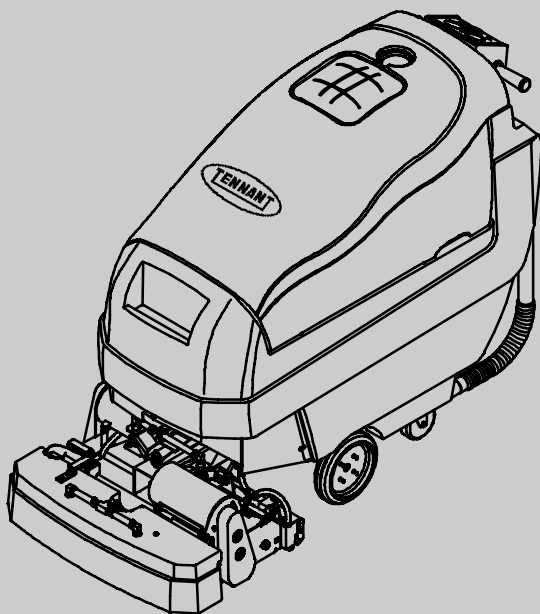




1610

Operator Manual **EN**



READY SPACE®

CE

www.tennantco.com

1026164
Rev. 01 (04-2007)





This manual is furnished with each new model. It provides necessary operation and maintenance instructions.

Read and understand the operator’s manual before operating or servicing machine.

A complete illustrated Parts List manual is also furnished with each new model. Use the Parts List manual to order replacement parts. Before ordering parts or supplies, be sure to have your machine model number and serial number available. Parts and supplies may be ordered by phone or mail from any authorized parts and service center, distributor or from any of the manufacturer’s subsidiaries.

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

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



PROTECT THE ENVIRONMENT

Please dispose of packaging materials, old machine components such as batteries, hazardous fluids such as antifreeze and oil, in a safe environmentally way according to your local waste disposal regulations.

Always remember to recycle.

MACHINE DATA

Please fill out at time of installation for future reference.

Model No.- _____

Install. Date - _____


Serial No.- _____

TENNANT N.V.
Industrielaan 6 5405 AB
P.O. Box 6 5400 AA Uden-The Netherlands
europe@tenantco.com
www.tenantco.com


Specifications and parts are subject to change without notice.
Copyright ©2005, 2007 Tennant Company. All rights reserved.

EN

TENNANT N.V.
Address: Industrielaan 6 5405 AB
P.O. Box 6 5400 AA Uden-The Netherlands
Uden/Netherlands, 26-05-04



Richard van den Hoogen - Technical Support Engineer



EC DECLARATION OF CONFORMITY FOR MACHINERY (Directive 98//37/EEC, Annex II, sub A)

Model: **1610** nr.: M16105003

Herewith declares, on our own responsibility, that the machinery

- is in conformity with the provisions of the Machinery Directive (98/37/EEC), as amended with national implementing legislation
- is in conformity with the provisions of the E.M.C. Directive (89/336/EEC), as amended with 91/263 EEC, 92/31 EEC, 93/67EEC , 93/68 EEC

and that

- the following (parts/clauses of) harmonized standards have been applied: EN: 292-1, 292-2, 292-3, 1050, 418, 982, 1037, 60204-1,61310-1, 61310-2, 457, 614-1, 1005-3, 563, 50081-2, 50082-2, 12895, ISO: 3744, 3746
- the following (parts/clauses of) national technical standards and specifications have been used: NA

TABLE OF CONTENTS


SAFETY PRECAUTIONS	4	DRAINING TANKS	16
SAFETY LABELS	5	CHARGING BATTERIES	17
MACHINE COMPONENTS	6	MACHINE MAINTENANCE	18
CONTROL CONSOLE SYMBOLS	7	DAILY MAINTENANCE	18
MACHINE INSTALLATION	8	WEEKLY MAINTENANCE	19
UNCRATING MACHINE	8	MONTHLY MAINTENANCE	20
INSTALLING BATTERIES	8	MOTOR MAINTENANCE	21
DUAL CLEANING TECHNOLOGY	9	BATTERY MAINTENANCE	21
HOW THE DUAL TECHNOLOGY WORKS .	9	PRIMING SOLUTION SYSTEM	22
MACHINE SETUP	10	MACHINE JACKING	22
PREPARING MACHINE FOR READYSpace		TRANSPORTING MACHINE	23
CLEANING	10	STORING MACHINE	23
PREPARING MACHINE FOR RESTORATIVE		RECOMMENDED STOCK ITEMS	23
EXTRACTION CLEANING	11	TROUBLESHOOTING	24
FILLING SOLUTION TANK	12	MACHINE SPECIFICATIONS	26
ADJUSTING CONTROL CONSOLE HEIGHT	12	MACHINE DIMENSIONS	27
MACHINE OPERATION	12	SOLUTION FLOW DIAGRAM	
PRE-OPERATION CHECKS	12	(AFTER SERIAL #10314332)	27
OPERATING MACHINE	12	SOLUTION FLOW DIAGRAM	
EMERGENCY STOPPING	14	(BEFORE SERIAL #10314332)	28
WHILE OPERATING MACHINE	14		
ACCESSORY TOOL CLEANING (OPTION) .	14		
OPERATING ACCESSORY TOOLS:	15		
MACHINE CIRCUIT BREAKERS	16		
HOUR METER	16		

SAFETY PRECAUTIONS

This machine is intended for commercial use. It is designed exclusively to clean carpets and upholstery in an indoor environment and is not constructed for any other use. Only use recommended accessory tools and commercially available carpet cleaners intended for machine application.

All operators must read, understand and practice the following safety precautions.

The following warning alert symbol and the "FOR SAFETY" heading are used throughout this manual as indicated in their description:

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

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

Failure to follow these warnings may result in personal injury, electrical shock, fire or explosion.

 **WARNING: Fire Or Explosion Hazard:**

- **Do Not Use Flammable Liquids Or Operate Machine In Or Near Flammable Liquids, Vapors Or Combustible Dusts.**

This machine is not equipped with explosion proof motors. The electric motors will spark upon start up and during operation which could cause a flash fire or explosion if machine is used in an area where flammable vapors/liquids or combustible dusts are present.

- **Do Not Pick Up Flammable Materials Or Reactive Metals.**
- **Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.**

 **WARNING: Electrical Hazard. Disconnect Battery Cables Before Servicing Machine.**

 **WARNING: Pinch Point Hazard. Stay Clear Of Scrub Head Lift Area.**

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

FOR SAFETY:

1. **Do not operate machine:**
 - With flammable liquids or near flammable vapors as an explosion or flash fire may occur.
 - Unless trained and authorized.
 - Unless operator manual is read and understood.
 - If not in proper operating condition.
2. **Before operating machine:**
 - Make sure all safety devices are in place and operate properly.
 - Place "wet floor" signs as needed.
3. **When using machine:**
 - Go slow on inclines and slippery surfaces.
 - Reduce speed when turning.
 - Report machine damage or faulty operation immediately.
 - Never allow children to play on or around.
 - Follow mixing and handling instructions on chemical containers.
4. **Before leaving or servicing machine:**
 - Stop on level surface.
 - Turn off machine.
 - Set parking brake.
 - Remove key.
5. **When servicing machine:**
 - Avoid moving parts. Do not wear loose jackets, shirts, or sleeves.
 - Disconnect battery connections before working on machine.
 - Block machine tires before jacking up.
 - Jack machine up at designated locations only. Block machine up with jack stands.
 - Use hoist or jack that will support the weight of the machine.
 - Do not power spray or hose off machine. Electrical malfunction may occur.
 - Wear protective gloves and eye protection when handling batteries or battery cables.
 - Avoid contact with battery acid.
 - Use manufacturer supplied or approved replacement parts.
 - All repairs must be performed by a qualified service person.
 - Do not modify the machine from its original design.

6. When transporting machine:

- Turn machine off.
- Use a recommended ramp when loading/unloading on/off truck or trailer.
- Place blocks behind wheels and use tie-down straps to secure machine.
- Put scrub head in the lowered position.
- Set parking brake.

SAFETY LABELS

The safety labels appear on the machine in the locations indicated. Replace labels if they are missing or become damaged or illegible.



FOR SAFETY LABEL -

Located on the recovery tank lid.

FOR SAFETY: Do not operate machine unless operation manual is read and understood.



BATTERY CHARGE LABEL -

Located on bottom side of recovery tank.

⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep battery Compartment Open When Charging.



FLAMMABLE MATERIALS LABEL -

Located on the recovery tank lid.

⚠ WARNING: Fire Or Explosion Hazard. Do Not Use Flammable Liquids Or Operate Machine In Or Near Flammable Liquids, Vapors Or Combustible Dusts. Do Not Pick Up Flammable Materials Or Reactive Metals.

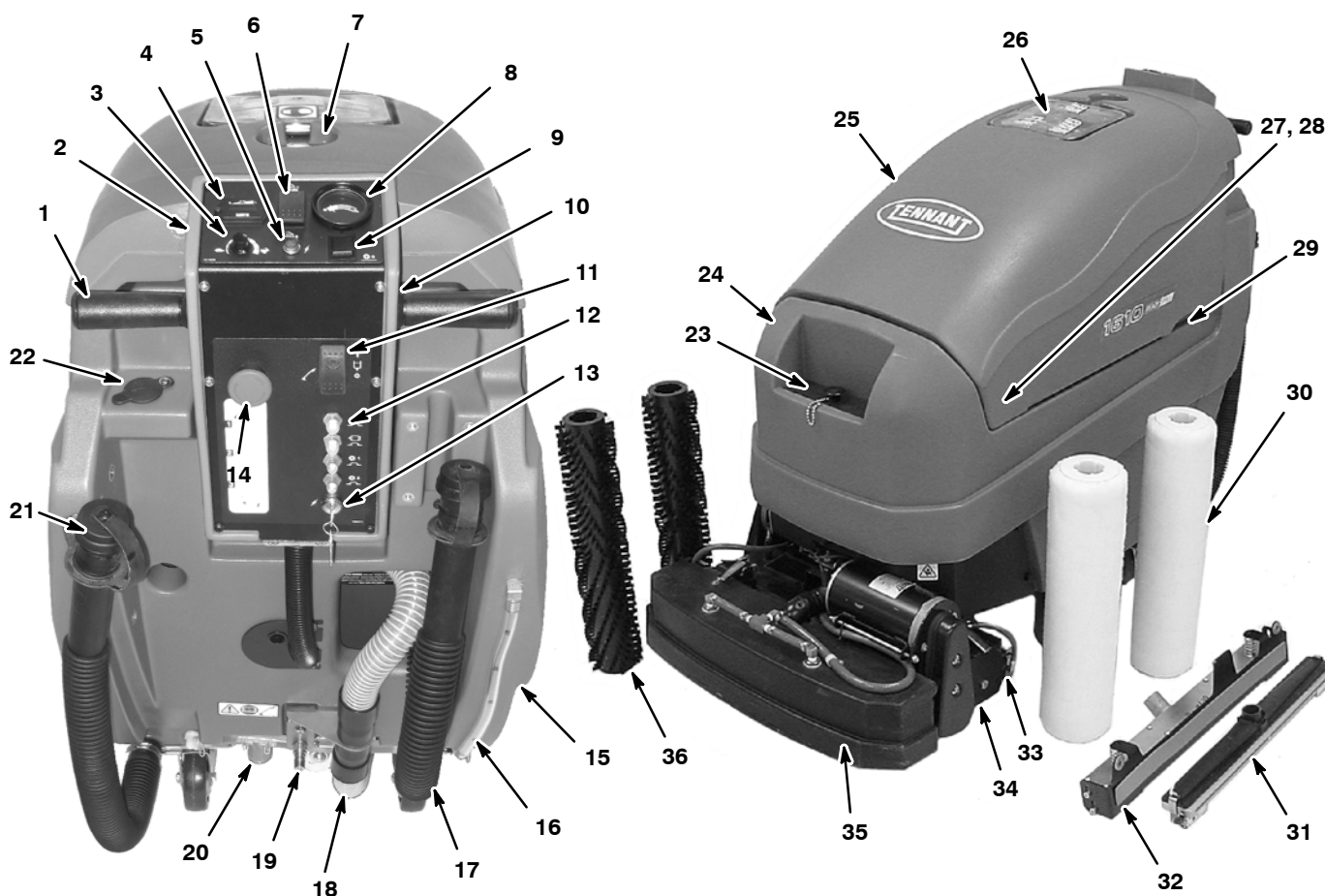


PINCH POINT HAZARD LABEL -

Located on scrub head shroud and near the scrub head lift actuator.

⚠ WARNING: Pinch Point Hazard. Stay Away Of Scrub Head Lift Area.
















MACHINE COMPONENTS



1. Control Grips
2. Control Console
3. Speed Control Knob
4. Battery Meter
5. Main Power Indicator Light
6. Scrub Head Lift/Lower Switch
7. Bottle Holder
8. Brush Pressure Meter
9. Brush Pressure Switch
10. Control Console Height Adjustment Lever
11. Solution On/Off Switch
12. Circuit Breaker Panel
13. Main Power Key Switch
14. Emergency Stop Button
15. Parking Brake
16. Solution Tank Sight Gauge
17. Recovery Tank Drain Hose
18. Accessory Tool Vacuum Hose Connector

19. Accessory Tool Solution Hose Coupler
20. Solution Tank Filter
21. Solution Tank Drain Hose
22. Solution Tank Rear Fill Port
23. Solution Tank Front Fill Port
24. Solution Tank
25. Recovery Tank
26. Recovery Tank Lid
27. Battery Charge Receptacle
28. Hour Meter
29. Battery Compartment
30. ReadySpace Rollers
31. ReadySpace Vacuum Shoe (2 supplied)
32. Extruder Vacuum Shoe
33. ReadySpace Flush Line (2)
34. Scrub Head
35. Spray Tip Bumper
36. Extruder Brushes

CONTROL CONSOLE SYMBOLS

	Main Power Indicator Light		Scrub Head Lift/Transport Position		Main Power 10A Circuit Breaker
	Battery Meter		Scrub Head Lower/Cleaning Position		Brush Motor 17A Circuit Breaker
	Slow Speed	 	Brush Pressure		Brush Motor 17A Circuit Breaker
	Fast Speed		Solution Flow		Drive Motor 20A Circuit Breaker
			Off-Aisle Wand (Accessory Tool)		Parking Brake

MACHINE INSTALLATION

UNCRATING MACHINE

1. Carefully check shipping crate for signs of damage. Report damages at once to carrier.
2. To uncrate the machine, remove the shipping hardware and straps that secure the machine to the pallet. Use the attached ramp and carefully back the machine off the pallet. Make sure the scrub head is in the raised position.

ATTENTION: Use the supplied ramp when uncrating the machine to prevent machine damage.

3. Check the contents list, contact the distributor if an item is missing.

Contents:

- Machine
- 2 Extractor Brushes
- 2 ReadySpace Rollers
- 1 Extractor Vacuum Shoe
- 2 ReadySpace Vacuum Shoes (installed)
- Vacuum Shoe Removal Tool
- 2 Scrub Head Flush Lines (installed)
- Scrub Head Vacuum Tube (Installed)
- Battery Tray (installed)
- Operator Training CD-ROM (English)
- Battery Kit (Option)
- Battery Charger (Option)

INSTALLING BATTERIES

⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Hood Open When Charging.

FOR SAFETY: When servicing machine, wear protective gloves and eye protection when handling batteries and battery cables. Avoid contact with battery acid.

Battery Specifications:

Four 6 volt deep cycle lead acid batteries.

180AH/5H Semi Traction Batteries

165AH/5H Maintenance Free Batteries

175AH/5H Traction Batteries

Maximum battery dimensions: 181 mm W x 260 mm L x 292 mm H.

1. Park the machine on a level surface, remove the key and set the parking brake.

2. Lift the recovery tank to access the battery compartment (Figure 1).



FIG. 1

3. Carefully install the batteries into the battery compartment tray and arrange the battery posts as shown (Figure 2).

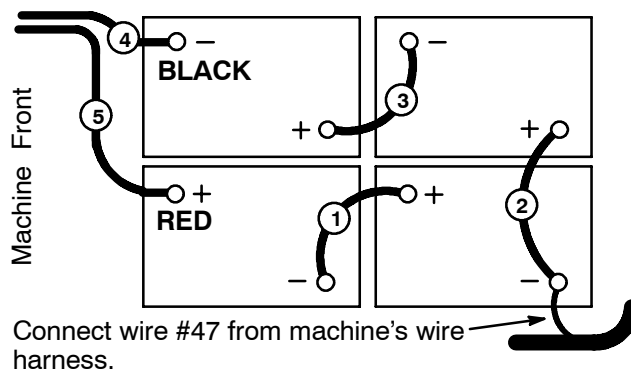


FIG. 2

4. Before connecting the battery cables, make sure the terminals and posts are clean. Use a post cleaner and wire brush if necessary.

NOTE: Apply a light coating of non-metallic grease or protective spray on the cable connections to prevent battery corrosion.

5. Connect the cables to the battery posts in numerical order as labeled (Figure 2), RED TO POSITIVE & BLACK TO NEGATIVE.
6. After installing the batteries, check the battery meter charge level. The machine must be in full operation for an accurate reading (See MACHINE OPERATION). Charge batteries if needed.

DUAL CLEANING TECHNOLOGY

The machine offers two cleaning technologies, Restorative Extraction and Soil Transfer Extraction which is referred to as ReadySpace. By using both technologies you can easily develop a cleaning program to greatly extend the use-life of your carpet. With the simple exchange of a vacuum shoe and two rollers or brushes you can easily switch from one technology to the other.

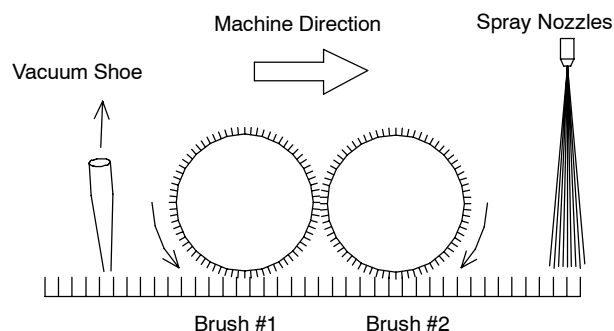
Restorative Extraction: Use this technology periodically to thoroughly clean to the base of the carpet. The amount and type of daily traffic are important factors to determine how often restorative extraction should be performed. This type of cleaning should be planned in advance to allow enough time for the extracted carpet to dry.

ReadySpace: Use this technology to clean visible soils on a daily basis or as needed to maintain a high level of carpet cleanliness. ReadySpace may be used during normal business hours because often the carpet is dry in less than 30 minutes. Drying time may vary due to carpet type and climate conditions.

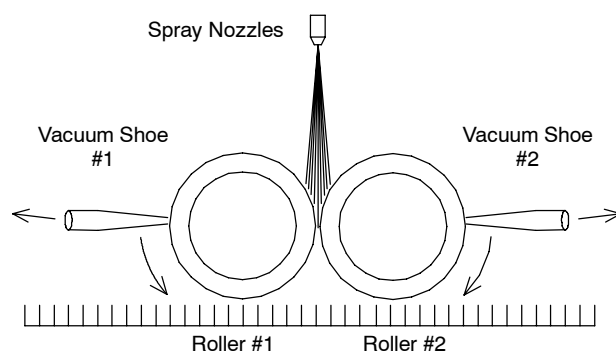
NOTE: Before using ReadySpace, first use restorative extraction if carpets are heavily soiled. Then begin your ReadySpace cleaning program.

HOW THE DUAL TECHNOLOGY WORKS

Restorative Extraction: Hot water and cleaning detergent from the solution tank is sprayed directly onto the carpet. As the machine moves forward, two counter-rotating chevron brushes agitate the solution deep into the carpet. As the machine continues to move forward, the vacuum shoe recovers the dirty solution out of the carpet.



ReadySpace: Cleaning detergent is pre-sprayed on the carpet with the use of a pump-up sprayer. After allowing the detergent to dwell for about 5-10 minutes, the machine is then put to work. Hot water is sprayed directly on two counter-rotating nylon fiber rollers, not the carpet. Then much of the water is removed from the rollers using two vacuum shoes, leaving the rollers damp. The damp rollers then agitate the carpet, working both sides of the carpet fiber, at the same time transferring the soil to the rollers. Again, hot rinse water is sprayed on the soiled rollers allowing the two vacuum shoes to easily extract the soil from the rollers.

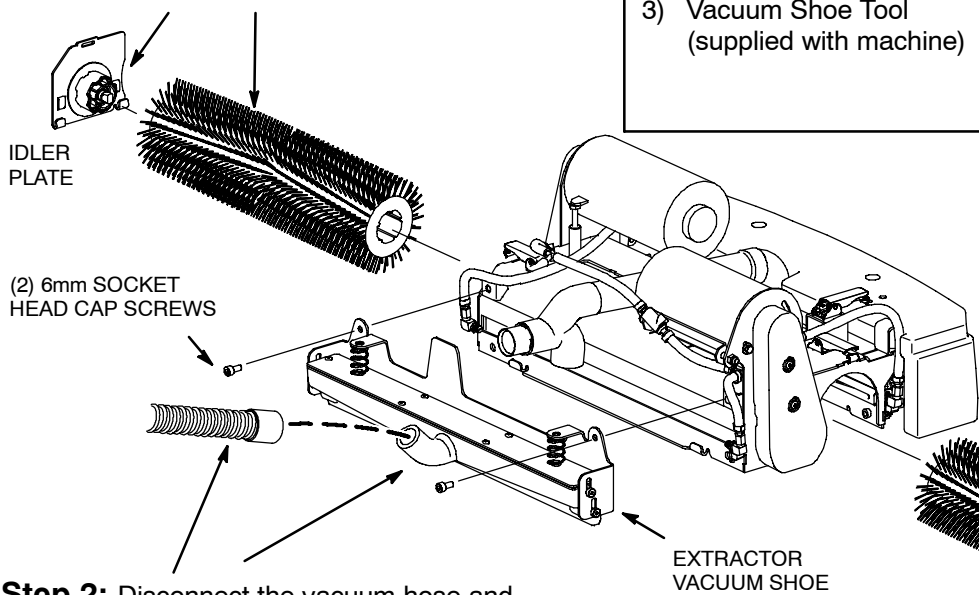


MACHINE SETUP

PREPARING MACHINE FOR READYSpace CLEANING

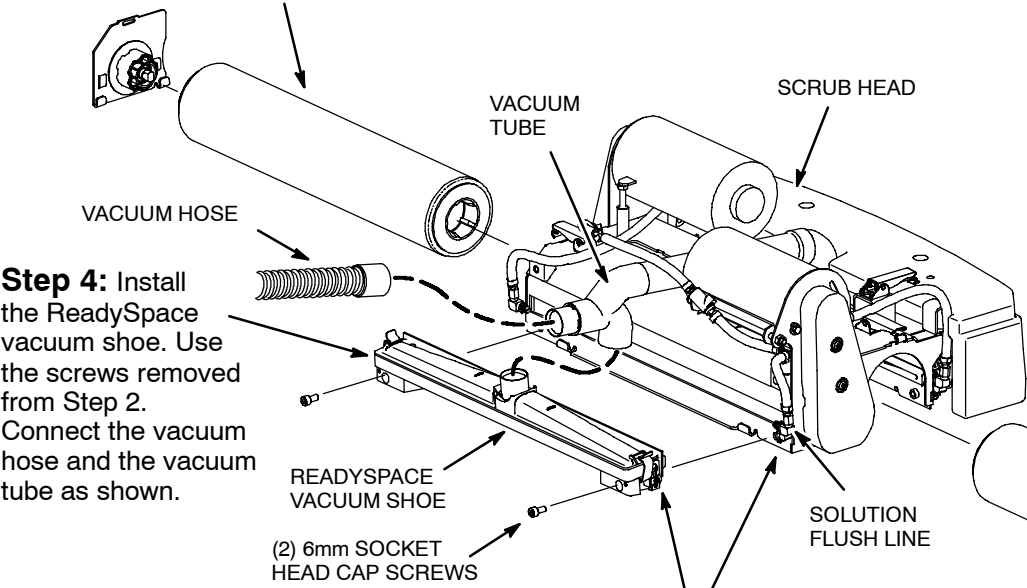
FOR SAFETY: Before preparing machine, turn machine off and remove key.

Step 1: Unlatch the idler plates and remove the two extractor brushes if installed.



Step 2: Disconnect the vacuum hose and remove the extractor vacuum shoe if installed. 6mm hex head tool required.

Step 3: Install the two ReadySpace Rollers.

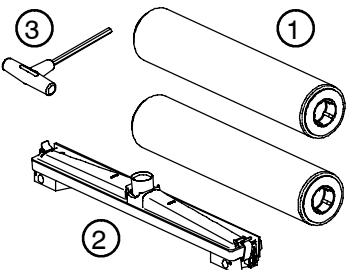


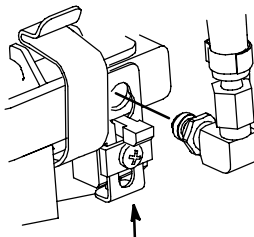
Step 4: Install the ReadySpace vacuum shoe. Use the screws removed from Step 2. Connect the vacuum hose and the vacuum tube as shown.

Step 5: Connect the solution flush line to the vacuum shoe (See **DETAIL**). Repeat for opposite side.

Equipment Needed:

- Two ReadySpace Rollers
- Rear ReadySpace Vacuum Shoe
- Vacuum Shoe Tool (supplied with machine)



DETAIL


Push the retainer tab upward to engage the solution flush line tip.

PREPARING MACHINE FOR RESTORATIVE EXTRACTION CLEANING

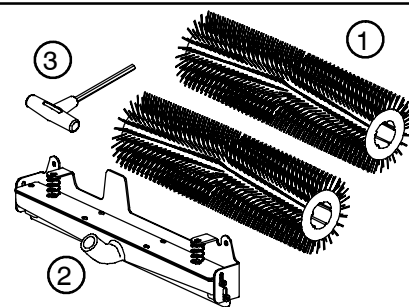
FOR SAFETY: Before preparing machine, turn machine off and remove key.

Step 1: Unlatch the idler plates and remove the two ReadySpace rollers if installed.

IDLER PLATE

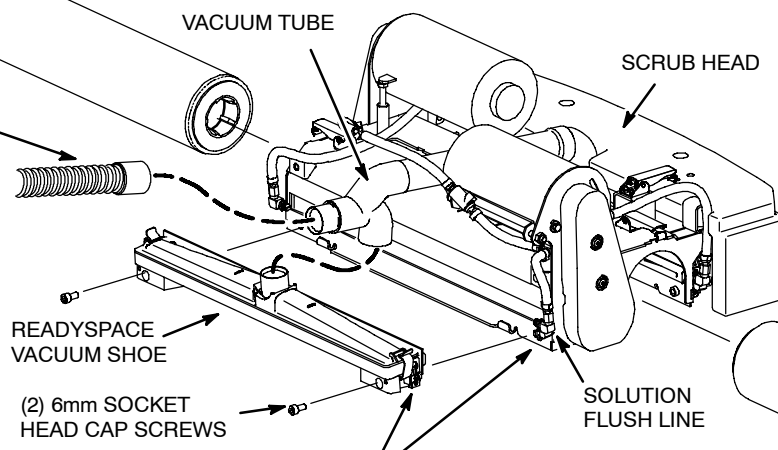
Equipment Needed:

- 1) Two Extractor Brushes
- 2) Extractor Vacuum Shoe
- 3) Vacuum Shoe Head Tool (supplied with machine)

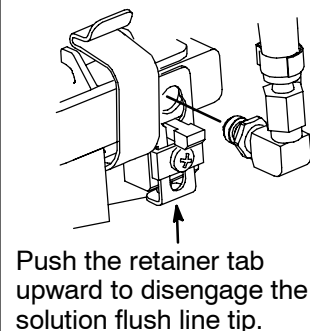


Step 2:

Disconnect the vacuum hose and the vacuum tube from the rear ReadySpace vacuum shoe if installed.



DETAIL A

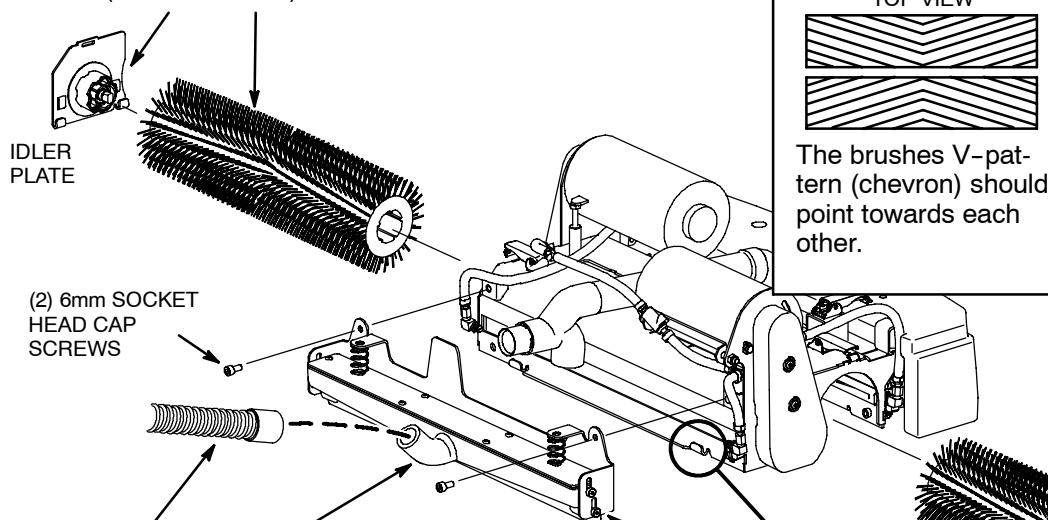


Step 3: Disconnect the solution flush lines from the rear vacuum shoe (See **DETAIL A**).

NOTE: To prevent misplacing, DO NOT remove the disabled solution flush lines and the vacuum tube from the scrub head.

Step 4: Remove the ReadySpace vacuum shoe. 6 mm hex head tool required.

Step 5: Install the two extractor brushes (See **DETAIL B**).

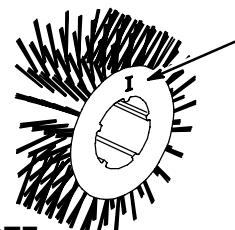


DETAIL B

TOP VIEW



The brushes V-pattern (chevron) should point towards each other.



NOTE: "I" indicates idler plate end.

Step 6: Install the extractor vacuum shoe. Make sure that the shoe is positioned behind the two support tabs. Use the screws removed from Step 4. Connect the vacuum hose to the extractor vacuum shoe as shown.

EXTRACTOR VACUUM SHOE

SUPPORT TABS (2)

FILLING SOLUTION TANK

The machine may be filled from either the rear, using the hose fill-port, or from the front using the bucket fill-port (Figure 3).

NOTE: When filling solution tank with a bucket, make sure that the bucket is clean. Do not use the same bucket for filling and emptying the machine.

Fill the solution tank to the 75 liter mark with hot water, 50°C maximum (Figure 3).

FOR RESTORATIVE EXTRACTION CLEANING: Pour a recommended cleaning detergent into the solution tank. Follow mixing instructions on the bottle.

FOR READYSPACE CLEANING: Do not add extractor cleaning detergents into the solution tank. The cleaning detergent must be pre-sprayed on the carpet with the use of a pump-up sprayer (Figure 5).

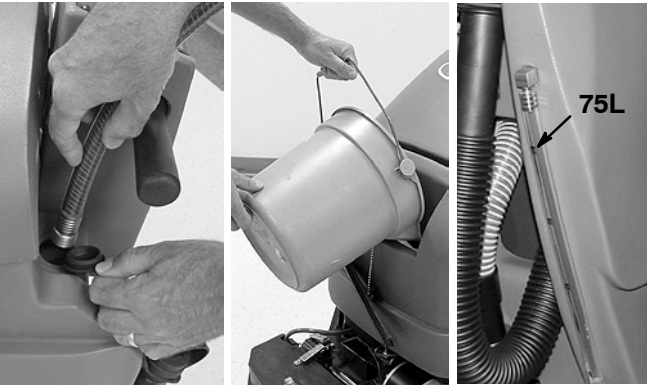


FIG. 3

ATTENTION: When using the machine for restorative extraction cleaning, only use recommended cleaning detergents in the solution tank. Machine failure due to improper detergent usage will void the manufacturer’s warranty.

⚠ WARNING: Fire or Explosion Hazard. Never Use Flammable Liquids.

ADJUSTING CONTROL CONSOLE HEIGHT

Pull the console height adjustment lever and lift or lower the console to a comfortable operating height. Release lever to lock the position (Figure 4).

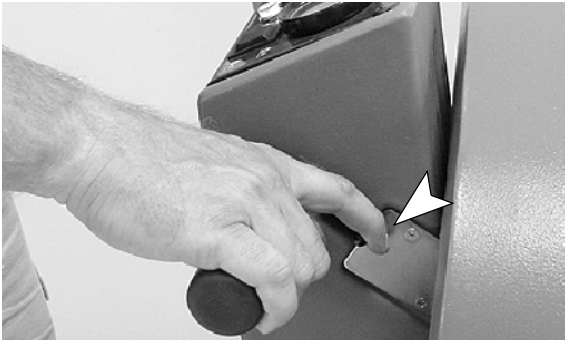


FIG. 4

MACHINE OPERATION

FOR SAFETY: Do not operate machine unless operator manual is read and understood.

PRE-OPERATION CHECKS

NOTE: Refer to the Machine Maintenance section for further details.

- ☐ Vacuum floor and remove any debris.
- ☐ Check battery meter charge level.
- ☐ ReadySpace Cleaning: Check rollers for wear.
- ☐ Inspect spray nozzles for proper spray pattern.
- ☐ ReadySpace Cleaning: Inspect roller vacuum shoes for debris.
- ☐ Make sure recovery tank float shut-off screen is clean.
- ☐ ReadySpace Cleaning: Make sure solution tank is filled with only water, no cleaning detergents.

OPERATING MACHINE

If the machine is set up for ReadySpace cleaning, pre-spray the carpet with an approved pre-treatment cleaning detergent using a pump-up sprayer (Figure 5). Allow the detergent to dwell for 5-10 minutes before operating the machine.

ATTENTION: Using unapproved pre-treatment cleaning detergents may result in poor cleaning performance.

⚠ WARNING: Fire or Explosion Hazard. Never Use Flammable Liquids.



FIG. 5

1. Release the parking brake (Figure 6).

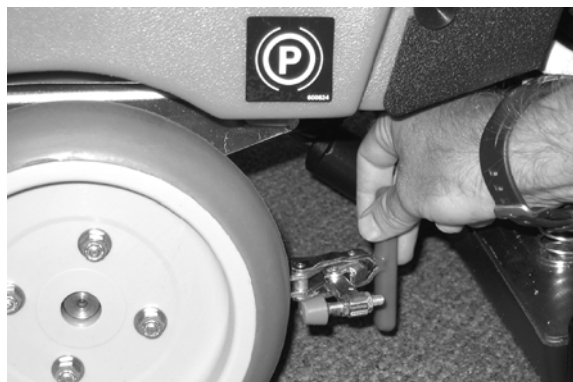


FIG. 6

2. Turn the key and the solution switch to the on (I) position (Figure 7).

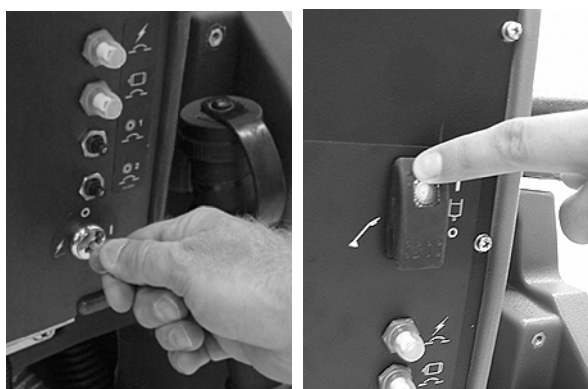


FIG. 7

3. Lower the scrub head by pressing the scrub head switch (Figure 8).

NOTE: If the machine is set up for ReadySpace cleaning, a 20 second priming process will automatically begin spraying solution when the scrub head is lowered.



FIG. 8

4. To begin cleaning, rotate the control grips forward and gradually turn the speed control knob to the recommended cleaning speed (Figure 9).

ReadySpace Cleaning: 30m (100 ft.) per minute.

Restorative Extraction Cleaning: 15m (50 ft.) per minute.

NOTE: The control grips activate the drive, brushes and solution flow.



FIG. 9

To operate the machine in reverse, simply rotate the control grips backwards. The machine will continue to clean in reverse during ReadySpace cleaning. This allows you to back clean over heavily soiled areas, into corners and tight spaces. When reversing during restorative extraction the scrub head will raise and the cleaning stops.

5. Adjust the brush pressure meter. For best cleaning results, adjust the brush pressure meter within the green zone as shown below (Figure 10).

ATTENTION: Do not operate the machine with the brush pressure meter in the red zone, circuit breakers will trip.



FIG. 10

6. To stop the machine, position the machine on a level surface and gradually release the control grips.
7. After restorative extraction cleaning, place air movers in the area to reduce the drying time.
8. Perform the DAILY MACHINE MAINTENANCE procedures.

EMERGENCY STOPPING

Strike the emergency-stop button, located on the control console, to stop the machine in an emergency. Turn the button clockwise to reset (Figure 11).



FIG. 11

WHILE OPERATING MACHINE

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

1. Overlap each cleaning path by 50 mm.
2. Use a collapsing rectangle pattern when cleaning large rooms (Figure 12).

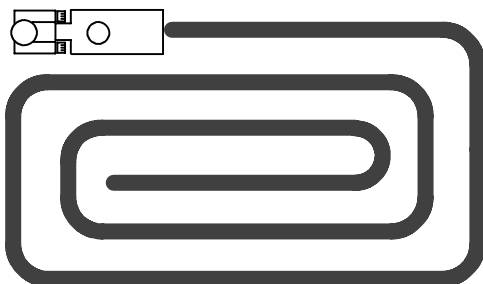


FIG. 12

3. Restorative Extraction Cleaning: Turn the solution switch off when turning 180° and just before coming to a stop. This will prevent un-recovered solution on floor.
4. If excessive foam appears in the recovery tank, pour a recommended foam control solution into the tank.

CAUTION: If foam or liquid escapes from the machine, switch off immediately.

ATTENTION: Do not allow foam to enter the float shut-off screen, vacuum motor damage will result. Foam will not activate the float shut-off screen.

5. Do not operate machine on inclines that exceed 3° when cleaning or 11° while transporting.

FOR SAFETY: When using machine, go slow on inclines and slippery surfaces.

6. Observe the battery meter discharge level (Figure 13). If the meter begins to flash, stop scrubbing and transport the machine to the recharging area. If two lights begin to flash alternately, the cleaning function will automatically shut off and the scrub head will rise to the transport position. This protects the batteries from total discharge. Recharge batteries immediately.

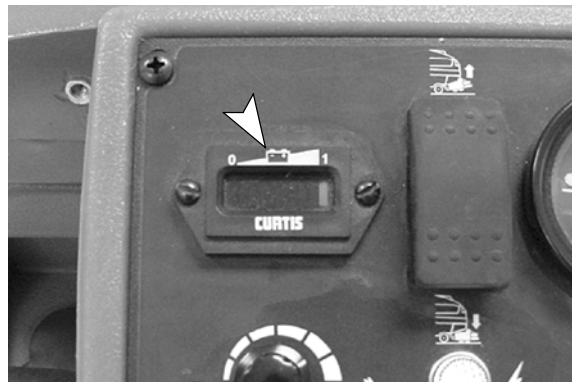


FIG. 13

7. Observe the solution tank level (Figure 14). Do not allow the solution tank to run dry when restorative extraction cleaning. If tank runs dry, the solution system will need to be reprimed (See PRIMING SOLUTION SYSTEM).



FIG. 14

8. When leaving the machine unattended, park the machine on a level surface, set parking brake and remove the key.

ACCESSORY TOOL CLEANING (OPTION)

Optional accessory tools allow you to clean upholstery and carpeted areas that the machine is unable to reach, such as alcoves, stairs, corners and small rooms.

For a complete list of accessory tools see the OPTIONS section in the Parts List manual.

Preparing Machine for Accessory Tool Cleaning:

1. Park the machine on a level surface and turn the key to the off position.

2. Connect the accessory tool's solution hose to the coupler located at the rear of the machine (Figure 15).

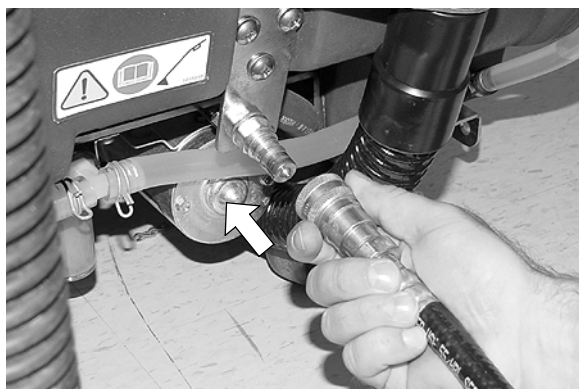


FIG. 15

3. Disconnect the lower vacuum hose from the machine and replace it with the accessory tool's vacuum hose (Figure 16).

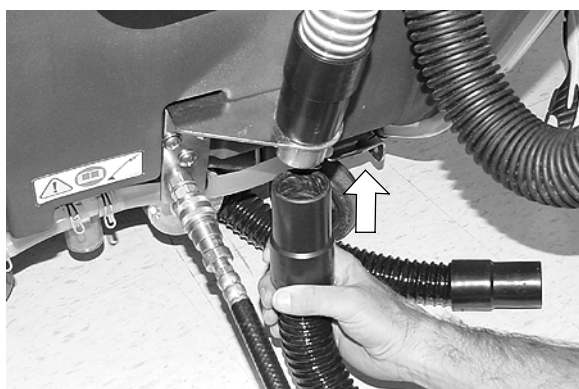


FIG. 16

4. Attach the accessory tool to the hoses.

Operating Accessory Tools:

1. Turn the key to the on (I) position.
2. Press the solution switch towards the accessory tool symbol, off (O) position (Figure 17).

NOTE: If you need to move the machine while using the accessory tool, you must turn the solution switch on to activate the drive system. This only applies when the machine is set up for ReadySpace Cleaning.



FIG. 17

3. Lower the scrub head to activate the vacuum suction (Figure 18).



FIG. 18

4. Place the accessory tool on the area to be cleaned. Squeeze the trigger on the accessory tool and slowly pull the tool backwards while applying downward pressure (Figure 19). Release the trigger 6 inches from end of stroke. When returning to the next stroke, push the tool forward over the same path with trigger released. Continue this pull and push method with a 50-100mm overlap.

NOTE: When cleaning upholstery, always follow the cleaning instructions sewn in the furniture by the manufacturer.

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



FIG. 19

5. After cleaning, relieve the water pressure from the accessory tool before disconnecting the solution hose. Squeeze trigger for five seconds after turning the key off.

MACHINE CIRCUIT BREAKERS

The machine is equipped with four resettable circuit breakers to protect the machine from damage. If a circuit breaker should trip during operation, determine the cause, allow motor to cool and then manually reset the breaker button. The circuit breaker panel is located at rear of machine (Figure 20).

- 10 Amp. Main Circuit Breaker
- 20 Amp. Drive Motor Circuit Breaker
- 17 Amp. Brush Motor Circuit Breaker #1
- 17 Amp. Brush Motor Circuit Breaker #2

FIG. 20

The two vacuum motors are protected with a 30 amp fuse. The fuses are located in the wire harness that is connected to each vacuum motor. When replacing a fuse never substitute a higher amp rated fuse than specified (Part No. 768688 - Fuse, 30AMP).

FOR SAFETY: When servicing machine, all repairs must be performed by a qualified service person.

HOURLY METER

The hour meter records the number of total hours the brush motors have been powered on. Use the hour meter to determine when to perform recommended maintenance procedures and to record service history (Figure 21).

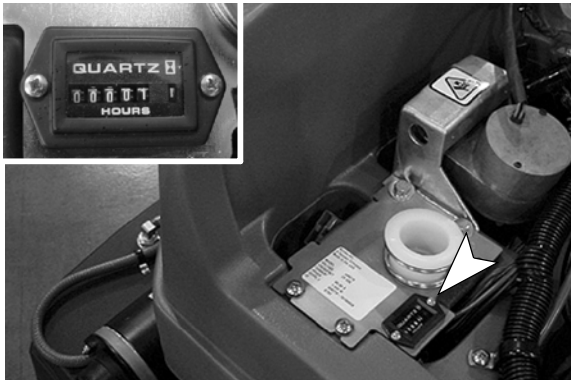


FIG. 21

DRAINING TANKS

Drain and rinse out the tanks after every use. Janitor closets with floor sinks are best suited for waste water disposal. Use a five gallon bucket if floor sink is unavailable.

1. Raise the scrub head to the transport position and transport the machine to draining site. Turn the key to the off position.
2. Remove the drain hose cap and slowly lower the hose over the drain site (Figure 22). Lift the hose to stop the flow. The recovery tank drain hose is located on the right side and the solution tank drain hose is located on the left side.

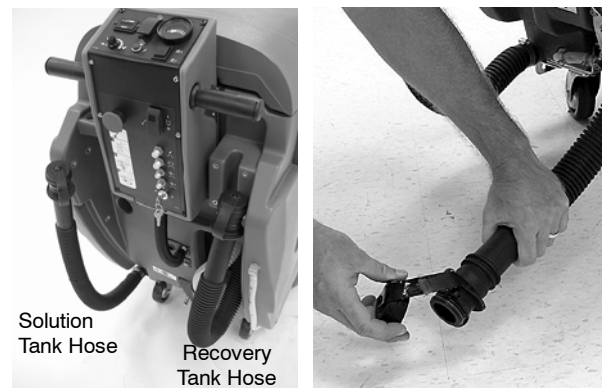


FIG. 22

NOTE: When using a bucket to drain the recovery tank, do not use the same bucket to fill the solution tank.

3. Rinse out the recovery tank and the float shut-off screen with clean water (Figure 23).

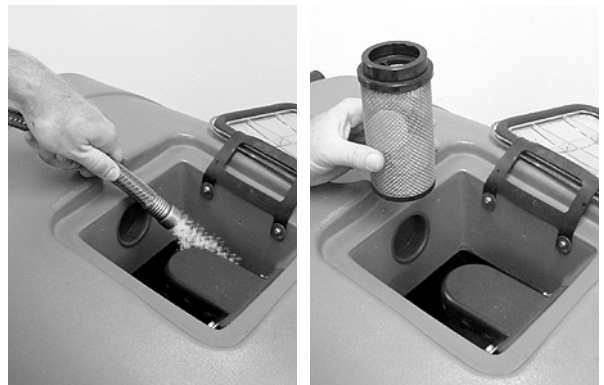


FIG. 23

4. Replace the drain hose caps securely after draining.

CHARGING BATTERIES

ATTENTION: To prolong the life of the batteries and to provide optimum machine performance, **ONLY** recharge the batteries after a total of 30 minutes of use or more. Do not leave batteries discharged for lengthy periods.

BATTERY METER: When the machine's battery meter begins to flash, stop scrubbing and recharge batteries. If two lights begin to flash alternately, the cleaning function will automatically shut off and the scrub head will rise to the transport position. This will protect the batteries from total discharge.

Only use a battery charger with the following specifications to prevent battery damage.

BATTERY CHARGER SPECIFICATIONS:

- CHARGER TYPE:
 - FOR MAINTENANCE FREE BATTERIES
 - FOR LEAD ACID BATTERIES
- OUTPUT VOLTAGE - 24 VOLTS
- OUTPUT CURRENT - 20 AMPS
- AUTOMATIC SHUTOFF CIRCUIT
- FOR DEEP CYCLE BATTERY CHARGING

1. Transport the machine to a well-ventilated area for charging.

⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.

2. Park the machine on a level surface, set parking brake and turn the key off.
3. Before charging the batteries, periodically check the electrolyte level in each battery cell (Figure 24).

The electrolyte level (A) should slightly cover the battery plates (B). Add distilled water as needed. **DO NOT OVERFILL**, the fluid may expand and overflow while charging. Replace cell caps before charging (Figure 24).

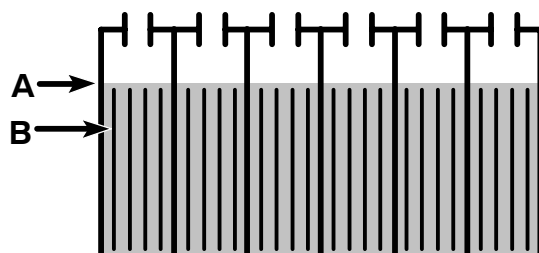


FIG. 24

FOR SAFETY: When servicing machine, wear protective gloves and eye protection when handling batteries and battery cables. Avoid contact with battery acid.

4. Connect the charger's AC power supply cord to a properly grounded receptacle.
5. Connect the charger's DC cord to the machine's battery receptacle located under the recovery tank (Figure 25). Rest the recovery tank on the support stand to promote ventilation during charging.

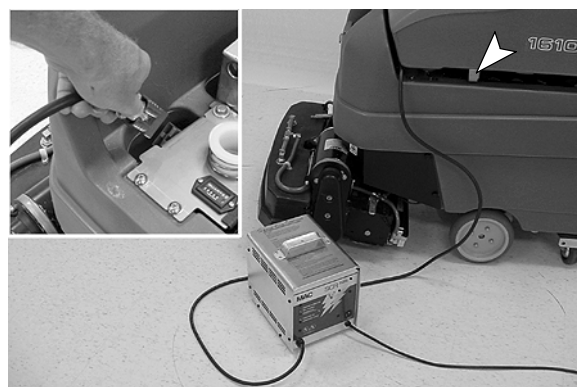


FIG. 25

6. The charger will automatically begin charging and shut off when fully charged.

NOTE: The machine will not operate once the battery charger is connected.

ATTENTION: Do not disconnect the charger's DC cord from the machine's receptacle when the charger is operating. Arcing may result. If the charger must be interrupted during charging, disconnect the AC power supply cord first.

⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.

7. After charging, check the electrolyte level (A) again. The level should be approximately 1 cm from the bottom of the fill-port (B) (Figure 26). Add distilled water if needed. **DO NOT OVERFILL.**

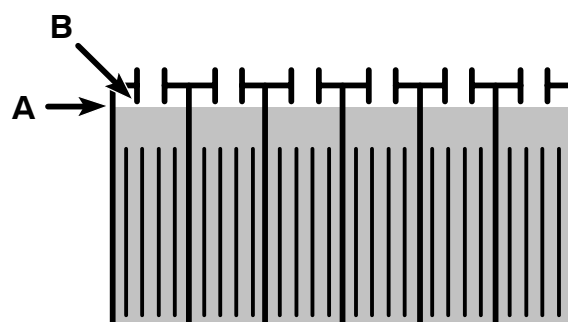


FIG. 26

MACHINE MAINTENANCE

To keep the machine in good working condition, simply follow the daily, weekly and monthly maintenance procedures.

FOR SAFETY: Before leaving or servicing machine, stop on level surface and turn off machine.

⚠ WARNING: Electrical Hazard. Disconnect Battery Cables Before Servicing Machine.

ATTENTION: Contact an Authorized Service Center for machine repairs. Machine repairs performed by other than an authorized person will void your warranty.

DAILY MAINTENANCE (After Every Use)

1. Drain and rinse out the recovery tank (Figure 27).



FIG. 27

2. Rinse off the float shut-off screen located in recovery tank (Figure 28).



FIG. 28

3. Drain and rinse out the solution tank.

4. ReadySpace Cleaning: Remove the splash shroud and inspect the rollers for wear. If the gap between the two rollers is greater than 4mm replace the rollers (Figure 29). Always replace rollers as a set.

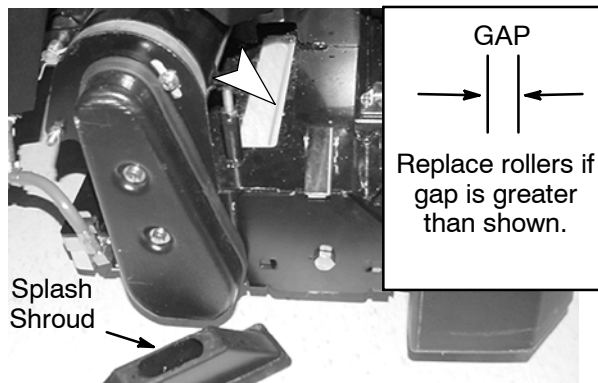


FIG. 29

5. Clean the machine housing with an all purpose cleaner and damp cloth (Figure 30).

FOR SAFETY: When servicing machine, do not power spray or hose off machine. Electrical malfunction may occur.



FIG. 30

6. Recharge the batteries (Figure 31). See CHARGING BATTERIES.

NOTE: To prolong the battery life, *ONLY* recharge the batteries after a total of 30 minutes of use or more.

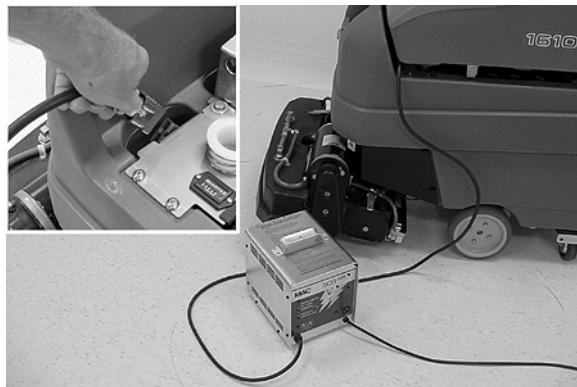


FIG. 31

WEEKLY MAINTENANCE (Every 10 Hours of Use)

1. Flip the ReadySpace rollers end-for-end every 10 hours of use (Figure 32). The roller life is rated for at least 100 hours of use under normal cleaning conditions. If the gap between the two rollers is greater than 4mm replace the rollers.

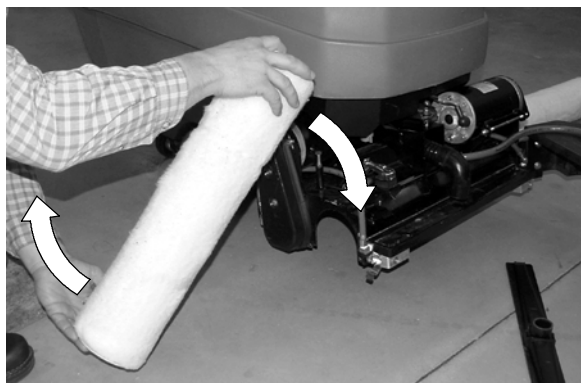


FIG. 32

2. Remove any debris build-up from the underside of the scrub head (Figure 33).

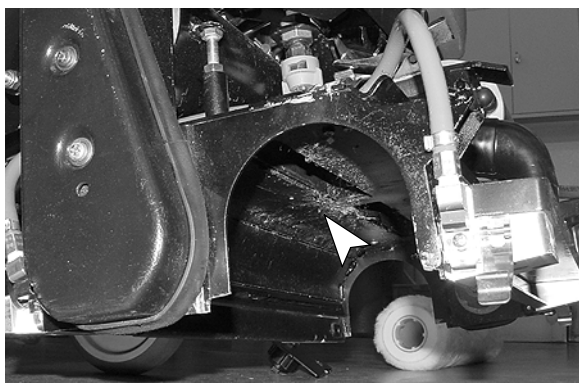


FIG. 33

3. Remove the front and rear roller vacuum shoe covers and remove any debris (Figure 34).



FIG. 34

4. Remove any entangled carpet fibers and debris from the brushes (Figure 35). Replace brushes if worn. To determine when to replace worn brushes observe the brush pressure meter.

If unable to adjust the pressure into the green zone this may be a good indication that the brushes should be replaced.

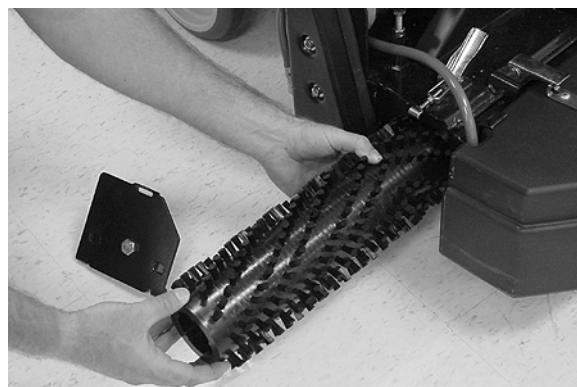


FIG. 35

5. Remove any debris lodged in the carpet extraction vacuum shoe (Figure 36).



FIG. 36

6. Inspect the spray tips for proper spray pattern (Figure 37). If spray pattern is obstructed, clean or replace the spray tips (See MONTHLY MAINTENANCE).



FIG. 37

MONTHLY MAINTENANCE (Every 80 Hours of Use)

1. Remove the solution tank filter from underneath the machine and rinse out the screens. Make sure the solution tank is empty before removing filter (Figure 38).

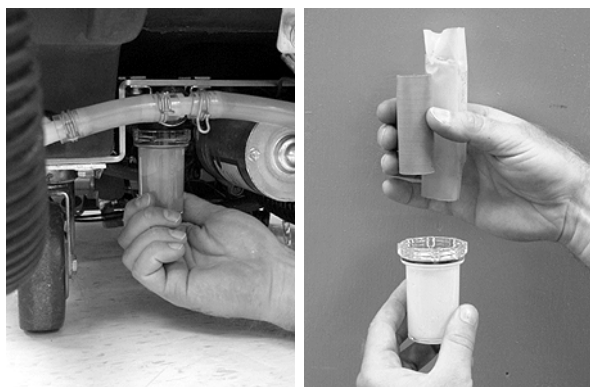


FIG. 38

2. Flush the plumbing system with an approved acetic acid solution to dissolve normal alkaline buildup. Follow procedure below:
 - a. Remove rollers/brushes from the machine.
 - b. Pour 11 liters (3 gal) of hot water into the solution tank, do not exceed 50°C.
 - c. Add the acetic acid solution according to the mixing directions on the bottle.

FOR SAFETY: When using machine, follow mixing and handling instructions on chemical containers.

- d. Place the machine in an area with a floor drain.
 - e. Block the wheels and turn the speed control knob to slowest setting.
 - f. Operate both cleaning technologies for one minute each over the floor drain.

NOTE: Rear vacuum shoe exchange is required to operate both ReadySpace and Restorative Extraction cleaning technologies.
 - g. Turn the key off and let the machine set overnight to allow the acetic acid solution to breakdown the alkaline buildup.
 - h. Next day, disperse the remaining acetic acid solution and rinse the solution system with 11 liters (3 gal) of clean water.
3. Remove the four quick-release spray tips from the scrub head (Figure 32). Turn spray tip caps counter-clockwise to remove. Soak the tips and screens in an acetic acid solution for up to six hours (Figure 39). Follow the mixing directions on the bottle. Do not use pointed objects to clean tips, damage will occur.

IMPORTANT: When replacing the spray tips, make sure to install the green spray tip assembly (tip #11002) above the ReadySpace rollers and the white spray tip assembly (tip #11005E) into the front bumper. *NOTE: The spray tip filter is not required for ReadySpace.*

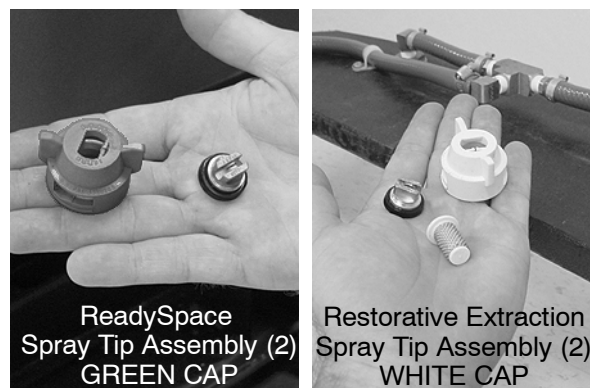
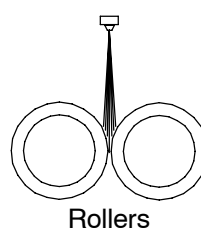


FIG. 39

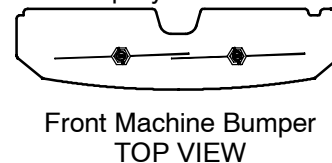
Check the spray pattern direction after installing the spray tips. The ReadySpace spray tips should spray directly between the two rollers. The Restorative Extraction spray pattern should slightly overlap at a 3° angle (Figure 40).

ReadySpace Spray Pattern



Rollers

Restorative Extraction Spray Pattern



Front Machine Bumper
TOP VIEW

FIG. 40

4. Inspect the spray tip pattern in the two ReadySpace flush lines (4 spray tips). If tips are clogged, remove the flush lines and soak them in an acetic acid solution for up to six hours (Figure 41). Do not remove tips from flush lines.

NOTE: During ReadySpace operation the flush line spray tips will spray every 2 1/2 minutes for 3 seconds.

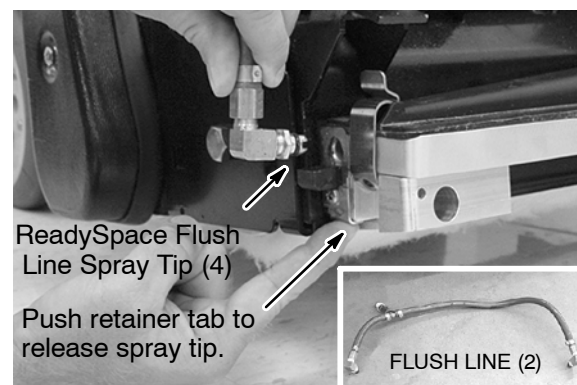


FIG. 41

5. Maintain the batteries (See BATTERY MAINTENANCE).

6. Lubricate the caster grease fittings with a water resistant grease (Figure 42).



FIG. 42

7. Lubricate all pivot points with silicone spray then coat with a water resistant grease to maintain smooth operation.
8. Check the machine for water leaks and loose nuts and bolts.
9. Periodically check the belt tension on the two brush motors. Tighten the belt if you're able to twist it beyond 90° at midpoint (Figure 43).

FOR SAFETY: When servicing machine, disconnect the battery connections.



FIG. 43

MOTOR MAINTENANCE

Quarterly (Every 250 Hours) – Check the drive transaxle motor and vacuum motors for carbon brush wear. Replace carbon brushes when worn to a length of 10 mm or less.

Annually (Every 1000 Hours) – Check the brush motors for carbon brush wear. Replace carbon brushes when worn to a length of 10 mm or less.

Contact an Authorized Service Center for machine repairs.

FOR SAFETY: When servicing machine, all repairs must be performed by a qualified service person.

⚠ WARNING: Electrical Shock Hazard. Disconnect Battery Cables Before Servicing Machine.

BATTERY MAINTENANCE

⚠ WARNING: Fire Or Explosion Hazard. Batteries Emit Hydrogen Gas. Keep Sparks And Open Flame Away. Keep Battery Compartment Open When Charging.

FOR SAFETY: When servicing machine, wear protective gloves and eye protection when handling batteries and battery cables. Avoid contact with battery acid.

1. Check the specific gravity using a hydrometer to determine the charge level and the condition of the batteries (Figure 44). If one or more of the battery cells read lower than the other battery cells (0.050 or more), the cell is damaged, shorted, or is about to fail. Check the hydrometer readings against the following chart to determine the remaining battery charge level.

NOTE: Do not take readings immediately after adding distilled water. If the water and acid are not thoroughly mixed, the readings may not be accurate.



FIG. 44

SPECIFIC GRAVITY at 27° C	BATTERY CHARGE
1.265	100% CHARGED
1.223	75% CHARGED
1.185	50% CHARGED
1.148	25% CHARGED
1.110	DISCHARGED

NOTE: If the readings are taken when the battery electrolyte is any temperature other than 27°C, the reading must be temperature corrected. Add or subtract to the specific gravity reading 0.004, 4 points, for each 6°C above or below 27°C.

2. Always follow proper charging instructions (See CHARGING BATTERIES).

3. Check the electrolyte level (A) in each battery cell **after charging batteries**. The level should be approximately 1 cm from the bottom of the fill-port (B). Add distilled water if needed (Figure 45). **DO NOT OVERFILL.**

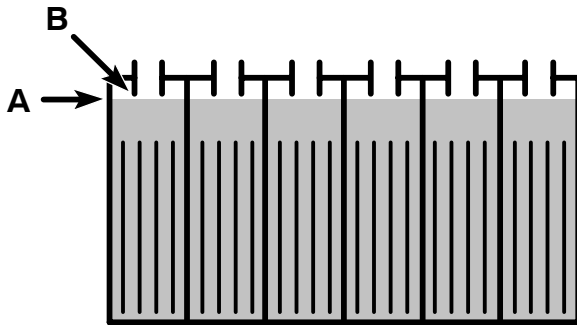


FIG. 45

4. Keep the battery tops clean to prevent battery corrosion.

To clean batteries:

FOR SAFETY: When servicing machine, wear protective gloves and eye protection when handling batteries and battery cables. Avoid contact with battery acid.

- a. Mix a strong solution of baking soda and water (Figure 46).



FIG. 46

- b. Brush the solution sparingly over the battery tops and cable connectors.

NOTE: Do not allow baking soda solution to enter battery cells.

- c. Use a wire brush to clean the battery terminals and cable connectors.
 - d. After cleaning, apply a light coating of non-metallic grease or protective spray on the cable connections to prevent battery corrosion.
5. Check for loose or worn cables. Replace if worn.

PRIMING SOLUTION SYSTEM

The following instructions are for priming the restorative extraction solution system. The ReadySpace solution system has an automatic priming process.

Priming the restorative extraction solution system is only required if the solution tank runs dry or if center streaking occurs while cleaning.

To Prime the Solution System:

Priming Hose (p/n 700141) required.

1. Connect bleeder hose to the accessory tool solution hose coupler (Figure 47).
2. Press the solution switch to the on position.
3. Turn the key on and rotate the control grips for approximately 20 seconds.

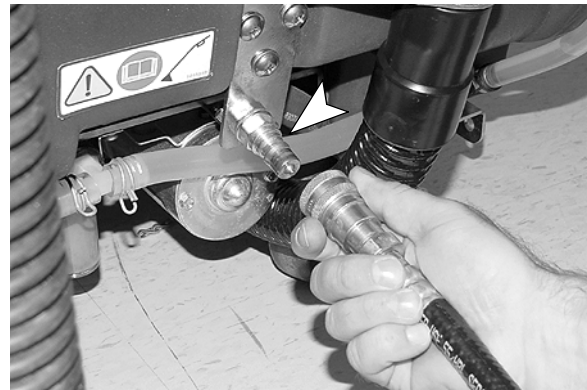


FIG. 47

MACHINE JACKING

Use the designated location under the solution tank for jacking up the machine. Use a piece of wood to distribute the machine weight load (Figure 48).

Position the machine on a flat level surface and block machine tires before jacking up the machine.



FIG. 48

FOR SAFETY: When servicing machine, jack machine up at designated locations only. Block machine up with jack stands.

TRANSPORTING MACHINE

When transporting the machine by use of trailer or truck, be certain to follow tie-down procedures below:

FOR SAFETY: When using machine, go slow on inclines and slippery surfaces.

1. Raise the scrub head to the transport position.
2. Load the machine using a recommended loading ramp.
3. Position the front of the machine up against the front of the trailer or truck. Once machine is positioned, lower the scrub head and turn key off.
4. Set the parking brake and place a block behind each drive wheel to prevent machine from rolling.
5. Place tie-down straps over the top of the machine to prevent it from tipping. It may be necessary to install tie-down brackets to the floor of your trailer or truck.

NOTE: Do not use the control grips to secure machine when transporting.

FOR SAFETY: When transporting machine, use a recommended ramp when loading/unloading on/off truck or trailer, use tie-down straps to secure machine to truck or trailer.

NOTE: When transporting machine in freezing temperatures see *STORING MACHINE*.

STORING MACHINE


1. Charge the batteries before storing. Never store the machine with discharged batteries.
2. Drain and rinse tanks thoroughly.
3. Store the machine in a dry area with the scrub head in the raised position.
4. Remove the recovery tank lid to promote air circulation.

ATTENTION: If storing the machine in freezing temperatures, be certain to drain tanks, purge pump and remove the solution tank filter located under the machine at rear.

ATTENTION: Do not expose machine to rain, store indoors.

RECOMMENDED STOCK ITEMS

Refer to the Parts List Manual for recommended stock items. Stock Items are clearly identified with a bullet preceding the parts description. See example below:



Ref.	Part No.	Description	Qty.
1	701103	ASM., STANDPIPE	1
2	180613	•FLOAT, SHUTOFF	1
3	230197	NIPPLE	1
4	101714	•GASKET	1
5	210240	NUT, FLANGED	1

TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
No machine power.	Key turned off.	Turn key on.
	Emergency-stop button activated.	Turn button clockwise to reset.
	Tripped main power circuit breaker.	Reset breaker.
	Discharged batteries.	Recharge batteries.
	Loose or disconnected battery cable.	Secure battery cable connections.
	Expired battery life.	Replace batteries.
Brush motor(s) do not operate.	Control grips not rotated.	Rotate control grips forward.
	Tripped brush motor circuit breaker(s).	Determine cause and reset breaker.
	Solution switch is turned off.	Solution switch must be turned on to activate brush motors.
	Low voltage interrupter activated.	Recharge batteries.
	Loose or broken belt.	Contact Service Center.
	Faulty brush motor or wiring.	Contact Service Center.
	Worn carbon brushes in motor.	Contact Service Center.
Vacuum motor(s) do not operate.	Scrub head is raised off floor.	Lower scrub head.
	Low voltage interrupter activated.	Recharge batteries.
	Blown fuse.	Replace fuse. (p/n 768688-30A Fuse)
	Faulty vacuum motor or wiring.	Contact Service Center.
	Worn carbon brushes in motor.	Contact Service Center.
Machine does not propel or propels incorrectly.	Parking brake is set.	Release parking brake lever.
	Solution switch is turned off.	Solution switch must be activated when ReadySpace cleaning.
	Tripped drive motor circuit breaker.	Determine cause and reset breaker.
	Faulty potentiometer or speed control board.	Contact Service Center.
	Faulty drive motor or wiring.	Contact Service Center.
	Worn carbon brushes in motor.	Contact Service Center.
Scrub head will not lower.	Wire #47 is not connected to batteries.	Connect wire #47 to battery as shown in battery cable connection label.
	Low voltage interrupter activated.	Recharge batteries.
No solution spray or solution spray is uneven (Streaking occurs).	Control grips not rotated.	Rotate control grips to activate spray.
	Solution switch is turned off.	Turn on solution switch.
	Scrub head not lowered.	Lower scrub head.
	Solution tank is empty.	Refill solution tank.
	Wrong rear vacuum shoe installed.	Install correct vacuum shoe.
	Plugged spray tips.	Clean spray tips.
	Spray tip pattern out of alignment.	Realign spray tips.
	Plugged solution tank filter.	Clean solution tank filter.
	Clogged solution line.	Flush plumbing system.
	Faulty pump or solenoid.	Contact Service Center.
	Low solution spray pressure.	Prime solution system.

TROUBLESHOOTING - Continued

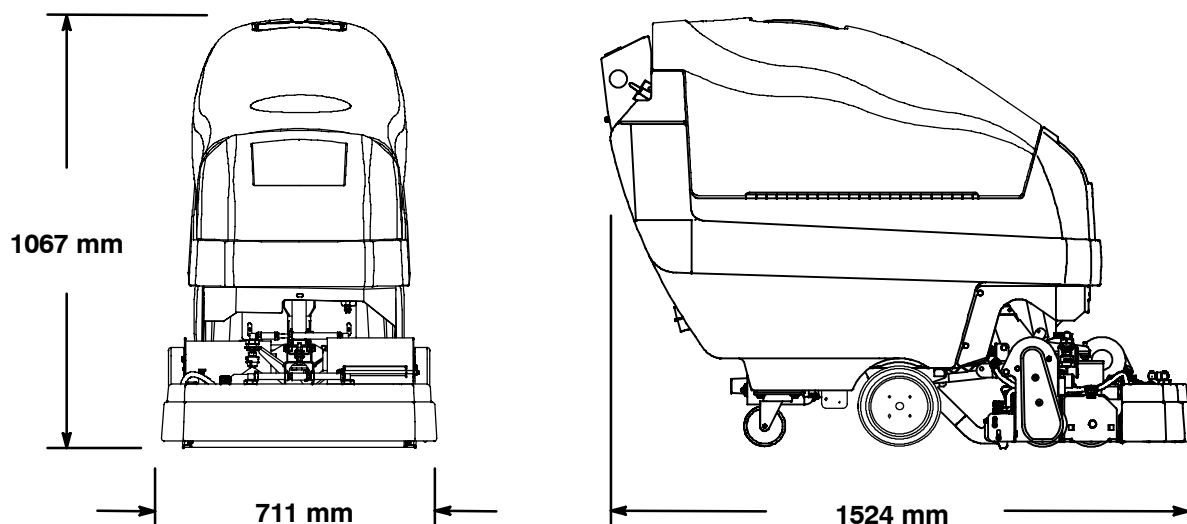
PROBLEM	CAUSE	SOLUTION
Scrub head continues to disperse water when using accessory tools.	Solution Switch is turned on.	Press solution switch to accessory tool symbol (off position).
Poor water pickup.	Full recovery tank.	Drain recovery tank.
	Worn ReadySpace rollers.	Replace rollers.
	Clogged vacuum shoes.	Clean vacuum shoes.
	Wrong rear vacuum shoe installed.	Install correct vacuum shoe.
	Clogged float shut-off screen inside recovery tank.	Clean screen.
	Loose recovery tank drain hose cap.	Tighten cap.
	Loose or disconnected vacuum hose.	Connect hose cuffs securely.
	Clogged vacuum hose.	Remove clogged debris.
	Defective vacuum hose.	Replace vacuum hose.
	Recovery tank lid is not in place.	Properly position lid.
	Worn tank lid gasket.	Replace gasket.
Excessive foam/cream appears on the floor during ReadySpace cleaning.	Cleaning detergents were added to solution tank.	Drain and rinse out solution tank and refill with water only, do not add cleaning detergents.
	An unapproved pre-treatment cleaning detergent was pre-sprayed on the floor.	Use an approved pre-treatment cleaning detergent.
Unable to adjust brush pressure meter in the green zone or meter shows no reading.	Worn extractor brushes.	Replace brushes.
	Tripped circuit breaker.	Reset brush circuit breaker button.
	Loose or broken front brush motor belt.	Contact Service Center.
Short run time.	Low battery charge.	Charge batteries.
	Defective batteries.	Replace batteries.
	Batteries need maintenance.	See BATTERY MAINTENANCE.
	Faulty charger.	Repair or replace battery charger.

MACHINE SPECIFICATIONS

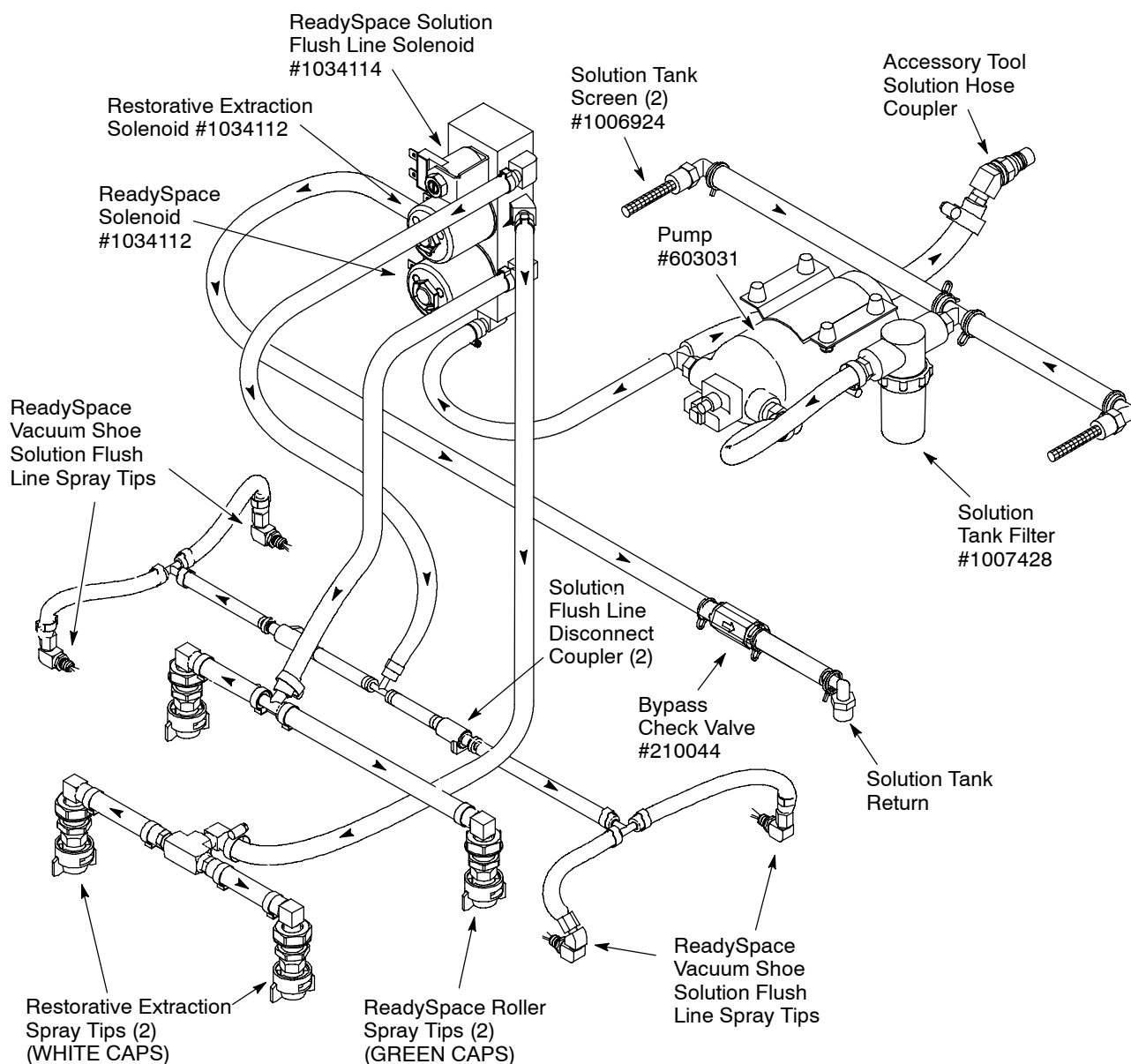
MODEL	Tennant 1610
LENGTH	1524 mm
WIDTH	711 mm
HEIGHT	1067 mm
WEIGHT	268 Kg / 154 Kg less batteries
RECOVERY TANK CAPACITY	79 L
SOLUTION TANK CAPACITY	79 L
PRODUCTIVITY RATE (MAX)	ReadySpace Cleaning: 1200 m ² per hour Restorative Extraction Cleaning: 1000 m ² per hour
TRAVEL SPEED (MAX)	ReadySpace Cleaning: 36.5 m per minute Restorative Extraction Cleaning: 30.5 m per minute Transporting: 76 m per minute
CLEANING PATH WIDTH	559 mm
DRIVE SYSTEM	Transaxle, 24 V, 104 W
BRUSH MOTOR	Two 24V, 17A, .625 HP, 700 RPM
VACUUM MOTOR	Two 24 VDC, 21 A, 535W, 3-stage, 145 mm
WATER LIFT/ AIR FLOW	3050 mm / 1.84 m ³ per minute
PUMP	24V, 4.5A, 6.9 bar, 3.8 L per minute
SOLUTION FLOW RATE	ReadySpace Cleaning: 1.3 L per minute Restorative Extraction Cleaning: 3.8 L per minute
VOLTAGE DC	24 VDC
TOTAL POWER CONSUMPTION	65 Amp nominal
BATTERIES	Four 6V Deep Cycle
BATTERY CAPACITY	180 Ah / 5 hour rate
RUN TIME PER CHARGE	Up to 2.5 hours
PROTECTION GRADE	IPX4
SOUND POWER LEVEL	72 dB (1m x 1m)
DECIBEL RATING AT OPERATOR'S EAR, INDOORS.	72 dB(A)
VIBRATIONS AT HAND CONTROLS	<1.0m/s ²
MAXIMUM GRADE LEVEL	19% (11°) Transporting / 5% (3°) Cleaning

Specifications are subject to change without notice.

MACHINE DIMENSIONS



SOLUTION FLOW DIAGRAM (AFTER SERIAL #10314332)



SOLUTION FLOW DIAGRAM (BEFORE SERIAL #10314332)

