

# Invacare® Kite Series



en Power Wheelchair  
Service Manual



PROVIDER: Keep this manual.  
The procedures in this manual MUST be performed by a qualified technician.



**Yes, you can.®**

© 2020 Invacare Corporation

All rights reserved. Reproduction, duplication or modification in whole or in part is prohibited without prior written permission from Invacare. Trademarks are identified by ™ and ®. All trademarks are owned by or licensed to Invacare Corporation or its subsidiaries unless otherwise noted.

Making Life's Experiences Possible is a registered trademark in the U.S.A.

# Contents

<b>1 General</b> . . . . .	<b>4</b>
1.1 Introduction . . . . .	4
1.2 General Information . . . . .	4
1.3 Notes on Shipping . . . . .	4
1.4 Symbols in this Manual . . . . .	4
1.5 Images in This Manual . . . . .	5
<b>2 Safety</b> . . . . .	<b>6</b>
2.1 Safety information . . . . .	6
2.2 Safety and Fitting Instructions . . . . .	6
<b>3 Hygiene</b> . . . . .	<b>8</b>
3.1 Handling of Returned Used Products . . . . .	8
<b>4 Setup</b> . . . . .	<b>9</b>
4.1 General information on setup . . . . .	9
4.2 Adjusting Seating Position . . . . .	9
4.3 Adjusting Lower Leg Length . . . . .	9
4.4 Adjusting Seat Depth . . . . .	9
4.5 Adjusting Seat Height . . . . .	9
4.6 Adjusting Centre of Gravity of the Seat . . . . .	10
4.6.1 Modulite Seat . . . . .	11
4.6.2 Telescopic Seat Frame . . . . .	12
4.6.3 One-Piece Seat Plate . . . . .	12
<b>5 Testing</b> . . . . .	<b>14</b>
5.1 Testing Motor . . . . .	14
5.2 Testing Motor Brake . . . . .	14
5.3 Rain test . . . . .	14
5.4 Field Load Test . . . . .	15
5.5 Checking Battery Charge Level . . . . .	15
5.6 Checking Actuator . . . . .	16
<b>6 Service</b> . . . . .	<b>17</b>
6.1 General Warning Information on Installation Work . . . . .	17
6.2 Tightening Torques . . . . .	17
6.3 Troubleshooting . . . . .	17
6.3.1 Operational Faults . . . . .	17
6.3.2 Drive Fault Diagnosis . . . . .	18
6.4 Service Plan (Once a Year) . . . . .	18
6.5 Overview Components . . . . .	20
6.5.1 Overview Mobility Device . . . . .	20
6.6 Shrouds . . . . .	21
6.6.1 Rear Shroud . . . . .	21
6.6.2 Middle shroud . . . . .	21
6.6.3 Side Shroud . . . . .	22
6.6.4 Front Shroud . . . . .	22
6.6.5 Replacing Front Fender (Single-Sided Fork) . . . . .	22
6.6.6 Replacing Fender (Double-Sided Fork) . . . . .	23
6.6.7 Replacing Rear Fender . . . . .	24
6.7 Chassis . . . . .	25
6.7.1 Replacing Tube Frame . . . . .	25
6.7.2 Replacing Double Bearing of Dual Swing Technology (D.S.T.) . . . . .	25
6.7.3 Replacing Rubber Shock Absorbers . . . . .	26
6.7.4 Replacing Battery Tray . . . . .	27
6.8 Drive Components . . . . .	28
6.8.1 Replacing Motor-Gearbox Unit . . . . .	28
6.8.2 Replacing or Rotating Motor-Gearbox Unit Sealing Ring . . . . .	29
6.8.3 Replacing Motor-Gearbox Coupling . . . . .	30
6.8.4 Replacing Carbon Brushes . . . . .	30
6.8.5 Replacing Engaging Turn Knob . . . . .	32
6.9 Wheels . . . . .	33
6.9.1 Tyre Pressure . . . . .	33
6.9.2 Tyre Types . . . . .	33
6.9.3 Specific Tightening Torques . . . . .	34
6.9.4 Overview of Power Wheelchair Models and Wheel Types . . . . .	34
6.9.5 Replacing Drive Wheel (5-Screw Installation) . . . . .	36
6.9.6 Replacing Drive Wheel (1-Bolt Installation) . . . . .	37
6.9.7 Replacing Castor Wheel on Double-Sided Fork . . . . .	39
6.9.8 Replacing Castor Wheels on Single-Sided Fork . . . . .	41
6.9.9 Replacing Tyres . . . . .	42
6.9.10 Replacing Steering Head Bearings on Castors . . . . .	43
6.9.11 Replacing Drive Wheel Hub . . . . .	45
6.10 Electronics . . . . .	46
6.10.1 Replacing Power Module . . . . .	46
6.10.2 Replacing Actuator Module . . . . .	47
6.10.3 Replacing G-Trac Sensor . . . . .	47
6.10.4 Replacing Operating Hour Counter . . . . .	48
6.10.5 Updating Software . . . . .	49
6.10.6 Drive Program Selection After Component Replacement . . . . .	49
6.11 Batteries . . . . .	49
6.11.1 General Instructions on Handling Batteries . . . . .	50
6.11.2 Handling Damaged Batteries Correctly . . . . .	50
6.11.3 Replacing Batteries . . . . .	50
6.11.4 Checking and Replacing Main Fuse . . . . .	51
6.11.5 Checking Cables . . . . .	53
6.12 Lighting unit . . . . .	53
6.12.1 Replacing Headlight (LED Light) . . . . .	53
6.12.2 Replacing Front Lamp Holder (LED Light) . . . . .	54
6.12.3 Replacing Rear Light (LED Light) . . . . .	54
6.12.4 Replacing Light Bulbs (Conventional Lighting System) . . . . .	55
6.12.5 Replacing Headlights (Conventional Lighting System) . . . . .	55
6.12.6 Replacing Lamp Holder (Conventional Lighting System) . . . . .	56
6.12.7 Replacing Rear Bulb (Conventional Lighting System) . . . . .	56
6.12.8 Replacing Rear Light (Conventional Lighting System) . . . . .	57
6.12.9 Replacing Rear Lamp Holder (Conventional Lighting System) . . . . .	57
6.13 Seating . . . . .	58
6.13.1 Replacing Tilt Module . . . . .	58
6.13.2 Replacing Lifter/Tilt Module . . . . .	58

# 1 General

## 1.1 Introduction

This document contains important information about assembly, adjustment and advanced maintenance of the product. To ensure safety when handling the product, read this document and the user manual carefully and follow the safety instructions.

Find the user manual on Invacare's website or contact your Invacare representative. See addresses at the end of this document.

Invacare reserves the right to alter product specifications without further notice.

Before reading this document, make sure you have the latest version. You find the latest version as a PDF on the Invacare website.

For pre-sale and user information, see the user manual.

For more information about the product, for example product safety notices and product recalls, contact your Invacare representative. See addresses at the end of this document.

## 1.2 General Information

Service and maintenance work must be carried out taking this document into account.

It is imperative that you observe safety information.

Information about operation or about general maintenance and care work on the product should be taken from service manual.

Assembly of accessories might not be described in this document. Refer to the manual delivered with the accessory. Additional manuals can be ordered from Invacare. See addresses at the end of this document.

You can find information about ordering spare parts in the spare parts catalogue.

Spare parts must match original Invacare parts. Only use spare parts which have been approved by Invacare.

The product may only be maintained and overhauled by qualified personnel.

The minimum requirement for service technicians is suitable training, such as in the cycle or orthopedic mechanics fields, or sufficiently long-term job experience. Experience in the use of electrical measuring equipment (multimeters) is also a requirement. Special Invacare training is recommended.

Alterations to the mobility device which occur as a result of incorrectly or improperly executed maintenance or overhaul work lead to the exclusion of all liability on the side of Invacare.

If you have any problems or questions contact your provider.

## 1.3 Notes on Shipping

- If the mobility device has to be shipped back to the manufacturer for major repairs, you should always use the original packaging for transport.
- Please attach a precise description of the fault.

## 1.4 Symbols in this Manual

Symbols and signal words are used in this manual and apply to hazards or unsafe practices which could result in personal injury or property damage. See the information below for definitions of the signal words.



**DANGER**

Indicates a hazardous situation that will result in serious injury or death if it is not avoided.



**WARNING**

Indicates a hazardous situation that could result in serious injury or death if it is not avoided.



**CAUTION**

Indicates a hazardous situation that could result in minor or slight injury if it is not avoided.



**IMPORTANT**

Indicates a hazardous situation that could result in damage to property if it is not avoided.





Gives useful tips, recommendations and information for efficient, trouble-free use.



Identifies required tools, components and items which are needed to carry out certain work.

## 1.5 Images in This Manual

The detailed images in this manual are given marks to identify various components. Component marks in text and operational instructions always relate to the image directly above.

## 2 Safety

### 2.1 Safety information



**WARNING!**

The procedures in this service manual, must be performed by a specialized dealer or qualified service technician.

- Do not handle this product or any available optional equipment without first completely reading and understanding these instructions and any additional instructional material such as user manuals, installation manuals or instruction sheets supplied with this product or optional equipment.



The information contained in this document is subject to change without notice.

### 2.2 Safety and Fitting Instructions

These safety instructions are intended to prevent accidents at work, and it is imperative that they are observed.

#### Before any inspection or repair work

- Read and observe this repair manual and the associated user manual.
- Observe the minimum requirements for carrying out the work (see 1.2 *General Information, page 4*).

#### Personal Safety Equipment

##### Safety shoes

The mobility device, and some of its components, are very heavy. These parts can result in injuries to the feet if they are allowed to drop.

- Wear standardized safety shoes during all work.

##### Eye protection

It is possible that battery acid can be discharged when working on defective batteries or when handling batteries improperly.

- Always wear eye protection when working on any defective or possibly defective batteries.

##### Safety gloves

It is possible that battery acid can be discharged when working on defective batteries or when handling batteries improperly.

- Always wear acid-proof safety gloves when working on any defective or possibly defective batteries.

#### General Safety Information and Information About Fitting / Removal



**DANGER!**

**Risk of Death, Serious Injury, or Damage**

Lighted cigarettes dropped onto an upholstered seating system can cause a fire resulting in death, serious injury, or damage. Mobility device occupants are at particular risk of death or serious injury from these fires and resulting fumes because they may not have the ability to move away from the mobility device.

- DO NOT smoke while using this mobility device.



**WARNING!**

**Risk of Serious Injury or Damage**

Storing or using the mobility device near open flame or combustible products can result in serious injury or damage.

- Avoid storing or using the mobility device near open flame or combustible products.



**CAUTION!**

**Risk of crushing**

Various components such as the drive unit, batteries, seat etc are very heavy. This results in injury hazards to your hands.

- Note the high weight of some components. This applies especially to the removal of drive units, batteries and the seat.



**CAUTION!**

**Injury hazard if the mobility device starts moving unintentionally during repair work**

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before lifting up, secure the mobility device by using chocks to block the wheels.

**CAUTION!****Fire and burn hazard due to electrical short-circuit**

- The mobility device must be completely switched off before removal of voltage-carrying components! To do this, remove the batteries.
- Avoid short-circuiting the contacts when carrying out measurements on voltage-carrying components.

**CAUTION!****Risk of burns from hot surfaces on the motor**

- Allow the motors to cool down before commencing work on them.

**CAUTION!****Injury hazard and risk of damage to mobility device due to improper or incomplete maintenance work**

- Use only undamaged tools in good condition.
- Some moving parts are mounted in sockets with PTFE coating (Teflon™). Never grease these sockets!
- Never use "normal" nuts instead of self-locking nuts.
- Always use correctly-dimensioned washers and spacers.
- When reassembling, always replace any cable ties which were cut during dismantling.
- After completing your work / before renewed start-up of the mobility device, check all connections for tight fitting.
- After completing your work / before renewed start-up of the mobility device, check all parts for correct locking.
- Only operate the mobility device with the approved tyre pressures (see technical data).
- Check all electrical components for correct function. Note that incorrect polarity can result in damage to the control system.
- Always carry out a trial run at the end of your work.

**CAUTION!****Risk of injury and damage to property, if the maximum speed reduction on a wheelchair with a lifter does not function correctly**

The wheelchair's control unit must reduce the maximum possible speed as soon as the lifter is raised.

- Test the maximum speed reduction for correct function after any maintenance work or modifications to the wheelchair.

**CAUTION!****Any changes to the drive program can affect the driving characteristics and the tipping stability of the mobility device**

- Changes to the drive program may only be carried out by trained Invacare providers.
- Invacare supplies all mobility devices with a standard drive program ex-works. Invacare can only give a warranty for safe mobility device driving behavior - especially tipping stability - for this standard drive program.



Mark all current settings for the mobility device (seat, armrests, backrest etc.), and the associated cable connecting plugs, before dismantling. This makes reassembly easier. All plugs are fitted with mechanical locks which prevent release of the connecting plugs during operation. To release the connecting plugs the safety locks must be pressed in. When reassembling ensure that these safety locks are correctly engaged.

## 3 Hygiene

### 3.1 Handling of Returned Used Products

When reconditioning or repairing returned mobility devices:

- Take precautions for yourself and the product.
- Use protection equipment as specified locally.

#### Before Transport (According to Biological Agents Ordinance)

Treat product according to following process steps:


Process Step	Component	Application	Conditioning technique	Work Station
Manual cleaning	Surface of used device	Before repair or reconditioning	Use saturated towel to apply cleaning detergent and remove residues after impact.	Cleaning and disinfection
Disinfection	Surface of used device	Before repair or reconditioning	Use saturated disinfectant wipes and clean* the device surface.	Cleaning and disinfection

\*Invacare uses detergent "Nücosept special" 1.5% in water ml/ml

#### Disinfection Tools

- Disposable wipes (fleece)
- Brushes to clean areas difficult to access

#### Further Information

 For more information contact your Invacare service department.

## 4 Setup

### 4.1 General information on setup

The tasks described in this chapter are intended to be performed by trained and authorized service technicians for initial setup. They are not intended to be performed by the user.

### 4.2 Adjusting Seating Position

To adapt the mobility device optimally to the requirements of the user, we recommend that you ask your authorised Invacare provider to adjust the seat depth individually. Adapting the seat to the user's seating position depends on which seat has been fitted, and should be carried out in the following sequence.

1. Adjusting lower leg length and seat depth. See 4.3 *Adjusting Lower Leg Length*, page 9 and 4.4 *Adjusting Seat Depth*, page 9.
2. Adjusting seat height. See 4.5 *Adjusting Seat Height*, page 9.
3. Adjusting centre of gravity of seat frame. See 4.6 *Adjusting Centre of Gravity of the Seat*, page 10.
4. Checking that castors can move freely.
5. Repetition of steps 3 to 4, if necessary.



**CAUTION!**

**Risk of injury after tilting of mobility caused by blocked castors.**

- Always check seat depth settings for both forward and reverse movement. Make sure that castors can rotate freely and have not contact to any fixed mobility device component.



**CAUTION!**

**Any changes to drive program can affect driving characteristics and tipping stability of vehicle.**

- Changes to drive program may only be carried out by trained Invacare providers.
- Invacare supplies all mobility devices with a standard drive program ex-works. Invacare can only give a warranty for safe vehicle driving behaviour - especially tipping stability - for this standard drive program.



**CAUTION!**

**Risk of Crushing to Hands and Feet**

The seat is very heavy. Risk of injury to hands and feet.

- Pay attention to hand and feet.
- Use proper lifting techniques.

### 4.3 Adjusting Lower Leg Length

Invacare offers a range of legrests which can be adjusted individually. See user manual.

### 4.4 Adjusting Seat Depth

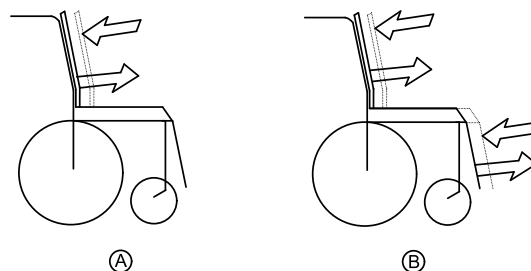


Fig. 4-1

A: Seat depth

B: Centre of gravity of the seat/seat position

The seat depth **A** can be adjusted by moving the position of the backrest in relation to the seat surface. See user manual of Modulite.

### 4.5 Adjusting Seat Height

The seat height is adjusted via the seat angle and the actuator mounting bracket.



Seat height for Max seat is 10 mm higher than Modulite seat.

There are two kinds of seat angle adjustment:

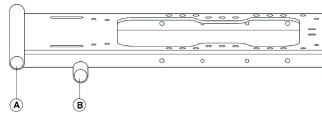


Fig. 4-2

A = 12° — Seat angle adjustment (Max seat)

B = 20° — Seat angle adjustment (Modulite seat, Max seat)

## 4.6 Adjusting Centre of Gravity of the Seat

The centre of gravity of the seat can be adjusted by mounting the seat frame farther towards the front or the rear of the chassis.



### CAUTION!

The seating system of the mobility device is delivered ex works with a standard adjustment of centre of gravity (CoG), which meets 80 – 90 % of user requirements. CoG can be adjusted individually. However, any change in this adjustment setting can negatively influence the stability of the mobility device.

– You must perform an individual risk analysis every time you change the centre of gravity of the seating position to ensure the safety and stability of the mobility device.

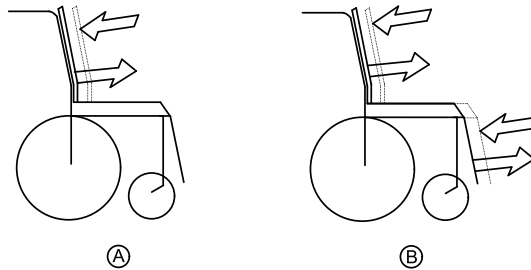


Fig. 4-3

Ⓐ: Seat depth

Ⓑ: Centre of gravity of the seat



The user weight and seat depth have strong influences on the choice of the centre of gravity (CoG). If the user is heavy and the seat depth is greater, the focus should be the farther back. For best possible driving characteristics of rear-wheel drive mobility device, the weight should be distributed: 30 – 40 % front and 60 – 70 % rear. Front- and centre-wheel drives are uncritical with regard to distribution of user weight.

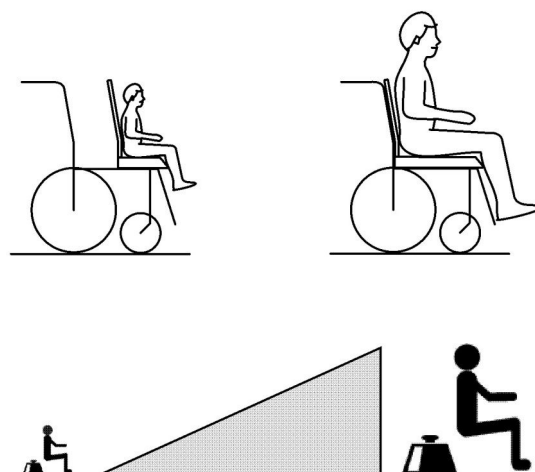


Fig. 4-4

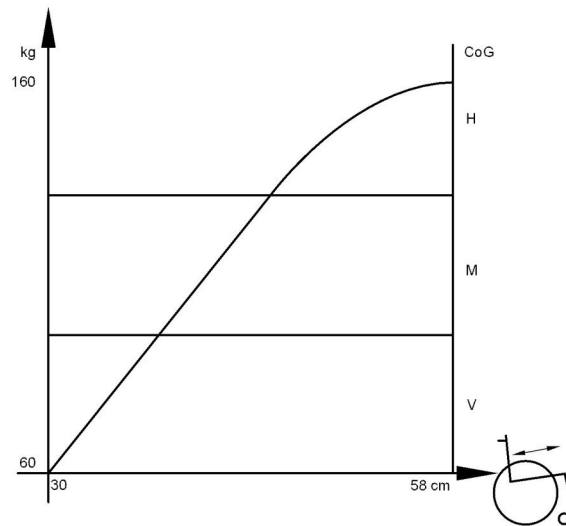


Fig. 4-5

**CAUTION!**

**Risk of damage due to collisions of the legrests with other parts of the mobility device.**

- Set legrests to smallest angle before adjusting seat centre of gravity.
- Pay attention with adjusting the seat centre of gravity that the legrests do not touch any other parts of the wheelchair. This ensures that the legrests cannot collide with other parts of the wheelchair.

For details on the Modulite seat see below.

#### 4.6.1 Modulite Seat

The Modulite seat is available in two versions:

- Adjustment of the centre of gravity via the lateral profiles of the telescopic seat frame (plate and strap). See 4.6.2 *Telescopic Seat Frame, page 12*.
- Adjustment of the centre of gravity via the oblong holes of the seat adaptor of the one-piece seat plate. See 4.6.3 *One-Piece Seat Plate, page 12*.

**CAUTION!**

**Risk of Tipping Over**

Increased risk of tipping over, if the centre of gravity is shifted too far towards the rear.

- There must ALWAYS be at least 46 mm clearance between the backrest and the rear axle.

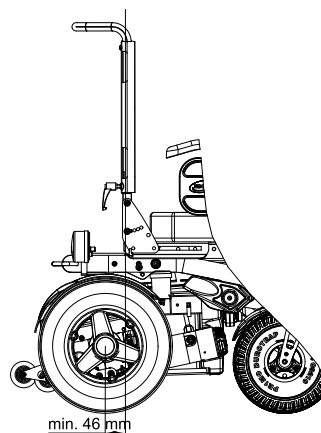


Fig. 4-6

**CAUTION!**

**Risk of Collisions of Legrests and Castors**

The front edge of the seat frame profile should be located 15 to 17 mm in front of the steering heads of the castors. If you decrease this value, make sure that:

- You decrease the seat depth by the same value, and
- There are no collisions between the legrests and the castors.

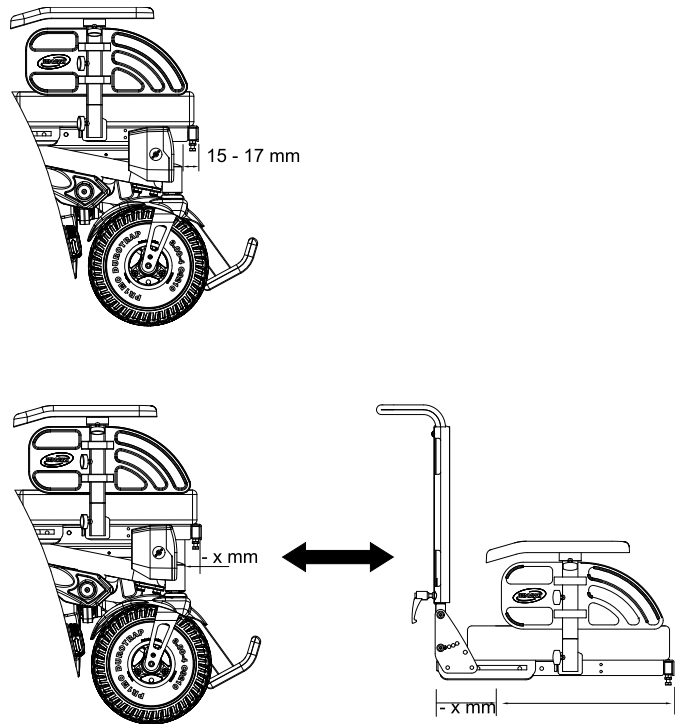


Fig. 4-7

#### 4.6.2 Telescopic Seat Frame



- 6 mm Allen key

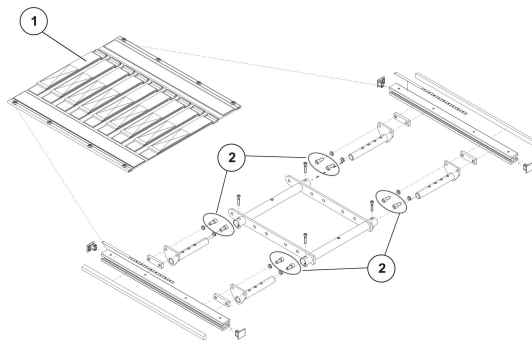


Fig. 4-8

1. Remove seat plate or sling seat (1). See Modulite service manual, “Adjusting seat width/backrest width” chapter.
2. Loosen screws (2) in front and rear, left and right – DO NOT remove.
3. Shift position of seat.
4. Re-tighten screws.
5. Install seat plate or sling seat.

#### 4.6.3 One-Piece Seat Plate



- 6 mm Allen key



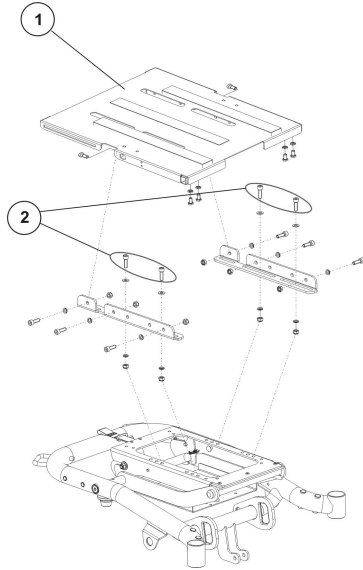




Fig. 4-9 This picture is an example.


1. Remove seat plate.
2. Loosen screws (2) left and right – DO NOT remove.
3. Shift position of seat frame.
4. Tighten screws.
5. Install seat plate.

## 5 Testing

### 5.1 Testing Motor

-  • Phillips screwdriver, size 2
-  • Digital multimeter with resistance measurement

1. Remove shroud that covers power module. See 6.6 *Shrouds, page 21*.
2. Unplug cable of motor (A) from power module.
3. Connect multimeter (B) to motor plug contacts (C) and (D) and measure resistance between contacts.

 A resistance of between 0.5 ohms and 5 ohms indicates a motor ready for operation. A resistance of between 15 ohms and infinity indicates a defective motor. High resistances are normally caused by bad connections or worn carbon brushes.

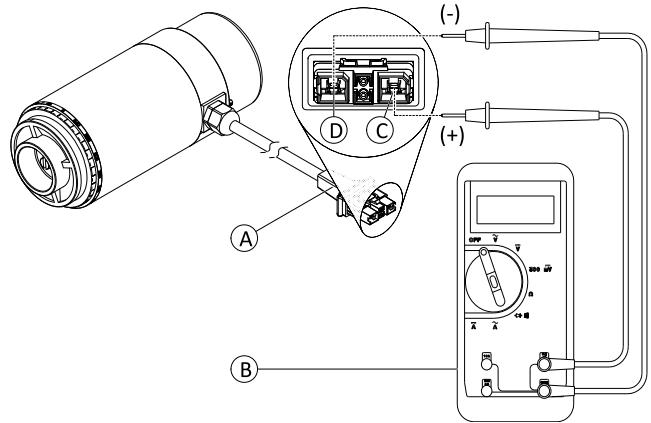


Fig. 5-1 DuraWatt motor serves as an example.

### 5.2 Testing Motor Brake


 This test should only be carried out on mobility device with conventional motor-gearbox units.





#### CAUTION!


#### Risk of damage to power module due to shorts in motor brake

- NEVER connect a shorted motor brake to an intact power module.
- Always replace shorted brakes immediately.

 A defective motor can damage the power module, but a defective power module cannot damage the motor.

-  • Phillips screwdriver, size 2
-  • Digital multimeter with resistance measurement

1. Remove shroud that covers power module. See 6.6 *Shrouds, page 21*.
2. Unplug cable of motor (A) from power module.
3. Connect multimeter (B) to motor plug contacts (E) and (F) and measure resistance between contacts.

 A resistance of between 40 ohms and 80 ohms indicates an intact brake. A resistance of 0 ohms or a very high resistance (mega-ohms or infinity) indicates a short-circuit, a bad connection or a defective brake.

4. If there is a defect, replace motor and send it to Invacare Service for inspection or repair.

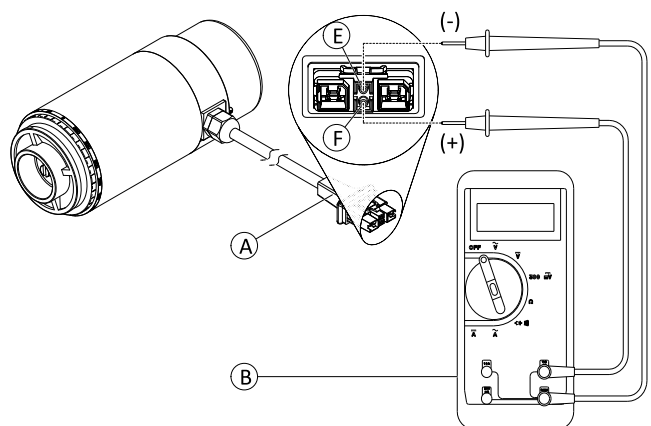



Fig. 5-2 DuraWatt motor serves as an example.


### 5.3 Rain test

- Check to ensure that the black battery terminal caps are secured in place, gaiter is not torn or cracked where water can enter and that all electrical connections are secure at all times.
- Do not use the mobility device if the gaiter is torn or cracked. If the gaiter becomes torn or cracked, replace immediately.

## 5.4 Field Load Test

Old batteries lose their ability to store and release power due to increased internal resistance. In this procedure, batteries are tested under load using a digital voltmeter to check battery charge level at the charger connector. The charger connector is located on the remote. When voltage at the output drops 1.0 volts under load (2.0 volts for a pair), replace the batteries.

 Read these instructions carefully and the manufacturer's instructions on the digital voltmeter before proceeding.


 • Voltmeter




### WARNING!

– When performing the following steps, ensure your feet are clear from casters and wall, otherwise injury may result.


1. Switch electronics OFF on remote.
2. Make sure battery is fully charged. An extremely discharged battery will exhibit the same symptoms as a bad battery.
3. Remove footboard/legrests from mobility device.
4. Connect voltmeter leads to charger connector **(A)** on mobility device. Most digital voltmeters **(B)** are not affected by polarity. However, analog meters (meters with swinging needles) can be and should be used carefully.

 A good meter reading should be 25.5 VDC to 26.0 VDC with the chair in neutral.

5. Switch electronics ON on remote.
6. Ensure that your feet are clear from casters and wall.
7. Run mobility device in neutral for at least 2 minutes.
8. Sit in mobility device and place your feet against a door jam, workbench or other stationary object.
9. Carefully give forward command, trying to drive the mobility device through the stationary object. The load should draw between 30 amps to 40 amps from the batteries for 0.3 seconds.

 Performing this step puts a heavy load on the batteries as they try to push through the stationary object. If the wheels spin, have two individuals (one on each arm) apply as much downward pressure as possible on the arms of the mobility device.

10. Read meter while motors are straining to determine voltage under load.

 If the voltage drops more than 2.0 volts from a pair of fully charged batteries during the 0.3 seconds, they should be replaced regardless of the unloaded voltages.

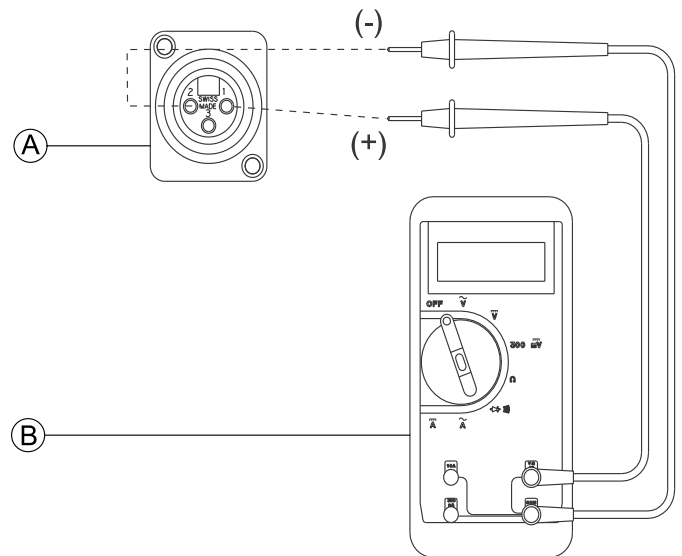


Fig. 5-3

## 5.5 Checking Battery Charge Level

The following “Dos” and “Don’ts” are provided for your convenience and safety.

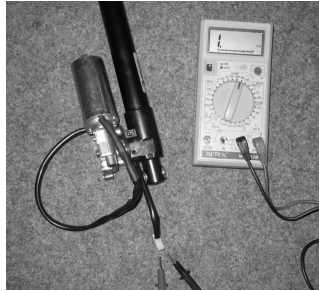
DON'T	DO
Don't perform any installation or maintenance without first reading this manual.	Read and understand this manual and any service information that accompanies a battery and charger before operating the personal transporter.
Don't perform installation or maintenance of batteries in an area that could be damaged by battery spills.	Move the personal transporter to a work area before cleaning terminals, or opening battery box.
Don't make it a habit to discharge batteries to the lowest level.	Recharge as frequently as possible to maintain a high charge level and extend battery life.

DON'T	DO
Don't use chargers or batteries that are not appropriate for the chair.	Follow recommendations in this manual when selecting a battery or charger.
Don't put new batteries into service before charging.	Fully charge a new battery before using.
Don't tip or tilt batteries.	Use a carrying strap to remove, move or install a battery.
Don't tap on clamps and terminals with tools.	Push battery clamps on the terminals. Spread clamps wider if necessary.

## 5.6 Checking Actuator



- Digital multimeter with resistance measurement



1. Turn OFF controls on remote.
2. If necessary, remove shroud.
3. Take note of the positions of all cables and sockets that they are connected to. Mark connectors and sockets or take a photograph with a digital camera.
4. Unplug actuator.
5. Connect multimeter to the contacts and measure the resistance between the contacts. The plug can have a different shape than shown in illustration.



A resistance below 1 ohms indicates a short-circuit. Very high resistances indicates (mega-ohms or infinity) indicates a defective actuator. Actuator must be replaced in both cases.

## 6 Service

### 6.1 General Warning Information on Installation Work



**CAUTION!**

**Risk of damage to vehicle**

Collisions can be caused if the adjusting washers are removed during fitting work to the drive wheels. Adjusting washers are often fitted between the drive shaft and the wheel hub to even out tolerances. If these adjusting washers are removed and not replaced again, collisions can be caused.

- Always replace the adjusting washers exactly as they were before you started dismantling.



**CAUTION!**

**Risk of injury and damage to property, if the maximum speed reduction on a mobility device with a lifter does not function correctly**

The mobility device's control unit must reduce the maximum possible speed as soon as the lifter is raised.

- Test the maximum speed reduction for correct function after any maintenance work or modifications to the mobility device.

### 6.2 Tightening Torques



**CAUTION!**

**Risk of damage to mobility device due to improperly tightened screws, nuts or plastic connections.**

- Always tighten screws, nuts etc. to the stated tightening torque.
- Only tighten screws or nuts which are not listed here fingertight.

The tightening torques stated in the following list are based on the thread diameter for the nuts and bolts for which no specific values have been determined. All values assume dry and de-greased threads.

Thread	Tightening Torque in Nm $\pm 10\%$
M4	3 Nm
M5	6 Nm
M6	10 Nm
M8	25 Nm
M10	49 Nm
M12	80 Nm
M14	120 Nm
M16	180 Nm

### 6.3 Troubleshooting

#### 6.3.1 Operational Faults

Proceed as follows if you have any problems:

1. First assess the possible cause of the problem using the following table.
2. Check the remote status display. Evaluate the flash error code.
3. Carry out the necessary checks and repairs as recommended in the following table.

The various power modules can be fitted in connection with different remotes in the mobility device. Rectification of operational faults depends on the power module fitted. The power modules used are described in the corresponding controls manual.



The tables for rectification of operational faults listed in the following chapters are only an excerpt from the original manufacturer's manuals. You can obtain the original manuals from Invacare.

### 6.3.2 Drive Fault Diagnosis

Problem	Other symptoms	Possible cause	Solution	Documentation
<b>Mobility device will not start</b>	The remote status display illuminates normally and shows an error code.	Drive motors disengaged	Engage drive motors	See corresponding remote manual
	Remote status display does not illuminate	Batteries defective	Replace batteries	See 6.11 Batteries, page 49
		Completely discharge battery	Pre-charge batteries	See user manual
		Power supply to remote interrupted	Check main fuse	See <i>Main Fuse</i>
		Remote defective	Check cables between the modules for loose connections and damage	See <i>Checking Cables</i>
	Remote status display blinking	Various causes	Assess error code	See corresponding remote manual
<b>Mobility device judders in drive mode</b>	None	Batteries defective (unstable voltage)	Replace batteries	See 6.11 Batteries, page 49
		Drive motor(s) defective	Replace motor(s)	See 6.8 Drive Components, page 28
			Replace carbon brushes	
<b>Batteries not being charged</b>	None	Batteries defective	Replace batteries	See 6.11 Batteries, page 49
	LEDs blinking on charging unit	Charging unit defective	Replace charging unit	See user manual
<b>Mobility device runs too slowly</b>	None	Remote defective	Replace remote	See corresponding electronics manual
		Batteries defective	Replace batteries	See 6.11 Batteries, page 49

### 6.4 Service Plan (Once a Year)


**CAUTION!**

Risk of injury and damage to property, if the maximum speed reduction on a mobility device with a lifter does not function correctly.

The mobility device's control unit must reduce the maximum possible speed as soon as the lifter is raised.

- Test the maximum speed reduction for correct function after any maintenance work or modifications to the mobility device.

Component	Check	Remedy	Notes	✓
Posture belt	Damage to posture belt	Replace belt if damaged	See <i>Replacing Posture Belt</i> in service manual of seating system.	
	Belt lock function	Replace belt if damaged	See <i>Replacing Posture Belt</i> in service manual of seating system.	
Armrests	Damage to armrests	Replace covers if damaged		
	Armrest fixings	Tighten screws		

Component	Check	Remedy	Notes	✓
Clothing guard	Damage to clothing guard	Replace clothing guard, if damaged		
	Clothing guard fixings	Tighten screws		
Seat lock	Seat lock defective	Replace seat lock		
Tilt	Check bolt for correct fit	Replace bolt, if necessary		
Power recline (if fitted)	Damage to backrest	Replace parts if damaged		
	Seams	Tighten screws		
	Fixing	Replace cable or motor if necessary		
	Check cable			
Frames (chassis) / battery mounting	Check fixings, welded seams and battery mounting	Tighten screws		
		Replace components if necessary		
Wheel suspension and wheels	Check drive wheels for tight fit and side play	Adjust, replace wheel hubs	<i>6.9.11 Replacing Drive Wheel Hub, page 45</i>	
	Check castors for tight fit, float and side play	Replace wheels, castor forks or wheel bearings	<i>See 6.9 Wheels, page 33.</i>	
	Pneumatic tyres (if fitted)	Repair or replace if damaged	<i>6.9.9 Replacing Tyres, page 42</i>	
Drive units, coupling mechanism	Check functions in drive and push modes	Replace motor if necessary	<i>See 6.8 Drive Components, page 28.</i>	
	Check coupling mechanism	Tighten screws/nuts, adjust or replace if necessary		
Brakes	Check motor brake	Test motor brake	<i>See 5.2 Testing Motor Brake, page 14.</i>	
Legrests	Check welded seams, interlocking, screws, foot-plates	Tighten, replace if necessary		
Powered legrests (if fitted)	Check cable	Replace cable if necessary		
	Check contacts			
	Check functions			
Lighting (if fitted)	Check cable	Replace bulb, LEDs or cable, if necessary		
	Check function			
Batteries	Check batteries for damage	Replace batteries, if necessary	<i>See 6.11 Batteries, page 49</i>	
	Check battery voltage	Charge batteries	<i>See user manual.</i>	
	Check contacts and terminals	Clean contacts and terminals	<i>See 6.11 Batteries, page 49.</i>	

Component	Check	Remedy	Notes	✓
Remote	Remote, status LED flashing	Evaluate error/flash code		
	Fixings	Check fixings for tight fit, replace if necessary		
	Cables and connecting plugs	Check connecting plugs for tight fit, replace if necessary		
	Joystick function	Replace joystick, if necessary		
		Replace remote, if necessary		
Power supply	Check connecting plugs for tight fit, replace if necessary			
Chair configuration	Check chair configuration version	Update software if newer version available	See LiNX service manual.	
Screws (every 6 months)	Check screws for tight fit	Tighten screws if necessary		

## 6.5 Overview Components

### 6.5.1 Overview Mobility Device

#### Underneath Rear Shroud

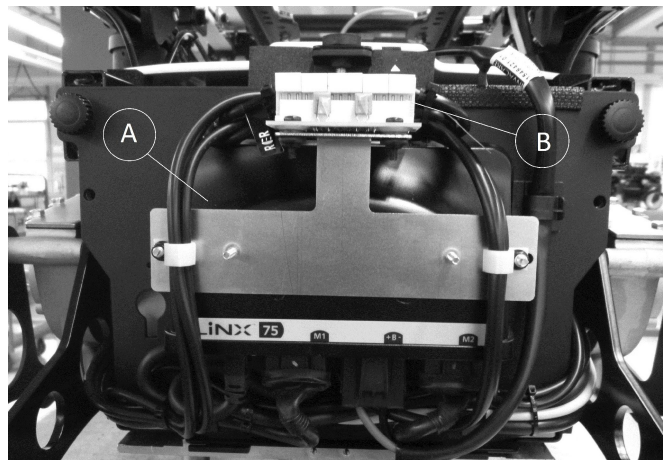


Fig. 6-1

- Ⓐ Power module
- Ⓑ Lighting PCB



## Underneath Seat

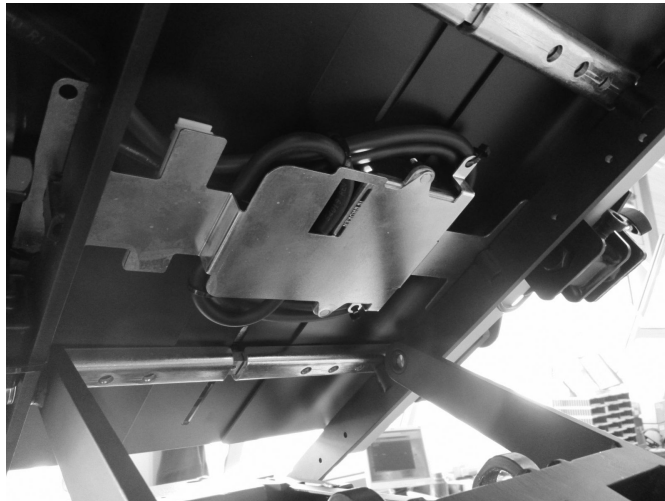


Fig. 6-2

Actuator module for lifter or powered elevating legrests

## 6.6 Shrouds

### 6.6.1 Rear Shroud

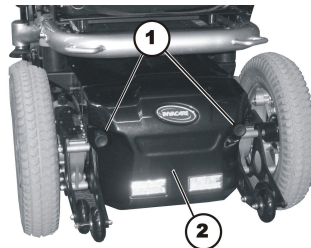


Fig. 6-3

#### Removing Rear Shroud

1. Loosen and remove left and right screws (1) on rear shroud (2).
2. Carefully pull rear shroud backwards and off.
3. On models with LED lighting system / rear lights in rear shroud: Pull both of the rear light plugs off of lighting circuit board.

#### Installing Rear Shroud

1. On models with LED lighting system: Plug both of rear light plugs back into lighting circuit board.
2. Push rear shroud over battery box from back. Pay attention to power cables while doing so.
3. Tighten both screws hand-tight.

### 6.6.2 Middle shroud

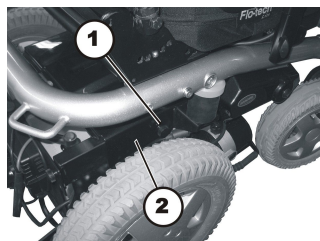


Fig. 6-4

#### Removing Middle Shroud

1. Remove rear shroud. See *6.6 Shrouds, page 21*.
2. Loosen two screws (1) on left and right sides of mobility device.
3. Pull shroud towards rear and out of mobility device.

#### Installing Middle Shroud

1. Push shroud into mobility device from rear.
2. Make sure that cables that run from battery box to seat are lying in recesses provided on front edge of shroud.
3. Tighten both screws hand-tight.

### 6.6.3 Side Shroud



- 4 mm Allen wrench

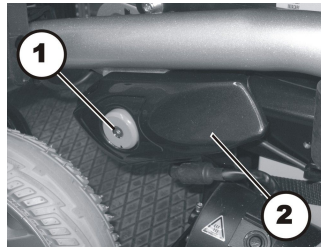


Fig. 6-5

#### Removing Side Shroud

1. Loosen screw (1).
2. Remove shroud (2).

#### Installing Side Shroud

1. Install parts in reverse order.

### 6.6.4 Front Shroud



- 4 mm Allen wrench
- 5 mm Allen wrench
- 10 mm Allen wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 13 mm open-ended wrench
- 19 mm open-ended wrench
- 36 mm open-ended wrench
- 24 mm box wrench
- Torque wrench 20 – 200 Nm
- Wooden blocks

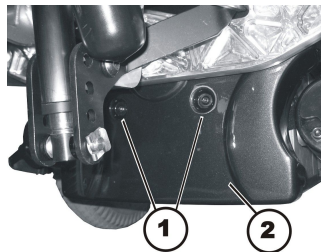


Fig. 6-6

#### Removing Front Shroud

1. Remove double bearing of the Dual Swing Technology (D.S.T.). See 6.7.2 *Replacing Double Bearing of Dual Swing Technology (D.S.T.)*, page 25.
2. Loosen both screws.
3. Remove screws, including washers.
4. Remove shrouds (2) towards front.
5. Replace shroud.

#### Installing Front Shroud

1. Install parts in reverse order.

### 6.6.5 Replacing Front Fender (Single-Sided Fork)



**CAUTION!**  
**Risk of Crushing to Hands and Feet by Weight of Mobility Device**  
 – Pay attention to hand and feet.  
 – Use proper lifting techniques.

**CAUTION!****Risk of Uncontrolled Movement of Mobility Device**

- Turn off power supply (ON/OFF key).
- Engage drive.
- Before raising mobility device, secure wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case. If the wooden block is too short or too high, the mobility device can still tip.



- 4 mm Allen wrench
- 24 mm socket wrench
- 24 mm open-ended wrench
- Flat screwdriver
- Oblong wooden blocks, at least 14 x 14 x 30 cm
- Medium-strength thread locking adhesive (Loctite 243 or similar)
- Heat gun

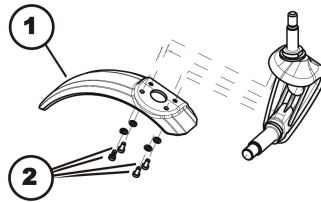


Fig. 6-7

1. Lift mobility device on one side and place wooden block underneath it so that front wheel is off ground and can rotate freely. Use proper lifting techniques.
2. Remove front wheel. See 6.9.8 *Replacing Castor Wheels on Single-Sided Fork*, page 41.

**Removing Fender**

1. Loosen and remove screws (2) together with washers.
2. Replace fender (1).

**Installing Fender**

1. Install parts in reverse order.

**6.6.6 Replacing Fender (Double-Sided Fork)**

- Vice
- Cordless drill
- 4 mm drill
- Flat screwdriver
- Drift pin
- Rivet gun
- 30 mm ring wrench
- Hammer

1. Place fork in vice.
- 2.



Fig. 6-8

Pry off starlock washer **A** with flat screwdriver **B**.

3.

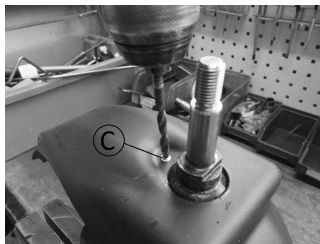


Fig. 6-9

Drill open rivet ©.

4.

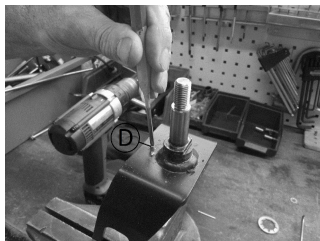


Fig. 6-10

Drift out rivet with drift pin and hammer.

5. Replace fender.

6.



Fig. 6-11

Rivet fender to front fork.

7.



Fig. 6-12

Install starlock washer with wrench and hammer.

### 6.6.7 Replacing Rear Fender



- 6 mm Allen key

#### Removing Fender

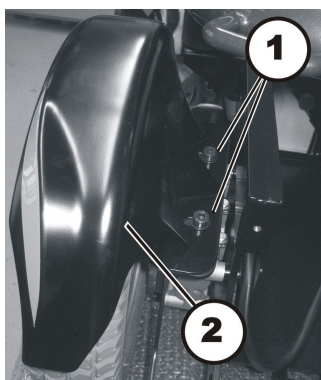


Fig. 6-13

1. Loosen and remove screws (1) and washers.
2. Remove fender (2).

### Installing Fender

1. Replace fender.
2. Install parts in reverse order.

## 6.7 Chassis

### 6.7.1 Replacing Tube Frame



- 4 mm Allen wrench
- 5 mm Allen wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 19 mm socket wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 19 mm box wrench
- Torque wrench 20 – 200 Nm
- Oblong wooden blocks (at least 12 x 12 x 30 cm) for propping up device

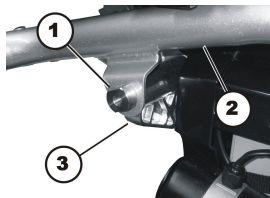


Fig. 6-14

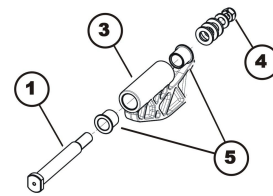


Fig. 6-15

### Removing Tube Frame

1. Remove both batteries. See 6.11 Batteries, page 49.
2. Remove both lateral shrouds. See 6.6.3 Side Shroud, page 22.
3. Remove the seat, together with tilt module. See 6.13.1 Replacing Tilt Module, page 58.
4. Remove both lamp brackets. See 6.12.8 Replacing Rear Light (Conventional Lighting System), page 57.
5. Remove both rubber shock absorbers. See 6.7.3 Replacing Rubber Shock Absorbers, page 26.
6. Remove both front forks. See 6.9.10 Replacing Steering Head Bearings on Castors, page 43.
- 7.



#### Risk of Damage to Tube Frame

- Hold in place bearing bolt but do not turn it.

Hold in place bearing bolt (1).

8. Loosen and remove nut (4).
9. Remove bearing bolt. Pay attention to self-locking nut (4), washers and sliding bushings (5).
10. Repeat steps on other side of mobility device.
11. Lift off tube frame (2) of the double bearing of Dual Swing Technology (D.S.T.).

### Installing Tube Frame

1. Install parts in reverse order.
2. Tighten self-locking nuts (4) to a torque of 120 Nm.

### 6.7.2 Replacing Double Bearing of Dual Swing Technology (D.S.T.)



- 4 mm Allen wrench
- 5 mm Allen wrench
- 10 mm Allen wrench
- 11 mm socket wrench
- 13 mm socket wrench (2x)
- 24 mm open-ended wrench
- 36 mm open-ended wrench
- 24 mm box wrench
- torque wrench 20 – 200 Nm
- oblong wooden block (at least 12 x 12 x 30 cm) for propping up device

### Removing Double Bearing of Dual Swing Technology (D.S.T.)

1. Remove both batteries. See 6.11 Batteries, page 49.
2. Remove middle shroud. See 6.6.2 Middle shroud, page 21.
3. Remove both lateral shrouds. See 6.6.3 Side Shroud, page 22.
4. Remove all cables that run from power module on battery box to seat (for example, to the remote or actuators) or to tube frame (for example, to the lighting system).
5. Place wooden blocks under battery box, so that it is secured in its position.
6. Loosen lower screws on both rubber shock absorbers. See 6.7.3 Replacing Rubber Shock Absorbers, page 26.
- 7.

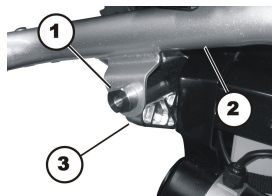


Fig. 6-16

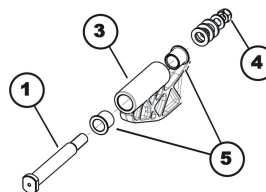


Fig. 6-17

**!** **Risk of Damage to Tube Frame**  
 – Hold in place bearing bolt but do not turn it.

8. Hold in place bearing bolt (1).
9. Loosen and remove nut (4).
10. Remove bearing bolt. Pay attention to self-locking nut (4), washers and sliding bushings (5).
11. Repeat steps on other side of mobility device.

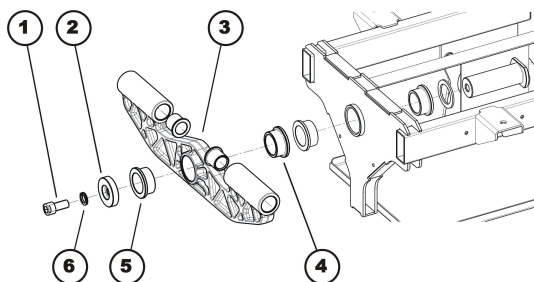


Fig. 6-18

Push seat and tube frame to one side on front wheels. Make sure tube frame does not get scratched during this procedure.

12. Loosen screw (1).
13. Remove screw together with Nord-Lock washer (6) and spacer (2).
14. Pull off double bearing (3) of bearing bolt.
- 15.

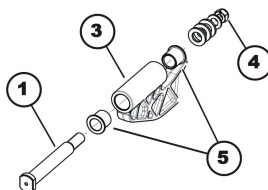


Fig. 6-19

Remove and inspect bearing bolts (4) and (5). Replace if damaged or worn.

16. Replace double bearing.

### Installing Double Bearing of Dual Swing Technology (D.S.T.)

1. Install parts in reverse order.
2. Tighten screw (1) of double bearing to a torque of 80 Nm.
3. Tighten self-locking nuts of bearing bolts (4) to a torque of 120 Nm.

### 6.7.3 Replacing Rubber Shock Absorbers



- 13 mm socket wrench
- Several wooden blocks



To remove rubber shock absorbers the wheelchair must either be lifted up manually and secured in this position using wooden blocks. Alternatively, you can use a crane or a combination of pulley and belts, if your workshop has the corresponding equipment.

**CAUTION!****Risk of accidents**

The specifications of the crane or pulley and belts must be sufficient for the weight of the wheelchair.

- Pay attention to the maximum load capacity of the crane and the breaking strength of the belts.
- Never position yourself under heavy objects suspended in the air by cranes or pulleys.

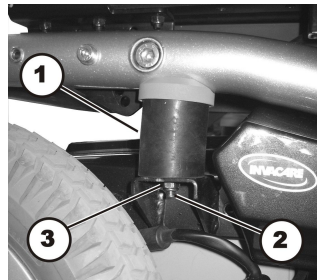
**Removing Rubber Shock Absorbers**

Fig. 6-20

1. Remove rear and middle battery box shrouds. See 6.6 *Shrouds*, page 21.
2. Loosen and remove the self-securing nut (3).
3. Repeat this on the other side of mobility device.
4. Lift frame tube of mobility device in rear so that threaded pin (2) is pulled out of guide.
5. Place one or more wooden blocks between frame tube and battery box.
6. Turn rubber shock absorber clockwise (as seen from above) by hand and replace it.
7. Repeat this on other side of mobility device.

**Installing Rubber Shock Absorbers**

1. Install parts in reverse order.
2. Tighten rubber shock absorbers and nuts hand-tight.

**6.7.4 Replacing Battery Tray**

- 4 mm Allen wrench
- 5 mm Allen wrench
- 6 mm Allen wrench
- 10 mm Allen wrench
- 8 mm socket wrench
- 11 mm socket wrench
- 13 mm socket wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 24 mm box wrench
- Phillips screwdriver, size 2
- Torque wrench 20 – 200 Nm
- Wooden blocks (approx. 12 x 12 x 30 cm) for propping up mobility device

**Removing Battery Tray**

1. Remove rear and middle shrouds. See 6.6.1 *Rear Shroud*, page 21 and 6.6.2 *Middle shroud*, page 21.
2. Remove fenders. See 6.6.7 *Replacing Rear Fender*, page 24.
3. Remove both lateral shrouds. See 6.6.3 *Side Shroud*, page 22.
4. Take exact note of positions of all cables and sockets that they are connected to. Mark connectors and sockets or take a photograph with a digital camera.
5. Remove all power modules.
6. Remove both batteries. See 6.11 *Batteries*, page 49.
7. Remove both drive wheels. See 6.9 *Wheels*, page 33.
8. Remove both motor-gearbox units. See 6.8.1 *Replacing Motor-Gearbox Unit*, page 28.
9. Remove seat together with tilt module. See 6.13.1 *Replacing Tilt Module*, page 58 or Modulite seat (Modulite service manual).
10. Remove both rubber shock absorbers. See 6.7.3 *Replacing Rubber Shock Absorbers*, page 26.
11. Remove double bearing of Dual Swing Technology (D.S.T.). See 6.7.3 *Replacing Rubber Shock Absorbers*, page 26.
12. Remove front shroud. See 6.6.4 *Front Shroud*, page 22.

**Installing Battery Tray**

1. Replace battery tray.
2. Install parts in reverse order.



## 6.8 Drive Components

### 6.8.1 Replacing Motor-Gearbox Unit



**CAUTION!**

**Risk of Crushing to Hands and Feet by Weight of Mobility Device**

- Pay attention to hand and feet.
- Use proper lifting techniques.



**CAUTION!**

**Risk of Uncontrolled Movement of Mobility Device**

- Turn off power supply (ON/OFF key).
- Engage drive.
- Before raising mobility device, secure wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case. If the wooden block is too short or too high, the mobility device can still tip.



**CAUTION!**

**Risk of crushing**

- The motor-gearbox unit is extremely heavy. Risk of injury to hands.
- Note the high weight.



- 6 mm Allen key
- 19 mm socket wrench
- Oblong wooden blocks, at least 14 x 14 x 30 cm

#### Removing Motor-Gearbox Unit

1. Turn off electronics on remote.
2. Remove rear shroud. See 6.6.1 *Rear Shroud*, page 21.
3. Pull motor plug out of power module.
4. Open cable clamps and expose motor cable.
5. Remove drive wheel. See 6.9 *Wheels*, page 33.
6. Remove wheel hub. See 6.9.11 *Replacing Drive Wheel Hub*, page 45.
7. Remove fender. See 6.6.7 *Replacing Rear Fender*, page 24.

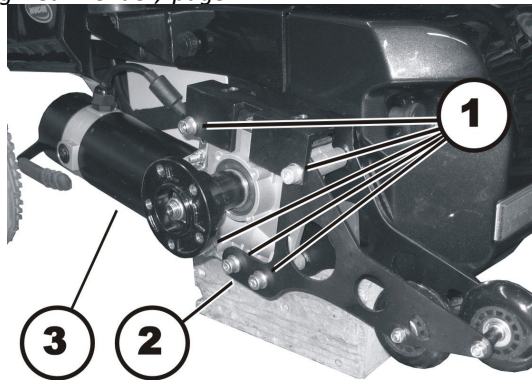


Fig. 6-21

8. Loosen and remove four screws (1).
9. Remove screws together with washers.
10. Pull motor-gearbox unit (3) forwards out of its holder (2). Take into account the heavy weight of unit.

#### Installing Motor-Gearbox Unit

1. Replace defective components.
2. Before installing a new motor-gearbox unit, make sure the sealing ring is correctly mounted. The sealing ring securely attaches the motor and the gearbox. The ring must be installed so, that the self-locking nut is located on the outside.
3. If the sealing ring is incorrectly installed, rotate it around. See 6.8.2 *Replacing or Rotating Motor-Gearbox Unit Sealing Ring*, page 29.
4. Install motor-gearbox unit in reverse order.



5.

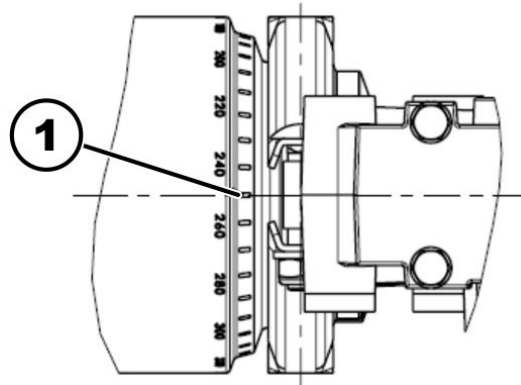


Fig. 6-22

Use scale to align motor to centre axis (1):

- 2-pole motors:
  - Left: 200°
  - Right: 280°
- 4-pole motors and DuraWatt motors:
  - Left: 280°
  - Right: 280°

6. Make sure that motor cable cannot be pinched or bent, and that it is not exposed to chafing in any place.
7. If LiNX system is used, perform calibration process. See *Suggested programing procedure* in LiNX Service Manual.
8. Test all functions.

### 6.8.2 Replacing or Rotating Motor-Gearbox Unit Sealing Ring



#### CAUTION!

#### Risk of crushing

The motor-gearbox unit is very heavy. Risk of injury to hands.  
– Pay attention to the heavy weight.



- 10 mm socket wrench

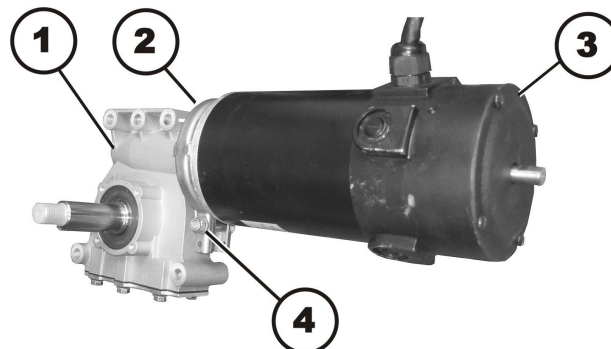


Fig. 6-23

#### Removing Sealing Ring

1. Remove motor-gearbox unit. See *Replacing Motor-Gearbox Unit*.
2. Loosen and remove self-securing nuts (4) including washers.
3. Remove carriage bolt, which secures sealing ring (2).
4. Carefully bend sealing ring apart and remove it.

#### Installing Sealing Ring

1. Install sealing ring so that square hole for carriage bolt is on inside of mobility device.
2. Insert carriage bolt through sealing ring.
3. Install washer and self-locking nut.
4. Do not tighten self-locking nut completely, as the motor orientation must be adjusted during installation.

### 6.8.3 Replacing Motor-Gearbox Coupling


**CAUTION!**
**Risk of crushing**

The motor-gearbox unit is very heavy. Risk of injury to hands.  
– Pay attention to the heavy weight.



- 10 mm socket wrench

#### Removing Motor-Gearbox Coupling

1. Remove motor-gearbox unit. See *Replacing Motor-Gearbox Unit*.
- 2.

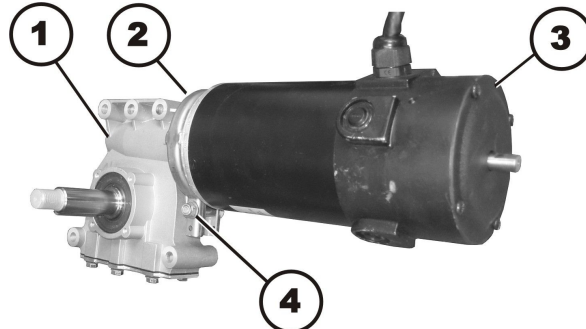


Fig. 6-24

- Loosen and remove self-securing nut (4).
3. Remove carriage bolt, which secures sealing ring (2).
4. Carefully bend sealing ring apart and remove it.


**WARNING!**
**Risk of damage to mobility device if coupling is not serviced correctly**

– Be careful not to damage coupling mechanism during maintenance work.

5. Carefully pull motor (3) and gearbox (1) apart.
6. Remove component parts of coupling.
7. If necessary replace coupling.

#### Installing Motor-Gearbox Coupling

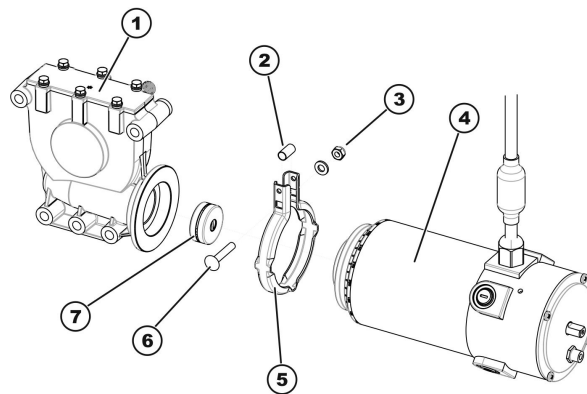


Fig. 6-25

1. Place new clutch (7) on motor axle. Pay attention to position of groove.
2. Position locking ring (5) on motor (4) or gearbox (1).
3. Carefully insert motor into gearbox. Pay attention to position of groove in axle of gearbox. If necessary, rotate motor and gearbox to correct position.
4. Insert carriage bolt through locking ring. Do not forget spacer sleeve (2).
5. Install washer and self-locking nut.
6. Do not tighten self-locking nut completely, as motor orientation must be adjusted during installation.
7. Install motor-gearbox unit. See *Replacing Motor-Gearbox Unit*.

### 6.8.4 Replacing Carbon Brushes



The mobility device can be fitted with 2-pole or 4-pole motors. Always replace all carbon brushes on both motors at the same time. Use only the same type of carbon brushes.

 DuraWatt motors are service-free due to lifetime brushes.



**CAUTION!**  
**Risk of Crushing to Hands and Feet by Weight of Mobility Device**

- Pay attention to hand and feet.
- Use proper lifting techniques.



- 6 mm Allen key
- 10 mm socket wrench
- Flat screwdriver
- Two oblong wooden blocks, at least 14 x 14 x 30 cm

### Removing Carbon Brushes

1. Turn off mobility device.
2. Remove drive wheels. See 6.9.5 *Replacing Drive Wheel (5–Screw Installation)*, page 36.
- 3.

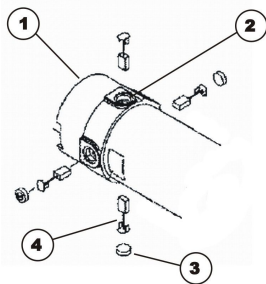


Fig. 6-26

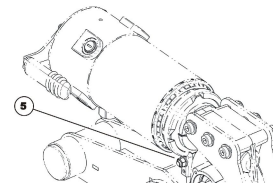



Fig. 6-27

Set engaging lever to “Push” to disengage motor (1).



You can loosen bolt (5) with 10 mm socket wrench and then turn motor around so that you can access rear carbon brushes more easily.

4. Loosen and remove all four plastic caps (3) using a flat screwdriver.
5. Note fixing position and location of carbon brushes.
  -  Used carbon brushes need to be refitted exactly in the same position from which they were taken to guarantee optimum contact to the collector.
6. Make a marking on motor and carbon brushes to guarantee correct refitting.
7. Remove carbon brushes completely from mounting (2).
8. Check carbon brush and spring for level of wear, broken components or discolouration.

### Installing Carbon Brushes

1. Depending on condition of brush and spring:
  - either replace brushes in exactly the same position from which they were taken or
  - fit new brushes.
2. Refit plastic caps and tighten them firmly.
3. Turn motor round in position so that engaging lever can be set both to "Push" and "Drive" position.
4. Retighten bolt (5) finger-tight.
5. Refit drive wheels. See 6.9.5 *Replacing Drive Wheel (5–Screw Installation)*, page 36.
- 6.



The following procedure is necessary to run the carbon brushes in after replacement and thus guarantee maximum performance.



**CAUTION!**  
**Risk of accidents**


- Hazards to workers, surroundings and mobility device
- Do not leave mobility device unattended during following procedure.
  - Make sure that both drive wheels are raised and cannot touch ground.
  - Secure area.


Lift mobility device up on one side and get a second person to place a wooden block at least 14 cm high underneath it so that drive wheel is suspended freely.

7. Repeat this on the other side of mobility device.
8. Allow motors to run for an hour in forward direction.
9. Allow motors to cool down for 30 minutes.

10. Allow motors to run for an hour in reverse direction.
11. Lift mobility device off wooden blocks.

### 6.8.5 Replacing Engaging Turn Knob

 When replacing the engaging turn knob, you must ensure that the correct fitting position is used during assembly.

-  • 3 mm Allen key

1.

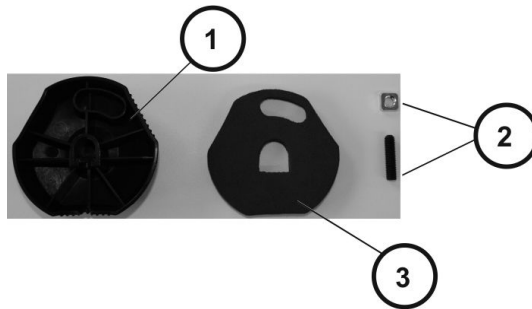


Fig. 6-28

Screw shim onto grub screw.

2. Place screw joint in engaging turn knob (rear side (1)).

3.

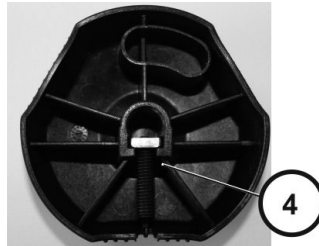


Fig. 6-29

Check that screw joint (4) is positioned precisely in engaging turn knob.

4. Place nonwoven fabric (3) in engaging turn knob (rear side (1)).

5.

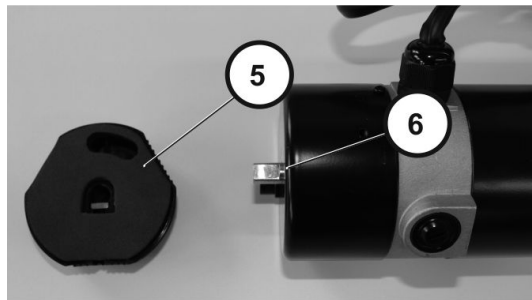


Fig. 6-30

When installing engaging turn knob (5) make sure that position (6) is correct.

6.

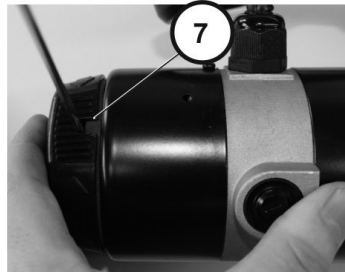


Fig. 6-31

Tighten bolt (7).

7.

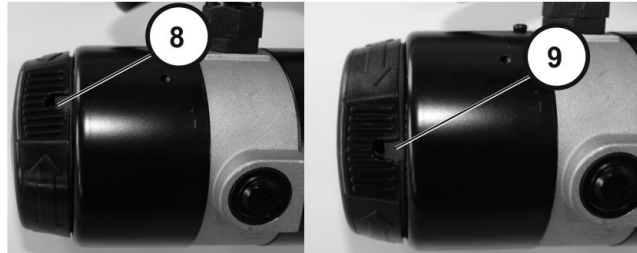


Fig. 6-32

Check that engaging turn knob can be turned to "push" position (clockwise) and "drive" position (counterclockwise).

## 6.9 Wheels

### 6.9.1 Tyre Pressure



**CAUTION!**  
**Risk of damage to rim and tyre when tyre pressure is exceeded**  
 – Observe recommended tyre pressure.

For recommended tyre pressure see inscription on tyre, rim, or contact Invacare. Compare table below for conversion.

psi	bar
22	1.5
23	1.6
25	1.7
26	1.8
28	1.9
29	2.0
30	2.1
32	2.2
33	2.3
35	2.4
36	2.5
38	2.6
39	2.7
41	2.8
42	2.9
44	3.0

### 6.9.2 Tyre Types


There are three different types of tyres or inner tubes, and specific points must be observed for the replacement of each type. The individual types of tyres can be easily distinguished:


- Pneumatic tyres have black valve caps.

- Puncture-protected tyres have red valve caps.
- Puncture-proof tyres have no valves.






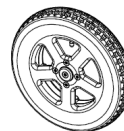


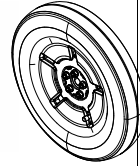
There are five chapters about tyre repair and wheel replacement:






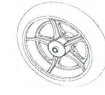




- 6.9.5 Replacing Drive Wheel (5-Screw Installation), page 36
- 6.9.6 Replacing Drive Wheel (1-Bolt Installation), page 37
- 6.9.7 Replacing Castor Wheel on Double-Sided Fork, page 39
- 6.9.8 Replacing Castor Wheels on Single-Sided Fork, page 41
- 6.9.9 Replacing Tyres, page 42 deals with tube repair and replacing solid tyres.

 Not all chapters are necessarily contained in this manual.

 Specific tightening torques for wheels and rim halves are listed in 6.9.3 *Specific Tightening Torques*, page 34.



### 6.9.3 Specific Tightening Torques










	Drive Wheels								
	10" x 3"		12 1/2" x 2 1/4"			14"			
									
<b>Wheel Fixation</b>	70 Nm	70 Nm	33 Nm	35 Nm	70 Nm	33 Nm	60 Nm	25 Nm	18 Nm
<b>Rim Halves</b>	25 Nm	25 Nm	10 Nm	25 Nm	25 Nm	10 Nm	25 Nm	25 Nm	18 Nm

	Castor Wheels									
	6"		8"				9"		10"	
										
<b>Wheel Fixation</b>	18 Nm	18 Nm	25 Nm	16 Nm	16 Nm	25 Nm	25 Nm	25 Nm	18 Nm	100 Nm
<b>Rim Halves</b>	10 Nm	25 Nm	5 Nm	—	—	—	25 Nm	5 Nm	25 Nm	25 Nm

### 6.9.4 Overview of Power Wheelchair Models and Wheel Types

- Not all wheel types are available for all power wheelchairs, see footnotes.
- The symbols indicate three tyre types:

		
pneumatic = black valve cap	puncture-protected = red valve cap	puncture-proof = no valve

Models	Drive wheels								
	10" x 3"	12 1/2" x 2 1/4"			14"				
									
4-Spoke Rim (1-Bolt Installation)	3-Spoke Rim (1-Bolt Installation)	5-Spoke Rim (1-Bolt Installation)	5-Spoke Plastic Rim (1-Bolt Installation)	3-Spoke Rim (1-Bolt Installation)	5-Spoke Rim (1-Bolt Installation)*	5-Spoke Rim (5-Screw Installation)	5-Spoke Rim for True Track*	Solid Rim (5-screw installation)	
TDX SP2							<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		
Storm <sup>4</sup> Series							<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
Kite					<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		
Bora		<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/>						
Fox		<input type="checkbox"/> <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					
Stream						<input type="checkbox"/> <input checked="" type="checkbox"/>			
Mirage			<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>					
Dragon			<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>					
Pronto M41	<input checked="" type="checkbox"/>								
AVIVA RX									<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>

\* For wheelchair-specific mounting instruction, see respective manual.

Models	Castor Wheels									
	6"		8"				9"		10"	
	Single-Sided/ Double-Sided Fork	Double-Sided Fork				Single-Sided/ Double-Sided Fork	Double-Sided Fork	Single-Sided/ Double-Sided Fork	Double-Sided Fork	Single-Sided Fork
TDX SP2	■									
Storm <sup>4</sup> Series									□ ■ ■	□ ■ ■
Kite							* * □ ■		□ ■ ■	□ ■ ■
Bora		■		□ ■	■		□ ■			
Fox		■	■							
Stream							■			
Mirage		■	□ ■		■					
Dragon							■			
Pronto M41	■									
AVIV-A RX						■		□ ■ ■		

\* For wheelchair-specific mounting instruction, see respective manual.

### 6.9.5 Replacing Drive Wheel (5-Screw Installation)

This chapter deals with drive wheels that are installed with four or five screws.



**CAUTION!**  
**Risk of Crushing to Hands and Feet by Weight of Mobility Device**

- Pay attention to hand and feet.
- Use proper lifting techniques.



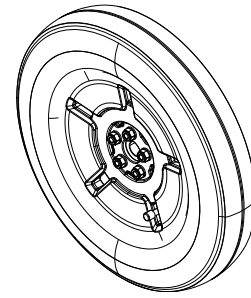
**CAUTION!**  
**Risk of Uncontrolled Movement of Mobility Device**

- Turn off power supply (ON/OFF key).
- Engage drive.
- Before raising mobility device, secure wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case. If the wooden block is too short or too high, the mobility device can still tip.

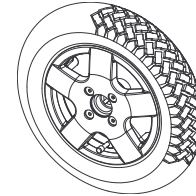




- 6 mm Allen key
- 13 mm wrench
- Torque wrench
- Oblong wooden block (at least 12 x 12 x 30 cm) for propping up mobility device



- Torx wrench with TX 40 bit
- Torque wrench
- Mounting kit
- Oblong wooden block (at least 12 x 12 x 30 cm) for propping up mobility device



- 6 mm Allen key
- Torque wrench
- Oblong wooden block (at least 12 x 12 x 30 cm) for propping up mobility device
- Medium-strength thread locking adhesive (Loctite 243 or similar)



When removing, take care of small parts such as screws and washers. Put all small parts down so that they can be installed in correct sequence.

1. Remove legrests.
2. Place wooden block under frame to prevent mobility device from rolling away.
3. Loosen and remove screws which secure wheel.
4. Remove wheel from hub.
- 5.



#### CAUTION!

##### Risk of Injury if Wheels Come Off

- If drive wheels are insufficiently tightened during assembly, they can come off during driving.
- Always use new screws with undamaged coating.
  - Tighten screws to prescribed torque when mounting drive wheels.

Install parts in reverse order.

6. When installing wheel, pay attention to correct direction of rotation.

### 6.9.6 Replacing Drive Wheel (1-Bolt Installation)

This chapter deals with drive wheels that are installed with one central bolt.



#### CAUTION!

##### Risk of Crushing to Hands and Feet by Weight of Mobility Device

- Pay attention to hand and feet.
- Use proper lifting techniques.



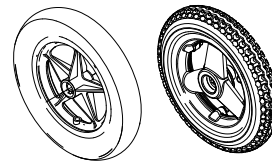
#### CAUTION!

##### Risk of Uncontrolled Movement of Mobility Device

- Turn off power supply (ON/OFF key).
- Engage drive.
- Before raising mobility device, secure wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case. If the wooden block is too short or too high, the mobility device can still tip.



- 19 mm wrench
- Flat screwdriver
- Tightening kit
- Oblong wooden blocks (at least 14 x 14 x 30 cm)



### Removing Wheel

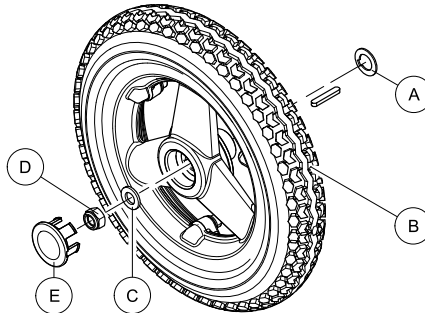


Fig. 6-33

1. Remove plastic cap ⑤.
2. Loosen and remove nut ④ and washer ③.
3. Remove wheel ② from axle.
4. Remove remaining washer ①.

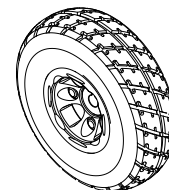
### Installing Wheel

1. Install parts in reverse order.
2. When installing wheel, pay attention to correct direction of rotation.
3. Tighten nut to prescribed torque. See 6.9.3 *Specific Tightening Torques*, page 34.

### Replacing Wheel (10" x 3")



- 19 mm wrench
- Oblong wooden blocks (at least 14 x 14 x 30 cm)



### Removing Wheel

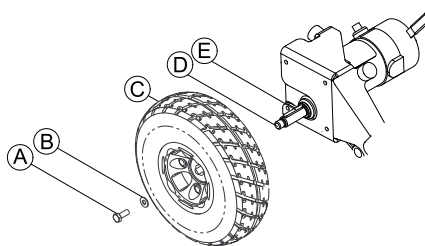


Fig. 6-34

1. Loosen and remove nut ① and washer ②.
2. Remove wheel ③ from drive shaft ④. If necessary, use wheel puller to remove wheel from drive shaft.

### Installing Wheel

1. Apply anti-seize compound to drive shaft ④ and keystone ⑤.



**Do not apply more than one-inch (25.4 mm) (in length) thin film of anti-seize compound to the drive shaft. Applying more than one-inch (25.4 mm) (in length) can cause the anti-seize compound to leak resulting in damage to flooring (carpet, tile, etc.).**

2. When installing wheel, pay attention to correct direction of rotation.
3. Align keystone in drive shaft with cutout in wheel hub and position wheel on drive shaft.



Ensure keystone in cutout on drive shaft. Keystone must line up with wheel hub cutout.

4. Tighten nut to prescribed torque. See 6.9.3 *Specific Tightening Torques*, page 34.

## 6.9.7 Replacing Castor Wheel on Double-Sided Fork



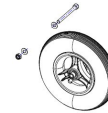
- 5 mm Allen key
- 13 mm wrench
- Oblong wooden block (at least 14 x 14 x 30 cm)



- 13 mm wrench (2x)
- Oblong wooden block (at least 14 x 14 x 30 cm)



- 6 mm Allen key
- 13 mm wrench
- Oblong wooden block (at least 14 x 14 x 30 cm)



- 6 mm Allen key
- 13 mm wrench
- Oblong wooden block (at least 14 x 14 x 30 cm)



- 5 mm Allen key
- Oblong wooden block (at least 14 x 14 x 30 cm)



- 5 mm Allen key
- 13 mm wrench
- Oblong wooden block (at least 14 x 14 x 30 cm)



### Removing Wheel

1. Place wooden block underneath mobility device and prop up mobility device.
2. Remove end-caps from bolt and nut (if applicable).
- 3.

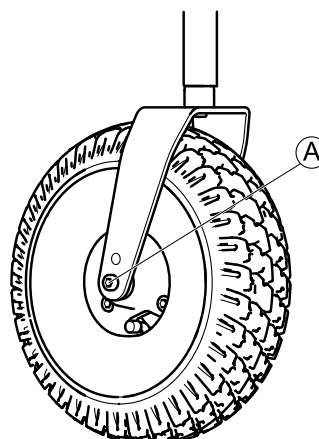


Fig. 6-35

Remove nut from bolt (A).

4. Remove bolt and wheel from fork.

### Installing Wheel

1. Install parts in reverse order.
2. When installing wheel, pay attention to correct direction of rotation.
3. Tighten nut to prescribed torque. See 6.9.3 *Specific Tightening Torques*, page 34.

## Replacing Castor Wheel (Aviva RX and Storm<sup>4</sup> Max)



- 5 mm Allen key (up to August 2016)
- TX40 Torx key (starting August 2016)
- Oblong wooden block (at least 14 x 14 x 30 cm)

### Removing Wheel

1. Loosen and remove bolts (A).
- 2.

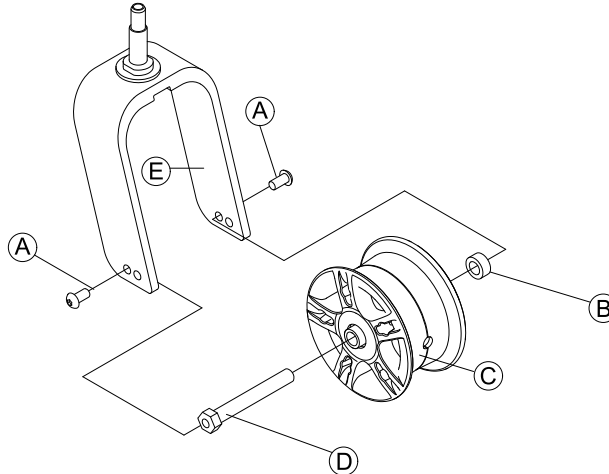


Fig. 6-36

Pull wheel (C) including axle (D) and bushing (B) out of fork (E).

### Installing Wheel



#### CAUTION!

#### Risk of injury from wheels coming loose

If wheels are insufficiently secured during mounting, it can come loose when driving.

- When mounting wheels tighten bolts with prescribed torque.
- Secure all bolts using a suitable blocker.
- Never use normal nuts instead of self-locking nuts.
- Always use new nuts and bolts with an undamaged coating.

1. Install parts in reverse order. Pay attention to correct direction of rotation when installing wheels.
2. Test all functions.

## Replacing Castor Wheel (6 inch wheel)



- 2 x 7/16 inch wrench
- Oblong wooden block (at least 14 x 14 x 30 cm)



### Removing Wheel

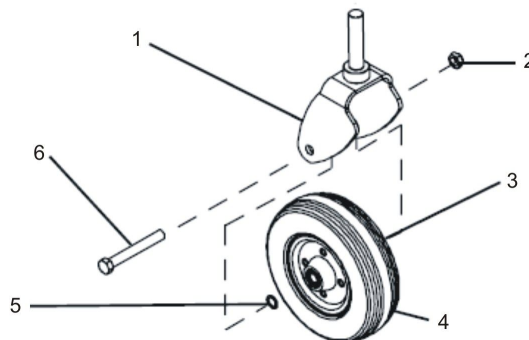


Fig. 6-37

1. Loosen nut (2).
2. Remove screw (6).
3. Remove two washers (3) and (5).
4. Remove wheel (4).
5. Replace any defective parts.

### Installing Wheel

1. Install parts in reverse order.
2. When installing wheel, pay attention to correct direction of rotation.
3. Tighten nut to prescribed torque. See 6.9.3 *Specific Tightening Torques*, page 34.

### 6.9.8 Replacing Castor Wheels on Single-Sided Fork



- 24 mm wrench
- Oblong wooden block (at least 14 x 14 x 30 cm)



#### Removing Wheel

1. Place wooden block underneath mobility device and prop up mobility device.
2. Remove end-caps from bolt and nut (if applicable).
3. Remove nut and washer from bolt.
4. Remove bolt and wheel from fork.

#### Installing Wheel

1. Install parts in reverse order.
2. When installing wheel, pay attention to correct direction of rotation.
3. Tighten nut to prescribed torque. See 6.9.3 *Specific Tightening Torques*, page 34.

#### Replacing Castor Wheel (AVIVA RX, TDX SP2)



- TX30 Torx key (TDX SP2)
- TX40 Torx key (AVIVA RX)
- Oblong wooden block (at least 14 x 14 x 30 cm)



#### Removing Wheel

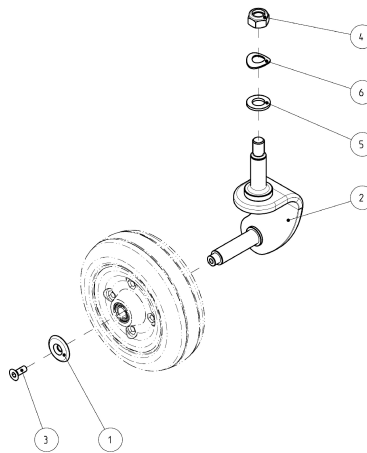


Fig. 6-38

1. Loosen and remove screw (3) including washer (1).
2. Remove castor.
3. Replace castor.

#### Installing Wheel

1. Install parts in reverse order.
2. When installing wheel, pay attention to correct direction of rotation.
3. Tighten screw (3).

## 6.9.9 Replacing Tyres

### Repairing Pneumatic and Puncture-Protected Tyres



- 6 mm Allen key
- Tightening kit
- Oblong wooden block (at least 12 x 12 x 30 cm) for propping up mobility device
- Repair kit for tyre repair or a new inner tube
- Talcum powder
- Tyre pump or compressor



#### **WARNING!**

##### **Risk of Injury**

If tyre with one or more damaged rim threads is inflated, rim could burst and cause serious injury.

- Do not inflate tyre if one or more rim threads are damaged.
- Immediately replace rim with damaged threads.



#### **WARNING!**

##### **Risk of Explosion**

There is considerable pressure in the tyre. Risk of injury. Parts can be thrown out and injure you if you do not secure rim halves.

- Secure rim halves with joiner's clamps.



##### **Risk of Damage to Rim Threads**

Incorrectly tightened screws can cause damage to rim threads.

- Tighten rim screws with prescribed tightening torque.

1. Remove wheel as described in respective chapter in this manual.



#### **CAUTION!**

##### **Risk of Damage by Gel When Repairing Puncture-Protected Tyres With Red Valve Caps**

Valve can become blocked by the puncture protection gel and get unusable.

- During following work you should always hold up valve so that puncture protection gel cannot enter valve.

2. Remove valve cap.
3. Let air escape completely out of tyre by firmly pressing in pin in the centre of valve.



#### **CAUTION!**

##### **Risk of Explosion**

The wheel explodes if air pressure has not been released from wheel before wheel rim is removed.

- Always let all air out of tyre before removing rim.

- 4.

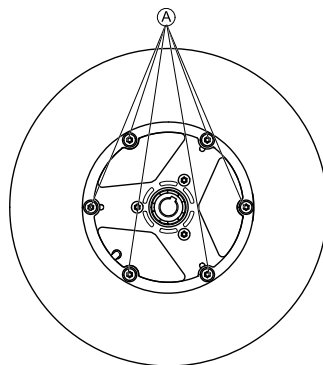


Fig. 6-39 This picture is an example.

Remove screws **A** on inside of wheel.

5. Remove rim halves from wheel.
6. Remove inner tube from tyre.
7. Repair inner tube and re-fit it, or replace it with a new one.



If old inner tube has been repaired and is to be used again, and became wet during repair, it is easier to replace it if it is lightly dusted with talcum powder beforehand.

8. Install tyre in reverse order.
9. Apply rim halves to wheel.
10. Inflate tyre a little.
11. Place screws in wheel rim and tighten screws with prescribed torque. Make sure that inner tube is not clamped between wheel rim halves.

12. Make sure that tyre is contacting wheel rim directly.
13. Inflate tyre to prescribed pressure.
14. Make sure that tyre is still closely contacting wheel rim.
15. Screw valve cap on.
16. Install wheels according to instruction. See respective chapter.

### Repairing Solid Tyre



- 6 mm Allen key
- 3 joiner's clamps with plastic caps



#### Risk of Damage to Rim Threads

- Incorrectly tightened screws can cause damage to rim threads.
  - Tighten rim screws with prescribed tightening torque.

1. Remove wheel as described in respective chapter in this manual.
2. Secure rim halves against unexpected discharge with three joiner's clamps. When doing so, make sure that you do not scratch rims.
- 3.

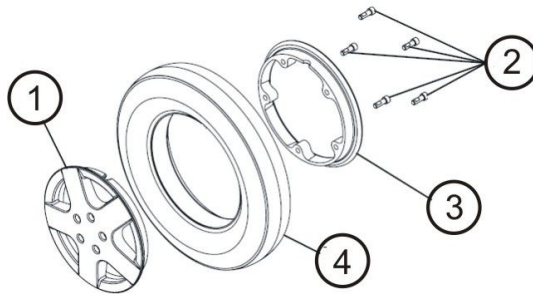


Fig. 6-40

Loosen and remove screws (2) on inside of wheel.

4. Loosen joiner's clamps carefully and alternately until you can remove rim halves without risk.
5. Remove inner (3) and outer (1) half of rim from tyre (4).
6. Replace any defective or worn parts.
7. Install tyre in reverse order.
8. When fitting rim halves together, make sure that drill holes and threads for screws are placed exactly on top of each other.
9. Place joiner's clamps in position.
10. Tighten joiner's clamps alternately in small stages until rim halves are precisely aligned.
11. Install and tighten screws.
12. Remove joiner's clamps.
13. Install wheel as described in respective chapter in this manual.

### 6.9.10 Replacing Steering Head Bearings on Castors



#### CAUTION!

##### Risk of Crushing to Hands and Feet by Weight of Mobility Device

- Pay attention to hand and feet.
- Use proper lifting techniques.



#### CAUTION!

##### Risk of Uncontrolled Movement of Mobility Device

- Turn off power supply (ON/OFF key).
- Engage drive.
- Before raising mobility device, secure wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case. If the wooden block is too short or too high, the mobility device can still tip.



#### CAUTION!

##### Incorrect reassembly can damage bearings and cause castors to come off.

- The single-row angular ball bearing rings are not identical on both sides. There is only one correct way to insert them.
- Follow assembly instructions precisely.



- 19 mm socket wrench
- Torque wrench
- Flat large screwdriver
- Oblong wooden block (at least 12 x 12 x 30 cm) for propping up mobility device
- Parallel Pin Punches (6/8)
- Hammer (300 g - 500 g)
- Shaft retaining compound (e.g. Loctite 662)

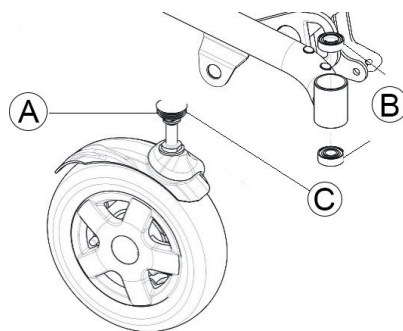



Fig. 6-41

The figure above shows an overview of the individual parts.

Ⓐ	Plastic cap
Ⓑ	Ball bearings
Ⓒ	Nut

 When removing, take care of small parts such as screws and washers. Put all small parts down so that they can be installed in correct sequence.

### Removing Steering Head Bearings

1. Place wooden block under mobility device on the side on which ball bearing is to be replaced.
2. The wheel on the side where bearing is to be replaced must have enough ground clearance to pull it out of bearing.
3. Secure mobility device against rolling away.
- 4.

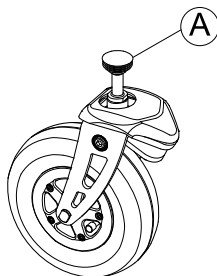


Fig. 6-42

Carefully remove plastic cap Ⓐ with large screwdriver.

5.

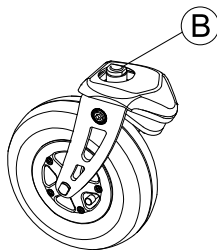



Fig. 6-43

Loosen and remove nut Ⓑ. Hold wheel so that it does not rotate when removing nut.

6. Pull steering head shaft downwards out of steering head tube.
7. Take washers out of tube.
8. Take ball bearing out of tube.  
If needed, use hammer and parallel pin punch to drive bearing out of housing. Hit outer ring of bearing.

### Installing Steering Head Bearings

 Make sure you glue-in bearings every time you change them, even though they were not glued-in in the first place.



**CAUTION!****Incorrect reassembly can damage bearings and cause castors to come off**

Single-row angular ball bearing rings are not identical on both sides. There is only one correct way to insert them.

- Bearings must always be installed so that narrow borders of the ball bearings are facing each other (inside).
- Steering head bolts and nuts must always be pressing against wide (outside) border of ball bearings. Otherwise, bearings will be pressed apart and damaged by bolts.



Fig. 6-44



Fig. 6-45

The illustrations show the wide border of the ball bearing on the outside of the ball race (A) and the narrow ball bearing edge on the inside (B).

1. Clean and degrease inner surface of housing and outer diameter of new bearing.
- 2.

**Shaft retaining compound can cause damage to varnish and bearing parts**

- Apply only a small trace of shaft retaining compound.
- Make sure shaft retaining compound does not touch varnished parts or sealing ring.

Apply shaft retaining compound to outer ring of ball bearing.

3. Make sure you insert ball bearings exactly as described above. Thicker inner bearing ring must face outwards.
4. Move bearing 2–3 times to distribute the glue between bearing and housing.
5. Apply shaft retaining compound to second bearing. Check that thicker inner bearing ring faces outwards.
6. Install bearing on fork, pay heed to the warnings above.
7. Make sure that washers are correctly replaced.
8. Insert fork into frame. After installation, castor should rotate freely but bearings should have no play.
9. Tighten nut with 16 Nm.
10. Loosen nut, and tighten again with torque wrench.
11. Install plastic cap.

### 6.9.11 Replacing Drive Wheel Hub

**Risk of Damage**

Collisions can be caused if the adjusting washers are removed during fitting work to the drive wheels.

- Adjusting washers are often fitted between the drive shaft and the wheel hub to even out tolerances. If these adjusting washers are removed and not replaced again, collisions can be caused.
- Always replace the adjusting washers exactly as they were before you started dismantling.



- Torque wrench with 19 mm socket wrench
- Flat screwdriver
- Mounting kit

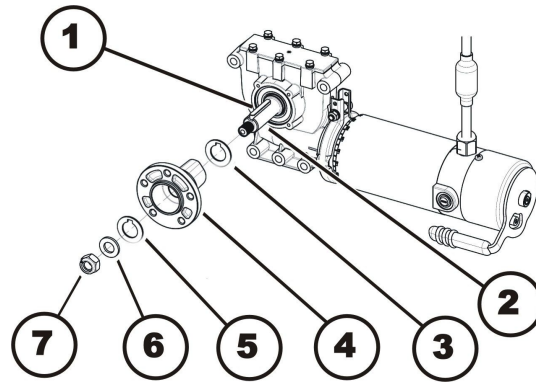


Fig. 6-46

### Removing Drive Wheel Hub

1. Remove hub shroud with screwdriver.
2. Loosen and remove nuts (7).
3. Remove washer (6).
4. Remove shim ring (5).
5. Pull wheel hub (4) off of axle (2).
6. Remove shim ring (3).
7. Remove feather key (1) from axle.

### Installing Drive Wheel Hub



#### CAUTION!

#### Risk of Injury if Wheels Come Off

If drive wheels are insufficiently attached during assembly, they can come off during driving.

- Tighten nuts to 70 Nm when mounting drive wheel hubs.
- Always use new nuts with undamaged coating.
- Ensure that clamping parts are intact.

1. Install parts in reverse order.
2. Use a thin film of lubricant to replace the wheel hub on axle.

## 6.10 Electronics

### 6.10.1 Replacing Power Module

When replacing the power module or remote, take into account the final selection of the drive program. See *6.10.6 Drive Program Selection After Component Replacement, page 49*.

Different combinations of power modules and remotes can be fitted to the mobility device. Power modules are described in earlier revisions of this service manual or in the LiNX service manual.




#### CAUTION!

#### Any changes to drive program can affect driving characteristics and tipping stability of mobility device.

- Changes to drive program may only be carried out by qualified technicians.
- Invacare can only give a warranty for safe mobility device driving behaviour - especially tipping stability - for unaltered standard drive programs.



All power modules are delivered with a standard drive program. If you have made any customer-specific modifications to the drive program, these must be adapted after the installation of the new power module.

- 
-  • 8 mm socket wrench
  - To adapt the drive program: programming software or hand programming device and system installation manual, available from Invacare.
- 

### Removing Power Module

1. Turn off electronics on remote.
2. Remove rear shroud. See *6.6.1 Rear Shroud, page 21*.
3. Take exact note of positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.

4.

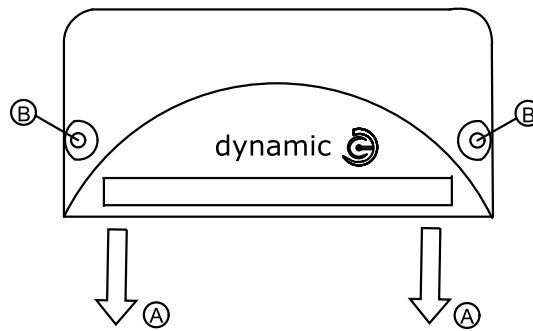



Fig. 6-47

Remove plugs Ⓐ from power module.

5. Loosen and remove screws Ⓑ.
6. Remove power module.

#### Installing Power Module

1. Replace power module.
2. Install parts in reverse order.

 For details on cable routing, see LiNX service manual.

3. Update drive program if a new software version is available. See *6.10.5 Updating Software, page 49*.  
Select driving program. See *6.10.6 Drive Program Selection After Component Replacement, page 49*.
4. Plug all free slots with a suitable covering cap.
5. Adapt drive program using programming software if necessary.
6. If LiNX system is used, perform calibration process. See *Suggested programming procedure* in LiNX service manual.
7. Test all functions.

### 6.10.2 Replacing Actuator Module



- 7 mm socket wrench
- Size 2 Phillips screwdriver

#### Removing Actuator Module

1. Turn off electronics on remote.
2. Remove rear shroud. See *6.6 Shrouds, page 21*.
3. Take exact note of positions of all cables and sockets that they are connected to. Mark connectors and sockets or take photograph with digital camera.
4. Disconnect plugs from actuator module Ⓐ.
5. Loosen both screws with Phillips screwdriver.
6. Replace actuator module.

#### Installing Actuator Module

1. Install parts in reverse order.
2. Reconnect all cable connectors to their former positions.
3. Plug all free slots with suitable protective cap.
4. Test all functions.

### 6.10.3 Replacing G-Trac Sensor



- 10 mm wrench

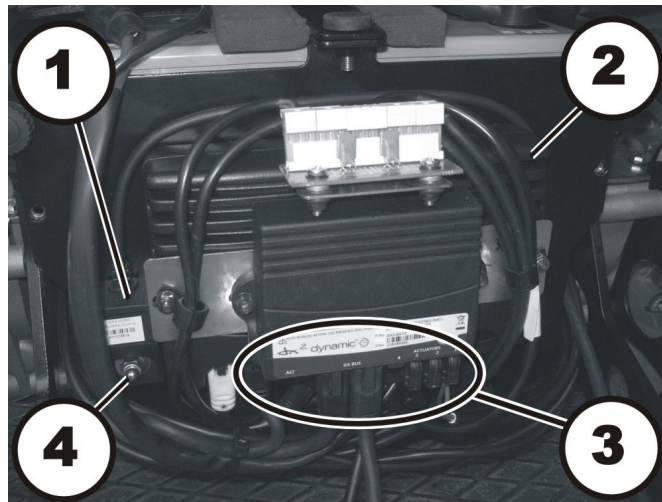


Fig. 6-48



### Removing G-Trac Sensor

1. Turn off electronics on remote.
2. Remove rear shroud. See 6.6.1 *Rear Shroud*, page 21.
3. Take exact note of positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.
4. Disconnect plug of G-Trac sensor (1) from power module (3).
5. Loosen nut (4) and push G-Trac sensor upwards.
6. Pull G-Trac sensor backward and out.

### Installing G-Trac Sensor

1. Insert square-end piece into slot provided for this purpose.
2. When installing G-Trac sensor, make sure it is positioned exactly vertical.
3. Reconnect all cable connectors to their former positions.
4. Test all functions.

## 6.10.4 Replacing Operating Hour Counter

-  • Size 2 Phillips screwdriver
-  • 7 mm open-ended wrench

### Removing Operating Hour Counter

Operating hour counter is located in side shroud.

- 1.

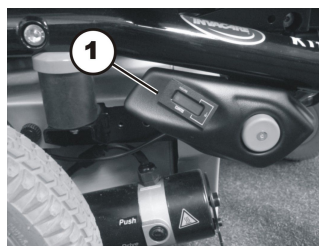


Fig. 6-49

Disconnect plug-in connection of operating hour counter (1) from drive motor.

2. Remove side shroud. See 6.6.3 *Side Shroud*, page 22.
3. Detach operating hour counter from side shroud.
- 4.

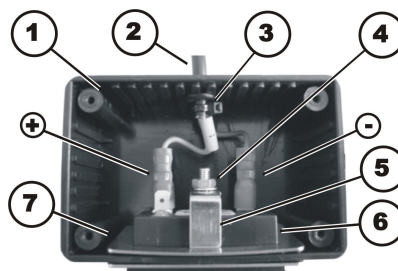


Fig. 6-50

Disconnect plugs (+) and (-).

5. Remove nut (4) including locking washer.
6. Pull operating hour counter (6) forwards out of shroud (1). Pay attention to mounting bracket (5) and retaining frame (7).
7. Replace operating hour counter.

**CAUTION!****Risk of Damage**

Property damage can result if counter is wrongly connected. If plus and minus wires are connected the wrong way, it will damage electronic components of operating hour counter.

- Make sure cable is connected correctly.

**Installing Operating Hour Counter**

1.

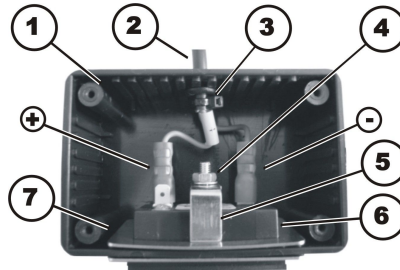


Fig. 6-51

Install parts in reverse order.

2. Connect plug of blue wire (-) to plug contact of operating hour counter which is marked with a "2".
3. Blue wire is additionally marked with a minus symbol.
4. Connect plug of brown wire (+) to plug contact of operating hour counter which is marked with a "1".
5. The blue wire is additionally marked with a sleeve, which has a plus symbol on it.
6. Install parts in reverse order.

**6.10.5 Updating Software**

See LiNX service manual.

**6.10.6 Drive Program Selection After Component Replacement**

The drive program is saved in the remote, and also in the power module. If one of these two components is replaced, the system must be told which of the components has not been replaced so that it knows which contains the current controller profile.



The system allows normal usage of the mobility device after component replacement only if the profile is selected afterwards.



For details, see corresponding remote manual.

**6.11 Batteries****CAUTION!****Injury hazard and possible material damages if batteries are handled improperly**

The installation of new batteries may only be carried out by authorised specialists.

- Observe the warning information on the batteries.
- Only use battery versions stated in the specifications.

**CAUTION!****Fire and burns hazard if battery terminal is bypassed**

- Take great care to ensure that the battery terminals are never short-circuited with tools or mechanical mobility device parts.
- Ensure that the battery terminal caps have been replaced if you are not working on the battery terminals.

**CAUTION!****Risk of crushing**

Batteries can be extremely heavy. This results in injury hazards to your hands.

- Handle the batteries with care.
- Ensure that batteries do not fall to the ground when removed from chassis.
- Pay attention to hands.
- Use proper lifting techniques.

**WARNING!****Burn hazard**

Injury hazard due to discharged acid.

- Always wear acid-proof protective gloves when handling batteries.
- Always wear protective goggles when handling batteries.

**What to do if acid is discharged**

- Always take clothing which has been soiled by or dipped in acid off immediately!
- Rinse any areas of your skin which has come into contact with battery acid off immediately with plenty of water!

**If contact with eyes is made**

- You should also consult an eye specialist immediately afterwards!



When removing, take care of small parts such as screws and washers. Put all small parts down so that they can be installed in correct sequence.

**6.11.1 General Instructions on Handling Batteries**

- Never mix and match different battery manufactures or technologies, or use batteries that do not have similar date codes.
- Never mix gel with AGM batteries.
- The batteries reach their end of life when the drive range is significantly smaller than usual. Contact your provider or service technician for details.
- Always have your batteries installed by a properly trained mobility device technician or a person with adequate knowledge. They have the necessary training and tools to do the job safely and correctly.

**6.11.2 Handling Damaged Batteries Correctly****CAUTION!****Corrosion and burns from acid leakage if batteries are damaged**

- Remove clothes that have been soiled by acid immediately.

**After contact with skin:**

- Immediately wash affected area with lots of water.

**After contact with eyes:**

- Immediately rinse eyes under running water for several minutes; consult a physician.

- Always wear safety goggles and appropriate safety clothing when handling damaged batteries.
- Place damaged batteries in an acid-resistant receptacle immediately after removing them.
- Only ever transport damaged batteries in an appropriate acid-resistant receptacle.
- Wash all objects that have come into contact with acid with lots of water.

**Disposing of Dead or Damaged Batteries Correctly**

Dead or damaged batteries can be given back to your provider or directly to Invacare.

**6.11.3 Replacing Batteries**

- 11 mm socket wrench

**Removing Batteries**

1. Turn off electronics on remote.
2. Remove rear shroud. See *6.6.1 Rear Shroud, page 21*.

3.

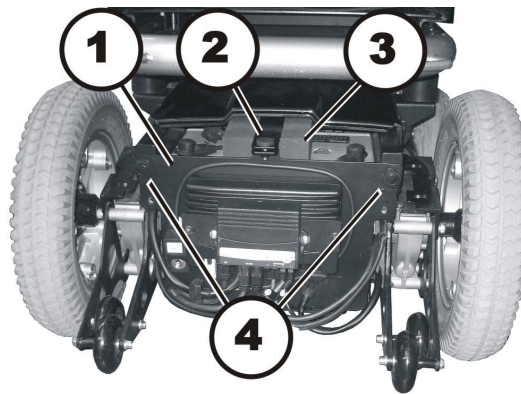


Fig. 6-52

Disconnect battery cable from power module.

4. Loosen and remove screws (4).
5. Loosen and remove screws (2).
6. Turn rear shroud (1) down along with power modules.
- 7.

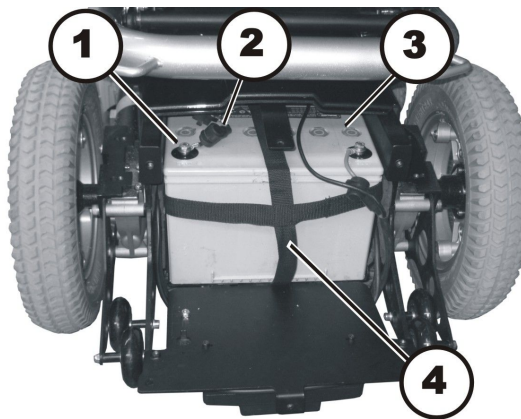


Fig. 6-53

Pull foam block (3) backwards out of battery box.

8. Pull off terminal caps (2) of both battery terminals (1).
9. Loosen and remove battery terminal screws.
10. Remove battery cable.
11. Pull battery (3) out onto rear shroud by its belt (4).
12. Remove battery.
13. Pull second battery towards you by its belt and repeat previous steps.

#### Installing Batteries

1. Install batteries in reverse order.
2. Make sure battery box sockets and plugs are correctly installed. A diagram showing how to connect battery terminals correctly can be found in rear shroud.

#### 6.11.4 Checking and Replacing Main Fuse



##### CAUTION! Risk of fire

A short circuit can cause extremely high currents which can result in spark formation and fire.

- Always use an original strip fuse with the approved amperage.
- If the main fuse has blown, first rectify the cause before fitting a new one.



##### CAUTION! Risk of fire and burns

Fitting incorrect strip fuse causes fire hazard.

- Only fix strip fuses in sequence shown in image below.
- Tighten nuts with 3.3 or 3.5 Nm.

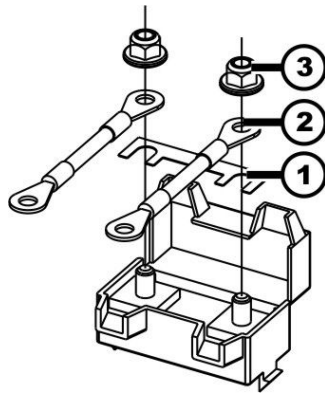





Fig. 6-54 Correct sequence of fitting original strip fuse

1	Strip fuse
2	Ring terminal
3	DIN 6923 nut

-  • 8 mm socket wrench
-  • 11 mm socket wrench
- 80 A strip fuse
- Flat screwdriver
- Torque wrench 0-20 Nm (or similar)

 If the fuse holder is damaged, you can replace it completely with the battery cables.

### Removing Main Fuse

1. Turn off electronics on remote.
2. Remove rear battery. See 6.11 Batteries, page 49.
3. Fuse holder is located on top of rear battery.
- 4.

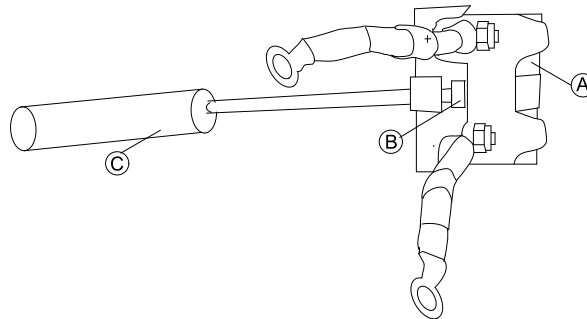



Fig. 6-55

Pry open snap hook **B** with screwdriver **C**. Fuse holder shroud **A** is open.

5. If strip fuse has blown, you must first ascertain and rectify the cause of the fault.
6. Main fuse may only be replaced once fault has been rectified.

 Older fuse holder versions may be locked with a cable tie. If so, cut open cable tie to access fuse strip.

7.

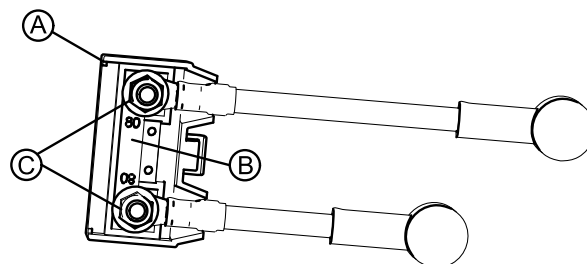


Fig. 6-56


Remove strip fuse nuts **C**.


8. Remove strip fuse.



## Installing Main Fuse

1. Replace strip fuse.
2. Install parts in reverse order.

 Make sure to press two parts of fuse holder shroud together until it snaps.

 If older fuse holder is used, lock fuse holder with UL94V0 cable tie.


3. Test all functions.


## 6.11.5 Checking Cables

1. Turn off electronics on remote.
2. Remove rear shroud. See *6.6 Shrouds, page 21*.
3. Remove batteries. See *6.11 Batteries, page 49*.
4. Check all cables for visible damage, crushing points or abrasion points.
5. Replace damaged cables.
6. Pull on each plug carefully. The plug must not come out of its socket when pulled on lightly.
7. If a plug is loose, apply slight pressure to push plug into socket. The plug must snap in place securely.
8. Check that plug is firmly attached to its socket.
9. Install parts in reverse order.
10. Test all functions.

## 6.12 Lighting unit

### 6.12.1 Replacing Headlight (LED Light)

 Replacing an individual LED is not possible. If there is a defect, replace the entire front headlight.


- 
-  • 7 mm wrench  
• 3 mm Allen key  
• Oblique pliers  
• Tie wraps
- 

### Removing Headlights



Fig. 6-57

1. Turn off electronics on remote.
2. Remove rear and the middle shrouds. See *6.6 Shrouds, page 21*.

 Take exact note of positions of all cables and sockets that they are connected to. Mark connectors and sockets or take a photograph with a digital camera.

3. Disconnect plug of headlight from lighting circuit board (PCB).
4. Pull headlight cable out of wheelchair. If necessary, also remove tie wraps.
5. Remove front headlight plug from lighting PCB.
6. Free cable or remove any tie wraps.
7. Loosen nut (2).
8. Remove headlight (1) from lamp holder (3).

### Installing Headlights

1. Install parts in reverse order
2. Test all functions.

## 6.12.2 Replacing Front Lamp Holder (LED Light)



- 7 mm wrench
- 3 mm Allen key
- TX25 screwdriver
- Oblique pliers
- Tie wraps

1.



Fig. 6-58

Loosen nut (2) and remove.

2. Remove front headlight (1) from lamp holder (3) and place it carefully to the side.

3.



Fig. 6-59

Undo and remove screws (4) with a TX25 screwdriver.

4. Replace lamp holder (3).

5. Install parts in reverse order.

6. To complete, check all vehicle functions.

## 6.12.3 Replacing Rear Light (LED Light)



Replacing an individual LED is not possible. If there is a defect, replace entire rear light.

### Removing Rear Light

1. Turn off electronics on remote.

2. Remove rear shroud. See 6.6 Shrouds, page 21.

3.

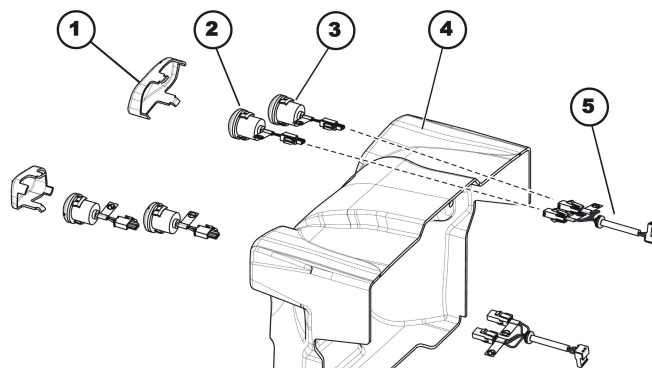


Fig. 6-60

Press clips of rear light lens (1) together slightly.

4. Pull off rear light lens carefully of the rear shroud (4).

5. Disconnect plug of rear light (2) and direction indicator (3) from rear light cable (5).

6. Press clips of rear light lens or direction indicator together slightly.

7. Pull corresponding light towards rear and out of rear shroud.

8. Replace defective part.

### Installing Rear Light

1. Install parts in reverse order.
2. Pay attention to markings on plugs of rear light cable, rear light and direction indicator.
3. Test all functions.

### 6.12.4 Replacing Light Bulbs (Conventional Lighting System)



- Size 2 Phillips screwdriver

1.

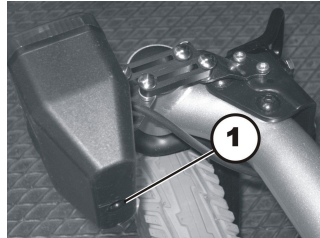


Fig. 6-61

- Loosen screw (1) on back of headlight / direction indicator combination.
2. Remove glass.
3. Replace defective light bulb.
4. Reposition cap and tighten screw hand-tight.

### 6.12.5 Replacing Headlights (Conventional Lighting System)



- Size 2 Phillips screwdriver
- Side cutting pliers
- Tie wraps

#### Removing Headlights

1. Turn off electronics on remote.
2. Remove rear and middle shrouds. See *6.6 Shrouds, page 21*.
3. Take exact note of positions of all cables and sockets that they are connected to. Mark connectors and sockets or take a photograph with a digital camera.
4. Disconnect plug (2) of headlight from the lighting circuit board (1).
5. Pull headlight cable out of mobility device. If necessary, also remove tie wraps.
- 6.

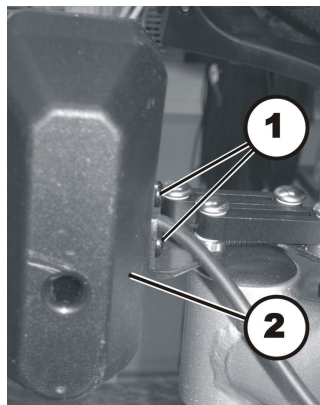



Fig. 6-62

- Loosen both screws (1).
7. Detach headlight (2) from lamp holder.
8. Replace headlight.

#### Installing Headlights

1. Install parts in reverse order.
2. Install cables carefully and secure them with tie wraps.
3. Tighten screws hand-tight.
4. Test all functions.
5. Perform an approximate adjustment of the headlight using the ratchet plate as a guide. The final adjustment can be performed by the user according to user manual.

## 6.12.6 Replacing Lamp Holder (Conventional Lighting System)

-  • TX25 Torx wrench
- Size 2 Phillips screwdriver

### Removing Lamp Holder

1.

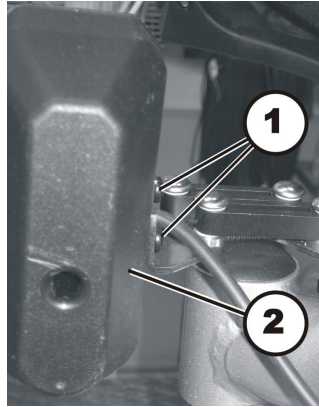


Fig. 6-63

Loosen both screws (1).

2. Detach headlight (2) from lamp holder.
3. Carefully put headlight aside on cable.
- 4.

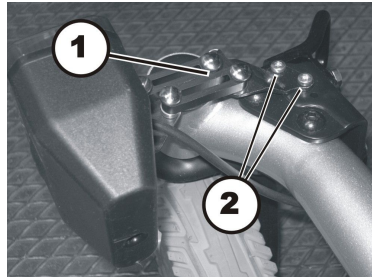


Fig. 6-64


Loosen both screws (2).

5. Remove lamp holder (1).
6. Replace lamp holder.

### Installing Lamp Holder

1. Install parts in reverse order.
2. Tighten screws hand-tight.
3. Test all functions.

## 6.12.7 Replacing Rear Bulb (Conventional Lighting System)

-  • Size 2 Phillips screwdriver

### Removing Rear Bulb

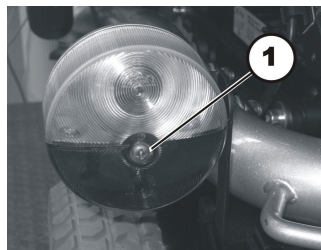


Fig. 6-65

1. Loosen screw (1) in glass.
2. Remove glass.
3. Replace defective bulb.

### Installing Rear Bulb

1. Install glass and tighten the Phillips screw finger-tight.
2. Test all functions.

### 6.12.8 Replacing Rear Light (Conventional Lighting System)



- 8 mm socket wrench

#### Removing Rear Light

1. Turn off electronics on remote.
2. Remove rear shroud. See 6.6 *Shrouds*, page 21.
3. Take exact note of positions of all cables and sockets that they are connected to. Mark connectors and sockets or take a photograph with a digital camera.
- 4.

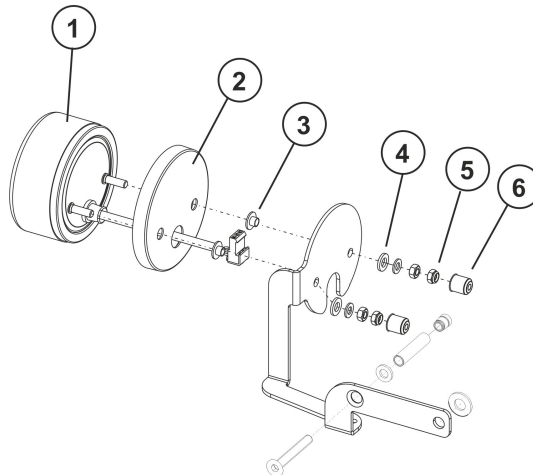


Fig. 6-66

Disconnect cable of rear light from lighting circuit board.

5. Remove both covering caps (6).
6. Loosen four nuts (5).
7. Remove nuts and washers (4).
8. Pull rear light (1) towards rear and remove both bushings (3) including lamp protector (2).

#### Installing Rear Light

1. Install parts in reverse order.
2. Tighten screws hand-tight.
3. Test all functions.

### 6.12.9 Replacing Rear Lamp Holder (Conventional Lighting System)



- Size 2 Phillips screwdriver
- 8 mm socket wrench
- 4 mm Allen wrench
- 5 mm Allen wrench

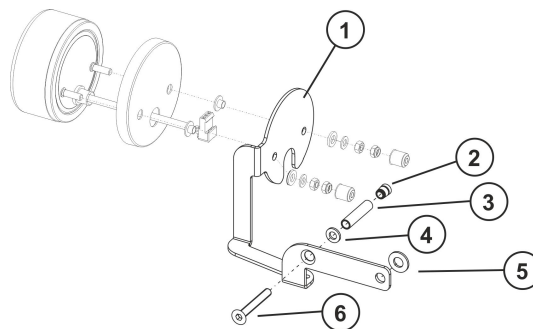


Fig. 6-67

#### Removing Rear Lamp Holder

1. Remove rear light.
2. Loosen screw on seat frame that goes through drill hole of light bracket.
3. Remove screw. Pay attention to the distance washer (5).

4. Loosen screw (6).
5. Remove screw. Pay attention to distance washer (4) and distance tube (3).
6. Replace lamp bracket (1).

### Installing Front Lamp Holder

1. Install parts in reverse order.
2. Test all functions.

## 6.13 Seating

This chapter deals with the replacement of interface components between the base of the mobility device and the corresponding seating system.

For detailed instructions on the seating system, see the service manual of the corresponding seating system.

### 6.13.1 Replacing Tilt Module



#### WARNING!

#### Risk of Crushing

The seat/seat support is very heavy. Risk of injury to hands and feet.  
– Use proper lifting techniques



- 10 mm Allen wrench
- 13 mm open-ended wrench
- 24 mm open-ended wrench
- 24 mm box wrench
- Side cutting pliers
- Tie wraps

1. Remove legrests.
2. If possible, tilt seat back as far as it will go.
3. Turn off electronics on remote.
4. Remove rear and middle shrouds. See *6.6 Shrouds, page 21*.
5. Take exact note of positions of all cables and sockets that they are connected to. Mark connectors and sockets or take a photograph with a digital camera.
6. Disconnect plug of actuator to be tested from actuator module.
7. Pull actuator cable out of mobility device. If necessary, also remove tie wraps.
8. Under seat **ⓑ** loosen and remove four screws **Ⓐ**.
- 9.

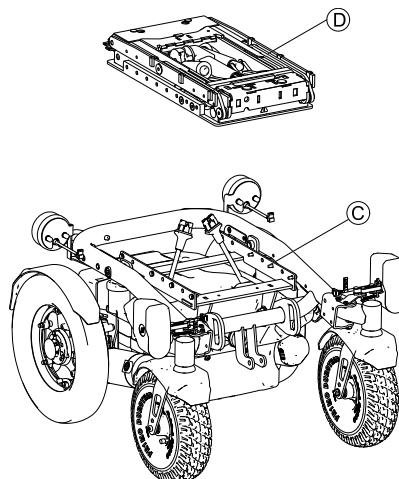


Fig. 6-68

Remove lifter **Ⓒ** from mobility device frame **Ⓓ** and replace it.

10. Install parts in reverse order.
11. Test all functions.

### 6.13.2 Replacing Lifter/Tilt Module



#### CAUTION!

#### Risk of Crushing

The seat/seat support is very heavy. Risk of injury to hands and feet.  
– Use proper lifting techniques.



- 5 mm Allen key
- 6 mm Allen key
- 6 mm wrench
- Side cutting pliers
- Tie wraps



Take careful note of exact position of seat. Mark position it is mounted in, angle and so on. If necessary, make photographs with a digital camera. Any modification of seat affects center of gravity of mobility device.

### Removing Lifter/Tilt Module

1. If possible, raise lifter to highest position.
2. If possible, tip wheelchair with tilt module as far backwards as it will go.
3. Turn off electronics.
- 4.

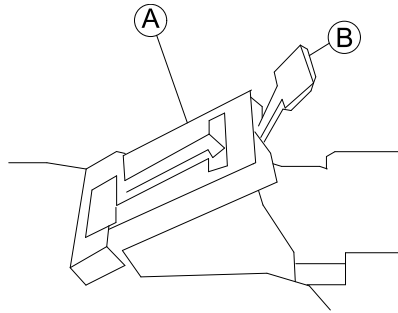


Fig. 6-69

5. Open power supply chain of lifter:
  - a. Flip shroud **A** up.
  - b. Pull flap **B** out of shroud.
  - c. Repeat this procedure link by link.
- 6.

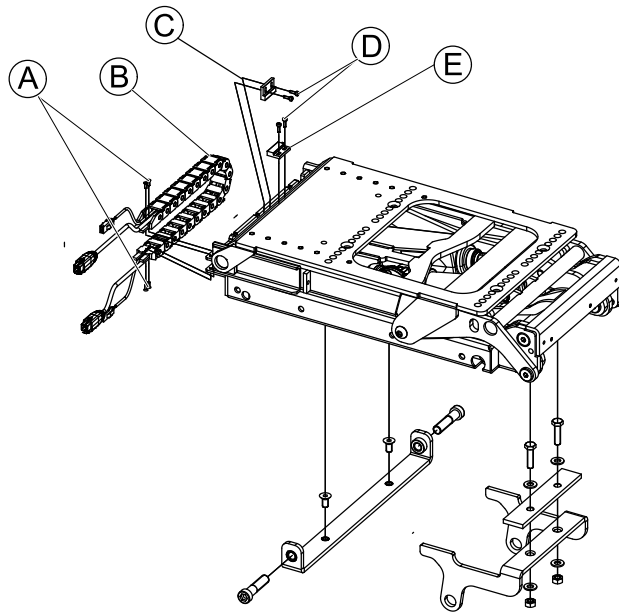


Fig. 6-70

Remove both tie wraps that secure cable at ends of power supply chain **B**.

7. Pull cable out of power supply chain.
8. Loosen screws **A** that connect seat and module **B**.
9. Remove power supply chain **B**.
10. Loosen screws **D**.
11. Loosen nuts on sensor **E**.
12. Remove magnet **C**.
13. Remove sensor **E**.
14. Loosen four screws **A** that attach seat **B** to lifter/tilt module.
15. Lift seat up off of lifter/tilt module. Use proper lifting techniques.
16. Disconnect plug from actuator module.
17. Free up all cables so that you can lift seat off.

18.

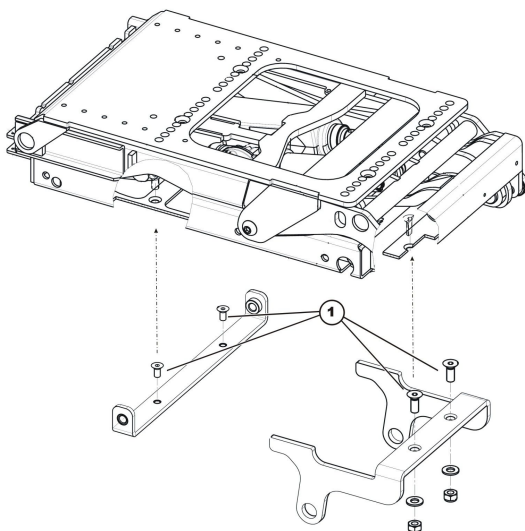


Fig. 6-71

Loosen four screws (1).

19. Lift lifter/tilt module out of frame.

**Installing tilt module**

1. Install tilt module in reverse order. Make sure that seat tilt mounting brackets are affixed with screws to the top holes in the seat frame brackets.
2. Tighten connecting screws of seat tilt mounting brackets and the seat frame mounting brackets to 18 Nm.
3. When installing cables again, make sure that they are placed in such a way that they cannot be crushed or damaged in any position of the tilt module.
4. Install seat.
5. Install all shrouds again.
6. Test all functions.









## Invacare Sales Companies

### Australia:

Invacare Australia Pty. Ltd.  
1 Lenton Place, North Rocks NSW  
2151  
Australia  
Phone: 1800 460 460  
Fax: 1800 814 367  
orders@invacare.com.au  
www.invacare.com.au

### United Kingdom:

Invacare Limited  
Pencoed Technology Park, Pencoed  
Bridgend CF35 5AQ  
Tel: (44) (0) 1656 776 222  
Fax: (44) (0) 1656 776 220  
uk@invacare.com  
www.invacare.co.uk

### Canada:

Invacare Canada L.P.  
570 Matheson Blvd East, Unit 8  
CDN Mississauga, On. L4Z 4G4  
Phone: (905) 890 8300  
Toll Free: 800.668.5324  
www.invacare.ca

### Eastern Europe, Middle East & CIS:

Invacare EU Export  
Am Achener Hof 8  
D-88316 Isny  
Tel: (49) (0)7562 700 397  
eu-export@invacare.com  
www.invacare-eu-export.com

### Ireland:

Invacare Ireland Ltd,  
Unit 5 Seatown Business Campus  
Seatown Road, Swords, County Dublin  
Tel : (353) 1 810 7084  
Fax: (353) 1 810 7085  
ireland@invacare.com  
www.invacare.ie

### New Zealand:

Invacare New Zealand Ltd  
4 Westfield Place, Mt Wellington 1060  
New Zealand  
Phone: 0800 468 222  
Fax: 0800 807 788  
sales@invacare.co.nz  
www.invacare.co.nz



### Manufacturer:

Invacare Deutschland GmbH  
Kleiststraße 49  
D-32457 Porta Westfalica  
Germany

