

DYNAMIC[™]

DX[™] Modular Mobility System

DX Lighting Module (LM) (Part No. DX-LM-Z) Installation Manual



Order/Part Number for this Manual : GBK60028 issue 4

Important Notes

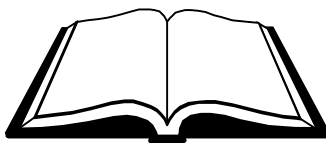
1. Read this Manual carefully before installing or operating your DX control system.
2. Due to continuous product improvement Dynamic reserves the right to update this Manual. This manual supersedes all previous issues which must not continue to be used.
3. Any attempt to gain access to or in any way abuse the electronic components and associated assemblies that make up the wheelchair control system renders the Manufacturer's Warranty void and the Manufacturer free from liability.

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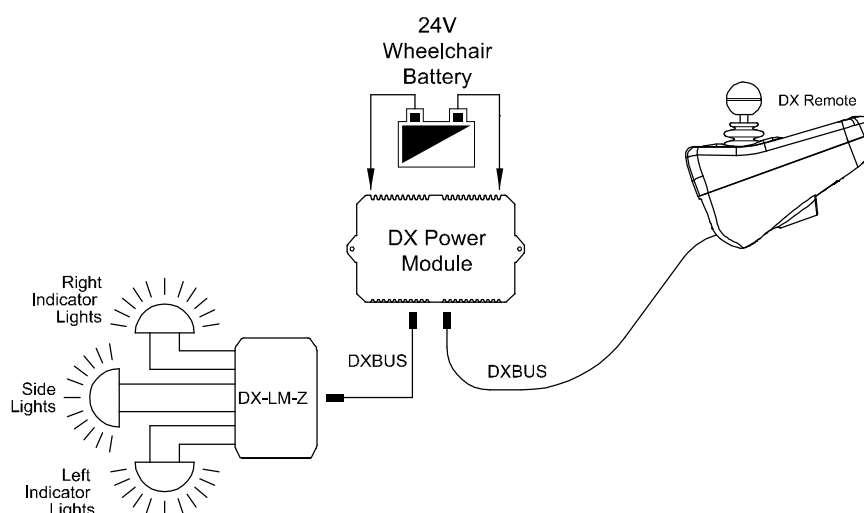
1 INTRODUCTION



The DX Lighting Module (LM-Z) controls the lighting system on a power wheelchair. It is used as part of a DX System comprising a DX Power Module and a DX Remote with lighting control switches, as a minimum system. See diagram below.

The lighting consists of side lights and turn indicators. The indicators can be flashed together to provide a hazard warning. The lights are accessed by the DX Remote. The LM-Z has two standard DXBUS connectors so that it may be connected to the DX System.

This manual and others listed below must be read and understood. For more information contact Dynamic Controls Ltd or an agent as listed in section 14.



Example of Minimum DX System with LM-Z

Installation Manual Re-order Information
(Please quote this information when re-ordering this manual)

DX Lighting Module (DX-LM-Z) - GBK60028

2 RELATED DOCUMENTATION

A DX based wheelchair control system may comprise between two and sixteen DX compatible modules depending on the application. Each DX compatible module has its own Installation Manual which describes the installation requirements of that particular module.

This Manual describes the installation of the DX-LM-Z only and must be read in conjunction with the:

- DX Power Module (PM) Installation Manual;
- DX Hand Held Programmer (HHP) Manual;
- Dynamic Wizard Installation Sheet;
- Installation Manuals for all other DX Modules to be used in your system.

This manual and others listed above must be read and understood. For more information concerning this or other Dynamic products, contact Dynamic Controls Ltd. or an agent as listed in section 14.

3 GENERAL DESCRIPTION

The DX Lighting Module (LM-Z) has two turn indicator outputs and a side light output for the lighting system on a power wheelchair. Each output can power multiple lights but must be kept within the electrical specifications limits : see section 4.

The DXBUS is used to control and monitor all DX Modules. The DX Power Module has two identical DXBUS connectors and is connected in a chain type arrangement with the LM-Z. The LM-Z can be powered from an independent 24 V wheelchair battery, but low power lighting can be powered from the DXBUS 24 V supply. The DXBUS can supply a total maximum current of 12 A via the PM.

The lighting is controlled by buttons on the DX Remote. The turn indicators are flashed at 75 flashes per minute and both left and right indicator outputs are activated when the hazard lights are selected. The hazard lights can only be deactivated by re-selecting the hazard button on the DX Remote.

The LM-Z has simple diagnostic capabilities described in section 8. The electronics are housed in a compact enclosure protected against water, dust and tampering - see section 4 for protection rating.

General Features

The LM-Z has the following general features:

- Three lighting outputs.
- Powered by a 24 V wheelchair battery, via the DXBUS connection for a total supply current less than 12 A, or directly from the battery.
- Two identical DXBUS compatible sockets.
- Electromagnetically compatible:
 - emitting low levels of RFI
 - protected against high levels of ESD
- Compact, rugged enclosure providing protection against water and dust up to IP54.
- Easy slide mounting bracket.

Safety and Protection Features

The LM-Z has the following safety and protection features:

- Lighting outputs protected against external short circuits to each other and the battery.
- Reverse battery protected.
- Detection of open and short circuit lighting output faults.
- Controlled power down in event of DXBUS disconnection or communication failure.

4 SPECIFICATIONS

Electrical

$T_{amb} = -25$ to 50°C , $V_{BAT} = 24.0$ V unless otherwise specified.

Symbol	Parameter	Conditions	Min	Nom	Max	Units
V_{BAT}	Battery Voltage		18.0	24.0	32.0	V
P_Q	Quiescent Power	All outputs off		1.5	2.0	W
P_{SB}	Standby Power	LM-Z Off			24	mW

Turn Indicator Output (each output)

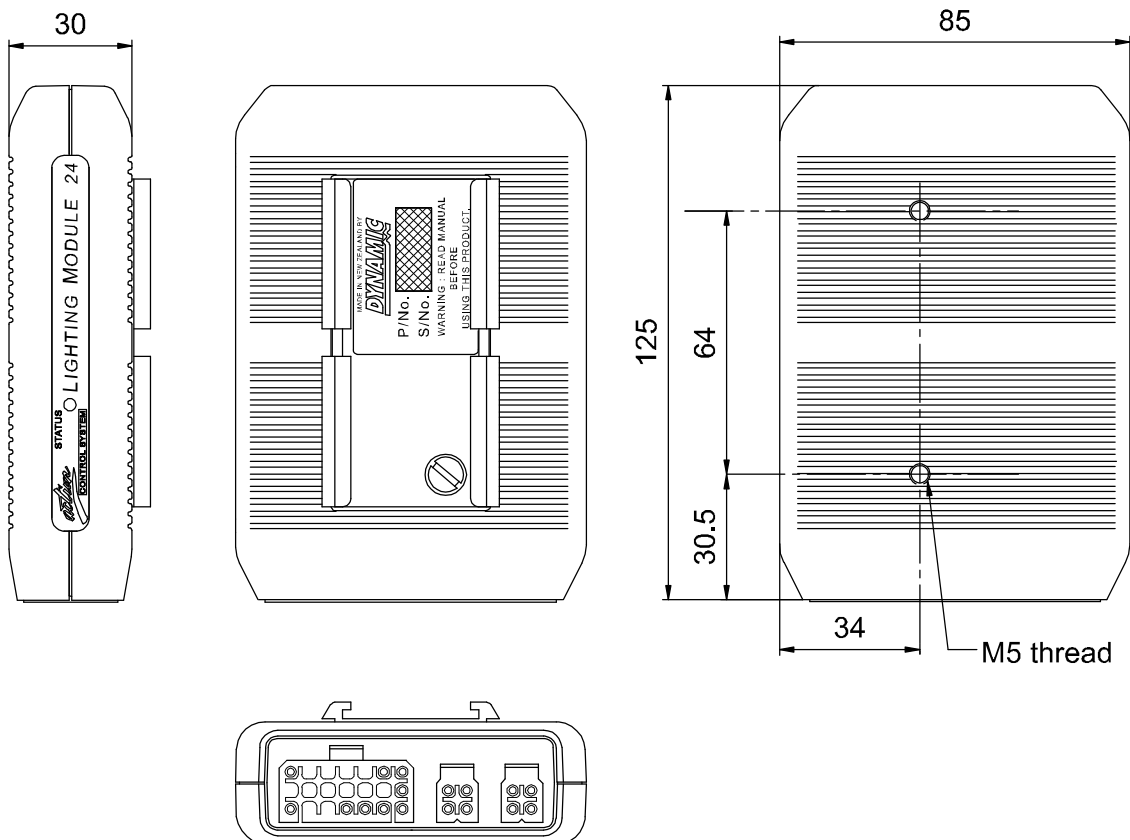
I_{TIO}	Continuous output current	Output On		2.3	2.5	A
V_{TIO}	Output voltage	Output On, $I_{TIO} = 0.6\text{A}$, $T_{amb} = 20^{\circ}\text{C}$	V_{BAT-1}	$V_{BAT-0.1}$	V_{BAT}	V

Side Light (Head/Tail Light) Output

I_{SLO}	Continuous output current	Output On		2.3	2.5	A
V_{SLO}	Output voltage	Output On $I_{TIO} = 0.6\text{A}$, $T_{amb} = 20^{\circ}\text{C}$	V_{BAT-1}	$V_{BAT-0.1}$	V_{BAT}	V
I_{TOT}	Total Lighting output current				6.0	A

Mechanical

- Size: 125 * 85 * 30 mm
- Weight: 0.340 Kg including the mounting plate.
- Mounting: Chassis and tube mounting with optional brackets.
- Case material: Pressure die cast aluminium, powder coat finish.
- Case Protection: Tamper proof, IP54 if mounted as per mounting instructions : see section 5.



Environmental

Parameter	Min	Max	Units
Operating ambient temperature range	-25	50	EC
Storage temperature range	-25	70	EC
Operating and storage humidity	0	90	%RH
Environmental Protection Rating	IP54, ISO 7176 : part 9		
RFI Immunity	IEC 801-3, 20V/m 26MHz-1GHz		
RFI Emissions	CISPR 11 class B		
ESD	ISO 7176 : part 21		
Durability	ISO7176 : part 14. If only one DXBUS outlet is used on the LM-Z, a DXBUS plug outlet cover must be inserted on the unused outlet.		
Vibration Specification	120 minutes @ 4g's random vibration without damage.		
Standards	The DX-LM-Z has been designed to meet the requirements of prEN12184 : 1997 (pending).		

5 INSTALLATION

General

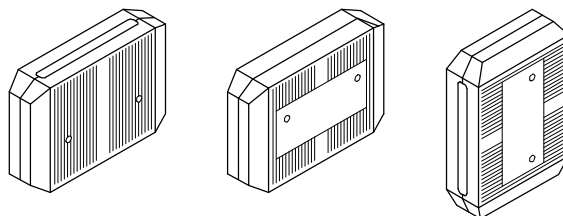
Installing a LM-Z requires the following steps:

- 1 Mounting the LM-Z
- 2 Connecting the LM-Z to the rest of the DX system
- 3 Connecting Power and Lighting to the LM-Z
- 4 Programming the LM-Z

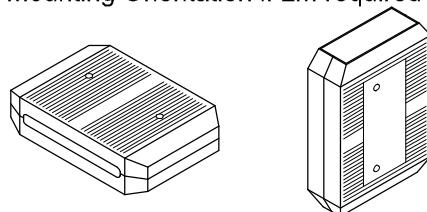
Mounting

Environmental Protection

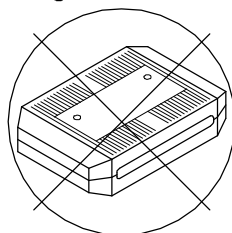
The LM-Z must be mounted in a position which offers the maximum protection from water and mechanical abuse. The LM-Z provides protection up to IP54 when mounted in the recommended orientation as shown below, but other orientations can be used if environmental conditions are sheltered.



Recommended Mounting Orientation if LM required to meet IP54 rating



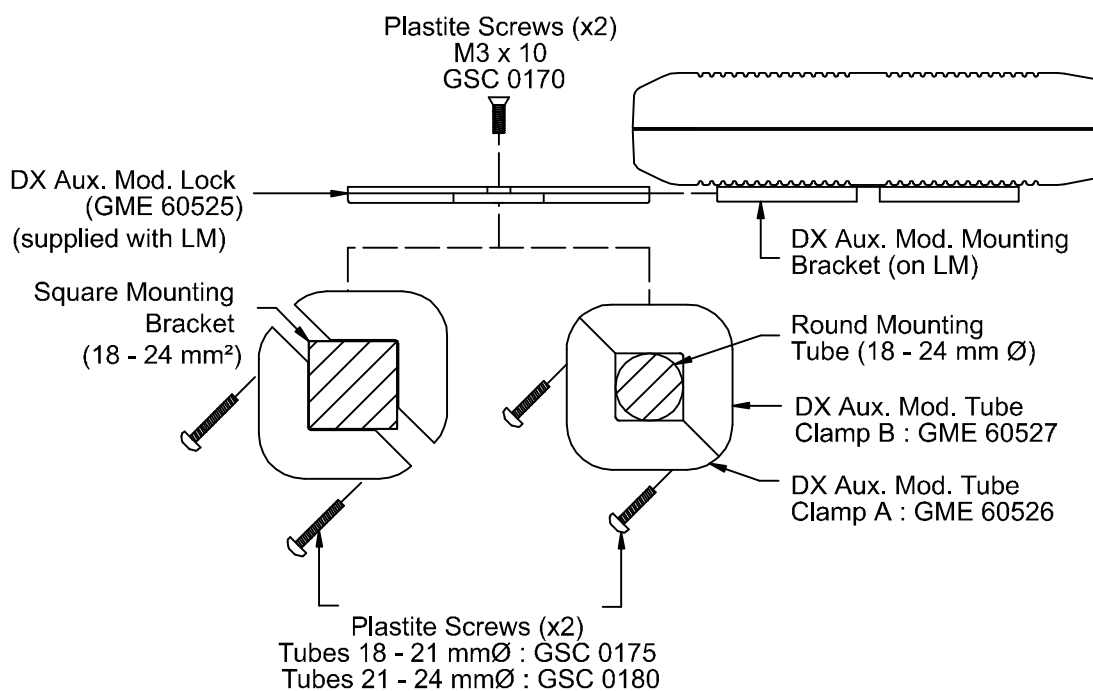
Acceptable Mounting Orientation - splash proof only



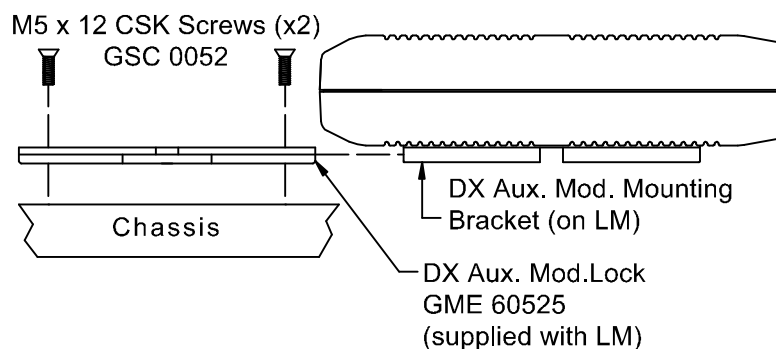
Unacceptable Mounting Orientation if LM exposed to any water

Securing the LM-Z

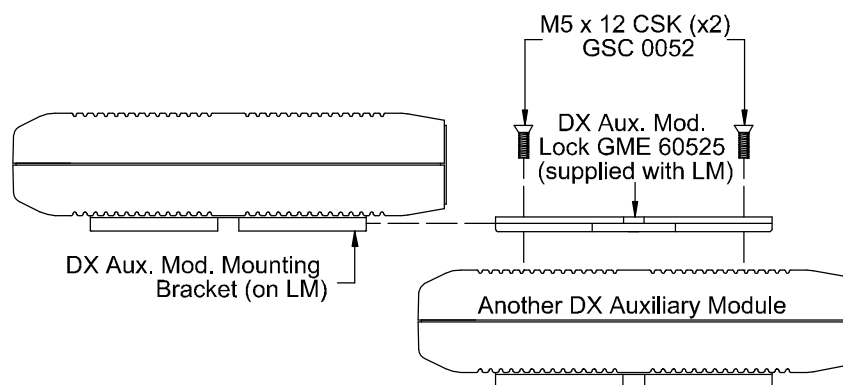
The LM-Z is supplied fitted with a DX Auxiliary Module Mounting Bracket. This allows the LM-Z to be chassis mounted, tube mounted, or mounted to another DX Auxiliary Module as follows:



Round or Square Tube Mounting



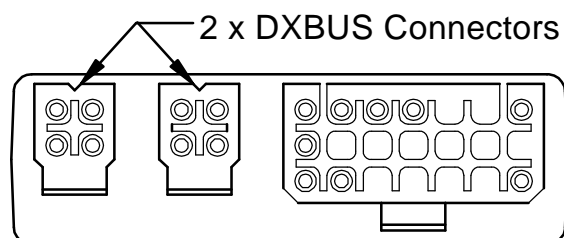
Chassis Mounting



Mounting on other Auxiliary Modules

LM-Z Connection with the DX System

DXBUS Connections



Note: If only one DXBUS connector is used on the LM-Z and the remaining connector is accessible to the wheelchair user, a dummy plug should be fitted to the unused connector. This will comply with ISO7176.

Like all DX Modules, the LM-Z is connected to the DX system using the DXBUS. The DXBUS cables are available in the following standard lengths:

DXBUS CABLE, Straight, 0.12 M	Part/Order Number GSM 630012
DXBUS CABLE, Straight, 0.3 M	Part/Order Number GSM 63003
DXBUS CABLE, Straight, 0.5 M	Part/Order Number GSM 63005
DXBUS CABLE, Straight, 1.0 M	Part/Order Number GSM 63010
DXBUS CABLE, Straight, 1.5 M	Part/Order Number GSM 63015

Other cable lengths in multiples of 0.1 m are available on request.

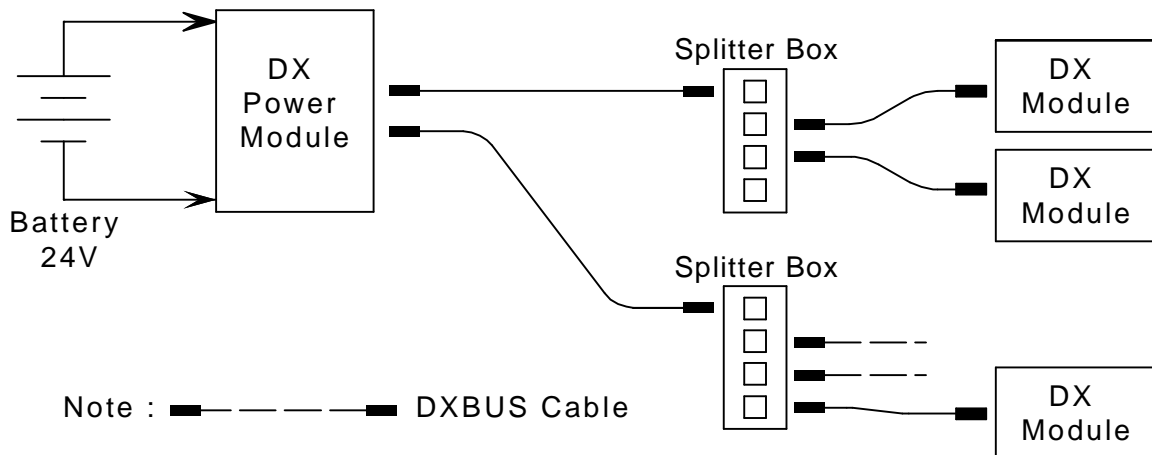
DXBUS cables are also available fitted with a ferrite bead to improve Electromagnetic Compatibility (EMC).

DXBUS CABLE, Ferrite, 2.0 M	Part/Order Number GSM 63020F
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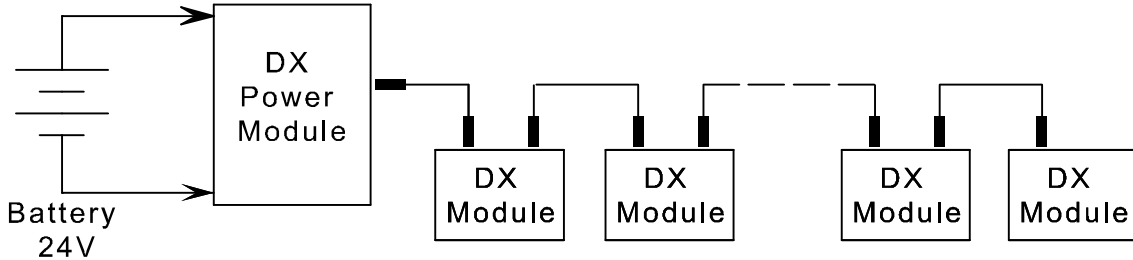
Note: The order and positioning of the LM-Z within the DX system is important and **must** be based on the rules discussed in this section.

DX Module Interconnection Topology Options

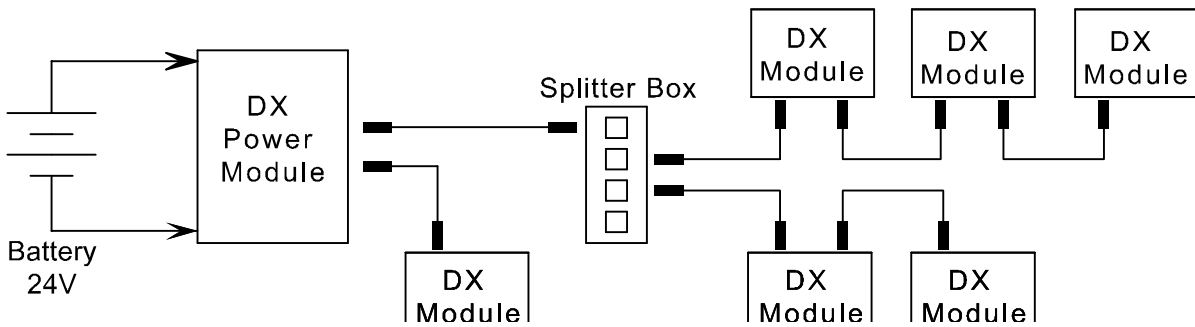
The battery and DX Power Module combination are always considered the heart of a DX system. Other DX Modules can be arranged in several ways:



Star DXBUS Topology



In-line DXBUS Topology



Mixed DXBUS Topology

DX modules normally have one or two DXBUS sockets for system interconnections. Smaller DX modules may have a permanently mounted cable terminated in a DXBUS plug, rather than DX sockets.

The star and mixed topologies both require the use of one or more DX Splitter Boxes. A Splitter Box is a separate panel of four DXBUS sockets that may be purchased from Dynamic or a Dealer.

The DX Splitter Box Part / Order Number is: DX-SKT-X4.

For lowest cost and simplicity the In-line topology is generally preferred, provided the DXBUS length and voltage drop requirements described below can be met.

DXBUS Length and Voltage Drop Restrictions

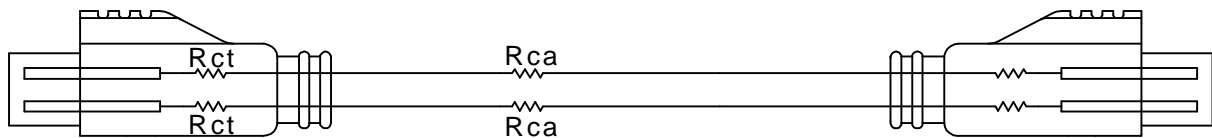
Due to signal distortion that increases with increasing DXBUS length, the total length of all DXBUS cable must not exceed 15 metres in any topology.

Two of the DXBUS's four cores (DXB+ and DXB-) are used to supply power to the modules and to the loads connected to them. A Positive Temperature Coefficient (PTC) device in the Power Module limits the total DXBUS current to 12 A, to protect the DXBUS wiring and connectors. The topology and cable lengths used may reduce the DXBUS's upper limit to below 12 A.

The golden rule is that for correct DX operation the voltage drop on the DXBUS's DXB- wire due to return currents must not exceed 1.0 V between any two modules within the system. The topology and module placement that reduces this voltage drop as low as reasonably possible is to be preferred.

Voltage drops occur along the DXBUS due to the return of current back to the battery through the small but finite resistance of the DXBUS cable and connectors.

A DXBUS connector can be modelled as:



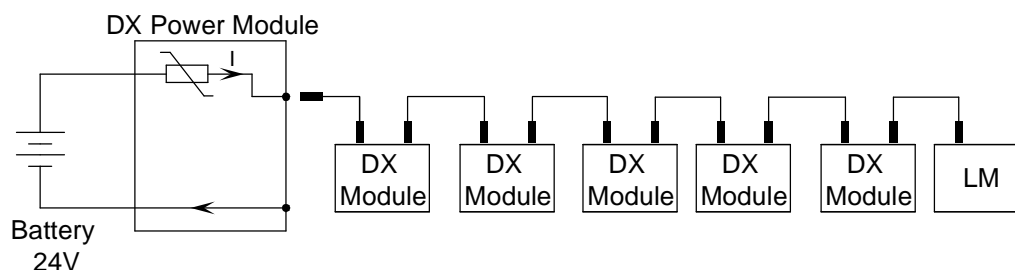
DXBUS Cable Model

R_{ct} = contact resistance = 5 mOhm

R_{ca} = cable resistance = 12 mOhm / metre

Example:

Consider a Power Module to LM-Z connection via five other DX Modules using 1 metre cables.



The total resistance of the 0 V return path, between the Power Module and LM-Z is:

$$6 \times (2 * R_{ct} + R_{ca}) = 132 \text{ mOhms}$$

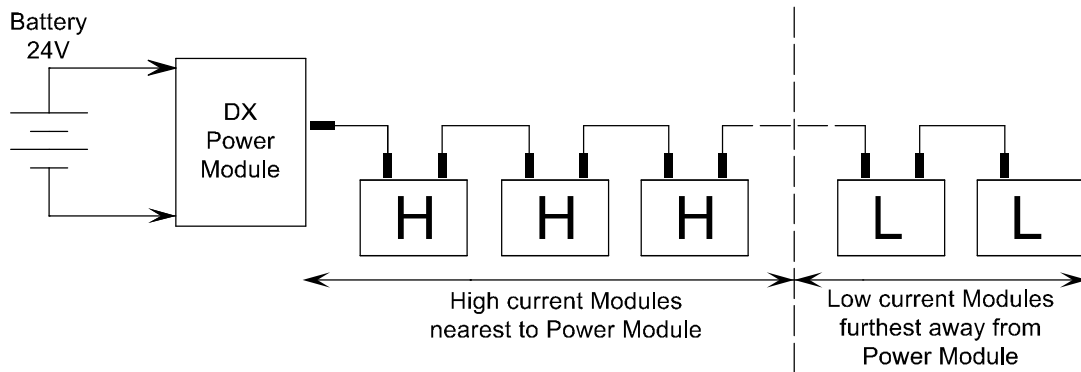
This means that the maximum load that the LM-Z can drive and not exceed the 1.0 V drop requirement is $1 / 0.132 = 8 \text{ A}$.

If, for example, the lighting that the LM-Z is required to drive has a peak current of 10 A, the interconnection order of the DX modules will have to be changed to place the LM-Z closer to the Power Module.

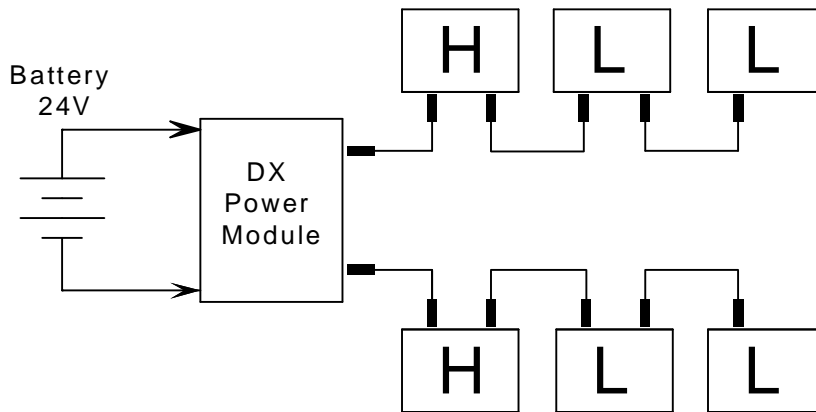
The above example illustrates a fundamental rule of DX Module interconnection **All DX Modules that connect to high current loads (e.g. actuators / motors and lights) must be connected as close to the Power Module as possible.**

The above example is simplified and does not include current to other DX Modules. The DXBUS maximum current rating of 12 A is for the entire DX System. To supply greater than the 12 A DXBUS current, see '*Power Supplied from the Battery*' Section.

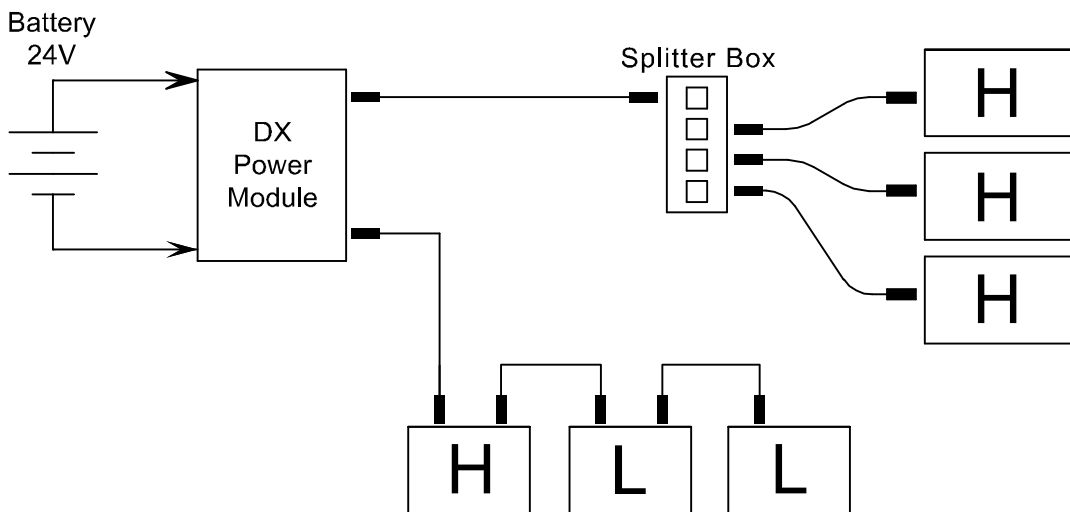
This favours topologies such as:



Rationalised In-line Topology



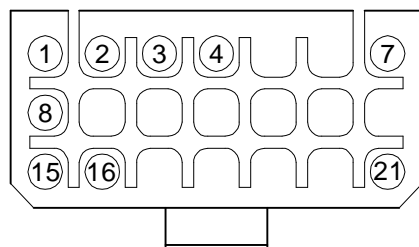
Two way star Topology



Multi Star Topology

LM-Z Power and Lighting Connections

21 Way Connector Pin Definition



Pin	Function
1	DXBUS -
2	Side Lights -
3	RightIndicators -
4	Left Indicators -
7	Not used
8	Battery -
15	DXBUS +
16	Lighting +
21	Not used

Wires and Terminations

To build a matching connector to fit to the 21 way connector, the parts are :

DX 21W Plug Housing	Part / Order Number GCN 0796
DX 21W Boot	Part / Order Number GCN 0795
DX Positronics Contact, FC114N2 (Lge)	Part / Order Number GCN 0793
DX Positronics Contact, FC116N2 (Med)	Part / Order Number GCN 0797
DX Positronics Contact, FC120N2 (Sml)	Part / Order Number GCN 0794

The DX Positronics Contacts are crimp terminals, and are available from Positronic Industries Ltd or from Dynamic.

Contact GCN 0793 is for crimping to 1.5 - 2.5 mm² (14 - 16 GA) wires.

Contact GCN 0797 is for crimping to 1.0 - 1.5 mm² (16 - 18 GA) wires.

Contact GCN 0794 is for crimping to 0.25 - 0.5 mm² (20 - 24 GA) wires.

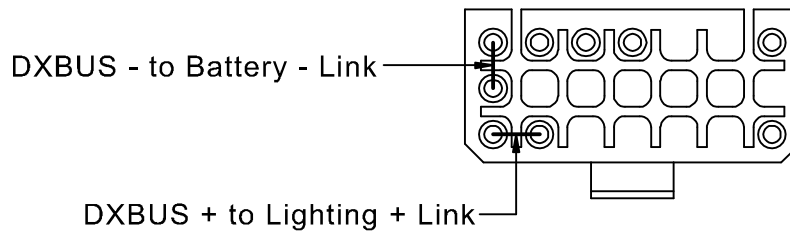
Wires and Terminations

Function	Wire Size (min)	Terminal Part
DXBUS -	1.0 mm ²	FC116N2
Side Lights -	0.5 mm ²	FC120N2
Left Indicators -	0.5 mm ²	FC120N2
Right Indicators -	0.5 mm ²	FC120N2
Battery -	1.0 mm ²	FC116N2
DXBUS +	1.0 mm ²	FC116N2
Lighting +	1.0 mm ²	FC116N2

Power Supplied from the DXBUS

To power the lighting from the DXBUS, links must be inserted to short the DXBUS- pin to the Battery- pin, and the DXBUS+ pin to the Lighting+ pin.

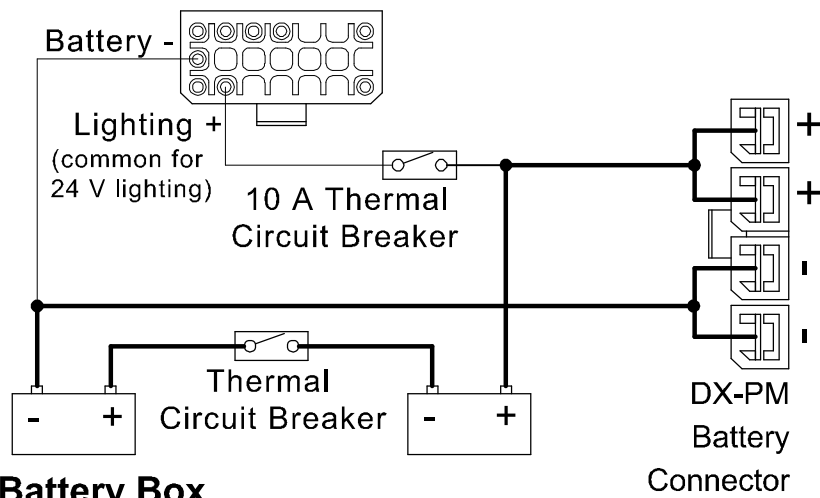
Total DX System load must be within the 12 A DXBUS current rating.



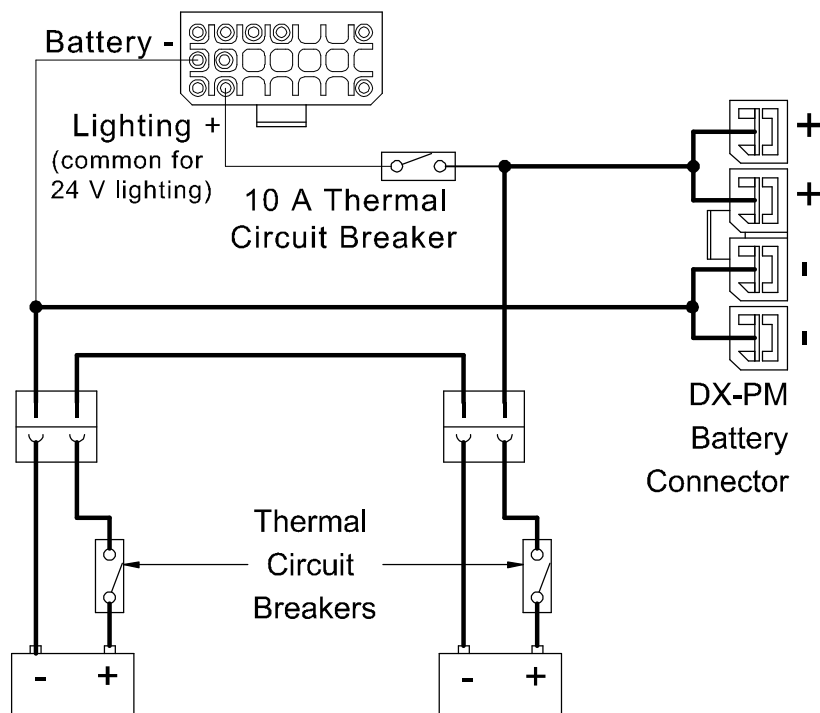
Power Supplied from the Battery

When the lighting circuitry requires more current than is available from the 12 A DXBUS current rating, the LM-Z must be powered directly from the battery. This can occur when there are other DX Modules, such as the DX-CLAM, drawing current from the DXBUS.

Thermal circuit breakers must be installed in the battery wiring to protect the batteries, wiring loom and LM-Z from external short circuits. If the two batteries are permanently wired together (single battery box), the best position for the battery circuit breaker is between the two batteries. If the batteries are individually plugged together (separate battery boxes), each battery requires a circuit breaker. This thermal circuit breaker will normally have a trip rating no higher than the current limit of the PM.



Single Battery Box



Separate Battery Boxes

Note: Heavy lines denote 3 mm² wire. All other wires from the 21 way connector as specified.

Battery Type

The DX System is designed to perform optimally with either Lead-Acid or Gel Cell 24 V deep cycle batteries, rated at 20 - 120 Amp hours. The maximum average discharge rate must not exceed half the rated capacity, in Amp hours.

High continuous discharge rates dramatically reduces the available battery capacity. For example, at a discharge rate equal to the rated capacity, the available capacity is 50 - 60 %. At a discharge rate of half the rated capacity, the available capacity is 70 - 80 %.

A wheelchair that draws maximum average battery current of 20 A, requires a battery of at least 40 Amp hours. A battery of only 20 Amp-hours, would begin to suffer a drop in performance at about half of its available capacity. The 40 Amp hour battery has a full performance range of 4.5 greater than the 20 Amp hour battery; a 80 Amp hour battery would only increase this range by 2.5 when compared to a 40 Amp hour battery.

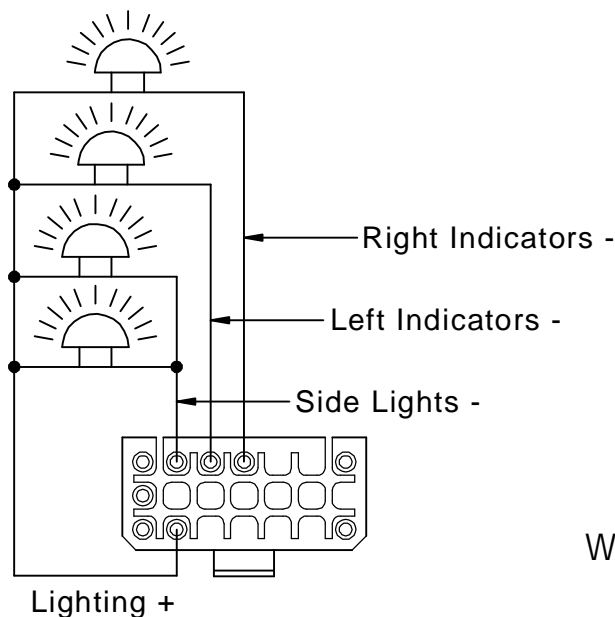
LM-Z Connection to Lights

The three lighting outputs :

- Pin 2 Side Lights -
- Pin 3 Right Indicators -
- Pin 4 Left Indicators -

The Side Light Output is active pull-down when the light is turned on. This output is used to power head and tail lights. Multiple bulbs can be connected to the output in parallel, as shown in the following diagram.

The Left and Right Indicator Outputs are also active pull-down when the light is turned on. Again, multiple bulbs can be connected on each output.



Wiring Example

6 OPERATION

LM-Z Activation

The LM-Z is operated by a DX Remote. Each DX Remote has different facilities and not all support a full lighting system. The operation of the LM-Z is therefore very dependent on what remote it is used with, and the programmable options that are set up for it.

Please consult the User Manual for the DX Remote or other DX Module used in your DX System.

7 PROGRAMMING

Wizard Programmable LM-Z Parameters

Programmable parameters relating to the LM-Z are contained in the DX Remote program. This program can be modified using the 'Wizard', which is a PC based tool for programming, configuring and performing diagnostics on DX products.

To view and / or edit these parameters:

1. Enter the Wizard's Main Menu screen as described in the Wizard Installation Sheet.
2. Use the keyboard or the mouse to select the File, Open menu option.
3. Select the "SuperChair, Deluxe" program from the file dialog box.
4. Select the "Edit Module Parameters" menu option.
5. Select "Lighting Parameters".
6. Scroll through the list of parameters and adjust as necessary.
7. Press «Enter» to accept the changes or «Esc» to exit without saving. Select the File, Save menu option. These values will now be part of the Chair Program for the "SuperChair, Deluxe".

Listed on the following page are the relevant LM parameters and their functionality.

Lighting Parameters

Lighting Module Enable State: yes / no Default: no

Must be set to 'Yes' for **LM-Z** operation.

This parameter is also programmable using the HHP, see following section.

CLAM Lighting Enable State: yes / no Default: no

Must be set to 'Yes' for **CLAM** operation. Should be set to 'no' in a LM-Z system.

This parameter is also programmable using the HHP, see following section.

Sidelights Enable State: yes / no Default: yes

If set to 'Yes', sidelights are enabled.

If set to 'No', there will be no response to a DX Remote sidelight (head or tail) button being pressed (other than a beep from some varieties of DX Remotes).

Lighting buttons can be disabled if the DX Remote used in a system has lighting buttons that do not have the corresponding lights attached.

Indicators Enable State: yes / no Default: yes

As for the Sidelight Parameter.

Hazard Enable State: yes / no Default: yes

As for the Sidelight Parameter.

HHP Programmable LM-Z Parameters

A DX System must have a parameter set in order to use a LM-Z with the system. This parameter is called “Lighting Module Enable” and is accessible using the DX Hand Held Programmer (HHP). If the LM-Z is later withdrawn from the DX System and the parameter remains set to Enable, the system may still function normally, depending on other parameters (see previous section).

To Enable or Disable a LM-Z with the HHP, proceed as follows:

1. Plug HHP into the Programmer Socket on the DX Remote and turn the DX System on. The initial screen appears for two seconds.

```

DX HHP V1.x

```

2. Then the main menu screen appears.

```

** MAIN MENU **
View or edit?
Program : 1?
NEXT          YES

```

3. Press 'NEXT' until the Technician Mode screen appears.

```

** MAIN MENU **
Technician Mode
disabled. Enable ?
NEXT          YES

```

4. Pressing 'YES' toggles this screen between Technician Mode Enabled and Technician Mode Disabled. Press ‘YES’ to enable. A screen will appear to enter the three digit password.

```

Technician Mode
Enter Password
  0 0 0
EXIT   D1   D2   D3

```

Press the D1, D2 and D3 buttons to cycle each digit through to the correct password. When the password reads correctly, press the 'EXIT' button.

5. The screen now reads :

```

** MAIN MENU **
Technician Mode
enabled. Disable ?
NEXT          YES

```

6. Press 'NEXT' until the screen reads :

↓

```

** MAIN MENU **
View or edit Remote
Module ? (Tech Only)
NEXT          YES

```

Press 'YES'.

7. Press 'NEXT' until the Lighting screen is displayed.

```

LIGHTING
enabled. Disable ?
EXIT    NEXT    YES

```

Press 'YES' to toggle the lighting to enabled.

8. Press 'EXIT'. The HHP returns to the main menu ↓ . The parameter setting is now saved with the LM-Z enabled. Unplug the HHP and turn off the DX System.

8 DIAGNOSTICS

DX System Fault Handling

Any fault condition on the DX system will cause the DX Remote's System Status LED (generally the Power On indicator) 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. The title of the Flash Code is also displayed by the HHP if connected to the faulty wheelchair.

There are only two DX faults that are LM-Z related:

- Flash Code 1 : DX Module Fault
- Flash Code 2 : DX Accessory Fault

Refer to the DX Remote Installation Manual for a full list and explanation of Flash Codes.

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 (**non-latched**) while others are **latched** and must be cleared by turning the DX System off, waiting 5 seconds, and then turning it back on again.

LM-Z Specific Faults

General LM-Z Connection Faults

LM-Z connection faults usually result in a DX Module Fault (Flash Code 1) on the DX Remote's System STATUS Indicator. If the LM-Z will not operate or operates incorrectly, check :

1. The LM-Z's STATUS indicator is on steady. If it is off when the system is turned on, the LM-Z, or the DXBUS connection to it, is faulty.

Note that the LM-Z is controlled by the DX Remote and is not able to detect and indicate all possible faults.

2. Check the reliability of the DXBUS plug connection to the remainder of the DX system.
3. Check the battery connection to the LM-Z, if used.
4. Replace either the LM-Z or the DXBUS cable where necessary.

LM-Z Programming Related Faults

The LM-Z may not run at all, or operate in an unexpected way, if the programmable parameters are not set up correctly. Using the Wizard, examine all the parameters detailed in section 7 to ensure they are correctly configured for your application.

Connected Device Faults

Faults with devices connected to the LM-Z usually result in a DX Accessory Fault (Flash Code 2) on the DX Remote's System Status Indicator.

Light Bulb Open Circuit If a bulb is open circuit, attempted activation will cause a non-latching DX Accessory Fault.

Light Bulb Output Short to B+ or V Detection of a light bulb short circuit will cause a DX Accessory fault when activation is attempted.

9 PRODUCT DISCLAIMER

Dynamic Controls Ltd. products built today allow our customer's vehicles to conform to national and international requirements.

In particular to: **ISO7176-9** Climatic Tests for Electric Wheelchairs.
ISO7176-14 Power and Control Systems for Electric Wheelchairs.
ISO7176-21 Requirements and test Methods for Electromagnetic Compatibility of Electric Powered Wheelchairs and Scooters.

However the performance of controllers fitted to wheelchairs and scooters is very dependant on the design of the scooter or wheelchair so final compliance must be obtained by the vehicle manufacturer for their particular vehicle. No component compliance certificate issued by Dynamic Controls Ltd. relieves a wheelchair / scooter manufacturer from compliance testing their particular vehicles.

If Dynamic Controls Ltd. controllers are fitted to vehicles or applications other than wheelchairs and scooters, testing to appropriate standards for the particular application must be completed as ISO7176 may be inappropriate.

10 ELECTROMAGNETIC COMPATIBILITY (EMC)

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

Emissions: **CISPR22, class B**

Susceptibility: **IEC1000-4-3**

ESD: **IEC1000-4-2**

Compliance levels and set-up as per **ISO 7176, part 21**.

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

Minimising Emissions

Motors : Motor brushes generate electromagnetic emissions. It may be necessary to fit capacitors between the brush holders and motor case. Ensure the leads are kept as short as possible.
A suitable capacitor is 4n7, 250V Ceramic.

Wiring : Keep wire lengths as short as practical for a tidy layout. Minimise any wire loops, particularly loops of single wires as opposed to wire pairs.
Endeavour to run wires in pairs or bunches.
Where practical, tie cables to wheelchair frame.

Immunity to Radiated Fields

Follow the wiring recommendations for minimising emissions.

Immunity to ESD

Follow the wiring recommendations for minimising emissions.
Ensure all vehicle sub-frames are electrically connected.
Ensure speed setting potentiometers are electrically connected to the vehicle frame.
Do not leave connections unnecessarily exposed.

11 MAINTENANCE

1. The DX System should be regularly checked for integrity. Loose, damaged or corroded connectors or terminals, or damaged cabling should be replaced.
2. All switchable functions on the DX System should be regularly tested to ensure they function correctly.
3. All DX system components should be kept free of dust, dirt and liquids. If necessary wipe with a cloth dampened with warm water or alcohol. **Do not** use solvents or abrasive cleaners.
4. Where any doubt exists, consult your nearest Service Centre or Agent.
5. There are no user-serviceable parts in any DX System component - do not attempt to open any case.

Warning: If any DX 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.

12 SAFETY AND MISUSE WARNINGS

Do not install, maintain or operate this equipment without reading, understanding and following the proper instructions and manuals, otherwise injury or damage may result.

The completed installation must be thoroughly checked, and all programmable options must be correctly adjusted for safe operation prior to use.

A warning must be conveyed to the wheelchair operator that the controller could cause the chair to come to a sudden stop. In situations where this may affect the safety of the user, this will require the fitting and wearing of a seat belt.

The DX control system is fully programmable to optimise performance and safety. Do not operate the wheelchair unless you have full control. Ensure that the chair is correctly programmed for your needs and environment and ask your dealer to adjust if necessary. Always choose a Drive Program that you feel safe with and that is compatible with your environment.

Performance adjustments should only be made by professionals of the health care field or persons fully conversant with this process and the drivers capabilities. Incorrect settings could cause injury to the driver, bystanders, damage to the chair and surrounding property.

After the wheelchair has been set up, check to make sure that the wheelchair performs to the specifications entered in the programming procedure. If the wheelchair does not perform to specifications, turn the wheelchair off immediately and re-program. Repeat procedure until the wheelchair performs to specifications.

Do not operate the DX System if it behaves erratically, or shows abnormal response, heating, smoke or arcing. Turn the system off, disconnect the battery or open the battery overload switch, and consult your Service Agent.

Do not operate your DX System if the battery is nearly flat as a dangerous situation may result due to loss of power in an inopportune place.

Ensure the controller is turned off when not in use.

No connector pins should be touched, as contamination or damage due to electrostatic discharge may result.

Most electronic equipment is influenced by Radio Frequency Interference (RFI). Caution should be exercised with regard to the use of portable communications equipment in the area around such equipment. While the manufacturer has made every effort to ensure that RFI does not cause problems, very strong signals could still cause a problem. If RFI causes erratic behaviour, shut the wheelchair off immediately. Leave off while transmission is in progress.

In the event of a fault indicator flashing while driving (battery gauge and/or Status LED), the user must ensure that the system is behaving normally. If not, the system must be turned off and a service agent contacted.

Report any malfunctions immediately to your Service Agent.

13 WARRANTY

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

The Warranty is subject to the provisions that the equipment:

- Has been correctly installed.
- Has been used solely in accordance with this manual.
- 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 person other than someone authorised by Dynamic Controls Ltd.
- Has been used solely for the driving of electrically powered wheelchairs in accordance with the wheelchair manufacturer's recommendations.

14 SALES AND SERVICE INFORMATION

For Sales and Service advice, or in case of any difficulty, please contact:

Head Office

Dynamic Controls Limited
Print Place
Christchurch
New Zealand



Telephone: Int. 64 3 338 0016
Fax: Int. 64 3 338 3283

Australia

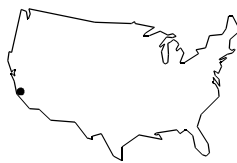
Electronic Mobile Service (EMS)
46 Berripa Close
North Ryde, Sydney
NSW Australia 2113



Tel 24 hr: Int. 61 2 9887 2824
Pager: Int. 61 2 9963 1778
Fax: Int. 61 2 9887 2114

North America

Rosstron Inc
1521 W. 259th St
Harbor City, CA 90710
USA



Telephone: Int. 1 310 539 6293
Fax: Int. 1 310 539 4078

Europe

Controls Dynamic Ltd
Lisle Avenue
Kidderminster
DY11 7DL.
United Kingdom



Telephone: Int. 44 1562 820 055
Fax: Int. 44 1562 742 720

Note: The controller should be clearly labelled with the manufacturer's service agent's telephone number.

APPENDIX A : LM-Z ACCESSORY PARTS LIST

Part / Order Number	Part Name	Page Reference
GME60525	DX Aux. Mod. Lock (one supplied with LM)	9
GME60526	DX Aux. Mod. Tube Clamp A	9
GME60527	DX Aux. Mod. Tube Clamp B	9
GSC0170	M3x10 Countersink Plastite Screw	9
GSC0175	M3x12 Pan Plastite Screw	9
GSC0180	M3x16 Pan Plastite Screw	9
GSC0052	M5 x 12 CSK Screw	9
GSM630012	DXBUS Cable, straight 0.12 M	11
GSM63003	DXBUS Cable, straight 0.3 M	11
GSM63005	DXBUS Cable, straight 0.5 M	11
GSM63010	DXBUS Cable, straight 1.0 M	11
GSM63015	DXBUS Cable, straight 1.5 M	11
GSM63020F	DXBUS Cable, Ferrite 2.0 M	11
DX-SKT-X4	DX Splitter Box	13
GCN0793	DX Positronics Contact FC114N2 (large)	17
GCN0797	DX Positronics Contact FC116N2 (medium)	17
GCN0794	DX Positronics Contact FC120N2 (small)	17
GCN0795	DX 21W Boot	17
GCN0796	DX 21W Plug Housing	17

See Dynamic Controls or a Sales and Service Agent for information regarding parts and their availability.

APPENDIX B : CHANGE RECORD

This section lists the changes implemented into this manual from previous revisions.

Page / Section	Change	Approval
Page 4	RFI Immunity claim removed	
Page 7	Standards claim added	PCO 2674
Page 11	Cable with ferrite added	
Page 17	Pinout corrected	
Section 14	Telephone numbers corrected (EMS)	PCO 2754
Section 9	Disclaimer Section added	PCO 2766
Section 10	Electromagnetic Compatibility Section added	PCO 2766
Section 12	Safety and Misuse Warnings rewritten	PCO 2766