

## Section 3: System Operation

### Daily Startup

1. Check the water reservoir level before beginning **Startup** for the first time.
2. The toggle switch labeled, **AC Power**, should have been left on after the last use. If not, do the following:
  - On the front panel of the Surelite power unit, flip the toggle switch up that is labeled **AC POWER** (this is the **On** position). After a quick diagnostic check, the LEDs on the front panel display will readout 888, software rev. #, then **OFF**. The “Power On” button is located on the rear panel of the laser head.
  - After approximately 6 seconds, the **LASER ON** lights will turn on. They are located on the top of the laser head and on the front panel of the power supply.
3. Insert the key into the keyswitch and rotate it counter-clockwise to the On position. The readout LED will momentarily display the following.

Total # flashlamp discharges	Displays as a series of 3 displays for millions, thousands, and hundreds.
Water flow startup	FLo displays while system waits for water flow to be verified in the laser heads.
Flashlamp discharge frequency	Displays the last saved rep, in Hertz (flashes/second).

4. Press the **SELECT** button and toggle the LED display through these six modes to verify the accuracy of all the settings. The normal values are:

Rep Rate	Factory set for either 10 or 20 Hz
Q-switch	Set to the value listed in the Quality Assurance Document at the front of the manual
Pulse Division	P01 (laser output with every discharge of flashlamp)
Pump Voltage	Set to the value listed in the Quality Assurance Document at front of manual.
Serial Mode	SoF (serial port off)
External Mode	EoF (External mode off)

5. Press the **START/STOP** button and its LED will come on. The laser head will now flash at the designated frequency. Allow the system to run for 15-20 minutes to thermally stabilize the YAG head before proceeding.
6. Put on laser safety goggles.
7. On the front of the laser bench, slide the exit port shutter to the **OPEN** position.



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#### LASER RADIATION!

The next step results in laser output.

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8. Press the **SHUTTER** button and its LED will come on. An audible click will be heard from laser bench as the intra-cavity shutter withdraws from the oscillator. The system should now lase.

## Continuum Surelite Laser

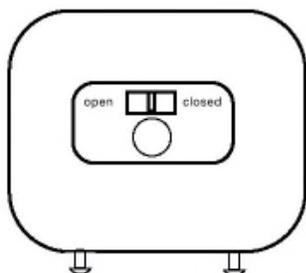
Note: During the first 20 minutes after the red AC Power toggle is turned on, the software will not allow the SHUTTER to open. This enables thermal stabilization of the Pockels cell and harmonic generators.

9. If harmonic crystals are used, allow laser output to pass through crystals for 5 minutes and then optimize the crystals for maximum energy. See **Harmonics optimization** on page 31.

## Daily Shutdown

1. Depress the **START/STOP** button. The LEDs on the **START/STOP** button and **SHUTTER** button should turn off. A click will be heard as the intra-cavity shutter drops. The laser head flashlamps should stop flashing.

2. On port



3. Turn system should

the front of the laser bench, slide the exit shutter to the **CLOSED** position.

key clockwise to **STANDBY** and the **LASER ON** light will shut off. After 1 second a beep will sound and then the will power down. The LED display read **oFF**. Remove key.

4. Leave toggle switch labeled **AC POWER** up and in the **ON** position.

Note: The AC POWER can be toggled off if there are no plans to use the laser for an extended period of time.

## Display readouts

This is an explanation of the 3 digit LED readout that appears on the front panel of the Power Cooling Unit. The explanations are listed in the order in which they appear at start up and then if you step through the displays by pressing the **SELECT** button.

- 8.8.8. This is a test sequence where all segments of the red LED display are illuminated so that the user can verify that there are no burned out display sections.
- rxx Rev number of software being run in system. The current revision level will be displayed when laser is turned on.
- oFF Displayed when the **AC POWER** is toggled on and the keyswitch is in the **STANDBY** position.
- 000 The flashlamp discharge count is displayed during the startup sequence. This count is given in a series of three displays of numbers. The first being millions, the second thousands and the third hundreds.
- Flo Displayed during start up sequence. Indicates pause in system startup while logic waits for water flow to be established in the laser heads. The pause can be as long as 40 seconds.
- Fxx Frequency of flashlamp discharge. Normal value for 10 Hz system is F10, for a 20 Hz system, F20. This value can be changed within preset boundaries by pressing **ARROW UP** or **ARROW DOWN** buttons.

### Section 3: System Operation

- XXX Q-switch delay setting in microseconds. Red light labeled **Q-SW DELAY**  $\mu$ s next to LED display should also be on. This value indicates the time between the command to fire the flashlamp and the command to fire the Pockels cell. The normal value is listed in the QA in front of the manual.
- Pxx Flashlamp discharge divider for laser output. Take the frequency of flashlamp discharge and divide it by Pxx to get the frequency of laser output. (Example: Fxx = F10 and Pxx = P05 then for every fifth discharge of the flashlamps you get laser output. The system lases at 2 Hz) This feature allows user to change the frequency of laser output without changing the flashlamp discharge rate. The value of Pxx can be changed from 0-99 by pressing the **ARROW UP** or **ARROW DOWN** buttons. Normal value for Pxx is P01.
- XXX Flashlamp discharge voltage in kilovolts. Red light labeled **VOLTS KV** next to LED display should also be on. This indicates the charge voltage of the laser head flashlamp capacitor. The normal value is listed in the QA in front of the manual.
- SoF Indicates that the serial mode of operation through the RS232 port is off and the system is running on its own internal clock commands.
- Son Indicates that the serial mode of operation through the RS232 port is on and the system will await indicated input commands to operate. (See page 42.)
- EoF Indicates that the external mode of operation through the **EXTERNAL** connector is off and the system is running on its own internal clock commands.
- Eon Indicates that the external mode of operation through the **EXTERNAL** connector is on and the system will await indicated input commands to operate. (See page 42.)

### Error messages

There are nine programmed error messages. When they appear, they are accompanied by flashing and beeping. The definitions for the error messages are given below. Refer to **Table 12 Electrical troubleshooting** on page 71 to resolve these problems.

- E00 Normal return.
- E01 Surelite not in serial mode. Serial port is turned off. To operate in serial mode, press **SELECT** then **ARROW UP** button.
- E02 Coolant flow interrupted. Check water level and kinks in water lines.
- E03 Coolant temperature over temp. Cooling water temperature is too high.
- E04 (not used)
- E05 Laser head problems.
- E06 External interlock. External interlock has opened.
- E07 End of charge not detected before lamp fire.

## Continuum Surelite Laser

E08 Lamp simmer not detected.

E09 Flow switch stuck on.

CSE This is displayed if a “check sum error” occurs in the EEPROM. This display means that the EEPROM has lost its saved memory and has reverted to preset software limits. It will be necessary to toggle through the display menu and re-enter the QA values for frequency (Fxx), lamp pump voltage, Q-switch delay and pulse division (P01). If display does not go away after recycling keyswitch, contact Continuum.

## Single shot (SS) button

An operational feature of your Surelite is the ability to operate the system in a single shot mode. That is, a single laser pulse on demand. This feature can be very useful when aligning downstream optics or verifying target position.

### To enable SS

To enable the Single Shot operation do the following:

1. Perform the Daily Shutdown procedure found on page 28.
2. Locate the Single Shot (SS) cable that was shipped with your system in the Accessories Box. It is approximately 15 ft. (4.5 m) long, has a momentary push button switch at one end, and a BNC connector at the other.
3. Connect the Single Shot cable to BNC connector labeled **SINGLE SHOT** on front panel of PCU.
4. Turn the keyswitch to the **ON** position.
5. Press the **SELECT** button and toggle to pulse division (Pxx). Check that the pulse division displayed is >00. The normal reading for a system would be P01.

Note: If system operation mode was in P00 prior to initialization and user wants a mode other than single shot, he must press SELECT ARROW UP button to obtain desired laser output.

6. Press the **START/STOP** button. Laser head should now flash.
7. Press the **SHUTTER** button on. System will now be lasing.
8. Initially press the SS button once and lasing output will stop but the laser head will continue to flash.
9. From this point on, each subsequent press of the SS button results in a single laser pulse.

### To disable Single Shot (SS) operation

1. With the system on, the laser head flashing and **SHUTTER** button **ON**, depress **SS** button and hold down for 10 seconds. Normal lasing operation will resume.