MM144
4-85

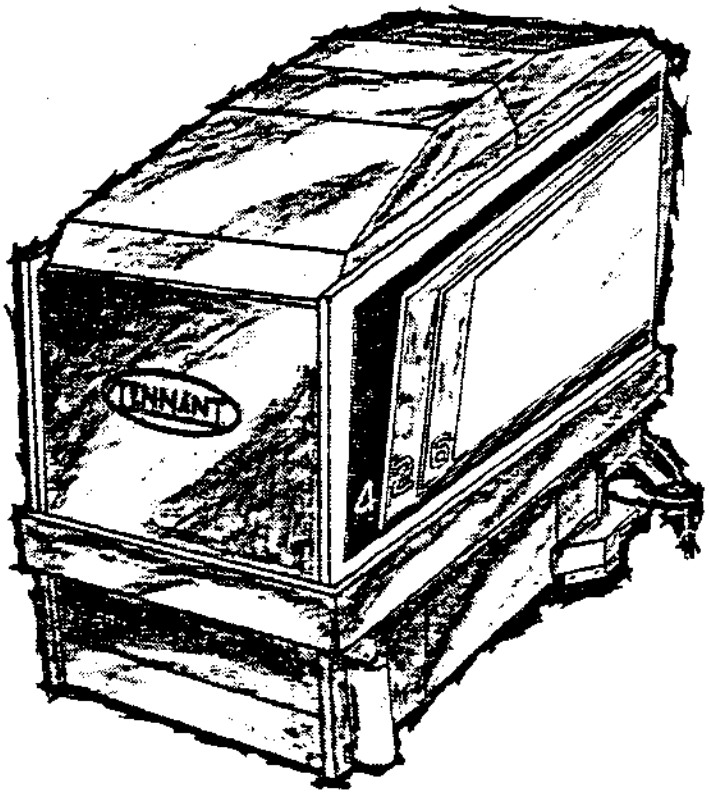
TENNANT®

426

Operator Manual

POWER SCRUBBER

Operation, Maintenance, and Parts Manual



SPECIALIZED MAINTENANCE SYSTEMS

SWEEPERS • SCRUBBERS • SCARIFIERS • FLOOR COATINGS

426
POWER SCRUBBER

This manual is furnished with each new TENNANT® 426 Power Scrubber. The machine operators will easily learn how to operate the machine and understand its mechanical functions by following the directions and absorbing the information under Operation.

This machine will give excellent service and scrubbing results and save maintenance expenses. However, as with all specially engineered mechanical equipment, best results are obtained at minimum costs if:

- The machine is operated with reasonable care and
- The machine is maintained regularly per the maintenance instructions provided.
- Components used in this machine have been carefully selected for performance and safety. Use only 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.

The telephone, telex, mailing addresses, and locations are listed on the last page of the manual.

MANUAL NO. MM144
Published: 4-85

SAFETY PRECAUTIONS

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

DANGER: To warn of immediate hazards which will result in severe personal injury or death.

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

CAUTION: To warn of hazards or unsafe practices which could result in minor personal injury.

ATTENTION! To warn of unsafe practices which could result in extensive equipment damage.

NOTE: To give important information or to warn of unsafe practices which could result in equipment damage.

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 the machine operating personnel. Report machine damage or faulty operation immediately.

WARNING: Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by smoking or electrical arcing. Keep the front machine cover open when charging batteries.

CAUTION: Always disconnect batteries-to-machine connector before working on machine electrical components.

CAUTION: Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted when working on machine because of the danger of becoming caught in moving parts. Make sure all nuts and bolts are secure. Keep shields and guards in position. If adjustments must be made while the unit is running, use extreme caution around moving parts.

NOTE: When spraying the machine off with water spray, avoid the instrument panel area.

WARNING: Do not use flammable or combustible cleaning agents when scrubbing.

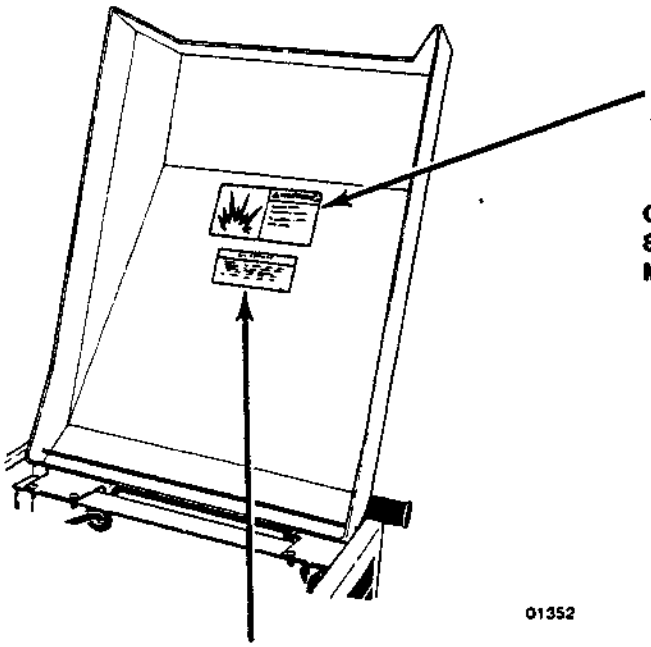
WARNING: Avoid contact with battery acid. Battery acid can cause severe burns. Wash immediately and get medical attention if contact with battery acid occurs.

CAUTION: Do not operate machine until you read and understand the machine manual.

ATTENTION: Connect battery cables only as shown in Batteries Section. Incorrect cable connections will damage the speed control unit.

NOTE: Hardware on this machine may be metric or SAE. Be sure to use correct replacement hardware when repairing the machine.

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.



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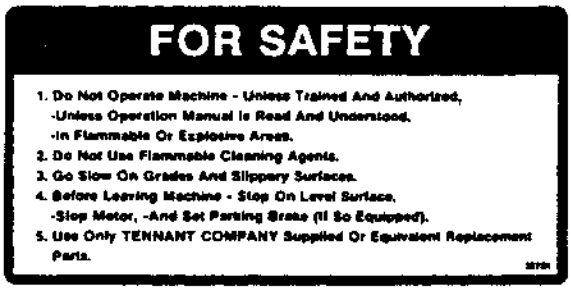
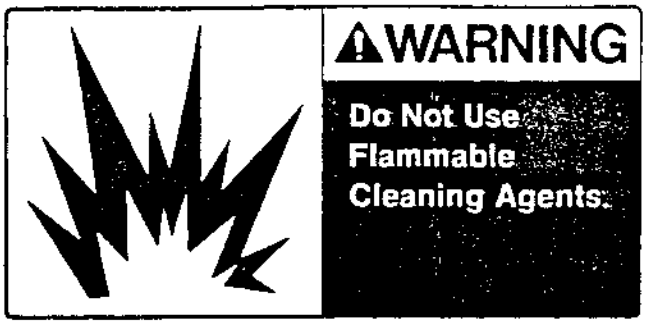
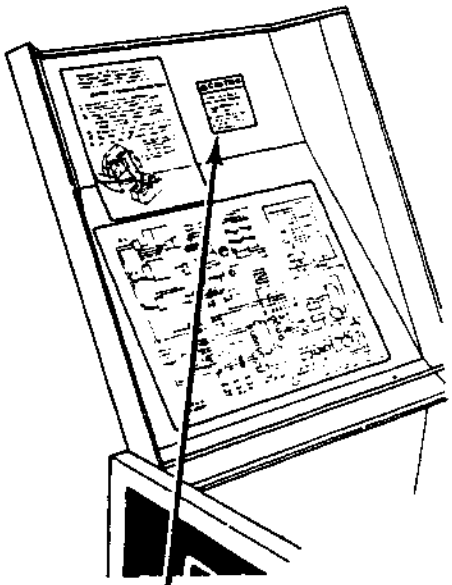


FOR SAFETY DECAL (TENNANT® PART NO. 32784) LOCATED ON THE INSIDE OF THE REAR MACHINE COVER.



CLEANING AGENTS DECAL (TENNANT® PART NO. 89638) LOCATED ON THE INSIDE OF THE REAR MACHINE COVER.



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CHARGING DECAL (TENNANT® PART NO. 89612) LOCATED ON THE INSIDE OF THE FRONT MACHINE COVER.

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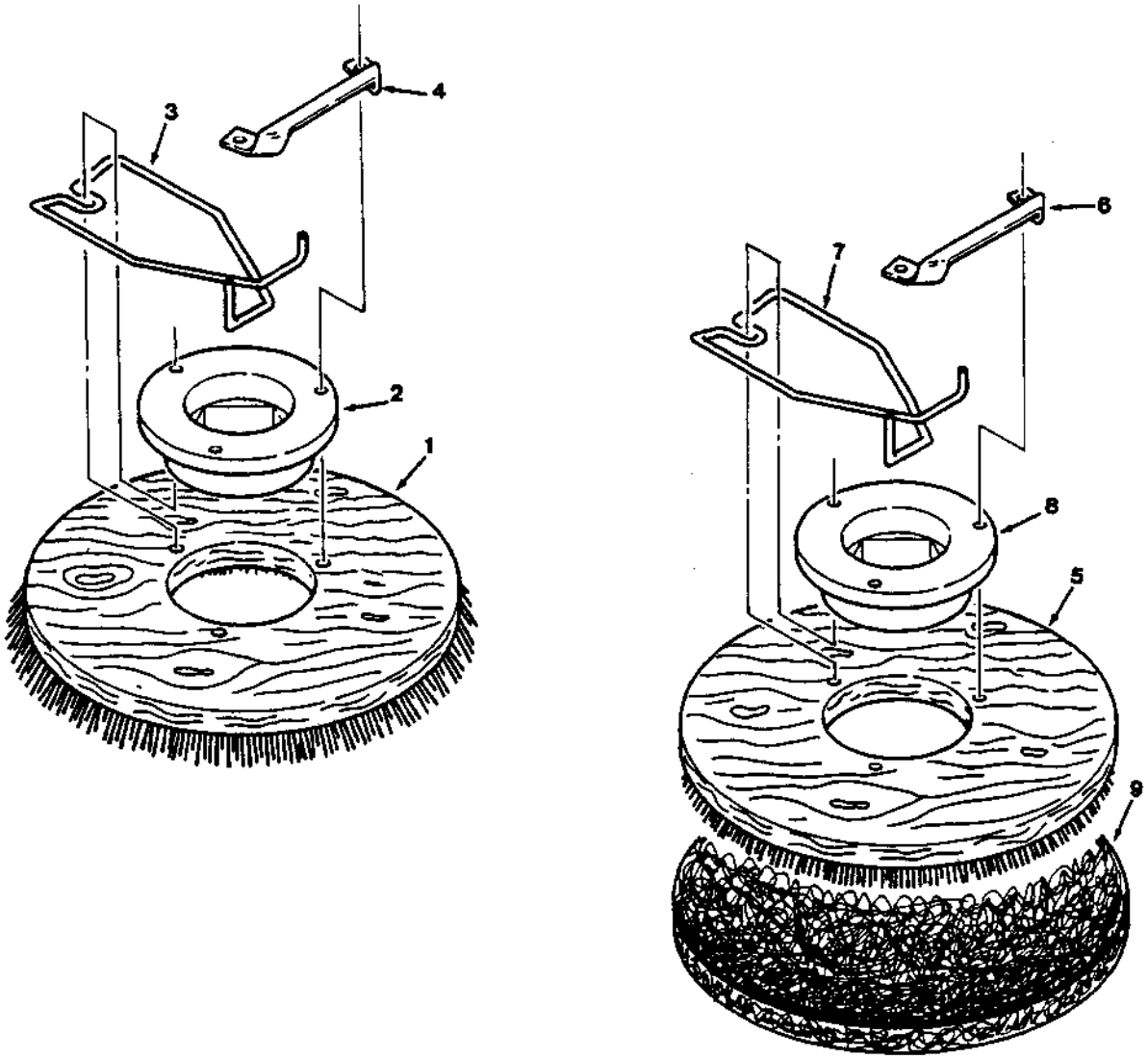

REPLACEMENT BRUSHES

REPLACEMENT BRUSHES

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KEY	TENNANT® PART NO.	MACHINE SERIAL NUMBER	DESCRIPTION	QTY.
1	89556	(-)	BRUSH ASSEMBLY, Heavy polypropylene	2
2	89216	(-)	ADAPTOR, Brush	1
3	02853	(-)	SPRING	1
4	02856	(-)	BRACKET	1
	89557	(-)	BRUSH ASSEMBLY, Abrasive	2
	89216	(-)	ADAPTOR, Brush	1
	02853	(-)	SPRING	1
	02856	(-)	BRACKET	1
	89558	(-)	BRUSH ASSEMBLY, Wire	2
	89216	(-)	ADAPTOR, Brush	1
	02853	(-)	SPRING	1
	02856	(-)	BRACKET	1
	89555	(-)	BRUSH ASSEMBLY, Bassine	2
	89216	(-)	ADAPTOR, Brush	1
	02853	(-)	SPRING	1
	02856	(-)	BRACKET	1
	02865	(-)	BRUSH ASSEMBLY, Soft nylon	2
	89216	(-)	ADAPTOR, Brush	1
	02853	(-)	SPRING	1
	02856	(-)	BRACKET	1
5	89045	(-)	BRUSH ASSEMBLY, Insta-lok	2
6	02856	(-)	BRACKET	1
7	02853	(-)	SPRING	1
8	89216	(-)	ADAPTOR, Brush	1
9	89046	(-)	PAD, Brown stripper	2
9	89047	(-)	PAD, Blue cleaner	2
9	89048	(-)	PAD, Red buffer	2
9	89049	(-)	PAD, White super polish	2

RECOMMENDED GENERAL MAINTENANCE ITEMS

01410

KEY	TENNANT® PART NO.	MACHINE SERIAL NUMBER	DESCRIPTION	QTY.
	89575	(-)	REPLACEMENT PARTS PACKAGE	1
	89024	(-)	SEAL, Vacuum fan	2
	89320	(-)	FILTER, Vacuum fan	1
	89032	(-)	SKIRT, Brush, R.H.	1
	89033	(-)	SKIRT, Brush, L.H.	1
	89034	(-)	BLADE, Front squeegee	1
	89031	(-)	BLADE, Rear squeegee	1
	89035	(-)	STRIP, Squeegee backup	1
	89418	(-)	CIRCUIT BREAKER, 22 A	1
	89105	(-)	HOSE, Squeegee	1
	89316	(-)	FLOAT	1
	89408	(-)	PADS, Brake	1
	89275	(-)	RESISTOR ASSEMBLY, Speed control	1
	89566	(-)	KEY, Master power switch	1
	89187	(-)	CABLE, Squeegee lift	1
	89410	(-)	CONTROLLER	1
	89500	(-)	SKIRT, Scrubber head cover	1
	89146	(-)	GUIDE, Ceramic	1
	89183	(-)	PIN, Hair cotter	1
	89404	(-)	CAM, R.H.	1
	89628	(-)	CAM	1
	89152	(-)	CIRCUIT BREAKER, 15 A	2
	89610	(-)	REPAIR KIT, Motor brushes, vacuum fan	2
	89611	(-)	REPAIR KIT, Motor brushes, vacuum fan, industrial version	2
	89102	(-)	GASKET, Adaptor, industrial version	2
	89394	(-)	FILTER, Vacuum fan, industrial version	1

GENERAL INFORMATION

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SECTION 1
SPECIFICATIONS

CONTENTS

MACHINE SPECIFICATIONS

MODEL 426 POWER SCRUBBER

POWER TYPE

Electric propelling motor-
nominal voltage 36 VDC
0.5 hp (0.37 kw) @ 320 rpm, 14 A

Scrub brush drive motor,
standard-nominal voltage 36 VDC
0.45 hp (0.34 kw) @ 400 rpm, 14 A
heavy duty-nominal voltage 36 VDC
0.75 hp (0.56 kw) @ 400 rpm, 25 A

Vacuum fan drive motor,
standard-nominal voltage 36 VDC
0.75 hp (0.56 kw) @ 13,000 rpm, 11A
heavy duty-nominal voltage 36 VDC
1.25 hp (0.93 kw) @ 10,500 rpm, 26A

Batteries·
(6)-6V, 220 A/h @ 20 hour rate
battery charger-36 VDC 23A, 120 VAC input

POWER TRAIN

Propelling-chain driven differential
Scrub brush (2)-direct drive
Vacuum fan - direct drive

STEERING

Type - individually disc braked rear drive wheels (2)

SUSPENSION SYSTEM

Front (2) - 5 in (127 mm) diameter wheel casters
Rear (2) - 4.10/3.50 x 5 tube-type tires

GENERAL MACHINE DIMENSIONS - CAPACITIES

Length - 66 in (1676 mm)
Width - 27 in (686 mm)
Height - 43 in (1092 mm)
Track, front - 12.25 in (311 mm)
rear - 17.38 in (441 mm)
Wheel base - 18 in (457 mm)
Scrub brush (2) diameter - 13.5 in (343 mm)
Scrub path width (total) - 26 in (660 mm)
Rear squeegee path width - 32 in (813 mm)
Solution tank capacity - 21 gal (80 L)
Recovery tank capacity - 21 gal (80 L)

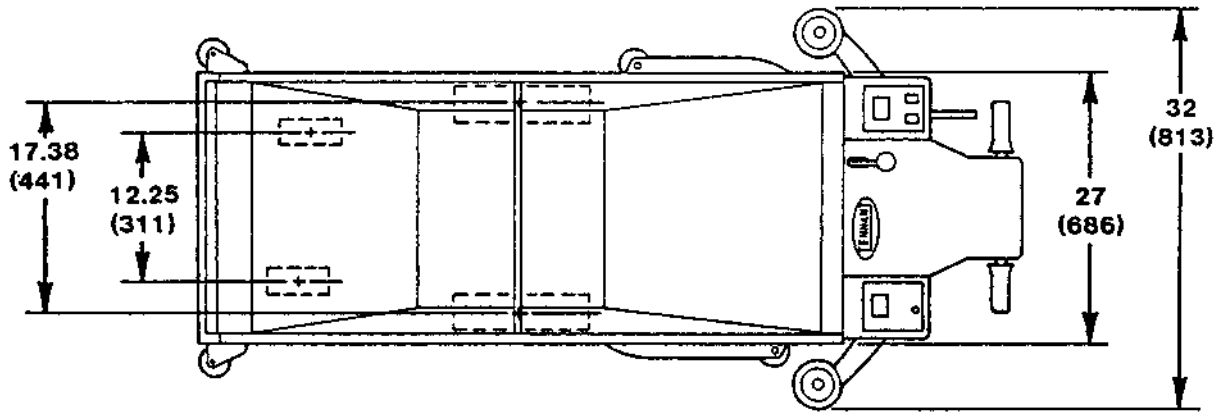
MACHINE WEIGHTS

Net weight, less solution, brushes, and batteries - 630 lb (286 kg)
Net weight, with solution, brushes, and batteries - 1200 lb (544 kg)

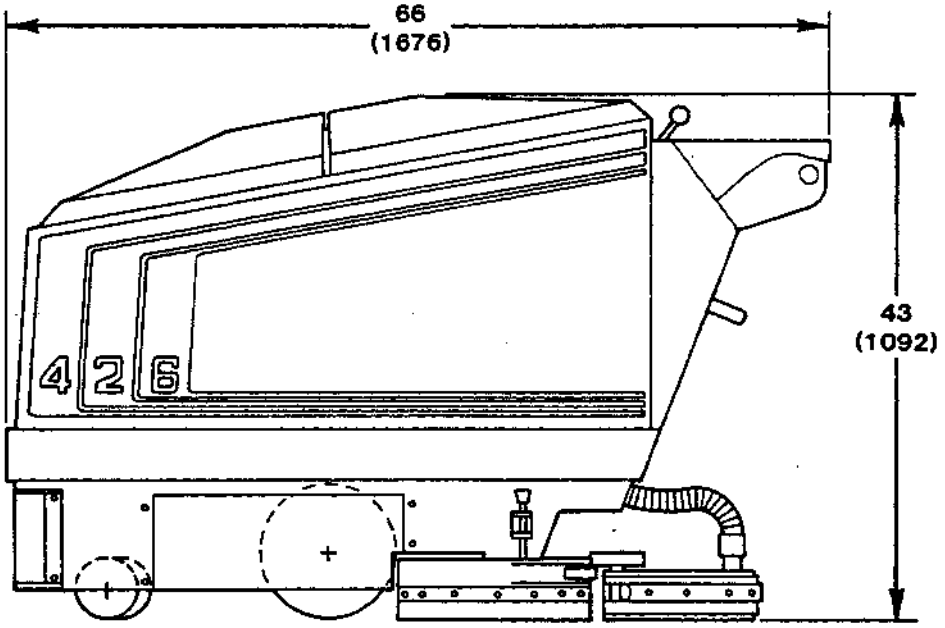
GENERAL MACHINE PERFORMANCE

Maximum forward travel speed - 3.2 mph (5.1 km/h)
Maximum reverse speed - 1.5 mph (2.4 km/h)
Turning radius - 36 in (914 mm)

MACHINE DIMENSIONS



TOP VIEW



SIDE VIEW

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NOTE: The first number is in inches; the second number in parenthesis is in millimeters.

SECTION 2
OPERATION

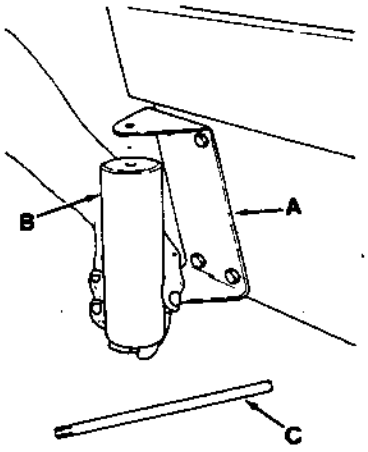
CONTENTS

PREPARATION FOR OPERATION

1. Uncrate the machine and push it off the crate bottom onto the ramps provided in the crate.
2. Check the machine for shipping damage. Report any damage to the carrier at once.
3. Read and understand this manual before operating the machine.

⚠ CAUTION: Do not operate the machine until you read and understand the operating instructions and are properly trained.

4. Open the front machine cover.
5. Standard Machines: Remove the wall rollers from the battery tray. Tighten the bolts holding the wall roller bracket in place. Position the roller in the bracket and slide the roller pin through the roller. Secure the roller pin with hardware provided.



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MOUNTING WALL ROLLER

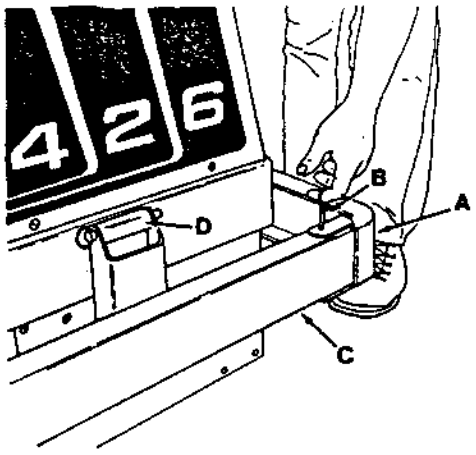
A. Roller Bracket
B. Wall Roller
C. Pin

Machines Equipped With Wraparound Bumper: Uncrate the wraparound bumper. Bolt the four side bumper mounting brackets to the machine.

Hold each side bumper in place and insert the two retaining pins which secure each side bumper to the machine.

Slide the front bumper onto the front ends of the side bumpers.

Insert the two front bumper retaining pins through the front bumper and each of the side bumpers.



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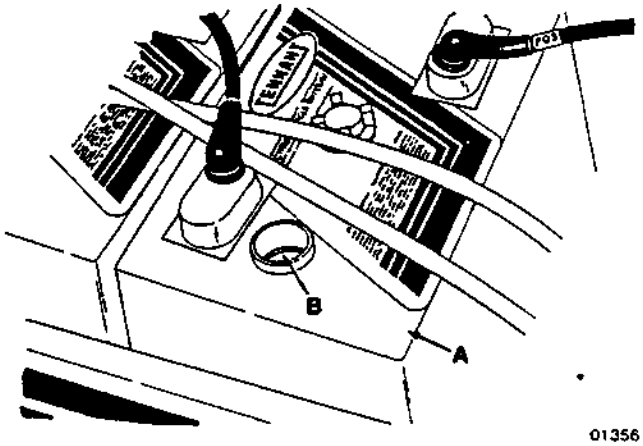
INSTALLING FRONT BUMPER

A. Front Bumper
B. Retaining Pin
C. Side Bumper
D. Side Bumper Mounting Bracket

6. Uncrate the machine batteries. If they are of the wet-type, check the electrolyte level as described in Batteries. If they are of the dry-type, activate them as described in Activating Dry-Type Batteries.



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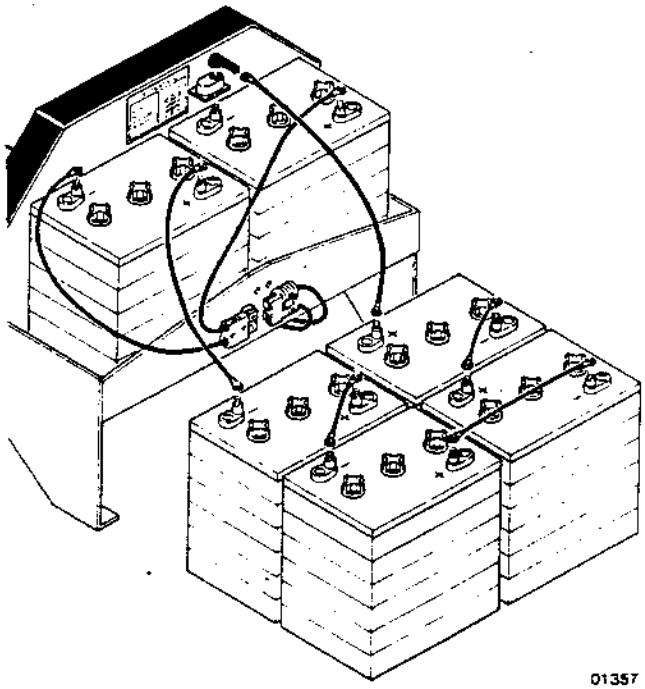
CHECKING BATTERY ELECTROLYTE LEVEL

A. Battery
B. Electrolyte Indicator Ring

7. Check the battery specific gravity to determine the state of charge as described in Batteries. Charge the batteries if necessary.

8. Install the batteries and connect the battery cables to the batteries as shown. Be sure to connect the battery cables as shown. Connecting the battery cables incorrectly will damage the speed control unit.

ATTENTION! Connect the battery cables only as shown. Incorrectly connecting the battery cables will damage the speed control unit.



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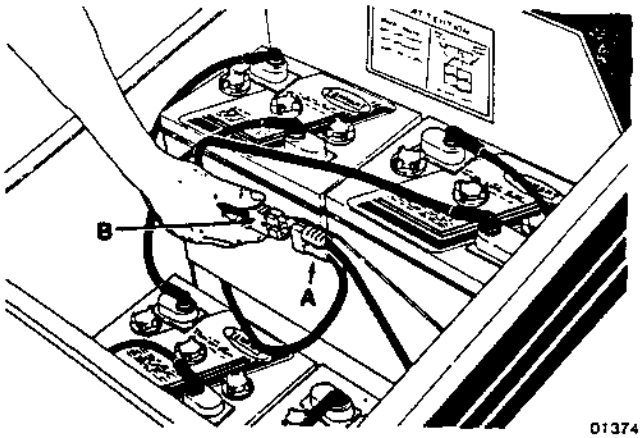
BATTERY CABLE CONNECTIONS

9. Recheck the battery cable connections and connect the batteries-to-machine connector.



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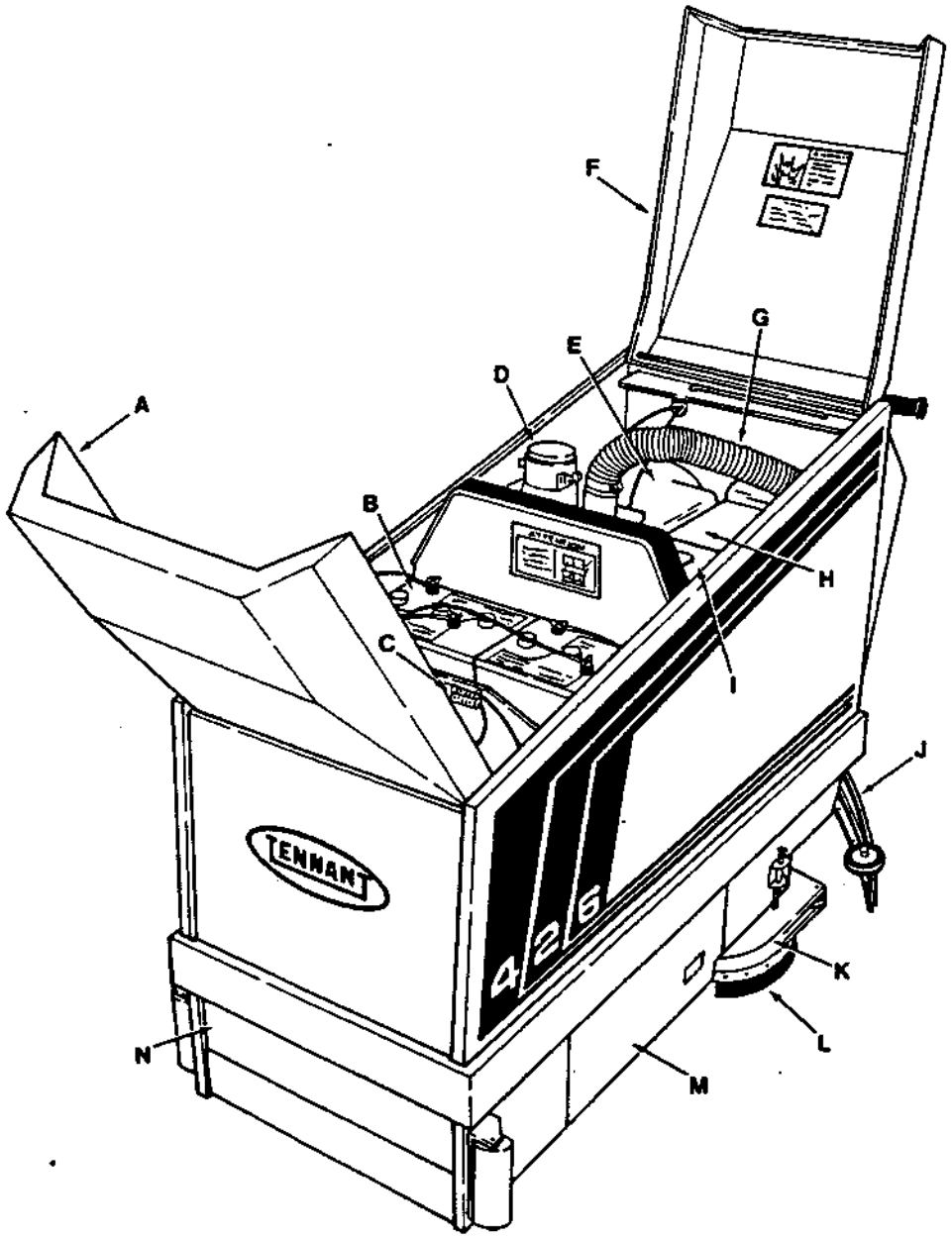
CONNECTING BATTERIES-TO-MACHINE CONNECTOR
A. Machine Connector
B. Batteries Connector

10. Close the front and rear machine covers.
11. Install scrub brushes as described in To Install Scrub Brushes.
12. Drive the machine to the machine filling area.
13. Operate the machine as described in Machine Operation.



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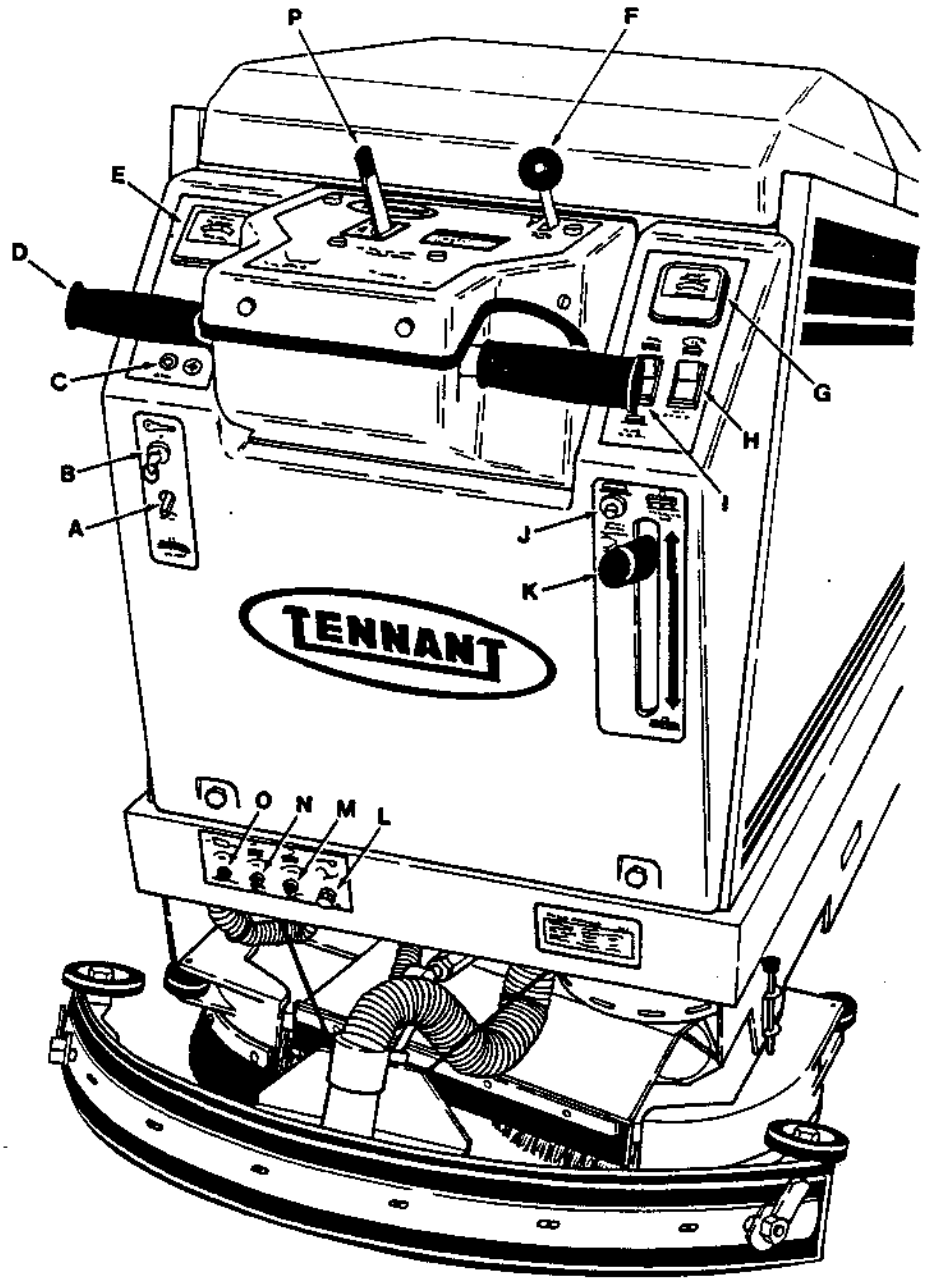
MACHINE COMPONENTS

A. Front Machine Cover
B. Battery
C. Batteries-To-Machine Connector
D. Vacuum Fan
E. Recovery Tank
F. Rear Machine Cover
G. Vacuum Fan Exhaust Hose
H. Solution Tank
I. Solution Tank Cover
J. Squeegee Assembly
K. Side Skirt Shell
L. Side Skirt
M. Lower Side Access Panel
N. Recovery Tank Drain Hose Access Door



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CONTROLS AND INSTRUMENTS

A. Vacuum Fan Switch
B. Master Power Switch
C. Master Power Indicator Lamp
D. Steering Control Handle
E. Battery Condition Gauge
F. Solution Control Lever
G. Brush Pressure Gauge
H. Scrub Brush Switch
I. Scrub Head Position Switch
J. Heavy Scrub Brush Pressure Switch
K. Squeegee Lift Handle
L. Master Power Fuse
M. Right Scrub Brush Circuit Breaker
N. Left Scrub Brush Circuit Breaker
O. Propelling Motor Circuit Breaker
P. Parking Brake Lever

VACUUM FAN SWITCH

The vacuum fan switch controls the vacuum fan. Flipping the switch toggle up to the "on" position starts the vacuum fan. Flipping the switch toggle down to the "off" position stops the vacuum fan.

The vacuum fan switch also provides the machine electrical overload protection. It is a 25 A circuit breaker.

In the event of a circuit overload, the switch toggle will return to the "off" position. The switch must then be placed in the "on" position to restart the vacuum fan.

The vacuum fan may be operated with or without the master power switch in the "on" position. This feature is present to allow the vacuum wand accessory to be used without the entire machine operating.

MASTER POWER SWITCH AND INDICATOR LAMP

The master power switch controls most of the machine power. Only the vacuum fan may be operated independently of the master power switch.

Turning the switch key counterclockwise into the "on" position allows power to flow. Turning the switch key clockwise into the "off" position stops all power flow except to the vacuum fan switch.

Whenever the master power switch is in the "on" position, the indicator lamp will light.

STEERING CONTROL HANDLES

The steering control handles control machine speed, and forward and reverse directions, through a solid state switching circuit. The steering control handles control the machine's right and left direction through a disc brake and cable arrangement on each wheel.

To move the machine straight forward, twist the handle grips forward. To move the machine straight backward, twist the handle grips backward.

To stop the machine, release the handle grips.

To turn the machine to the left while moving forward or in reverse, apply down pressure on the left handle grip.

To turn the machine to the right while moving forward or reverse, apply down pressure on the right handle grip.

BATTERY CONDITION GAUGE

The battery condition gauge indicates the present state of charge of the batteries. The gauge needle should be in the white zone of the gauge movement when the batteries are fully charged. As the batteries discharge, the gauge needle will move into the green zone and then into the red zone. The batteries should be recharged when the gauge needle enters the red zone.

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

SOLUTION CONTROL LEVER

The solution control lever operates a cable which controls the solution control valve, which controls the flow of solution to the surface being cleaned.

Pushing the control lever forward opens the solution control valve, allowing solution to reach the floor. Pulling the control lever backward closes the solution control valve, stopping solution flow.

The rate of solution flow is variable. Pushing the control lever forward slightly, opens the control valve a small amount. Pushing the control lever forward all of the way allows the maximum solution flow to reach the floor.

BRUSH PRESSURE GAUGE

The brush pressure gauge indicates how hard the brush drive motors are working.

Under normal operating conditions, the brush pressure gauge needle should be in the green zone of the gauge movement.

Under harsh operating conditions, the brush pressure gauge needle will be in the red zone of the gauge movement, indicating excessive brush pressure. Excessive brush pressure will cause the brush drive circuit breaker to trip. If the brush drive circuit breaker trips or the brush pressure meter needle is in the red zone of the meter movement, lighten the brush down pressure by raising the scrub head.

SCRUB BRUSH SWITCH

The scrub brush switch controls the scrub brush motors. Flipping the switch rocker forward from the center position places the scrub brush motors into the "on" position. Flipping the switch rocker backward places the scrub brush motors in the "off" position.

When scrubbing on a rough floor, or if too much scrub brush pressure is applied, the scrub brush circuit breakers may trip. If the circuit breakers trip, wait until they cool before resetting them.

SCRUB HEAD POSITION SWITCH

The scrub head position switch controls the scrub head actuator, which raises and lowers the scrub head and controls scrub brush pressure.

Pushing the switch rocker forward to the "raise" position raises the scrub head. Pulling the switch rocker backward to the "lower" position lowers the scrub head. The center switch position is the "hold" position.

Keep the scrub head in the "raised" position whenever transporting, storing, or parking the machine.

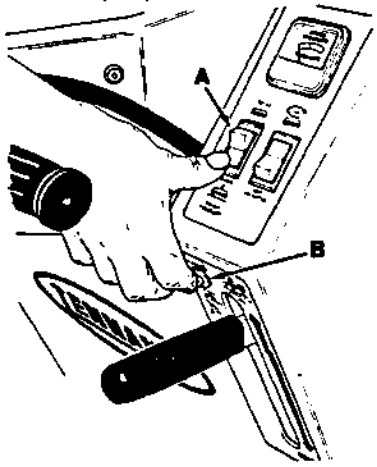
HEAVY SCRUB BRUSH PRESSURE SWITCH

The heavy scrub brush pressure switch allows the machine operator to apply extra heavy scrub brush pressure on areas of compacted dirt and debris.

The switch controls the scrub head actuator, which determines the height of the scrub head and controls scrub brush pressure.

Holding the heavy scrub brush pressure switch toggle and the scrub head position switch toggle back lowers the scrub head to apply extra heavy brush pressure.

NOTE: Prolonged use of the heavy scrub brush pressure feature may trip the brush circuit breakers.



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ENGAGING HEAVY SCRUB BRUSH PRESSURE

A. Scrub Head Position Switch
B. Heavy Scrub Brush Pressure Switch

SQUEEGEE LIFT HANDLE

The squeegee lift handle operates a cable which controls the rear squeegee assembly position.

Lifting the handle up and to the left raises the rear squeegee into the "raised" position. Lifting the handle up to the right, and lowering the handle into the "lower" position, lowers the rear squeegee to the floor.

Always place the rear squeegee in the "raised" position when not operating the machine.

HOUR METER

The hour meter is present on Industrial Version Machines. It records the number of hours the machine has been operated. This information is useful in determining when to service the machine.

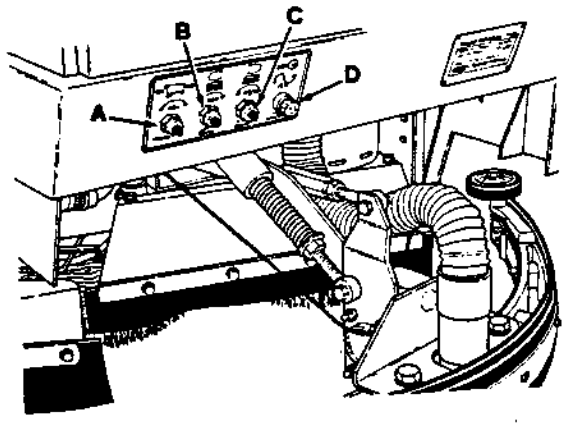
FUSES AND CIRCUIT BREAKERS

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.

Circuit breakers are reusable 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.

If the overload which caused the circuit breaker to trip is still present in the circuit, the circuit breaker will continue to stop current flow until the overload is corrected. The chart below shows the various fuses and circuit breakers, the electrical components they protect, and their locations in the machine.

PROTECTIVE DEVICE	RATING	CIRCUIT PROTECTED	LOCATION
Switch/Circuit Breaker	25A	Vacuum Fan	Instrument Panel
Fuse	15A	Master Power Switch	Machine Frame
CB-1	22A	Propelling Motor	Machine Frame
CB-2	15A	Left Brush Motor, Standard	Machine Frame
	25A	Left Brush Motor, Industrial Version	Machine Frame
CB-3	15A	Right Brush Motor, Standard	Machine Frame
	25A	Right Brush Motor, Industrial Version	Machine Frame



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MACHINE FRAME MOUNTED CIRCUIT BREAKERS AND FUSE

A. Propelling Circuit Breaker
B. Left Scrub Brush Circuit Breaker
C. Right Scrub Brush Circuit Breaker
D. Master Power Fuse

PARKING BRAKE LEVER

The parking brake lever is present on machines with the parking brake accessory. It controls the two steering control brake cables. To engage the parking brake, pull the lever back. To disengage the parking brake, push the handle forward.

MACHINE OPERATION

NORMAL SCRUBBING OPERATION

A normal scrubbing operation involves making a single scrubbing pass over the surface being cleaned. A single scrubbing pass will remove routine accumulations of dirt and spills. In areas where excessive dirt or spills accumulate, double pass scrubbing may be necessary.

TO OPERATE MACHINE

NOTE: Before operating machine, perform the pre-operation checks.

PRE-OPERATION CHECKS

- Solution control lever in "off" position.
- Squeegee lift handle in "raise" position.
- Recovery tank drain hose in storage location with drain plug clamp closed.

1. Fill the solution tank with water and the required amount of detergent. See To Fill Solution Tank.
2. Place the master power switch in the "on" position.
3. Drive the machine to the area to be cleaned.
4. Place the squeegee lift handle in the "lower" position to lower the squeegee.
5. Place the vacuum fan switch in the "on" position to start the vacuum fan.
6. Place the scrub brush speed control switch in the "on" position to start the scrub brush rotating.
7. Place the solution control lever in the desired position to start solution flowing.
8. Hold the scrub head position switch rocker in the "lower" position until the scrub head is in the desired lowered position.
9. Scrub the area as needed.

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

   When the recovery tank is full, the vacuum fan motor sound level will increase. Empty the recovery tank, clean the vacuum fan screen and filter, and refill the solution tank with clean water and detergent. Then continue scrubbing.
10. When finished scrubbing, place the solution control lever in the "off" position to stop solution flow; hold the scrub head position switch rocker in the "raise" position until it tops out to raise the scrub head; place the scrub brush switch rocker in the "off" position to stop the scrub brush rotation; place the squeegee lift handle in the "raise" position to raise the squeegee; and place the vacuum fan switch toggle in the "off" position to stop the vacuum fan.
11. Place the master power switch key in the "off" position.
12. At the end of the day, clean the squeegee, the suction hose, the recovery tank, and the vacuum fan screen and filters.

NOTE: After operating machine, perform the post operation checks.

POST OPERATION CHECKS

- Scrub brushes free of tangled string or wire.
- Rear squeegee free of rips or tears.
- Rear squeegee securely mounted to frame.
- Batteries charged or on charger, if needed.

DOUBLE PASS SCRUBBING OPERATION

Double pass scrubbing is a method of removing heavy accumulations of dirt, wax, or spills.

A double pass scrubbing operation involves making a single scrubbing pass over the surface being cleaned while having the squeegee in the "raised" position, the vacuum fan "off," and the solution control lever in the "full flow" position; allowing the solution to soak on the floor; and then making a second scrubbing pass over the surface with the squeegee in the "lowered" position, the vacuum fan "on," and scrubbing in the normal manner.

⚠ CAUTION: Use care when driving on wet surfaces.

OPERATION ON GRADES

The maximum rated ramp angle for machine operation is 10°. Do not operate the machine beyond this limit.

⚠ CAUTION: Operating the machine on grades of more than 10° may cause the machine to become unstable.

When climbing ramps, if the drive motor circuit breaker trips, fully twist the steering handles. This utilizes the motor's braking ability, allowing the machine to be walked down the ramp to a level surface where the circuit breaker may be reset.

When climbing steep ramps, it may be necessary to remove the scrub brushes, squeegee assembly, and side skirt shells to prevent possible machine damage.

SOLUTION TANK

The machine solution tank supplies the scrub brushes with a water and detergent solution. The solution tank is mounted on the left side of the machine. It has a 21 gal (80 L) capacity.

Access to the solution tank is gained by opening the rear machine cover. For specific filling instructions, see To Fill Solution Tank. To drain the solution tank, see Tank Cleaning Instructions.

TO FILL SOLUTION TANK

1. Stop the machine next to the filling station.
2. Place the master power switch key in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Place the solution control lever in the "off" position.
4. Open the rear machine cover.
5. Remove the solution tank cover.
6. Fill the solution tank with warm water.

NOTE: Water temperature should not exceed 120° F (49° C).

7. Add detergent and stir the solution.
8. Replace the solution tank cover.
9. Lower the machine cover.

DETERGENT RECOMMENDATIONS

Floor conditions, water condition, amount of soilage, type of soilage, brush action, and squeegee action all play an important role in determining the type and the concentration of detergent to be used. For specific recommendations, contact the local Tennant Company Representative.

⚠ WARNING: Do not use flammable or combustible cleaning agents when scrubbing.

RECOVERY TANK

The machine recovery tank stores the water solution picked up by the machine squeegee and vacuum fan. The recovery tank is located on the right side of the machine. It has a 21 gal (80 L) capacity.

Access to the recovery tank is gained by opening the rear machine cover. To drain the recovery tank, remove the recovery tank drain hose from its storage location at the front of the machine and lower the hose to a floor drain. Remove the drain hose plug. The tank will then empty. For specific draining instructions, see To Drain Recovery Tank.

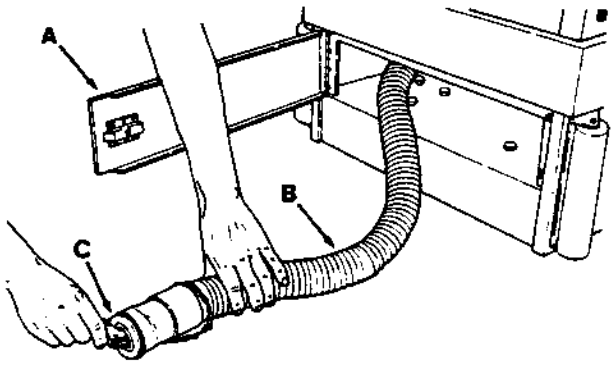
To clean the recovery tank, see Tank Cleaning Instructions.

TO DRAIN RECOVERY TANK

1. Stop the machine next to a floor drain.
2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Open the drain hose access door.
4. Remove the drain hose from the machine.

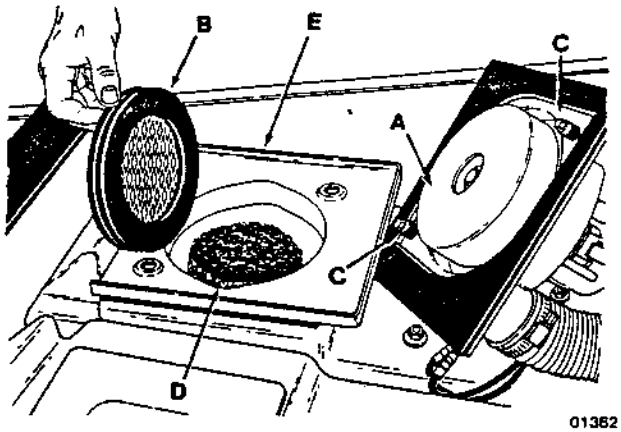


01361

RECOVERY TANK DRAIN HOSE

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

5. Unlatch and remove the hose plug from the drain hose next to the drain. The tank will then drain.
6. Open the rear machine cover.
7. Unlatch the two vacuum fan cover latches.
8. Lift the vacuum fan off the recovery tank cover.
9. Lift out the vacuum fan screen and filter from the recovery tank cover.



01362

REMOVING VACUUM FAN SCREEN AND FILTER

A. Vacuum Fan
B. Screen
C. Vacuum Fan Cover Latch
D. Filter
E. Recovery Tank Cover

10. Rinse and clean the vacuum fan screen and filter.
11. Remove the recovery tank cover and rinse the float clean.
12. Hose out the interior of the recovery tank.
13. Position the vacuum fan screen and filter on the recovery tank cover.

NOTE: Position the screen and filter on the recovery tank cover with the screen on top of the filter.

14. Position the vacuum fan on the recovery tank cover.
15. Latch the two vacuum fan cover latches.
16. Lower the rear machine cover.
17. Replace the recovery tank drain hose plug.
18. Place the drain hose in its storage compartment and close the access door.

WRAPAROUND BUMPER

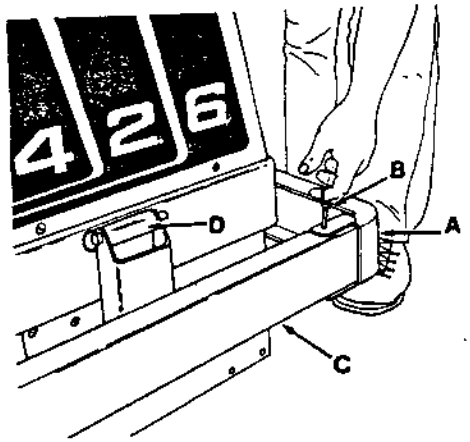
The wraparound bumper, standard on all Industrial Version machines, provides the machine with an extra amount of front and side protection.

TO REMOVE WRAPAROUND BUMPERS

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Pull the two front bumper retaining pins out from the bumpers.



01366

REMOVING FRONT BUMPER PINS

A. Front Bumper
B. Retaining Pin
C. Side Bumper
D. Side Bumper Bracket

3. Slide the front bumper off the side bumpers.
4. Pull the two side bumper retaining pins, holding each side bumper in place, and remove the bumper.

TO REINSTALL WRAPAROUND BUMPERS

1. Place the master power switch in the "off" position:

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Hold each side bumper in place and insert the two retaining pins which secure each side bumper to the machine.
3. Slide the front bumper onto the front ends of the side bumpers.
4. Insert the two front bumper retaining pins through the front bumper and each of the side bumpers.

VACUUM WAND ACCESSORY

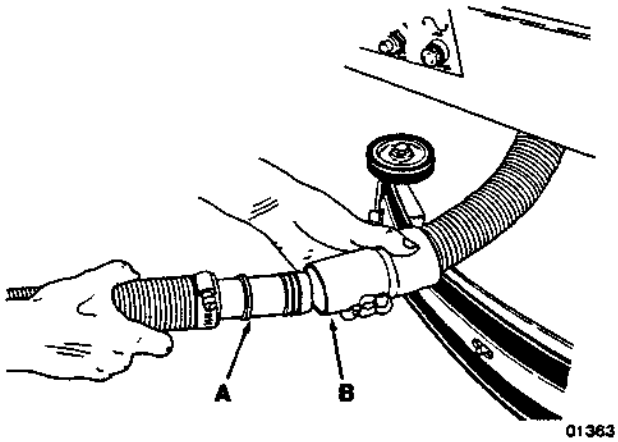
The vacuum wand accessory gives the machine the added flexibility of picking up spills not accessible by the machine. An 84 in (2134 mm) hose and wand utilize the machine vacuum system.

TO OPERATE VACUUM WAND

1. Stop the machine near the spill to be picked up.
2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Place the vacuum fan switch in the "off" position.
4. Remove the vacuum wand and hose from their storage locations under the rear machine cover.
5. Remove the rear squeegee suction hose from the squeegee frame.
6. Insert the wand hose coupling into the end of the rear squeegee suction hose.

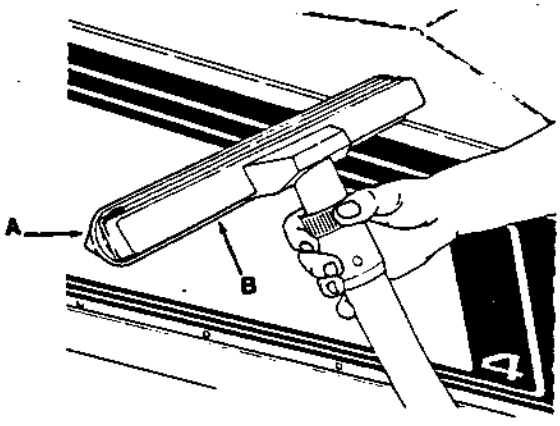


01363

CONNECTING WAND HOSE

A. Wand Hose Coupling
B. Rear Squeegee Suction Hose

7. Assemble the vacuum wand to the wand hose.
8. Tighten the knurled vacuum wand end to fix the nozzle position.



00892

ASSEMBLING VACUUM WAND NOZZLE

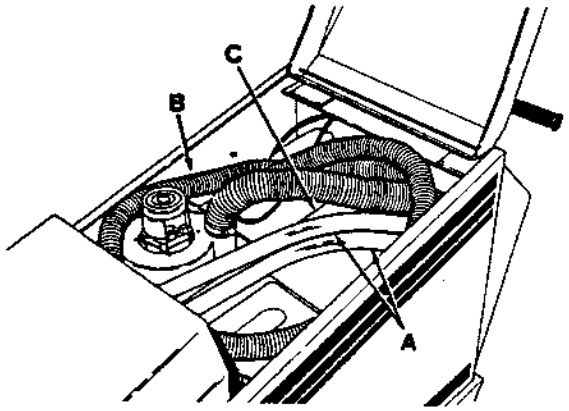
A. Vacuum Wand Nozzle
B. Vacuum Wand

9. Place the vacuum fan switch in the "on" position.
10. Operate the vacuum wand as required.


01364

OPERATING VACUUM WAND

11. When finished, place the vacuum fan switch in the "off" position.
12. Loosen the knurled vacuum wand end.
13. Disconnect the vacuum wand from the wand hose.
14. Disconnect the wand hose from the rear squeegee suction hose.
15. Push the rear squeegee hose onto the rear squeegee frame hose coupling.
16. Disassemble, clean, and rinse the vacuum wand and wand hose as required.
17. Store the vacuum wand and wand hose under the rear machine cover.



01365

VACUUM WAND STORAGE

A. Vacuum Wand
B. Vacuum Hose
C. Vacuum Wand Nozzle

TRANSPORTING MACHINE

The machine should be blocked up when it is to be trailered from one location to another. Be sure to adequately tie the machine down to avoid having the machine roll off the blocks.

Before climbing trailer ramps, remove the machine scrub brushes, side skirt shells, and squeegee assembly.

MACHINE JACKING INSTRUCTIONS

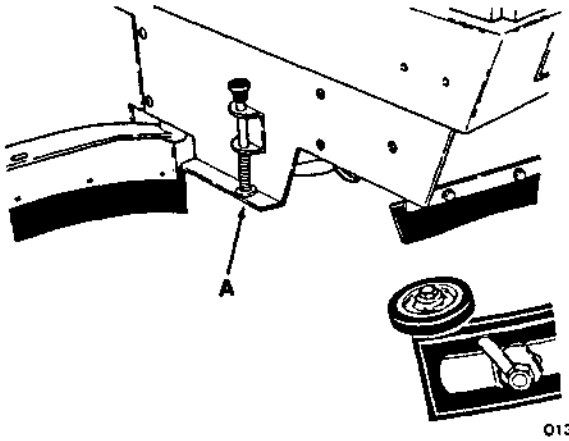
The machine must be jacked up and blocked to gain access to some machine components. The machine should also be blocked up when it is to be trailered from one location to another.

TO JACK UP MACHINE

1. Place the master power switch and vacuum fan switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.
3. Block the front of the machine up with a 4 in (102 mm) x 4 in (102 mm) block or similar support so the front casters are just off the floor.
4. Open or remove the side skirt shells.
5. Position a hydraulic jack under one side of the machine frame where the rear of the side skirt shell is secured to the machine.



REAR MACHINE JACKING LOCATION

A. Machine Jacking Location

6. Jack the machine up until the drive wheel clears the floor.
7. Position a jack stand or a 6 to 8 in (152 to 203 mm) block under the machine.
8. Lower the machine onto the jack stand or block.

⚠ WARNING: Always block the machine up. Never rely on hydraulic or scissors-type jacks to keep the machine raised.

9. Jack up and block the other side of the machine as previously described.
10. When finished working on the machine, jack up the machine, remove the jack stand or block, and lower each side of the machine.
11. Remove the front machine block.

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, and other undesirable deposits from forming:

1. Empty and clean the solution supply. Flush the supply hoses and control valve.
2. Empty and clean the solution recovery system. Flush the pickup hose. Clean the vacuum fan screen and filter.
3. Place the scrub head in the "raised" position.
4. Place the squeegee assembly in the "raised" position.
5. Fully charge the batteries.
6. Disconnect the batteries-to-machine connector.
7. Place the machine on jack stands or blocks, see Machine Jacking Instructions.

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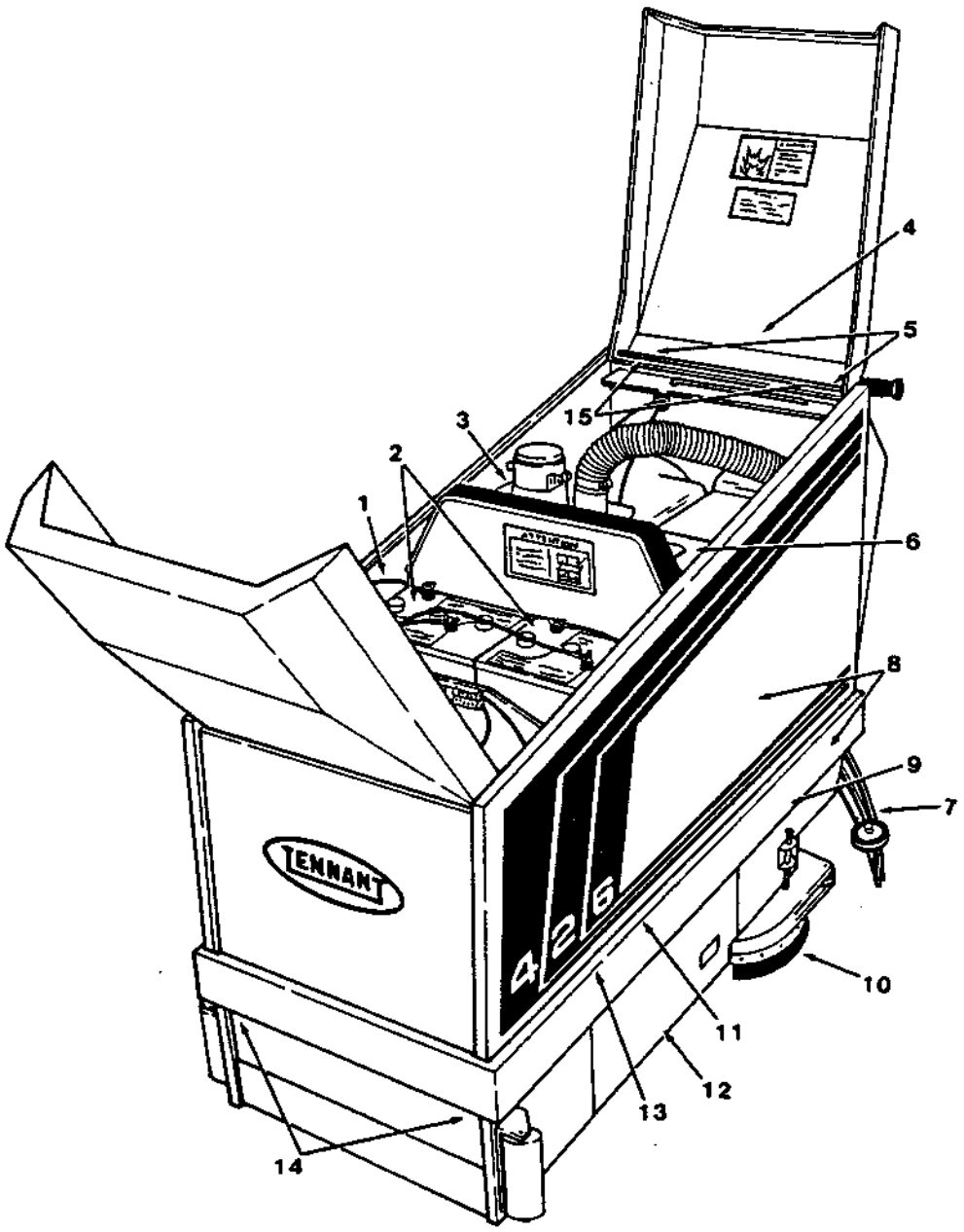
SECTION 3
MAINTENANCE

CONTENTS

RECOMMENDED FIRST 20-HOUR MACHINE INSPECTION

After the first 20-hours of operation, perform the following procedures:

1. Check the squeegee down pressure adjustment.
2. Check the specific gravity of the batteries.
3. Check the battery cable connections.
4. Check the drive chain tension.
5. Check the steering control handle brake linkage adjustment.
6. Check the floor skirts to floor clearance.
7. Check the tire pressure of the drive wheels.



MAINTENANCE CHART

01358

MAINTENANCE CHART

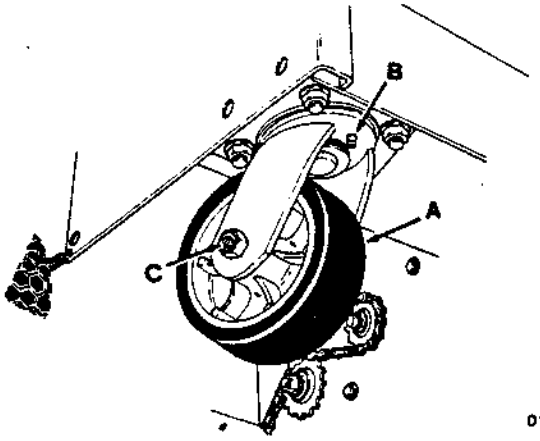
Key	Description	Procedure	Maintenance Interval: Daily 4 Hours	Weekly 20 Hours	Monthly 80 Hours	Bi-Monthly 160 Hours	Semi-Annual 480 Hours
1	Battery cables	Check for loose or corroded connections	X				
2	Batteries (6)	Clean battery tops			X		
		Check electrolyte level	X				
		Check specific gravity		X			
3	Solution recovery system	Clean	X				
4	Steering control pivot cams (2)	Lubricate					X
5	Brake cables (2)	Check tension			X		
6	Solution supply system	Clean			X		
7	Squeegee assembly	Check for wear or damage	X				
		Adjust down pressure		X			
		Lubricate pivot			X		
8	Scrub brushes (2)	Check for tangled wire or string, wear, or damage	X				
9	Rear brush skirt	Check for wear or damage	X				
10	Side skirts	Check for wear or damage	X				
11	Differential	Lubricate				X	
12	Drive wheel tires (2)	Check air pressure		X			
13	Wheel drive chain	Lubricate			X		
		Check and adjust tension				X	
14	Front caster wheels (2)	Apply grease to swivel and axle grease fitting			X		
15	Brake clevis pins (2)	Lubricate					X
16	Electric motors (4)	Inspect brushes				X	

LUBRICATION

FRONT CASTER WHEELS

There are two front caster wheels that support the weight of the front of the machine.

Two grease fittings have been provided on each caster wheel for lubrication purposes. One grease fitting is located on each of the caster wheel axles. Another grease fitting is located on the swivel of each caster wheel. Apply a lithium base moly-disulphide EP grease to each of the grease fittings with a cartridge-type grease gun after every 80 hours of operation. The caster axle is full when grease appears between the caster wheel and the caster fork. The caster swivel is full when grease appears through the o-ring.



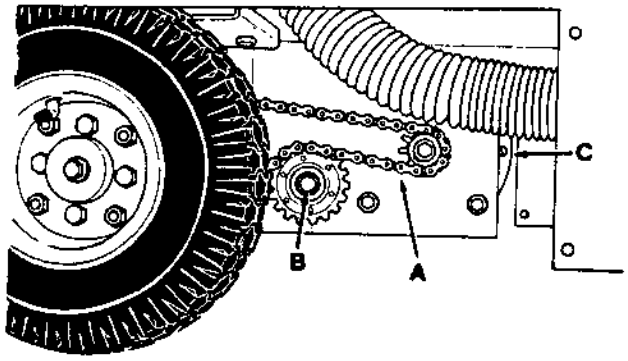
01367

FRONT CASTER

A. Caster Wheel
B. Swivel Grease Fitting
C. Axle Grease Fitting

WHEEL DRIVE CHAIN

There is one wheel drive chain on the right side of the machine. Lubricate the chain with lithium base moly-disulphide EP grease after every 80 hours of operation.



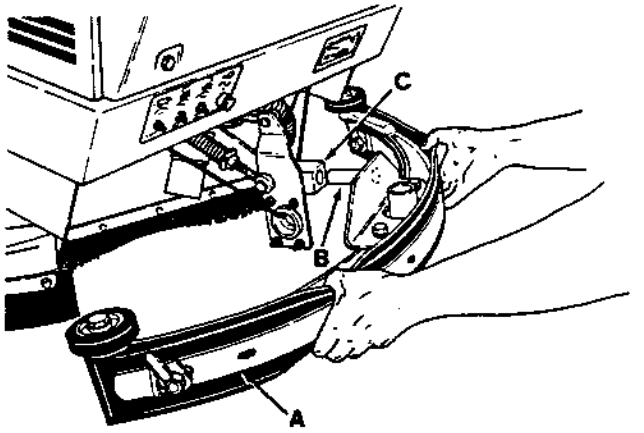
01368

WHEEL DRIVE CHAIN

A. Chain
B. Chain Idler
C. Drive Motor

SQUEEGEE ASSEMBLY PIVOT LUBRICATION

The squeegee assembly pivot connects the squeegee assembly to the machine. To keep the pivot movement free and to make mounting and dismounting the squeegee assembly easier, lubricate the squeegee pivot pin with a lithium base moly-disulphide EP grease after every 80 hours of operation.



01369

SQUEEGEE PIVOT

A. Squeegee Frame
B. Pivot Pin
C. Squeegee Pivot Block

STEERING CONTROL PIVOT POINTS AND BRAKE CLEVIS PINS

The steering control mechanism has two pivot cams and brake clevis pins which require regular lubrication. Apply a lithium base moly-disulphide EP grease to each of the pivot cams and clevis pins after every 480 hours of operation.

TO LUBRICATE STEERING CONTROL PIVOT POINTS

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Unscrew the solution control lever knob.
4. Remove the eight exposed socket head screws holding the top and bottom console covers to the console frame.
5. Pull the top and bottom console covers apart to gain access to the two remaining socket head screws. Remove the two screws.

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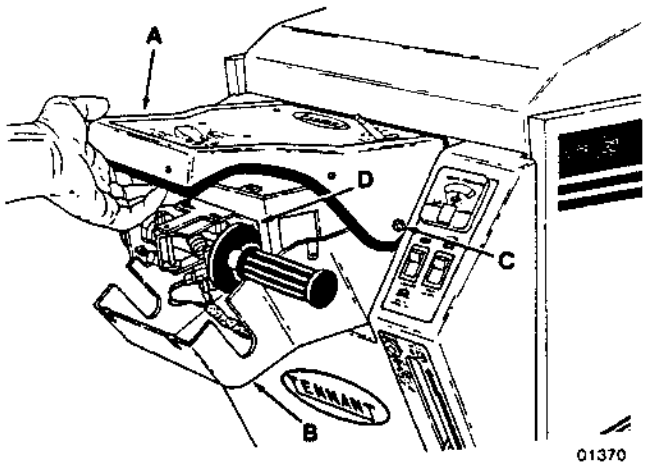
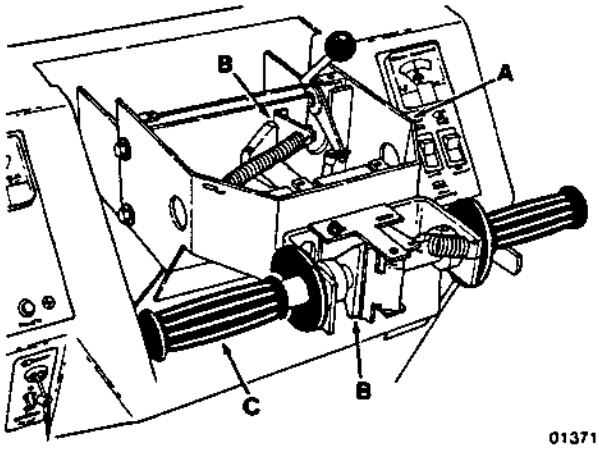


01370

REMOVING HIDDEN SOCKET CAP SCREWS FROM CONSOLE

- **A. Top Console Cover**
- **B. Bottom Console Cover**
- **C. Socket Cap Screw**
- **D. Console Frame**

6. Apply a lithium base moly-disulphide EP grease to the two steering control pivot cams.



01371

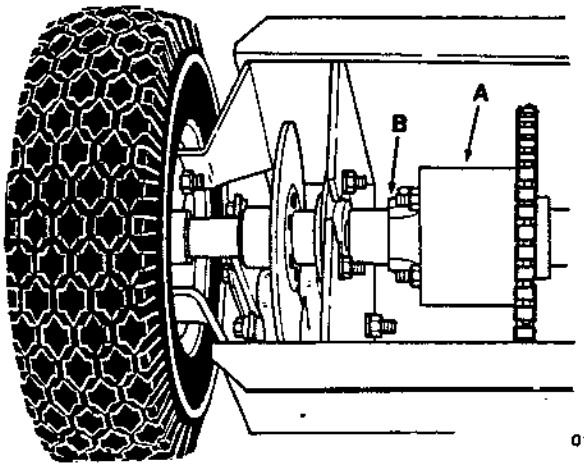
STEERING CONTROL PIVOT POINTS

- **A. Console Frame**
- **B. Pivot Point**
- **C. Steering Handle**

7. Replace the console covers and solution control lever knob.

DIFFERENTIAL

The differential transfers the power from the wheel drive chain to the drive wheels. To keep the internal components of the differential working properly, apply lithium base moly-disulphide EP grease to the differential grease fitting after every 160 hours of operation.



01372

DIFFERENTIAL

- **A. Differential**
- **B. Grease Fitting**

BATTERIES

The machine batteries provide all of the energy used by the machine. 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 discharged beyond 80%, specific gravity below 1.120.

Check the battery cables for loose connections on the battery terminals daily. Inspect the cables for corrosion or damage.

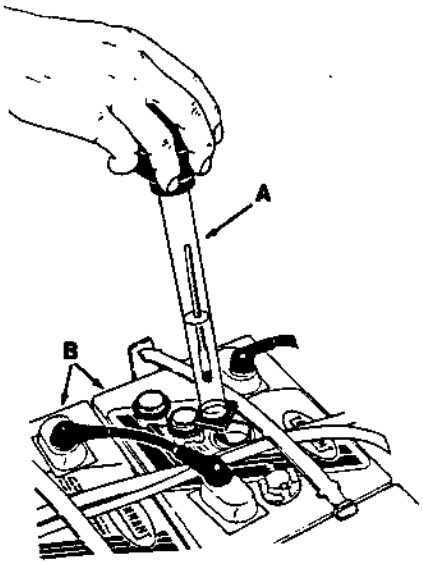
Clean the top surface and the terminals of the batteries after every 80 hours of operation. Use a strong solution of baking soda and water. Brush the solution sparingly over the battery top, terminals, and cable clamps. Do not allow any baking soda solution to enter the battery. Use a wire brush to clean 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 daily in each battery cell. 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.

⚠ WARNING: Avoid contact with battery acid. Battery acid can cause severe burns. Wash immediately and get medical attention if contact with battery acid occurs.

Use a hydrometer to check the electrolyte specific gravity after every 20 hours of operation.



01373

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
1.260 - 1.280	100% charged
1.230 - 1.250	75% charged
1.200 - 1.220	50% charged
1.170 - 1.190	25% charged
1.110 - 1.130	Discharged

NOTE: If the readings are taken when the battery electrolyte is any temperature other than 80°F (26.6° 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 (26.6° C):

Add to the specific gravity reading 0.004, 4 points, for each 10° F (5.5° C) above 80° F (26.6° C).

Subtract from the specific gravity reading 0.004, 4 points for each 10° F (5.5°C) below 80° F (26.6° C).

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BATTERY REPLACEMENT

There are six, 6-volt batteries which power the machine. The batteries are rated at 220 amp/hours at a 20 hour rate.

Use only 6-volt batteries; do not attempt to substitute 12-volt batteries.

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 80% of the battery power has been used, so the battery specific gravity is between 1.190 and 1.170.

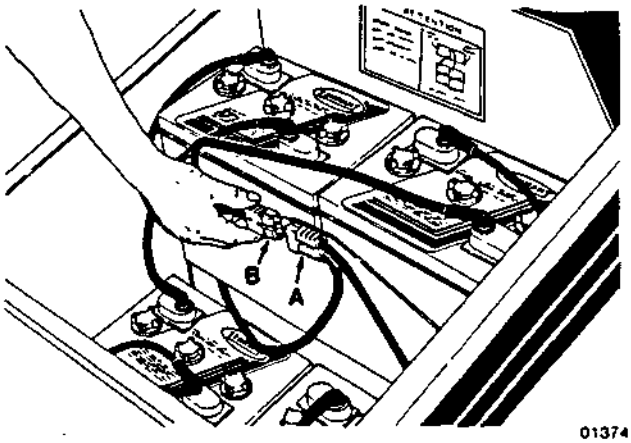
Do not expose the battery charger to water. Do not touch uninsulated battery terminals or unnecessarily expose any portion of your body to the batteries when making electrical connections.

TO CHARGE BATTERIES

1. Stop the machine on a flat, dry surface next to an electrical outlet and the battery charger.
2. Turn off the master power switch.
3. Lift and lock the machine cover in the "open" position.

⚠ WARNING: Keep machine cover open. Do not smoke or allow spark producing equipment to be operated while charging batteries. Batteries give off an explosive gas when being charged.

4. Disconnect the batteries-to-machine connector.



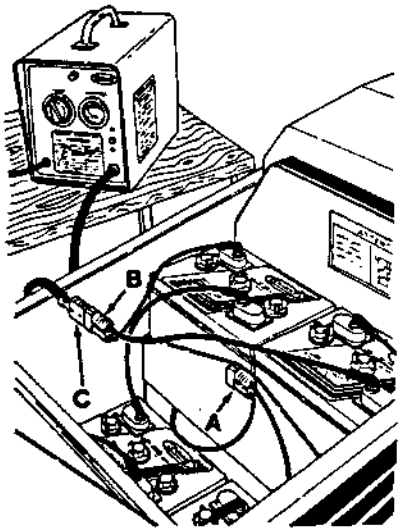
01374

DISCONNECTING BATTERIES-TO-MACHINE CONNECTOR
A. Machine Connector
B. Batteries Connector

5. Check the water 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.

⚠ CAUTION: Do not attempt to charge defective or frozen batteries.

6. Unplug the battery charger from its power source.
7. Turn the battery charger to the "off" position.
8. Plug the charger output into the machine batteries connector.



01375

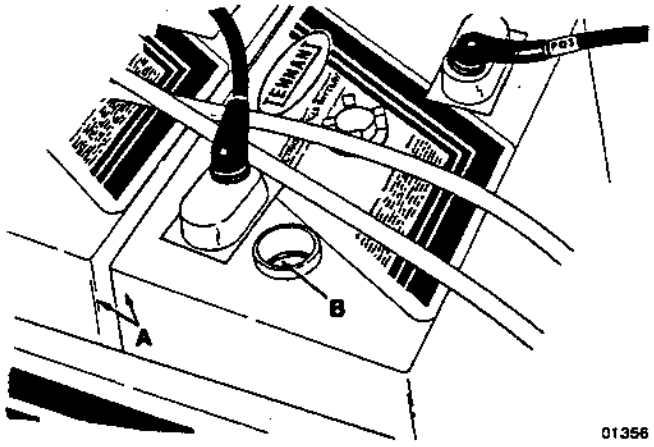
CHARGER CONNECTIONS
A. Machine Connector
B. Battery Connector
C. Charger Connector

9. Plug the battery charger into its power source.
10. Turn the battery charger to the "start" position. The charger pilot light and ammeter will indicate the charger is operating.
11. The batteries will be fully charged when the timer reads "off" or the battery specific gravity is 1.28 to 1.26.

12. Turn the timer to the "off" position.
13. Disconnect the battery charger from its power source.

⚠ CAUTION: Disconnect battery charger power source before disconnecting the battery charger to battery connector.

14. Disconnect the battery charger-to-batteries connector.
15. Check the electrolyte level of the batteries; it should be up to the indicator mark.
16. Reconnect the batteries-to-machine connector.



01356

CHECKING BATTERY ELECTROLYTE LEVEL

A. Battery
B. Electrolyte Indicator Ring

17. Lower the front machine cover.

ACTIVATING DRY-TYPE BATTERIES

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

TO ACTIVATE DRY-TYPE BATTERIES

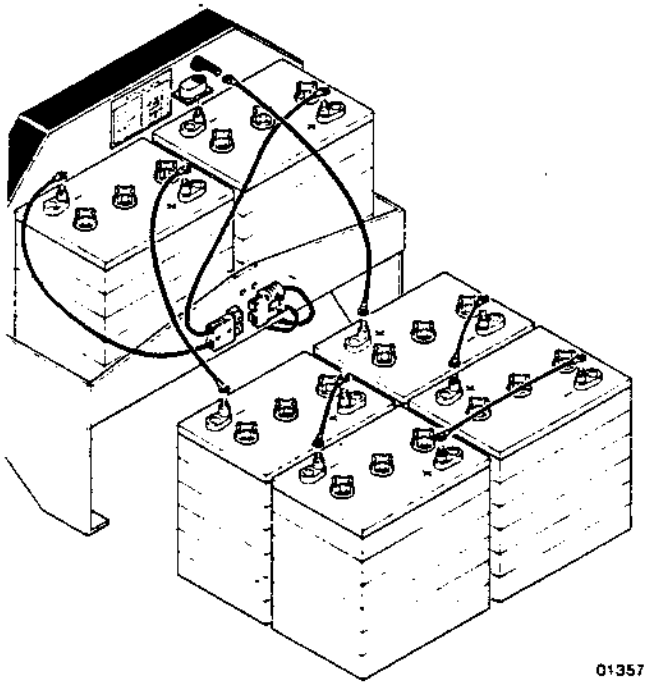
1. Extinguish all cigarettes, fire, and spark producing equipment in the area.

⚠ WARNING: Batteries emit a highly explosive gas that may be ignited by cigarettes, fire, or spark producing equipment.

2. Remove the batteries from the shipping crate and place them on a level surface.
3. Remove and save the battery vent caps; or if they are equipped with ventless plugs, remove and discard the vent plugs.
4. Carefully fill each battery cell with battery grade sulfuric acid to 0.38 in (10 mm) above the battery plates.

⚠ WARNING: Avoid contact with battery acid. Battery acid can cause severe burns. Wash immediately and get medical attention if contact with battery acid occurs.

5. Check the specific gravity of the batteries. Charge the batteries until the specific gravity is 1.28 to 1.26 temperature corrected.
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 battery posts.
11. Fill the batteries with water, if necessary, up to the electrolyte indicator rings. Do not add battery acid to the batteries after inserting the vent caps.

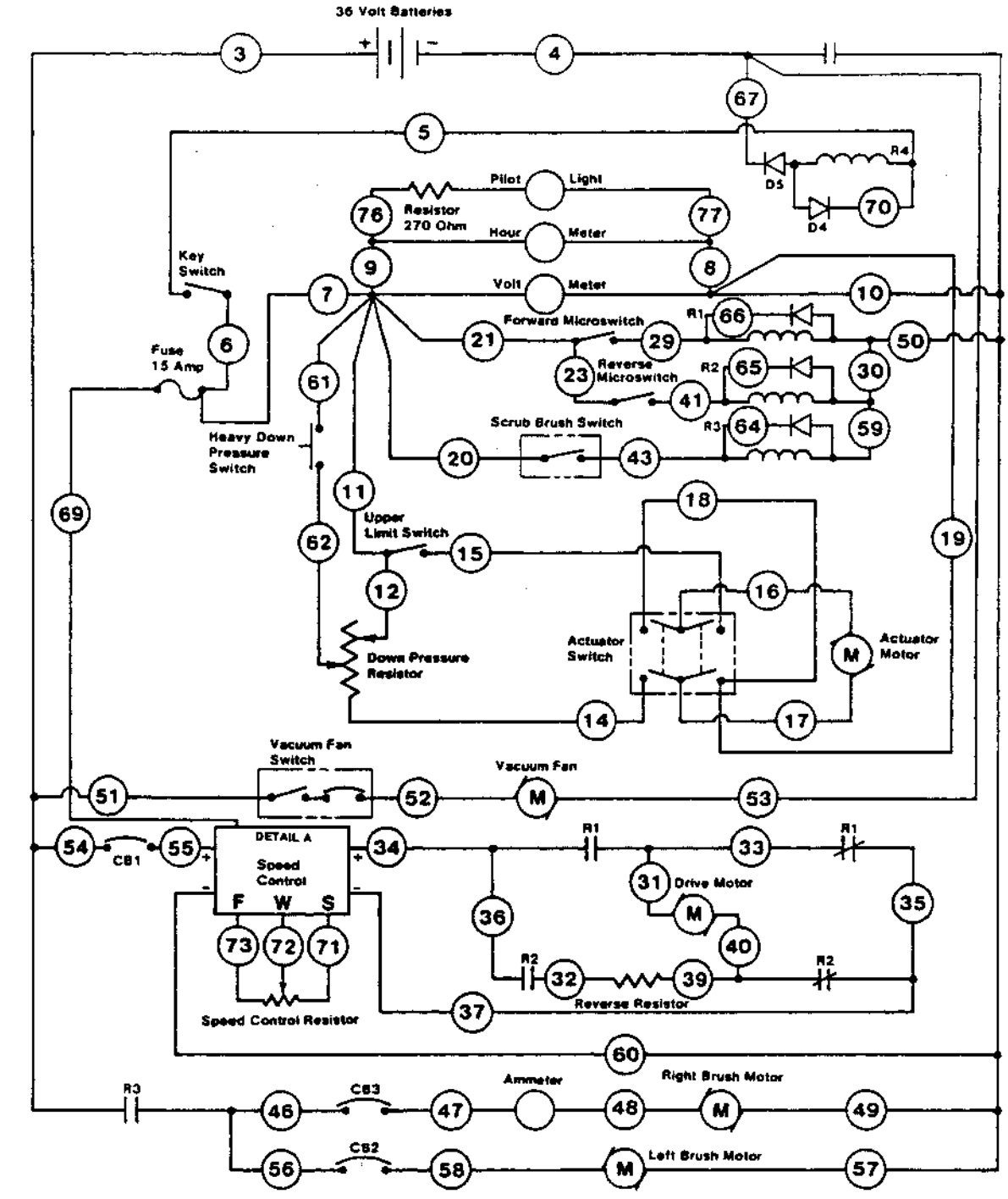

01357

BATTERY CONNECTIONS

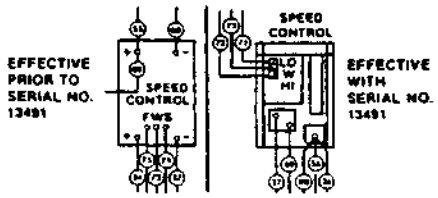
ELECTRIC MOTORS

The electric motor brushes should be inspected and the brush dust should be blown out of the motor after every 160 hours of operation. If the brushes have been worn to less than 0.38 in (10 mm) in length, they should be replaced.

If the commutator is worn or rough, the armature should be removed. The commutator should be turned in a lathe, the mica recut, and commutator polished. Reassemble, and seat the new brushes using a brush seating stone. Be sure the rocker arm is set on the neutral mark.



DETAIL A ——— SPEED CONTROL WIRING



ELECTRICAL SCHEMATIC

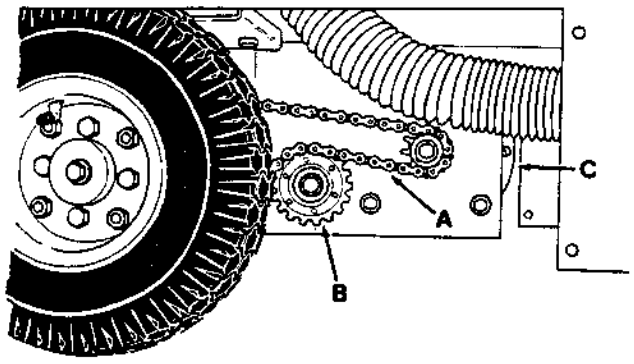
01376

STEERING AND DRIVE

WHEEL DRIVE CHAIN

There is one wheel drive chain on the right side of the machine.

Lubricate the chain with lithium base moly-disulphide EP grease after every 80 hours of operation.



01368

WHEEL DRIVE CHAIN LUBRICATION

A. Chain
B. Chain Idler
C. Drive Motor

Adjust the wheel drive chain tension after every 160 hours of operation.

TO CHECK AND ADJUST WHEEL DRIVE CHAIN TENSION

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

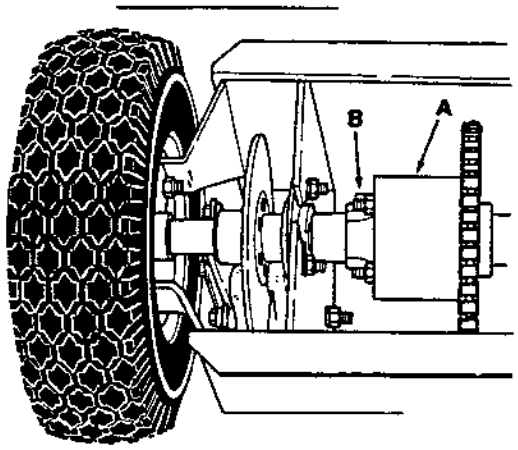
2. Open the machine cover.
3. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before making repairs on the machine.

4. Remove the lower right side access panel.
5. Check the drive chain slack between the drive motor and the differential sprocket. There should be 0.25 in (6 mm) slack.
6. To adjust the chain tension, loosen the chain idler sprocket nut. Slide the chain idler up to tighten the chain, or slide the chain idler down to loosen the chain. Tighten the chain idler sprocket nut.
7. Replace lower side access panel.
8. Reconnect the batteries-to-machine connector.

DIFFERENTIAL

The differential transfers the power from the wheel drive chain to the drive wheels. To keep the internal components of the differential working properly, apply lithium base moly-disulphide EP grease to the differential grease fitting after every 160 hours of operation.



01372

DIFFERENTIAL

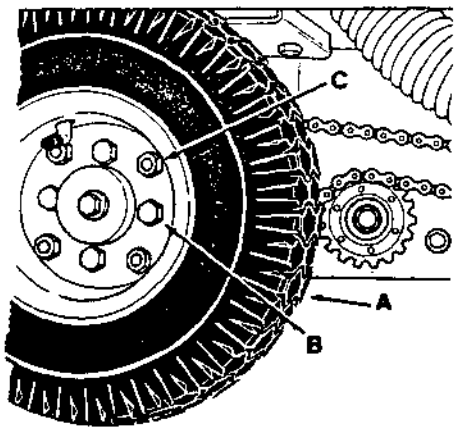
A. Differential
B. Grease Fitting

DRIVE WHEEL TIRES

There is one pneumatic drive wheel tire on each side of the machine. Check the tire air pressure after every 20 hours of operation. The correct air pressure is 65 to 75 psi (448 to 517 kPa).

If the machine is equipped with foam-filled tires, it is not necessary to check the tire air pressure.

When the machine is operated in areas where solvents, oils, and other petroleum-base fluids may contact the tires, clean the tires after every work shift. This will greatly prolong the life of the tire.



01368

RIGHT SIDE TIRE

A. Tire
B. Tire Bolts
C. Rim Half Nuts

When removing tire from the machine, be sure to loosen only the tire bolts. Loosening the rim half nuts will allow the tire rim halves to separate.

⚠ CAUTION: Do not loosen the tire rim half nuts unless the tire tube is completely deflated.

SPEED AND DIRECTIONAL CONTROL

This machine is equipped with a transistorized speed control designed to provide fully variable speed in both forward and reverse directions. The machine is also equipped with dual disc brakes to control the right and left machine direction. The speed control is comprised of:

A. A hand twist steering mechanism which, when twisted, activates directional control microswitches. When pressed to one side, the steering mechanism pulls a brake cable which activates a disc brake that slows the rotation of the wheel on that side of the machine.

B. A forward microswitch, activated by a forward twist of the handle grips, energizes the forward solenoid.

C. A reverse microswitch, activated by a reverse twist of the handle grips, energizes the reverse solenoid.

D. A speed control potentiometer, activated by a sliding mechanism when the handle grips are twisted, raises the voltage that is applied to the transistorized speed control. This varied voltage determines the machine speed.

E. A forward solenoid, R1, activated by the forward microswitch, carries a "forward" current to the drive motor.

F. A reverse solenoid, R2, activated by the reverse microswitch, carries a "reverse" current to the drive motor.

G. A transistorized speed control, activated by a voltage from the speed control potentiometer, sends pulses of electricity to the drive motor turning the motor on and off at varying rates to determine the machine speed.

The transistorized speed control is made up of a printed circuit board and a power controller. The printed circuit board analyzes the voltage from the speed control potentiometer and tells the power controller how much power to send to the drive motor. The printed circuit board deals with low voltage and microamperes of current. The power controller pulses 36 V, high amperage current to the drive motor.

BRAKE CABLES

The brake cables operate the disc brakes on the two drive wheels. Check the brake cable tension after every 80 hours of operation.

TO CHECK AND ADJUST BRAKE CABLE TENSION

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

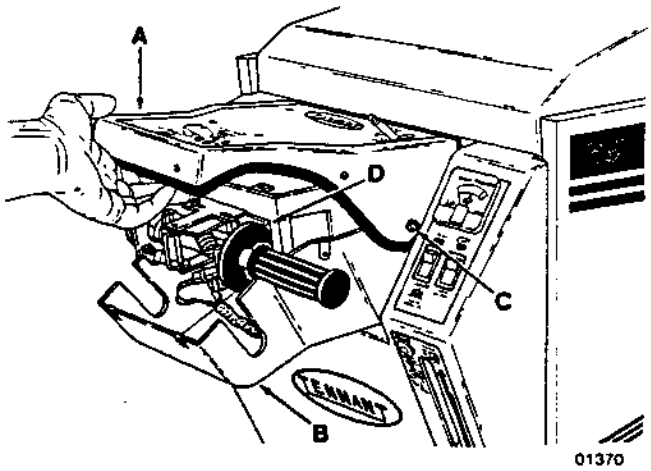
2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Unscrew the solution control lever knob.

4. Remove the eight exposed socket head screws holding the top and bottom console covers to the console frames.

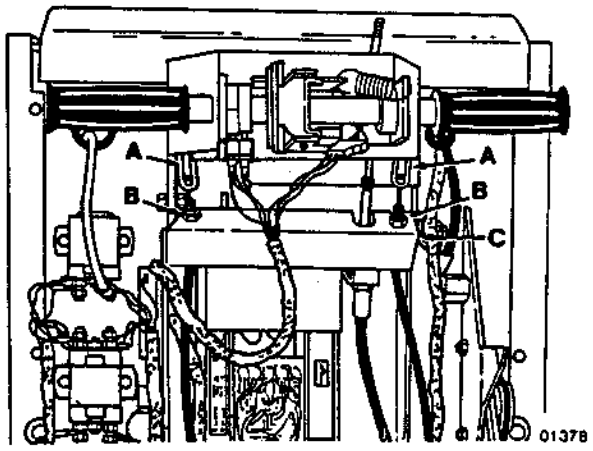
5. Pull the top and bottom console covers apart to gain access to the two remaining socket head screws. Remove the two screws and the console covers.



REMOVING HIDDEN SOCKET CAP SCREWS FROM CONSOLE

A. Top Console Cover
B. Bottom Console Cover
C. Socket Cap Screw
D. Console Frame

6. Loosen the two brake cable lock nuts at the cable mounting bracket.



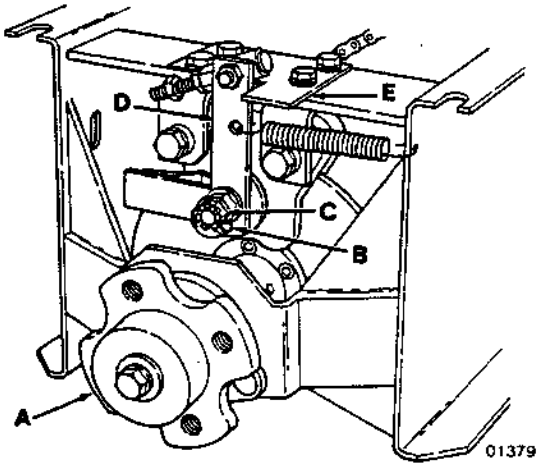
BRAKE CABLE

A. Brake Cable Clevis
B. Lock Nut
C. Cable Mounting Bracket

7. Turn the lower nut, increasing tension on the cable until the brake clevis has slight slack. Turn each cable nut the same amount.

NOTE: One cable nut may have to be adjusted more on one side than the other if the machine is steered mostly to one side.

If adequate cable tension is not achieved after using up all of the cable adjustment, back both brake cables off equally to the middle of the cable adjustment. Jack the rear of the machine up as described in Machine Jacking Instructions. Remove both rear wheels. Remove the cotter pin from the castle nut on each side. Pull the brake bell crank away from the bell crank stop. Turn the castle nut on each side until the distance between the bell crank and the bell crank stop is 0.31 ± 0.06 in (8 ± 2 mm). Replace the cotter pin and tires. Lower the machine. Then fine tune the brake cable adjustment as earlier described.



BRAKE ADJUSTMENTS

A. Wheel Hub
B. Cotter Pin
C. Castle Nut
D. Bell Crank
E. Bell Crank Stop

8. Tighten the brake cable lock nuts.
9. Check the adjustment by pushing down on the handle. The handle should engage the brake almost immediately and should move down one-half the available travel to lock the brake.
10. Connect the batteries-to-machine connector and turn the machine on. Check the brakes to see if they drag without applying downward pressure on the handle. If the brakes drag, reduce the brake cable tension.
11. Disconnect the batteries-to-machine connector.
12. Replace the console covers and the solution control lever knob.

STEERING CONTROL PIVOT POINTS

The steering control mechanism has two pivot points which require regular lubrication. Apply a lithium base moly-disulphide EP grease to each of the pivot points after every 480 hours of operation.

TO LUBRICATE STEERING CONTROL PIVOT POINTS

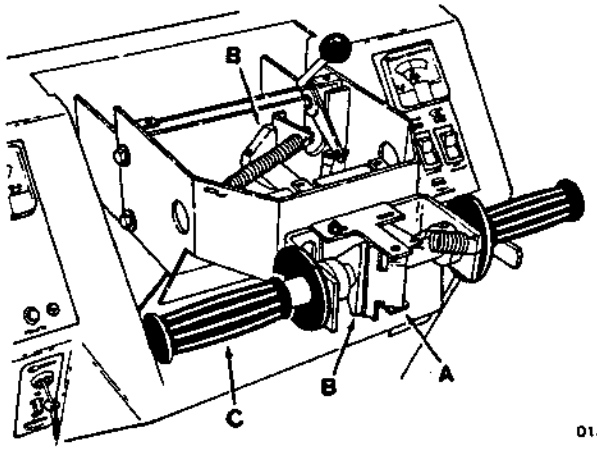
1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Unscrew the solution control lever knob.
4. Remove the eight exposed socket head screws holding the top and bottom console covers to the console frame.
5. Pull the top and bottom console covers apart to gain access to the two remaining socket head screws. Remove the two screws and the console covers.
6. Apply a lithium base moly-disulphide EP grease to the two steering control pivot points.



01371

STEERING CONTROL PIVOT POINTS

A. Console Frame
B. Pivot Point
C. Steering Handle

7. Replace the console covers and solution control lever knob.

DIRECTIONAL CONTROL MICROSWITCHES

The directional control microswitches are factory-adjusted. If the troubleshooting guide has indicated a problem with the microswitch area, or if a microswitch has been replaced, adjust the microswitches as described.

TO ADJUST DIRECTIONAL CONTROL MICRO-SWITCHES

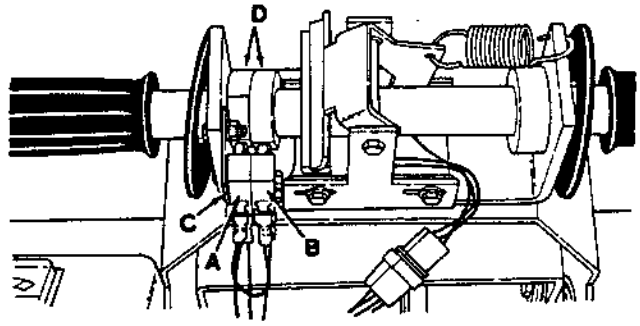
1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Unscrew the solution control lever knob.
4. Remove the eight exposed socket head screws holding the top and bottom console covers to the console frame.
5. Pull the top and bottom console covers apart to gain access to the two remaining socket head screws. Remove the two screws and the console covers.
6. Place ohmmeter leads on both terminals of each microswitch.



01380

DIRECTIONAL CONTROL MICROSWITCHES

A. Forward Microswitch
B. Reverse Microswitch
C. Microswitch Bracket
D. Microswitch Cam

7. Twist the steering handles and observe the ohmmeter reading. The microswitches are normally open, so when the cam activates the microswitch, the ohmmeter should indicate no resistance. If the microswitch is not working properly, replace it. Check both switches. If both microswitches are good, but neither activate in the proper sequence, the microswitch bracket is out of adjustment.

   To adjust the microswitch bracket, loosen the bracket lock screw. Move the bracket up or down so a slight forward twist of the steering handles activates the forward (left) microswitch, and so a slight twist backward, from neutral, activates the reverse (right) microswitch. Then tighten the microswitch bracket lock screw.

   If only one microswitch is out of adjustment, the corresponding microswitch cam should be adjusted.

NOTE: When replacing either microswitch, do not move the adjustment bracket. Just replace the microswitch to possibly avoid having to readjust the microswitch bracket.

8. Replace the console covers and solution control knob.

SPEED CONTROL POTENTIOMETER

The speed control potentiometer is factory adjusted. If the troubleshooting guide has indicated a problem with the speed control potentiometer, or if the potentiometer has been replaced, check and adjust the potentiometer as described.

TO CHECK AND ADJUST SPEED CONTROL POTENTIOMETER

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Unscrew the solution control lever knob.
4. Remove the eight exposed socket head screws holding the top and bottom console covers to the console frame.
5. Pull the top and bottom console covers apart to gain access to the two remaining socket head screws. Remove the two screws and the console covers.
6. To test with an ohmeter:
   A. Disconnect the potentiometer connector.
   B. Position one probe of the ohmeter to the center tab and the other probe to either the right or left side tab.
   C. Twist the handle grip either direction. The meter will either start at zero and move up the scale with the twisting motion or vice versa, depending on which end tap the ohmeter is connected to. If the ohmeter does not follow the twisting motion of the handle grip, the potentiometer tab is broken off, the potentiometer has failed, or the cams or the directional control microswitch bracket is misadjusted.

   To test with a DC voltmeter:

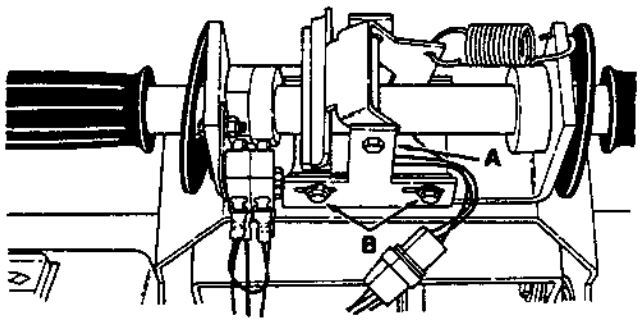
   A. Connect the batteries-to-machine connector and place the master power switch in the "on" position.
   B. Set the voltmeter in the 0-12 VDC range.
   C. Position one probe of the voltmeter to the center tab and the other probe to either the right or left side tab.
   D. Twist the handle grip either direction. Depending on which end tap the voltmeter is connected to, the meter should register 0 to 8 VDC or vice versa. If the meter movement does not follow the twisting motion of the handle grip, the potentiometer tab is broken off, the potentiometer has failed, or the cams or directional control microswitch bracket are misadjusted.

⚠ CAUTION: Use care when testing the machine when the master power switch is in the "on" position. The circuitry is "live." When twisting the handle grips, the machine will move. Be prepared to move with the machine.

If the potentiometer is working properly, check the forward and reverse solenoids.

Replace the potentiometer if the tab is broken off or if the potentiometer has failed. Adjust the potentiometer as further described.

7. Loosen the two potentiometer mounting screws.

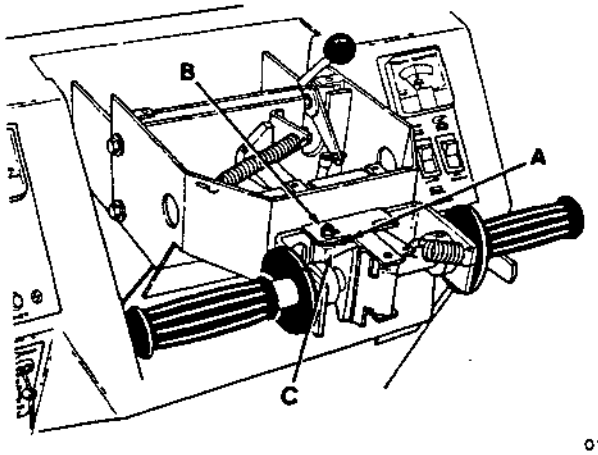


01360

POTENTIOMETER MOUNTING SCREWS

A. Potentiometer
B. Mounting Screw

8. Position the potentiometer and bracket so that the potentiometer sliding tab just reaches the right end of the slot. Also make sure the tab is not bottoming at this point.



01371

SPEED CONTROL POTENTIOMETER

A. Speed Control Potentiometer
B. Stop Screw
C. Sliding Tab

9. Tighten the potentiometer mounting screws.
10. Loosen the potentiometer stop screw.
11. Twist the steering handle fully forward. The sliding tab should contact the stop screw about 0.06 in (2 mm) from the left end of the slot. Tighten the stop bolt.
12. Connect the batteries-to-machine connector and check the machine for proper operation.
13. Disconnect the batteries-to-machine connector.
14. Replace the console covers and solution control knob.

FORWARD AND REVERSE SOLENOIDS

The forward and reverse solenoids cannot be adjusted. If the directional control microswitches are operating properly but a click is not heard upon actuation of the microswitches, the solenoid may be faulty. If a click is heard, the contacts may be burnt and will not carry current. In either case, the solenoid must be replaced.

TO TEST SOLENOID

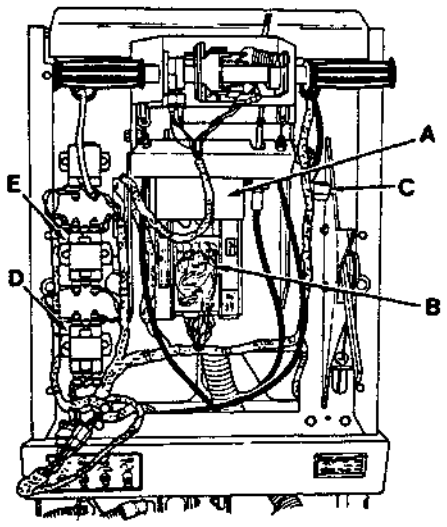
1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Open the rear machine cover.
4. Remove the four hex bolts holding the top rear shroud.
5. Remove the two hex bolts from the bottom rear of the shroud.
6. Lower the rear shroud to the floor. Place it on a protective pad.
7. Remove the two hex bolts holding the speed control shroud in place. Remove the shroud.



01378

REAR FRAME COMPONENTS

A. Speed Control Shroud
B. Speed Control
C. Negative Standoff
D. Forward Solenoid
E. Reverse Solenoid

8. Place the master power switch in the "on" position.
9. Twist the hand grips in the direction of the malfunction.
10. To check the solenoid coil, using a DC voltmeter set on a range above 36 V, place one probe on the coil wire post and the other probe on the negative standoff on the right side of the rear frame. If 36 V are read and the solenoid doesn't click, the solenoid coil is faulty.
11. To check the solenoid contacts, place one probe of the voltmeter on the negative standoff and the other probe on the top left post of the solenoid. Twist the hand grip. If the solenoid clicks and no current is registered, the solenoid contacts are bad.

NOTE: At this point, if the solenoids operate properly in both directions but the drive motor will not operate in either direction, the problem could either be in the speed control or motor. If the machine operates in one direction only at this point, the problem is most likely in the speed control.

TRANSISTORIZED SPEED CONTROL

The transistorized speed control is factory adjusted. If the previous circuit checks have been made and the troubleshooting guide indicates a problem with the transistorized speed control, or if the unit has been replaced, check and adjust the unit as described.

TO CHECK AND ADJUST TRANSISTORIZED SPEED CONTROL

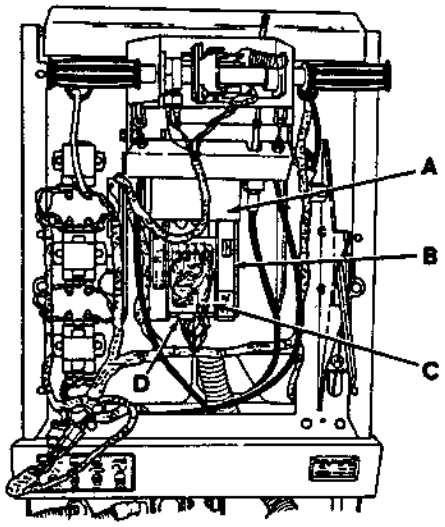
1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Open the rear machine cover.
4. Remove the four hex bolts holding the top rear shroud.
5. Remove the two hex bolts from the bottom rear of the shroud.
6. Lower the rear shroud to the floor. Lay it on a protective pad.
7. Remove the two hex bolts holding the speed control shroud in place. Remove the shroud.



01378

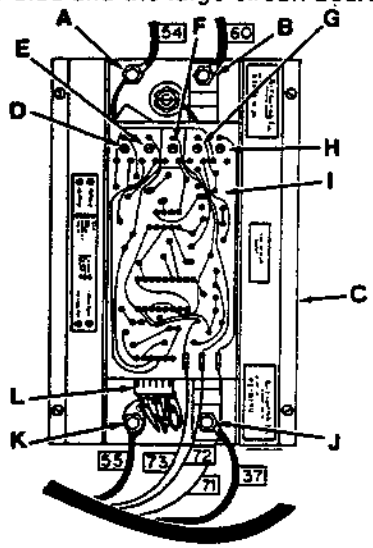
REAR FRAME COMPONENTS

A. Speed Control Shroud
B. Speed Control
C. "HI," "W," "LO," Terminals
D. Multipin Connector

8. Make a visual inspection of the speed control.

Observe all of the circuit board components for burn spots. If burn spots are found, substitute a new speed control in the circuit. If the problem is corrected, the speed control was at fault.

NOTE: Be sure when reinstalling speed controls that all wire connections are properly made. Refer to the electrical schematic or pictorial diagram. Also, when removing or replacing wires on the main "in" or "out" terminals of the speed control, be sure to hold the bottom stud lock nut with a wrench. This will keep the stud from loosening and destroying the connection between the stud and the large circuit board.



SPEED CONTROL UNIT 01382

A. Positive (+) Battery Input
B. Negative (-) Battery Input
C. Speed Control
D. IR Potentiometer
E. CUR LIM Potentiometer
F. MAX Potentiometer
G. ACCEL Potentiometer
H. MIN Potentiometer
I. Printed Circuit Board
J. Negative (-) Motor Output
K. Positive (+) Motor Output
L. Multipin Connector

9. Adjust replacement circuit boards or entire speed controls before using the machine. There are five adjustment potentiometers on the printed circuit board. They are labeled:

   IR - factory adjusted to minimum setting, do not tamper or the warranty will be voided.

   CUR LIM - factory adjusted to maximum setting, do not tamper or the warranty will be voided.

   MAX - user adjustable, adjusts the maximum machine speed by finding the saturation pulse point of the transistors.

   ACCEL - user adjustable, balances the machine acceleration so it is smooth, not jerky.

   MIN - user adjustable, sets the minimum machine speed.

   Using an assistant, adjust the speed control as follows:

   A. Connect the batteries-to-machine connector.

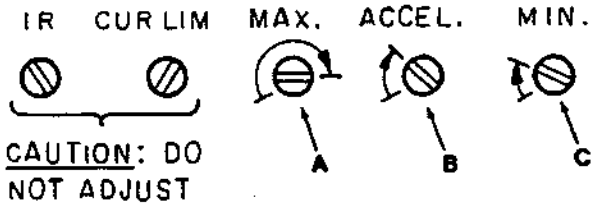
⚠ CAUTION: The machine circuitry is "live," do not drop metal objects into the machine electrical components.

B. Have the assistant carry rear shroud as the machine will be moving while adjustments are being made.

C. Turn master power switch to the "on" position.

D. Operate machine at full speed. While operating, adjust the MAX potentiometer slightly counterclockwise just beyond the point where the hum disappears and the speed no longer increases. Normal factory adjustment is approximately at 3:00.

NOTE: If MIN cannot be adjusted correctly, the MAX adjustment may be adjusted too far beyond the point where the hum disappears.



01377

POTENTIOMETER POSITIONS

A. 3:00 Position
B. 10:30 Position
C. 9:30 Position

E. Check the acceleration of the machine. If the machine accelerates too quickly or in a jerky manner, adjust the ACCEL potentiometer clockwise. If the machine accelerates too slowly, adjust the ACCEL potentiometer counterclockwise. Normal factory adjustment is at 10:30.

F. Slowly rotate the hand twist grip forward just to the point where the forward solenoids are activated (click). A humming sound should result with no machine movement. If the machine begins to move, rotate the MIN potentiometer counterclockwise until there is a hum without machine movement. If no hum is apparent, rotate the MIN potentiometer clockwise until a hum appears without machine movement. Normal factory adjustment is approximately at 9:30.

ATTENTION! If the battery cables were removed, be sure they are reinstalled correctly. Incorrectly connecting the battery cables will damage the speed control unit.

10. Disconnect the batteries-to-machine connector.

11. Replace the speed control shroud and the rear shroud.

PARKING BRAKE

The parking brake operates the steering control brake cables. Adjust the parking brake whenever adjusting the steering control cables or brakes.

TO ADJUST PARKING BRAKE

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

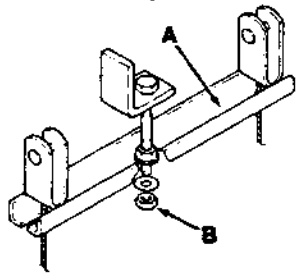
⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine.

3. Unscrew the solution control lever knob.

4. Remove the eight exposed socket head screws holding the top and bottom console covers to the console frame.

5. Pull the top and bottom console covers apart to gain access to the two remaining socket head screws. Remove the two screws and the console covers.

6. Adjust the brake channel adjustment nut so that when the parking brake lever is engaged, the machine will not propel forward. There must be no drag when the parking brake is disengaged. The steering and battery run-time will be reduced if drag is present.



ADJUSTMENT NUT 02857

A. Brake Channel
B. Adjustment Nut

7. Replace the console covers and solution control knob.

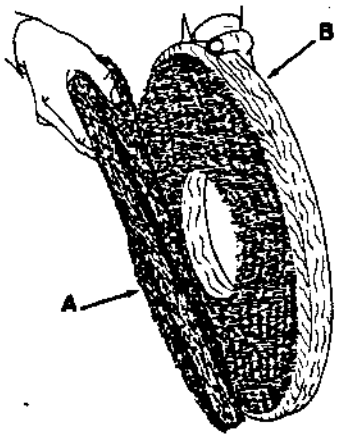
SCRUB HEAD

SCRUB BRUSHES

Two disc-type scrub brushes are used to scrub the floor surface. Each scrub brush is driven by a separate electric motor. The scrub brushes are connected to the motor through a floating drive assembly. Spring clips hold the scrub brushes to the floating drive assembly.

There are many variations of brushes and cleaning pads to choose from. A scrub brush or cleaning pad is available for any application.

Scrub brushes are ready for use when they are equipped with a brush drive plate and spring clip assembly. Cleaning pads must be placed on drive pads equipped with a brush drive plate and spring clip assembly before they are ready for use. Cleaning pads cling to one drive pad through the use of Insta-Lok fibers.



00910

INSTA-LOK CLEANING PAD DRIVE

A. Cleaning Pad
B. Drive Pad

SCRUB BRUSH REPLACEMENT

Scrub brushes or cleaning pads should be checked daily for tangled wire or string, wear, or damage. Scrub brushes should be replaced if large portions of the brush bristles are missing or if the remaining brush bristle length is less than 0.50 to 0.25 in (13 to 6 mm).

Cleaning pads should be cleaned when soilage or wax clogs the pads. Cleaning pads should be replaced when they become damaged or when the pads cannot be cleaned enough to produce acceptable cleaning results.

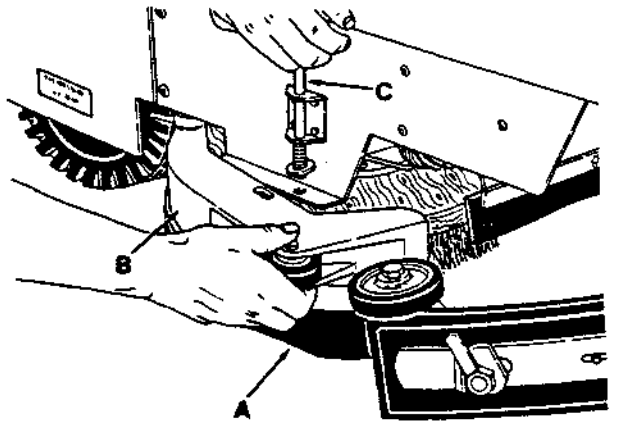
NOTE: Be sure to replace brushes or pads in sets. Otherwise, one scrub brush or pad will be more aggressive than the other.

TO REMOVE SCRUB BRUSHES

1. Push the scrub head position switch forward in the "raise" position until the scrub head is fully raised.
2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Pull the right side skirt shell retaining pin up.



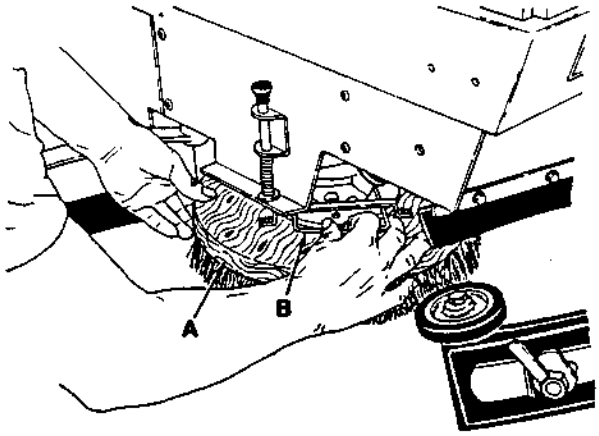
01383

REMOVING SIDE SKIRT SHELL

A. Side Skirt
B. Skirt Shell
C. Retaining Pin

4. Slide the skirt shell open and release the retaining pin.
5. Rotate the scrub brush until the brush spring clip is exposed.
6. Press the brush spring clip together with a thumb and index finger, and apply downward pressure to the scrub brush to release it from the brush drive plug.

POWER SCRUBBER - 426 MM144 (8-82) LITHO IN U.S.A.



01384

REMOVING SCRUB BRUSH

A. Scrub Brush
B. Brush Spring Clip

7. Repeat the procedure for the left scrub brush.

TO INSTALL SCRUB BRUSHES

1. Slide the left scrub brush under the scrub brush drive plug.
2. Line up the hex socket of the scrub brush with the hex on the drive plug.
3. Press the brush spring clip together and lift the scrub brush into place over the brush drive plug. Release the spring clip when the brush is in place.
4. Pull the left side skirt shell retaining pin up.
5. Slide the skirt shell into place over the machine frame lip and release the retaining pin.
6. Repeat the procedure for the right scrub brush.

SCRUB BRUSH ADJUSTMENT

The scrub brush overlap prevents centerline streaking of the scrub brushes. Scrub brush overlap is adjusted by moving the scrub brush motors in their slotted mounting holes. The proper adjustment is achieved when there is 13 in (330 mm) between the centers of the brush drive plugs.

Scrub brush down pressure is self-regulating. An adjustable resistor has been factory matched to the actuator in the machine. When the electric actuator is being extended, the actuator extends until it stalls out due to a limited amount of voltage. When the heavy brush pressure feature is exercised, additional voltage is applied to the actuator to further extend it. When required, replace the actuator and the adjustable resistor as a set.

The scrub brush lift actuator has an upper limit switch that controls the maximum brush height. The distance between the floor and the bottom of the scrub brush drive plug should be 4 in (102 mm). Adjust the limit switch after replacing the actuator or the limit switch, or if the actuator does not shut itself off when raising the scrub brushes and ratchets. Ratcheting the actuator can burn the actuator motor out. Be sure the drive tires are properly inflated before making scrub brush adjustments.

To adjust the maximum brush height, loosen the microswitch worm drive clamp; slide the microswitch assembly forward to reduce the height or slide the microswitch assembly backward to increase the height, and retighten the worm drive clamp.

NOTE: Do not move the microswitch assembly too far backward as the actuator may not shut off and will ratchet.

SOLUTION SUPPLY AND RECOVERY SYSTEMS

SOLUTION SUPPLY SYSTEM

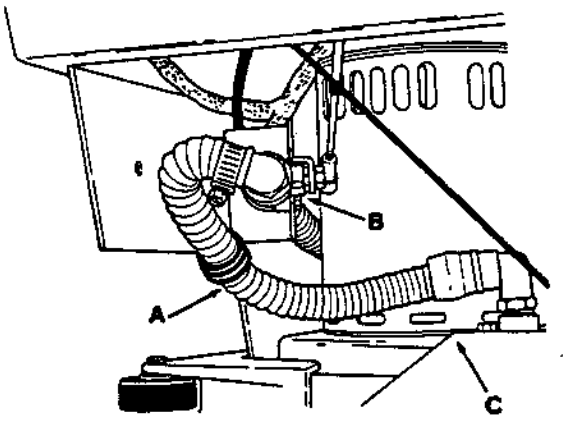
The solution supply system consists of the solution tank and the solution supply hoses and control valve. Under normal operating conditions, the solution tank and the solution supply hoses and control valve should be cleaned after every 80 hours of operation.

TO CLEAN SOLUTION SUPPLY SYSTEM

1. Stop the rear of the machine next to a floor drain.
2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Pull the solution feed hose off the elbow on the scrub head frame. Aim the end of the hose at the floor drain.



01385

SOLUTION FEED HOSE

A. Solution Feed Hose
B. Solution Control Valve
C. Scrub Head Frame

4. Open the rear machine cover.
5. Lift the solution tank cover off the solution tank.
6. Push the solution control lever to open the solution control valve.
7. Hose out the interior of the solution tank.
8. Direct a stream of clean water at the solution tank solution system outlet to flush the solution supply hoses and control valve.
9. Reconnect the solution feed hose to the elbow on the scrub head frame.
10. Replace the solution tank cover on the solution tank.
11. Close the rear machine cover.
12. Pull the solution control lever back into the "off" position to close the solution control valve.

SOLUTION RECOVERY SYSTEM

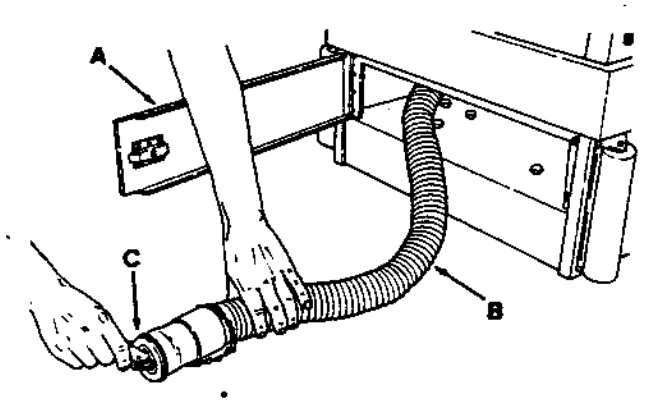
The solution recovery system consists of the recovery tank, the vacuum fan, the solution pickup hose, and the rear squeegee assembly. Under normal operating conditions, the solution recovery system should be cleaned after each work shift. The vacuum fan filter requires cleaning whenever the recovery tank is drained and after each work shift.

TO CLEAN SOLUTION RECOVERY SYSTEM

1. Stop the front of the machine next to a floor drain.
2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Open the drain hose access door.
4. Remove the drain hose from the machine.



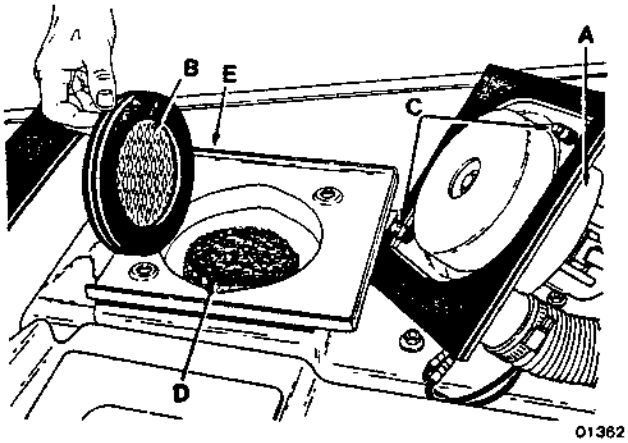
01361

RECOVERY TANK DRAIN HOSE

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

5. Unlatch and remove the hose plug from the drain hose next to the drain.
6. Open the rear machine cover.
7. Unlatch the two vacuum fan cover latches.
8. Lift the vacuum fan off the recovery tank cover.
9. Lift out the vacuum fan screen and filter from the recovery tank cover.

POWER SCRUBBER - 426 MM144 (4-85) LITHO IN U.S.A.



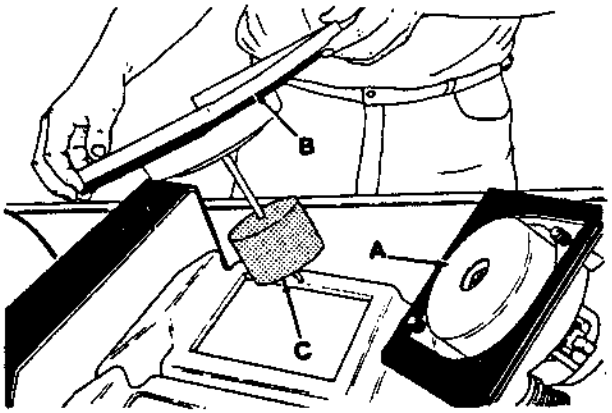
01362

REMOVING VACUUM FAN SCREEN AND FILTER

A. Vacuum Fan
B. Screen
C. Cover Latch
D. Filter
E. Recovery Tank Cover

10. Rinse and clean the vacuum fan screen and filter.

11. Remove the recovery tank cover from the recovery tank and rinse float clean.



01366

REMOVING RECOVERY TANK COVER

A. Vacuum Fan
B. Recovery Tank Cover
C. Float

12. Hose out the interior of the recovery tank.

13. Direct the flow of water into the solution pickup hose to backflush the hose.

14. Place the recovery tank cover on the recovery tank.

15. Position the vacuum fan screen and filter on the recovery tank cover.

NOTE: Position the screen and filter on the recovery tank cover with the screen on top of the filter.

16. Position the vacuum fan on top of the recovery tank cover.

17. Latch the two vacuum fan cover latches.

18. Lower the rear machine cover.

19. Replace the recovery tank drain hose plug.

20. Place the drain hose in its storage compartment and close the access door.

SQUEEGEE ASSEMBLY

The squeegee assembly is made up of a front squeegee blade and blade retainer, a squeegee frame and a rear squeegee blade, backup strip and blade retainer. The front squeegee blade channels water into the center of the squeegee frame. The rear squeegee blade wipes the floor nearly dry.

The squeegee assembly can be removed easily for loading and unloading on trailers or to allow the machine to pass through narrow doorways or passageways.

Check the squeegee blades for wear or damage daily.

The rear squeegee blade has four edges which may be used to wipe the floor. Rotate end-for-end, or flip the squeegee blade when approximately one-half of the squeegee blade width has worn. Replace the squeegee blade when all four edges have worn. Replace the front squeegee blade if it is damaged or if the rear squeegee blade has worn all four edges.

The squeegee assembly should be adjusted for proper down pressure after every 20 hours of operation.

The squeegee lift cable requires no regular adjustment. After cable or cable guide replacement, adjustment is required. Lubricate the squeegee assembly pivot after every 80 hours of operation.

TO REMOVE SQUEEGEE ASSEMBLY

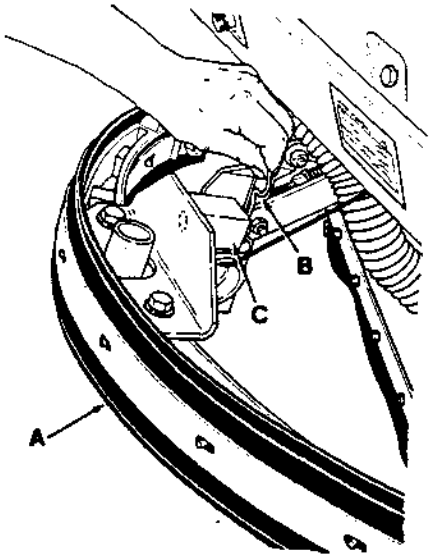
1. Raise the squeegee assembly.

2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Pull the squeegee suction hose off the squeegee frame.

4. Pull the squeegee assembly retaining pin out of the squeegee pivot pin.



01387

REMOVING RETAINING PIN

A. Squeegee Assembly
B. Retaining Pin
C. Squeegee Pivot Block

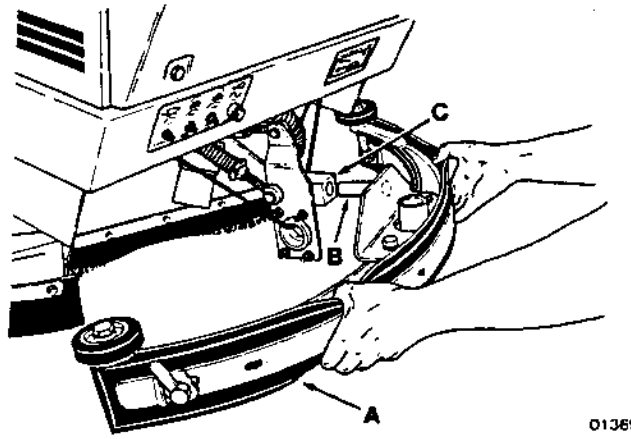
5. Pull the squeegee assembly out of the squeegee mounting block.

TO INSTALL SQUEEGEE ASSEMBLY

1. Place the squeegee lift handle in the "raised" position.
2. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

3. Slide the squeegee assembly pivot pin into the squeegee mounting block.



01369

INSTALLING SQUEEGEE ASSEMBLY

A. Squeegee Assembly
B. Pivot Pin
C. Squeegee Mounting Block

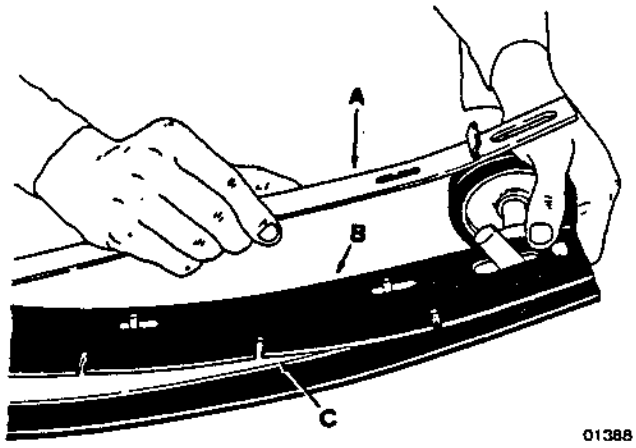
4. Insert the squeegee assembly retaining pin through the squeegee pivot pin.
5. Push the squeegee suction hose onto the squeegee frame hose connection.

TO REPLACE SQUEEGEE BLADES

1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Remove the rear squeegee assembly from the machine as described in To Remove Squeegee Assembly.
3. Place the rear squeegee assembly on a work bench.
4. Remove one of the front squeegee cams to relieve tension on the squeegee retention band.
5. Remove the remaining cam and the retention band.
6. Remove the front squeegee from the squeegee frame.
7. Position the new front squeegee blade on the squeegee frame pins.



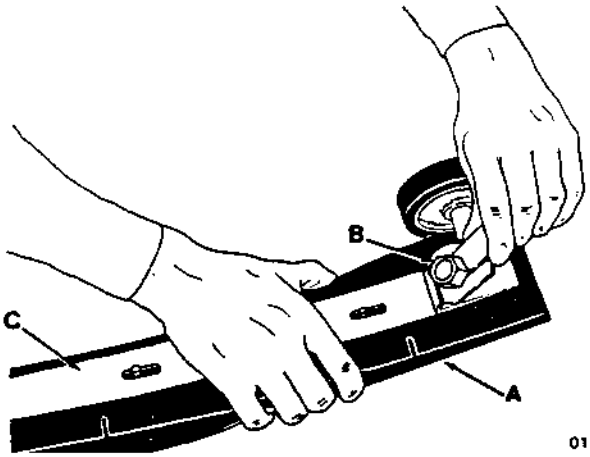
01388

INSTALLING FRONT SQUEEGEE BLADE AND BAND

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

8. Position the retention band over the squeegee blade.
9. Position the cams on the squeegee retention band.

NOTE: The cam stamped with an RH should be on the right side of the squeegee, as seen from the rear of the machine.



01389

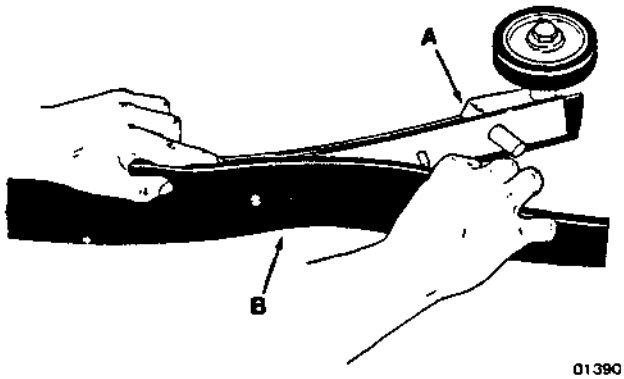
INSTALLING CAM

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

10. Tighten the cams at the same time to tighten the front squeegee in place.

NOTE: The cam levers should be above the horizontal axis to keep from possibly scratching the floor. If the cam levers are below the horizontal axis, loosen the cams and retighten them. Make sure the cam stamped with an RH is on the right side of the squeegee. Overtightening the levered cam may damage the squeegee frame and retention band.

11. Turn the rear squeegee cams to relieve tension on the squeegee retention band.
12. Remove the squeegee retention band and cams.
13. Remove the backup strip and rear squeegee from the squeegee frame.
14. 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.
15. Position the rear squeegee blade on the squeegee frame pins.

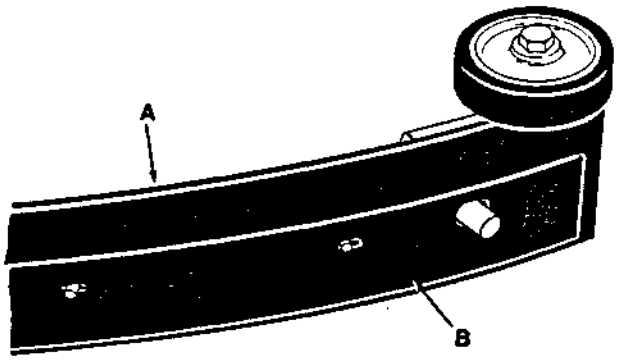


01390

INSTALLING REAR SQUEEGEE BLADE

A. Squeegee Frame
B. Rear Squeegee Blade

16. Position the squeegee backup strip over the rear squeegee.



01391

INSTALLING BACKUP STRIP

A. Rear Squeegee Blade
B. Backup Strip

17. Position the cams on the squeegee retention band.

NOTE: The cam stamped with an RH should be on the right side of the squeegee, as seen from the rear of the machine.

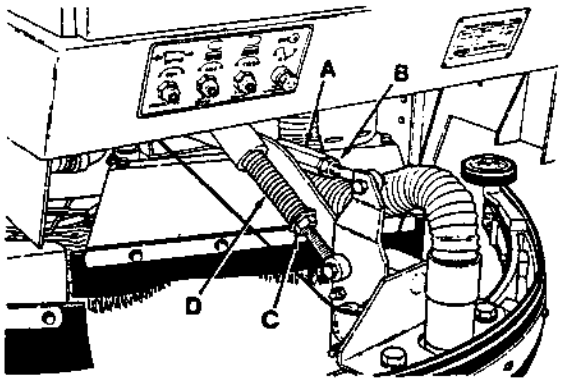
18. Tighten the cams at the same time to tighten the rear squeegee in place.

NOTE: The cam levers should be above the horizontal axis to keep from possibly scratching the floor. If the cam levers are below the horizontal axis, loosen the cams and retighten them. Make sure the cam stamped with an RH is on the right side of the squeegee. Overtightening the levered cam may damage the squeegee frame and retention band.

TO ADJUST SQUEEGEE DOWN PRESSURE

1. Place the master power switch in the "on" position.
2. Place the squeegee lift handle in the "lower" position.
3. Operate the machine in a forward direction to deflect the squeegee blades.
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, loosen the squeegee angle turnbuckle jam nuts and rotate the turnbuckle clockwise. Recheck the squeegee deflection, readjust if necessary, and tighten the jam nuts.

   If the squeegee tips are deflecting more than the middle of the squeegee, loosen the squeegee angle turnbuckle jam nuts and rotate the turnbuckle counterclockwise. Recheck the squeegee deflection, readjust if necessary, and retighten the jam nuts.



01392

SQUEEGEE ADJUSTMENTS

A. Squeegee Angle Turnbuckle
B. Jam Nut
C. Down Pressure Adjustment Nut
D. Down Pressure Spring

5. Raise and lower the squeegee.
6. Operate the machine in a forward direction to deflect the squeegee blades.
7. Check the rear squeegee blade deflection. The rear squeegee should deflect approximately 0.5 in (13 mm). If the squeegee is deflecting too much, turn the squeegee down pressure adjustment nut counterclockwise. If the squeegee is deflecting too little, turn the squeegee down pressure adjustment nut clockwise.

TO ADJUST SQUEEGEE LIFT CABLE

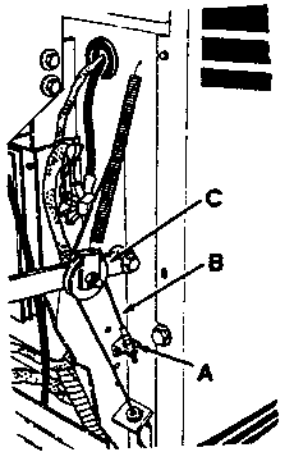
1. Place the master power switch in the "off" position.

⚠ CAUTION: Always place the master power switch in the "off" position before working on the machine.

2. Disconnect the batteries-to-machine connector.

⚠ CAUTION: Always disconnect the batteries-to-machine connector before working on machine electrical components.

3. Open the rear machine cover.
4. Remove the four hex bolts holding the top rear shroud.
5. Remove the two hex bolts from the bottom rear of the shroud.
6. Lower the rear shroud to the floor. Place it on a protective pad.
7. Place the squeegee lift handle in the "raised" position.
8. Loosen the top squeegee lift cable jam nut.



01393

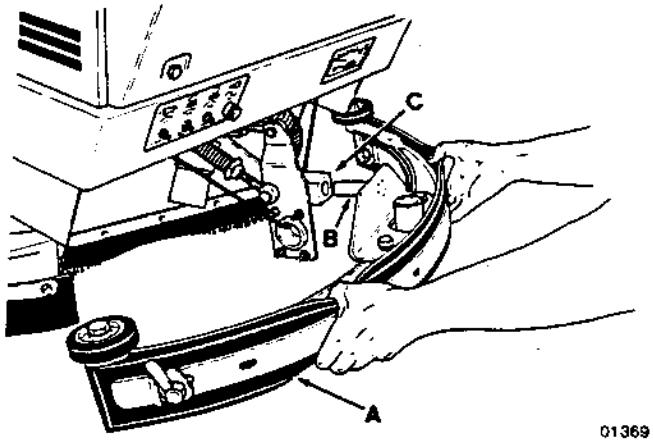
SQUEEGEE LIFT CABLE

A. Jam Nut
B. Lift Cable
C. Cable Roller

9. Adjust the lower jam nut until the entire rear squeegee clears the floor by 1 in (25 mm).
10. Tighten the top jam nut.
11. Reinstall the rear shroud.
12. Close the rear machine cover.

SQUEEGEE ASSEMBLY PIVOT LUBRICATION

The squeegee frame pivot connects the squeegee assembly to the machine. To keep the pivot movement free and to make mounting and dismounting the squeegee assembly easier, lubricate the squeegee pivot pin with a lithium base moly-disulphide EP grease after every 80 hours of operation.



01369

SQUEEGEE PIVOT

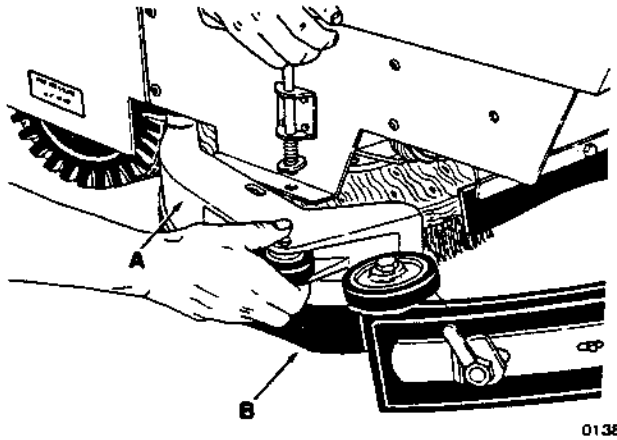
A. Squeegee Frame
B. Pivot Pin
C. Pivot Block

SKIRTS

SIDE SKIRTS

The side skirts control the scrub brush water spray. Check the skirts for wear or damage daily.

The side skirt floor clearance should be adjusted after every 80 hours of operation. The skirts should be adjusted so there is a maximum of 0.06 in (2 mm) space between the floor and the bottom of the skirts.



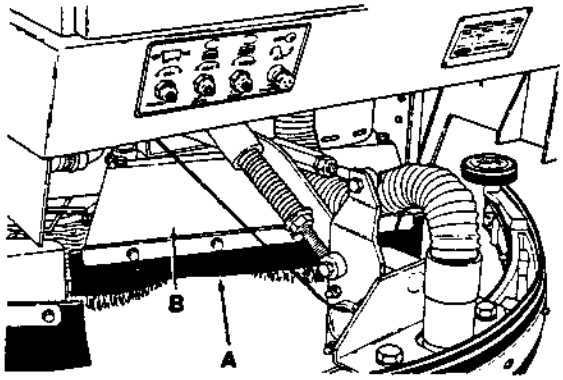
01383

SIDE SKIRT

A. Side Skirt Shell
B. Side Skirt

REAR BRUSH SKIRT

The rear brush skirt controls the scrub brush water spray. Check the skirt for wear or damage daily. There is no adjustment needed on the rear brush skirt.



01392

REAR BRUSH SKIRT

A. Rear Brush Skirt
B. Rear Brush Shroud

TROUBLESHOOTING

DEFECT	PROBABLE CAUSE	REMEDY
GENERAL SECTION		
No machine functions at all	Battery connector in battery compartment not plugged in.	Attach connector and test.
	Batteries completely discharged.	Charge batteries.
	Battery cable disconnected or corroded.	Check all connections for tightness. Clean and lubricate corroded connections.
	Key switch not turned on.	Key switch must be "on" for all functions except vacuum motor. Light on panel indicates "on" condition.
	Main circuit fuse blown.	Install new fuse. If it blows immediately, a short circuit is indicated and a circuit check should be made.
	Open electrical circuit.	Trace main electrical circuit.
	Key switch defective.	Replace switch.
SPEED CONTROL SECTION (also see Transport Drive Section).		
No transport drive, either direction.	Drive circuit breaker tripped.	Push breaker button. If it trips immediately, trace circuit to locate overload or short.
	Motor connector unplugged.	Reattach plug and check.
	Open electrical circuit.	Trace drive system electrical circuit.
	Potentiometer drive disconnected.	Repair potentiometer drive.
	Potentiometer defective.	Replace potentiometer and test.
	Speed control defective.	Speed control should be replaced and tested.
	Motor brushes worn.	Replace drive motor brushes.
	Motor defective.	Replace drive motor.

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DEFECT	PROBABLE CAUSE	REMEDY
No forward, only reverse.	Switch cam out of adjustment.	Adjust forward switch cam.
	Switch defective.	Replace forward microswitch.
	Forward motor solenoid defective.	Replace solenoid contactor.
	Electrical open in forward circuit.	Trace forward electrical circuit to locate open.
No reverse, only forward.	Switch cam out of adjustment.	Adjust reverse switch cam.
	Switch defective.	Replace reverse microswitch.
	Reverse motor solenoid defective.	Replace reverse solenoid contactor.
	Electrical open in reverse speed control resistor.	Replace resistor. Failure was probably caused either by using reverse as a brake, or unit was backed into an obstruction which caused circuit overload. Warn machine operators of future potential problems.
	Electrical open in reverse circuit.	Trace reverse electrical circuit to locate open.
Constant speed - no variation available.	Potentimeter drive disconnected or slide tab broken.	Reconnect, or install new potentiometer. Proper adjustment of potentiometer drive stop tabs will prevent slide breakage.
	Potentiometer defective.	Replace potentiometer.
	Speed control defective.	Speed control should be replaced and tested.
Uneven (jerky) drive on start.	Potentiometer out of adjustment.	Readjust potentiometer and/or stop tabs to obtain proper performance.
	Speed control not properly adjusted.	Individual potentiometers on speed control circuit board may need adjustment. These adjustments should only be performed by qualified service personnel.
	Speed control defective.	Replace speed control.

DEFECT	PROBABLE CAUSE	REMEDY
Drive circuit breaker trips during use.	Operator attempting too steep grade.	Steep inclines may cause circuit overload and tripping of breaker. If breaker continually trips, try to negotiate with all other systems turned off. If breaker still trips, grade is too steep and should not be attempted.
	Machine travel obstructed.	Remove physical obstruction.
	Brake(s) dragging.	Back off brake cable adjustment(s).
	Motor brushes worn.	Replace motor brushes.
	Electrical short circuit.	Trace drive electrical circuit. Correct short condition.
	Defective motor.	Replace drive motor.
	Caster or differential bearings seized or dragging.	Replace as required.
Drive control (either direction) will not shut off.	Return cam needs lubrication.	Lubricate pivot points.
	Switch cam out of adjustment.	Readjust problem switch cam.
	Short in switch.	Replace switch.
	Solenoid shorted or welded.	Replace problem solenoid contactor.
Speed control twist grips will not return to neutral automatically.	Return cams require lubrication.	Lubricate control console pivot points.
	Return spring weak, broken, or disconnected.	Repair or replace return spring.
	Pivot mechanism binding.	Locate source of binding. Repair and lubricate.
	Potentimeter bracket out of adjustment.	Readjust bracket and stops.
Reverse control resistor smokes.	Machine travel obstructed while attempting reverse.	Remove or travel around obstruction.
	Operator using reverse as brake.	Reverse control should not be used as a brake.
	Brake(s) dragging.	Back off brake cable adjustments to remove drag.

POWER SCRUBBER - 426 MM144 (8-82) LITHO IN U.S.A

DEFECT	PROBABLE CAUSE	REMEDY
Drive "pulsates" during operation.	Battery charge low.	Charge batteries.
	Operator attempting to negotiate incline (ramp) with too steep grade.	Reduce load by turning off all other functions, or discontinue running on this grade..
	Speed control out of adjustment.	Individual potentiometers on speed control circuit board may need adjustment. These adjustments should only be performed by qualified service personnel.
	Speed control defective.	Replace circuit board or complete speed control.
	Motor brushes worn.	Replace drive motor brushes.
TRANSPORT DRIVE SECTION - MECHANICAL (see speed control ection also for electrical)		
Motor runs, but no drive.	Drive chain disconnected or broken.	Reattach or install new, drive chain.
	Key sheared or missing in motor sprocket.	Replace key.
	Key sheared or missing in either drive hub.	Replace key.
	Defective gear section in differential.	Replace differential.
Drive "noisy".	Drive chain loose.	Retension drive chain.
	Loose hardware in drive section.	Inspect and tighten all hardware if loose.
	Low lubricant level in differential.	Grease differential.
BRUSH DRIVE SECTION		
Brush motors will not run.	Brush switch defective.	Replace brush switch.
	Open in electrical circuit.	Trace brush drive circuit to locate open.
	Motor solenoid defective.	Replace solenoid.
One brush motor will not run.	Circuit breaker tripped.	Reset breaker. Tripped breaker usually indicates excessive brush pressure. Reduce pressure and continue.
	Motor connector disconnected.	Reconnect.
	Open in individual motor circuit.	Trace brush drive electrical circuit to locate open.
	Motor brushes worn.	Replace motor brushes.
	Motor defective.	Replace motor.

DEFECT	PROBABLE CAUSE	REMEDY
Breakers trip constantly.	Excessive brush pressure applied, overloading circuits.	Reduce brush pressure. Meter should show operation in green only.
	If only one breaker, tire pressure may be low on that side, causing heavier pressure to the brush.	Inflate to proper pressure.
	If only one breaker, breaker may be weak.	Replace breaker.
	Worn motor brushes.	Replace motor brushes.
Scrubs unevenly, more on one side than the other.	Low tire pressure on heavily scrubbed side.	Inflate to proper pressure.
	Worn or improperly sized brushes or pads.	Replace with new or properly sized attachments.
	One of two pressure control springs disconnected or broken.	Reattach or replace spring(s).
Leaves a streak down the center.	Improperly sized brushes or pads.	Replace with new or properly sized brushes or pads.
	Scrubbing too fast for floor conditions.	Reduce scrubbing speed to allow better cleaning action.
	Brush motor centers out of adjustment.	Brush motors must be properly positioned in motor mount.
BRUSH PRESSURE SECTION		
Brush unit will not lower.	Electrical open in circuit.	Trace brush lift circuit to locate open.
	Faulty resistor in circuit.	Replace resistor.
	Panel switch faulty.	Replace panel switch.
	Lift actuator faulty.	Replace actuator.
Brush unit will not raise.	Electrical open in circuit.	Trace brush lift circuit to locate open.
	Up limit switch faulty or out of adjustment.	Readjust or replace up-limit microswitch.
	Panel switch faulty.	Replace panel switch.
	Lift actuator faulty.	Replace actuator.
	If lift actuator runs, but brush unit does not lift, linkage is disconnected or broken.	Reconnect or replace faulty component.
Actuator continues to run after unit is raised.	Up limit switch out of adjustment, or faulty (open).	Readjust or replace up-limit microswitch.

DEFECT	PROBABLE CAUSE	REMEDY
Cannot attain enough brush pressure (meter needle does not reach red line).	May be normal. Meter shows relative motor amp draw, so less aggressive brushes or floor surfaces may allow full pressure at lower draw.	Slow operating speed to achieve desired results.
	Excessive electrical resistance in down pressure circuit.	Check for loose connections in resistor circuit.. Also check for possible previous field installation of improperly rated resistor.
	Scrubber head linkage binding.	Check for obstruction or bind; repair.
	Low battery charge.	Charge batteries.
	Actuator faulty.	Replace actuator.
Brushes will lower under heavy pressure selection, but not normal selection.	Resistor in normal circuit is burned out.	Replace resistor.
Brushes will lower under normal pressure selection, but not increase for heavy selection.	Override switch inoperative.	Replace switch.
STEERING/BRAKE SECTION		
Machine will not track straight, pulls to one side.	Low tire pressure on one side.	Inflate to proper pressure.
	Brake dragging on one side.	Back off cable adjustment to remove drag.
	Caster dragging on one side.	Lubricate caster wheel and pivot bearings. If no improvement found, replace caster.
	Differential bearings faulty.	Replace faulty bearing(s).
Steering uneven - less on one side than the other.	Brake cable requires adjustment.	Adjust brakes.
	Brake pads worn.	Replace brake pads.
	Steering brake cable broken or disconnected.	Repair or replace cable.
	Grease or foreign material on pads or disc.	Clean pads and discs.
Brakes squeal.	Glaze on pads or disc.	Remove glaze with 320 grit or finer sandpaper.
VACUUM MOTOR SECTION		
Motor will not run.	Motor quick-disconnect unplugged.	Reconnect plug.
	Breaker (in switch) tripped.	Reset breaker in switch.
	Switch faulty.	Replace switch.
	Electrical open in circuit.	Trace vacuum circuit to locate open.
	Motor brushes worn.	Replace motor brushes.

DEFECT	PROBABLE CAUSE	REMEDY
	Motor faulty.	Replace motor.
Motor continues to trip circuit breaker.	Worn motor brushes.	Replace motor brushes.
	Defective motor.	Replace motor.
	Electrical short in wiring.	Trace vacuum circuit to locate short.
Poor vacuum pickup (also see squeegee section).	Poor seal between float shutoff and tank, or motor and float housing.	STANDARD MACHINE: Make sure motor is positioned properly on tank. Check for faulty gaskets on both float housing and between motor and housing. Replace if required. INDUSTRIAL MACHINE: Make sure float housing is positioned properly on tank and against motor. Check both float and motor gasket. Replace if required.
	Recovery tank drain hose left open.	Install and seal stopper.
	Hole or leak in pickup hose.	Inspect; repair or replace.
	Blockage in pickup hose or tool.	Inspect hose and tool for blockage. Inspect recovery tank at pickup hose entrance for solid material buildup.
	Low battery charge.	Recharge batteries.
	Defect in vacuum motor.	Repair or replace motor.
	Leak to recovery tank motor mounts.	Check three motor mount bolts (hole plugs on standard machine) for tightness and proper seal.
Float shutoff trips prematurely.	Air leak around float shutoff gasket.	Make sure float shutoff is positioned properly on tank. Check gaskets. Replace if required.
	Excess foam in recovery tank.	Use low-foam cleaner, or use defoamer in recovery tank.
	Improper replacement float installed.	Float used is a specific size for the machine. Make sure that previous replacement float was proper part.
SQUEEGEE SECTION		
Squeegee streaks, uneven pick-up (also see vacuum section).	Squeegee obstructed with debris.	Check squeegee for obstructions. Floor should always be swept prior to scrubbing.
	Squeegee angle out of adjustment.	Adjust squeegee angle.

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DEFECT	PROBABLE CAUSE	REMEDY
	Improper squeegee pressure for floor conditions.	Adjust squeegee pressure.
	Squeegee floor blades worn.	Reverse or replace squeegee blades.
	Inadequate lubrication for cleaning conditions.	Too little cleaning solution on very dirty floors can cause "smearing" by the squeegee. Increase solution flow.
Cannot lift squeegee.	Lift cable out of adjustment, disconnected, or broken.	Repair or replace lift cable.
	Lift cable out of lift lever pulley.	Reinstall cable into pulley.
Squeegee difficult to lift.	Excessive squeegee pressure applied.	Reduce squeegee pressure.
	Cable guide broken.	Replace ceramic guide.
	Squeegee pivot bearings frozen.	Replace bearings.
SOLUTION SUPPLY SECTION		
Solution will not feed.	Solution tank empty.	Fill tank.
	Solution screen plugged.	Clean solution screen.
	Solution line plugged.	Remove, inspect, and clean lines.
	Valve or lever linkage disconnected.	Reconnect linkage.
	Valve defective.	Replace valve.
Solution will not shut off.	Valve or lever linkage out of adjustment or disconnected.	Readjust or reconnect linkage.
	Valve defective.	Replace valve.
Solution feeds unevenly to brushes.	Distribution "T" or line plugged.	Inspect and clean lines.
	Feed holes in brush hub plugged.	Flush hubs with water to clean.
	Feed holes in brush adaptor plate obstructed.	Flush plate with water to clean.
	Individual supply hose kinked.	Inspect and repair/replace.
BATTERY SECTION		
Batteries will not accept a charge.	Operator plugging charger into wrong receptacle.	Charger must be plugged into loose connector that runs directly to top batteries. Do not plug into connector attached to battery tray, as this is connected to machine circuit.
	Open in battery cables, connector, or clamps.	Check for loose connection; tighten.
	Corroded battery terminals.	Clean and lubricate all posts and cable connectors.

DEFECT	PROBABLE CAUSE	REMEDY
	Defective batteries	Test batteries. Replace if required.
	Defective charger.	Inspect charger. Repair or replace if required.
Machine runs only short time on full charge.	Dirty batteries or corroded battery terminals.	Clean tops of batteries per Maintenance Instructions. Clean and lubricate posts and cable connectors.
	Batteries not accepting full charge.	Verify if batteries or charger is defective. Repair or replace defective component.
	Charger output not great enough to fully charge batteries.	Check battery size and charger data plate for proper match.
	Excessive brush pressures and load factor on machine.	The heavier load requirements for the machine will demand more amperage, hence a shorter running time. Time will be increased by lightening the load.
	Batteries sulfated/defective.	Repair or replace batteries. Batteries that are slightly sulfated may be "brought back" by additional charging over the normal cycle.
Batteries boil over during charge cycle.	May be normal. Some venting occurs during normal charge.	Clean tops of batteries with baking soda to neutralize acid.
	Batteries over-filled with water prior to charge.	Do not overfill batteries prior to charging. Plates should be covered but not filled to ring. Fill to ring with distilled water after charging.
	Too high output charger being used.	Excessive charger amperage output will overcharge batteries. Make sure charger is properly sized for batteries.
Batteries overcharging.	Defective charger or charger operation.	Repair or replace charger. Verify correct charging procedures followed.
	Bad cell(s) in one or more batteries.	Check individual battery cell voltages. Replace defective battery(ies).
Batteries discharge when not in use.	Normal. Batteries in storage or limited use must be charged periodically.	If machine is in limited use, put on maintenance charge at least once per month.
	Battery tops dirty or wet.	Clean batteries.

SECTION 4
APPENDIX

CONTENTS

HARDWARE INFORMATION

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

STANDARD BOLT TORQUE CHART

Thread Size	SAE Grade 2 Torque ft lb (Nm)	SAE Grade 5 Torque ft lb (Nm)	SAE Grade 8 Torque ft lb (Nm)
0.25 in	5-6 (7-8)	7-10 (9-14)	10-13 (14-18)
0.31 in	9-12 (12-16)	15-20 (20-27)	20-26 (27-35)
0.38 in	16-21 (22-28)	27-35 (37-47)	36-47 (49-64)
0.44 in	26-34 (35-46)	43-56 (58-76)	53-76 (72-103)
0.50 in	39-51 (53-69)	65-85 (88-115)	89-116 (121-157)
0.62 in	80-104 (108-141)	130-170 (176-231)	117-265 (159-359)
0.75 in	129-168 (175-228)	215-280 (291-380)	313-407 (424-552)
1.00 in	258-335 (350-454)	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)	Class 12.9 Torque ft lb (Nm)
M4	2 (3)	3 (5)	4 (6)
M5	4 (7)	6 (9)	7 (11)
M6	7 (11)	10 (16)	11 (19)
M8	18 (27)	25 (38)	29 (45)
M10	32 (53)	47 (74)	58 (87)
M12	58 (91)	83 (128)	100 (154)
M14	94 (145)	133 (204)	159 (244)
M16	144 (222)	196 (313)	235 (375)
M20	260 (434)	336 (610)	440 (732)
M24	470 (750)	664 (1050)	794 (1270)

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 12.9

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