

SQ Laser

**Squid Ink SQ-10 & SQ-30
Laser Marking System**

User Guide



SQUID INK[®]
MANUFACTURING

SQ-Laser

Squid Ink SQ-10 & SQ-30 Laser Marking System

User Guide

Revised 1/5/2018

P/N 2004610 Rev C

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Safety

The Squid Ink CO2 Laser Marking System is very easy to install, operate and maintain. Please follow these simple safety steps to insure a smooth and safe operation:

- The marking system is fairly heavy. While unpacking and setting up the unit, always take care to use proper lifting techniques. Avoid over-reaching and twisting while handling the marking system and accessories. If necessary, use more than one person to lift and move the marking system.
- Make sure the electrical power source is properly wired and grounded. The power source should comply with all safety regulations and codes applicable to the installation location.
- The equipment generates heat, so make sure the area is properly ventilated.
- Do not mark reflecting items (mirrors, smooth metal).



Danger

Never look at the outgoing or reflected laser – it can cause eye damage.



Warning

Do not contact laser beam with any parts of the body. It will cause burns to the skin.

Safety Notes:



Invisible output emissions. Do not look at or into beam.



Possible health hazard (PVC marking will cause the production of hydrochloric gas). Insure proper ventilation and filtering.



Electrical Hazard-do not open cover. No user-serviceable parts inside.



Burn hazard.



Ensure that unit is properly grounded.



Keep the equipment dry and indoors.

WARNING!**CLASS IV LASER PRODUCT****ALL PRECAUTIONS RELEVANT TO THIS PRODUCT MUST BE FIRMLY HEEDED.**

The installer hereby accepts to establish the requirements of its Local Factory Inspector, Laser Safety, and Country Regulations as to the proper guarding of the Laser Marking System supplied by Squid Ink and ensures guarding is installed and properly connected to the laser interlock system (see page 15 for information on how to use the interlock system). Safety apparatus are to be properly operated and used. Safety devices and guards supplied by Squid Ink will not necessarily meet requirements of the Customer's Local Factory Inspector, Laser Safety and Country Regulations, and no warranty or representation is given or made that they comply with any statutory or other requirement and no liability is accepted by Squid Ink.

**The product involves a possibility of hazard to the user if not used correctly.
Read the entire manual meticulously before installing and starting the system.**

CAUTION! The use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure. Firm compliance with the safety measures set out and referred to in this manual and extreme care when using are vital to minimize the chance of accidental damage to the equipment or personal injury.

Squid Ink recognizes that there may be errors or omissions in this manual. Squid Ink does not accept responsibility for any loss or damage resulting from the use of information, errors, or omissions.

WARNING! Laser output with optical instruments may result in an eye hazard for Class 1M or an increased hazard for Class 2M.

FDA / ANSI Requirements

FDA

The U.S. Food & Drug Administration's Center for Devices and Radiological Health (CDRH) mandates are released as federal code in Title 21 of the Code of Federal Regulations (21CFR). The subsections of this title list the required elements to which manufacturers must comply if they are offering a product for sale in the United States. A summary of 21CFR chapters related to laser products:

21CFR1000-1005 - Broad scope list of devices regulated the records and reports that must be produced and retained by a manufacturer, and the import / export requirements.

21CFR1010 - General performance standards, certifications, and variances.

21CFR1040.10 - Performance standards for manufacture of laser products. This is where one will find the information pertaining to the laser housing interlocks, remote electrical interlocks, labeling, and power classification. In addition to providing the required information for manufacturers, this standard is a useful reference for the end user in situations where the user is building their own class 1 enclosure around class 3B or class 4 laser systems.

The chapters above are collectively known by the acronym FLPPS, which stands for Federal Laser Product Performance Standards.

All class 3, 3B and 4 lasers are registered with the Environmental Health and Safety Office.

Cautions

CLASS 4 (Class IV) High powered lasers (CW >500mW, pulsed >10J/cm²) are capable of causing severe eye damage with short-duration exposure to the direct, specularly-reflected, or diffusely-reflected beam. They are also capable of producing severe skin damage. Flammable or combustible materials may ignite if exposed to the direct beam.

SKIN:

Skin damage can occur from exposure to infrared or ultraviolet light over a period of 10-100 seconds. For infrared exposure, the results can be thermal burns or excessively dry skin depending on the intensity of the radiation. In the 230 - 380 nm range of ultraviolet light, erythema (sunburn), skin cancer, or accelerated skin aging are possible. The most damaging region of ultraviolet is 280 - 315 nm, also known as UV-B. Gloves, long sleeves, and face shields should be worn when manipulating class ultraviolet lasers.

UV-B (280-315 nm) spectrum laser emissions can cause Erythema, increased pigmentation, cancer, and accelerated aging.

EYE:

Different structures of the eye can be damaged by laser light depending on the wavelength. Retinal burns, resulting in partial or complete blindness are possible in the visible (400 - 700 nm) and near-infrared (700 - 1400 nm) regions. At these wavelengths, the eye will focus the beam or specular reflection on a tiny spot on the retina. This focusing increases the irradiance of the beam by a factor of about 100,000. Corrective lenses will further focus the beam. Laser emissions in the ultraviolet (< 400 nm) and far infrared (> 1400 nm) regions are primarily absorbed by and cause damage to the cornea. In the near-ultraviolet range (315 - 400 nm), some of the radiation reaches the lens of the eye. Eye damage may be painless and instantaneous. Report all known or suspected beam exposures of the eye to EH&S 228-7864.

Bio-effects of the eye can cause the following:

SPECTRUM, nm	LOCATION	EFFECT
UV-B (280-315)	Cornea	Photokeratitis

Protective Clothing:

- UV Gloves
- Long sleeves
- Face shields

Must be worn when manipulating class 4 ultraviolet lasers.

Laser Eye Surveillance Program

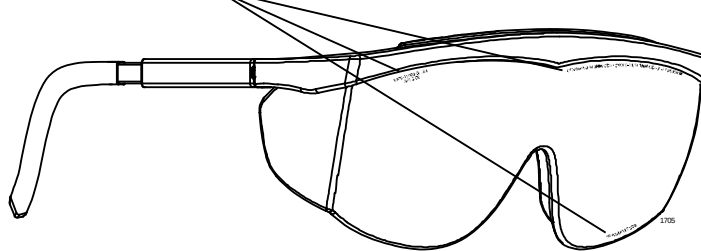
Eye exams are no longer required for laser users per ANSI Z136.12007. An exam is required after an exposure.

Laser Safety Eyewear

Enclosure of the laser equipment or the beam path is the preferred method of control. However, when enclosures are not feasible and there is potential exposure to the beam or reflected beams at levels above the MPE, it may be necessary to wear protective eyewear.

- Laser safety eyewear shall be available and worn by laser operators, incident personnel and visitors in laboratories where a Class 3B or Class 4 laser is present and there is a potential exposure to the beam or reflected beams at levels above the MPE.
- The Principal Investigator is responsible for ensuring that the appropriate eyewear is organized and stored.
- Scratched or damaged eyewear will not be used.
- One pair of laser safety eyewear may not be sufficient when working with tunable or multiple wavelength lasers. Always check the OD and wavelength prior to use. Eyewear with multiband filters and flip-up eyewear are available for some applications.
- Retinal injury can be thermal, acoustic, or photochemical.
- OSHA requires the wavelength filtered, optical density, and visible light transmission to be printed on the eyewear.

Lens Classification



A pair of Honeywell Laser Protective Eyewear is shipped with every SQ Laser.

FLPPS requirements specific to the remote laser interlock:

Every commercial Class 3b and Class 4 laser sold in the United States shall include a remote electrical interlock connection. The connection will have two terminals that need to be electrically shorted to each other for the laser to operate. If the circuit is open or opens, the laser will not emit any radiation above the MPE threshold.

The end client is given leeway in choosing the method to be employed to accomplish this task. The end client may use an electro-mechanical shutter, or electro-optic modulator behind the laser housing.

When a safety circuit has tripped the laser off, the laser must remain off until it has been restarted by an operator even if the safety circuit trip was momentary.

Lasers or laser systems manufactured for "in-house" use:

Every effort should be made to meet the intent of FLPPS when a facility is constructing a laser or laser enclosure for its own use. FLPPS is intended for the safety of the end user. With the increased availability of high power laser diodes, any person with a basic understanding of electronics can construct class 3B or class 4 lasers without any knowledge of laser physics or laser safety. This will place an increased emphasis on the laser safety officer to monitor and enforce laser safety issues.

A facility that fully adopts the ANSI Z136.1 standard is effectively adopting FLPPS. A majority of the FLPPS requirements are repeated (almost verbatim) in section 4.3 of the ANSI Z136.1 standard. This repeat of the FLPPS requirements within the ANSI standard provides beneficial safety information, but can lead to confusion when trying to implement end user engineered safety controls. ANSI Z136.1-2014

sections 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5.1, 4.3.7, 4.3.8, and 4.3.14 are FLPPS specifications that are expected to already exist as a performance feature in a commercially certified product. These items should be verified to exist upon receipt of a laser and should be checked periodically to verify their functionality. If the laser or laser system is built in-house, full compliance is an expectation.

End user interlocking requirements:

Noted earlier was mention of a legal mandate in FLPPS to provide an external interlock on all commercial class 3B and class 4 lasers. There is not a federal legal mandate for the end client to use it. The SQ-10 and SQ-30 require the end client to provide the correct connection of the remote interlock (see page 15) to allow the laser to operate.

ANSI Z136

ANSI Z136.1 is the American National Standard for Safe Use of Lasers. Z136.1 is the parent document referenced by all other Z136 standards. The standards are developed by the ANSI Accredited Standards Committee (ASC) Z136, a collaboration of the leading experts in the field, and are considered to be the authoritative standard in the United States for safe laser operation and practices. Although the standards are not "law," compliance with the standard is often mandated by federal entities.

10CFR851.23(11) requires all Dept. of Energy contractors to comply with ANSI Z136.1-2000see: <http://ecfr.gpoaccess.gov>.

The ANSI Z136.1-2014 standard is a copyrighted publication available for purchase from several commercial sources. The ANSI Z136 secretariat and publisher is the Laser Institute of America (LIA), whose web address is: <http://www.laserinstitute.org>.

The SQ Laser Marking System is a class IV type laser per power considerations and energy content. It is a high-power device exceeding the AEL of class IIIB, wherein, it exceeds 0.5W and emission exposure is more than 10^5 Jm^{-2} .

Laser Classifications and Safety

Lasers and laser systems are divided into four major classifications per their potential to cause biological damage to the eye or skin. The purpose of these classifications is to warn users of the hazards associated with the laser relative to the Accessible Emission Limits (AEL). These limits are based on laser output energy or power, radiation wavelengths, exposure duration, and cross-sectional area of the laser beam at the point of interest.

Class IV lasers are high power lasers are hazardous to view under any condition (directly or diffusely scattered) and are a potential fire hazard and a skin hazard. Significant controls are required of Class IV laser facilities.

Precautions for Safe Operation of Class IV High Power Lasers

1. Establish a controlled area for laser operation: limit access to those trained in the principles of laser safety.
2. Post warning signs prominently near entrances to the laser operation area.
3. Set up shields to prevent the beam from escaping the laser operation area.
4. Set up a target to block the beam after it passes through the operating area.
5. Keep the protective cover on the laser head during operation.
6. Beam path must be covered.
7. Keep the laser beam either above or below eye level.
8. Do not look at the beam directly or as reflected by a mirror or polished surface. When working with a class 4 laser, do not expose skin to beam.
9. Safety glasses must be worn at all times when working with a class IV laser.
10. Environmental Health and Safety Office. When working with a class IV laser, contact your laser safety officer for operation of the laser activation warning system. The Laser Safety Officer 229-7864 is available to provide support in all aspects of laser safety and is responsible for the Laser Safety Program.

Laser Safety Terms

Accessible Emission Limits (AEL) - the maximum accessible level of laser radiation permitted within a particular laser class.

Aversion Response - Blinking of the eye, or movement of the head to avoid exposure to a bright light.

Continuous Wave (CW) - Continuous emission of radiation as opposed to short bursts.

Controlled Area - An area where the occupancy and activity of those within is subject to control and supervision for the purpose of protection from radiation hazards.

Diffuse Reflection - Change of the spatial distribution of a laser beam when it is reflected in multiple directions by a rough or matte surface.

Intrabeam Viewing - Exposing the eye to all or part of a laser beam.

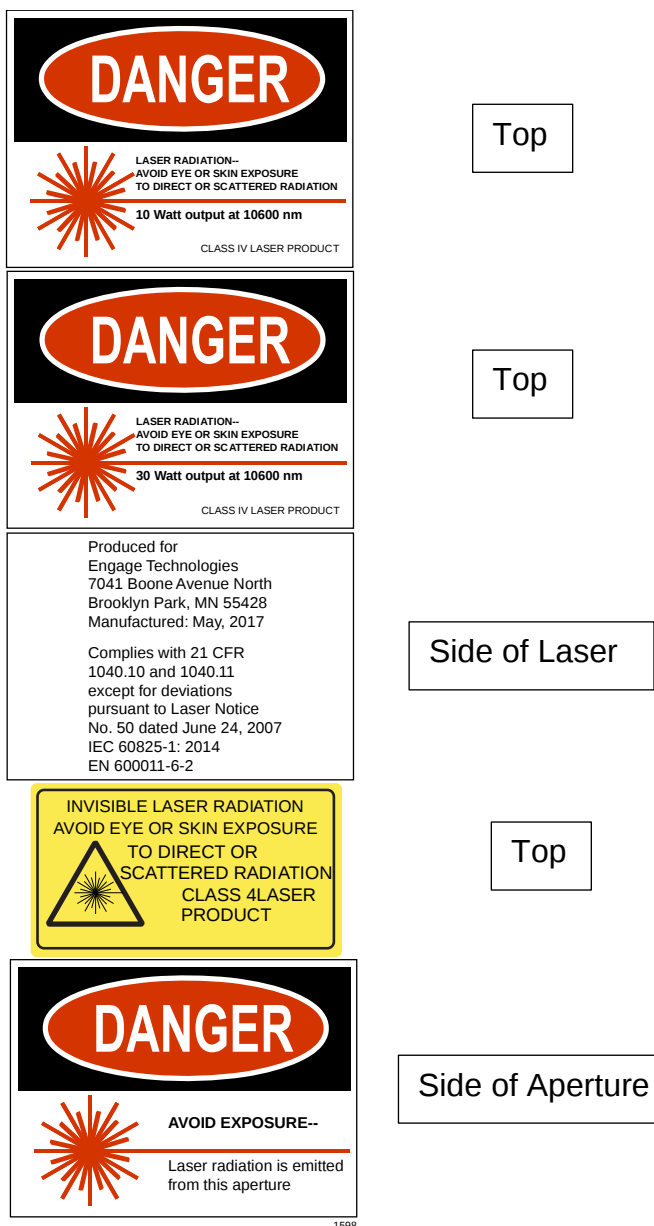
Maximum Permissible Exposure (MPE) - The level of laser radiation to which a person may be exposed without hazardous effect or adverse biological changes in the eye or skin.

Nominal Hazard Zone (NHZ) - The space within which the level of the direct, reflected, or scattered radiation during normal operation exceeds the applicable MPE.

Specular Reflection - A mirror-like reflection of a laser beam.

Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Laser Label Placement



Label type	Location
Danger	Top of laser housing
ID and Certification	Side of laser housing
Aperture	Side of aperture housing
IEC Warning	Top of laser housing

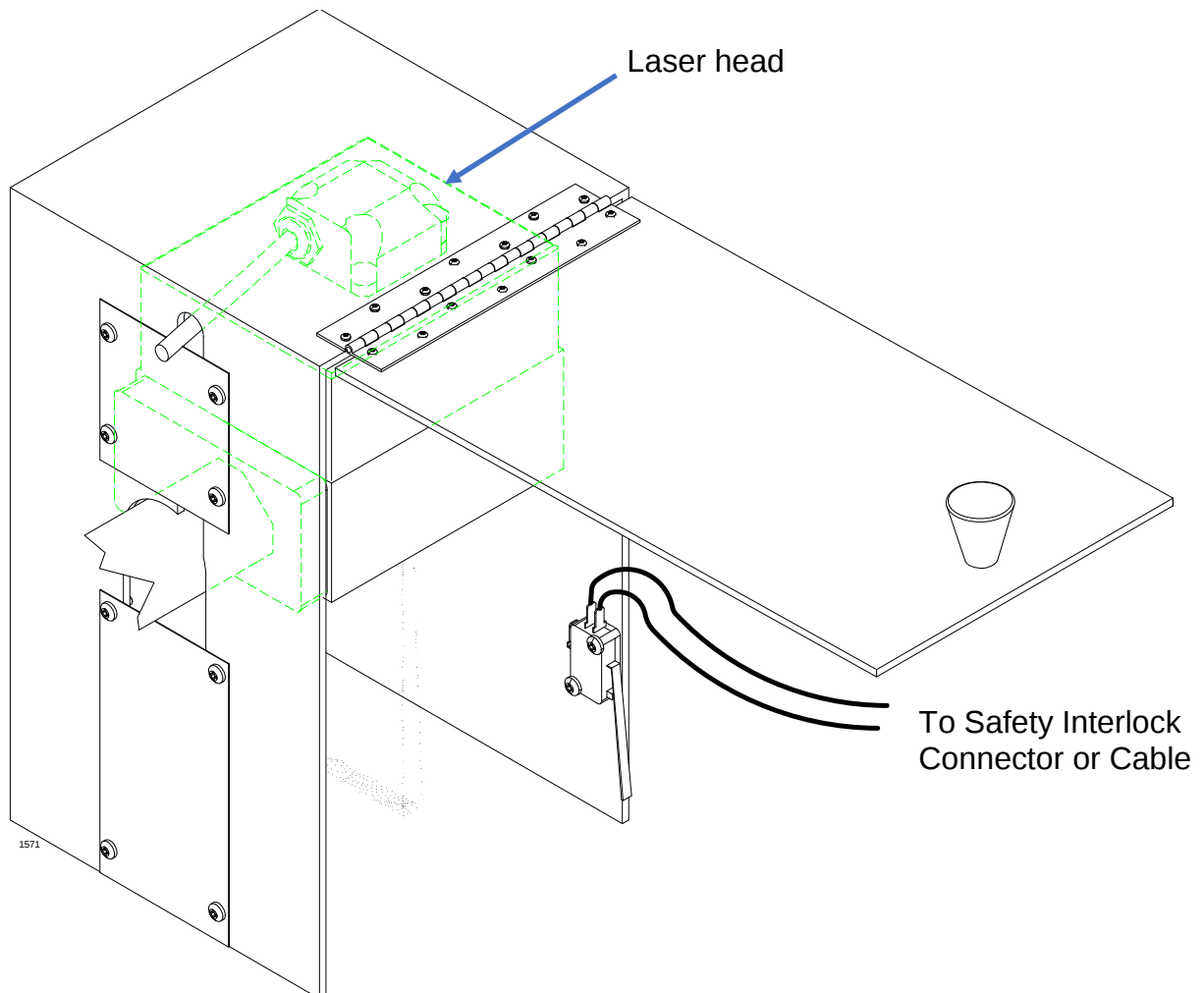
Safety Interlock System

This laser marking system has been equipped with this safety interlock system to eliminate the possibility of human access to the laser output.

Proper connection of the safety interlock system is required for the laser to operate.

Protective Cover:

The end client is expected to provide the necessary protection for their system that will eliminate all possible human access to direct or reflected laser radiation paths. This could involve a protective cover that would shield the entire laser field between the marking head and the object being marked as the example cover demonstrates below:



This example cover incorporates a hinged access area.

Any hinged or removable access area(s) must be secured by an appropriate sensor that will detect the use of the access panel to allow human access to the laser or its reflections. This sensor must then be connected to the safety interlock system to ensure the laser is disabled whenever the access panel is utilized. In the example protective cover, a relay is shown which activates or opens its relay when the access panel is opened.

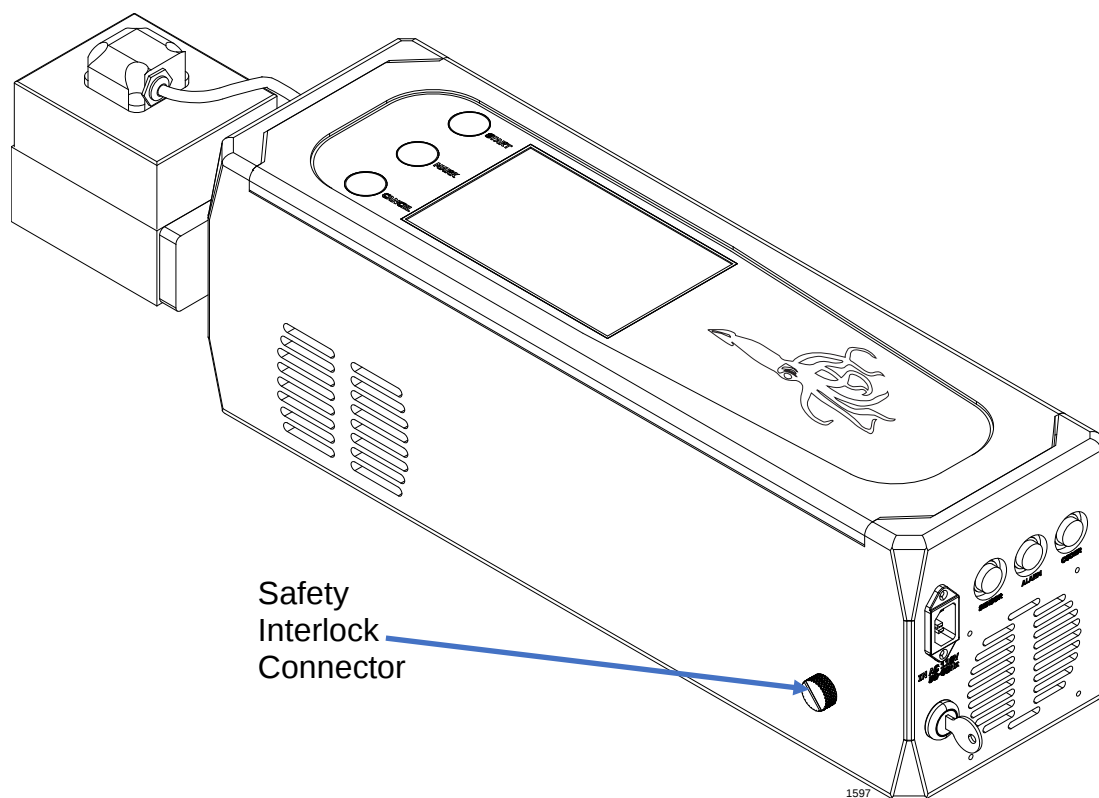
When that relay opens, it will disable the laser so it is immediately disabled if it was accidentally left in operation, and it will prevent operation of the laser until the relay is closed through closure of the access panel. If multiple access panels are used, the relays must be wired in series. Additional safety interlock options may include a switch activated by the door of the room of the laser or similar safety measures. Multiple safety switches or options can also be employed by connecting these devices in series with one of the safety interlock connections.

Safety Interlock Connections:

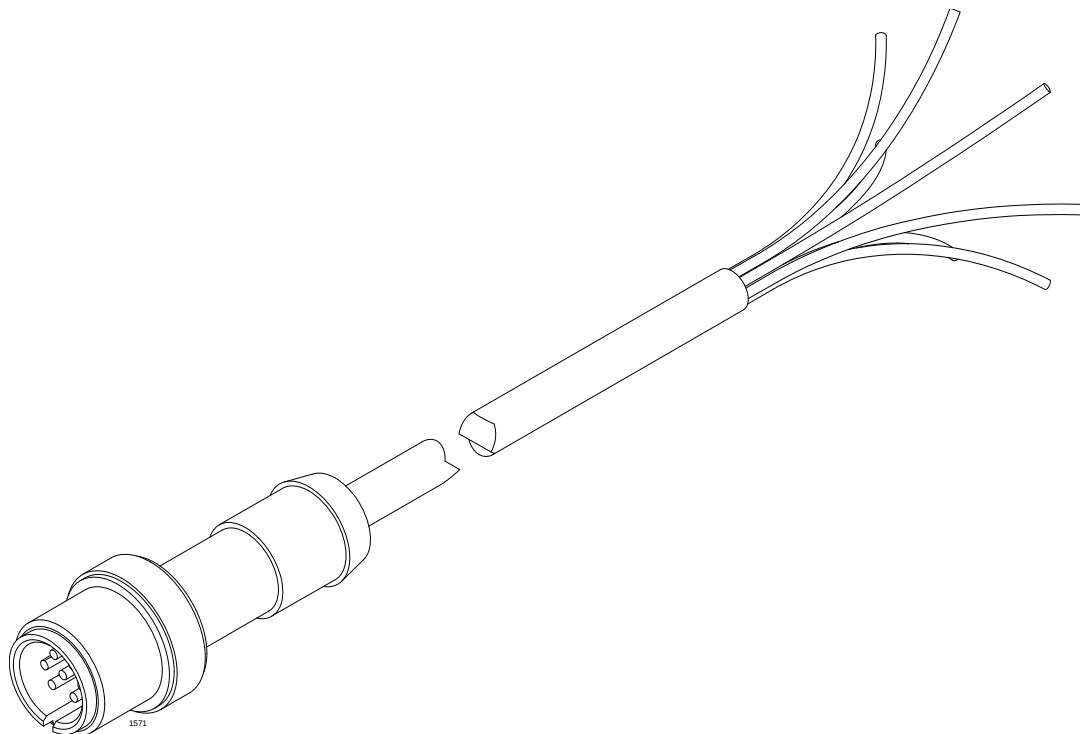
There are four input connection options provided by the safety interlock system. **One of these input options must be properly utilized for the laser to operate.** The safety interlock cable provides access to the two low active inputs and two high active inputs along with +24 VDC and Ground connections as shown with their wire colors below:

Safety Interlock Cable:

The supplied Safety Interlock Cable must be plugged into the laser where shown in next illustration:



The available wires must be connected to the end client access panel safety relay as described in the following tables and illustrations.



Connection Options	Wire Color
NPN	Brown/White
Relay to Ground	Blue
PNP	Blue/White
Relay to +24 VDC	Green
Ground	Green/White
+24VDC	Brown

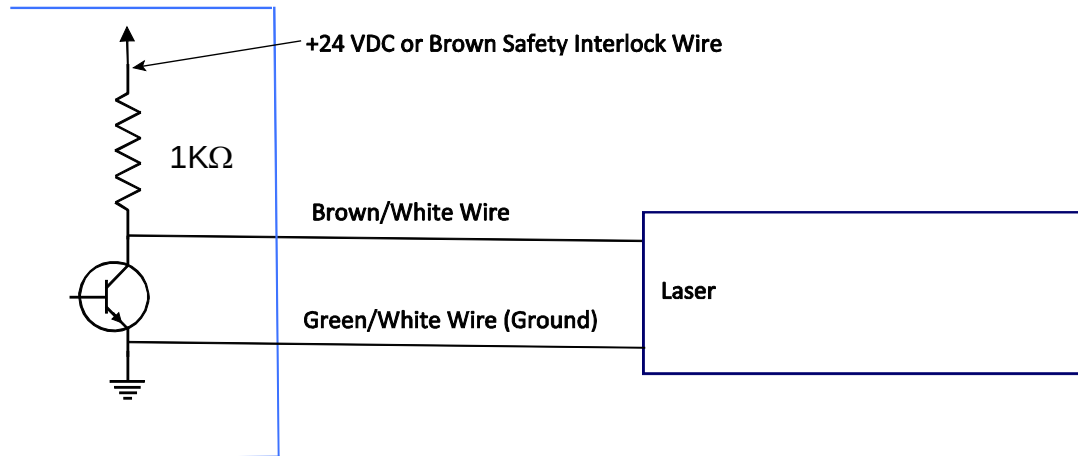
Interlock Cable Connections		
Connection number	Description	Voltage
1	+24VDC	+24VDC
2	NPN	
3	Relay to ground	
4	PNP	
5	Relay to +24V	
6	GND	GND
7	NC	

Connection Options Wiring Diagrams:

Connection Options Wiring Diagrams:

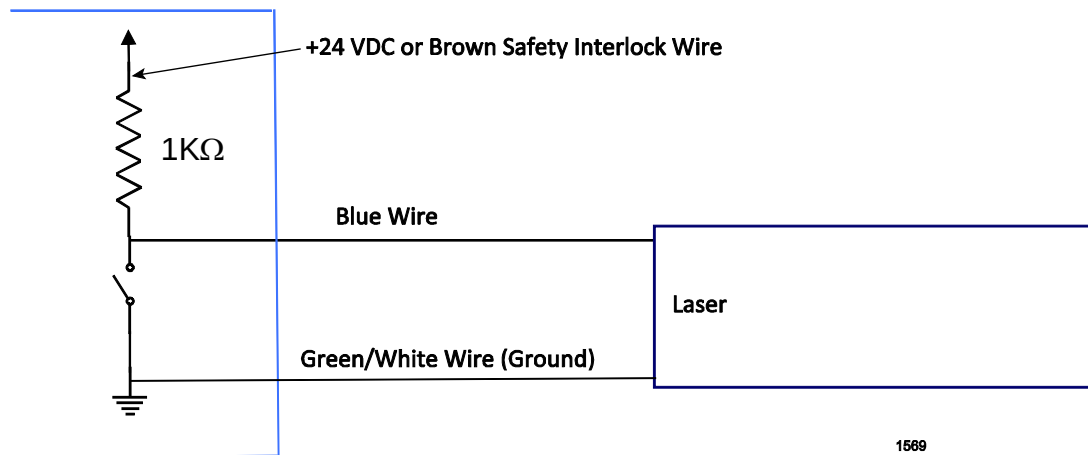
NPN Option:

End Client Safety Circuit



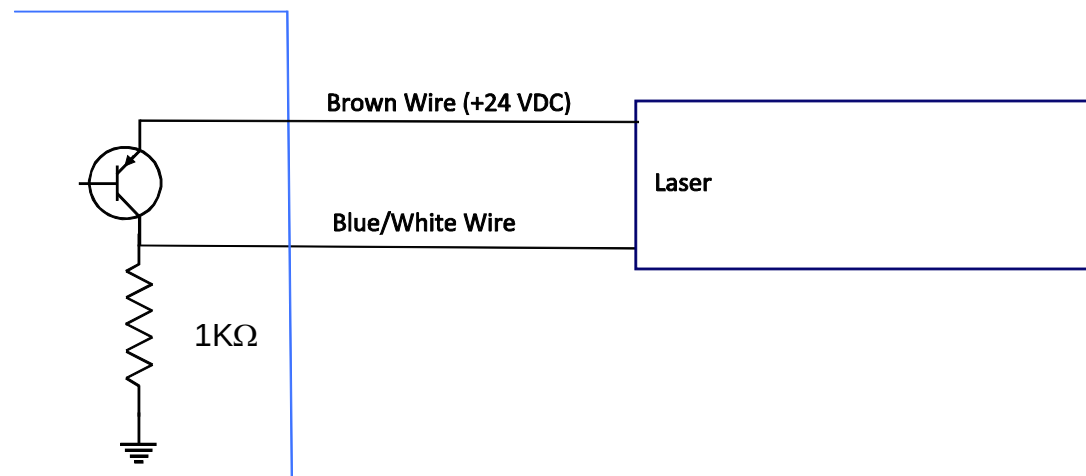
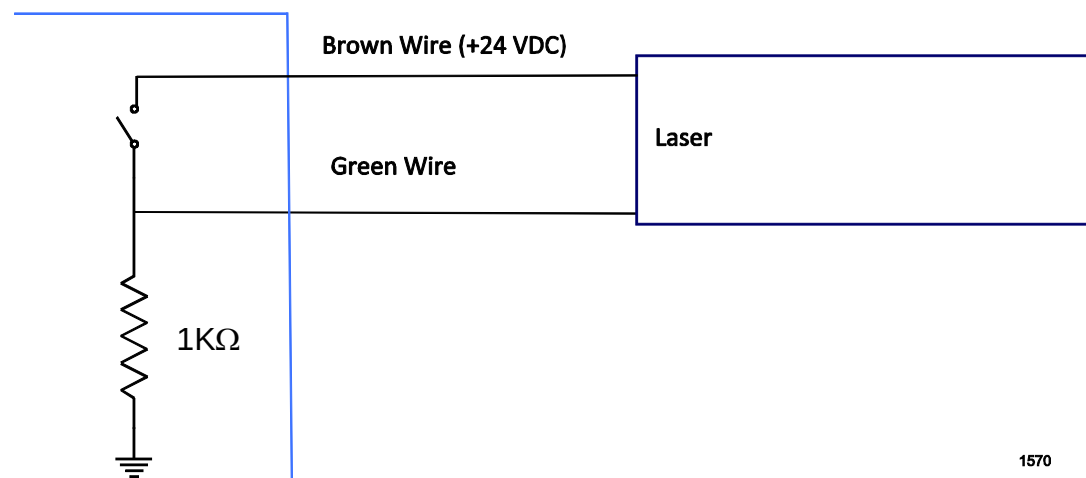
Relay to Ground Option:

End Client Safety Circuit



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Ensure that transistor or relay is pulled to ground for proper operation.

PNP Option:**End Client Safety Circuit****Relay to + 24 VDC Option:****End Client Safety Circuit**

1570

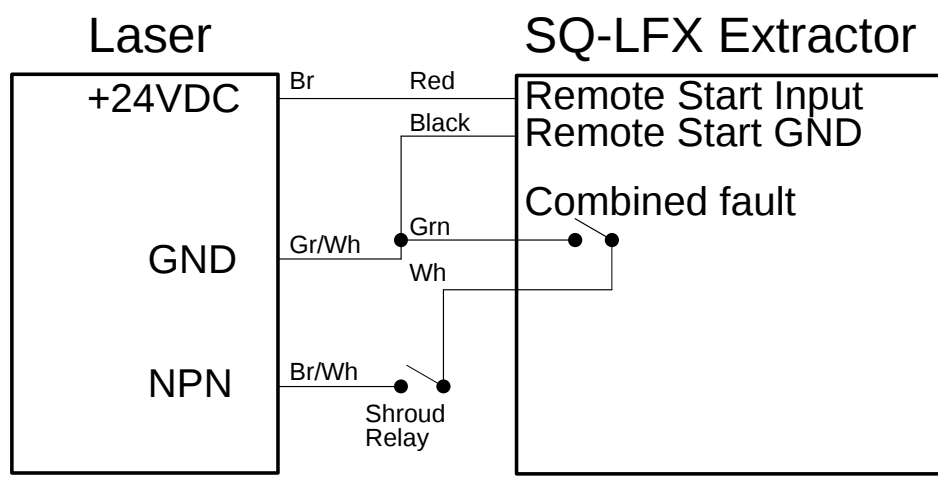
Ensure that transistor or relay is pulled to ground for proper operation.

Fume Extraction

It is recommended that fume extractors should always be used when laser marking to ensure the operator and other employees are not exposed to any possible harmful vapors. It is imperative that the appropriate fume extractor is always used when laser marking PVC or similar materials due to the potential creation of Hydrochloric vapors. The following two fume extractors have been approved for use with the SQ-10 and SQ-30 lasers:

Part Number	Description
2004660	Fume extractor for non-PVC applications
2004661	Fume extractor for PVC applications

These fume extractors must be connected to the laser safety interlock circuitry using the following connections:



SQ-LFX
2004660 FUME EXTRACTION KIT
Non-PVC Laser Marking
Fume Extraction



SQ-LFX-PVC
2004661 FUME EXTRACTION KIT – PVC
PVC Laser Marking
Fume Extraction

Changing the Fume Extraction Filter

With thanks to Bofa Systems



Technical Bulletin - Issued by John Horsey 22.9.16 Personal Protective Equipment Recommended when changing AD PVC and AD PVC IQ Filters

Introduction

The fumes from the laser processing of PVC usually contain solid polymeric particles and droplets of hydrochloric acid, together with droplets of oil-like substances used to make the PVC more flexible (plasticizers such as Di Octyl Phthalate).

When AD PVC or AD PVC IQ units are used to extract these fumes, they become contaminated with the hydrochloric acid droplets, and the plasticizers which appear often as a clear viscous liquid.

Most of the contaminated particles and droplets are collected in the pre-filter bag and it is this filter which is changed most frequently.

Health risks associated with changing filters:

Action	Health Risk	Risk Level
Removing spent filter bag and packing for disposal	Hand Skin contamination, sensitization	High
	Eye contamination from ejection of particles/droplets from the filter inlet	Moderate
	Breathing in particles / droplets	Low
Removing and replacing spent combined filter for disposal	Hand Skin contamination, sensitization	High
	Eye contamination from ejection of particles/droplets from the filter inlet	Moderate
	Breathing in particles / droplets	Low
	Dropping filter on feet	Moderate

Recommended Personal Protective Equipment

1. Safety Glasses with wraparound or side pieces, to prevent particle or droplet eye contamination.
2. Safety (steel toe capped) shoes / boots.
3. Gloves. These should be disposable type acid resistant rubber or plastic gloves with extended wrists.
4. Face Mask. Standard dust type face mask is sufficient as the time needed to replace the filters is very low and the Workplace Exposure Limit or Threshold Limit Value should not be exceeded.
5. Overalls with long sleeves in case of contact with arms.

Specifications for Personal Protective Equipment

Safety Glasses

For the UK/Europe, the standard for safety glasses is En 166: 2001. In the US, OSHA have adopted the standard set by the ANSI / ISEA which is Z87.1 – 2015.

Gloves

In the UK / Europe the standard for gloves used for chemical and biological protection is BS En 374-1 to 4 (2004) expected to be replaced/revised in 2017.

According to OSHA, there is no specific standard for gloves to be used for chemical protection (there are standards for cut protection). The recommendation is that the gloves should be matched to the chemical being handled using the manufacturers guide. This means the end user approaches their industrial glove supplier and asks for the gloves that meet their requirements which are:

- Resistance to hydrochloric acid.
- Short term usage i.e. less than 30 mins.
- Single-use only.
- Extended wrist to cover approximately half the forearm.
- Ease of removal.

Respiratory Protection (Face Masks)

The European standard for the dust face mask is EN 149: 2001 and the classification can be FFP 1, 2 or 3.

In the US, the most common face mask approved by NIOSH is the N95. The N is for non-oil and the 95 refers to the removal of 95% of dust particles. Masks to this standard should be adequate for use when changing filters because any oil in the filters should not become airborne.

The qualification to this is that the use of the N95 should be where one or a small number of filters is being changed. An operative spending more than a few minutes changing PVC filters could be exposed to a higher level of odor etc. from the contaminated filter and the use of a mask designed for use with chemical vapors should be considered.

Protective Footwear

In the UK and Europe, protective footwear should be to the standards En 345 / En ISO 20345: 2011.

In the US, the previous standard ANSI Z41 class 75 has been replaced by ASTM F 2412 - 05 class 75.

Please refer to the Fume Extractor manual for further questions.

Pin Definitions for Connectors

See “General Layout” section for location of connectors.

DB9 Male COM1 Connector

Pin 1-Marking status output. Low active TTL levels.

Once the laser is on, the signal goes low when marking starts (Beam output), and high when marking stops (no beam) It has a 20mA current which can drive an optocoupler.

Pin 2- RX

Pin 3-TX

This is the COM1 of the controller and a direct connection to the computer.

Pin 4- 5VDC

Pin 5- GND

Pin 6- GND

Pin 9- 5VDC

Note: Single-ended shield earth grounding is required for serial port communication. All other pins are reserved- Do Not Use.

Example of pin 1 signal:

Level-**HIGH**

Waiting for trigger signal

Level-**HIGH**

Waiting for trigger signal

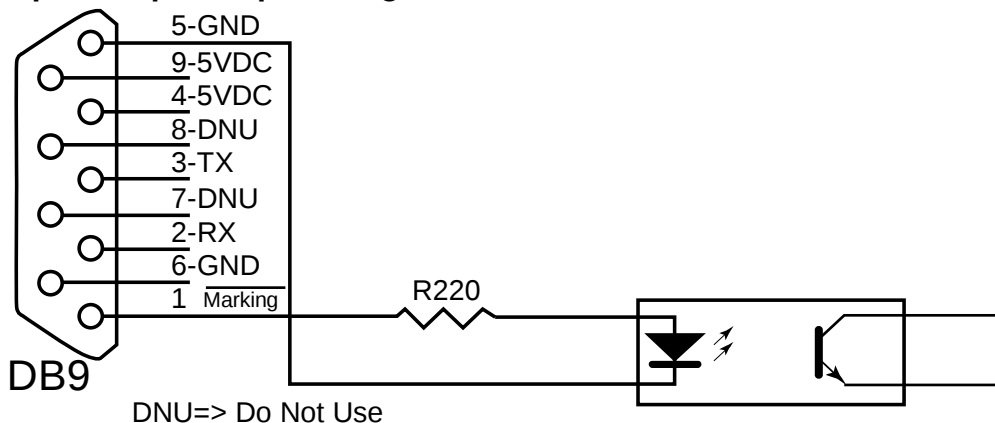
HIGH-to-LOW
Start marking

LOW-to-HIGH
Stop marking

LOW-Marking

1737

Example of Optocoupler usage:



1738

DB9 Female Sensor Connector

Pin 2-Encoder Input Signal A

Pins 3- GND

Pin 4- Photocell input

Pin 5- 12V, 2A output

Pin 6- Encoder Input Signal B

Pin 8- GND

All other pins are reserved-**do not use**.**DB9 Male COM2 Connector**

Pin 1-Signal for Marking Status-Low active

Pin 2- TX

Pin 3- RX

Pin 5- GND

Pin 6- GND

Pin 7- 12V, 2A output

Pin 8- NPN output alarm signal activated when a trigger signal initiates a marking message, but the message is cancelled before completion.

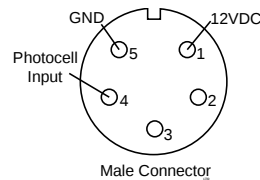
Pin 9- NPN output signal indicating the marking status as described on pin 1 above.

5-pin Sensor Connector on the back

Pin 1- 12V, 2A output

Pin 4- Photocell input

Pin 5- GND

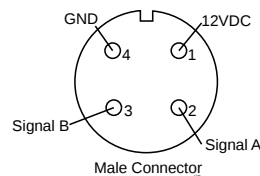
**4-pin Coder Connector on the back**

Pin 1- 12V, 2A.

Pin 2- Encoder Input Signal A

Pin 3- Encoder Input Signal B

Pin 4 - GND.

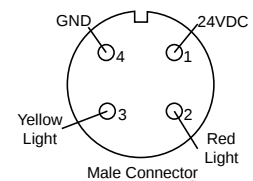
**4-pin Alarm Connector**

Pin 1- 24V, 2A

Pin 2- Red light, NPN (together with Pin 1)

Pin 3- Yellow light, NPN (together with Pin 1)

Pin 4- GND (Used only when Pins 2 and 3 are using as PNP type).



Note: Although multiple connections are available on the connectors, for encoder or photocell applications, only **one** of each of the sensors can be used, as the circuitry is shared. Also, the 12VDC supplied on these connectors provides a total maximum current of 2A, which can be shared on all connectors.

Items Required

Packed in Box

- Laser
- Toolkit
- Alarm Beacon

Customer Supplied

- Interlock system
- Laser protective cover
- Appropriate laser-related signage
- All necessary safety precautions

Optional Equipment

- Stand
- Synchronous encoder
- Photocell(s)
- Air purification system

Introduction

System Components

The Laser Marking System contains 3 main parts:

- Laser head
- WIN CE System
- Power Supply (internal on the SQ-10, external on the SQ-30)

Laser Head

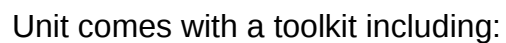
The Laser head is the source of the marking beam.

WIN CE System

WIN CE is a highly integrated industrial computer system used in forming marking information input, editing, and fast and precise control of the laser and galvanometers. Care must be taken with touchscreen. Do not use hard, sharp objects to operate the unit. It will damage the screen and affect touch sensitivity. Piercing the screen voids the warranty.

Power Box

Converts the A.C. power to D.C. power. The 10W unit power supply is built-in, while the 30W is external.



- A. Additional Socket Head Cap Screws
- B. Metric Allen head wrench set
- C. 2 electrical cords
- D. Phillips screwdriver
- E. Screen Protectors
- F. Power Cable (30W only)
- G. Laser Safety Glasses
- H. Stylus for touchscreen
- I. Alarm Beacon Cable
- J. Safety Interlock Cable
- K. Stand Hardware (Optional)

SQ-Laser System General Description

Laser Head

The Laser head has an aluminum alloy shell. Its main parts consist of:

The Laser Marking Head-contains the laser marking control, galvanometer, and galvanometer control card.

Note: The galvanometers are high-precision parts and should not be handled roughly.

Laser Tube-The fully sealed RF-excited tube

F-Theta Lens-One of the key optical components in the laser marking system, used to focus the beam.

WIN CE Control System

Industrial control computer contains

- Standard I/O interface
- Built-in marking control system
- 7" LCD touchscreen
- Connections for external keyboard, mouse, sensors, and USB devices

Power Supply Control Box

30W/60W Dedicated

Converts 110V AC power to DC for the laser and galvanometer.

Environmental Requirements

- Temperature: 10~40 °C (50~104°F)
- Operating temperature: 5~60 °C (41~140°F)
- Environmental humidity: 45%~75%
- Atmospheric pressure: <altitude 2000m
- Voltage, current and frequency: 110V, 5A and 50HZ

System Specifications

Laser Type CO₂ Laser (Full sealed RF-excited metal tube)

Laser Wavelength 10.6 μ m

Laser Power SQ-10 10W, SQ-30 30W

Laser Galvanometer High-precision 2D high-speed scanning galvanometers

Cooling Method Atmospheric air-cooled

Dust Way Sealed

Power Consumption 500W~1000W (220VAC, 50HZ)

Standard Marking Focal Length 135mm

Positioning Accuracy 0.01mm

Min Line Width 0.1mm

Standard Marking Area 100mm X 100mm

Assembly Line Speed Support <120m/min

Marking Speed 800~1000 char/sec

Character Size Adjustable in Marking Range

Marking Line Number Adjustable Marking Range

Marking Content Chinese and English Character/Numbers/Graphics/Date and Time/Serial Number, etc.

Marking Font Many standard CAD geometric fonts, also can be user defined and extended.

***Technical parameters and other information varies per specific application conditions and materials, and are subject to change without notice.**

System Dimensions

710L X 138W X 183H (28" X 5½" X 7¼")

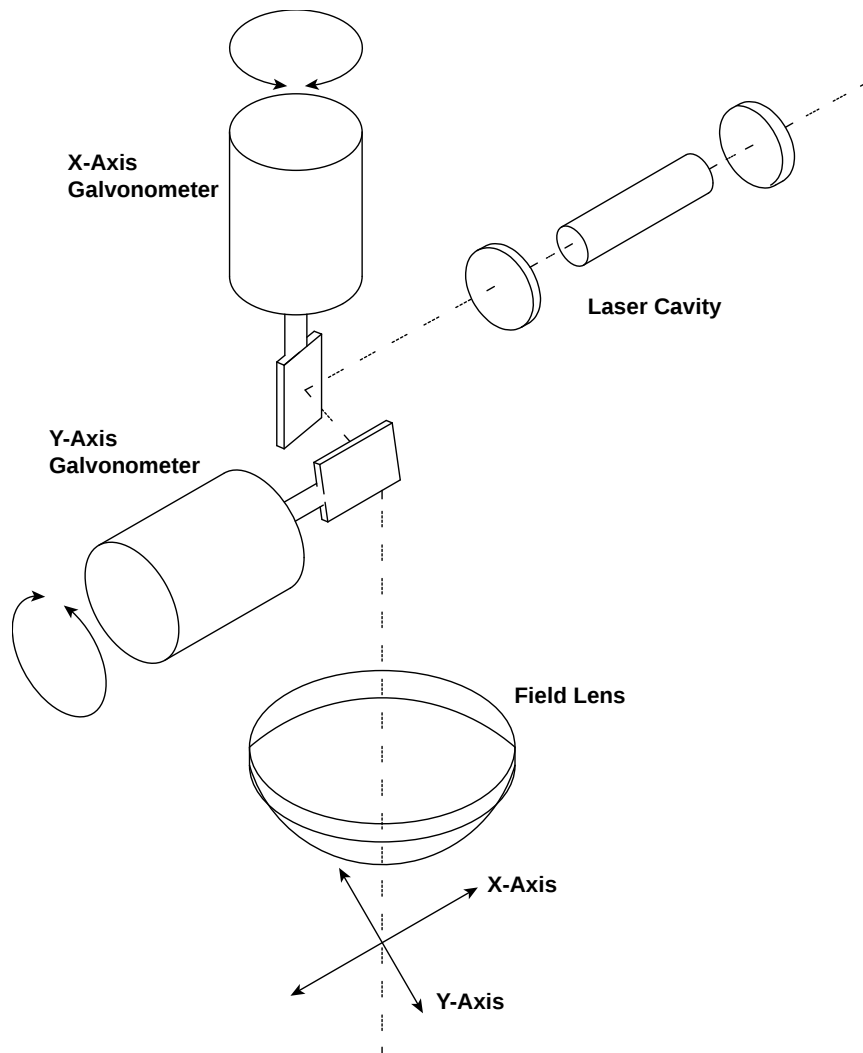
Weight-18KG (40 LBS)

Theory of Operation

Laser marking is used on a variety of different substances as a surface engraving permanent marker. Laser marking is caused by the evaporation of the surface material exposing the deep substance or energy, and leads to chemical and physical changes of the surface material being "carved" out of the traces, or by light energy burning off part of the material, showing the required etching patterns, and text.

The accepted principle of "Thermal Processing" is having a higher energy density of the laser beam (being a centralized energy flow) irradiating on the surface of the material to be processed. The material surface absorbs the laser energy, and the thermal excitation process is generated in the irradiated regions, so that the material surface (or coating) temperature is raised.

Laser Marking System Diagram



Unpacking

One box contains:

- Laser assembly

Other box contains:

- Stand (optional)
- Separate Power Supply Enclosure (30W Only)
- Sensor bracket
- Alarm beacon
- Toolkit
- Required hardware (Socket head cap screws)



SQ-10



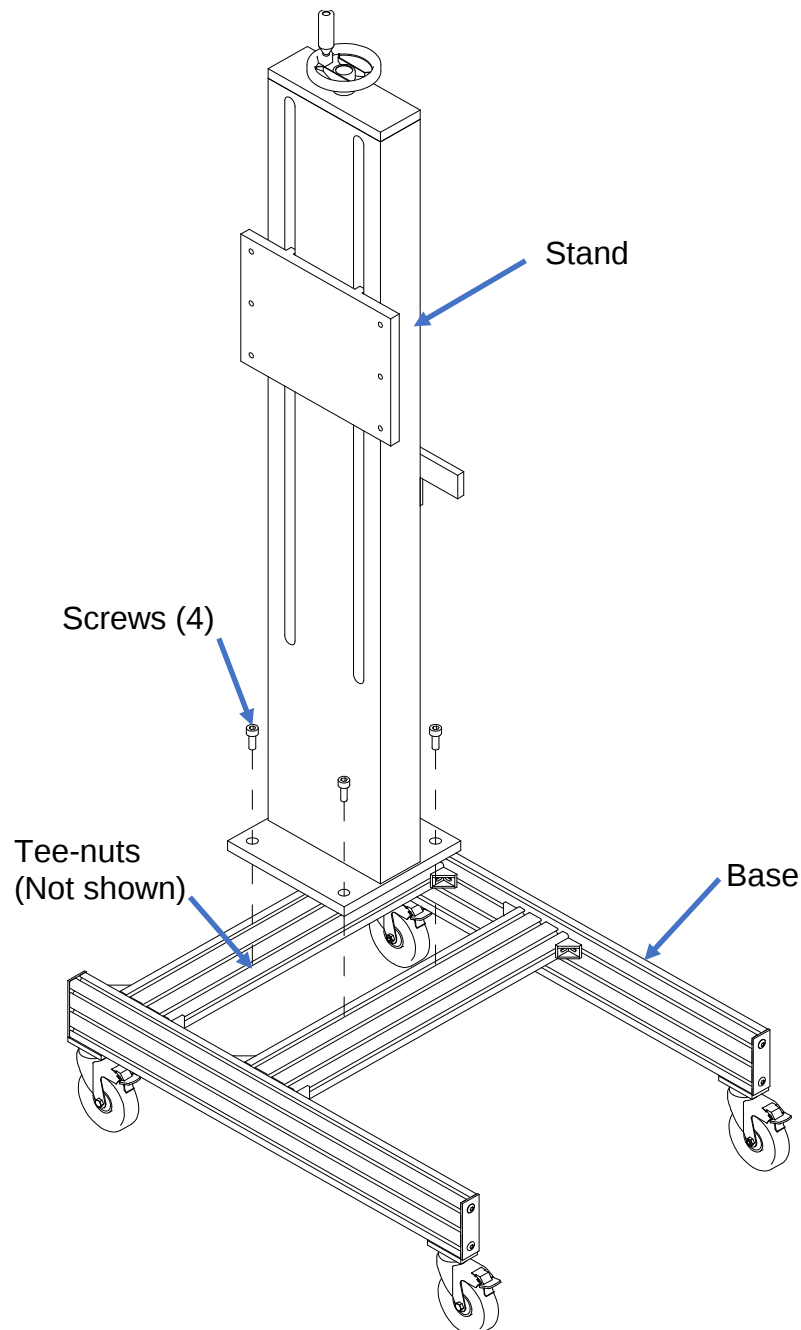
SQ-30

Installation and Setup

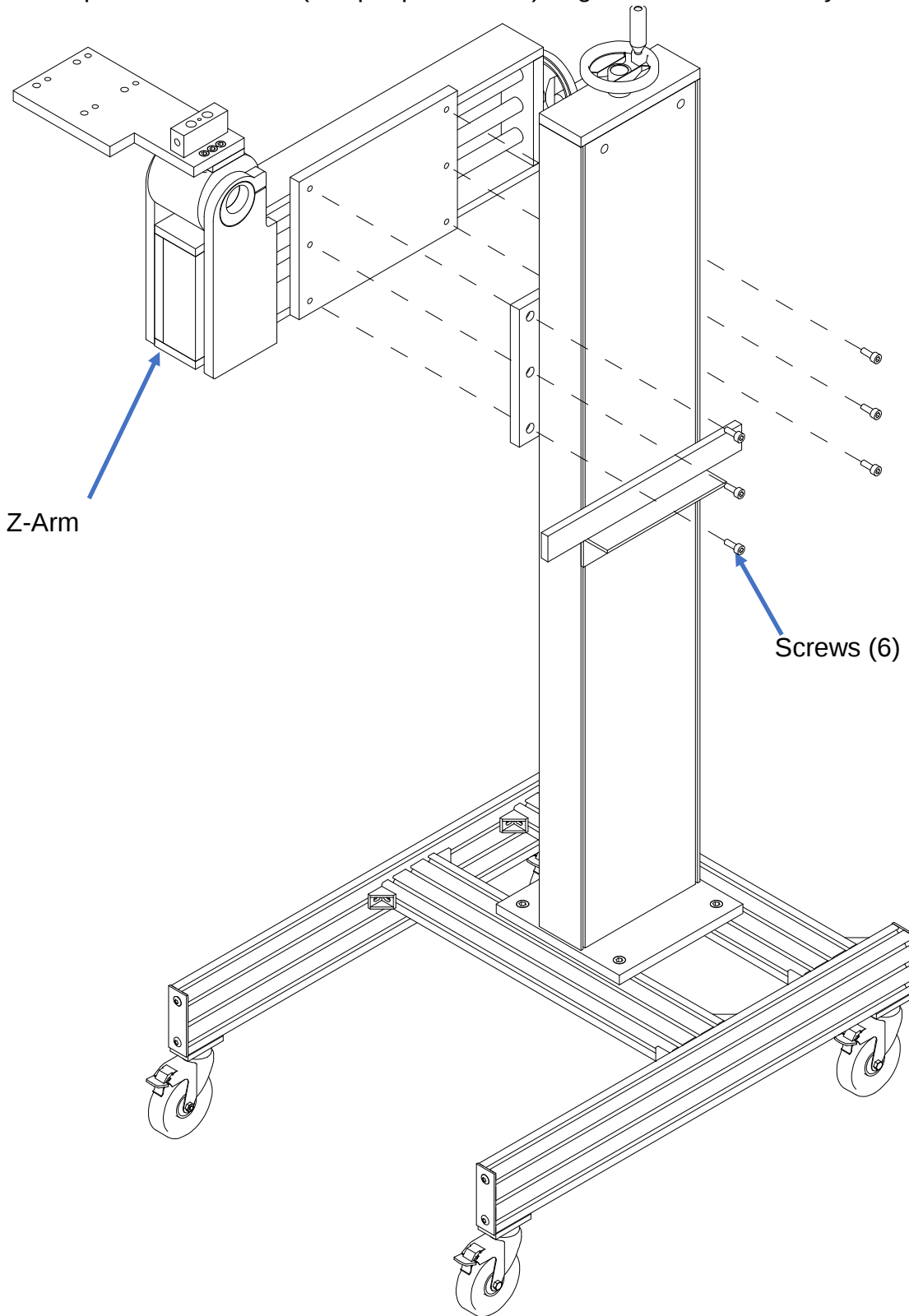
Assemble stand first using the included hardware. A minimum of 2 people will be required for assembly. Stand (if ordered) and Laser come in separate boxes.

Stand Assembly

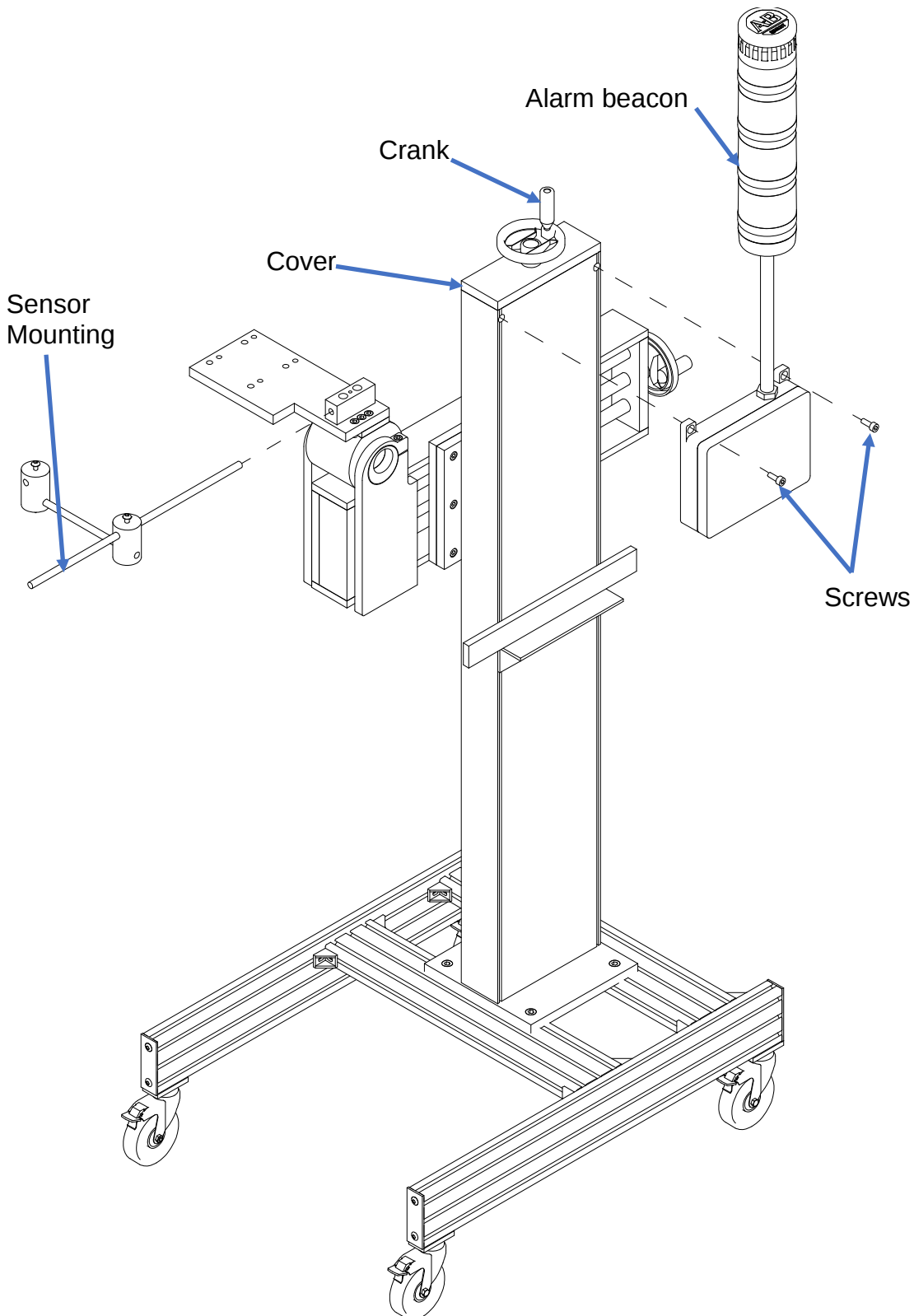
Unpack the base and attach the stand to the main braces with the four (4) 6mm socket head cap screws included. Line up and mate the screws with the captive tee-nuts in the base and tighten securely (the tee-nuts should be located on the inner “tracks” of the base).



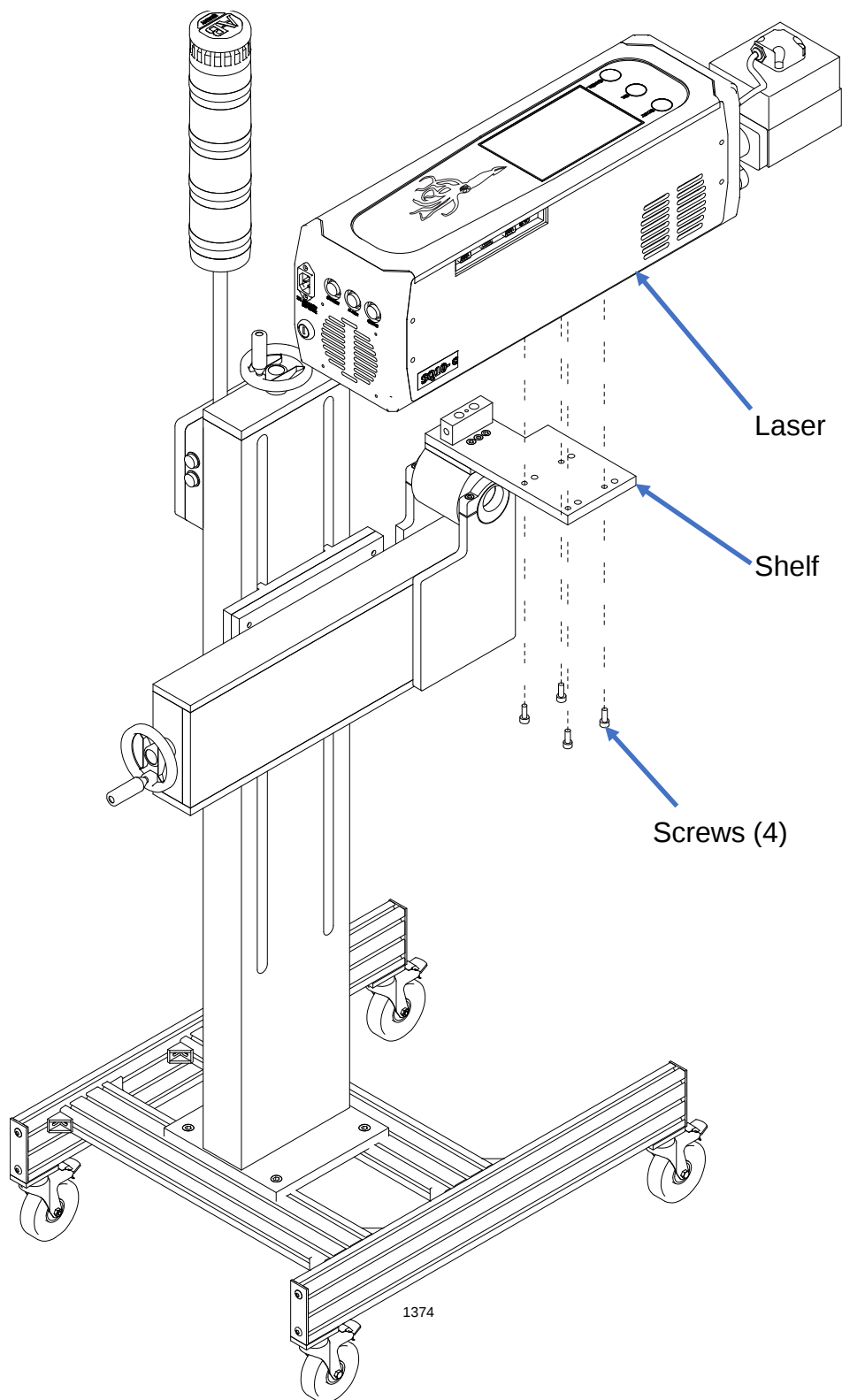
Lock the casters. Attach the Z-direction arm to the stand with the six (6) 5mm socket head cap screws included (two people needed). Tighten screws securely.



Attach the alarm beacon power box and the alarm beacon where shown with two (2) 5mm screws. The top crank and cover may have to be removed to place tee-nuts into the grooves of the column. Attach the sensor mount to the sensor block.

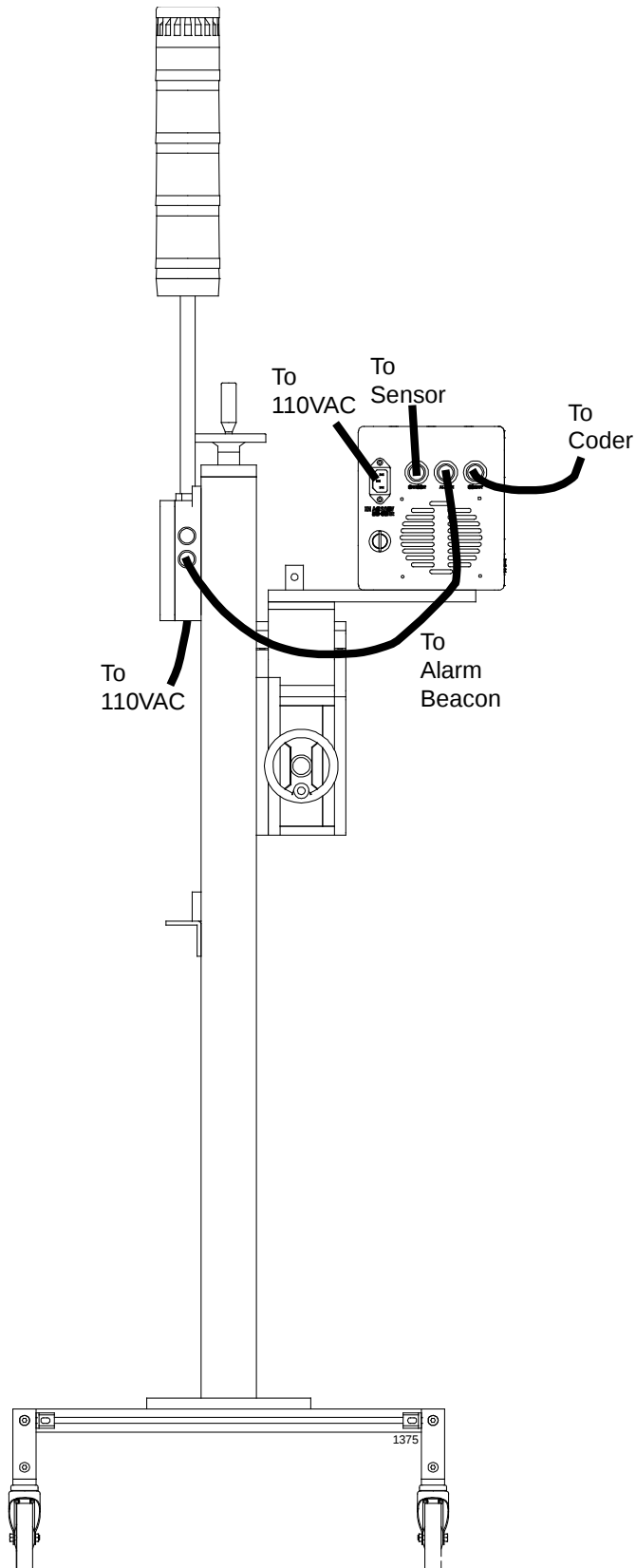


Place the laser on the shelf part of the stand. Secure laser to stand with four (4) 8mm screws and tighten.

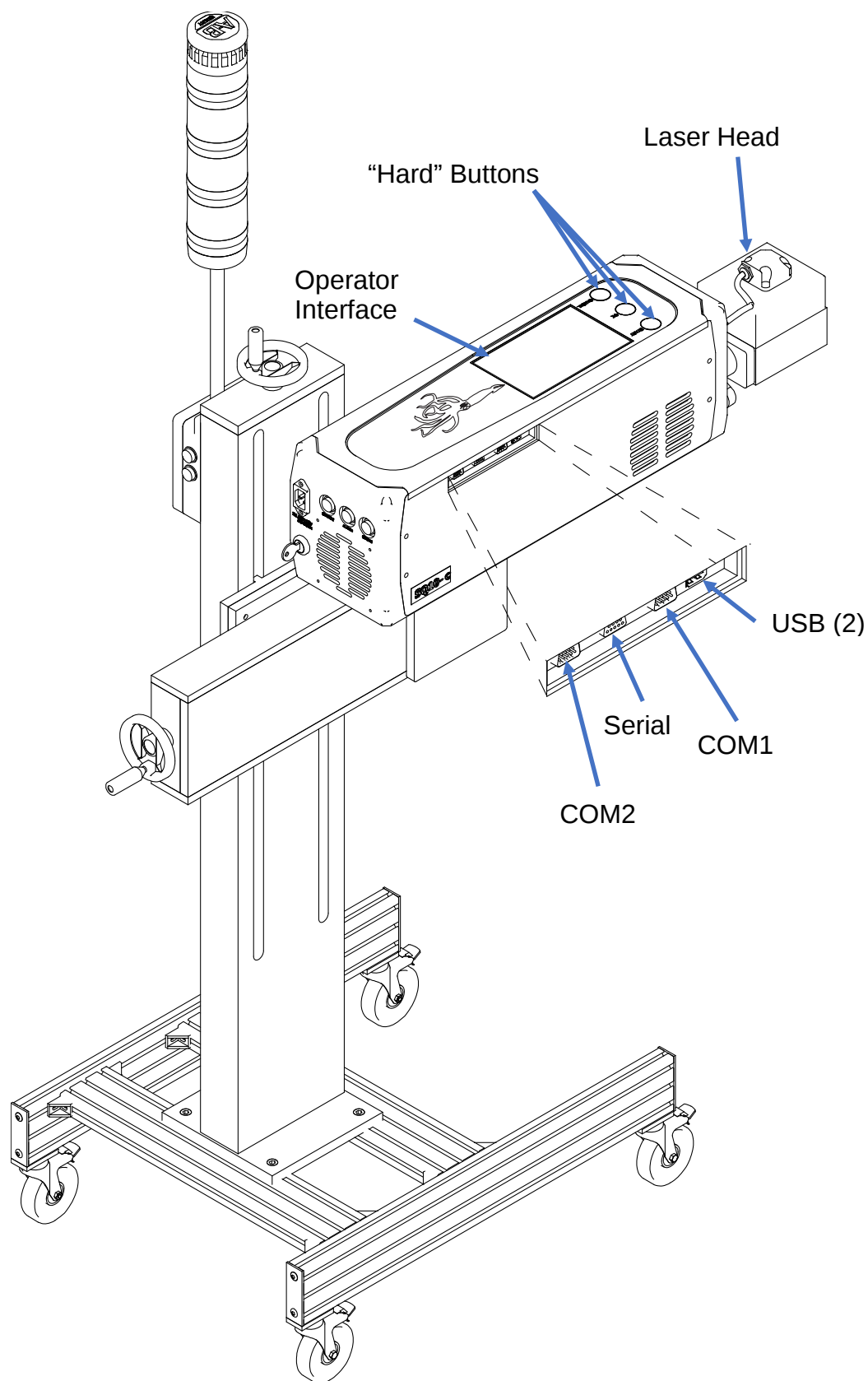


Cable Connections

Plug in the cables.



General Layout



Connections

1. USB Connections

The system includes two (2) USB ports suitable for a USB thumbdrive, mouse, keyboard, or other external USB devices. May also be used for external peripheral expansion.

2. RS-232 Connections

The system includes two (2) RS-232 serial communication DB9 interface ports.

3. Also included is a DB9 female for sensors and synchronous encoder interface.

Note: Ensure that air outlet remains clear. Promptly remove any foreign objects.

Operation

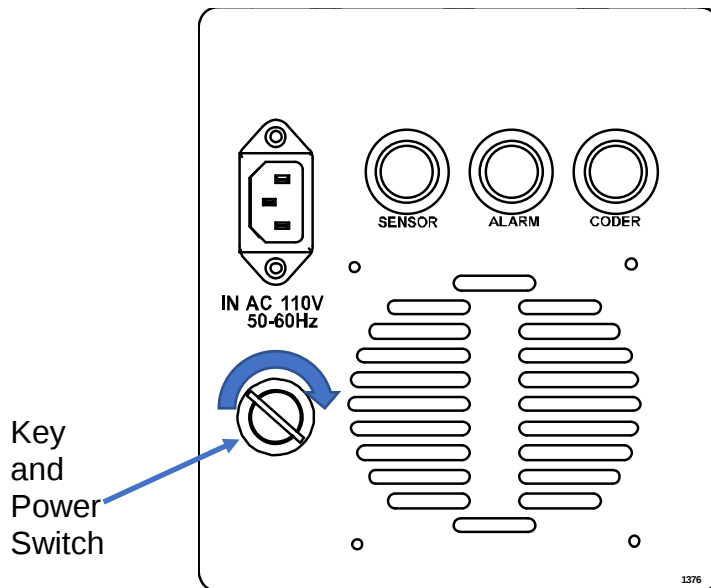
The laser marking system is based on embedded WINDOWS CE (WIN CE) system, has functions of robust real-time, fast start, high stability, and strong antiviral ability. It can be powered on/off anytime with no system crash. When you turn on the power switch, it automatically enters the marking program.

In the “marking files” folder, if the file AUTO.LMF exists, the system will automatically open and load this file, otherwise, start a new file, or open an existing one.

Power Up

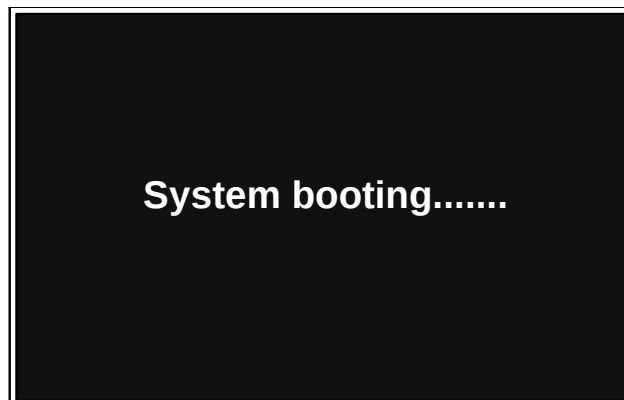
Power Switch

To power up the SQ Laser Marking System, insert the key and turn the power switch located on the back panel to the **ON** position. The operator interface comes on.



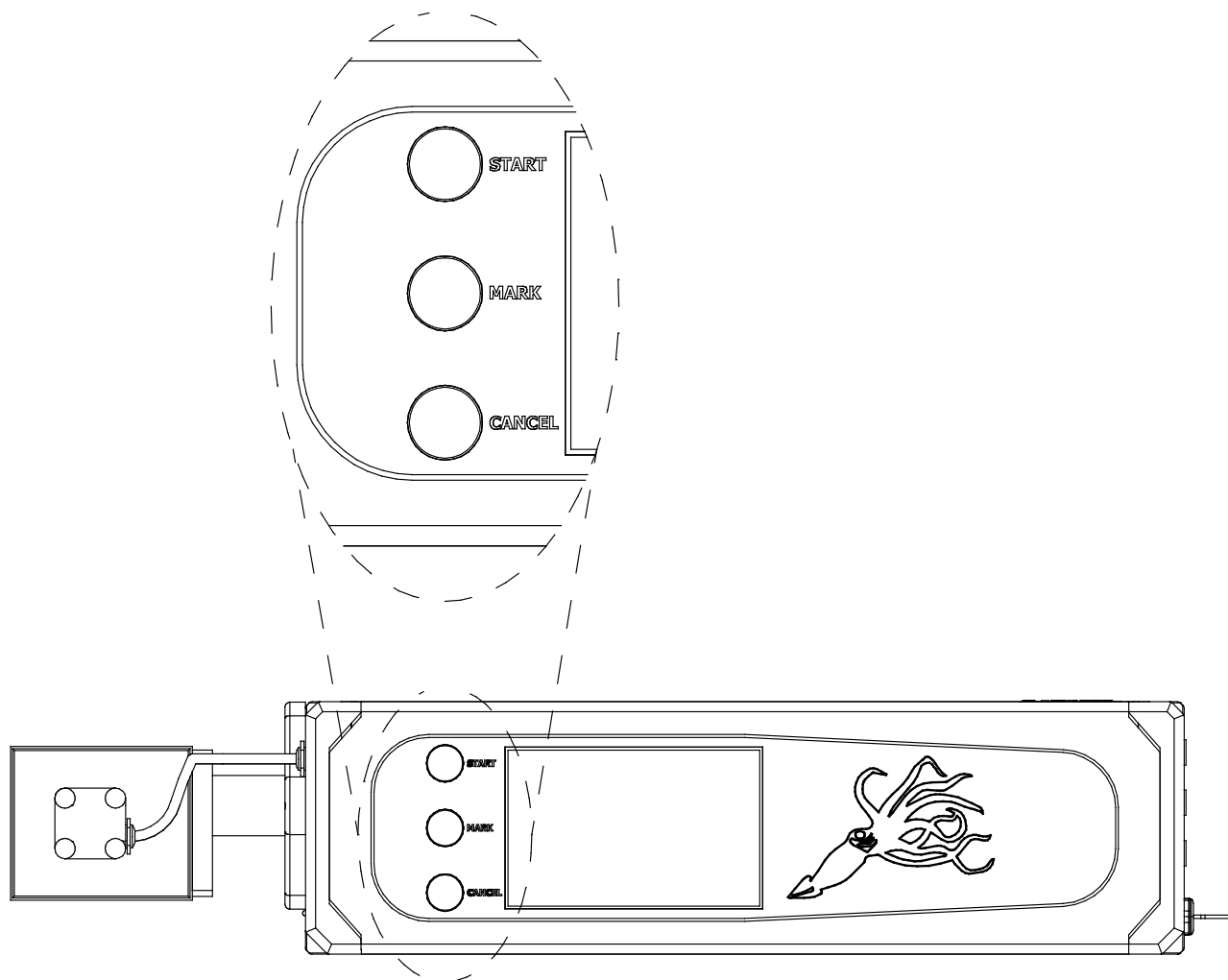
Operator Interface

On power-up, the “**System booting.....**” announcement appears in the operator interface.

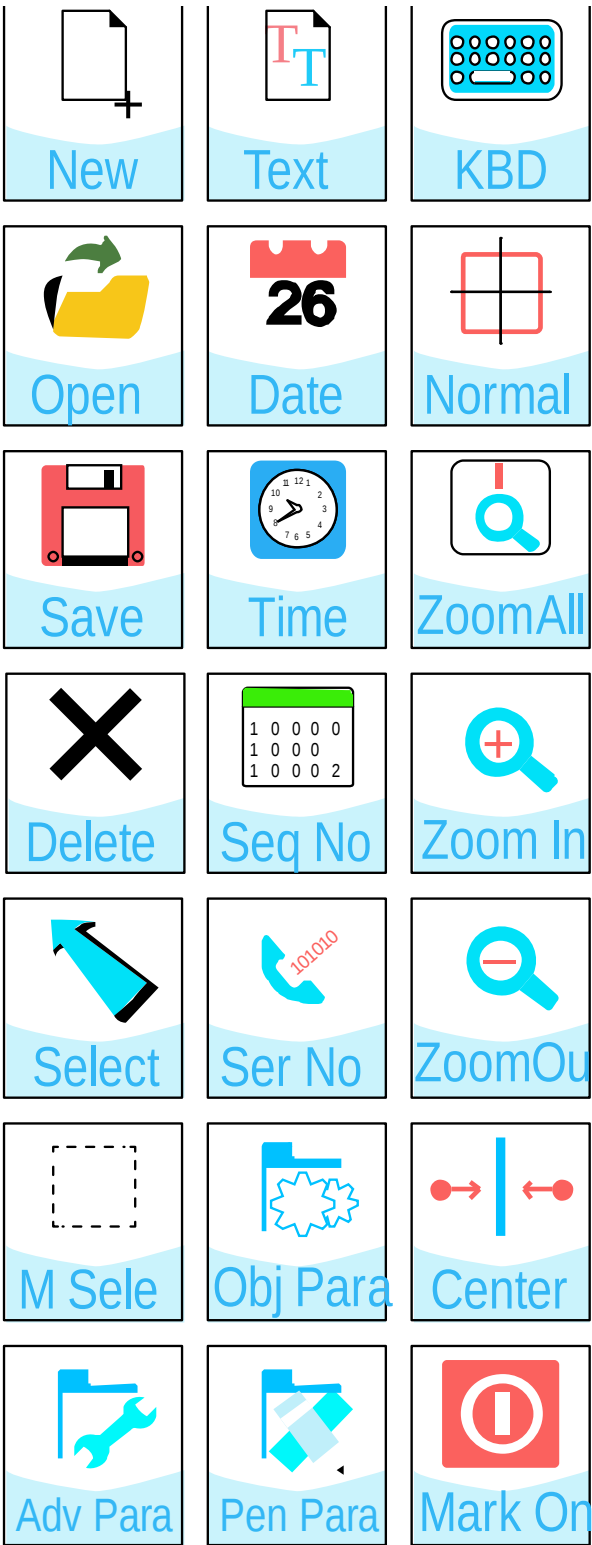


There are 3 “Hard” shortcut buttons on the top of the unit-

- START
- MARK
- CANCEL



The system includes the following 21 basic tool buttons in the interface:



1528

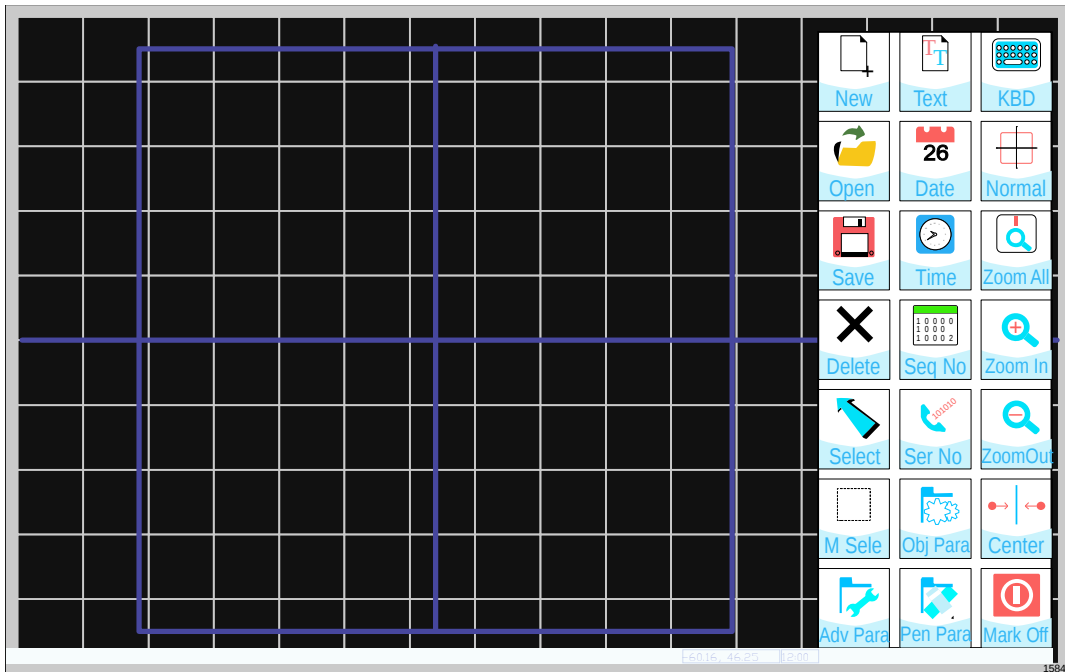
The interface shows this array of the function “soft” buttons.

A brief introduction to each buttons' function:



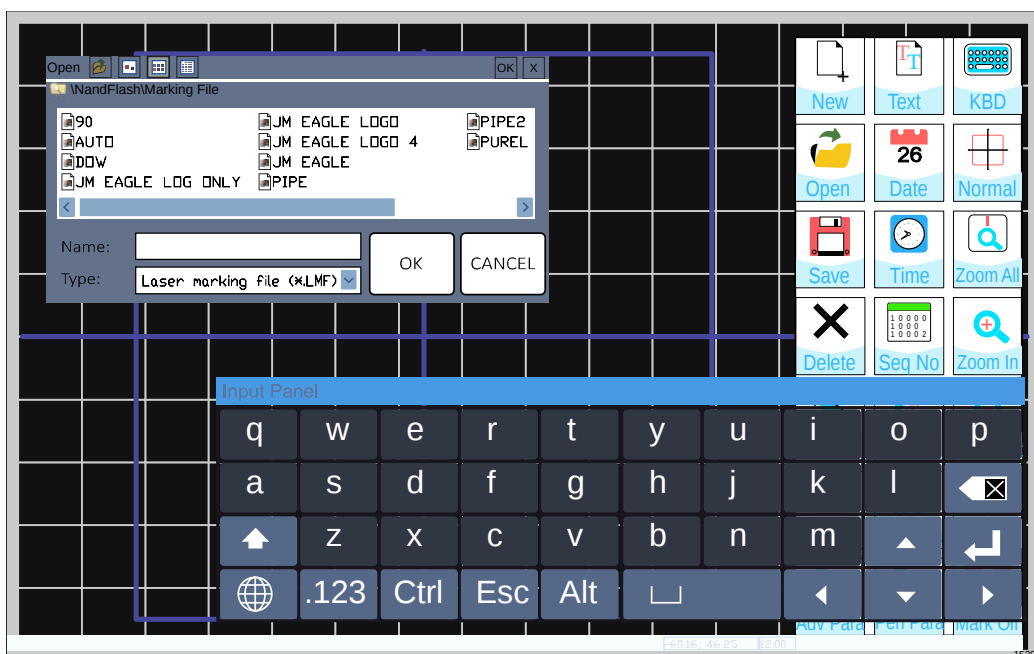
New

Select this button to make a new marking file. The blank screen will appear. The blue frame is the marking area. Each gray grid is graduated in centimeters.



Open

Select the “open” button to open an existing marking file. Select the desired file and click OK. This will load the file into the system. The system default is “LMF” (If there is a saved marking file, it will have an extension of “MRK”).



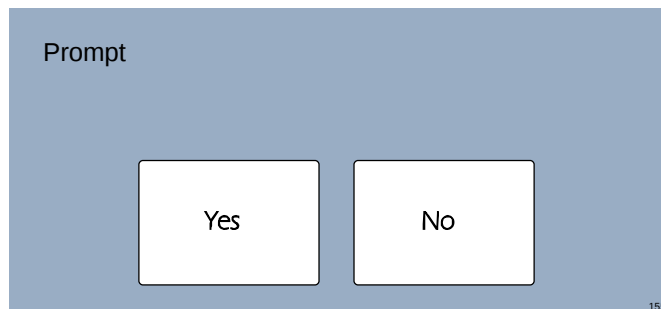
**Save**

This button allows saving the debugged marking file parameters for future use. If the file name already exists, the system will not prompt for a new filename but will modify the information, overwriting the original file. The operator can save to a new file name if desired.

Note: If this file name already exists, the system will prompt the operator “Replace existing file?” If yes is selected, the system overwrites the contents of the original file.

**Delete**

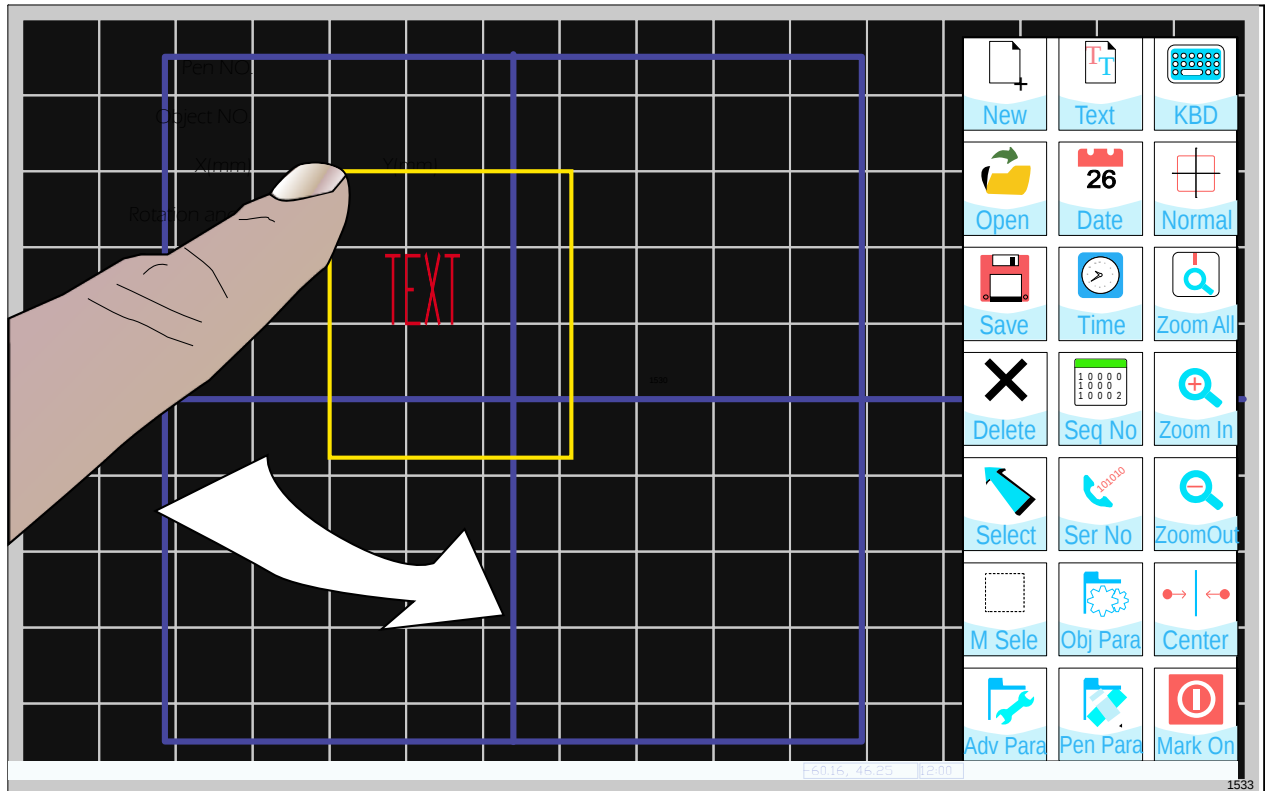
This allows deletion of marking contents, either individually or several at once. Selected items turn from white to red, then may be deleted. The next dialog box allows for a last choice.

**Select**

This is used to select an object to be edited. Selected objects turn from white to whichever pen color is active.

**M Sele**

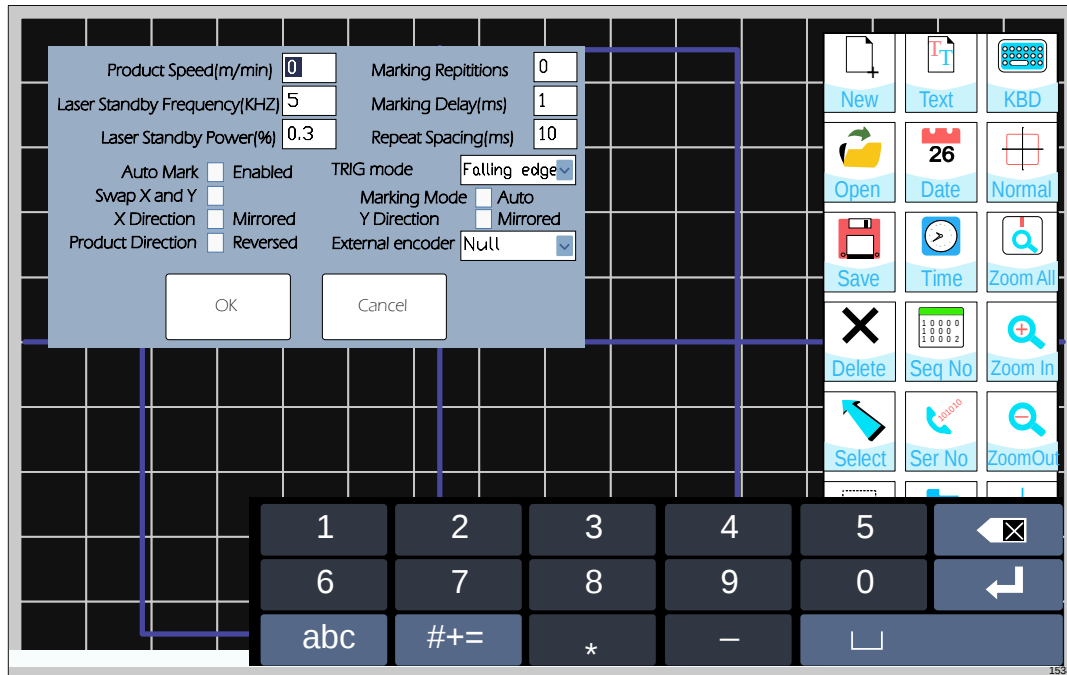
Multi-select is used to select, and move or delete objects. Using a finger, press the screen, and drag, making a yellow rectangle. Selected objects turn from white to active pen color.





Adv Para

Opens the Advanced Parameters dialog box when object is selected.



Product Speed(m/min)

Product speed – value is linear speed the object to be marked is traveling. Set to zero (0) for static marking applications.

Resolution (spot / cm)

Used with External encoder option below.

Marking Repetitions

Refers to the marking times in one induction trigger, generally the value is 1. If you need more marking times in one trigger a suitable value can be set. If the value is 0, when the workpiece triggers the sensor, the machine will keep marking. It will stop if there is no trigger. Whether to induct is relative to and the setting of photoelectric switch.

Laser Standby Frequency (KHz)

The output power of the laser in standby state. Generally, the manufacturer presets this, and doesn't need to be changed.

Marking Delay(ms)-

Delay time before marking starts after trigger is received.

Laser Standby Power (%)

Refers to the output power of the laser in standby state, if it is too strong, it will also lase when not marking, oppositely, it will affect the switch time. Therefore, generally you should set the value as large as possible without laser leakage. The general value is 0.5%~1%. The way to check the laser leakage is to put the marking test paper in the focal point and test it when marking.

Repeat Spacing (ms)

“Time spacing” for static marking while spacing distance for fly marking. The correct value avoids repeated marking, for example, a value of 200~300MS can avoid the repeated marking caused by the jitter of mechanical switch. A proper value can also avoid the repeated marking, which is caused by the repeated color testing of the workpiece. This value cannot be too high, otherwise it will cause non-marking during fly marking, and have a slow response when static marking.

Auto Mark ☐ Enabled

This mode will provide repeated message marking.

TRIG mode

This mode will change the trigger direction of the photoelectric induction switch. Most photoelectric induction switches have small slide switches to achieve their secondary function. The user can change both switches as needed.

Swap X and Y ☐

Used for conversion of X-axis and Y-axis. If selected, the marking object will rotate 90 degrees.

Marking Mode ☐ Auto

Used for defining the marking sequence. When set to automatic, the output sequence is calculated by the system, and this value is not generally set.

X Direction ☐ Mirrored

Used to change the X marking direction.

Y Direction ☐ Mirrored

Used to change the Y marking direction.

Product Direction ☐ Reversed

Used to adjust the direction of conveyor movement of different products. It is not affected in the static state, but used in fly marking. It is determined by the direction of the conveyor belt (first come first mark). To test this principle, input one or several characters and reduce the power of its Pen No. and drawing speed, then mark the characters one by one in static state and check whether it is first come first mark. If not, modify this value. Note that this value is very important in fly marking. If it is not correct, the machine cannot mark in flying state.

External Encoder has three options-

- Null is used for static marking or marking without the use of an encoder.
- Isolated Input refers that the encoder inputs signal through the optical coupler (through pin-2 of DB9 female).

When using the encoder, the message must be centered with the encoder running at the desired line speed in order to obtain proper spacing.

**TEXT**

This button is used for the input of ordinary static numbers, letters, barcode, or Chinese characters. Click this button and then click any position in the marking area, and a pop-up dialog box will appear (shown below). It includes all detailed parameters of the text.

Pen NO. 0

Object NO. 0

X(mm) -10 Y(mm) 10

Rotation Angle 0

Content TEXT

Font Setup

OK Cancel ENG/CH Keyboard

1530

Pen NO.

Select the marking pen for the object, and it will mark based on defined parameters.

Object NO.

A number greater than 0. It defines the marking order of the objects, but if the “output type” is set to “Auto”, the system will not mark in this order.

X (mm), Y (mm)

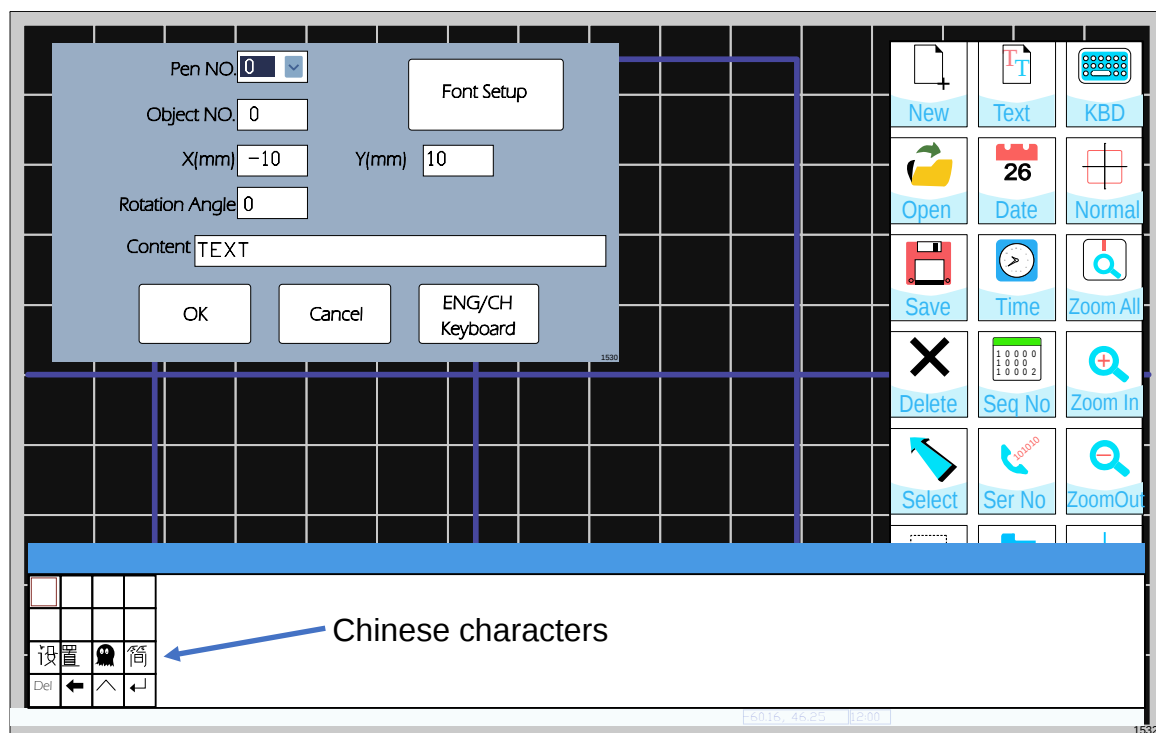
Refers to the coordinate values of the lower left corner of the present object.

Rotation Angle

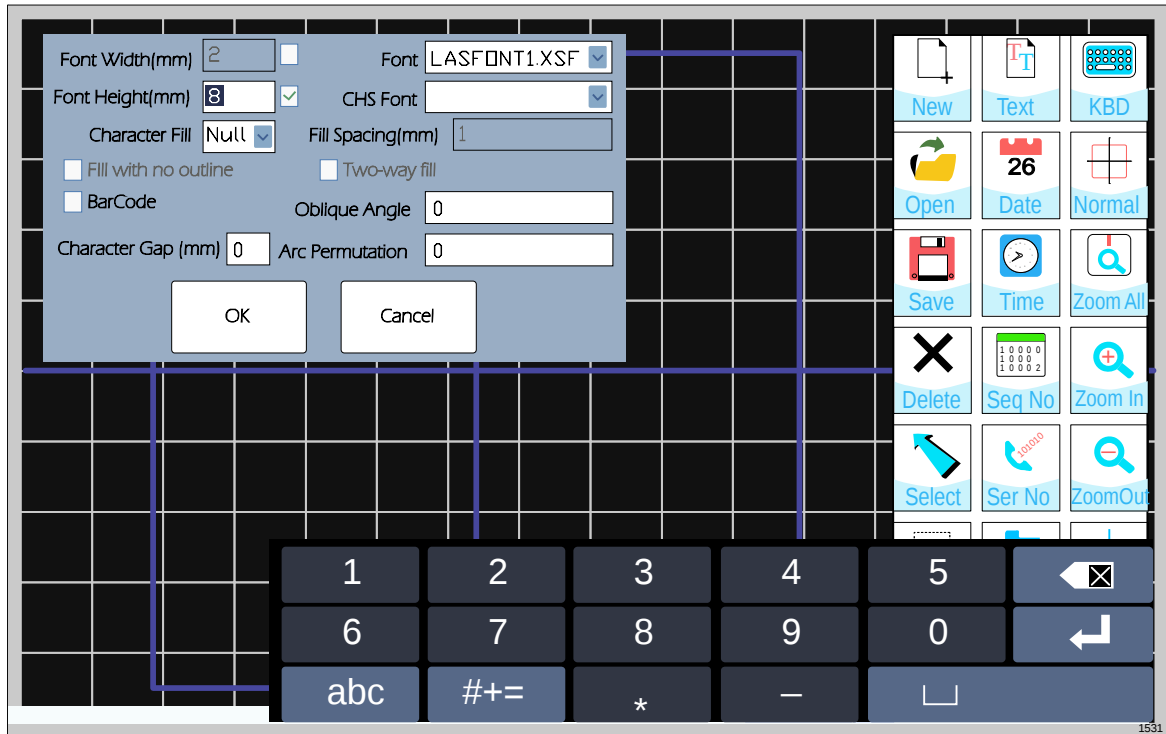
Angle of rotation of text.

Content

Message content (English).

ENG/CH Keyboard-switches from English to Chinese character keyboard**Font Setup**

Selects the font of the numbers and letters in the message. Pressing the “Font Setup” button brings up the following screen:



Font Width (mm)

Refers to the width of the letters and numbers. The width of the Chinese character is 2 times this value. Box must be checked for use.

Font

Type of font used.

Font Height (mm)

Refers to the height of the letters and numbers. Box must be checked for use.

CHS Font

Selects the Chinese font of the numbers and letters in the message.

Character Fill

- Null
- Transverse
- Vertical
- Diagonal

Fill Spacing(mm)

Fill with outline

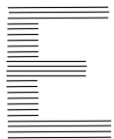
Horizontal fill shown

Fill spacing = distance between



Distance between fill

Fill With No Outline



Two-Way Fill

Two fill directions can be selected from three choices.

Barcode

Switches to barcode mode.

Oblique Angle

Used to incline the words (equivalent to italics). The range is from -45 to 45 degrees.

Character Gap (mm)

Refers to the spacing between the characters. The value may be negative.

Arc Permutation

If the value is not 0, the object will be arranged like an arc. The arc radius determines curvature. If the value is negative, it will be a concave shape, if positive, it will be convex. You can also modify the "Rotation Angle" to set the starting angle.

OK to save.

Cancel to cancel.

**DATE**

This button is used for dynamic data input. Most of the operation is the same as the operation of TEXT, as shown below.

Pen NO. 0

Date Format 0

X(mm) -10

Y(mm) 0

Expiration (days) 0

Content 20130720

Font Setup

OK Cancel ENG/CH Keyboard

1535

Pen NO.

Select the marking pen for the object, and it will mark based on defined parameters.

Date Format

Defines the marking data format.

X (mm), Y (mm)

Refers to the coordinate values of the lower left corner of the present object on the screen.

Content

Message content. (English). Displays date to be marked with selected format.

Expiration (days)

Number of days to advance date for marking expiration dates.



TIME

This button is used for dynamic data input.

Pen NO. 0

Time Format %H %M %S

Object NO. 1 Rotation Angle 0

X(mm) -10 Y(mm) -10

Content 17 01 21

Font Setup

OK Cancel ENG/CH Keyboard

1536

Choose a proper **Time Format** as needed. You can place additional characters after the time input (including Chinese), but not in front of it.

Pen NO.

Select the marking pen for the object, and it will mark based on defined parameters.

Time Format

Defines the time format.

Object NO.

A number greater than 0. It defines the marking order of the objects, but if the “output type” is set to “Auto”, the system will automatically select the order.

X (mm), Y (mm)

Refers to the coordinate values of the lower left corner of the present object.

Rotation Angle

Angle of rotation of text.

Content

Message content. (English). Time format is Hours Minutes Seconds.



SEQ No

The Sequence Number button is used for dynamic data input.

Pen NO	0	Font Setup
Character Type	Decimal	
Object NO	0	Rotation Angle
X(mm)	-10	Y(mm)
Step	1	Repeat
Min Code	0	Max Code
End Count	0	
Content	00000001	
Reset	OK	Cancel
		ENG/CH Keyboard

1537

Pen NO.

Select the marking pen for the object, and it will mark based on defined parameters.

Character Type-

Defines the marking data format.

The System Settings in incremental mode are decimal, hexadecimal, Alphanumeric, Letter, Exclude 4,7, Septenary and Random Number.

In **Decimal** mode, only digital 0 to 9 are used.

In **Hexadecimal** mode, digital 0 to 9, A and B to F. Incrementing past F returns to 0.

In the English **Alphanumeric** mode, the letters A through Z are used.

Incrementing past Z returns to A.

Letter, Numbers 0 to 9 and the letters A through Z are used. Example: 01, 02...0Z, 10, 11, 12...1Z, 20. Incrementing past returns to 0.

Exclude 4, 7 excludes the number 4. Uses 0, 1, 2, 3, 5, 6, 7, 8, and 9.

Septenary uses 0, 1, 2, 3, 4, 5, and 6.

In **Random Number** mode, random numbers are generated.

Object NO.

A number greater than 0. It defines the marking order of the objects.

Rotation Angle

Angle of rotation of text.

X (mm), Y (mm)

Refers to the coordinate values of the lower left corner of the present object.

Step

Refers to the added value of each marking encoding.

Repeat

Number of marking times the same code is marked.

Min Code

Refers to the minimum or starting values of the sequence.

Max Code

Refers to the maximum or final value of the sequence. Increments beyond this will restart the sequence at the min code.

Content

Message content. (English). Numbers, letters, or characters.

Note: If marking manually, the serial number will not be changed, but it will in triggered Marking Mode.



SER No

This button is also used for dynamic encoding of the input, the differences between "serial number" and this button is that it is encoding from a formatted text. The system will first prompt to select the serial number file.

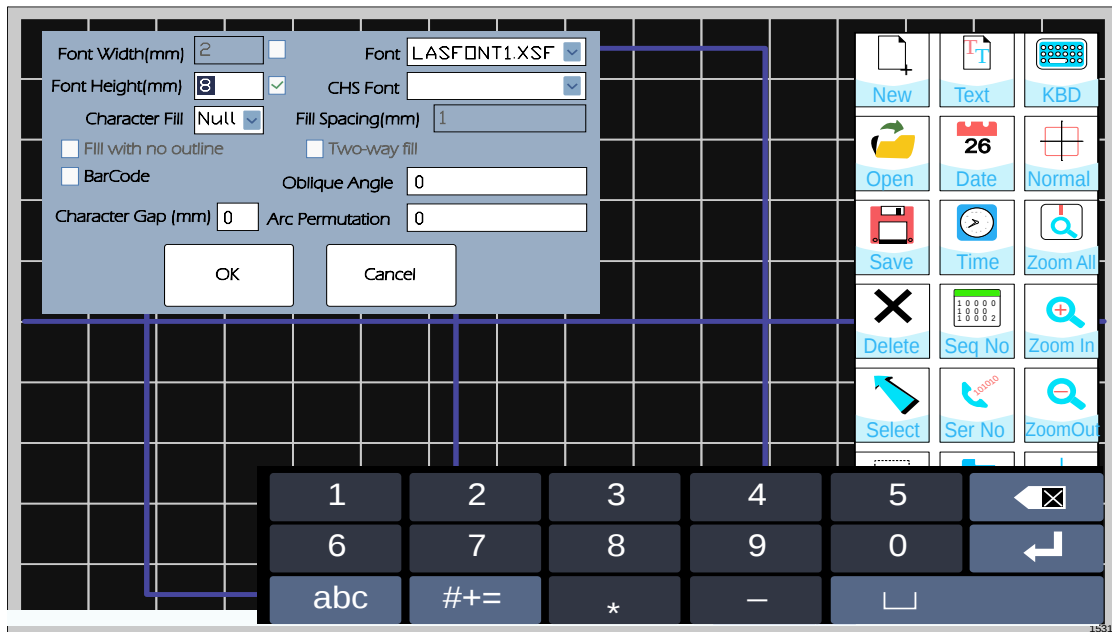
A screenshot of a software dialog box titled 'SER No'. It has a light blue background. At the top left, there is a 'Pen NO.' label followed by a dropdown menu showing a blue checkmark. Below it is an 'Object NO' label followed by a text box containing the number '0'. To the right of these is a 'Font Setup' button. Further down, there are two text boxes: 'X(mm)' containing '-10' and 'Y(mm)' containing '-10'. Below those are 'Rotation' (containing '0') and 'Row space(mm)' (containing '0'). At the bottom is a 'Content' label followed by a long text box filled with the character '8'. At the very bottom are three buttons: 'OK', 'Cancel', and 'ENG/CH Keyboard'. A small number '1538' is in the bottom right corner.

Note that, the format of the contents of the serial number file must be in accordance with the format of the "System Setting". The number of characters in each line in the serial number file must be the same, and the number of characters should be the same as the numbers of " # " in "System Setting". See "System Setting" on page 60.



Obj Para

This button is used to open the specific parameter dialog box of objects.



Selecting the **Obj Para** button allows the operator to modify the parameters of the array (rows, columns, and spacing). When selected, the object changes from white to active pen color. Click on the **Obj Para** button and the **Parameters** dialog box will appear, which allows the operator to modify object parameters, such as font, size, position, and other parameters. The selected object can be moved with keyboard direction keys.

Pen NO.

Select the marking pen for the object, and it will mark based on defined parameters.

Object NO.

A number greater than 0. It defines the marking order of the objects, but if the “output type” is set to “Auto”, the system will not mark in this order.

X (mm), Y (mm)

Refers to the coordinate values of the lower left corner of the present object.

Rotation Angle

Angle of rotation of text.

Content

Message content (English).

Choosing “OK” will save the current modification selected, and edit or modify its parameters.

Cancel will cancel it. Either “hard” or “soft” keys can be used.



Pen Para

Pen NO	0	Auto-Delayed	Null
Output Power(%)	75	Laser Frequency(Khz)	10
Draw Speed(mm/s)	1750	Jump Speed(mm/s)	6000
Laser On Delay (μS)	150	Laser Off Delay(μS)	170
Dotting Time(μS)	0		
Initial Power(%)	99	Power Increment(%)	100
OK		Cancel	

1539

Pen NO

The system defines a total number of 10 pens-pen 0 to pen 9. The parameters of each pen are different, and can accomplish 9 different marking results using different parameters. Specify the pen No. for the marking object, and it will mark with the parameters with which it has been set, such as power, speed and more. Select the pen to be edited in the "Pen No." drop-down and modify its parameters.

Auto-Delayed

When the marking content is too long and the flying speed is too low, Auto-Delayed will automatically insert delay time for each character or each line. Generally, it is **Null**. For example, if the marking content is too long when marking on wire, cable, or pipe. If the speed is too low, you can set **Char** for delay between characters, or **Line** for automatic delay between lines.

Output Power (%)

Used to determine how much power is being output, depending on the material of the workpiece. You can achieve the requested marking effect by choosing a different power setting based on the laser absorption of different materials.

Laser Frequency (KHz)

When marking vector objects, the frequency should be 10 ~ 18KHz. The frequency should not exceed 20KHz or it will affect the laser power output. When you need to mark dotted lines, use low frequencies (1Khz ~ 5Khz), the value depends on the point density. The lower the density, the sparser the pattern, the higher the density, the denser the pattern is.

Note: Power should not exceed 50% when marking dotted lines.

Draw Speed (mm/s)

Refers to the moving speed of the light-spot on the marking plane when marking. The higher drawing speed, the shorter time it needs to mark. It has two limits, one is the response speed of the galvanometers, when the speed is low, marking character strokes will not be neat. The other is the laser power. When the laser power is set to more than 95%, and marking is still not clear enough, the only way to rectify this is to reduce the draw speed. Therefore, the marking speed depends on these two limits and the marking material. Under the premise that the character is neat, clear and without jitter, users can trade-off speed and quality.

Jump Speed (mm/s)

The difference between jump speed and draw speed is that the jump speed doesn't mark while jumping to the start of the next field. The factor which affects it is the response speed of the galvanometers. The number entered can be large for neat marking characters, but generally it is 2 to 4 times the speed of draw speed.

Laser On Delay(μS)

Because the speed of the mechanical movement of the galvanometers is lower than the electrical operating speed, to ensure the accuracy of the marking position, laser on delay needs to be added. The time unit is one microsecond, and is directly related to the speed of the galvanometers.

Laser Off Delay (μS)

The length of time it takes to turn off the laser when the line drawing is finished. The time unit is in microseconds. If the segment is not closed, you can increase the **Laser On Delay** to postpone the closing time of the laser, and finish the marking. However, it should be noted that too much **Laser On Delay** will not only result in wasting time marking, but also keep the laser marking at the endpoint, which will affect the marking result (may burn a hole).

Note: **Laser Off Delay** and **Laser On Delay** are two options to set the response delay of the galvanometers. It should be adjusted by using Jump Speed and Draw Speed.

Dotting Time (μ S)

When marking bitmap fonts, the operator can use dotting time to set the Dotting Time (using Draw Speed is not recommended for bitmap fonts. Similarly, do not use Dotting Time when marking vector objects).

Initial Power

This setting controls the primary power of the laser, since this initial radiation pulse is higher than the steady laser power. Reducing this setting below 100% can provide a more consistent mark from the start to the end of the mark.

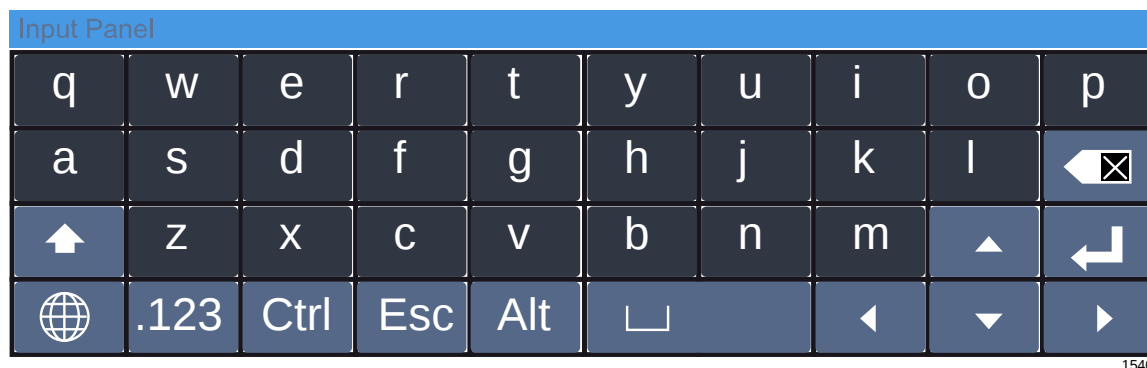
Power Increment

Combined with Initial Power, this setting can help keep the mark consistent from start of mark to the end of the marking segment.

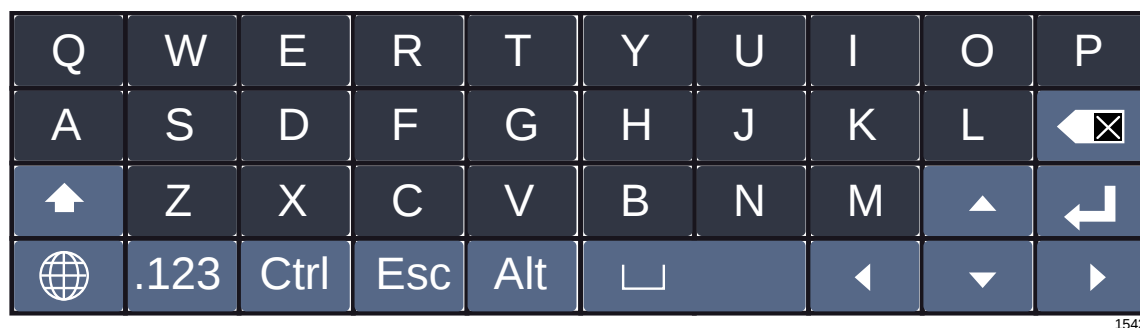


KBD

Turns on and off system's on-screen keyboard.

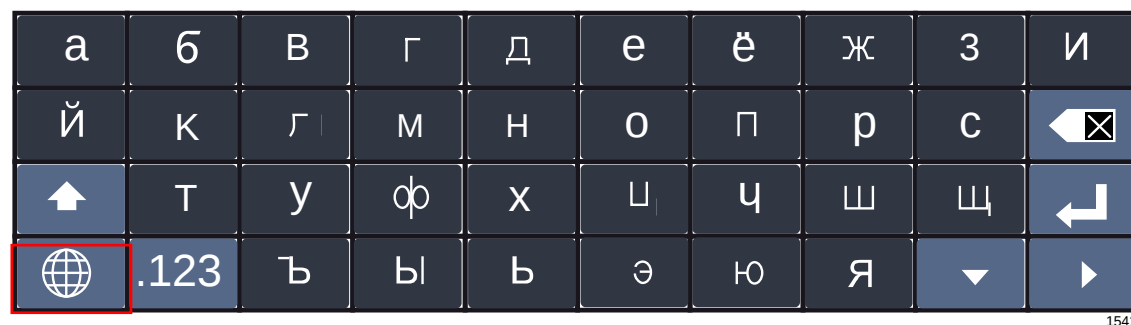


A simplified computer keyboard which contains all keys that the system needs. If you need to enter capital letters or other symbols, you can press "Shift" or "Caps Lock". The keyboard will change to the following:



Arrow keys

The 4 arrow keys are used for moving the marking position. If there is a selected object, the selected object is moved. If no object is selected, pressing the arrow keys will use the entire marking region. " - "means reduce," = " means increase.



Pressing the "World" icon brings up the Cyrillic alphabet input.

**Normal**

displays entire marking area.

**Zoom All**

Zooms to entire marking area.

**Zoom In**

Zooms in for detailed observation of marking area.

**Zoom Out**

Zooms out for overall observation of marking objects.

**Center**

This function is used to adjust the horizontal position of all marking objects, but also can detect if the marking objects are beyond the marking area.

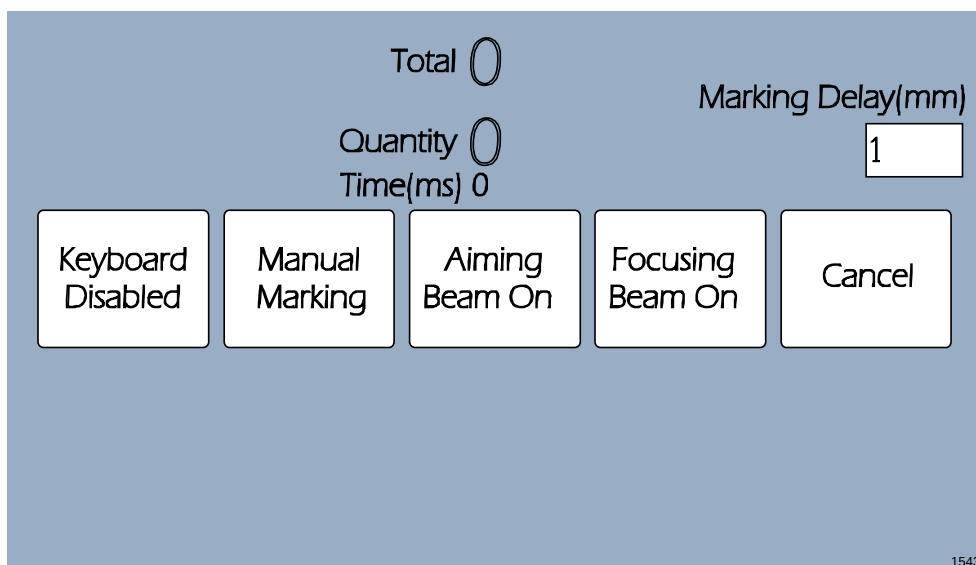
A pop-up “Please Wait” message will briefly appear.

Please Wait

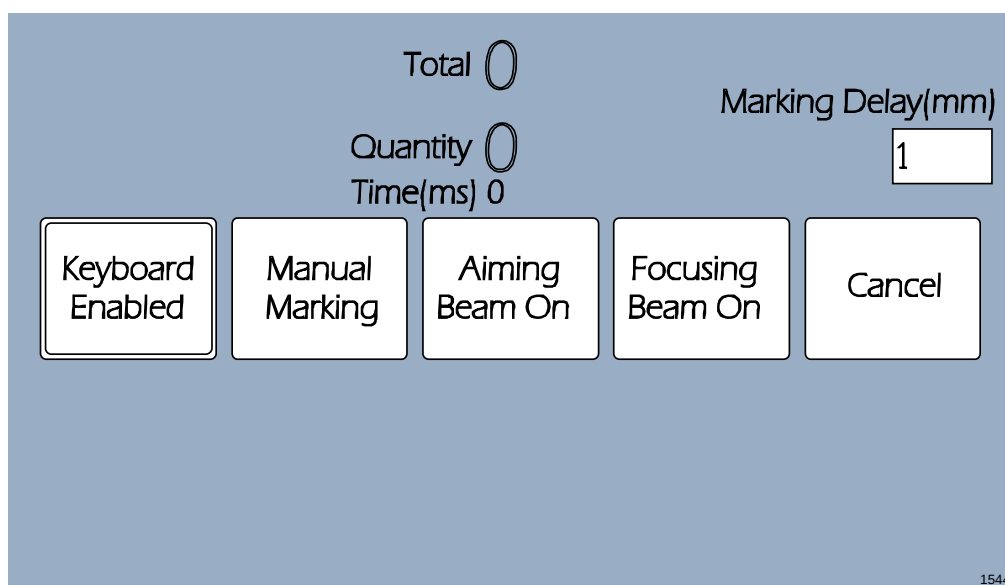


Mark On

This button performs the marking state, the shortcut key is the hard START button on the top of the laser.



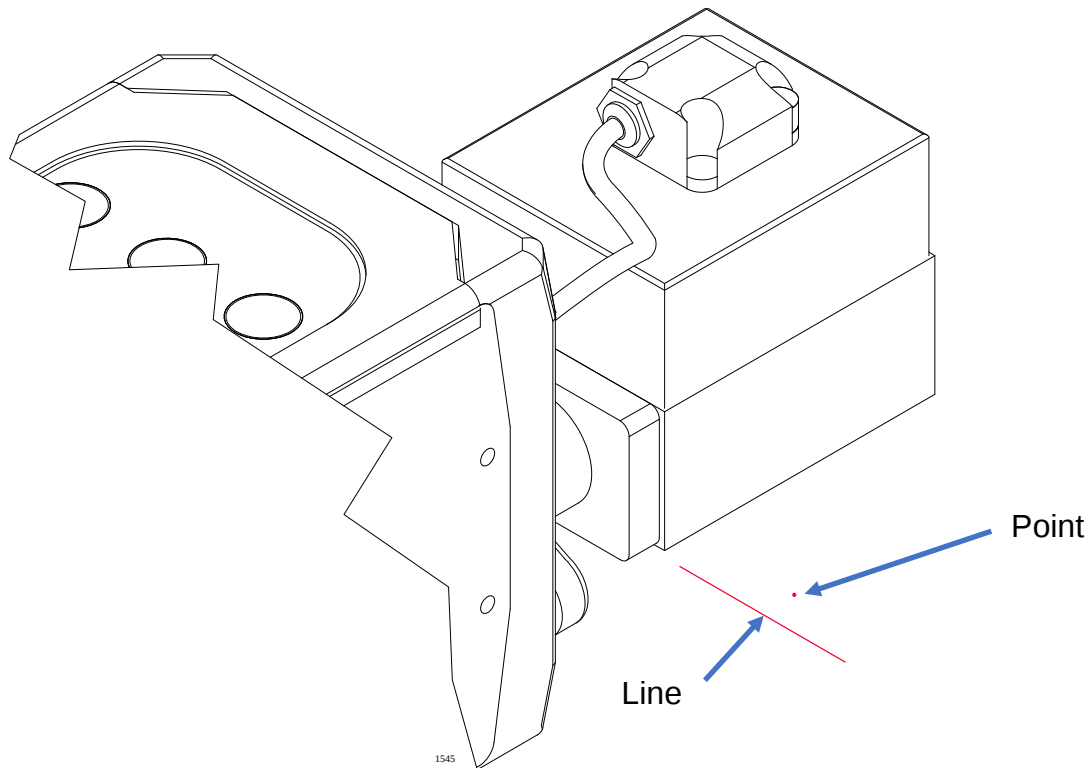
Select the **Keyboard Disabled** button and, the interface below will be shown.



Manual Marking

For a single marking. You can also click hard **MARK** button directly. To stop marking, you can click **Cancel** or the hard **CANCEL** button on top of the laser.

Press **Focusing Beam On** to turn on the two focusing red indicators. These are indicated by a line and a point on the marking medium.



Adjust the distance between the f-theta lens and the workpiece with the Y-axis turning wheel on the cart to find the focal point when the red point and the red line overlap. 136mm (approximately 5-1/4") is the appropriate distance for marking. Press the button again to turn off the focusing red indicators.

Aiming Beam On

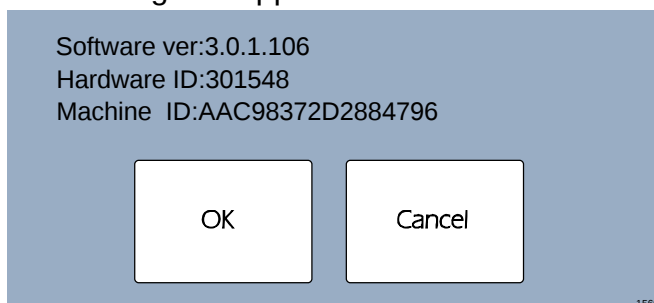
Shows the marking position as a box with an arrow. The arrow on the box edge indicates the moving direction of the workpiece. If the direction is inconsistent with the desired direction, modify the **moving direction** parameter in the **public parameter box** to change direction.



Note: For these to be used, they must be selected prior to placing the laser shroud, or the interlock will not allow usage. Shroud can be placed over the laser head afterwards.

System Parameter Settings

Access the System parameter settings from the internal keyboard by pressing the **Ctrl** and the **s** keys. The following box appears:



Choose **OK** (may have to press twice). The following box materializes:

A settings dialog box titled "Basic Parameter" with tabs for "Extended Parameter", "Serial Number", and "Pe". The "Pe" tab is active, showing navigation arrows. The settings are as follows:

Lens Calibration XY(mm): 90

Actual Marking Line Width (μm): 250

Start Mark Delay (μs): 1000

Overall Angle adj.: 0

Max Jump Delay (μs): 3000

Min Jump Delay (μs): 400

X Pincushion: /U

Y Pincushion: -100

Auto Goto Mark: ☐

Default Standby Power (%): 0.3

At the bottom are "OK" and "Cancel" buttons.

A small number "1548" is visible in the bottom right corner of the dialog box.

In this setting, there are 9 tabs in total:

- Basic Parameter
- Extended Parameter
- Serial Number
- Pen Color
- Interface Parameters
- Set Password
- Shift Set
- Screen Setting
- Aiming Beam Adjustment

As before, the **OK** button saves the current modified content as well as the hard shortcut **OK** key. This will reset the system after the completion of a restart. The **Cancel** button will cancel the command (also hard **CANCEL** button).

Basic Parameter**Lens Calibration XY (mm)**

Sets the range of the laser marking area, that follows the blue square. This value is important. The font size and the speed of movement will be relatively accurate only after this value is determined. In general, this parameter has been set before shipment, so there is no need to reset it unless replacing the marking head and f-theta.

Actual Marking Line Width (μm)

A given value and, does not mean setting a marking line width. It means the actual line width of the actual marking result.

Start Mark Delay (μS)

Adjusts the first position of the galvanometer, because most of the time, the marking of the contents of the first document is not at the origin, so the operator must add a start delay.

Overall Angle Adj. (μS)

Used for the correction of font tile due to the orthogonal galvanometer, typically 0.

Max Jump Delay (μS)

Refers to the large angle of the galvanometer response time.

Min Jump Delay (μS)

Refers to a small angle of the galvanometer response time.

Note: The above 3 delays are related to the performance of the galvanometer. If possible, it should be as small as possible, as it can save marking time

X Pincushion

Defines a corrected value for X direction.

Y Pincushion

Defines a corrected value for Y direction.

Auto Goto Mark

The System goes directly into Marking Mode on startup.

Default Standby Power

(%) of 0.3. Normally, this factory setting is acceptable. Setting it higher can help with high-speed marking. The laser will “leak beam” when not marking if the setting is too high.

Extended Parameter

The screenshot shows a menu titled 'Extended Parameter' with several settings:

- Barcode Scanner Print Mode: Common
- Record Marking Content: No
- Hold Sequential Number: No
- Alarm Output: Disabled
- Language: English
- Automatic Character Width: No

At the bottom are 'OK' and 'Cancel' buttons. A small '1549' is visible in the bottom right corner.

Barcode Scanner Print Mode drop-down includes the modes **Common**, **Cache**, and **Mark**. To achieve these three kinds of functions, the first marking file must have an object for the serial number, and the increment must be 0.

After choosing one of the above conditions, the marking interface appears as in the next box: If the cursor is placed at the input box under the **Input Information**, the typed information will be added to the large list box on the right. Alarm output must be in the enabled state. The unit reboots, and the **START** button must be selected.

The screenshot shows a marking interface with the following elements:

- Total: 0
- Quantity: 0
- Time(ms): 0
- Repeat Spacing(mm): 450
- Buttons: Keyboard Enabled, Manual Marking, Aiming Beam On, Focusing Beam On, Cancel

A small '1599' is visible in the bottom right corner.

Common

Marking area can only store 1 message. External triggers (such as photoelectric switches, foot switches, etc.) have no response when there is no marking information. External triggers will only respond when there is marking information. The system automatically clears pending marking zone information, after finishing marking. If new information continues to be entered in the pending marking area, the new information will overwrite the existing information.

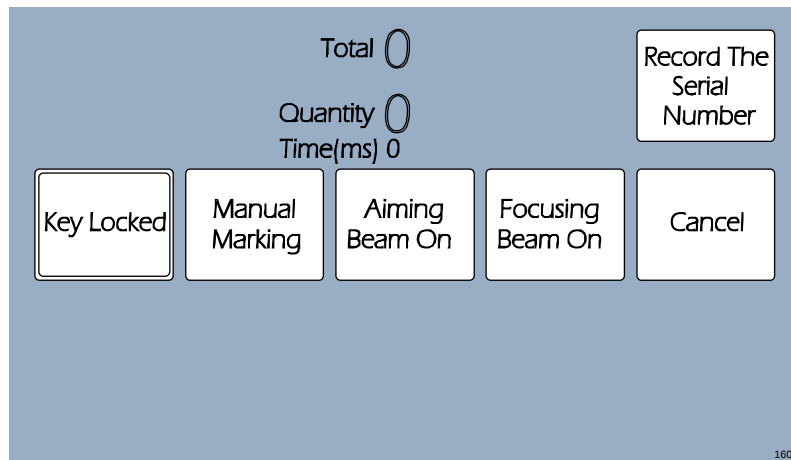
The difference between Cache and Common, is that more information can be put in the pending marking area. It can mark in order after every induction. Similarly, pending marking area information systems do not mark.

Mark

There is no waiting. Unit does not need an external trigger to perform induction marking. When the system receives a line of information, it begins marking instantly.

Note: Two consecutive marks of the same information are not allowed.

The **Record Marking Content** setting is a function to record marking the serial number. The interface will have a **Record The Serial Number** button. When this function is turned on, and this button is selected, the user is prompted to enter the saved file name. After confirmation, the system will begin marking the serial number recorded in the following format: (starting serial number is 00000011).



```

2012.08.25 10:22:21;00000011
2012.08.25 10:22:22;00000012
2012.08.25 10:22:23;00000013
2012.08.25 10:22:24;00000014
2012.08.25 10:22:25;00000015
2012.08.25 10:22:26;00000016
2012.08.25 10:40:40;00000017
2012.08.25 10:40:41;00000018
2012.08.25 10:40:41;00000019
2012.08.25 10:40:43;00000020
  
```

Record Marking Content

Hold Sequential Number means that when the user opens a new file, the marking content is not the original contents of what was saved, but the contents of the current system. An example would be, after 00000020, the current serial number should be 00000021.

Alarm Output means that there is an **Enable Alarm** button enabled on the interface after turning on the alarm button. Clicking this button will prompt the user to enter the number of alarms. One alarm is for one marking. When the number of alarms is 0, the marking state exits the alarm system. Example-set to 200 to mark 200 parts, then stop marking.

The screenshot displays a control panel with the following elements:

- Enable Alarm**: A button in the top left.
- Number of**: A label above a text input field containing the value **1**.
- Keyboard Disabled**: A button below the 'Number of' input.
- Total 0**: A status indicator at the top center.
- Quantity 0**: A status indicator below the total.
- Time(ms) 0**: A status indicator below the quantity.
- Marking Delay(mm)**: A label above a text input field containing the value **1**.
- Manual Marking**: A button in the bottom row.
- Aiming Beam On**: A button in the bottom row.
- Focusing Beam On**: A button in the bottom row.
- Cancel**: A button in the bottom row.

A small number **1601** is visible in the bottom right corner of the interface.

Language is used to select the language of the system interface, **English**, "简体中文" (Simplified Chinese) and "繁体中文" (Traditional Chinese) The user can choose according to their own preferences.

Serial Number

Serial Number Format 1 defines the serial number of the first row of the number of characters. The intermediate can be added to a space, the space is not the number of characters, " #" is considered a character, such as 16 characters, then, can be set to "#####", this is a continuous 16 characters, also can set like "#### #", these 16 characters are divided into 4 groups.

The screenshot shows a configuration window titled 'Serial number'. It contains two text input fields for 'Serial Number Format 1' and 'Serial Number Format 2', both containing the text '#####'. Below these fields are two checkboxes: 'Serial Number From TXT File' and 'Operation Log', both of which are unchecked. At the bottom of the window are 'OK' and 'Cancel' buttons. The window also features a tabbed interface with 'Basic Parameter', 'Extended Parameter', and 'Serial number' tabs, with 'Serial number' being the active tab. A small 'Pe' button with navigation arrows is located next to the 'Serial number' tab. The number '1550' is visible in the bottom right corner of the window.

Serial Number Format 2 defines the number of characters in the second line of the serial number. If only one line is to be marked, this parameter can be empty. If "serial number format 2" is different, then "*" should be added in the front of the second line.

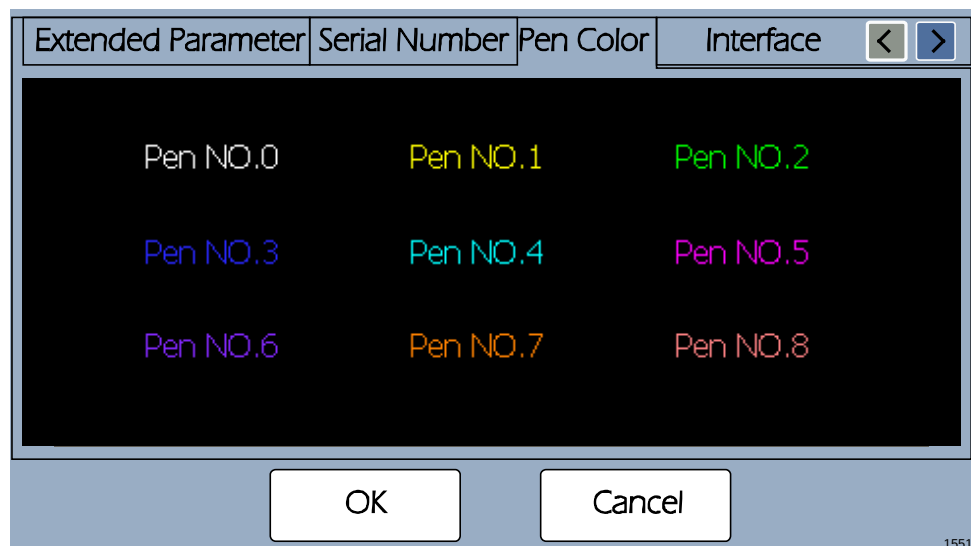
Serial Number From Txt File

A serial number can be read from a .txt (Windows Notebook) file.

Operation Log is a log file created for actual marked information.

Pen Color

This setting box is used for defining 0 to 8 pen colors, mainly for distinguishing the pen number of the marking object., It can be adjusted in accordance with user preferences.



Choosing one of the Pen NO's brings up the color boxes



Some products require different power and marking speed settings depending on object type and material marking properties. Pen colors allow easy identification that objects are using different pens. Most jobs will only require the use of one pen.

Interface Parameters

Serial Number	Pen Color	Interface Parameters	Set Pass
		Serial Barcode Scanner Connection	Null
		COM1 Buad Rate(BPS)	115200
		COM2 Buad Rate(BPS)	115200
		Return Data After Coding	Disabled
		Encoder Direction	Common
Galvanometer Interface		Digital	Laser Type C02
OK		Cancel	

Some barcode scanners are RS232. To connect this equipment, the system defines the parameters as below:

Serial Barcode Scanner Connection selections can be **Null**, **COM1** and **COM2**.

- Null means that this device is not connected
- COM1 means devices connected to serial port 1, correspond to the keyboard input and is redirected to COM1.
- COM2 and COM1 are the same, just different ports. After one of them is occupied, the occupied ports will not be used as a remote-control port, or other data input port.

COM1 baud rate (BPS) is used to set the serial communication speed, it must match the connected peripherals.

COM2 baud rate is used to set the serial communication speed. It must match the connected peripherals.

Return Data After Coding is similar to **Record Marking Content**, except that the serial number it is not written to the file, but is send out through the first defined port.

Encoder Direction

Sets direction of encoder.

Galvanometer Interface refers to the type of external galvanometer, both analog and digital, per the actual connection of the equipment to set up. if set incorrectly, the galvanometer will not work properly.

Laser Type is used to set the laser type of the marking machine.

Note: The user does not need to modify these last two items.

Set Password

Allows the password to be set.

The image shows a software window with a tabbed interface. The tabs are 'Pen Color', 'Interface Parameters', 'Set Password', and 'Shift Se' with left and right arrow buttons. The 'Set Password' tab is active. Inside this tab, there are two text input fields: 'Enter New Password' and 'Confirm New Password'. To the right of these fields is an 'OK' button. Below the input fields is a 'Cancel' button. The number '1553' is visible in the bottom right corner of the window.

Pen Color	Interface Parameters	Set Password	Shift Se < >
Enter New Password Confirm New Password OK Cancel 1553			

Shift Set

Interface Parameters		Set Password		Shift Set		Screen S	
Time To Change The Date				0	0		
	Name		Time				
Shift A		0	:0	OK			
Shift B		0	:0				
Shift C		0	:0				
Shift D		0	:0				
Cancel							

Sets Shift codes for different work shifts.

Screen Settings

Turn Off After will turn off the backlight after however many minutes are chosen.

Brightness Adjust adjusts the brightness of the screen; while setting a screen protection.

Screen Rotation will rotate the screen. To facilitate the rotation process during actual operation, the rotated screen function set by the system can select an appropriate screen direction for the user to operate the software. After this is selected, press OK, then the system will reboot.

Aiming Beam Adjustment

Shift Set	Screen Settings	Aiming Beam Adjustment	<	>
		X Offset	-0.6	mm
		Y Offset	-0.1	mm
		X Amplify	2.4	%
		Y Amplify	3.8	%
		Auxiliary Focus	-63	%
OK				
Cancel				

1556

The **Offset** and **Amplify** settings are factory-set calibration settings for the red display laser position. The **Auxiliary Focus** setting is a factor setting that establishes the red laser focus line that is used to set the focal length of the lens. These settings should not be changed.

Additional Keyboard Commands

Spot Parameter

Draw Point (Alt-D)

Press the **Alt** key, and then press the **D** key, to use the Spot parameter command. Press a point on the screen to place a spot in any position in the target area. Select and press the **Delete** key to delete the point. Multiple spots can be placed on the screen.

Line Parameter

Draw Line (Alt-L)

Press the **Alt** key, and then press the **L** key. The system enters the Line Parameter mode. Press a point on the screen to place the starting point of a line, and then click to another location for the endpoint of the line. Select and press the **Delete** key to delete the line. Multiple lines can be placed on the screen.

Circle Parameter

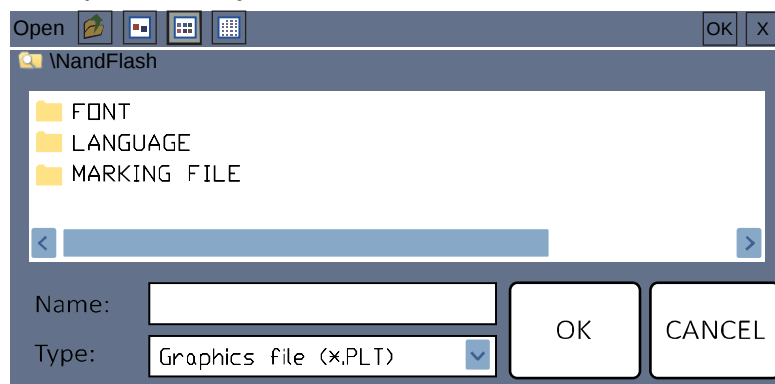
Draw Circle (Alt-C)

Press the **Alt** key, and then press the **C** key, to use the circle parameter command. Press a point on the screen to place a circle in any position in the target area, and drag for size. Select and press **Delete** key to delete the circle. Multiple circles can be placed on the screen.

Import PLT Files

Logo Files (Alt-T)

Press the **Alt** key, and then press the **T** key, the system enters the import logo state. Select the file to import. The system default file is *. PLT.



Attention: .PLT files are exported by CAD. The user must choose the **General LHPGL** form that is printed out by an HP printer, then export the .PLT vector file.

Maintenance

Clean the exterior of the lens with the laser power unplugged.

Cleaning of Lenses and Mirrors

(With thanks to Laser Beam Products of England).

The principles of cleaning optical elements outlined here, apply broadly to all optics, regardless of the conditions they operate under. The examples are mainly related to infrared lasers. With an imaging system, increasing detector amplification can offset absorption of light by optical elements. With high power systems however, that absorbed light will lead to heating of the elements and a level of distortion is inevitable, as the optic changes shape, or refractive index, with temperature. In laser processing this can have a positive feedback effect, as optical elements distort, the focused spot or beam alignment drifts away from the predetermined conditions, process back scatter can increase, causing even more contamination and debris. All optics from the moment of use, and occasionally in storage, will acquire a level of contamination. A cutting lens close to plastic being cut, will be contaminated with condensates and smoke that are essentially organic in nature. It is not realistic that a single prescriptive cleaning technique could deal with such diversity. Few optics can be mechanically abraded or soak-cleaned, so everyday cleaning is limited to wiping with a solvent and a swab.

Reasons for Wiping:

- 1) The optic is not mechanically damaged by scratching.
- 2) The optic is not chemically damaged, by etching or other chemical attack.
- 3) That absorption is lowered (transmission increased) to a suitable level for a lens or window.
- 4) That absorption is lowered (reflectance increased) to a suitable level for a mirror.

Given that physical removal of the debris or contamination by rubbing is not feasible, cleaning is reliant on the solvent dissolving the contamination, allowing the resulting solution to be soaked up and removed by the swab. The essential point here is that the solvent **dissolves** the contamination, resulting in a solution of dissolved dirt that can be taken away from the optics surface. Consider an everyday example, washing car bodywork. Rock salt is obviously easily dissolved into water, but no matter how many gallons of water were used, no one would expect it to dissolve even a fleck of tar. However, a drop of paraffin results in complete removal of tar. This shows how successful the approach is of knowing the properties of the contamination, and then choosing the appropriate solvent. The only restrictions in choosing a solvent are, avoiding chemical damage to the optic and it's coating, and Health and Safety guidelines. Cost is typically not an issue.

The Cleaning Process

- 1) The preferred method involves a swab such as cotton wool, which will hold a large volume of solvent. Use natural cotton wool, rather than man made mixtures, which will cause scratches. The swab needs to be free from all particles, and kept in a sealed bag. Check for seeds and knots before use. The swab should be well wetted, but capable of absorbing a little more liquid. Use a piece at least as large as the optics diameter so only a single wipe is needed for the entire surface.
- 2) First, blow particulate matter off the optic with “canned” air-Note: all shop airlines contain oil vapor, no matter how well filtered. Don’t forget to check the sides/chamfers and back of the optic where debris can be attached. This can be caught up into the swab and then dragged unobserved across the surface.
- 3) The solvent soaked swab is dragged, under its own weight ONLY, slowly across the optic. The solvent at the leading edge will dissolve the dirt; the trailing part of the swab will absorb the resulting solution back off the optic. This should be repeated several times. It is important that the solvent is absorbed back onto the swab and not allowed to dry into a tide mark of concentrated dirt. Change the swab every time, as fresh solvent will dissolve the contamination better. Particles picked up in the swab cannot be repeatedly dragged back across the optic.
- 4) Check that the optic is clear and free from stains and marks.
If this approach is not familiar, then try a few tests on some older unused optics first to get a feel for the technique.

How Much Care Should Be Used?

- 1) Has the optic been scratched?
- 2) Has the absorption of the optic returned to a low enough level to allow it to function well? Any short answer to these questions will be incomplete, and probably provocative, but some guidance is essential.

Considering scratching: Optics for high power lasers will be of good quality despite a small number of scratches that may appear. With good natural lighting, unskilled examination will easily detect scratches of this level. The absence of scratches when viewed in this way indicates a good quality surface. In general, there is no need for artificial lighting or viewing aids in most situations.

Squid Ink Cleaning Kit (Part Number 2004615) includes:

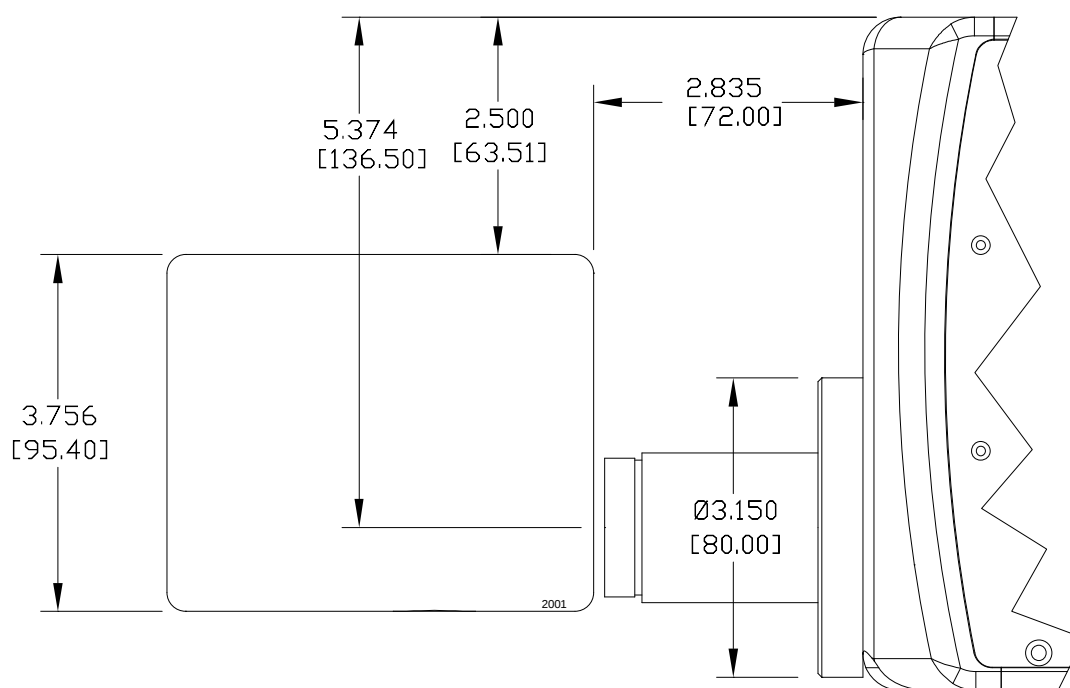
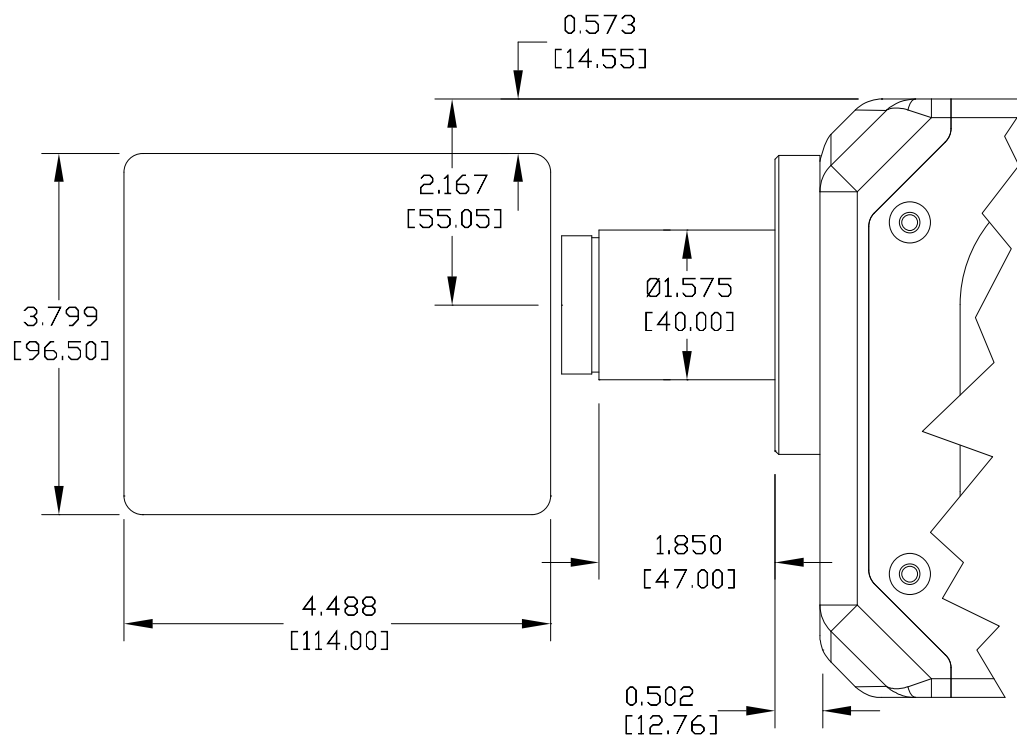
Isopropyl Alcohol, reagent grade: .25 oz bottle
Acetone, reagent grade: .25 oz bottle
Lens Paper Booklet: 50 sheets
Cotton-Tipped Swab Pack, lint-free: 24
Finger Cot Pack, large, powder-free: 24
Optics Cleaning Instruction Booklet



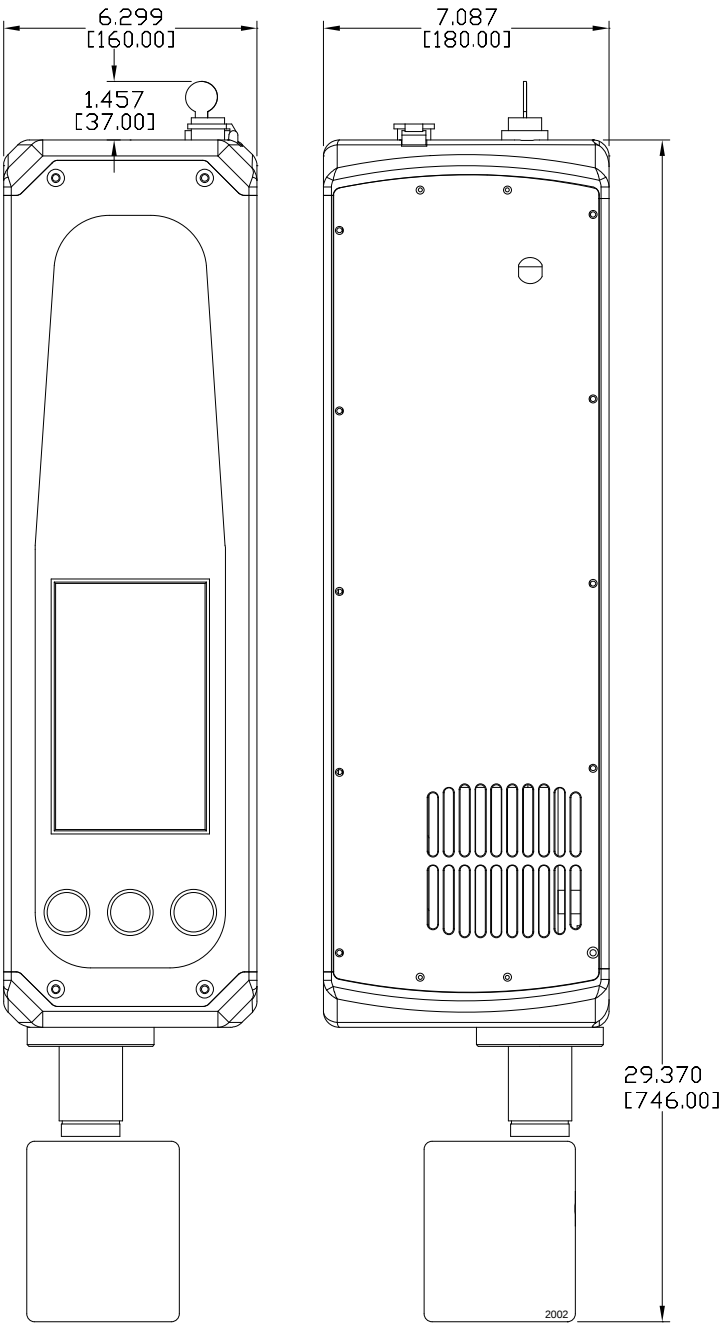
Parts List

Stock Code	Description	Long Description
2004601	Laser Print Sys, 10W CO2	W/Safety Interlock/Alarm/Std
2004603	Laser Print Sys, 30W CO2	W/Safety Interlock/Alarm/Std
2004605	Stand-Laser Print Sys	Adjustable Mounting Stand
2004610	User Guide- Laser Print System	Laser Print System, CO2
2004611	Safety Glasses-Laser	Laser Print System, CO2
2004615	Lens Cleaning Kit	Laser Print System, CO2
2004620	Photocell Retroflective- Laser	Laser Print System, CO2
2004621	Photocell Fiber Optic-Laser	Laser Print System, CO2
2004622	Photocell Diffuse-Laser	Laser Print System, CO2
2004623	Photocell Laser	Laser Print System, CO2
2004624	Photocell Ultrasonic	Laser Print System, CO2
2004630	Encoder TR1-U2R6	Laser Print System, CO2
2004632	Encoder W/Bracket, Sunine	Laser Print System, CO2
2004635	Controller, Handheld-10 inch	Laser Print System, CO2
2004640	Head Pivot Extension-90 degree	Laser Print System, CO2
2003975	Tower Light, R Y G, w/bracket	Audible Alarm, USB

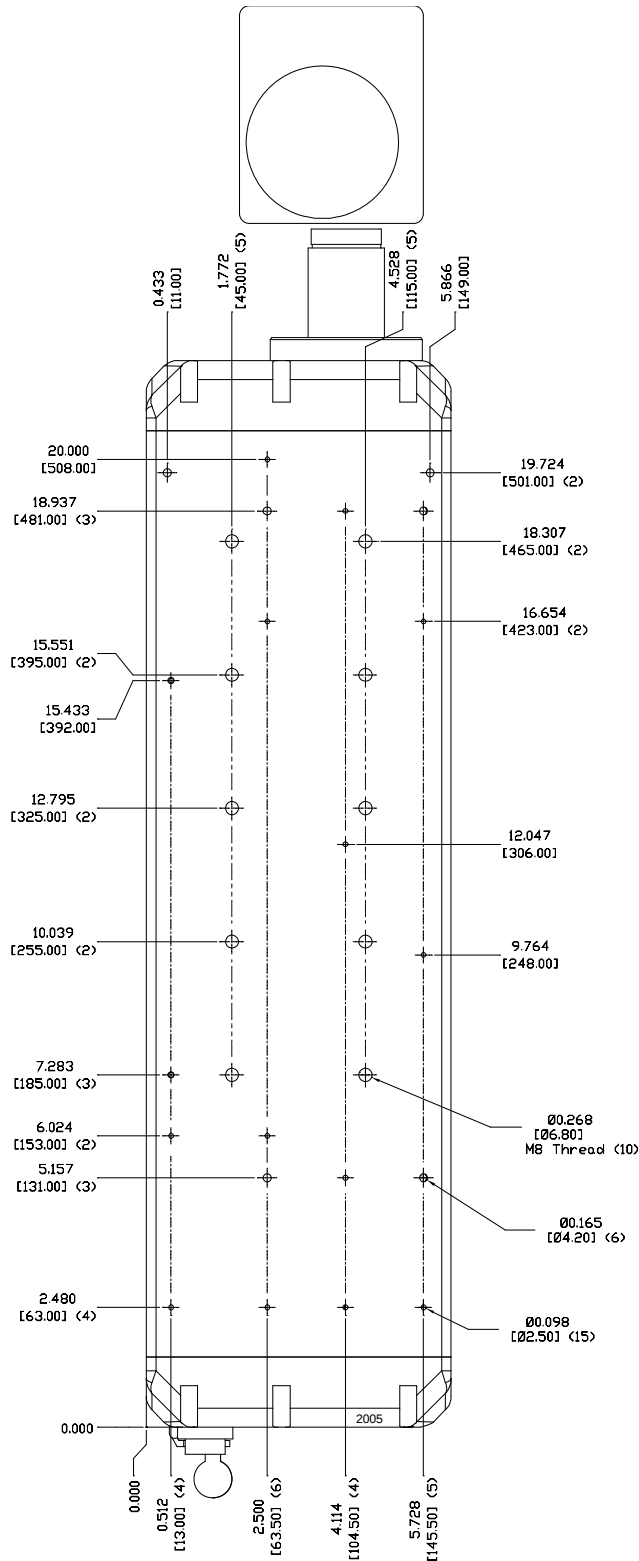
Component (Head) Dimensions 10W



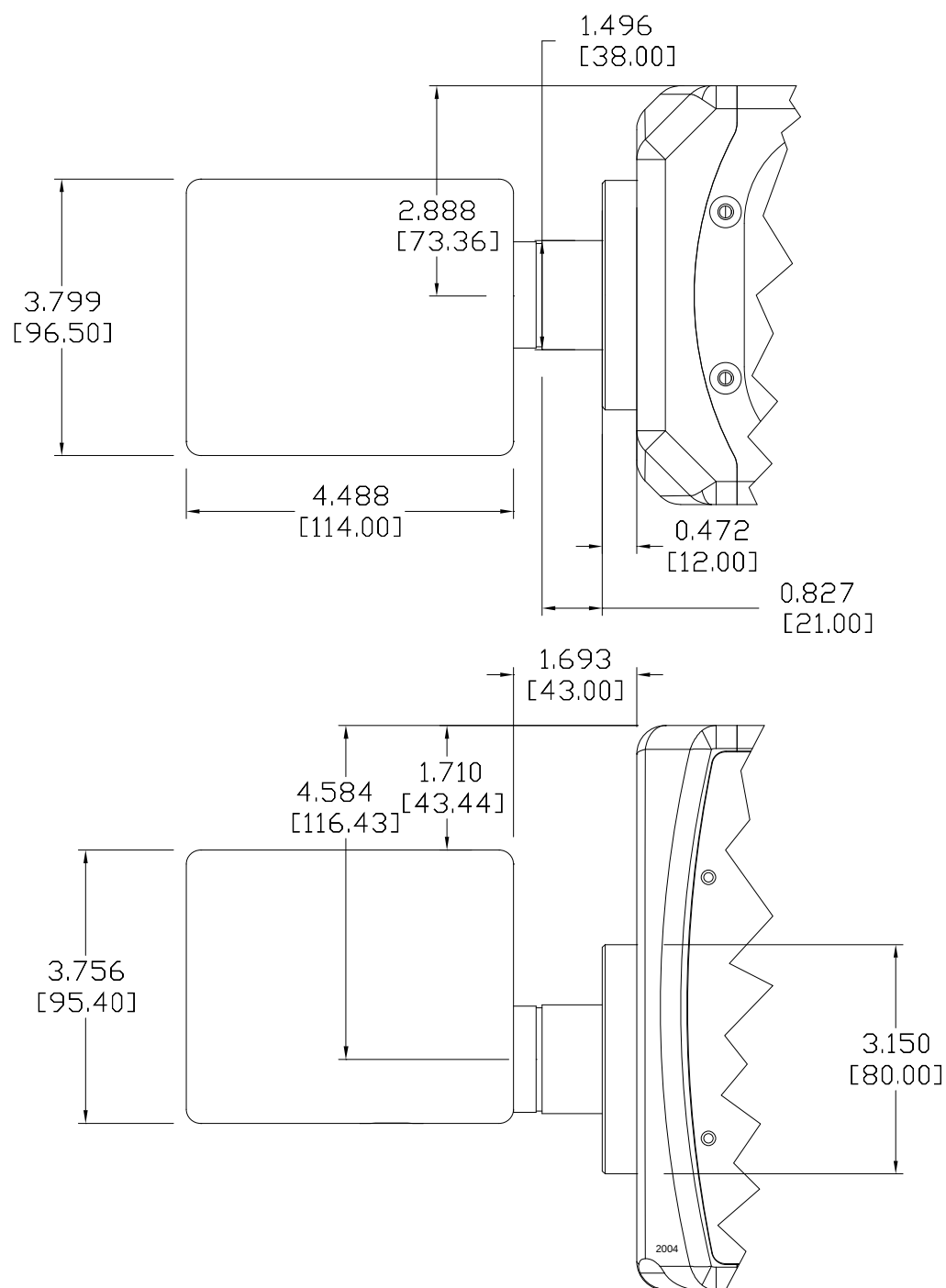
Component Dimensions 10W



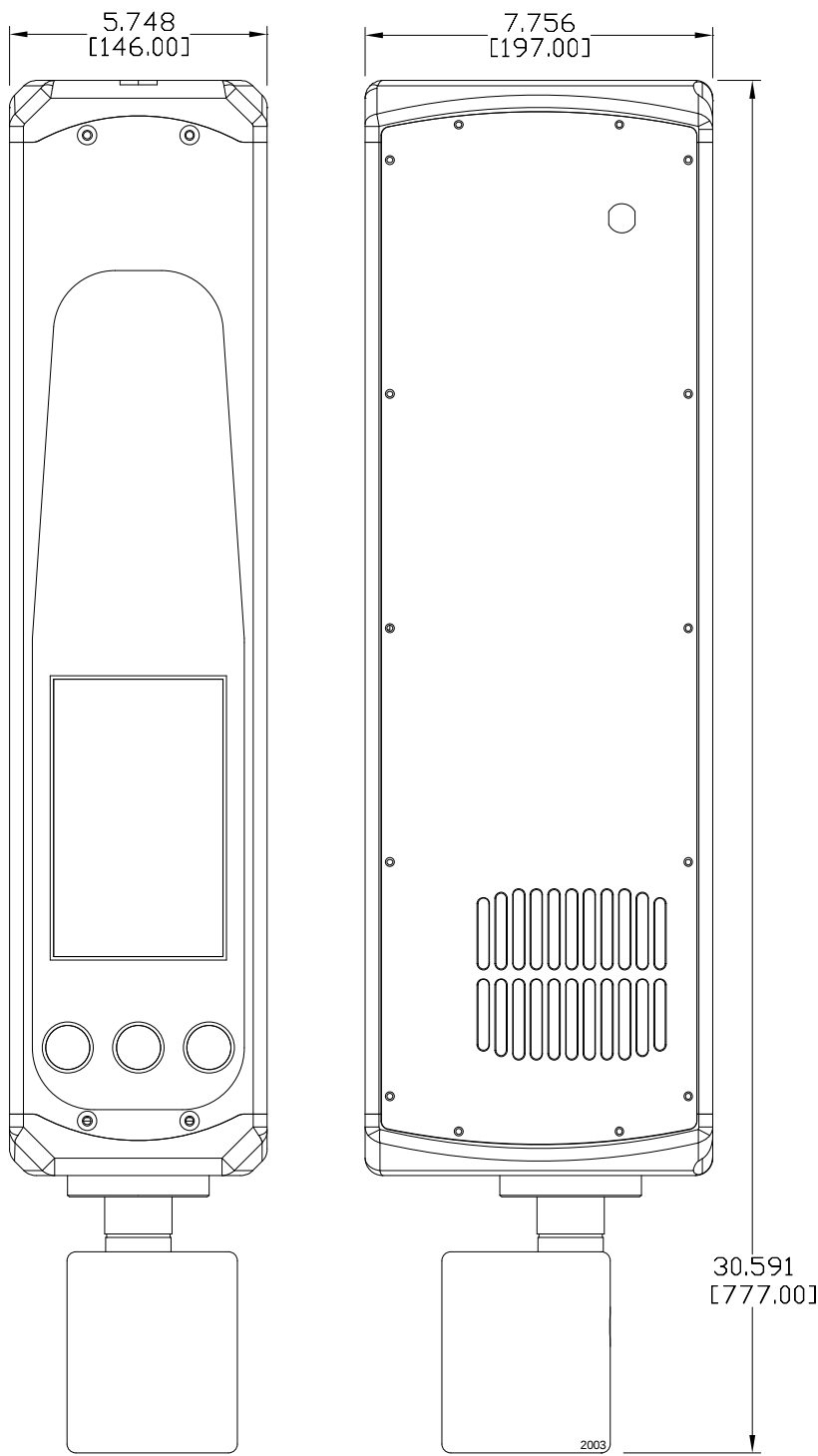
Mounting Hole Locations 10W



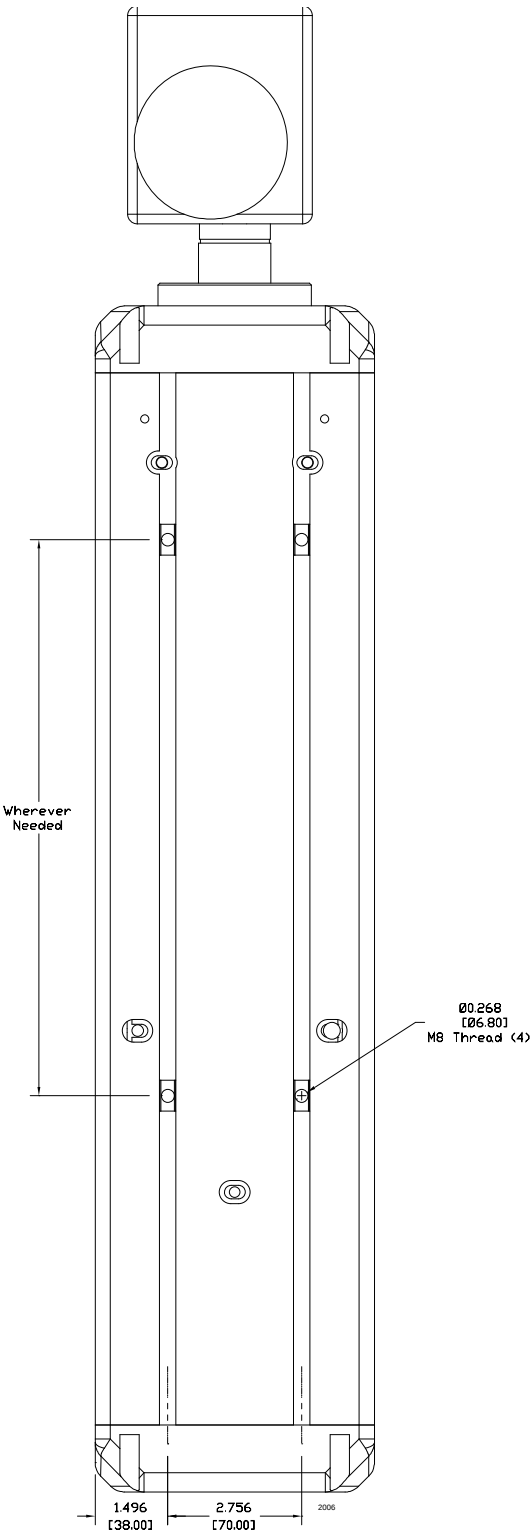
Component (Head) Dimensions 30W



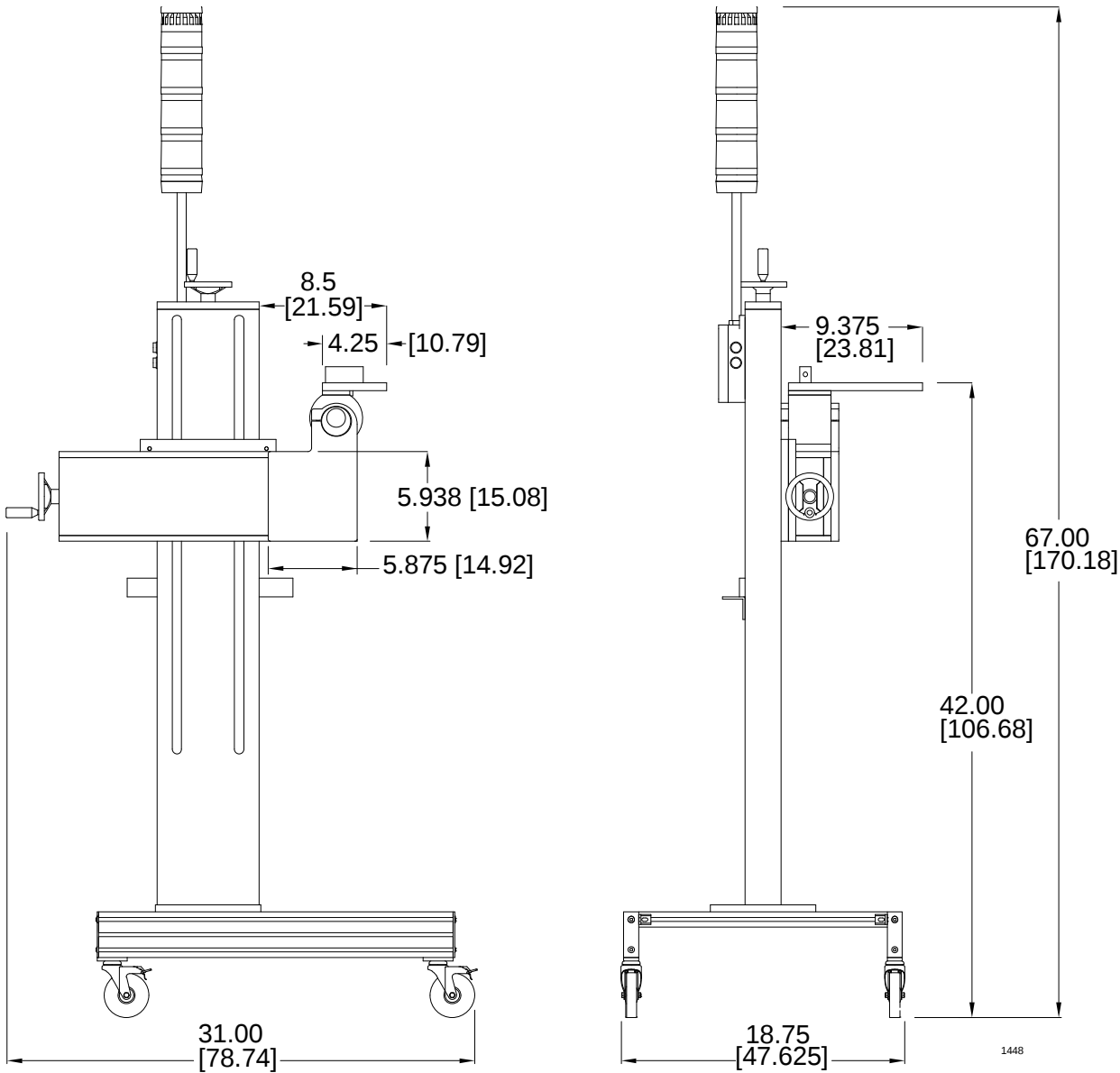
Component Dimensions 30W



Mounting Hole Locations 30W



Cart Dimensions (inches)



Squid Ink Laser Product Warranty

Warranty Statement

Squid Ink Manufacturing, Inc. warrants that all of the Laser printer products it ships will be in good working order and free from defects in material and workmanship and will conform to the published specifications for that product.

Warranty Period

For hardware and software products, the warranty period is 12 months from the date of shipment from Squid Ink.

Repairs

All repairs are rigorously tested for optimum operation and print performance and warranted to be, under normal and proper use, free from defects in material and workmanship for a period of 90 days from the date of service.

Print Quality

Print quality achieved in a given application is dependent on the installation, the material handling, and the maintenance provided. Squid Ink makes no warranty that the print quality achieved in an application will be the same as that achieved during a printer demonstration or on a test piece in our print laboratory.

Shipping Policy

Customer pays all incoming shipping charges. If the item is defective and under warranty, Squid Ink will pay all return shipping charges via the least costly method. If expedited shipping is desired, the customer must furnish their shipping account number and shipping fees will be charged to that account.

Exclusions

Damage due to tampering, abuse, improper adjustment, electrical interference, or the use of non-approved components will void any and all warranties by Squid Ink and its distributors.

Warranty Procedures

If you believe that a product may be defective and may be covered by warranty, please call your local Squid Ink distributor. Your local distributor will provide support and information regarding warranty claims.

Warranty Eligibility

The warranty provided by Squid Ink Manufacturing, Inc. is only to the original buyer.

Limited Warranty

THE ABOVE WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.

Disclaimer of Damages

REGARDLESS OF WHETHER ANY REMEDY SET FORTH HEREIN FAILS OF ITS ESSENTIAL PURPOSE, IN NO EVENT WILL SQUID INK MANUFACTURING, INC. BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT OR SIMILAR DAMAGES, INCLUDING LOST PROFIT OR LOST OPPORTUNITIES OF ANY TYPE ARISING OUT OF THE USE OR INABILITY TO USE THESE PRODUCTS EVEN IF SQUID INK MANUFACTURING, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Customer Support

Squid Ink Technical Service

For help installing or operating the SQ Laser System, please contact your authorized Squid Ink reseller or Squid Ink Technical Service at one of the numbers listed below.

Toll-Free Phone	800-877-5658
Phone	763-795-8856
Fax	763-795-8867
E-mail	info@squidink.com
Web	www.squidink.com

Thank you for your purchase of Squid Ink products. We are pleased to be a part of your marking and coding needs.

