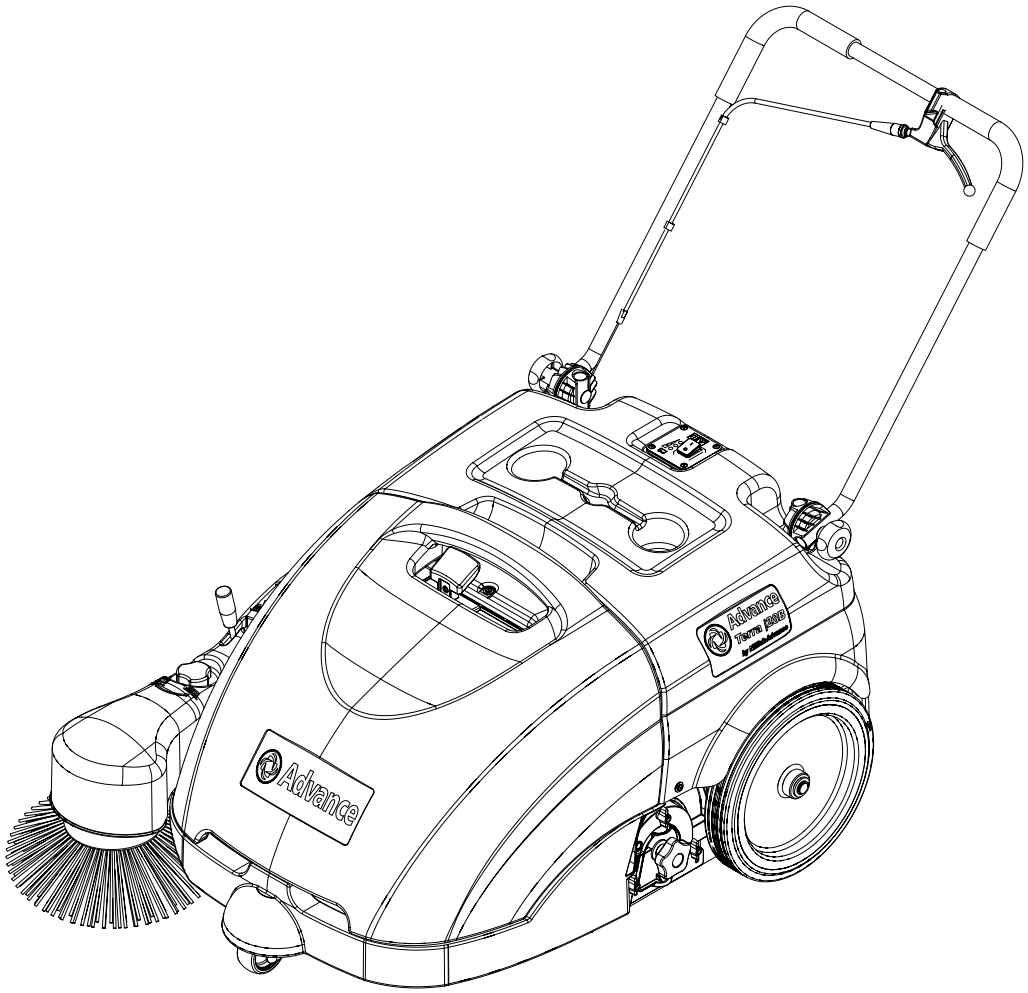
Terra™ 28B



SERVICE MANUAL
Advance model: 908 4702 010

Advance
by Nilfisk-Advance

1463163000(1)2007-02

GENERAL INFORMATION **2**
CONVENTIONS 2
MACHINE LIFTING 2
MACHINE TRANSPORT 2
OTHER AVAILABLE MANUALS 2
SAFETY 3
GENERAL INSTRUCTIONS 3
TECHNICAL DATA 4
MAINTENANCE 5
SCHEDULED MAINTENANCE TABLE 5
MACHINE NOMENCLATURE 6

SWEEPING SYSTEM **7**
SIDE BROOM HEIGHT CHECK AND ADJUSTMENT 7
SIDE BROOM DISASSEMBLY/ASSEMBLY 8
MAIN BROOM HEIGHT CHECK AND ADJUSTMENT 9
MAIN BROOM DISASSEMBLY/ASSEMBLY 10
MAIN MOTOR-TO-IDLER GEAR BELT DISASSEMBLY/ASSEMBLY (FOR MAIN BROOM) 11
MAIN BROOM BELT DISASSEMBLY/ASSEMBLY 12
SIDE BROOM MOTOR ELECTRICAL INPUT CHECK 13
SIDE BROOM MOTOR DISASSEMBLY/ASSEMBLY 14
TROUBLESHOOTING 15

SKIRT **16**
SKIRT HEIGHT AND OPERATION CHECK 16
LEFT SIDE SKIRT DISASSEMBLY/ASSEMBLY 17
RIGHT SIDE SKIRT DISASSEMBLY/ASSEMBLY 18
REAR SKIRT DISASSEMBLY/ASSEMBLY 19
FRONT SKIRT DISASSEMBLY/ASSEMBLY 19

DUST AND DEBRIS COLLECTION SYSTEM **20**
DUST FILTER CLEANING AND INTEGRITY CHECK, HOPPER GASKET CHECK 20
FILTER SHAKER OPERATION CHECK 21
VACUUM SYSTEM MOTOR ELECTRICAL INPUT CHECK 22
VACUUM SYSTEM MOTOR DISASSEMBLY/ASSEMBLY 23
TROUBLESHOOTING 23

DRIVE SYSTEM **24**
DRIVE SYSTEM CONTROL CABLE ADJUSTMENT 24
DRIVING BELT DISASSEMBLY/ASSEMBLY 25
TROUBLESHOOTING 26

MAIN MOTOR **27**
DRIVING BELT AND CLUTCH VISUAL INSPECTION AND ADJUSTMENT 27
MAIN MOTOR ELECTRICAL INPUT CHECK 28
MAIN MOTOR CARBON BRUSH CHECK AND REPLACEMENT 29
MAIN MOTOR DISASSEMBLY/ASSEMBLY 30
TROUBLESHOOTING 32

OTHER SYSTEMS **33**
NUT AND SCREW TIGHTENING CHECK 33
HOOD DISASSEMBLY/ASSEMBLY 34
SIDE BROOM COVER DISASSEMBLY/ASSEMBLY 35

ELECTRICAL SYSTEM **36**
BATTERY CHARGER CABLE INTEGRITY CHECK 36
BATTERY CHARGING 37
BATTERY DISASSEMBLY/ASSEMBLY 38
HOOD SAFETY SWITCH OPERATION CHECK 38
LAMELLAR FUSE CHECK/REPLACEMENT 39
TROUBLESHOOTING 40
COMPONENT LAYOUT 41
WIRING DIAGRAM 42

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 Advance Literature Service Department:
- Terra 28B, Spare Parts List – Advance Form Number 146 3086 000
- Terra 28B, User Manual – Advance Form Number 146 3081 000

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, turn the main switch to "0".***
- ***Before performing any maintenance/repair procedure on electrical components, disconnect the battery negative terminal.***
- ***This machine must be used by properly trained and authorised personnel only. Children or disabled people cannot use this machine.***
- ***Do not wear jewerly 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.***

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.***
- ***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.***
- ***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 Advance recommended accessories.***
- ***Take all necessary precautions to prevent hair, jewerly and loose clothes from being caught by the machine moving parts.***
- ***Do not leave the machine unattended if the main switch is not turned to "0" and without being sure that it cannot move independently.***
- ***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 warm to other people, and children especially.***
- ***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 the machine on slopes with a gradient exceeding the specifications.***
- ***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.***
- ***If the machine is used according to the instructions, the vibrations are not dangerous. The machine vibration level is less than 2.5 m/s2 (98/37/EEC-EN 1033/1995).***
- ***Carefully read all the instructions before carrying out any maintenance/repair procedure.***
- ***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 19.7 in (998 x 797 x 501 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 (A Lpa)	59.3 dB(A)

Electrical components	Values
Electrical system voltage	12 V
Standard battery	GEL, 12 V, 77 Ah
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
Dust filter surface	10.8 ft2 (1 m^2)
Main broom compartment vacuum	0.24 in H_2O (6.2 mm H_2O)

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 clutch visual inspection				
Drive system belt tensioner adjustment				
Nut and screw tightening check			(1)	
Motor carbon brush check or replacement				

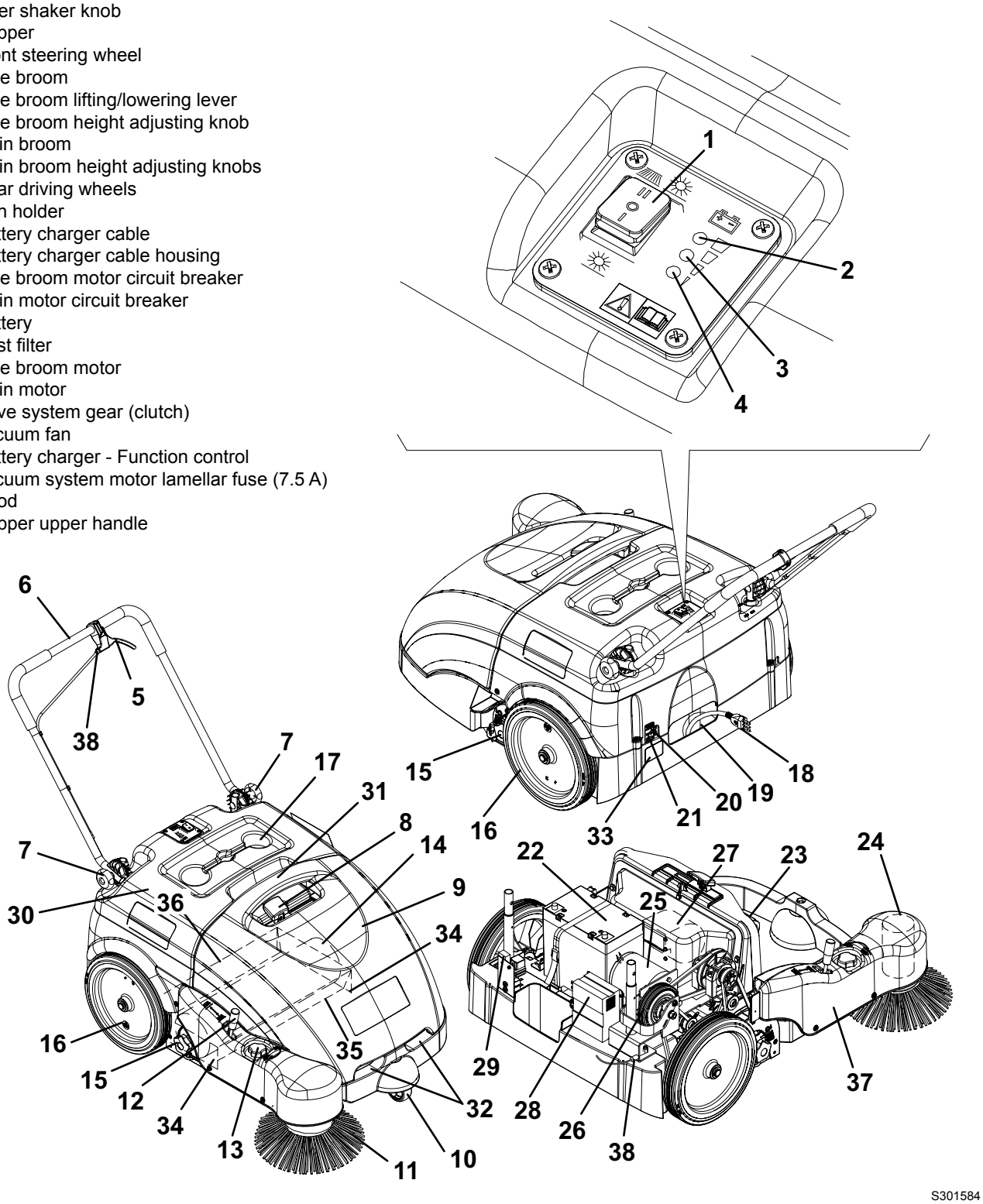
(1): And after the first 8 hours.

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

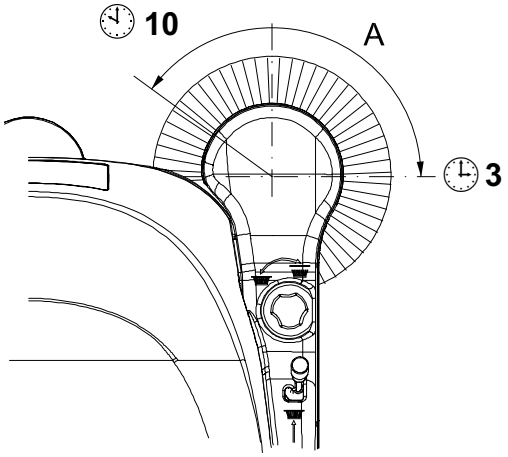


S301584

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.



S301585

SWEEPING SYSTEM

SIDE BROOM DISASSEMBLY/ASSEMBLY

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

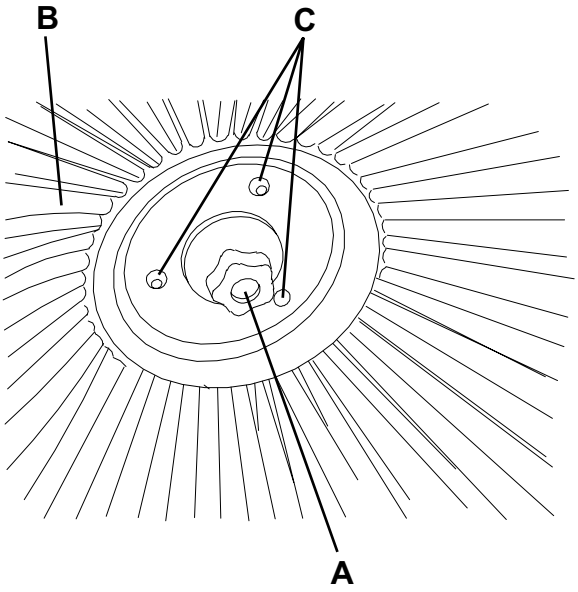
CAUTION!
It is advisable to use protective gloves when replacing the side brooms because there can be sharp debris between the bristles.

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.



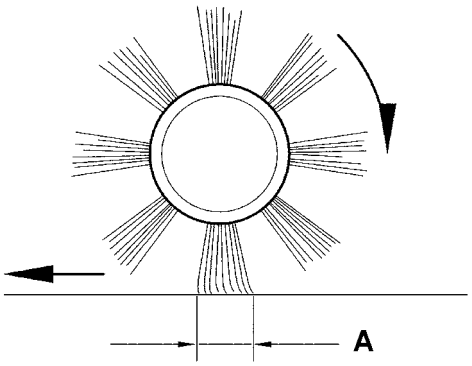
S301586

MAIN BROOM HEIGHT CHECK AND ADJUSTMENT

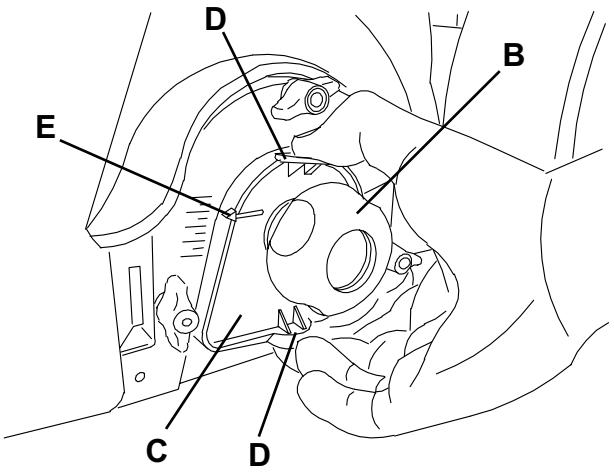
NOTE
Brooms of various hardness are available. This procedure is applicable to all types of brooms.

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.



1.2 in - 2 in
3 cm - 5 cm



S301587

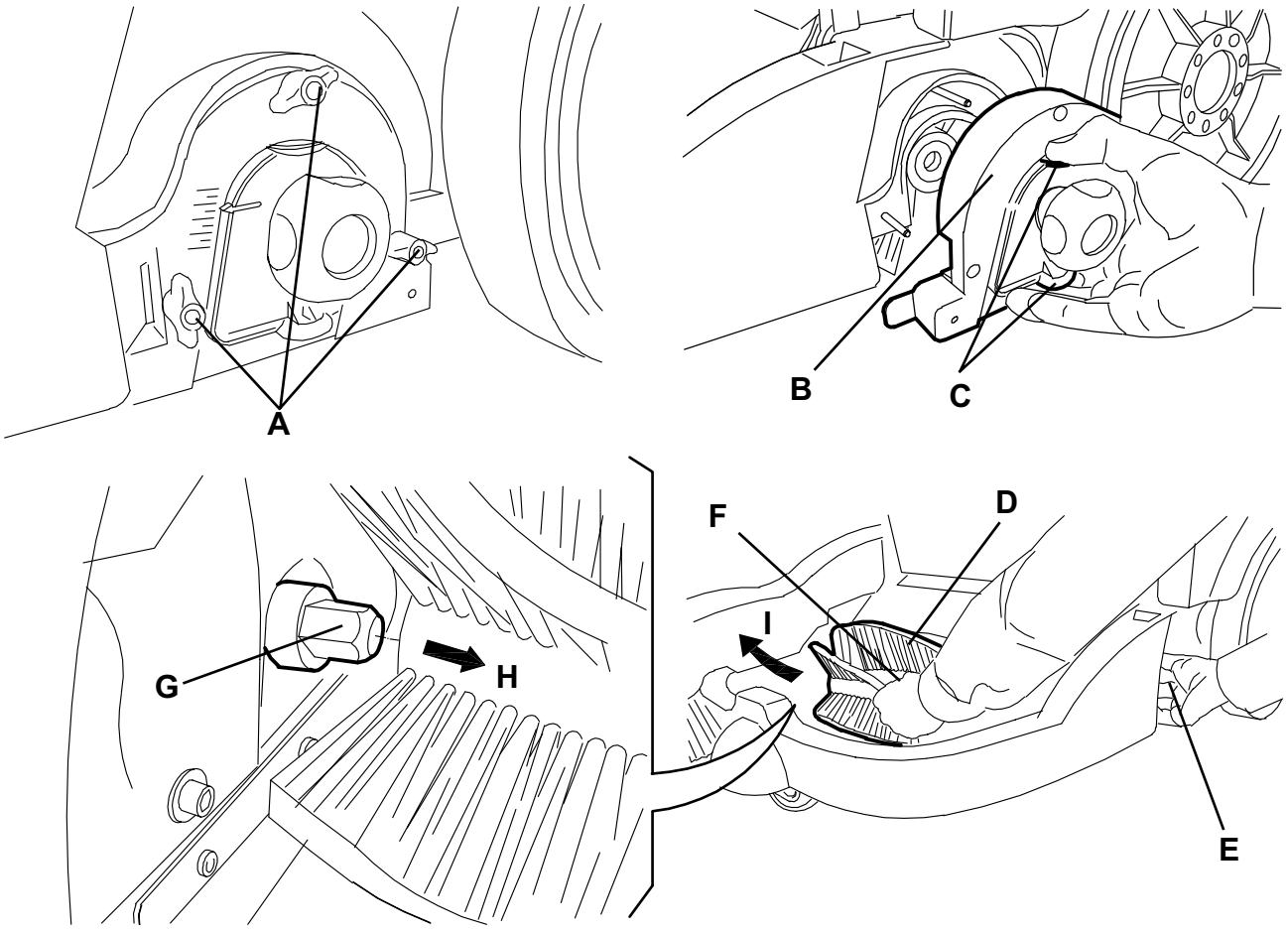
SWEEPING SYSTEM

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.



S301588

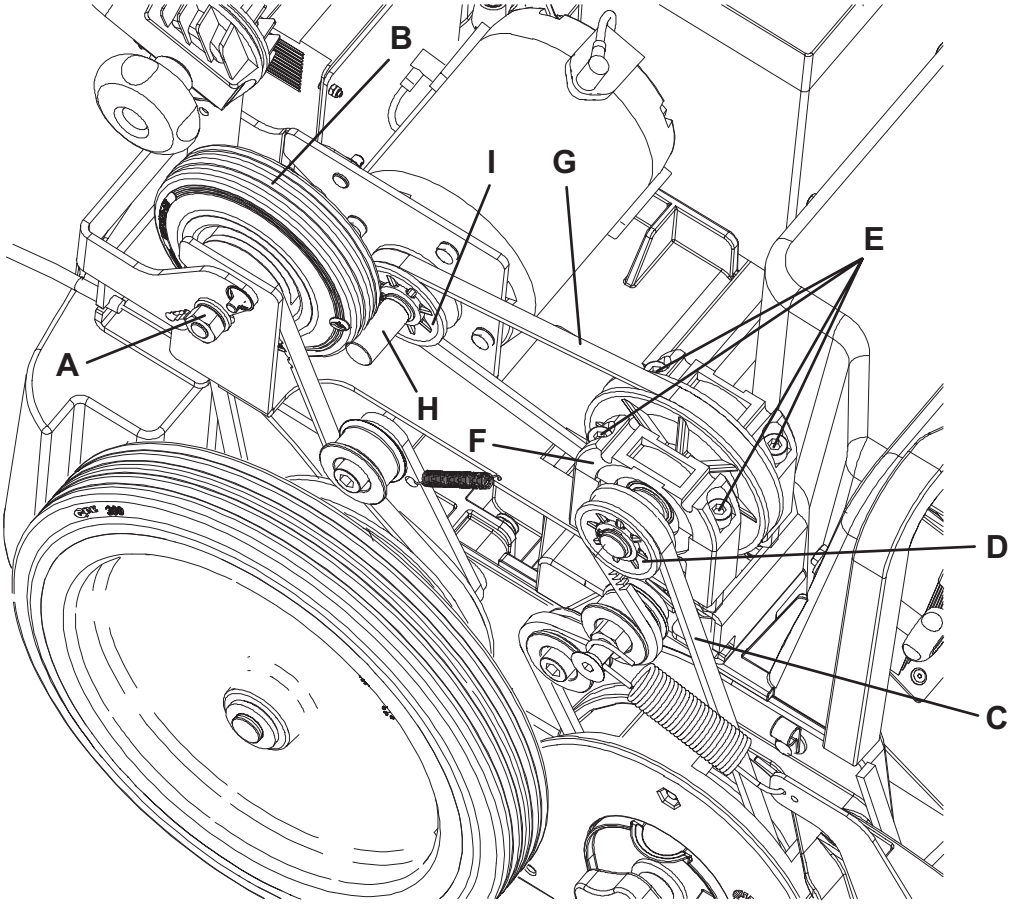
MAIN MOTOR-TO-IDLER GEAR BELT DISASSEMBLY/ASSEMBLY (FOR MAIN BROOM)

Disassembly

1. Remove the hood (see the procedure in the relevant paragraph).
2. Loosen the nut (A) and move away the 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 clutch (see the procedure in the relevant paragraph).
7. Install the hood (see the procedure in the relevant paragraph).



S301589

SWEEPING SYSTEM

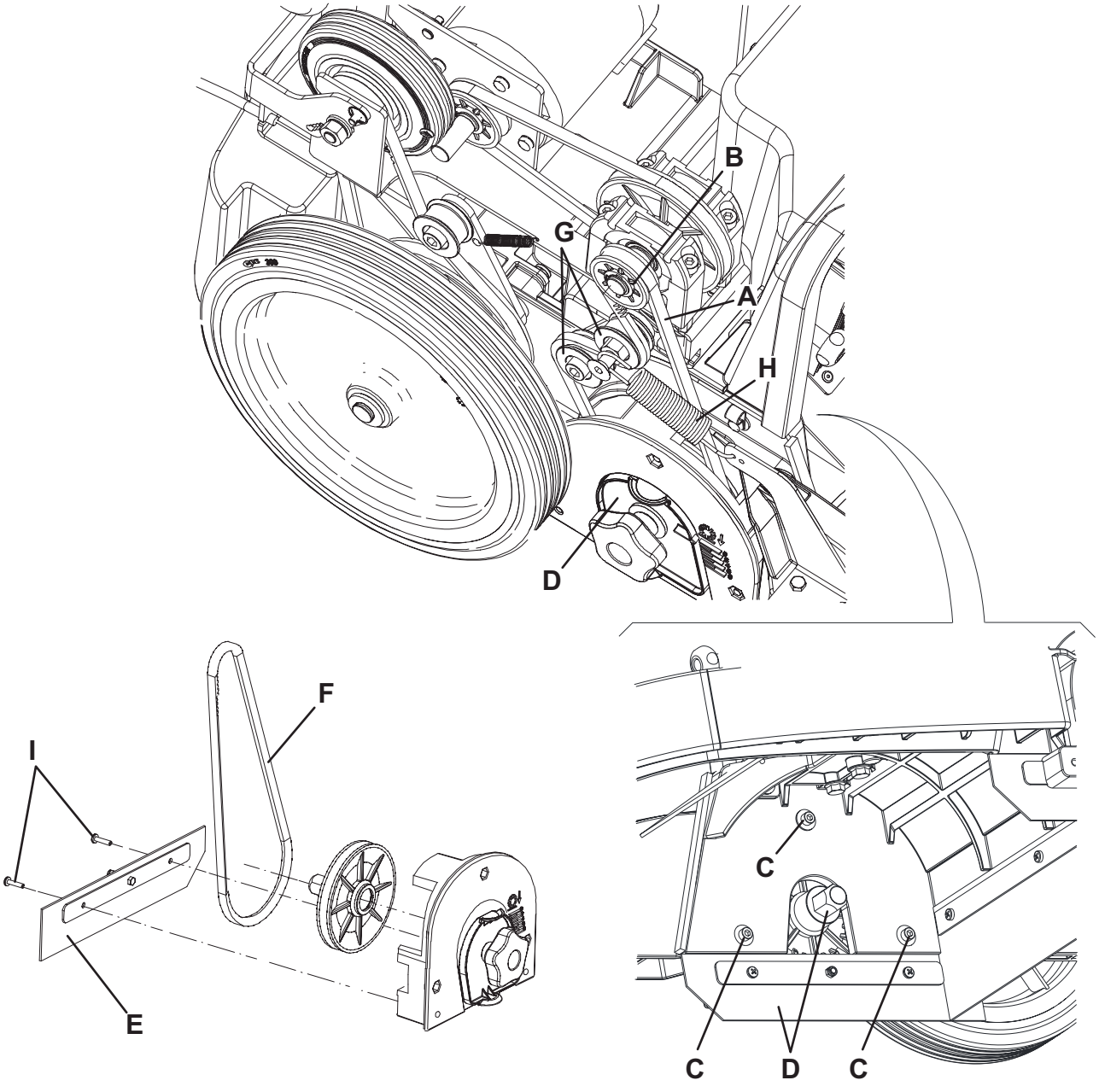
MAIN BROOM BELT DISASSEMBLY/ASSEMBLY

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 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).



S301590

SIDE BROOM MOTOR ELECTRICAL INPUT CHECK

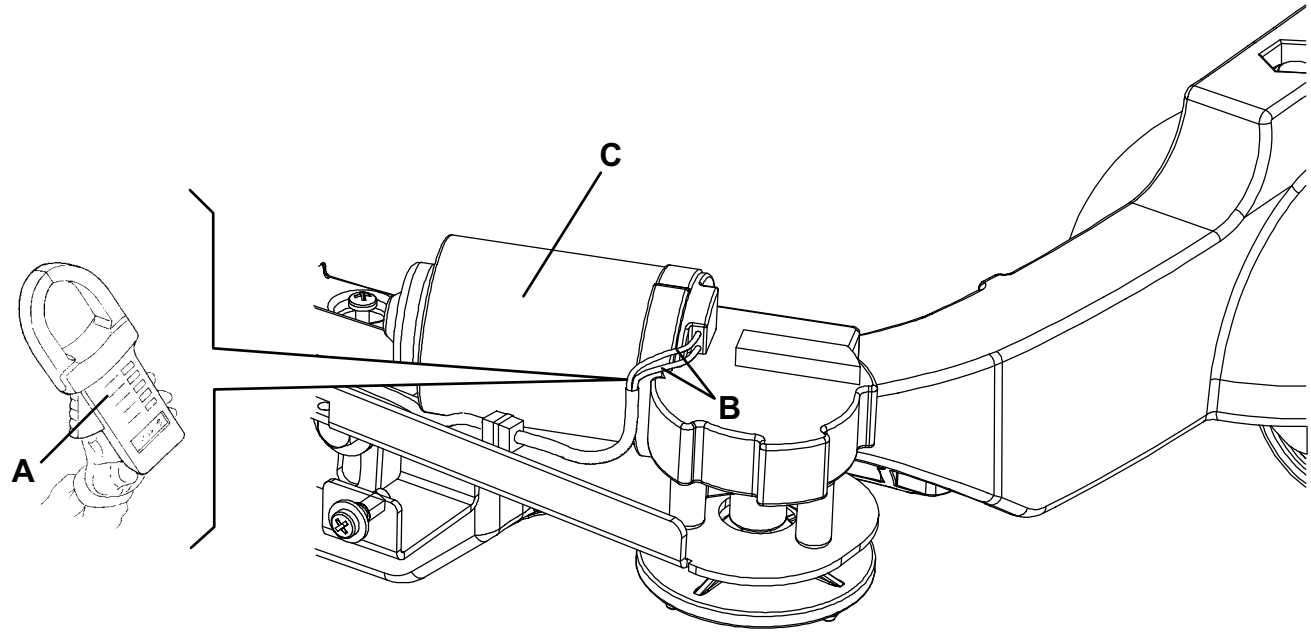
WARNING!
This procedure must be performed by qualified personnel only.

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).



S301591

SWEEPING SYSTEM

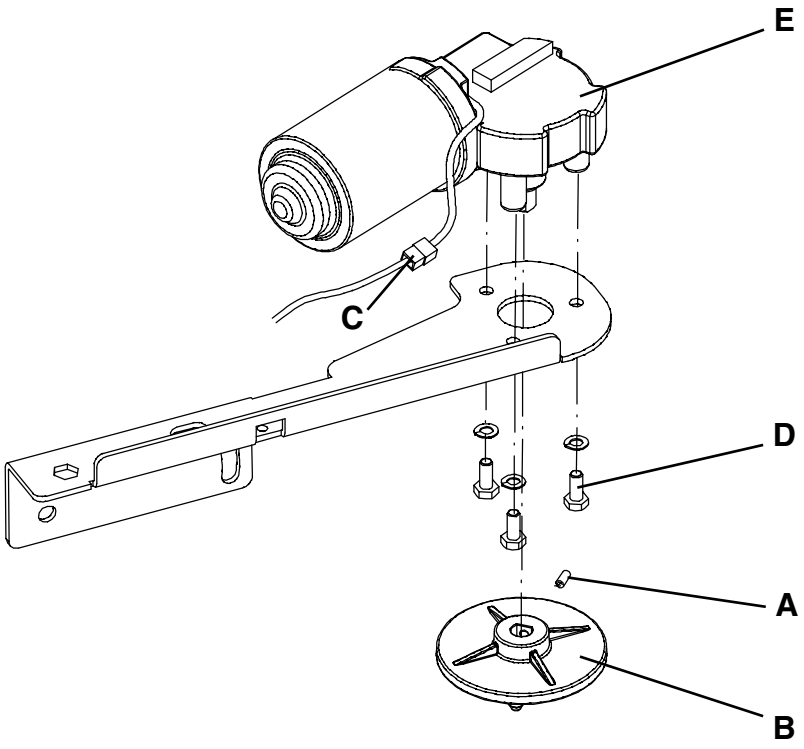
SIDE BROOM MOTOR DISASSEMBLY/ASSEMBLY

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.



S301592

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).

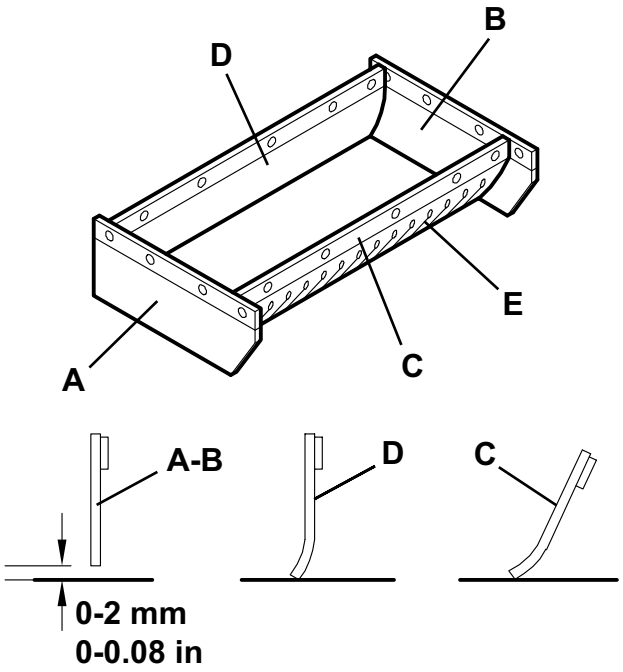
THE SIDE BROOM DOES NOT TURN

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 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).



S301593

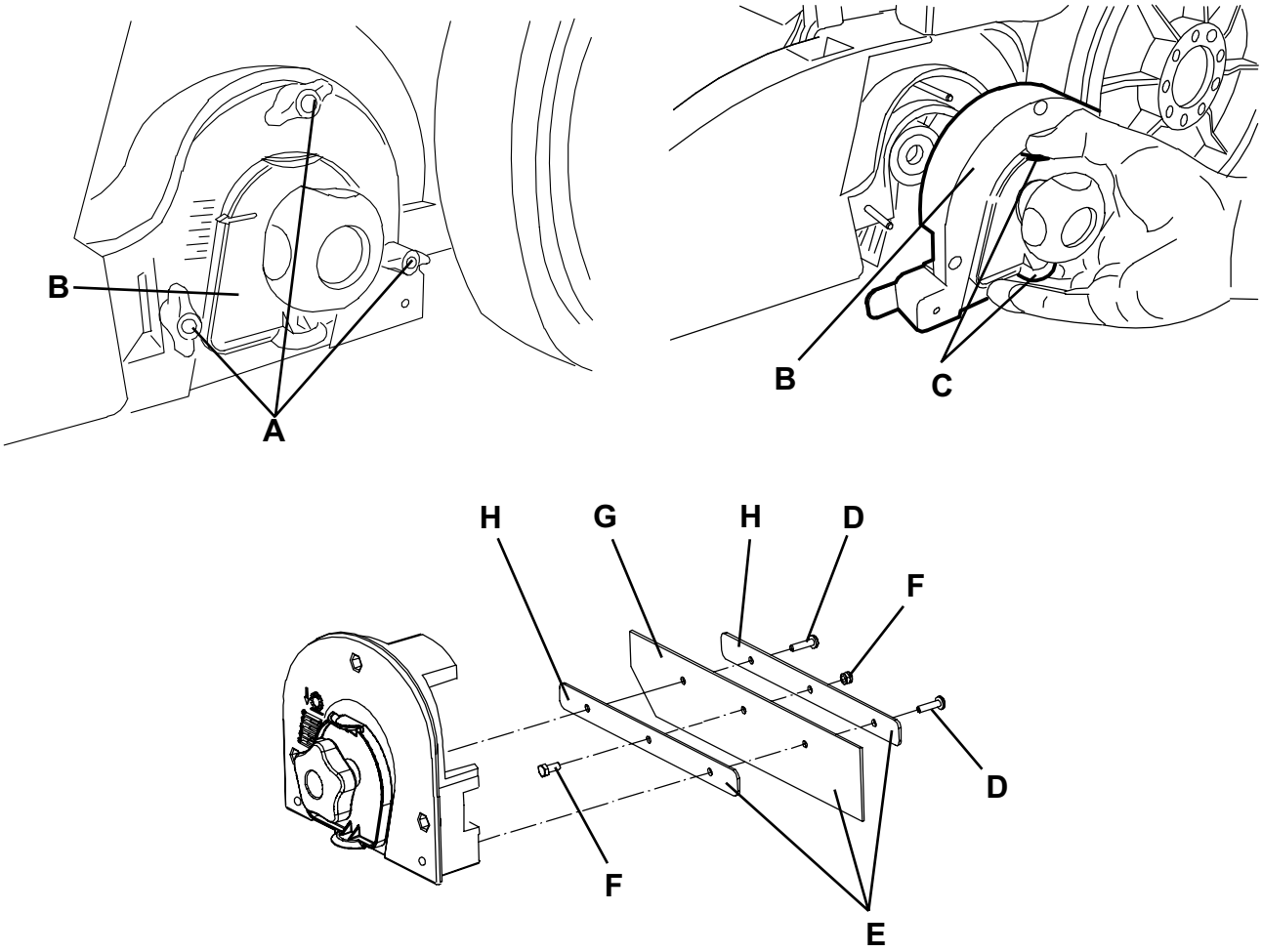
LEFT SIDE SKIRT DISASSEMBLY/ASSEMBLY

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.



S301594

SKIRT

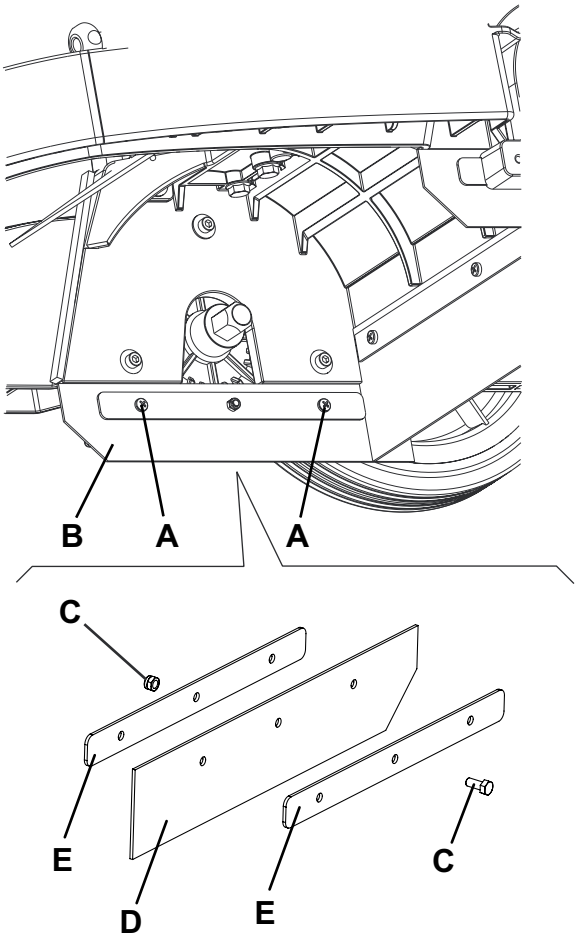
RIGHT SIDE SKIRT DISASSEMBLY/ASSEMBLY

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.



S301595

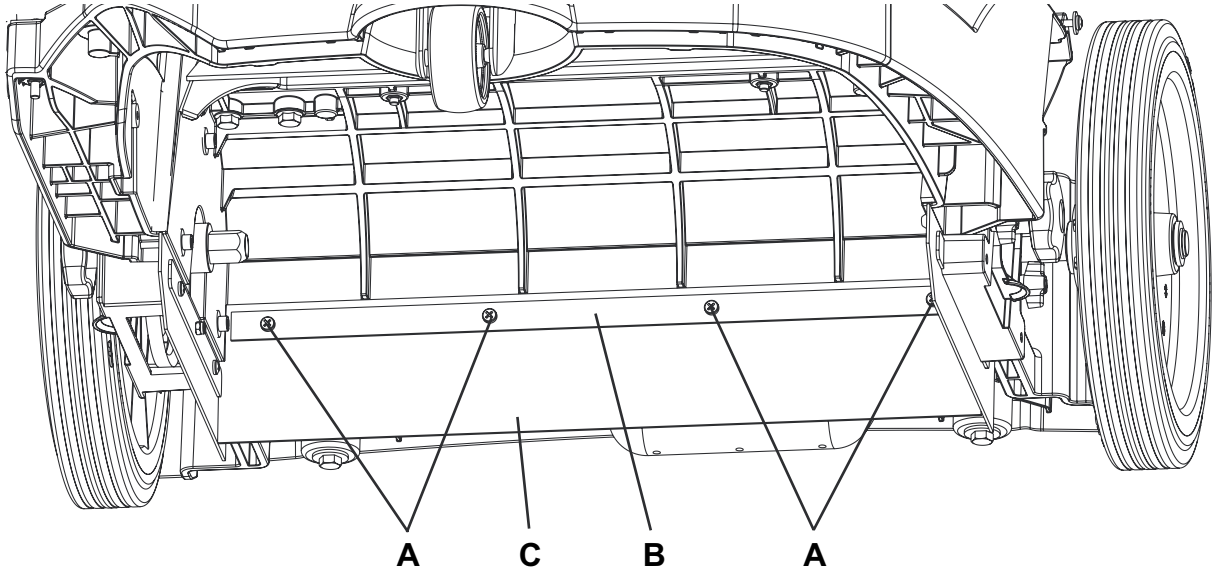
REAR SKIRT DISASSEMBLY/ASSEMBLY

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

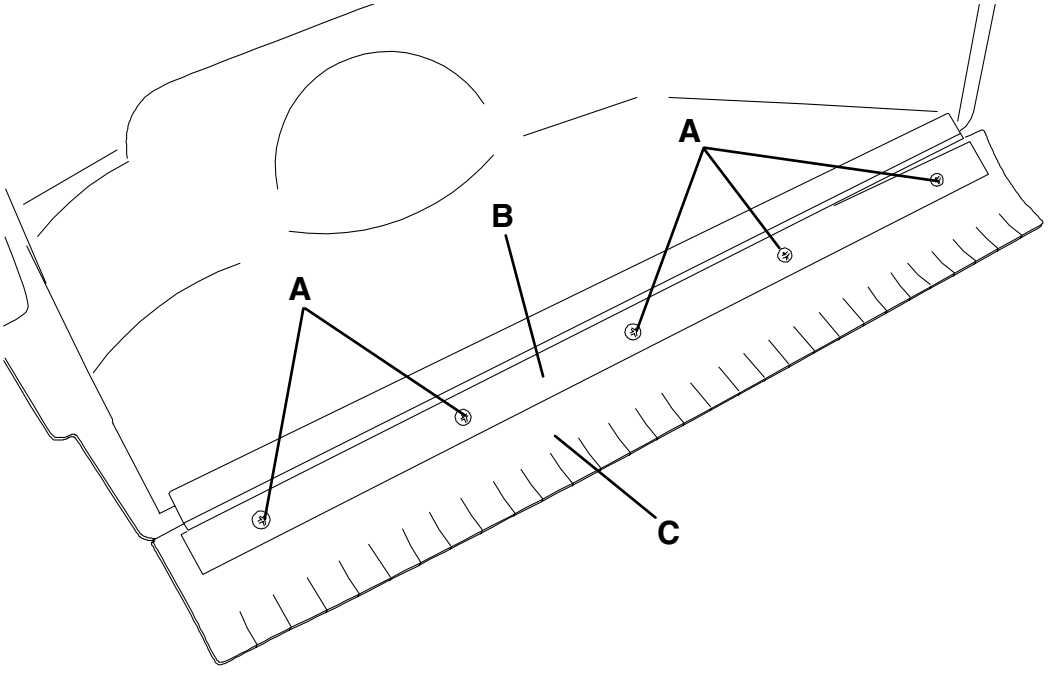
FRONT SKIRT DISASSEMBLY/ASSEMBLY

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.



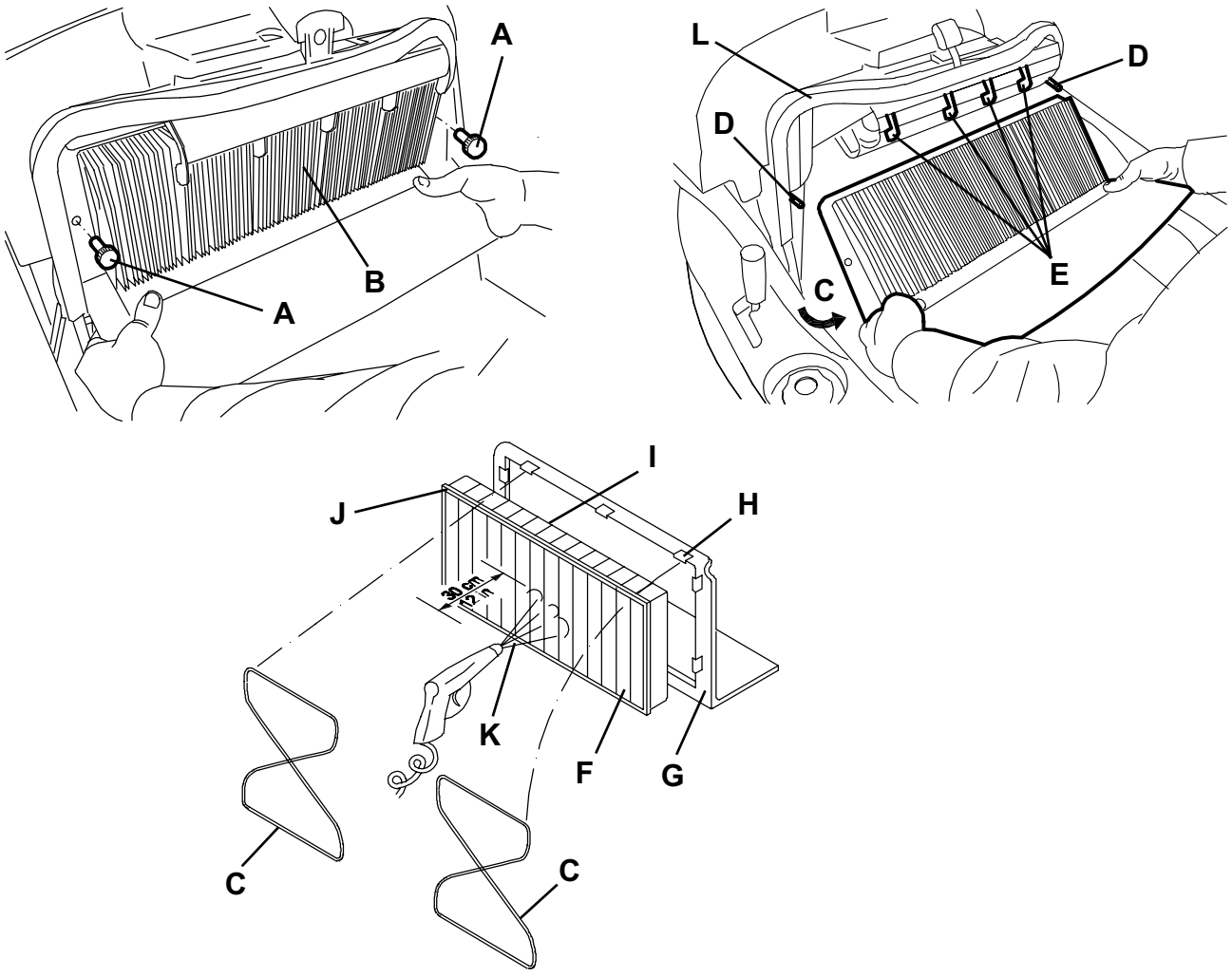
S301597

DUST AND DEBRIS COLLECTION SYSTEM

DUST 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).
   Do not use water or detergents to clean it, otherwise it can be damaged.
   Check the filter body for tears. If necessary, replace it.
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.

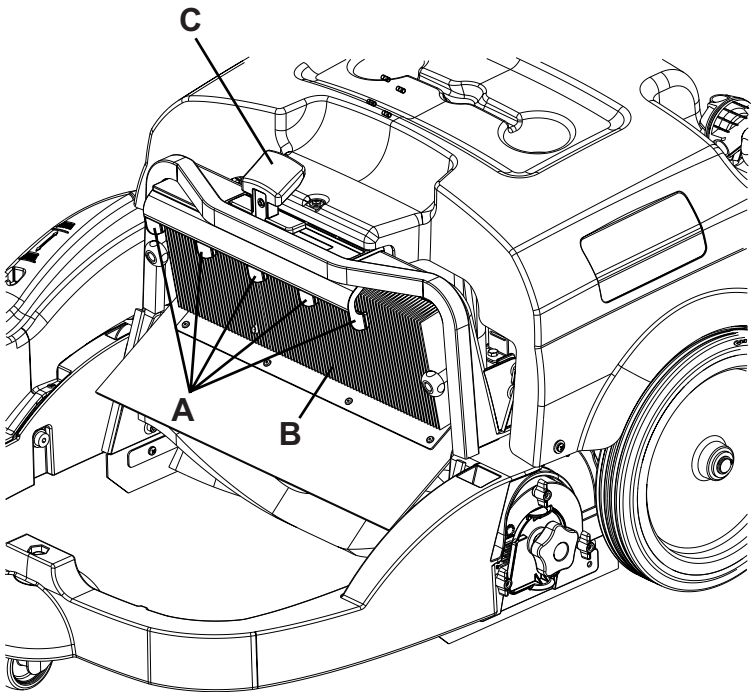
NOTE
Assemble the filter with the gasket (J) positioned as shown in the figure.



S301598

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.

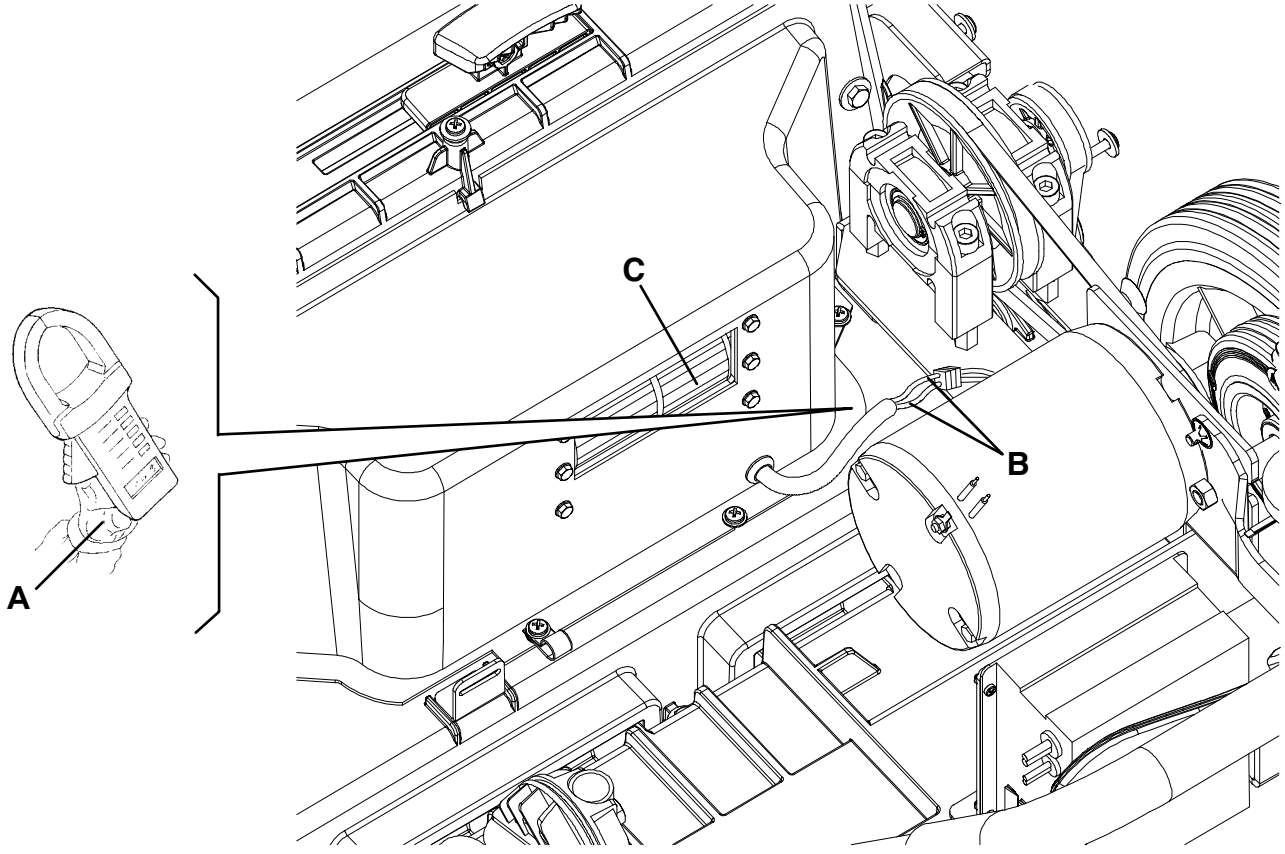
1. Remove the hood (see the procedure in the relevant paragraph).

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

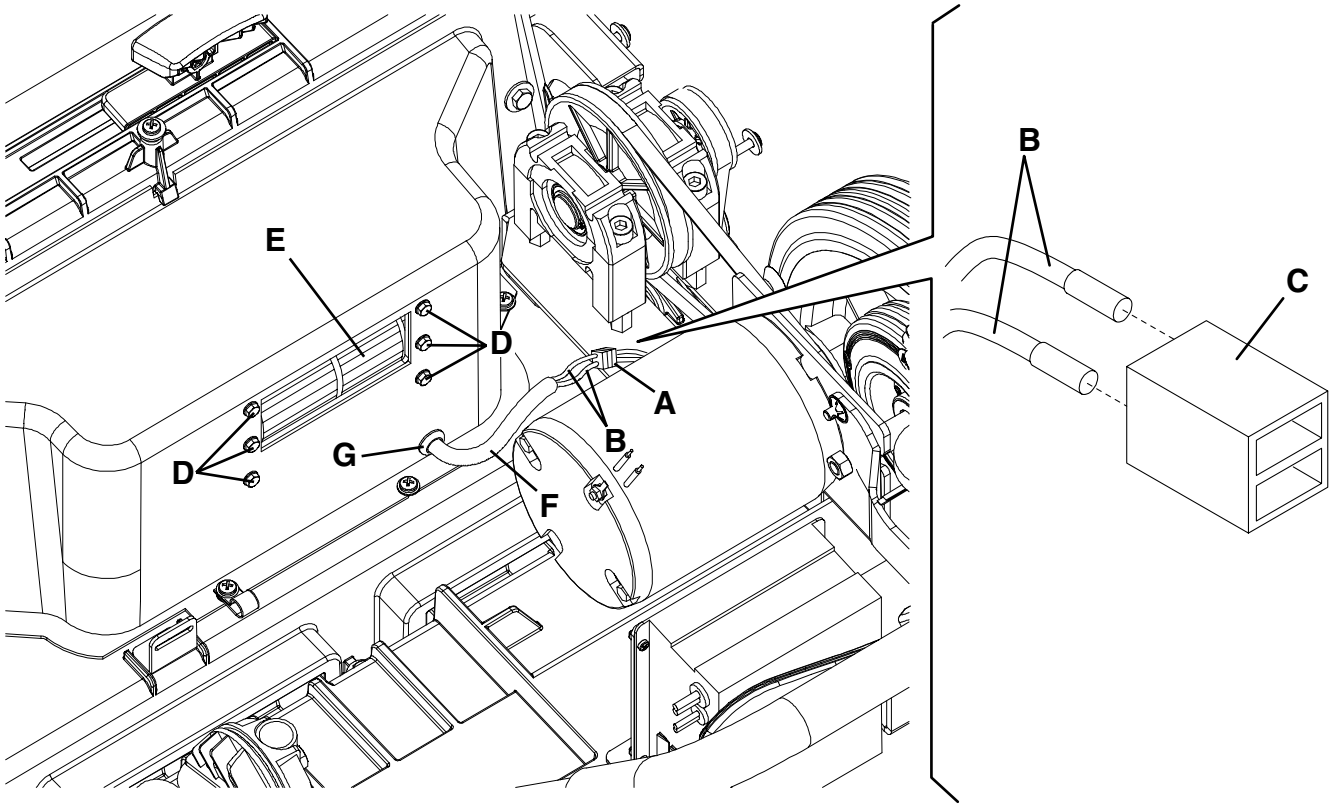
VACUUM SYSTEM MOTOR DISASSEMBLY/ASSEMBLY

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

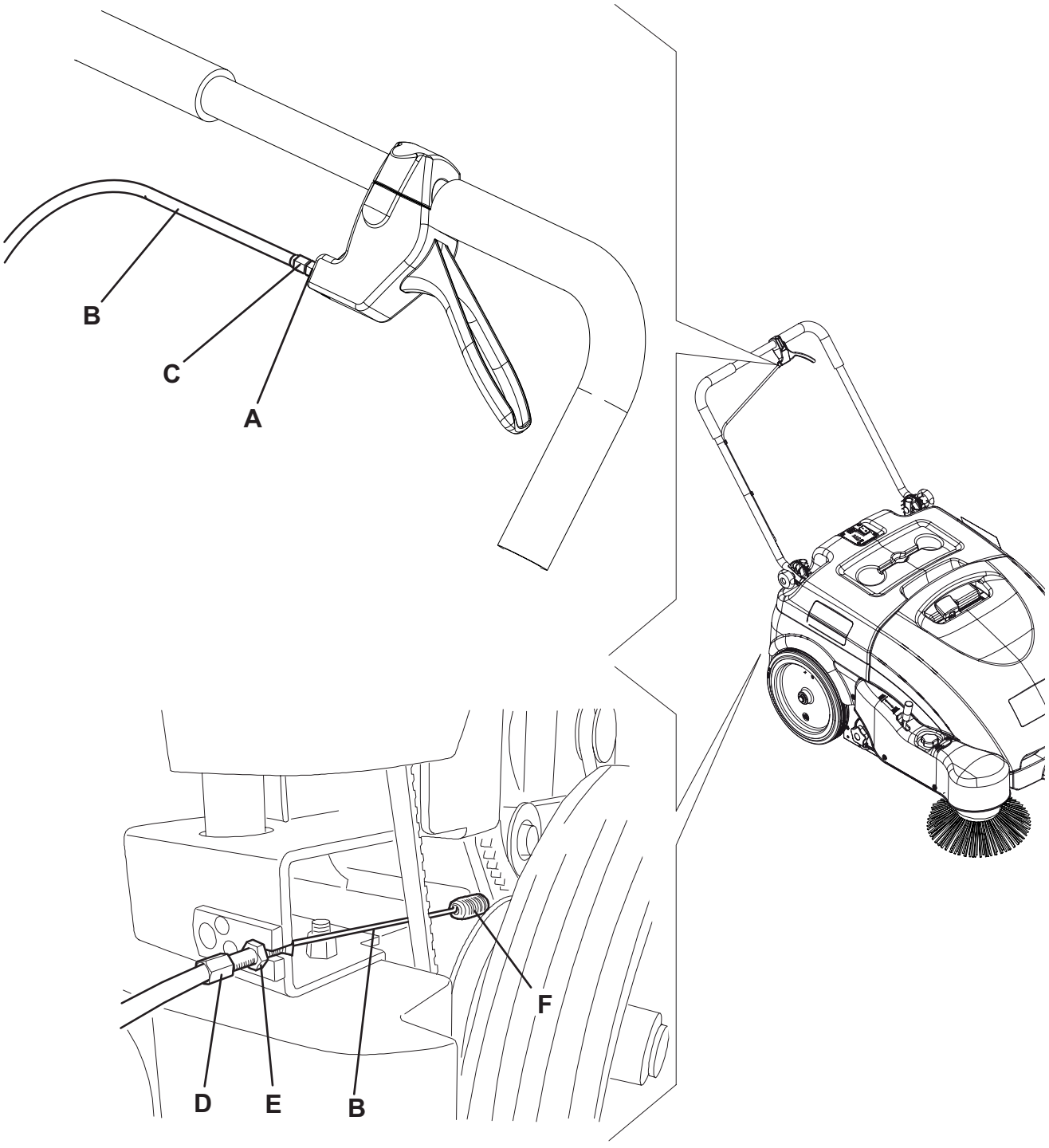
Possible causes:

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

DRIVE SYSTEM

DRIVE SYSTEM 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).
   If it is not possible to obtain the proper adjustment, adjust the control cable on the adjuster (D) according to the following procedure.
4. Remove the hood (see the procedure in the relevant paragraph).
5. Loosen the nut (E), then adjust the drive system control cable with the adjuster (D). When the adjustment is completed, tighten the nut (EN).
6. Check the return spring (F) for proper operation.
7. Install the hood (see the procedure in the relevant paragraph).



S301602

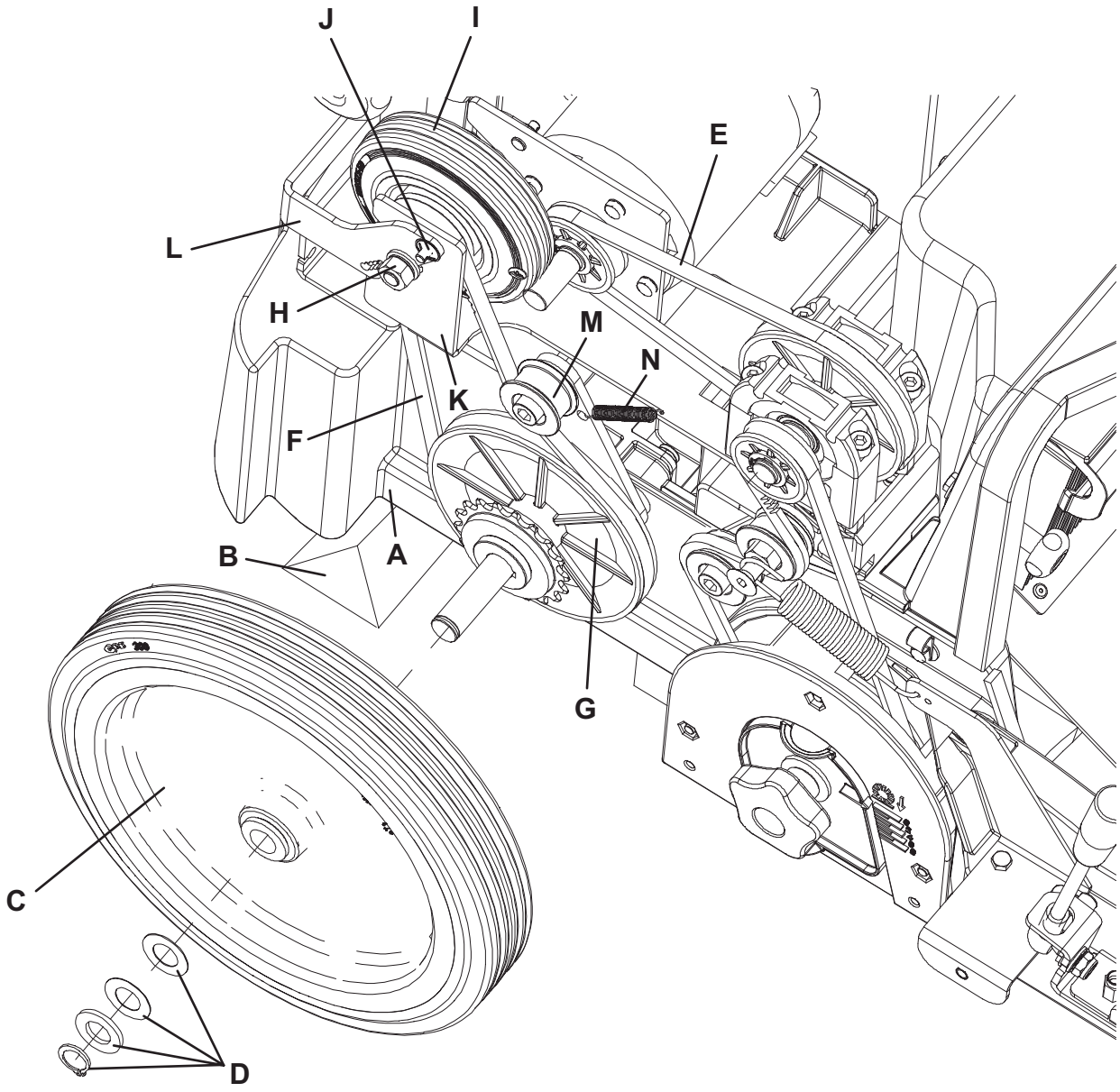
DRIVING BELT DISASSEMBLY/ASSEMBLY

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 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 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).

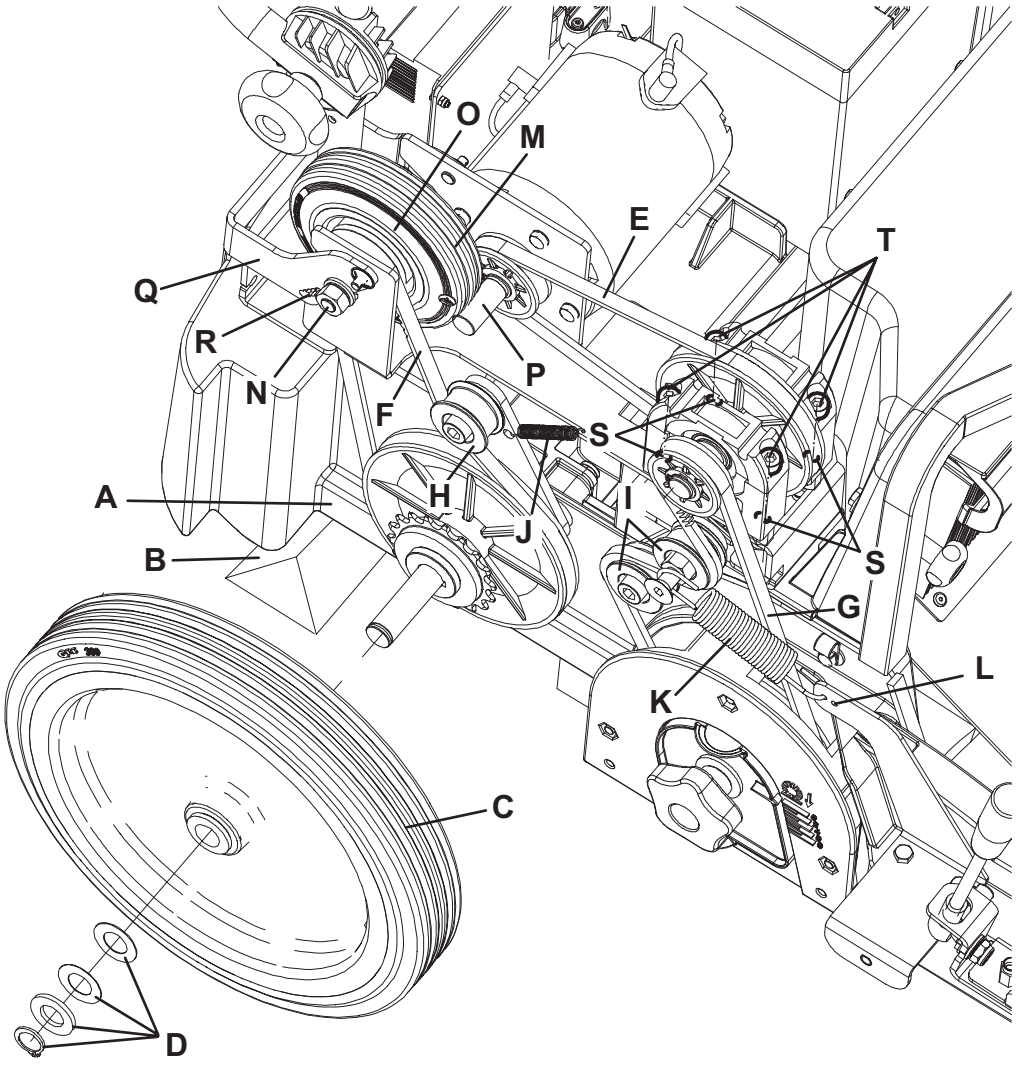
Wait at least 2 minutes after the open circuit. After repairing, press the circuit breaker button (21).

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 clutch is misadjusted or broken (adjust/replace).

DRIVING BELT AND 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 clutch (O) for integrity and efficiency. If necessary, replace the clutch (O) (see the procedure in the relevant paragraph).
6. If necessary, loosen the nut (N) and adjust the pressure of the clutch (O) on the shaft (P), by moving the lever (Q) for one or more notches (R). When the adjustment is completed, tighten the nut (N).
7. 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).

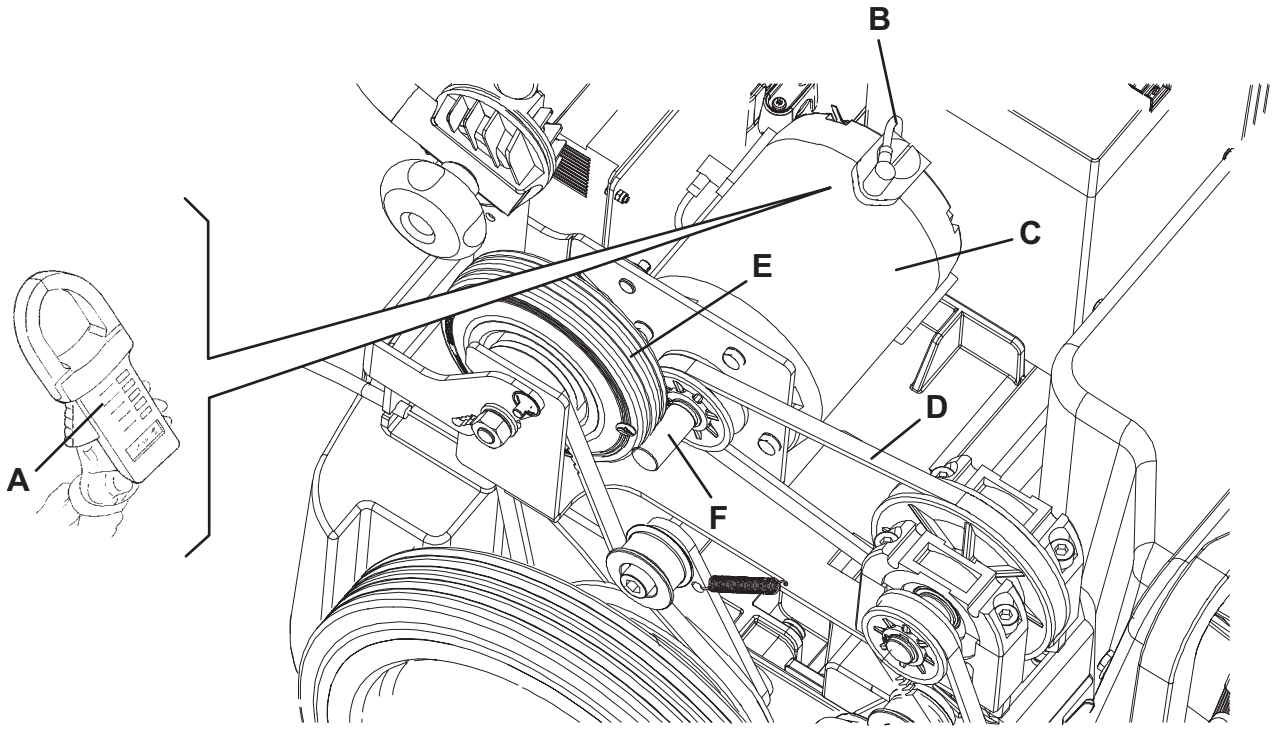
WARNING!
Pay attention to the broom rotation while performing the following steps.

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 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

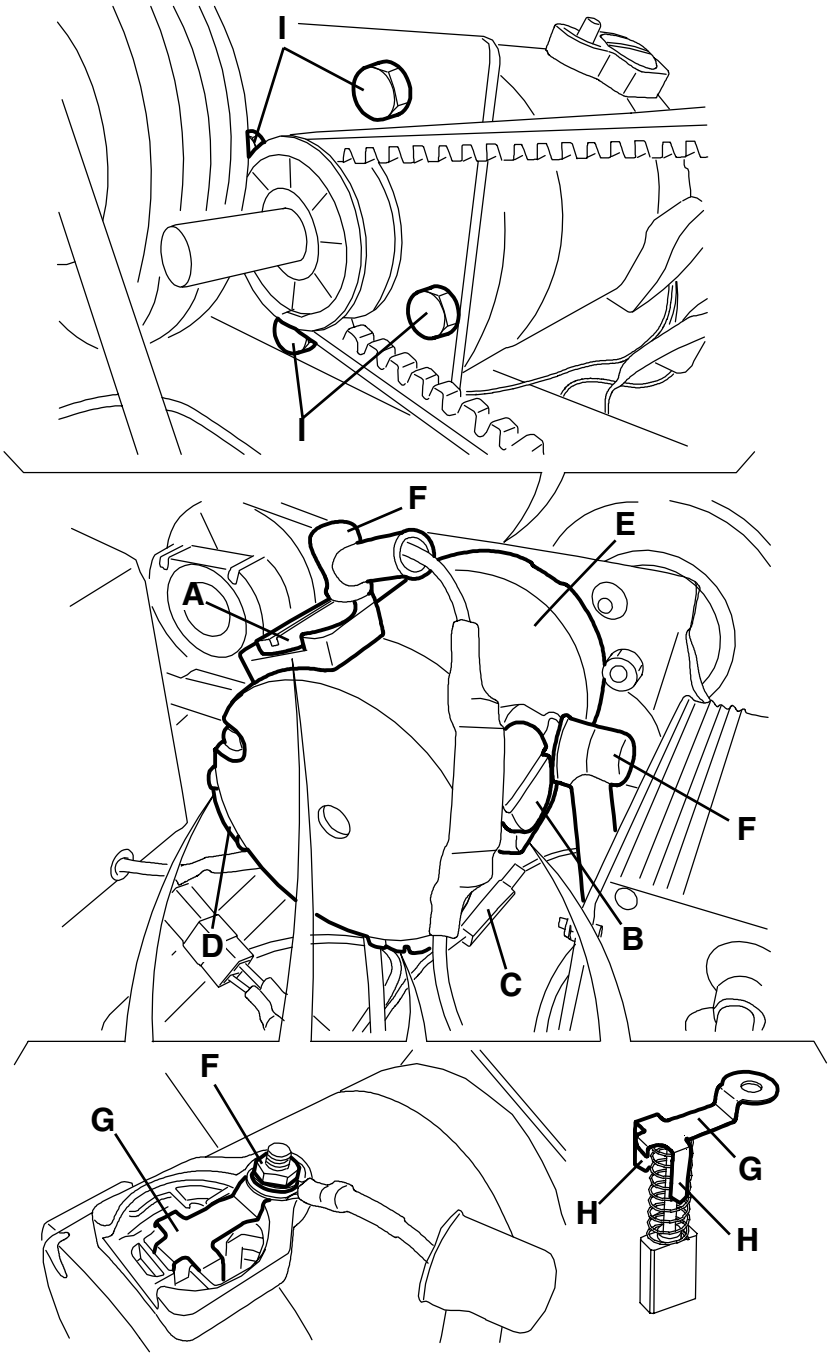
MAIN MOTOR CARBON BRUSH CHECK AND REPLACEMENT

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

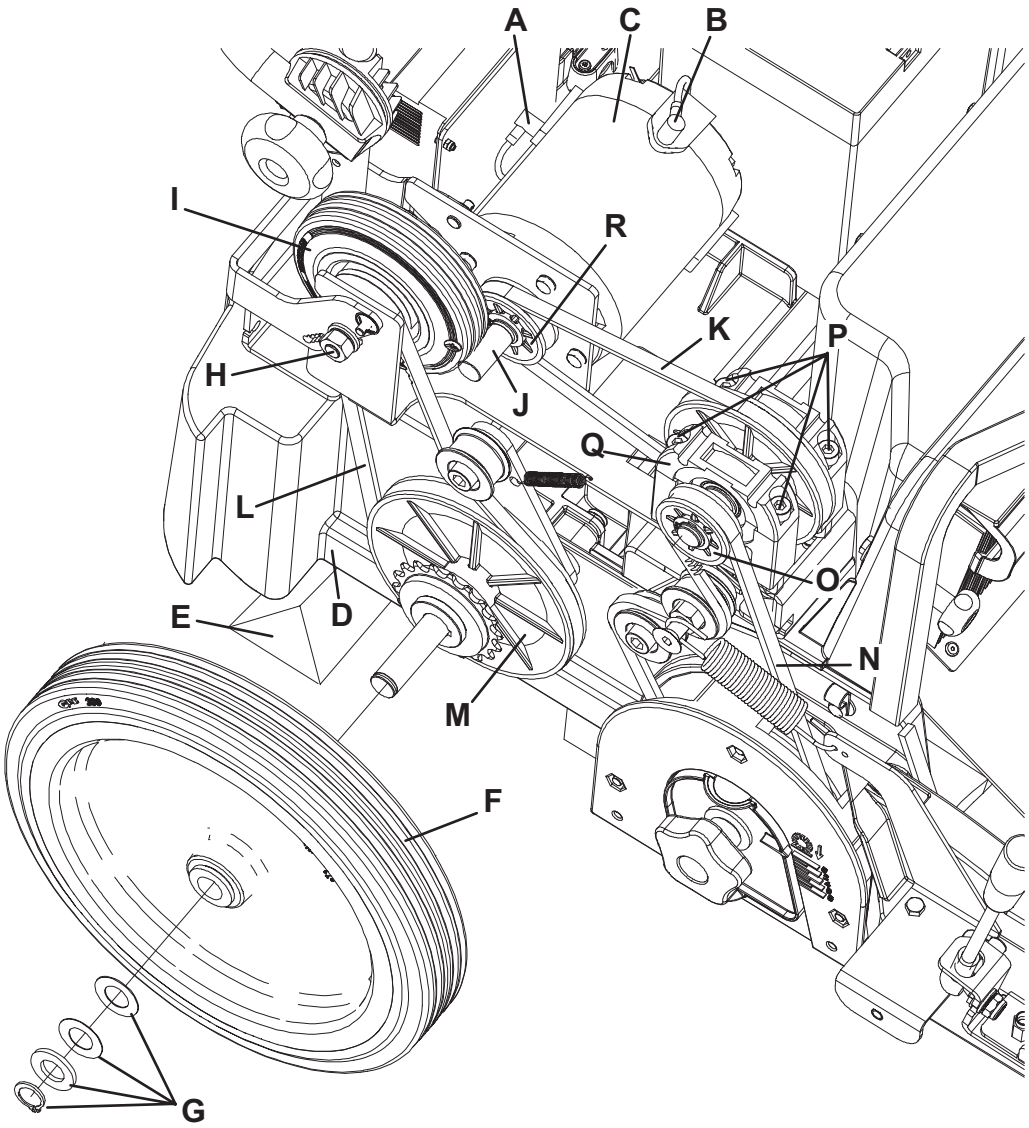
MAIN MOTOR DISASSEMBLY/ASSEMBLY

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 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).

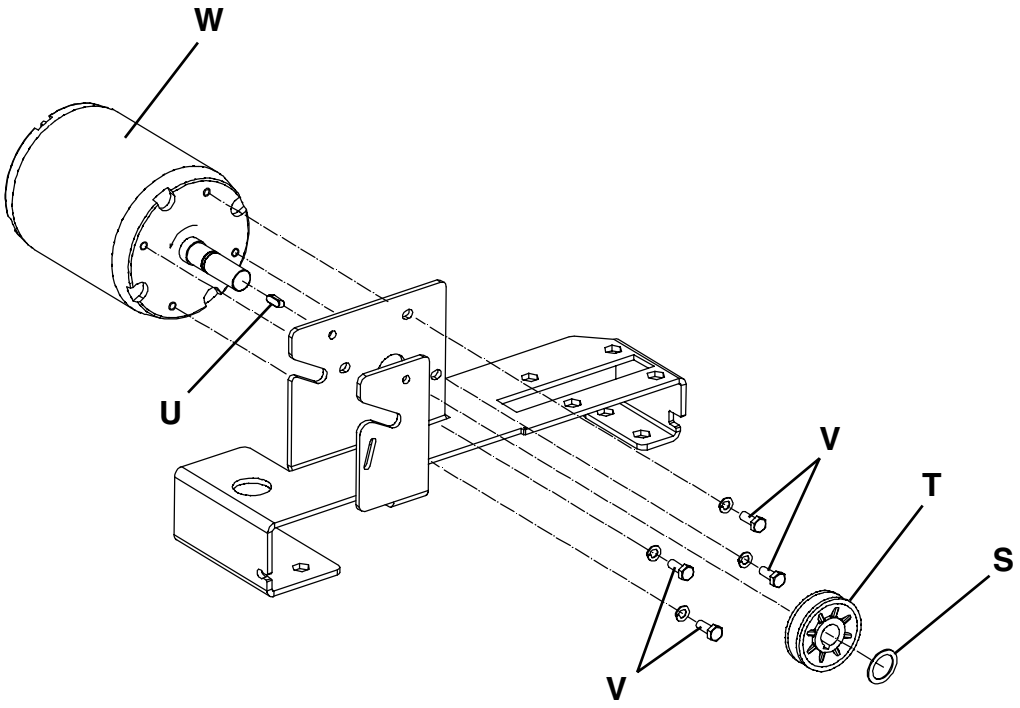
Assembly

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



S301607

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

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

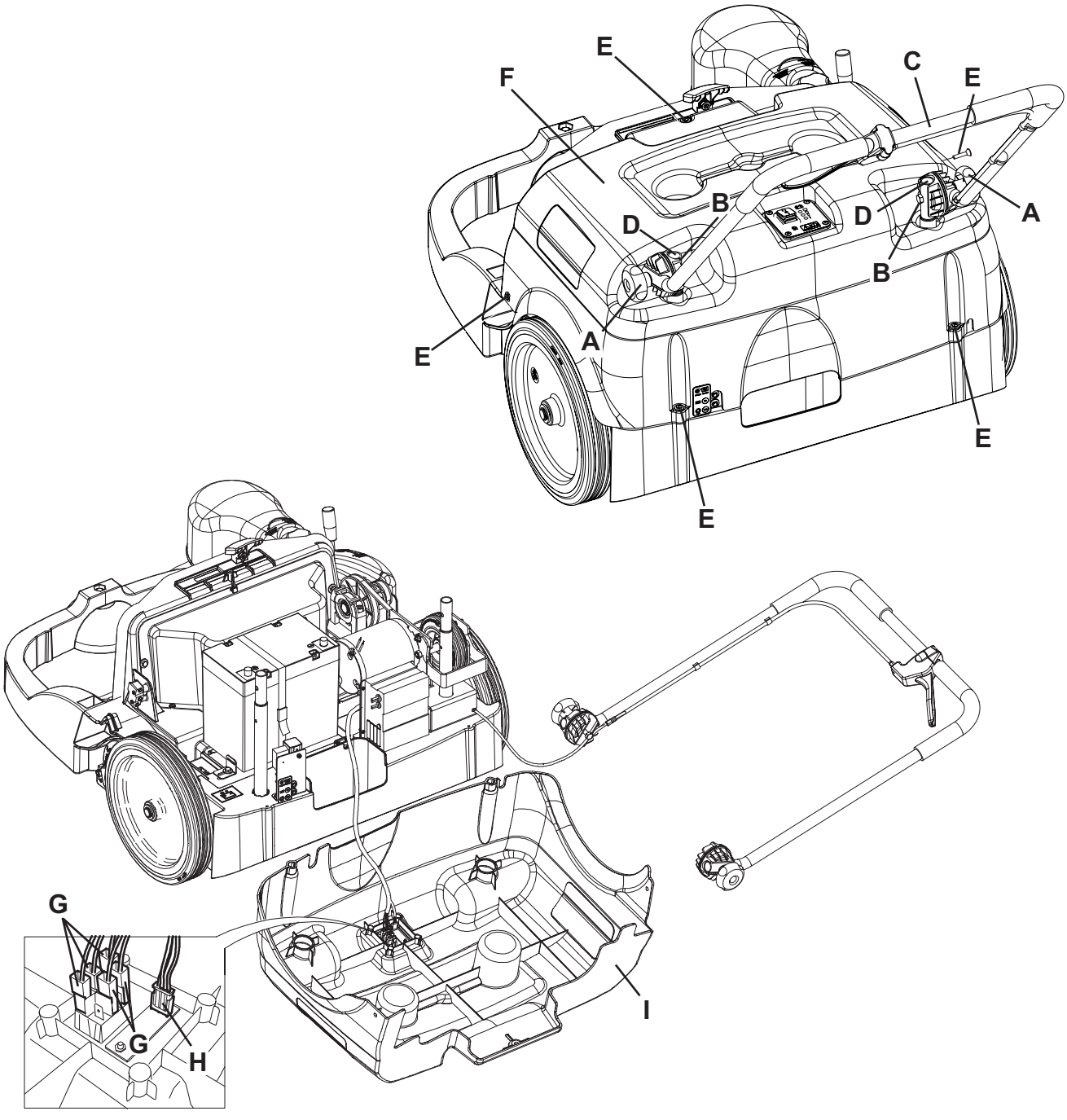
HOOD DISASSEMBLY/ASSEMBLY

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

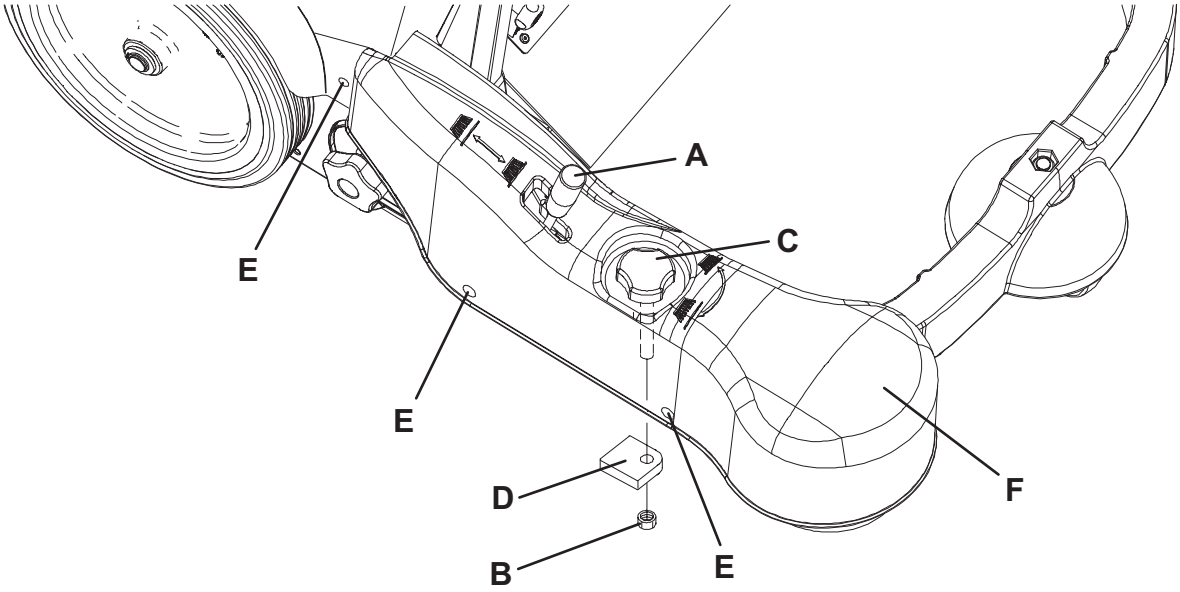
SIDE BROOM COVER DISASSEMBLY/ASSEMBLY

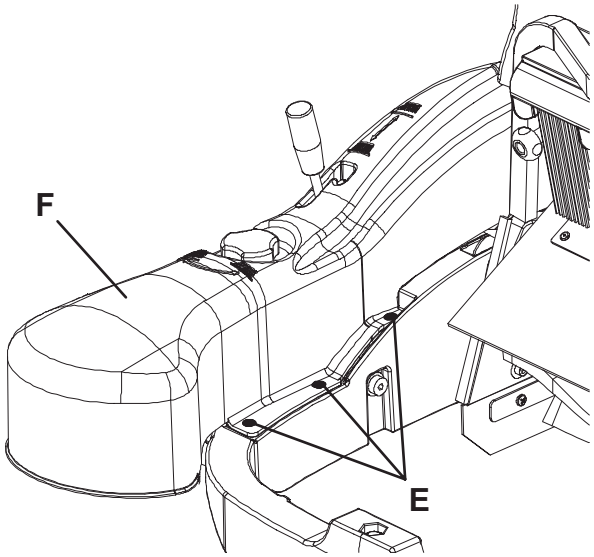
Disassembly

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

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).

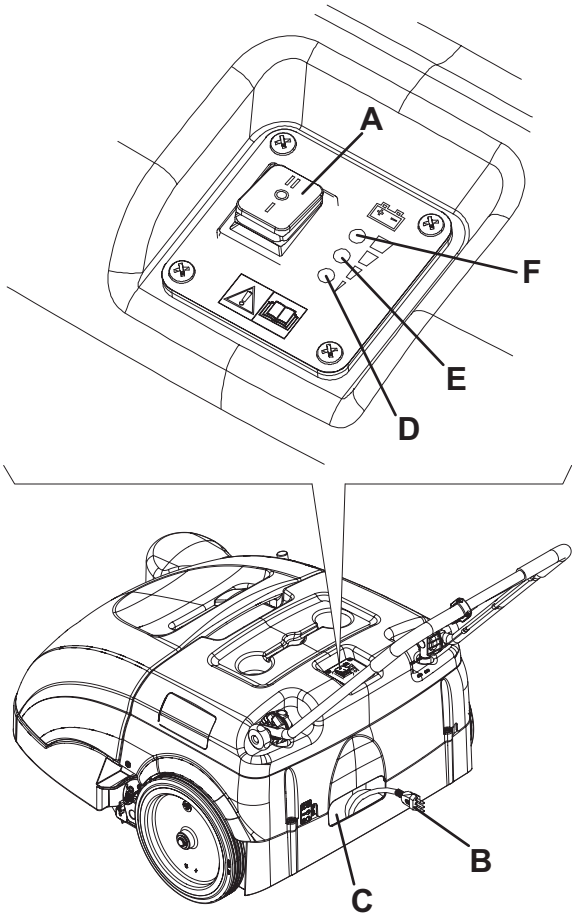
BATTERY CHARGING

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

BATTERY DISASSEMBLY/ASSEMBLY

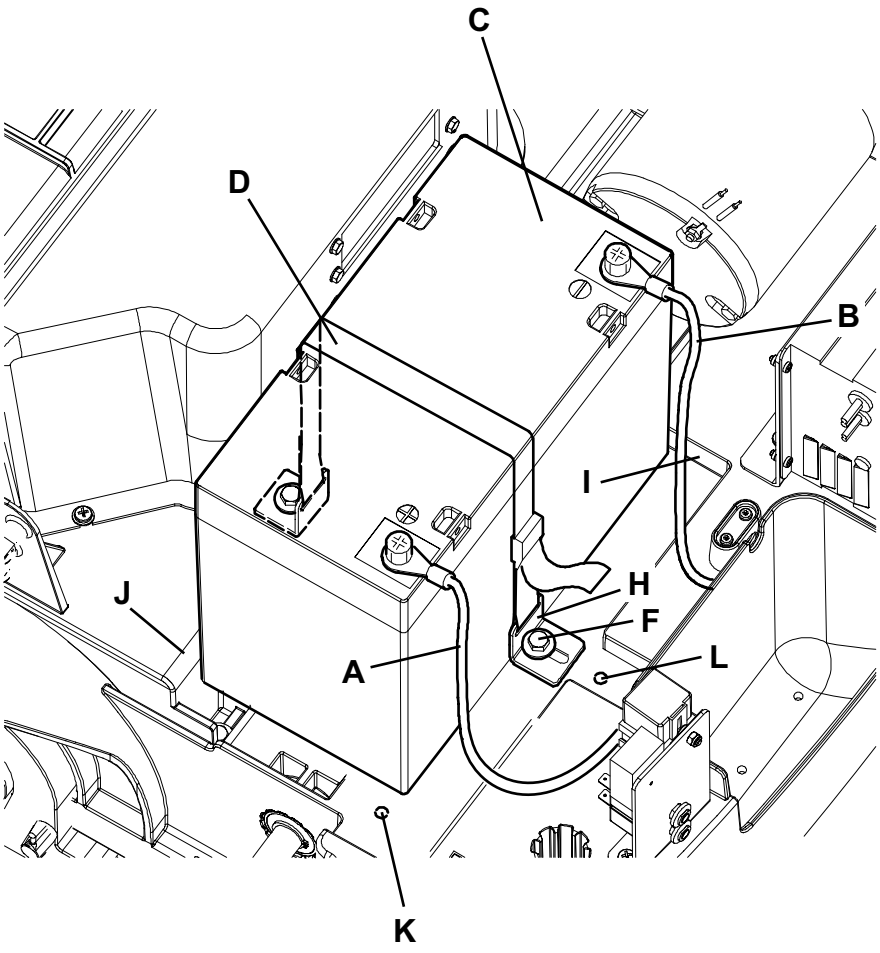
Disassembly

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).

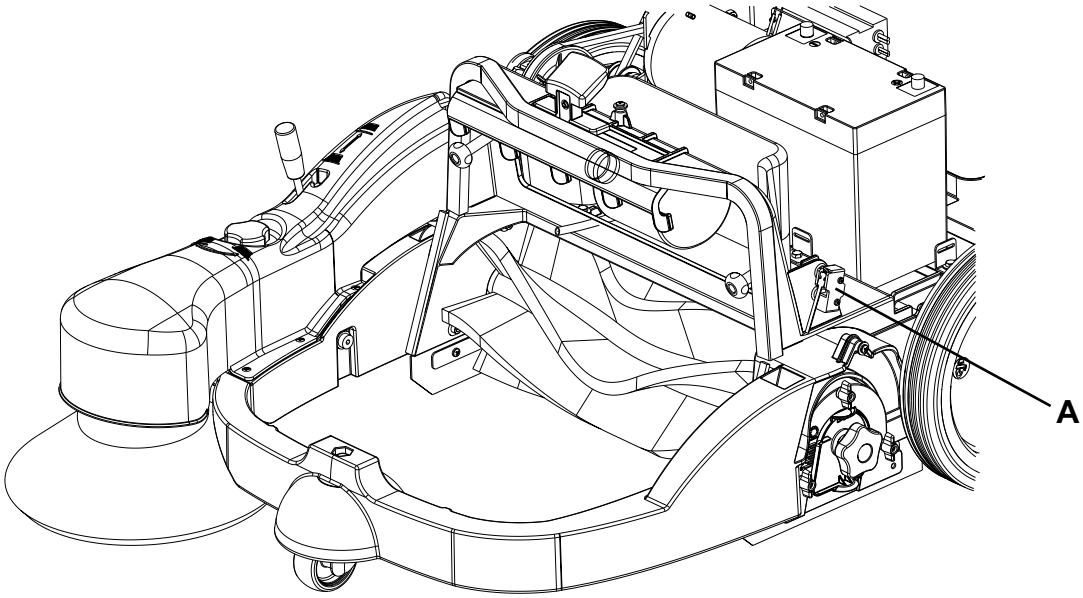


S301612

ELECTRICAL SYSTEM

HOOD SAFETY SWITCH OPERATION CHECK

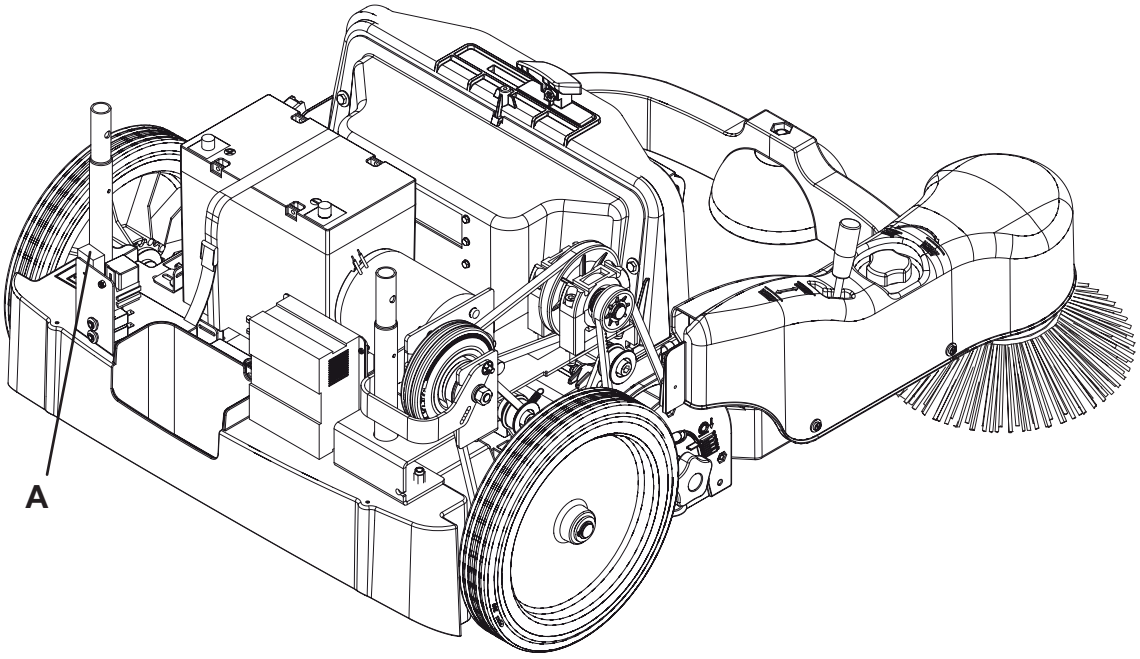
1. Remove the hood (30) (see the procedure in the relevant paragraph).
2. When the hood (30) is removed, press the main switch (1) and check that all machine functions are disabled. If necessary, check the microswitch (A) operation and, if necessary, replace it.



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

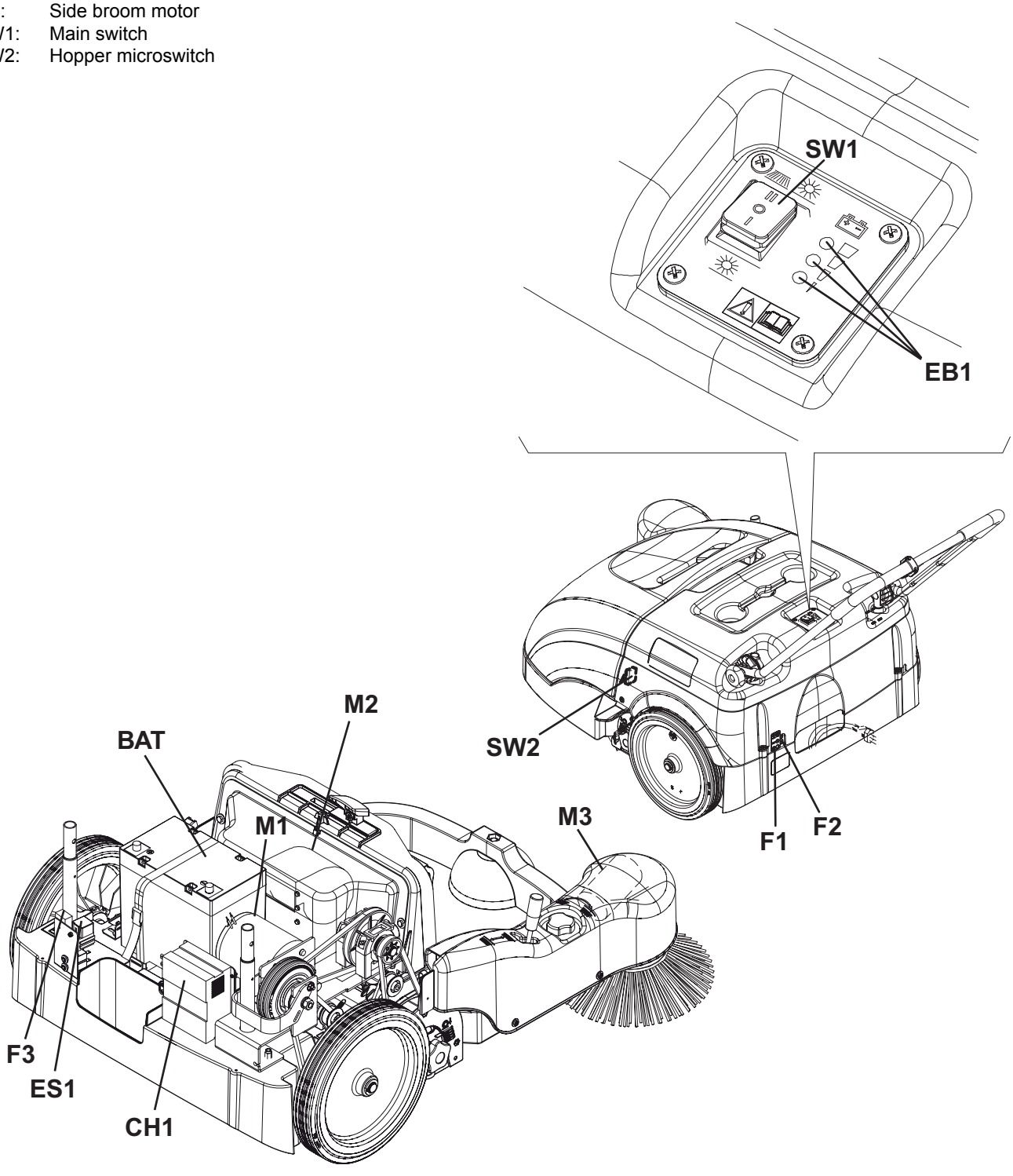
See the previous chapters relevant to the use of the electrical system.

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

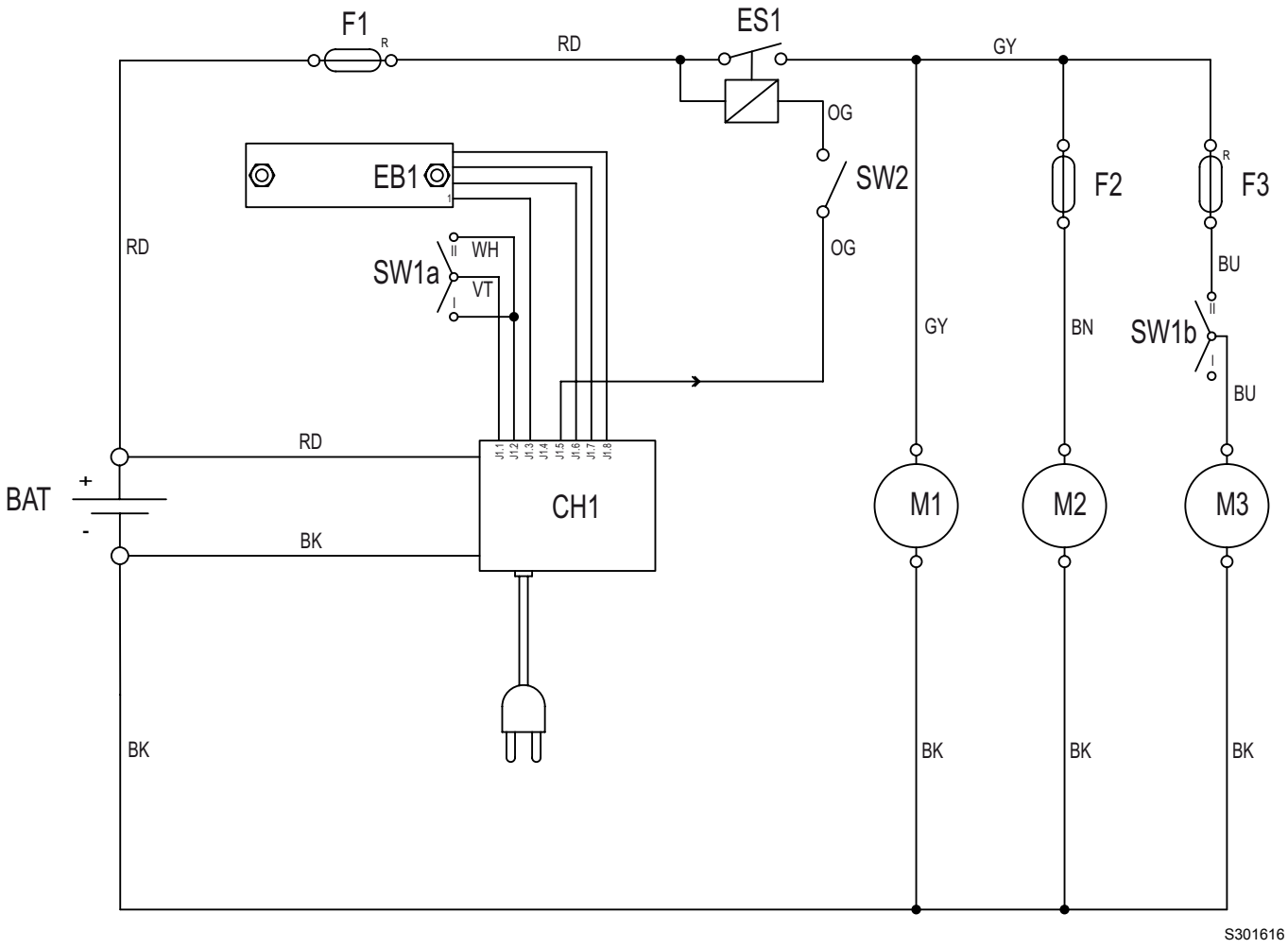
Key:

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.



ELECTRICAL SYSTEM

Nilfisk-Advance, Inc.
14600 21st Avenue North
Plymouth, MN, 55447-3408
www.nilfisk-advance.com
Phone: 800-989-2235
Fax: 800-989-6566

Printed in Italy