

# Invacare® Leo

## en Scooter Service Manual



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



***Yes, you can.***

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

# 1 General

## 1.1 Introduction

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

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

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

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

Previous product versions may not be described in this Manual's current revision. If you require assistance, please contact Invacare.

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

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

## 1.2 General Information

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

Note that there may be sections in this document, which are not relevant to your product, since this document applies to all available models (on the date of printing). If not otherwise stated, each section in this document refers to all models of the product.

The models and configurations available in your country can be found in the country-specific sales documents.

It is imperative that you observe safety information.

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

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

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

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

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

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

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

If you have any problems or questions contact your provider.

## 1.3 Notes on Shipping

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

## 1.4 Symbols in This Manual

Symbols and signal words are used in this document and apply to hazards or unsafe practices which could result in personal injury or property damage. This document is printed in greyscale. For your information, the safety messages have the following colour coding according to ANSI Z535.6: Danger (Red), Warning (Orange), Caution (Yellow) and Notice (Blue). See the information below for definitions of the signal words.



### **DANGER!**

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



### **WARNING!**

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



### **CAUTION!**

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



### **NOTICE!**

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



### **Tips and Recommendations**

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



### **Tools**

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

## 1.5 Images in This Manual

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

## 2 Safety

### 2.1 Safety Information



#### **WARNING!**

**Installation, mounting, maintenance or repairs made by unqualified persons can result in hazardous situations to you and others**

- The procedures in this service manual, must be performed by a specialised provider or qualified service technician.
- Invacare expects that the qualified technician is familiar with the product, with good technical knowledge to understand and follow the steps of the described instructions in this manual, and equipped with proper tools.
- Do not handle this product or any available optional equipment without first completely reading and understanding these instructions and any additional instructional material such as user manuals, installation manuals or instruction sheets supplied with this product or optional equipment.



- The CE marking is invalidated if components or accessories/options are replaced or added that have not been approved for this product by Invacare.
- In this case, the company that adds or replaces the components or accessories/options is responsible for the conformity assessment/CE marking or for registering the scooter as a special design and for the relevant documentation.



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

### 2.2 Safety and Fitting Instructions

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

#### **Before any inspection or repair work**

- Read and observe this repair manual and the associated user manual.
- Observe the minimum requirements for carrying out the work (see 1.2 *General Information*, page 3).

#### **Personal Safety Equipment**

##### **Safety Shoes**

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

- Wear standardised safety shoes during all work.

##### **Eye Protection**

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

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

#### **Safety Gloves**

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

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

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



#### **DANGER!**

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

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

- DO NOT smoke while using this scooter.



#### **WARNING!**

##### **Risk of Serious Injury or Damage**

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

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



#### **CAUTION!**

##### **Risk of crushing**

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

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



#### **CAUTION!**

##### **Injury hazard if the scooter starts moving unintentionally during repair work**

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



#### **CAUTION!**

##### **Fire and burn hazard due to electrical short-circuit**

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



#### **CAUTION!**

##### **Risk of burns from hot surfaces on the motor**

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





**CAUTION!**

**Injury hazard and risk of damage to scooter due to improper or incomplete maintenance work**

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



**CAUTION!**

**Any changes to the drive program can affect the driving characteristics and the tipping stability of the scooter**

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



**CAUTION!**

**Risk of Injury**

Adaptions to the scooter can influence the performance.

- When adaptions with third party products are made, this is only allowed within the scope of a valid combination agreement.
- The maximum values and restrictions of both products shall be observed.
- Machining, bending, welding, or bracing on any safety relevant components is not allowed.



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

## 3 Hygiene

### 3.1 Handling of Returned Used Products

When reconditioning or repairing returned scooters:

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

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

Treat product according to following process steps:

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

\*The detergent "Nüscosept Spezial" has been tested on product surfaces.

#### Disinfection Tools

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

#### Further Information



For more information contact your Invacare service department.

## 4 Service

### 4.1 General Safety Information on Installation Work

- ! NOTICE!**  
Collisions can be caused if shim rings are removed from the drive wheels during installation work. Shim rings are frequently placed between drive shaft and wheel hub to compensate tolerances. Collisions can be caused if these shim rings are removed and not re-installed.
- Install all shim rings in exactly the same positions they were in before dismantling.

### 4.2 Tightening Torques

- ⚠ CAUTION!**  
**Risk of damage to scooter due to improperly tightened screws, nuts or plastic connections.**
- Always tighten screws, nuts etc. to the stated tightening torque.
  - Only tighten screws or nuts which are not listed here fingertight.

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

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

### 4.3 Accessories / Options List

- Mirror (right or left)
- Seat suspensions
- Personal key
- Crutch / cane holder (right or left)
- Lockable storage box, front
- Lockable storage box, rear, incl. clutch holder bracket
- Rear basket
- Seat belt
- Walking frame holder
- Rollator holder incl. crutch holder
- Windscreen
- Covers: Storage cover (Full scooter cover), Seat Cover (Rain & Dirt protection)

 The installation instructions for additional accessories / options are available at your Invacare provider or directly from Invacare.

### 4.4 Troubleshooting

#### 4.4.1 Operational Faults

Proceed as follows if you have any problems:

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

### 4.4.2 Drive Fault Diagnosis

| Problem                              | Other Symptoms                                          | Possible Cause                                | Solution                                                    | Documentation                                                  |
|--------------------------------------|---------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------|
| <b>Scooter will not start</b>        | Status display on operating console does not illuminate | Batteries defective                           | Replace batteries                                           | See user manual                                                |
|                                      |                                                         | Completely discharged battery                 | Pre-charge batteries                                        |                                                                |
|                                      |                                                         | Power supply to operating console interrupted | Check main fuse                                             | See user manual for main fuse position                         |
|                                      |                                                         | Operating console defective                   | Check cable between modules for loose connections or damage | See 8.3.1 Replacing Power Module, page 23                      |
|                                      |                                                         |                                               | Replace operating console                                   | See 8.3.2 Replacing Operating Console / Circuit Board, page 24 |
|                                      | Status display on operating console flashing            | Various causes                                | Assess error code                                           | See controls user manual                                       |
| <b>Scooter judders in drive mode</b> | None                                                    | Drive motor(s) defective                      | Replace motor(s)                                            | See 8.4 Replacing Drive Motor, page 27                         |
|                                      |                                                         | Drive lever potentiometer defective           | Replace potentiometer                                       | See 8.3.3 Replacing Potentiometer, page 25                     |
| <b>Batteries not being charged</b>   | None                                                    | Batteries defective                           | Replace batteries                                           | See user manual                                                |
|                                      | LEDs flashing on charger                                | Charger defective                             | Replace charger                                             | See charger user manual                                        |
| <b>Scooter runs too slowly</b>       | None                                                    | Operating console defective                   | Replace operating console                                   | See 8.3.2 Replacing Operating Console / Circuit Board, page 24 |
|                                      |                                                         | Batteries defective                           | Replace batteries                                           | See user manual                                                |

### 4.4.3 Error Codes and Diagnostic Codes

| Flash Code | Fault                                          | Consequence for the Scooter | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------|------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | Batteries must be charged                      | Continues to drive          | <ul style="list-style-type: none"> <li>The batteries are discharged. Charge the batteries as soon as possible.</li> </ul>                                                                                                                                                                                                                                                                                                                                    |
| 2          | Battery voltage too low                        | Stops driving               | <ul style="list-style-type: none"> <li>The batteries are depleted. Charge batteries.</li> <li>If you switch the scooter off for a few minutes, the batteries can often recuperate to such a stage that a short journey is still possible. You should only do this in an emergency, however, because this causes the batteries to become excessively discharged.</li> </ul>                                                                                   |
| 3          | Battery voltage too high                       | Stops driving               | <ul style="list-style-type: none"> <li>The battery voltage is too high. If the battery charger is connected, disconnect it from the scooter.</li> <li>The electronic system charges the batteries when running downhill and when braking. This fault is caused when the battery voltage becomes too high during this process. Switch the scooter off and on again.</li> </ul>                                                                                |
| 4          | Power time exceeded                            | Stops driving               | <ul style="list-style-type: none"> <li>The maximum current was exceeded over too long a period, probably because the motor was overloaded or has been working against an immovable resistance. Switch the scooter off, wait a few minutes and then switch on again.</li> <li>The electronic system has determined a motor short-circuit. Check the wiring harness for short-circuit and check the motor.</li> <li>Contact your Invacare provider.</li> </ul> |
| 5          | Brake failure                                  | Stops driving               | <ul style="list-style-type: none"> <li>Ensure that the disengaging lever is in the engaged position.</li> <li>There is a defect in the braking coil or in the cabling. Check the magnetic brake and cabling for open or short-circuited circuitry. Contact your Invacare provider.</li> </ul>                                                                                                                                                                |
| 6          | No neutral position when switching scooter on. | Stops driving               | <ul style="list-style-type: none"> <li>Drive lever is not in neutral when the keyswitch was turned. Put the drive lever in neutral, turn the power off and then turn on again.</li> <li>It may be necessary to replace the drive lever. Contact your Invacare provider.</li> </ul>                                                                                                                                                                           |
| 7          | Fault in speed potentiometer                   | Stops driving               | <ul style="list-style-type: none"> <li>The drive lever controls could be faulty or incorrectly connected. Check the cabling for open or short-circuited circuitry.</li> <li>Potentiometer is not correctly adjusted and must be replaced. Contact your Invacare provider.</li> </ul>                                                                                                                                                                         |
| 8          | Motor voltage error                            | Stops driving               | <ul style="list-style-type: none"> <li>The motor or its cabling is defective. Check the cabling for open or short-circuited circuitry.</li> </ul>                                                                                                                                                                                                                                                                                                            |
| 9          | Miscellaneous internal fault                   | Stops driving               | <ul style="list-style-type: none"> <li>Contact your Invacare provider.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                            |
| 10         | Push/freewheel mode error                      | Stops moving                | <ul style="list-style-type: none"> <li>The scooter has exceeded the permissible maximum speed during pushing or freewheeling. Switch the electronics system off and on again.</li> </ul>                                                                                                                                                                                                                                                                     |

#### 4.4.4 Service Plan

| Component                           | Check                                                 | Remedy                                                 | Notes                                                                     | ✓ |
|-------------------------------------|-------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------|---|
| Seat                                | Check welded seams, fixings and upholstery            | Tighten screws, replace parts if damaged               |                                                                           |   |
|                                     | Check seat suspension                                 | Grease the spring generously, replace parts if damaged | See 5.2 Replacing Seat Suspension, page 11                                |   |
| Frames (chassis) / battery mounting | Check fixings, welded seams and battery mounting      | Tighten screws, replace parts if damaged               |                                                                           |   |
|                                     | Check battery fixing straps                           |                                                        |                                                                           |   |
| Wheel suspension and wheels         | Check drive wheels for tight fit                      | Tighten hub nuts, replace if necessary                 |                                                                           |   |
|                                     | Check front wheels for tight fit, float and side play | Adjust / replace                                       |                                                                           |   |
|                                     | Check pneumatic tyre                                  | Repair or replace if damaged                           | See user manual                                                           |   |
|                                     | Check tracking and steering link                      | Tighten screws                                         |                                                                           |   |
|                                     |                                                       | Check tracking and steering                            | Installing and removing wheels, see 8.5.1 Replacing Front Wheels, page 29 |   |
| Drive units, coupling mechanism     | Check functions in drive and push modes               | Replace motor if necessary                             | See user manual                                                           |   |
|                                     | Check clutch mechanism                                | Tighten screws / nuts, adjust or replace               |                                                                           |   |
| Batteries                           | Check batteries for damage                            | Replace batteries                                      | See user manual                                                           |   |
|                                     | Check battery voltage                                 | Charge batteries                                       | See user manual                                                           |   |
|                                     | Check contacts and terminals                          | Clean contacts and terminals                           |                                                                           |   |
| Drive controls                      | Check status display (flashing)                       | Evaluate flash code                                    | See 4.4.3 Error Codes and Diagnostic Codes, page 9                        |   |
|                                     | Check fixing                                          | Tighten or replace fixing                              |                                                                           |   |
|                                     | Check cable, connecting plug                          | Replace cable, connecting plug                         |                                                                           |   |
|                                     | Check drive lever function                            | Replace drive lever                                    |                                                                           |   |
|                                     | Check power supply                                    | Replace cable, connecting plug or console              |                                                                           |   |
| Drive program                       | Check drive program version. New version available?   | Update software                                        |                                                                           |   |
| Screws                              | Check screws for tight fit                            | Tighten screws if necessary                            |                                                                           |   |



## 5 Seat System

### 5.1 Removing the Seat

1. Pull up the seat lock lever (A).
2. Turn the seat assembly (B) to one side.
3. Lift the seat assembly up and away from the seat post.
4. Install parts in reverse order. Make sure the seat is in a locked position before use.



### 5.2 Replacing Seat Suspension


**CAUTION!**

**Risk of injury or damage if the scooter is accidentally set into motion during repairs**

Unintended movement or rolling away of the scooter can lead to accidents or damage of the property.

— Secure scooter against unintended movement and rolling away.



When removing, note position of small parts such as screws and washers. Put small parts down so that they can be installed in right sequence.



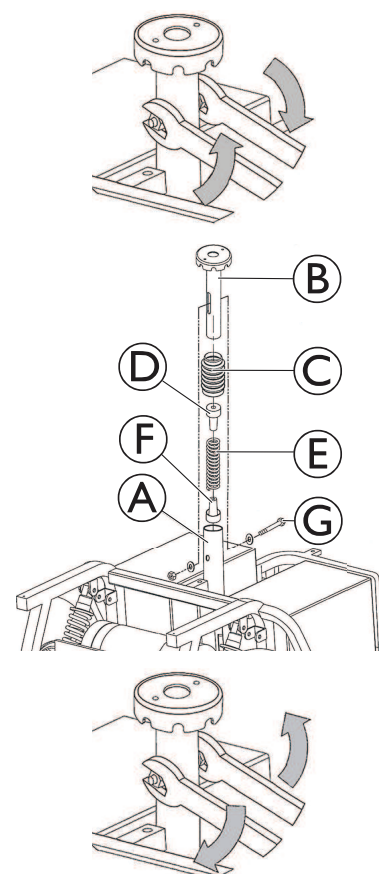
The following seat support tubes are available:

| Seat Suspension Hardness | Seat Height |
|--------------------------|-------------|
| low                      | 510 mm      |
| mid                      | 535 mm      |
| high                     | 560 mm      |



- 17 mm open wrenches

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove bolt ③, nut and washers.
3. Remove seat support tube ② from receptacle tube ①.
4. Remove concertina type shroud ④ including spring ⑤ and plastic end pieces ⑥ and ⑦.
5. Fit plastic end pieces ⑥ and ⑦ to new spring.
6. Grease spring generously. The spring should be covered completely.
7. Install concertina type shroud ④ including spring ⑤ and plastic end pieces ⑥ and ⑦.
8. Insert seat support tube ② into receptacle tube ① and press down gently.
9. Reposition bolt ③, nut and washers.
10. Firmly tighten seat support bolt.
11. Reposition seat.



## 6 Shrouds

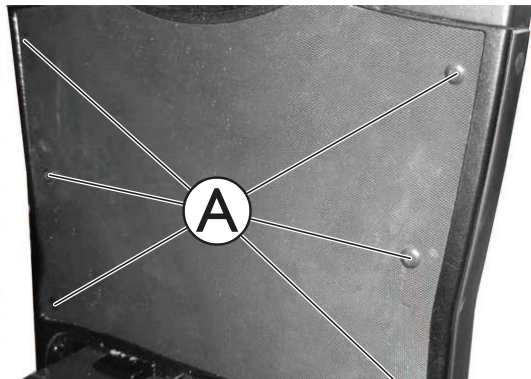
### 6.1 Replacing Front Shroud



- 10 mm socket wrench

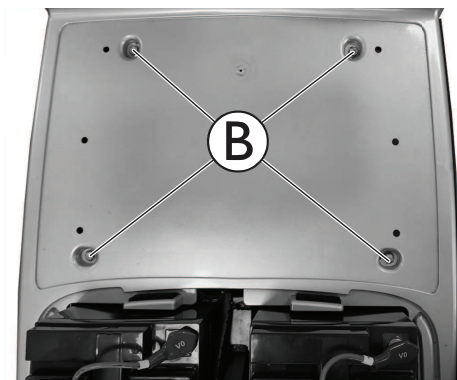
1. Remove steering column, see 8.6.1 *Replacing Steering Column*, page 33.

2.



Remove caps Ⓐ.

3.



Loosen and remove screws Ⓑ.

4. Take off front shroud.

5. Install parts in reverse order.

### 6.2 Replacing Front Bumper Cover



#### WARNING!

##### Risk of accidents

Accidents may result from standing the chassis upright on its end.

- Secure chassis against falling over.



#### NOTICE!

The plastic cover can be damaged if you attempt to lift the scooter by its shroud.

- Only lift scooter by chassis.

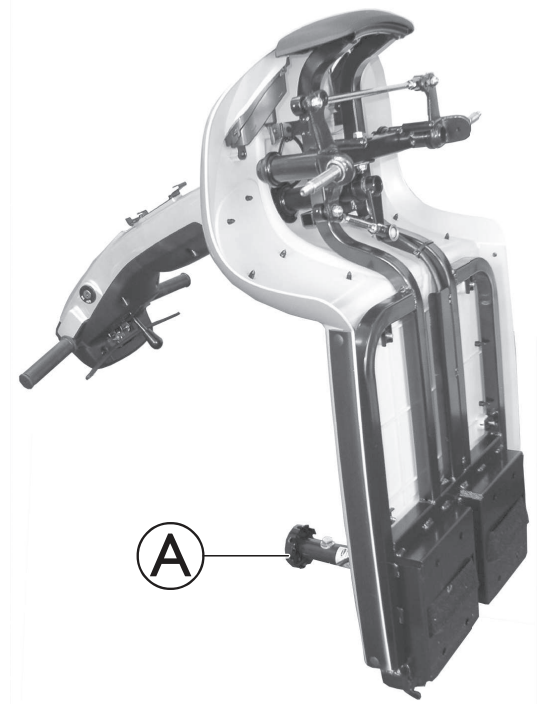


Pay attention to the positions of small parts such as screws and washers during disassembly. Put small parts aside in such a way that they can be re-fitted in the correct order.



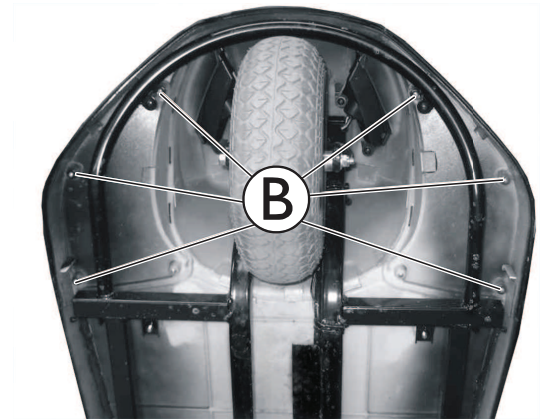
- Phillips screwdriver

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove batteries, see *8.1.2 Replacing the Batteries, page 20*.
3. Disconnect rear frame assembly, see *8.2 Disconnecting Rear Frame Assembly, page 22*.
4. Place chassis upright on its seat adapter (A).
5. Secure chassis against falling over.



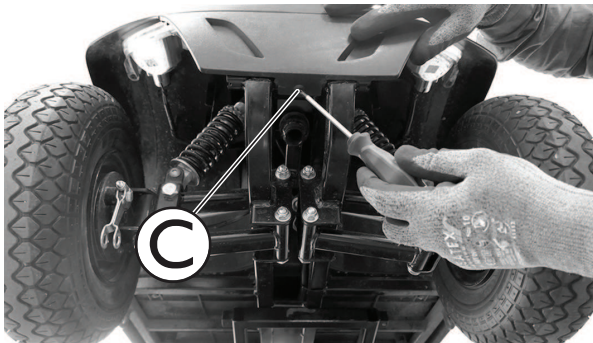
### 3-Wheel Version

1. Remove the fixation screws (B).
2. Remove front bumper cover.
3. Install parts in reverse order.
4. Test all functions.



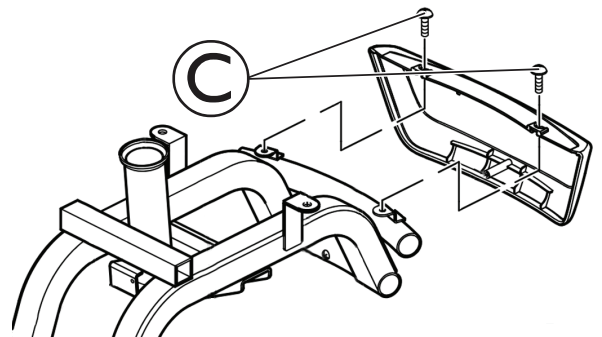
### 4-Wheel Version

- 1.



Remove the fixation screws (C).

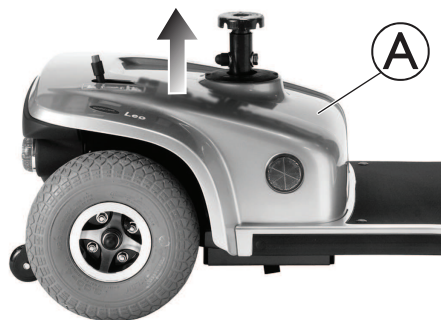
2. Remove front bumper cover.
3. Install parts in reverse order.
4. Test all functions.





## 6.3 Replacing Rear Shroud

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Lift rear shroud ① up to remove it.

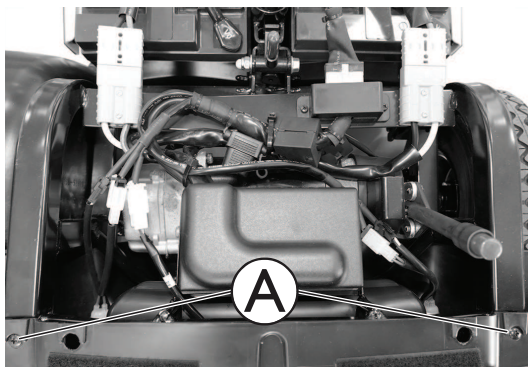


## 6.4 Replacing Rear Bumper Cover

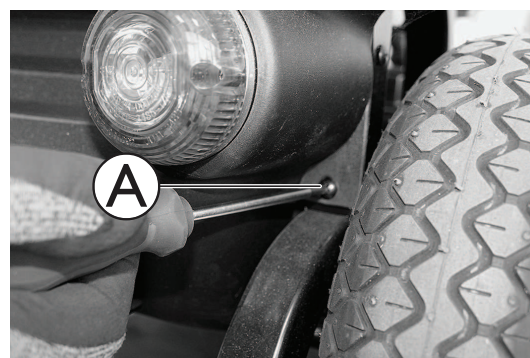


- Phillips screwdriver

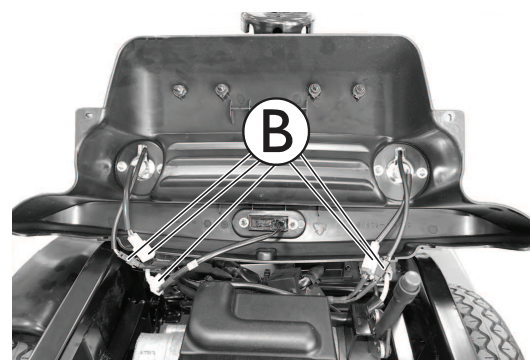
1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Disconnect battery cables.
- 4.



Remove screws ①.



5. Fold rear bumper cover upwards and disconnect plugs ②.
6. Replace rear bumper cover.
7. Install parts in reverse order.
8. Test all functions.



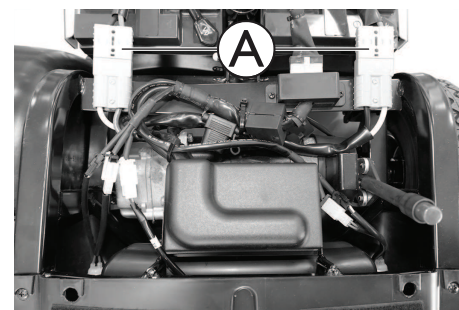
## 7 Lighting Unit

### 7.1 Replacing Headlight / Direction Indicator

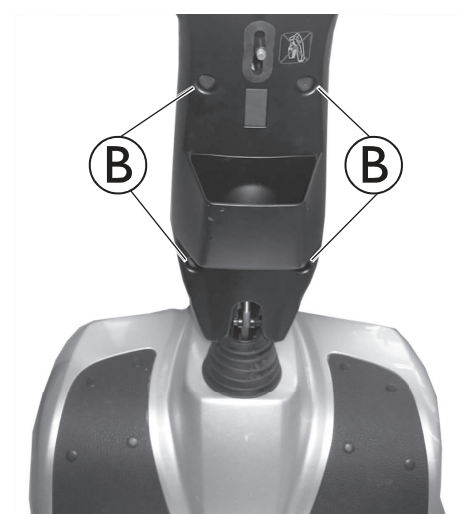


- Phillips screwdriver

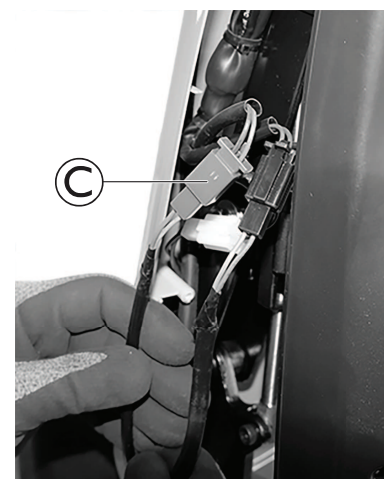
1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Disconnect battery cable ①.



4. Remove screws ② to remove rear shroud of steering column.



5. Disconnect plug ③ from light cable.



6. Remove screws **D** and cable tie **E** from underneath the front shroud.



7. Pull headlight out to replace it.  
8. Install parts in reverse order.  
9. Test function.



## 7.2 Replacing Rear Stoplight



### CAUTION!

#### Risk of burning if power cable is shorted

- Turn off the power completely before removing any power supply components of the scooter. Therefore take out the batteries.
- Avoid bridging of contacts during measurements on live electrical components.

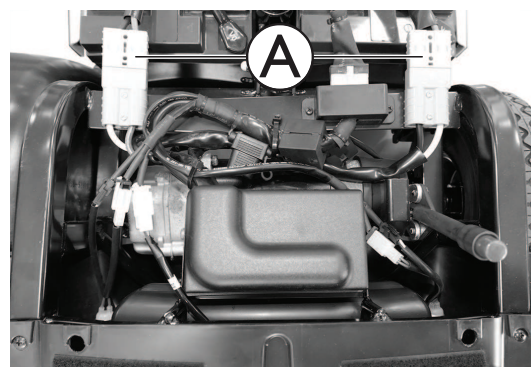


When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.



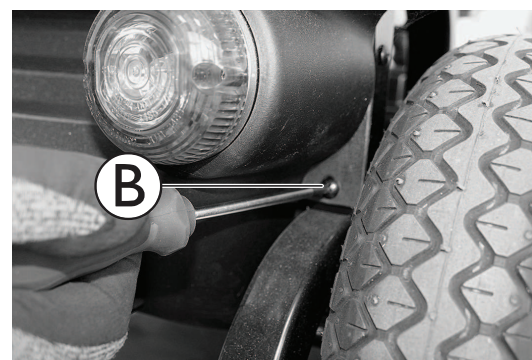
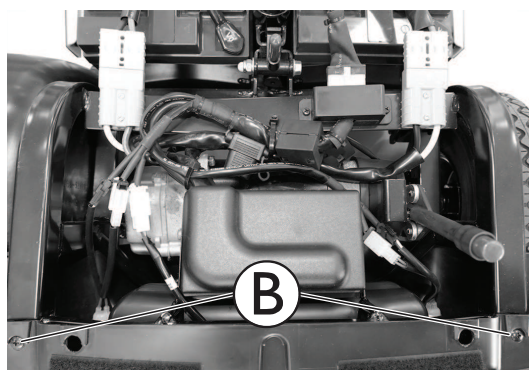
- Phillips screwdriver
- 7 mm socket wrench

1. Remove seat, see *5.1 Removing the Seat, page 11*.  
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.  
3. Disconnect battery cable **A**.

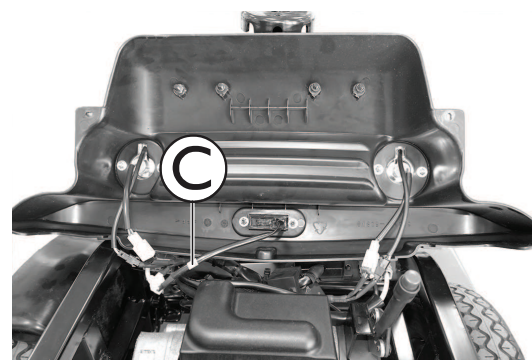




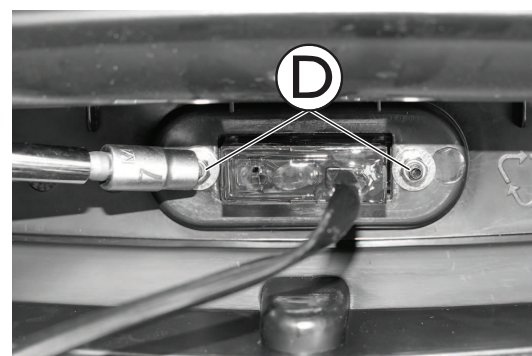
4. Remove bolts **Ⓑ** on both sides of rear bumper cover.



5. Lift the rear bumper cover upwards and disconnect plug **Ⓒ**.



6. Remove screws **Ⓓ**.
7. Replace rear stoplight.
8. Install parts in reverse order.
9. Test all functions.



### 7.3 Replacing Rear Lights / Direction Indicators



#### CAUTION!

##### Risk of burning if power cable is shorted

- Turn off power completely before removing any power supply components of scooter. Therefore take out batteries.
- Avoid bridging of contacts during measurements on live electrical components.

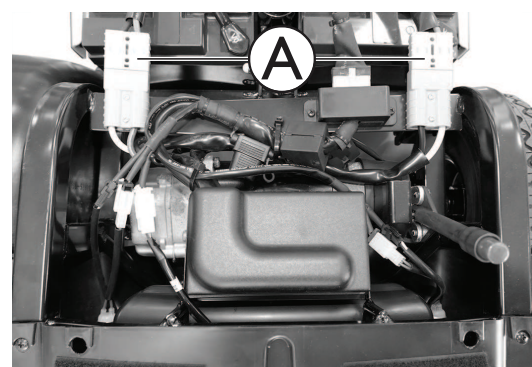


When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.



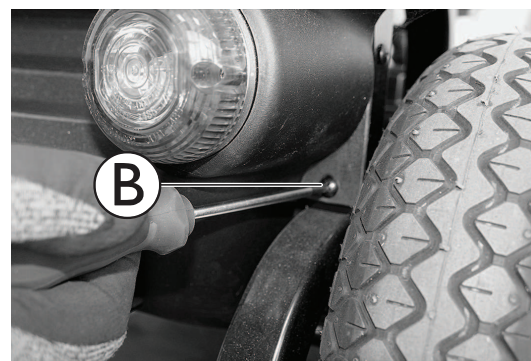
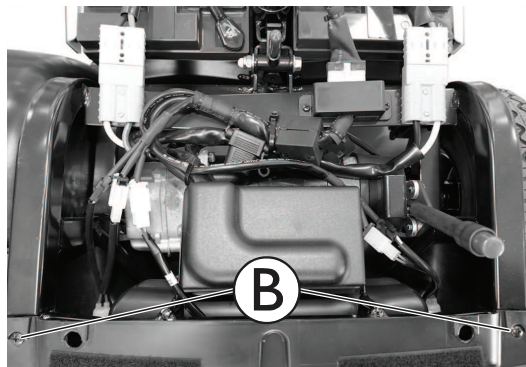
- Phillips screwdriver
- 7 mm socket wrench

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Disconnect battery cable **Ⓐ**.





4. Remove bolts ⑥ on both sides of rear bumper cover.

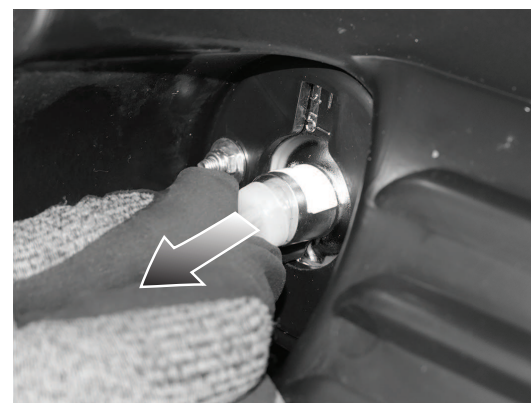


5. Fold the rear bumper cover upwards to have access to the rear lights.



### Replacing Light Bulb

1. Pull light bulb holder out.
2. Replace light bulb.
3. Install parts in reverse order.
4. Test all functions.



### Replacing Rear Light Cover Glass

1. Remove screws ③ to remove cover glass.
2. Replace cover glass and install parts in reverse order.
3. Test all functions.



## 8 Drive Components

### 8.1 Batteries


**CAUTION!**

**Injury hazard and possible material damages if batteries are handled improperly**

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


**CAUTION!**

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

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


**CAUTION!**

**Risk of crushing**

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

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



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

#### 8.1.1 General Instructions on Handling Batteries

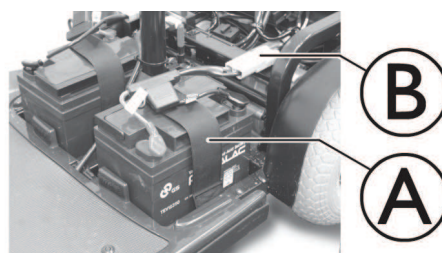
- Never mix and match different battery manufactures or technologies, or use batteries that do not have similar date codes.
- Never mix gel with AGM batteries.
- The batteries reach their end of life when the drive range is significantly smaller than usual. Contact your provider or service technician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

#### 8.1.2 Replacing the Batteries

1. Remove the seat, see *5.1 Removing the Seat, page 11*.
2. Remove the rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Open the battery retention strap **A**.
4. Disconnect the battery plugs **B**.
5. Remove the batteries from the base frame.
6. Install parts in reverse order.



Orient the batteries as shown in the illustration.  
The battery retention strap should go under the battery harnesses.



### 8.1.3 Handling Damaged Batteries Correctly


**WARNING!**
**Risk of burns**

- Never touch or remove overheating batteries. Only unplug the charger.
- Never touch leaking batteries.


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

Injury hazard due to discharged acid.

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

**What to do if acid is discharged**

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

**If contact with eyes is made**

- You should also consult an eye specialist immediately afterwards!

- Place damaged batteries in an acid-resistant receptacle immediately after removing them.
- Only ever transport damaged batteries in an appropriate acid-resistant receptacle.
- Wash all objects that have come into contact with acid with lots of water.

#### Disposing of Dead or Damaged Batteries Correctly


**WARNING!**
**Environmental Hazard**

- DO NOT dispose of batteries in normal household waste.
- DO NOT throw batteries into a fire.
- Batteries MUST be taken to a proper disposal site. The return is required by law and free of charge.
- Only dispose of discharged batteries.
- Cover terminals of batteries prior to disposal.


**CAUTION!**
**Fire and burns hazard if battery is not stored correctly**

- Take great care to ensure that the battery terminals are never short-circuited by metallic parts or liquids.
- Ensure that the battery terminal caps have been installed before storing.

Batteries are following special disposal rules. Your provider has all information available to safely exchange and dispose the defect batteries.

## 8.2 Disconnecting Rear Frame Assembly

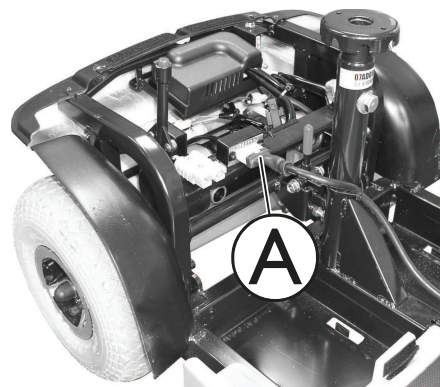


### WARNING!

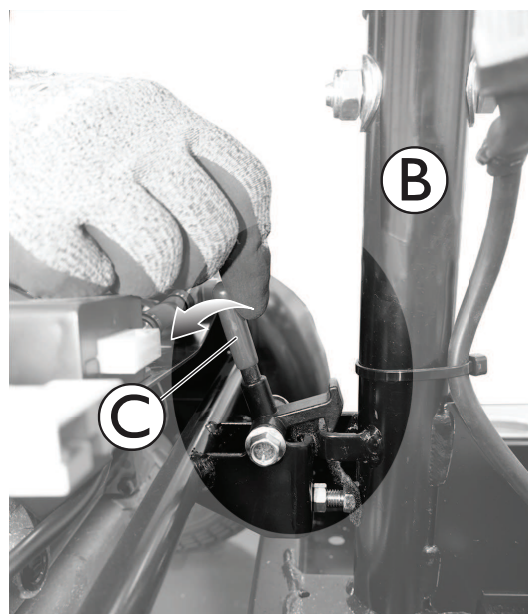
#### Risk of injury or damage

- After any adjustments, repair or service and before use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.
- Before performing any maintenance, adjustment or service, turn power off and remove key from ignition.
- Do not lift the scooter by the rear shroud - otherwise damage to the scooter may occur.

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Remove batteries, see *8.1.2 Replacing the Batteries, page 20*.
4. Disconnect the main wiring harness connector (A).



5. Hold the seat post (B) with one hand.



6. With the other hand, push the release lever (C) to the rear of the scooter.
7. Disconnect the rear frame assembly from the front frame assembly.
8. Install parts in reverse order.
9. Test all functions.



## 8.3 Controls

### 8.3.1 Replacing Power Module


**CAUTION!**
**Risk of accident**

When parking the scooter on antitippers, it is no longer slowed by the motor brake. The scooter can roll away out of control.

- Place scooter's rear frame on a jacking device before you remove wheels.


**CAUTION!**
**Risk of burning if power cable is shorted**

- Turn off the power completely before removing any power supply components of scooter. Therefore take out batteries.
- Avoid a bridging of the contacts during measurements on live electrical components.


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

- Changes to drive program may only be carried out by trained Invacare providers.
- Invacare can only give a warranty for safe scooter driving behavior - especially tipping stability - for unaltered standard drive programs.


**CAUTION!**
**Risk of injury or damage if the scooter is accidentally set into motion during repairs**

Unintended movement or rolling away of the scooter can lead to accidents or damage of the property.

- Secure scooter against unintended movement and rolling away.



The controls system is supplied with a standard drive program. If you have carried out customer-specific modifications to the drive program, you will have to make these changes again after installing the new power module.

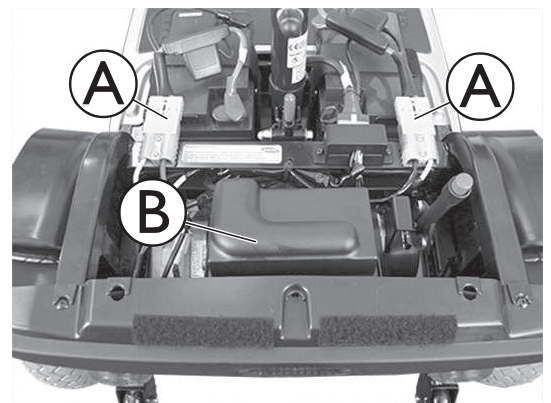


When removing, note position of small parts such as screws and washers. Put small parts down so that they can be installed in correct sequence.



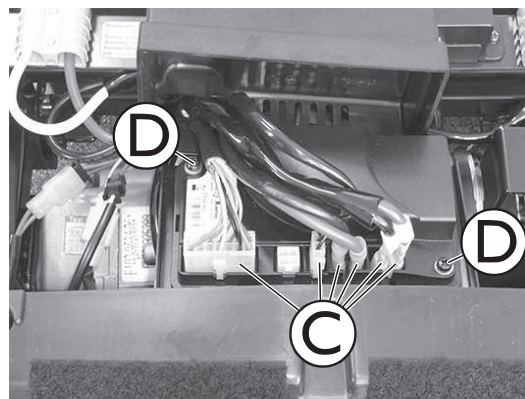
- Phillips screwdriver
- Jacking device
- To adapt drive program: programming software or hand programming device and controls system installation manual, available from Invacare.

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Remove battery plugs Ⓐ.
4. Remove cable cover Ⓑ from power module.





5. Remove all plugs © from power module.
6. Remove screws ④ on both sides of power module.
7. Replace power module.
8. Load drive program onto power module. See controls software description.
  -  Please check the [Dynamic Controls website](#) for updates of the controls software, to make sure you have the latest version available.
9. Install parts in reverse order.
10. Test all functions.



### 8.3.2 Replacing Operating Console / Circuit Board



#### CAUTION!

##### Risk of burning if power cable is shorted

- Turn off the power completely before removing any power supply components of the scooter. Therefore take out batteries.
- Avoid a bridging of the contacts during measurements on live electrical components.

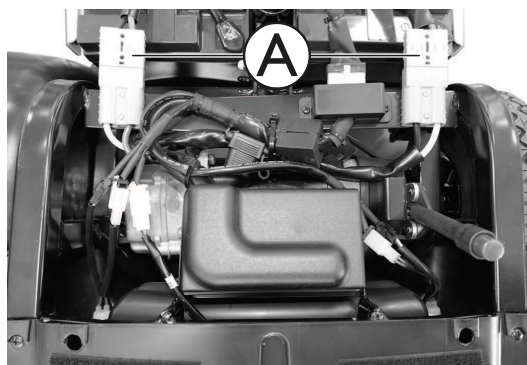


When removing, note the position of small parts such as screws and washers. Put small parts down so that they can be installed in the right sequence.



- Phillips screwdriver

1. Remove seat, see 5.1 *Removing the Seat*, page 11.
2. Remove rear shroud, see 6.3 *Replacing Rear Shroud*, page 15.
3. Disconnect battery cable ①.



4. Remove plugs from rear mirror fixing ② or rear mirror depending on fittings.

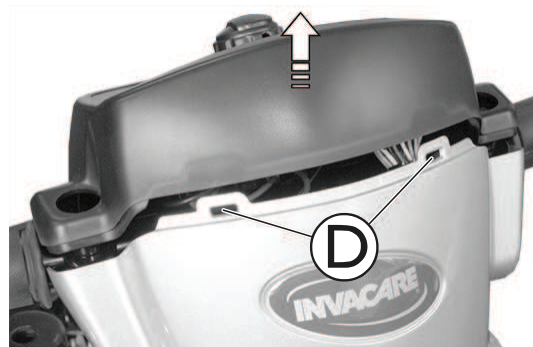




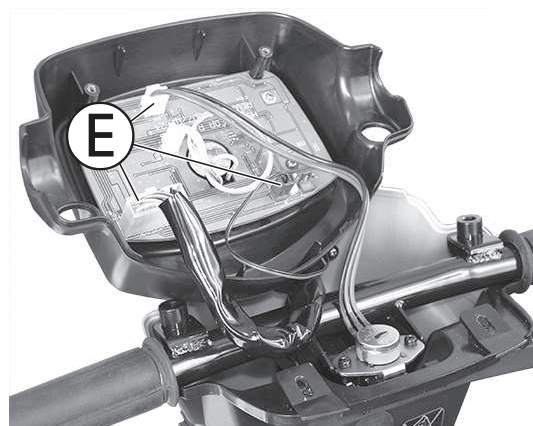
5. Remove screws © below operating console.



6. Pull operating console upwards out of front fixing ④.



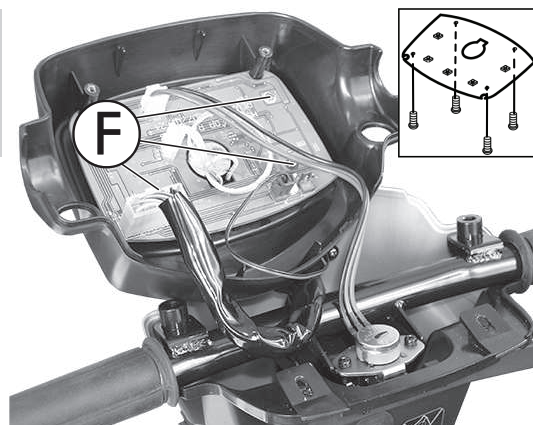
7. Remove all plugs ⑤ from operating console.



8. Remove screws ⑥ to disconnect circuit board from operating console.

**! NOTICE!**  
**Risk of damaging circuit board by electrostatic discharge**  
 — Handle circuit boards only in (EPA) Electrostatic Protected Areas.

9. Replace operating console (see Step a.) or replace circuit board (see Step b.).
  - a. Use screws ⑥ to connect new operating console with circuit board.
  - b. Use screws ⑥ to connect new circuit board with operating console.



10. Connect all plugs ⑤ with circuit board.
11. Install parts in reverse order.
12. Test all functions.

### 8.3.3 Replacing Potentiometer

**! CAUTION!**  
**Risk of burning if power cable is shorted**  
 — Turn off the power completely before removing any power supply components of scooter. Therefore take out batteries.  
 — Avoid a bridging of the contacts during measurements on live electrical components.

**CAUTION!**

**Risk of damage to operating console by instant high current/voltage**

- Unplug battery cable before removing/installing operating console.
- Make sure all pins are correctly connected.

**CAUTION!**

**Risk of accidents**

Wrong potentiometer setting can result in dangerous driving situations.

- Connect potentiometer to drive lever mounting.

**NOTICE!**

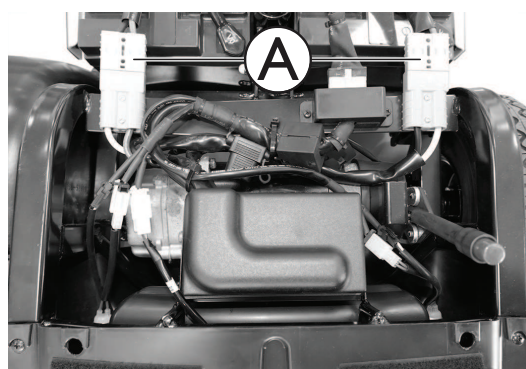
**Risk of damaging circuit board by electrostatic discharge**

- Handle circuit boards only in (EPA) Electrostatic Protected Areas.



- Phillips screwdriver
- 2 mm Allen key – open-ended wrench

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Remove battery cable ①.



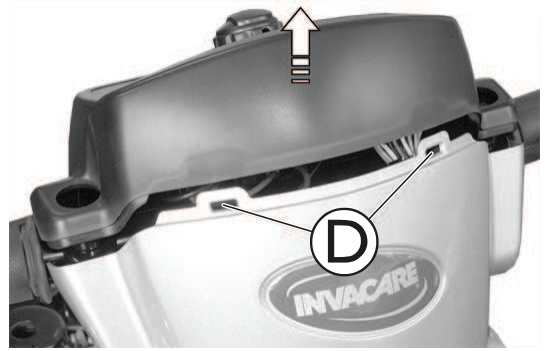
4. Remove plugs from rear mirror fixing ② or rear mirror, depending on fittings.



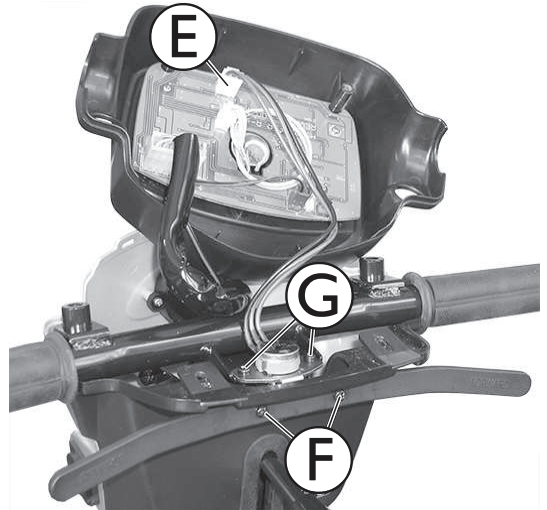
5. Remove screws ③ below operating console.



6. Pull operating console upwards out of front fixing ①.



7. Disconnect potentiometer plug ⑤ from operating console.
8. Remove screws ⑥ on drive lever to remove drive lever.
9. Remove screws ③ on potentiometer.
10. Replace potentiometer.
11. Install parts in reverse order.
12. Test all functions.



### 8.3.4 Checking Cables

1. Switch controls OFF on the operating control.
2. Check all cables for visible damage, crushing points or abrasion points.
3. Replace damaged cables.
4. Pull on each plug carefully. The plug must not come out of its socket when pulled on lightly.
5. If a plug is loose, apply slight pressure to push the plug into the socket. The plug must snap in place securely.
6. Check that the plug is firmly attached to its socket.
7. Remove batteries, see *8.1.2 Replacing the Batteries, page 20*.
8. Check battery cables for visible damage, crushing points or abrasion points.
9. Replace damaged cables.
10. Assemble all parts again in reverse order.
11. Test all functions of the scooter.

## 8.4 Replacing Drive Motor



### CAUTION!

#### Risk of accident

When parking the scooter on antitippers, it is no longer slowed by the motor brake. The scooter can roll away out of control.

- Place scooter's rear frame on a jacking device before you remove wheels.



### CAUTION!

#### Risk of injury or damage if the scooter is accidentally set into motion during repairs

Unintended movement or rolling away of the scooter can lead to accidents or damage of the property.

- Secure scooter against unintended movement and rolling away.



When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.



The plugs on the power module cannot be wrongly connected because all plugs have a different size and only fit in one socket.

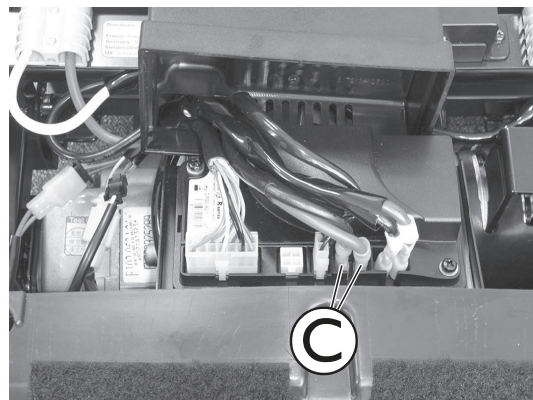
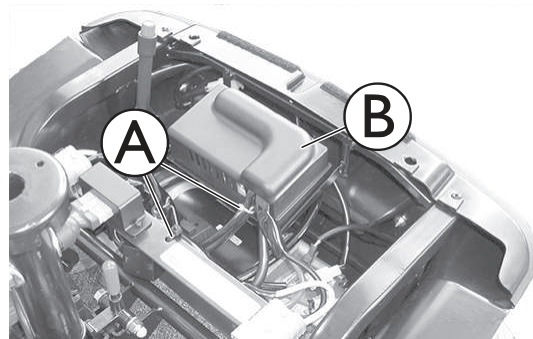




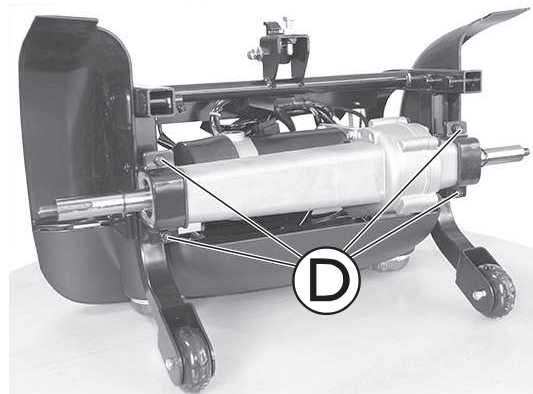
- 10 mm open spanner
- 17 mm open spanner
- Oblique pliers
- Rubber hammer

- Phillips screwdriver
- Jacking device
- 17 mm self-locking nut

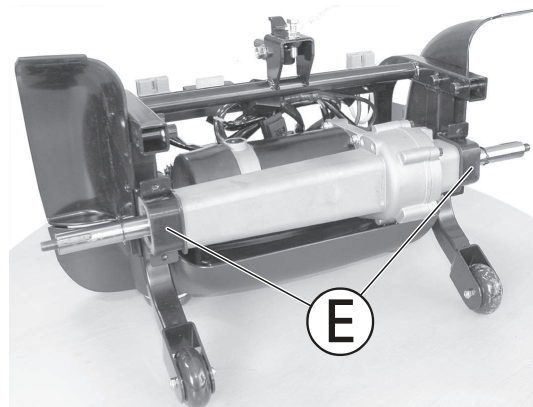
1. Secure scooter against rolling away.
2. Place jacking device under the frames at battery holder height.
3. Remove seat, see *5.1 Removing the Seat, page 11*.
4. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
5. Remove batteries, see *8.1.2 Replacing the Batteries, page 20*.
6. Disconnect rear frame assembly from front frame assembly, see *8.2 Disconnecting Rear Frame Assembly, page 22*.
7. Remove cable ties **A**.
8. Remove cable cover **B** from power module.
9. Remove motor cable plug **C** from power module.
10. Remove motor cable.
11. Fold drive to the rear onto enclosure and antitipper.
12. Remove wheels, see *8.5.2 Replacing the Rear Wheels, page 30*.



13. Remove motor fixing bolts **D**.



14. Check rubber bearing **E** on motor suspension. Replace damaged rubber bearings.
15. Remove motor downwards out of the frame.
16. Install parts in reverse order.
17. Secure motor cable with cable tie.
18. Test all functions.



## 8.5 Wheels

### 8.5.1 Replacing Front Wheels


**CAUTION!**
**Risk of accident**

When parking the scooter on antitippers, it is no longer slowed by the motor brake. The scooter can roll away out of control.

- Place scooter's rear frame on a jacking device before you remove wheels.


**CAUTION!**
**Risk of injury or damage if the scooter is accidentally set into motion during repairs**

Unintended movement or rolling away of the scooter can lead to accidents or damage of the property.

- Secure scooter against unintended movement and rolling away.



When removing, note position of small parts such as screws and washers. Put small parts down so that they can be installed in right sequence.



- 17 mm wrench
- Rubber hammer
- Flat screwdriver
- 17 mm self-locking nut
- Jacking device

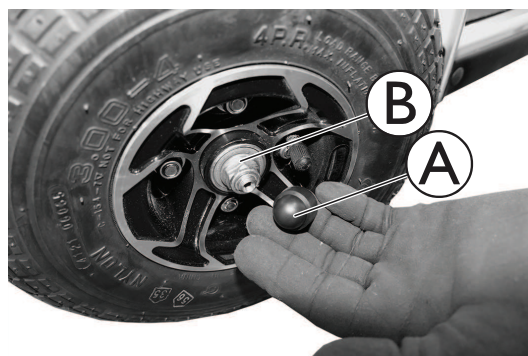
#### 4-Wheel Version

1. Turn power off.
2. Jack up the front of the scooter so that the front wheels are off the ground.
3. Remove cap **A** and nut **B**.
4. Remove wheel.



If necessary, loosen wheel by tapping it lightly with a rubber hammer.

5. Install parts in reverse order, use a new self-locking nut.
6. Test all functions.

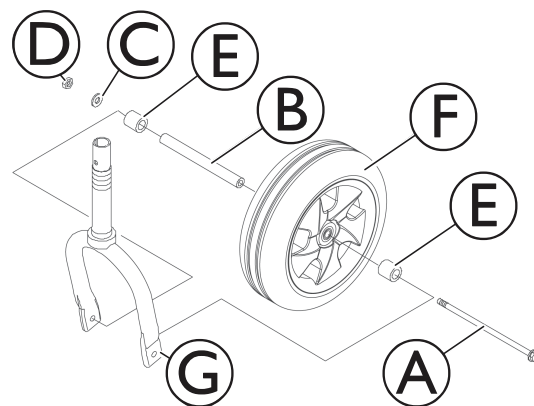


#### 3-Wheel Version



- 12 mm spanner
- 13 mm spanner
- 13 mm safety nut
- Jacking device

1. Turn power off.
2. Jack up the front of the scooter so that the front wheel is off the ground.
3. Remove the bolt **A**, axle **B**, washer **C**, nut **D** and two spacers **E** that secure the wheel **F** to the fork **G**.
4. Remove the wheel from the fork.
5. Install parts in reverse order.
6. Test all functions.





## 8.5.2 Replacing the Rear Wheels



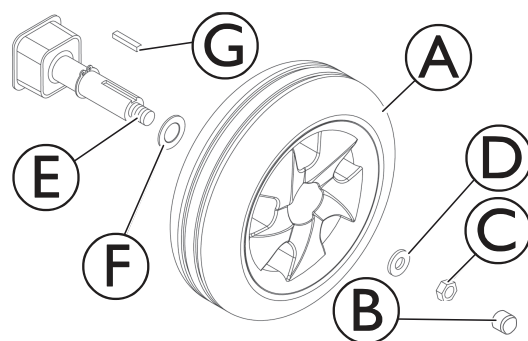
Take note of position and orientation of wheel and mounting hardware before removing.



- 17 mm spanner
- Rubber hammer
- Screwdriver
- 17 mm safety nut
- Jacking device

### Removing the Rear Wheels

1. Turn power off.
2. Remove seat, see *5.1 Removing the Seat, page 11*.
3. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
4. Disconnect rear frame assembly, see *8.2 Disconnecting Rear Frame Assembly, page 22*.
5. Jack up the rear frame assembly (not shown) so that the rear wheels **A** are off the ground.
6. Remove the cap **B**, locknut **C** and small washer **D** from the threaded end of the drive shaft **E**.
7. Remove the existing drive wheel assembly from the drive shaft.
  - If necessary, loosen wheel by tapping it lightly with a rubber hammer.
8. Remove the large washer **F** from the drive shaft.
9. Remove keystick **G** from drive shaft. Set aside.
10. If necessary, repeat STEPS 5 - 8 to remove other rear wheel.



### Installing the Rear Wheels

1. Place keystick **G** in cutout on drive shaft **E** as shown in the illustration above.
  - The keystick in the drive shaft **MUST** lineup with the cutout in the wheel hub.
  - If necessary, use a rubber hammer to gently tap drive wheel completely into position on the drive shaft.
2. Install the large washer **F** onto the drive shaft.
3. Install the drive wheel **A** onto the drive shaft.
4. Secure wheel to drive shaft by installing the small washer **D** and locknut **C** onto the threaded end of the drive shaft. Securely tighten.
5. Install the cap **B**.
6. Repeat STEPS 1-5 to install the other rear wheel.

## 8.5.3 Replacing Front Swing Arm Assembly (4-Wheel Version)



### WARNING!

#### Risk of accidents

Accidents may result from standing the chassis upright on its end.  
— Secure chassis against falling over.



### NOTICE!

The plastic cover can be damaged if you attempt to lift the scooter by its shroud.  
— Only lift scooter by chassis.

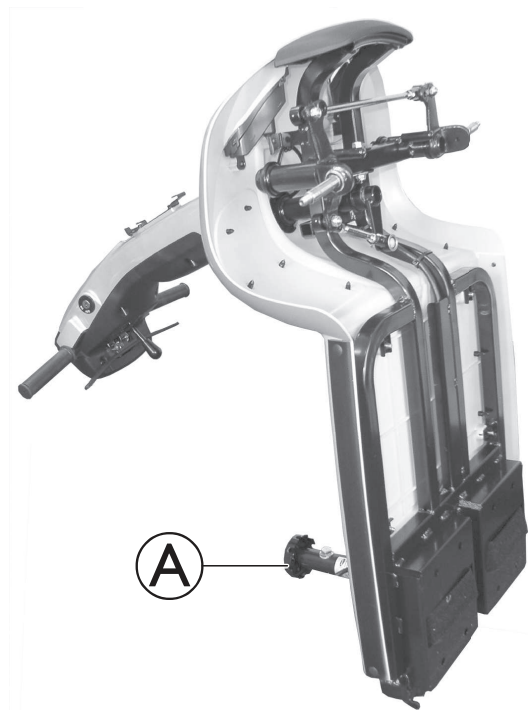


Pay attention to the positions of small parts such as screws and washers during disassembly. Put small parts aside in such a way that they can be re-fitted in the correct order.

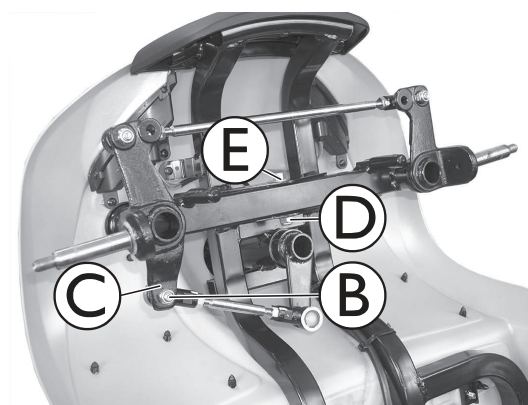


- 17 mm wrench
- 19 mm wrench

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Remove batteries, see *8.1.2 Replacing the Batteries, page 20*.
4. Disconnect rear frame assembly, see *8.2 Disconnecting Rear Frame Assembly, page 22*.
5. Place chassis upright on its seat adapter **A**.
6. Secure chassis against falling over.
7. Remove front wheels, see *8.5.1 Replacing Front Wheels, page 29*.



8. Remove nut **B** on the steering rod.
9. Remove steering rod from the right front axle **C**.
10. Remove nut **D** and bolt **E** of the swing arm.
11. Remove swing arm assembly.
12. Install parts in reverse order.
13. Test all functions.

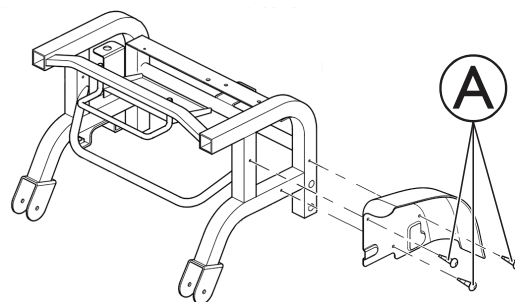


### 8.5.4 Replacing Fender



- Phillips screwdriver

1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Disconnect battery cables.
4. Disconnect rear frame assembly, see *8.2 Disconnecting Rear Frame Assembly, page 22*.
5. Remove rear wheels, see *8.5.2 Replacing the Rear Wheels, page 30*.
6. Remove screws **A** on both sides of frame.
7. Replace fender.
8. Install parts in reverse order.
9. Test all functions.



### 8.5.5 Repairing Tyre Punctures (Pneumatic Tyres of Type 10")



- Inner tube repair set **or** a new inner tube
- Talcum powder
- 13 mm socket spanner
- 13 mm open-ended spanner

1. Remove valve cap.
2. De-inflate the tyre by pressing in the center valve pin.
3. Loosen the four bolts **A** with the socket spanner and remove them.
4. Remove both wheel rim halves out of the tyre and remove the inner tube.
5. Repair the inner tube and refit in the wheel, or replace it with a new inner tube.
 

 If the old inner tube has been repaired and is to be used again, and became wet during repair, it is easier to replace it if it is lightly dusted with talcum powder beforehand.
6. Refit the wheel rim parts from outside into the tyre.
7. Pump up the tyre lightly.
8. Reinsert the nuts and bolts which hold the wheel rim together and tighten fully.
9. Make sure that the tyre is properly located on the wheel rim.
10. Inflate the tyre up to the recommended tyre pressure.
11. Check to make sure that the tyre is still located properly on the wheel rim.
12. Screw the valve cap back on.
13. Locate the wheel on the drive shaft again.
14. Reassemble the wheel.



## 8.6 Steering

### 8.6.1 Replacing Steering Column


**WARNING!**
**Risk of accidents**

Accidents may result from standing the chassis upright on its end.  
— Secure chassis against falling over.


**NOTICE!**

The plastic cover can be damaged if you attempt to lift the scooter by its shroud.  
— Only lift scooter by chassis.

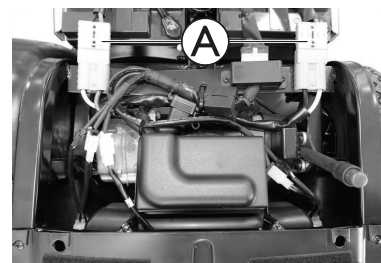


Pay attention to the positions of small parts such as screws and washers during installation. Put small parts aside in such a way that they can be installed in correct order.



- 12 mm wrench
- 13 mm wrench
- Phillips screwdriver

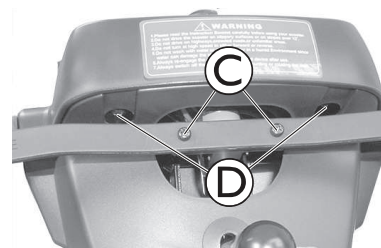
1. Remove seat, see *5.1 Removing the Seat, page 11*.
2. Remove rear shroud, see *6.3 Replacing Rear Shroud, page 15*.
3. Disconnect battery cable Ⓐ.



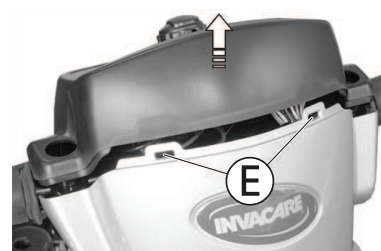
4. Remove plastic plugs Ⓑ or rear view mirrors, if fitted, from threaded holes.



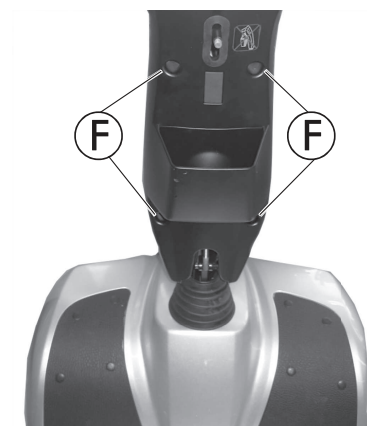
5. Remove screws Ⓒ to remove drive lever.
6. Remove screws Ⓓ below operating console.



7. Pull control console up out of front fixation Ⓔ.



8. Remove screws ⑥ from rear cover of steering column.



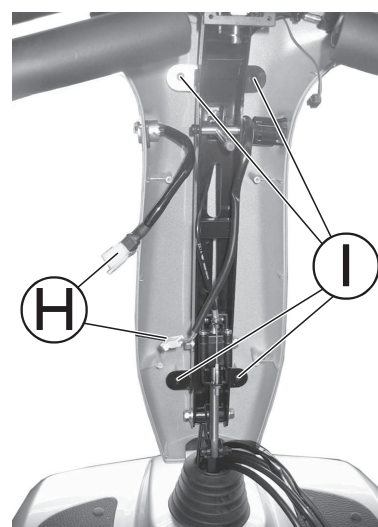
9. Remove screws ⑦ of front basket holder.



10. Disconnect cables ⑧ from cable loom.

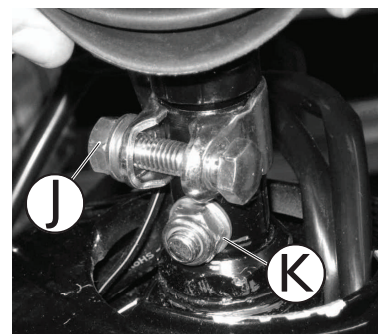
11. Remove screws ① to remove front cover of steering column.

12. Slide rubber sleeve upwards.



13. Remove fixation screw ① of steering column.

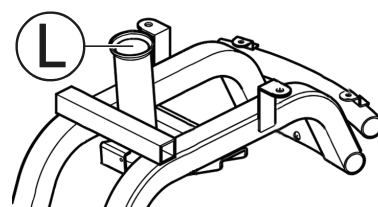
14. Loosen screw ⑫.



15. Pull steering column out of steering head holder ⑬ on the chassis.

16. Install parts in reverse order.

17. Test all functions.



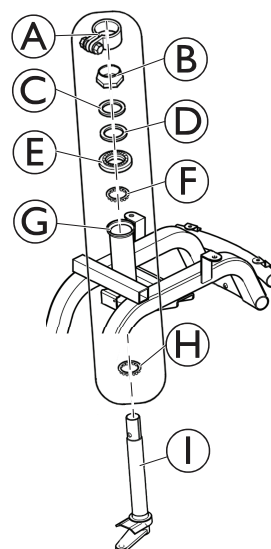


## 8.6.2 Replacing Steering Head (4-Wheel Version)



- 13 mm wrench
- 32 mm wrench

1. Remove seat, see 5.1 *Removing the Seat*, page 11.
2. Remove rear shroud, see 6.3 *Replacing Rear Shroud*, page 15.
3. Remove batteries, see 8.1.2 *Replacing the Batteries*, page 20.
4. Disconnect rear frame assembly, see 8.2 *Disconnecting Rear Frame Assembly*, page 22.
5. Remove steering column, see 8.6.1 *Replacing Steering Column*, page 33.
6. Remove steering rod from the right front axle, see Step 8 in 8.5.3 *Replacing Front Swing Arm Assembly (4-Wheel Version)*, page 30.
7. Remove clamp ①.
8. Loosen fork bolt ②.
9. Remove retaining ring ③.
10. Remove serrated washer ④.
11. Remove knurled screw ⑤.
12. Remove ball bearing ⑥.
13. Pull steering head ① out of steering head holder ⑦.
14. Remove ball bearing ⑧.
15. Install parts in reverse order.
16. Test all functions.



### 8.6.3 Replacing the Fork (3-Wheel Version)



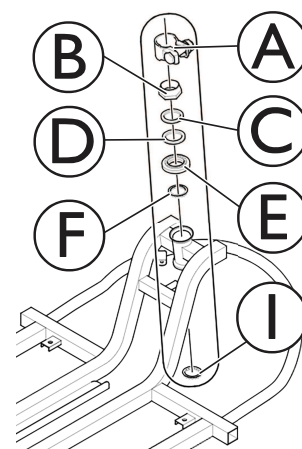
Take note of position and orientation of wheel and mounting hardware before removing.



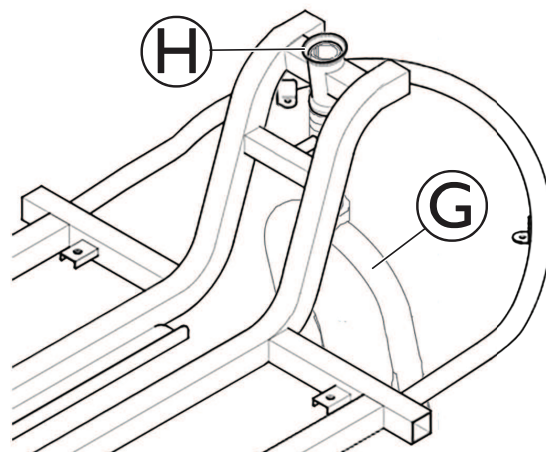
- 13 mm wrench
- 32 mm wrench

1. Remove seat, see 5.1 *Removing the Seat*, page 11.
2. Remove rear shroud, see 6.3 *Replacing Rear Shroud*, page 15.
3. Remove batteries, see 8.1.2 *Replacing the Batteries*, page 20.
4. Disconnect rear frame assembly, see 8.2 *Disconnecting Rear Frame Assembly*, page 22.
5. Remove steering column, see 8.6.1 *Replacing Steering Column*, page 33.
6. Remove front wheel, see 8.5.1 *Replacing Front Wheels*, page 29.

7. Remove clamp ①.
8. Loosen fork bolt ②.
9. Remove retaining ring ③.
10. Remove serrated washer ④.
11. Remove knurled screw ⑤.
12. Remove ball bearing ⑥.



13. Pull fork ⑦ out of steering head holder ⑧. This can require a lot of strength.
14. Remove ball bearing ①.
15. Install parts in reverse order.
16. Test all functions.



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