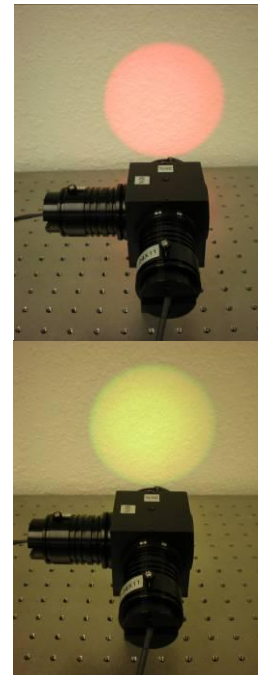
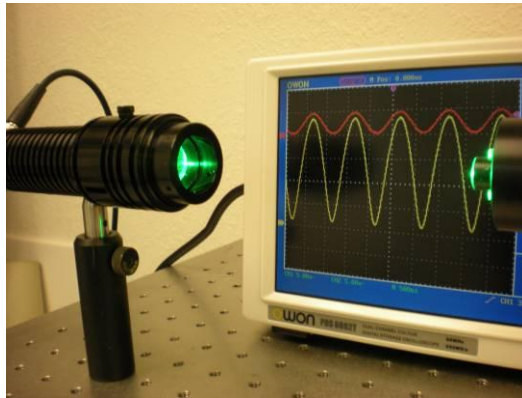


**LIGHTSPEED**  
TECHNOLOGIES

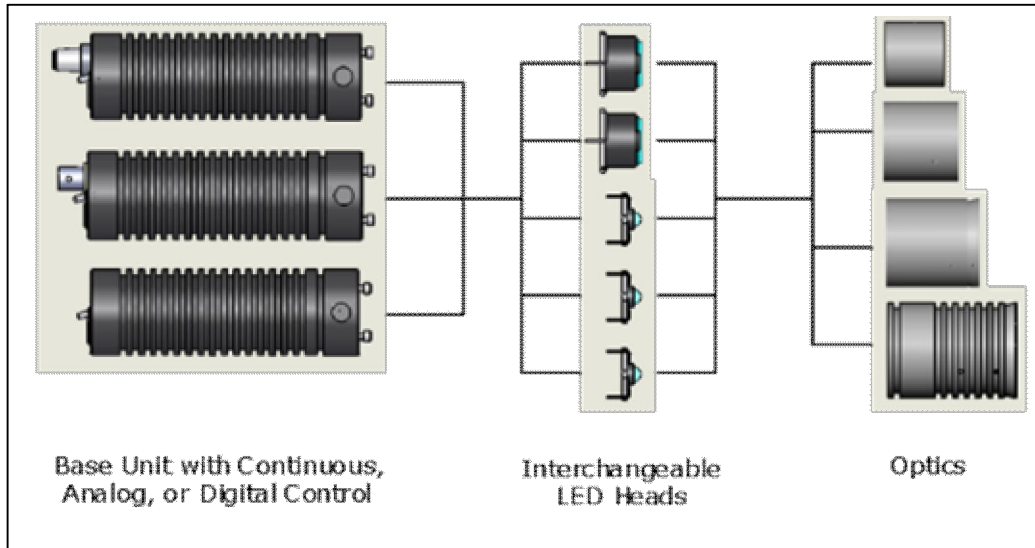
service and solutions at the speed of light

## User Guide

### DRAGON Series HPLS36 High Power LED Light Sources



## HPLS-36 Configurations



### Accessories

Light Launchers:  
SMA  
Light Guide

Beam Cube  
Control 2, 3  
wavelengths

Photodiode  
probes monitor  
output



Focused Output



Uniform Illumination



Collimated Output

### System Description HPLS-36:

The Dragon Series High Power Light Sources (HPLS) are a flexible, plug and play, single emitter illuminator. The HPLS-36 is an all in one unit with built in driver, manual and/or analog and digital control, with optics accessories for illumination applications in microscopes, machine vision, fluorescence, high speed imaging, photosynthesis research, and much more. All OH36 accessories fit the HPLS-36 driver bodies and the drivers themselves are available in configurations including on/off switch, potentiometer for variable power, remote enable, analog control, digital control and high intensity short pulse configurations. If your HPLS has a switch or potentiometer on it, then controlling it is straight forward as turning it on and adjusting the brightness. If using the analog or digital versions, then some input is required by pulse generators, cameras, or analog signal (0-5V).

Unique to the HPLS-36 series are linear analog control and digital overdrive. In the analog mode, the HPLS drivers are linear to better than 1% giving precise optical control we refer to as 'the optical function generator'. In the digital, or overdrive mode, short intense flashes are possible driving the LED with as much as 3, 7, even 18 Amps of current. This mode is useful for high speed imaging, fluorescence imaging, and some time resolved studies.

The standard drivers include the HPLS-36APL750, a manually adjusted driver with locking potentiometer, the HPLS-36AD3500, the most versatile model with both analog and digital control capabilities, the HPLS-36DD7500 for very intense flashes of 40 microseconds or less, and other configurations including the HPLS-36-18A that operates flashes at 18 Amps.

## **Sample Applications:**

### **Narrow Band Illumination**

- Petri dishes, cultures
- Alignment of targets at a distance (10m, 20m)
- UV, Visible, NIR

### **Fluorescence Illumination**

- Microscopy
- Forensics
- Counterfeit detection
- Multiple Wavelength Excitation

### **High Speed Imaging (Digital Overdrive)**

- Microjets
- Fast moving production
  - laser scribe alignment
  - product moving faster than 1m/s
- <100ns flashes
- Synchronize easily with Cameras

### **Schlieren Imaging**

#### **UV**

- Pressure Sensitive Paint
- UV Curing
- Uncaging
- Fluorescence excitation

#### **NIR**

- Analysis of Insects

Please visit our web site or contact us about other LED illuminators including high intensity rings, multiple LED panels, multiple wavelength configurations, Photodiode measurement of output, and accurate control of optical output at high and low output levels.

The HPLS Dragon Series are Ideal for R&D, production, instruments, calibration, and a variety of other applications.

**OH-36 Optics for HPLS-36 Series and HPLS-36-RS1 LED socket:**



**OH36-38X17.5 on HPLS-36**



**OH36-24X11 LED socket**



**Long Range Collimator**

There are a range of collimators/focusing optics and diffusers / filter configurations for the HPLS-36 series drivers and these are referred to as the OH-36 optics. Popular collimators include the OH-36-24X11 and OH-36-38X17.5 and there are a range of collimators available with different optical properties. The OH36-24X11 collimator is the most versatile having a 1 inch aperture and accepting up to two filters / diffusers / polarizers as well as also accepting the light launching accessories for launching into fibers, light guides, fiber bundles, and plastic optical fibers. Photodiode probes are also available to monitor the output.



**Fiber / Light Guide Launching**

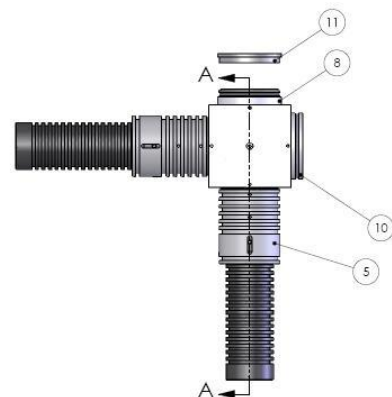
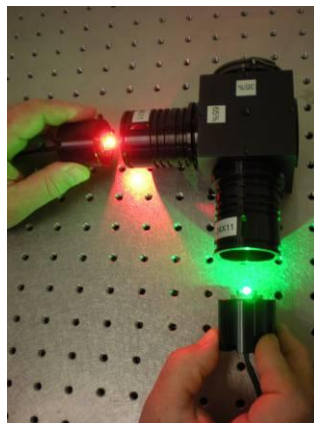


**Photodiode Feedback**

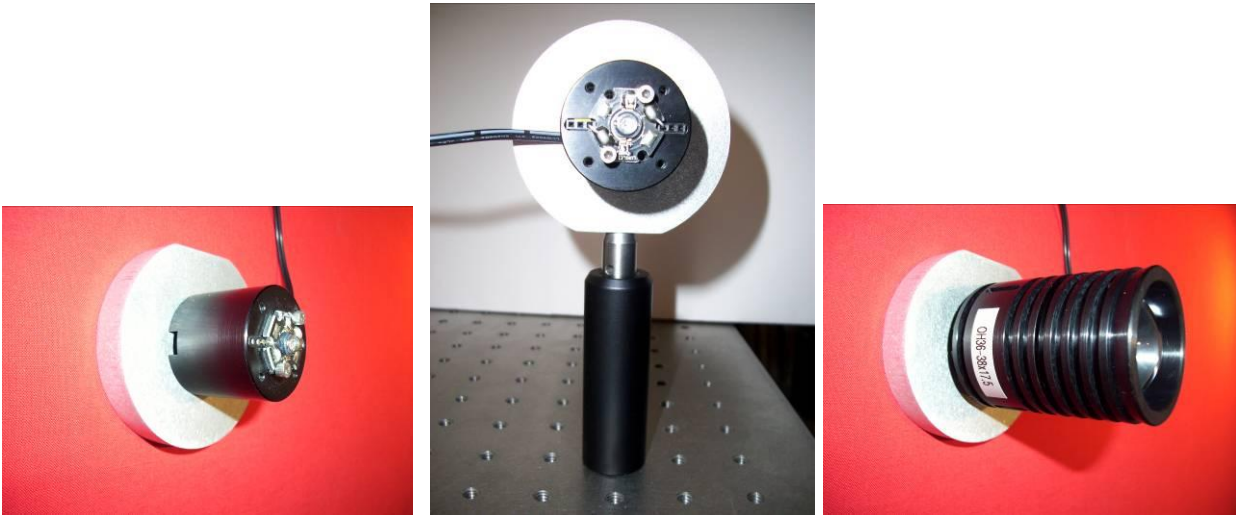


**Local and Remote Control**

Beam combining cubes allow multiple wavelengths of light to be accurately controlled electronically with both analog and/or digital control. These beam combining cubes also provide for collinear illumination for cameras.



## HPLS-36-RS1 LED Socket:



The HPLS-36-RS1 LED socket provides a more compact solution than the HPLS-36 series with integrated driver. The RS1 LED socket has the same diameter and LED interface as the HPLS-36 series and accepts all the OH36 optics and accessories. Drivers are separated from the LED mechanics and heat sink in a separate box driver called the HPLS-45 (more information in HPLS Drivers section).

The HPLS-36-RS1 LED sockets require the HPLS-30 or HPLS-45 Box Drivers. Information about driver configurations is in the following sections.



### **HPLS-36 Series with Built In Drivers:**

There are four types of built in drivers available from Lightspeed Technologies for the HPLS Dragon series illuminators:

1. Analog control, with precise linear control of the LED current
2. Digital control for TTL/CMOS gated high current, short duration intense flashes
3. Dual Input control of both analog and digital modes simultaneously
4. Manual setting with locking potentiometer.

The popular AD3500 driver has both 1. Analog and 2. Digital overdrive selectable by a switch. **A**nalog control provides 1% linear control of 0-500mA from 0-5V input while **D**igital mode allows pulses of 1 millisecond or shorter on with TTL input. It can also be configured as a **D**ual **I**nput for simultaneous control of analog and digital functions with the AD3500-DI

The DD7500 has a digital only control, delivering 7.5 Amps to an LED for flash durations of 40 microseconds or shorter (down to 100ns).

The APL750 is a manually controlled analog driver with locking potentiometer.



**APL750 Locking Potentiometer**

**AD3500 Power and control input**

The HPLS-36 series with built in drivers all use the same body style:

## HPLS-45 Driver Boxes for HPLS-36-RS1 LED sockets

The HPLS-36 series has built in drivers but for applications that have less space available the same functionality can be achieved by using the HPLS-36-RS1 socket with the HPLS-45 Driver boxes. These come with the same driver capabilities as the HPLS-36 drivers described previously but with both local control by digital potentiometer and external control by 0-5V and TTL/CMOS

### HPLS-45AD3500-DIP:

Has the same analog and digital control capabilities as the HPLS-36AD3500-DIP in addition to local control.



Switch 1: External, Local Switch 2: On/Off Local Control: Digital Potentiometer



Output to LED, Power Input, Analog Control, Digital Control

## HPLS-45REGXXX-3DEXT

TTL and Analog Control, repeatable but non-linear output, Local and Remote Control.



## HPLS-45-A-10-1000

This model provides excellent control of LED Light over 4 orders of magnitude with two settings 0-10mA and 0-1000mA. Local and remote control, an output indicates the range selected.

HPLS-36-RS1-REGXXX RS1LED socket with built in driver.



## HPLS-30 Box Drivers:

More compact for industrial applications are the HPLS-30 box drivers which can be configured to drive up to 3 LEDs.



## Additional HPLS Drivers and LED Socket Configurations:

The variety of drivers providing analog and digital control, combined with the flexibility of placement of LED sockets and OH36 optics allows for a wide range of configurations for LED Illumination.

### Standard Configurations:

Analog: 0-5V input provides linear control of optical output 0-Full Power.

Digital: Short duration (1ms or less) high intensity flashes operate at 3.5A, 7.5A, or higher

Dual Input: Dual input allows simultaneous analog and digital control High intensity flashes riding on a biased output.

Multiple Ranges Analog Control: Switchable ranges 0-10mA and 0-1000mA standard

REG: Basic current regulated driver, repeatable but non linear analog or TTL control

### Some Additional Configurations:

Drivers can be pre configured to deliver specific pulse widths of light when triggered.

Photodiode Signal monitors optical output

Low Pulse / High Pulse:

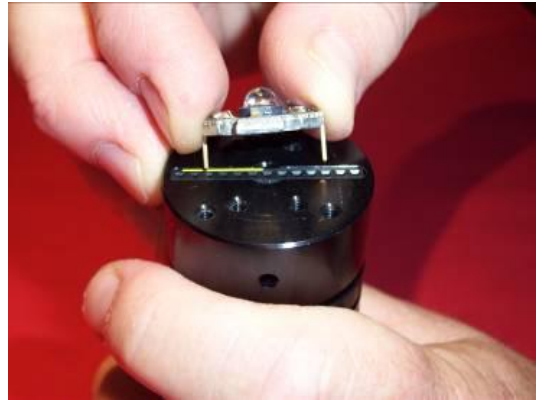
## Replacing LED Heads on HPLS36 series and HPLS36-RS1 LED sockets:

HPLS-LED heads are labelled on the back with the center peak wavelength.

1. Remove screws (2)
2. Slide off LED module
3. Select new wavelength (labelled on back)
4. **Align Polarity (Important-align '+' polarity with yellow strip on driver head)**
5. Tighten screws (2)



**Replacing LEDH with different wavelength**



**+ Polarity to yellow stripe**

## Attaching Collimators and C/CS mounts:

Use the knurled screws to attach the C/CS-mount or high performance collimators. Note that the collimators are intended to be used with the LEDH heads



There is a selection of collimators. The OH36-24X11 is configured to hold 1 inch filters, diffusers, polarizers, etc. Other accessories for use with the LEDH LEDs include fiber and light guide launchers, collinear or multiple color illumination, microscope adapters, and long range collimators that provide a compact spotlight.



**OH36-24X11 Collimator  
Mounted on HPLS-36-RS1 LED Socket  
Shown with HPLS-45 Box Drivers**

## Installing A Diffuser or Window onto OH36-38X17.5 Collimator



Insert filter or window into ring holder,



Position in place over front of Collimator



Tighten knurled screw or set screw

## Installing a Filter, Diffuser, or Window onto OH36-24X11 Collimator



Insert filter(s) polarizers, and/or diffusers into OH36-24X11.



Tighten set screws

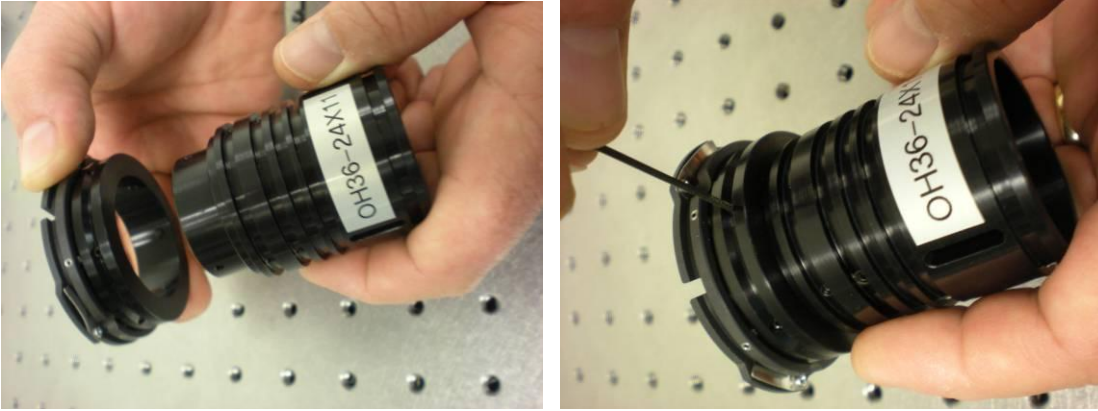
## Attaching FL25X0.5 to OH36-24X11 Collimator:

The FA-25X0.5 Light Launcher attaches to the OH36-24X11 collimator and focuses light into various FA-25 adapters to launch light into fibers, light guides, fiber bundles and other attachments.

The FA25X0.5 Light Launcher is shown below with FA-25X3POF which launches light equally into three 1mm plastic optical fibers. Other adapters available include SMA, Fiber bundle, light guides, etc.



## Attaching Adapter to OH36024X11 Microscope or Beam Cube Combiner:



Note: Install filters or polarizers into OH36-24X11 first. Fit adapter onto end of OH36-24X11 as shown and tighten the 6 set screws with the allen wrench that is provided with the kit.

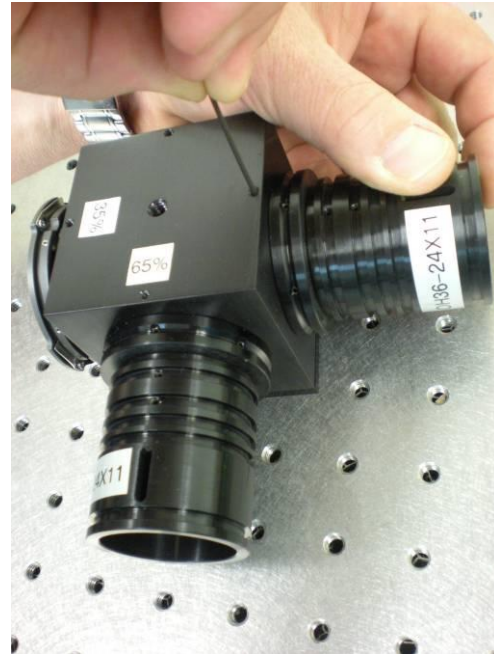
## OH36-CU36S Beam Combining Cube

The CU36 Beam Combining Cube can be used to combine the output of two HPLS Illuminators, providing analog linear control as well as high intensity flashes of illumination.

The CU36 can also be used to provide colinear illumination for cameras providing uniform brightfield illumination.



**Insert Collimator into selected port**



**Tighten Set Screw**

OH36-38X17.5 Collimators fit directly onto the CU36 Beam Combining Cube. OH36-24X11 collimators shown require additional adapter. This configuration is shown with a Nikon Bayonett adapter for attaching to a microscope.

**Accessories:**



LEDH: Use collimator  
OH36-24X11 holds 1  
inch diameter filters



Beam Splitter Cube –  
Co-linear Illumination  
or Multiple Color  
Illumination



FL-25X0.5 Filter Holder,  
Fiber and Light Guide  
Launcher



Long Range Variable  
Collimator – LED  
Spotlight

## **Getting the Most Power:**

If you want maximum Average power, run it in Analog mode; 5V on the input corresponds to 500mA to the LED.

If you want maximum pulse power, run it in Digital mode, but in this case the current to the diode is 3.5A for the AD3500 driver which is 8 times higher than maximum CW current. In other words, the diode is significantly "over clocked" beyond nominal CW current. If it would be supplied with 3.5A, it will be burned in about 5-20 ms. It depends on diode model. That is why the digital mode has "pulse limiting circuitry", to limit cumulative energy supplied to the diode to prevent burning it out.

Of course, the length of the TTL pulse does make a large difference in the intensity, but just the average intensity. Peak optical power remains stable; accurate to within 1%.

Collimators are generally designed to project the image of LED to about 1m distance (almost infinity for those small collimators supplied) at most backward position. Sliding it forward will bring image closer, down to 5-10cm, depends on the collimator model. So, there is no intended position. It is adjustable, to get the spot size and power, for a need for a particular setup. Even bigger lenses can be used to project the light on such a distance. For instance, if you would take a lens 50-70 mm diameter, 200mm EFL, put the solid reflector in the led housing, put the HPLS-36 in about focal point of the lens, you will be able to project the light further and into tighter spot than with the supplied collimators.

In general, LEDs have lower brightness than lasers, therefore it is just not possible to collimate them as well as laser beam; in turn, they have such a linear and predictable response over time and currents, that is just not possible in most laser systems.

## **Warranty and Return Conditions:**

Contact Lightspeed Technologies if there are any questions about the HPLS installation or operation.

The HPLS driver and optics are warranted for 1 year after delivery except if damaged by misuse or accident. LEDs are warranted for 90 days from delivery.

A return merchandise authorization (RMA) number is required to return products. Contact Lightspeed Technologies for a RMA number. Damage and determination if covered by warranty will be made by Lightspeed Technologies.

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