Stradus VersaLase™

User Manual

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3.0 Symbols

ESD – This symbol is used to alert the user of hazards associated with Electro-static Discharge.

Laser Radiation – This symbol is used to alert the user of hazards associated with optical radiation emitted from the laser.

CE Mark – This symbol represents the European Directive Conformite Europeenne" to certifiy that a product has met EU health, safety, and environmental requirements, which ensure consumer safety. Manufacturers in the European Union (EU) and abroad must meet CE marking requirements where applicable in order to market their products in Europe.

Ground – This symbol represents electrical ground.

USB – This symbol is used to reference Universal Serial Bus Communication.

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4.0 Laser Safety

4.1 A Note Regarding Compliance

The Vortran Stradus VersaLase™ OEM System has features which allow it to be easily integrated a system which meets CDRH safety requirements, based on EN60825-1. These features include the interlock, emission LEDs, 5 second emission delay.

4.2 Laser Classification

The Stradus VersaLase™ is classified as a Class IIIb laser device as specified by the Center for Device and Radiological Health (CDRH). The device emits visible or invisible laser radiation from the aperture located in the front of the laser system chassis. The emitted wavelength(s) and maximum power level(s) are specified on the laser safety label.

4.3 Observations

If the equipment is used in a manner not specified by Vortran Laser Technology, the protection provided by the equipment may be impaired.

4.4 Laser Safety Labels

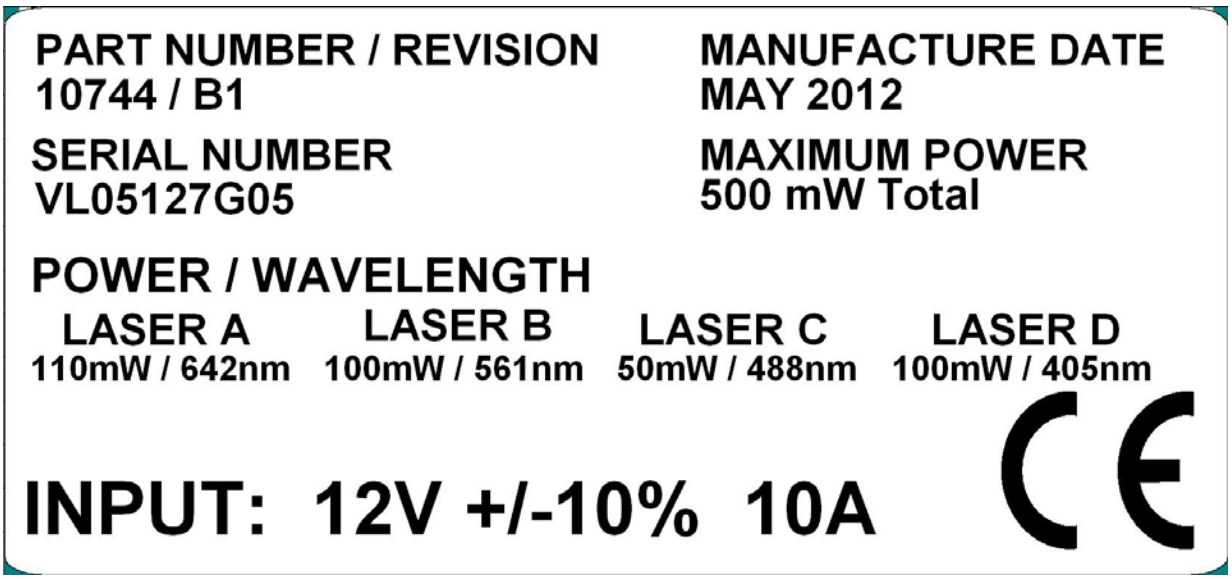

Figure 1
Laser Safety Label

4.5 Electrical Safety

No hazardous voltages are contained in the Stradus VersaLase™ laser head. The system does not contain any user accessible components within the system enclosure. The warranty will void if the enclosure is disassembled.

ESD 

Vortran Laser Technology recommends that proper ESD precautions are taken when handling the laser head. The Vortran Stradus VersaLase™ System is designed with internal safeguards for protection against ESD. Even with the tested design safeguards in place, high energy ESD discharge events may cause damage to the laser system. Vortran Laser Technology recommends handling and operating the laser system on a grounded work bench or optical table.

4.6 Optical Safety 

Based on the properties associated with laser light, special optical safety precautions are recommended by Vortran Laser Technology. Direct eye exposure from the laser light emitted from the output aperture located on the front of the laser head is considered dangerous. Vortran Laser Technology recommends the use of proper laser safety eyewear when operating the laser system. The user is advised to wear appropriate safety eyewear for the wavelength(s) and power level(s) of lasers in their application. The laser output should be contained in a secure beam path. The user should be aware of propagation associated with reflective and refractive optical components prior to laser exposure. The laser emission indicators located on the laser head are visible even when using laser safety eyewear.

4.7 Vortran Laser Safety Features

4.7.1 Protective Housing – The Stradus VersaLase™ is enclosed in a protective metal housing. This housing is not intended to be removed by the user as there are no user-serviceable parts inside the module. If the housing is removed, the user may be exposed to laser radiation and electrical shock hazards and all warranties will be void. Please return the laser or control box to the factory for any required repair or service. The factory contact information is located at the end of this manual.

4.7.2 Power Indicator – A power indicator, shown in Figure 3 below, is located on the rear panel of the chassis. This indicator is visible even when using laser safety eyewear.

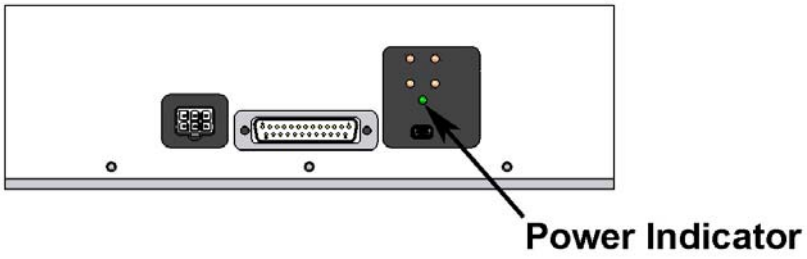

Figure 2
Power Indicator

4.7.3 Interlock- The Stradus VersaLase™ features safety interlock circuitry which must be closed electrically for laser emission to occur. The electrical interlock is available at the DE-25 25-pin connector on the rear panel. More information about the interlock may be found in the Section 6 or 7 of this manual.

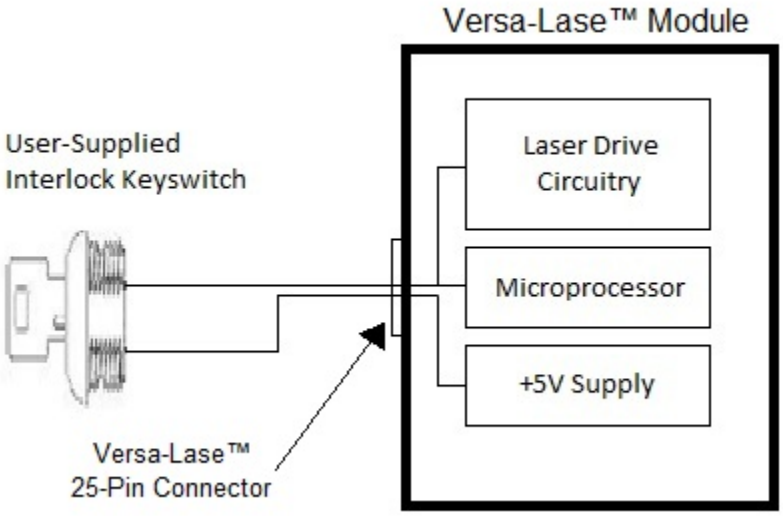

Figure 3
Interlock Diagram

4.7.4 Laser Emission Indicators – The Stradus VersaLase™ module includes emission indicators to indicate emission from each laser module enclosed in the chassis. The wavelength of the indicators allows them to be viewed when using laser safety eyewear. The laser emission indicators will illuminate prior to laser emission and during laser emission. The laser system should be considered dangerous when the emission indicators are active.

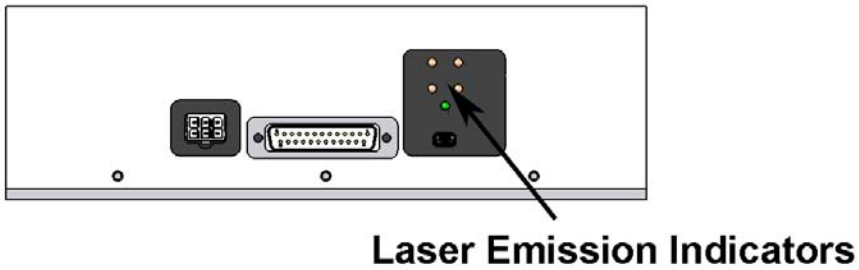

Figure 4
Laser Emission Indicators

4.7.5 Computer Control – The Stradus VersaLase™ may be controlled by a computer via USB or RS-232 connections. The status of safety features such as the electronic laser emission interlock may be monitored by firmware terminal commands and queries or by using the Stradus VersaLase™ user interface software.

5.0 System Information

5.1 System Features

- **Compact full-featured multi-laser platform with a common control interface**
- **USB or RS-232 remote communication**
- **Control and monitoring available through Stradus VersaLase™ Software**
- **External Analog Power Control (if equipped)**
- **Digital Modulation Control (if equipped)**
- **Field-upgradable multi-laser platform**

5.2 System Description

The Vortran Stradus VersaLase™ provides a compact, full-featured, field upgradeable, multiple laser platform with a common hardware and software control interface for all lasers in the package. The multiple laser system includes visible indicators for power and laser emission for each wavelength.

5.3 Power Supply Requirements and Protection

12V +/- 10% (10.5V to 13.5V) at 9 amps
It is recommended that the Stradus VersaLase™ ground is connected to a power supply which has a connection to Earth ground. Many “brick” style power supplies do not provide this connection.

5.4 Environmental Operating Conditions

The Vortran Stradus VersaLase™ module is designed for indoor or enclosed use only. Typical operating temperatures range from 10ºC to 40ºC, based on the heat sink used to maintain base plate temperatures at or below 50ºC. The Vortran Stradus VersaLase™ laser can operate at altitudes up to 2000 meters. Maximum relative humidity is 80% for ambient temperatures up to 31ºC, with a linear decrease to 50% at 40ºC. The laser system does not emit any type of pollution.

5.5 Block Diagram

Stradus VersaLase™ Block Diagram

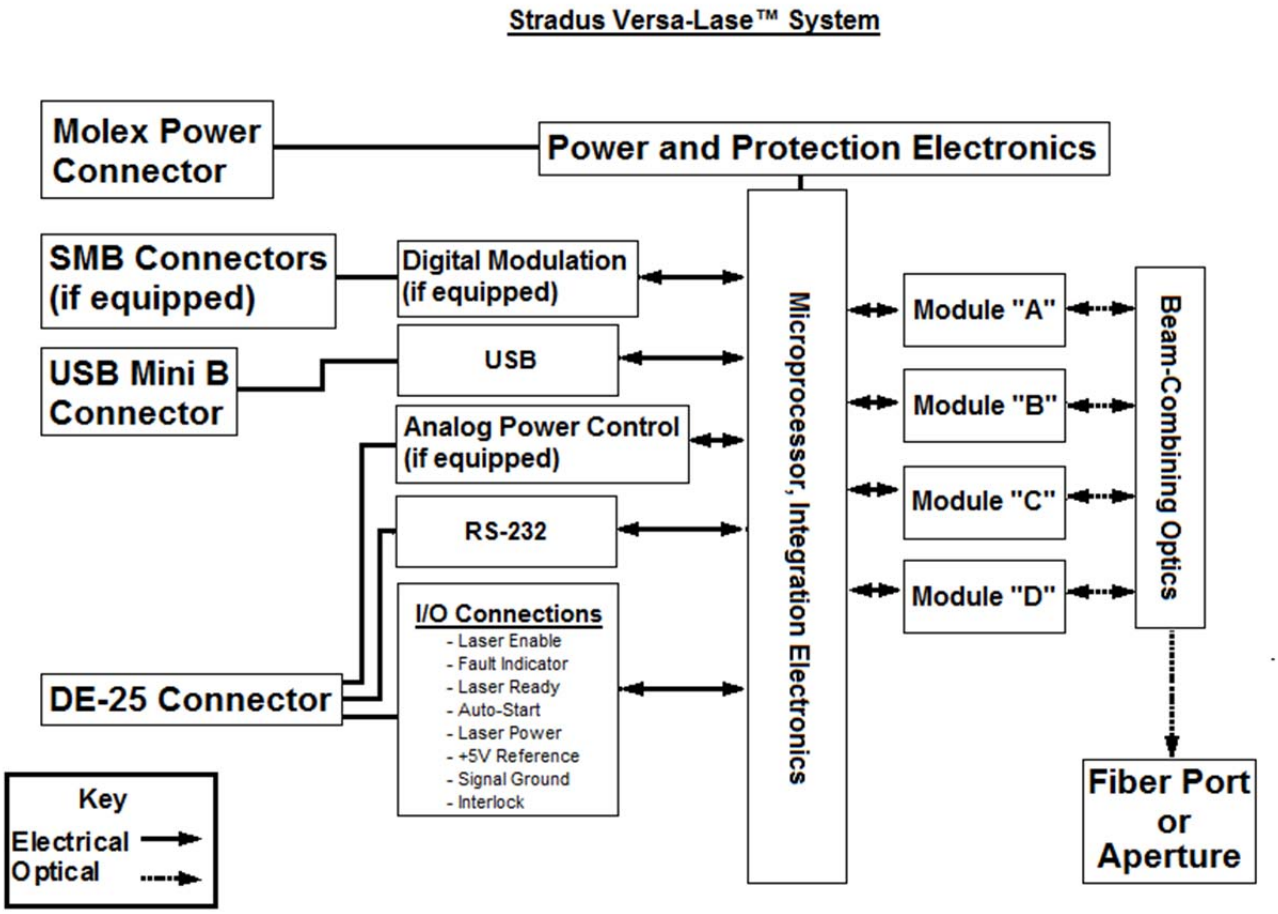

Figure 5
System Block Diagram

6.0 System Installation

6.1 System Installation Checklist

- ✓ Unpack and Inspect the Stradus VersaLase™ System
- ✓ Secure the system to an appropriate Heat Sink
- ✓ Torque Laser Head to Heat Sink at 20 in-lbs, Using a Progressively Increasing Cross Torque Pattern
- ✓ Connect the Power Supply
- ✓ Connect USB or RS-232 connections if Computer Control is Desired
- ✓ Connect DE-25 I/O connector to access all I/O signals
- ✓ If Computer Control is Desired, Install Vortran Stradus VersaLase™ User Interface Software
- ✓ Proceed to Operation Section for Additional Information

Note:
The electrical interlock MUST be CLOSED for laser emission to occur!

6.2 Unpacking and Inspection

Upon receipt of your new Vortran product, inspect the contents of the shipping box for potential damage from mishandling during shipment. Immediately report any damage to Vortran Laser Technology.

The VersaLase™ System is designed for custom OEM integration. The contents of the box are based on specific customer needs. Typically the box will contain the items listed below.

Description	Part Number	Quantity
Laser Head	See Packing List	1
Laser Control Software CD	10820	1
Mini B USB Cable	10126	1

Table 1
Packing List

6.3 Laser System Mounting

6.3.1 Laser System Drawings

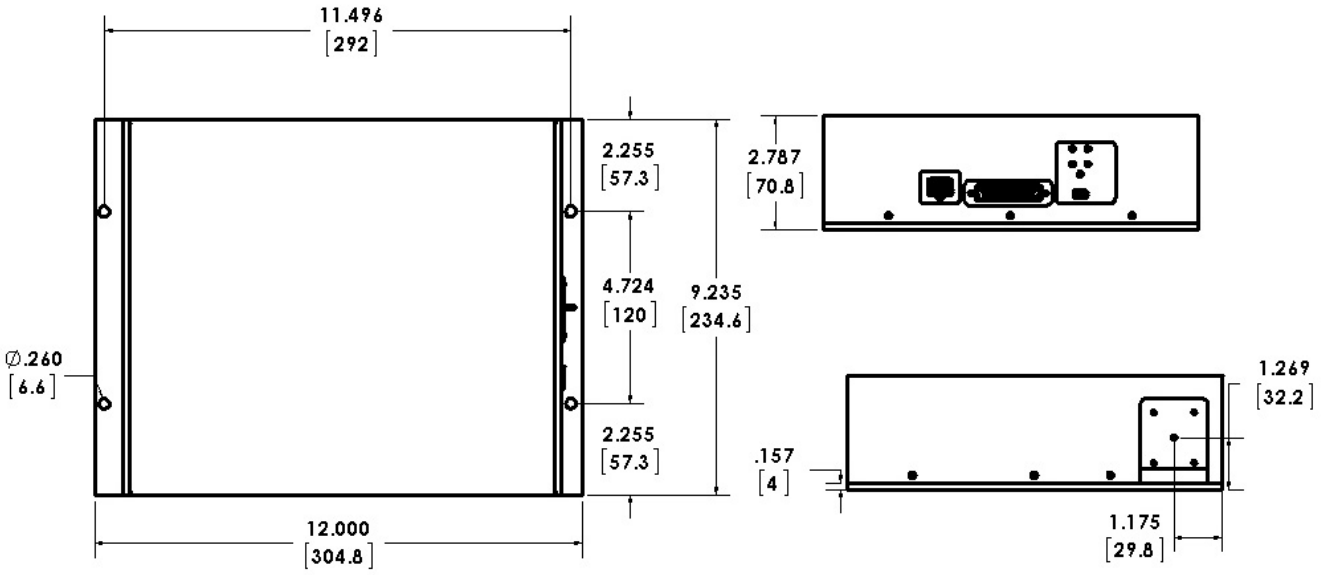

Figure 6
System Dimensions

6.3.2 Heat Sink Requirements

The Stradus VersaLase™ system is conduction-cooled and requires a heat sink for operation.

- ***Failure to use a heat sink will overheat the module***
- ***Heat sink compound is not required or recommended for mounting.***
- ***A heat sink capable of dissipating 75 Watts is required for laser mounting.***
- ***A 32 finish is recommended for the system mounting surface, to ensure optimum thermal transfer.***
- ***A high tolerance heat sink surface flatness is recommended for mounting.***

6.3.3 Laser Mounting Hardware

Recommended mounting hardware for the Stradus VersaLase™ system is M6 x 6mm or ¼ - 20 x ¼".

6.3.4 Torque Specifications

Normal mounting can be accomplished by using the provided hex key to secure the laser head to the heat sink, by tightening the screws gradually in a progressing cross pattern. This method should provide stable thermal and pointing performance. Optimum thermal and pointing performance is accomplished by securing the laser head to the heat sink, with a precision torque driver. Torque the laser module to the heat sink by using a cross torque pattern and progressively increasing torque from 10in-lbs to 15-in-lbs to 20in-lbs. Torque the module in the sequence shown below.

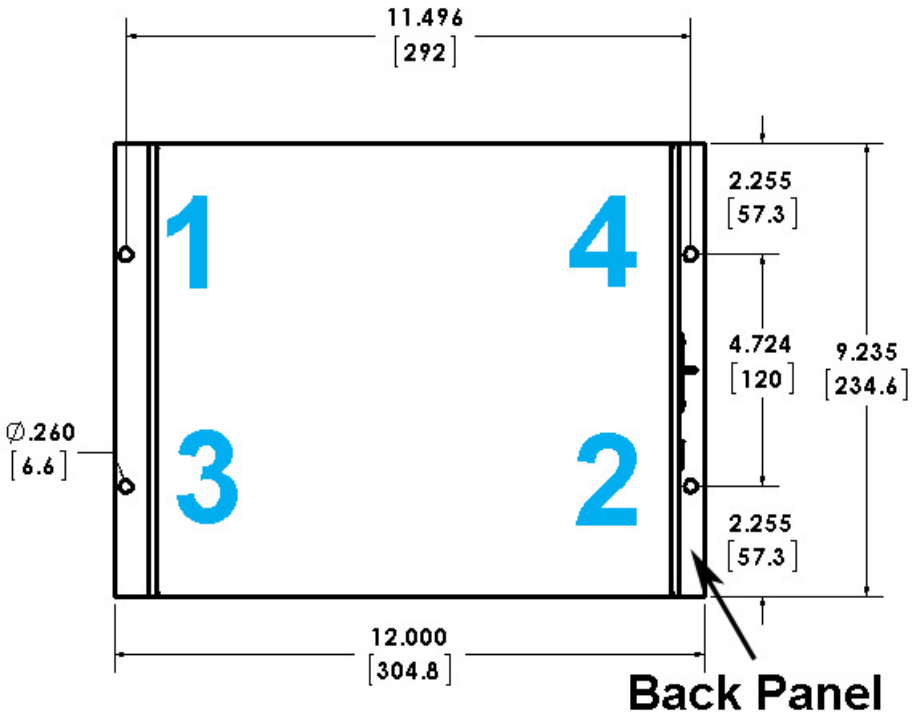

Figure 7
System Torque Pattern

6.4 Electrical Connections:

6.4.1 Power Supply Connection

A standard Stradus VersaLase™ Laser System does not include a power cable. Power connector diagrams are shown below:

Plug P/N: Molex® 39-01-2060
Solder Pins P/N: Molex® 45750-3112

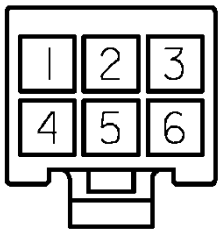

Figure 8
System Power Connector

Pin Number	Function
1	+12V DC
2	Earth Ground
3	0V
4	+12V DC
5	Earth Ground
6	0V

6.4.2 USB Connection

The Stradus VersaLase™ includes USB communication capability and a cable is supplied with each system. The included cable is specified as a USB-A to Mini-B cable and they are readily available at many consumer electronic stores. Refer to Sections 10 and 11 for computer controlled operation.

6.4.3 RS-232 Connection

The DE-25 connector on the rear panel of the system provides access to the RS-232 input and output. Refer to sections 10 and 11 for computer controlled operation. See “I/O Connection” below for connection information.

Communication Protocol	
Baud Rate	19200
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

Table 2: RS-232 Protocol

6.4.4 I/O Connections

Access the system Input /Output functions on the rear panel of the Stradus VersaLase™. The connections are available at the DE-25 connector and allow the user to build an interface cable which can access some or all I/O pin functions. Solder pin connection information is shown below:

Function	Pin	Direction	Description
No Connection	1	n/a	n/a
Laser Ready	2	Out	TTL High indicates laser is ready for emission
Fault Indicator	3	Out	TTL High indicates fault condition
Ch. A Laser Power Out	4	Out	0-2V output signal represents 0-100% of Laser A power
Ch. B Laser Power Out	5	Out	0-2V output signal represents 0-100% of Laser B power
Ch. C Laser Power Out	6	Out	0-2V output signal represents 0-100% of Laser C power
Ch. D Laser Power Out	7	Out	0-2V output signal represents 0-100% of Laser D power
+5 VDC	8	Out	+5V Reference
RS-232 Tx	9	Out	RS-232 Transmit
RS-232 Rx	10	In	RS-232 Receive
Signal Ground	11	Out	Chassis Ground
Ch. A Modulation Input	12	In	Analog input for direct laser power control (Channel A)
Ch. A Modulation Ground	13	In	Ground reference for direct laser power control
Ch. B Modulation Input	14	In	Analog input for direct laser power control (Channel B)
Ch. B Modulation Ground	15	In	Ground reference for direct laser power control
Ch. C Modulation Input	16	In	Analog input for direct laser power control (Channel C)
Ch. C Modulation Ground	17	In	Ground reference for direct laser power control
Ch. D Modulation Input	18	In	Analog input for direct laser power control (Channel D)
Ch. D Modulation Ground	19	In	Ground reference for direct laser power control
Autostart	20	In	This feature is not currently available
Interlock	21	In	Connection to +5V is required for laser emission
Ch. A Laser Enable	22	In	TTL signal to toggle laser emission ON/OFF (Channel A)
Ch. B Laser Enable	23	In	TTL signal to toggle laser emission ON/OFF (Channel B)
Ch. C Laser Enable	24	In	TTL signal to toggle laser emission ON/OFF (Channel C)
Ch. D Laser Enable	25	In	TTL signal to toggle laser emission ON/OFF (Channel D)

Table 3
DE-25 Connector Pin Descriptions

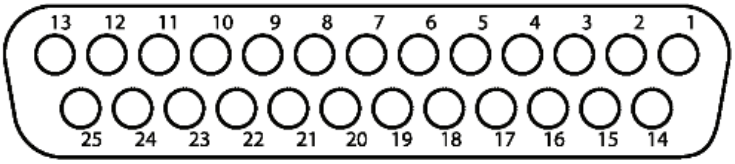

Figure 9
DE-25 Pin Diagram

I/O Signal Detailed Descriptions:

Laser Ready – The Laser Ready an output signal used to indicate when laser emission is active. When the pin has a TTL high state, laser emission is active.

Fault Indicator – The Fault Indicator is an output that is set to a TTL high state when a laser fault is present. A fault condition also includes the interlock open and when the user turns the TE cooler off. Review the RS-232 communication section for a complete list of fault conditions.

Laser Power Out (Channel A,B,C,D) – The laser power output pin is a voltage representation of the present laser output power. A zero volt signal represents no laser output. A 2 volt signal represents full laser power. Intermediate voltage levels are scaled in a linear fashion.

5 Volt Reference – The Vortran provides a 5 volt output reference signal, which can be used for a variety of laser control functions such as closing the interlock.

RS-232 Transmit – Connect this pin to a DE-9 (female) connector, Pin 2, for RS-232 communication.

RS-232 Receive – Connect this pin to a DE-9 connector (female), Pin 3, for RS-232 communication.

Signal Ground – The signal ground pin is used as a reference for all I/O connections ***Except Modulation Inputs.*** Also, connect this pin to a DE-9 (female) connector, Pin 5, as a ground for RS-232 communication.

Modulation Input (Channel A,B,C,D) – The Modulation Input pin is used to control the laser power with an external analog input signal. A 0 to 5 volt input signal will correspond to a zero to full-power laser output. Use the LP command (If the Channel supports this command) to set the maximum laser output represented with a 5 volt input. The laser output can be continuously varied with maximum bandwidth of 500 KHz. Review the Tutorial section for an example of external laser power control.

Modulation Ground (Channel A,B,C,D) – These signals are required as a ground reference for the respective Modulation Input.

Do not use the Signal or Chassis Ground with the Modulation Inputs.

Auto-Start – The Auto-Start feature is currently disabled.

Interlock – The Interlock is an input, allowing laser interlock control. A TTL high signal level represents “INTERLOCK CLOSED.”, which is a condition required for laser emission.

Laser Enable (Channel A,B,C,D) – The Laser Enable is an input, and provides direct emission control. A TTL high laser input will turn the laser on. A TTL low signal will disable the laser output. A maximum digital modulation bandwidth of 50 KHz is available with this pin.

7.0 OEM Installation

7.1 OEM Installation Checklist

- ✓ Unpack and Inspect Stradus VersaLase™ Laser System
- ✓ Secure Unit to Heat Sink
- ✓ Torque Laser Head to Heat Sink at 20 in-lbs, Using a Progressively Increasing Cross Torque Pattern
- ✓ Configure Laser Control Cable with Desired Operational Connections
- ✓ Connect Laser Control Cable to Laser Head
- ✓ Proceed to Operation Section for Additional Information

7.2 System Chassis Drawings

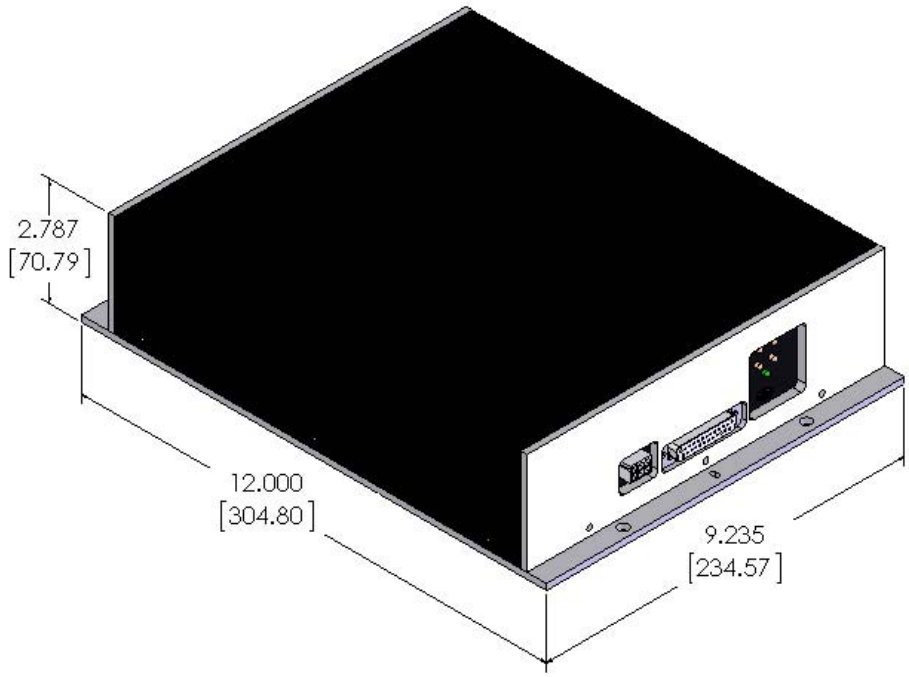

Figure 10
System Dimensions

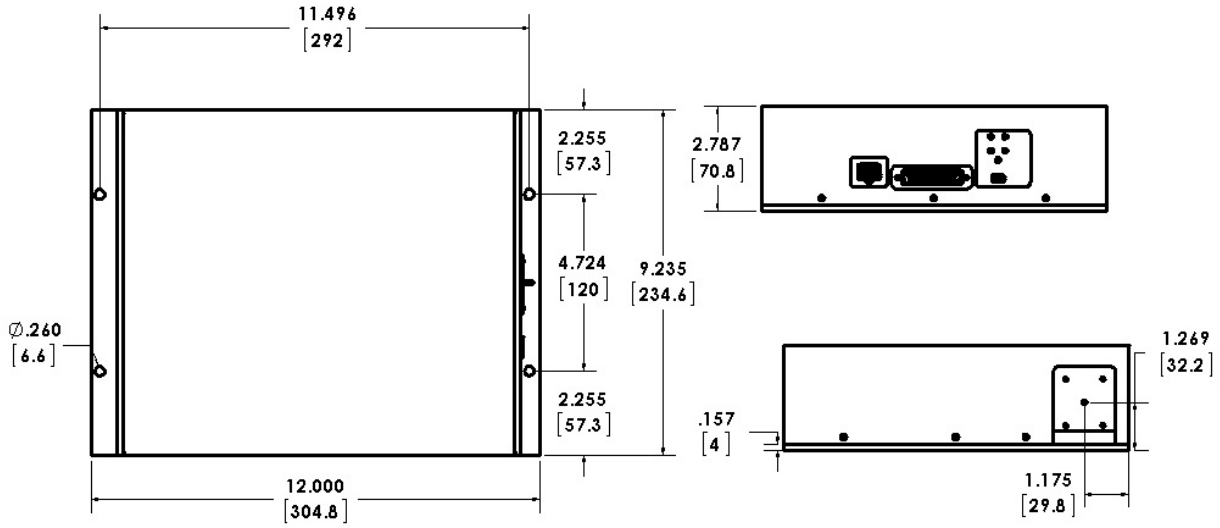

Figure 11
System Mounting Dimensions

7.3 Heat Sink Requirements

The Stradus VersaLase™ system is conduction cooled and requires a heat sink for operation.

- ***Failure to use a heat sink will overheat the laser system***
- ***Heat sink compound is not required or recommended for system mounting.***
- ***A heat sink capable of dissipating 75 Watts is required for laser mounting.***
- ***A 32 finish is recommended for the laser mounting surface, to ensure optimum thermal transfer.***
- ***A high tolerance heat sink surface flatness is recommended for system mounting.***

7.4 Laser Mounting Hardware

Recommended mounting hardware for the Stradus VersaLase™ system is M6 x 6mm or ¼ - 20 x ¼".

7.5 Torque Specifications

Normal mounting can be accomplished by using the provided hex key to secure the laser head to the heat sink, by tightening the screws gradually in a progressing cross pattern. This method should provide stable thermal and pointing performance.

Optimum thermal and pointing performance is accomplished by securing the laser head to the heat sink, with a precision torque driver. Torque the laser head to the heat sink by using a cross torque pattern and progressively increasing

torque from 10 in-lbs to 15 in-lbs to 20in-lbs. Torque the laser in the sequence shown below.

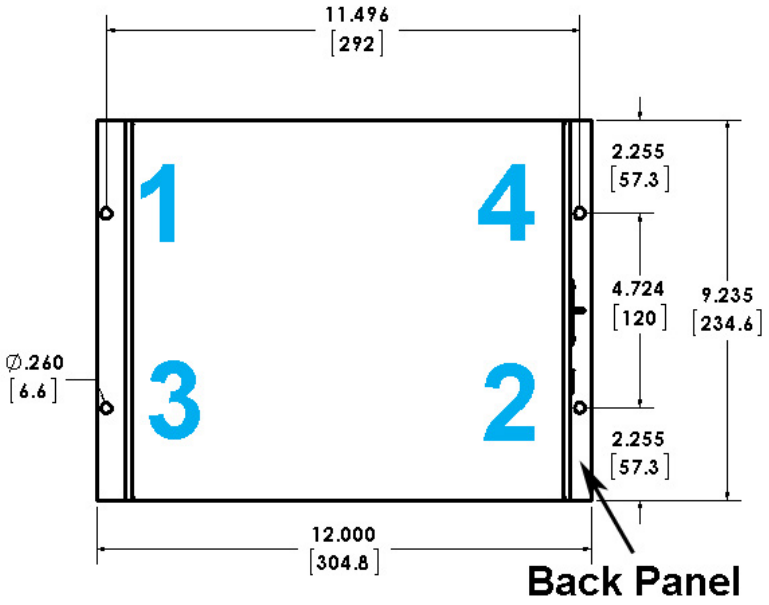

Figure 12
System Mounting Torque Pattern

7.6 Power Supply Requirements

The Stradus VersaLase™ system requires a 12V +/- 10% or 10.5V to 13.5V at 9 amps. A standard Stradus VersaLase™ Laser System does not include a power cable. Power connector diagrams are shown below:

Plug P/N: Molex® 39-01-2060
Solder Pins P/N: Molex® 45750-3112

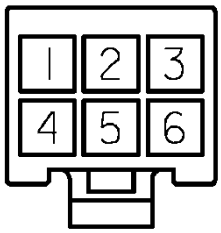

Figure 13
System Power Connector

Pin Number	Function
1	+12V DC
2	Earth Ground
3	0V
4	+12V DC
5	Earth Ground
6	0V

7.7 Stradus VersaLase™ I/O Connector

The Stradus VersaLase™ Laser System input connector is a standard DE-25 connector. The solder-type connector allows for connections to only the pins required for the specific application.

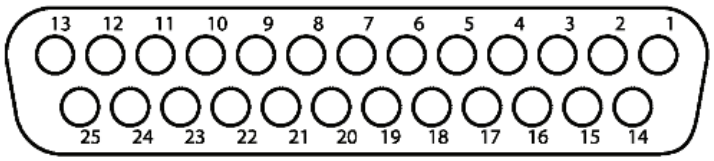

Figure 14: I/O Connector DE-25 Pin Diagram

Function	Pin	Direction	Description
No Connection	1	n/a	n/a
Laser Ready	2	Out	TTL High indicates laser is ready for emission
Fault Indicator	3	Out	TTL High indicates fault condition
Ch. A Laser Power Out	4	Out	0-2V output signal represents 0-100% of Laser A power
Ch. B Laser Power Out	5	Out	0-2V output signal represents 0-100% of Laser B power
Ch. C Laser Power Out	6	Out	0-2V output signal represents 0-100% of Laser C power
Ch. D Laser Power Out	7	Out	0-2V output signal represents 0-100% of Laser D power
+5 VDC	8	Out	+5V Reference
RS-232 Tx	9	Out	RS-232 Transmit
RS-232 Rx	10	In	RS-232 Receive
Signal Ground	11	Out	Chassis Ground
Ch. A Modulation Input	12	In	Analog input for direct laser power control (Channel A)
Ch. A Modulation Ground	13	In	Ground reference for direct laser power control
Ch. B Modulation Input	14	In	Analog input for direct laser power control (Channel B)
Ch. B Modulation Ground	15	In	Ground reference for direct laser power control
Ch. C Modulation Input	16	In	Analog input for direct laser power control (Channel C)
Ch. C Modulation Ground	17	In	Ground reference for direct laser power control
Ch. D Modulation Input	18	In	Analog input for direct laser power control (Channel D)
Ch. D Modulation Ground	19	In	Ground reference for direct laser power control
Autostart	20	In	This feature is not currently available
Interlock	21	In	Connection to +5V is required for laser emission
Ch. A Laser Enable	22	In	TTL signal to toggle laser emission ON/OFF (Channel A)
Ch. B Laser Enable	23	In	TTL signal to toggle laser emission ON/OFF (Channel B)
Ch. C Laser Enable	24	In	TTL signal to toggle laser emission ON/OFF (Channel C)
Ch. D Laser Enable	25	In	TTL signal to toggle laser emission ON/OFF (Channel D)

Table 4: I/O Connector Pin Descriptions

I/O Signal Detailed Descriptions:

Laser Ready – The Laser Ready an output signal used to indicate when laser emission is active. When the pin has a TTL high state, laser emission is active.

Fault Indicator – The Fault Indicator is an output that is set to a TTL high state when a laser fault is present. A fault condition also includes the interlock open and when the user turns the TE cooler off. Review the RS-232 communication section for a complete list of fault conditions.

Laser Power Out (Channel A,B,C,D) – The laser power output pin is a voltage representation of the present laser output power. A zero volt signal represents no laser output. A 2 volt signal represents full laser power. Intermediate voltage levels are scaled in a linear fashion.

5 Volt Reference – The Vortran provides a 5 volt output reference signal, which can be used for a variety of laser control functions such as closing the interlock.

RS-232 Transmit – Connect this pin to a DE-9 (female) connector, Pin 2, for RS-232 communication.

RS-232 Receive – Connect this pin to a DE-9 connector (female), Pin 3, for RS-232 communication.

Signal Ground – The signal ground pin is used as a reference for all I/O connections ***Except Modulation Inputs.*** Also, connect this pin to a DE-9 (female) connector, Pin 5, as a ground for RS-232 communication.

Modulation Input (Channel A,B,C,D) – The Modulation Input pin is used to control the laser power with an external analog input signal. A 0 to 5 volt input signal will correspond to a zero to full-power laser output. Use the LP command (If the Channel supports this command) to set the maximum laser output represented with a 5 volt input. The laser output can be continuously varied with maximum bandwidth of 500 KHz. Review the Tutorial section for an example of external laser power control.

Modulation Ground (Channel A,B,C,D) – These signals are required as a ground reference for the respective Modulation Input.

Do not use the Signal or Chassis Ground with the Modulation Inputs.

Auto-Start – This feature is currently disabled.

Interlock – The Interlock is an input, allowing laser interlock control. A TTL high signal level represents “INTERLOCK CLOSED.”, which is a condition required for laser emission.

Laser Enable (Channel A,B,C,D) – The Laser Enable is an input, and provides direct emission control. A TTL high laser input will turn the laser on. A TTL low signal will disable the laser output. A maximum digital modulation bandwidth of 50 KHz is available with this pin.

7.8 USB Connection

The Vortran Stradus VersaLase™ Laser Head includes a standard Mini B USB connector for computer controlled operation. The Stradus VersaLase™ is a self-powered USB device and does not draw significant currents from the USB bus. For additional USB operational information, please refer to section 8.0.

7.9 USB Driver

The Vortran Stradus VersaLase™ Laser Control CD contains the USB drivers necessary to establish communication with the laser head. The CD can be shipped with each OEM head upon request. The USB drivers can also be downloaded from the Vortran Laser Technology Website.

7.10 RS-232 Connection

The Vortran Stradus VersaLase™ Laser supports USB or RS-232 communication. Refer to the table below for information on connecting a computer serial port directly to a Vortran Stradus VersaLase™ laser system.

The Vortran Stradus VersaLase™ will not operate with a null-modem cable. A standard RS-232 cable is required for serial computer controlled operation.

Function	Computer DE9	DE-25
RS-232 Transmit	Pin 2	Pin 9
RS-232 Receive	Pin 3	Pin 10
Signal Ground	Pin 5	Pin 11

Communication Protocol	
Baud Rate	19200
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

Table 5
RS-232 System Connection

8.0 System Operation

8.1 System Operation Checklist

- ✓ Ensure All Laser Safety Precautions Are Taken
- ✓ Apply 12 Volts to System Power and Ground pins on Molex power connector
- ✓ Close electrical Interlock by connecting I/O Connector DE-25 Pin 8 to Pin 21
- ✓ Allow Thermal and Power Stabilization (Warm-up)
- ✓ If Computer Control Is Desired, Launch Vortran Stradus VersaLase™ Control Software

8.2 Laser Warm-up and Standby

When power is first applied to the system, the temperature and power must stabilize before the CDRH delay 5 second countdown, followed by laser emission. When no faults exist and the emission is disabled the condition is referred to as Standby.

8.3 Laser Emission

8.3.1 Near-field Beam Quality

Based on the propagation characteristics of laser diode modules, the appearance of the beam in the near-field is different from the appearance of the beam in the far-field. Structure in the beam occurring in the near-field will propagate away from the beam and not appear in the far-field. Most applications utilizing the Vortran Stradus™ Laser involve the use of a focused beam. In this case, the focused beam represents a far-field image. A near-field image taken at 0.5 Meters is shown below.

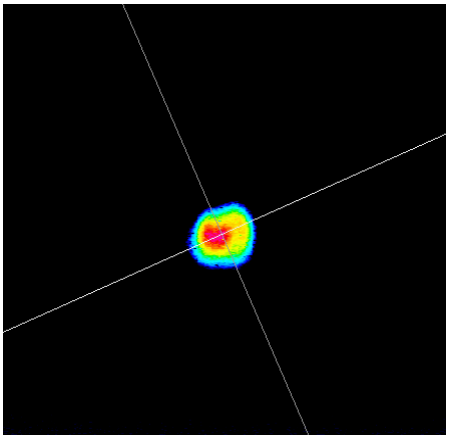

Figure 15
Near-Field Beam Image

8.3.2 Far-field Beam Quality

The typical Rayleigh range for a Vortran Stradus™ Laser is greater than 2 meters. When measuring beam quality with a camera, the image should be collected at a distance of 4 meters or greater. A true representation of beam quality occurs in the Far-field and directly relates to a focused beam application. The image below represents the far-field and was taken at a distance of 5 meters.

M^2 is a measure of the beam quality in the far-field. Camera images taken in the near-field do not represent the measured M^2 or the focused beam quality.

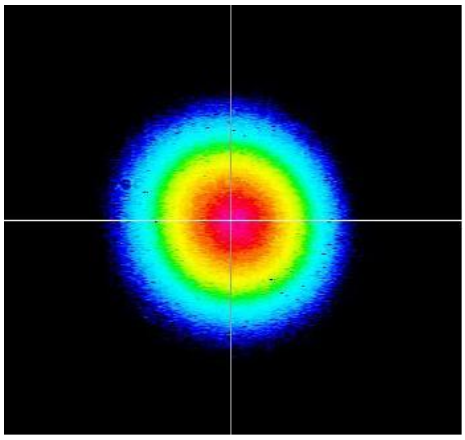

Figure 16
Far-field Beam Image

8.3.3 External Power Control

Each laser channel (A,B,C, or D) has a dedicated external power control input which is available at the DE-25 I/O connector on the rear of the Stradus VersaLase™. The Stradus VersaLase™ provides the capability to control the laser power at a maximum bandwidth of 500 kHz. Some configurations of the Stradus VersaLase™ contain non-diode type lasers which may have a different bandwidth for External Power Control. A dedicated Modulation Ground is available for each channel and is required to meet specified performance. A zero volt signal will represent no laser output power and a 5 volt signal will represent 100% of the present laser set power. If the laser power is set to 100mW, a 5 volt analog modulation signal will represent a 100mW laser output. If the laser is set to 50mW, a 5 volt analog modulation signal will represent a 50mW laser output.

8.4 Digital Modulation

The Vortran Stradus VersaLase™ is available with optional digital modulation. By inputting standard TTL voltage levels into the SMB connector, the laser output can be modulated from DC to 200MHz (for diode lasers only). Some configurations of the Stradus VersaLase™ contain non-diode type lasers which may have a reduced bandwidth for Digital Modulation. Computer control is required to set the laser in "Pulse Mode". Please refer to section 9 for instructions on computer controlled operation.

8.4.1 Specifications for Standard Single Mode Diode Lasers

	Min	Typical	Max
Optical Rise Time (nsec)	**1.0**	**1.3**	**2.0**
Optical Fall Time (nsec)	**1.0**	**1.6**	**2.0**
Laser Off Input Voltage			**0.8**
Laser On Input Voltage	**3.5**		**5.0**
-3dB Bandwidth (MHz)	**200**	**250**	

Table 6
Digital Modulation Specifications

8.4.2 SMB Connection

If the Stradus VersaLase™ includes optional digital modulation, SMB connectors for each channel A-B-C-D will be located on the rear panel. The location of these connectors is shown below.

Figure 17
SMB Connector Location

****The SMB connectors require a 50Ω termination****

8.4.3 Operation

To operate the Stradus VersaLase™ lasers in pulse mode, install the Vortran Stradus VersaLase™ software and USB drivers. If RS-232 operation is required, refer to Section 9. Activate “Digital Modulation” by clicking the “On” button in the “Digital Modulation” section of the “Home Screen”. Enter the desired power level in mW, to represent the Peak Power of the laser output. Enter values between 1mW and the Nominal Power of the connected laser. As a reference, the nominal power is displayed in the title bar. Click the “Set” button and then click the “OK” button to initiate modulation.

*****Digital Modulation Mode is <u>not</u> maintained when the system is powered down”***

*****Initiate Digital Modulation each time the system is powered on****

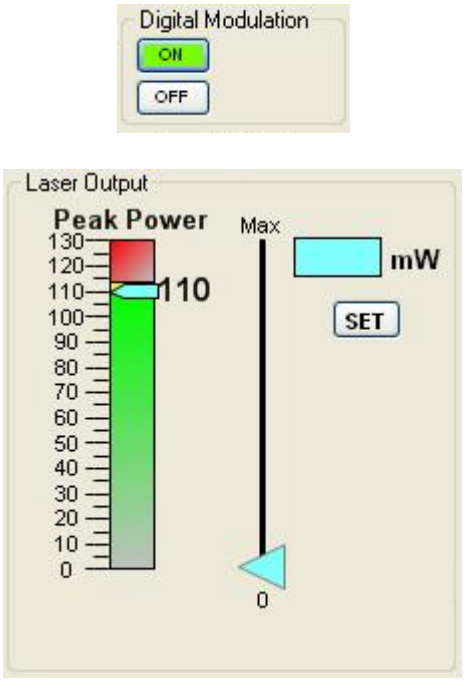

Figure 18
Pulse Mode Example

9.0 Computer Controlled Operation

9.1 USB Connection

The Vortran Stradus VersaLase™ System provides capability for remote USB communication. A Mini-B USB connector is located on the rear panel.

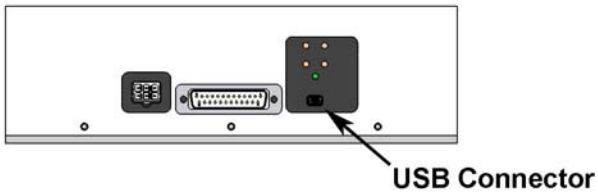

Figure 19
USB Connector Location

9.2 RS-232 Connection and Setup

The Vortran Stradus VersaLase™ System provides the capability for remote RS-232 communication. The pin connections and communication protocol requirements are shown below.

Communication Protocol

Baud Rate	**19200**
Parity	**None**
Data Bits	**8**
Stop Bits	**1**
Flow Control	**None**

Table 7
RS-232 Pin Descriptions and Protocol

Interfacing Tips

- All commands transmitted to Stradus VersaLase™ must terminate with a carriage return “\r” or 0x0D to be processed.
- All replies to commands are in upper case.
- Replies begin with carriage return, newline “/r/n” or 0x0D, 0x0A.
- Commands are case-insensitive.
- Echoes and “Stradus>” prompt may be disabled.

9.3 Command and Query Summary

The Stradus VersaLase™ commands and queries are classified as Global or Laser-Specific. Laser-Specific commands/queries require a prefix of “A”, “B”, “C”, or “D” to indicate the laser in the system for which the command/query is intended. Depending on the particular types of lasers in the system, not all commands/queries are available for every laser in the system.

For example, to obtain the laser emission status from Laser “B”, the user would type “b.?le<Enter>*” and the reply would be* “B.?LE=1” *if laser emission is enabled*.

Global commands/queries do not require a prefix and are always available.

9.3.1 Global Commands

Command	Function	Range	Description
ECHO	Echo ON-OFF	0/1	Turns RS-232 Terminal ECHO ON-OFF
PROMPT	Prompt ON-OFF	0/1	Turns Terminal Prompt ON-OFF

9.3.2 Global Queries

Query	Function	Range	Description
?BPT	Display Base-plate Temperature	0-55 (°C)	Displays the measured Base-plate Temperature
?H	Display Help File	Information	Displays list of available commands/queries
?IL	Request Interlock Status	0/1	Returns Actual Interlock Status: 1 = Closed, 0=Open
?SFV	Display System Firmware Version	##.##.##	Displays Stradus VersaLase™ Firmware Version
?SPV	Display System Firmware Protocol Version	##.##.##	Displays Stradus VersaLase™ Protocol Version

9.3.3 Laser-Specific Commands

Command	Function	Range	Description
C	Laser Drive Control Mode	0/1	Sets Power or Current Control (1 = Current Control)
DELAY	5 Sec. Delay On/Off	0/1	Toggle 5 Second Laser Emission Delay On and Off
EPC	External Power Control	0/1	Enables External Power Control (1= External Control)
LC	Laser Current Control	0 - Max	Sets Laser Diode Current directly
LE	Toggle Laser Emission	0/1	Toggles Laser Emission On and Off (1 = On)
LP	Laser Power	0 - Max	Sets Laser Power
PP	Pulse Power	0 - Max	Sets Pulse Power
PUL	Pulse Mode	0/1	Toggle Pulse Mode On and Off (1=On)

9.3.4 Laser-Specific Queries

Query	Function	Range	Description
?C	Request Laser Drive Control Mode	0/1	Returns Present Laser Drive Control Mode
?CC	Request Computer Control	0/1	Returns Present State of Computer Control Pin, 1=AUTOSTART, 0=MANUAL START
?CT	Request Controller Temperature	0-55 (°C)	Returns Controller Electronics Temperature
?DELAY	Request 5 Second Emission Delay Status	0/1	Returns Present Emission Delay Status
?EPC	Request External Power Control Status	0/1	Returns Present External Power Control Status
?FC	Request Fault Code (BINARY) & Status	0 - 32	Returns Laser Status and Fault Codes
?FD	Request Fault Description	Information	Returns Fault Description in English
?FP	Request Firmware Protocol		Returns Firmware Protocol Version
?FV	Request Firmware Version		Returns the Loaded Firmware Version
?LC	Request Laser Current	0 - 1000ma.	Returns Present Laser Diode Current
?LCS	Request Laser Current Setting		
?LE	Request Laser Emission Status	0/1	Returns Present Laser Emission Status
?LH	Request Laser Operating Hours	0 - 100,000	Returns Present Laser Diode Hours
?LI	Request Laser Identification	Information	Returns Unique Laser Information
?LP	Request Laser Power	0 - Max	Returns Present Measured Laser Power
?LPS	Request Laser Power Setting	0 - Max	Returns Present Laser Power Setting
?LW	Request Laser Wavelength		Returns Actual Measured Laser Wavelength
?MAXP	Request Maximum Laser Power		Returns Maximum Output Power
?OBT	Request Optical Block Temperature	15 - 35 (°C)	Returns Optical Block Temperature (°C)
?OBTS	Request Optical Block Temp. Setting	15 - 35 (°C)	Returns Optical Block Set Temperature (°C)
?PP	Request Pulse Power	0 - Max	Returns Pulse Power Setting
?PUL	Request Pulse Mode	0/1	Returns Pulse Mode Setting
?RP	Request Rated Laser Power	0-1000mW	Returns Standard Laser Power Rating

Table 8
Command and Query Summary

9.4 Command Detail

C	
Function	Laser Drive Control Mode
Description	As a command it is used to toggle the laser diode drive control mode between regulated power OR regulated diode current. (0 = Power Control, 1 = Current Control)
	As a query, it returns the present laser diode drive control mode.
Command/Query	Both
Syntax:	
Command	C=0, C=1
Query	?C
Example:	
Normal Operation:	Laser is running normally in power control mode. User enters C=1.
	Laser switches to current control mode, using the stored laser current value.
	Return value C=1
Not Allowed:	Fault condition exists. User enters C=1.
	The laser will not change to current control mode when fault condition is cleared.
	Return value C=0
Range	0,1
Resolution	N/A
Stored on Set	Yes
Default	0
Dependencies	The command function will write a new value only when a no fault condition exists.
Conditional Information	The query is available any time.

DELAY	
Function	5 sec. Delay On/Off
Description	Toggles 5 second laser emission delay on and off
Command/Query	Both
Syntax:	
Command	DELAY=0, DELAY=1
Query	?DELAY
Range	0,1
Resolution	N/A
Stored on Set	Yes
Default	1
Dependencies	The command function will write a new value only when a no fault condition exists.
Conditional Information	The query is available any time.

EPC	
Function	External Power Control
Description	Enables External Power Control Input Port (1= External Control)
Command/Query	Both
Syntax:	
Command	EPC=0, EPC=1
Query	?EPC
Example:	
Normal Operation:	Laser emission 100mW in power control mode (C=0). 2.5 volts on laser connector pin 10.
	User enters EPC=1. Laser power drops to 50mW. Return value EPC=1.
Not Allowed:	Fault condition is present. User enters EPC=1. Return Value EPC=0.
Range	0,1
Resolution	N/A
Stored on Set	Yes
Default	0
Dependencies	Operation is based on the operating mode (Power or Current Control). See below.
Conditional Information	0-5 volts on the external control pin will control the corresponding laser output 0-100%. The output is based on the present laser power or current setting

LC	
Function	Laser Current Control
Description	Sets Laser Diode Current Directly
Command/Query	Both
Syntax:	
Command	LC=###.# (ma.)
Query	?LC
Example:	
Normal Operation:	Laser Emission is active, with laser running at 50mA. User enters LC=100.
	Laser Emission remains active and the measured value is returned LC=99.8
	Laser Emission is active, with laser running at 50mA. User enters LC=10000, No change in laser power is made for the excessive value. The value returned is 49.9mA
Not Allowed:	Fault condition exists or laser emission is not active. User enters LC=100. The new value is not written.
Range	Zero to Maximum Current Setting Plus 30%
Resolution	###.# (ma.)
Stored on Set	Yes
Default	Command is only allowed when C=1, TEC=1 and no fault greater than 16.
Dependencies	The initial default value will be the stored following the initial laser calibration.
Conditional Information	The command function will write a new value only when laser emission is active.
	The query is available any time
	In a fault condition, the command will not write a value.
	The light regulator is always connected so if the user asks for a current that will over power the output, the light loop will clamp the output at MAXP. The return value in this condition will be the measured current when the power is set at MAXP.

LE	
Function	Toggle Laser Emission On/Off
Description	Toggles Laser Emission On and Off (1 = On, 0 = Off)
Command/Query	Both
Syntax:	
Command	LE=0, LE=1
Query	?LE
Example:	
Normal Operation:	LE=1 Response LE=1
Not Allowed:	Fault Condition LE=1 Response LE=0
Range	0,1
Resolution	N/A
Stored on Set	No
Dependencies	No fault 32 or greater

LP	
Function	Laser Power
Description	As a command, it sets laser power through USB and RS-232 interfaces. As a query, it will return the laser power measured by the power regulation circuitry.
Command/Query	Both
Syntax:	
Command	LP=###.# (mW)
Query	?LP
Example:	
Normal Operation:	Laser Emission is active, with laser running at 50mW. User enters LP=100.
	Laser Emission remains active and the measured value is returned LP=99.8.
Not Allowed:	Laser Emission is active, with laser running at 50mW. User enters LP=10000. No change in laser power is made for the excessive value. The measured return value is LP=49.9.
	Fault condition exists or laser emission is not active. User enters LP=100.
	The new value is not written. The measured returned value is LP=0.00.
Range	Zero to the maximum power the laser system is calibrated to.
Resolution	###.#
Stored on Set	Yes
Default	Calibrated Laser Power
Dependencies	Command is only allowed when C=0.
Conditional Information	The default value will be stored following initial laser calibration. The command function will write a new value only when laser emission is active. The query is available any time. If laser emission is not active, the query will return the measured laser power. In a fault condition, the query will return the measured laser power. In a fault condition, the command will not write a value. Values greater than MAXP, will not change present set value.

PROMPT	
Function	Prompt ON-OFF
Description	Turns RS-232 Prompt ON-OFF (Prompt=1 is Prompt on)
Command/Query	Command Only
Syntax	PROMPT=0, PROMPT=1
Range	0,1
Resolution	N/A
Store on Set	Yes
Dependencies	None
Default	1

PP	
Function	Pulse Power
Description	As a command, it sets pulse laser power through USB and RS-232 interface. As a query, it will return the pulse laser power setting.
Command/Query	Both
Syntax:	
Command	PP=###.# (mW)
Query	?PP
Example:	
Normal Operation:	Laser Emission is active, with laser running at 50mW. User enters PP=100.
	Laser Emission remains active and the measured value is returned PP=99.8.
Not Allowed:	Laser Emission is active, with laser running at 50mW. User enters PP=10000. No change in laser power is made for the excessive value. The measured return value is PP=49.9.
	Fault condition exists or laser emission is not active. User enters PP=100.
	The new value is not written. The measured returned value is PP=0.00.
Range	Zero to the maximum power the laser system is calibrated to.
Resolution	###.#
Stored on Set	Yes
Default	Calibrated Laser Power
Dependencies	Command is only allowed when C=0.
Conditional Information	The default value will be stored following initial laser calibration. The command function will write a new value only when laser emission is active. The query is available any time. If laser emission is not active, the query will return the measured laser power. In a fault condition, the query will return the measured laser power. In a fault condition, the command will not write a value. Values greater than MAXP, will not change present set value.

PUL	
Function	Digital Modulation Mode
Description	As a command it is used to toggle the laser diode drive control mode between CW and Digital Modulation. (0 = CW, 1 = Digital Modulation)
	As a query, it returns the present laser diode drive control mode.
Command/Query	Both
Syntax:	
Command	PUL=0, PUL=1
Query	?PUL
Example:	
Normal Operation:	Laser is running normally in CW mode. User enters PUL=1.
	Laser switches to current Digital Modulation mode.
	Return value PUL=1
Not Allowed:	Fault condition exists. User enters PUL=1.
	The laser will not change to Digital Modulation mode when fault condition is cleared.
	Return value PUL=0
Range	0,1
Resolution	N/A
Stored on Set	No
Default	0
Dependencies	The command function will write a new value only when a no fault condition exists.
Conditional Information	The query is available any time.

Table 9
Command Detail

9.5 Query Detail

?BPT	
Function	Request Base Plate Temp.
Description	Returns Present Base Plate Temperature
Command/Query	Query
Syntax	?BPT
Example	?BPT Response ?BPT=35
Range	0-55°C
Resolution	Whole Numbers
Dependencies	Base Plate Temperature is valid even in a fault conditon.
Conditional Information	

?CC	
Function	Request Computer Control
Description	Returns Present State of Computer Control Input Pin. 0 = Computer Control Only , 1 = Internal Control
Command/Query	Query
Syntax	?CC
Example	?CC Response ?CC=0
Range	0,1
Resolution	N/A
Dependencies	Only applied at power up.
Default	0

?FC		
Function	Request Fault Code ** ***The displayed value represents a sum of all active faults.***	
Description	Returns Fault Code as a Whole Number	
Command/Query	Query	
Syntax	?FC	
Example	?FC Response ?FC=0	
Range	32 Error Codes Maximum	
Resolution	Binary Values	
Dependencies	None	
Note	**Value**	**Description**
Laser State	0	LASER EMISSION ACTIVE
Laser State	1	STANDBY
Laser State	2	WARMUP
Syntax Error	4	VALUE OUT OF RANGE
Syntax Error	8	INVALID COMMAND
Fault Condition	16	INTERLOCK OPEN
TEC Status	32	TEC OFF
Fault Condition	64	DIODE OVER CURRENT
Fault Condition	128	DIODE TEMPERATURE FAULT
Fault Condition	256	BASE PLATE TEMPERATURE FAULT
Fault Condition	512	POWER LOCK LOST
Fault Condition	1024	EEPROM ERROR
Fault Condition	2048	I2C ERROR
Fault Condition	4096	FAN
Fault Condition	8192	POWER SUPPLY
Fault Condition	16384	TEMPERATURE
Warning Condition	32768	DIODE END OF LIFE INDICATOR

?FD	
Function	Request Fault Description
Description	Returns Fault as descriptive text
Command/Query	Query
Syntax	?FD
Example	?FD Response FD=LASER EMISSION ACTIVE
Range	35 Characters Maximum
Resolution	N/A
Dependencies	
Conditional Information	Values greater than 32 will stop laser emission and Set I/O Fault Pin (DE-25 Pin 3) High for Values of 16 or Greater
Value	**Description**
0	LASER EMISSION ACTIVE
1	STANDBY
2	WARMUP
4	VALUE OUT OF RANGE
8	INVALID COMMAND
16	INTERLOCK OPEN
32	TEC OFF
64	DIODE OVER CURRENT
128	DIODE TEMPERATURE FAULT
256	BASE PLATE TEMPERATURE FAULT
512	POWER LOCK LOST
1024	EEPROM ERROR
2048	I2C ERROR
4096	FAN
8192	POWER SUPPLY
16384	TEMPERATURE
32768	DIODE END OF LIFE INDICATOR

?FP	
Function	Request Firmware Protocol
Description	Returns Firmware Protocol Version
Command/Query	Query
Syntax	?FP
Example	?FP Response ?FP=1.01.01
Range	N/A
Resolution	#.##.##
Dependencies	None

?FV	
Function	Request Firmware Version
Description	Returns the Loaded Firmware Version
Command/Query	Query
Syntax	?FV
Example	?FV Response ?FV=1.01.01
Range	N/A
Resolution	#.##.##
Dependencies	None

?H	
Function	Display Help File
Description	Returns Help File Text from Laser EEPROM
Command/Query	Query
Syntax	?H
Example	?H, Response List of Supported Commands/Queries

?IL	
Function	Request Interlock Status
Description	Returns Actual Interlock Status: 1 = Closed, 0 = Open
Command/Query	Query
Syntax	?IL
Example	?IL Response ?IL=1
Range	0,1
Resolution	N/A
Dependencies	None

?LH	
Function	Request Laser Operating Hours
Description	Returns Present Laser Diode Hours (Clock only runs when laser emission is active)
Command/Query	Query
Syntax	?LH
Example	?LH Response ?LH=1423.2
Range	0 – 100,000
Resolution	12 Minutes (.2Hrs)
Dependencies	None

?LI	
Function	Request Laser Identification
Description	Returns Unique Information (S/N, Part Number, Nom. λ, Nom. Power, C/E for circular or elliptical)
Command/Query	Query
Syntax	?LI
Example	?LI Response ?LI= VL1008025, 10010, 405nm, 100mW, C
Range	VLmmyy####, #####, ###nm, ###mW, C
Resolution	N/A
Dependencies	None

?LPS	
Function	Request Laser Power Setting
Description	Returns Present Laser Power Setting
Command/Query	Query
Syntax	?LPS
Example	?LPS Response ?LPS=95
Range	0-1000mW
Resolution	Whole Numbers
Dependencies	None

?LW	
Function	Request Laser Wavelength
Description	Returns Actual Measured Laser Wavelength
Command/Query	Query
Syntax	?LW
Example	?LW Response ?LW=406
Range	N/A
Resolution	###
Dependencies	None

?MAXP	
Function	Request Maximum Laser Power
Description	Returns Maximum Output Power Available from the Laser
Command/Query	Query
Syntax	?MAXP
Example	?MAXP Response ?MAXP=106.5
Range	0-1000mW
Resolution	###.#
Dependencies	None

?OBT	
Function	Optical Block Temperature
Description	Request Optical Block Temperature in °C
Command/Query	Query
Syntax	?OBT
Example	?OBT Response ?OBT=25
Range	10 to 35
Resolution	###.#
Dependencies	None

?RP	
Function	Request Rated Laser Power
Description	Returns Standard Laser Power Rating
Command/Query	Query
Syntax	*?RP*
Example	?RP Response ?RP=100
Range	0-1000mW
Resolution	###
Dependencies	None

Table 10
Query Detail

9.6 Fault Codes

Note	Value	Description
Laser State	0	LASER EMISSION ACTIVE
Laser State	1	STANDBY
Laser State	2	WARMUP
Syntax Error	4	VALUE OUT OF RANGE
Syntax Error	8	INVALID COMMAND
Fault Condition	16	INTERLOCK OPEN
TEC Status	32	TEC OFF
Fault Condition	64	DIODE OVER CURRENT
Fault Condition	128	DIODE TEMPERATURE FAULT
Fault Condition	256	BASE PLATE TEMPERATURE FAULT
Fault Condition	512	POWER LOCK LOST
Fault Condition	1024	EEPROM ERROR
Fault Condition	2048	I2C ERROR
Fault Condition	4096	FAN
Fault Condition	8192	POWER SUPPLY
Fault Condition	16384	TEMPERATURE
Warning Condition	32768	DIODE END OF LIFE INDICATOR

Table 11
Fault Codes

10.0 Vortran Stradus VersaLase™ Software

Each standard Vortran Stradus VersaLase™ Laser System includes a CD with control software. This software provides access to all computer controlled laser functions.

10.1 Supported Operating Systems

- ***Windows 2000***
- ***Windows XP***
- ***Windows Vista***
- ***Windows 7***

10.2 CD Contents

- ***USB Drivers***
- ***.pdf version of the User Manual***
- ***Readme File***
- ***Vortran Stradus VersaLase™ Control Software Installation***

10.3 Software Installation

The Vortran Stradus VersaLase™ software installation will "Autorun", if permitted. For security reasons, Windows possibly may not permit this. If the Vortran Stradus VersaLase™ software CD is installed into the CD drive and the installation process does not initiate, manually select the computer CD drive and double-click on the Vortran Logo icon. Then double-click on Setup.msi. When the installation process begins, the following screen will appear.

If a Vortran Laser Software upgrade is required, use the "Add and Remove Programs" function to remove the existing software prior to upgrade. The "Add and Remove Programs" function is contained within the Windows Control Panel.

Click "Next" to continue the installation process and the following screen will appear.

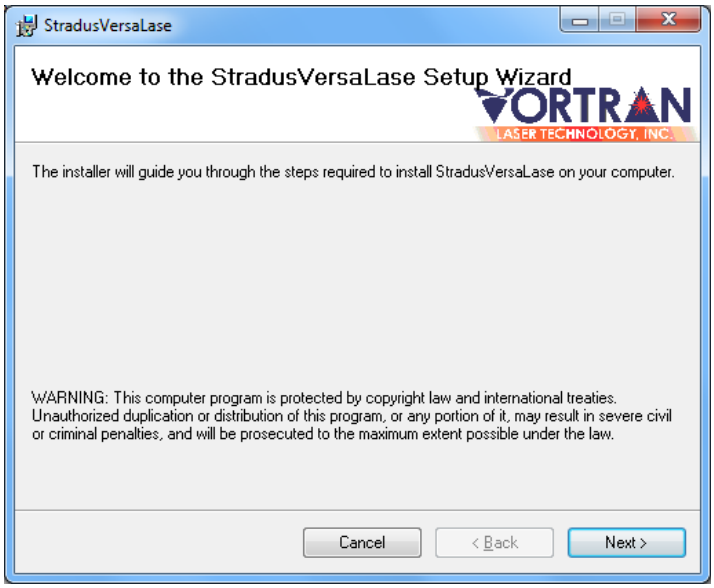

Figure 20
Software Installation Welcome Screen

The “Welcome” screen provides a preview of the software installation process. This screen also provides warnings associated with copyright protection. Click “Next” to continue the installation process.

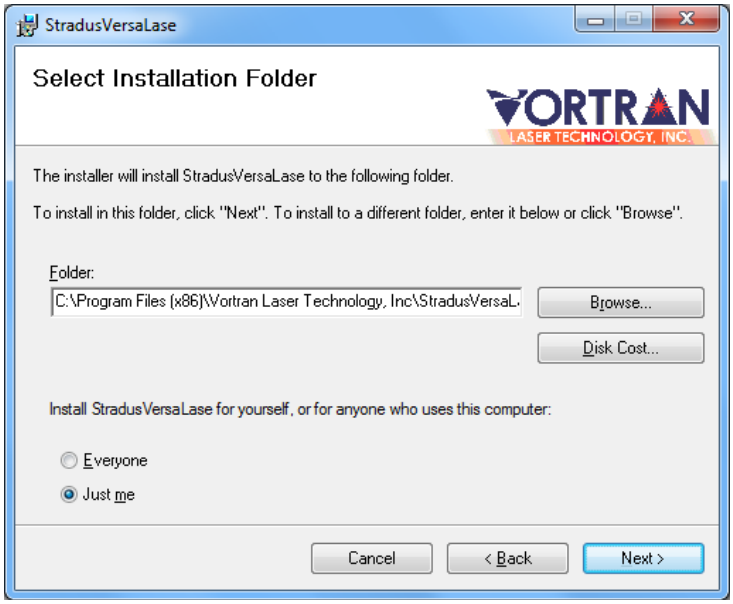

Figure 21
Software Installation Location Screen

The default software installation location will be displayed. An alternate installation location can be selected by clicking on the “Browse” button and navigating to a desired installation location. Click “Next” to continue the installation process.

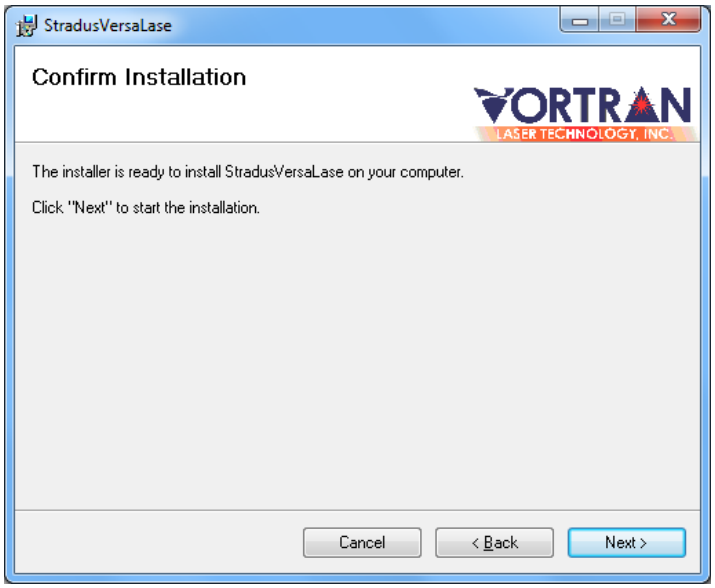

Figure 22
Software Installation Confirmation Screen

Click “Next” to initiate the actual software installation process. A progress indicator will be displayed during the software installation process.

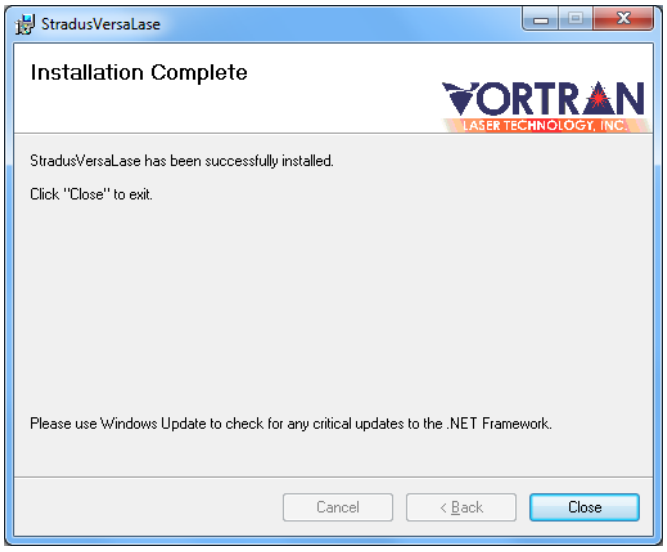

Figure 23: Software Installation Complete Screen

When the software installation is complete, the screen above will be displayed. Click “Close” to complete the software installation process.

10.4 USB Driver Installation

The Stradus VersaLase™ requires installation of a USB driver. It is recommended that the Stradus VersaLase™ Software be installed prior to plugging in the USB cable so that the USB driver may be pre-installed. The USB driver is installed by following the Stradus VersaLase™ USB Driver Installation Utility which launches automatically following the installation of the Stradus VersaLase™ Software.

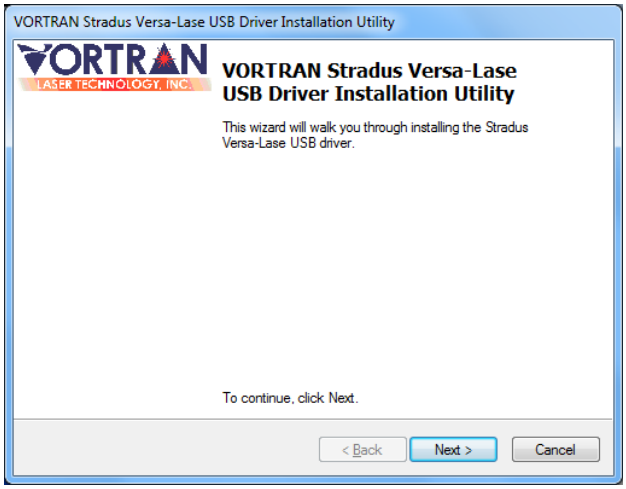

Figure 24
USB Driver Installation Utility

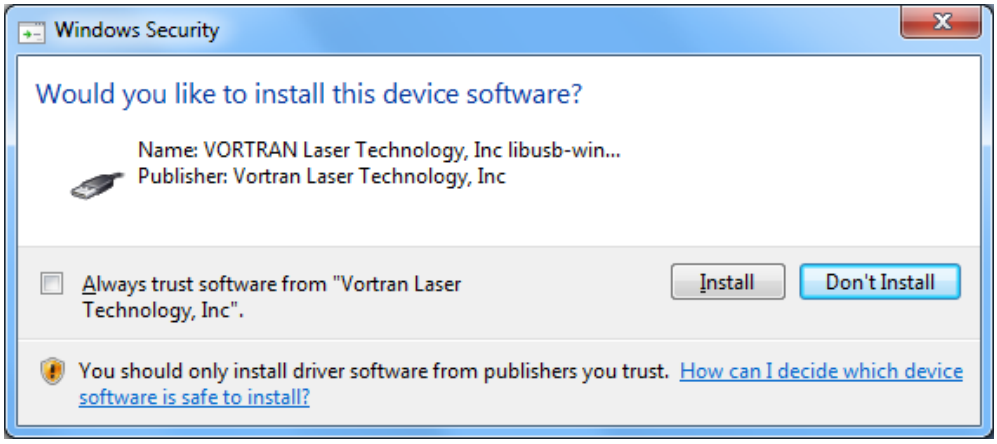

Figure 25
Windows Security Message

Click **Install** to begin the driver installation.

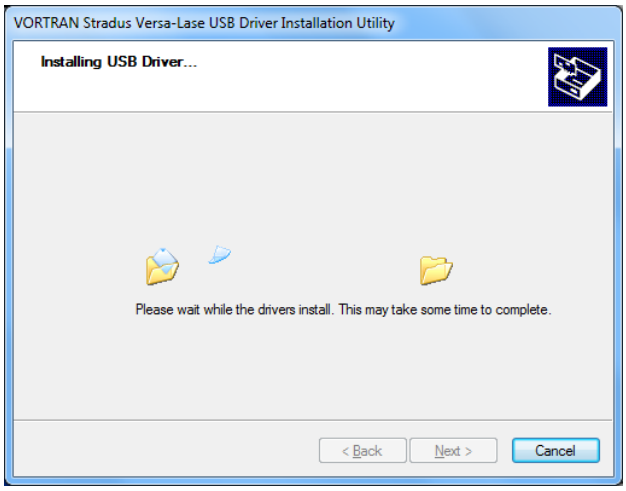

Figure 26
Installing USB Driver Progress Message

Wait while the USB Driver is installed.

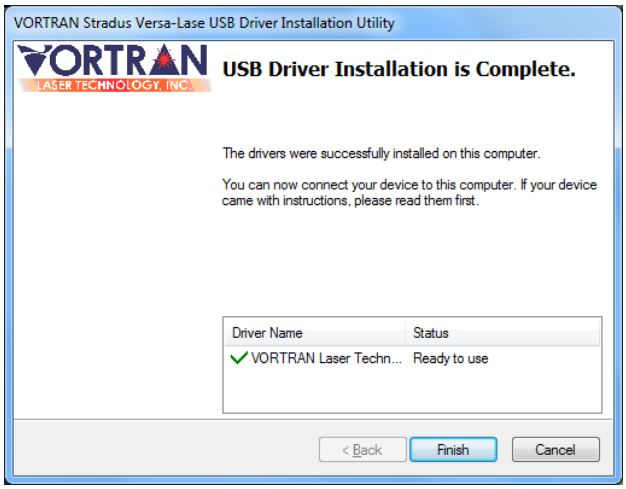

Figure 27
USB Driver Installation Complete Message

When the driver file installation is complete, the screen above will be displayed. Click **Finish** to begin using the USB capability of the Vortran Stradus VersaLase™ System. The Stradus VersaLase™ Software will now detect the system when the USB cable is connected and power is applied to the system.

10.5 Menu Items

The Vortran Stradus VersaLase™ provides access to control and monitoring of each laser installed in the system.

10.5.1 File Menu The file menu provides the Print Screen selection which allows direct printing of the Stradus VersaLase™ software screen. Exit closes USB and RS-232 connections and exits the application.

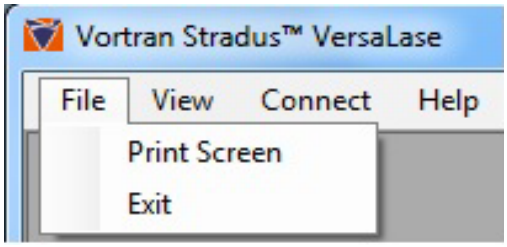

Figure 28
File Menu

10.5.2 View Menu The view menu provides the capability to navigate between the Vortran Stradus VersaLase™ Control screens and adjust multiple laser views. The Home and Terminal Screen buttons are used to switch between the selected screens.

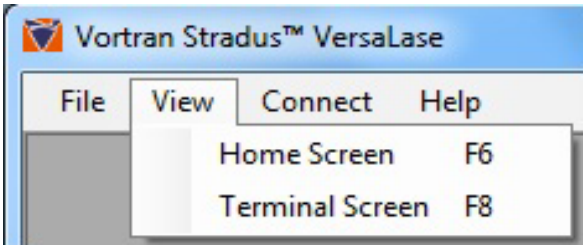

Figure 29
View Menu

10.5.3 Connect Menu The Connect menu contains a selection “RS-232 Connection” which is required to establish an RS-232 connection with the Stradus VersaLase™.

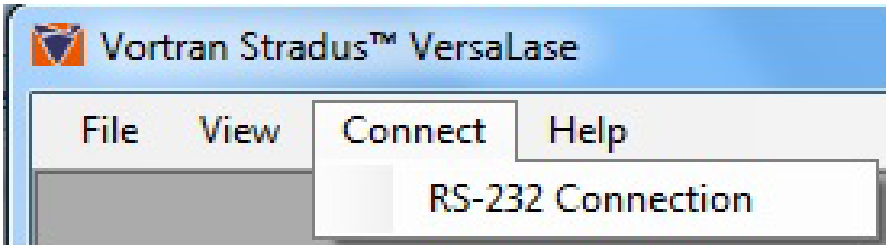

Figure 30
Connect Menu

10.5.4 Help Menu

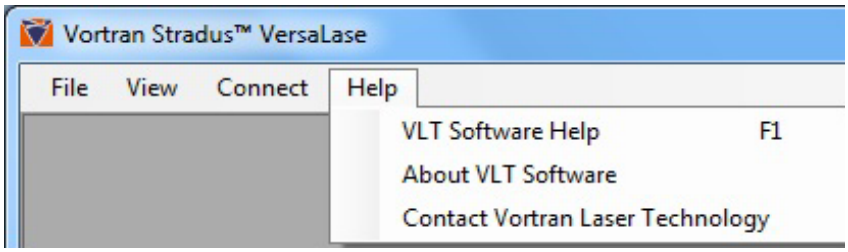

Figure 31
Help Menu

The Help Menu provides a variety of information to assist with the Vortran Stradus VersaLase™ Software. Use the Help menu to launch interactive Help with a variety of tools to access Stradus VersaLase™ Software information contained in the user manual.

The “**About VLT Software**” menu item displays version information associated with the software application. The version information displayed can be compared to the current version listed on the Vortran Laser web site.

The “**Contact Vortran Laser Technology**” menu item provides a complete list of Vortran Laser contact information. Feel free to contact Vortran Laser Technology Inc. with any questions or special application needs.

10.6 Home Screen

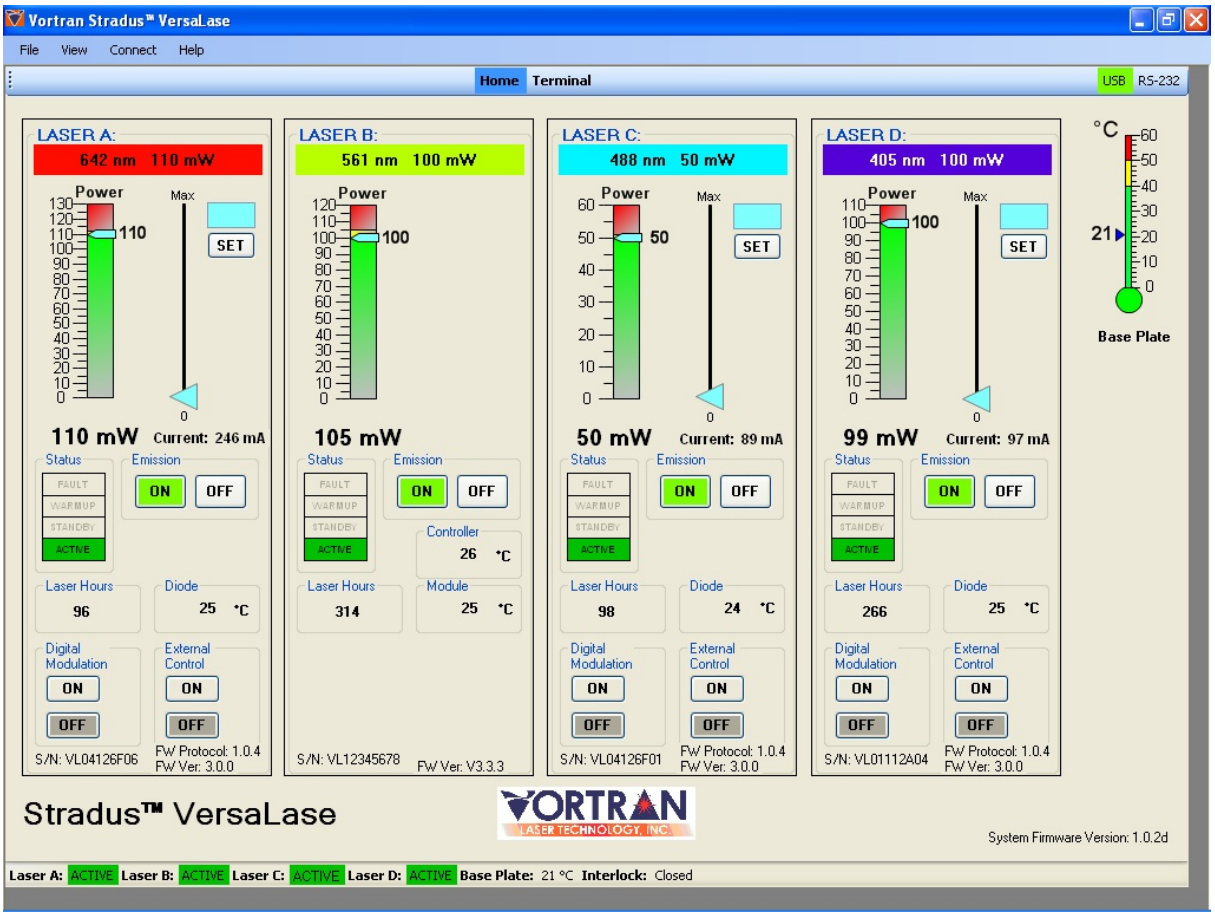

Figure 32
Home Screen

When the Vortran Stradus VersaLase™ Software is started and a USB or RS-232 connection is established, the Stradus VersaLase™ Software will display available controls and indicators for each laser in the system.

10.6.1 Status

The Status indicator shows the present laser operating condition. When laser emission is active, a green “ACTIVE” indicator is shown. When the laser is operating normally and emission is stopped, the “STANDBY” indicator will be shown. When power is first applied to the laser and the optical block temperature and/or power has yet to stabilize, the “WARMUP” indicator will be shown. If a fault condition exists, the red “FAULT” indicator will be displayed.

If a fault condition exists, type ?FD in the Terminal Window to display specific fault information.

Figure 33
Laser Status Indicator

10.6.2 Laser Hours

The Laser Hours display will show the actual hours of active laser emission.

Figure 34
Laser Hours

10.6.3 Digital Modulation

Certain types of lasers in the Vortran Stradus VersaLase™ system are able to operate in Digital Modulation mode. This mode is selectable with the “Digital Modulation” Button. When “On” is selected the laser output is modulated as a function of the TTL voltage level input at the SMB connector. Some lasers do not require the user to enable digital modulation and therefore do not have ON/OFF buttons on their software control panels.

When the Digital Modulation “On” button is selected, the software allows the user to set the amplitude of the pulse output. Enter the desired peak power in mW and the laser will use the photocell to calibrate the peak pulse power to the user-entered value.

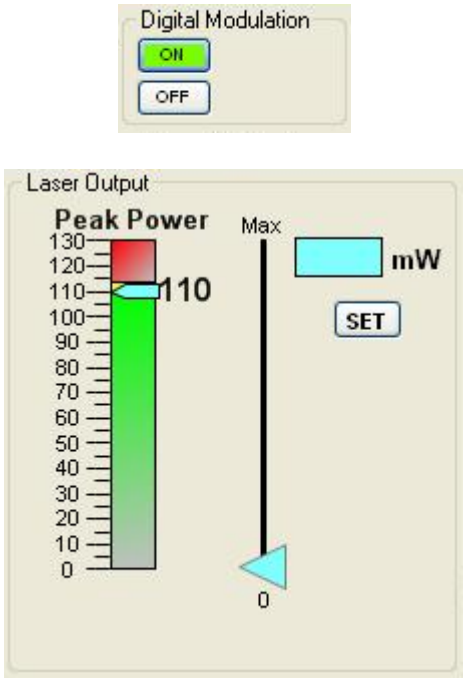

Figure 35
Digital Modulation

10.6.4 External Control

The External Control function provides the ability to control the laser power directly with an analog voltage. When “OFF” is selected, the laser operates in a constant power mode, based on the present power setting. When “ON” is selected, the laser power is directly controlled by the voltage applied to the external control input. The output power is based on the voltage applied.

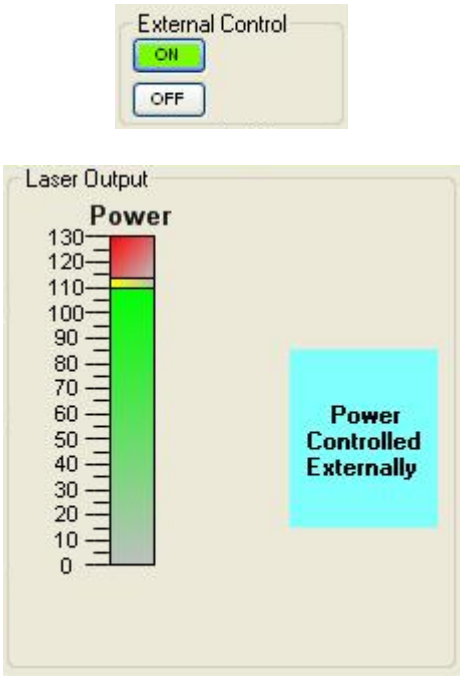

Figure 36
External Control

10.6.5 Emission

The Emission indicator provides the capability to start and stop laser emission. When “ON” is selected, laser emission will be established following the 5 second CDRH delay. If the interlock is open or a fault condition exists, laser emission is not possible. Under these conditions, if “ON” is selected, the “OFF” condition will be shown until the fault condition is resolved.

Figure 37
Laser Emission Indicators

10.6.6 Laser Output

The Laser Output function allows the user to set the power directly. To make a change, type a new value in the entry box and click “SET.” The Blue triangle can be used as a slider to allow the use of a mouse to drag and set the laser power. **If dragging the Blue triangle to a desired power setting, the “SET” button must be clicked to set the laser power.** The value shown next to the scale represents the present set value and the value shown below the power scale represents the value measured by the microprocessor and is updated continuously. The scale values represent both nominal and maximum values unique to the laser that is connected. The green scale represents the normal laser operating range. The yellow section represents a range of values that are available for setting but not necessarily recommended for normal operation. The yellow scale represents the power level between the nominal rated laser power and the maximum calibrated laser power available for setting. Values in the Red section of the scale are not available for setting. The value of the displayed laser diode current represents the value measured by the microprocessor and is updated continuously for diode-based lasers only.

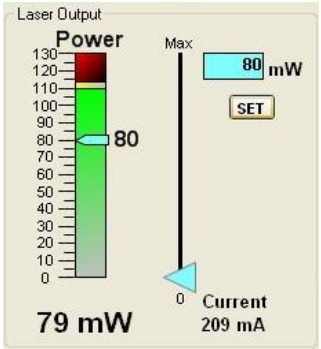

Figure 38: Laser Power and Current Indicators

10.6.7 Base Plate Temperature

The base plate temperature gauge displays the present measured base plate temperature. The base plate temperature is measured by the microprocessor and is updated continuously. Once again, green represents the normal and safe operating range. Yellow indicates a level of temperature that will allow the laser to operate, but is not recommended for long-term operation. Red represents excessive temperature.

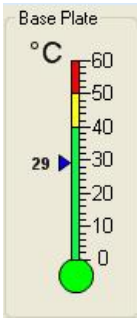

Figure 39
Base Plate Temperature Indicator

10.6.8 Diode Temperature or Module Temperature

The present diode temperature or module temperature is displayed as a numerical value with no associated scale. This diode temperature is set at the factory to ensure long-term reliability and maintain the specified optical propagation parameters. The module temperature is the temperature of the laser device for other than diode lasers.

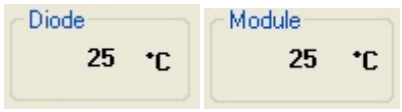

Figure 40
Diode / Module Temperature

10.6.9 Controller Temperature

Some types of lasers have associated controllers whose temperatures may require monitoring. The Controller temperature indicator provides this information to the user.

10.7 Terminal Screen

The terminal screen allows the user to communicate directly with the Vortran Stradus VersaLase™ System. This screen provides flexibility to set controller parameters or query specific controller parameters using the list of commands and queries. As a secondary function, the user can test custom laser applications, by using a script containing a series of parameters.

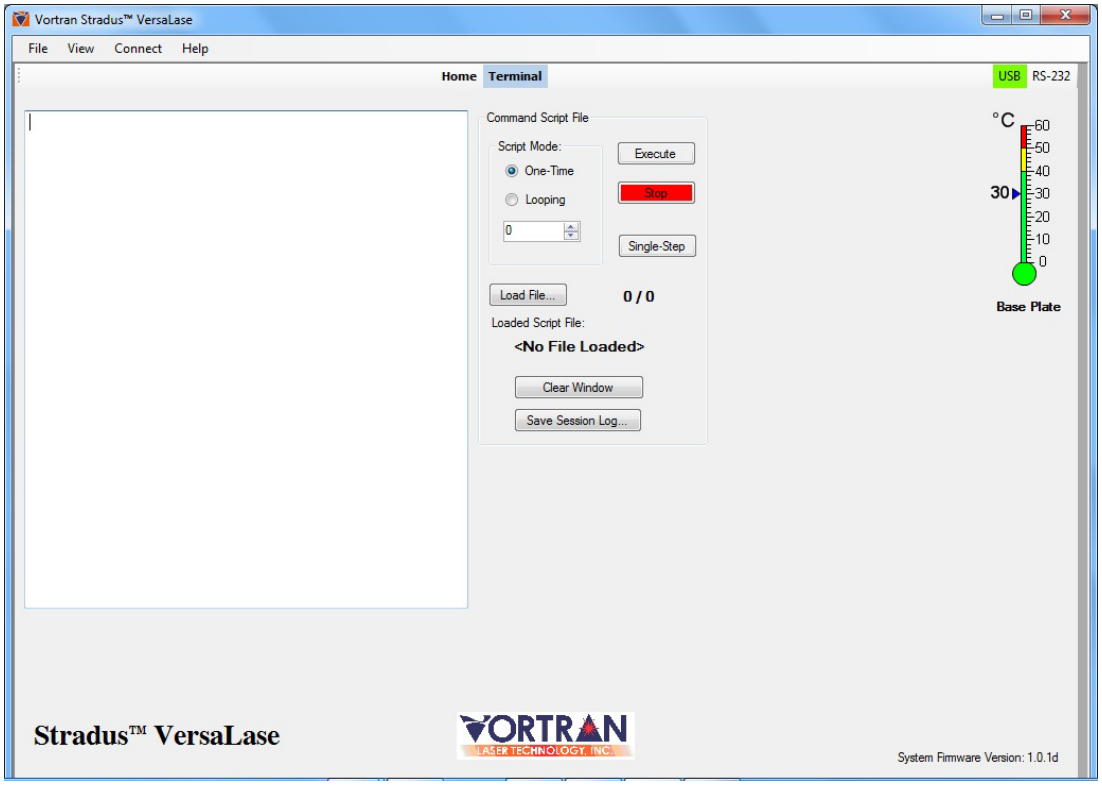

Figure 41
Terminal Screen

10.7.1 Script Mode

The Script Mode radio button allows the user to execute a single pass through a string of commands and queries. By selecting the “Looping” function the command and query string will continue to be executed in sequence until the “Stop” button is selected.

When Looping a Script, a maximum of 32,000 lines will be executed. The Script will stop running at that point.

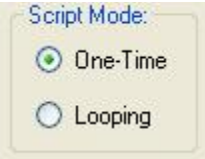

Figure 42
Script Mode

10.7.2 Control Buttons

The control buttons allow the user to execute or stop the list of commands and queries displayed in the script window. The “Execute Script” button will sequence through the entire list of script commands and queries in the script window. The “Stop” button will interrupt the current execution of script commands and queries. The “Single Step” button will execute the next command or query listed in the script window each time the button is clicked.

Figure 43
Execute Script

10.7.3 Load Script File

The Load Script File function allows the user to recall a previously saved script file. When the “Load File” button is selected, a standard Windows “Open” dialog will appear. Select the desired script file and click “Open.” The contents of the file will be loaded into the script window. The file name will also be displayed. The default script file location is C:\Program Files\Vortran Laser Technology, Inc\Script

Script files are saved as .txt This will allow the user to view them with a standard text editor.

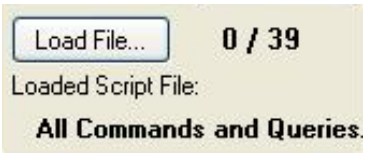

Figure 44
Load Script File

10.7.4 Clear Window and Save Session File Log

The "Clear Window" button will clear the contents of the script window when clicked. The "Save Session Log" button will display a standard Windows "Save As" dialog when clicked. The user can enter a file name and save the list of commands and queries displayed in the Script Window as a new script file.

Script Files are Saved as .txt. This will allow the user to view the file contents with a standard text editor.

Figure 45
Clear Window / Save Session Log

10.8 Tool Bar

The "Home" and "Terminal" buttons are navigation buttons. When one of these buttons is clicked, the associated screen will be displayed. Each button is also highlighted when the associated active screen is displayed. The Tool Bar also displays the communication method, USB or RS-232.

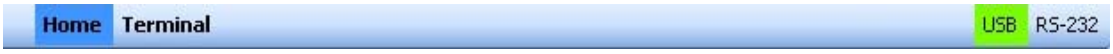

Figure 46
Tool Bar

10.9 Status Bar

Each displayed laser window contains a status bar at the bottom of the window, to display important laser parameters. The emission status is shown on the left side of the status bar. If a fault condition exists, the “Active” display will display as red with “Fault” to replace the green active status. The present laser power is also displayed. If laser emission is not active, the laser power will display 0mW. The present laser base plate temperature is also displayed, along with the present interlock status.

Figure 47
Status Bar

11.0 Tutorials

11.1 External Laser Power Control

The Vortran Stradus VersaLase™ has the capability of external power control with a voltage source independently for each channel A-B-C-D. A 0V to 5V input signal will provide a corresponding laser output from 0% to 100%. External power control inputs are available for each channel A-B-C-D and are accessed from the DE-25 I/O Connector. The input impedance of these inputs is 550Ω. A computer is generally required to initiate external laser power control. Certain types of lasers do not require external laser power control to be enabled in the software. The computer can be connected directly to the system with a USB connection or with an RS-232 connection.

The Vortran Stradus VersaLase™ Laser System will <u>not</u> communicate with a null modem (cross-over) cable. A typical host to device cable is required.

The RS-232 pin connections are shown below:

Function	I/O Connector DE-25
RS-232 Transmit	Pin 9
RS-232 Receive	Pin 10
Signal Ground	Pin 11

The following RS-232 communication parameters are required with the Vortran Stradus VersaLase™ System.

Baud Rate	19200
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

Table 12
RS-232 Connections and Communication Protocol

Once computer communication is established with the laser system, the "EPC=1" command will enable External Laser Power Control. External Laser Power Control can also be enabled with Vortran Stradus VersaLase™ software. The External Power Control button is located on the software Home Screen.

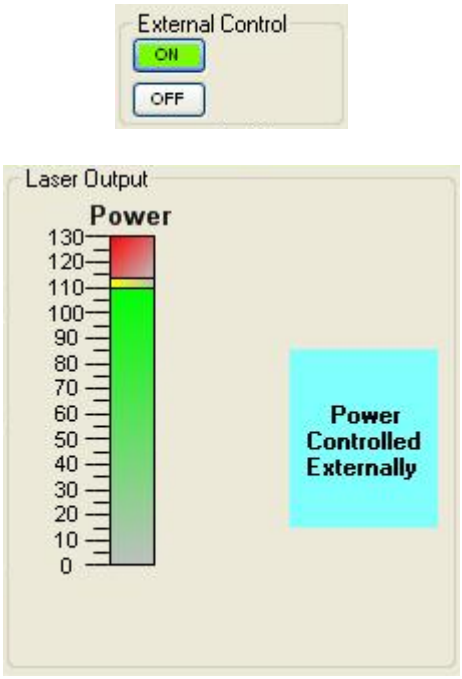

Figure 48
External Control Setting

Once External Power Control is enabled with a computer, the laser output is directly proportional to the input voltage.

A 0-5 Volt input will correspond to a 0%-max laser power regardless of the present laser set power.

11.2 Laser Enable Modulation

The Vortran Stradus VersaLase™ system provides independent laser enable inputs for each channel A-B-C-D. This input allows a TTL signal to toggle the laser emission on and off. The laser enable signal is connected directly to the laser drive circuitry and is able to switch the laser on and off at a maximum rate of 50KHz. Due to the nature of some types of non-diode laser technologies, certain lasers in the Stradus VersaLase™ will not be able to achieve a 50kHz modulation rate using the Laser Enable Modulation method. The Digital Modulation or External Power Control Methods may instead be used.

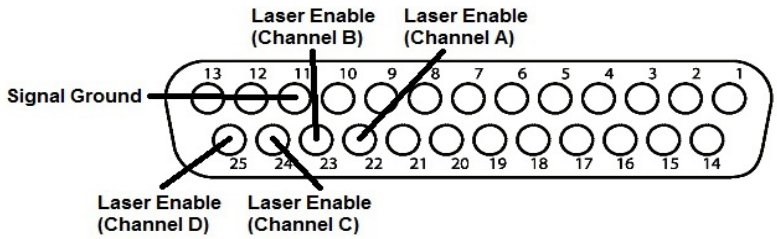

Figure 49
Laser Enable and Signal Ground DE-25 Pins

The TTL input will modulate laser emission on and off at the laser set power. The laser output amplitude can also be controlled with the Analog input simultaneously. For additional information on Analog Power control, refer to the previous section.

11.3 Digital Modulation

The output of the Stradus VersaLase™ Laser System can operate in a Continuous Wave or Digital Modulation mode. Prior to setting the laser into Digital Modulation mode, the voltage levels of the input to the SMB connector should be verified using an oscilloscope terminated at 50 ohms.

External Sources Designed to Drive High Impedance Loads Will Not Provide TTL Voltage Levels When Terminated at 50 Ohms

The required voltage levels are less than 0.2 volts for a laser off condition and greater than 3.2 volts for laser on. Inputs to the SMB connector do not provide direct control of the amplitude of the pulsed laser output. When the Digital Modulation Button is selected, a dialog will appear to allow the user to set the peak power of the laser output. Enter a value in mW and the laser will automatically calibrate the peak output power using the power control photocell. The peak power can be changed by using the PP command via USB or RS-232. See the Command Detail section for additional information on the PP command.

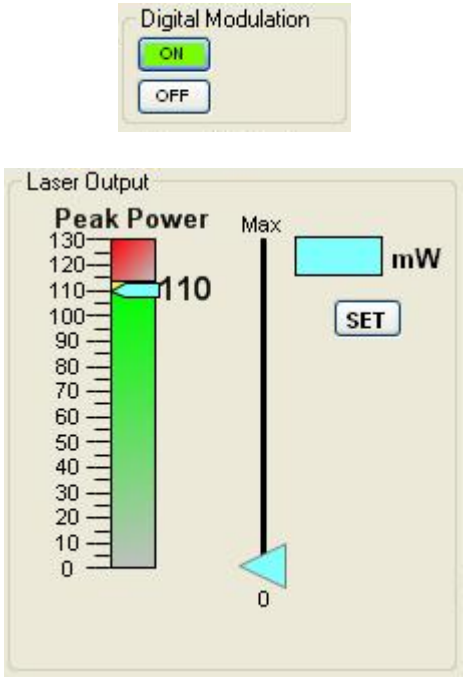

Figure 50: Digital Modulation Control

12.0 Troubleshooting Guide

12.1 Resolving Faults

If a fault occurs, the Vortran Stradus VersaLase™ will set the Fault Pin on the I/O connector to a TTL high level. The fault pin is accessed with the I/O connector DE-25 Pin 3. The associated ground reference is found on the I/O connector DE-25 Pin 11.

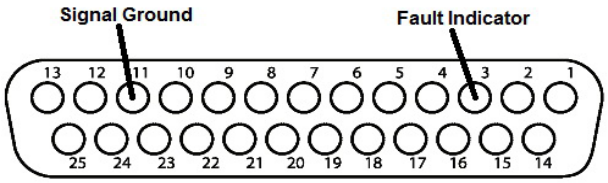

Figure 51
Fault Indicator DE-25 Pin

If a fault occurs, the user can use RS-232 or Vortran Stradus VersaLase™ software to determine the actual fault condition. When communicating with RS-232, use the query ?FC to obtain a binary representation of all existing fault conditions. If using Vortran Stradus VersaLase™ software, use the terminal screen to enter the ?FC query.The binary response will be in the same binary sum format as RS-232 serial communication.

Please review the information below on fault conditions and potential resolutions.

Fault Code Resolution		
Value	**Description**	**Resolution**
0	LASER EMISSION ACTIVE	Normal Operation, Laser Emission Active
1	STANDBY	Normal Operation, Laser Emission Not Active.
2	WARMUP	Normal Operation, Laser Start-up
4	VALUE OUT OF RANGE	Normal Operation, Invalid Command Value
8	INVALID COMMAND	Normal Operation, Syntax Error
16	INTERLOCK OPEN	Normal Operation
32	TEC OFF	Laser Power On, TEC Turned Off. Turn on TEC or restart laser.
64	DIODE OVER CURRENT	Fault Condition, Laser Over Current, Contact Vortran Laser Technology for Repair.
128	DIODE TEMPERATURE FAULT	Fault Condition, If environment is excessively cold or hot, adjust environment temperature to normal room conditions. (20-30 degrees C) System will recover automatically.
256	BASE PLATE TEMPERATURE FAULT	Fault Condition If environment is excessively cold or hot, adjust environment temperature to normal room conditions (20-30 degrees C). System will recover automatically.
512	POWER LOCK LOST	Fault Condition. Restart System. If not resolved, return system for repair.
1024	EEPROM ERROR	Fault Condition. Restart System. If not resolved, return system for repair.
2048	I2C ERROR	Fault Condition. Restart System. If not resolved, return system for repair.
4096	FAN WARNING	Fault Condition.
8192	POWER SUPPLY WARNING	Fault Condition.
16384	TEMPERATURE WARNING	Fault Condition.
32768	LASER END OF LIFE INDICATOR	Warning Condition: Laser current has increased by 20%. Service Laser Soon.

Table 13
Fault Code Resolution

12.2 Temperature Faults

A temperature fault can exist with static temperatures below 10ºC or greater than 40ºC. If the laser is not properly mounted, or the heat sink is insufficient, a temperature fault could result. Rapid changes in temperature may cause laser emission to be interrupted until the diode temperature stabilizes.

The Vortran Stradus VersaLase™ provides temperature protection for the contained lasers. If a temperature fault occurs, laser emission will be interrupted until the temperature returns to a safe range.

When a temperature fault occurs, the fault pin is set to TTL high and laser emission will stop. When the temperature returns to a safe range, laser emission will resume. An optical block temperature fault will occur when the measured temperature is less than 20ºC ***or*** greater than 24ºC.

12.3 Laser at Half Power

If a laser is running at half power, it could be a result of the External Power Control being active with no connection to the external power control input. The laser internal resistor will provide voltage to the External Power Control circuit with no external connection. This voltage would result in output of approximately ½ of the rated laser power.

13.0 Glossary

ºC	Degrees Celsius
µm	Micrometers (10^{-6} Meters)
µrad	Microradians (10^{-6} Radians)
AC	Alternating Current
A	Amp
BNC	Bayonet Neill Concelman Connector
CDRH	Center for Devices and Radiological Health
ESD	Electrostatic Discharge
KHz	Kilohertz (10^{3} Cycles per Second)
LED	Light Emitting Diode
mA	Milliamps (10^{-3} Amps)
mm	Millimeter (10^{-3} Meters)
mrad	Milliradian (10^{-3} Radians)
mW	Milliwatt (10^{-3} Watts)
nm	Nanometer (10^{-9} Meters)
OEM	Original Equipment Manufacturer
RMS	Root Mean Squared
RMA	Return Material Authorization
TEC	Thermal Electric Cooler
TTL	Transistor Transistor Logic <0.8V Low >2.0V High Input <0.8V Low >3.3V High Output
V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current
W	Watts

14.0 Warranty

Vortran Laser Technology, Inc. provides a warranty for a period of 12 months from the original shipment date. This warranty applies only to the original purchaser and covers material defects, workmanship and adherence to published specifications. If a replacement unit is provided, the warranty is based on the shipment date of the original unit.

The Vortran Laser Technology Warranty will be void under the following conditions:

- Removing the Protective Housing from the Laser Head
- Removing the Protective Housing from the Control Box
- Not Providing Correct Input AC Voltage
- Insufficient Heat Sink
- Improper Mounting
- Not Providing Environmental Requirements
- Incorrect User Supplied Interface Components
- Visible Damage or Misuse of the Laser System

If the user provides custom interface components, Vortran Laser Technology does not support the warranty without factory approval.

Following repair, the Vortran Stradus VersaLase™ Laser System Warranty is based on the date of original shipment.

15.0 Returning Systems for Service

Return Material Authorization (RMA) Instructions

The Vortran Stradus VersaLase™ system does not require interval calibration or factory maintenance. If service is required, contact Vortran Laser Technology. Be ready with the system part number, serial number and problem description when contacting the factory. The factory will provide an RMA number and shipping instructions. Please follow the packaging and shipping instructions for Laser System factory returns.

Repacking Instructions

Please return the system to Vortran Laser Technology in the original shipping containers if possible. Package the system and control box with ESD protective bags. For non-warranty events, only return the system components suspected of having problems. For warranty events, please return all items originally shipped with the Laser System. Please write the RMA number on the outside of the shipping box. A complete list of factory shipped system items is shown below.

16.0 Contact Vortran Laser Technology

Vortran Laser Technology, Inc.
21 Goldenland Court, #200
Sacramento, California 95834

Phone
(916) 283-8208

Fax
(916) 648-9751

E-mail

Sales
sales@vortranlaser.com

Service
service@vortranlaser.com

Web Site
www.vortranlaser.com