Kam

INSTRUCTION MANUAL

Energy SD1
Powerful colour animation laser

MANUAL VERSION 2.0
29-05-14

SPECIAL DOWNLOAD AREA

**Please visit the Kam website Download Area to get custom created ILDA files
that you can download and add to an SD card to play on your Kam Energy SD1 laser!**

For the latest instruction manual updates, the Laser Download Area and information on the entire Kam range visit:

www.kam.co.uk

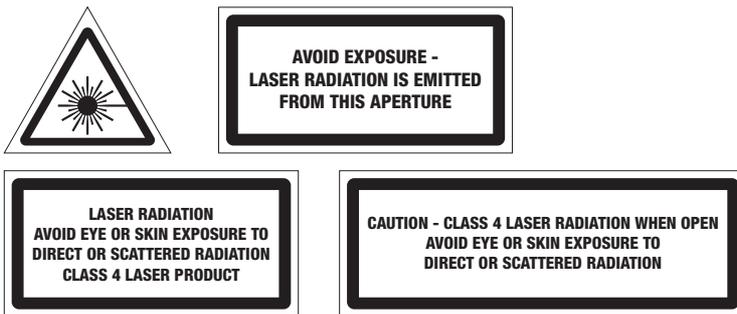**Thank you for purchasing this Kam product, we are sure that it will serve you for many years to come.**
To optimise it's performance, please read these instructions carefully to familiarise yourself with the basic operations of the unit.
Please retain them for future reference.This unit has been tested at the factory before being shipped to you. To prevent or reduce
the risk of electrical shock or fire, do not expose the unit to rain or moisture. To prevent a fire hazard, do not expose the unit to
any naked flame sources. Unplug this apparatus during lightning storms or if it is unlikely to be used for long periods of time.

When installing the unit, please ensure you leave enough space around the unit for ventilation. Slots and openings in the unit are
provided for ventilation to ensure reliable operation of the product and to protect it from overheating. To prevent fire hazard, the
openings should never be blocked or covered.

The unit is powered by the mains, always handle the power cable by the plug. Never pull out the plug by pulling on the cable.
Never touch the power cable when your hands are wet as this could cause an electric shock. Do not tie a knot in the cable. The
power cable should be placed such that it is not likely to be stepped on. A damaged power cable can cause a fire or give you an
electrical shock. Check the power cord periodicaly, if you ever find that it is damaged, replace it before using the unit again.
Contact your retailer for a replacement.

The voltage of the available power supply differs according to country or region. Be sure that the power supply voltage of the area
where this unit is to be used meets the requirements of the unit.

**The lightning flash symbol inside a triangle is to alert the user to the presence high voltage within the unit's enclosure
that may be of sufficient power to constitute a risk of electrical shock to persons. Caution: to prevent the risk of electric
shock, do not attempt to open the unit. No user-serviceable parts inside. Refer all servicing to qualified service
personnel. The exclamation mark inside a triangle is intended to alert the user to the presence of important operating
and maintenance instructions in the literature accompanying the appliance. Please read and pay attention to all laser
safety warning sticker labels on the unit.**

AVOID EXPOSURE -
LASER RADIATION IS EMITTED
FROM THIS APERTURE

LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT

CAUTION - CLASS 4 LASER RADIATION WHEN OPEN
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

Select the installation location of your unit carefully. Avoid placing it in direct sunlight or locations subject to vibration and
excessive dust. Do not use the unit where there are extremes in temperature (below 41ºF / 5ºC or exceeding 95ºF / 35ºC).

Unpacking and safety Please unpack your new product carefully. Your new product should reach you in perfect condition.
Please check that no damage has occurred during transit. If any damage is found, do not operate your unit. Please contact the
retailer you purchased it from immediately. If there is any damage to the mains cable do not use the device. Always disconnect
the unit from the mains supply when carrying out any cleaning of the unit.

Manufacturer declarations

In compliance with the following requirements: **RoHS Directive (2002/95/EU)** and **WEEE Directive (2002/96/EU).**
If this product is ever no longer functional please take it to a recycling plant for environmentally friendly disposal.

CE declaration of conformity
R&TTE Directive (1999/5/EU), EMC Directive (2004/108/EU), Low Voltage Directive (2006/95/EU).
The declarations are available on application from certification@lambaplc.com
Before putting the devices into operation, please observe the respective country-specific regulations.

This manual contains important laser system safety and operation information. Read and understand all instructions prior to
powering on the laser unit the first time to avoid eye injury and to avoid breaking the law. Keep this manual in a safe place for
future reference. Lasers can be hazardous and have unique safety considerations. Permanent eye injury and blindness is
possible if lasers are used incorrectly. Pay close attention to each safety WARNING statement in this manual.

Please refer to the **Kam Class 4 Laser Product Safety Guide** for more information on laser safety issues.

Laser safety warnings…
Potential laser injury hazard exists with this product! Please read these instructions carefully, which include important information about installation, safe use and service!

⚠ **Caution** Avoid direct eye contact with laser light. Never intentionally expose your eyes or others to direct laser radiation.

⚠ **Caution** This laser product can potentially cause instant eye injury or blindness if laser light directly strikes the eyes.

⚠ **Caution** It is illegal and dangerous to shine this laser into audience areas.

⚠ **Caution** It is illegal and dangerous to shine any laser at aircraft.

⚠ **Caution** Operating procedures other than those specified herein may result in hazardous radiation exposure.

Overhead rigging
Important - the installation must be carried out by qualified service personal only. Improper installation can result in serious injuries and /or damage to property. Overhead rigging required extensive experience. Working load limits should be respected, certified installation materials should be used, the installed unit should be inspected regularly for safety.
- Make sure the area below the installation place is free from unwanted persons during rigging, de-rigging and servicing.
- Locate the unit in a well ventilated spot, far away from any flammable materials and/or liquids. The fixture must be fixed **at least 50cm** from surrounding walls
- The device should be installed out of reach of people and outside of areas where persons may walk by or be seated.
- Before rigging make sure that the installation area can hold minimum point load of 10 times the device`s weight.
- The device should be well fixed; a free swinging mounting is dangerous.
- Do not cover any ventilation opening as this may result in overheating
Before first time use, the unit should be inspected for safety. Inspection the unit regularly every year.

AC power
The unit is supplied with a power plug appropriate to its voltage. Should any other connections be required they must be carried out with the following configuration:

| Cable (EU)	Cable (US)	Pin	International
Brown	Black	Live	L
Light blue	White	Neutral	N
Yellow/green	Green	Earth	⏚

DMX-512 connection
If you are using a standard DMX controller, you can connect the DMX output of the controller directly to the DMX input of the first unit in a DMX chain. If you wish to connect a DMX controller with other XLR outputs you will need to use adapter cables.

1 = Shield
2 = Signal (-)
3 = Signal (+)

DMX output
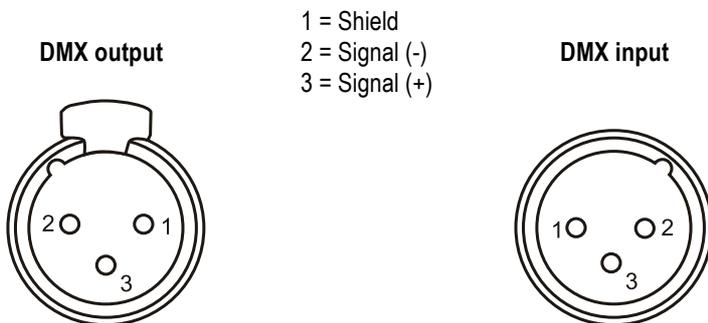
DMX input

Connect the DMX output of the first unit in a DMX chain with the DMX input of the next unit in the chain. Always connect the the output of one unit with the input of the next unit until all units are connected.

If you use a controller with 5 pin DMX connection you will need to use a 5 pin to 3 pin adapter.

Caution at the unit, the DMX cable has to be terminated with a terminator. Solder a 120 Ohm resistor between Signal (-) and Signal (+) into a 3-pin XLR connector and plug this into the DMX output of the last unit in the chain.

Pin 2   Pin 3
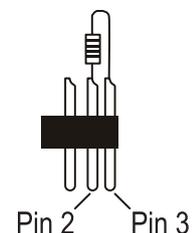
Front panel functions
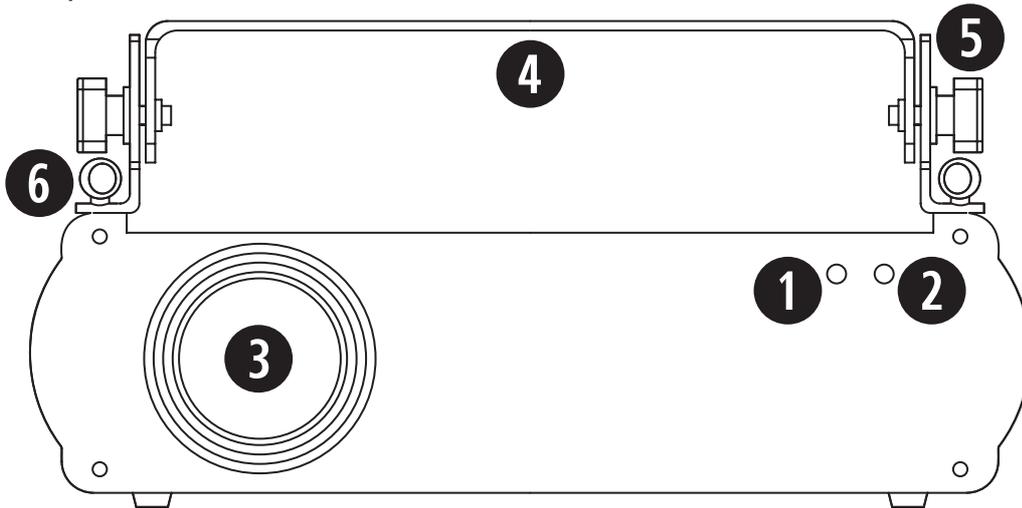
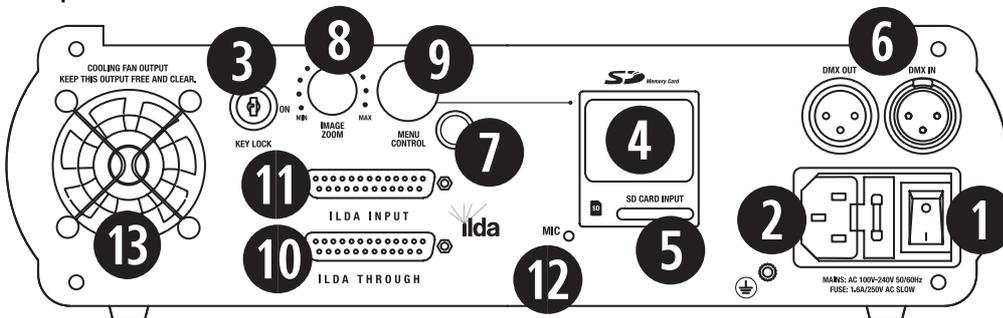| Number	Feature	Function
1	Power indicator LED	Illuminates red when the unit is turned on to show the unit is powered up.
2	Sound indicator LED	Flashes when an audio signal is received by the built-in microphone for reference.
3	Laser output aperture	The laser light is emmited from here. Never look directly into the hole when the unit is on.
4	Handle bracket	Adjustable handle for carrying the unit and for mounting.
5	Handle adjustment	Adjusts the angle of the handle bracket.
6	Safety chain eyelets	Attach safety chains to these eyelets when mounting the unit.

Rear panel functions

| Number	Feature	Function
1	Power switch	Turns the unit on or off when connected to the mains power supply.
2	Power supply input	Attach the mains cable here. Built-in fuse and spare fuse.
3	Key switch	Even when powered up, the unit will not operate without the key inserted and turned to on.
4	Information display	Menu display to control and select the software from an inserted SD card.
5	SD card input	Slot for inserting an SD card.
6	DMX input/output	3 pin XLR connectors for DMX communication
7	Remote connect	Safety connector (optional) used to turn the unit of immediately.
8	Image zoom knob	Controls the projected laser image size from 5% to 100%.
9	Menu control knob	Rotate the control knob to adjust the menu. Press to select/confirm/exit/etc.
10	ILDA through	Standard ILDA interface. Used to connect to other ILDA lasers.
11	ILDA input	Standard ILDA interface. Automatically switches between the internal program and ILDA.
12	Microphone	Receives audio signal for use in Sound-to-Light mode.

ILDA 'through' playback control (Master/Slave mode)

Ensure you use ILDA DB25 cables. When there is no external ILDA control signal via the ILDA Input (11), the unit can operate as a Master unit running from the SD card and can control other units via the ILDA Through (10) interface on the rear of the unit. This unit will not operate as a Master/Slave using DMX.

Menu operating instructions

After powering up the laser, the version number and manfuacturer information will briefly show on the rear panel Information Display LCD (4). After this, the Information Display will show the current operating standalone mode or DMX address (if the unit is in DMX mode). With the help of this Information Display LCD, it is very easy to set and change the operating mode of the laser. After setting the laser, this new mode info will be shown when the unit is next powered on.

Information Display
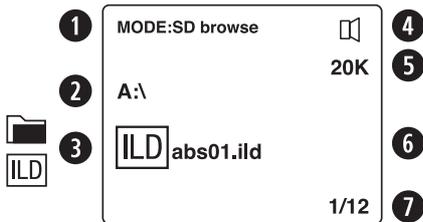
1. Indicates the current operating mode
2. Current open folder name (e.g. A:\ directory on SD card)
3. File type (folder icon = graphic/folder ILDA icon = ILD format)
4. Mic icon indicates Sound-to-Light mode is in operation
5. Current scanner speed
6. Area that shows the current selected file or folder
7. Total number of files in current directory

The Menu Control knob (9)

IMPORTANT - this is a rotary knob AS WELL as a button that can be pressed.

Rotate the knob to choose your selection in the the Information Display (4).

Press it once to confirm your selection.

Press it for TWO seconds to jump to the main menu or to return to the previous level in the menu.

Recommended operation settings

The Kam Energy SD1 laser comprises of two main menus. The first menu (Projector setting menu) is accessed when the unit power is switched on (1) and the Menu control knob (9) is **simultaneously** rotated. The second menu is accessed when the unit has fully powered up and has pre-loaded its settings. This second menu is activated by pressing the Menu control knob for three seconds.

1. Access the first main menu by rotating the Menu control knob when the unit power is first switched ON
2. Select **Projector setting** and choose **multi-colour** from the menu (press the knob to select)
3. Then go to the **Scanner rate** and select **20K**
4. Scroll to where is says **Exit** and when it says **Save changes**, select **Yes**

The layout for this initial menu (Projector setting menu) is illustrated below:
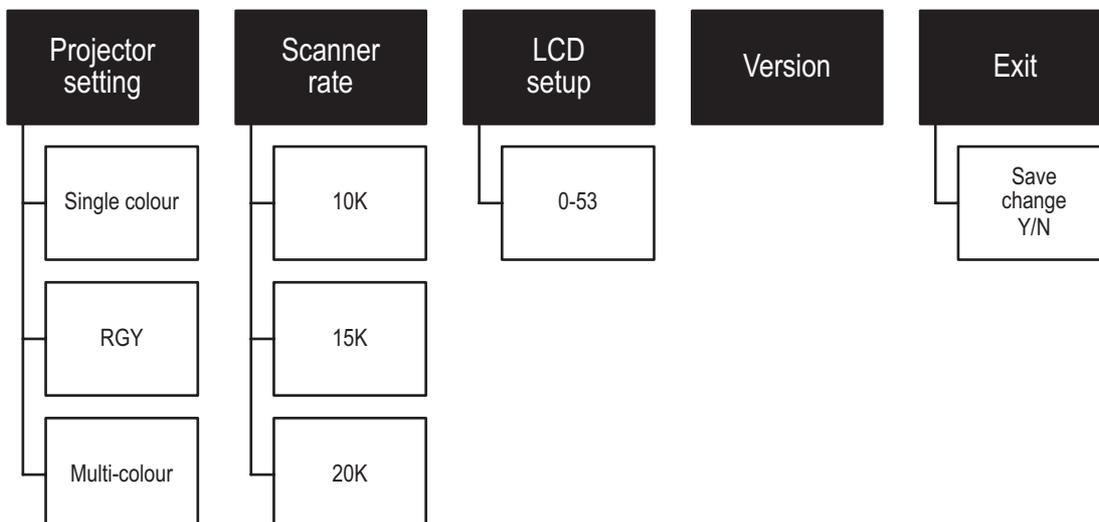
Important: To access ALL the option in the secondary menu, ensure that you have selected **Multi-colour** in the **Projector setting** and set the **Scanner rate** to **20K** and then **Saved** these options. This will allow you to change between all of the available settings in the secondary menu. If, for example, **Single colour** is selected in the first menu (the Projector setting menu), then this will be the only option available in the secondary menu. If RGY is selected in the first menu then both the single colour option and the RGY projector settings will be available in the secondary menu (but not the multicolour option).

Language setting
If you need to change the language for any reason, please use the following instructions. Immediately after turning the unit on (when the version number info appears on the Information Display (4)), press in and hold the Menu Control knob (9) for two seconds. To choose your preferred language, rotate the Menu Control knob (Simplified Chinese, Traditional Chinese, English and Japanese). To make your selection, press the Menu Control knob to confirm.
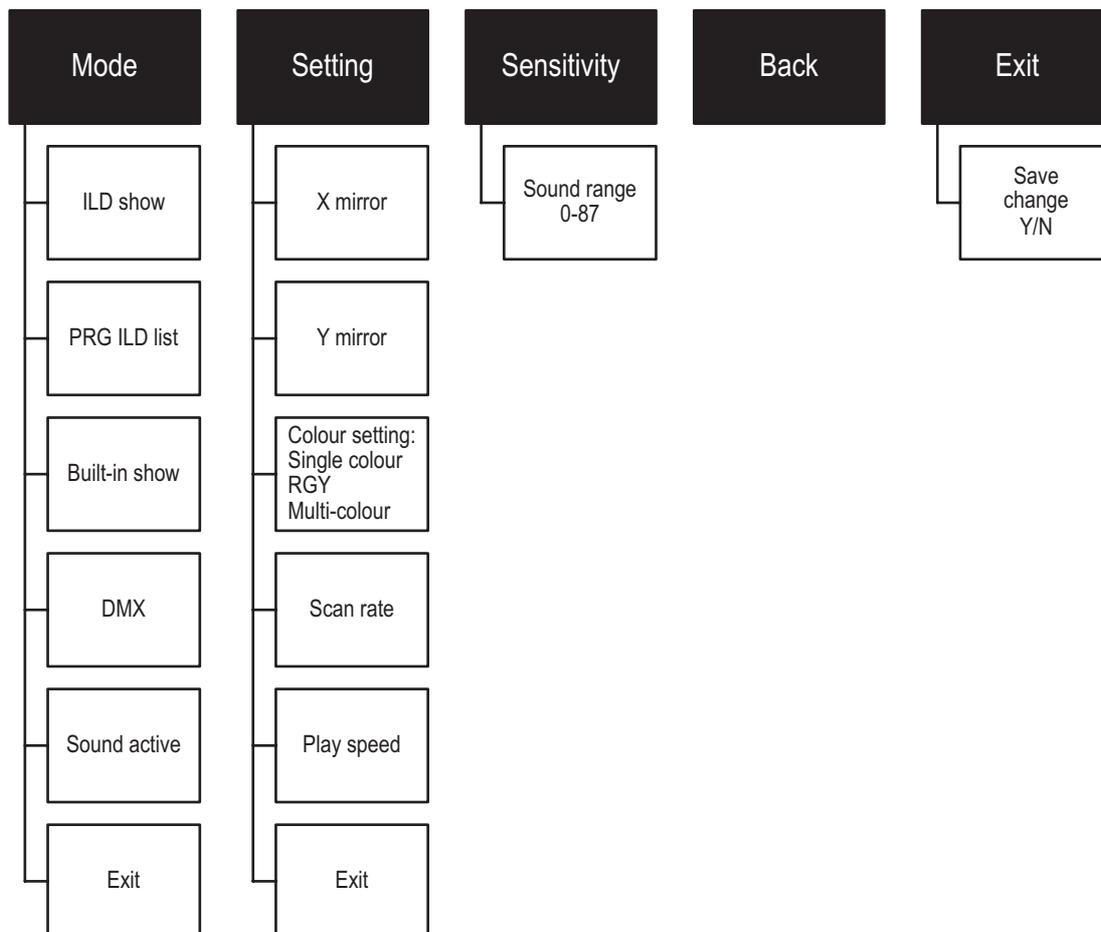
Standard operation settings
When the unit has been set to its recommended settings (see above), it is now ready to start operating. To change the unit's mode settings, hold down the Menu Control knob for three seconds and the secondary menu will appear. The menu comprises of **Mode**, **Setting**, **Sensitivity**, **Back** and **Exit**.

1. Select the **Mode** from the menu options
2. Choose **PRG ILD** (*this will access the ILDA files as a list on the SD card*)
3. Next select **Setting** and scroll down to **Colour Setting** and choose the **Multi-colour** option
4. Finally select the **Exit** menu

IMPORTANT: Ensure that **Sound active** in the **Mode** menu is NOT selected if Sound-to-Light operation is not required. The unit requires audio of a reasonably high volume to work in Sound-to-Light mode. If the music or audio is too quiet, the animations may tend to stall. The sound sensitivity in the **Sound Active** mode can be adjusted to make it more sensitive to sound with a range of 1, the least sensitive to 87.

The layout for the secondary menu is illustrated below:

Mode	Setting	Sensitivity	Back	Exit
ILD show	X mirror	Sound range 0-87		Save change Y/N
PRG ILD list	Y mirror			
Built-in show	Colour setting: Single colour RGY Multi-colour			
DMX	Scan rate			
Sound active	Play speed			
Exit	Exit			

The available **Settings** may differ from the above depending on which **Mode** is selected in the menu.
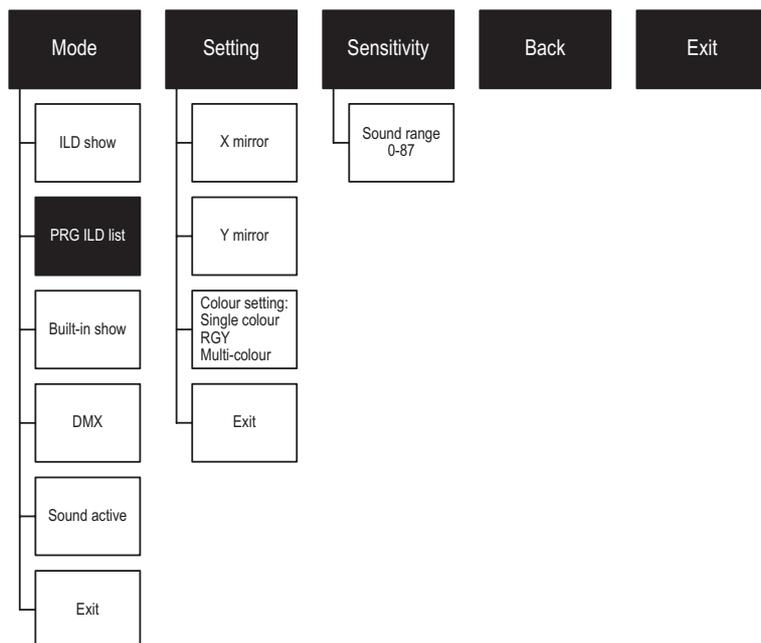
ILDA show mode - This mode plays each individual animation on the SD card. It allows the user to cycle through each animation individually. To operate in this mode, select **ILD show** from the **Mode** menu, then scroll down and select **Exit.** All available ILDA files are then listed. Rotate the Menu Control knob to view the files. To select and play a file, simply press the Menu Control knob. To select another ILDA file from the list, simply rotate the Menu Control knob until you see the file you wish to play and then press the Menu Control knob. To pause an animation, press the Menu Control knob once, press the knob again to resume.

The layout for the ILD show mode menu is illustrated below:

Mode	Setting	Sensitivity	Back	Exit
ILD show	X mirror	Sound range 0-87		
PRG ILD list	Y mirror			
Built-in show	Colour setting: Single colour RGY Multi-colour			
DMX	Scan rate			
Sound active	Play speed			
Exit	Exit			
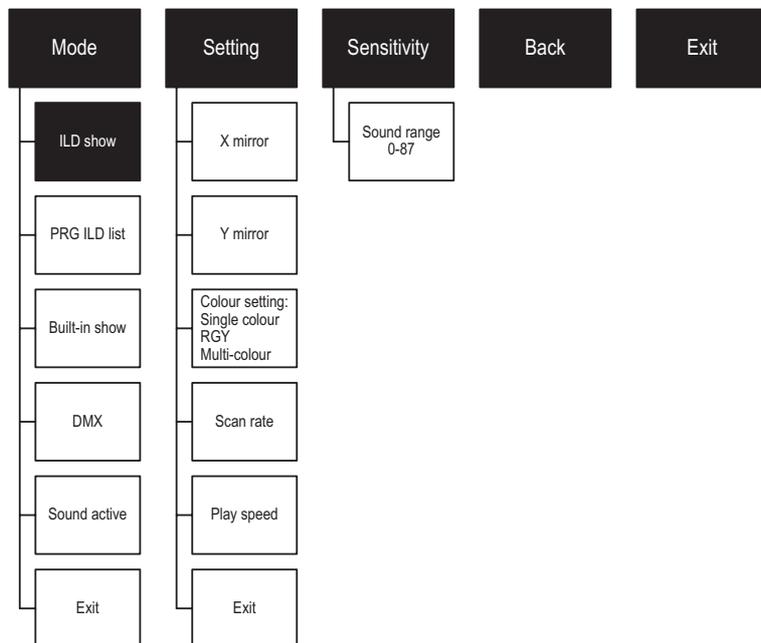
PRG ILD list mode - This mode plays a group of animations. To operate in this mode, select **PRG ILD list** from the **Mode** menu, then scroll down and select **Exit.** Rotate the Menu Control knob to view the available folders. To select and play the contents of a folder, simply press the Menu Control knob when the chosen folder name is visible. All files from within the selected folder will automatically begin to play. If you wish to stop playing the contents of a folder, simply rotate the Menu Control knob. To begin playing the folder contents again, rotate the Menu Control knob until the word 'LIST.ist' appears, the files will now begin to play again.

The layout for the PRG ILD list mode menu is illustrated below:

Mode	Setting	Sensitivity	Back	Exit
ILD show	X mirror	Sound range 0-87		
PRG ILD list	Y mirror			
Built-in show	Colour setting: Single colour RGY Multi-colour			
DMX	Exit			
Sound active				
Exit				

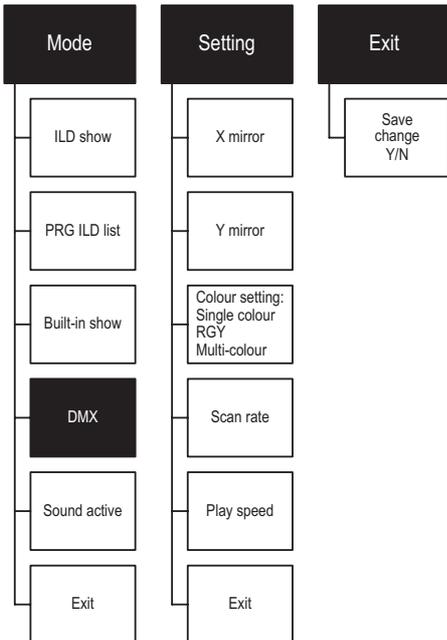**Built-in show mode** - This mode plays the animations that are built into the hardware of the laser. To operate in this mode, select **Built-in show** from the **Mode** menu, then scroll down and select **Exit.** Rotate the Menu Control knob to view the available shows 1-3. To select and play a show, simply press the Menu Control knob when the chosen show name is visible. All files from within the selected show will automatically begin to play. If you wish to stop playing a show, simply rotate the Menu Control knob. To begin playing the show again, rotate the Menu Control knob until the name of the show appears again, the show will now begin to play again.

The layout for the Built-in show mode menu is illustrated below:

Mode	Setting	Sensitivity	Back	Exit
ILD show	X mirror	Sound range 0-87		
PRG ILD list	Y mirror			
Built-in show	Colour setting: Single colour RGY Multi-colour			
DMX	Scan rate			
Sound active	Exit			
Exit				
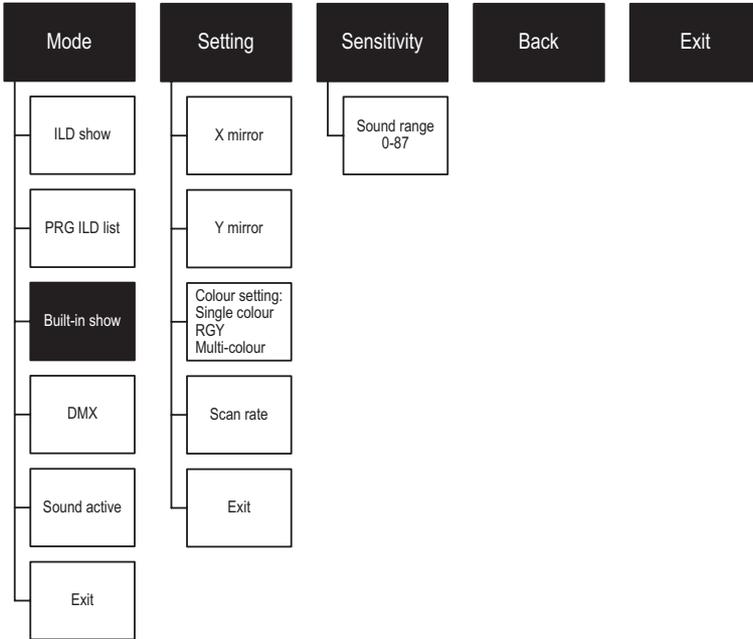
DMX mode - This mode allows you to operate the laser using DMX. To operate in this mode, select **DMX** from the **Mode** menu, then scroll down and select **Exit.** Rotate the Menu Control knob to select your chosen DMX address. The DMX programming guide can be found later in this manual.

The layout for the DMX mode menu is illustrated below:

Mode	Setting	Exit
ILD show	X mirror	Save change Y/N
PRG ILD list	Y mirror	
Built-in show	Colour setting: Single colour RGY Multi-colour	
DMX	Scan rate	
Sound active	Play speed	
Exit	Exit	

Play function settings

Mode selection	Menu Control knob	Function
ILD mode	Rotate knob to select	After you have made a selection, there is a delay before the Information Display will reflect the change (this can take a few seconds)
Play list		
Built-in effects	Press to confirm selection	
Sound control		Sound-to-Light pattern change
Quit	Press and hold for 2 seconds	Returns to main menu / returns to the previous level in the menu

Edit SD play list

In ILD mode, select the ILD document you want to edit using the Menu Control knob, press to confirm then follow the order below:

MODE:ILD 20K	MODE:ILD 20K	MODE:ILD 20K
Repetition **2**	**Add To List?** [Yes] [No]	**Remove List?** Yes [No]
ILD file playback times	SD default list	Select 'No', previously compiled list will be added to the back, empty on the new list, restart editing a new list

Pattern setting

X mirror	Horizontal direction of the pattern flip	
Y mirror	Vertical direction of the pattern flip	
Colour setting	Single red green yellow RGB	Compatible with the initial setting
Scanning speed	Set your scanning speed: 0-20K	
Play speed	The rate change of the pattern speed. The larger the numerical value, the slower the playback speed	Effective only in the ILD play mode

DMX instructions

Several operating modes were pre-programmed into the unit on DMX channel 1. Before controlling other DMX channels, please ensure that DMX channel 1 is set in it's proper value. The Energy SD1 is configured in such a way that this unit can operate in 24 channels. Channel 1 operates laser black out, ILDA show directory, AUTO, Sound-to-light and DMX modes. If channel 1 is set below DMX value 200, the laser defaults to 5-channel operation and channel protocol is as follows.

Channel		Value	Function
CH1	ILD playlist	000	Laser black out
		001-040	ILD show in SD card
		041-080	LIST show in SD card
		081-100	ILD show in SD card using Sound-to-Light control
		101-120	LIST show in SD card using Sound-to-Light control
		121-160	AUTO show
		161-200	MUSIC show
	DMX program mode	201-240	DMX mode
		241-255	DMX mode using Sound-to-Light control

ILD mode or play list

Channel	Value	Function
CH2	000-255	Sound-to-Light microphone sensitivity control
CH3	-	-
CH4	000-255	Select the SD card folder
CH5	000-255	ILD file folder or play the file LIST

Important: In channel 1 in DMX mode when the value is below 200 it coresspondes with the ILD mode or playlist above with the above channels 1-5. However when the value goes above 200 i.e. 201, then channel 2-5 correspond to the DMX programming mode that can be found in the table below.

With DMX channel 1 the value being above 201, the laser becomes 24-channel operation set into two sections. The reason for the two sections is that this Energy SD1 laser will allow pattern shape overlay. DMX channels 3-14 give you full control on the first layer of patterns, 15-24 will give you full control of the second layer of patterns. The two-default channel modes 5 channel and 24 channels provide independent control of the SD playback feature and dual layer independent pattern control.

DMX programming mode

Image layer	Channel	Value	Function
Pattern Image One	CH2	000-255	Sound-to-Light microphone sensitivity control
	CH3 pattern mode selection	000	Laser black out
		0001-049	Pattern out through the mode. Channel values of 1-6 will see the pattern shrink
		050-099	Pattern out of bounds foldback mode. Channel values of 51-56 will see the pattern shrink
		100-149	Pattern out through the mode. Channel values of 101-106 will see the pattern shrink
		150-199	Pattern out of bounds foldback mode. Channel values of 151-156 will see the pattern shrink
		200-255	Pattern out of bounds reentrant mode. Channel values of 201-206 / 251-256 will see the pattern shrink
	CH4	000-255	Total of 128 patterns, each 2 values become one pattern
	CH5 shrinking	000-063	Adjusts the size of the pattern manually
		064-191	Zooms in and out to morph the image
		160-192	Shrinking
		192-223	Enlarging
		224-255	Zooms back and forth (largest to smallest)
	CH6 rotation	000-063	Adjusts the angle of rotation manually
		064-191	Bends, stretches and morphs the image
		192-223	Clockwise rotation
		224-255	Anti-clockwise rotation
	CH7 horizontal	000-063	Manually adjusts the horizontal movement
		064-255	Bends, stretches and morphs the image
	CH8 vertical	000-063	Manually adjusts the vertical movement
		064-255	Bends, stretches and morphs the image
	CH9 horizontal shrinking	000-063	Manually adjusts the Y axis position
		064-255	Bends, stretches and morphs the image
	CH10	000-063	Manually adjusts the X axis position

	vertical shrinking	064-255	Bends, stretches and morphs the image
	CH11 gradual redraw	000-063	Manually adjusts gradual redraw position
		064-255	Adjusts the speed of gradual redraw
	CH12	000-255	Adjusts the pattern node clarity
	CH13 colour	000-007	Primary
		008-015	Red
		016-023	Green
		024-031	Yellow
		032-039	Blue
		040-047	Pink
		048-055	Cyan
		056-063	White
		064-127	Colour rotation
		128-191	Single colour rotation
		192-255	Blending transition
Pattern Image Two	CH14 pattern mode selection	000	Laser black out
		0001-049	Pattern out through the mode. Channel values of 1-6 will see the pattern shrink
		050-099	Pattern out of bounds foldback mode. Channel values of 51-56 will see the pattern shrink
		100-149	Pattern out through the mode. Channel values of 101-106 will see the pattern shrink
		150-199	Pattern out of bounds foldback mode. Channel values of 151-156 will see the pattern shrink
		200-255	Pattern out of bounds reentrant mode. Channel values of 201-206 / 251-256 will see the pattern shrink
	CH15	000-255	Total of 128 patterns, each 2 values become one pattern
	CH16 shrinking	000-063	Adjusts the size of the pattern manually
		064-191	Zooms in and out to morph the image
		160-192	Shrinking
		192-223	Enlarging
		224-255	Zooms back and forth (largest to smallest)
	CH17 rotation	000-063	Adjusts the angle of rotation manually
		064-191	Bends, stretches and morphs the image
		192-223	Clockwise rotation
		224-255	Anti-clockwise rotation
	CH18 horizontal	000-063	Manually adjusts the horizontal movement
		064-255	Bends, stretches and morphs the image
	CH19 vertical	000-063	Manually adjusts the vertical movement
		064-255	Bends, stretches and morphs the image
	CH20 horizontal shrinking	000-063	Manually adjusts the Y axis position
		064-255	Bends, stretches and morphs the image
	CH21 vertical shrinking	000-063	Manually adjusts the X axis position
		064-255	Bends, stretches and morphs the image

	CH22 gradual redraw	000-063	Manually adjusts gradual redraw position
		064-255	Adjusts the speed of gradual redraw
	CH23	000-255	Adjusts the pattern node clarity
	CH24 colour	000-007	Primary
		008-015	Red
		016-023	Green
		024-031	Yellow
		032-039	Blue
		040-047	Pink
		048-055	Cyan
		056-063	White
		064-127	Colour rotation
		128-191	Single colour rotation
		192-255	Blending transition

Product specification

Mains input	AC100~240V, 50/60Hz
Fuse	250V / T1.6A
Total power	1500mW
Scanner angle	1-36°
Scanner speed	20K
Music control	Audio/sound activated
Laser power	550mW 638nm red laser 150mW 532nm green laser 800mW 450nm blue laser
Laser classification	Class 4
Operating temperature	10~40°
DMX connections	3 pins XLR male/female
DMX channels	24
ILDA connections	DB25
S/D connections	External SD card
Dimensions	316 x 254 x 150mm
Nett weight	4.26Kg