

CS7010

Instructions for use

Instructions for Use
Original Instructions
Kullanım Talimatları
Инструкции за употреба
Instrucțiuni de utilizare
Upute za korištenje

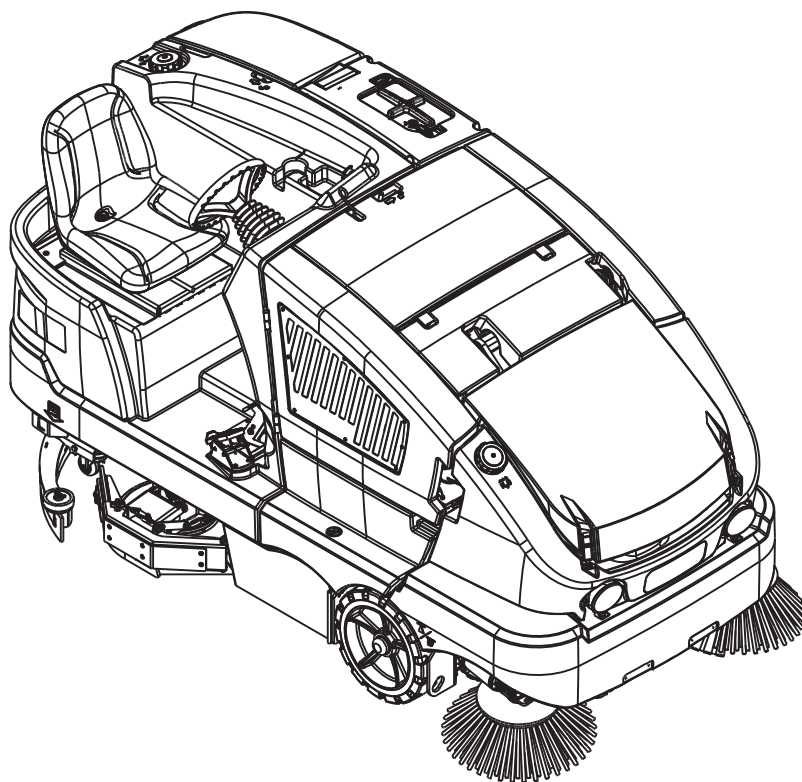


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ecoflex™

A-English
B-Türkçe
C-български
D-Românesc
E-Hrvatski



Models: 56511815 (CS7010 1200D Hybrid), 56511816 (1200B), 56511818 (1200P Hybrid)
56511821 (1200LPG Hybrid)

 **Nilfisk**

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INTRODUCTION

This manual will help you get the most from your Nilfisk™ Sweeper / Scrubber. Read it thoroughly before operating the machine. References to “right” and “left” in this manual mean right or left as seen from the driver’s seat.

Note: **Bold** numbers or letters in parentheses () indicate an item illustrated on pages A-6 – A-13 unless referred to a specific figure number.

PARTS AND SERVICE

Repairs, when required, should be performed by your Authorized Nilfisk Service Center, who employs factory trained service personnel, and maintains an inventory of Nilfisk original replacement parts and accessories.

Call the Nilfisk Authorized Service named below for repairs or service. Please specify the Model and Serial Number when discussing your machine.

(Dealer, affix service sticker here)

NAMEPLATE

The Model Number and Serial Number of your machine are shown on the Nameplate.

One Nameplate is located on the wall of the operator's compartment just below the circuit breaker decal. The second Nameplate is located on the chassis beneath the recovery tank. This information is needed when ordering repair parts for the machine.

Date of Manufacture "Date Code" is also marked on the Nameplate. For example, Date Code "A17" = January 2017.

Use the space below to note the Model Number and Serial Number of your machine for future reference.

MODEL No. _____

SERIAL No. _____

Note: Reference the separately supplied engine manufacture's maintenance and operator manual for more detailed engine specification and service data.

MODIFICATIONS

Modifications and additions to the cleaning machine which affect capacity and safe operation shall not be performed by the customer or user without prior written approval from Nilfisk Inc. Unapproved modifications will void the machine warranty and make the customer liable for any resulting accidents.

UN-CRATING

Upon delivery, carefully inspect the shipping crate and the machine for damage. If damage is evident, save all parts of the shipping crate so that they can be inspected by the trucking company that delivered the machine. Contact the trucking company immediately to file a freight damage claim.

- 1 After removing the crate, remove the wooden blocks next to the wheels.
- 2 Check the engine oil and coolant levels.
- 3 Check the hydraulic oil level.
- 4 Read the instructions in the Preparing the Machine For Use section of this manual, then fill the fuel tank.
- 5 Place a ramp next to the front end of the pallet.
- 6 Read the instructions in the Operating Controls and Operating the Machine sections of this manual and start the engine. Slowly drive the machine forward down the ramp to the floor. Keep your foot lightly on the brake pedal until the machine is off the pallet.

GUIDELINES WHEN OPERATING THIS MACHINE

Always follow the CAUTION guidelines listed below when operating this machine.

CAUTION!

- Use extreme CAUTION when operating this machine. Be certain that you are thoroughly familiar with all operating instructions before using this machine. If you have any questions, contact your supervisor or your local Nilfisk Industrial Dealer.
- If the machine malfunctions, do not try to correct the problem unless your supervisor directs you to do so. Have a qualified company mechanic or an authorized Nilfisk Dealer service person make any necessary corrections to the equipment.
- Use extreme care when working on this machine. Loose clothing, long hair, and jewelry can get caught in moving parts. Turn the Key Ignition Switch OFF and remove the key before servicing the machine. Apply the parking brake before getting off of the machine. Use good common sense, practice good safety habits and pay attention to the yellow decals on this machine.
- Drive the machine slowly on inclines. Use the Brake Pedal **(38)** to control machine speed while descending inclines. DO NOT turn the machine on an incline; drive straight up or down.
- The maximum rated incline for sweeping and scrubbing is 17.6% (10°). The maximum rated incline during transport is 21% (12°).

CAUTIONS AND WARNINGS

Nilfisk uses the symbols below to signal potentially dangerous conditions. Always read this information carefully and take the necessary steps to protect personnel and property.

DANGER!

DANGER is used to warn of immediate hazards that will cause severe personal injury or death.

WARNING!

WARNING is used to call attention to a situation that could cause severe personal injury.

CAUTION!

CAUTION is used to call attention to a situation that could cause minor personal injury or damage to the machine or other property.



Read all instructions before using.

GENERAL SAFETY INSTRUCTIONS

Specific Cautions and Warnings are included to warn you of potential danger of machine damage or bodily harm.

This machine is only suitable for commercial use, for example at manufacturing plants, warehouses, cement block & brick facilities, parking garages, municipal parks, entertainment and transportation facilities.

DANGER!

- This machine emits exhaust gases (carbon monoxide) that can cause serious injury or death, always provide adequate ventilation when using machine (Engine models only).

WARNING!

- This machine shall be used only by properly trained and authorized persons.
- This machine is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.
- While on ramps or inclines, avoid sudden stops. Avoid abrupt sharp turns. Use low speed down ramps.
- To avoid hydraulic oil injection or injury, always wear appropriate clothing and eye protection when working with or near hydraulic system.
- Keep sparks, flame and smoking materials away from battery. Explosive gases are vented during normal operation.
- Charging the battery produces highly explosive hydrogen gas. Charge battery only in well-ventilated areas away from open flame. Do not smoke while charging the battery.
- Remove all jewelry when working near electrical components.
- Turn the key switch off (O) and disconnect the batteries before servicing electrical components.
- Never work under a machine without safety blocks or stands to support the machine.
- Do not dispense flammable cleaning agents, operate the machine on or near these agents, or operate in areas where flammable liquids exist.
- Do not pressure wash operator control panel, fuse panel, contactor panel or engine compartment area.
- Do not inhale exhaust gas fumes. Only use indoors when adequate ventilation is provided, and when a second person has been instructed to look after you.
- Do not use the machine without a falling object protective structure (FOPS) in areas where it is likely that the operator is hit by falling objects.
- Machines shall be parked safely.
- The machine shall be inspected by a qualified person regularly, in particular regarding the LPG container and their connections, as required for safe operation by regional or national regulations.
- Observe the Gross Vehicle Weight, GVW, of the machine when loading, driving, lifting or supporting the machine.



CAUTION!

- This machine is not approved for use on public paths or roads.
- This machine is not suitable for picking up hazardous dust.
- Use care when using scarifier discs and grinding stones. Nilfisk will not be held responsible for any damage to floor surfaces caused by scarifiers or grinding stones.

NOTE: Use care when using abrasive brushes or concrete polishing tools. Nilfisk will not be held responsible for any damage to floor surface where such usage is inappropriate.

- When operating this machine, ensure that third parties, particularly children, are not endangered.
- Before performing any service function, carefully read all instructions pertaining to that function.
- Do not leave the machine unattended without first turning the key switch off (O), removing the key and applying the parking brake.
- Turn the key switch off (O) before changing the brushes, and before opening any access panels.
- Take precautions to prevent hair, jewelry, or loose clothing from becoming caught in moving parts.
- Use caution when moving this machine in below freezing temperature conditions. Any water in the solution or recovery tanks or in the hose lines could freeze.
- The batteries must be removed from the machine before the machine is scrapped. The disposal of the batteries should be safely done in accordance with your local environmental regulations.
- Do not use on surfaces having a gradient exceeding that marked on the machine.
- Before use, all doors and hoods should be properly latched.
- If the engine misfires or runs rough, stop engine operation and have machine serviced by a qualified technician. Continued operation under this condition may result in damage to the engine, catalytic converter or other machine components.

SAVE THESE INSTRUCTIONS

HOPPER SAFETY BAR**⚠ WARNING!**

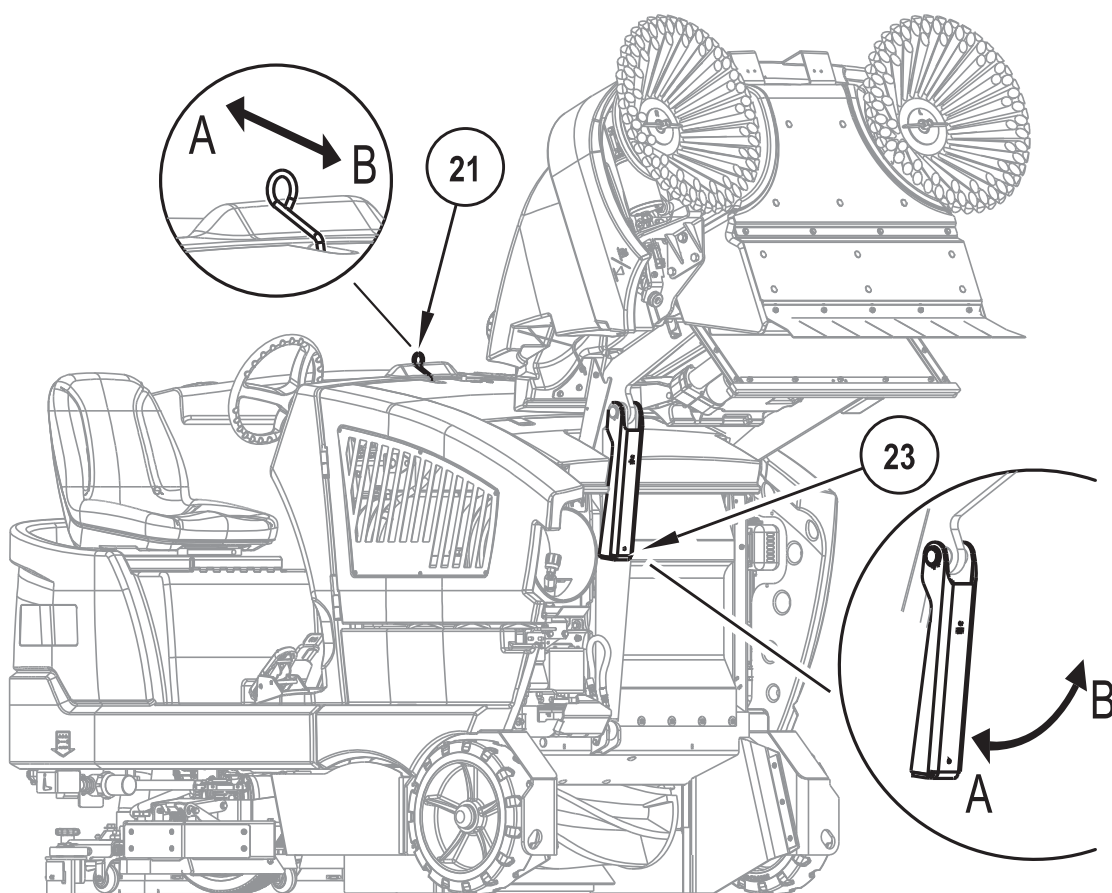
See **Figure 1**. Make sure the Hopper Safety Bar (**23**) is engaged whenever attempting to do any maintenance work under or near the raised hopper. The Hopper Safety Bar (**23**) holds the hopper in the raised position to allow work to be performed under the hopper. **NEVER** rely on the machine's hydraulic components to safely support the hopper.

A - To Engage Hopper Safety Bar:

1. Press and hold the hopper raise switch to raise the hopper.
2. Pull the hopper safety bar handle (**21**) toward you to retract the safety bar (**23**).
3. Press and hold the hopper lower switch to lower the hopper until it contacts the hopper safety bar.

B - To Disengage Hopper Safety Bar:

1. Press and hold the hopper raise switch to raise the hopper slightly so it lifts off of the hopper safety bar.
2. Push the hopper safety bar handle (**21**) toward the front of the machine to extend the safety bar (**23**).
3. Press and hold the hopper lower switch to lower the hopper.

FIGURE 1

ENGAGING THE PARKING BRAKE

CAUTION!

When parking on an incline, turn the steering wheel fully in one direction such that if the parking brake were to be accidentally released or fail the machine would not roll and cause damage or bodily injury, if necessary, block the wheels.

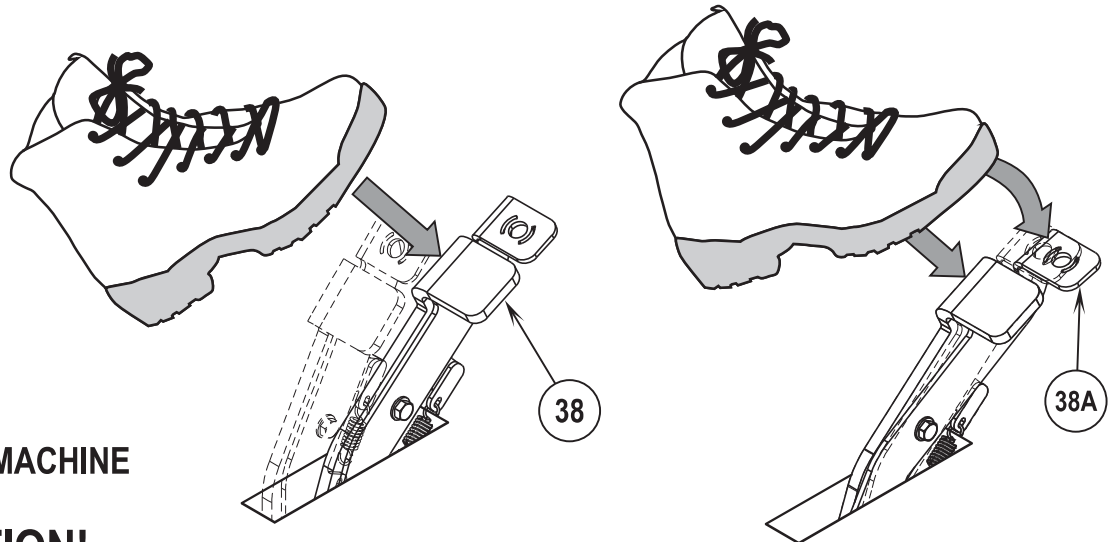
A. To Engage Parking Brake:

1. See Figure 2. Press the Brake Pedal (38) completely.
2. With the brake pedal pressed, rotate your foot to engage the Parking Brake Pedal (38A).

B. To Release Parking Brake:

1. See Figure 2. Press the Brake Pedal (38) to disengage the parking brake pedal.

FIGURE 2



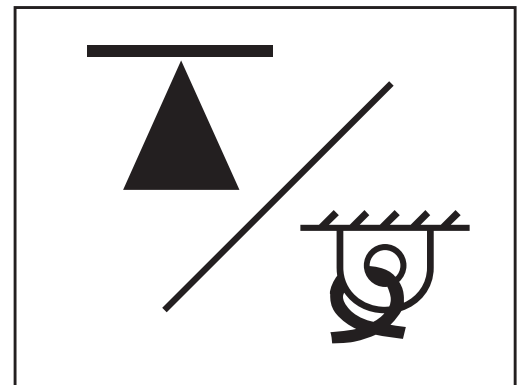
LIFTING THE MACHINE

CAUTION!

Never work under a machine without safety stands or blocks to support the machine.

- When lifting the machine, do so at designated locations (**Do Not** lift on the hopper).
- See the Lift Point / Tie Down Point locations (33) shown on page A-9.
- See Figure 3. Lift Point / Tie Down Point symbols.

FIGURE 3



Lift Point / Tie Down Point symbol

TRANSPORTING THE MACHINE

CAUTION!

Before transporting the machine on an open truck or trailer, make sure that:

- All access doors are latched securely.
- The machine is tied down securely. See the Lift Point / Tie Down Point locations (33).
- The machine parking brake is set.

TOWING OR PUSHING A DISABLED MACHINE

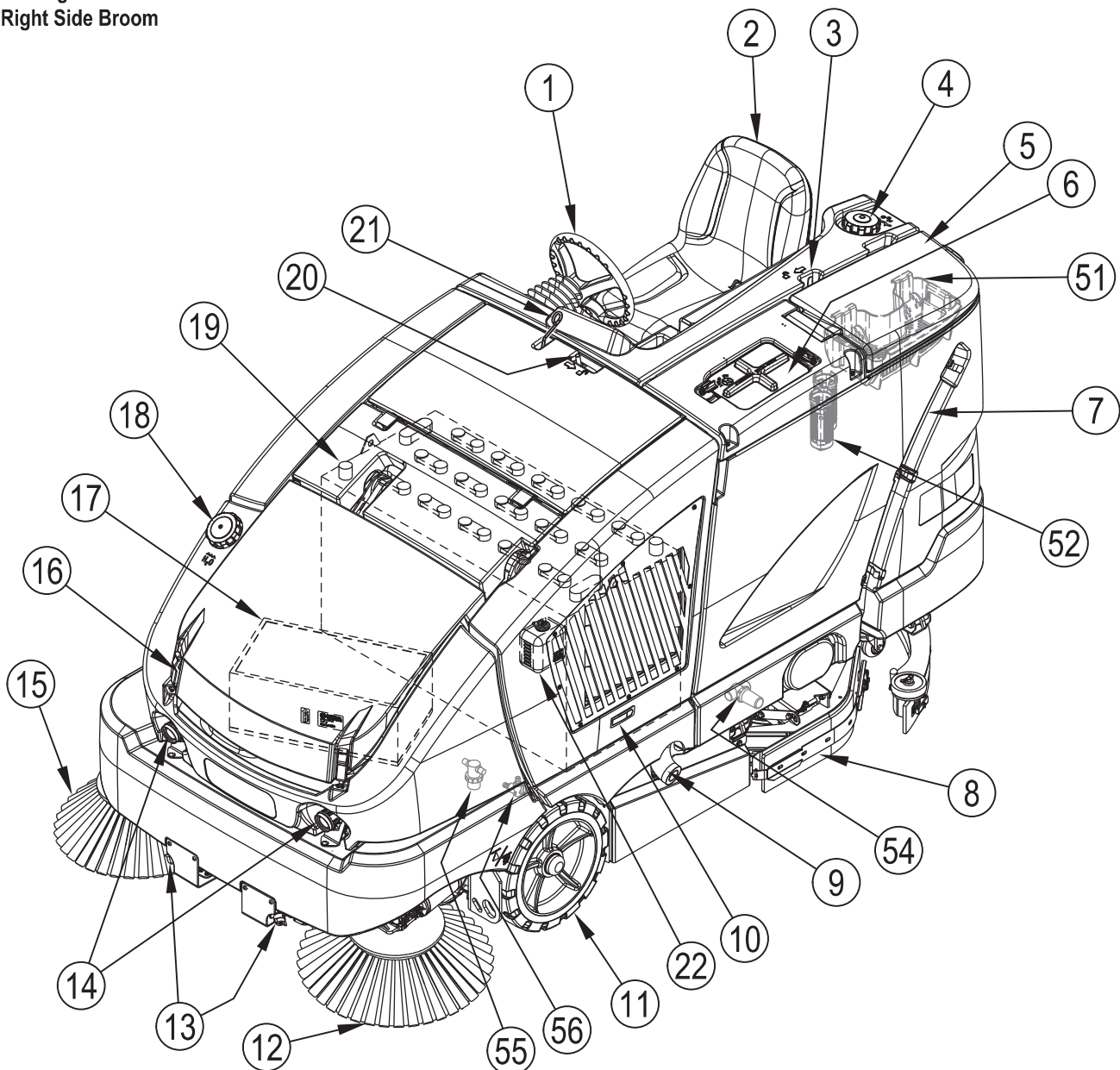
CAUTION!

If the machine must be towed or pushed, make sure the Key Switch is in the Off position and do not move the machine faster than a normal walking pace (2-3 mph, 3-5 kph) and for short distances only.

KNOW YOUR MACHINE

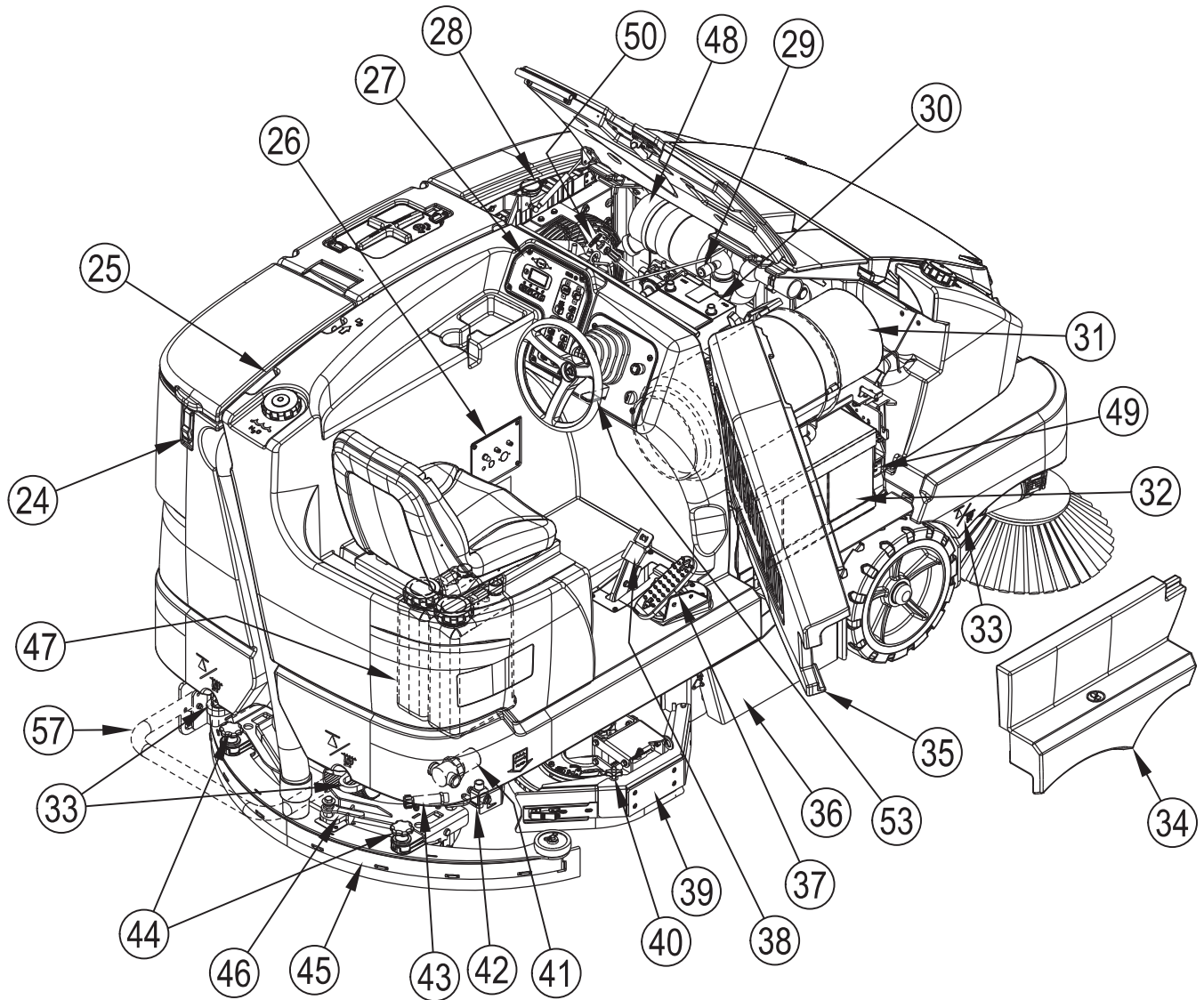
As you read this manual, you will occasionally run across a bold number or letter in parentheses - example: **(2)**. These numbers refer to an item shown on these pages unless otherwise noted. Refer back to these pages whenever necessary to pinpoint the location of an item mentioned in the text. **NOTE:** Refer to the service manual for detailed explanations of each item illustrated on the next 5 pages.

- | | | | |
|----|---------------------------------------|----|------------------------------------------|
| 1 | Steering Wheel | 16 | Hopper Cover Latches |
| 2 | Operator's Seat | 17 | Dust Control Filter |
| 3 | Recovery Tank Tip-Out Lock | 18 | DustGuard™ Tank Fill |
| 4 | Solution Tank Fill | 19 | Battery (battery models) |
| 5 | Recovery Tank Lid | 20 | Engine/Battery Compartment Latch |
| 6 | Vacuum Filter Access Lid | 21 | Hopper Safety Bar Handle |
| 7 | Recovery Tank Drain Hose | 22 | Engine Coolant Reservoir (Engine models) |
| 8 | Left Skirt Assembly | 51 | Recovery Tank Debris Basket |
| 9 | Exhaust Pipe (Engine models) | 52 | Vac Motor Inlet Shutoff Floats |
| 10 | Engine Compartment Access Panel Latch | 54 | High-Pressure Wash Filter (optional) |
| 11 | Front Wheel | 55 | DustGuard™ Filter (optional) |
| 12 | Left Side Broom | 56 | DustGuard™ Shut-Off Valve (optional) |
| 13 | DustGuard™ Spray Nozzles (optional) | | |
| 14 | Headlights | | |
| 15 | Right Side Broom | | |



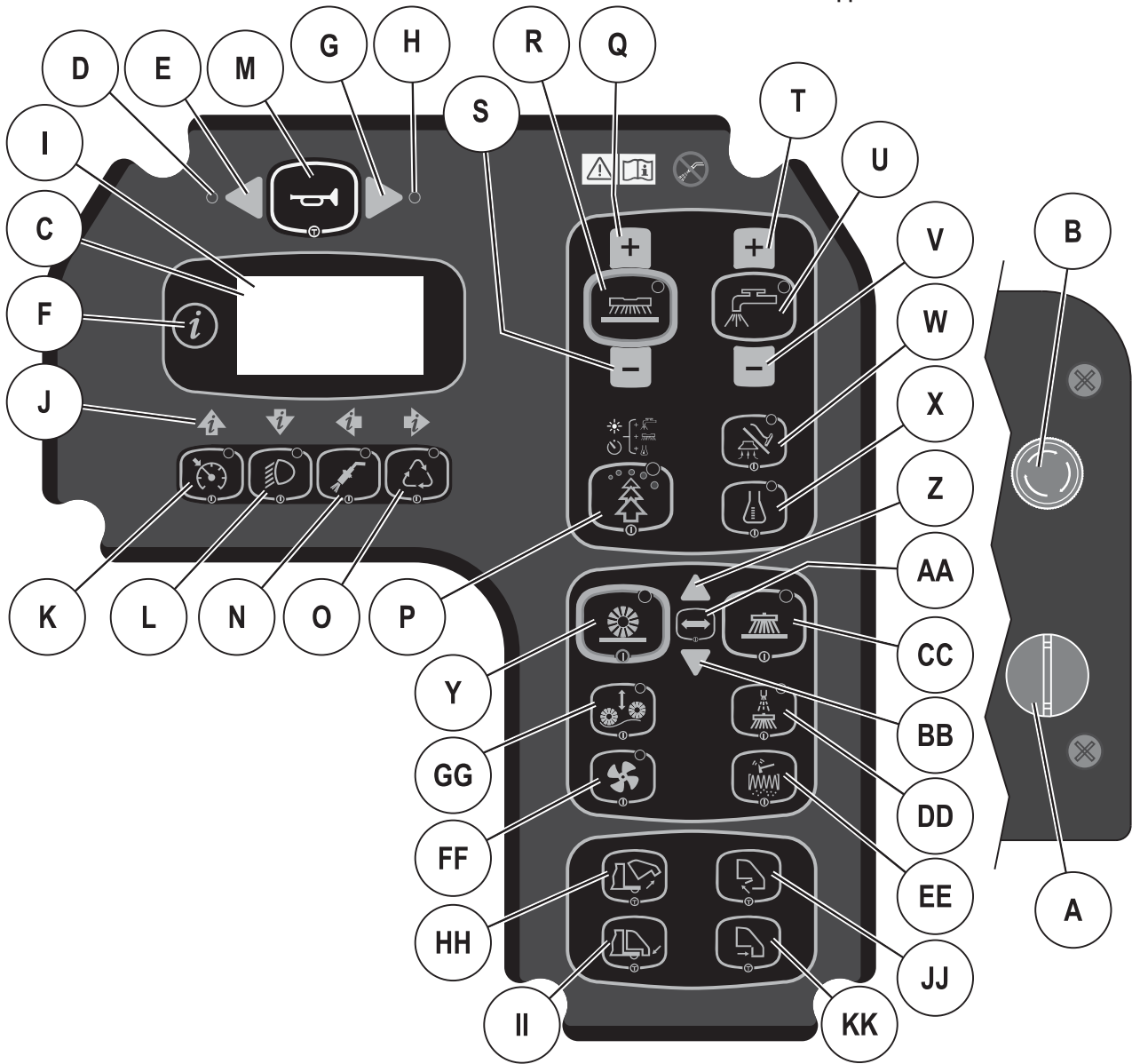
KNOW YOUR MACHINE (CONTINUED)

- | | | | |
|----|---------------------------------------------|----|---------------------------------------------|
| 24 | Recovery Tank Lid Latch | 39 | Right Scrub Skirt Assy |
| 25 | Recovery Tank Tip-Out Grip | 40 | Edge Guard Retainer Knob |
| 26 | Circuit Breaker Panel (see troubleshooting) | 41 | Solution Filter |
| 27 | Control Panel | 42 | Solution Shut-Off Valve |
| 28 | Radiator Cap | 43 | Solution Tank Drain Hose |
| 29 | Air Filter Service Indicator | 44 | Squeegee Removal Knobs |
| 30 | Engine Starting Battery (Engine models) | 45 | Squeegee Assembly |
| 31 | LPG Fuel Tank (LPG models) | 46 | Squeegee Tilt Adjustment Handle |
| 32 | Battery Pack | 47 | Detergent Cartridges (EcoFlex™ models only) |
| 33 | Jack Point / Tie Down Point Location | 48 | Engine Air Filter |
| 34 | Lower Cover | 49 | Hydraulic Power Unit |
| 35 | Right Side Door | 50 | Engine Oil Dipstick (Engine models) |
| 36 | Broom Access Door | 53 | Steering Wheel Tilt Adjust Lever |
| 37 | Drive (Foot) Pedal, Directional/Speed | 57 | Rear Squeegee Guard (optional) |
| 38 | Brake Pedal/Parking Brake | | |



CONTROL PANEL

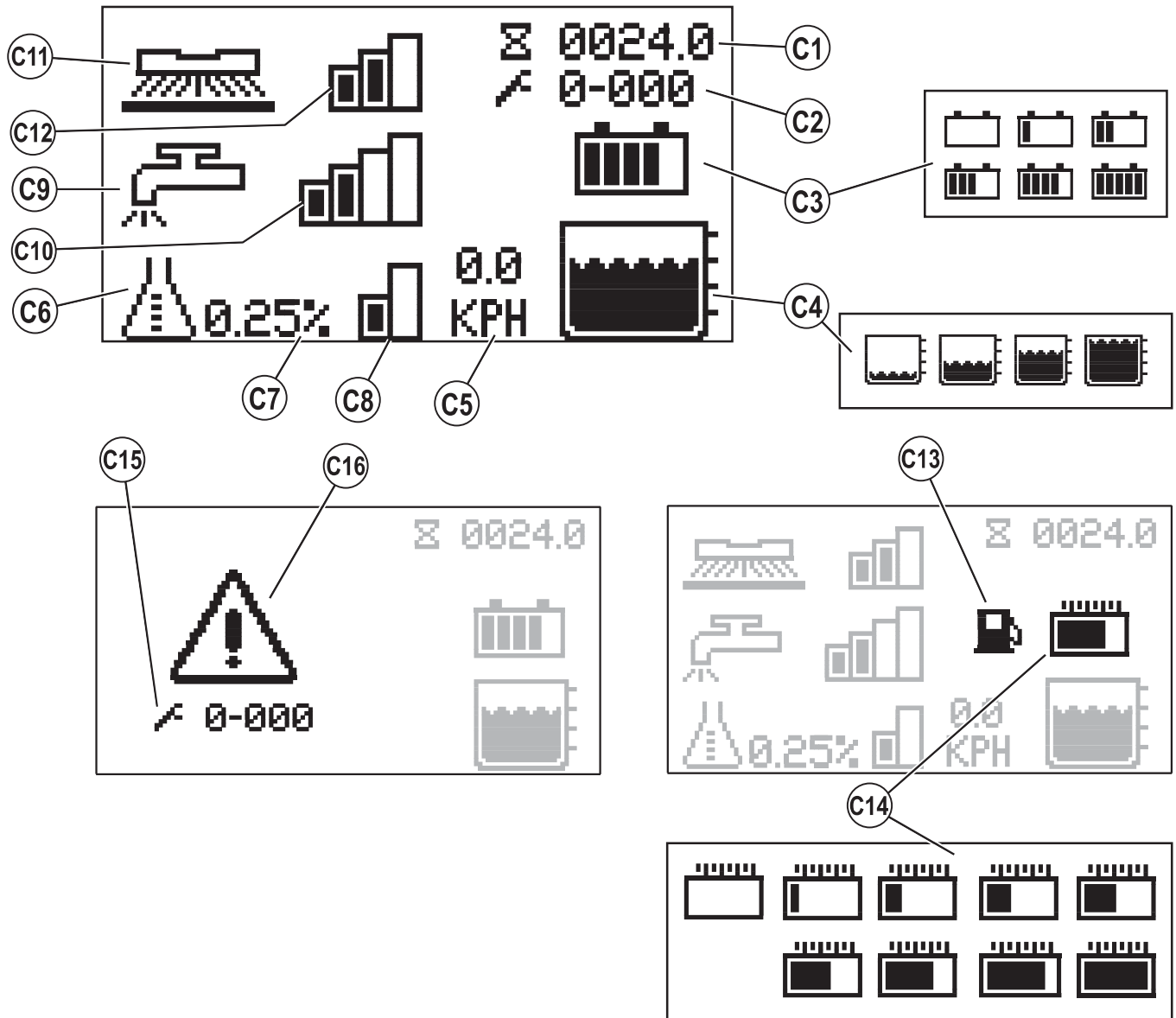
- | | |
|-----------------------------------------------------------------------------------|-----------------------------------------|
| A Key Switch | S Scrub Pressure Decrease Switch |
| B Emergency Stop | T Solution Flow Increase Switch |
| C LCD Display | U Solution Switch |
| D Left Turn Indicator | V Solution Flow Decrease Switch |
| E Left Turn Signal (Optional Brake Light with Turn Signal Kit) | W Vacuum/Wand Switch (optional) |
| F Information Switch | X Detergent Switch |
| G Right Turn Signal (Optional Brake Light with Turn Signal Kit) | Y One-Touch™ Sweep Switch |
| H Right Turn Indicator | Z Broom Height Raise Switch |
| I Menu (located in LCD Display (C) when Information Switch (F) is pressed) | AA Broom Select Switch |
| J Navigation Arrows (up, down, left and right) | BB Broom Height Lower Switch |
| K Speed Limiter Switch | CC Side Broom Switch |
| L Headlight Switch | DD DustGuard™ Spray Switch |
| M Horn Switch | EE Filter Shaker Switch |
| N High-Pressure Wash Switch (optional) | FF Dust Control Fan Switch |
| O Extended Scrub Switch (optional) | GG Main Broom Float Switch |
| P Burst of Power Switch (EcoFlex™ only) | HH Hopper Raise Switch |
| Q Scrub Pressure Increase | II Hopper Lower Switch |
| R One-Touch™ Scrub Switch | JJ Hopper Door Open Switch |
| | KK Hopper Door Close Switch |



CONTROL PANEL (CONTINUED)

- C1 Hour Meter (Hour Glass and Drive Hours)
- C2 Active Fault Codes
- C3 Battery Indicator
- C4 Solution Tank Level Indicator
- C5 Speed
- C6 Detergent Indicator (if so equipped)
- C7 Detergent Ratio Indicator
- C8 Detergent Indicator Bar Graph
 - FIRST = Minimum Concentration Detergent Mode
 - SECOND = Maximum Concentration Detergent Mode
 - NONE = Off
- C9 Solution Flow Indicator
- C10 Solution Flow Rate Bar Graph
 - FIRST = Low
 - SECOND = Medium
 - THIRD = High
 - FOURTH = Extreme
 - NONE = Off

- C11 Scrub Pressure Indicator
- C12 Scrub Brush Pressure Bar Graph
 - FIRST = Regular
 - SECOND = Heavy
 - THIRD = Extreme
 - NONE = Off
- C13 Low Fuel Warning
- C14 Fuel Tank Level (Diesel and Petrol models)
- C15 Wrench (Active Fault Indicator)
- C16 Warning Symbol (Critical Fault Indicator)



CONTROL PANEL (CONTINUED)

- C17 Solution Tank Empty Indicator
- C18 Extended Scrub Active Indicator
- C19 Emergency Stop Activated Indicator
- C20 No Presence (Operator) Indicator
- C21 Recovery Tank Full Indicator
- C22 Parking Brake Indicator
- C23 Hopper Raised Indicator
- C24 Hopper Temperature Indicator (optional)
- C25 Clogged Hopper Filter
- C26 Check Engine Indicator
- C27 Oil Pressure Indicator
- C28 Engine Over-Temperature Indicator
- C29 Glow Plug Active Indicator (Diesel models)

- C30 Vacuum Mode Indicator
- C31 Wand Mode Indicator
- C32 Detergent Purge Indicator
- C33 Battery Low Voltage Indicator
(Battery models = low battery voltage)
(Engine models = low battery pack voltage)
- C34 Burst of Power Indicator (EcoFlex models only)
- C35 Main Broom Adjustment Indicator
- C36 Side Broom Adjustment Indicator
- C37 Battery Interlock Open Indicator
- C38 Engine Fault Indicator

C17 	C18 	C19 	C20 	C21
C22 	C23 	C24 	C25 	C26
C27 	C28 	C29 	C30 	C31
C32 	C33 	C34 	C35 	C36
C37 	C38 			

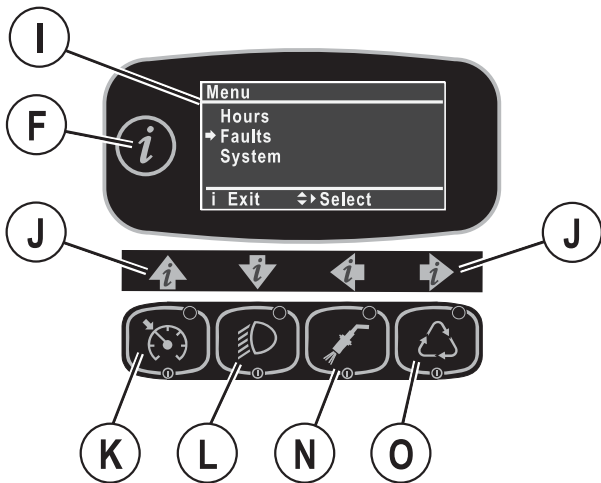
INFORMATION MENU DISPLAY

There are three “User Types” (modes) within the Menu display that allow for different functions. The three “User Types” include:

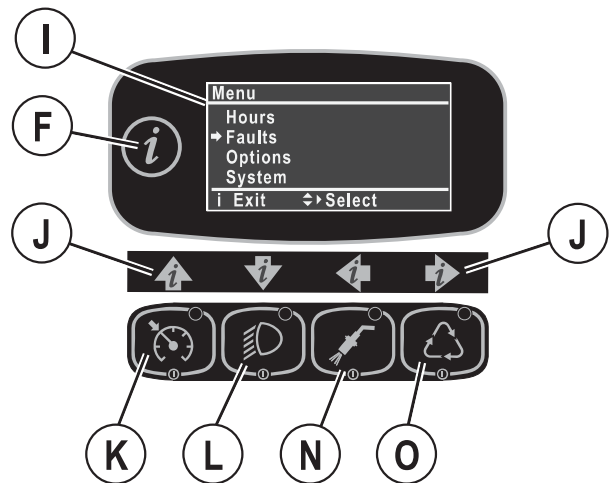
- Operator
- Supervisor
- Technician

User Type	Function	To Enter the User Type mode
Operator	Hours, Faults, Systems	Simply turn on the machine
Supervisor	Hours, Faults, Systems and Options	Press and hold the Scrub and Solution buttons then turn the key to the on position
Technician	Service Technician only	See Service Manual

OPERATOR MODE



SUPERVISOR MODE



Pressing the Information Switch (F) will display the menu (I). This allows access to change machine settings and gather machine information. The four Navigation Arrows shown (J) identify which buttons to press to move through the menu. For example, press (K) to move up, press (L) to move down, press (N) to move left and press (O) to move right. When finished, press the information switch (F) to exit the menu.

INFORMATION MENU DISPLAY (CONTINUED)

Menu Level		Notes
1	2	
Hours		The Hours menu displays the current machine hours
	On Time	Displays key-on (power-on) hours
	Drive Time	Displays drive time (non-neutral) hours
	Scrub Time	Displays scrub/brush on hours
	Recovery Time	Displays recovery/vacuum on hours
	Engine Time	Displays engine-on hours (engine models only)
Faults		The Faults menu displays Active and Historical faults
	Active Faults	Displays list of active faults with timestamp and description*
	Fault History	Displays list of fault history with number of events, timestamp and description List View - shows list of fault codes, quantity and latest time stamp Detail View – shows selected fault codes, quantity, description and Latest time stamp
System		The System menu displays current system information
	Firmware	Displays current firmware revision number
	Serial Num	Displays serial number of the control board from factory

* See Fault Code Display

INFORMATION MENU DISPLAY (CONTINUED)

Menu Level		Notes
1	2	
Options		Available in Supervisor mode
	Scrub Start	Scrub level at start of scrub: Light, Heavy, Extreme, Last*
	Scrub Max	Maximum scrub level allowed: Light, Heavy, Extreme*
	BOP Time (s)	Burst of Power (BOP) time duration: min (60), max (300), step (60), default (60)
	Solution	Solution sets the mode for the solution rate: Fixed = Solution flow stays the same despite machine speed Proportional* = Solution flow increases or decreases with speed of machine
	Solution in Rev	Leave solution on in reverse? No* or Yes
	Shaker Time (s)	Amount of time to run shaker: min (10), max (40), step (1), default (15)
	Broom Up in Rev	Raise broom when in reverse? No* or Yes
	Max Speed (%)	Maximum forward speed allowed (% of maximum available speed)
	Lock Speed Limit	Lockout scrub speed limit for user? No* or Yes NOTE: Do not allow basic user to enable/disable scrub speed limit
	Headlight	Headlight on/off control: Manual* = panel switch controlled Auto = always on
	Backup Alarm	Backup alarm is active when: Off* = disabled Rev = machine in reverse Rev/Fwd = machine is moving Rev/Fwd/Hop = machine is moving or hopper is up
	Language	Menu display language English* Italiano Deutsch Portuguese Francais Espanyol

*Default setting

PREPARING THE MACHINE FOR USE

Read pages 15 – 20 for preparing the machine for use.

PRE-OPERATIONAL CHECKLIST

NOTE: Refer to pages A-8 – A-12 for the reference numbers and letters called out below.

When	Action Required
Before Each Use	
	▶ Inspect the machine for damage, oil or coolant leaks.
	▶ Squeeze the rubber dust cup on the Engine Air Filter (48) to release built-up dust.
	▶ Check the Air Filter Service Indicator (29) .
	▶ Check the engine coolant level (22) .
	▶ Check the engine oil level (50) .
	▶ Check the hydraulic fluid level.
	▶ Check the Fuel Gauge (C14) on the diesel and petrol models.
	▶ Check the Fuel Gauge located on the LPG tank (31) for propane model.
	▶ Check the Battery Charge Level (C3) on battery models.
	▶ Make sure the battery charger is not connected to the machine.
	▶ Make sure the recovery tank is empty.
In the Driver's Seat	
	▶ Be sure that you understand the operating controls and their functions.
	▶ Adjust the seat to allow easy reach of all controls.
	▶ Turn the (Ignition) Key Switch (A) to the ON position. Check for proper operation of the Horn (M) , Hour Meter (C1) and Headlights (L) . Turn the Key Switch (A) to the OFF position.
	▶ Check the Brake Pedal (38) . The pedal should be firm and should not go all the way down. The latch should hold the pedal when applied.
As Needed	
	▶ Report all defects immediately to service personnel.
Plan Your Cleaning in Advance	
	▶ Arrange long runs with a minimum of stopping or starting.
	▶ Allow 6 inches (15 cm) of broom path overlap to ensure complete coverage.
	▶ Avoid making sharp turns, bumping into posts or scraping the side of the machine.

ENGINE OIL – PETROL, LPG

Check the engine oil level when the machine is parked on a level surface and the engine is cool. Change the engine oil after the first 50 hours of operation and every 200 hours after that. Use any SF or SG rated oil meeting API specifications and suited to seasonal temperatures. **Refer to the *Engine Workshop* manual for oil capacities and additional engine specifications. Replace the oil filter with every oil change.**

OIL TYPE	TEMPERATURE RANGE	OIL WEIGHT
SF or SG rated oil meeting API specifications and suited to seasonal temperatures.	Above 77 °F (25 °C)	SAE 30 or SAE 10W-30
	32 °F to 77 °F (0 °C to 25 °C)	SAE 20 or SAE 10W-30
	Below 32 °F (0 °C)	SAE 10W or SAE 10W-30

ENGINE OIL – DIESEL

Check the engine oil level when the machine is parked on a level surface and the engine is cool. Change the engine oil after the first 50 hours of operation and every 200 hours after that. Use CF, CF-4 or CG-4 oil meeting API specifications and suited temperatures (*important reference the oil/fuel type note below for further diesel oil recommendations). **Refer to the *Engine Workshop* manual for oil capacities and additional engine specifications. Replace the oil filter with every oil change.**

OIL TYPE	TEMPERATURE RANGE	OIL WEIGHT
CF, CF-4 or CG-4 rated oil meeting API specifications and suited to seasonal temperatures.	Above 77 °F (25 °C)	SAE 30 or SAE 10W-30
	32 °F to 77 °F (0 °C to 25 °C)	SAE 20 or SAE 10W-30
	Below 32 °F (0 °C)	SAE 10W or SAE 10W-30

* Diesel Lubricating Oil Note:

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use with a low-sulfur fuel used in on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.

Lubricating Oil class	Fuel		Remarks
	Low sulfur (0.5 % ≥)	High sulfur	
CF	O	O	TBN ≥ 10
CF-4	O	X	
CG-4	O	X	

O : Recommended

X : Not recommended

ENGINE BREAK-IN PERIOD –PETROL, LPG

During initial engine break-in period you may experience a slight smell or small amount of smoke coming from the engine.

ENGINE COOLANT

CAUTION!

Do not remove the radiator cap when the engine is hot.

To check the engine coolant level, unlatch the Engine Compartment Access Panel Latch (10) and remove the side panel, and observe the coolant level in the Engine Coolant Reservoir (22). If the level is low add automotive type anti-freeze appropriately diluted for the environment. Clean the radiator exterior by washing with low-pressure water or using compressed air every 30 hours.

ENGINE AIR FILTER

Check the Air Filter Service Indicator (29) before each use of the machine. Do not service the air filter unless the red flag is visible in the service indicator.

CAUTION!

When servicing the engine air filter elements, use extreme care to prevent loose dust from entering the engine. Dust can severely damage the engine.

The engine air filter contains a Primary (outer) and a Safety (inner) filter element. The Primary Element may be cleaned twice before being replaced. The Safety Element should be replaced every third time that the Primary Filter Element is replaced. Never attempt to clean the Inner Safety Element.

To clean the Primary Filter Element, unsnap the 2 clips at the end of the air filter and remove the end housing. Pull the primary element out. Clean the element with compressed air (maximum pressure 100 psi (6.89 bar)) or wash it with water (maximum pressure 40 psi (2.75 bar)). **DO NOT** put the element back into the canister until it is completely dry.

FUEL

WARNING!

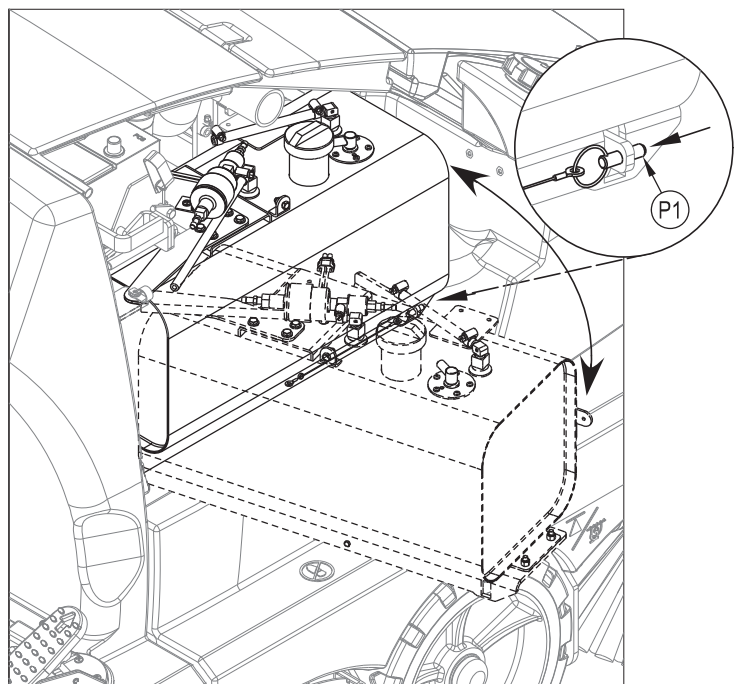
- ALWAYS STOP THE ENGINE BEFORE FILLING THE FUEL TANK.
- ALWAYS ROTATE THE FUEL TANK OUTWARD BEFORE REFUELING.
- DO NOT SMOKE WHILE FILLING THE FUEL TANK.
- FILL THE FUEL TANK IN A WELL-VENTILATED AREA.
- DO NOT FILL THE FUEL TANK NEAR SPARKS OR OPEN FLAME.
- USE ONLY THE FUEL SPECIFIED ON THE FUEL TANK DECAL.

On machines with diesel and petrol engines, a decal near the fuel tank filler neck shows the proper fuel to use in the machine.

See Figure 4. Pull out quick release Pin (P1) then rotate the fuel tank. Before removing the cap from the tank, wipe all dust and dirt from the cap and from the top of the tank to keep the fuel as clean as possible.

On machines with propane engines, a decal near the tank gives specific information about the proper type of tank to be used on the machine.

FIGURE 4



DIESEL ENGINE

Fill the tank with Number 2 Diesel Fuel if the machine will be used in an area where the temperature is 30° Fahrenheit (0° Celsius) or higher. Use Number 1 Diesel Fuel if the machine will be used in an area where the temperature is below 30° Fahrenheit (0° Celsius).

NOTE: If the diesel machine runs out of fuel completely, the fuel system must be bled before the engine can be re-started. To avoid this situation, fill the fuel tank when the fuel gauge indicates 1/4 tank.

LPG ENGINE

Mount a standard 33 lb. (14.85 kg) liquid withdrawal propane tank on the machine, connect the fuel hose and open the shutoff valve on the tank. Wear gloves when connecting or disconnecting the fuel hose. Shut the propane tank service valve OFF when the machine is not in use.

PETROL ENGINE

Fill the tank with unleaded (AKI) 87 octane regular petrol that is the average of the RON + MON indicated on pumps as (R+M)/2.

Note: Reference the separately supplied engine manufacture's maintenance and operator manuals for more detailed engine specification and service data.

BATTERY INSTALLATION

See **Figure 5**. The battery required for this machine is sold separately. The maximum battery weight for this machine is 1,875 lbs (850 kg); the minimum battery weight is 1,400 lbs (635kg). For proper battery installation, please consult your Nilfisk Industrial Dealer. DO NOT attempt to install the battery with an overhead hoist or forklift; it can only be installed with a battery cart. Connect the connector plug (**AB**) on the battery to the machine plug behind the steering wheel. Make sure the battery is firmly seated against the brace on the left side of the battery compartment. Reinstall the battery Stop Plate (**AC**) on the right side of the compartment and snug up the Bumpers (**AD**) so the battery cannot slide from side-to-side.

NOTE: If the Stop Plate (**AC**) is not in place, machine functions will be disabled and the Battery Interlock Open Indicator (**C37**) will flash.

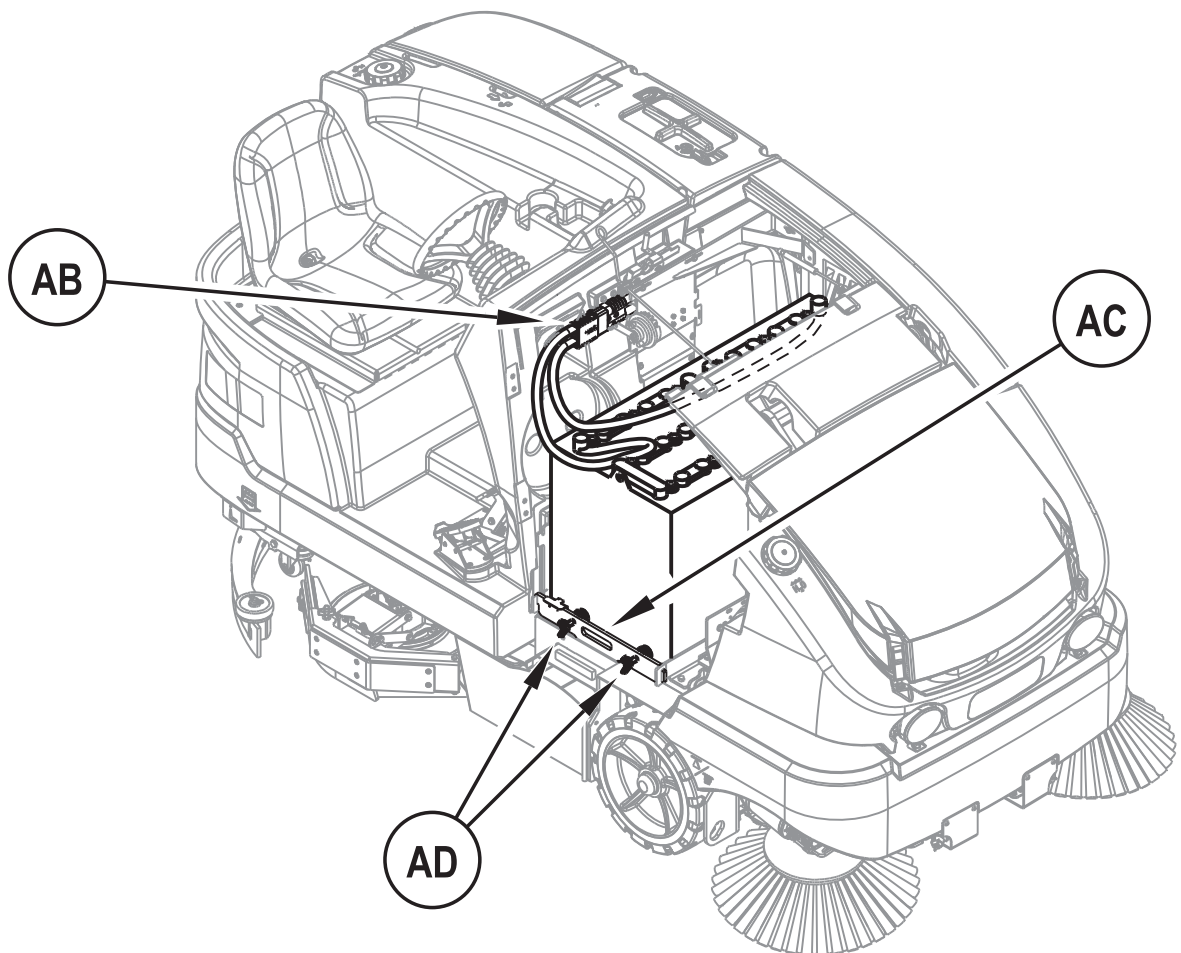
⚠ WARNING!

Battery weight in excess of 1,875 lbs (850 kg) or below 1,400 lbs (635kg) may cause the premature failure of parts including the tires, and may result in decreased stability and control, which could cause personal injury or death and/or property damage. Use of a battery in excess of the weight limit will void the warranty.

⚠ IMPORTANT!

Follow instructions packed with the battery and charger before charging the battery. Read the instructions for *Charging the Battery* in the *Maintenance* section of this manual.

FIGURE 5



MAIN BROOM

Several different main brooms are available for this machine. Contact your Nilfisk dealer if you need help selecting the best broom for the surface and litter that you will be sweeping. Note: Reference broom maintenance for installation steps.

SCRUB BRUSHES (DOUBLE SCRUB MODE)

1. Make sure the Key Switch (A) is OFF (O).
2. See Figure 6. Raise the side skirt assemblies for easier access. **NOTE:** Lift straight up on the middle of the side skirt assembly and engage the catch (AE) to keep the skirt assembly raised while installing the brushes.
3. Pull Lever (AF) outward to disengage the gas spring. This allows the right scrub brush assembly to be swung towards the rear of the machine and provide easier access to the middle scrub brush.
4. See Figure 7. To mount the brushes (or pad holders) align the lugs on the brush with the holes on the mounting plate and turn to lock in place according to rotation directions shown.

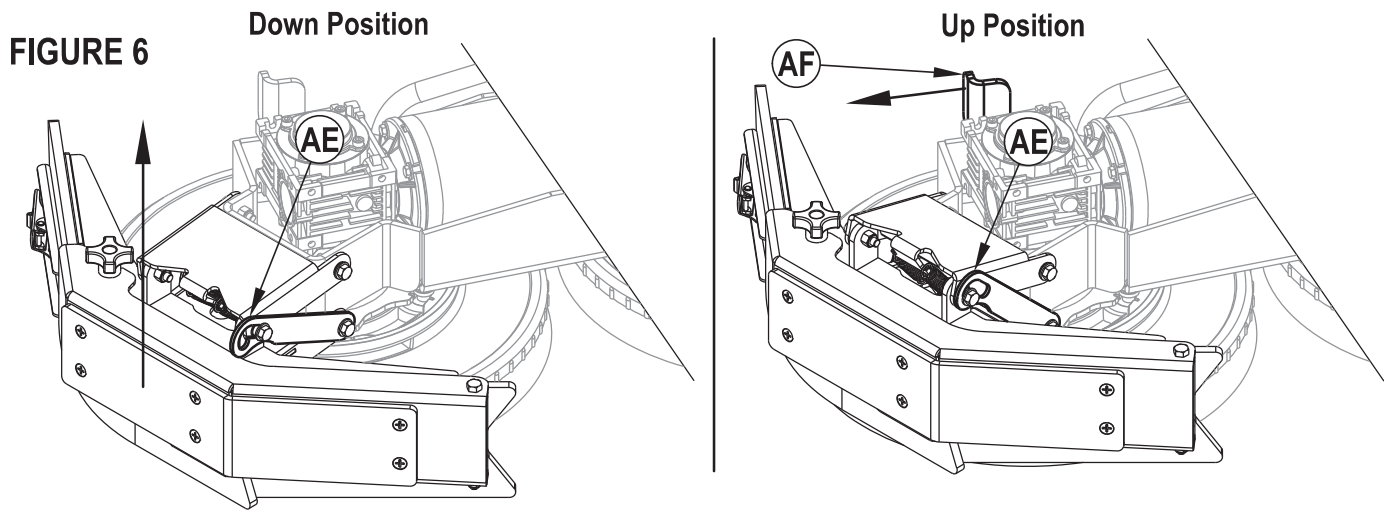
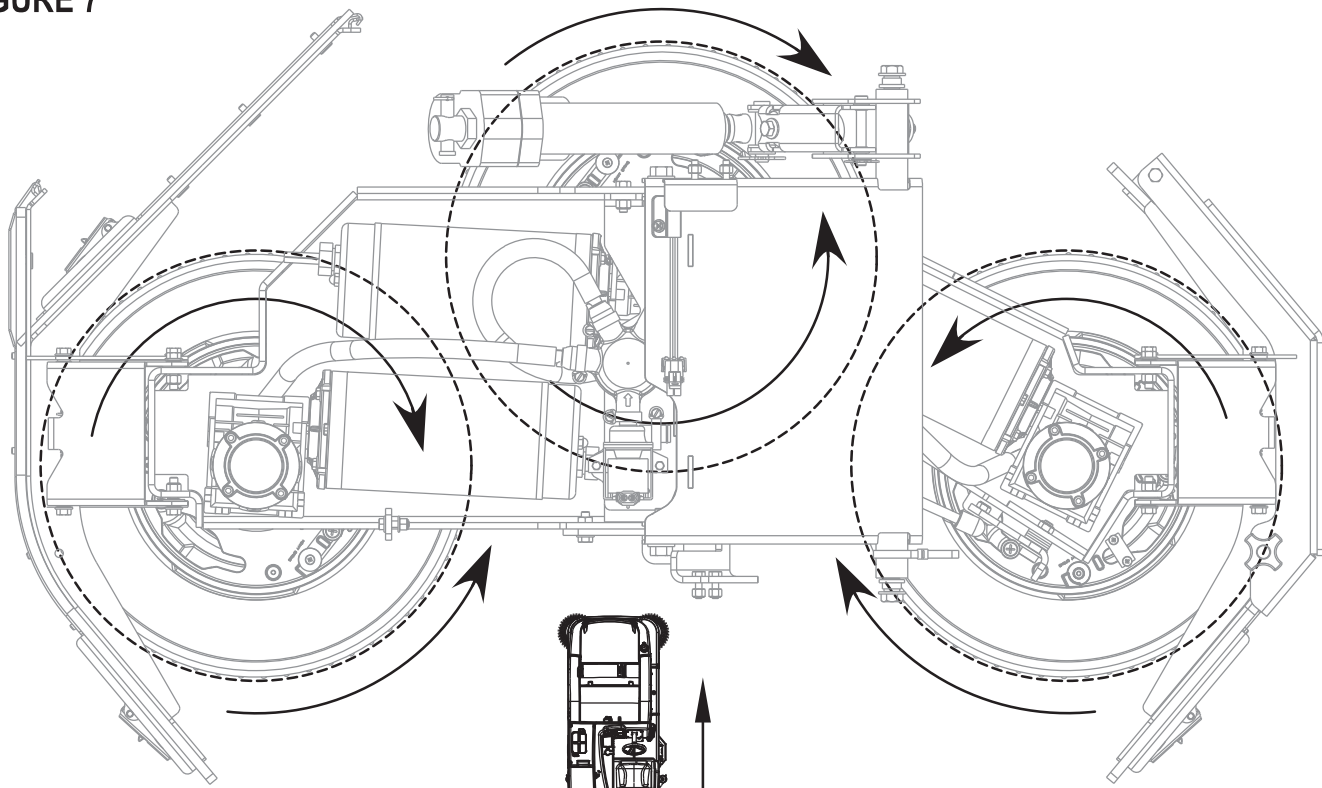


FIGURE 7



Outside arrows represent brush installation rotation direction.
 Inside arrows represent brush motor rotation while scrubbing.

FILLING THE SOLUTION TANK

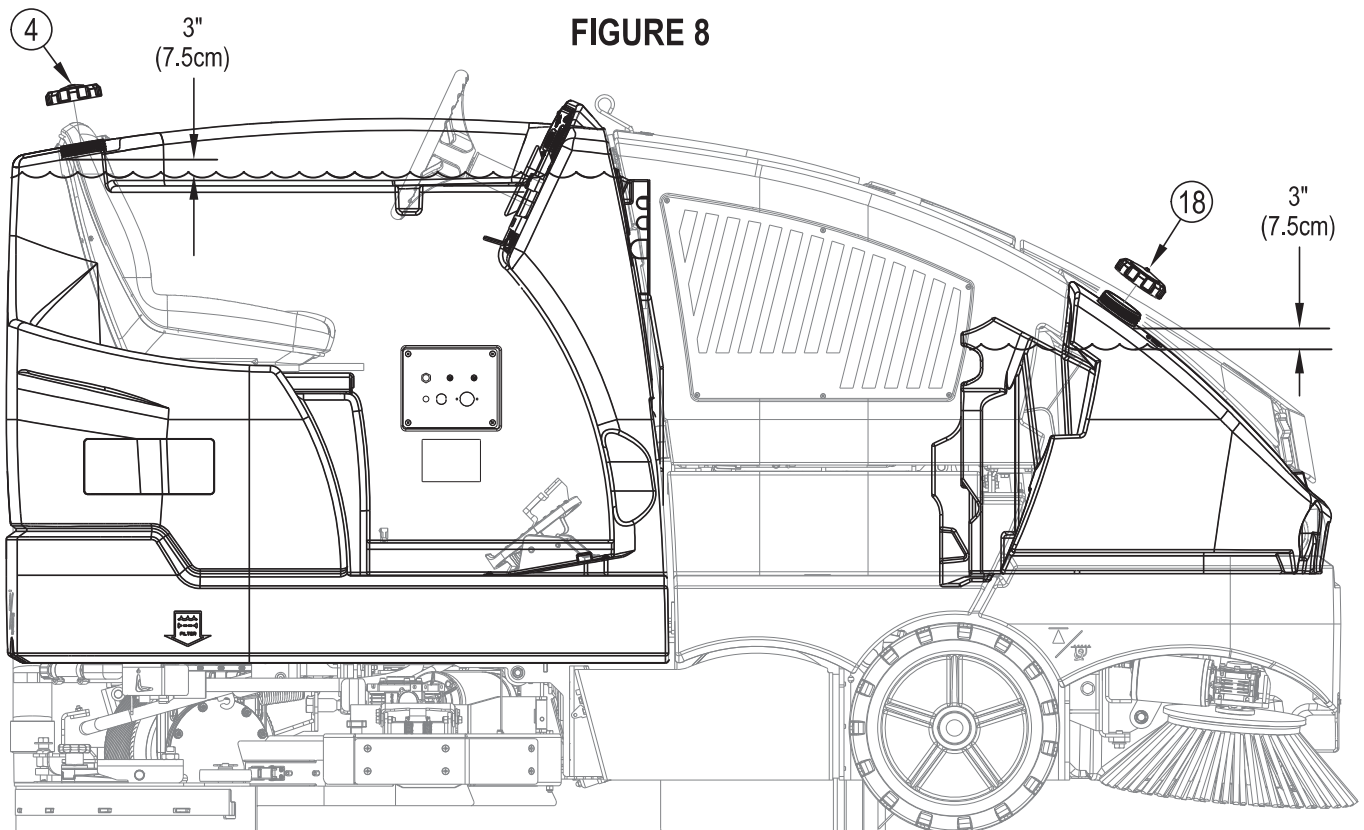
See Figure 8. Fill the solution tank with a maximum of 75 gallons (284 Liters) of cleaning solution. Do not fill the solution tank above 7.5 cm (3 inches) from the bottom of the Solution Fill (4). The solution should be a mixture of water and the proper cleaning chemical for the job. Always follow the dilution instructions on the chemical container label. **NOTE:** EcoFlex machines can either be used conventionally with detergent mixed in the tank or the detergent dispensing system can be used. When using the detergent dispensing do not mix detergent in the tank, plain water should be used.

⚠ CAUTION!

Use only low-foaming, non-flammable liquid detergents intended for machine application. Water temperature should not exceed 130 degrees Fahrenheit (54.4 degrees Celsius).

FILLING THE DUSTGUARD™ SOLUTION TANK

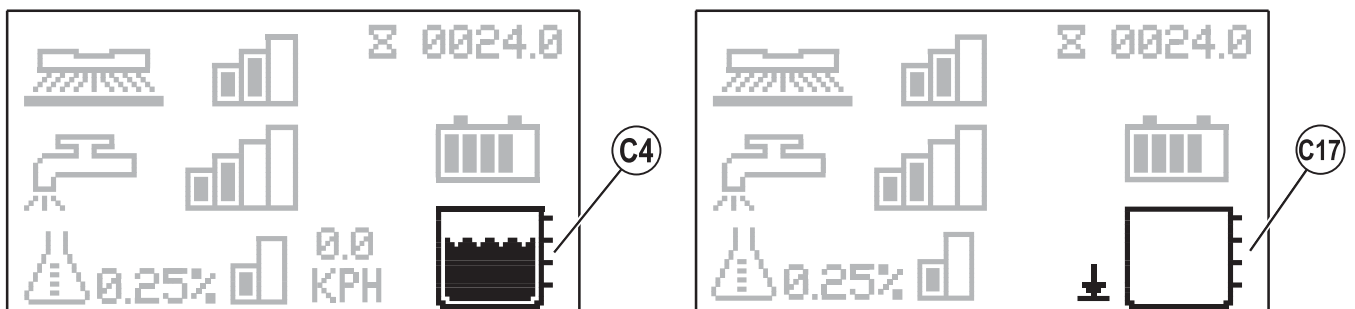
See Figure 8. Fill the solution tank with a maximum of 29 gallons (110 Liters) of water. Do not fill the solution tank above 7.5 cm (3 inches) from the bottom of the DustGuard Tank Fill (18). Do not mix detergent in the tank, plain water should be used.



SOLUTION TANK INDICATOR

See Figure 9. The solution tank has a level sensor with four measurement points. The Solution Level Indicator (C4) displays the level (1 – 4) of the solution in the tank. Once the tank is empty the Solution Empty Indicator (C17) will flash on the display.

FIGURE 9



OPERATING THE MACHINE

The CS7010 is a rider-type automatic floor sweeping and scrubbing machine. It is designed to sweep up debris, lay down cleaning solution, scrub the floor, and vacuum dry all in one pass. The sweeping and scrubbing operations can also be performed separately.

The controls were designed with *one touch operation* in mind. For single pass scrubbing the user can simply depress one switch and all scrub functions on the machine will be enabled. For sweeping, the operator can simply depress one switch and all sweeping functions will be enabled.

NOTE: Bold numbers or letters in parentheses indicate an item illustrated on pages 6-10.

STARTUP HOMING SEQUENCE

When the machine is powered, the drive wheel will turn all the way to the left and then all the way to the right to locate the home position. This will take less than 2 seconds. The steering wheel does not move during this process only the drive (rear) wheel. This startup homing sequence helps set the home position which in-turn facilitates the max. speed limiting in very sharp turns to improve the overall drivability and safety of the machine.

WARNING!

Keep hands clear of rear wheel assembly when key is turned on.

STARTING THE DIESEL ENGINE

1. Turn the key switch **(A)** clockwise to the RUN (ON) position. The glow plugs will activate for 10 seconds as indicated by the glow plug icon on the display. If the engine is already warm, turn the key switch to the start position to crank the engine. If the engine is cold, wait for the glow plug icon to turn off before cranking the engine. The engine should start immediately. If the engine does not start within 15 seconds release the key, wait for approximately one minute and repeat the above steps.
2. Let the engine run at IDLE speed for five minutes before using the machine.

STARTING THE LPG ENGINE

1. Open the service valve on the LPG fuel tank.
2. Turn the Ignition Key Switch **(A)** clockwise to the START position and release it as soon as the engine starts. If the engine does not start after cranking for 15 seconds, release the key, wait for 1 minute, then try again.
3. Let the engine run at "IDLE" speed for 5 minutes before using the machine.

ENGINE FAULT CODE FOR DIESEL AND LPG ENGINES ONLY

NOTE: If the engine has been running for at least 3 seconds and the run signal is lost while the key switch is still in the run/on position, then the **1-303 fault code (Eng No Run Signal)** will be set and the display will alternate between the Engine Fault Indicator **(C38)** and the Oil Pressure Indicator **(C27)**. See the Service Manual for troubleshooting information.

STARTING THE PETROL ENGINE

1. Turn the Ignition Key Switch **(A)** clockwise to the START position and release it as soon as the engine starts. If the engine does not start after cranking for 15 seconds, release the key, wait for 1 minute, then try again.
2. Let the engine run at "IDLE" speed for 5 minutes before using the machine.

The Engine Speed (RPM) will automatically adjust depending upon load. Use the **Drive Pedal (37)** not the Engine Speed Switch **(K)** to control the **speed** of the machine. The speed of the machine will increase as the pedal is pushed closer to the floor. Do not press the Drive Pedal **(37)** until the engine has started.

DETERGENT SYSTEM PREPARATION AND USE (ECOFLEX MODELS ONLY)

The Detergent Cartridges (47) are located below the Operator's Seat (2). Fill the detergent cartridge with a maximum of 2.2 gallons (8.32 Liters) of detergent.

SERVICE NOTE: Remove the detergent cartridges from the machine prior to filling to avoid spilling detergent on the machine.

It is recommended that a separate cartridge be used for each detergent you plan to use. The detergent cartridges have a white decal on them so you can write the detergent name on each cartridge to avoid mixing them up. When installing a new cartridge, remove the Cap (BC) and place the cartridge in the detergent box. Install the Dry Break Cap (BD) as shown in Figure 10.

The system should be purged of previous detergent when switching to a different detergent. **SERVICE NOTE:** Move machine over floor drain before purging because a small amount of detergent will be dispensed in the process.

To Purge When Changing Detergents (SCRUB AND SOLUTION SYSTEMS MUST BE OFF)

1. Disconnect and remove the detergent cartridge.
2. Turn the key switch (A) to the RUN (ON) position. Wait a few seconds for the start-up sequence to finish.
3. Press and hold the Solution Switch (U) and the Detergent Switch (X) for approximately 2 seconds. Release the switches when the Detergent Purge indicator (C12) appears on the display (the Detergent Switch Light (X1) and Solution Switch Light (U1) will be ON. **NOTE:** Once activated the purge process takes 20 seconds. Press (U) and (X) again before 20 seconds to cancel purge. See Figure 10 for Detergent System indicators. Normally one purge cycle is adequate to purge the system.

To Purge Weekly (SCRUB AND SOLUTION SYSTEMS MUST BE OFF)

1. Disconnect and remove the detergent cartridge. Install and connect a Cartridge filled with clean warm water.
2. Follow steps 2 and 3 from "To Purge When Changing Detergents".

When the detergent level is nearing the bottom of the cartridge it is time to refill or replace the cartridge(s).

SERVICE NOTE: Follow the "To Purge Weekly" instructions above if the machine is going to be stored for an extended period of time.

Detergent Ratio (SCRUB SYSTEM MUST BE ON)

No detergent is dispensed until the scrub and detergent systems are activated and the Drive Pedal (37) is pushed forward.

- The Detergent Indicator (C6) will be displayed in scrub mode when the detergent system is installed on the machine.
- The Detergent Ratio Indicator (C7) will display the selected ratio when the detergent system is on.

Four Modes of EcoFlex Operation

1. **Plain Water Cleaning Mode** - During scrubbing, the detergent system can be turned off at any time by pressing the Detergent Switch (X) to allow scrubbing with water only. Detergent Ratio Indicator (C7) will be blank and Detergent Indicator Bar Graph (C8) will display no bars filled. Detergent Light (X1) will be off.
2. **Minimum Concentration Detergent Mode** - Activated by pressing the Detergent Switch (X) when detergent is off (repeated presses will cycle to maximum mode, off and back to minimum mode). Detergent Ratio Indicator (C7) will display the current minimum detergent level and Detergent Indicator Bar Graph (C8) will display first bar filled. Detergent Light (X1) will be on. See below the steps "To program the Minimum Detergent Level".
3. **Maximum Concentration Detergent Mode** - Activated by pressing the Detergent Switch (X) when detergent is at minimum mode (repeated presses will cycle to minimum mode, off and back to maximum mode). Detergent Ratio Indicator (C7) will display the current maximum detergent level and Detergent Indicator Bar Graph (C8) will display left and right bars filled. Detergent Light (X1) will be on. See below the steps "To program the Maximum Detergent Level". Do not use a concentration level exceeding the detergent manufacturer's recommendation.
4. **Burst of Power Cleaning Mode** - Press the Burst of Power Switch (S) to increase the detergent ratio for one minute to the pre-programmed "maximum concentration" detergent level (as noted in programming instructions below). Detergent system will be turned ON at "minimum concentration" detergent level if it was off. This will also cause the solution flow rate to increase to the next level and the scrub pressure to increase to the next level. Burst of Power Indicator (C34) will blink for one minute on the display along with a 60 second timer countdown. Press the Burst of Power Switch (S) again before 60 seconds to cancel Burst of Power. The amount of time Burst of Power runs is adjustable (see "Information Menu Display" submenu "Options").

To program the Maximum Concentration Detergent Level

1. Press the OneTouch™ Scrub switch (R) to activate the scrub system.
2. Press and release Detergent Switch (X) until you have entered the maximum concentration detergent mode ((C8) shows left and right bars filled).
3. Press and hold the Detergent Switch (X) for approximately 2 seconds until the Ratio Indicator (C7) flashes.
4. While the ratio is flashing, pressing and releasing the detergent switch will cycle through the available ratio percentages (0.25%, 0.3%, 0.4%, 0.5%, 0.7%, 0.8%, 1%, 1.5%, 2%, 3%, 3.8%).
5. Once the desired ratio is displayed on the screen, stop and it will save the setting after 3 seconds.
6. Whenever the maximum concentration detergent setting is set to a lower concentration than the current minimum programmed concentration setting, the minimum concentration default setting will be equal to the maximum concentration setting until changed by the operator.

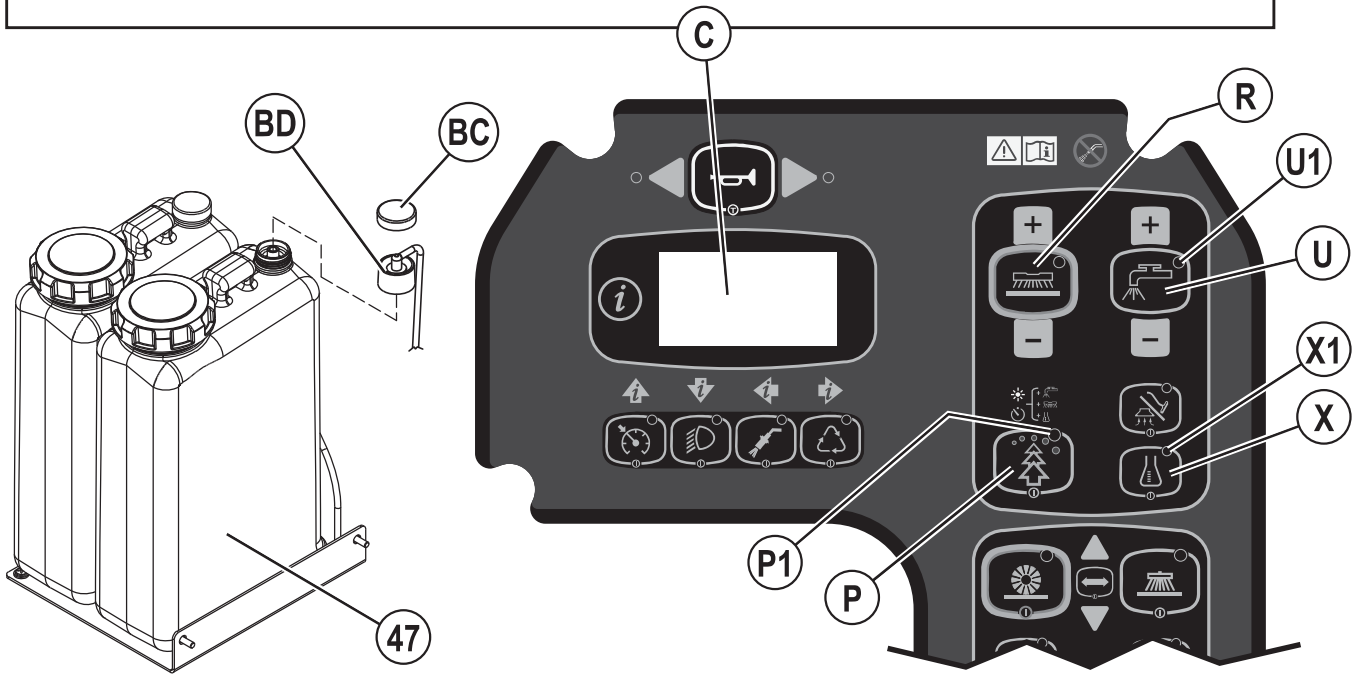
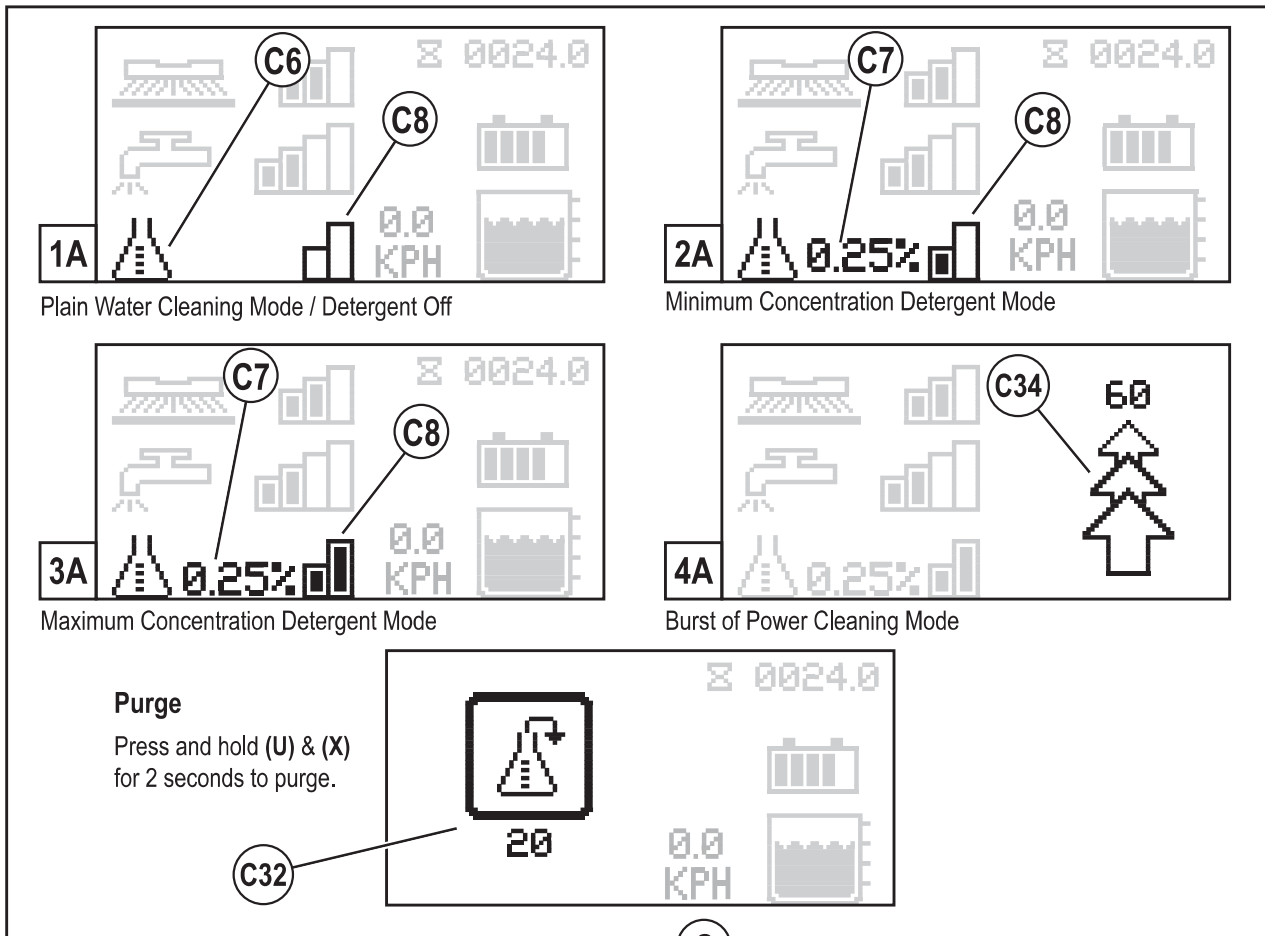
To program the Minimum Concentration Detergent Level

1. Press the OneTouch™ Scrub switch (R) to activate the scrub system.
2. Press and release Detergent Switch (X) until you have entered the minimum concentration detergent mode ((C8) shows left bar filled).
3. Press and hold the Detergent Switch (X) for approximately 2 seconds until the Ratio Indicator (C7) flashes.
4. While the ratio is flashing, pressing and releasing the detergent switch will cycle through the available ratios (Note: only ratios that are a lower concentration or equal to the maximum detergent setting will be available).
5. Once the desired ratio is displayed on the screen, stop and it will save the setting after 3 seconds.

Once set, the detergent flow rate automatically increases and decreases with the solution flow rate, but the detergent ratio remains the same.

DETERGENT SYSTEM PREPARATION AND USE (ECOFLEX MODELS ONLY- CONTINUED)

FIGURE 10



SWEEPING

WARNING!

Be sure you understand the operator controls and their functions.

While on ramps or inclines, avoid sudden stops when loaded. Avoid abrupt sharp turns. Use low speed down hills.

Follow the instructions in preparing the machine for use section of this manual. Start the engine following the instructions in the appropriate "Starting the Engine" section (Engine models).

1. While seated on the machine, adjust the seat and steering wheel to a comfortable operating position.
2. Release the Parking Brake (38). To transport the machine to the work area, apply even pressure with your foot on the front of the Drive Pedal (37) to go forward or the rear of the pedal for reverse. Vary the pressure on the foot pedal to obtain the desired speed.
3. See Figure 11. Push the Lower Hopper Switch (II) to make sure the hopper is seated properly.
4. Press the One-Touch™ Sweep Switch (Y) to lower and the main broom and side brooms. The main broom, side brooms, dust control and optional DustGuard (if installed) systems all start when the Drive Pedal (37) is activated. Side Brooms (CC), Dust Control (FF) and DustGuard (DD) can each be turned off and on individually by pressing their corresponding switch. **NOTE:** The dump door opens automatically when the main broom is lowered and closes when the broom is raised.
Press the Main Broom Float Switch (GG) only when sweeping extremely rough or uneven floors. Use at other times will only increase broom wear. When in the full float position the float switch indicator light will be ON, press the Float Switch (GG) to return to the normal mode.
5. When sweeping floors with puddles, push the Dust Control Switch (FF) to turn OFF the dust control system before the machine enters a puddle. Turn the dust control system back ON when the machine is back on completely dry floor.
When sweeping wet floors, keep the Dust Control Switch (FF) OFF at all times.
6. To adjust the side broom sweeping pattern or main broom sweeping pressure, see the Maintenance section.
7. Drive the machine straight forward at a quick walking speed. Drive the machine slower when sweeping large amounts of dust or debris or when safe operation dictates slower speeds. Overlap passes 6 inches (15 cm).
8. If dust comes out of the broom housing while sweeping, the Dust Control Filter (17) may be clogged. Push the Shaker Switch (EE) to clean the dust control filter. The dust control system (FF) will automatically turn OFF while the shaker is running and turn ON after the shaker turns OFF (the shaker runs for 15 seconds). Run the shaker (EE) every 10 minutes on average (depending upon the dustiness of the area being cleaned). For proper machine operation, the dust filter must be kept as clean as possible.
9. Check behind the machine occasionally to make sure that the machine is picking up debris. Dirt left behind in the path of the machine usually indicates that the machine is moving too fast, the broom needs to be adjusted, or the hopper is full.
10. When the operator wants to stop sweeping, press the One-Touch™ Sweep Switch (Y). This will automatically raise and stop the main and side brooms. The dust control and DustGuard (if installed) will turn off. The hopper door will close and the shaker motor will run for 15 seconds.

EMPTYING THE HOPPER

WARNING!

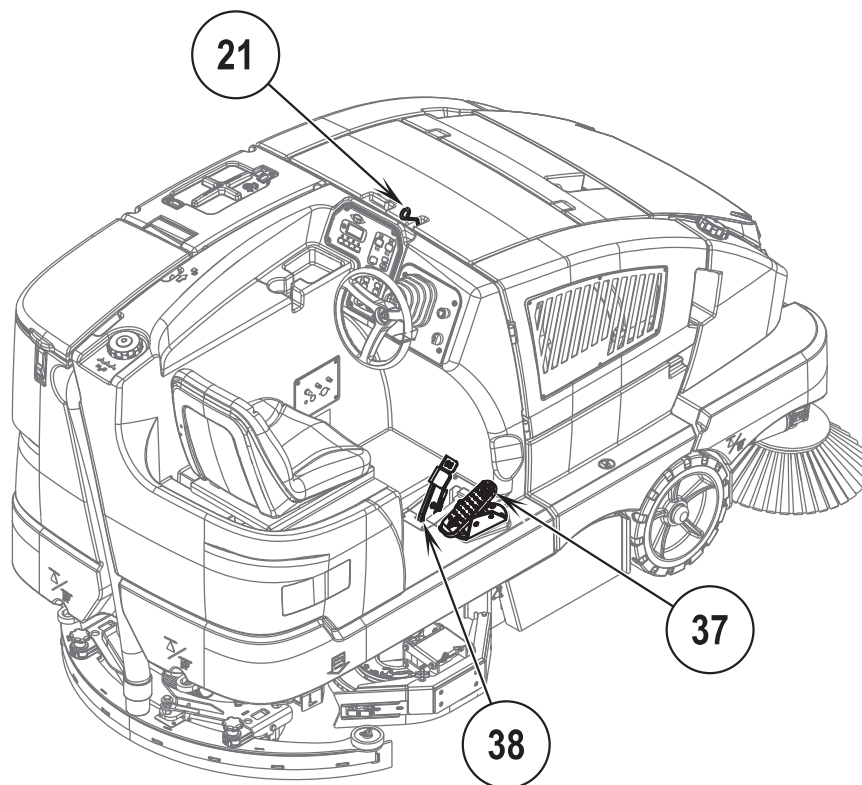
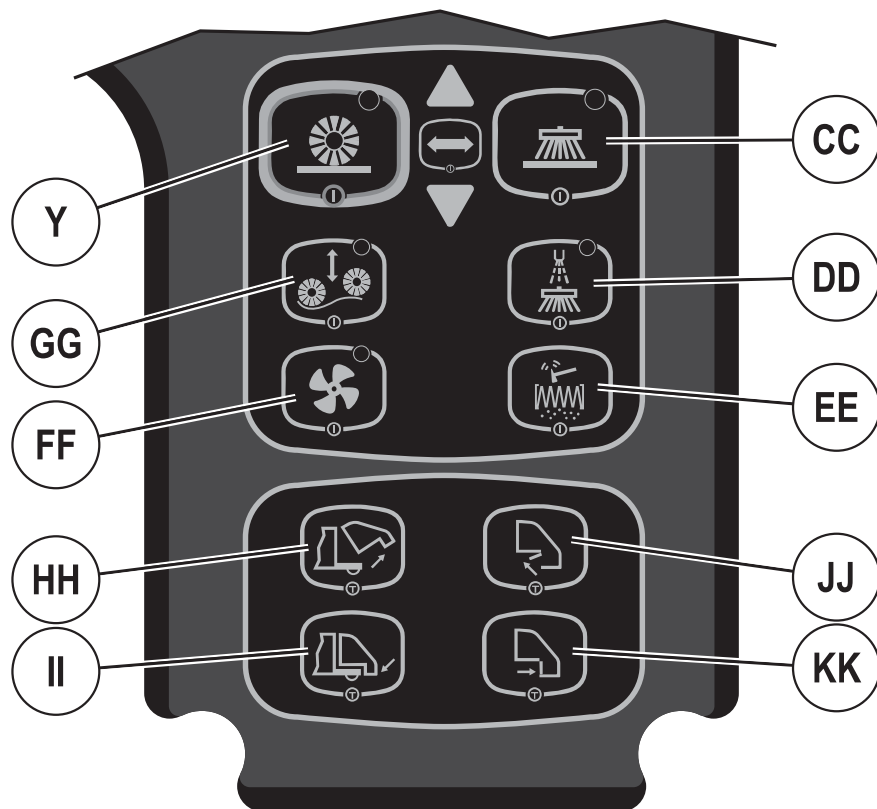
Make sure the Hopper Safety Bar (23) is engaged whenever attempting to do any maintenance work under or near the raised hopper. The Hopper Safety Bar (23) holds the hopper in the raised position to allow work to be performed under the hopper. NEVER rely on the machine's hydraulic components to safely support the hopper.

NOTE: The MINIMUM ceiling height dumping clearance required for raising the hopper is 90" (228.6 cm).

1. See Figure 11. Press the Filter Shaker Switch (EE) to remove excess dirt from the dust control filter. **SERVICE NOTE: For best shaker performance always run the shaker with the hopper fully down.**
2. Drive the machine close to a large trash receptacle and hold the Raise Hopper Switch (HH) until the hopper is all the way up. **NOTE:** The dump door automatically closes when switch (HH) is pushed. You regain control of the dump door as soon as the hopper begins to rise so you can dump at any height if necessary.
3. Move the machine forward until the hopper is over the receptacle and set the Parking Brake (38). Press the Hopper Door Open Switch (JJ) to open the dump door and empty the hopper. **NOTE:** If not dumping into a trash receptacle, low dumping is recommended to help eliminate airborne dust.
4. Put the Hopper Safety Bar (23) in place by pulling back on the Hopper Safety Bar Handle (21), then press the Hopper Lower Switch (II) to lower the hopper slightly and secure.
5. Check the hopper door and the front edge seal. Use a broom, if necessary, to remove litter from these areas. The hopper door must seal tightly against the broom housing for proper operation.
6. Return to the operator's compartment. Release the parking brake. Press and hold the Hopper Door Close Switch (KK) to close the hopper door. Move the machine back until the hopper will clear the receptacle. Raise the hopper slightly and push forward on the Hopper Safety Bar Handle (21) until the Hopper Safety Bar (23) disengages, then press the Hopper Lower Switch (II) to lower the hopper. **NOTE:** The brooms will not turn on if the hopper is not completely down.

EMPTYING THE HOPPER (CONTINUED)

FIGURE 11



SCRUBBING

WARNING!

Be sure you understand the operator controls and their functions.

While on ramps or inclines, avoid sudden stops when loaded. Avoid abrupt sharp turns. Use low speed down hills.

Follow the instructions in "Preparing the Machine for Use" section of this manual. Start the engine following the instructions in the appropriate "Starting the Engine" section (Engine models).

1. While seated on the machine, adjust the seat and steering wheel (tilt steering is optional) to a comfortable operating position.
2. Release the Parking Brake (38). To transport the machine to the work area, apply even pressure with your foot on the front of the Drive Pedal (37) to go forward or the rear of the pedal for reverse. Vary the pressure on the foot pedal to obtain the desired speed.
3. **SEE FIGURE 12.** Press and hold the Solution Switch (U) to pre-wet the floor, solution will be dispensed while the switch is held. **NOTE:** This will help prevent scarring of the floor surface when starting to scrub with dry brushes. This must be done prior to pressing the One-Touch™ Scrub Switch (R).
4. Press the One-Touch Scrub ON Switch (R) once for Regular Scrub. Press the Scrub Pressure Increase Switch (Q) once for Heavy Scrub or twice for Extreme Scrub mode. The solution flow has settings that coincide with the scrub pressure, it will increase and decrease along with the scrub pressure.
NOTE: The solution flow rate can also be increased or decreased independently of the scrub pressure by pressing the Solution Flow Increase Switch (T) or Solution Flow Decrease Switch (V), observe the Solution Flow Rate Bar Graph (C10) (see Control Panel). Any subsequent scrub pressure adjustments will reset the solution flow rate to default.
5. When the One-Touch Scrub ON Switch (R) is selected, the brushes and squeegee are automatically lowered to the floor. The scrub, solution, vacuum and detergent (EcoFlex models) systems are all automatically enabled and will start when the Drive Pedal (37) is activated. Any individual system can be turned OFF or back ON by simply pressing its switch at any time during scrubbing.
NOTE: When operating the machine in reverse the squeegee automatically raises.
6. Begin scrubbing by driving the machine forward in a straight line at a normal walking speed and overlap each path by 2-3 inches (50-75 mm). Adjust the machine speed and solution flow when necessary according to the condition of the floor.
NOTE: While scrubbing the maximum machine speed can be set by pressing the Speed Limiter Switch (K). Adjust the machine to the desired speed using the Drive Pedal (37) then press the Speed Limiter Switch (K). The operator can now press the pedal all the way forward without increasing the machine speed thereby reducing operator fatigue. The machine Speed (C5) is shown on the display.

CAUTION!

To avoid damaging the floor, keep the machine moving while the brushes are turning (the brushes will turn OFF after a 2 second delay when the drive pedal is placed in the neutral position).

7. When scrubbing, check behind the machine occasionally to see that all of the waste water is being picked up. If there is water trailing the machine, you may be dispensing too much solution, the recovery tank may be full, or the squeegee tool may require adjustment.
8. The machine defaults to the last cleaning mode used Minimum or Maximum Concentration Detergent (if detergent is installed and was activated). Press the Burst of Power Switch (P) to override the current cleaning mode and temporarily increase scrub pressure, solution flow and the detergent ratio (unless in Maximum Concentration). This will cause the Burst of Power Indicator (C34) to be displayed along with a countdown timer for one minute, solution flow rate will increase to the next level, scrub pressure will increase to the next level and the detergent ratio will be at the Maximum Concentration level (detergent system will be turned on at Minimum Concentration level if it was off).
NOTE: Repeatedly pressing and releasing the Detergent Switch (X) will cycle between Minimum Concentration, Maximum Concentration and detergent off. The EcoFlex system will only function if the scrub system (R) has been enabled.
9. For extremely dirty floors, a one-pass scrubbing operation may not be satisfactory and a "double-scrub" operation may be required. This operation is the same as a one-pass scrubbing except on the first pass the squeegee and scrub deck blades are in the up position (press the Vacuum/Wand Switch (L) to raise the squeegee). The Side Skirts (8 and 39) can also be raised for double scrubbing (if needed and held in place with the catch (AE) shown in Figure 6). This allows the cleaning solution to remain on the floor to work longer. The final pass is made over the same area, with the squeegee and side blades lowered to pick up the accumulated solution.
10. The recovery tank has two Vac Motor Inlet Shut-Off Floats (52) that cause ALL systems to turn OFF except the drive and sweeping systems when the recovery tank is full. When the float(s) is activated, the recovery tank must be emptied. The machine will not pick up water or scrub with the float activated. The machine can continue to be used for sweeping.
NOTE: The Recovery Tank Full Indicator (C21) appears on the LCD Display (C) when the switch is activated.
11. When the operator wants to stop scrubbing or the recovery tank is full, press the One-Touch Scrub Switch (R) once. This will automatically stop the scrub brushes and solution flow and the scrub deck will raise up. The squeegee will raise up after a brief delay and the vacuum will stop after an additional delay (this is to allow any remaining water to be picked up without turning the vacuum back on).

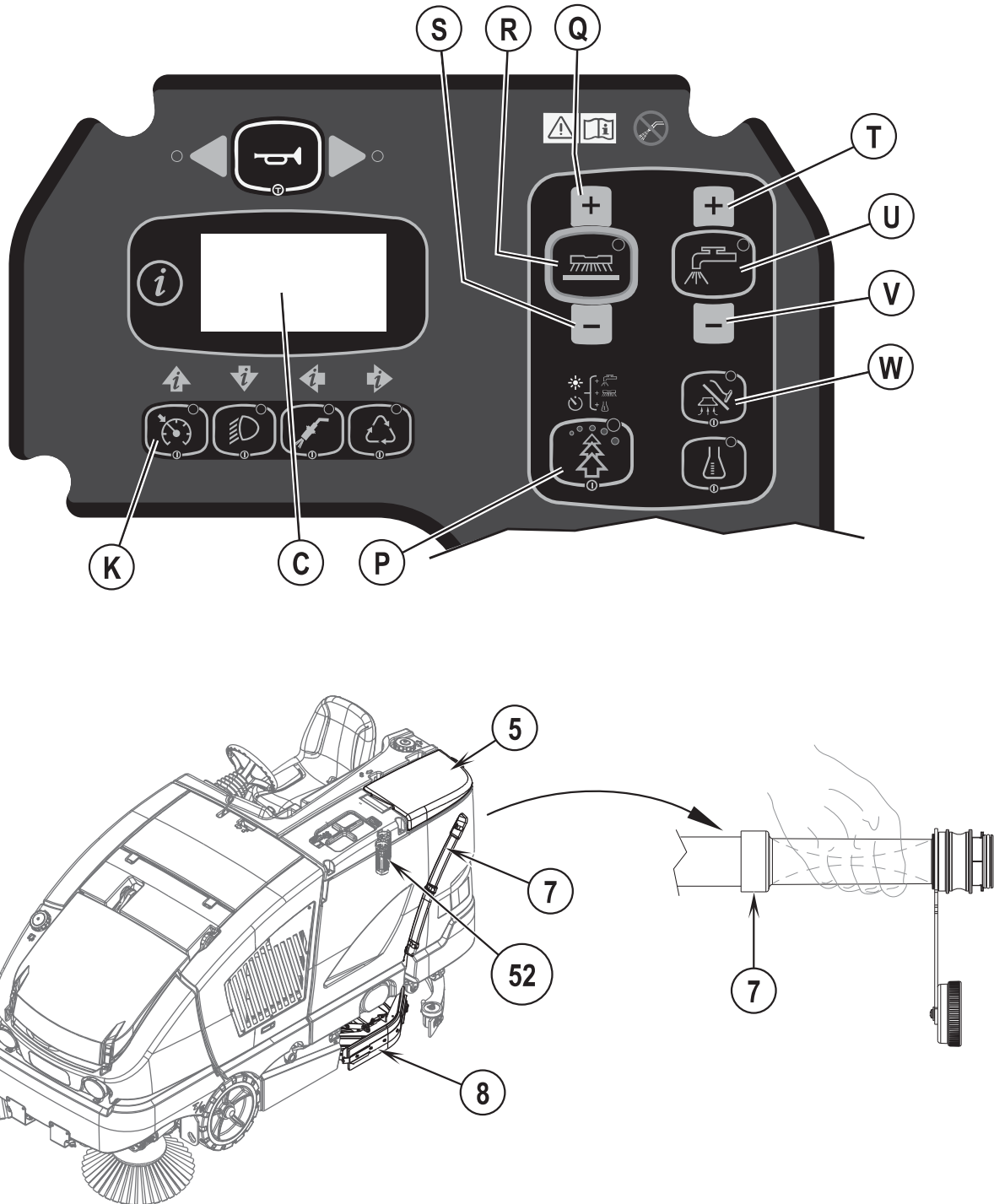
SCRUBBING (CONTINUED)

12. Drive the machine to a designated waste water "DISPOSAL SITE" and empty the recovery tank. To empty, pull the Recovery Tank Drain Hose (7) from its rear storage area. Then remove the plug (hold the end of the hose above the water level in the tank to avoid sudden, uncontrolled flow of waste water). Refill the solution tank and continue scrubbing.

NOTE: Make sure the Recovery Tank Lid (5) and the Recovery Tank Drain Hose (7) cap are properly seated or the machine will not pick-up water correctly.

Battery Models: When the batteries require recharging the Battery Low Voltage Indicator (C33) will be displayed. The scrub brushes and solution flow will stop and the scrub deck will raise up. The squeegee will raise up after a brief delay and the vacuum will stop after an additional delay. Transport the machine to a service area and recharge the batteries according to the instructions in the Battery section of this manual.

FIGURE 12



AFTER USE

1. Raise the scrub brushes and the brooms.
2. Shake the dust control filter and empty the hopper.
3. Drain and flush the recovery tank. Check that the drain hose cap is sealed.
4. Flush the vacuum hose and squeegee by opening the recovery tank lid and running water down the pickup tube on the rear of the tank.
SERVICE NOTE: The recovery tank can be tipped out to the side for cleaning after emptying. Unlatch the Recovery Tank Tip-Out Lock (3) between the solution and recovery tank and then pull out on the tank with Recovery Tank Tip-Out Grip (25) until the tank reaches the end of its tether.
5. Remove and clean the squeegee tool.
6. Remove and clean the scrub brushes. Rotate the scrub brushes.
NOTE: Replace scrub brushes if half of the original length is used up.
7. Wipe the machine with a damp cloth.
8. Perform all required maintenance before storage. See the "Maintenance Schedule" located on the next page.
9. Move the machine to a clean, dry storage area.
10. Apply the parking brake.
11. Store the machine with the brooms, the squeegee and the scrub brushes in the UP position, and the tank covers open so that the tanks can air out.

Report any defect or malfunction noted during operation to Authorized Service or Maintenance Personnel.

SHUTTING DOWN THE DIESEL ENGINE

1. Put all controls to the OFF position.
2. Raise the squeegee, the scrub brushes, and the brooms.
3. Apply the Parking Brake (38).
4. Turn the Key Ignition Switch (A) OFF and remove the key.

SHUTTING DOWN THE LPG ENGINE

1. Put all controls to the OFF position.
2. Raise the squeegee, the scrub brushes, and the brooms.
3. Turn the service valve on LPG fuel tank OFF.
4. Let the engine idle until all the LPG gas is dispelled from the line.
5. Apply the Parking Brake (38).
6. Turn the Key Ignition Switch (A) OFF and remove the key.

SHUTTING DOWN THE PETROL ENGINE

1. Put all controls to the OFF position.
2. Raise the squeegee, the scrub brushes, and the brooms.
3. Apply the Parking Brake (38).
4. Turn the Key Ignition Switch (A) OFF and remove the key.

IMPORTANT NOTE FOR LPG MACHINES ONLY: During normal operation the engine will continue to run for a short period of time (1-3 seconds) after turning the key OFF until all fuel is dispelled from fuel system.

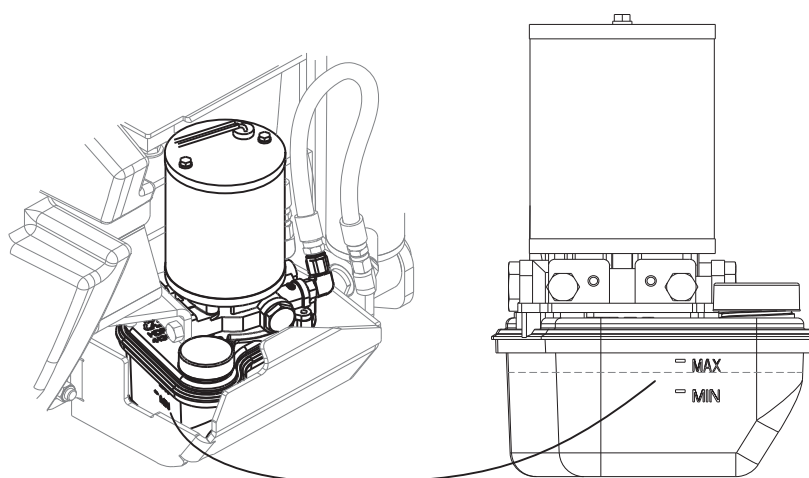
CHECK HYDRAULIC OIL

To check the hydraulic oil level, swing open the Right Side Door (35) and lift out the Lower Cover (34). The Hydraulic Oil Reservoir (49) will be visible in the area above the front tire. Look through the translucent reservoir to check the oil level it should be between the MIN and MAX lines. **See Figure 13.**

If the oil level is below the MIN line with the hopper in the down position you will need to add oil to the reservoir. Raise the hopper and engage the hopper safety bar to access the hydraulic oil reservoir fill cap.

Note: With the hopper raised some oil has entered the cylinder causing the oil level to drop, DO NOT fill the reservoir to the MAX line with the hopper raised. Add 10W30 motor oil until the oil is at the MIN level line. Change the oil if major contamination from a mechanical failure occurs.

FIGURE 13



MAINTENANCE SCHEDULE

Keep the machine in top condition by following the maintenance schedule closely. Maintenance intervals given are for average operating conditions. **Machines used in severe environments may require service more often.**

MAINTENANCE ITEM	PERFORM DAILY	PERFORM WEEKLY
Perform the "After Use" maintenance steps	X	
Charge battery (battery models)	X	
Check parking brake	X	
Check engine oil (engine models only)	X	
Check engine coolant level (engine models only)	X	
Check air filter service indicator	X	
Clean main and side brooms	X	
Check and clean the brushes	X	
Clean the DustGuard system spray nozzles	X	
Drain / Check / Clean Tanks & Hoses	X	
Clean recovery tank Debris Basket (51)	X	
Check / Clean / Adjust the squeegee	X	
Clean the hopper	X	
Clean / Inspect scrub deck side skirts	X	
Check/Clean/Rinse the vacuum motor foam filter and screen, under lid (6)	X	
Check hydraulic oil level		X

MAINTENANCE ITEM	15-20 Hours	150 Hours	400 Hours	1000 Hours	1500 Hours	1900 Hours	2000 Hours
Check the electrolyte level in the battery (battery models)	X						
Check the battery cables and connections	X						
Rotate main broom	X						
Inspect and clean solution filter	X						
Rotate the scrub brushes	X						
Inspect/adjust main and side brooms	X						
Inspect broom housing skirts	X						
Check / Clean Hopper Dust Control Filter	X						
Inspect hopper seals	X						
Purge Detergent System (EcoFlex only)	X						
Clean radiator		X					
Perform engine maintenance		X					
Inspect and drain any oil buildup from the LPG fuel system EPR		X					
Inspect complete air intake system (engine models only)			X				
Check battery electrolyte level & terminals (engine models only)			X				
Replace fuel filter (engine models only)			X				
Change the spark plugs (LPG only)				X			
Flush the radiator				X			
Replace Alternator Drive Belt				X			
Check main broom motor carbon brushes					X		
Check side broom motor carbon brushes					X		
Check scrub brush motor carbon brushes						X	
*Perform engine maintenance							X

*See the Service Manual for detailed maintenance information of systems listed (Engine, Sweeping, Hopper, Steering, Dust Control, Recovery, Scrub, Solution, Wheel and Squeegee).

CHARGING THE BATTERY (BATTERY MODELS)

Charge the battery each time the machine is used, or whenever the Battery Low Indicator (C12) is displayed.

To Charge the Battery:

1. Unlatch the Battery Compartment Latch (20) and open the door to provide proper ventilation.
2. **See Figure 15.** Disconnect the battery from the machine (AB) and connect the charger plug to the battery plug.
3. Follow the instructions on the battery charger.
4. Check the fluid level in all battery cells after charging the battery. Add distilled water, if necessary, to bring the fluid level up to the bottom of the filler tubes.

⚠ WARNING!

Do not fill the battery before charging.

Only charge battery in a well-ventilated area.

Do not smoke while servicing the battery.

⚠ CAUTION!

To avoid damage to floor surfaces, always wipe water and acid from the top of the battery after charging.

CHECKING THE BATTERY ELECTROLYTE LEVEL

Check the electrolyte level of the battery at least once a week.

After charging the battery, remove the vent caps and check the electrolyte level in each battery cell. Use distilled water to fill the battery to the bottom of the filler tube.

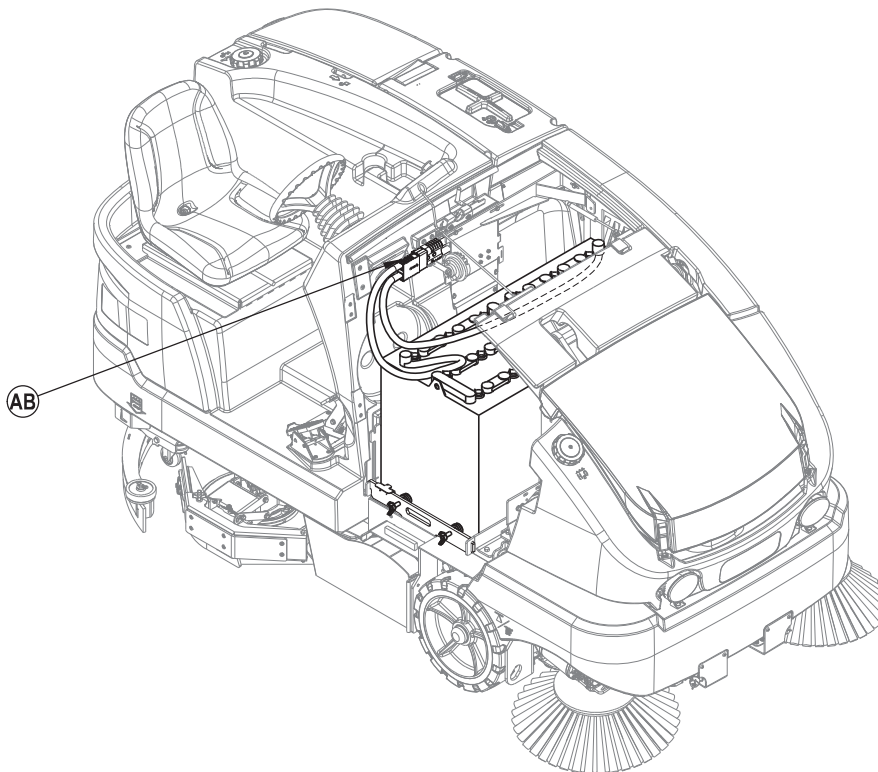
Do not over-fill the battery!

⚠ CAUTION!

Acid can spill onto the floor if the battery is overfilled.

Tighten the vent caps. If there is acid on the battery, wash the tops of the battery with a solution of baking soda and water (2 tablespoons of baking soda to 1 quart of water).

FIGURE 15



CHARGING THE BATTERY PACK (HYBRID MODELS)

The engine runs a generator which is the main source of electrical power. The battery pack (32) is used as a back-up. If the engine is not running, the machine can operate for a limited time using only the battery pack. Charge the battery pack whenever the Battery Low Indicator (C12) is displayed (signifying a low-voltage cutout state). The battery pack can be recharged by running the engine and scrubbing with the machine for at least four hours. An alternative is to follow the steps below to charge the battery pack using a shelf charger.

To Charge the Battery Pack:

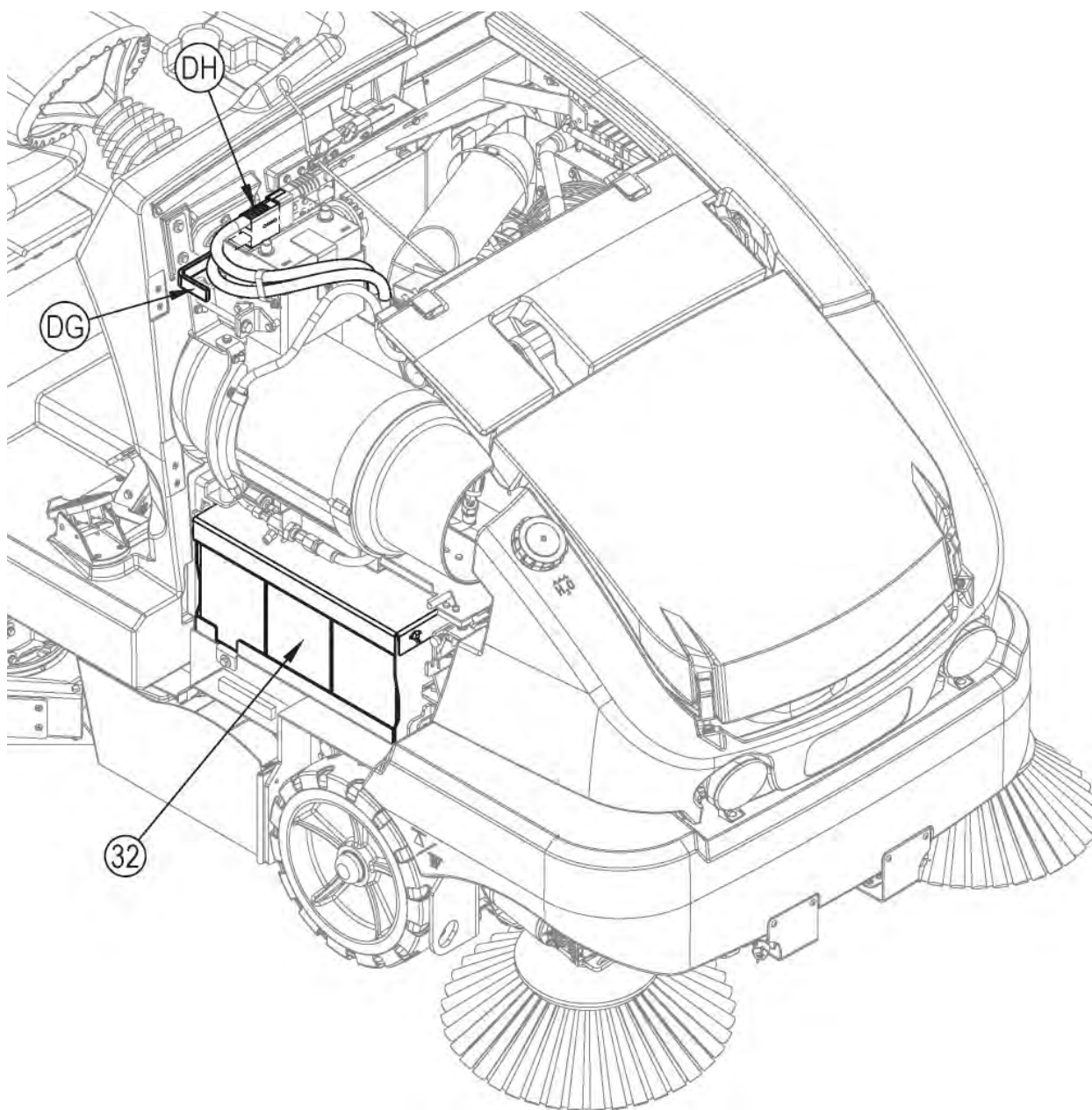
1. Unlatch and open the Right Side Door (35).
2. See Figure 16. Pull the yellow Handle (DG) to disconnect the battery pack from the machine at plug (DH).
3. Connect the charger plug to the battery plug (DH).
4. Follow the instructions on the battery charger; use an appropriate charger for gel batteries.

⚠ CAUTION!

Use only Nilfisk approved 36 V gel battery charger.

Never leave the machine in a low-voltage cutout state overnight without charging the battery pack.

FIGURE 16



MAIN BROOM MAINTENANCE

Since the Main Broom Motor always turns in the same direction, the bristles on the broom eventually become curved, reducing sweeping performance. Sweeping performance can be improved by removing the broom and turning it around (end-for-end). This procedure, known as "rotating" the main broom, should be done once every 15-20 hours of operation.

The main broom should be replaced for optimal performance when the bristles are worn to a length of 2-1/2 inches (6.35 cm). The main broom stop must be re-adjusted when the broom is replaced. **NOTE:** Bristle length on a new broom is 3-3/4 inches (9.5 cm).

NOTE: The machine should be stored with the Main Broom in the raised position.

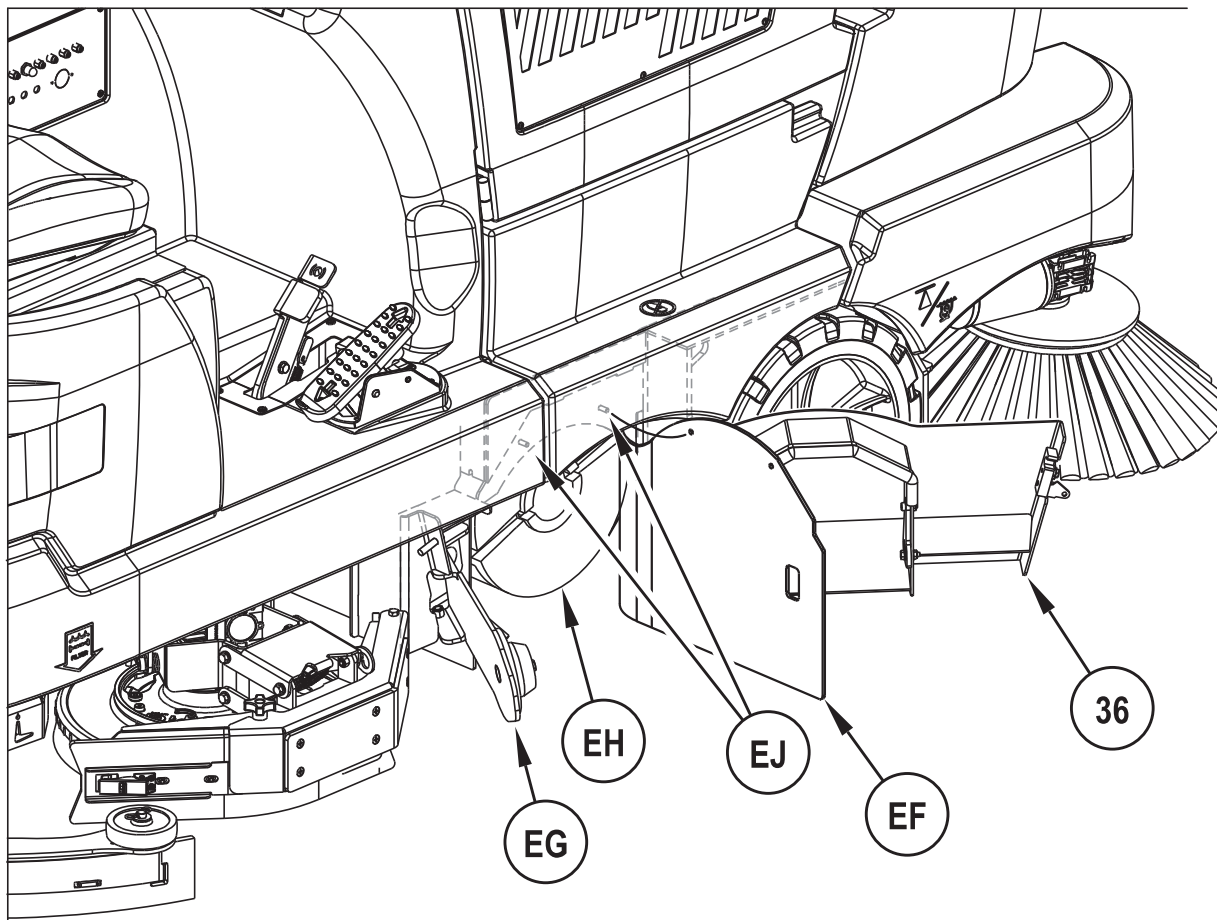
WARNING!

The engine must not be running when performing this procedure.

To Rotate or Replace the Main Broom:

1. Turn the Ignition Key Switch (A) OFF.
2. Open the Main Broom Access Door (36).
3. See Figure 17. Move aside the right side skirt (EF).
4. Pivot the Idler Arm Assembly (EG) out of the main broom core. **NOTE:** The Idler Arm is held in place by the Main Broom Access Door (36).
5. Pull the Main Broom (EH) out of the broom housing and remove any string or wire wrapped around it. Also inspect the skirts at the front, back and sides of the broom housing. The skirts should be replaced or adjusted if they are torn or worn to a height of more than 1/4 inch (6.35 mm) off the ground.
6. Turn the broom around (end-for-end) and slide it back into the broom housing. Make sure that the lugs on the broom core (left side) engage the slots in the broom drive hub and that the broom is fully seated.
7. Swing the idler arm assembly back into the broom core. **NOTE:** Make sure the lugs on the idler arm engage the slots in the broom core.
8. Move the right side skirt (EF) back into position being sure to press the skirt over the two Pins (EJ).
9. Close and latch the Main Broom Access Door (36).
10. If you are replacing a used broom with a new broom go to the *Main Broom Maintenance* section to readjust the broom height.

FIGURE 17

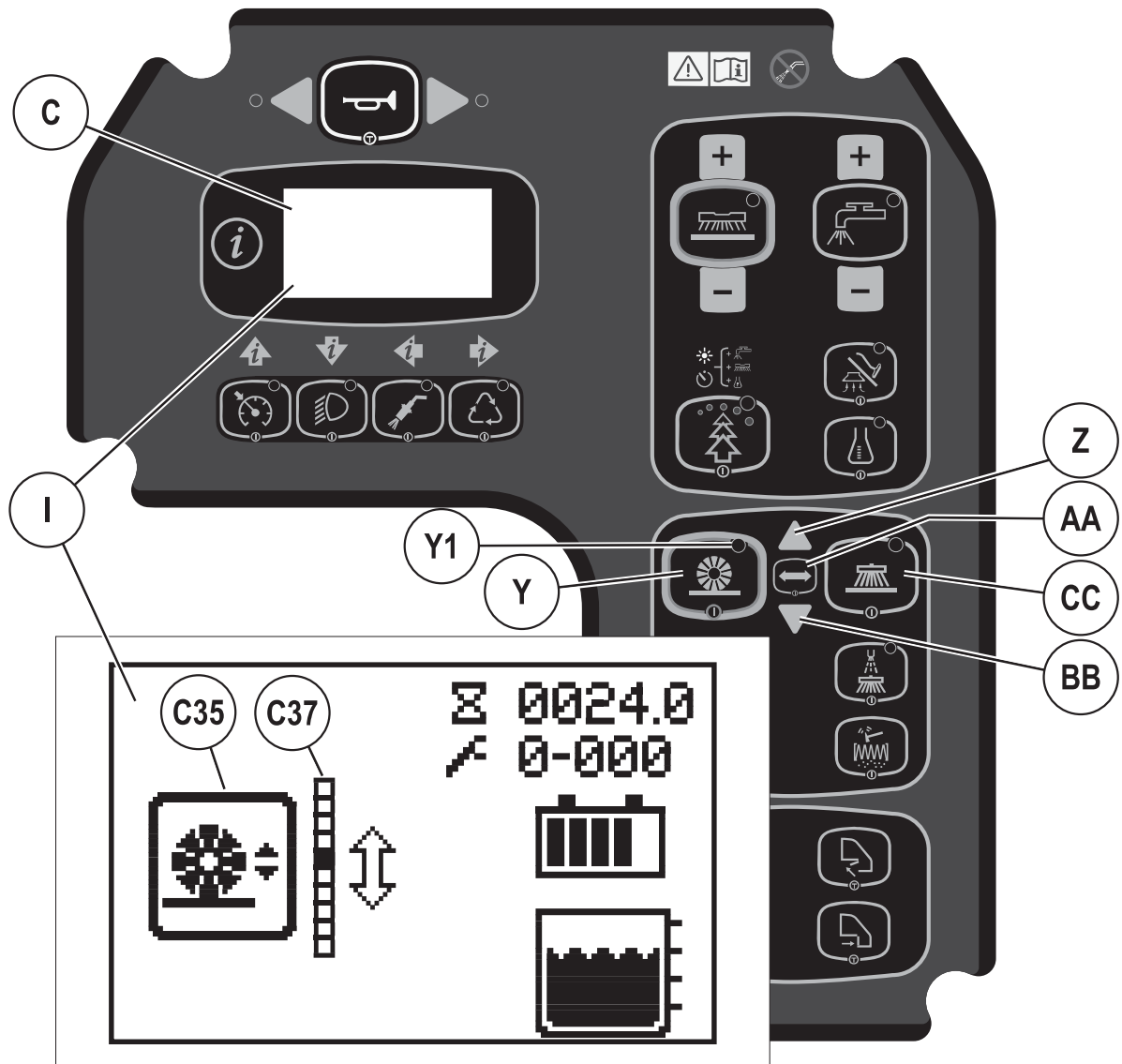


MAIN BROOM MAINTENANCE (CONTINUED)

To Adjust the Main Broom Height:

1. Drive the machine to an area with a level floor and set the parking brake.
2. **See Figure 18A.** Press the One-Touch™ Sweep Switch (Y) to lower the main broom. **DO NOT** move the machine.
3. Lightly press the Drive Pedal (37) to start the main broom and let it run in place for 1 minute. This allows the broom to polish a "strip" on the floor. After 1 minute, raise the broom, release the parking brake and move the machine so that the polished strip is visible.
4. Inspect the polished strip on the floor. If the strip is less than 2 inches (5.08 cm) or more than 3 inches (7.62cm) wide, the broom needs to be adjusted.
5. To adjust, press the Broom Select Switch (AA) twice, or until the Main Broom Indicator Light (Y1) is flashing. The LCD Display (C) will show the broom position bar graph (C37) and main broom symbol (C35). Press and hold or repeatedly press the Broom Height Raise Switch (Z) to raise the main broom or Broom Height Lower Switch (BB) to lower the main broom (the position indicator will move up and down to represent the broom position). After 10 seconds without adjustment the main broom will be set at this position and exit the adjustment menu. Start with the position indicator at the top of the bar graph for a new broom. Adjust the position indicator down as the broom wears. Replace the broom when the position indicator reaches the bottom of the bar graph.
6. Repeat steps 1-5 until the polished strip is 2-3 inches (5.08-7.62cm) wide.
The width of the polished strip should be the same at both ends of the broom. If the strip is tapered, move the machine to a different area and repeat steps 1-5. If the polished strip is still tapered, contact your Nilfisk Dealer for service.

FIGURE 18A



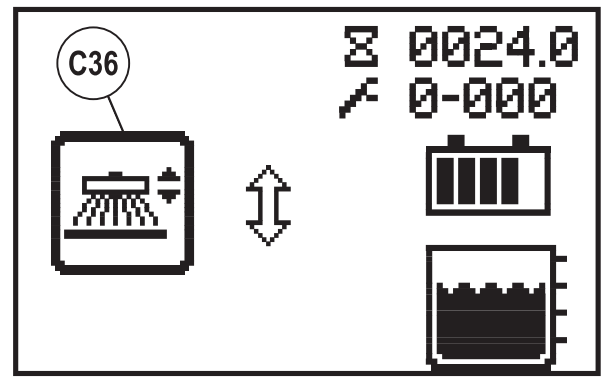
SIDE BROOM MAINTENANCE

The side brooms move dirt and debris away from walls or curbs and into the path of the main broom. Adjust the side brooms so that the bristles are contacting the floor from the (FG) to (FH) area shown in **Figure 19** when the broom is down and running.

To adjust the Side Broom:

1. Press the One-Touch™ Sweep Switch (Y) to lower the side brooms. DO NOT move the machine.
2. **See Figures 18A and 18B.** To adjust, press the Broom Select Switch (AA) once. The LCD Display (C) will show the side broom symbol C36. Press and hold the Broom Height Raise Switch (Z) to raise the side brooms or Broom Height Lower Switch (BB) to lower the side brooms. After 10 seconds without adjustment the side brooms will be set at this position and exit the adjustment menu.

FIGURE 18B



NOTE: The machine should be stored with the Side Broom(s) in the raised position. The Side Broom(s) should be replaced when the bristles are worn to a length of 3 inches (7.62 cm) or they become ineffective.

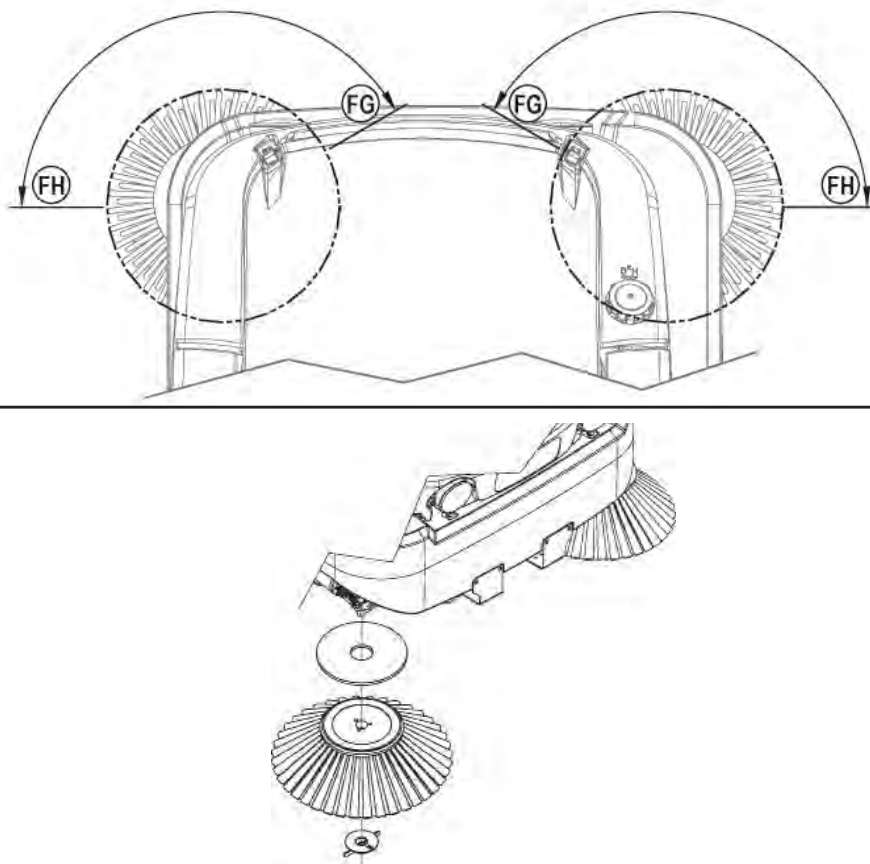
To replace the Side Broom:

1. Raise the Side Broom(s).
2. **See Figure 19.** Reach under the Side Broom and remove the large Thumb-Nut Weldment holding the side broom on and remove the broom and plastic disc. **NOTE:** The right side Thumb-Nut has right handed threads and the left side thumb-nut has left handed threads.
3. Install the new broom and plastic disc by aligning the three alignment pins and pushing on. Re-install the Thumb-Nut and tighten.

DUSTGUARD NOZZLE CLEANING PROCEDURE

To prevent nozzle plugging remove nozzle(s) after each daily use and soak overnight in clean white vinegar or appropriate calcium/lime remover. To avoid machine downtime best practice is to purchase spare nozzle(s) and replaced those that have just been used with those that have been cleaned. When nozzles can no longer be cleaned effectively replace as necessary.

FIGURE 19



SQUEEGEE MAINTENANCE

If the squeegee leaves narrow streaks or water, the blades may be dirty or damaged. Remove the squeegee, rinse it under warm water and inspect the blades. Reverse or replace the blades if they are cut, torn, wavy or worn.

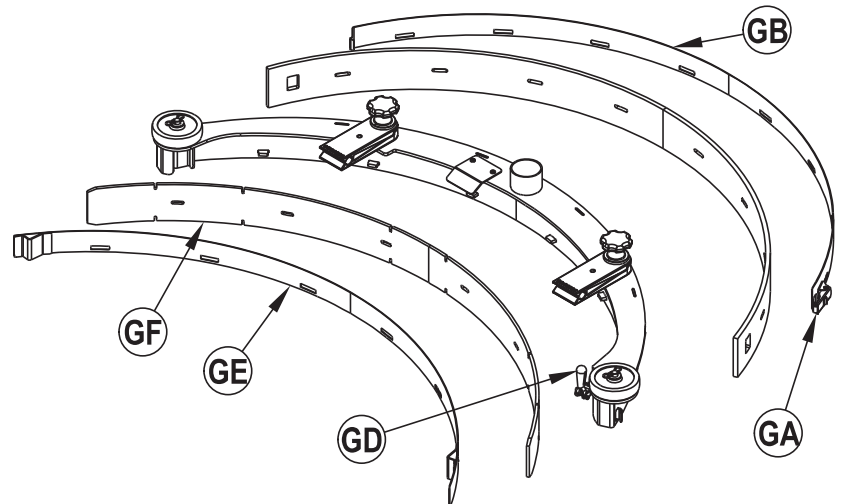
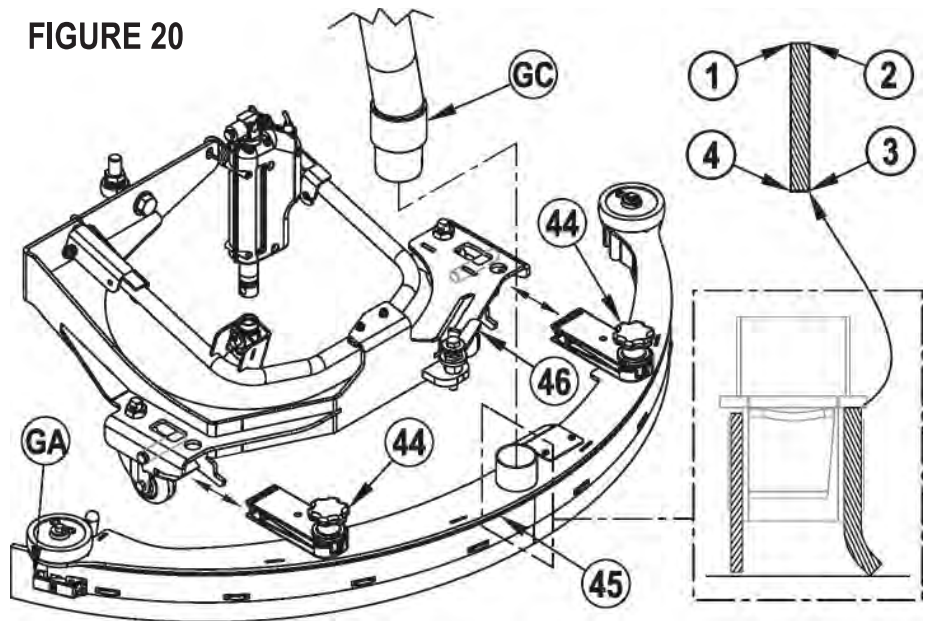
To Reverse or Replace the Rear Squeegee Wiping Blade:

1. See Figure 20. Raise the squeegee off the floor, then unsnap the Latch (GA) on the squeegee tool.
2. Remove the Tension Strap (GB).
3. Slip the rear blade off the alignment pins.
4. The squeegee blade has 4 working edges as shown. Turn the blade so a clean, undamaged edge faces toward the front of the machine. Replace the blade if all 4 edges are nicked, torn or worn to a large radius.
5. Install the blade, following the steps in reverse order and adjust the squeegee tilt.

To Reverse or Replace the Front Squeegee Blade:

1. See Figure 20. Raise the squeegee off the floor. Disconnect the vacuum Hose (GC) from the squeegee tool.
2. Loosen the (2) Squeegee Removal Knobs (44) on the squeegee clips and remove the Squeegee Assembly (45) from the mount.
3. Release the Push/Pull Clamp (GD) and remove the Weldment Strap (GE) and the front squeegee blade (GF).
4. The squeegee blade has 4 working edges as shown. Turn the blade so a clean, undamaged edge faces toward the front of the machine. Replace the blade if all 4 edges are nicked, torn or worn to a large radius.
5. Install the blade, following the steps in reverse order and adjust the squeegee tilt.

FIGURE 20

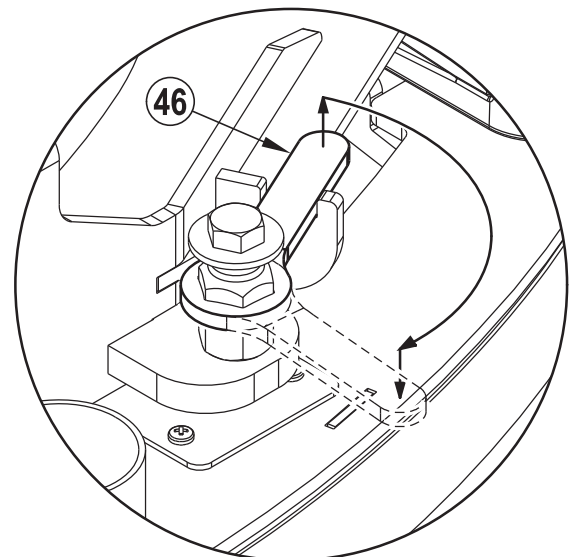


SQUEEGEE ADJUSTMENT

Adjust the squeegee angle whenever a blade is reversed or replaced, or if the squeegee is not wiping the floor dry.

To Adjust the Squeegee Angle:

1. Park the machine on a flat, even surface.
2. Lower the squeegee, move the machine ahead slightly.
3. Lift the Squeegee Tilt Adjustment Handle (46) out of its yoke. Rotate the handle and allow it to drop back down onto the hex. Use the handle to rotate the hex (raise or lower) so that the rear squeegee blade touches the floor evenly across its entire width and is bent over slightly as shown in the squeegee cross section. When the adjustment is completed, return the handle to its yoke.



HOPPER DUST CONTROL FILTER

The hopper dust control filter must be cleaned regularly to maintain the efficiency of the vacuum system. Follow the recommended filter service intervals for the longest filter life.

⚠ CAUTION!

Use only the approved Nilfisk high capacity dust control filter in this machine. Use of standard pleated filters will result in insufficient air flow, inadequate clean shaking, and potential machine damage.

Wear safety glasses when cleaning the filter.

Do not puncture the paper filter.

Clean the filter in a well-ventilated area.

To remove the hopper dust control filter:

1. See Figure 21. Unlatch the Hopper Cover Latches (16) and lift the Hopper Cover.
2. Loosen the two Thumb Nuts (HA), then slide the Filter Shaker Motor Assembly (HB) to the left and lift it out of the hopper.
3. Hang the shaker assembly on the hopper cover Hinge Hook (HC).
4. Inspect the top of the Hopper Dust Control Filter (17) for damage. A large amount of dust on top of the filter is usually caused by a hole in the filter or a damaged filter gasket.
5. Lift the Hopper Dust Control Filter (17) out of the machine.
6. **Clean the filter using one of the methods below:**

Method "A"

Vacuum loose dust from the filter. Then **gently** tap the filter against a flat surface (with the dirty side down) to remove loose dust and dirt. **NOTE:** Take care not to damage the gasket.

Method "B"

Vacuum loose dust from the filter. Then blow compressed air (maximum pressure 100 psi) into the clean side of the filter (in the opposite direction of the airflow).

Method "C"

Vacuum loose dust from the filter. Rinse the filter under a gentle stream of water (maximum pressure 40 psi). Let the filter dry **completely** before putting it back into the machine. It is recommended to have a spare filter on hand to use while the washed filter is drying out.

7. Keep Ledge (HD) clean of any dust or debris, this is where the filter gasket contacts the hopper.
8. Follow the instructions in reverse order to install the filter. If the gasket on the filter is torn or missing, it must be replaced. **NOTE:** Be sure to reinstall so that the air flow decal is pointing up as shown.

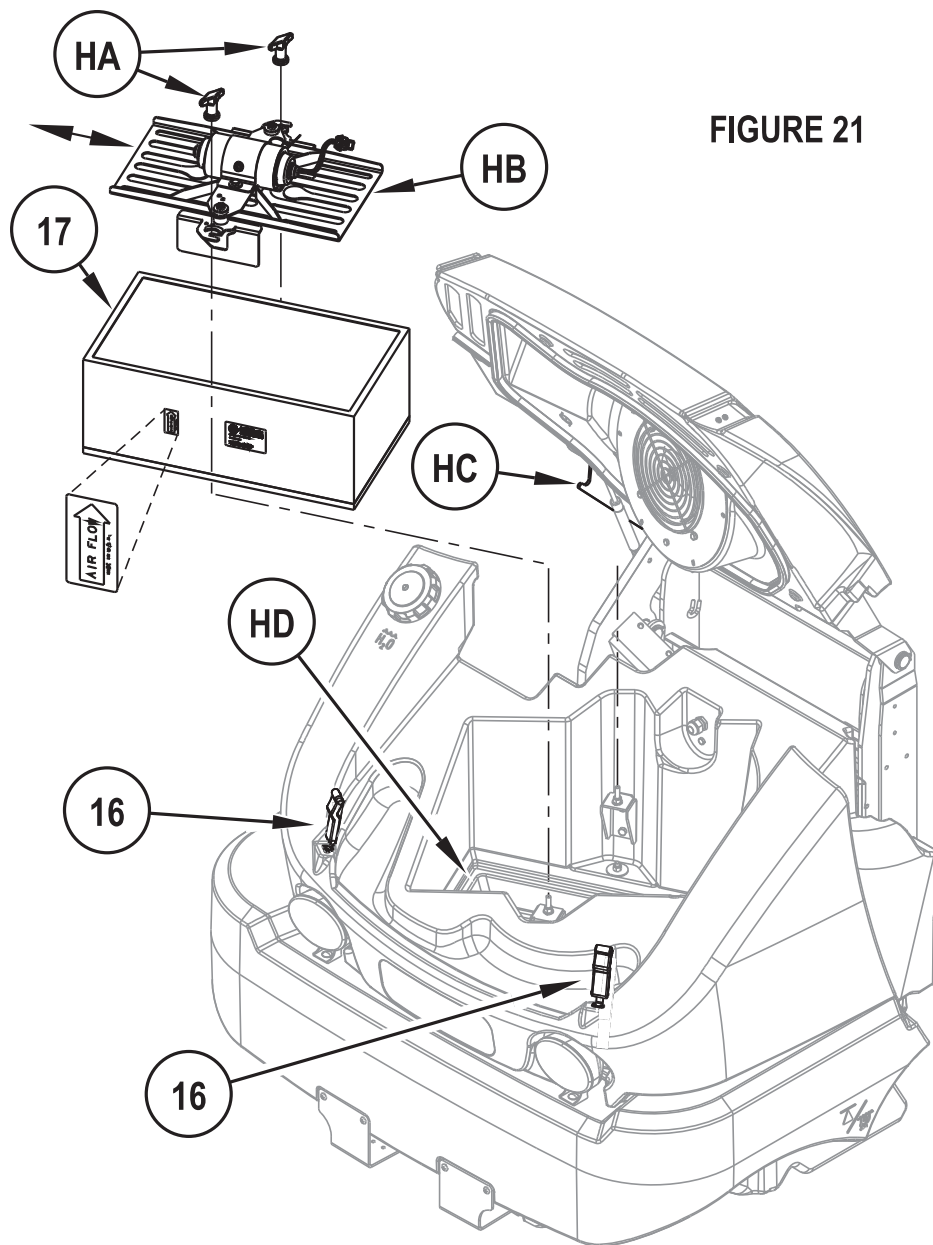


FIGURE 21

SIDE SKIRT MAINTENANCE

CAUTION!

Turn the key switch off (O) and remove the key, before changing the brushes, and before opening any access panels.

The side skirt's function is to channel the waste water to the squeegee, helping contain the water within the machines cleaning path. During normal use the blades will wear in time. **NOTE:** The blades on each skirt assembly are held on with Tool-less Retainers.

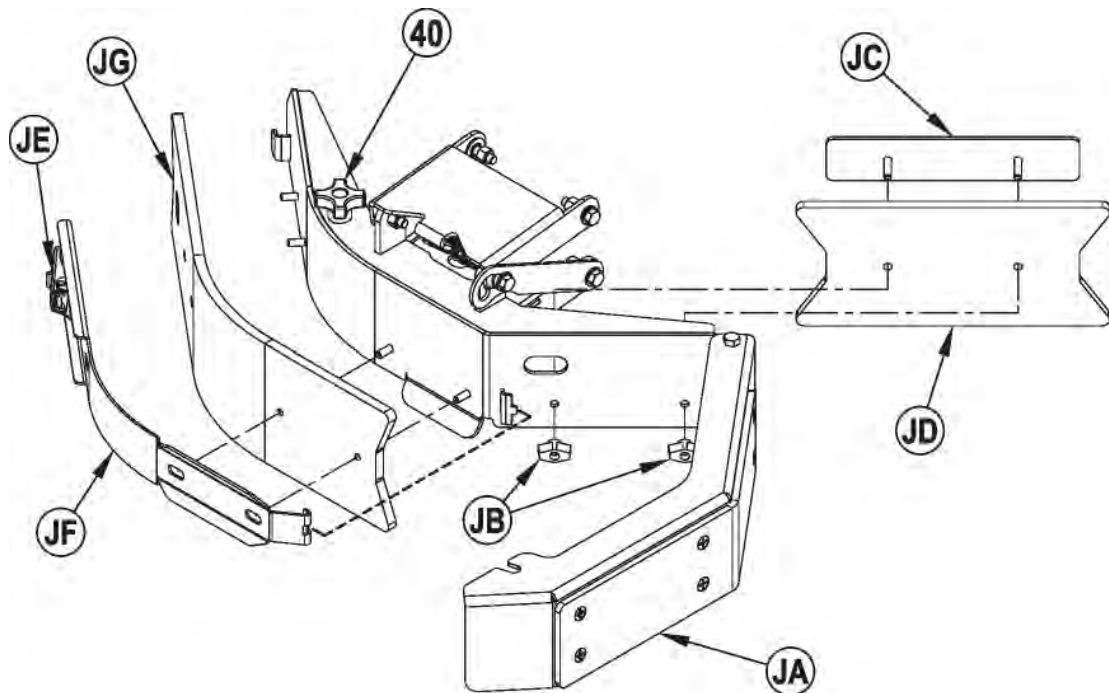
To reverse or replace the leading deck blade (JD):

1. **See Figure 22.** Loosen Retainer Knob (40) and swing the Edge Guard (JA) open as shown. **NOTE:** Edge Guard is only on the right side deck skirt.
2. Remove the two Wing Knobs (JB). Remove the Strap Weldment (JC) and the Leading Deck Blade (JD) from the inside of the skirt.
3. The leading deck blades have 4 working edges as shown. Turn the blades so a clean, undamaged edge faces toward the center of the machine. Replace the blades as a set if all working edges are nicked, torn or worn excessively.
4. Follow the steps in reverse to install the leading deck blade.

To reverse or replace the trailing deck blade (JG):

1. **See Figure 22.** Loosen Retainer Knob (40) and swing the Edge Guard (JA) open as shown. **NOTE:** Edge Guard is only on the right side deck skirt.
2. Unlatch the Latch Assembly (JE) at the rear of the skirt assembly. Swing out the Retainer Strap (JF) and unhook at the front of the skirt assembly. Remove the Trailing Deck Blade (JG) from the skirt assembly.
3. The trailing deck blades have 2 working edges. Flip the blade so a clean, undamaged edge faces toward the center of the machine. Replace the blades as a set if both working edges are nicked, torn or worn excessively.
4. Follow the steps in reverse to install the trailing deck blade.

FIGURE 22



TROUBLESHOOTING

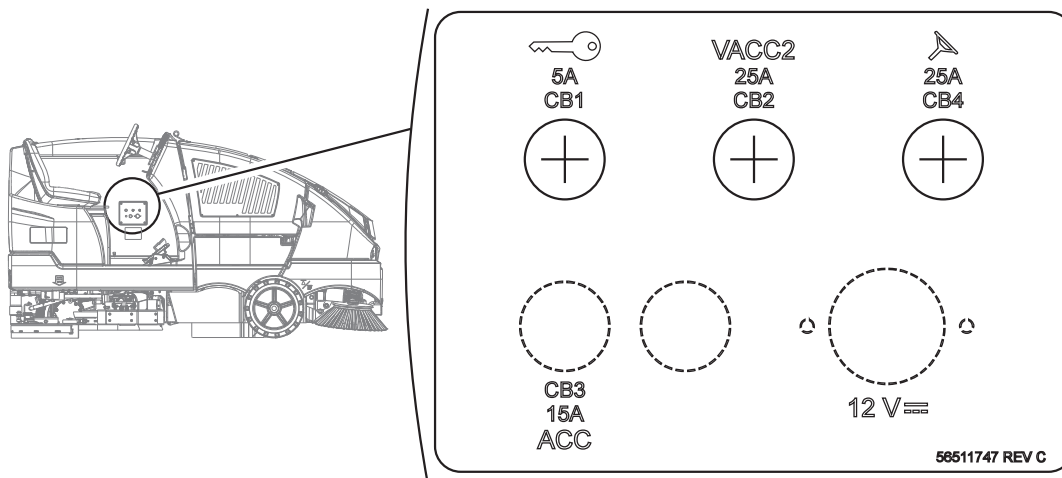
If the possible causes listed below are not the source of trouble, it is a symptom of something more serious. Contact your Nilfisk Service Center immediately for service.

TRIPPING THE CIRCUIT BREAKERS

The circuit breakers are located on the Circuit Breaker Panel in the operator's compartment. They protect electrical circuits and motors from damage due to overload conditions. If a circuit breaker trips, try to determine the cause.

Circuit Breaker (CB)	Rating	Possible Cause (if CB is tripped)
CB1 For Control Board	5 Amp	Overload current on the Control Board (A1)
		Shorted Control Board (A1)
		Shorted wires. See Service Manual for troubleshooting information.
CB2 For Loads	25 Amp	Overload current on the Control Board (A1)
		Shorted Control Board (A1)
		Shorted wires. See Service Manual for troubleshooting information.
		Overload current or short circuit on following loads: <ul style="list-style-type: none"> • Extended Scrub Pump (M21) • Dust Guard Pump (M22) • Dust Guard Solenoid (L) • Solution Pump (M23) • Horn (H2) • Backup Alarm (H1) • Solenoid Valve (L2) • Headlight (LT1 and LT2) • Beacon (LT1) or Low Pressure Pump (M24)
CB3 ACC	15 Amp	Overload on Accessory Power Outlet
		Shorted wires
CB4 For Steering Controller	25 Amp	Adjust broom
		Empty hopper
		Replace or rotate broom
		Replace skirts
		See service manual

NOTE: The 12 V Accessory Fuse is located behind the Circuit Breaker panel.



GENERAL MACHINE TROUBLESHOOTING

Before you start troubleshooting, check to make sure:


- the emergency stop switch **(B)** on the operator control panel is disengaged (rotate clockwise).
- the seat switch is closed.
- the battery stop plate **(AC)** is in place (battery models).
- reset any tripped circuit breakers.

Problem	Possible Cause	Remedy
Poor water pick-up	Worn or torn squeegee blades	Reverse or replace
	Squeegee out of adjustment	Adjust so blades touch floor evenly across entire width
	Recovery tank full	Empty recovery tank
	Recovery tank drain hose leak	Secure drain hose cap or replace
	Recovery tank cover gasket leak	Replace gasket / Seat cover properly
	Debris caught in squeegee	Clean squeegee tool
	Vacuum hose clogged	Remove debris
	Using too much solution	Reduce flow via control panel solution decrease switch
Poor scrubbing performance	Worn brush	Rotate or replace brushes
	Wrong brush type	Consult Nilfisk
	Wrong cleaning chemical	Consult Nilfisk
	Moving machine too fast	Slow down
	Not using enough solution	Increase flow via control panel solution increase switch
	Incorrect detergent ratio	Verify concentration setting if EcoFlex equipped.
Poor sweeping performance	Broom out of adjustment	Adjust broom
	Hopper full	Empty hopper
	Broom bristles worn or curved	Replace or rotate broom
	Broom housing skirts damaged or worn	Replace skirts
	Broom not turning	See service manual
Inadequate solution flow or no solution	Solution tank empty	Fill solution tank
	Solution lines, valve or filter clogged	Flush lines & valve / clean solution filter
	Solution turned OFF	Activate flow via control panel solution switch / verify shutoff valve is in open position
	Solution solenoid valve plugged or defective	Clean or replace valve (see service manual)

GENERAL MACHINE TROUBLESHOOTING (CONTINUED)

Problem	Possible Cause	Remedy
Machine does not run	Tripped 5 Amp (CB4) circuit breaker	Check for electrical short circuit & reset
	Emergency Stop activated	Rotate Emergency Stop knob clockwise to reset.
	Main system controller	Check error fault codes (see Service Manual)
No FWD/REV wheel drive	Parking brake set	Release parking brake
	Emergency Stop activated	Rotate Emergency Stop knob clockwise to reset.
	Tripped circuit breakers	Reset any tripped circuit breakers
Vacuum shuts off and display shows "FULL" when recovery tank is not full	Plugged squeegee hose	Clear debris
	Vacuuming large amounts of water at a high travel speed	Slow down or disable auto shut-off feature (see service manual)
No Detergent Flow (EcoFlex models only)	Empty detergent cartridge	Fill detergent cartridge
	Plugged or kinked detergent flow line	Purge system, straighten lines to remove any kinks
	Dry seal cap on detergent cartridge not sealed	Reseat dry seal cap
	Detergent pump wiring disconnected or backwards	Connect or reconnect wiring correctly
Main and/or Side Brooms will not run	Debris wrapped around the broom drive	Remove debris
	Hopper is not completely down	Lower hopper completely
	Tripped circuit breaker	Reset any tripped circuit breaker
Hopper will not raise	Tripped circuit breaker	Reset any tripped circuit breakers
	Hopper overloaded	Check the hopper
Hopper dump door will not open	Dump door jammed by debris	Remove debris and clean edges or dirt chamber
Scrub system will not run	Hopper is not completely down	Lower hopper completely

FAULT CODE DISPLAY

Any fault codes detected by the controllers will be displayed on the control panel display as they occur. If more than one error exists, the display will sequence through the error codes at one-second intervals. The error will display as a mechanical wrench symbol  followed by a four-digit code.

Fault codes are displayed as X-YYY, where:

X = system number

YYY = fault code number

See the Service Manual for additional information.

System = 1 A1 Main Controller Faults

Fault Code	Description
1-001	K1 Coil Open
1-002	K1 Coil Short
1-003	K1 Contact Weld
1-010	CAN Bus 0
1-011	CAN Bus 1
1-101	L2 Sol Valve Short
1-102	M22,L1 Dust Grd Short
1-103	H1 Backup Alarm Short
1-104	LT2-4 Headlights Short
1-105	H2 Horn Short
1-106	M19 Det Pump 1 Short
1-107	M20 Det Pump 2 Short
1-108	Y1 HP Pump Short
1-109	M23 Sol Pump Short
1-110	M21 Ext Scrub Pump Short
1-111	LT7,8 Taillights Short
1-112	LT6 RF Turn Short
1-113	LT5 LF Turn Short

Fault Code	Description
1-114	LT10 RR Turn Short
1-115	LT9 LR Turn Short
1-201	U13 Sol Level Sensor
1-300	Check Engine
1-301	Engine Overtemp
1-302	Oil Pressure
1-303	Eng No Run Signal
1-320	Eng Ignition Short
1-321	Eng Start Short
1-322	Eng Throttle 1 Short
1-323	Eng Throttle 2 Short
1-324	Eng Glow Plug Short
1-350	Alternator 12V
1-351	Alternator 42V
1-352	R1 Fuel Level Sensor
1-117	U13 Sol Level Sensor
1-560	EEPROM Configuration
1-561	EEPROM Options
1-562	EEPROM System Values
1-563	EEPROM Fault Log
1-564	EEPROM Usage Log

FAULT CODE DISPLAY (CONTINUED)**System = 2 A2 Power Module 1 Faults**

Fault Code	Description
2-001	A2 PM 1 Timeout
2-011	Precharge Fail
2-012	K2 Overload
2-014	K2 Contact Open
2-017	OverVolt Cutoff
2-018	UnderVolt Cutoff
2-021	M1 Main Broom Open
2-022	M2 Dust Fan Open
2-023	M3 Side Brooms Open
2-024	M4 Vac 1 Open
2-025	M5 Vac 2 Open
2-026	M6 MB Act Open
2-027	M7 Dump Door Open
2-028	M8 Shaker Open
2-031	M1 Main Broom Overload
2-032	M2 Dust Fan Overload
2-033	M3 Side Brooms Overload
2-034	M4 Vac 1 Overload
2-035	M5 Vac 2 Overload
2-036	M6 MB Act Overload
2-037	M7 Dump Door Overload
2-038	M8 Shaker Overload
2-041	M1 Main Broom Overcurrent
2-042	M2 Dust Fan Overcurrent
2-043	M3 Side Brooms Overcurrent
2-044	M4 Vac 1 Overcurrent
2-045	M5 Vac 2 Overcurrent
2-046	M6 MB Act Overcurrent
2-047	M7 Dump Door Overcurrent
2-048	M8 Shaker Overcurrent
2-051	M1 Main Broom Mosfet Short
2-052	M2 Dust Fan Mosfet Short
2-053	M3 Side Brooms Mosfet Short
2-054	M4 Vac 1 Mosfet Short
2-055	M5 Vac 2 Mosfet Short

Fault Code	Description
2-056	M6 MB Act Mosfet Short
2-057	M7 Dump Door Mosfet Short
2-058	M8 Shaker Mosfet Short
2-061	M1 Main Broom Current Sensor
2-062	M2 Dust Fan Current Sensor
2-063	M3 Side Brooms Current Sensor
2-064	M4 Vac 1 Current Sensor
2-065	M5 Vac 2 Current Sensor
2-066	OverTemp Cutoff
2-067	UnderTemp Cutoff
2-071	M1 Main Broom Overload Trip
2-072	M2 Dust Fan Overload Trip
2-073	M3 Side Brooms Overload Trip
2-074	M4 Vac 1 Overload Trip
2-075	M5 Vac 2 Overload Trip
2-076	M6 MB Act Stall
2-077	M7 Dump Door Stall
2-078	M8 Shaker Stall
2-081	EEPROM Fault
2-082	PDO Timeout
2-083	CAN Bus
2-084	Actuator Timeout
2-086	OverTemp Cutback
2-087	UnderTemp Cutback
2-088	K2 Coil Open
2-091	M1 Main Broom HW Fault
2-092	M2 Dust Fan HW Fault
2-093	M3 Side Brooms HW Fault
2-094	M4 Vac 1 HW Fault
2-095	M5 Vac 2 HW Fault
2-096	Parameter Change
2-097	M6 MB Act Current Sensor
2-098	M7 Dump Door Current Sensor
2-101	M8 Shaker Current Sensor
2-102	Thermal Sensor
2-103	K2 Coil Short

FAULT CODE DISPLAY (CONTINUED)**System = 3 A3 Power Module 2 Faults**

Fault Code	Description
3-001	A3 PM 2 Timeout
3-011	Precharge Fail
3-012	K2 Overload
3-013	K2 Contact Weld
3-014	K2 Contact Open
3-017	OverVolt Cutoff
3-018	UnderVolt Cutoff
3-021	M11 Hopper Open
3-022	M11 Hopper Open
3-023	M13 Ctr Brush Open
3-024	M14 Lt Brush Open
3-025	M15 Rt Brush Open
3-026	M16 Squeegee Open
3-027	M17 Deck Open
3-028	M18 SB Act Open
3-031	M11 Hopper Overload
3-032	M11 Hopper Overload
3-033	M13 Ctr Brush Overload
3-034	M14 Lt Brush Overload
3-035	M15 Rt Brush Overload
3-036	M16 Squeegee Overload
3-037	M17 Deck Overload
3-038	M18 SB Act Overload
3-041	M11 Hopper Overcurrent
3-042	M11 Hopper Overcurrent
3-043	M13 Ctr Brush Overcurrent
3-044	M14 Lt Brush Overcurrent
3-045	M15 Rt Brush Overcurrent
3-046	M16 Squeegee Overcurrent
3-047	M17 Deck Overcurrent
3-048	M18 SB Act Overcurrent
3-051	M11 Hopper Mosfet Short
3-052	M11 Hopper Mosfet Short
3-053	M13 Ctr Brush Mosfet Short
3-054	M14 Lt Brush Mosfet Short
3-055	M15 Rt Brush Mosfet Short

Fault Code	Description
3-056	M16 Squeegee Mosfet Short
3-057	M17 Deck Mosfet Short
3-058	M18 SB Act Mosfet Short
3-061	M11 Hopper Current Sensor
3-062	M11 Hopper Current Sensor
3-063	M13 Ctr Brush Current Sensor
3-064	M14 Lt Brush Current Sensor
3-065	M15 Rt Brush Current Sensor
3-066	OverTemp Cutoff
3-067	UnderTemp Cutoff
3-071	M11 Hopper Overload Trip
3-072	M11 Hopper Overload Trip
3-073	M13 Ctr Brush Overload Trip
3-074	M14 Lt Brush Overload Trip
3-075	M15 Rt Brush Overload Trip
3-076	M16 Squeegee Stall
3-077	M17 Deck Stall
3-078	M18 SB Act Stall
3-081	EEPROM Fault
3-082	PDO Timeout
3-083	CAN Bus
3-084	Actuator Timeout
3-086	OverTemp Cutback
3-087	UnderTemp Cutback
3-088	K2 Coil Open
3-091	M11 Hopper HW Fault
3-092	M11 Hopper HW Fault
3-093	M13 Ctr Brush HW Fault
3-094	M14 Lt Brush HW Fault
3-095	M15 Rt Brush HW Fault
3-096	Parameter Change
3-097	M16 Squeegee Current Sensor
3-098	M17 Deck Current Sensor
3-101	M18 SB Act Current Sensor
3-102	Thermal Sensor
3-103	K2 Coil Short

FAULT CODE DISPLAY (CONTINUED)**System = 4 A4 Drive Controller Faults**

Fault Code	Description
4-001	A4 Drive Ctrl Timeout
4-100	Motor Short
4-101	DC Bus Low
4-102	DC Bus High
4-103	HW Overvolt
4-104	Precharge Fail
4-105	Motor OverTemp
4-106	Ctrl OverTemp
4-108	CAN Fault
4-109	Current Sensor
4-111	High-Side Fault
4-112	K4 Contactor
4-113	Motor OverCurrent
4-114	Sensor Supply Current
4-115	Encoder Fault
4-116	Encoder Open
4-117	Internal Supply
4-118	Pwr Stg Watchdog
4-119	K4 Contact Weld
4-121	Throttle Not Zero
4-122	Motor Speed High
4-125	Motor Slip Speed
4-126	Motor AC Current
4-127	Motor Frequency
4-128	CPU Fault
4-129	CPU EEPROM
4-130	Ctrl Temp Sensor
4-131	Motor Temp Sensor
4-214	K4 Contact Open
4-224	Throttle Signal
4-227	Drive Enable Open

System = 5 A5 Steering Controller Faults

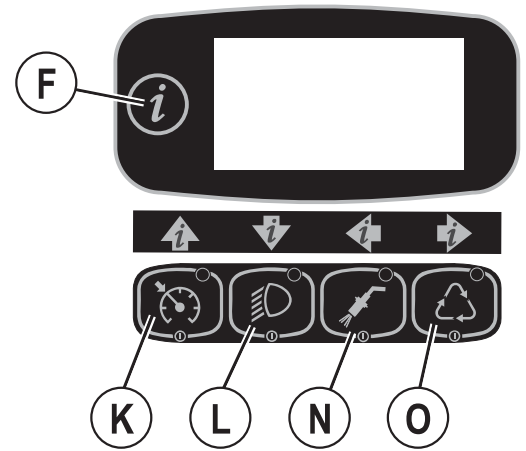
Fault Code	Description
5-100	Motor Short
5-101	DC Bus Low
5-102	DC Bus High
5-103	HW Overvolt
5-104	Precharge Fail
5-105	Motor OverTemp
5-106	Ctrl OverTemp
5-107	TFD Fault
5-108	CAN Fault
5-109	Current Sensor
5-110	Application Fault
5-111	High-Side Fault
5-112	K5 Contactor
5-113	Motor OverCurrent
5-114	Sensor Supply Current
5-115	Encoder Fault
5-117	Internal Supply
5-118	Enable Drive Output
5-119	K5 Contact Weld
5-120	Locked Rotor
5-121	Power Stage Off
5-123	Dynamic Ref Ratio
5-124	Control Fault
5-125	Speed Cross Fault
5-126	Motor Limits
5-127	Internal Comm
5-128	CPU Fault
5-129	CPU EEPROM
5-130	Ctrl Temp Sensor
5-131	Motor Temp Sensor

FAULT CODE HISTORY

Every fault code that occurs is recorded by the machine and kept in a history log. To view the fault history follow the steps listed in the Table below. Navigate through the menu using the four Navigation keys (K, L, N and O) as shown in **Figure 23A**. Press the Information switch (F) to exit the menu.

Step #	Description (See Figures 23A – 23D for steps listed below)
1	Press the Information Switch (F).
2	Scroll down to "Faults" using the Down Arrow Key (L).
3	Select "Faults" using the Right Arrow Key (O).
4	Scroll down to "Fault History" .
5	Select "Fault History" to display Fault History.
6	Use the up and down arrow keys to scroll through the list of faults.
7	Select a Fault Code to view the Fault Code description.
8	When finished, press the Information Switch (F).to exit the menu.

FIGURE 23A



NOTE (1): In Figure 23D, the number to the far right of the Fault Code (0029.1) represents the most recent Time Stamp in Drive Hours.

NOTE (2): In Figure 23D, the number in () is the number of times the Fault Code has occurred. For example, "(1x)" means that the Fault Code has appeared only once and "(2x)" means that the Fault Code has occurred twice.

FIGURE 23B

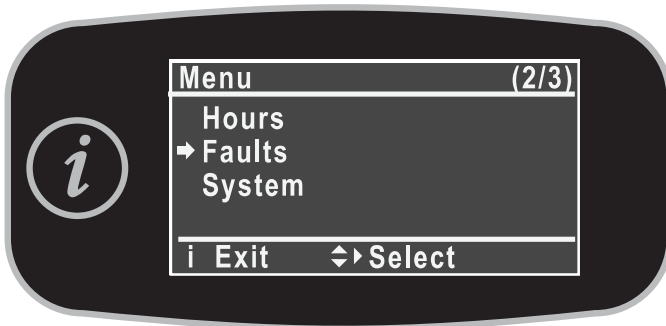
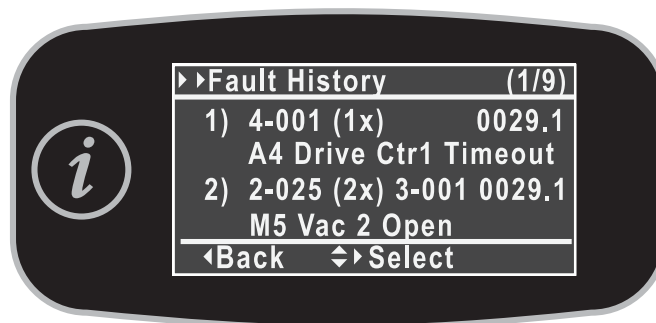


FIGURE 23C



FIGURE 23D



ACCESSORIES / OPTIONS

In addition to the standard components, the machine can be equipped with the following accessories/options, according to the machine specific use:

Extended Scrub Kit
Deluxe Seat Kit
Overhead Guard Kit - Low
Overhead Guard Kit - Standard
Seat Belt Kit – Standard Seat
Brake Light w/Turn Signal Kit
Rear Corner Roller Kit
Front Corner Roller Kit
Super Duty Kit
Fire Extinguisher Kit
Back-Up Alarm Kit
Floor Mat Kit
ECOFlex Kit
High Pressure Pump Kit - Diesel
High Pressure Pump Kit - LPG
Plugged Filter Switch Kit
Hopper Temperature Sensor Kit
OHG Beacon Kit
Overhead Guard Canopy Kit
Warning Beacon Kit

Solution Fill Shut-Off Kit
Vac Wand Kit
Wash Hose Kit
Hot Water Option LPG
Hot Water Option Diesel
Arm Rest Kit R/H Only
Squeegee Guard Kit
Front Bumper Kit
Drain Hose Extension
Recovery Tank Clean Out Kit
Accessory Socket Kit
Dust Guard Kit
Strobe Kit
Bumper Kit
Tank-LPG
Light Kit

For further information about the above-mentioned accessories, contact an authorized Nilfisk Dealer.

TECHNICAL SPECIFICATIONS

Description	Models			
	LPG	Petrol	Diesel	Battery
Model No.	56511821	56511818	56511815	56511816
Configuration	<ul style="list-style-type: none"> Independent front sweeping w/dust control and rear scrubbing functions Electronically controlled electric drives for all sweeping and scrubbing functions Electronically driven hydraulic power unit for hopper raise / lower functions 			
Sweeping Systems				
	LPG	Petrol	Diesel	Battery
• Sweeping Path w/Dual Side Brooms	Squeegee path width is fully swept			
• Main Broom	36 in (90 cm) x 12.2 in (31 cm)			
• Sweeping Coverage Rate Per Hour	146,400 ft ² (13,600 m ²)			
• Dust Control System	115 ft ² (10.7 m ²) Donaldson high-capacity PowerCore [®] UltraWeb [®] filter w/synthetic media.			
• Hopper Dumper Height (Max.)	60 in (152 cm)			
• Hopper Capacity	7 ft ³ (198 L) 300 lb (136 kg)			
• Dust Guard™ Tank Capacity	29 gal (110 L)			
Scrubbing and Recovery Systems				
	LPG	Petrol	Diesel	Battery
Scrubbing Path and Brushes	48 in(122 cm) – 3 x 17 in (43 cm) disc			
Scrubbing Coverage Rate Per Hour	118,600 ft ² (11,000 m ²)			
Scrub Pressure	Three scrub pressure settings up to 400 lb (182 kg) of down force at maximum setting			
Recover/Solution Tank Capacity	75 gal (285 L) each			
Recovery Vacuum	Dual vac fan motors capable of 65 in (165 cm) waterlift			
Power and Propulsion Systems				
	LPG	Petrol	Diesel	Battery
Power System	Kubota WG972: 3 cy., 0.96 L. 30 hp (22.0 kw)		Kubota D1305 ³ : 3 cy., 1.26 L 29 hp (21.7 kw)	Battery: 36 V / 770 Ah
Propulsion System	Variable speed brushless A/C Drive			
Propel Speed (Variable)	5.5 mph (8.9 km/h)			
Operational Run Time Sweeping/Scrubbing	5.5 hrs w/32.5 lb (14.5 kg) tank	5.9 hrs w/ 9.2 gal (35 L) tank	15 hrs w/ 9.2 gal (35 L) tank	5.4 hrs w/770Ah battery
Gradeability	Transport @ Gross Weight	21% (12 deg.)		
	Scrubbing/Sweeping	17.6% (10 deg.)		

TECHNICAL SPECIFICATIONS (CONTINUED)

Dimensions/Weight/Sound Environmental				
	LPG	Petrol	Diesel	Battery
Length	97 in (246 cm)			
Width	48 in (122 cm)			
Height	[59 in (150 cm)] [82 in (208 cm) std. overhead guard] [79 in (201 cm) low clearance overhead guard]			
Minimum Aisle Turn	104 in (264 cm)			
Weight::	GVW	4,350 lb (1,977 kg)	4,239 lb (1,927 kg)	5,400 lb (2,455 kg)
	Empty	3,400 lb (1,545 kg)	3,313 lb (1,506 kg)	4,366 lb (1,985 kg)
Sound Level (IEC60335-2-72)	82 dB A		72 dB A	81 dB A
Water Ingression	All electric drive motors and actuators rated IP55 for water washdown			
As Installed and Tested on the Unit				
	LPG	Petrol	Diesel	Battery
Voltage, Battery	N/A			36V
Battery Capacity				770 AH
Protection Grade	IPX4			
Sound Pressure Level (ISO 11201)	82dB LpA, 3dB $u(L_w)$		81dB LpA, 3dB $u(L_w)$	72dB LpA, 3dB $u(L_w)$
Sound Power Level (ISO 3744)	103dB L_{WA}		102dB L_{WA}	N/A
Gross Vehicle Weight	4676 lbs. (2121 kg)		4537 lbs. (2058 kg)	5716 lbs. (2593 kg)
Transportation Weight	3636 lbs. (1649 kg)		3511 lbs. (1593 kg)	4682 lbs. (2124 kg)
Vibrations at the Hand Controls (ISO 5349-1)	0.33 m/s ²		0.35 m/s ²	0.36 m/s ²
Vibrations at the Hand Controls (ISO 5349-1) Uncertainty	0.03 m/s ²		0.03 m/s ²	0.04 m/s ²
Vibrations at the Seat (EN 1032)	0.03 m/s ²		0.03 m/s ²	0.02 m/s ²
Solution Tank Capacity	75 gal (284 L)		75 gal (284 L)	75 gal (284 L)
Recovery Tank Capacity	75 gal (284 L)		75 gal (284 L)	75 gal (284 L)
DustGuard Tank Capacity	29 gal (110 L)		29 gal (110 L)	29 gal (110 L)
Maximum Wheel Floor Loading (right front)	104.5 psi / 0.720 N/mm ²		102.8 psi / 0.709 N/mm ²	126.6 psi / 0.873 N/mm ²
Maximum Wheel Floor Loading (left front)	104.5 psi / 0.721 N/mm ²		107.9 psi / 0.743 N/mm ²	125.1 psi / 0.863 N/mm ²
Maximum Wheel Floor Loading (rear center)	146 psi / 1.007 N/mm ²		136.5 psi / 0.941 N/mm ²	147.9 psi / 1.019 N/mm ²

MATERIAL COMPOSITION AND RECYCLABILITY

Type	% of machine weight Petrol / LPG	% of machine weight Diesel	% of machine weight Battery	% recyclable
Aluminum	0.5%	0.5%	0.3%	88%
Electrical / motors / engines - misc	27%	29.3%	50.1%	95%
Ferrous metals	53.8%	51%	35.2%	95%
Harnesses / cables	1.1%	1.2%	0.9%	74%
Liquids	0.7%	0.7%	0.9%	95%
Plastic - non-recyclable	1.5%	1.8%	1.1%	0%
Plastic - recyclable	0.9%	0.7%	0.4%	91%
Polyethylene	12%	12.3%	9.2%	100%
Rubber	2.5%	2.5%	1.9%	60%