orion
by sunstone

Orion Laser Welder User Manual
Orion Combo 200

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INTRODUCTION:

Thank You for Choosing Orion Welders and congratulations on your purchase!

You are now the proud owner of an Orion Laser Welder. This manual was designed to help you set up the welder and begin welding. Please read and follow all safety precautions before proceeding with the welding process.

Sunstone Engineering is the parent company of Orion Welders. At Sunstone & Orion we are committed to producing quality products and ensuring complete owner satisfaction. If you require assistance after reading this manual please contact us with the information provided below.

Orion Welders, a Subsidiary of
Sunstone Engineering R&D Corp.
1693 American Way Suite #5
Payson, UT 84651
Email: sales@orionwelders.com
Voice: +1.801.658.0015
Fax: 866.701.1209

NOTE: The information contained in this manual is subject to change as improvements are made to our products. Visit www.orionwelders.com or www.sunstonewelders.com for the latest version of this document.

USE AND INSTALLATION

IMPORTANT

Carefully follow the content of this manual, pay attention to the information and warnings for the installation, use, and the maintenance of this machine. Any repairs or services should only be performed by a qualified technician. With any questions or needed assistance, please contact Sunstone/Orion Welders.

Sunstone / Orion Welders
1693 American Way #5
Payson, UT, USA 84651
+1.801.658.0015
www.sunstonewelders.com
www.orionwelders.com

Caution: Improper use of this equipment can result in harmful exposure to laser radiation. Carefully follow all instructions and warnings included in this document.

CONTENT GUARANTEE

The information included in this manual is subject to modifications without notice. Sunstone Welders and Orion Welders will not be responsible for errors included in this document nor for any incidental damages or consequences due to any erroneous interpretation of this manual.

INTENDED USAGE

The Orion LZR laser welding machines are designed for making small-sized welds on metal parts.

NOTE

This equipment should only be used for its intended use and purpose. It is not allowed to modify, change, or use any part of the equipment for any purposes other than the intended usage. Sunstone / Orion Welders declines all responsibility for any non-conformance use of the equipment.

CONTRACTUAL GUARANTEE / WARRANTY

Sunstone Welders guarantees this product will be free of any defects for the duration of two years from the date of purchase. The warranty covers all components excluding the following: the LED lamps found in the weld chamber, fuses, protection glass, fire lens and all consumable material. Sunstone Welders will, at its discretion, chose to repair or replace any defective part during the 2 year warranty period. If an issue should arise during the 2 year warranty, Sunstone Welders will be responsible for any costs associated with the repair or replacement on any components, excluding any shipping costs. Any damaged and replaced parts will become property of Sunstone Welders. Any replaced or repaired parts will also be covered under this guarantee until the 2 year term is expired.

The guarantee is void under the following circumstances:

- The buyer fails to report to Sunstone Welders any initial defects or issues due to shipping within seven days of recieving the product.
- The device or its parts have been used in a way different from that which it was intended to be used.
- The device has been entrusted for repair to an unauthorized agent or company, or the device or its pieces have had some modifications not authorized by Sunstone Welders.
- The recommendations and procedures regarding the use and the maintenance of the machine found in this manual have not been respected and followed.
- The warranty seals and stickers on the machine have been removed or broken without authorization from Sunstone Welders.

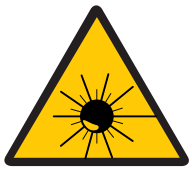
Any other defects or damages caused by normal wear and tear are also excluded from the warranty.

If there is a defect during the warranty period, Sunstone Welders will take action to completely resolve the problem in accordance with this guarantee.

Chapter 1: Symbols

GENERIC WARNING:

This symbol indicates a need to carefully read and follow instructions found here to ensure proper use and maintenance of the equipment.



LASER WARNING:

This symbol shows the danger of being exposed to visible and invisible laser radiation. This symbol can be included also on the machine in corresponding areas of risk to exposure. If you see this symbol:

- Don't ever introduce mirrors or reflecting objects in the welding chamber while the machine is in use.
- Check the weld chamber exclusively through the green-tinted viewing glass found on the front of the machine.
- Don't ever remove the leather strip curtains that cover the opening to the weld chamber.

When using the machine, ensure that no one is seated with their face being eye-level with the weld chamber. This includes children whose standing height would be level with the weld chamber.

It is also recommended that the weld operator use adequate and approved working gloves when using the machine.

FIRE WARNING:

This symbol shows the danger of fire when working with flammable materials are processed. When there is a danger of fire, it is very important to follow the instructions provided from the manufacturer during the installation of the machine.

Don't weld near flammable materials.

Remove all flammable materials from nearby the welder. If this is not possible, carefully cover all flammable material with fireproof material.

Also, it is recommended to keep fire extinguishers in the vicinity of this machine.

EXPLOSION WARNING:

This symbol shows that the gas contained in the cylinders is under pressure and can consequently explode if the cylinders aren't handled with the necessary cautions.

Protect any cylinder from excessive heat and mechanical stresses.
Install the cylinders in a vertical position and position them with a fixed support chain or with a proper cylinder case to avoid falls or knocks.
Maintain the cylinders far away from the welding place and from any electric circuits.
Use only regulation cylinders, pressure reducers, pipes and joints approved for the specific use; maintain them in good conditions together with the connected parts.

GAS AND FUMES WARNING:

The welding processes produce fumes and gas, which can be harmful and dangerous if inhaled.
Do not breathe any welding fumes.
Don't cover the grids and vents placed on the machine.
Carefully read the supplied instructions regarding the different types of metals, cleaning substances and shielding gases.
When possible, dedicate a room for the use of this machine. If the room is small, use it only if well ventilated. The shielding gas used to weld can gradually change the air causing sickness or death. Assure that the air in the room is safe to breathe.
Don't weld near any degreasing, cleaning or vaporization areas. The heat could react with the vapors to form very toxic and irritating gases.
Check that the metals do not have impurities that may produce fumes or gases during the weld process.

ELECTRIC WARNING:

This symbol shows dangerous voltages associated to the laser which may have sufficient power to cause electric risk. This symbol can also be found on the machine.
Touching electric parts under voltage can cause fatal damages or serious burns. The electric circuits are always under voltage when the machine is switched on. Incorrect installation and/or inappropriate wiring and grounding of the machine is dangerous.
Don't touch electric parts under voltage.
Remove the power plug from the machine before installing or performing any maintenance to the machine.
Ensure that the power cord is correctly connected to both the wall plug and to the back of the machine- according to this manual and any local standards and rules.

Switch off the machine when not in use.
Do not use any power cables that are damaged or that are not rated for this machine.
Ensure that the cables are not near any heat sources.
Use the equipment only when in perfect conditions. Immediately repair or change any damaged parts.

IMPORTANT WARNING:

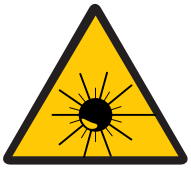
This symbol shows the need to pay special attention to suggestions or warnings included in this manual.

Chapter 2: Safety

This chapter discusses matters relating to the safety of the individuals using this machine.
When used properly, this laser welding machine is safe and reliable. It is necessary, however, that the operator is informed about the precautionary standards so as to avoid possible damages to themselves or to the machine.

LASER RADIATION

Laser radiation is an electromagnetic emission with micrometric wavelengths that are placed in the far infrared (CO2 laser), in the near infrared (laser at Nd-YAG, Nd-YVO4), in the visible (laser He: Ne or Argon), or in the ultraviolet (excimer laser) ranges. Laser radiation produced from the LZR machines is invisible and therefore can be very dangerous, especially dangerous to eyes and skin.

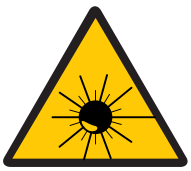


NOTE

Direct exposure of a laser beam can provoke irreversible damages to eyesight and vision

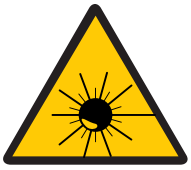
To avoid permanent damage to the operator and others nearby, it is necessary to follow some precautions.
Everyone in the near vicinity of the machine and who may be exposed to harmful levels of laser radiation, must be informed when the laser is active.

Due to the high power of the laser generated in this machine, there is a potential that the laser may reflect off of welded pieces. If this happens, the reflected light can be potentially dangerous for the eyes and the skin. As stated previously, the laser generated in the LZR welder is invisible, and therefore it is not easy to identify if the laser is reflecting off the piece, nor is it easy to know where the laser may be travelling once reflected.



NOTE

It is crucial to be protected from the reflected light beams, because they can be sufficiently intense to create permanent damages to the eyes or to the skin



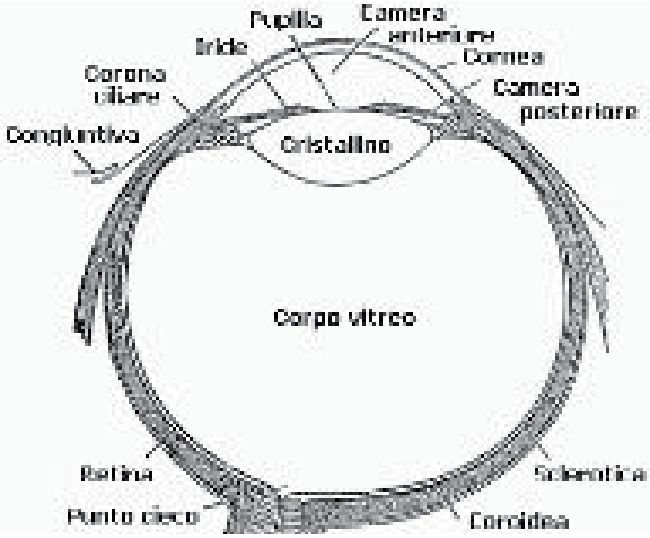
NOTE

The laser generated here is a class IV. The risks associated with class IV lasers include not only the risk of direct or reflected radiation, but also of diffused radiation. These lasers can present a remarkable risk for the skin and eyes, as well as a fire risk when working near flammable materials

2.1: LASER RADIATION ABSORPTION

The human tissue absorbs electromagnetic radiation in different ways, depending on the wavelength of the radiation. Eyes and skin accept some wavelengths, while refracting others. Specifically relating to the eye, the cornea and the lens both allow lasers within the 400-1400nm wavelengths to pass through and reach the retina. The wavelength of the LZR machines is 1064nm, and therefore it will pass through unobstructed to the retina.

In regards to skin, the absorption of the radiation will vary from one person to the next, regardless of the wavelength. Therefore, seeing as the absorption may vary, the exact and specific details are hard to state regarding the maximum tolerable exposure levels.



Picture 1: Eyeball

The extent of damages due to radiation absorption depends on the wavelength. The short wavelengths (ultraviolet UV-C 180-280nm, UV-B 180-280nm, UV-A 315-400nm) generally provoke and cause photochemistry effects: cataract or opacification of the lens in the eye, blackening or reddening for the skin. Major wavelengths (infrared: IR-a 780-1400nm IR-c 3000-10 E6nm) generally provoke thermal effects: retinal detachment and photocoagulation for the eye, burning for the skin.

The extent of the damage depends on the quantity of absorbed radiation and on the power and intensity of the radiation source.

2.2: CLASSIFICATION AND DANGEROUSNESS

Laser classifications are based on the laser's ability to cause damage to people. All lasers are classified according to their output, from Class 1, which describes lasers which are of such low power that they represent no hazard at all, to Class 4 lasers which are always hazardous.

The LZR lasers belong to the class IV and can produce risks, not only from direct or reflected radiation, but also from diffused radiation. For these reasons users must take all precautions to assure that safety guidelines are established and followed. In addition, the operator must be informed of the risks deriving from the exposure to laser radiation, and he/she must be provided with the proper personal protective equipment, potentially consisting of certified protection glasses for the laser radiation.

2.3: RADIATION VISION CONDITIONS

The laser beam is highly collimated and intense as it is generated and leaves the internal resonator. If this collimated beam were to pass through to a person's retina, this focused beam of high-dense power can be very dangerous. Conversely, if the beam becomes divergent and spreads out, then the beam is much less dense and therefore less dangerous. Below are some different scenarios related to viewing the laser beam.

DIRECT VIEW OF A LASER BEAM

This type of exposure is the most dangerous and can occur through the opening to the weld chamber, or if the optics have been removed.

DIRECT VIEW OF A REFLECTED LASER BEAM

This can happen anytime the laser beam reflects off a reflective surface. A reflected beam can be equally dangerous as a direct view of a laser beam.

DIRECT VIEW OF A LASER BEAM EXITING A FIBER OPTIC

This can happen anytime the optical fiber is connected to the resonator. The beam can be dangerous even if viewed from considerably far away.

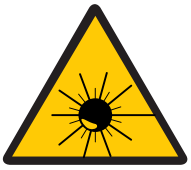
DIRECT VIEW OF A LASER BEAM AFTER FOCUSING OPTICS

This can happen if the beam is not absorbed at the end of its path. This beam can be dangerous even if viewed over considerable distances. Filters and protective glasses can guarantee the safety for short exposures, on the condition that they are well dimensioned and certified to be safe for the relating wavelength.

VIEWING A DIFFUSED LASER BEAM AFTER FOCUSING THE OPTICS

This happens when using this machine. Viewing the diffused beam is not dangerous over a short period of time, and viewing through a filter and lenses can guarantee safety, even during long exposures..

THE NOMINAL OCULAR HAZARD DISTANCES (NOHD) FOR THE LZR LASERS IS LESS THAN 15M FOR DIRECT OR SPECULAR REFLECTED RADIATION, AND LESS THAN 0.5M FOR THE DIFFUSED REFLECTION. ONLY A SUITABLE WELD LENS WITH OPTICAL DENSITY GREATER THAN 4 CAN SUFFICIENTLY PROTECT THE SIGHT FROM THE ACCIDENTAL VIEWING OF THE HARMFUL LASER RADIATION.



NOTE

Always use certified eye protection.

2.4: RISKS FOR THE EYES AND THE SKIN

The cornea and the retina can be burned and damaged, possibly irreversibly, if exposed to an intense laser radiation, regardless of duration. Also, exposure to a less intense laser radiation over a long duration, can result in similar dangerous and possibly irreversible outcomes. This danger is completely realistic in any case of direct vision of any laser beam.
Skin can also burn, if submitted to the focused direct radiation. In addition to focused direct exposure, exposure to ultraviolet radiation over time can also cause negative consequences to skin.

2.5: SAFETY GENERAL PRESCRIPTIONS

We recommend developing a Standard Operating Procedure (SOP) to follow when operating and servicing the machine. A written copy of this procedure should be easily accessible to any operator using the machine. Training and review of the process over time is recommended as well to ensure:

- Operators are familiar with the system functioning procedures
- Operators are aware of the dangers related to the exposure to radiation, and the biological effects that could result from exposure to the skin and eyes
- Operators understand the need to use Individual Protection Devices (IPDs)

Chapter 3: Seals

There are various seals in and on the LZR machines. These seals must not be, for any reason, broken or removed without authorization from Sunstone / Orion Welders.

NOTE

Removing or breaking certain seals on this machine can have immediate and negative effects on the weld system.

ATTENTION

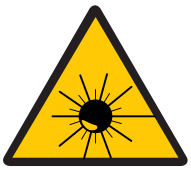
The manufacturer denies all responsibility for the nonconformance use of this machine.

It is prohibited to start the equipment before the machine is declared in conformance with the actual directives.

NOTE

Opening the laser and accessing the internal parts of the equipment is allowed only to authorized personnel who are qualified, trained, and aware of the potential electric risks.

Sunstone / Orion Welders denies all responsibility for any interventions on behalf of untrained personnel.



NOTE

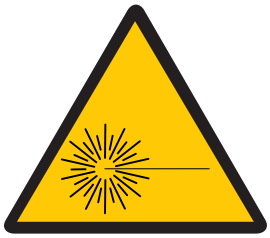
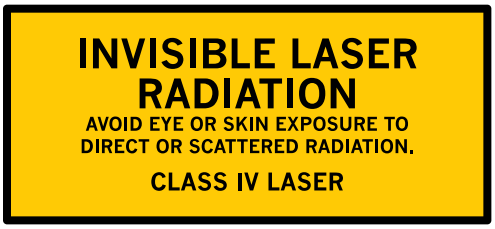
Access to the internal parts of the laser resonator is allowed only to authorized personnel who are qualified, trained, and aware of the optical risks.

Sunstone / Orion Welders denies all responsibility for any interventions on behalf of untrained personnel.

3.1: SAFETY LABELS

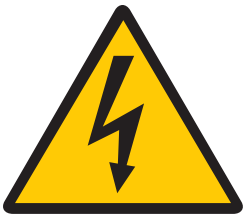
The labels and the stickers are applied on the equipment in conformance with both the FDA and European safety rules. They must not be removed or damaged. For possible changes you can contact Sunstone / Orion Welders.

LASER WARNING LABELS:

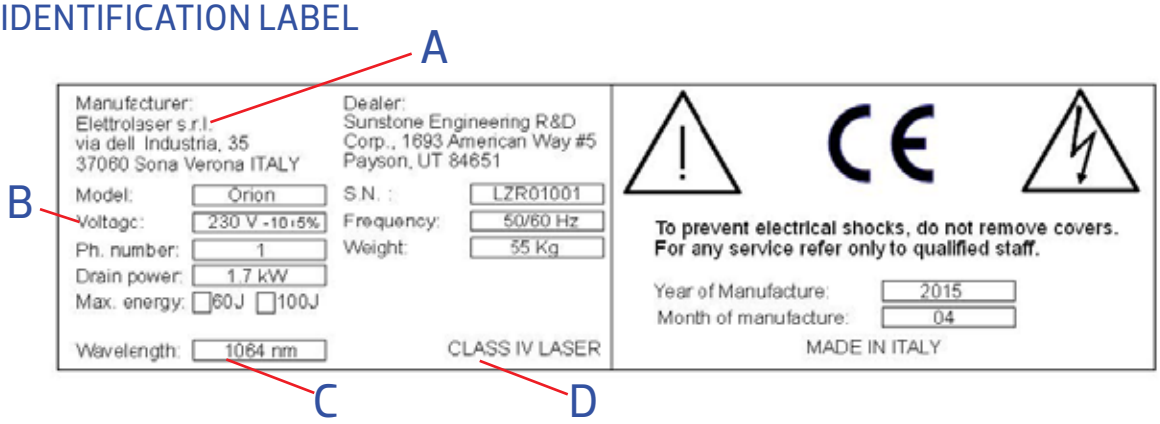
Label	Shape and type	Sizes (mm)
Laser N. 1	Laser warning 	Side 22 Side 50
Laser N. 2	Laser class information 	104 x 52 52 x 26
Laser N. 3	Radiation information 	104 x 52 52 x 26
Laser N. 4	Laser exposure information 	56 x 40

Laser N.5	Laser technical data **LASER YAG DI CLASSE 4** E = 140J λ = 1064 nm t = 0.5 ~ 20ms P = 75 W CEI-EN 60825/1 2003	104 x 25
Laser N.6	Laser opening information **LASER APERTURE**	104 x 26

ELECTRIC WARNING LABELS

Label	Shape and type	Sizes (mm)
Electric N.1	Electricity warning 	Side 22 Side 50

PRODUCT IDENTIFICATION LABEL



This label shows the data about the manufacturer (Ref A), the electric specifications (Ref B), the generator power (Ref C) and the risk class of the laser machine (Ref D).

3.2: LABELS POSITIONING

The Laser warning labels are placed on the machine in the following ways:

Picture 2: Outside laser warning labels

Picture 3: Internal laser warning labels

The Laser warning labels are placed on the backside of the machine in the following way:

Picture 4: Backside laser warning labels

Chapter 4: Technical Data

4.1: LASER SPECIFICATIONS

SPECIFICATIONS	DESCRIPTION
Electric Input VAC	110V or 230V
Electric Power Phase	Single Phase
Electric Frequency Hz	50-60 Hz
Average Energy Consumption W	100 W
Laser Crystal Type	Nd:YAG
Wavelength nm	1064 nm
Weld Energy joule	0.5-200 J
Weld Length msec	0.5-20 msec
Repetition Frequency Hz	0.5-30 Hz
Peak Power KW	12 KW
Duty Cycle	80%
Weld Spot Sizes mm	0.9-1.8 mm
Maximum Argon Gas Pressure bar	1.5 bar
Cooling Type	Liquid
Fuse	25 AT
Weight lbs (kg)	77 lbs (45 kg)
Sizes - L x W x H- in (cm)	30x21x22 (50x90x56)

4.2: OTHER DATA

SPECIFICATIONS	DESCRIPTION
Work Environment Temperature °F (C)	17-35
Maximum Humidity during Operation %	65
Noise Level dB(A)	<70
Recommended Argon Purity %	99.8-99.996
Shield Gas (Argon) Consumption l/min	2-4 con 1.5 bar

Chapter 5: Installation

Position the Combo 200 power supply in a strong and sturdy area that is able to support the weight of the machine (approximately 73 lbs or 33 Kg). Make sure that all four support wheels of the laser are resting firmly on the floor. Lock the wheels once the power supply is in the desired location.

Picture 5: Machine resting on floor

If using shielding gas, connect it to the gas inlet connection. Do not exceed 1.5 bar of pressure to the shielding gas connection. (Picture 6).

Picture 6: Protection gas connection and air connection

NOTE

Do not exceed 1.5bar of pressure to the shielding gas connection.

Connect the power cable to the back of the machine then to AC power. (Picture 7)

Picture 7: Power cable connection

Connect the foot pedal to the back of the machine (Picture 8)

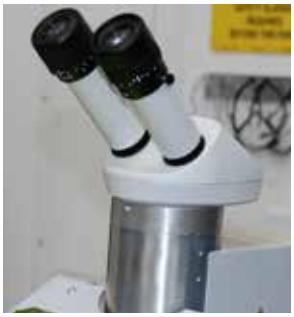
Picture 8: Foot pedal

ATTENTION:

Use only the cables and equipment provided with the machine. Do not substitute or change any cables or plugs. If needed, contact Sunstone / Orion Welders before making any changes

Remove the eyepieces from their containers and fasten them to the microscope on the articulating arm. Finger tighten the set screw to hold them in place.

For steps on aligning the crosshairs, see chapter 7.3.



Picture 9: Eyepieces Mounted on Ocular tubes

NOTE

As a general practice, to streamline the alignment of the crosshair, the eyepiece with the crosshair should be placed in the right ocular tube.

5.1: ADDING WATER

NOTE

During the initial setup and installation, extra steps are needed to get the machine functioning. The next steps are only important during the initial setup, or after changing the water in the machine.

Steps to install water correctly:

1. Insert the plastic connection equipped with the machine (Fig. 1) to the female connector at the bottom of the rear panel. (Fig.3)
2. Remove the red plug from the upper connector tube. (Fig.3)
3. Use the funnel equipped with the machine to refill the tank. (Fig.2, Fig.4)
4. Continue to fill the machine until you see water coming out of the upper connector of the tank (Fig.4).
5. Remove the plastic connection from the female connector (Fig.1), but do not replace the red plug. To minimize the amount of spilled water, place you thumb over the open end of the tube while removing it from the connector. (Fig 3).
6. Turn on the machine by flipping the switch on the back of the machine. Do not turn the key switch.
7. Push the internal joystick down for 5–6 seconds, until you hear the fans and the pump turn on. This will force the air out of the system.
8. After a minute, turn the key and press start. If an error message appears saying: "ERROR 02 TEST FLUX H20" then you will need to turn off the machine and repeat steps 6 and 7.
9. If you do not see the "ERROR 02 TEST FLUX H20" error, your machine is ready to use. The final step is to plug the upper connector with the red plug (Fig.2, Fig.4).

FIG. 1

FIG. 2

FIG. 3

FIG.4

5.2: FIRST SWITCHING ON

Ensure that the emergency stop button is disengaged and not pushed in. (Picture 10)

Picture 10: Emergency stop button

Turn the switch on the left side of the machine to the on position (Picture 11)

Picture 11: Power switch

Insert the key and put it in the central position. (Picture 12)

Picture 12: Switching on key

After turning the key, a "start" button should appear. Pressing start will allow you to adjust parameters and make welds.

Picture 13: Combo 200 touch screen interface

NOTE

Do not proceed with the installation if the display does not show as described above. If you encounter any problems or errors, consult chapter 8 of this document, or contact Sunstone / Orion Welders.

At this point the operator will be able to:

- Select the welding parameters and begin welding.
- Load a previously saved setting and begin welding.

5.3: WELDER SWITCHING OFF

ATTENTION:

Before flipping the power switch, make sure to always turn the key to the locked position. This will allow the microprocessor to drain the internal capacitors.

Turn the key to the Locked position and wait for the screen to display the message: "LASER BLOCKED."

Picture 14: Power switch

When the message appears, then tirn the power switch on the left of the machine to the off position.

ATTENTION:

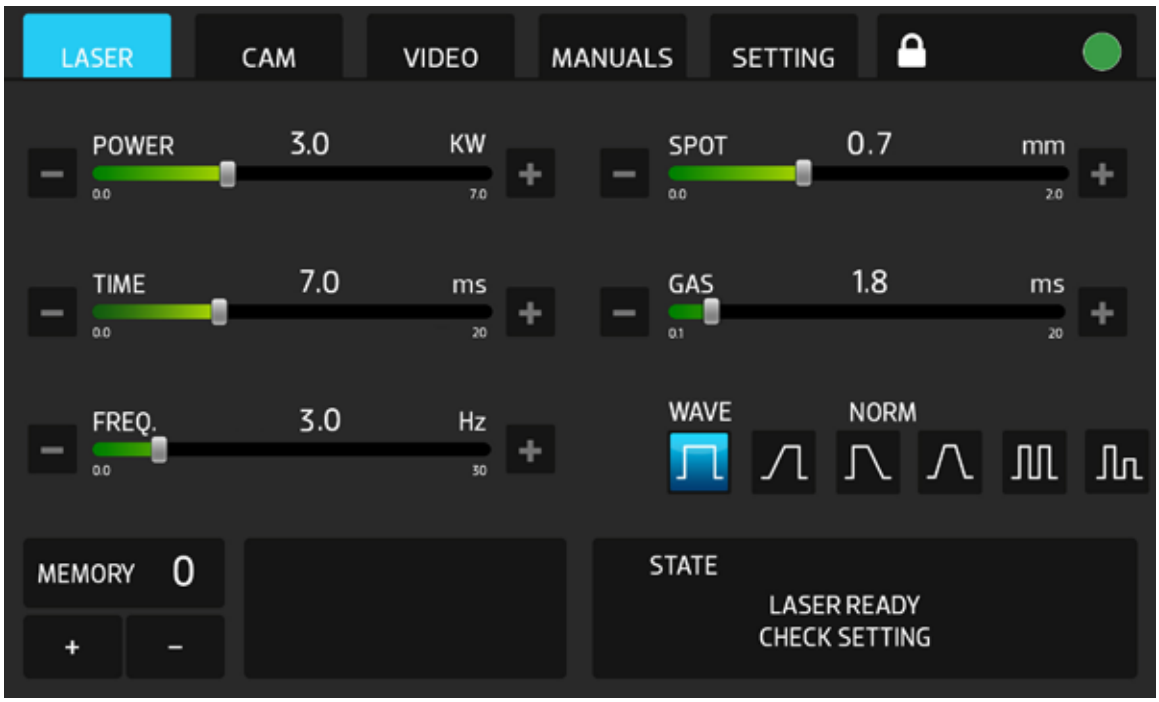
When the welder is not being used, ensure that the key is removed from the machine.

Chapter 6: Controls

The Orion LZR laser welder has a touchscreen interface. To make changes to the welder's parameters and settings can be achieved by tapping a button or moving a slider bar. In addition to the touchscreen controls, the welder also has a joystick inside the weld chamber. When using the joystick, the selected parameter will be outlined with an orange box. By moving the joystick, users can cycle through the parameters and also make changes to the selected parameter.

6.1: DISPLAY TOUCH SCREEN CONTROLS

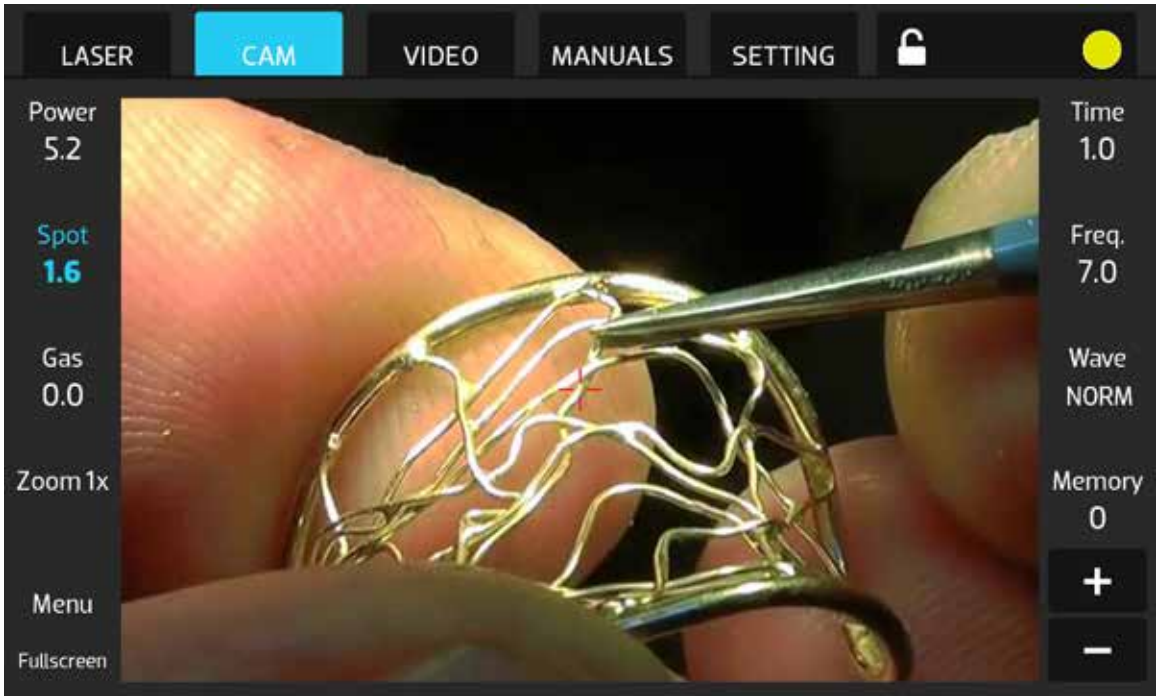
Picture 17: Display Touch screen



Weld Parameters	Description
Power	The power bar is used to select the power of the weld.
Time	The time bar is used to select the duration of the weld.
Frequency	The frequency bar is used to select the rate at which the welds are made. Selecting "0" will cause the welder to weld only when the foot pedal is initially pressed. Each subsequent foot pedal press will cause a weld. With a setting as low as 0.5 Hz or as high as 30 Hz, the welder will continue to weld at that rate per second for as long as the foot pedal is pressed. To stop the welds, simply lift your foot off the pedal. In some cases, the slider bar may automatically adjust to a lower value that what is selected. This may occur when either the power and/or time value is too large to handle a high repetition rate. The frequency will automatically adjust to the highest possible value given the selected power and time. If changes are made to either the power or the time, slide the frequency bar up to ensure that the welder is set to the maximum weld rate.
Spot Size	The spot size bar is used to select the weld spot diameter. The minimum setting is 0.2mm and the maximum setting is 2.0mm.
Gas Flow	The gas flow bar is used to select the amount of time that protective shield gas (argon) is allowed to flow after the last weld is made. A value of "0" will deactivate the gas flow. If the value is set between 00 (min) and 00 (max).
Waveform	There are 6 different waveforms to choose from. Each waveform has slightly different characteristics. The available waveforms are: Normal (Square), Slope+ (Upslope), Slope- (Downslope), BRD (both up and down slope), Pulse (2 square welds), and FDC (2 square welds, one at 50% power). The most common waveforms are Normal, Slope+, and Slope-.
Memory	This box shows the currently selected saved settings. Pressing the "+" and "-" buttons below the memory number will cycle through the saved settings. It is possible to name each saved setting, and the saved name will be displayed in the box to the right of the memory boxes.
Memory Box	This box will display instructions, status conditions, system settings, warnings, and error messages.

MANUALS

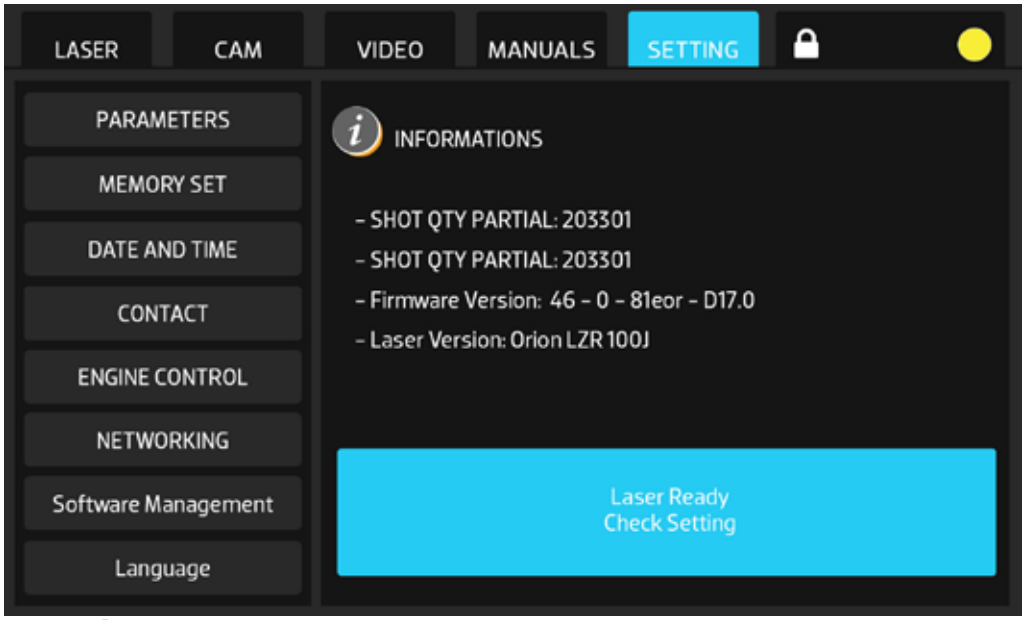
The Manuals screen provides on-screen documentation and instructions for users to read and reference when using the welder.



Picture 15: Manuals

SETTINGS

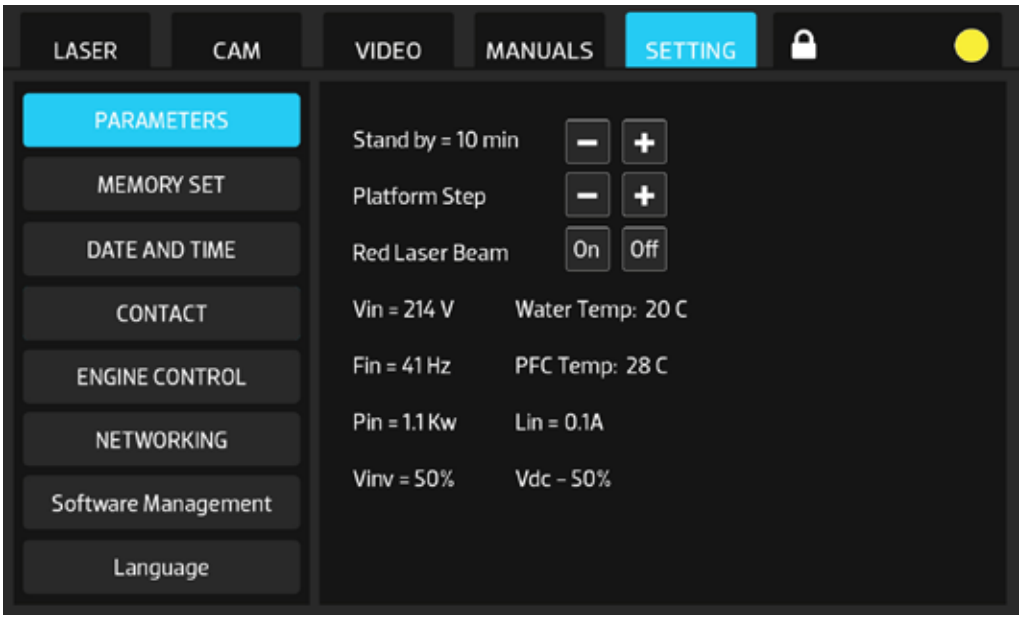
The Settings screen has multiple tabs with different contents. The main settings screen displays the weld counter, firmware version, and welder model number. The system status box is also visible on this page.



Picture 16: Settings Tab

SETTINGS: PARAMETERS

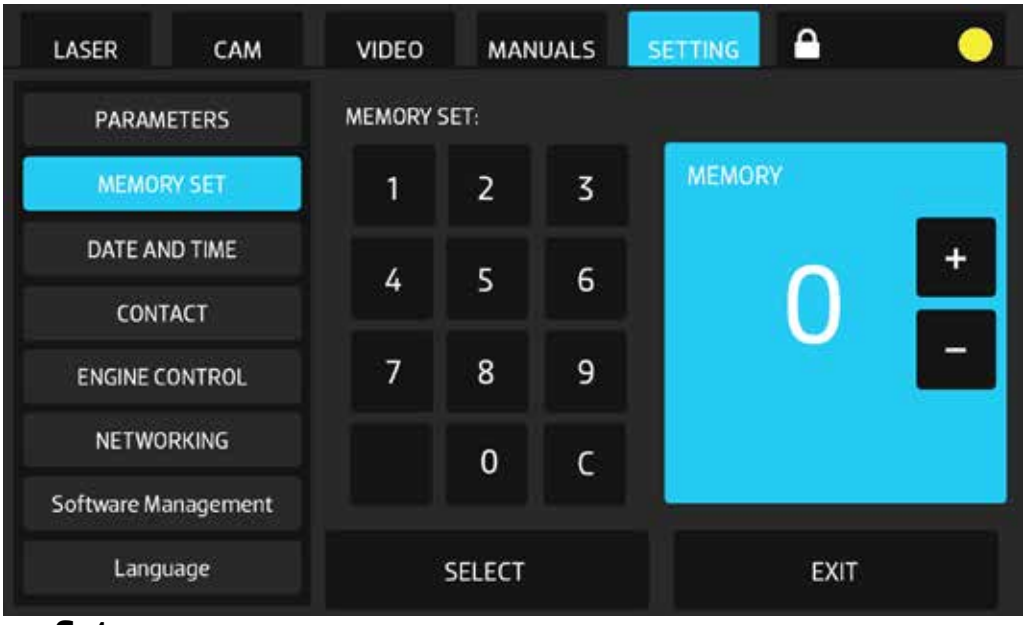
The parameters tab displays various parameters including: the standby time, up/down movement of the optional motorized pedestal stand, option to turn on/off the red aiming laser, and other temperature and setting readouts.



Picture 17: Parameters

SETTINGS: MEMORY SET

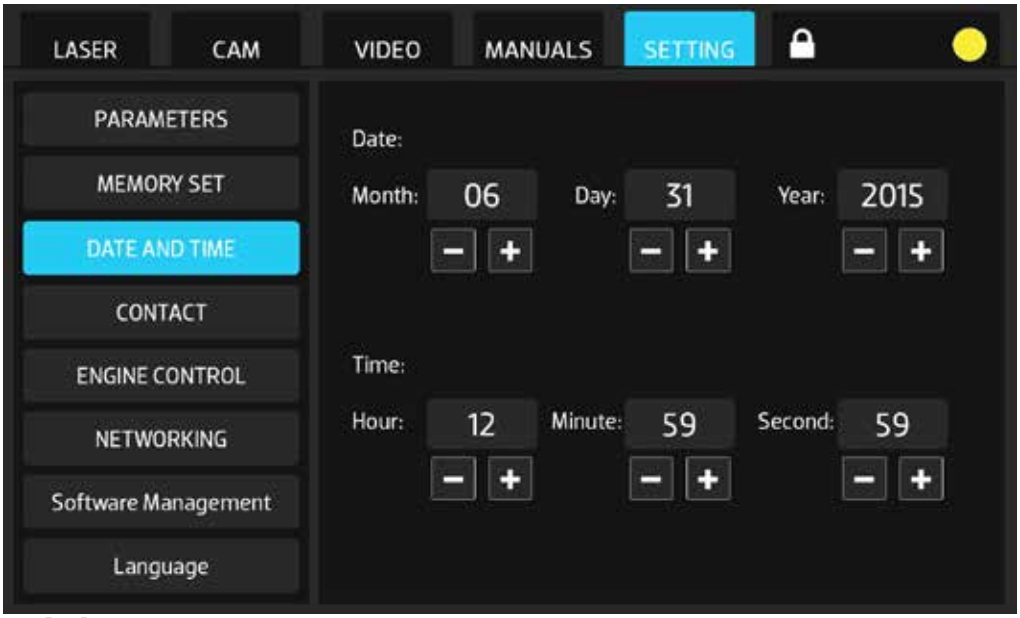
The Memory Set tab allows you to quickly load any saved setting by number rather than scrolling through one by one.



Picture 18: Memory Set

SETTINGS: DATE AND TIME

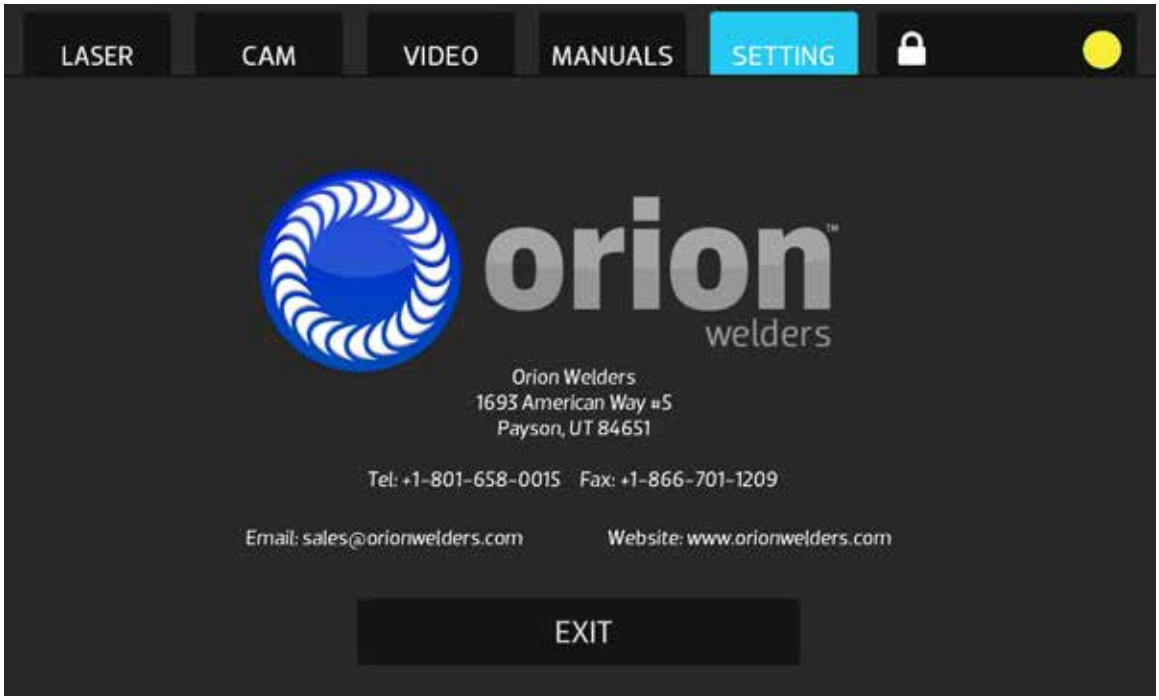
The date and time tab allows users to enter in the current date and time settings.



Picture 19: Date and Time

SETTINGS: CONTACT

The contact tab displays all the contact details for Orion Welders.



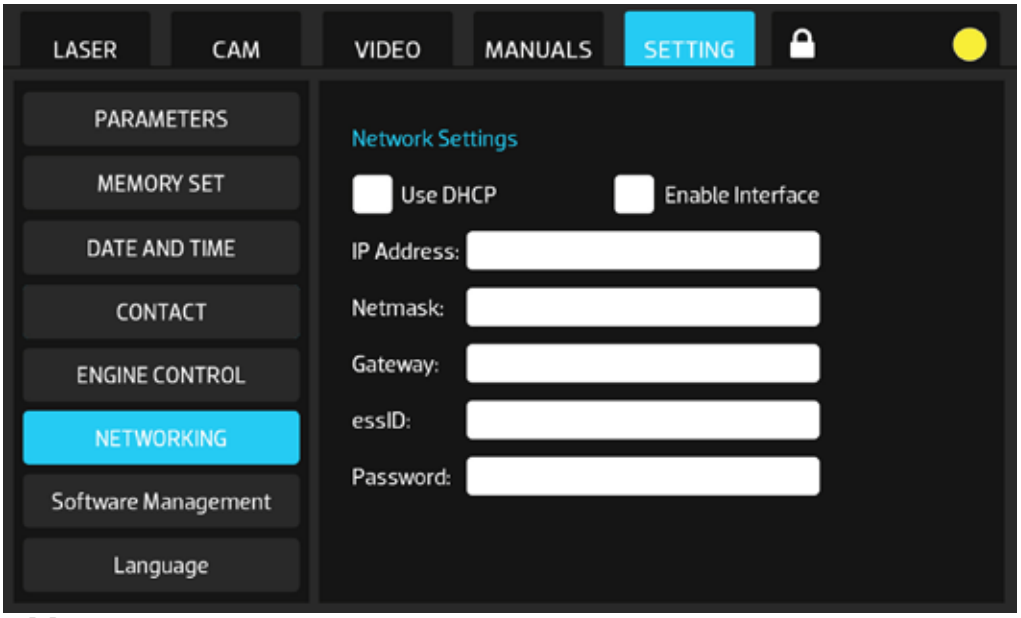
Picture 20: Contact

SETTINGS: ENGINE CONTROL

The engine control tab can be used when the welder is equipped with optional accessories designed for automated welding. For example, a rotary ring clamp can be purchased and used to make uniform weld beads around an object such as a ring or tube. Contact Orion Welders with any questions regarding this option.

SETTINGS: NETWORKING

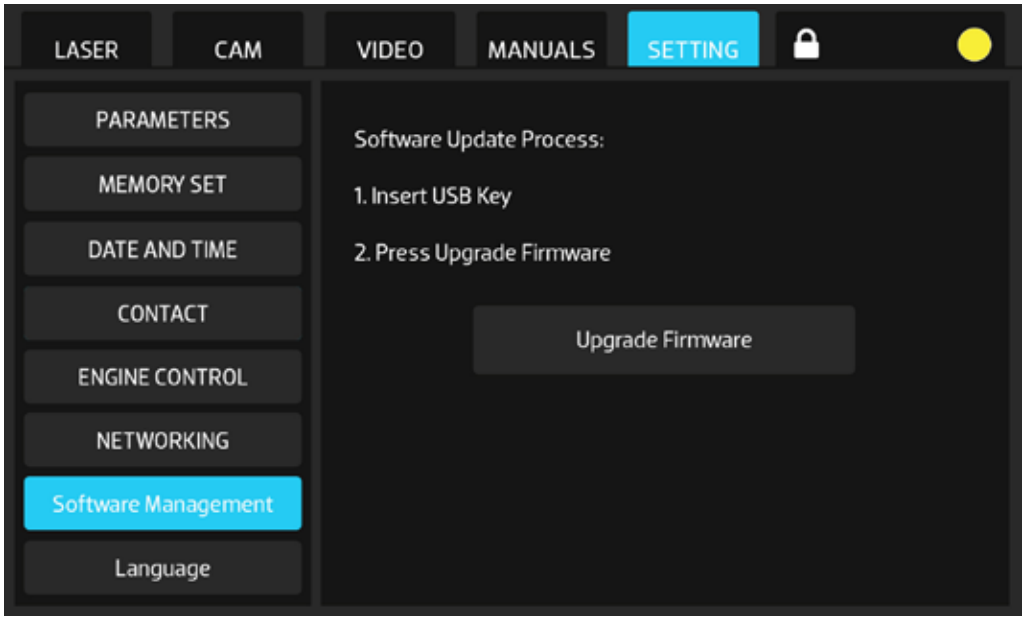
The networking tab can be used to connect the welder to a LAN, which in turn can allow users to control the welder remotely. To view and control the screen remotely, users will need to download and install the VNC software available at www.realvnc.com.



Picture 21: Networking

SETTINGS: SOFTWARE MANAGEMENT

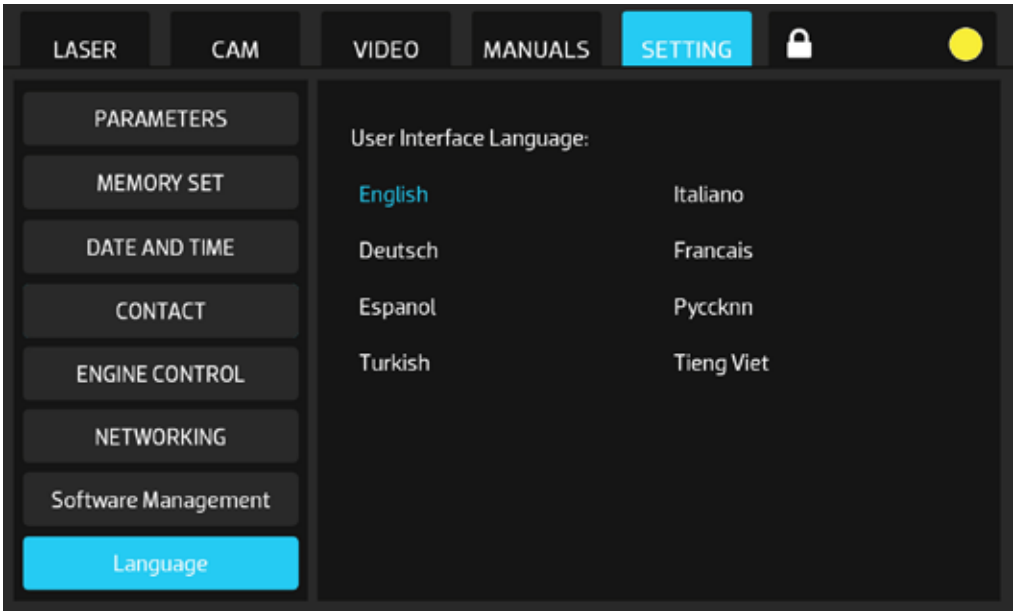
The software management tab can be used to update the welder's software.



Picture 22: Software Management

SETTINGS: LANGUAGE

The language tab can be used to change the language of the interface. Available languages include: English, Spanish, Italian, German, French, Russian, Turkish, and Vietnamese.



Picture 23: Language

Chapter 7: Maintenance

ATTENTION

Do not ever open the laser case and panels. Even if the machine is switched off, there are some internal parts that may still be subject to live voltage, and therefore there may be the possibility of electric shock.

ATTENTION

Any required maintenance on the laser's optic rail and trajectory path, must be performed EXCLUSIVELY by Sunstone / Orion Welders or an agent authorized by Sunstone / Orion Welders.

In order to keep the machine in a safe and optimal working condition, ensure that the following safety measures are followed:

- Change the leather protection strips that cover the entrance to the weld chamber if there are ever any signs of wear or damage.
- If the green-tinted viewing glass for viewing inside the weld chamber should ever break, this must be replaced only with approved spare parts. Regular glass or plastic cannot be used as these do not provide safety from the laser emission.
- Do not ever remove the filter inserted in the microscope lens.
- Do not ever insert large mirror-like surfaces (mirrors, aluminum sheets, chrome plated items) into the weld chamber. These mirror-like surfaces could cause dangerous reflections of the laser beam inside the weld chamber.

The following maintenance items can be performed by the user since they do not create any risk of personal injury.

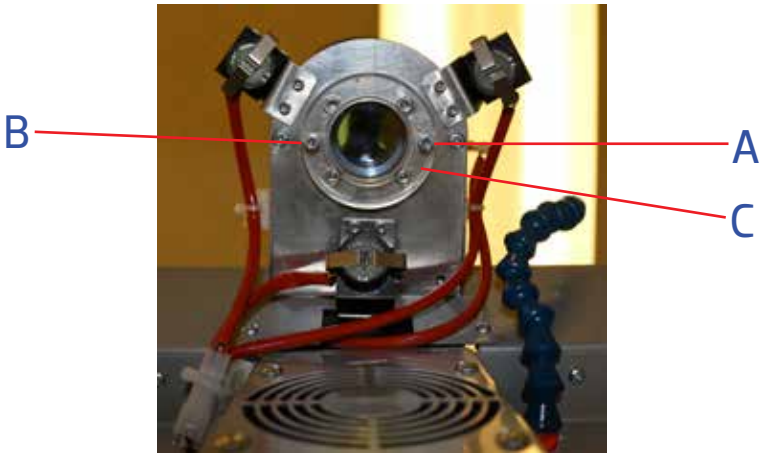
7.1: CLEAN OR REPLACE THE PROTECTION LENS

Over time, the protective glass lens may become dirty, and can cause a reduction in amount of weld energy that gets delivered. If the lens does become dirty or contaminated with metal slag, it will need to be cleaned and/or possibly replaced.

Periodically check the lens of the microscope that is found inside the weld chamber. This special glass is treated with an anti-glare of 1064 nm. The lens is held in place with two screws at the bottom of the optic assembly.

To change or clean the protective lens:

1. Unscrew the two screws (Ref. A and B) seen in the picture below.
2. Disconnect the housing unit (Ref. C) from the optic assembly and remove the lens.
3. Clean the surface with a soft and non-abrasive cloth.
4. Do not try to scrape off the metal slag that may be deposited on the lens. This could potentially remove some of the protective filter material on the lens.
5. Reinsert the lens into place and carefully reposition everything back into place.



Picture 24: Changing or replacing the protective lens

ATTENTION

It is recommended to keep this lens clean. If it becomes dirty with metal deposits, it is recommended to replace the lens. There is possible that the metal slag deposits could heat up while the laser is in use, and the lens could crack or break due to the heat.

7.2: REALIGNING THE CROSSHAIRS

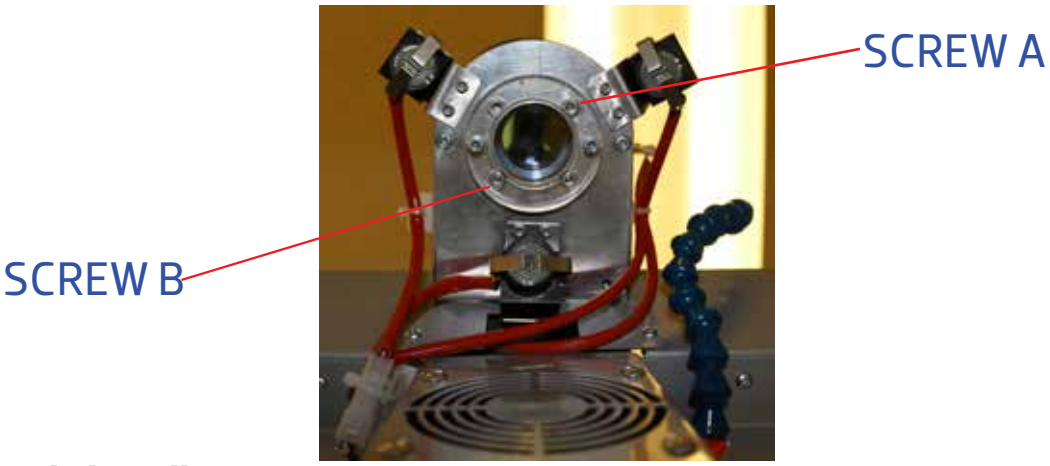
The welding crosshairs must be aligned correctly in order to be able to make accurate and precise welds. The crosshairs can become out of alignment anytime the welder is moved or lifted. Also, any impact to the microscope could also affect the crosshair alignment.

Aligning or realigning the cross hair is a simple process that any user can perform.

ATTENTION

Make sure that your hands and other objects are free and clear of the path of the laser beam when testing the crosshair alignment. If the crosshairs are mis-aligned, the beam may travel to unexpected locations inside the weld chamber.

To set the cross alignment it is necessary to make slight adjustments to two allen screws inside the chamber (Ref. A and B below). These screws require a 3 mm allen key.



Picture 25: Cross hair realignment

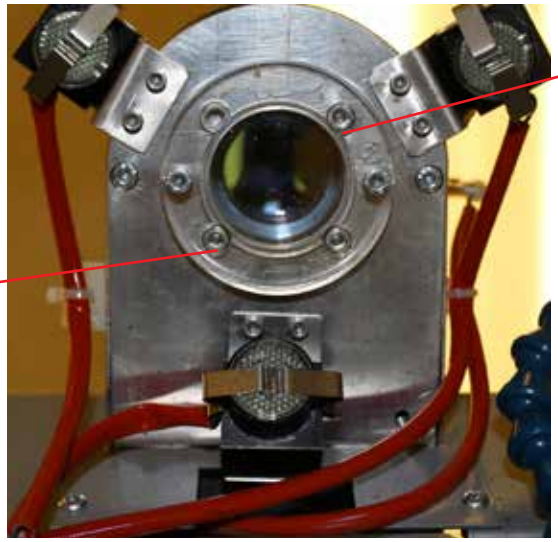
Before making any adjustments, make sure the stereomicroscope is firmly attached in place. Also, make sure that the eyepieces are set to the '0' position before making any alignment changes.

Picture 26: Fastening of the Stereomicroscope

The easiest way to align the cross hairs is to place a flat metal piece inside the chamber so that it is in focus through the microscope. Then perform low-powered welds one at a time to see where the laser is being directed onto the metal piece.

Screw A (below) adjusts the vertical (up/down) positioning of the laser. Turning the screw in a clockwise direction will raise the weld spot location. Screw B adjusts the horizontal (left/right) positioning. Turning the screw in a clockwise direction will move the weld spot location to the right. Only adjust one screw at a time. Also, typically only small adjustments are needed. A ¼ turn of the screw will result in a large change in the weld spot location.

Continue turning these screws until you are able to make the weld spot location fall in line with the crosshairs.



Picture 27: Turning Screws

ATTENTION

Always use small adjustments when aligning the crosshairs, and ensure that the test piece you are welding on stays stationary inside the weld chamber.
DO NOT ever completely unscrew either of these adjustment screws.

7.3: PERIODICALLY CHANGE THE COOLING WATER

It is necessary to periodically change the internal refrigerating liquid (distilled water or demineralized water). The purpose in changing the water is to avoid the formation of micro alga inside the cooling system that could reduce or block the thermal exchange efficiency.

ATTENTION

It is advisable to change the cooling water at least every two years, and in particular before or after any periods of heavy usage.

7.4: HOW TO REMOVE THE WATER

1. Insert the plastic connection equipped with the machine (Fig. 1) to the female connector at the right bottom of the rear panel. (Fig.3)
2. Remove the red plug in upper position and let the water going out. (Fig.3)

7.5: HOW TO REFILL THE COOLING SYSTEM – (use de-ionized water)

1. Insert the plastic connection equipped with the machine (Fig. 1) to the female connector at the right bottom of the rear panel. (Fig.3)
2. Remove the red plug in upper position. (Fig.3)
3. Use the funnel equipped with the machine to refill the tank. (Fig.2, Fig.4)
4. Continue to fill the machine until you see water coming out of the upper connector of the tank.
5. Plug the upper connector with the red plug and remove the plastic connection from the female connector.

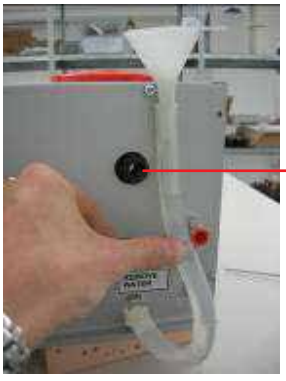
FIG. 1

FIG. 2

RED PLUG

FEMALE CONNECTOR

FIG. 3



UPPER CONNECTOR

FIG.4

Chapter 8: Error Messages and Troubleshooting

The table shows information regarding the various error and messages that may appear on the welder.

ER.N°	MESSAGE	CAUSE	REMEDY
01	Error Simmer	The laser lamp is not switching on.	A. Check the fuse. B. Contact Sunstone / Orion Welders
02	Not Working Refrigerating Liquid (Error 02 Test Flux H20)	The refrigerating liquid is not flowing inside the cooling pipes. A. The pump is not working. B. The water is dirty and needs to be changed.	A. Make sure there is water in the machine, and that the water level is full. This might be a good opportunity to change the water. B. Before turning the key switch, remove the red plug on the back of the unit and push the Joystick down for 5-6 seconds to force start the water pump and clear any air in the system. This process may need to be repeated 2-3 times. C. Contact Sunstone / Orion Welders.
03	Refrigerating Liquid High Temperature	The refrigerating liquid has reached the temperature mark of 55°C. Possible causes: A. High work cycle of the machines. B. Insufficient liquid inside the tank. C. Faulty or not working cooling fans. D. Too much dust or dirt on the heat pump.	A. With the machine turned on, wait 15 min until the error disappears. B. Make sure there is water in the machine. Add water if needed. C. Make sure the fans are working. If not, contact Sunstone Engineering. D. Blow some compressed air into the machine to try and remove any dust or dirt that may have settled inside. Do not, however, open the case without first contacting Sunstone Engineering.

ER.N°	MESSAGE	CAUSE	REMEDY
04	High Electronic Temperature	The internal thermostat inside the power electronic has noticed an high temperature: A. High work cycle. B. Dust or dirt left on the cooling fans. C. Non-working cooling fans.	A. Let the machine rest for 15-20 minutes and wait for the error to disappear. B. Blow some compressed air into the machine to remove any dust or dirt that may have settled inside. C. Contact Sunstone Engineering.
05	Relay Input	The machine doesn't weld.	A. Check the connection to the power supply. B. Change the power supply.
06	Low Capacitor Voltage	The capacitors are not charging. A. The generator is broken.	A. Contact Sunstone Engineering
07	Blocked Optical Motor	The motor that sets weld diameter doesn't move.	A. Switch off the machine and switch on again. In this way the machine will perform again the motor check. If the error persists contact Sunstone Engineering.

8.1: Other Anomalies

PROBLEM	RESOLUTION
The machine switches on but is not in the START position	· Verify the key position inside the weld chamber.
The display shows the parameters but the laser doesn't shoot.	· Check that the foot pedal is connect to the machine.
The microscope shutter closes, but no weld is made.	· The power and time settings are too low. · MS5 zoom drum is not in the correct position. · Dirty position glass. (see Chapter 7)

PROBLEM	RESOLUTION
The lights inside the welding chamber do not turn on.	· Check the light adjustment knob inside the weld chamber and make sure it is not in the off posi-tion. (Ref. Fig 4) · Check the fuses.
Smoke created from the weld rises towards the microscope and impairs vision of the workpiece.	· The filter on the internal fan of the welding cham-ber is too dirty. · The fan is not working; check the fuse.
The shielding gas doesn't flow when the pedal is pushed.	· Check the home screen to verify the gas flow is turned on. · Check that the input pressure is not higher than 2 Bars. · Check the flux regulator insidethe weld chamber. · Verify that in gas tubing is not kinked or blocked.
I try to blow compressed air from the nozzle, but no air comes out.	· Verify that in gas tubing in not kinked or blocked. · Too low pressure.
The laser doesn't turn on.	· Verify that the switch placed on the back is in ON position. · Verify that the emergency stop switch is released. · Check the fuses. · Verify the welder is plugged in to an active power source.

When replacing fuses, ensure that the replacement fuse is of the same rating and same type. It is always recommended to have a fuse installed when using this machine.
Contact Sunstone Engineering with any questions.

Chapter 9: Safety Systems

This laser welder is equipped with a high number of safety system checks to avoid any radiation leaks from the machine.

Here follow the list of these systems and their functioning description:

1. Resonator shutter
2. Microscope shutter
3. Microscope infrared filter
4. Welding room infrared filter
5. Weld chamber opening (leather strip curtain)

9.1: RESONATOR SHUTTER

Description	This device is formed from a small flag controlled by an electromagnet and it is placed inside the laser resonator. The shutter disconnects the laser inside the resonator when the welder is in STAND-BY mode.
Purpose	The purpose of this device is to prevent the generation of undesired laser radiation.
Functioning	When the power switch is turned on, and key is still not turned on, the resonator shutter is engaged. When the key is turned on the shutter is disengaged. When the key turned off, the shutter is engaged again.

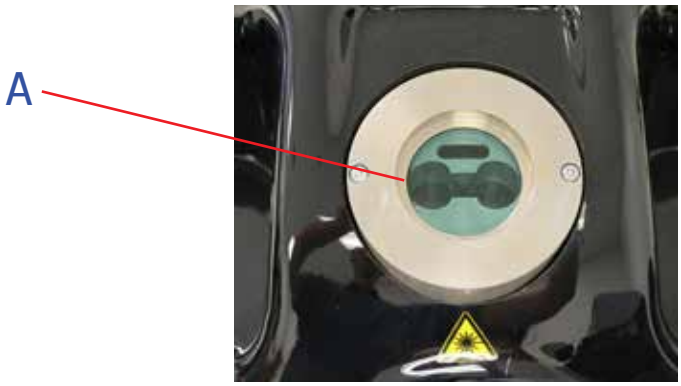
9.2: MICROSCOPE SHUTTER

Description	The microscope shutter is a liquid crystal filter (LCD) that dims completely when a regulated voltage is supplied. It is placed between the 45° mirror and the focus lens of the microscope. The shutter obstructs the operator's vision through the microscope at the precise moment that the laser weld is initiated.
Purpose	The purpose of this device is to prevent the operator from exposure to the visible radiation light flash that may result from the weld being formed. This is second of three safety systems in place that are working each and every time a weld is made.

Functioning	This shutter is normally in an opened state and is independent from the previously mentioned resonator shutter. This allows the microscope to be used at any moment. After the key has been turned to 'start', the shutter will engage under the following steps: · The foot pedal is pressed. · The microprocessor responds by engaging the shutter. · The microprocessor turns on the laser lamp. · The shutter remains engaged as the lamp is on, and then also remains engaged for a short time after the lamp is turned off while the weld puddle cools and solidifies. · The shutter will disengage allowing the operator to see through the microscope again.

9.3: MICROSCOPE INFRARED FILTER

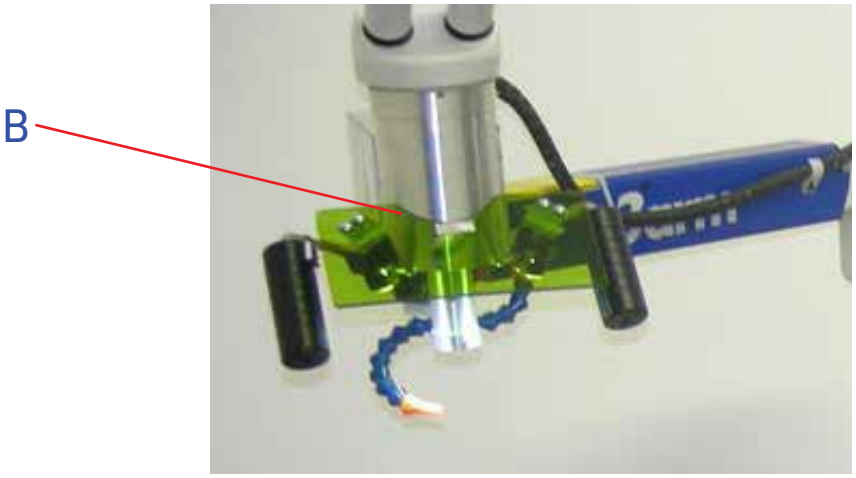
Description	This filter is an optical glass designed to filter laser radiation of 1064nm. It has a slight gray color but is perfectly transparent. It is placed inside the microscope. (Ref. A Picture 35)
Purpose	The purpose of this filter is to preserve the operator eyes from leaks, and to completely ensure that all laser light is blocked from passing through the microscope.
Functioning	Being opaque to the wavelength of 1064nm prevents any possibility of laser light passing through the microscope.



Picture 28: Microscope infrared filter

9.4: WELD INFRARED FILTER

Description	This filter is an optical glass designed to filter laser radiation of 1064nm (Ref. B Picture 36). It has a slight green tint but is perfectly transparent. Operators should look through this window any time they need to view inside the weld chamber, rather than looking through the leather strips.



Picture 29: Welding room infrared filter

ATTENTION

If this filter should ever break, it is very important to get it replaced with a new filter. To ensure safety, use only original and approved spare parts from Sunstone Engineering.

	POWER	SPOT	TIME m/s	FREQUENCY	WAVE
Yellow Gold thin	2.0	0.2	2.0	5.0	SLO+
Yellow Gold wire	2.4	0.4	2.4	6.5	SLO+
Yellow Gold smoothing	3.6	0.7	3.6	6.5	SLO+
White Gold thin	1.5	0.2	1.6	6.5	SLO-
White Gold wire	1.7	0.4	1.7	6.5	SLO-
White Gold smoothing	2.3	0.8	2.1	6.5	SLO-
Rose Gold thin	1.6	0.2	1.9	5	SLO+
Rose Gold wire	1.8	0.3	2.2	5	SLO+
Rose Gold smoothing	3.2	0.6	3.1	6.5	SLO+
Silver thin	3.7	0.3	3.7	5	NORM
Silver wire	4.2	0.3	4.2	5	NORM
Silver smoothing	4.5	0.4	4.5	4	NORM
Platinum thin	1.8	0.4	0.8	5	NORM
Platinum wire	1.8	0.5	1	1.6	NORM

Platinum smoothing	2.2	0.8	1.8	1.9	NORM
Stainless steel thin	1	0.3	1	6	NORM
Stainless wire	1.2	0.5	1.2	7	NORM
Stainless steel smoothing	1.8	0.7	1.8	7	NORM
Titanium thin	1.8	0.7	1.8	7	NORM
Titanium wire	1	0.2	0.2	2.5	NORM
Titanium smoothing	1.0	0.2	0.2	2.5	NORM
Palladium thin	1.6	0.2	1.3	5.0	NORM
Palladium wire	1.8	0.5	1.6	6.5	NORM
Palladium smoothing	2.4	0.7	1.8	8	NORM
Nickel Silver thin	1.6	0.7	1.4	5	NORM
Nickel Silver wire	1.4	0.	1.4	7.0	NORM
Nickel Silver smoothing	1.	0.9	1.9	8	NORM

Chapter 10: Quick Setup

10.1: COMBO 200 QUICK SETUP

1. Remove the the Combo 200 power supply and place it in a safe and se-cure location. Be sure to lock the wheels once it is in your desired location.

2. With the help of another person, remove the articulating arm and place it in a desired location on your tabletop. Once it is in the desired location have the other person trace the holes that are on the bottom of the articulating arm base.
3. Move the articulating arm and drill the traced holes out of your table.
4. Run the hardware through the holes in the bottom of the articulating arm and then lower them into the holes in your table. Secure the Combo 200 articulating arm to the table. *Be sure that it is close enough to the power supply to connect the necessary system cables.

5. Connect the green laser cable to the port on the back of the laser head at the top of the articulating arm.

    1. Connect the opposite end of the green cable to the port on the back of the power supply.


6.Connect the black laser cable to the port on the back of the laser head at the top of the articulating arm.

1. Connect the opposite end of the black cable (which has two separate connectors) to the ports on the back of the power supply.

7. Connect the blue air cable to the air port on the back of the laser head at the top of the articulating arm.

1. Connect the opposite end of the blue air cable to the air port on the back of the power supply.

8. Connect the foot pedal cable to the foot pedal port on the back of the power supply.

9. Connect the female end of the power cable to the back of the power supply.

10. Connect the male end of the power cable to AC power.

11. If using shielding gas, connect the gas tube into the gas port on the back of the power supply.

12. Fill the water (follow water filling instructions, section 7.5 manual). De-ionized water should be used.

13. Turn the welder power switch on the back of the welder clockwise to turn on the welder.

14. Insert the key on the front of the power supply and turn it clockwise to allow the welder to function.

15. Setup the microscope eyepieces.

16. Touch start on the touch screen user interface.
17. Set the welding parameters.

18. Look through the microscope eyepieces and bring your workpiece into focus. (See ch 5 for eyepiece setup)
19. Line up the crosshairs on your workpiece where you want to weld.

20. Step on the foot pedal or press the thumb switch on the left hand grip to initiate a weld.

10.2: LASER WELDER SAFTY BASICS

1) If laser is not used in a room of its own (with all windows covered), make sure laser operating area is completely surrounded by walls of non-see-through material of some type.

2) Operator of laser must be looking through the microscope eye pieces for safety.

3) Anyone inside the laser operating area (while laser is in use) must be wearing laser safe approved protective goggles (one pair included with new laser welder purchase...contact Sunstone for purchase of more sets of laser safe eye protection).