LiNX® Control System
REM110, REM210, REM211, REM216, Supplement to power wheelchair user manual

Remote User Manual

This manual MUST be given to the user of the product. BEFORE using this product, read this manual and save for future reference.
Contents

1 General ................................................................. 5
  1.1 About This Manual ............................................. 5
  1.2 Symbols .......................................................... 5
  1.3 Prescription Statement ......................................... 5
  1.4 Intended Use ..................................................... 5
    1.4.1 Intended Use — REM110 .................................. 6
    1.4.2 Intended Use — REM210, REM211, REM216 .............. 6
  1.5 Indication for Use ................................................ 6
  1.6 Service Life ....................................................... 6

2 Safety ................................................................. 7
  2.1 General Guidelines .............................................. 7
    2.1.1 Live Edit Guidelines ....................................... 10
    2.1.2 Usage Guidelines ........................................... 11
    2.1.3 Setup and Service Guidelines .............................. 12

3 Electromagnetic Compatibility (EMC) Information ................. 14
  3.1 Electromagnetic Compatibility ................................ 14
    3.1.1 Minimizing Emissions .................................... 14

4 Components .......................................................... 15
  4.1 Overview ........................................................ 15
  4.2 User interface REM110 ......................................... 16
  4.3 User interface REM210 and REM211 .......................... 16
  4.4 User interface REM216 ......................................... 17
  4.5 The status indicator ............................................ 18
  4.6 Battery gauge .................................................... 18
  4.7 Labels on the product ......................................... 19

5 Usage ................................................................. 21
  5.1 Operating the remote ........................................... 21
    5.1.1 Using the joystick ........................................ 21
    5.1.2 Controlling the maximum speed .......................... 22
  5.2 Emergency stop ................................................ 22
  5.3 The horn ......................................................... 23
  5.4 Locking/unlocking the remote .................................. 23
  5.5 The sleep mode ................................................ 24
  5.6 Operating powered seating functions ......................... 24
    5.6.1 Through external switches ................................ 24
    5.6.2 Through the joystick ...................................... 28
    5.6.3 Speed reduction and seating function inhibits ............ 29
  5.7 Activating the drive function ................................ 30
  5.8 Operating the lights ........................................... 30
  5.9 Operating the hazard lights ................................... 31
  5.10 Operating the direction indicators .......................... 31
  5.11 Connecting the remote ....................................... 32
  5.12 Charging the batteries ....................................... 32
    5.12.1 Battery alarms .......................................... 34
  5.13 Using the USB charger ....................................... 34

6 Maintenance .......................................................... 36
  6.1 Maintenance Information ...................................... 36
  6.2 Setup/Delivery Inspection ..................................... 36
  6.3 Wear and Tear Information .................................... 36
  6.4 User/Attendant Inspection Checklists ........................ 37
    6.4.1 Inspect/Adjust Weekly ................................... 37
    6.4.2 Inspect/Adjust Monthly ................................... 37
    6.4.3 Inspect/Adjust Periodically ............................... 37
  6.5 Service Inspection .............................................. 37
    6.5.1 Six Month Inspection ..................................... 38
  6.6 Cleaning ........................................................ 38

7 Troubleshooting ...................................................... 40
  7.1 Fault diagnosis ................................................ 40
    7.1.1 Fault codes and diagnosis codes ......................... 40
  7.2 OON (“Out Of Neutral”) ....................................... 41
  7.3 Drive inhibit indication ....................................... 42
  7.4 Cut-off voltage ................................................ 43

8 Technical data ........................................................ 44
  8.1 Technical specifications ....................................... 44

9 Wireless Technology .................................................. 46
  9.1 Wireless Technology Overview ................................ 46
1 General

1.1 About This Manual

This document is a supplement to the mobility device’s documentation.

For more information about the product, for example product safety notices and product recalls, contact your local Invacare representative. Before reading this manual, make sure you have the latest version. You will find the latest version on the Invacare website. For the address and website see the back page of this manual.

1.2 Symbols

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

- **DANGER!**
  - Danger indicates a imminently hazardous situation which, if not avoided, will result in death or serious injury.

- **WARNING!**
  - Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

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

- **CAUTION!**
  - Caution indicates a potentially hazardous situation which, if not avoided, may result in property damage or minor injury or both.

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

- **This symbol identifies a list of various tools, components and items which you will need in order to carry out certain work.**

1.3 Prescription Statement

Per 21 CFR 801.109(b)(1) the device is labeled for prescription use only.

- **CAUTION!**
  - Federal Law (USA) restricts this device to sale by or on the order of a licensed physician.

1.4 Intended Use

- Refer to the user manual for the power wheelchair base and for the seating system for the intended use of the mobility device.
1.4.1 Intended Use — REM110

The REM110 is a variant of the LiNX remote module family, intended to allow powered wheelchair users to interact with the LiNX System. The REM110 allows control of drive functions, as well as providing an input for battery charging and a Bluetooth® interface for programming and diagnostics.

1.4.2 Intended Use — REM210, REM211, REM216

The LiNX REM210, REM211, and REM216 are remote modules of the LiNX family, intended to allow powered wheelchair users to interact with the LiNX System.

The REM210 and REM211 remote modules allow control of drive and actuator functions. The REM216 remote modules allow control of drive, actuator and lighting functions.

All the above remote modules provide an input for battery charging. The REM211 and REM216 remote modules allow the use of more than two actuators.

1.5 Indication for Use

Refer to the user manual for the base and for the seat for the indication for use for the mobility device.

1.6 Service Life

The expected service life is five years, presuming that the product is used daily and in accordance with safety instructions, maintenance instructions and intended use, stated in this manual.
2 Safety

2.1 General Guidelines

The safety section contains important information for
the safe operation and use of this product.

Refer to the wheelchair base and seating system
user manuals for additional safety and operation
information.

⚠️ WARNING! Risk of Death, Injury or Damage
Improper use of this product may cause injury
or damage
  - If you are unable to understand the warnings,
  cautions or instructions, contact a health care
  professional or provider before attempting to
  use this equipment.
  - DO NOT use this product or any available
  optional equipment without first completely
  reading and understanding these instructions
  and any additional instructional material such
  as user manual, service manuals or instruction
  sheets supplied with this product or optional
  equipment.

⚠️ WARNING! Risk of Injury, Damage or Death
Improper setup, service, adjustment or
programming may cause injury, damage or death.
  - Qualified technician MUST setup, service and
  program the wheelchair.
  - DO NOT allow non-qualified individuals to
  perform any work or adjustments on the
  wheelchair.
  - DO NOT setup or service the wheelchair while
  occupied except for programming or unless
  otherwise noted.
  - Turn off power BEFORE adjusting or servicing
  the wheelchair. Note that some safety features
  will be disabled.
  - Ensure all hardware is securely tightened after
  setup, service or adjustments.
  - Warranty is void if non-qualified individuals
    perform any work on this product.
**DANGER!**
Risk of Death, Serious Injury, or Damage
Continued use of the wheelchair that is not set to the correct specifications may cause erratic behavior of the wheelchair resulting in death, serious injury, or damage.
- Performance adjustments should only be made by professionals of the healthcare field or persons fully conversant with this process and the driver’s capabilities.
- After the wheelchair has been set up/adjusted, check to make sure that the wheelchair performs to the specifications entered during the set up procedure. If the wheelchair does not perform to specifications, turn the wheelchair Off immediately and reenter set up specifications. Contact Invacare, if wheelchair still does not perform to correct specifications.

**WARNING!**
Risk of Injury or Damage
Failure to remove the LiNX Access Key (LAK) from the wheelchair after programming is complete may lead to unauthorized access to the wheelchair settings.
- Always remove the LAK from the wheelchair when programming is complete.

**WARNING!**
Risk of Serious Injury or Damage
Use of unapproved accessories may result in serious injury or damage.
- Invacare products are specifically designed and manufactured for use in conjunction with approved Invacare accessories. Unapproved accessories have not been tested by Invacare and are not recommended for use with Invacare products.
- DO NOT use unapproved accessories.
- To obtain approved Invacare accessories, contact Invacare by phone or at www.invacare.com.

**WARNING!**
Risk of Serious Injury or Damage
Loss of power due to loose electrical connections could cause the wheelchair to suddenly stop resulting in serious injury or damage.
- ALWAYS ensure that all electrical connections are tightly connected so they don’t vibrate loose.
**WARNING!**
Risk of Injury or Damage
Connector pins on cables connected to the power module can still be live even when the system is off. Human contact or other materials may cause an electrical short. To prevent injury or damage due to electrical shorts:
- Cables with live pins should be connected, restrained or covered (with non-conductive materials) so they are not exposed to human contact or materials that could cause electrical shorts.
- When cables with live pins have to be disconnected, (for example, when removing the bus cable from the remote for safety reasons) make sure to restrain or cover the pins (with non-conductive materials).

**DANGER!**
Risk of Death, Serious Injury, or Damage
Corroded electrical components due to water, liquid exposure, or incontinent users can result in death, serious injury, or damage.
- Minimize exposure of electrical components to water and/or liquids. Electrical components damaged by corrosion MUST be replaced immediately.
- Wheelchairs that are used by incontinent users and/or are frequently exposed to water/liquids may require replacement of electrical components more frequently.

**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.
Wheelchair 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 wheelchair.
- DO NOT smoke while using this wheelchair.

**WARNING!**
Risk of Injury, Damage or Death
Improper routing of cable(s) may cause a tripping, entanglement or strangulation hazard that may result in injury, damage or death.
- Ensure all cable(s) are routed and secured properly.
- Ensure there are no loops of excess cable extending away from the chair.
- Close supervision and attention is needed when operating the wheelchair near children, pets or people with physical/mental disabilities.
WARNING!
Risk of Injury, Damage or Death
Pinched or severed cable(s) may be a shock or fire hazard and may cause injury, damage or death.
– Ensure all cable(s) are routed and secured properly.
– Inspect cable(s) periodically for proper routing, pinching, chafing or other similar wear.
– Replace any damaged cables immediately.

Risk of damage to the mobility device
There are no user-serviceable parts inside any case.
– Do not open or disassemble any case.

As a manufacturer of wheelchairs, Invacare endeavors to supply a wide variety of wheelchairs to meet many needs of the end user. However, final selection of the type of wheelchair to be used by an individual rests solely with the user and his/her healthcare professional capable of making such a selection. Invacare recommends working with a qualified rehab technology provider, such as an ATP, (Assistive Technology Professional).

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

2.1.1 Live Edit Guidelines

WARNING!
Risk of Injury or Damage
Rapid and unfamiliar parameter changes may lead to injury or damage.
– Qualified technicians should make the user aware that in live edit mode, the performance of the wheelchair will be changed instantly.
– After programming in live edit mode, the wheelchair performance should be checked for driving safety. Ensure the wheelchair performance is appropriate to the capabilities and needs of the user.
– Users should use caution when driving the wheelchair while operating in Live Edit mode.
– Users should use care to stay in the programming range.
– Always perform live edit changes in a safe environment.

Live edit adjustments are best done in an unrestricted but safe area. The presence of an attendant is recommended.

The Bluetooth® range of the programmer is 33 ft (10 m). If the wheelchair drives out of range of the Bluetooth programmer, the programmer must reconnect before the parameters can be changed.
2.1.2 Usage Guidelines

**DANGER!**
**Risk of Death, Serious Injury, or Damage**
Misuse of the wheelchair may cause component failure and/or the wheelchair to start smoking, sparking, or burning. Death, serious injury, or damage may occur due to fire.
- DO NOT use the wheelchair other than its intended purpose. If the wheelchair starts smoking, sparking, or burning, discontinue using the wheelchair and seek service IMMEDIATELY.

**WARNING!**
**Risk of Injury, Damage or Death**
Misuse of wheelchair may result in injury, damage or death.
- Use care when operating the wheelchair on roads, streets or other roadways.
- Use care when operating the wheelchair when vision is impaired by poor lighting such as unlit rooms, during the night or similar situations.
- ALWAYS be aware of motor vehicles and your surroundings.

**WARNING!**
**Risk of Injury, Damage or Death**
Use of the wheelchair while judgement or ability is impaired may result in injury, damage or death.
- DO NOT operate the wheelchair under the influence of alcohol, medications or other substances that impair judgement or function.
- Changing medications may affect your ability to operate the wheelchair. Discuss the impact on your ability to operate the wheelchair with a health care professional when changing medications.
- DO NOT operate the wheelchair under conditions where judgement or function may be impaired. This may include but is not limited to lack of sleep or poor sight.
- Always be aware of your surroundings.

**WARNING!**
**Risk of Injury, Damage or Death**
Loss of traction or stability on rough or unstable terrain may cause injury, damage or death.
- Use care when operating the wheelchair on rough or unstable terrain. This would include but is not limited to areas of rock, mulch, mud, uneven pavement, roots and similar conditions.
- Be aware of your surroundings and conditions that might affect the ability to operate the wheelchair.
**WARNING!**
**Risk of Serious Injury**
Impacting objects in the surrounding environment can cause serious injury.
– When maneuvering the wheelchair around, ALWAYS have assured cleared distance with all objects in environment.

**CAUTION!**
**Risk of Injury**
Remote module can get hot when exposed to strong sunlight for long periods.
– Do not leave mobility device in direct sunlight for long periods.

**DANGER!**
**Risk of Death, Serious Injury, or Damage**
Malfunctioning joystick could cause unintended/erratic movement resulting in death, serious injury, or damage.
– If unintended/erratic movement occurs, stop using the wheelchair immediately and contact a qualified technician.

**2.1.3 Setup and Service Guidelines**

**DANGER!**
**Risk of Death, Serious Injury, or Damage**
Use of incorrect or improper replacement (service) parts may cause death, serious injury, or damage.
– Replacement parts MUST match original Invacare parts.
– ALWAYS provide the wheelchair serial number to assist in ordering the correct replacement parts.

**WARNING!**
**Risk of Serious Injury**
Sharp edges can cause serious injury.
– Be mindful that some parts may have sharp edges. Use caution when encountering these sharp edges.

**WARNING!**
**Risk of Serious Injury**
Hot surfaces can cause severe burns.
– Be mindful of potential hot surfaces and avoid touching.
WARNING!  
Risk of Death, Serious Injury, or Damage  
Improperly connected joystick could cause loss of power resulting in death, serious injury, or damage.  
– Ensure the joystick is securely connected to controller.
3 Electromagnetic Compatibility (EMC) Information

3.1 Electromagnetic Compatibility

Refer to the power wheelchair base and seating system user manuals for more electromagnetic compatibility information for your mobility device.

Dynamic Controls Electronic Controllers have been tested on typical, representative vehicles to confirm compliance with the following appropriate EMC standards:

- USA: ANSI/RESNA WC-2:2009 Sec 21

National and international directives require confirmation of compliance on particular vehicles. Since EMC is dependent on a particular installation, each variation must be tested. The guidelines in this section are written to assist with meeting EMC requirements in general.

3.1.1 Minimizing Emissions

To minimise emissions and to maximise the immunity to radiated fields and ESD, follow the wiring recommendations in the LiNX System Service Manual.
4 Components

4.1 Overview

Non-Expandable Remotes

REM110
- Drive function

REM210
- Drive function
- Seating function (up to two actuators)

Expandable Remotes

REM211
- Drive function
- Seating function (two or more actuators)

REM216
- Drive function
- Seating function (two or more actuators)
- Lights/Hazard lights
4.2 User interface REM110

Fig. 4-1

A  ON/OFF button/Status indicator
B  Battery gauge
C  Speed dial
D  Horn
E  Joystick

4.3 User interface REM210 and REM211

The REM210 and REM211 remotes have the same user interface. The REM211 remote has a ring around the base of the joystick.

A  ON/OFF button/Status indicator
B  Battery gauge
C  Speed dial
Components

4.4 User interface REM216

- Connectivity indicator
- Seating function selector
- Drive/actuator status
- Horn
- Joystick
- Drive function indicator
- Drive function selector

- ON/OFF button/Status indicator
- Battery gauge
- Speed dial
- Connectivity indicator

The REM216 remote has a ring around the base of the joystick.
LiNX® Control System

- Seating function selector
- Drive/actuator status
- Lights and direction indicator right
- Horn
- Joystick
- Hazard lights and direction indicator left
- Drive function indicator
- Drive function selector

4.5 The status indicator

The status indicator is located inside the ON/OFF button. When the LiNX remote is not powered up, the status indicator is not lit.

When the LiNX remote is powered up and there are no faults with the system, the status indicator lights green.

If there is a fault with the system when powered up, the status indicator flashes red. The number of flashes indicates the type of fault. Refer to 7.1.1 Fault codes and diagnosis codes, page 40.

4.6 Battery gauge

The battery charging status is shown in the battery gauge.

Maximum driving range
- Green, green, amber, amber and red LEDs on.

Decreased driving range
- Red, amber and one green LED on.

Decreased driving range
- Red and two amber LEDs on.

Decreased driving range
- Red and one amber LED on.
- Consider charging batteries.

Very low driving range
- Only red LED on.
- Batteries need immediate charging.
4.7 Labels on the product

A  ⚠️  Recommendation to read the instruction manual before using the module.

B  IPx4  This is the enclosure's ingress protection rating.

C  This is the WEEE symbol (Waste Electrical and Electronic Equipment Directive).

This product has been supplied from an environmentally aware manufacturer. This product may contain substances that could be harmful to the environment if disposed of in places (landfills) that are not appropriate according to legislation.

- The ‘crossed out wheelie bin’ symbol is placed on this product to encourage you to recycle wherever possible.
- Please be environmentally responsible and recycle this product through your recycling facility at its end of life.

D  WARRANTY VOID IF SEAL IS BROKEN  Tamper evident seal.
LiNX® Control System

Product label containing:
- Dynamic Controls' 'dynamic' logo
- Dynamic Controls' website address
- Dynamic Controls’ part description

Product label containing:
- The product's bar code
- The product's serial number
- The product's part number

The petrol pump indicates the battery charger input.

Hardware and application firmware version label
1. Hardware version
2. Hardware major version
3. Hardware minor version
4. Application version
5. Application major version
6. Application minor version

Serial number and date of manufacture

The serial number on a Dynamic Controls product provides both the date of manufacture as well as a unique serial number for the particular module.

The format, as shown above, is MYYnnnnnn, where:
- M is for the month of manufacture, using the letters A to L (A = Jan, B = Feb, C = Mar, etc.),
- YY is the year of manufacture,
- nnnnnn is a unique six digit sequential number.

For example, the remote’s serial number, as shown above, begins with A14 indicating that it was manufactured in January 2014, and its unique, sequential value is 132800.
5 Usage

5.1 Operating the remote

Your wheelchair always powers up in drive function 1 and is ready to drive. For remotes that provide multiple drive functions (DLX-REM210 or DLX-REM215) the drive function can be changed. For details about changing the drive function, refer to 5.7 Activating the drive function, page 30.

![Remote Control Diagram]

Powering up the remote

1. Press ON/OFF button A.
   If there is no fault with the system, the status indicator lights up green and the battery gauge displays the current battery status. Refer to 4.6 Battery gauge, page 18.
   If there is a fault with the system when powering up, the status indicator indicates the fault with a series of red flashes. Refer to 7.1.1 Fault codes and diagnosis codes, page 40. If the fault is one that prevents the system from driving, the battery gauge flashes continuously.

Powering down the remote

1. Press ON/OFF button A.
2. System powers down and status indicator switches off.

The ON/OFF button can also be used to perform an emergency stop, refer to 5.2 Emergency stop, page 22.

The ON/OFF button is also used to lock the system, refer to 5.4 Locking/unlocking the remote, page 23.

5.1.1 Using the joystick

The joystick controls the direction and speed of the wheelchair.

When the joystick is deflected from the center (neutral) position, the wheelchair moves in the direction of the joystick movement.
The speed of the wheelchair is proportional to the joystick deflections, so that the further the joystick is moved from the neutral position, the faster the wheelchair travels.

If the user moves the joystick back to the neutral position, the wheelchair slows down and stops.

If the user releases the joystick from any position other than the neutral position, the joystick returns to the neutral position and the wheelchair slows down and stops.

The joystick can also be used to wake up the system when in sleep mode, if this parameter has been enabled by the provider. Refer to 5.5 The sleep mode, page 24.

5.1.2 Controlling the maximum speed

The speed dial allows you to limit the maximum speed of the mobility device (that is the speed when the joystick is fully deflected) to suit your preferences and environment.

The speed dial A offers ten discrete steps between the lowest speed B and the highest speed C.

5.2 Emergency stop

If you press the ON/OFF button while driving, an emergency stop is carried out. The remote powers down after this.
5.3 The horn

Press the horn button A to sound the horn. The horn sounds for as long as the horn button is pressed.

The horn button is also used for unlocking a locked system. Refer to 5.4 Locking/unlocking the remote, page 23.

5.4 Locking/unlocking the remote

Locking the remote

1. Press the ON/OFF button A for more than four seconds.

When entering the locked state, the battery gauge indicates the transition by flashing LEDs red, amber and green (far left, middle and far right) three times.
Unlocking the remote

1. Press the ON/OFF button A.
2. Press the horn B twice within ten seconds.

If you implement the unlock sequence incorrectly or press the ON/OFF button again before the unlock sequence is complete, the system returns to the locked state.

During an unlock attempt, the battery gauge indicates the system is in a locked state by flashing LEDs red, amber and green (far left, middle and far right) until either the system is powered off, unlocked or the Sequence Timeout is reached.

5.5 The sleep mode

The sleep mode is not a factory setting, but can be enabled by your provider. If this parameter is set ON, the system goes into sleep mode after a period of time without user activity. This period of time can be set by the provider.

The transition to sleep mode is indicated by the remote module’s LEDs dimming gradually. During the transition, the joystick, horn, speed dial and power button will continue to operate.

To wake the system from sleep, either press the ON/OFF button or move the joystick, if this parameter has been enabled by the provider.

5.6 Operating powered seating functions

Powered seating functions, such as powered elevating legrests or powered recline, are carried out as described below.

5.6.1 Through external switches

With an external switch, seating functions can be controlled while driving and without using seating cards.

Egg switch

The egg switch alternates powered seating functions of the following single power configurations:

- Powered recline only
- Powered seat tilt only
- Center-mount elevating legrest (LNX) only

1. Make sure mobility device is on level surface and turned on.
2. Press and hold tagged area of egg switch to run powered seating function.
3. Release egg switch if desired seating position is reached. If egg switch is pressed again within three seconds, powered seating function moves into same direction.
4. To alternate direction, press egg switch after it has been released for more than three seconds.

**Stereo toggle switch**

The stereo toggle switch alternates powered seating functions of the following single power configurations:
- Powered recline only
- Powered seat tilt only
- Center-mount elevating legrest (LNX) only

1. Make sure mobility device is on level surface and turned on.
2. Press and hold stereo buttons A or B to move particular seating function. Seating function moves as long as button is pressed.

**Stereo button switch**

The stereo button switch alternates powered seating functions of the following single power configurations:
- Powered recline only
- Powered seat tilt only
- Center-mount elevating legrest (LNX) only

1. Make sure mobility device is on level surface and turned on.
2. Deflect and hold toggle switch up A or down B to move particular seating function. Seating function moves as long as toggle switch is deflected.
4-way toggle switch

1. Make sure mobility device is on level surface and turned on.
2. Deflect and hold toggle switch to direction, that moves particular seating function. Seating function moves as long as toggle switch is deflected. See tables below for combinations of directions and powered seating functions.

- The tables shows the factory settings. For reprogramming, contact your provider.

Powered seat tilt and LNX legrest
- A (Forward) Powered seat tilt up
- B (Reverse) Powered seat tilt down
- C (Left) LNX up
- D (Right) LNX down

Powered recline and LNX legrest
- A (Forward) Powered recline and LNX up
- B (Reverse) Powered recline and LNX down
- C (Left) LNX up
- D (Right) LNX down

Powered seat tilt and elevating seat
- A (Forward) Powered seat tilt up
- B (Reverse) Powered seat tilt down
- C (Left) Elevating seat up
- D (Right) Elevating seat down

Dual powered elevating legrests
- A (Forward) Left powered elevating legrest up
- B (Reverse) Left powered elevating legrest down
- C (Left) Right powered elevating legrest up
- D (Right) Right powered elevating legrest down
4-way button switch

1. Make sure mobility device is on level surface and turned on.
2. Press and hold button to move particular seating function.
   Seating function moves as long as button is pressed.
   See tables below for combination of buttons and powered seating functions.

   The tables show the factory settings. For reprogramming, contact your provider.

**Powered seat tilt and LNX legrest**

A  Powered seat tilt up
B  Powered seat tilt down
C  LNX up
D  LNX down

**Powered recline and LNX legrest**

A  Powered recline and LNX up
B  Powered recline and LNX down
C  LNX up
D  LNX down

**Powered seat tilt and elevating seat**

A  Powered seat tilt up
B  Powered seat tilt down
C  Elevating seat up
D  Elevating seat down

**Dual powered elevating legrests**

A  Left powered elevating legrest up
B  Left powered elevating legrest down
C  Right powered elevating legrest up
D  Right powered elevating legrest down
5.6.2 Through the joystick

Activating seating function

1. Press Seating function key A.
   - The wheelchair changes to seating function and the Drive/actuator status display C lights up amber.

2. Press Seating function selector keys A and B or move joystick left or right several times until desired seating function lights up. Refer to table below.

3. Deflect joystick to front or rear to activate actuator.

   The distance you deflect the joystick determines the dynamics of the movement.

   If you only deflect the joystick a little, the actuator only moves slowly.

   If you deflect the joystick as far as you can, the actuator moves faster.

Displayed symbols and meanings

Not every wheelchair has all options.

- Powered seat tilt
- Powered recline
- Elevating seat
- Left or center-mount powered elevating legrest
- Right powered elevating legrest
- Both powered elevating legrests
5.6.3 Speed reduction and seating function inhibits

The mentioned speed reduction and seating function inhibits do not apply to all Invacare wheelchair models.

Speed reduction

If the elevating seat has been adjusted above a certain point, the drive electronics considerably reduces the speed of the wheelchair. If speed reduction has been activated, drive mode can only be used to carry out movements in reduced speed and not for regular driving. To drive normally, adjust the elevating seat until the speed reduction has been deactivated again.

Speed reduction is shown in the status display. If the elevating seat is raised above a certain point, the elevating seat symbol and the drive symbol start pulsing. These two symbols remain pulsing while driving to show the speed reduction until speed reduction has been deactivated again.

Seating function inhibits

- Tilt limit

The maximum tilt limit switch is a function to prevent the backrest angle from extending beyond a maximum pre-set angle, when the elevating seat is raised above a certain point. The drive electronics stops automatically and the seat tilt or backrest symbol starts pulsing.
• **Elevating Seat Lockout**

The drive electronics is equipped with an elevating seat lockout switch to prevent the elevating seat from rising up above a certain point when the seat tilt or backrest angle is adjusted above a certain point. The drive electronics stops automatically and the elevating seat symbol starts pulsing.

### 5.7 Activating the drive function

1. **Press Drive function key A.**
   - The remote switches to drive function, the Drive function indicator © shows the pre-selected drive function (1,2 or 3) and the wheel in the drive status display lights up green.

2. **Press Drive function selector keys A or B until desired drive function lights up.**
   - The Drive function indicator © shows the drive function.

<table>
<thead>
<tr>
<th>Drive function</th>
<th>Drive function</th>
<th>Drive function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

   With the Drive function selector key you can choose between three different drive functions, that are configured by Invacare and can be fitted to your needs and requests by the provider.

### 5.8 Operating the lights

- If you drive outside, turn on the lights under bad visibility conditions or darkness.
1. Short press Light button A.
The lights are turned on or off.

5.9 Operating the hazard lights

1. Short press Hazard lights button A.
The hazard lights are turned on or off.

5.10 Operating the direction indicators

Direction indicator left
1. Press Hazard lights button A for more than three seconds.
   Left direction indicator is turned on.
2. To turn off direction indicator, short press Hazard lights button again.

Direction indicator right
1. Press Light button B for more than three seconds.
   Right direction indicator is turned on.
2. To turn off direction indicator, short press Light button again.
5.11 Connecting the remote

**CAUTION! Risk of unintended stops**
If the plug of the remote cable is broken, the remote cable may come loose while driving. The remote could suddenly switch off when losing power. This causes an unintended stop.
- Always check the plug of the remote for damage. Contact your provider immediately in case of a damaged plug.

**Risk of damage to the remote**
The remote plug and connector socket fit together in one way only.
- Do not force them together.

1. Lightly push to connect the plug of the remote cable and the connector socket. The plug must lock in place with an audible click.

5.12 Charging the batteries

**WARNING! Risk of Injury or Damage**
Using the wrong battery charger may cause explosion and destruction of batteries. To avoid injury or damage:
- Only use the battery charger supplied with your mobility device, or a charger that has been approved by Invacare.

**WARNING! Risk of Injury or Damage**
Explosive gases can be generated while charging. To avoid flammable gas buildup and injury or damage due to explosion:
- During charging, keep the wheelchair and battery charger away from sources of ignition, such as flames and sparks.
- Charge the wheelchair in a space at least twice the volume of the wheelchair.

**WARNING! Risk of Injury, Damage or Death**
Improper routing of charger cord(s) may cause tripping, entanglement or strangulation hazard that may result in injury, damage or death.
- Ensure all charger cord(s) are routed and secured properly.
- Close supervision and attention is needed when charging the wheelchair near children, pets or people with physical/mental disabilities.
Refer to the charger user manual, the power wheelchair base user manual and instructions supplied with the batteries for more information concerning charging the batteries.

1. Plug the battery charger into the remote’s charger socket A.

If the remote is powered up, the battery gauge indicates the system is connected to the charger by cycling between a left-to-right chase sequence, and then displaying the approximate battery charge state at the end of the chase sequence.

- **Battery charge state 1**
  - Red LED on.
- **Battery charge state 2**
  - Red and one amber LED on.
- **Battery charge state 3**
  - Red and two amber LEDs on.
- **Battery charge state 4**
  - Red, amber and one green LED on.
- **Fully charged**
  - Green, green, amber, amber and red LEDs on.

The LiNX system does not have to be powered up when charging the batteries, however, if it is not powered up, the battery gauge does not indicate the charging state. For more information about the charging state, refer to the user manual of your charger.

For more information about the drive inhibit mode, refer to chapter 7.3 *Drive inhibit indication, page 42.*

NEW Batteries Only—The wheelchair power must be on during charging to ensure that accurate battery charge levels display on the remote. New batteries must be charged fully. The Battery synchronization Procedure MUST be performed within 24 hours of powering on the wheelchair. The Battery Synchronization Procedure can be found in the LiNX service manual and must be performed by a provider or qualified technician.
5.12.1 Battery alarms

High voltage warning

The batteries are overcharged.
All LEDs on and the green LEDs flashing.

1. Disconnect battery charger.

Low voltage warning

The batteries are empty.
Only one red LED on and flashing.

1. Power down wheelchair.
2. Charge batteries immediately.

5.13 Using the USB charger

WARNING!
Risk of injury
If you use mobile phone while operating mobility device, accidents could lead to injury or property damage.
– Only use mobile phone in conjunction with hands-free equipment to operate mobility device while driving.

Risk of property damage
Handle USB charger with care, otherwise damage could occur.
– Always keep the USB charger dry. If USB charger gets wet, let USB charger dry before use.
– Do not use or store USB charger in dusty or dirty areas.
– Do not insert sharp objects into the USB ports.

WARNING!
Risk of Injury or Damage
Erratic or unintended movement of the wheelchair may occur if wireless transmitters are connected to the wheelchair. To avoid injury or damage:
– DO NOT use the USB charger connector as a wireless transmitter.
– Only use the USB charger for the purposes described in this manual.
With the USB charger you can charge the battery of your mobile phone or a compatible device when you do not have access to a regular power source. Both USB ports can be used at the same time and each USB port has a charging current up to 1 A.

1. Open bung A.
2. Connect device with USB port.

- Replace bung when USB ports are not in use.

- The usage of the USB charger influences the drive range of the mobility device. For more information about the drive range, refer to chapter Technical Data in the user manual of your mobility device.
6 Maintenance

6.1 Maintenance Information

Risk of damage to the remote
There are no user-serviceable parts in any electronic component.
– Do not attempt to open any case or undertake any repairs, else warranty will be voided and the safety of the system may be compromised.

If any component is damaged in any way, or if internal damage may have occurred (for example by being dropped), have it checked by qualified personnel before operating.

Where any doubt exists, consult your nearest Invacare provider.

6.2 Setup/Delivery Inspection

Setup/delivery inspection should be performed by provider at time of delivery/set up.

Initial adjustments should be made to suit your personal body structure needs and preference. Thereafter weekly, monthly and periodic inspections should be performed by user/attendant between the six month service inspections.

Every six months, and as necessary, take your wheelchair to a qualified technician for a thorough inspection and servicing.

- Check all parts for shipping damage. In case of damage, DO NOT use.
- Check that cables are routed and secured properly to ensure that cables do NOT become entangled and damaged during normal operation of seating system.
- Ensure proper operation of powered functions (Example: drive, seating and legrests).

6.3 Wear and Tear Information

General Information

Normal wear and tear items and components include but are not limited to: all upholstery items including seat and back upholstery, arm and calf pads, cushions, wheels, tires and casters, all types of batteries, joystick overlays and inductive rubberized protective boots.

Invacare reserves the right to ask for any item back that has an alleged defect in workmanship. Refer to the Warranty section in this manual for specific warranty information.

Refer to the Inspection Checklists for proper preventative maintenance schedule.

This is just a general guideline and does not include items damaged due to abuse and misuse.

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Product Wear and Tear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchairs</td>
<td>Wheels, Brake Assembly, Hand Grips</td>
</tr>
</tbody>
</table>
6.4 User/Attendant Inspection Checklists

- Every six months, and as necessary, take your wheelchair to a qualified technician for a thorough inspection and servicing.

Weekly, monthly, and periodic inspections should be performed by user/attendant between the six month service inspections.

Regular cleaning will reveal loose or worn parts and enhance the smooth operation of your wheelchair. To operate properly and safely, your wheelchair MUST be cared for just like any other vehicle. Routine maintenance will extend the life and efficiency of your wheelchair.

6.4.1 Inspect/Adjust Weekly
- Ensure proper operation of powered functions (Example: drive, seating and legrests).

6.4.2 Inspect/Adjust Monthly
- Check all components for loose, damaged or corroded components, such as connectors, terminals or cables. Contact your Invacare provider to replace damaged components.
- Ensure that all connectors are fully mated.
- Cables shall be inspected periodically to ensure that they are routed and secured properly. Periodic inspection is recommended as it may reveal loose and/or damaged cables. Contact your Invacare provider to re-secure or replace cables.
- Check for and remove any foreign objects or material.

6.4.3 Inspect/Adjust Periodically
- Check the joystick boot for damage. Contact your Invacare provider for replacement if damaged.
- Check that all labels are present and legible. Replace if necessary.

6.5 Service Inspection

- Every six months take your wheelchair to a qualified technician for a thorough inspection and servicing.

Service inspections MUST be performed by a qualified technician.

The following are recommended items to inspect during regular service inspections performed by a qualified technician.
technician. Actual items to be inspected during the service inspection may vary according to the specific wheelchair:

6.5.1 Six Month Inspection

- Cables shall be inspected periodically to ensure that they are routed and secured properly. Periodic inspection is recommended as it may reveal loose and/or damaged cables. Re-secure all loose cables and replace by following the recommendations outlined in the LiNX service manual.
- Ensure proper operation of powered functions (drive, seating, legrests, etc.).
- Inspect electrical components for signs of corrosion. Replace if corroded or damaged.
- Check that all labels are present and legible. Replace if necessary.

6.6 Cleaning

**WARNING!**

Risk of Injury, Damage or Death

Electrical shock may cause injury, damage or death.
- Always unplug the product from the electrical outlet before cleaning.
- Always unplug accessories from the electrical outlet before cleaning.

**CAUTION!**

Risk of Damage

Cleaning or maintenance may cause damage to carpeting or flooring.
- Place the wheelchair in a well ventilated area where cleaning or maintenance can be performed without risk of damage to carpeting or flooring.

**CAUTION!**

Risk of Damage

Exposure to liquids may damage components or accessories of wheelchair and electronics.
- DO NOT spray with any type of water or liquid.
- Electrical components damaged by corrosion MUST be replaced immediately.

**CAUTION!**

Risk of Damage

Improper cleaning may cause damage to the product.
- DO NOT use chemicals, solvents or abrasive cleaners.

Regular cleaning will reveal loose or worn parts and enhance the smooth operation of your wheelchair. To operate properly and safely, your wheelchair must be cared for just like any other vehicle.

Keep all electronic components free of dust, dirt and liquids.
1. Use a cloth dampened with warm water and mild non-abrasive soap to clean this product.
2. Dry the surface with dry cloth.
3. DO NOT use solvents or kitchen cleaners.
7 Troubleshooting

7.1 Fault diagnosis

If the electronic system shows a fault, use the following fault-finding guide to locate the fault.

Ensure that the drive electronics system is powered up before starting any diagnosis.

If the status display is OFF:
- Check whether the drive electronics system is powered up.
- Check whether all cables are correctly connected.
- Ensure that the batteries are not discharged.

If a fault number is displayed in the status display:
- Proceed to the next section.

7.1.1 Fault codes and diagnosis codes

If there is a fault with the system when it is powered up, the status indicator flashes red. The number of flashes indicates the type of fault.

The actions listed are not in any particular order and are suggestions only. The intention is that one of the suggestions may help you clear the problem. If in doubt, contact your provider.

<table>
<thead>
<tr>
<th>Flash code</th>
<th>Fault description</th>
<th>Possible action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote fault</td>
<td>• Check cables and connectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contact your provider.</td>
</tr>
<tr>
<td>2</td>
<td>Network or configuration fault</td>
<td>• Check cables and connectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recharge the batteries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check charger.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contact your provider.</td>
</tr>
<tr>
<td>3</td>
<td>Motor 1 fault</td>
<td>• Check cables and connectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contact your provider.</td>
</tr>
<tr>
<td>4</td>
<td>Motor 2 fault</td>
<td>• Check cables and connectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contact your provider.</td>
</tr>
<tr>
<td>Flash code</td>
<td>Fault description</td>
<td>Possible action</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 5          | Left magnetic brake fault         | • Check cables and connectors.  
• Check left magnetic brake is engaged.  
• Refer to the chapter “Pushing the mobility device in freewheel mode” in the user manual of your wheelchair.  
• Contact your provider. |

<table>
<thead>
<tr>
<th>Flash code</th>
<th>Fault description</th>
<th>Possible action</th>
</tr>
</thead>
</table>
| 6          | Right magnetic brake fault         | • Check cables and connectors.  
• Check right magnetic brake is engaged.  
• Refer to the chapter “Pushing the mobility device in freewheel mode” in the user manual of your wheelchair.  
• Contact your provider. |

<table>
<thead>
<tr>
<th>Flash code</th>
<th>Fault description</th>
<th>Possible action</th>
</tr>
</thead>
</table>
| 7          | Module fault (other than remote module) | • Check cables and connectors.  
• Check modules.  
• Recharge batteries.  
• If the chair was stalled, reverse away or remove obstacle.  
• Contact your provider. |

1  Configuration of the motors depending on the wheelchair model

### 7.2 OON ("Out Of Neutral")

OON ("Out Of Neutral") is a safety feature that prevents accidental driving or seating movements, when:

- the system is powering up,
- after a function change or
• when the system comes out of an inhibit or drive lock-out.

**Drive OON warning**

![Diagram](image)

Fig. 7-1

The joystick must be in the center position:
• when a system is powering up
• on a function change or
• when transitioning from a drive lock-out or inhibit state.

Otherwise a drive OON warning is displayed. During a Drive OON warning, the battery gauge LEDs and the drive wheel indicator (if equipped) flash continually (all on, followed by all off) to alert the user. In this state the wheelchair does not drive. If the joystick is returned to the center position, the warning clears and the wheelchair drives normally.

**Seating OON Warning**

![Diagram](image)

Fig. 7-2

When a system is powering up or after a function change, no direct access switches can be active, otherwise a seating OON warning is displayed.

During a seating OON warning, the battery gauge LEDs and the seating indicator flash continually (all on, followed by all off) to alert the user. In this state the seating motions do not operate. If the switches are deactivated, the warning clears and the seating motions operate normally.

### 7.3 Drive inhibit indication

The drive inhibit mode ensures that the wheelchair does not drive when connected to the charger.

![Diagram](image)

Drive inhibit mode is indicated by the battery gauge with a right-to-left chase sequence.

The chase sequence continues until the fault condition has been cleared.
7.4 Cut-off voltage

When the battery voltage decreases below the battery cut-off voltage:

- the status indicator flashes red (Flash code 2, refer to 7.1.1 Fault codes and diagnosis codes, page 40),
- the red LED on the battery gauge flashes,
- the horn sounds once every ten seconds.
8 Technical data

8.1 Technical specifications

Mechanical specifications

<table>
<thead>
<tr>
<th>Permissible operating, storage and humidity conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range for operation according to ISO 7176–9:</td>
<td>-13 °F (−25 °C)— +122 °F (+50 °C)</td>
</tr>
<tr>
<td>Recommended storage temperature:</td>
<td>59 °F (15 °C)</td>
</tr>
<tr>
<td>Temperature range for storage according to ISO 7176–9:</td>
<td>-40 °F (−40 °C)— +149 °F (+65 °C)</td>
</tr>
<tr>
<td>Operating humidity range according to ISO 7176–9:</td>
<td>0 ... 90 %RH</td>
</tr>
<tr>
<td>Degree of protection:</td>
<td>IPX4¹</td>
</tr>
</tbody>
</table>

Operating forces

<table>
<thead>
<tr>
<th>REM110/REM210/REM211/REM216</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Joystick</td>
<td>1.9 N</td>
</tr>
<tr>
<td>Power button</td>
<td>2.5 N</td>
</tr>
<tr>
<td>Speed dial</td>
<td>1.2 N</td>
</tr>
<tr>
<td>Horn button</td>
<td>2.5 N</td>
</tr>
</tbody>
</table>

¹ IPX4 classification means that the electrical system is protected against spray water.
### Electrical specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Nominal</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage (Vbatt)</td>
<td>• 17</td>
<td>• 24</td>
<td>• 34</td>
<td>• V</td>
</tr>
<tr>
<td>Idle current</td>
<td>-</td>
<td>• 56</td>
<td>-</td>
<td>• mA at 24V</td>
</tr>
<tr>
<td>Quiescent current (power off)</td>
<td>-</td>
<td>-</td>
<td>• 0.23</td>
<td>• mA at 24V</td>
</tr>
</tbody>
</table>
9 Wireless Technology

9.1 Wireless Technology Overview

The LiNX control system makes use of Bluetooth wireless technology. Bluetooth is a wireless communications system that is designed to operate in short-range wireless personal area networks (WPAN).

LiNX supports both the Smart (low energy) and Classic Bluetooth protocols. These operate in the spectrum range 2.400 GHz to 2.4835 GHz industrial, scientific and medical (ISM) band. Bluetooth Classic uses 79 x 1MHz channels and Bluetooth Smart uses 40 x 2MHz channels. Within a channel, data is transmitted using Gaussian frequency shift modulation. The bit rate is 1Mbit/s, and the maximum transmit power is 5mW. Both Bluetooth protocols use frequency hopping to counteract narrowband interference problems.

Bluetooth Technology Specifications

<table>
<thead>
<tr>
<th>Technical Specification</th>
<th>Classic Bluetooth</th>
<th>Smart (low energy) Bluetooth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>Class 2</td>
<td></td>
</tr>
<tr>
<td>Distance/Range (theoretical max.)</td>
<td>10m (33ft)</td>
<td></td>
</tr>
<tr>
<td>Over the Air Data Rate</td>
<td>1–3 Mbit/s</td>
<td>1 Mbit/s</td>
</tr>
<tr>
<td>Application Throughput</td>
<td>0.7–2.1 Mbit/s</td>
<td>0.27 Mbit/s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Specification</th>
<th>Classic Bluetooth</th>
<th>Smart (low energy) Bluetooth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>56/128-bit and application layer user defined</td>
<td>128-bit AES with Counter Mode CBCMAC and application layer user defined</td>
</tr>
<tr>
<td>Robustness</td>
<td>Adaptive fast frequency hopping, FEC, fast ACK</td>
<td>Adaptive frequency hopping, Lazy Acknowledgement, 24-bit CRC, 32-bit Message Integrity Check</td>
</tr>
<tr>
<td>Latency (from a non-connected state)</td>
<td>Typically 100 ms</td>
<td>6 ms</td>
</tr>
<tr>
<td>Network Topology</td>
<td>Scatternet</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>5 mW</td>
<td></td>
</tr>
<tr>
<td>Service Discovery</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Profile Concept</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

9.2 Intended Wireless (Electromagnetic) Environment

The intended environments for the LiNX wheelchair are defined as the users home, assisted living facilities, nursing
homes, vocational settings and health care facilities. Across these environments, there are numerous different items of both medical and non-medical equipment that also operate wirelessly.

9.3 LiNX Wireless Functions

The LiNX control system functions that use Bluetooth include:

- **Remote diagnostics**—provides status information of the powered wheelchair (battery status, fault conditions etc.).
- **Configuration**—by a trained provider, dealer, therapist or clinician using the programming and diagnostic tools, configures the LiNX control system.

9.3.1 Remote Diagnostics

The system transmits wheelchair-specific diagnostic information to an Apple iOS device. This information helps with the technical support of the wheelchair.

The information provides the status of the wheelchair electronics, including:

- The state of charge of the battery,
- Active and historical fault data,
- Wheelchair driving time, and
- Information about the modules attached to the wheelchair (e.g. module serial numbers).

The information updates once every 12 hours (when connected), or whenever requested by an application on the iOS device. Note that the wheelchair may be in motion at the time of transmission.

9.3.2 Configuration

The LiNX Programming and Diagnostic (P&D) tools use Bluetooth to communicate with the LiNX control system via the LiNX Access Key (LAK). The LAK is a standalone device that plugs into a remote module. A system cannot be configured without using the LAK and only manufacturers, trained providers, dealers, therapists or clinicians have access to the LAK. This means that end users, their friends, relatives or caregivers cannot change the configuration.

There are two levels of access:

- Manufacturer (or OEM) and
- Distributor (provider/clinician).

The levels of access permit the following:

- **LAK Manufacturer Level**
  With this level, the manufacturer sets the system's default parameters to suit a particular wheelchair.

- **LAK Distributor Level**
  With this level, a subset of the system's parameters is configured by trained providers, dealers, clinicians or therapists. Critical parameters are limited within a predetermined range as set by the manufacturer.

Whilst the wheelchair may be in motion when the system is being configured, instructions for safe use, training and built-in safety mechanisms minimize the potential for non-life threatening injuries resulting from inappropriate configuration of the wheelchair. The likelihood of the aforementioned hazardous situation occurring is remote. A human intermediary, knowledgeable in the control system and specific user needs, can intervene to prevent harm to the wheelchair user during wheelchair set-up.
The P&D tools do not allow direct control of the LiNX wheelchair. Complete control of the wheelchair remains with the end-user at all times. Should a user determine during the customization process that the wheelchair set-up is inappropriate in providing full control in everyday usage, they may return the joystick to the neutral position and the wheelchair will come to a complete and safe stop in a controlled manner.

Similarly, the user, provider, therapist or clinician, may at any time turn-off the control system using the power button/s within the system (for example, on the primary remote module or the attendant control unit). Such action will also bring the wheelchair to a complete and safe stop in a controlled manner.

9.4 Quality of Service

As per the risk assessment, none of these items can cause or contribute to a safety hazard should the data link be compromised. Data latency and/or the probability of loss of service creates an inconvenience only and does not inhibit the user’s therapy or treatment.

9.4.1 Data Integrity

Errors in the integrity of the data transmitted are a nuisance and will not cause a safety related issue. Data is not used for clinical purposes.

Loss of, or incorrect data transmitted in Mouse Mover mode could result in loss of, or incorrect movement of the user’s PC cursor. Similar conditions exist with normal off-the-shelf USB or wireless PC mice when their batteries are low.

Loss of diagnostic data transmitted could result in a gap in historical information presented to a service technician. Errors in the wheelchair-specific diagnostic information could result in short term erroneous information being presented to a technician. Both conditions may result in wheelchair troubleshooting taking longer than initially estimated.

Loss of configuration data transmitted in programming and diagnostic mode would result in no effect. The existing wheelchair configuration would be maintained. Errors in the configuration data transmitted would be rejected by built-in safety mechanisms and/or detected during the subsequent evaluation of the configuration updates through the prescribed user testing.

The programming and diagnostic tools serve no specific medical purpose and do not control the wheelchair’s operation. Complete control of the wheelchair’s actions remain with the user at all times.

9.4.2 Safeguards and Redundancy

Safeguards will include warnings in the user manuals around minimum separation distances, the ability to turn off the Bluetooth connections, inherent encryption of the Bluetooth protocols, and direct indication to a user when a connection is made.

Due to the nature of the functions using the wireless technology, there is no requirement for redundancy.

Security risks are addressed by compliance to recognized standard AAMI-TIR57:2016 - Principles for medical device
security - Risk management (FDA recognition No: 13-83) and the NIST Framework as appropriate.

The built-in safety features, such as and without limitation, necessity for the LiNX Access Key to be physically present when configuring the device, the use of standard Bluetooth security protocols, single connection at any point in time, limited range, limited exposure time and the visual indication of an established connection, minimize the threats and vulnerabilities from malicious attack.

9.5 Wireless Coexistence

Wireless coexistence testing has been conducted in line with ANSI C63.27 using the radiated anechoic chamber (RAC) test method.

The LiNX Access Key has been tested per ISO 7176-21:2009 Clause 5.2.3 at 20 v/m field strength. During testing the LiNX Access Key disconnected from its paired device when subjected to a frequency of 2.44 GHz. The function of the wheelchair was not impacted by the disruption of the LiNX Access Key wireless communication. If the LiNX Access Key becomes disconnected from its paired device during use, remove the wheelchair from the RF field and wirelessly reconnect the device.

9.6 Cybersecurity

The LiNX product range has been designed with cybersecurity in mind to assure device functionality and safety. The cybersecurity measures taken address:

- The embedded software,
- The programming and diagnostic tools' software, and
- Bluetooth wireless technology.

9.6.1 Cybersecurity Controls

A number of controls are in place to assure that the LiNX system software maintains its integrity from the point of origin to the point at which a system leaves the control of the manufacturer, and during product use.

These are summarized below:

- Devices leaving the point of origin are equipped with a tamper evident seal, which allows for the detection that a product's case has been opened and thus potentially compromised. The Factory Test Interface is not accessible without opening the case of any given module.
- Once the system leaves the point of origin, it can only have its software upgraded using the Programming and Diagnostic tools by a healthcare professional or a service technician with a LiNX Access Key (LAK) connected to the charging port. Access controls and licensing is provided through the physical LAK.
- Programming can only occur using either the P&D tools or via Single Wire Communication interface, both through the charging port. The embedded system ensures safe envelopes for programmed parameters.
- The system will only run valid software. Cyclic Redundancy Checks (CRC) are conducted on the software before it is executed.
• LiNX products use Class 2 Bluetooth wireless technology. This technology has built-in safety features that can maximize the product's integrity. These features include:
  – operating range to 10 m (33 ft);
  – the use of standard Bluetooth security protocols;
  – single connection at any point in time;
  – limited exposure time, and
  – visual indication when in a connectivity function.

9.6.2 User Actions

Users are not required to take any specific actions in order to assure cybersecurity of the LiNX system. However, should the user be concerned about the Bluetooth connection for any reason, the user can switch off the Bluetooth functionality by powering down the system. The user also has the option to power up the system with the Bluetooth functionality disabled, if they so desire.
10 Warranty

10.1 Limited Warranty—US

Except as otherwise set forth below, Invacare warrants that the following components of the mobility device ("product") will be free from defects in materials and workmanship for a period of one (1) year from the date Invacare ships the product to the original purchaser or provider: base frame, electronics and electrical components (excluding batteries), motors, powered seating actuators, gearboxes, bearings and bushings, seat frame, fixed seat post, upholstered materials, padded materials, casters, tires and tubes (excluding normal wear and tear). Invacare warrants all product batteries will be free from defects in materials and workmanship for a period of six (6) months from the date Invacare ships the product to the original purchaser or provider. The warranties described above are referred to as the “Warranty”. A copy of the original product invoice is required for coverage under the Warranty.

10.2 Limited Warranty—Canada

Except as otherwise set forth below, Invacare warrants the base frame of the mobility device ("product") will be free from defects in materials and workmanship for a period of five (5) years from the date Invacare ships the product to the original purchaser or provider. Invacare warrants that the seat frame and fixed seat post will be free from defects in materials and workmanship for a period of three (3) years from the date Invacare ships the product to the original purchaser or provider. Invacare warrants that the following components of the product will be free from defects in materials and workmanship for a period of two (2) years from the date Invacare ships the product to the original purchaser or provider: electronics and electrical components (excluding batteries), motors, powered seating actuators, gearboxes. Invacare warrants that the following components of the product will be free from defects in materials and workmanship for a period of one (1) year from the date Invacare ships the product to the original purchaser or provider: bearings and bushings, upholstered materials (excluding normal wear and tear), padded materials (excluding normal wear and tear), brake pads (excluding normal wear and tear), casters (excluding normal wear and tear), tires and tubes (excluding normal wear and tear). Invacare warrants all product batteries will be free from defects in materials and workmanship for a period of six (6) months from the date Invacare ships the product to the original purchaser or provider. The warranties described above are referred to as the “Warranty”. A copy of the original product invoice is required for coverage under the Warranty.

10.3 Repair or Replacement

Invacare's sole obligation and the original purchaser's exclusive remedy under the Warranty is limited to Invacare's repair and/or replacement, at Invacare's option, of defective components and batteries covered by the Warranty. Such repair or replacement does not include any labor or shipping charges incurred by Invacare in the replacement and/or repair of any such component or battery. For Warranty service, please contact the provider from whom you purchased your product. In the event you do not receive satisfactory Warranty service, please write directly to Invacare at the address on the bottom of the back cover. Provide provider's name address, date of purchase, indicate
nature of the defect and, if the product is serialized, indicate the serial number. Do not return products to Invacare without Invacare's prior written authorization.

10.4 Limitations and Exclusions

The Warranty is extended only to the original purchaser who purchases the product new and unused from Invacare or a provider. The Warranty is not extended to any other person or entity and is not transferable or assignable to any subsequent purchaser or owner. Coverage under the Warranty will end upon any such subsequent sale or other transfer of title to any other person.

The Warranty does not apply to serial numbered products if the serial number has been removed or defaced, products subject to neglect, abuse, accident, improper operation, maintenance or storage, commercial or fleet use, products modified without Invacare's express written authorization (including, but not limited to, modification through the use of unauthorized parts or attachments), products damaged by reason of repairs made to any component without Invacare's express written authorization, or to a product damaged by circumstances beyond Invacare's control, and such evaluation will be solely determined by Invacare.

The Warranty does not apply to problems arising from normal wear and tear or failure to adhere to the product instructions. A change in operating noise, particularly relative to motors and gearboxes does not constitute a failure or defect and will not be repaired or replaced as all products are expected to exhibit changes in operating noise due to aging.

10.5 Disclaimers

The Warranty may not be modified or waived in any manner whatsoever without Invacare's express written authorization.

THE WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCEPT AND TO THE EXTENT AS MAY BE PROHIBITED BY STATE OR PROVINCIAL LAW, IN NO EVENT SHALL INVACARE BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM OR ARISING OUT OF OR RELATED TO A DEFECT IN ANY PRODUCT, OR INVACARE’S PERFORMANCE OR FAILURE TO PERFORM ANY OF ITS OBLIGATIONS UNDER THIS WARRANTY, WHETHER OR NOT INVACARE HAS BEEN ADVISED, KNEW OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOST PROFITS.
Invacare Corporation

Canada
570 Matheson Blvd E Unit 8
Mississauga Ontario, L4Z 4G4
Canada
Tel: 800–668–5324
www.invacare.ca

USA
One Invacare Way
Elyria, Ohio USA
44035
Tel: 440–329–6000
Tel: 800–333–6900
www.invacare.com

New Zealand
Invacare New Zealand Ltd
4 Westfield Place, Mt Wellington 1060
New Zealand
Tel: 0800 468 222
www.invacare.co.nz

Australia
Invacare Australia PTY. Ltd.
1 Lenton Place, North Rocks NSW 2151
Australia
Tel: 1800 460 460
www.invacare.com.au

Manufacturer
Dynamic Controls
17 Print Place
P.O. Box 1866
Christchurch 8140
New Zealand
www.dynamiccontrols.com/en/

Making Life’s Experiences Possible®