Service manual

M3 Corpus
Introduction

This is the Service Manual of your product. The Service Manual is not a stand-alone document, but rather a complement to the User’s Manual. It is intended for technical personnel who maintain and repair Permobil power wheelchairs. It is important that anyone who performs maintenance and repairs described in this manual reads and understands the content of this manual so that the work is performed professionally.

This Service Manual is not intended for end users or their caregivers. They must contact their local Permobil dealer for any maintenance or repair needs.

Always state the chassis number when contacting Permobil to ensure that the correct information is provided.
How to contact Permobil

Permobil Inc.
300 Duke Drive
Lebanon, TN 37090
USA
Tel.: 800.736.0925
Fax: 800.231.3256
E-mail: TechSupport@permobil.com
Web: www.permobilus.com

Head office of the Permobil group

Permobil AB
Box 120
861 23 Timrå
Sweden
Tel.: +46 60 59 59 00
Fax: +46 60 57 52 50
E-mail: info@permobil.com
Web: www.permobil.com
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1 Important information

All information, pictures, illustrations and specifications are based upon the product information available at the time this manual was released. Pictures and illustrations used in this manual are representative examples and not intended to be exact depictions of the various parts of the wheelchair.

We reserve the right to make changes to the product without prior notice.

If you are visually impaired, this document can be downloaded at www.permobil.com. Use the magnifying tool in your PDF reader to achieve desired text and picture size.

It is also possible to obtain information concerning our products from our website: www.permobil.com.

1.1 Warranty

Contact your dealer or Permobil Inc. USA for information about the warranty period for this product.

Product Warranty Information sets forth the conditions of the warranty. For further information about applicable warranties, see .

NOTICE

Unapproved replacement of parts

If any part is replaced without approval from Permobil, the wheelchair warranty will become void. Permobil accepts no liability for any loss that occurs as a result of a control system component being opened, adjusted or modified without permission.

If any part is replaced without approval from Permobil, the warranty will become void. Permobil accepts no liability for any loss that occurs as a result of the being modified without permission.

1.2 Technical support

In the event of technical problems, contact your dealer or call Permobil Inc. USA on 1-800-736-0925.

Be prepared to provide the wheelchair serial number, located on the chassis, to ensure proper support. See 3.2 Serial number labels, Page 17.

Be prepared to provide the chassis serial number, to ensure proper support. See 3.2 Serial number labels, Page 17.

1.3 Spare parts and accessories

Spare parts and accessories must be ordered through your dealer.

The expected service life of this product is five years.

1.4 Ordering documentation

Should you need another copy of this manual, one may be ordered from Permobil. Ask for the order number specified on the back cover.
1.5 **Scrapping and recycling**

Contact Permobil for information about scrapping agreements in force.
2 Safety instructions

2.1 Descriptions of admonitions

The following admonitions describing warnings, remarks and explanatory texts are used throughout this manual to draw attention to items of significant importance to safety:

![DANGER!]

Danger admonition

Indicates a dangerous situation which, if not avoided, could result in death as well as serious damage to the product or other property.

![WARNING!]

Warning admonition

Indicates a hazardous situation which, if not avoided, could result in serious injury or death as well as damage to the product or other property.

![CAUTION!]

Caution admonition

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury as well as damage to the product or other property.

![NOTICE]

Notice admonition

Indicates an important but not hazardous situation which, if not avoided, could result in damage to the product or other property.

ℹ️ Provides information about the conditions or circumstances under which the information given applies.
3 Specifications

3.1 Wiring diagram

3.1.1 Seat
Figure 1. Wiring diagram seat (1/2).
Figure 2. Wiring diagram seat (2/2).
3.1.2 Chassis

Figure 3. Wiring diagram chassis (1/2).
Figure 4. Wiring diagram chassis (2/2)
3.2 Serial number labels

3.2.1 Serial number label on chassis

The serial number label is located on the lower, left hand side of the wheelchair chassis. Look between the rim spokes.

3.2.1.1 Serial number label description

1. Made in (country of final assembly) by (address of site of final assembly).
2. Serial number.
3. Product type.
4. Date of assembly.
5. EAN code.
6. Maximum user weight.

3.2.2 Serial number label R-net power module

See 4.3.3 R-net power module, Page 165 for further information.

3.2.3 Serial number label on the control panel

See for further information.

The serial number label is only visible when the panel is removed from the panel holder.
4 Repairs
4.1 Seat
4.1.1 Seat
For this task the following tools are necessary:
• 1 Allen key 4 mm.
• 1 Allen key 5 mm.
• 1 Circlip pliers.

4.1.1.1 Removing seat
1. Switch off the main power switch on the control panel.

2. Remove the seat cushion by lifting it straight up.
3. Remove the seat plates, they are fitted with four screws at the back and front edge.
4. Remove the UniTrack rail on the right hand side of the seat. It is assembled with two screws. See 4.1.3 UniTrack rails, Page 23.

5. Disconnect the tilt motor cabling from the contact block at the seat frame. Release the cable from its cable bracket. Make note of how the cable is assembled with consideration to subsequent re-assembly. See 4.2.2.4 AP elevator tilt motor cable, Page 111.
6. Disconnect the ICS bus cable from the contact block at the seat frame. Release the cable from its cable bracket. Make note of how the cable is assembled with consideration to subsequent re-assembly. See 4.3.2 R-net and ICS bus cabling, Page 160.

7. Remove the screw securing the plastic knob.
8. Remove the plastic knob.

9. Remove the four screws securing the plastic cover.

10. Document the cable setup behind the plastic cover.
11. Disconnect the R-net cable from the contact block at the back of the backrest. Release the cable from its cable brackets. Make note of how the cable is mounted with consideration to subsequent mounting. See 4.3.2 R-net and ICS bus cabling, Page 160.

12. Detach the parallel armrest rod from the backrest hinge. It is attached with a pin and circlip.

13. Remove the six screws holding the seat. Make note of in what hole pattern the seat is mounted with consideration to subsequent mounting.

14. Lift the seat off the AP elevator.
4.1.1.2 Mounting seat

1. Position the seat on to the AP elevator.
2. Mount the six screws holding the seat. The seat should be mounted in different hole patterns depending on the seat depth setting.

<table>
<thead>
<tr>
<th>Seat Depth</th>
<th>Front position</th>
<th>Rear position</th>
<th>Front extension</th>
<th>Rear extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>15”</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-100</td>
</tr>
<tr>
<td>16”</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>-75</td>
</tr>
<tr>
<td>17”</td>
<td>3</td>
<td>3</td>
<td>+50</td>
<td>-100</td>
</tr>
<tr>
<td>18”</td>
<td>3</td>
<td>4</td>
<td>+50</td>
<td>-75</td>
</tr>
<tr>
<td>19”</td>
<td>3</td>
<td>5</td>
<td>+50</td>
<td>-50</td>
</tr>
<tr>
<td>20”</td>
<td>3</td>
<td>6</td>
<td>+50</td>
<td>-25</td>
</tr>
<tr>
<td>21”</td>
<td>3</td>
<td>7</td>
<td>+50</td>
<td>0</td>
</tr>
<tr>
<td>22”</td>
<td>3</td>
<td>7</td>
<td>+75</td>
<td>0</td>
</tr>
<tr>
<td>23”</td>
<td>3</td>
<td>7</td>
<td>+100</td>
<td>0</td>
</tr>
</tbody>
</table>

3. Mount the parallel armrest pad to the backrest hinge. It is attached with a pin and circlip.

4. Check your documentation of the cable set up.
5. Connect the R-net cables to the contact block at the back of the backrest. Assemble the cables to its cable brackets. See 4.3.2 R-net and ICS bus cabling, Page 160.
6. Attach the plastic cover with the four screws. Tightening torque: 0.89 lb.ft.

7. Attach the plastic knob with the screw. Tightening torque: 0.22 lb.ft.

8. Reconnect the ICS bus cable to the contact block at the seat frame. Mount the cable to its cable brackets. See 4.3.2 R-net and ICS bus cabling, Page 160.

9. Reconnect the tilt motor cabling to the contact block at the seat frame. Mount the cable to its cable brackets. See 4.2.2.4 AP elevator tilt motor cable, Page 111.
10. Remount the seat plates, they are fitted with four screws at the back and front edge.

11. Remount the seat cushion.

4.1.2 Seat plates

For this task the following tools are necessary:

• 1 Allen key 4 mm.

4.1.2.1 Removing seat plates

1. Remove the seat cushion by lifting it straight up. It is attached by means of velcro on the rear of the cushion.

2. Remove the seat plates, which are held in place by four screws.

4.1.2.2 Mounting seat plates

1. Assemble the seat plates with the four screws.

2. Fit the seat cushion by pressing it against the seat plate in the desired position to ensure good contact for the velcro on its underside.

4.1.3 UniTrack rails

For this task the following tools are necessary:

• 1 Torque wrench.

• 1 Allen key 5 mm.
4.1.3.1 Removing UniTrack rail
UniTrack rails are available in five different lengths that are used depending on the seat depth selected.
1. Remove the two screws that hold the rail in place.

4.1.3.2 Mounting UniTrack rail
1. Assemble the UniTrack rail using two screws. Use a torque wrench to tighten the screws. Tightening torque 7.2 lb.ft.

4.1.4 Backrest
Backrest plates are available in three different widths to fit most users. If you change the size of the backrest plates you will also have to change the cushion to one that is a suitable size. See 7 Customizations, Page 200.

4.1.4.1 Removing backrest
1. Remove the backrest cushion by pulling it straight forwards. It is attached by means of velcro on the rear of the cushion.
2. Remove the backrest upper plate. For access to the locking mechanism, set the backrest angle to its most upright position. Remove the upper section of the backrest by carefully opening the locking mechanism catch outwards while also pulling the upper section of the backrest straight up.
3. Remove the knob securing the position of the lower backrest plate.

4. Remove the lower section of the back rest by pulling the backrest plate straight up so it can be removed from the four locking devices.

4.1.4.2 Mounting backrest

1. Assembly the lower backrest plate by lining up the four ‘keyholes’ on the locking devices and then sliding the plate straight down.
2. Secure the position of the plate by fitting the knob.

3. Assemble the upper backrest plate by sliding it down into the lower plate's grooves. The height of the backrest may need to be adjusted.

4. Fit the backrest cushion by pressing it against the plate in the desired position to ensure good contact for the velcro on its underside. The lower section of the cushion is fastened to the seat plate by means of velcro.

4.1.5 Backrest actuator
For this task the following tools are necessary:
- 1 Torque wrench.
- 1 Allen key 3 mm.
- 1 Allen key 5 mm.
- 1 Allen key 8 mm.
- 1 Socket 17 mm.
- 1 Circlip pliers (if the rear attachment uses a circlip).

NOTICE
Identify the actuator
The powered backrest exists in two different versions. What sets them apart is the brand of the actuator. One version uses an LINAK LA28 actuator and the other one an actuator from REAC. The most apparent difference is that the REAC actuator has a orange seal. Their different brand marks is also found on each of them. The replacement actuator must be the same as the original actuator otherwise the actuator will not fit in the bracket.
4.1.5.1 Removing backrest actuator

**WARNING!**
Risk of injury while adjusting backrest

Do not place any weight or load on the backrest while adjusting the backrest.

1. Raise the seat to its highest position.
2. Switch off the main power switch on the control panel.

3. Remove the seat cushion.
4. Remove the thigh supports.
5. Remove the seat plates. See 4.1.2 Seat plates, Page 23.
6. Remove the two screws securing the seat plate brackets on the left side.

7. Remove the UniTrack and the seat plate brackets as one unit by pulling it straight out from the left-hand side.

8. Remove the actuator connector by pushing in the two latches on the connector and pulling it straight out from the junction box on the right side of the seat. Remove the cable clips then detach the actuator cabling.
   - Widen the right-hand side of the seat if the seat width is 17” or smaller to make it possible to disconnect the connector.
   - Make a note of how the cabling is positioned; this is needed when you re-attach it later.
9. Remove the nut (D) and the washer (C).
   • Newer revision of the rear attachment uses a pin with a washer and a circlip.
   Remove the circlip (C) and the washer (B).

10. Hold the backrest and the actuator in a steady grip unit when you remove the screw (A) and the washer (B) from the slewing bracket and the actuator.
    • Newer revision of the rear attachment uses a pin with a washer and a circlip.

Hold the backrest and the actuator in a steady grip unit when you remove the pin (A) from the slewing bracket and the actuator.

11. Once the slewing bracket has been detached from the actuator, the backrest can be angled forward to rest on the seat frame.

12. Remove the spacer.
13. Remove the screw and washer from the front bracket of the actuator.

14. Remove the actuator.

4.1.5.2 Mounting backrest actuator

1. Apply grease (Lubetec Red Guard or equivalent) on the shaft.

2. Assemble the front end of the actuator with the screw and washer. Tightening torque 7.2 lb.ft.
3. Apply grease (Lubetec Red Guard or equivalent) on the spacer.

4. Fit the spacer into the actuator's end.

5. Raise the backrest to get the slewing bracket in the correct position. Hold the actuator and backrest in place until it is secured with the screw in the upcoming step.
6. Push the screw (A) with washer (B) through the spacer and the slewing bracket. Fit the nut (D) with washer (C) onto the screw. Hold the screw to counteract rotation while tightening the nut. Tighten the nut using a torque wrench. Tightening torque: 17.7 lb.ft

   - Newer revision of the rear attachment uses a pin with a washer and a circlip.

   Push in the pin (A) through the spacer and the slewing bracket. Fit the circlip (C) with washer (B) onto the pin.

7. Secure the cabling for the actuator in its fixing points. Consider the arrangement of the cables carefully and make sure there is no risk of them getting trapped or otherwise damaged.

8. Connect the actuator connector to the same position as noted, in step 8. in the removing section, into the junction box on the right-hand side of the seat. Fit the connector by pushing it straight in at any point.

9. Assemble the seat plate brackets together with UniTrack rail, adjust it to its original width.

10. Assemble the seat plates. See 4.1.2 Seat plates, Page 23.

11. Assemble the thigh supports.

12. Reattach the cushions by means of velcro.

### 4.1.6 Backrest actuator bracket

For this task the following tools are necessary:

- 1 Torque wrench.
- 1 Allen key 5 mm.
- 1 Allen key 8 mm.
- 1 Socket 10 mm.
- 1 Allen key 3 mm.
- 1 Awl.
- 1 Circlip pliers (if the rear attachment uses a circlip).
4.1.6.1 Resetting backrest actuator bracket function

The backrest actuator bracket provides the backrest with a function that enables it to move slightly forward and then snap to a fixed position in case of a sudden stop when moving fast forward. This function reduces the movement backwards of the user and decreases the risk of injuries sustained to the head, back and neck.

When triggered, this function needs to be reset before the seat is used again. If the rear edge of the actuator bracket is in line with the seat bar, it means that it hasn’t been triggered. But if the actuator bracket is protruding at the rear, the function has been triggered and the bracket must then be reassembled and some parts must be replaced. Parts needed are included in the spare parts kit. Contact Permobil or your dealer for further information.

4.1.6.2 Removing backrest actuator bracket

1. Raise the seat to its highest position.
2. Switch off the main power switch on the control panel.

Figure 57. If the rear edge of the actuator bracket is in line with the seat bar, it means that it hasn’t been triggered.

Figure 58. If the actuator bracket is protruding at the rear, the function has been triggered and the bracket must then be reassembled and some parts must be replaced.

Figure 59. On/Off symbol depending on model.
3. Remove the seat cushion.
4. Remove the thigh supports.
5. Remove the seat plates. See 4.1.2 Seat plates, Page 23.
6. Remove the two screws securing the seat plate brackets on the left side.

7. Remove the UniTrack and the seat plate brackets as one unit by pulling it straight out from the left-hand side.

8. Remove the actuator connector by pushing in the two latches on the connector and pulling it straight out from the junction box on the right side of the seat. Remove the cable clips then detach the actuator cabling.

- Widen the right-hand side of the seat if the seat width is 17” or smaller to make it possible to disconnect the connector.
- Make a note of how the cabling is positioned; this is needed when you re-attach it later.
9. Remove the nut (D) and washer (C).
   - Newer revision of the rear attachment uses a pin with a washer and a circlip.

   Remove the circlip (C) and the washer (B).

10. Hold the backrest and the actuator in a steady grip unit when you remove and screw (A) and the washer (B) from the slewing bracket and the actuator.
   - Newer revision of the rear attachment uses a pin with a washer and a circlip.

   Hold the backrest and the actuator in a steady grip unit when you remove the pin (A) from the slewing bracket and the actuator.

11. Remove screw and washer from the front bracket of the actuator.

12. Remove the actuator.
13. Remove the three screws and the nut with the washer securing the actuator.
   ☑️ If triggered: remove the broken part of the middle screw by screwing it upwards from underneath.
14. Check for damages on other parts and replace if needed.

4.1.6.3 Mounting backrest actuator bracket

<table>
<thead>
<tr>
<th>Items</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Screw, M4x20</td>
</tr>
<tr>
<td>B</td>
<td>Bushing</td>
</tr>
<tr>
<td>C</td>
<td>Key</td>
</tr>
<tr>
<td>D</td>
<td>Leaf spring</td>
</tr>
<tr>
<td>E</td>
<td>Screw, M6x20</td>
</tr>
<tr>
<td>F</td>
<td>Washer</td>
</tr>
<tr>
<td>G</td>
<td>Lock nut</td>
</tr>
</tbody>
</table>

1. Fit the leaf spring on the actuator bracket.
2. Fit the key on top of the leaf spring.
3. Fit the front screw thru the seat plate into the actuator bracket. Leave a 3/64 inch gap between the actuator bracket and the seat plate.

4. Fit the M6x20 screw thru the rear seat bar, the actuator bracket and washer into the lock nut. Leave a 3/64 inch gap between the actuator bracket and the seat plate.
5. Mount the backrest actuator, see 4.1.5.2 *Mounting backrest actuator*, Page 29.

6. Test the backrest actuator bracket function by pushing the backrest forward and then try to pull it backwards. It should lock in a forward position. If the function is defective then the backrest will go back to its original position. When defective always check that the gap between the actuator bracket and seat is $\frac{3}{64}$ inch and that the leaf spring isn’t flattened or damage in any way.
7. Push in the key using an awl and pull the backrest backwards into its original position.

8. Fit the M4x20 screw thru the bushing and the rear seat bar.

9. Tighten the M4x20 screw (A) with 2.2 lb.ft.

10. Tighten the front attachment (H) and the M6x20 (E) at the rear attachment with 7.2 lb.ft.
11. Push back the UniTrack rail brackets with the rail onto the seat bars.
12. Mount the two screws securing the two UniTrack rail brackets.

13. Secure the cabling for the actuator in its fixing points. Consider the arrangement of the cables carefully and make sure there is no risk of them getting trapped or otherwise damaged.
14. Connect the actuator connector to the junction box on the right side of the seat. Fit the connector by pushing it straight in at any point.
15. Assemble the seat plates. See 4.1.2 Seat plates, Page 23.
16. Assemble the thigh supports.
17. Assemble the seat cushion by means of velcro.

4.1.7 Manual backrest adjustment unit
For this task the following tools are necessary:
• 1 Torque wrench.
• 1 Allen key 5 mm.
• 1 Allen key 8 mm.
• 1 Socket 17 mm.

WARNING!
Risk of injury while adjusting backrest
Do not place any weight or load on the backrest while adjusting the backrest.

4.1.7.1 Removing manual backrest adjustment unit
1. Switch off the main power switch on the control panel.
2. Remove the UniTrack rail from the left side of the seat. See 4.1.3 UniTrack rails, Page 23.

3. Hold the backrest in a steady grip as you remove the manual adjustment unit. Remove the nut, washer and screw from the rear bracket of the adjustment unit. Once the rear bracket has been removed the backrest can be angled forward to rest on the seat cushion.

4. Remove screw and washer from the front bracket of the adjustment unit.

4.1.7.2 Mounting manual backrest adjustment unit

1. Assemble the front end of the adjustment unit with the screw and washer. Tightening torque 7.2 lb.ft

2. Fit the rear fixing screw, spacer and washer for the adjustment unit. Tighten the screw using a torque wrench. Tightening torque 17.7 lb.ft.

3. Fit the lock nut and washer on the rear bracket of the adjustment unit. Hold the screw to counteract rotation while tightening the nut. Tighten the nut using a torque wrench. Tightening torque 17.7 lb.ft.

4. Assemble the UniTrack rail on the left side of the seat. See 4.1.3 UniTrack rails, Page 23.

4.1.8 Armrest height adjustment mechanism

For this task the following tools are necessary:

- 1 Torque wrench.
- 1 Allen key 3 mm.
- 1 Allen key 5 mm.
4.1.8.1 Removing armrest height adjustment mechanism

1. Remove the backrest plates. For a detailed description, see 4.1.4 Backrest, Page 24.
2. Remove the screw securing the plastic knob.
3. Remove the plastic knob.

4. Remove the four screws securing the plastic cover.

5. Document the cable set up behind the plastic cover.

6. Remove the BUS contacts from the contact block and divide the cabling for the ICS switchbox at the contacts on the cabling.
7. Remove the four screws attaching the armrest hinge to the backrest. Also remove the four washers.

8. Remove the joint for the backrest slide function, which is held in place by one screw.

9. Carefully move the armrests together with armrest hinge backwards. Lay the armrest together with the armrest hinge behind the seat.

10. Loosen the two screws on the left and the right side of the backrest profile.
11. Slide the backrest profile out from the hinge and slewing bracket by pulling it straight up.
12. Loosen the screws on the left and right side of the backrest profile and then remove its end cover by sliding it straight out.

13. Remove the adjustment bar brackets, which are each held in place by two screws.

14. Screw the adjustment bar down far enough to be able to prize it up out of the groove on the backrest profile.
4.1.8.2 Mounting armrest height adjustment mechanism

1. Push the threaded rod into the backrest profile and at the same time screw on the driver (1).
2. Apply thread locker (Loctite 2701) to the ends of the threaded rod and fit the two end pieces (2 & 3) onto the threaded rod.

3. Assemble the adjustment bar brackets, which are each held in place by two screws.

4. Reassemble the end cover of the backrest profile by pushing it straight into the end of the profile. Secure the cover by tightening the screws on the left and right.

5. Reassemble the backrest profile by fitting the hinge and the slewing bracket into the profile groove on the left and right sides. Slide the profile downwards until the stop on the bracket and the slewing bracket is touching the end of the backrest profile on both the left side and the right. Secure the backrest profile by tightening the two screws on the left and right. Tighten the screws using a torque wrench. Tightening torque 7.2 lb.ft.

Figure 98. Apply thread locker.

Figure 99. The adjustment bar brackets are each held in place by two screws.

Figure 100. The end cover of the backrest profile is secured using one screw on the left side and one on the right.

Figure 101. The backrest profile is secured by two screws on the left and right.
6. Carefully put the armrests and the armrest hinge back to its original position.

7. Reattach the armrests using the four screws with the washers. Tighten the screws using a torque wrench. Tightening torque 7.2 lb.ft.

8. Assemble the joint for the backrest slide function using the screw supplied. Tighten the screw using a torque wrench. Tightening torque 7.2 lb.ft.

9. Check your documentation on the cable set up.

10. Connect the BUS contacts into the contact block and assemble the cabling for the ICS switchbox at the contact on the cabling.

11. Attach the plastic cover with the four screws. Tightening torque: 0.89 lb.ft.

12. Reassemble the backrest plates. For a detailed description. See 4.1.4 Backrest, Page 24.
4.1.9 Panel holder

- Allen key, 4 mm.
- Allen key, 5 mm.
- Diagonal pliers.
- Something to document with (camera, pen and paper etc.).

4.1.9.1 Removing panel holder

1. Switch Off the main power switch on the control panel.

2. Document the locations of the cable ties for the reassembly. The locations of the cable ties can vary between different configurations.

3. Remove the cable ties necessary for removing the panel holder.

4. Disconnect the control panel’s cable.
5. Loosen the screw(s).

6. Pull out the panel holder.
4.1.9.2 **Mounting panel holder**

1. Push in the panel holder either in through the clamp or into the UniTrack.

2. Tighten the screw(s).
3. Connect the control panel’s cable connection.

![Figure 118. The control panel’s cable connection is in most cases located under the armrest.]

4. Check your documentation of the cable ties locations ...

5. ... and attach the cable ties accordingly.

![Figure 119. Check your documentation.]

6. Switch On the main power switch on the control panel.

![Figure 120. Be careful when tightening the cable ties. Do not damage the cables.]

4.1.10 Leg rest

For this task the following tools are necessary:
- 1 Torque wrench.
- 1 Allen key 6 mm.
- 1 Allen key 8 mm.
- 1 Socket 17 mm.

![Figure 121. On/Off symbol depending on model.]
WARNING!
Risk of injury while working on the leg rest
Do not place any weight on the leg rest while working on it.

4.1.10.1 Removing leg rest

1. Switch off the main power switch on the control panel.

2. Remove the leg rest's top cover by carefully pulling it straight out.

3. Remove the front ends of the UniTrack rails.
4. Remove the front bracket of the manual adjustment unit or actuator. Start with the lock nut and the washer on the inside of the bracket, then remove the screw and washer.

5. Remove the leg rest, which is held in place by two screws and spacers.

4.1.10.2 Mounting leg rest

1. Assemble the leg rest using the two screws and spacers. Use a torque wrench to tighten the screws. Tightening torque 17.7 lb.ft.

2. Assemble the front bracket of the manual adjustment unit or actuator. Start with the screw and washer. Tighten the screw using a torque wrench. Tightening torque 17.7 lb.ft. Then fit the lock nut and washer on the inside of the bracket. Hold the screw to counteract rotation while tightening the nut. Tighten the nut using a torque wrench. Tightening torque 17.7 lb.ft.

3. Assemble the front ends of the UniTrack rails.
4. Assemble the leg rest's top cover by carefully pressing its bracket into place on the leg rest's fixing screws/spacers.

4.1.11 Leg rest actuator

The powered leg rest exists in two different versions. What sets them apart is the brand of the actuator. One version uses an LINAK LA28 actuator and the other one an actuator from REAC. The most apparent difference is the motor location compared to the front. The motor on LINAK LA28 is pointing forward, see figure 133, while the motor on REAC points backwards, see figure 134. Their different brand marks is also found on each of them.

For this task the following tools and grease are necessary:
- 1 Torque wrench.
- 1 Socket 17 mm.
- 1 Allen key 5 mm.
- 1 Allen key 8 mm.
- Grease: Lubetec Red Guard or MICROLUBE GL 261/GL 262.

4.1.11.1 Removing leg rest actuator

![WARNING!]

**Risk of injury while working on the leg rest**

Do not place any weight on the leg rest while working on it.

1. Raise the seat to its highest position.
2. Switch off the main power switch on the control panel.
3. Remove the seat cushion.
4. Remove the thigh supports.
5. Remove the seat plates on the right-hand side. See 4.1.2 Seat plates, Page 23.
6. Remove the UniTrack rail from the right side of the seat. See page 4.1.3 UniTrack rails, Page 23.
7. Remove the actuator connector by pushing in the two latches on the connector and pulling it straight out from the junction box on the right side of the seat.
   - Make a note of how the cabling is positioned; this is needed when you re-attach it later.
8. Loosen the actuator cabling from its fixing points. Pay attention to how the cable is positioned and strapped; this will help during reassembly. It is very important that positioning and strapping is performed the same way during the reassembling.

9. Remove the nut (F) and shim washer (E) from the front fixing screw (C).
10. Unscrew the front fixing screw (C) and dismount the thick washer (D), bushing (A in the front) and actuator from the leg rest arm.
11. Unscrew the rear mount screw with its washer (B) and dismount the actuator from the trunnion (A in the rear).
4.1.11.2 Mounting leg rest actuator

1. Apply grease (Lubetec Red Guard or equivalent) on trunnion and bushing surfaces (A).
2. Mount the rear of the actuator onto the trunnion using the M6x12 screw (B) and its washer. Tighten the screw using a torque wrench. Tightening torque 7.2 lb.ft.
3. Place the thicker washer 2 mm (approximately 0.08”) (D) onto the front fixing screw (C).
4. Mount bushing (A), front fixing screw (C), thick washer (D) and actuator to the leg rest arm.
5. Place the shim washer (E) on the front fixing screw (C) and screw the check nut (F) by hand onto the front fixing screw (C).
6. Use a Allen key to hold the front fixing screw (C), this to prevent it from loosening of the leg support arm when tightening the check nut (F). Tighten the check nut (F) using a torque wrench. Tightening torque: 17.7 lb.ft.
7. Consider the cables placement carefully, ensuring that there is no risk for them to jam or become damaged. It is very important that the positioning and strapping is performed in the same way as they were before disassembly.
8. Connect the actuator connector to the same position as noted in step 7. into the junction box on the right-hand side of the seat. Fit the connector by pushing it straight in at any point. See fig. 130.
9. Assemble the UniTrack rail on the right side of the seat. See 4.1.3 UniTrack rails, Page 23.
10. Assemble the seat plates on the right-hand side. See 4.1.2 Seat plates, Page 23.
11. Assemble the thigh supports.
12. Reattach the cushions by means of velcro.

4.1.12 Leg rest strap

For this task the following tools are necessary:
- 1 Allen key 3 mm.
- 1 Steel ruler.

**WARNING!**
Risk of injury while working on the leg rest

Do not place any weight on the leg rest while working on it.

4.1.12.1 Removing leg rest strap

1. Switch off the main power switch on the control panel.
2. Lift up the leg rest’s top cover.
3. Remove one end of the leg rest strap by carefully raising the lower section of the leg rest slightly and at the same time removing the two screws on the front of the leg rest. Then pull the assembling plate out of the loop of the strap.
   Once the strap is loosened the lower section of the leg rest will become loose and can be carefully placed on the floor.
4. Remove the two screws holding the strap bracket on the back of the leg rest in place.
5. Pull the strap out of the leg rest mechanism.

4.1.12.2 Mounting leg rest strap
1. Pull the strap through the bracket on the back of the leg rest. Measure to make sure that the strap extends 85 mm from the bracket. Secure the strap by tightening the two screws on the bracket.
2. Slide the lower section of the leg rest up and pull the strap through the leg rest mechanism.
3. Place the assembling plate in the loop of the strap and then assemble this on the front of the leg rest using the two screws.

4.1.13 Leg rest slide bushings
For this task the following tools are necessary:
• 1 Allen key 3 mm.

**WARNING!**
Risk of injury while working on the leg rest
Do not place any weight on the leg rest while working on it.

4.1.13.1 Removing leg rest slide bushings
1. Set the angle of the leg rest to its outermost position.
2. Switch off the main power switch on the control panel.
3. Remove one end of the leg rest strap by carefully raising the lower section of the leg rest slightly and at the same time removing the two screws on the front of the leg rest. Pull the assembling plate out of the loop of the strap. See fig. 141. Once the strap is loosened the lower section of the leg rest will become loose and can be carefully pulled downwards/forwards until the lower section of the leg rest is completely loose.

4. Remove the slide bushing in the upper section of the leg rest, which is attached using two screws.

5. Remove the slide bushing in the lower section of the leg rest, and at the same time use a suitable tool to press in the locking tabs on the bushing, located in the hole immediately below the top edge of the leg rest.

4.1.13.2 Mounting leg rest slide bushings

1. Fit the slide bushing in the lower section of the leg rest, making sure the locking tabs on the bushing are securely fixed in the hole in the leg rest. See fig. 140.

2. Fit the slide bushing in the upper section of the leg rest using the two screws. See fig. 139.

3. Slide the upper and lower sections of the leg rest together, and pull the leg rest strap through the leg rest mechanism.

4. Place the assembling plate in the loop of the strap and then assemble this on the front of the leg rest using the two screws.
4.1.14 Articulating leg rest
For this task the following tools are necessary:
- 1 Torque wrench.
- 1 Allen key 5 mm.
- 1 Allen key 8 mm.
- 1 Socket 17 mm.
- 1 Circlip pliers.

**WARNING!**
Risk of injury while working on the leg rest
Do not place any weight on the leg rest while working on it.

4.1.14.1 Removing leg rest
1. Switch off the main power switch on the control panel.

2. Remove the leg rest's top cover by carefully pulling it straight out.
3. Disconnect the articulation actuator by dividing the connector on its cable.

4. Remove the front ends of the UniTrack rails.
5. Remove the front bracket of the manual adjustment unit or actuator. Start with the lock nut (7) and the shim washer (6) on the inside of the bracket, then remove the screw (3), washer (4) and spacer (5).

6. Remove the leg rest, which is held in place by a axle (2) with a circlip (1) on the left and right hand side of the leg rest.

### 4.1.14.2 Mounting leg rest

1. Mount the leg rest using the axle and the two circlips.

2. Mount the front bracket of the manual adjustment unit or actuator.
   
   Start with the screw (3), washer (4) and spacer (5). Tighten the screw using a torque wrench. Tightening torque: 17.7 lb.ft. Then fit the shim washer (6) and lock nut (7) on the inside of the bracket. Hold the screw to counteract rotation while tightening the nut. Tighten the nut using a torque wrench. Tightening torque: 17.7 lb.ft.

3. Mount the front ends of the UniTrack rails.

4. Connect the articulation actuator to the connector on its cable.

Figure 145. The leg rest is held in place by an axle (2) with a circlip (1) on the left and right hand side of the leg rest. The front bracket of the actuator is held in place by a screw (3), washer (4) and shim washer (5) and lock nut (7).

Figure 146. The leg rest is held in place by an axle (2) with a circlip (1) on the left and right hand side of the leg rest. The front bracket of the actuator is held in place by a screw (3), washer (4) and shim washer (5) and lock nut (7).

Figure 147. Remount the front ends of the UniTrack rails.
5. Mount the leg rest's top cover by carefully pressing its bracket into place on the leg rest's axle.

4.1.15 Manual leg rest adjustment unit
For this task the following tools are necessary:
• 1 Torque wrench.
• 1 Allen key 5 mm.
• 1 Allen key 8 mm.
• 1 Socket 17 mm.

WARNING!
Risk of injury while working on the leg rest
Do not place any weight on the leg rest while working on it.

4.1.15.1 Removing manual leg rest unit
1. Switch off the main power switch on the control panel.

2. Remove the UniTrack rail from the right side of the seat. See 4.1.3 UniTrack rails, Page 23.
3. Remove the lock nut from the front bracket of the adjustment unit.
4. Remove the adjustment unit, which is held in place by two screws.
4.1.15.2 Mounting manual leg rest unit

1. Fit the rear fixing screw (M6x12) and washer for the adjustment unit. Tighten the screw using a torque wrench. Tightening torque 7.2 lb.ft.

2. Fit the front fixing screw (M10x60), spacer and washer for the adjustment unit. Tighten the screw using a torque wrench. Tightening torque 17.7 lb.ft.

3. Fit the lock nut and washer on the front bracket of the adjustment unit. Hold the screw to counteract rotation while tightening the nut. Tighten the nut using a torque wrench. Tightening torque 17.7 lb.ft.

4. Assemble the UniTrack rail on the right side of the seat. See 4.1.3 UniTrack rails, Page 23.

4.1.16 Footplates

For this task the following tools are necessary:

- 1 Torque wrench.
- 1 Allen key, 5 mm.

**WARNING!**

Risk of injury while adjusting footplates

Do not place any weight or load on the footplates while adjusting the footplates.

4.1.16.1 Removing footplate

1. Switch off the main power switch on the control panel.
2. Remove the screw holding the footplate in place.
3. Remove the footplate friction brake by taking the parts off the shaft.
4. Remove the footplate by taking it off the shaft.

4.1.16.2 Mounting footplate
1. Assemble the footplate by sliding it onto the shaft.
2. Assemble the footplate friction brake by sliding the parts onto the shaft. Make sure that the metal butt is positioned in the intended hole in the footplate.
3. Fit the screw that holds the footplate in place. Tighten the screw using a torque wrench. Tightening torque: 17.7 lb.ft.

4.2 Chassis
4.2.1 Covers
4.2.1.1 Removing chassis covers
1. If possible, on chassis with powered seat lift, raise the seat halfway up, or on chassis with seat tilt only, raise the seat tilt halfway backwards, to facilitate removal of the chassis top cover.
2. Switch off the main power switch on the control panel.
3. Remove the two knobs holding the chassis covers.

4. Pull the top chassis cover backwards off the chassis.

5. Pull the rear chassis cover off the chassis. Note that the cover is mounted around the axles of the link arms. On chassis with lights, disconnect the connector on the cable at the back marked “Rear lights and turn signals”.

Pull the rear chassis cover off the chassis. Note that the cover is mounted around the axles of the swing arms. On chassis with lights, disconnect the connector on the cable at the back marked “Rear lights and turn signals”.

Figure 156. The chassis covers are fitted with two knobs.

Figure 157. Top cover.

Figure 158. Rear cover.

Figure 159. An enlargement of the rear cover going over the rear axle.
6. Pull the front chassis cover off the chassis. Note that the cover is mounted with snap hooks on the lower part of the chassis.

4.2.1.2 Mounting chassis covers

1. Switch off the main power switch on the control panel.

2. On chassis with lights, connect the rear light cables on the rear cover to the cables marked "rear lights and turn signal" on the back of the chassis.

3. Mount the rear chassis cover on to the chassis by positioning the cover on the link arms axles.
   Mount the rear chassis cover on to the chassis by positioning the cover on the swing arms axles.

4. Secure the cover by pressing its upper part against the Velcro strip on the back of the chassis.
5. Mount the front chassis cover on to the chassis. Note that the cover is mounted with snap hooks on the lower part of the chassis. Position the cover making sure the fixing points are correctly positioned with the corresponding holes of the chassis.

Figure 164. Front cover.

Figure 165. Snap hooks and its fixing point in the lower part of the chassis.

Figure 166. The lower screws of the chassis have to match the holes in the extrudes of the front cover.
6. Slide the top chassis cover on to the chassis and at the same time press the rear edge of it downwards to make sure it hooks on to the rear chassis cover.

7. Mount the two knobs holding the chassis covers without tightening them.
8. Press the top chassis cover and the front chassis cover against each other until any space between them is eliminated, then tighten the two knobs.

4.2.1.3 Remove fenders
1. Switch off the main power switch on the control panel.
2. Use a screwdriver or equivalent and carefully pry off the accent cover.

3. Remove the screw holding the front of the fender.

4. Remove the two knobs holding the fenders.
5. Pull the fenders off the chassis.

4.2.1.4 Install fenders

1. Switch off the main power switch on the control panel.

2. Install the fenders onto the chassis.

3. Install the two knobs holding the fenders without tightening them.
4. Install and tighten the screw in the countersunk hole in the front of the fender. Tightening torque: 2.1 lb.ft.

5. Attach the accent cover. Start with inner snap hook and pinch the accent cover to install the middle snap hook next. And then the outer snap hook will go in its position automatically.

6. Tighten the two knobs, holding the fenders, by hand.

4.2.1.5 Remove drive unit covers

1. Switch off the main power switch on the control panel.

2. Remove the fender. See 4.2.1.3 Remove fenders, Page 65.

3. Remove the brake release cover, it is attached with one screw.
4. Remove the drive unit cover, it is attached with two screws.
5. On wheelchairs equipped with turn signals, disconnect the turn signal’s cabling from the rear of the turn signals.

4.2.1.6 Install drive unit covers
1. Switch off the main power switch on the control panel.

2. On wheelchairs equipped with turn signals, connect the turn signal’s cabling into the rear of the turn signals.
3. Install the drive unit cover with the two screws. Tightening torque: 0.9 lb.ft.

4. Install the brake release cover using the screw.
5. Assemble the fenders again. See 4.2.1.4 Install fenders, Page 67.

4.2.1.7 Remove front swing arm covers
1. Switch off the main power switch on the control panel.
2. Pry of the swing arm accent cover, use a screwdriver or equivalent for removing the accent covers.

3. On wheelchairs equipped with front lights, pull out the light cable from the cable channel on the swing arm cover.

4. Locate the three screws under the accent cover.

5. Remove the three screws holding the front swing arm covers.
6. Remove the front swing arm covers.

4.2.1.8 Install front swing arm covers

1. Switch off the main power switch on the control panel.
2. Place the front swing arm covers in position and hold them together.

3. Insert the three screws and tighten them.
4. On wheelchairs equipped with front lights, push in the light cable from the cable channel on the swing arm cover.

5. Install the swing arm accent cover by carefully pushing it in to position until you hear a “click”.

4.2.1.9 Remove rear swing arm covers

1. Switch off the main power switch on the control panel.

2. Pry off the swing arm accent cover, use a screwdriver or equivalent for removing the accent covers.
3. Locate the three screws.
4. Remove the three screws holding the rear swing arm covers.

5. Remove the rear swing arm covers.

4.2.1.10 Install rear swing arm covers
1. Switch off the main power switch on the control panel.
2. Place the rear swing arm covers in position and hold them together.

3. Insert the three screws and tighten them.
4. Install the swing arm accent cover by carefully pushing it in to position until you hear a “click”.

4.2.2 AP elevator

4.2.2.1 AP elevator

For this task the following tools are necessary:
• 1 Torque wrench.
• 1 Allen key 3 mm.
• 1 Allen key socket 6 mm.
• 1 Allen key socket 8 mm.
• 1 Ring wrench 17 mm.
• 1 Torx key T–20.
• Means of documentation (camera, pen and paper etc.).

Manual operation of AP elevator

If the AP elevator does not work normally because the batteries are discharged or the adjustment devices are defective, the seat can be raised or lowered manually.

Prepare manual operation

1. Switch off the main power switch on the control panel.

2. Remove the seat cushion by lifting it straight up.
3. Remove the seat plates, they are fitted with four screws at the back and front edge.

4.2.2.1.1 AP elevator
4. Remove the actuator from the leg rest, it is attached with one screw, washer, spacer, washer and a lock nut.

5. Remove the leg rest’s top cover by carefully pulling it straight out. If the three attachment screws of the power motor of the seat tilt mechanism are accessible, proceed to step 10.

6. Remove the rear attachment screw of the UniTrack rail on the left and right hand side of the seat.

7. Remove the circlip and the bolt at the back of the parallel armrest rod.
8. Remove the seven screws marked (B) securing the seat frame’s rear section.

9. Take note of the current seat depth setting with consideration to subsequent assembling. The rails with which the seat depth is adjusted are marked with the settings for each potential position. The scale is marked with "millimeters" on one side and "inches" on the other. Pull the rear section of the seat forward to uncover the three screws holding the power motor of the seat tilt mechanism.

10. Remove the power motor of the seat tilt mechanism, it is assembled with three screws.

11. Remove the protective rubber cover underneath the chassis to get access to the seat elevator axle. In the figure the wheelchair is shown without the front chassis cover for better view, the front chassis cover does not need to be removed.
**Manual adjustment of height and angle**

1. Fold the leg rest upwards to get access to the seat elevator axle.
2. Use the Allen key from the back rest to manually adjust the height of the seat elevator i.e. rotate the axle.
3. Use the supplied spanner to manually adjust the angle of the seat elevator i.e. rotate the seat elevator axle. It is accessed through the hole in the bottom of the chassis. See fig. 219.

**Reassemble after manual operation**

1. Refit the protective rubber cover underneath the chassis.
2. Refit the power motor of the seat tilt mechanism, it is assembled with three screws. The actuator has to be calibrated after refitting. If the rear section of the seat frame hasn’t been moved, proceed to step 6.
3. Pull the rear section of the seat backwards to the correct seat depth setting. Tighten the seven screws marked (B) securing the seat frame’s rear section.

Figure 220. Use the Allen key from the back rest to manually adjust the height of the seat elevator. The seat is shown without the leg rest to get a better view, the leg rest do not need to be removed for this operation.

Figure 221. The power motor of the seat tilt mechanism is assembled with three screws.

Figure 222. The position of the rear section of the seat frame (backrest position) is fixed by seven screws, here marked with the letter B.
4. Refit the circlip and the bolt at the back of the parallel armrest rod.

5. Refit the rear attachment screw of the UniTrack rail on the left and right hand side of the seat.

6. Mount the leg rest's top cover by carefully pressing its bracket into place on the leg rest's axle.

7. Refit the actuator to the leg rest, it is attached with one screw, washer, spacer, washer and lock nut. Tighten the screw and nut using a torque wrench. Tightening torque: 17.7 lb.ft.
8. Refit the seat plates, they are fitted with four screws at the back and front edge.

9. Refit the seat cushion.

**Removing AP elevator**

1. Raise the seat lift to its highest position. To raise the seat on a chassis with an powered seat lift that does not work normally because the batteries are discharged or the adjustment device is defective, see *Manual operation of AP elevator*, Page 76.
2. Switch off the main power switch on the control panel.

3. Set the main circuit breaker to the “OFF” position. See 4.3.5 *Main circuit breaker*, Page 168.
4. Remove the chassis covers. See 4.2.1 *Covers*, Page 61.
5. Remove the seat plates. See 4.1.2 *Seat plates*, Page 23.
6. Remove the UniTrack rail on the right hand side of the seat. It is mounted with two screws. See 4.1.3 *UniTrack rails*, Page 23.
7. Disconnect the Tilt motor cabling from the contact block at the seat frame. Release the cable from its cable brackets on the seat and the AP elevator. Make note of how the cable is assembled with consideration to subsequent re-assembly. See also 4.2.2.4 *AP elevator tilt motor cable*, Page 111.

8. Disconnect the cable that connects the ICS master module to the contact block at the seat frame. Make note of how the cables are assembled on the seat frame with consideration to subsequent re-assembly. See also 4.3.2 *R-net and ICS bus cabling*, Page 160.
9. Remove the screw securing the plastic knob.
10. Remove the plastic knob.

11. Remove the four screws securing the plastic cover.

12. Document the cable setup behind the plastic cover.

13. Disconnect the R-net cable from the contact block at the back of the backrest. Release the cable from its cable brackets. Make note of how the cable is mounted with consideration to subsequent mounting. See 4.3.2 R-net and ICS bus cabling, Page 160.
14. Detach the AP elevator rod from the back rest hinge. It is attached with a pin and circlip.

15. Remove the seat. See 4.1.1 Seat, Page 18.

16. Disconnect the AP elevator cabling from the ICS master module. It is connected to one of the connectors J11 or J12. Release the cable from its cable brackets. Make note of how the cable is mounted with consideration to subsequent re-assembly.

17. Remove the ICS master module. See 4.3.4 ICS master module, Page 166.

18. Remove the front transport eyes, they are attached with two screws each.

19. Remove the six screws (1) and loosen the two screws (2) holding the AP elevator at the front.
20. Remove the two screws (3) holding the AP elevator at the back.

21. Lift the AP elevator straight up out of the chassis.

**Mounting AP elevator**

Mount in the reverse order.

1. Fit the AP elevator into the chassis. Fit the six screws (1) and tighten the two screws (2) holding the AP elevator at the front. Use a torque wrench to tighten the screws. Tightening torque: 17.7 lb.ft.

2. Fit the two screws (3) holding the AP elevator at the back. Use a torque wrench to tighten the screws. Tightening torque: 17.7 lb.ft.
3. Refit the front transport eyes, they are attached with two screws each. Use a torque wrench to tighten the screws. 17.7 lb.ft

4. Mount the ICS master module. See 4.3.4 ICS master module, Page 166.

5. Connect the AP elevator cabling to the ICS master module. It should be connected to either one of the connectors J11 or J12.

6. Mount the seat. See 4.1.1 Seat, Page 18.

7. Mount the AP elevator rod to the back rest hinge. It is attached with a pin and circlip.
8. Connect the Tilt motor cabling to the contact block on the seat frame. Mount the cable to its cable brackets on the right hand side of the seat. See 4.2.2.4 AP elevator tilt motor cable, Page 111.

9. Check your documentation of the cable set up.
10. Connect the R-net cables to the contact block at the back of the backrest. Assemble the cables to its cable brackets. See 4.3.2 R-net and ICS bus cabling, Page 160.

11. Attach the plastic cover with the four screws. Tightening torque: 0.89 lb.ft.

12. Attach the plastic knob with the screw. Tightening torque: 0.22 lb.ft.
13. Connect the ICS bus cable at the connector on the cables next to the contact block at the back of the back rest. See 4.3.2 R-net and ICS bus cabling, Page 160.

14. Mount the UniTrack rail. See 4.1.3 UniTrack rails, Page 23.

15. Mount the seat plates. See 4.1.2 Seat plates, Page 23.

16. Mount the chassis covers. See 4.2.1 Covers, Page 61.

17. Switch the main circuit breaker to ON (ON). See 4.3.5 Main circuit breaker, Page 168.

4.2.2.2 AP elevator lift motor and belt

For this task the following tools are necessary:
- 1 Allen key 4 mm.
- 1 Allen key 5 mm.
- 1 Allen key 6 mm.
- 1 Tensiometer

Removing AP elevator lift motor and belt

1. Raise the seat to its highest position.
2. Switch off the power supply using the On/off-key on the control panel and switch the main circuit breaker to OFF. See 4.3.5 Main circuit breaker, Page 168.
3. Remove the chassis covers. See 4.2.1 Covers, Page 61.
4. Disconnect the elevator lift motor cable from the ICS master module.
5. Remove the support wheel unit to facilitate removal of the protective plate underneath the motor. See .
6. Remove the protective plate underneath the motor, it is attached with two screws.
7. Remove the ICS master module. See 4.3.4 ICS master module, Page 166.

8. Remove the ICS master module bracket. It is attached with two screws.

9. Remove the motor, it is attached with three screws.
10. Remove the belt from the belt wheels.
Mounting AP elevator lift motor and belt

1. Assemble the belt on to the belt wheels.
2. Assemble the motor using the three screws and washers. Do not tighten the screws fully, they have to be somewhat loose in order to adjust the belt tension.
3. Adjust the belt tension by pulling the motor to the side and then tightening the three screws.

4. Place the tensiometer to the belt assembly so that the wheel is touched and the side plates are on each side of the belt.
5. Let the tensiometer adjust itself by letting it go.
6. Check that the tension is correct by making sure the pointer mark is in the allowed range between the “left” and “right” marks. If the belt tension is incorrect it must be adjusted once again. Loosen the three screws holding the motor and start over with step 3. once again.

7. Assemble the ICS master module bracket. It is attached with two screws.
8. Assemble the ICS master module. See 4.3.4 ICS master module, Page 166.
9. Connect the motor cable to the ICS master module.

10. Assemble the protective plate underneath the motor, it is attached with two screws.

11. Assemble the chassis covers. See 4.2.1 Covers, Page 61.

4.2.2.3 AP elevator tilt actuator

For this task the following tools are necessary:
- 1 Allen key 4 mm.
- 1 Allen key 5 mm.
- 1 Allen key 6 mm.
- 1 Brush
- Grease (Molykote or equal lubricant compatible with plastic and elastomer).
- 1 Measuring tape
- 1 Ring wrench 17 mm.
M3 Corpus Repairs - Chassis

• 1 Circlip pliers
• 1 Strap with ratchet (Approved for ≥ 440 lbs).
• ICS switchbox if not installed on the chair.

Replacing AP elevator tilt actuator

CAUTION!
No user in the seating system
The user of the power wheelchair cannot be seated in the seating system during this repair.

CAUTION!
Maintenance by a qualified service technician
Only qualified service technicians should perform the maintenance and repair specified in this manual. Read all instructions carefully before proceeding. If any questions arise, contact Permobil for assistance.

NOTICE
Always change the textile tube
The textile tube should always be changed when the actuator is replaced.

1. Begin by fully elevating the seating and fully elevating the leg rest.

2. Remove the seat cushions by lifting it straight up. It is attached by means of Velcro on the rear of the cushion. Remove the seat plates, which are held in place by four screws.
3. Remove the cable clips from the left and right side of the top plate. Save them for later installation.

---

**CAUTION!**

**Seating unbolted**

The seating system is unbolted from the top plate in these steps. Carefully slide the seating system to and fro to gain access to the bolts required.

4. Note the location of the M6x12 bolts identified with circles. The location of these bolts indicates the original seat depth. Remove these M6x12 bolts.

5. Remove the eight M6x25 bolts.

6. Note the center of gravity setting for reassembly.
7. Remove the four M6x12 bolts. The plate and plastic cover are now disassembled.

8. Remove the two M6x12 bolts securing the rear seat bar to the top plate.

9. Remove the four M6x25 bolts. Carefully slide the width adjustment brackets together with the UniTrack rail.

10. Push the plate and plastic cover backwards to expose the two bolts securing the end stop.
11. Remove the end stop and scrap. The end stop can look different depending on the revision. See A or B.

12. Remove the bracket holding the end of the actuator. Remove the plastic bearing from the bracket and scrap it and save the bracket for later. The bracket can look different depending on the revision, see A or B.
13. This is not applicable for leg rest power extension. Remove the two bolts securing the roller bracket. Remove the roller bracket, save the bolts and the roller bracket for later installation.

14. Carefully position the seating to gain access to the four bolts securing the actuator’s holder. Remove the bolts securing the actuator’s holder. Save the bolts.

15. Remove and save the holder. Note the orientation for reassembly.
16. Remove the pinch guard from the top plate.

17. Place the plate in the "center of gravity", position 3, for easy access of the bolts in the coming steps. Return the two M6x12 bolts.

**CAUTION!**

Seating unbolted

The seating system is unbolted from the top plate in these steps. Carefully slide the seating system to and fro to gain access to the bolts required.

18. Position the rear seat bar in the position –2". Return the two M6x12 bolts.

19. Position the front seat bar in position +2" and return these ten bolts and snug them tight. They will be removed again at a later stage.
20. Check that the leg rest is fully elevated.

21. **Enter seating into the Emergency operation mode.**
   
   I. Turn off the wheelchair.
   
   II. Press and hold button 6 and 8 on the ICS switchbox.
   
   III. While holding these buttons, turn on the wheelchair with the Power button on the joystick (or input device). All LED:s on the ICS switchbox will glow green, continue to hold buttons 6 and 8.

   IV. When all the ICS switchbox LED:s glow red, release buttons 6 and 8 (approximately 30 seconds). The switchbox LED:s will oscillate green to signify that you are in Manual operation mode. If the switchbox LED:s do not oscillate green, begin again.

22. Press and hold button 5 to anterior tilt the seating system. The seating system will move very slowly. Monitor closely for binding or possible collision of seating.

23. The goal is to anterior tilt the seating to a position that allow easy access to the underside of the top plate. After reaching this position power down the chair.
24. Use a strap to secure the elevators position. Attach the strap to the leg rest and the shaft of the lower back of the AP elevator.

25. Remove the cable clip securing the wiring harness from the actuator. Disconnect the actuator lead from ICS system.

26. Remove the snap ring and pin securing the actuator to the top plate assembly.
CAUTION!

Always replace the textile cover
The textile cover should always be replaced when the actuator is replaced.

27. Depending on the revision of the carriage there are different actions.

Carriage A: Remove the nut and the M6 screw and scrap them, remove the locking plate (A) and save it for later installation. If the M5 screw and textile cover is present remove and scrap them.

Carriage B: Remove the M5 screw for the locking plate and scrap it, remove the locking plate (A) and save it for later installation. If the M5 screws and textile cover is present remove and scrap them.

28. Gradually loosen the strap that goes around the leg rest and the AP elevator shaft while unscrewing the plastic nut.

29. Remove the actuator.
30. The length of the actuator spindle might differ depending on different revisions.
Position, by eye, the polymer nut on the new actuator in the same position as the nut on the previously removed actuator.

31. Insert the new actuator into the carriage. You might need to loosen the strap and tilt back the seat a little in order to fit the new actuator.

![Figure 295. Place the new actuator beside the old actuator.]

![Figure 296. The top plate without the seat for better visuals.]

32. Mount the polymer nut in the carriage.

![Figure 297. Screw in the polymer nut into the carriage.]

33. There must be a gap of 3/64 inch between the polymer nut and the carriage.

![Figure 298. It is very important that there is a gap between the polymer nut and the carriage.]

CAUTION!

Do not use tools

Do not use tools when mounting the polymer nut. Usage of tools can lead to critical damage on the polymer nut.
34. Reattach the snap ring and the shaft holding the actuator.

![Reattach the snap ring and the shaft.](image1)

35. Detach the strap from the leg rest and the shaft of the lower back of the AP elevator.

![Detach the shaft of the lower back of the AP elevator.](image2)

36. This step is only necessary if the textile cover is in separate parts. Drop the plastic bushing inside the textile cover. Work the bushing into the hole at the other end as shown.

![Drop the new plastic bearing into the textile cover.](image3)

![Pull it thru the smaller hole in the textile cover.](image4)
37. This step is only necessary if the textile cover is in separate parts. Assemble the plate to the textile cover.

38. Mount the plastic bearing into the bracket. Apply grease (Molykote PG-75 or equal lubricant compatible with plastic and elastomer) on the inside of the bearing. The bracket can look different depending on the revision. See A or B.

39. Slide the textile tube onto the actuator spindle. Make sure that the seam of the cover is facing the top plate's underside.
40. Mount one of the new M5x12 screws in the upper hole. Do not tighten the screw.

41. Depending on the revision of the carriage there are different actions.

**Carriage A:** Mount the locking plate on the actuator plastic nut. Mount the new M6x40 screw and washer. Tightening torque 7.2 lb.ft. Mount the new nut. Tightening torque 2.1 lb.ft. Tighten the screw mounted in step 40. Tightening torque 4.2 lb.ft.

**Carriage B:** Mount the locking plate on the actuator plastic nut. Mount the M5x16 screw securing the locking plate. Mount the M5x12 screw securing the textile tube. Tighten all three screws, including the screw in step 40., with 4.2 lb.ft.

42. Connect the actuator lead to the ICS system and power the chair up thru the On/Off button on the input module. After the chair powers up all LED:s flashes red.
43. Turn off the wheelchair and disconnect the actuator lead.

44. Power the chair up thru the On/Off button on the input module. After the chair powers up, connect the actuator lead to the ICS system. Install the cable clip securing the wiring harness from the actuator. Tighten the screw for the cable clip with 0.89 lb.ft.

45. LED 1 will now flash red/yellow. The actuator is now in calibration mode.
NOTICE
Monitor the textile cover
Carefully monitor the textile cover as the seating moves. Make certain the cover does not entangle with the rotating spindle.

46. Push and hold button 1 to move the seating from its anterior tilt position to 0 °/horizontal position.

47. Push the plastic bearing onto the spindle. The bracket can look different depending on the revision. See A or B.

48. Mount the bracket with two screws to the top plate. Tighten with 9.4 lb.ft. The bracket can look different depending on the revision. See A or B.
49. Continue to push and hold button 1 until the actuator reaches the end stop and the LED:s flashes red.

50. When the LED:s flash red the system is requesting a restart. The system may require multiple restarts. Power the chair off and back on again. The switchbox will return to normal operation.

51. Return the seating to 0°/ horizontal position and elevate the seating for access to the underside of the AP elevator’s top plate.
Figure 321. The placement of the eight bolts.

Figure 322. The placement of the four bolts.

Figure 323. The placement of the two bolts.

CAUTION!

Seating unbolted

The seating system is unbolted from the top plate in these steps. Carefully slide
the seating system to and fro to gain access to the bolts required.

52. Make sure the 12 marked bolts are removed so the plastic cover and
plate can be moved.

53. Remove the two M6x12 bolts securing the rear seat bar to the top
plate. Move the seating system so you can access the screw holes in
step 55.
54. Work the bracket into position from the underside of the top plate. Install the new end stop with the two new M6x12. Tighten with 9.4 lb.ft.

55. This action is not applicable for leg rest power extension. Reassemble the roller bracket. Reattach the two bolts securing the roller bracket. Tighten with 7.2 lb.ft.
56. Put back the holder and reattach the four screws. Tightening torque 5.46 lb.ft.

57. Fit the pinch guard to the top plate using the two screws. Tightening torque 2.2 lb.ft.

58. Push in the two plastic rivets into the pinch guard and the top plate.

59. Adjust and reposition the seating to its original seat depth and center of gravity setting. According to steps 4. to 6.
60. Reattach the bolts securing the plastic cover and plate. Tighten with 7.2 lb.ft.

61. Reattach the bolts securing the plastic cover and plate. Tighten with 7.2 lb.ft

62. Reattach the UniTrack rail and the width adjustment brackets. Tighten the bolts with 7.2 lb.ft.
63. Reattach the two M6x12 bolts securing the rear seat bar to the top plate. Tighten with 7.2 lb.ft.

64. Reattach the cable clips with cables in them. Tighten with 0.9 lb.ft.

65. Reattach the seat plates, which are held in place by four screws. Tighten with 7.2 lb.ft. Reattach the seat cushions. It is attached by means of Velcro on the rear of the cushion.

66. Carefully test the system for proper operation of the seat functions. Pay particular attention to the operation of tilt and the seat lift in both directions of travel. Make certain the textile cover cannot become entangled in the rotating spindle.

4.2.2.4 AP elevator tilt motor cable
For this task the following tools are necessary:
- 1 Torque wrench.
• 1 Allen key 3 mm.

This section describes how the tilt motor cabling is mounted.

1. The first cable bracket must be mounted with the cable jacket protruding approximately 0.2”.

2. The two cable brackets on the AP elevator are mounted with one screw each. Use a torque wrench to tighten the screws. Tightening torque 0.9 lb.ft.

3. Based on the seat depth, the cable either requires five or four cable brackets on the right hand side of the seat. If the seat depth is set between 15” - 21”, the cable is mounted in five cable brackets. If the seat depth is set between 22” - 23”, the cable is mounted in four cable brackets.
4. The tilt motor cable is connected to the fifth position of the connector block at the right hand side of the seat.

4.2.2.5 AP elevator pinch guards
For this task the following tools are necessary:
• 1 Allen key 2,5 mm.

Removing AP elevator pinch guards
1. Raise the seat to its highest position.
2. Switch off the main power switch on the control panel.
3. Remove the four screws holding the pinch guard to the upper arm.
4. Remove the pinch guard.
5. Remove the five screws holding the pinch guard to the lower elevator arm.
6. Remove the pinch guard from the lower elevator arm.
7. Pull out the two plastic rivets out of the pinch guard and the top plate (depending on revision could the rivets be screws instead).

8. Remove the two screws holding the pinch guard on the top plate.
9. Remove the pinch guard from the plate.

**Mounting AP elevator pinch guards**

1. Fit the pinch guard to the top plate using the two screws.
   Tightening torque 2.2 lb.ft.

2. Push in the two plastic rivets into the pinch guard and the top plate.
3. Fit the pinch guard to the lower elevator arm with the five screws. 
   Tightening torque 2.2 lb.ft.

4. Fit the pinch guard to the upper elevator arm with the four screws. 
   Tightening torque 2.2 lb.ft.

4.2.2.6 AP elevator battery pole protection

Removing AP elevator battery pole protection

1. Raise the seat to its highest position.
2. Switch off the main power switch on the control panel.

3. Remove the top chassis cover. See 4.2.1 Covers, Page 61.
4. Remove the battery pole protection by carefully levering its edges outwards and at the same time pull it off from the AP elevator.
Mounting AP elevator battery pole protection
1. Push the battery pole protection on to the AP elevator.
2. Assemble the top chassis cover. See 4.2.1 Covers, Page 61.

4.2.2.7 AP elevator spring unit
For this task the following tools are necessary:
• 1 Allen key 4 mm.

Removing AP elevator spring unit
1. Raise the seat a bit to get access to the spring unit, stop just before
   the AP elevator axle touches the spring unit.
2. Switch off the power supply using the On/Off key on the control
   panel.
3. Remove the spring unit, it is attached with two button head screws
   with washers and one countersunk head screw.

Mounting AP elevator spring unit
1. Assemble the spring unit, it is attached with two button head screws
   with washers and one countersunk head screw.

4.2.2.8 AP elevator track wheel kit
For this task the following tools are necessary:
• 1 Torque wrench.
• 1 Allen key 6 mm.
**WARNING!**

**Risk of crushing - two people are required**

Two people are required for this task due to heavy lifting. Watch out for moving parts, there is a risk of crushing.

---

**Removing track wheel kit**

1. Raise the seat a bit, stop just before the AP elevator axle touches the spring unit.
2. Run the leg rest slightly outwards, approximately 30°.
3. Switch off the main power switch on the control panel.

4. Hold the rear end of the seat in a steady grip. Remove the screw (1) and washers (2 and 3) on both sides.
5. When the screws are removed, the rear end of the seat will come loose. Tilt the seat slightly forward in order to reveal the axle and all the parts.
6. Remove the roller (4), the slide bearing (5), the shaft (6), the slide bearing (7) and the inner roller (8) from each side.
7. Remove the shaft (9).

---

**Mounting track wheel kit**

1. Position the shaft (9).
2. Assemble the inner roller (8), the slide bearing (7), the shaft (6), the slide bearing (5), the roller (4), the washers (3 and 2) and the screw (1) on to the shaft (9).
3. Tighten the screws (1) using a torque wrench. Tightening torque: 17.7 lb.ft.

---

**4.2.3 Batteries**

**4.2.3.1 Removing batteries**

The following tools are necessary for this task:

- 1 Allen key, 6 mm.
• 1 Ring wrench, 10 mm.
• Means of documentation (camera, pen and paper etc.).

WARNING!
Use safety gloves and safety goggles

Always use safety gloves and safety goggles when working with batteries. Exercise caution when using metallic tools or other objects while working with batteries. Batteries are heavy and charged devices and must be handled with great caution. Failure to follow any of these warnings could cause a short circuit, explosion, property damage and/or bodily harm.

CAUTION!
Recycling batteries

Used or malfunctioning batteries must be disposed of responsibly in accordance with local recycling regulations.

1. Place the wheelchair on a level surface. If possible, raise the seat lift halfway up, to facilitate removal of the chassis top cover.
2. Switch off the power supply using the On/Off key on the control panel and switch the automatic main circuit breaker to OFF.

3. Remove the two knobs holding the chassis top and front covers.
4. Slide the top cover off the chassis.

5. Pull the back cover off the dual locks and off the chassis.

---

**WARNING!**

Do not load the seat

Do not load the seat or the AP elevator during this operation. Any load on the seat or the AP elevator could cause permanent damage to the wheelchair or injuries on person(s) in the wheelchair or in its close vicinity. These conditions apply until the screws are reinstalled and tightened to the correct torque.

6. Remove the four screws holding the battery box.
7. Disconnect the right motor and inhibit cable connector (C).
8. Disconnect the left motor and the bus cable connector (B).
9. Disconnect the control panel connector (A).

10. Use the straps to pull the battery box out of the chassis.

11. Slide the battery terminal covers along the cables to access all four battery terminal screws.
12. Disconnect the cables from the four battery terminals.
13. Lift the batteries out of the battery box using the battery straps.

4.2.3.2 Installing batteries
The following tools are necessary for this task:
• 1 Torque wrench.
• 1 Allen key socket, 6 mm.
• 1 Ring wrench, 10 mm.
**NOTICE**

**Different types of batteries**

The chair can be equipped with 60 Ah or 73 Ah maintenance-free batteries. Check carefully which battery you have.

---

**CAUTION!**

**Always use recommended batteries**

Always use Permobil recommended batteries. Other replacement batteries have not been tested for use with Permobil wheelchairs.

---

1. Use the battery straps and lift the new batteries in reverse order (leave the straps on the new batteries).

2. Make sure the batteries are positioned correctly to bring terminals into the right position; refer to the wiring diagram. Connect the four wires to the correct terminals on the batteries as shown in the diagram. Also refer to the sticker inside of the cover.

3. Attach the cable that is connected to the rear battery's left terminal on its cable holder.
4. Attach the cable that is connected to the front battery's right terminal in its cable holder.

5. Push the battery box in to the chassis.

6. Connect the right motor and inhibit cable connector (C).
7. Connect the left motor and bus cable connector (B).
8. Connect the control panel connector (A).

9. Refit the four screws securing the battery box. Use a torque wrench to tighten the screws. Tightening torque: 17.7 lb.ft.
10. Refit the rear chassis cover on to the chassis.

11. Refit the top chassis covers on to the chassis.

12. Refit the two knobs.
13. Switch the automatic main circuit breaker to the On position.

4.2.4 Drive units

The following items are necessary for this task:
- Torque wrench.
- Allen socket, 6 mm.

4.2.4.1 Remove drive unit

1. Switch off the main power switch on the control panel.
2. Remove the drive wheel. See 4.2.5.1 Drive wheels, Page 126.
3. Remove the chassis covers, the fenders and the drive unit cover. See 4.2.1 Covers, Page 61.
4. Disconnect the drive unit cabling from the power module (M1 and M2).
5. Remove the cable from the cable tunnel (A).
6. Remove the cable holder bracket attached with screw (B). Leave the cable clip on so that the clip is maintained at correct place on the cable.
7. Unscrew the screw (B) to the cable clip (A) and remove the cable.
8. Remove the drive unit (F) and the bracket (E). It is attached with four screws (C) and two washers (D).

4.2.4.2 Install drive unit
1. Install the drive unit (F) and bracket (E) to the front swing arm using the four screws (C) and two washers (D). Tighten the screw using a torque wrench. Tightening torque: 7.2 lb.ft.

2. Attach the cable to the cable clip (A) and fasten it to the bracket (E) with screw (B).
3. Position the clip by the marking on the cable.

4. Install the bracket holding the cable to the chassis (B).
5. Press the drive unit cable and wheel lock cable into the cable tunnel (A).
6. Connect the drive unit cabling to the power module (M1 and M2).
7. Install the covers. See 4.2.1 Covers, Page 61.
8. Install the drive wheel. See 4.2.5.1 Drive wheels, Page 126.

![Figure 390. Magnetic wheel lock connection and drive unit connection on power module.](image)

NOTICE

Check brake release

Check that the brake release works properly. When the brakes are released, it should not be possible to drive the wheelchair.

### 4.2.5 Wheels

#### 4.2.5.1 Drive wheels

A. Hub cap (the design may vary depending on markets and market regulations).
B. Screw, ISO 4762 M8x20 8.8 Fe/Zn 5 C1/TUF-LOK DIN 267-28.
C. Washer, ISO 7089 8 200 HV Fe/Zn 5 C1 (8,4x16x1,6).
D. Drive wheel.
E. Spacer, in use only when the wheelchair is fitted with winter tires.
F. Wheel hub, do not remove the hub from drive unit while performing service on the wheel.

The following tools are necessary for this task:
- 1 Torque wrench.
- 1 Allen key socket, 6 mm.
- 1 Jack.
- 4 Blocks for securing the wheelchair.

![Figure 391. Installing the drive wheel.](image)

NOTICE

Replace used wheel bolt

If a wheel bolt is removed for tire service, replace it with a new, unused bolt from Permobil and tighten it to the recommended torque. Also, inspect the drive axle and wheel rim for any damage. Damage to either part can cause the wheel bolt to loosen or fracture. Because the TUF-LOK thread lock fluid wears off, Permobil recommends that wheel bolts only be used once.

Removing the drive wheels

Do not remove the wheel hub (F) from drive unit while performing service on a wheel.
1. Switch off the main power switch on the control panel.

2. Jack up the wheelchair until the wheel turns freely.

3. Use the blocks to secure the chair further.
4. Remove the hub cap (the design may vary depending on markets and market regulations) by carefully levering it out using fingers on two edges of the hub cap.

5. Remove the three screws that hold the wheel in place. The central screw must not be removed.

6. Remove the wheel by pulling it straight out.

7. Remove the spacer (only on some models).

   Remove the spacer.

---

**Installing drive wheels**

1. Fit the spacer (only on some models).

   Fit the spacer.

2. Fit the wheel onto the wheel hub.

3. Insert the three screws and the three washers. Tighten the screws no more than 11 lb.ft.

4. When all screws and washers are in place, tighten the screws. Tightening torque 17.7 lb.ft.
5. Push the hub cap (the design may vary depending on markets and market regulations) in place.
6. Remove the blocks.
7. Lower the wheelchair using a jack or equivalent.

---

**Drive wheel rim**

![Diagram of drive wheel rim with labels A, B, C, D, E]

**Figure 401. Fitting a pneumatic tire to a split rim.**

A. Screw, ISO 4762 M6x25 8.8 Fe/Zn 5 C1/TUF-LOK DIN 267-28.
B. Rim, inner section.
C. Inner tube (only on pneumatic tires).
D. Tire.
E. Rim, outer section.

**Taking the drive wheel rim apart**

---

**WARNING!**

**Risk of injury - release air from tire**

Before taking the wheel rim apart, release air from the pneumatic tire. Failure to do so may cause damage to the tire, rim and/or bodily injury.
The rim can be taken apart to allow fitting or removal of solid or pneumatic tires.

1. Remove the wheel from the wheelchair. See 4.2.5.1 Drive wheels, Page 126.
2. If the tire is pneumatic, release the air.
3. Remove the six screws holding the two halves of the rim together.
4. Take the rim apart.

**Assembling the drive wheel rim**

Read all warnings contained in this section before filling the tires. Failure to do so may result in injury to the user and damage to the wheelchair and other property and also void any warranty applicable to the wheelchair.

Assemble in the reverse order. Tighten the six screws using a torque wrench. Tightening torque: 16.2 lb.ft. Inflate the tire to the recommended tire pressure: 29–36 psi.

---

**CAUTION!**

**Risk of injury if tire pressure is incorrect**

Before operating the wheelchair for the first time and regularly thereafter, check that the tire pressure meets the specifications in this manual. Check the tire pressure when the wheelchair experiences a significant change in temperature or altitude. Incorrect tire pressure may cause the wheelchair to be less stable, less maneuverable and cause damage to the wheelchair and/or bodily injury.

**NOTICE**

**Risk of damage if tires are overfilled**

Do not overfill the tires. Overfilling may result in damage to the wheel assembly.

**NOTICE**

**Risk of reduced performance when tire pressure is insufficient**

Insufficient tire pressure may result in abnormal wear and a shorter driving range.

**CAUTION!**

**Maintenance by a qualified service technician**

Only qualified service technicians should perform the maintenance and repair specified in this manual. Read all instructions carefully before proceeding. If any questions arise, contact Permobil for assistance.
4.2.5.2 Inflating tires

Read all warnings contained in this section before filling the tires. Failure to do so may result in injury to the user and damage to the wheelchair and other property and also void any warranty applicable to the wheelchair.

Applies only if the wheelchair is fitted with pneumatic tires.

At regular intervals, check that the wheelchair’s tires have the prescribed pressure between 29–36 psi. Incorrect tire pressure can impair stability and maneuverability, while extremely low tire pressure can cause abnormal wear as well as shorter tire life.

1. Unscrew and remove the plastic valve cap on the tire air valve.
2. Connect the compressed air nozzle to the valve and adjust the tire pressure to the prescribed level.
3. Install the plastic valve cap.

CAUTION!

Risk of injury if tire pressure is incorrect

Before operating the wheelchair for the first time and regularly thereafter, check that the tire pressure meets the specifications in this manual. Check the tire pressure when the wheelchair experiences a significant change in temperature or altitude. Incorrect tire pressure may cause the wheelchair to be less stable, less maneuverable and cause damage to the wheelchair and/or bodily injury.

NOTICE

Risk of damage if tires are overfilled

Do not overfill the tires. Overfilling may result in damage to the wheel assembly.

NOTICE

Risk of reduced performance when tire pressure is insufficient

Insufficient tire pressure may result in abnormal wear and a shorter driving range.

CAUTION!

Maintenance by a qualified service technician

Only qualified service technicians should perform the maintenance and repair specified in this manual. Read all instructions carefully before proceeding. If any questions arise, contact Permobil for assistance.
4.2.5.3 Casters

Figure 403. Assembling the rim.

A. Spacer.
B. Wheel.
C. Washer, 8,5x23x3.
D. Screw, ISO 4762 M8x16 10.9 Fe/Zn/TUF-LOK.
E. Hub cap (the design may vary depending on markets and market regulations).

The following tools are necessary for this task:
- 1 Torque wrench.
- 1 Allen key socket, 6 mm.
- 1 Jack.
- 4 Blocks for securing the wheelchair.

Removing casters
1. Switch off the main power switch on the control panel.

2. Jack up the wheelchair until the wheel turns freely.
3. Use the blocks to secure the chair further.

4. Remove the hub cap (E) by carefully prying it out using a screw driver.
5. Remove the screw (D) and the washer (C).
6. Pull the wheel off the shaft.

*Installing casters*

**NOTICE**

*Replace used wheel bolt*

If a wheel bolt is removed for tire service, replace it with a new, unused bolt from Permobil and tighten it to the recommended torque. Also, inspect the drive axle and wheel rim for any damage. Damage to either part can cause the wheel bolt to loosen or fracture. Because the TUF-LOK thread lock fluid wears off, Permobil recommends that wheel bolts only be used once.
1. Check that the wheel shaft and rim are undamaged. Clean to remove dirt and rust. Replace damaged parts.
2. Fit the spacer (A) on the axle.
3. Install the wheel (B) on the axle by hand without using any tools. Make sure the rim is fully seated on the axle.
4. Use the screw (D) and washer (C) to install the wheel (B); do so by hand without using any tools.
5. Tighten the screw (D) using a torque wrench. Tightening torque: 17.7 lb.ft. Do not use a pneumatic impact wrench.
6. If the tire is pneumatic fill it with recommended pressure. See .
7. Fit hub cap (E).
8. Remove the blocks.
9. Lower the wheelchair using the jack.

**Taking the caster rim apart**

1. Remove the caster from the wheel fork. See *Removing casters*, Page 132.
2. If the tire is pneumatic, release the air.
3. Remove the three bolts with nuts which holds the inner and outer parts of the rim together.
4. Take the rim apart.

**Putting the caster rim together**

1. Fit the two rim halves together with tire.
2. Tighten the three screws using a torque wrench.
   Tightening torque: 7.2 lb.ft.
3. Fit the wheel on to the wheelchair. See *Installing casters*, Page 133.
4. Remove the blocks.
5. Lower the wheelchair with the jack or equivalent.

### 4.2.6 Wheel hubs

The following items are necessary for this task:
- Torque wrench.
- Allen socket, 6 mm.
- Puller
4.2.6.1 Install wheel hub

1. Check the axle and key for damages.
2. Clean all parts with alcoholic cleaner.

3. Attach the key onto the axle.
4. Position the hub onto the axle using just your hands and make sure the key fits the groove of the hub.

5. Make sure to fit the hub with the longer sleeve (11 mm) towards the gear housing. Push the hub 3–5 mm onto the axle.
6. Apply a thin layer of Loctite 638 around the chamfer of the shaft.

7. Attach the screw (TUF-LOK) with washers on the axle. Mind the assembly order of the different types of washer. Push the hub onto the axle by tightening the screw. Tighten the screw using a torque wrench. Tightening torque: 24.3 lb.ft.

**WARNING!**

Replace wheel hub screw

Failure to follow these instructions could cause the wheel to malfunction causing damage to the wheelchair and/or bodily injury.

### 4.2.7 Wheel fork

#### 4.2.7.1 Remove wheel fork

1. Switch off the main power switch on the control panel.
2. Jack up the wheelchair so that the wheel turns freely.

![Figure 418. Use a jack or equivalent to lift up the wheelchair.]

3. Use the blocks to secure the chair further.

![Figure 419. Use two blocks on each side of the chassis box. The wheels has been removed in this figure for better viewing.]

![Figure 420. The position of the blocks. The arrow points in the direction of travel.]

4. Remove the cover on the top of the swing arm.
   Remove the cover on the top of the link arm.

![Figure 421. Remove the cover and unscrew the screw.]
5. Unscrew the screw.

6. Remove the spacer, bearing, washer and wheel fork.

This step does only apply if the wheelchair is equipped with a later revision of the friction brake.

7. Remove the nut, washer, adjustment unit, o-ring, friction brake screw and friction brake plate.

This step does only apply if the wheelchair is equipped with an early revision of the friction brake (see Figure 423).

4.2.7.2 Install wheel fork

1. Check that the wheel fork and swing arm with bearings and friction brake are not damaged. Clean to remove dirt and rust. Replace damaged parts. Make sure the washer is installed on the wheel fork.
   Check that the wheel fork and link arm with bearings and friction brake are not damaged. If necessary, clean to remove dirt and rust. Replace damaged parts. Make sure the washer is installed on the wheel fork.

2. Attach the wheel fork together with the washer, bearing and spacer on the swing arm using just your hands. Check that the wheel fork is fully pushed into the swing arm.
   Attach the wheel fork together with the washer, bearing and spacer on the link arm using just your hands. Check that the wheel fork is fully pushed into the link arm.
3. Attach the nut, washer, adjustment unit, o-ring, friction brake screw and friction brake plate.
   For the adjustment see: .

**CAUTION!**

Be careful with the O-ring

Do not damage the O-ring. It will affect the maneuverability of the wheelchair.

4. Install the screw. Screw the friction brake in place while holding the wheel fork. Tightening torque: 17.7 lb.ft.

5. Install the cover on top of the swing arm.
   Install the cover on top of the link arm.

### 4.2.8 Magnetic wheel lock

The wheelchair is equipped with a magnetic wheel lock on the left and right drive unit. The magnetic wheel locks are both equipped with a brake release lever which is used to manually release the brakes.

The following items are necessary for this task:

- Allen key, 3 mm.
- Allen key, 4 mm.

#### 4.2.8.1 Remove magnetic wheel lock

1. Raise the seat to its highest position.
2. Switch off the main power switch on the control panel.
3. Jack up the wheelchair.
4. Remove the chassis covers, the fenders and the drive unit cover. See 4.2.1 Covers, Page 61.
5. Remove the drive wheels. See 4.2.5.1 Drive wheels, Page 126.
6. Disconnect the drive unit cable from the power module.
7. Disconnect the magnetic wheel lock cable at the connector by the power module.

8. Remove the cable from the cable cover (A).
9. Remove the two cable ties that holds the cable (B).
10. Loosen the screws holding the two cable clips and remove the cable (C).

11. Spin the cable cover off the cables.

12. Remove the cable tie located at the base of the motor.
13. Loosen the three screws (G) and remove the magnetic wheel lock (F) and the bracket (E) from the drive unit (D).

4.2.8.2 Install magnetic wheel lock

1. Install the magnetic wheel lock (F) and bracket (E) to the drive unit (D) using the three screws (G). Note that the screws have different lengths (two M4x35 and one M4x30), the shorter screw in the lower hole and the longer screws in the upper holes. Apply thread lock Loctite 222, or an equivalent low strength product locking fluid, onto the screws. Make sure that the brake release lever is pointing upwards. Tightening torque 2.2 lb.ft.

2. The brake release lever has an end position screw which is installed in different positions depending on if the magnetic wheel lock is installed on the chassis right or left drive unit. Install the end position screw in the hole on the outside of the lever. Reuse the screw from replaced unit.

3. Attach the cable at the base of the motor cable with a cable tie. The brake cable is routed along the motor cable from this point onward.
4. Route the cables tight to the outside of the motor and attach them in the cable clip on top of the motor (C). Use a torque wrench to tighten the screw. Tightening torque: 0.88 lb.ft.

5. Attach the cables in the second cable clip (C). Tightening torque: 0.88 lb.ft. Position the cable clip over the white marking on the motor cable.

6. Attach the cables in the bracket on the chassis box using two cable ties (B), place the cable tie heads on the outside of the bracket.

7. Attach the cables into the cable cover on the chassis (A).

8. Attach the cable collector around the cables in the transition between second cable clip and bracket.

9. Connect the magnetic wheel lock cable to the drive unit cable by the power module.

10. Connect the drive unit cable to the power module.

11. Install the covers. See 4.2.1 Covers, Page 61.

12. Install the drive wheel. See 4.2.5.1 Drive wheels, Page 126.

**4.2.9 Friction brakes**

The following items are necessary for this task:

- Torque wrench.
- Allen socket.
NOTICE
Use the correct tools and spare parts

Do not use a pneumatic impact wrench.
Do not use other types of screws or washers.
Do not use any other type of thread lock.

4.2.9.1 Remove friction brake
1. Switch off the main power switch on the control panel.

2. Jack up the wheelchair so that the wheel turns freely.
3. Use the blocks to secure the chair further.

Figure 442. Use two blocks on each side of the chassis box. The wheels have been removed in this figure for better viewing.

Figure 443. The position of the blocks. The arrow points in the direction of travel.

3. Use the blocks to secure the chair further.

Figure 444. Remove the cover and unscrew the screw.

NOTICE
Always replace the cover

Always replace the old cover. The old cover will let in water in the housing causing damage to the friction brake.

The swing arms are equipped with friction brakes working as anti flutter devices.

The rear link arms are equipped with friction brakes working as anti flutter devices.

There are two variants of the friction brake.

4. Remove the cover on the top of the swing arm.
   Remove the cover on the top of the link arm.

This step does only apply if the wheelchair is equipped with a later revision of the friction brake (see Figure 447).

5. Unscrew the screw.
This step does only apply if the wheelchair is equipped with an early revision of the friction brake (see Figure 445).

6. Remove the nut, washer, adjustment unit, o-ring, friction brake screw and friction brake plate.

This step does only apply if the wheelchair is equipped with a later revision of the friction brake (see Figure 447).

7. Pull off the wheel fork.

This step does only apply if the wheelchair is equipped with a later revision of the friction brake (see Figure 447).

8. Push out the friction brake with a steel rod (1/2” in diameter) or equivalent.
4.2.9.2 Install friction brake

1. Clean the friction brake and the friction brake housing. Remove all grease and dirt.

2. Attach the wheel fork and hold it in place.

3. Attach the friction brake while holding the wheel fork.

   **CAUTION!**
   Be careful with the O-ring
   Do not damage the O-ring. It will affect the maneuverability of the wheelchair.

   **NOTICE**
   Always replace the cover
   Always replace the old cover. The old cover will let in water in the housing causing damage to the friction brake.

4. Install the screw. Screw the friction brake in place while holding the wheel fork. Tightening torque: 17.7 lb.ft.

5. Install the new cover on top of the swing arm.
   Install the new cover on top of the link arm.
4.2.10  Shock absorbers

The following items are necessary for this task:

• Torque wrench.
• Allen socket, 6 mm.

4.2.10.1  Remove shock absorber

1. Switch off the main power switch on the control panel.
2. Lift up and jack up the wheelchair chassis so that the wheels are off the ground.
3. Remove the drive wheel. See 4.2.5.1 Drive wheels, Page 126.
4. Remove the rear swing arm. See 4.2.11 Swing arms, Page 148.
5. Remove the shock absorber. It is installed with a screw (A), two disc springs (B), a washer (C), a socket (E) and a spacer (F).

4.2.10.2  Install shock absorber

1. Install the shock absorber to the swing arm with the screw (A), two disc springs, the washer, the socket and the spacer. Tighten the screw using a torque wrench. Tightening torque: 17.7 lb.ft.
2. Install the rear swing arm. See 4.2.11 Swing arms, Page 148.
3. Install the drive wheel. See 4.2.5.1 Drive wheels, Page 126.

4.2.10.3  Remove FlexLink™

1. Switch off the main power switch on the control panel.
2. Remove the drive wheel. See 4.2.5.1 Drive wheels, Page 126.
3. Remove the FlexLink™ upper screw (A) and washer (B). Meanwhile hold the front swing arm (C), preventing it from dropping down when the screw is removed.
4. Remove the FlexLink™ lower screw (D) and washer (C).
5. Remove the FlexLink™ (B) and the sockets (A).

4.2.10.4 Install FlexLink™
1. Install the upper and lower sockets (A) to the FlexLink™ (B).
2. Attach the washer (C) to the screw (D) and install the lower part of the FlexLink™ to the rear swing arm.

3. Raise up the front swing arm with your hand (C) and fasten the upper part of the FlexLink™ with the washer (B) and screw (A).
4. Install the drive wheel. See 4.2.5.1 Drive wheels, Page 126.

4.2.11 Swing arms
The following items are necessary for this task:
• Torque wrench.
• Allen socket, 6 mm.
4.2.11.1 Remove rear swing arm

1. Switch off the main power switch on the control panel.
2. Lift up and jack up the wheelchair chassis so that all wheels, or at least both wheels on one side, are free of the ground.
3. Remove the drive wheel. See 4.2.5.1 Drive wheels, Page 126.
4. Remove the fender. See 4.2.1.3 Remove fenders, Page 65.
5. Unscrew the FlexLink™ lower screw (A) with its washer (B). Meanwhile hold the front swing arm (C), preventing it from dropping down when the screw is removed.

6. Unscrew the shock absorber. It is attached with one screw (E), two disc springs (D), a washer (C), a socket (B) and a spacer (A).
7. Remove the cover (I) from the swing arm (F) by pulling it straight out. If necessary, carefully lever it out using a screwdriver in the slot on the cap.
8. Remove the swing arm (F), it’s fitted with a screw (H) and a washer (G).
9. Remove the shock absorber. See 4.2.10 Shock absorbers, Page 147.
10. Remove the wheel forks. See 4.2.7 Wheel fork, Page 136.

4.2.11.2 Install rear swing arm

1. Check that the shaft and swing arm are undamaged. Clean as necessary to remove dirt and rust. Replace damaged parts.
2. Install the wheel fork onto the swing arm (F). See 4.2.7 Wheel fork, Page 136.
3. Install the shock absorber to the swing arm (F). See 4.2.10 Shock absorbers, Page 147.
4. Install the swing arm (F) onto the axle with the use of hand force only. Make sure the swing arm (F) is fully seated upon the axle.
5. Install the washer (G) and screw (H). Tighten the screw using a torque wrench. Tightening torque: 17.7 lb.ft.
6. Check that the swing arm (F) can move freely.
7. Install the cover (I) on to the swing arm by pushing it straight in.
8. Attach the shock absorbers to the chassis. It is attached with a spacer (A), a socket (B), a washer (C), two disc springs (D) and a screw (E). Tighten the screw using a torque wrench. Tightening torque: 17.7 lb.ft.
9. Raise the front swing arm (C) and install the rear swing arm to the FlexLink™. It is attached with one screw (A) and a washer (B).
10. Install the fenders. See 4.2.1 Covers, Page 61.
11. Install the drive wheel. See 4.2.5.1 Drive wheels, Page 126.

4.2.11.3 Remove front swing arm
1. Remove the drive wheel. See 4.2.5.1 Drive wheels, Page 126.
2. Remove the rear chassis cover and the fender. See 4.2.1 Covers, Page 61.
3. Disconnect the motor cables from the power module.
4. Remove the cable from the cable tunnel (A).
5. Remove the screw from the bracket holding the cable clips (B). Leave the cable clip on so that the clip is maintained at correct place on the cable.
6. Remove the FlexLink™. See 4.2.10 Shock absorbers, Page 147.
7. Remove the drive unit. See 4.2.4 Drive units, Page 124.
8. Remove the cover (D) from the swing arm by pulling it straight out. If necessary, carefully lever it out using a screwdriver in the slot on the cap.
9. Remove the swing arm (A), it’s fitted with a screw (C) and a washer (B).
4.2.11.4 Install front swing arm

1. Install the swing arm (A) onto the axle with the use of hand force only. Make sure the swing arm is fully seated upon the axle.
2. Install the washer (B) and screw (C). Tighten the screw using a torque wrench. Tightening torque: 17.7 lb.ft.
3. Install the cover (D) on to the swing arm screw by pushing it straight in.
4. Check that the swing arm can move freely.
5. Install the drive motor onto the swing arm. See 4.2.4 Drive units, Page 124.
6. Install the FlexLink™. See 4.2.10 Shock absorbers, Page 147.
7. Attach the bracket including the clips holding the drive motor cable and fasten the screw (B).
8. Press the drive motor cable to the cable tunnel.
9. Connect the drive motor cabling to the power module.
10. Install the fenders and chassis covers. See 4.2.1 Covers, Page 61.
11. Install the drive wheel. See 4.2.5.1 Drive wheels, Page 126.

4.2.12 Lights and turn signals

4.2.12.1 Main cable

Remove main cable

1. Switch off the power supply using the On/Off key on the control panel and switch the main circuit breaker to OFF. See 4.3.5 Main circuit breaker, Page 168.
2. Remove the chassis covers, front fender and drive motor cover. Disconnect the main cable from the back lights and turn signals when removing the rear chassis cover and from the front turn signals when removing the drive motor cover. See 4.2.1 Covers, Page 61.
3. Disconnect the front light connectors located on top of the drive motor.
4. Remove the turn signal cable from cable clip A.
5. Unwind the cables from the motor cable.
6. Remove the cables from the cable clips, B.

7. Open the cable fastener and remove the front light and turn signal cables from the motor cable.

8. Remove the front lights and turn signals cables from the cable tunnels on the left and right hand side of the chassis.
9. Disconnect the connectors J4, J5 and J7 from the ICS master module.

Install main cable

1. Connect the connectors J4, J5 and J7 from the ICS master module.

2. Position the front lights and turn signals cabling on the chassis and press the cables into the cable tunnels on the left and right hand side of the chassis.

3. Open the cable fastener and fasten the front light and turn signal main cables to the motor cable.
4. Fasten the turn signal cable to the upper cable clip and the front light cable to the lower cable clip. Make sure the cable markings are positioned 1.6" from the clip, distance A. Be careful not to stretch or damage the cable.

5. Carefully wind the cables around the motor cable.

6. Fasten the turn signal cable to the cable clip on the drive motor.

7. Connect the main cable to the front light cable located on top of the drive motor.

8. Install the covers. Connect the main cable to the front turn signal when installing the drive motor cover and to the back lights and turn signals when installing the rear chassis cover. See 4.2.1 Covers, Page 61.

4.2.12.2 Front turn signals

Removing front turn signal

1. Switch off the power supply using the On/Off key on the control panel and switch the main circuit breaker to off. See 4.3.5 Main circuit breaker, Page 168

2. Remove the fender and drive motor cover. See 4.2.1 Covers, Page 61.

3. Disconnect the cable from the back of the turn signal by pulling the connector straight out.

4. The turn signals are assembled on the drive motor cover with double sided tape. Carefully peel the turn signal off, if needed use a suitable tool to facilitate removal. Be careful not damaging the paint work on the cover.
Install front turn signal
1. Remove the protective tape on the back of the turn signal.
2. Rotate the turn signal until the text "TOP" is pointing straight upwards and position the turn signal on the drive motor cover. Press it against the cover until the double sided tape sticks on to the cover.

3. Connect the cable to the back of the turn signal. The cable must be connected to one of the connectors facing inwards towards the ICS master module.
4. Install the drive motor cover and fender. See 4.2.1 Covers, Page 61.

4.2.12.3 Front lights
For this task the following tools are necessary:
• 1 Allen key 17 mm.

Removing front light
1. Switch off the power supply using the On/Off key on the control panel and switch the main circuit breaker to off. See 4.3.5 Main circuit breaker, Page 168.
2. Remove the swing arm accent cover, fender and drive motor cover. See 4.2.1 Covers, Page 61.
3. Disconnect the lights cable from the main cable.
4. Remove the cable from the cable clip on the drive motor.
5. Remove the cable from the swing arm cover by pulling out the cable from the cable clips.

6. Unscrew the screw holding the lights bracket to the swing arm.
7. Remove the front light by lifting it straight up.

**Install front light**
1. Slide the bracket with the front light into the swing arm.

2. Adjust direction of the light by angling the bracket forwards or backwards.
3. Fasten the bracket to the swing arm with a screw. Tightening torque: 4.2 lb.ft
4. Fasten the lights cable to the swing arm cover by pushing it into the four cable clips.

5. Fasten the lights cable by pushing it into the cable clip on the top of the drive motor.
6. Connect the lights cable to the main cable
7. Install the drive motor cover, fender and swing arm cover. See 4.2.1 Covers, Page 61.

Adjusting front light
1. Loosen the attachment screw.
2. Adjust the direction of the light by angling the bracket forwards or backwards.
3. Fix into desired angle by tightening the attachment screw.
   Tightening torque: 4.2 lb.ft
4.2.12.4 Rear lights and turn signals

**Remove rear light and turn signal**

1. Remove the chassis covers. See 4.2.1 Covers, Page 61.
2. Disconnect the cables on the back of the light or turn signal by pulling them straight out.
3. The lights or turn signals are assembled on the cover with double sided tape. Carefully peel the light or turn signal in question off, if needed use a suitable tool to facilitate removal. Be careful not to damage the paint work on the cover.

**Install rear light and turn signal**

1. Remove the protective tape on the back of the light/turn signal.
2. Rotate the light or turn signal until the text TOP is pointing straight upwards and position the turn signal on the rear cover. Press it against the rear cover until the double sided tape sticks on to the cover. See fig. 490.
3. Connect the cables on the back of the light or turn signal.
4. Connect the lights or turn signals cable to the lights main cable in the chassis.
5. Fit the covers. See 4.2.1 Covers, Page 61.

4.3 Control panel and electronics

4.3.1 R-net control panel

The following tools are necessary for this task:

- 1 Allen key 4 mm.

4.3.1.1 Removing R-net control panel

1. Switch Off the main power switch on the control panel.
2. Remove the cable ties holding the R-net control panel (A) and the ICS control panel (B) cabling in place under the arm rest. Note the attachment locations of the cable ties for subsequent reassembly. Same attachment points must be used.

3. Disconnect the R-net control panel (A) cable connector.

4. Remove the R-net control panel (A). It is held in place by two screws. The same two screws also fasten the bracket for the ICS control panel (B), where fitted.

4.3.1.2 Mounting R-net control panel

1. Assemble the R-net control panel (A). It is held in place by two screws. The same two screws also fasten the bracket for the ICS control panel (B). Be sure not to over tighten the screw.

2. Reconnect the R-net control panel cable connector.

3. Use cable ties to secure the cabling from the R-net control panel (A) and the ICS control panel (B). Use the same mounting points for the cable ties that were used before the cables were disassembled.
4. Switch On the main power switch on the control panel.

4.3.2 R-net and ICS bus cabling

This section describes how the R-net and ICS bus cables are mounted between the chassis and the seat.

1. The R-net bus cable is connected to the connector block and mounted with the cable brackets at the back of the backrest.

2. The cable is mounted in the four cable attachments on the right hand side of the seat.

   Based on the seat depth, the cable bracket on top of the AP elevator should be mounted in position A, B, C or D.

<table>
<thead>
<tr>
<th>Seat depth</th>
<th>Mounting position</th>
</tr>
</thead>
<tbody>
<tr>
<td>15”</td>
<td>A</td>
</tr>
<tr>
<td>16”–17”</td>
<td>B</td>
</tr>
<tr>
<td>18”–19”</td>
<td>C</td>
</tr>
<tr>
<td>20”–23”</td>
<td>D</td>
</tr>
</tbody>
</table>
3. The cable loop between the upper and lower cable bracket should be 5”.

4. The ICS bus cable is connected to the seventh position of the connector block on the right hand side of the seat.

5. The ICS bus cable is laid across the seat frame and mounted in the two cable brackets. Avoid crossing the cables with each other between the connector block and the first cable bracket on top of the seat. Use a Torque wrench to tighten the screws. Tightening torque 0.9 lb.ft.
6. The length of the cable loop between the first cable bracket on the AP elevator and the seat frame must be 7” as indicated by the with double-pointed arrow. The ICS bus cable is mounted behind the R-net bus cable in the cable brackets.

On seats with a VS leg rest, power transfer leg rest or power adjustable leg length, the actuator’s cable must always be positioned in front of the bus cables loop. This to avoid damages to the cables during leg rest movement.

7. The bus cables are mounted in the two cable brackets on the upper AP elevators arm. The cable brackets are mounted with one screw each. Use a torque wrench to tighten the screws. Tightening torque 0.9 lb.ft.

8. The length of the cable loop between the cable brackets on the upper and lower AP elevator arm must be 7”.

9. The bus cable is mounted in the two cable brackets on the lower AP elevators arm. The cable brackets are mounted with one screw each. Use a torque wrench to tighten the screws. Tightening torque 0.9 lb.ft.
10. The bus cables are tied together with a cable tie in the middle of the cable loop.

11. The length of the cable loop between the lowest cable bracket on the lower AP elevator arm and the cable brackets on the pillar must be 11".

12. The bus cables are mounted on the pillar with three cable brackets. The ICS bus cable is mounted above the R-net bus cable in the cable brackets.
13. The cable brackets are mounted with one screw each. Use a Torque wrench to tighten the screws. Tightening torque 0.9 lb.ft.

14. The bus cables are tied together with two cable ties, at regular distances on the cable loop.

15. The bus cables are connected to the ICS master module.
16. The rest of the cables is tied into a loop with a cable tie. It is important that the cables go straight down from the last cable bracket on the pillar to avoid pinching when mounting the chassis front cover.

4.3.3 R-net power module

For this task the following tools are necessary:

• 1 Ring wrench 8 mm.

4.3.3.1 Removing R-net power module

1. Switch OFF the main power switch on the control panel.
2. Switch the main circuit breaker to OFF. See 4.3.5 Main circuit breaker, Page 168.
3. Remove the chassis covers, see 4.2.1 Covers, Page 61.
4. Disconnect the electrical connections to the R-net controller, being attentive to their placement.
5. Remove the two nuts.
6. Remove the battery cable holder on each side of the R-net power module.
7. Remove the R-net power module.
4.3.3.2 Mounting R-net power module

Assemble in reverse order.

1. Reassemble the power module and battery cable holder, it is fitted with two nuts. See fig. 513.
2. Reconnect the electrical connections to the R-net controller and wrap the cable according to fig. 513.
3. Reassemble the chassis covers, see 4.2.1 Covers, Page 61.
4. Switch the main circuit breaker to OFF. See 4.3.5 Main circuit breaker, Page 168.

<table>
<thead>
<tr>
<th>BUS</th>
<th>BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Motor 1, Left</td>
</tr>
<tr>
<td>BATT</td>
<td>Battery</td>
</tr>
<tr>
<td>M2</td>
<td>Motor 2, Right</td>
</tr>
<tr>
<td>INH</td>
<td>Inhibit</td>
</tr>
<tr>
<td>OBC</td>
<td>External charger socket</td>
</tr>
</tbody>
</table>

4.3.4 ICS master module

4.3.4.1 Removing ICS master module

1. Switch off the main power switch on the control panel.

2. Switch the main circuit breaker to OFF (OFF). See 4.3.5 Main circuit breaker, Page 168.
3. Remove the front chassis cover. See 4.2.1 Covers, Page 61.
4. Disconnect the electrical connections of the ICS master module, being attentive to their placement. See fig. 518.
5. Pull the master module straight out of its holder.
6. If the wheelchair is equipped with lights, remove the lid from the ICS master module and disconnect the lights cabling from the contacts on the circuit board. See fig. 518.
4.3.4.2 Mounting ICS master module

Mount the ICS master module in the reverse order.

**CAUTION!**

Configure ICS master module

The ICS master module must be configured for the seat before mounting. Detailed information on configuration is provided in the Technical manual for the ICS control system.

1. If the wheelchair is equipped with lights, reconnect the lights cabling to the contacts on the circuit board and then fit the lid on the ICS master module.
2. Push the ICS master module straight into its holder.
3. Reconnect the electrical connections of the ICS master module, being attentive to their placement. See also the sticker on the lid.
4. Refit the chassis covers. See 4.2.1 Covers, Page 61.
5. Switch the main circuit breaker to ON (ON). See 4.3.5 Main circuit breaker, Page 168.
6. Switch on the main power switch on the control panel.

<table>
<thead>
<tr>
<th>R-net 1</th>
<th>R-net connector 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-net 2</td>
<td>R-net connector 2</td>
</tr>
<tr>
<td>R-net 3</td>
<td>R-net connector 3</td>
</tr>
<tr>
<td>J4</td>
<td>Left light or turn signal</td>
</tr>
<tr>
<td>J5</td>
<td>Right light or turn signal</td>
</tr>
<tr>
<td>J6</td>
<td>Serial channel (PC)</td>
</tr>
<tr>
<td>J7</td>
<td>Left and right light or turn signal</td>
</tr>
<tr>
<td>J8</td>
<td>Inhibit input</td>
</tr>
<tr>
<td>J11</td>
<td>ICS connector 1 &amp; 2</td>
</tr>
<tr>
<td>J12</td>
<td>ICS connector 3 &amp; 4</td>
</tr>
<tr>
<td>F1</td>
<td>Fuse (seat functions)</td>
</tr>
</tbody>
</table>
4.3.5 Main circuit breaker

4.3.5.1 Resetting main circuit breaker

![Notice]

Investigate tripped main circuit breaker

A tripped main circuit breaker often indicates a major electrical fault. The cause of a tripped main circuit breaker must be carefully investigated and determined before resetting the circuit breaker.

The main circuit breaker also serves as a battery isolator but is normally referred to as a circuit breaker.

Main circuit breaker replacement is normally not required; it is of the automatic type that can be reset when tripped.

4.3.5.2 Replacing main circuit breaker

For this task the following tools are necessary:

- 1 Wrench 11 mm.

![Warning]

Avoid short circuit

Turn the main circuit breaker off before performing any work on the batteries to prevent any short circuit, damage to the wheelchair and/or bodily injury.

1. Switch the main circuit breaker to OFF.
2. Remove the chassis rear cover. See 4.2.1 Covers, Page 61.

Check the wheelchair to confirm the specified battery type.

If the wheelchair is equipped with 60 A batteries:

3. Disconnect the minus cable from the front battery.
4. Disconnect the plus cable from the rear battery.
5. Pull off the battery terminal covers from the cables.

If the wheelchair is equipped with 73 A batteries:

6. Disconnect the minus cable from the rear battery.
7. Disconnect the plus cable from the front battery.
8. Pull off the battery terminal covers from the cables.

If the wheelchair is equipped with 45 A batteries:

9. Disconnect the minus cable from the rear battery.
10. Disconnect the plus cable from the front battery.
11. Pull off the battery terminal covers from the cables.
**NOTICE**

**Pre mounted cables**

Replacement main circuit breakers are delivered with pre-mounted cables that are tightened to the correct torque. Do not loosen, tighten or in any way adjust the pre-mounted cables.

12. Remove the cables from all the attachments between the batteries and the main circuit breaker. Note how they are attached for correct reassembly. See also page 121.

13. Release the main circuit breaker by pulling out the small handle on the right hand side. Pull it in direction B.

14. Set the replacement main circuit breaker to OFF position. Note the orientation of the new main circuit breaker with consideration to subsequent assembly. The On/Off positions must agree with the decal on the rear cover.

15. Pull out the small handle on the right hand side of the new main circuit breaker and position it onto the holder. Fix it in correct position by pushing in the small handle, direction A.

16. Mount the cables to their attachments.

17. Pull the terminal covers over the battery terminal connectors.

18. Reconnect the battery connection cables to the batteries.

19. Cover the battery terminals with the terminal covers.

20. Refit the chassis covers. See 4.2.1 Covers, Page 61.

21. Switch the main circuit breaker to On; see fig. 520.

![Figure 522. Main circuit breaker release handle.](image)

![Figure 523. Battery connections relative to the battery capacity.](image)
5 Adjustments

5.1 Seat

5.1.1 Seat width

For this task the following tools are necessary:

- 1 Allen key 4 mm.
- 1 Allen key 5 mm.

The seat width can be adjusted to give the user optimal comfort. There are four fixed levels, each 1” apart.

1. Remove the seat cushion by lifting it straight up. It is attached by means of velcro on the rear of the cushion.
2. Remove the seat plates, which are held in place by four screws.

3. Remove the four screws securing the seat width adjustment unit.
4. Adjust the seat width by moving the right or left section of the seat frame to the required position. The rails with which the seat width is adjusted are marked with the settings for each potential position. The scale is marked with millimeters and inches.
5. Secure it at the required setting by replacing the four screws.
6. Reassemble the seat plates using four screws. See fig. 524.
7. Fit a cushion of a suitable length and width for this setting. See 7 Customizations, Page 200. Secure the cushion in place using the velcro on the back of the cushion.

5.1.2 Seat depth

For this task the following tools are necessary:

- 1 Torque wrench.
- 1 Allen key 4 mm.
- 1 Allen key 5 mm.

The seat depth can be adjusted to suit different users. There are seven fixed levels, each 1” apart.

Adjustment of the seat depth is performed by mounting the front section of the seat frame including leg rest and the rear section of the seat frame including backrest into desired positions according to the table on 7 and 8. When the seat depth is adjusted it may be necessary to replace cushions, seat plates and UniTrack rails for ones of the appropriate length. The mounting position for the seat on the seat lift, or fixed seat column, may also need adjusting.
1. Remove the seat cushion by lifting it straight up. It is attached by means of velcro on the rear of the cushion.

2. Remove the seat plates, which are held in place by two screws at the back edge and two quick-mount clamps at the front. First remove the screws, then use your hand to carefully push the seat plate from below to release the quick-mount clamps at the front.

3. Remove the UniTrack rails which are each held in place by two screws.

4. Adjustment of the front section of the seat frame (leg rest position): remove the five screws marked (L) securing the seat frames front section.
5. Adjust the seat depth by moving the front section of the seat frame to the required position. The rails with which the seat depth is adjusted are marked with the settings for each potential position.

<table>
<thead>
<tr>
<th>Seat depth</th>
<th>Leg rest position</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;</td>
<td>0</td>
</tr>
<tr>
<td>16&quot;</td>
<td>0</td>
</tr>
<tr>
<td>17&quot;</td>
<td>+2&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>+2&quot;</td>
</tr>
<tr>
<td>19&quot;</td>
<td>+2&quot;</td>
</tr>
<tr>
<td>20&quot;</td>
<td>+2&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>+2&quot;</td>
</tr>
<tr>
<td>22&quot;</td>
<td>+3&quot;</td>
</tr>
<tr>
<td>23&quot;</td>
<td>+4&quot;</td>
</tr>
</tbody>
</table>

6. Secure it at the required setting by remounting the five screws.

7. Adjustment of the rear section of the seat frame (backrest position): remove the seven screws marked (B) securing the seat frames rear section, see fig. 529.

8. Adjust the seat depth by moving the rear section of the seat frame to the required position. The rails with which the seat depth is adjusted are marked with the settings for each potential position. The scale is marked with "millimeters" on one side and "inches" on the other.

<table>
<thead>
<tr>
<th>Seat depth</th>
<th>Backrest position</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;</td>
<td>-4&quot;</td>
</tr>
<tr>
<td>16&quot;</td>
<td>-3&quot;</td>
</tr>
<tr>
<td>17&quot;</td>
<td>-4&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>-3&quot;</td>
</tr>
<tr>
<td>19&quot;</td>
<td>-2&quot;</td>
</tr>
<tr>
<td>20&quot;</td>
<td>-1&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>0</td>
</tr>
<tr>
<td>22&quot;</td>
<td>0</td>
</tr>
<tr>
<td>23&quot;</td>
<td>0</td>
</tr>
</tbody>
</table>

9. Secure it at the required setting by remounting the five screws.

10. Mount UniTrack rails of a suitable length for the seat depth setting. The rails are each held in place by two screws. Use a torque wrench to tighten the screws. Tightening torque 7.2 lb.ft.
11. Mount seat plates of a suitable length for the seat depth setting. The plates are held in place by two screws at the back edge and two quick-mount clamps at the front.

12. Fit a cushion of a suitable length and width for this setting. Secure the cushion in place using the Velcro on the back of the cushion.

**WARNING!**
**Risk of injury - check seat mounting position**

After adjusting the seat depth, check that the seat’s mounting position is in the correct position for the end user as the mounting position may need to be changed. Failure to check the seat mounting position after a seat depth adjustment may cause the chair seat to be in an incorrect position that could cause impaired driving, property damage, damage to the wheelchair and/or bodily injury.

### 5.1.3 Backrest height

For this task the following tools are necessary:
- 1 Allen key 3 mm.

The backrest height can be adjusted to give the user optimal comfort. Adjustment is possible by moving the locking mechanism on the upper section of the backrest between six fixed stages 1” apart.

1. Remove the backrest cushion by pulling it straight forwards. It is attached by means of velcro on the rear of the cushion.

2. For access to the locking mechanism, set the backrest angle to its most upright position. Remove the upper section of the backrest by carefully opening the locking mechanism catch outwards while also pulling the upper section of the backrest straight up.

**Figure 532. The upper section of the backrest is secured with a locking mechanism.**
3. Remove the two screws holding the backrest locking mechanism in place.

4. Adjust the height of the backrest by sliding the upper section upwards or downwards to the required position. The upper backrest plate is marked with the settings for each potential position. The scale is marked with millimeters and inches.

5. Lift up the upper section of the backrest enough that the locking mechanism can be assembled with its top edge in line with the required height on the backrest scale. Assemble the locking mechanism using the two screws.

6. Slide the upper section of the backrest down until secured in position by the locking mechanism. See fig. 532.

7. Fit a cushion of a suitable height/width for this setting. See 7 Customizations, Page 200. Secure the cushion in place using the Velcro on the back of the cushion.

5.1.4 Armrest height

The following tools are necessary for this task:

- 1 Allen key, 5 mm.

The height of the armrest is adjustable for optimal comfort. Refer to the scale on the center of the backrest to see the current height of the armrest.

1. Loosen the four screws on the rear of the backrest that secure the height of the armrest.
2. Remove the adjustment crank.

3. Adjust the armrests to the required position using the adjustment crank in the adjustment screw on the rear of the backrest.

4. Secure the height of the armrest by tightening the four screws on the rear of the backrest.

5.1.5 Armrest width

For this task the following tools are necessary:

- 1 Allen key 6 mm.

The distance between the armrests can be adjusted to give the user optimal comfort. Adjustment of the left and right armrests uses three fixed levels, each 1” apart.

1. Loosen the screw for armrest width adjustment approximately 3 turns.
2. Push in/pull out the armrest shaft to the desired position.
3. Secure it at the required setting by retighten the screw.

5.1.5.1 Turning adjustment bar bracket
For this task the following tools are necessary:
• 2 Block spanners 10 mm.

With the armrests set both wide and low, the adjustment bar for the left
armrest angle can touch the rear actuator bracket for the backrest angle.
If this is the case, turn the adjustment bar bracket.

1. Remove the lower bracket of the adjustment bar, which is secured
with a screw, washer and nut.

2. Turn the bracket 180° so the adjustment bar is closer to the center
of the seat.
3. Refit the lower bracket of the adjustment bar in its new position
using the screw, washer and nut.
5.1.6 Armrest angle
The armrests are both individually foldable. The armrest angle can easily be adjusted for optimal comfort.
1. Loosen the two lock nuts on the adjustment bars.
2. Adjust the armrest angle by turning the adjustment bars.
3. Tighten the two lock nuts to secure the adjustment bars in position.

WARNING!
Risk of injury while adjusting armrests
Do not subject the armrests to load while adjusting.

5.1.7 Armrest height and angle
The following tools are necessary for this task:
• 1 Allen key, 8 mm.

The armrest height and angle is normally adjusted as described previously. However, for special needs, the armrests is adjustable individually for users who want a left and right arm rest at different heights and/or angles. The angle of the armrest is secured using a screw.
1. Loosen the two nuts (D) securing the position of the adjustment bar.
2. Adjust the armrest by turning the adjustment bar (C).
3. Secure into position by tightening the lock nuts (D).
4. Secure the armrest angle by moving the screw from a fixed position (A) to a flexible position (B).
5. Adjust the armrest to the required angle.
6. Secure by tightening the screw (B).

NOTICE
Armrest flexible position
This type of adjustment should only be made for special needs. It may have negative effects on the movement of the armrest when raising or lowering the backrest.

WARNING!
Risk of injury while adjusting armrests
Do not subject the armrests to load while adjusting.

5.1.8 Panel holder
The control panel holder can be mounted on the left or right armrest.
5.1.8.1 Rotational panel holder

The location of the control panel is adjustable lengthwise for the optimal driving position. It is also possible to adjust the angle of the panel sideways to facilitate getting in and out of the wheelchair.

**Length adjustment**

1. Undo the screw (A) on the panel joint and adjust the panel to the required position.
2. Tighten the screw.

**Angle adjustment with friction joint**

Using the knob (B) on the friction joint, it is possible to adjust how easily the panel can be pushed out to the side.

**Control panel sliding angle adjustment**

1. Remove one of the screws. Choose the side that is desired to be sliding.
2. Angle the panel.
3. Refit the screw. Tighten the screw to the preferred friction.
Panel holder height adjustment
1. Remove the control panel, see .
2. Remove the two screws.
3. Position the front part of the panel holder to the preferred height.
4. Screw in the two screws securing the front part of the panel holder.
5. Install the control panel, see .

Panel holder base position
1. Remove the control panel, see .
2. Remove the two screws and the front part of the panel holder.
3. Unscrew the handle until the joint is separated.
4. Flip the panel holder bracket making its base position low or high.
5. Screw together the joint parts with the handle.
6. Screw the two screws securing the front part of the panel holder.
7. Install the control panel, see .

5.1.8.2 Parallel panel holder

- Allen key, 4 mm.
- Allen key, 5 mm.

Length adjustment

1. Undo the screw(s) on the underside enough to slide the panel holder.
2. Adjust the panel to the preferred position. Leave at least a gap of 0.4 inches between the armrest and the panel.
3. Tighten the screw. Tightening torque 7.2 lb.ft.

Adjusting the friction joint

1. Undo the screw or the knob to make the friction joint more loose.
2. Slide the panel to the preferred position.
3. Tighten the screw or knob to keep it in position.

Control panel base position
1. Remove the panel holder, see 5.1.8 Panel holder, Page 177.
2. Remove the panel, see.
3. Remove the screws holding the two plates in place.

4. Remove the two plates.

5. Turn the adjustment links to the preferred position.
6. Refit the two plates.

7. Reinstall the two screws securing the plates. Tightening torque 7.2 lb.ft.
8. Install the panel holder, see 5.1.8 Panel holder, Page 177.
9. Install the panel, see .

Panel holder base position
1. Remove the panel holder, see 5.1.8 Panel holder, Page 177.
2. Remove the two screws securing the panel holder to bracket.
This adjustment applies only to earlier models of the parallel panel holder.

The panel holder can be installed under either the right or left armrest, the holes closest to the seat is supposed to be used for the panel holder. Rotate the bar 180° to make it left- or right compatible. It can also be adjusted for a high (A) or low (B) position.

When the preferred position is reached, tighten the two screws together with the two washers. Tightening torque 4.2 lb.ft.

Install the panel holder, see 5.1.8 Panel holder, Page 177.

This adjustment only applies to the new parallel panel holder.

The panel holder bracket is adjustable height wise. The panel holder bracket can also be flipped to alter the base position further.

When the preferred position is reached, tighten the two screws together with the two washers. Tightening torque 4.2 lb.ft.

Install the panel holder, see 5.1.8 Panel holder, Page 177.

5.1.9 Trunk support height

For this task the following tools are necessary:

- 1 Allen key 5 mm.

The height of the trunk support can be adjusted to give the user optimal comfort.
1. Loosen the screw for trunk support height adjustment approximately 2 turns.
2. Slide the trunk support up/down to the desired position.
3. Secure it at the required setting by retighten the screw.

5.1.10 Thigh support
The position of the thigh support can be adjusted forwards or backwards to give the user optimal comfort. Slide the thigh support forwards or backwards to the desired position.

5.2 Chassis
5.2.1 Shock absorber
For this task the following tool are recommended:
• Shock absorber adjustment tool

The spring force of the shock absorber must be adjusted to the proper value in relation to the user's weight.

To get the best comfort and performance in relation to the user's weight, the shock absorbers should be adjusted according to the table below.

<table>
<thead>
<tr>
<th>User weight</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–220 lbs</td>
<td>A</td>
</tr>
<tr>
<td>220–275 lbs</td>
<td>B</td>
</tr>
<tr>
<td>275–330 lbs</td>
<td>C</td>
</tr>
</tbody>
</table>
The adjustment can be made manually or by using an adjustment tool that can be ordered from Permobil.

When using the tool, some components need to be removed to gain proper access to the shock absorber's adjustment nut.

1. Remove the chassis top cover. See 4.2.1 Covers, Page 61 and/or the drive wheel. See 4.2.5.1 Drive wheels, Page 126
2. Rotate the nut to the proper setting, either by hand or by using the tool that can be ordered from Permobil.
3. Reassemble cover and/or drive wheel.

5.3 Control panel and electronics

5.3.1 R-net control system

The wheelchair control system can be programmed to optimize wheelchair performance while also maintaining a high level of safety regardless of the wheelchair’s other settings and equipment. The control system can also be programmed to make adjustments needed for a specific user. Standard parameter files can be downloaded from the Permobil website: www.permobil.com.

For more information on programming or adjustment of the R-net control system and obtaining parameter files refer to the technical manual.
6 Troubleshooting

6.1 Troubleshooting guide

The following troubleshooting guide describes a number of faults and events which may occur when you use the wheelchair, together with suggested remedies. Note that the guide cannot describe all the problems and events which may occur and you should always contact your service provider or Permobil in case of doubt.

<table>
<thead>
<tr>
<th>Event</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The wheelchair does not start.</td>
<td>Batteries discharged.</td>
<td>Charge the batteries.</td>
</tr>
<tr>
<td>The cable connection to the control panel has come loose.</td>
<td></td>
<td>Insert the cable in the control panel.</td>
</tr>
<tr>
<td>Main circuit breaker switched to off position after e.g. battery replacement.</td>
<td></td>
<td>Reset the main circuit breaker. See page 168.</td>
</tr>
<tr>
<td>Main circuit breaker tripped.</td>
<td></td>
<td>See page 168.</td>
</tr>
<tr>
<td>The wheelchair cannot be driven.</td>
<td>Battery charger connected.</td>
<td>Stop charging. Disconnect the charging cable from the wheelchair charger socket.</td>
</tr>
<tr>
<td>Brake release activated.</td>
<td></td>
<td>Reset the brake release.</td>
</tr>
<tr>
<td>Wheelchair locked.</td>
<td></td>
<td>Unlock the wheelchair.</td>
</tr>
<tr>
<td>The wheelchair switches itself off after a certain period of inactivity (1 - 30 min).</td>
<td>The electronics’ energy saving mode has been activated.</td>
<td>Switch the wheelchair on again using the start button on the control panel.</td>
</tr>
<tr>
<td>The wheelchair stops while being driven.</td>
<td>The cable connection to the control panel has come loose.</td>
<td>Insert the cable in the control panel.</td>
</tr>
<tr>
<td>Main circuit breaker tripped.</td>
<td></td>
<td>See page 168.</td>
</tr>
<tr>
<td>The wheelchair can only be driven at reduced speed.</td>
<td>Seat lift or seat angle raised too high.</td>
<td>Lower the seat lift or seat angle.</td>
</tr>
<tr>
<td>Applies only to power seat lift and seat angle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The wheelchair cannot be charged.</td>
<td>Main circuit breaker switched to off position after e.g. battery replacement.</td>
<td>See page 168.</td>
</tr>
<tr>
<td>The charging circuit breaker has tripped.</td>
<td></td>
<td>Wait five minutes, the circuit breaker will automatically reset.</td>
</tr>
</tbody>
</table>

6.2 Diagnostics R-net LED control panel

6.2.1 Battery voltage indicator

Each time the wheelchair is started, parts of its electronics are checked. When a fault occurs in these parts, it is displayed on the control panel battery voltage indicator and the indicator for speed or driving profile in the form of one or more flashing LEDs.

Troubleshooting and repairs must always be performed by qualified personnel with good knowledge of the wheelchair’s electronics.

NOTICE

Error signals

Error messages are not displayed on the indicators while the wheelchair is being driven. They appear when it is next started.
6.2.2 Steady
Everything is in order. The number of LEDs that light up depends on the charge remaining in the batteries. If the batteries are fully charged, all the LEDs light up.

6.2.3 Slowly flashing red LEDs, 1–2 LEDs
The batteries must be charged immediately.

6.2.4 Rapidly flashing, 1–10 LEDs
A fault has been detected in the wheelchair’s electronics and the wheelchair may not be driven.
1. Switch off the wheelchair.
2. Check that all visible cables and the cable to the control panel are connected correctly.
3. Switch the wheelchair on again. If the fault persists, count the number of flashing LEDs and check for a possible cause and remedy in the following table.
4. Do not use the wheelchair until the problem has been remedied or you have received other information from your service provider.

**WARNING!**
Performing diagnostics
Diagnostics may only be performed by personnel with knowledge of the wheelchair’s electronic control system. Incorrect or poorly performed repair works may make the wheelchair dangerous. Permobil accepts no liability for any personal injury or damage to the wheelchair and its surroundings that occur due to incorrect or poorly performed repairs.

**NOTICE**
Unapproved replacement of parts
If any part is replaced without approval from Permobil, the wheelchair warranty will become void. Permobil accepts no liability for any loss that occurs as a result of a control system component being opened, adjusted or modified without permission.

If any part is replaced without approval from Permobil, the warranty will become void. Permobil accepts no liability for any loss that occurs as a result of the being modified without permission.

6.2.5 Example of error messages and remedies

<table>
<thead>
<tr>
<th>Event</th>
<th>Indication</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 LED Low battery voltage</td>
<td><img src="image" alt="LED indicator" /></td>
<td>Check the condition of the batteries. Check the contact between the battery and the control unit.</td>
</tr>
<tr>
<td>2 LEDs Failure in left drive motor</td>
<td><img src="image" alt="LED indicator" /></td>
<td>Check the connection of the left drive motor.</td>
</tr>
</tbody>
</table>
### Event Indication Remedy

<table>
<thead>
<tr>
<th>Event</th>
<th>Indication</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3 LEDs</strong>&lt;br&gt;Short circuit in left drive motor</td>
<td><img src="image" alt="3 LEDs" /></td>
<td>Check the left drive motor’s contacts and cables.</td>
</tr>
<tr>
<td><strong>4 LEDs</strong>&lt;br&gt;Failure in right drive motor</td>
<td><img src="image" alt="4 LEDs" /></td>
<td>Check the connection of the right drive motor.</td>
</tr>
<tr>
<td><strong>5 LEDs</strong>&lt;br&gt;Short circuit in right drive motor</td>
<td><img src="image" alt="5 LEDs" /></td>
<td>Check the right drive motor’s contacts and cables.</td>
</tr>
<tr>
<td><strong>6 LEDs</strong>&lt;br&gt;Battery charger connected</td>
<td><img src="image" alt="6 LEDs" /></td>
<td>Disconnect the battery charger.</td>
</tr>
<tr>
<td><strong>7 LEDs</strong>&lt;br&gt;Joystick error</td>
<td><img src="image" alt="7 LEDs" /></td>
<td>Check that the joystick has not been moved when starting the wheelchair.</td>
</tr>
<tr>
<td><strong>8 LEDs</strong>&lt;br&gt;Control system error</td>
<td><img src="image" alt="8 LEDs" /></td>
<td>Check the contacts to the output stage.</td>
</tr>
<tr>
<td><strong>9 LEDs</strong>&lt;br&gt;Failure in brake circuit</td>
<td><img src="image" alt="9 LEDs" /></td>
<td>Check the contacts to the magnetic brakes.</td>
</tr>
<tr>
<td><strong>10 LEDs</strong>&lt;br&gt;High battery voltage</td>
<td><img src="image" alt="10 LEDs" /></td>
<td>Check the battery and the contacts between the battery and the output stage.</td>
</tr>
<tr>
<td><strong>7+5 LEDs</strong>&lt;br&gt;Communication error</td>
<td><img src="image" alt="7+5 LEDs" /></td>
<td>A communication error has been detected. Check that the cable to the control panel is not damaged and is correctly inserted.</td>
</tr>
<tr>
<td><strong>Actuator indicator</strong>&lt;br&gt;Actuator error</td>
<td><img src="image" alt="Actuator indicator" /></td>
<td>An actuator error has been detected. Contact authorized service for help.</td>
</tr>
</tbody>
</table>

### 6.3 Diagnostics R-net LCD control panel

#### 6.3.1 General

When an error or a fault occurs in the wheelchair’s electronics, information about it is displayed in the control panel display. This information can then be used to diagnose where the error, or fault, occurred and its cause.

Troubleshooting and repairs must always be performed by qualified personnel with good knowledge of the wheelchair’s electronics.

#### 6.3.2 Diagnostic screens

##### 6.3.2.1 Current diagnostic screen

When the control system’s integrated protection circuits have tripped so that the control system can no longer operate the wheelchair, a diagnostic screen is displayed in the control panel display.

This indicates a system fault, i.e. R-net has detected a problem somewhere in the wheelchair’s power system.
NOTICE

The diagnostic screen displays error occasionally

If the fault is in a module not currently in use, it may still be possible to drive the wheelchair, but the diagnostic screen will display occasionally.

Switch off the wheelchair and leave it switched off for a few minutes. Restart the wheelchair. If the fault persists, you must switch off the wheelchair and contact your service provider. Write down the information displayed in plain text in the control panel display and pass it on to your service provider.

Do not use the wheelchair until the problem has been remedied or you have received other instructions from your service provider.

WARNING!

Performing diagnostics

Diagnostics may only be performed by personnel with knowledge of the wheelchair’s electronic control system. Incorrect or poorly performed repair works may make the wheelchair dangerous. Permobil accepts no liability for any personal injury or damage to the wheelchair and its surroundings that occur due to incorrect or poorly performed repairs.

NOTICE

Unapproved replacement of parts

If any part is replaced without approval from Permobil, the wheelchair warranty will become void. Permobil accepts no liability for any loss that occurs as a result of a control system component being opened, adjusted or modified without permission.

If any part is replaced without approval from Permobil, the warranty will become void. Permobil accepts no liability for any loss that occurs as a result of the being modified without permission.

6.3.3 Example of a screen showing system fault

6.3.3.1 Identified module

The system fault indicator is displayed on the screen when the control system module has detected a problem. The codes below indicate where the problem is located.

PM = Power module

JSM = Joystick module

6.3.3.2 Error message

The error message displayed in the bottom left corner of the screen provides a brief description of the error type.
6.3.3.3 Error code
The four-digit code displayed in the bottom right corner of the screen indicates which protection circuit has tripped.

6.3.4 Example
The view shown displays the following information:
Identified module: PM; power module error.
Error message: Low Battery.
Error code: 2C00; means the battery needs charging or that it is not connected properly.
• Check the battery connections. Attempt to charge the battery if it is properly connected.

6.3.5 System log
All errors are saved in the system log regardless of whether or not they have been remedied or are still active. The system log saves the error messages and the number of times they arise. The errors are saved in their respective modules in the system.
The system log is accessed by means of programming directly in the system (On Board Programming, OBP).
Contact Permobil for more information on OBP.

Go to OBP mode
• Select System from the menu.
• Select Diagnostics from the menu.
• The diagnostics screen will now appear, showing the connected modules and version history.
• If a module has experienced no errors, the message No Entries will be displayed.

6.3.6 Definitions of diagnostics messages
When an error message has been displayed and the defective module has been identified, use the following definitions to determine the possible cause of the error and the remedial action required to correct it.

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### 6.3.6.1 Joystick Error

The most common cause for this error is joystick movement away from its central position just before or at the moment the control system was switched on. The moved joystick view is displayed for 5 seconds. If the joystick is not released during this time, a joystick error is registered. Even if an error screen is not displayed, the error and the number times it arises is registered in the system log.

- Ensure that the joystick is in the central position and start up the control system.

If the error persists, the joystick or joystick module may be defective. Read more in 6.4 Repairing defective units, Page 199.

### 6.3.6.2 Low Battery

This occurs when the control system detects that the battery voltage is lower than 16 V.

- Check the batteries and their connection to the control system.
If the error persists after the batteries and connections have been checked, the power module may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.6.3 High Battery
This occurs when the control system detects that the battery voltage is higher than 35 V. The most usual causes for this error are battery overcharging or a poor connection between the control system and the batteries.

- Check the batteries and their connection to the control system.

If the error persists after the batteries and connections have been checked, the power module may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.6.4 Brake Error
This occurs when the control system detects a problem in the solenoid brakes or the connections to them.

1505 - M1 Brake Error (M1; motor connected to M1 on the power module).
1506 - M2 Brake Error (M2; motor connected to M2 on the power module).

- Check the solenoid brakes, their cables and the connections to the control system.

If the error persists after the checks listed above, the power module may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.6.5 Motor Error
This occurs when the control system detects that a motor has been disconnected.

3B00 - M1 Motor Error (M1; motor connected to M1 on the power module).
3C00 - M2 Motor Error (M2; motor connected to M2 on the power module).

- Check the motors, their cables and the connections to the control system.

If the error persists after the checks listed above, the power module may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.6.6 Inhibit Active
This occurs when one of the inhibit signals is active and is in blocked mode.

The last two digits of the error code indicate the active inhibit signal. The code is hexadecimal.

1E01 - For inhibit signal 1.
1E09 - For inhibit signal 9.
1E0A - For inhibit signal 10.

- Switch power off and on. This will deactivate the block mode, which may remedy the error.
- Check all connections and switches for the indicated inhibit signals.
6.3.6.7 Joystick Calibration Error
This occurs when joystick calibration has been unsuccessful.
• Go to OBP (on board programming) mode and recalibrate.

If the error persists, the joystick module may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.6.8 Latched Timeout
This occurs when the control system detects that the programmed block time has been exceeded. This may be due to insufficiently frequent use of the signal units (joystick, main steering device, suction and blowing device, etc.)

The error reference provides information on why the control system has left block mode.
• Switch power on and off.
• Activate block mode.

If the error persists after the checks listed above, the signal unit may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.6.9 Brake Lamp Short
This occurs when the control system detects a short circuit in the brake light electrical circuit.
• Check the brake lamps, their cables and the connections to the control system.

6.3.6.10 Lamp Short
This occurs when the control system detects a short circuit in the electrical circuit of one of the lights.
7205 - Short circuit left-hand lamp.
7209 - Short circuit right-hand lamp
• Check the lamps, their cables and the connections to the control system.

6.3.6.11 Indicator Lamp Short
This occurs when the control system detects a short circuit in the electrical circuit of one of the turn signals.
7206 - Short circuit left turn signal.
720A - Short circuit right turn signal.
• Check the turn signals, their cables and the connections to the control system.

6.3.6.12 Indicator Lamp Failed
This occurs when the control system detects an error in the electrical circuit of one of the turn signals. This usually means the turn signal needs replacing.
7207 - Error in left turn signal.
7208 - Error in right turn signal.
• Check the turn signals, their cables and the connections to the control system.
6.3.6.13  **DIME Error**
This occurs when the control system detects an ID conflict between two modules in the system.

If a new module has been added:
• Disconnect the new module and switch power off and on.
• If no error occurs, connect the new module to the system and switch power off and on.
• If the error recurs, the new module must be the cause of the problem.

If no new modules have been added:
• Disconnect one module at a time and switch power off and on.

If the error persists after the checks listed above have been performed, contact Permobil.

6.3.6.14  **Memory Error**
This is a non-specific memory error that may be caused by any of the system modules.
• Check all cables and connections.
• Switch power off and on.

If the error persists and the system includes third-party modules:
• Disconnect all modules that do not come from Penny & Giles Drives Technology and switch power off and on.

If this has rectified the error:
• Connect one third-party module at a time and switch power off and on each time.
• If the error recurs when the power is switched on, the last module to be connected is defective.

If the error persists after the checks listed above, the power module may be defective. Read more in 6.4 *Repairing defective units*, Page 199.

6.3.6.15  **PM Memory Error**

**WARNING!**
**Incorrect programming may make the wheelchair unsafe**
Programming should only be performed by persons with knowledge of control systems from Penny & Giles Drives Technology. Incorrect programming may mean that the wheelchair is unsafe. Permobil cannot be held responsible for losses of any kind if the control system factory settings are altered by programming.

This is a specific error in the power module.
• Check all cables and connections.
• Reprogram the control system with the help of R-net PC programmers.

This should be done with either the latest specific program file for the wheelchair or the original Permobil program file.
If the error persists after the checks listed above, the power unit may be defective. Read more in 6.4 *Repairing defective units*, Page 199.

### 6.3.6.16 Bad Cable
This occurs when the control system detects a connection error in the communication cables between the modules.
- Check all cables and connections to ensure there are no breaks.
- Replace any cables with visible damage. Turn the power off and on.
- Disconnect one cable at a time from the system and turn the power off and on after each disconnection.

If the error persists after the checks listed above, the power unit may be defective. Read more in 6.4 *Repairing defective units*, Page 199.

### 6.3.6.17 Bad Settings
This occurs when the control system detects incorrect or invalid program settings.
- Check all parameter settings and then reprogram the control system with the help of R-net PC programmers.
- Make a note of the current parameter settings and then reset the control system to the default settings.
- Reprogram the required settings in small groups and turn the power off and on after each group to see if the error recurs.

If the error persists after the checks listed above, the power unit may be defective. Read more in 6.4 *Repairing defective units*, Page 199.

### 6.3.6.18 Module Error
This occurs when the control system detects an error in a specific module.
- Check all cables and connections.
- If the error persists after the checks listed above, the module specified may be defective. Read more in 6.4 *Repairing defective units*, Page 199.

### 6.3.6.19 System Error
This occurs when the control system detects an error that cannot be ascribed to a specific module.
- Check all cables and connections.
- Switch power on and off.

If the error persists and the system includes third-party modules:
- Disconnect all modules that do not come from Penny & Giles Drives Technology and switch power off and on.

If this has rectified the fault:
- Connect one third-party module at a time and switch power off and on each time.
- If the error recurs when power is switched back on, the last module connected is defective.

If the error persists after the checks listed above, the system from Penny & Giles Drives Technology may be defective. Read more in 6.4 *Repairing defective units*, Page 199.
6.3.6.20  Gone to Sleep
The system has gone into energy saving mode. This occurs when the system has not been used for a period that exceeds the Sleep Timer parameter used for setting the energy saving mode. Each time this occurs it is registered in the system log.

6.3.6.21  Charging
This occurs when the control system detects that a charger has been connected to either inhibit contact 1 or inhibit contact 3.
The battery charging view is displayed when a charger is connected.
Each time this occurs it is registered in the system log.
When using an integral charger:
• Disconnect the charger from the mains.
When using an external charger:
• Disconnect the charger from the power wheelchair.
If the error persists after the charger has been disconnected, the joystick module may be defective. Read more in 6.4 Repairing defective units, Page 199.

6.3.7  Basic test

WARNING!
Always perform safety tests after maintenance

The tests described are minimum recommendations. It is the responsibility of the service technician to perform other tests on the basis of the original error source and the wheelchair model. Permobil cannot be held responsible for losses of any kind that may arise when these tests are conducted, or that arise as a consequence of further relevant tests not being conducted.

These tests should be conducted in an open space, and some kind of restraining device, such as a safety belt, should always be used. Permobil cannot be held responsible for losses for any kind arising due to the non-observance of these recommendations.

After a repair has been completed, the following test should be performed. These are minimum recommendations. Depending on the original error source, further tests may be necessary.

6.3.7.1  Basic inspection
Check that all contacts are properly connected.
• Check all cables and contacts to ensure there is no visible damage.
• Check that the rubber gaiter around the base of the joystick is not damaged. Inspect the gaiter visually. It should not be handled manually.
• Ensure that all components of the control system are securely installed.
• Do not over-tighten the mounting screws.
6.3.7.2 Brake test
These tests should be carried out on an even surface with at least one meter of free space around the wheelchair.

- Switch on the control system.
- Check that the screen remains on after start-up.
- Move the joystick slowly forward until you hear the park brakes release. In some cases the wheelchair may begin to move.
- Release the joystick immediately. Both park brakes must be engaged within 2 seconds.
- Repeat the test three times, bringing the joystick slowly backwards, to the left and to the right.

6.3.7.3 Test run
Set the highest permitted speed to the lowest value and run the wheelchair in all directions while checking that it runs smoothly and is easy to maneuver.

Repeat the test with the speed control set to the highest possible value.

6.3.7.4 Gradient test

**WARNING!**

Prevent tipping during test

When this test is conducted, an additional person must be present in order to prevent the wheelchair tipping over backwards.

Run the wheelchair forwards up its steepest permitted gradient. Release the joystick when the wheelchair is moving up hill; check that the wheelchair stops and that the brakes function as intended without the front wheels lifting from the ground.

Move the joystick forward and continue uphill. Check that the wheelchair moves gently forwards.

Stop the wheelchair then back it downhill. Release the joystick when the wheelchair is moving downhill; check that the wheelchair stops and that the brakes function as intended without the front wheels lifting from the ground.

6.3.7.5 Testing lights, turn signals and warning lights
If the wheelchair is equipped with lights:

- Check that they all light up as intended.
- Check that they all light up as intended and that the flashing frequency is 1.5 Hz ± 0.5 Hz.
- Remove the bulbs in turn and check that the remaining bulb on the same side flashes at a frequency of 3 Hz ± 0.5 Hz.

If the wheelchair is equipped with hazard lights:

- Check that all bulbs light up as they should and that the flashing frequency is 1.5 Hz ± 0.5 Hz.
6.3.7.6 Testing adjustment device
If the wheelchair is equipped with an adjustment device:
• Check that all motors move in the right direction.
• Make sure that the mechanical end stops are secured and that they stop the adjustment device motors, and thus use the automatic end stop tracking that is in the seat and light module (ISM).

6.3.7.7 Testing inhibit signal
Connect a suitable battery charger or equivalent inhibit connecting device in the charging contact on the joystick module and check that the wheelchair is prevented from running.

If inhibit contacts 2, 3, 4 and 5 are used for inhibiting or restricting speed, suitable test must be performed in order to check that they are functioning as intended.

6.4 Repairing defective units
Apart from specific OEM-approved spare parts, there are no replaceable parts in the R-net control system. Contact Permobil for further information on OEM-approved spare parts. Defective units must be sent for repair to Permobil or an authorized Permobil service center.
### 7 Customizations

#### 7.1 Seat cushions, seat plates and UniTrack rails

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<th>Cushion, length</th>
<th>Cushion, width</th>
<th>Seat plate, length</th>
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