Service Manual

Luca XL

V2.0 from Jan. 1st 2015

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1. Introduction

1.1. Scope of this manual

This service manual contains information and instructions about general maintenance and repairs of this electric wheelchair.
This service manual is meant for:

- Service technicians: personnel that performs the regular maintenance and that solves technical problems to the wheelchair.
  Only service technicians that have completed the equipment training for this wheelchair are allowed to do maintenance on this wheelchair.
- Customer support personnel at Sunrise Medical HCM BV dealers: personnel that support customers when customers call to the dealer's office with questions about the wheelchair.
  For customer support this manual serves as reference material.

1.2. Reference documentation

This service manual refers, where necessary, to one of the other manuals that are available for this wheelchair.

- User manual wheelchair: for general information about the use of the wheelchair.
- User manual for the electronics: for detailed information about the use of the controller of the wheelchair.
- User manual for the seating system: for detailed information about the user adjustments and the use of the seating system.
- Spare parts manual: for information about the spare parts and their ordering numbers.
- Supplier documentation for the electronics: for detailed information about changing settings and doing repairs on the controls of the wheelchair.

1.3. Symbols used in this manual

This manual uses the following symbols to highlight information that needs extra attention.

WARNING!
Follow the instructions next to this symbol closely.
Not paying careful attention to these instructions could result in physical injury or damage to the wheelchair or to the environment.

NOTICE!
This provides useful background information.

1.4. Guidelines and useful information for maintenance

Service technicians
Maintenance (regular maintenance and repairs) to the wheelchair may only be done by service technicians that have been trained and authorised by Sunrise Medical HCM BV. Temporary employees and personnel in training are also allowed to do this work but only under the supervision of an authorised service technician.

Work safely
Always make sure that you work safely, particularly when you need to lift up the wheelchair. During maintenance and repair work you are at all times fully responsible to obey the local applicable guidelines and standards with regard to safety and environment. We advise you

to contact our service department before you do repairs to a wheelchair that has been involved in an accident.
We advise you to disconnect the wheelchair from the battery power, if the wheelchair has to be repaired because of a fault condition. Remove the main fuse(s) while the wheelchair is unattended.

Service and technical support
For information about settings, maintenance and repair works, please contact you supplier.

Make sure you have the following information at hand:
- Type
- Identification number
- Year of manufacture

This information is printed on the identification plate of the wheelchair.

How to order spare parts
For spare parts please use the Spare part manual to see what part numbers you need.

When you order spare parts, please specify:
- Identification number
- Part number
- amount of parts you need
- description (in the relevant language)
- dimensions (if applicable)

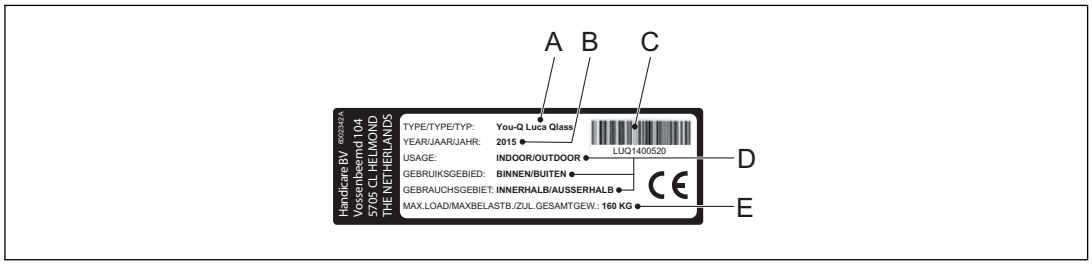
Please use e-mail or fax to send your orders to your supplier.

Remarks:
- Parts that do not have a position number cannot be ordered separately. Such parts belong to an assembly that must be ordered and replaced as one piece.
- Boxed position numbers refer to the relevant separate drawing.

Disposal
Always handle waste materials according to the local regulations.

Contact information Sunrise Medical HCM BV
Sunrise Medical HCM BV
Vossenbeemd 104
5705 CL Helmond
The Netherlands
T +31 (0)492 59 38 88
F +31 (0)492 53 79 31
customerservice@sunrisemedical.nl
www.SunriseMedical.eu

1.5. Product identification



A. Model
B. Year of manufacture
C. Identification number
D. Usage area
E. Maximum load in kg

2. Warranty and Liability

In the following warranty and liabilty stipulations the following terms are used:

- **Product**: the electric wheelchair manufactured Sunrise Medical HCM BV.
- **User**: the person who actually uses the product.
- **Customer**: the person who obtains the product from Sunrise Medical HCM BV.
- **Dealer**: the person/company who supplies the product from Sunrise Medical HCM BV to the customer.

2.1. Warranty

1. Save in so far as the following provisions stipulate otherwise, Sunrise Medical HCM BV warrants to the Customer or user of the Product that the Product is sound and fit for the purpose for which the Product is intended to be used – as set forth in the user's manual of the Product. Sunrise Medical HCM BV furthermore warrants the quality of the material used to manufacture the Product as well as the quality of the manufacturing process.
2. Sunrise Medical HCM BV shall replace parts of the Product which are defective due to faulty materials or manufacturing defects on free of cost basis, provided that such defects arise within one (1) year after the date of delivery of the Product to the Customer. Consequently, the following shall be excluded from the scope of free replacement as meant in the preceding sentence:
   a) replacement of parts of the Product required on account of defects arisen more than one (1) year after the date of delivery of the Product to the Customer;
   b) replacement of parts of the Product required on account of defects resulting due to improper or careless use of the Product or resulting due to using the Product for a purpose other than the intended purpose; if a Dealer is a Customer, this Customer shall save Sunrise Medical HCM BV harmless from and against any claims by Users or other third parties for defects resulting due to improper or careless use of the Product;
   c) parts subject to wear and tear, and the repair/replacement of these parts is the result of normal wear and tear;
   d) without prejudice to the provisions of article 2, the warranty with respect to the battery of the electric wheelchair only covers instances of malfunctioning or non-functioning which are evidently the direct result of material defects or manufacturing defects. The warranty as set out in these provisions does not cover a battery which is malfunctioning or non-functioning due to normal wear and tear or due to improper or incompetent use of the Product or the battery forming part of the Product, including the improper charging of the battery and the failure to perform timely and proper maintenance; the Customer shall save Sunrise Medical HCM BV harmless from and against any claims by Users or other third parties for defects resulting due to improper or careless use of the Product or the battery forming part thereof. This includes damage resulting due to the leakage of battery acid when performing maintenance to (wet) batteries.
3. The warranties as explained in the preceding provisions shall in any event cease to be effective if:
   a) the Product maintenance guidelines drawn up by Sunrise Medical HCM BV have been observed not at all or to an insufficient extent;
   b) repair/replacement of parts results from neglecting, damaging or overburdening the Product or using the Product for purposes other than its intended purpose;
   c) parts of the Product have been replaced by parts not of the same origin as those used by Sunrise Medical HCM BV and/or parts of the Product have been replaced without authorisation by Sunrise Medical HCM BV
4. The warranties as set forth in articles 1 up to and including article 3 above shall become null and void if the Product is reused by a new User within the warranty period and that reuse necessitated modifications, of whatever kind, to the Product, which modifications were not authorised or performed by and/or on the instructions of Sunrise Medical HCM BV
5. The above warranty shall also become null and void if through the agency of the Customer, in instances other than those mentioned in article 4, our Products have been altered in such way as to cause our Products to malfunction.
6. In the event of damage or other calamities the User or the Customer must contact Sunrise Medical HCM BV as soon as possible and provide the most extensive information possible if they wish to retain their rights under the warranty set out above. The possibility to lodge a claim under the above warranties shall lapse upon expiry of a period of twenty (20) days after the damage or calamity occasioning the claim arose.
7. The replacement of a part or the repair or reconditioning of the Product during a warranty period shall not extend the warranty period.

8. Any repair to or reconditioning of the Product not authorised or performed by and/or on the instructions of Sunrise Medical HCM BV shall not be covered by the scope of this warranty. If a User has authorised or performed and/or instructed the repair or reconditioning of a Product, the Customer shall save Sunrise Medical HCM BV harmless from and against any claims by third parties following – in the widest sense – from such repair or reconditioning.
9. In consideration of the matters considered in the preceding paragraphs of this article 9, the following parts subject to wear and tear or breakage risk shall in any event be excluded from the scope of free repair/replacement unless the breakage and/or wear and tear has been caused by faulty materials and/or manufacturing defects:
   a) foot plates and/or foot rests;
   b) carbon brushes;
   c) upholstery of the seat;
   d) frame covers, rain covers and other covers, apron, winter cover, immobilisation waistcoats, cross straps, sitter's pants and other similar accessories;
   e) tyres;
   f) damage to breakable materials such as lamps and other parts qualifying as vulnerable.
   Depending on the other specifications of the Product, this list may be extended on the basis of a list possibly attached to these terms and conditions (Schedule 1).
10. In the event that a User lodges a claim under a warranty with a Customer or that a Customer lodges such claim, Sunrise Medical HCM BV shall be notified immediately.
11. If Sunrise Medical HCM BV has determined a claim under the warranty to be justified, the costs of transport to Sunrise Medical HCM BV will be borne by the Customer, the costs of transport to the Customer will be borne by Sunrise Medical HCM BV

2.2. Liability

1. Subject to the following provisions, Sunrise Medical HCM BV only assumes liability for damage arising out of death or bodily injury due to a defect in the Product for which Sunrise Medical HCM BV is liable and for damage to another good owned by the User of the Product in a private capacity, provided that such damage is the direct result of a defect in the Product.
2. Sunrise Medical HCM BV shall indemnify for damage as referred to in article 1 up to the sum covered by its statutory liability insurance taken out with its insurance company.
3. Sunrise Medical HCM BV shall not assume any other or additional liability than the liability set out in article 1. In particular, Sunrise Medical HCM BV shall not assume any liability for consequential damage in whatever form.
4. In so far as Sunrise Medical HCM BV – notwithstanding the provision of article 3 – is ordered by a Netherlands court or in any other forum for the settlement of disputes to pay damages other than referred to in article 1, Sunrise Medical HCM BV shall make indemnification in accordance with the provisions of article 2.
5. Sunrise Medical HCM BV shall not assume liability for damage resulting due to repair or replacement required to remedy defects caused by improper or careless use of the Product or caused by modifications made by the Customer or User which were not authorised or performed by and/or on the instructions of Sunrise Medical HCM BV
6. The Customer shall save Sunrise Medical HCM BV harmless from and against any claims by Users under the warranty provisions referred to in Article 9 or claims for liability under mandatory law if the Customer or third parties have made modifications which are not in accordance with the supplied instructions and/or which have been made using the wrong materials, unless this failure to observe the instructions or use the right materials is based on an error in the technical manual or other instructions imparted by Sunrise Medical HCM BV
7. The Customers shall likewise save Sunrise Medical HCM BV harmless from any against any liability resulting due to representations made by the Customer with regard to the Product which are incompatible with the quality or the normal use of the Product.

3. Safety

3.1. Personnel qualifications

Only service technicians that are trained and authorised by Sunrise Medical HCM BV are allowed to do maintenance and repairs to the wheelchair.
Temporary employees and persons in training are only allowed to do the maintenance and repairs to the wheelchair if they work under the supervision of an authorised service technician.

3.2. Cautions and warning statements

Safety information

- Safety information is indicated with the warning symbol. Wherever possible, safety information is provided in the relevant chapter.

Functionality

- After repairing, reprogramming or replacing parts, always check the functionality of the entire wheelchair. Pay special attention to safety features such as slowdown driving or drive inhibits when seat lift and tilt are both used.

Temperature

- Avoid physical contact with the wheelchair's motors at all times. Physical contact can cause burns. Motors are continuously in motion during use and can reach high temperatures. After use, the motors cool down slowly.
- If the wheelchair is not in use, make sure that it is not exposed to direct sunlight for lengthy periods of time. Some parts of wheelchair, such as the seat, the back and the armrest can become hot if they have been exposed to full sunlight for too long. This may cause burns or allergic reactions to the skin.

Programming

- Programming should only be conducted by healthcare professionals with in-depth knowledge of wheelchair control systems. Incorrect programming could result in an unsafe set-up of the wheelchair for a user. Sunrise Medical HCM BV accepts no responsibility for losses of any kind if the programming of the control system is altered without authorization of Sunrise Medical HCM BV

Seat adjustment factory settings
Sunrise Medical HCM BV will deliver a wheelchair with default factory settings. These settings depend on the options ordered with the wheelchair. When a configuration is ordered that causes interference, Sunrise Medical HCM BV applies modified settings.

Moving parts

- Contact with moving parts of the wheelchair should be avoided. Contact with moving parts can result in serious physical injury or damage to the wheelchair. Pay attention to the following parts:
  - Wheels (drive and castor)
  - Electric tilt in space adjustment
  - Electric back adjustment
  - Electric legrest

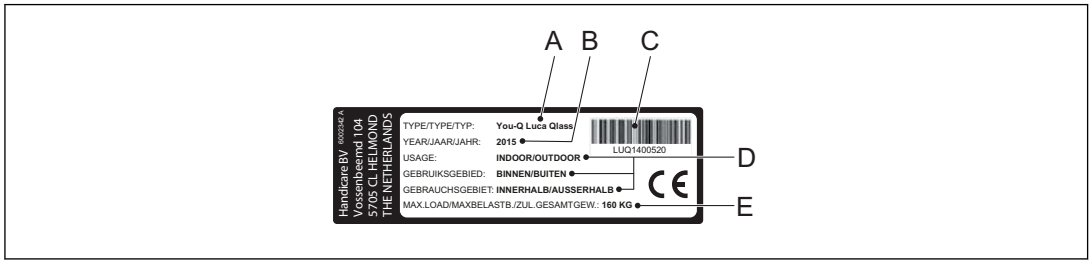
Electromagnetic radiation

The standard version of the electric wheelchair has been tested on the applicable requirements with respect to electromagnetic radiation (EMC requirements). In spite of these tests:

- it cannot be excluded that electromagnetic radiation can have influence on the wheelchair. For example:
  - mobile telephony
  - large scale medical apparatus
  - other sources of electromagnetic radiation
- it cannot be excluded that the wheelchair can interfere with electromagnetic fields. For example:
  - shop doors
  - burglar alarm systems in shops
  - garage door openers

In the unlikely event that such problems occur, contact your supplier immediately.

3.3. Pictograms on the wheelchair



A check manual before using.

B Danger of crushing
Be careful when swinging the controller aside to avoid getting anything crushed.

C Battery charging connection

D Attachment point of the tie down system for transportation on a vehicle.

E Freewheel switch
Do not put the freewheel switch in 'Push' mode on a slope.

F Trap danger
Danger of getting fingers jammed.

G Identification plate

4. Maintenance schedule & tooling

4.1. Overview of scheduled maintenance tasks

No Spares

NOTICE!
The wheelchair must be checked regularly by an authorized service technician.

System Unit	Task	Limit
Batteries	Charging	Daily (by the user)
Tyres	Check pressure and inflate if necessary	Weekly (by the user)
Wheelchair and upholstery	Clean	Weekly (by the user)
Electrical system	Inspection	Twice a year / every 6 months
Batteries	Inspection	Twice a year / every 6 months
Drive	Inspection	Twice a year / every 6 months
Mechanical parts	Inspection	Yearly
Bearings	Inspection	Yearly
Tyres	Check condition and profile	Yearly
Fasteners and bolts	Check condition and tighten if necessary	Yearly
Wheelchair	Check overall functionality	Yearly

4.2. Mechanical tools

The following tools and general supplies are needed to do the maintenance as described in this manual:

Description	Remark
Screwdriver	size: medium
Screwdriver	Phillips head
Rubber mallet	
Pair of wire cutters	
Circlip pliers	
Waterpump pliers	
Open ended spanner	sizes: 10, 13, 17, 19
Ring spanner	sizes: 10, 13, 17, 19
Torque wrench, up to 60 Nm with sockets	sizes: 10, 13, 17, 19
Allen keys	sizes: 3, 4, 5, 6, 7, 8
Loctite 270	for bolt securing
Loctite 648	
Tie wraps	color: black

n/a: not applicable

4.3. Electronical tools

The following tools and general supplies are needed to do the maintenance as described in this manual:

Part number	Description	DX2	DX	Shark	R-Net	VR2
00355.0440	Dynamic Hand Held Programmer (DX-HHP-GDW)	x	x	x		
1003236	Dynamic Wizard USB set OEM (DWIZ-KIT + DWD-OEM-U)	x				
6000668	Dynamic Wizard USB set dealer (DWIZ-KIT + DWD-DLR-U)	x		x	x	
9003295	PGDT R-Net programmer OEM (D50611)				x	
6000614	GDT VR2 PC-Programmer B set (D50145)					x
	Universal meter (voltage and resistance	x	x	x	x	x

4.4. Torque table

Use the general torques as indicated in the table below, unless specified otherwise

Thread Size	Pitch (mm)	Max. torque (Nm)
M4	0.7	3
M5	0.8	6
M6	1	10
M8	1.25	25
M10	1.5	50
M12	1.75	80
M14	2	120

The minimum torque values are 7 - 9 % below the maximum values.

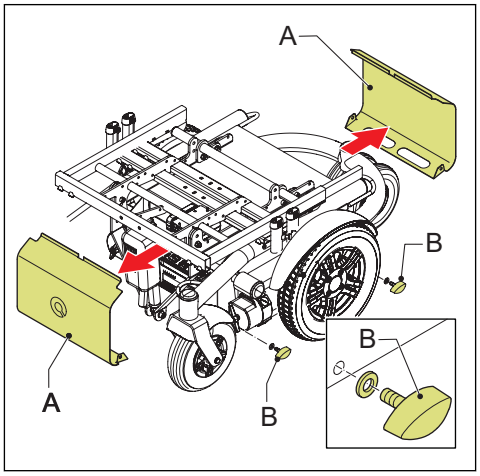
5. Maintenance tasks & adjustments

5.1. General preparations for maintenance

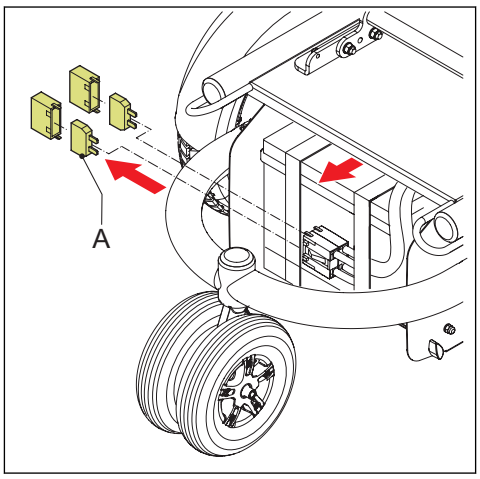
This chapter describes the general preparations that apply for all maintenance and repairs to the wheelchair.

WARNING!
Only do maintenance on an empty wheelchair.

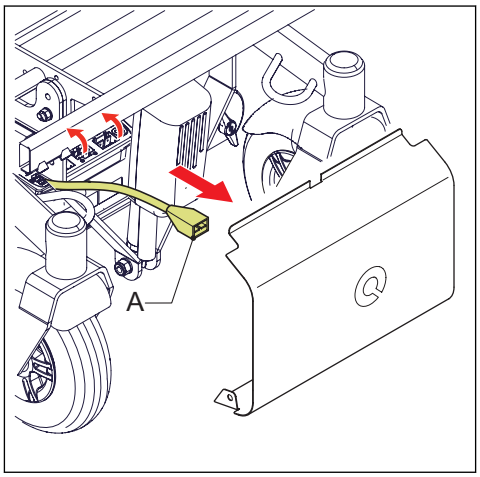
1. Switch off the wheelchair via the button on the controller.
2. Set both freewheel switches in 'Drive' mode.
3. Remove the wing bolts (B) and remove the covers (A).



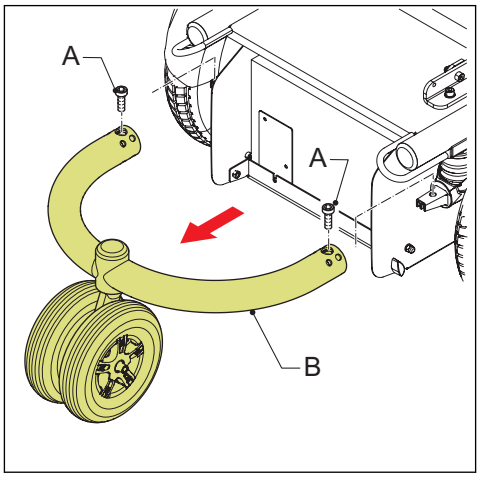
4. Disconnect the batteries by removing the main fuses (A).



5. Disconnect the motor cables (A) from the interconnection of the power module.



6. Remove the screws (A) to remove the rear bridge (B).

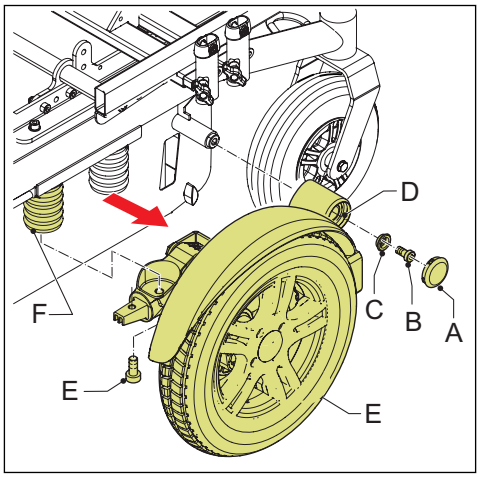


WARNING!
After repairing, reprogramming or replacing parts, always check the functionality of the entire wheelchair. Pay special attention to safety features such as slowdown driving or drive inhibits when seat lift and tilt are both used.

5.2. Carrier

5.2.1. Disassemble a motor arm

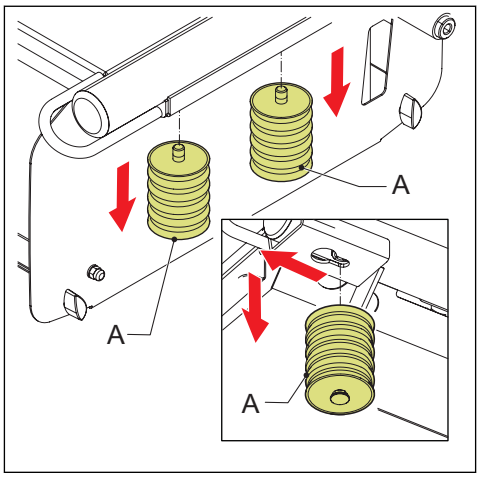
Preparation
See section *5.1.*
Procedure
1. Lift the wheelchair until the wheels are free from the floor.
   - Use a lifting platform.
2. Remove the cap (A).
3. Remove screw (B) and bearing holder (C).
   - Use an allen key size 7.
   - The screw is secured with locking glue.
4. Remove the screw (E) to loosen the rubber suspension (F) from the motor arm.
5. Hold the motor arm (D) in position and carefully slide it outward.
6. Take the motor cable out of the carrier.



A number of parts are now accessible for repairs. See the applicable procedure for further instructions.

5.2.2. Replace a rubber suspension

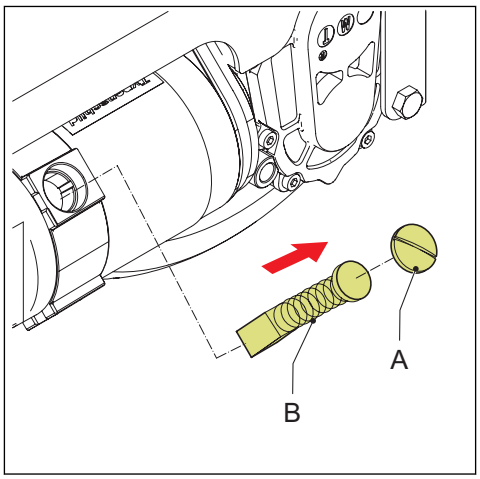
Preparation
See section *5.2.1.*
Procedure
1. Remove the old rubber suspensions (A) from the carrier frame.
2. Put the new rubber suspensions on the carrier frame.
3. Install the motor arm on the wheelchair. See section *5.2.5.*



5.2.3. Replace the carbon brushes

Preparation
See section
Procedure

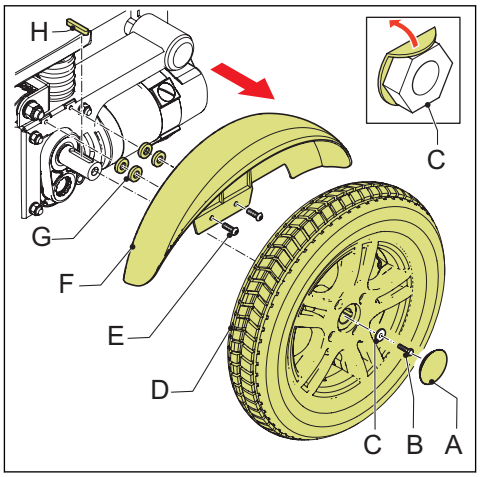
1. Remove the cap (A).
2. Remove the old carbon brush (B).
3. Gently blow some air through the hole (to remove any dust).
4. Put the new carbon brush in the motor.
5. Put the cap on the motor.
6. Repeat steps 1 through 5 for all the carbon brushes on the motor.
7. Mount the motor arm on the wheelchair. See section



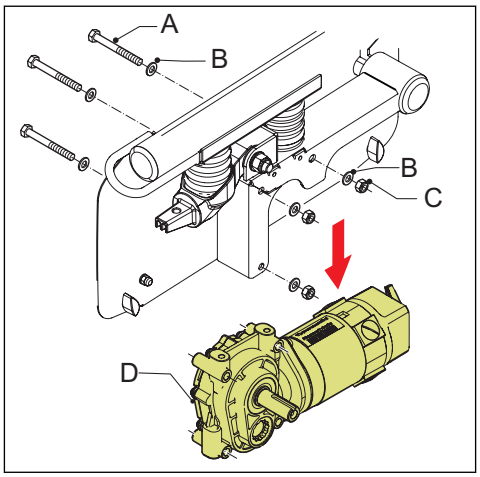
5.2.4. Replace a drive motor

Preparation
See section *5.1.*
Procedure

1. Remove cap (A).
2. Unfold the washer (C).
3. Remove screw (B).
4. Remove the drive wheel (D) from the motor axle.
   - Make sure that you do not loose the key (H).
5. Remove the mudguard (F) for easy access.



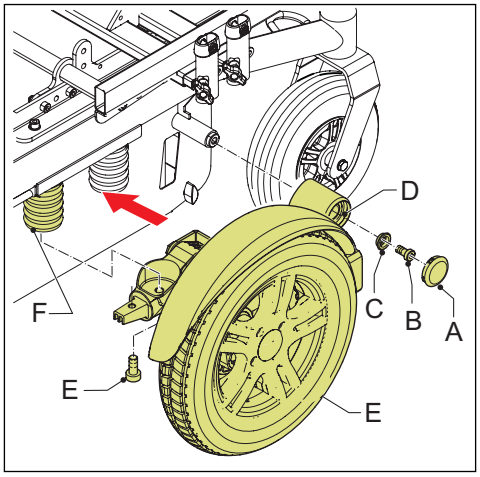
6. Remove the old drive motor (D)
   The screws (A), rings (B) and nuts (C) can be discarded.
7. Install the new motor.
   Use the screws and nuts that are enclosed with the new motor.
8. Install the mudguard.
9. Install the drive wheel.
   a. Put some grease on the axle to prevent fretting.
   b. Mount the drive wheel on the axle.
   c. Make sure to lock the nut by folding the washer.
10. Make sure that the drive wheel does not interfere with the motor.



11. Install the motor arm on the wheelchair. See section *5.2.5.*

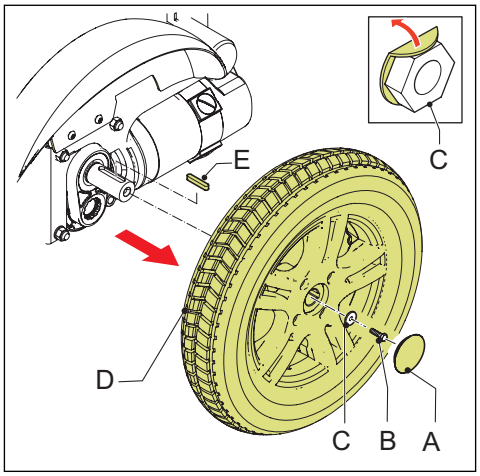
5.2.5. Install a motor arm

Preparation
Make sure that the rubber suspension is installed on the carrier.
Procedure
1. Put the motor cable through the carrier.
   Do not connect it yet.
2. Hold the motor arm (D) and carefully slide it inward on the carrier.
   - Make sure that the rubber suspension (F) fits into the gap on the motor arm.
3. Fasten screw (E) to secure the rubber suspension.
4. Fasten the motor arm to the carrier frame. Use some Loctite 648 to secure the screw (B).
5. Connect the motor cable to the interconnection of the power module.



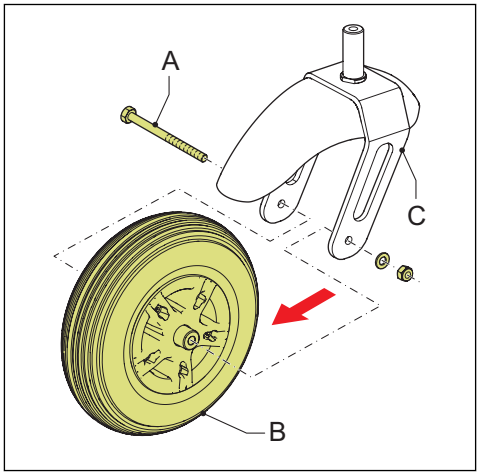
5.2.6. Replace a drive wheel

Preparation
See section *5.1.*
Procedure
1. Lift the wheelchair until the wheels are free from the floor.
   - Use a lifting platform.
2. Remove cap (A).
3. Unfold the washer (C).
4. Remove screw (B).
5. Remove the old drive wheel (D) from the motor axle.
   - Make sure that you do not loose the key (E).
6. Install the new drive wheel.
7. Make sure that the drive wheel does not interfere with the motor.



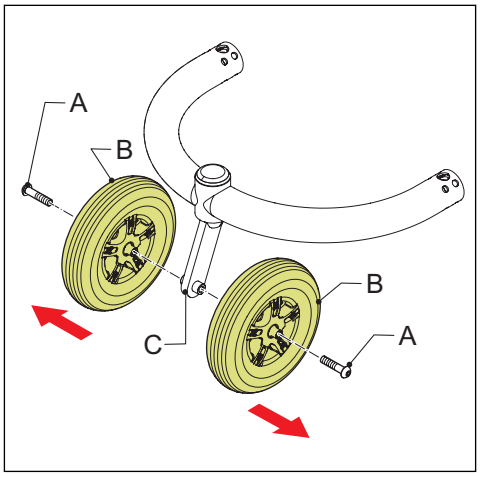
5.2.7. Replace the castor wheel on the frontside

Preparation
See section *5.1.*
Procedure
1. Lift the wheelchair until the wheels are free from the floor.
   - Use a lifting platform.
2. Remove screw, washer and nut A.
3. Take out the old castor wheel (B) from the castor fork (C).
4. Install the new castor wheel.
   - Use a new lock nut.



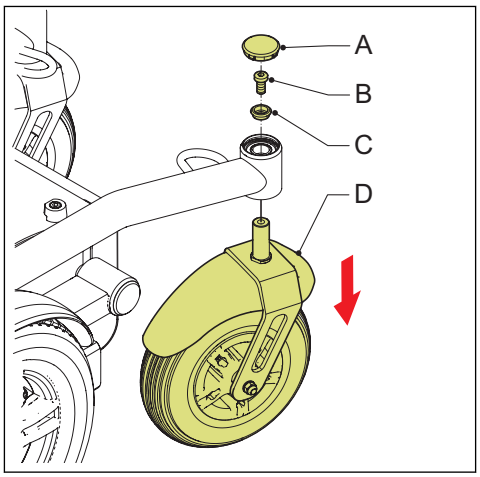
5.2.8. Replace a castor wheel on the rear bridge

Preparation
See section *5.1.*
Procedure
1. Lift the wheelchair until the wheels are free from the floor.
   - Use a lifting platform.
2. Remove the screws (A).
3. Take out the old castor wheels (B) from the castor fork (C).
4. Install the new castor wheels.
   - Use a new lock nut.



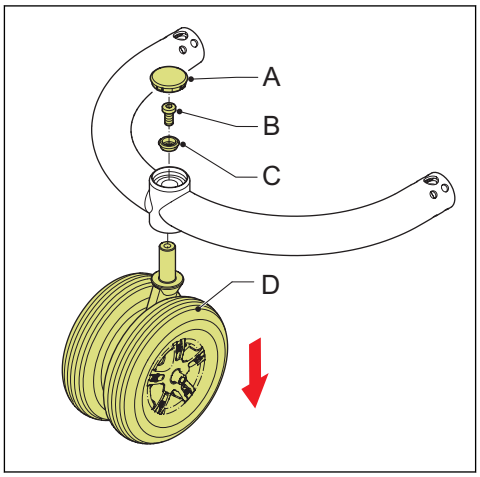
5.2.9. Replace a castor fork at the frontside

Preparation
See section *5.1.*
Procedure
1. Lift the wheelchair until the wheels are free from the floor.
   - Use a lifting platform.
2. Remove cap (A).
3. Remove screw (B) and bearing holder (C).
   - Use an allen key size 7.
   - The screw is secured.
4. Remove the old castor fork (D) from the carrier frame.
5. Install the new castor fork on the carrier frame.
   Use some Loctite 648 to secure the screw (B).



5.2.10. Replace a castor fork at the rear bridge

Preparation
See section *5.1.*
Procedure
1. Lift the wheelchair until the wheels are free from the floor.
   - Use a lifting platform.
2. Remove cap (A).
3. Remove screw (B) and bearing holder (C).
   - Use an allen key size 7.
   - The screw is secured.
4. Remove the old castor fork (D) from the carrier frame.
5. Install the new castor fork on the carrier frame.
   Use some Loctite 648 to secure the screw (B).



5.2.11. Replace the batteries

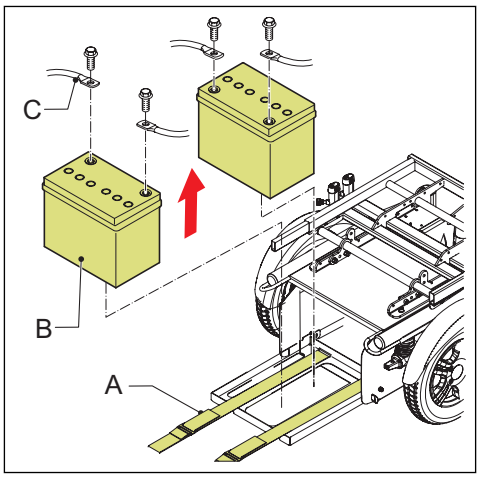
Preparation
See section *5.1.*
Procedure

1. Loosen the battery straps (A).
2. Disconnect the power cables (C).
3. Remove the old batteries (B).
4. Put the new batteries in the carrier.
5. Connect the power cables.

WARNING!
See the 'cables and module schemes' in section *8.*

6. Tighten the battery straps and make sure that the power cables are properly placed underneath the battery straps.

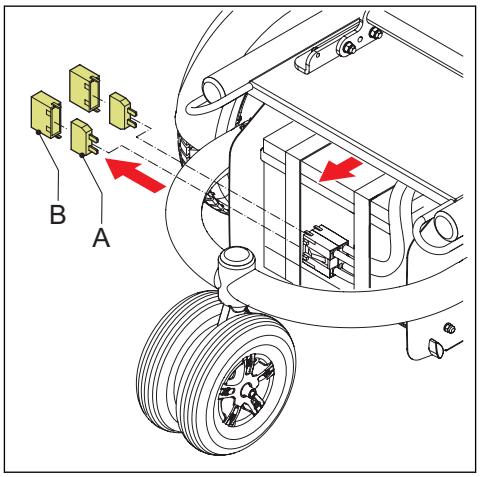
WARNING!
Make sure that the battery straps are tight.



5.2.12. Replace main fuses

Preparation
See section *5.1.*
Procedure

1. Remove the caps (B) and the old fuses (A).
2. Put the new fuses in the fuse holders and put the caps on the fuse holders



5.3. Legrests

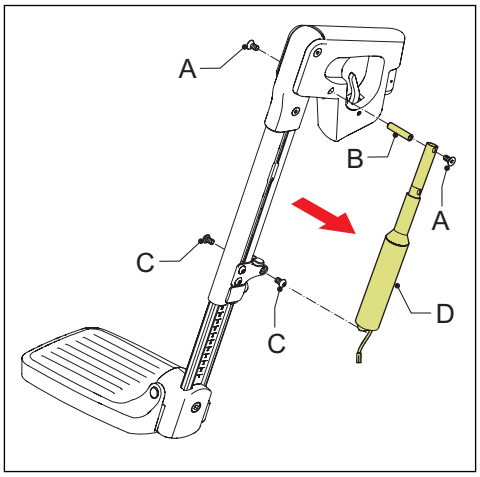
5.3.1. Replace the actuator of a powered legrest

Preparation

1. Lift the legrest out of the wheelchair.

Procedure

1. Remove the tie wraps and disconnect the actuator cable from the legrest.
2. Remove the screws (A) and (C) and the tube (B).
3. Remove the old actuator (D) from the legrest.
4. Put the new actuator in the legrest.
5. Connect the actuator cable to the legrest.
6. Put the connector cable into the groove of the legrest and fasten the connector cable with tie wraps.
   Make sure that you leave enough free cable length to let the actuator reach its full length.
7. Check the functionality of the actuator.



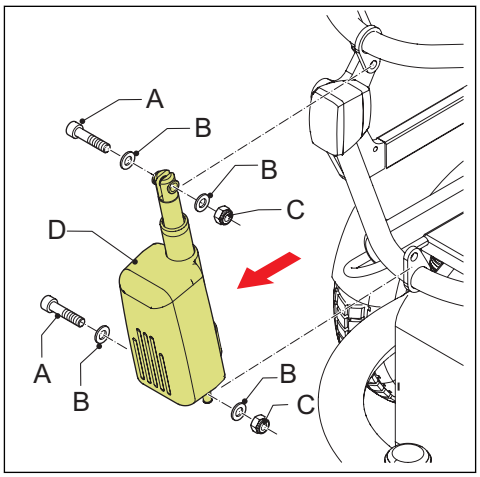
5.3.2. Replace the motor of the backrest recline

Preparation

See section *5.1.*

Procedure

1. Remove the seat cushion for easy access.
2. Disconnect the motor cable.
3. Remove the old motor (D) from the backrest by removing screws (A), the washers (B) and mugs (C).
4. Put the new motor in the backrest.
5. Fasten the screws (A), the washers (B) and mugs (C).
6. Connect the motor cable.
7. Make sure that the motor cable is properly arranged. Use tie wraps.
8. Put the seat cushion in the wheelchair.
9. Check the functionality of the actuator.



5.4. Seating system

5.4.1. Replace the tilt actuator

Preparation

1. Set the seat in the maximum tilted position for easy access.
2. See section *5.1.*

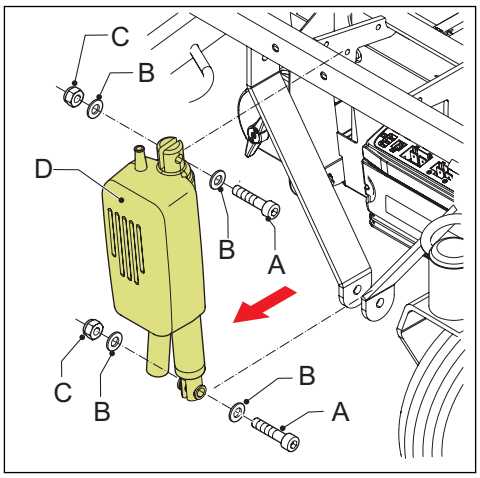
Procedure

1. Make sure that the seat is kept in the tilted position. For instance by placing a support.
2. Remove the seat cushion for easy access.
3. Disconnect the actuator cable.
4. Remove the screws (A), washers (B) and nuts(C) at both ends of the actuator (D).
5.

WARNING!
Make sure that the tilted seat is supported safely.

Remove the old actuator.

6. Put the new actuator into the tilt mechanism.
7. Connect the actuator cable.
8. Make sure that the actuator cable can follow the movement of the mechanism but that the cable does not get jammed by the mechanism.
9. Check the functionality of the actuator.



6. Maintenance on the control system

6.1. Replace the remote control (R-Net)

The driving program of the R-Net controller systems is stored in the power module.
Replacing the remote control can therefore be done without any programming.

1. Replace the remote control.

6.2. Replace the power module (R-Net)

The driving program of the R-Net controller systems is stored in the power module.

1. Make a backup of the driving program from the power module.
   Use a laptop and programming software for this step.
2. Replace the power module.
3. Load the backup of the driving program in to the new power module.
4. Check all functionality of the wheelchair.

7. Troubleshooting

This chapter contains table with troubleshooting information. One table shows the troubleshooting for the wheelchair in general, the other tables show information about troubleshooting for the available controls systems.

NOTICE!
If the problem is not solved with the help of the solutions in the tables, contact your dealer/distributor or the Service Department of Sunrise Medical HCM BV.

7.1. General diagnostics and faultfinding

Problem	Cause	Solution
Wheelchair does not switch on	Buscables not connected	Check buscable connections of the joystick module to the power module (can also be through the actuator module!)
	Pins in connectors are loose or damaged	Check connectors for loose or damaged pins. If damaged replace cable.
	Buscable defect	Check all bus cables for damage. Bypass each buscable with new one to check functionallity.
	Fuse defect / Thermal trip	Check fuses and replace if needed.
	Battery connections are loose	Check battery connections and restore if needed.
	Battery voltage too low	Measure battery voltage and charge batteries.
	Battery defect	Measure battery voltage. Voltage below 10 V can indicate that one battery is defect. Replace batteries.
	Remote control or button defect	Check by replacing with new one.
	Power Module defect	Check by replacing with new one.
Wheelchair continuously drives slower than normal	Speed limit due to microswitch signal from seating function.	Check if all seating options are in neutral position.
		Measure resistance from the speed limit cable in different seating positions. Bad cable connections or a broken resistor influences the drive inhibit signal.
	Incorrect programming	Check for correct program. Re-program if needed.

Problem	Cause	Solution
	Parking brake partially engaged	Check parking brake function. Clicking sound at engaging/disengaging should be present. Check temperature of parking brake after driving.
Wheelchair drives slower throughout the day (or after several hours)	Poor batteries	Check batteries and battery voltage.
	Poor or incomplete battery charging	Check battery charger. Check charging duration with the user.
	Thermal rollback (overheating)	Check usage of wheelchair, extreme usage can cause the power module to decrease the maximum currents for protection. Check wheelchair in freewheel mode for extreme resistance on rolling or turning.
	(DX2 controls only) Gyro module (if present) is not connected correctly or is not functioning properly => Controllers switch to *SystemSlowDown* mode.	Check Gyro cabling and/or replace Gyro module.
Wheelchair only drives well for a short period of time.	Current limit is set too low or the controller is underspecified	Check program settings and/or replace controller.
Wheelchair can be powered up, but does not drive.	Parking brakes are in freewheel mode (flash code on remote!)	Set parking brakes to Drive mode.
	Drive inhibits active (flash code on remote)	Check program which Drive inhibits are present. Check cabling of Drive inhibits on wheelchair.
Wheelchair has too little power to drive properly	Tyre pressure of drive wheels or castors is too low	Check pressure and inflate if needed. See User manual for correct value.
	Programming of speed and Torque Settings is not correct	Check programming and make corrections if needed.

Problem	Cause	Solution
	Programming of Motor Load Compensation is not correct	Check programming and make corrections if needed. Check with manufacturer for correct value.
Wheelchair veers to one side	Programming of Load Compensation is not correct.	Check programming and make corrections if needed.
	Motors are not "balanced"	Check motor rpm. See motor label for correct value.
	Tyre pressure or tyre size left and right are different	Check tyre pressure and tyre size (diameter).
	Suspension "hardness" left and right are different.	Check suspensions and make sure left and right side have identical suspension rates.
	Carrier is not "in balance" due to mechanical flaws	Check for loose bolts, cracked or worn frame parts. Check height of carrier left and right.
	User weight is not in the center of the wheelchair	Check position of user, see if position can be improved. If not possible use veer compensation in program to correct the steering.
	Chair stops intermittently	High Voltage due to overcharging or driving down slopes with full batteries (regenerative braking). Check battery voltage, drive down slope at lower speed.
	Worn carbon brushes	Check brushes, replace if needed.
	Speed Limit due to micro switch	Check functioning of micro-switch. Due to vibrations or shocks it can temporarily switch to Slowdown mode.
Castor wheels "wobble" at higher speed	Tyre pressure too high.	Check tyre pressure and decrease if needed. See user manual for correct value.
	Too little load on the castor wheels.	Modify seating setup if possible or decrease tyre pressure.

Problem	Cause	Solution
Motors make excessive noise	Worn carbon brushes	Check carbon brushes and collector. If needed replace brushes or motor.
Wheelchair wobbles overall or moves up and down when driving	Drive wheels have radial misaligned tyres. Can be caused by long (weeks) inactive periods	Check for misalignment of tyres. If misaligned, reduce tyre pressure to 1 bar, drive for several minutes at moderate speed and increase pressure again to advised value. Misalignment can be reduced this way. If not sufficient replace wheel.
Seating actuator does not function	Current setting is not correct	Check programming and make corrections if needed. Contact manufacturer for correct settings.
	Cables not connected or cables damaged	Check cables and replace if needed.
	Wheelchair goes into fault status when actuator is operated	Actuator has a short circuit that becomes active when the actuator is operated. Replace actuator.
	Actuator inhibit is active	Check program to see what actuator inhibit is present. Check if inhibit signal is functioning correctly. (example : with lift and tilt to maximum, recline will no longer move backwards.
	Actuator module (output) fault	Try actuators on different output channel to check what output channel has a fault.
Seating actuator only functions for a short time	Maximum current setting is too low	Check programming and make corrections if needed. Contact manufacturer for correct settings.
	Actuator time out setting is too short (or actuator speed is too low)	Check programming and make corrections if needed. Contact manufacturer for correct settings.
	Actuator is internally not functioning properly	Check actuator temperature after operation and/or check for excessive noise when operated. Replace actuator.

Problem	Cause	Solution
	Seating mechanism is moving poorly or with extreme friction	Check mechanisme on loose bolts, cracked or bent parts. Replace parts or modules.
Seating actuator moves in wrong direction (after replacement)	Wiring connections possibly twisted in cable or motor	Change actuator direction in driving program or replace cable or part.
Lighting does not function	Cabling not (correctly) connected	Check cabling. See wiring diagrams for correct connections.
	Lighting settings not correctly set in program	Check programming and make corrections if needed.
Wheelchair moves/turns very slowly and seems to be lacking power	Load compensation too low, incorrect setting.	Modify load compensation in driving program. Check with manufacturer for correct settings.
	Too much load on front castors (RWD).	Modify seating setup to have better weight distribution.
Wheelchair moves very rapidly and jerky	Load compensation is too high.	Modify load compensation in driving program. Check with manufacturer for correct settings.

7.2. Diagnostics and troubleshooting for R-Net controls

WARNING!
Remove both fuses from the batteries before you change any cables, fuses and/or modules. This way the power is disconnected from the wheelchair.

NOTICE!
For more detailed information about R-Net Controllers, specific manuals can be downloaded from the website: www.pgdt.com.

Trip Text	Trip code	Description
Joystick error	-	The most common cause of this error is when the joystick is not in the center position when the control system is switched on. The *Joystick displaced* screen is shown for 5 seconds. If the joystick is not released within this time, the system reports an error. • Make sure that the joystick is in the center position and re-try to switch on the system. If the error is still present: the joystick or the joystick module may need to be replaced.
Low Battery	-	The control system detects that the battery voltage is below 16V. • Check the condition of the batteries and check the connections to the control system. If this does not solve the error, the power module may be defect.
High Battery	-	The control system detects that the battery voltage is above 35 V. Most common reasons for this are: overcharging of the batteries or bad connections between the batteries and the control system. • Check the condition of the batteries and check the connections to the control system. If this does not solve the error, the power module may be defect.
M1 Brake Error	1505	The control system detects a problem in the solenoid brakes of the M1 motor or the connection to them. • Check the solenoid brakes, cables and the connections to the control system. If this does not solve the error, the power module may be defect.
M2 Brake Error	1506	The control system detects a problem in the solenoid brakes of the M2 motor or the connection to them. • Check the solenoid brakes, cables and the connections to the control system. If this does not solve the error, the power module may be defect.
M1 Motor Error	3B00	The control system detects that this motor has become disconnected. • Check the motor, cables and the connections to the control system. . If this does not solve the error, the power module may be defect

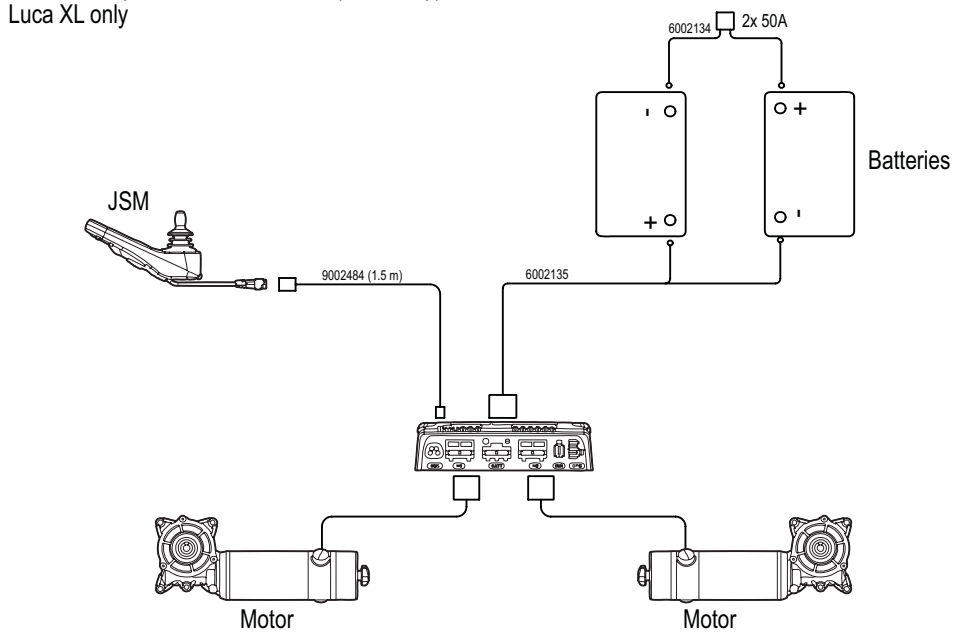
Trip Text	Trip code	Description
M2 Motor Error	3C00	The control system detects that this motor has become disconnected. • Check the motor, cables and the connections to the control system. If this does not solve the error, the power module may be defect.
Inhibit Active	1E01 1E09 1E0A	One of the inhibit input is active and in a latched state. The active inhibit is indicated by the last 2 digits of the trip code. • Turn the power off and on. This will drop out of the Latched Mode which might clear the trip. • Check all cables and switches that are connected to the active inhibit. If this does not solve the error, the ISM may be defect.
Joystick Calibration Error	-	The Calibration of the joystick has not been successful. • Enter OBP and re-try to calibrate. If this does not solve the error, the joystick module may be defect.
Memory Error	-	This is a non-specific memory error which can be caused by any of the modules within the system. • Check all cables and connections. • Turn the power off and on. If the error is still present and the system contains modules not supplies by PGDT: • Disconnect all non-PGDT modules and turn the power off and on. If this has solved the error: • Connect each non-PGDT module in turn and turn the power off and on each time to see which module causes the problem. If this does not solve the error, the power module may be defect.
PM Memory Error	-	This is a specific error for the Power Module • Check all cables and connections. • Re-program the control system. Use the R-Net PC programmer to program the most current specific program for wheelchair or the manufacturers original programming file. If this does not solve the error, the power module may be defect.

Trip Text	Trip code	Description
Gone to Sleep	-	The control system has been left inactive for a longer period of time than the time indicated by the Sleep Timer. An entry is made in the log each time this occurs. The control system "wake up" again when the joystick or a button is used.
Charging	-	The control system detects that a charger is connected to Inhibit 1 or to in Inhibit 3. The *Battery charger* screen is shown during charger connection. An entry is made in the system log each time this occurs. If the On-Board charger is used: • Disconnect the charger from the AC supply. If an Off-Board charger is used: • Disconnect the charger from the wheelchair. If this error is still present when the charger is disconnect, the joystick module may be defect.

8. Cable and module schemes

8.1. R-Net controls

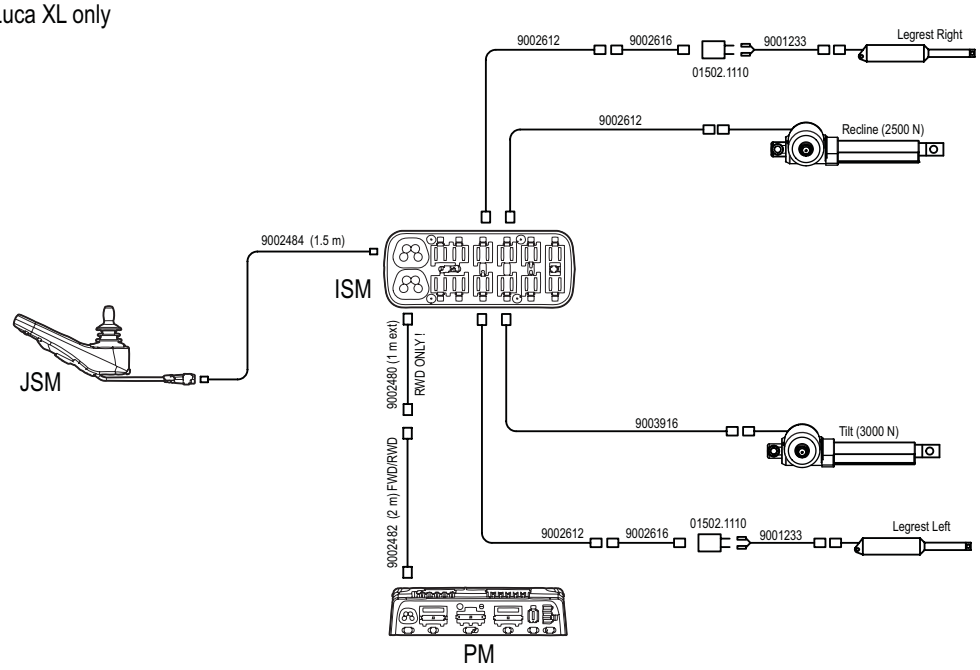
R-Net Battery & Motor connections (Drive only)
Luca XL only



Cable lenghts are not drawn to scale!

R-Net 1

R-Net Tilt45, Recline, Legrests, Lift (Lights can be optional)
Luca XL only



Cable lenghts are not drawn to scale!

R-Net 2

9. Version history

Version	Release date	Changes
V0.1	Oct. 8th 2014	Draft 1
V0.2	Oct. 10th 2014	Draft 2
V1.0	Oct. 10th 2014	Final
V2.0	Jan. 1st 2015	New company name.