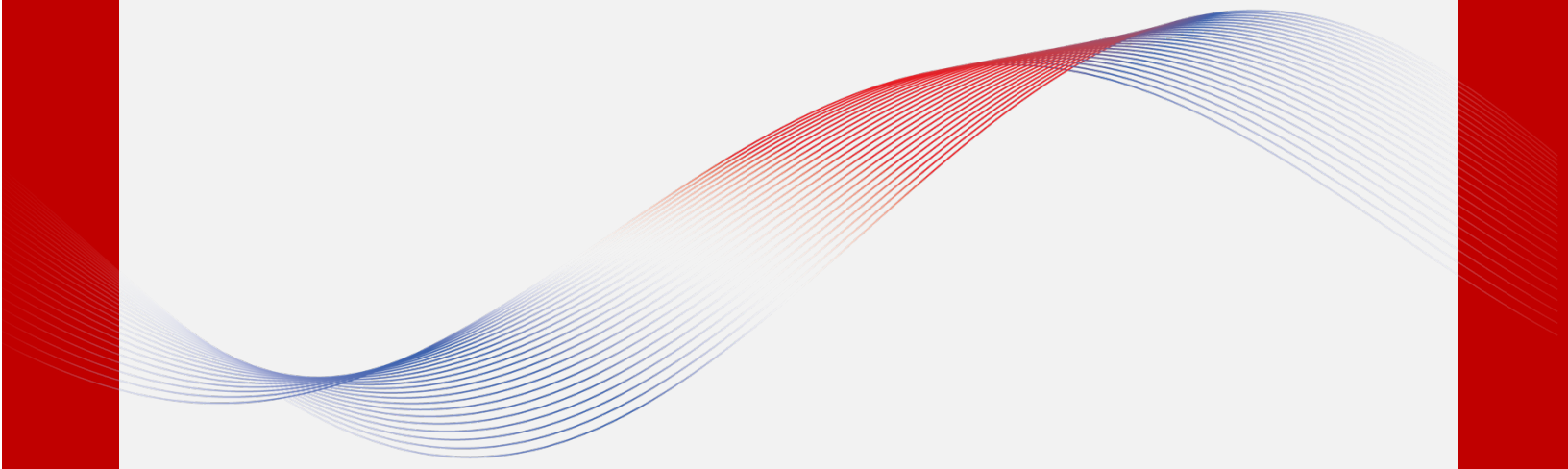
SLS-1xx
Stabilized
Light Source

Instruction manual

SLS-1xx-M-E-Ver. 1.0



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COMPLIANCE

CE Compliance

Electronic test equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment. This unit has undergone extensive testing according to the European Union Directive and Standards.

2

GENERAL INFORMATION

SLS-1xx Stabilized Light Source Overview

The SLS-1xx offers a compact solution for multiple individual or switched sources in a single unit. SLS-1xx supports FP, LED, SLED, DFB, and more source types. This multichannel source is configured to specifications and supports the following source combinations in one unit:

- Single wavelength source (850nm, 980nm, 1310nm, 1550nm, 1625nm, etc.)
- Dual wavelength singlemode source (1310nm & 1550nm)
- Single wavelength multimode LED (850nm, 1300nm)
- Dual wavelength switched multimode LED (850nm & 1300nm)
- Custom wavelengths available upon request.

For custom configurations, please contact Santec.

The SLS-100 is easily combined with OPM-150 or OPM-160 multichannel optical power meters and together with Santec software solutions for multichannel optical power measurements such as STA-OPM or STA-LOG can be captured over any length of time.

Figure 1: SLS-1xx Stabilized Light Source

Applications

- Optical alignment
- Environmental testing of IL for cables and optical components
- Real time IL monitoring

Key Features

- Up to 24 LEDs or Lasers in one rack
- Factory configurable wavelength mix including various SM and MM source types
- Adjust power levels
- Customer definable launch condition
- Combined sources in one port (850/1300 MM, 1310/1550 SM)
- Support common connector types on front panel (FC, SC, ST)
- Always on optical source

Test & Measurement Standards

- Available with controlled launch conditions (EF,70/70, AS100, etc.)

Standard Contents

- Model SLS-1xx Stabilized Light Source
- Power Cord (U.S. Shipments only)
- USB A-B cable
- Certificate of Calibration and if requested the Metrology Report
- Instruction Manual(s)
- USB with applicable software and documentation (if ordered)
- Detector Adapters (if applicable)

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SAFETY INFORMATION

To avoid situations that could result in serious injuries or death, always observe the following precautions.

The safety instructions must be observed whenever the unit is operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the user manual is in direct violation of the standards of design, manufacturing, and intended use of the unit. Santec Inc. assumes no liability for the customer's failure to comply with any of these safety requirements.

Safety Markings on the Unit

See Table 1 for symbols and messages that can be marked on the unit. Observe all safety instructions that are associated with a symbol.

Table 1: Safety symbols

	Laser radiation may be present. Refer to the user manual for instructions on handling and operating the unit safely. Avoid looking into any ports near which this symbol appears.
	Frame or chassis terminal for electrical grounding within the unit.
	Protective conductor terminal for electrical grounding to the earth.
WARNING	Procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding.
CAUTION	Procedure can result in serious damage to or destruction of the unit if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding.

Classification

The SLS-1xx consists of an exposed metal chassis that is connected directly to earth via a power cord and is therefore classified as a Class 1 instrument.

The laser (or lasers) contained in the SLS-1xx is (are) Class 1M laser(s) as specified under the international standard IEC 60825-1 Ed. 3.0 b:2014 and ANSI Z136.1-2014.

Important Safety Information

Laser Hazards

Warning

- Never look directly into the end of an optical cable connected to an optical output device that is operating. Laser radiation is invisible and direct exposure can severely injure the human eye.

Electrical Hazards

Warning

- Some of the circuits are powered whenever the unit is connected to the AC power source (line power). To ensure that all circuits are powered off, disconnect the power cord from either the power inlet on the unit's rear panel or from the AC line-power source (receptacle). The power cord must always be accessible from one of these points. If the unit is installed in a cabinet, the operator must be able to disconnect the unit from the line power by the system's line-power switch.
- Use only the type of power cord supplied with the unit. If you need to replace a lost or damaged cord, make sure to replace with a power cord of the same type.
- Connect the power cord only to a power outlet equipped with a protective earth contact. Never connect to an extension cord or any receptacle that is not equipped with this feature.
- If using a voltage-reducing autotransformer to power the unit, ensure that the common terminal connects to the earthed pole of the power source.
- Do not interrupt the protective earth grounding. Such action can lead to a potential shock hazard that can result in serious personal injury. Do not operate the unit if an interruption to the protective grounding is suspected.
- Do not operate the unit when its cover or panels have been removed.
- To prevent potential fire or shock hazard, do not expose the unit to any source of excessive moisture.

- Do not use the unit outdoors.

- Operating the unit in the presence of flammable gases or fumes is extremely hazardous.

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Only technicians authorized by Santec Inc. should carry out repairs. In addition to voiding the warranty, opening the unit (even when unplugged) can expose you to potential shock hazards.

- Some of the unit's capacitors can be charged even when the unit is not connected to the power source.

- Do not perform any operating or maintenance procedure that is not described in the user manual.

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GETTING STARTED

Caution

- To avoid injury or death, always observe the precautions listed in SAFETY INFORMATION on page 4.

This manual contains complete operating instructions for safe and effective operation of the SLS-1xx Stabilized Light Source. It is recommended that users of the SLS familiarize themselves with contents of this manual before using the instrument.

The inspection report and a description of any customer-requested information may be found in the calibration document envelope included with the instrument.

Initial Inspection

Warning

- To avoid electrical shock, do not initialize or operate the unit if it bears any sign of damage. Ensure that the unit and any devices or cords connected to it are properly grounded.

- ✓ Inspect the package and contents for signs of damage.
- ✓ Ensure all contents are included.
- ✓ Read the user manual thoroughly and become familiar with all safety symbols and instructions to ensure that the unit is operated and maintained safely.
- ✓ If the initial inspection reveals any damage or missing components, immediately notify Santec Inc. and if necessary, the carrier.

Operational Requirements

For the unit to meet the warranted specifications, the operating environment must meet the conditions outlined in Table 2.

Table 2: Environmental requirements

Parameter	Specification
Altitude	Up to 2000m
Temperature	0 to 40°C
Humidity	Up to 95% RH (0 to 40°C)
Voltage	Main supply voltage fluctuations must not exceed ± 10% of the nominal voltage

Powering on the instrument

Prior to powering on the unit, verify that the appropriate power supply and power cord is connected. A power cord with a C13 male connector is needed to mate to this to the AC to DC desktop power supply. The power supply is attached to a P6 5.5mm/2.5mm DC plug and connects to the DC barrel power jack on the back of the unit.

The other end of the C13 power cord should have a grounded 3 prong connector that is appropriate for the outlets used in the region of operation. For more information please contact Santec Corporation.

To power the unit on, push the power button until it locks. To power off the unit, push the power button again to release the button.

Notice Concerning Front Panel Connector

It is advised by Santec that the user connects a short SAVer cable to the front panel. This cable must be angle polished on both ends and can range from 0.4m in length to 3m in length. The cable should be of reference quality and should stay on the unit even during down time. One APC end of this cable is connected to the front panel and the other end is where the reference cable would be connected. The sacrificial cable should be replaced or repaired when its open connector becomes damaged. This cable and additional accessories are listed in the care, cleaning and warranty booklet also included in this shipment.

Keeping the front panel interface clean and contaminant-free is paramount to good, repeatable insertion loss and return loss measurements, and minimizing the amount of connections made to the front panel will limit the possibility of scratching or contaminating the front panel connector.

The SLS-1xx has a removable panel for the source connector. This will allow the customer to re-polish the front panel connector if it gets damaged without having to send the unit back to Santec. Please see the instructions included in this manual for removing the source panel.

Definition of Specifications

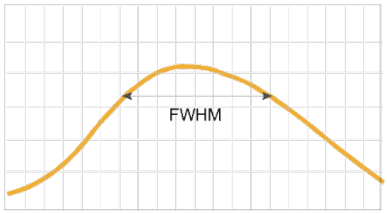
Source Wavelength

The wavelength specifications of the source are nominal specifications, the exact center wavelength varies depending on the source type. Laser sources are typically within +/- 10nm of the nominal center wavelength. LED sources have a broad spectral width and usually within +/- 20nm of the nominal center wavelength.

Source Type

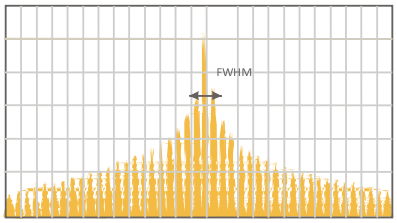
For singlemode measurements either a Fabry-Perot (FP) or Distribution Feedback (DFB) laser source is applied, for multimode measurements usually a LED source is used.

Light Emitting Diode (LED)
Typical Spectrum



center wavelength

Fabry Perot Laser
Typical Spectrum



center wavelength

Output Power

The typical output power is the minimal power level that the source delivers at a 100% setting. Actual power levels are usually slightly higher and depend on the installed source component as well as the fiber size the absolute power reading is taken with.

Launch Condition

For multimode sources the launch condition is qualification for to what degree the core of the fiber is filled (modal distribution). The CPR (coupling power ratio) is a measurement that indicates the fullness of the fill, a high CPR indicates a full-fill or over-fill whereas a low CPR indicates an under-fill.

Stability

The source power stability is measured over one hour of operation at ambient temperature unless specified otherwise. To measure the stability the fiber should not be excessively moved, ideally fibers are fixed in

place. For singlemode measurements strong back reflections should be avoided as they can influence the stability of the measurement. The SLS-1xx sources have a typical temperature dependence of better than 0.03dB/ ºC.

Settling Time

Switched multichannel sources require a switch settling time.

Warm-up Time

The optical power meters in general do not need any warm-up time unless the instrument has to acclimate to a changing environment, in order to calibrate the instrument or to perform stable measurement the instrument.

Environmental

Operating Temperature: This is the temperature range in which the instrument will conform to the specifications after the specified warm up time. Storage Temperature: This is the temperature range at which the instrument can be stored with the power off without any damage or any loss of specification to the instrument. It is required that the instrument be brought back to within the operating temperature range before it is turned on. Humidity: The relative non-condensing humidity levels allowed in the operating temperature range.

LASER Safety

Santec source modules, depending on the model, may contain LASERs that are harmful to the human eye. The single mode (typically 1310nm or 1550nm) LASERs typically have an output of -2dBm. These are considered a Class I LASER and should not be viewed directly, pointed at anyone, or viewed through a telescopic device as this could cause eye damage. The multimode LEDs (typically 850nm and 1300nm) are Class II LEDs and should not be viewed directly for long periods of time or through a telescopic device ever as this could result in eye damage.

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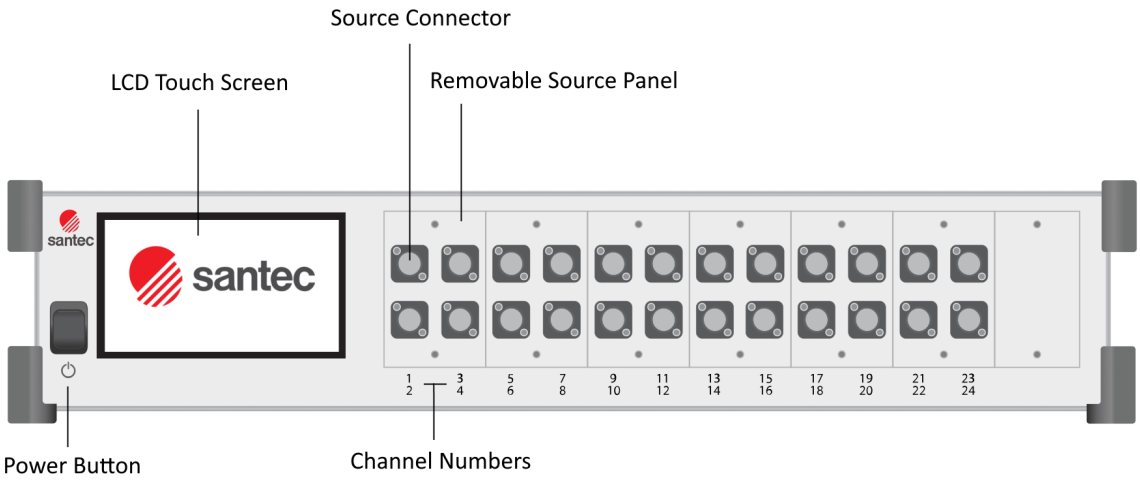
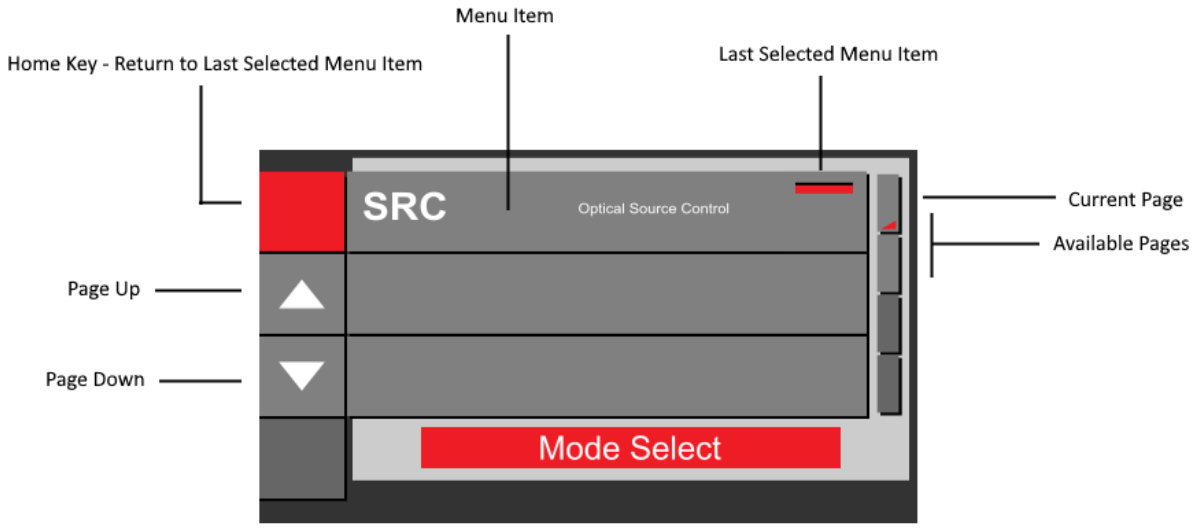
OPERATION

Powering Up the instrument

When powered on, the instrument will display a splash screen showing the Santec logo. Once the splash screen has finished, the unit will load the mode which has been selected as the Startup Mode in the Settings screen. To change mode screens, press the Home Key and the unit will transition to the Mode Select screen. The startup mode can be set by the user under the Settings Menu from the front panel.



(Note: Do not attempt to initialize USB or ethernet communication to the instrument until the splash screen has completed.**)**



Mode Select 1 Screen:

How to Navigate the User Interface

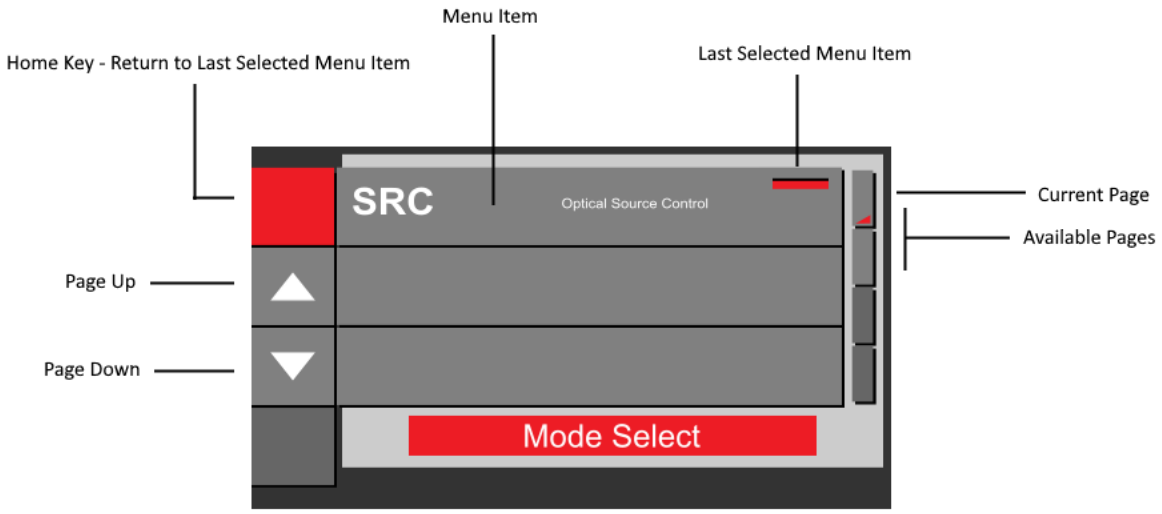
Mode Select Screen

On the Mode Select screen, press the select operation modes for the unit, such as **SRC,**,settings, and status. The up and down arrows on the left side of the screen will navigate the pages of mode screens. Pressing the home button on the Mode Select screen will put the unit back into the mode that it was in most recently.

The Mode Select screen functions as a home screen for the unit. Operators can use the Mode Select screen as a point of reference for the user interface or if they need to change Operation Modes.

The unit's Mode Select screen deploys several modes. Each page has three selections to choose from and the page number is indicated on the bottom of the screen by the placement of the wedge as seen in the figure below.

Below is a brief description of the operation modes on each page of the Mode Select Screen

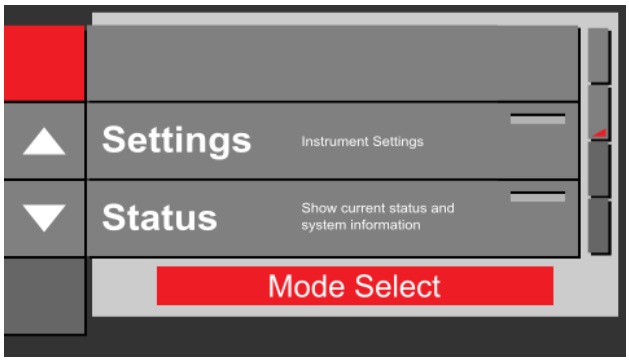


Mode Select 2 Screen:

shown in Mode Select 2

Mode Select Screen Page 1

SRC	Optical Source Control



Mode Select Screen Page 2

Settings	Change Instrument Settings
Status	Show current status and system information

Front Panel Operation

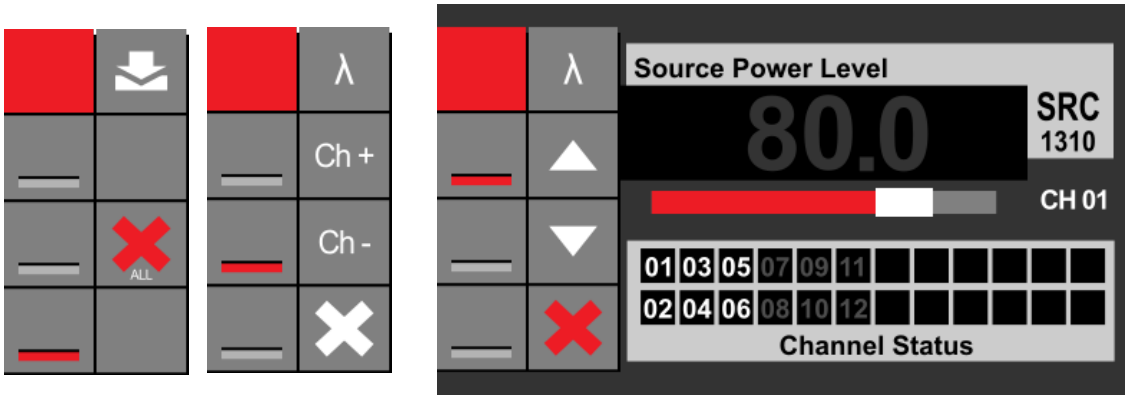
SRC Mode

SRC Mode (or Source Mode) is the primary operation mode for the SLS-1xx. This mode allows the user to control the source for each channel of the instrument. On the top half of the screen shows the Source Power Level, Source Wavelength, Active Source Channel, and the Source Power Slider. The Source Power Level is a level from 0 – 100 (increments of 0.5) that show the relative intensity of the light source. At Power Level = 0, the source is OFF while at Power Level = 100, the source is at full power.

The red bar just below the Source Power Level value is the Source Power Slider. Touch and drag the slider to the left to adjust the power down; slide to the right to adjust the power up.

The Source Power Level value turns dim gray when the source is turned OFF using the ON/OFF Toggle Key. In this state, changing the Source Power Level will change the value but the source will remain OFF. When the source is turned back ON, the output power will be set to the current Source Power Level.

The bottom half of the screen is the Source Channel State Indicator. This shows the state of each channel. If the source is ON for that channel, the associated channel number will be white. If the source is OFF for that channel, the channel number will be dim gray.



SRC Mode Page 1

λ	Iterates through the available source wavelengths. Wavelengths are remembered per channel. As such, to set the wavelength of multiple channels, each must be set to the desired wavelength.
▲	Adjust power up by an increment of 0.5

	Adjust power down by an increment of 0.5
	Toggle the current channel ON or OFF.

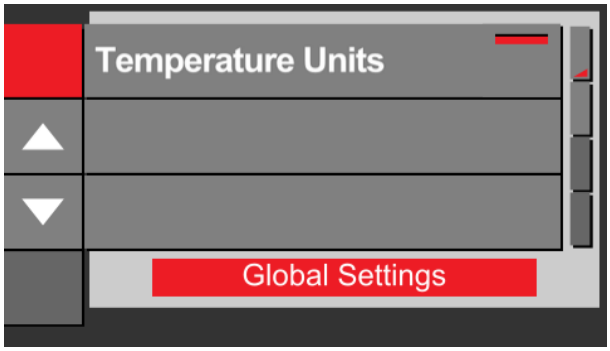
SRC Mode Page 2

	Iterates through the available source wavelengths. Wavelengths are remembered per channel. As such, to set the wavelength of multiple channels, each must be set to the desired wavelength.
	Go to the next Channel
	Go to the previous Channel
	Toggle the current channel ON or OFF.

SRC Mode Page 3

	Save Source States. At next instrument start-up, the sources will be initialized to the Saved Source States.
	Toggle ALL Sources ON/OFF

Below is a brief description of the operation modes on each page of the Mode Select Screen.



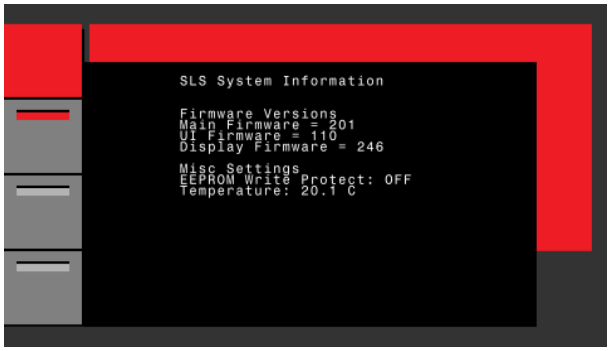
Settings Mode Page 1

Temperature Units setting allows the operator to specify whether they would prefer the unit to display the ambient temperature in Celsius or Fahrenheit.

Status Mode

The Status Mode is a troubleshooting tool which displays the state of the various user configurable settings on the SLS-1xx. It can also be used to quickly check the unit's settings before beginning to test. The settings, which are displayed on this screen, are as follows:

Status Mode Page 1

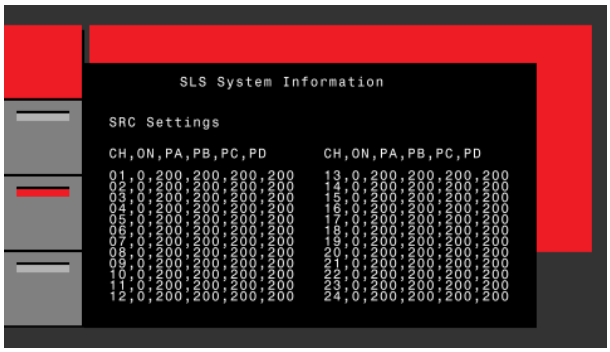


Firmware Versions

Miscellaneous Settings

- EEPROM Write Protect – Toggle ON/OFF with EEPROM Write Protect Switch
- Temperature – Shows the current temperature

Status Mode Page 2



- SRC Settings – Shows the startup source states for each channel
  - CH – Channel
  - ON – Source ON/OFF State
  - PA – Source A Power Level (0-200, shown as 0-100 in SRC Mode)
  - PB – Source B Power Level (0-200, shown as 0-100 in SRC Mode)
  - PC – Source C Power Level (0-200, shown as 0-100 in SRC Mode)
  - PD – Source D Power Level (0-200, shown as 0-100 in SRC Mode)

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MAINTENANCE

Warning

- Devices with malfunctioning lasers must be returned to the manufacturer for repair.

Cleaning the Unit

1. Unplug the unit from the line power.
2. Clean the enclosure with a damp cloth.
3. Do not plug the unit back in until it is completely dry.

Cleaning the Output

Warning

- Connecting contaminated or damaged connectors to the SLS-1xx can damage the unit and affect its performance.
- Damaging the output fiber during maintenance can affect the performance of the unit.

1. Inspect all connectors before each mating and if needed, clean with a lint-free wipe and/or IPA.
2. Loosen the front panel thumbscrews.
3. Gently remove the output panel. Ensure a clear line of sight to the fiber to prevent any stress on the output fiber.
4. Remove the connectors from the mating sleeves
5. Clean the connectors and mating sleeves
6. Reinstall the connectors into the mating sleeves.
7. Reinstall the output panel with the thumbscrews.

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STORAGE AND SHIPPING

Damage can occur from improper handling. Make sure to maintain the unit within the specified temperature range during storage or shipping. Please follow the recommendations below to minimize the possibility of damage:

- If possible, pack the unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations that could generate condensation within the unit.
- Avoid unnecessary shocks and vibrations.

Returning Instruments to Santec

As indicated above, please ship the returned material in the original shipping box and packing material. If these are not available, follow the guidelines below:

1. Contact Santec to obtain an RMA number.
2. Cover the front panel with foam to prevent damage.
3. Wrap the unit in anti-static packaging. Use anti-static connector covers.
4. Pack the unit in a strong enough shipping box considering the unit's weight.
5. Use enough shock-absorbing material (10 to 15 cm) to cushion the unit and prevent it from moving inside the box. Pink poly anti-static foam is recommended.
6. Seal the shipping box securely.
7. Clearly mark FRAGILE on at least 3 of the 4 sides of the box.
8. Always provide the model and serial number of the unit and, if applicable, the RMA number on any accompanying documentation. If possible, indicate the RMA number on the box itself to facilitate identification.

Contact Information

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11

SPECIFICATIONS

Table 3: SLS-1xx optical and electrical specifications sheet

Parameter	Specification		
	FP Laser	DFB	LED
Fiber Type (µm)	9/125	9/125	50/125,62.5/125 or 105/125
Launch Condition	N/A	N/A	Avail. upon request
Nominal Wavelengths (nm) [1]	1310 / 1490 / 1550 / 1625 /	1271 to1611 [3]	850 / 1300
Center Wavelength Accuracy (nm)	< 15	< 3	< 30
Source Bandwith (nm)	<10	< 1	➢ 30
Output Power (typ.) (dBm)	0	0, 10 or 13	-18 @ 850 nm -21 @ 1300 nm
Source Stability (dB) [2]	± 0.02		
Remote Interface	USB or Ethernet		
Display	4.3” touchscreen		
Power Supply	Input: 90 – 264 V AC, 47 – 63 Hz Output: 18V DC, 5 A		
Power Consumption (VA)	36 Maximum		

Notes:
[1] Custom sources available upon request
[2] Over 1 hour
[3] Selectable in 20nm increments

Table 4: SLS-1xx mechanical and environmental specifications sheet

Parameter	Specification
Maximum Channel Count	24
Unit Dimensions W x H x D (cm)	42.5 x 8.9 x 20.3
Operating Temperature (°C)	0 to 40
Humidity (Non-condensing)	Max 95% RH from 0 to 40°C

In the event of any trouble with this product, turn the unit off in accordance with the procedures to shut off the power described in this operation manual, disconnect the power source cord, make sure the product name and serial number described on the name plate of the product, and then contact our dealer at your place or directly contact us at Santec Photonics Laboratories. Our telephone number and facsimile number are shown below. However, we are not responsible for any trouble arising from your own repair or modification on this product.

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