

Clarke®

BSW 28



Service Manual



READ THIS BOOK

This book has important information for the use and safe operation of this machine. Failure to read this book prior to operating or attempting any service or maintenance procedure to your Clarke machine could result in injury to you or to other personnel; damage to the machine or to other property could occur as well. You must have training in the operation of this machine before using it. If your operator(s) cannot read this manual, have it explained fully before attempting to operate this machine.

All directions given in this book are as seen from the operator's position at the rear of the machine. For new books write to: Clarke®, 2100 Highway 265, Springdale, Arkansas 72764.

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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 with the hands on the handlebar.

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 guards and hoods are closed*
- *The machine is off*
- *The machine is securely fastened to the means of transport.*

OTHER AVAILABLE MANUALS

The following manuals are available at Clarke Literature Service Department:

- BSW 28B, User Manual and Spare Parts List – CLARKE Form Number 146 3084 000
- Installation Instruction for BATTERY ASSEMBLY – CLARKE Form Number 1463535000

GENERAL INFORMATION

SAFETY

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

**DANGER!**

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

**WARNING!**

It indicates a potential risk of injury for people.

**CAUTION!**

It indicates a caution or a remark related to important or useful functions. Pay particular attention to the paragraphs marked by this symbol.

**NOTE**

It indicates the necessity to refer to the User Manual before performing any procedure.

**CONSULTATION**

It indicates that it is necessary to consult the User Manual before performing any procedure.

GENERAL SAFETY PRECAUTIONS

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

**DANGER!**

- *Before performing any maintenance/repair procedure on electrical components, disconnect the battery negative terminal.*
- *The machine is only to be used by persons who have been adequately instructed. Children or disabled people cannot use this machine.*
- *Do not wear jewelry when working near electrical components.*
- *Keep the battery away from sparks, flames and incandescent material.*
- *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 picking up hazardous dust.*

GENERAL INFORMATION

**WARNING!**

- Carefully read all the instructions before carrying out any maintenance/repair procedure.
- Before using the battery charger, ensure that frequency and voltage values, shown 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 charge the batteries if the battery charger cable or the plug are damaged.
- If the battery charger cable is damaged, replace it.
- 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.
- If the machine is not working as it should, has been damaged, left outdoors or dropped into water, return it to Clarke Service Center.
- Do not smoke while charging the batteries.
- The machine left unattended are to be secured against unintentional movement.
- 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 is for dry use only and is not to be used or stored outdoors in wet conditions.
- Before using the machine, close all doors and/or covers.
- 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 Clarke recommended accessories.
- Take all necessary precautions to prevent hair, jewelry and loose clothes from being caught by the machine moving parts.
- Do not wash the machine with direct or pressurised water jets, or with corrosive substances. Do not use compressed air to clean this type of machine.
- While using this machine, take care not to cause harm to other people, and children especially.
- Do not put any can containing fluids on the machine.
- The machine storage temperature must be between 0°C and +40°C.
- The machine working temperature must be between 0°C and +40°C.
- The humidity must be between 30% and 95%.
- Do not use the machine as a means of transport.
- Do not use on surfaces having a gradient exceeding that marked on the machine .
- Do not allow the brooms to operate while the machine is stationary to avoid damaging the floor.
- In case of fire, possibly use a powder fire extinguisher, not a water one.
- Do not bump into shelves or scaffoldings, especially where there is a risk of falling objects.
- Adjust the operation speed to suit the floor conditions.
- This machine cannot be used on roads or public streets.
- Do not remove or modify the plates affixed to the machine.
- Do not tamper with the machine safety guards and follow the ordinary maintenance instructions scrupulously.
- Only use brushes provided with the machine or those specified in the instruction manual. The use of other brushes may impair 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.
- To ensure machine proper and safe operation, perform the scheduled maintenance shown in the relevant chapter of this Manual.
- If parts must be replaced, require ORIGINAL spare parts from a Dealer or Authorised Retailer.
- The machine must be disposed of properly, because of the presence of toxic-harmful materials (batteries, plastics, etc.), which are subject to standards that require disposal in special centers (see Scrapping chapter in the User Manual).

GENERAL INFORMATION

TECHNICAL DATA

General	Values
Cleaning width (without side broom)	19.7 in (500 mm)
Cleaning width (with side broom)	28.3 in (720 mm)
Machine size with folded handlebar and without side broom (length x width x height)	39.3 x 31.4 x 24.4 in (998 x 797 x 621 mm)
Minimum distance from the ground (skirts not included)	1.0 in (25 mm)
Main broom size (diameter x length)	7.9 x 19.7 in (200 x 500 mm)
Side broom diameter	12.4 in (315 mm)
Main broom speed	335 rpm
Side broom speed	100 rpm
Gradeability	2%
Hopper capacity	15.8 US gal (60 litres)
Total machine weight with standard battery	167.5 lb (76 kg)
Front steering wheel size (diameter x length)	3.0 x 1.3 in (75 x 32 mm)
Rear wheel size (diameter x length)	11.8 x 1.8 in (300 x 45 mm)
Maximum drive speed	2.3 miles/h (3.7 km/h)
Sound pressure level at workstation (ISO 11201, ISO 4871) (LpA)	59.3 ±3 dB(A)
Machine output acoustic power (ISO 3744, ISO 4871) (LwA)	78 dB(A)
Vibration level at the operator's arms (ISO 5349-1) (*)	<98.4 in/s ² (< 2,5 m/s ²)

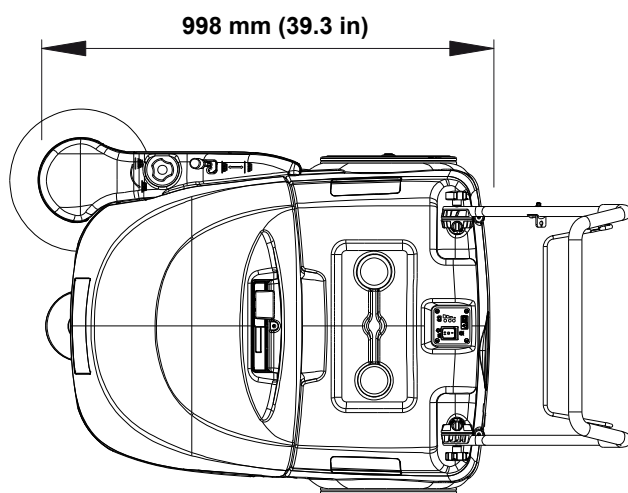
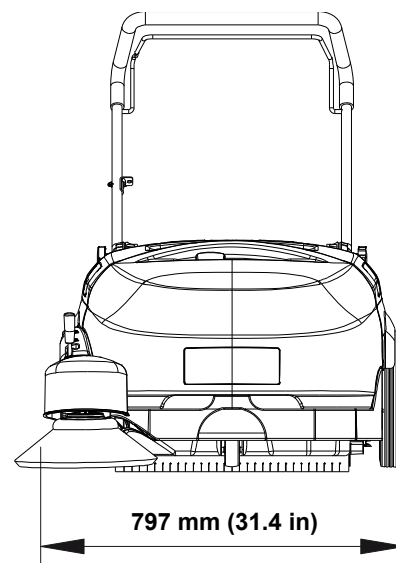
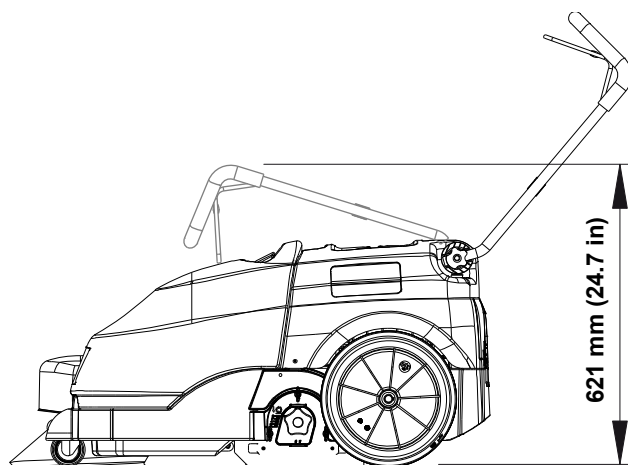
(*) Under normal working conditions, on a level asphalt surface.

Electrical components	Values
Electrical system voltage	12 V
Standard battery	12 V, 86 Ah@20 GEL
Battery charger	6 A
Main motor	200 W, 1,500 rpm
Side broom motor	40 W
Vacuum system motor	50 W

Dust vacuuming and filtering	Values
Dust filter	5-10 µm (polyester)
Dust filter surface	10.8 ft ² (1 m ²)
Main broom compartment vacuum	0.47 in H ₂ O (12 mm H ₂ O)

GENERAL INFORMATION

DIMENSIONS



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GENERAL INFORMATION

MAINTENANCE

The lifespan of the machine and its maximum operating safety are ensured by correct and regular maintenance. The following table 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. The following paragraphs give further instructions about maintenance procedures listed in the Scheduled Maintenance Table.



NOTE

To perform maintenance procedures, the machine must be off and, if necessary, the batteries must be disconnected. Moreover, carefully read the instructions in the Safety paragraph.

SCHEDULED MAINTENANCE TABLE

Procedure	Every 10 hours	Every 50 hours	Every 200 hours	Every 400 hours
Battery charger cable check				
Side and main broom height check and adjustment				
Skirt height and operation check				
Dust filter cleaning and integrity check				
Hopper gasket check				
Filter shaker operation check				
Drive belt and wheel clutch visual inspection				
Drive system belt tensioner adjustment				
Nut and screw tightening check			(1)	
Motor carbon brush check or replacement				

(1): And after the first 8 hours.

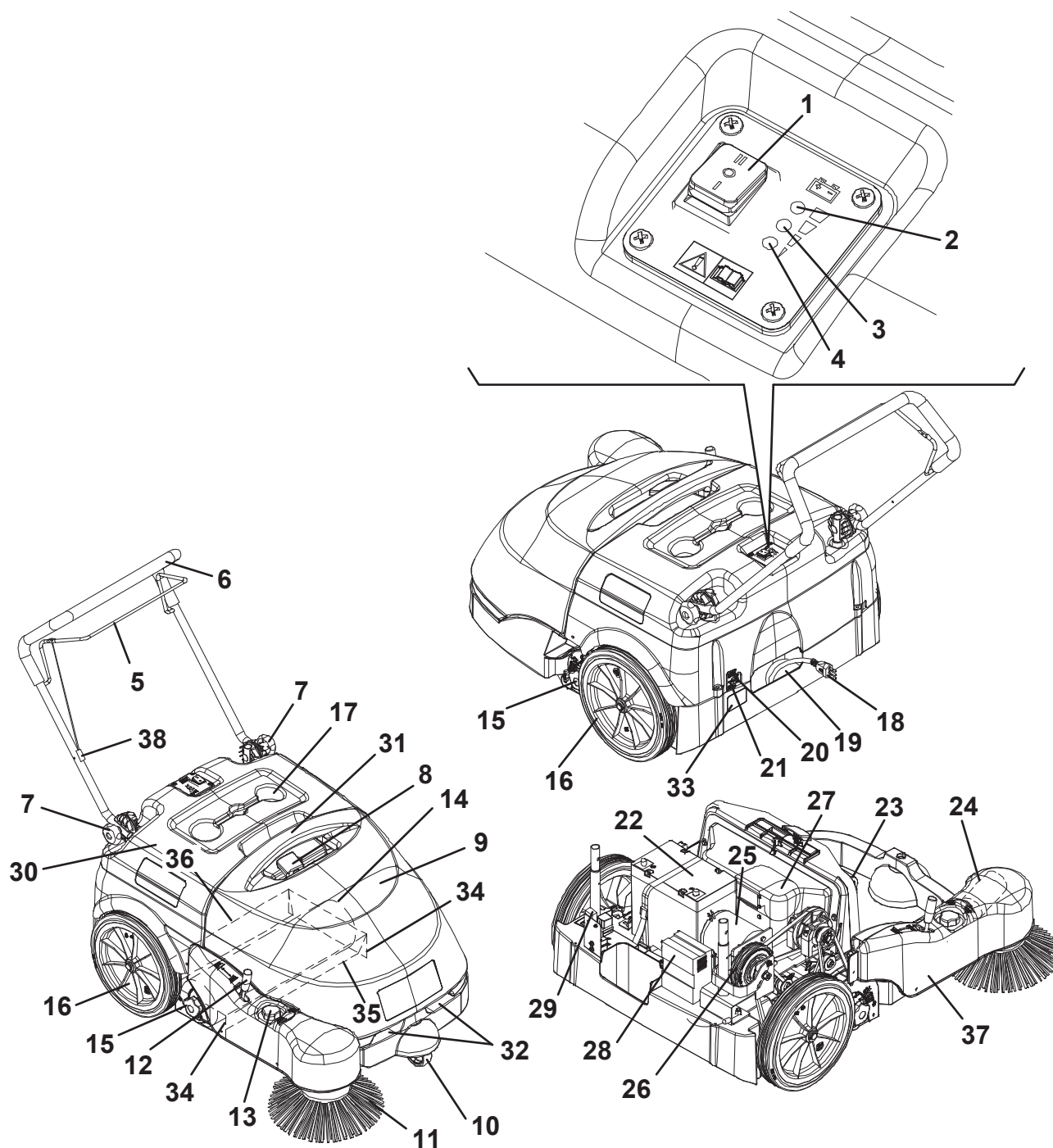
GENERAL INFORMATION

MACHINE NOMENCLATURE

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

1. Main switch for vacuum system, main broom and side broom activation
2. Charged battery warning light (green)
3. Semi-discharged battery warning light (yellow)
4. Discharged battery warning light (red)
5. Drive control lever
6. Handlebar
7. Handlebar adjusting knobs
8. Filter shaker knob
9. Hopper
10. Front steering wheel
11. Side broom
12. Side broom lifting/lowering lever
13. Side broom height adjusting knob
14. Main broom
15. Main broom height adjusting knobs
16. Rear driving wheels
17. Can holder
18. Battery charger cable
19. Battery charger cable housing
20. Side broom motor circuit breaker
21. Main motor circuit breaker
22. Battery
23. Dust filter
24. Side broom motor
25. Main motor
26. Drive system gear (clutch)
27. Vacuum fan
28. Battery charger - Function control
29. Vacuum system motor lamellar fuse (7.5 A)
30. Hood
31. Hopper upper handle
32. Hopper lower handles
33. Serial number plate/technical data/conformity certification
34. Side skirts
35. Front skirt
36. Rear skirt
37. Side broom cover
38. Drive system control cable adjuster

GENERAL INFORMATION



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SWEEPING SYSTEM

SWEEPING SYSTEM

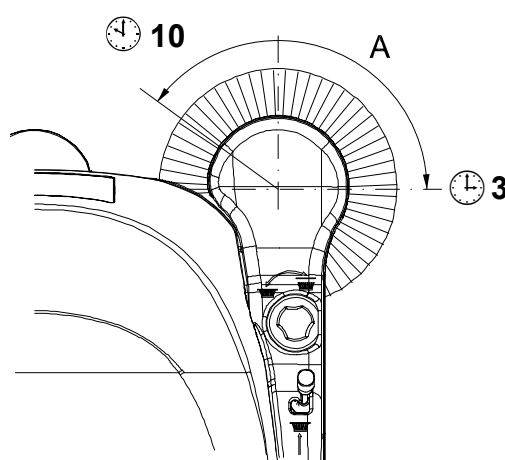
SIDE BROOM HEIGHT CHECK AND ADJUSTMENT



NOTE

Brooms of various hardness are available. This procedure is applicable to all types of brooms.

1. Check that the side broom is at the correct distance from the ground, according to the following procedure:
 - Drive the machine on a level ground and lower the side broom.
 - Keep the machine stationary and turn on the side broom for a few seconds.
 - Turn off the side broom by pressing the switch (1), then lift it and move the machine.
 - Check if the size and orientation of the print left by the side broom are as shown in the figure (A, Fig. 1): the side broom must touch the ground along a circle arc ranging from "10 o'clock" position to "3 o'clock" position.
 - If the print is not within specifications, it is necessary to adjust the broom height, according to the procedure shown in step 2.
2. Turn the knob (13) clockwise or counter-clockwise to adjust the broom height up or down.
3. Perform step 1 again to check that the side broom is at the correct distance from the ground.
4. When the broom is too worn and can no longer be adjusted, replace it according to the procedure shown in the relevant paragraph.



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SWEEPING SYSTEM

SIDE BROOM DISASSEMBLY/ASSEMBLY

**NOTE**

Brooms of various hardness are available. This procedure is applicable to all types of brooms.

**CAUTION!**

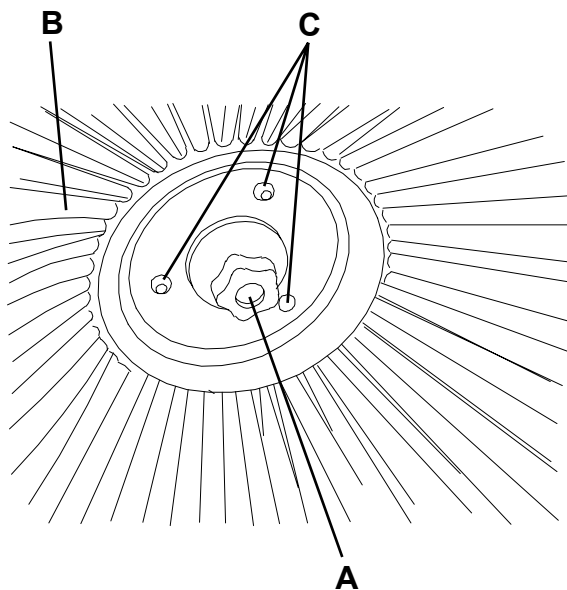
It is advisable to use protective gloves when replacing the side brooms because there can be sharp debris between the bristles.

Disassembly

1. Drive the machine on a level ground.
2. Turn the main switch (1) to "0".
3. Lift the side broom.
4. Loosen the knob (A) inside the side broom, then remove the broom (B) by disengaging it from the pins (C).

Assembly

5. Install the new broom on the machine engaging it on the pins (C), then tighten the knob (A).
6. Adjust the height of the new broom according to the procedure shown in the previous paragraph.



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SWEEPING SYSTEM

MAIN BROOM HEIGHT CHECK AND ADJUSTMENT



NOTE

Brooms of various hardness are available. This procedure is applicable to all types of brooms.

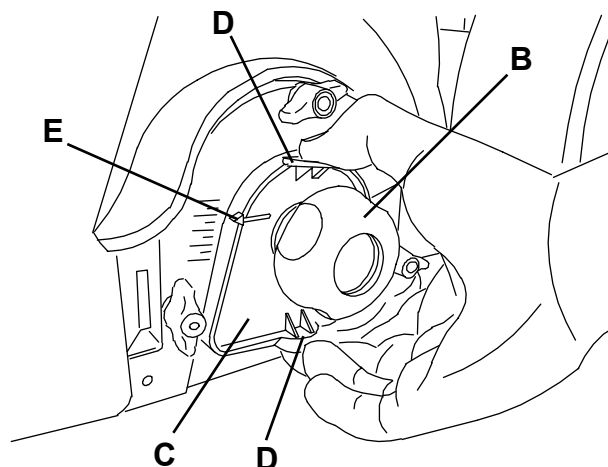
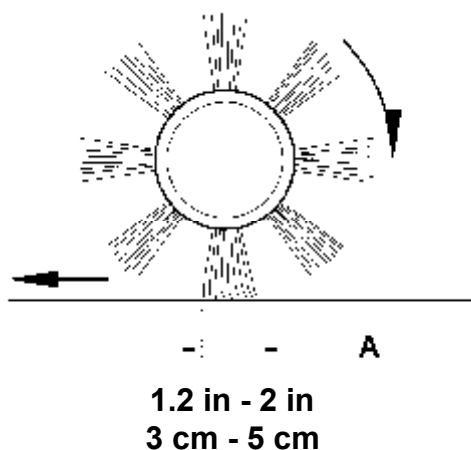
1. Check that the main broom is at the correct distance from the ground, according to the following procedure:
 - Drive the machine on a level ground.
 - Keep the machine stationary and turn on the main broom for a few seconds.
 - Turn off the main broom by pressing the switch (1), then move the machine.
 - Check that the main broom print (A), along its length, is 1.2-2 in (3-5 cm) wide.
 - If the print is not within specifications, it is necessary to adjust the broom height, according to the procedure shown in step 2.
2. Turn the main switch (1) to "0".
3. On both sides of the machine, loosen the knob (B).
4. Grasp the support (C) on the points (D) and move it upwards, then lift it or lower it to change the main broom height. For height variation, refer to the indicator (E). Then tighten the knob (B) on both sides of the machine.
5. Perform step 1 again to check that the main broom is at the correct distance from the ground.
6. When the broom is too worn and can no longer be adjusted, replace it according to the procedure shown in the relevant paragraph.



CAUTION!

An excessive print (larger than 5 cm) of the main broom can lead to machine malfunction and overheating of moving and electric parts, thus reducing machine life.

Pay careful attention when performing the above-mentioned checks, and always use the machine according to the indicated conditions.



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SWEEPING SYSTEM

MAIN BROOM DISASSEMBLY/ASSEMBLY

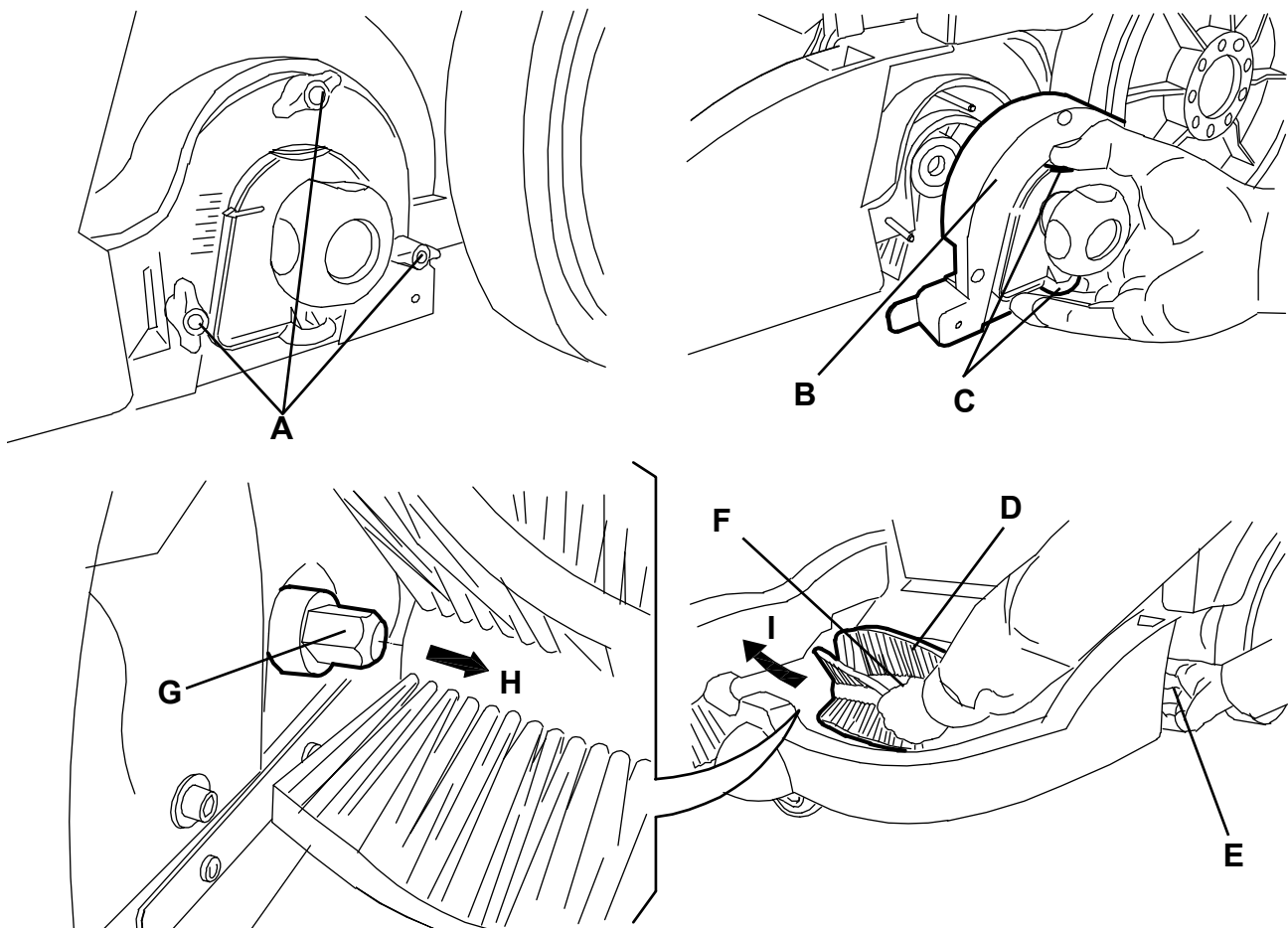

NOTE

Brooms of various hardness are available. This procedure is applicable to all types of brooms.


CAUTION!

It is advisable to use protective gloves when replacing the main broom because there can be sharp debris between the bristles.

1. Drive the machine on a level ground.
2. Turn the main switch (1) to "0".
3. Remove the hopper (9).
4. Completely loosen the handwheels (A) on the left side of the machine.
5. Remove the lid (B) by grasping it on the points (C).
6. Grasp the main broom (D) on the points (E) and (F), then disconnect it from the drive hub (G) by pulling it in the direction shown by the arrow (H); then remove it in the direction shown by the arrow (I).
7. Install the new main broom with the bristles rows (D) bent as shown in the figure.
8. Install the new broom by performing steps 3 to 6 in the reverse order.
9. Adjust the main broom height according to the procedure shown on the relevant page.



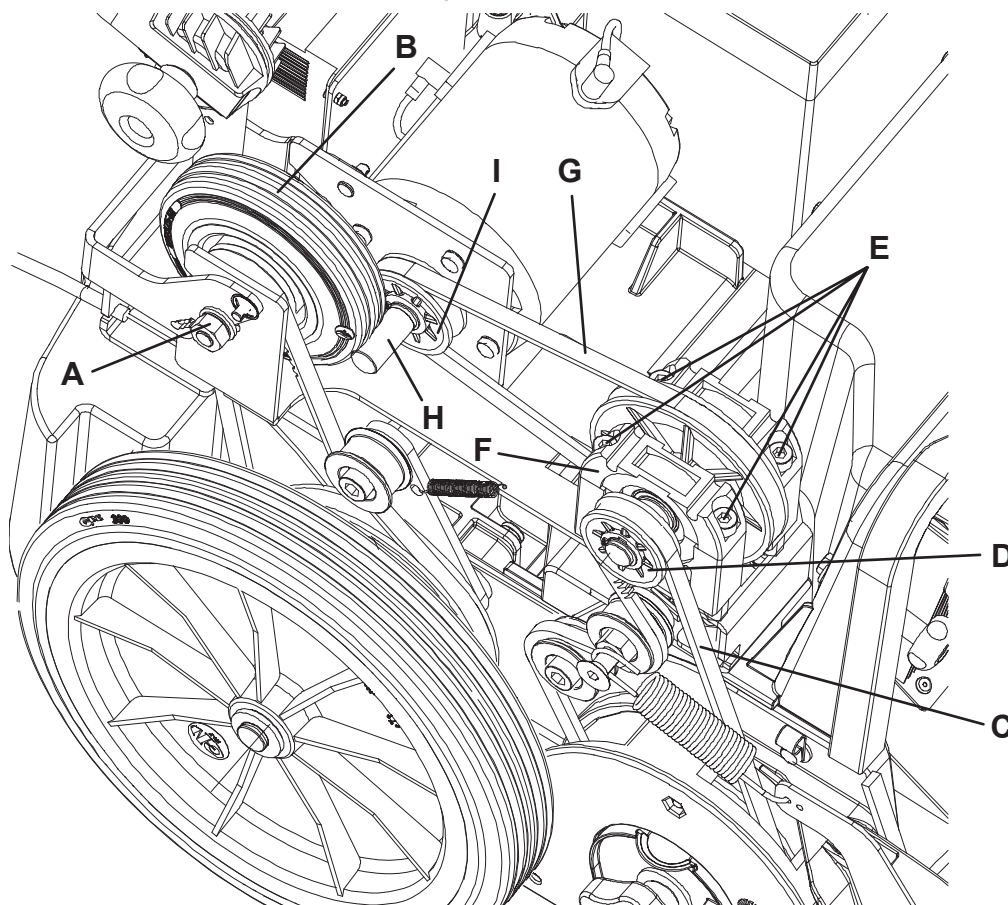
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SWEEPING SYSTEM**MAIN MOTOR-TO-IDLER GEAR BELT DISASSEMBLY/ASSEMBLY (FOR MAIN BROOM)****Disassembly**

1. Remove the hood (see the procedure in the relevant paragraph).
2. Loosen the nut (A) and move away the wheel clutch (B) from the crankshaft (H).
3. Manually disengage the belt (C) from the pulley (D).
4. Remove four screws (E), then remove the idler gear assembly (F) and the belt (G) by disengaging it from the pulley (I).

Assembly

5. Perform steps 2 to 4 in the reverse order.
6. Visually inspect and adjust the driving belts and wheel clutch (see the procedure in the relevant paragraph).
7. Install the hood (see the procedure in the relevant paragraph).



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SWEEPING SYSTEM

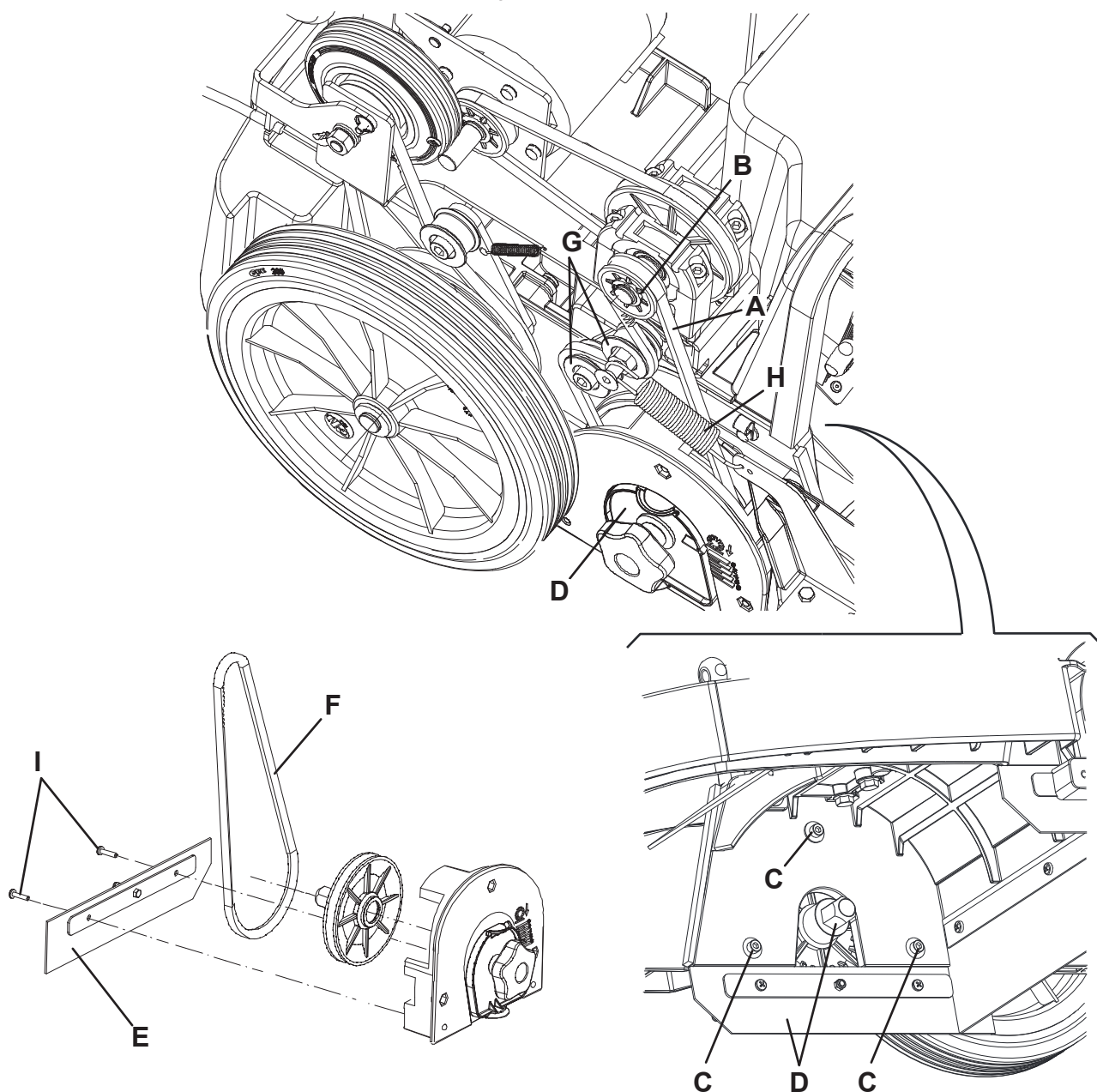
MAIN BROOM BELT DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the hood (see the procedure in the relevant paragraph).
2. Remove the main broom (see the procedure in the relevant paragraph).
3. Manually disengage the belt (A) from the pulley (B).
4. Remove the screws (C), then remove the right lid (D) and the main broom belt.
5. At the workbench, remove the screws (I) and the skirt (E), then remove the main broom belt (F).
6. Check the tensioner (G) and the spring (H) for proper operation.

Assembly

7. Perform steps 3 to 5 in the reverse order.
8. Visually inspect and adjust the driving belts and wheel clutch (see the procedure in the relevant paragraph).
9. Install the main broom (see the procedure in the relevant paragraph).
10. Install the hood (see the procedure in the relevant paragraph).



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SWEEPING SYSTEM

SIDE BROOM MOTOR ELECTRICAL INPUT CHECK

**WARNING!**

This procedure must be performed by qualified personnel only.

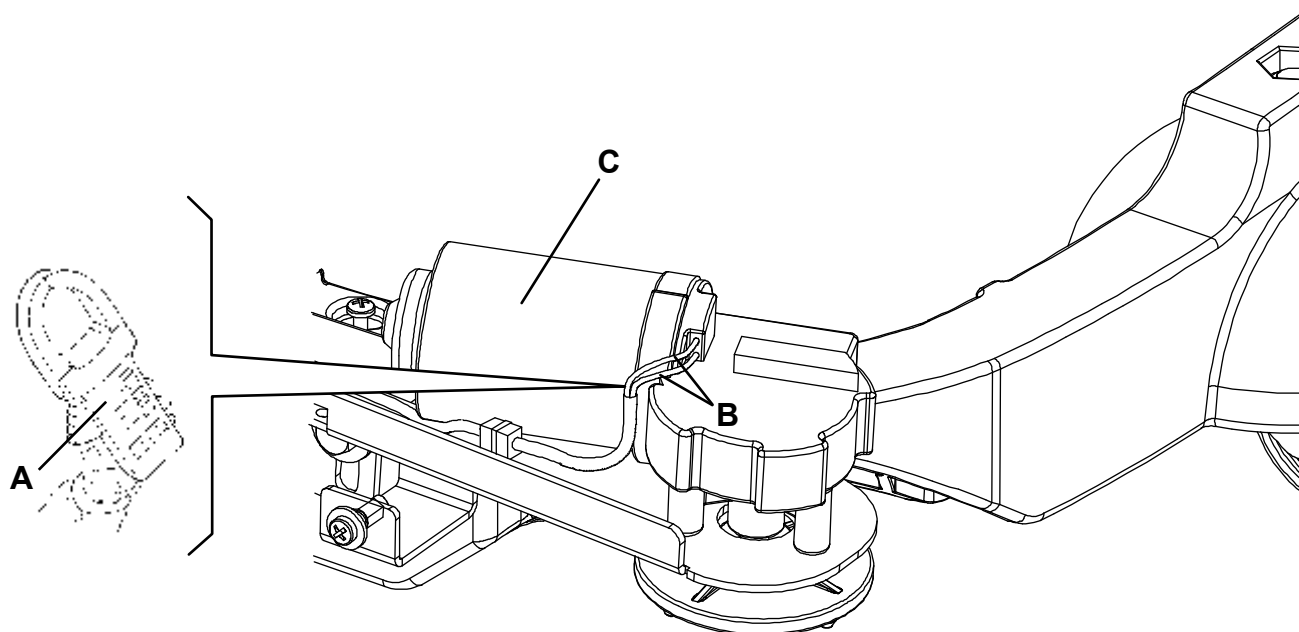
1. Remove the side broom cover (see the procedure in the relevant paragraph).

**WARNING!**

Pay attention to the main broom rotation while performing the following steps.

2. Apply the amperometric pliers (A) on one cable (B) of the main broom, motor (C).
3. Grasp the handlebar (6) and slightly lift the front part of the machine, in order to lift the main broom from the ground, then turn the main switch (1) to "II" and check that the side broom motor electrical input is:
 - - 2 to 3 A at 12 V.
 - Turn the main switch to "0" and lower the front part of the machine. Remove the amperometric pliers.
 - If the electrical input is higher, perform the following procedures to detect the cause and correct the abnormal input:
 - Check for debris or cords around the side broom hub.
 - If necessary, disassemble the motor (see the procedure in the relevant paragraph), clean it and check 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).
4. Install the side broom cover (see the procedure in the relevant paragraph).



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SWEEPING SYSTEM

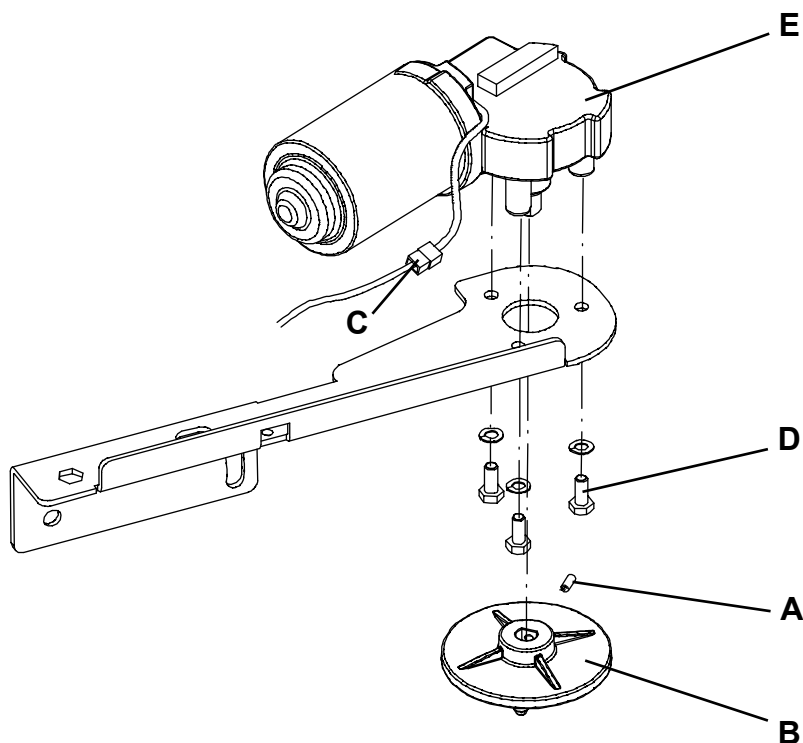
SIDE BROOM MOTOR DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the side broom cover (see the procedure in the relevant paragraph).
2. Remove the hood (see the procedure in the relevant paragraph), then disconnect the negative connector of the battery (22).
3. Loosen the threaded dowel (A).
4. Remove the side broom hub (B).
5. Disconnect the connector (C) of the side broom motor (E).
6. Remove the screws (D).
7. Remove the side broom motor (E).

Assembly

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



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SWEEPING SYSTEM

TROUBLESHOOTING

OPEN CIRCUIT

The circuit breakers (20) and (21) determines the open circuit. This system prevents the main motor and broom motor circuits from being damaged in case of overload.

In case of open circuit, possible causes are:

Main motor (for main broom): The circuit breaker (21) determines the open circuit. Possible causes:

1. There are bulky debris or cords around the broom or between the broom and its flange (remove the debris).
2. The broom pressure on the ground is excessive (check the broom height).
3. The main motor electrical input is too high (check the electrical input).

Wait at least 2 minutes after the open circuit. After repairing, press the circuit breaker button (21).

Side broom motor: The circuit breaker (20) determines the open circuit. Possible causes:

1. There are bulky debris or cords around the broom or between the broom and its flange (remove the debris).
2. The broom pressure on the ground is excessive (check the broom height).
3. The side broom motor electrical input is too high (check the electrical input).

Wait at least 2 minutes after the open circuit. After repairing, press the circuit breaker button (20).

THE MAIN BROOM DOES NOT TURN

Possible causes:

1. The battery voltage is too low, the warning light (4) is on (charge the battery).
2. The main motor carbon brushes are worn (replace).
3. The motor is faulty (repair/replace).
4. The motor driving belts are inefficient or broken (replace).
5. The wiring harness is damaged (repair).
6. The relay is faulty (replace).
7. There is an open in the circuit breaker (reset).
8. The hopper microswitch does not work (adjust/replace).
9. The main switch is damaged (replace).
10. The battery charger-function control is faulty (replace).

THE SIDE BROOM DOES NOT TURN

Possible causes:

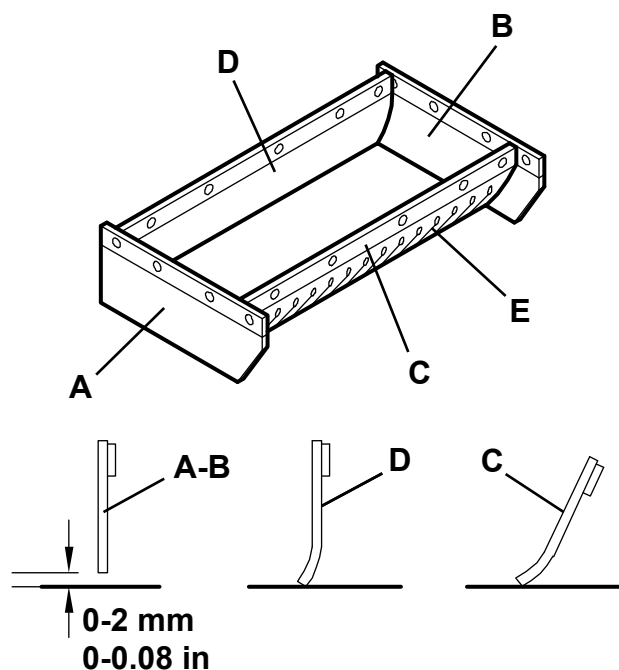
1. The battery voltage is too low, the warning light (4) is on (charge the battery).
2. The motor carbon brushes are worn (replace).
3. The motor is faulty (repair/replace).
4. The wiring harness is damaged (repair).
5. There is an open in the circuit breaker (reset).
6. The main switch is damaged (replace).

SKIRT

SKIRT

SKIRT HEIGHT AND OPERATION CHECK

1. Drive the machine on a level ground that is suitable for checking the skirt height.
2. Turn the main switch (1) to "0".
3. Check that the distance from the ground of the side skirts (A and B) is 0 to 0.08 in (0 to 2 mm). Check the skirts for integrity, cuts or tears, which can reduce the machine vacuum capabilities. If necessary replace the side skirts (see the procedure in the relevant paragraph).
4. Check that the front and rear skirts (C and D) slightly rub on the ground. Check the skirts for integrity, cuts or tears, which can reduce the machine vacuum capabilities. Note that the front skirt has typical vertical cuts (E). If necessary replace the front and/or rear skirts (see the procedure in the relevant paragraph).



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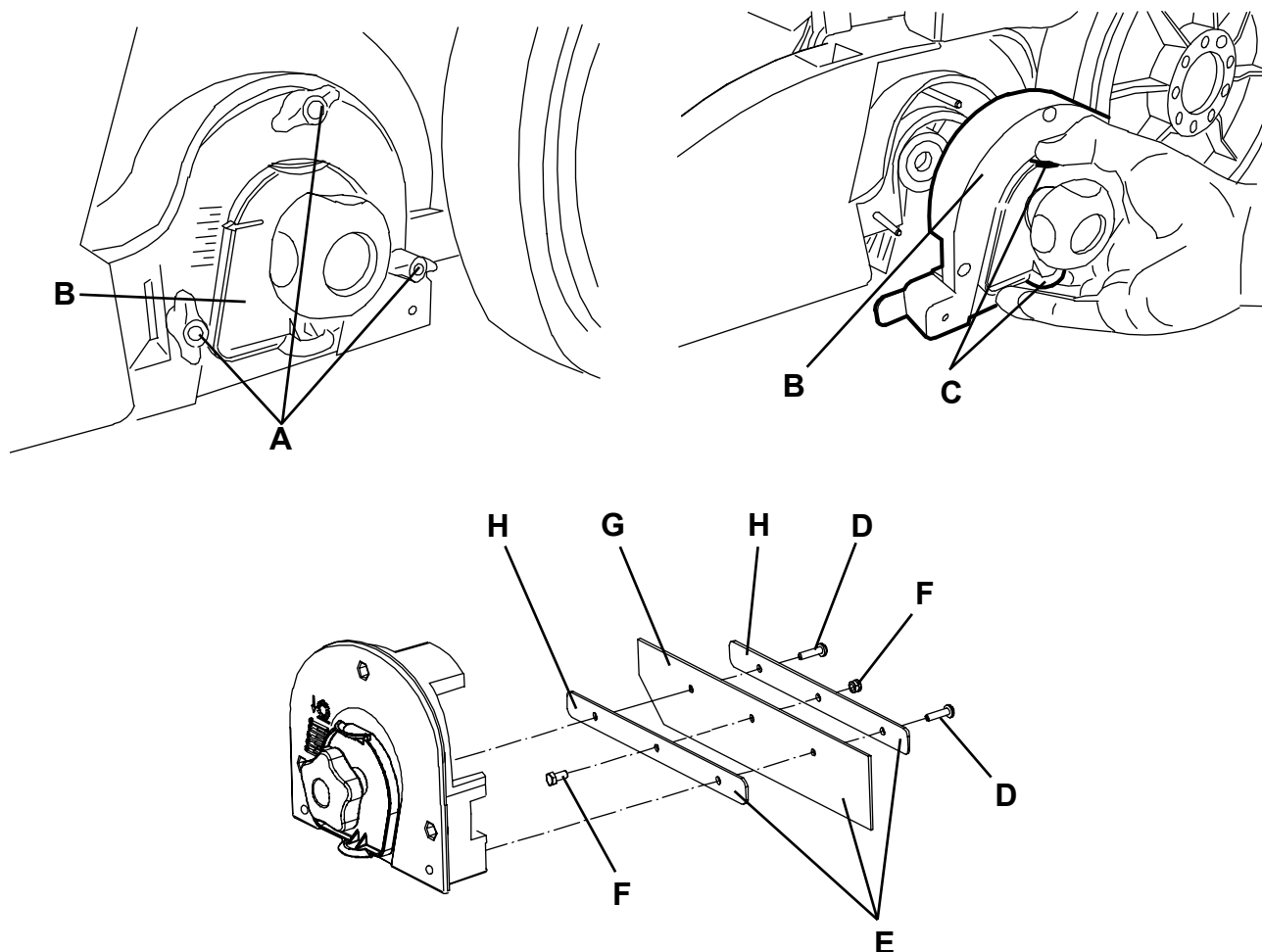
LEFT SIDE SKIRT DISASSEMBLY/ASSEMBLY

Disassembly

1. Drive the machine on a level ground that is suitable for checking the skirt height.
2. Turn the main switch (1) to "0".
3. Completely loosen the handwheels (A) on the left side of the machine.
4. Remove the cover (B) by grasping it on the points (C).
5. At the workbench, remove the screws (D), then remove the skirt assembly with straps (E).
6. Remove the screw (F) and separate the left skirt (G) from the straps (H).

Assembly

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



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SKIRT

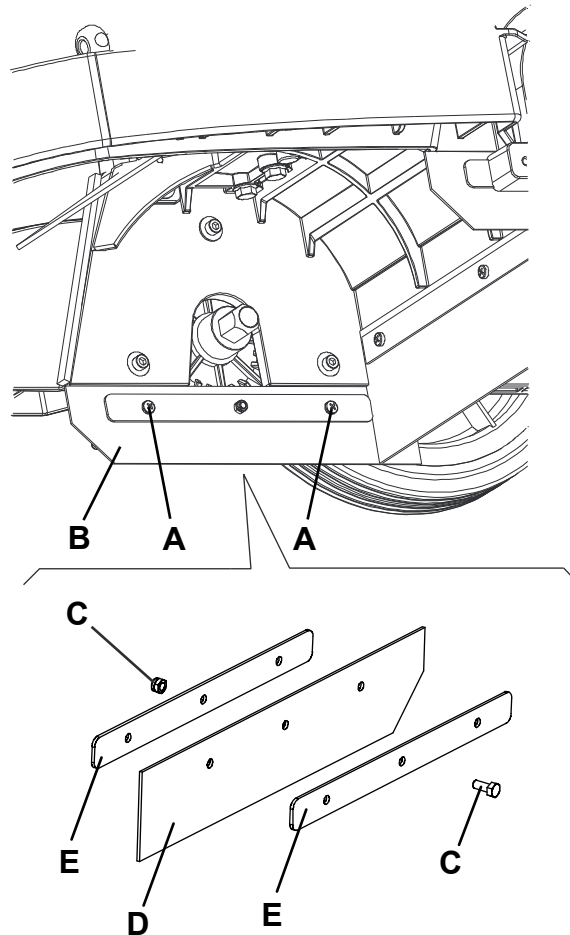
RIGHT SIDE SKIRT DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the main broom (see the procedure in the relevant paragraph).
2. Remove the screws (A), then remove the right skirt assembly with straps (B).
3. At the workbench, remove the screw (C) and separate the right skirt (D) from the straps (E).

Assembly

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



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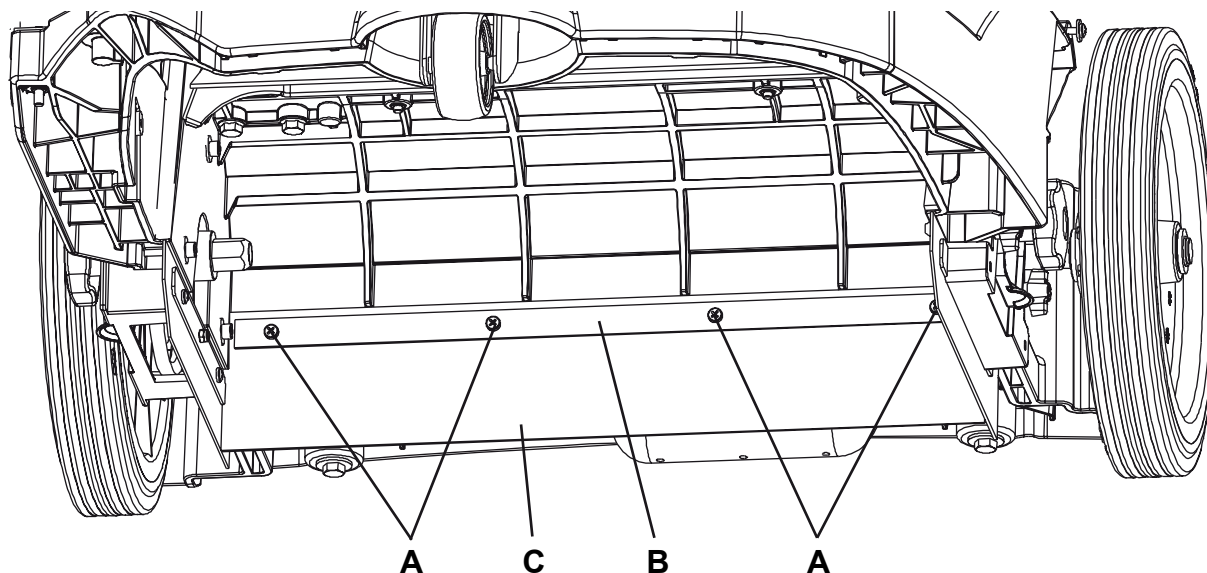
REAR SKIRT DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the main broom (see the procedure in the relevant paragraph).
2. Remove the dust filter (see the procedure in the relevant paragraph).
3. Remove the screws (A), then remove the strap (B).
4. Remove the rear skirt (C).

Assembly

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



S301596

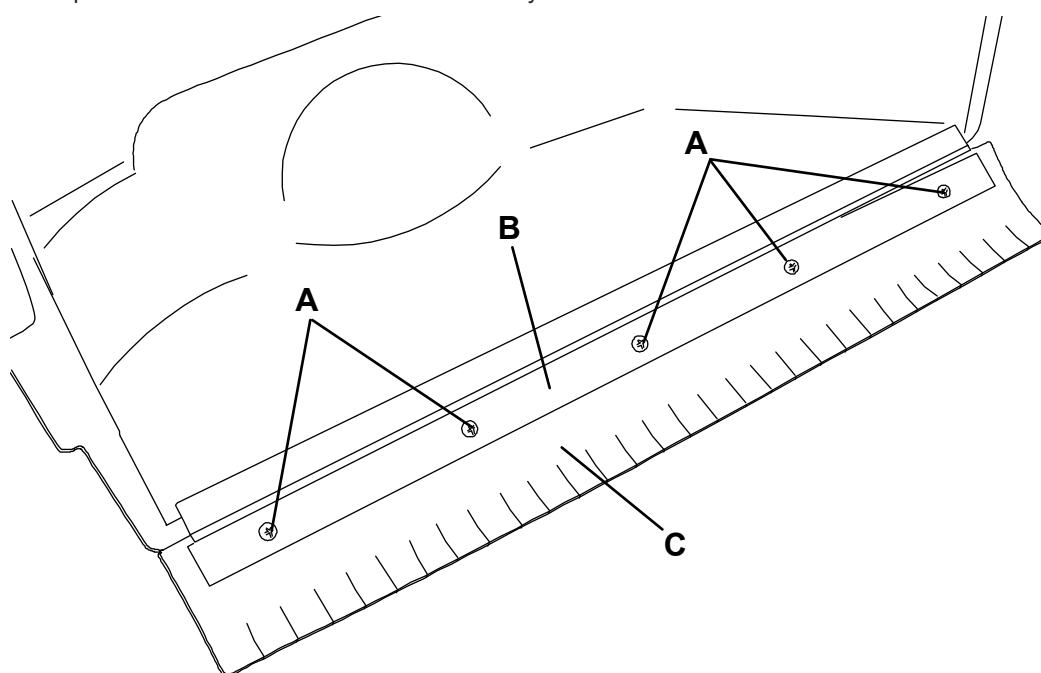
FRONT SKIRT DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the hopper (9).
2. At the workbench, remove the screws (A), then remove the strap (B).
3. Remove the front skirt (C).

Assembly

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



S301597

DUST AND DEBRIS COLLECTION SYSTEM

DUST AND DEBRIS COLLECTION SYSTEM

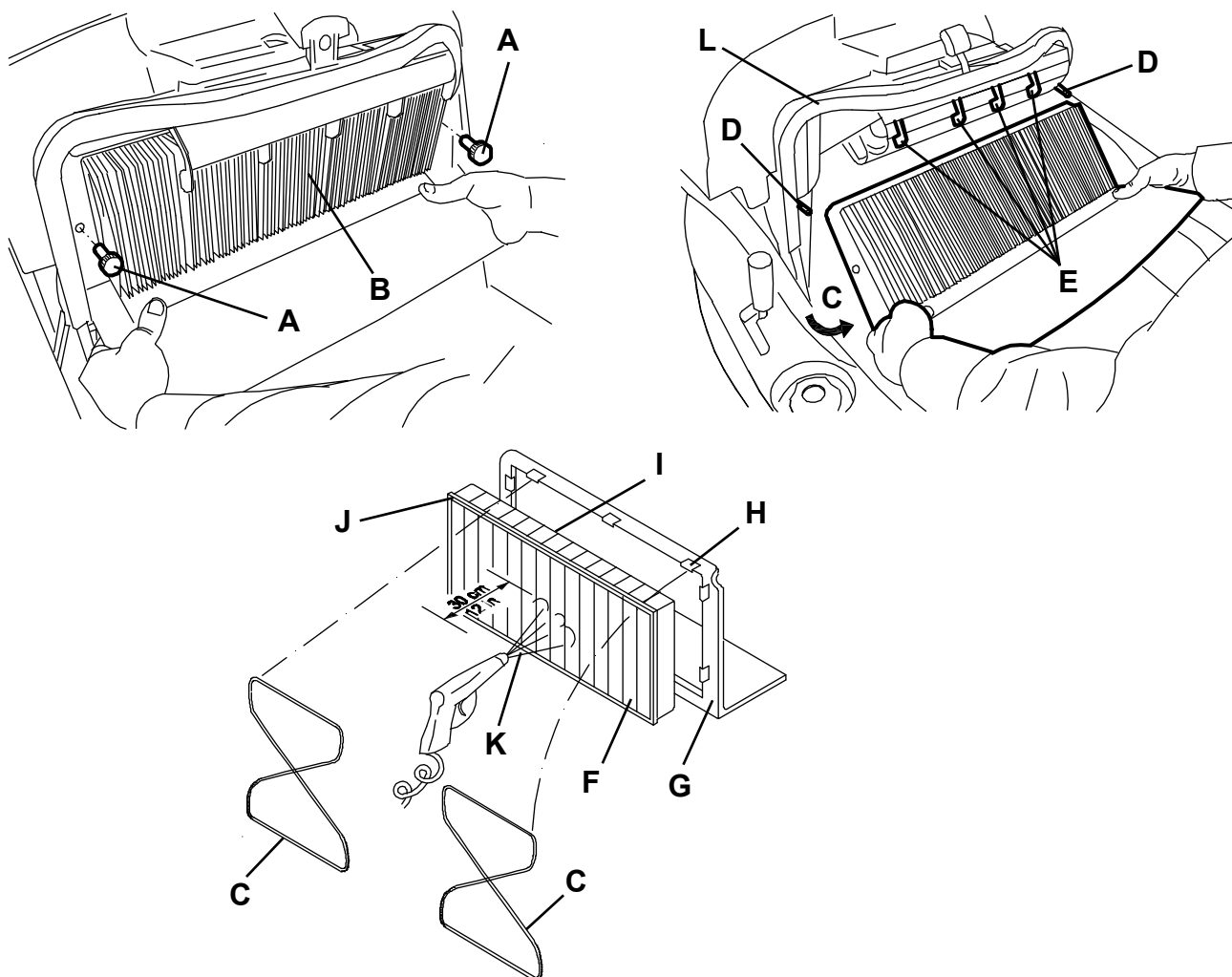
DUST FILTER CLEANING AND INTEGRITY CHECK, HOPPER GASKET CHECK

1. Drive the machine on a level ground.
 2. Turn the main switch (1) to "0".
 3. Remove the hopper (9).
 4. Unscrew the knobs (A).
 5. Grasp the dust filter (B) as shown in the figure.
 6. Remove the dust filter by turning it in the direction shown by the arrow (C) to disengage it from the pins (D), then lower the filter to disengage it from the filter shaker combs (E).
 7. Remove the filter (F) from the frame (G) by disengaging the rubber bands (C).
 8. In an appropriate outdoor area, clean the filter by shaking it on a level and clean surface, tapping the side (I) opposite to the gasket (J).
- Complete the cleaning procedure by using compressed air (K) at maximum 87 psi (6 Bars), blowing only from the side of the gasket (J), at a minimum distance of 12 in (30 cm).
- Check the filter body for tears. If necessary, replace it.
- For a better cleaning, it is allowed to wash the filter with water and non-lathering detergents. This provides better quality cleaning but reduces the life of the filter, which will have to be replaced more frequently. The use of inadequate detergents can damage the filter.
9. Clean the bearing surface of the filter rubber gasket (J) and check it for integrity and sealing capabilities. If necessary, replace the filter.
 10. Clean the bearing surface of the hopper gasket (L) and check it for integrity and sealing capabilities. If necessary, replace it.
 11. Assemble the components in the reverse order of disassembly.



NOTE

Assemble the filter with the gasket (J) positioned as shown in the figure.

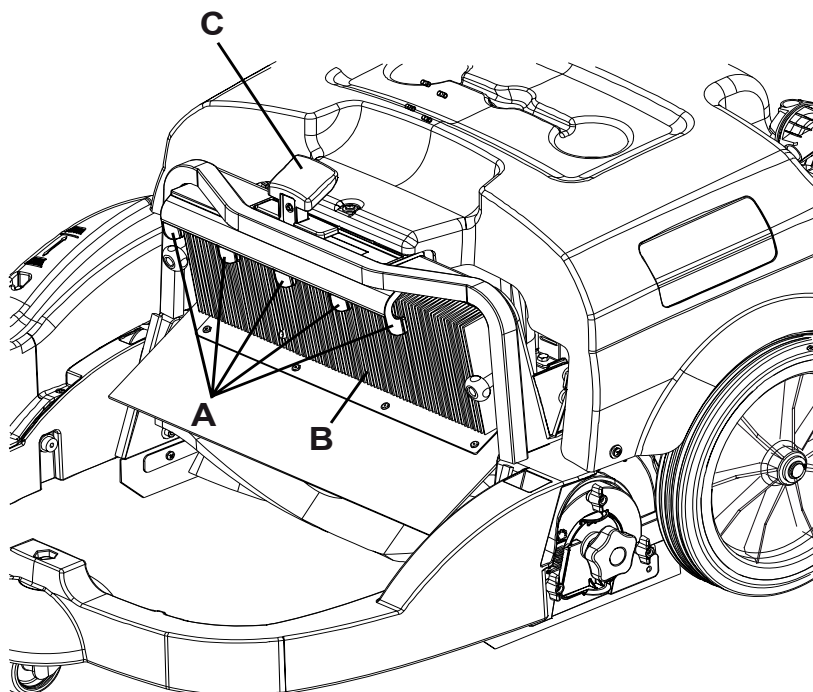


S301598

DUST AND DEBRIS COLLECTION SYSTEM

FILTER SHAKER OPERATION CHECK

1. Drive the machine on a level ground.
2. Turn the main switch (1) to "0".
3. Remove the hopper (9).
4. Check the filter shaker terminals (A) for integrity and contact with the dust filter (B).
5. Activate the filter shaker knob (C) and check that the terminals (A) shake the dust filter (B) correctly.
6. Install the hopper (9).



S301599

DUST AND DEBRIS COLLECTION SYSTEM

VACUUM SYSTEM MOTOR ELECTRICAL INPUT CHECK


WARNING!

This procedure must be performed by qualified personnel only.

1. Remove the hood (see the procedure in the relevant paragraph).


WARNING!

Pay attention to the broom rotation while performing the following steps.

2. Apply the amperometric pliers (A) on one cable (B) of the vacuum system motor (C).
3. Grasp the handlebar (6) and lift the front part of the machine, in order to lift the brooms from the ground, then turn the main switch (1) to "I" or "II" and check that the vacuum system motor electrical input is:
 - 4 to 5 A at 12 V.

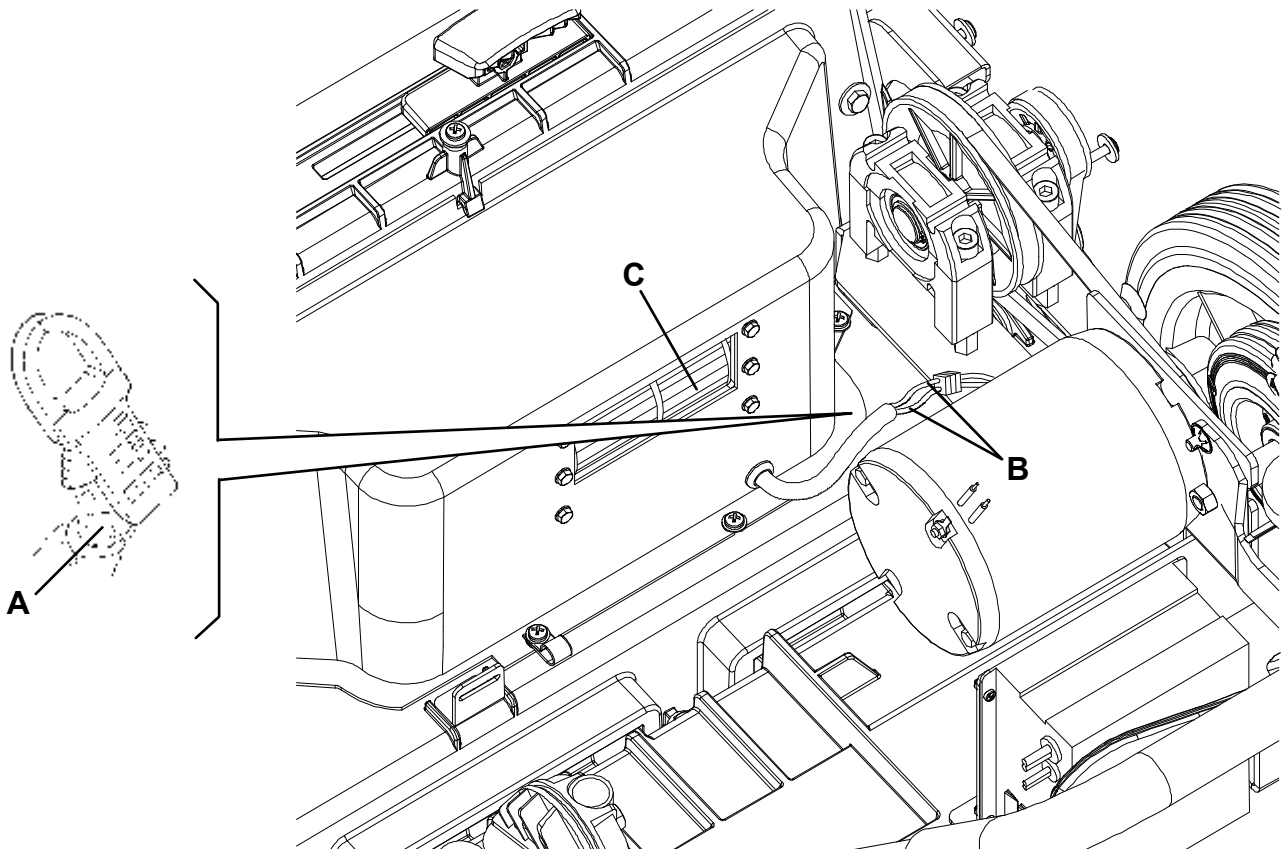
Turn the main switch to "0" and lower the front part of the machine. Remove the amperometric pliers.

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

- Check the motor carbon brushes (see the procedure in the relevant paragraph).
- If necessary, disassemble the vacuum system motor (see the procedure in the relevant paragraph), clean it and check 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).

4. Install the hood (see the procedure in the relevant paragraph).



S301600

DUST AND DEBRIS COLLECTION SYSTEM

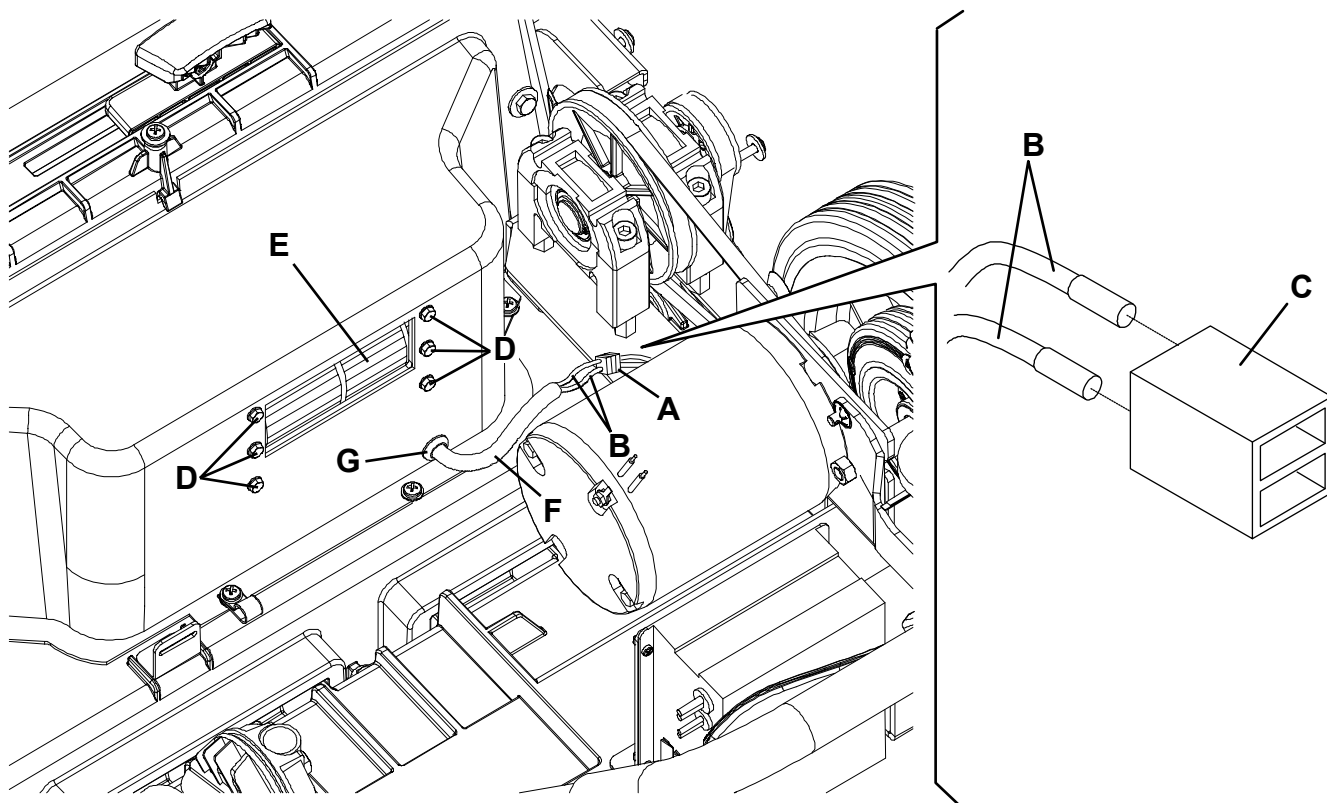
VACUUM SYSTEM MOTOR DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the dust filter as shown in the User Manual.
2. Remove the hood (see the procedure in the relevant paragraph).
3. Remove the battery (see the procedure in the relevant paragraph).
4. Disconnect the vacuum fan connector (A).
5. Disconnect the cables (B) from the connector (C).
6. Remove the vacuum fan mounting screws (D).
7. Remove the motor and the vacuum fan (E), then remove the wiring harness (F) from the grommet (G).

Assembly

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



S301601

TROUBLESHOOTING

POOR OPERATION OF THE VACUUM FAN

Possible causes:

1. The dust filter is clogged (clean).
2. The vacuum fan blades are broken/worn (replace the motor and the vacuum fan).
3. The hopper gaskets are worn (replace).

THE VACUUM FAN DOES NOT OPERATE

Possible causes:

1. There is an open in the circuit breaker (29) (replace).
2. There are foreign materials clogging the vacuum fan (remove the motor and the vacuum fan).
3. The vacuum system motor is faulty (repair/replace).

THE FILTER SHAKER DOES NOT WORK

Possible causes:

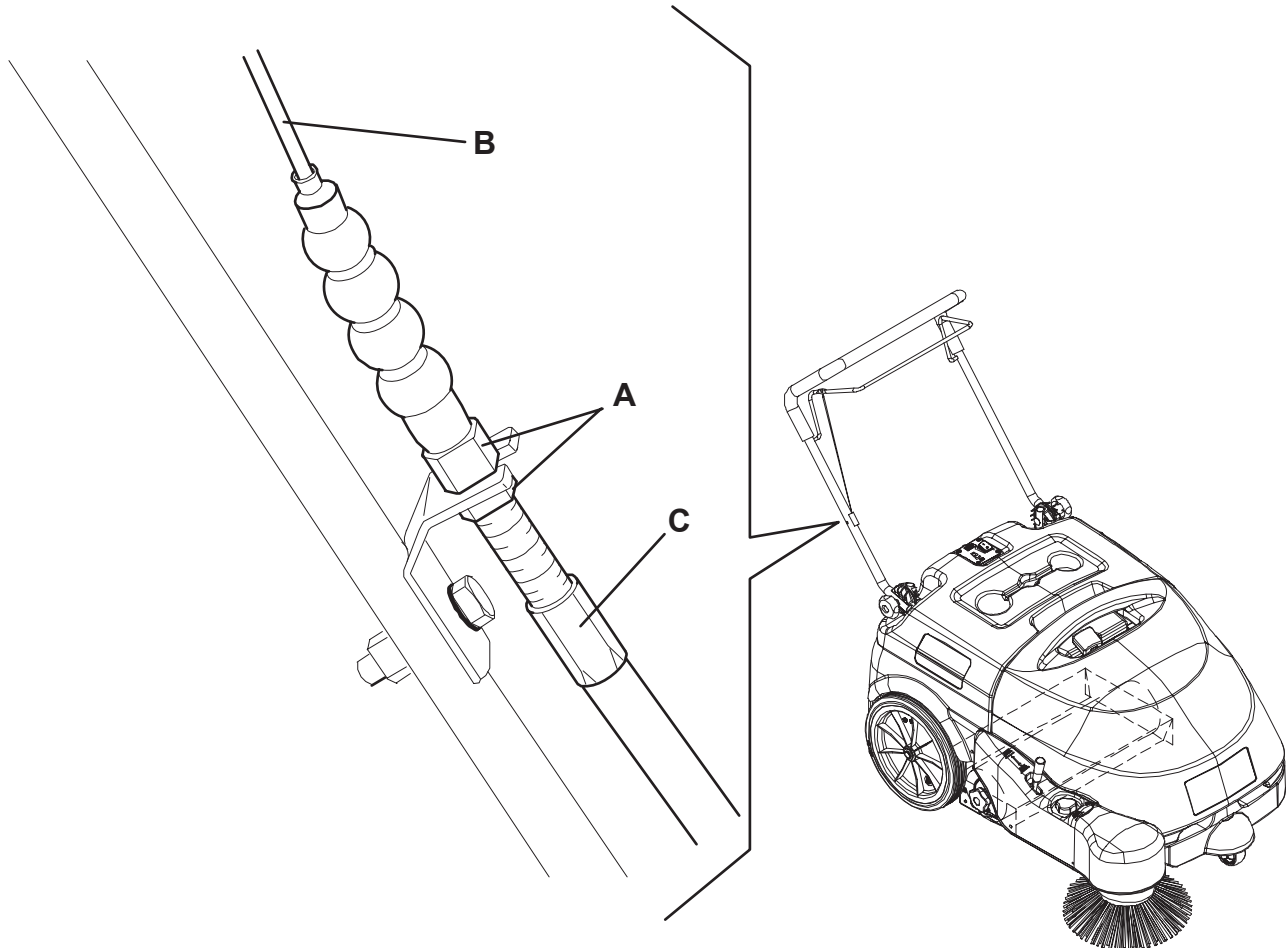
1. The filter shaker terminals are damaged (replace the filter shaker).

DRIVE SYSTEM

DRIVE SYSTEM

DRIVE SYSTEM CONTROL CABLE ADJUSTMENT

1. Drive the machine on a level ground.
2. Turn the main switch (1) to "0".
3. Loosen the nuts (A), then adjust the drive system control cable (B) with the adjuster (C). When the adjustment is completed, tighten the nuts (A).



S301602

DRIVE SYSTEM

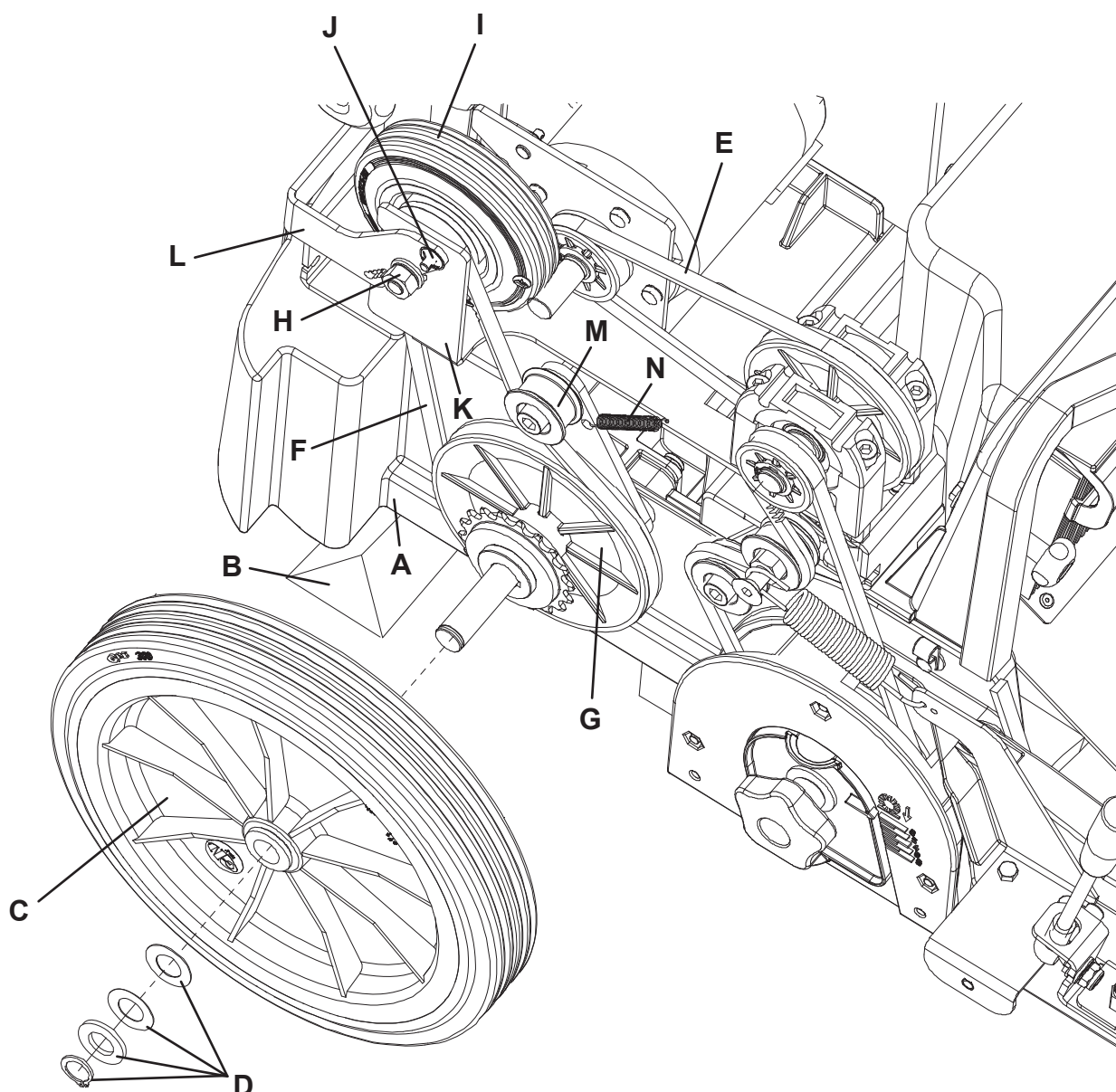
DRIVING BELT DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the hood (see the procedure in the relevant paragraph).
2. Place a suitable shim (B) under the machine frame area (A) in order to keep the right wheel (C) lifted and remove it.
3. Remove the retaining ring and the washers (D), then remove the right wheel (C).
4. Move the belt (E) by hand and disengage the belt (F) from the pulley (G).
5. Loosen the adjusting nut (H) of the wheel clutch (I).
6. Remove the washer (J). When reassembling, do not use the old washer, replace it with a new one.
7. Remove the belt (F) by routing it between the plate (K) and the bracket (L).
8. Check the tensioner (M) and the spring (N) for proper operation.

Assembly

9. Perform steps 4 to 8 in the reverse order.
10. Visually inspect and adjust the driving belts and wheel clutch (see the procedure in the relevant paragraph).
11. Perform steps 1 to 3 in the reverse order.



S301603

DRIVE SYSTEM

TROUBLESHOOTING

OPEN CIRCUIT

The circuit breaker (21) determines the open circuit. This system prevents the main motor from being damaged in case of breakdown.

In case of open circuit, possible causes are:

1. There are bulky debris or cords around the wheel hubs (remove the debris).
2. The floor gradient is excessive (change direction).
3. The main motor electrical input is too high (check the electrical input).

Wait at least 2 minutes after the open circuit. After repairing, press the circuit breaker button (21).

THE MACHINE DOES NOT MOVE

Possible causes:

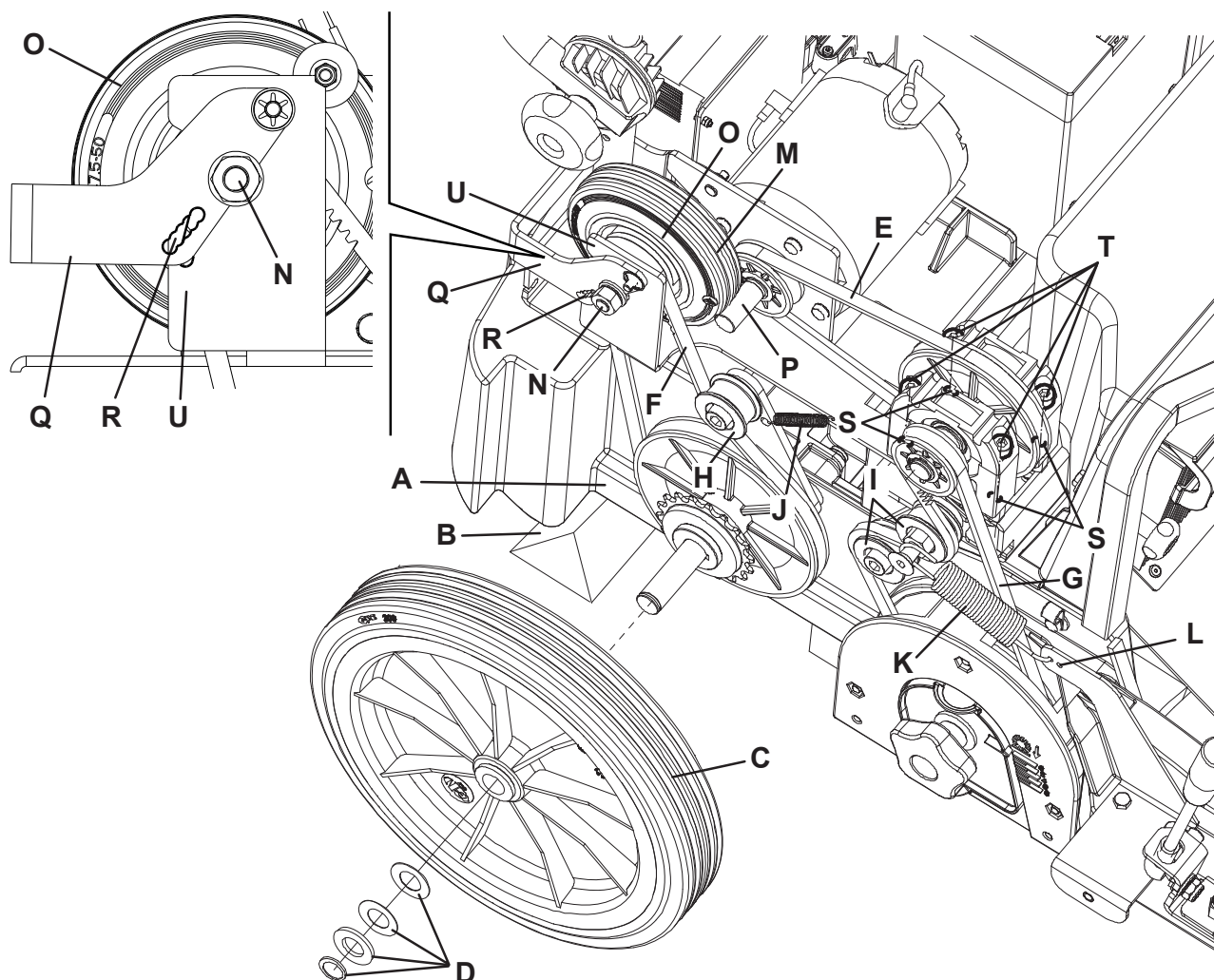
1. The drive system control cable is misadjusted or broken (adjust/replace).
2. The driving belt is misadjusted or broken (adjust/replace).
3. The main motor carbon brushes are worn (replace).
4. The main motor is faulty (repair/replace).
5. The wheel clutch is misadjusted or broken (adjust/replace).

MAIN MOTOR

MAIN MOTOR

DRIVING BELT AND WHEEL CLUTCH VISUAL INSPECTION AND ADJUSTMENT

1. Remove the hood (see the procedure in the relevant paragraph).
2. Place a suitable shim (B) under the machine frame area (A) in order to keep the right wheel (C) lifted and remove it.
3. Remove the retaining ring and the washers (D), then remove the right wheel (C).
4. Check the driving belts (E), (F) and (G) for integrity, tears, cracks or breaks along their whole length. To see the lower part of the belt (G), move the belt (E) with the hand.
If necessary, replace them (see the procedure in the relevant paragraph).
Check the tensioners (H) and (I), and springs (J) and (K), for efficiency.
The tension of the belt (E) is slightly adjustable, by using the slots (S) on the mounting screws (T) of the idler gear assembly (U).
The tension of the belt (G) is slightly adjustable, by using second hole (L) for anchoring the spring (K).
The tension of the belt (F) can be adjusted by using the drive system control cable (see the procedure in the relevant paragraph).
5. Check the whole perimeter surface (M) of the wheel clutch (O) for integrity and efficiency. If necessary, replace the wheel clutch (O) (see the procedure in the relevant paragraph).
6. If necessary, loosen the nut (N) and adjust the pressure of the wheel clutch (O) on the shaft (P), by pushing the lever (Q) in order to align one of the holes (R) with the support slot (U). For this operation use a drill of 0.21 in (5.5 mm).
With an integral wheel clutch (O) or not worn it is suggested the alignment with the 3rd hole (R).
7. When the adjustment is completed, tighten the nut (N).
8. Perform steps 1 to 3 in the reverse order.



S301604

MAIN MOTOR

MAIN MOTOR ELECTRICAL INPUT CHECK


WARNING!

This procedure must be performed by qualified personnel only.

1. Remove the hood (see the procedure in the relevant paragraph).


WARNING!

Pay attention to the broom rotation while performing the following steps.

2. Apply the amperometric pliers (A) on one cable (B) of the main motor (C).
3. Grasp the handlebar (6) and lift the front part of the machine, in order to lift the brooms from the ground, then turn the main switch (1) to "I" or "II" and check that the main motor electrical input is:

- 9 to 13 A at 12 V.

Turn the main switch to "0" and lower the front part of the machine.

If the electrical input is higher and it is necessary to check the electrical input by cutting out the broom transmission mechanisms, the driving belt (D) must be removed and the wheel clutch (E) must be disengaged from the crankshaft (F) (see the procedure in the relevant paragraph), then turn the main switch (1) to "I" or "II" and check that the main motor electrical input is:

- 1.5 to 2.5 A at 12 V.

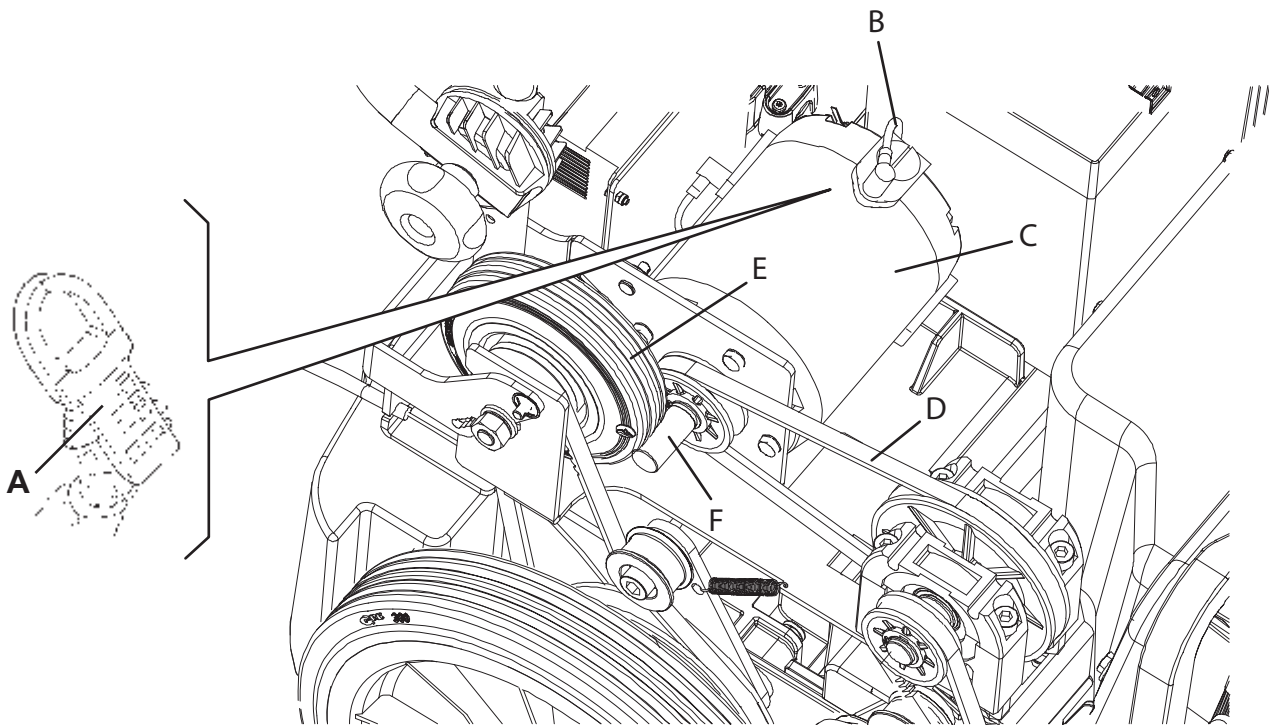
Turn the main switch to "0" and remove the amperometric pliers.

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

- Check the motor carbon brushes (see the procedure in the relevant paragraph).
- If necessary, disassemble the motor (see the procedure in the relevant paragraph), clean it and check 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).

4. Install the hood (see the procedure in the relevant paragraph).



S301605

MAIN MOTOR

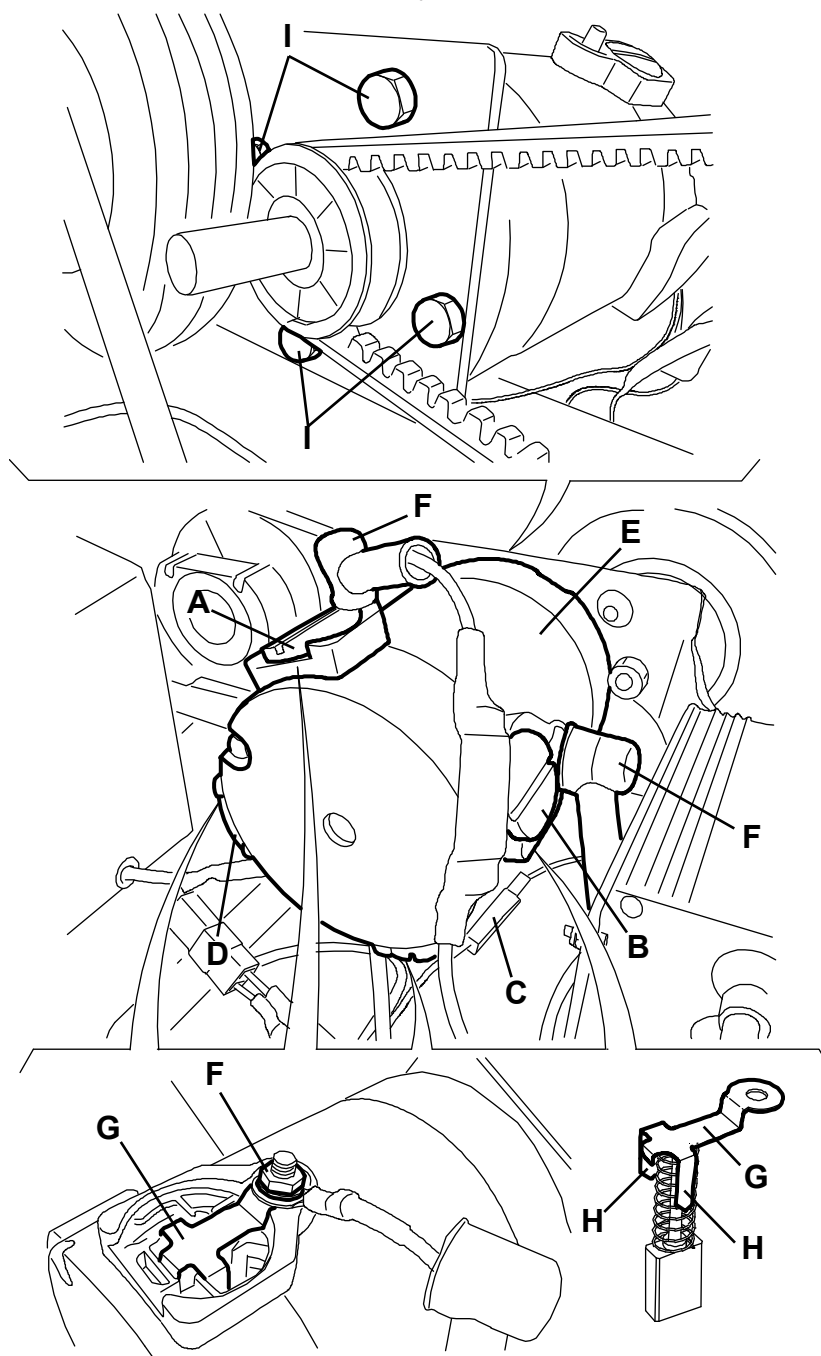
MAIN MOTOR CARBON BRUSH CHECK AND REPLACEMENT

Check and replacement

1. Remove the hood (see the procedure in the relevant paragraph).
2. Remove the protections (A), (B), (C) and (D) (bayonet joint) of the main motor (E).
3. Disconnect the connections (F).
4. Remove four carbon brushes (G) by disengaging the tabs (H).
If necessary, to remove the carbon brush in the position (C), disconnect the connections (F) and remove the screws (I), then turn the main motor (E) as necessary.
5. 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.
If necessary, replace the carbon brushes. Replace the carbon brushes as an assembly.

Reset

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



S301606

MAIN MOTOR

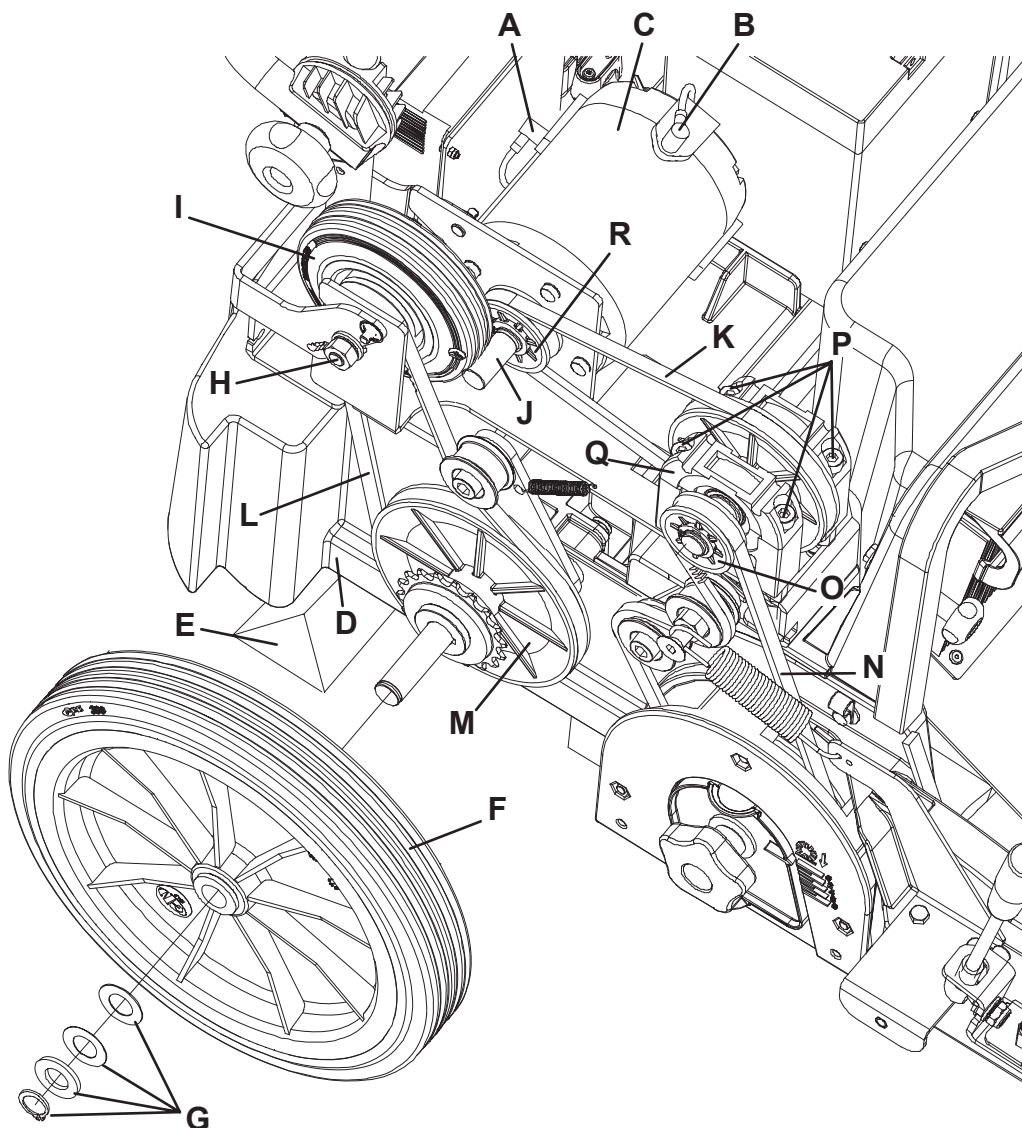
MAIN MOTOR DISASSEMBLY/ASSEMBLY

Disassembly

1. Remove the hood (see the procedure in the relevant paragraph).
2. Remove the battery (see the procedure in the relevant paragraph).
3. Disconnect the connections (A) and (B) of the main motor (C).
4. Place a suitable shim (E) under the machine frame area (D) in order to keep the right wheel (F) lifted and remove it.
5. Remove the retaining ring and the washers (G), then remove the right wheel (F).
6. Loosen the nut (H) and move away the wheel clutch (I) from the shaft (J).
7. Move the belt (K) by hand and disengage the belt (L) from the pulley (M).
8. Disengage the belt (N) from the pulley (O).
9. Remove four screws (P), then remove the holder (Q) and the belt (K) by disengaging it from the pulley (R).
10. Remove the retaining ring (S) and the pulley (T), then recover the key (U).
11. Remove the screw (V), then remove the main motor (W).

Assembly

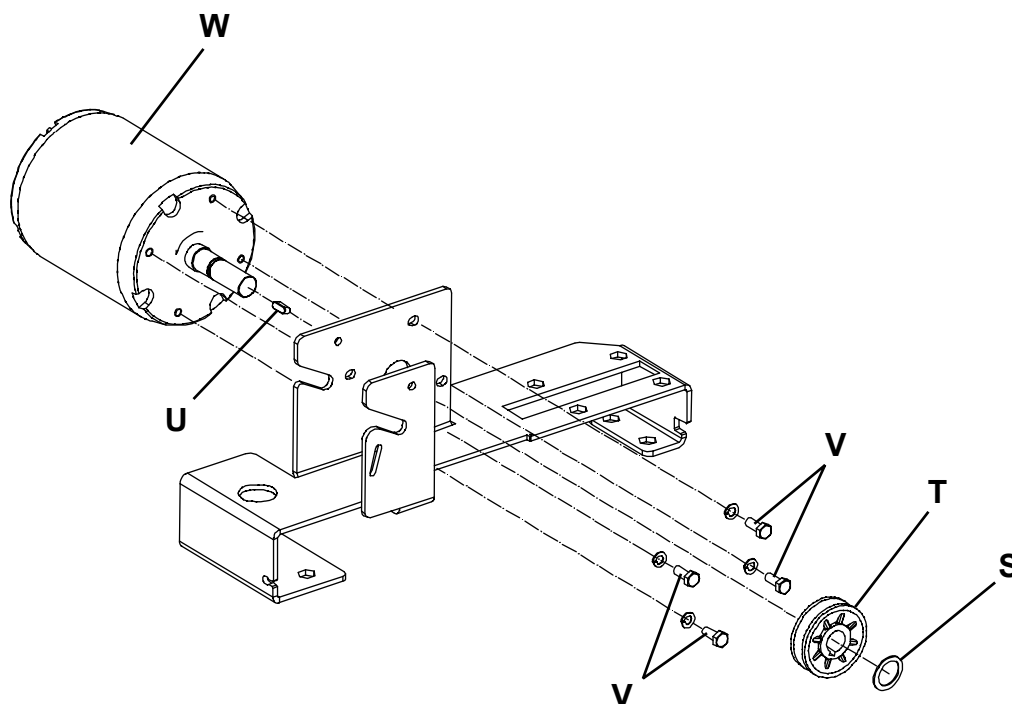
12. Perform steps 6 to 11 in the reverse order.
13. Visually inspect and adjust the driving belts and wheel clutch (see the procedure in the relevant paragraph).
14. Perform steps 1 to 5 in the reverse order.



S301607

MAIN MOTOR

MAIN MOTOR DISASSEMBLY/ASSEMBLY (Continues)



S301608

MAIN MOTOR

TROUBLESHOOTING

The circuit breaker (21) determines the open circuit. This system prevents the main motor from being damaged in case of breakdown.

In case of open circuit, possible causes are:

1. The main broom pressure on the ground is excessive (check the broom height).
2. There are bulky debris or cords around the wheel hubs (remove the debris).
3. There are bulky debris or cords around the broom or between the broom and its flange (remove the debris).
4. The floor gradient is excessive (change direction).
5. The main motor electrical input is too high (check the electrical input).

Wait at least 2 minutes after the open circuit. After repairing, press the circuit breaker button (21).

THE MACHINE DOES NOT MOVE/THE MAIN BROOM DOES NOT TURN

Possible causes:

1. The driving belts are misadjusted or broken (adjust/replace).

See also the Troubleshooting of the following systems:

- Sweeping system
- Drive system

OTHER SYSTEM**OTHER SYSTEM****NUT AND SCREW TIGHTENING CHECK**

1. Remove the side broom cover (see the procedure in the relevant paragraph).
2. Remove the hood (see the procedure in the relevant paragraph), then disconnect the negative connector of the battery (22).
3. Check for:
 - Tightening of mounting screws and nuts;
 - Correct position of the fasteners;
 - Visible faults in the components;
4. Connect the negative connector of the battery (22), then install the hood (see the procedure in the relevant paragraph).
5. Install the side broom cover (see the procedure in the relevant paragraph).

OTHER SYSTEM

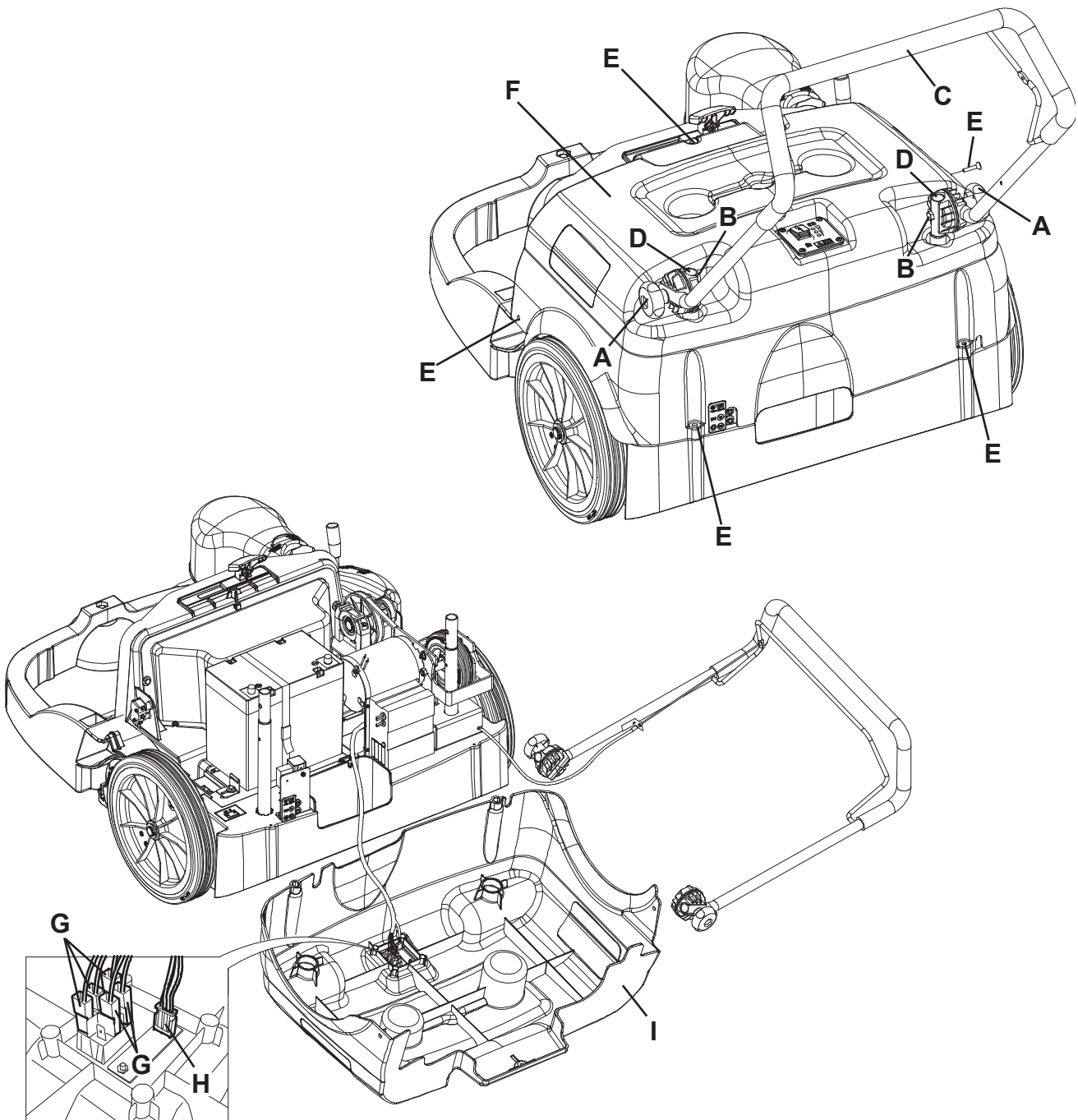
HOOD DISASSEMBLY/ASSEMBLY

Disassembly

1. Drive the machine on a level ground and ensure that it cannot move.
2. Turn the main switch (1) to "0".
3. Remove the hopper (9).
4. Unscrew the knobs (A) and remove the relevant screws (B).
5. Remove the handlebar (C) from the tubular shafts (D) and lay it on the ground.
6. Remove the mounting screws (E) of the hood (F).
7. Lift the hood (F) and lay it on the ground.
8. If necessary, disconnect the connectors (G) (mark their positions to reinstall them correctly); then disconnect the connector (H) and remove the hood (I).

Assembly

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



S301609

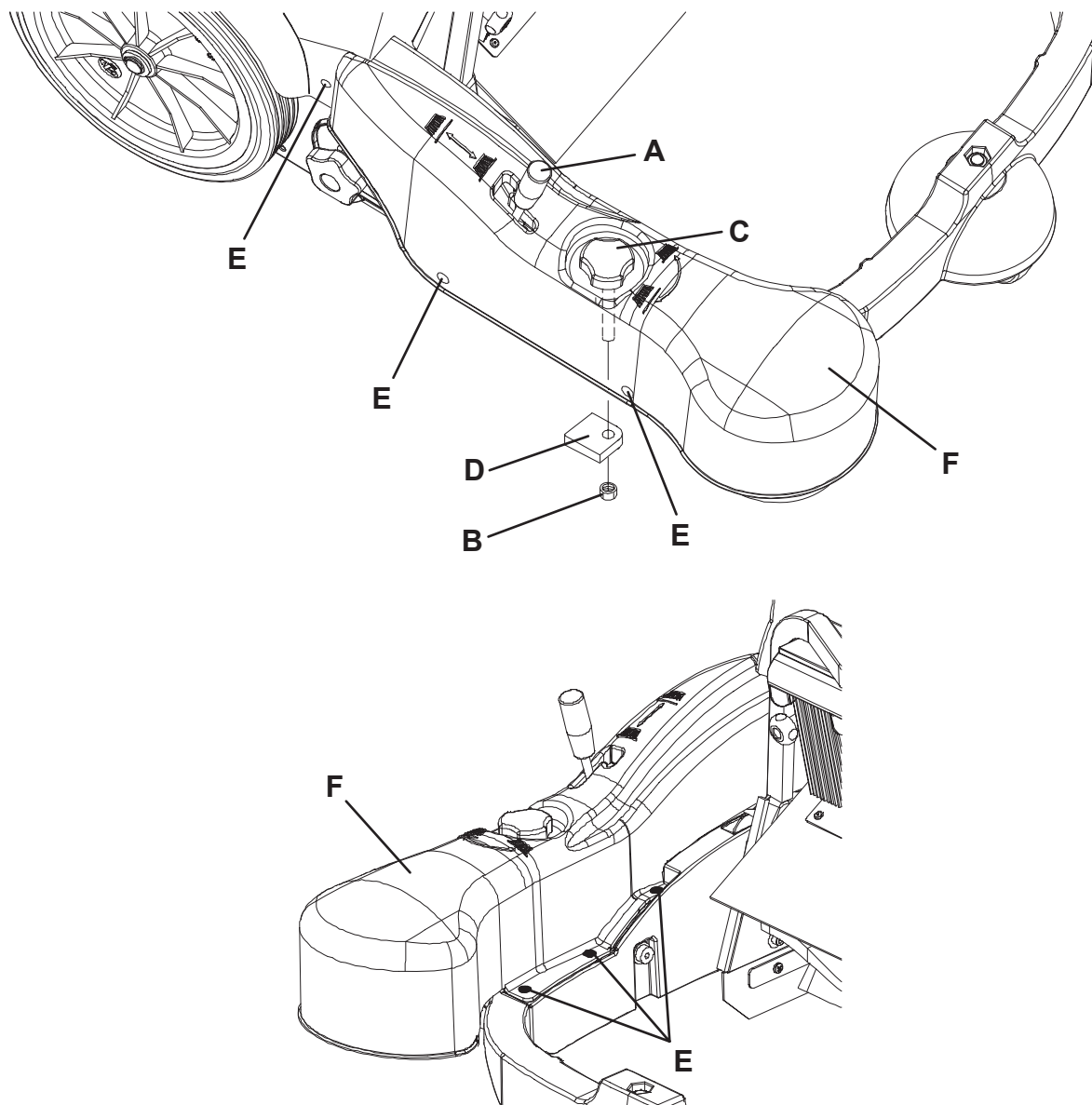
SIDE BROOM COVER DISASSEMBLY/ASSEMBLY

Disassembly

1. Drive the machine on a level ground and ensure that it cannot move.
2. Turn the main switch (1) to "0".
3. Remove the hopper (9).
4. Remove the side broom (see the procedure in the relevant paragraph).
5. Remove the lever (A).
6. Remove the self-locking nut (B).
7. Unscrew the knob (C) from the plate (D).
8. Remove the screws (E), then remove the side broom cover (F).

Assembly

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



S301610

ELECTRICAL SYSTEM

ELECTRICAL SYSTEM

BATTERY CHARGER CABLE INTEGRITY CHECK

Carefully check the battery charger cable (18) and the relevant plug for wear, cuts, cracks or other damages.

If damaged:

- Remove the hood (30) (see the procedure in the relevant paragraph).
- Replace the cable (18).

BATTERY CHARGING

1. Drive the machine to the appointed recharging area and ensure that it cannot move independently.
2. Turn the main switch (A) to "0".
3. Remove the battery charger cable (B) from the housing (C) and connect it to the electrical mains.



WARNING!

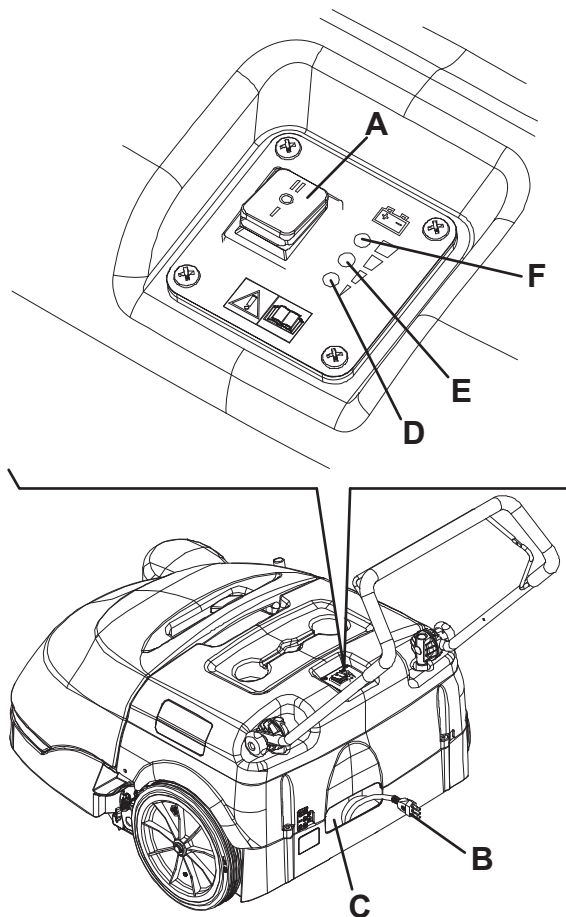
Before connecting the battery charger (B), ensure that frequency (Hz) and voltage (V) values, shown on the machine serial number plate (33), match the electrical mains voltage.

4. While charging the batteries, the red warning light (D) and the yellow warning light (E) turn on in sequence. When the green warning light (F) turns on, the batteries are charged.
5. Disconnect the battery charger cable (B) from the electrical mains and place it in the housing (C).



NOTE

When the battery charger is connected to the electrical mains, all machine functions are automatically disabled.



S301611

ELECTRICAL SYSTEM

BATTERY DISASSEMBLY/ASSEMBLY

Disassembly

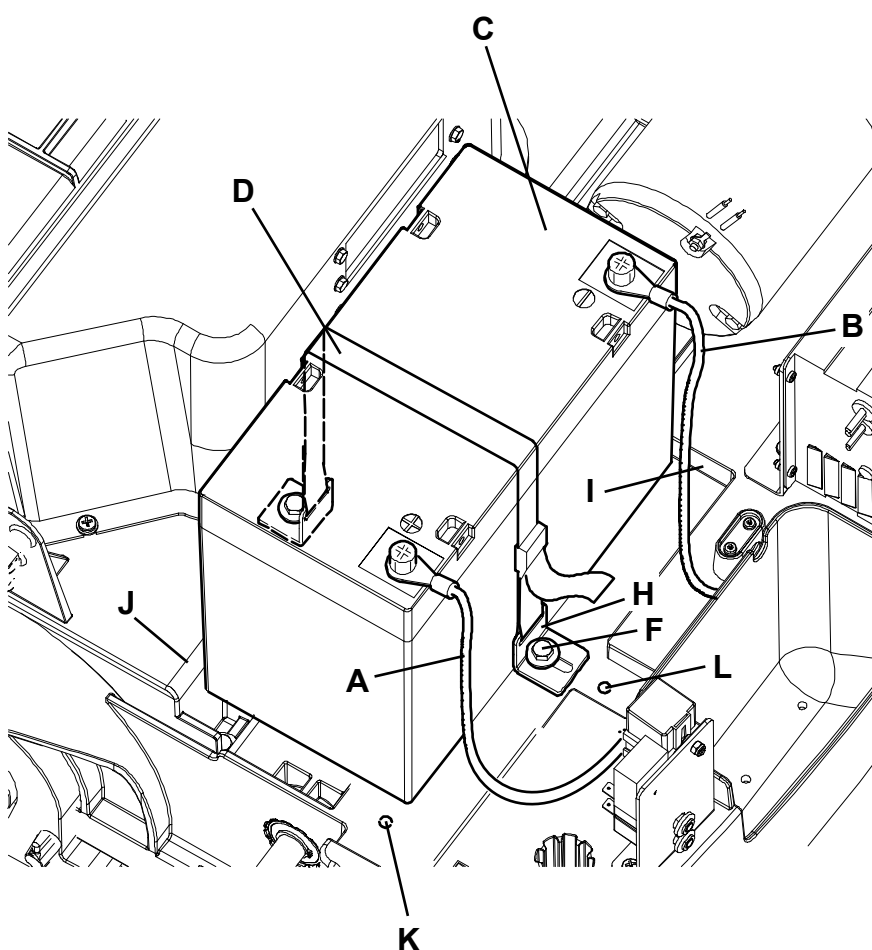
1. Remove the hood (30) (see the procedure in the relevant paragraph).
2. Disconnect the connections (A) and (B) of the battery (C).
3. Open the battery retaining belt (D).
4. If necessary, loosen the screws (F), and move the battery holding brackets (H) against the edges (I) and (J).
5. Remove the battery (C).

Assembly

**WARNING!**

If a new battery is to be installed, refer to Technical Data chapter to check which types of batteries can be installed on this machine.

6. Assemble the components in the reverse order of disassembly, and note the following:
 - Place the battery against the edges (I) and (J), then bring the brackets (G) and (H) against the battery (C) and tighten the screws (F). If necessary, when installing a bigger battery, use the holes (K) and (L) to hold the battery with the brackets (H), with the screws (F).

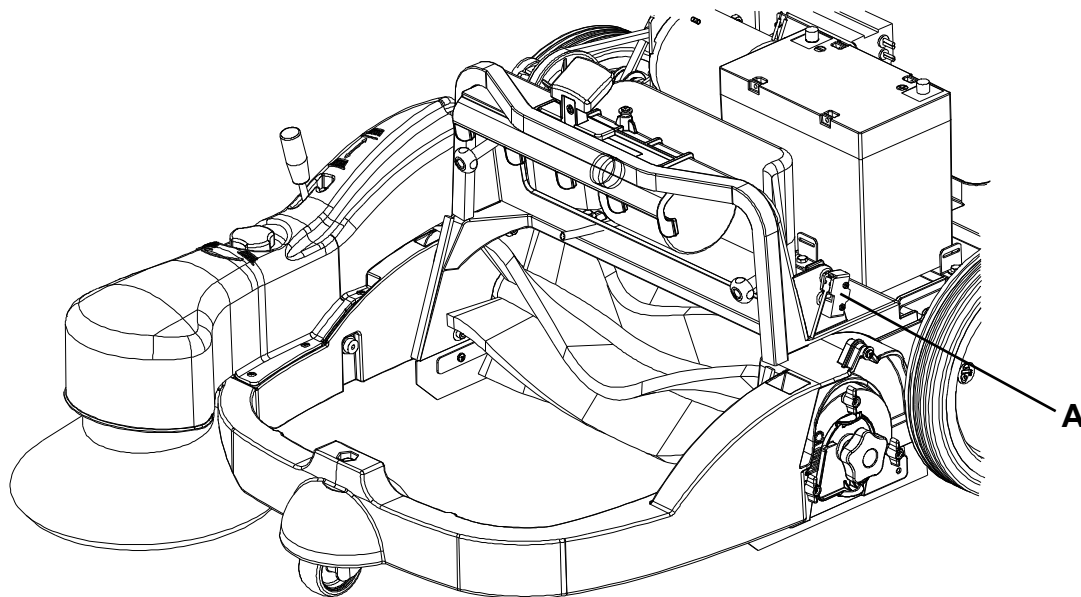


S301612

ELECTRICAL SYSTEM

HOOD SAFETY SWITCH OPERATION CHECK

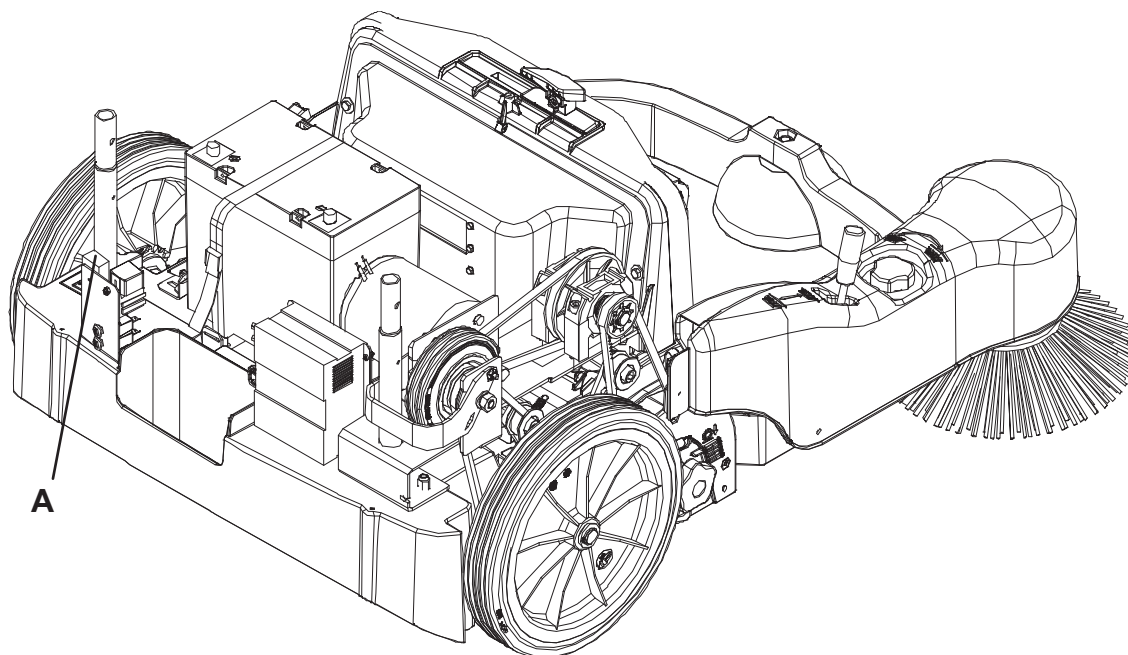
1. Remove the hood (30) (see the procedure in the relevant paragraph).
2. When the hood (30) is removed, press the main switch (1) and check that all machine functions are disabled.
If necessary, check the microswitch (A) operation and, if necessary, replace it.



S301613

LAMELLAR FUSE CHECK/REPLACEMENT

1. Remove the hood (30) (see the procedure in the relevant paragraph).
2. Check/replace the 7.5 A vacuum system motor lamellar fuse (A).
3. Install the hood (30) (see the procedure in the relevant paragraph).



S301614

ELECTRICAL SYSTEM

TROUBLESHOOTING

See the previous chapters relevant to the use of the electrical system.

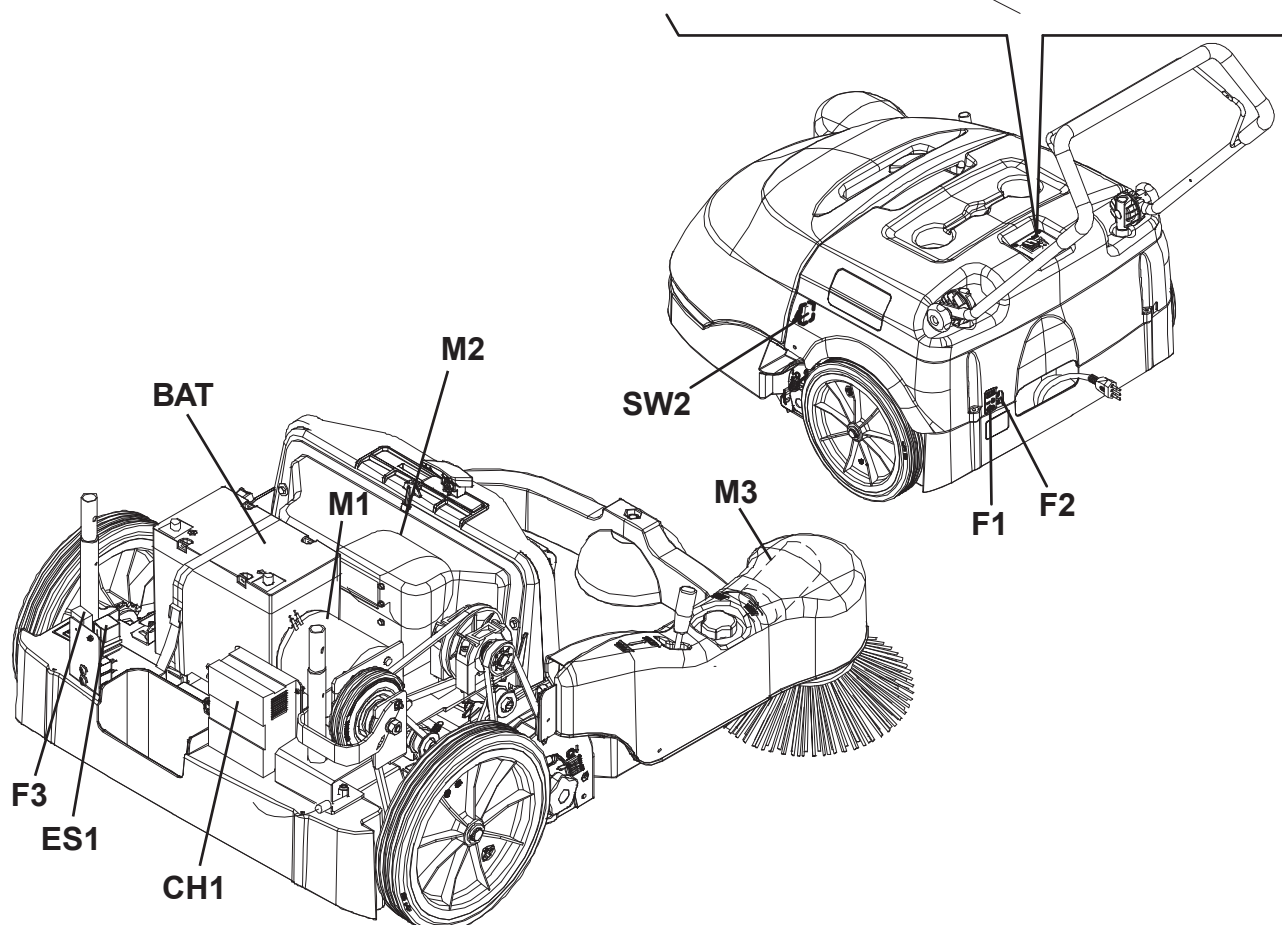
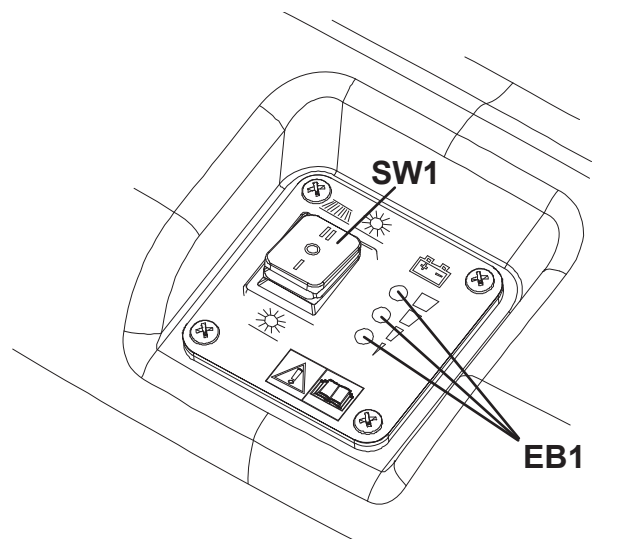
Other possible causes:

1. The battery is discharged or the connections are inefficient (check the battery or clean the connections).
2. There is an open in the fuses (reset/replace).
3. The wiring harness is cut or squashed (repair).

COMPONENT LAYOUT

Key:

BAT	Batteries
CH1	Battery charger - Function control
EB1	Electronic board LED
ES1	Relay
F1	Main fuse
F2	Vacuum fan fuse
F3	Side broom fuse
M1	Main motor
M2	Vacuum system motor
M3	Side broom motor
SW1	Main switch
SW2	Hopper microswitch



S301615

ELECTRICAL SYSTEM

WIRING DIAGRAM

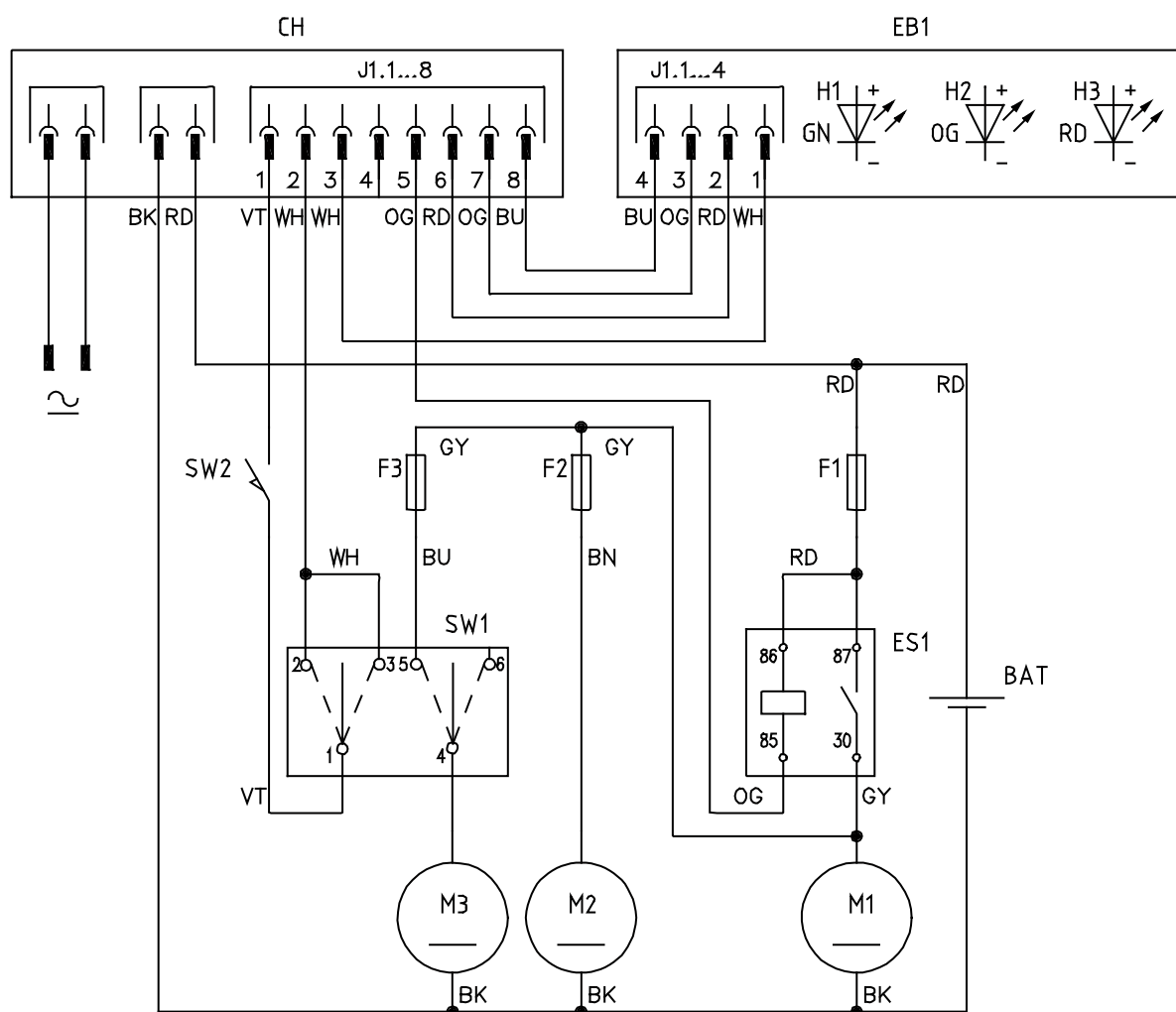
Key:

BAT	Batteries
CH1	Battery charger - Function control (*)
EB1	Electronic board LED
ES1	Relay
F1	Main fuse
F2	Vacuum fan fuse
F3	Side broom fuse
M1	Main motor
M2	Vacuum system motor
M3	Side broom motor
SW1	Main switch
SW2	Hopper microswitch

Colour code

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

(*) The battery charger cable has also the function of checking the battery charge and the machine ignition.



S301616

ELECTRICAL SYSTEM

CHARGER (CH1) CONNECTOR PINOUT

J1: model MOLEX MINIFIT 8 ways

PIN	Description	in/out	V ref.	Condition
1	Input from SW1	in	12V	SW1 on I or II
2	SW1 power	out	12V	always
3	LED common cathode	out	0V	always
4	(not connected)			
5	Output to ES1	out	0V	SW1 on I or II and charged battery
6	Red LED anode (LDR)	out	(12V)	SW1 on I or II and discharged battery or plugged charger in I or II charge phase
7	Yellow LED anode (LDY)	out	(12V)	SW1 on I or II and nearly discharged battery or plugged charger in III charge phase
8	Green LED anode (LDG)	out	(12V)	SW1 on I or II and charged battery or plugged charger with charge completed

ELECTRICAL SYSTEM

NOTES

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting or typing. There are no margins, text, or other markings on the page.

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Customer Service - 1-800-253-0367
Technical Service - 1-800-356-7274

American Lincoln®, Bowling Green, Ohio 43402
1100 Haskins Road

SERVICE FACILITIES

Clarke®, Elk Grove, Illinois 60007
2280 Elmhurst Road
(847) 956-7900

Clarke®, Denver, Colorado 80204
1955 West 13th Ave.
(303) 623-4367

Clarke®, Houston, Texas 77040
7215 North Gessner Road
713-937-7717

SERVICE AND SALES FACILITY

American Lincoln® / Clarke, Madison Heights,
Michigan 48071-0158
29815 John R.
(810) 544-6300

American Lincoln® / Clarke, Marietta, Georgia 30066
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(770) 973-5225

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Clarke American Sanders

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Clarke® LIMITED U.S. WARRANTY

This Clarke Product is warranted to be free from defects in materials and workmanship under normal use and service, when operated and maintained in accordance with Clarke's Maintenance and Operations instructions. The warranty period is subject to the conditions stated below.

3 YEARS FOR PARTS AND 1 YEAR FOR SERVICE LABOR (See exceptions below)

Motors must be inspected for carbon motor brush wear at six-month intervals by an authorized Clarke repair station. Failure to comply with the six-month inspection requirement or failure to replace worn motor brushes identified during the inspection will void the warranty on the motors. Cost of the six-month inspection and replacement of carbon motor brushes is the responsibility of the purchaser. In the event of a warranty claim on the motors, proof of inspection and any required motor brush replacement must be provided. This warranty is extended only to the original purchaser for use of the product. It does not cover normal wear parts such as electrical cable, rubber parts, hoses and motor brushes.

BATTERY WARRANTY

In addition to the items above, any original equipment Clarke Battery which becomes unserviceable under normal use within a period of ninety (90) days from date of sale to the original user will be repaired or replaced with one of equal specification at our option, F.O.B. any authorized Clarke Sales or Service Branch, with no charge to the user, except transportation costs. After expiration of the above ninety (90) day period, any battery which fails under normal use will be adjusted to the original user with a new battery of equal specification on an eighteen (18) months pro rate basis from the date of purchase. Adjustment will be determined using the then current list price, plus transportation costs.

Warranty is rendered null and void if battery is not kept filled to the proper level with DISTILLED WATER.

Clarke: POLYDUR® AUTOMATIC SCRUBBER SOLUTION AND RECOVERY TANK EIGHT-YEAR U.S. GUARANTEE

Your new Clarke machine has polydur Solution and Recovery Tanks. Polydur is a rotationally molded, low-density linear polyethylene that won't crack or dent, and withstands most corrosives and temperature extremes. Clarke backs up your Polydur tanks with an eight-year guarantee. If a tank breaks or leaks under normal use within eight years of the date of purchase, it will be replaced free.

STATED WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED

Clarke's liability under this warranty is limited to repair of the product and/or replacement of parts and is given to purchaser in lieu of all other remedies, including INCIDENTAL AND CONSEQUENTIAL DAMAGES.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SPECIFIED HEREIN. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION OF THE FACE HEREOF. NO WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY, SHALL BE IMPLIED. A warranty registration card is provided with your Clarke product. Return the card to assist Clarke in providing the performance you expect from your new floor machine.

If a difficulty develops with the product, you should: a) Contact the nearest authorized Clarke repair location or contact the Clarke Service Operations Department, 2100 Highway 265, Springdale, Arkansas 72764, for the nearest authorized Clarke repair location. Only these locations are authorized to make repairs to the product under this warranty. (b) Return the product to the nearest Clarke repair location. Transportation charges to and from the repair location must be prepaid by the purchaser. Clarke will repair the product and/or replace any defective parts with out charge within a reasonable time after receipt of the product.

Clarke, 2100 Highway 265, Springdale, Arkansas 72764.

**Clarke reserves the right to make changes or improvements to its machine without notice.
Always use genuine Clarke Parts for repair.**

Clarke®

**2100 Highway 265
Springdale, Arkansas, 72764**