User's Guide

LED Solar Simulator
LSH-7320

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Safety and Warranty Information

✓ Details about cautionary symbols
✓ Safety markings used on the instrument
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Safety Information and the Manual

Throughout this manual, you will see the words Caution and Warning indicating potentially dangerous or hazardous situations which, if not avoided, could result in death, serious or minor injury, or damage to the product.

⚠ **CAUTION**

Caution indicates a potentially hazardous situation which can result in minor or moderate injury or damage to the product or equipment.

⚡ **WARNING**

Warning indicates a potentially dangerous situation which can result in serious injury or death.

General Safety Considerations

If any of the following conditions exist, or are even suspected, do not use the instrument until safe operation can be verified by trained service personnel:

- Visible damage
- Severe transport stress
- Prolonged storage under adverse conditions
- Failure to perform intended measurements or functions

If necessary, return the instrument to Oriel Instruments, or an authorized local Oriel Instruments distributor, for service or repair to ensure that safety features are maintained.

All instruments returned to Oriel Instruments are required to have a Return Merchandise Authorization Number assigned by an official representative of Oriel Instruments. See Returning an Instrument for more information.

Safety Symbols

This section describes the safety symbols and classifications.

Technical specifications including electrical ratings and weight are included within the manual. See the Table of Contents to locate the specifications and other product information.

- Indoor use only

- Ordinary Protection: This product is NOT protected against the harmful ingress of moisture.

- IEC Class I Equipment (grounded type)

- Mains supply voltage fluctuations are not to exceed ±10% of the nominal supply voltage.

- Pollution Degree II

- Installation (overvoltage) Category II for transient over-voltages

- Maximum Relative Humidity: <85% RH, non-condensing

- Operating temperature range of 20 °C to 30 °C

- Storage and transportation temperature of –40 °C to 70 °C

- Maximum altitude: 3000 m (9843 ft.)

- This equipment is suitable for continuous operation.

Safety Marking Symbols

This section provides a description of the safety marking symbols that may appear on the instrument. These symbols provide information about potentially dangerous situations which can result in death, injury, or damage to the instrument and other components.

Symbol	Description
⚠	Caution, refer to manual
⚡	Caution, risk of electric shock
⏚	Earth ground Terminal
⏚	Protective Conductor Terminal
∿	Alternating current
⏚	Frame or chassis terminal
DANGER LASER RADIATION AVOID DIRECT EYE EXPOSURE 630-680 nM / 4mW CLASS IIIA LASER	Laser radiation hazard
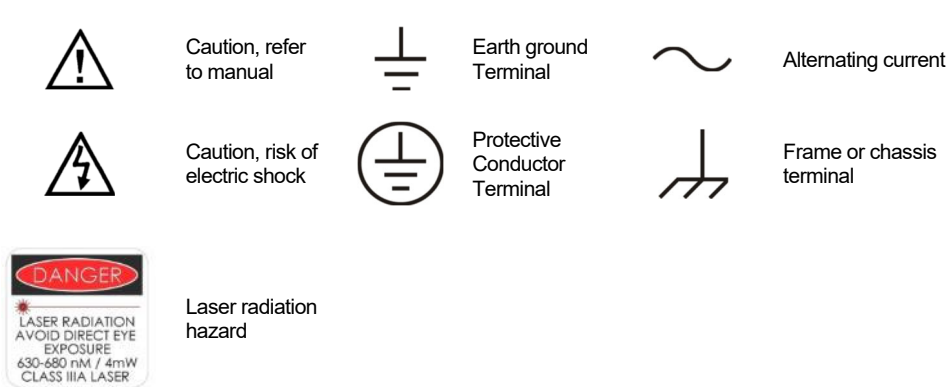
Warranty

Oriel Instruments warrants this instrument to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Oriel Instruments will repair or replace the unit, at our option, without charge.

Limitations

This warranty does not apply to fuses, defects caused by abuse, modifications, or to use of the product for which it was not intended.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for any particular purpose. Oriel Instruments shall not be liable for any incidental, special, or consequential damages.

If a problem occurs, please contact Oriel Instruments with the instrument's serial number, and thoroughly describe the nature of the problem.

Returning an Instrument

If an instrument is to be shipped to Oriel Instruments for repair or service, be sure to:

- Obtain a Return Merchandise Authorization number (RMA) from Oriel Instruments' Customer Service.

- Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number from the rear panel of the instrument.

- Attach the anti-static protective caps that were shipped with the instrument.

- Place the instrument in the original packing container with at least 3 inches (7.5 cm) of compressible packaging material. Shipping damage is not covered by this warranty.

- Secure the packing box with fiber reinforced strapping tape or metal bands.

- Send the instrument, transportation pre-paid, to Oriel Instruments. Clearly write the RMA number on the outside of the box and on the shipping paperwork. Oriel Instruments recommends you insure the shipment.

- If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

Once repairs have been made, the instrument will be returned with transportation pre-paid. Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

Claims for Shipping Damage

When you receive the instrument, inspect it immediately for any damage or shortages on the packing list. If the instrument is damaged, file a claim with the carrier. The factory will supply you with a quotation for estimated costs of repair. You must negotiate and settle with the carrier for the amount of damage.

Comments, Suggestions, and Problems

To ensure that you get the most out of your Oriel product, we ask that you direct any product operation or service related questions or comments to Oriel Instruments Customer Support.

Customer Support Contact:

Phone: (949) 863-3144
Fax: (949) 253-1680
E-mail: PV.sales@newport.com
Web: www.newport.com\oriel

Shipping and Mailing Address:

Oriel Instruments
31950 East Frontage Road
Bozeman, Montana, U.S.A 59715-8642

When you contact us, please have the following information:

- ✓ Model Number
- ✓ Serial Number
- ✓ End-user Name
- ✓ Company
- ✓ Phone
- ✓ Fax
- ✓ Description of the problem

If Oriel Instruments determines that a return to the factory is necessary, you will be issued a Return Merchandise Authorization (RMA) number. Please mark this number on the outside of the shipping box.

You and your shipping services are responsible for any shipping damage when returning the instrument to Oriel Instruments. Oriel recommends you insure the shipment. If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

We look forward to better serving you in the future!

Chapter 1:
Introduction and Specifications

This chapter is an introduction to the LSH-7320 LED Solar Simulator. With breakthrough LED technology, the LSH-7320 LED Solar Simulator provides a compact solar simulator solution while delivering ABA-rated performance in spectral, uniformity and temporal stability.

- ✔ Safety Considerations and unpacking information
- ✔ Product Overview
- ✔ Options and accessories
- ✔ Specifications

Safety Considerations

⚠ WARNING

If any of the following symptoms exist, or are even suspected, remove the LSH-7320 from service:

- **Visible damage**
- **Severe transport stress**
- **Prolonged storage under adverse conditions**
- **Failure to perform intended measurements or functions**

Do not use the LSH-7320 until trained service personnel can verify safe operation. If necessary, return the LSH-7320 to Oriel Instruments for service and repair to ensure that safety features are maintained.

Initial Inspection

When you receive your LSH-7320 LED Solar Simulator, verify that the following items were shipped with the instrument:

- LSH-7320 LED Solar Simulator
- Power Cord
- AC/DC Power Supply
- LSH-7320 Vertical Adjustment Assembly
- Shipping Kit
- USB Thumb Drive (Includes Manual and Test Data)
- Screws for Assembly
- 3/16" Ball Hex Driver

Note: The optical bread board is sold separately.

Product Overview

Newport is proud to introduce the Oriel$^{®}$ MIniSol LSH-7320 LED Solar Simulator. Designed to meet the specific needs of the Photovoltaic (PV) research market, the MiniSol is certified for class ABA—Spectral Match, Non-Uniformity of Irradiance, and Temporal Stability[*]. The MinSol drives multiple wavelengths of LEDs across a spectrum—from 400 nm – 1100 nm insuring a spectral match of AM1.5G in order to meet Class A requirements. Oriel Instruments puts each LED-based system through rigorous testing to insure compliance and to provide a certificate of calibration. Our system provides a variable output from 0.1 SUN – 1.1 SUN over a 2" × 2" illumination area at a specified working distance.

An independent head includes device controls, LEDs, and optics to allow users flexible mounting and orientation options. External remote on/off triggering and long lamp life make remote mounting practical, bringing LED technology to applications requiring only ABA ratings. The typical lifetime of LEDs of over 10,000 hours removes the need to change expensive and hazardous bulbs. The LEDs can come up to a stable operating power within a 5-minute warm up period. This allows the unit to be shut off in between tests without having to wait for the lamp to stabilize or sacrificing the integrity of test results. This results in an effective lamp usage time several times over a conventional lamp and eliminates the need for shutters on the output.

MiniSol Model LSH-7320 Features:

- Fast Turn on Time, < 100ms – No Shutter Required.
- 10,000 Hour LED Lifetime.
- Independent Head – includes All Controls, LEDs and Optics.
- Multi-Position Head for Flexible Mounting and Orientation Options.
- USB External Remote On/Off Triggering.
- PV Cell Placement Indicator.
- Optical Support Rod for Height Adjustment.
  SUNSUNSUN
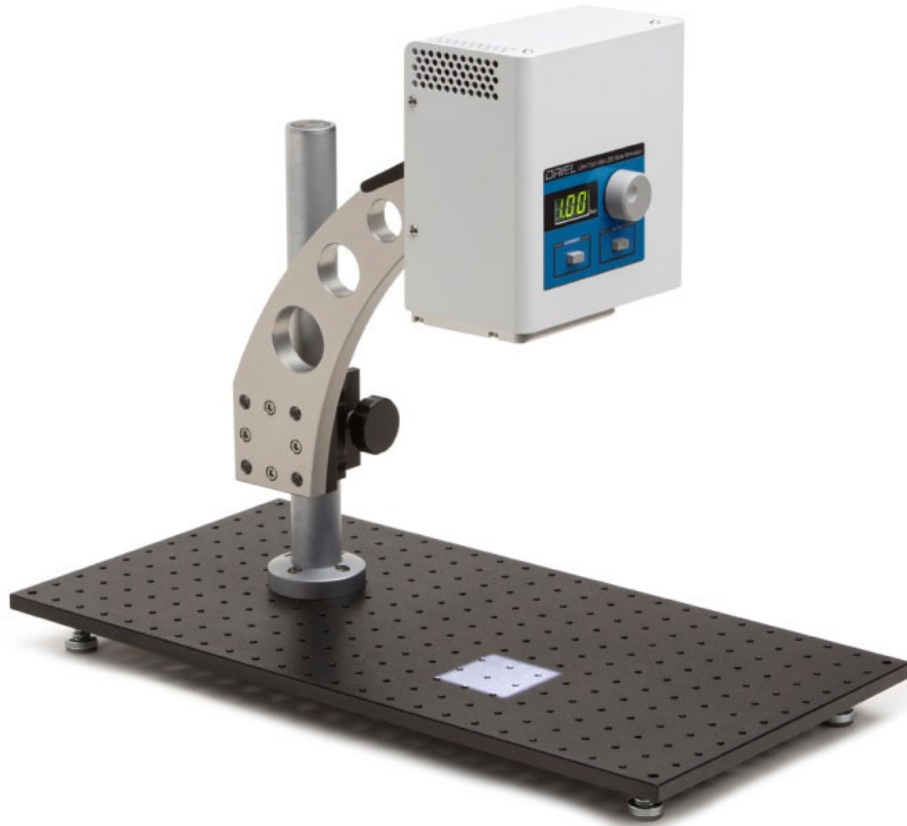
Figure 1.1 – LSH-7320 LED Solar Simulator Assembly*

* Newport SA2 breadboards sold separately.

Options and Accessories

DESCRIPTION	MODEL / PART NUMBER
Class ABA LED Solar Simulator	LSH-7320

Options and accessories available for LSH-7320 LED Solar Simulator:

DESCRIPTION	MODEL / PART NUMBER
Solid Aluminum Optical Breadboard, 12 x 24 in., 1 in. 1/4-20 Grid	SA2-12
Solid Aluminum Optical Breadboard, 300 x 600 mm, 25 mm M6 Grid	M-SA2-12

Specifications

PERFORMANCE SPECIFICATIONS[1]	
Illumination Area (in.) [mm]	2 x 2 [50 x 50]
Maximum Output Power	110 mW/cm2 (1.1 SUN)
Variable Output Control	0.1 to 1.1 SUN
Wavelength Range	400 – 1100 nm
Nominal Working Distance (inches) [mm]	12.0 +/- .5 [304 +/- 12]
Alignment	Laser Diode-Based Optical Alignment
Z Axis Head Adjustment from Base (inches) [mm]	7.5 – 17.75 [190 – 450]
Head Rotation[2]	0 – 360°
Remote Interface	USB 2.0 (B-Type) or BNC TTL for ON/OFF
TTL Turn On/Off Transition Time	10 ms

1. All values are specified after a five minute warm up period.
2. Indents on the mounting plate at 0°, 90°, 180°, and 270° orientations.

ELECTRICAL AND MECHANICAL SPECIFICATIONS	
Weight lbs. [kg]	
Head	9.3 [4.2]
Stand	9.0 [4.1]
Power Supply	1.8 [0.8]
Head Dimensions inches [mm]	
Height	7.7 [197]
Width	7.2 [182]
Depth	4.2 [106]
Dimensions (on vertical assembly stand) inches [mm]	
Height	15.25 – 25.5 [387 – 648]
Width	7.15 [182]
Depth	14.0 [362]
Operating Temperature Range (°C)	10 to 40
Storage Temperature Range (°C)	-40 to 70
Humidity	<85%, relative, non-condensing
Power Requirements	100-240 VAC, 47-63 Hz, 2.8A max
CERTIFICATIONS	
CE Certification	Yes
Spectral Irradiance scan[1]	250 – 1700 nm at 1 SUN
Spectral Match Classification[2]	A- IEC 60904-9 (2007), JIS 8904-9 (2017)
Uniformity Classification[2]	B- IEC 60904-9 (2007), JIS 8904-9 (2017)
Temporal Stability Classification[2,3]	A- IEC 60904-9 (2007), JIS 8904-9 (2017)

1. Provided with the Class ABA test data on the USB thumb drive
2. At conditions as reported in the test data
3. Class A per IEC 60904-9 (2007) section 5.4.2

Chapter 2:
Assembly Instruction

This chapter describes the assembly process for the LSH-7320 system. The LSH-7320 kit includes the following parts:

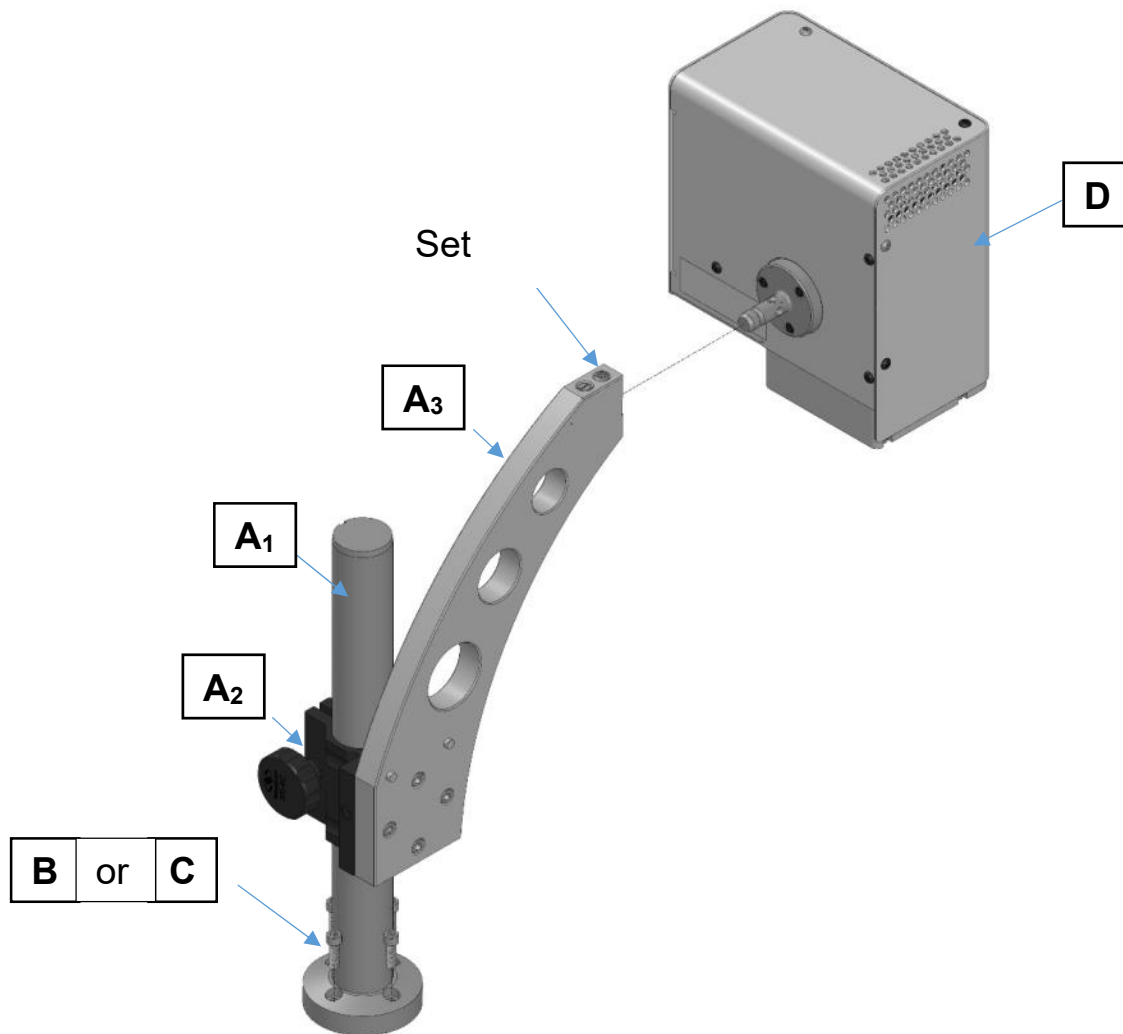| A	1	Newport Model 75 damped support rod (1), Model 370-RC Rack-and-pinion rod clamp (2), and attached arm (3) comprising the Vertical Adjustment Assembly
B	4	¼-20 x ¾ socket head cap screws
C	4	M6 x 20mm socket head cap screws
D	1	LSH-7320 solar simulator head

Figure 2.1 - LSH-7320 Solar Simulator Assembly

Tools Required:

- 3/16th inch Ball Point Hex Driver (provided)
- 5mm Ball Point Hex Driver for assembly to metric optical bread board only

Step 1: Mount A_1 to an optical table or breadboard, using B or C.

⚠ **CAUTION**

Be careful to select the correct screws for your bread board. Selecting the wrong screws may damage the screw and bread board hole threads.

Step 2: Ensure that A_2 is locked by tightening the locking knob.

Step 3: Install D by aligning the axle to the hole in A_3 and pushing until the parts bottom out.

⚠ **CAUTION**

The LSH-7320 LED Head is fragile. To avoid personal injury or damage to the unit it is advised that you get assistance when mounting the head to the vertical assembly.

Step 4: Tighten the set screw in A_3 using a 3/16-inch ball-driver. The set screw will establish the desired orientation in one of four orthogonal orientations.

Step 5: Install power supply by plugging the mini-DIN connector into the LSH-7320 solar simulator head.

Step 6: Plug power supply into an AC outlet.

90 Degree Head Mounting Instructions

The LSH-7320 may be installed in a 90° or 180° orientation by following these simple directions:

Set screw

Figure 2.2 - 90 Degree Head Mounting
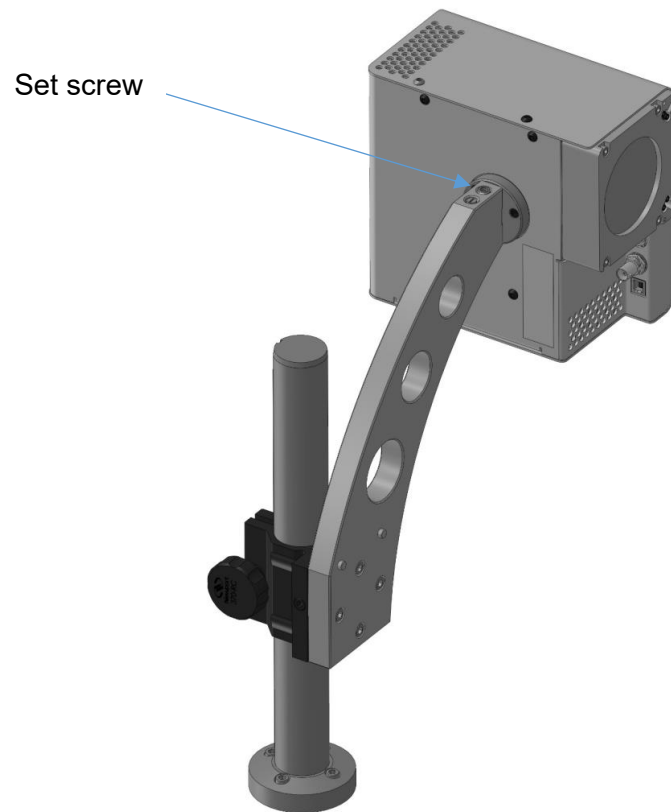
Step 1: Loosen the set screw in the support arm using a 3/16-inch ball-driver. Rotate the head to the desired orientation.

Step 2: Tighten the set screw, which will establish the desired orientation in one of four orthogonal orientations.

Step 3: Install power supply by plugging the mini-DIN connector into the LSH-7320 solar simulator head, then plugging into an AC outlet.

Chapter 3:
General Operation

This chapter is an overview of the operation of the LSH-7320 Solar Simulator.

- ✓ Power requirements
- ✓ Front panel operation
- ✓ General operating procedures

Grounding Requirements

The LSH-7320 solar simulator comes with an external DC power source, which in turn has a three conductor AC power cable. The power cable must be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adaptor with the grounding wire connected to an electrical ground (safety ground). Oriel Instruments recommends connecting the instrument only to properly earth grounded receptacles. The power cord connector and power cable meet IEC safety standards.

AC Line Power Requirements

The LSH-7320 solar simulator can operate at line voltages between 100 and 240 VAC.

The Power Up Sequence

⚠ WARNING

Prior to power up ensure the fan inlet located on the bottom of the instrument as well as the exhaust holes on the side of the instrument have no obstructions that would impede airflow.

An external power source supplies DC power to the instrument. When the LSH-7320 receives power it initiates a power up sequence.

During the power up sequence, the LSH-7320 performs a self-test to ensure that the internal hardware and software are communicating. After the self-test, the LSH-7320 output power configuration is set to its saved value, described in the "Output On Button & Adjustment Knob" section below. The output is initialized to the off state.

Firmware Upgradeability

The firmware on the LSH-7320 can be upgraded via USB. Contact Oriel Instruments technical support for information on upgrading the firmware.

USB Communication

The USB connector is located on the rear panel. The USB connector is the square "B"-type connector. A standard USB A/B cable is required to communicate with the instrument. Please refer to Chapter 4 for more detailed instructions on operating the instrument using a USB-type connection.

Trigger Input

The LSH-7320 can be turned on/off by external TTL input (2 ~ 5V).

⚠ **CAUTION**

The LED head emits wavelengths in the Near IR bands. These wavelengths are not visible to the human eye. Caution should be taken when pointing the light upwards or to the side to ensure operators do not look directly into the output port of the head.

Front Panel Operation

This section describes the fundamentals of operation for the LSH-7320 solar simulator.

Connect the LSH-7320 power supply to the external DC power source. When powered on, the LSH-7320 will follow the power up sequence described earlier in this chapter.

Numerical Display

The numeric display consists of three seven-segment LED displays. The display provides an AM1.5G normalized output intensity in SUN. In normal operation it displays the output power at the working plane.

Output "On" Button & Adjustment Knob

Pressing the Output button turns the output on and off. When the output is on, the light emits from the solar simulator. When the output is off, the LEDs are turned off.

If the output-on button is pressed to turn on the output, but there is no light out then please refer to Chapter 7 for more detailed instructions on troubleshooting.

The knob adjusts output power. In the normal operating mode the total output intensity is adjusted when the knob is turned. The relative output percentage difference between each LED is maintained throughout the adjustment range.

The output power setting is saved after 10 seconds of stable operation at a point set by the adjustment knob. This saved setting is restored when the instrument is powered on.

Instrument uses factory determined amplitude values for each LED corresponding to the AM1.5G spectrum as a percentage of a 1.00 SUN output. The overall output intensity does not change but the relative percentages of output remain consistent with an AM1.5G spectrum.

Note that the Adjustment knob is disabled while operating remotely.

LSH-7320 LED Head Operation

The LSH-7320 is designed to reduce the amount of user adjustment required to ensure a uniform consistent output. The only user adjustment to the LED Head is the height adjustment and head orientation.

Working Plan Height Adjustment

The LSH-7320 LED head is calibrated at the factory at the specified working height stated on the calibration certificate. To ensure the irradiance measurement displayed on the front panel of the LSH-7320 controller is within specification, the working plane needs to be adjusted to the calibrated working height below the output lens. Adjusting the working plane will also affect the illumination area and uniformity.

To aid in setting the correct working plane height the LSH-7320 has a pair of red laser pointers to indicate the height the unit was calibrated to at the factory. The laser pointers can be turned on by the Alignment button on the front panel.

The height adjustment knob with the Newport logo located on the Model 370-RC vertical height adjustment can be turned to move the head up and down. The opposite side of round knob allows for locking the position. The procedure for adjustment is as follows:

1. Place the test sample under the LED head light source.
2. Turn the Laser Pointers on via Alignment button on the front panel.
3. Adjust the height of the head with the height adjustment knob until the two red dots intersect. You are now at the calibrated working plane.
4. Lock the height adjustment locking knob and turn the laser pointers off by selecting the Alignment button again.

Head Orientation

The LSH-7320 can be oriented with the light source facing down, up, or to either side. The orientation does not affect the calibration or operation of the unit. The user should show extra care not to place anything on the unit when the light source is facing upward. Scratches and/or dirt on the output optics will affect the irradiance parameters.

The head has indents at 90° and 180° for easy alignment at 0°, 90°, 180°, and 270°. In addition, the head can be rotated from 0-360° and locked in any position. See Chapter 2 for assembly instructions.

Chapter 4:
Remote Operation

This chapter is an overview of the remote operation of the LSH-7320 Controller.

✓ Fundamentals of Remote Operation
✓ Command Syntax

USB (abbreviation of Universal Serial Bus) is an industry standard that establishes specifications for cables, connectors and protocols for connection, communication and power supply between computers and their peripheral devices. The following sections explain the fundamentals of operating the LSH-7320 remotely through the USB computer interface. The LSH-7320 is designed to conform to the USB Mass Storage Interface Class, which is the same interface as used on memory sticks. This device is considered a component of the Small Computer System Interface (SCSI) interface subclass. No driver installation is needed since most operating systems support USB mass storage devices.

USB Communication

Commands to the device can be given by reading and writing to sector 100000. Newport provides a Dynamic Link Library (dll) for Windows operating systems as well as a programming example in C#.

- The dll file is called "BasicDLL.dll" and is located on the USB drive supplied with the instrument in the "LSH-7320 App" directory.

- The C# example program is called "npt-sim.exe" and located in the "LSH-7320 App" directory. The source code is found in the "src" subdirectory, and may be viewed and modified using Microsoft Visual Studio by opening in the C# project file, "npt-sim.csproj."

- Operating the head remotely disables the Front Panel Adjustment Knob.

Command Syntax

This section describes command syntax and structure. This information must be understood in order to effectively write a control program. The syntax of commands follows the rules defined in the Standard Commands for Programmable Instruments (SCPI v1999.0) standard. This standard is based on the IEEE 488.2 standard.

Letters

Commands must contain all of the letters shown in uppercase in the command definition. Optional letters shown in lowercase for some device dependent commands in the command reference (Chapter 4) are useful for clarity. If any of the optional letters are included, they must all be included, and in the correct sequence. The LSH-7320 accepts either upper or lower case. Some examples of what works and what does not are shown below:

DEFINITION	ACCEPTABLE	NOT ACCEPTABLE
OUTput	OUT or output	OU or outp
AMPLitude	AMPLitude or AmPL	AMP or AMPLIT

White Space

"White space" is any number of space characters (space bar). A white space must separate a command from its parameters or data. For example:

ACCEPTABLE	NOT ACCEPTABLE
output 1	Output1

A query has no space between the mnemonic and the question mark. For example:

ACCEPTABLE	NOT ACCEPTABLE
*IDN?	*IDN ?

Terminators

A program message terminator identifies the end of a command string. Valid terminator sequences are <LF> (linefeed), <CR> (carriage return) and <CR><LF > (carriage return / line feed). The LSH-7320 terminates its responses with <CR><LF>.

Command Separators

More than one command may be placed in the same command string if each command is separated by a semicolon. The semicolon can be preceded by one or more spaces. For example:

> OUTPUT ON;*IDN?;SYSTEM:ERROR?

> OUTPUT ON ; *IDN?;   SYST:ERROR?

The instrument will respond to multiple queries within the same command string by separating each response with a command separator.

Parameters

Some commands require a parameter. The parameter must be separated from the command by white space.

The syntax symbol <numeric_value> refers to the flexible numeric representation described by section 7.7.2.1 of IEEE 488.2. Some numbers may be represented with or without a decimal point and with or without exponent. Whitespace is not accepted on either side of the decimal or after the sign character, but is acceptable on either side of the "e/E" exponent character. For example the number "twenty" may be represented by any of the following ASCII strings:

FORMAT	EXAMPLE 1	EXAMPLE 2 (W/ SIGN)
Integer	20	+20
Floating Point	20.0	+20.0
Scientific Notation	2 E 1 2.0e+1	+2.0E+1 +2.0 e1

Refer to the command reference section to determine what forms of parameters a command accepts.

Chapter 5:
Command Reference

This chapter is a guide to all of the commands for the LSH-7320. This chapter is divided into two parts.

- ✓ Overview of the remote commands
- ✓ List of remote commands in alphabetical order

Remote Command Reference Summary

This section contains all of the commands for the LSH-7320.

Table 4.1 – Remote Command Summary

NAME	FUNCTION
*IDN?	Returns the Device Identification string.
AMPLitude	Sets the output amplitude in SUNsSUN
AMPLitude?	Reports the output amplitude in SUNsSUN
LEDTEST	Perform LED test: turns LEDs on sequentially
LEDTEST:RESULT?	Reports the results of the LED test
LEDTEST:HOURs?	Report the number of hours of ON time of the unit
SYSTem:ERRor:COUNt?	Reports the number of errors in the error queue
SYSTem:ERRor[:NEXT]?	Queries the errors in the error queue.
ERRor?	Queries the errors in the error queue (alternate)
OUTput ON|OFF|1|0	Turn output (light) on|off
OUTput?	Reports output status
STATus?	Report a list of LEDs that are in fault state

Command Reference

The following pages contain a reference of commands for the LSH-7320 LED Controller.

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*IDN?
Instrument Identification

Description	Requests the instrument to identify itself
Parameters	None
Notes	Returns a string of instrument identification information. The string contains a comma separated list of manufacturer, model number, serial number, and firmware revision.
Examples	"*IDN?" Responds with "NEWPORT, LSH-7320, 1234, 0x8100"

AMPLitude <SUNs>
AMPLitude?

Description	Sets or reports the output power of the Head relative to number of SUNs (1 kW/m^2)
Parameters	SUNs – output intensity

STATus?

Description	Requests the status of the LSH-7320.
Response	A decimal number containing bit-encoded information: If bit 0 is set, the output is on. If bit 1 is set, there is an open circuit in one of the LED circuits

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LEDTEST

Description	Sequentially turns on each LED while measuring the current consumption.
Parameters	None

LEDTEST:RESULT?

Description	Returns the measured value of current consumption for each LED
Parameters	None
Return	LED 1 Power, LED 2 Power,….LED 12 Power# - current consumption of each LED

LEDTEST:HOURs?

Description	Returns the number of hours that the unit has been ON.
Parameters	None
Return	A floating point number in hours

SYSTem:ERRor[:NEXT]?
ERRor?

Description	Requests errors that may have occurred.
Parameters	None
Response	ASCII character string containing an error number and a brief description.
Notes	If more than one error has occurred, repeated error queries are required until the response is "0, No error". See below for a list of error numbers.
Examples	SYST:ERR?- Response "0, No error" means no errors to report. System:Error? - Response "-109, Missing parameter": a parameter was missing from a command.

:OUTPut ON|OFF|1|0
:OUTPut?

Description	Controls whether the output is enabled or not
Parameters	ON/1: Turns the output on OFF/0: Turns the output off
Reset Value	OFF

System Error Messages

A user may see the errors the unit has stored in the error queue by sending the "ERROR?" query. The unit retrieves and sends one error from the queue in response to the "ERROR?" query. To see all the errors, continue to send the "ERROR?" query until the response is "0".

SCPI ERROR CODES:

- -102 - Syntax error
- -103 - Invalid separator
- -113 - Undefined header
- -108 - Parameter not allowed
- -109 - Missing parameter
- -131 - Invalid suffix
- -138 - Suffix not allowed
- -200 - Execution error
- -224 - Illegal parameter value

Chapter 6:
Remote Control Software

The LSH-7320 system includes a remote software application to perform system functional tests. The software can be found on the USB thumb drive provided with the unit. This software also serves as the C# code example for remote communications.

Installation
No driver installation is necessary. The LSH7320 will install as a mass storage device on the PC when first connected. The executable is located in the "LSH-7320 App\" directory of the included USB flash drive. It may be copied to and run from other locations as long as the "BasidDLL.dll" file is copied to the same directory. To run, double click on "npt-sim.exe".

The source code for the software is in the "LSH-7320 App\src\" directory on the USB flash drive. The "npt-sim.csproj" file can be loaded using Microsoft Visual studio and the sources modified as needed. Accessing the functions in the dll as demonstrated in the C# code may be adapted to the programming environment of your choice.

Operation
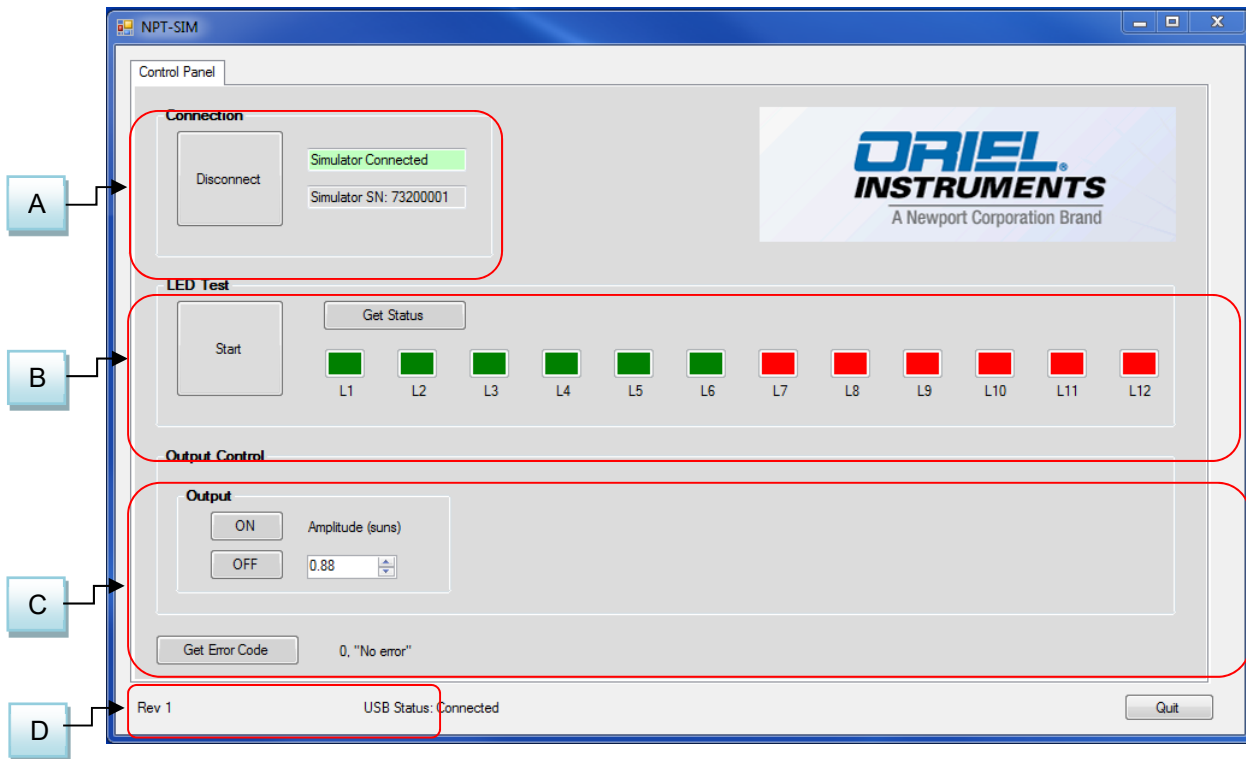
A – Connection

This section is used to connect to the instrument. You must first connect a USB cable between your computer and the instrument. Follow the installation instructions above to load and install the appropriate drivers for the system.

This area displays:

- The Connection Status
- The LSH-7320 serial number

B – Self-Test

The self-test will cycle through each LED to check if all individual LEDs are operating normal. If the LED is running normal, then the indicator light, L1 through L2, will be green. If the indicator is red, then recycle power and repeat the self-test. If the indicator is still red after the power recycle, then please contact Oriel sales. The self-test should last less than 5 seconds.

C – Output Control

This section controls the output of LSH-7320. Output can be turned on or off. The irradiance output can be adjusted manually between 0.10 to 1.10 SUN. Note that in the present firmware version, the remote amplitude setting cannot be saved.

D – Error Code

An error code is described in Chapter 7.

Chapter 7:
Calibration and Troubleshooting

This chapter is to help you resolve any problems you may experience with your LSH-7320. If you need additional help, please contact Oriel Instruments Customer Service. See page viii for contact information.

Oriel Instruments provides in-house calibration services. International customers may contact our services centers for regional calibration support. Oriel factory calibrations employ NIST traceable measurement instrumentation, and our calibration engineers and technicians use automated test equipment to accurately and efficiently capture and record calibration data. An original certificate of calibration authenticity is provided with all instrument calibrations, and a detailed report showing any pre-calibration out-of-tolerance conditions is available upon request.

Calibration turn-around times are normally five business days or less. Please contact Oriel Customer Support (see Comments, Suggestions, and Problems on page viii for contact information) for additional calibration information.

Troubleshooting Guide
This section lists some common problems and corrective actions. In the event that the corrective action does not resolve problem; please contact Oriel Instruments.

SYMPTOM	CORRECTIVE ACTION
The instrument does not power up	Check the power cord to make sure that it is properly connected and check the wall outlet by connecting to a known operational device.
The instrument display "E##"	See display error messages below.
The head does not seem to be generating enough power.	Check to see that the head is at the correct working height. See page 15 – Working Plane Height Adjustment. OR The output adjustment is set to below 1.0 SUN. Verify the Intensity CAL button is in the Default mode. See page 12.
The output is a strange color. Not AM1.5G.	Please contact Oriel customer service
LEDs are not operating	Perform the Self-Test routine provided in the system software. If all of the indicators are green the unit is working properly. If the indicators are RED return to factory for repair.
Output shuts off automatically and the display displays E16 or E18	This indicates that LED is running hot. Check ambient temperature so within the operating temperature range.

Display Error Messages

ERROR CODE	DESCRIPTION
E15	Visible Light Engine Board Temperature too low
E16	Visible Light engine over temperature (reached 65C)
E17	Infrared Light Engine Board Temperature too low
E18	Infrared Light engine over temperature (reached 65C)
E19	24V supply failure (Voltage below 23V or above 25V)
E25	24V supply not present when attempting to turn light on
E26	Abnormal Board State when light is ON

Appendix A:
Dimensional and Mounting Diagrams
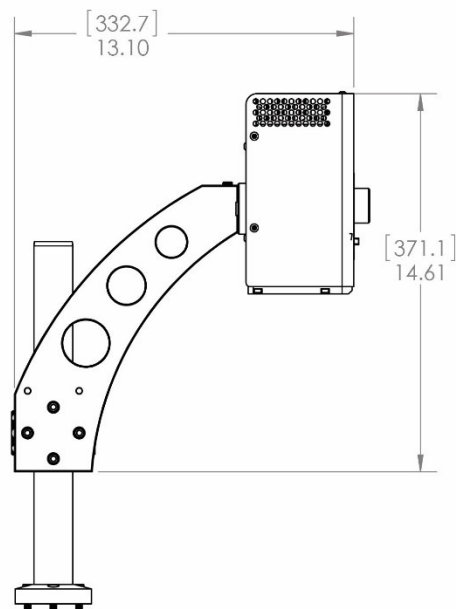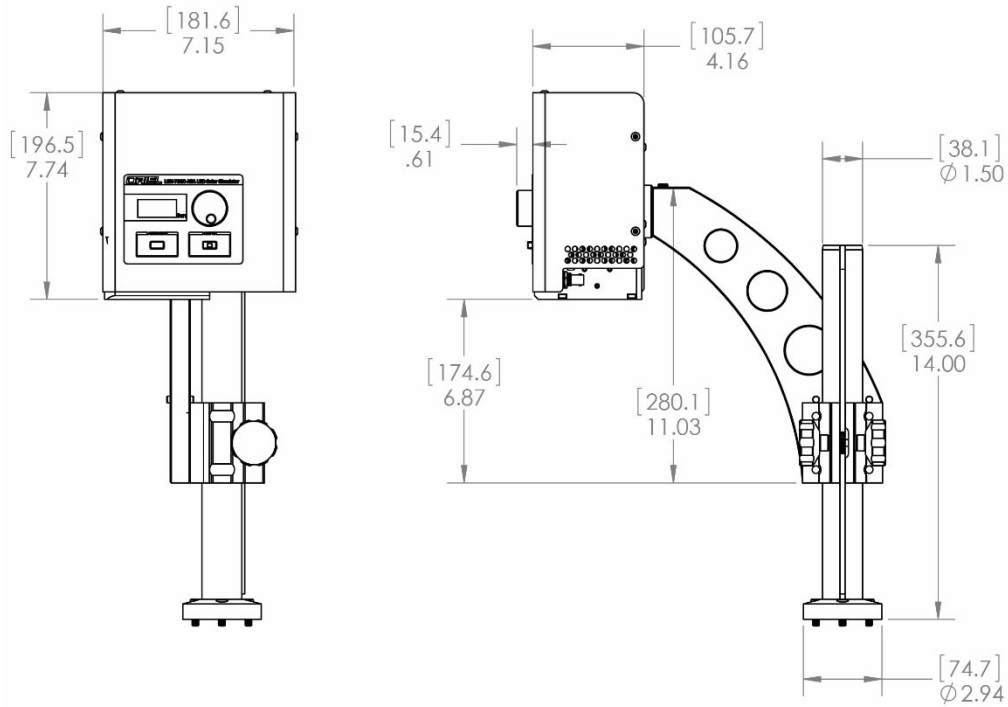
NOTE: Dimensions are listed in [millimeters] and inches.