

User Manual

Amplified Spontaneous Emission (ASE) Light Source Integrated Spectral Bench (ISB4)



Contact Support

For any issues related to technical support or service, please contact:
techsupport@dayyphotonics.com

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1. Description

The amplified spontaneous emission (ASE) Integrated Spectral Bench (ISB4) product is a compact light source solution that employs DAYY's high-performance Optical Spectral Engine (OSE4) module and amplifier module. The ISB4 is a broadband light source that operates in the near-infrared range. It is a turn-key product that can easily be integrated into existing devices that require higher light power.

The ASE ISB4 includes a proprietary driver and controller, each of which enable the light power to easily be adjusted. A Graphical User Interface (GUI) with a USB and RS232 connection allows for external monitoring and adjustment capabilities. The ASE ISB4's light output is powered by a standard FC/APC connector (FC/PC or SMA available upon request).

This unit is ideal for users requiring higher optical ASE power than what a superluminescent diode (SLED) can provide.

Features

- Compact and user-friendly
- Centre wavelength (CW) options: 770nm, 850nm, 930nm, 1050nm, 1300nm, 1340nm, 1390nm, 1430nm, 1480nm, 1550nm, 1615nm, and 1680nm
- ASE can be run from 0% to 100% of maximum rating
- Bandwidth FWHM: 15nm-70nm
- Optical powers: 50mW-100mW
- Light output connector: FC/APC (optional: FC/PC or SMA)
- Multiple communication interfaces: USB and RS-232,
- Low Degree of Polarization (DOP) outputs available
- User-friendly GUI and custom API available for test Automation

2. Safety

All statements regarding safety of operation and technical data in this user manual will only apply when the unit is operated correctly.

- ⚠ The driver must not be operated in environments susceptible to explosion hazards.
- ⚠ Do not obstruct the air ventilation slots.
- ⚠ If any parts of the driver, or electronics are broken or exposed, contact DAYY Photonics technical support and do not attempt to operate the unit.
- ⚠ The ISB4 is a Class 1M laser product. It is safe for all conditions of use except when passed through magnifying optics such as microscopes and telescopes. It produces a beam that is divergent. ***If light is re-focused use protective eye wear.***

3. Operation

3.1 Parts List

Inspect the shipping container for damage. If the shipping container seems to be damaged, keep it until you have inspected the contents and the unit mechanically and electrically.

Verify that you have received the following items within the package:

- 1 ASE Integrated Spectral Bench
- 1 Power supply. Input: AC 100-240V Output: 12V
- 1 Power Cord
- 1 USB 2.0 A to B Cable
- 1 Final Inspection Test Report

3.2 Physical Driver Functionality

Side Panel - Power:

The power side panel consists of the 12V power jack and a two-position power switch to turn the unit ON/OFF as shown in Figure 1.

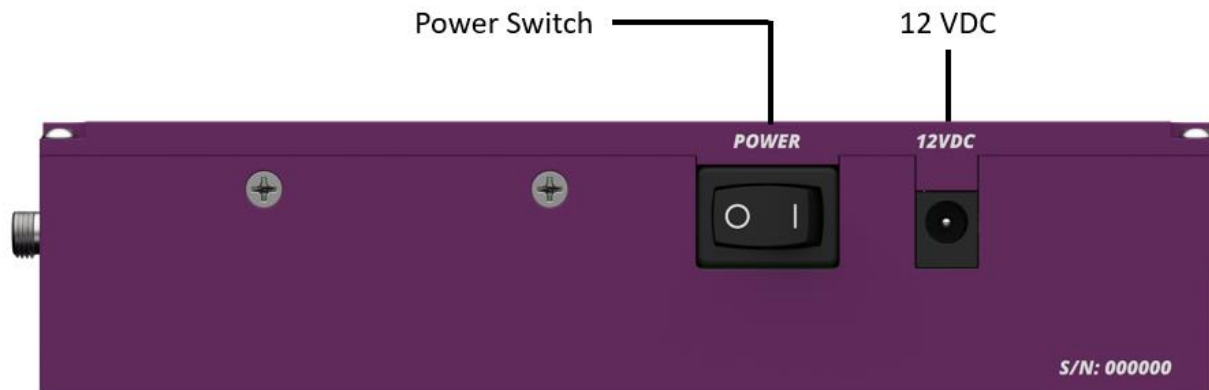



Figure 1: Power Side Panel

When the unit is plugged in and the power button is in the “I” (ON) position, the power LED of the front panel will light up.

The ISB4 can be powered up with the power supply provided by DAYY Photonics or with the user’s power supply if it fits the following specifications:

1. 12VDC (max. 14VDC) and minimum 3A current supply capability
2. Power Barrel Connector Jack 2.00mm ID, 5.50mm OD, 9.5 mm Length.
3. Center Positive 

Side Panel – Communications and Control:

The right-side panel consists of a USB Type B connector, TTL Interface and RS232 for communication, and a 2-position slide type switch module; see Figure 2. Figure 3 and 4 show the RS-232 and TTL pinout respectively.

The left-most switch controls whether the driver will be operated in MANUAL MODE or PC MODE. The right-most switch enables the ASE to be turned on and off.

If the driver is controlled through the PC-based software or DAYY Photonics API, connect either a USB, and/or Serial cable for communication. In MANUAL MODE, no connection to USB or RS232 is required and the ASE can be turned ON/OFF with the ASE Source Control switch.

When turning the ASE “on” or “off” in MANUAL MODE it will be driven at its default current settings. Default current settings for MANUAL MODE can be changed through the software and will be explained in the Software Operation section (Section 3.4).

When running the DAYY software, toggle the left switch to PC MODE in order to control the SLED from the software. The SLED control will be disabled in the software if operating in MANUAL MODE. Software will still display current levels when running in MANUAL MODE but users will not be able to adjust the operating currents.

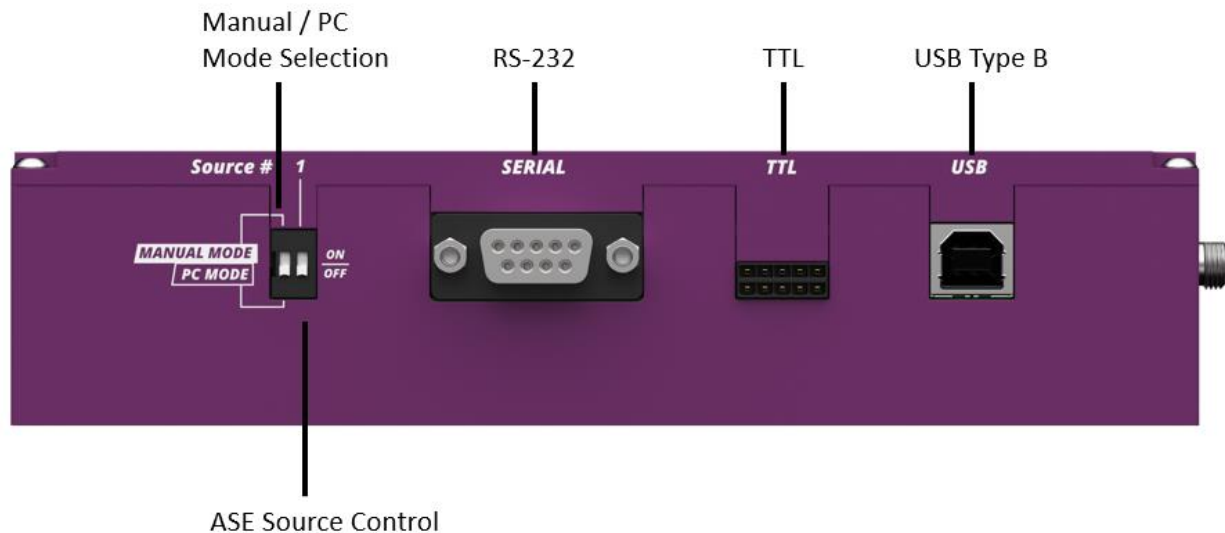


Figure 2: Communications and Control Panel

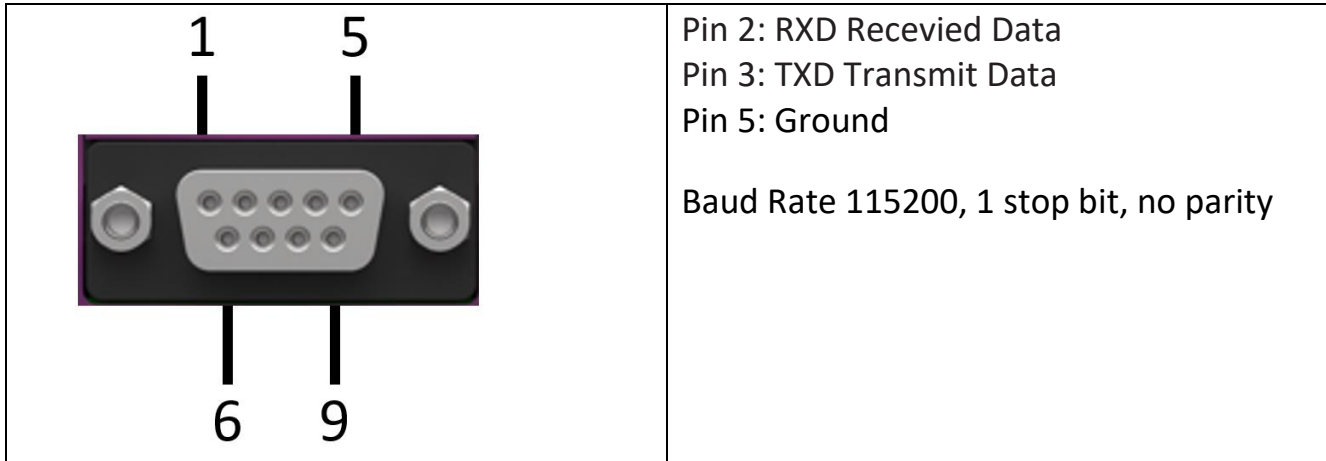


Figure 3: RS-232 Pinout to ASE

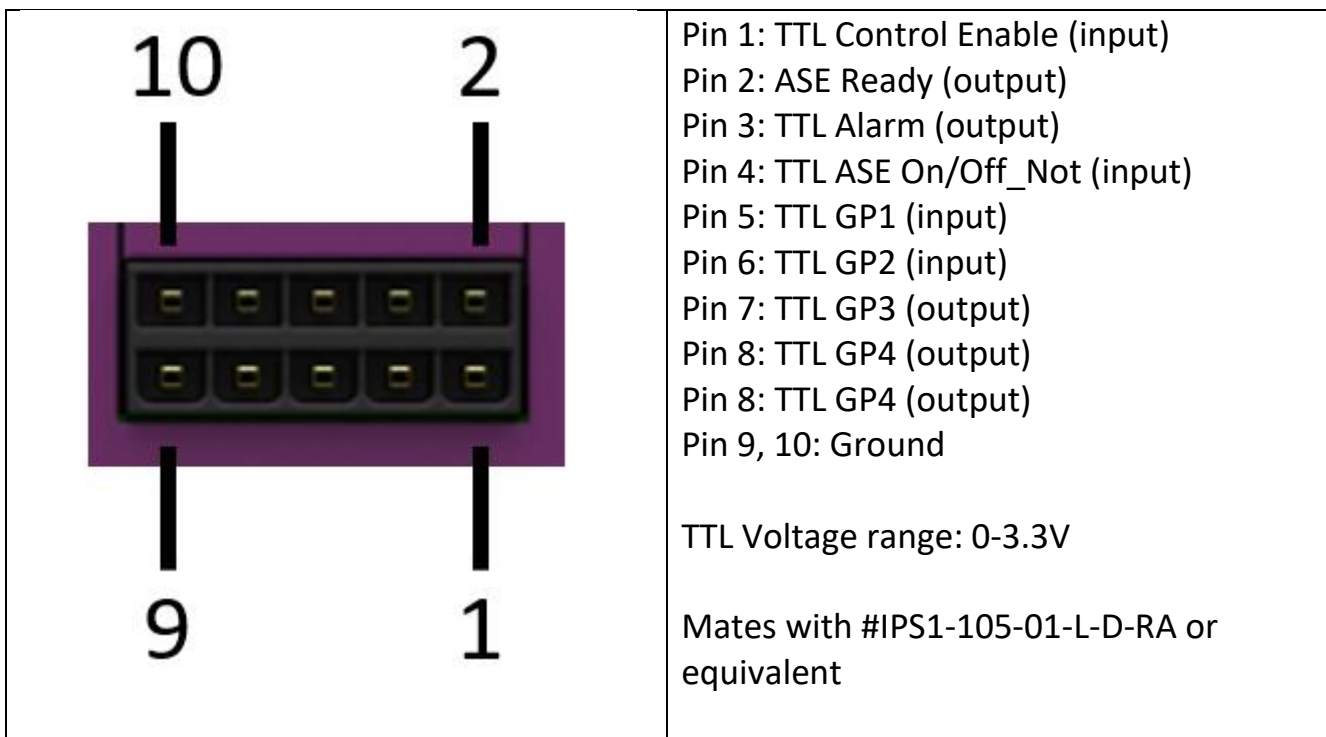


Figure 4: TTL Pinout

Front Panel - Light Output:

The front panel includes three LEDs, vent holes and light output connector, allowing users to connect their own fiber optic cable to the ISB4; see Figure 5. The ASE source comes with FC/APC as standard, but FC/PC and SMA connectors are available upon customer request.

When the unit is plugged in for power and the power button (side panel) is in the “I” position the red “POWER” LED will light up.

The yellow “READY” LED will start blinking until the unit is ready for operation. When the yellow “READY” LED stops blinking and stays on, the ASE is ready and the output power is stable. When the ASE is turned on and light is being emitted, the green “ON” LED will light up.

If the ISB4 is controlled through the DAYY Photonics software in PC mode, to turn ON/OFF the ASE and control the current is all done through the software or API. Otherwise, in MANUAL MODE the switches will turn on the ASE source. Once the yellow “READY” is on, the ISB4 temperature is stable and the unit is ready for operation.

In the event of a fast and large temperature change in the environment, the unit may stop emitting light until the ASE is ready again, in such case, the yellow “READY” LED will start blinking.

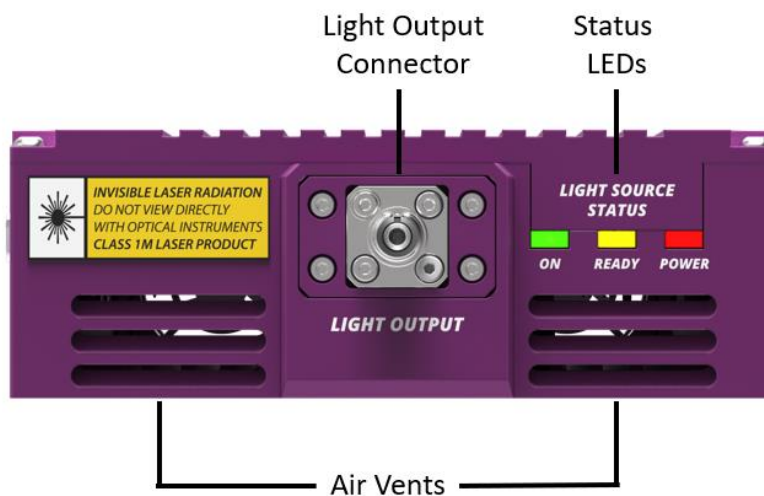


Figure 5: Front Panel – Light Output

Back Panel - Thermal Management:

Free air circulation around the rear of the unit should be maintained for good thermal performance. If the ISB4 is operated in environments over 35°C, the ISB4 should be mounted to an external heatsink. Free air circulation around the ISB4 is required when it is used without a heatsink. A minimum of 0.5" clearance is recommended for free air circulation around the top and sides of the ISB4 Unit.

Air circulation is located on the back panel of the ISB4, while additional ventilation holes are located on the front panel. Ensure vents are not obstructed to allow for maximum air flow.

The back panel includes two fans as shown in Figure 6. Upon powering up the unit, each fan is regulated automatically to its maximum speed. Users do have the option, however, to control fan speed manually as explained in the Software Operation section.

If the fan is not working and the heat sink temperature goes over 60°C, turn the unit off and contact DAYY Photonics technical support.

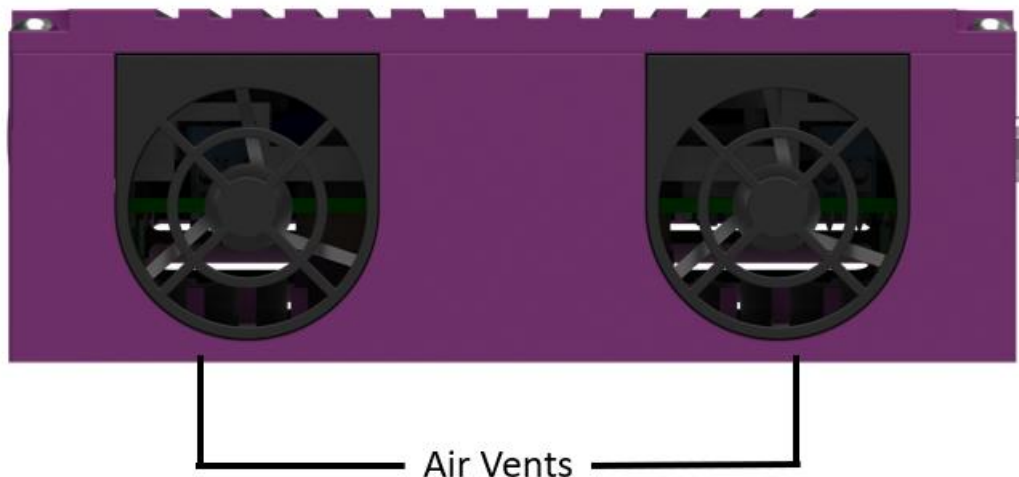


Figure 6: Back Panel – Thermal Management

3.4 Software Operation

To download the latest software package, refer too:

<https://dayyphotonics.com/products/ase>

When starting up, the software will automatically scan your computer's ports and find the ASE source. Please wait until a connection is established and the status bar in the bottom-right corner shows your connection type (USB/RS-232). Figure 7 shows the main console of the software.

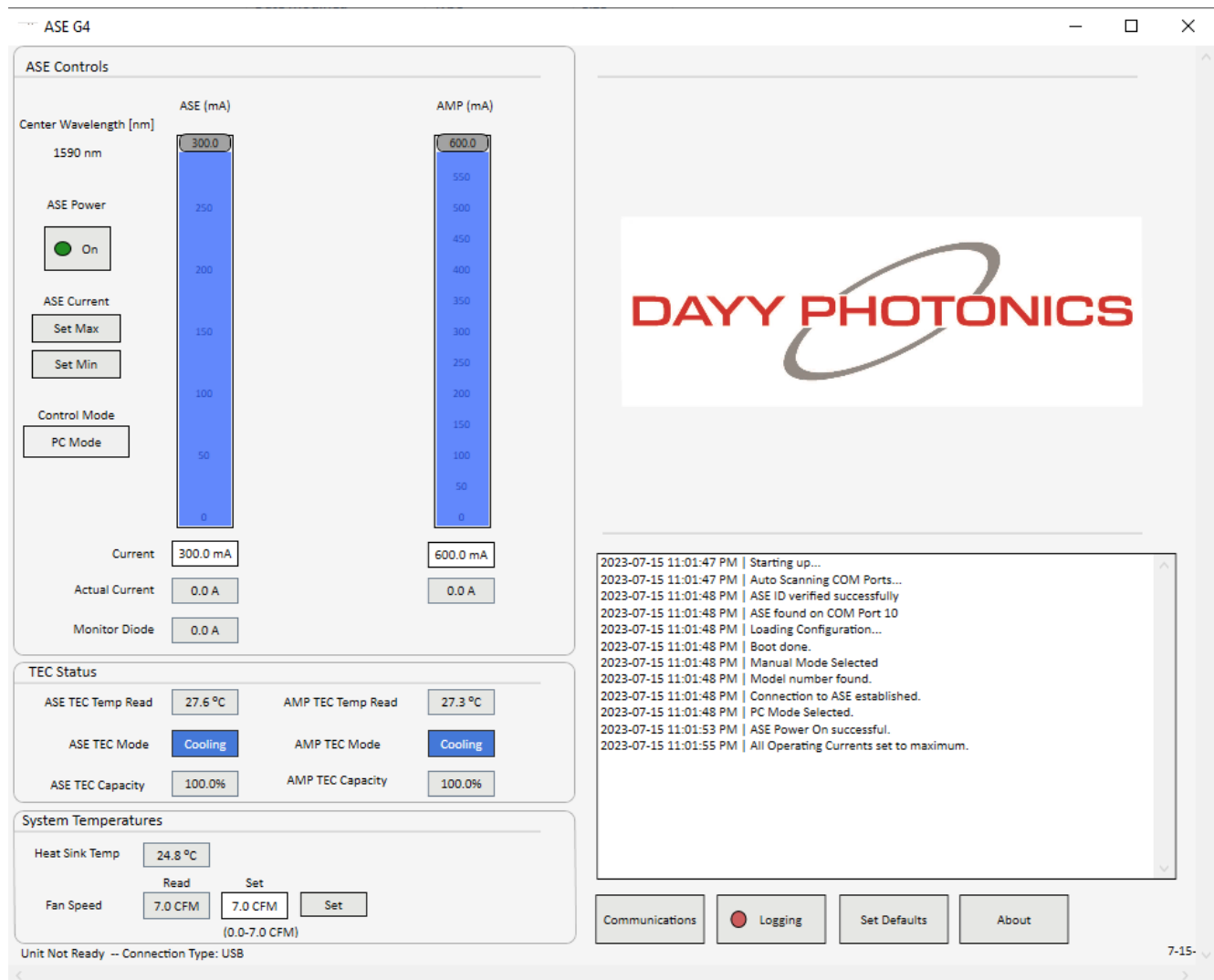


Figure 7: Main Console of ASE Software

ASE and AMP Control:

There is one slider bar to adjust the current of the ASE and one slider bar to adjust the current of the amplifier. Set both bars to maximum to full output power.

Based on the ISB4 model, the maximum current of the ASE and the AMP will be limited and the slider maximum value will be adjusted accordingly when the ASE source is connected. The center wavelength will be displayed on the top left corner.

The ASE and AMP current can be adjusted using the sliding bar. Additionally, the ASE and AMP can be set to the Maximum or Minimum by clicking the “Set Max” or “Set Min” buttons on the left of the slider. The user can also manually type the desired set current by typing a desired value in the ASE and AMP Current box underneath the sliding bar.

When the unit is turned on in PC mode, the ASE Control will be disabled, inhibiting the user from moving the sliders or setting the current until the “ASE Power” is turned on. If the temperature of the ASE or AMP goes over 32°C, the ASE will be turned off automatically.

The Actual Current is sensed and displayed. The box below the Actual Current shows the monitor photodiode current of the ASE. The monitor photodiode is physically placed on the back facet of the ASE, inside the optical package, and can be used as a reference for the light the ASE is emitting. Note that monitor diode value will vary depending on the ASE operating current.

Thermoelectric Cooler (TEC) Controls:

The ASE and AMP TEC is used to control the bench temperature of the ASE and AMP.

Users can set their desired TEC temperature by clicking the “Save” button in the defaults section explained in the “Set Defaults” section. The user will need to power cycle the unit before the new settings come into effect. The real-time TEC temperatures are shown in the “Temp Read” box and TEC Current is shown in the “Current Read” box. TEC Capacity represents how hard the TEC is working to maintain the temperature of the ASE and AMP. At 100% capacity, the TEC is working at its maximum capacity to maintain this temperature.

TEC Status			
ASE TEC Temp Read	27.7 °C	AMP TEC Temp Read	27.3 °C
ASE TEC Mode	Cooling	AMP TEC Mode	Cooling
ASE TEC Capacity	100.0%	AMP TEC Capacity	100.0%

Figure 8: TEC Controls Section

System Temperatures and Fan Setting

Factory default settings will automatically control the air flow. When the unit is powered on, fan speed will default to its maximum value. Realtime fan speed is read from the unit and displayed in the fan speed “Reading” box. See Figure 9 below.

To change the fan speed, the user may type a desired fan speed value (0.0 to 7.0 CFM) into the fan speed “Set Point” field, then click the “Set” Button.

Note: The user-defined fan speed Set Point will not be saved when the unit is powered off. It is recommended to run the unit only at factory default fan speed. To change the fan setpoint when the unit gets power cycled as well, go to the “Set Defaults” section and change it there. The setting in the default section will only come into effect after a power cycle of the unit.

The internal Heat Sink Temperature is also displayed.

System Temperatures			
Heat Sink Temp	24.8 °C		
	Read	Set	
Fan Speed	7.0 CFM	7.0 CFM	Set
	(0.0-7.0 CFM)		

Figure 8: TEC Controls Section

Communications:

The screen shown in Figure 9 will appear when clicking on the “Communications” button from the main console. When software loads up, the Auto-Scan function will run to find the virtual com port settings for a USB or RS232 connection. Users can manually enter the communication settings by clicking on “Autoscanning...” to stop the Auto-scan, then

clicking “Manual Connect” to connect via their preferred communications settings. To Disconnect from a Manual Connection, click the “Disconnect” button.

USB/RS-232 Serial Configuration:

1. COM Port can be found on device manager
2. COM Speed should always be set to a 115200 Baud Rate
3. MODBUS ID is the unique identifier for the ISB4. It will be 1 by factory default. Multiple ISB4 Modules can be set up and used with different Modbus ID's. To change Modbus ID, enter the new ID into the “Modbus ID” field before attempting to connect.

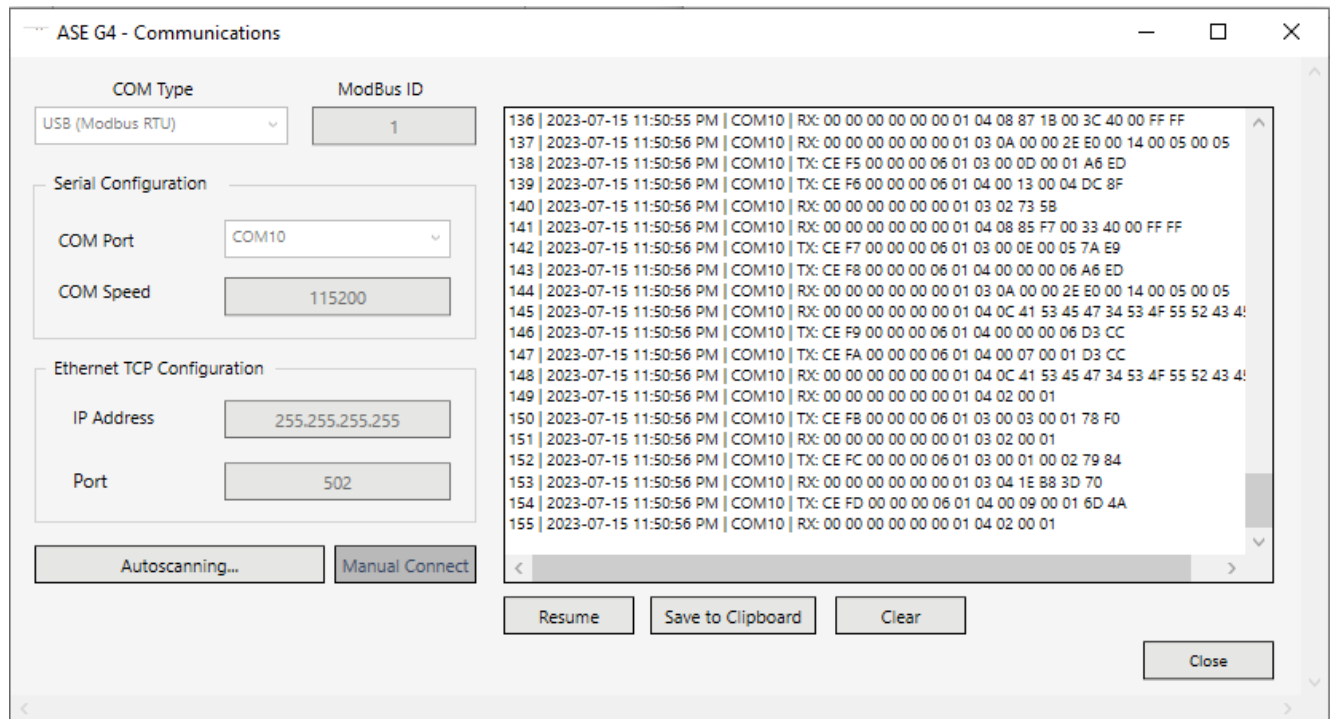


Figure 9: Communications Window

The Communications Window shows the continuous raw data transfers from the software to your ASE unit, and is used to monitor communications. The data transfer is represented as TX (data send) and RX (data receive) messages, accompanied by their time-stamps, see Figure 9. The Communications log can be paused by clicking “Pause,” exported to a file by clicking “Save to Clipboard,” or the window can be emptied by clicking “Clear.”

In an event of a communication error, send the communication log to DAYY Photonics technical support at techsupport@dayyphotonics.com

Logging:

The ASE source supports continuous logging of data such as the currents, temperatures, fan flow, etc. by clicking on the “Logging” tab from the main console. The window shown in Figure 10 will open. A new file can be created by clicking the “Create New Log File” button or the data can be appended to an existing file with the button “Selecting Existing File”. After the filename and path have been selected, to start logging, the logging will start automatically and the “Start Logging” button will change to “Stop Logging”. To stop the logging click on “Stop Logging”. To Resume Logging to same file, click “Start Logging”.

Note: Existing Log Files must use the .csv (Comma Separated Value) file extension.

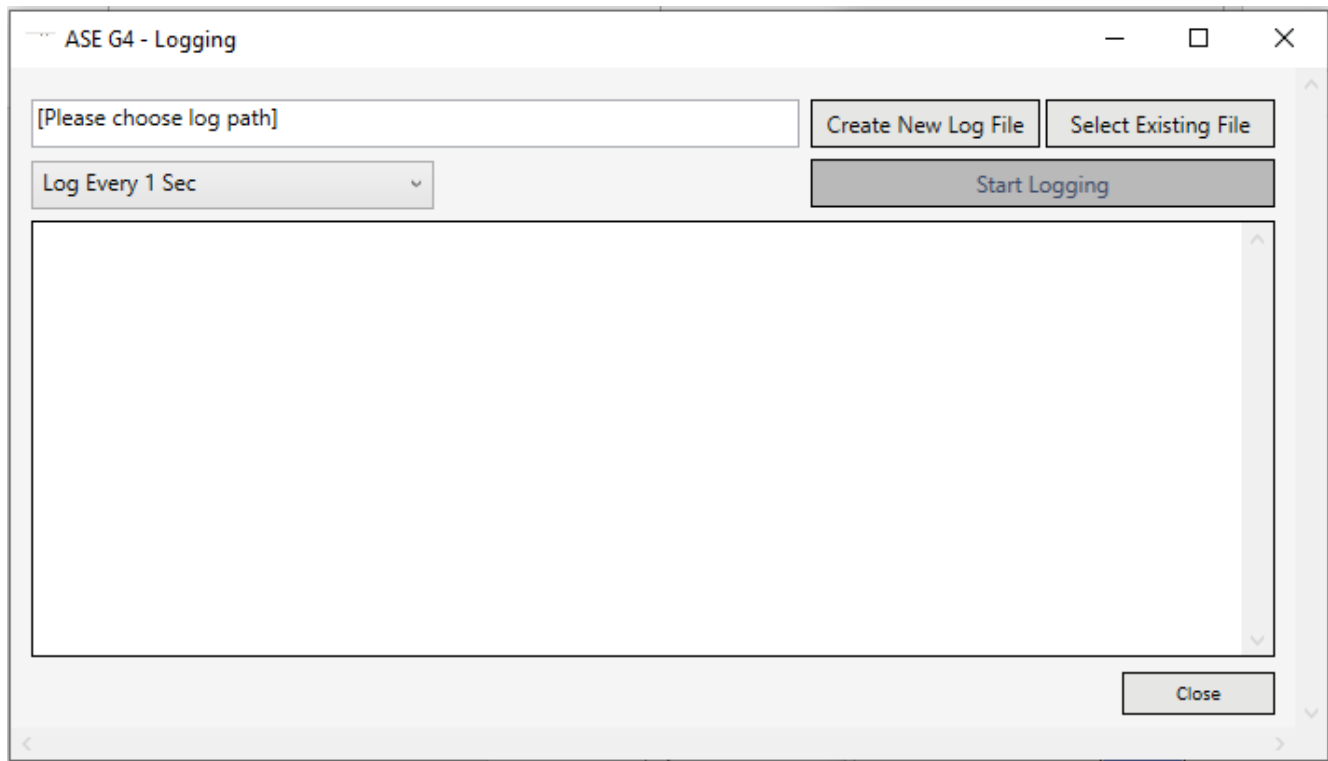


Figure 10: Data Logging Window

Set Defaults:

Clicking the “Set Defaults” tab from the main window will bring up the window displayed in Figure 11. For each of the parameters, the software displays the Existing Setting (First box from the left) and the Manufacturer Default Setting (Second box).

In order to change the value of any parameter, users must type the new value into the “New Setting” text field, then click the “Save” button next to this new value. Clicking this button will store the new value recorded in the “New Setting” field as its new default start-up setting. The new value will be stored in the ASE Source, and not on the user’s computer, so if the unit is powered off and taken to a different work station, the new settings will be kept as the default values when the unit is powered on again. The New Settings will remain stored in the driver until a different New Setting is saved, or “Reset to Factory Defaults” is clicked, which will reset all of these settings to their Factory Default Values. Note: For the new setting to take effect the unit needs to be power cycled after completing updates to the default window.

ASE G4 - Set Defaults

Parameter	Existing Default Setting	Manufacturer Default Setting	New Setting	Save
ASE Current	0.0 mA	0.0 mA		Save
AMP Current	0.0 mA	0.0 mA		Save

Parameter	Existing Default Setting	Manufacturer Default Setting	New Setting	Save
ASE Current	300.0 mA	300.0 mA		Save
AMP Current	600.0 mA	600.0 mA		Save

ASE TEC Control

Parameter	Existing Default Setting	Manufacturer Default Setting	New Setting	Save
Temperature Setpoint	21.0 °C	21.0 °C		Save
Time Constant	0.0053 s	0.0053 s		Save
Kp Factor	20	20		Save
Kd Factor	5	5		Save
Ki Factor	5	5		Save

AMP TEC Control

Parameter	Existing Default Setting	Manufacturer Default Setting	New Setting	Save
Temperature Setpoint	21.0 °C	21.0 °C		Save
Time Constant	0.0053 s	0.0053 s		Save
Kp Factor	20	20		Save
Kd Factor	5	5		Save
Ki Factor	5	5		Save

Communications

Parameter	Existing Default Setting	Manufacturer Default Setting	New Setting	Save
Modbus ID	1	1		Save

Fan Control

Parameter	Existing Default Setting	Manufacturer Default Setting	New Setting	Save
Fan Speed	7	7		Save

Reset to Factory Defaults Close

Figure 11: Set Defaults Window

The section “ASE Drive Current – PC Mode” allows user to set the initial current levels for the ASE and AMP when the unit is turned on, ASE power is enabled and is in PC MODE.

The section “ASE Drive Current – MANUAL MODE” consists of the operating current at which the ASE and AMP will be driven when the ASE Source is operated in MANUAL MODE.

Note: The ASE and AMP should be operated per manufacturer-recommended current setting provided in the Final Test Inspection Report for the. Running the ASE or AMP at higher currents may cause damage. DAYY Photonics is not liable for damage if the ASE is operated at higher than specified current ratings.

The section “ASE TEC Controls” and “AMP TEC Controls” allows users to change the default settings for the TEC temperature set point on the ASE TEC and AMP TEC as well as the factors for the PID TEC Controller.

The section “Communications” allows users to change the default settings for Modbus ID.

The section “Fan Control” allows users to change the default settings for fan speed.

Changes and notifications are displayed in the text box in the lower-right quadrant of the Set Defaults window.

About:

Refer to the About section by clicking on the “About” button in the main console. The About window is shown in Figure 12. The software name and version are shown underneath DAYY logo. Based on the ISB4 model, the Capabilities column shows the functionality enabled on the driver.

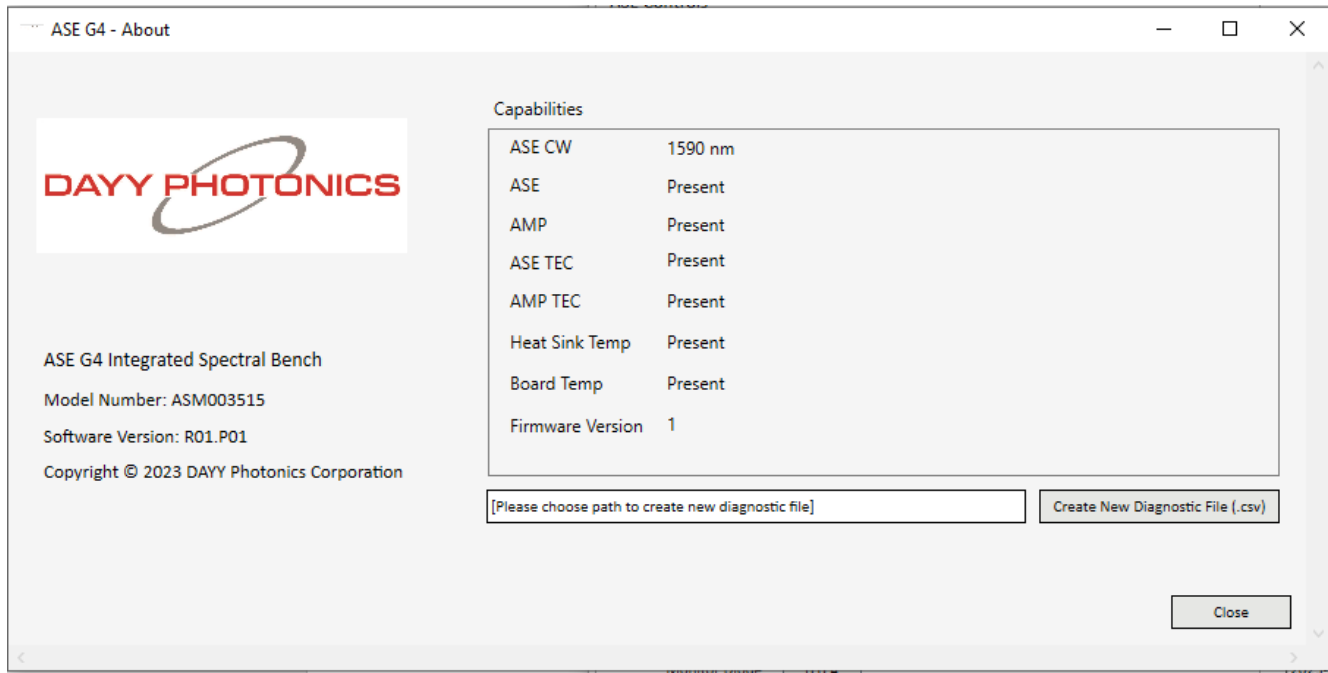


Figure 12: About Window

4. Application Protocol Interface (API)

DAYY's driver utilizes the MODBUS Protocol for communications. Users can find numerous detailed specifications for the protocol on the internet. This manual will only provide a high-level overview. MODBUS is a master/slave protocol and is used widely in industrial applications. The driver is designed to use this protocol over all of its communication interfaces, and the MODBUS specification has outlined how a user can adapt the overall packet structure to suit each interface requirement. The primary section of a MODBUS packet is known as the Protocol Data Unit (PDU) and it is independent of the underlying communication interface. The PDU includes additional byte fields for the MODBUS transaction per the Application Data Unit (ADU).

4.1 Serial MODBUS-RTU (USB interface/RS232)

MODBUS over Serial Line is a master/slave protocol and is employed by the USB port. The ADU packet structure for each serial interface is shown below.

Serial Header	MODBUS PDU		Serial Footer	
Slave Address	Function Code	Data	CRC16	
1 byte	1 byte	0 up to 252 byte(s)	2 bytes	
			Low	High

As per the MODBUS Standard, this structure is used regardless of whether a packet is a request or a response. Each MODBUS-RTU packet consists of at least 4–256 bytes. The slave address byte is used to uniquely identify different units on the serial line and must be a number from 1 to 247. The function code byte indicates the request to perform. The Data bytes are dependent on the transaction data per the MODBUS protocol. The CRC16 bytes are transmitted with the low byte first and are calculated using the common CRC16 algorithm with the values of the slave address, function code, and the data bytes.

4.2 ASE Source ISB4 Register Map

If users want to develop their own API, ASE Source ISB4 Register Map is available upon request. Please contact technical support: techsupport@dayyphotonics.com

5. Technical Data

ABSOLUTE MAXIMUM RATINGS



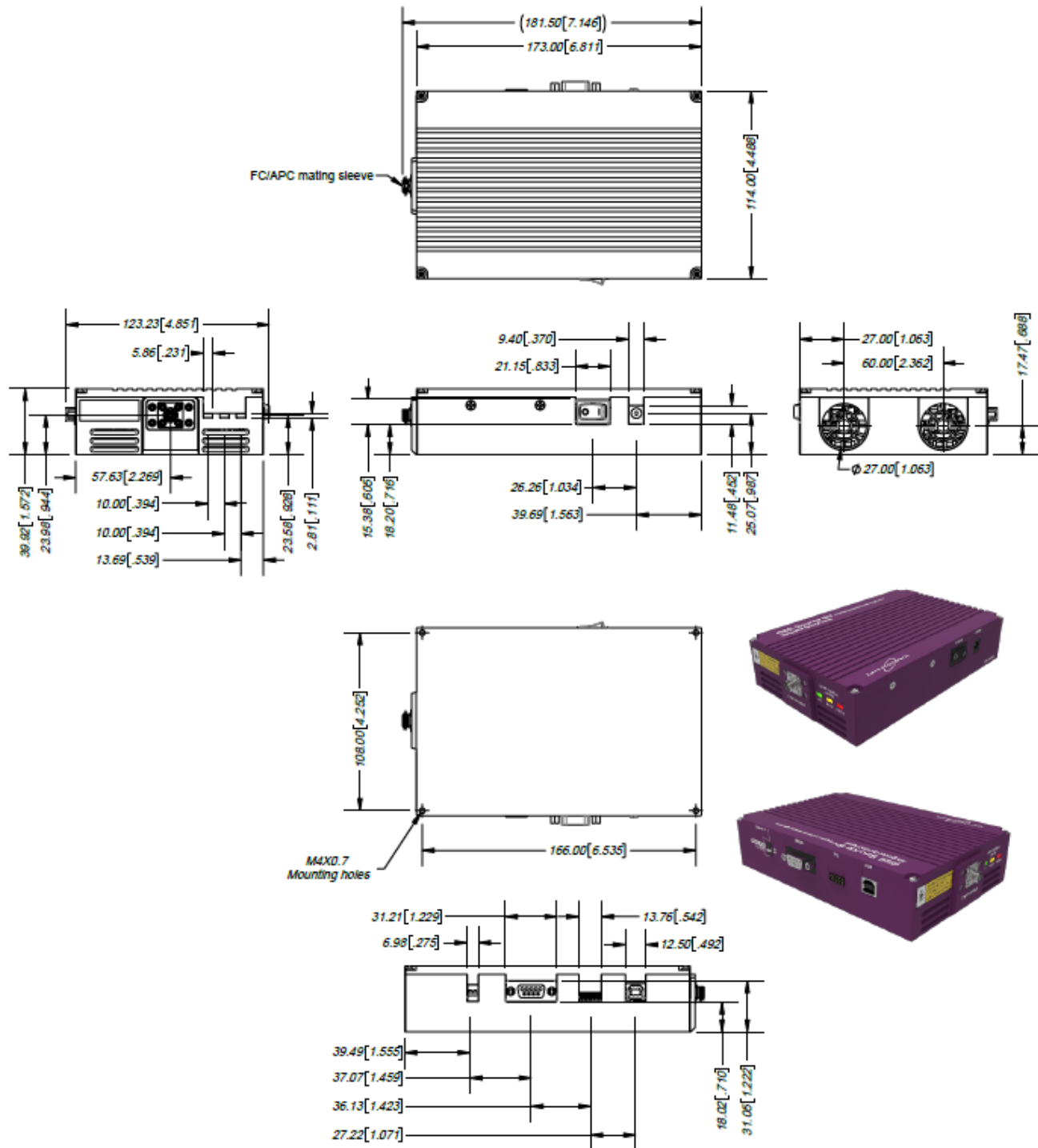
Parameter	Symbol	Condition	Minimum	Maximum	Unit
DRIVER POWER SUPPLY SPECIFICATIONS					
Input Power Supply Voltage	V_S	CW	10	14	V
Input Power Supply Current	I_S	CW	5	-	A
TEMPERATURE SPECIFICATIONS					
Case Temperature (see note 2)	T_{Case}		0	60	°C
Storage Temperature (see note 4)	T_{stg}	No condensation, Unbiased	-40	85	°C
Storage Humidity (see note 4)	RH_{stg}		5	85	%RH
Ambient Operating Temperature (See note 3)	T_{OP}		0	50	°C
Notes: <ol style="list-style-type: none"> Please note that exceeding the Absolute Maximum Ratings above may cause device failure. DAYY does not bear responsibility for laser power damage that is attributed to electrostatic discharge, excessive current levels, and current spikes (transients). Any attempts to increase the ASE drive current above the pre-set limits or recommended specification limits, can damage the device, and nullify the warranty period. It should be emphasized that the current limit set points cannot be exceeded. For optimum performance of the Integrated Spectral Bench (ISB4), the ISB4 must be operated within the specified temperature ranges. The ASE Source has an internal thermoelectric cooler (TEC) to remove heat from the light source and dissipate it through the ISB4 case. It is required to provide free air circulation around the ISB4 device. It is always recommended to cool down the unit with a fan, and/or to mount the ISB4 on an appropriate heatsink, capable of dissipating up to 10W. The thermal resistance between ISB4 metal case and heatsink can be minimized by applying thermal grease, thermal glue or thermal pad between the contact surfaces. When the ASE source is used without a heatsink, maximum ambient operating temperature is 40°C. The specification lists the operating temperature for the electrical/optical characteristics, which is the temperature of the ISB4 during the time that the specifications were measured. Variation in temperature beyond what is specified can have a significant effect on the optical characteristics, like changes in wavelength or drop in output power. Storage temperature and relative humidity should be chosen so the dew point of the humid air around the package is below the storage temperature of the package, to avoid condensation inside the ISB4 enclosure. 					

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
DRIVER POWER SUPPLY SPECIFICATIONS						
Input Power Supply Voltage	V_S	CW	10	12	14	V
Input Power Supply Current	I_S	CW	5	-	-	A
Input Power Supply Voltage Ripple and Noise	γ	CW	-	-	200	mVpp
CONSTANT CURRENT MODE						
Operating Current	I_{OP}	CW	-	900	950	mA
Current Setting Resolution	R_{IOP_SET}	CW	-	-	0.1	mA
ISB4 Current Reading Resolution	R_{IOP_READ}	CW	-	0.1	-	mA
LIGHT OUTPUT CONNECTOR						
Type of Fiber Connector	F_{conn}	CW	-	FC/PC, FC/APC, SMA	-	-
ISB4 TEC SPECIFICATIONS						
ISB4 TEC Temperature Setpoint	T_{isb4_SET}	CW	0	-	40	°C
ISB4 TEC Temperature Setpoint Resolution	R_{Tisb4_SET}	CW	-	0.1	-	°C
ISB4 TEC Temperature Reading	T_{isb4_READ}	CW	-40	-	100	°C
ISB4 TEC Temperature Reading Resolution	R_{Tisb4_READ}	CW	-	0.1	-	°C
TEMPERATURE SPECIFICATIONS						
Heatsink Temperature Reading Range	T_{HS}	CW	-40	-	100	°C
Heatsink Temperature Reading Resolution	R_{THS}	CW	-	0.1	-	°C

6. Dimensions – ASE Source ISB4

Overall dimensions for the connector, venting locations, and mounting holes.



7. Troubleshooting

If an error occurs on your unit send diagnostic file to DAYY Photonics tech support. To send the diagnostic file, follow these steps:

1. While your unit is connected and running, click on the “About” button on the main screen to open the About window.
2. Click “Create New Diagnostic File” button and save with your desired filename and path (.csv extension)

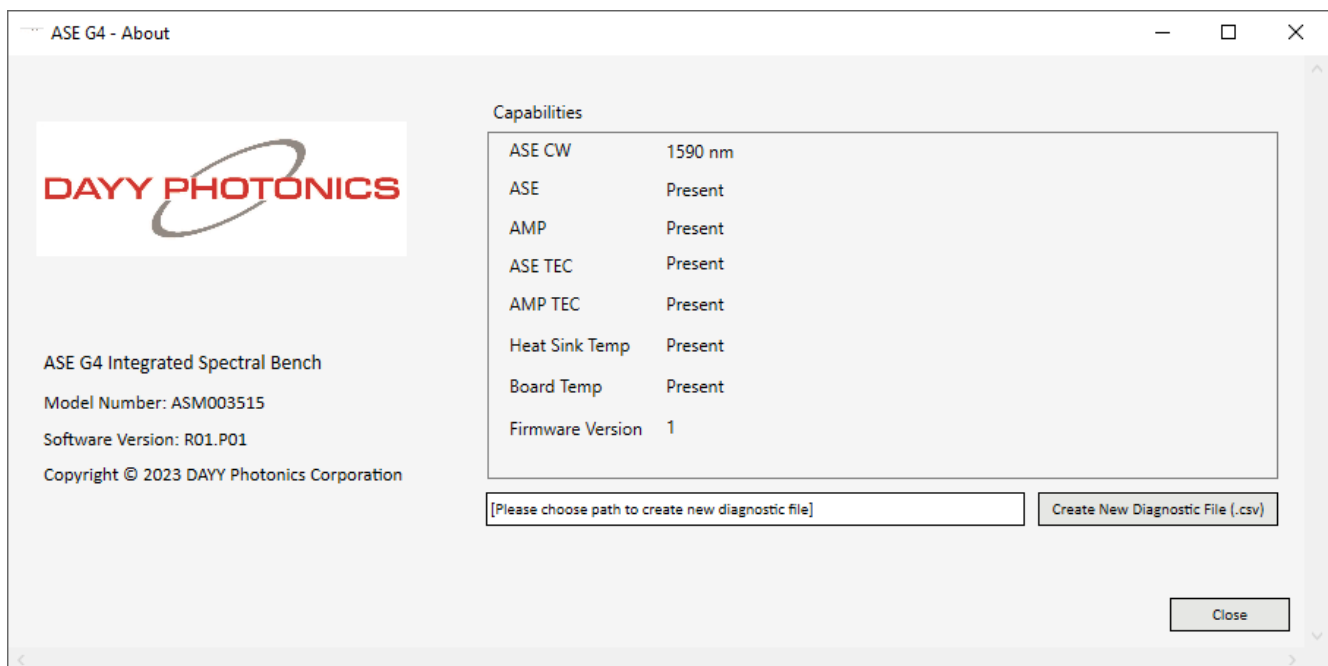


Figure 13: About Window

3. Attach this file along with a brief explanation in an e-mail and send to techsupport@dayyphotonics.com

8. Limited Product Warranty (“WRTY”)

DAYY Photonics Corporation (“DAYY”) products and components are warranted against defects in materials and workmanship for a period of one year (unless otherwise stated) beginning on the product shipment date. This warranty is provided only to the original end user, and is not transferrable. The warranty ceases upon transfer of the product to a new owner. Except as otherwise proscribed by applicable law, in the event of a breach of this warranty, the sole and exclusive remedy, and DAYY’s sole and exclusive liability, shall be for DAYY to use its commercially reasonable efforts to repair or replace the product that caused the breach of this warranty. If DAYY cannot, or determines that it is not practical to, repair or replace the returned product, then the sole and exclusive remedy and the limit of DAYY’s obligation under this warranty shall be to refund the amount received by DAYY for such product.

Warranty Returns

All products must be returned to DAYY in accordance with DAYY’s then-current Return Material Authorization (RMA) procedure. Products obtained from DAYY that do not comply with the warranty and which are returned to DAYY during the applicable warranty period will be repaired or replaced at DAYY’s option, provided the reseller or end user bears the cost of freight, insurance, duties and import and export fees to the point of repair or return. If the returned product is covered by a DAYY warranty, DAYY will bear the cost of freight, insurance, duties and import and export fees for return of goods to reseller (if any) or end user. If the product is purchased from a DAYY reseller, the reseller will handle and be responsible for the warranty return process for its end users. If the product was purchased directly from DAYY, the end user will be responsible for the warranty return process. For the first 30 days of the warranty period, DAYY will provide advance replacement same day ship via standard overnight shipping (must meet shipment cut-off time) for the covered product after confirming coverage and the warranty failure. The product arrival date is subject to local transport conditions. Additional service coverage such as Advanced Replacement service, or an extended warranty are available for purchase under a separate support and service agreement.

Warranty Exclusions and Disclaimer

The warranties described in this document do not extend to any product that is repaired, modified or altered by anyone other than DAYY or an DAYY authorized company, is not maintained to DAYY's maintenance recommendations, is operated in a manner other than that specified by DAYY, has its serial number removed or altered. The warranty does not cover abuse of the product including but not limited to neglect, damage or abuse, such as water damage, back-reflection, broken fiber, incorrect input voltage, improper wiring, shock or severe impact, damage during shipment, exposure to rain, excessive humidity, corrosive environments or other contaminants are not covered by the terms and conditions of our warranty. The warranty does not cover cosmetic defects associated with normal wear that do not interfere with product functionality.

9. Compliance



10. Acronyms

ASE – Amplified Spontaneous Emission
AMP – Optical Amplifier
ISB - Integrated Spectral Bench
PCB – Printed Circuit Board
TEC – Thermal Electric Cooler
ESD – Electrostatic Discharge
API – Application Protocol Interface
PDU - Protocol Data Unit
ADU - Application Data Unit
MBAP - MODBUS Application Protocol
UI - Unit Identifier

11. Ordering Code

ORDERING CODE:		DAY	ISB4	FT	DOP	SC [nm]	FWHM [nm]	CW [nm]	LOP [mW]
DAY	DAYY Photonics Corporation								
ISB4	Amplified Spontaneous Emission (ASE) Source - Integrated Spectral Bench G4								
FT	Fiber Type, choose 1: PM: Polarization Maintaining SM: Single Mode								
DOP	Degree of Polarization								
SC	Spectral Coverage [nm]								
FWHM	Full Width Half Maximum [nm] [FWHM defined as the bandwidth from the lowest spectral dip]								
CW	Center Wavelength [nm]								
LOP	Light Output Power [mW]								

Product Code
 Available Options
 Taken From Table

12 Optional: Light Output Connector

The ASE Source comes with FC/APC Connector as standard. If customer requires FC/PC or SMA connector instead, please indicate on the order.

13. Contact Information

DAYY Photonics Corporation
 #700, 1816 Crowchild Trails NW
 Calgary, AB
 Canada T2M 3Y7

+1 (587) 328-0739
 sales@dayyphotonics.com
 www.dayyphotonics.com