BEYOND Advanced Course (Self Guided)

Document very much in Progress, there will be gaps but we prefer to publish what we have, so people can use it as fast as possible, Information may be in draft form, and inaccuracies will likely exist.

Welcome to the BEYOND Advanced Course, this started as the outline for in person trainings we held around the world, and it was decided to convert that workbook into a guided learning document. That will serve as outlines for trainings, as well as the ability for users around the world to learn from.

The materials provided in this document are “In order” and follow the beginner document linked below, however, feel free to just use this as a guide to learn different topics you would like to learn about.

BEYOND Beginner Course (Self Guided)

One of the most useful aspects of this document is the number of links to external and internal sources. This Document will not re-hash any information that has been written in other manuals on the Pangolin Wiki, however any text that is in this document in each section is new content that isn't found in other internal sources. But instead, information to help provide context, and further information, that is not strictly technical. Most documentation on the wiki is designed to be “Technical Education” not “Practical Education” and this document will explore some more practical and real-world knowledge.

Introduction to Advanced Laser Technician Course (For in Person Training)

This course is designed for users who are experienced using lasers and pangolin software, and while the beginner course isn’t a pre-requisite, users should already be familiar with pangolin software and laser projectors. This course will pick up where the beginner course left off and teach more advanced topics going deep in the effects engine, cue types, and dive into designing your shows, for both live operation and pre-programmed timeline shows.

This course will also cover advanced topics that many users aren’t even familiar with. Including the internal scripting language “Pangoscript”, midi mapping for live control devices, the BEYOND Universe for creating custom layouts, Visualizing lasers, Configurations, and how to really make your setup yours. Plus, this course will begin to delve away from just “technical education” of the tools and features but “creative education” of how to use features, situations that these tools can be used, and how to improve your shows overall.

What is Covered in Major Categories

- Deep Dive into Effects Engine and cue types
- Timeline laser programming
- Pangoscript and advanced features

- Creative guidance to improve your shows overall

Recommended Course Preparation

It is recommended for students to bring their own windows computer and have BEYOND installed beforehand, learning licenses will be provided free for all students to follow along with the course but is not required for participation.

As this course is to take beginners and turn them into advanced users, its expected to understand most everything for normal operation, and most things within the “basic” quick hints video series. Taking the beginner course is also a good pre-requisite, but its recommended not to take this immediately after the first course, and instead put time into using the tools before taking the advanced course.

Frame Drawing

As an advanced user, you will want to focus on using the “advanced frame editor”. This tool in BEYOND is incredibly expansive, including many types of drawing tools from “I don’t know what I’m doing” to “I kind of know what I’m doing” and “I definitely know what I’m doing”.

The Advanced frame editor also includes lots of hidden tools that we will discuss in this chapter. Including an advanced tracing tool, effects layers, onion skinning, morphing between frames and so much more.

This chapter is specifically about the technical aspects of drawing frames.

Chapter Resources

Advanced Frame Editor in BEYOND 4.0

Drawing Laser Graphics

Now that you understand the technical aspects of drawing and the tools to achieve it, lets talk creatively about generating graphics.

We will draw using the “I know what I’m doing “ tools from the previous chapter, but if that is getting tricky, feel free to use the “I kind of know what I’m doing tools”

We will cover drawing Logos, and creatively identifying what lines to draw, and techniques surrounding color and getting the most out of your scanner.

We will ask for logos from the participants companies to draw.

Utilizing the techniques from logos, we will consider techniques for drawing things like characters and portraits of real people.

Finally we will discuss frame by frame animation vs rigging vs morphing.

Chapter Resources

https://lasershowprojector.com/pages/laser-graphics-and-abstracts?_pos=1&_sid=0f528af40&_ss=r

Tool types

Using Physics to "Cheat" (Point Pulling)

Composition

Post Processing

Laser Mapping

Armed with the skills to draw graphics well, we will expand on the possibilities beyond logos and simple characters and show how graphics can be more then just graphics.

Utilizing mapping, we will discuss color tools, animation effects and the importance of post processing laser content, so you don’t necessarily have to do all the work in the frame. As well as turn your graphics into much prettier animations using filters like soft line endings.

Chapter Resources

3D Animation Tools

This chapter will discuss the different 3D animation plugins available to use with BEYOND: Blender, Cinema4D, 3DSMax and BEYOND 3D.

We will discuss how the plugins are installed and attach to BEYOND, and the design philosophy behind the plugins designs.

Within the plugins, we will look at optimizing your render, and getting the best results when you press Render so you can get the least flickery image you can.

Chapter Resources

Other ways to generate frames

Tracing Tools

Processing Video to Frames

Live Content and Operation

In this chapter we will discuss how to use effects to create cues for live operation. Programming around BPM, color, texture and more.

We will break down the elements of a live cue, from its animation, its texture, its color and overall emotion.

We will show how cues can be made for different types of music with standard timing, as well as cues that recolor well.

Cover utilizing the stock content to pull ideas, animations, and content from for your own live cues, or to just understand how they are made.

This chapter will also cover how to understand the style of live control you can chose from, and what may suit different music or styles of each.

The topic of midi controllers will be briefly discussed, but only in context of style of control, where programming is in future chapters.

The framerate of your beam cues is very important, and we will discuss the balance of framerate to brightness and give the reasons why you may use one over the other and balancing them.

Chapter Resources

Live Cues

Chapter Resources

Offset Effects

Zone offset effects are the “holy grail” of looks, as more and more lasers are put on a stage, the more

they must start to act like and mimic lighting effects. In this chapter we discuss the many ways to achieve the looks you are after, and how they can be implemented permanently in time with the cue, added on as later effects, or added in live to add spice to your output.

Chapter Resources

Groups, ProTracks, Other ways of Selecting

Groups, and Protracks for that matter, are a more advanced way of determining how content is assigned for your live shows. And we will discuss their advantages and disadvantages to help you determine if either of these styles make sense for your mindset or live control style.

Chapter Resources

Midi Mapping

With all the styles of live control out of the way, now its finally time to discuss how you can interface with the software with hardware controllers. We will discuss available hardware on the market, the controllers supported by default, and look at programming your own Midi profiles for your live control setup.

In the same vein, we will discuss different types of setups elements of control you may find important, or hardware to use for your live control setup.

Chapter Resources

Timeline programming (Timecode, Programmed shows)

Chapter Resources

Timeline Technical

In this chapter we will discuss the functions of the BEYOND Timeline and how to structure a show. This includes the tools provided for building timelines, the different medias included, the effects tree, cue list and effect list. As well as utilizing timelines for Timecode, live cues, and for show export for remote playback or rendering of frames.

Also discussed will be topic of beat markers, programming techniques, keyboard shortcuts, and navigation. How to utilize events for storyboarding, how to use video for references.

We will look at rigging characters, building scenes and layering content for masks and overlays.

We will consider how to utilize things like DMX, pangoscript, object animators, and more within your timeline to create a true multimedia timeline, or use it for show control purposes. Like utilizing the beyond timeline as a “reaper” kind of software.

Chapter Resources

Timeline Creative

Now that you understand the technical side of creating a timeline we will go into creative design elements for creating an amazing timeline shows.

- Intersection point
- Track setup for organization
- Animation, Frames, Textures, Color separately
- Dance Choreography for light
- Breaking up sections and loops
- Output count and grouping
- Stupid rules like don’t clip
- Musical counts to laser counts

Chapter Resources

Using Timecode

Using Timelines in Playlist

Using Timelines in Grid

Visualization

Many people are turning to visualization software for designing and preparing their shows we will discuss the workflow data transfer, and the option to use geometric correction or preview for zones in your setup.

How to render shows with Depence

Kinetic Lights Plugin

The Kinetic Lights plugin is an extra tool created for use with motorized winches, this allows you to “mimic” their position and target their position with content. This tool is within the “Quick Targets Beam Settings” and adds control options. While this tool was primarily designed to be used with kinetic light balls, this tool can mimic many types of motion that can be controlled via dmx, and there are many opportunities to use this technology.

- Move content on moving set pieces
- Kinetic lights
- Movable mirrors and positions
- Targeting moving fixtures
- Moving termination points like truss.

Pangoscripts, Channels, Objects and More!

Chapter Resources

Channels

Channels are a way of storing and referencing data for hundreds of applications. These can be manually operated, or data can be driven to them through endless applications like DMX input, OSC input, Object animation, Scripting them, and so much more. These channels datasets can then be referenced by effects, parameters and allow you to link basically anything to anything else.

This expands further with Color channels, basically the same thing as channels but instead of raw data we store color data including RGB values, Hue, alpha and more. These can be extremely useful when linking color parameters to external color controls and inputs.

Objects

Before we can discuss pangoscript, we must discuss the existence of the object tree, and how everything that exists in BEYOND has an object name and can be referenced within code. We will also look at discovering the names of things and values outside of object tree using the laser preview window’s show internal command option.

Objects and their values are incredibly important to understand before considering pangoscript as it opens up the software to you in a way that only experts understand, and can allow you to really dive into the magic of full control of a piece of software.

PangoScript

Pangoscript is an internal scripting language for BEYOND, it allows for some amazing things, where you can tie things together, set up scripts, build macros, and so much more. Some common complaints that

may be given to BEYOND can often be solved via pangoscript. Some examples are below

- Autosave Timeline
- Daily schedule
- Midi sends for color
- Converting data
- Setting things in motion on commands
- DMX to pangoscript
- Midi to Pangoscript
- Commanding external software like restarting the pc

There is an unimaginable number of things that could be accomplished with Pangoscript and often it's a solution looking for a problem, Knowing the rough overview of how Pangoscript works, allows you to create solutions to your own unique challenges and desires within your system.

PangoScipt for Midi

Filming Lasers

Of course, once you complete your masterpiece you will want to record and share with the world! Filming lasers often can be a mystery to those who are unfamiliar with both how lasers work and how cameras work, so lets go over how to get the best shot

- Rolling Shutter vs Global Shutter
- Camera Settings
- Framing your show
- Syncing framerate and TV mode

Chapter Resources

Cameras and Settings

Framerate and TV Mode

Laser Banding

Now that you know how to film lasers correctly, lets learn how to do it wrong, but in a cool way. Laser banding is the act of creating these "light bending" or "choppy" looking laser output in a camera. It's important to note this is a camera trick and not something that can be done in real life. The trick uses the rolling shutter aspect of a camera, to capture only small portions of a scanned imagine.

This is achieved by precisely timing the scanrate of the laser and framerate of drawings to achieve the look. Utilizing scanrate effects, point distribution, and locking framerate with TV mode.

System Optimizations and System Installs

The amount of data processed by BEYOND for laser shows is often seen as similar to lighting, which has a pretty low processing and data transmission requirement, however BEYOND is much closer to the processing and transmission requirements of video. As we are sending data frames of images, to possibly hundreds of lasers, and all of those need to be processed in time and synced up. There are a few things you can do to ensure the reliability of your show and get the best possible output.

- Windows changes
- Network adapter changes
- Uninstalling unneeded apps
- Performance tuning
- Disabling updates for good

Chapter Resources

Monitoring Tools

Computer Optimizations

System Install Considerations

Permanent installs are an important fixture in show production, and we will tie many of the functions we have already discussed into some theoretical installs and how to achieve the best results.

Further Reading, Where To Go From Here?

Thank you for taking the advanced technician course. You are now equipped with a lot of knowledge to take with you on your laser journey. Some recommendations:

Take 1 day off, then dive straight into playing and practicing, if you wait to long between this course and practicing what you have learned, you will loose a lot of what you learned.

This course gives some technical and creative guidance, but just like an art class teaches you the tools and how to use them, its now time to develop your style, live laser shows, programmed laser shows and how you do your installs and setups will be different from everyone else and that’s perfect! If you are struggling to come up with your style, its okay to look to other designs and programs to learn how to develop a style first, then to move on and create your own.

There is many ways to do the same thing in beyond, you will learn for yourself what the shortest path to success is for you, it will be different than others and that's okay!

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