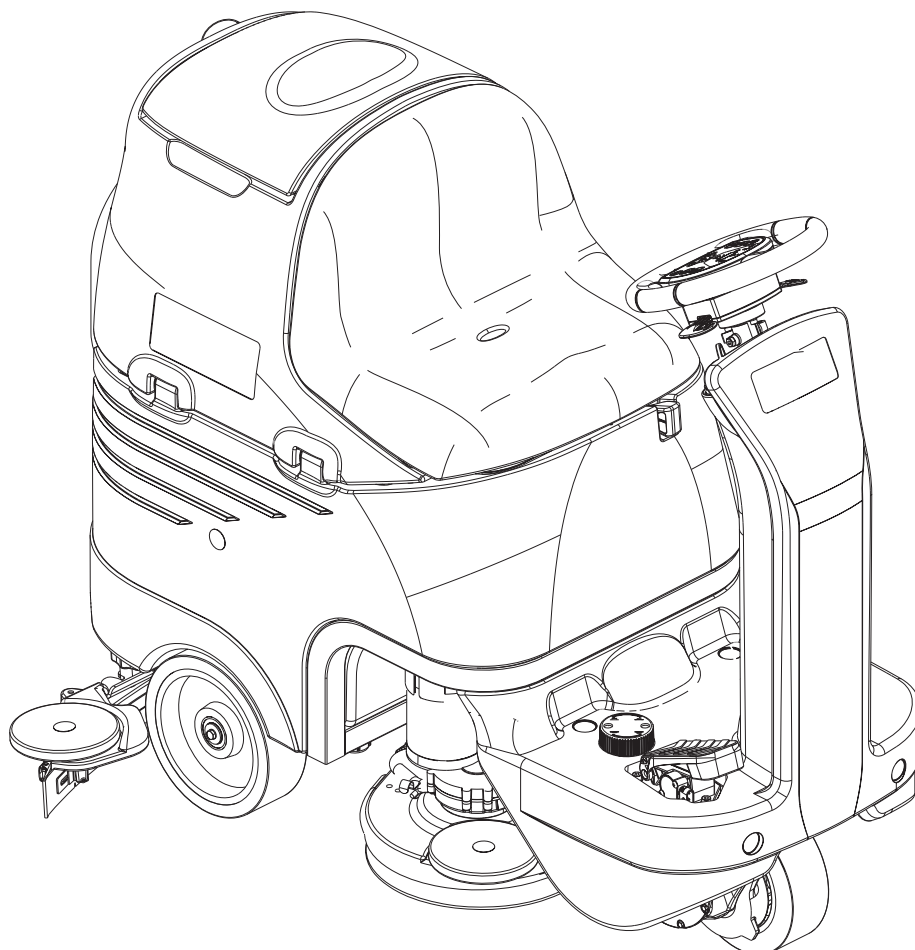


# SC3000 26" Disc

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## SERVICE MANUAL

Advance models: 9087267020 - 26" Disc - EcoFlex™ + Charger

ENGLISH



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## GENERAL INFORMATION

## GENERAL INFORMATION

## CONVENTIONS

Forward, backward, front, rear, left or right are intended with reference to the operator's position, that is to say in driving position.

## MACHINE LIFTING

**WARNING!**

*Do not work under the lifted machine without supporting it with safety stands.*

## MACHINE TRANSPORTATION

**WARNING!**

*Before transporting the machine, make sure that:*

- *All covers are closed.*
- *The ignition key is removed.*
- *The machine is securely fastened to the means of transport.*

## OTHER REFERENCE MANUALS

The following manuals are available at Nilfisk Literature Service Department:

- SC3000 Operator manual - Form Number 9098828000
- SC3000 Spare Parts List - Form Number 9098828000
- 24V 670W Motor Installation Instructions - Form Number 9098456000

## SAFETY

The following symbols indicate potentially dangerous situations. Always read this information carefully and take all necessary precautions to safeguard people and property.

## SYMBOLS

**DANGER!**

*It indicates a dangerous situation with risk of death for the operator.*

**WARNING!**

*It indicates a potential risk of injury for people or damage to objects.*

**CAUTION!**

*It indicates a caution related to important or useful functions.*

*Pay careful attention to the paragraphs marked by this symbol.*

**NOTE**

*It indicates a remark related to important or useful functions.*

**CONSULTATION**

*It indicates the necessity to refer to the Operator manual before performing any procedure.*

## GENERAL INFORMATION

### GENERAL INSTRUCTIONS

Specific warnings and cautions to inform about potential damages to people and machine are shown below.



#### **DANGER!**

- *Before performing any maintenance, repair, cleaning or replacement procedure disconnect the battery connector and remove the ignition key.*
- *This machine must be used by properly trained operators only.*
- *Keep the battery away from sparks, flames and incandescent material. During the normal operation explosive gases are released.*
- *Do not wear jewelry when working near electrical components.*
- *Do not work under the lifted machine without supporting it with safety stands.*
- *Do not operate the machine near toxic, dangerous, flammable and/or explosive powders, liquids or vapours: This machine is not suitable for collecting dangerous powders.*
- *Battery charging produces highly explosive hydrogen gas. Keep the tank assembly open during battery charging and perform this procedure in well-ventilated areas and away from naked flames.*



#### **WARNING!**

- *Carefully read all the instructions before performing any maintenance/repair procedure.*
- *Before using the battery charger, ensure that frequency and voltage values, indicated on the machine serial number plate, match the electrical mains voltage.*
- *Do not pull or carry the machine by the battery charger cable and never use the battery charger cable as a handle. Do not close a door on the battery charger cable, or pull the battery charger cable around sharp edges or corners. Do not run the machine on the battery charger cable.*
- *Keep the battery charger cable away from heated surfaces.*
- *Do not use the machine if the battery charger cable or plug is damaged. If the machine is not working as it should, has been damaged, left outdoors or dropped into water, return it to the Service Center.*
- *To reduce the risk of fire, electric shock, or injury, do not leave the machine unattended when it is plugged in. Before performing any maintenance procedure, disconnect the battery charger cable from the electrical mains.*
- *Do not smoke while charging the batteries.*
- *To avoid any unauthorised use of the machine, remove the ignition key.*
- *Do not leave the machine unattended without being sure that it cannot move independently.*
- *Always protect the machine against the sun, rain and bad weather, both under operation and inactivity condition. Store the machine indoors, in a dry place: This machine must be used in dry conditions, it must not be used or kept outdoors in wet conditions.*
- *Before using the machine, close all doors and/or covers as shown in this Manual.*
- *Do not allow to be used as a toy. Close attention is necessary when used near children.*
- *Use only as shown in this Manual. Use only Nilfisk's recommended accessories.*
- *Take all necessary precautions to prevent hair, jewelry and loose clothes from being caught by the machine moving parts.*

## GENERAL INFORMATION

**WARNING!**

- Do not use the machine on incline.
- Do not tilt the machine more than the angle indicated on the machine itself, in order to prevent instability.
- Do not use the machine in particularly dusty areas.
- Use the machine only where a proper lighting is provided.
- If the machine is to be used where there are other people besides the operator, it is necessary to install the pivoting light and the reverse gear buzzer (optional).
- While using this machine, take care not to cause damage to people or objects.
- Do not bump into shelves or scaffoldings, especially where there is a risk of falling objects.
- Do not put any can containing fluids on the machine.
- The machine working temperature must be between 32 °F and 104 °F (0 °C and +40 °C).
- The machine storage temperature must be between 32 °F and 104 °F (0 °C and +40 °C).
- The humidity must be between 30% and 95%.
- When using floor cleaning detergents, follow the instructions on the labels of the detergent bottles.
- To handle floor cleaning detergents, wear suitable gloves and protections.
- Do not use the machine as a means of transport.
- Do not allow the brushes to operate while the machine is stationary to avoid damaging the floor.
- In case of fire, use a powder fire extinguisher, not a water one.
- Do not tamper with the machine safety guards and follow the ordinary maintenance instructions scrupulously.
- Do not allow any object to enter into the openings. Do not use the machine if the openings are clogged. Always keep the openings free from dust, hairs and any other foreign material which could reduce the air flow.
- Do not remove or modify the plates affixed to the machine.
- To manually move the machine, the electromagnetic brake must be disengaged. After moving the machine manually, engage the electromagnetic brake again. Do not use the machine when the electromagnetic brake handwheel is screwed down.
- When the machine is to be pushed for service reasons (missing or discharged batteries, etc.), the speed must not exceed 2,5 mi/h (4 km/h).
- This machine cannot be used on roads or public streets.
- Pay attention during machine transportation when temperature is below freezing point. The water in the recovery tank or in the hoses could freeze and seriously damage the machine.
- Use brushes and pads supplied with the machine and those specified in the Operator manual. Using other brushes or pads could reduce safety.
- In case of machine malfunctions, ensure that these are not due to lack of maintenance. Otherwise, request assistance from the authorised personnel or from an authorised Service Center.
- If parts must be replaced, require ORIGINAL spare parts from an Authorised Dealer or Retailer.
- To ensure machine proper and safe operation, the scheduled maintenance shown in the relevant chapter of this Manual, must be performed by the authorised personnel or by an authorised Service Center.
- Do not wash the machine with direct or pressurised water jets, or with corrosive substances.
- When WET batteries are installed on the machine, do not tilt the machine for more than 30° from the horizontal plane to prevent the highly corrosive acid from leaking out of the batteries. If the machine must be tilted to perform any maintenance procedure, remove the batteries.
- The machine must be disposed of properly, because of the presence of toxic-harmful materials (batteries, etc.), which are subject to standards that require disposal in special centres (see Scrapping chapter).

## GENERAL INFORMATION

## TECHNICAL DATA

General technical data	
Description	SC3000 26" Disc
Cleaning width	26 in (660 mm)
Squeegee width	35 in (890 mm)
Solution/clean water tank capacity	21 US gal (80 L)
Solution flow	da 0,26 a 0,8 US gal/min. (from 1 to 3 L/min.)
Recovery tank capacity	21 US gal (80 L)
Minimum/maximum solution flow (with and without EcoFlex™ system)	0 ÷ 0,8 US gal/min. (0 ÷ 3 L/min.)
EcoFlex™ system solution tank capacity	1,3 US gal (5 L)
EcoFlex™ system detergent flow setting	Ratio 1:400 ÷ 1:33
Rear wheel diameter	9.8 in (250 mm)
Front wheel specific pressure on the floor (*)	72 psi (0,5 N/mm²)
Rear wheel specific pressure on the floor (*)	130 psi (0,9 N/mm²)
Front steering, driving and braking wheel diameter	8,8 in (225 mm)
Vacuum system motor power	0.56 hp (420 W)
Drive system motor power	0.4 hp (300 W)
Maximum speed	3.7 mi/h (6 km/h)
Maximum gradient when working	2% (1,14°)
Sound pressure level at workstation (ISO 11201, ISO 4871, EN 60335-2-72) (LpA)	65 dB(A) ± 3 dB(A)
Machine sound pressure level (ISO 3744, ISO 4871, EN 60335-2-72) (LwA)	82 dB(A)
Vibration level at the operator's arms (ISO 5349-1, EN 60335-2-72)	< 98.4 in/s² (< 2,5 m/s²)
Vibration level at the operator's body (ISO 2631-1, EN 60335-2-72)	3.1 in/s² (0,8 m/s²)
Battery compartment size (length x width x height)	14,9 x 21,2 x 11,8 in (380 x 540 x 300 mm)
Battery type	4 x 6 V batteries, 180 Ah C5 (WET)
	4 x 6 V batteries, 180 Ah C5 (GEL/AGM)
Standard batteries autonomy	2.5 - 3.5 hours
Total electrical input	60 A
Machine height	46,8 in (1.190 mm)
Machine maximum length	53.5 in (1.360 mm)
Machine width without squeegee	26.4 in (670 mm)
Vacuum system circuit capacity	0.0098 MPa (1.000 mmH <sub>2</sub> O)

(\*) Machines have been tested under the following conditions:

- With operator [165.3 lb (75 kg)] if ride-on
- Maximum battery size
- Maximum brush and squeegee size
- Full clean water tank
- Optional components installed
- Weight on wheels checked
- Print on the floor checked on cement for each single wheel
- Result expressed as maximum value for front and rear wheels

## GENERAL INFORMATION

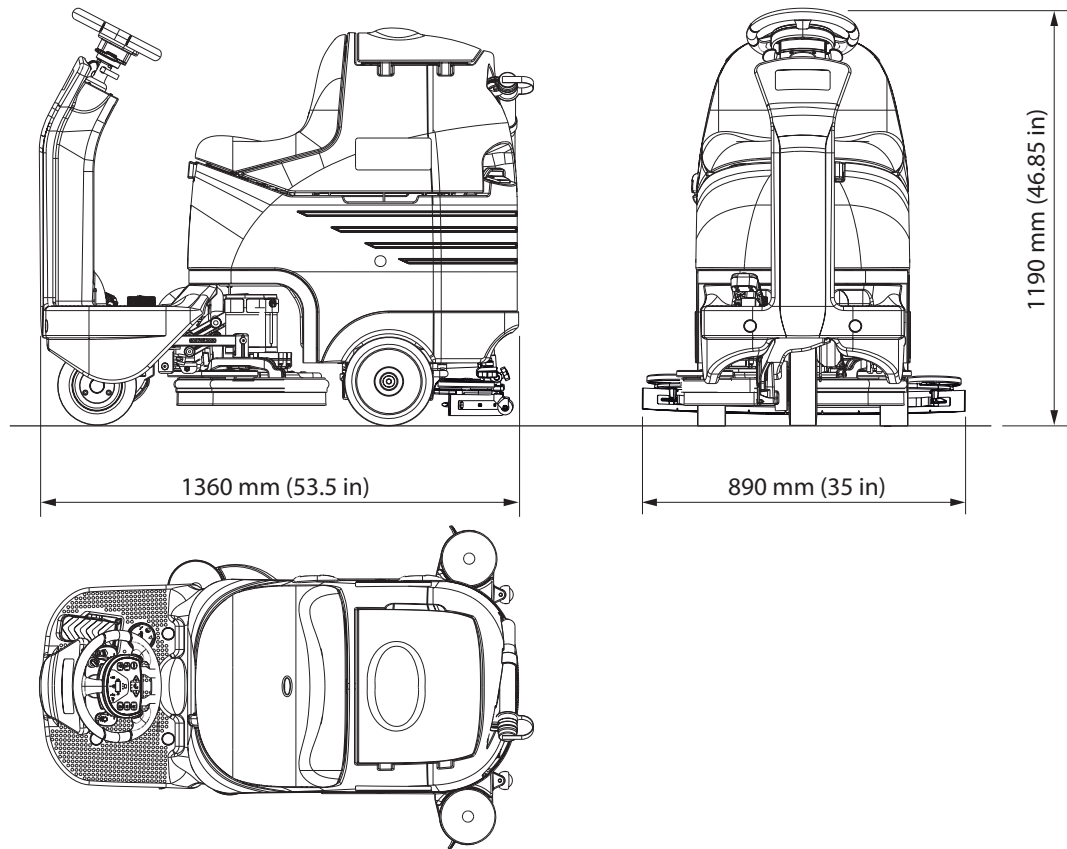
## TECHNICAL DATA (Continues)

Technical data for machines with brush/pad-holder deck	
Description	SC3000 26" Disc
Brush/pad diameter	13 in (330 mm)
Weight without batteries and with empty tanks	385.8 lb (175 kg)
Maximum weight with batteries, full tanks and operator (GVW)	983.2 lb (446 kg)
Hourly efficiency [2,5 mi/h (4 km/h)]	~ 24488 ft² (~ 2,275 m²)
Deck right/left offset (variable)	0 ÷ 3,9 in / 1 ÷ 0 in (0 ÷ 100 mm / 25 ÷ 0 mm)
Brush distance from the floor (when lifted)	1,9 in (48 mm)
Brush/pad motor power	2 x 0.53 hp (2 x 400 W)
Brush/pad-holder speed	230 rpm
Brush/pad-holder pressure with extra-pressure function turned off	66.1 lb (30 kg)
Brush/pad-holder pressure with extra-pressure function turned on	105.8 lb (48 kg)

## GENERAL INFORMATION

### DIMENSIONS

#### SC3000 26" Disc



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## GENERAL INFORMATION

## MAINTENANCE

The lifespan of the machine and its maximum operating safety are ensured by correct and regular maintenance.

**WARNING!**

*Read carefully the instructions in the Safety chapter before performing any maintenance procedure.*

The following tables provides the scheduled maintenance. The intervals shown may vary according to particular working conditions, which are to be defined by the person in charge of the maintenance.

For instructions on maintenance procedures, see the following paragraphs.

## SCHEDULED MAINTENANCE TABLE

Procedure	Daily, after using the machine	Weekly	Every six months	Yearly
Battery charging				
Squeegee cleaning				
Brush cleaning				
Tank, debris collection grid and vacuum grid with float cleaning, and cover gasket check				
EcoFlex™ system cleaning and draining (optional)				
Squeegee blade check and replacement				
Solution filter cleaning				
Vacuum system motor filter cleaning				
Battery (WET) fluid level check				
Screw and nut tightening check			(1)	
Electromagnetic brake efficiency check				
Brush/pad-holder motor carbon brush check or replacement				
Vacuum system motor carbon brush check or replacement				
Drive system motor carbon brush check or replacement				

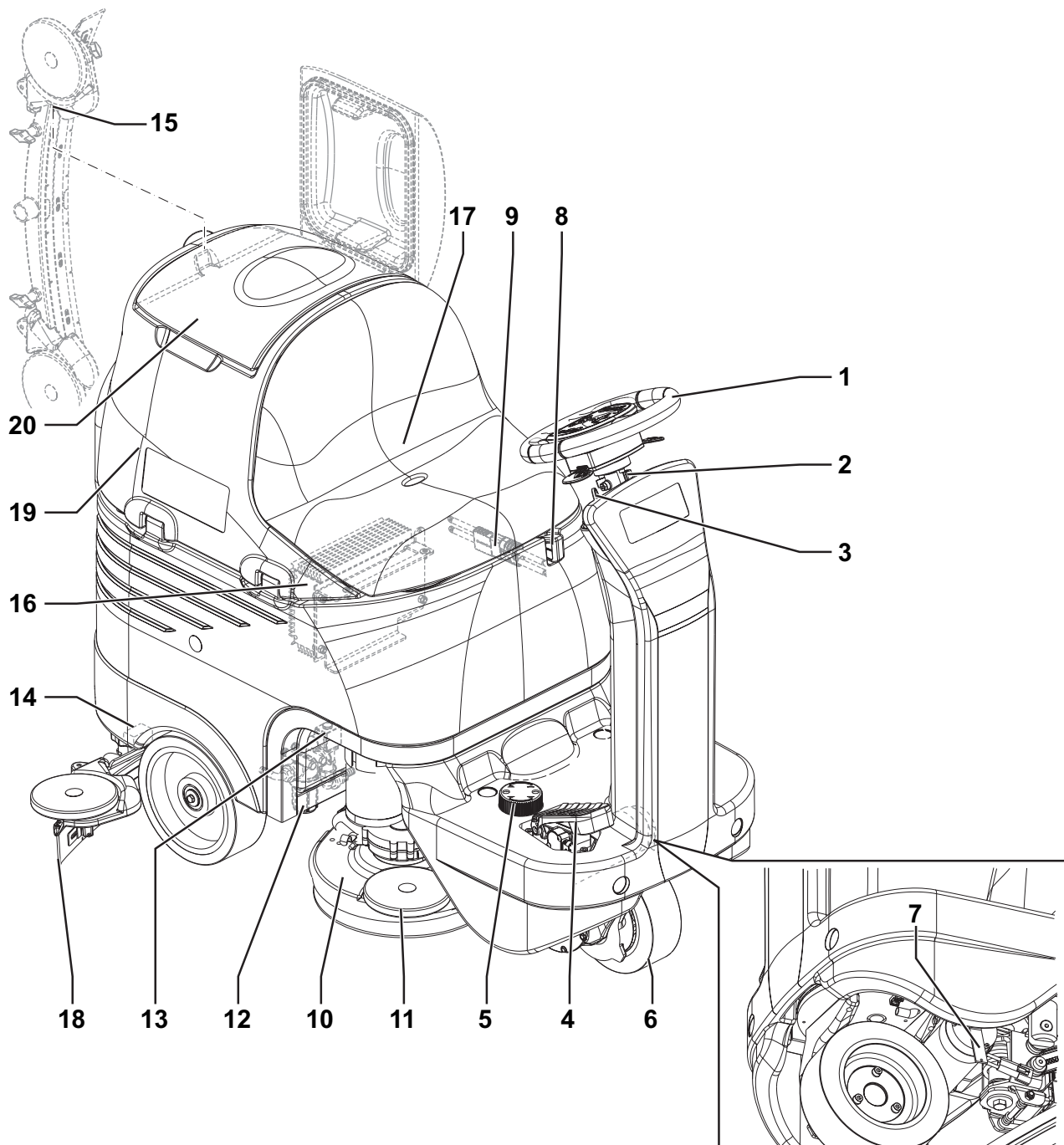
(1) And after the first 8 working hours.

## GENERAL INFORMATION

### MACHINE NOMENCLATURE

Throughout this Manual you will find numbers in brackets – for example: (2). These numbers refer to the components indicated in these two nomenclature pages. Refer to these pages whenever you need to identify a component mentioned in the text.

- |  |   |
|--|---|
| 1. Steering wheel with control panel (see the following paragraph) | 11. Bumper wheel                                    |
| 2. Steering wheel height control lever                             | 12. Solution filter                                 |
| 3. Ignition key  | 13. Solenoid valve                                  |
| 4. Drive pedal   | 14. Solution/clean water tank opening/closing valve |
| 5. Heel support height adjustment                                  | 15. Squeegee hook                                   |
| 6. Front steering, driving and braking wheel                       | 16. Battery charger (optional)                      |
| 7. Electromagnetic brake unlocking lever                           | 17. Seat  |
| 8. Emergency push-button   | 18. Squeegee blades assembly                        |
| 9. Battery connector   | 19. (Dumping) recovery tank assembly                |
| 10. Brush/pad-holder deck  | 20. Recovery tank cover                             |

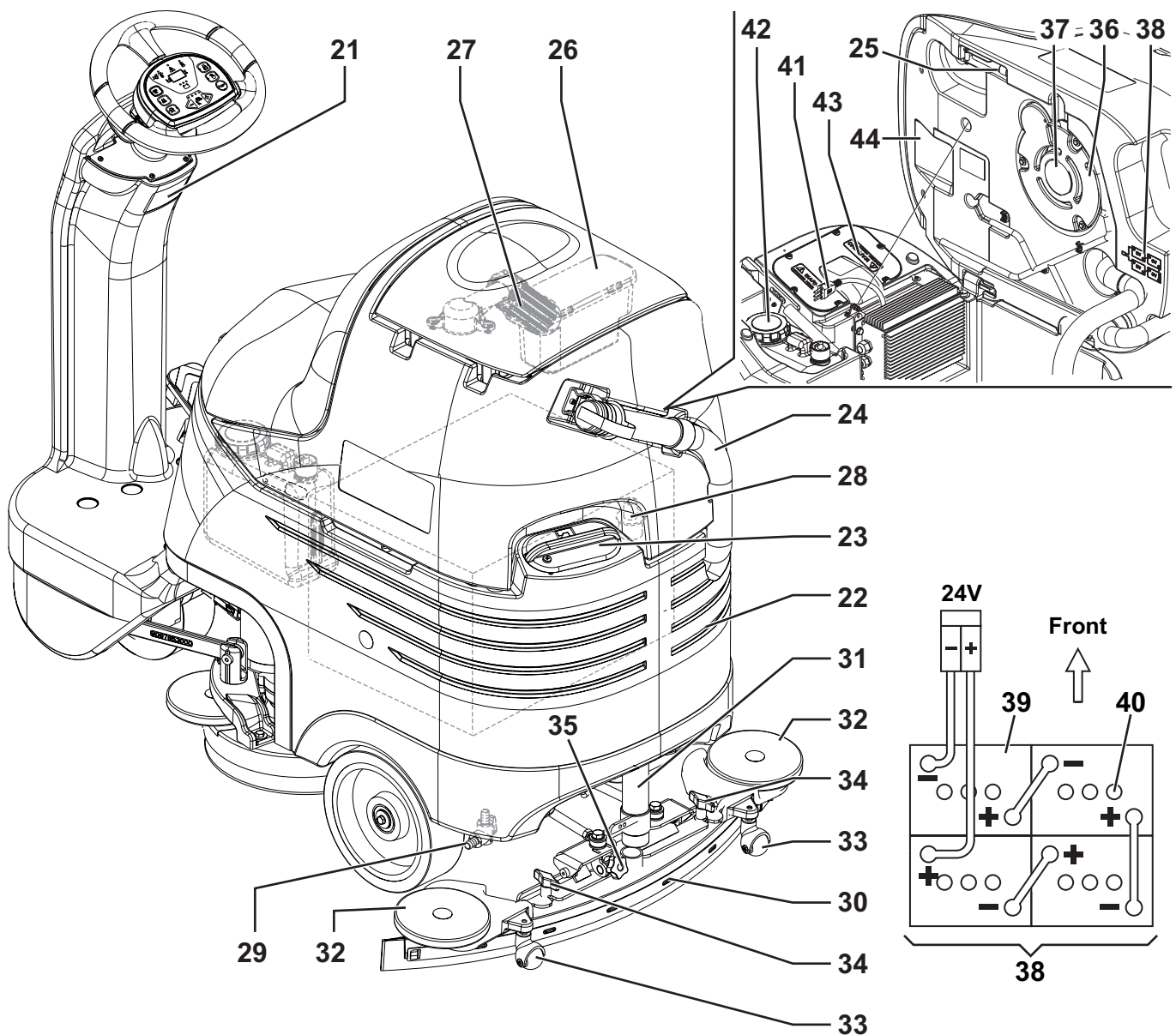




## GENERAL INFORMATION

## MACHINE NOMENCLATURE (Continues)

- |  |   |
|--|---|
| 21. Serial number plate/technical data/conformity certification      | 33. Squeegee support wheels                           |
| 22. Solution/clean water tank  | 34. Squeegee mounting handwheels                      |
| 23. Solution/clean water tank filler plug with removable filler hose | 35. Squeegee balance adjusting handwheel              |
| 24. Recovery water drain hose  | 36. Vacuum system motor                               |
| 25. Tank assembly stand  | 37. Vacuum system motor filter                        |
| 26. Container with debris collection grid                            | 38. Battery connection diagram                        |
| 27. Vacuum grid with automatic shut-off float                        | 39. Batteries   |
| 28. Solution/clean water draining adapter                            | 40. Battery caps                                      |
| 29. Solution/clean water tap   | 41. Battery charger cable (optional)                  |
| 30. Squeegee   | 42. Detergent tank (*)                                |
| 31. Squeegee vacuum hose   | 43. Electronic component compartment cover            |
| 32. Squeegee bumper wheels   | 44. (Lifted) recovery tank assembly and driver's seat |
- (\*) Only for machine with EcoFlex™ system (optional)



# GENERAL INFORMATION

## MACHINE NOMENCLATURE (Continues)

51. Reverse gear activation/deactivation lever
52. Reverse gear LED indicator
53. Detergent flow control switch (\*)
54. Washing detergent flow control switch led indicator (\*)
55. Mute function switch
56. Mute function switch LED
57. Horn switch
58. Ignition key
59. Solution flow increase switch
60. Solution flow decrease switch
61. Solution flow indicator
62. Battery warning lights
  - Green warning light - charged battery
  - Yellow warning light - semi-discharged battery
  - Red warning light - discharged battery
63. Vacuum system switch
64. Vacuum system led indicator
65. Extra pressure switch
66. Extra pressure led indicator
67. Brush/pad-holder deck and squeegee lifting/lowering switch

68. Brush/pad-holder deck and squeegee lifting/lowering LED indicator
69. EcoFlex™ activation/deactivation lever (\*)
70. EcoFlex™ system LED indicator (\*):
  - LED on - EcoFlex™ system on
  - LED flashing - EcoFlex™ system override
71. Hour counter and solution level display:
  - When the machine is started, it displays for a few seconds the number of working hours which have been performed.
  - While using the machine, it displays the solution/ washing water level in the tank (in gallons).
  - When the level is above 18 USgal, the display indicates "FUL".
  - When the level is under 4 USgal, the display indicates "LO".
  - When the tank is almost empty, "LO" starts flashing.

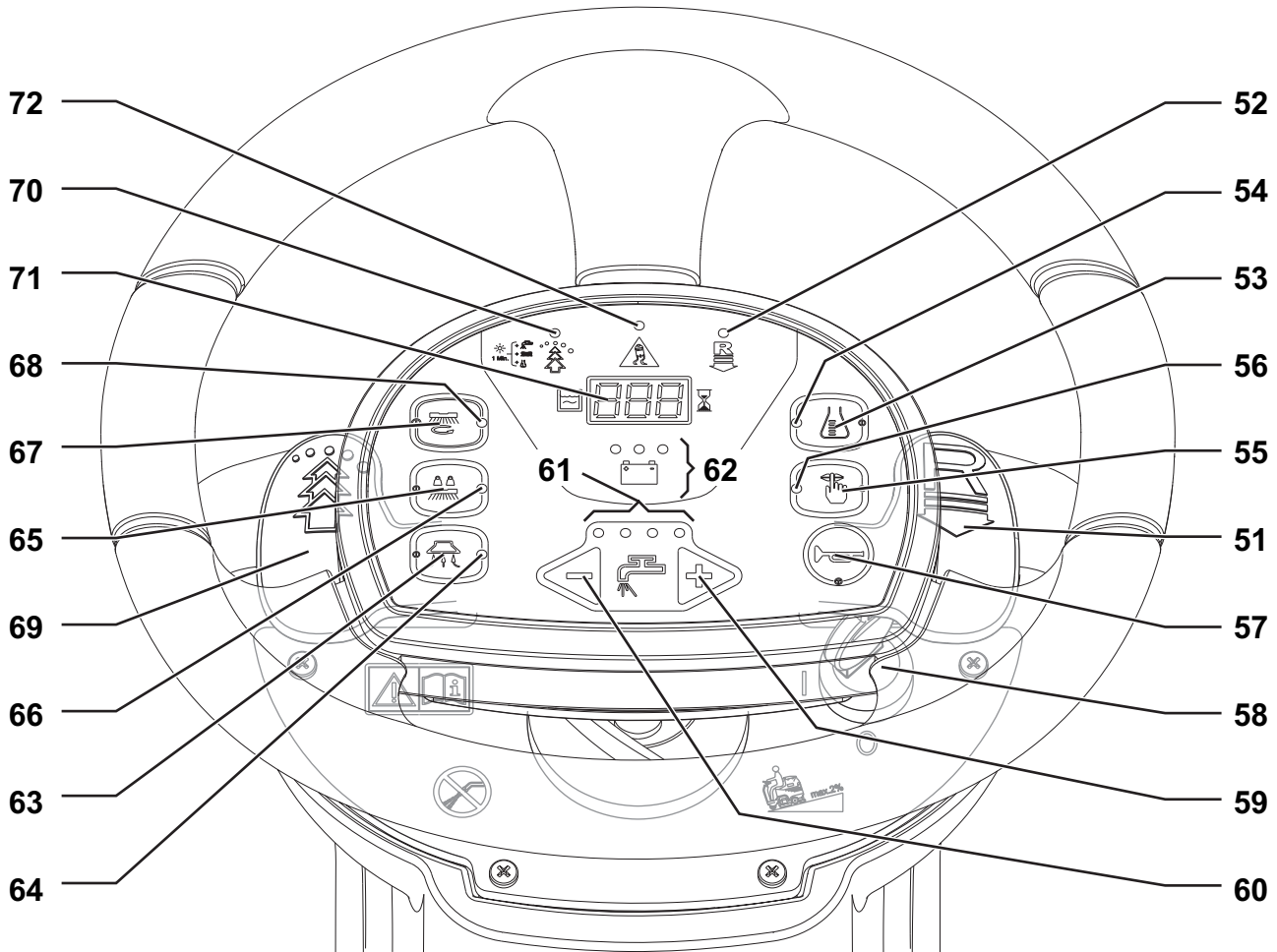


### NOTE

The display could indicate "LO" even if the tank is not completely empty, thus allowing to complete the cleaning cycle; in any case, it is recommended to check the actual solution flow supplied to the brushes.

72. Anti-skid control activation LED indicator

(\*) Only for machine with EcoFlex™ system (optional)



## SOLUTION/CLEAN WATER SUPPLY SYSTEM

### SOLUTION/CLEAN WATER SUPPLY SYSTEM

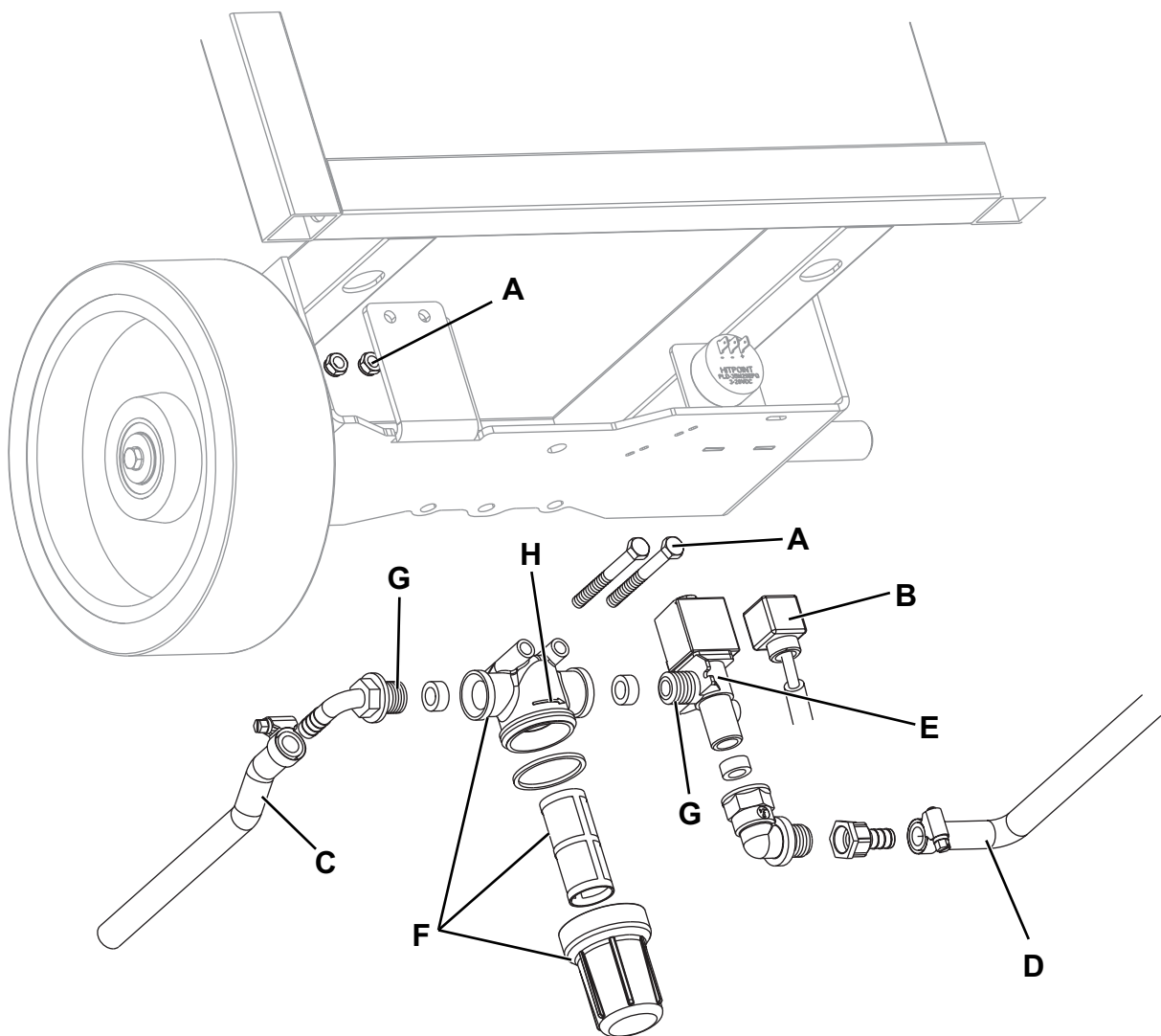
#### SOLENOID VALVE/SOLUTION SYSTEM FILTER DISASSEMBLY/ASSEMBLY

##### Disassembly

1. Place the machine on a hoisting system (if available), then lift it. Otherwise, drive the machine on a level floor.
2. Lower the brush deck.
3. Lower and remove the squeegee from the holder.
4. Turn the ignition key to "0" and disconnect the batteries.
5. On the right side of the machine, remove the screws and nuts (A).
6. Disconnect the connector (B).
7. Disconnect the hose (C) and (D).
8. Recover the whole assembly and, at the workbench, remove the solenoid valve (E), or the filter assembly (F) by disconnecting/unscrewing the connecting/fastening components.

##### Assembly

9. Assemble the components in the reverse order of disassembly, and note the following:
  - Before screwing the threaded fittings (G) clean them, then apply Teflon tape, according to the screwing direction.
  - When assembling the filter (F) the stamped arrow (H) must be tuned in the direction of the solution flow.



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## SOLUTION/CLEAN WATER SUPPLY SYSTEM

### TROUBLESHOOTING

#### Small amount of solution or no solution reaches the brush

Possible causes:

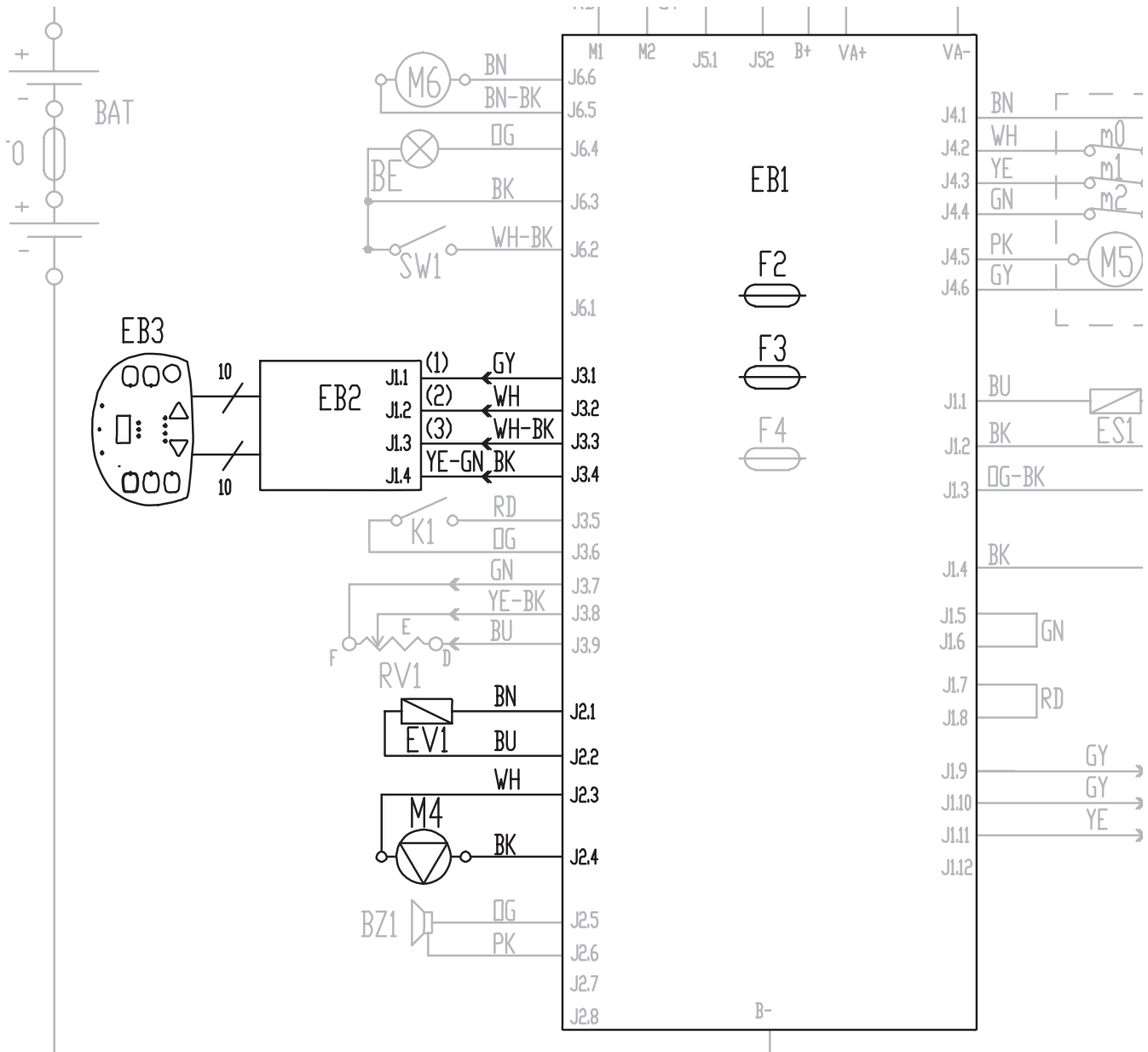
1. The tank filter (optional) is clogged/dirty (clean).  
The solution filter is clogged/dirty (clean).
2. The solution tap is closed/semi-closed (replace).
3. The solenoid valve (EV1) is broken or there is an open in the electrical connection (replace the solenoid valve/repair the electrical connection).
4. There is debris in the solution/clean water tank clogging the output hole (clean the tank).
5. There is debris in the solution/clean water hoses clogging the flow (clean the hoses).
6. The function electronic board (EB1) is faulty (replace).
7. The display electronic board (EB2) is faulty (replace).
8. The dashboard electronic board (EB3) is faulty (replace).

#### The solution reaches the brush also when the machine is off

Possible causes:

1. There is dirt or calcium deposit on the solenoid valve gasket (clean).
2. The solenoid valve is broken (replace).

### WIRING DIAGRAM



P100374A

## ECOFLEX™ SYSTEM

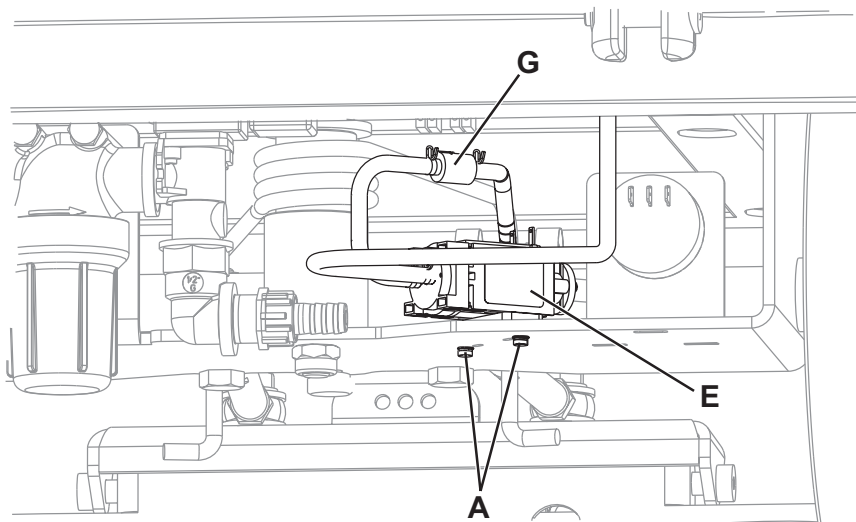
### DETERGENT PUMP AND ONE-WAY VALVE DISASSEMBLY/ASSEMBLY

#### Disassembly

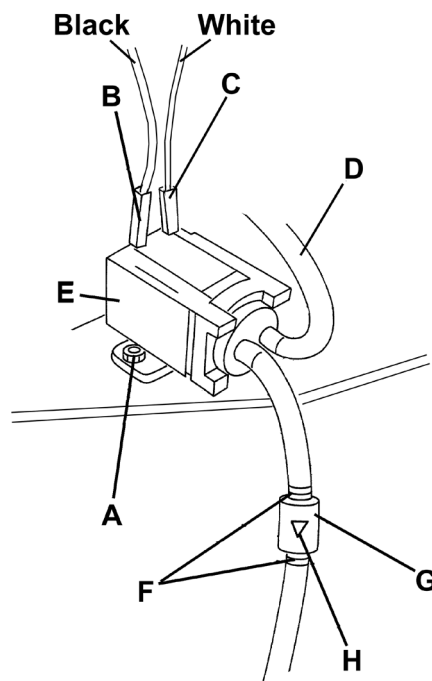
1. Place the machine on a hoisting system (if available), then lift it. Otherwise, drive the machine on a level floor.
2. Lower the brush deck.
3. Turn the ignition key to "0" and disconnect the batteries.
4. Open the detergent tank plug (42).
5. On the left side of the machine, remove the screws and nuts (A).
6. Disconnect the connectors (B) and (C).
7. Disconnect the hose (D).
8. Remove the detergent pump (E).
9. If necessary, remove the retaining springs (F) and disconnect the one-way valve (G) from the relevant hoses.

#### Assembly

10. Assemble the components in the reverse order of disassembly, and note the following:
  - Connect the connector with black cable (B) and white cable (C) as shown in the figure.
  - Install the one-way valve (G) with the arrow (H) turned in the direction of the detergent flow.



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## ECOFLEX™ SYSTEM

### ECOFLEX™ SYSTEM DISABLING PROCEDURE

In order to permanently disable the EcoFlex™ system, proceed as follows:

1. Turn off the machine by turning the ignition key (58) to "0".
2. Lift the lever (69), then turn the ignition key (58) to "I".
3. Release the lever (69) at least 8 seconds after turning on the machine.

After this procedure, the EcoFlex™ the lever cannot be operated again (LED (70) off) and the detergent concentration level is the one which has been set.

In order to re-enable the system, repeat the steps 1 to 3.



#### NOTE

The permanent disabling of the EcoFlex™ system is stored into memory even after the machine is turned off.

### TROUBLESHOOTING

#### Small amount of detergent or no detergent reaches the brush

Possible causes:

1. The detergent flow percentage is too low (check/change the percentage as shown in the Operator manual).
2. The hydraulic circuit upstream of the detergent pump is not triggered (check if the hose is filled and, if necessary, perform one or more draining cycle, as shown in the relevant paragraph of the Operator manual).
3. The pump (M1) is broken or there is an open in the electrical connection (replace the pump/repair the electrical connection).
4. There is foreign material/debris in the detergent tank clogging the output hole (clean the tank).
5. There is debris in the detergent hoses clogging the detergent flow (clean the hoses).
6. The detergent flow control switch is malfunctioning (check that the LED (78) turns on; if necessary, replace the dashboard electronic board).
7. The function electronic board (EB1) is not set for the operation with EcoFlex™ system (if equipped, remove the jumper wire (J4) in front of the electronic board).
8. The function electronic board (EB1) is faulty (replace).
9. The display electronic board (EB2) is faulty (replace).
10. The dashboard electronic board (EB3) is faulty (replace).

#### The detergent reaches the brush also when the machine is off

Possible causes:

1. The pump (M1) is broken (replace).
2. The one-way valve is broken (replace).

#### There is water in the detergent tank

Possible causes:

1. The one-way valve is broken (replace).

#### The EcoFlex™ system does not work in the "US mode" but in the "EU mode".

Possible causes:

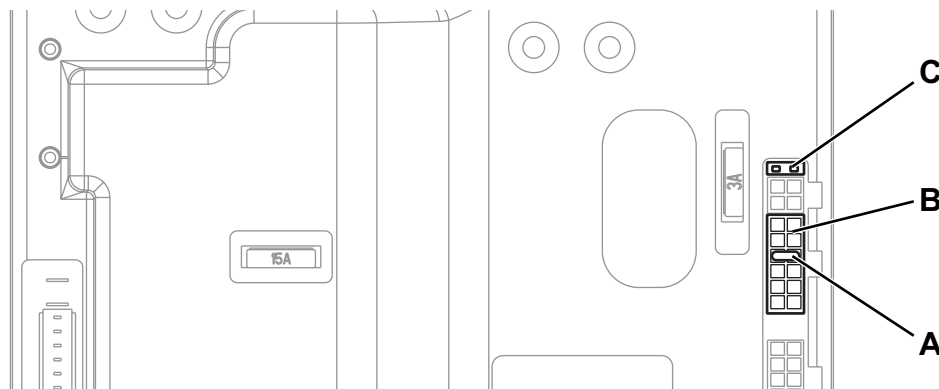
1. Check the GREEN bridge from pin 5 to pin 6 (A) of the connector J1 (B): it has not to be present (if present, switch off the machine and cut it).

#### The EcoFlex™ system does not turn on when pressing the switch (77) and the LED (78) does not turn on

To check the function electronic board, remove the panel as shown in Function Electronic Board Disassembly/Assembly paragraph (steps 1 to 4).

Possible causes:

1. The function electronic board (EB1) is not set for the operation with EcoFlex™ system [if present, remove the jumper wire J8 (C) behind of the electronic board].
2. The dashboard electronic board (EB3) is faulty (replace).





## BRUSHING SYSTEM

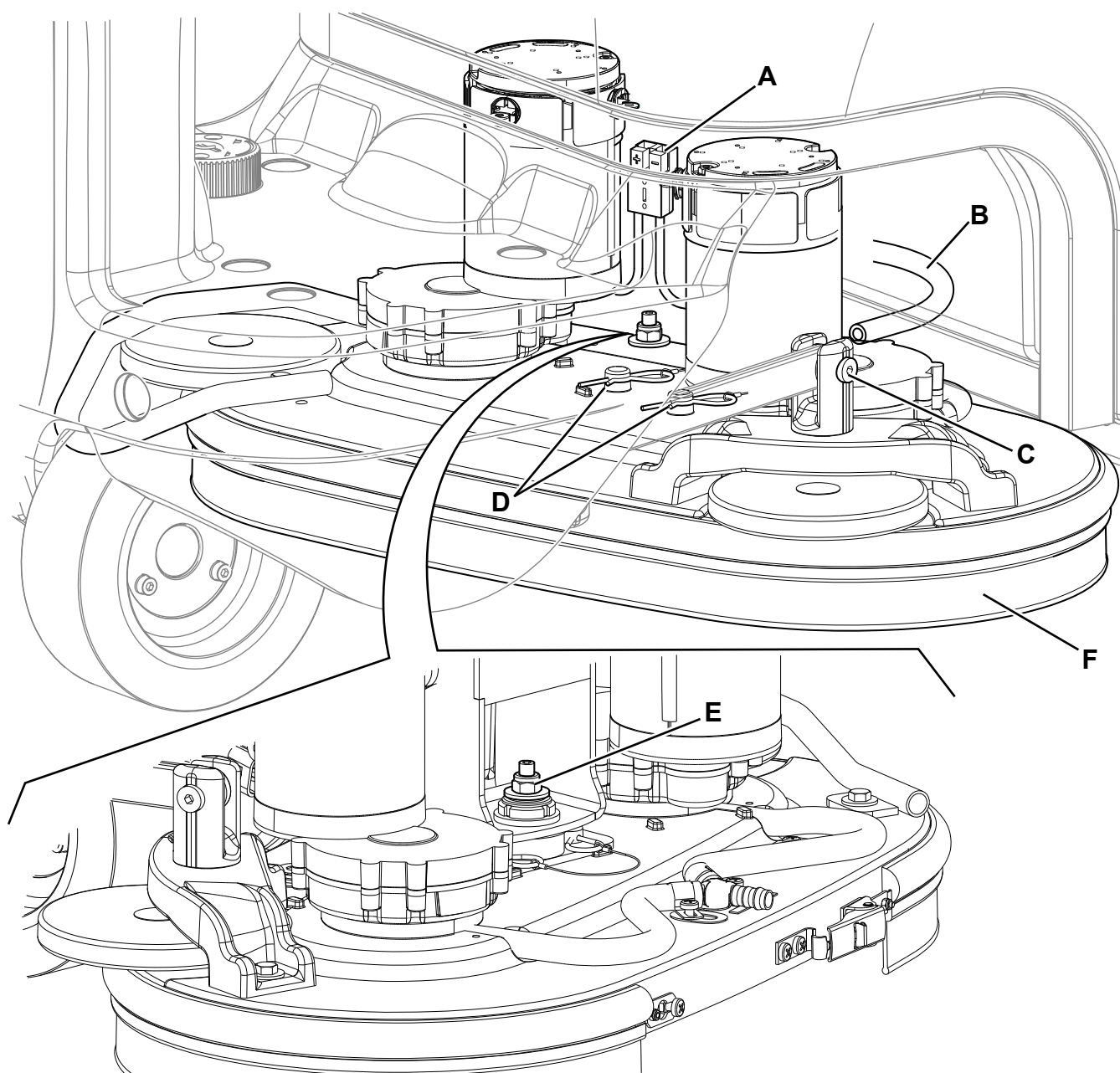
### BRUSH/PAD-HOLDER DECK DISASSEMBLY/ASSEMBLY

#### Disassembly

1. Drive the machine on a level floor or on a lift platform to facilitate disassembly.
2. Remove the brushes, as shown in the Operator manual.
3. Turn the ignition key (58) on "I".
4. Pressing the switch (67) to lower the brush/pad deck.
5. Turn the ignition key (58) to "0".
6. Disconnect the red connector (A).
7. Unplug the pipe (B) of the cleaning solution.
8. Unscrew the screw (C) and recover the nut.
9. Remove the safety pins (D).
10. Unscrew the nut (E) and recover the washer, then remove the brush/pad-holder deck (F).

#### Assembly

11. Assemble the components in reverse order of disassembly.



## BRUSHING SYSTEM

### BRUSH MOTOR ELECTRICAL INPUT CHECK


**WARNING!**

*This procedure must be performed by qualified personnel only.*

1. Drive the machine on a level floor.
2. Remove the brushes, as shown in the Operator manual.
3. Place two wooden shims (A) under the brush deck sides (B), as shown in the figure. Wooden shim thickness must be 1 in (25 mm).


**WARNING!**

*Keep the wooden shims at an appropriate distance from the brush hubs.*

4. Use a jumper wire to disable the driver's seat microswitch.
5. Disconnect the driving wheel connector to disable the drive system.
6. Turn the ignition key (58) to "I".
7. Lower the brush/pad-holder deck by pressing the switch (67).
8. Apply the amperometric pliers (E) on one cable (F) of the right motor (G), or on one cable (H) of the left motor (I).
9. Turn on the brushes by pressing the drive pedal (4), then check that the electrical input of the right (G) or left motor (I) is as follows:
  - 3 to 4 A at 24V, for the brush/pad-holder deck motors;
10. Turn off the brushes by releasing the drive pedal (4) and lift the brush/pad-holder deck by pressing the switch (67).
11. Turn the ignition key (58) to "0".

Remove the amperometric pliers (A).

If the electrical input is higher, perform the following procedures to detect and correct the abnormal input:


**NOTE**

*If the electrical input is higher than the maximum allowed value, the 3 battery warning lights (81) flash simultaneously.*

- Check the tightening of F1 fuse screw (see the procedure in Fuse check/replacement paragraph).
- Check if there is dust or dirt (ropes, cables, etc.) on the brush hubs.
- Check the motor carbon brushes (see the procedure in the relevant paragraph).
- Remove the motors (see the procedure in the relevant paragraph), and check the condition of all components.

If the above-mentioned procedures do not lead to a correct electrical input, the motors must be replaced (see the procedure in the relevant paragraph).

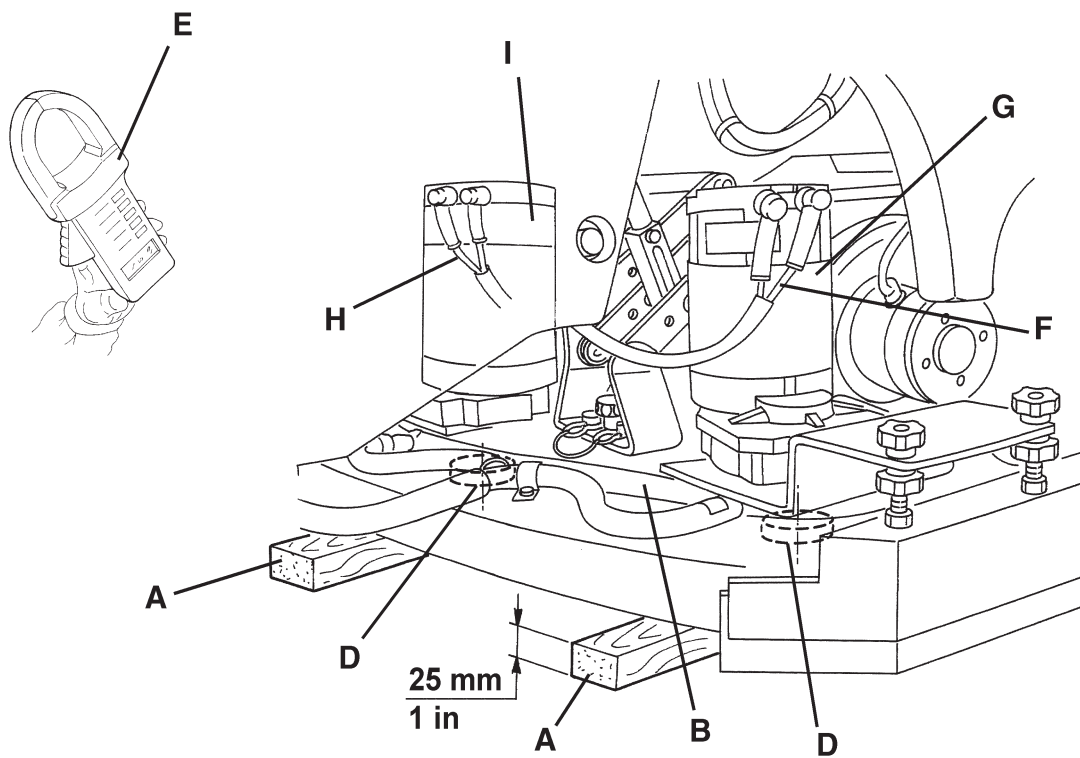
**Reset**

12. Connect the driving wheel connector.
13. Remove the jumper wire and enable the driver's seat microswitch.
14. Remove the wooden shims and install the brushes.



## BRUSHING SYSTEM

## BRUSH MOTOR ELECTRICAL INPUT CHECK (Continues)



S301326

## BRUSHING SYSTEM

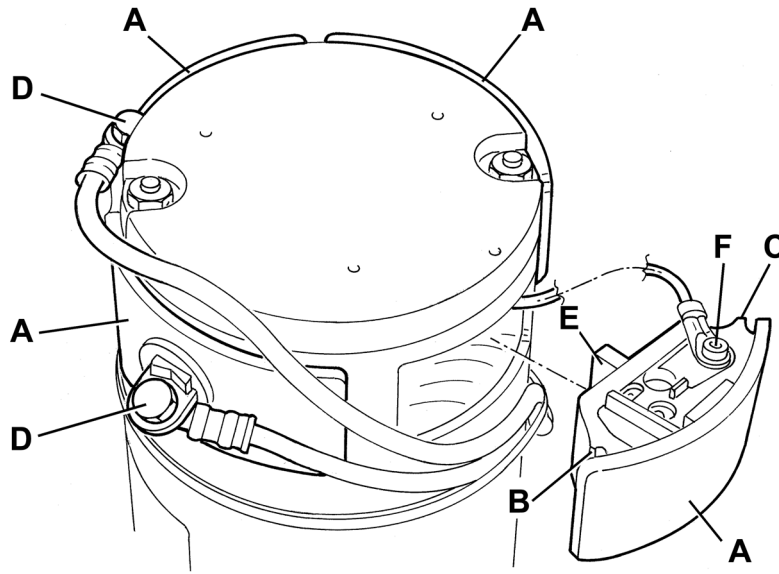
### BRUSH MOTOR CARBON BRUSH CHECK/REPLACEMENT

#### Check

1. Remove the brush/pad-holder deck.
2. Remove dust and dirt from the motor carbon brush support area (A).
3. Disengage the fasteners (B) and (C), then remove the four carbon brush supports (A). If necessary, disconnect the electrical connections (D).
4. Check the carbon brushes (E) for wear. Replace the carbon brushes when: the contact with the motor armature is insufficient, the carbon brushes are worn, the carbon brush contact surface is not integral, the thrust spring is broken, etc.
5. If necessary, disconnect the connections (F) and remove the carbon brushes with their supports (A) and replace them. Replace the carbon brushes as an assembly.

#### Reset

6. Assemble the components in the reverse order of disassembly, and note the following:
  - When connecting the terminals (F), take care of their insulation from the surrounding parts of the frame.



S301327A

**BRUSH MOTOR DISASSEMBLY/ASSEMBLY****Disassembly**

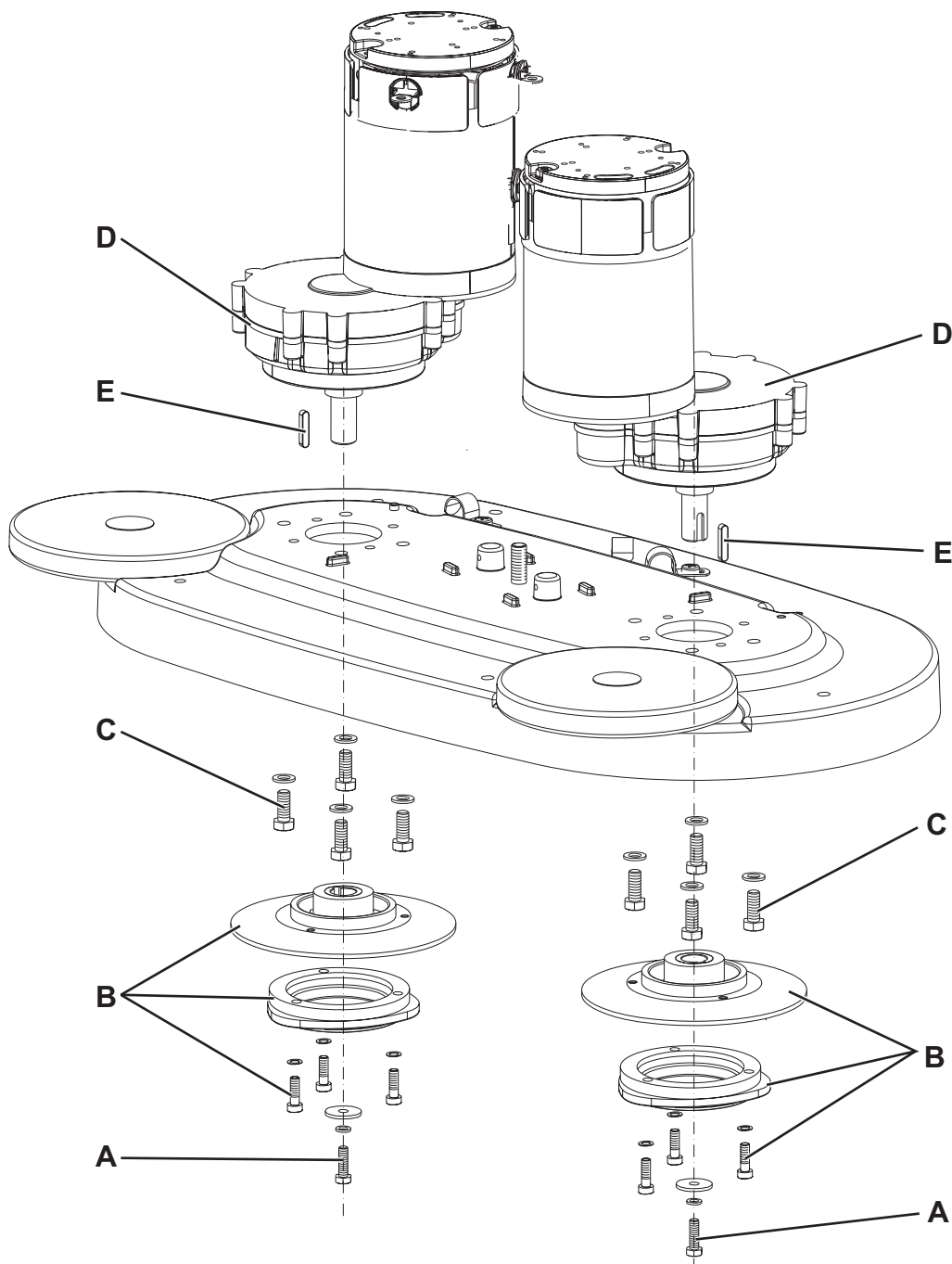
1. Remove the brush/pad-holder deck (see the procedure in the relevant paragraph).
2. At the workbench, remove the screw (A) from the reduction unit which has to be disassembled.
3. Remove the hub assembly (B) with a puller.
4. Remove the screws (C).
5. Remove the reduction unit (D).
6. Recover the key (E).

**Assembly**

7. Assemble the components in the reverse order of disassembly.

**NOTE**

For further information on deck components see the Spare Parts List.



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## BRUSHING SYSTEM

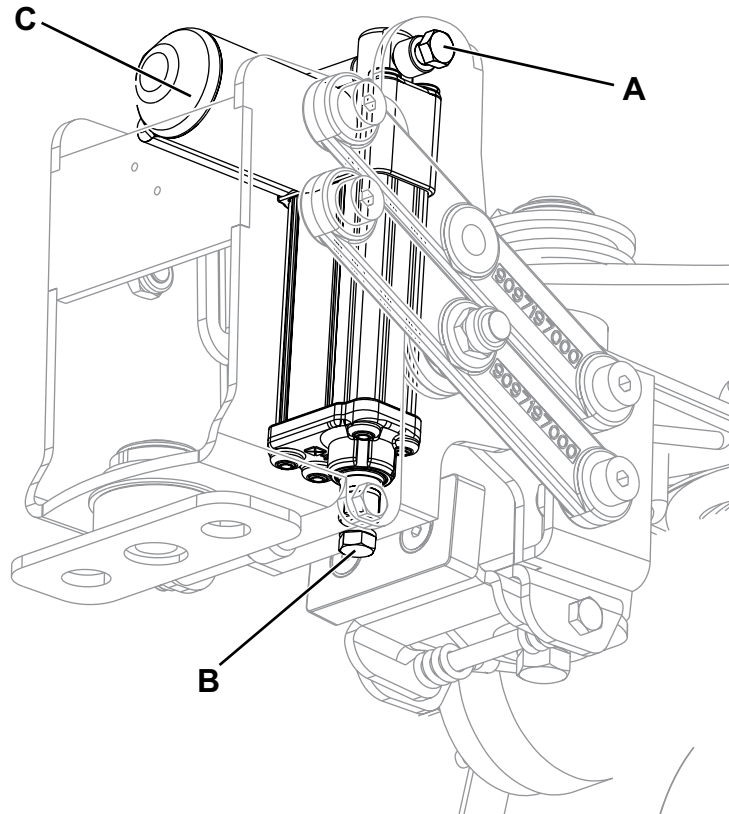
### BRUSH DECK LIFTING/LOWERING ACTUATOR DISASSEMBLY/ASSEMBLY

#### Disassembly

1. Lower the brush deck.
2. Remove the brush deck (see the procedure in the relevant paragraph).
3. Turn the ignition key to "0" and disconnect the batteries.
4. Disconnect the actuator connector (see the function electronic board).
5. Remove the screw (A) and recover nuts, bushings and washers.
6. Remove the screw (B) and recover the washer.
7. Remove the actuator (C).

#### Assembly

8. Assemble the components in the reverse order of disassembly.



P100381

## BRUSHING SYSTEM

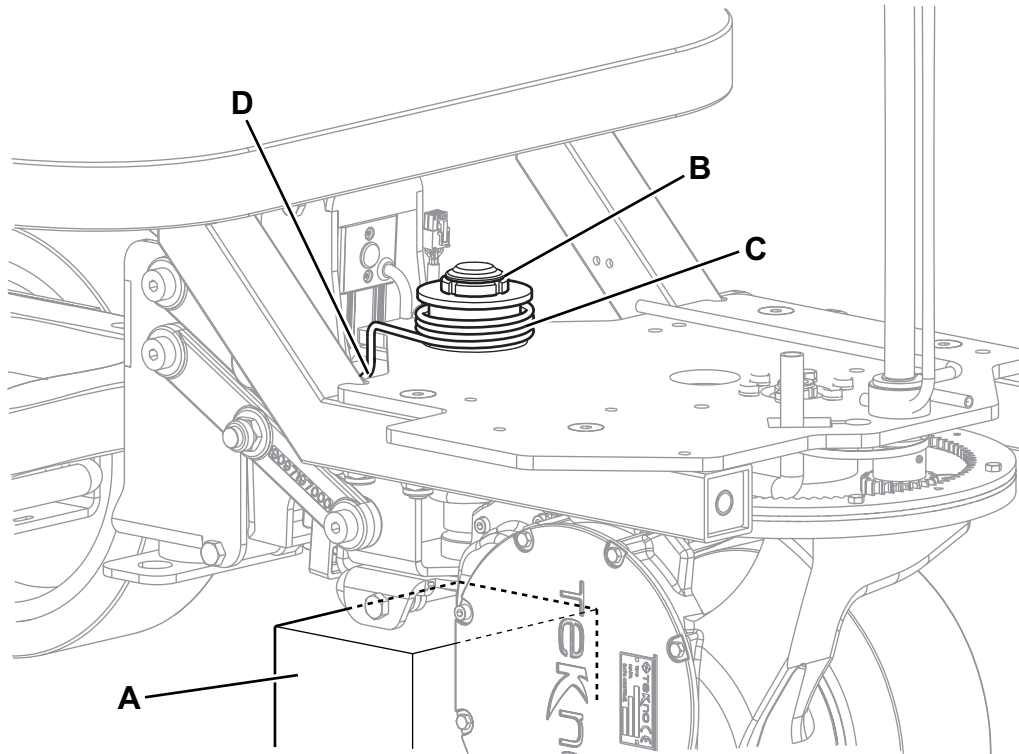
## BRUSH DECK ADJUSTER SPRING DISASSEMBLY/ASSEMBLY

**Disassembly**

1. Drive the machine on a level floor.
2. Remove the brush/pad-holder deck (see the procedure in the relevant paragraph).
3. Turn the ignition key to "0" and disconnect the batteries.
4. Remove the front fairing (see the procedure in the relevant paragraph).
5. Place a wooden shim (A) under the deck holder assembly. Wooden shim thickness must be 160 mm.
6. Unscrew the ring nut (B), recover the washer, then carefully remove the spring (C).
7. If necessary, replace the spring taking care to properly place the elastic ends (D) on the frame.

**Assembly**

8. Assemble the components in the reverse order of disassembly, and note the following:
  - Tighten the ring nut (B) so that the deck holder assembly can turn freely.



P100382

## BRUSHING SYSTEM

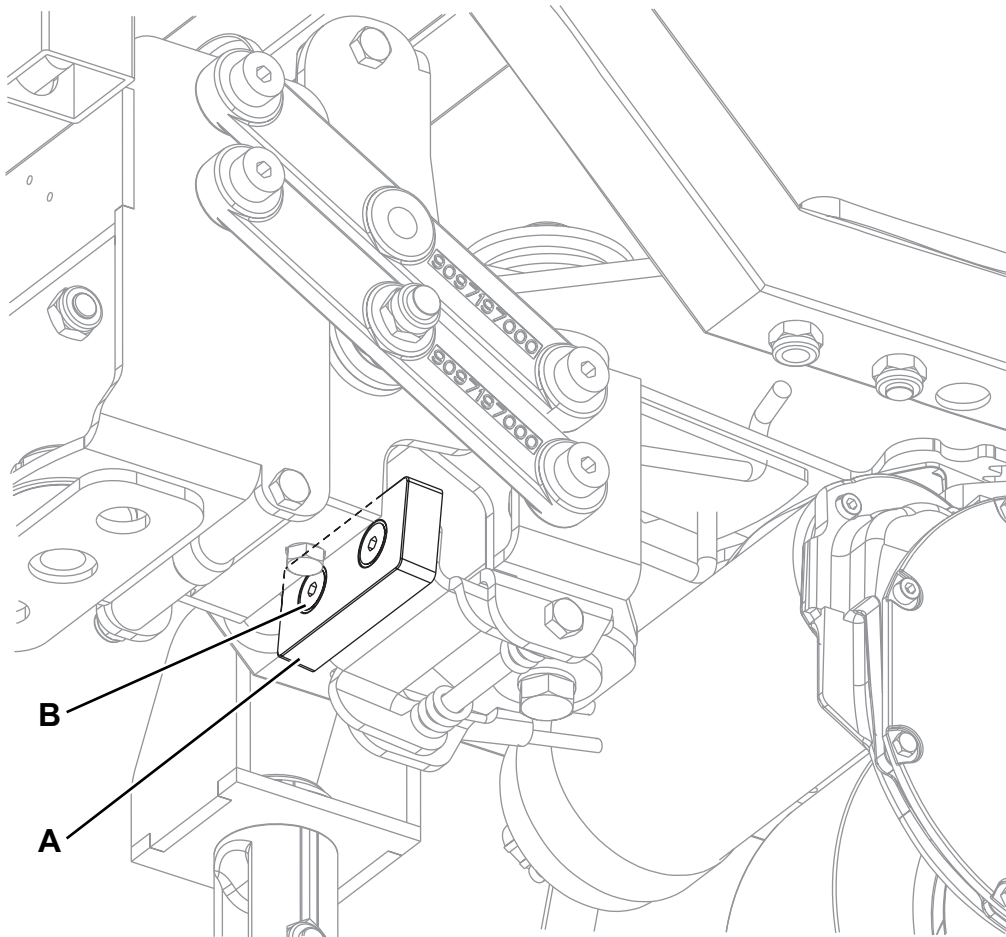
### BRUSH DECK DRIVE GUIDE DISASSEMBLY/ASSEMBLY

#### Disassembly

1. Drive the machine on a level floor.
2. Remove the brush/pad-holder deck (see the procedure in the relevant paragraph) and leave the deck holder assembly lifted.
3. Turn the ignition key to "0" and disconnect the batteries.
4. Turn the steering wheel to accommodate the position of the drive guide (A) to be removed.
5. Under the machine, remove the screws (B) and the drive guide (A).
6. Replace the drive guide if it is too worn.

#### Assembly

7. Assemble the components in the reverse order of disassembly.



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**BRUSHING SYSTEM****TROUBLESHOOTING****Open circuit**

The fuse (F1) determines an open in the supply circuit of the brush deck motors. This system allows to prevent the circuits from being damaged under overload conditions.

The open in the fuse can be caused by the following:

1. Short circuit in the brush motor wiring harness; fault in the motor.

**All brushes do not turn**

Possible causes:

1. The brush motor electromagnetic switch wiring harness is damaged (repair).
2. The function electronic board (EB1) is faulty (replace).
3. The wiring harness between function electronic board (EB1) and brush motor electromagnetic switch (ES1) is damaged (repair).
4. The brush motor electromagnetic switch (ES1) is damaged (replace).
5. The brush motor fuse (F1) is open (replace).

**One brush does not rotate**

Possible causes:

1. The motor carbon brushes are worn (replace).
2. Bulky debris or cords around the brushes or between the brushes and its flange (remove and clean the brushes).
3. The motor is faulty (repair or replace).
4. The wiring harness is damaged (repair).

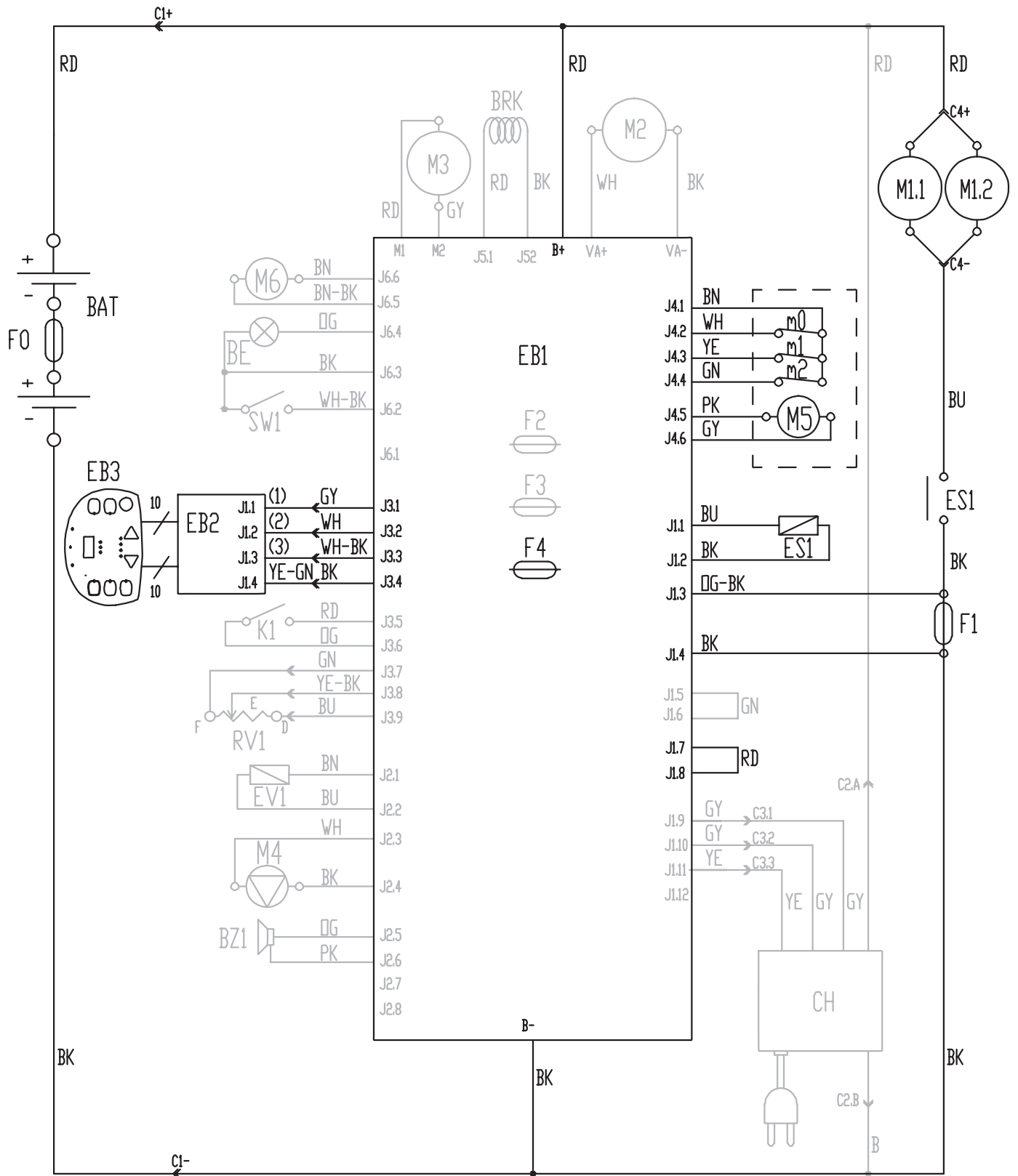
**The brushes cannot be lifted/lowered or the extra pressure function cannot be turned on**

Possible causes:

1. See the Electrical System chapter, function electronic board error codes.
2. The deck lifting/lowering actuator (M5) end-of-stroke microswitches are broken (replace the actuator).
3. The deck lifting/lowering actuator (M5) is broken (replace).
4. There is an open in the actuator wiring harness (check the connections according to the procedures shown in the Electrical System chapter, Troubleshooting paragraph).
5. The actuator fuse (F4) is open (replace).
6. The function electronic board (EB1) is damaged (replace).

## BRUSHING SYSTEM

## WIRING DIAGRAM



P100384A



## RECOVERY WATER SYSTEM

## RECOVERY WATER SYSTEM

## VACUUM SYSTEM MOTOR ELECTRICAL INPUT CHECK

**WARNING!**

*This procedure must be performed by qualified personnel only.*

1. Apply the amperometric pliers (A) on one cable (B) of the batteries.
2. Turn the ignition key (58) to "I".
3. Turn on the vacuum system by pressing the switch (63) and check that the motor electrical input is 16 - 19 A at 24 V.
4. Turn off the vacuum system motor by pressing the switch (63).

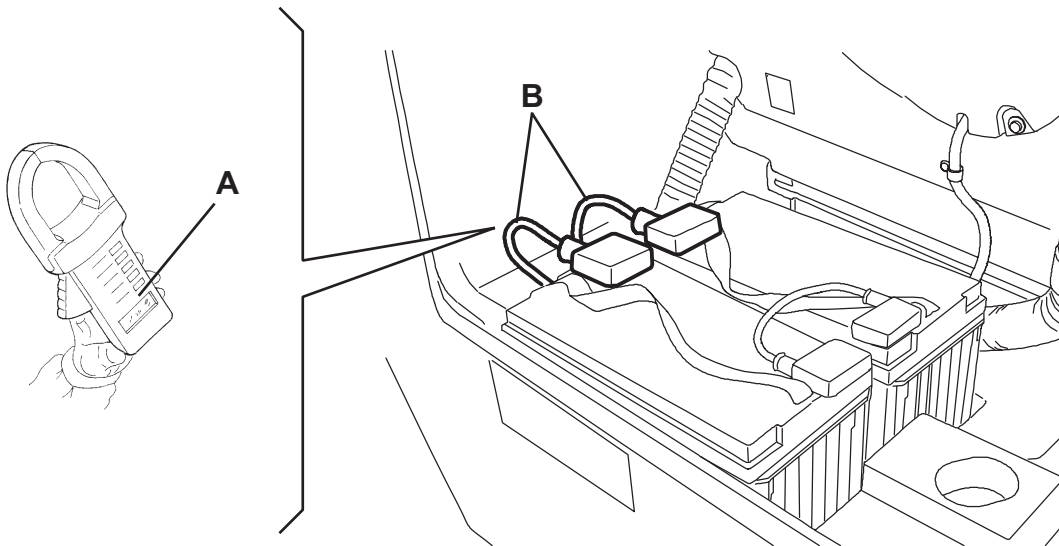
Remove the amperometric pliers (B).

If the electrical input exceeds the specifications, check the motor carbon brushes (see the procedure in the relevant paragraph).

If necessary, remove the vacuum system motor (see the procedure in the relevant paragraph), and check the condition of its moving parts.

If the above-mentioned procedures do not lead to a correct electrical input, the motor must be replaced (see the procedure in the relevant paragraph).

5. Perform steps 3 and 4 in the reverse order.

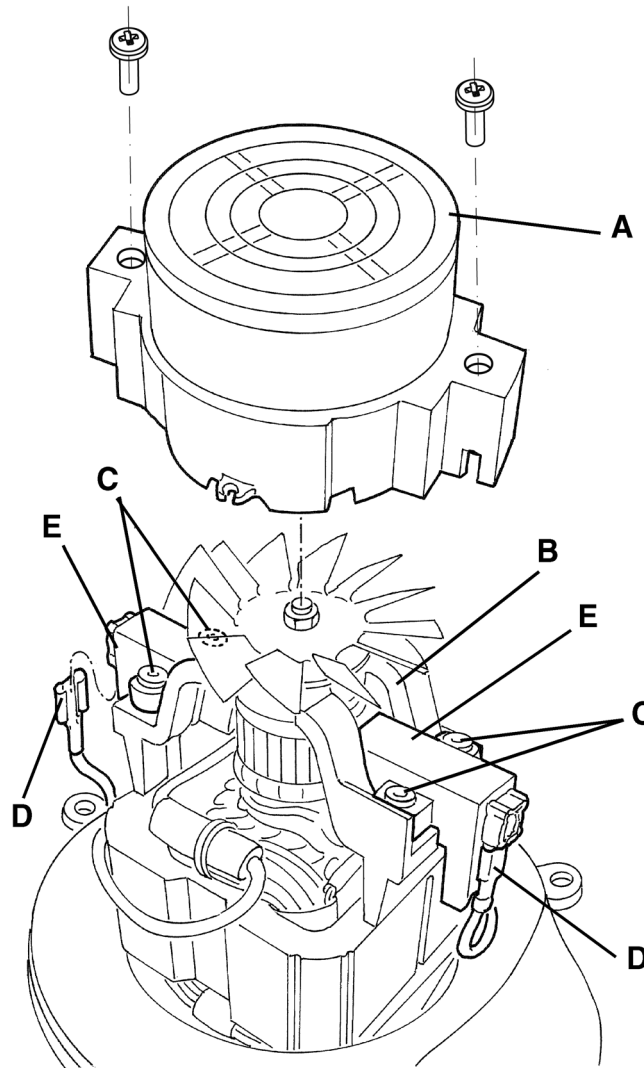


S301553

## RECOVERY WATER SYSTEM

### VACUUM SYSTEM MOTOR CARBON BRUSH CHECK/REPLACEMENT

1. Remove the vacuum system motor (see the procedure in the relevant paragraph).
2. At the workbench, remove the screws and the cover (A) from the vacuum system motor (B).
3. Remove the screws (C).
4. Disconnect the electrical connections (D).
5. Remove the carbon brushes (E).
6. Check the carbon brushes for wear. Replace the carbon brushes when: the contact with the motor armature is insufficient, the carbon brushes are worn, the carbon brush contact surface is not integral, the thrust spring is broken, etc.
7. If necessary, replace the carbon brushes. Replace the carbon brushes as an assembly.
8. Assemble the components in the reverse order of disassembly.



S301555

## RECOVERY WATER SYSTEM

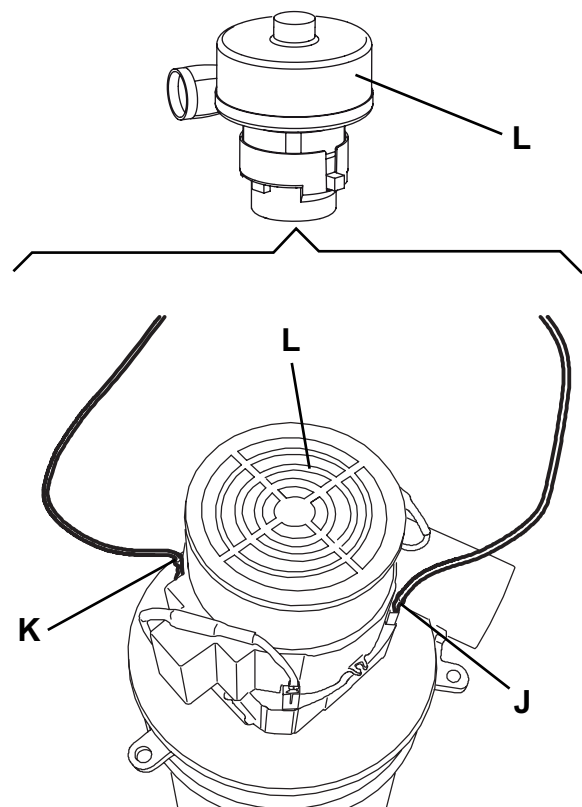
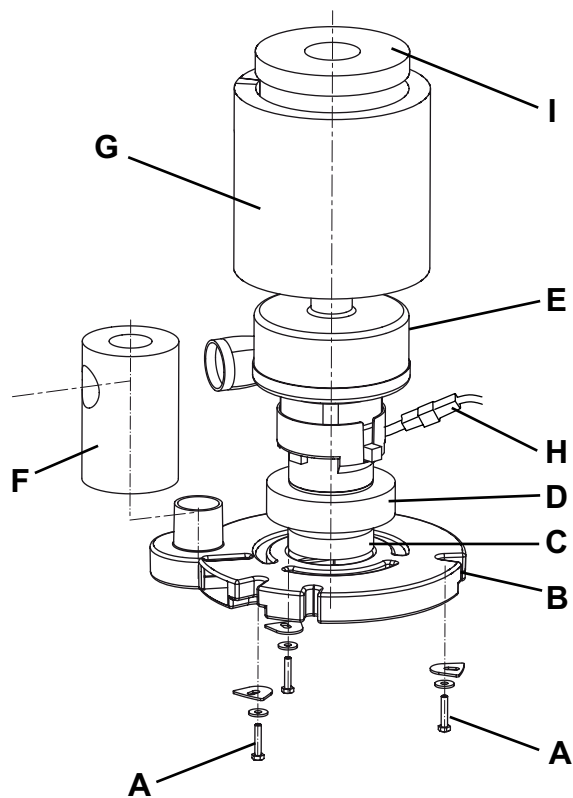
## VACUUM SYSTEM MOTOR DISASSEMBLY/ASSEMBLY

## Disassembly

1. If there is recovery water in the tank, drain it.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Lift the recovery tank.
4. Remove the screws (A) and recover the washers.
5. Remove the motor cover (B).
6. Remove the filter (C) and the gasket (D).
7. Remove the motor (E) or (L), the sound-deadening pipe (F) and the sound-deadening panel (G).
8. Disconnect the connector (H) of the motor (E).
9. Check the efficiency of the gasket (I) and, if necessary, replace it.

## Assembly

10. Assemble the components in the reverse order of disassembly.



S301556B

## RECOVERY WATER SYSTEM

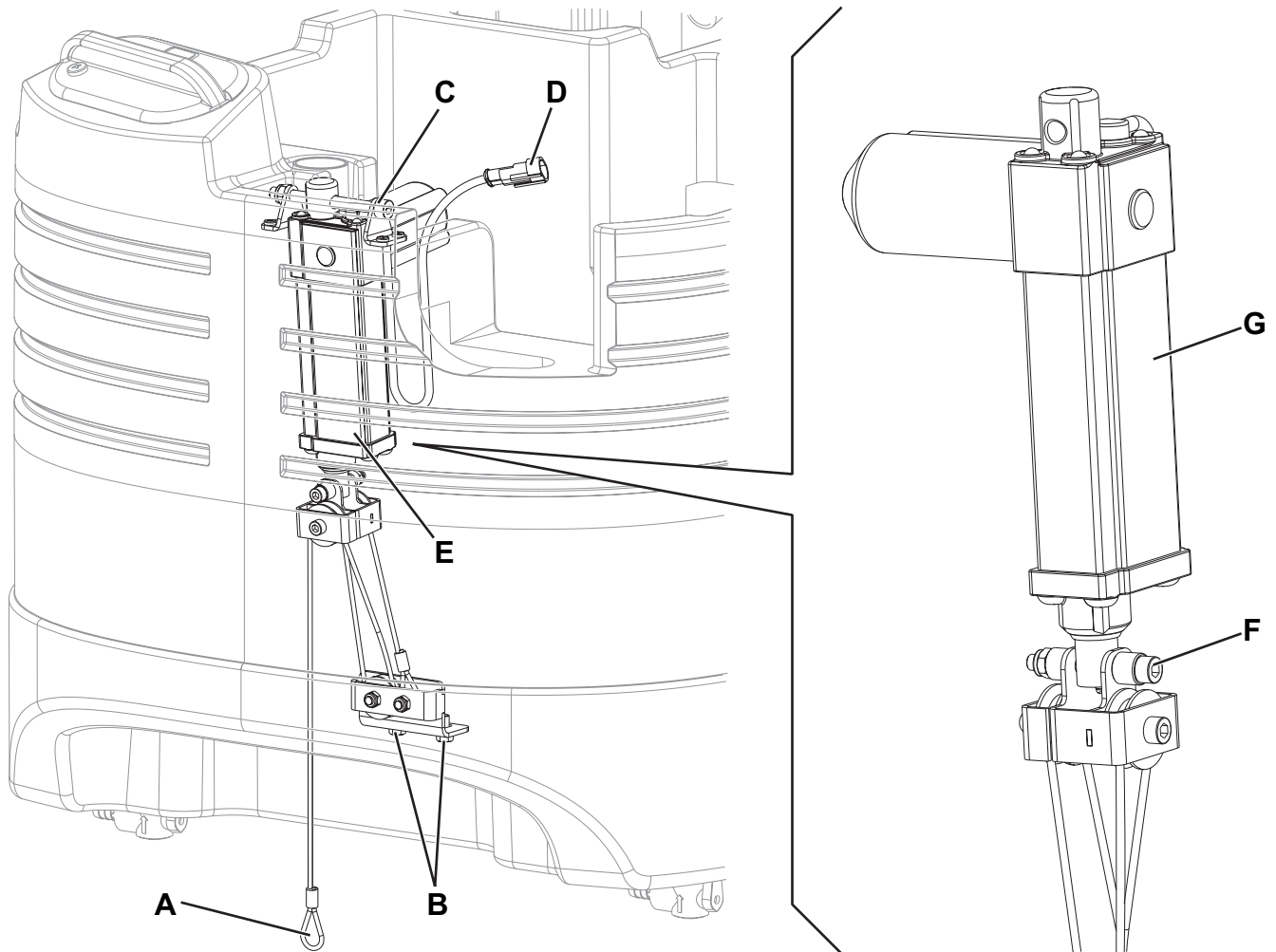
### SQUEEGEE LIFTING ACTUATOR DISASSEMBLY/ASSEMBLY

#### Disassembly

1. Lower the squeegee.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Disengage the cable grommet (A) and remove it from the squeegee.
4. Remove the screws (B) and recover the washers.
5. Remove the screw (C) and recover the nut.
6. Disconnect the connector (D) and remove the squeegee lifting assembly (E).
7. At the workbench, remove the screw (F), recover the spacers and the nut.
8. Remove the squeegee lifting actuator (G).

#### Assembly

9. Assemble the components in the reverse order of disassembly.



P100385

## RECOVERY WATER SYSTEM

## SQUEEGEE LIFTING CABLE DISASSEMBLY/ASSEMBLY

**Disassembly**

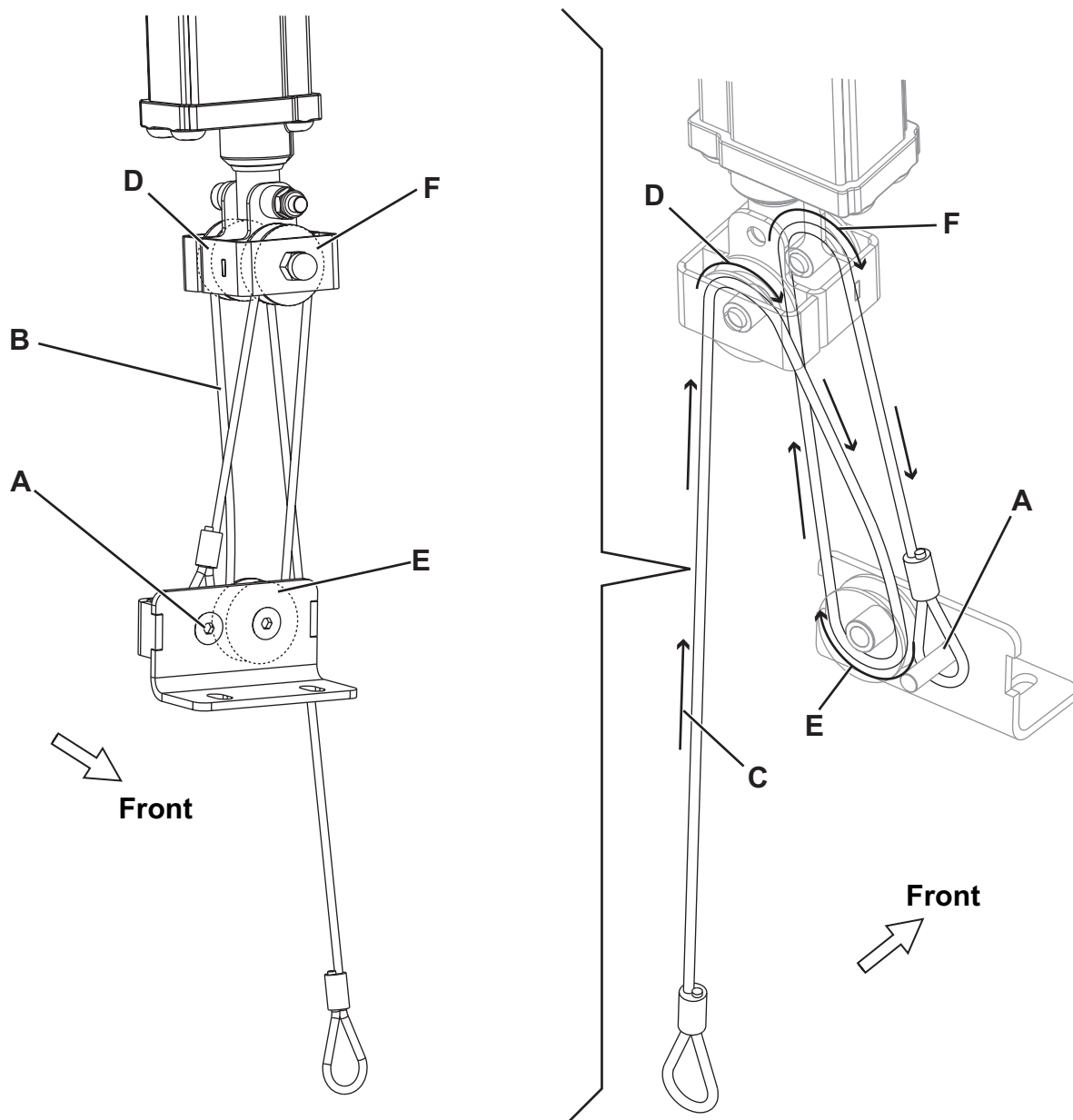
1. Remove the squeegee lifting assembly (see the previous paragraph, steps 1 to 6).
2. At the workbench, remove the screw (A) and recover the nut.
3. Carefully remove the squeegee lifting cable (B) from the pulleys.

**Assembly**

4. Install the lifting cable and note the following:
  - Grease the cable along its entire length with AGIP GR 30 or equivalent grease.
  - Insert the cable in the direction shown by the arrow (C).
  - Route the cable in the pulleys (D), (E) and (F) in sequence.
  - Fasten the cable grommet with the screw (A) and nut.
5. The components must be carefully installed as shown in the figure for the proper operation of the lifting system.
6. Install the squeegee lifting assembly (see the previous paragraph).
7. Check the proper operation of the squeegee lifting system.

**NOTE**

The squeegee lifting system pulleys are self-lubricating and do not require maintenance.



P100386

## RECOVERY WATER SYSTEM

### TROUBLESHOOTING

#### The vacuum system motor does not turn on

Possible causes:

1. The wiring harness between function electronic board and vacuum system motor is damaged (repair).
2. The vacuum system motor carbon brushes are worn (replace).
3. The vacuum system motor is faulty (check the electrical input).
4. The function electronic board (ES1) is damaged (replace).

#### Dirty water vacuuming is insufficient or there is no vacuuming

Possible causes:

1. The vacuum grid with automatic shut-off float is activated because the recovery tank is full (empty the recovery tank).
2. The debris tray is clogged (clean).
3. The vacuum grid with automatic shut-off float is dirty, or the vacuum pre-filter is dirty (clean).
4. The tank cover is not correctly positioned (adjust).
5. The tank cover gasket is not efficient, or the compensating hole is clogged (repair/clean).
6. The vacuum system motor filter is dirty (clean).
7. The squeegee or the vacuum hose is clogged or damaged (clean or repair/replace).
8. The vacuum gaskets are damaged or do not match perfectly (repair or replace).

#### The squeegee leaves lining on the floor or does not collect water

Possible causes:

1. There is debris under the blade (remove).
2. The squeegee blade edges are torn or worn (replace).
3. The squeegee is not balanced (adjust it with the relevant handwheel).

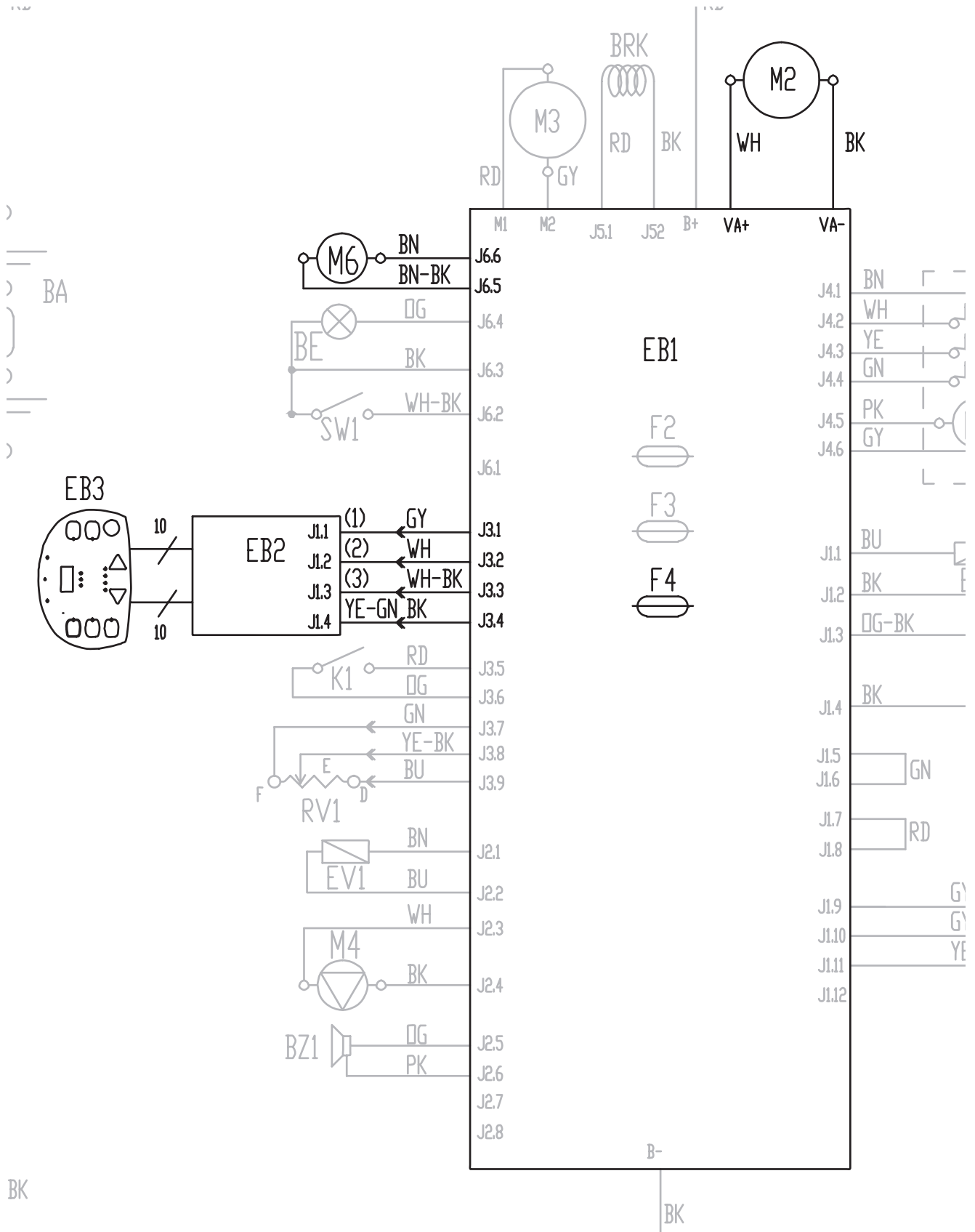
#### The squeegee does not lift/lower

Possible causes:

1. See the Electrical System chapter, function electronic board diagnosis.
2. The cable is broken (replace).
3. The actuator (M6) is faulty (replace).
4. The actuator fuse (F4) is open (replace).

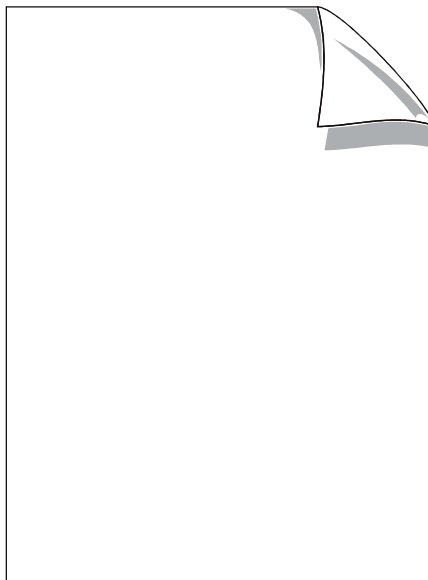
## RECOVERY WATER SYSTEM

## WIRING DIAGRAM



P100387A

## RECOVERY WATER SYSTEM



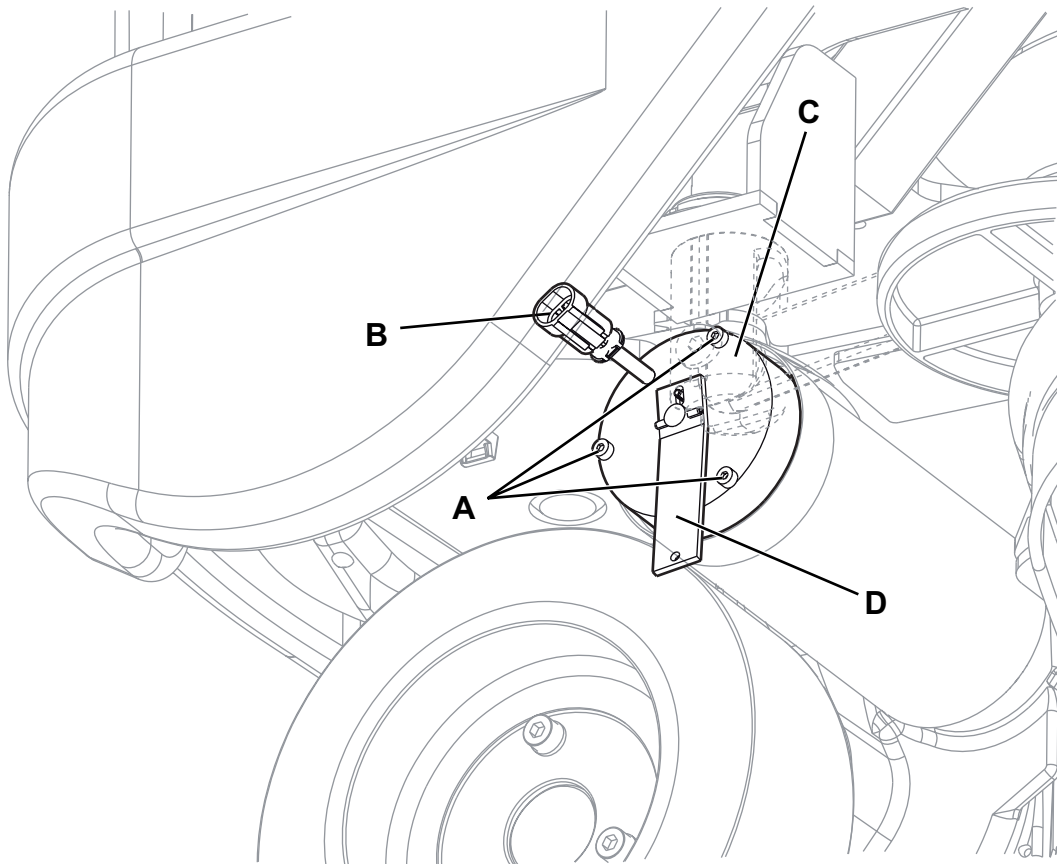


**PARKING BRAKE SYSTEM****PARKING BRAKE SYSTEM****ELECTROMAGNETIC BRAKE DISASSEMBLY/ASSEMBLY****Disassembly**

1. Place the machine on a hoisting system (if available), then lift it. Otherwise, drive the machine on a level floor.
2. Lower the brush deck.
3. Turn the ignition key to "0" and disconnect the batteries.
4. Turn the steering wheel to reach the electromagnetic brake.
5. On the left side of the machine, remove the screws (A) and disconnect the connector (B).
6. Remove the electromagnetic brake (C).

**Assembly**

7. Assemble the components in the reverse order of disassembly, and note the following:
  - Before installing the electromagnetic brake (C) clean it with compressed air.
  - Install the electromagnetic brake with the lever (D) downwards.
8. After installing the electromagnetic brake check the parking brake.



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## PARKING BRAKE SYSTEM

### TROUBLESHOOTING

#### **The brake does not operate**

Possible causes:

1. The electromagnetic brake deactivation lever is turned to unlock position (remove the shim).
2. The braking masses are not efficient (replace the electromagnetic brake).

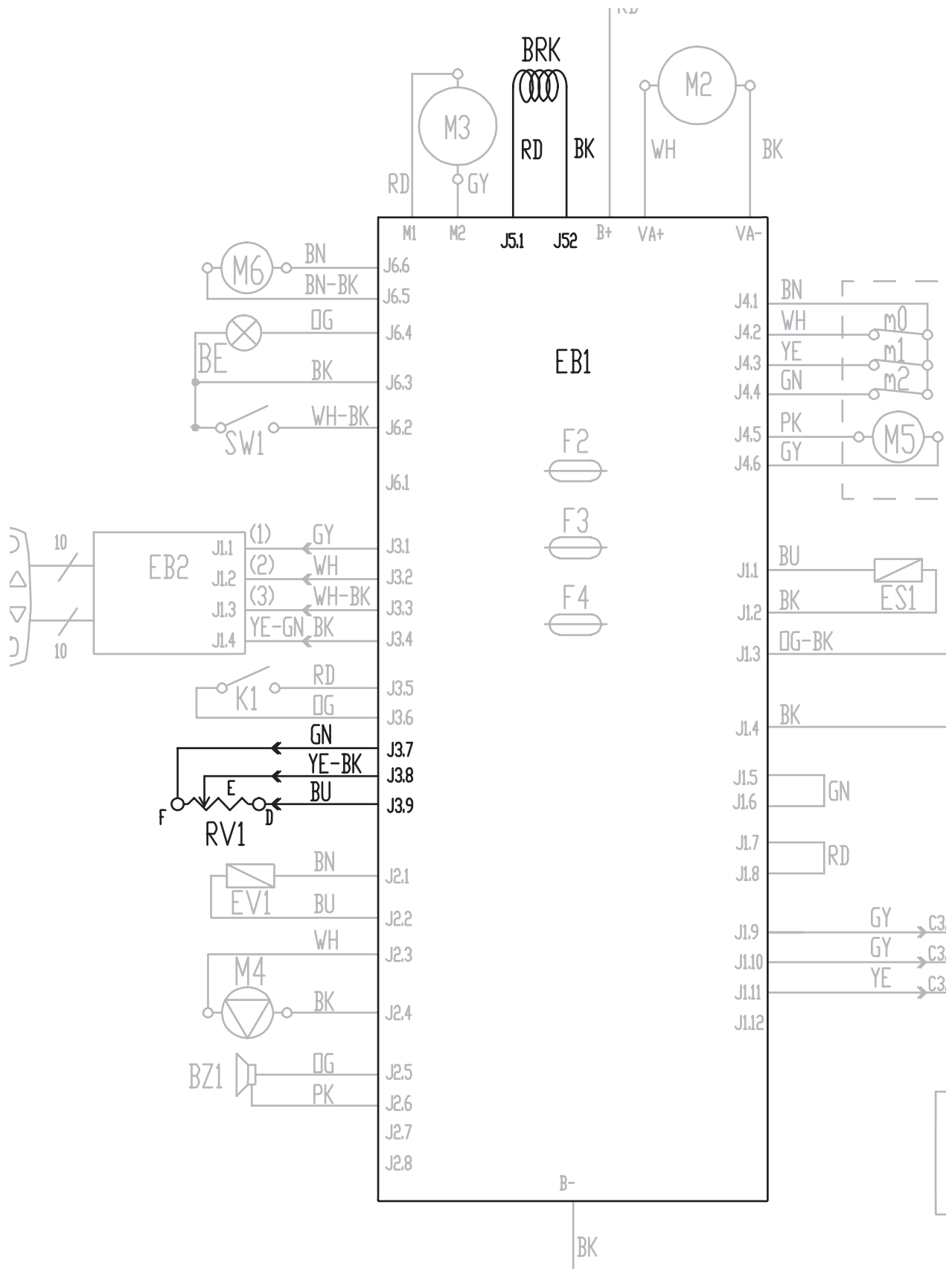
#### **The brake does not activate when pressing the forward/reverse gear pedal**

Possible causes:

1. There is an open in wiring harness between function electronic board and electromagnetic brake (check/repair the wiring harness/electrical connections).
2. The electromagnetic brake (BRK) is faulty (replace).
3. The function electronic board (ES1) is faulty (replace).

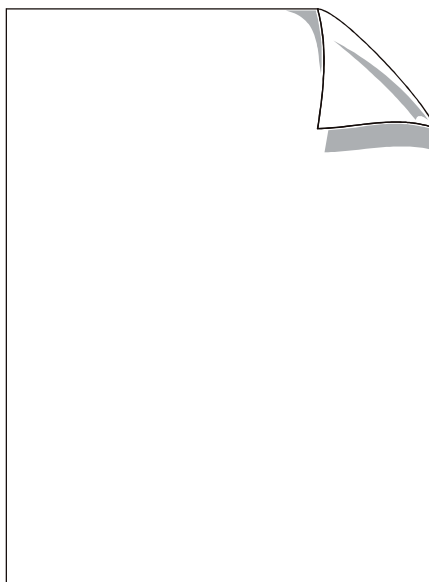
## PARKING BRAKE SYSTEM

## WIRING DIAGRAM



P100389A

## PARKING BRAKE SYSTEM



## DRIVE SYSTEM

### DRIVE SYSTEM MOTOR ELECTRICAL INPUT CHECK

**WARNING!**

*This procedure must be performed by qualified personnel only and with the help of an assistant.*

1. Drive the machine on a level floor.
2. Apply proper wedges to rear wheels, so that the machine cannot move when the front wheel is lifted.
3. Slightly lift the front part of the machine and apply to the frame brackets two proper wooden shims high enough to keep the front wheel lifted for about 3/4" (2 cm) from the floor.

**WARNING!**

*Pay attention to the rotation of the driving wheel when performing the following steps.*

4. Use a jumper wire to disable the driver's seat microswitch.
5. Apply the amperometric pliers on the positive cable (red) of the battery wiring harness.
6. Turn the ignition key (58) to "I".
7. Drive the machine at the maximum forward speed by pressing the pedal (4) and check that the electrical input is 5 - 7 A at 24 V. Release the pedal (4). Turn the ignition key (58) to "0" and remove the amperometric pliers.  
If the electrical input is higher, perform the following procedures to detect and correct the abnormal input:
  - Check if there is dust or debris preventing the wheel rotation.
  - If necessary, check if the electromagnetic brake slows down the wheel when the drive system motor is operating (remove the electromagnetic brake and repeat the electrical input check (see the procedure in the relevant paragraph)).
  - If necessary, check the motor carbon brushes (see the procedure in the relevant paragraph).
  - If necessary, disassemble the motor (see the procedure in the relevant paragraph), and check the condition of all its components.

If the above-mentioned procedures do not lead to a correct electrical input, the motor must be replaced (see the procedure in the relevant paragraph).

## DRIVE SYSTEM

### DRIVE SYSTEM MOTOR CARBON BRUSH CHECK/REPLACEMENT

#### Check and replacement

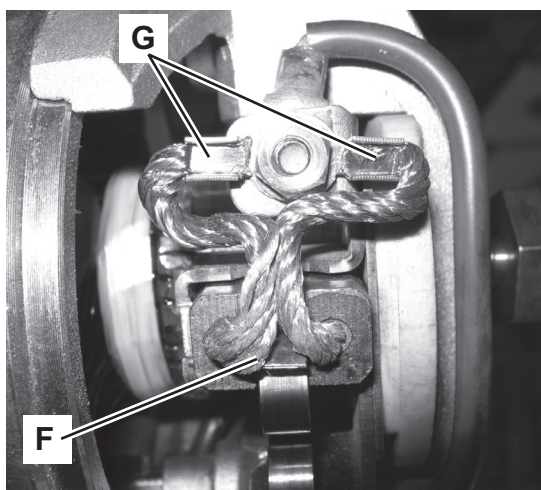
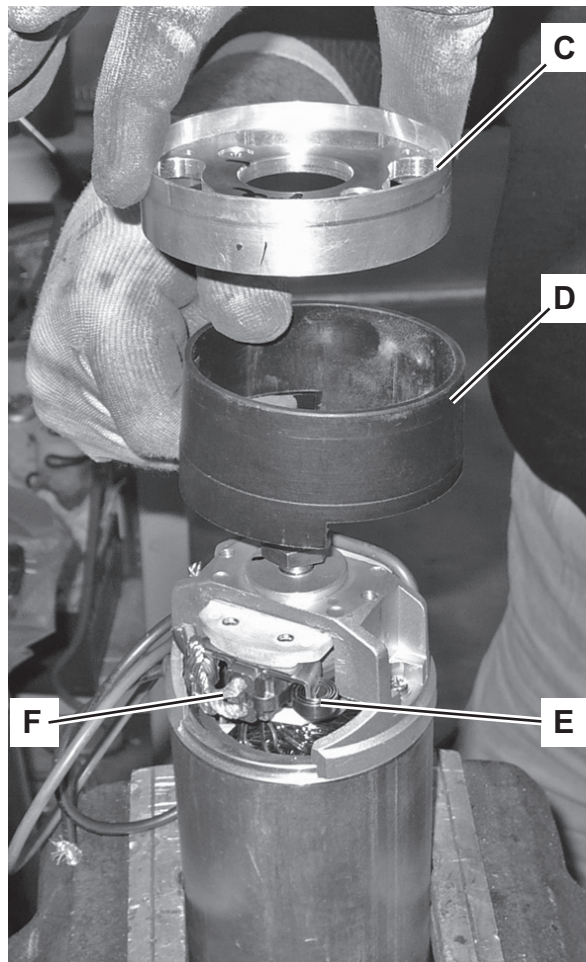
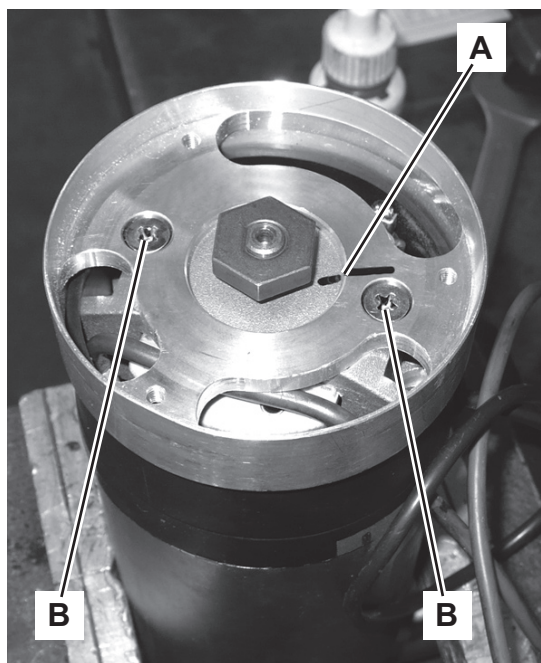
1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Remove the electromagnetic brake (see the procedure in the relevant paragraph).
4. Remove the drive system motor (see the procedure in the relevant paragraph).
5. At the workbench, with indelible pen mark the installation position of the flange on the drive system motor (A).
6. Remove the screws (B), the flange (C) and the plastic ring (D).
7. Disengage the thrust spring (E) and remove the 2 carbon brushes (F).
8. Check the carbon brushes for wear.

The carbon brushes are worn when the contact with the motor armature is insufficient, the contact surface is not even, the thrust spring is broken, etc.

If necessary, replace the carbon brushes.

#### Reset

9. Assemble the components in the reverse order of disassembly, and note the following:
  - Clean (with compressed air) the area around the carbon brushes and the removed components.
  - Assemble the carbon brushes (F) with the cables (G) positioned as shown in the figure.
  - Install the flange (C) on the drive system motor using the mark (A) as reference.



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**DRIVE SYSTEM MOTOR DISASSEMBLY/ASSEMBLY****Disassembly**

1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Under the driving wheel assembly, disconnect the drive system motor and electromagnetic brake connections (A).
4. Remove the electromagnetic brake (see the procedure in the relevant paragraph).
5. Remove the driving wheel assembly (see the procedure in the relevant paragraph).
6. At the workbench, with indelible pen mark the installation position of the motor on the gear box (B).
7. Remove the screws (C) and carefully remove the drive system motor (D).
8. Check the oil seal gasket (E) for wear. In case of oil leaks between the drive system motor and the gear box, replace the oil seal as indicated below.

**Oil seal replacement**

9. Remove the screw (F) and recover the washer.
10. Carefully remove the gear (G) from the motor pin (I).
11. Remove and replace the oil seal gasket (H).
12. Rub the pin (I) of the drive system motor with 400 grit sand paper. Clean the pin with thinner.
13. Apply **Loctite 542** on the pin (I) and on the gear (G), then install.
14. Apply strong threadlock on the threads of the screw (F), then tighten the screw at 7,4 ftlbs (10 Nm).

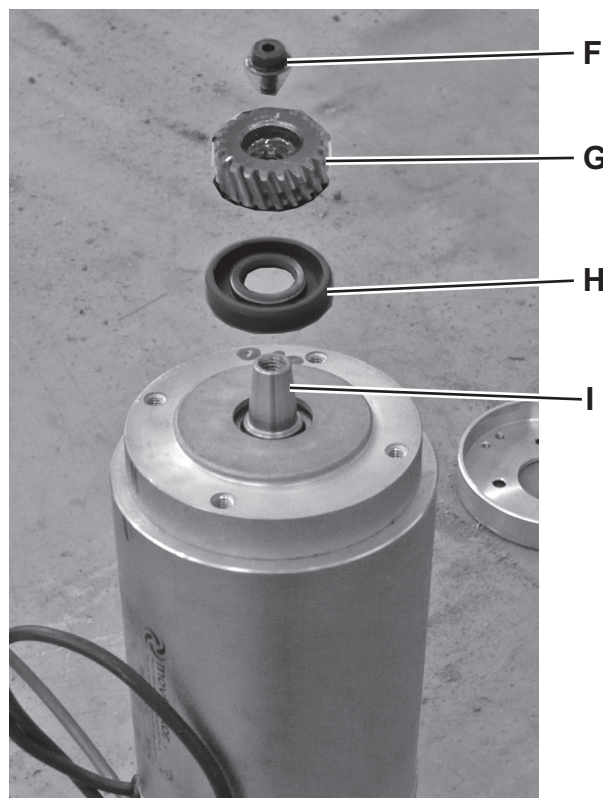
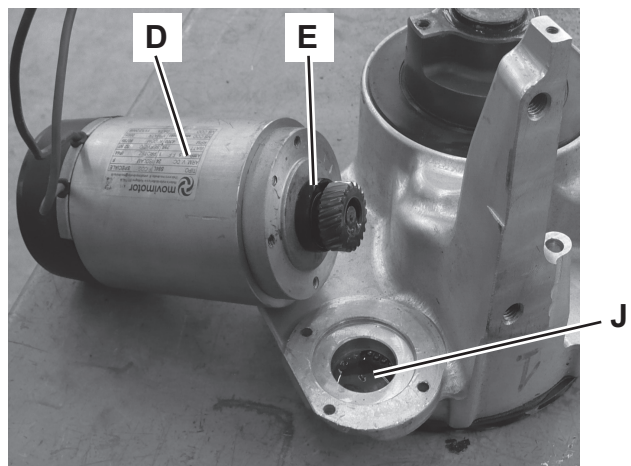
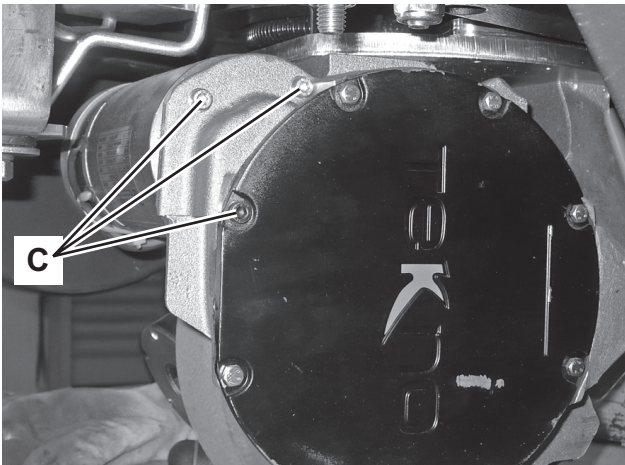
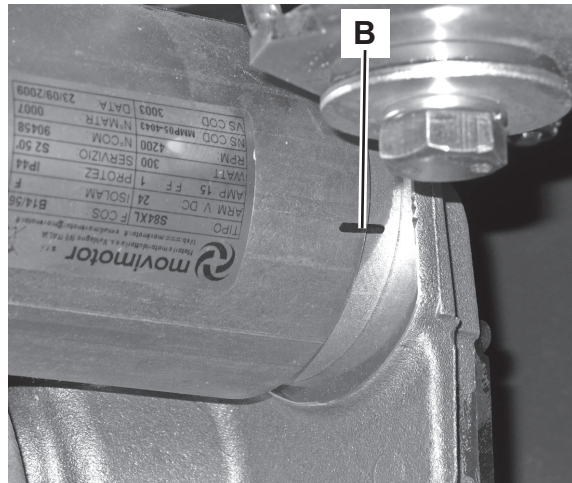
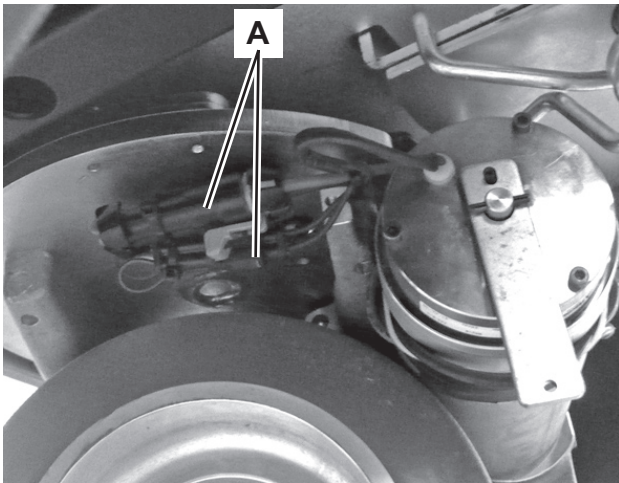
**Assembly**

15. Assemble the components in the reverse order of disassembly, and note the following:
  - Check the oil level in the hole (J) of the gear box. If necessary, top up with SAE 80W/90 oil.
  - Install the drive system motor on the gear box motor using the mark (B) as reference.



# DRIVE SYSTEM

## DRIVE SYSTEM MOTOR DISASSEMBLY/ASSEMBLY (Continues)



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## DRIVING WHEEL DISASSEMBLY/ASSEMBLY

**WARNING!**

*This procedure must be performed by qualified personnel only and with the help of an assistant.*

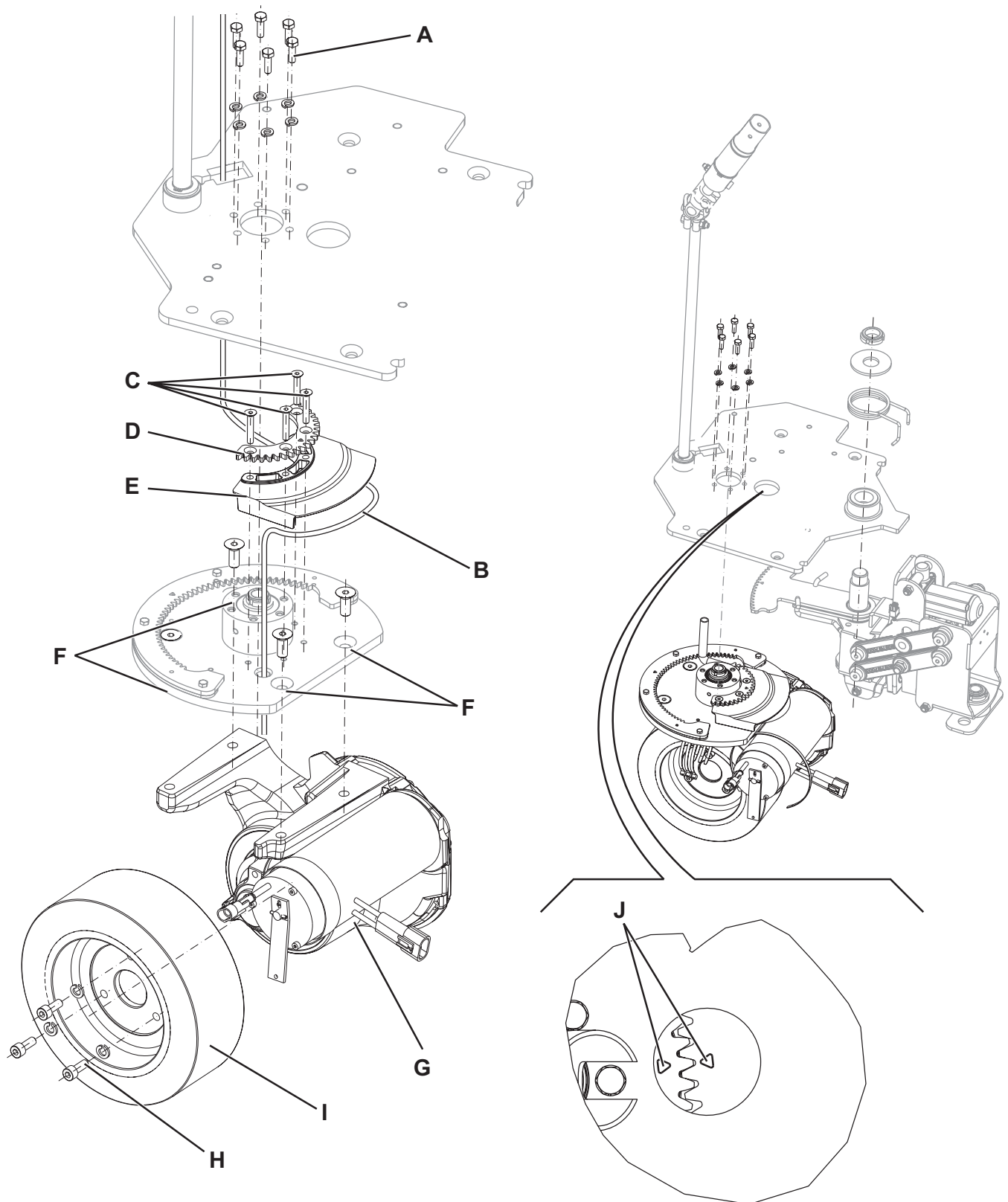
1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Remove the machine foot board (see the procedure in the relevant paragraph).
4. Apply proper wedges to rear wheels, so that the machine cannot move when the front side is lifted.
5. Lift the front part of the machine and apply to the frame front sides two proper wooden shims high enough to keep the front wheel lifted for about 4 in (10 cm) from the floor.
6. Under the driving wheel assembly, disconnect the drive system motor and electromagnetic brake connections.
7. Remove the screws (A) and recover the washers.
8. Carefully lower the driving wheel assembly with steering, paying attention to the wiring harness (B).
9. Remove the screws (C), then remove the main gear (D) and the wiring harness shield (E). Note the wiring harness routing under the shield (E), for proper reassembly.
10. Remove the screws (F) and remove the driving wheel (G).
11. Remove the screws (H), recover the washers and remove the wheel (H).

**Assembly**

12. Assemble the components in the reverse order of disassembly, and note the following:
  - Tighten the screws (H) at 11,8 ftlbs (16 Nm).
  - When installing the driving wheel assembly, the gears must be coupled with the straight wheel and the arrows (J) aligned as shown in the figure.
  - Tighten the screws (F, C and A) at 16,21 ftlbs (22 Nm).

# DRIVE SYSTEM

## DRIVING WHEEL DISASSEMBLY/ASSEMBLY (Continues)



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## DRIVER'S SEAT SAFETY MICROSWITCH REPLACEMENT

### Disassembly

1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Lift the recovery tank assembly (19) and remove the driver's seat mounting screws.
4. Disconnect the microswitch connector.
5. Lift the recovery tank cover (20) and remove the remaining driver's seat mounting screws.
6. Remove the driver's seat, remove the wiring harness from the hole and then remove the driver's seat microswitch by peeling off the adhesive.

### Assembly

7. Assemble the components in the reverse order of disassembly.
8. Check that the machine cannot be started when the operator is not on the driver's seat (17).

## TROUBLESHOOTING

### The machine does not move

Possible causes:

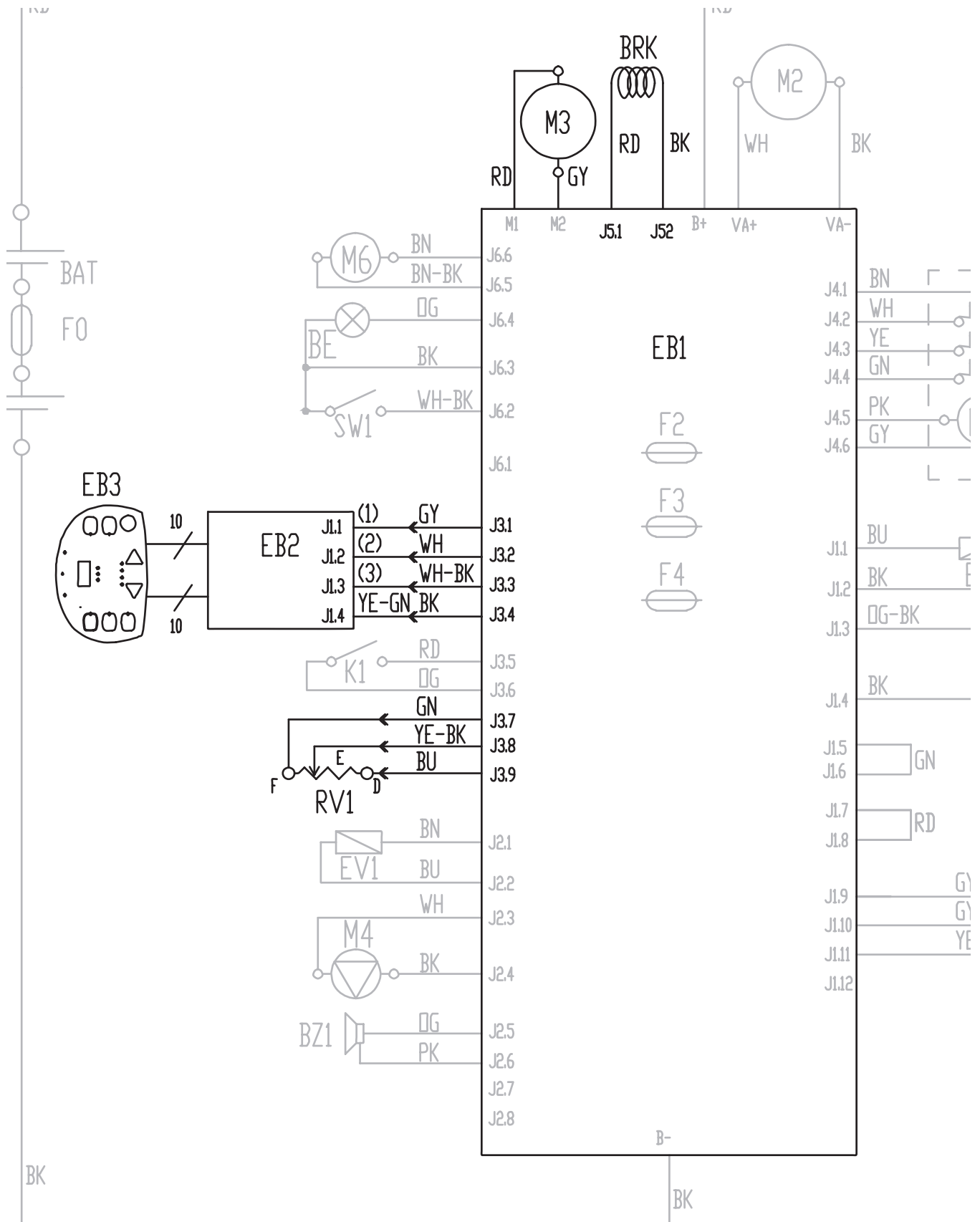
1. The battery voltage is too low (charge the battery).
2. The drive pedal potentiometer (4) is misadjusted or broken (adjust or replace) (RV1).
3. The function electronic board (EB1) is faulty (replace).
4. The wiring harness is damaged (check all connections inside the electrical component compartment, included those of the function electronic board).
5. The drive system motor carbon brushes are worn (replace).
6. The drive system motor (M3) is faulty (replace).
7. The driver's seat microswitch is faulty (repair/replace).
8. The parking brake cannot be disengaged (see the Parking Brake chapter).
9. There is an open in the function electronic board fuse (F2) (replace).
10. The function electronic board (EB1) is faulty (see the Electrical System chapter).

### FUNCTION ELECTRONIC BOARD ERROR CODES

The function electronic board error codes indicate the drive system faults (see the Function Electronic Board Error Codes paragraph).

## DRIVE SYSTEM

## WIRING DIAGRAM



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## OTHER SYSTEMS

### SCREW AND NUT TIGHTENING CHECK

1. Drive the machine on a level floor with the recovery tank empty.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Carefully lift the tank assembly.
4. Then check:
  - Tightening of mounting screws and nuts
  - Correct position of fasteners
  - Visible faults in the components
  - Leaks
5. Carefully lower the tank assembly.

### FRONT FAIRING DISASSEMBLY/ASSEMBLY

#### Disassembly

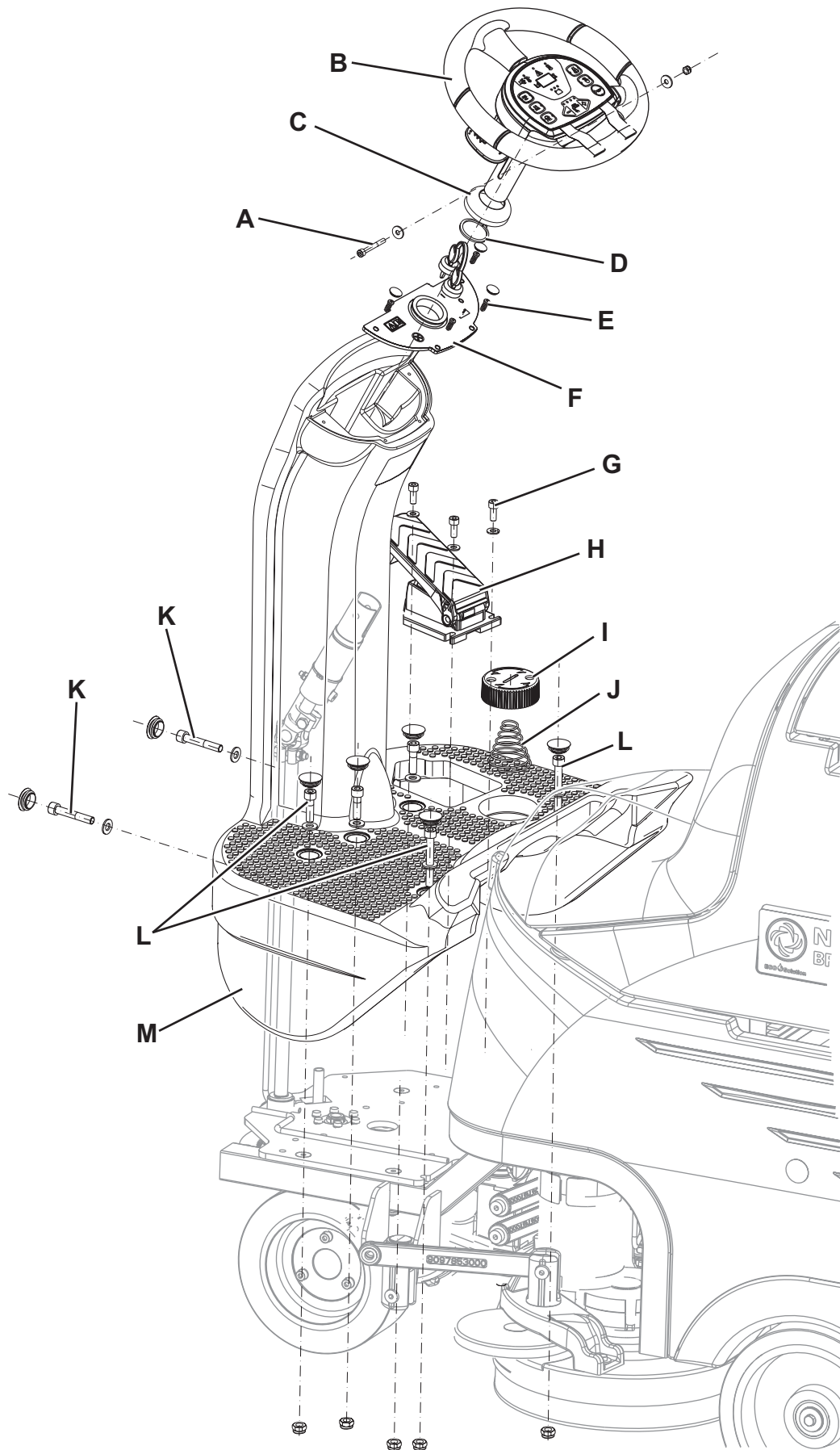
1. Drive the machine on a level floor with the recovery tank empty.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Unscrew the steering wheel screw (A).
4. Remove the steering wheel assembly (B), disconnect the wiring harness connection.
5. Remove the cover (C), then remove the Seeger ring (D).
6. Remove the caps, the screws (E) and the steering wheel plate (F).
7. Disconnect the ignition switch wiring harness.
8. Remove the screws (G), recover the washers, disconnect the wiring harness and then remove the drive pedal (H).
9. Remove the adjustable heel support (I) and recover the spring (J).
10. Remove the caps, the screws (K) on the machine front and recover the washers.
11. Remove the caps, the screws (L) on the machine foot board and recover the washers and the nuts.
12. Carefully remove the front fairing (M).

#### Assembly

13. Assemble the components in the reverse order of disassembly.

## OTHER SYSTEMS

## FRONT FAIRING DISASSEMBLY/ASSEMBLY (Continues)



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**ELECTRICAL SYSTEM****ELECTRICAL SYSTEM****MACHINE WORKING HOUR CHECK**

1. Turn the ignition key (A) to "I".
2. In the first 2 seconds of machine operation, the display (B) shows the total number of working hours (ignition key to "I") performed by the machine.
3. Turn the ignition key (A) to "0".

It is possible to check the working hours performed by the machines through specific hour counters for: DRIVE SYSTEM, BRUSHES, VACUUM SYSTEM (see Display of Current Values of Significant Variables, Hour Counters and Stored Alarms paragraph).

**CHARGE CONDITION DISPLAY**

	INDICATION	TRANSITION THRESHOLD (VOLT)		CONSEQUENCE
		WET	GEL	
1	GREEN LED: fixed - YELLOW LED: fixed	22 V	22.2 V	-
2	YELLOW LED: fixed - RED LED: flashing	20.4 V	21.6 V	Brushes OFF
3	Safety threshold	19.4 V	20.6 V	Vacuum system OFF
4	Drive threshold	18.4 V	19.6 V	Drive system OFF

## ELECTRICAL SYSTEM

### BATTERY TYPE SETTING (WET OR GEL/AGM)

Set the electronic board of the machine and the battery charger (optional) according to the type of batteries installed (WET or GEL/AGM) as shown below:

1. Turn the ignition key (A) to "I" and, in the very first seconds of machine operation, detect the current setting by counting the number of flashes of the battery warning lights (B), as shown in the following table:

SETTING	DISPLAY (E)	BATTERY WARNING LIGHT INDICATION (B)	BATTERY TYPE	CHARGING CURRENT
1	WET 20A	4 flashes of the red warning light	WET	STANDARD
2	GEL 20A	4 flashes of the green warning light	GEL-AGM	
3	GEE 20A	4 flashes of the yellow warning light	GEL EXIDE® type	
4	WET 15A	2 flashes of the red warning light	WET	REDUCED (see note)
5	GEL 15A	2 flashes of the green warning light	GEL-AGM	
6	GEE 15A	2 flashes of the yellow warning light	GEL EXIDE® type	

2. If the setting is to be changed, perform the following procedure.
3. Turn off the machine by turning the ignition key (A) to "0".
4. Press and hold the switches (C) and (D) at the same time, then turn the ignition key (A) to "I".
5. Release the switches (C) and (D) at least 5 seconds after starting the machine.
6. Within 3 seconds, shortly press the switch (D) to go to the next setting (1 to 6 in cyclic sequence).



#### NOTE

When performing steps 5 and 6, the settings are shown on the display (E) too, by the code in the table.



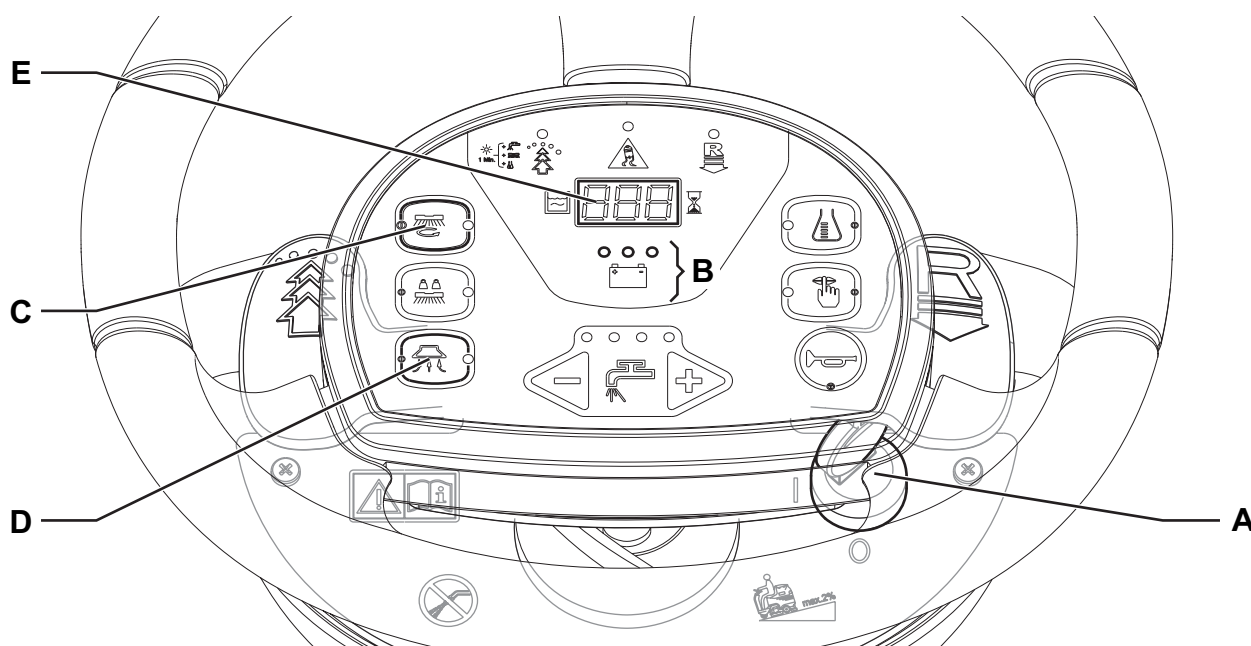
#### NOTE

When using batteries with a capacity lower than 160Ah@5h (in case of doubt, refer to the battery documents), to avoid battery overheating during charging procedure, use the REDUCED charging current with setting 4, 5 or 6 shown in the table, according to the type of batteries installed.



#### NOTE

The battery charger (optional) must be set according to the type of batteries.

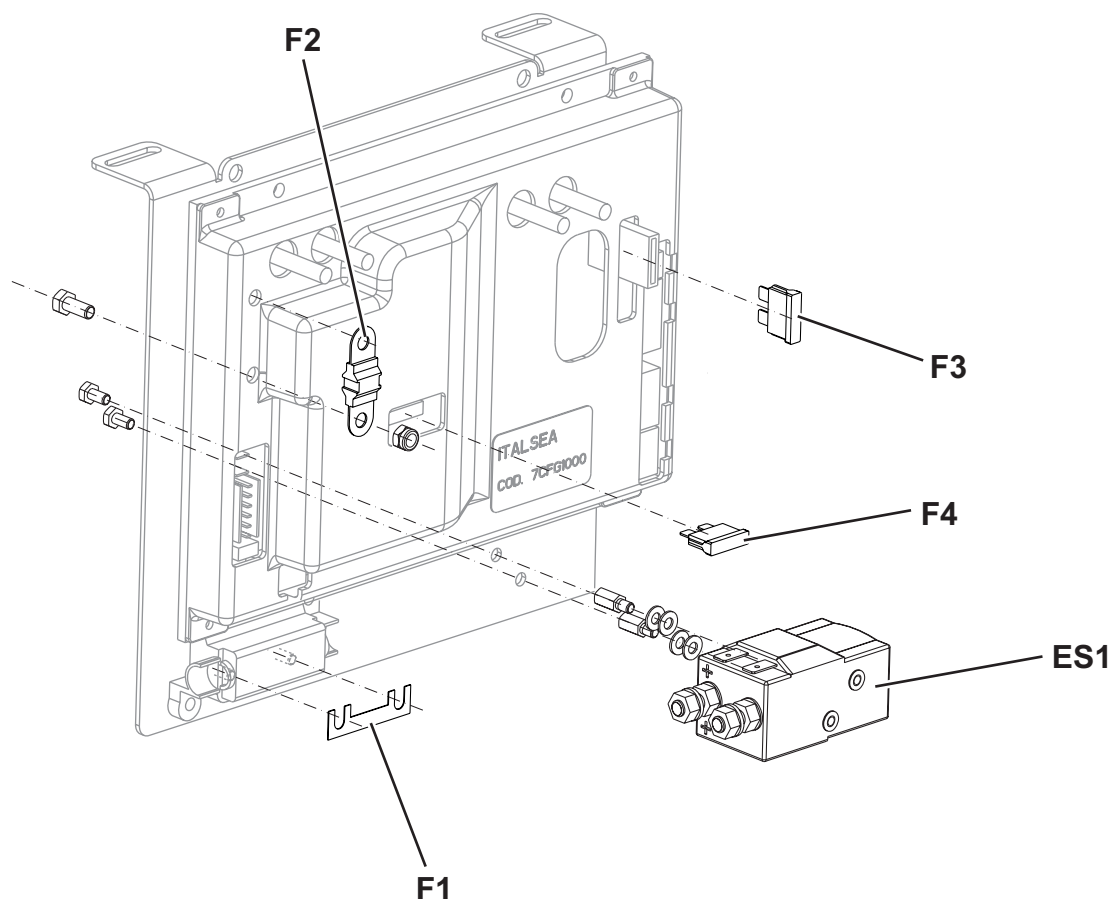


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**ELECTRICAL SYSTEM****FUSE AND ELECTROMAGNETIC SWITCH CHECK/REPLACEMENT**

1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Remove the screws and remove the electronic component compartment cover (43).
4. Remove the mounting screws of the function electronic board assembly and remove it from the housing.
5. Check/replace the following fuses:
  - (F1) 50A fuse - Brush motors.
  - (F2) 100A MIDI fuse - Function electronic board (drive and vacuum system).
  - (F3) 3A blade fuse - Signal circuit.
  - (F4) 15A blade fuse - Deck and squeegee lifting actuator.
6. Further move the function electronic board assembly to remove the electromagnetic switch (ES1).
7. Place the function electronic board assembly in its housing, tighten the mounting screws and install the electronic component compartment cover (43).



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## ELECTRICAL SYSTEM

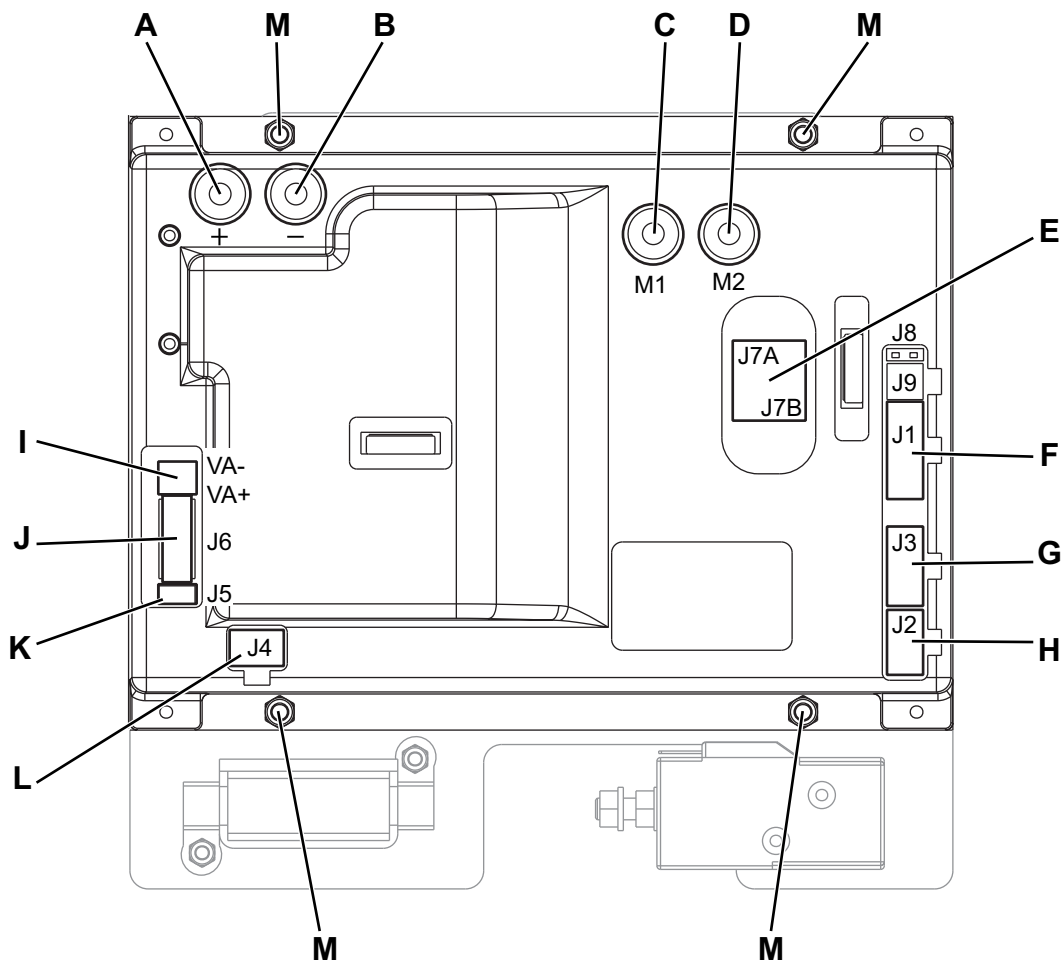
### FUNCTION ELECTRONIC BOARD LAY-OUT AND DISASSEMBLY/ASSEMBLY

#### Disassembly

1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Remove the screws and remove the electronic component compartment cover (43).
4. Remove the mounting screws of the function electronic board assembly and carefully remove it from the housing.
5. Disconnect the following connections sequentially:
  - (A) and (B) Power supply connection (+) and (-).
  - (C and D) Driving wheel connection (M1) and (M2).
  - (E) Pressure switch module connection (J7A and J7B).
  - (F) Electrical component wiring harness connection (J1).
  - (G) Foot board wiring harness connection (J3).
  - (H) Frame wiring harness connection (J2).
  - (I) Vacuum system wiring harness connection (VA+ and VA-).
  - (J) Recovery tank wiring harness connection (J6).
  - (K) Electromagnetic brake wiring harness connection (J5).
  - (L) Brush deck actuator wiring harness connection (J4).
6. Remove the function electronic board mounting screws (M) from the plate.

#### Assembly

7. Assemble the components in the reverse order of disassembly.



## ELECTRICAL SYSTEM

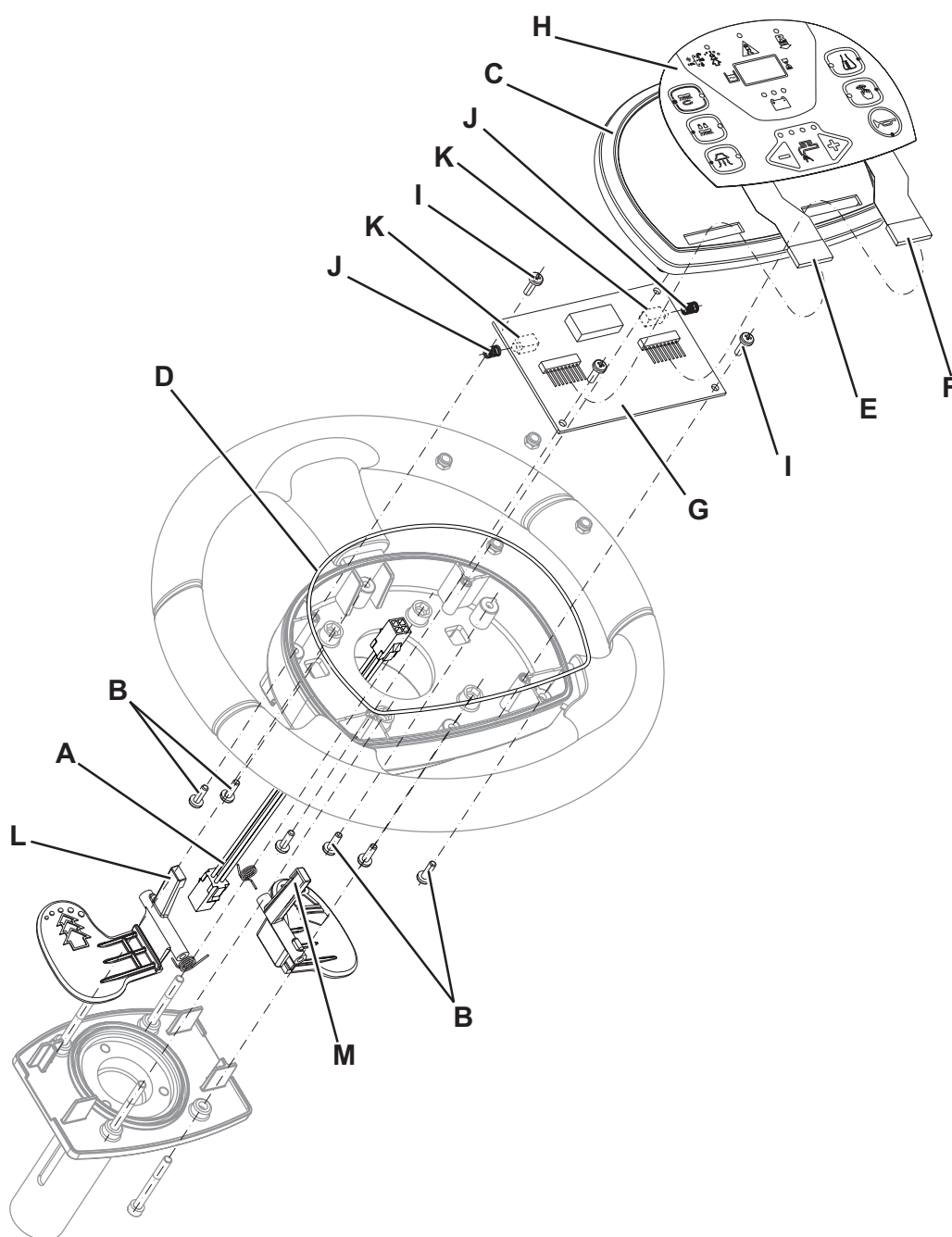
## DISPLAY ELECTRONIC BOARD AND DASHBOARD ELECTRONIC BOARD REPLACEMENT

## Disassembly

1. Drive the machine on a level floor.
2. Turn the ignition key to "0" and disconnect the batteries.
3. Unscrew the steering wheel height control lever (2) and disconnect the wiring harness connection (A).
4. At the workbench, remove the screws (B), the cover (C) and recover the gasket (D).
5. Disconnect the flat connections (E) and (F) of the display electronic board (G) to the dashboard electronic board (H).
6. Remove the screws (I), remove the display electronic board (G) and recover the springs (J) of the microswitches (K).

## Assembly

7. Assemble the components in the reverse order of disassembly, and note the following:
  - Install the display electronic board (G) and check the proper operation of springs (J), microswitches (K) and levers (L and M).
  - Install the dashboard electronic board (H) by carefully attaching it to the cover (C) and paying attention to the routing of the flat connections (E) and (F) in the cover slots.



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## ELECTRICAL SYSTEM

### TROUBLESHOOTING

See the other chapters related to the use of the electrical system.

Other possible causes:

1. The batteries are discharged or the connections are not efficient (charge the batteries or clean the connections).
2. The batteries are broken (check the battery no-load voltage).



#### NOTE

*A damage to the battery charger or its connections can prevent the machine from operating properly.*

3. The battery charger is broken (replace).
4. There is an open in the fuses (replace).
5. The wiring harness is cut or pressed or short circuited (repair).

## ELECTRICAL SYSTEM

## FUNCTION ELECTRONIC BOARD ERROR CODES

The function electronic board indicates a series of alarms in case of malfunction of one or more systems, and in case of abnormal conditions detected in the input signals.

The alarms are shown on the display (71) (except "F6") by 2 signs following each other: "AL" and "XX", where XX is the alarm code (see the descriptions in the following tables).

Also, the alarms are repeated (in case of display malfunction) by the diagnostic LEDs (yellow and red) on the electronic board, as described in the following tables.

General Alarms (YELLOW LED + RED LED FLASHING)			
Alarm Code = No. of flashes	Meaning	Condition	Effect
G2	EEPROM error	EEPROM error	Function block + Default setting reset
G3	General thermal protection	Heatsink temperature > 90 °C	Function block
G4	Blown F2 fuse	V > 1V on F2	Function block
G5	Wrong KEY sequence	Wrong key sequence	Function block
G6	No signal from BATTERY CHARGER	No signal from battery charger	The charging battery phase is not shown
G7	Undervoltage	B+ - B- < THRESHOLD2 for t > 10"	Function block
G8	Serial communication error with dashboard electronic board	No signal or decoding error	No block
G9	Battery voltage drop	DeltaV (neg.) > 3V on battery voltage	Drive system + electromagnetic brake block

Function Alarms (RED LED FLASHING)			
Alarm Code = No. of flashes	Meaning	Condition	Effect
F2	BRUSH motor amperometric protection	Voltage higher than the safety threshold	Brush electromagnetic switch output block
F3	VACUUM SYSTEM amperometric protection	Vacuum system abnormal electrical input > 30A for T > 10s	Vacuum system block
F4	DECK ACTUATOR position irregularity	End-of-stroke microswitch configuration not plausible or end-of-stroke not reached within 10"	Deck actuator block
F5	VACUUM SYSTEM power section damage	CC MOSFET	Vacuum system block
F6	PRESSURE SWITCH signal fault	Pressure switch Vout > 4.0V	Water level visualisation missing + water flow and % detergent management fault
F7	VACUUM SYSTEM output short circuit	I > 2 * 50A	Vacuum system block
F8	Function general relay fault	Always closed / opened	Function block

All "general" and "function" alarms, and their relevant effects remain until reset from KEY input. In case of simultaneous errors, the one with greater priority is shown first (priority order is opposite to the number of flashes).

## ELECTRICAL SYSTEM

### FUNCTION ELECTRONIC BOARD ERROR CODES (Continues)

Drive system alarms (YELLOW LED FLASHING)		
Alarm Code and No. of flashes	Meaning	Condition
<b>t2</b>	Amperometric protection intervention	$I > \text{rated current for } t > \text{protection time}$
<b>t3</b>	Electromagnetic brake not present	Res. J5.1-J5.2 > 1k
<b>t4</b>	Pedal input activated by ignition	J3.8 > DEADL on ascend. front J3.6
<b>t5</b>	Drive system power section damage	CC MOSFET
<b>t6</b>	Pedal input not admitted	Res. J3.7-J3.9 > 10k or J3.8 > J3.7
<b>t7</b>	Overcurrent (motor D.C.)	$I > 1.5 * I_{MAX}$
<b>t8</b>	Drive system relay fault	Contacts always opened/closed

All the drive system alarms activates to cut off the power supply to the driving wheel motor (not to the ELECTROMAGNETIC BRAKE), until reset from KEY input (except alarm t4 which is reset as soon as J3.8 < DEADL). In case of simultaneous errors, the one with greater priority is shown first (priority order is opposite to the number of flashes).

Other alarm indications on the display		
DISPLAY	Meaning	Condition
<b>“---”</b>	Water level signal missing or not as specified	Pressure switch module signal > 4.0V or floating
<b>“888”</b>	Serial communication problem between dashboard electronic board and function electronic board	Signal missing or errors
<b>Off</b>	Dashboard electronic board power supply missing	J1.1 – J1.4 < 12V

**ELECTRICAL SYSTEM****BLACK-BOX: RECORD OF ALARMS, BATTERY MANAGEMENT PARAMETERS, PARTIAL HOUR COUNTER**

The data indicated in the following table (ALARMS, BATTERY MANAGEMENT DATA) are stored in the non-volatile memory of the electronic board and can be recalled and displayed by the external programmer (ITALSEA UNIVERSAL PROGRAMMER, NILFISK P/N 9097297000) connect to port J9. For each stored datum (event) the value HOURS.MINUTES of the TOTAL hour counter is associated when the alarm occurred. The last 20 events are stored. When the total number of events is used up, the next events overwrite the older ones.

The data are shown on the programmer display, listed by decreasing order (starting from the latest) as: DATUM - HOUR (1 per page). The UP and DOWN buttons are used to select 1 page at a time. All the stored paged can be scrolled. The "info" button shows the DATUM - EVENT DESCRIPTION for the selected line.

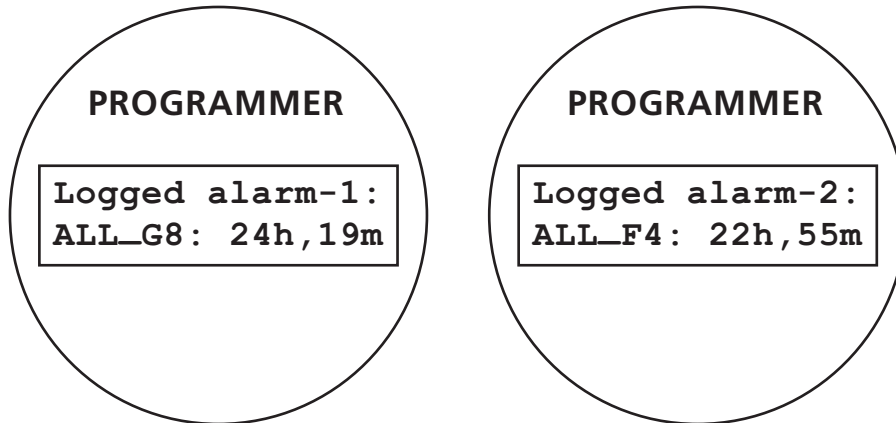
DATUM	EVENT DESCRIPTION	Condition
<b>G2</b>	EEPROM error	See alarm code description
<b>G3</b>	General thermal protection	See alarm code description
<b>G4</b>	Blown F2 fuse	See alarm code description
<b>G5</b>	Wrong KEY sequence	See alarm code description
<b>G6</b>	No signal from BATTERY CHARGER	See alarm code description
<b>G7</b>	Battery undervoltage	See alarm code description
<b>G8</b>	Serial communication error with dashboard electronic board	See alarm code description
<b>G9</b>	Battery voltage drop	See alarm code description
<b>F2</b>	Brush motor protection intervention	See alarm code description
<b>F3</b>	VACUUM SYSTEM overcurrent	See alarm code description
<b>F4</b>	DECK ACTUATOR position irregularity	See alarm code description
<b>F5</b>	VACUUM SYSTEM power section damage	See alarm code description
<b>F6</b>	PRESSURE SWITCH signal fault	See alarm code description
<b>F7</b>	VACUUM SYSTEM output short circuit	See alarm code description
<b>F8</b>	Function general relay fault	See alarm code description
<b>t2</b>	Drive system amperometric protection intervention	See alarm code description
<b>t3</b>	Electromagnetic brake not present	See alarm code description
<b>t5</b>	Drive system power section damage	See alarm code description
<b>t6</b>	Pedal input not admitted	See alarm code description
<b>t7</b>	Drive system overcurrent	See alarm code description
<b>t8</b>	Drive system relay fault	See alarm code description
<b>GB-N</b>	Time of continuous use with discharged batteries	N = Number of hours from the ignition with KEY to switching off with B+ - B- < THRESHOLD2, if > 10 min.
<b>GC</b>	Charging cycle interrupted before completion	Battery charger disconnection before PHASE IV (= with red or yellow LED on)
<b>GD-N</b>	Charging phase duration	N = Number of hours from battery charger connection to completion of PHASE II (red LED on) if < 4

## ELECTRICAL SYSTEM

### BLACK-BOX: RECORD OF ALARMS, BATTERY MANAGEMENT PARAMETERS, PARTIAL HOUR COUNTER (Continues)

#### EXAMPLE 1:

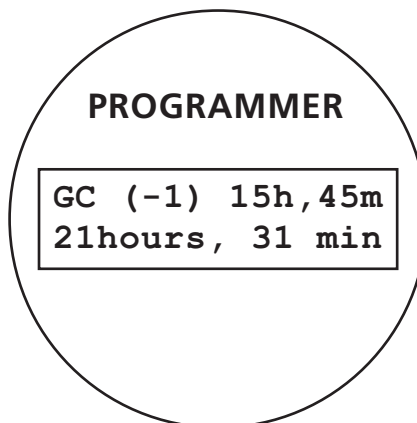
Last stored alarm: alarm G8 occurred when the machine working hours were 24h and 19m, next to last stored alarm: alarm F4 occurred when the machine working hours were 22h and 5m.



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#### EXAMPLE 2:

Charging cycle interrupted before completion when the machine working hours were 15h and 45m (last stored event).

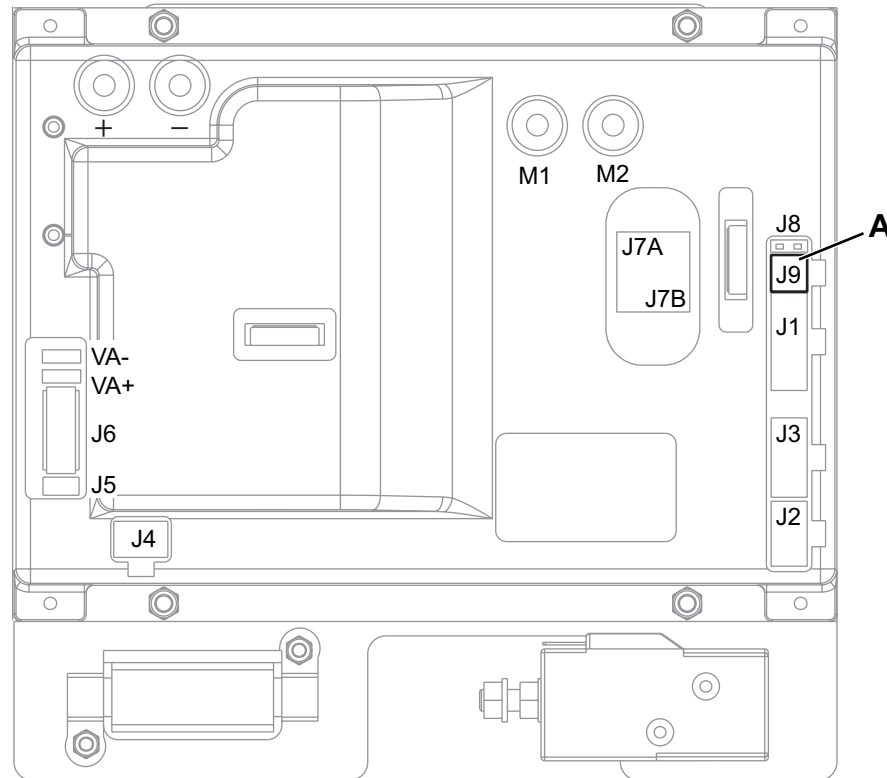


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**ELECTRICAL SYSTEM****DISPLAY OF CURRENT VALUES OF SIGNIFICANT VARIABLES, HOUR COUNTERS AND STORED ALARMS**

1. Turn the ignition switch to "0".
2. Open the electrical component compartment.
3. Connect the ITALSEA programmer, NILFISK P/N 9097297000 to the function electronic board connector J9 (A).
4. Turn the ignition switch to "I".
5. Scroll with the UP and DOWN buttons the pages in the order shown in the table below.



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Variable description	Value meaning
<b>Software Release</b>	Software version loaded on the electronic board
<b>Supply Voltage</b>	Battery voltage (V)
<b>Ref. Voltage</b>	Drive pedal input voltage (V)
<b>Drive Motor Voltage</b>	Drive system motor output voltage (V)
<b>Drive Motor Current</b>	Drive system motor current (A)
<b>Brushes Current</b>	Brush deck motor current (mV) (*)
<b>Vacuum Current</b>	Vacuum system motor current (A)
<b>Heatsink Temp.</b>	Temperature detected on the electronic board heatsink (°C)
<b>Hour counter: total</b>	TOTAL HOUR COUNTER (h.min)
<b>Hour counter: drive system</b>	DRIVE SYSTEM HOUR COUNTER (h.min)
<b>Hour counter: brushes</b>	BRUSH HOUR COUNTER (h.min)
<b>Hour counter: vacuum</b>	VACUUM SYSTEM HOUR COUNTER (h.min)
<b>Logged Alarm-N</b>	ALARM STORAGE (possible) (**)

(\*) The value is the same as the voltage drop on the F1 fuse, which is proportional to the current but does not have the same value in Amp.

(\*\*) See BLACK-BOX paragraph

## ELECTRICAL SYSTEM

### DISPLAY AND CHANGE OF PARAMETERS WHICH CAN BE SET BY THE USER

1. Turn the ignition switch to "0".
2. Open the electrical component compartment.
3. Connect the programmer to the function electronic board connector J9 (see figure).
4. Turn the ignition switch to "I".
5. Press the MODE button.
6. Scroll the parameters with the UP and DOWN buttons to find the one to be changed.
7. Press the MODE button to enter the "change" mode (the parameter starts to flash).
8. Change the value with the UP and DOWN buttons.
9. Store the new set value by pressing the MODE button.

### FUNCTION ELECTRONIC BOARD PARAMETER

Parameters which can be set through programming port J9				
Code	Description	Min.	default *	max. values
<b>VRID</b>	Vacuum system partial supply voltage (V)	10	<b>16</b>	20
<b>VS1</b>	Brush motor protection threshold 1 (mV)	30	<b>50</b>	90
<b>VS2</b>	Brush motor protection threshold 2 (mV)	30	<b>60</b>	90
<b>DT</b>	Deck actuator m1 microswitch delay (ms)	0	<b>0</b>	10
<b>SPT</b>	SPOT function timer (s)	5	<b>60</b>	300
<b>DEADL</b>	Drive pedal bottom dead area (V)	0.0	<b>0.9</b>	1.5
<b>DEADH</b>	Drive pedal top dead area (V)	0.0	<b>2.2</b>	2.5
<b>FVM0</b>	Maximum forward speed (%)	10	<b>100</b>	100
<b>RVM0</b>	Maximum reverse speed (%)	10	<b>70</b>	100
<b>AR</b>	Maximum acceleration ramp (s)	0.5	<b>3.0</b>	5.0
<b>DR</b>	Maximum deceleration ramp (s)	0.5	<b>1.0</b>	5.0
<b>IR</b>	Maximum deceleration ramp on reversal (s)	0.5	<b>0.5</b>	5.0
<b>BRK</b>	Electromagnetic brake activation delay (s)	0.5	<b>1.0</b>	5.0
<b>INOM</b>	Drive system rated current (A)	10	<b>20</b>	30
<b>IMAX</b>	Drive system maximum current (A)	10	<b>80</b>	100
<b>TMAX</b>	Protection intervention time for IMAX (s)	0	<b>15</b>	60
<b>AMAX</b>	Maximum lateral acceleration (g/100)	1	<b>15</b>	100
<b>KG</b>	Lateral acceleration control constant	1.0	<b>1.6</b>	2.0
<b>WSMIN</b>	(not used)	-	-	-
<b>WSMAX</b>	(not used)	-	-	-

(\*) The default value is stored in the Electronic board by the manufacturer.

## ELECTRICAL SYSTEM

## CONNECTORS

Power connections (male RADSOK terminals Ø6mm (AMPHENOL P/N N01 060 0001 1 or equivalent)) ( )					
Ref.	Description	Electronic board in/out	V ref.	I max.	Connected to
<b>B+</b>	Electronic board power supply +	in	24V	120A	BAT+
<b>B-</b>	Electronic board power supply -	in	24V	120A	BAT-
<b>M1</b>	Drive system motor +	out	24V	100A	M3+
<b>M2</b>	Drive system motor -	out	24V	100A	M3-

Vacuum system connections (2-ways male faston 6.3x0.8 – pitch 6.5mm)					
Ref.	Description	Electronic board in/out	V ref.	I max.	Connected to
<b>VA+</b>	Vacuum system power supply +	out	0V	30A	M2+
<b>VA-</b>	Vacuum system power supply -	out	10-24V	30A	M2-

J1: MOLEX MINIFIT type, 12-ways vertical					
PIN	Description	Electronic board in/out	V ref.	I max.	Connected to
<b>1</b>	Brush electromagnetic switch power supply +	out	24V	<1A	ES1
<b>2</b>	Brush electromagnetic switch power supply -	out	0V	<1A	ES1
<b>3</b>	Brush fuse voltage drop reading +	in	0V	<1A	F1
<b>4</b>	Brush fuse voltage drop reading -	in	0V	<1A	F1
<b>5</b>	Power supply for N/A version configurator	out	0V	<1A	J1.6
<b>6</b>	N/A version configurator return	in	0V	<1A	J1.5
<b>7</b>	Power supply for deck configurator	out	0V	<1A	J1.8
<b>8</b>	Deck configurator return	in	0V	<1A	J1.7
<b>9</b>	Consent for battery charger	out	24V	<1A	CH.1
<b>10</b>	Enabling from battery charger	in	24V	<1A	CH.2
<b>11</b>	Battery charger data communication slot	in/out	5V	<1A	CH.3
<b>12</b>	Auxiliary power supply + (under key)	out	24V	<1A	-

J2: MOLEX MINIFIT type, 8-ways vertical					
PIN	Description	Electronic board in/out	V ref.	I max.	Connected to
<b>1</b>	Solenoid valve power supply +	out	24V	1A	EV1
<b>2</b>	Solenoid valve power supply -	out	0V	1A	EV1
<b>3</b>	Detergent pump power supply +	out	24V	<1A	M4
<b>4</b>	Detergent pump power supply -	out	0V	<1A	M4
<b>5</b>	Buzzer power supply +	out	24V	<1A	BZ1.+ / PR1+
<b>6</b>	Buzzer power supply -	out	0V	<1A	BZ1.cont
<b>7</b>	Auxiliary power supply + (under key)	out	24V	<1A	-
<b>8</b>	Auxiliary power supply -	out	0V	<1A	-

J3: MOLEX MINIFIT type, 10-ways vertical					
PIN	Description	Electronic board in/out	V ref.	I max.	Connected to
<b>1</b>	Dashboard power supply +	out	24V	<1A	EB2.1
<b>2</b>	Dashboard serial +	in/out	5V	<1A	EB2.2
<b>3</b>	Dashboard serial -	in/out	0V	<1A	EB2.3
<b>4</b>	Dashboard power supply -	out	0V	<1A	EB2.4
<b>5</b>	Power supply for key circuit	out	24V	<1A	K1
<b>6</b>	Return from key	in	24V	<1A	K1
<b>7</b>	Pedal potentiometer power supply +	out	5V	<1A	RV1.F
<b>8</b>	Pedal potentiometer return -	In	0-5V	<1A	RV1.E
<b>9</b>	Pedal potentiometer power supply -	out	0V	<1A	RV1.D
<b>10</b>	-				

## ELECTRICAL SYSTEM

## CONNECTORS (Continues)

**J4: MOLEX MINIFIT type, 6-ways vertical**

PIN	Description	Electronic board in/out	V ref.	I max.	Connected to
1	Actuator power supply - microswitch	out	0V	<1A	M5.m0,1,2
2	Return from microswitch actuator m0	in	0V	<1A	M5.m0
3	Return from microswitch actuator m1	in	0V	<1A	M5.m1
4	Return from microswitch actuator m2	in	0V	<1A	M5.m2
5	Deck actuator power supply +/-	out	0/24V	8A	M5
6	Deck actuator power supply -/+	out	0/24V	8A	M5

**J5: MOLEX MINIFIT type, 2-ways vertical**

PIN	Description	Electronic board in/out	V ref.	I max.	Connected to
1	Driving wheel brake power supply +	out	24V	1A	BRK
2	Driving wheel brake power supply -	out	0V	1A	BRK

**J6: TYCO MODU1 type, 6-ways vertical**

PIN	Description	Electronic board in/out	V ref.	I max.	Connected to
1	Squeegee actuator power supply +/-	out	0/24V	8A	M6
2	Squeegee actuator power supply -/+	out	0/24V	8A	M6
3	Flashing light power supply +	out	24V	<1A	BE
4	Lamp / seat microswitch / float power supply -	out	0V	<1A	BE / SW1,2
5	Return from driver's seat microswitch	in	0V	<1A	SW1
6	Return from float	in	0V	<1A	SW2

**J7: PRESSURE SWITCH connector, Berger type, 3+3-ways vertical ( )**

A1	Pressure switch power supply +	out	5V	<1A	Press.A1
A2	Pressure switch power supply -	out	0V	<1A	Press.A2
A3	-	-	-	-	Press.A3
B1	-	-	-	-	Press.B1
B2	Pressure switch signal +	in	0-5V	<1A	Press.B2
B3	Pressure switch signal -	in	0V	<1A	Press.B3

**J8: JUMPER, 2-ways vertical****J9: MOLEX MINIFIT type, 4-ways vertical**

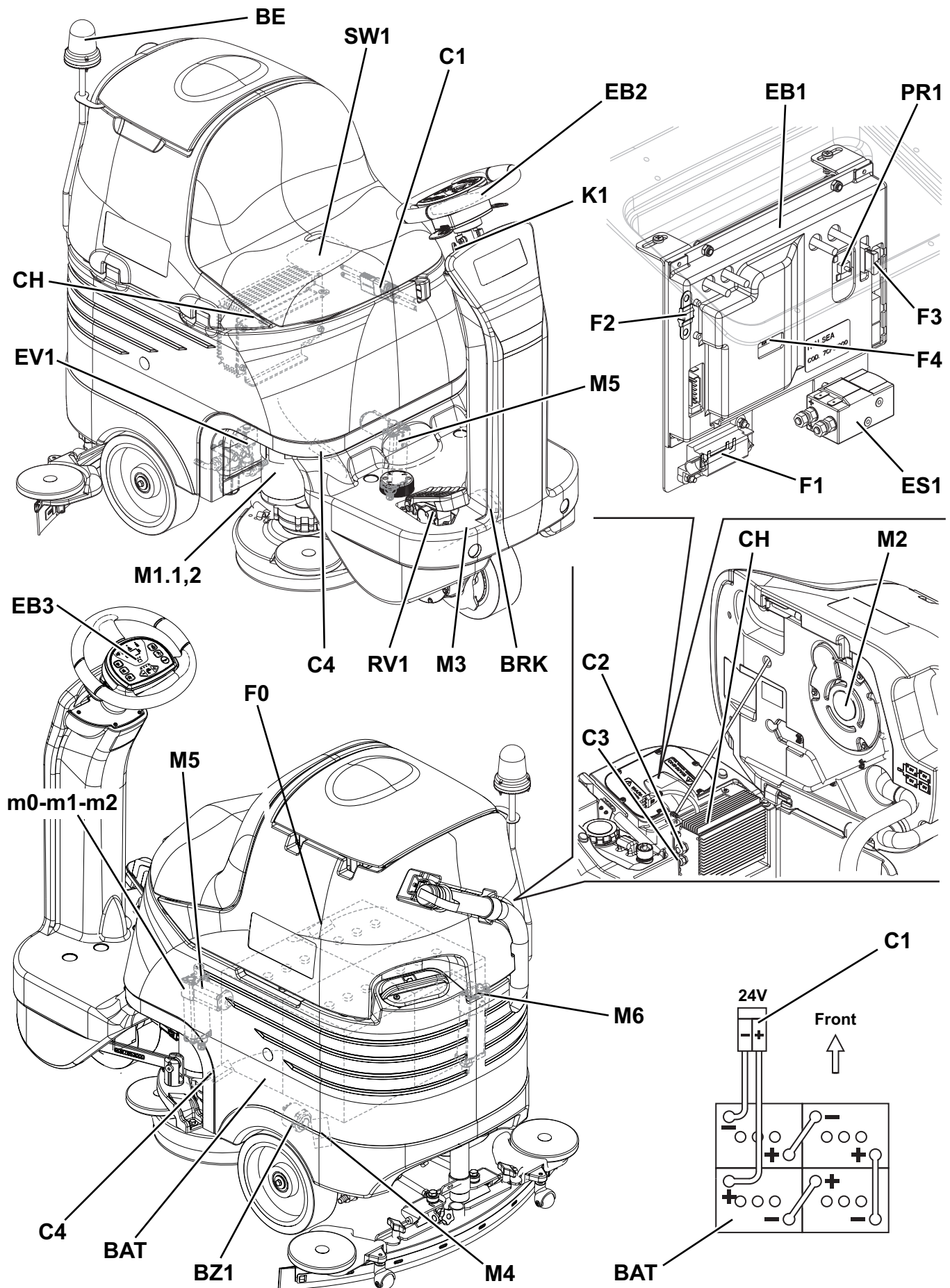
Connector for parameter programming

**ELECTRICAL SYSTEM****ELECTRICAL COMPONENT LAYOUT****Key**

BAT	24 V battery box
BE	Flashing light (optional)
BRK	Electromagnetic brake
BZ1	Reverse gear warning buzzer/horn
C1	Battery connector
C2	Battery charger main connector
C3	Battery charger sub-connector
C4	Brush deck connector
CH	Battery charger
EB1	Function electronic board
EB2	Display electronic board
EB3	Dashboard instrument electronic board
ES1	Brush electromagnetic switch
EV1	Solenoid valve
F0	Battery fuse
F1	Brush deck fuse
F2	Main electronic board fuse
F3	Signal circuit fuse
F4	Actuator fuse
K1	Ignition switch
M1.1,2	Brush motor
M2	Vacuum system motor
M3	Drive system motor
M4	Detergent pump
M5	Brush deck actuator motor
m0	Brush deck actuator position 0 microswitch
m1	Brush deck actuator position 1 microswitch
m2	Brush deck actuator position 2 microswitch
M6	Squeegee actuator motor
PR1	Solution/clean water level pressure switch
RV1	Drive pedal potentiometer
SW1	Driver's seat microswitch

# ELECTRICAL SYSTEM

## ELECTRICAL COMPONENT LAYOUT (Continues)



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## ELECTRICAL SYSTEM

## WIRING DIAGRAM

## Key

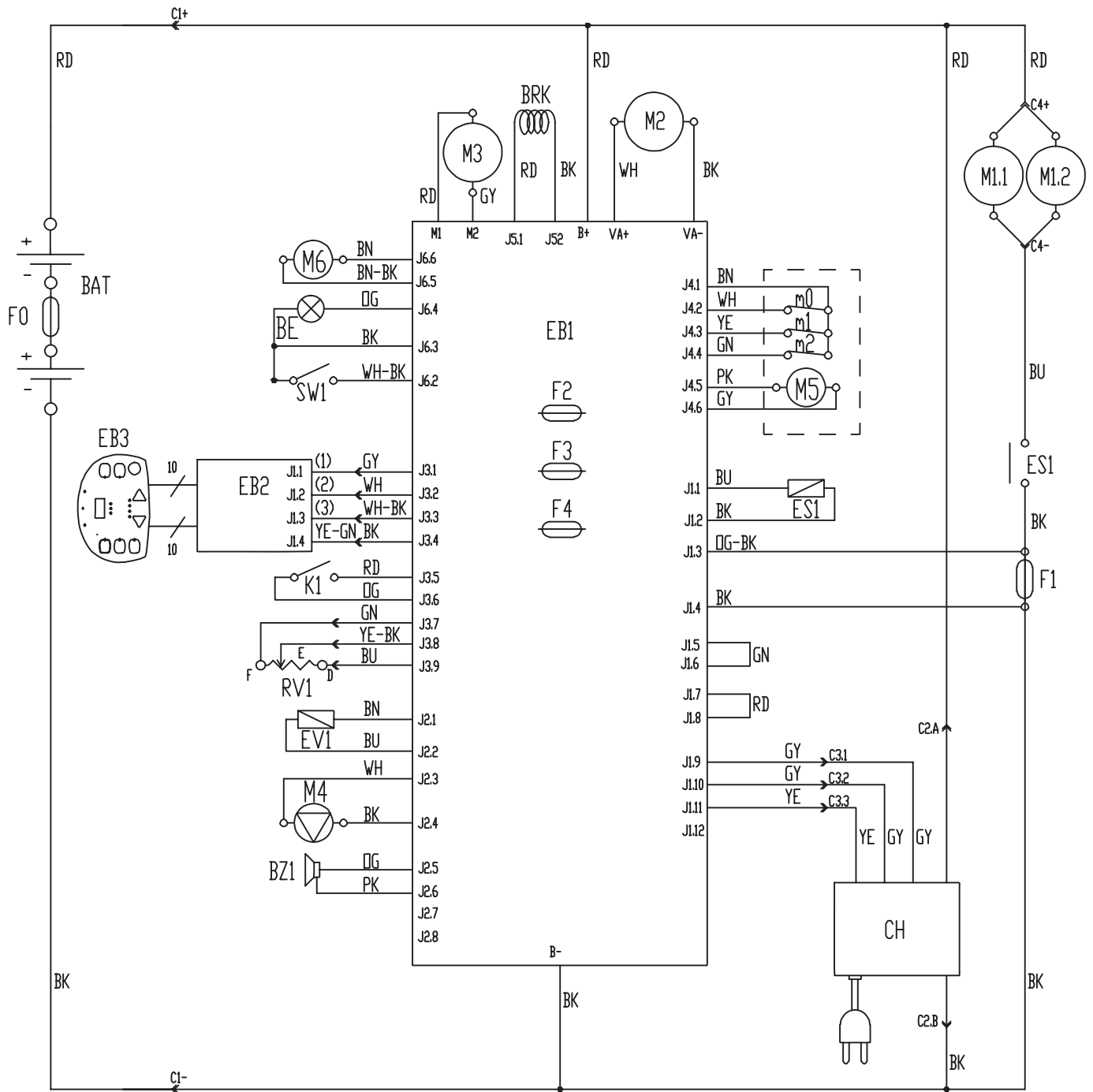
BAT	24 V battery box
BE	Flashing light (optional)
BRK	Electromagnetic brake
BZ1	Reverse gear warning buzzer/horn
C1	Battery connector
C2	Battery charger main connector
C3	Battery charger sub-connector
C4	Brush deck connector
CH	Battery charger
EB1	Function electronic board
EB2	Display electronic board
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ES1	Brush electromagnetic switch
EV1	Solenoid valve
F0	Battery fuse
F1	Brush deck fuse
F2	Main electronic board fuse
F3	Signal circuit fuse
F4	Actuator fuse
K1	Ignition switch
M1.1,2	Brush motor
M2	Vacuum system motor
M3	Drive system motor
M4	Detergent pump
M5	Brush deck actuator motor
m0	Brush deck actuator position 0 microswitch
m1	Brush deck actuator position 1 microswitch
m2	Brush deck actuator position 2 microswitch
M6	Squeegee actuator motor
PR1	Solution/clean water level pressure switch
RV1	Drive pedal potentiometer
SW1	Driver's seat microswitch

## Colour codes

BK	Black
BU	Blue
BN	Brown
GN	Green
GY	Grey
OG	Orange
PK	Pink
RD	Red
VT	Violet
WH	White
YE	Yellow

# ELECTRICAL SYSTEM

## WIRING DIAGRAM (Continues)



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14600 21st Avenue North  
Plymouth, MN 55447-3408  
[www.advance-us.com](http://www.advance-us.com)  
Phone: 800-989-2235  
Fax: 800-989-6566  
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