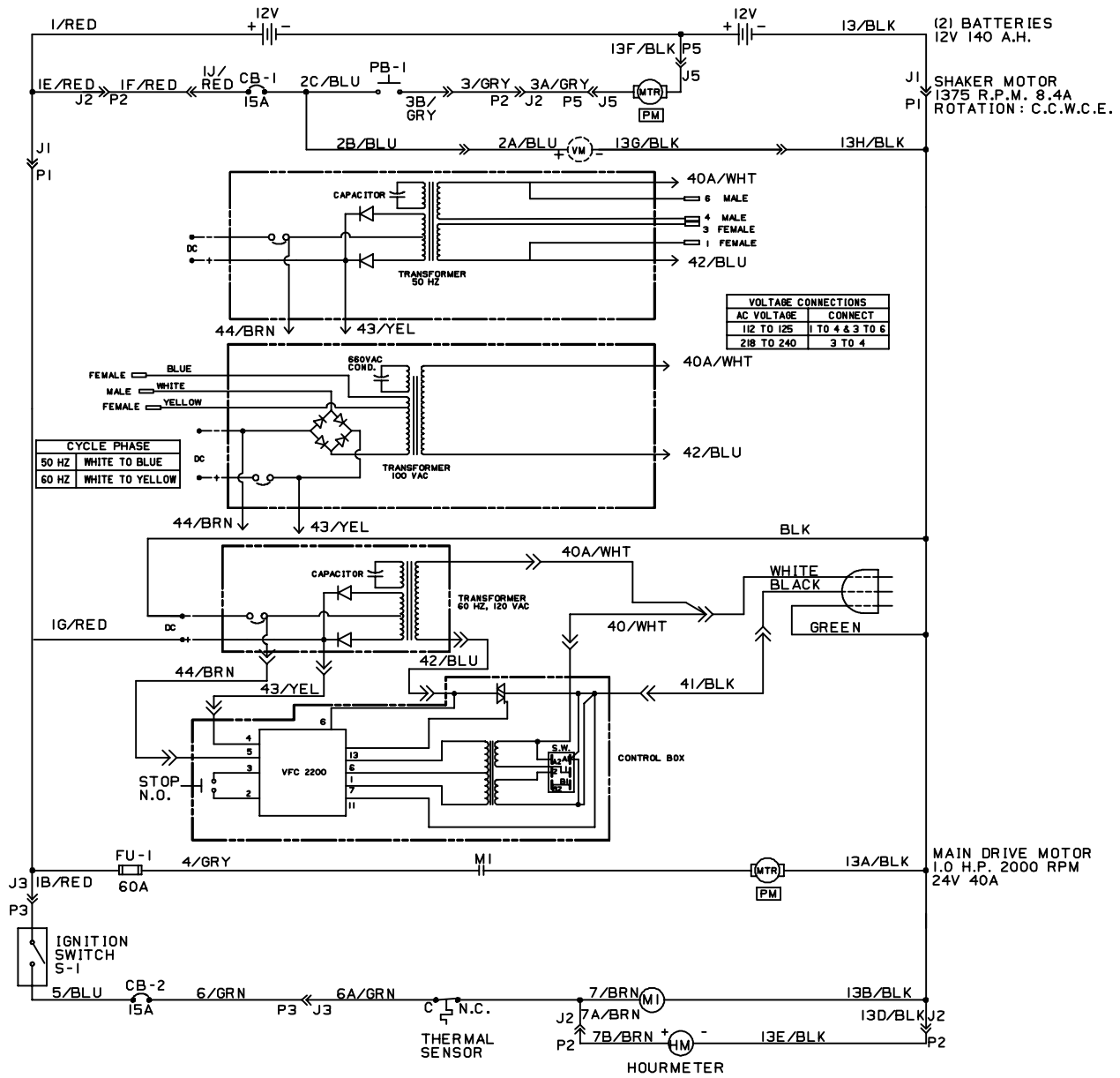


VOLT SUPPLY	CONNECTION	AC LINES ON
112 TO 125	1 TO 4 & 3 TO 6	1 & 6
218 TO 240	3 TO 4	1 & 6

M	POWER RELAY	HM	HOURLMETER
MTR	MOTOR	SV	SOLENOID VALVE
CB	CIRCUIT BREAKER	S	SWITCH
PM	PERMANENT MAGNET	ACC	ACCESSORY
J	JACK-FEM. SOCKET	GND	GROUND CHASSIS
P	PLUG-MALE PIN	C	COMMON
PB	PUSHBUTTON	N.O.	NORMALLY OPEN
VM	VOLTMETER	N.C.	NORMALLY CLOSED
FU	FUSE		

03095

ELECTRICAL SCHEMATIC, 186EE (For machines serial number 006823 and above)



LEGEND			
M	POWER RELAY	HM	HOURLMETER
MTR	MOTOR	SV	SOLENOID VALVE
CB	CIRCUIT BREAKER	S	SWITCH
PM	PERMANENT MAGNET	D	DIODE
J	JACK-FEM. SOCKET	GND	GROUND CHASSIS
P	PLUG-MALE PIN	C	COMMON
PB	PUSHBUTTON	N.O.	NORMALLY OPEN
VM	VOLTMETER	N.C.	NORMALLY CLOSED
FU	FUSE		

03095

BELTS AND CHAINS

PROPELLING BELTS

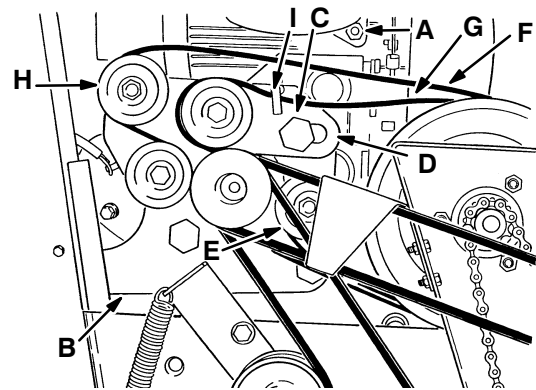
The propelling belts transfer power from the motor to the machine differential. Check the belts for wear and tension after every 50 hours of operation.

TO CHECK AND ADJUST PROPELLING BELTS TENSION

1. Park on level surface. Turn off the machine and set the machine parking brake.

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

2. Remove the access cover, and right side bumper and cover.
3. Observe the position of the clutch plate bolt with no pressure on the clutch handle. It should be approximately in the center of the slot.
4. Press the clutch handle to tighten the forward propelling belt. The clutch handle should be at least 0.75 in (20 mm) from the stationary handle for machines below serial number 006000. The clutch handle should be 0.25 to 0.50 in (7 to 13 mm) from the stationary handle for machines serial number 006000 and above. Observe the position of the clutch plate bolt. It should not touch the end of the slot. If the handle and bolt are in the proper position, skip to step 8; if not, continue with step 5 to readjust forward belt tension.



PROPELLING BELTS

03151

- A. Motor**
- B. Clutch Plate**
- C. Clutch Plate Bolt**
- D. Bolt Slot**
- E. Forward Belt Idler Sheave**
- F. Reverse Propelling Belt**
- G. Forward Propelling Belt**
- H. Reverse Belt Idler Sheave**
- I. Belt Guide**

5. Loosen the forward idler sheave bolt and slide the idler sheave down to tighten the belt (this also increases distance between clutch handle and stationary handle); slide the sheave up to loosen the belt (this also reduces distance between clutch handle and stationary handle).
6. Tighten the idler sheave bolt.
7. Recheck handle and bolt positions. Repeat as necessary to adjust belt tension.

NOTE: After adjusting the forward belt, it may contact the belt guide when engaged causing a whining noise. To stop the noise, bend the guide up out of the belt's way.

8. Pull the clutch handle to tighten the reverse propelling belt. Observe the position of the clutch plate bolt. It should not touch the end of the slot. If the bolt is in the proper position, skip to step 12; if not, continue with step 9 to readjust reverse belt tension.

MAINTENANCE

NOTE: If the reverse belt is too tight, it will require excessive clutch handle pressure to propel machine in the forward direction. It may also cause the machine to creep backward when the handle is released. If the reverse belt is too loose, the machine will not propel backward.

9. Loosen the reverse idler sheave bolt and slide the idler sheave to the rear to tighten the belt; slide the sheave forward to loosen the belt.
10. Tighten the idler sheave bolt.
11. Pull the clutch handle to recheck the position of the clutch plate bolt. Repeat as necessary to adjust belt tension.
12. Check steering effort. After repairing or replacing drive system parts, effort may increase due to poor alignment. To correct, do the following:
 - A. Loosen the bearing flanges as well as the split coupling bolts.
 - B. Snug one split coupling bolt.
 - C. Align the propelling belts. Check for clearance between the differential and the locking collar.

NOTE: Minimum clearance between differential and sheave is 0.010 in (0.3 mm).

- D. While holding belt alignment, pull the shaft away from the differential.
- E. Tighten the center (early style only) and left bearing flanges. Check for hard rotation of shaft.
- F. Tighten the center (early style only) and left bearing collars.
- G. Pull the short differential shaft away from differential to spread the differential gears.
- H. Tighten the right side bearing flange. Rap on bearing before tightening.
- I. Tighten the right bearing collar.

J. Check for free spinning of differential. Loosen the center and right bearing flanges if it is not spinning freely. Rap and retighten.

K. Align and tighten sprockets. Chains must be slack to minimize steering effort.

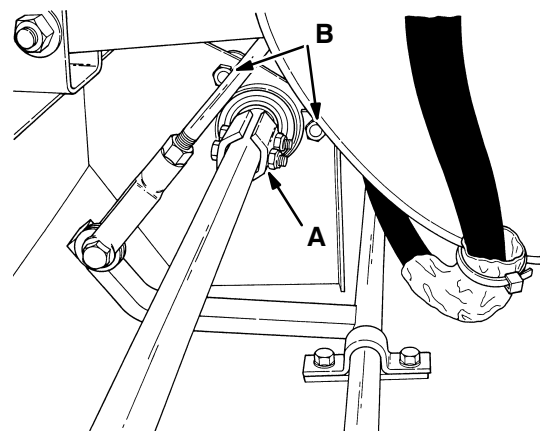
13. Replace the access cover, and right side bumper and cover.

TO REPLACE PROPELLING BELTS

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, And Turn Off Machine.

2. Remove the right side bumper and cover, debris hopper, and access cover.
3. Loosen the belt idler sheave bolts.
4. Slip the propelling belts off the idler sheaves.
5. Lift the filter cover.
6. Remove the differential coupling.



03147

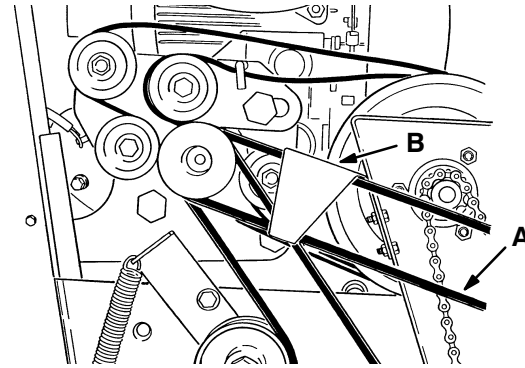
COUPLING (EARLY STYLE SHOWN)

A. Coupling
B. Flange Bolts

7. Slide the old belt out through the coupling opening.
8. Slide the new belt through the coupling opening.

9. Reconnect the coupling to the differential shafts.
10. Slip the belt over the idler and motor sheaves.
11. Adjust the belt as described in *TO CHECK AND ADJUST PROPELLING BELT TENSION*.
12. Replace the right side cover and bumper, and the access cover.
13. Replace the debris hopper.
14. Lower the filter cover.

6. Check the belt tension at a point 9 in (230 mm) from the motor shaft. The belt should deflect 0.75 in (20 mm) from a force of 6 lb (3 kg).



03151

SIDE BRUSH BELT

- A. Side Brush Belt**
- B. Belt Guide**

SIDE BRUSH BELT

The side brush belt transfers power from the motor to the side brush gear reducer. Check the belt for wear and tension after every 50 hours of operation.

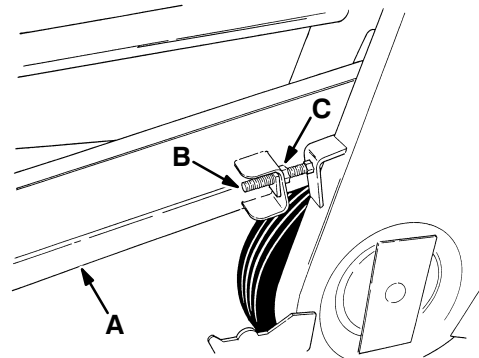
TO CHECK AND ADJUST SIDE BRUSH BELT TENSION

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

7. To adjust belt tension, loosen the button head screw through the side cover.
8. Pull the side brush arm out to tighten the belt.
9. Tighten the button head screw when the correct tension is reached.

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

2. Lift the filter cover.
3. Remove the debris hopper.
4. Remove the access cover, and right side bumper and cover.
5. Place the side brush arm in the down position.



03153

STOP BOLT

- A. Side Brush Arm**
- B. Stop Bolt**
- C. Lock Nut**

10. Adjust the stop bolt so it clears the stop by 0.06 in (5 mm).
11. Replace the debris hopper.
12. Lower the filter cover.

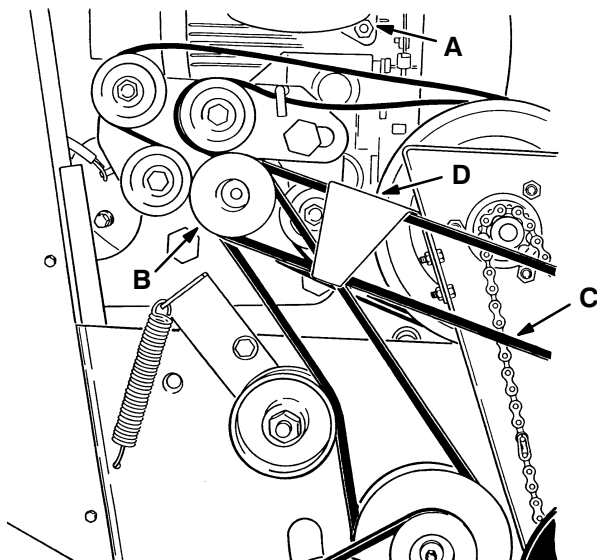
MAINTENANCE

TO REPLACE SIDE BRUSH BELT

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, And Turn Off Machine.

2. Remove the debris hopper.
3. Remove the right side bumper and cover, and access cover.
4. Place the side brush arm in the raised position.
5. Remove the four speed reducer mounting bolts and the speed reducer from the side brush arm.
6. Slide the belt off the motor sheave and out of the machine.



SIDE BRUSH BELT

03151

- A. Motor**
- B. Motor Sheave**
- C. Side Brush Belt**
- D. Belt Guide**

7. Position the new belt over the motor sheave, under the belt guide, and through the side brush arm.
8. Loop the belt over the speed reducer sheave and bolt the speed reducer back onto the side brush arm.

9. Adjust the belt tension as described in *TO CHECK AND ADJUST SIDE BRUSH BELT TENSION*.
10. Replace the right side bumper and cover, and access cover.
11. Replace the debris hopper.

SHORT MAIN BRUSH BELT

The short main brush belt transfers power from the main brush two-step sheave to the main brush. Check the belt for wear after every 50 hours of operation. A self-adjusting sheave is provided to control belt tension; it is not adjustable.

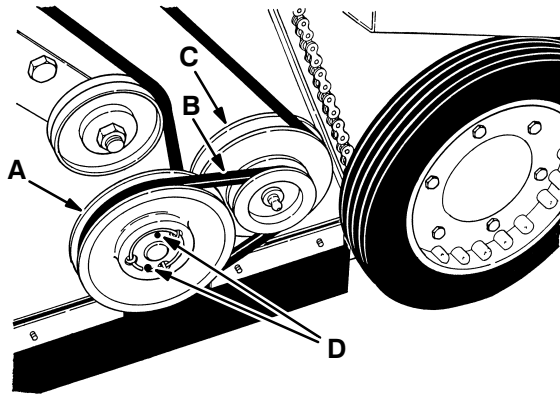
TO REPLACE SHORT MAIN BRUSH BELT

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, And Turn Off Machine.

2. Remove the debris hopper.
3. Remove the right side bumper and cover, and access cover.

4. Thread two 10-24 screws into the two threaded holes in the face of the self-adjusting sheave.



SHORT MAIN BRUSH BELT

03141

- A. Self-Adjusting Sheave**
- B. Short Main Brush Belt**
- C. Two-Step Sheave**
- D. Threaded Holes**

5. Evenly tighten the two screws to expand the self-adjusting sheave.
6. Slip the belt off the sheaves.
7. Slide the new belt over the sheaves.
8. Unthread the two screws.
9. Replace the right side bumper and cover, and access cover.

LONG MAIN BRUSH BELT

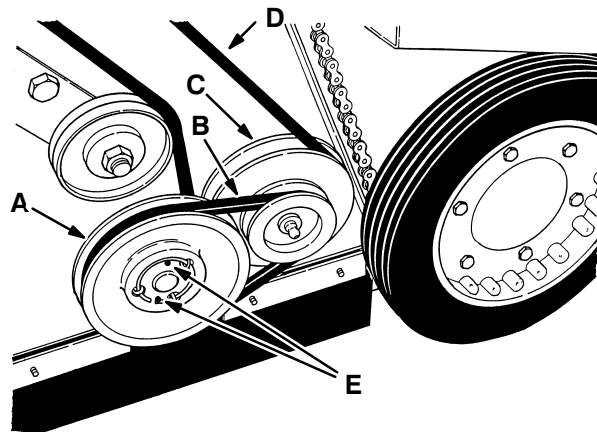
The long main brush belt transfers power from the motor to the main brush two-step sheave. Check the belt for wear after every 50 hours of operation. A belt idler is provided to control belt tension and is not adjustable.

TO REPLACE LONG MAIN BRUSH BELT

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, And Turn Off Machine.

2. Remove the debris hopper.
3. Remove the right side bumper and cover, and access cover.
4. Thread two 10-24 screws into the two threaded holes in the face of the self-adjusting sheave.



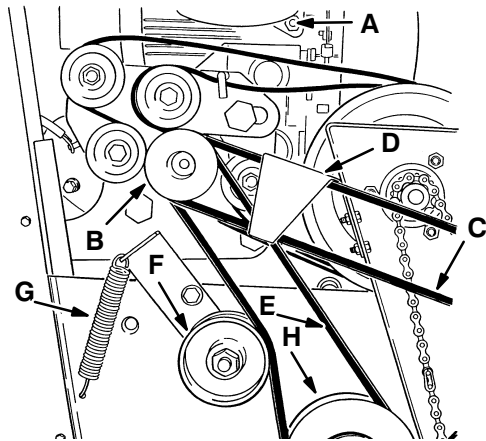
LONG MAIN BRUSH BELT

03141

- A. Self-Adjusting Sheave**
- B. Short Main Brush Belt**
- C. Two-Step Sheave**
- D. Long Main Brush Belt**
- E. Threaded Holes**

MAINTENANCE

5. Evenly tighten the two screws to expand the self-adjusting sheave.
6. Slip the short main brush belt off the sheaves.
7. Place the side brush arm in the raised position.
8. Slide the side brush belt off the motor sheave.



SIDE BRUSH BELT

03151

- A. Motor
- B. Motor Sheave
- C. Side Brush Belt
- D. Belt Guide
- E. Long Main Brush Belt
- F. Belt Idler
- G. Idler Sheave Spring
- H. Two-Step Sheave

9. Disconnect the idler sheave spring.
10. Remove the snap ring from the two-step sheave and slide the sheave off the shaft.
11. Pull belt idler back and slide the long main brush belt out of the machine.
12. Position the new long main brush belt in the machine.

13. Reinstall the two-step sheave and reconnect the idler sheave spring.
14. Position the side brush belt over the motor sheave and under the belt guide.
15. Slide the short main brush belt over the self-adjusting sheave and the two-step sheave.
16. Unthread the two screws separating the self-adjusting sheave.
17. Adjust the belt tension as described in *TO CHECK AND ADJUST SIDE BRUSH BELT TENSION*.
18. Replace the right side bumper and cover, and access cover.
19. Replace the debris hopper.

VACUUM FAN BELT

The vacuum fan belt transfers power from the motor to the vacuum fan impeller. Check the belt for wear and tension after every 50 hours of operation.

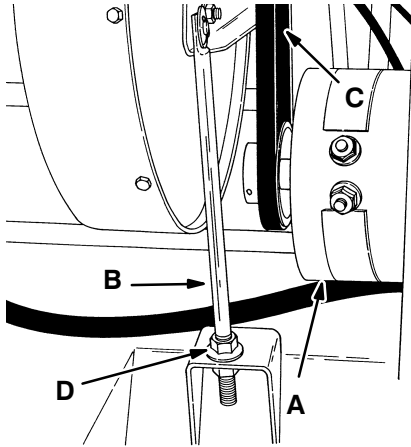
TO CHECK AND ADJUST VACUUM FAN BELT TENSION

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, And Turn Off Machine.

2. Remove the rear panel.
3. Check belt deflection by applying a force of 6 lb (3 kg) to the midpoint of the belt span. The belt should deflect 0.06 in (5 mm).

- To adjust belt tension for machines below serial number 02253, loosen the belt adjusting stud jam nut. Tighten the top nut to tighten the drive belt. Loosen the top nut to loosen the belt.

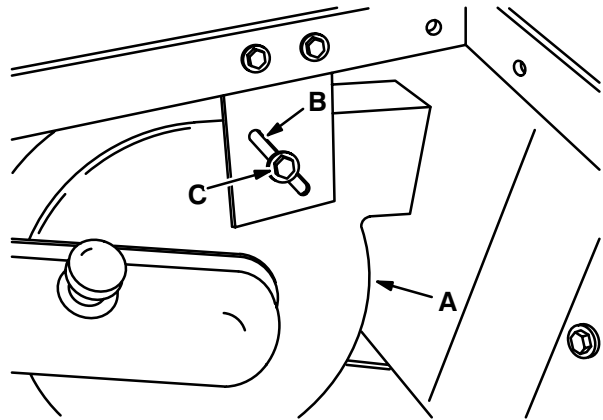


03155

VACUUM FAN BELT (OLD STYLE)

- A. Motor
- B. Adjustment Stud
- C. Vacuum Fan Belt
- D. Jam Nut

- To adjust belt tension on machines with serial numbers 02253 and above, loosen the belt adjusting stud nut. Pull the vacuum fan assembly back to tighten the belt and tighten the stud nut.



06320

VACUUM FAN (NEW STYLE)

- A. Vacuum Fan
- B. Adjustment Slot
- C. Stud Nut

- Tighten all nuts and recheck belt tension.
- Replace the rear panel.

MAINTENANCE

TO REPLACE VACUUM FAN BELT

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

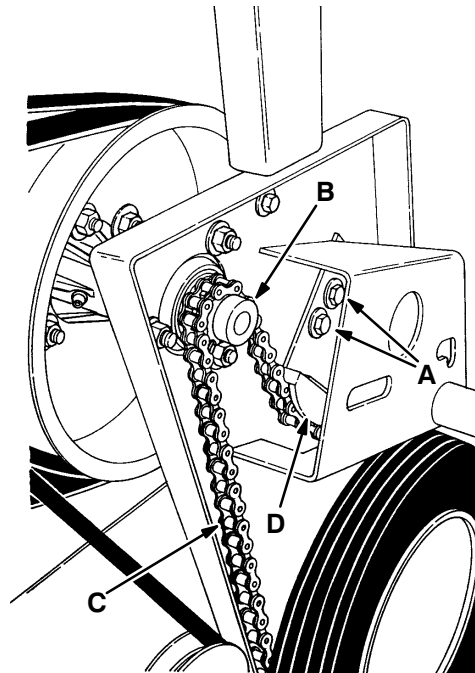
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, And Turn Off Machine.

2. Remove the rear panel.
3. Loosen the vacuum fan belt.
4. Slide the belt off the sheaves.
5. Position the new belt on the motor sheave and the vacuum fan sheave.
6. Adjust belt tension as described in *TO CHECK AND ADJUST VACUUM FAN BELT TENSION*.
7. Replace the rear panel.

WHEEL DRIVE CHAINS

The two wheel drive chains transfer power from the differential to the drive wheels. Lubricate the chains with a penetrating-type spray lubricant after every 100 hours of operation.

Check the chains for wear or damage and tension after the first 50 hours of operation and then after every 100 hours of operation. The wheel drive chains should have 0.5 in (15 mm) slack measured midway between the sprockets.



03139

WHEEL DRIVE CHAIN

- A. Adjustment Bolts**
- B. Sprocket**
- C. Chain**
- D. Adjustment Block**

STATIC DRAG CHAIN

A static drag chain is provided to prevent the buildup of static electricity in the machine. The chain is attached to the machine by a rear brush skirt mounting bolt.

Check the chain for wear periodically. Make sure it is making contact with the floor at all times.

BRUSHES

MAIN BRUSH

The main brush sweeps debris into the debris hopper. Inspect the main brush daily for wear or damage. Remove any string or wire found tangled on the main brush, the main brush drive hub, or the main brush idler hub.

Rotate the main brush end-for-end after every 50 hours of operation to obtain maximum brush life. The main brush should be replaced when the remaining bristle measures 0.5 in (15 mm).

The main brush pattern should be checked after every 50 hours of operation. The main brush pattern should be 1.25 in (30 mm) wide. Main brush pattern adjustments are made by turning the main brush lift handle.

TO REMOVE MAIN BRUSH

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, And Turn Off Machine.

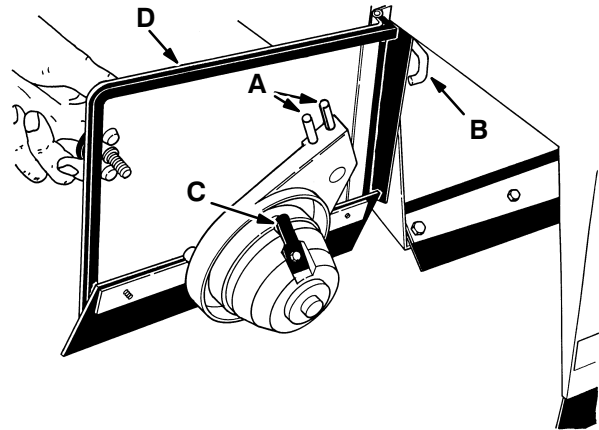
2. Place the main brush lift handle in the (Main Brush Free-Float) position.
3. Open the main brush access door.
4. Pull the main brush out of the brush compartment.

TO INSTALL MAIN BRUSH

1. Slide the main brush through the main brush access door into the brush compartment.
2. Rotate the main brush until the slots on the ends of the main brush engage the keys on the main brush drive hub.

NOTE: Do not force the main brush onto the drive hub. When the main brush slots and drive hub keys are properly aligned, the main brush will easily engage the drive hub.

3. Close and secure the main brush access door, making sure the lift arm engages the idler arm lift pins.



CLOSING MAIN BRUSH ACCESS DOOR

- A. Lift Arm Pin
- B. Lift Arm
- C. Idler Key
- D. Access Door

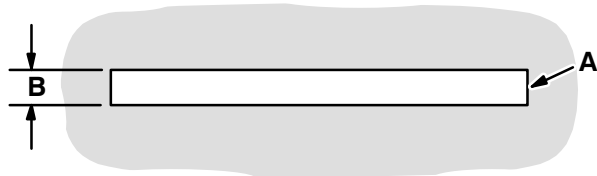
4. Check and adjust main brush pattern as described in *TO CHECK AND ADJUST MAIN BRUSH PATTERN*.

TO CHECK AND ADJUST MAIN BRUSH PATTERN

1. Apply chalk or some material that will not blow away easily, to a smooth, level surface.
2. Start the motor.
3. With side brush and main brush raised, position main brush over the chalked area.
4. While holding the machine in place, move the main brush lift handle in the (Main Brush Free-Float) position. Let the brush remain on the floor for 15 to 20 seconds.
5. Place the main brush lift handle in the (Main Brush Up) position.

MAINTENANCE

6. Move the machine from the main brush polish mark.
7. Stop the motor.
8. Observe the width of the polish mark. The proper polish width is 1.5 in (40 mm).



MAIN BRUSH PATTERN

00582

- A. Main Brush Pattern
- B. Polish Width

To reduce the polish width, turn the main brush lift handle to the right.

To widen the polish width, turn the main brush lift handle to the left.

If any adjustments are made, recheck the main brush pattern before continuing sweeping with the machine.

SIDE BRUSH

The side brush deflects debris into the path of the main brush. The side brush should be inspected daily for wear or damage.

Remove any string or wire found tangled on the side brush, side brush drive hub, or shaft.

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

The side brush pattern should be checked after every 50 hours of operation. The side brush is properly adjusted when, with the side brush arm in the raised position, there is approximately 1 in (25 mm) of space between the floor and the side brush bristles.

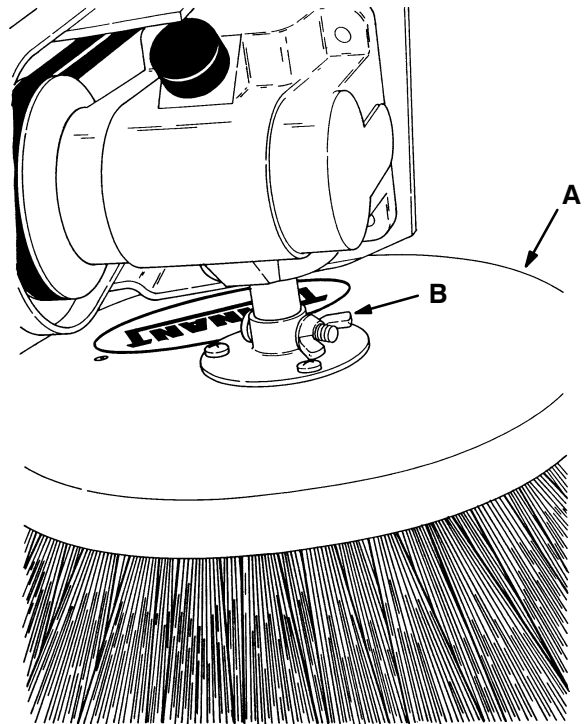
Side brush adjustments are made by mounting the side brush in a different one of the five mounting holes in the side brush drive shaft.

TO REMOVE SIDE BRUSH

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, And Turn Off Machine.

2. Pull the side brush arm up into the raised position.
3. Remove the side brush retaining bolt or clevis pin.



SIDE BRUSH

03144

- A. Side Brush
- B. Retaining Bolt

4. Slide the side brush off its drive shaft.

TO INSTALL SIDE BRUSH

1. Slide the side brush onto its drive shaft.
2. Push the side brush retaining bolt or clevis pin through the side brush and the drive shaft.
3. Tighten the retaining bolt or secure clevis pin with cotter pin.
4. Check the side brush adjustment as described in *TO ADJUST SIDE BRUSH PATTERN*.

TO ADJUST SIDE BRUSH PATTERN

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, And Turn Off Machine.

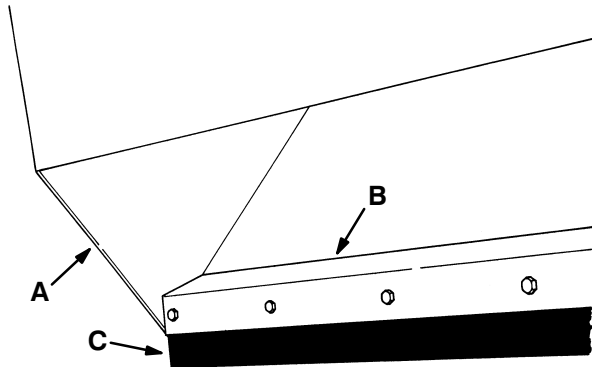
2. Pull the side brush arm up into the raised position.
3. Remove the side brush retaining bolt or clevis pin.
4. Slide the side brush up or down on the shaft until there is approximately 1 in (25 mm) of space between the floor and the brush bristles.
5. Line up the side brush and drive shaft holes.
6. Secure the side brush to the drive shaft with the retaining bolt or clevis pin.

NOTE: It may be necessary to readjust the side brush drive belt tension after adjusting the side brush height.

SKIRTS AND SEALS

HOPPER LIP SKIRT

The hopper lip skirt is located on the lower rear of the hopper. It floats over debris and helps deflect that debris into the hopper. The hopper lip skirt should be inspected for wear or damage daily.



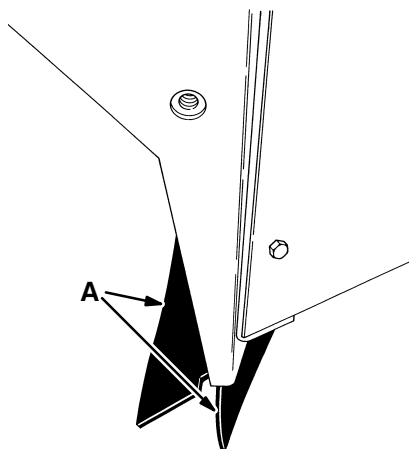
HOPPER LIP SKIRT

02348

- A. Hopper
- B. Retaining Strip
- C. Hopper Lip Skirt

REAR BRUSH SKIRTS

The rear brush skirts are located on the bottom rear of the brush compartment. The skirts seal the rear of the brush compartment. The rear brush skirts have slotted mounting holes and should be adjusted to clear the floor by 0.06 in (2 mm). Inspect the skirt for wear or damage and proper floor clearance daily.



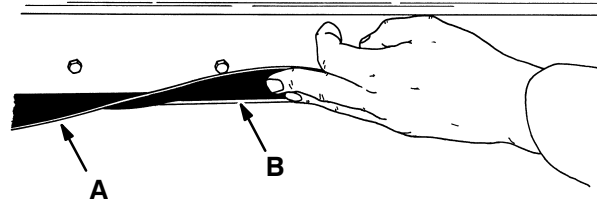
REAR BRUSH SKIRTS

03157

- A. Rear Brush Skirts

HOPPER TOP SEAL

The hopper top seal is located on the front edge of the machine frame. It seals the area between the top of the hopper and the brush compartment. Inspect the seal for wear or damage daily.



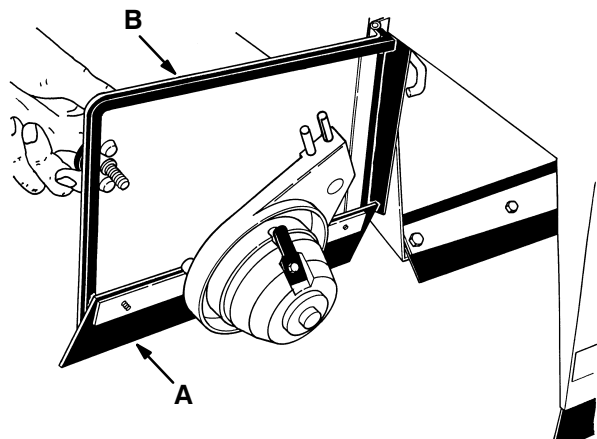
02349

HOPPER TOP SEAL

- A. Seal
- B. Frame

MAIN BRUSH COMPARTMENT SKIRTS

Two main brush compartment skirts seal the lower sides of the brush compartment. The right side seal is mounted to the machine frame. The left side seal is mounted to the main brush access door. The skirts have slotted mounting holes and should be adjusted to clear the floor by 0.06 in (2 mm). Inspect the skirts for wear or damage and proper floor clearance daily.



02347

BRUSH DOOR SKIRT

- A. Skirt
- B. Door

DEBRIS HOPPER AND DUST FILTER

DEBRIS HOPPER

The debris hopper collects debris swept up by the machine. It should be emptied after every work shift. The debris hopper floor clearance should be checked after every 50 hours of operation. The filter assembly to hopper seal can also be adjusted to correct dusting when shaking the dust filter.

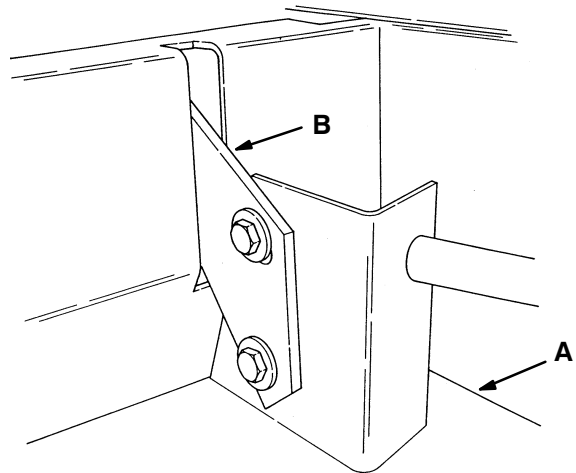
TO CHECK AND ADJUST HOPPER FLOOR CLEARANCE

1. Park the machine on a smooth, level surface.
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, And Turn Off Machine.

3. Empty the debris hopper and replace it on the machine.
4. The bottom rear metal edge of the hopper should clear the floor by 0.5 in (15 mm). Also, be sure the hopper is level side to side.

5. To adjust the hopper, loosen the hanger bracket bolts, reposition the hanger bracket, and retighten the hanger bracket bolts. Be sure the hopper brackets do not rub against the pivot pins preventing the hopper from floating.



HOPPER HANGER BRACKET

03159

- A. Hopper**
- B. Hanger Bracket**

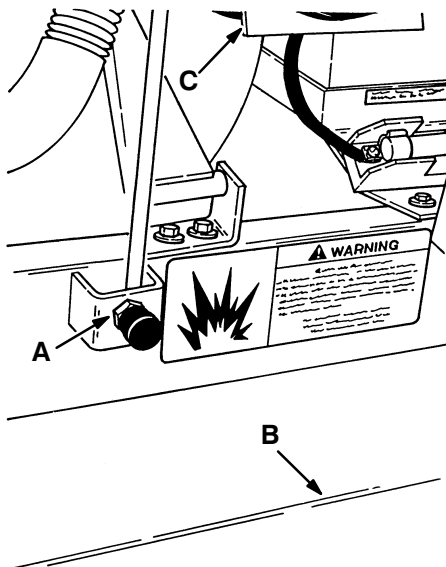
MAINTENANCE

TO ADJUST DUST FILTER TO HOPPER SEALING

1. Park the machine on a smooth, level surface.
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, And Turn Off Machine.

3. Lift the filter assembly.
4. Make sure stop bolt is making contact with the filter assembly. If it is, continue with step 5. If it is not, press the round vacuum fan seal bracket back to allow the assembly to contact the stop bolt.



STOP BOLT

03541

- A. Stop Bolt**
- B. Hopper**
- C. Vacuum Fan Seal Bracket**

5. Turn the filter stop bolt clockwise one-half turn.
6. Close the filter assembly and check the clearance between the filter cover and the hopper. This can be done by placing a 1 in (25 mm) wide strip of paper between the filter cover and the hopper. When correctly adjusted, the paper will be difficult to pull out. The seal pressure should not be so great that the hopper will not float. Push the hopper down to check – it should be able to go down and return to its original position.

DUST FILTER

The dust filter filters the air which is drawn up from the main brush compartment by the vacuum fan. It is located inside the dust filter compartment. Shake the excess dust from the filter daily and before emptying hopper. Inspect and clean or replace the dust filter after every 100 hours of operation.

To clean the dust filter use one of the following methods:

- **TAPPING** – Tap the filter gently on a flat surface with the dirty side down. Do not damage the edges of the filter element or the filter will not seat properly in the filter frame.
- **AIR** – Blow compressed air, 35 psi (240 kPa) maximum, through the dust filter opposite the direction of the arrows. This may be done with the filter in the machine. Always wear eye protection when using compressed air.
- **WATER** – Soak the dust filter in a water and mild detergent solution. Rinse the dust filter until it is clean. The maximum water pressure allowable is 40 psi (275 kPa). Air dry the wet dust filter; do not use compressed air.

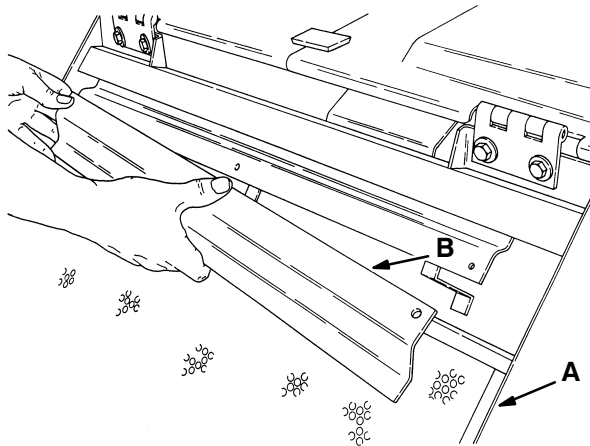
NOTE: Be sure the dust filter is dry before reinstalling it in the machine.

TO REMOVE HOPPER DUST FILTER

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, And Turn Off Machine.

2. Remove the six front filter cover screws and the front filter cover.
3. Remove the filter hold-down bar. Remove the dust filter.



03158

REMOVING HOLD-DOWN BAR

- A. Dust Filter**
- B. Hold-Down Bar**

4. Inspect and clean or replace the dust filter.
5. Position the dust filter in the filter frame with the arrows pointing away from the machine.
6. Position the filter hold-down bar on the filter.
7. Secure the front filter cover on the filter frame with the six bolts.

VACUUM WAND OPTION

VACUUM WAND OPTION

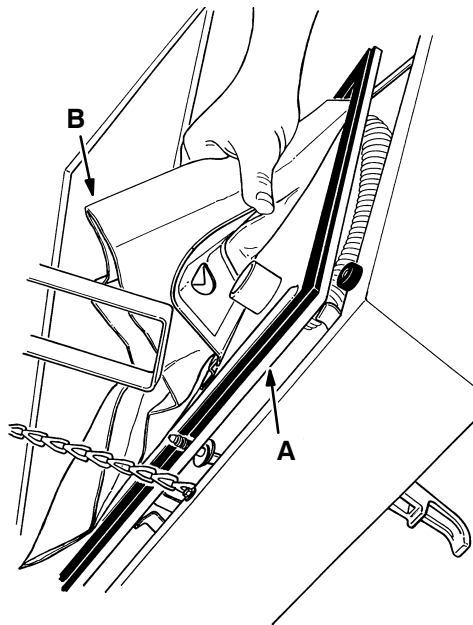
The vacuum wand option gives the machine the added flexibility of picking up debris not accessible by the machine. An 84 in (2135 mm) hose utilizes the machine vacuum system. A vacuum bag collects the debris vacuumed up by the wand. Replace it when it becomes full. The vacuum fan also has a filter which should be cleaned after every 25 hours of operation.

TO REPLACE VACUUM WAND BAG

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, And Turn Off Machine.

2. Open the rear access panel.
3. Unthread the two vacuum panel thumbscrews. Open the panel.
4. Pull the bag off the panel connection.



VACUUM BAG

03156

- A. Vacuum Panel
- B. Bag

5. Position the new bag on the panel. Be sure the bag is not pinched when closing the door.

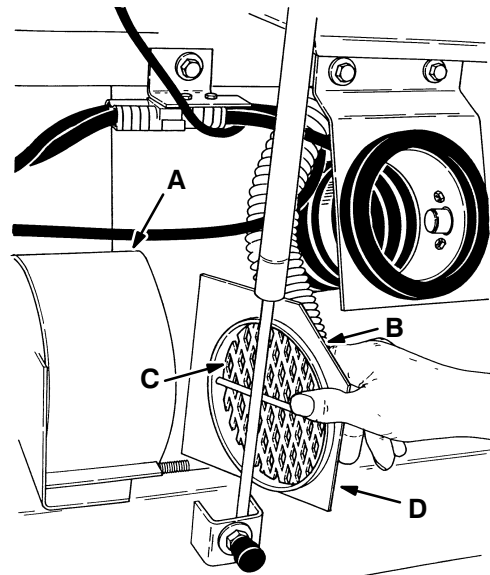
6. Close and secure the panel with the thumbscrews.
7. Close the rear access panel.

TO CLEAN VACUUM FAN FILTER

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, And Turn Off Machine.

2. Lift the filter assembly.
3. Remove the two filter cover wing nuts.



VACUUM FAN

03173

- A. Vacuum Fan
- B. Filter
- C. Screen
- D. Cover

4. Pull the cover off the vacuum fan.
5. Remove the filter and screen.
6. Rinse the filter clean and replace the screen and filter.
7. Replace the cover and secure with the wing nuts.
8. Lower the filter assembly.

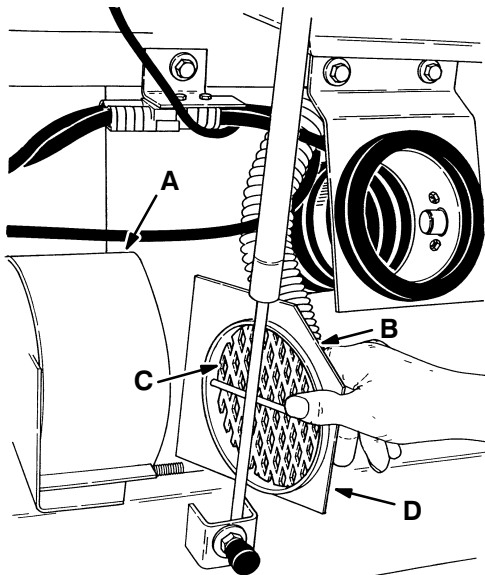
WATER PICKUP OPTION

WATER PICKUP OPTION

The water pickup option allows machines without the scrub attachment to pick up water from the floor. The kit includes a filter bypass, a vacuum fan motor, a recovery tank, and a squeegee.

VACUUM FAN

The vacuum fan filter should be cleaned after every 25 hours of operation. To clean the vacuum fan filter, stop the motor, lift the filter assembly, remove the two filter cover wing nuts, pull the cover off the vacuum fan, and remove the filter and screen. Rinse the filter clean and replace the screen and filter. Replace the cover and secure with the wing nuts.



VACUUM FAN

03173

- A. Vacuum Fan
- B. Filter
- C. Screen
- D. Cover

RECOVERY TANK

The recovery tank stores the water solution picked up by the machine squeegee and vacuum fan. The recovery tank is located at the rear of the machine.

The recovery tank should be drained after the solution tank is empty or whenever the float rises and stops the water vacuum.

Clean the recovery tank after every work shift. An inspection door has been provided to make the tank cleaning job easier. It is located on the top of the recovery tank.

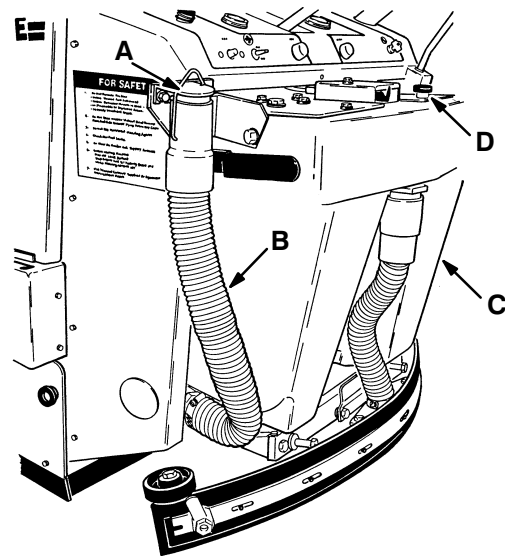
Keep vacuum hoses clean. Clogged hoses are a common cause of poor water pickup.

TO DRAIN RECOVERY 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, And Turn Off Machine.

2. Remove the drain hose from its retention plug.



RECOVERY TANK DRAIN HOSE

03148

- A. Retention Plug
- B. Drain Hose
- C. Recovery Tank
- D. Inspection Door

MAINTENANCE

3. Lower the hose to a floor drain to drain the tank.

NOTE: The tank will not empty with the vacuum fan operating.

4. Spray the inside of the tank with clean water. Remove all sludge and debris from the bottom of the tank.

NOTE: The water must not be hotter than 130° F (54° C) or tank damage may occur.

5. Return the drain hose to its retention plug.

REAR SQUEEGEE

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

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

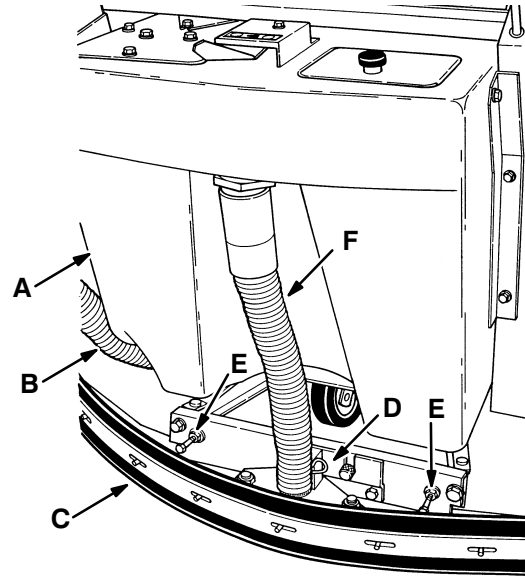
The rear blade has four wiping edges. To use them all, start with one wiping edge. To use the next wiping edge, swap the squeegee end-for-end. To use the next wiping edge, rotate the top edges down, bottom edges up. To use the last edge, swap the squeegee end-for-end. Replace the back-up strips if they become damaged, or if they lose their resiliency.

TO REMOVE SQUEEGEE ASSEMBLY

1. Place the squeegee lever in the up position.
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, And Turn Off Machine.

3. Pull the squeegee suction hose off the recovery tank connector.



SQUEEGEE ASSEMBLY

03162

- A. Recovery Tank**
- B. Drain Hose**
- C. Squeegee Assembly**
- D. Retaining Pin**
- E. Side Bolts**
- F. Squeegee Suction Hose**

4. Pull the squeegee assembly retaining pin out of the squeegee pivot pin.
5. Pull the squeegee assembly off the squeegee mounting block.

TO INSTALL SQUEEGEE ASSEMBLY

1. Place the squeegee lever in the up position.
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, And Turn Off Machine.

3. Slide the squeegee assembly onto the squeegee mounting block. Be sure the side bolts are above the squeegee frame.
4. Slide the squeegee assembly retaining pin through the squeegee pivot pin.
5. Push the squeegee suction hose onto the recovery tank connector.

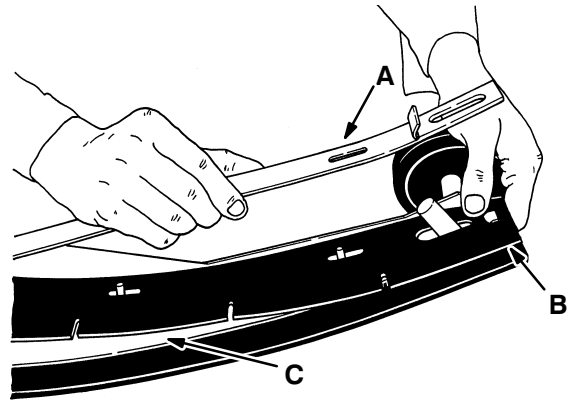
TO REPLACE FRONT SQUEEGEE BLADE

1. Place the squeegee lever in the up position.
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, And Turn Off Machine.

3. Remove the squeegee assembly from the machine.
4. Turn the front squeegee levered cam to the right to relieve tension on the squeegee retention band.
5. Remove the stationary cam and levered cam.
6. Remove the squeegee retention band.
7. Remove the front squeegee from the squeegee frame.

8. Position the new front squeegee blade on the squeegee frame pins.

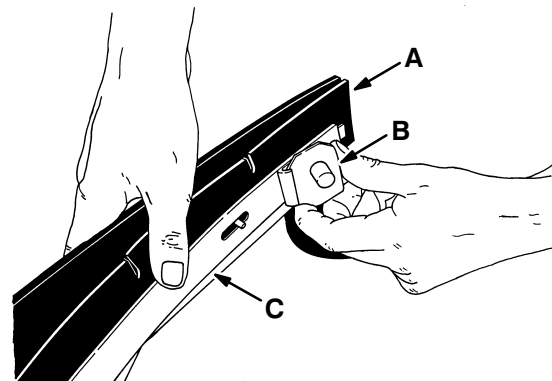


00927

INSTALLING FRONT SQUEEGEE BLADE AND BAND

- A. Retention Band**
- B. Front Squeegee Blade**
- C. Squeegee Frame**

9. Position the stationary squeegee cam and retention band over the squeegee blade.



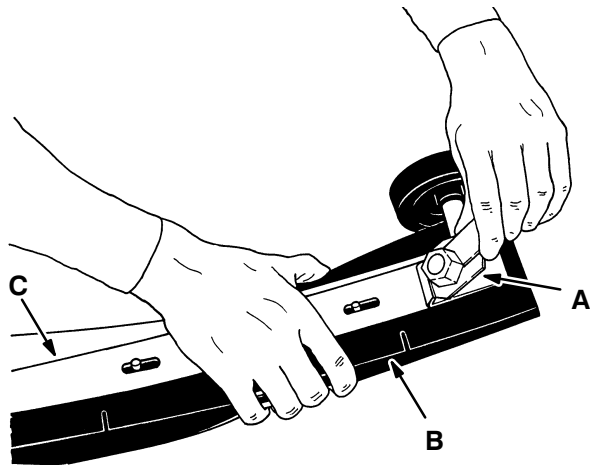
00928

INSTALLING STATIONARY CAM

- A. Front Squeegee Blade**
- B. Stationary Cam**
- C. Retention Band**

MAINTENANCE

10. Position the levered cam on the squeegee retention band with the lever down.



00929

INSTALLING LEVERED CAM

- A. Levered Cam
- B. Front Squeegee Blade
- C. Retention Band

11. Pull the levered cam lever up to tighten the front squeegee in place.

NOTE: If the levered cam is too loose to clamp the squeegee blade, rotate the stationary cam to the next flat edge and retighten the levered cam. Overtightening the levered cam may damage the squeegee frame and retention band.

12. Reinstall the squeegee assembly on the machine.

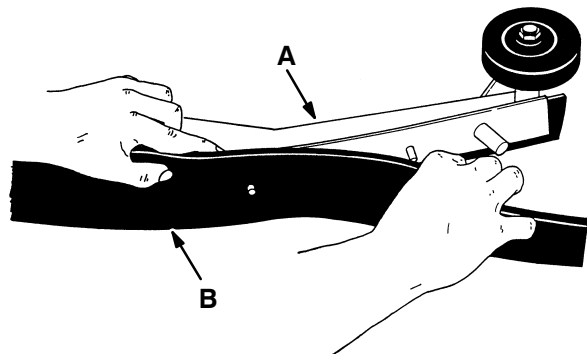
TO REPLACE REAR SQUEEGEE BLADE

1. Lift the squeegee lever into the up position.
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, And Turn Off Machine.

3. Remove the squeegee assembly from the machine.
4. Turn the rear squeegee levered cam to the right to relieve tension on the squeegee retention band.
5. Remove the squeegee retention band, stationary cam, and levered cam.

6. Remove the backup strip and rear squeegee from the squeegee frame.
7. Rotate end-for-end or flip the rear squeegee blade to use an unused edge of the squeegee blade, or discard the old squeegee and replace it with a new squeegee blade.
8. Position the rear squeegee blade on the squeegee frame pins.

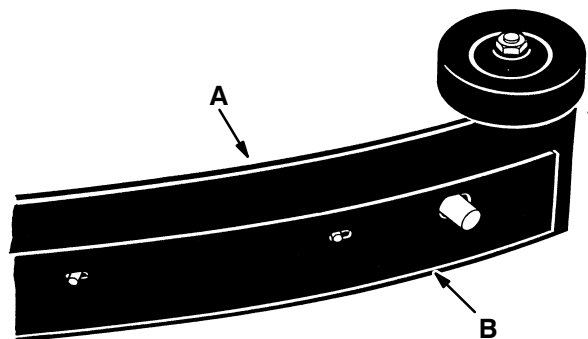


03163

INSTALLING SQUEEGEE BLADE

- A. Squeegee Frame
- B. Rear Squeegee Blade

9. Position the squeegee backup strip over the rear squeegee with the long side down.

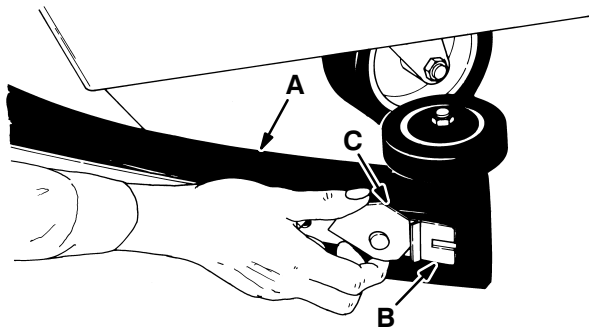


03164

INSTALLING BACKUP STRIP

- A. Rear Squeegee Blade
- B. Backup Strip

- Position the stationary cam and the retention band over the backup strip.

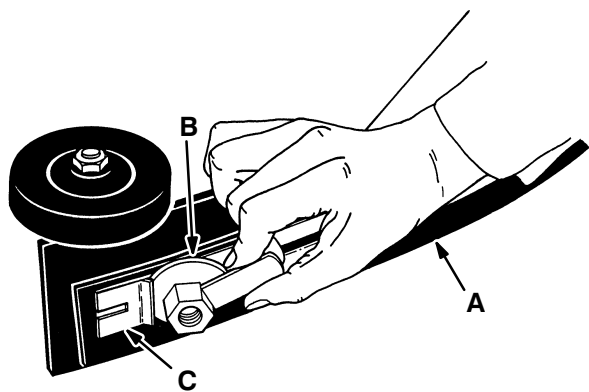


POSITIONING STATIONARY CAM

- A. Rear Squeegee Blade**
- B. Retention Band**
- C. Stationary Cam**

00932

- Position the levered cam on the squeegee retention band with the lever down.



INSTALLING LEVERED CAM

- A. Rear Squeegee Blade**
- B. Levered Cam**
- C. Retention Band**

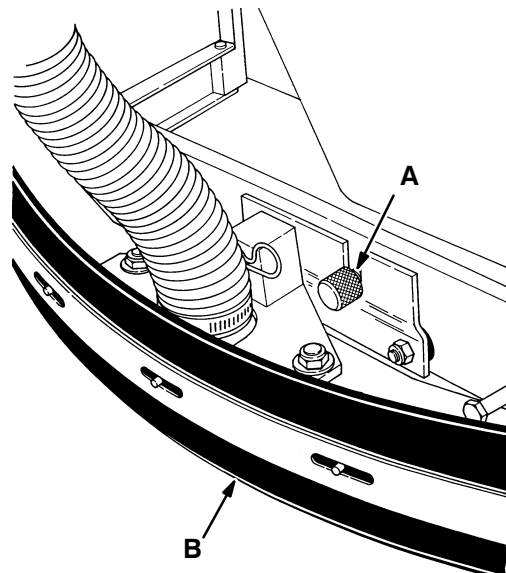
00933

- Pull the levered cam lever up to tighten the rear squeegee in place.

NOTE: The cam lever should be above the horizontal axis to keep from possibly scratching the floor. If the levered cam is too loose to clamp the squeegee blade, rotate the stationary cam to the next flat edge and retighten the levered cam. Overtightening the levered cam may damage the squeegee frame and retention band.

TO ADJUST SQUEEGEE

- Start the motor.
- Place the squeegee lever in the down position.
- Operate the machine in a forward direction to deflect the squeegee blade.
- Observe the squeegee blade deflection. The squeegee blade should be evenly deflected from one end to the other. If the squeegee tips are deflecting less than the middle of the squeegee, turn the squeegee tips adjusting knob clockwise. If the squeegee tips are deflecting more than the middle of the squeegee, turn the squeegee tips adjusting knob counterclockwise. Raise and lower the squeegee, operate the machine, and recheck the squeegee tips deflection if an adjustment was made.



SQUEEGEE TIPS ADJUSTMENT KNOB

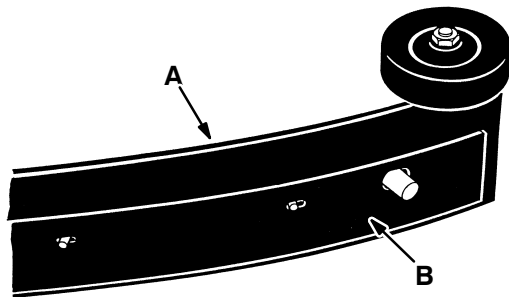
- A. Squeegee Tips Adjustment Knob**
- B. Squeegee Assembly**

03166

- Operate the machine in a forward direction with the squeegee down to deflect the squeegee blades once again.

MAINTENANCE

6. Check the rear squeegee blade deflection. The backup strip controls the squeegee blade deflection. Flip the backup strip to increase or decrease the squeegee blade deflection.



03164

BACKUP STRIP

- A. Rear Squeegee Blade
- B. Backup Strip (This position has the smallest deflection)

SCRUB ATTACHMENT

SCRUB ATTACHMENT

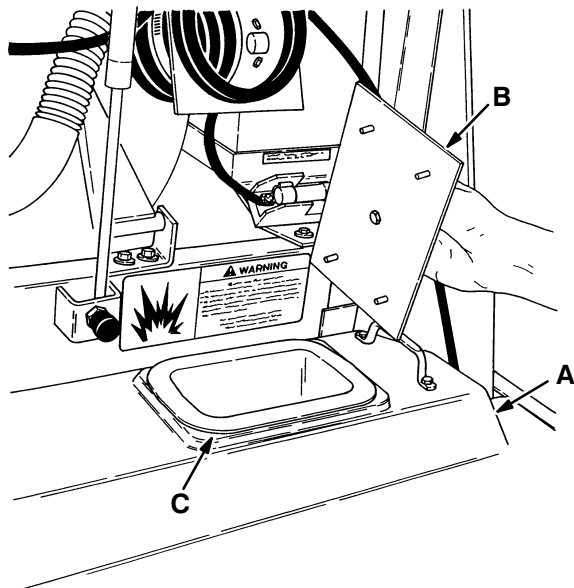
The scrub attachment option gives the machine the added flexibility to scrub floors. It consists of five groups of parts—the solution tank and debris tray, the side and main scrub brushes, the recovery tank, the vacuum fan, and the rear squeegee.

The solution tank, debris tray, and side and main scrub brushes are to be removed when sweeping. The recovery tank, vacuum fan, and rear squeegee may be left on the machine. The rear squeegee must be kept in the “up” position to prevent being damaged however. The solution tank and debris tray takes the place of the sweeping hopper. The side scrub brush takes the place of the side sweep brush. The main sweeping brush is also exchanged for a scrubbing brush in the conversion.

SOLUTION TANK

The solution tank supplies the scrub brush with a water and detergent solution. It is mounted in place of the hopper.

The solution tank requires no regular maintenance. If detergent cakes on the bottom of the tank, remove the deposits with a strong blast of water.



SOLUTION TANK

03150

- A. Solution Tank
- B. Tank Cover
- C. Soap Basket

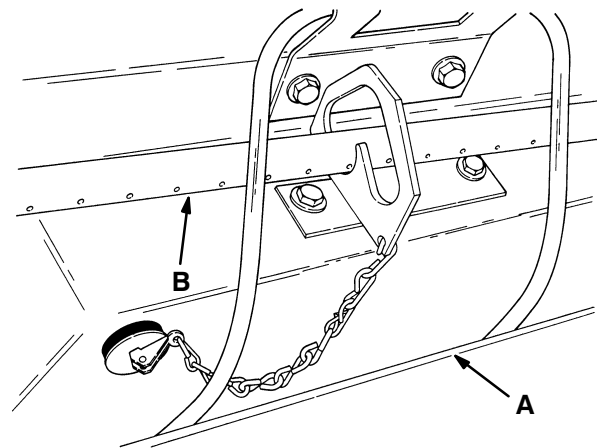
SOLUTION DISTRIBUTION SYSTEM

The solution distribution system consists of a feed line from the solution tank to a cable controlled flow-rate valve, then to the solution spreader tube.

The solution spreader tube distributes scrub solution to the scrub brush. It must be positioned so the solution runs down toward the side brush to work effectively. It may be flushed out if it becomes clogged with soap or other debris. A drain plug is located on the end of the spreader tube.

Before cleaning the solution spreader tube, make sure that the cable controlled flow-rate valve is opening fully.

A brush and hot water may be needed to remove stubborn clogs. A sharp instrument may be used to clear the small distribution holes in the spreader tube.



SPREADER TUBE

03160

- A. Solution Tank
- B. Spreader Tube

MAINTENANCE

DEBRIS TRAY

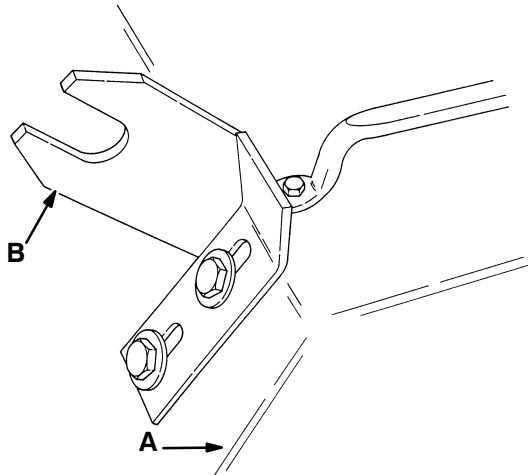
The debris tray collects debris swept up by the machine when using the scrub attachment. It should be emptied after every work shift. The debris tray floor clearance should be checked after every 50 hours of operation.

TO CHECK AND ADJUST DEBRIS TRAY FLOOR CLEARANCE

1. Park the machine on a smooth, level surface.
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, And Turn Off Machine.

3. Empty the debris tray and replace it on the machine.
4. Measure the distance between the floor and the bottom of the of the debris tray handle. It should be 1 in (25 mm) from the floor. Adjust the solution tank hangers if needed.



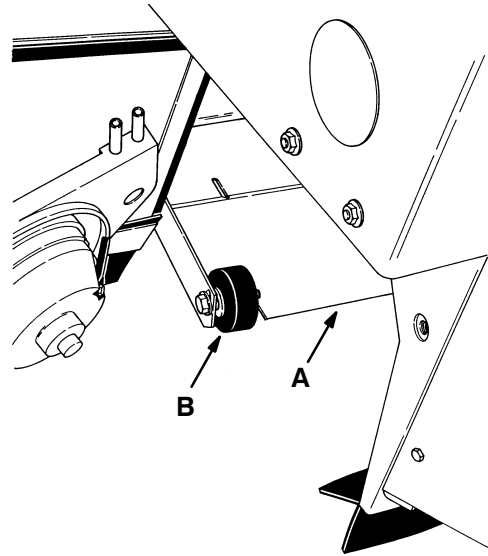
SOLUTION TANK HANGER

03170

- A. Solution Tank**
B. Hanger

5. The bottom rear metal edge of the tray should clear the floor by 0.18 in (5 mm). Also, be sure the tray is level side to side.

6. To adjust the tray for old style, loosen the caster bracket bolts, reposition the caster bracket, and retighten the bolts. For new style, loosen caster bolts, reposition the caster, and retighten the bolts.



03161

DEBRIS TRAY CASTER

- A. Debris Tray**
B. Caster

SCRUB BRUSHES

Scrub brushes are used instead of sweeping brushes when the scrub attachment is set up. The side brush scrubs and deflects debris into the path of the scrub brush. The main brush scrubs and deflects debris into the debris tray.

The brushes should be inspected daily for damage or wear. Remove any string or wire found tangled on the brushes, brush drives, or idler hubs.

The scrub brush patterns should be checked after every 50 hours of operation. Replace the scrub brushes when the brush bristle is 0.5 in (15 mm) or less in length.

RECOVERY TANK

The recovery tank stores the water solution picked up by the machine squeegee and vacuum fan. The recovery tank is located at the rear of the machine.

The recovery tank should be drained after the solution tank is empty or whenever the float rises and stops the water vacuum.

Clean the recovery tank after every work shift. An inspection door has been provided to make the tank cleaning job easier. It is located on the top of the recovery tank.

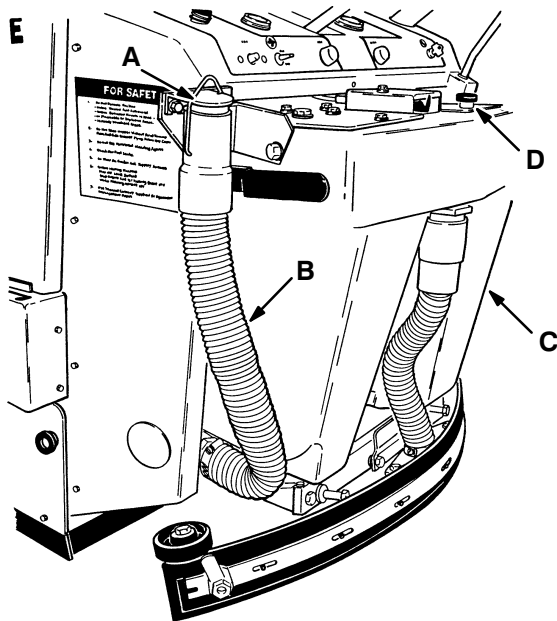
Keep vacuum hoses clean. Clogged hoses are a common cause of poor water pickup.

TO DRAIN RECOVERY 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, And Turn Off Machine.

2. Remove the drain hose from its retention plug.



RECOVERY TANK DRAIN HOSE

03148

- A. Retention Plug
- B. Drain Hose
- C. Recovery Tank
- D. Inspection Door

3. Lower the hose to a floor drain to drain the tank.

NOTE: The tank will not empty with the vacuum fan operating.

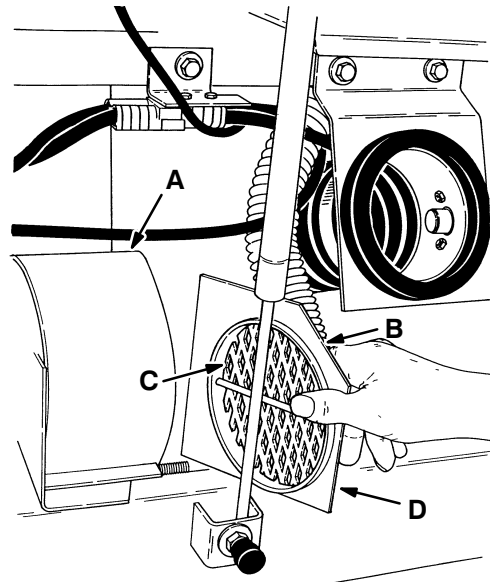
4. Spray the inside of the tank with clean water. Remove all sludge and debris from the bottom of the tank.

NOTE: The water must not be hotter than 130° F (54° C) or tank damage may occur.

5. Return the drain hose to its retention plug.

VACUUM FAN

The vacuum fan filter should be cleaned after every 25 hours of operation. To clean the vacuum fan filter, stop the motor, lift the filter assembly, remove the two filter cover wing nuts, pull the cover off the vacuum fan, and remove the filter and screen. Rinse the filter clean and replace the screen and filter. Replace the cover and secure with the wing nuts.



VACUUM FAN

03173

- A. Vacuum Fan
- B. Filter
- C. Screen
- D. Cover

MAINTENANCE

REAR SQUEEGEE

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

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

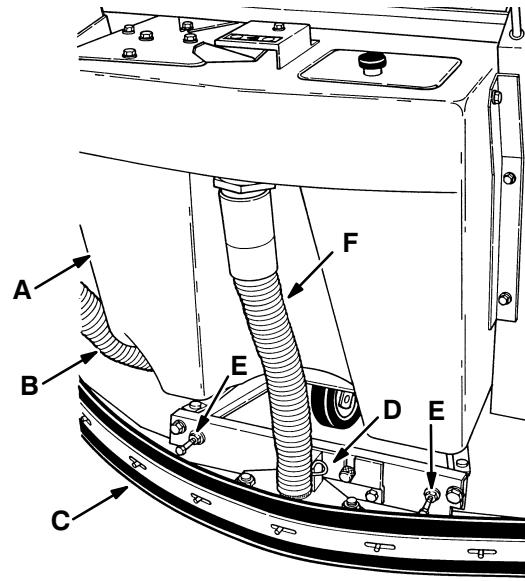
The rear blade has four wiping edges. To use them all, start with one wiping edge. To use the next wiping edge, swap the squeegee end-for-end. To use the next wiping edge, rotate the top edges down, bottom edges up. To use the last edge, swap the squeegee end-for-end. Replace the back-up strips if they become damaged, or if they lose their resiliency.

TO REMOVE SQUEEGEE ASSEMBLY

1. Place the squeegee lever in the up position.
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, And Turn Off Machine.

3. Pull the squeegee suction hose off the recovery tank connector.



03162

SQUEEGEE ASSEMBLY

- A. Recovery Tank
- B. Drain Hose
- C. Squeegee Assembly
- D. Retaining Pin
- E. Side Bolts
- F. Squeegee Suction Hose

4. Pull the squeegee assembly retaining pin out of the squeegee pivot pin.
5. Pull the squeegee assembly off the squeegee mounting block.

TO INSTALL SQUEEGEE ASSEMBLY

1. Place the squeegee lever in the up position.
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, And Turn Off Machine.

3. Slide the squeegee assembly onto the squeegee mounting block. Be sure the side bolts are above the squeegee frame.
4. Slide the squeegee assembly retaining pin through the squeegee pivot pin.
5. Push the squeegee suction hose onto the recovery tank connector.

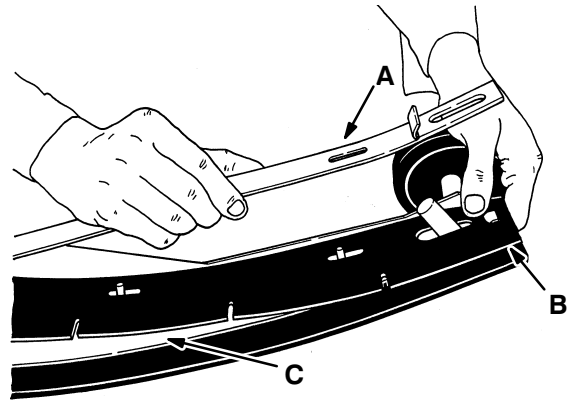
TO REPLACE FRONT SQUEEGEE BLADE

1. Place the squeegee lever in the up position.
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, And Turn Off Machine.

3. Remove the squeegee assembly from the machine.
4. Turn the front squeegee levered cam to the right to relieve tension on the squeegee retention band.
5. Remove the stationary cam and levered cam.
6. Remove the squeegee retention band.
7. Remove the front squeegee from the squeegee frame.

8. Position the new front squeegee blade on the squeegee frame pins.

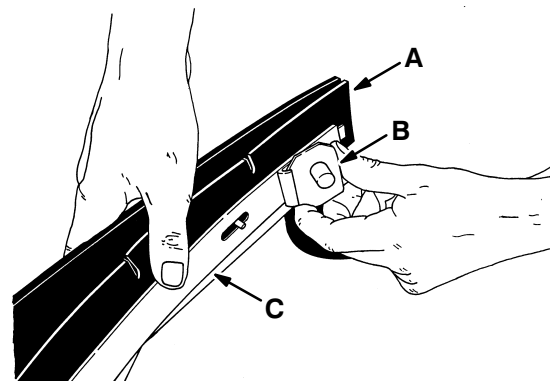


00927

INSTALLING FRONT SQUEEGEE BLADE AND BAND

- A. Retention Band
- B. Front Squeegee Blade
- C. Squeegee Frame

9. Position the stationary squeegee cam and retention band over the squeegee blade.



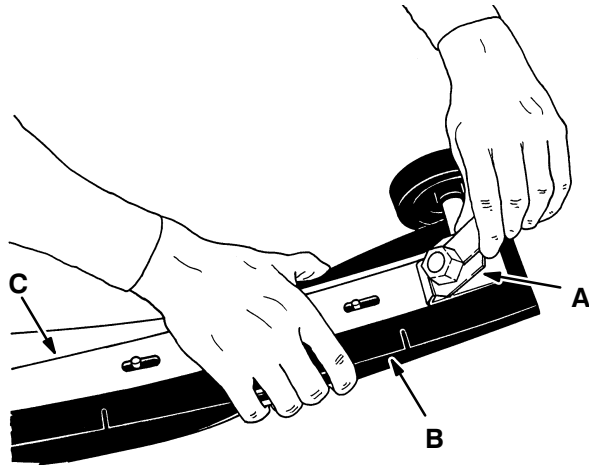
00928

INSTALLING STATIONARY CAM

- A. Front Squeegee Blade
- B. Stationary Cam
- C. Retention Band

MAINTENANCE

10. Position the levered cam on the squeegee retention band with the lever down.



INSTALLING LEVERED CAM

00929

- A. Levered Cam
- B. Front Squeegee Blade
- C. Retention Band

11. Pull the levered cam lever up to tighten the front squeegee in place.

NOTE: If the levered cam is too loose to clamp the squeegee blade, rotate the stationary cam to the next flat edge and retighten the levered cam. Overtightening the levered cam may damage the squeegee frame and retention band.

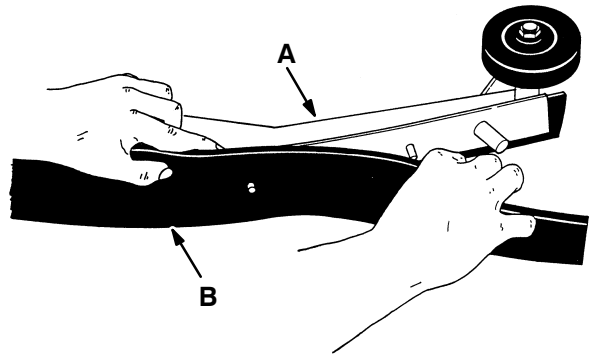
12. Reinstall the squeegee assembly on the machine.

TO REPLACE REAR SQUEEGEE BLADE

1. Lift the squeegee lever into the up position.
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, And Turn Off Machine.

3. Remove the squeegee assembly from the machine.
4. Turn the rear squeegee levered cam to the right to relieve tension on the squeegee retention band.
5. Remove the squeegee retention band, stationary cam, and levered cam.
6. Remove the backup strip and rear squeegee from the squeegee frame.
7. Rotate end-for-end or flip the rear squeegee blade to use an unused edge of the squeegee blade, or discard the old squeegee and replace it with a new squeegee blade.
8. Position the rear squeegee blade on the squeegee frame pins.

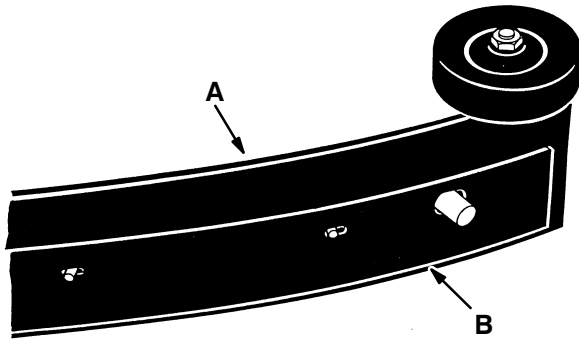


INSTALLING SQUEEGEE BLADE

03163

- A. Squeegee Frame
- B. Rear Squeegee Blade

9. Position the squeegee backup strip over the rear squeegee with the long side down.

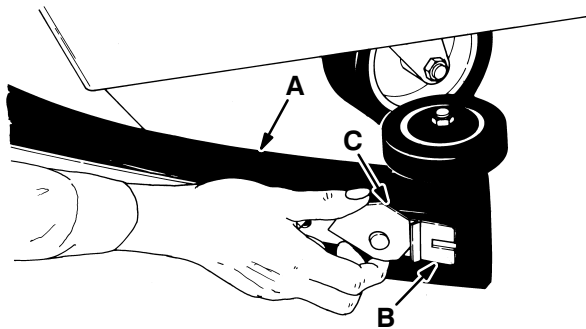


03164

INSTALLING BACKUP STRIP

- A. Rear Squeegee Blade
- B. Backup Strip

10. Position the stationary cam and the retention band over the backup strip.

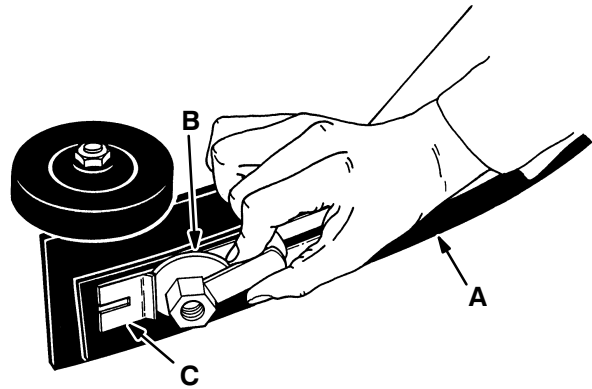


00932

POSITIONING STATIONARY CAM

- A. Rear Squeegee Blade
- B. Retention Band
- C. Stationary Cam

11. Position the levered cam on the squeegee retention band with the lever down.



00933

INSTALLING LEVERED CAM

- A. Rear Squeegee Blade
- B. Levered Cam
- C. Retention Band

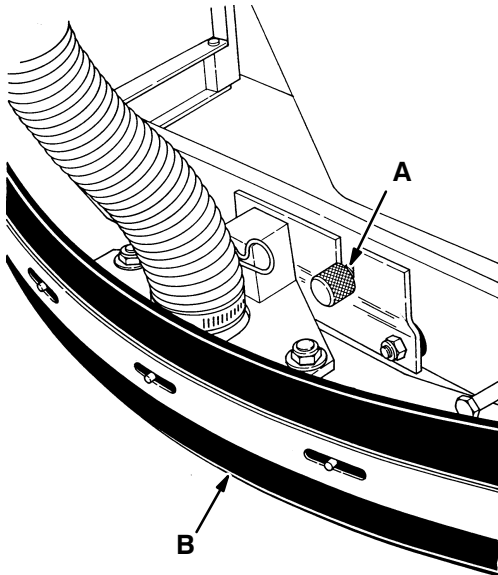
12. Pull the levered cam lever up to tighten the rear squeegee in place.

NOTE: The cam lever should be above the horizontal axis to keep from possibly scratching the floor. If the levered cam is too loose to clamp the squeegee blade, rotate the stationary cam to the next flat edge and retighten the levered cam. Overtightening the levered cam may damage the squeegee frame and retention band.

MAINTENANCE

TO ADJUST SQUEEGEE

1. Start the motor.
2. Place the squeegee lever in the down position.
3. Operate the machine in a forward direction to deflect the squeegee blade.
4. Observe the squeegee blade deflection. The squeegee blade should be evenly deflected from one end to the other. If the squeegee tips are deflecting less than the middle of the squeegee, turn the squeegee tips adjusting knob clockwise. If the squeegee tips are deflecting more than the middle of the squeegee, turn the squeegee tips adjusting knob counterclockwise. Raise and lower the squeegee, operate the machine, and recheck the squeegee tips deflection if an adjustment was made.

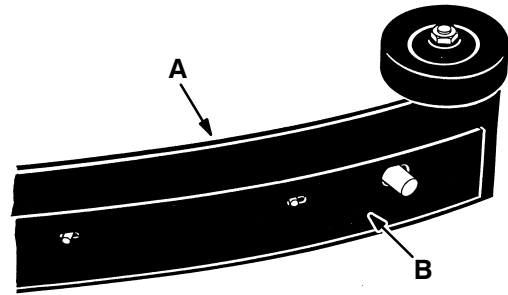


SQUEEGEE TIPS ADJUSTMENT KNOB

- A. Squeegee Tips Adjustment Knob
- B. Squeegee Assembly

5. Operate the machine in a forward direction with the squeegee down to deflect the squeegee blades once again.

6. Check the rear squeegee blade deflection. The backup strip controls the squeegee blade deflection. Flip the backup strip to increase or decrease the squeegee blade deflection.



BACKUP STRIP

- A. Rear Squeegee Blade
- B. Backup Strip (This position has the smallest deflection)

03164

03166

SECTION 4

CONTENTS

	Page
HARDWARE INFORMATION	4-3
STANDARD BOLT TORQUE CHART ..	4-3
METRIC BOLT TORQUE CHART	4-3
BOLT IDENTIFICATION	4-3
THREAD SEALANT AND LOCKING COMPOUNDS	4-3

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.

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:

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

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

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

