Service and Maintenance for Scooters

Technical Manual
Little Gem 2

STEPS®

KNOWLEDGE
FOR THE FUTURE

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PRODUCT INFORMATION

CERTIFICATION:

Sunrise Medical is ISO 9001 certified, which ensures quality at all stages of the development and production of this scooter.
This product is manufactured to comply with the requirements of EEC directives 89/336/EEC

IMPORTANT:

It is potentially hazardous to fit or use any parts other than genuine Sterling parts.
The company disclaims all liability for the consequences of such use, which in addition voids the machine warranty.

USAGE:

This vehicle is for the carriage of ONE PERSON and must not be used for any other purpose.

DESCRIPTION:

The Little Gem 2 is designed to be a flexible four-wheel, highly transportable scooter and Rear Wheel Drive, Single Transaxle configuration.
Features include:
Fold down, height adjustable swivel seat with flip up width adjustable armrests. Battery box fitted with ergonomically designed handle for easy removal/transport. Easily detachable rear drive pack fitted with twin handles for secure lifting, Fold down, infinitely adjustable tiller to accommodate comfortable ride position and luggage compartment or cupboard storage.
All parts interconnect in a logical sequence, ultimately combining to create an elegant yet simple modular construction.
It is this simplicity that makes the Little Gem 2 easy to understand therefore quick and easy to service.

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WARRANTY

WARRANTY CONDITIONS

1. The repair or replacement will be carried out by an authorised Sunrise Medical dealer/service agent.

2. To apply the warranty conditions, should your scooter require attention under these arrangements, notify the designated Sunrise Medical service agent immediately giving full information about the nature of the difficulty. Should you be operating the scooter away from the locality of the designated Sunrise Medical service agent, work under the “Warranty Conditions” will be carried out by any other service agent designated by the manufacturer.

3. Should any part of the scooter require repair or replacement, as a result of a specific manufacturing or material defect, within twenty four months from the date on which the possession of the scooter was transferred to the original purchaser, and subject to it remaining within that ownership, the part or parts will be repaired or replaced completely free of charge if returned to the authorised servicing agent.

NOTE: This guarantee is not transferable.

4. Any repaired or replaced part will benefit from these arrangements for the balance of the warranty period applicable to the scooter.
5. Parts purchased after the original warranty has expired are covered for twelve months.
6. Items of a consumable nature will not generally be covered during the normal warranty period, unless such items have clearly suffered undue wear as a direct result of an original manufacturing defect. These items include amongst others: batteries, upholstery, tyres, inner tubes and similar parts.
7. The above warranty conditions apply to all scooter parts for models purchased at full retail price.
8. Under normal circumstances, no responsibility will be accepted where the scooter has required repair or replacement as a direct result of:

a) The scooter or part not having been maintained in accordance with the manufacturer’s recommendations, where such exist, or failing to use only the specified original equipment parts.
b) The scooter or part having been damaged by neglect, accident or improper use.
c) The scooter or part having been altered from the manufacturer’s specifications, or repairs being attempted prior to the service agent being notified.

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Health & Safety

Good Working Practice

Whilst working on powered mobility products, it is essential to observe good working practice.
Below are a series of safety guidelines and recommendations.
Please note that these precautions are intended to serve only as a guide and are not intended to supersede or replace any safety statute, NHS or other safety regulations.

General

- Always wear suitable protective clothing when handling batteries.
- Always wear suitable eye protection when drilling or inspecting.
- When safe to do so, wear protective gloves when handling the running gear or batteries, as these parts are exposed to paths, parks etc..
- If the drive wheels have to be raised off the floor, always use a pair of axle stands to secure the vehicle correctly.

Batteries

All work carried out on batteries or battery boxes should demand a degree of extra caution.

- Always make sure that the batteries are disconnected from the vehicle before commencing work.
- Always check that the battery charger is disconnected from the vehicle / batteries before commencing work.
- Do not smoke.
- Keep batteries away from all sources of ignition.
- Do not place objects on the battery tops.
- Always try to keep someone within earshot of your work area so that they may come to your assistance if needed.
- Always wear personal protection when handling batteries, including eye / face protection and gloves.
- Make sure there is easy access to soap and water in case of acid spills.
- Avoid touching eyes or unprotected parts of the body while working on batteries.
- Remember that non-sealed batteries can contaminate any packaging, housing or boxes they may have been transported in, so handle all packaging with care especially when disposing of.

If battery acid should come into contact with bare skin or clothing, be sure to wash immediately using plenty of soap and water. If battery acid enters the eyes, flush with running cold water for as long as possible while medical help is sought.

Batteries continued

- When the tops of batteries are exposed, take extra care when working on or around the terminals.
- Do not allow metal tools to drop on to or touch the exposed terminals of the batteries or other exposed connections as this could cause a short circuit, which may result in an explosion.
- Remove personal items of jewel lery such as rings, watches, chains etc. before commencing work on batteries.
  If such items were to cause short circuit whist being worn, very seri ous burns would result.
- Batteries are constructed using very heavy materials. Because of this it is essential that correct lifting tech niques be employed when moving batteries around. It is also recom mended that safety footwear be worn.
- When disposing of old batteries, please ensure that correct disposal procedures are followed. Contact your local authority for their recom mendations.

Battery Chargers

Remember battery chargers are con nected to Mains Electricity

- Always observe all guidelines and laws relating to mains-connected installations and equipment.
- Never operate the battery charger in wet or damp conditions.
- If you suspect that the charger has been exposed to water or excessive damp, do not use it Return the unit back to the dealer/supplier for inspection.
- If the battery charger is suspected of being defective or is visibly damaged, return the unit back to the dealer for inspection.

Tool Box

Tool Box

The following list of tools will enable any task covered by this module to be carried out quickly, effectively and safely.
The order in which tasks are executed can vary depending on individual circumstances.

Be Aware!

It is the responsibility of the Servicing Engineer to use their own judgement as to the suitability of a particular work area for the task in hand.
If the safety of the engineer or others close by is in question, we recommend that the vehicle is removed to a more suitable safe area or workshop.

1. Metric socket set.
2. Hexagon wrenches (Allen Keys).
3. 3.5 - 8mm flat screwdriver.
4. No. 0 cross-head screwdriver.
5. No. 1 cross-head screwdriver.
6. No. 2 cross-head screwdriver.
7. Metric spanner set 5 - 25mm
8. Mole grips.
9. Long nose pliers.
10. Adjustable spanner.
11. Combination pliers.
12. Circlip pliers.
13. Soft hammer, (rubber, hide or nylon).
14. Stanley knife.
15. Pin punches.
16. Torque wrench.
17. Steel engineering rule.
18. Tape measure.
19. Tyre pump.
20. Tyre pressure gauge.
21. Personal safety gear.
22. Wire strippers/cutters.
23. Tag crimper.
24. Multi-meter.
25. Battery tester.
26. PC programmer.
27. Parts, Owners & Workshop Manuals.

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SERVICE INFORMATION

IMPORTANT

All scooter components should be regularly checked for loose, damaged or corroded connectors, terminals or cabling. All cables should be restrained to protect them from damage. Damaged components should be replaced.

All switchable functions on the electronics system should be regularly tested to ensure they function correctly.

All electronic components should be kept free of dust, dirt and liquids. If necessary, wipe with a cloth dampened with warm water. Do not use solvents or abrasive cleaners.

There are no serviceable parts in the Main Control Box, Batteries or Battery Charger.
Do not attempt to open the case or undertake any repairs whatsoever, as safety critical systems could be compromised.

Use Sunrise Medical spare parts only.
When replacing fasteners be sure to tighten to the correct torque settings.
All fasteners must be replaced like for like using the correct length, tensile strength and materials.
Never use nylok nuts twice.

Any drive testing should take place in a clear safe space.
It is recommended that the servicing of this equipment is best undertaken in a controlled workshop environment away from children, animals and the general public.
Failure to comply with this recommendation is the sole responsibility of the servicing agent.

Annual Service & Inspection

Controller

- Plug Connections
- Switches & Buttons
- External Connections
- Dynamic Braking (See Test Run).
- Programmable Settings
- Multi Profile Settings (Where Used).
- Drive Profile (See Test Run).
- Disable functions (safety circuits).
- Rubber Gaiters/Grommets
- Check for Water Incursion
- Fasteners & Brackets

Batteries

- Physical Inspection
- Check Type
- Charger Operation & Output Power
- Charger Type (GEL, WET, Automatic etc.).
- Connections
- Discharge Test
- Fuses & Resets

Wheels & Tyres

- Tyre Wear/cuts
- Pressure (Pneumatic Tyre).
- Bonding to Rim (Solid Tyre).
- Bearings (where appropriate).
- Wheel/Hub Nuts & Rim Studs
- Drive Key & Key-ways

Motors & Actuators

- Wiring
- Brushes
- Noise
- Connections & Looms
- Brake & Freewheel
- Micro Switch(s)
- Seals (leaks).
- Performance (Up -Down & See Test Run)

Chassis & Seat

- Condition (Welded Joints etc.).
- Alignment (Twists etc.).
- Bearing Housing
- All Fasteners & Brackets
- Handles & Grips
- Arm Rests & Upholstery
- Seat Post & Securing Pin

Electrical

- Looms
- Micro Switches
- Cable Ties
- Connections
- Lights/Indicators
- Unauthorised Modifications?

Full Drive Profile (Test Run)

- Forward Speed (max - min)
- Reverse Speed (max - min)
- Acceleration (fwd - rev)
- Deceleration (fwd - rev)
- Stopping Distance
- Brake
- Emergency Stop
- Drive a Straight Line
- Left/Right Arc Turn
- Ascend Slope
- Stop on Ascent
- Pull Away on Ascent
- Descend Slope
- Stop on Descent (Dynamic Braking).
- Pull Away on Descent
- Over obstacles
- Freewheel Push

Accessories

- Posture Belts
- Head Rest
- Dining Tray
- Auxiliary Equipment & Brackets

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SERVICE INFORMATION

IMPORTANT

The Technical Specifications shown on the facing page are intended for information purposes only. Small differences may occur.
Sunrise Medical reserve the right to alter any specification without notice.

The range figures are calculated to the Industry Standard ISO 7178 Part 4: Scooter Energy Consumption Theoretical Range.

***User weight, terrain, environmental conditions, battery condition/age and other factors, can all affect the maximum range of the vehicle.**

CHAPTER 4

Technical Specifications General

LENGTH	**98 cms** (38.5”)
WIDTH	**51 cms** (20”)
MAXIMUM USER WEIGHT	**113kg** (248.6 lbs)
BATTERIES (Test @ 5hr discharge)	**12 AH** (AGM)
BATTERIES (Dimensions in mm.)	**W = 98.1, L = 151.2, H = 103.2**
MAXIMUM SAFE ANGLE	**6 degrees** (Dynamic)
TURN RADIUS	**115 cms** (45.25”)
BASE to SEAT HEIGHT	**39.5 - 49 cms** (15.5” - 19.25”)
MOTOR POWER	**120 Watts** (@ rated load)
MAXIMUM SPEED	**6 kph** (4 mph)
WHEEL SIZE FRONT	**17.5 cms** (6.875“)
WHEEL SIZE REAR	**19 cms** (7.5”)
CHARGER OFF-BOARD	**2.0 A**
MAXIMUM RANGE*	**15.7 km** (9.8 mls)
OVERALL WEIGHT	**47.5 kg** (104.5 lbs)
SEAT WEIGHT	**10.4 kg** (22.9 lbs)
BATTERY WEIGHT (each)	**4.31 kg** (9.5 lbs)
DRIVE UNIT WEIGHT	**10.7kg** (23.6 lbs)
HEAVIEST PART (Footboard/Tiller)	**15 kg** (33 lbs)
TYRE PRESSURE	**Solid**
GROUND CLEARANCE	**6 cms** (2.4”)
MAX OBSTACLE CLIMB	**5 cms** (2”)

Technical Specifications
Torque

Generic Settings

FASTENER SIZE	TORQUE SETTING (Nm)
M3 Bolt / Stud	1
M4 Bolt / Stud	2.5 - 3
M5 Bolt / Stud	5 - 6
M6 Bolt / Stud	9 - 10
M8 Bolt / Stud	19 - 20
M10 Bolt / Stud	30
M12 Bolt / Stud	47.5
M16 Bolt / Stud	54
No6 Screw	1.5

Specific Settings

FASTENER SIZE	TORQUE SETTINGS (Nm)
GIMBLE BOLT (Through Front Axle)	36 - 37
WHEEL NUTS	33 - 34
TILLER HINGE BOLTS	6.15 - 6.4
AIR STRUT HINGE BOLTS	6.15 - 6.4
STEM BEARING CUP ASSY.	3.5 - 3.6
STEM BOLT	26 - 27

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SERVICE INFORMATION

IMPORTANT

The service and maintenance of any mobility scooter or powered wheelchair should only be undertaken by qualified or experienced engineering personnel.

This document is not intended for use by the general public.

This Technical Manual may recommend the use of certain tools/equipment during maintenance procedures. It requires that the servicing engineer has, by means of qualification or experience, the skills necessary to use such tools/equipment correctly and safely.
It is highly recommended that all specific instruction manuals and safety recommendations supplied with the tools/equipment, should be read and understood before such equipment is used.

It is recommended that all mandatory safety procedures are strictly adhered to.

No responsibility is accepted by Sunrise Medical for any consequence, directly or indirectly resulting from incorrect use of tools/equipment during any service procedure pertaining to this or other Technical/Workshop Manual issued by Sunrise Medical.

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SERVICE INFORMATION

IMPORTANT

Use extreme care when working on batteries.
Take all precautions and observe all safety rules and best working practice.
Use suitable protective gear.

When using electronic measuring devices be sure to read, understand and follow the product instruction booklet.

Do not touch the metal portion of the probes or allow them to touch each other when measuring voltage.

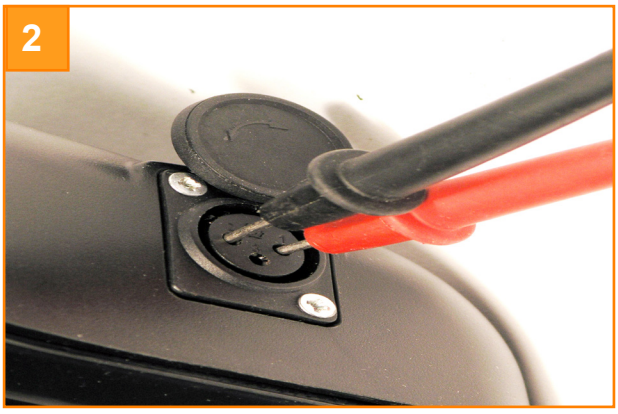
CHAPTER 5 Batteries & Battery Box Checking the Voltage

This is only an approximate field test. The true battery state should be determined by using a proprietary battery test unit.

1

Set the Multimeter to dc voltage on a suitable range to measure up to 30v or more.

2



Carefully insert the probes into the charging socket on the battery box as shown.

3

Take note of the reading obtained. If it is less than 24.5v, charge the batteries & start again.

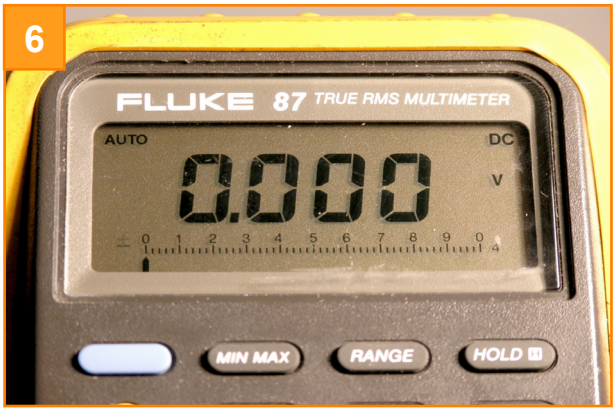
4

Now switch the scooter ON. Drive/run the scooter for a couple of minutes. Stop the scooter, but don't turn it off.

5

Note the reading. If there is a difference of more than 1.5v the batteries may be worn out.
22v = Deep Cycle Discharge.
23v = Full Discharge.
24v = Discharged.
24v - 24.5v = Partial Discharge.
25v and above = Fully Charged.

6



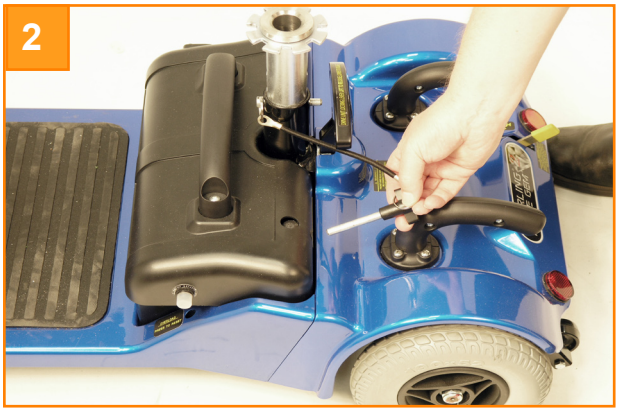
If the initial voltage reading is 0v check the fuses, reset button & wiring in the battery box.

Batteries & Battery Box
Changing the Batteries

1

Push the seat lever forward & lift the seat off.

2



Remove the battery box securing pin.

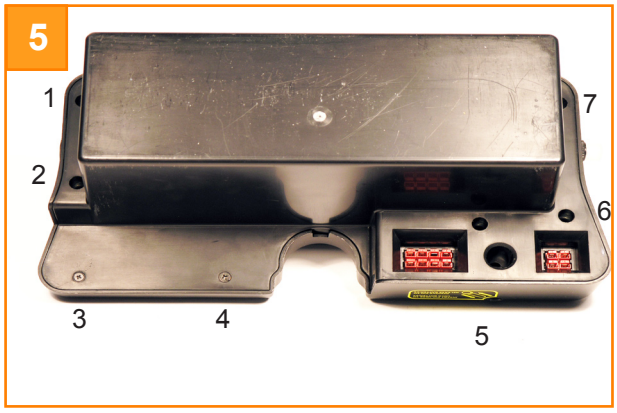
3

Lift the battery box off the scooter.

4

Place the battery box on a suitable work surface.

5



Invert the battery box to expose the 7 screws. Note that screws 3 & 4 are shorter than the rest.

6

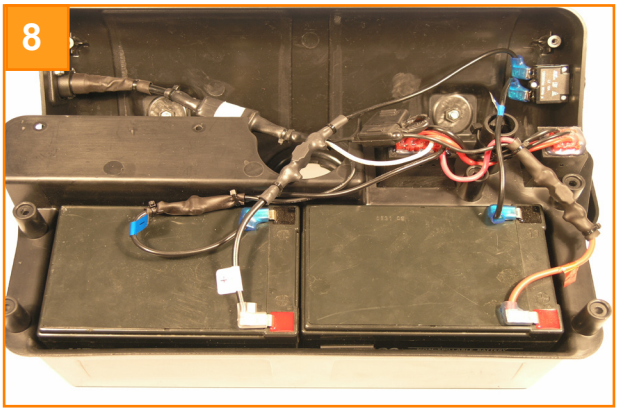
Use a Phillips screwdriver to undo the screws.

Batteries & Battery Box
Changing the Batteries

7

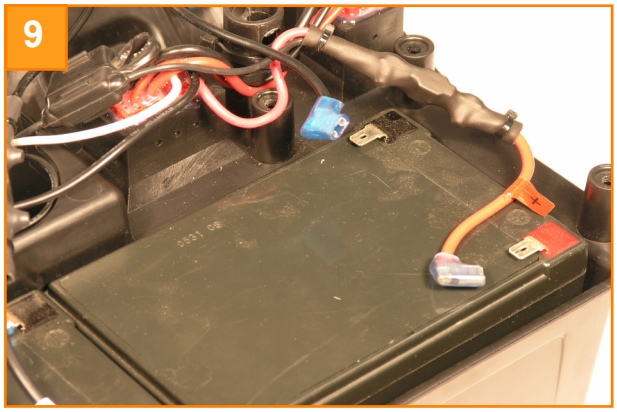
Turn the battery box back upright. Retrieve the 7 screws as they fall out.

8



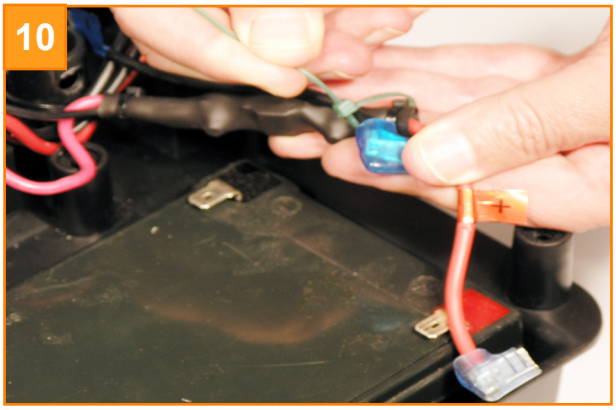
Open the top & hinge it back for access.

9



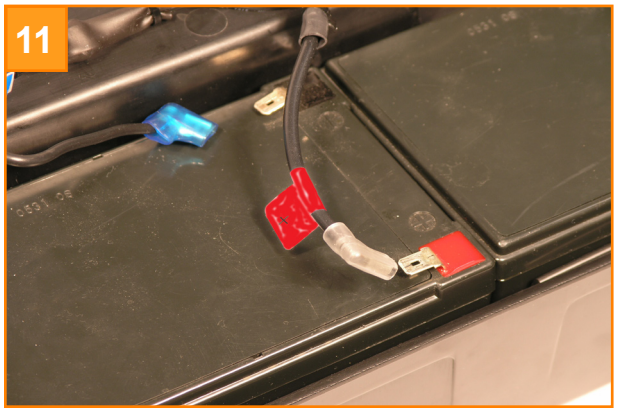
Disconnect the right hand battery.

10



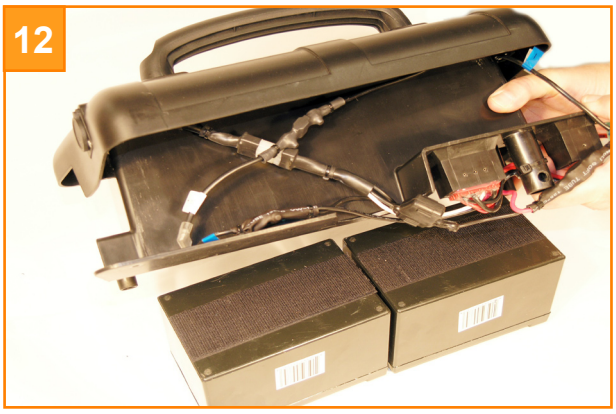
To aid re-assembly, mark or tie the leads together.

11



Repeat for the other battery.

12

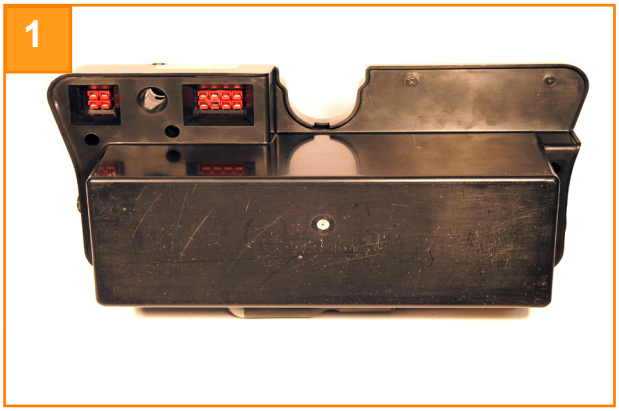


The batteries are held by Velcro. To release them invert the box & gently shake until the seal is overcome & the batteries drop out. Do not try to lever the batteries out from the top.

Batteries & Battery Box
Checking the Fuses

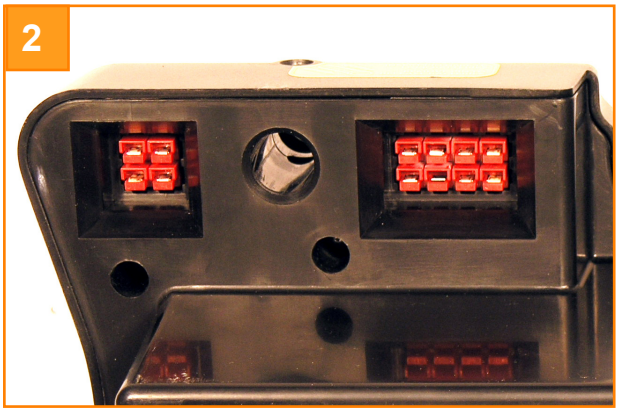
The Multimeter should be set to read DC VOLTS for photo's 3 - 6.

1



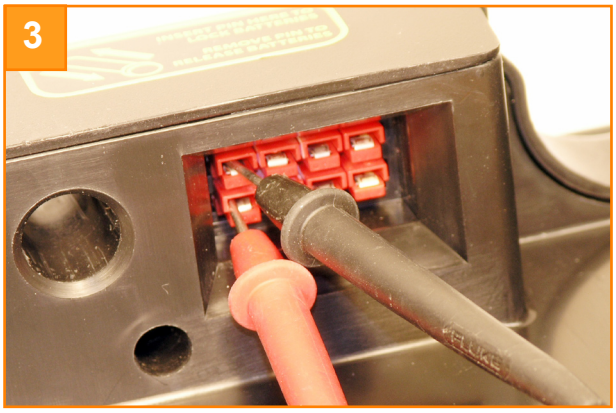
Place the battery box on its front as shown.

2



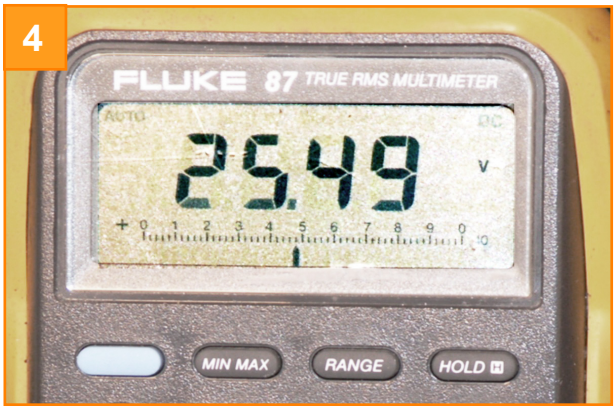
Ensure both sockets are orientated as above.

3



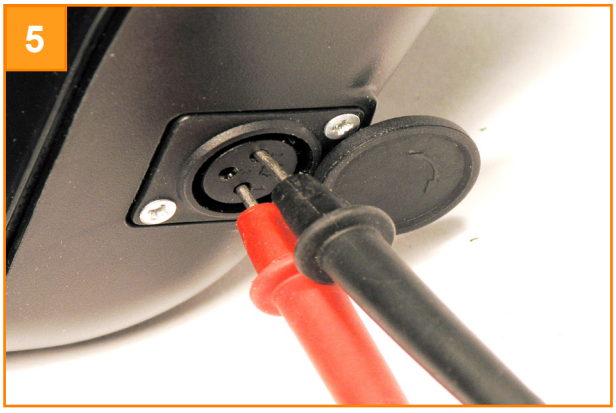
Place BLACK probe in top left & RED in bottom left sockets of the 8 pin plug . Do not short the probe pins.

4



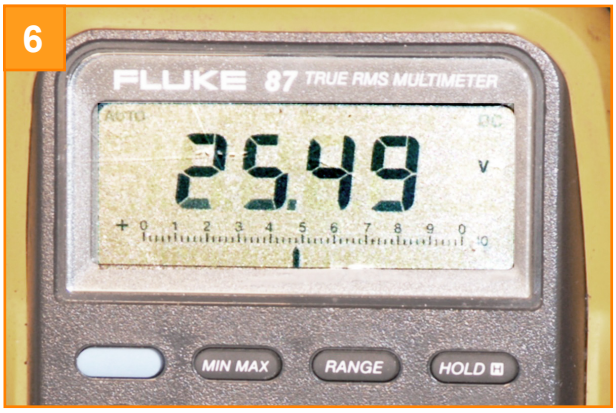
A reading of at least 24.5V should be obtained. If lower charge the batteries. If reading is zero, check for blown main fuses, reset button or broken leads.

5



Place BLACK probe in pin 2 & RED in pin 1 as shown. Do not short the probe pins.

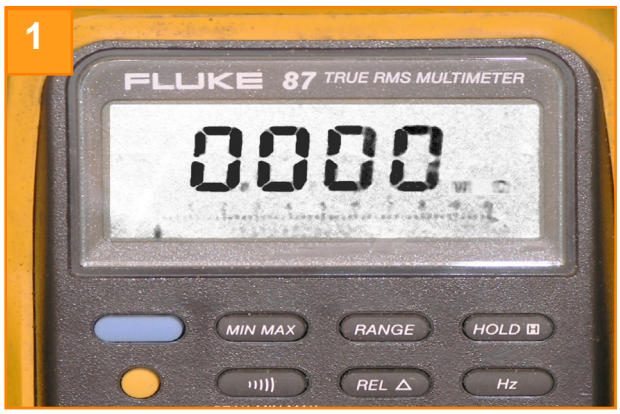
6



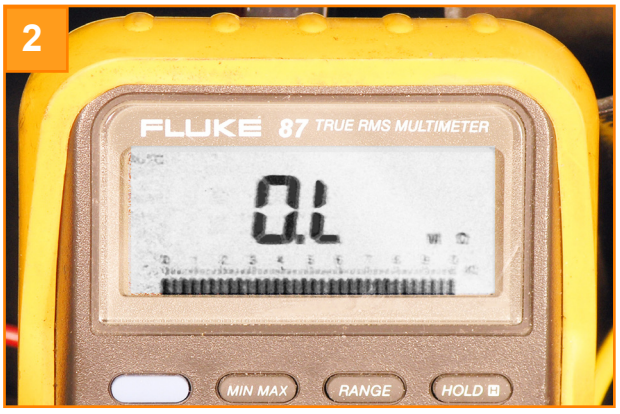
A reading of at least 24.5V should be obtained. If reading is lower, charge the batteries. If reading is zero, check for blown charging fuse or broken leads.

Batteries & Battery Box
Checking the Wiring

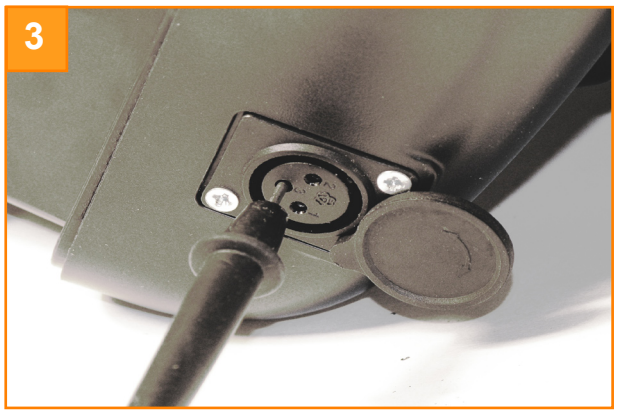
The Multimeter should be set to read RESISTANCE for the following tasks.



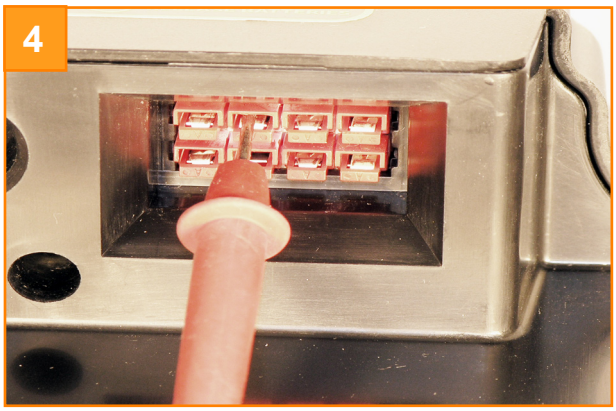
For good continuity (reading is OK) the meter should read close to Zero as above.



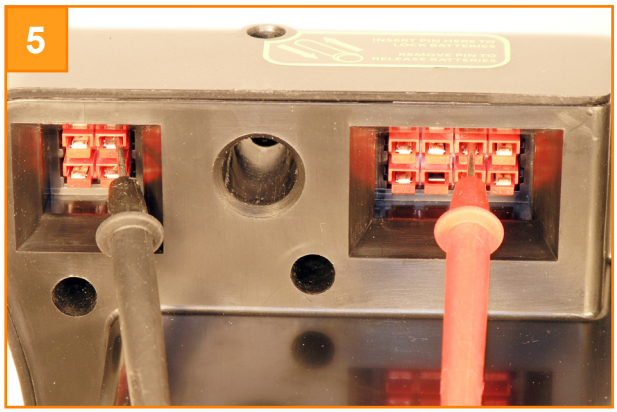
For no continuity or open circuit (bad reading) the meter will read similar to above. In this case, check for broken wires etc.



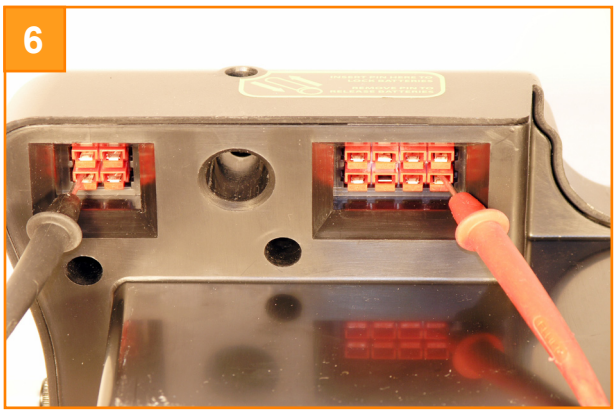
Place one probe into pin 3 on the charging socket.



Place the other probe second from top left on the 8 pin plug as shown. Meter reads close to Zero.



Place one probe top right of the 4 pin socket & the other second from top right on the 8 pin socket. Meter reads close to Zero.

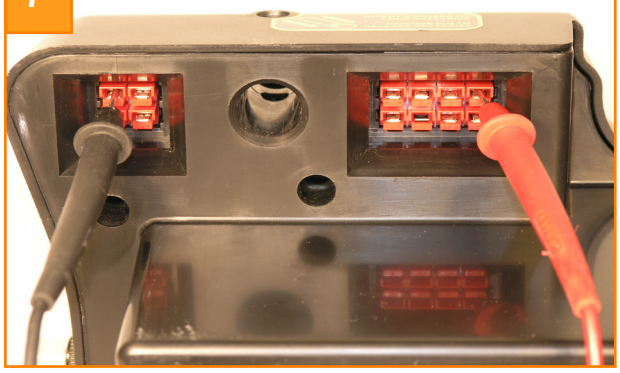


Place one probe bottom left of the 4 pin socket & the other bottom right on the 8 pin socket. Meter reads close to Zero.

Batteries & Battery Box
Checking the Wiring

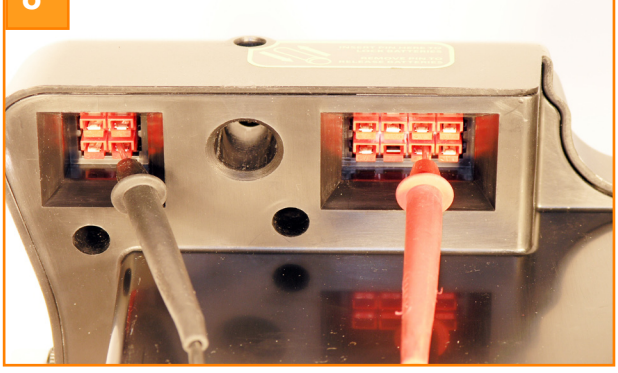
The Multimeter should be set to read RESISTANCE for the following tasks.

7



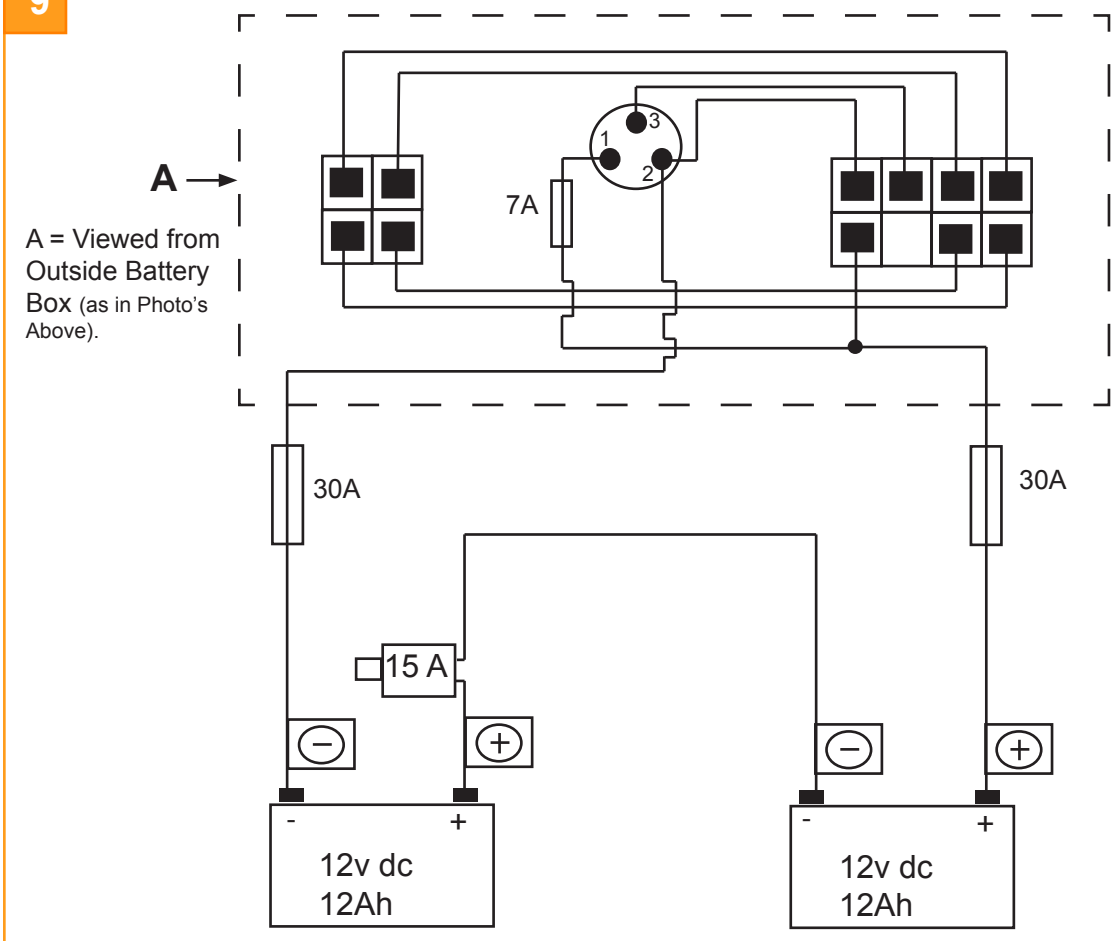
Place one probe top left of the 4 pin socket & the other top right on the 8 pin socket. Meter reads close to Zero.

8



Place one probe bottom right of the 4 pin socket & the other second from bottom right on the 8 pin socket. Meter reads close to Zero.

9



Battery Box Wiring Diagram

CHAPTER 6 Battery Charger Connection & Charge LED

Always connect the charger to the scooter before switching on the mains power. Observe all safety recommendations when charging batteries. This charger is for Indoor Use Only. Do not expose to moisture. Allow space around the casing.

1

The battery charger has a detachable mains lead.

2

The charger output plug connects to the battery box.

3

The power lead connects to the socket on the bottom of the charger.

4

The top of the charger shows the charge status.
RED LED = POWER ON

5

AMBER LED = CHARGING

6

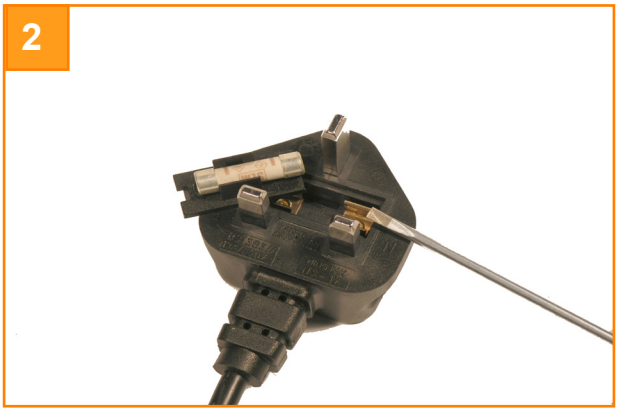
GREEN LED = CHARGED

Battery Charger Troubleshooting

1

NO LIGHT when batteries & mains are connected.

2

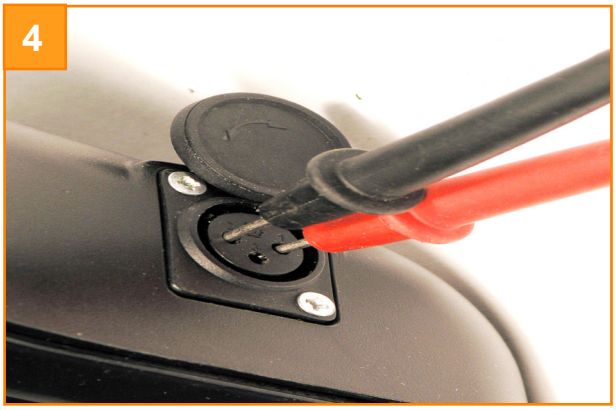


Lever the fuse carrier out & check the 3A fuse. Check the mains lead is pushed home into its sockets. Confirm mains wall socket is OK

3

RED LIGHT when batteries & mains are connected.

4



Check charging socket for battery voltage. If below 17V change batteries. If zero check reset button, charging fuse, main fuses & wiring in battery box (Ch 5).

5

AMBER LIGHT stays on for longer than 24 hours.

6

Check the charger plug & socket for moisture or dirty contacts. If burning is evident change the socket AND the charger. Perform discharge test on batteries as they may be worn out or faulty.

CHAPTER 7

Tiller Console & Fuse

The Tiller Console is sold as a complete assembly for spares. Only Keys & Fuses are sold separately

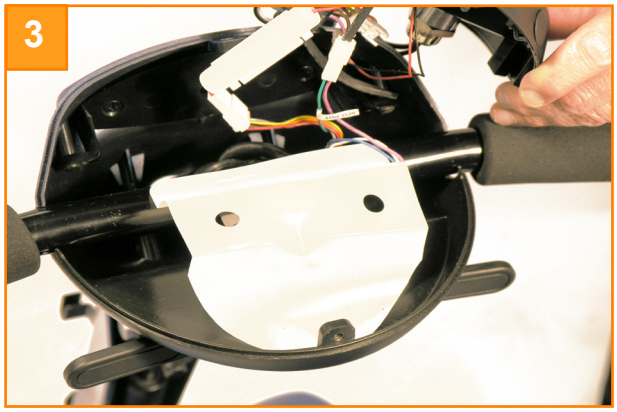
1

Release the top screw using a Phillips screwdriver.

2

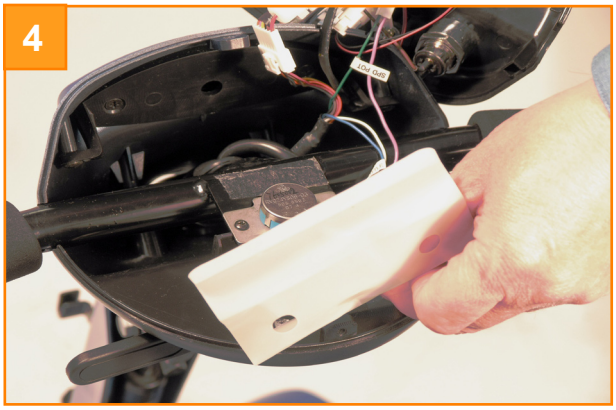
Do the same with the front screw.

3



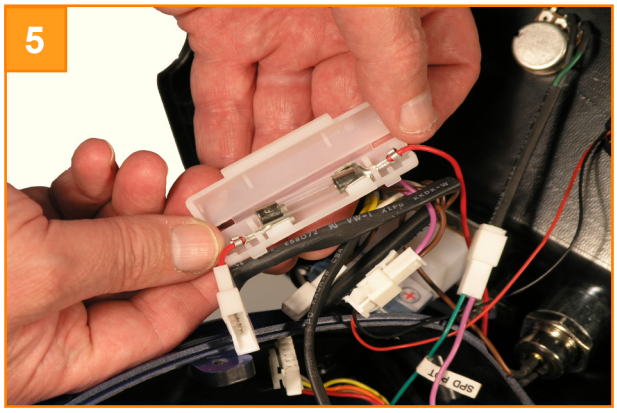
Lift the top off the console.

4



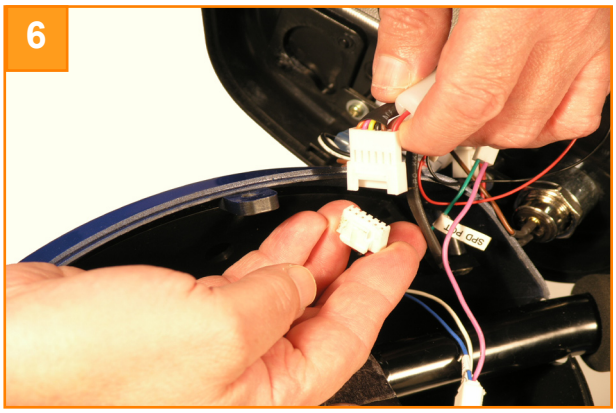
Peel off the splash guard & keep it in a safe place.

5



If the battery gauge does not illuminate when the key is turned, open the in line fuse holder to gain access to the 2A fuse & check for continuity.

6

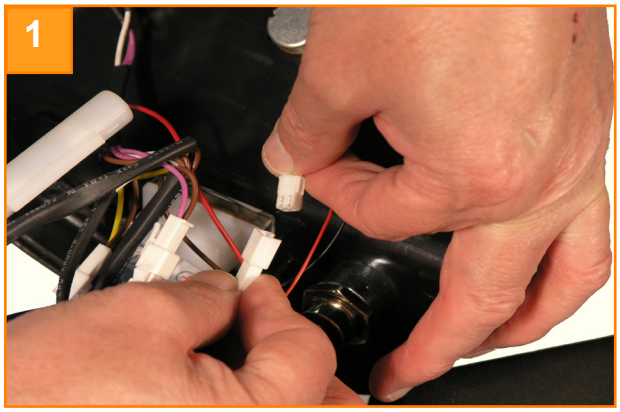


Release the locking clip on the large white plug & disconnect.

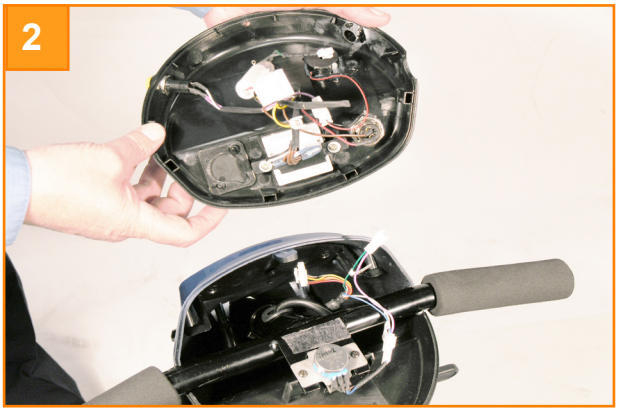
Tiller

Console & Throttle Pot (Wigwag)

To refit the Tiller Console, reverse this process. Ensure that the battery box is removed from the scooter when working on the Tiller Console to prevent accidental short circuits.



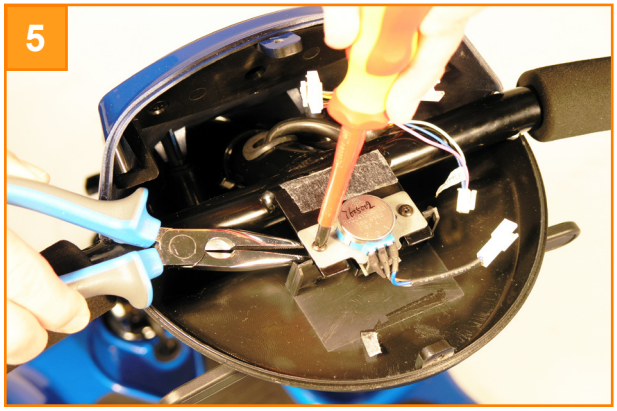
Disconnect the 2 pin plug attached to the preset speed control.



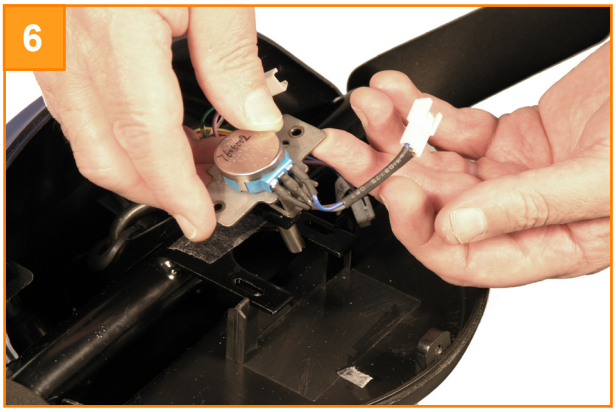
The top console is now disconnected.

If the wigwag throttle control needs replacing, use a 1.5 mm allen key to loosen the 2 set screws on the wigwag lever.

Slide the lever off the stem together with the small washer.



Use thin nosed pliers & small Phillips screwdriver to undo the 2 small bolts on the wigwag throttle control.

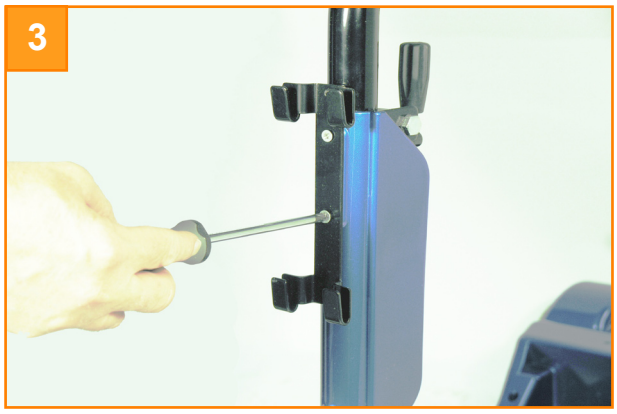


Lift out the wigwag throttle assembly.

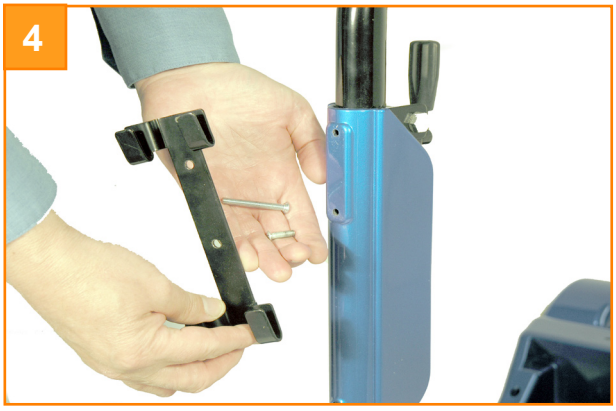
Tiller
Panels

Use a Phillips screwdriver to undo the 3 screws under the console panels.

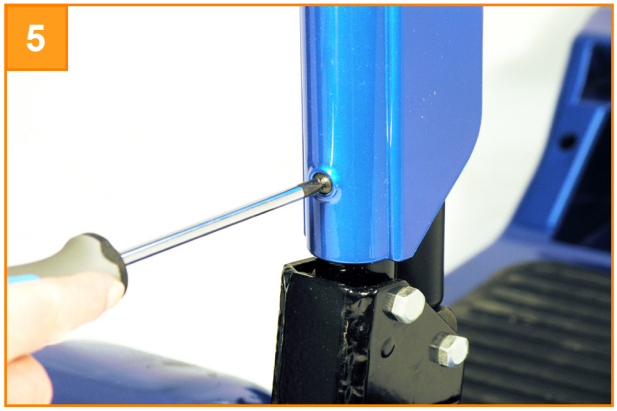
Lift off the 2 console panels.



Use a Phillips screwdriver to undo the 2 basket bracket screws.



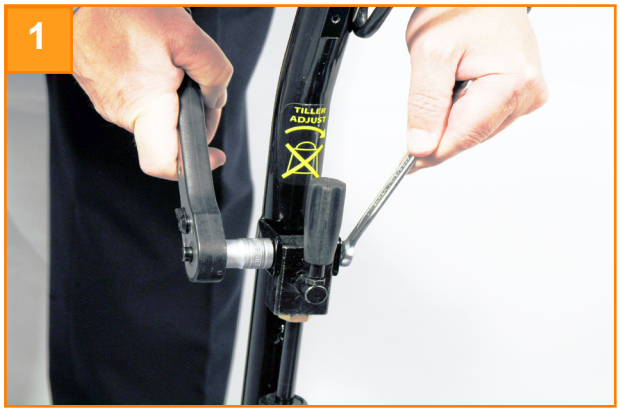
Remove the bracket. Note that the top screw is shorter.



Use a Phillips screwdriver to undo the lower screw.

Lift away the bottom panel.

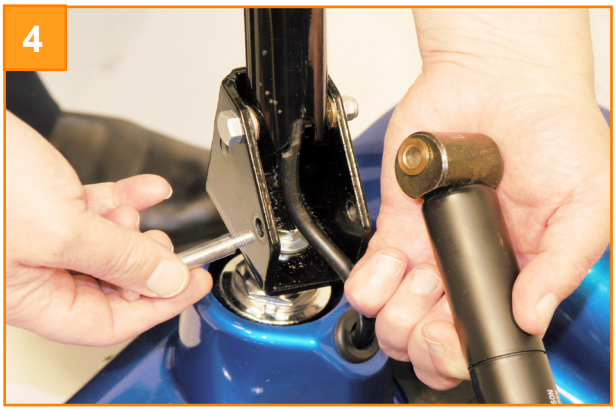
Tiller
Air Strut



Use a 13.0 mm socket & 10.0 mm spanner to undo the top bolt.

Remove the shoulder bolt from the top fixing.

Use a 13.0 mm socket & 10.0 mm spanner to undo the bottom bolt.

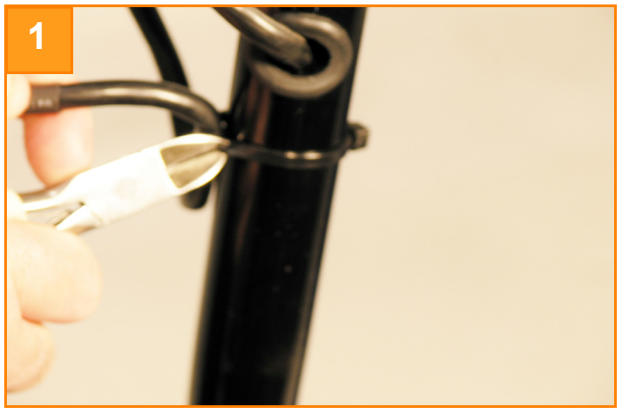


Remove the shoulder bolt from the bottom fixing.

The Air Strut assembly.

Tiller

Tiller Bar Removal



Cut the tie wrap at the top of the tiller.

Pull the grommet out & slip it over the end of the main loom.

Feed the main loom into the opening in the tiller bar.

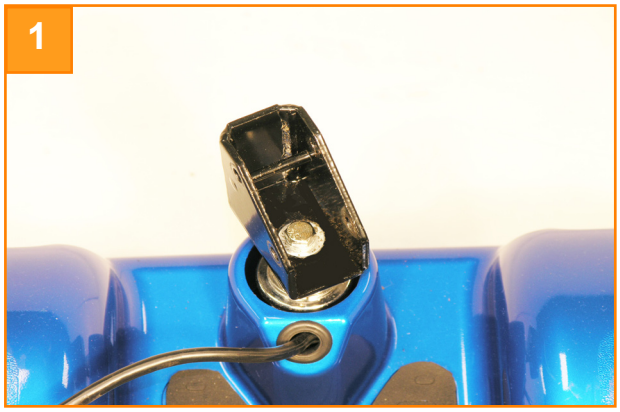
Use a 13.0 mm socket & 10.0 mm spanner to remove the lower tiller mount bolt.

Pull the 2 bushes out of the way to allow the main loom to be withdrawn.

The Tiller Bar removed.

Tiller
Connecting Bracket

1

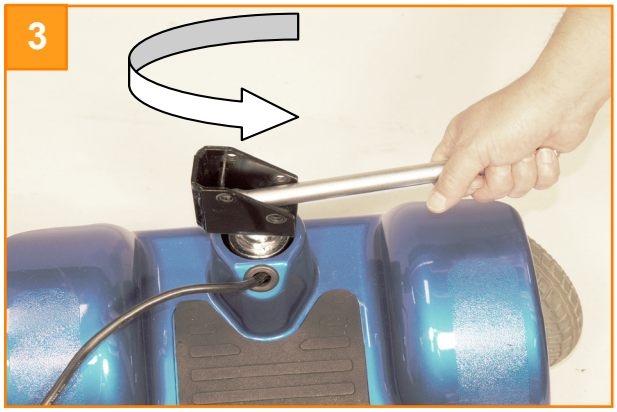


The connecting bracket is secured by one long bolt.

2

Turn the bracket against the steering stop then use a 13.0mm socket & extension to undo the bolt approximately 3 - 4 turns. Do not undo completely.

3



The bracket relies on the tightening of friction fittings & may require the seal breaking by turning with a “tommy” bar as shown.

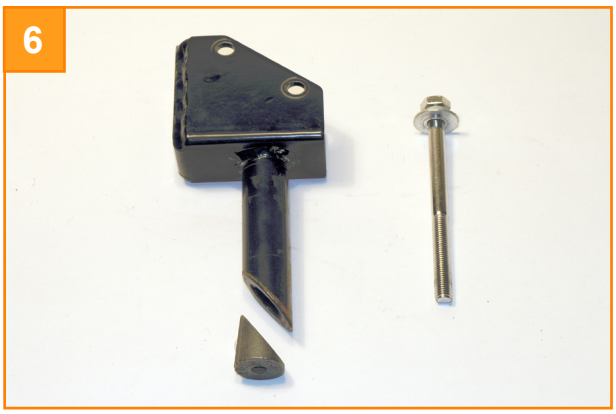
4

Withdraw the bracket. When refitting ensure the drive wheels are front & parallel to each other & the tiller connecting bracket is facing straight ahead.

5

Notice the small segment at the foot of the connecting bracket. The segment is part of the friction fit. As the bolt tightens the segment moves in a shear motion that wedges it inside the tube of the steering head.

6



The Tiller Connecting Bracket.

CHAPTER 8

Wheels

Front Removal

If a clean safe space is available, it is a good idea to remove the seat & batteries from the scooter, loosen the axle stud & tip it on one side to remove the wheel.

1

With the wheel on the floor, use a 5.0mm allen key to loosen the axle stud.

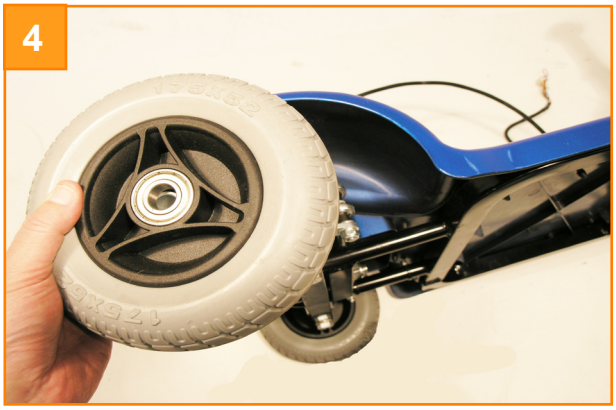
2

Tip the scooter on to its side for better access to the wheel.

3

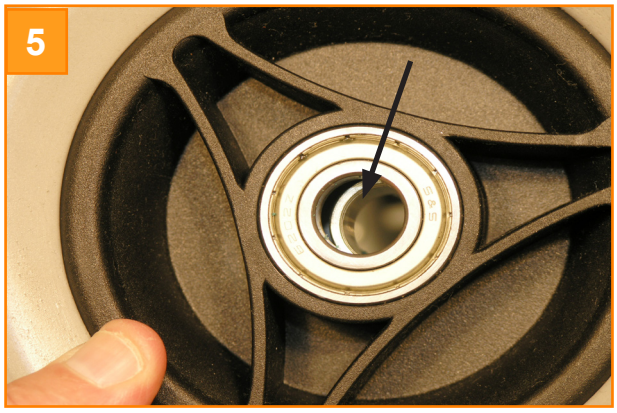
Remove the axle stud taking care not to lose the washer. When refitting use thread lock.

4



Lift the wheel off the stub axle.

5



When refitting ensure that the inner guide is aligned with the stub axle.

6

The Front Wheel assembly removed.
Store all fixings in a safe place.

Wheels

Rear Removal

The scooter can be tipped on its side for rear wheel removal, or the rear drive assembly can be detached and worked on as a separate assembly.

1

Place the scooter into drive to stop the wheels turning.

2

With the wheel on the ground, use a 19.0mm socket to loosen the centre nut.

3

Either turn the scooter on one side or split the drive assembly & turn that on end, then remove the nylok nut & washer. Always use a new nut when refitting.

4

Gently remove the wheel.

5

Take care not to lose the drive shaft key.

6

The Rear Wheel assembly.

CHAPTER 9 Front Frame Floor Panel & Mat

1

Release the grommet from the floor panel & slide it off the end of the main loom.

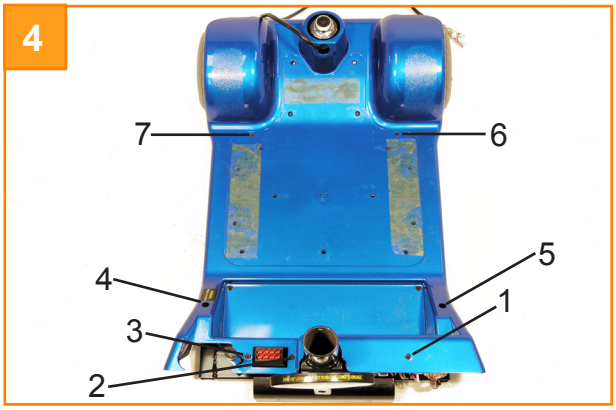
2

Peel the rubber mat back to remove it.

3

Remove the 2 screws at the front of the floor panel using a Phillips screwdriver.

4

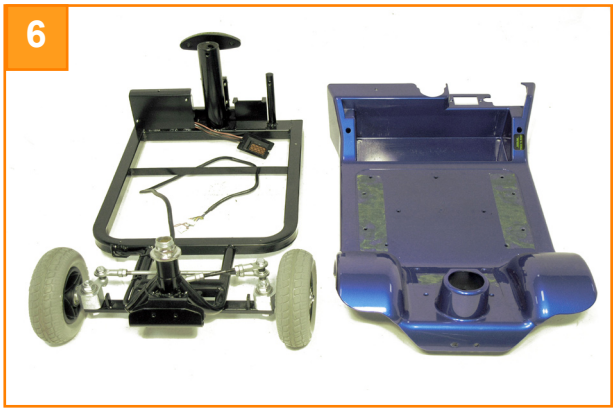


Remove the remaining 7 screws using a Phillips screwdriver.

5

Carefully lift the floor panel off the frame feeding the main loom through at the same time.

6

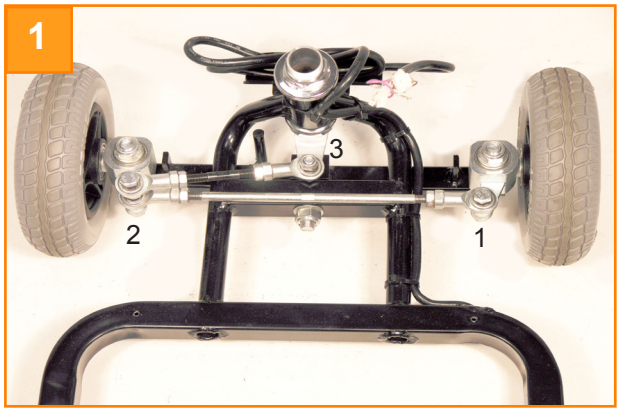


The Floor Panel removed.

Front Frame
Steering Rods & Stub Axles

This process is best carried out with the floor panel & front wheels removed.

1

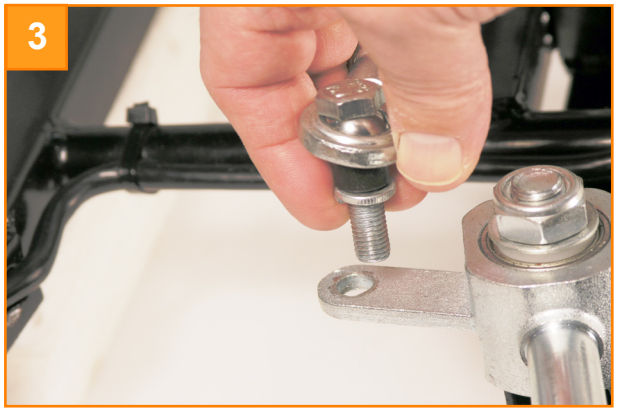


There are 3 bolts securing the connecting rods.

2

Use a 13.0 mm spanner/socket to undo the right hand, single connection bolt.

3



Lift the connecting rod out of the stub axle. Note the positions of the washers & spacers.

4

Use a 13.0 mm spanner/socket to undo the left hand, double connection bolt.

5

Lift the connecting rods out of the stub axle. Note the positions of the washers & spacers.

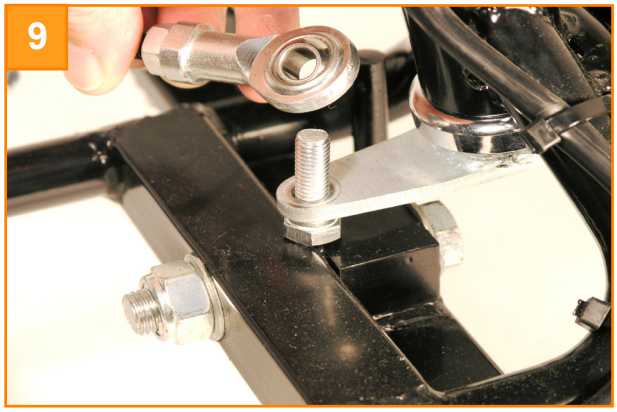
6

Slip the long connecting rod off the bolt.

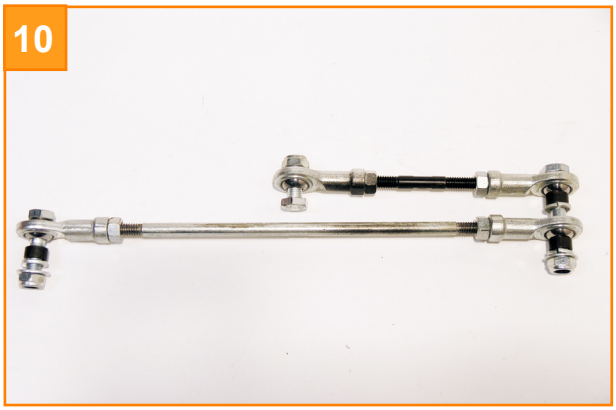
Front Frame
Steering Rods & Stub Axles

The short connecting rod is bolted to the steering stem.

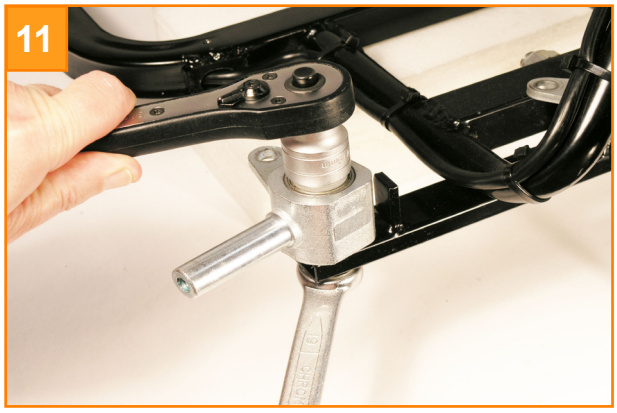
Use a 13.0 mm spanner/socket to undo the bolt.



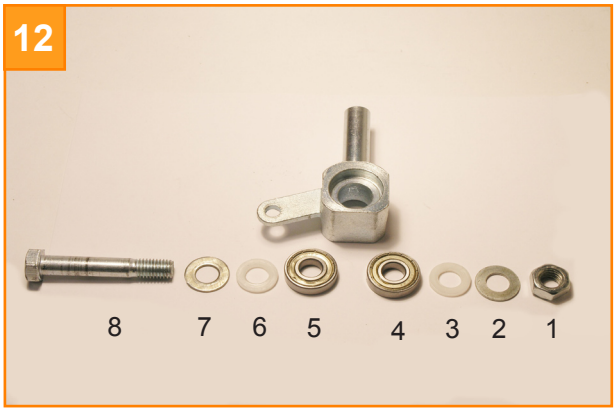
Lift the connecting rod off the bolt. Turn the steering to one side to remove the bolt.



The connecting rods showing the washer & spacer sequence.



Use a 13.0 mm spanner/socket to undo the bolt securing the stub axle.



The stub axle removed showing the top to bottom sequence of nut, washers bearings & bolt.

Front Frame
Steering Stem

1

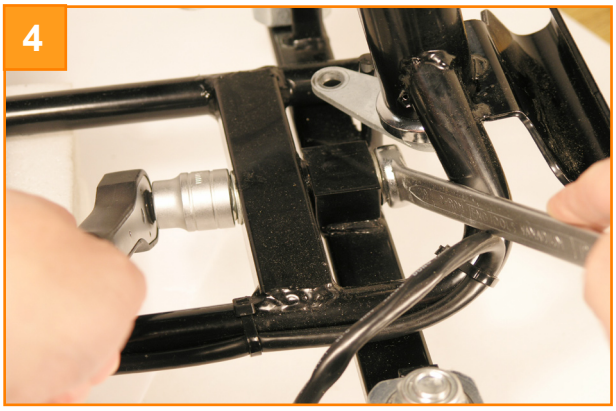
Undo the steering rod stub axle connections using a 13.0 mm spanner/socket.

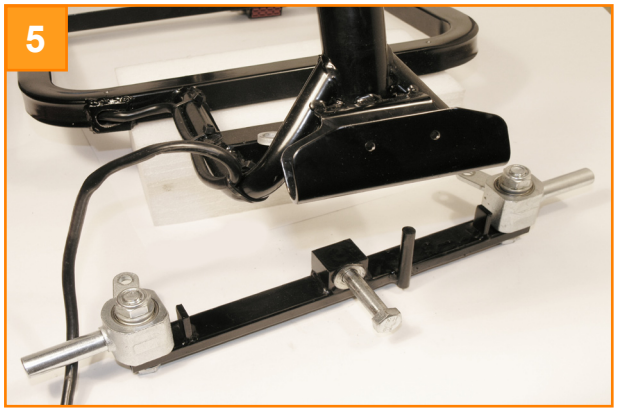
2

Undo the connection to the steering stem using the same tools.

3

Cut the cable ties attached to the steering stem.

4

Use a 13.0 mm spanner/socket to undo the stub axle pivot bar.

5

Remove the assembly.

6

Use an adjustable spanner to loosen the top steering nut.

Front Frame
Steering Stem

Remove the top nut by hand.

Remove the locking ring by hand.

Remove the knurled ring by hand.

Slide the steering stem out of the head. The lower bearing should come with it, if not use thin nosed pliers to extract it from the head.

Use thin nosed pliers to extract the top bearing.

The steering stem showing the nut, locking ring, knurled ring & bearings.

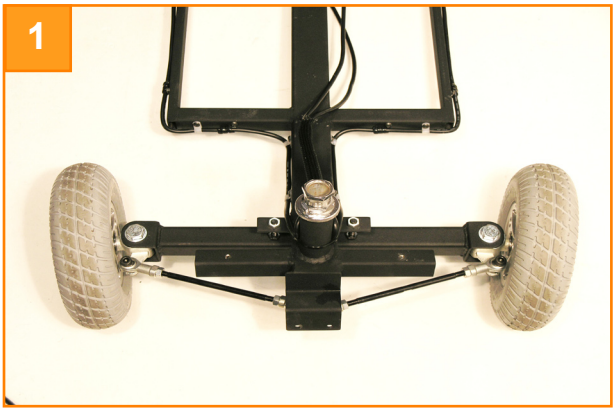
On refitting, check that the steering is fully free to move from left hand lock to right hand lock without stiffness & that there is no up & down play in the steering head.

Front Frame

Adjusting the Steering Track

If the steering is not set up correctly severe tyre wear and low range become evident. Below are some examples to identify this problem.

1

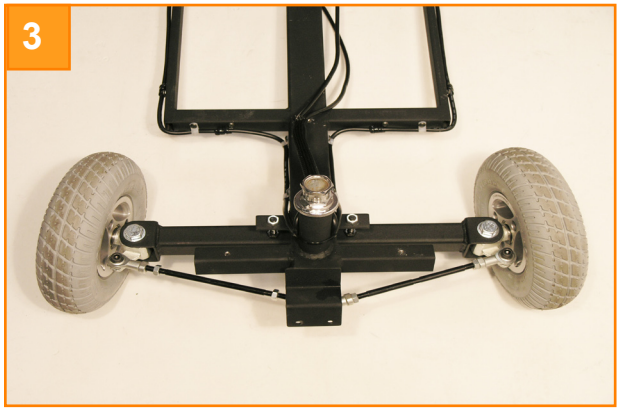


Above is an example of TOW IN.

2

The tyre exhibits scuffing or a lightening of the tread colour on the outside half of the tyre.
View from front of scooter.

3

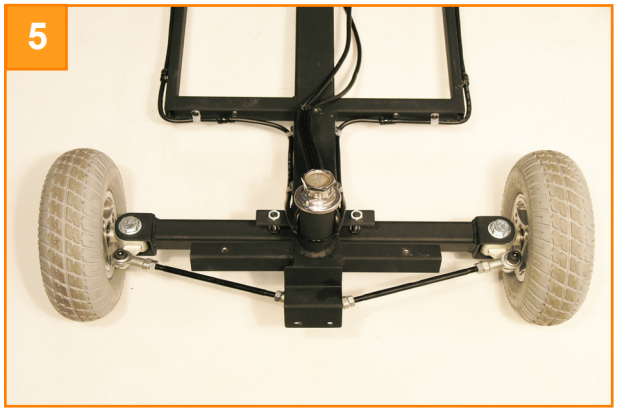


Above is an example of TOW OUT.

4

The tyre exhibits similar wear patterns as the tow in fault, but the damage is on the inside edge.
View from front of scooter.

5



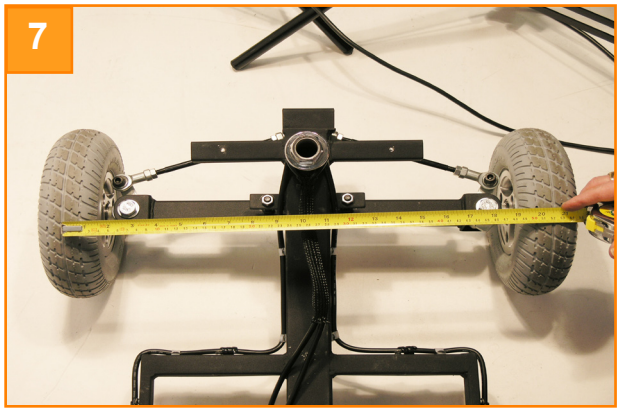
Above is an example of correctly set tracking.

6

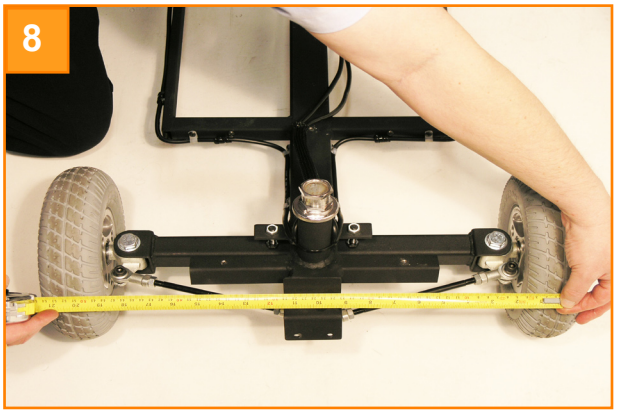
The tyre has no scuffing & any signs of normal wear are symmetrical.

Front Frame
Adjusting the Steering Track

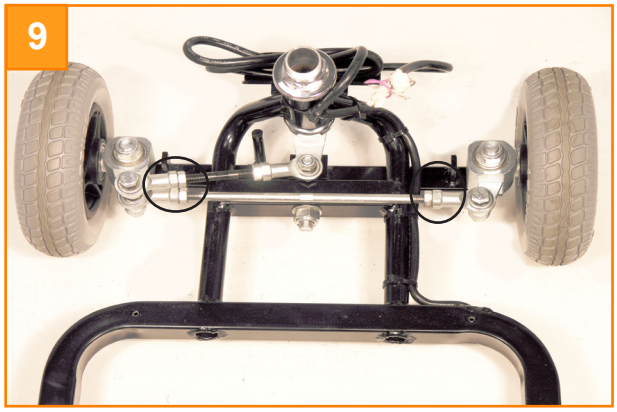
The steering should be turned straight ahead during this process.



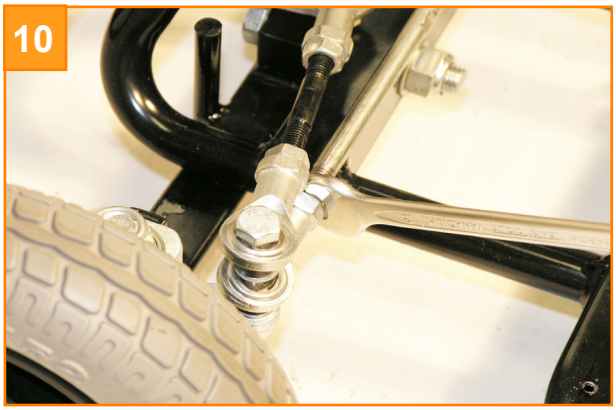
The easiest way to check for correct tracking is to measure the distance between the tyre centre tread line. Start at the back of the tyres.



Then measure the front of the tyres. The measurement should be the same (380mm).

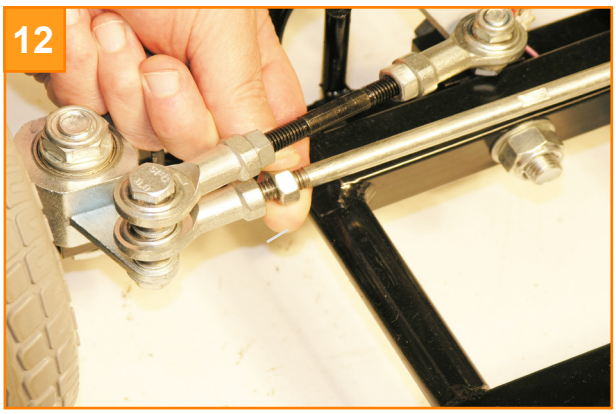


These are the nuts that control the tracking.



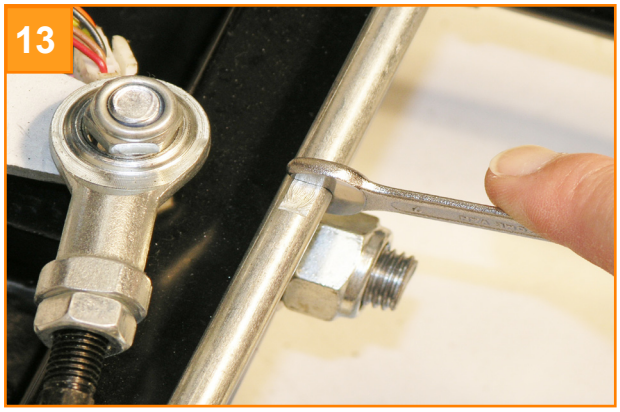
Loosen the left hand nut using a 13.0 mm spanner.

Loosen the right hand nut using a 13.0 mm spanner.

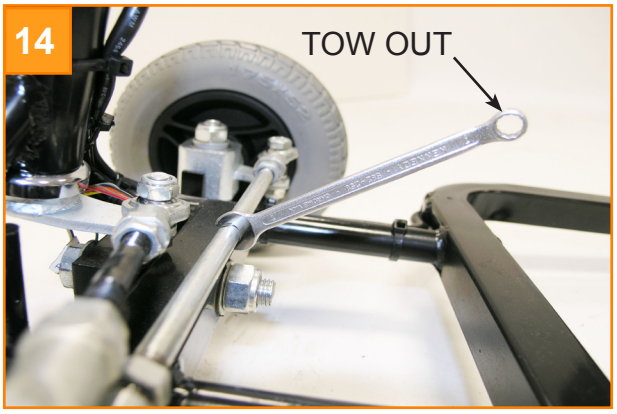


Give the nuts a few turns by hand to allow free movement.

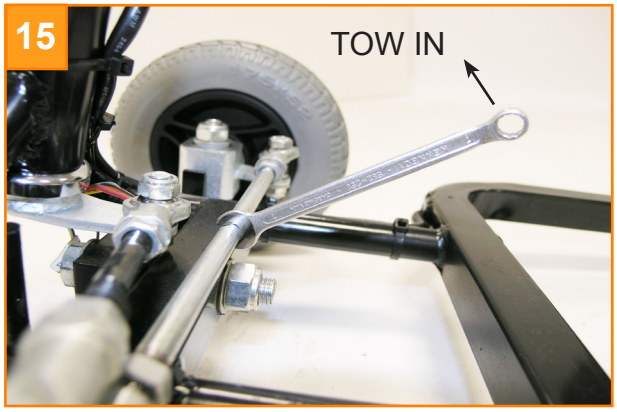
Front Frame
Adjusting the Steering Track



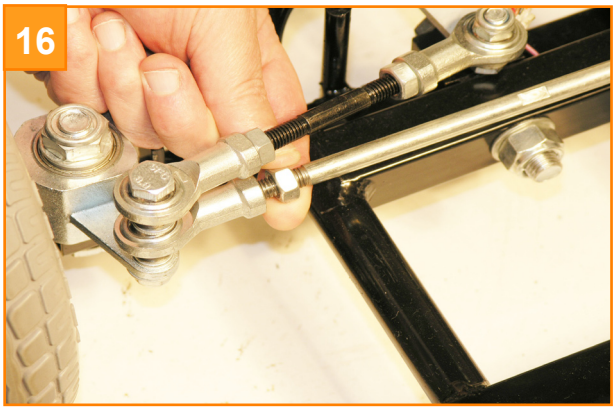
Using a 7.0 mm spanner, turn the flat on the main steering connecting rod to adjust tracking.



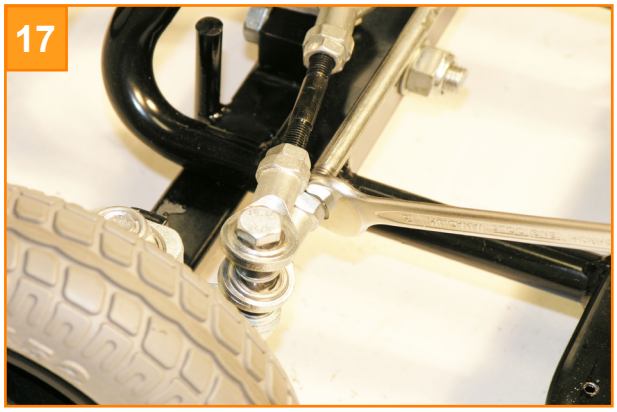
Pushing downwards increases TOW OUT.



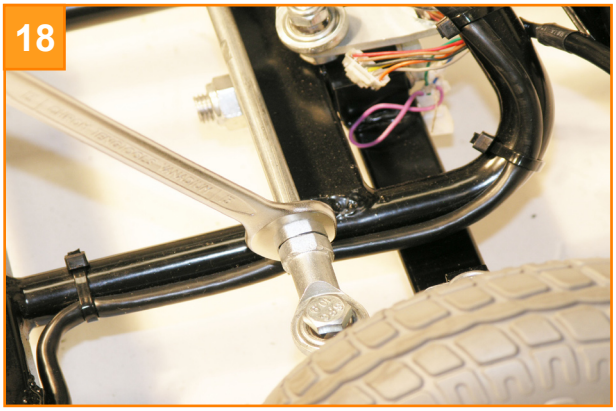
Pushing upwards increases TOW IN.



When tracking is correct, finger tighten the nuts.



Carefully tighten the left hand nut using the 13.0 mm spanner.

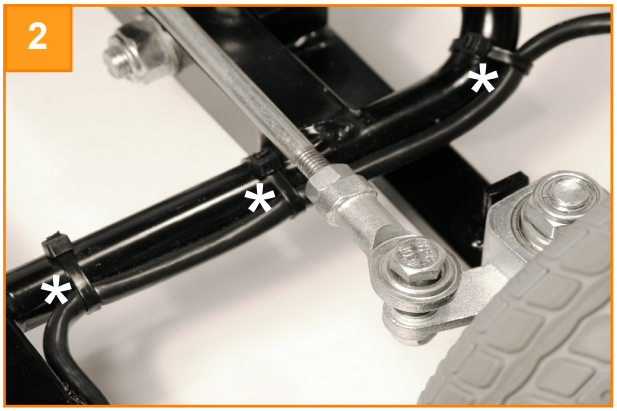


Do the same for the right hand nut. Recheck the steering before finishing.

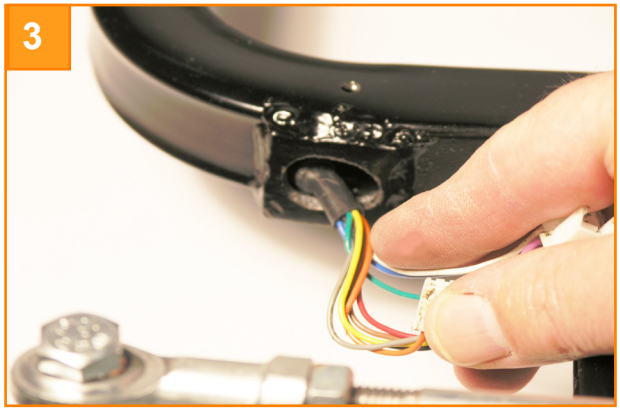
Front Frame
Control Box & Looms

Remove the tiller & floor panel as previously shown (Ch 7 & 9).

Cut the 2 cable ties on the steering head.

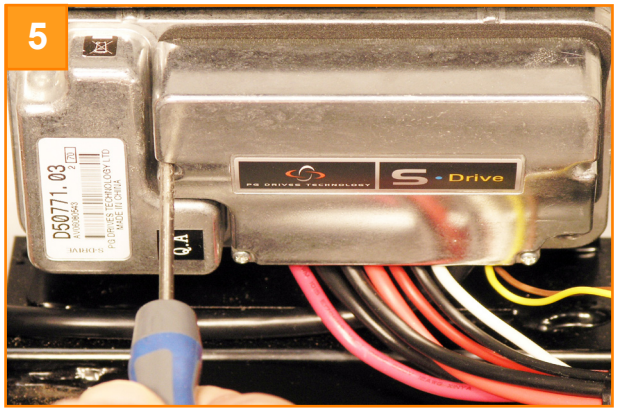


Cut the 3 cable ties on the frame.

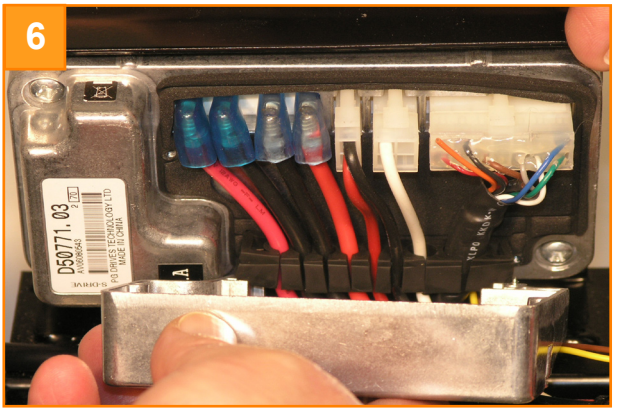


Feed the main loom into the hole at the front of the frame.

Simultaneously pull from the rear of the frame until the loom is through.



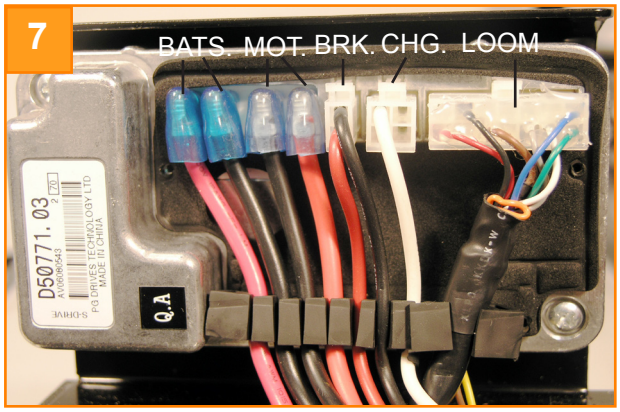
Use a small Phillips screwdriver to undo the 2 screws on the controller cover.



Carefully remove the cover taking care not to damage the gasket.

Front Frame
Control Box & Looms

7



Make a note of the wiring layout before disconnecting any plugs.

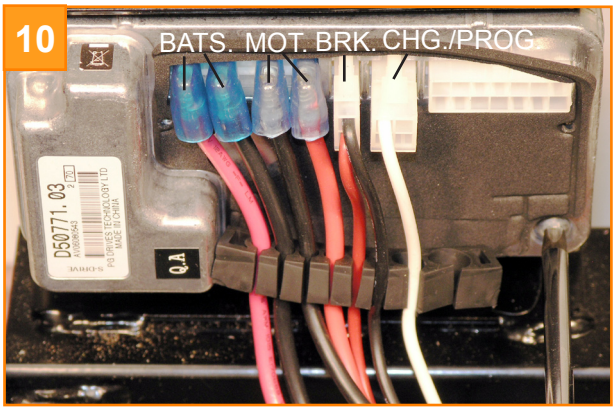
8

Depress the clip & remove the 14 pin plug.

9

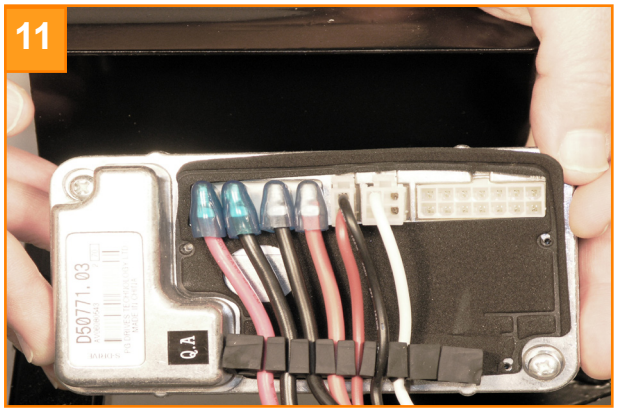
The Main Loom.

10



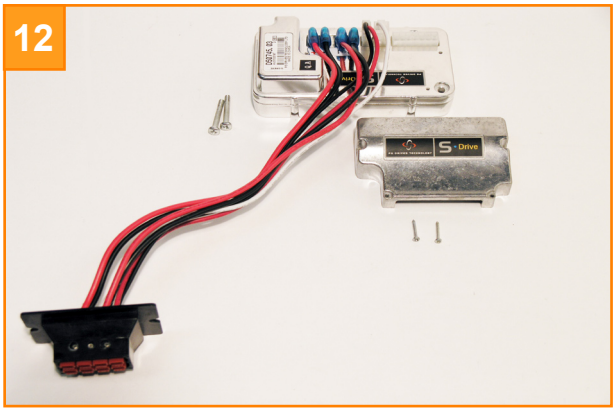
Use a Phillips screwdriver to undo the 2 screws securing the controller to the frame.

11



Lift the controller off the frame.

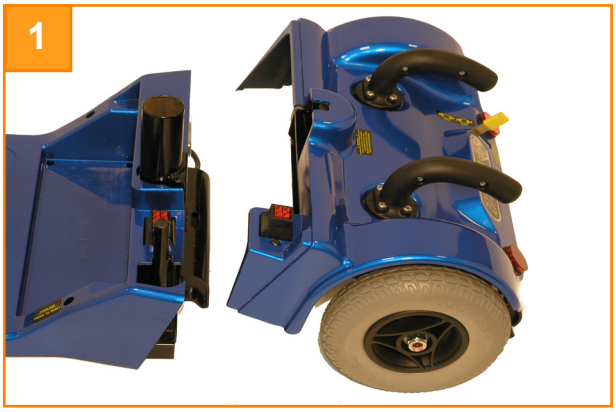
12



The S-Drive controller & Power Loom.

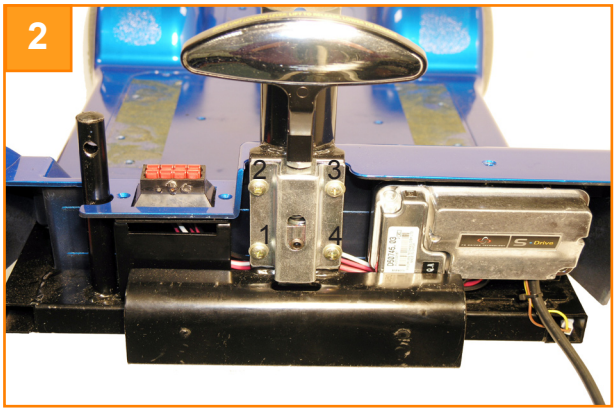
Front Frame
Docking & Lock

1



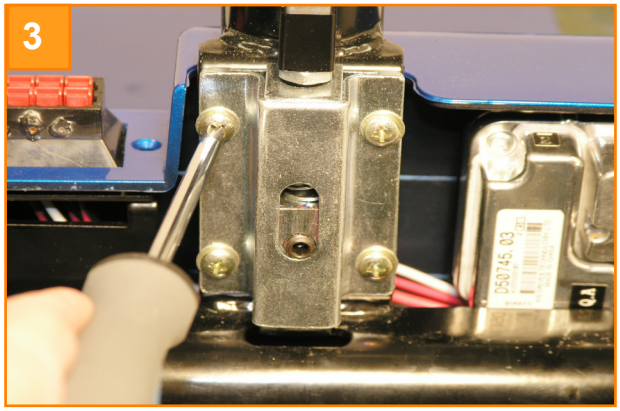
De-dock the Drive assembly.

2



The docking lock is secured to the front frame by 4 screws.

3

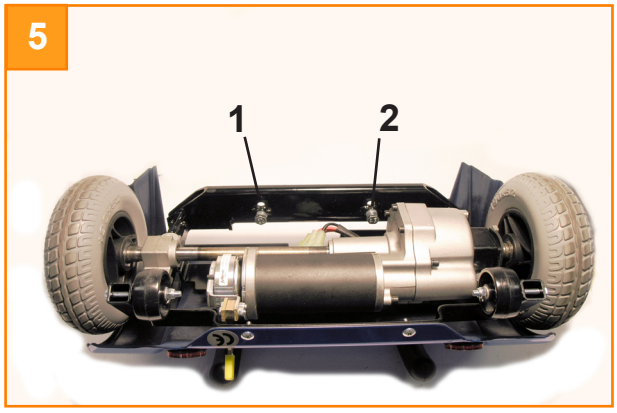


Use a Phillips screwdriver to undo the 4 screws.

4

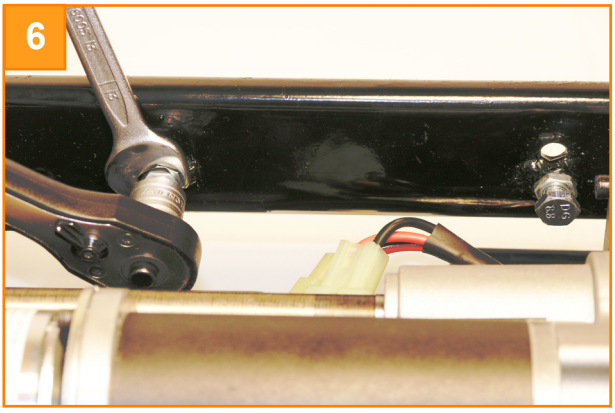
The Docking Lock Assembly.

5



If docking is loose or rattles it can be adjusted via 2 adjuster bolts on the mating surface of the drive assembly.

6



Use a 13.0 mm spanner/socket. First loosen the lock nut, adjust the bolt, then retighten the lock nut. Repeat for both sides.

STEPS
Sunrise Training and Education Programmes

SERVICE INFORMATION

IMPORTANT

Sunrise Medical recommend and support the factory installed programme only. Details of the recommended programme are set out in this Technical Manual within Chapter 10.

Any deviation from this programme is deemed to be a third party fit and as such the responsibility for any modification lies with the person amending the programme.

Any alterations or amendments must be carried out by competent personnel and a full function test should be performed to confirm suitability and safety of the installed programme. All parameters should comply with acceptable safety standards.

It is strongly recommended that any person likley to be required to programme any Sunrise Medical equipment, should attend the relevant STEPS training course offered by Sunrise Medical.
Contact Sunrise Medical for details.

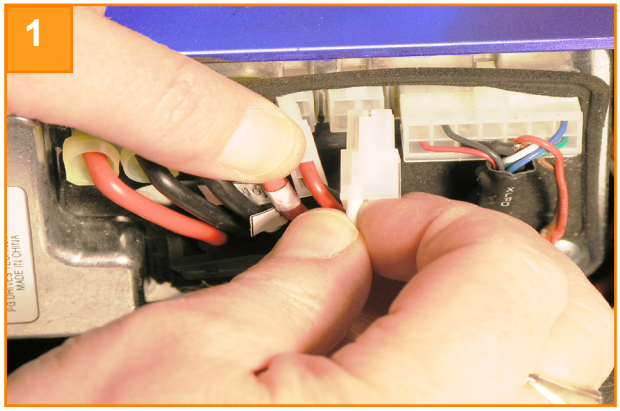
If in any doubt, do not change anything as a wrongly installed programme could lead to a dangerous drive profile.

Contact Sunrise medical for further advice.

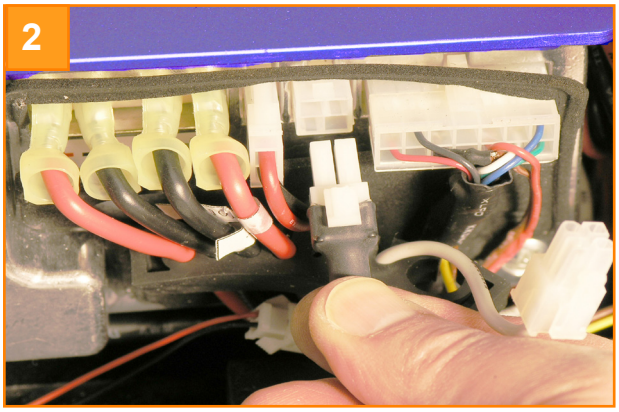
CHAPTER 10

Programming Port Access

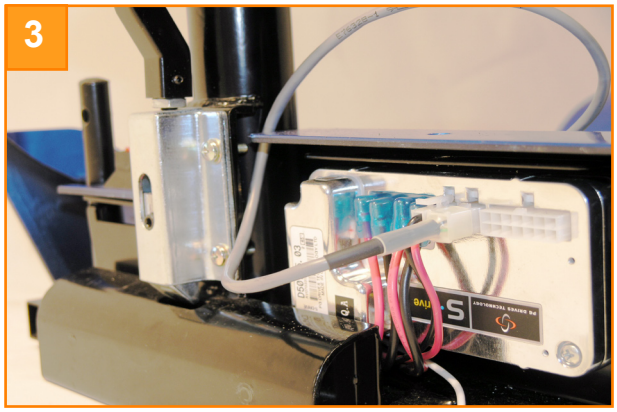
This process starts with the seat, batteries & drive assembly removed.
Use SP 1 Hand Held Programmer or PGDT PC Programming Software.



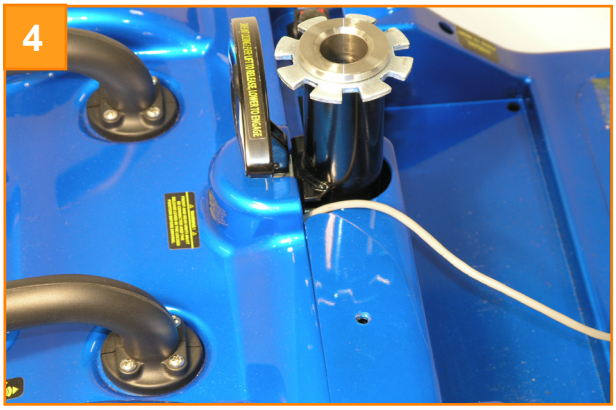
Remove the S-Drive cover & disconnect the 4 pin plug (Ch 9).



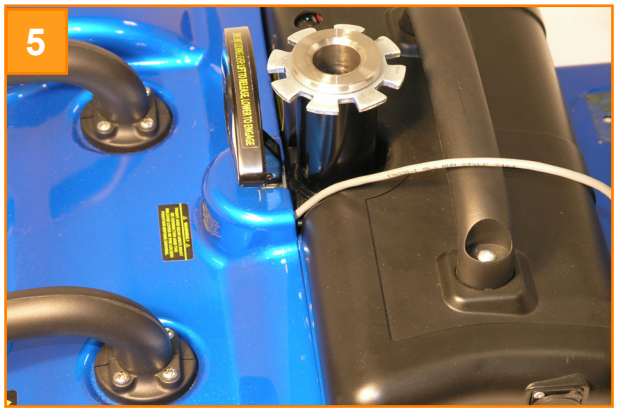
Insert the programmer plug into the 4 pin socket.



Route the programmer wire as shown.



Carefully dock the drive assembly ensuring the cable is not trapped.



Refit the battery box & seat.

Programme using the SP1 hand held programmer or the PGDT PC mobility programmer.

Programming Parameter List

SPEED SETTINGS	FAST	SLOW
FWD ACCEL (0.1Sec. Increments)	18	10
FWD DECEL (0.1Sec. Increments)	6	8
REV ACCEL (0.1Sec. Increments)	12	12
REV DECEL (0.1Sec. Increments)	8	4
MAX FWD SPEED %	100	50
MIN FWD SPEED %	30	30
MAX REV SPEED %	40	40
MIN REV SPEED %	30	30
SPEED LIMIT POT ENABLED	OFF	
OPERATION SETTINGS		
SLEEP TIMER (Minutes)	10	
THROTTLE INVERT	NO	
BATTERY SETTINGS		
LOW BATTERY FLASH LEVEL (BARS)	0	
CABLE RESISTANCE (mΩ)	40	
CALIBRATION FACTOR	85	
LOW BATTERY ALARM	OFF	
INHIBIT SETTINGS		
INHIBIT 1 MODE	1	
INHIBIT 1 OPERATION	LATCHING	
INHIBIT 1 SPEED %	0	
INHIBIT 2 MODE	1	
INHIBIT 2 OPERATION	NON-LATCHING	
INHIBIT 2 SPEED %	100	
INHIBIT 3 MODE	1	
INHIBIT 3 OPERATION	NON-LATCHING	
INHIBIT 3 SPEED %	100	
AUX OUTPUT: MODE	0	
GENERAL SETTINGS		
SOFT STOP	ON	
BRAKE TIME (mS)	1100	
OUTPUT VOLTAGE	24V	
STATUS OUTPUT TYPE	2 (Analogue)	
DIAGNOSTIC FLASH SEQUENCE	4	

Programming Parameter List

GENERAL SETTINGS CONT.	MAX	MIN
REVERSE ALARM	ON	
PULSED REVERSE ALARM	ON	
DIAGNOSTIC ALARM	ON	
BRAKE DISCONNECTED ALARM	OFF	
BRAKE FAULT DETECT	ON	
BRAKE LIGHT	OFF	
FREEWHEEL SPEED LIMIT	100	
FREEWHEEL TIME OUT (0.1Sec.)	2	
FREEWHEEL ENABLE	ENABLE	
MOTOR SETTINGS		
CURRENT LIMIT MAX	45A	
BOOST DRIVE CURRENT	45A	
BOOST DRIVE TIME (Sec.)	0	
CURRENT FOLDBACK THRESHOLD	30A	
CURRENT FOLDBACK TIME (Sec.)	20	
CURRENT FOLDBACK LEVEL %	90	
MOTOR COOLING TIME (Sec.)	120	
CURRENT FOLDBACK TEMP. (C)	80	
CURRENT LIMIT MIN	10A	
MOTOR COMPENSATION (mΩ)	210	
ANTI ROLLBACK LEVEL	12	
PULL-AWAY DELAY (0.1 Sec)	30	
SLOPE FACTOR	90	
ANTI ROLLBACK VELOCITY	0	
FACTORY SETTINGS		
ACCELERATION (0.1 Sec)	100	1
DECELERATION (0.1 Sec)	100	1
FORWARD SPEED %	100	0
REVERSE SPEED %	100	0
THROTTLE SETTINGS		
THROTTLE TYPE	1 (WIGWAG)	
THROTTLE DEADBAND %	10	
THROTTLE GAIN %	110	
THROTTLE OPERATED AT POWER UP	2 (TRIP)	
THROTTLE REFERENCE TEST	ON	
ISO TEST RESISTOR	OFF	

Programming
On-board Diagnostics

The on-board diagnostic status is indicated by a pulsed buzzer.
There will be a series of repeated pulses on the buzzer followed by a pause, then repeated pulses again and so on. It is the number of pulses between pauses that indicates the fault code.
Please refer to the table below for guidance.

The fault conditions can also be read by using the SP1 Hand Held programmer or PGDT PC Programming Software.

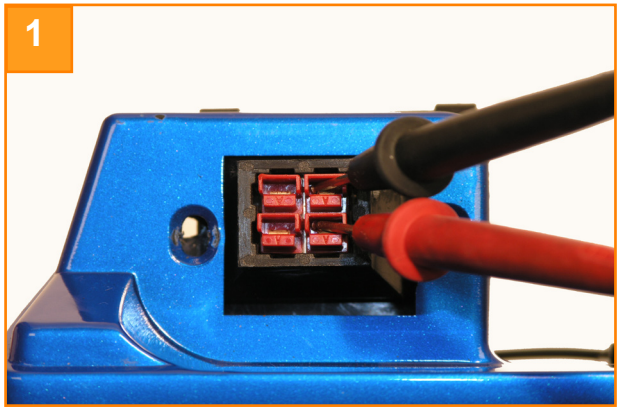
No. Pulses	Description	Remedy
None	All is OK	----
Slow Beep	Batteries deeply discharged	Charge batteries as soon as possible
1 x Pulse per 5 Sec.	Controller gone to sleep	Switch OFF & ON again
Pulses 1 x	Battery flat or bad connection	Charge batteries - Check all connections
Pulses 2 x	Motor connection bad or intermittent	Check all connections between Motor & Controller
Pulses 3 x	Motor short-circuit to battery	Check all Motor & Battery looms including plugs & sockets
Pulses 4 x	Freewheel activated	Check freewheel lever, check micro-switch & wiring
5 x Not Used	----	----
Pulses 6 x	Battery charger inhibit activated	Check charger is not plugged in
Pulses 7 x	Throttle fault	Check wig-wag is central - check throttle & preset speed pot
Pulses 8 x	Possible controller fault	Check all connections between the tiller console & main controller
Pulses 9 x	Bad brake connection	Check Brake & Motor connections
Pulses 10 x	Over voltage detect	Check battery connections - check battery charger - Check batteries

CHAPTER 11

Rear Drive Assembly
Checking the Motor/Brake

Please refer to Service Note on page 10

1

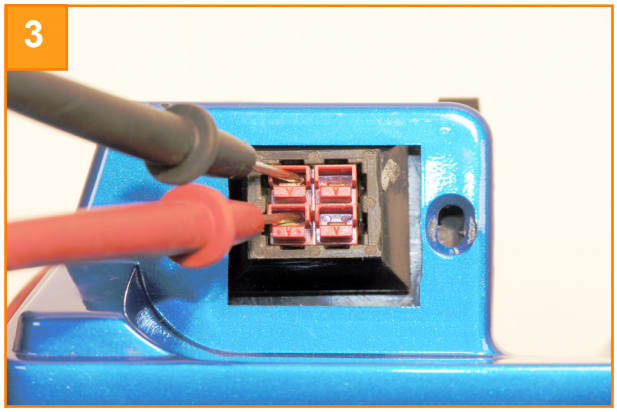


To check the motor place the probes top right & bottom left of the 4 pin plug.

2

Switch the meter to RESISTANCE. A reading of approximately 8 - 12 Ohms is OK.

3

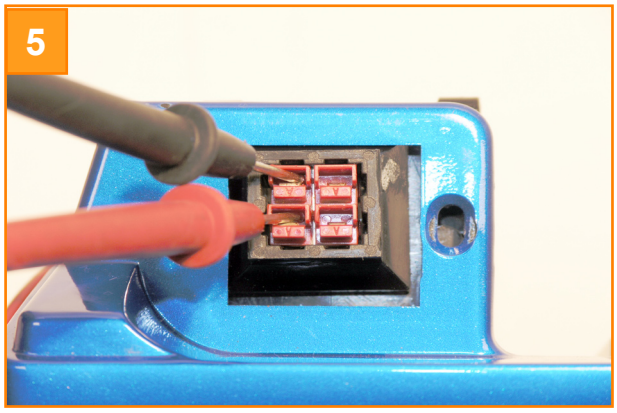


To check the brake & micro switch, place the probes top left & bottom left of the 4 pin plug.

4

Switch the meter to RESISTANCE. With the parking brake released an open circuit reading is shown.

5



Leave the probes as they are.

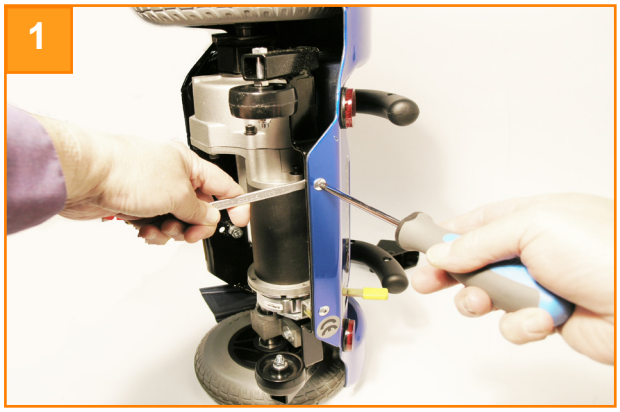
6

Engage the parking brake lever. The meter will read approximately 25 - 35 Ohms.

Rear Drive Assembly Panel

De dock the drive assembly.

1



Use an 8.0 mm spanner & Phillips screwdriver to undo the 2 bolts at the rear of the assembly.

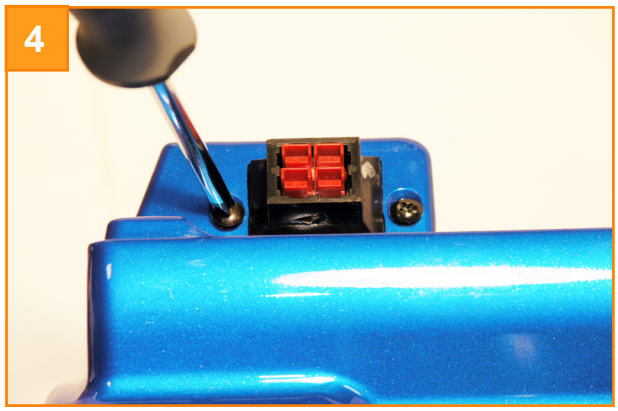
2

Use a Phillips screwdriver to undo the 4 screws on each handle.

3

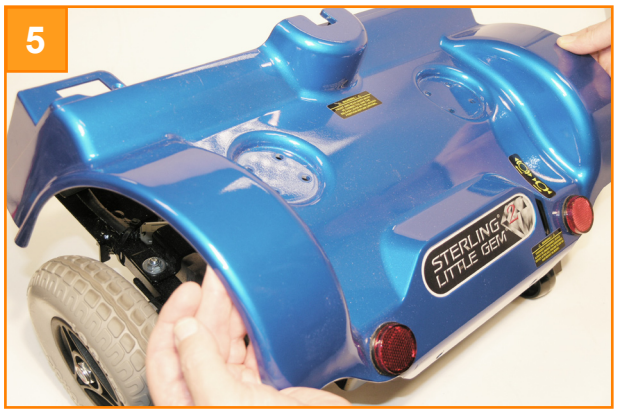
Remove both handles.

4



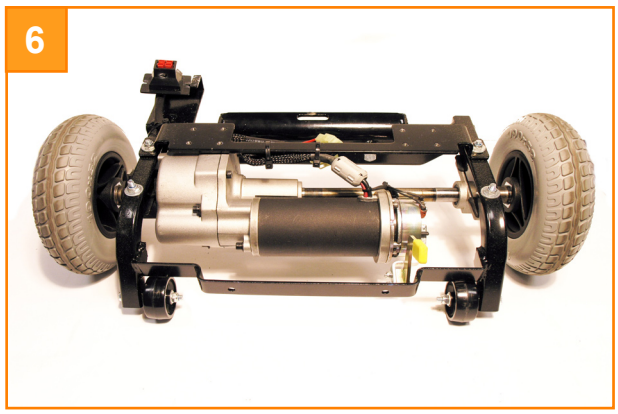
Use a Phillips screwdriver to undo the 2 screws on the 4 pin plug.

5



Carefully lift the rear panel off the drive assembly.

6

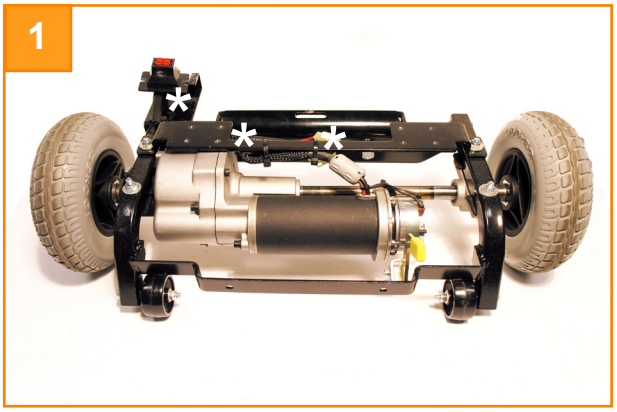


The Drive Assembly with the panel removed.

Rear Drive Assembly
Motor & Brake Removal

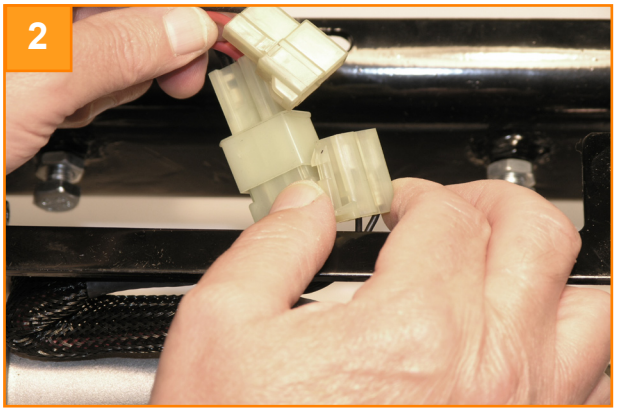
Please note that the motor, brushes, brake & micro switch are available as a complete assembly only.

1



Cut the 3 cable ties as shown above.

2



Disconnect the 2 plugs on the motor loom.

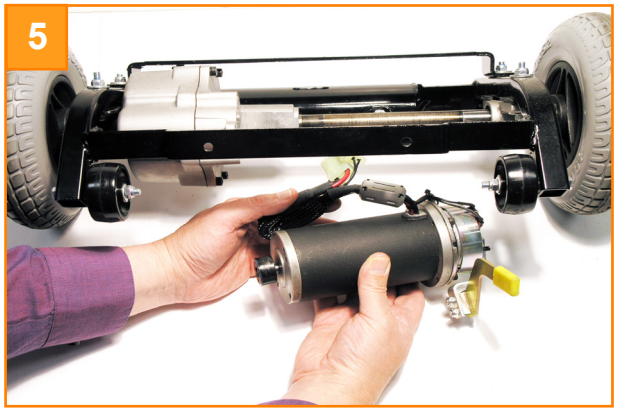
3

Use a 4.0 mm Allan Key to remove studs 1 & 2.
Note that stud 2 is the short stud.

4

Lift the drive assembly up to access stud 3.

5



Carefully pull the motor away from the transaxle.

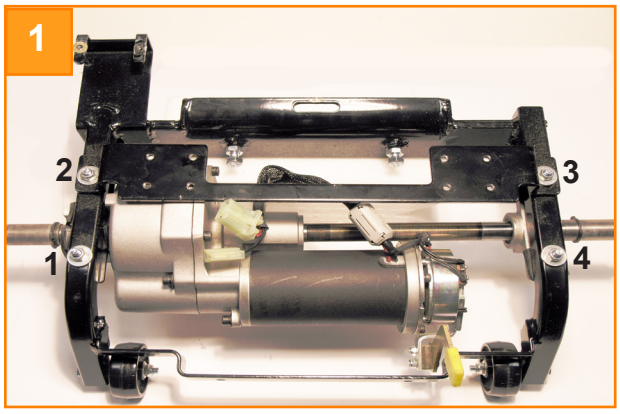
6

Take care not to lose the drive coupling key insert.
When refitting, the insert must be aligned with the slot in the gearbox coupling.

Rear Drive Assembly
Transaxle Removal

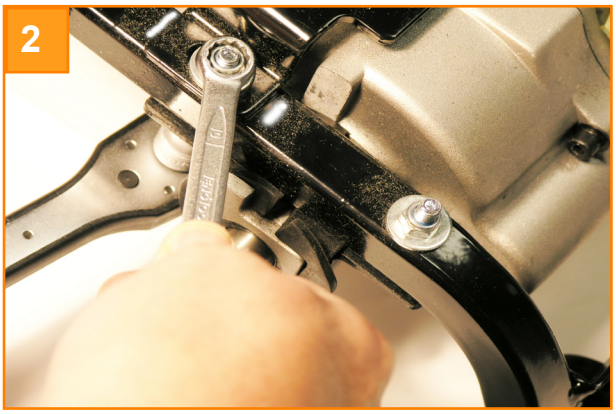
Remove the rear wheels (page 26) remove the panels (page 44) unplug the power loom (page 45).

1



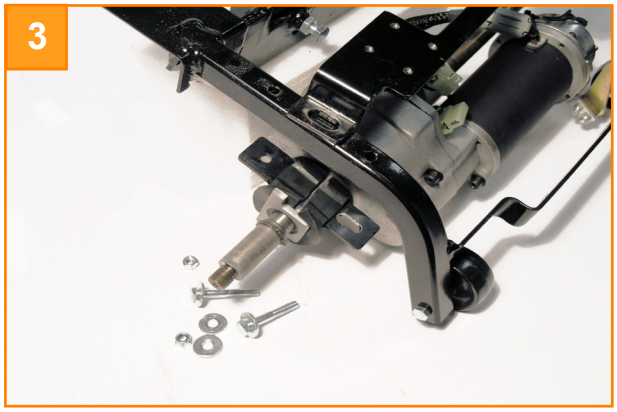
There are 4 bolts securing the transaxle to the frame. Note that bolts 3 & 4 are longer.

2



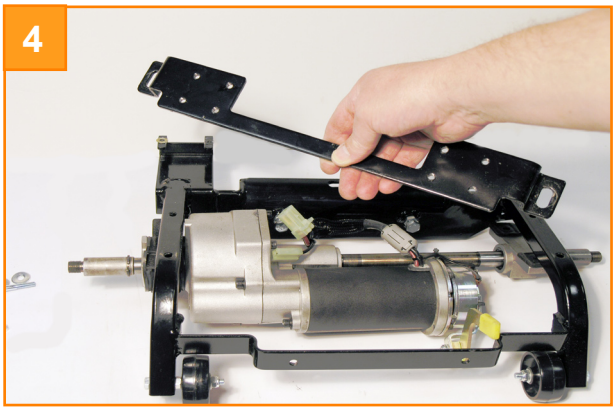
Mark the position of the bracket on the frame. Use a 10.0 mm spanner/socket to loosen all 4 bolts but do not remove the nuts completely.

3



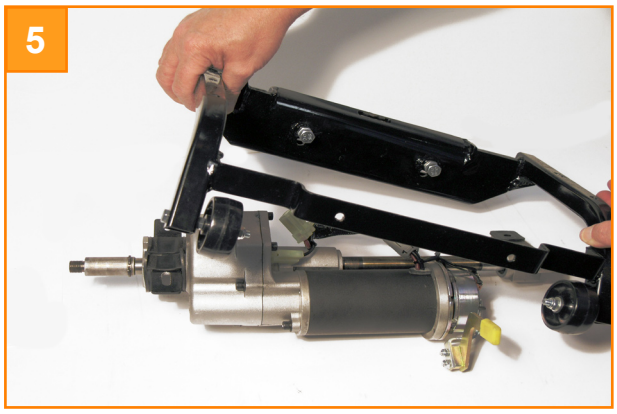
Remove the nuts from the heavier gearbox side & gently lower the transaxle. Release the nuts on the other side.

4



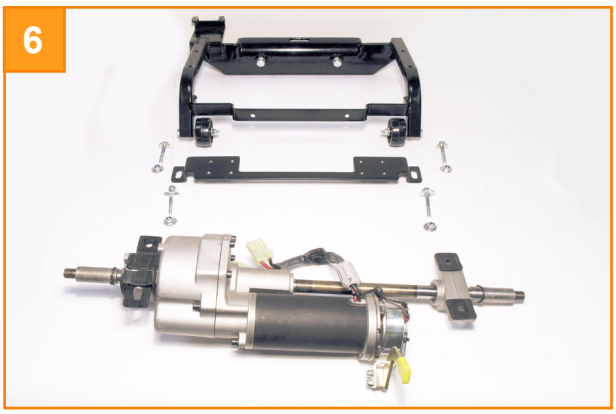
Lift the bracket off the frame.

5



Lift the frame off the transaxle.

6



The Transaxle, Bracket & Frame. Note that the motor can be removed at this point if preferred, (see page 45).

CHAPTER 12

Seat Assembly
Armrest Pads

1

Lift the armrest up.

2

Use a 10.0mm spanner/socket to undo the hinge bolt.

3

Lift the armrest off the bracket taking care not to lose the 2 plastic bushes on the inside edges.

4

Invert the armrest & use a Phillips screwdriver to undo the 2 screws. Note that the countersunk screw is towards the back.

5

Lift the armrest away from the arm pad.

6

The Armrest & Arm pad.

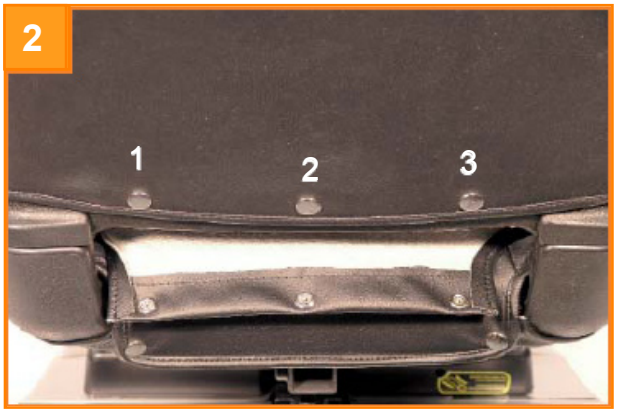
Seat Assembly Covers

To clean the upholstery, wipe down with a damp cloth using a mild detergent. DO NOT MACHINE WASH the covers.

1

The cushion covers can be replaced while the seat is still attached to the scooter.

2

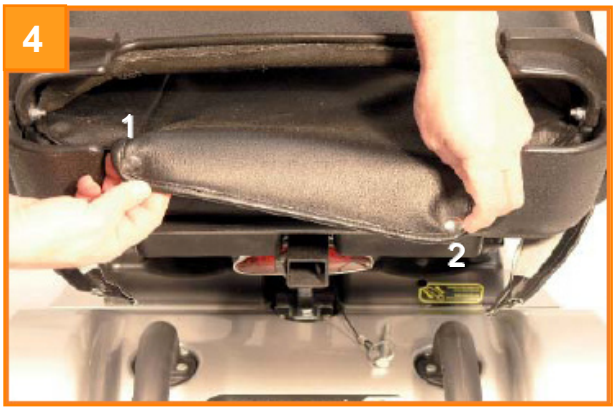


To release the backrest cover, undo the 3 pop studs at the back.

3

Peel the backrest cover upwards & back over the backrest. The cover will turn inside-out; this is normal.

4



Release the 2 pop studs on the seat cover

5

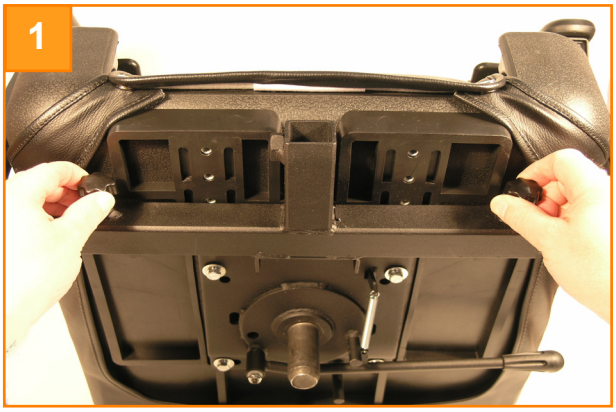
Peel the seat cover from the front, the cushion will lift & the cover will pull clear.

6

The Backrest & Seat Covers.

Seat Assembly
Seat Plate

1

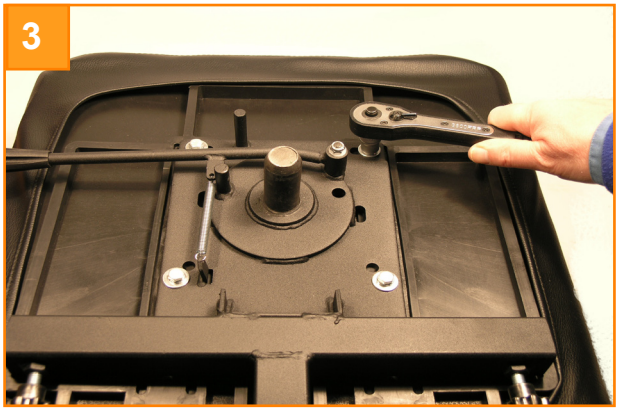


Unscrew by approximately 2 turns, the 2 width adjustment hand wheels.

2

Remove the armrests.

3



Use a 10.0mm spanner/socket to undo the 4 seat plate bolts as shown.

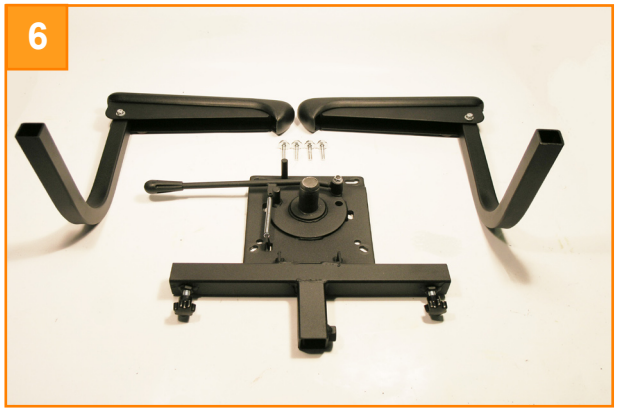
4

Remove the bolts and lift the seat plate away from the seat base.

5

The Seat Assembly.

6



The Armrest assemblies & Seat Plate assembly.

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446666