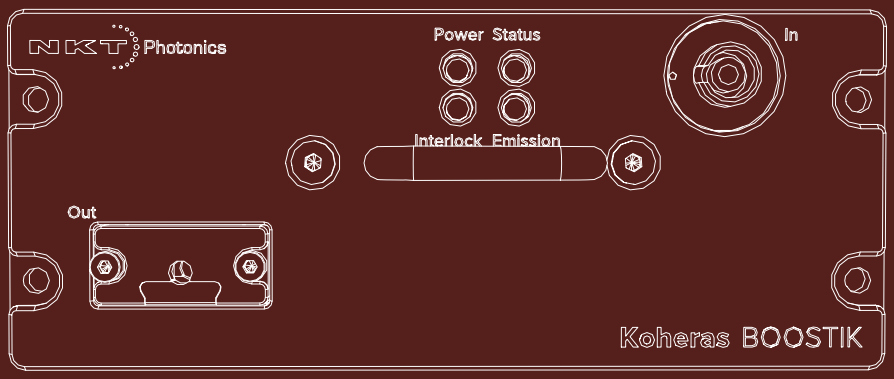
800-631-01

Koheras
BOOSTIK LC

Product Guide

Revision 1.4 10-2023



Photonics

PRODUCT GUIDE

This guide includes information for the following NKT Photonics products:

Koheras BOOSTIK LC 2W 1550 nm

2W narrow linewidrh line card amplifier housed in a line card form factor

Koheras BOOSTIK LC 200 mW 1550 nm

200 mW narrow linewidrh line card amplifier housed in a line card form factor

Koheras BOOSTIK LC 200 mW 1064 nm

200 mW narrow linewidrh line card amplifier housed in a line card form factor

CAUTION: Do not open the laser module. The laser is equipped with warranty labels (see Figure 43) on the covers of the module. The warranty is void if the system is opened.

Manufactured by:

NKT Photonics A/S
Blokken 84, Birkerød-3460 Denmark

Author: W-10456

Guide Overview

This product guide is intended to provide functional, operational and installation information for Koheras BOOSTIK LC laser amplifiers.

WARNING: Do not operate the laser before first reading and understanding all warnings, cautions and handling information stated within the document:

Koheras BOOSTIK LC-series Laser Safety, Handling and Regulatory Information

WARNING: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Documentation

A USB memory stick is included. It contains the soft copy documentation for this laser.

Terminology

The guide may refer to both the Koheras BOOSTIK LC as the laser amplifier or just simply module. The Koheras BOOSTIK LC is a module designed to be fitted to and as part of a complete laser system.

Target Audience

This guide is for technical personnel involved in the selection, planning and deployment of lasers in laboratory and industrial settings. The guide assumes a reasonable knowledge level of lasers, photonic principles and electrical interface connectivity.

Chapters Inside This guide includes the following chapters:

- Chapter I “Description” — Describes the Koheras BOOSTIK LC laser amplifier module including its general operational description and features, interfaces.
- Chapter 2 “Installation” — Includes information and procedures on how to correctly install the module. Procedures within this chapter focus on providing adequate temperature regulation.
- Chapter 3 “CONTROL GUI” — Introduces and describes how to use the software control interface software to manage the module.
- Chapter 4 “SDK Registers and Tabs” — An introduction to the registers and tabs of the Generic User Interface included with the NKT Photonics Software Development Kit.
- Appendices — The guide includes multiple appendices including specifications, support contact details, connector pin assignments, error codes and a control software installation procedure.

Added information and Safety Notices

Lasers are highly dangerous devices that can cause serious injury and property damage. This guide use the following symbols to either highlight important safety information or provide further information in relation to a specific topic.

NOTE: Highlights additional information related to the associated topic and/or provides links or the name of the NKTP guides describing the additional information.

CAUTION: Alerts you to a potential hazard that could cause loss of data, or damage the system or equipment.

WARNING: The laser safety warning alerts you to potential serious injury that may be caused when using the laser.

Revision

This section records the document revision history.

Release date	Version and changes
2021-September	1st revision
2021-October	Revision 1.1 Added the following: • "CONTROL settings" on page 36 - added Power/Current mode setting item in the table. • "Power/current mode" on page 36 • "Current mode" on page 44 • Error codes 65 and 65 to Table 14 on page 63 Updated the following: • Figure 38 on page 54 - added Bit 8 - Input power low.
2022-March	Revision 1.2 • Minor changes to language throughout to improve clarity. • Changed figure arrows and other figure highlights throughout. • Updated Procedure 4 on page 65 to Windows 10 format.
2023-March	Revision 1.3 • Edited the incorrect caption of Figure 4 on page 20. • Fixed the broken link in the note under ""Rear panel" on page 20. • Fixed the broken link in section "Errors" on page 54. • Updated minor grammar and other link issues throughout. • Updated NKT Photonics website addresses. • Updated some of the pagination in chapter ""SDK Registers and Tabs" on page 49".

Release date	Version and changes
2023-October	Revision 1.4 • Updated the style of the document. • Updated images with the latest chassis and faceplate markings.

CONTENTS

TABLES

FIGURES

PROCEDURES

1 Description

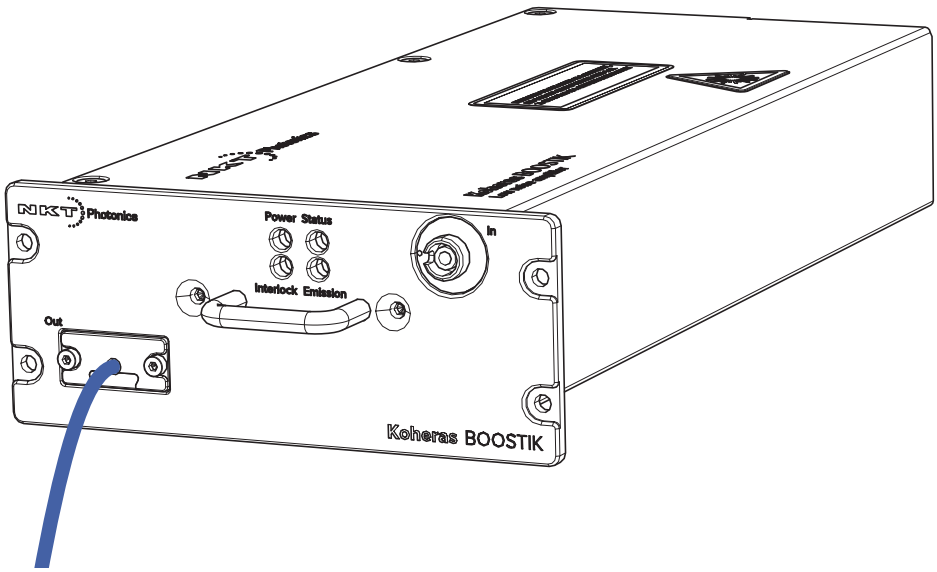
The Koheras BOOSTIK LC is a compact fiber amplifier module for low-noise, narrow-linewidth Koheras seed lasers. The module is designed as a line card component of a complete laser system. The module inserts into a Koheras ACOUSTIK 16-slot rack shelf where it occupies two slots.

The ACOUSTIK shelf provides power and communications to the BOOSTIK LC module and it also houses a seed laser such as a Koheras BASIK. The optical output fiber of a Koheras BASIK seed laser connects to the optical input of a BOOSTIK LC module where the light is amplified before exiting from its optical output fiber and finally the standard FC/APC connector.

The amplifier module operates in the 1060-1075 nm or 1545-1565 nm wavelength range. Depending on the variant, the amplifier is designed to extend the output power of its seed laser to either 200 mW or 2 W output power. The amplifier achieves this while preserving the seed laser's ultra-low noise and narrow linewidth optical output.

The rear panel of a BOOSTIK LC module includes an electrical connector. The connector is designed to interconnect with an ACOUSTIK backplane connector when the module is inserted into the shelf. Using NKT Photonics CONTROL software, all inserted modules in the shelf are controlled from a single ACOUSTIK software interface through either USB or Ethernet connectivity.

Figure 1 BOOSTIK LC general view



NOTE: You can also implement BOOSTIK LC modules as components in a custom laser system. For these applications, an SDK is available to integrate the module with the system control platform.

Variants

Three different BOOSTIK LC variants are available and mainly characterized by their output power and center wavelength. You can compare their characteristics in Table 1 below.

Table 1 BOOSTIK LC variants and their characteristics

Variant:	2 W@ 1550 nm	200 mW@1550 nm	200 mW@1064 nm
Compatible Koheras seed laser(s)	E15, X15,C5	E15, X15,C5	Y10
Operation mode	CW[i]	CW[i]	CW[i]
Operating wavelength [nm]	1545 to 1565	1545 to 1565	1060 to 1075
Input power [mW]	1 to 50	10 to 50	10 to 50
Output power [mW]	2000	200	200
Output power tunability [%]	10 to 100	10 to 100	10 to 100
Polarization	PM[ii] or SM[iii]	PM[ii]	PM[ii]
Input and output optical termination	FC/APC[iv]	FC/APC[iv]	FC/APC[iv]
Output fiber type	PM1550 or SMF28	PM1150	PM980

i. Continuous Wave - inherently single frequency
ii. Polarization Maintaining
iii. Singe Mode
iv. E2000 optional

Front and rear panels

Front panel

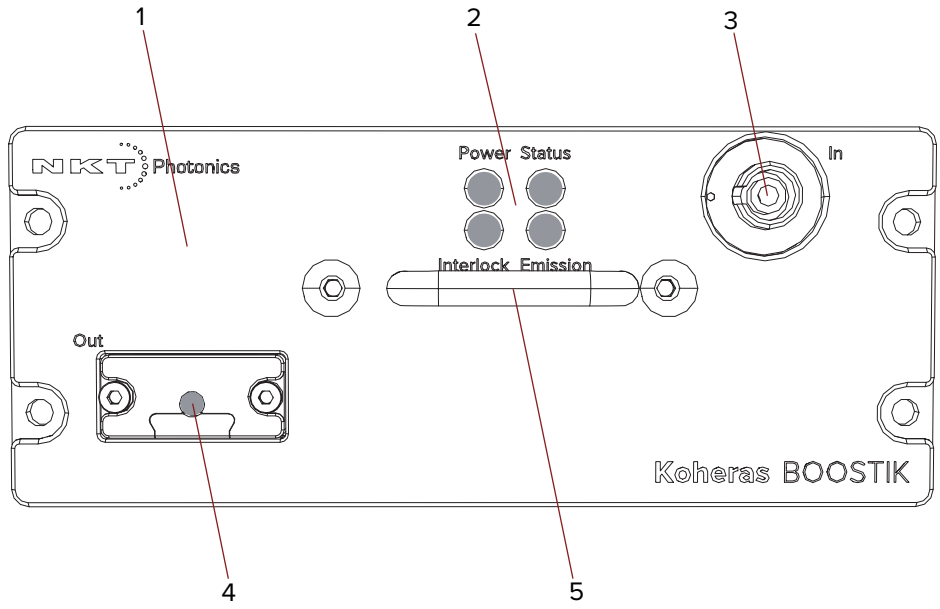
The front panel shown in Figure 2 is typically fitted with a Koheras ACOUSTIK faceplate and includes: an Output fiber and connector, an Input fiber connector, and status LEDs. Note that the output fiber and connector is fitted at the factory.

The status LEDs on the front panel indicate the following states:

- Power – the supply voltage status
- Interlock – interlock circuit open/closed (not OK/OK)
- Emission – the laser emission status (enabled or disabled)
- Status – the module stability status

For more information see “Status LEDs” on page 22.

Figure 2 BOOSTIK LC front panel layout

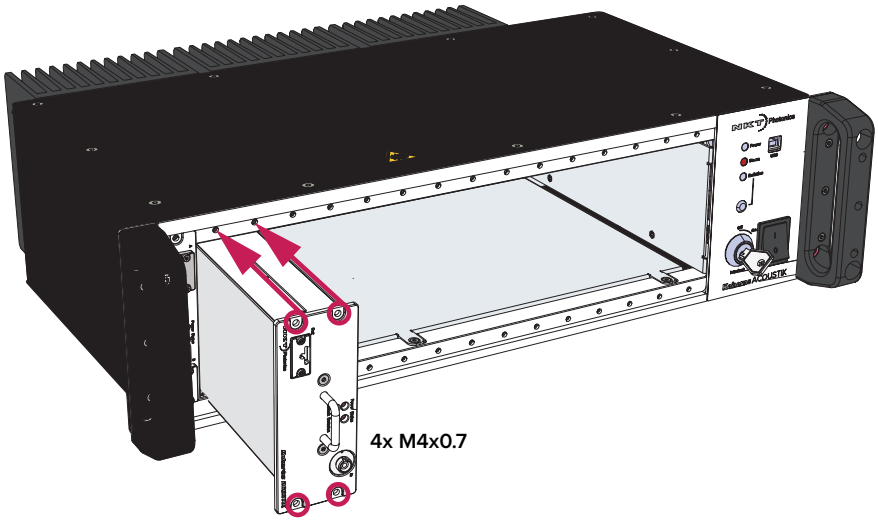


1	Koheras ACOUSTIK faceplate	4	Output fiber and connector
2	Status LEDs	5	Handle
3	Input fiber connector		

Koheras ACOUSTIK faceplate

A faceplate is mounted onto the front panel of the module casing and has four screw holes that align with the mounting holes of the ACOUSTIK slots. Once inserted into the ACOUSTIK, the module is fastened using four M4x0.7 screws.

Figure 3 Inserting a BOOSTIK LC into an ACOUSTIK shelf



Input fiber connector
A threaded E2000 input connector. The connector is designed to received the seed optical signal from a BASIK module.

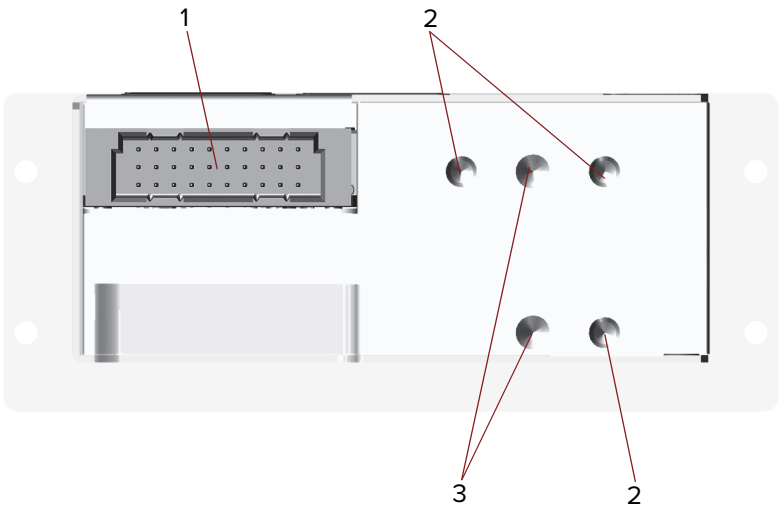
Output fiber and connector
Optical output fibers and connectors are specified in Table 1.

Handle
Grip the handle firmly, when inserting and removing the BOOSTIK LC from a slot in the ACOUSTIK shelf.

Rear panel

The rear panel, shown in Figure 4, includes: the main electrical interface, alignment holes, a heat transfer surface and three M4 tapped holes for fastening the laser from the rear.

Figure 4 BOOSTIK rear panel layout



1 Main electrical interface – C3
2 M4 mounting screw holes
3 Alignment holes

Main electrical Interface
The main electrical interface is a 30-pin male C/3 connector located on the rear panel of the module. The interface includes pins for the following signals:

- Serial communication – RS-485
- Interlock
- Emission control
- Modulation input/output – wavelength modulation

NOTE: For a complete description of the pin assignments, see “Electrical interface pinout” on page 61.

CONTROL GUI

You can manage a BOOSTIK LC laser amplifier and all other modules inserted into an ACOUSTIK shelf using NKT Photonics CONTROL graphical user interface (GUI) software installed on a PC. The PC is connected to an ACOUSTIK through either a USB or Ethernet connection.

To connect to and access a BOOSTIK LC module, follow the procedures to connect CONTROL to the ACOUSTIK shelf described in the document:

Koheras ACOUSTIK Product Guide

Once connected, use the software to control and monitor the amplifier emission. You can also view the amplifiers status and error state. For more information, refer to the chapter: “CONTROL GUI” on page 31.

Generic UI and NKT Photonics SDK

The Generic User Interface or Generic UI is control interface software intended for setting and monitoring the BOOSTIK LC registers. Registers are set or monitored through the Interbus protocol of the NKT Photonics SDK.

The SDK and Generic UI are intended for integration of the laser with a custom-built control system. The Generic UI platform provides a convenient interface useful during development and deployment. Instructions on how to use the Generic UI and Interbus protocol can be found in the SDK user manual included with the kit.

For BOOSTIK LC error codes and status bits, see Appendix D.

Enabling emission

The BOOSTIK LC is intended for use as a component in an ACOUSTIK shelf as part of a complete laser system. To enable emission from the module, refer to the procedures in the document:

Koheras ACOUSTIK Product Guide

Status LEDs

The rear panel houses four status LEDs that behave as described in Table 2. The LEDs are located on the center top of the front panel as shown in Figure 5.

Figure 5 Status LEDs

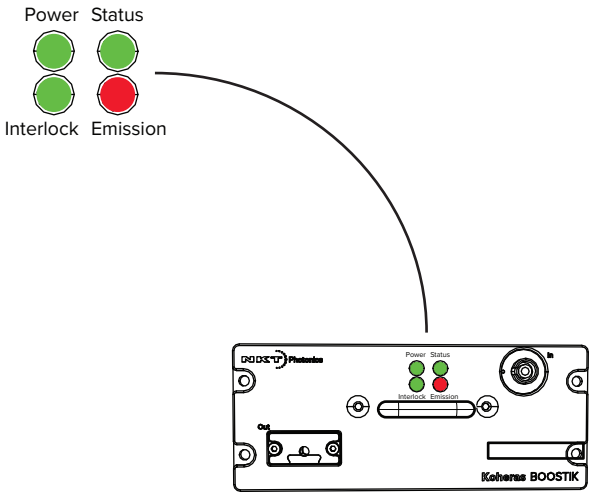


Table 2 Status LEDs

LED Name	Condition	Description
Power	ON Green	DC Voltage at the DC power input pins is OK.
	ON Red	DC voltage at the DC power input pins is too low.
	Flashing Amber	The module is transmitting data.
	OFF	No DC power at the module power input pins.
Emission	ON Red	Laser amplifier emission is ON.
	OFF	Laser amplifier emission is OFF.
Status	ON Green	Output power OK
	ON Amber	Module ready
Interlock	ON Green	The interlock status is OK – the door circuit is closed and energized.
	ON Red	The interlock status is Not OK – the door circuit is open or not energized.

NOTE: DO NOT OPERATE the laser until you are familiar with the controls and have taken all precautions necessary as described in the *Koheras BOOSTIK LC-series Laser Safety, Handling and Regulatory Information*.

Chassis labels

BOOSTIK LC labels The Koheras BOOSTIK LC chassis includes multiple labels that indicate hazards, regulatory and manufacturing information. The labels are described in Table 3 and their location is shown in Figure 6.

Table 3 BOOSTIK LC Chassis labels

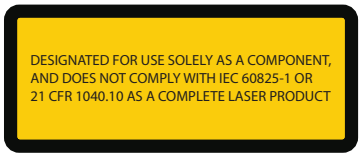
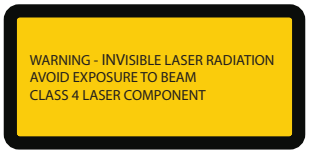
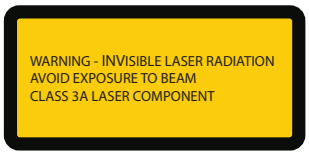
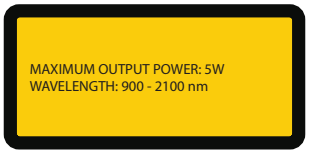
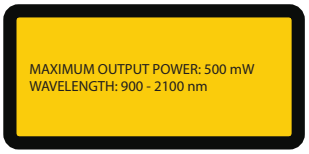
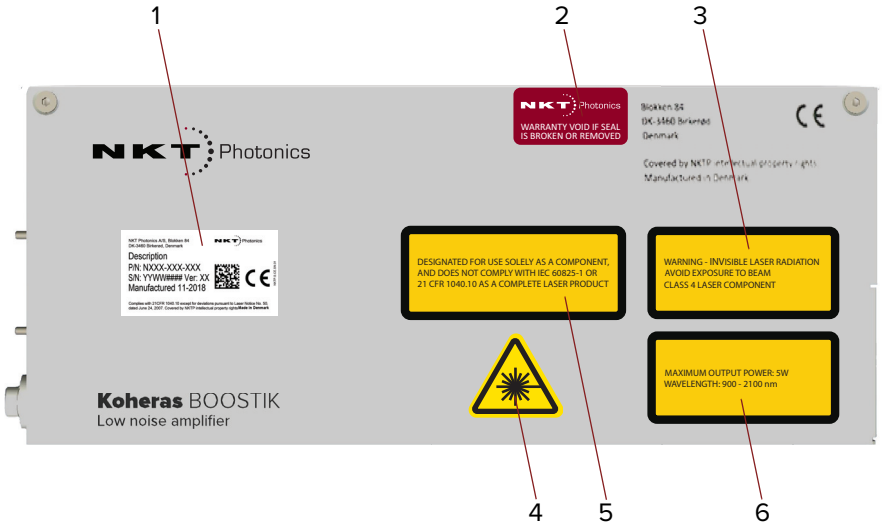
Label	Description	2 W	200 mW
Laser component designation	Statement indicating the device is a component of a laser system.		
Classification emission hazards	Safety information stating the laser emission hazards and the amplifier's laser class rating.		
Product information	Safety label showing the emission specifications the amplifier is capable of.		
Laser Radiation Warning	Safety information alert indicating this area of the laser is near a source of dangerous laser emission.		
Manufacturing	Manufacturing information including address, part and serial number, and date manufactured.		
Warranty	The module is sealed with this label. It is prohibited to remove the chassis cover.		

Figure 6 Top panel label locations



1. Product identification
2. Warranty
3. Product information
4. Laser radiation warning
5. Laser component designation
6. Classification emission hazards

2 Installation

Safety

WARNING: A Koheras BOOSTIK LC is a Class 4 laser and exposure to its emission is hazardous. Follow all regional laser safety regulations regarding installation, operation, and otherwise. Ensure to verify with your Laser Safety Officer (LSO) that the installation follows all applicable safety regulations and do no operate the laser until the officer approves it.

Passive cooling

A BOOSTIK LC module generates a substantial amount of heat that must be dissipated. The module uses a passive cooling design to dissipate the heat. To facilitate passive cooling, ensure either the rear or left panel is in firm contact with a heat conductive material that has an efficient thermal path.

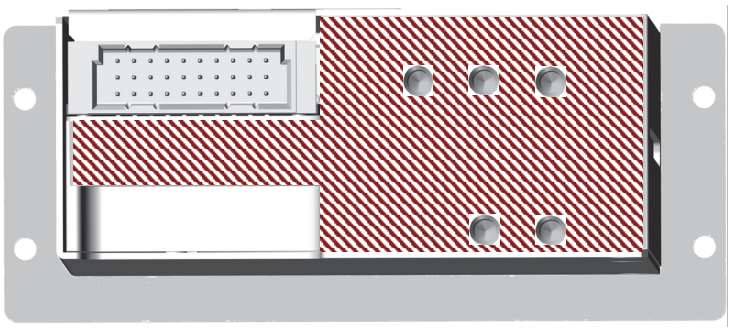
CAUTION: For reliable operation, do not expose the BOOSTIK LC to corrosive agents or excessive moisture, heat or dust.

CAUTION: Table 11 in Appendix A lists the specifications for the BOOSTIK LC operating environment.

Rear panel

The rear panel surface shown in Figure 7 acts as passive heat conductor for the module. Using this surface, mount the module so that the surface is in contact with a heat conductive material and path to for example, cooling fins. When the module is inserted into an ACOUSTIK shelf, the rear panel surface is firmly pressed against special conductive metal foil lining the rear backplane of the shelf. This facilitates heat transfer to the cooling fins mounted on the rear of the ACOUSTIK.

Figure 7 Rear panel heat conduction surface s

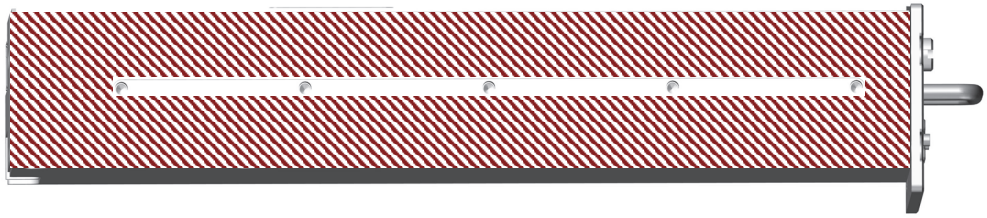


CAUTION: For proper operation and to prevent equipment damage, do not insert and operate more than two Koheras BOOSTIK LC modules inserted into specific slots of a Koheras ACOUSTIK shelf. Ensure to follow all installation instructions noted in the *Koheras ACOUSTIK Product Guide*.

Left side panel surface

You can optionally mount the left side panel surface, shown in Figure 8 below, in contact with a heat conductive material and preferably a heat sink. Five M3x0.5 screw holes are available to firmly mount the module for proper heat conduction.

Figure 8 Left side panel heat conduction surface s



Example side panel cooling

Figure 9 shows a custom passive cooling block mounted on the left panel. The block is custom built and illustrated as an example only. NKT Photonics only supplies cooling fins included on the rear of an Koheras ACOUSTIK shelf.

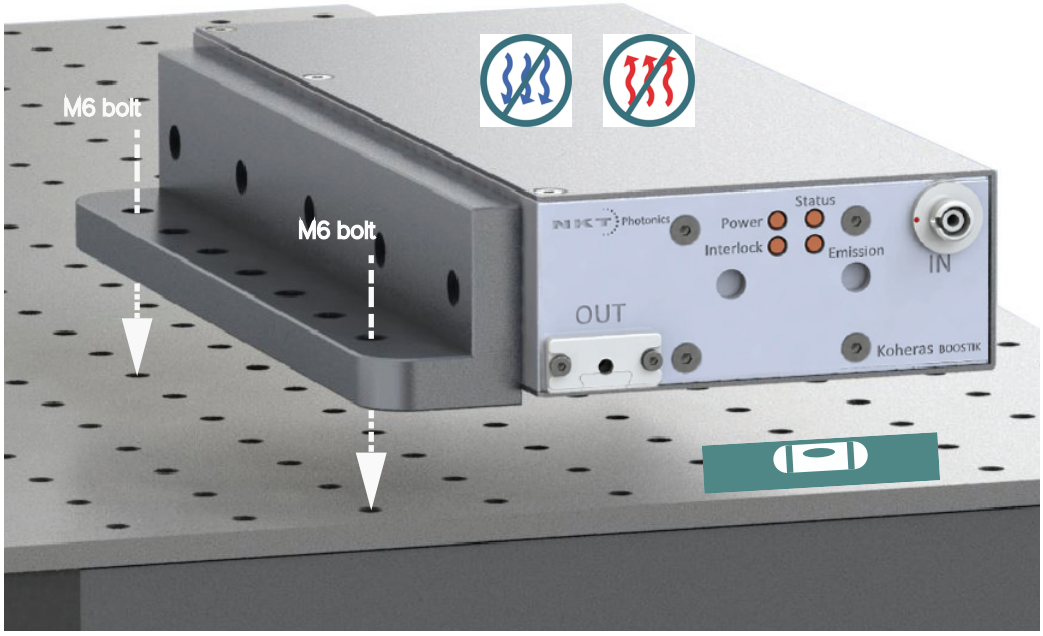
Figure 9 Custom passive cooling block mounted on the left panel

Custom mounting

As an example, for a simple custom system, you can place the BOOSTIK LC module on a level and stable surface. Bolt the module for example, to a table

using a custom mounting bracket (not included) attached to the side of the module as shown in Figure 10.

Figure 10 Example custom mount installation



Custom installation rules

- Allow for proper ventilation and cable access.
- Do not store or place anything on the top panel of the amplifier.
- Ensure the ambient operating temperature and humidity is stable as stated in the Table 11 on page 57.
- Avoid placing the amplifier near sources that could cause temperature fluctuations.
- The surface the amplifier is placed on, must be free of vibration or mechanical shocks.
- Always provide a thermal cooling path from either the rear or side panel.
- Do not bend the fibers below a bend radius of 10 cm.
- The amplifier is a Class 4 laser and as such the installation area must follow all regional laser safety regulations as defined by the assigned Laser Safety Officer (LSO).

Interlock

The BOOSTIK LC includes a safety Interlock function. The function shuts down the emission immediately when a circuit loop connected to pins A3 and A4 is either opened or shorted to ground.

When inserted into an ACOUSTIK shelf, the interlock circuit loop is connected through all installed modules and an external door switch circuit to protect the operating enclosure. For more information regarding the Interlock and how to connect a door safety switch, refer to the *Koheras ACOUSTIK Product Guide*.

Fiber tip cleaning

The output aperture of the BOOSTIK LC is a fiber with a optical connector. At the tip of the connector is a fiber facet where Class 4 emission are present. Without proper care the facet is easily contaminated or damaged affecting the output.

To clean it, only use cleaning tools specifically designed for use with optical fibers. Always use extreme caution when cleaning fibers.

Examples of appropriate cleaning tools are:

Lens cleaning tissue (lint free wipes) see Figure 11

Optical fiber cleaning tool see Figure 12

Figure 11 Lens cleaning tissue - lint free

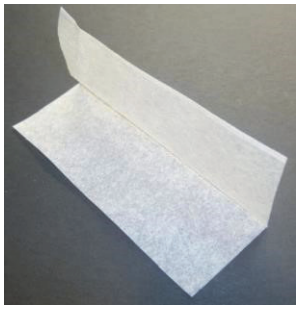


Figure 12 Optical fiber cleaning tool

Signs of damage Indications of a damaged fiber facet may be due to one of the following:

- Output power suddenly decreases.
- The spectrum (recorded from an optical spectrum analyzer) is significantly degraded compared to the original spectrum found in the measurement report.
- Light emitted from the fiber facet has a large color variation.

Emitted beam shape
When the fiber facet is clean and undamaged, the emitted beam has a discernible shape. An Incorrect beam profile occurs as a result of a damaged or dirty fiber facet. In this case, the emitted beam is random in direction and may even show variation in color.

Damaged facet If the fiber facet is damaged, you must re polish the connector before operating the laser. Failing to do so, could result in incorrect measurements/usage or even damage to the laser unit itself.

CAUTION: Do NOT remove the connector attached to the fiber, special equipment and procedures are required to fit a new connector with the fiber.

Polishing

The end of the fiber is collapsed to a length of 150-200 microns. This allows enough length to polish the fiber end; however, be careful not to over-polish, generally NKTP recommends to return the unit for factory polishing.

The general procedure is to:

1. Clean the connector and quickly and very lightly, polish the connector end.

CAUTION: Do not over-polish the connector end (fiber facet). Over-polishing the connector end will damage it due to its limited length.

2. Clean the connector and then switch the source on. Observe the exit beam on a screen. If it is not a well-formed emission, repeat step 1.
3. Continue this "quick polish, check beam" process until a well-formed beam is obtained.

CAUTION: If you do not obtain a good beam profile after polishing, the connector may be damaged. Return the laser to NKT Photonics for repair. Note that this type of repair is not covered by warranty.

3 CONTROL GUI

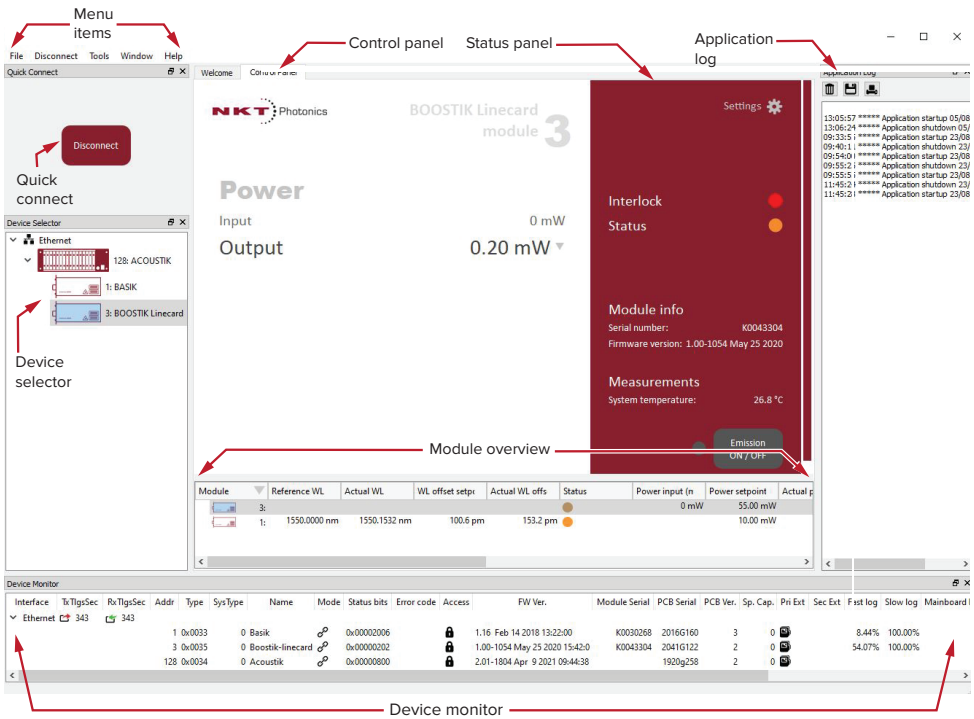
CONTROL GUI overview

The CONTROL window includes multiple panels and a selection of menu drop down items in the upper left corner. Using the top left drop-down menu, you can add or remove the displayed panels and panels can be dragged within the main window or into separate windows. The panels and menu shown in Figure 13 are briefly described Table 4 with links to more details descriptions.

Table 4 CONTROL panels and menu

Panel	Function	See
Status panel	Displays the selected device statuses, errors, module information, emission control and a CONTROL settings menu.	Status panel on page 34
Menu items	Four drop down menus with multiple functions.	CONTROL menu on page 37
Control Panel	This panel provides configuration controls such as wavelength, pulse power and repetition rate.	Control panel on page 44
Application Log	This panel displays a debugging log that can be saved to a file.	Application log on page 42
Device Monitor	To also help debugging issues, this panel displays multiple port and device module parameters.	Device monitor on page 41
Module overview	Displays parameters and the status of modules inserted in an ACOUSTIK shelf where the BOOSTIK is inserted.	Refer to the *Koheras ACOUSTIK Product Guide*.
Quick Connect	Click to connect to all devices available to CONTROL on serial and Ethernet connections.	Quick connect on page 33
Device Selector	A clickable icon tree for all connected devices. Click on the icon to access the device.	Device Selector on page 33

Figure 13 CONTROL panels and menu



Relocating panels

You can drag the different panels of CONTROL to any location within the main interface or into a separate floating panel. Procedure 1 describes how to relocate a panel within the main window.

Procedure 1 Relocating panels

	Action
1	Left click and hold the top title bar of the panel.
2	While holding the left mouse button down, drag the panel to another location in the main window.
3	In the new location. when the background turns blue, release the mouse button – see Figure 14.
4	Alternatively, drag the panel out from the main window and release the mouse button. A separate window for the panel is created. (see Figure 15)

Figure 14 Panel dragged to a new location in the main window

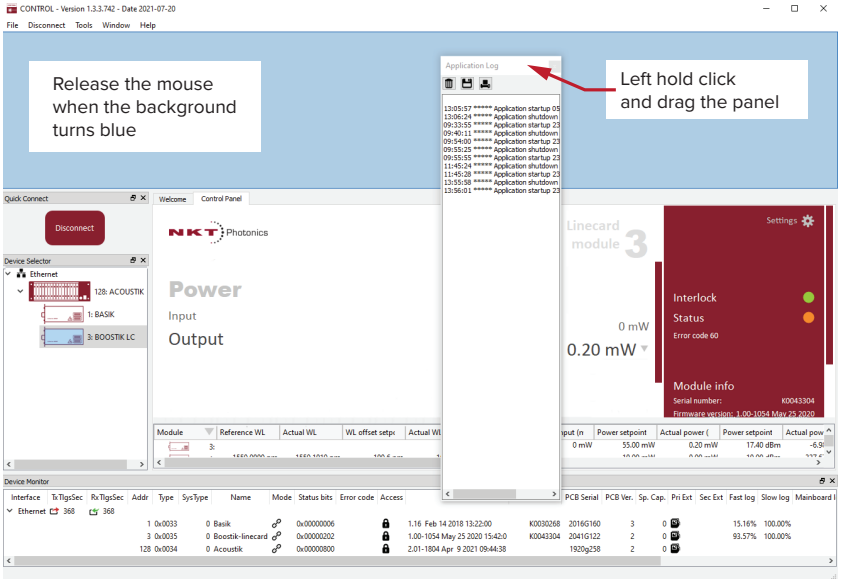
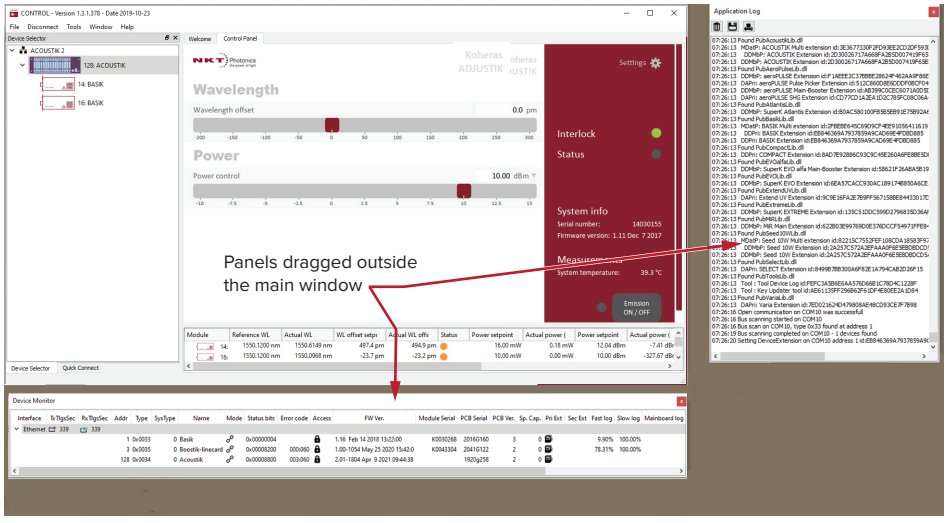


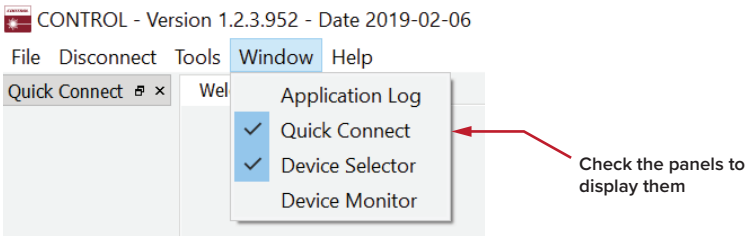
Figure 15 Panels dragged outside the main window



Toggling panels visible

Use the Menu > Window drop down menu to check and uncheck panels to be displayed. A blue check mark indicates the panel is displayed.

Figure 16 Toggling panel visibility



NOTE: To close a panel, click the X at the upper right corner of the panel.

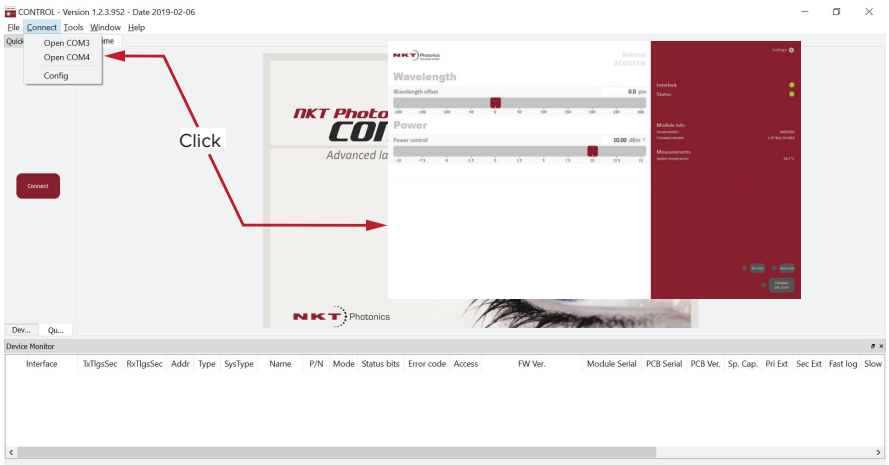
Connecting to the laser

When CONTROL launches, the Welcome panel is displayed as in Figure 17. In the menu bar, click the 'Connect' drop down menu and then click on the COM or Ethernet port your ACOUSTIK shelf is using to connect CONTROL to the ACOUSTIK. The Control and Status panels are displayed when the laser connects to CONTROL.

NOTE: To connect the PC to CONTROL, refer to the document:

Koheras ACOUSTIK Product Guide

Figure 17 Welcome screen and connecting



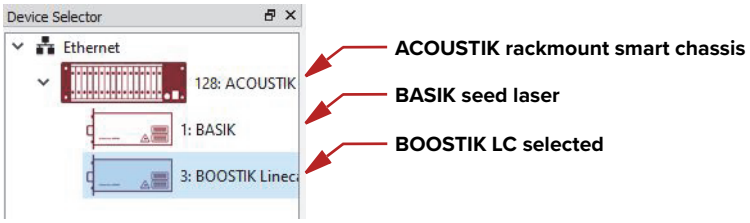
Quick connect

Alternatively, click the quick connect button to scan the PC ports for compatible devices. CONTROL connects to any valid device connected to the PC.

Device Selector

Left-click any BOOSTIK LC icon in the device selector to access its controls as shown in Figure 18. For an ACOUSTIK shelf, all inserted modules including any inserted BOOSTIK modules are shown as child modules of the ACOUSTIK.

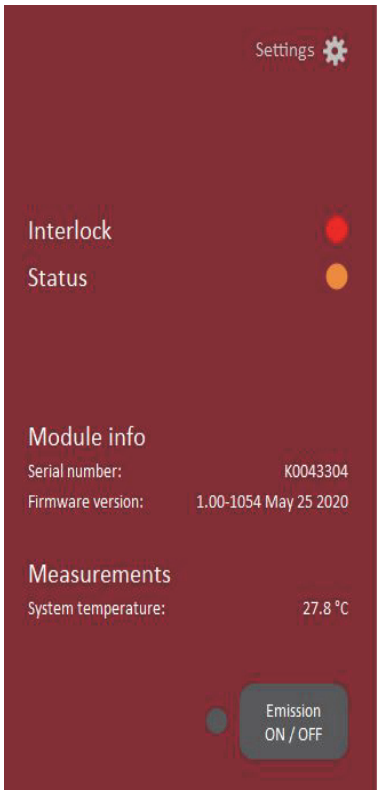
Figure 18 Device selector panel



Status panel

The Status Panel provides status indicators, error messages, system information, emission control function and a settings menu.

Figure 19 Status panel indicators



Status indicators The panel displays the following indicators:

Interlock
Indicates the state of the safety interlock circuit.

- ON Green – The interlock loop back circuit is closed i.e. connected.
- ON Red – The interlock loop back circuit is shorted to earth or open. For example, a connected door switch is open.

Status
Indicates the operational state of the laser.

- ON Red – An fault in the modules operation has occurred producing an error message in the status panel. Errors generated are listed below the Status indicator – see Appendix D for a list of possible errors.
- ON Amber – The laser amplifier is ready.
- ON Green – The laser amplifier is operating normally and emission are enabled

Error messages

Should a fault occur, an error message and its associated error code is displayed directly below the Status indicator. Error codes and their recovery actions are described in Table 14 on page 63.

System info

The System Info section shows the following:

- Laser Serial Number
- Laser Firmware Revision

NOTE: System info is only displayed if the option is checked in the View menu - see “View” on page 37.

Measurements

The system temperature is displayed.

NOTE: Measurements are only displayed if the option is checked in the View menu - see “View” on page 37.

Emission button

The Emission button turns the laser amplifier emission ON. The button indicator is lit steady ON Red when any laser emission are generated. Otherwise, it is OFF Grey.

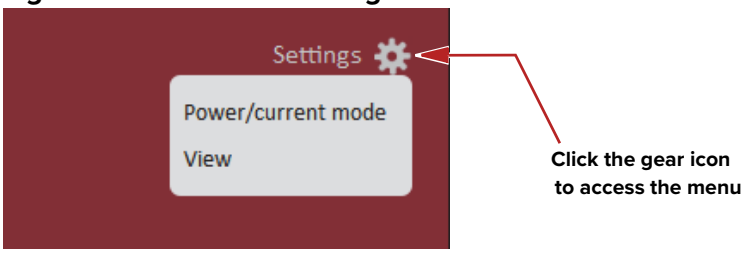
WARNING: Class 4 laser emission are emitted when the Emission button LED is ON Red.

NOTE: A BOOSTIK LC is a laser amplifier, as such its emission can only be enabled when its connected seed laser emission is enabled. If you click the Emission button without a seed laser signal at the input , the action fails and raises error code 60.

CONTROL settings

CONTROL settings are accessible by clicking the gear icon in the upper right corner of the Status panel. Clicking the gear icon displays a drop-down menu of setting items as shown in Figure 20.

Figure 20 CONTROL settings



Setting Item	Function	See
Power/current mode	When selected, the control panel allows you to set the amplifier to operate in either power or current mode.	Power/current mode on page 36
View	Panel with check boxes to enable displaying the module Information and/or the system temperature on the status panel.	View on page 37

Power/current mode

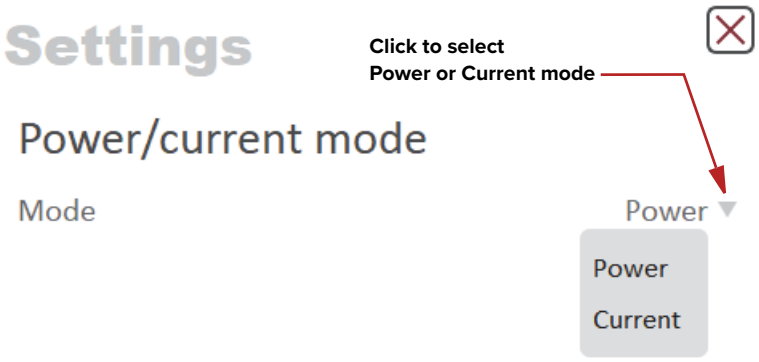
Click the down arrow to access the mode selection drop-down menu on the right of the panel.

Selecting “Power mode” sets the laser output power based on the power control setting and is kept stabilized using feedback from a sensor in the optical output.

Selecting “Current mode”, sets the output power to the level set using the power control slider in power mode. However, once in current mode, the power control setting is not available in the main Control panel and setpoint level of the output power is maintained by constant current fed to the amplifier.

Click the X in the upper right corner to close the panel and return to the main Control panel - see “Control panel” on page 44.

Figure 21 Power/current mode settings



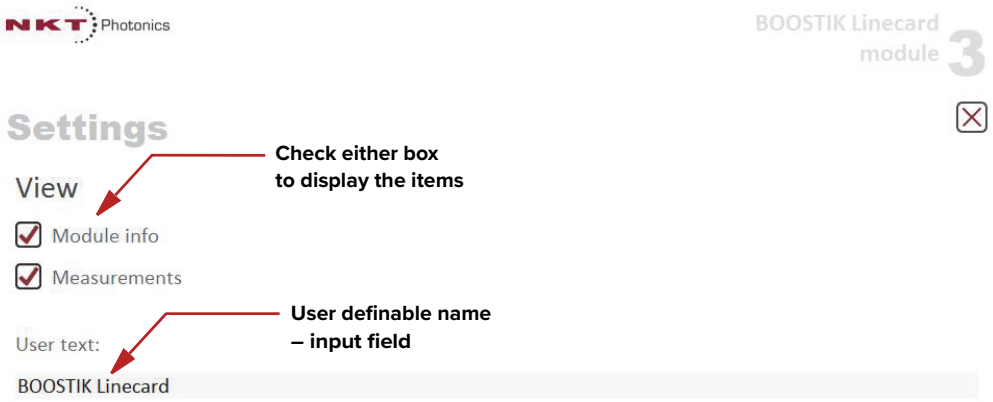
View

Check the *Module info* box to display the laser serial number and firmware release number within the status panel.

Check the *Measurements* box to display the system temperature in the status panel.

In the *User text*: field, input an alphanumeric text string for the module. The string is displayed next to the module icon in the Device Selector.

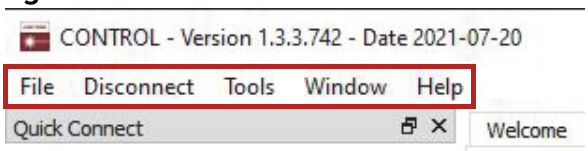
Figure 22 View settings



CONTROL menu

There are four drop down menus in the main control window as highlighted in Figure 23. Click on the items in the menu to reveal the drop down menus.

Figure 23 Menu items



Menu Item	Function	See
File	Exits the CONTROL program	
Connect / Disconnect	Connect – drop-down selection of pre-configured device connections to connect control to. Disconnects the currently connected device from CONTROL.	• Refer to the included CONTROL user help under: *Help-Show Instruction Manual.*

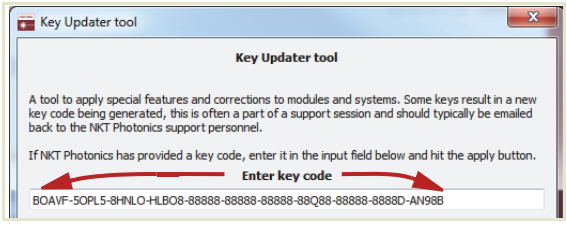
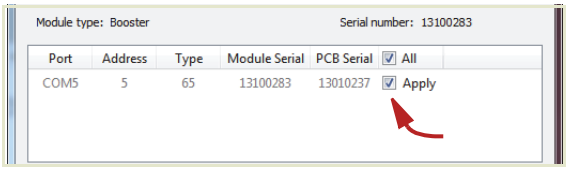
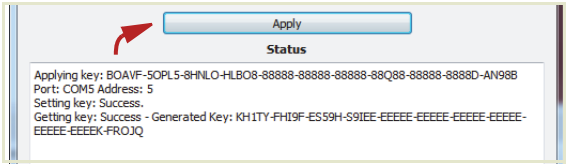
Menu Item	Function	See
Tools	Select from one of three special tools to use with your laser. Tools available are: • Key Updater Tool • Log Downloader • Extensions Overview	• Key Updater tool on page 38 • Log downloader on page 38 • Extensions overview on page 40
Window	Selects whether or not to display the Application Log and/or the Device monitor.	• Device monitor on page 41 • Application log on page 42
Help	Displays the current version of CONTROL and provides access to the included CONTROL user help.	

Key Updater tool

The Key Updater tool is used to apply special features and corrections to modules and systems of the laser.

To use the Key Updater tool follow Procedure 2.

Procedure 2 Using the Key Updater tool

	Action	
1		Enter the key code in the field *Enter key code*.
2		In the list of modules, check the box on the right of each applicable module.
3		Click *Apply*

NOTE: Certain keys generate a new locally generated key code. Locally generated keys are usually required during a support session and are emailed back to the NKT Photonics support personnel.

Log downloader

If your laser requires support from NKT Photonics, our support engineers may request that you send the log files collected by the laser. You can use the log downloader tool to save the laser log files to your CONTROL PC.

CONTROL automatically downloads log files from the modules of any connected devices. The log files are stored in a local database on the CONTROL PC. However, certain modules, including the Koheras BOOSTIK LC main board do not support automatic download of log files. For these modules. you can use the *Log Downloader* tool to put the device into dedicated log download mode by enabling a collect log function.

Fast log vs. slow log

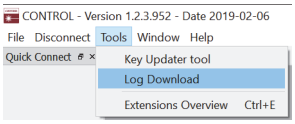
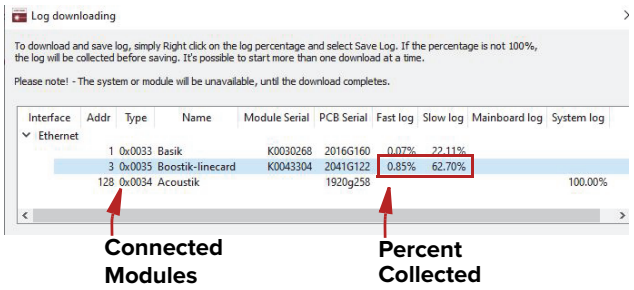
Both fast and slow log types collect the same data from the device. The difference between the two logs is their polling resolution. A fast log polls for data at a far shorter interval then a slow log which is intended for device analysis over the life of the device. Since a fast log collects far more data over the same time, it appears to collect logs at a slower rate than a slow log, but this is only due to the large amount of data it collects in comparison.

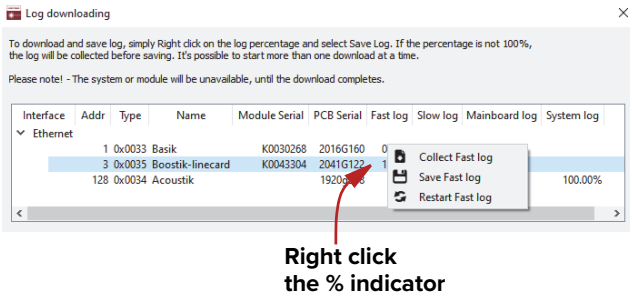
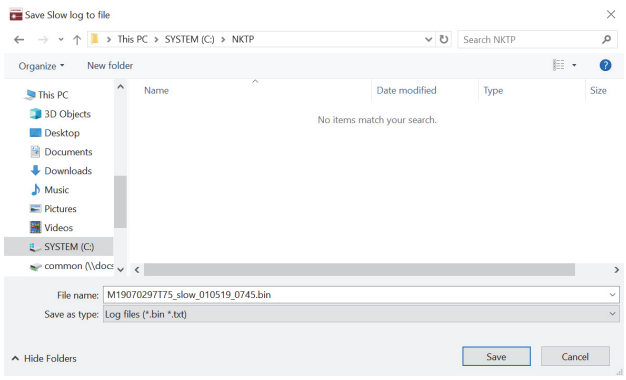
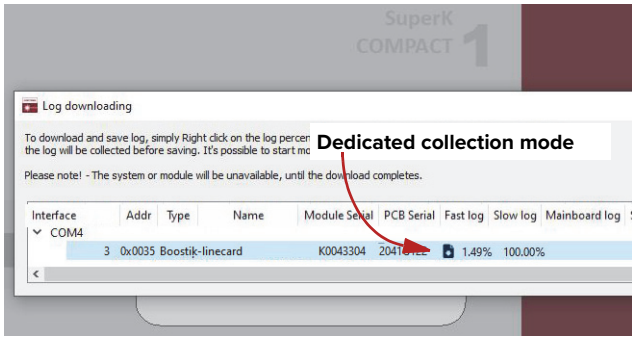
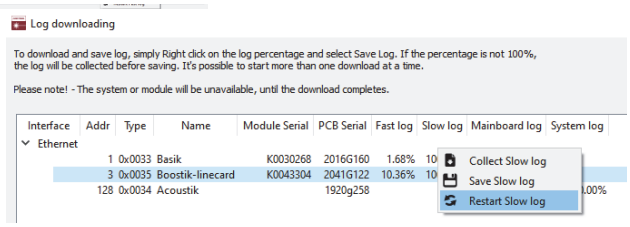
NOTE: When the collect log function is enabled, it temporarily disables automatic log collection from all other devices. The CONTROL interface turns grey (gray), and communication with the laser and log collection with all other modules is disabled

NOTE: Right clicking any device in the “Device monitor”, also displays log download functions.

To download log files use the *Log Downloader* as described in Procedure 3.

Procedure 3 Using the *Log Downloader*

	Action	
1	Open the Tools menu and click on *Log Download* to start the Log Downloader tool.	
2	The tool displays all connected modules with log capability. To decrease the download time of the module log files, CONTROL continuously collects module log data and stores this log data in a local database on the PC. The percentage indicator shows the amount of log data collected for each module. Logs are collected from each module. The total collected percentage is displayed for the module’s logs.	

	Action	
3	To download and save a log file to the CONTROL PC, right click the percentage indicator and select either: • **Save log** – Immediately saves the fast or slow log file onto the CONTROL PC. If the percentage shows less than 100%, the log is collected first. See Collect log below. • **Collect log** – Starts a dedicated log collection mode that disabled all other CONTROL activity.	
4	If you select *Save Fast* or *Slow log*, a dialog box prompts for a filename and folder to store the log in.	
5	If you select *Collect Fast or Slow log*, the log is collected and saved in dedicated mode. The CONTROL panel turns grey and all other functions are disabled. When the log is finished being collected, all other CONTROL functions are enabled.	
6	Select *Restart Fast* or *Slow log* to clear all the collected log data and restart the log data collection.	

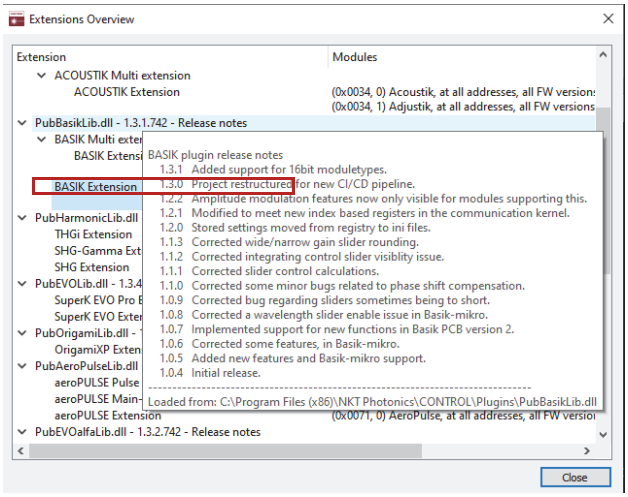
Extensions overview

You can use the *Extensions Overview* tool to view the installed extensions (plugins) that are included with CONTROL. The extensions are found in the following folder:

```
C:\Program Files (x86)\NKT Photonics\NKTP CONTROL\Plugins
```

To view the extensions, open the *Tools* menu and click on *Extensions Overview*. The *Extensions Overview* window is launched as shown in Figure 24.

Figure 24 Extensions Overview



NOTE: To show a short description of the release notes as seen in Figure 24, hover the mouse pointer over the *Release notes* text

NOTE: Multiple extensions for a wide range of lasers types and accessories are typically installed when using the default installation of CONTROL.

Device monitor

The device monitor provides a real-time display of communication port parameters and any connected device modules.

The parameter values displayed are continuously updated and can be used to help debug issues with connected devices. The parameters are listed and described in Table 5.

Table 5 Device Monitor parameters

Parameter	Description
Interface	The PC port interface the device(s) is connected to. Click the greater than symbol to the left of the port to display the connected device (s) parameters.
TxTlgsSec	The number of telegrams per second being transmitted to the connected device.
RxTlgsSec	The number of telegrams per received from the connected device.
Addr	The address of the connected module.
Type	The type of the connected module read from the module.
SysType	The system type, default 0 – can be used to describe system variants and is read from the module.
Name	The name of the connected device module.
P/N	The device module part number.
Mode	The mode or status of the connected module: connected, disconnected, or disabled

Parameter	Description
Status bits	The actual status bits read from the connected module.
Error code	The actual error code read from the connected module.
Access	Protected/Locked status of the module.
FW Ver.	The device module's firmware release date.
Module Serial	The serial number of the device module
PCB Serial	The device module's printed circuit board serial number
PCB Ver,	The version of the device module's printed circuit board.
Sp. Cap/	The module speed capability in bits per second as read from the module – Values: 0=(default) 115200, 1=230400, 2=460800, 3=921600
Pri Ext	Primary extension/GUI loaded for this module. Hover over the icon to list more details – Note that there can only be 1 primary.
Fast Log	0%-100% collected. Note only if the module has a fast log and only internal modules have fast and slow logs.
Slow Log	0%-100% collected. Note only if the module has a slow log.
Mainboard Log	0%-100% collected. Note only if the module has a main log. Only main boards have a main and system logs.
System Log	0%-100% collected. Note only if the module has a system log. Only main boards have a main and system logs.
Timeout	Time in milliseconds since the last telegram was received from the device module.
Nack	Total number of negative acknowledgments received from the device module.
CRC	Total number of received telegrams with CRC failures
COM	Total number of communication errors with framing or protocol errors. Hover over the icon to list more details.
Busy	Total number of busy responses from the module. Busy responses occur when the module receives a message but cannot process it due to its current work load.

The panel is enabled by placing a check mark on the *Window* drop-down menu next to the *Serial Monitor* item.

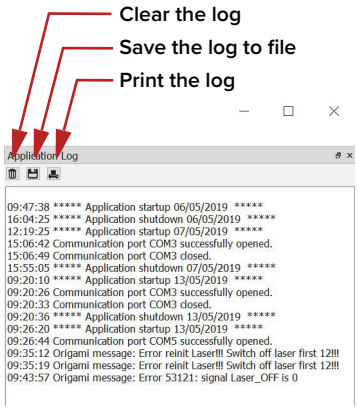
To close the panel click on the upper right corner "X" or uncheck the item in the drop-down menu.

Application log

In addition to the *Serial Monitor,* the *Application Log* panel is used for debugging serial communications. The panel displays time stamps for both

COM port open and close times and also general status information. You can clear, save and print the log data using the buttons in the upper left corner.

Figure 25 Serial monitor



The panel is enabled by placing a check mark on the *Window* drop-down menu next to the *Application Log* item.

To close the panel click on the upper right corner “X” or uncheck it in the drop-down menu.

Control panel

Power mode

When set to *Power* mode within the *Control Panel* you can view both the measured input and output power, plus you can set the setpoint level of the output power. The laser amplifier measures the optical output power and uses the measurement to constantly adjust the level to the setpoint.

Input

The *Input* field displays the optical power in milliwatts measured at the *In* (input) fiber port.

Output

The *Output* field displays the optical power in milliwatts measured at the *Out* (output) fiber port. This is the laser output aperture power and you can display the power level in either mW or dBm units by clicking the drop-down menu arrow.

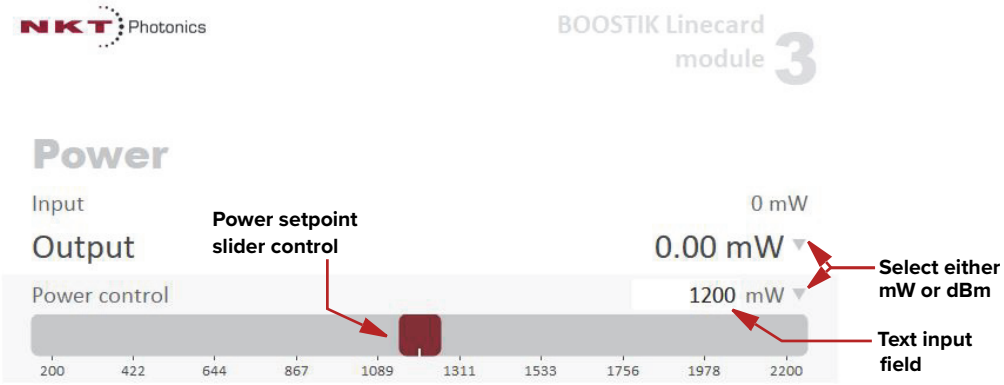
Power control

Set the output power setpoint level using the slider control. You can set the level can from 10 to 100% of the maximum rated power.

You can additionally key in the power level directly by using the text input field at the upper-right corner of the slider control.

NOTE: Typically the maximum power exceeds the 100% rated value.

Figure 26 Power mode – viewing and setting optical power



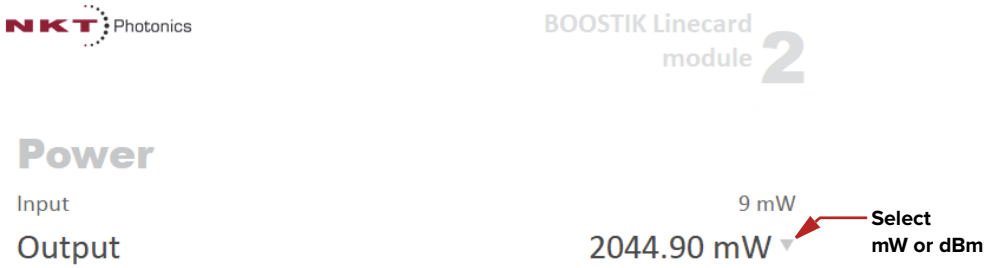
Current mode

When set to *Current* mode within the *Control Panel* you can view both the measured input and output power, but the *Power control* slider is removed. A constant current is fed to the laser amplifier to stabilize the output power. Before configuring the amplifier to operate in *Current* mode, the output power level must first be set in *Power* mode using the *Power control* slider.

Input
The *Input* field displays the optical power in milliwatts measured at the *In* (input) fiber port.

Output
The *Output* field displays the optical power in milliwatts measured at the *Out* (output) fiber port. This is the laser output aperture power and you can display the power level in either mW or dBm units by clicking the drop-down menu arrow.

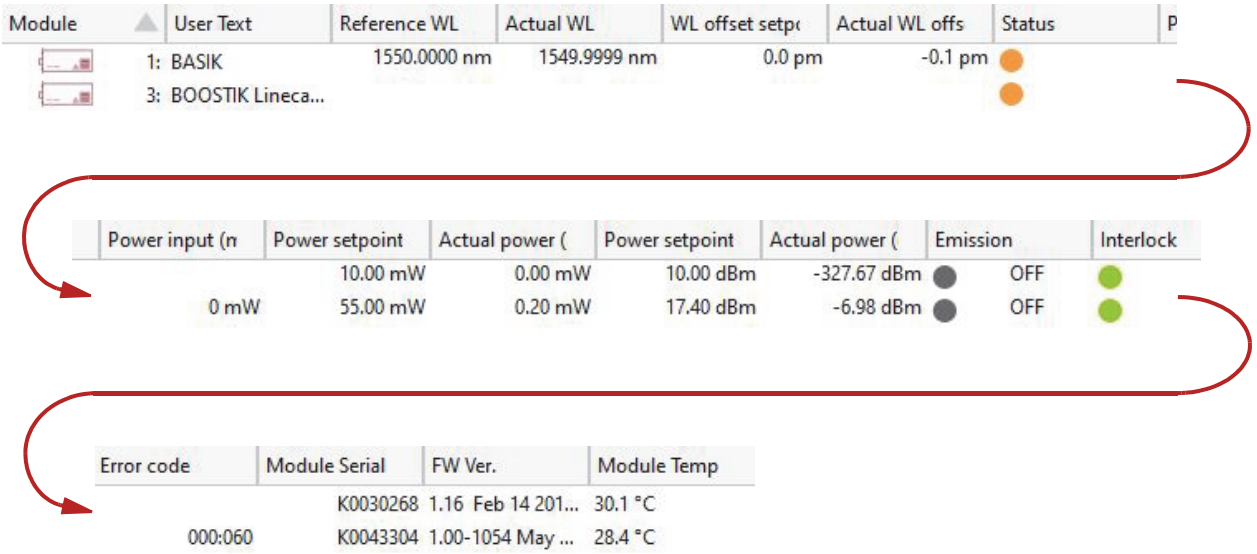
Figure 27 Current mode – viewing optical power



Module overview

When CONTROL connects to a Koheras ACOUSTIK shelf, a Module overview panel is displayed beneath the *Control* and status panels. As shown in Figure 28, each row in the overview represents an inserted module and the column fields display the module parameters and statuses. Clicking on a row, selects the actual module and switches the view to the *Control* and status panels for the module.

Figure 28 Module overview - all fields selected



The following information is available from each of the available fields:

Table 6 Module overview fields

Column heading	Description
Module	Chassis slot number
Reference WL	Base wavelength of the module in nm
Actual WL	Output wavelength of the module in nm
WL offset Setpoint	Wavelength offset set with CONTROL in pm
Actual WL offset	Measured wavelength offset in pm.
Status	Module status indicator
Power setpoint (mW)	Power level set with CONTROL in mW
Actual power (mW)	Measured power level in mW
Power setpoint (dBm)	Power level set with CONTROL in dBm
Actual Power (dBm)	Measured power level in dBm
Emission	Displays status of module emission: • Red ON - emission enabled • OFF - emission disabled
Interlock	Displays status of the interlock circuit: • Green ON - Interlock circuit closed • Red ON - Interlock circuit open or key switch off.
Error code	Error code for an existing module fault - contact NKT Photonics support of the error persists.
Module Serial	Factory serial number of the module.
FW. Ver.	Firmware currently executing on the module.
Module Temp	Temperature within the module.
User Text	Text describing the module – see View on page 37.

Toggling and sorting the overview fields

In the module overview, you can sort the order of the fields and select the fields to display.

Setting the field order

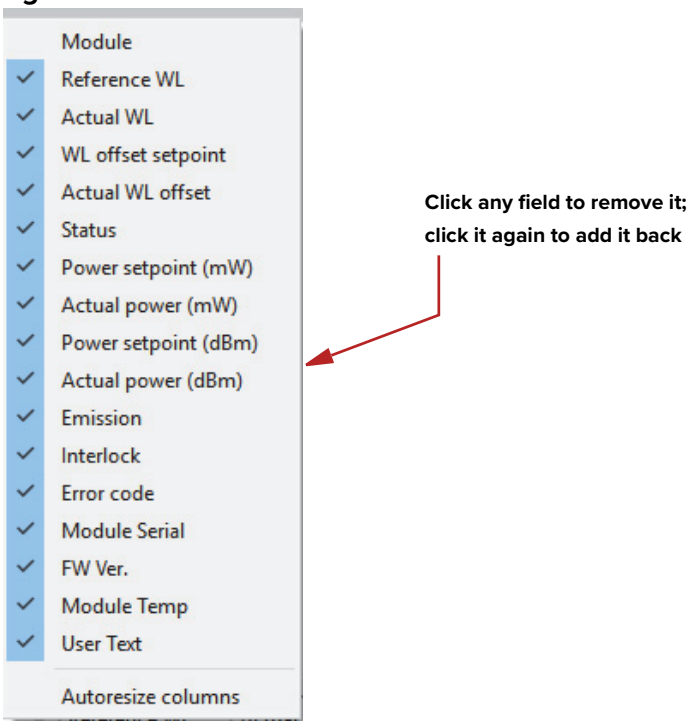
With your mouse, click-hold on a field in the header and drag it to a new location to change the order of the fields in the header.

Togging fields on and off

Right-clicking on any of the fields in the header displays the menu shown in Figure 29.

To remove a field from the overview, click once on the any of the fields (except for Module) to uncheck it. Clicking once on an unchecked field, adds it back to the overview.

Figure 29 Module overview field selection



4 SDK Registers and Tabs

NKT Photonics' Software Development Kit (SDK) allows access to registers controlling the module's operating parameters using its Generic User Interface (Generic UI). For general operation it is recommended to use CONTROL. This section's purpose is to help introduce how to use the Generic User Interface to set some of the laser's operating parameters. Table 7 presents the registers by their function with a link to a detailed description.

Table 7 Generic user interface registers

Register name and link	Function	Read/Write Register	Read-only Register	Unit
Output power setpoint on page 50	Sets the emission output power level.	22 & A0	–	mW & dBm
Emission on page 50	Enables or disables emission	30	–	–
Setup bits on page 51	Configures the operational mode,	31	–	–
Stage one input monitor on page 52	Displays the optical input power received.	–	10	mW
Pump temperature on page 53	Displays the set pump temperature.	–	13	°C
Heat sink temperature on page 53	Displays the rear temperature sensor measurement.	–	1C	°C
Errors and status indicators on page 54	Boolean status indicators and error codes displayed	–	–	–
Graphing on page 55	X-Y graphing of selected registers.	–	–	–

NOTE: This chapter introduces the Generic UI and its registers. For a full description of the SDK, registers and using the Generic User Interface, refer to the NKT Photonics document: *SDK Instruction Manual*. The manual is installed when the SDK installer is run.

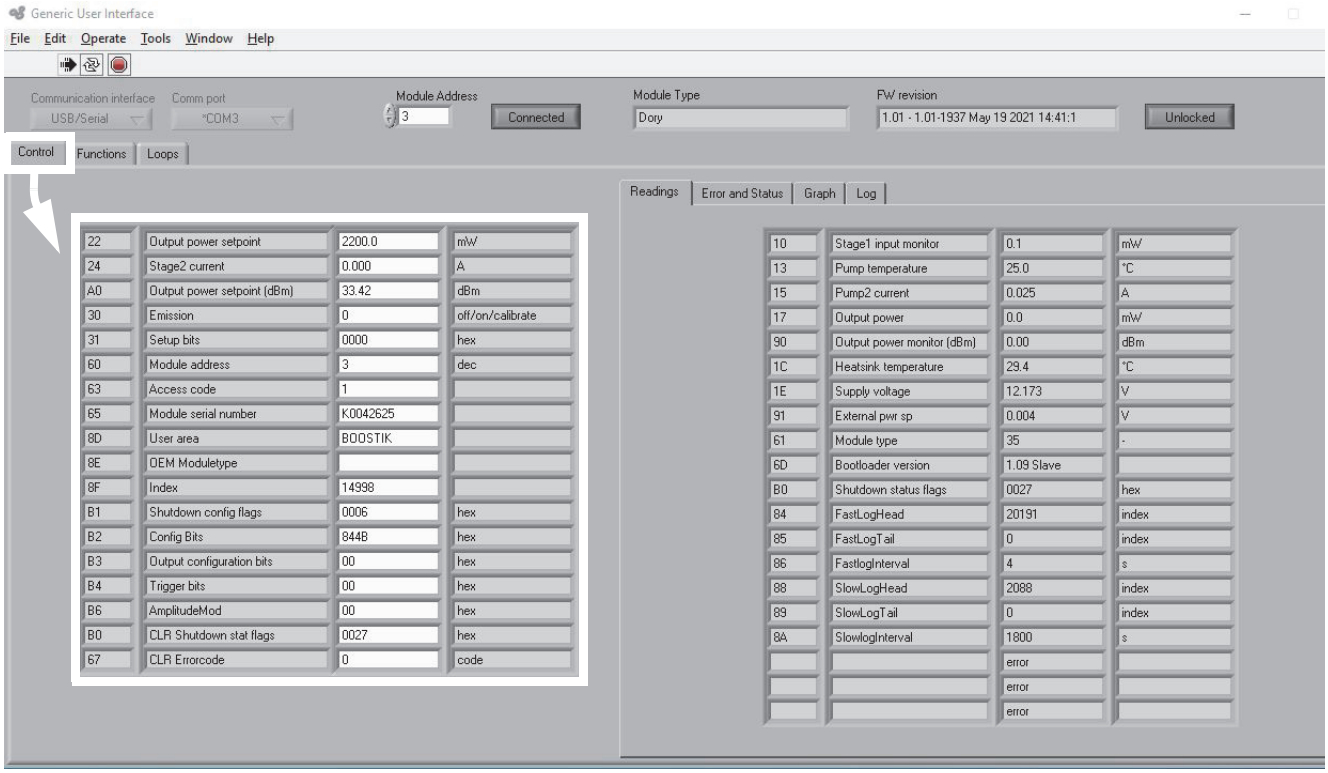
SDK installer The SDK installer including instructions is available at the following URL:

https://www.nktphotonics.com/support

Read/write registers

To to set and operate the BOOSTIK LC, click on the *Control* tab in the left side half of the Generic UI window to view the read/write registers. For read/write registers not described in this document, refer to the SDK instruction manual included with the SDK installation.

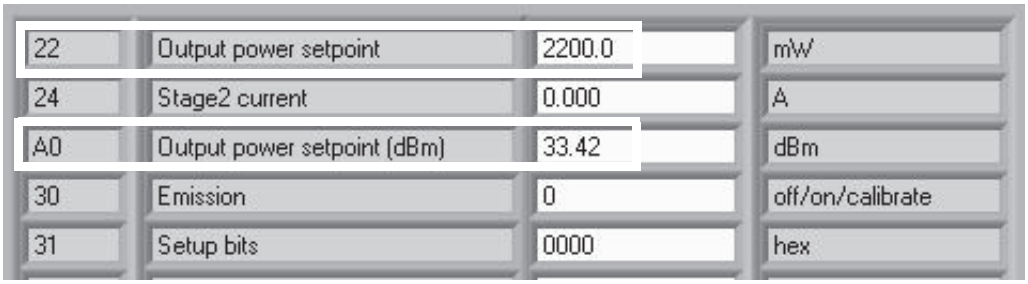
Figure 30 Read/write registers under the *Control* tab



Output power setpoint

Input the setpoint power level of the optical output in mW or dBm. For setting the power using mW units, use register 22, and for using dBm units, used register A0.

Figure 31 Setting the output power setpoint

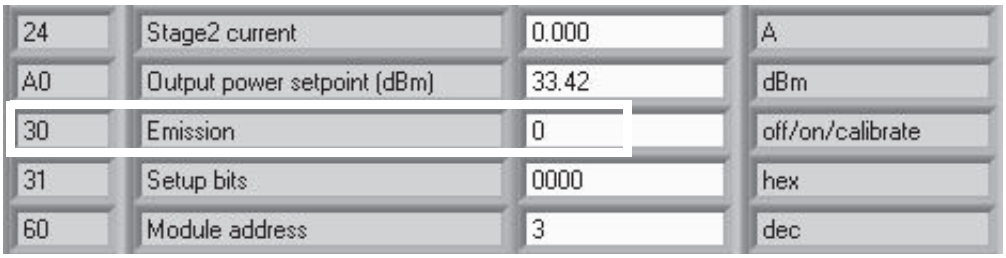


Emission

Keying 1 into register 30 enables emission from the amplifier module. If there is no input power (“Stage one input monitor”), then enabling emission fails and a

fault is raised with error code 60 displayed – see “Errors and status indicators” on page 54.

Figure 32 Enabling emission

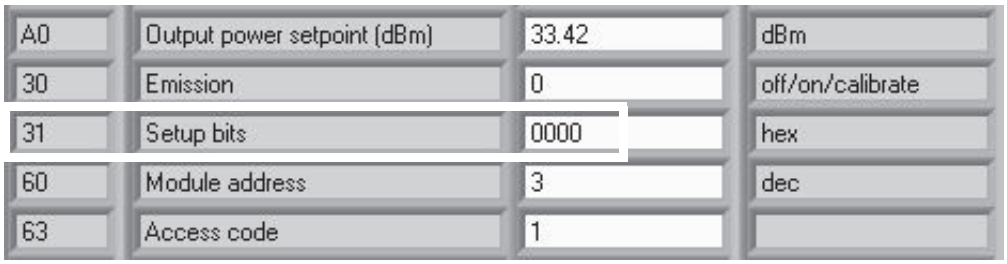


Setup bits

Register 31 *Setup bits* configures the laser amplifier to operate in either current or power mode. Set as follows;

- 0000 – Power mode
- 0001 – Current mode

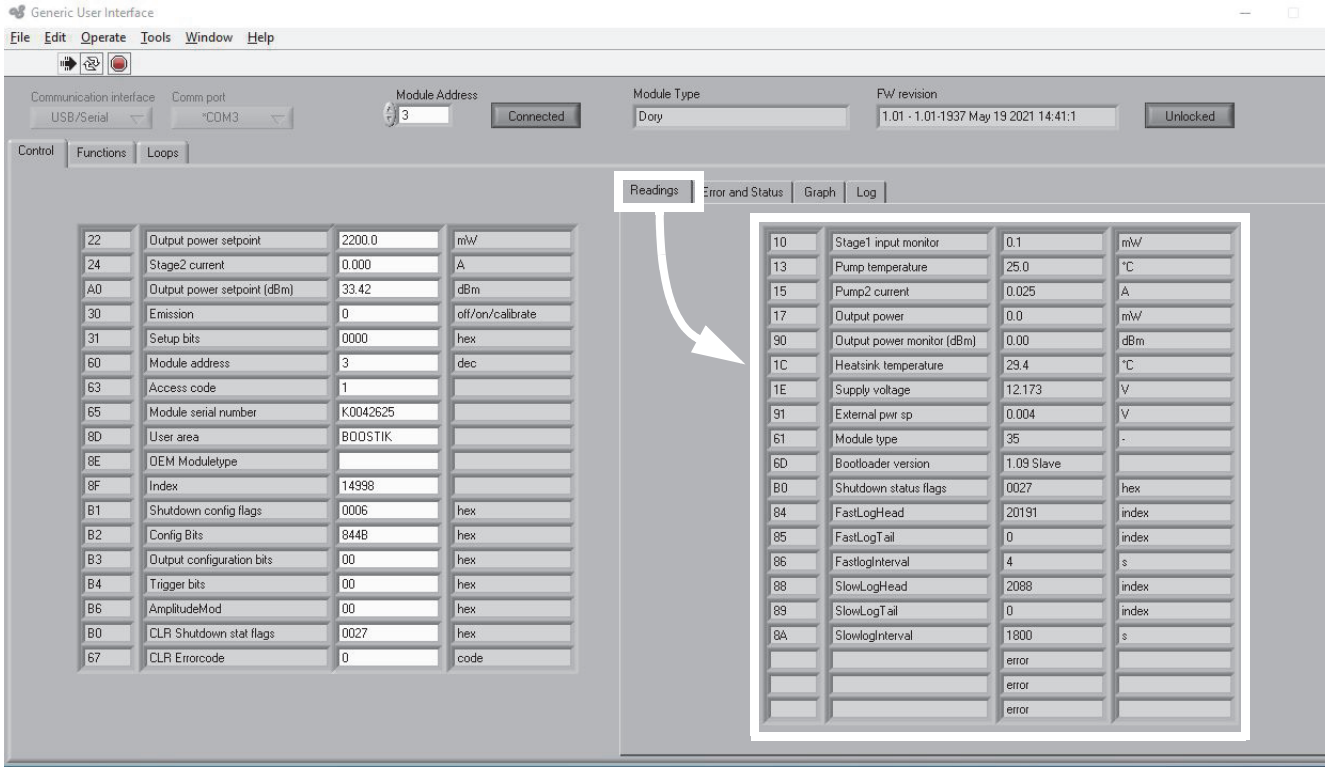
Figure 33 Setting the setup bits



Readings

To monitor the BOOSTIK LC, click on the *Readings* tab in the right side of the Generic UI window to view the contents of read-only registers. For read-only registers not described in this document, refer to the SDK instruction manual included with the SDK installation.

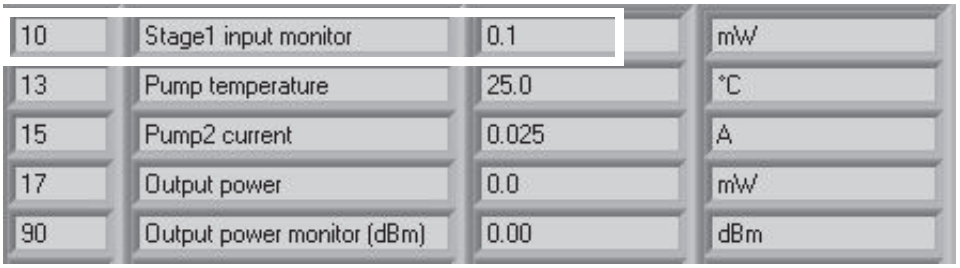
Figure 34 Read-only (monitor) registers under the *Readings* tab



Stage one input monitor

Readings register 10 displays the input power in mW received at the optical input of the laser amplifier. Before enabling the amplifier emission, ensure the minimum input power is displayed by this register.

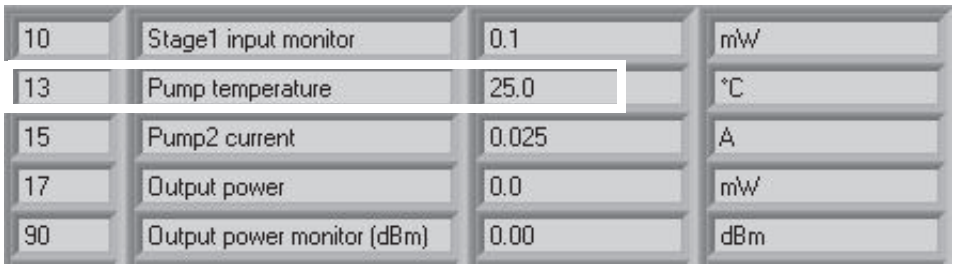
Figure 35 Stage one input monitor



Pump temperature

The hard-coded pump temperature of the BOOSTIK LC is displayed in *Readings* register 13. When operating, the module is designed to maintain its pump temperature at this value.

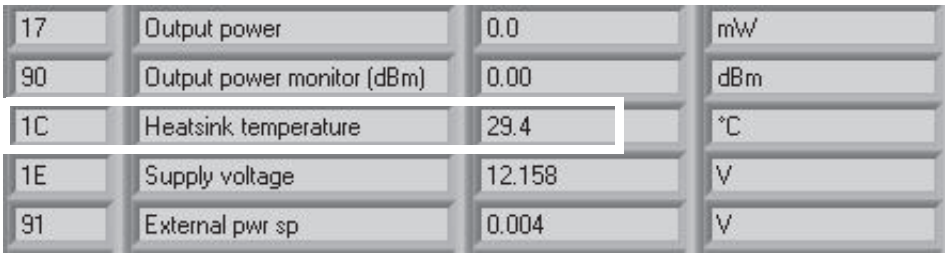
Figure 36 Pump temperature



Heat sink temperature

Register 1C displays the temperature measurement from a sensor within the module near its rear passive cooling surface.

Figure 37 Pump 1 current



Errors and status indicators

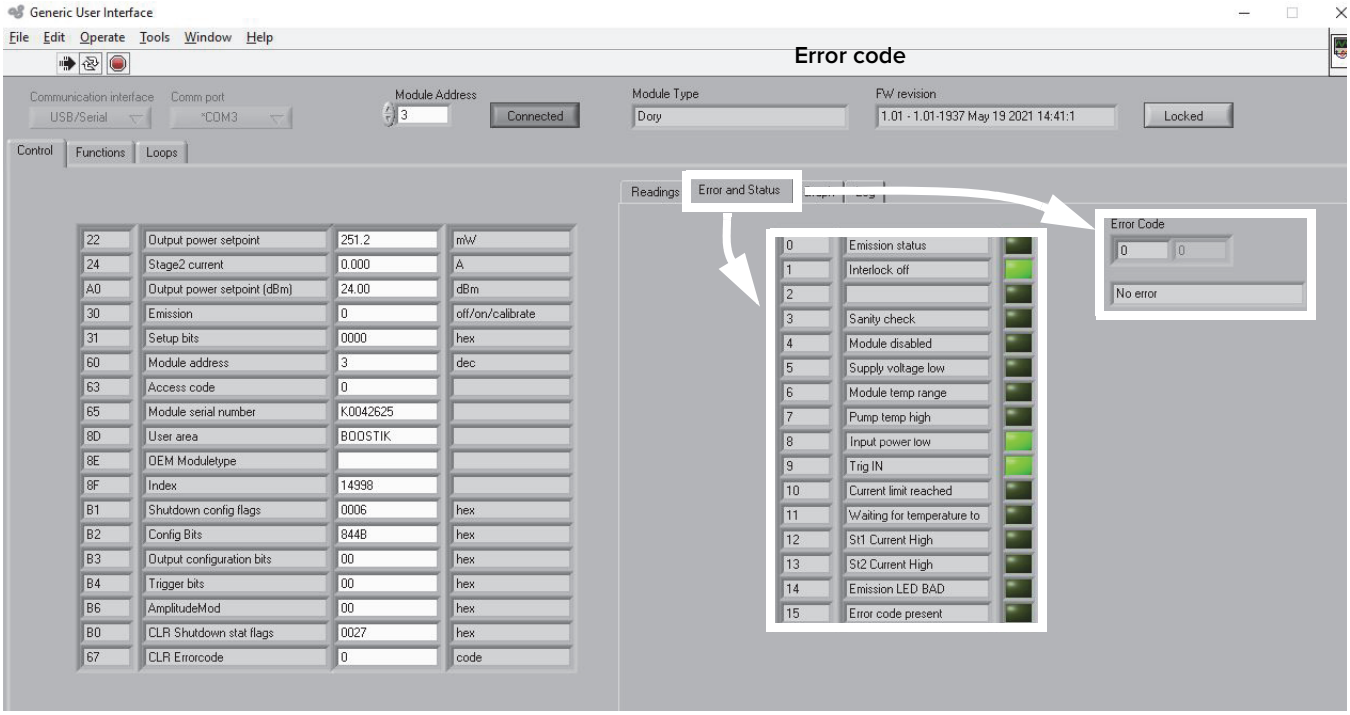
For each module, click on the *Error and Status* tab to view the status indicators and if any error codes are displayed.

Status indicators The status indicators is lit green if the condition in the text is true.

Errors If an error code is listed and cannot be cleared contact NKT Photonics support, see “Support contact details” on page 60.

Error codes are listed in Table 14 on page 63.

Figure 38 Error and status tab



Graphing

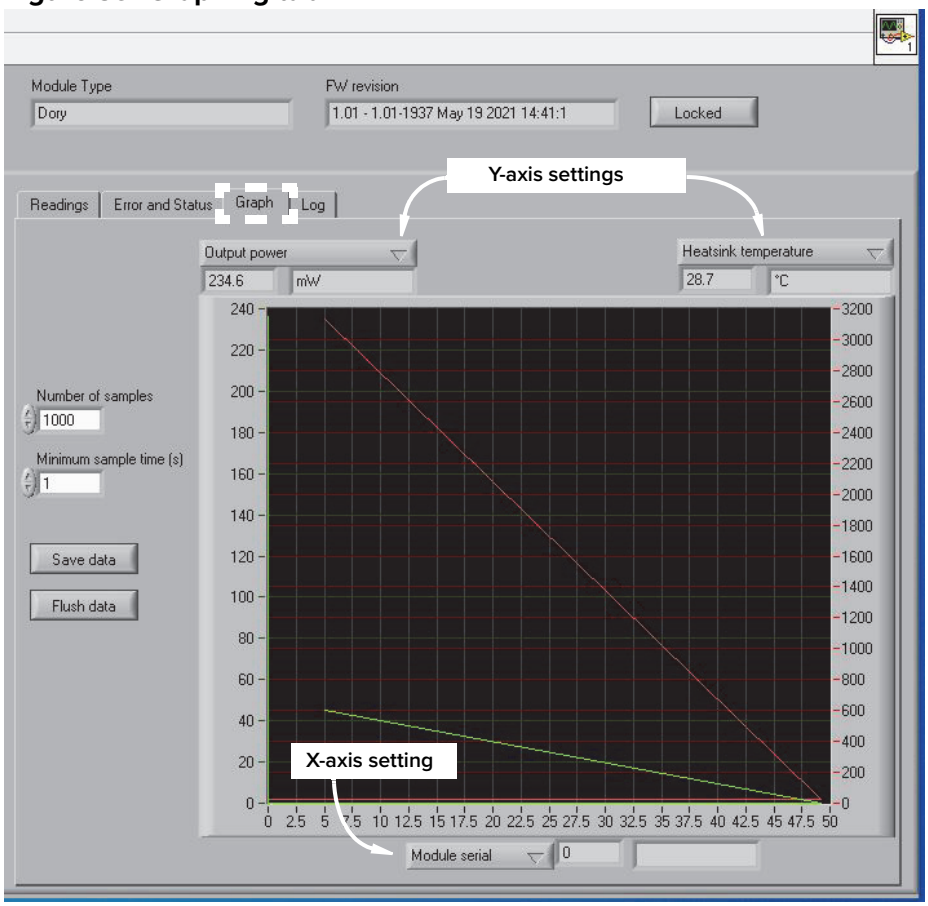
As shown in Figure 39, you can graph the values of selected parameters by clicking on the *Graph* tab and selecting the parameters you want to graph. To use the graphing function:

1. Select the parameters to graph from the drop-down menu at the left/right y-axis and bottom x-axis of the graph.

2. Modify the left/right y-axis and x-axis maximum range with the input boxes.

3. Set the sample number and rate using the input boxes to the left of the graph.

Figure 39 Graphing tab



A Specifications

Table 8 Optical specifications

Variant:	2W @ 1550	200mW @ 1550	200 mW @ 1064
Mode of operation	Continuous wave - inherently single frequency		
Output power	2.0 W	200 mW	200 mW
Wavelength range	1545-1565 nm	1545-1565 nm	1060-1075 nm
Output fiber	PM1550 or SMF28	PM1150	PM980
Input power	1 – 50 mW		
Input/output optical termination	FC/APC or E2000 (optional)		

Table 9 Power consumption

Variant:	2W 1550	200mW 1550	200mW 1064
Power Consumption [W]	20-30[i]	5-10#	5-10#

i. Subject to variant and operating conditions

Table 10 Mechanical dimensions

Size (H x W x D)	92 x 220 x 39 mm (3.62 x 8.66 x 1.54 in)
Weight	< 1 kg (< 2.2 lb)

Table 11 Operating and storage environment

Operating Temperature (internal case)	15°C to 55°C (59°F to 131°F)
Storage Temperature	-20°C to 60°C (-4°F to 140°F)
Operating Humidity (non-condensing)	20 to 80%

Table 12 Safety and regulatory compliances

Safety	Regulatory
EN 60825-1:2014: Safety of laser products Part 1: Equipment classification and requirements **[Laser Class 4]** **EN 61010-1:2010**:Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements	**EN 61326-1:2013**: Electrical equipment for measurement, control and laboratory use EMC requirements – Part 1: General requirements **2004/108/EC** Electromagnetic Compatibility **2011/65/EC** Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS) **FDA**: **21 CFR1040.10** – Performance standards for light-emitting products

Figure 40 Mechanical dimensions – front panel (without faceplate)

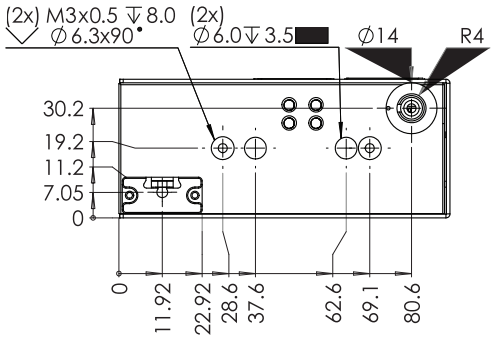


Figure 41 Mechanical dimensions – side panel

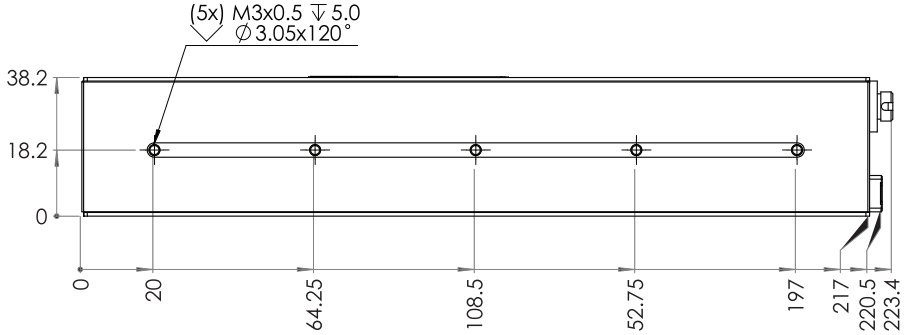
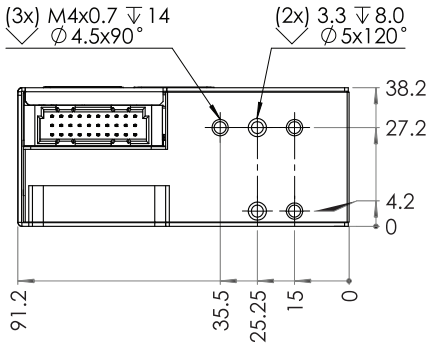


Figure 42 Mechanical dimensions – rear panel



B Service and Support Information

Servicing the laser

The laser amplifier has no user serviceable components. In case of malfunction, contact NKT Photonics using the support channels in section “Support contact details” on page 60.

CAUTION: Do not open the laser amplifier module. The module is equipped with warranty labels (see Figure 43) that seal the covers of the module. The warranty is void if the module is opened by removing or breaking the warranty seal.

Figure 43 Warranty seal

CAUTION: The laser amplifier contains electro-static discharge (ESD) sensitive components. To avoid permanent ESD damage, use ESD protection precautions when handling it. Always connect any earth point to a ground earth within your facility.

Opening the module

There are no user serviceable components inside the module. Should your laser amplifier malfunction, and it cannot be serviced, raise an RMA ticket request from the support site – see “Support contact details” on page 60.

WARRANTY VOID IF REMOVED label

The module is sealed with a label:

“WARRANTY VOID IF SEAL IS BROKEN OR REMOVED”

as shown in Figure 43. It is strictly prohibited to remove the chassis cover thus breaking or removing the seal doing so.

Support contact details

If you need help or have questions regarding your Koheras BOOSTIK LC laser or its accessories, contact NKT Photonics through our support website below:

Support website

1. Go to:

   https://www.nktphotonics.com/support

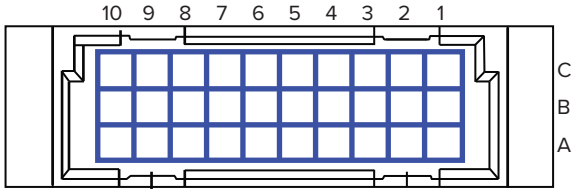
2. Scroll down and click or press:

3. Select the type of help required, fill in the form, and click or press *Submit*.

C Electrical interface pinout

Figure 44 C/3 electrical interface pins



30 pin DIN41612 male C/3 type

Table 13 C/3 electrical interface pin descriptions

Pin #	Signal	Description
A1	Module OK	Low: module enable low OR module power low High: module power high
A2	RS485-	Negative/inverted RS485 differential data signal
A3	Interlock loop+	Positive connection of interlock loop. Should be connected to Interlock loop- (pin no. 4) to enable emission from the system.
A4	Interlock loop-	Negative connection of interlock loop. Should be connected to Interlock loop+ (pin no. 3) to enable emission from the system.
A9	N/C	
A10	N/C	
B1	Service	NKTP Technical Support
B2	Service	NKTP Technical Support
B3	Service	NKTP Technical Support
B4	N/C	
B9	AGND	Analog ground for amplitude and wavelength modulation signals.
B10	AGND	Analog ground for amplitude and wavelength modulation signals.
C1	Emission	Collector output with internal 240 Ω resistor in series. The output is high when the amplifier emission is ON. An LED anode can be connected directly to this pin and the Cathode to GND to indicate emission externally.
C2	RS485	Positive/non-inverted RS485 differential data signal
C3	Enable	Logic input that permits emission when a high (5V) i is applied. During emission if Enable is set low, emission is shut off.
C4	Enable logic input	Logic input that permits emission when a high is applied. If during emission the input is set low, emission is shut off. This control input is for personal safety and is designed with redundancy within the module.
C9	N/C	
C10	N/C	
A5, A6, B5, B6, C5, C6	GND	0 volt / ground
A7, A8, B7, B8, C7, C8	12V	12 volt supply voltage for the module.

D Fault troubleshooting

If a fault occurs the laser may raise an error code. Error codes are displayed in the Status panel of CONTROL. Table 14 below provides a list of laser errors displayed and possible solutions to resolve them.

Contact support If you require further support to resolve the error, contact NKT Photonics support – see “Support contact details” on page 60. Ensure to include error codes and collected log files – see “Log downloader” on page 38.1.1

Table 14 Error codes

Code	Name	Description	Solution (perform in sequence)
2	Interlock	Interlock circuit open or shorted.	1. Resolve any shorts or opens in the circuit, retry emission procedure. 2. Check voltage ≥ 5V at interlock pins 3 and 4 (see Appendix C). 3. Contact support with error code and log files.
3	Low supply voltage	DC power input voltage too low.	1. Check connection of the electrical cables to the modules. Retry emission. 2. Measure supply voltage with multi-meter. It should be >11.5V. Replace power supply and electrical cables. 3. Contact NKT Photonics support service for further recommendations.
4	Memory problem	Memory problem, EEPROM read/write operation failed.	1. Contact support with error code and log files.
6	Bad emission LED	Emission LED circuit fault.	1. Check that the power supply and electrical cables are working properly. 2. Contact support with error code and log files.
7	Board temperature range	Control board temperature out of range.	1. Let the module cool down and provide proper cooling. Retry emission. 2. Contact support with error code and log files.
8	Module disabled	The module reporting the error is disabled with an interbus hardware signal.	1. Retry emission. 2. Check electrical connections. Retry emission. 3. Contact support with error code and log files.
12	Pump temperature range	Fiber pump temperature out of range.	1. Let the module cool down and provide proper cooling. Retry emission. 2. Contact support with error code and log files.
16	Sanity		1. Retry emission. 2. Contact support with error code and log files.
48	Reflection		1. Retry emission. 2. Contact support with error code and log files.
60	Stage 1 input power	Stage 1 input optical power too low. Possible causes: • Seed power too low • Connector damaged or soiled. • Defective optics	1. Verify with fiberscope that the input connector is clean. Clean connectors if needed. Retry emission. 2. Check that the power of the seed exceeds 1 mW or 10 mW depending on the BOOSTIK LC amplifier input requirement. 3. The input monitor response function is dependent on wavelength. Try increasing the input power over the minimum specification. 4. Contact support with error code and log files.

Code	Name	Description	Solution (perform in sequence)
62	Stage 2 input power	Internal optical power low.	*1.* Contact support with error code and log files.
64	Maximum output power exceeded	Maximum output power exceeded.	*1.* Contact support with error code and log files.
65	Stage 1 current high	Stage 1 current too high	*1.* Contact support with error code and log files.
66	Stage 2 current high	Stage 2 current too high	*1.* Contact support with error code and log files.

E Control Software

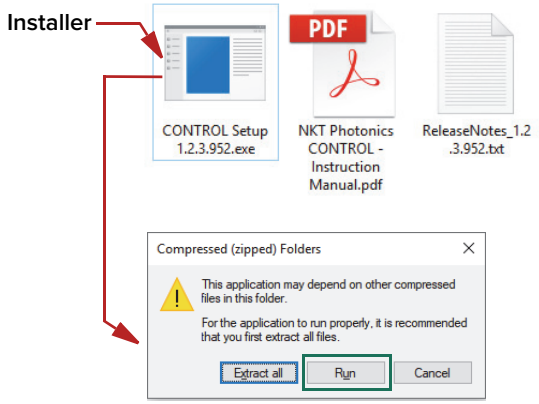
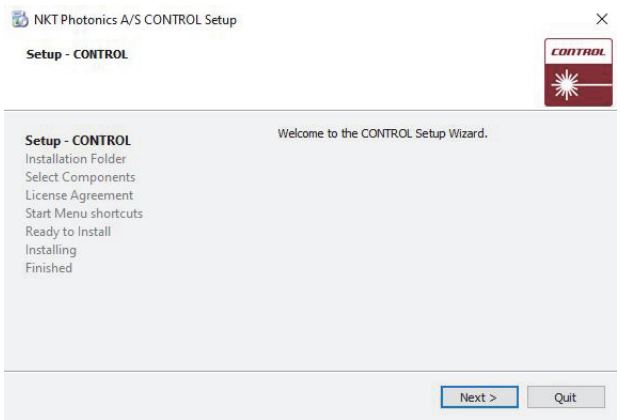
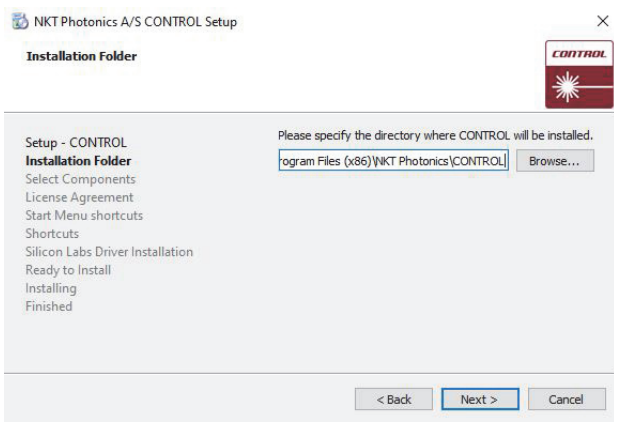
Installing CONTROL

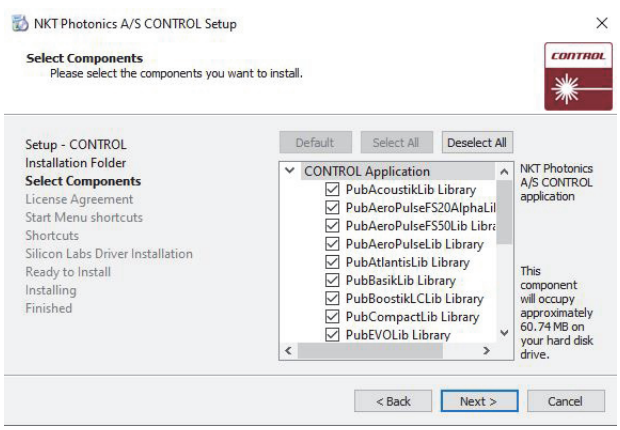
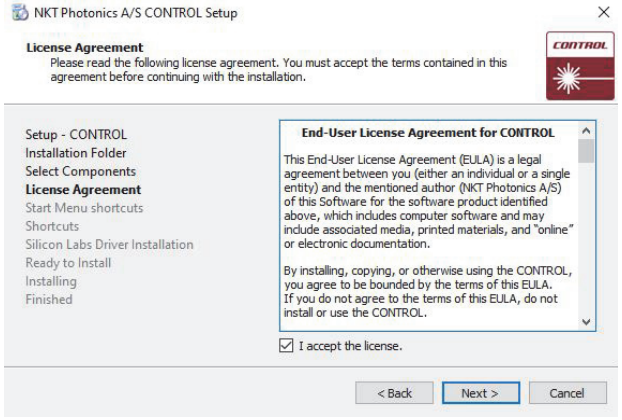
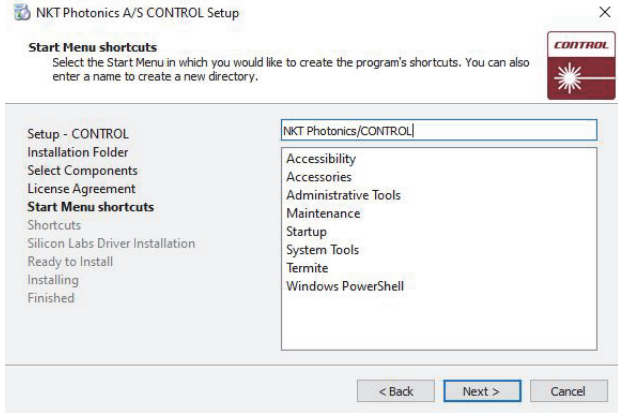
Download the software from:

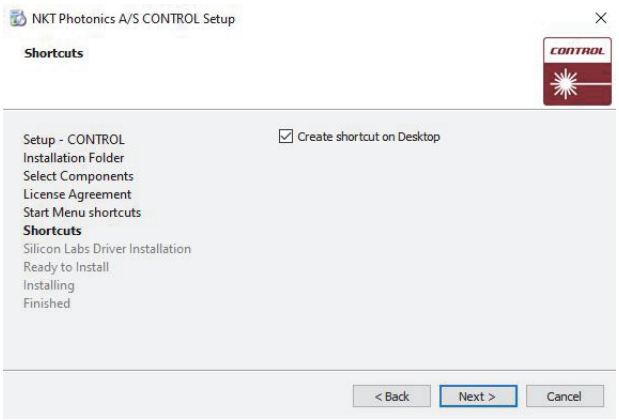
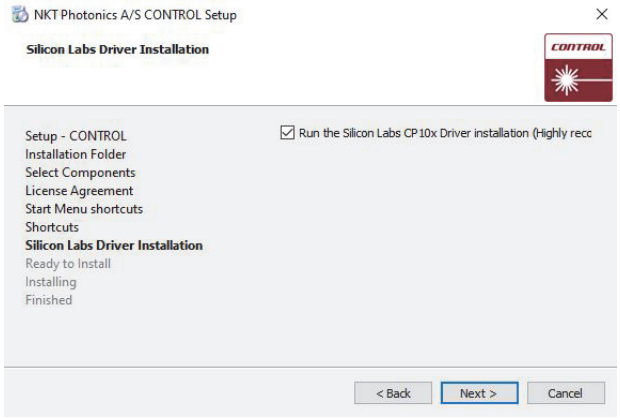
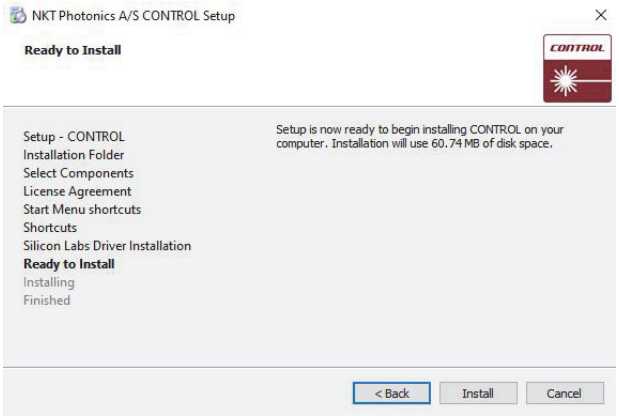
https://www.nktphotonics.com/support

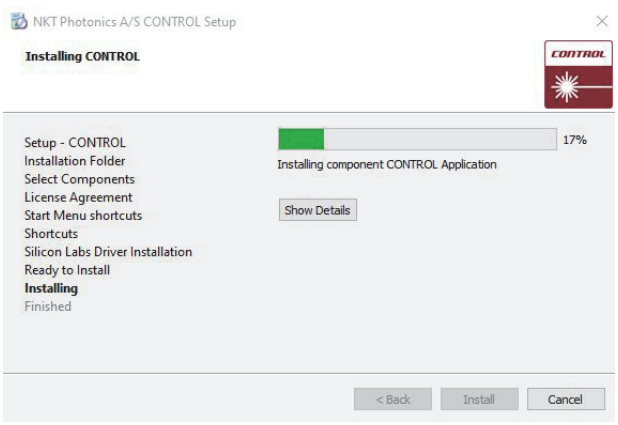
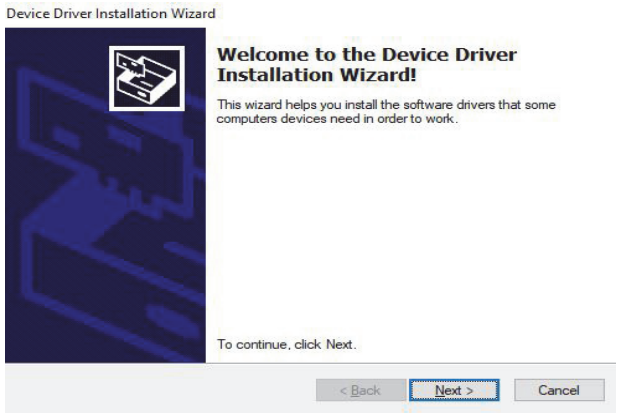
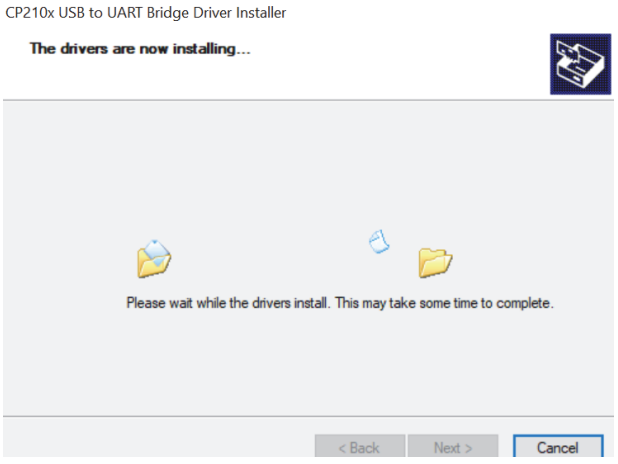
Follow the steps in Procedure .

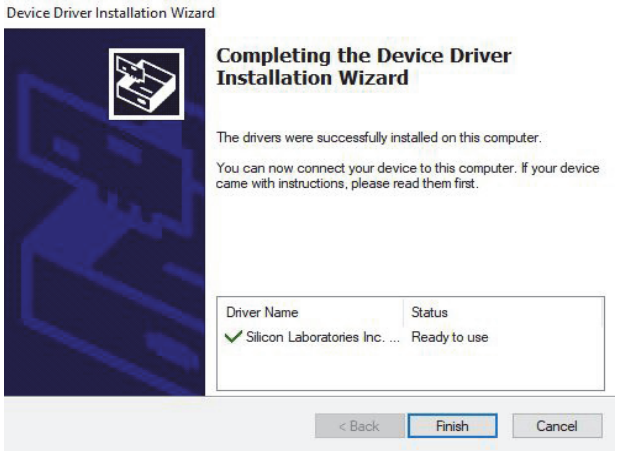
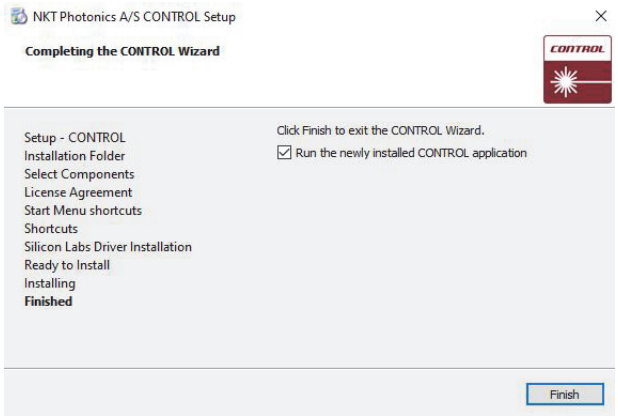
Procedure 4 Installing CONTROL

	Action	
1	On the PC, launch the installer package and then click the Run button.	
2	The installation wizard appears. Click Next to continue.	
3	Accept to use the default installation directory or select another directory by clicking the *Browse* button. Click *Next* to continue.	

	Action	
4	Uncheck the components you do not require. By default, all components are installed. Click *Next* to continue.	
5	Read the End-User License Agreement, and check “I accept the license.” box. Not checking the box ends the installation wizard. Click *Next* to continue.	
6	The wizard creates a start menu folder with program short-cuts. Use the default name or enter a new name for the folder. Click *Next* to continue.	

	Action	
7	Check the box to create a desktop shortcut to access Control. Click *Next* to continue	
8	Check the 'Run the Silicon Labs CP10x driver installation' box and click *Next*. **Note**: USB connectivity fails if you do not install the driver.	
9	Click *Install* to install NKTP CONTROL software on your PC. Click *Cancel* if you want to abort the installation.	

	Action	
10	The wizard displays a progress meter for the installation. **Note:** a normal install should only take a few seconds.	
11	Click *Next* to install the UART drivers for the PC USB port.	
12	The drivers are installed. **Note**: Depending on your computer this occurs so fast you may not see this.	

	Action	
13	The Silicon Labs drivers is installed successfully. Click *Finish* to end the driver installation.	
14	CONTROL is now installed. Check the Run box to launch CONTROL when the *Finish* button is clicked. Click *Finish* to end the installation wizard.	

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