Link User's Manual

Preliminary

Please review the user manual - this guide and the interactive Help - before using GyroSet Link. To view the Help in the Glory Tools application, click on the question mark icon in the upper right corner.

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This document must be read and understood by the healthcare professional who is installing and configuring the Link and PGDT Omni.

MEDICAL DEVICE INTERFERENCE

GyroSet Link contains an IEEE 802.15.4 Standard compliant 2.4 GHz RF transceiver that emits electromagnetic radiation. This electromagnetic radiation may interfere with pacemakers, defibrillators, or other medical devices. Maintain a safe distance of separation between your medical device and the GyroSet Link. Consult your physician and medical device manufacturer for information specific to your medical device. If you suspect your GyroSet Link is interfering with your pacemaker, defibrillator, or any other medical device, stop using GyroSet Link.

Now Technologies Ltd. hereby declares that this wireless device is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive and Radio Equipment Directive 2014/53/EU, as applicable.

WARRANTY

Now Technologies Ltd. provides one year's full warranty on the products. This warranty covers any defects in materials or workmanship, with the exceptions stated below:

Faults resulting from the installation by an unqualified person. Any problem that is caused by abuse, misuse, extreme water damage or extreme weather are not covered. Also, consequential and incidental damages are not recoverable under this warranty.

Link installation instructions

Gyroset **Link** enables Gyroset **Glory** users to use their headset on a PGDT **Omni** or IOM equipped wheelchair as a specialty input device (SID). The Omni is a universal specialty controls interface that accepts signals from many different types of SIDs and translates them into commands compatible with the PG Drives Technology R-net control system.

Before proceeding please make sure that one of the compatible devices are already installed on the chair and working properly. For more information on how to set-up the Omni please follow the instructions of R-NET OMNI TECHNICAL MANUAL SK78813/7. It is possible to set up a control system so that it is unsuitable for some users or even some vehicles. Although this guide contains recommended settings for Omni for all of the above reasons it is important that you contact PG Drives Technology if you have the slightest doubt or if you need any advice on programming.

Mounting

The Link enclosure has two M4 sized screw threads on the back of the device that is designed specifically for mounting. As every vehicle and user is unique there is no general mounting bracket available.
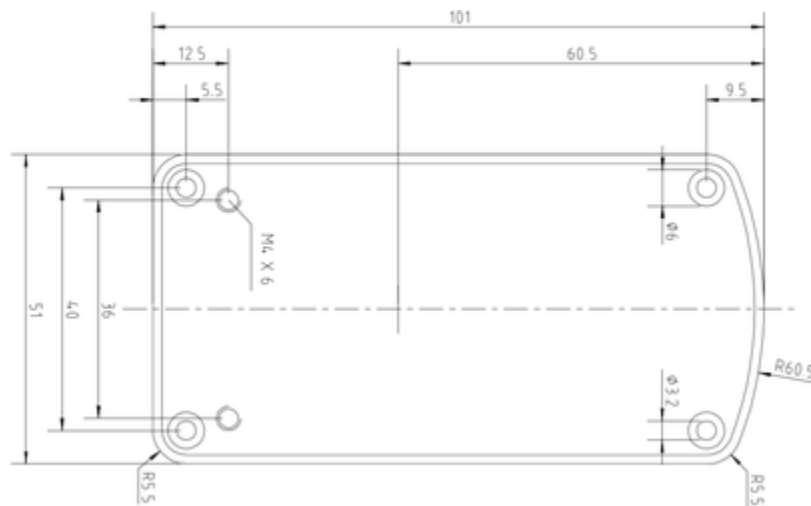

Dimensions and position of mounting points

Please make sure that the physical mounting meets the following criteria:

- Mounting should be removable as calibration of the sensors may be required from time to time.
- Mounting shall be solid to minimise vibration effects between the chair and the Link unit. Vibrations and orientation of the chair are processed by the onboard inertial sensors and it is mandatory that these measurements represent the movement of the chair and not the movement of the mounting bracket on the chair.
- Non elastic mounting material is highly recommended, please avoid use of velcro or any other temporary tapes or cable ties.
- To take advantage of the IP54 protection of the casing, cables must face the ground to prevent rain from falling into the connector:
  - When there is no intention to use the wired interface please leave the connector's silicon cap in place.
- Placement shall avoid the closeness of any magnetic materials or large iron parts as they affect the orientation initialisation process and prevent the sensors to find the true magnetic north.
  - Magnetic materials such as active magnets shall be avoided, magnetic noise shall be less than 10µT.
  - Electromagnetic components such as motors, relays, actuators must be at a distance where magnetic noise is less than 10µT.

- Ferromagnetic components such as wheelchair frame must be at a distance where their hard iron effect is minimal, usually more than 50mm depending on the composition of the frame.
- Placement shall allow the Link a clear radio connection with the Glory headset, that practically means:
  - A clear line of sight between the Link and the Headset must be provided.
  - Devices that may produce radio interference, such as Smartphones, Pagers, Bluetooth devices must be kept out of the way and placed in a distance from the Link.
  - Large metal surfaces that may deflect radio signal must be placed relative to the Link so that they don't block the signal.
- Placement is also important when wired connection is used, the distance between the headset and the Link must be less than the length of the standard cable provided. (1.2m)
  - Mounting should in no way cause the connectors to tense or slip out. (In case of cables slipping out the Link will automatically initiate radio connection.)
  - The connector interface for the headset data cable must be accessible to allow the caretaker to plug in or out the cable.
- Link should be placed as such that the Status LED (logo) is visible for at least the caretaker, preferably for the user as well.
- Link's mode selection touch interface (touch button with the logo) must be accessible for the caretaker.
  - Devices that may produce high capacity charges, such as ionisators must be at a safe distance from the touch interface to avoid accidental activation.
- The audible feedback of the Link is of high importance for the user, placement should avoid blocking of the speaker.

Wiring
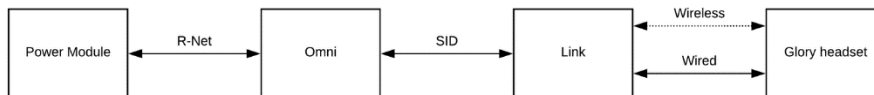
General wiring diagram

The Gyroset **Link** provides a proportional analogue signal compatible with PGDT Omni. The interface is the standard D-type connector, fitted with "detect link" and "fifth switch" functions. As there is no internal power source or auxiliary power input connector on the Link the power for operation is provided by the Omni. The limitation of Omni's power output is 12V and 100mA distributed between the two SID connectors and the Link consumes about 60-90mA typically when turned on. Please make sure that there is no other device connected to the Omni that would surpass the power limitation and prevent the system from operation. For the above reason if the Omni is configured with programmable parameter "Sleep 12V" to cut the power on SID

connectors when turned off, Link is going to be turned off as well. Link doesn't require a permanent power supply. For power saving reasons "Sleep 12V" parameter is advised to be set.

Omni Port-1 D-type connector

On the **Link** there are two connector interfaces. One of which is an integrated cable with D-type connector on it to control the Omni (referred to as Omni cable) and another oval shaped interface to connect the Glory cable into (referred to as Data cable).

*The two interfaces of the Link (on the left the oval shaped data connector)*

Connecting the Link to Omni	*Connecting the Link to IOM*

The preferred SID port if there is only one input device connected to the Omni is Port 1 as shown on the picture below. In case of PGDT IOM there is only one INPUT port where the D-type connector can be connected:

In case of use of a wired Glory to Link connection please use the standard cable provided with the headset. The shape of the connectors are designed so that they seal the interfaces from water and are not interchangeable with each other:

Connecting the Data cable to the Link	*Connecting the Data cable to the Glory*
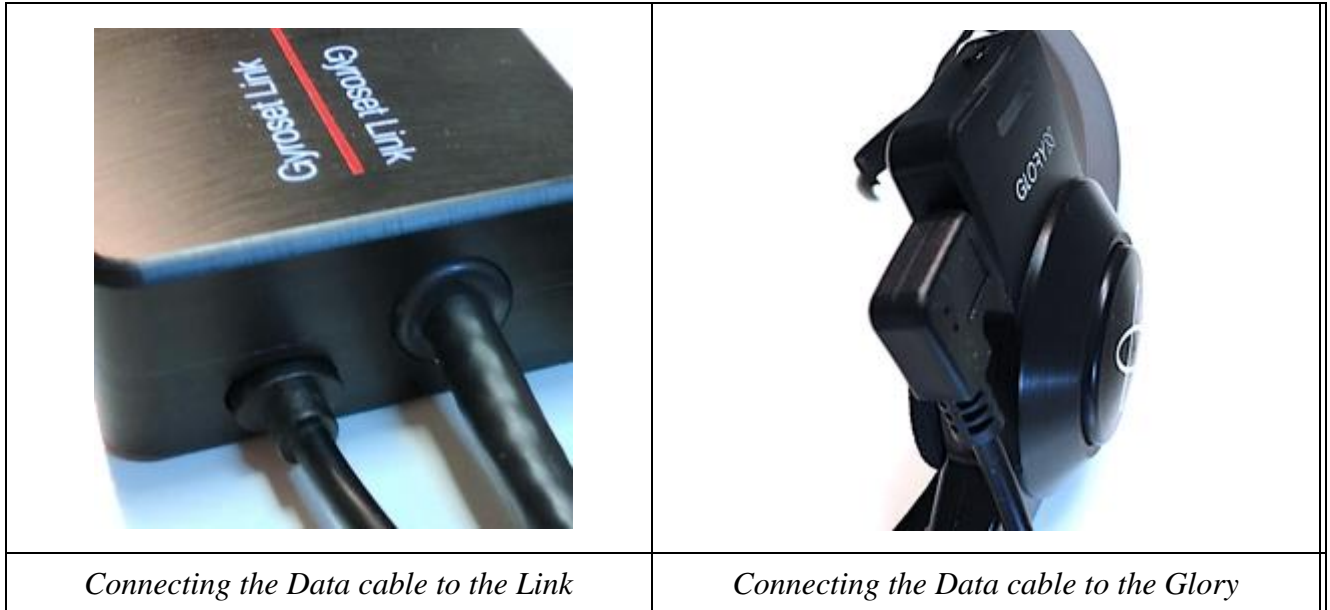
Please make sure that the wiring meets the following criteria:

- The Link must be properly connected to PGDT Omni or IOM:
  - Cable that connects to the wheelchair controller must be secured with screws.
  - Cable that connects to the wheelchair must be tightened to the frame to avoid accidental crushing by the movement of actuators.
  - Cable placement shall not allow accidental crushing if the wheelchair hits an obstacle.
  - The analogue connector should be connected to Omni Port-1 or IOM INPUT only.

In case the D-type connector has become disconnected a screen will appear on the Omni with error code 0905:

Setting up the Omni and the Link

Programming the Omni

For programming the Omni please follow the instructions provided by Penny and Giles Drive Technologies. There are three methods of programming the Omni. Details of the actual programmable parameters are given in the SK78813 Programming chapter. Ensure the R-net Control System's Drive, Acceleration and Deceleration settings are at a comfortable and safe level prior to attempting to program the Omni to suit the user. Refer to the R-net Technical Manual SK77981 or the On-Board Programming Manual SK78571 for details of how to program the R-net Control System. Programming should only be conducted by professionals with in-depth knowledge of PG Drives Technology electronic control systems. Incorrect programming could result in an unsafe set-up of a wheelchair for a user. Now Technologies Ltd. accepts no liability for losses of any kind if these conditions are not met.

Using the R-Net PC programmer to configure Omni, Port 1 SID has to be set to **proportional**. To use the Gesture sensor of the headset to activate menu functions on the Omni, Port 1 User control has to be set to **Menu and Return To Drive**.

For Setup Though Omni's OBP

Omni - Port 1 or 2 - SID - **PRP** (Proportional)

Omni - Controls - Menu Scan Rate - **0** (Zero)

Omni - User Menu - Position - Position 2 - **Blnk** (Blank)

The last setting is to remove the Drive option from the Omni menu, please check the menu first to check if Drive is in position 2 on the menu screen.

WARNING

The Omni can be put to sleep by selecting that option in the User Menu. To awaken the Omni, the following SID sequence is required: Left, Right, Left, Right. Note, this waking method only works if the Omni has been put to sleep via the User Menu. For that to work "Sleep 12V" parameter has to be turned off to allow the Link to operate constantly. For a more safe operation of the chair Now Technologies doesn't recommend the above described scenario, rather please install a separate User button in the reach of the User that can act as an emergency stop as well.

Please make sure that your R-Net configuration meets the following criteria:

- The correct SID port is configured as proportional.
- Sleep 12V parameter is set.
- User control is set.
- Drive, Acceleration and Deceleration settings are at a comfortable and safe level.

Programming the IOM Input/output Module

Input Output Module					
Input Module	Input 1	Input 2	Input 3		
Input Type	Proportional	Proportional	Proportional		
Output Module	Output 3	Output 4	Output 5	Output 6	Output 7

Using the R-Net PC programmer to configure IOM please ensure all Input channels are set to proportional as the above diagram. Also by default the IOM is set to OUTPUT mode and must be physically disassembled and reconfigured. Set the switch inside to 0 for a single IOM Module setup as the diagram below. For setups using more than one IOM Module please check the PGDT manual for the settings.
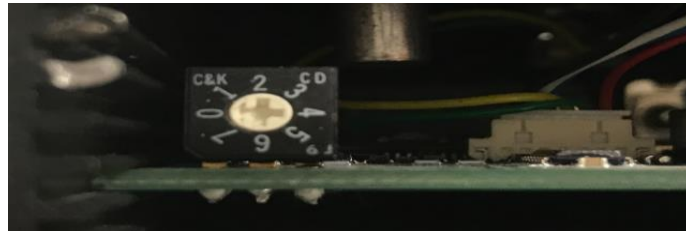
Link configuration

In this document we presume that the user is already familiar with the usage of the GyroSet Glory headset, for detailed instructions on how to use the headset please follow the Headset's User's Manual.
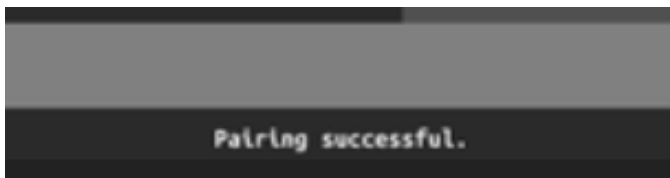
The Link translates the user's head movements into analogue joystick sweeps. For that to function correctly all Link parameters must be set according to the individual user's needs. The configuration of the Link can be achieved through the Glory Tools application - available for all

users - that provides an interactive Help and settings Wizard or through the Link Configuration Tool - available only for distributors - as described below. The headset can measure tilting of the head in the four main directions, forward, backward, left and right and also capable of measuring the turn of the head on all axes. To drive the chair in the safest way we recommend to use tilting of the head to turn the chair as head rotations would otherwise interfere with the movements of just looking around.

Link Configuration Tool

The Link Configuration Tool is provided only for official Gyroset product distributors. (To set the Link through Glory Tools please follow the on screen live instructions of the application.)

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	Please insert Gyroset Dongle to one of the USB ports of the computer. After starting the application please select the correct port from the dropdown list as stated in the upper status bar.

The application detects if the correct port was selected by establishing communication with the dongle. If the port selection was not successful press the restart button at the bottom left on the screen.

On a successful connection to the dongle, the dropdown list disappears and Tremor Filter slider appears. Also the bottom status bar will give guidance on how to proceed.

To lower the risk of involuntary wireless tampering (malicious hacking) with the settings of the Link, the Gyroset Logo has to be touched on the Link for at least 3 seconds. The Logo will turn into red. That means that the device entered into the secure wireless network called "Service Network".

At the same time the text on the bottom status bar will change from "Waiting for Link..." to "Pairing successful".
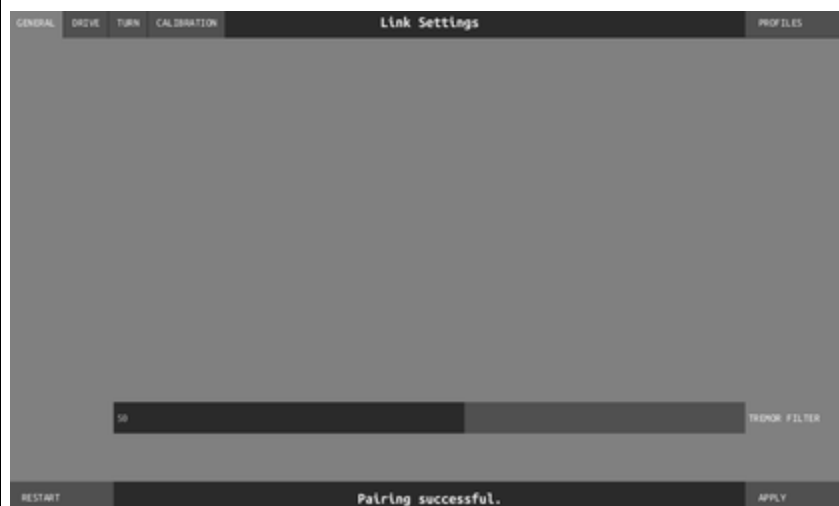
|	
	After the Link enters the Service Network it will initiate handshake with the dongle. On successful pairing the text on the bottom status bar will change accordingly. On the upper left side of the screen there are four tabs for each specific type of settings. The General tab contains a slider for adjusting the tremor filter. Tremor filter: 0% no filtering, 100% maximum amount of filtering.
	The Drive tab contains an animation on the left side showing how the head movement is going to be translated into the movement of the chair. Please ensure that before editing any of the settings that the that the message at the bottom of the screen reads "Configuration Downloaded" and not "Command sent. No Response" If it reads "Command sent. No Response" continually click on the tab of the of the desired setting you wish to edit until the message at the bottom of the screen reads "Configuration Downloaded
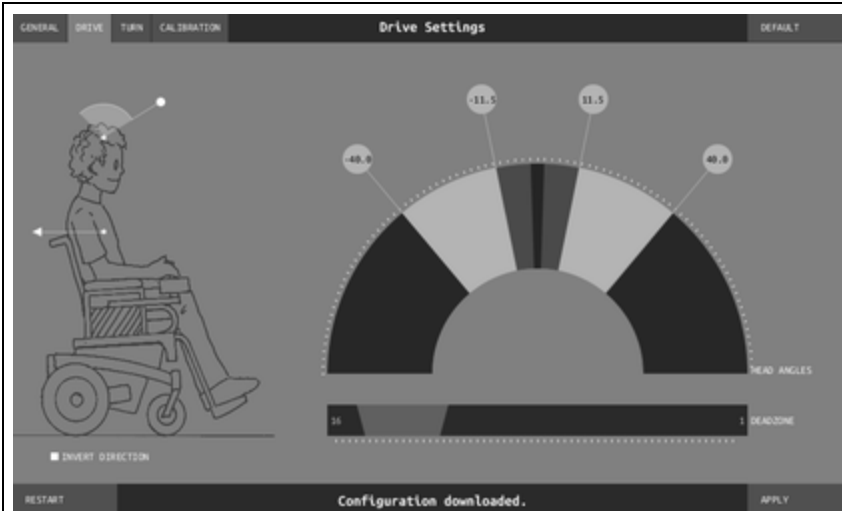
Direction can be inverted by clicking on the checkbox. Animation is going to show that by turning the head forward the chair will move backwards.

To adjust the safety angle limit of the backward direction just drag the circle attached to the angle display.

If a property is selected it will change it's colour accordingly.

If the user's head fall below a certain angle the chair will stop. Safety angle limit tells the Link which angle to use as limit for these safety feature.
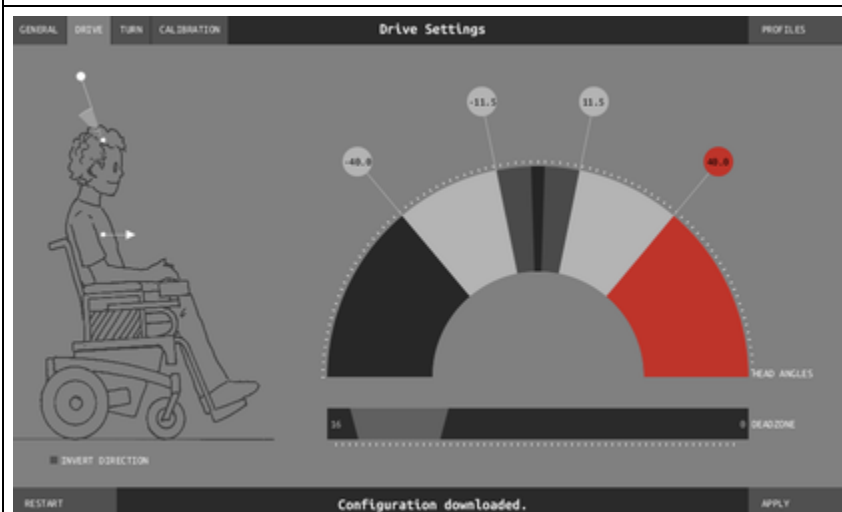
All properties can be set for all four directions individually. Forward angle limit has the same function as backward safety limit, only for the forward direction.
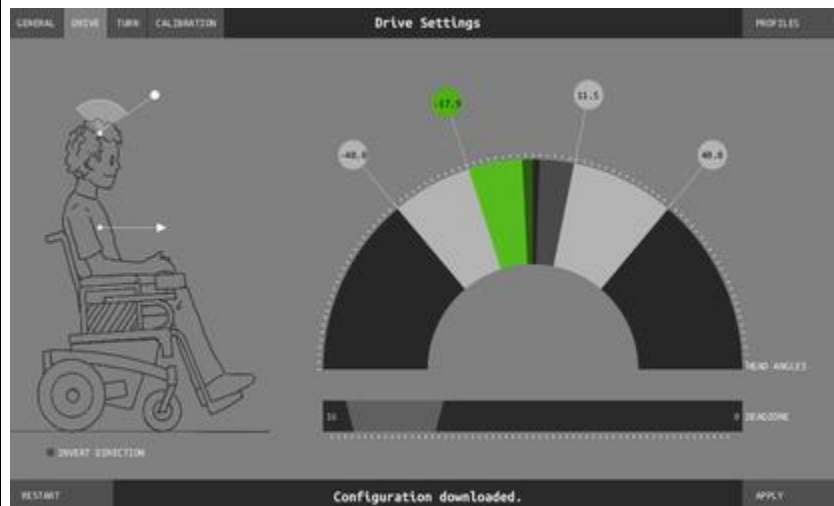
Setting the backward head angle will tell the Link how to map the full reverse joystick sweep to the users head angle. Setting this value small will result very sensitive operation hence reaching full reverse on a very small head movement.

The optimal setting depends on the capabilities of the user, please make sure that the user is satisfied with the outcome.

Parameters can be adjusted online, while the chair is fully stopped. To try out certain settings the headset must be connected to the "Service Network" as well, or connected via Data cable to the Link.

To a setting to make an effect Apply button has to be pressed in the bottom right corner of the screen.

Set the forward head angle, that is tied to full forward joystick sweep.
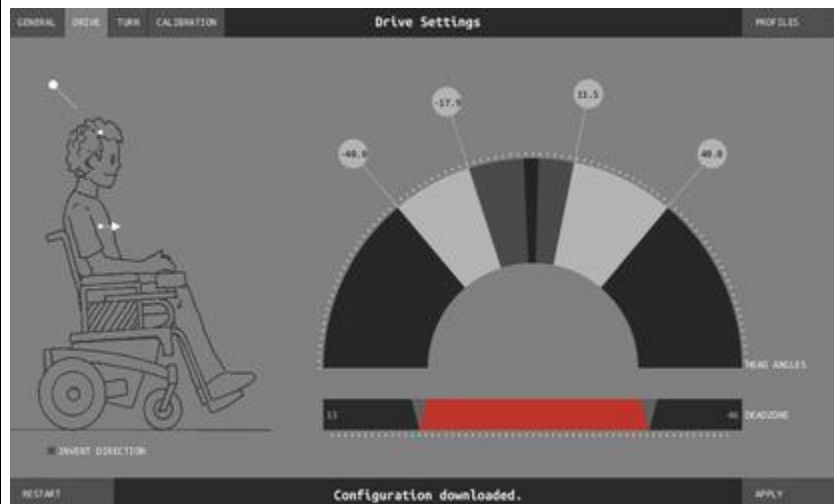
Just as with a joystick, the Link can be parameterised to have a range of movement where no output is generated. This head angle range is called the dead-zone.

The Link utilises a so called "Dynamic Dead-zone" mapping that can be set under the angle display dome with a range slider called "deadzone".

The Link Configuration Tool will calculate automatically the precise angles and show the results on the angle display. The dark range in the middle of the operation range represents the angles of the dead-zone.

The left triangle on the slider marks the percentage of the dead-zone when a chair is at full stop - this is called the slow dead-zone.

The right triangle is tied to the amount of dead-zone when the joystick sweep is at the maximum - this is called the fast dead-zone.

The slow and fast dead-zone parameters can be set the the same value resulting normal static dead-zone mapping.

It is recommended to set the fast dead-zone value slightly higher than the slow

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	to achieve more stable maneuverability thus at higher wheelchair speeds the Link won't react to turn commands so sensitively as for lower speeds.
	Setting the turn parameters is just as easy as setting the drive parameters. Note: if one of the angles is set to 0 degrees as shown on the image the chair is not going to move in that direction at all.

On the top right corner of the screen there is an always available dropdown menu called "Profiles".

If the settings got messed up during the adjustment process there are three pre-programmed fallback options to choose from. Clicking on one of the items will affect all three settings tab contents immediately.

Default profile settings are usually a good start for users with unlimited healthy head movements.

Limited profile settings are a good start for users with limited head movement.

Tremor profile settings are a good start for users with more frequent or bigger than usual involuntary movements.
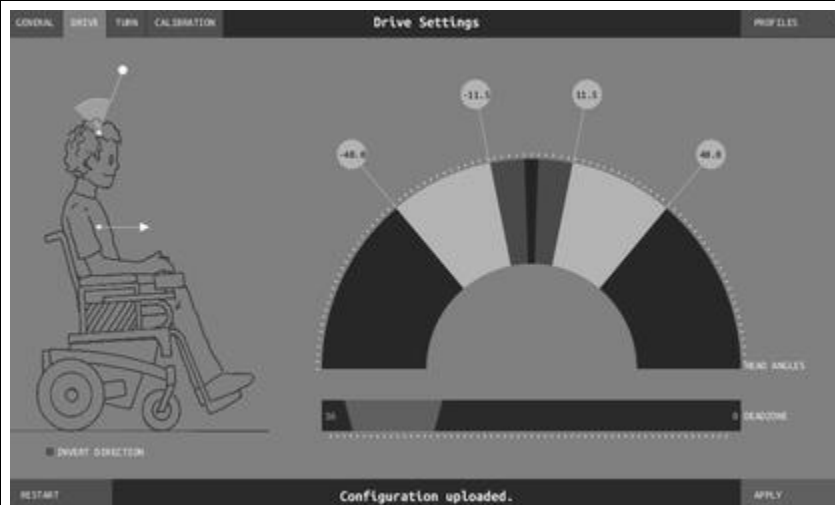
To have the Link save any of the parameters adjusted just press Apply button on the bottom right corner of the screen.

On a successful store event the bottom status bar will display "Configuration uploaded."

It is also possible that the Link wasn't able to receive the instructions of the Configuration Tool due to an intermittent radio interference or if the Link has been turned off.

In that case the bottom status bar will display: "Configuration sent. No response."

If the Link is powered on press the Apply button again, otherwise turn the Link on.

Using the Gyroset

Preparations:

1. Find a comfortable seating position for the user and adjust the headrest so that is always in the reach with the headset's mode button. It is recommended that there is a distance of 3-5 cm between the headset's button and the headrest.
2. Turn on the headset, and place it on the user's head, adjust the gesture sensor's flexible tube as described in Headset User's Manual. The sensor should be placed approximately 1 cm from the movable part of the user's face (corner of the eye, cheek, corner of the mouth etc.)
3. Turn on the Omni or IOM Module
4. Select drive mode on the headset by a long press on the Rear Button.

Omni Driving

To drive the wheelchair, simply active the Glory Headset by doing a short tap of the Rear Button while the OMNI is in the home screen.

Immediately after you have done a short tap of the Rear Button and activated the Glory Headset you will hear a beep countdown.

During this countdown you must ideally keep your head in a straight upright position with your chin slightly raised, please hold this position until the countdown has finished as this will be your home/zero position, which means the wheelchair will stop and the brakes will be applied when your head returns back to this position. (the home/zero position countdown calibration will take place every time the Glory Headset is activated)

Once the countdown is completed your head is now the live joystick, to drive simply tilt your head in the direction you want to go in and to stop, just return your head back to the home/zero position.

To stop driving completely, deactivate the Glory Headset with another short press of the Rear Button…. just the same as you did to activate drive.

OMNI Menu Screen

To enter the OMNI menu screen from the home screen is done by a single wince to the Gesture Sensor. (the Gesture sensor will only work when the Glory Headset is deactivated)
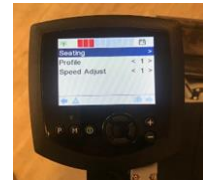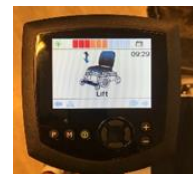
Once you are in the OMNI menu screen, in order to navigate through the menu, you must activate the Glory Headset in exactly the same procedure as explained in Omni Driving.

Once activated, tilt your head forwards and backwards to go up and down the menu until you have reached the desired option.

The directions for the options are as follows;

Seating- Tilt your head sideways to select the desired axis, then tilt your head forwards and backwards to move the actuator.

Profile- Tilt your head right to go up through the profiles and tilt your head left to go down.

Speed Adjust- Tilt your head right to increase the speed and tilt your head left to decrease the speed.

When you have finished in the OMNI menu, simply deactivate the Glory Headset in exactly the same procedure as explained in Omni Driving, then a single wince to the Gesture Sensor will return you back to the OMNI home screen.

IOM Driving / Profile

Before driving the wheelchair, you must first select your desired profile. This is done by wincing into the *Gesture Sensor, each single wince will ascend you up through the profile numbers eventually returning you back to your first profile.

Once the R-Net Controller is in your desired profile, to drive the wheelchair, simply activate the Glory Headset by doing a short tap of the Rear Button.

Immediately after you have done a short tap of the Rear Button and activated the Glory Headset you will hear a beep countdown.

During this countdown you must ideally keep your head in a straight upright position with your chin slightly raised, please hold this position until the countdown has finished as this will be your home/zero position, which means the wheelchair will stop and the brakes will be applied when you return your head back to this position. (the home/zero position countdown calibration will take place every time the Glory Headset is activated)

Once the countdown is completed your head is now the live joystick, to drive simply tilt your head in the direction you want to go in and to stop, just return your head back to the home/zero position.

To stop driving completely, deactivate the Glory Headset with another short tap of the Rear Button…. just the same as you did to activate drive.

IOM Seating

To enter the seating menu, simply wince into the *Gesture Sensor as explained in IOM Driving / Profile and navigate up through the profiles until you get to seating.

To navigate through the seating menu, you must activate the Glory Headset in the same procedure as explained in IOM Driving / Profile.

When the Glory Headset is activated in the seating menu, simply tilt your head sideways to select the desired axis, then tilt your head forwards and backwards to move the actuator.
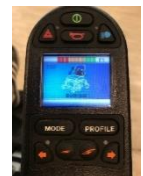
When you have finished in the Seating menu, simply deactivate the Glory Headset with a short tap to the Rear Button. Once the Glory Headset is deactivated, please re-select your desired profile again before driving.

*(The Gesture Sensor will only work when the Glory Headset is deactivated)

Please make sure that the following criteria are met before trying to drive the wheelchair with the Link:

- Understanding of the intended use of the headset: Headset User's Manual
- The adjustment of the headrest:
  - The User must be able to reach the headrest with the headset's mode button at any times.
- Inertial sensors of the headset must be calibrated with Glory Tools
- Inertial sensors of the Link must be calibrated with Glory Tools / Link Configuration Tool
- Intended direction of movement must be set with Glory Tools / Link Configuration Tool
- Range of head movement must be set with Glory Tools / Link Configuration Tool
- Faint detection threshold must be set out of operation range with Glory Tools / Link Configuration Tool
- Tremor filter must be set with Glory Tools / Link Configuration Tool
- Click sensor functions and parameters must be set with Glory Tools.
  - Click sensor long press maximal timeout must be set with Glory Tools.
- Centre mode and parameters must be set with Glory Tools:
  - If the centre mode is on a countdown, timeout has to be set.
- The maximum speed, acceleration, deceleration of the head drive profile of the wheelchair controller must be adjusted:
  - Settings of the PGDT controller must be administered by PGDT trained and authorised personnel.
  - Acceleration and deceleration of the wheelchair shall not cause an inertia on the users head that the user cannot compensate.
  - Maximum speed must be always in correlation with the local regulations.
- The Link shall be paired with the Users Personal Area Network.
- User password of the Personal Area Network must be changed frequently.
  - The password must be chosen carefully, it should contain lower and upper case letters, symbols and numbers.
  - The password must be minimum 8, ideally 16 characters long.
- Service network must be used only for the time when changes are made to the personal drive profile.
  - The wheelchair can be driven in Service mode to allow fine tuning of the parameters but Service mode shall not be used for regular drive.
  - User network protected with users unique password is more safe and doesn't allow parameter settings online.
- The user should avoid:
  - Environments with extreme radio interference when controlling the Link with the headset wirelessly.
  - Environments of extreme magnetic fields, such as MRI because these can damage the onboard sensors.
- The user shall be aware:
  - The usage of the headset's mode button.
  - That the Link must be selected for control with the headset.
  - The mode of centre detection.

- If the mode is on a countdown, the user shall be motionless in a neutral position after activating the drive function.
  - That the headset acts as a joystick on the R-Net:
    - By programming the wheelchair controller, various functions can be tied to "fifth button" presses.
      - When fifth button's long press timeout is set smaller on the R-Net than on the Link the click sensor can turn off the chair but the user won't be able to turn it back that way.
      - When fifth button function is programmed so that the User can access menus the headset will navigate.
      - When fifth button function is programmed so that the User can control actuators the headset will control.
        - If the Link is mounted to a part that stays in level when the backrest is tilting it won't be able to compensate the change.
          - The Link measures the head orientation relative to the Link.
          - Tilting of the backrest will cause a change in the orientation of the User's head and will have a feedback effect on the actuator.
  - After the drive mode is initiated a distinguishable audible feedback can be heard.
    - The chair will move according to the head movements and the profile settings of the Link and the R-Net controller.
    - The chair will move as long as the function is deactivated or failure detected.
  - That unpredictable changes in the environment can cause the sensors to drift and change the behaviour of the chair.
    - If the centre of the head joystick is off when driving the user shall stop and reinitiate drive.
  - That depletion of the headset's battery will cause the chair to stop.
    - A distinguishable audible feedback is given when the charge reaches 30% of the headset's battery.
    - The headset's battery must be charged on a daily basis.
  - The falling of the headset will cause the chair to stop.
  - The falling of the Link will cause the chair to stop.
  - If the Users head reaches the end of the range of operation the sweep of the head joystick is at maximum.
  - If the Users head reaches the safety zone the chair will stop.
  - If the Users head is in the range of the dead zone the chair won't move or will stop.
  - If the headset is in a forbidden orientation it will deactivate the function or won't activate the function:
    - If the angle of headsets basis to the ground is more than 90 degrees in any direction it will detect forbidden orientation.
    - Upside-down corresponds to 180 degrees that is larger than 90 degrees.

- If the headset measures accelerations bigger than 1g it will deactivate the function.
  - Inertia that can not be compensated by healthy neck muscles will cause the chair to stop.

Appendix

Colour codes of the status LED (Gyroset Logo):

Colour	Blinks	Status
None	no	The device is turned off or in sleep.
Blue	no	Connection to the headset established.
Green	no	The headset is actively controlling the drive function.
Red	no	Link is in Service Mode
Red	yes	System halted due to an error. Driving is stopped.

Audible feedback

Sound	Description	Meaning
.-	one short low sound followed by a longer high pitch sound	Headset connected
.-	one short high sound followed by a lower pitch sound	Headset disconnected
...--	min. 1 to 5 lower beeps followed by a longer higher pitch sound	Drive initialisation countdown and drive control started
. . .	short bursts of very high pitch sounds	System halted

Software update

Currently there is no possibility for the end-user nor the distributor to update the firmware. To update the software on the Gyroset Link the device has to be disassembled and reprogrammed by one of our authorised partners.

WARNING

The microcontroller is protecting the firmware with built in hardware fuses, any attempt on reading or modifying the content of the flash will fail. All user related variables are encrypted, any attempt on gaining access to secure data will erase the chip content.