

EK-DZ  
**Advanced Laser Router**

User Guide  
v1.3



[www.aldebaran-systems.com](http://www.aldebaran-systems.com)

## **Introduction**

The Advanced Laser Router (ALR) was designed by Ed Keefe and David Zurcher to fill a need in the laser show industry of controlling multiple laser projectors via DMX.

The ALR has 6 fully buffered and clamped output ILDA compatible channels, 2 fully buffered pass-thru channels and 2 ILDA compatible input channels.

With the ALR and a single DAC, you are able to individually control up to 6 laser projectors. With the same imagery being displayed by the DAC, using DMX commands each output may have a different color, size and orientation; all dynamically modified 'on the fly'.

This functionality was taken a step further with the dual input capabilities of the ALR. In Dual Router mode with DMX commands you are able to move an individual output to a secondary input.

In order to simplify the use of the ALR, and limit the DMX footprint, there are 4 basic modes of operation, often referred to 'Personalities'. The Basic Splitter personality is the only one of the four that does not respond to DMX. This mode acts as simple signal buffer/splitter, passing the input directly to the outputs. The other three personalities, Advanced Splitter, Single Input Router and Dual Input Router, all respond to DMX and have a footprint of between 20 and 108 DMX channels, depending on the configuration.

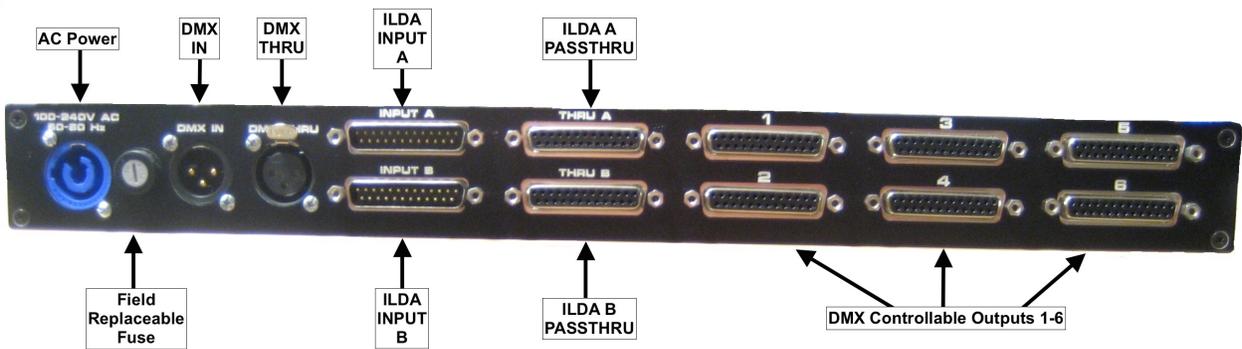
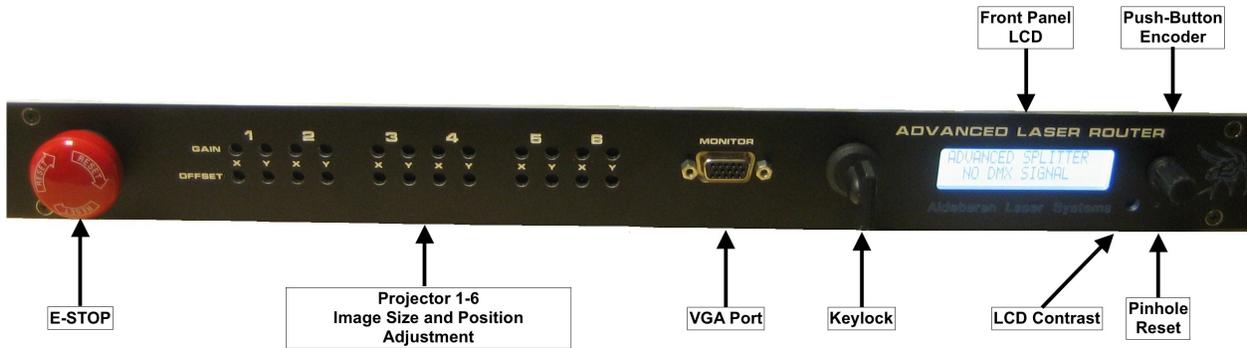
## **Safety**

Laser show safety is of utmost importance and the responsibility of performing a safe laser show ultimately rests in the hands of the laser show operator. Using the ALR or not, laser shows present many possible points of failure and it is important to design a setup taking this into account. The ALR is not a perfect device and is prone to failure. It is the laser show operators' responsibility to ensure that in the event of a failure the show remains safe for an audience. Aldebaran Laser Systems, EK and DZ are not responsible for the mis-use of this product or the affects of an unsafe show. That said, there are a number of safeguards we have in place to assist an operator with safety. The front panel has recessed potentiometers to prevent accidental adjustment during a show, the LCD configuration via encoder may be locked out with a key switch and the E-Stop button will open all interlock loops and close shutters if installed.

## **Index**

Locations	Page 4
Specifications	Page 5
DMX Controllable Features	Page 6
RDM	Page 8
Video	Page 9
Interlock and Shutter	Page 12
Basic Splitter Personality	Page 13
Advanced Splitter Personality	Page 14
Single Input Router Personality	Page 16
Dual Input Router Personality	Page 18
Pangolin's Beyond and PangoScripting	Page 20

# Locations



## **Specifications**

Power requirements: 100-240VAC 50-60Hz Neutrix Connector

DMX:

- In and Thru, 3-pin, optically isolated.
- DMX base address range of 1 to 400 (up to 108 channel footprint)
- RDM v1.20 compliant

ILDA compatible ports:

- 2 Input ports (Input B only used when in Dual Router Mode)
- 2 Buffered pass-thru ports (One for input A and one for Input B)
- 6 DMX controllable output ports. Fully buffered and clamped. ILDA signals used are X, Y, Red, Green, Blue, Shutter and interlock. All other signals are ignored.
- Interlock lines are optically isolated and short circuit protected.

Front Panel:

- 24 recessed trim potentiometers, 270 degree, not multi turn.
- E-Stop button, requires turn and pull to reset.
- Key Switch, locks out configuration options on the LCD.
- Encoder, allow configuration changes via the LCD, if key switch is engaged.
- Reset, pinhole to force the Router processor to reboot without removing power.
- LCD Contrast adjustment
- VGA Port, allows monitoring of DMX effect addresses.

Size:

- Width - 19"
- Height - 1.75"
- Depth - 8.5"

Field replaceable fuse.

## **DMX Controllable Features**

	Advanced Splitter	Single Input Router	Dual Input Router
X-Gain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
X-Offset	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Y-Gain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Y-Offset	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Red Gain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Green Gain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Blue Gain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
X-State	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Y-State	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Swapped	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Red Map		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Green Map		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Blue Map		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
X-Source			<input checked="" type="checkbox"/>
Y-Source			<input checked="" type="checkbox"/>
Red Source			<input checked="" type="checkbox"/>
Green Source			<input checked="" type="checkbox"/>
Blue Source			<input checked="" type="checkbox"/>

### **An important concept to understand about the ALR.**

When the Router is in any DMX controllable mode, on boot up all DMX channels will have a starting value of 0 until told via DMX to set to a different value. If you have no DMX cable attached, no DMX signal or the DMX values being sent to the Router are all zero, none of the projectors attached will display an image. At the very minimum you will need to send the appropriate DMX values to center

the X/Y offsets and set the X/Y RGB gain to max. If a loss of DMX signal occurs when running, the DMX values will remain the same until the DMX signal is re-established. It is possible to boot the Router, connect DMX and adjust all projector settings to where you want them for the show and then disconnect the DMX cable. The Router will continue to run with those settings until it's rebooted, power cycled or told to change to a different personality.

X/Y RGB Gain - Each of the six outputs of the Router have independently controllable settings for X/Y RGB gain. This adjusts the size, brightness or color balance of a image being displayed on each of the six outputs. A DMX value of 0 is fully off and a DMX value of 255 is fully on.

X/Y Offset - Each of the six outputs may have it's image position independently controlled by DMX. A DMX value of 127 is center.

X/Y State - X or Y may be independently inverted for all six outputs. A DMX value of 0-126=Not Inverted, 127-255=Inverted.

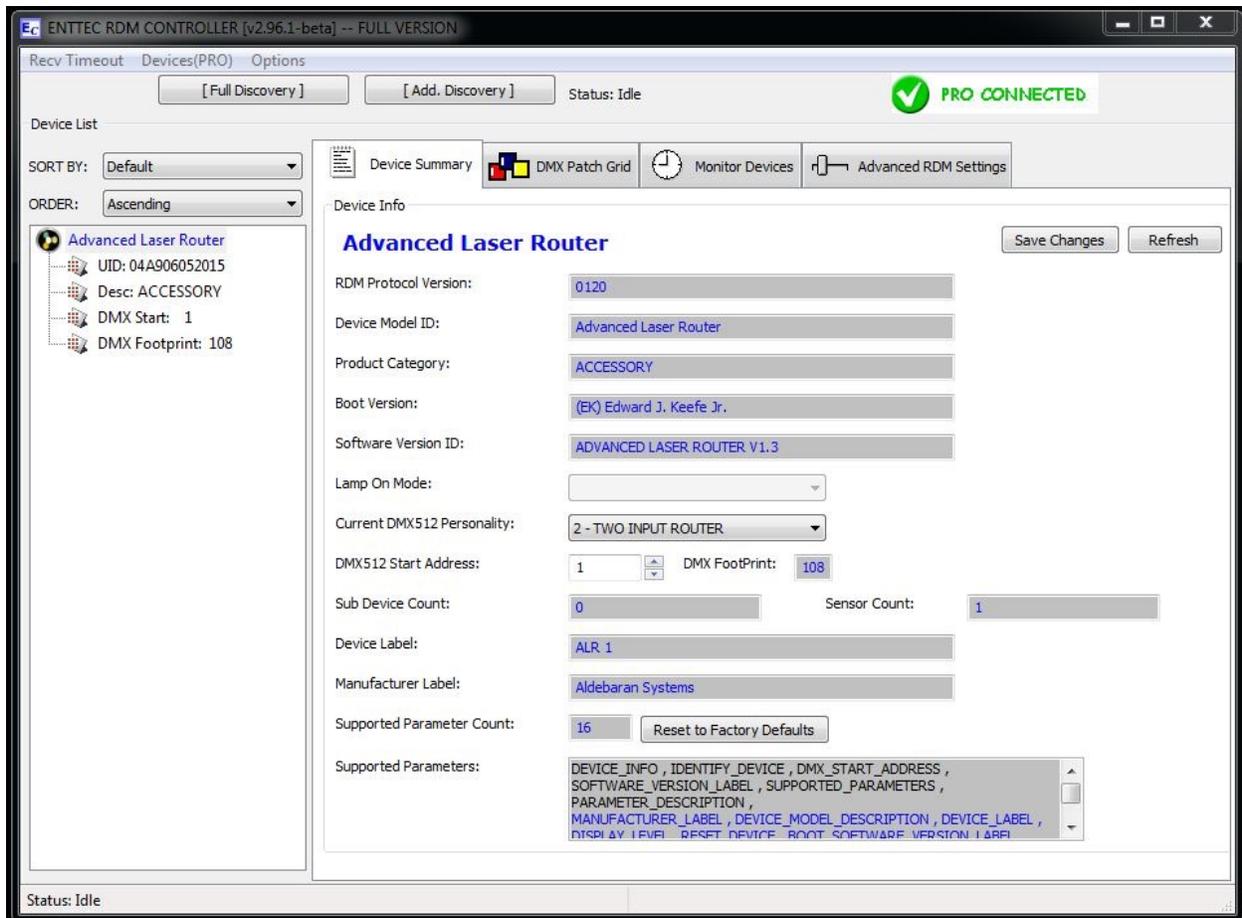
Swapped - This features allows X/Y to be swapped, this will cause an image to appear on its side in relation to an output that doesn't have X/Y swapped. A DMX value of 0-126=Not Swapped 127-255=Swapped

Color Mapping - This is a very unique feature that allows output RGB channels to be mapped to different RGB input signals. RGB input signals may not be combined together, however an RGB output can be tied to R input. This can be a complex feature and will be explained in more detail in the Single and Dual Input Router modes.

X/Y RGB Source - This feature is only available in Dual Router mode and allows any or all of the six outputs to be switched between the A or B input. When in Dual Router mode, if the setting 'Link Inputs' is disabled via the front panel LCD, the output channels X/Y RGB may be individually changed between the A or B input. This means you can have output channel five receive its X, Red and Blue signal from input A and it's Y and Green signal from input B. A DMX value of 0-126 will force the selected Source signal to the ILDA A input, a value of 127-255 will force the selected signal to the ILDA B input.

# RDM

Remote Device Management or RDM, is a feature of DMX that allows the ALR to be remotely configured or monitored over DMX. The Router is RDM v1.2 compliant and has a number of supported functions. By using RDM you may assign the Router a specific name, adjust the DMX starting address, change personalities and more!



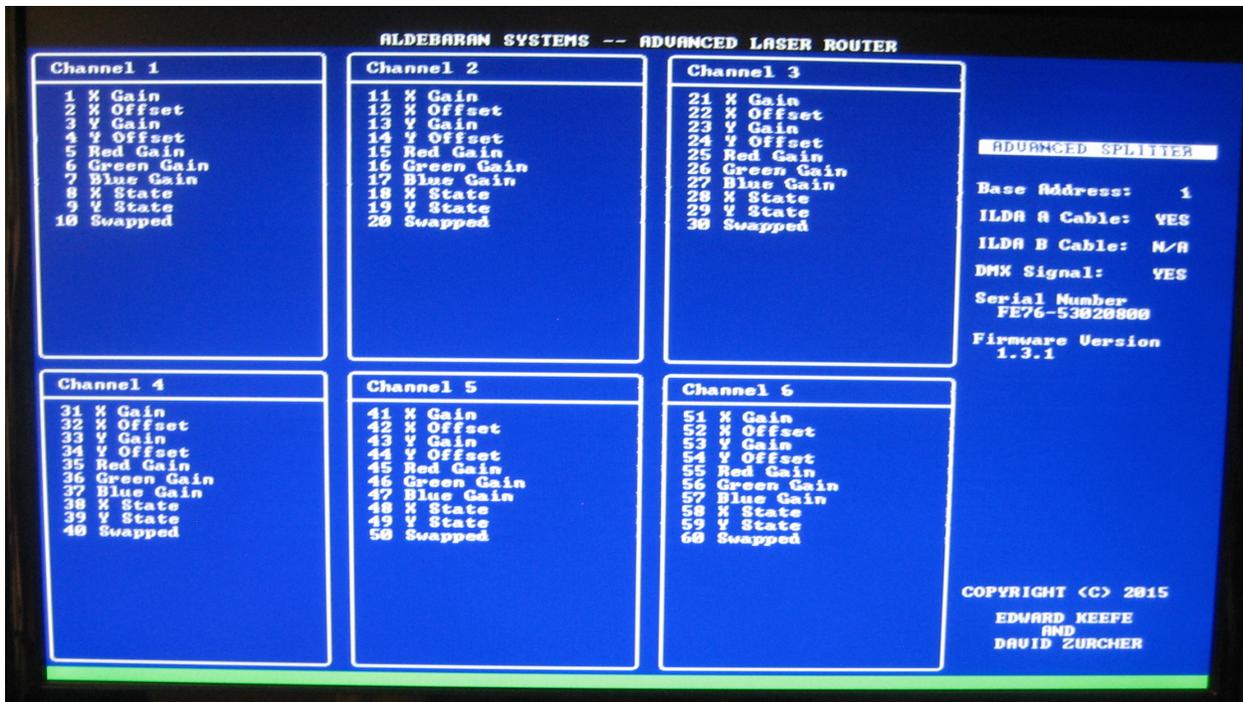
## Video

The VGA port on the Router has a number of useful functions for programming cues and effects. There is a customized display programmed for each of the four personalities to indicate the effects available for that mode.

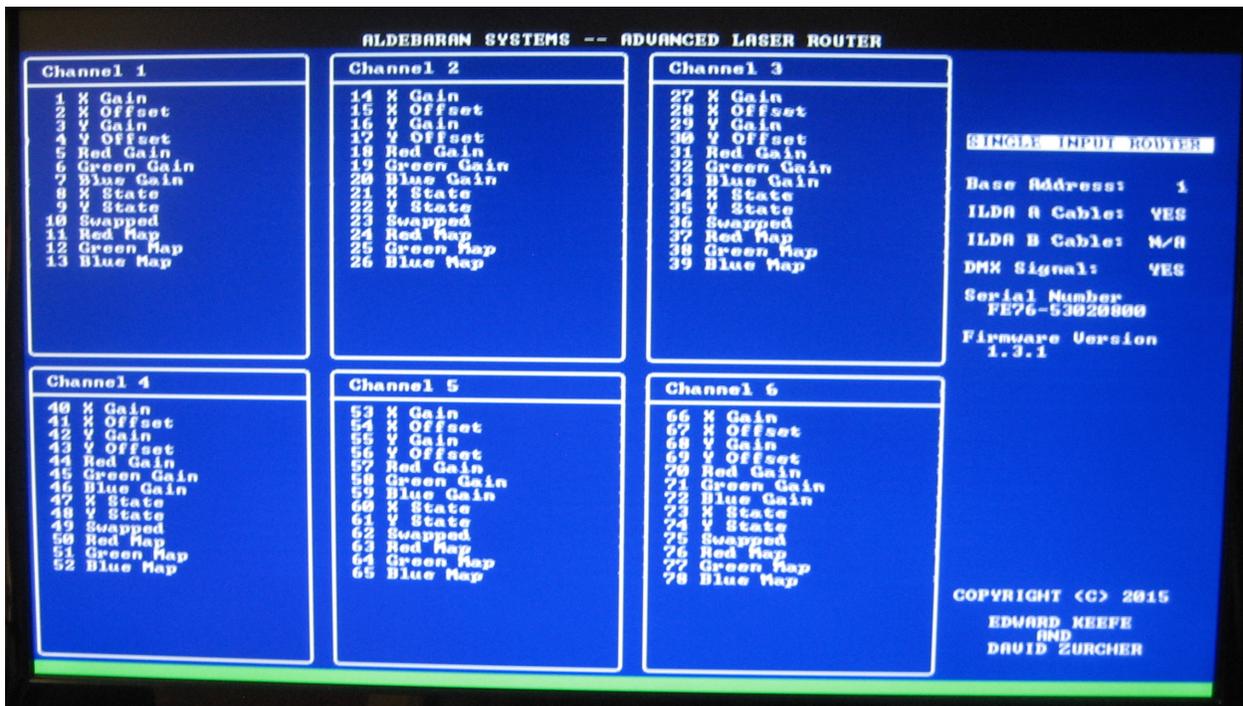
**Basic Splitter:** In this mode, the video is unique in that the invert and swap states are indicated on the display. These settings are changed via the encoder and LCD. There are no DMX addresses listed in this mode because Basic Splitter doesn't respond to DMX commands. The green bar at the bottom of the screen indicates the state of the interlock. If a DAC is connected and the interlock is satisfied then the bar will be green. If the interlock is broken or E-Stop pressed, the bar will be red.



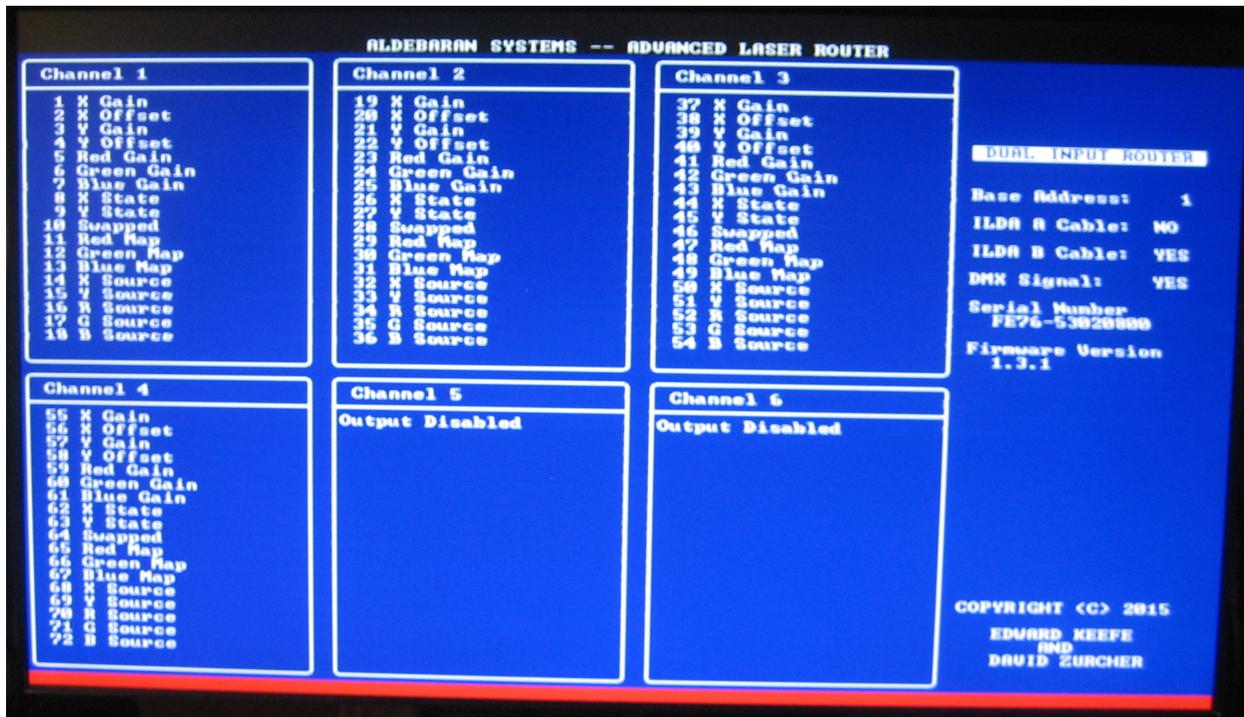
**Advanced Splitter:** In Advanced Splitter, as well as the other DMX controlled modes, the display will no longer show the invert and swap states. Instead, it shows the current DMX address for each output channel. These DMX addresses change when the base DMX address of the Router changes. The green bar at the bottom works the same way as the Basic Splitter mode. In the example below, you will also notice that Advanced Splitter mode only shows the available effects and DMX addresses. A loss of DMX signal would be indicated on both the LCD display as well as the video port.



One Input Router: The video in this mode is identical to the Advanced Splitter except for the additional effects and DMX addresses.



Dual Input Router: The video in this mode is identical to the previous modes except for the additional effects, DMX addresses and the monitoring of the ILDA B input. In the example below, output channels 5 and 6 have been disabled. This is to reduce the overall DMX footprint of the Router when in Dual Input mode. The red bar at the bottom indicates that the interlock loop to a DAC has been interrupted. The text on the right side of the screen indicates that the ILDA A Cable has been disconnected.



## Interlock and Shutter

The interlock loop and shutter are two very important aspects of the Router. Understanding their use is key. Both operate exactly the same in 3 of the 4 Router modes. In Dual Input Router mode there is a change in how these function.

Basic Splitter, Advanced Splitter and Single Input Router Mode:

- Interlock - The Router sends a signal to your DAC through pin 4 of the ILDA A input connector. If the signal is returned on pin 17 then that part of the interlock loop is satisfied. The Router will also check the E-Stop switch and if it is in the reset position then the entire interlock loop is satisfied. The Router will then close a dedicated relay for each output channel including the pass-thru connector. This relay will short pins 4 and 17 on each output connector. If the E-Stop is pressed or the DAC connected to ILDA A Input gets disconnected, all output channel relays will open.
- Shutter - In this mode the Router will buffer and pass the shutter signal to each output including the pass-thru. If the E-Stop is pressed or the DAC is disconnected the Router will disconnect the shutter signal from each output connector.

Dual Input Router:

- Interlock - In this mode the Interlock functions basically the same except that the Router will now monitor the ILDA B input as well. If either DAC is disconnected from the Router, or the E-Stop button pressed, the Router will open all output channel interlocks and leave them open until both DACs are reattached and the E-Stop reset.
- Shutter - There are two different ways that the shutter works in Dual Router Mode. In Dual Router Mode you have the option of having the sources 'Linked' together (more on this in the Dual Router Mode section). **If the sources ARE linked then the shutter signal gets routed with X/Y RGB.** For example, if output channel 4 has its X/Y RGB Source attached to the ILDA B input, then the output channel 4 will get its shutter signal from the ILDA B input. **When the sources ARE NOT linked then the shutter signal will ALWAYS come from the ILDA A input.**

## **Basic Splitter Personality**

The Basic Splitter mode acts as simple signal splitter. X/Y RGB are still buffered however, DMX has no control over the output channels. Only ILDA A input is active and is sent to all outputs including the pass-thru. So you basically have 1 IN and 7 OUTS. The six main output channels can be manipulated by the front panel X/Y gain and offset potentiometers. The six channels may also have X/Y inverted and swapped through the front panel menu options controlled by the encoder and LCD.

Despite DMX being disabled in this mode, RDM is still active. So with a DMX cable attached, through RDM the Router mode may be changed.

No monitoring is done for the ILDA B input interlock loop so a 2nd DAC is not required.

## **Advanced Splitter Personality**

Advanced Splitter mode is the first mode to support DMX manipulation of the output channels.

Each of the six outputs have the following features controllable via DMX:

- X/Y Size
- X/Y Offset
- RGB Gain
- X/Y Invert
- X/Y Swap

It is important to remember that when the Router is in a DMX controllable mode that specific DMX addresses need a base value set in order for your projector to receive a signal. When the Router boots up with no DMX signal, all addresses receive a value of 0. This places X/Y and RGB gain to zero. With X/Y offsets set to 0, the scanners, on a properly configured projector, will point to the bottom left of their image scanning area. A typical RGB projector will have no output image even though a DAC attached may be sending an image. At the very minimum, you will need to set specific DMX addresses to a certain value to bring the gains up for X/Y RGB and center the X/Y offsets.

As an example, if we wanted an image to display on a projector attached to the #3 output channel with a Router base DMX address of 1, we would need to set the following values to these DMX address:

DMX Address	DMX Value	Function
21	255	Projector 3 X-Gain
22	127	Projector 3 X-Offset
23	255	Projector 3 Y-Gain
24	127	Projector 3 Y-Offset
25	255	Projector 3 Red Gain
26	255	Projector 3 Green Gain
27	255	Projector 3 Blue Gain

When in Advanced Splitter mode X/Y Invert and Swap are no longer accessible through the front panel encoder and LCD. These functions are now controlled by DMX.

By default, this mode will have a DMX footprint of 60. If you need to reduce this DMX footprint and only have 2 projectors to attach to the Router, it's possible to disable some of the Router output channels. Via the front panel encoder and LCD, select 'Active Output' and select 2, 4 or 6. With just two active outputs, the DMX footprint is now 20. Router output channels 1 and 2 will be active while 3-6 will be disabled. The pass-thru will also remain active so you may have up to 3 projectors attached.

## **One Input Router Personality**

This mode is identical to the Advanced Splitter mode except for the additional DMX effects added. In this mode you now have RGB mapping capability. Color mapping opens up some interesting possibilities with the Router. Individual output channels may be mapped differently so that each projector will display the same image in different colors. Or, with some simple DMX programming, fast or slow color cycling can be accomplished.

Color mapping is implemented by placing a certain value at a DMX address. Assuming we have a Router with a base DMX address of 1 and want to change the green map on output channel 1, we would alter the value of DMX address 12. If the value at this address is between 0 and 35, the green map is normal. This means the green on output channel 1 is attached to green on the input. If the DMX value is set between 72 and 107, then the green on output channel 1 is attached to green on the input. This may seem redundant however, as you use this feature you will understand why it works this way!

DMX Value	Effect
000 - 035	Normal
036 - 071	Red Input
072 - 107	Green Input
108 - 143	Blue Input

Let's take a look at an example. The following image on the left is a simulated pic of an image being sent by the DAC. R is red, G is green and B is blue. All six output projectors are displaying this same image. Let's say we want to change the colors on Router output channel 2, assuming a base DMX address of 1.

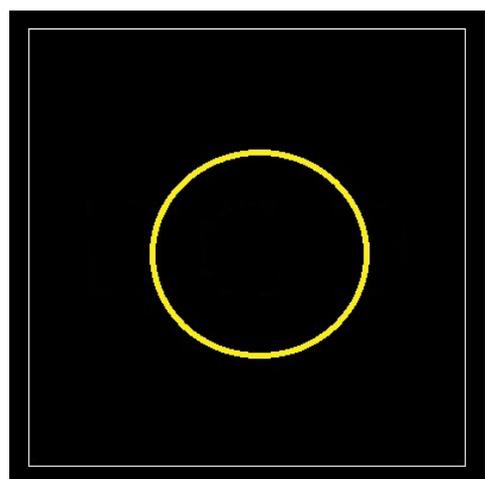
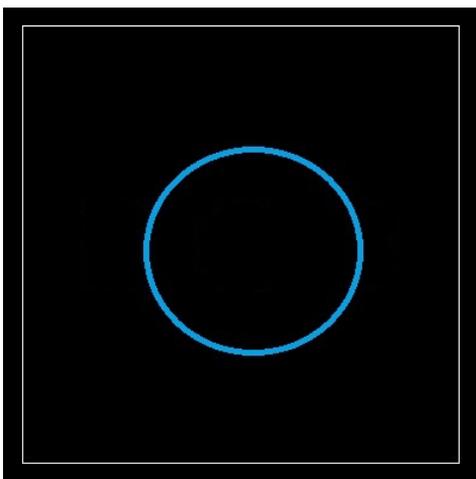
DMX Address	DMX Value	Effect
24	85	Maps the Red output to Green input
25	125	Maps Green output to Blue input
26	50	Maps Blue output to Red input

After these values have been set, the output of the projector will look similar to the following picture on the right.



In this next example, we have a blue circle as projected by the DAC and shown below on the left. In the list following are the DMX channels and values to turn the blue circle yellow on projector #5. First we route the red and blue output channels to the blue input, then reduce the gain of blue to zero.

DMX Address	DMX Value	Effect
59	0	Set Blue gain to zero
63	125	Maps Red output to Blue input
64	125	Maps Green output to Blue input



## **Dual Input Router**

This mode has all the same features as the Single Input Router mode and includes a new feature called Source as well as the enablement of the 2nd ILDA input. An important difference between Single and Dual Input Router modes is how the shutter and interlock systems behave.

**Interlock:** In Dual Input Router mode, a DAC **MUST** be attached to both the ILDA A and ILDA B input connectors. If either cable is missing or becomes detached during a show all output interlocks will open. It is not required that the 2nd DAC send any kind of signal for the projectors, it just needs to be present.

**Shutter:** The routing of the shutter signal from your DAC is slightly different when in Dual Router mode. If the input sources are 'Linked' (more on this below), then the shutter signal will follow the X/Y RGB signal. More simply, if you send the DMX command to switch channel output 3 from the ILDA A input to the ILDA B input, then projector 3 will now receive its shutter signal from the ILDA B input.

If the inputs are NOT 'Linked', all output channels will receive their shutter signal from the from the ILDA A input, no matter the configuration.

**Source:** The Source effect allows the X/Y RGB signals to be dynamically switched between the ILDA A and ILDA B inputs. When you have two DACs attached to the Router you can easily switch any or all of the outputs to either input. There are two modes to the Source effect, 'Combined' or 'Separate'. These are also referred to as linked or unlinked.

When the Sources are unlinked, you have the option of routing any or all of the X/Y RGB signals to an output channel. As an example, you can have output channel 1 receive its X/Y signal from the ILDA A input and it's RGB signal from the ILDA B input.

If the Sources are linked, you no longer have the option of sending any of the individual X/Y RGB signals to an output. Each output channel will now receive it's signal from either the ILDA A or ILDA B input.

Also, when the Sources are linked you only need to send a change in value of the X Source to change an output channel from the A or B input. Changing the values of Y, R, G and B Sources will have no effect.

Setting the Sources to be Combined or Separated is accomplished through the front panel LCD and encoder.

In Dual Router mode the Color Mapping is also slightly different. With a DMX value of 0 for the color mapping effects, a change in signal Source works normally. If you have the color map specifically set, this will override the Source selection. In other words, if I change the signal Source for channel output 1 from ILDA A input to ILDA B input and have a color map setting for the red color, then the red color will not change with the Source change. It will only change if the color map DMX value is between 0 and 35.

DMX Value	Effect
000 - 035	Normal
036 - 071	Red from Input A
071 - 107	Green from Input A
108 - 143	Blue from Input A
144 - 179	Red from Input B
180 - 215	Green from Input B
216 - 255	Blue from Input B

## Pangolin's Beyond and PangoScripting

Pangolin's Beyond has proven to be a very powerful tool for taking advantage of the features offered by the Router. Beyond's unique implementation of DMX, Midi and OSC allows certain coding to be added to greater increase flexibility. In this section, we will discuss the setup of a base configuration script, DMX cues and chases, Midi to DMX scripting and OSC control of the Router.

### Base Configuration Script:

As discussed earlier, the DMX controllable modes of the Router require certain DMX addresses to be set with certain values in order for a laser image to be displayed thru the Router. In Beyond, it's possible to setup a PangoScript that will run every time Beyond is launched. This script will configure these addresses with predefined values. For this example only the configuration of the Router output channel 1 will be displayed for the Advanced Splitter mode:

*CodeName "Autostart Router Config"*

*Autostart*

*dmxout 1, 255*

*dmxout 2, 127*

*dmxout 3, 255*

*dmxout 4, 127*

*dmxout 5, 255*

*dmxout 6, 255*

*dmxout 7, 255*

*dmxout 8, 0*

*dmxout 9, 0*

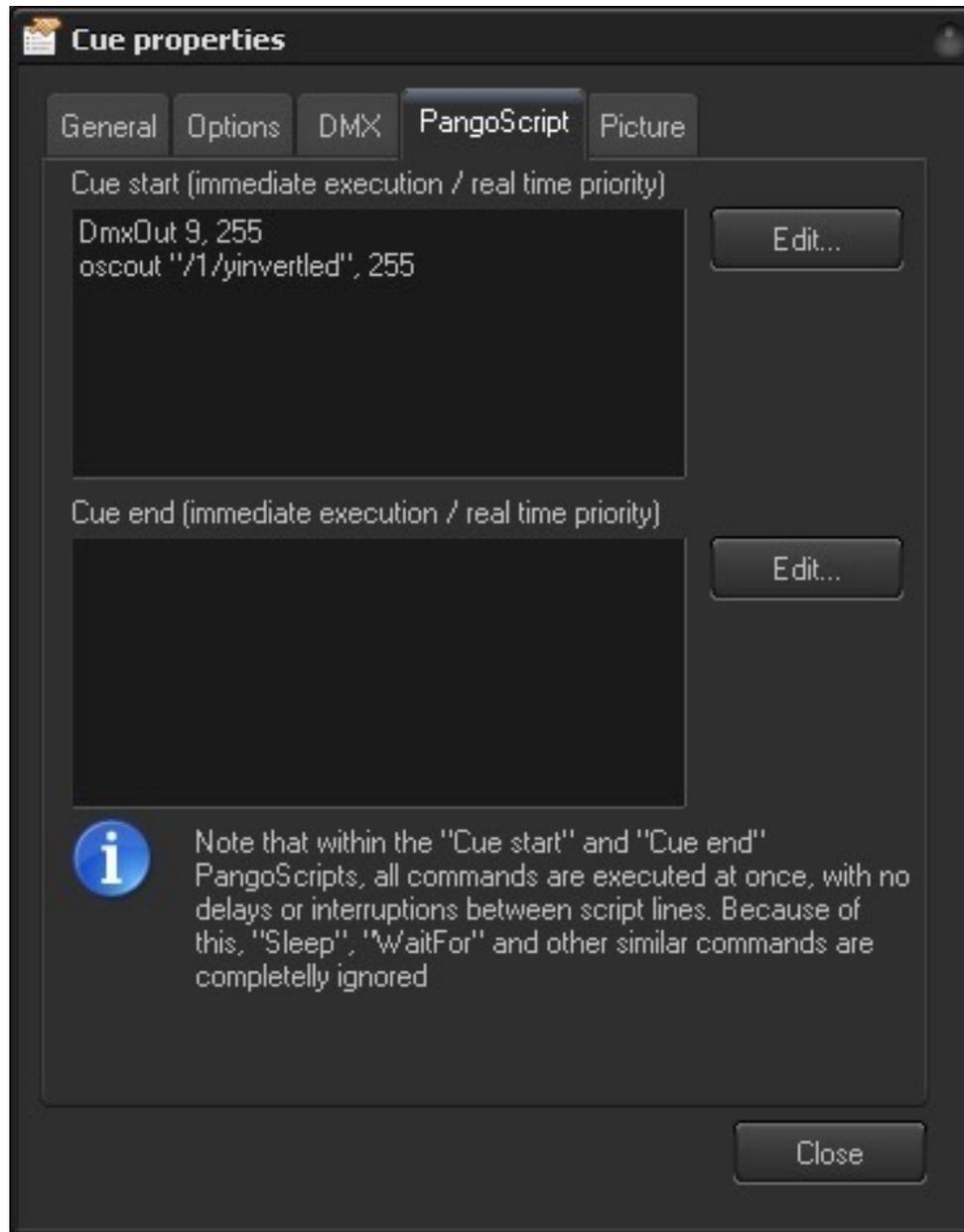
*dmxout 10, 0*

The PangoScript listed above will configure output channel 1 of the Router for max gain on X/Y RGB and center the offsets for X/Y. The `dmxout` is a command that Beyond uses for sending a value to a specified DMX address. The format for this command is: `dmxout` address, `value`.

### DMX Cues and Chases:

There are two types of DMX cues that can be created in Beyond; one that runs a single script or one that steps thru a repeating chase. A cue that runs a single script may be used to adjust an X/Y invert, swap, color change, etc. Start by right clicking on a cue and selecting 'Cue Properties', then select the PangoScript tab. In the example below you will see the `dmxout` command. This is setting a value

of 255 for address 9. This corresponds to Y invert on output channel 1. The scout command will be discussed later.



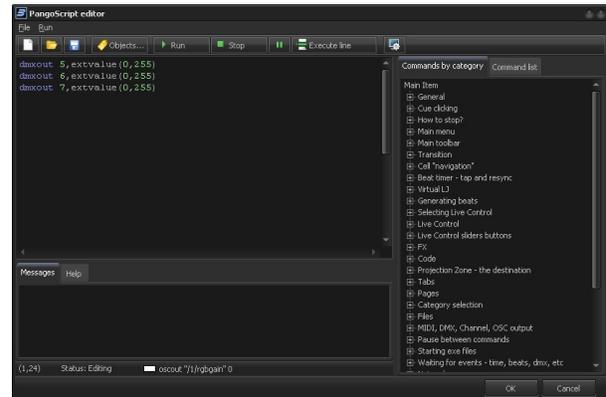
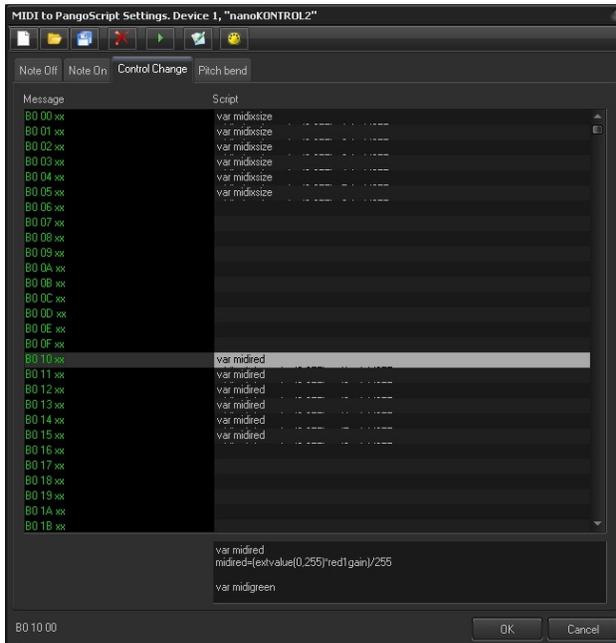
A DMX cue that starts a chase requires a few additional steps. Once a DMX cue is created, right click on the cue and select 'Edit DMX Sequence'. This will load the DMX cue into the Quick DMX tab where you may create steps and alter any or all of the values for each address at every step. You are also able to change the sequence timing method to lock to the 'Beats per Minute' or a specific length of time.



If you prefer to create a 'smooth' chase, simply click on Menu > Channel Operations and select 'Use "Smooth Change"".

### Midi to DMX Scripting:

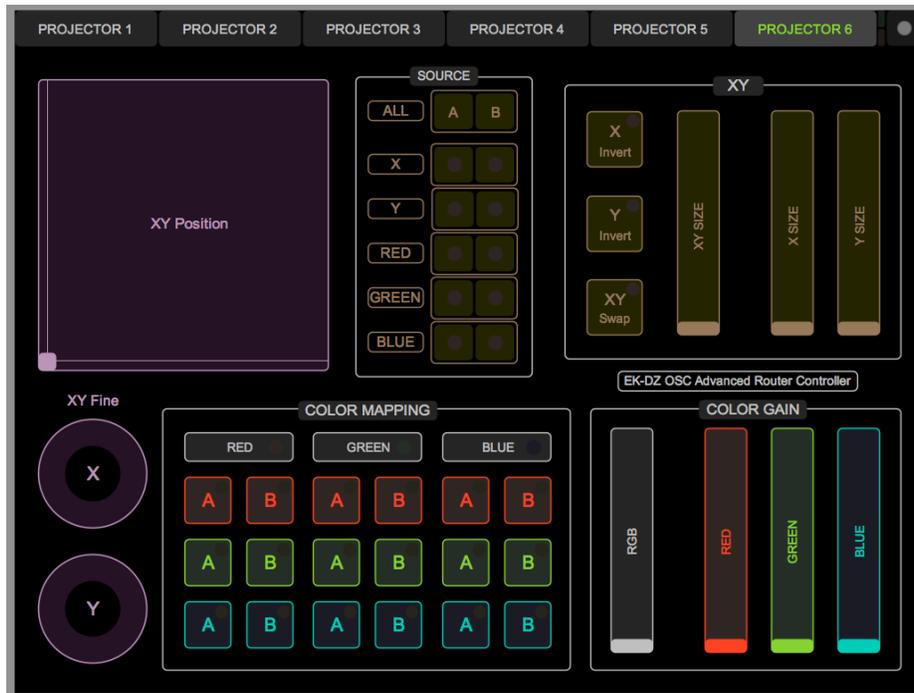
If you would like to use a Midi console or device to manipulate the Router, simply setup a Midi to PangoScript effect. With the Midi device attached, in Beyond select Settings > Midi > (your device)Settings. Next, click on the 'Configure' button for the Midi to PangoScript section. From this menu, select the Midi message you would like to create the script for and double click on the script field.



The proper syntax for scripting a dmx output channel to a midi input is `dmxout address, extvalue(0,255)`. In the example above, you will notice that I have dmx address 5, 6 and 7 tied to a single Midi message. In this case, I am using a knob on my midi controller to control RGB brightness on projector 1.

## OSC Control of the Router:

OSC stands for Open Sound Control. Basically, it's another form of communication between a device and a host. With Beyond's PangoScript, OSC offers another method of controlling the Router.



In the example above, each button, slider and LED is assigned a specific address and value range. The syntax used is “/projector/function”. So an address of /3/redgain would identify the red slider for projector 3.

When Beyond and Touch OSC are communicating, commands will be passed between the two applications. If we wanted to invert X on projector 6, pressing the invert button will only send the following command: /6/xinvert 255. In Beyond, a PangoScript assigned to the /6/xinvert function will set the X invert on projector 6 via a DMX command and return a command to Touch OSC to illuminate the LED for projector 6 X invert. The specific command used to turn on the Touch OSC LED is: oscout “/6/xinvertled”, 255. To turn the LED off use the following command: oscout “/6/xinvertled”, 0.