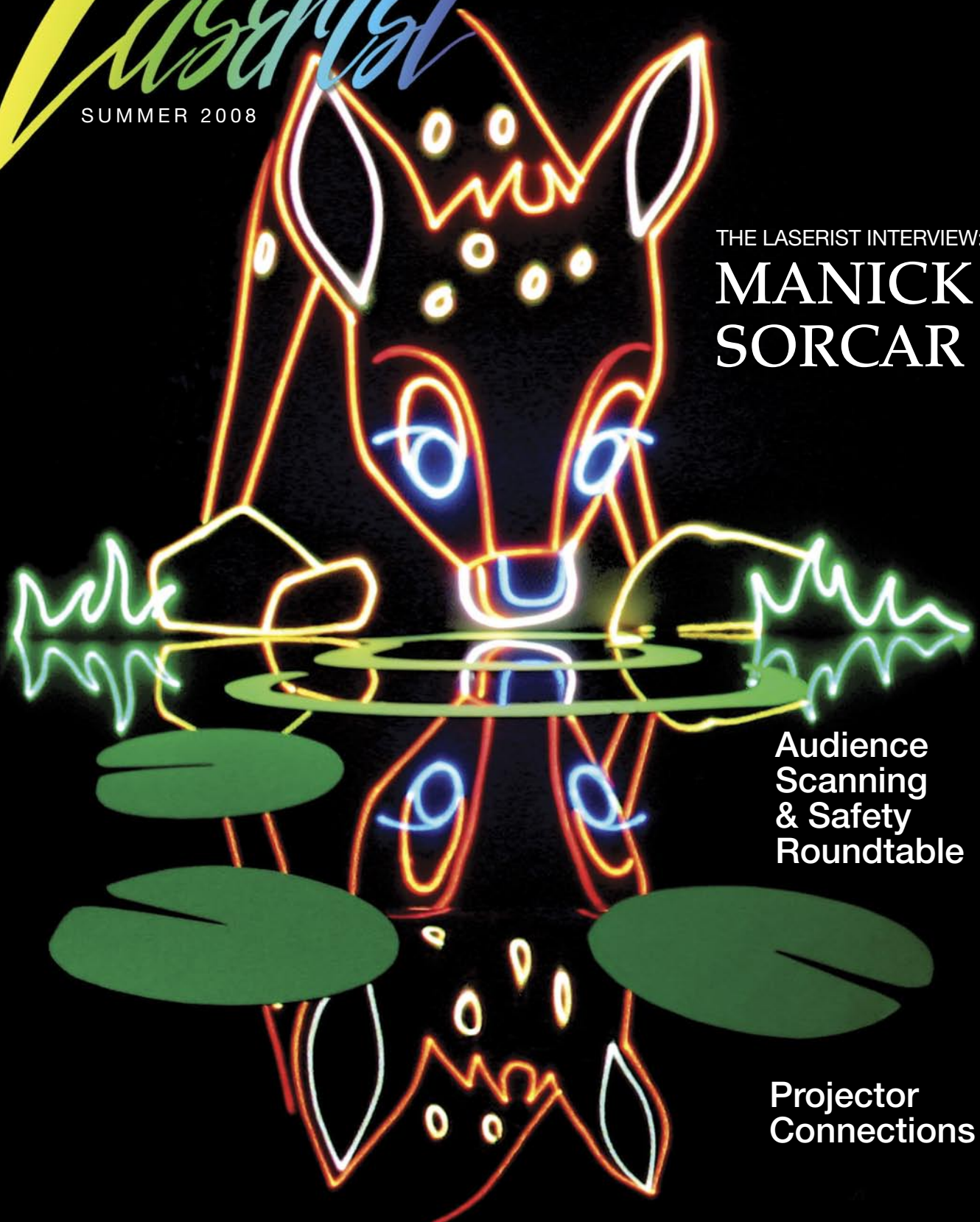


the Laserist

SUMMER 2008



THE LASERIST INTERVIEW:
**MANICK
SORCAR**

**Audience
Scanning
& Safety
Roundtable**

**Projector
Connections**

NEW PRODUCT LAUNCH

IRIS ColorSafe

The IRIS *ColorSafe* is a revolutionary new product that will change the way RGB lasers display color and permit audience scanning like no other system on the market.

The system comprises of two modules on the same board

IRIS Color

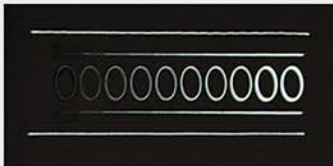
The first module (IRIS Color) is an APC (Automatic Power Control) stage for the red, green and blue laser sources of your RGB laser. Using an RGB sensor to monitor the output from the laser sources, it employs advanced servo techniques to correct in real-time for non-linearity, offset and instability. For the first time in solid state laser history, what you see on your monitor is what you get from your laser.

The unretouched pictures below clearly demonstrate the difference.



In the picture on the left you can see the color distortion as we fade from white to black. Also, a closer look on the right side of the top and bottom lines reveals green and blue laser settling instabilities.

The same laser as before but with the IRIS Color enabled. You can see the smooth color fade from white to black and the settling stability.

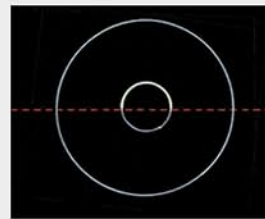


The system is tested to work with all kinds of lasers, be it a direct diode, DPSS green, DPSS blue, noisy or not. The servo system is pretuned, requiring only some simple user settings. Plus, there is a delay stage for each color, so it is also possible to match the different bandwidths of the RGB laser sources.



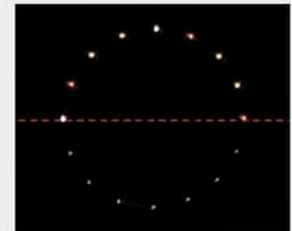
IRIS Safe

The second module (IRIS Safe) is the most advanced audience scanning safety system. Instead of just switching off the laser at a certain scanner speed, which 99% of the times is already way above MPE values, the IRIS Safe regulates the laser output according to laser beam velocity (XY vector) in realtime. This way the exposure to the audience is kept always within safe limits, and your show runs smoothly without interruptions. The real pictures below demonstrate the effect of the IRIS Safe



In this picture, two circles of equal points are projected. The outer circle at 20 degrees shows no attenuation inside the safety zone, while the inner circle, at 5 degrees, has its bottom half attenuated, matching the brightness of the outer circle. (Safety zone placement is indicated by the red dotted line)

In this second photo, the beams that are inside the safety zone are heavily attenuated demonstrating the ability of the system to deal with any effect, whether it is a zooming tunnel or fast beam effects. The processing speed is high enough to regulate laser power point-by-point, in realtime.

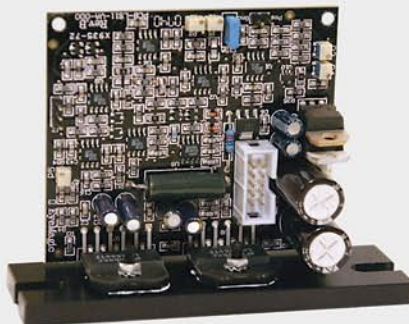


IRIS ColorSafe. The added value to your laser system

NEW PRODUCT LAUNCH

EMA - 1900

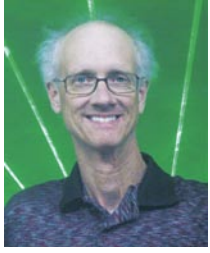
The new EMA-1900 full bridge servo driver is designed to drive the EMS-4000 scanners with maximum speed and accuracy. Using highest quality components and complex servo design, it offers a 35% speed increase in both small and large angles. Optimized for our best-seller 5mm aperture (6.8x12mm mirror) scanner, it offers higher scanning speeds than most 3.5mm aperture scanners on the market.



- Maximum speed at both small and large steps
- Zero resonance at any frequency
- Requires only 2 Amps per scanner
- Easy tuning
- Drives 5mm aperture (6,8X12mm mirror) scanner

From The President's Desk

Welcome ILDA members and friends to this new edition of the Laserist magazine! It is your best way to have laser display related reading material around your place of business! We are pleased to welcome noted entertainment technology journalist Bruce Jordahl as editor of the magazine this year. My hope is that the Laserist magazine will be a beacon for those seeking to learn about the market place for laser display.



A long time ago, when ILDA began, we had a dream of full color lasers that could be plugged into a wall, any wall, and run with no water connections! I am pleased to say that the time has arrived. New laser display related products and shows are being introduced to the market at an amazing rate, and new applications of laser display are appearing as a result of more mobile and effortless products.

While we are breaking the old barriers in laser hardware, some boundaries remain the same - those dealing with laser safety. While they are easier to work with, the new lasers must be operated with caution and a working knowledge of safe operation. ILDA has always taken a leading role in promoting safe applications of laser display, and will continue to in the future. See the Round Table in the pages of this magazine for a discussion of current safety issues.

ILDA is setting new boundaries with our 2008 Conference Cruise out of Miami - could this be the first laser show gathering on a ship? Many thanks to Laser Production Network for proposing this idea, and taking on the job of hosting our event this year.

Enjoy the Laserist magazine, support our advertisers, and I hope to meet you all at a great laser show soon!

ILDA President



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Orlando, Florida USA
 (+1) 407-797-7654
www.laserist.org

EDITOR

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FATHER AND SON TEAM DANIEL O'LEARY AND ETHAN O'LEARY, OF THE ORIGINAL LOGIC SYSTEMS, HAVE PURCHASED THE COMPANY AND ARE RESTRUCTURING IT IN ORDER TO BRING ALL CUSTOMERS, NEW AND RETURNING ALIKE, A HIGHER STANDARD OF SERVICE AND QUALITY.

SO KEEP A KEEN EYE OUT FOR UPDATES AND ALLOW US TO PROVE THAT YEAH, WE ARE THAT GOOD!

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Annual lasershow revenues over USD \$1,000,000

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spectrabeam.de

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Spectronika Ltd.

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Multimedia show in the Pyramids
for Ode To Alexander The Great



Large scale projection, Rhodes Island



From Cairo to Rhodes, from Berlin to Dubai...

LaserDesign has successfully realized numerous multimedia shows, combining the latest in laser and video technology. The perfect orchestration of 3D and hand-drawn laser graphics, video and music along with spectacular beam effects, makes every show a unique experience and a memory for the senses. To find out more, visit our web site at : www.laserdesign.gr



Ministry of Tourism,
Berlin, Germany



35 Years UAE, Emirates Palace, Abu Dhabi



The Rise of the Phoenix

If you attended the 2007 ILDA Conference in China, at the Lase-Off you saw a stage covered with three big lasers, three moving head laser fixtures, and six moving head lights. One software system took on the job of taking control of all these fixtures simultaneously and presenting them in a show – the Phoenix Show Controller. Within 30 minutes of connecting to the system, company president Boris Bollinger had adapted their pre-programmed beam show “Pirates” to include every fixture on stage.

The Phoenix Show Controller 2.0 package, with even more features, is now available. The central concept of Phoenix is that a short period of familiarization with the software enables the user to learn the

principles of its timeline organization, and then to quickly create complex multimedia shows integrating lighting, lasers, pyro, and video.

One unique feature is the 3D visualisation of a laser show. It is possible to build a 3D model of a proposed venue, including truss, people, furniture, buildings, etc., and place the laser projectors into the model exactly as they are intended to be – and then view any programmed lighting, laser, and video shows in 3D, while changing the viewpoint of the show from every possible angle. There is nothing like flying through a virtual laser show!

Standard features included with Phoenix are a show player system

for standalone workstations, a 3D drawing editor, a BMP file converter, and 3D max to ILDA file conversion. The system is designed to be interactive at every step, with the user getting instant feedback from watching their programming come to life. More than sixty professionally programmed laser shows are included with the Phoenix package.

The newest member of the Phoenix package is called Phoenix-Live. It is designed for the user specializing in live performance situations, such as clubs and discos, and is fast and simple to use. The software enables the user to create different layers of pre-programmed professional beam effects, Run-Text, and 3D graphics, while interacting with the program in real time.

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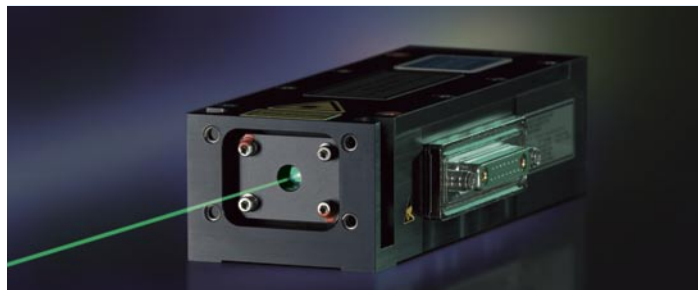
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Gas or Semiconductor Laser?

by Bernd Steinert, spectrabeam.de

With single-color laser projectors, the decision is clear: a green DPSS (diode-pumped solid state) system will give the most visible and reliable light, for the least amount of money. But buyers of a new RGB (“white-light”) projector have a question: “Gas or RGB semiconductor laser?” Existing gas lasers will last for a long time, and are fine if the operating cost is acceptable. As technical progress is made on diode lasers, the decision will be soon be easier.

For use outdoors, the choice depends on factors such as the laser output power, laser cost, and beam quality. For use indoors, both systems – gas and semiconductor – are available in a wide selection.

The smaller operating cost of semiconductor lasers allows more money to be put into investing in a higher quality system from the start. There are disadvantages and advantages depending on the manufacturer. The technical development of blue DPSS and particularly diodes continues to progress. These are used along with green DPSS and red diodes or DPSS to produce white and any mixture of the three colors.

Today some blue DPSS lasers’ representation are grainy and some users told me about early power losses to total failures. Different beam diameters and divergence (beam spreading factor) for the red, green and blue semiconductor lasers often produces a “white” spot that has a color halo with mixed color spots.

For larger powers, more than three lasers are used. These additional lasers must be aligned and mixed properly

to produce a single beam. Poor construction affects the long-term quality of the laser beam and color convergence, due to mechanical and thermal instability.

In order to keep maintenance costs low, you may prefer solid mechanical constructed projectors with reliable heat dissipation and high quality precision-adjustable mirror and dichroic filter mounts.

Heat dissipation is very important. Forced-air cooled projectors with shared housing for electronic devices and optical components that use fans are unsuitable. Even with filters, dust can get into the projector and settle on the optical components, and dirty filters obstruct the heat dissipation.

Some solid-state lasers of very high power do not produce a continuous beam, but instead a pulsed beam. This can produce a dotted line when scanned. Low- and middle (kHz) frequencies lasers are very dangerous to eyes because of the short, high-

power pulses. Never use such a laser for direct audience scanning! The harmless of high frequency (MHz) pulsed lasers for audience scanning has not been finally discussed or proven.

Anyone who believes buying a cheap laser product to save money, whether it uses gas tubes or diodes as the laser source, is off the track. This is a hard way to learn: disappointment, scrapping, and a new purchase will ultimately be necessary.

Whichever laser is chosen, the interface between the laser-controlling computer and the laser projector should conform to the ILDA specifications. These are producer-independent specifications for the connector (DB-25 - it looks like a “parallel port”) and for the electrical signals. Some companies use DB-25 connectors and even state “ILDA compatible” but their signals are incorrect, so you need to be sure your laser computer really can control your laser projector.

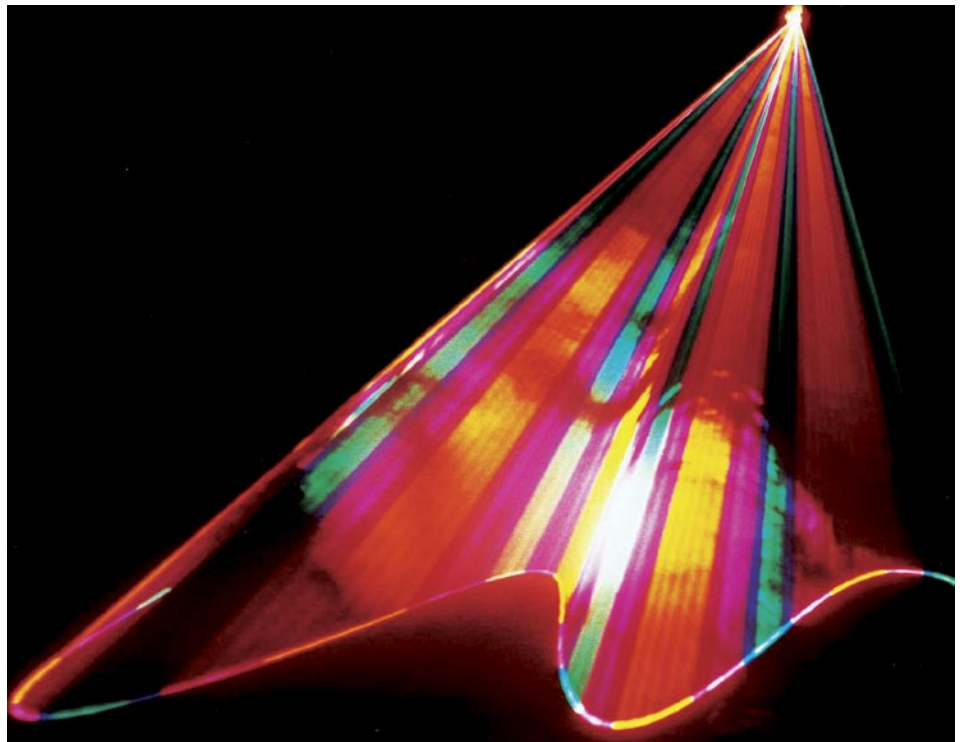


Photo Courtesy Bernd Steinert

Bring On The Night With Laserstars

Laserist Editor Bruce Jordahl's favorite cat Ladybird goes nuts over her vintage 1990's laser pointer, no catnip required. But Birdie couldn't handle NewAje's newest Laserpen, an intoxicating hand tool no true laserist should resist purchasing. Outputting multiple arrays of green patterns that morph and multiply with each turn of the wrist, this Laserpen is hard to put down, and could sure blow a little cat's mind with its sparkling stars. Best of all, the device is small enough to fit in a pocket, yet powerful enough to provide a true effect, not just a single tiny beam.

But even though one can find



many interesting products at newaje.com, the company's true home run is a product named Laserstars. First introduced a few years ago, Laserstars is back and is hipper than ever. With a low MSRP, Laserstars gives you big bang for the buck; an animated night sky effect that is perfect for home use or for more creative applications.

Most impressive are the dual effects the machine produces. The green LaserStar Projector produces thousands of unique green stars moving at various speeds and intensities. Given the unit's price, the sheer amount of coverage is unbelievable. And the morphing ultra-violet nebula cloud effect creates an intoxicated centerpiece to the 'room full of stars' laser effect. A control on the unit lets the user dial the nebula from full to off. The Laser Stars projector ships with an AC power adapter, and will fill any dark space with a super sharp spectacle of animated stars and cloud formations - as well as the occasional shooting star.

An optional extended warranty option now offered by NewAje extends the functionality of LaserStars beyond the warranty period. While laser snobs may turn up their noses at such an inexpensive effect, don't let the price fool you. Ladybird gives it two paws up!

The Laserstar Projector from NewAje

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Devil's Angel, from **Laser Entertainment SRL** of Milan, Italy. The artwork, drawn by Lorenzo Pompei, won second place for Laser Photography.

ILDA AWARD WINNERS



Touched By The Light, by **Lightwave International** of Bridgeville, Pennsylvania. This submission received third place in the Laser Photography category.



A scene from the *Moaptea Alba* show from **LOBO** of Aalen, Germany. The show won first place in the Beams and Screen Show category.

The ILDA Awards are the most prestigious honor in the laser display industry. The most recent entries were submitted in late 2007. ILDA received 100 artistic entries from 21 different companies. The Awards were judged in 2008. The winning Awards will be presented at a gala performance during ILDA's 2008 Conference, September 8-13 on the cruise ship Carnival *Imagination*.

The cover of this magazine showcases the first place winner for Laser Photography, *Reflection* by Manick Sorcar of Laserlight Magic in Arvada, Colorado. A scene from the stage production *Shakuntala*, this is a single image created with one click of the camera. The laser graphic, projected on a wall, is reflected in a sheet of Plexiglas® laid on the floor. Paper cutouts were used for the ripples and three leaves; these glowed under black light. The judges were impressed both with the artistry of the image, and with the clever way it was done live without any computer graphics.



Super Bowl 2007, by **Laser Production Network (LaserNet)** of Miami, Florida. This shows part of a display that used four 20W argon lasers and two 25W YAG lasers, to do beam effects throughout the city of Miami.



Flashed Motions, from **BB Laserkomponenten** of Schwaebisch Gmuend, Germany. This was an entry for the Laser Photography category.

*Background Image: The background image to this page shows colorful beams photographed by **Image Engineering, Inc.**, of Baltimore, Maryland. This was an entry for the Laser Photography category.*

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The Laserist Interview: Manick Sorcar

Manick Sorcar may be seen as an enigma, but it's much simpler just to call him 'Jekyll and Hyde'. The mediums he utilizes to produce art span far beyond lasers. Yet by day, he is a mild-mannered electrical engineer. The Laserist was fortunate enough to get Manick to speak with us about his formative years in the business, his dual careers, and the passion he brings to each moment on the planet.

The Laserist: Tell us about working with your father and your first creative experiences.

Manick: My father, P.C. Sorcar, was a renowned magician of India, who toured the world from the 1950's through the 1970's with his magic acts. His program was two and a half hours long, consisting of thirty-five assistants and over a dozen illusions – each based on a separate theme with elaborate stage settings, colorful costumes, and beautiful lighting. He noticed my artistic ability in painting, as well as my interest in lighting design when I was in my early teens. At first, he allowed me to paint some of his backdrops. I went ahead and worked on the stage lighting as well. I don't know what I did, but he was very impressed, and thereafter, as I grew older, he gave me more and more responsibilities.

The Laserist: As a young man, how did you balance the early "Jekyll & Hyde" between classes in electrical engineering and creative things you were doing and taking in - visual experiences and influences. Did you have a master plan or vision for where your career was heading?

Manick: Lighting for magic shows, particularly for stage illusions, can be very tricky. Apart from the theatrical lighting, it also has a very important role in playing with the psychology of the audience in making the trick possible. This meant unique lighting with creative ideas, which excited me very much. It was a true mix of science with art. Soon, I found out I was in love more with the 'magic of lighting' than the actual magic trick itself, which eventually led me to become an electrical engineer.

It was not quite like Jekyll & Hyde yet, but as a student, I did have the opportunity to apply anything that I learned in my engineering classes to my father's shows. My love in mixing art with science through lighting eventually made me what I am today. At my engineering office, lighting design is a key element, and my designs have spread internationally.

The Laserist: How did Butterweck & Co. become Sorcar Engineering?

Manick: It is a story that has spanned over 28 years. After graduating with an MSEE in 1972, I found my first job with Howard W. Butterweck and Company, a reputable



Manick Sorcar at his animation studio in Arvada, Colorado.

electrical consulting engineering firm in Denver, Colorado. They had advertised for an electrical engineer with artistic lighting experience – it was too good to be true. After one call to Mr. Butterweck and an interview later, I landed the job.

I was very fortunate to have an employer like Mr. Butterweck, who appreciated my ideas and hard work. One of the things he appreciated most was the shortcut technique I had developed through which a lighting design and its cost estimate could be determined in a fraction of the time. Don't forget this was in early 1970's, when there were no desktop computers. My technique used a bunch of graphs to cut short the process. This was very useful to the company, particularly for projects where we were to provide a quick design and realistic construction cost to the owner to make a decision.

Because the method saved time and money, a pleased Mr. Butterweck offered me part ownership, and the company was re-incorporated to Butterweck-Sorcar Engineering, Inc. in 1974. The technique I developed eventually led

to my first book, *Rapid Lighting Design & Cost Estimating*, published by the renowned McGraw-Hill, and soon to be followed by more books. Some were even used as university textbooks. Meanwhile, my lighting designs spread into many parts of the world including sport centers in Japan, palaces for Saudi princes, and the Denver International Airport, Colorado Convention Center, etc. Our partnership lasted until Mr. Butterweck's demise in 2000, when I purchased his share, and changed the name to Sorcar Engineering, Inc.

The Laserist: 'Deepa & Rupa: A



TOP: Manick Sorcar at his laser laboratory in Arvada, Colorado. ABOVE: Rupa talks to her friend, an animated cow, in a scene from Manick Sorcar's 'Deepa & Rupa: A Fairy Tale from India', which won a host of prestigious awards including the *Gold Plaque* at the 26th Chicago International Film Festival. This was recorded as India's first animation mixed with live action, which was nationally telecast in India and at several PBS stations in the USA. Rupa was portrayed by Manick's daughter Piya, who won the nomination for a *Heartland Regional Emmy Award* for acting.

Fairy Tale From India' - your first animation project - took three years in the basement. What sparked it? Tell us about that experience, and give us a timeline for your creative development.

Manick: The artistic side of me and the computer revolution of the late 1980's tempted me to experiment with one-man animation films. I made two shorts for American CableVision; they were hits and a great source of inspiration. 'Deepa & Rupa' was my first major production, which combined live-performances with animation. It took me three long

years to complete as I could only work on it at nights, weekends, and any other time I could spare from my engineering profession. But the hard work paid off. After it was premiered at the PBS channel of Colorado, the media, newspapers and magazines all gave it rave reviews. It went on to win a host of prestigious awards

at various international film festivals, including the *Gold Plaque* at the Chicago International Film Festival. I was invited to schools to make presentations on my animations. This was in 1990, and there has been no looking back since then. I made a series of other animations from 1990 to 2003, all based on fables from India. They were entertain-

ing and educational, swept a host of awards and became a staple to schools and television stations. On Colorado PBS channels, they have been telecast for last sixteen consecutive years.

The Laserist: When did you get interested in lasers, and how does the balance between lasers, animation, performance art and stage direction all take shape? Tell us about the projects that helped you evolve this concept.

Manick: At my electrical engineering firm, we deal with lasers for many purposes - but they were mostly for laboratories and industries. But being an animator and having thorough experience with stage shows, it was only a matter of time before I would implement lasers into my projects under the banner Laser-Light Magic, a branch of Sorcar Engineering. Finding art through lasers on stage had endless possibilities, and that was the biggest thrill to me. I found ways to tame the dangerous beam of light into a mild paintbrush, which I started using along with my live-action productions in unison. The results were astonishing, bringing recognition and it just took off. 'Dancing with My Soul' involves a live performer who dances with her 'laser soul', and it was well-received throughout the world; it was a finalist for the 2005 ILDA Artistic Award. My following productions, 'Enlightenment of Buddha', and 'Reflection' received the ILDA Artistic Award - which has been a great source of inspiration to me to do more creative things.

When doing a laser show without any live performance involved, I do not believe in confining it to just some beam shows married with popular

*Around the world,
the most laser shows
and the best laser shows
are created with Pangolin's*

Lasershow Designer 2000

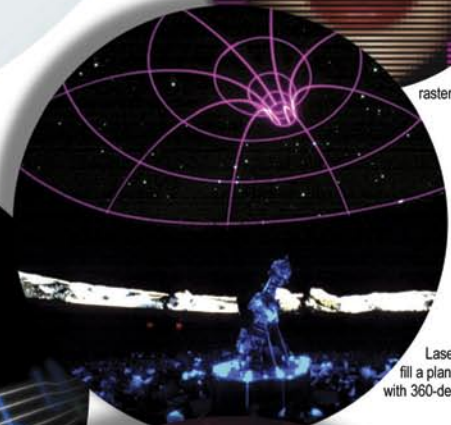
Passion Drink logo
projected from
inside a 16-meter
Stratosphere
dome



TV-like
photorealistic
raster laser images



Lasers completely
fill a planetarium dome
with 360-degree graphics



Project
hand-drawn
and computer
animations



Multi-colored
beams provide a
dramatic backdrop
for music performances



Laser light
reaches out
and touches an
eager audience in Europe

Flight through a cityscape created in
3ds Max then automatically converted to laser



The world's most versatile laser show software centered around Lasershow Designer 2000

Easily create and playback laser shows

Create laser shows at the office or on the road

Pangolin's LD2000 system is packed with all of the features you need to create sophisticated laser shows. In fact, it is so powerful that your entire show production can be done on a notebook computer plus external box that all fits into an airline carry-on bag. Here's a typical "on the road" scenario:

- Snap your client's picture with a webcam or digital camera, and turn it into a TV-like laser-projected photograph.
- Select additional artwork from over 300,000 clip art frames and animations.
- Type in text using any TrueType font — even Arabic and Chinese fonts.
- Load an audio CD or MP3 song, then drag-and-drop your frames onto Showtime's timeline, to match the music. A visual waveform makes it easy to sync the laser with musical beats.
- Set cues for other media and devices. LD2000 is a multimedia controller, integrating lasers, video, audio and even DMX cues for running lights, fog machines, water fountains, etc.

- Preview the laser show for your client, without needing a laser projector. See the show on your computer screen, complete with realistic beams and graphics.

Desktop computers use Pangolin's QM2000 internal controller board; notebooks and standalone projectors use an external QM2000.NET box (pictured at left). In fact, you can run up to 30 projectors, each with its own QM2000.NET system, from a single computer. For example, one

Pangolin customer used 23 projectors and QM2000.NET boxes, to control stunning laser effects for an "in-the-round" performance at the 2006 MTV Europe Music Awards.

Whether you're in the office or on the road, and whether you're controlling a single projector or a whole network, Pangolin makes it easy to create and playback laser shows.



Every LD2000 system includes Lasershow Designer 2000 and Showtime. These two programs let you create more award-winning laser shows. You can also add other Pangolin software to your system.

Lasershow Designer 2000 creates and edits laser show drawings, logos and text. If you're doing basic drawings, such as fans, rays, cones and waves. **Abstract Generator** makes incredible multi-colored patterns. It can turn photographs into TV-type raster images.

Showtime is where you add effects to your show. You can drop frames and effects onto the timeline. You can program an event to your desired time. Showtime is pre-programmed (just hit Play) and you can assign events to other software. You can play along with the show.

Play live "visual music" at discos and raves

New LivePRO software is the ultimate for jamming to music

Designed by laser DJs, new LivePRO goes beyond other controllers with added features specialized for disco and rave work. Four effects can run simultaneously, so you can fade them in and out, or instantly switch on the beat. Trigger modes include manual, audio, timer, and MIDI. Three text modes provide simple scrolling as well as animated words and messages. Record your live performance for later playback.

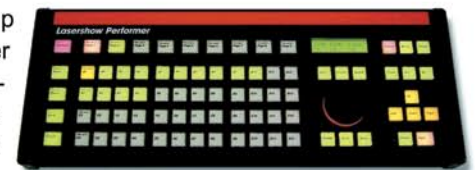
All this sophistication makes LivePRO the ultimate live performance software.

Run live beams and graphics with the ultra-cool Lasershow Performer console

Pangolin has two programs that let you set up live shows by assigning events to the computer keys. With either Showtime or the more advanced LivePRO, just press the keys in time to music and you'll have a great looking show.

However, if you're doing a lot of live performances, then you'll also want to add Lasershow Performer. This rugged console features professional-style lighted keys plus extras like a fast knob controller. Run it manually, or let it trigger automatically to music. Lasershow Performer even includes a built-in microphone that can actually switch effects on the beat — just as if you were pressing the buttons yourself.

For live action, nothing beats the feel of a true console like Lasershow Performer.



World's most laser system is and Lasershow and Showtime.

Lasershow Designer 2000
programs have been used to
laser shows than any other.
Pangolin products for special needs.

adds graphics and beam frames. It works like
added for laser. You can make graphics like
beam shows, use LD2000 for aerial effects
For 1970s-style psychedelic images, the
moving spirograph patterns. You can even
pictures for unique special effects.

to your frames. Simply drag and
timeline and stretch the resulting
Shows can be completely pre-
y or start SMPTE), or you
keys, so that you can
with live music.

Let viewers become part of the show

Use SMS mobile phone messaging to project your customers' messages in glowing laser light (and video, too!)

The hottest new laser fun in discos is Lasershow Messenger. It lets anyone with a mobile phone send a text message to the laser's phone number, and then see their message projected larger-than-life. It outputs to both laser and video projectors.

Lasershow Messenger works for discos, clubs, raves, billboards, trade shows and other public message applications. Built-in filtering can block specified words, messages and users. As a bonus, it keeps a database of all calls. This lets you send your own text message back to customers. Tell them about "today's specials" or just thank them for coming by your location.

Pangolin customers report that Lasershow Messenger is extremely popular. Patrons just pick up their mobile phone and easily create personal, interactive messages displayed with the high-tech uniqueness of laser light, or displayed on large-screen video systems. And it works with all types of mobile phones in all countries, including GSM, TDMA and CDMA systems.



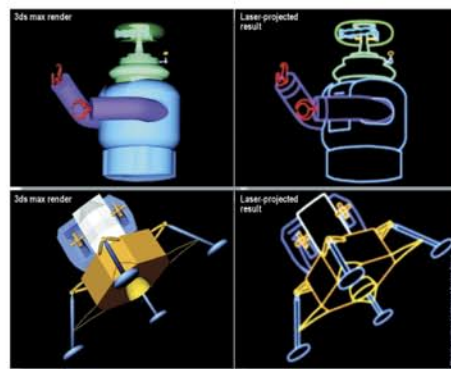
Four ways to easily add custom artwork to your laser show

Convert 3D computer graphics into amazing laser graphics using the award-winning Lasershow Converter Max

Lasershow Converter Max is the technology breakthrough that won first place in the prestigious 2001 ILDA Awards. It works with *3ds Max*, the most popular 3D modeling software in the world with over 250,000 users. As the name implies, Lasershow Converter Max converts *3ds Max* computer graphic scenes so you can see them in laser light.

It is amazing because 1) the resulting scenes have perfect computer realism, and 2) it is incredibly easy to use. Even if a computer artist has never used lasers before, they can create perfect laser scenes with *3ds Max* and LCMMax. That's because LCMMax works as a plug-in, directly inside *3ds Max*. As the artist draws in *3ds Max*, they see the resulting laser outline generated by LCMMax in real-time. This speeds production and gives astounding quality.

LCMMax truly is a breakthrough. You get the best of both worlds: use a standard 3D computer graphics program to make the highest quality laser images. No wonder LCMMax is Pangolin's most popular add-on software.



Convert Flash, video and pictures as well

These three programs also generate laser frames from existing artwork:

- **Lasershow Converter Flash** turns animations created with *Adobe Flash*, into stunning laser animations. As with *3ds Max*, there are many *Flash* artists who can create scenes and even complete movies ready to be turned into laser. (Included free with LD2000 Pro version.)

- **Lasershow Converter Video** lets you use video images, either live or played from VCR. Convert them in realtime to outline or raster laser frames. (Included free with all three LD2000 versions.)

- **TraceIT** traces bitmap pictures such as drawings, photos or other high-contrast artwork. Produce outline traces, centerline traces and raster (TV-type) images. (Included free with all three LD2000 versions.)

Why LD2000 is the word's most popular and best-selling laser show system

When you choose Lasershow Designer 2000, you're getting the best. It has won the most awards, comes with the most free shows and frames, and provides you with the best value. That's why more laserists around the world use Pangolin than all other laser display systems combined!

The most awards

For over two decades, Pangolin has been consistently honored as the world's leader for laser technology and for creating high-quality laser shows.

The most technology awards

Pangolin has won far more international laser awards for technology than any other company. Winners in recent years include Lasershow Converter Max, LD4D, Showtime, and the QM2000 board.



The most artistic awards

Perhaps even more important, shows created using Pangolin software have also won far more international awards for artistry. Plus, the wide variety of winners proves LD2000's versatility and power:

- Pangolin users have won awards in every category possible, including abstracts, beams, animation, and multimedia extravaganzas.
- Since LD2000's power is available to anyone, winners range from one person operations, to teams of artists from the world's top laser companies.

These awards demonstrate that no matter what type of laser show you're creating, and no matter how big or small your staff, LD2000 is perfect for the job.

LD2000 is the fastest way to quickly create high-quality beams and graphics for all types of shows: corporate, planetarium, disco, trade fairs, and multimedia. There are three versions, so you can pick the one that's best for your budget and needs:

LD2000 Intro gets you started; it lets you create up to 8 tracks of beams and 2D graphics. **LD2000 Basic** works with 16 tracks, while **LD2000 Pro** is the most powerful system with 32 tracks and true 3D graphics. All three versions are available in 6 languages: English, German, Spanish, French, Portuguese, and Chinese. More details about the three versions, and about all the great features of LD2000, are at www.pangolin.com.

The best value

With a 90-day money back guarantee, there's no risk. Try LD2000 on your own laser projection system for three months, to be sure that it's right for you.

Free updates

So that LD2000 will always be the best, Pangolin continually improves the software. You'll get the newest features *absolutely free*, for the life of your system. Your system will never be obsolete.

Many support options

LD2000 ships with a tutorial DVD. Additional training and support are available from the many local Pangolin dealers. For more complex questions, contact Pangolin directly — we're always available with fast phone and e-mail help.

How to get started

To join the over 9000 users in 63 countries who rely on LD2000, contact one of our many worldwide dealers listed at www.pangolin.com/dealerlist.htm, or call us toll-free at 1-800-PANGOLIN.



Pangolin Laser Systems
9501 Satellite Blvd. #109, Orlando, Florida USA
Telephone (407) 299-2088, fax (407) 299-6066
www.pangolin.com contact@pangolin.com

The most free shows and frames

Every LD2000 system includes over 100 high-quality shows (24 of which are international award winners) and more than 300,000 frames and animations. This tremendous amount of free material, including the high-quality Lightspeed laser library, has many benefits:

- You can get started right away. Use the laser shows as-is, or change a few frames to add your clients' logos.
- Use the shows as learning aids. If you see a great effect, you can go into the show to see how it was done.
- Use the pre-drawn "clip art" frames and animations to build your own shows. LD2000 has previewing and indexing features, to help you find the right frame.

With all this free artwork, you'll get a great head start on producing impressive laser shows.

music. I strongly believe that it is a media through which we can bring people together for good causes and communicate with children in a visual language that they are attracted to. We experimented with that in 'Lasertoons', a 30-minute extravaganza of laser with intelligent lighting, based on popular Indian nursery rhymes. We took this show to India and performed at Nicco Park (the

"When doing a laser show without any live performance involved, I do not believe in confining it to just some beam shows married with popular music. I strongly believe that it is a media through which we can bring poeple together for good causes and communicate with children in a visual language that they are attracted to."

Disneyland of India) with unprecedented success. We covered a total of 78 shows in one month, with multiple shows per day – each show drew a packed audience! The demand was at its peak, but we had to return to the USA because of other prior commitments.

The Laserist: How did the photo-



A scene from Manick Sorcar's 'The Enlightenment of Buddha', winner of the 2005 Artistic Award from ILDA, for best use of laser on stage with live performance. The black magic of a devil sets the forest in inferno with ghostly fire in a daring attempt to break the meditation of Lord Buddha.

graph that won the Award this year come about? Did you freehand directly to the laser? Or work from a paper sketch?

Manick: 'Reflection' is a scene from one of my forthcoming stage shows that combines live action with laser-animated characters. For all of my creations, I always develop a storyboard. These contain quick sketches of each scene, complete with intended lighting and sound effects. These sketches are drawn to reflect the camera angle for the best visual effect. So, yes, I drew the scene as a part of the storyboard first. However, the actual laser art was drawn free-hand with an electronic pen directly on a digital canvas.

The Laserist: What dictates which path you go down as a creator - la-

sers, paints, digital, or more!

Manick: You know, I have been asked this question many times - and I've never come up with a straight answer, simply because, there isn't one! The truth is that I am a full-time electrical engineer by day and all of my work is performed to meet applicable codes, rules and regulations, and the specifications of others. By night, however, I am a free artist where no other rules and regulations except for mine apply, and I just let myself explore places of the unknown. For many years I have balanced my life with science and art like Dr. Jekyll and Mr. Hyde, until I discovered how to work with lasers - thus, mixing the two on stage. I finally found a media where I can apply all of my interests simultaneously, and explore areas where no one has gone before.

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Projector Connections: Making The Right Connections for Perfect Laser Images

This article is guide for manufacturers wanting to create a laser projector conforming to the ILDA Standard Projector (ISP) specification. It discusses the two sets of connections inside the projector: those related to power supplies (the “Power Connections”); and those related to the ILDA DB-25 signals (“Signal Connections”).

POWER CONNECTIONS

Figure 1 shows how power connections should be made between the various components. We will discuss the connections for the scanner power supplies first, because they are at the top of the page, and also because once that foundation is laid, the other power connections can be easily understood.

Power enters the projector from the AC Mains Supply. An integrated switch and fuse assembly is often used as shown. The brown wire is the Line (or “Hot”) lead; the blue wire is the Neutral lead.

With laser projectors whose optical output power is relatively low (for example, a few hundred milliwatts) and projectors that have a plastic enclosure, there may only be two AC power wires (Line and Neutral) and the Ground wire may or may not be used. For projectors that have a metal enclosure, a green Ground wire must always be used and connected as shown.

The Power Connections diagram shows two separate power supplies used to generate +24V and -24V for the scanner amplifiers, but this could be embodied as a single power supply that generates both voltages as

indicated by the light gray box. In either case, the +24V and -24V power wires are connected from these power supplies to the scanner amplifiers. As with the power supplies, the scanner amplifiers may also be embodied as two separate single-axis amplifiers, or as one dual-axis amplifier as indicated by the light gray box around them.

The most important part of Figure 1 is the “Central Grounding Point”. This

avoids a ground loop). When an AC ground is not used, then ILDA DB-25 pin 25 should be connected to the “Central Grounding Point”.

POWER CONNECTIONS FOR THE LASERS

In addition to showing the connections for the scanner power supply, Figure 1 also shows the connections for the lasers. This is intended to be more conceptual than literal. The

reason is because the lasers may have integrated AC power supplies and laser diode drivers, or may each operate on a separate power supply and driver.

If the laser power supply is small enough to fit within the projector, then the “Power Ground” from the power supply and from the laser diode driver should each be routed to the “Central Grounding Point”.

PROJECTOR INTERLOCK (required by the ISP standard)

The diagram also shows a relay placed in series with the laser power supplies. This facilitates the required ILDA Standard Projector interlock. When connected as shown, the laser diode drivers (and optionally, the shutter driver) will only receive power when the interlock loop is closed.

The ISP specification allows for voltages up to 25 volts, and currents up to around 160 milliamps to exist on the DB-25 pins. The projector interlock must be facilitated in such a way that these values are not exceeded. However, I recommend trying to implement an interlock that uses far less voltage and current – for example 5

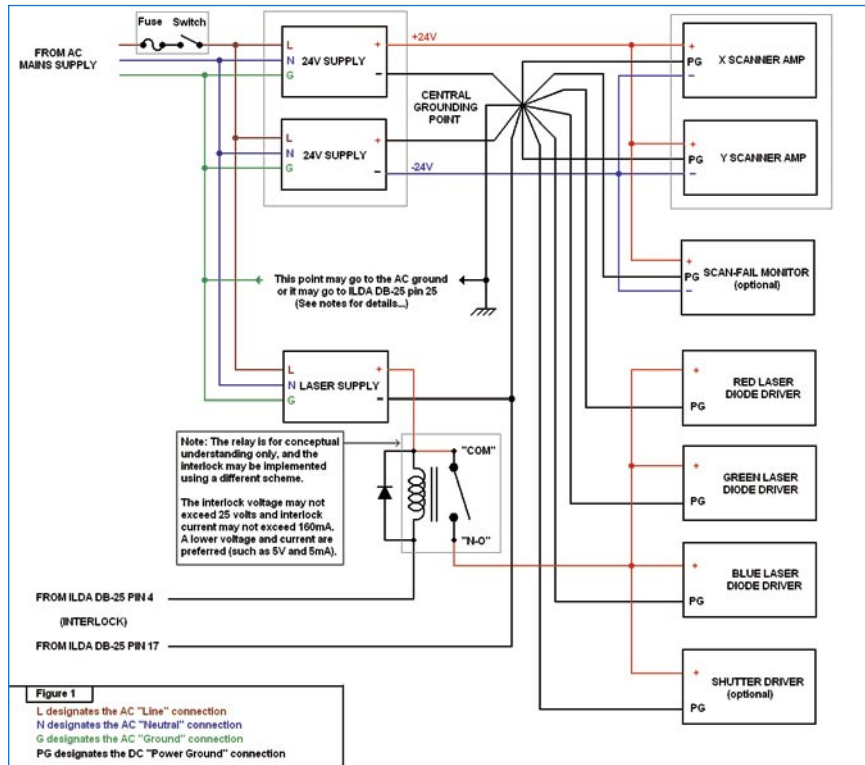


Figure 1

volts and 5 milliamps. This could be done using an electronic relay instead of an electro-mechanical relay.

SIGNAL CONNECTIONS

The ILDA DB-25 connector primarily contains signals that control beam motion (i.e. X-Y scanning), and beam color and brightness (i.e. R, G, B beam power). The motion and color signals are arranged as differential pairs. The laser projector derives the actual signal level by taking the difference between two signals (i.e. by subtracting). For example, ILDA DB-25 pin 1 contains the X+ signal, and pin 14 contains the X- signal. Often times, when pin 1 is going from 0V to +5V, pin 14 will be going from 0V to -5V. The actual signal level is found by subtracting; thus +5V minus -5V = +10V. This means that the voltage level that the X scanner amp should sense is +10V.

Note that I used the term “often times” above. There is no strict requirement for X- and X+ to be “equal but opposite”. As far as the projector is concerned, the same X position could be commanded if the X+ signal goes to +10V and the X- signal stays at 0V, because +10V minus 0V = +10V. Likewise, the same result could be generated if the X+ signal goes to +20V and the X- signal goes to +10V, because +20V minus +10V = +10V.

This is an important concept. The ISP standard absolutely requires projectors to derive all motion and color signals by taking the difference between two signals. No motion or color signal should be assumed to be referenced to ground, and – at the projector – no motion or color signal should be connected to ground.

With that in mind, we connect ILDA DB-25 pin 1 to the X+ input on the X scanner amplifier, and we connect pin 14 to the X- input. Likewise we connect pin 2 to the Y+ input of the Y scanner amplifier, and we connect pin 15 to the Y- input. Note that, although the scanner amplifiers themselves may have a “Signal Ground” input (labeled SG in the diagram), this is NOT connected! If it were

connected, this would destroy the single-point grounding scheme that was established and discussed above in the Power Connections section.

If a scan-fail interlock were used, it would be connected to the X POSITION and Y POSITION signal from the scanner amplifier. But, there is something tricky to watch out for. If the scan-fail monitor does not have a differential position input, you should NOT connect the “Signal ground” or “Position ground” from the scanner amplifier to the scan-fail monitor. You should only connect the scan-fail monitor to the scanner amplifier’s ground connection if the scan-fail monitor itself has differential inputs. (Pangolin’s PASS does have a differential position input, but most others do not.)

The scan-fail monitor would also be connected to a shutter or to the laser diode drivers. Consult the manufacturer of the scan-fail safeguard for details on how to do this.

The color signals are also connected using differential signaling. ILDA DB-25 pin 5 is connected to the “positive modulation input” on the red laser diode driver, while pin 18 is connected to the “negative modulation input”. Similarly, for the green diode driver, pin 6 connects to positive modulation; pin 19 connects to negative. For the blue driver, pin 7 connects to positive modulation; pin 20 connects to negative.

Some laser diode drivers, such as Laserwave and Viasho have differential inputs, but, other laser diode drivers such as CNI and Melles Griot do not.

Since the ISP standard absolutely requires all motion and color signals to be implemented as differential pairs within the projector, this means that if you have scanner amplifiers or laser diode drivers that do not have differential inputs, you will need to implement the differential receiver as a separate circuit. One easy way to do this is with a difference amplifier.

TTL VERSUS ANALOG COLOR

MODULATION (avoiding fires!)

The ISP standard requires the color signals to respond in an analog fashion, such that 0V does not produce any light from the projector, 2.5V produces around half the nominal laser power, and 5V produces the full laser power. The standard also assumes that if the laser projector is disconnected from the signal source, there should be NO light coming out of the laser projector (because there would be no difference between the color signals).

Some projectors have laser diode drivers that use TTL instead of analog modulation inputs. TTL modulation means that the laser can be either fully on or fully off. This does NOT conform to the ISP standard. However, what’s worse is that the TTL modulation inputs “float high”, so that disconnecting the projector from the signal source produces a full-power, non-moving beam. This is a laser safety hazard! TTL modulation should be avoided, but if they are used, at the very least, implement a differential receiver to force the TTL lasers to “float low” instead of “float high”.

SHUTTER AND DB-25 SHIELD SIGNALS

ILDA DB-25 pin 13 provides a signal to control a shutter. Its presence is optional, and may depend on laws where the laser projector is to be used. Because a shutter offers an additional layer of safety, it is a desirable thing to have. The shutter signal is TTL: the shutter is either fully open or fully closed. The shutter is opened when pin 13 is roughly 5V when compared to pin 25.

ILDA DB-25 pin 25 is considered to be the “Shield” signal of the ILDA connector. Note that this should not be considered to be a “Ground” signal, since, most often, this signal is not connected to any “Ground” per se.

Since the shutter signal is TTL in nature, and is referenced to DB-25 pin 25, one good way to receive the

Continued, page 28

Road Shows 2008

2008 has been a great year for laserists, with familiar faces and new designers and applications all pushing the creative boundaries of art with lasers. Here's a look at some highlights.

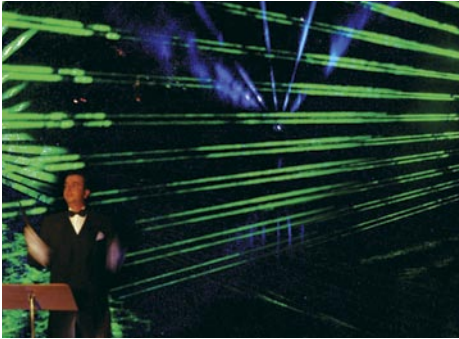
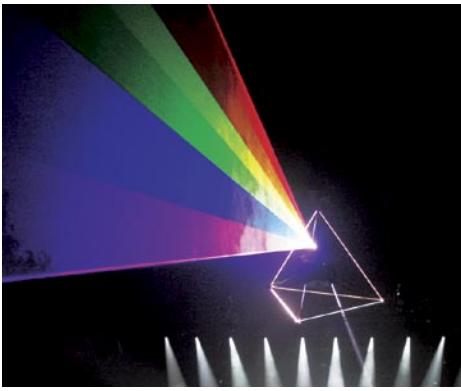
Laser Design Productions worked with sister company Pyrotek on many fascinating projects this year, including Chris Brown, The Spice Girls, Van Halen, and Transiberian Orchestra's holiday shows. For The Spice Girls, LDP's Doug Adams presented a number of proposals to LD Roy Bennett. Roy returned requesting if it were possible to have a pink and purple laser effect, which he explained Victoria was anxious to have. For her catwalk entrance the lasers are coordinated to the pulse of the song that is in sync with each of her steps to form a fashion show theme. Adams says, "I wanted

to ensure that the lasers generated full color, and brought a strong appearance. We invested in three new 10 watt full color lasers to really make the laser show punchy". One laser is recessed beneath the stage in the center of the upstage area, while the other two are located stage right and stage left under the band risers. The system is handled by a 3-Card Pangolin Laser Control System and with a total of 60 bounce mirrors. The mirrors are located in the center trussing, along the main stage and upstage edges, on the runway, and at each corner of the B-stage. In creating a full look to the design, Adams

ensured that the framing of the scans were as wide as they could possibly be.

Lightwave International's head honcho George Dodsworth is a hard guy to catch, but he says that KORN and the Ghostland Observatory would top his list of 2008 shows. The company also worked in tandem with ETG on MTV's VMA Awards (and continued Roger Waters shows), and did large installations at the Orlando Science Center and the Carnegie Science Center. Big civic events round out the action, but who can forget





LEFT: Rush's Snakes and Arrows Tour.
 TOP: Roger Waters' DSOTM Laser Prism.
 ABOVE: LOBO's Summer Nights,

about those Roger Waters' effects? To recap, the Pink Floyd frontman's tour continued through 2008 with LD Marc Brickman's gorgeous design, and perhaps the most over-the-top laser effect ever seen on a roadshow. A high-powered solid-state laser system is used specifically to reproduce the cover artwork of 'Dark Side Of The Moon', an iconic effect that truly tops off the show. With this effect, Brickman brought Waters his artistic vision of Storm Thorgerson's original album cover artwork. Now lasers form the prism, as well as the trademark look of a single bright beam entering the prism, and the prismatic fan exiting the other side.

Dodsworth says the prism effect is created by five custom-built solid-state lasers, producing an awesome 100+ watts of total power. The three dimensional rotating tetrahedron is created by 2" diameter white beams, and sculpted by a precisely aligned mirror array.

The massive scanning lasers produce an assortment of effects in addition to the iconic white beam and rainbow fan. These lasers output over 34 watts each, and George adds that the lasers are rated at the projec-

tor output, so "these power levels are truly monumental." Martin Potoczny of Lightwave International serves as the laser board programmer and operator.

Laser giant **LOBO** staged Summer Nights, which ran from July 11th through August 30th. This is the fifth run of the spectacular open-air show at Holiday Park. On the summer night dates, the park is open until midnight, and a completely new laser show production above the Holiday Park lake was the highlight of each evening. It was considered the largest laser performance of the German summer. Interactive elements embedded in hologram-like projections above the lake, fascinating 3D beam effects and up to 13 meter high flame effects provided more than 20 minutes of fun and visual tidbits of the highest level to the spectators.

Howard Ungerleider's company **Production Design International** has been part of some fabulous projects recently, including the Las Vegas Hilton's production of Barry Manilow's 'Music and Passion', Tool, the musical 'We Will Rock You', Carrie Underwood and more, but you can always find him behind the visuals of rock legends Rush. 'Snakes and Arrows' combines the trio's superlative musicianship with jaw-dropping visuals. It spans three hours with a definite emphasis on their most recent material, and like all Rush shows, lasers are used to punch up the action. This time out, Howard augmented his unique blend of the latest lighting technologies with two Laserscope 60 watt YAG laser systems. Laser operator/tech on the tour was Andrew Seabeck.

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Laser Roundtable Panel: Audience Scanning and Safety

Being inside beam effects is much more beautiful than seeing beams overhead. Audience-scanned beams provide unlimited possibilities for creative laser expression – but it must be done safely. What is the difference between correct and incorrect audience scanning? An international roundtable of laser display experts discuss this very popular and common use of lasers. Participants in the panel are William Benner (Pangolin Laser Systems), Hugo Bunk (Laserimage, b.v.), Jim Hardaway (Neo Laser), Alex Hennig (LOBO), Steve Jander (Showlasers), and Greg Makhov (Lighting Systems Design, Inc.). You can read additional comments and more details online at www.laserist.org/laserist2008.

Is it legal to do audience scanning everywhere? What are your memories of the evolution of audience scanning?

Alex Hennig: Audience scanning is allowed in Europe and most of all other countries in the world. In general and under certain circumstances it is even allowed in the USA. Some countries have very strict regulations on audience scanning, others don't have any clear regulations at all.

William Benner: It is legal to do audience scanning in most places in the world, including the USA. There has historically been a misconception that it was not legal in the USA. In fact, audience scanning has always been possible in the USA, as long as you can prove to the CDRH that it is safe, and could provide calculations and other forms of proof. Regarding my memories of the "evolution", really I guess audience scanning started long ago with people pointing a laser projector toward people and doing audience scanning. It was Ruediger Mueller, one of the founders of the famous German laser company called "tarm", who claims he started doing audience scanning within Germany. He claims that before him, the German laws restricted it, but that somehow he was able to convince them to change the law.

Greg Makhov: The question of legality actually goes to the nature of individual countries' laws and regulations, and certainly the issue of enforcement. At one of the ILSC [International Laser Safety Conference] sessions some years ago, we had several presentations on audience scan-

ning, and the gentleman from Sweden stood up and declared that audience scanning was a source of man-made radiation and could never be justified for human exposure. To the best of my knowledge, Sweden does not allow audience scanning at all. I have heard rumors that Thailand has also restricted audience scanning, because of widespread abuse, but I am not sure if this is enforced.

Hugo Bunk: At least in Sweden it is not allowed. It has always been there for me, but since we entered the age of cheap high power DPSS lasers and more amateurs, I see more shows where I am concerned about safety.

Jim Hardaway: I have been around the world a bit and seen my fair share of audience scanning lasers. I wouldn't really term it evolution of audience scanning; I would probably call it the de-evolution of audience scanning. I would expand on that but I may offend some people in government or in "laser safety" fields.

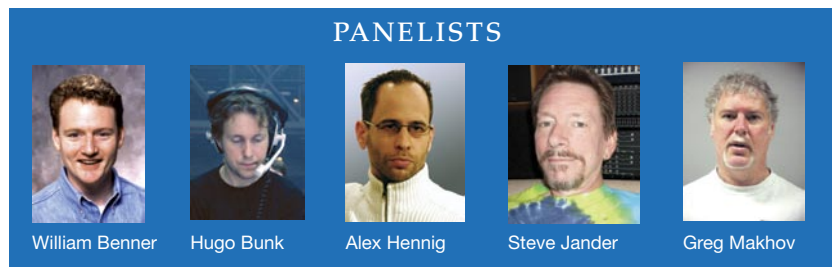
Steve Jander: My experience is mostly in the USA. My first recollection of the FDA was when I toured with Led Zeppelin in 1977. I believe the FDA's involvement was a result of the trail of fear and ill will in the wake

of Blue Oyster Cult's tour around that time, in which a performer with a fiber optic laser bracelet illuminated a mirror ball and also pointed it directly into the audience. They were stunning effects but very dangerous in my opinion. I first saw an audience scan effect at a Who concert in 1976. This was before any US regulations.

By 1980, I had come up with some audience scan effects and ways to make them legal and safe. The FDA - BRH (Bureau of Radiation Health, which preceded the CDRH) sent electro-optic specialists/inspectors with four big red flight cases full of measuring equipment to follow me around for a couple of weeks, taking measurements and observing procedures. I had my own measuring equipment, and we were able to compare measurements and calculations. They were satisfied that my audience scan effects and procedures were safe and legal. I have continued scanning since then with no problems.

Are the basic restrictions the same everywhere? Is it just a matter that in some countries there are "guidelines" while others have "laws"?

William Benner: The accepted "safe levels" of laser light are virtually the



same all over the world. I believe Russia has a slightly different “safe level” for pulses whose width is less than 20 microseconds or so. But we can say that there is a consensus for the level of laser light that is safe, all over the world. There are several laser safety standards available for people to examine and follow. The units of measure are different among the standards (for example, watts per square meter in the European standard, and watts per square centimeter in one of the American standards) but the actual levels are the same.

Alex Hennig: Independent of the valid regulations of the given venue, it makes sense to make any endeavor ensuring safe laser performances, as it is not just a question of applicable laws and regulations at the given country or venue, but finally a question whether people are harmed or not. Certainly sometimes inspectors have more or less expertise (as in any other field of work).

Jim Hardaway: You have some countries like China who have no rules, no laws about audience scanning, the application of lasers into navigable airspace yet no planes have fallen from the sky that we know of. Most developing nations and underdeveloped nations have little to no regulations. It is the developed nations who perhaps have too much time on their hands and need more things to create jobs.

The Maximum Permissible Exposure (MPE) is the highest level to which a person may be exposed. Is there an “orange zone” above the MPE where scanning is still safe - even though it may not be legal?

Steve Jander: I think so ...

Greg Makhov: Most laser safety professionals will not accept any exposure over the MPE, although this may happen with some frequency in the real world. For example, in addition to the MPE for ocular exposure, there is an MPE for skin exposure (nominally 1.1 W/cm²). Skin exposure

above the MPE can result in burns, but technicians, scientists, and even doctors routinely expose their skin to levels well in excess of the MPE when evaluating lasers.

Jim Hardaway: It is a little-known secret that the government standards are about 60% less than what truly is safe. There is room for error above the stated MPE, so the MPE is too low and can be raised to brighter visible levels without hurting anyone.

Alex Hennig: Every industry has its safety standards. Every standard has a certain safety margin, taking into account that sometimes unforeseen things happen.

William Benner: All standards make some number of assumptions. The assumptions made by the laser safety standards in coming up with the MPE is that the pupil is fully dilated -- meaning 7mm. Assumptions are also made as to how the light is “pulsed” and other factors. And the assumption is made that as these pulses enter the eye, the person will not do anything to evade the pulses (such as turn their heads or move out of the way of the beam). It could very well be that for the practice of audience scanning, some of these assumptions are not valid.

So yes, there could very well be an orange zone. It could very well be that the green zone is wider than we think. However, to me it comes down to how well you want to sleep at night. I sleep very well, because I simply never break the law.

You’ve all have seen certified safe legal audience scanning, and the colors have been dim. Only when the laser was turned up beyond this point did the laser colors look really good. Is this the experience of the panel, and how do you make your shows look good using legal safe audience scanning?

William Benner: I actually disagree with this statement. The colors have been bright, and in fact the brightness depends on several factors including

power level and divergence. Higher power can be used, which results in brighter colors AS LONG AS divergence is made higher. Empirically we can say that audience scanning – even when done by nearly complete idiots – must be pretty safe, because it has gone on for 30 years - with no body bags.

Why haven’t we seen it in the US? Well, it’s because historically there has been a large barrier to entry in so much as CDRH insisting that people prove that it is safe. This proof must be done both mathematically, and also procedurally. As a rule, laserists are not very mathematically inclined, and also are not very procedurally inclined, so those individuals could not prove it.

Jim Hardaway: With some audience scanning safety systems you can decrease the MPE in audience areas and increase them in areas in the Nominal Hazard Zones, thus creating the illusion it is a brighter laser show. A lot of this has to do with the ambient lighting and how LD’s program “around” the limitation of audience scanning with conventional lights. You can make it look brighter if you turn down the discharge lamps or use complimentary colors. The use of lasers in the US on shows has gone down because of many factors. Cost per cue is still higher than lights, other lights and effects got cooler, LED and well ... NO AUDIENCE SCANNING! I think one huge factor here is the 3 Meter Rule. I believe in safety for certain, but I also believe in freedom. Freedom comes with risks and as long as you know the risks you can make the choice.

Greg Makhov: I am not sure I would agree with the “colors are dim” statement. The brightness is controlled, and an aversion response is not triggered. This gets into some very technical matters concerning color palettes and linearity of the brightness in the laser projectors. This is perhaps parallel to an old sound tech saying it doesn’t sound good until the meter reads 115 to 120 dB! Most of us are

quite happy at 90-95 dB.

On the other hand, there is a delicate balance between beam divergence and allowable power. The “softness” of the scanned pattern is usually a function of the enhanced divergence, which allows more laser power to be used. But this is certainly an artistic judgment, and can be accommodated by adjustment, as long as the measured irradiance is within the limits. The problem with very tight beams is that the irradiance limit imposes a very low power limit on the beam, so the question becomes do you prefer dim and tight, or brighter and softer. This can only be done by experiment.

On July 5, approximately 30 persons attending a rave suffered eye injuries when a laser, intended for a sky show, was instead aimed into the audience. ILDA issued a press release stating, “It appears that a pulsed laser was used in a completely unapproved way. It was shocking to us – any competent laser operator should know to never direct a pulsed beam towards an audience.” (The full press release and additional information on the incident is at ILDA’s website).

In your view, what happened in Russia?

Jim Hardaway: The same thing that happens each time a car goes out of control and smashes into a park bench full of people. Someone who should not have been operating that car/laser was behind the wheel.

Greg Makhov: In simple terms, we don’t know. I think we can make some pretty good guesses, however, based on the video we have seen. The laser appears to be pulsed, and single color, which strongly suggests a Q-switched Nd:YAG laser. These are common on the surplus medical market, at significantly discounted prices. Finding such a piece of gear at a rave party is not too surprising. My best guess is that this was initially setup in a reasonably safe manner, intending to project beams overhead (which is quite reasonable with the Q-switched laser). A second guess is

that the tech that set up this laser was not present when the laser was redirected into the audience. I honestly don’t believe that anyone competent and experienced would simply project it into the audience in such a careless manner. We have heard numbers of 30 watts, which is quite believable given this technology, and certainly could cause the type of damage reported.

William Benner: Plain and simple, a complete idiot used an industrial laser to perform a light show. I have spoken to the top people in Russia, and it still is not known (or not admitted) as to who did the show. But the type of laser has been confirmed as an industrial pulsed YAG laser. Pulsed YAG lasers are great for cutting metal, but completely inappropriate for doing laser shows. Unfortunately, there are plenty of complete idiots in the world, whether they get their hands on a laser or not. For example, take a look at the number of people killed by drunk drivers every day. As Jessie Ventura says, you can’t legislate against stupidity. Although I wish you could!

What baseline of knowledge is needed to do audience scanning? Do I need to take an IEC safety course or a special laser show meter to calculate safe audience scanning? Is a projector with a scan-fail safeguard 100% safe?

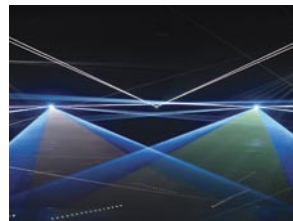
William Benner: What kind of knowledge? Well, you need, let’s say, “better than basic” laser safety knowledge. Knowledge of the MPE is good, and ability to calculate it with a calculator would be a good thing to be able to demonstrate -- even if the calculations were not done routinely for shows. An IEC safety course may do little to foster the understanding of how to do audience scanning itself, but it help to understand laser safety basics, and how the MPE works.

A “special laser show meter” is not necessarily needed. You would

certainly need some kind of instrumentation – for example, a light energy meter capable of measuring relatively low light levels, and having a detector area that is 1 square centimeter. A projector with any kind of scan-fail safeguard is not 100% safe. Going even further than this, even a projector with a scan-fail safeguard and good safety practices might not be 100% safe. Many scan-fail safeguards are not designed very well at all.

However, lets set this aside for a moment, and look at the problem from another angle. An unsafe projector and show scenario with a scan-fail safeguard will be unsafe. BUT, a projector and show scenario that are properly configured for safe audience scanning will be safe (at least until something goes wrong when the scan-fail safeguard would be required to act). Therefore the emphasis should be on making shows safe, not on the equipment itself. The bottom line is that despite the high degree of mystery around audience scanning safety calculations and measurements, it’s all quite easy to setup and perform; if you have the light energy meter mentioned above, you could perform a single measurement at the closest point of audience access, and that one measurement will give you a good indication as to whether the entire show will be safe or not, regardless of the actual show content. I will allow Greg Makhov to describe how this is done ...

Greg Makhov: With a lot of discussion and research into scanning parameters and how they can affect exposure, I believe we can make a valid generalization that will effectively limit the exposure within the MPE for normal scanning behavior, particularly if we have a highly respon-



sive scan-fail monitor. However, it is important to understand that limiting the irradiance is far more important than monitoring the scanning.

With the development of the PASS system [Professional Audience Safety System, a commercial scanning safety device], it is possible to have a pre-calibrated laser projector that can be used at a preset range, and only a confirmation measurement is required in the field. This was all that was necessary with the set up of the projector at the ILDA Theater last fall.

Alex Hennig: LOBO has invested a lot of time and money to make audience scanning safe. This not only refers to our DDL safety system, but also to the laser show safety meter LMS-2 we produce. According to our experience, there is no valid recipe or what you call a “baseline knowledge”. This is the reason why LOBO provides a free and individual laser safety training for each client who purchases a LOBO system. This gives you the practical knowledge to apply the system in a safe way.

Steve Jander: I think anyone who can pass the New York State test to obtain a Class B Laser Oper-

ator’s Certificate probably has a sufficient baseline of knowledge needed to do audience scanning. Measuring equipment is useful. Calculations are probably sufficient if worst case assumptions are made. My philosophy is to have multiple parameters independently interlocked so that a failure of any one parameter will shut off the beam, even though more than one parameter would have to fail for the MPE to be exceeded.

The interlocks should fail in a safe mode, and their reaction time should be much faster than the scan failure time.

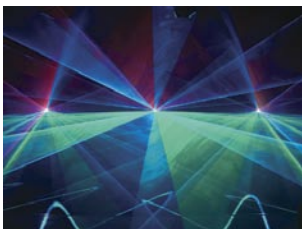
What can a producer do to hire a company that knows what they are doing versus one full of hot air?

Hugo Bunk: Well he can ask for references before hiring them

Steve Jander: Research the company’s background and experience. Make sure they have a variance that allows audience scanning (for U.S. companies).

William Benner: Within the U.S. it’s simple math. Ask to see the variance document that shows that audience scanning is approved. Outside the U.S., ask to see that some form of documentation as some kind of proof. I also think it is not such a bad idea to ask to see their insurance policy or other “bonding” credentials.

Greg Makhov: Other than the reputation of the company, there is little a producer can know to evaluate a laser show provider. This is true for both the artistic and technical aspects, and the complex safety of audience scanning is pretty far beyond any layperson to comprehend. Part of the problem is that there is so much technical jargon associated with laser displays, even people inside the industry can get confused. As we go forward, we may develop some industry qualification for laser projectors that provide audience scanning, which would be a significant step forward.



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Projector Connections, continued from page 21

shutter signal is by using an optical isolator. This receives the TTL-level signal between pin 13 and pin 25 and allows isolation of these signals from the rest of the projector components.

OTHER PROJECTOR PARTS THAT MAY BE NECESSARY

In addition to the fundamental components described above which are in most laser projectors, additional components might also be needed or desired. For example, the United States and certain other countries require additional safety features for laser projectors, including "key-switch", "cover interlock", "external interlock", "time delay" and a "manual reset". The first three are all easily understood and implemented, but the last two provide some difficulty since off-the-shelf components such as laser diode drivers do not have a time delay or manual reset feature.

Often these two features are implemented in the form of an electronic circuit made by the projector manufacturer. (As a point of interest, Pangolin's PASS system incorporates differential receivers for both the color and position signals, and also implements the time delay and manual reset features, thus, this multi-purpose projector control board can help to solve some of the most difficult problems in constructing a projector.)

CONCLUSION

Lasers are able to create stunning high-visibility graphic displays, as well as breathtaking audience scanning displays. Lasers serve a niche that can't be approached by any other light form. Getting the connections right inside a laser projector will ensure maximum quality of the projected image, as well as a safe display for all. A longer and more detailed version of this article is available online at www.laserist.org/laserist2008.



William R. Benner Jr. is President and CTO of Pangolin Laser Systems and has been active in the laser display community since 1985. In addition

to his current role at Pangolin, he also served for five years as a member of the ILDA Board of Directors as well as serving for seven years as ILDA's Technical Committee Chairman. Benner holds numerous US and International Patents, and has received personal letters of commendation from former U.S. President Ronald Reagan and former Florida Governor Bob Graham.



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Laser diodes are supposed to last as long as 100,000 hours. But few ever reach this mark. Why?

The number one reason that laser diodes mysteriously fail is because of electrostatic discharge (ESD) and power surges. That's why Lasorb was developed. It is the only solution which protects diodes against even high, Tesla-coil voltage levels of over 50 kilovolts. In addition, Lasorb inherently absorbs diode-killing power surges that can occur during power up and power down.

Lasorb is a unique, patent-pending component about the size of a resistor. For just a few dollars, Lasorb ensures that your expensive laser diodes are protected.

For more information, visit www.lasorb.com



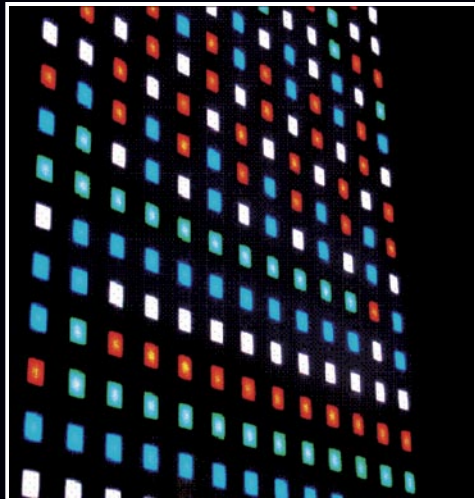
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Audio Workshop: Part 1 – Setting Things Up

I'm Andy Hagerman, the training manager for Digidesign in the Asia Pacific region. Based in Tokyo, my job is to teach audio production techniques to professionals of all types, as well as to audio educators worldwide. I've also done a fair bit of laser show production, and know a thing or two about getting a show out the door.



One of the things I've always loved about laser shows is that that music and audio play such important roles in the final product. In some productions, audio reinforces the reality of a laser scene, much as it would in video production. In more abstract shows, the music can go the opposite direction, and help take the audience into a fantasy world of light and sound.

We'll start with the basics of system setup in this column, and move through all phases of audio production, from editing to mixing and mastering. Though the majority of concepts that I'll be covering are applicable to digital audio production in general, I'll be pointing out some specific DAW techniques from time to time, and for that I'll be using Digidesign's Pro Tools LE.

Pro Tools is a standard in virtually all facets of the audio industry worldwide. On its face, that's a good indication of the high quality of the software's design, and the relevance of the tools and features that it boasts. If you dig deeper though, the implication of Pro Tools as an industry standard means that professionals worldwide can seamlessly collaborate and share work without inefficient and time-consuming conversions. As a laser producer, Pro Tools is worth serious consideration on both counts, and I'd particularly point out the advantage of interoperability with the global audio community.

Getting The Gear Together

Before you can start making sound, you've got to get your hardware and software together. Here are the major actors on your sonic stage:

Host Computer: Most DAWs rely on the power of the host computer for signal processing and other tasks. Your computer's CPU speed, the number of CPUs, and amount of RAM will all affect performance, so it's best to not scrimp. In particular, having too little RAM can be very problematic (most manufacturers recommend at least 1 GB of RAM, and I'd personally recommend twice that amount).

Audio Interface: While you could use the sound capabilities of your computer in some cases, listening through a higher-quality audio interface is the more serious way to go. When shopping for an interface, take special care to choose one that gives you the inputs and outputs you need, and can be placed away from the host computer.

Software: Your DAW software is critically important, as it is your gateway to controlling your audio. In addition to price, here are some things to keep in mind:

Features: Does the software do what you need to do now? Will it be able to do what you need over the long term?

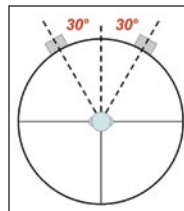
Compatibility: Is the software a good match for the hardware you want to use?

Interoperability: Is the software a good match for the people that you want to work with? Using DAW that allows interoperability with the audio industry could be a real plus.

Monitor Speakers: One of the big mistakes that people make is using the same criterion for their studio monitors that they would use for speakers in their living room. With consumer level speakers, there are certain frequencies that are boosted, emphasizing crisp high end or punchy low end. That's great when chilling out to some music, but when we're buying studio reference monitors, what you're looking for is clarity at

all frequencies, without any specific boosting – that way, you'll be hearing your mix, rather than your speakers. Look for a pair that provides a clean, flat response (listen before you buy!). A flat response will not only give you the most accurate picture of your mix, but will also reduce ear fatigue during those marathon audio sessions. When you're done with your mix, though, always double-check it on speakers that most closely match the ones you're using in the field.

The placement of your speakers is another important consideration. The studio standard for speaker placement is 30 degrees off center, at roughly ear level, as shown here.



Dedicated Audio Hard Drives: While you could record and playback digital audio from your system hard drive, it's not the recommended method of working. Hard drives are limited by their individual bandwidth, and a good portion of your system drive's bandwidth is already taken up with system-related processes. Adding a dedicated hard drive to your system will greatly increase performance, giving you higher track count and even increasing the effectiveness of some plugins. FireWire drives are especially attractive for small facilities, being a good compromise between bandwidth and portability.

Creating a Session

Once you have your system put together, you're ready to create your first files. Though this is a simple process on its face, the choices you make are critically important to the overall production process. Before we close this column, let's take a quick look...

One of the important things to keep in mind is that most DAWs are pointer-based applications. The DAW employs a central file at the top of the file hierarchy (in the case of Pro Tools, this is called a session file). This file doesn't have any audio in it, but rather refers (or points) to audio files elsewhere on your hard drive.

With that in mind, let's walk through the steps of creating a Pro Tools session. After launching Pro Tools, go to the File drop-down menu, and choose New Session. The New Session dialogue box says it all, but allow me to point out some of the important points:

Save In: Professional laser producers know the raw fear that accompanies frantically searching for files. Your audio session files are no different – always know where your files are stored.

Audio File Type: Most DAWs support more than one file type, but which is the best? Actually, there is no sonic quality difference between the major PCM (Pulse Code Modulation) types (wav, aiff, Sd2, etc.). Currently .wav files are very popular, since they are equally supported between both PC and Mac platforms.

Sample Rate: Without getting too deep into the math behind digital audio, higher sample rates can give you subtle improvements at the very high frequencies, and higher sample rates generally have less jitter. However, for these minor improvements, high sample rates will force your CPU to process a greater number of samples in any given time span, which can reduce track count. A good general rule is to use either 44.1 or 88.2 kHz sample rates for material that will eventually be stored on audio CDs, and either 48 or 96 kHz sample rates for material that will eventually find its way to DVD.

Bit Depth: Though the benefit of high sample rates is a matter of some debate, high bit-depth is generally considered to be the way to go. Using 24-bit audio in your session will give you more accurate audio, greater dynamic range and even buy you a bit of recording level headroom when you need it. Even if your final product will be 16-bit, you'll get better results if you use 24-bit audio in your session.

There's more to talk about in our discussion of audio production, but hopefully this has sparked some ideas. Let's continue our discussion next time!

Know your shows are safe with Pangolin's Professional Audience Safety System (PASS)

The most beautiful and unique laser show effect is audience scanning. To be inside the light, to have colors and shapes wash over you in time to music – there is no other experience like it.

How to ensure audience safety

Clients and regulators justifiably want to know that, when audience scanning shows are performed, the light levels are safe. To accomplish this, Pangolin developed the Professional Audience Safety System.

PASS continually monitors the laser power, scanner signals, and the projector. If anything is not within preset safety parameters, PASS shuts down the laser beam until the problem is resolved.

Goes far beyond scan-fail circuits

PASS is significantly more advanced than any previous “scan-fail” or “laser show safety” products. It went through ten years of R&D, and two years of U.S. government scrutiny to determine that it provides true safety. PASS was also reviewed by ILDA judges last year and received the first place Fenning Award for Technical Achievement.



PASS is designed to be installed inside a projector or X-Y head. You can retrofit the circuit board (above) and light sensor into an existing projector, or build them into new designs.

PASS uses intelligent, redundant circuit design with analog components instead of microprocessors and software that may not have been through recognized safety validation procedures. Due to its redundant approach, there is no single point of failure that permits hazardous light levels to reach an audience.

Safety-critical parameters — such as laser beam power, scanner velocity, effect size and power supply voltages — are checked at least twice, using independent circuits with different designs and components from different manufacturers. If any parameter is unsafe, or if a monitoring circuit within PASS fails, it will go into a safe mode where laser light ceases.

Not just for U.S. shows

PASS is not just for the U.S. It is for anyone who needs to prove to a client, an insurance company, or a government inspector that an audience scanning show will not exceed user-set safety limits under any condition.

For example, some clients have concerns about liability in case there is a claimed injury. With PASS, you can perform shows that were never before possible. If there is any claim of injury, you'll be able to prove that laser power in the audience was continuously controlled.

Easy to install in any projector

PASS consists of two components inside your projector: a credit-card-size circuit board which inserts into the ILDA signal path, and a light sensor just before the scanners. A few additional connections are then made to the scanner position signals and the system power supply.

PASS provides five trimpot adjustments to customize its response:



The credit-card-sized PASS circuit board continually monitors the show. It is so advanced that a projector designed with PASS was the first system to receive a U.S. FDA/CDRH variance for European style audience scanning laser shows.

- Scanner velocity
- Effect size
- Timing parameters
- Laser beam power parameters
- Horizon level

During setup at the show location, simply adjust the horizon and beam power parameters. That's it! PASS works automatically to protect the audience.

The only guaranteed audience scanning safety system

Increasingly, clients and regulators are wanting reassurance that audience scanning levels are known and safe. Pangolin guarantees that PASS will keep the beam power in the audience at or below your preset level, even under system failure conditions.

To find out more about Pangolin's award-winning breakthrough, visit www.pangolin.com/pass.

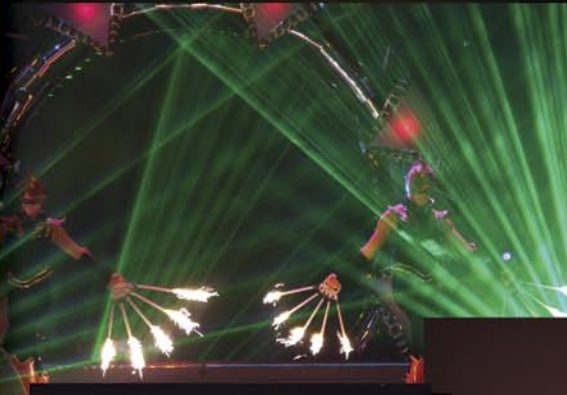


Pangolin Laser Systems

9501 Satellite Boulevard
Suite 109, Orlando FL 32837, USA
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Tel.: +1 360 666 6522

E-mail: kyle@laseronics.com

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