Service Manual

Minuteman®
Excellence Meets Clean

For The
X Ride 28 Rider Extractor
Model XR28QP

For:
Training
Troubleshooting
Adjustments

Contents

Contents

1. Cautions

- When disconnecting the batteries from the charger, always unplug the charger from the AC outlet first.
- Disconnect the battery pack battery pack before servicing the machine. Except for making voltage and current measurements.
- After any repair work test the machine for proper operation.
- When servicing the machine always observe the general safety and accident prevention guidlines.
- Do not apply power directly to the the machine‘s motors without first disconnecting the motor connectors from the controller.
- Do not manually push the machine without first dis-engaging the electric brake see section 15.1 and unplug the traction harness from the controller.
- Do not attempt to power up the machine with battery chargers or power supplies. Most 36 volt battery chargers have output voltages in excess of 48 volts, which will damage the controller.

2. Safety Information

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Safety Information

Maintenance Precautions

- Maintenance and repairs must be performed by qualified personnel only. Maintain adjustments on machine pursuant to specifications noted in the service manual.
- Maintenance and repair work must be performed by using appropriate, undamaged tools.
- Spare and replacement parts must conform with factory machine specifications. Failure to do so may result in machine malfunctions. Genuine spare and replacement parts are highly recommended.

Switch off and remove the machine's key before inspecting the machine or performing and maintenance or repair work. Failure to do so may result in accidental machine activation and personal injury.

When performing maintenance or repair work on the machine's electrical system, be sure to disconnect the machine's battery plug first. Failure to do so could result in accidental machine activation and personal injury.

- Before commencing operation of the machine, check for obvious signs of loose parts, potential conditions indicative of malfunctions, etc. Any signs of potential problems must be remedied before actual operation commences.

Before commencing operation of the machine following maintenance or repair activities, check to ensure that all protective devices have been properly refitted and positioned, or other potential problems before actual operation commences, otherwise personal injury may occur.

3. Technical Data

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	Cylindrical brush deck			
Machine length	61	in	155	cm
Machine height	54	in	137	cm
Working width	28	in	71	cm
Surface performance theoretical	9060	ft^2/h	842	m^2/h
Service voltage	36	V	36	V
Nominal power drive motor	600	W	600	W
Nominal power vacuum motor	650x2	W	650x2	W
Nominal power brush motor	2x600	W	2x600	W
Number of brushes	2	Qty.	2	Qty.
Diameter of brushes	5.9	in	15	cm
Working speed	65	fpm	19.8	m/min
Solution tank	27	gal	122	L
Recovery tank	25	gal	113	L
Weight without batteries and solution	475	lb	215	kg
Weight with solution and batteries	1315	lb	596.5	kg

Noise emission		
The sound pressure level measured under maximum conditions of use (LwA) according to DIN EN 60335-2-72 amounts to:	83dB (A)	83dB
The sound pressure level measured (at the ear of the driver) under normal conditions of use (LpA) according to DIN EN 60335-2-72 amounts to:	72dB (A)	72dB
Measurement inaccuracy (KpA):	2dB (A)	2dB
Vibration		
The frequency weighted acceleration measured according to DIN EN ISO 5349 which have an effect upon the upper limbs (hand-arm-system) amounts under normal working conditions:	<0.8 m/s^2	<0.8 m/s^2

4. Maintenance Intervals

•In a modular structure, the Minuteman System Maintenance determines the specific technical proceedures to be preformed and sets the time interval between the two maintenance cycles.
•For each of the maintenance cycle, the replaceable parts are determined as well.
Further details described in the specific chapters.
•**Minuteman System Maintenance K:**
To be performed by the customer (in daily or weekly intervals) according to the maintenance and care instructions as specified in the operating instructions.
The operator must be professionally instructed after delivery of the machine by selling dealer.
•**Minuteman System Maintenance I:** (after every 125 hours of operation)
To be preformed by an authorized Minuteman Service Center in accordance with the machine-specific system maintenance.
•**Minuteman System Maintenance II:** (after every 250 hours of operation)
To be preformed by an authorized Minuteman Service Center in accordance with the machine-specific system maintenance.
•**Minuteman System Maintenance S:** (after every 500 hours of operation, safety check) To be performed by an authorized Minuteman Service Center in accordance with the machine-specific system maintenance.

4.1 Maintenance Intervals

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Record the maintenance intervals completed in the customers Operation Manual, located in the battery compartment of the machine.

Handing over Upgrade Test drive Handing over to the customer Instruction carried out on: at _____ operating hours	System Maintenance I 125 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance II 250 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance I 375 operating hours Workshop stamp carried out on: at _____ operating hours
System Maintenance S 500 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance I 625 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance II 750 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance I 875 operating hours Workshop stamp carried out on: at _____ operating hours
System Maintenance S 1000 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance I 1125 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance II 1250 operating hours Workshop stamp carried out on: at _____ operating hours	System Maintenance I 1375 operating hours Workshop stamp carried out on: at _____ operating hours

4.2 Minuteman System Maintenance K

To be performed by the customer	Interval	
	daily	weekly
Fill solution tank and proceed to chemical agent dosage	o	
Charge batteries	o	
Check brush deck and clean if required	o	
Check vacuum shoe and clean if required	o	
Clean tank lid seal of the recovery tank	o	
Empty recovery tank. Clean recovery tank and suction filter	o	
Check brushes and replace if required	o	
Clean suction hose of recovery tank		o
Clean drain hose of solution tank		o
Check solution supply to brushes and clean if required		o
Check solution filter and clean if required		o
Check roller bumpers		o
Test drive and function test		o

4.3 Minuteman System Maintenance I

To be performed by an authorized service center	Interval
	every 125 hours of operation
Check battery charger	o
Check tank lid seal of the recovery tank and replace if required	o
Check drain hose of the recovery tank and replace if required	o
Grease joints at the brush lift mechanism	o
Check wheel fixing screws and tighten (24 lb ft) if required	o
Check condition of tires	o
Test drive and function test	o

4.4 Minuteman System Maintenance II

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To be performed by an authorized service center	Interval
	every 250 hours of operation
Perform maintenance works according to System Maintenance I	o
Inspect steering damages and bearing slackness and replace if required	o
Check drain hose of the recovery tank and replace if required	o
Check roller bumperof the brush deck and replace if required	o
Check suction hose for tight fit and damages and replace if required	o
Test drive and function test	o

4.5 Minuteman System Maintenance S

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(Safety Check)

To be performed by an authorized service center at least once a year	Interval
	every 500 hours of operation
Perform maintenance works according to System Maintenance II	o
Clean traction drive motor from carbon dust and check carbon brushes for smooth operation and wear and replace carbon brushes if required	o
Clean brush motors from carbon dust and check carbon brushes for smooth operation and wearing and replace carbon brushes if required	o
Test drive and function test	o

5. Cleaning the Float/Screen

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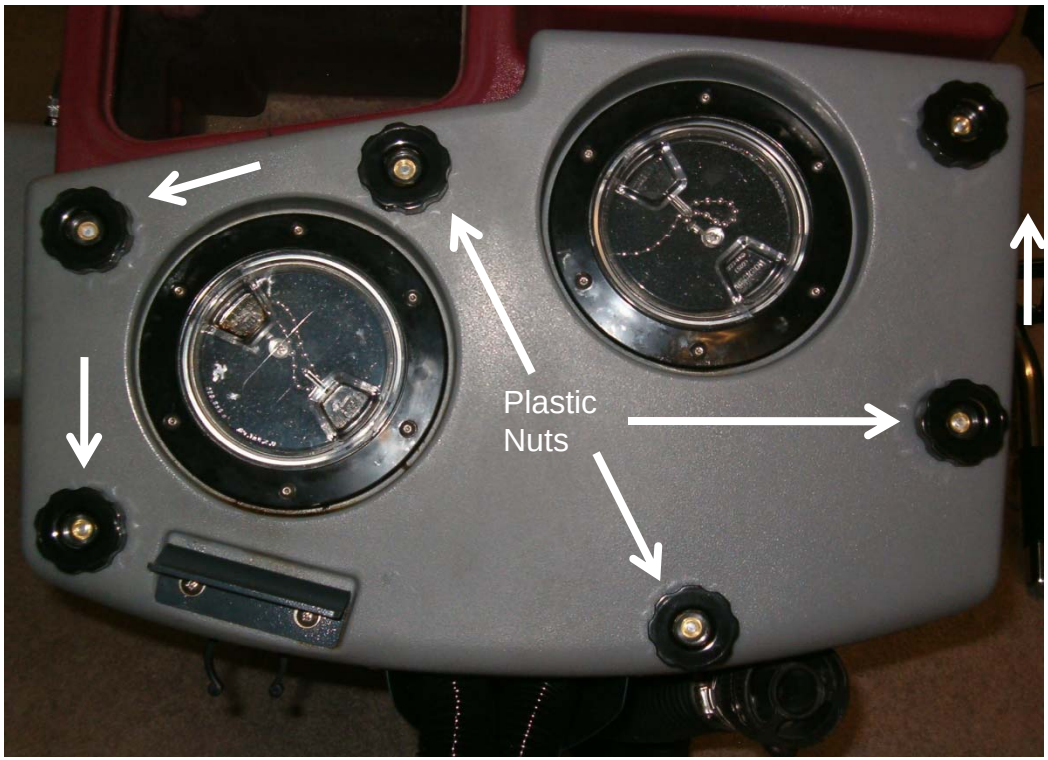
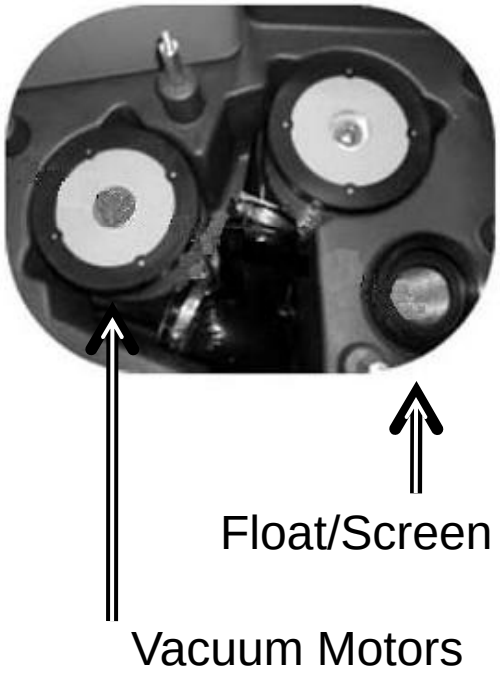
- To access the float/screen assembly
- Remove the 6 plastic nuts.
- Remove the plastic cover
- Remove the Float/Screen assembly to clean.

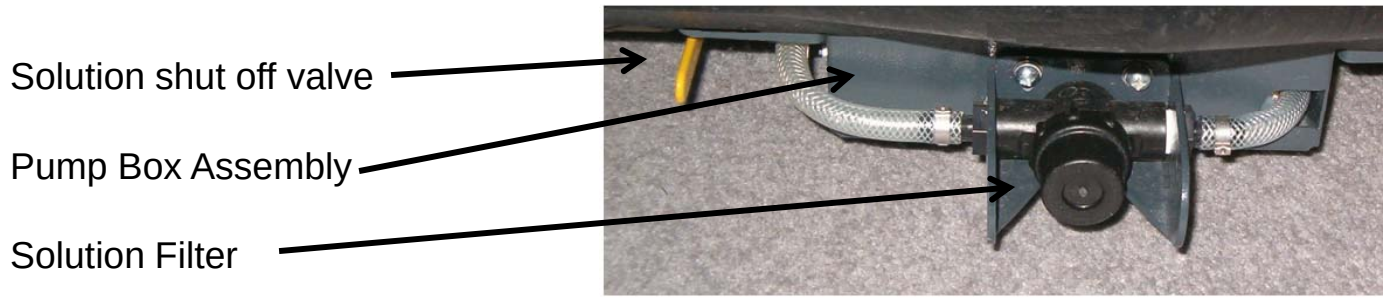




5.1 Solution Filter, Valve and Pump Box

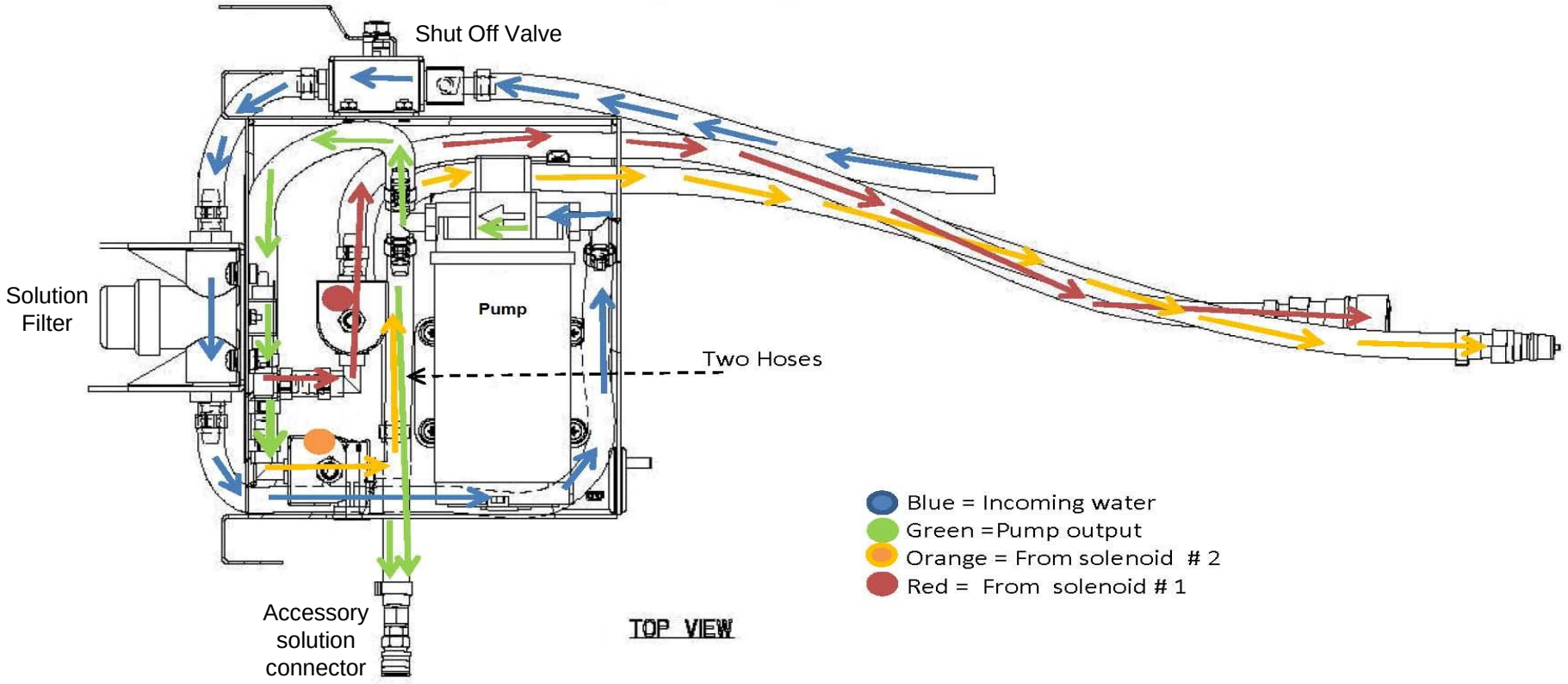
Solution Filter:

- The filter is located on the bottom rear of the machine in the center.
- Turn the solution valve off before unscrewing the solution filter cap.
- To clean, unscrew the black plastic cap to clean the filter inside.
- The pump box includes the two electric water solenoids and the water pump.



5.2 Pump Box

Pump Box Plumbing and Solution Flow

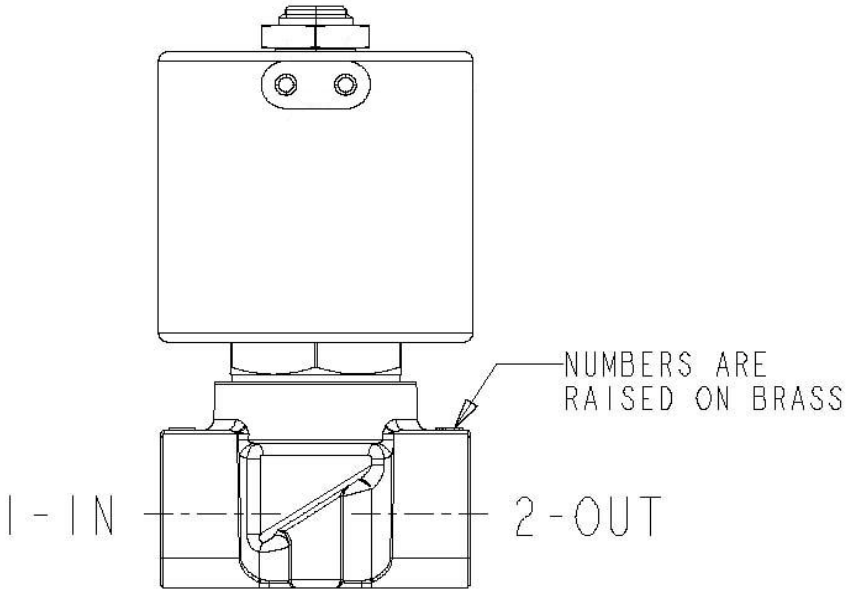


5.3 Water Solenoids

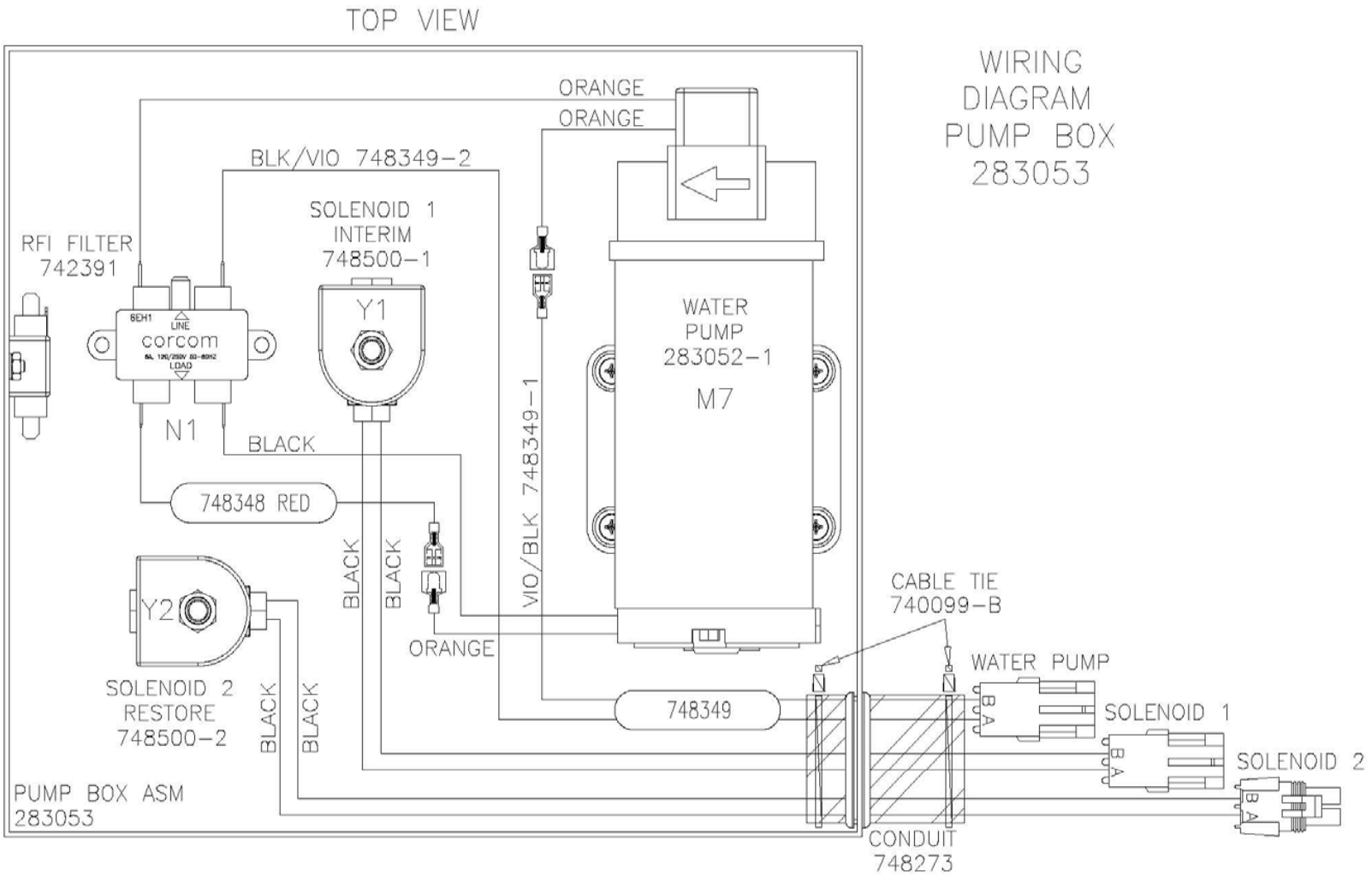
•Replacing the Solenoid
When replacing the water solenoid, connect the line from the pump to the side marked #1 and the spray jets to the side marked #2.

•Cleaning the Solenoid
The water solenoid can be taken apart and cleaned.

1. Remove the water solenoid from the machine.
2. Remove the nut on the on the top of the coil.
3. Unscrew the stem
4. Clean the plunger
5. Assemble in reverse

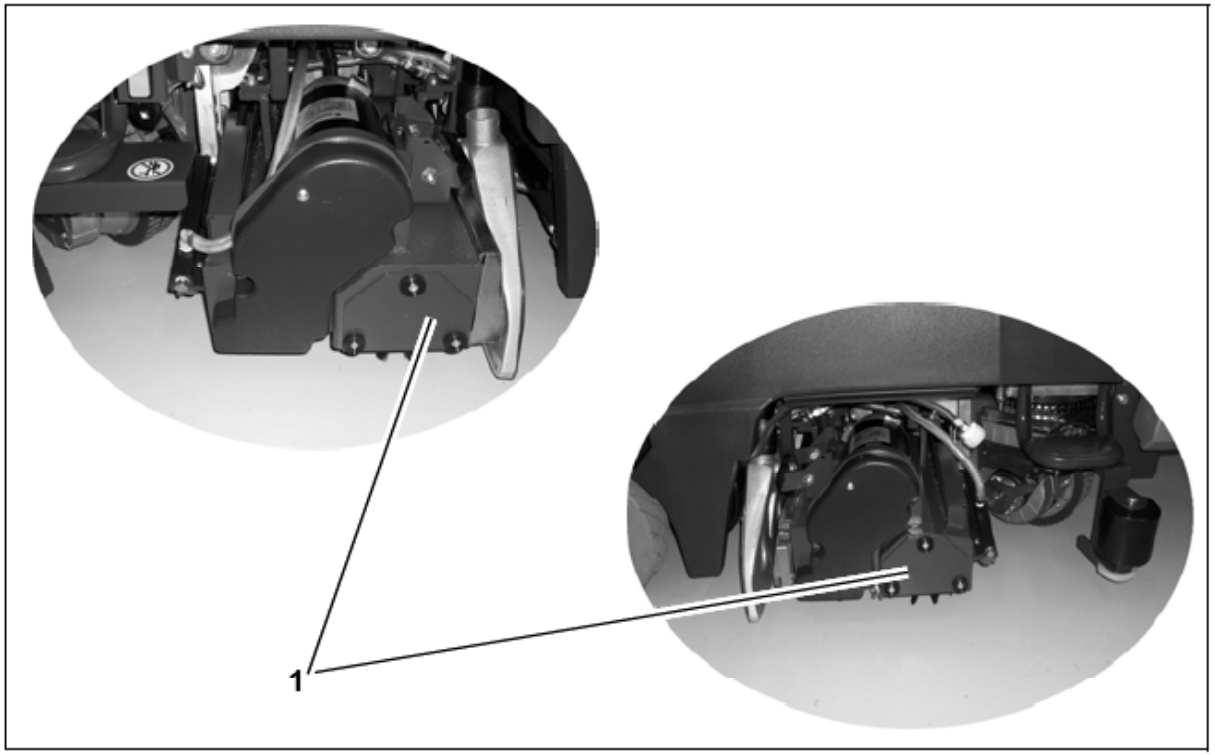


5.4 Pump Box Wiring



6. Changing the Brush

This hub (both sides) can be removed to access the cylindrical brushes. The cylindrical brushes may be easily removed without tools.



7: Replacing the Belt

Replacing the belt(s)

There are two belts, one on each side for each brush. They are located under the plastic cover.

1. Locate the belt cover (Fig 1)
2. Loosen and remove the three nuts. (Fig 2)
3. Remove the belt cover
4. Locate the tension spring (Fig 3)
5. Unhook the spring from the frame at the top. (Fig 3)
6. Pull the tension pulley away from the belt (Fig 4)
7. Replace the belt
8. Connect the spring
9. Replace the belt cover

Fig. 1

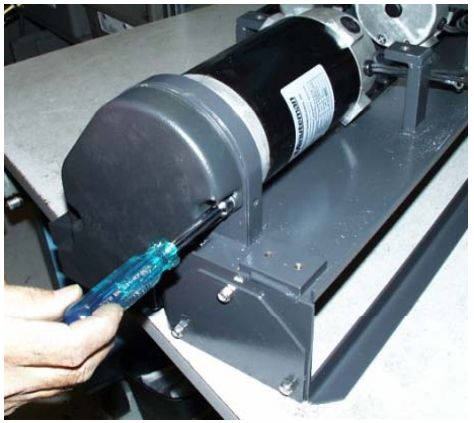


Fig. 2

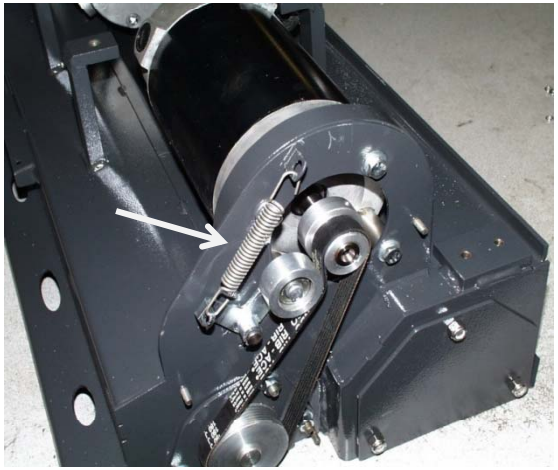


Fig. 3

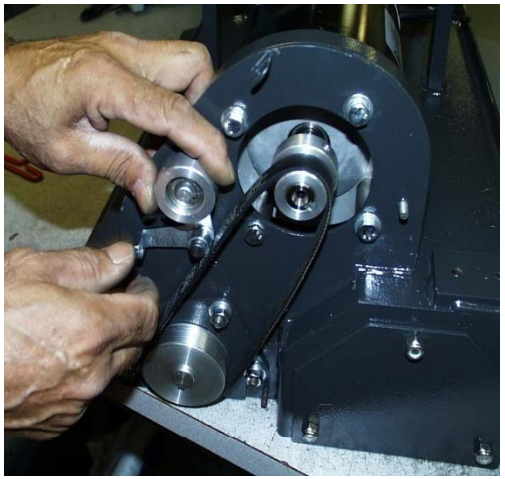


Fig. 4

8. Static Chain

•**The Rear Static Chain** is located between the two rear wheels.

•It should be present and must always drag on the floor.

•It should have continuity to the frame.

•Do not remove or disable or damage to the controller may occur.

10. Battery Charger

The default setting for the charger is for AGM battery types.

Do not attempt to service the AGM batteries to add water. The batteries will be damaged by doing so.

The Minuteman stand alone charger is capable of being programmed to charge lead acid wet, gel and agm type maintenance free batteries.

•The on board charger does has a variety of other programming settings.

•Use caution when making changes. Incorrect settings may cause the charger to malfunction and or damage the batteries.

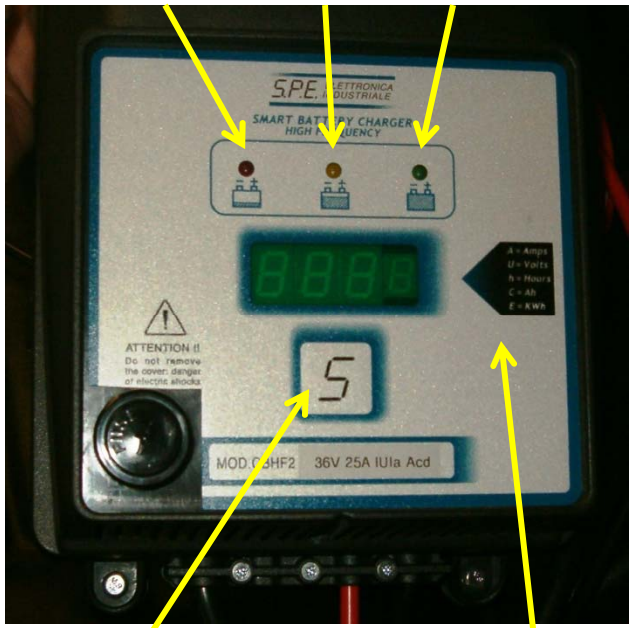
•The charger has a series of dip switches located under the front decal that can be used to change the settings.

•The output information will be displayed on the charger's display while it is charging.

•Press the number 5 on the decal to change the information displayed. Use the display key for reference.

A = Amperage
V = Volts
H = Hours charging,
C = Amp hour
E = KWH (kilowatt hours)

3 Charging Status LEDS
Red = Needs Charging
Yellow = 80% Charged
Green = Full Charge



Press to change the information displayed.

Display key

10.1 Programming the Battery Charger

- 1. To access the Dip Switches, carefully peal the decal back on the front of the charger. Start at the bottom left side and peal up. (Removing the plastic charger cover is not necessary.) Use caution not to damage the decal.
- 2. There is a series of eight dip switches located under the decal.
- 3. Each switch is numbered 1 through 8.
- 4. The switches have two positions, ON and OFF.
- **Dip Switches 1 to 4 are for setting the type of battery.**

Type of Battery	Switch 1	Switch 2	Switch 3	Switch 4
Lead Acid Wet Batteries	OFF	ON	ON	ON
→ AGM	ON	OFF	OFF	OFF
Gel and Maintenance Free	ON	OFF	OFF	ON

10.2 Programming the Battery Charger

The dip Switches 5 and 6 are for selecting the amperage output of the charger. Use the 25 amps. and the 36 volt settings only.

Current (Amperage Output)	Switch 5	Switch 6
15 AMPS	ON	ON
20 AMPS	OFF	ON
→ 25 AMPS	ON	OFF
30 AMPS	OFF	OFF

Dip Switches 7 and 8 is to select the output voltage.

Voltage Output	Switch 7	Switch 8
12 Volts	ON	ON
24 Volts	OFF	ON
→ 36 Volts	ON	OFF
48 Volts	OFF	OFF

11. Battery Charger Errors

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Codes that could be displayed on the charger are as follows:

“Bat” = The batteries are not detected. Voltage is below 2 volts,
The polarity could be reversed or batteries disconnected.

“Acd” = the charger programming set for wet lead acid batteries. (not an error)

“Gel” = charger programming set for gel batteries (not an error)

“E01” = maximum battery voltage has been reached.

“E02” = charger is overheating, faulty cooling fan or the cooling air to charger is obstructed.

“E03” = the batteries have exceeded the normal charge time. Possible battery sulfation has occurred. Cycle the batteries several times (charge and discharge).

“SCt” = safety timer operation. This normally occurs after any allotted phase time period has expired.

“Srt” = internal short circuit in charger. Replace the charger.

11.1 Trouble Shooting the Battery Charger

Verifying the output of the charger

If the charger appears to turn on, do the following:

1. The charger's display should be lighted, when plugged in the A.C. outlet. If not, replace the charger.
2. Check for errors on the chargers display
3. Press the number 5 on the charger decal.
4. This will display different pieces of information about the charging process such as errors
5. (see error list), battery voltage, output amperage, hours of charging and estimated amp hour of battery and wattage.
6. The voltage and amperage output should start to climb after a few minutes of starting the charger, unless batteries are still hot from charging. If not, replace the charger.

12. Service Mode

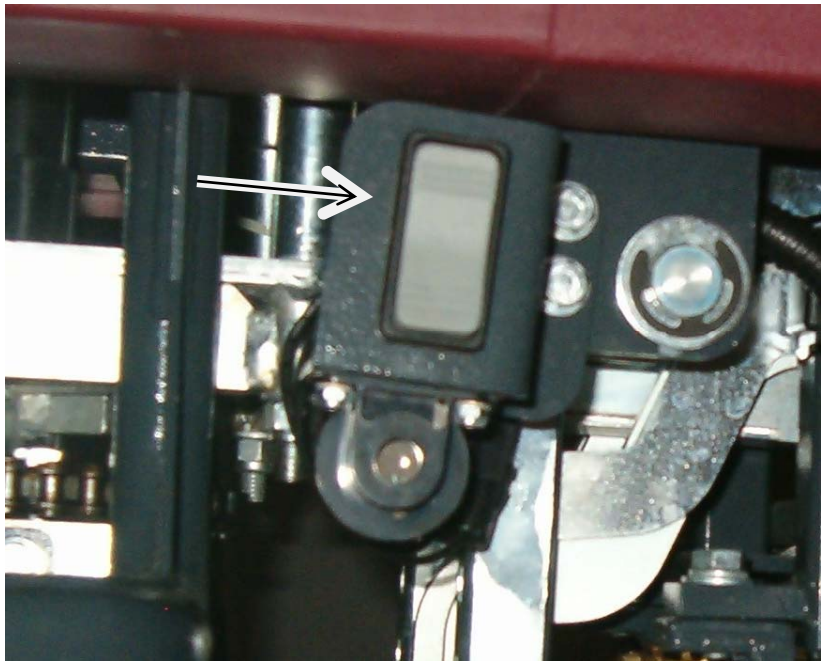
•The Service mode switch is located on the operators left side below the solution tank and on the right side of the step.

•The Service mode switch can be used to lower the deck when servicing the brush deck assembly.

•Press and hold the lower side of the switch for 15 seconds. The deck will lower. Pressing the upper side will raise the deck.

•The brush deck may be removed, when it's down for easier servicing.

•The controller will go back to normal operation by turning the key switch off



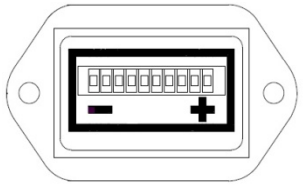
13. Circuit Breakers

CB 1 = Main Circuit Breaker Up=On Down= Off
CB 2 = Control Circuit
CB 3 = Brush Motor Right (M3)
CB 4 = Brush Motor Left (M4)
CB 5 = Vacuum Motor Right (M1)
CB 6 = Vacuum Motor Left (M2)

14. Trouble Shooting the System

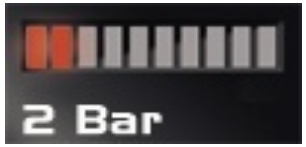
1. Trouble Shooting Electrical Problems on the E Ride
2. The E Ride uses a state of the art electronic circuitry with several diagnostic features. The battery indicator serves two purposes. They are:

- **a**. To display the charge status of the batteries on the LED display. This uses 10 LED bars, for example: 10-lighted LED bars indicates a fully charged battery, 5-lighted LED bars, indicates batteries are discharged 50%, 1-lighted LED indicates the batteries are discharged and so on.
- **b**. To display error codes for easier diagnosis of electrical problems. These are displayed by flashing a quantity of LED bars in different sequences. The deferent flash sequences are as follows:
- **Rippling**: One LED bar lighted, then two LEDS, then three LEDS and so on until all ten LEDS are lighted. Then it starts over.
- **Flashing Steadily:** Flashing a set amount of LEDS for each error code on and off steadily. The number of LEDS lighted indicates the type of error detected.
- **Flashing in Sequence:** Flashing a set amount of LEDS for each error Code in a pulse sequence. Example: The four LEDS flashes two times then pauses, then it repeats itself.
- **Soft and Hard errors:** Soft errors will flash the codes but will not shut down the machine. Hard errors will disable the machine.

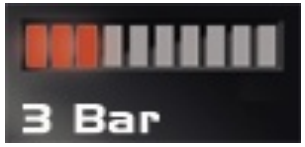


14.1 Error Codes

Single flash-Low Batteries- Charge the batteries



Single flash - Soft and hard errors Traction drive motor disconnected, shorted harness, shorted chassis drive or overload.



Single flash – Soft Error Brush motor disconnected or overload.

Single flash – Soft and hard errors, brush actuator circuit overload

Two flash – Water solenoid overload

Single flash – Soft Vacuum motor disconnected, overloaded or shorted

14.1 Error Codes

Single flash- Off Isle Wand Activated

Single flash- Potentiometer Fault

Two flash - Potentiometer or emergency stop switch fault.

Three flash –

Single flash- Hard Control fault check all connections to controller- see “Trouble Shooting the Code 8 Error” Machine is disabled.

14.1 Error Codes

Single flash- Solution tank empty- Riders only

Two flash – Soft error - overload occurred

Three flash – Soft error - Solution pump overload

Four flash – Soft error - Water solenoid overload

Five flash - Electric brake circuit fault- Check all connections to the brake on the chassis drive and the drive harness.

14.1 Error Codes

Single flash- High battery voltage- Check all connections between the batteries and the controller, including the circuit breaker.

Ripple-Throttle activated during start up. If throttle pedal was depressed during start up, release. If problem re-occurs: Check throttle return springs for breakage. Check potentiometer for fault or improper adjustment .

14.2 Code 8 Error

The code 8 can be triggered by external components such as motors, harnesses and the controller.

1. Check for loose or burnt connections on the controller, batteries, cables and the circuit breaker.
2. Make the sure the circuit breaker is not damaged.
3. Measure the total battery voltage at the batteries and at the battery connections on the controller. They should be exactly the same. A 1/10 of a volt or more difference would indicate a problem in the connections.
4. Check to see, if the operator has recently washed the machine down and got water inside of the brush motor or in the controller area.
5. Check for a disconnected or an open circuit or faulty potentiometer on the throttle or speed circuit. Controller may not be detecting it in the circuit. Perform a continuity test. See “Testing the Potentiometer” section.
6. Disconnect one motor connector from the Trio controller at a time and disconnect the batteries for 1 minute and restart the machine with motor disconnected. If the code 8 disappears and is replaced by a different code, the circuit disconnected should be considered suspect. For example the brush was disconnected. The code 8 is replaced by code 3. Code 3 indicates the brush motor is disconnected.
7. Check for a loose or broken connection at the brush deck. Check to see if water has gotten inside the brush motor. Check for a shorted motor.
8. Static electricity. Check both the ground chains: there is one on the brush deck and one on the rear of the machine. They should be contacting the floor. The one on the scrub deck should touch the floor only when the deck is down. They also should have continuity between the end of the chain and the frame of the machine. Repair or clean, if needed.
9. If everything checks OK, replace the Trio Controller.

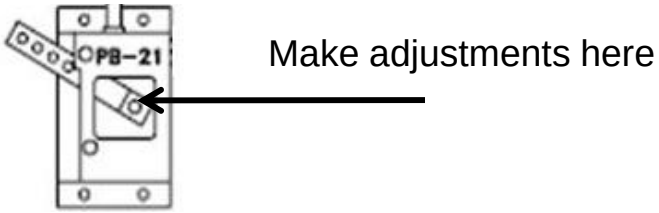
Note controllers can be damaged by loose connections on inputs and outputs, static electricity and water on electrical components such as on or in the controllers and motors.

14.3 Potentiometer

Testing the Potentiometer

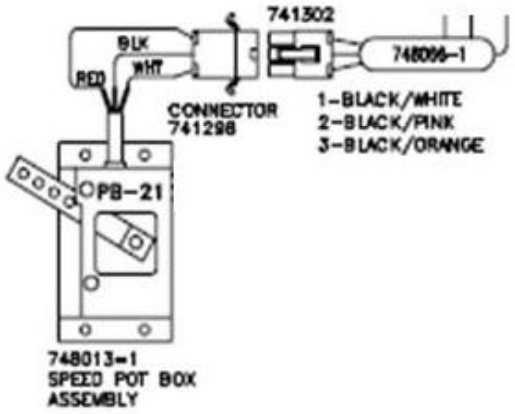
1. The throttle potentiometer resistance can be measured with an ohmmeter.
2. Unplug the throttle potentiometer at the connector next to it.
3. Analog type meters are recommended for this test.
4. Measuring across the black and white wires on the potentiometer, the resistance should be zero ohms with pedal on the riders in the neutral position in the full counterclockwise position. When the pedal is moved to the full throttle position, in should be a smooth resistance change without dropping out. It should measure 5K (5 thousand ohms) in the full position.
5. Measuring across the black and the red wire the resistance should be approximately 5K ohms (5 thousand), when in the neutral position.
6. When the pedal is at full throttle or the knob is full speed position, the resistance should drop to zero.
7. Loosen the nut and screw on the throttle arm and adjust if needed.
8. It can also be tested at the P3 connector on the controller to insure a good connection to the controller. Unplug the P3 connector from the controller. The throttle must be plugged into the harness while testing. See below.

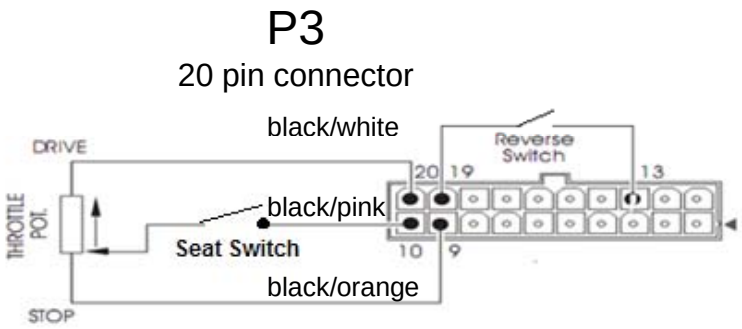
- Note: when moving the throttle to the full position, the resistance should be smooth, without dropping out for both tests. If the resistance does not go to 5K during the test, the arm and the potentiometer may need to be adjusted. See picture below. Loosen clamp and adjust according to the information on step 4.



14.3 Potentiometer

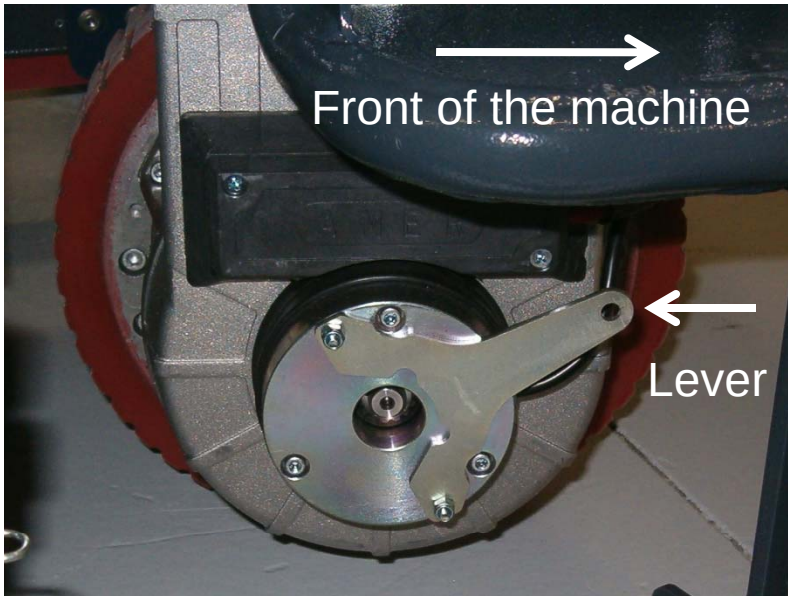
8. If they do not find a problem here, have them retest at the connector at the Trio controller. Reconnect the plug at the throttle potentiometer.
9. Unplug the P3 connector (The large white connector) on the controller below the seat, behind the rear panel.
10. Locate the black/orange and the black/pink wire.
11. Measuring across the black/orange and black/pink wires the resistance should be zero ohms in the neutral position. It should be approximately 5k in the full throttle position. When the pedal is at full throttle the resistance should drop to zero.
12. Measure across the black/pink and the black/white wires. The resistance should be approximately 5K (5 thousand) in the neutral position.
13. It should drop to zero ohms with the throttle in the full position.
14. If your reading is different with this test check all the connections between the controller and the throttle control, including the seat switch.



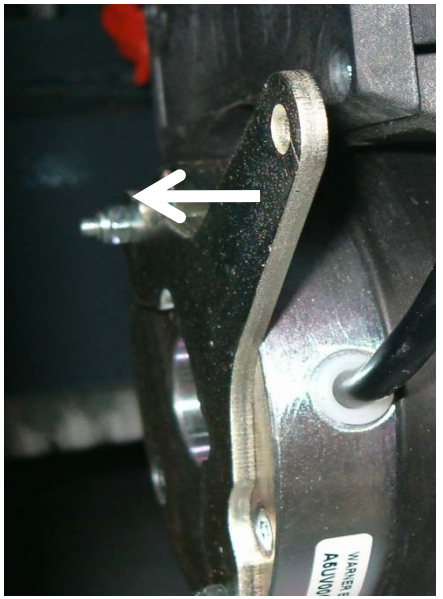


15. Electric Brake

- The chassis drive motor uses a electric brake system.
- The lever can be used to unlock the brake, in the event the machine can not move on it's own power. When the brake is released the machine will be easier to push.
- Pull lever away from the chassis drive motor to release. The lever will need to be wedged to hold the brake in the released position. See the following page.
- The brake will automatically lock the chassis drive, when the lever is released.
- The brake will be electronically released, when the drive system is activated.



Pull the lever away from the motor to release and hold.



15.1 Releasing the Electric Brake

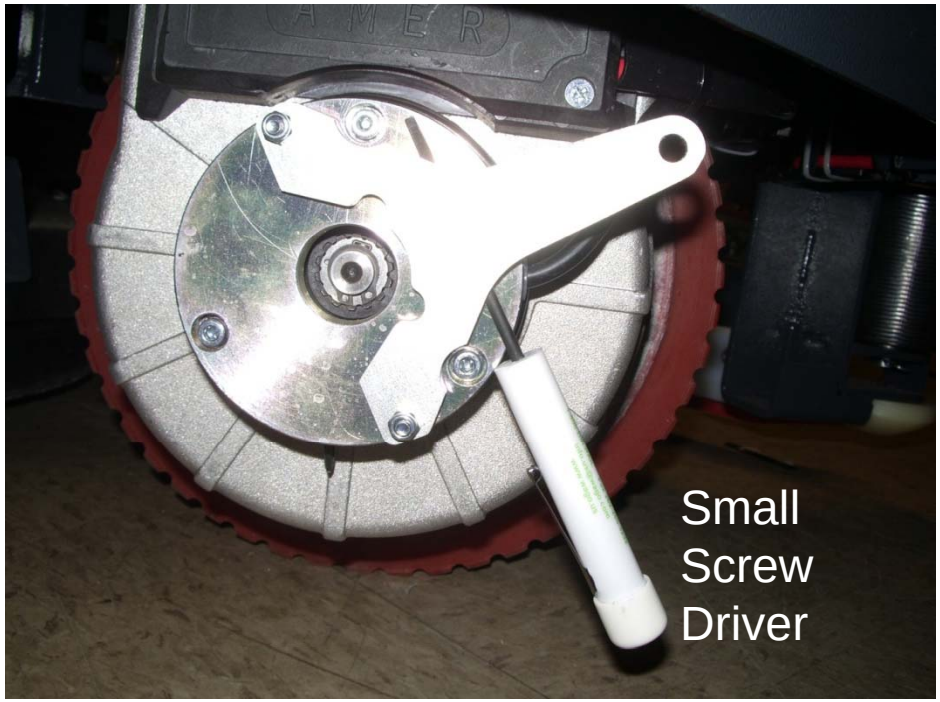
Releasing the Brake

•If the machine needs to be moved manually.

•The brake can be disengaged by putting a wedge or a small screwdriver (shown) or coin behind lever arm to hold it away from the brake body.

•Use caution not to force to the lever out to far. Damage may occur.

•Do not leave the lever permanently wedged.



Note: To prevent damage to the control board, always unplug the traction harness from the controller, when pushing the machine manually by hand, with a forklift or similar equipment.

15.1 Electric Brake Fault Code 9

(5 Flashes)

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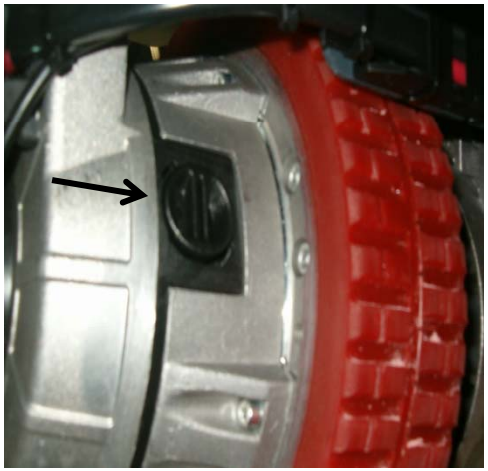
Testing the Chassis Drive Motor Harness For Broken Wires

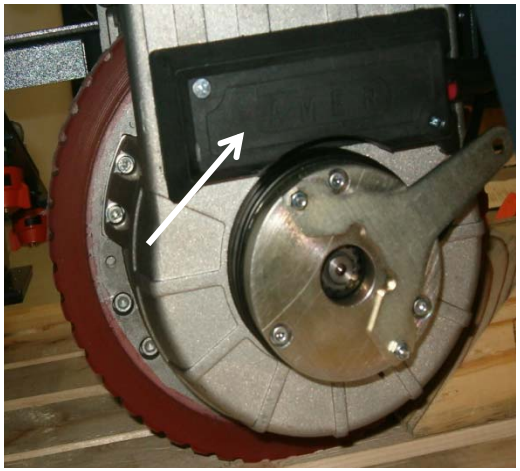
1. Remove the large metal cover below the seat.
2. Locate the harness marked “Traction” on the controller.
3. Disconnect the plug labeled Traction on the Trio controller.
4. Connect a digital multi-meter to the two smaller wire connectors on the harness plug.
5. Set the meter for Ohms (resistance). The resistance should be 4 to 6 ohms.
6. Turn the steering wheel in both directions until it stops several times.
7. Monitor the meter while turning. The resistance should not change or vary while turning.
8. Any variation even .1 ohm would be indicate a broken wire, which could cause an error.
9. If the meter reading reads open.
10. Locate the connector near the electric brake (E-Mag).
11. Unplug the connector at the electric brake (E-Mag).
12. Test the resistance across the plug on the small harness that is going into the E-Mag on the drive motor.
13. The resistance should be between 4 and 6 ohms, If not, replace the electric brake.

16. Carbon Brushes

- Replace the carbon brushes on or before on the following:
- Vacuum Motor at 1000 hours of operation
- Brush Motors (all) at 2000 hours of operation
- Chassis Drive Motor 3000 hours of operation



Chassis Drive Motor Carbon Brush Locations (under caps)
Carbon Brushes Part # 241400-2



Chassis Drive Side Carbon Brush Location (under cover)
Carbon Brushes Part # 241400-3

17. Notes