KLC101
K-Cube™ Liquid Crystal Controller

User Guide

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Chapter 1 Safety

1.1. Safety Information

For the continuing safety of the operators of this equipment, and the protection of the equipment itself, the operator should take note of the **Warnings, Cautions,** and **Notes** throughout this handbook and, where visible, on the product itself. The following safety symbols may be used throughout the handbook and on the equipment itself.

Warning: Risk of Electrical Shock

Given when there is a risk of injury from electrical shock

CAUTION

Caution is given when there is a possibility of damage to the product.

WARNING

Given when there is a risk of injury to users.

1.2. General Warnings

WARNING

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment maybe impaired. In particular, excessive moisture may impair operation. In any installation that uses the KLC101 it is the user's responsibility to ensure adequate insulation and precautions are taken to avoid shock risk.Spillage of fluid, such as sample solutions, should be avoided. If spillage does occur, clean up immediately using absorbant tissue. Do not allow spilled fluid to enter the internal mechanism.

Chapter 2 Overview and Setup

2.1. Introduction

The K-Cube Liquid Crystal Controller (KLC101) is a compact single channel controller/driver for easy manual and automatic control of all Thorlabs Liquid Crystal Variable Retarders and Liquid Crystal Cells with the exception of the LCC2415. The KLC101 produces a square wave output, the frequency of which is adjustable from 500 Hz to 10 kHz, with an amplitude that can be varied from 0 to ± 25 Vrms. Both the output amplitude and frequency can be set via the front panel controls, the USB interface, and the external input.

Figure 1 K-Cube Liquid Crystal Controller (KLC101)

This unit features two selectable set points, Preset V1 and Preset V2. The output amplitude and frequency of both set points are controlled by the user and produce a square wave that is plus/minus the set point. For example, if the user sets Preset V1 to 15.000 V, the output would be a ±15.000 V, 2 kHz square wave (see Figure 2).

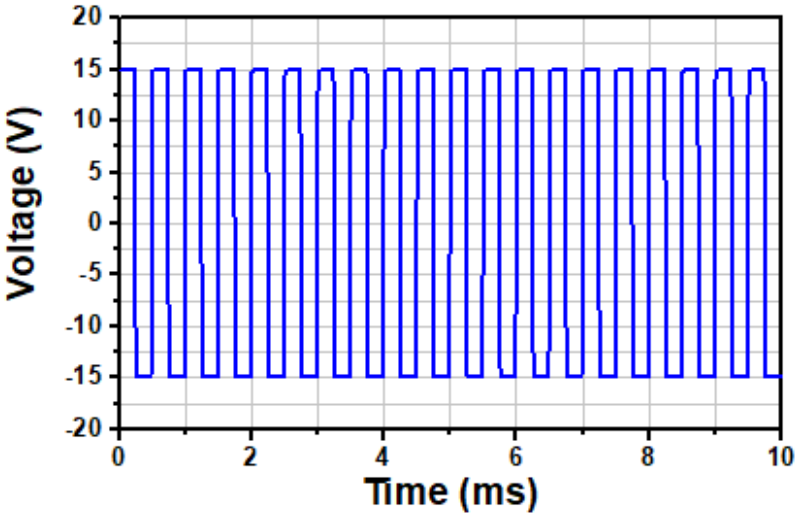


Figure 2 A 2 kHz Square Wave Output

The user can also select a modulated output with a frequency range of 0.1 to 150 Hz. The first cycle will be equal to Voltage 1 and the second cycle will be equal to Voltage 2 (see Figure 3).

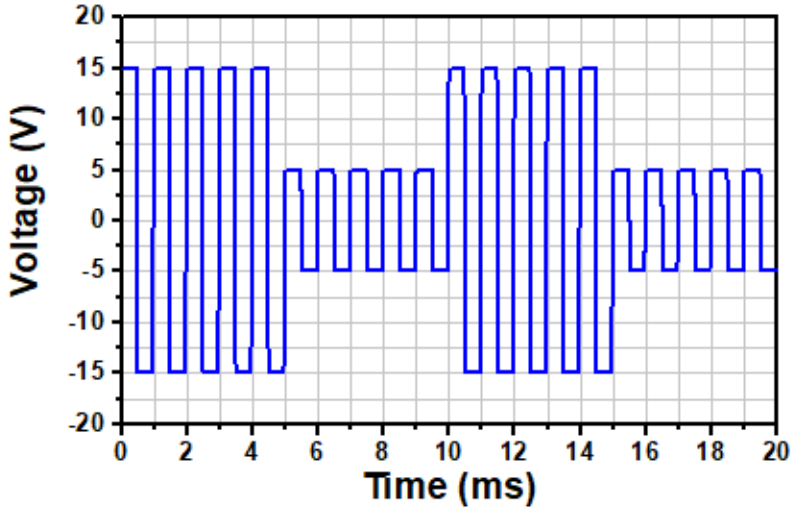


Figure 3 A 1 kHz Square Wave Output with 100 Hz Switching

The KLC101 will automatically detect and correct any DC offset in real time to within ±10 mV. This feature increases the life of the liquid crystal device.

For convenience, the footprint of this unit has been kept to a minimum with measurements of 60 mm x 60 mm x 47 mm (2.36" x 2.36" x 1.85") and with the facility to directly mount to the optical table, close to the device under control. Table top operation also allows minimal drive cable lengths for easier cable management. All manual controls are located on the top face of the unit – convenient when manually adjusting Liquid Voltage or Frequency using the digitally encoded adjustment pot and easy to read voltage display (with brightness adjustment).

2.2. Power Options

For power, a compact two-way power supply unit (TPS002) is available from Thorlabs allowing up to 2 K-Cube Liquid Crystal Controllers to be powered from a single outlet. This power supply unit is also designed to take up minimal space and can be mounted to the optical table in close proximity to the driver units, connected via short power leads.

As a further level of convenience when using the K-Cube Controllers, Thorlabs also offers 3-channel and 6-channel K-Cube Controller Hubs (KCH301 and KCH601). These products have been designed specifically with multiple K-Cube operation in mind in order to simplify issues such as cable management, power supply routing, multiple USB device communications, and different optical table mounting scenarios.

The K-Cube Controller Hub comprises a slim base-plate type carrier with electrical connections located on the upper surface to accept the K-Cubes.

Internally the Controller Hub contains a fully compliant USB 2.0 hub circuit to provide communications for all K-Cubes – a single USB connection to the Controller Hub is all that is required for PC control. The Controller Hub also provides power distribution for the K-Cubes, requiring only a single power connection.

2.3. PC Software Overview

2.3.1. Introduction

The stand-alone software user interface of the KLC101 allows full control of all settings and operating modes, enabling complete 'out-of-box' operation with a single KLC101 unit. The stand-alone KLC101 software also provides full functionality support of a single KLC101 as well as quick generation of sequence operation and a sweeping mode. The stand-alone software package comes with a SDK that supports C++, Labview, and Python. Please refer to the help file of the software package for more details.

The stand-alone software GUI is available on www.thorlabs.com.

2.3.2. Software Upgrades

Thorlabs operates on a policy of continuous product development and may issue software upgrades as necessary.

Chapter 3 Getting Started

3.1. Install The Software

Caution

Some PCs may have been configured to restrict the users ability to load software and on these systems, the software may not install/run. If you are in any doubt about your rights to install/run software, please consult your system administrator before attempting to install.

If you experience any problems when installing software, contact Thorlabs Technical Support.

Note

This section is applicable only if the K-Cube is to be used with a PC. If your application consists only of local operation via the K-Cube front face, proceed to Chapter 4.
When operating via a PC, direct user interaction with the liquid crystal controller is accomplished through intuitive graphical user interface panels (GUIs), which expose all key operating parameters and modes. The user can select multiple panel views displaying different information about a particular hardware unit. The multitasking architecture ensures that the graphical control panels always remain live, showing all current hardware activity.

DO NOT CONNECT THE CONTROLLER TO YOUR PC YET

1) Go to Services/Downloads at www.thorlabs.com and download the software.
2) Run the .exe file and follow the on-screen instructions.

3.2. Mechanical Installation

Warning

The safety of any system incorporating this equipment is the responsibility of the person performing the installation.

3.2.1. Environmental Conditions

Warning

Operation outside the following environmental limits may adversely affect operator safety.

Location:	Indoor use only
Maximum altitude:	2000 m
Temperature range:	10 to 40 ˚C
Maximum humidity:	Less than 80% RH (non-condensing) at 31 °C

To ensure reliable operation the unit should not be exposed to corrosive agents, excessive moisture, heat, or dust.

If the unit has been stored at a low temperature or in an environment of high humidity, it must be allowed to reach ambient conditions before being powered up.

3.2.2. Mounting Options

The K-Cube liquid crystal controller is shipped with a baseplate for use when fitting the unit to a breadboard, optical table, or similar surface.

For multiple cube systems, 3-channel and 6-channel K-Cube Controller Hubs (KCH301 and KCH601) are also available (see Section 2.2. for more details). Full instructions on the fitting and use of the controller hub are contained in the handbook available at www.thorlabs.com.

Caution

When sitting the unit, it should be positioned so as not to impede the operation of the control panel buttons.

Ensure that proper airflow is maintained to the rear of the unit.

3.2.3. Using the Baseplate

The baseplate must be bolted to the worksurface before the K-Cube is fitted, as shown below. The K-cube is then placed on two dowels in the baseplate and secured by two clips.

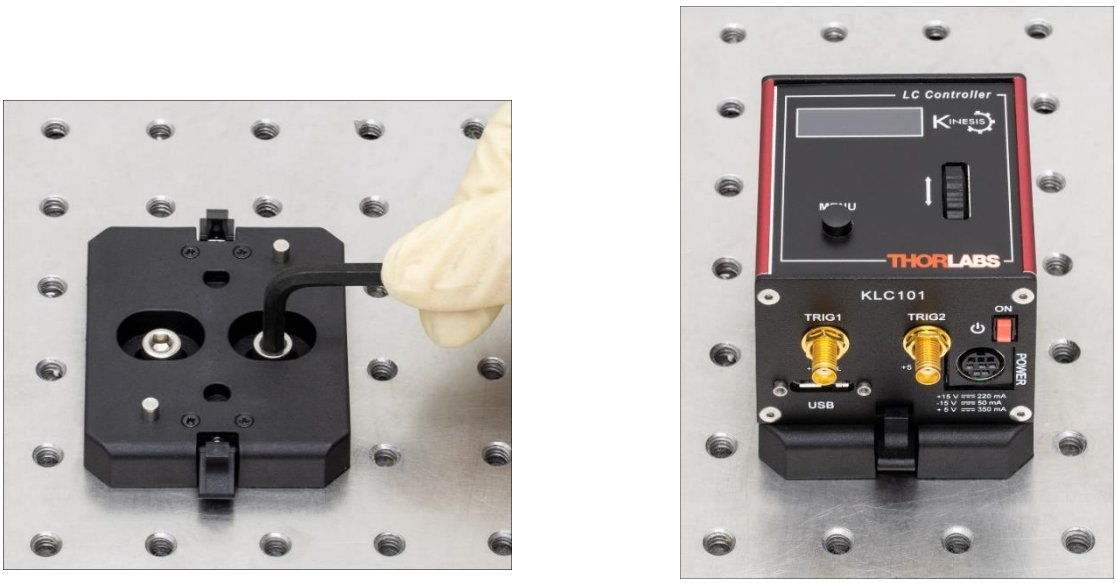


Figure 4 Using The Baseplate

3.3. Electrical Installation

3.3.1. Rear Panel

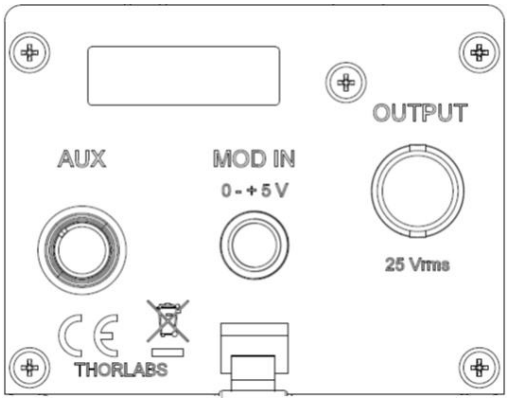


Figure 5 Rear Panel Connections

MOD IN (SMA Female Connector) - external analog signal input, 0~+5 V DC;

AUX (8 Position Circular Connector) - Reserved for future use

OUTPUT (BNC Female Connector) - controller voltage output to driver Liquid Crystal Retarders, 0~+/-25 V RMS.

3.3.2. Supply Voltage and Current Requirements

Supply	Minimum	Maximum	Max Operating Current
+5V	+4.9V	+5.1V	350 mA
+15V	+14.5V	+15.5V	220 mA
-15V	-14.5V	-15.5V	50 mA

3.3.3. Front Panel

Warning

The unit must be connected only to a DC supply as detailed in Section 3.3. Connection to a supply of a different rating may cause damage to the unit and could result in injury to the operator.

Caution

Ensure the power switch on the front panel of the unit is switched off before connecting power to the K-Cube. Always power up the K-Cube unit by its ON switch. DO NOT connect the K-Cube unit to a 'live' external power supply. Doing so (i.e. “hot plugging”) carries the risk of PERMANENT damage to the unit. Similarly, to power down the unit, turn the power switch off before disconnecting the power supply.

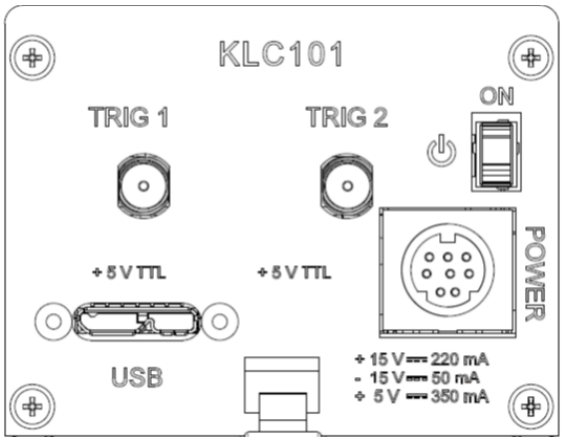


Figure 6 Front Panel

POWER - Eight pin connector for connecting the unit to a regulated DC power supply of the rating detailed in Section 3.3.2.

USB - USB port for system communications..

Note

The USB cable length should be no more than 3 meters unless a powered USB hub is being used.

ON - Power ON/Standby switch.

TRIG 1 and TRIG 2 - SMA connectors for use with external trigger input and output signals (5 V TTL levels). The function is set to trigger IN or OUT via the settings panel.

3.3.4. Connecting to a Power Supply

Warning

The unit must be connected only to a DC supply as detailed in Section 3.3. Connection to a supply of a different rating may cause damage to the unit and could result in injury to the operator.

Caution

Ensure the power switch on the front panel of the unit is switched off before connecting power to the K-Cube. Always power up the K-Cube unit by its ON switch. DO NOT connect the K-Cube unit to a 'live' external power supply. Doing so (i.e. “hot plugging”) carries the risk of PERMANENT damage to the unit. Similarly, to power down the unit, turn the power switch off before disconnecting the power supply.

1) Using the front panel connector as shown above, connect the unit to a regulated DC power supply of the rating detailed in Section 3.3.
2) Switch on the Power Supply unit, then switch on the KLC101.
3) The version number of the embedded software is displayed for a few seconds.

Thorlabs offers a compact, two-way power supply unit (TPS002), allowing up to two K-Cubes to be powered from a single outlet. However, if an external supply is to be used, see Section 5.1.1 for power supply connector pin out details.

Caution

If an external power supply is used, ensure that the 3 voltage supplies are turned on and off simultaneously. Applying the voltage supplies with a large (more than 1 second) time delay between them can result in the K-Cube showing an incorrect reading.

3.3.5. Powering Down The Unit

Warning

Always use the front panel ON switch to power down the unit. When in the ON position, the unit is fully powered up. When the switch is turned to the Standby position, the unit initiates a controlled power down sequence, saving all user adjustable parameters to non-volatile memory before turning off the power. For the first few seconds, the shutdown can be cancelled by turning the switch on again, in which case the unit will save the parameters but will remain powered up. In a powered down (Standby) state, the logic circuits are powered off and the unit will draw only a small quiescent current.

3.4. Connect The Hardware

1) Perform the mechanical installation as detailed in Section 3.2.
2) Install the software.

Caution

During items (3) to (6) the instructions should be followed strictly in the order stated. Problems may occur if the process is not performed in the correct sequence.

3) Connect the Controller unit to your PC.
(**Note**. The USB cable should be no more than 3 meters in length. Communication lengths in excess of 3 metres can be achieved by using a powered USB hub).

Caution

During item (4) ensure the power supply unit is isolated from the mains before connecting to the K-Cube unit. Always power up the K-Cube unit by connecting its power supply to the mains. DO NOT connect the K-Cube unit to a 'live' external power supply. Doing so (i.e. “hot plugging”) carries the risk of PERMANENT damage to the unit. Similarly, to power down the unit, disconnect the power suply from the mains before disconnecting the K-Cube unit.

4) Connect the Liquid Crystal Retarders to the Controller unit - see Section 3.3.1..
5) Connect the Controller unit to the power supply - see Section 3.3.2..
6) Connect the PSU to the main supply.
7) Switch ‘ON’ the unit using the switch on the front panel.

The unit takes about 5 seconds from power application until warm up is finished, during which time the software revision is displayed. Windows™ should detect the new hardware. Wait while Windows™ installs the drivers for the new hardware.

8) The unit starts up with the output disabled. This must be enabled before any other settings can be adjusted - see Section 4.1.2..
9) LCD screen displays the start menu as shown below:

Thorlabs KLC101
SwRev 10001

Chapter 4 Standalone Operation

4.1. Control Panel

Operating Elements

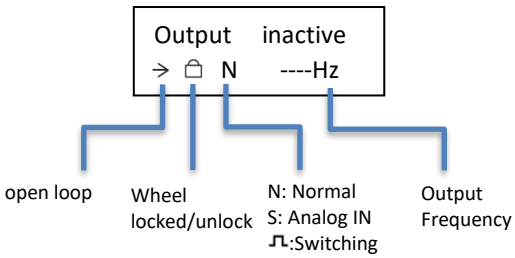
Scrolling Wheel - Used to make menu selections and to choose voltage and frequency values with either forward or reverse scrolling - see Section 4.1.3.

Digital Display - The display shows the menu options and settings, accessed via the menu button - see Section 4.1.1. When the Ident button on the associated GUI panel is clicked, the display will flash for a short period.

MENU - Used to access the settings menu - see Section 4.1.1.

4.1.1. Digital Display - Operating Mode

During normal operation, the top line of the digital display shows the current drive voltage applied. The bottom line shows various icons which indicate the operating state of the device, i.e. the feedback loop mode (currently, only open-loop mode is available; closed-loop mode will be added in a future version of the firmware), the unlocked symbol to show the output is enabled (see Section 4.1.2.), the analog input mode (see Section 4.1.4.), and the output frequency (see Section 4.1.3.).



Settings Menu

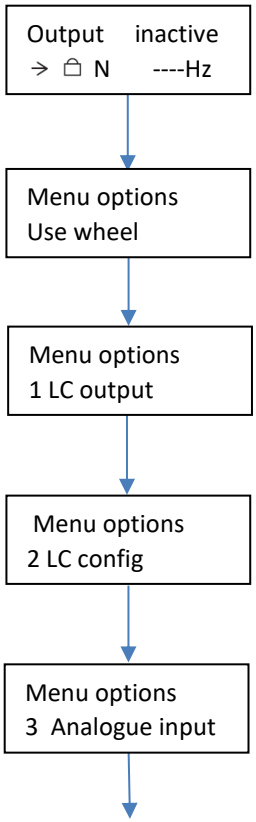
Press the MENU button to enter the main menu.

Scroll the wheel to get access to more options.

Enable/disable the drive output - see Section 4.1.2.

Set the output voltage and frequency - see Section 4.1.3.

Set the analogue input source - see Section 4.1.4.

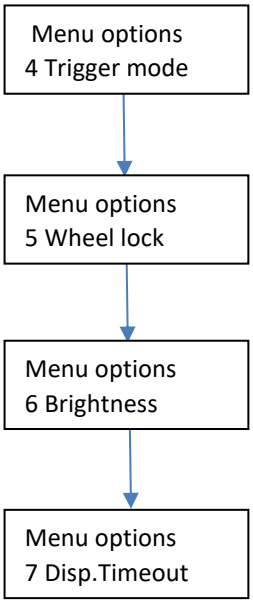


Set the Trigger input/output mode - see Section 4.1.5.

Set wheel adjust lock or unlock - see Section 4.1.6.

Set the display brightness - see Section 4.1.7.

Set the display timeout period - see Section 4.1.8.



4.1.2. Menu Option - LC output

This mode is used to enable or disable the drive output.

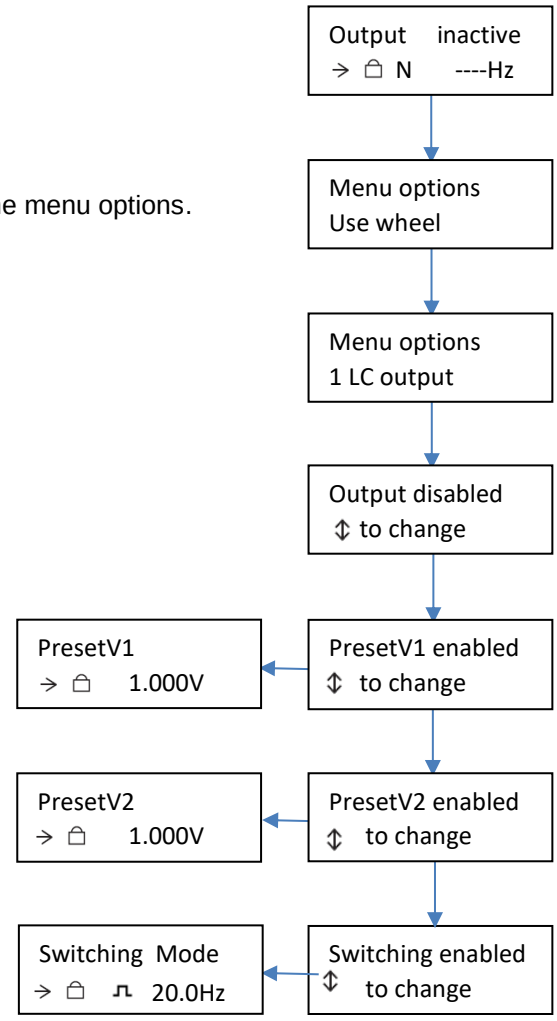
Press the MENU button, then use the wheel to scroll through the menu options.

Press the MENU button to enter the “1 LC output” option.

This screen is used to enable/disable the drive output voltage. Scroll down for more options.

Enable the PresetV1 output. Use the wheel to scroll to the next screen. Press the MENU button to store the selection and return to the operating screen.

Enable the switching mode to cycling output between PresetV1 and PresetV2.



4.1.3. Menu Option - LC Config

When using the wheel to set the output Voltage and Frequency, there are three speed modes to quickly get the desired voltage. When the user moves the scroll wheel quickly, the value will increase or decrease by 0.1; when scrolling the wheel at medium speed, the value will increase or decrease by 0.01; when scrolling the wheel at slow speed, the value will increase or decrease by 0.001.

Use wheel to scroll to the “2 LC config” menu.

Press MENU button to enter the 2 LC config option.
This menu is used to configure the output voltage or frequency.

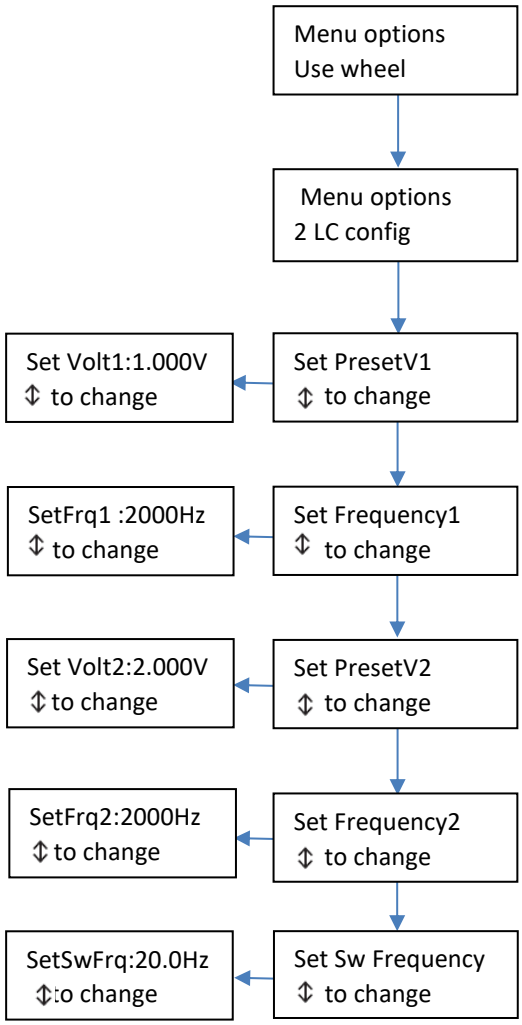
Set the voltage of PresetV1 and use the wheel to change the voltage value. Press the MENU button to store the selection and return.

Set the frequency of PresetV1 and use the wheel to change the freqency value. Press the MENU button to store the selection and return.

Set the voltage of PresetV2 and use the wheel to change the voltage value. Press the MENU button to store the selection and return.

Set the frequency of PresetV2 and use the wheel to change the freqency value. Press the MENU button to store the selection and return.

Set the frequency of Switching and use the wheel to change the freqency value. Press the MENU button to store the selection and return.



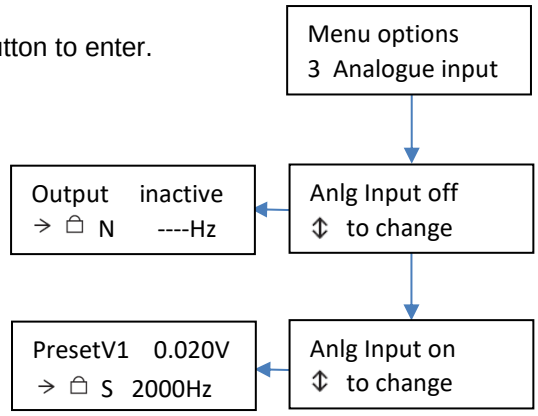
4.1.4. Menu Option - Analogue input

When the analogue input is on, the output voltage of the controller is set by the external input signal of the “MOD IN” port. The 0~5.0 V DC external input corresponds to the output voltage of 0 to ±25 Vrms.

Press the MENU button then use the wheel to scroll to option 3 to set the Analogue input source. Press the MENU button to enter.

Use the wheel to set the Analogue input to off.
Press the MENU button to store the selection and return.

Use the wheel to set the Analogue input to on.
Press the MENU button to store the selection and return.



4.1.5. Menu Option – Trigger Mode

The K-Cube liquid crystal controller has two bidirectional trigger ports (TRIG1 and TRIG2) that can be used to read an external logic signal or output a logic level to control external equipment. Electrically, the ports output 5 V logic signals and are designed to be driven from a 5 V logic.

When the port is used on input mode, the logic levels are TTL compatible, i.e. a voltage level less than 0.8 V will be recognized as a logic LOW and a voltage level greater than 2.4 V will be recognized as a logic HIGH. The input contains a weak pull-up, so the state of the input with nothing connected will default to a logic HIGH. When the input signal is at a high level, the output voltage will select PresetV2, otherwise it will select PresetV1.

When the port is used as an output it provides a push-pull drive of 5 V, with the maximum current limited to approximately 8 mA. The current limit prevents damage when the output is accidentally shorted to ground or driven to the opposite logic state by external circuitry. When “Switching mode” is enabled, the Trig Port will output the Switching frequency level. A high level indicates current output PresetV2, while a low level indicates current output PresetV1.

Caution

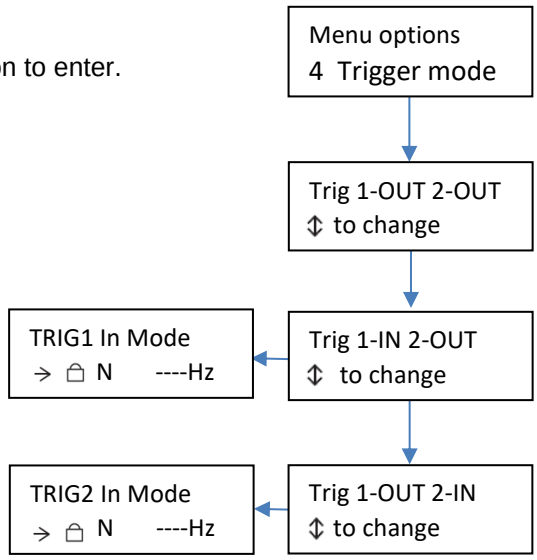
Do not drive the TRIG ports from any voltage source that can produce an output in excess of the normal 0 to 5 V logic level range. In any case the voltage at the TRIG ports must be limited to -0.25 to +5.25 V.

Press the MENU button then use the wheel to scroll to 4 Trigger Mode to set the Trigger state. Press the MENU button to enter.

Use the wheel to set both Trig 1 and Trig 2 as output. Press the MENU button to store the setting and return.

Use the wheel to set Trig 1 as input and Trig 2 as output. Press the MENU button to store the setting and return.

Use the wheel to set Trig 1 as output and Trig 2 as input. Press the MENU button to store the setting and return.

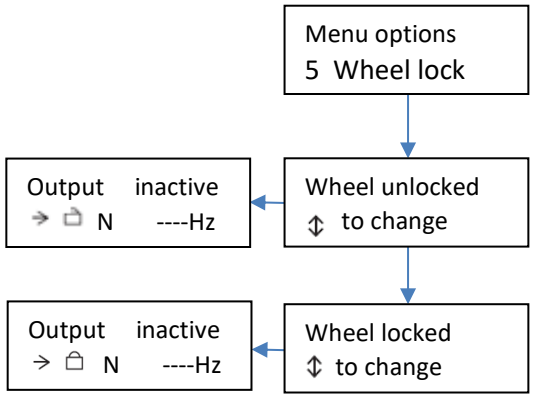


4.1.6. Menu Option – Wheel lock

Press the MENU button then use the wheel to scroll to option 5 to set the Wheel status. When the Wheel is locked, the user can not change the output voltage value in the start menu directly. In certain applications, it may be advantageous to disable the wheel to remove the possibility of any unwanted disturbances due to accidental movement of the wheel.

Press the MENU button then use the wheel to scroll to 5 Wheel Lock. Press the MENU button to enter.

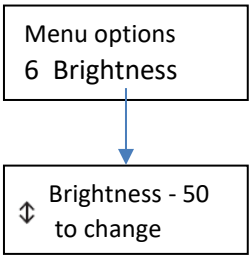
Use the wheel to select the wheel state. Press the MENU button to store the setting and return.



4.1.7. Menu Option – Brightness

For certain applications, it may be necessary to adjust the brightness of the LED display. The brightness is set as a value from 0 (Off) to 100 (brightest). The display can be turned off completely by entering a setting of zero; however, pressing the MENU button on the top panel will temporarily illuminate the display at its lowest brightness setting to allow adjustments. When the display returns to its default operating display mode, it will turn off again.

Press the MENU button then use the wheel to scroll to 6 Brightness.
Press the MENU button to enter.

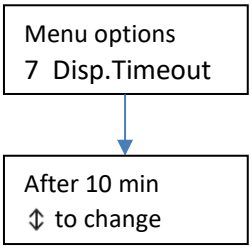


Use the wheel to change the brightness value.
Press the MENU button to store the setting and return.

4.1.8. Menu Option – Disp.Timeout

'Burn In' of the display can occur if it remains static for a long time. To prevent this, the display is automatically dimmed after a specified time interval.

Press the MENU button, then use the wheel to scroll to 7 Disp. Timeout.



The adjustment is done in steps of 1 minute if the timeout is between 1 and 10 minutes; 10 minute steps between 10 minutes and 1 hour; and 30 minute steps above 1 hour, up to a maximum of 480 minutes. After 480 minutes there is an option for Never.

4.2. Software Operation

This chapter only covers the operation of the stand-alone software GUI.

4.2.1. Device Connection

After software installation, connect the KLC101 to the PC with a USB3.0 cable and power on the device. Once powered on, start the software. The software should recognize and connect to the device automatically. If not, click the connect button and manually select and connect devices from the pop-up window.

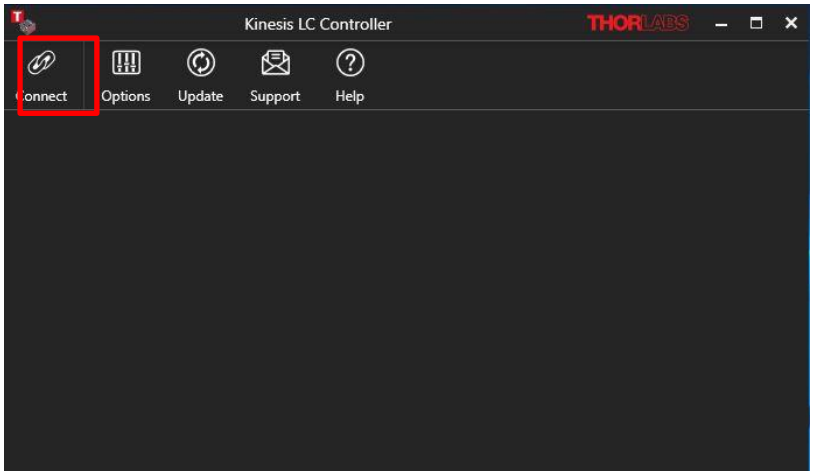


Figure 7 Click the Connect Button to Select and Connect KLC101

4.2.2. Normal Operation

The software features a master switch to swtich on/off the main output of the KLC101 and a wheel lock swtich to enable/disable the wheel on the KLC101 front panel.

In normal operation, the GUI allows easy switching among the output mode as shown below:

Preset 1: in which the KLC101 outputs a signal according to the value set in Voltage 1 and Frequency 1.

Preset 2: in which the KLC101 outputs a signal according to the value set in Voltage 2 and Frequency 2.

Switching: in which the KLC101 toggles its output between Preset 1 and Preset 2. The toggle frequency is also adjustable in Switching Mode.

MOD IN: in which the output voltage of the controller is set by the external input signal of the “MOD IN” port. The 0~5.0 V DC external input corresponds to the output voltage of 0 to ±25 Vrms.

TRIG1 Input: in which the TRIG1 port on the KLC101 is set to be the input and TRIG2 port is set to be the output.

TRIG2 Input: in which the TRIG1 port on the KLC101 is set to be the input and TRIG2 port is set to be the output.

For detailed information on trigger operation, please refer to section 4.1.5 Menu Option – Trigger Mode.

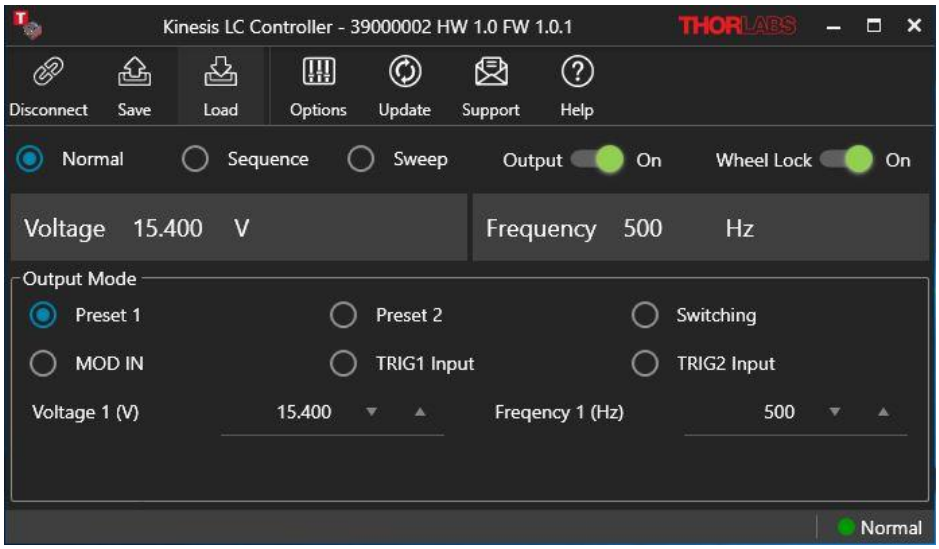


Figure 8 Stand-Alone GUI Main Screen

4.2.3. Sequence

The software GUI also provides a tool to generate an operation sequence for a single KLC101 unit. In the sequence, the output voltage amplitude, frequency, and duration of each step are all editable. The functions of the buttons are listed below:

: Add one step into the sequence table.

: Delete the selected step from the sequence table.

: Delete the entire sequence table.

: Play the sequence.

: Quickly generates a linear sequence table by setting the start and end point as well as the number of steps in between.

The entire sequence can be set to just play once (infinite) or to play by a number of cycles.

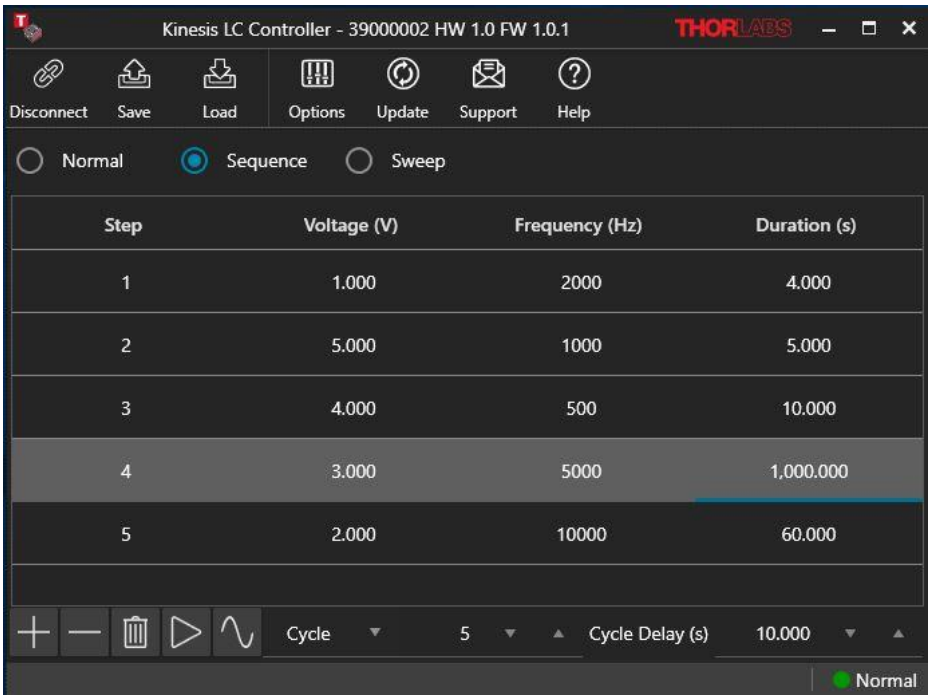


Figure 9 Generating Sequence

4.2.4. Sweeping Mode

The software GUI also has a sweeping mode in which users can set a start voltage, an end voltage, step size and step duration. The KLC101 will scan from the start to the end point after the sweep is started from the GUI.

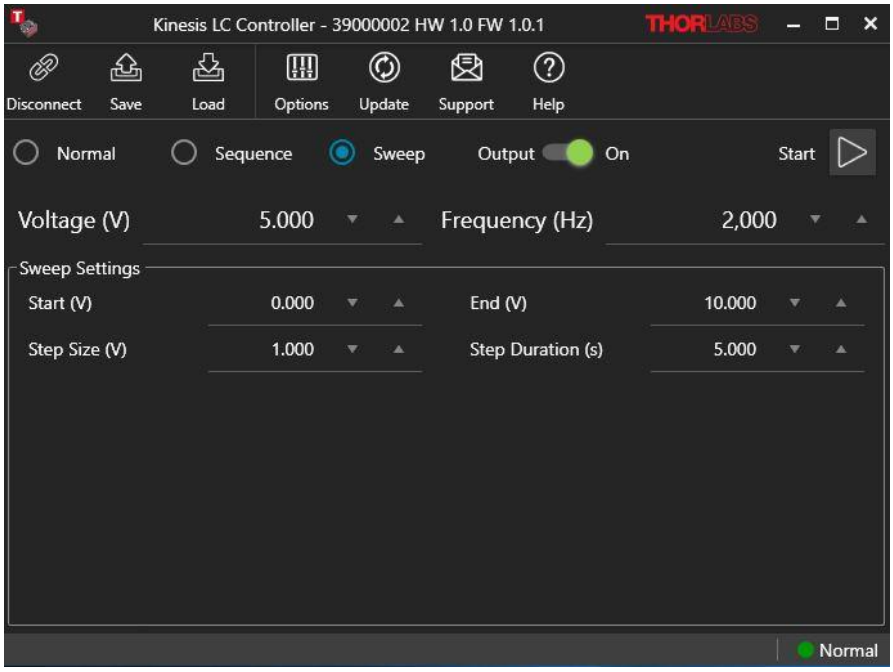


Figure 10 Sweeping Mode

Chapter 5 Connector Pinout Details

5.1. Power Connector

5.1.1. Pin Identification

Thorlabs recommends that the liquid crystal cube controller is operated with the Thorlabs TPS002 Power Supply, as it was specifically designed for use with this product. However, to enable customers to use the cube in installations where a ±15 V and 5 V power is already available, the piezo cube can be operated with a different external power supply, such as a bench or lab supply.

In this case however, extreme care must be taken to ensure that it meets the specifications and is connected to the cube correctly. Out of tolerance supply voltages or incorrect connection, applied even momentarily, can result in the sensitive electronics inside the cube getting damaged, invalidating warranty. The cube uses a standard “mini-DIN” type of input connector, the corresponding plug is available from most standard electronics suppliers.

Figure 10 below shows the mini-DIN socket as viewed by looking at the rear panel of the cube. The pin numbering follows the standard for mini-DIN connectors.

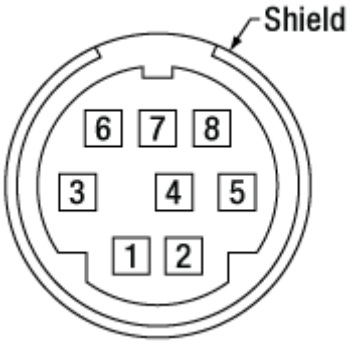


Figure 11 POWER Connector Pin Identification

Pin	Description	Pin	Description
1	+5V	6	Common Ground
2	+5V	7	Common Ground
3	-15V	8	Common Ground
4	+15V	Shield	Common Ground
5	+5V		

Warning

When wiring the mini-DIN plug, ensure that all the ground pins are used and the shield is connected to common ground. This provides a level of protection against overvoltages due to loss of ground. A “loss of ground” condition can seriously damage the electronics inside the cube.

Chapter 6 Preventive Maintenance

Warning: Risk of Electrical Shock

The equipment contains no user servicable parts. There is a risk of electrical shock if the equipment is operated with the covers removed. Only personnel authorized by Thorlabs and trained in the maintenance of this equipment should remove its covers or attempt any repairs or adjustments. Maintenance is limited to safety testing and cleaning as described in the following sections.

6.1. Cleaning

Warning

Disconnect the power supply before cleaning the unit.

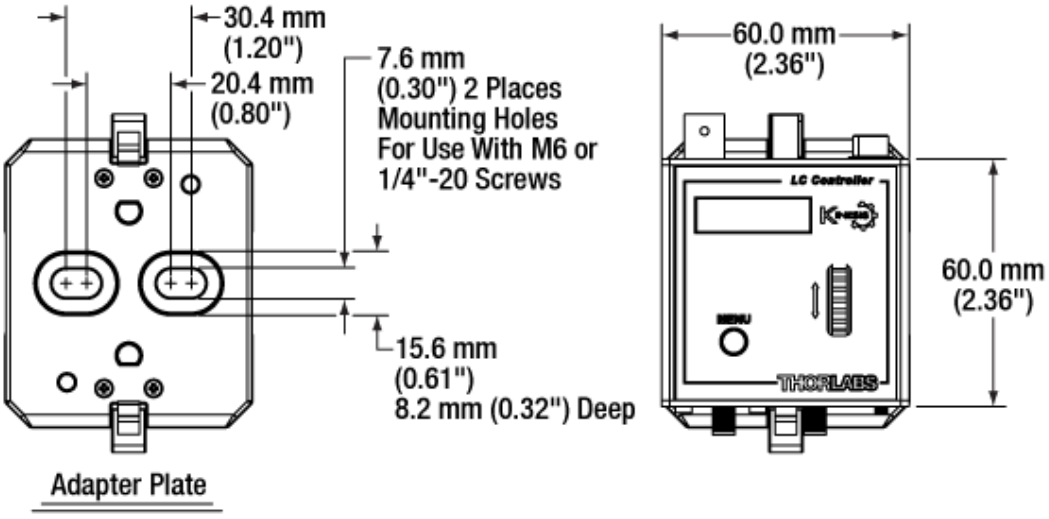
Never allow water to get inside the case.

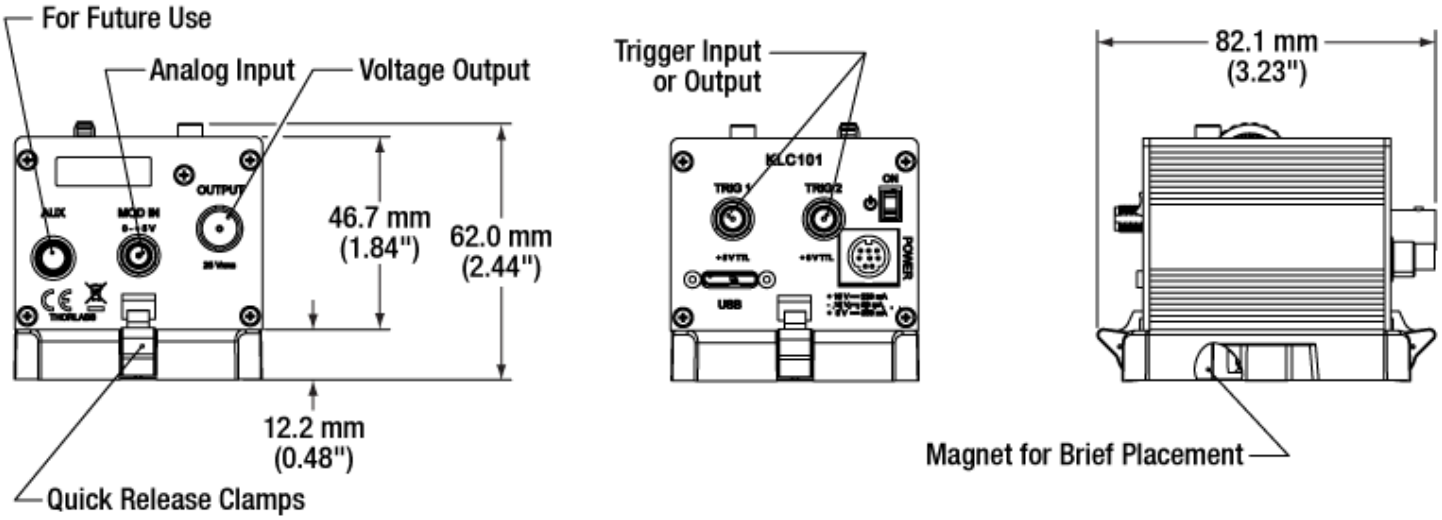
Do not saturate the unit.

Do not use any type of abrasive pad, scouring powder, or solvent (e.g. alcohol or benzene).

The fascia may be cleaned with a soft cloth, lightly dampened with water or a mild detergent.

Chapter 7 Mechanical Drawings





Chapter 8 Specifications & Accessories

8.1. Specifications

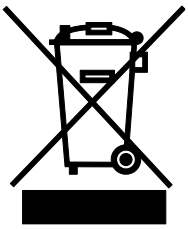
Parameter	Value
Electrical Characteristics	
Adjustable Output Voltage	0 to ±25 V RMS
Voltage Resolution	1.0 mV
Adjustable Output Frequency	500 Hz to 10 kHz, 50% Duty Square Wave
Adjustable Internal Switching Frequency	0.1 to 150 Hz @ 50% Duty Cycle
Slew Rate	10 V/µs
DC Offset	±10 mV
Warm Up Time	30 Minutes
USB Port	USB 3.0 Micro B
K-Cube Controller Hub Connector	26-Way ERNI
Maximum Ratings	
Maximum External Input Voltage	5 VDC
Maximum External Modulation	150 Hz
Maximum Output Current	50 mA
Operating Temperature Range	10 to 40 °C
Maximum Relative Humidity	85%
Input Power Requirements (DIN Connector)	
Voltage (Current)	+15 V (220 mA), -15 V (50 mA), +5 V (350 mA)
General Data	
Housing Dimensions (W x D x H) (Excluding Buttons, Baseplate, and Connectors)	60.0 mm x 60.0 mm x 46.7 mm (2.36" x 2.36" x 1.84")
Weight	140 g (5.0 oz)

8.2. Power Supplies & Cables

Product Description	Item #
2-Way Power Supply Unit	TPS002
K-Cube 6-Channel Controller Hub	KCH601
K-Cube 3-Channel Controller Hub	KCH301
SMA to BNC Converter Cable 6”	CA2806
SMA Female to BNC Male Converter	T4289
SMA Male to BNC Female Converter	T4290

Chapter 9 Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.



- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated

As the WEEE directive applies to self-contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e.g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCB’s, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

Waste Treatment is Your Own Responsibility

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

Ecological Background

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of life products will thereby avoid negative impacts on the environment.

9.1. Declarations Of Conformity

9.1.1. For Customers in Europe

See Section 9.2.

9.1.2. For Customers in the USA

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the company could void the user’s authority to operate the equipment.

9.2. CE Certificate

CE

Declaration of Conformity

We: Thorlabs Optical Electronic Technology (Shanghai) Co., Ltd
of: Room A101, No.100, Lane 2891, South Qilianshan Rd, Shanghai

In accordance with the following Directive(s):

2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)

hereby declare that:

Model: ***KLC101***
Equipment: ***Liquid Crystal Controller***

Is in conformity with the applicable requirements of the following documents:

EN 61010-1: 2010 (Third Edition) + A1: 2019
EN 61326-1: 2013
EN 61326-2-1: 2013
EN 61326-2-2: 2013
EN 55011: 2009 + A1: 2010 (Class A)
EN 61000-3-2: 2014
EN 61000-3-3: 2013
EN 61000-4-2: 2009
EN 61000-4-3 :2006 + A2: 2010
EN 61000-4-4: 2012
EN 61000-4-5: 2014 + A1: 2017
EN 61000-4-6: 2014
EN 61000-4-8: 2010
EN 61000-4-11: 2004 + A1: 2017

and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:
does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive.

I hereby declare that the equipment named has been designed to comply with the relevant section of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.

Signed: on: 9th Sept 2020

Name: Shanshan Song
Position: General Manager

Chapter 10 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at **www.thorlabs.com/contact** for our most up-to-date contact information.

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