TENNANT®

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TECHNICAL OFFICE

CS 5

TECHNICAL SERVICE MANUAL

Contents

IMPORTANT

Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Turn off the machine by pressing the main switch.

Disconnect the battery, removing it from the battery compartment on the machine.

i INFORMATION

Important information

In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine. These always refer to the direction of travel of the machine.

In this Service Manual, the version of the machine is written in brackets " () ".
This note indicates that the instructions only refer to the version specified in brackets.

A1 BRUSH MOTOR

The brush motor is 36 V, with a maximum power of 100 W. It is powered by the batteries via the electronic board, with softstart. The brush axis rotation speed after the mechanical reduction drive is 160 rpm. The electric motor connected the brush via the reduction drive attached to the motor features IP 44 protection. It is therefore is protected against foreign bodies larger than 1 mm and from water spray in all directions

The motor carbon brushes and rotor should be checked for wear every 400 - 500 operating hours.

A1.1 Checking brush motor current draw

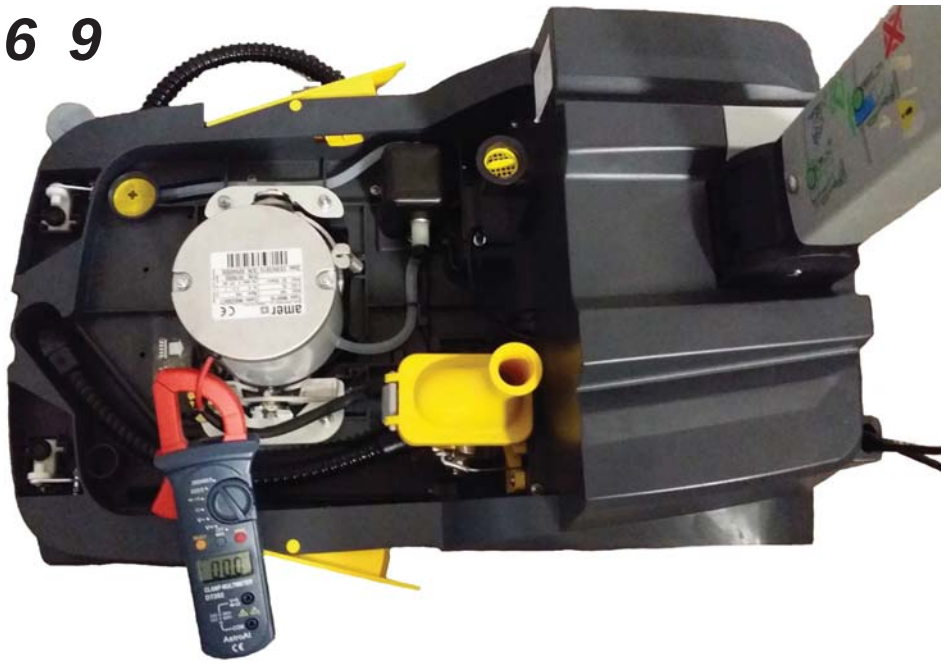
1. **Make sure that the batteries on the machine are charged (36 V ± 1 V).**
2. **Use a clamp-on ammeter with a full scale reading of at least 100 A (amperes).**
3. **Move the machine onto a flat and smooth floor to ensure a correct current reading.**
4. Make sure that there is enough room around the machine to perform the checks safely.
5. **Make sure that the standard brush is fitted (Medium).**
6. Remove the tank, identify the Red wire on the brush motor and connect the clamp-on ammeter to it.
7. **On the control panel, disable the suction motor.**
8. Activate the brush using the corresponding brush control lever on the handle.
9. Carry out a test with the brush and without the tank and a second test without the brush.
10. Read the value and compare it against those shown in the table.
11. If the readings are between the values shown in the table, disconnect the clamp-on ammeter.
12. If on the other hand the readings do not correspond to the values shown in the table, perform the following checks.
13. Remove the brush and check that the no-load current is within the values shown in the table.

13a. *If the reading is outside of the values shown in the table (usually higher), check motor carbon brush wear.*

13b. *If the reading is within the range of values shown in the table, check that the brush is not rubbing on the brush cover or the rear squeegee, and that the brush motor reduction drive does not produce abnormal noise.*

13c. *Replace the brush motor with a new one.*

Carry out the test with the machine off, as testing with the machine in movement (forwards gear) may cause an increase in the current reading.



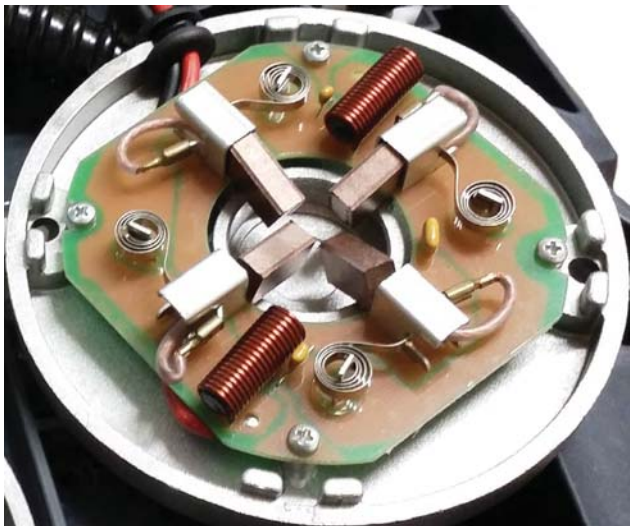
Current draw A (amperes)	*Min*	*Max*
No load (without brushes)	***0.05 A***	***0.10 A***
Load applied (brushes operating)	***0.18 A***	***0.30 A***

A1.2 Checking and replacing the centre brush motor carbon brushes

The carbon brushes can be checked only by removing the motor cover, as the motor does not have openings for carbon brush inspection, as may be the case with other motors.

Disassembly

1. Move the machine onto flat and dry flooring.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. If necessary, clean the working area with a jet of compressed air.
4. Release the dirty water tank using the two locking levers and remove it together with the solution tank.
5. Identify the brush motor and unscrew the two self-locking nuts that secure the cap to the motor housing.
6. Remove the cap by pulling it upwards and at the same time tapping it lightly with a plastic mallet.
7. To simplify removal, jiggle it slightly to release it from the bearing and the studs.
8. Move the spring that presses on one of the carbon brushes and remove it from its housing.



Checks

9 Measure the carbon brush to determine wear, and then compare the values against those shown below.

10 The length of the carbon brush must be no less than 9 mm / 0.35 in.

11 If the value measured is near that specified for replacement, disconnect the carbon brush fast-ons and replace all four at the same time.

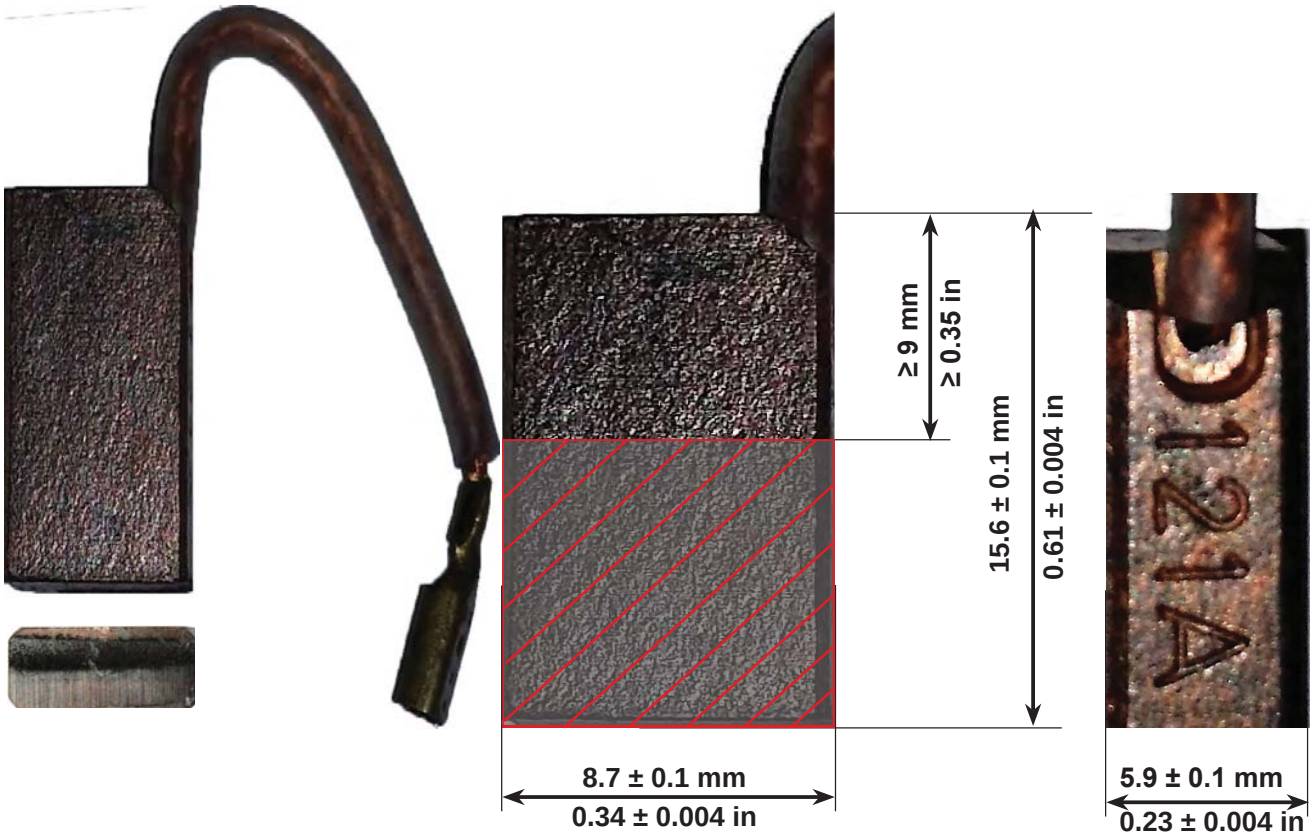
12 Check the sliding contact surface of the carbon brushes for signs of abnormal wear or burning.

13 Blow the inside of the motor clean with a jet of compressed air, paying particular attention to the area around the carbon brushes and the rotor where the carbon brushes slide.

14 Check wear in the places where the carbon brushes slide before replacement. A damaged rotor would cause premature wear of the new carbon brushes.

Always replace all four brush motor carbon brushes at the same time.

Always check that the new carbon brushes are the same shape and size as those being replaced (naturally apart from the length) and that they slide freely in their seats.



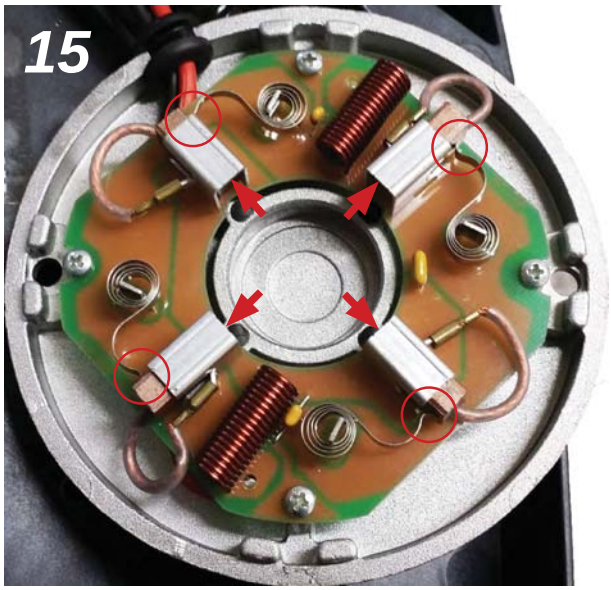
Reassembling the carbon brushes

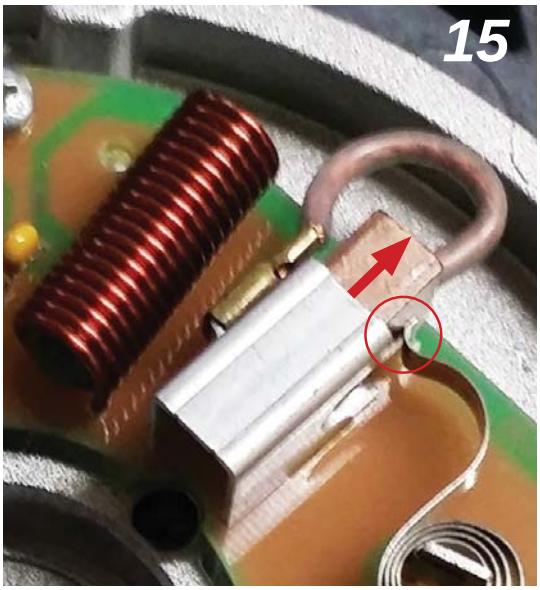
15 Reassemble four new carbon brushes, positioning them so that they remain secured in their housings by the springs, and when assembling the cap they do not interfere with the rotor.

16 Assemble the cap, screw the nuts on a few threads until the bearing is partially inserted. Keeping the cap slightly raised, slowly push each carbon brush against the rotor with a thin screwdriver.

17 Tap the centre of the cap with a rubber mallet to move the bearing into position.

18 Tighten the self-locking nuts to a maximum torque of 5.5 Nm / 48.68 lbf in.





Reassembly

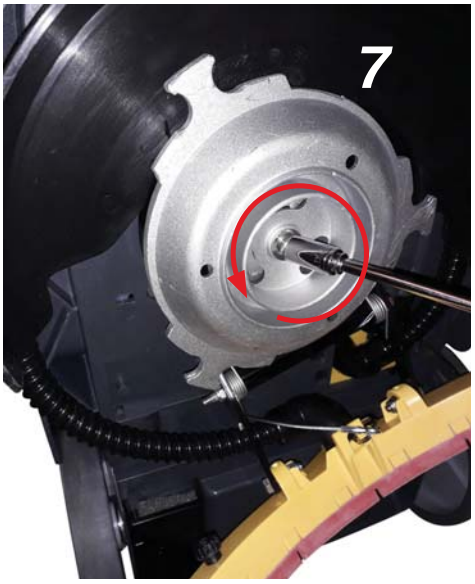
1 Continue reassembly by repeating the disassembly operations in reverse order.

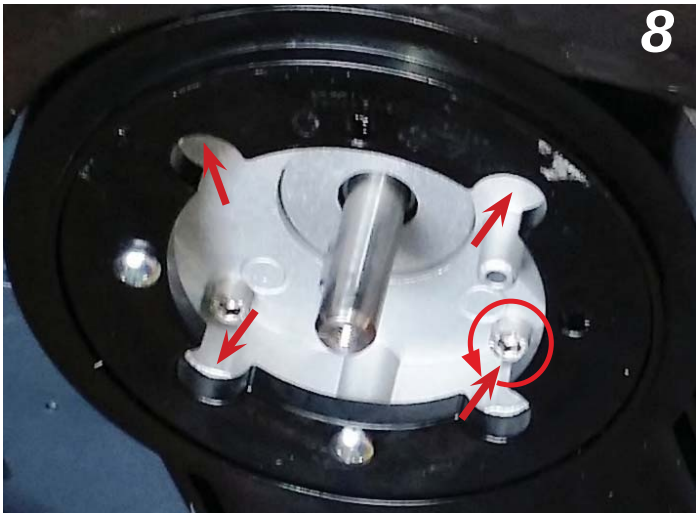
A1.3 Disassembling and replacing the centre brush motor

Disassembly

1. Move the machine onto flat and dry flooring.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Remove the battery and put it in a safe place, away from liquids; release and remove the brush.
5. Press the two tank locking levers to release them, remove the dirty water tank and the solution tank and identify the brush motor.
6. Position the handle vertically and tilt the machine backwards until the handle rests on the ground.
7. Remove the brush drive by unscrewing the single centre screw that fixes it directly to the reduction drive shaft.
8. Unscrew the four screws that secure the motor to its support, leaving one of the two screws at the top to last, so as to prevent the motor from falling, while holding it with one hand.

If removing the motor cap to check and/or replace the motor carbon brushes, it is recommended to mark the position of the cap on the motor housing with a marker.



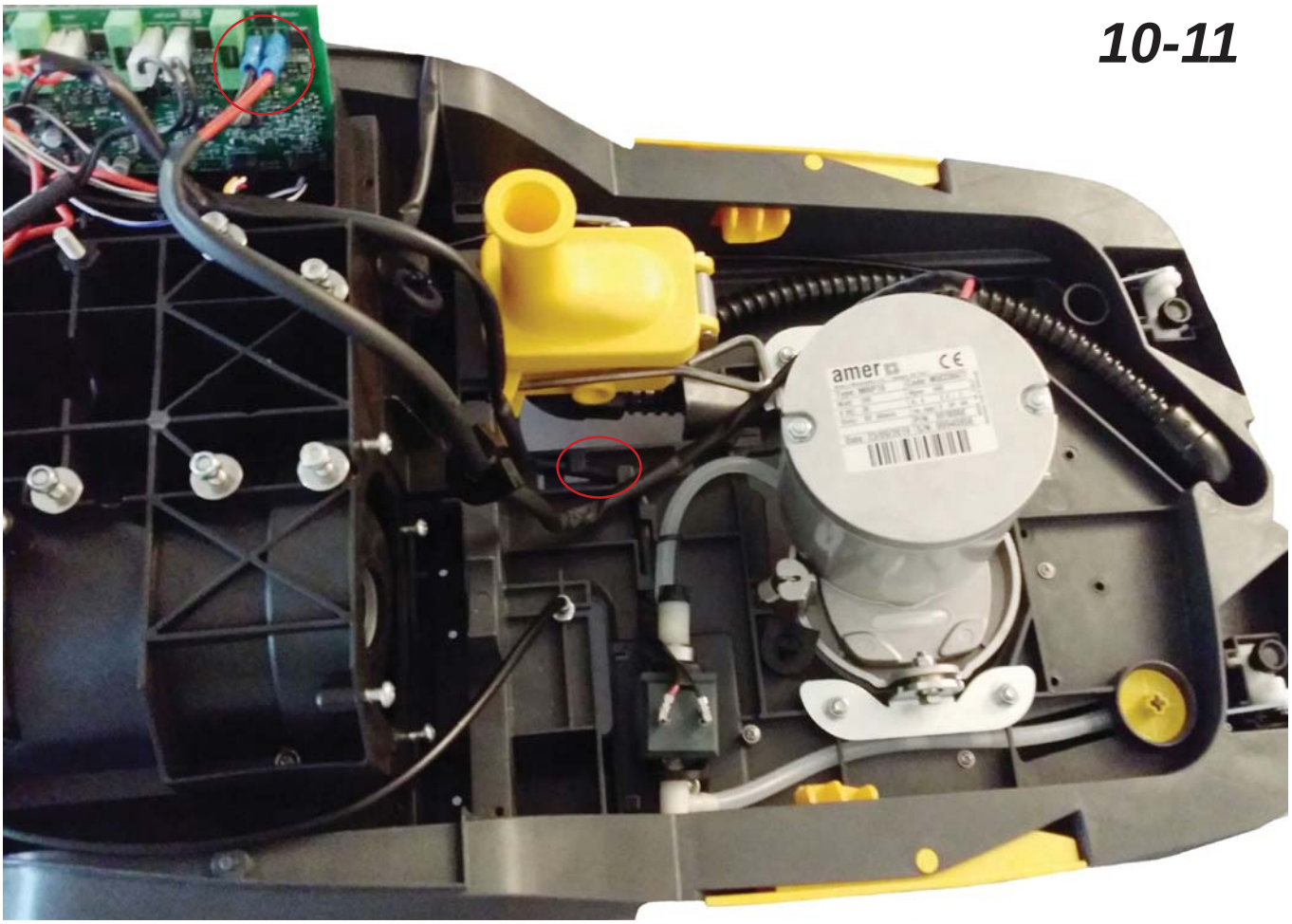


9 Lift the electronics cover casing and then remove the electronics compartment cover to reach the power board.

10 Disconnect the motor electrically from the power board and then remove the cable from the plastic guides that anchor it to the plastic chassis; remove the motor.

11 Replace the motor with a new one.

10-11



Reassembly

1 For assembly, repeat the steps for dismantling in reverse order.

2 Tighten the screw that fixes the brush drive to a maximum torque of 10 Nm - 88.51 lbf in

☝ IMPORTANT

Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Turn off the machine by pressing the main switch.

Disconnect the battery, removing it from the battery compartment on the machine.

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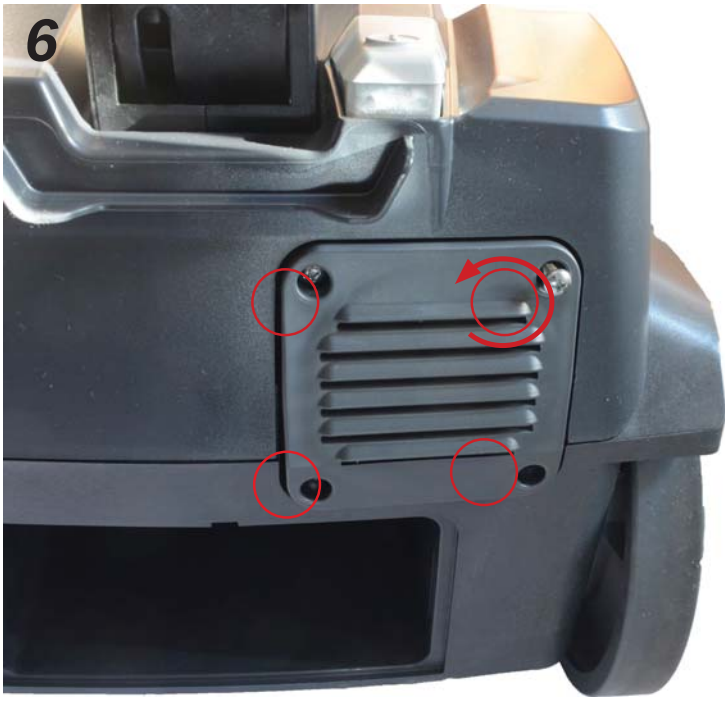
B1 SUCTION MOTOR

The suction motor is a single-stage centrifugal-tangential 36 V DC motor, powered directly via the functions board; it is activated on the instrument panel using the button provided, with the suction start signal sent via the functions board using a MOS-FET for ramped starting.
The maximum power consumption is 160 W, with a suction capacity of 18.7 litres/s - 4.95 gal/s, and a vacuum capacity of 120 mm H_20 - 4.72 in H_20 - 0.17 psi.
A brushed motor is used, with stainless steel bearings resistant to moisture infiltration. No routine maintenance is needed, therefore no carbon brushes need to be replaced.
It is however recommended to measure current draw so as to check that there are no problems, or that the motor needs to be replaced.

The electric fan used for suction during the drying phase is maintenance-free, and therefore in the event of problems it will be replaced completely.

B1.1 Checking suction motor current draw

1. **Make sure that the batteries on the machine are charged (36 V ± 1 V).**
2. **Use a clamp-on ammeter with a full scale reading of at least 100A (amperes).**
3. Move the machine to flat, dry flooring.
4. Make sure that there is enough room around the machine to perform the checks safely.
5. **Remove the dirty water tank and the plastic filter (yellow) on the suction motor hose.**
6. Undo the four screws fixing the suction motor closing flange and remove it.
7. Locate the two suction motor power wires and remove them.
8. Connect the clamp-on ammeter to one of the white wires.



9 Activate the suction motor from the control panel.

10 Wait for current draw to stabilise before reading the value for comparison against the table below.

11 If the reading is between the values shown in the table, disconnect the clamp-on ammeter and return the machine to operating conditions.

12 If on the other hand the reading does not correspond to the value shown in the table, perform the following checks.

12a *Make sure that the wiring that powers the suction motor is intact and that the connections are tight.*

12b *Replace the suction motor with a new one.*

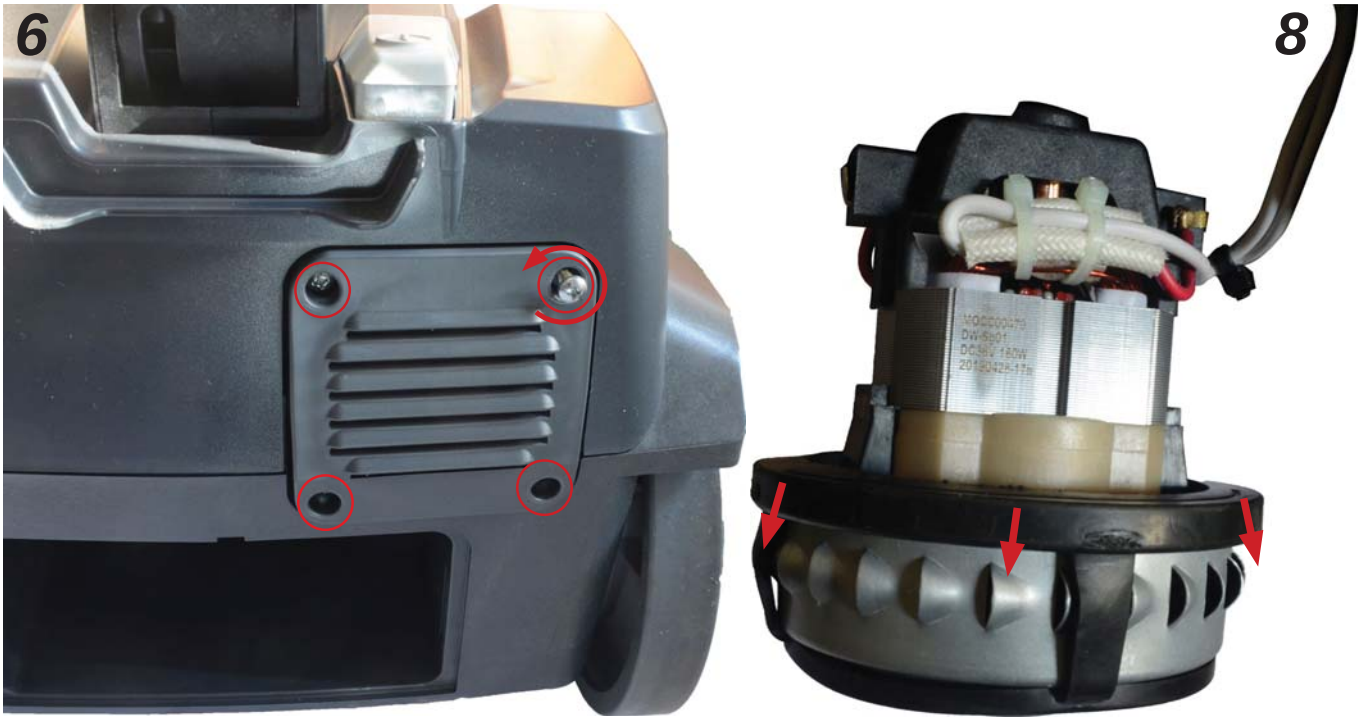
Current draw A (amperes)	*Min*	*Max*
No-load	***0.14 A***	***0.62 A***

B1.2 Removing the suction fan

Disassembly

1. Move the machine to flat, dry flooring.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. If necessary, clean the working area with a jet of compressed air.
4. Remove the battery and put it in a safe place, away from liquids.
5. Undo the four screws that secure the suction motor closure flange and remove it.
6. Remove the suction motor from the compartment carefully and firmly.
7. Disconnect the fast-ons that connect the motor to the electrical system and replace the suction motor.
8. **Remove the gasketfrom the suction motor, clean it and use it again for the new suction motor.**

If the gasket mounted on the suction motor is still in good condition, use it again for the new motor, otherwise if it shows signs of abrasion or cuts, replace it with a new one.



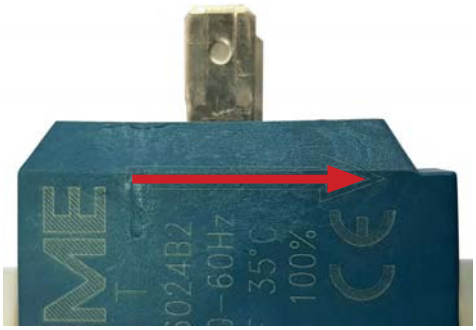
Reassembly

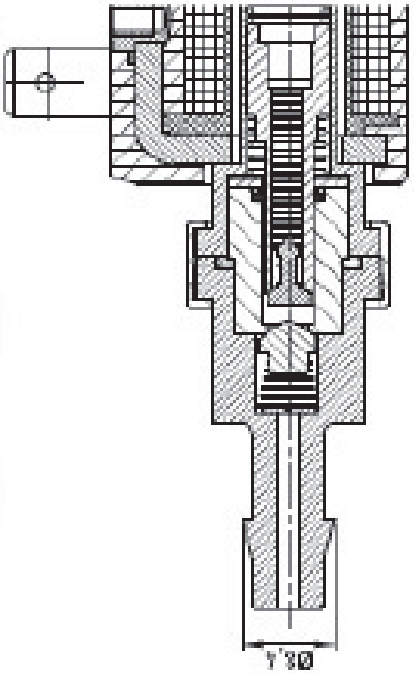
1. For assembly, repeat the steps for dismantling in reverse order.
2. **Tighten the screws on the plastic parts gently.**

B2 SOLUTION PUMP

The electric pump used to deliver the solution is a vibration pump, operating at 24 VAC with a frequency of 50 Hz and a maximum power consumption of 20 W.
It has a suction capacity of 100 mbars = 0.1 bars = 1019.74 mm H_2O = 1.45 psi.
The maximum achievable pressure is 5.3 bars / 76.85 psi, while the maximum flow rate is 0.45 l/min - 15.21 oz/min at 0 pressure.
The pump is powered by the electronic board, which in addition to converting from direct to alternating current, provides a PWM signal to adjust the flow of the detergent in three levels, maximum, medium, minimum.
Due to the type of operation via valves that open and close intermittently, the pump must be mounted in one direction only; see to the arrow shown on the pump.
If used as indicated, the pump does not require maintenance; in the event of malfunction or breakages it cannot be repaired and therefore must be replaced completely.
It should only be used with water or a water-detergent solution.

The electric pump is powered at 24 VAC (alternating current); it is therefore necessary to use this power supply voltage for any tests.
However, electrical operation can be checked using a 24 VDC battery (direct current).

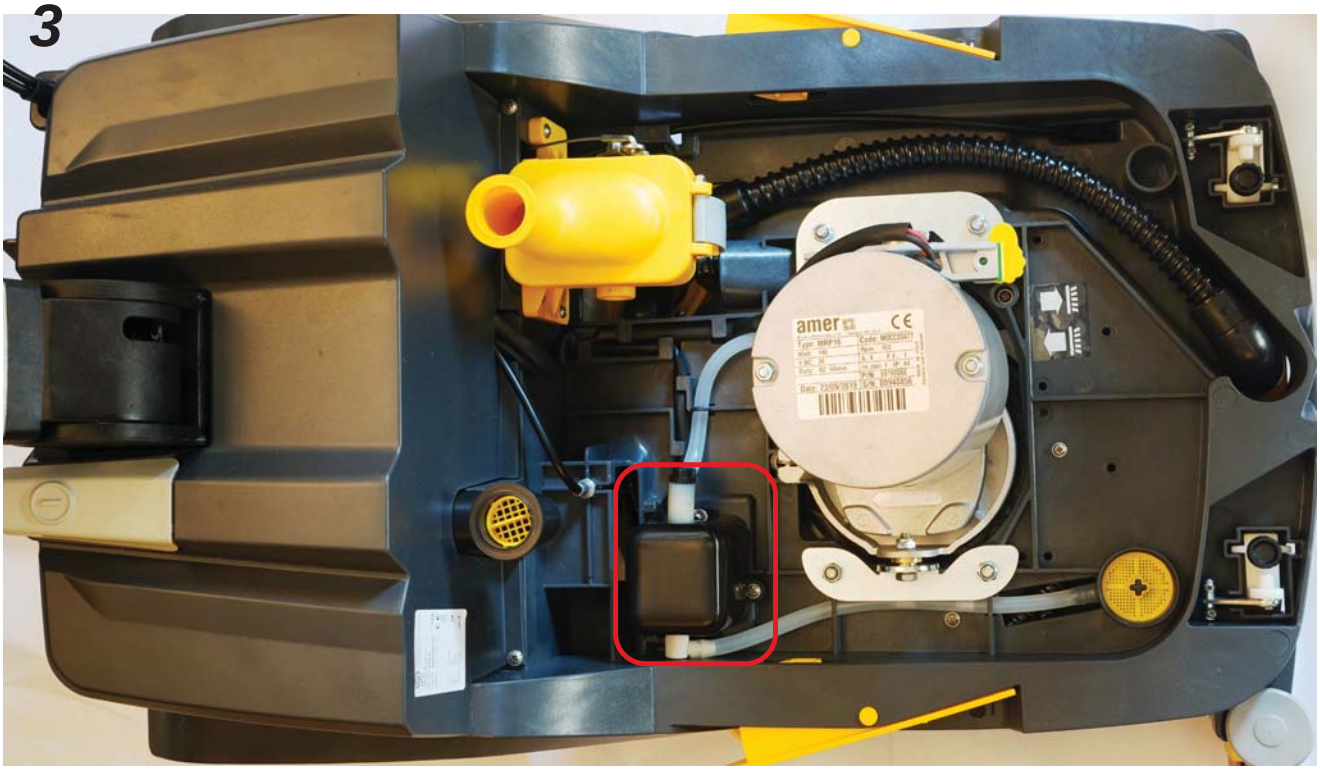




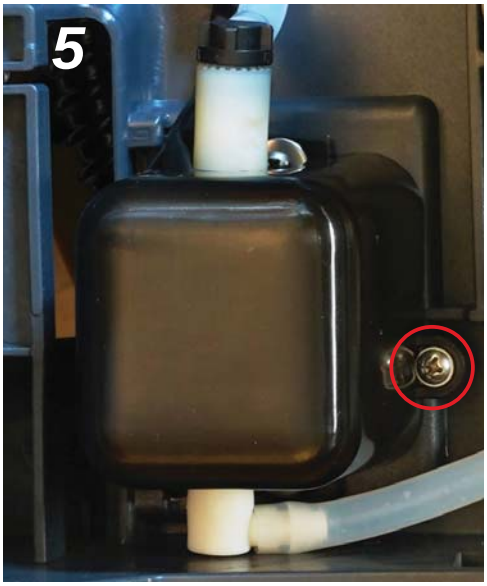
B2.1 Testing and/or replacing the solution pump

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the dirty water tank and the solution tank and identify the solution pump.
4. If necessary, clean the working area with a jet of compressed air.



5. Using a Phillips-head screwdriver, Undo the screw that secures the plastic cover on the solution pump.
6. Remove the cover and disconnect the two fast-ons on the solution pump.



Checking electrical operation

1 Get a charged battery with a voltage between 12 V and 24 V and two sufficiently long cables.

2 Connect one of the two cables between one pole of the battery and a fast-on on the solution pump.

3 Connect the other cable either to the battery pole or the fast-on on the solution pump (one end only).

4 Touch the other end of the cable to the remaining contact a series of times; each time the solution pump will make a “CLICK” noise.

4a This “CLICK” means that the pump is working electrically; proceed to the next check.

4b Check that the solution hoses are not clogged or crushed and that the solution filter is clean.

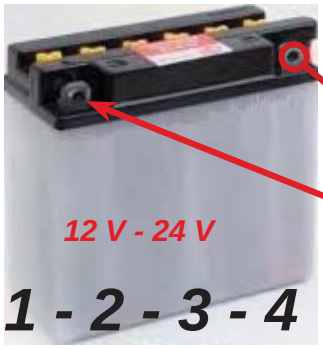
4c If the hoses are free and not crushed, check the power board.

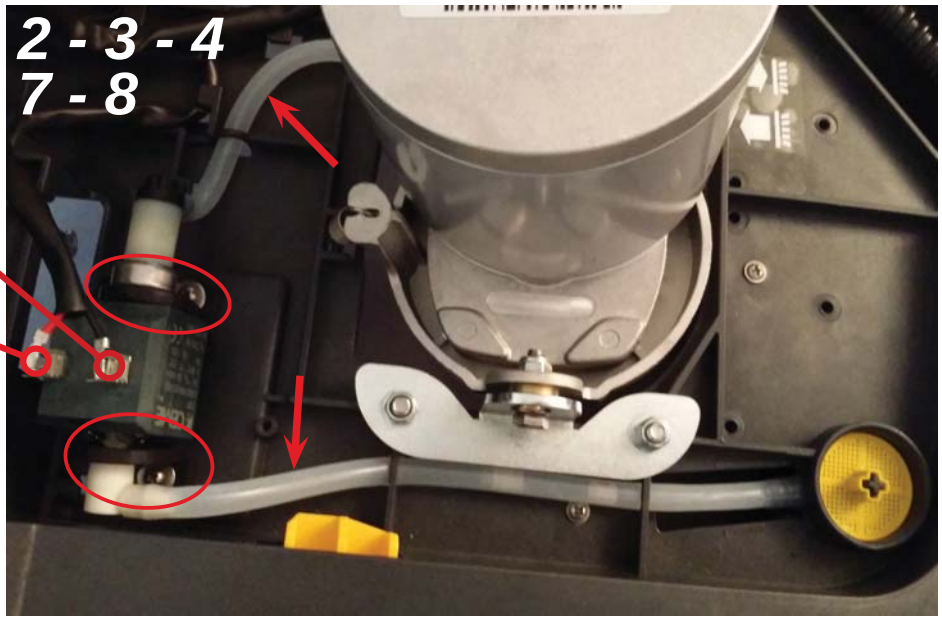
4d If no “CLICK” noise is heard, replace the solution pump with a new one.

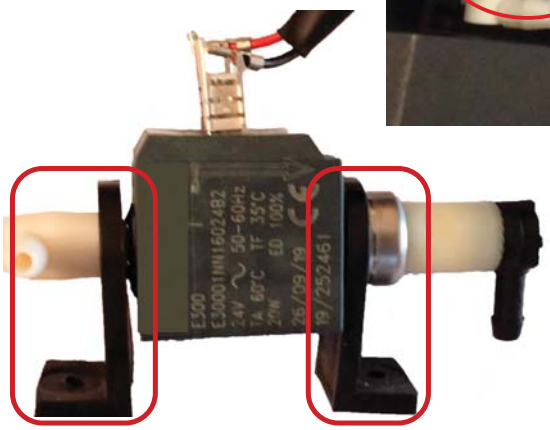
Disassembly

7 Using a Phillips-head screwdriver, undo the two screws that fix the two rubber supports on the pump to the chassis.

8 Remove the two rubber hoses from the solution pump fittings and then the rubber supports.







Reassembly

1 For assembly, repeat the steps for dismantling in reverse order.

2 **Tighten the screws on the plastic parts gently.**

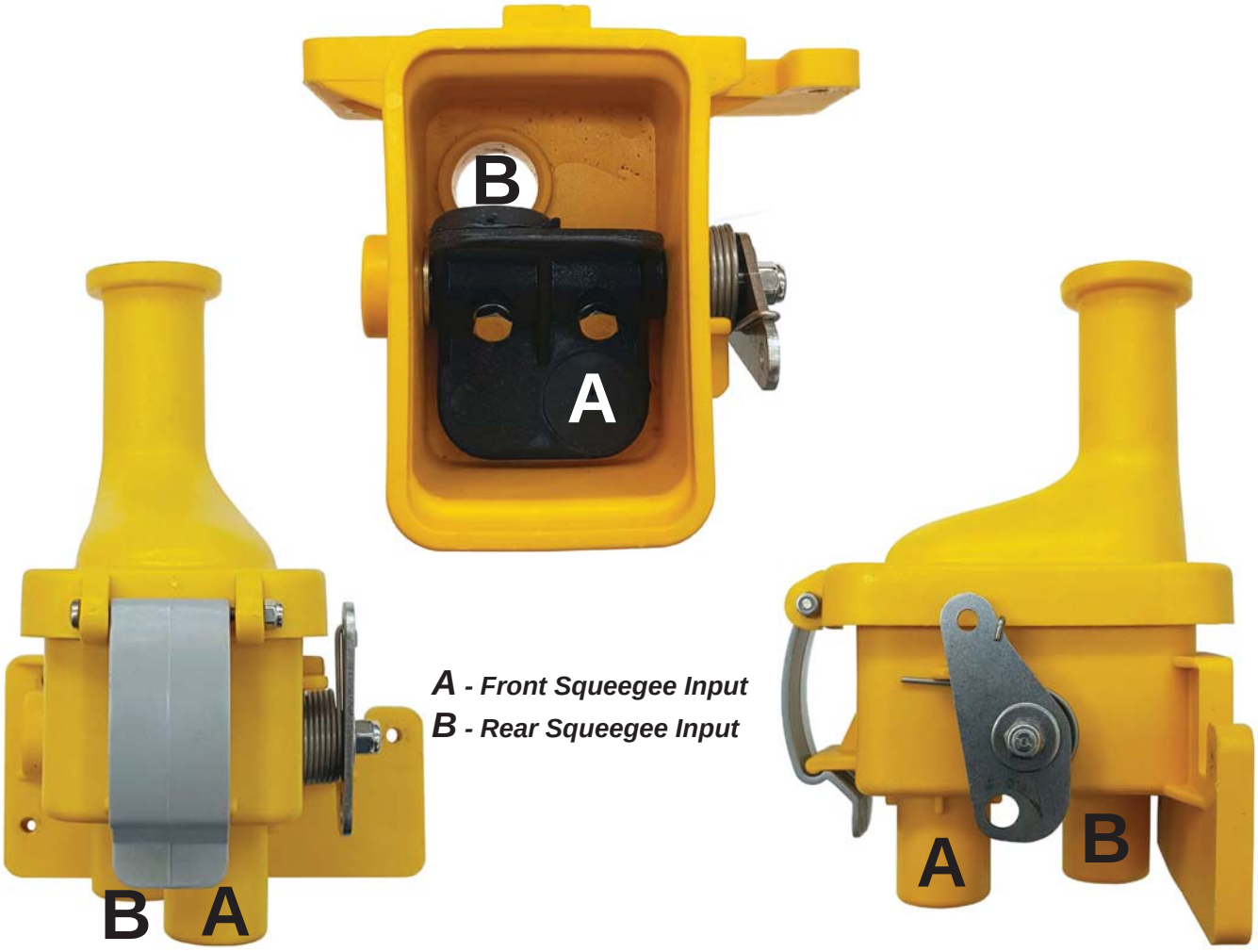
B3 DIVERTER VALVE

The diverter valve has the purpose of internally diverting the suction air flow in relation to the direction of work in the suction phase, so as to allow suction from the front or rear squeegee. It is located under the dirty water tank and fixed to the vertical wall of the chassis. Operation is manual, controlled via a lever on the handle. Via a system of levers connected to the diverter valve, the front and rear squeegees are also lowered and raised alternately when the valve is operated. The valve can be easily divided into two pieces to facilitate cleaning and ensure correct operation. Two circular rubber plugs moulded onto the inside of the valve alternately ensure the closure of the two hoses connected to the squeegee. The valve is configured so that the front squeegee hose is always closed, and only opens if controlled by the lever on the handle.

It is recommended to regularly clean the inside of the diverter valve to ensure best drying performance.

Periodically check the rubber plugs inside that valve that close the suction lines.

The valve is configured so that the front squeegee hose is always closed.



***A** - Front Squeegee Input*
***B** - Rear Squeegee Input*

B3.1 Replacing the suction diverter valve

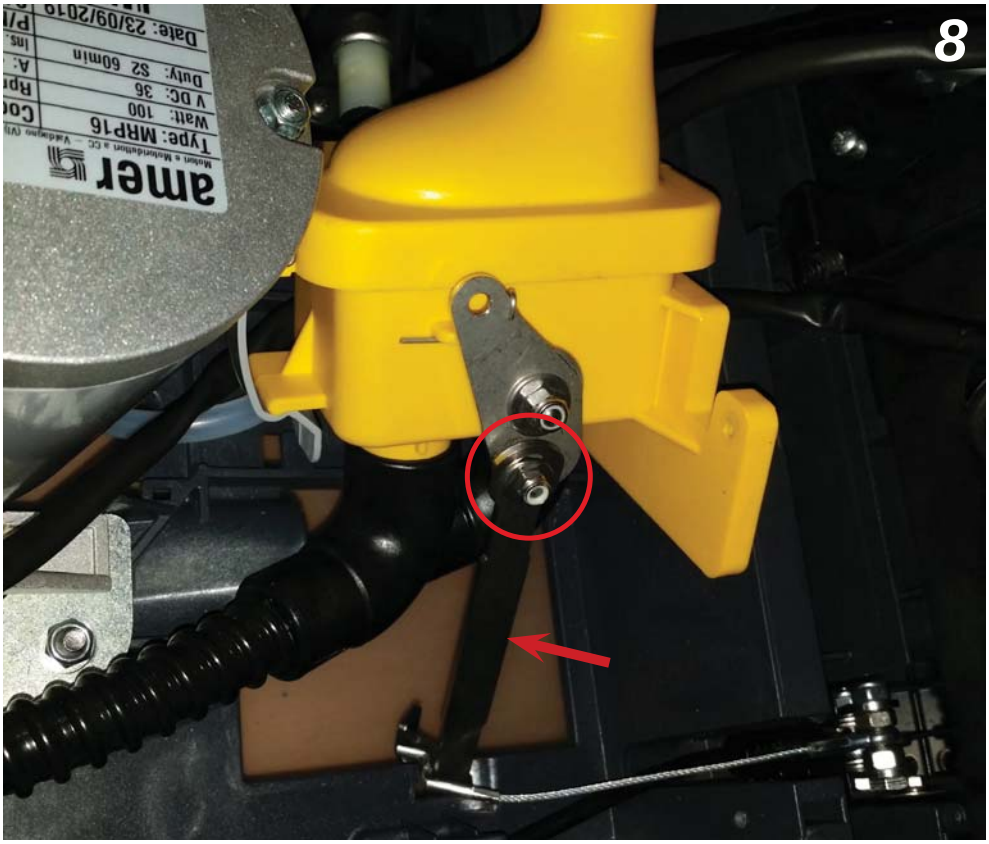
Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the dirty water tank and the solution tank and identify the diverter valve.
4. If necessary, clean the working area with a jet of compressed air.
5. Undo the three screws fixing the valve with a Phillips-head screwdriver
6. Detach the two squeegee hoses, check that they are intact and clean, clean them if necessary.

7 Turn the diverter valve control lever fully anti-clockwise to release the hook.

8 Unscrew the bolt that secures the tie rod for the rear squeegee.

9 Replace the complete suction diverter valve or the damaged components.



Reassembly

1 For assembly, repeat the steps for dismantling in reverse order.

2 **Tighten the screws on the plastic parts gently.**

B4 SQUEEGEE LIFTING LEVERS AND CABLES

The front and rear squeegees are lifted using lever controls which, via sheathed steel cables, raise and lower the rear squeegee, invert the rear and front squeegees and control the diverter valve.

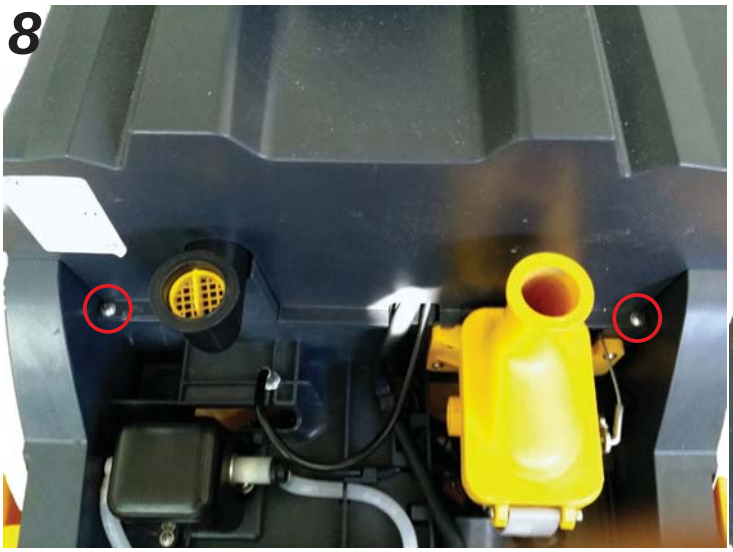
The cable for the rear squeegee is directly connected to the corresponding lifting lever. Via a second lever, the cable for inverting the rear and front squeegees is managed by means of a "splitter bracket" that, using a lever mechanism, controls the diverter valve. For correct use of the machine, the steel cables must run freely in their sheaths. If replacing damaged cables (excluding the one that controls the diverter valve), these must be adjusted to ensure correct operation of the machine. The splitter bracket is located at the rear of the plastic chassis, underneath the power board.

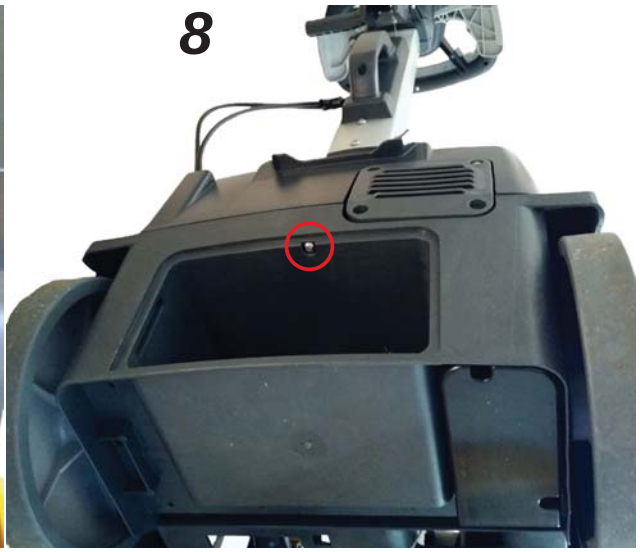
It is recommended to check that the cable adjustment has not been accidentally modified due to impact.

B4.1 Replacing the rear squeegee cable

Disassembly

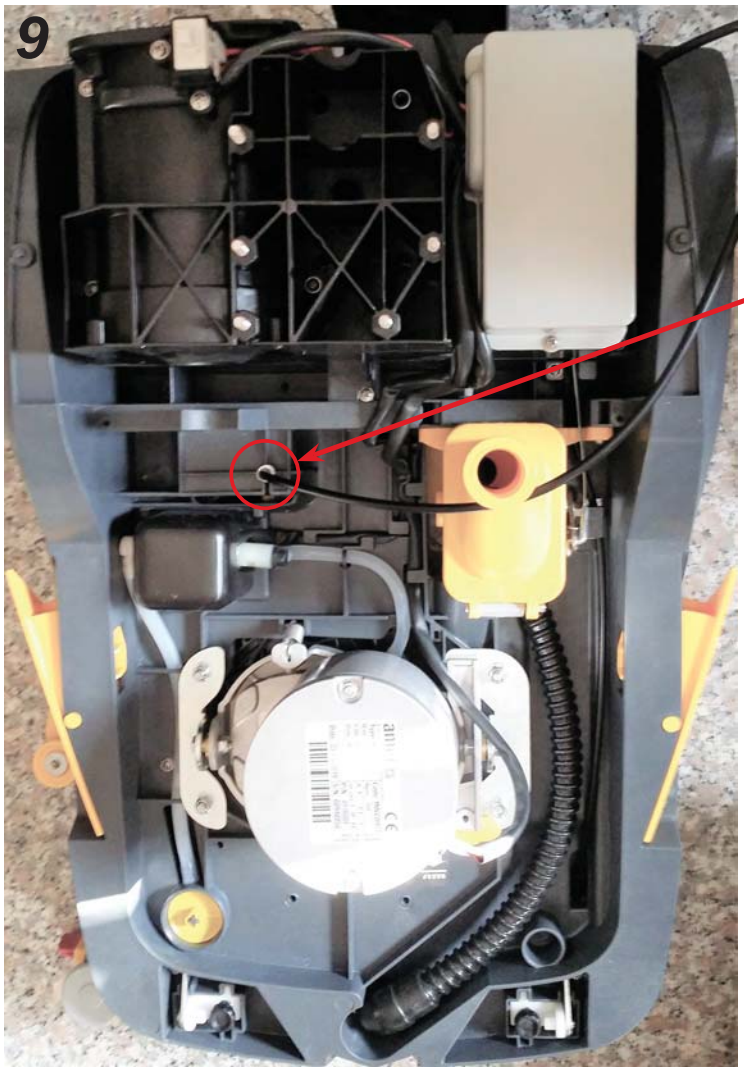
1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the cover clip and disassemble the carrier grip, located on the handle.
4. Undo the screw that fixes the eyelet of the rear squeegee lifting cable to the lifting lever.
5. Unscrew the nut on the lifting lever and remove the cable from the recess and from the handle.
6. Remove the dirty water and solution tanks.
7. If necessary, clean the working area with a jet of compressed air.
8. Remove the rear protective guard to free the lifting cable from underneath the guard.

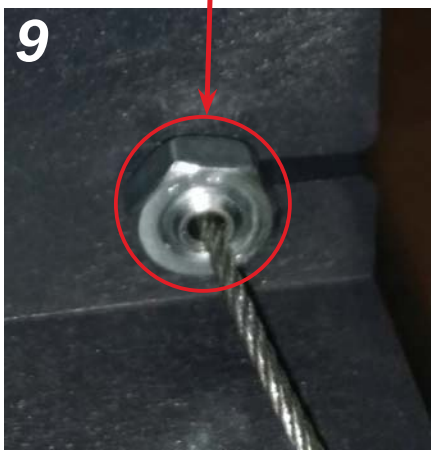




9 Unscrew the bottom nut on the lifting cable, at the squeegee end, and remove it from its housing.

10 Remove the snap ring from the eyelet on the squeegee and remove the rear squeegee lifting cable.





Reassembly

1 To reassemble the new lifting cable, repeat the disassembly operations in reverse order.

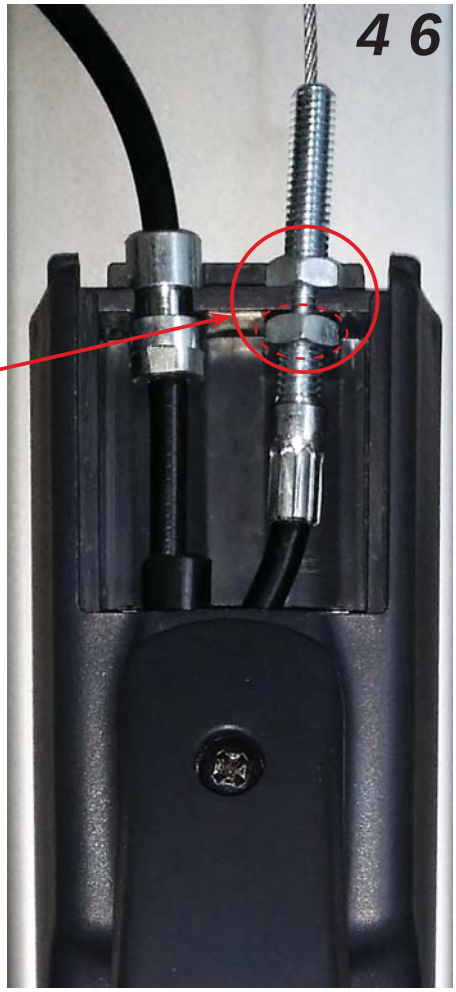
2 **Tighten the screws on the plastic parts gently.**

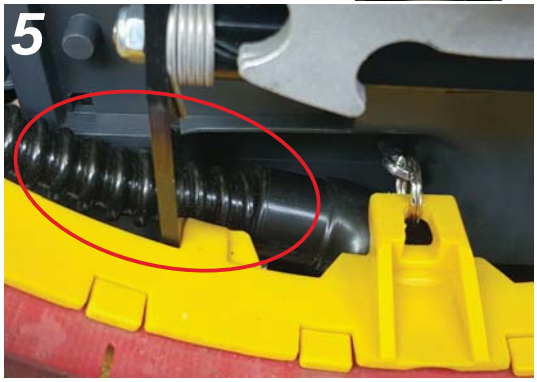
3 **Once assembly is complete, adjust the rear squeegee, see paragraph B4.2.**

B4.2 Adjusting the rear squeegee cable

Adjustment

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the adjustments safely.
3. **To adjust, use the top register on the handle, with the lifting lever raised.**
4. Remove the protection clip. Unscrew the nut at the bottom to allow the register to move.
5. Position the squeegee centrally, the ring on the squeegee must be in line with the lifting cable.
6. Tighten or unscrew the top nut on the register on the handle until the suction hose touches the chassis.
7. After adjustment, move the nut down to fix the position, tighten moderately.

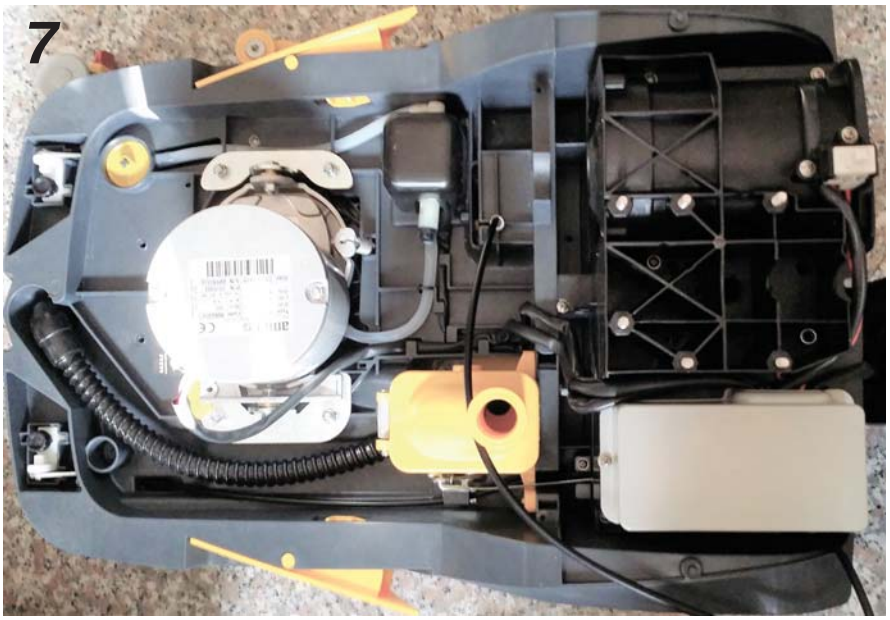


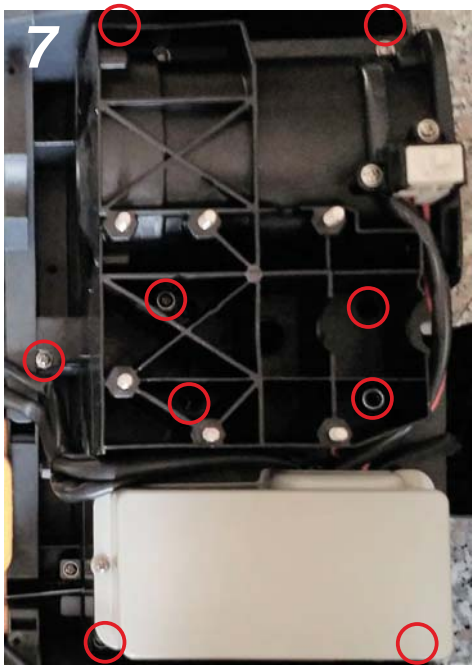


B4.3 Removing the splitter bracket

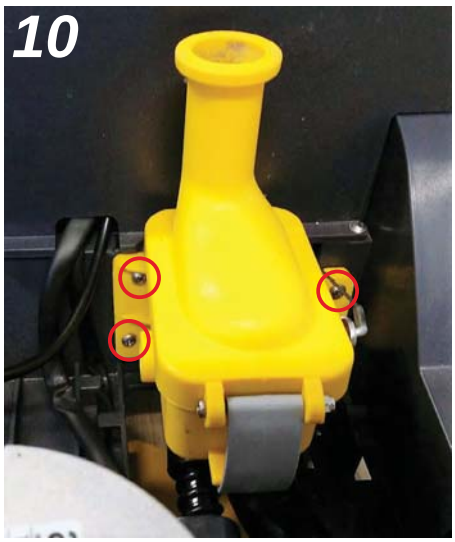
Disassembly

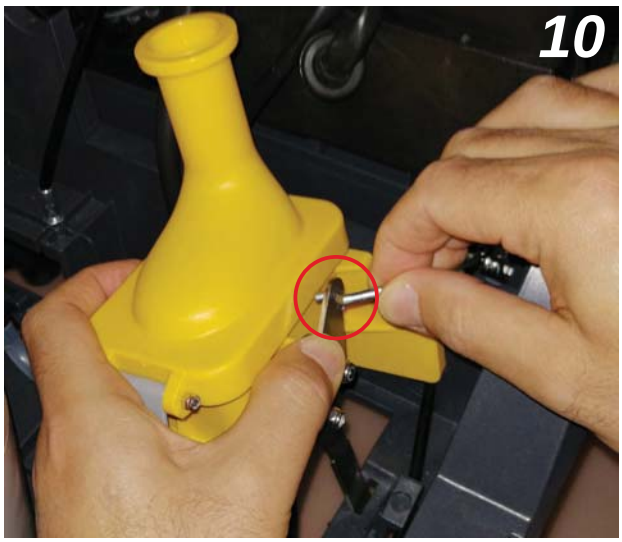
1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Disconnect the machine's battery and remove the dirty water tank and solution tank.
4. Disassemble the complete handle from the machine's chassis as described in paragraph C2.5.
5. If necessary, clean the working area with a jet of compressed air.
6. Place the handle next to the machine, taking care not to stretch the wired, sensors and mechanical cables.
7. Undo the 9 screws that secure the top half-chassis to the bottom half-chassis.
8. Lift the top half-chassis carefully, paying attention to the battery board power cables.
9. Once the half-chassis has been lifted, rotate it just enough to allow access for disassembling the splitter bracket.



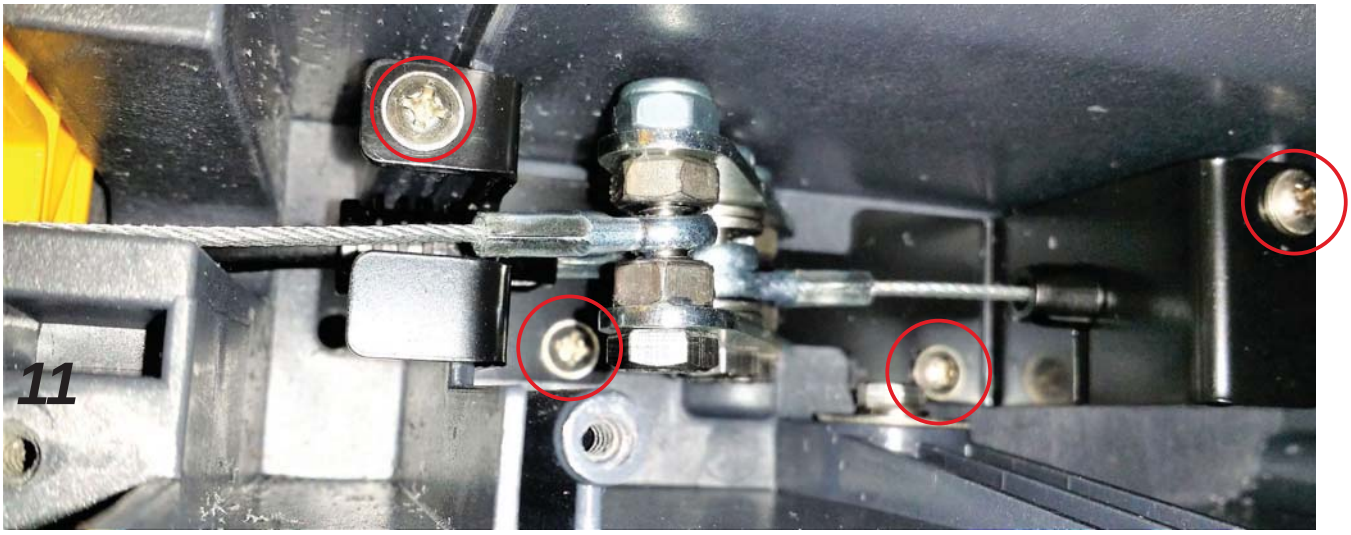


10. Undo the three screws that secure the diverter valve and disconnect the cable in common with the splitter bracket.





11 Unscrew the four splitter bracket fixing screws



12 Turn the splitter bracket on its side and unscrew the two screws that hold the two plastic pieces together

13 Replace the damaged cable with a new one.

Reassembly

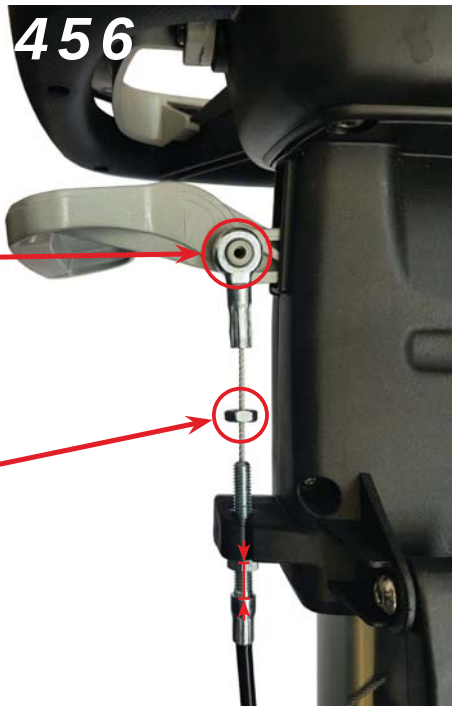
1 For assembly, repeat the steps for dismantling in reverse order.

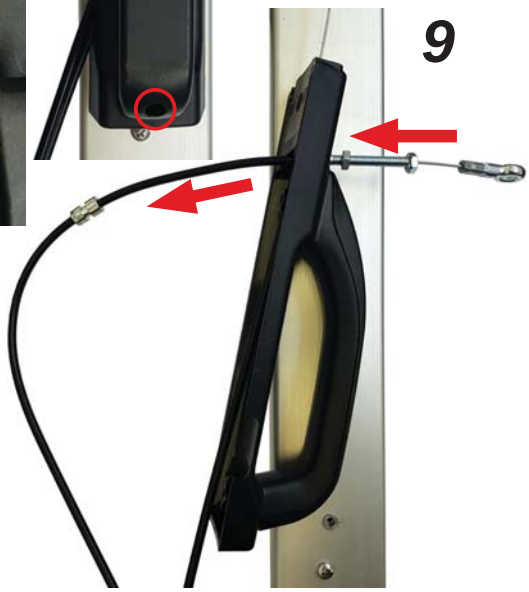
2 **Tighten the screws on the plastic parts gently.**

B4.4 Replacing the splitter bracket control cable “A”

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Disconnect the machine’s battery and remove the dirty water tank and solution tank.
4. Undo the plastic screw that secures the eyelet on the splitter bracket control cable.
5. Unscrew *only* the nut at the top of the register to remove the cable.
6. **The position of the nut at the bottom can be useful for adjusting the new cable.**
7. Press and simultaneously push the protection clip outwards to remove it.
8. Unscrew the two bolts that fasten the grip to the handle.
9. Remove the cable from the grip.
10. Disassemble as described in the previous paragraph to reach the other end of the cable.





Reassembly

1. To reassemble the new cable, repeat the disassembly operations in reverse order.
2. **Tighten the screws on the plastic parts gently.**

B4.5 Adjusting the splitter bracket control cable “A”

Adjustment

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the adjustments safely.
3. With the splitter bracket control cable mounted and the machine completely reassembled, adjust the cable.
4. Unscrew the top nut on the cable a few turns.
5. Pull and hold the squeegee inverting lever as far as it will go while unscrewing the bottom nut until the moulded plug inside the valve closes the opening for the rear squeegee.
6. When the adjustment is complete, check that when the lever is released, the plug inside the valve correctly closes the opening for the front squeegee.
7. **The lever is correctly adjusted when the openings are completely closed, both when the lever is pulled or at rest.**
8. After adjustment, tighten the top nut to fix the adjustment.

B4.6 Replacing the diverter valve control cable “B”

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Disconnect the machine’s battery and remove the dirty water tank and solution tank.
4. Disassemble as described in the paragraph B4.4.
5. Remove the splitter bracket, unscrew the two Torx screws securing the plastic bracket and replace the cable “B”

Reassembly

1. To reassemble the new cable, repeat the disassembly operations in reverse order.
2. **Tighten the screws on the plastic parts gently.**

After replacement, the diverter valve control cable “B” does not require adjustment.

B4.7 Replacing the front squeegee control cable “C”

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Disconnect the machine’s battery and remove the dirty water tank and solution tank.
4. Disassemble as described in paragraph B4.4 to reach the splitter bracket.
5. Undo the two Torx screws securing the plastic bracket and remove the front squeegee control cable “C”.

6. Lift the front of the machine and locate the cable stop, unscrew it and remove the front squeegee cable.
7. Replace the steel cable “C” with a new one.

Tighten the cable stop screw only when adjustment has been completed

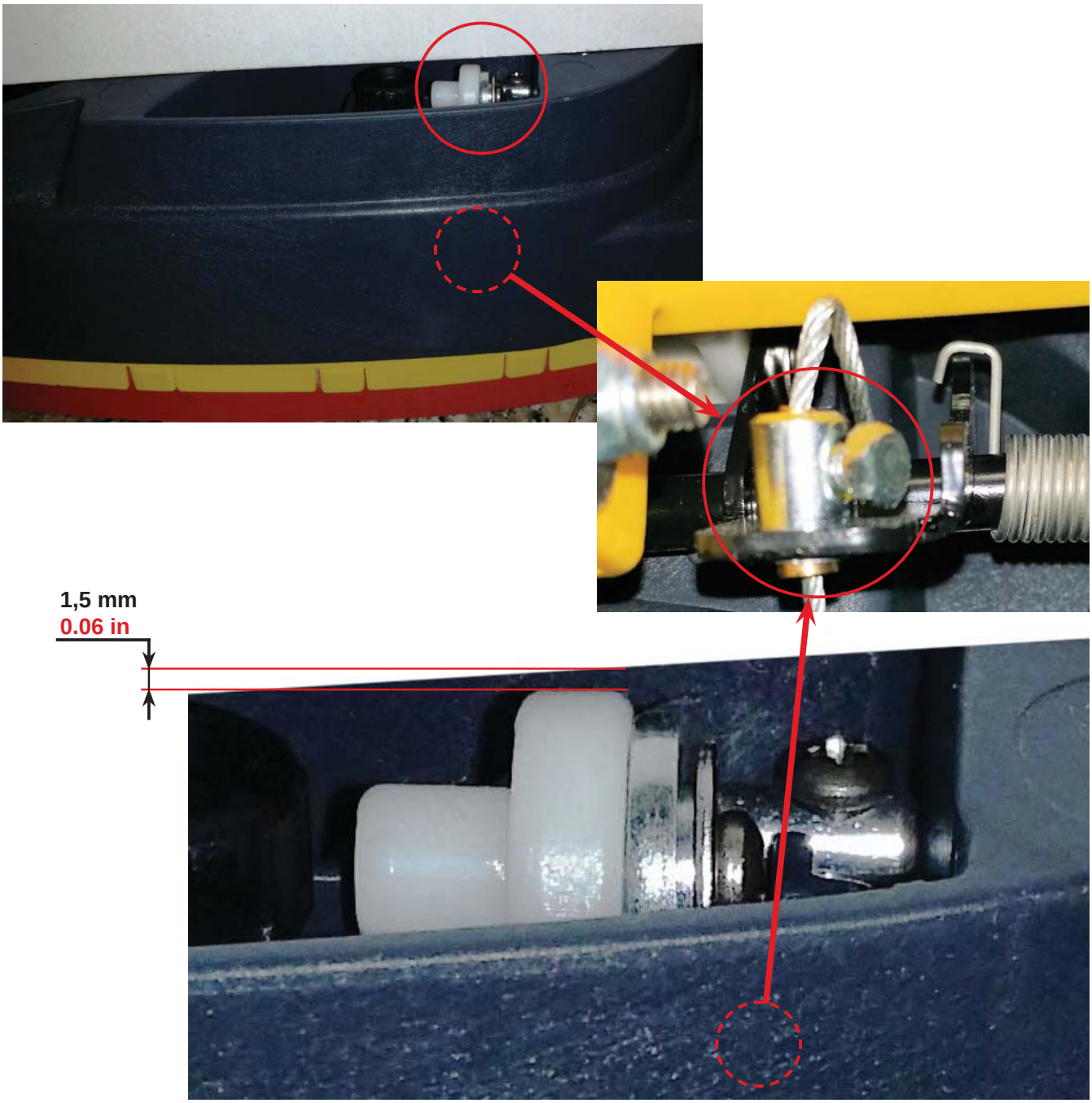
Reassembly

1. To reassemble the new cable, repeat the disassembly operations in reverse order.
2. After assembly, adjust the height of the squeegee.
3. **Remember to always tighten the screws on the plastic parts gently.**

B4.8 Adjusting the front squeegee control cable “C”

Adjustment

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the adjustments safely.
3. With the front squeegee control cable assembled and the machine completely reassembled, adjust the cable.
4. Lift the front of the machine and locate the cable stop, make sure that the screw does not tighten the cable.
5. Place the top of the rotation pins at a distance of about 1.5 mm / 0.06 in from the machine’s chassis, to simplify the operation, use a ruler and a spacer to measure the distance to be left.
6. Pull lightly on the steel cable to recover play and gently tighten the screw on the cable stop.



IMPORTANT

Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Turn off the machine by pressing the main switch.

Disconnect the battery, removing it from the battery compartment on the machine.

i INFORMATION

Important information

In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine. These always refer to the direction of travel of the machine.

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This note indicates that the instructions only refer to the version specified in brackets.

C1 WHEEL

The rear idle wheels bear most of the weight of the machine; the rest of the weight rests on the brush. They measure 200 millimetres - 7.87 inches in diameter and are almost totally made from plastic, with the exception of the 10 mm - 0.39 inch tread made from non-marking rubber. Free rotation of the wheels is ensured by a pair of roller bearings on each wheel. The wheels are very simple to replace; remove the cap to access an M5 stainless steel screw that fixes the centre of the wheel bearings to the metal axle attached to the plastic chassis.
The wheels only need to be replaced when broken.

C1.1 Replacing the idle wheels

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. If necessary, clean the working area with a jet of compressed air.
4. Remove the battery, dirty water and solution tanks.
5. Turn the machine onto its side, opposite to the wheel being replaced.
6. With a pointed object, lift the cap that covers the fixing screw.
7. Undo the screw, remove the wheel and replace it with a new one.

Reassembly

1. To assemble the new wheels, repeat the disassembly operations in reverse order.
2. **Tighten the M5 screws onto the metal axle gently.**

C2 Carrying handle - Hand grip - Complete handle

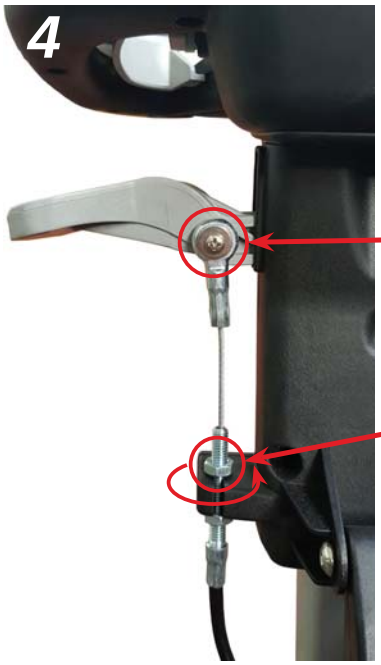
The handle is used to control the machine during operation. To this end, near the handle there are levers for adjusting its angle and levers for controlling the front and rear squeegees. On the top of the handle is a control panel for managing the electrical part of the machine. A carrying handle has been fitted on the aluminium rod of the handle that, when the latter is folded onto the machine, makes it easier to transport. If used correctly, no specific maintenance is needed.

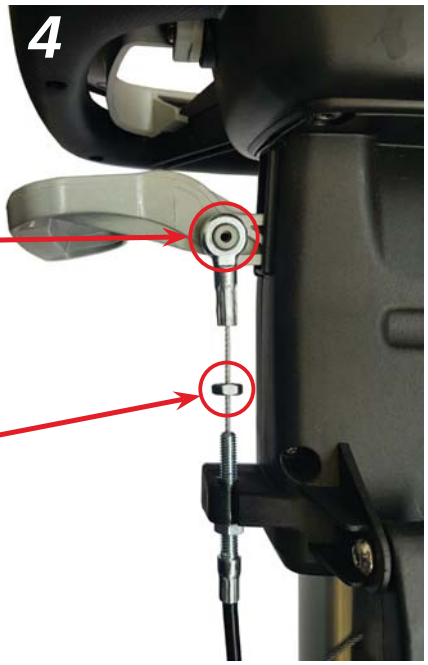
C2.1 Replacing the carrying handle

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Undo the screw that secures the eyelet on the rear squeegee lifting cable.
4. Undo the screw that secures the eyelet on the inversion cable and unscrew the top nut on the register.

It is recommended not to unscrew the bottom nut on the squeegee inversion cable and the bottom nut on the rear squeegee lifting cable to avoid losing the adjustments.

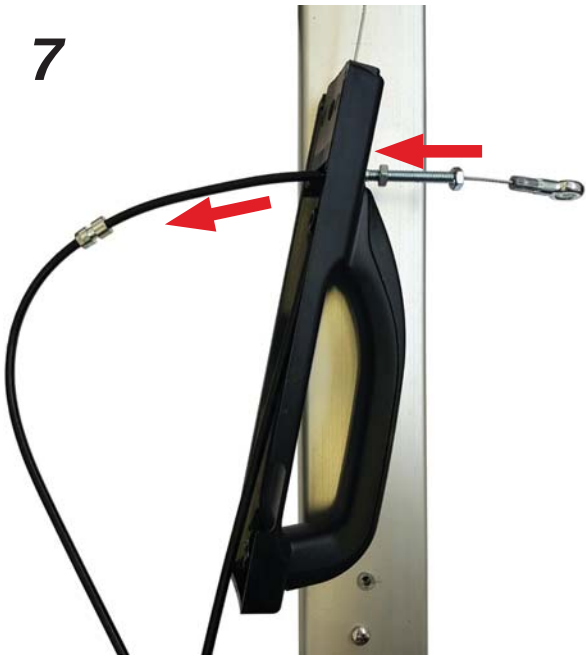




5 Remove the cover clip and completely unscrew the top adjusting nut on the rear squeegee cable

6 Undo the two screws that fasten the grip to the handle.

7 Remove the two cables from the carrying handle and replace the carrying handle with a new one.



Reassembly

1 To assemble the new carrying handle, repeat the disassembly operations in reverse order.

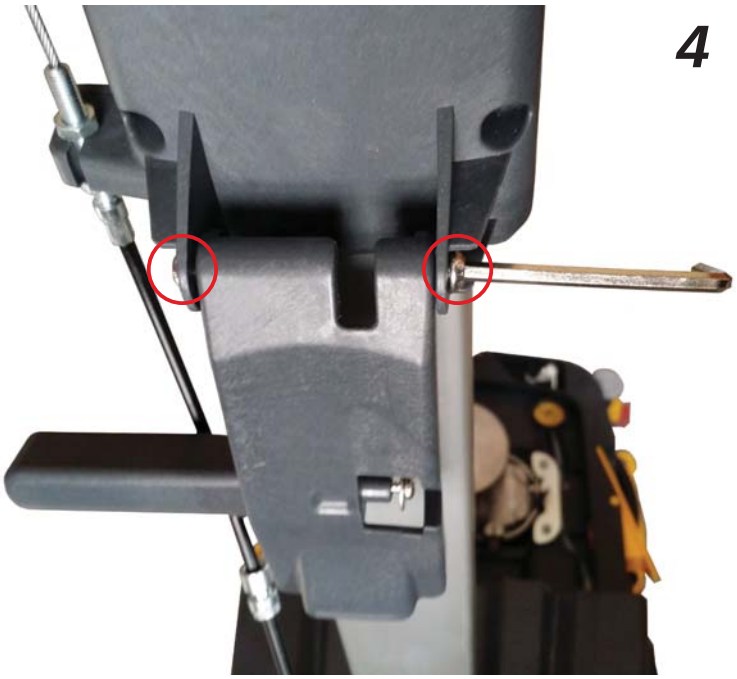
2 After assembly, adjust the height of the squeegee.

3 **Remember to always tighten the screws on the plastic parts gently.**

C2.2 Replacing rear squeegee activation lever

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Undo the screw that fixes the eyelet of the rear squeegee lifting cable to the lifting lever.
4. Undo the two screws that fasten the carrying handle to the handle.
5. Remove and replace the carrying handle with a new one.



Reassembly

1. To assemble the new carrying handle, repeat the disassembly operations in reverse order.
2. **Tighten the screws on the plastic parts gently.**

C2.3 Disassembling the hand grip

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the battery from the machine and remove the dirty water tank and the solution tank.
4. Place the machine on its side and disassemble the hand grip.
5. With a Torx TX25 key, undo the 4 screws located under the handle.

6. Move the handle carefully until accessing the connections on the instrument panel electronic board.
7. Very carefully unplug the 2 connectors from the instrument panel board, if necessary use long-nosed pliers, pay attention to the locking tabs on the connectors.

Reassembly

1. To assemble the new hand grip, repeat the disassembly operations in reverse order.
2. **Tighten the screws on the plastic parts gently.**

C2.4 Disassembling the handle adjustment and squeegee inversion levers

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the battery from the machine and remove the dirty water tank and the solution tank.
4. Place the machine on its side and disassemble the hand grip, see the previous paragraph.
5. With a Torx TX25 key, undo the 4 screws located under the handle, see the previous paragraph.
6. Undo the two screws that secure the two half-shells to the aluminium handle and separate them.
7. If the half-shells are damaged, replace them with new ones.
8. If replacing the rear half-shell, remove the squeegee inversion microswitch.

The microswitch mounted on the rear half-shell disables operation of the water pump when the front squeegee is activated. In the event of a pump malfunction, check the microswitch.

Squeegee inversion lever

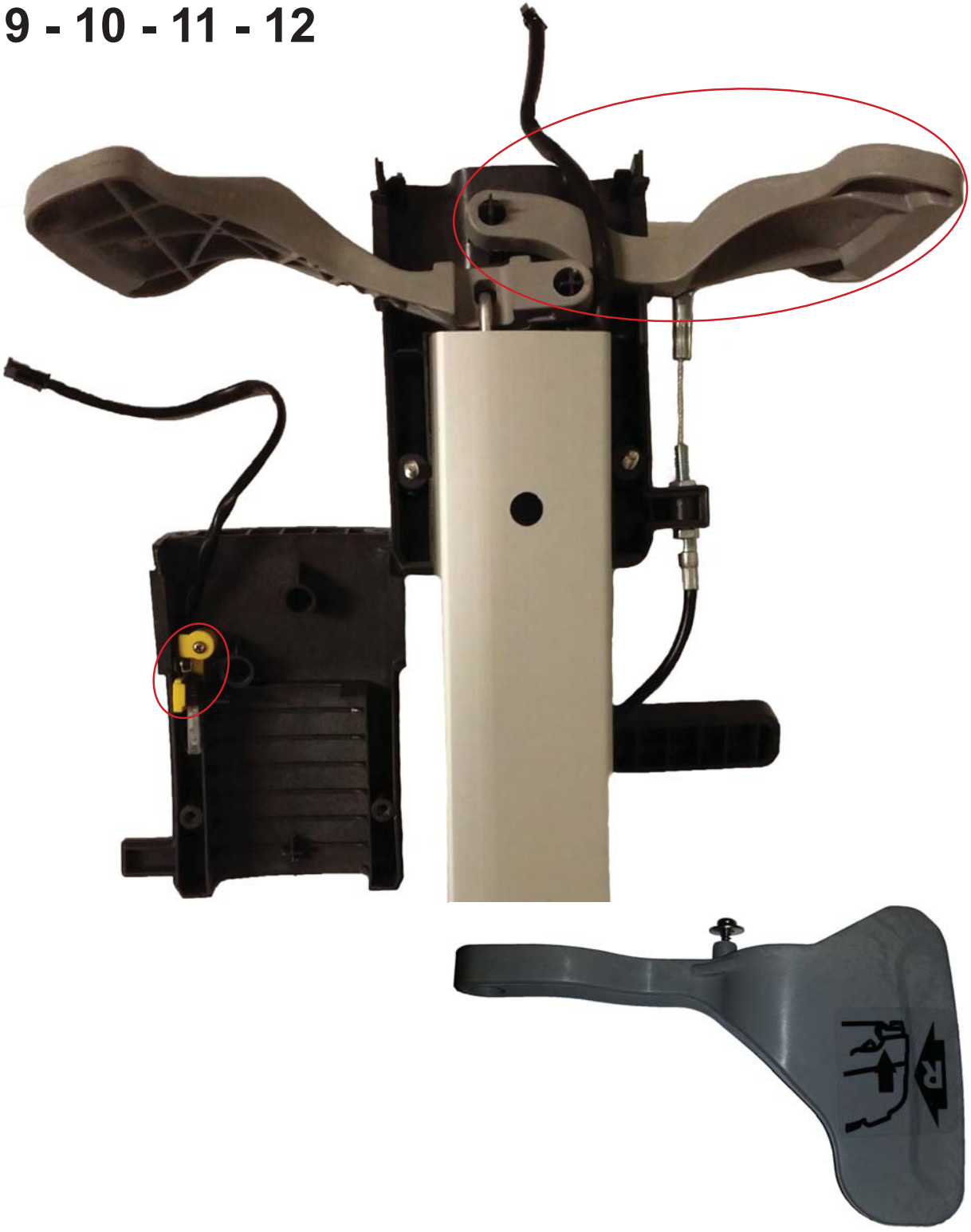
9 Undo the screw that secures the eyelet on the splitter bracket control cable.

10 Using a fine-tip flat-head screwdriver, remove the Starlock elastic safety ring from the connecting rod.

11 Remove the lever, replace it with a new one and reassemble the safety ring.

12 Reassemble the two half-shells and check that the squeegee inversion switch is working correctly.

9 - 10 - 11 - 12

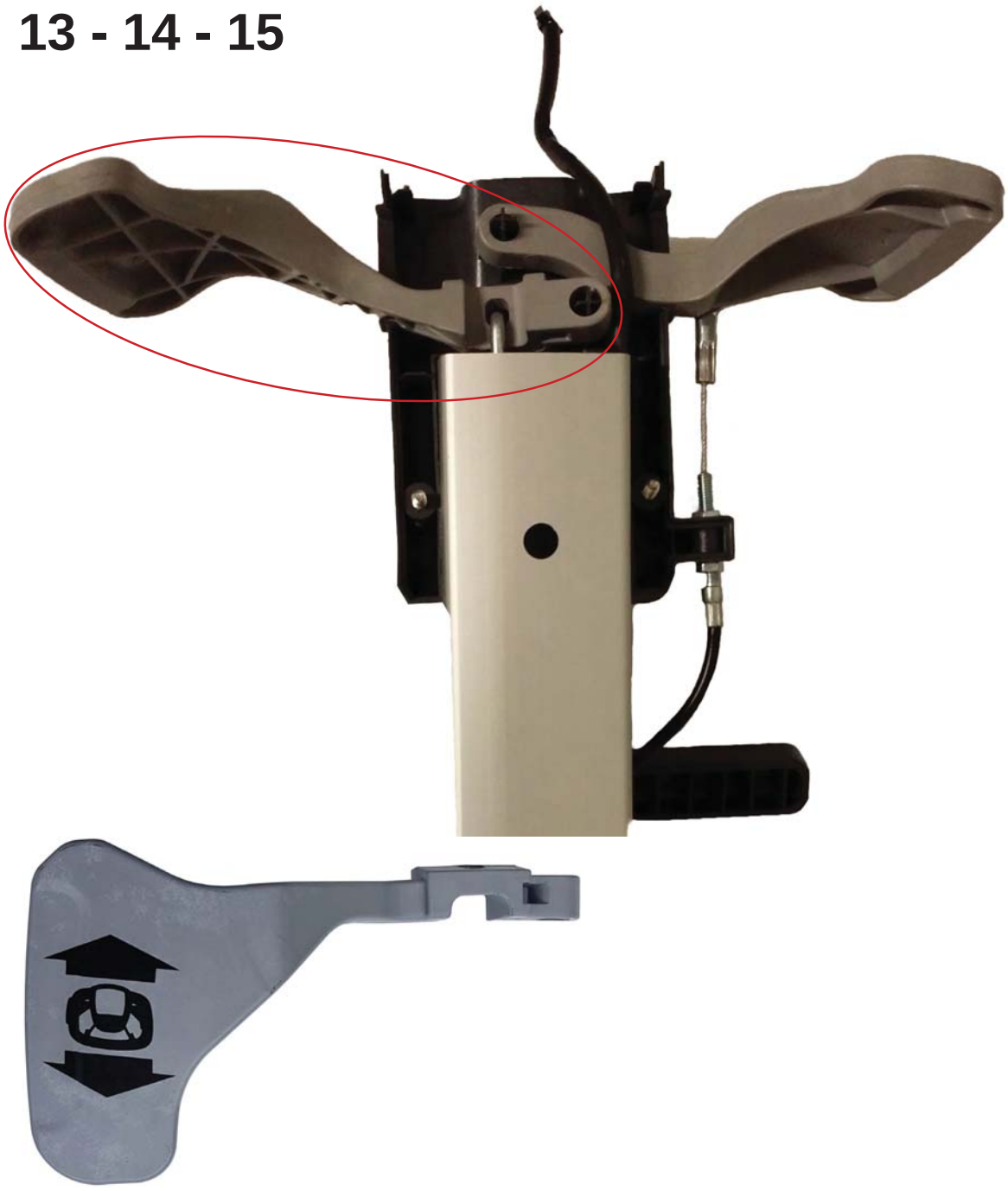


Handle tilt adjustment lever

13 Using a fine-tip flat-head screwdriver, remove the Starlock elastic safety ring from the connecting rod.

14 Remove the lever, replace it with a new one and reassemble the safety ring.

15 Reassemble the two half-shells and check that the squeegee inversion switch is working correctly.



Reassembly

1 To reassemble the new levers, repeat the disassembly operations in reverse order.

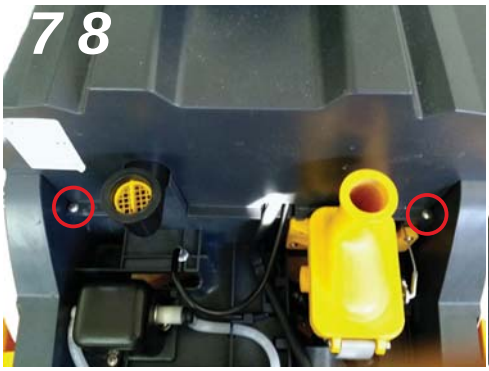
2 Check that the squeegee inversion microswitch is working correctly.

3 **Tighten the screws on the plastic parts gently.**

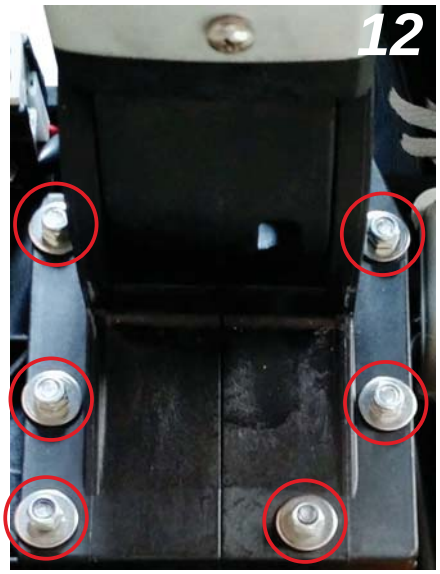
C2.5 Disassembling and replacing the complete handle

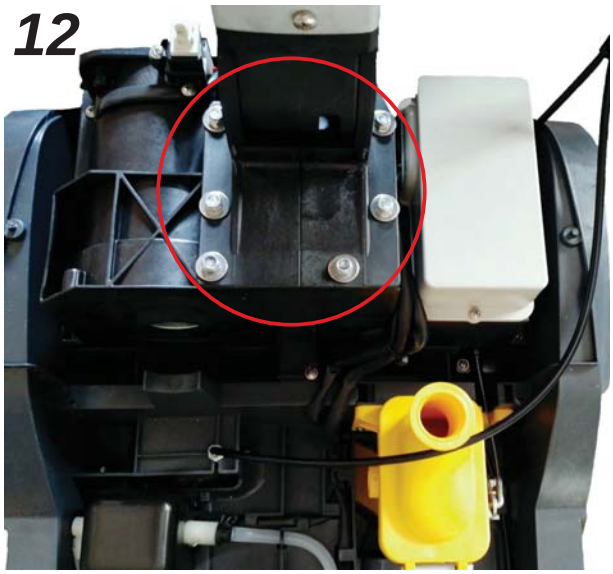
Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the battery from the machine and remove the dirty water tank and the solution tank.
4. Undo the screw that secures the eyelet for the rear squeegee cable, see paragraph B4.1.
5. Undo the screw that secures the eyelet for the splitter bracket control cable, see paragraph B4.4.
6. Remove the carrying handle as described in paragraph C2.1.
7. Remove the rear protective guard to access the 6 nuts that secure the handle to the chassis.
8. Undo the three screws that secure the protective guard, one in the battery compartment, two under the dirty water tank.
9. Lift the protective guard by sliding it on the aluminium rod of the handle.



10. Undo the 2 screws that secure the protective guard for the power board.
11. Remove the board from the guides and unplug the 4-pin connector for the instrument panel board from the power board.
12. Undo the 6 nuts that secure the handle to the chassis, and remove it.





13 Unscrew the centre bolt on the handle rotation pin to uncouple it from the joint supports.

14 Replace the handle with a new one.

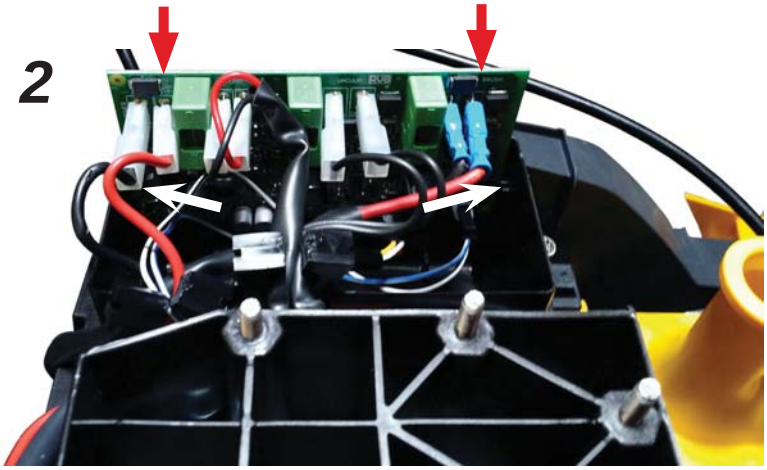
Reassembly

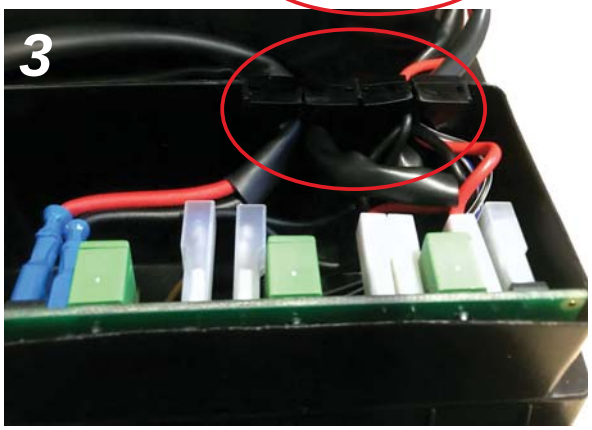
1 To reassemble the new complete handle, repeat the disassembly operations in reverse order.

2 Place the power board in the appropriate guides correctly.

3 **Pay attention to correct assembly of the cable gasket.**

4 **Tighten the screws on the plastic parts gently.**





☝ IMPORTANT

Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Turn off the machine by pressing the main switch.

Disconnect the battery, removing it from the battery compartment on the machine.

i INFORMATION

Important information

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D1 HAND GRIP - INSTRUMENT PANEL BOARD

The plastic hand grip made specifically for the machine is ergonomic, allowing it to be controlled in all directions. The operating lever is located along the perimeter of the top of the grip, to allow it to be activated in any position of the grip and simplify operation. In the centre are the instruments for electronic control of the machine and information on operation. It can be completely dismantled to simplify replacement of components that have been damaged during use or accidentally.

D1.1 Disassembling and replacing hand grip components

Disassembly

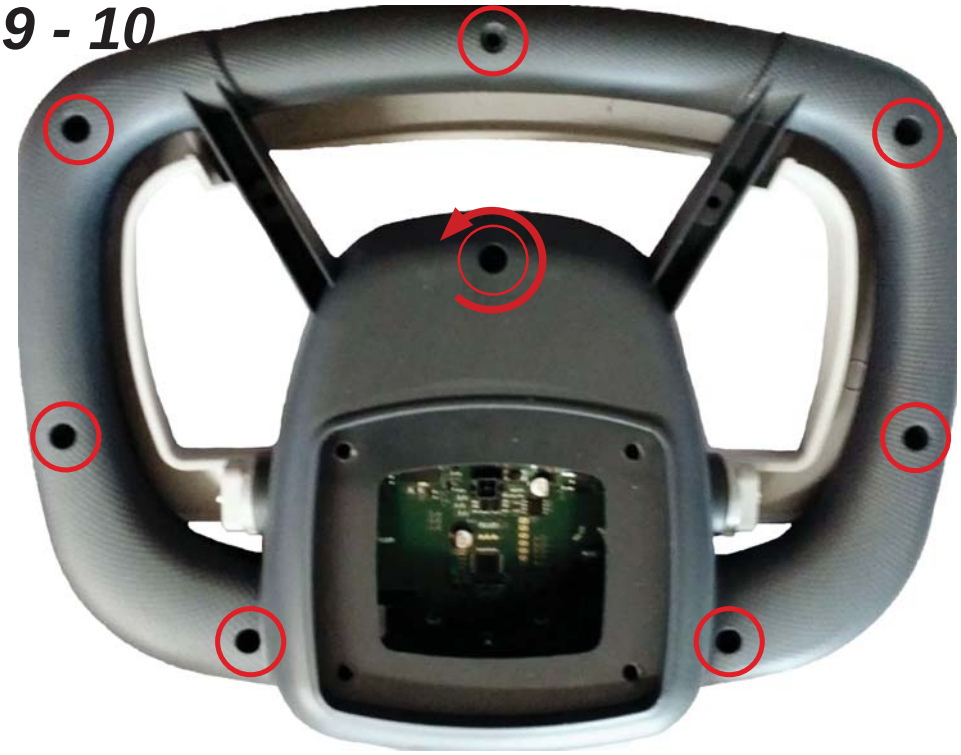
1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the battery and place it in a safe area, away from liquids.
4. Release the dirty water tank and the solution tank using the two locking levers and remove them.
5. Place the machine on its side.
6. With a Torx TX25 key, unscrew the 4 screws located under the handle.

7. Move the handle carefully until accessing the connections on the instrument panel electronic board.
8. Very carefully unplug the 2 connectors from the instrument panel board, if necessary use long-nosed pliers, pay attention to the locking tabs on the connectors.

9 Place the instrument panel on a flat surface and position it carefully with the control panel facing downwards.

10 With a Phillips-head screwdriver, unscrew the 8 screws that join the two half-shells of the handle.

9 - 10

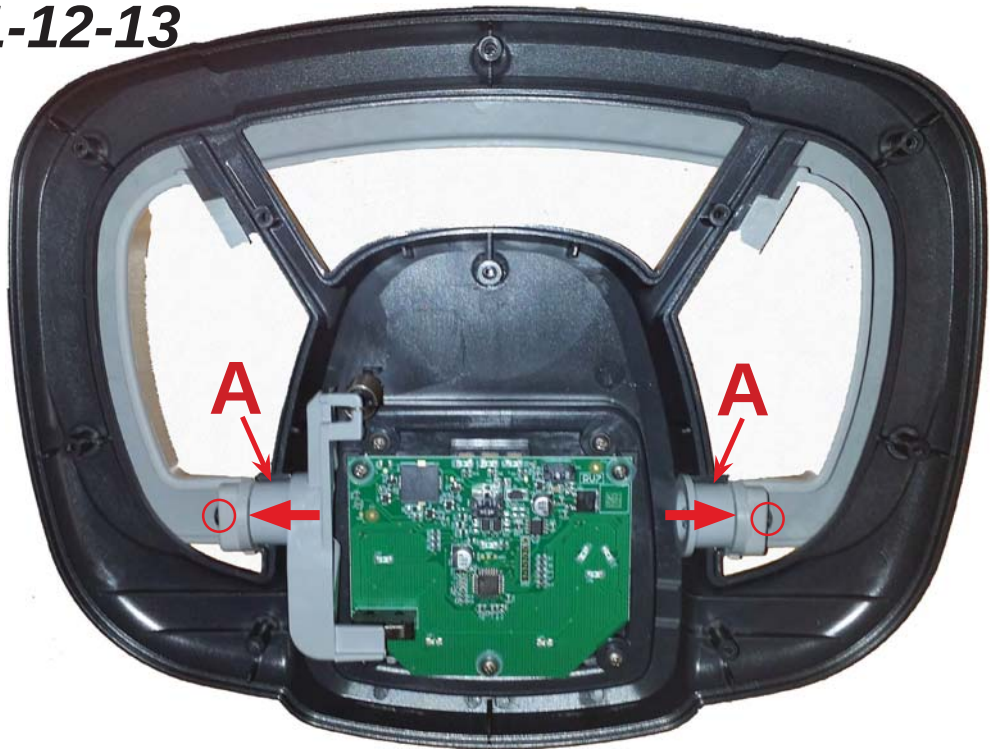


11 Lift and remove the half-shell of the handle.

12 Unscrew the 2 screws that secure the lever to the two pivots A.

13 Remove the activation lever from the two pivots **A** with rectangular couplings.

11-12-13



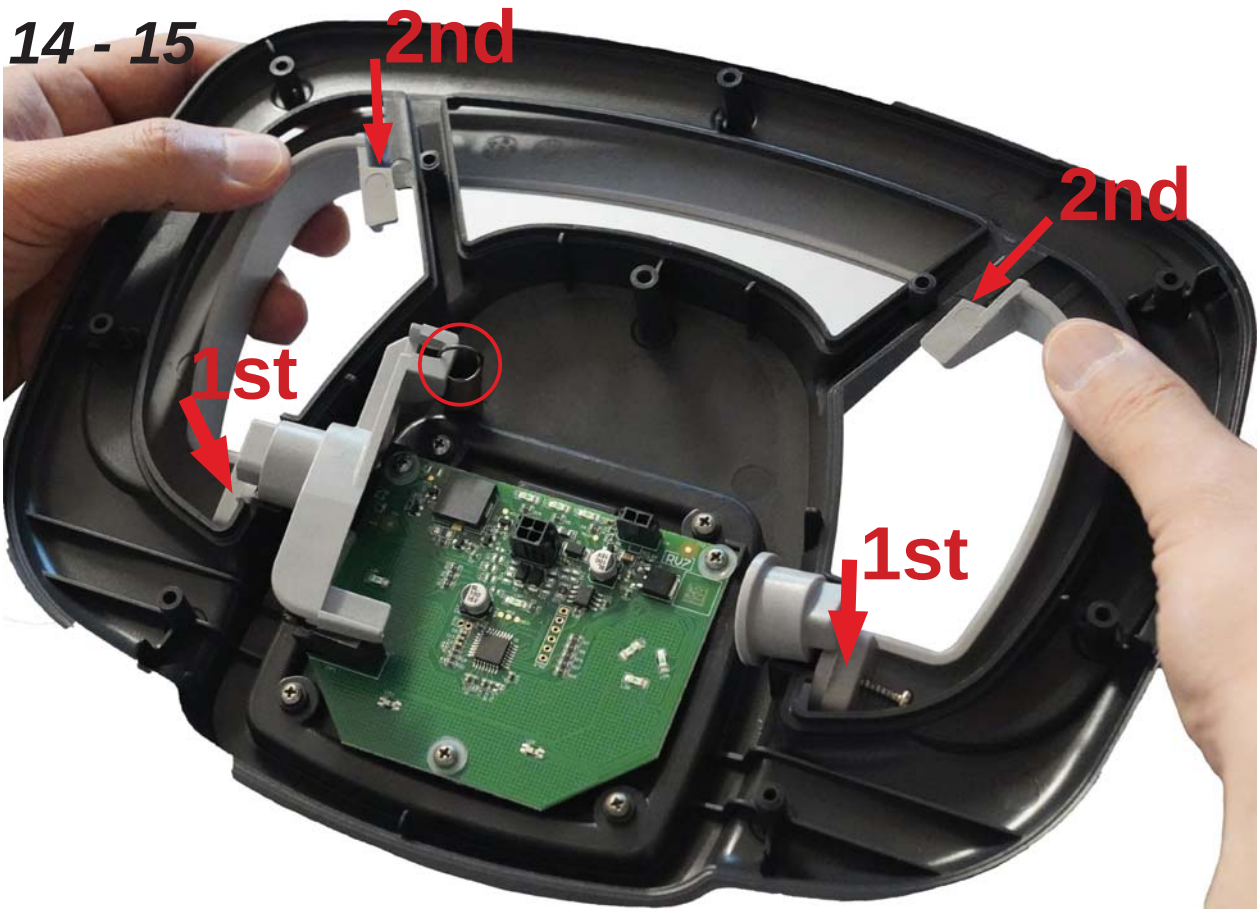
14 Move the pivoted part of the activation lever outwards, then slide it out from the limit switches on the handle.

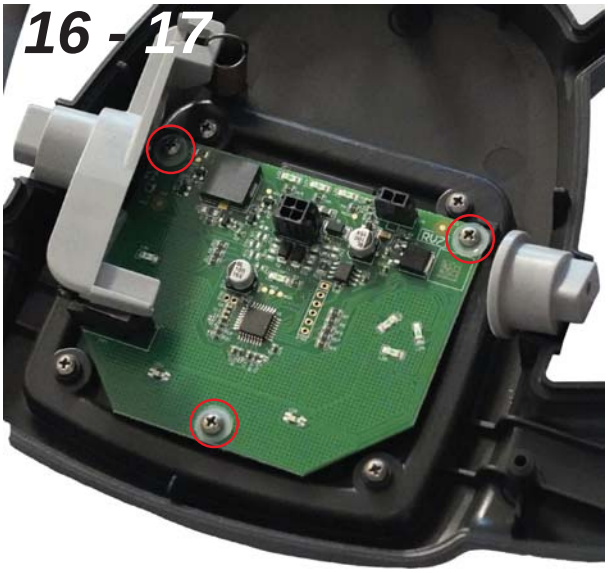
15 Release the pivot spring on the right rocker arm and remove the two pivots **A**.

16 With a Phillips-head screwdriver, unscrew the 3 screws fixing the control panel board.

17 Remove the control panel board, paying attention to the springs on the buttons.

18 Finally, unscrew the 4 screws fixing the glass with the panel label.





19 Turn the handle and remove the panel glass with label.

Reassembly

1 For assembly, repeat the steps for dismantling in reverse order.

2 **Tighten the screws on the plastic parts gently.**

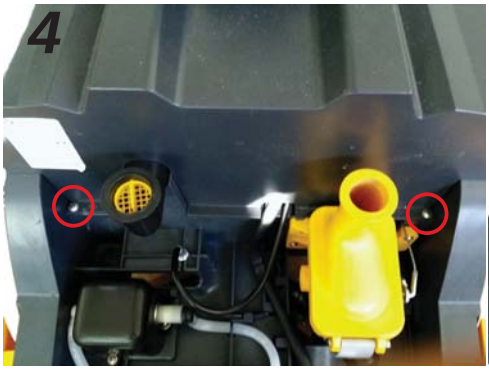
D1.2 Checking and replacing the main switch

Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the battery, the dirty water tank and the solution tank from the machine.
4. Unscrew the three screws that secure the top plastic guard, 2 on the inside and 1 on the outside, in the battery compartment.
5. Lift the top plastic guard up to the carrying handle.
6. Identify and disconnect the fast-on connectors on the main switch and reposition the battery.
7. Connect the two fast-ons on the main switch together

7a. If the machine turns on, replace the main switch.

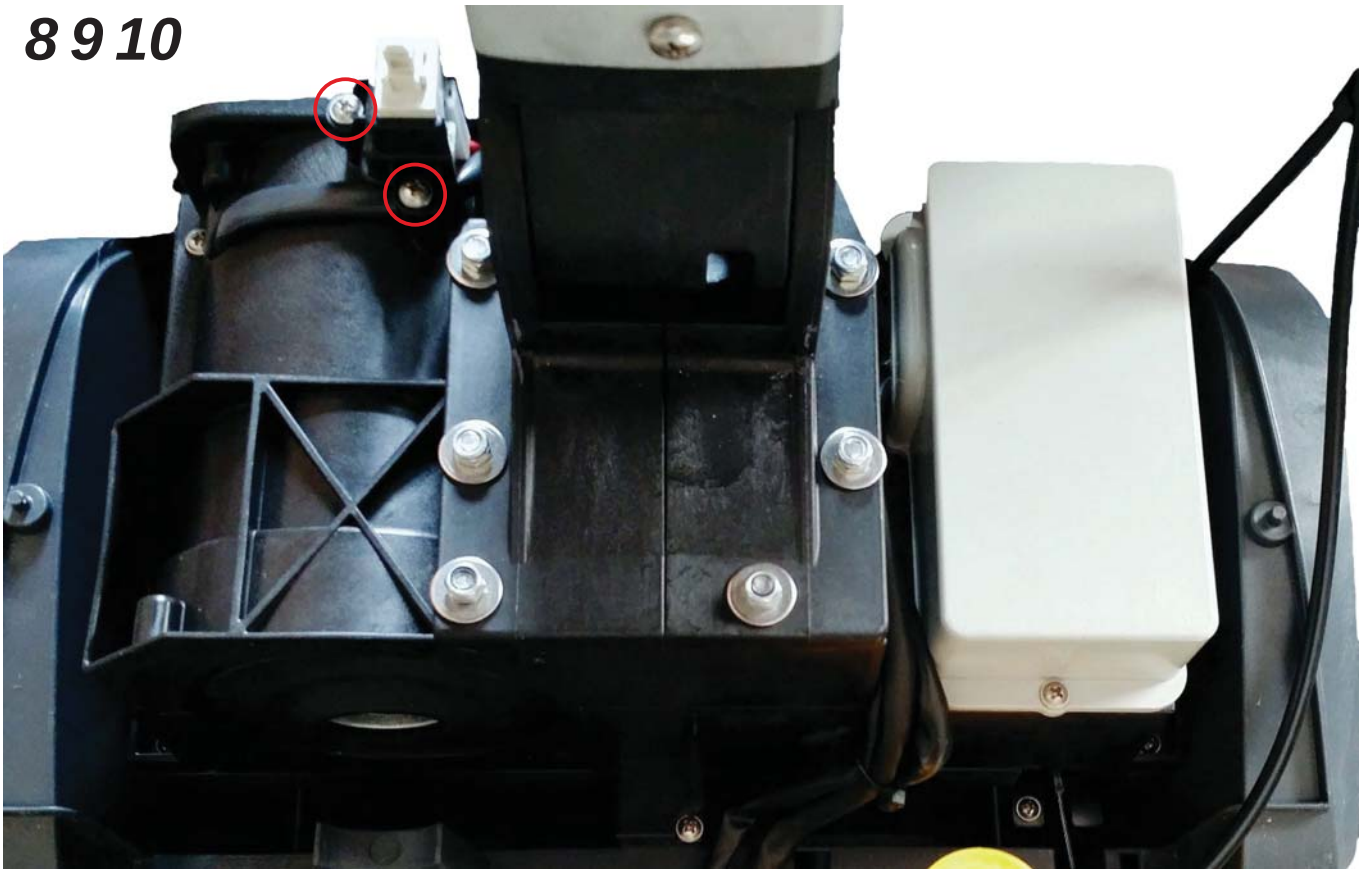
7b. If the machine does not turn on, check the power board and the control panel board

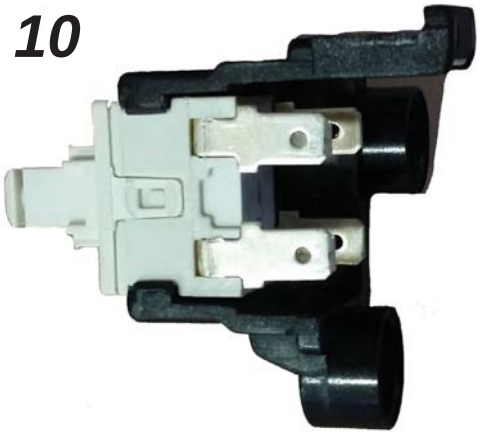


8 To replace the main switch, unscrew the two screws that secure the support.

9 Disconnect the two fast-ons on the main switch, if not already done.

10 Remove the switch from its support and replace it.





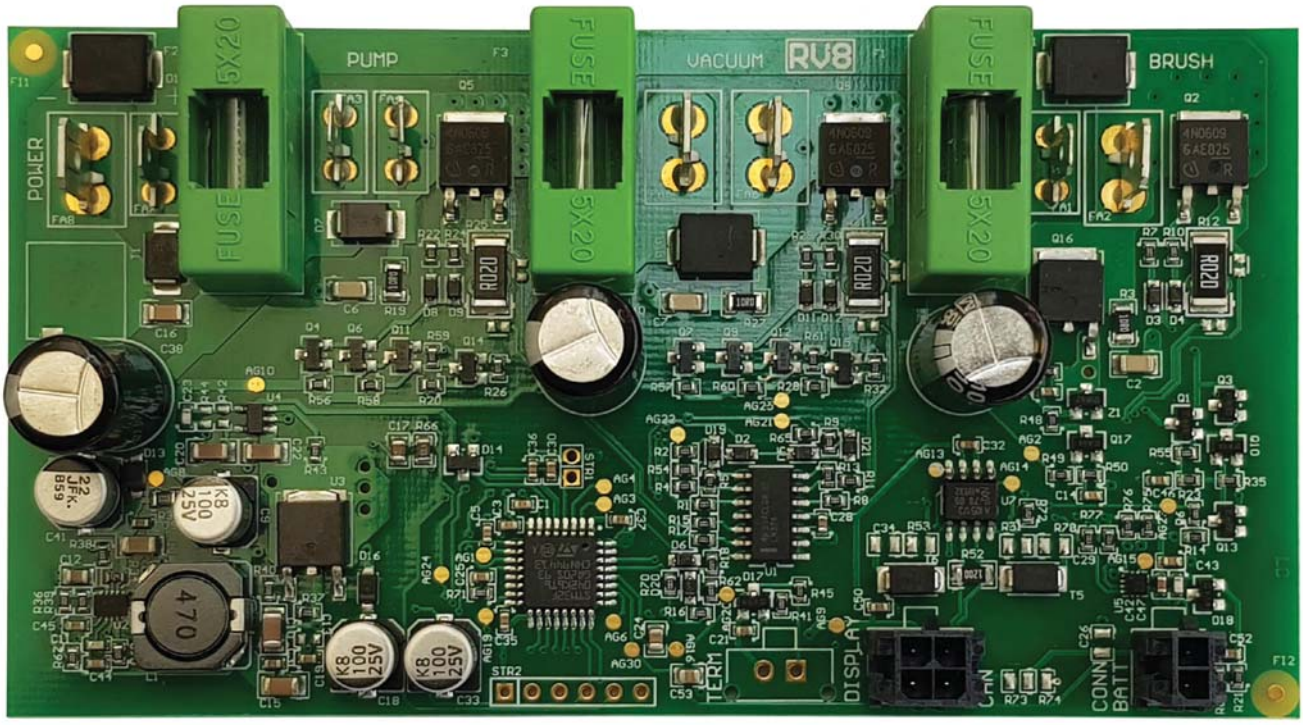
Reassembly

1 For assembly, repeat the steps for dismantling in reverse order.

2 ***Always tighten the screws on the plastic parts gently.***

POWER BOARD

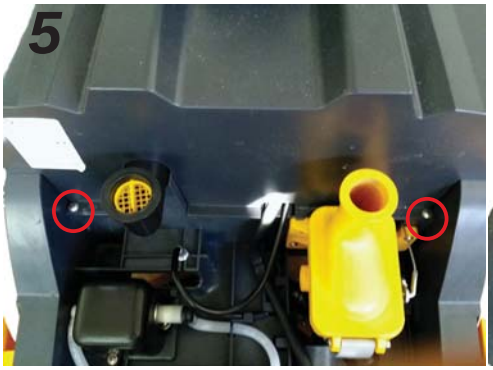
The power board supplies power to all of the motors fitted on the machine, which are activated via communication with the instrument panel board. The motors are started using a soft-start procedure to avoid peak current draw. The power board communicates via a two-wire cable with the battery board, which sends a signal indicating its level of charge. The fuse carriers for the motors are mounted on the board.

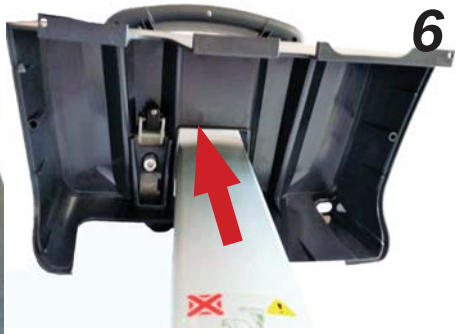


D2.1 Disassembling and replacing the power board

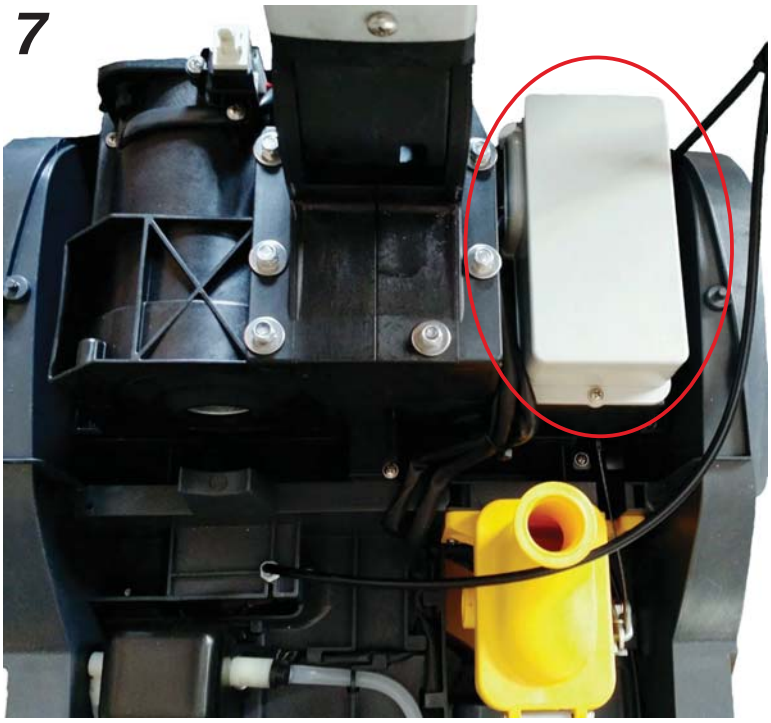
Disassembly

1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. If necessary, clean the working area with a jet of compressed air.
4. Remove the battery, the dirty water tank and the solution tank from the machine.
5. Unscrew the three screws that secure the top plastic guard, 2 on the inside and 1 on the outside, in the battery compartment.
6. Lift the top plastic guard up to the carrying handle.
7. Unscrew the four screws fixing the electronics compartment cover.
8. Disconnect the cables from the electronic board gently, paying attention to the fast-in connectors soldered to the board.
9. If damaged, replace the board with a new one.





Take care when unplugging the fast-on connectors on the cables from the board; if overpulled, there is the risk of tearing off the fast-in connectors soldered to the board.



Connections

A The fast-on connectors **A** are used to supply power to the electronic board from the batteries; they cannot be reversed, as the positive and negative fast-ons have different sizes.

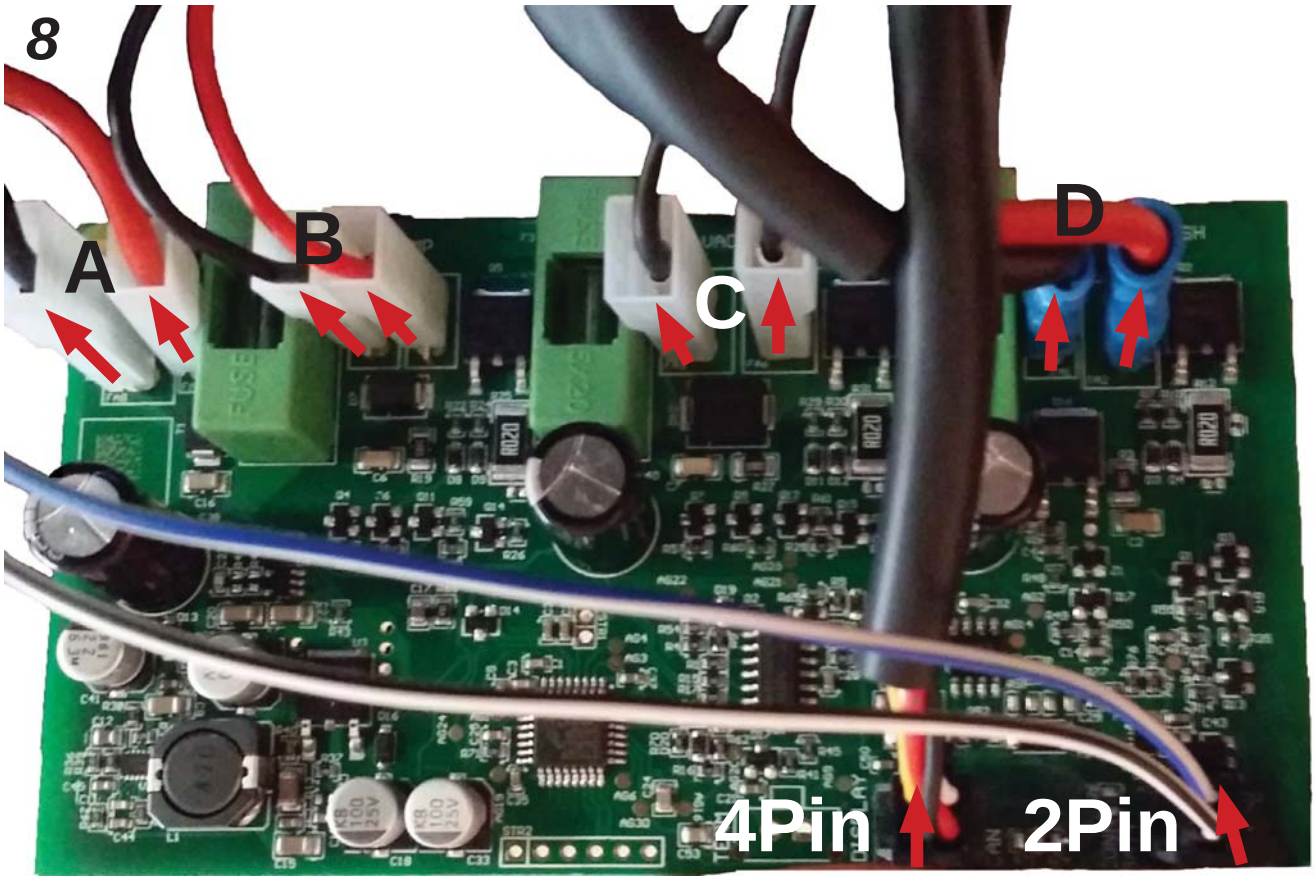
B The fast-on connectors **B** connect to the solution pump, with an AC (alternating current) output and consequently can be reversed.

C The fast-on connectors **C** connect to the suction motor, with DC voltage, and can be reversed.

D The fast-on connectors **D** connect to the brush motor, with DC voltage; these cannot be reversed, and the positive and negative fast-ons consequently have different sizes.

2P Two-pin connector from the battery together with the power supply; the connection cannot be reversed.

4P Four-pin connector to the instrument panel display; the connection cannot be reversed.



Reassembly

1 For assembly, repeat the steps for dismantling in reverse order.

2 ***Always tighten the screws on the plastic parts gently.***

D2.2 Checking and replacing the fuses

Disassembly

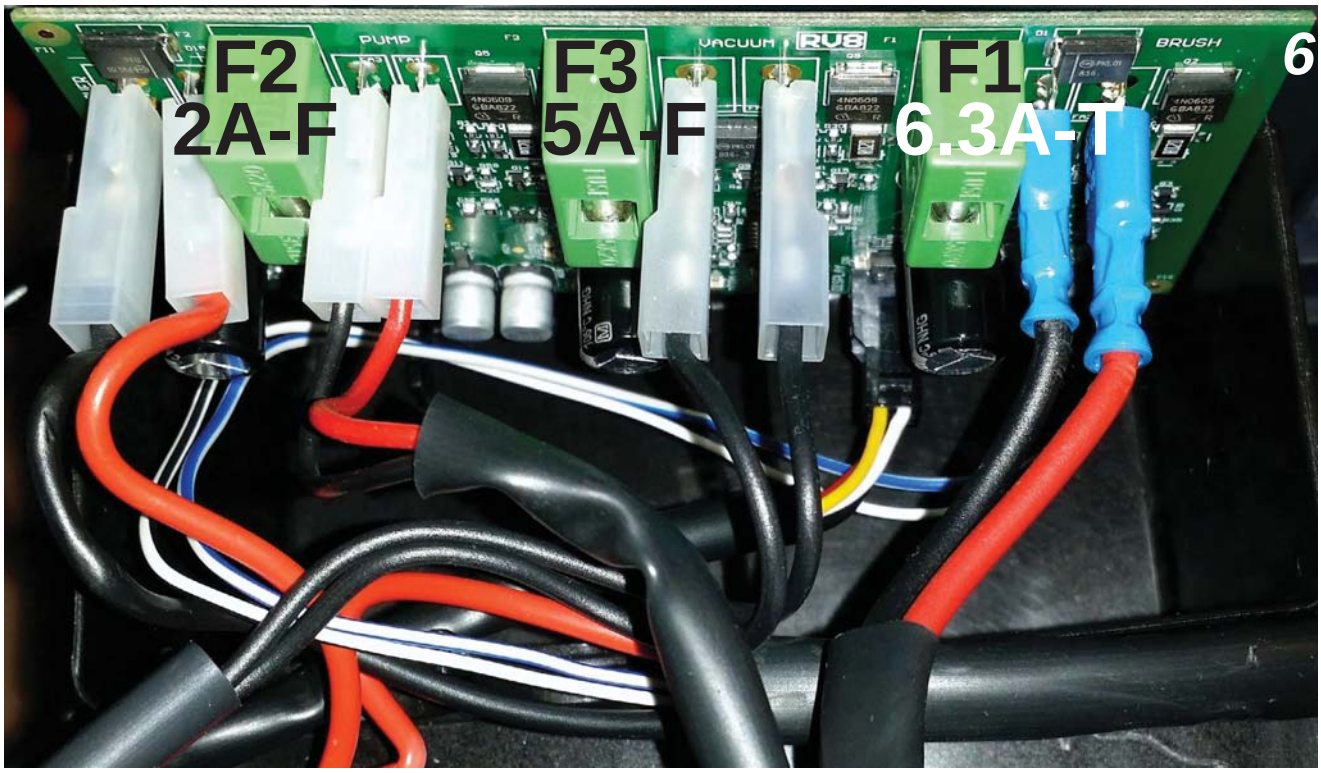
1. Move the machine onto flat and dry flooring, or onto a work bench, if available.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. Remove the battery, the dirty water tank and the solution tank from the machine.
4. Remove the top protective guard as described in paragraph D2.1.
5. Identify the fuse in being checked or replaced.
6. Remove the three fuses one at a time, check them and replace them if necessary.

Fuse ratings

F2 Water pump fuse, 2A - F fast-blow

F3 Suction motor fuse, 5A - F fast-blow.

F1 Brush motor fuse, 6.3 A - T slow-blow

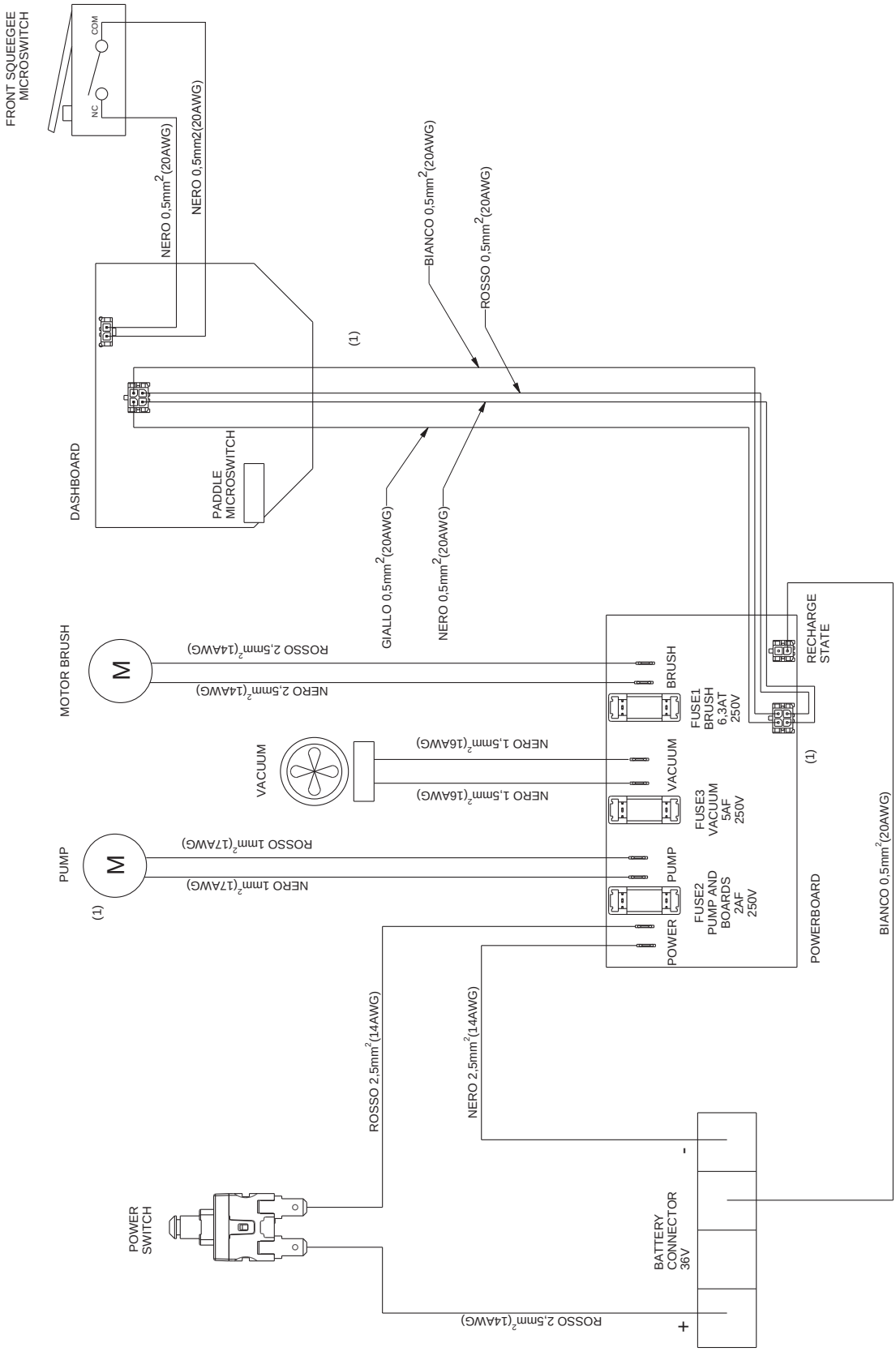


Reassembly

1. For assembly, repeat the steps for dismantling in reverse order.
2. To replace the fuse, insert it into the cap and then into the fuse carrier.
3. ***Always tighten the screws on the plastic parts gently.***

D3 ELECTRICS

D3.1 Wiring diagram



☝ IMPORTANT

Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Turn off the machine by pressing the main switch.

Disconnect the battery, removing it from the battery compartment on the machine.

i INFORMATION

Important information

In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine. These always refer to the direction of travel of the machine.

In this Service Manual, the version of the machine is written in brackets “ () ”.
This note indicates that the instructions only refer to the version specified in brackets.

E1 ERROR CODES

E1.1 Error codes on the instrument panel

Error Shown	Error Description		Troubleshooting
RED BRUSH LED Quick flashing 250ms ON + 250ms OFF	Brush motor overcurrent / Short circuit		Press the button to remove the error
RED BRUSH LED Double quick flashing 100ms ON + 100ms OFF + 100ms ON + 450ms OFF	Overcurrent / Short circuit solution pump H2O		Press the button to remove the error
RED VACUUM MOTOR LED Fast flashing 250ms ON + 250ms OFF	Vacuum motor overcurrent / Short circuit		Press the button to remove the error
RED VACUUM MOTOR LED + RED BRUSH MOTOR LED Fast flashing simultaneously	Generic overcurrent / Generic short circuit		Press the button to remove the error
BUZZER SOUNDS Buzzer sounds when the paddle is being pressed	TILT sensor: Incorrect machine position, or accelerometer on Power		Put the machine in horizontal position
ALL BATTERY LEDs FLASH IN SEQUENCE (red > yellow > green)	Battery charging in progress		Remove the charging connector from the battery
BATTERY LEDs ALL FLASH SIMULTANEOUSLY	No communication be-tween power board and touch board		Check the connection cable between panel and power board, change the power board
ALL LEDs ON + BATTERY GREEN LED FLASHING 500ms ON + 500ms OFF	Charge> 100%		Wait few seconds to have the voltage stabilised.

Error Shown	Error Description		Troubleshooting
ALL BATTERY LEDs ON	Charge > 30% to <100%		
YELLOW + RED BATTERY LEDs ON	Charge > 10% to <30%		
RED BATTERY LED ON	Charge> 5% to <10%		
RED BATTERY LED FLASH-ING	Charge <5%		Recharge the battery

E1.2 FW Version Control

Only for diagnostics it is possible to recover the current firmware version of the POWER board and the TOUCH board.

PROCEDURE	
1	Press and hold the ECO + H2O touch buttons for at least 4 seconds.
2	As soon as the sequence is recognised, the buzzer emits a special sound.
3	From now on until the paddle switch is pressed the touch board repeats the FW version in sequence
4	Battery red LED flashes M times (Major version).
5	Battery yellow LED flashes D times (tens Minor version).
6	Battery green LED flashes U times (Minor version unit).
7	If the IPC LOGO LED is on, the battery flashes are showing firmware version of the touch board.
8	If the BRUSHES LED is on purple, the battery flashes show the firmware version of the POWER board.
Examples	
10	M=1 D=3 U=0 > version 1.30
11	M=1 D=2 U=5 > version 1.25



E2 TROUBLESHOOTING

E2.1 Troubleshooting

PROBLEMS	CAUSES	SOLUTIONS
Machine not working.	Flat battery.	Recharge the battery.
	Main switch is not on.	Activate main switch.
	Main switch broken.	Replace main switch.
	Blown fuses.	Replace the fuses.
The brush doesn't rotate	Brush control button not depressed.	Press the brush button.
	Brush control lever not activated	Activate brush control lever.
	Fuse on brush motor functions board blown.	Replace the fuse.
Brush motor has problems starting.	Working with a dry brush on a very rough floor.	Increase the quantity of detergent.
Machine not scrub-bing uniformly.	The brush or disk is worn.	Replace the brush
No detergent is delivered	The detergent tank is empty	Fill detergent tank.
	The filter is dirty.	Clean the water/detergent tank filter.
	The hose delivering the detergent to the brush is clogged.	Remove blockage.
The suction motor isn't working.	Suction control button not pressed.	Press the suction button.
	Blown fuse.	Replace the fuse.
Squeegee not cleaning or poor suction.	The edge of the squeegee rubber blades in contact with the floor is worn.	Replace the rubber blades.
	Float controlled shut-off has been tripped (dirty water tank full).	Empty the dirty water tank.
	Squeegee suction hose clogged.	Unclog the hose.
	The suction hose is not connected to the squeegee or is damaged.	Connect or repair the hose.
	Dirty suction diverter valve.	Clean the suction diverter valve
Battery not giving expected working time.	The battery charger is not working.	Replace battery charger.
	Dead battery	Replace the battery

TECHNICAL SERVICE MANUAL REVISIONS-UPDATES

EDITION No.	*DATE*
Revision 00	
Work commenced on preparing the manual	***July 31, 2020***
Revision 01	***Xxxxxx XX, 2019***