



EXTREME 4X4 Power Wheelchair **Owners Manual**

Please read this manual carefully as it contains important maintenance and warranty information.

The Extreme 4X4 Power Wheelchair series may be custom made to measure and may vary in detail from chair to chair however they should all comply with the enclosed basic specifications.

SAFETY WARNING

- Avoid wheelchair use in the rain as this may damage electrical components.
- Do not carry passengers.
- Use caution when near steps and ramps.

Joystick Controls

The joystick controls as with other items on the chair may be customized and may be one of a number of different models depending upon user requirements. Detailed information on the joystick controls is contained within this manual on a separate page. The controls should be one of the following:

DOLPHIN Joystick Model DX-REM34
EUROPA Joystick Model DX-REMG90

The joystick hand control unit IS NOT WATERPROOF so care must be exercised so as not to get caught outdoors in the rain. We recommend the carrying of a small plastic bag large enough to cover the joystick module and the user's hand, in case of rain. The joystick module is splashproof but may be permanently damaged if water transgresses the rubber seals (this damage is not covered under warranty). If for any reason, the joystick lead is disconnected take care when reconnecting, do not force the plug into the socket. The lead is polarized and should only be fitted one way. Forcing the plug into the socket the wrong way can permanently damage the electronics system.

WARRANTY

This wheelchair is provided with a 3 Year Limited Warranty the frame and a 12 month Limited Warranty on the parts and workmanship contained within. This warranty does not cover wearing items such as tires, batteries, upholstery etc. The warranty does not cover freight to or from the manufacturer. That is the chair must be returned to the factory or agent for all warranty repairs. The warranty on the

Extreme 4X4 does not cover breakage / damage to the motors, gearboxes, or axle shafts caused by use of the wheelchair. Warranty will not cover these items, as Vestil Manufacturing Company has no control over the severity of use that this all terrain wheelchair may encounter. We will, at our discretion, repair / replace items that we consider were faulty at time of manufacture.

All warranties are detailed in "Terms & Conditions of Sale – Vestil-Innovation in Motion (available upon request)

Upon acceptance of goods at delivery the purchaser accepts the "Terms & Conditions of Sale"

Master Distributor for the United States and Canada

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The following patents cover this product:

USA Patent No 5482125

CANADA Patent Application No 2125172

AUSTRALIAN Patent No 669139

EUROPE Patent Application No 92924499.4

Batteries and Battery Charger

We recommend using only a high quality dual rate intelligent battery charger with your Extreme 4X4 Power Chair. All Extreme 4X4 chairs are supplied with sealed, no maintenance, AGM batteries as standard.

The following are the minimum sizes and brands of batteries and charger that we recommend.

Batteries: 75 Amp Hour (MK Battery 8G24)

Charger: 24 Volt, 6 Amp Constant Current (Soniel Model No. 2412SRF)

Charger Operation

Battery Charging is via a socket within the joystick module. When a charger is plugged in, the joystick unit recognizes the unit is plugged in and powers the joystick indicators on to enable monitoring of the charging process. Chair driving is inhibited. The Profile Display will indicate a "-". The Battery Fuel Gauge will be illuminated. As the battery reaches fully charged the Battery Fuel Gauge will start to flash, this is normal.

1. **AC connected and battery not connected:** When the charger is connected to the AC power, the **red** light will be ON, showing that AC power is connected. If the output is not connected to the socket, the **green** light will flash.
2. **Charging:** When the charger is connected to the battery and the AC is plugged in, the **red** (power) and **yellow** (charging) light will be ON.
3. **Full Charge:** When the battery voltage reaches about 28.8 volts, the **yellow** light changes to **green** light.
4. **Maintaining full charge:** The charger maintains the battery at full charge and does not overcharge. The light remains **green**. At upper cut-off voltage, the charger shuts-off complete. By using the pulse method for final charging, the charger maintains the battery at full charge at all time without overcharging. For a new battery with lower internal losses, the pulses are less often. With an older battery with higher internal losses, the pulses are more often. The charger adjusts itself to the requirement of the battery.
5. **Temperature compensation:** The Soneil charger automatically adjusts its output at temperatures above 75° F when the batteries need less terminal voltage to fully charge.

PLEASE NOTE THE FOLLOWING:

Do not put the charger on the seat of the wheelchair when charging as the charger can become quite warm. Always put the charger on the floor near the chair when in use

Caution: Do not use charger within 10 ft. of electronic or medical equipment.

Maintenance

It is important to regularly (every month) have such items as tires, castors, wheels and control systems inspected for wear or damage. These inspections can be carried out by anybody familiar with the wheelchair but **we recommend that every 12 months the chair should be inspected by a factory authorized service facility.** Repairs or replacements should only be carried out with manufacturer-approved components to assure proper performance.

Batteries

The batteries used in the Extreme 4X4 Power Chairs are all sealed, no maintenance gel cells and require only correct charging procedures - see Battery Charger section. Typically these batteries would last 6 months to 2 years depending upon type of usage.

Tires

We recommend that the tire pressures be checked weekly, as running under inflated tires may be dangerous and can leave the tires prone to punctures. **FRONT & REAR TIRES** - Black knobby low-pressure high traction tires - these should be inflated to 3-5 psi for general use. (Do not exceed 10psi.)

TIRE INFLATION - All pneumatic Extreme 4X4 tires are fitted with automotive type valves and can be inflated using most typical automotive hand and foot type pumps as well as service station air outlets. All tires should be checked **weekly** for correct inflation to the specifications given above.

TIRE WEAR - tire wear varies greatly depending on usage (from months to years), but no matter what sort of time your tires last this is mostly governed by your typical daily requirements. To achieve the most from your tires it is important to have them correctly inflated. Always use manufacturer recommended parts. Replace tires when the tread pattern wears to less than 2mm in depth as tires will start to lose safe traction and can be more prone to puncture.

Upholstery

The upholstery and frame of the wheelchair may be cleaned using mild soap and water. Avoid getting water into any electric components.

EUROPA JOYSTICK – DXREMG90



The Display Area

All G90 variants contain an identical display area consisting of:



- 1. Actuator Icons**
When illuminated, the remote is in Seat Mode. The selected actuator is indicated by a flashing icon. Only enabled actuators are illuminated.
- 2. ECU Mode Indicator**
When illuminated, the remote is in ECU Mode.
- 3. Hazard Light Indicator**
Shows the status of the hazard lights. When flashing, the hazard lights are on.
- 4. Left Turn Indicator**
Shows the status of the left indicator. When flashing, the left indicator light is on.
- 5. Battery Gauge**
6 multi-colored LEDs depict charge state of the battery. All 6 LEDs on indicate a full charge.

6. 7 Segment Display

Displays current Drive Profile, and Lighting Menu if enabled. Attendant control mode is shown by 'A'. Inhibit mode is shown by '-'. Other symbols are used in 'Head control', refer Section 8.2.

7. Right Turn Indicator






Shows the status of the right indicator. When flashing, the right indicator light is on.

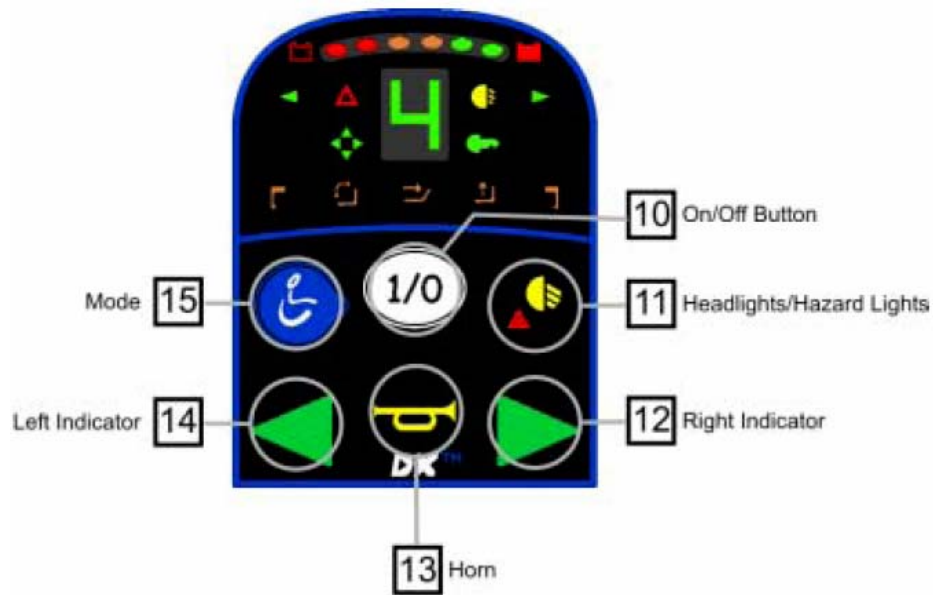
8. Headlight Indicator

Shows the status of the headlights. When illuminated, the headlights are on.

9. Lock/System Status LED

Red flashing LED indicates the keypad is locked. Green LED denotes the status of the system: on steady indicates no system faults, flashing indicates a fault. Refer Section 6.3.

LED Icon	Description	DX-CLAMB Output
	Left Foot Rest	3
	Seat Tilt-In-Space	1
	Back Recline	2
	Seat Height	5
	Right Foot Rest	4



10. On/Off Button

To turn the power on press the On/Off button. The current battery charge will be indicated and the System Status LED will illuminate and not flash. Press the On/Off button again to turn the power off.

11. Headlights/Hazard Lights

Headlights To turn the Headlights on/off, press and release ('short press') the Headlight/Hazard Light button.
Hazard Lights To toggle the Hazard Lights on/off, press and hold ('long press') the Headlight/Hazard Light button.

12. Right Indicator

Press the Right Indicator button to activate the right indicators. Press again to turn off.

13. Horn

Pressing the Horn button will sound the horn for as long as the button is pressed.

14. Left Indicator

Press the Left Indicator button to activate the left indicators. Press again to turn off.

15. Mode

Each press of the Mode button will increment the drive profile, up to the maximum configured value and then back to profile 1. The current drive profile will be shown in the 7 Segment Display. If accessory functions are present, further presses of the Mode button will select these modes in turn. If accessories are enabled but not present a '0' will be displayed.

SPECIAL ITEMS TO NOTE

If the chair is driving and the Mode button is pressed, the drive profile will increase by a single increment with each press until the maximum configured value is reached. While driving, Mode will not enter any available accessory modes.

The programmable parameter **Change Profile While Driving** can be used to select if changes to drive profile whilst driving are required.

The programmable parameter **Wrap Profiles** is not used for this product variant.

The programmable parameter **Allow non-driving Profile** should be used to access accessory options.

DOLPHIN JOYSTICK – DXREM34 *When Fitted*



1. Battery Fuel Gauge

All 10 lights on	=	100% Full
5 lights on	=	50% Full
2 lights on and flashing	=	5% Full
1 light on and flashing	=	Empty -Needs recharging as soon as possible

2. I/O Power Switch

Indicator -Denotes that the wheelchair is turned ON
-When this light is flashing indicates an electronic system fault

3. Left Blinker

Operates the left flashing blinker (when optional full light system is fitted)

4. Right Blinker

Operates the right flashing blinker (when optional full light system is fitted)

5. Horn

Depress once to sound built-in horn.

6. Profile Select Switch

Depressing this button cycles through the drive programs – speeds (a maximum of 5 is generally available). See SPECIAL ITEMS TO NOTE section for further explanation.

7. Profile Display

The Profile Display is used to display a number of messages. They are as follows:

*Currently Selected Drive Program (Usually 1 to 5)

*Inhibit Status “-“ When the chair is inhibited from driving, normally during operation of actuators.

*Remote Status. If the displayed number (or “-“) is flashing this indicates that the joystick unit is faulty.

8. Hazard Lights

Operates the hazard lights (when optional full light system is fitted)

9. Driving Lights

Operates the front and rear lights (when optional light system is fitted)

With the chair turned on swipe the supplied magnetic key across the key symbol and the chair will be locked. A small red indicator within the key symbol will flash if the chair is turned on again. To unlock the, chair simply swipe the key symbol again.

10. Seat Lift (optional)

Depressing this button once transfers the joystick function from driving the chair to actuating the seat lift function, indicated by a “-“ on the profile display. When in this mode the forward motion of the joystick causes the seat to rise and the rearward motion of the joystick causes the legrest to lower.

11. Left Elevating Legrest (optional)

Depressing this button once transfers the joystick function from driving the chair to actuating the right elevating legrest function, indicated by a “-“ on the profile display. When in this mode the forward motion of the joystick causes the legrest to rise and the rearward motion of the joystick causes the legrest to lower.

12. Backrest Recline (optional)

Depressing this button once transfers the joystick function from driving the chair to actuating the backrest recline function, indicated by a “-“ on the profile display. When in this mode the backward motion of the joystick causes the backrest to recline and the forward motion causes the backrest to move forward.

13. Seat Tilt-In-Space (optional)

Depressing this button once transfers the joystick function from driving the chair to actuating the seat tilt-in-space function, indicated by a “-“ on the profile display. When in this mode the forward motion of the joystick causes the seat to tilt forward and the rearward motion of the joystick causes the seat to tilt back.

14. Right Elevating Legrest (optional)

Depressing this button once transfers the joystick function from driving the chair to actuating the right elevating legrest function, indicated by a “-“ on the profile display. When in this mode the forward motion of the joystick causes the legrest to rise and the rearward motion of the joystick causes the legrest to lower.

SPECIAL ITEMS TO NOTE

EXPLANATION OF DRIVE PROFILES

A Drive Profile is a set of parameters, which together define the response, or feel of the driving of the chair. The parameters that make up a Drive Profile are:

- Maximum Forward Speed
- Forward Acceleration
- Forward Deceleration
- Maximum Reverse Speed
- Reverse Acceleration
- Reverse Deceleration
- Maximum Turning Speed
- Turning Acceleration
- Turning Deceleration
- Damping Factor

The chair may be programmed, by Innovation in Motion, or it's agent, for up to 5 different profiles. These settings are stored in the memory of the joystick unit so if the joystick were changed for any reason the new one would have to be reprogrammed.

EXTREME 4X4 Driving Tips

Driving a 4X4 wheelchair can be a safe, enjoyable and worthwhile. However the Extreme is still a wheelchair and it must be remembered that putting yourself in a dangerous situation is very risky. Remember to establish your own safe limits with someone to assist you. Once you establish these limits stick to them.

Section DT1 Descending Steep slopes

Face the chair forward directly down the slope.

Before driving down a steep slope, if your chair is equipped with Tilt-In-Space, tilt the seat back to roughly the angle of the slope. This will assist you in going down the slope in a comfortable sitting position and will add grip to the rear of the chair.

If your chair is not equipped with Tilt-In-Space make sure you are sitting as far back in the seat as possible and that your upper body will not fall forward. Never try driving down a slope that you feel concerned about. Always drive straight down a slope or at a very slight angle if necessary. Never try driving across a steep slope it is possible to tip the chair over in this situation. If at all possible have an attendant with you at the rear of the chair.

Section DT2 Climbing Steep slopes

Face the chair forward directly up the slope.

Before driving up a steep slope, if your chair is equipped with Tilt-In-Space or Power Recline Backrest ensure both are in the fully upright position. Always drive straight up a steep slope. Never, if possible, drive sideways up a steep slope. If possible shift your weight to the front of the chair, as this will aid the front wheels in maintaining traction.

Should the front wheels start to lose traction and start fluttering left and right, continue to drive up the slope at the fastest safe speed. The rear wheels will continue to steer and power the chair. If at all possible have an attendant with you at the rear of the chair in case required.

Section DT3 Climbing 90° curbs

Before driving up a curb ensure that Power-Tilt-In-Space or Power Recline Backrest (if fitted) are in the fully upright position.

It is possible to climb 90° curbs up to a height of 4" with a user weight up to 170lbs however there is a correct technique to do so. It is necessary to drive the chair on speeds 4 or 5 and directly facing the curb so that both front wheels starts to climb at the same time.

Position the chair forward directly facing the curb.

Drive the chair at about ½ speed until you are about 15 cm (6") from the curb. Just as the two front wheels hit the curb give the chair full speed. As the two front wheels go over the top of the curb start to lean forward (if possible) whilst holding full speed on the joystick control. Once the rear wheels have gone over the curb immediately slow down and continue your driving. If you or the chair hesitate or fail to climb the curb before the rear wheels go up, back up slightly and make another attempt. Take care when climbing curbs it may not always be safe to do so. If at all possible have an attendant with you at the rear of the chair, in case required.

Section DT4 Descending 90° curbs

Ensure that the curb height does not exceed 4" before attempting any descent.

Position the chair forward directly facing the curb.

Section DT4 Descending 90° curbs (cont.)

Drive slowly to the edge of the curb and make sure both front wheels are lined up to go down the curb at the same time. Adjust the speed to either 1,2 or 3 for safety. Drive the chair to the edge of the curb and with one smooth movement drive the front wheels slowly over the curb till the contact the bottom.

Continue to drive forward until the rear wheels slowly go over the curb. If at all possible have an attendant with you at the rear of the chair in case required.

Section DT5 Driving on soft sand

It is possible to drive the chair on many types of soft and hard sand, however the climbing ability of the chair may be reduced in some angles of very soft sand. It is important when driving on sand not to have too low a speed; we suggest that speeds lower than 4 are not used. Should any of the wheels start to skid or slip on sand continue driving, as they will gain traction as the chair moves along. Please read sections DT1, DT2 and Tire inflation as these contain important information that will be useful when driving on sand. If at all possible have an attendant with you at the rear of the chair in case required.

SectionDT6 Driving through water or mud

It is possible to drive the chair through limited depths of water or mud but great care must be taken to ensure that you do not become bogged or the chair damaged. We recommend that you do not drive the chair through more that 50mm (2") of water or mud. When driving through water keep the speed low (1 or 2) and if possible drive the chair slowly over a dry surface when exiting the water to limit the amount of moisture that may splash under the chair. Allowing water to enter the electronics, wiring, motors or Joystick will cause damage to these systems and should be absolutely avoided. When driving through mud keep the speed of the chair at a moderate pace so as not to allow the wheels to spin excessively or slow down too much. Should the chair ever be driven through salt water, great care must be taken to wipe down all wet parts with a cloth soaked in fresh water. Failure to clean off salt water will result in excessive corrosion and may eventually end in the need to replace effected components.

Driving through water or mud should only be done on flat areas. If at all possible have an attendant with you at the rear of the chair in case required.

Section DT7 Driving on snow

Please read the sections DT1, DT2, DT6 and Tire Inflation before attempting to drive on a snow covered surface.

It is possible to drive the chair on snow-covered surfaces however this can be a most hazardous situation so great care must be taken. If at all possible have an attendant with you at the rear of the chair in case required.

Never drive the chair at an angle across a snow-covered surface.
Always drive the chair on speeds no more that speed 3.

Section DT8 Obstacle Climbing

The chair will climb numerous obstacles but also has some self-limiting functions to ensure some level of safety. The center mounting frame for the one piece foot-plate, that is located in between the front wheels just behind the fiberglass cowl limit steps, curbs and obstacles to a height of 100mm (4") and the rear frame bar to a height of 75m (3"). This does not mean that obstacle climbing is limited to these, only that obstacles greater than this cannot pass directly under the chair. When climbing obstacles take great care not to tip the chair over. Please read sections DT1, T2, DT3 and DT4. The chair has a stall time-out of 15 seconds and will automatically cease to drive if stalled for a period longer than this. Should this occur turning the chair off and on again will reset the system. Continually stalling the chair can damage the drive train.

FAULT FINDING

THE CHAIR WILL NOT DRIVE

Should the chair fail to drive check the following items:

- * Is the Battery Fuel Gauge in the RED section (batteries flat) or FLASHING?
- * Has the control lead to the joystick control module been damaged or dislodged from either end?
- * All EXTREME 4X4 model wheelchairs are fitted with a DX Series control system that disables driving should the built-in self-test discover a fault in any of the driving components (motors, electronics, brakes). Each of the DX electronics modules is fitted with a STATUS indicator in the form of a small green LED. Should any of the modules be faulty the LED on the faulty module will flash. If this happens refer to the joystick diagnostic and fault finding section or call your local Extreme 4x4 agent.

JOYSTICK OUT OF NEUTRAL AT POWER UP

The Joystick Module features “Out Of Neutral At Power Up” detection. If the system is turned on with the joystick not in the neutral position (deflected) the Power Indicator will flash and the chair will be prevented from driving until the joystick is returned to neutral.

THE BATTERIES WILL NOT CHARGE

Should the batteries not charge check the following items:

- * Is the Battery Connected Indicator on the battery charger illuminated? If not check all plugs, sockets, leads and battery connections.
- * Is the Mains Power Indicator illuminated? Check mains power point.
- * Should the Charge Complete Indicator not be illuminated after a normal charging period, or no more than 12 hours the most likely cause is worn out or faulty batteries.
- * On a full charge the batteries will generally provide a good 6 to 8 hours of typical daily use. As the batteries wear out this time will be reduced.

MANUAL FREEWHEELING - PUSHING THE CHAIR

The built-in brakes and electric drive may be easily disengaged for manually pushing the chair as follows:

Located on each of the motors at the rear of the chair under the bumper bar are the disengagement paddles and on the front motors, these are located just inside the front mudguard at the front of the motor.

Simply flick each of the paddles to the outside of the chair and it will release the drive. Don't forget to flick them back again when finished pushing the chair.

DIAGNOSTICS AND FAULT FINDING

REMG90 diagnostics can be examined from the Flash Codes signaled with the System Status LED of the REMG90. Your dealer or OEM can provide more detailed diagnostic and troubleshooting information.

Flash Code

Any fault condition on the DX system will cause the REMG90's System Status LED to flash. Flashing occurs in bursts of flashes separated by a two second pause. The number of flashes in each burst is referred to as the Flash Code and indicates the nature of the fault.

Faults that affect the safety of the chair will cause the chair to stop while less critical ones will be indicated but allow the chair to continue driving. Some faults will automatically clear when the fault condition is removed, in which case the System Status LED will become steady and the wheelchair may be driven normally. Other faults are latched and must be cleared by turning the DX System off, waiting for five seconds, and then turning it back on again.

DX System Status LED Flash Code	Likely Cause of Condition and Probable Action
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- | | |
|----------|---|
| 1 | <p>DX Module Fault (see Limp Mode below)
 Cause: An Auto Download has occurred.
 Action: • Turn the REMG90 off then on again.
 Cause: Connection between DX Modules may be faulty, or there may be an internal fault in a Module.
 Action: • Check DXBUS connections and replace where necessary.</p> <ul style="list-style-type: none"> • If the Status LED on another Module is flashing, replace the Module. • An expected module may not be present (e.g. the DX Lighting Module). |
| <hr/> | |
| 2 | <p>DX Accessory Fault
 Cause: There is a fault in an accessory device attached to a DX Module (excluding the PM). Examples of faults in accessory devices may be: the clutch is, or has been, disengaged; a light bulb has a short or open circuit; an actuator terminal is shorted to Battery +.
 Action: • Check all accessory devices connected to you DX System.</p> |
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DX System Likely Cause of Condition and Probable Action
Status LED
Flash Code

3 Left (M1) Motor Fault

Cause: The connection from the PM left (M1) connector to its associated motor, or the motor itself, is defective. The connection is either open or has a short circuit.

Action:• Refer to dealer

4 Right (M2) Motor Fault

Cause: The connection from the PM right (M2) connector to its associated motor, or the motor itself, is defective. The connection is either open or has a short circuit.

Action:• Refer to dealer

5 Left (M1) Park Brake Fault

Cause: The M1 plug connection to its associated Park brake is either open or has a short circuit.

Action:• Refer to dealer

6 Left (M2) Park Brake Fault

Cause: The M2 plug connection to its associated Park brake is either open or has a short circuit.

Action:• Refer to dealer

7 Low Battery Fault

Cause: The battery charge is not sufficient to allow safe driving. It has fallen below 17V.

Action:• Check battery connection and terminals. The battery voltage should be similar when the battery is on charge, and when it isn't.

- Check that fuses have not blown, or circuit breakers tripped.
- Replace battery if worn out or if the capacity is insufficient for the user's needs.

Note: The wheelchair will behave sluggishly and the Battery Gauge will flash indicating low battery voltage prior to the display of this fault.

8 Over Voltage Fault

Cause: The battery voltage has exceeded 32V.

Action:• If this fault occurs during battery charging, the battery charger is defective or incorrectly adjusted.

- Check the battery chargers open circuit voltage is in accordance with the battery manufactures limits, and is less than 32V.

Cause: The battery connector is making intermittent contact when the wheelchair is stopped, or traveling down a slope.

Action:• Check that the battery wiring and terminating is secure.

DX System Likely Cause of Condition and Probable Action
Status LED
Flash Code

9 CANL Fault (See Limp Mode below)

Cause: 1. An invalid voltage has been detected on the DXBUS CANL line.
2. Communication is not possible using the CANL wire.

Action:• Refer to dealer

10 CANH Fault (See Limp Mode below)

Cause: 1. An invalid voltage has been detected on the DXBUS CANH line.
2. Communication is not possible using the CANH wire, or the CANH and CANL wires are shorted together.
3. Hazard lights were turned on when the DX System was turned on.
4. The CANH is used to generate a Kill signal by any DX Module which detects an unsafe condition, or by an external device such as an emergency stop switch.

The CANH wire is pulled to either Battery + or Battery – and causes the DX System to shut down.

Action:• If the Hazard Lights were already switched on when the DX System was turned on, Flash Code 10 on Limp Mode (slow driving) may result.

To clear this fault, turn the Hazard Lights off, then turn the DX System off then on again.

• If generated by a Kill signal, the cause of the fault is severe. Refer to dealer.

11 Stall Timeout Fault

Cause: The motor current has been at, or close to, current limit for longer than the Stall Timeout parameter value.

Action:• Turn the DX System off then on again.

Cause: Motor(s) are faulty. Wheel(s) may be rubbing on frame.

Action:• Ensure wheels turn freely while under no load. Have motor(s) checked by a service technician or dealer.

12 Module Mismatch

Cause: There is a compatibility problem between DX Modules in the System. The wheelchair will be disabled.

Action:• Refer to dealer



Limp Mode

If the DX System detects some faults, it will revert to Limp Mode. This is a reduced speed mode, which recognizes problems, but allows the wheelchair user to limp home, where the problem can be assessed.

Warning: If the DX System is displaying a fault and the chair enters Limp Mode, do not operate except to reach a safe environment. Proceed with caution as the chair performance may be significantly altered. Have the chair serviced by a service agent or dealer.

Caution: It is very important that you read this information regarding the possible effects of electromagnetic interference on your powered wheelchair.

Electromagnetic Interference (EMI) From Radio Wave Sources

Powered Wheelchairs may be susceptible to electromagnetic interference (EMI), which is interfering electromagnetic energy (EM) emitted from sources such as radio stations, TV stations, amateur radio (HAM) transmitters, two-way radios and cellular phones. The interference (from radio wave sources) can cause the powered wheelchair to release its brakes, move by itself, or move in unintended directions. It can also permanently damage the powered wheelchair's control system. The intensity of the interfering EM energy can be measured in volts per meter (v/m). Each powered wheelchair can resist EMI up to a certain intensity. This is called its "immunity level" The higher the immunity level, the greater the protection. At this time, current technology is capable of achieving at least a 20-v/m immunity level, which would provide useful protection from the more common sources of radiated EMI. This powered wheelchair model as shipped, with no further modification, has an unknown immunity. There are a number of sources of relatively intense electromagnetic fields in the everyday environment. Some of these sources are obvious and easy to avoid. Others are not apparent and exposure is unavoidable. However, we believe that by following the warnings listed below, your risk to EMI will be minimized.

The sources of radiated EMI can be broadly classified into three types:

1) Hand held portable transceivers (transmitters-receivers) with the antenna mounted directly on the transmitting unit. Examples include: citizens band (CB) radios, "walkie-talkie," security, fire and police transceivers, cellular telephones, and other personal communication devices. **NOTE: Some cellular telephones and similar devices transmit signals while they are ON, even when not being used;

2) Medium-range mobile transceivers, such as those used in police cars, fire trucks, ambulance, and taxis. These usually have the antenna mounted on the outside of the vehicle; and

3) Long range transmitters and transceivers, such as commercial broadcast transmitters (radio and TV broadcast antenna towers) and amateur (HAM) radios.

NOTE: Other types of hand-held devices, such as cordless phones, laptop computers, AM/FM radios, TV sets, CD players, and cassette players and small appliances such as electric shavers and hair dryers, so far as we know are not likely to cause EMI problems to your powered wheelchair.

Powered Wheelchair Electromagnetic Interference (EMI)

Because EM energy rapidly becomes more intense as one moves closer to the transmitting antenna (source), the EM fields from hand-held radio wave sources (transceivers) are of special concern. It is possible to unintentionally bring high levels of EM energy very close to the powered wheelchair's control system while using these devices. This can affect powered wheelchair movement and braking. Therefore, the warnings listed below are recommended to prevent possible interference with the control system of the powered wheelchair.

WARNINGS

Electromagnetic interference (EMI) from sources such as radio and TV stations, amateur radio (HAM) transmitters, two way radios and cellular phones can affect powered wheelchairs. Following the warnings listed below should reduce the chance of unintended brake release or powered wheelchair movement that could result in serious injury.

- 1) Do not operate hand held transceivers (transmitter-receivers), such as citizens band (CB) radios, or turn ON personal communication devices, such as cellular phones, while the powered wheelchair is turned ON;
- 2) Be aware of nearby transmitters, such as radio or TV stations, and try to avoid coming close to them;
- 3) If unintended movement or brake release occurs, turn the powered wheelchair OFF as soon as it is safe;
- 4) Be aware that adding accessories or components, or modifying the powered wheelchair, may make it more susceptible to EMI (note: There is no easy way to evaluate their effect on the overall immunity of the powered wheelchair); and
- 5) Report all incidents of unintended movement or brake release to the powered wheelchair manufacturer, and note whether there is a source of EMI nearby.

Important Information

- 1) 20 volts per meter (v/m) is a general y achievable and useful immunity level against EMI (as of May 1994) (the higher the level the greater the protection)
- 2) This product has a 20 V/m immunity.

Extreme 4x4 Facts

1. Tires

- a. **Type** – The tires used on the Extreme 4x4 are Split Rim (double rim) with an inner tube. They are type 145/70-6 knobbies. Unconfirmed reports have mentioned that these are the same type of tires used on the Suzuki LT-50 Quad Bike.
- b. **Tire Pressure** – The Extreme is equipped with special low-pressure tires. The tire pressure affects the performance of Extreme. The lower the pressure the more torque the Extreme will have because the “effective” wheel diameter is smaller and therefore the “gearing” is lower. As a result of the smaller diameter the maximum speed will be lower. The higher the pressure the greater the wheel diameter will be. As a result the speed will be faster but there will be less torque available. The ideal tire pressure is 3-5psi with a maximum of 10psi.
 - i. **Speed vs. Torque** – The effects that the tire pressure can have on both speed and torque is considerable and very noticeable. Too high a pressure and the user will think that the chair has no torque. Too low a pressure and the chair won't turn and will quickly drain the batteries. Every user seems to find the best pressure that suits them.
- c. **Foam Filled Tires** – We looked at foam filling but it added 8 kgs (17.6 lbs) or more to the weight for each tire. Adding a total of 32 kgs (70.5 lbs) for the chair. We decided that would add too much extra weight. Instead we offer a self-sealing liquid sealant. There are quite a few brands available most of which are either made or readily available in the United States. We also looked at having solid tires molded. However the Extreme is very dependent on the special 3.5psi low-pressure tires. Without the very soft and compressible tires the Extreme loses a huge amount of torque. You can see for yourself the difference by pumping the tires up to around 20psi and try climbing something, then letting them down to 3.5psi and seeing what a difference it makes. Therefore we determined that the self-sealing liquid would be the most effective material.

2. Power

- a. **Horsepower** – The question of horsepower does come up a lot. However it is a misnomer spread by individuals trying to make their product seem better. The reason that it is wrong to talk about the power output in terms of horsepower is that firstly, it's the power at the gearbox shaft that's important, not the “horsepower” of the motor. Secondly, “horsepower” is only correct at one specific speed (rpm). It varies greatly with the speed of the motor. The motors on the Extreme are rated at 100 watts each. There are 4 motors on the Extreme. Therefore the motors have a combined rating of 400 watts. There are 750 watts to 1 horsepower. Therefore the Extreme has .53 horsepower.
- b. **Torque** – The important power specification is the available torque. Torque is measured in units of Newton Meters. The torque available in the Extreme is 35NM.

3. Climbing Ability

- a. **Slope** – The maximum slope recommended for the Extreme 4x4 is 15 degrees. The Extreme has been tested on slopes up to 15 degrees without any problems. For safety reasons slope driving should not be performed at speeds greater than 3.

4. **Steering**

- a. **Passive Steering System** – The Extreme 4x4 uses a patented “passive” steering system. It has no active mechanical or electrical functioning steering. The chair turns by the physics of the frame geometry and the differential speed control of the front wheels. If the front of the chair is lifted off the ground the wheels simply flop around with only the tie rod between the wheels connecting them. When the Extreme is on loose surfaces and with higher gradient slopes it is common for the front wheels to flop back and forth. However in times like this the chair is usually driving straight up a slope and it generalizes the direction that it is going and causes no problems.
- b. **Turning** – The Extreme 4x4 does not turn like a conventional wheelchair. Its turning ability is compared to that of a car. The front wheels have a fixed turning circle and the chair needs to do a 3 point turn in order to turn around in a confined area. It must be steered around rather than point the joystick in the direction that you want to go.

5. **Seating**

- a. **Size** – The MPS seat generally comes in widths of 16”, 18”, and 20” and depths of 18”, 19”, and 20”. However it can be manufactured to almost any size.
- b. **Seat Height** – The seats are not normally adjustable in height due to the fixed height of the front seat strut. With the Power Tilt-In-Space fitted the length of the actuator determines the seat height. It is possible to order a special manufacturing run of front strut lengths but the seat mounting post length will need to be changed as well as these need to be longer in order to raise the seat.
- c. **Power Recline**
 - i. **Manual override** – There is currently no manual override available for Extremes equipped with power recline.
- d. **Power Leg Rests** – The power leg rests each have an actuator to raise them. Normally they are wired together to lift both at the same time. This way with a DX-TAM power tilt and power legs can easily be fitted to the same chair. Otherwise a DX-CLAM with more complicated wiring would need to be installed.
- e. **Power Recline with Power Elevating Legs** – The Extreme can be programmed to have power recline and power elevating legs. However, the DX-TAM will only drive 2 actuators therefore a DX-CLAM will need to be installed to drive more.

6. **Controller**

- a. **Safety Features**
 - i. **Auto Shut Down** – Certain controllers can be programmed to shut down if the motor tries to draw too much power. Note that Dynamic includes many parameters for the PM controller in order to protect the motor and electronics. These parameters can be reset only with the OEM Wizard.

6. Controller (cont)

b. Controller Needed for Specific Functions

- i. **Power Leg Rests** – The Dolphin or the Europa controllers may be used for power leg rests. The Europa can handle 2 power functions, one on the purple function button and one on the green function button. The Europa can also be programmed to operate up to 5 power functions on the blue profile button. However, be aware of the TAM and CLAM limitations.
- ii. **Lighting Systems** – The DX-REMG90 Europa or Dolphin is needed to operate the lighting system.

c. Non-recommended Systems

- i. **Sip & Puff** – It is not recommended that a sip & puff control system be used on the Extreme 4x4. The reason is that all Sip & Puff controls are set up to work on “castored” conventional chairs. At this stage we have not been able to satisfactorily set one up on an Extreme.

7. Batteries

- a. **DOT Number for Non Hazardous Batteries** – 60682DOT173.159D
- b. **Air Transport** – The MK Batteries meet Provision A67 of the International Air Transport Association.

8. Lights

- a. **Power Usage** – The total wattage for a set of front and rear lights without indicators is 14 watts. Which is equal to .58 Amps.

9. Ventilator Mounts

- a. **Ventilator Mounts** – A ventilator mount can be made for the Extreme 4x4. However, depending on the ventilator and whether the chair has power tilt-in-space, it can considerably lengthen the chair. Also, depending on the weight of the ventilator it can make the chair possibly unstable when climbing.

EXTREME 4X4

FAQ's - Frequently Asked Questions

Q. Can the joystick be mounted on either side, left-handed or right-handed?

A. Yes, the standard DX-REMG90 is interchangeable. The slide in mounting stem may be unbolted to swap to either side.

Q. Can I have Driving Lights?

A. Yes, the standard DX-REG90 may be fitted to operate front and rear lights or the optional DX-REM34 may be fitted to operate front and rear lights as well as turn indicators and hazard flashers.

Q. Can I go faster or have more power?

A. No, the Extreme 4X4 has been optimized for it's speed, torque and battery range characteristics using current technology. To change any of these would mean to reduce one of the others. Magic Mobility strives to keep ahead of the latest advances in technology and incorporate them into our products.

Q. Can the Extreme have Power Tilt-In-Space Seating or a Power Reclining Backrest?

A. Yes, various power options are available including Power Tilt-In-Space, Power Reclining Backrest and Power Elevating Legrests. (However, we cannot offer the Tilt-In-Space with the Power Reclining Backrest)

Q. Can the Extreme be pushed manually?

A. Yes, although it is definitely not a lightweight chair, each of its four motors may be individually disengaged and the chair moved by an attendant.

Q. Will I be able to use my existing seat cushion (e.g. JAY)?

A. Yes, a model of our standard MPS seat is available with a flat board seat base to take an external seat cushion or alternatively our new Modular Seating Unit is also available to take an external seat cushion and a clamp on backrest.

Q. Are there alternative control systems available to drive the Extreme?

A. Yes, a wide range of controls is available from Hand Control Joysticks with external switches to chin and head controls. Ask your supplier for a complete listing.

Q. Is the Extreme waterproof?

A. No. While the electronics systems used in the Extreme are certified to the International Standard IP54, an environmental standard, getting the Extreme 4X4 wet may damage the electronic components and is not recommended. It is possible to drive the Extreme through shallow puddles of water without concern provided caution is used.

Q. Will the Extreme drive on snow?

A. Yes, the Extreme has been used successfully on snow, although on steeper snow covered and icy tracks it is possible for the knobby tires to lose traction.

Q. What sort of suspension does the Extreme have?

A. The Extreme does not need any suspension. It features special low-pressure (4-psi) tires that provide it with all the flexibility and ride absorption that you'll ever need.

Q. Will it really drive on beach sand?

A. Yes, with the average 154 to 176 lb. adult the Extreme 4X4 can easily cope with soft beach sand. The actual performance, speed and battery life are quite variable when being used on surfaces that require a great deal of power from the chair so these can vary considerably.

EXTREME 4X4

FAQ's - Frequently Asked Questions (cont.)

Q. How steep an incline can it climb?

A. With a 165 lb. user the Extreme can climb a slope of 1:3.5 or 15 degrees. The performance is improved on the higher speeds but caution must be used so as to not endanger the user.

Q. What colors does it come in?

A. The Extreme 4X4 is available in Royal Blue, Burgundy, Forest Green and Black.

Q. I am a quadriplegic and cannot hold a normal ball joystick, are there other options available?

A. Yes, we have a number of joystick ends available including a quad paddle specifically for this use.

Q. Can the Extreme have swing-away legrests?

A. No, due to the size and required placement of the front driving wheels using swing-away legrests was impractical. To clear the front wheels when they swing-away meant having the footplates out a further 12" than standard and it was not then possible to rest your feet on them. It is quite practical to use the standard lift off types and simply flip up the footplates to stand up.