Laser Unpacking:

1. Under your Series 48 laser at the bottom of the box you will find the mounting hardware/components kit. Don’t forget to save all shipping containment and plug covers and set them aside.

2. Upon arrival, inspect all shipping containers for signs of damage. If you discover shipping damage, document the damage (photographically if possible), then immediately notify the shipping carrier (responsible party for any transportation damage) and SYNRAD®. See the inventory section within the Introduction chapter of the Operation Manual for packaging list(s).

Important Note: Keep All Foam and Packaging, you will need to re-use it when moving your laser to prevent damage that could void your warranty. Refer to this guide and the Technical Reference chapters in the laser’s Operation Manual when re-packaging for shipping and/or relocation. Remove all accessory items not originally attached to the laser prior to re-packaging for shipping.

Caution! When packing the laser for relocation or shipment, nothing can be on the sides of the units at any time as damage will occur. The skin on the sides of the laser is fragile! All box components must be stowed as they were when they arrived.

Please refer to the examples above and the laser’s Operation Manual drawings located at the end of the Technical Reference Chapter.

Note: If shipped completely assembled, jump to the cooling section of this guide.
Readying your Laser for use:

**Note:** Remove the laser aperture self-adhesive film before mounting your laser into final position.

3. Failure to remove the aperture seal can damage your system!

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**Important Note:** Consult the factory for further mounting angle guidance outside >20% from the horizontal. **When mounting the laser,** use only one metric or SAE fastener per mounting tab on the baseplate. Do not use any type of jackscrew arrangement as this will twist the baseplate and may distort the tube.

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**Note:** The recommended mounting orientation for the Series 48 is horizontal. Refer to the drawings within the Series 48 Operation Manual, see the Technical Reference chapter for further information.
Cooling:

Important Note: Customers must provide some type of cooling to prevent the laser from overheating.
Refer to the cooling specifications in the Technical References chapter of the Series 48 Operation manual.
If water cooling is desired, refer to the water cooled 48 Series QSG located on our website.

4. The fans must have at a minimum 2.25” (52.7 mm) clearance between the unit and the wall or any obstructive surface. A maximum fan offset mounting of <3.0” (76 mm) is required.
Cooling (Continued):

4.2 Fan mounting offset

<3.0” (76 mm)

>2.25” (57.2 mm)
Power & Control Connections:

5. Connect the mini-Din to the power cord as shown below. The BNC from the UC-2000 controller to the laser’s port(s) shown in the figure below located on the rear of the laser.

A. ANV/ANC Connector- input BNC connector for applications using external analog voltage or current control signals.

B. Laser Connector- 4 pin mini-DIN connection for the Power/Control cable & tickle/PWM.

C. Serial Port Connector- DB9 connector allows a computer or programmable logic controller (PLC) to control the UC-2000 via an RS-232 serial port.

D. C/L Connector- 8-pin mini-DIN connector allows closed loop power control of lasers equipped with SYNRAD® closed loop kit.

E. Gate Connector- Input BNC connector for applications using external gating signals to gate the laser beam on and off.
Initial Start up (with a UC-2000 Controller):

Important Note: When performing the initial start-up sequence, check that the factory-installed DB-9 jumper plug is installed. If not, you must provide the required Remote Interlock and Remote Keyswitch signals to the DB-9 Connector. See the Series 48 Operation Manual for DB-9 connections, pinouts and signal descriptions.


Ensure that all personnel in the area are wearing protective eye-wear!

6. Before starting your Series 48 laser, verify functionality by placing an appropriate beam block 61cm (24 in) from the laser aperture or a power meter to prevent the beam from traveling beyond the work area. If using water for cooling, see the Operation Manual for specifications.

7. Set the UC-2000 to MANUAL mode, and then set the PWM Adj Knob to provide zero percent output (0.0%). The UC-2000’s Lase indicator should be Off. Verify that the laser’s Keyswitch (if equipped) is in the OFF position.

7.1 Assure the key switch is set to “Off”.

7.2 To adjust PWM to 00.0%, turn the “PWM’ coarse adjustment till 0 percent PWM output displays.

A. PWM Adj Knob- Rotate to change PWM duty cycle. When setting PWM duty cycle manually, rotate to change output in 0.5% increments OR press down and turn to increase/decrease laser PWM duty cycle in 5% increments.
Initial Start up (with a UC-2000 Controller-continued):

8. If the laser has a Diode Pointer installed, remove its aperture dust cover.

9. Move the Shutter Switch (if equipped) to the Open “ON” position.

10. Turn on the DC power supply.

10.1 Assure the shutter is set to “On”.

10.2 Shutter set to “Off” disables the laser.

11. Rotate the Keyswitch (if equipped) to the “ON” position. Verify that the green PWR LED illuminates. If the Keyswitch is already ON, turn it OFF, then back ON (or cycle the Remote Keyswitch input) to reset the laser.

11.1 Green PWR LED is “On”.

11.2 Keyswitch is “On”.

UC-2000 LASER CONTROLLER
Initial Start up (with a UC-2000 Controller):

12. Verify that the red LASE LED illuminates dimly approximately five seconds after rotating Keyswitch to on. This indicates that tickle pulses are being applied to the laser and that it is safe to apply a PWM Command signal. Cycle the Keyswitch as described in the previous step.

Note: Each time an OEM laser is powered up or a Keyswitch version is cycled OFF/ON, a five-second delay occurs between the time that the PWR LED illuminates and the laser is permitted to lase.

13. Press the UC-2000’s Lase “ON/OFF” button. The Lase indicator on the UC-2000 should illuminate. Use the “PWM” Adj Knob on the UC-2000 to slowly increase power. The intensity of the laser’s LASE indicator increases in brightness as the PWM duty cycle increases. The spot where the beam hits the beam block should also increase in brightness to indicate increased power output.

Important Note: Decrease power before proceeding to the next step, otherwise damage to your unit could occur!
Initial Start up (Checking laser’s output power with a UC-2000 Controller):

14. Reduce the PWM duty cycle to 0.0% and press the UC-2000’s Lase On/Off button to stop lasing. The Lase indicator on the UC-2000 turns off and the laser’s LASE LED turns dim.

15. Move the Shutter Switch (if equipped) to the Closed position.

16. Turn off the DC power supply.

**Warning**

Serious personal injury

In electrically-noisy environments, long lengths of unshielded wire act like an antenna and may generate enough voltage to trigger un-commanded lasing.
Initial Start up (Without a UC-2000 Controller):

**Note:** If you have chosen not to use a UC-2000 to control the laser, follow the procedure below to verify the laser’s functionality. You will need to provide a tickle signal and a pulse width modulated (PWM) Command signal to the laser’s CTRL input connector. Refer to Controlling laser power in the Technical Reference chapter for tickle and PWM Command signal descriptions.

Starting auxiliary equipment

17. Ensure that all personnel in the area are wearing protective eyewear.

18. Assure the red self-adhesive aperture seal is removed from the laser faceplate.

19. Place a power meter, or appropriate beam block, 61 cm (24 in) from the laser aperture to prevent the beam from traveling beyond the work area.

20. Ensure that your PWM controller is set to zero percent output (0.0%).

21. Verify that the laser’s Keyswitch (if equipped) is in the “OFF” position.

22. If the laser has a Diode Pointer installed, remove its aperture dust cover.

**Caution**

Possible equipment damage

Series 48 lasers MUST be provided with a pre-ionizing “tickle” signal during standby or laser “low” periods. This signal is automatically provided by SYNRAD®’s UC-2000 Universal Laser Controller or FH Series Marking Head.

A tickle signal keeps the plasma ionized during laser ‘low’ periods and facilitates plasma breakdown and pulse-to-pulse fidelity. Damage to or malfunction of the laser may occur if this, or equivalent drive signals are not provided.

If the laser has been “OFF” or the tickle has not been applied for any length of time apply the tickle signal for at least two seconds before applying any PWM command signal.
Initial Start up (Without a UC-2000 Controller-Continued):

23. Move the Shutter Switch (if equipped) to the Open “ON” position.

![Shutter Switch Diagram]

24. Turn on the DC power supply.

25. Rotate the Keyswitch (if equipped) to the ON position. Verify that the green PWR LED illuminates. If the Keyswitch is already ON, turn it OFF, then back ON (or cycle the Remote Keyswitch input) to reset the laser.

![Keyswitch Diagram]

26. Apply a tickle signal (a +5 VDC, 5 kHz square wave of 1 µs duration) to the laser’s CTRL connector.

27. Verify that the red LASE LED illuminates dimly after approximately five seconds. See the above figure. This indicates that tickle pulses are being applied to the laser and that it is safe to apply a PWM Command signal.

28. Apply a PWM Command signal (a +5 VDC, 5 kHz square wave of 1 µs to 3 µs duration) to the laser’s CTRL connector.

29. Slowly increase the duty cycle of the signal. The intensity of the laser’s LASE indicator increases in brightness as the PWM duty cycle increases. The spot where the beam hits the beam block should also increase in brightness to indicate an increasing power output.

![PWM Command Signal Diagram]
Initial Start up (Without a UC-2000 Controller-Continued):

30. Reduce the PWM duty cycle to 0.0%. The Lase indicator on the laser’s LASE LED turns dim (tickle signal only).

31. Move the Shutter Switch (if equipped) to the Open or “ON” position.

32. Turn on the DC power supply.