



Instruction Manual for Sandhouse Design's Fiber Optic  
Coupled LED Light source.

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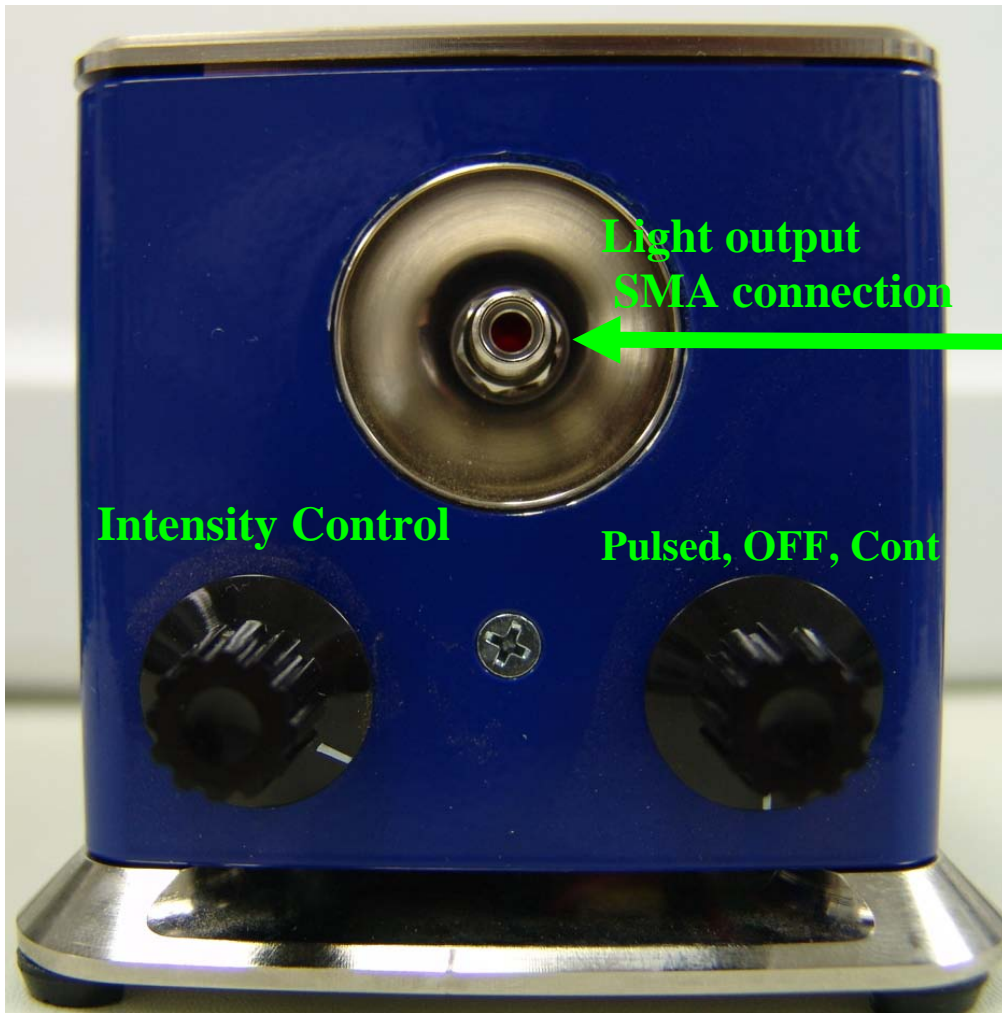
Sandhouse Design's LED light source (LLS) is engineered to be a versatile tool for scientific and general lighting applications. Light is coupled directly into a fiber with the highest efficiency possible via the SMA 905 connection. The user can adjust the optical intensity in continuous (CW) and pulse modes. The LLS supports a 'pulse mode' to allow higher current and thus higher optical power when in pulsed mode. The LLS module is designed to accommodate external control of intensity, pulse and lamp on/off. This system also has the ability to have interchangeable light modules. Please see the list of available modules in this document or our website for more details.

## 1.0 User Controls

The LLS Light source features two control knobs on the front. The knob on the right controls the input mode. The switch turned fully clockwise is the continuous mode, "off" is the middle position and fully counter-clockwise is pulse mode. Remember that an external trigger is required for pulsing. This can be accomplished via a cable connected to your electronics, or through an optional USB controller.

The left knob controls intensity. Turn clockwise for maximum intensity. The intensity control will work in both pulse and continuous modes.





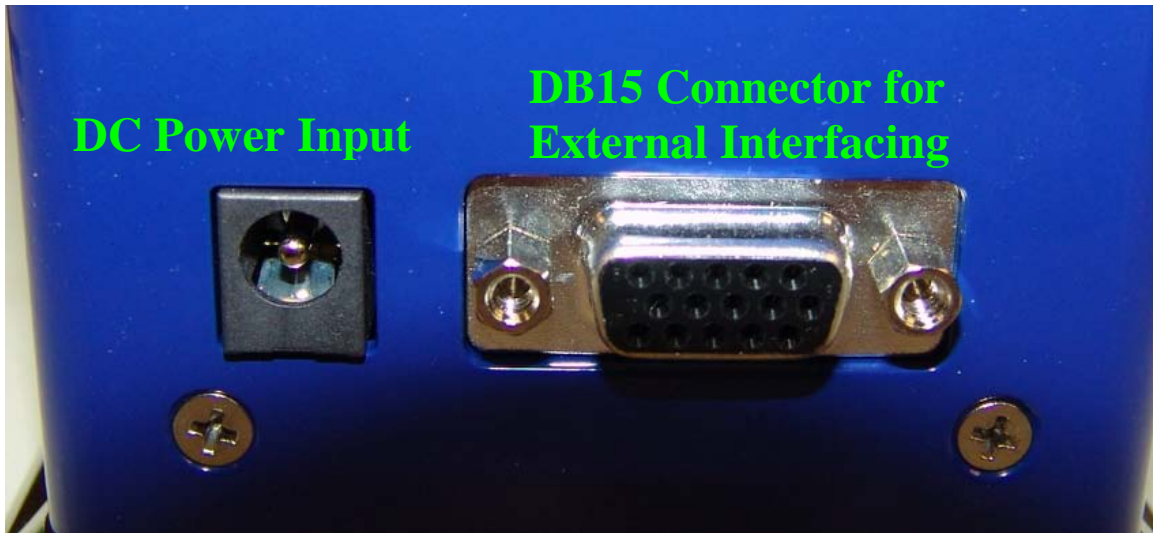
**Figure 1: Front of LLS**

## **2.0 External Interface:**

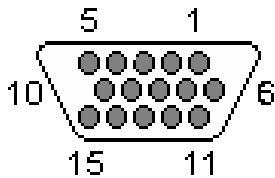
External interface is accomplished through a female High Density DB15 connector (Figure 2). All external signals are TTL compatible and will work with 3.3V or 5V logic. Please see Figure 3 for a pin map and Table 1 for a complete list of pins.

The lamp can be externally turned off when in continuous mode by controlling pin 3. The signal is internally pulled high and will return to “on” when no low level signal is present.

Pin 1 is the external trigger for pulse mode. Please see section 3.0 External Triggering for more detailed information. Never modulate this pin with a greater duty cycle and current than recommended by the LED manufacturer as damage to the LED can result.



**Figure 2: Back Of LLS**



**Figure 3**

**Table 1.**

[DB15 connector Interface](#)

PIN	Function
1	Pulsed Input (rising edge). Use this pin for Pulsed mode
2	Pulse end output( This pin goes high at the end of the internal fixed length pulse).
3	Lamp enable used in CW only)
4	5 volt output. Can be used to power external controller.
5	Address line A1 (for onboard EEPROM) 24LC64
6	Address line A2 (for onboard EEPROM) 24LC64
7	I2C SCL
8	I2C SDA
9	Ground
10	Ground
11	3.3.V in (Only required for accessing memory
12	N/C
13	N/C
14	N/C
15	Analog Control Input (requires a jumper change to use.) Never exceed 2.5Volts into this pin.

### 3.0 External Triggering and Control

There are two sets of internal jumpers located on the main PCB board. These are accessible by removing the four screws located on the top of the light source. J5 controls the modulation mode and switches the control from single trigger to direct modulation. J6 selects the source of the analog control voltage.

**Internal/External Control (J5):** When in the EXT position, as shown in Figure 4, modulation will follow the external TTL input control directly. When in the INT position it will switch to a 500  $\mu$ s pulse which triggers on a rising edge. This feature is extremely important when modulating deep UV LEDs (250nm-355nm). These LEDs should not be modulated faster than 150Hz. All other LEDs can be modulated up to 1 kHz. The circuit for these UV LEDs is pre-configured to deliver a 200mA maximum pulse current. The LLS comes pre-configured to work in this internal pulse width mode.

#### Intensity Control Jumper (J6)

When externally controlling the intensity, the control input channel must be set via the external control jumper to coordinate with the desired input channel. The control input voltage is from 0 to 2.5 Volts. The drive current will proportionally follow this voltage. For example, if the control voltage is 1.25 Volts, the LED will be driven 1.25/2.5 Volts or 50% of the maximum current. Therefore if the LED circuit is configured for 1500mA maximum, the drive current will be 750mA. (See Table 2 for current drive specifications). Do not drive this voltage with more than 2.5 Volts as damage to LEDs may occur. This control will work for both Pulse and CW modes.

The jumpers are located by removing the four screws at the top of the light source and accessing these connectors on the main board.

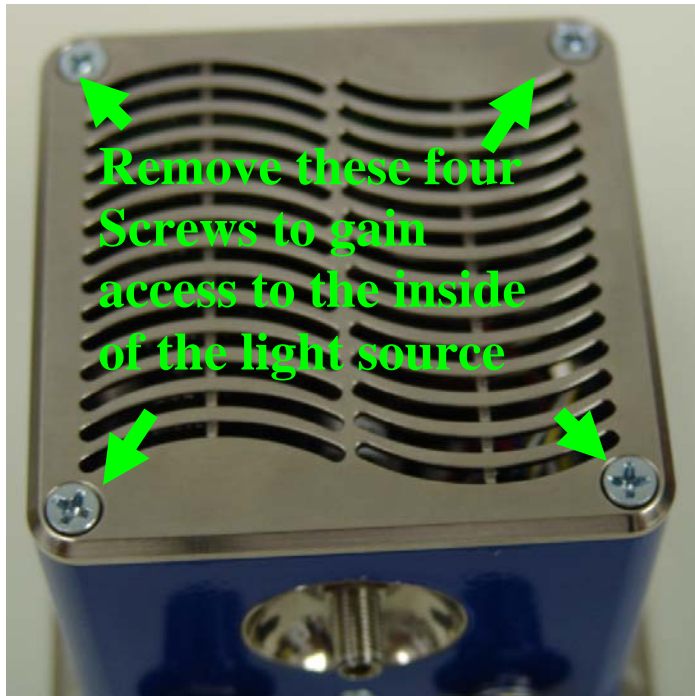
### External Power requirements

#### Power Requirements

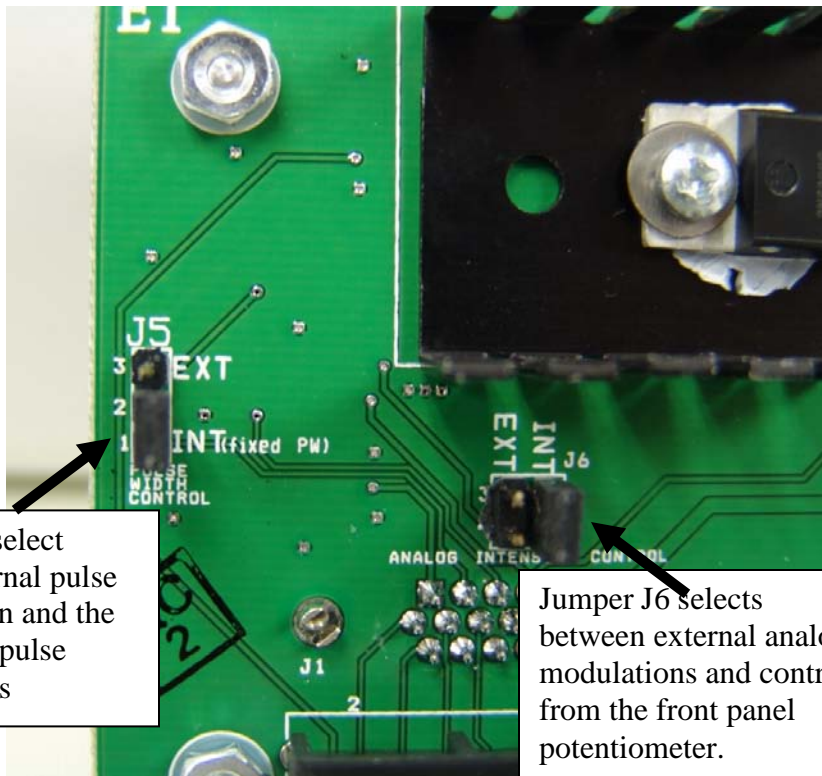
Wavelengths 250nm - 355nm	9 Volts 200mA
Wavelengths 365nm - 627nm and Visible	6 Volts, 3000mA

#### Power Plug

2.1mm ID, 5.5mm OD
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**Figure 3: Top view of LLS**



Jumper J5 to select between External pulse width selection and the internal fixed pulse width of 500us

Jumper J6 selects between external analog modulations and control from the front panel potentiometer.

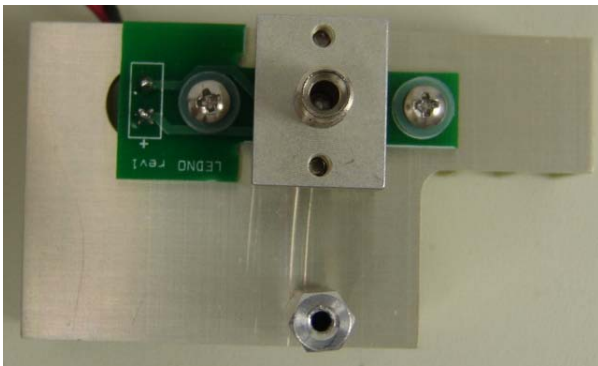
**Figure 4: View of Jumpers on LLS board.**

## 4.0 Exchanging LED modules.

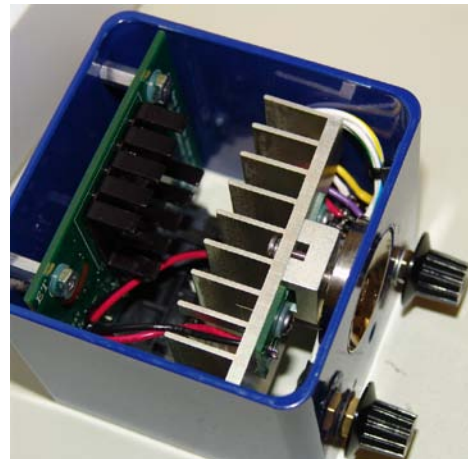
LED modules can be easily exchanged in the LLS. Each LED module has a small Printed Circuit Board that programs the drive current for the device attached to it. Therefore there is no need to worry about driving too much current into the new LED module. Just plug it in and go.

It is not recommended to replace LEDs without exchanging the included module. These modules also have EEPROM memory that store critical information about the devices. These EEPROM memory are read by our external USB controller and can identify which LEDs are in which locations.

There are two types of modules. High Power and fiber coupled. The High power modules have an attached heatsink. To replace these it is necessary to have a 5/16" nut driver and Phillip's head screw driver. A picture of this module is shown in Figure 5 and installed in Figure 6.



**Figure 5: High Power LED Module**

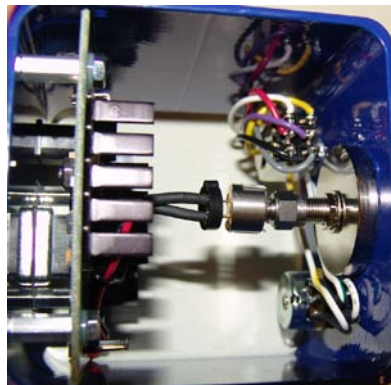


**Figure 6: Installed High Power**

The second type of module is the fiber coupled LED. This one has an SMA connection, so that it can be simply screwed into the SMA connection through the front panel of the light source.



**Figure 7: Fiber Coupled LED**



**Figure 8: Installed Fiber Coupled**

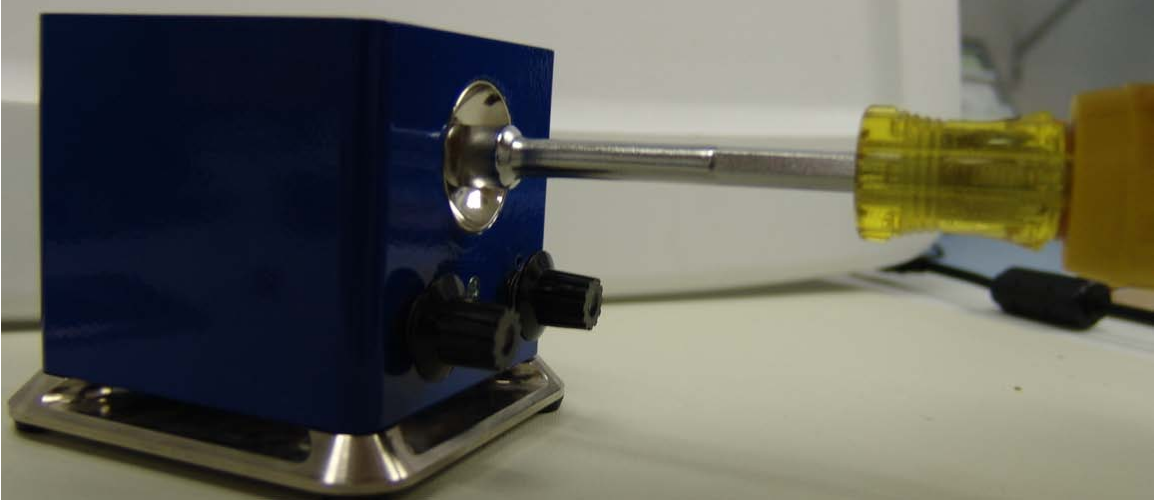


Figure 9: Removal of a high power LED module.

The LEDs all use the same style of module to plug into the LLS board. This can be accessed at the bottom of the LLS box. As shown in Figure 9. The LED module board can be unplugged by simply pulling it out of its “blind mate” socket. (Gently rocking the connector from side to side helps to loosen it).

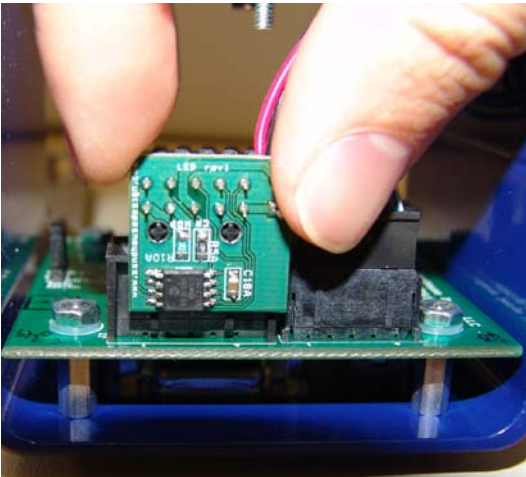


Figure 10: Removing LED connection board.

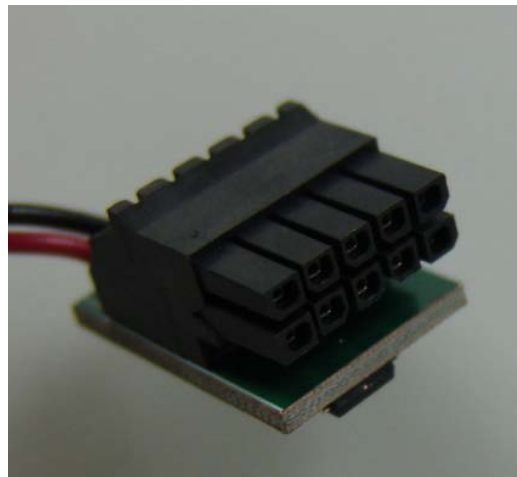


Figure 11:View of LED daughter

## Table 2: Available LEDs and modules.

Part #	Wave-length	FWHM	Min Power coupled into a 600um .22NA fiber	Maximum Drive Current CW	Maximum Drive Current Pulsed	Maximum duty Cycle in pulsed mode
LLS-240	240	10 nm	2μW	20mA	200mA	1%
LLS-245	245	10 nm	2μW	20mA	200mA	1%
LLS-250	250	12 nm	5μW	20mA	200mA	1%
LLS-255	255	12 nm	5μW	20mA	200mA	1%
LLS-260	260	12 nm	15μW	20mA	200mA	1%
LLS-265	265	12 nm	15μW	20mA	200mA	1%
LLS-270	270	12 nm	15μW	20mA	200mA	1%
LLS-275	275	12 nm	15μW	20mA	200mA	1%
LLS-280	280	12 nm	15μW	20mA	200mA	1%
LLS-285	285	12 nm	15μW	20mA	200mA	1%
LLS-290	290	12 nm	15μW	20mA	200mA	1%
LLS-295	295	12 nm	15μW	20mA	200mA	1%
LLS-300	300	12 nm	15μW	20mA	200mA	1%
LLS-305	305	12 nm	15μW	20mA	200mA	1%
LLS-310	310	10 nm	15μW	20mA	200mA	1%
LLS-315	315	10 nm	15μW	20mA	200mA	1%
LLS-325	325	12 nm	15μW	20mA	200mA	1%
LLS-335	335	15 nm	20μW	20mA	200mA	1%
LLS-345	345	15 nm	20μW	20mA	200mA	1%
LLS-355	355	15 nm	20μW	20mA	200mA	1%
LLS-365	365	10nm	1mW	500mA	1000mA	50%
LLS-375	375	12nm	750μW	500mA	1000mA	50%
LLS-385	385	10nm	1mW	500mA	1000mA	50%
LLS-395	395	15nm	200μW	30mA	60mA	50%
LLS-405	405	15nm	750μW	500mA	1000mA	50%
LLS-415	415	15nm	200μW	30mA	60mA	50%
LLS-430	430	15nm	200μW	30mA	60mA	50%
LLS-455	455	18nm	1mw	1000mA	2000mA	50%
LLS-470	470	18nm	1mw	1000mA	2000mA	50%
LLS-490	490	20nm	1mw	1000mA	2000mA	50%
LLS-505	505	20nm	1mw	1000mA	2000mA	50%
LLS-530	530	30nm	750μW	1000mA	2000mA	50%
LLS-590	590	20nm	750μW	700mA	1500mA	50%
LLS-617	617	20nm	750μW	700mA	1500mA	50%
LLS-627	627	20nm	750μW	700mA	1500mA	50%

LLS-680	680	20nm	200 $\mu$ W	50mA	100mA	50%
LLS-Cool White	6500K CCT	N/A	1mw (measured at 550nm)	1000mA	2000mA	50%
LLS-Neutral White	4100K CCT	N/A	1mw (measured at 550nm)	1000mA	2000mA	50%
LLS-Warm White	3000K CCT	N/A	1mw (measured at 550nm)	1000mA	2000mA	50%

**Revisions:**

Rev 1.1 4/25/08 Updated the pulse time.

Rev 2.1 7/18/09 Updated interchangeable modules and new pictures