dynamic™

SHARK

NO COMPROMISE

SHARK DK-PMA, DK-PMB & DK-PMC Series Power Modules

Installation Manual

GBK80262 Issue 7, August 2014

About this Manual

This manual has been designed to help you install and configure a Dynamic Controls (DYNAMIC) SHARK powerchair control system for a 'generic' brand powerchair. It describes the general principles, but it gives no guidelines for specific applications. If there is a specific requirement for your application, please contact Dynamic Controls or one of the sales and service agents to assist you.

This manual must be read together with all other relevant SHARK Module manuals, as well as all applicable DYNAMIC Technical Service Bulletins (TSBs), application notes and service instructions.

In this manual, a few symbols will help you identify the purpose of the paragraph that follows:

Notes & Precautions:

Notes provide supporting information in order to install, configure, and use the product. Not following the instructions given in notes or precautions can lead to equipment failure.

Warnings:

*Warnings provide important information that **must** be followed in order to install, configure, and use the product safely and efficiently. Not following the instructions given in a warning can potentially lead to equipment failure, damage to surrounding property, injury or death.*

*The term **'programming'** used throughout this manual refers to adjusting parameters and configuring options to suit an application. 'Programming' does not change or alter any software within the controller and is performed using a controlled programming tool available only to authorised personnel.*

SHARK is not user serviceable. Specialized tools are necessary for the repair of any SHARK component.

Do not install, maintain or operate this equipment without reading, understanding and following this manual – including the Safety and Misuse Warnings – otherwise injury or damage may result. This manual contains integration, set-up, operating environment, test and maintenance information needed in order to ensure reliable and safe use of the product.

Due to continuous product improvement DYNAMIC reserves the right to update this manual. This manual supersedes all previous issues, which must no longer be used.

DYNAMIC reserves the right to change the product without notification.

Any attempt to gain access to or in any way abuse the electronic components and associated assemblies that make up the powerchair system renders the manufacturer's warranty void and the manufacturer free from liability.

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1 Introduction to SHARK

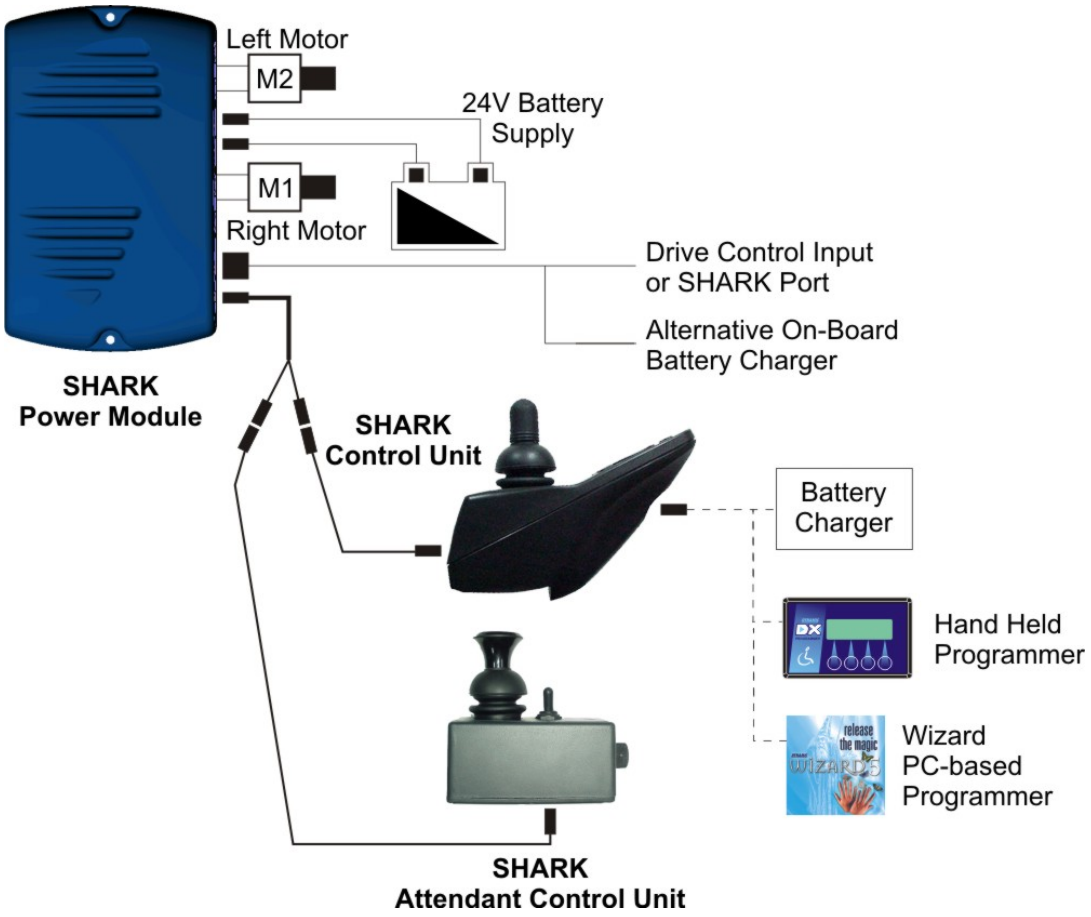
SHARK is a low cost powerchair control solution using a dedicated power module and remote, which has none of the compromises that go into the design of one-box controllers. This means more power, unrivalled ergonomics, greater versatility and superior usability.

- SHARK features DYNAMIC's breakthrough "*Chair Tamer*" technology, providing unprecedented chair performance, control and safety.
- A number of remotes are available to meet a wide range of user needs.
- A choice of power modules offers basic 'drive only' functionality up through modules supporting multiple seat adjustments, lights, etc.
- No heavy power cables running from the armrest to the motors and batteries.
- No hot surfaces for the user to touch.
- A longer and higher current delivery than equivalently rated integral controllers.
- Superior EMC performance due to minimized power wiring.

Note
The SHARK system has been designed to allow wheelchairs in combination with controllers and applicable accessories to comply with national and international performance and safety requirements such as ISO7176, EN12184, and ANSI/RESNA WC-2 wheelchair standards.

It is highly recommended the OEM manufacturers verify that their product complies with the relevant standards for the market into which their vehicle is sold.

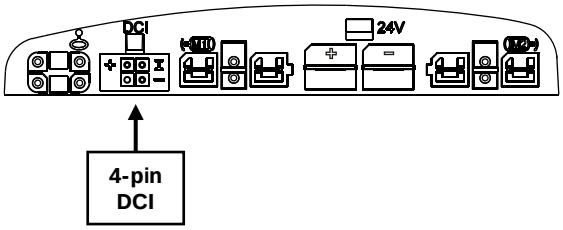
1.1 The SHARK system



1.2 The SHARK Power Module

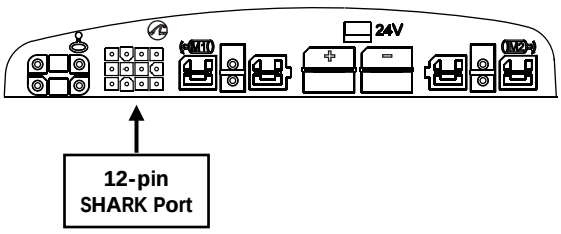
- Up to 90 A of power for optimal chair driving performance.
- Optional Lighting and up to 2 seating functions available.
- Chair stability technology optimizes Mid and Front Wheel Drive chair performance.
- DCI function that enables Shark to control seat swivel, stop and slow down features.
- Direct On-Board Battery Charger connection.

SHARK Power Module variants



Drive-only variants

DK-PMB40	*40 A*
DK-PMB50	*50 A*
DK-PMB60	*60 A*
DK-PMA01	*60 A (Obsolete)*
DK-PMB01	*60 A + 15 A Boost*
DK-PMC01	75 A + 15 A Boost



Lighting and/or Seating variants

DK-PMB60AL	60 A *2 Seat Functions + Lights*
DK-PMB11	*60 A + 15 A Boost* *1 Seat Function*
DK-PMB21	*60 A + 15 A Boost* *2 Seat Functions + Lights*
DK-PMB31	*60 A + 15 A Boost* *Lights*
DK-PMC21	*75 A + 15 A Boost* *2 Seat Functions + Lights*

Wizard will auto-detect the appropriate settings for your power module and show the appropriate parameters for your unit.

This manual should be read in conjunction with other associated installation manuals. Refer to Section 7.1 for a list of Installation Manuals and their part numbers.

2 Specifications

2.1 Electrical Specifications

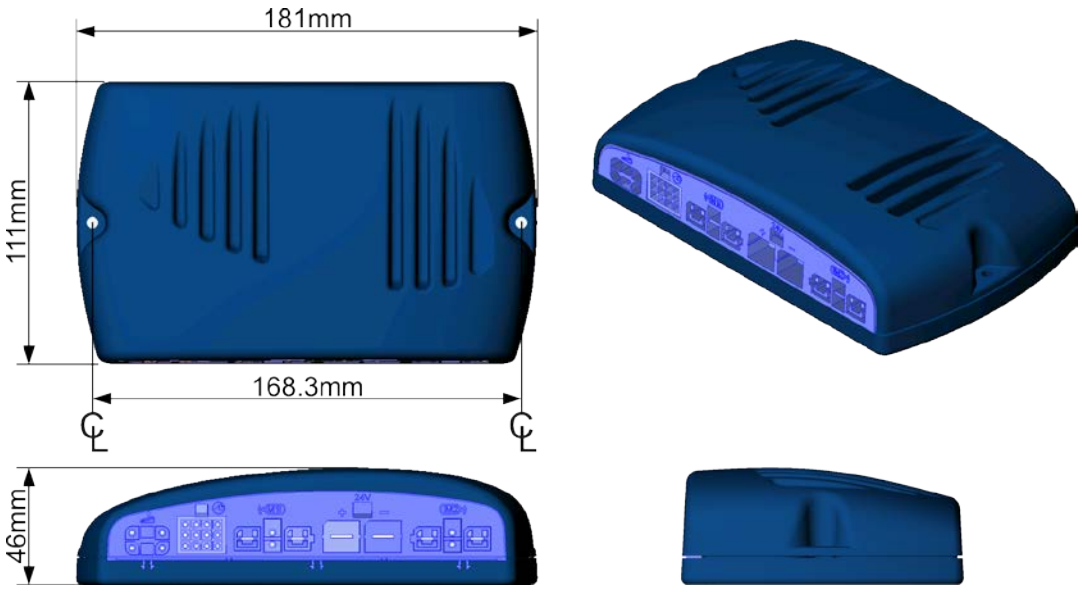
Parameter	Description			
Compatible Battery Supply	24V supply, 2 x 12V in series, circuit breaker protected, lead-acid type of recommended minimum capacity 20 Ah.			
Compatible Motor	24V DC permanent magnet type, typically rated 100-300 W.			
Compatible Park Brake	Either 2 x 24V connected in parallel or 2 x 12V connected in series.			
	Min	**Nominal**	**Max**	**Units**
SHARK Operating Voltage (V_{batt})	18	24	32	V
Reverse Supply Voltage	-32			V
Continuous current (@ 20°C ambient)				
• DK-PMA • DK-PMB • DK-PMC	13 16 18	15 18 20		A A A
Peak current (<60 sec @ 20°C initial)				
• DK-PMB40 • DK-PMB50 • DK-PMA, DK-PMB (other than 40/50) • DK-PMC	35 45 55 70	40 50 60 75	43 53 63 78	A A A A
Boost current (< 10 sec on top of peak current)				
• DK-PMB (not 40/50/60/60AL) • DK-PMC	0		15	A
SHARK Park Brake Output				
• Voltage	V_{batt} – 1.2		V_{batt}	V
• Current	0.6	0.7		A
Quiescent Current (idle)		120	150	mA

	Min	Nominal	Max	Units
Drive Control Input				
• Short Circuit Output Current	8		15	mA
• Maximum Input Voltage Range	0		50	V
SHARK Communications Bus				
• SBHi, SBLo Voltage Range	0		38	V
• Max Output Current (SBB+)		8	12 (RMS)	A
Controller Battery Charger Max Current		8	12 (RMS)	A
Power Module OBC Max Current			5 (RMS)	A
Seat 1 / 2 Current (60 second rating, programmable)	0	6	12	A
Seat 1 / 2 Output Voltage (with Seat X Speed set to 100 %, proportional)		Battery Voltage - 1.0V		V
Nominal Left/Right/Head Light Bulb Voltage		24		V
Lighting Circuit Supply Voltage (Shark Port Pins 3 + 12)		Battery Voltage – 1.0V		V
Lighting Circuit Supply Current (Shark Port Pins 3 + 12)			8	A
Headlight Output Current Rating		3		A
Left/Right Indicator Output Current Rating		3		A

2.2 Physical Specifications

Parameter	
Material	Die cast Aluminium
Finish	Powder coated “Rolling Thunder” (Charcoal/Silver)
Protection Rating	IPx4
Shipping Weight	960g

	Min	Nominal	Max	Units
Operating Temperature Range	-25		50	°C
Operating Temperature Range – SHARK Programming Adaptor	0		50	°C
Storage Temperature Range	-40		65	°C
Operating Humidity Range	0		90	%RH



Warning:

To achieve the specified IPx4 rating, do not mount the Power Module with the connectors facing upward. If necessary, add a water shielding cover to protect the Power Module from water entry as appropriate to the environment that the chair will be used in.

3 Installation

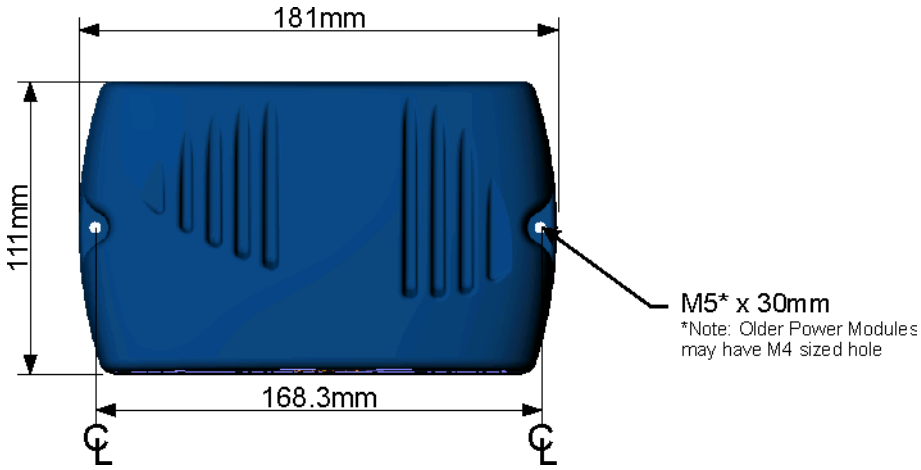
3.1 Installation Procedure

- First read and understand all applicable SHARK installation manuals.
- Mount all the electrical parts of the powerchair setup (motors, park brakes, batteries, Power Module, Remote) on the powerchair. See the mounting section (3.2) for the physical dimensions of the SHARK Power Module and mounting recommendations.
- Do not connect any cables before all the parts of the electrical system are mounted.
- Connect the SHARK Power Module to the motors (see section 3.3.6), the park brakes (see section 3.3.7) and the Remote.
- Connect the SHARK Power Module to the batteries (see section 3.3.4). Do not turn on the powerchair yet.
- Connect the SHARK Power Module to the remote. Do not turn on the powerchair yet.
- Lift the powerchair off the ground and check the installation thoroughly.
- Program the system to the requirements of a particular powerchair or user (see chapter 4).
- Test the system for functionality and safety (see chapter 5).

Warning:

Do not connect the '+' terminal of the battery to the SHARK Power Module until the powerchair is completely wired and ready for testing as described in the Testing section (5.2).

3.2 Mounting



- The position and orientation should give maximum mechanical protection to the SHARK Power Module.
- Mount out of the path of water splashes from wheels or cowling.
- Protect the front (connector panel) from direct splashing.
- Failure to adhere to the mounting orientations specified might lead to water ingress, which could result in system malfunctions and long-term damage to the unit.
- For peak performance, locate SHARK so that air can flow over and around the case.
- A position close to the batteries and motor is recommended to reduce the length of high-current wires.
- Use both screw positions to attach the SHARK Power Module. M5 x 30mm socket cap screws are recommended. Early Power Modules recommended M4 (11/64") screws.

Regardless of mounting orientation, protect powerchair wiring and connectors from the risk of damage, water splashes and/or water ingress, and route the cabling so that water will not run down into the connector system. The use of cable boots is highly recommended.

Do not mount the SHARK Power Module in a position where the user can come into contact with the unit. The case temperature can exceed 41°C.

3.3 Connections and Wiring

SHARK Power Module connections are located along the front panel of the case.

3.3.1 General Wiring Notes and Recommendations

The following notes apply to all wiring on the powerchair. Notes specific to particular component wiring can be found under each component's designated sub-section (i.e. battery connections). It is the installer's responsibility to ensure the finished wiring package is safe and fit for purpose.

- All wiring should comply with the requirements of ISO7176-14.
- Before making any connections to the controller, disable the powerchair to prevent accidental movement.
- To disable the powerchair, either place the battery charger circuit breaker in the open position, or disconnect the motor or batteries and/or elevate the drive wheels.
- Keep all cables as short as possible.
- Try to run wires in pairs or bunches.
- Avoid wire loops, especially loops of single wires instead of wire pairs.
- Do not route the motor cables near the motor case, where possible.
- Fasten cables to the powerchair frame to prevent strain on the connectors.
- Do not leave electrical connections unnecessarily exposed.
- Make sure that all vehicle sub-frames are electrically connected.
- For adequate ESD protection, make sure that the outer case of the Power Module is electrically connected to the vehicle sub-frame.
- Do not use the vehicle frame as the earth return. Any electrical low-resistance connection to the frame is a safety risk and is not allowed by international safety standards.
- To minimise electromagnetic emissions by the motor brushes, it may be necessary to fit capacitors between the brush holders and the motor case. Make sure that the leads are kept as short as possible. A suitable capacitor is 4n7, 250V Polypropylene.
- The type of cable used must be appropriate for the mechanical and environmental abuse it is likely to encounter. For low-current signals, do not use wire sizes smaller than 0.5 mm^2/AWG20, because smaller wires are physically not strong enough for this application.
- For best electrical performance, the wire size must be as large as possible. Generally, the larger the wire size, the better the powerchair performance will be.
- Do not use damaged or abused cables. A damaged cable can potentially produce localised heat, sparks or arcing and as such, it can cause a fire.
- Protect all cables against possible contact with flammable material.

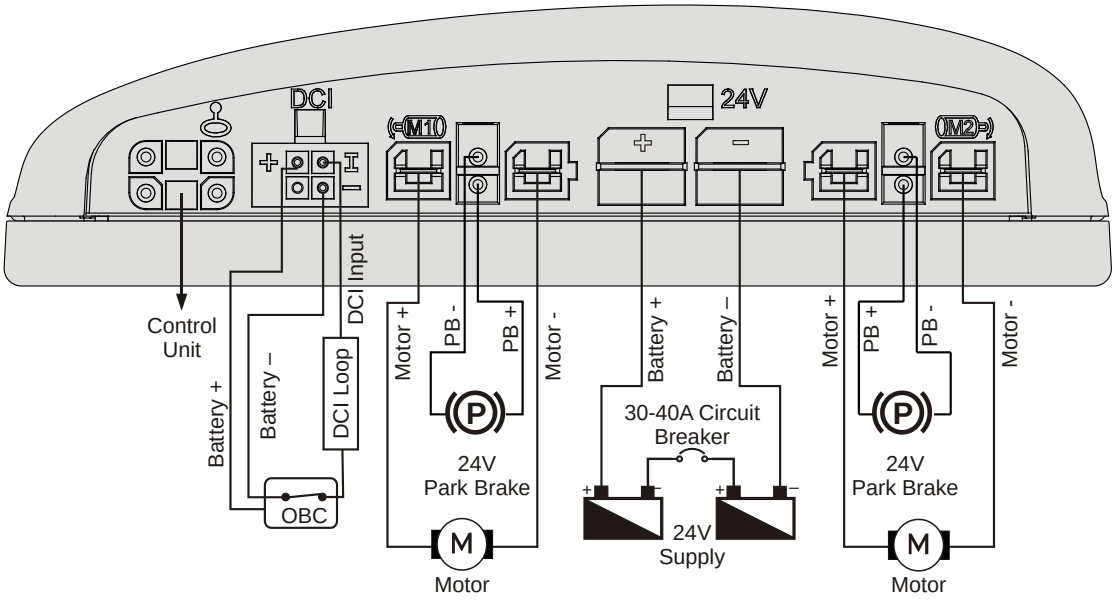
Warnings:

1. *Route the cables and fasten all powerchair components in a position so that the cables, the connectors and the connector sockets do not allow water entry or suffer from physical strain, abuse or damage, like cutting or crushing. Take particular care on powerchairs with movable structures such as seat raise, tilt, recline, or chairs with swing-away arms. Make sure that the cables do not extend from the powerchair so that they cannot be caught or damaged by external objects.*

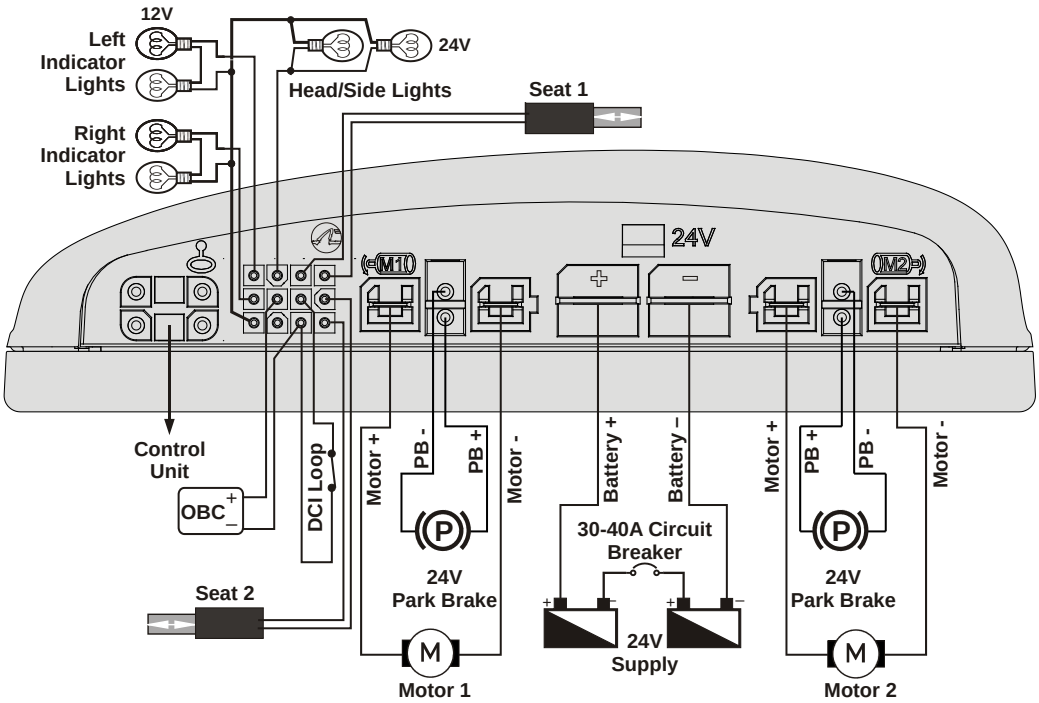
2. *The user maintenance schedule and the service instructions of the powerchair must include the appropriate inspection and maintenance requirements for the connectors and the cables.*

3.3.2 Typical Cabling Installation

Wiring Diagram - Drive-only variants



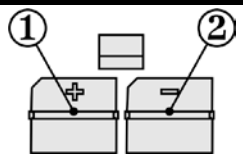
Wiring Diagram - Lighting & Actuator variants



Refer to Section 3.3.9.4 for SHARK TÜV Compliant Lighting Installation.

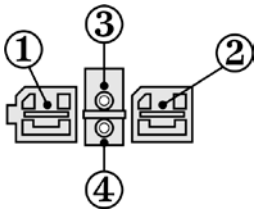
3.3.3 Connector pin-outs

Battery Connector



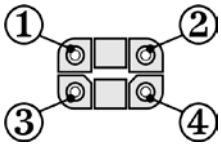
Pin	Function
1	Battery Positive
2	Battery Negative

Motor Connector



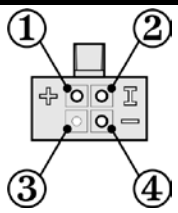
Pin	Function
1	Motor Positive
2	Motor Negative
3	Park Brake Negative
4	Park Brake Positive

SHARK Bus Connector



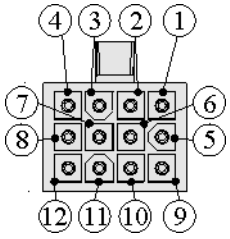
Pin	Function
1	Battery Positive
2	SHARK Communications BUS High
3	SHARK Communications BUS Low
4	Battery Negative

Drive Control Input (DCI) Connector (Drive-only variants)



Pin	Function
1	Battery Positive
2	DCI Input
3	Inhibit or No Connection
4	Battery Negative

SHARK Port Connector (Actuator/Lighting variants)



Pin	Function
1	Actuator 1 (-)
2	Actuator 1 (+)
3	Head/Side Light Indicator (-)
4	Left Light Indicator (-)
5	Actuator 2 (-)
6	Drive Control Input
7	Battery (+)
8	Right Light Indicator (-)
9	Actuator 2 (+)
10	Battery (-)
11	Inhibit
12	Lighting Supply (+)

3.3.4 Battery Connections

The Battery connector has two terminals: Battery Positive (+) and Battery Negative (-).

MAX Current	MIN Wire Size	MAX Length	Note:
40 A, 50 A, 60 A	6 mm²	800 mm	Increase 1.0 mm² for each additional 400 mm run length
75 A, 90 A	6 mm² with 60 A breaker 8 mm² with 70/75 A breaker	400 mm	

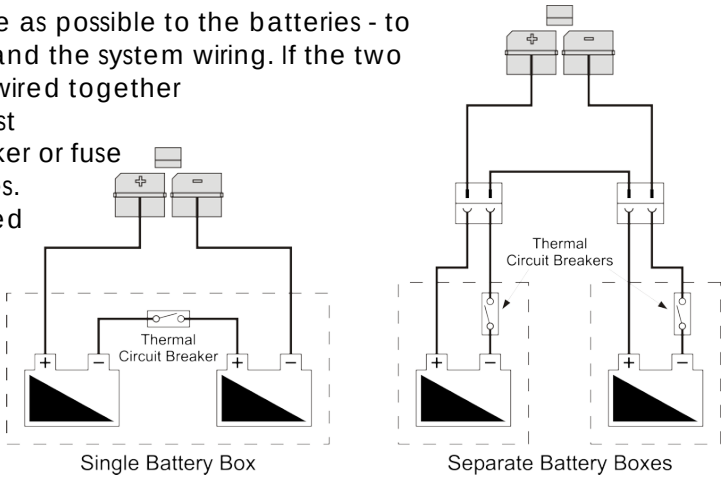
Battery leads should be as short as possible. The heavier the wire, the better chair performance will be, particularly for controllers which feature current "boost".

***Note**:*

The final connection to the Battery Positive (+) terminal should not be made until the wheelchair is completely wired and ready for testing as described in the Testing section.

SHARK has been designed to perform optimally with either absorbed glass mat or Gel Cell 24 V deep cycle, lead-acid batteries, rated between 20 - 120 Ah.

A thermal circuit breaker or fuse must be installed between the batteries and the Power Module - as close as possible to the batteries - to protect both the batteries and the system wiring. If the two batteries are permanently wired together (single battery box), the best position for the circuit breaker or fuse is between the two batteries. If the batteries are separated (individual battery boxes), each battery requires a circuit breaker or fuse.



Single Battery Box Separate Battery Boxes

***Note**:*

A fuse may need a higher current rating than a typical thermal breaker. This may in turn require larger battery wiring.

Warning:

A 30-40 A slow-acting, thermal type circuit breaker is suggested for the PMA and PMB series. For the PMC series, a circuit breaker of 55 – 70 A is suggested. The thermal circuit breaker should have a trip rating no higher than the current limit of the Power Module.

The above suggestions are only a guideline. Check thoroughly to make sure that the circuit breaker provides adequate protection for the complete system, including wiring, motors and batteries.

3.3.5 Battery Charger Connections

Batteries may be charged either using an off board charger plugged as required into the charging socket mounted on the SHARK Remote, or an On Board Charger (OBC) permanently connected to the Shark Port as described in Section 3.3.9.2.

The wheelchair manufacturer should comply with the requirements of ISO7176, Part 25 regarding batteries and chargers.

***Note**:*

The charger socket on the Remote is to be used exclusively for the intended purpose. Warranty will be voided if any unauthorised device is connected to this port.

3.3.6 Motor Connections

The SHARK Power Module has two motor connectors – M1 and M2. Each motor connector has two motor pins (Positive and Negative), as well as two Park Brake pins (Positive and Negative). The motor connectors are optionally 'keyed' so they cannot be swapped or inserted incorrectly.

MAX Current	MIN Wire Size	MAX Length	Note:
40 A	2.5 mm^2	400 mm	a) Increase 0.5 mm^2 for each additional 200 mm run length b) The recommended motor contacts (GCN 1781) will crimp wires in the range 3 – 6 mm^2 (12 – 10 AWG) c) If using 2.5 mm^2 (13 AWG) wire, double over the wire in the crimp contact to ensure a good crimp.
50 A, 60 A	3 mm^2	400 mm	Increase 0.5 mm^2 for each additional 200 mm run length
75 A	4 mm^2	800 mm	Motor leads should be of equal length
90 A	6 mm^2	800 mm	Motor leads should be of equal length

Motor leads should be as short as possible. The heavier the wire, the better chair performance will be, particularly for controllers which feature current "boost"

These notes are in addition to the "General Wiring Notes and Recommendations" described in Section 3.3.1.

1. M1 is typically connected to the left motor, and M2 to the right motor.
   To swap the left and right motor connection, set **Motor Swap** (4.2.5.6) to 'Yes'.

2. It is preferred that the left and right motor harnesses – M1 and M2 – are of equal length.

3. The length and gauge of wire effects the wire resistance and consequently the optimum Load Compensation setting. Load Compensation compensates for the

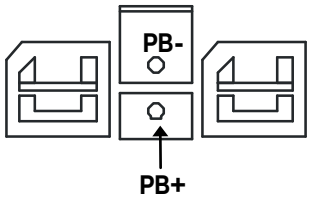
resistance of the motor + the resistance of the motor wiring. If the motor wiring is changed, make sure that the chair still drives safely using the tests that are described in the **Load Compensation** section 4.2.2.12.

4. Left and right motors must not be physically interchangeable. The preferred method to ensure this is to use the polarised motor connectors. However alternative methods to prevent transposing the motor wiring can be used, such as cable tying the wiring in a suitable position.

If necessary, the motor connections can be swapped when programming SHARK. For this reason, the connectors are not labelled Left and Right, but M1 and M2.

3.3.7 Park brake connections

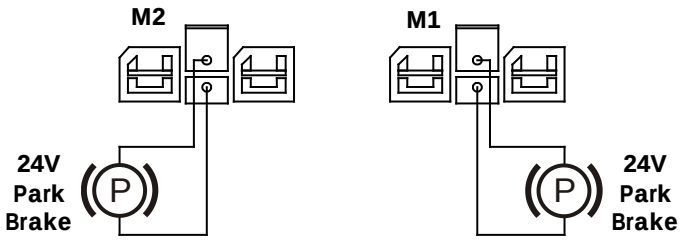
The park brake connection pins are located in the motor connector sockets of the SHARK Power Module.



SHARK supports both 24V and 12V park brake wiring.

3.3.7.1 Two 24V park brakes – Dual, M1 and M2

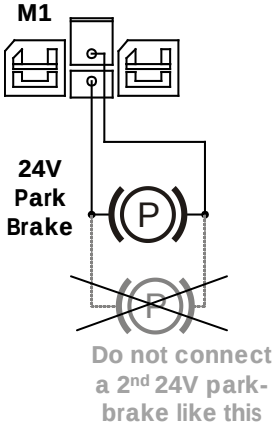
In the dual configuration each park brake is driven from a separate output.



For this configuration, set the **Parkbrake Type** parameter (see section 4.2.5.1) to 'Dual'.

3.3.7.2 One 24V park brake – Single, M1 only

In the single configuration the park brake is driven from the M1 output only.



For this configuration, set the **Parkbrake Type** parameter (see section 4.2.5.1) to 'Single'.

Warning:

In the 'Single' configuration, do not connect a second 24V park brake in parallel to M1, because an open circuit fault in only one of the two park brakes cannot be detected. Always use the dual configuration for two 24V park brakes.

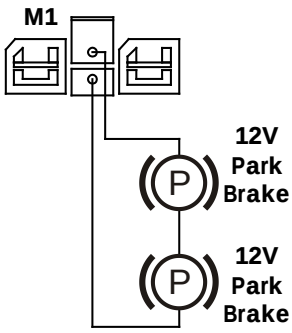
Note:

1. *If in the 'Single' configuration the park brake is connected to M2 instead of M1, a Left Park brake Fault (Flash code 5) will occur.*
2. *If the **Parkbrake Type** parameter is set to 'Dual' in this configuration (with no park brake connected to M2), a Right Park brake Fault (Flash Code 6) will occur.*

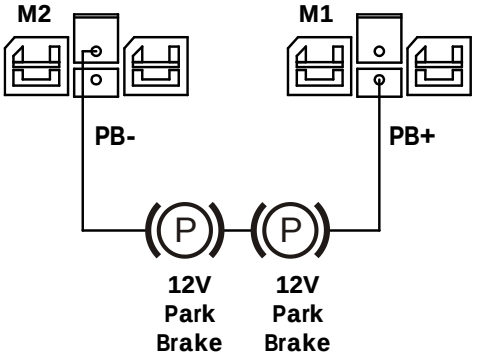
See also section 6.4: Flash Codes

3.3.7.3 Two 12V parkbrakes

If the powerchair has two 12V park brakes, both can be driven from a single 24V output by connecting the 12V park brakes in series. Alternatively, the 12V park brakes can be connected to both park brake outputs. In the latter case the park brakes will be driven from the PB+ output of M1.



12V parkbrakes configuration 1



12V parkbrakes configuration 2

For both these configurations, set the **Parkbrake Type** parameter (see section 4.2.5.1) to 'Single'.

Notes:

Configuration 1: if the park brakes are connected to M2 instead of M1, a Left Park brake Fault (flash code 5) will occur.

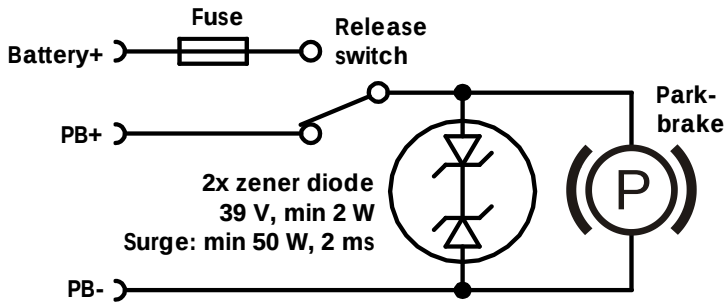
Configuration 2: if PB+ is connected to M2 instead of M1, a Left Park brake Fault (flash code 5) will occur.

*Both configurations: if the **Parkbrake Type** parameter is set to 'Dual', a Right Park brake Fault (flash code 6) will occur.*

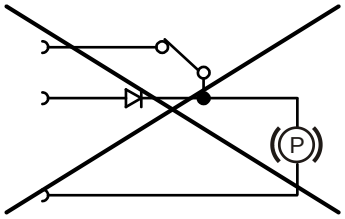
See also section 6.4: Flash Codes

3.3.7.4 Manual park brake release switch

Manually operated park brake release switches must be fitted together with a suitable suppression device across each park brake.



Always fit a suppression device



Do NOT connect like this

The suppression device prevents the generation of high voltage transients causing possible damage to the Power Module or to the park brake release switch itself.

Some suitable suppression devices are:

Motorola	NXP
3EZ39D5	BZX70C36
3EZ36D5	BZX70C39
1N5365A	BZT03C36
1N5366A	BZT03C39

3.3.7.5 Mechanical park brake release

To make it possible to manually push the chair if the battery is empty, some form of mechanical clutch or park brake release is required. For safety, if the park brake is mechanically released the chair must not be able to drive.

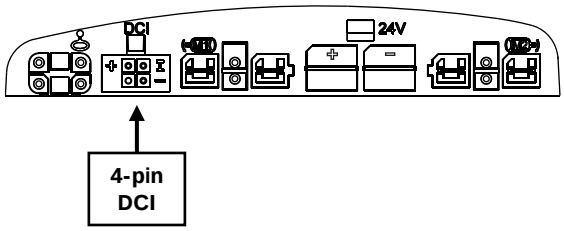
One way to achieve this is to put a switch that disconnects the park brake from the Power Module in the mechanical park brake release. When the park brake is disconnected from the Power Module a Park brake Fault will occur and the powerchair will not be able to drive.

3.3.8 SHARK Communications Bus

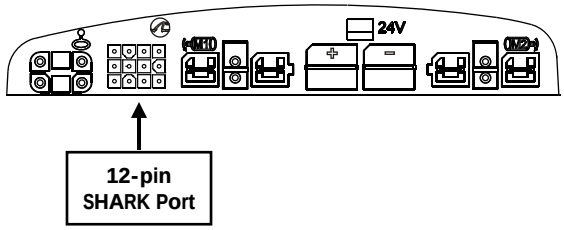
The SHARK Power Module communicates to the Remote through the SHARK Communications Bus. The Bus also supplies power to the Remote. The connector is 'keyed' and can only be plugged in one way.

3.3.9 DCI Port / SHARK Port Connections

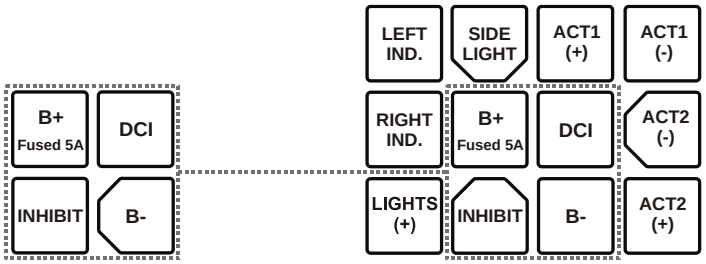
The drive-only versions of the SHARK Power Module (all PMA, PMB40/50/60, PMB0x and PMC0x variants) have a 4-pin DCI Port.



The Actuator and lighting versions of the SHARK Power Module have a 12-pin SHARK port, which has an extra row of pins around the DCI pins.



The pin location of the DCI pins is the same for the DCI Port and the SHARK Port, as shown below. However, the pin numbers are not the same, see Connector pin-outs (section 3.3.3)



DCI Port
Drive-only variants

SHARK Port
Actuator or lighting variants

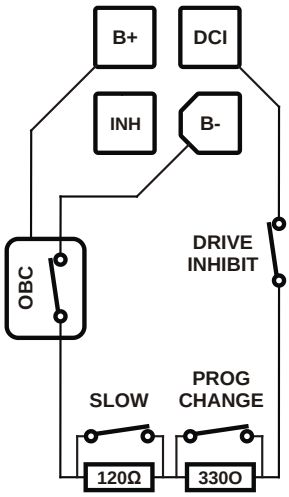
It is recommended to use the largest gauge wire supported by the Shark Port contacts (16 AWG/1.3 mm^2).

Approved SHARK Port connector components are included in the GSM80226 SHARK Port Connector Kit, which includes the 12-Pin Housing and compatible contacts.

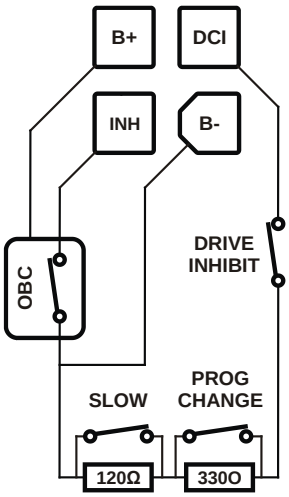
3.3.9.1 Drive Control Input (DCI) Connections

The DCI changes chair behaviour depending on the resistance between the DCI pin and Battery Negative. The DCI is typically used as an input for
Microswitches that Inhibit driving or limit the speed, for example when the seat is raised.
An on-board charger (OBC) that inhibits driving during charging.
Microswitches that invert the joystick input when the seat is swivelled.

Inhibit signals that are not zero resistance, including certain OBCs, must use the dedicated 'Inhibit' input instead.



Possible "Normally Closed" configuration



Possible "High R Inhibit" configuration

For further details on the DCI, and the resistances required to perform specific actions, see **DCI Options** (section 4.2.6). The operation of the inhibit input is set with the **OBC Inhibit Operation** parameter (4.2.6.5).

While the DCI loop is a low current circuit it is recommended that a wire gauge of not less than 0.5 mm^2 is used for mechanical robustness.

Warning:

1. *Activation of seat lift / seat tilt beyond certain limits may cause the chair to be unstable while driving. The Drive Inhibit / Speed Limitation functions allow the wheelchair to be configured such that drive is not possible, or speed is limited, when the seat is in such a position.*
2. *Inform the user regarding proper actuator operation - particularly with regard to safe control of seat lift / seat tilt.*

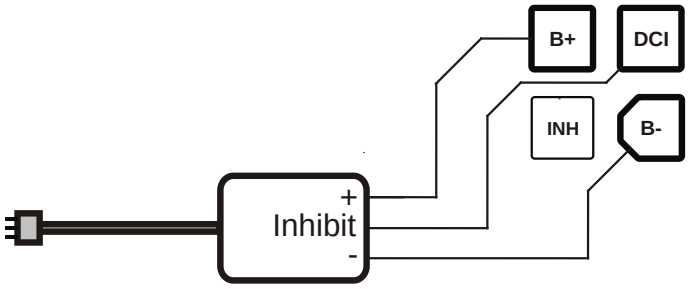
Precaution:

Use the DCI to inhibit driving when the chair is being charged or when the seat is in an extended or undefined position.

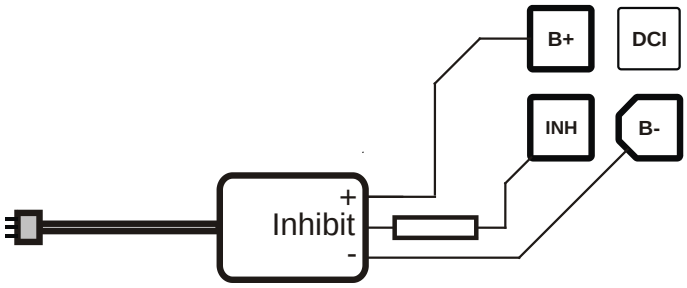
3.3.9.2 On-Board Charger (OBC) connections

An On Board Charger (OBC) of up to 5 A continuous may be connected between B+ and B-.

As with all battery charger connections, provision MUST be made to inhibit driving when the charger is plugged in. For an OBC, this is done either by wiring the inhibit contact of the charger into the DCI loop along with any other microswitches (see 3.3.9.1), or by connecting non-zero resistance inhibit outputs to the Inhibit Pin.



Zero resistance inhibit



Non-zero resistance inhibit

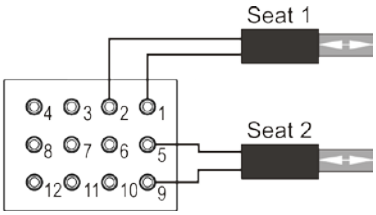
The wiring to B+ and B- should be compatible with the current rating of the OBC. It is recommended that the largest gauge wire supported by the Shark Port contacts (16 AWG/1.3 mm^2) is used.

The wiring to the DCI or Inhibit pin is low current and can be lighter, typically 0.5 mm.

The operation of the inhibit input is set with **OBC Inhibit Operation** (4.2.6.5).

3.3.9.3 Seat Functions

Several variants of Power Module support one or two seat control outputs, available on the Shark Port on Pins 1 and 2 for Seat Function 1, Pins 5 and 9 for Seat Function 2. Available seat functions may then be operated depending on the functionality of Shark Remote used.



Pin 2	ACT 1 (+)
Pin 1	ACT 1 (-)
Pin 9	ACT 2 (+)
Pin 5	ACT 2 (-)

Precaution:

Set the current limit so that it is adequate for actuator operation, but trips when a reasonable force is exceeded. See Seat Options (4.2.7) for programming details related to Seat Functions.

Since the actuators may draw relatively high currents it is recommended that the largest gauge wire supported by the Shark Port contacts (16 AWG/1.3 mm²) is used.

3.3.9.4 SHARK TÜV Compliant Lighting Installation

This guidance allows OEM wheelchair manufacturers and installers to meet the TÜV lighting requirements. The installer should ensure the installation of lights and indicators is safe and reliable. It is the responsibility of the installer to ensure any additional risks are appropriately assessed.

Specifications

Bulbs	Headlamp/Tail light	24V (maximum combined rating 50W)
	Indicators – Left	12V x 2 *identical* bulbs in series connection (maximum rating 24W)
	Indicators – Right	12V x 2 *identical* bulbs in series connection (maximum rating 24W)
Fuses	Headlamp Indicators (Left/Right)	2A slow-blow

Refer to the Recommended Wiring Diagram on the following page.

Since lighting circuits draw relatively high currents it is recommended that the largest gauge wire supported by the Shark Port contacts (16 AWG/1.3 mm^2) be used.

Installation

For safe and reliable operation, the installation of lights and indicators must follow basic safety principles for all power wiring. The wiring must be adequate to carry the desired load and be properly routed and secured to prevent cutting, crushing, chaffing or other physical damage or abuse. Care is required to prevent dangling wiring which can allow snagging on external objects.

Warning:

All indicators must use identical wattage bulbs.

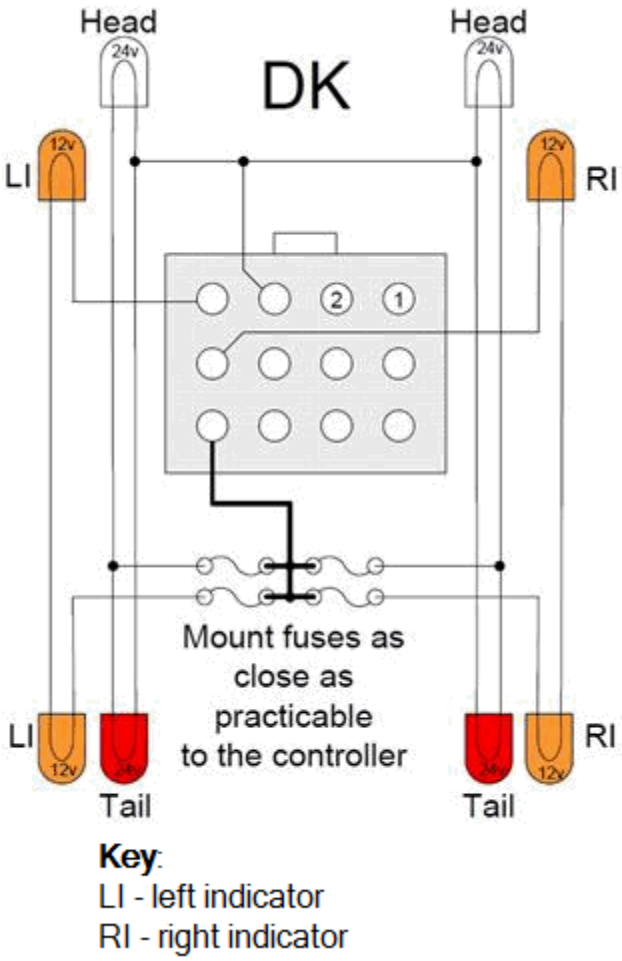
Electrical Protection

The Shark Power Module provides internal electrical overload and short circuit protection. However, it is the responsibility of the installer to fit individual fuses to protect against short circuit conditions.

Warning:

Ensure all light circuits are isolated from the chair frame.

Recommended Wiring Diagram



Care & Maintenance

The wheelchair user must be instructed to undertake routine maintenance and servicing, including frequent inspection and appropriate care to ensure all lights, fuses, connectors, cables and wiring are maintained in good working order.

Warning:

It is the responsibility of the installer to ensure adequate protection exists for the Lighting system. Use of appropriate gauge of wiring, bulbs and independent fusing is recommended.

Warning:

*Hazard lamps will **not** function when the system is switched off.*

4 Programming SHARK

Warning:

Performance adjustments must only be made by healthcare professionals, or by persons who completely understand the programming parameters, the adjustment process, the configuration of the vehicle, and the capabilities of the driver.

Wrong settings can make the vehicle uncontrollable or unstable. An uncontrollable or unstable vehicle can cause an unsafe situation such as a crash, with the risk of serious injury to the driver or bystanders, or damage to the vehicle or surrounding property.

After you have programmed the vehicle, test the vehicle thoroughly according to the test method that is described in this and all other relevant installation manual(s). Check that the vehicle drives safely and that the performance of the vehicle is appropriate to the capabilities and needs of the user. If the vehicle does not perform as intended, reprogram the vehicle and test again. Repeat this procedure until the vehicle performs as intended. If the intended performance cannot be reached, contact your service agent.

It is responsibility of the health care professional to make sure that the user is capable of both cognitively understanding and physically operating the programmed features and functions.

With inappropriate programming settings, certain features and options may not be accessible or perform as expected.

Dynamic Controls accepts no liability for any loss sustained through inappropriate programming or use by unqualified personnel.

All SHARK systems are fully programmable to provide superb performance for a wide variety of powerchair configurations and users. All programmed values are stored in the Power Module. In the event the Remote is replaced, there is no need to reprogram SHARK. If the Power Module is replaced, SHARK can simply be reprogrammed with a suitable powerchair program.

This chapter starts with a list of all parameters, followed by a detailed description.

Note:

Load Compensation *(4.2.2.12) affects the performance of all speed and acceleration parameters. Set* ***Load Compensation*** *to the correct value before you program any of these parameters. If* ***Load Compensation*** *is changed after the chair has been set up, the complete programming and testing procedure must be repeated.*

If the chair gives poor performance on carpet or at low speeds, the most probable cause is a ***Load Compensation*** *value that is set too low.*

4.1 Parameter List

Key: ✓ Editable at this level (✓* = HHP Technician Mode)
👁 Viewable at this level
Par [C,D,S] Parameter only available in Power Modules with software Rev. C, D and S.

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
General Settings (4.2.1)						
Lowest Forward Speed	0 – 100 %	10 %		✓	✓	✓
Lowest Turn Speed	0 – 100 %	10 %		✓	✓	✓
Emergency Deceleration	50 - 100 %	60 %				✓
Active Drive Program	Program 1 Program 2 Program 3 Program 4 [S] DCI Select 1+2 [A,B]	Program 1		✓	✓	✓
Sleep Timer	0 – 30 min	0 min	✓	✓	✓	✓
Wakeup Style	Buttons Joystick and Buttons	Buttons				✓
Lock Enable	No / Yes	No		✓	✓	✓
Joystick Throw	Normal Short Very Short	Normal	✓	✓	✓	✓
Joystick Switch Threshold [C,D,S]	10 - 90 %	40 %				✓
Field Programmability	Full / Limited	Full				✓
Speedo Display [C,D,S]	Max Speed Only Speedo+Max Speed	Max Speed Only		✓	✓	✓
Speed Button Sensitivity [C,D,S]	0 - 10	5		✓	✓	✓
Indicator Auto-cancel [D,S]	Off, 5 - 15 s	5 s		✓	✓	✓
Beep on Keypress [C,D,S]	No / Yes	Yes		✓	✓	✓
Battery Deep Discharge Warning [S]	No / Yes	Yes				✓
Battery Cut-Off Voltage [S]	14.4 - 21.6 V	19.1 V				✓
Drive Programs (4.2.2)						
Drive Program Name	-	-		👁	👁	✓
Maximum Forward Speed	0 - 100 %	100 %	✓	✓	✓	✓
Forward Acceleration	0 - 90 %	40 %	✓	✓	✓	✓
Forward Deceleration	30 - 100 %	60 %	✓	✓	✓	✓
Maximum Reverse Speed	0 - 100 %	70 %	✓	✓	✓	✓
Reverse Acceleration	0 - 90 %	35 %	✓	✓	✓	✓
Reverse Deceleration	30 - 100 %	70 %	✓	✓	✓	✓
Maximum Turn Speed	0 - 90 %	50 %	✓	✓	✓	✓
Turn Acceleration	0 - 90 %	40 %	✓	✓	✓	✓
Turn Deceleration	20 - 100 %	60 %	✓	✓	✓	✓
Tremor Damping	10 - 100 %	40 %	✓	✓	✓	✓
Load Compensation	0 - Max Load Compensation	140 mΩ	✓*	✓	✓	✓
Max Load Compensation	100 - 600 mΩ	200 mΩ				✓
Active Stability Profile	Profile 1 - 8	Profile 1	✓*			✓
Traction	0 - 80 %	0 %	✓			✓

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Attendant Drive Program [D] (4.2.3)						
Joystick Swap Forward / Reverse [D,S]	No / Yes	No				✓
Joystick Swap Left / Right [D,S]	No / Yes	No				✓
Stability Profiles (4.2.4)						
Stability Profile Name	-	-	👁			✓
Max Speed In turn	5 - 100 %	100 %				✓
Speed Acceleration Scalar	0 - 200 %	100 %				✓
Turn Acceleration Scalar	0 - 200 %	100 %				✓
Turn at Max Speed	5 - 100 %	100 %				✓
Turn Acceleration at Max Speed	100 - 300 %	100 %				✓
Traction at Max Speedpot	0 - 80 %	0 %				✓
FWD/RWD Swivel	No / Yes	No				✓
Motor / Brake (4.2.5)						
Parkbrake Type	Dual Single	Dual		👁	👁	✓
Software Current Limit	10 - PM Rating	60 A				✓
Boost Current [C,D,S]	0 - 15 A	15 A				✓
Boost Time [C,D,S]	0 - 10 s	10 s				✓
Stall Timeout	0 - 60 s	15 s				✓
Veer Compensation	10% L - 10% R	Off	✓	✓	✓	✓
Motor Swap	No / Yes	No		👁	👁	✓
Left Motor Invert	No / Yes	No				✓
Right Motor Invert	No / Yes	No				✓
Enable Soft Start [C,D,S]	No / Yes	Yes				✓
Maximum Motor Volts [D,S]	20 - 36 V	26 V				✓
Motor Short-circuit Test [D,S]	No / Yes	Yes				✓
DCI Options (4.2.6)						
DCI Type [C,D,S]	Swivel Multi Speed Drive Select	Swivel				✓
DCI Operation	Off Normally Open Normally Closed	Off				✓
DCI Speed Limit [A,B]	0 - 100 %	50 %				✓
DCI Speed Limit 1 [C,D,S]	0 - 100 %	50 %				✓
DCI Speed Limit 2 [C,D,S]	0 - 100 %	50 %				✓
DCI Speed Limit 3 [C,D,S]	0 - 100 %	50 %				✓
OBC Inhibit Operation [C,D,S]	Off Normally Open Normally Closed	Off				✓

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Seat Options (4.2.7)						
Seat Control Type C,D,S	Switched Proportional	Switched				✓
Seat Current C,D,S	0 - 12 A	0 A				✓
Seat Speed C,D,S	0 - 100 %	100 %				✓
Seat Boost Level D,S	0 - 100 %	100 %				✓
Seat Boost Time D,S	0 - 3 s	2 s				✓
Actuator Stall Time D,S	0 - 10 s	0.5 s				✓
Actuator While Charging D,S	No / Yes	Yes				✓
Miscellaneous Settings (4.2.8)						
Thermal Rollback Start D,S	40 - 100 C	60 C				✓
Thermal Rollback End D,S	40 - 100 C	75 C				✓
FET Thermal Rollback Start D,S	40 - 100 C	80 C				✓
FET Thermal Rollback End D,S	40 - 100 C	90 C				✓

4.2 Parameter Descriptions

Warning:

Any given default or suggested settings in this section must be used as a guideline only.

- *It is the responsibility of the powerchair manufacturer to make sure that the program is safe and suitable for a particular chair configuration.*
- *It is the responsibility of the dealer or therapist to check and make sure that the settings of a chair for a particular user are safe and appropriate for that user.*

4.2.1 General Settings

4.2.1.1 Lowest Forward Speed

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Lowest Forward Speed	0 - 100 %	10 %		✓	✓	✓

Sets the speed of the powerchair when the lowest speed has been selected and the joystick is fully deflected forward or reverse.

To select the lowest speed:
turn the speed pot fully anti-clockwise (REMA), or
press the 'slow' (tortoise) button on the keypad until the speedometer shows the lowest possible speed (REMD).

4.2.1.2 Lowest Turn Speed

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Lowest Turn Speed	0 - 100 %	10 %		✓	✓	✓

Sets the turn speed of the powerchair when the lowest speed has been selected and the joystick is fully deflected left or right.

To select the lowest speed:
turn the speed pot fully anti-clockwise (REMA), or
press the 'slow' (tortoise) button on the keypad until the speedometer shows the lowest possible speed (REMD).

4.2.1.3 Sleep Timer

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Sleep Timer	0 - 30 min	0 min	✓	✓	✓	✓

Sets the period of inactivity before the controller goes to sleep.
A value of zero means that the controller never goes to sleep.

4.2.1.4 Wakeup Style

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Wakeup Style	Buttons Joystick and Buttons	Buttons				✓

Defines how the controller will wake up from sleep.

Buttons - Only the on/off button wakes up the controller.

Joystick and Buttons - Any button press or joystick movement wakes up the controller.

Note:

*If the value of **Sleep Timer** is zero, the value of **Wakeup Style** is ignored.*

4.2.1.5 Beep on Keypress

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Beep on Keypress	No / Yes	Yes		✓	✓	✓

Yes - The SHARK Remote beeps when a key is pressed.

No - The SHARK Remote does not beep when a key is pressed.

4.2.1.6 Speed Button Sensitivity

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Speed Button Sensitivity	0 - 10	5		✓	✓	✓

On SHARK Remotes that support a Virtual Speed Pot it is possible to adjust the maximum speed in fine steps by pressing and holding down the speed buttons. **Speed Button Sensitivity** sets how quick the maximum speed increments or decrements when a speed button is held down.

0 - Very slow.

10 - Very quick.

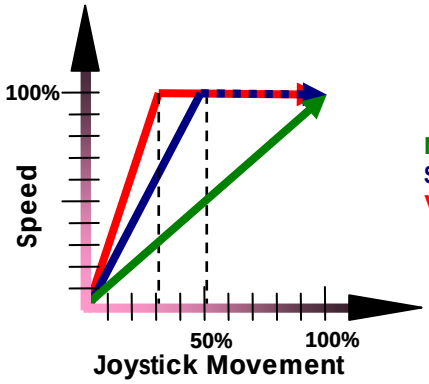
To activate or deactivate fine speed control, simultaneously hold down both the 'Slower' and 'Faster' buttons for 2 seconds. The Remote beeps when the mode has been changed.

4.2.1.7 Joystick Throw

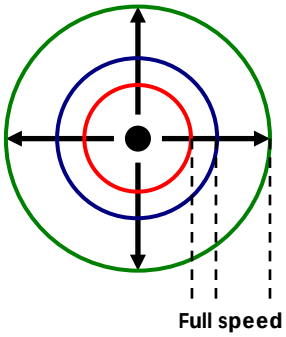
Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Joystick Throw	Normal Short Very Short	Normal	✓	✓	✓	✓

Normally the SHARK controller will drive at full speed only when the joystick is pushed as far as it can mechanically go (when it hits the restrictor plate).

Joystick Throw increases the sensitivity of the joystick so that less movement of the joystick is required to generate full speed. This can be useful to allow users with very little hand movement full proportional control.



Normal - 100 %
Short - 50 %
Very Short - 33 %



Warning:

*Setting **Joystick Throw** to **Short** or **Very Short** can introduce a **safety risk**, because the mechanical restrictor plate does not restrict the movement of the joystick anymore before full forward or turn speeds are achieved. It may be possible to demand full forward speed and full turn speed at the same time. This can be dangerous.*

4.2.1.8 Joystick Switch Threshold

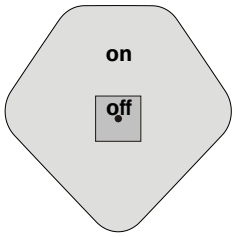
Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Joystick Switch Threshold	10 - 90 %	40 %				✓

Some functions such as actuator operation and lighting control can use the joystick as an input switch. **Joystick Switch Threshold** sets the value beyond which the SHARK controller assigns the joystick to be in the "on" position.

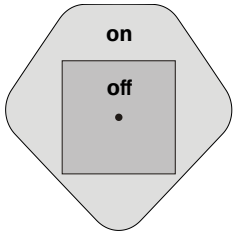
Set this parameter lower than 40 % to allow users with very little hand movement to operate the joystick switches comfortably.

Set this parameter higher than 40 % to allow users with little hand stability and/or fine motor control more room for error.

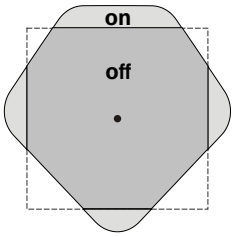
Joystick Switch Threshold 20 %



Joystick Switch Threshold 40 %



Joystick Switch Threshold 80 %



4.2.1.9 Lock Enable

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Lock Enable	No / Yes	No		✓	✓	✓

Yes - The SHARK can be locked by pressing the on/off button for more than 4 seconds.

No - It is not possible to lock the SHARK.

See the manual of your Remote for more information.

4.2.1.10 Field Programmability

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Field Programmability	Full / Limited	Full				✓

Limited - It is not possible to use the Hand Held Programmer with the SHARK. If this option is selected, the check marks in the HHP column of the parameter lists do not apply.

Full - The Hand Held Programmer can program the SHARK.

4.2.1.11 Active Drive Program

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Active Drive Program	Program 1 Program 2 Program 3 Program 4 [S] DCI Select 1+2 [A,B]	Program 1		✓	✓	✓

Defines which of the available Drive Programs is used.

If set to 'DCI Select 1+2', the Rev. A&B DCI Swivel function will change to a Drive Program Swap mode. For more information, see DCI Options (section 4.2.6).

Note:

*'DCI Select 1+2' is only used in Rev. A and Rev. B software (DK-PMAxx). For this reason, do not set this parameter to 'DCI Select 1+2' if you have a Power Module with Rev. C or Rev. D software (DK-PMBxx and DK-PMCxx). Use the **DCI Type** parameter (4.2.6.2) instead.*

If this parameter is set to 'DCI Select 1+2'on a Power Module with Rev. C or Rev. D software, Drive Program 3 will be used instead.

4.2.1.12 Emergency Deceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Emergency Deceleration	50 - 100 %	60 %				✓

Emergency Deceleration sets how quickly the powerchair comes to a halt when

- a fault that requires an emergency stop occurs
- the user switches off the system while driving.

If **Emergency Deceleration** is set to a higher value, the powerchair will stop in a shorter time period. The optimum value depends on the powerchair type, the preference of the manufacturer and the regulations that apply to the country of use.

To test this parameter, press the on/off button while driving.

Warning:

If this parameter is set too high, the user can lose balance or fall out of the chair.

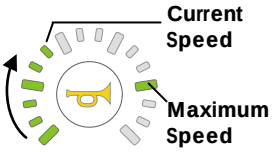
4.2.1.13 Speedo Display

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Speedo Display	Max Speed Only Speedo + Max Speed	Max Speed Only		✓	✓	✓

This parameter is only relevant to SHARK Remotes that have a Speedo display.

Max Speed Only - The speedometer only shows the maximum speed that has been set with the speed buttons.

Speedo Plus Max Speed - The speedometer shows the current chair speed together with the maximum speed that has been set with the speed buttons.



If the maximum speed is set to the lowest value, the maximum speed of the chair is limited by the value of **Lowest Forward Speed** (4.2.1.1) and **Lowest Turn Speed** (4.2.1.2).

If the maximum speed is set to the highest value, the maximum speed of the chair is limited by the value of **Maximum Forward Speed** (4.2.2.2), **Maximum Reverse Speed** (4.2.2.5) and **Maximum Turn Speed** (4.2.2.8).

4.2.1.14 Indicator Auto-cancel

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Indicator Auto-cancel	Off, 5 - 15 s	5 s		✓	✓	✓

Off - When the indicator lights are switched on, they will stay on until the user switches them off.

5-15 - When the indicator lights are switched on, they will automatically switch off after **Indicator Auto-cancel** seconds.

4.2.1.15 Battery Deep Discharge Warning

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Battery Deep Discharge Warning [S]	No / Yes	Yes				✓

Yes - If the battery is drained below the cut-off level that is set by **Battery Cut-Off Voltage**, the Shark will beep and show Flash Code 2 on the fault indicator LED as a warning that battery damage will occur if it is discharged any further.

No - The Shark will not warn the user if the battery voltage falls below the **Battery Cut-Off** Voltage.

Independent of the setting of **Battery Deep Discharge Warning**, the Shark will also protect the battery by driving slower at lower battery voltages.

4.2.1.16 Battery Cut-Off Voltage

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Battery Cut-Off Voltage [S]	14.4 - 21.6 V	19.1 V				✓

This parameter is only used when **Battery Deep Discharge Warning** has the value 'Yes'.

The Battery Cut-Off Voltage specifies the voltage at which the battery is empty and battery damage will occur if the battery is discharged any further. If the battery voltage falls below this value, the SHARK will beep twice and show flash code 2 on the fault indicator LED.

Set Battery Cut-Off Voltage to the value as specified by the battery manufacturer at which the discharge of a battery is considered finished. The cut-off level for lead-acid batteries normally is 21 V. To avoid false battery warnings during high-load conditions such as driving up a slope, the default value of Battery Cut-Off Voltage has been preset 9% lower to 19.1 V.

Contact your battery manufacturer for the best cut-off setting given your application and current requirements.

***Note**:*

An audible and visible deep discharge warning is required to comply with ISO7176-14.

4.2.2 Drive Programs

The Drive Program defines the driving performance of the powerchair:

The powerchair manufacturer defines three default Drive Programs that are stored in the SHARK Power Module. The Dealer selects the most appropriate Drive Program and then customizes it for each user.

4.2.2.1 Drive Program Name

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Drive Program Name	-	-		👁	👁	✓

You can give the 3 Drive Programs 15-character descriptive names.
These names will be displayed by the Hand Held Programmer.

4.2.2.2 Maximum Forward Speed

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Maximum Forward Speed	0 - 100 %	100 %	✓	✓	✓	✓

Sets the speed of the powerchair when the highest speed has been selected and the joystick is fully deflected forward.

To select the highest speed:
turn the speed pot fully clockwise (REMA & REMB), or
press the 'fast' (hare) button on the keypad until the speedometer shows the highest possible speed (REMD).

4.2.2.3 Forward Acceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Forward Acceleration	0 - 90 %	40 %	✓	✓	✓	✓

Sets how quickly the forward speed increases after the joystick has been deflected forward. 0 % Results in a very slow increase, 90 % results in a very quick increase.

4.2.2.4 Forward Deceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Forward Deceleration	30 - 100 %	60 %	✓	✓	✓	✓

Sets how quickly the powerchair slows down after the joystick has been returned from a forward position to the centre. 30 % Results in a very slow stop, 100 % results in an almost instant stop.

Warning:

Make sure that the deceleration parameters are always higher than the acceleration parameters for a safe response.

4.2.2.5 Maximum Reverse Speed

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Maximum Reverse Speed	0 - 100 %	70 %	✓	✓	✓	✓

Sets the reverse speed of the powerchair when the highest speed has been selected and the joystick is fully deflected reverse.

To select the highest speed:
turn the speed pot fully clockwise (REMA & REMB), or
press the 'fast' (hare) button on the keypad until the speedometer shows the highest possible speed (REMD).

4.2.2.6 Reverse Acceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Reverse Acceleration	0 - 90 %	35 %	✓	✓	✓	✓

Sets how quickly the reverse speed increases after the joystick has been deflected backward. 0 % Results in a very slow increase, 90 % results in a very quick increase.

4.2.2.7 Reverse Deceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Reverse Deceleration	30 - 100 %	70 %	✓	✓	✓	✓

Sets how quickly the powerchair slows down in the reverse direction after the joystick has been returned from a reverse position to the centre. 30 % Results in a very slow stop, 100 % results in an almost instant stop.

4.2.2.8 Maximum Turn Speed

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Maximum Turn Speed	0 - 90 %	50 %	✓	✓	✓	✓

Sets the turn speed of the powerchair when the highest speed has been selected and the joystick is fully deflected left or right.

To select the highest speed:
turn the speed pot fully clockwise (REMA & REMB), or
press the 'fast' (hare) button on the keypad until the speedometer shows the highest possible speed (REMD).

4.2.2.9 Turn Acceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Turn Acceleration	0 - 90 %	40 %	✓	✓	✓	✓

Sets how quickly the turning speed increases after the joystick has been deflected sideways. 0 % Results in a very slow increase, 90 % results in a very quick increase.

4.2.2.10 Turn Deceleration

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Turn Deceleration	20 - 100 %	60 %	✓	✓	✓	✓

Sets how quickly the powerchair slows down during a turn after the joystick has been returned to the centre. 20 % Results in a very slow stop, 100 % results in an instant stop.

4.2.2.11 Tremor Damping

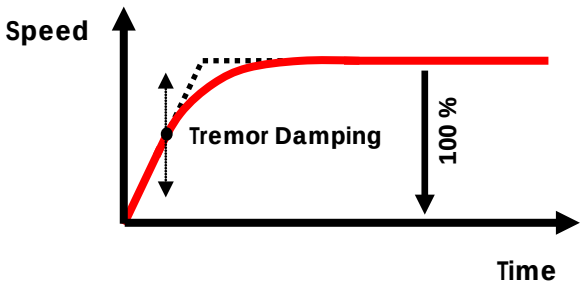
Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Tremor Damping	10 - 100 %	40 %	✓	✓	✓	✓

When the powerchair almost reaches its desired speed during acceleration or deceleration, the acceleration/deceleration rate is slowly decreased to zero. This prevents a sudden change in acceleration once the desired speed is reached.

Use the **Tremor Damping** parameter to adjust the point where the damping starts.

15 %: Very little damping
100 %: Maximum damping.

For most applications the default value of 40 % works fine.



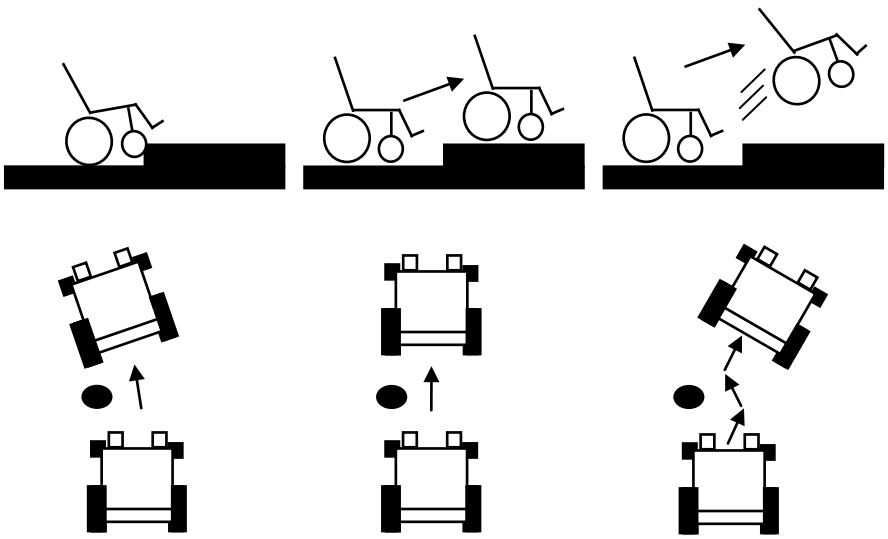
Increase the value of **Tremor Damping** to compensate for hand tremors.

4.2.2.12 Load Compensation

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Load Compensation	0 - Max Load Compensation	140 mΩ	✓*	✓	✓	✓

Load Compensation automatically compensates for changes in motor speed when the chair drives over loads such as sidewalks, curbs or slopes.

Load Compensation affects the performance of all speed and acceleration parameters. For this reason, set **Load Compensation** to the correct value before you program any of these parameters. If **Load Compensation** is changed after the chair has been set up, the complete programming and testing procedure must be repeated.

Load compensation	Too low	Correct	Too high
Chair behaviour	• Drives like it is going through thick mud • Slows down when it goes up a sidewalk edge or up a ramp • Slows down with heavier users • Changes direction when it drives over a bump • Changes direction when the weight of the user shifts.	• Drives smoothly • Keeps the speed reasonably constant. Only slightly slows down on a slope. • Keeps the direction constant. Only slightly changes direction when it drives over a bump.	• Drives very rough • Hard to steer or control, vibrates • Swerves when it drives over a bump. • Motor becomes hotter than normal very easily, decreased motor life
			

If the chair gives poor performance on carpet or at low speeds, the most probable cause is a **Load Compensation** value that is set too low.

Set **Load Compensation** to the correct motor resistance value of the used motor.

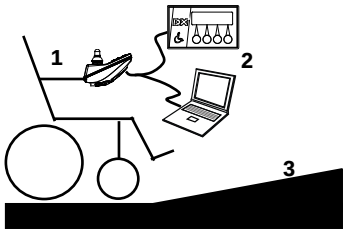
Determining the correct motor resistance by looking at the powerchair behaviour

Note:

It is important that both motors have approximately the same motor resistance and motor cable length. This is particularly important on front wheel drive chairs.

Tools needed

1. A powerchair with a SHARK controller fitted
2. A Hand Held Programmer (HHP) or a laptop with the Wizard Programmer
3. A slope that you can drive up to

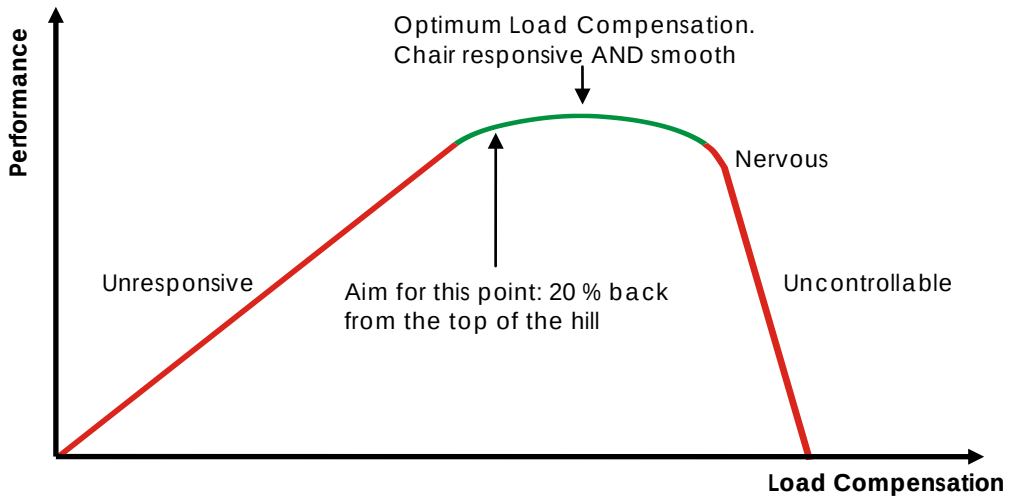


Procedure

- Set **Load Compensation** to 20.
- Drive the powerchair onto a slope and increase the **Load Compensation** value until the powerchair does not roll back after it has stopped on the slope.

Notes:

1. *This test procedure causes the motor to become hot. For this reason, the resulting value for **Load Compensation** is too high. Reduce the found Load Compensation by 20 %, and perform a driving test when the motors are cold to make sure that the powerchair is still comfortable to drive.*
2. *A new motor usually has a higher motor resistance than a motor that has been used for some time, because the motor brushes that are inside the motor do not make optimal contact until they are "worn in". If possible, perform this procedure when the motor has been used for several hours.*



4.2.2.13 Max Load Compensation

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Max Load Compensation	Load Compensation - 600 mΩ	200 mΩ				✓

This parameter sets the maximum value that the **Load Compensation** parameter (4.2.2.12) can be set to. This value must be set by the OEM to match the motors of the powerchair.

Max Load Compensation prevents anyone using a dealer dongle from setting **Load Compensation** to a value that is too high, which can be dangerous.

4.2.2.14 Active Stability Profile

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Active Stability Profile	Profile 1 - 8	Profile 1	✓*			✓

This parameter selects one of the eight pre-defined 'Chair Tamer' Stability Profiles (4.2.4).

In the HHP this parameter is only available in technician mode.

The HHP displays the name that has been set with **Stability Profile Name** instead of 'Profile 1 - 8'

The degree of application of the Stability Profile is controlled with **Traction** (4.2.2.15).

4.2.2.15 Traction

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Traction	0 - 80 %	0 %	✓			✓

The Traction parameter defines the overall effect of the three stability parameters (**Max Speed In turn**, **Speed Acceleration Scalar** and **Turn Acceleration Scalar**) that belong to the currently selected Stability Profile (see section 4.2.4).

The stability parameters are used by the **powerchair manufacturer** to

- provide a stable chair
- prevent the drive wheels from slipping.

The **powerchair manufacturer** sets up the stability parameters so that the chair is stable on a flat surface with good physical grip.

The **dealer or therapist** can use the **Traction** parameter to indicate to the SHARK controller the kind of surface that the chair will be mostly used in. If the intended surface offers little physical grip, the value of the **Traction** parameter can be increased.

A high value of **Traction** increases the effect that the stability parameters have, so the chair will become more stable on a surface with little physical grip (the chair will have more traction on that surface).

Traction value	Use when	Result
0 %	Good physical grip No adjustment needed	The stability parameters have their actual OEM programmed value
80 %	Very little physical grip Maximum stability needed	The effect of the stability parameters is increased to provide more stability

Physical grip is the amount of contact that the drive wheels have with the surface that they drive on. With little physical grip the drive wheels slip easily. If the wheels slip, the powerchair is uncontrollable.

For example:

- A chair on a non-slip surface has a high physical grip, so the **Traction** parameter can be set to 0 %.
- A Rear Wheel Drive chair on a slippery surface has a low physical grip, so the **Traction** parameter must be set higher.

Note:

*If the chair will be used mostly indoors, set **Traction** to a high value to prevent skid marks on the floor.*

Warning:

*The correct value for the **Traction** parameter is dependent on the value of the stability parameters (programmed by the powerchair manufacturer). Testing is required to verify suitability for individual chair designs and/or users.*

4.2.3 Attendant Drive Program

The attendant drive program has mostly the same parameters as a normal drive program. This section only describes the parameters that are different from a normal drive program.

4.2.3.1 Joystick Swap Forward / Reverse

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Joystick Swap Forward / Reverse	No / Yes	No				✓

This parameter reverses the forward/reverse direction of the Attendant Joystick.

Parameter Value	Deflection	Driving direction
No	Forward →	Forward
	Reverse →	Reverse
Yes	Forward →	Reverse
	Reverse →	Forward

Use this parameter if the Attendant Joystick is mounted in a reverse orientation.

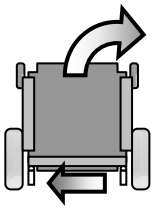
4.2.3.2 Joystick Swap Left / Right

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Joystick Swap Left / Right	No / Yes	No				✓

This parameter reverses the left/right direction of the Attendant Joystick.

Parameter Value	Deflection	Driving direction
No	Left →	Left
	Right →	Right
Yes	Left →	Right
	Right →	Left

Use this to make the back of the chair go in the same direction as the attendant joystick is held while turning. For example, if this parameter is set to 'Yes', and the joystick is held to the left, the chair itself will turn right and the back of the chair will move away to the left.



This makes it easier for the attendant to release the joystick, because the joystick is not moving towards the attendant's hand, but away from it.

4.2.4 Chair Tamer - Stability Profiles

SHARK's 'Chair Tamer' is a technology designed to provide a stable and comfortable driving experience on almost every combination of chair set-up and drive configuration.

Chair Tamer offers a simple and extremely effective means of solving the traditional Mid Wheel Drive (MWD) and Front Wheel Drive (FWD) issues of "spinning out" and "snaking", without compromising chair speed or drive performance.

The basis of Chair Tamer is the 'Stability Profile'. A 'Stability Profile' is simply a set of characteristics that define if and to what extent SHARK will assist the driver to keep the chair stable. Higher levels of Chair Tamer will make SHARK work harder to keep the chair stable and safe.

SHARK has eight Stability Profiles, any of which can be assigned to SHARK's three Drive Programs simply by selecting the appropriate **Active Stability Profile** (4.2.2.14) within each Drive Program.

For example, if Drive Program 2 has been set up with **Active Stability Profile** 7 selected, then the chair will behave with the speed and response characteristics defined by Drive Program 2, but overlaid with a level of Chair Tamer (or "drive assistance") as specified by Stability Profile 7.

The 8 Stability Profiles may be programmed by the powerchair manufacturer to suit their own specific needs.

4.2.4.1 Stability Profile Name

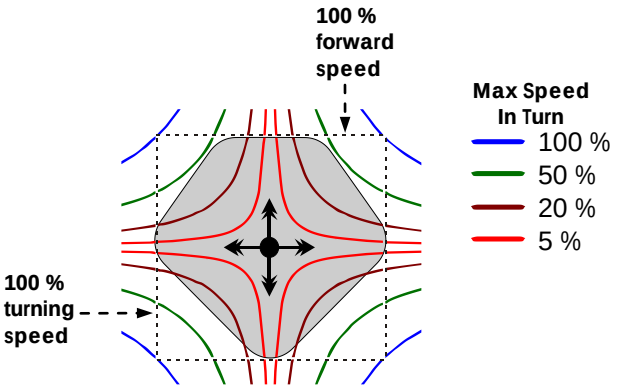
Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Stability Profile Name	-	-	👁			✓

The 8 Stability Profiles can be given 15-character descriptive names.
These names will be displayed by the Hand Held Programmer.

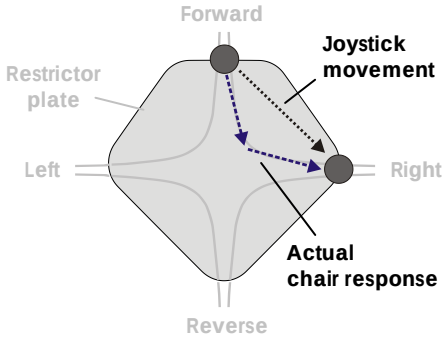
4.2.4.2 Max Speed In turn

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Max Speed In turn	5 - 100 %	100 %				✓

Max Speed In turn is the absolute maximum speed x turn product for which the chair is stable on a surface with good grip. The SHARK limits the turning speed when the forward speed is too high, and it limits the forward speed when the turning speed is too high.



The speed limiting does not limit the physical joystick position, but it limits the chair response. For example, with a 5 % **Max Speed In turn** value, if a powerchair travels at full speed forward and the joystick suddenly demands a sharp right turn, the chair will first slow down before it starts to turn.



Note:

The actual chair response can be limited by other factors or parameters (for example the acceleration parameters, tremor damping or the other chair stability parameters), and therefore the actual response path can be inside the limit curves. The path will never go outside the limit curve, however.

A dealer can increase the overall effect of this OEM parameter by increasing the **Traction** parameter (see 4.2.2.15).

4.2.4.3 Speed Acceleration Scalar

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Speed Acceleration Scalar	0 - 200 %	100 %				✓

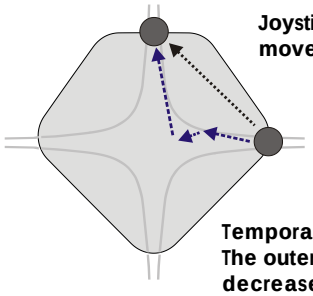
When a user of a Front Wheel Drive chair requests fast acceleration forward while the chair is turning, the chair stability will be reduced. On Front Wheel Drive chairs, acceleration forward causes less weight on the drive wheels because the weight shifts backwards. Less weight on the drive wheels means that these wheels loose traction more easily. At the same time, the acceleration request demands the wheels to apply more forward force to speed up the chair.

The increase of forward force demand combined with less traction reduces the stability of the chair.

To compensate for the reduced stability, the SHARK Power Module constantly calculates the traction on each drive wheel and then modifies the momentary value of the forward acceleration dependent on the value of **Speed Acceleration Scalar**.

- A value of 100 % has no effect
- A value less than 100 % reduces the forward acceleration out of a turn. This makes the chair more stable, but may introduce a steering delay.
- A value higher than 100 % increases the forward acceleration out of a turn. This makes the chair more responsive, but reduces stability. For this reason it is not recommended to set the Speed Acceleration Scalar higher than 100 %.

A very low value of Speed Acceleration Scalar combined with a fast turn may temporarily limit the forward acceleration to a negative value, effectively demanding deceleration or slowing down in spite of the user requesting the forward speed to be increased.



Temporary negative forward acceleration: The outer wheel must slow down to decrease the turning, before the inner wheel can accelerate forward.

A dealer can increase the overall effect of this OEM parameter by increasing the **Traction** parameter (see 4.2.2.15).

4.2.4.4 Turn Acceleration Scalar

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Turn Acceleration Scalar	0 - 200 %	100 %				✓

When the user of a Front Wheel Drive chair requests an increase in turning speed while the chair is moving forward (for example by requesting a turn when the chair is travelling straight ahead), the chair stability will be reduced. The turn acceleration will cause the weight to shift toward the outer drive wheel and away from the inner drive wheel. The inner drive wheel will therefore loose traction more easily. As the outer drive wheel speeds up to make the turn, and the inner drive wheel slowly loses traction, the powerchair can end up spinning.

To prevent the powerchair from spinning, the SHARK Power Module constantly calculates the traction on each drive wheel and then modifies the momentary value of the turning acceleration dependent on the value of **Turn Acceleration Scalar**.

- A value of 100 % has no effect
- A value less than 100 % reduces the turn acceleration.
  This makes the chair more stable, but may introduce a steering delay.
- A value higher than 100 % increases the turn acceleration.
  This makes the chair more responsive, but reduces stability. For this reason it is not recommended to set the Turn Acceleration Scaler higher than 100 %.

A dealer can increase the overall effect of this OEM parameter by increasing the **Traction** parameter (see 4.2.2.15).

4.2.4.5 Steering Stability Parameters

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Turn at Max Speed	5 - 100 %	100 %				✓
Turn Acceleration at Max Speed	100 - 300 %	100 %				✓

If the powerchair travels at full speed, it can be difficult to drive in a straight line. Sometimes the powerchair slightly changes direction from left to right and back.

The powerchair slightly changes direction at full speed

Two different events can cause a change of direction:

1. When the chair travels straight forward at full speed, small unintentional joystick movements (for example when the chair drives over a bump and the hand of the user shifts) can cause the chair to veer off. The user then over-corrects the direction, which causes that the powerchair continuously slightly changes direction. At full speed, a reduction of joystick sensitivity can help the user to keep the chair straight.

   Turn at Max Speed reduces the value of the **Maximum Turn Speed** parameter (see 4.2.2.8) when the joystick is pushed full forward.
   - A value of 100 % has no effect
   - A value of 50 % reduces steering at full speed by 50 %.

2. If the user *does* want to change direction slightly when travelling at full speed, the acceleration damping of the **Tremor Damping** parameter (see 4.2.2.11) in combination with the chair stability parameters (**Max Speed In turn**, **Speed Acceleration Scalar** and **Turn Acceleration Scalar**) can cause a steering delay. The user does not feel the chair turning and deflects the joystick further, effectively over-steering. When the chair starts to turn, it turns too far and the user has to correct again. This also causes the powerchair to continuously slightly change direction.
   A faster turning response helps to prevent this kind of behaviour.

   Turn Acceleration at Max Speed changes the value of the **Turn Acceleration** parameter (see 4.2.2.9) when the joystick is pushed full forward. A value above 100 % achieves a more responsive turn characteristic at high speed. This compensates the Tremor Damping effect for small sideways joystick deflections.
   - A value of 100 % has no effect
   - A value of 200 % doubles the turning acceleration at full speed.

   A lower value of the **Tremor Damping** parameter (see 4.2.2.11) can also prevent steering delays.

If **Turn at Max Speed** has a low value, increase the value of **Turn Acceleration at Max Speed** to minimise steering delays.

A possible starting point to help FWD powerchairs to drive in a straight line more easily:

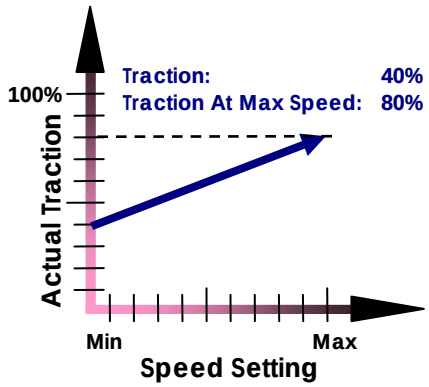
Parameter Name	Value
Turn at Max Speed	70 %
Turn Acceleration at Max Speed	200 %

4.2.4.6 Traction at Max Speedpot

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Traction at Max Speedpot	0 - 80 %	0 %				✓

Powerchairs are more unstable at a higher speed. For this reason it may be necessary to increase the value of **Traction** at a higher speed setting to provide more stability for the chair.

Traction at Max Speedpot sets the value of **Traction** to use when the maximum speed is selected with the speed buttons or the speed pot. If the lowest speed is selected, then the value of **Traction** is used. As the selected speed is increased with the speed buttons, the value of **Traction** is increased to **Traction At Max Speedpot**.



Note:

*If **Traction at Max Speedpot** has a lower value than **Traction**, **Traction** will be used for all speed settings and the value of **Traction at Max Speedpot** is ignored.*

4.2.4.7 FWD/RWD Swivel

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
FWD/RWD Swivel	No / Yes	No				✓

Yes - The motor direction is inverted in this Stability Profile: if the joystick is pushed forward, the motor will drive reverse. Use this setting if the DCI selects a Drive Program with this Stability Profile when the chair is swivelled.

No - The motor direction is normal in this Stability Profile.

4.2.5 Motor / Brake

4.2.5.1 Parkbrake Type

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Parkbrake Type	Dual Single	Dual		👁	👁	✓

This parameter sets the park brake configuration. The SHARK Power Module will periodically test the park brakes on the selected outputs.

Single – Only the left park brake output is tested.
Do not use the right park brake output.

Dual – The left and right park brake output are both tested.

See also Motor Connections (section 3.3.6) for more information on how to connect the park brakes.

This parameter only affects the testing of the park brakes. The Left and Right outputs will still both operate any connected park brake, regardless the value of **Parkbrake Type.**

4.2.5.2 Software Current Limit

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Software Current Limit	10 - PM Rating	60 A				✓

The **Software Current Limit** is the maximum sustained current that the Power Module is programmed to deliver to the motor.

To protect the electronics of the Power Module, the maximum current will be reduced further if the Power Module becomes too hot, dependent on the setting of the **Thermal Rollback** parameters (see 4.2.8.1).

This parameter cannot be set higher than the current rating of the Power Module that the currently loaded program/template is meant for.

Power Module current ratings
DK-PMB40: 40A, DK-PMB50: 50A, DK-PMA & DK-PMB (other than 40/50): 60A, DK-PMC: 75A

Warning:

Do not set this parameter too high for the type of motor used.

Note:

*The time that the Power Module will deliver the maximum sustained current to the motors is limited by the **Stall Timeout** parameter (4.2.5.4).*

4.2.5.3 Boost Current / Boost Time

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Boost Current	0 - 15 A	15 A				✓
Boost Time	0 - 10 s	10 s				✓

The Power Module can deliver an additional current of **Boost Current** Ampere for **Boost Time** seconds, to overcome transient loads such as starting on a hill, overcoming castor lock, climbing obstacles, etc.

If the **Boost Time** is reached, the current is limited to **Software Current Limit.**

Before the current can reach the **Boost Current** value again, the motor current must stay below the value of **Software Current Limit** for at least twice as long as that it has been above **Software Current Limit**.

4.2.5.4 Stall Timeout

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Stall Timeout	0 - 60 s	15 s				✓

If the joystick is deflected but the powerchair cannot drive because of an obstacle, the maximum current (as set by the **Software Current Limit** parameter, see section 4.2.5.2) will be drawn by the motors continuously, because the motors are still trying to drive. This situation is called motor stalling.

Motor stalling can cause motor damage when the motor becomes too hot.
To prevent motor damage, the Power Module disables drive after **Stall Timeout** seconds of maximum continuous current.

If a stall timeout has occurred:

- The powerchair will not drive and Flash Code 1 will be shown on the System Status LED.
- After a cool down period, the flash code goes away and the system drives normally.
- If the joystick is out of the centre position when the cool down period ends, the system will not drive until the joystick is released back to the centre.

Note:

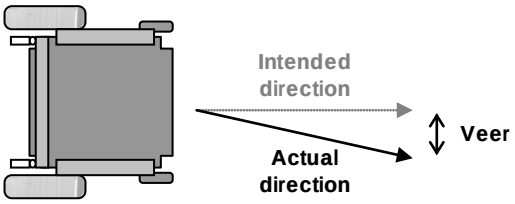
*Some safety standards require a particular **Stall Timeout** to be set.*

4.2.5.5 Veer Compensation

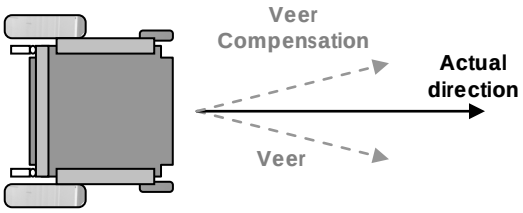
Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Veer Compensation	10% L - 10% R	Off	✓	✓	✓	✓

If the two motors of the powerchair do not perform exactly the same, the chair will not drive in a straight line. The chair will turn slightly (veer) when it drives forward.

Veer Compensation calculates how much the chair must correct its direction to drive in a straight line.



The chair does not drive straight when the performance of the two motors is not equal



The chair now drives straight because Veer Compensation corrects the direction

Notes:

1. *Adjust this parameter every time a motor is replaced.*
2. *Other factors than motor performance can cause chair veer, for example bent frames, flat tyres or faulty castor wheels. Correct these problems at the source, do not use **Veer Compensation**.*
3. *Do not use **Veer Compensation** to compensate for out-of-centre joystick deflection by the user.*
4. *Veer compensation can compensate for small differences in left/right motor performance. It cannot compensate for severely mismatched motors.*

4.2.5.6 Motor Swap

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Motor Swap	No / Yes	No		👁	👁	✓

If this parameter is set to Swap, the Power Module swaps the Left and Right motor outputs. Swapping the motor outputs allows the cabling between the Power Module and the motors to be optimised for particular mounting orientations of the Power Module.

Parameter value	Normal	Swap
Motor connection	Left motor → M1 Right motor → M2	Left motor → M2 Right motor → M1

Note:

Most Fault messages and Diagnostic messages ignore the value of this parameter. Left Motor/Park brake fault is always the motor/park brake connected to M1, Right Motor/Park brake fault is always the motor/park brake connected to M2.

4.2.5.7 Left/Right Motor Invert

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Left Motor Invert	No / Yes	No				✓
Right Motor Invert	No / Yes	No				✓

If these parameters are set to Yes, they swap the polarity of the motor output:
'+' will become '–' and '–' will become '+'.

If the polarity of a motor output is reversed, a forward command will cause the motor to drive in the reverse direction, and vice versa.

Note:

1. *If you invert only one of the two motors, the performance of the SHARK System will be reduced. This situation is not recommended for long term use.*

2. *The Left Motor can refer to M1 or M2, dependent on the **Motor Swap** setting.*

4.2.5.8 Enable Soft Start

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Enable Soft Start	No / Yes	Yes				✓

Soft Start temporary reduces the acceleration rate when the chair starts driving from a standstill. This reduces the jerk when starting, particularly with high acceleration rates or high load compensation settings. For example, it may prevent lifting of the castor wheels when starting on a slope.

Adjust to the chair configuration and personal preference.

4.2.5.9 Maximum Motor Volts

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Maximum Motor Volts	20 - 36 V	26 V				✓

Maximum Motor Volts sets the maximum voltage that the Power Module will apply to the motor.

Note:

If local regulations require that the powerchair speed is limited to a specific value, use this parameter to set a speed limit for a particular chair type (for specific motors and a specific wheel diameter).

If the momentary battery voltage is less than the programmed **Maximum Motor Volts** value (for example when the battery is almost empty), then the battery voltage itself is the maximum applied voltage at 100 % speed demand.

The actual voltage output from the Shark Power Module may at times be higher than this setting due to **Load Compensation** (4.2.2.12).

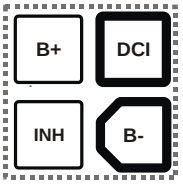
4.2.5.10 Motor Short-circuit Test

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Motor Short-circuit Test	No / Yes	Yes				✓

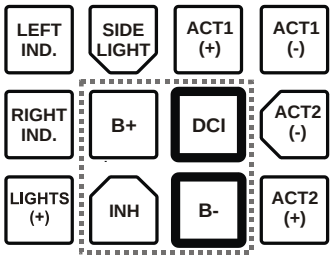
Before driving, the Shark system tests the motors to make sure that they are not short-circuited. Some special motors may fail this test even though they are healthy. This parameter should always be set to 'Yes', unless the motors are failing this test and they have been fully tested to make sure that they are healthy.

4.2.6 DCI Options

The Drive Control Input (DCI) changes chair behaviour depending on the resistance between the DCI pin and Battery Negative (B-). For schematics, see DCI Port / SHARK Port Connections (section 3.3.9).



DCI Port
Drive-only variants



SHARK Port
Actuator or lighting variants

The DCI is typically used as an input for
An extra external speed limit switch for the user.
Seat position switches that can slow down or stop the chair when the seat is in a position that makes the chair not stable enough to drive, for example when the seat is raised.
An external switch that inverts the joystick input or selects a different drive program when the seat is swivelled.
- An on-board charger (OBC) that inhibits driving during charging.

Note:

A green LED on the indication gauge will flash during the time that the DCI is actively changing the chair behaviour.*

**This can be the battery gauge or the speedometer, dependent on the remote used.*

The DCI works differently in Power Modules with software Rev. A&B (DK-PMA) and Power Modules with software Rev. C and higher (DK-PMB and DK-PMC):

The DK-PMA has fixed DCI resistance settings that are described in the **DCI Resistance Values** section (4.2.6.1).
- The DK-PMB and DK-PMC have programmable DCI resistance settings that are described in the **DCI Type** section (4.2.6.2).

Inhibit signals that are not zero resistance, including certain OBCs, must use the dedicated 'Inhibit' input instead. The operation of the inhibit input is set with the **OBC Inhibit Operation** parameter (4.2.6.5).

4.2.6.1 DCI Resistance Values (PMA only)

The values below are only used when **DCI Operation** (4.2.6.3) is not set to 'Off'.

The operation of the DCI input is dependent on the setting of the **Active Drive Program** parameter (4.2.1.11).

Program 1, 2, 3 - The SHARK inverts the motor direction when the 330Ω switch is active, to maintain correct joystick orientation when the seat is swivelled.

Band	Range (Ω)	Function (Normally Open*)	Function (Normally Closed*)
Short	0 – 60	Drive Inhibit	Normal Drive
120 Ω	60 – 239	DCI Speed Limit**	DCI Speed Limit**
330 Ω	240 – 379	Swivel (motor inverted)	Swivel (motor inverted)
450 Ω	380 – 500	DCI Speed Limit** Swivel (motor inverted)	DCI Speed Limit** Swivel (motor inverted)
Open	> 500	Normal Drive	Drive Inhibit

DCI Input 1+2 - The SHARK selects Drive Program 2 when the 330Ω switch is active, otherwise Drive Program 1 is selected. This is typically used in situations where not just the speed of the chair must be limited, but other drive characteristics must change as well (such as acceleration and the stability profile). If in this case the motor direction must also be inverted (for example because the seat is swivelled), set **FWD/RWD Swivel** (4.2.4.7) of Drive Program 2's Stability Profile to 'Yes'.

Band	Range (Ω)	Function (Normally Open*)	Function (Normally Closed*)
Short	0 – 60	Drive Inhibit	Drive Program 1 Normal Drive
120 Ω	60 – 239	Drive Program 1 DCI Speed Limit**	Drive Program 1 DCI Speed Limit**
330 Ω	240 – 379	Drive Program 2	Drive Program 2
450 Ω	380 – 500	Drive Program 2 DCI Speed Limit**	Drive Program 2 DCI Speed Limit**
Open	> 500	Drive Program 1 Normal Drive	Drive Inhibit

* 'Normally Open' or 'Normally Closed' is selected by **DCI Operation** (4.2.6.3).

Speed in any direction will be limited to the value set by **DCI Speed Limit (4.2.6.4).

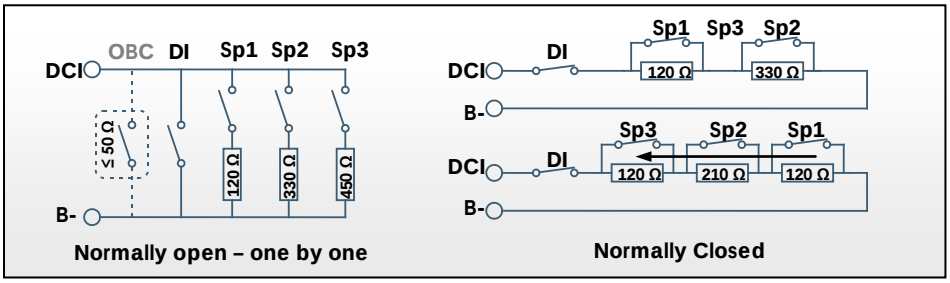
4.2.6.2 DCI Type (DK-PMB/DK-PMC only)

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
DCI Type	Swivel Multi Speed Drive Select	Swivel				✓

This parameter is only used when **DCI Operation** (4.2.6.3) is not set to 'Off'.

Multi Speed - Select this option if you simply want to control the maximum speed of the chair by using one or more micro switches. If a switch is active, speed in any direction will be limited to the value set by the corresponding **DCI Speed Limit** parameter (4.2.6.4) as indicated in the table below. This is the option of choice for fixed configuration chairs in which the seat does not swivel (the chair is always RWD or always FWD).

Band	Range (Ω)	Function (Normally Open*)	Function (Normally Closed*)
Short	0 – 60	Drive Inhibit	Normal Drive
120 Ω	60 – 239	DCI Speed Limit 1	DCI Speed Limit 1
330 Ω	240 – 379	DCI Speed Limit 2	DCI Speed Limit 2
450 Ω	380 – 500	DCI Speed Limit 3	DCI Speed Limit 3
Open	> 500	Normal Drive	Drive Inhibit



Some schematics – many more options are possible.

Drive Select - This option gives less flexibility on choice of speed limits, but adds the ability to change the controller's Drive Profile. This can be useful for variable configuration chairs in which the chair may be changed between FWD and RWD configurations, allowing the entire drive characteristics to be optimised for each configuration simply by activating an external switch.

Band	Range (Ω)	Function (Normally Open*)	Function (Normally Closed*)
Short	0 – 60	Drive Inhibit	Drive Program 1 Normal Drive
120 Ω	60 – 239	Drive Program 1 DCI Speed Limit 1	Drive Program 1 DCI Speed Limit 1
330 Ω	240 – 379	Drive Program 2 Normal Drive	Drive Program 2 Normal Drive
450 Ω	380 – 500	Drive Program 2 DCI Speed Limit 1	Drive Program 2 DCI Speed Limit 1
Open	> 500	Drive Program 1 Normal Drive	Drive Inhibit

* 'Normally Open' or 'Normally Closed' is selected by **DCI Operation** (4.2.6.3).

Swivel - This option is designed for use with chairs in which the seat can be reversed to change between FWD and RWD modes. If the seat is swivelled, the motor direction is inverted, so that the joystick has the same directional effect in both FWD and RWD modes.

Band	Range (Ω)	Function (Normally Open*)	Function (Normally Closed*)
Short	0 – 60	Drive Inhibit	Normal Drive
120 Ω	60 – 239	DCI Speed Limit 1	DCI Speed Limit 1
330 Ω	240 – 379	Swivel (Motor inverted) Normal Drive	Swivel (Motor inverted) Normal Drive
450 Ω	380 – 500	Swivel (Motor inverted) DCI Speed Limit 1	Swivel (Motor inverted) DCI Speed Limit 1
Open	> 500	Normal Drive	Drive Inhibit

* 'Normally Open' or 'Normally Closed' is selected by **DCI Operation** (4.2.6.3).

Note:

*If a 'DCI Swivel' mode is activated when the currently selected Stability Profile has its **FWD/RWD Swivel** parameter (4.2.4.7) already set to 'Yes' (which means the chair is already swivelled), the result will be 'Normal Drive' (no swivel).*

Warning:

When using the Swivel option the switch configuration must ensure that when the chair is being charged or when the chair/seat is in an undefined position (i.e. partially swivelled), driving is inhibited.

4.2.6.3 DCI Operation

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
DCI Operation	Off Normally Open Normally Closed	Off				✓

Defines the Normal/Inhibit Drive operation of the DCI input.

Off - Disables operation of the DCI completely (including Swivel and Slowdown)

Normally Open - short (< 60 Ω) → inhibit drive
open (> 500 Ω) → normal drive

Normally Closed - short (< 60 Ω) → normal drive
open (> 500 Ω) → inhibit drive

The effect of the DCI input values of 120, 330 and 450 Ω as selected by **DCI Type** (4.2.6.2) is not changed or reversed by 'Normally Open' or 'Normally Closed' operation. As long as **DCI Operation** is not set to 'Off', these input values will cause the effects as described in the **DCI Type** section.

Note:

The preferred setting when using DCI functionality is 'Normally Closed'. This setting will inhibit drive when the DCI circuit becomes disconnected.

4.2.6.4 DCI Speed Limit

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
DCI Speed Limit [A,B]	0 - 100 %	50 %				✓
DCI Speed Limit 1 [C,D]	0 - 100 %	50 %				✓
DCI Speed Limit 2 [C,D]	0 - 100 %	50 %				✓
DCI Speed Limit 3 [C,D]	0 - 100 %	50 %				✓

These parameters set the speed limits that are used by the DCI.
The DCI works differently between software versions A & B and C & D.

Rev. A & B

The DCI has only one speed it can use: **DCI Speed Limit**.

Rev. C & D

The DCI has three different Speeds it can use: **DCI Speed Limit 1**, **DCI Speed Limit 2** and **DCI Speed Limit 3**. See the description of **DCI Type** (4.2.6.2) for further information and the DCI input conditions that select each of the 3 alternative speed limits.

4.2.6.5 OBC Inhibit Operation

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
OBC Inhibit Operation	Off Normally Open Normally Closed	Off				✓

OBC Inhibit Operation defines the operation of the On-Board Charger Inhibit input.

This parameter is only used on Shark systems that support the Onboard Charger Inhibit function.

Off - Disables operation of the OBC Inhibit

Normally Open - The controller will allow normal drive when the OBC Inhibit is open circuit and inhibit drive when the OBC Inhibit is closed circuit.

Normally Closed - The controller will allow normal drive when the OBC Inhibit is closed circuit and inhibit drive when the OBC Inhibit is open circuit.

4.2.7 Seat Options

4.2.7.1 Seat Control Type

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Seat Control Type	Switched Proportional	Switched				✓

Seat Control Type sets how the Seat Function reacts to the joystick in Seat Mode.

Switched - A joystick deflection greater than **Joystick Switch Threshold** (4.2.1.8) drives the seat actuator at the fixed speed defined by **Seat Speed** (4.2.7.3).

Proportional - The amount of joystick deflection controls the speed of the seat actuator, up to the maximum speed defined by the **Seat Speed** parameter at full deflection. While proportional mode allows finer control of seat position it may require that the joystick is initially pushed full forward to provide sufficient power to start the actuator moving.

4.2.7.2 Seat Current

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Seat 1 Current	0 - 12 A	0 A				✓
Seat 2 Current	0 - 12 A	0 A				✓

Sets the maximum current that the Power Module delivers to the selected Seat Actuator. Actuator current is directly related to the ability of the actuator to lift a load, and to the power rating (and therefore the physical size) of the actuator.

Notes:

1. *To enable an actuator, set its **Seat Current** to 2 A or higher. If the value of **Seat Current** is lower than 2 A for a specific actuator, it is not possible to select that actuator on the SHARK Remote.*

2. *When the current drawn by an actuator during driving reaches the value that has been set with **Seat Current**, the system will cut power to the actuator after the time that is set with **Actuator Stall Time** (4.2.7.5). The current typically rises when an actuator is driven into its end-stop, and so this feature provides an automatic stop at end-of-stroke.*

4.2.7.3 Seat Speed

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Seat 1 Speed	0 - 100 %	100 %				✓
Seat 2 Speed	0 - 100 %	100 %				✓

Seat Speed adjusts the maximum voltage of the selected actuator output, and therefore the operating speed of the Seat Actuator that is connected to it. This allows fine adjustment for optimal actuator performance at the target speed and load requirements.

While a range of 0 % to 100 % (= 24 V = Full Speed) is possible, adjustment below about 60 % is rarely practical. Correct seat speed should always be achieved by correct choice of actuator/gearing rather than limiting the voltage, which not only reduces the speed but also reduces current/power and therefore load capacity.

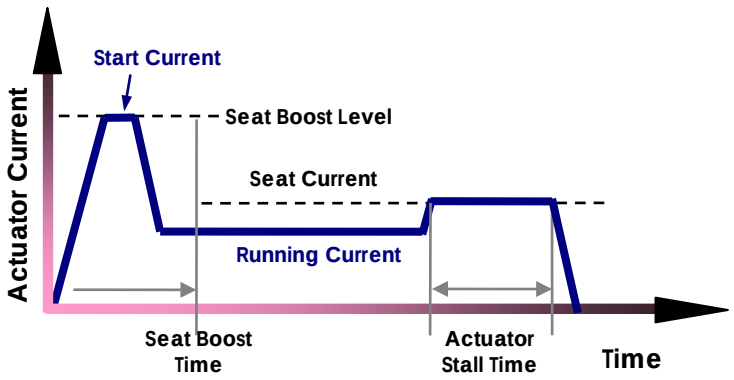
4.2.7.4 Seat Boost Level / Boost Time

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Seat 1 Boost Level	0 - 100 %	100 %				✓
Seat 2 Boost Level	0 - 100 %	100 %				✓
Seat 1 Boost Time	0 - 3 s	2 s				✓
Seat 2 Boost Time	0 - 3 s	2 s				✓

The start-up current of an actuator is usually much higher than the running current.

To help the actuator start moving, the **Seat Boost Level** parameter increases the maximum **Seat Current** (4.2.7.2) value directly after the user has started to operate the actuator. The increased maximum current is available during the time period that has been set with **Seat Boost Time**.

The **Seat Boost Level** percentage is added to the value of **Seat Current**. For example, if the boost level is set to 50 %, then the current available to the actuator at start-up will be 150 % of the normal **Seat Current**.



4.2.7.5 Actuator Stall Time

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Actuator Stall Time	0 - 10 s	0.5 s				✓

When the current drawn by an actuator during driving reaches the value that has been set with the **Seat Current** parameter (4.2.7.2), the system will cut power to the actuator after the time that is set with **Actuator Stall Time**.

The current typically rises when an actuator is driven into its end-stop, and so this feature provides an automatic stop at end-of-stroke.

4.2.7.6 Actuator While Charging

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Actuator While Charging	No / Yes	Yes				✓

"No" prevents actuator operation while a battery charger is connected. In this case a 'dummy' charger plug can prevent actuator usage in environments such as classrooms.

4.2.8 Miscellaneous Settings

These features combine to provide a staged response to heating in the controller. Generally the FET Thermal Rollback temperatures will be set higher than the Thermal Rollback temperatures.

4.2.8.1 Thermal Rollback

Parameter	Possible Values	Default	HHP	Lite	Std	Adv
Thermal Rollback Start	40 - 100 C	60 C				✓
Thermal Rollback End	40 - 100 C	75 C				✓

The Thermal Rollback feature is used by the system to reduce the maximum speed that the user can demand from the powerchair.

The drive speed is reduced, but the maximum possible current (or torque) is not reduced. This means that the powerchair will drive slower but should still be able to climb small obstacles, such as kerbs.

Thermal Rollback Start is the temperature at which the thermal rollback starts.

Thermal Rollback End is the temperature at which the thermal rollback limits the maximum speed of the chair to 10 % (see the left figure at the bottom of this page).

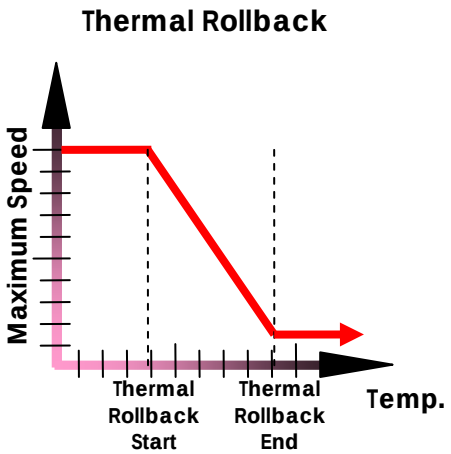
4.2.8.2 FET Thermal Rollback

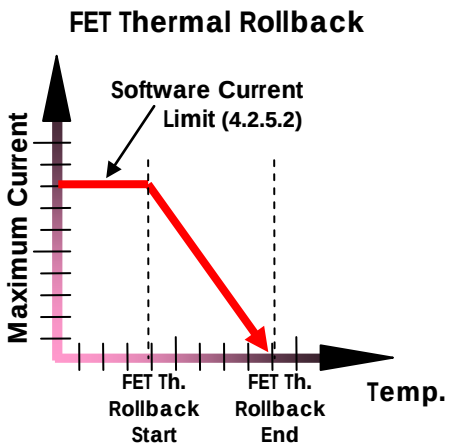
Parameter	Possible Values	Default	HHP	Lite	Std	Adv
FET Thermal Rollback Start	40 - 100 C	80 C				✓
FET Thermal Rollback End	40 - 100 C	90 C				✓

To protect the Power Module from overheating, an additional thermal rollback algorithm reduces the output current when the Power Module becomes too hot.

FET Thermal Rollback Start is the temperature at which the thermal rollback starts.

FET Thermal Rollback End is the temperature at which the thermal rollback limits the output current to zero, and driving is not possible.



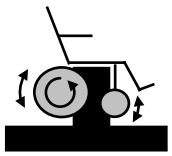


5 Testing

Perform the testing procedure to make sure that the powerchair meets a minimum level of safety.

5.1 Before testing

- Check that all cables are connected correctly. Check especially that the polarities of the batteries, the motors and the park brakes are connected correctly and that the polarities are not swapped.
- When the SHARK is turned on for the first time, the programmable parameters have an unknown value. For this reason the powerchair can be dangerous and uncontrollable when it is turned on. To make sure that the powerchair does not suddenly start to drive when you turn it on, **put blocks under the powerchair frame to lift the wheels off the ground.** Check that the wheels can turn freely.



- Make the final connection to the Battery positive (+) terminal and close the circuit breakers.
- Turn on the SHARK with the on/off button and program the SHARK for the appropriate powerchair application.
- Turn off the SHARK with the on/off button.

Warning:

Do not connect the '+' terminal of the battery to the SHARK until the powerchair is lifted off the ground.

To prevent the risk of injury, Dynamic Controls recommends the use of a lifting device when lifting the powerchair off the ground.

5.2 The testing procedure

1. Turn on the SHARK with the on/off button. Make sure that the controller turns on correctly. Check that all Battery Gauge LEDs turn on one by one, and that After the SHARK has started up successfully, the Battery Gauge indicates the charge of the battery.
2. Press the On/Off button again to turn the SHARK off. Check that it turns off correctly. Press the On/Off button again to turn the controller on again.
3. Press the Horn button. Check that the horn operates correctly.
4. Turn the SHARK ON and OFF several times and listen. Check that the park brakes do not click. Leave the SHARK ON.
5. Try to turn each drive wheel by hand to check that the park brakes are applied. It must not be possible to turn the wheels.
6. Push the joystick slightly out of the centre position. Check that the park brakes switch off (they will click when they switch off).

7. Move the joystick in all directions. Check that the wheels move smoothly in the correct direction.
8. Release the joystick back into the centre position. Check that the park brakes switch on again (they will click when they switch on).
9. Turn off the SHARK and remove the blocks from under the chair.

Warning:

Perform the following procedure in a large open environment, preferably outdoors. Make sure that the powerchair cannot crash into objects. Be prepared for unexpected powerchair movement in the event of a faulty installation.

If the powerchair becomes uncontrollable, turn the SHARK off for an emergency stop.

10. Turn on the SHARK. Select the slowest speed with the speed buttons.
11. Sit in the powerchair and drive the chair SLOWLY (small joystick movement) in all directions. Check for precise, smooth and progressive control.
12. Drive the chair FAST (large joystick movement) in all directions. Check for smooth and progressive control.
13. Select the highest speed with the speed buttons and repeat steps 11 and 12.
14. Drive the chair full speed FORWARD. Check that the chair moves forward in a straight line (the chair does not go to the left or to the right).
15. Drive the chair full speed REVERSE and check that you go backward in a straight line.

Note:

Rear wheel drive chairs often are unstable in reverse, which can cause the chair to drive in circles even when the joystick is central, reverse.

16. Drive full speed FORWARD and move the joystick from left to right along the front edge of the joystick restrictor plate, to check that you can still steer the chair.
17. Drive full speed FORWARD and then release the joystick to the centre. Check that the chair decelerates smoothly and in a straight line. Check that the park brakes switch on as soon as the chair stops.
18. Drive full speed in REVERSE and then release the joystick into the centre. Check that the chair decelerates smoothly and in a straight line. Check that the park brakes switch on as soon as the chair stops.
19. Drive full speed FORWARD and move the joystick into full reverse. Check that the chair decelerates smoothly and in a straight line before it moves in reverse.
20. Drive full speed in REVERSE and move joystick into the straightforward position. Check that the chair decelerates smoothly and in a straight line before it moves in a forward direction. Note: Deceleration in reverse is slower.

21. Drive forward SLOWLY and switch the SHARK OFF. Check that the chair stops instantly.
22. Push the joystick a little bit forward and switch the SHARK ON. Check that the chair does not drive. Release the joystick to the centre. Check that the chair drives normally.
23. Move the joystick forward just enough to release the park brake and check the creep speed. Repeat in reverse.
24. Drive the wheelchair up a 1 : 6 ramp. Check for normal power, smoothness and parking.
25. Reverse down the ramp and release the joystick when you are still on the ramp. Check that there is no rollback and that the park brakes switch on.
26. Accelerate up the ramp again, and reverse down the ramp to test good control.
27. Test the actuators if fitted.
28. Test the lights if fitted.
29. Repeat testing and programming of the SHARK until the performance of the powerchair is as expected.
30. Park the powerchair in a safe location and turn off the SHARK controller.

6 Diagnostics

SHARK is not user serviceable. Specialized tools are necessary for the repair of any SHARK component.

6.1 Limp Mode

If the SHARK detects a fault that is not serious enough to stop the powerchair completely, it will go to 'Limp Mode'. This is a reduced speed mode that recognises problems, but allows the powerchair user to drive slowly towards a safe environment where the problem can be investigated.

Warning:

If the SHARK is displaying a fault or the chair enters Limp Mode, do not operate the powerchair except to reach a safe environment. Proceed extremely carefully because the chair performance may be significantly different.
Have the chair serviced by an authorised service agent.

6.2 Out Of Neutral At Power Up (OONAPU)

An **O**ut **O**f **N**eutral **A**t **P**ower **U**p (OONAPU) condition occurs if the joystick is not in the centre position when the SHARK is switched on or an inhibit condition is removed (for example: a battery charger is disconnected). This makes sure that the powerchair does not suddenly start to drive.

If an OONAPU condition exists, all LEDs of the speedometer or battery gauge (depending on the Remote type) flash constantly. The powerchair does not drive.
If the joystick is returned to the centre, the OONAPU condition disappears and the powerchair can drive normally.

Warning:

If an OONAPU error does not go away after the joystick is released, the joystick of the Remote may be damaged. Do not use the powerchair and consult a service agent.

6.3 Diagnostics Tools

6.3.1 Hand Held Programmer (HHP)

When you plug an HHP into the Shark System when an abnormal condition exists, the HHP will show a 4-digit code on its screen. The 4-digit code indicates the detected fault. The first two digits provide the flash code number. The second two digits provide more specific diagnostics information that is suitable for repair technicians.

In some cases, viewing a history of any abnormal conditions that occurred previously on the system may be useful in diagnosing the current condition. This can be done by entering the Fault Log from the **Diagnostics** menu. Usage statistics are also available from this menu.

6.3.2 The PC-based Wizard program

Wizard is the preferred diagnostics tool in the workshop environment. The Wizard provides a full fault history and shows written descriptions of any current faults.

If after analysing the data, the condition cannot be diagnosed, it is possible to print, or preferably save and e-mail a Status Report for further analysis or distribution to a service centre.

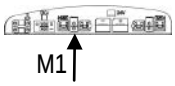
6.4 Flash Codes

An abnormal condition is indicated by a flash code on the Shark Remote's "Information Gauge" (generally the same as the battery gauge). A Flash Code is a sequence of flashes, separated by a pause, followed by a repetition of the sequence.

Flash	Description	
1	User Fault	Possible stall timeout or user error. Release the joystick to neutral and try again.
2	Battery Fault	Check the batteries and cabling. Try charging the batteries. Batteries may require replacing.
3	Left Motor Fault	Check the left motor connections and cabling.
4	Right Motor Fault	Check the right motor connections and cabling.
5	Left Park Brake Fault	Check the park brake connections and cabling.
6	Right Park Brake Fault	Check the park brake connections and cabling.
7	SHARK Remote Fault	Check the SHARK Communications Cable. Replace the Remote.
8	SHARK Power Module Fault	Check the SHARK connections and wiring. Replace the Power Module.
9	SHARK Communications Fault	Check for possible low battery. Check the SHARK connections and wiring. Check for worn motor brushes. Replace the Remote.
10	Unknown Fault	Check all connections and wiring. Consult a service agent.
11	Incompatible Remote	Wrong type of Remote connected.

6.5 HHP Fault codes with sub codes

If you connect an HHP during a fault condition, the fault log will show a 4-digit code. The first two digits provide the fault code number. The second two digits provide the sub code for more specific diagnostics information.

Code	Fault source	Sub code	Meaning
01	User	00	Out Of Neutral At Power Up (OONAPU) • Release the joystick to the center and try again Motor overload (too steep) • The motor is not strong enough, try an alternative route Controller is locked • Unlock controller
02	Battery	00	Voltage too high or too low • Check the batteries and the cables • Batteries may be empty: charge the batteries • Batteries may be overcharged: if driving downhill, slow down • Batteries may be damaged: replace the batteries
03 04	Motor 1  Motor 2  	00	Short circuit • Check the motor cables for damage • Motor brushes may be too stiff, bouncing against the case o Replace motor brushes or motor
		01	Open circuit • Check if the motor cables are loose • Motor brushes may be worn o Turn wheels to reconnect o Replace motor brushes or motor
		02	Motor terminal connected to battery negative (-) • Check if the motor has been connected correctly • Check the motor cables for damage
		03	Motor terminal connected to battery positive (+) • Check if the motor has been connected correctly • Check the motor cables for damage
		04	Motor voltage not consistent during drive • Possible motor short circuit o check the motor cables for damage o Motor brushes may be too stiff and bouncing • Otherwise internal controller fault, contact Dynamic
		06	Intermittent short circuit • Check for damaged cables • Motor brushes may be too stiff, bouncing against the case o Replace motor brushes or motor
		All other	Internal fault • Contact Dynamic

When a motor fault occurs:

- Swap the motor connections:
  - o If the chair has two park brakes, you can simply swap the motor connectors on the Shark power module, if the motor connectors are not keyed.
  - o If the chair has only one park brake, swap the motor connections at the motor end. Swapping the connectors will swap the park brake connections too; this will result in a park brake fault with only one park brake, because it must be connected to M1.
- When after swapping the fault moves from Motor 1 to Motor 2 or vice versa, the fault is caused by the motor or by the cables. Only when the fault does not move after swapping, the controller itself can be faulty.

Code	Fault source	Sub code	Meaning
05	Parkbrake 1	00	Drive-time test failed. • Check the park brake cables
06	Parkbrake 2	01	Park brake not connected or broken • Check if the cables of the park brake are loose
		02	Park brake short circuit or broken • Check the park brake cables for damage
		03	Fault during power-up testing • Check if the cables of the park brake are loose or damaged
		04	Park brake short circuit or broken • Check the park brake cables for damage
07	Remote	04 05	Attendant remote fault • Check attendant remote cables for damage • Disconnect and reconnect attendant remote • If the fault doesn't go away, disconnect the attendant remote as a temporary solution and contact Dynamic
		All other	Internal fault • Contact Dynamic
08	Power module	13	Actuator fault • Check the actuator and the actuator cables
		14	Lighting fault • Check the light bulb and the lighting cables
		All other	Internal fault • Contact Dynamic
09	Communication	00	Loss of communication between remote and power module • Check for possible low battery • Check for loose connectors or a damaged cable • Check for worn motor brushes
		01	Limp mode caused by unreliable communication • Check for loose connectors or a damaged cable • Check for worn motor brushes
		02	Loss of communication with attendant remote • Disconnect and reconnect attendant remote and try again • Check the attendant remote cables • If the fault doesn't go away, disconnect the attendant remote as a temporary solution and contact Dynamic
10	Internal fault	00	• Contact Dynamic
11	Wrong remote	00	Incompatible remote connected • Check that the brand on the remote and the power module are the same

When a park brake fault occurs and the chair has <u>two</u> park brakes:

- <u>Swap</u> the motor/park brake connectors, if the motor connectors are not keyed.
- When after swapping the fault moves from Park brake 1 to the Park brake 2 or vice versa, the fault is in the park brake or in the cables. Only when the fault ***<u>does not</u>*** move after swapping, the controller itself is faulty.

If the chair has only <u>one</u> park brake, this method <u>cannot</u> be used, because a single park brake must always be connected to Park brake 1.

6.6 Communications Fault

Two flashing amber coloured LEDs (REMA only) indicate the Remote has powered up correctly but communication with the SHARK Power Module has not been established.

Possible causes include:

- *A damaged cable*
- *Low Battery*
- *A communication fault with the power module*

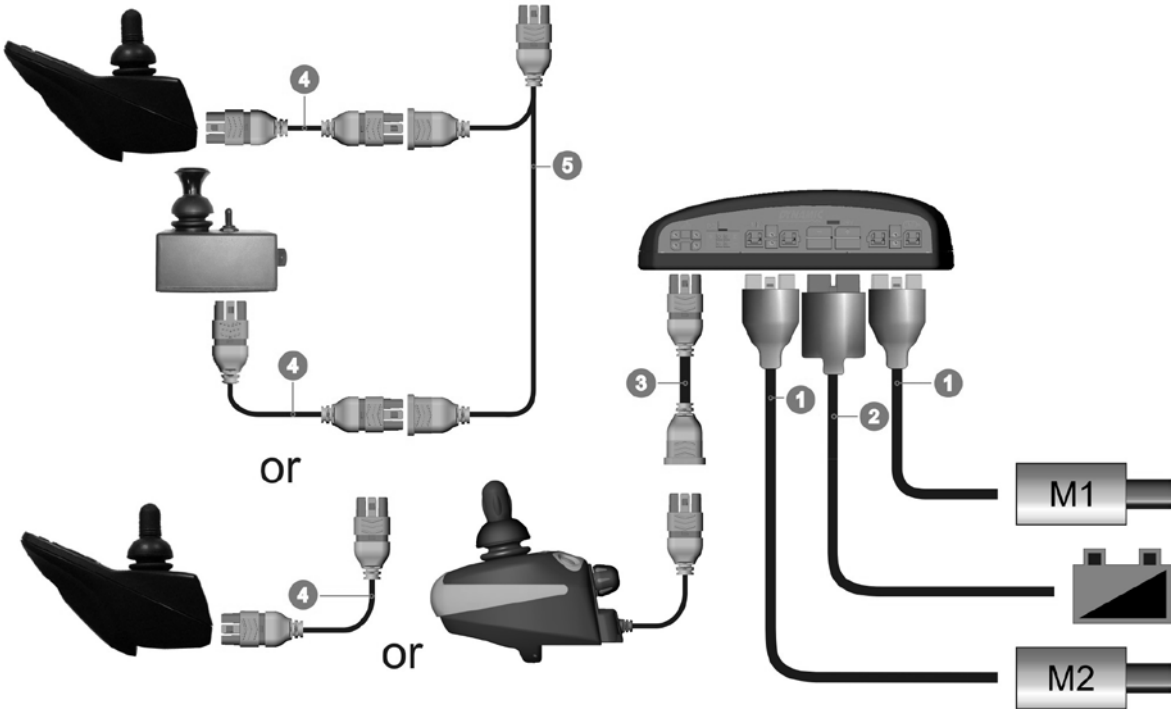
7 Appendices

7.1 Parts List

DYNAMIC SHARK Installation Manuals		
Part Description	**DCL Part #**	**Qty/Unit**
SHARK DK-PM(x) Installation Manual *(This Manual)*	GBK80262	1
SHARK DK-REMA Installation Manual	GBK80260	1
SHARK DK-REMB Installation Manual	GBK80261	1
SHARK DK-REMD Installation Manual	GBK80258	1
SHARK DK-ACU Installation Manual	GBK80257	1

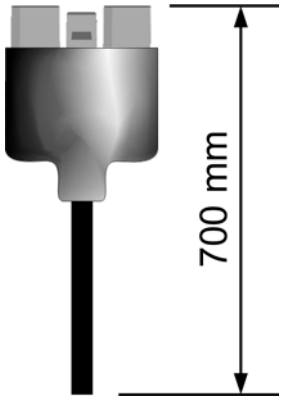
DYNAMIC SHARK Programming Tools		
Part Description	**DCL Part #**	**Qty/Unit**
SHARK Programming Adaptor Required for HHP connection	DK-ADAPT	1
Wizard 5 Kit – Programming Kit Contains software, cables and DWIZ-ADAPT adaptor (no dongle).	DWIZ-KIT	1
Wizard Dongle (USB) – OEM version Enhanced Dealer Dealer Factory	DWD-OEM-U DWD-EDL-U DWD-DLR-U DWD-FAC-U	1
DX Hand Held Programmer Includes DK-ADAPT	DX-HHP	1

SHARK Looms



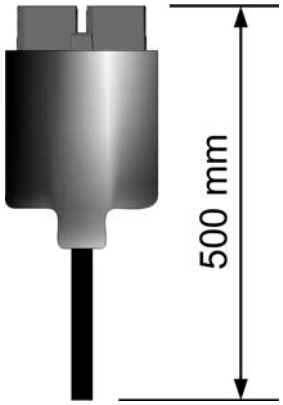
1 Motor Loom (700mm)

Part Description	DCL Part #	Qty/Unit
Preferred Option		
Motor Loom – Left Keyed/Polarized (700mm)	GSM61191P	1
Motor Loom – Right Keyed/Polarized (700mm)	GSM61192P	1
Or		
Motor Loom – Left Unkeyed (700mm)	GSM61191	1
Motor Loom – Right Unkeyed (700mm)	GSM61192	1



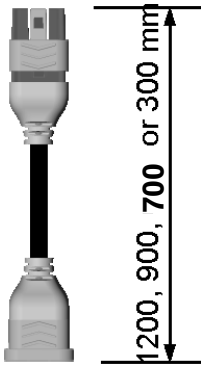
2 Battery Loom (500mm)

Part Description	DCL Part #	Qty/Unit
Battery Loom (500mm)	GSM80204	1



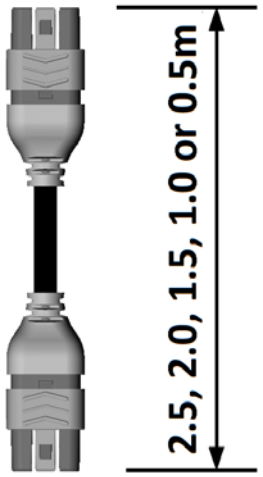
3 SHARK Remote Extension Cable

Part Description	DCL Part #	Qty/Unit
SHARK Remote Extension Cable (1200mm)	GSM80232	1
SHARK Remote Extension Cable (900mm)	GSM80231	1
SHARK Remote Extension Cable (700mm)	GSM80211	1
SHARK Remote Extension Cable (300mm)	GSM80203	1
SHARK Remote Extension Cable with Panel Mounting Spring (900mm)	GSM80224	1
SHARK Remote Extension Cable with Panel Mounting Spring (640mm)	GSM80221	1
SHARK Remote Extension Cable with Panel Mounting Spring (300mm)	GSM80220	1



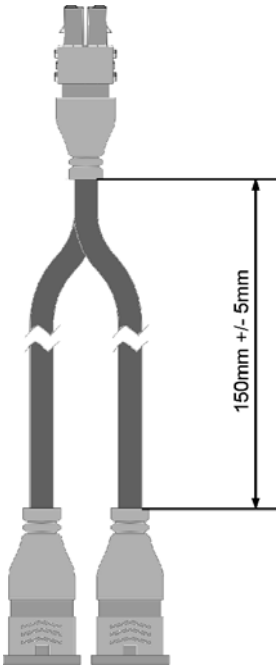
4 DK-REMD BUS Loom

Part Description	DCL Part #	Qty/Unit
SHARK BUS Loom (2.5 m)	GSM80241	1
SHARK BUS Loom (2.0 m)	GSM80212	1
SHARK BUS Loom (1.5 m)	GSM80233	1
SHARK BUS Loom (1.0 m)	GSM80234	1
SHARK BUS Loom (0.5 m)	GSM80236	1

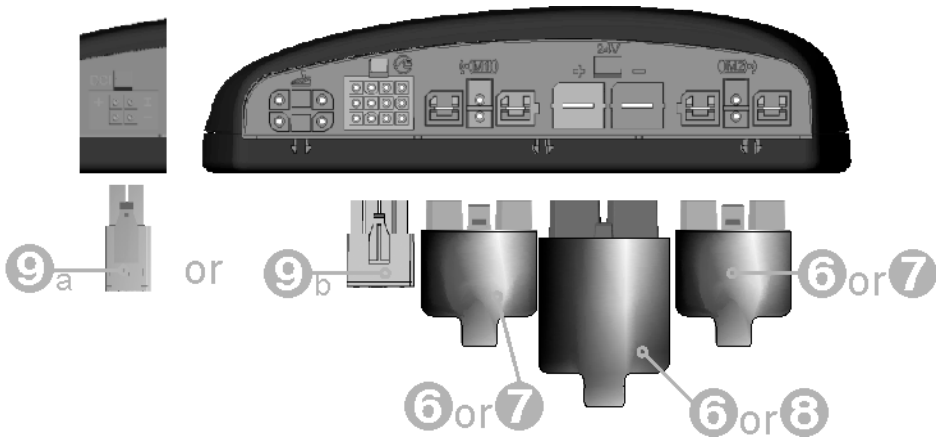


5 DK-ACU Connection Cable

Part Description	DCL Part #	Qty/Unit
Attendant Control Unit Connection Cable	GSM80951	1

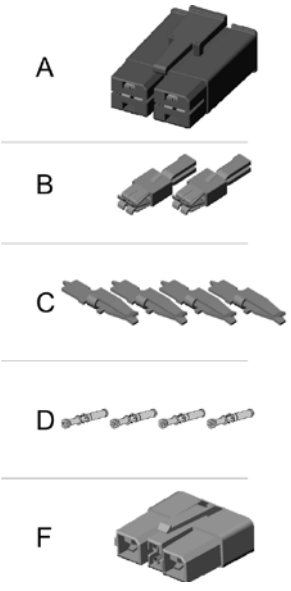


DYNAMIC SHARK Connector Kits and Adaptors



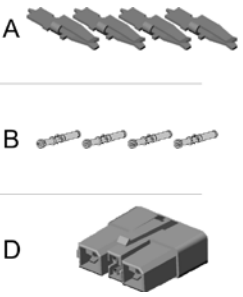
6 Motor & Battery Connector Kit – Unkeyed (GSM80210) or – Keyed (GSM80209)

Item	Part Description	DCL Part #	Qty/Unit
A	Battery Connector Housing	GME80016	1
B	Battery Spade Receptacle	GCN8002	2
C	Innergy Contact - Female	GCN1781	4
D	Positronic Contact – Female	GCN0794	4
E	Connector Boot (not shown)	GCN65129	3
	Either		
Fa	Motor Connector Housing – Unkeyed	GCN60325	2
	Or		
Fb	Left Motor Connector Housing – Keyed	GCN60326	1
Fc	Right Motor Connector Housing – Keyed (pictured)	GCN60327	1



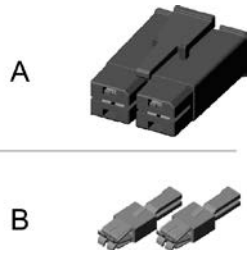
7 Single Motor Connector Kit – Unkeyed (GSM60182S)

Item	Part Description	DCL Part #	Qty/Unit
A	Innergy Contact – Female	GCN1781	2
B	Positronic Contact – Female	GCN0794	2
C	Connector Boot (not shown)	GCN65129	1
D	Motor Connector Housing – Unkeyed	GCN60325	1



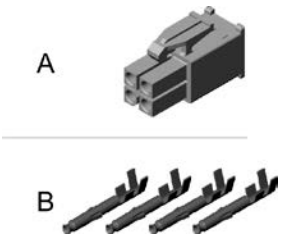
8 Battery Connector Kit – GSM80208

Item	Part Description	DCL Part #	Qty/Unit
A	Battery Connector Housing	GME80016	1
B	Battery Spade Receptacle	GCN8002	2
C	Connector Boot (not shown)	GCN65129	1



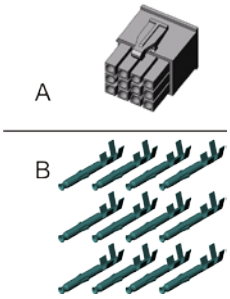
9a Drive Control Input (DCI) Connector Kit – GSM80206

Item	Part Description	DCL Part #	Qty/Unit
A	DCI Connector Housing (AMP MateNlok2 Mini 4w Hse #794188-1)	GCN8005	1
B	DCI Pins 16-20 AWG (AMP MateNlok2 Receptacle # 794223-1)	GCN0978	4



9b SHARK Port Connector Kit– GSM80226

Item	Part Description	DCL Part #	Qty/Unit
A	DCI 12 Pin Connector Housing (AMP MateNlok Mini 12w Hse #172170-1)	GCN8004	1
B	DCI Pins 20 -16 AWG (AMP MateNlok Receptacle #171637-1)	GCN0691	12



7.2 Intended Use and Regulatory Statement

Intended Use

The Shark Remote and Power Module are intended to provide speed and direction control for small or medium sized power wheelchair systems utilizing dual DC motors and integrated park-brakes. The controller may also operate up to two actuators (for example, seat lift and tilt) and lighting. The intended power source is a 24V battery. The SHARK controller will respond to user input demand via the joystick input, in terms of speed and direction.

The powerchair manufacturers are provided with all the integration, set-up, operating environment, test and maintenance information needed in order to ensure reliable and safe use of the controller.

Device Classification

Europe

The SHARK Controller is a component of a Class I medical device as detailed in the Council Directive 2007/47/EEC concerning Medical Devices.

USA

The SHARK Controller is a component of a Class II medical device (Powered Wheelchair) as detailed in 21 CFR § 890.3860.

Wheelchair Components are classified under 21 CFR § 890.3920 as Product Code KNN, Class I (General Controls), 510(k) exempt.

Compliance and Conformance with Standards

The Shark System has been designed such that the combination of the wheelchair and controller, along with accessories as applicable, complies with the Essential Requirements of EU Directive 93/42/EEC (and amendments) by adopting relevant clauses of harmonised standards EN12184 and EN12182, and relevant parts of the FDA Recognized Consensus standard ANSI / RESNA WC-2 for performance.

SHARK Programming Adaptor

The Shark programming adaptor is intended to allow the Shark Controller series of power wheelchair controllers to communicate with the DX Hand Held Programmer (DX-HHP) and the Wizard. The adaptor is not intended to alter the controller in any way, but simply passes information to and from the controller. The information passed may alter the controller performance.

The intended power source is a 24 V battery supply via the charger connector of the Shark controller. The intended environment is indoors, or outdoors in dry conditions.

7.3 Service life

If the product has been installed, used and maintained as recommended, all instructions contained in this manual have been properly followed, and the unit has not been abused, the expected service life period (i.e. serviceable life expectancy) of the product is five (5) years. After this period, Dynamic Controls recommends the product be replaced for safety

reasons. Dynamic Controls accepts no responsibility or liability for product failure if the product is retained in use beyond the stated service life period.

7.4 Maintenance

1. Keep all Dynamic Controls products free of dust, dirt and liquids. To clean the product, use a cloth dampened with warm soapy water. Do not use chemicals, solvents or abrasive cleaners, as this may damage the product.
2. Monthly check all vehicle components for loose, damaged or corroded components, such as connectors, terminals, or cables. Restrain all cables to protect them from damage. Replace damaged components.
3. Once every 6 months, test all switchable functions on the Dynamic Controls electronics system to ensure they function correctly.
4. There are no user-serviceable parts in any Dynamic Controls electronic product. 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.
5. Where any doubt exists, consult your nearest service centre or agent.

Warning:

It is the responsibility of the end user to maintain the product in a state of good repair at all times. 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.

7.5 Warranty

All equipment supplied by Dynamic Controls is warranted by the company to be free from faulty workmanship or materials. If any defect is found within the warranty period, the company will repair, or at its discretion replace, the equipment without charge for materials or labour.

This warranty is subject to the provisions that the equipment:

has been correctly installed

has been thoroughly checked upon completion of installation, and all programmable options correctly adjusted for safe operation prior to use

has been used solely in accordance with this manual and all other manuals of the Dynamic Controls products that are used on the mobility vehicle

has been properly connected to a suitable power supply in accordance with this manual

has not been subjected to misuse or accident, or been modified or repaired by any unauthorised personnel

has not been connected to third party devices without the specific approval of Dynamic Controls

has been used solely for the driving of electrically powered mobility vehicles in accordance with the intended use and the recommendations of the vehicle manufacturer

7.6 Safety and Misuse Warnings

Warnings to be included in the User Manual

The following warnings are applicable to the end user, the installation technician and the dealer or the therapist who supplies the vehicle to the end user. They must be passed on to the operator of the vehicle before use of the product.

1. Do not install, maintain, or operate this equipment before you have read and understood all the instructions and all the manuals for this product and all the other products that you use or install together with this product. Follow the instructions of the manuals. If you do not follow all instructions, injury or damage can be the result.
2. Do not try to open or disassemble any case - there are no user-serviceable parts inside.
3. The operator has the responsibility to keep the vehicle in a good safe operating condition. To protect all the components (for example the cables) from damage, the operator must fasten them in optimum positions.
4. If operators of the vehicle are left with limited or no mobility for any reason (for example, because the vehicle loses electric power or breaks down), it is important that they can still call for assistance from wherever they may be.
5. Make sure that the product does not become colder or hotter than the minimum and maximum temperatures specified in this manual.
6. Do not touch the connector pins. If you touch the pins, they can become dirty or they can be damaged by electrostatic discharge.
7. Most electronic equipment is influenced by Radio Frequency Interference (RFI). Be careful when portable communications equipment is used in the area around such equipment. Dynamic Controls has made every effort to make sure that RFI does not

change the behaviour of the controller, but very strong signals can still cause a problem. The vehicle manufacturer has the responsibility to make sure that the vehicle is tested according to local EMC regulations.

8. Immediately turn the controller off and consult your service agent if the vehicle
   - is damaged
   - does not behave the same every time
   - does not respond normally, the way you expect it to
   - becomes hotter than normal
   - smokes
   - arcs
   - does not change its speed when you adjust the speed reduction pot or the speed reduction switch (if one is available on your vehicle)
   - shows a fault on its fault indicator and the controller does not perform normally.
9. Turn the controller off
   - when you do not use it
   - before you get in or get out of the vehicle
   - before you answer or make a call from a mobile phone or a portable communications device near the vehicle
   - if your vehicle drives by itself or against your will. When you turn the controller off the vehicle will halt.
10. In the case of an emergency while the vehicle is driving, press the On/Off button or turn the key switch to perform an emergency stop and turn the controller off.
11. If the controller indicates that the battery is low, recharge the battery as soon as possible. The life of the battery decreases faster if the battery has a low charge; the longer a battery remains at a low charge, the shorter its life will be. Do not drive the vehicle if the battery is almost empty, this may cause the vehicle to drive slower or stop. If the battery becomes completely empty, the vehicle may stop suddenly.
12. Make sure that the battery charger that is used with the vehicle has a drive inhibit function that is correctly connected for use with the controller. If you are not sure, ask your dealer or vehicle manufacturer.
13. Operation of a vehicle on steep slopes can be dangerous. Before you drive up or down a slope, make sure that the slope does not exceed the capability of the vehicle.
14. Do not use the park brake release on a slope.
15. Go downhill slowly. When the vehicle drives downhill, the motors act as a dynamo and generate energy. The controller sends the generated energy from the motor to the battery. This charges the battery. However, if the battery is fully charged, it cannot accept the generated energy anymore. When this happens, there is a risk of damage to the battery or an explosion. To prevent this risk, the controller forces the vehicle to slow down until the battery can accept more energy. After this, it allows the vehicle to speed up again. The result of this will be sudden speed changes of the vehicle. To prevent these speed changes with fully charged batteries, turn on the lights (if fitted) and decrease the speed of the vehicle when going downhill.
16. The controller can cause the vehicle to come to a sudden stop. If this can be dangerous to the operator, the installer must install a seat belt, and the operator must wear this seat belt.
17. Performance adjustments must only be made by healthcare professionals, or by persons who completely understand the programming parameters, the adjustment process, the configuration of the vehicle, and the capabilities of the driver. Wrong settings can make the vehicle uncontrollable or unstable. An uncontrollable or unstable vehicle can cause an unsafe situation such as a crash, with the risk of serious injury to the driver or bystanders, or damage to the vehicle or surrounding property.
18. Performance adjustments must only be made indoors, or outdoors in dry conditions.

Service and configuration warnings

The following warnings are only applicable to the installation technician, and the dealer or the therapist who supplies the vehicle to the end user.

19. To make sure that the left motor and the right motor are not swapped, the motor connectors must not be interchangeable. Keying or labelling of motors is therefore recommended.
20. It is the responsibility of the installer to make sure that accessories that are connected to the wires of the vehicle do not interfere with the operation of the controller.
21. Do not use the vehicle frame as the earth return. Any electrical low-resistance connection to the frame is a safety risk and is not allowed by international safety standards.
22. It is the responsibility of the installer to specify a battery charger that is suitably adapted to handle the charging voltage drop created by the combined resistance of the controller, cabling and connectors used in a particular vehicle configuration.
23. If the vehicle loses electric power, it is important that an attendant is able to move the vehicle easily.
24. After you have completed the installation, check it thoroughly. Correctly adjust all programmable options before the vehicle is used.
25. After you have configured the vehicle, test the vehicle to make sure that the vehicle performs to the specifications entered in the programming procedure. Check that the vehicle drives safely and that the performance of the vehicle is appropriate to the capabilities and needs of the user. If the vehicle does not perform as intended, reprogram the vehicle and test again. Repeat this procedure until the vehicle performs as intended. If the intended performance and/or operation cannot be reached, contact your service agent.
26. After maintenance or service of the vehicle, check the functional operation of all components that are externally connected to the controller, such as
    - lights
    - external switches
    - actuators
    - DCI/ACI/OBC resistor switch circuits (including programmed slowdown behaviour)
27. The dealer, therapist or other agent who supplies the vehicle to the end user has the responsibility to make sure that the vehicle is correctly configured for the needs of that user.
28. For each individual user, the vehicle set up and configuration should take into consideration his or her
    - technical knowledge, experience and education, and
    - medical and physical condition, including the level of disability and capability (where applicable).
29. It is the responsibility of the OEM and installer to make sure that the maximum driving speed of the vehicle is limited as appropriate when the vehicle is in a mechanically unstable position, for example when the seat is raised.
30. The display (if present) must be visible to the user in all seating positions.
31. It may be possible to set up the vehicle seating in such a way that users cannot operate the controls in every position. For example, if the seat is tilted backward, it may not be possible for some users to reach the controls. Make sure that the user has alternative means of operating the seating until the seat is back in a seating position that is suitable for the use of the standard controls.
32. It is the responsibility of the therapist/ installer to minimize any risk of use error, including those arising from ergonomic features and/or the environment in which the device is intended to be used.
33. Prior to handing over the vehicle, make sure that users are fully able to operate the product by giving them appropriate training on functionality and safety features, and having them test-drive the vehicle in a safe area in the presence of their agent.

7.7 Electromagnetic Compatibility (EMC)

Dynamic Controls Electronic controllers and accessories have been tested on typical vehicles to confirm compliance with the following appropriate EMC standards:

USA: ANSI/RESNA WC/Vol:2 - 1998 Sec 21

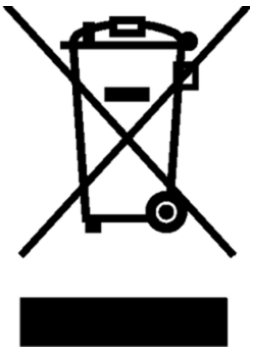
Europe: EN12184: 1999 Sec 9.8.1-3 / ISO7176-21

National and international directives require confirmation of compliance on particular vehicles. Since EMC is dependent on a particular installation, each variation must be tested.

Minimising emissions

To minimise emissions and to maximise the immunity to radiated fields and ESD, follow the General Wiring Notes and Recommendations in section 3.3.1.

7.8 Environmental statement



This product has been supplied from an environmentally aware manufacturer.

Please be environmentally responsible and recycle this product at the end of its life through your local recycling facility.

This product may contain substances that could be harmful to the environment if disposed of into a landfill.

Do not dispose of this product in fire.

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Dynamic Controls is the world's leading manufacturer of electronic controls for power wheelchairs and scooters.
DYNAMIC was established in 1972 and is headquartered in New Zealand.
Regional centres are located in Europe, United States, Asia, and Australasia.

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