

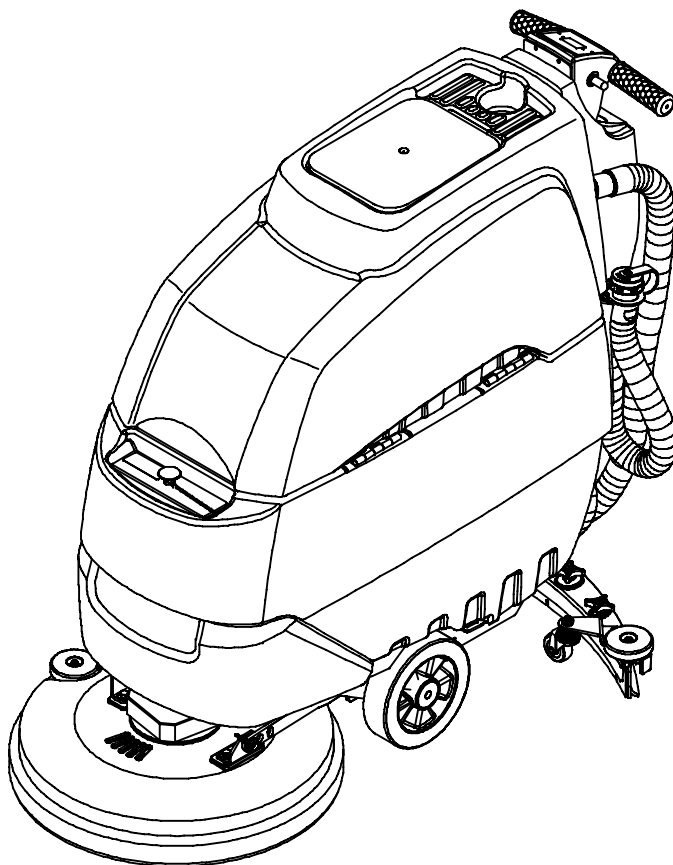


The Safe Scrubbing Alternative®

SPEED SCRUB®

17 in / 20 in AUTOMATIC SCRUBBER

OPERATOR MANUAL



OPERATION


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

Read this manual completely and understand the machine before operating or servicing it.

A complete illustrated Parts Manual is also furnished with each new model. Use the Parts Manual to order replacement parts. To ensure prompt delivery, follow the "HOW TO ORDER PARTS" instructions printed in the Parts Manual.


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 an environmentally safe way according to local waste disposal regulations.



Always remember to recycle.

MACHINE DATA

Please fill out at time of installation for future reference.

Model No. - _____

Serial No. - _____

Machine Options - _____

Sales Rep. - _____

Sales Rep. phone no. - _____

Customer Number - _____

Installation Date - _____

Tennant Company
PO Box 1452
Minneapolis, MN 55440 USA
Phone: (800) 553-8033 or (763) 513-2850
www.nobles.com

Specifications and parts are subject to change without notice.

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SAFETY PRECAUTIONS

This machine is intended for commercial use. It is designed exclusively to scrub hard floors in an indoor environment and is not constructed for any other use. Only use recommended pads, brushes and commercially approved floor cleaners intended for machine application.

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.

The following safety precautions signal potentially dangerous conditions to the operator or equipment. All operators must read, understand and practice them.

 **WARNING:** Fire Or Explosion Hazard:

- Never 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 and Charger Plug Before Servicing Machine.
- Do Not Charge Batteries with Damaged Power Supply Cord. Do Not Modify Plug.

If the charger supply cord is damaged or broken, it must be replaced by the manufacturer or its service agent or a similarly qualified person in order to avoid a hazard.

 **WARNING:** Spinning Brush. Keep Hands Away. Turn Off Power Before Working On Machine.

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 starting machine:
 - Make sure all safety devices are in place and operate properly.
3. When using machine:
 - Go slow on inclines and slippery surfaces.
 - Wear non-slip shoes.
 - 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.
 - Do not operate on inclines that exceed 5% (3°).
4. Before leaving or servicing machine:
 - Stop on level surface.
 - Turn off machine.
 - Set parking brake, if equipped.
 - Remove key.
5. When servicing machine:
 - Avoid moving parts. Do not wear loose jackets, shirts, or sleeves.
 - Disconnect battery connections before working on machine.
 - Wear protective gloves and eye protection when handling batteries or battery cables.
 - Avoid contact with battery acid.
 - Do not power spray or hose off machine. Electrical malfunction may occur.
 - 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 by use of truck or trailer:

- Drain tanks before loading.
- Use a recommended ramp when loading/unloading into/off truck or trailer.
- Do not lift machine when batteries are installed.
- Get assistance when lifting machine.
- Turn machine off.
- Put scrub head in the lowered position.
- Use tie-down straps to secure machine.
- Set parking brake, if equipped.

SAFETY LABELS

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

WARNING LABEL - Located on recovery tank cover.

⚠ WARNING	
  	
<p>EXPLOSION, FIRE AND SHOCK HAZARD. AVOID INJURY.</p> <ul style="list-style-type: none"> • Do Not Use or Pick Up Flammable Materials. • Do Not Use Near Flammable Liquids, Vapors or Combustible Dusts. • Disconnect Battery Cables and Charger Cord Before Servicing. • Keep Sparks and Open Flame Away When Charging Batteries. Keep Battery Compartment Propped Open When Charging. 	
⚠ AVERTISSEMENT	
<p>RISQUE D'EXPLOSION, D'INCENDIE ET DE DÉCHARGE. ÉVITEZ LES BLESSURES.</p> <ul style="list-style-type: none"> • N'utilisez Pas ou Ne Ramassez Pas de Matériaux Inflammables. • N'utilisez Pas Près de Liquides, Vapeurs ou Poussières Inflammables. • Débranchez les Câbles de Batterie et la Cordon du Chargeur Avant l'Entretien. • Eloignez les Sources d'Étincelles ou de Flamme Ouverte Lors du Chargement des Batteries. Laissez Ouvert le Compartiment des Batteries Pendant la Mise en Charge. 	
⚠ ADVERTENCIA	
<p>PELIGRO DE EXPLOSIÓN, FUEGO, DESCARGA EVITE LESIONES.</p> <ul style="list-style-type: none"> • No Use Ó Recoja Materiales Flamables. • No Use Cerca De Líquidos Flamables, Vapores Ó Materiales Combustibles. • Desconecte Cable De Bateria Y Cable Del Cargador Antes Del Mantenimiento. • Mantenga Chispas Y Fuego Alejados Mientras Carga Baterías. Mantenga el Compartimento De La Bateria Abierto Mientras Realiza La Operación De Carga. 	
⚠ 警告	
<p>爆発、火災、またはショックの危険！ 怪我に注意！</p> <ul style="list-style-type: none"> • 引火性物質を使用したり吸引をしないでください。 • 可燃性液体、引火性気体、または粉塵の近くでは、使用しないでください。 • 本機の点検整備をするときはバッテリーのケーブルと充電器のコードを外してください。 • バッテリーを充電するときには、火花や炎を近づけないでください。充電するときは、バッテリールームを開けたままにしてください。 	
<small>1038679</small>	



SPINNING BRUSH LABEL - Located on scrub head

⚠ WARNING: Spinning Brush. Keep Hands Away. Turn Off Power Before Working On Machine.

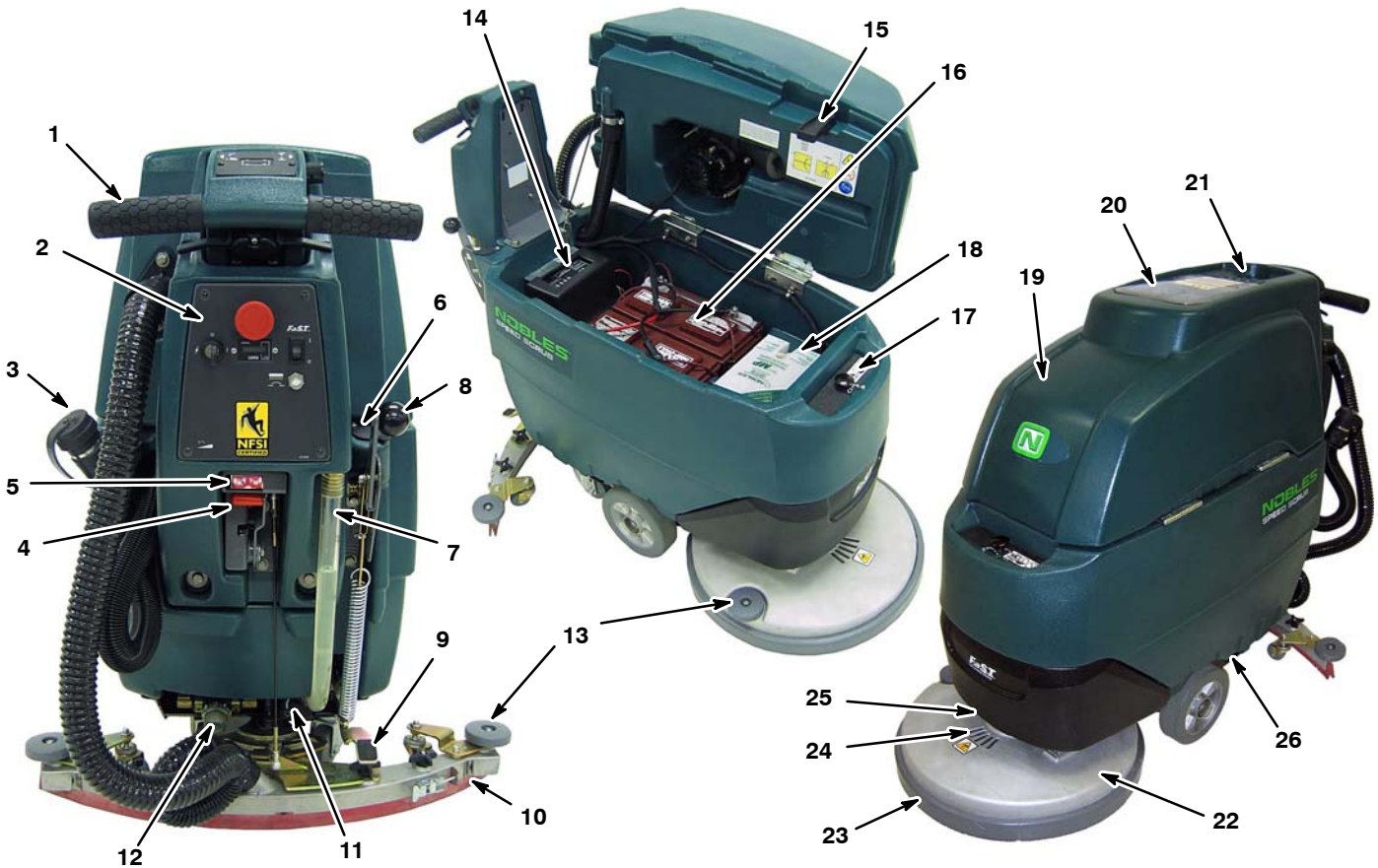


BATTERY CHARGE LABEL - Located on bottom side of recovery tank.

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

OPERATION

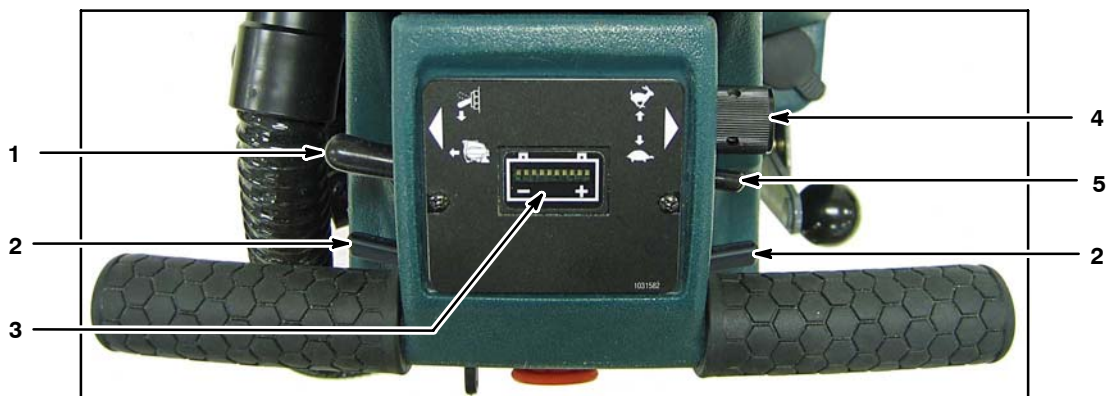
MACHINE COMPONENTS



- 1. Adjustable Control Handle
- 2. Control Console Panel
- 3. Recovery Tank Drain Hose
- 4. Squeegee Lift Lever
- 5. Battery Charge Receptacle
- 6. Hose Fill-Port
- 7. Solution Tank Sight Gauge/Drain Hose
- 8. Down Pressure Lever
- 9. Scrub Head Lift Pedal
- 10. Squeegee Assembly
- 11. Solution Flow Control Knob
- 12. Solution Tank filter
- 13. Wall Rollers

- 14. On-board Battery Charger
- 15. Recovery Tank Support Stand
- 16. Batteries
- 17. Solution Tank/Bucket Fill Port
- 18. FaST-PAK Concentrate (FaST Model)
- 19. Recovery Tank
- 20. Recovery Tank Cover
- 21. Cup Holder
- 22. Scrub Head
- 23. Scrub Head Skirt
- 24. Scrub Head Window
- 25. Motor Hub Lock Pin
- 26. Parking Brake (option)

CONTROL PANEL COMPONENTS



- 1. Reverse Trigger
- 2. Start Triggers
- 3. Battery Meter
- 4. Speed Control Knob (drive model)
- 5. Control Console Height Adjustment Lever

- 6. Emergency Stop Button (option)
- 7. Main Power on/off Key Switch
- 8. Hour Meter
- 9. FaST System on/off Switch (option)
- 10. Brush Motor Circuit Breaker Button

OPERATION

MACHINE INSTALLATION

UNCRATING MACHINE

1. Carefully check the shipping crate for signs of damage. Report damages at once to carrier.
2. Check the contents list. Contact distributor for missing items.

Contents:

- 2-12 V Batteries - Optional
- 24V Battery Charger - Optional
- 3-Foam Battery Spacers (#630375)
- Battery Tray (#1012994)
- 15 in / 38 cm Battery Cable (#130364)
- 4-Battery Cable Rubber Boots
- 1-FaST-PAK MP Concentrate (#1017019) (FaST Model)
- Squeegee Assembly (#9001178)
- Pad Driver - Optional

Brushes and pads must be purchased separately.

3. To uncrate your machine, remove the shipping hardware and straps that secure the machine to the pallet. With assistance, carefully lift the machine off the pallet.

ATTENTION: Do not roll machine off pallet unless a ramp is used, machine damage may occur.

ATTENTION: To prevent possible machine damage, install batteries after removing machine from shipping pallet.

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.

Recommended Battery Specifications:

Two 12 volt deep cycle lead acid batteries.

105 AH battery - 17 in / 43cm Brush Assist Model

130 AH battery - 20 in / 50cm Brush Assist Model

155 AH battery - 20 in / 50cm Drive Model

Maximum battery dimensions: 6.85 in / 174 mm W x 15 in / 380 mm L x 11.18 in / 284 mm H.

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

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). Insert the foam spacers as shown.
4. Connect the battery cables to the battery posts as shown (Figure 2). RED TO POSITIVE (+) and BLACK TO NEGATIVE (-).

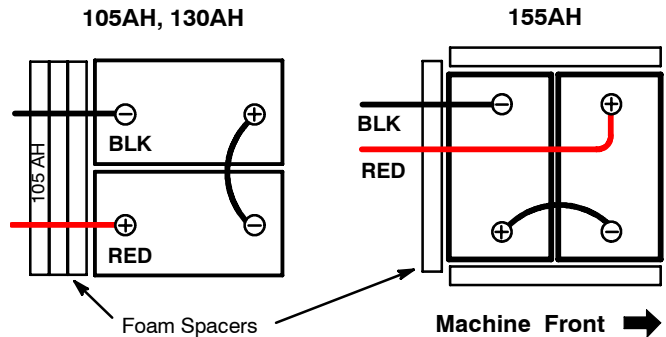


FIG. 2

IMPORTANT: If your machine is equipped with the on-board battery charger, make sure that the charger is properly set for your battery type before charging (See USING THE ON-BOARD CHARGER on page 16).

HOW THE MACHINE WORKS

Conventional Scrubbing:

Water and detergent from the solution tank flow to the floor through a manually controlled solution valve. The brush uses the detergent and water solution to scrub the floor clean. As the machine moves forward, the squeegee wipes the dirty solution from the floor into the recovery tank.

Foam Scrubbing (FaST Model):

(FaST-Foam activated Scrubbing Technology)

Unlike conventional scrubbing, the FaST system injects the FaST-PAK concentrate formula with a small amount of water and air onto the floor. The mixture creates a large volume of expanded wet foam for the brush to scrub the floor clean. As the machine moves forward, the foam collapses and the squeegee recovers the dirty solution into the recovery tank leaving the floor clean, dry and slip free.

BRUSH AND PAD INFORMATION

For best results, use the correct brush type for the cleaning application. The following are recommended brushes and pads.

Polypropylene Bristle Scrub Brush (Black) -

Part No. 1016765 - 17 in / 43 cm

Part No. 1016811 - 20 in / 50 cm

This general purpose polypropylene bristle scrub brush is used for scrubbing lightly compacted soilage. This brush works well for maintaining concrete, wood and grouted tile floors.

Soft Nylon Bristle Scrub Brush (White) -

Part No. 1016764 - 17 in / 43 cm

Part No. 1016810 - 20 in / 50 cm

Recommended for cleaning coated floors without removing finish. Cleans without scuffing.

Super Abrasive Bristle Scrub Brush (Gray) -

Part No. 1016763 - 17 in / 43 cm

Part No. 1016805 - 20 in / 50 cm

Nylon fiber impregnated with abrasive grit to remove stains and soilage. Strong action on any surface. Performs well on buildup, grease, or tire marks.

Polishing Pad (White) -

Used to maintain highly polished or burnished floors.

Buffing Pad (Red) -

Used for light duty scrubbing without removing floor finish.

Scrubbing Pad (Blue) -

Used for medium to heavy-duty scrubbing. Removes dirt, spills, and scuffs and leaves surface clean ready for recoating.

Stripping Pad (Brown) -

Used for stripping of floor finish to prepare the floor for recoating.

Heavy Duty Stripping Pad (Black) -

Used for aggressive stripping of heavy finishes/sealers, or very heavy duty scrubbing.

MACHINE SETUP

ATTACHING SQUEEGEE ASSEMBLY

1. Park the machine on a level surface, remove the key and set the parking brake if equipped.
2. Lift the squeegee lift lever to the upward position (Figure 3).



FIG. 3

3. Mount the squeegee assembly to the squeegee pivot bracket as shown (Figure 4). Make sure the knobs are completely seated into the slots before securing knobs.

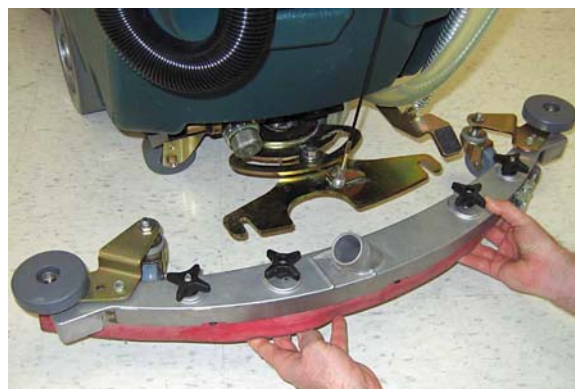


FIG. 4

4. Connect the vacuum hose to the squeegee assembly. Loop the hose as shown using the hose clip provided (Figure 5).

OPERATION

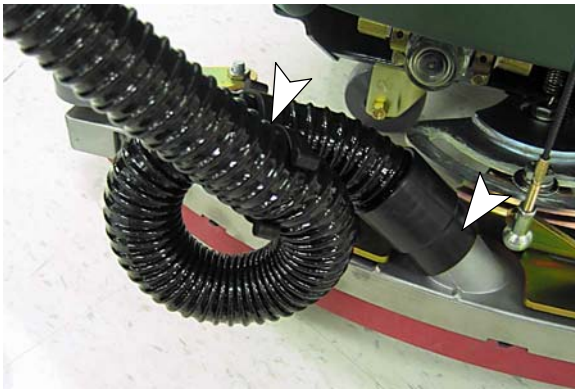


FIG. 5

5. Check the squeegee blades for proper adjustment (See *SQUEEGEE BLADE ADJUSTMENT* on page 22).

INSTALLING BRUSH/PAD DRIVER

FOR SAFETY: Before installing brushes or pad drivers, stop machine on level surface, remove key and set parking brake if equipped.

1. Park the machine on a level surface and remove the key.
2. Step down on the scrub head lift pedal to raise the scrub head off the floor (Figure 6).



FIG. 6

3. Attach the pad to the pad driver before installing pad driver (Figure 7). Secure pad with center lock.

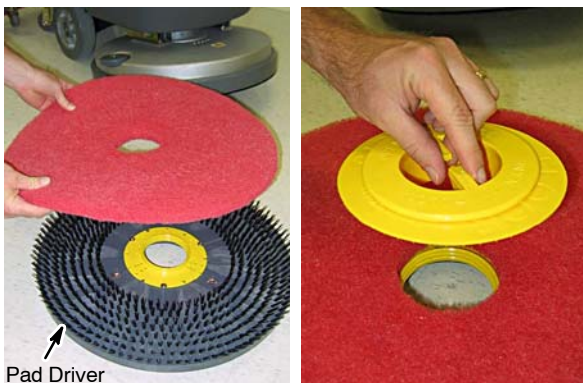


FIG. 7

4. Turn the brush motor hub until the slot with the spring clip is visible through the scrub head window (Figure 8).

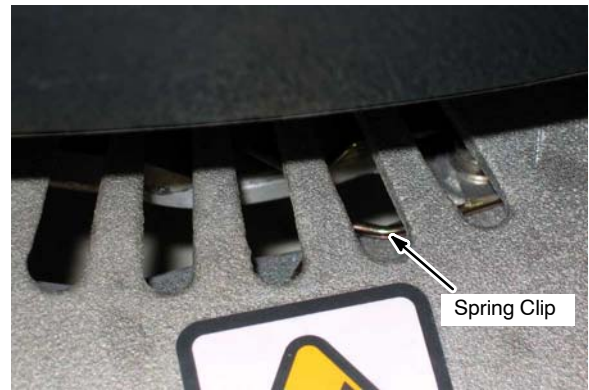


FIG. 8

5. Align the pad driver/brush mounting studs into the motor hub slots and turn the pad driver/brush counter-clockwise until stud is fully seated in spring clip (Figure 9). If necessary, press down on the motor hub lock pin to lock motor hub in place (Figure 10).

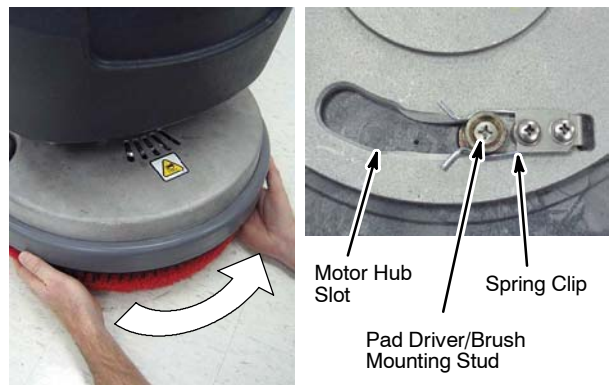


FIG. 9

6. To remove the pad driver/brush, press down on the motor hub lock pin and turn the pad driver/brush clockwise (Figure 10).

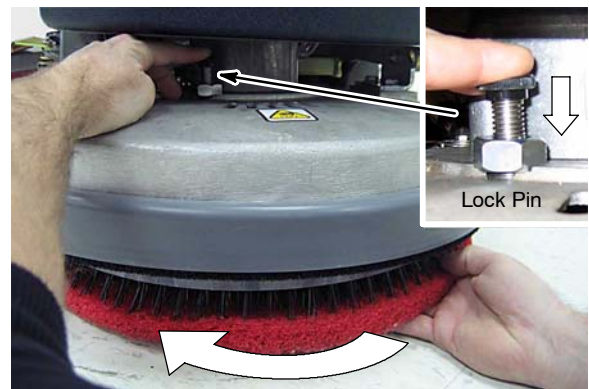


FIG. 10

INSTALLING FaST-PAK CARTON (FaST Model)

ATTENTION: The FaST-PAK Concentrate Formula is specifically designed for the FaST system. NEVER use a substitute, machine damage may result.

1. Remove the perforated knock-out from the FaST-PAK carton. Do not remove the bag from the carton. Pull the hose connector through the knock-out and remove the orange cap (Figure 11).

FOR SAFETY: When using machine, always follow the handling instructions on chemical container.



FIG. 11

2. Lift the recovery tank to access the FaST-PAK compartment. Connect the supply hose to the FaST-PAK and place carton into the compartment as shown (Figure 12). Make sure that the supply hose doesn't get kinked or pinched.

NOTE: If any dried concentrate is visible on the supply hose connector or on the FaST-PAK connector, soak and clean with warm water.



FIG. 12

3. When the supply hose is not in use, make sure to connect it to the storage plug (Figure 13). This will prevent the FaST system from drying out and clogging up the supply hose.



FIG. 13

FILLING SOLUTION TANK

The machine is equipped with a hose fill-port at the rear of the machine, and a bucket fill-port located at the front of the machine (Figure 14).

Fill the solution tank to the "44 L MAX" level on the solution tank sight gauge (Figure 14).

FOR FaST SCRUBBING: Use cool clean water only (less than 70°F / 21°C). Do not add any conventional floor cleaning detergents, FaST system failure may result.

FOR CONVENTIONAL SCRUBBING: Use hot water (140°F / 60°C maximum). Pour a recommended cleaning detergent into the solution tank according to mixing instructions on the container.



FIG. 14

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

ATTENTION: For Conventional Scrubbing, only use commercially approved cleaning detergents. Machine damage due to improper detergent usage will void the manufacturer's warranty.

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

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

OPERATION

ADJUSTING CONTROL CONSOLE HEIGHT

Pull the control console height adjustment lever and lift or lower the console to a comfortable operating height. Release lever to lock in position (Figure 15).

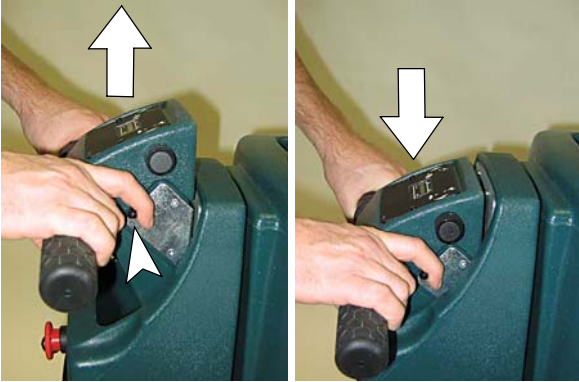


FIG. 15

MACHINE OPERATION

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

⚠ WARNING: Fire Or Explosion Hazard. Never Operate Machine In Or Near Flammable Liquids, Vapors Or Combustible Dusts.

FIRST TIME USE (FaST Model): The FaST system is protected against freezing during shipment. You must operate the FaST system for 10 minutes to disperse the mixture of RV anti-freeze/FaST concentrate before achieving maximum foam.

PRE-OPERATION CHECKS

- Sweep and dust-mop the floor.
- Check the battery meter charge level (See BATTERY METER on page 14).
- Check the pad/brush for wear.
- Check the squeegee blades for wear and proper adjustment.
- Make sure the recovery tank is empty and the float shut-off screen is installed and clean.
- Check the scrub head skirt for wear.
- Foam scrubbing (FaST Model): Check the FaST-PAK concentrate level.
- Foam scrubbing (FaST Model): Make sure the solution tank is filled with only cool clean water, no detergents.

STARTING THE MACHINE

1. Release the parking brake if equipped (Figure 16).
2. Turn the main power key switch to the on (I) position (Figure 16).



FIG. 16

3. To foam scrub (FaST model), press the FaST system switch to the on (I) position (Figure 17).

IMPORTANT: Do not activate the FaST system when conventional scrubbing. The conventional cleaning detergents/restorers in solution tank may cause failure to the FaST injection system. Drain, rinse and refill solution tank with cool clean water before operating the FaST system.



FIG. 17

4. Lower the squeegee assembly to floor by lowering the squeegee lift lever (Figure 18). The vacuum motor will automatically turn on.



FIG. 18

- Lower the scrub head to the floor by stepping on the scrub head lift pedal as shown (Figure 19).



FIG. 19

- Pull the triggers to start scrubbing (Figure 20). The drive model will begin to propel forward. To reverse the drive model, simply pull the reverse trigger.

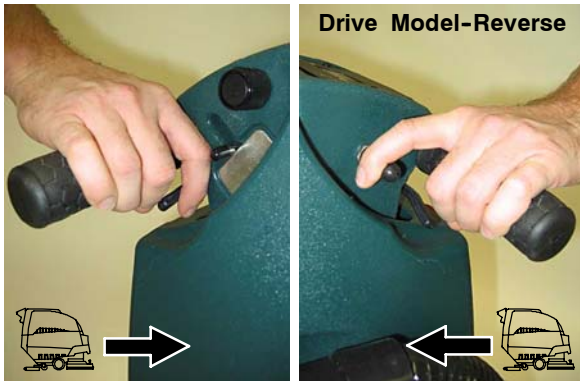


FIG. 20

- Drive Model: Adjust the speed control knob to a desired scrubbing speed (Figure 21).

NOTE: 45–60 meters per minute is the recommended scrubbing speed.



FIG. 21

- For conventional scrubbing, turn the solution flow control knob to a desired flow rate (Figure 22).

NOTE: FaST Model - When using the FaST system, the solution flow control knob is nonfunctional. The FaST system has a set solution flow rate.



FIG. 22

- When more brush pressure is needed for heavily soiled areas simply lift the down pressure lever (Figure 23).

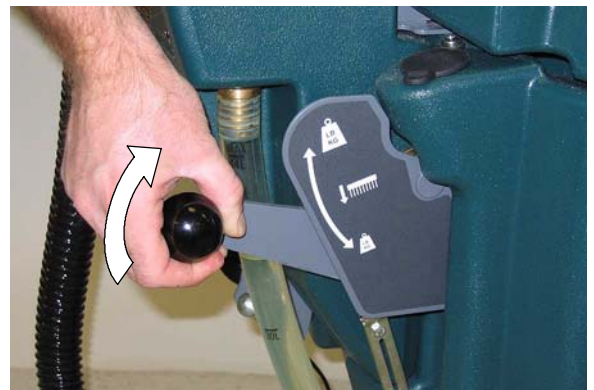


FIG. 23

- To stop scrubbing, release the triggers, raise the scrub head and the squeegee and turn the key to the off position.

EMERGENCY STOP BUTTON (OPTION)

Strike the emergency stop button, if equipped, in the event of an emergency (Figure 24). This button shuts off all power to machine. Turn the button clockwise and restart the key to regain power .

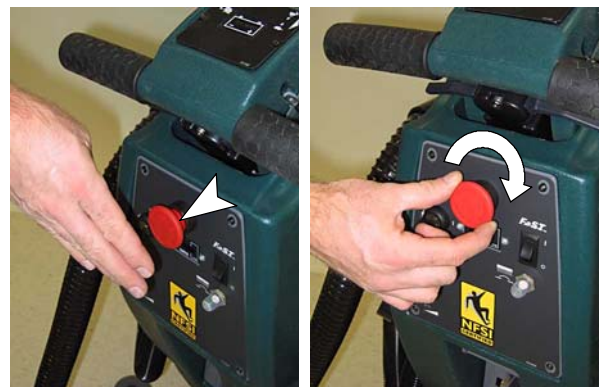


FIG. 24

OPERATION

WHILE OPERATING MACHINE

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

FOR SAFETY: When using machine, go slow on inclines and slippery surfaces. Wear non-slip shoes.

1. Overlap each scrubbing path by 2 in / 5 cm.
2. Keep the machine moving to prevent damage to floor finish.
3. Wipe the squeegee blades with a cloth if blades leave streaks. Pre-sweep the area to prevent streaking.
4. Do not operate the machine on inclines that exceed 5% (3°).
5. Pour a commercially approved foam control solution into the recovery tank if excessive foam appears.

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.

6. For heavily soiled areas, use the double scrubbing method. First scrub the area with the squeegee up, let solution set for 3-5 minutes, then scrub the area a second time with the squeegee down.
7. When leaving the machine unattended, remove the key and set the parking brake, if equipped.
8. Drive Model: If the machine detects a fault, the battery meter will blink a fault code (See BATTERY METER LED FAULT CODES on page 26).

BATTERY METER

The battery meter displays the charge level of the batteries. When the batteries are fully charged, all indicator lights will glow. As the batteries discharge, the indicator lights will begin to go out from right to left.

NOTE: To prolong the life of the batteries *ONLY* recharge the batteries when the machine is used for a total of 30 minutes or more.

DRIVE MODEL: When the discharge level reaches the first red light (Figure 25), stop scrubbing and recharge the batteries. If you continue to operate the machine beyond the first red light, the scrubbing function will automatically shut off when the last red light begins to blink. This protects the batteries from total discharge. Drive the machine to the charging area and recharge the batteries immediately.

NOTE: The Drive Model battery meter also displays machine fault codes. If a fault is detected the LED bars will flash specific fault codes (See BATTERY METER LED FAULT CODES on page 26).

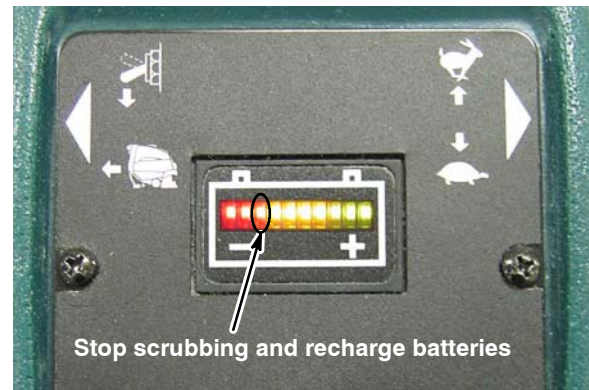


FIG. 25

BRUSH ASSIST MODEL: When the discharge level reaches the last yellow light (Figure 26), the light will begin to flash, stop scrubbing and recharge the batteries. If the red light appears, the scrubbing function will shut off automatically. This protects the batteries from total discharge. Recharge the batteries immediately.

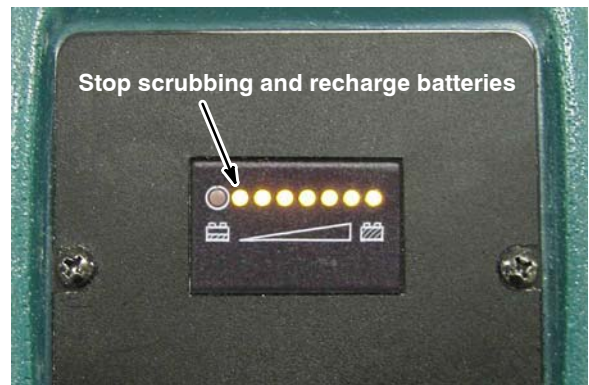


FIG. 26

CIRCUIT BREAKER / FUSES

The machine is equipped with a resettable circuit breaker to protect the brush motor from damage. The circuit breaker button is located on the control panel (Figure 27). If the circuit breaker should trip, determine the cause, allow the motor to cool, and then manually reset the circuit breaker button.

The machine is also equipped with three fuses located inside the control console: 30A Main fuse (drive model), 5A Main fuse (brush assist model), 25A vacuum motor fuse and 7.5A FaST Pump fuse. When replacing a fuse never substitute a higher Amp rated fuse than specified.

Contact an Authorized Service Center for machine repairs.

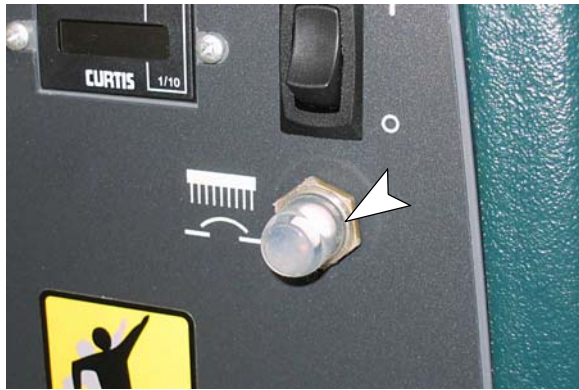


FIG. 27

HOUR METER

The hour meter records the number of total hours the brush motor has been powered on. Use the hour meter to determine when to perform recommended maintenance procedures and to record service history (Figure 28).



FIG. 28

DRAINING TANKS

After each use, the tanks should be drained and cleaned. **FOR SAFETY: Before leaving or servicing machine, stop on level surface, turn off machine and remove key.**

DRAINING RECOVERY TANK

1. Transport machine to disposal area and turn key switch off.
2. While holding the drain hose upward, remove the cap and lower hose to drain (Figure 29).



FIG. 29

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

3. Remove the recovery tank cover and rinse out the tank (Figure 30).



FIG. 30

4. Clean the float shut-off screen located in the recovery tank (Figure 31).



FIG. 31

OPERATION

DRAINING SOLUTION TANK

To drain any remaining water from the solution tank, pull the solution tank level hose off the hose fitting (Figure 32).



FIG. 32

CHARGING BATTERIES

The following charging instructions are intended for battery chargers supplied with the machine.

ATTENTION: To prolong the life of the batteries only recharge the batteries if the machine was used for a total of 30 minutes or more. Do not leave batteries discharged for lengthy periods.

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

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

BATTERY CHARGER SPECIFICATIONS:

- CHARGER TYPE:
 - FOR SEALED (Gel) BATTERIES
 - FOR WET (Lead Acid) BATTERIES
- OUTPUT VOLTAGE - 24 VOLTS
- OUTPUT CURRENT - 11 AMPS
- AUTOMATIC SHUTOFF CIRCUIT
- FOR DEEP CYCLE BATTERY CHARGING

USING THE ON-BOARD BATTERY CHARGER

IMPORTANT: If your machine is equipped with the on-board battery charger, make sure the charger profile is properly set for your battery type before charging. Failure to properly set will result in battery damage.

To determine your battery type, see battery label. Contact your battery supplier if not specified.

To verify the setting of the charger profile, connect the charger cord into an electrical receptacle. If the LED labeled “GEL” is on, the charger is set for Gel (sealed) batteries. If the LED is off, the charger is set for Wet/lead acid (flooded) batteries (Figure 33).



FIG. 33

To change the charger profile, unplug the charger, remove the “Charger Profile Selection” panel and position the switch towards the proper setting, “GEL” or “Flooded” (Figure 34).

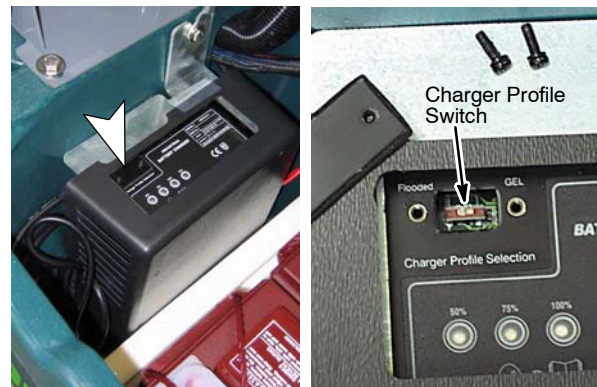


FIG. 34

1. Transport the machine to a well-ventilated area for charging.
2. Park the machine on a flat, dry surface. Turn the key off and set the parking brake, if equipped.
3. If charging wet (lead acid) batteries check the fluid level before charging (See BATTERY MAINTENANCE on page 22).
4. Connect the charger cord into a properly grounded electrical receptacle (Figure 35). The charger will start automatically within a few seconds. The LED's will display the charging state as described in the following table.

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

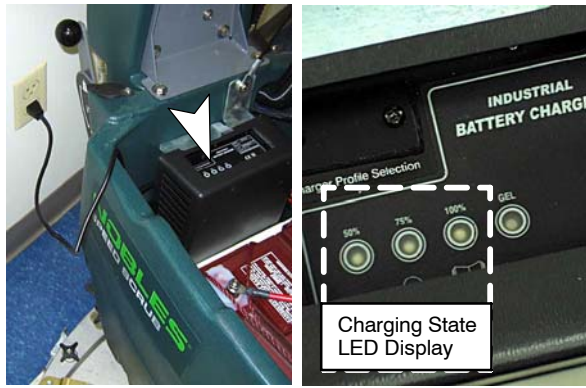


FIG. 35

CHARGING STATE LED DISPLAY			
Charging State	50% LED	75% LED	100% LED
0-50% charged	Blinking	Off	Off
50-75% charged	On	Blinking	Off
75-100% charged	On	On	Blinking
100% charged	On	On	On
Abnormal Cycle*	Off	Off	Blinking
Fault detected *	Blinking	Blinking	Blinking

* See the On-board Battery Charger Fault Codes table. When a fault occurs, the charger will also sound an alarm.

- Prop up the recovery tank for ventilation when charging (Figure 36).



FIG. 36

- Once the batteries are fully charged, the charger will stop supplying power, but will continue to monitor the battery voltage. The charger will restart if the batteries self-discharge.

NOTE: The charger may take up to 30 seconds to turn off once the charger cord is disconnected. During this time, the machine will not power up.

The charger cord must also be disconnected for 30 seconds before the charger can be restarted.

ON-BOARD BATTERY CHARGER FAULT CODES



Blinking LED's

LED FAULT CODE	FAULT	SOLUTION
3 LED's blink once repeatedly	Loose charger cable connection.	Check charger cable connection.
	Loose or damaged battery cable.	Check battery cable connections.
	Defective Battery.	Replace battery.
3 LED's blink twice repeatedly	Input voltage is out of range.	Try using a different wall outlet.
3 LED's blink three times repeatedly	Safety thermostat exceeded maximum internal temperature.	Open battery compartment to promote air circulation or move machine to a cooler climate.
3 LED's blink four times repeatedly	Output current exceeds a limit.	Disconnect charger cord, wait 30 seconds, then plug back in. If fault continues replace charger or Contact Service Center.
100% LED blinks while the 50% and 75% LED's are off.	Abnormal cycle. Safety timer exceeded the 18 hour charging time.	Battery maintenance required or replace battery.

OPERATION

USING THE OFF-BOARD BATTERY CHARGER

For battery charger operating instructions, refer to the Battery Charger Manual supplied with charger.

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

⚠ 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 flat, dry surface. Turn the key off and set the parking brake, if equipped.
3. If charging wet (lead acid) batteries, check the fluid level before charging (See BATTERY MAINTENANCE on page 22).
4. Prop up the recovery tank for ventilation when charging (Figure 37).



FIG. 37

5. Connect the charger's AC power supply cord to a properly grounded receptacle.
6. Connect the charger's DC cord to the machine's battery receptacle at the rear of the machine (Figure 38).

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



FIG. 38

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.

MACHINE MAINTENANCE

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

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

DAILY MAINTENANCE (After Every Use)

1. Drain and rinse out the recovery tank (Figure 39).



FIG. 39

2. Remove and clean the float shut-off screen located in the recovery tank (Figure 40).



FIG. 40

3. Drain the solution tank and rinse out the inside with hot water, 60°C maximum temperature, as needed (Figure 41)



FIG. 41

4. Remove the pad/brush and clean. Rotate pad or replace when worn (Figure 42).

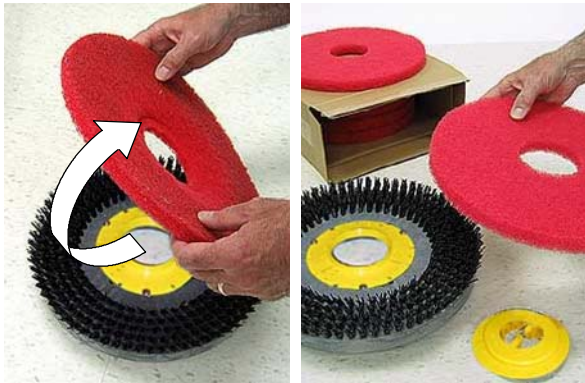


FIG. 42

5. Wipe the squeegee blades clean (Figure 43). Store the squeegee assembly in the raised position to prevent blade damage.

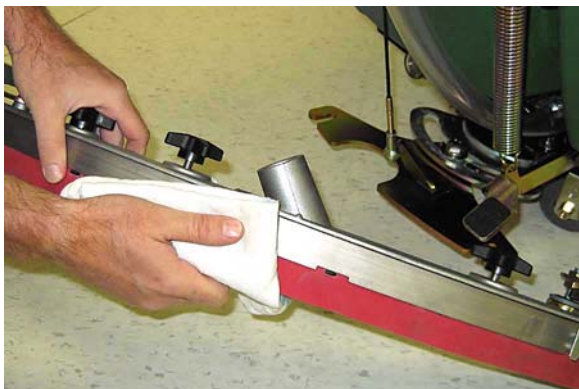


FIG. 43

6. Check the condition of the squeegee blade wiping edge (Figure 44). Rotate blade if worn. (See SQUEEGEE BLADE REPLACEMENT on page 21)



FIG. 44

7. Clean the machine with an all purpose cleaner and damp cloth (Figure 45).

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



FIG. 45

8. Inspect the condition of the scrub head skirt, replace if worn or damaged (Figure 46).



FIG. 46

9. FaST Model: Connect the FaST-PAK supply hose to the storage plug when not in use (Figure 47). Remove any dried concentrate from the hose connector by soaking it in warm water.

OPERATION



FIG. 47

10. Recharge the batteries. To prolong the life of the batteries, only recharge the batteries if machine was used for a total of 30 minutes or more (Figure 48).



FIG. 48

MONTHLY MAINTENANCE

1. Remove the solution tank filter from underneath the machine and rinse out the screen (Figure 49). Make sure the solution tank is empty before removing filter.



FIG. 49

2. Clean the battery tops to prevent corrosion (See BATTERY MAINTENANCE on page 22).
3. Check for loose battery cable connections.

4. Inspect and clean the recovery tank cover seal (Figure 50). Replace if damaged.



FIG. 50

5. Lubricate all pivot points and rollers with a water resistant grease.
6. If equipped, clean the parking brake clamp with a cleaning solvent.
7. Check the machine for loose nuts and bolts.
8. Check the machine for leaks.

MOTOR MAINTENANCE

Contact an Authorized Tennant Service Center for carbon brush replacement.

Carbon Brush Replacement	Hours
Drive Transaxle Motor	750
Vacuum Motor	750
Brush Motor	750

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

FaST SYSTEM MAINTENANCE

Every 1000 hours replace the orifice plate and filter screen located inside the detergent injector assembly. Order service kit p/n 9001489.

1. To access the detergent injector assembly, lower the scrub head and remove the front shroud. Then remove the injector assembly from clamp (Figure 51).



FIG. 51

2. Unthread the black filter housing and replace the orifice plate and filter (Figure 52).



FIG. 52

SQUEEGEE BLADE REPLACEMENT

Each squeegee blade has four wiping edges. When the blades become worn, simply rotate the blades end-for-end or top-to-bottom for a new wiping edge. Replace blade if all four edges are worn.

1. Remove the squeegee assembly from the machine.
2. Loosen the band clamp and remove the band from the squeegee assembly (Figure 53).

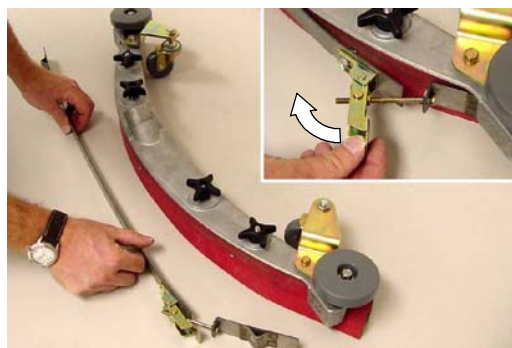


FIG. 53

3. Rotate the rear blade to a new wiping edge and reinstall the band. Make sure the notched edge of the band is facing downward (Figure 54).



FIG. 54

4. To replace the front blade, remove the rear band and fully loosen the four squeegee assembly knobs, do not remove the knobs. Lift and tilt the retainer plate to access the front blade (Figure 55). Rotate the front blade to a new wiping edge and return the retainer plate. Make sure the retainer plate tabs engage the blade slots. Reinstall the band then retighten the knobs.

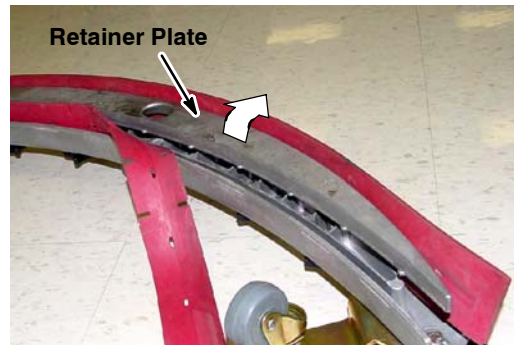


FIG. 55

OPERATION

SQUEEGEE BLADE ADJUSTMENT

The adjustment of the squeegee blades are factory set and require no further adjustment. Squeegee adjustment is only necessary if it comes out of adjustment.

For optimum squeegee blade performance, the squeegee assembly casters must be adjusted to a specified height as described below.

1. To check the squeegee assembly for proper adjustment, remove the squeegee assembly from the machine and place it on a level surface. Measure the distance between the caster and the surface. It should measure approximately 1/16 in / 2 mm (Figure 56).
2. To adjust the caster height, loosen the top nut and remove the plastic bearing cover to access the adjustment nut. Turn the adjustment nut until properly adjusted (Figure 56). After adjusting, tighten the top nut and replace the plastic bearing cover. Repeat step for the other caster.

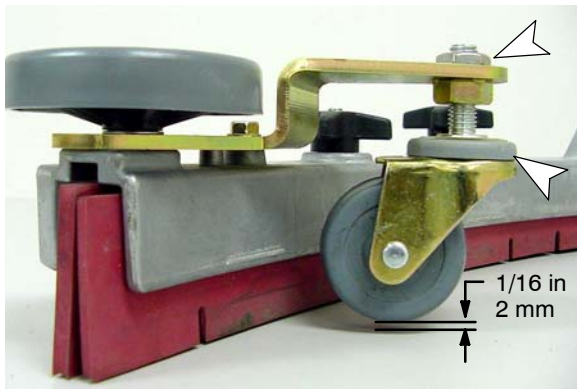


FIG. 56

3. During machine operation, with the casters properly adjusted, the squeegee blades should deflect as shown (Figure 57).



FIG. 57

BATTERY MAINTENANCE (Wet/lead acid batteries)

1. Check battery fluid level frequently to prevent battery damage. The fluid should be at the level shown (Figure 58). Add distilled water if low. DO NOT OVERFILL, the fluid may expand and overflow when charging.



CORRECT BATTERY FLUID LEVEL:

Before Charging

After Charging

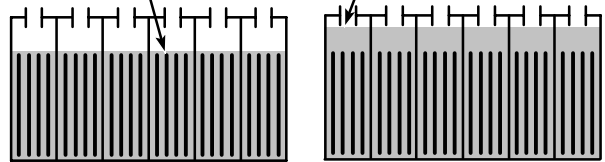


FIG. 58

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

2. Clean the batteries to prevent battery corrosion. Use a scrub brush with a mixture of baking soda and water (Figure 59).

FOR SAFETY: When cleaning batteries, wear protective gloves and eye protection. Avoid contact with battery acid.



FIG. 59

3. Check for loose or worn cables. Replace if worn.

TRANSPORTING MACHINE

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

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

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

STORING MACHINE

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

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

5. If storing machine in freezing temperatures, follow the FREEZE PROTECTION instructions below.

FREEZE PROTECTION

1. Drain the solution tank and recovery tank of all water.
2. Empty the solution tank filter located under the machine (Figure 60).



FIG. 60

3. Pour 1 gal / 3.8 liters of recreational vehicle (RV) antifreeze into the solution tank at full strength. Do not mix.
4. Turn the machine power on and operate the solution flow system. Turn the machine off when the red RV antifreeze is visible.

If your machine is equipped with the off-aisle wand option, operate the the off-aisle wand for a few seconds to protect the pump.

Continue with the instructions if your machine is equipped with the FaST system. The following items are required: valve coupling #1006205 and 6 in / 15 cm Hose #63182.

5. Remove the FaST-PAK carton and connect the valve coupling and 6 in / 15 cm hose to the FaST detergent supply hose (Figure 61).

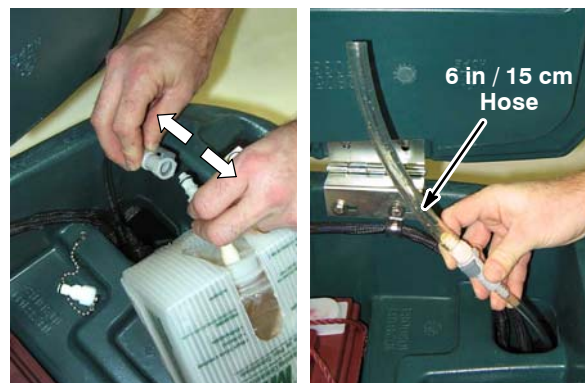


FIG. 61

6. Disconnect the opposite end of the FaST supply hose at the white check valve and drain the detergent from the hose (Figure 62). Reconnect the check valve after draining. To access the injector assembly remove the front shroud.



FIG. 62

7. Pour the recreational vehicle (RV) antifreeze into the supply hose until full (Figure 63).
8. Keep the hose upright to prevent the Anti-freeze from spilling and lower the recovery tank.



FIG. 63

9. Operate the FaST system until the foaming stops. This step could take anywhere from 5-10 minutes.
10. When finished, connect the supply hose to the storage plug (Figure 64).

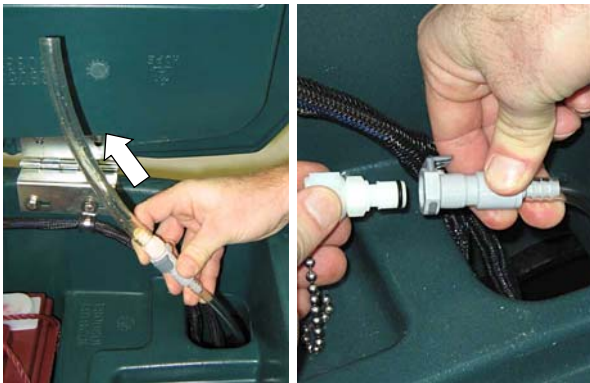


FIG. 64

11. To drain the antifreeze from the FaST supply hose, repeat steps 5 and 6.

RECOMMENDED STOCK ITEMS

Refer to the Parts List manual that is supplied with each machine for recommended stock items. Stock Items are clearly identified with a bullet preceding the parts description. See example below:

26	1017380	(00000000-)	•	Hose, Drain, Assy, 1.5d X 29.5l, Blk,Flx
27	1008639	(00000000-)	•	Drain Assy
28	1019563	(00000000-)	•	Strap, Drain Cap
29	1008637	(00000000-)	•	O Ring, 1.48" Id, 1.76" Od

TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
Machine will not operate	Triggers not pulled	Pull triggers
	Emergency-stop button activated	Turn button clockwise to reset
	Discharged batteries	Charge batteries
	Faulty battery(s)	Replace battery(s)
	Loose battery cable	Tighten loose cable
	Main fuse blown	Replace fuse
	Faulty key switch	Contact Service Center
	Machine fault detected (Drive model)	See Battery Meter LED Fault Codes
On-board battery charger will not operate	Plug not connected to power supply	Check plug connection
	Faulty power supply cord	Replace cord
	Fault detected.	See On-board Battery Charger Fault Codes
Brush motor will not operate	Scrub head is raised off floor	Lower scrub head
	Battery meter lockout activated	Recharge batteries
	Tripped brush motor circuit breaker	Reset brush circuit breaker button
	Faulty scrub head (up/down) switch	Contact Service Center
	Faulty triggers	Contact Service Center
	Faulty brush motor or wiring	Contact Service Center
	Worn motor carbon brushes	Contact Service Center
Machine does not propel (Drive model)	Main fuse blown	Replace 30 Amp fuse
	Faulty relay switch	Contact Service Center
	Faulty transaxle motor or wiring	Contact Service Center
	Worn motor carbon brushes	Contact Service Center
Vacuum motor will not operate	Squeegee is raised off floor	Lower squeegee
	Vacuum motor fuse blown	Replace 25 Amp fuse
	Faulty vacuum motor or wiring	Contact Service Center
	Worn motor carbon brushes	Contact Service Center
FaST Model: FaST System does not operate or operate correctly	FaST system switch is not turned on	Turn on FaST system switch
	FaST-PAK supply hose not connected	Connect supply hose
	FaST Pump fuse blown	Replace 7.5 Amp fuse
	Clogged FaST-PAK supply hose or connectors	Soak in warm water to unclog
	Empty FaST-PAK carton	Replace FaST PAK carton
	Kink in FaST-PAK supply hose	Undo hose kink
	Clogged FaST solution system	Contact Service Center
	Faulty FaST system on/off switch	Contact Service Center
	Faulty pump	Contact Service Center
	Clogged solution tank filter	Drain solution tank. remove solution tank filter, clean and reinstall
	Clogged orifice/filter screen	Replace orifice/filter screen (See FaST SYSTEM MAINTENANCE)

OPERATION

TROUBLESHOOTING - Continued

PROBLEM	CAUSE	SOLUTION
Little or no solution flow (Conventional Scrubbing)	Clogged solution tank filter or solution hose	Clean solution tank filter or flush out solution hose
	Clogged solution valve	Remove valve and clean
	Solution flow control knob set too low	Adjust solution control flow knob
	Loose screw on control knob	Calibrate knob and retighten screw
Poor water pickup	Recovery tank is full	Drain recovery tank
	Loose drain hose cap	Tighten cap
	Clogged float shut-off screen located in recovery tank	Clean screen
	Clogged squeegee assembly	Clean squeegee assembly
	Worn squeegee blades	Replace or rotate squeegee blades
	Incorrect Squeegee blade deflection	Adjust Squeegee blade height
	Loose vacuum hose connections	Secure hose connections
	Clogged vacuum hose	Remove clogged debris
	Damaged vacuum hose	Replace vacuum hose
	Recovery tank cover not in place	Properly position cover
	Damaged recovery tank cover seal	Replace seal
	Faulty vacuum motor	Contact Service Center
	Low battery charge	Recharge batteries.
Short run time	Low battery charge	Fully recharge batteries
	Defective batteries	Replace battery
	Batteries need maintenance	See BATTERY MAINTENANCE
	Faulty battery charger	Repair or replace battery charger
	Brush pressure lever is set for extra scrub head pressure	Lower brush pressure lever

BATTERY METER LED FAULT CODES *(Drive Model Battery Meter Display)*

CODE (Flashing LED Bars)	FAULT	SOLUTION
One	Low voltage shut-off. Scrubbing function stops.	Recharge batteries.
		Check battery connection.
Two	Battery charge level getting low.	Recharge batteries.
Three	Drive motor tripped.	Remove overload condition and reset key.
	Short circuit to drive motor.	Contact Service Center.
Four	Battery lockout.	Recharge batteries immediately.
Eight	Controller tripped.	Contact Service Center.
Ten	High battery voltage reading	Check battery connections.
No Bars	Sleep mode	Turn key to restore.
Bars Rippling	Throttle engaged.	Release triggers

MACHINE SPECIFICATIONS

MODEL	17 in / 43 cm Brush Assist	20 in / 50 cm Brush Assist	20 in / 50 cm w/ Drive
LENGTH	48 in / 1,219 mm	50.25 in / 1,276 mm	50.25 in / 1,276 mm
WIDTH	20 in / 507 mm	21.5 in / 549 mm	21.5 in / 549 mm
HEIGHT	43 in / 1093 mm	43 in / 1093 mm	43 in / 1093 mm
MINIMUM AISLE TURN	49.5 in / 1,257 mm	51.5 in / 1,308 mm	51.5 in / 1,308 mm
WEIGHT	203 lb / 92 kg	205 lb / 93 kg	216 lb / 98 kg
WEIGHT WITH BATTERIES	315 lb / 143 kg	340 lb / 154 kg	386 lb / 175 kg
RECOVERY TANK CAPACITY Includes Demisting Chamber	15 gal / 57 L	15 gal / 57 L	15 gal / 57 L
SOLUTION TANK CAPACITY	10.5 gal / 40 L	10.5 gal / 40 L	10.5 gal / 40 L
DRIVE SYSTEM	Brush Assisted	Brush Assisted	Transaxle, 24 V, .14 hp / .104 kW
TRAVEL SPEED, MAXIMUM	n/a	n/a	240 ft / 73 m /min
PRODUCTIVITY RATE Theoretical	20,230 ft ² / 1,880 m ² h	23,800 ft ² / 2,210 m ² h	23,800 ft ² / 2,210 m ² h
PRODUCTIVITY RATE Estimated Actual	8,440 ft ² / 785 m ² h	10,125 ft ² / 940 m ² h	16,065 ft ² / 1,490 m ² h
CLEANING PATH WIDTH	17 in / 430 mm	20 in / 500 mm	20 in / 500 mm
BRUSH PRESSURE	50 lb / 22.7 kg Minimum 90 lb / 40.8 kg Maximum	50 lb / 22.7 kg Minimum 90 lb / 40.8 kg Maximum	50 lb / 22.7 kg Minimum 90 lb / 40.8 kg Maximum
SOLUTION FLOW RATE	.4 gpm / 1.5 L/min	.4 gpm / 1.5 L/min	.4 gpm / 1.5 L/min
SQUEEGEE WIDTH	30 in / 763 mm	30 in / 763 mm	30 in / 763 mm
BRUSH MOTOR	1.0. hp / .746 kW, 200 rpm, 24 V, 42 A		
VACUUM MOTOR	.5 hp / .373 kW, 300 W, 2-stage 5.7, 24 V, 13 A		
WATER LIFT - AIR FLOW	40 in / 1,016 mm - 65 ft ³ / 1.84 L ³ /m		
BATTERIES	Qty 2, 12 V	Qty 2, 12 V	Qty 2, 12 V
BATTERY CAPACITY	105 Ah @ 20 h rate (WET)	130 Ah @ 20 h rate (WET)	155 Ah @ 20 h rate (WET)
RUN TIME PER CHARGE*	2.5 Hours	2.5 Hours	3.0 Hours
ON-BOARD BATTERY CHARGER	120/230 VAC, 5.5 A, 50/60 Hz, 24 VDC, 11 A output		
TOTAL POWER CONSUMPTION	28 A nominal @ 50 lb / 22.7 kg brush pressure 34 A nominal @ 90 lb / 40.8 kg brush pressure	29 A nominal @ 50 lb / 22.7 kg brush pressure 35 A nominal @ 90 lb / 40.8 kg brush pressure	30 A nominal @ 50 lb / 22.7 kg brush pressure 36 A nominal @ 90 lb / 40.8 kg brush pressure
VOLTAGE DC	24 VDC	24 VDC	24 VDC
PROTECTION GRADE	IPX3	IPX3	IPX3
DECIBEL RATING AT OPERATOR'S EAR, INDOORS.**	68.5 dBA	68.5 dBA	68.5 dBA
VIBRATION AT CONTROLS	<8.2 ft/s ² / <2.5 m/s ²	<8.2 ft/s ² / <2.5 m/s ²	<8.2 ft/s ² / <2.5 m/s ²
GRADE LEVEL, MAX.	Scrubbing 5% (3°), Transporting 8% (5°)	Scrubbing 5% (3°), Transporting 8% (5°)	Scrubbing 5% (3°), Transporting 8% (5°)

* Run times are based on Continuous Scrubbing Run Times.

** Sound levels (ISO 11201) as recommended by the American Association of Cleaning Equipment Manufacturers (AACEM) and OSHA.

OPERATION

FaST SYSTEM MODEL	17 in / 43 cm Brush Assist	20 in / 50 cm Brush Assist	20 in / 50 cm w/ Drive
PRODUCTIVITY RATE Estimated Actual	11,250 ft ² / 1,045 m ² /h	13,500 ft ² / 1,255 m ² /h	21,420 ft ² / 1,990 m ² /h
SOLUTION PUMP	24 Volt DC, 3.5 A, 1.5 gpm / 5.6 L/min open flow, 60 psi / 4.13 Bar bypass setting		
SOLUTION FLOW RATE	0.125 gpm / 0.47 L/min		
CONCENTRATE FLOW RATE	0.016 oz / 0.47 CC /min.		
CONCENTRATE TO WATER DILUTION RATIO	1:1000		

MACHINE DIMENSIONS

