User Manual

CO2 Laser Marker

LM-C300 Series

Thank you for purchasing the Hitachi Laser Marker LM-C300 Series.
This User Manual describes the basic operating procedures, maintenance procedures, and other detailed handling procedures of the Hitachi LM-C300 Series.
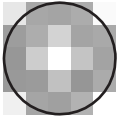If the Laser Marker is improperly handled or maintained, it may not operate smoothly and may become defective or cause an accident.
After thoroughly reading the Manual, properly store it for future reference.

CONTENTS

0. WARNING

ALL PRECAUTIONS RELEVENT TO THIS CLASS OF LASER PRODUCT SHOULD BE STRICTLY OBSERVED.

The company installing the system (installer) hereby undertakes to ascertain the requirements of the Customer's Work Place Safety Overseer, Laser Safety and Country Regulations. The installer further undertakes to install adequate protection to maintain the safety of the Laser Marker supplied by HITACHI. The installer is responsible for ensuring compliance with all safety precautions and that all Laser Marker safety devices are handled and used properly. Specifically, the installer is responsible for providing and installing safety devices to make this class 4 laser product to a safe laser. Safety devices and protection supplied by HITACHI will not necessarily meet requirements of the Customer's Work Place Safety Overseer, Laser Safety and Country Regulations and no warranty or representation is given or made that they comply with any statutory or other requirement. No liability is accepted by HITACHI in this respect, as stated in Chapter 1 or this Instruction Manual.

Important: It is very important to read the entire Instruction Manual thoroughly before installing and starting the system, since the product delivered to you by HITACHI involves an element of risk to the user if it is not used correctly.

The use of controls or adjusting devices or procedures other than those specified herein may results in exposure to laser emission.

Strict compliance with the safety precautions set out and referred to in this Instruction Manual and extreme care in use are essential to minimize the chance of accidental damage to the Laser Marker or personal injury.

HITACHI does not accept responsibility for any loss or damage resulting from the use of information, errors or commission contained in this Instruction Manual, or the incorrect use of the Laser Marker. Production losses caused by downtime or property damage (the damage to material printed or the damage to the peripheral equipment) caused by the Laser Marker failure or malfunction are not guaranteed.

We acknowledge that there may be errors or omissions in this Instruction Manual.

The following symbols are used in this Manual to inform the user of the nature of the process to be carried out:

	This symbol warns the user about the process that must be carried out with great care for the proper operation and maintenance of the Laser Marker.
	This symbol warns the user of invisible laser emission output that can be hazardous for the Laser Marker user.

TERMS

Certain terms are used throughout this Manual or on the equipment labels. Please familiarize yourself with their definitions and significance.

Danger	Hazards that could result in serious personal injury or death.
Warning	Hazards or unsafe practices that could result in serious personal injury or death.
Caution	Hazards or unsafe practices that could result in minor personal injury or product damage.
Note	Points of particular interest for more efficient or convenient equipment operation; additional information or explanation.

SAFETY PRECAUSIONS

⚠ WARNING

- Never look at laser beam directly or through lens. Diffused reflected beam is also harmful.
  CO_2 laser does not enter into eye's retina, however, if it exposed to the eyes, it can inflict severe corneal injuries.

- Wear laser protective goggles for operator's eyes. The goggles should be used against scattered beam, and should not be used for the direct or reflected beams.

- In order to prevent unexpected exposures from object to be marked or its peripherals, set protective enclosure which is made of acrylic resin, glass, or metal to enclose the laser radiation area.

- Although this product is equipped with a feature for stopping laser radiation when the cover is opened, hazard of exposure to laser radiation exists when the cover is unexpectedly opened.

- Avoid human skin from laser beam exposure directly. Burning into deep skin might result.
  Never touch laser beam.
  Moreover, be careful not to touch laser beam with clothing as well.
  When using the system, do not touch laser beam with human body, papers, or clothing, etc. Wear protective clothes. Protective clothes should be made of flame-retardant and fire-resistant material with minimal skin exposure.

- Never disassemble the product.
  Doing so may cause exposure to the laser beam or electric shock from high-voltage live parts.

- Read all packaged Manuals thoroughly, and do not operate any other methods except the instructions provided in the Manuals.
  Exposure of laser beam might occur.

- After power supply of Laser Marker is turned off, laser safety manager must remove the key and keep it.

┌───┐
│   CAUTION   │
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● Do not use this product near inflammable gas, in a dusty place or anywhere where fire is strictly prohibited. There is a risk of fire.
  Never put this product close to fire or it may cause product malfunction.

● Do not install this product in wet place or near flammable objects (organic solvents such as thinner or gasoline). Otherwise, electric shock, malfunction and/or fire may result.

● Construct interlock systems such as a function to stop laser radiation for the maintenance door of the protective enclosure.

● Use the product within the operating environment conditions.

● The product is air-cooled. Please install it where the flow of air cooling is not to be blocked. Avoid placing heat sources near the controller.
  Moreover, please do not insert hands or objects between the gaps of the exhaust port or inspiratory port.

● This product contains ZnSe (zinc selenide). If the lens is damaged, following care should be taken:
  • In order to prevent from swallowing of flakes or particles, inhaling them, or adhering them to skin, be sure to wear glove, mask and protective goggles.
  • When disposing the lens, be sure to obey the disposing method prescribed in the regulations of user's region/country fully. Do not dispose the lens with general industrial waste.
  • Do not throw the lens into the fire.
  • Do not soak the lens in acid and alkali.

● Since this product includes precision parts, please avoid vibration and please use the product in a place without any shocks.
  Marking quality may deteriorate or the optical system may be affected. Moreover, please do not drop this product.

⚠ CAUTION

- While marking is carried out with this product, dust and/or gas may be generated from the place to be marked. Always provide ventilation and remove them using a dust collector etc. Depending on the objects to be marked, harmful gas or smoke may be generated, which may have a bad influence onto the human body and the Laser Marker. Use a suitable type of dust collector under consideration of the objects to be marked etc. Or contaminants at the laser emission port or fumes (smoke) may shade the laser beam, resulting in adverse effects for the printing.

- Clean contaminants off the laser emission port of the marker head at regular time intervals. Contamination of the laser emission port may cause lens burn-in, resulting in adverse symptoms such as streaking and density reduction of the marking due to deterioration in laser output.

- When re-switching on the power supply, turn ON key switch after turning OFF key switch of the power supply box in 30 seconds or more.

- When carry the head part, do not touch Laser Emission Port and Laser Pointer Emission Port. They may affect the marking quality badly. If the laser emission port becomes dirty, clean the port.

- If the air filter becomes dirty, clean the filter without delay. Failure to do so may hinder the air flow, resulting in failure of printing. Clean the air filter periodically.

- When Laser Marker's power is ON, do not connect the touch screen, LAN cable, sensor, encoder and/or IO connector etc. to Laser Marker, or it may cause malfunction of Laser Marker and/or other peripherals.

- Do not touch the Laser Marker (especially connectors on the rear panel) carelessly as there is a possibility of failure due to static electricity (Laser Marker malfunction or failure).
  To prevent damage caused by static electricity, remove the static electricity that is charged before starting work.

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│                              NOTE                               │
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● When Laser Marker is operated in high ambient temperature, the output of the laser tube gets lowered. Be careful there is a case where the printed characters become thin.

● Please set the Focal distance to the distance described in the Focal label which comes with the Laser Marker. If the Focal distance is different from the distance described in Focal label, be careful it may cause thin print.

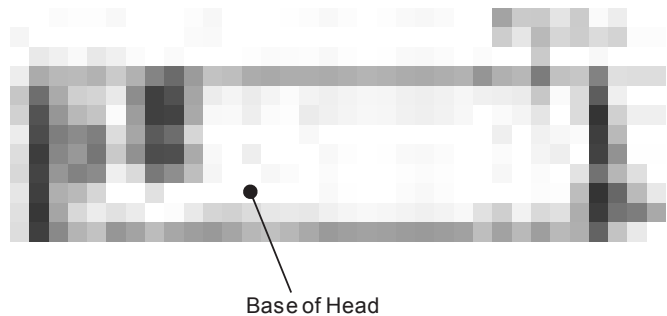
■Installation size
Head (LM-C330P, LM-C331P, LM-C330S, LM-C331S, LM-C310P, LM-C311P and LM-C310S)

The head can be fixed from the bottom with M5 screw at eight locations.

The inserting length of the screw and the torque is shown below.

・The inserting length of the screw should fall between 5 and 7 mm.

・Tightiening torque : between 0.8 and 3.0 N・m.

Base of Head

NOTE

- The lithium battery is installed in this product
  When discarding, please follow notes:

  - Used batteries should not be mixed with general household waste.

  - Recovery and recycling of used batteries, please take them to applicable collection points, in accordance with your national legislation and Directive (2006/66/EC).

  - For more information about collection and recycling of seed batteries, please contact your local municipality, waste disposal services, or the point of sale where you purchased the batteries.

  - By disposing used batteries correctly, you will help you save valuable resources and prevent any potential negative effects on human health and the environment which could otherwise arise from inappropriate waste handling.

  - Penalties may be applicable to incorrect disposal of this waste, in accordance with national legislation.

  - EU Battery Directive (2006/66/EC)
    EU Battery Directive obliges proper treatment, recovery, and recycling of batteries that are used inside the European Union.

  - In Case of Disposal in Other Region Outside the European Union
    The EU Battery Directive (2006/66/EC) is only valid in the European Union. If you wish to dispose used batteries in other region, please comply with its regional regulation. For the correct method of disposal, please contact and ask your local municipality, waste disposal services, or the point of sale where you purchased the batteries.

  - A chemical symbol [Cd (cadmium), Hg (mercury), Pb (lead)] may be displayed below the dust bin mark. This complies with the requirements set in the EU Battery Directive (2006/66 / EC). Exempted products must display a chemical symbol if the element exceeds the threshold.

- When Laser Marker is mounted on the other equipment or when the Laser Marker is mounted on the wall or ceiling by the bracket, the other equipment or the bracket shall withstand Laser Marker's weight, vibration, shock etc. which are applied to it during use.
  Laser Marker shall be mounted sturdily and robustly.

- In case you fixedly-mount Touch Screen and use it, fix it with M5 screws (4 pcs).
  In case you hold Touch screen and use it, pay extra attention NOT to drop it.

Grounding

Ensure that all electrical wiring, connections and grounding comply with applicable codes. Properly connect the Laser Marker to its dedicated ground. Complete the above procedure to avoid electrical shock hazards.

Installation Environment

If an extraneous noise enters the Laser Marker, it may cause a malfunction or a breakdown. For maximum noise immunity, observe the following installation and wiring precautions:
• Ensure that 100 to 120 VAC or 200 to 240 VAC power cables are not bundled with other power supply cables.
• Insulate the Laser Marker main body and the touch screen so that they do not come into direct contact with the conveyor or other devices.
• If the employed print target detector is housed in a metal case, use a plastic mounting piece for the purpose of insulating the detector from the conveyor and other devices.
• Be sure that the print target detector wiring is not bundled together with other power supply cables.
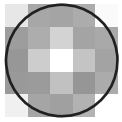
1. LASER SAFETY

1.1. LASER TYPES

There are different types of lasers according to the medium of photon propagation (gas, solid, liquid, etc.) contained inside the laser tube and the excitation mechanism used to cause the laser process. As a result, laser emissions of different wavelengths (energy content and power) are obtained. The risks from exposure to laser emission are different for each type of laser. According to the features mentioned above, lasers are categorized into 4 classes and their Accessible Emission Limit (AEL) is specified as follows:

- **Class I**.
  Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

- **Class IM**.
  Lasers emitting in the wavelength range from 302.5 nm to 4000 nm which are safe under reasonably foreseeable conditions of operation, but may be hazardous if the user employs optics within the beam. Two conditions apply:
  - a) for diverging beams if the user places optical components within 100 mm from the source to concentrate (collimate) the beam; or
  - b) for a collimated beam with a diameter larger than the diameter specified in table 10 for the measurements of irradiance and radiant exposure.

- **Class II**.
  Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation including the use of optical instruments for intrabeam viewing.

- **Class IIM**.
  Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses including the blink reflex. However, viewing of the output may be more hazardous if the user employs optics within the beam. Two conditions apply:
  - a) for diverging beams, if the user places optical components within 100 mm from the source to concentrate (collimate) the beam, or
  - b) for a collimated beam with a diameter larger than the diameter specified in table 10 for the measurements of irradiance and radiant exposure.

- **Class IIIR**.
  Lasers that emit in the wavelength range from 302.5 nm to 106 nm where direct intrabeam viewing is potentially hazardous but the risk is lower than for Class 3B lasers, and fewer manufacturing requirements and control measures for the user apply than for Class 3B lasers. The accessible emission limit is within five times the AEL of Class 2 in the wavelength range from 400 nm to 700 nm and within five times the AEL of Class 1 for other wavelengths.

- **Class IIIB**.
  Lasers those are normally hazardous when direct intrabeam exposure occurs (i.e. within the NOHD). Viewing diffuse reflections is normally safe.
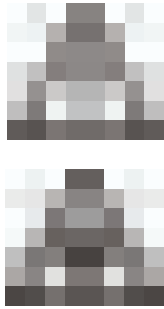
- **Class IV**.
  Lasers those are also capable of producing hazardous diffuse reflections. They may cause skin injuries and could also constitute a fire hazard. Their use requires extreme caution.

1.2. LASER SAFETY STANDARDS

The Laser Marker is fitted with basic safety features at the point there might be risk of laser emission if the allowed AEL limit is exceeded.

The Laser Marker is equipped with a protective housing which, except for the laser aperture, prevents human access to laser emission exceeding Class I.

Any part of the laser protective housing which, when removed or replaced to be repaired, would imply exposure to excessive emission, requires the use of tools. This prevents exposure to excessive laser emission in relation to the assigned AEL limit.

The safety interlock is designed to prevent the removal of the panel until the accessible emission values are lower than the AEL of the assigned class.

NOTE

Laser marking system protection covers can only be removed by using tools.

Class IIIB and IV lasers (except for those of Class IIIB which do not exceed five times the Class II AEL limit at a wavelength of 400nm to 700nm) will emit an audible or visual warning when the power source is activated.

The beam emitted by any Class IM, IIM, IIIR, IIIB and IV laser product should end its effective path in a diffused reflection material with suitable reflectivity and thermal properties, or an absorbent material. Whenever possible, the laser beam open patch must be located either above or below eye level.

NOTE

The final path of the laser beam should end at some diffused reflectivity element.

Mirrors, lenses and beam splitters should be tightly mounted and subject to controlled movements during laser emission to prevent accidental spectral reflection of the emission coming from Class IIIB or IV laser product.

There are risk control procedures for each class of laser:

- **Classes IM, II, IIM, and IIIR**.
  They only require precautions to prevent direct, continuous view of the beam. Momentary exposure due to accidental viewing is not considered dangerous.

- **Class IIIB**.
  These are considered hazardous when the naked eye is exposed to the direct beam or spectral reflection. In order to prevent these situations, the following precautions must be taken:
  (1) The beam must be used in a controlled area.
  (2) The beam must end its useful path at a diffused material with a suitable colour and reflectivity that allows the beam to be positioned while minimizing the risk of reflection.
  (3) In the absence of the conditions specified in point 2, eye protection must be worn.

- **Class IV**.

    These may produce injuries caused by the direct beam or its specular and diffused reflections. They also involve fire risk. In addition to the precautions mentioned in the previous section, the following should also be used:

    (1) The Laser Marker must be installed, adjusted and operated only by qualified, trained and authorized personnel.

    (2) The area where the Laser Marker will be operating must be identified with a suitable warning sign (supplied by HITACHI).

    (3) The beam and incidence area must be surrounded by the material resistant to the wavelength emitted by the laser in order to avoid specular reflection in the invisible spectrum due to the far infrared laser emission.

    (4) The presence of people in the beam path must be avoided in order to prevent exposure to emission or specular reflections.

    (5) Carbon plates or other sufficiently thick refractory materials must be installed at the end of the beam path. Nevertheless some precautions must be taken, as the surface of these materials can vitrify after lengthy exposure, causing specular reflection.

    (6) Whenever possible, the beam path must be located either above or below eye level.

In spite of all safety elements included in the Laser Marker end user should wear safety goggles that completely cover the eyes when operating the system, in order to avoid any injury caused by specular emission. It is also advisable to wear cotton clothing, which is much more resistant to this kind of emission.

Each country establishes its own safety standards concerning the sales and distribution of laser products. All of them are quite similar.

UNITED STATES OF AMERICA

In this country, the standards which regulate the use of Class IV laser products concerning labeling and safety interlocks must be observed.

OFFICE OF COMPLIANCE (HFZ-312)

CENTRE FOR DEVICES AND RADIOLOGICAL HEALTH

US DEPARTMENT OF HEALTH & HUMAN SERVICES

8757 GEORGIA AVENUE

SILVER SPRING, MD 20910

TEL.: (301) 427-1172

EUROPE

INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC STANDARD

EMISSION SAFETY OF LASER PRODUCTS, EQUIPMENT

CLASSIFICATION, REQUIREMENTS AND USER'S GUIDE.

Safety devices and protections supplied by HITACHI 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. No liability is accepted by HITACHI in this respect.

1.2.1. SAFETY SWITCHES

The Laser Marker includes the safety switch (interlock).

• **Lock control**. Consist of a micro-switch located on the protective cover of the laser tube. When this cover is removed while the system is working, the message "Laser Locked" will be displayed on the Laser Marker screen and the laser is deactivated.

1.2.2. PROTECTIVE HOUSING

The area between the marking head and the printing surface must have a protective housing to prevent user access to the Laser Marker.

Making this protective housing is the responsibility of the installer in each country.

The housing delivered by HITACHI may not be enough, and each client must adapt the housing to its production line, because the final protection must be a closed protection, and the housing delivered by HITACHI may not be completely closed.

This housing is a polycarbonate housing, which prevents the reflections of the laser beams to the user, as indicated in the following pictures:

The protection is mounted around the lens, and fixed with screws on the top part of the protection.

The polycarbonate does not permit the laser beam to go through it and redirects all the reflections to the production line.

All the technical requirements that the housing must accomplish found in EN 60825-4 norm (Europe) and in IEC 60825-4 (International).

One of the principal requirements that the housing must accomplish is the capacity to catch all the laser beam reflection that laser emits when it starts to work and marks.

As we observe in the picture, the reflections of the laser beam are always inside the protective housing.

1.3. WARNING AND INFORMATION SYMBOLS

This chapter includes all symbols used in this Instruction Manual or on the Laser Marker to alert both operating and service personnel to the precautions concerning the care, use, and handling of Laser Marker.

1.3.1. POSSIBLE PERSONAL INJURY WARNING

This product emits infrared radiation at a wavelength of 10.6 µm. Direct or indirect exposure to laser radiation may cause serious damage to the cornea, therefore it is mandatory to wear protective viewing goggles in areas exposed to the laser beam. Goggles protect against scattered radiation or reflections from metal surfaces. Protective goggles that block 10.6µm CO2 laser radiation are available from HITACHI.

RADIATION VIEWING CONDITIONS

The laser exiting the resonator is considered an intense monochromatic light source. Due to these features it can be seen as a source of high luminosity.

This means that its image is focused on the retina at a point of high-density power. If the beam diverges and is dispersed on a non-reflective screen, then there would be an "extended view" of the image, with a decisively less dangerous power density. So there are different types of radiation views based on the access to the radiation and consequently different degrees of danger.

Direct view of the Laser beam:
This type of view is the most dangerous and can occur at the exit of the laser aperture after having removed the lens. It must be avoided! Use of protective goggles is not sufficient to protect against direct view of the beam.

Direct view of the beam after mirror reflection:
This may occur by directing the beam towards a reflective surface.
Viewing a beam reflected off a flat surface is very dangerous and the same as direct viewing.

Direct view of the beam after focusing:
This occurs if the laser beam is not extinguished with an appropriate absorbent at the end of its useful path. Viewing the beam is dangerous up to a considerable distance.

Dispersive viewing of the beam after focusing:
This is the most frequent viewing condition during Laser Marker operation. Viewing the beam up close is dangerous, but appropriate filters and goggles can ensure safety, even during prolonged exposure.

The Optical Risk Nominal Distance (O.R.N.D.) for Laser Markers of HITACHI can be over 20m for direct or reflected radiation, and over 1m for Dispersive radiation.

Only goggles with an Optical Density (O.D.) over 4 can momentarily protect the eyes against accidental viewing of damaging laser radiation.

> **Always uses goggles with a conformity certificate. Remember that no goggles can provide prolonged protection from direct radiation.**

If exposed to intense laser radiation, even briefly, or to less intensity but longer duration, both the cornea and the retina can be burned and irreparably and permanently damaged.

Direct exposure to focused radiation can burn the skin. In addition, it is necessary to bear in mind that there may be collateral ultraviolet radiation along with the main radiation. Prolonged exposure may cause skin cancer.

Enclose the beam path whenever possible. Direct or diffused laser radiation can seriously burn humans or animals.

U.S. customers should refer to and follow the laser safety precautions in ANSI Z136.1-1993, American National Standard for Safe Use of Lasers. Procedures listed under the Standard include the appointment of a Laser Safety Officer, operation of the product in an area of limited access by trained personnel, servicing of Laser Marker only by trained and authorized personnel, and posting of signs warning of the potential hazards.

European customers should refer to and follow the laser safety precautions in EN 60825-1, Radiation Safety of Laser Products, Equipment Classification, Requirements, and User Guide.

Materials processing can generate air contaminants such as vapours, fumes, and/or particles that may be noxious, toxic, or even fatal. Safety Data Sheets (SDS) for materials being processed should be thoroughly evaluated and the adequacy of provisions for fume extraction, filtering and venting should be carefully considered. Review the following references for further information on exposure criteria:

ANSI Z136.1-1993, American National Standard for Safe Use of Lasers, Section 7.3 U.S. Government's Code of Federal Regulations: 29 CFR 1910, Subpart Z. Threshold Limit Values (TLV™s) published by the American Conference of Governmental Industrial Hygienists (ACGIH).

It may be necessary to consult local governmental agencies regarding restrictions on the ventilation of processing vapors.

1.3.2. POSSIBLE PERSONAL INJURY

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure.
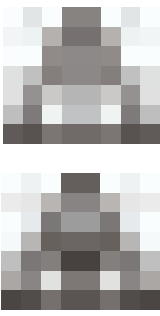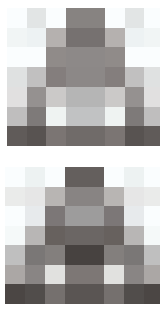
1.4. COMPLIANCE WITH REGULATION AND LAW

The Laser Marker is subject to several United States and European Union (EU) directives. These directives impose product performance requirements related to electromagnetic compatibility (EMC) and product safety features for laser products. The associated directives and specific provisions to which the Laser Marker must comply are identified and described in the following paragraphs.

1.4.1. CDRH REQUIREMENTS

HITACHI Laser Marker is designed to comply with requirements for Class IV laser products imposed by the Radiation Control for Health and Safety Act of 1968. Under this act, the U.S Food and Drug Administration (FDA) issued a performance standard in the Code of Federal Regulations (CFR) for laser products. This performance standard (21 CFR, Part 1040.10) was developed to protect public health and safety by imposing requirements upon manufacturers of laser products to provide an indication of the presence of laser radiation, to provide the user with certain means to control radiation, and to assure that all personnel are adequately warned of potential hazards through the use of product labels and instructions.

Federal regulation require that all laser products manufactured on or after August 2, 1976 must be certified as complying with the performance standard. The manufacturer must demonstrate the product's compliance with the standard prior to certification or introduction of the product in the market by filing reports pertaining to the radiation safety of the product and the associated quality control program to the Centre for Devices and Radiological Health (CDRH). Failure to provide the required reports or product certification is a violation of Section 360B of the Radiation Control and Health and Safety Service Act of 1968.

Product features included in the design of the laser marking system to comply with CDRH requirements are built into the system as control panels or indicators, internal circuit elements, or input/output signal interfaces. Specifically, these features include a key switch, Laser and Ready indicators, emergency stop button, remote interlock and five-second delay between POWER-ON (Ready indicator) and operation of laser. Table 1 summarizes the laser marking system product features, indicating type and description, and which features are required by CDRH regulations.

	Common safe operating practices should be exercised at all times when the laser is in use. To prevent exposure to direct or diffused laser radiation, follow all safety precautions specified in this Instruction Manual. The use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous invisible laser radiation, damage to, or malfunction of the laser. Severe burns may result from direct exposure to the laser beam. Always wear safety goggles with side shields to reduce the risk of damage to the eyes when operating the laser.
	Safe operation of the laser requires the use of external beam block to safely block the beam from travelling beyond the desired work area. Use a firebrick or similar non-dispersive, non-combustible material as the block. NEVER use organic material or metals as the beam blocker. Organic material, in general, are combustible and metals act as reflectors that may create an area of immediate danger.

This information is available at:

U.S Department of Health and Human Services

Public Health Services

Food and Drug Administration

Centre for Devices and Radiological Health

Division of Small Manufactures Assistance

Rockville, MD 20857

1.4.2. UNITED STATES FEDERAL COMMUNICATIONS COMISSION REQUIREMENTS

The United States Communications Act of 1934 vested the Federal Communications Commission (FCC) with the authority to regulate Laser Markers that emits electromagnetic radiation in the radio frequency spectrum. The purpose of the Communication Act was to prevent harmful electromagnetic interference (EMI) from affecting authorized radio communication services in the frequency range above 9 kHz.

1.4.3. UNITED STATES FCC REQUIREMENTS

The FCC regulation that governs Laser Marker is fully described in 47 CFR. The marking system has been tested and found to comply by proving performance features that have met or exceeded the requirements of 47 CFR, Part 15.

1.4.4. USER INFORMATION

NOTE
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instruction Manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION
The changes or modifications that are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.4.5. EUROPEAN UNION REQUIREMENTS

The Laser Marking System should be installed and operated at prepared facilities and by duly trained personnel. Due to the considerable risks and hazards associated with the installation and operation of this device with its built-in laser, the manufacturer must provide appropriate product warning labels and instructions to ensure safety. HITACHI assumes no responsibility for the compliance of the system into which the Laser Marking System is installed, other than to supply and/or recommend components complying with CE standard and European Directives.

Pursuant to Article 1, paragraph 2 and Article 3 of the Machinery Directive, the Machinery Directive does not apply to this system. Concerning the incorporation of the laser marking system into equipment that may fall under the definition of Machinery, HITACHI considers the application of the EMC Directive and Low voltage directive as sufficient evidence that the laser marking system will not compromise the compliance of the Machinery into which it is incorporated.

The following hazards would be typical for this product when incorporated to intended use:

   (a) Risk of injury from lifting or moving the unit.

   (b) Risk of exposure to hazardous laser energy through unauthorized removal of access panels, doors, or protective barriers.

   (c) Risk of exposure to hazardous laser energy and injury due to failure of personnel to use proper eye protection and/or failure to adhere to applicable laser safety procedures.

   (d) Generation of hazardous air contaminants that may be noxious, toxic, or even fatal.

With respect to instances of electromagnetic interference, HITACHI defines marking variations to be an unacceptable loss of performance, as long as the following criteria are met: (1) There is no damage to the marking equipment, or machinery into which it is integrated, (2) The marking variation does not cause a hazardous or unsafe condition, (3) The marking variation is apparent to the operator, and (4) Normal operation is recovered after removal the interfering signal.

A report of EU service requirements pertaining to the laser marking system is shown below.

European Union Directives

Applicable Standards / Norms

   CE mark

   IEC 62368-1

   EN 61000-6-4

   EN 61000-6-2

   EN 60825-1, Safety of laser products

Once a product has met the requirements of all applicable EU directives, it can bear the official compliance mark of the European Union.

SAFETY OF LASER PRODUCTS APPLICATION GUIDE

The European Norm (EN) document EN 60825-1 was developed to protect persons from laser radiation by imposing requirements upon manufacturers of laser products to provide an indication of laser radiation; to classify laser products according to the degree of hazard; to require both user and manufacturer to establish procedures so that proper precautions are adopted; to ensure adequate warnings of the hazards associated with accessible radiation through signs, labels, and instructions; to improve control of laser radiation through protective features; and to provide safe usage of laser products by specifying user control measures.

The marking system is designed to comply with the requirements set forth in EN 60825-1. Table 1 summarizes the marking system features, indicating the type and description of these features and whether those features are required by European Union regulations.

ELECTROMAGNETIC COMPATIBILITY APPLICATION GUIDE

The Electromagnetic Compatibility (EMC) is the Directive developed to address electromagnetic interference (EMI) issues in electronic Laser Marker. In particular, the Directive requires documents that define the emission and immunity standard. EN 61000-6-4 defines the emission limit. Generic standard EN 61000-6-2 defines the immunity requirements published by the International Electromechanical Commission (IEC).

The requirements to comply with required EMC regulations is due to the increasing use of powerful electronic devices, which because of the techniques used, are the source of disturbances in a wide range of frequencies (emission); at the same time they are also affected by disturbances produced by other devices and thus require an adequate level of immunity.

(1) Disturbances are normally classified as low frequency ($0 < f < 9$ kHz) and high frequency ($f > 9$ kHz). Low frequency phenomena, which are particularly important, are those connected to harmonic frequencies and electrical frequencies. There are other widespread phenomena such as electrostatic discharge in air or by contact.

(2) Disturbances can be transmitted via conductors (conducted disturbances in a field ranging from 0.15 MHz to 30 MHz) and via irradiation (irradiated disturbance ranging from 30 MHz to 1000 MHz).

(3) Case studies in industrial environments point to conducted disturbances as the main cause of failure to comply with electromagnetic compatibility. For this reason, installation of a Laser Marker must be carried out according to the instructions below.

Connections and wiring:
Laser Marker connections to other devices and external sources must be made taking into account criteria of minimizing electromagnetic influence between them. Power circuit wiring must be physically separated from command and control circuits (signal circuit). This is done using metal channels, protective mesh or protective screens.

Filter devices:
All Laser Marker, which requires supplementary devices to comply with the EMC regulations, must be equipped with such devices, and assembled according the manufacturer instructions. Supplementary devices include RC units to mount parallel to AC relay coils, diodes to mount parallel to DC relay coils, filters for high frequency conducted disturbance to be mounted on the network input (ask Hitachi for the most suitable type).

Wire shielding:
Wire shielding must end as close to the incoming terminal boards as possible.

Metal panels:

All the panels which make up the system must be interconnected so that they present low impedance to high frequencies. This is obtained by adding numerous screws between the unpainted covers or using non-anodized aluminum. All the metal parts are connected with a good ground connection.

> In applications where disturbances exceed legal limits, there may be disturbances and interferences between the Laser Marker and other appliances, despite correct conformance with installation rules.

> If there are interferences with another Laser Marker, do not use it at the same time, or move the two devices further apart.

GUIDE FOR APPLYING LOW VOLTAGE SAFETY

The Laser Marker complies with Low Voltage Directive concerning electrical equipment operating at voltages between 50 and 1000 VAC. Warning labels and shields for protecting the user are required. The Laser Marker installation should be evaluated to ensure that it complies with the requirements laid down in the Directives on Low Voltage.

(1) **Installation**:

Only professionally trained individuals can carry out installation work, connect the external power source and, in general, perform any type of work on the electrical part. Dangerous voltage is present inside the Laser source.

(2) **Power cut-off device**:

Since the Laser Marker is designed to be incorporated in a system including other equipment, it is necessary to install a manually controlled power cut-off device common to the entire system. This is the installer's responsibility.

(3) **Stop function**:

Since the Laser Marker is designed to be incorporated in a system including other equipment, it is necessary to create a category 0 stop common to the entire system. This is the installer's responsibility.

(4) **Emergency stop**:

Since the Laser Marker is designed to be incorporated in a system including other equipment, the emergency stop must be installed based on the technical specifications of the system, bearing in mind that it may be necessary in some equipment to let cooling water circulate for a few seconds before disconnecting power. The emergency function is the installer's responsibility.

(5) **Protection category**:

Most HITACHI Laser Marker has a minimum protection category of IP54. To comply with the Machine Directive and Standard EN 60204, the installer is responsible for placing them in a suitable container according to the protection category required for the end use.

(6) **Ground Protection**:

One of the three conductors of the electrical supply is grounded, meaning it has no electrical power. **This wire must be always connected to the laser**.
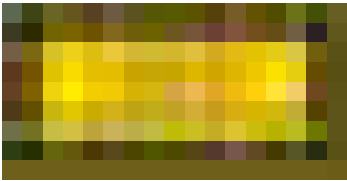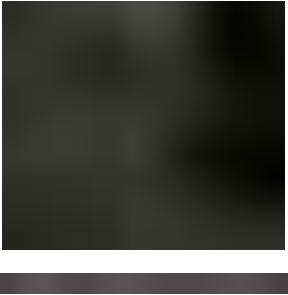
The main reason for use of a ground connection between the laser and the electricity is the safety of individuals, and the second is to protect the system.

In terms of operating safety, the ground connection helps prevent the occurrence of dangerous voltage between parts that are accessible at the same time, up to frequencies for which the ground connection (solely designed for the safety of individuals) can be considered low impedance.

1.5. FEATURES OF CO2 SYSTEMS

Element	Description	Required by CDRH	Required by EN60825-1
Protective housing	Laser tube covers	Yes	Yes
Safety Interlock	An interlock connected to the laser tube cover disconnects the laser power and closes the *shutter* to block the laser beam if the laser tube cover is removed. Safety Interlock Failure. The interlock is designed so that if there is a failure it will activate as if the cover has been removed.	Yes	Yes
Key switch	On/Off key switch controls power to laser electronics. Key cannot be removed from switch in the "On" position. When no key is inserted or it is in the "Off" position, the laser does not work.	Yes	Yes
Emergency stop switch	The switch that controls the power of laser electronics. The user must rearm the emergency button to restores operation. In this case, the Laser Marker never emits laser. The system must be rearmed.	Yes	Yes
Laser indicator Ready	Indicates that HITACHI Laser Marker is receiving power and is ready for laser emissions. The "Ready" LED lights up when the key switch is turned "On", the remote key switch is closed when the beam is active.	Yes	Yes
Laser radiation emission indicator	Indicates that HITACHI Laser Marker is emitting laser. The "Laser" LED lights up when the laser beam is active.	Yes	Yes
Five Second Delay	HITACHI Laser Marker circuit element disables RF driver/laser output for five seconds after key-switch is turned "ON" and the key switch is closed.	Yes	Yes
Power failure lock	HITACHI Laser Marker circuit element disables RF driver/laser output if input power is removed and then later reapplied (AC power failure or remote interlock actuation) while the key switch is still closed. Operator must reset the key switch or remote switch to restore Laser Marker operation.	Yes	Yes
Remote interlock	*Rear panel connection.* Disable RF driver /laser output when a remote interlock on Laser Marker door or panel is opened. Operator must reset the key switch or remote key switch to restore Laser Marker operation.	Yes	Yes
Overheating Protection	*Circuit element.* The Laser Marker shuts down when the laser temperature exceeds the safety limits.	No	No
Warning labels	On the exterior of HITACHI Laser Marker, labels attached to various external covers to warn the potential hazards.	Yes	Yes
Shutter	The *shutter* prevents laser emission until the user deactivates it from the front panel. It prevents laser output if an alarm occurs (like an open remote interlock or an open safety interlock).	Yes	Yes

1.6. WARNING LABELS

	Label 1 - CLASS IV LASER ALARM Label CO_2
	Label 2 - LASER HAZARD WARNING SYMBOL
	Label 3 - GENERAL HAZARD SYMBOL
	Label 4 - LASER OPENING
	Label 5 - LASER HAZARD
	Label 6 - INTERLOCKED PANEL LABEL
	Label 7 - COMPLIANCE AND HAZARD LABEL

[NOTE] The contents of the actual labels may differ from the labels above.
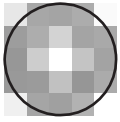
2. INTRODUCTION

2.1. INTRODUCTION

Please read the safety information in chapters 0 to 1 of this manual carefully before using the product. Incorrect handling may damage the human body and surrounding equipment. Please use the Laser Marker after fully understanding handling precautions, warnings, label display, etc.

This user manual describes information necessary for executing general Laser Marker functions such as system layout and interface screen operations. In addition to safety information, technical explanations, maintenance and troubleshooting, and how to perform the tasks shown below are also explained.

- Connect the Laser Marker
- Create a message to print
- Select the font style and the font size for your message
- Edit a message
- Create a Data field or a Time field and edit the file
- Print a message on a product
- Temporarily Stop printing
- Change the print position on a product
- Stop the laser and turn it off

2.2. OVERVIEW

This chapter describes the available interfaces and the following items:

- Interface types and access levels
- Meaning of indicator colors
- Interface screen configuration

2.3. ACCESS LEVELS

You can use the following external controllers as user interface with the Laser Marker to make messages and logos. These external controllers have three different access levels, and the functions available differ depending on the access level. (See the table below)

- Touch Screen
- Laser Marker application PC software (Hereinafter referred to as Laser Application)

Touch Screen:

Touch Screen has three access levels and two of them are password-protected.

Access level	Descriptions
User	Only operations related to "PRINT" are possible.
Supervisor	Operations related to "FILE", "EDIT", and "PRINT" are possible. Password setting is required.
Maintenance	Operations related to "FILE", "EDIT", and "PRINT" and some operations related to "SETTINGS" are possible. Password setting is required.

[NOTE] In old versions of the software, "Supervisor" is displayed as "Supervisor 1" and "Maintenance" is displayed as "Supervisor 2".

Laser Application:

Laser Application has three access levels and two of them are password-protected.

| Access level	Descriptions
User	This level can only be used for operations related to printing.
Advanced User	This level mainly allows operations related to message creation, modification, editing and printing. Password setting is required.
Supervisor	This level mainly allows operations related to message creation, modification, editing, printing, and laser settings except for some settings. Password setting is required.

2.4. USER INTERFACE

2.4.1. EXTERNAL CONTROLLERS

Touch Screen:

The Touch Screen includes a virtual keyboard that has standard alphanumeric keys and a series of special keys, as follows:

(1)   Back Space key

(2)   Space key

(3)   Return, enter or validate key

(4)   Two direction keys: Right and Left

(5)   Two keys to change the keyboard to be used (For example, change "lower case letter" to "upper case letter").

(6)   A key to New line of "TEXT"

(7)   A key to change the keyboard.

(8)   A key corresponding to ASCII code (Hex)
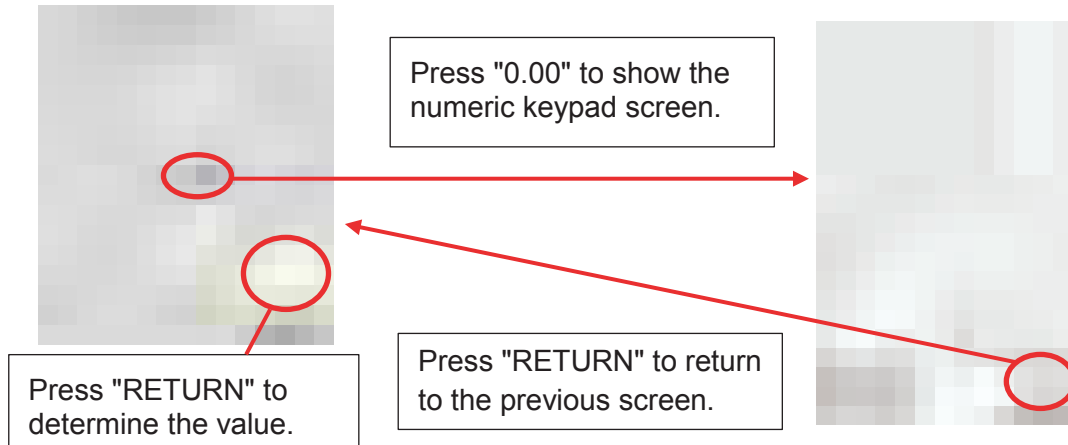
(9)   Input mode display field of (7)
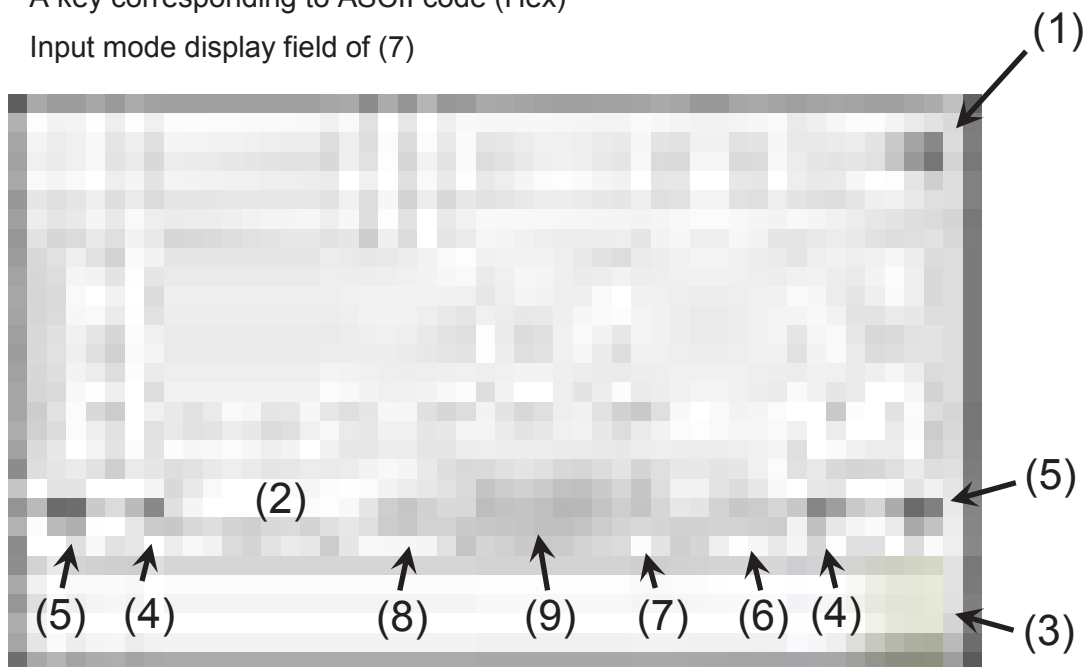
Numeric input screen:

For the item to set the numerical value such as the position, enter the numerical value as follows:

When that item is selected, a screen like the one on the lower left is displayed.

- Press the arrow (△ , ▽) to increase or decrease the value.

- When you press the numerical value in the center, the numeric keypad as shown in the lower right is displayed. Enter the number directly and press "RETURN".

Press "0.00" to show the numeric keypad screen.

Press "RETURN" to return to the previous screen.

Press "RETURN" to determine the value.

Laser Application:

Laser Application is the software that is installed on a computer. For this reason, Laser Application interface uses the PC keyboard.

2.4.2. INDICATORS

The Laser Marker is equipped with a three-color indicator that displays the system status for safe operation, and several buttons and switches related to the function and safety of this Laser Marker. This section explains the colors and their meanings.

| Color	State	Description
Green	Ready	The laser is ready for use, all the connections are correct.
Blue	Marking	The Laser Marker is marking.
Orange	Alarm	An alarm has occurred and shows the description on the external controller.

2.4.3. SCREENS

The screen configuration is different between touch screen and Laser Application.

Touch Screen:

It takes a several tens of seconds for the main screen to be accessible after turning key switch of the Laser Marker.
When startup is complete, the main screen as shown below appears.
Never touch any keys until the main screen appears or the alarm message "Not connected" will appear.
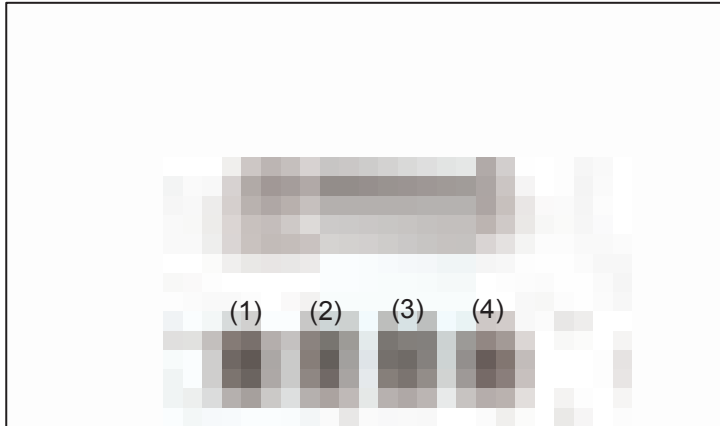
The following four menu icons are displayed on the main screen:

    (1) FILE (2) EDIT (3) PRINT (4) SETTINGS

[NOTE] Depending on the software version, "SETTINGS" may be written as "SETUP".

These icons drive to other screens with parameters, list… where these screens will let you configure the Laser Marker, create a message or print any message of the laser CPU.
To access to Setup and Manager menu you have to enter the password. You cannot access to these options without the password. You do not need password for printing.
The screen below is an example of the screen displayed when you select "FILE".
    (The screen may be different depending on the software version.)
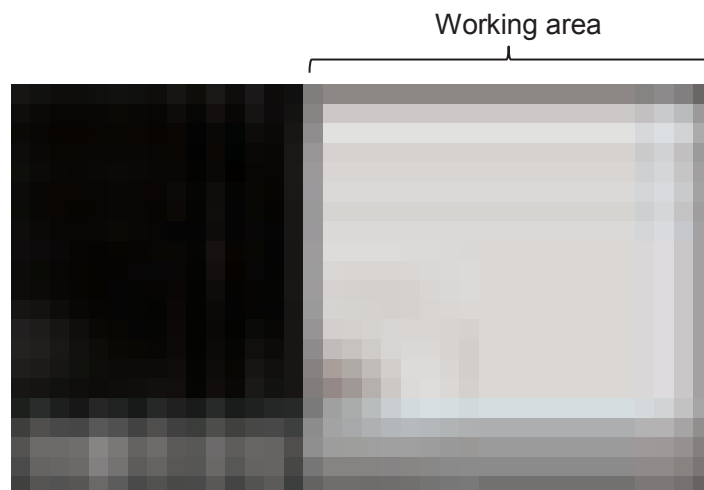
There are four basic types of screen on the Touch Screen user interface.

- Menu screens or configuration screens
- Operator-entry screens
- Task screens
- Information screens

Menu screens or configuration screens:

Some of these screens are gateways to other screens. These screens also give information about Laser Marker configuration or about instructions that was given. For example, on Laser setup screen, the Scanners option shows information about the Laser Marker used.

To select an option on Touch Screen, you touch the option you want to choose on screen.

Operator-entry screens:

To enter or change information of the Laser Marker, you use the operator-entry screens. For example, on the laser setup screens, press "SETTINGS" → "DYNAMIC & PHOTOCELL" → "Mode:" to select whether you print the stationary object or moving object.

Task screens:

You can use the task screen to create, edit or print the message. For example, at the General Window of the Print screen, you can start and stop the marking job. You can use the Message screen to create and modify (edit) the message.

Information screens:

If you want to know information about the Laser Marker (system status, last alarm value, etc.), you go "Print menu" → "Alarm".

The information screen contains information about the last event occurred in the Laser Marker. This event or alarm can be warning, a system failure, a print failure or an information event.

To close the information screen, press the "OK" button.

Most warnings refer to an event that does not prevent normal operation. You can read the information screen and continue to use the Laser Marker, but should correct the problem as soon as possible. If you cannot correct the problem, speak to your supervisor, or contact your local distributor.

If the event or alarm is a Print Failure, you must correct the problem immediately; you cannot continue to use the Laser Marker.
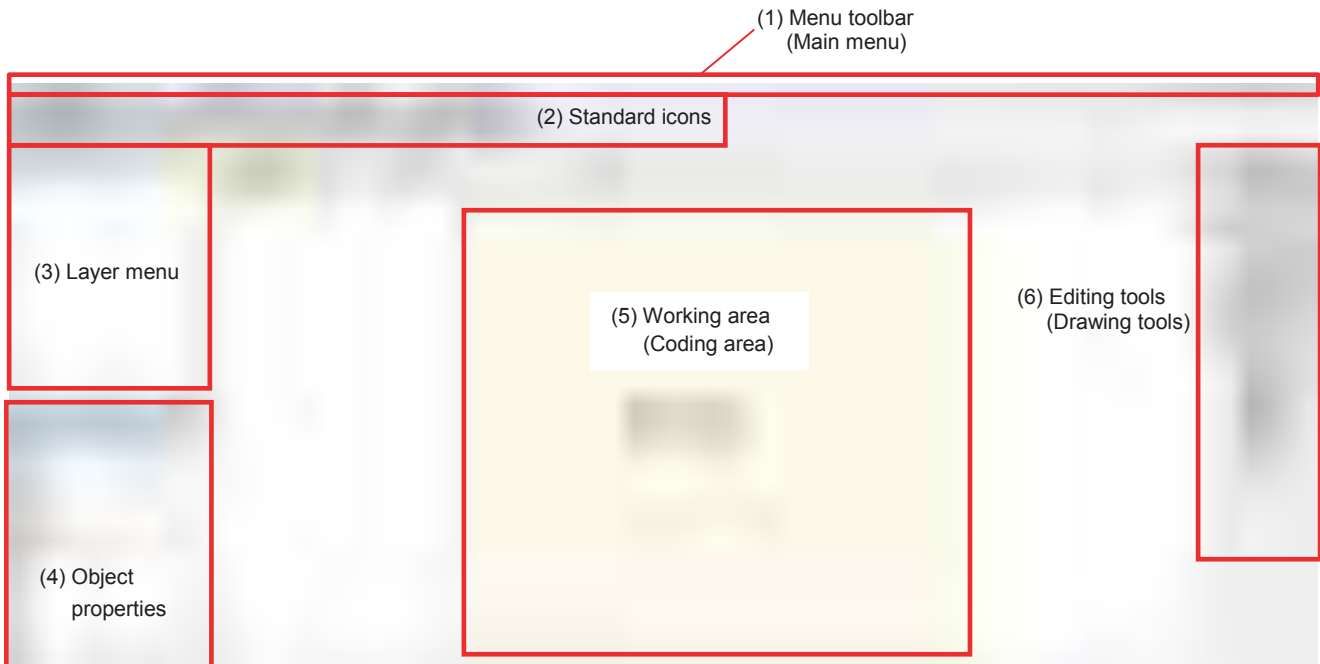
Laser Application:

The first step is starting Laser Application. There are two ways to start it.

- By choosing the "Hi-Laser" icon.
- Press START → ALL PROGRAMS → Laser Marker Application *** (Version No.) → Select access level.

When the startup is complete, you can see the screen like the figure below.

(1) Menu toolbar   : Access various functions, including Laser Marker settings.

(2) Standard icons : Functions often used when composing messages are displayed with icons.

(3) Layer menu   : Displays the layer configuration.
Layer is a function that allows you to set field power and speed, etc.
A total of 256 layers can be set.

(4) Object properties : Items for editing field layers are displayed in several tabs.
The number and type of tabs depends on the field selected.

(5) Working area   : Create messages in this area.

(6) Editing tools   : Icons for creating various fields such as diagrams and text are displayed.
(The icons etc. displayed vary slightly depending on the application version, but the screen configuration is the same.)

Depending on the access level, you cannot access to all options of Laser Application. Each access level requires a password except the User Level. The user level does not need any password.

There are no different types of screen, unlike the Touch Screen.

To select an option inside of a menu:

(1) Select the option you want to choose from the menu toolbar. (menu will be highlighted in blue) Then click to open the menu and see the possible options of this menu.

(2) When the menu is open, select the option that you want to select (this option is highlighted in blue) and click the mouse. Then press the left button of the mouse. In some cases it is necessary to use more steps to select the desired option, but the procedure is the same.

You enter the information into an information box:

To change the information in the box, click the mouse on the box then will appear a vertical line. This line is the cursor. The cursor shows your current position in the box. Move the cursor with the mouse or with Left arrow key or Right arrow key. Then you can add or insert some characters, or use the backspace key to delete a single character.
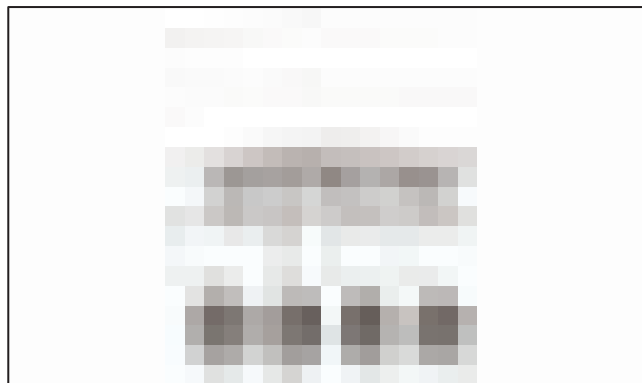
PASSWORDS

Touch Screen:

For the touch screen, the following passwords are set by default according to the access level:

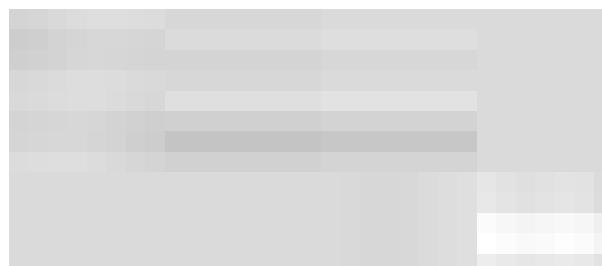| Access level	Initial password
Supervisor	HILASER1
Maintenance	HILASER2

[NOTE] In previous versions of the software, "Supervisor" is displayed as "Supervisor 1" and "Maintenance" is displayed as "Supervisor 2".

Follow the procedure below to change the password (for example, password of "Maintenance").

1. Press "SETTINGS".

2. Press "YES".

3. Enter the initial password.
   (The default password for "Maintenance" is "HILASER2", so enter it and press the Return key.)

4. Press "OPTIONS" and then "OPTIONS EXTRA".
   Scroll and press "Maintenance (password):".

5. Enter the current password in "Old Password:" field (the default password is "HILASER2").
   Enter the new password in "New Password:" and "Retype password:" fields.
   When finished, press "RETURN".
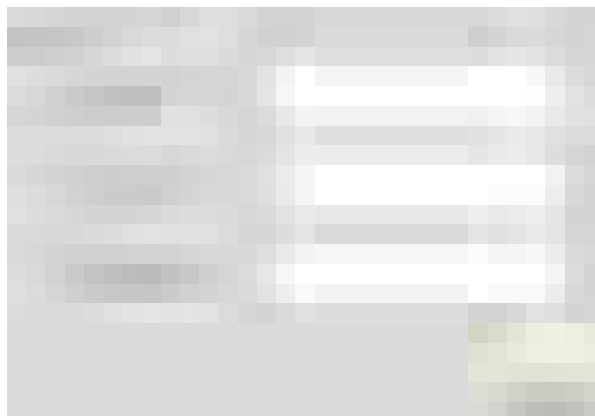
6. If the "Password changed!" dialogue appears, the password change is complete.
   Press "YES".

[NOTE] To enable the password input request. Put check marks in the "Supervisor (active password):", "Maintenance (active password):", and "Technician (active password):".
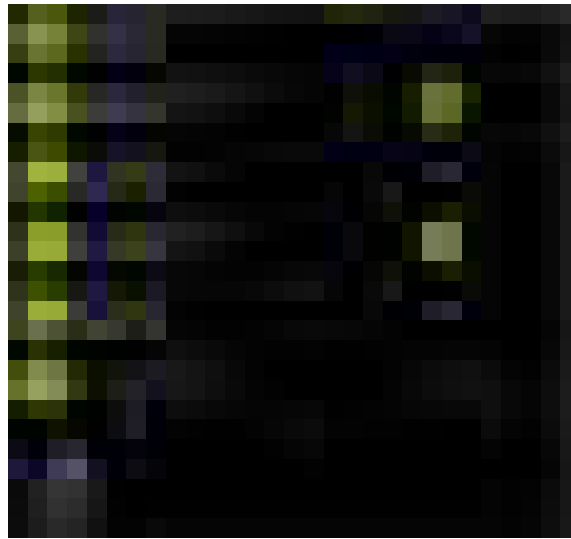
Laser Application:

For Laser Application, refer to "4.6. Password" in Software Manual.

3. THE LASER MARKER CONNECTION AND OPERATION

You can now begin to use the Laser Marker with the help of instructions in this chapter.

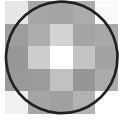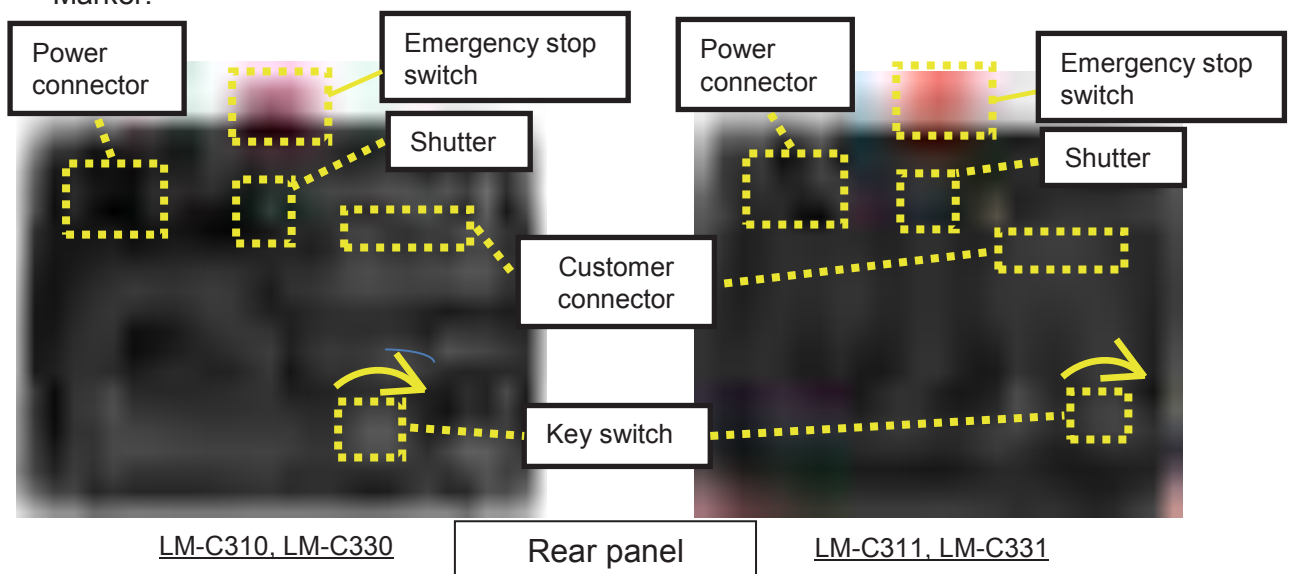These instructions will show you how to turn on the Laser Marker and how to create, edit and print the message. You will also learn how to stop the laser beam and turn off the Laser Marker.

3.1. CONNECTION AND STARTUP

Follow the steps below to connect and start up the Laser Marker.

(1) Connect the power supply cable to the power connector on the rear panel.

(2) Connect the CUSTOMER connector (DB-44) (Option) to the input marked "CUSTOMER" on the rear panel.

(3) Place the Laser Marker on the place you want to mark. Please note the following points when installing:

- Install the Laser Marker perpendicularly to the printing surface.

- Refer to "4.3 Lens" in this Manual for the distance between the print surface and print head.

(4) Remove the lens protection sheet.

(5) Plug the power connector to 100 to 120 / 200 to 240 V AC outlet.

(6) Check the installation status (perpendicular to printing surface / stability, etc.) and confirm that each connector is securely connected.

(7) Turn the emergency stop switch in the direction of the arrows (not shown in the photos, in the direction of "RESET" for LM-C310 and LM-C330), and confirm that the stop state has been released.

(8) Turn the key switch to the ON side (arrow direction in the photos below) to start up the Laser Marker.

Power connector | Emergency stop switch | Power connector | Emergency stop switch

Shutter | Shutter

Customer connector

Key switch

LM-C310, LM-C330 | Rear panel | LM-C311, LM-C331

(9) Once the unit is on, wait for the Hi-Scan internal management software being loaded. This means waiting until the READY LED is lit, which indicates that the Laser Marker is ready for marking.

(10) Before beginning the marking process, verify that the shutter is open ("**|**" side) to avoid obstructing the laser beam output.

3.2. CREATING A MESSAGE

In this section you will learn how to create and save a new message.

3.2.1. MESSAGE FIELD

A message can contain several parts. Each part is called Field. You can put different types of fields into your message. There are four main types of fields.

Text field:
The basic field for entering characters to be printed.

Date / week / month / year / hour / minutes / seconds field:
Used to print Date or Time.

User message field:
A field that is saved in the Laser Marker with a print setting number from 0 to 255 in advance. You can compose the message to be printed by loading and combining it with various fields.

Sequential number field:
Prints a value (sequential number) that increase or decrease with each printed message.

[CAUTION]

When printing while changing the date or time printing at a fixed time interval, use "SHIFT" for the touch screen and "Sequential Message" for Laser Application. The timing to increase the date to be printed can be set with the following parameters:

HOUR (hour, minute): The date changes according to the specified hour / minute.

MONTH : The month changes according to the specified month.

DAY : The date changes according to the specified date.

MONTH / DAY : The date changes according to the specified month / day.

DAY OF THE WEEK / HOUR (hour, minute):
The date changes according to the specified day of the week / hour / minute.

Font to use for printing

The following fonts are mainly used for printing:

Font type	Font	Feature
Laser-Font	newpal.mfs	Vector character
Crystal-Font	cryst7x5.mfs	Dot character

1
2
3
4
5
6
7
8
9
0

A	O	a	o
B	P	b	p
C	Q	c	q
D	R	d	r
E	S	e	s
F	T	f	t
G	U	g	u
H	V	h	v
I	W	i	w
J	X	j	x
K	Y	k	y
L	Z	l	z
M		m	
N		n	

;	)
:	*
_	+
,	/
.	<
–	=
!	>
"	?
#	@
$	[
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&	]
'	^
(	`
	{
	|
	}
	~

3.2.2. CREATING YOUR MESSAGE

Touch Screen:

Use the following steps to create a new message with the Touch Screen:

This section explains how to create a text message.

There are different types of messages: text messages and figure (rectangle, circle, polygon, arc, etc.). When creating a text message, you can select "Text field", "Sequential number field" or "Date / week / month / year / hour / minutes / seconds field" described in the previous section.

(1) Press "FILE" on the main screen of the Touch Screen. In order to access this mode you must enter a password. It is not possible to create a new message without password.

(2) Press "NEW" of main menu.

(3) Press "EDIT", then "CUSTOM ( )" and select the text field creation icon .

   [NOTE] There is no "CUSTOM" in older software versions. When "EDIT" is selected, a field creation icon such as a text field creation icon is displayed.

(4) Touch the position where you want to print the message in the working area on screen.

(5) Enter the message when the keyboard is displayed, and press "RETURN" to display the message in the working area.

Refer to 2.4.1 EXTERNAL CONTROLLERS "Touch Screen" for the function of each key.
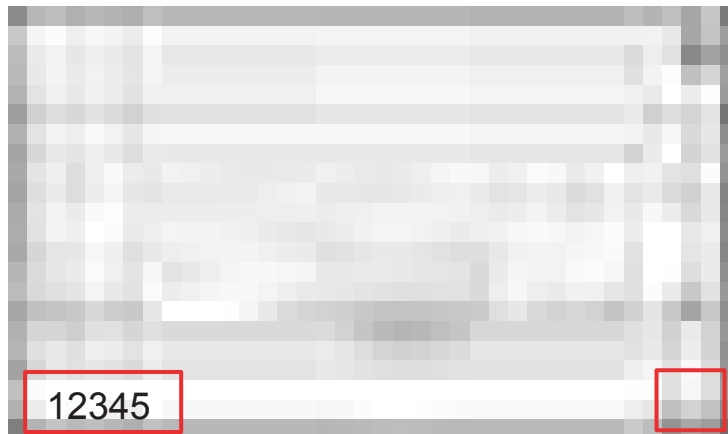

Note
Please note that the message created in the above procedure will be deleted if you press "NEW" before saving messages ("FILE" → "SAVE"). Refer to "3.2.3 SAVING YOUR MESSAGE" for details on the saving procedure.

<u>Laser Application:</u>

Use the following steps to create a new message with Laser Application:

(1) Select "File" menu on the menu toolbar and choose "New".

(2) From the editing tool on the right side of the screen, select the field type you want to insert into the working area. To print text, select the text field creation icon [ ] .

(3) Click the mouse where you want to insert the field in the working area.

(4) Enter characters using the keyboard.

(5) Press "OK" to insert the text field into the working area.
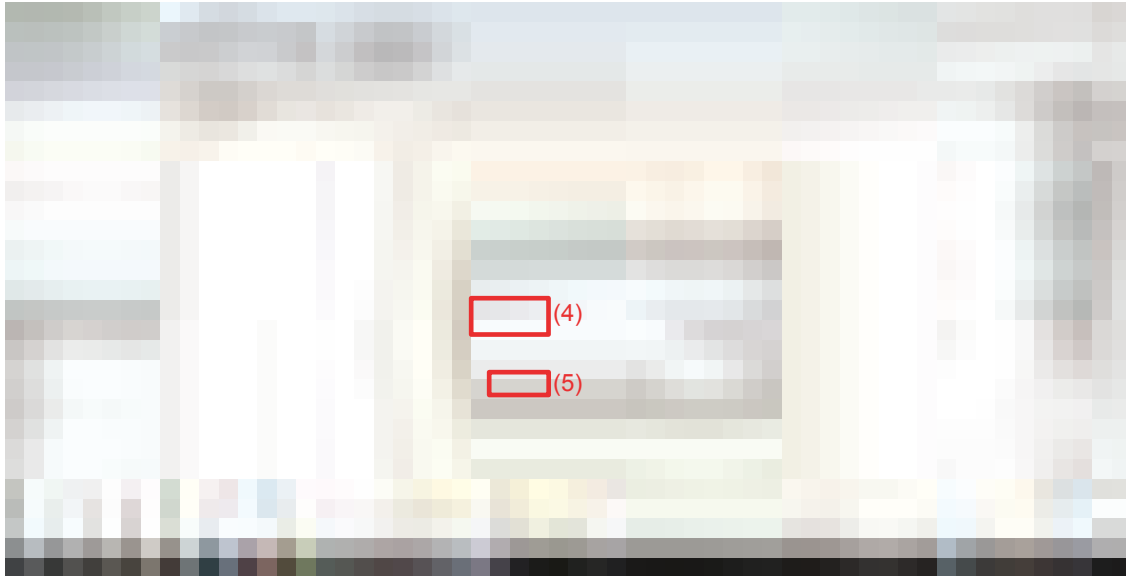
(6) Save the created message. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

After inserting the text field, adjust the message parameters as needed. Refer to "3.9.2 EDITING AN EXISTING FIELD" and "3.9.3 ACCESSING THE FIELD EDITING MENU". Laser Application places no limit on the number of lines of text. You can overlap the figures one on top of the other. On Laser Application, everything that enters the working area will be subsequently printed.

NOTE
For more information on how to make the message, please refer to Software Manual.

3.2.3. SAVING YOUR MESSAGE

This section explains how to save a created message.

Touch Screen:

To save the new message created using the Touch Screen, follow these steps.

(1) Select the icon "FILE" displayed on the bottom left of the screen.

(2) Select the icon "SAVE" displayed on the bottom right of the screen.

(3) Press "+ NEW FILE" displayed on the top left of the screen, use the displayed keyboard to enter the file name to be saved and then press "RETURN" to save the created message as a new message.

   [NOTE] File name must be 12 alphanumeric characters or less.
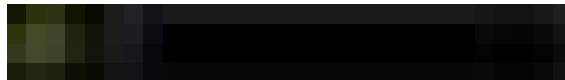
   [NOTE] If you want to overwrite the existing message with the created message, follow the procedure below.
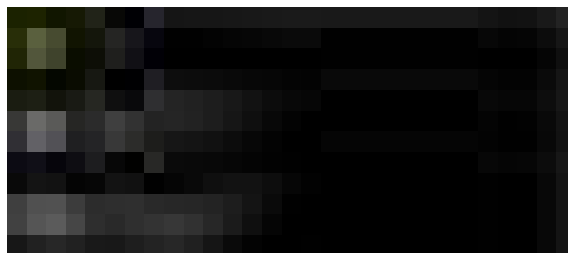
(4) Select the file to be overwritten from the list of existing files displayed under "+ NEW FILE".

(5) The message below is displayed.

(6) Press "YES" to confirm overwriting.

Laser Application:

To save the message with Laser Application, follow the procedure below.

  (1) After pressing the   icon, enter the file name to be saved.

  (2) Press "Save".

[NOTE] If you want to overwrite the existing message with the created message, follow the procedure below.

  (1) After pressing the   icon, select the file to be overwritten from the file list.

  (2) Press "Save". (Or "Save" on the menu toolbar)

  (3) When the confirmation message appears, press "Yes" to confirm overwriting. To save a message with Laser Application, select the "File" menu and choose the "Save" option (if this message is an existing message) or choose "Save as" (for new messages).

3.3. PRINTING A MESSAGE

This chapter provides more information on the printing process.

Touch Screen:

Follow these steps to print a message using the Touch Screen.

(1) Select the icon "PRINT" displayed at the bottom left of the screen.

(2) Press "FILE:" displayed in the upper left on screen.

(3) A list of printable file names is displayed. Select the file name you want to print.

> **[NOTE]** All Alphabet letters are displayed in lower case.

(4) The selected file name will be displayed on the right of "File:". Check if it is correct.

(5) Select the print function ("TEST" or "PRINT") displayed at the bottom right on screen.

> - If "TEST" is selected, printing is forcibly performed once. Use "TEST" to check the printing.

> > **[NOTE]** First set the object to be printed and then press "TEST". Printing is performed immediately when "TEST" is selected.

> - Press "PRINT" to wait for a print trigger. It continues waiting until you press "STOP".

(2) File: (4) File name

HITACHI
LM-C300 Series

(1) PRINT   TEST   PRINT
(5)
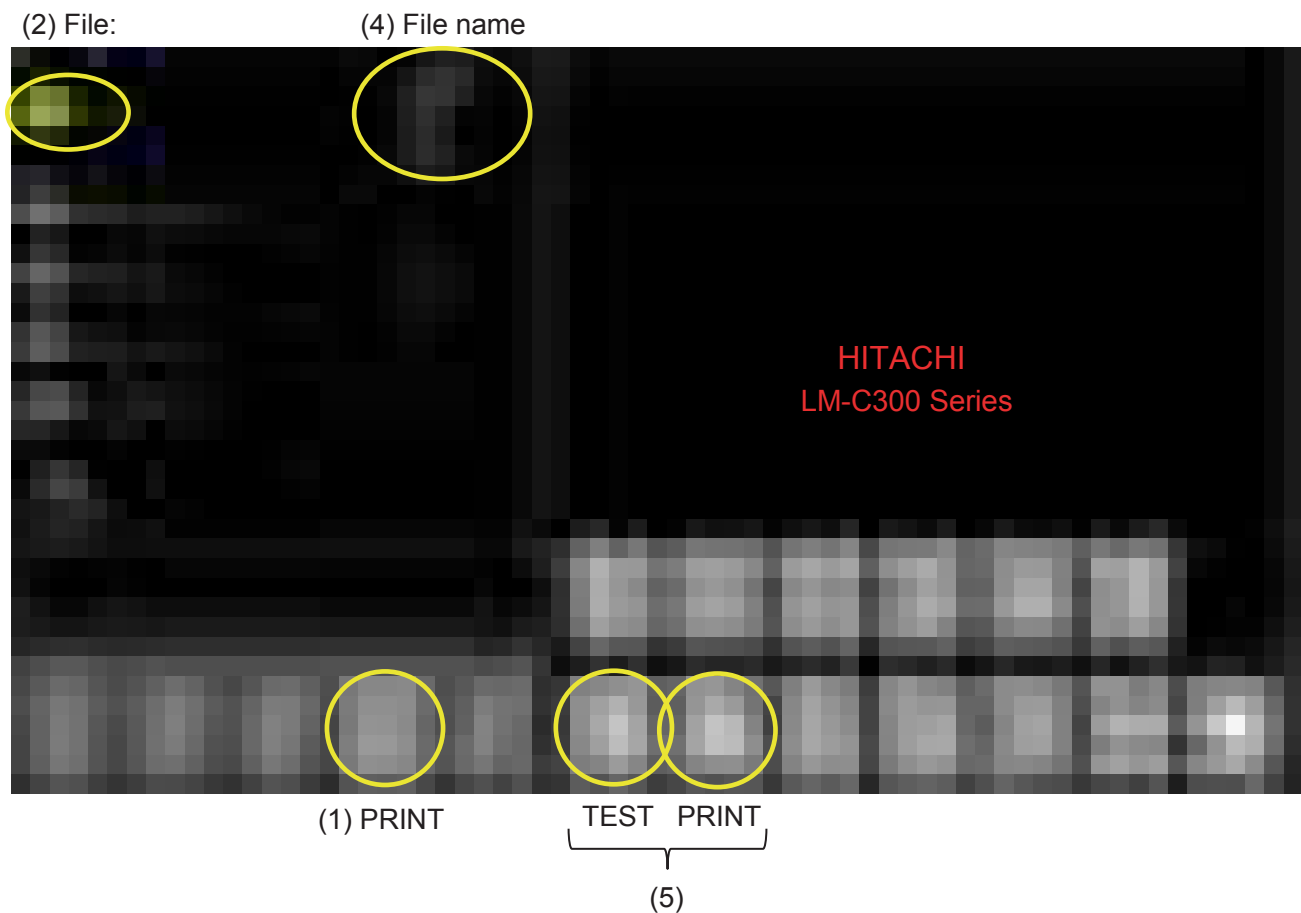
Laser Application:

To print a message with Laser Application, follow the procedure below.

(1) Click the icon ▨. Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. Select the file that contains the message you want to print.

(3) After checking the checkbox of "Layer" (upper left of the screen), change the print parameters (speed, resolution, etc.) from "Properties" (lower left of the screen).

　　[NOTE] Depending on the version of the application, there may be an "Apply" button on this "Properties" section. In that case, the change will be reflected by pressing this "Apply" button.

(4) Press the icon ▨ to open the dialogue below.

　　[NOTE] The button layout etc. vary depending on the application version. Please confirm the details of each button in Help ▨.

(5) Press the "Testprint" button to perform test print. (Forced printing once)

　　[NOTE] First set the object to be printed and then press "Testprint". Printing is performed immediately when "Testprint" is selected.

(6) Press the "Print" button to wait for a print trigger.

(7) When the printing process starts, the information box below opens. The total number of copies currently printed is displayed in "Total".

(8) When the print trigger is input, printing will be started. Click the icon ▨ if you want to stop the printing process.

[NOTE] When the trigger is set to OFF in the item "Signal", printing is immediately performed in "Printing mode active", and printing is not stopped unless the icon ▨ is pressed.

3.4. ADJUSTING THE PRINTING POSITION

This section explains how to ensure the printed message appears in the right position on the product.

The figure below will help you understand the print position. The large arrow shows the direction in which product moves. In this example, there is a fixed distance (C) between the marking head (A) and the photocell (B) that detects the edge of the product. This distance is the same for all products and messages. The distance is zero for some installations. The installation technician enters this measurement into the Laser Marker during installation, but you can change the value.

In this figure, the trigger signal from the sensor (photocell) occurs at the edge of the product, although the label (E) is not at the edge of the product. The distance between the sensor position and the print position (E) is the Print Delay or Photocell Distance (D).

Direction of movement
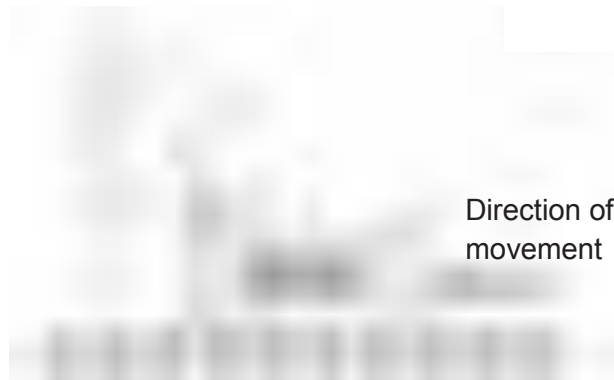
Touch Screen:

To adjust the print interval using the Touch Screen follow the procedure below.

Access level is "Maintenance".

    (1) Select "SETTINGS" on the main screen.

    (2) Select "DYNAMIC & PHOTOCELL" at the top left of the screen.

    (3) Scroll to select "Offset (mm):" and press ☐ area in the "Offset (mm)".
        Change the value with the arrow keys.
      [NOTE] When "Static" is selected in "Mode:", "Offset (ms):" is displayed.

    (4) Press "RETURN" to save the changes and return to the previous screen.
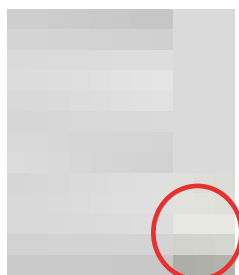
<u>Laser Application:</u>

To print the message using Laser Application, follow the procedure below.

Access level is "Supervisor".

    (1) Go to the "Configuration" menu on the upper right edge.

    (2) Select the "Dynamic and Photocell" option with the cursor.
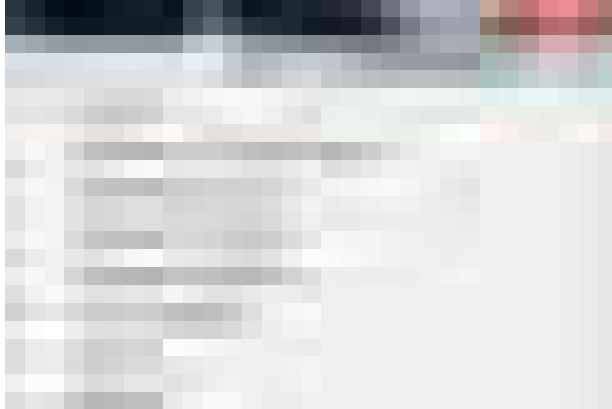
    (3) Select the "Offset (mm)" and enter the new value from the keyboard.
          [NOTE] When "Static" is selected in "Mode:", "Offset (ms)" is displayed.

    (4) Press the "Apply" button to validate the changes and return to the main screen.
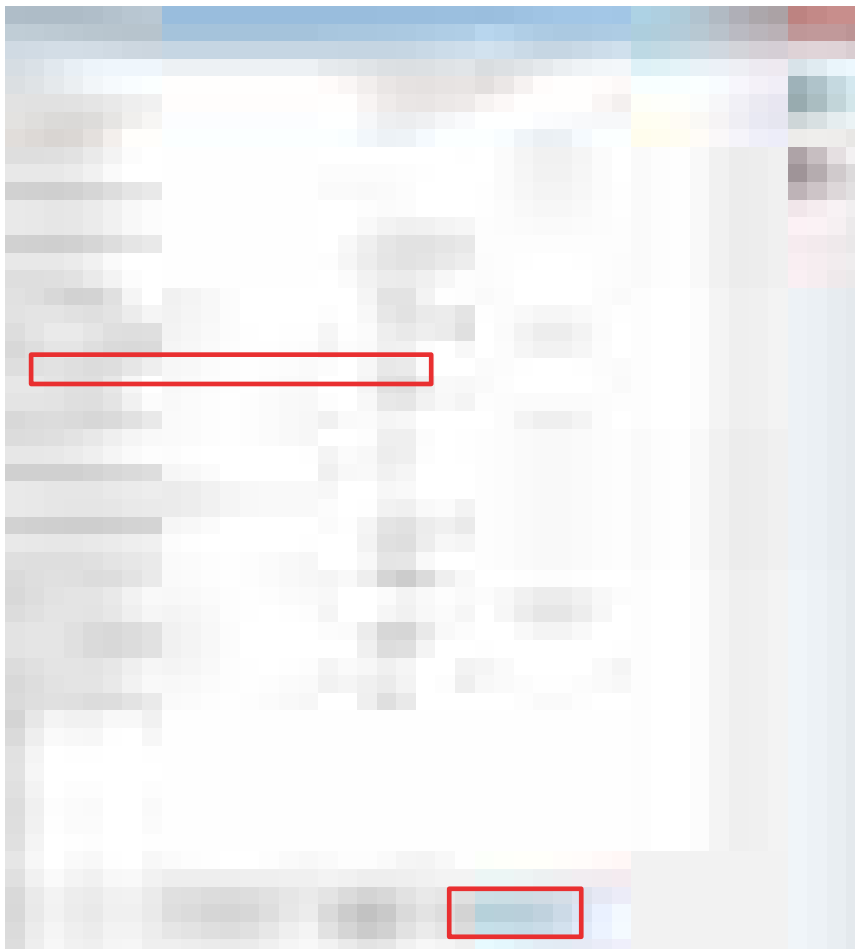
          [NOTE] Depending on the application version, different setting items may be displayed. Please check the details for each item in the help .

3.5. N-PRINT FUNCTION

By using the N-Print function, it is possible to print the number of times set by one sensor input signal.

For example, if the number of prints is set to 10, as shown in the figure below, you print 10 times with one sensor input signal.

Touch Screen:

To use the N-Print function on the Touch Screen, follow the procedures below.

    (1) Select "SETTINGS" on the main screen.

    (2) Select "DYNAMIC & PHOTOCELL" at the top left of the screen. Select "Mode:" and select "Dynamic distance".

    (3) Press "BACK". Select "Signal" at the top left of the screen. Select "Trigger UP" or "Trigger Down".

    (4) Press "BACK". Select "N-prints" at the top left of the screen. Enter how many times you wants to print with one sensor input signal.

Laser Application:

To use the N-Print function using Laser Application, follow the procedures below.

    (1) Go to the "Configuration" menu on the upper right edge.

    (2) Select the "Dynamic and Photocell" option with the cursor.

    (3) Select the "Mode:" and select "Dynamic distance".

    (4) Select the "Signal:" and select "Trigger UP" or "Trigger Down".

    (5) Select the "N-prints:" and enter how many times you wants to print with one sensor input signal.

    (6) Press the "Apply" button to validate the changes and return to the main screen.

[NOTE 1] Even if the sensor input is ON until the Laser Marker prints the message the set number of times, printing ends after the set number of times is printed.

[NOTE 2] If the sensor is turned off during printing of the set number of times and is turned on again before the prints reaches the set number of times, the printing of the set number of times is performed again from there. If there is chattering in the sensor input signal, the printing will not be performed for the correct number of times, so avoid chattering.

3.6. PRINT COUNTER

The print counter shows the number of prints of the messages.

Touch Screen:

To check the number of prints on the Touch Screen, follow the procedure below.

(1) Select "PRINT" on the main screen.

(2) Check the number of prints in "Total prints:" displayed on the left side of the screen. "Total prints:" is the total number of prints that the Laser Marker has printed so far.
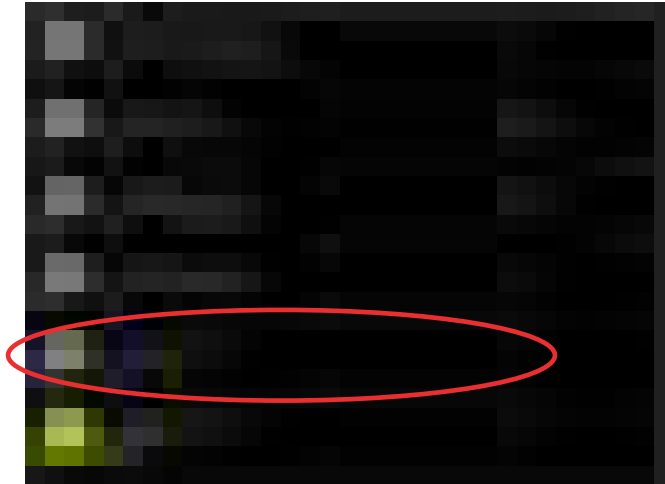
Laser Application:

To check the number of prints using Laser Application, follow the procedure below.

(1) When printing starts, the information box below opens. Refer to Laser Application explanation in "3.3 PRINTING A MESSAGE".

(2) The total number of prints currently made is displayed in "Total:".
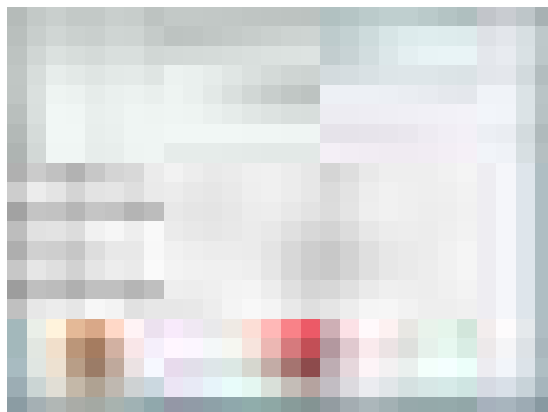
3.7. STOPPING AND TURNING OFF THE LASER MARKER

This section explains how to safely stop the Laser Marker and turn off the electrical power supply.

The Laser Marker must be turned off in a manner appropriate to the length of time of inactivity.

Depending on the length of time of inactive state, a key switch may be used or an emergency stop switch may be used.

WARNING

Always use the correct procedure (described below) to shut down and turn off the Laser Marker.

If the Laser Marker is turned off unexpectly, you will lose a record of changes that have not been saved. Make sure all changes are saved by taking the appropriate steps.

3.7.1. HOW TO STOP OR TURN OFF THE LASER MARKER

There are two procedures to stop printing with the Laser Marker.

Key Switch:

If you think the stoppage or period of inactivity of the Laser Marker is relatively brief, it may be stopped by the key switch. In this case, the laser beam is deactivated but the power is still supplied.

Emergency stop switch:

In an emergency, press the emergency stop switch if you need to stop the Laser Marker immediately. If it is difficult to access the emergency stop switch of the main power supply or the Laser Marker due to the dangerous situation that occurs, do nothing and evacuate from the site.

3.8. TOUCH SCREEN MENU DIAGRAM

HOME → FILE →
- NEW
- LOAD
- SAVE
- SAVE AS
- DELETE
- PROPERTIES
- LAYERS
- EXPIRY

EDIT →
- DATE + TIME
- USER MESSAGE
- QR CODE
- TIME SHIFT
- GS1
- EAN 13

- CUSTOM →
- GROUPED TEXT
  (GROUP TEXT)
- LINE
- RECTANGLE
- POLYLINE
  (POLYGON)
- CIRCLE
- ARC
- TEXT
- SECONDS
- MINUTES
- HOUR
- WEEK
- YEAR
- MONTH
- DAY
- USER MESSAGE
- SEQ. NUM.
  (SEQ. NUMBER)
- SHIFT
  (SEQ. MESSAGE)

- EXP DATE (US)
- EXP. DATE
- DM CODE

→
- ZOOM OUT
- ZOOM IN
- CENTER
- SELECT ALL
- UNSELECT ALL
- MOVE
- DELETE
- COPY
- MIRROR up / down
- MIRROR right / left
- ROTATE -30°
- ROTATE
- ROTATE +30°
- ALIGN LEFT
- ALIGN RIGHT
- ALIGN TOP
- ALIGN BOTTOM
- ALIGN CENTER X
- ALIGN CENTER Y

PRINT →
- TEST
- PRINT
- STOP
- USER MESSAGE
- SEQ. NUM.
- GLOB. NUM
- ALARMS
- POINTER
- OFFSET
- UPDATE
- CENTER
- ZOOM IN
- ZOOM OUT

SETTINGS
(SETUP) →
- LASER & SCANNER
- DYNAMIC & PHOTOCELL
- ALARMS
- OPTIONS

[NOTE] The screen may differ depending on the software version. For example, in older versions of the software or older versions of software,

- There are no items in blue. In addition, there is no menu screen corresponding to the contents enclosed by the blue frame.
- There may be displayed with the words written in parentheses.

For the Touch Screen there are three levels of access.

Access level	Contents
User	Only operations related to "PRINT" are possible.
Supervisor	Operations related to "FILE", "EDIT", and "PRINT" are possible. Password setting is required.
Maintenance	Operations related to "FILE", "EDIT", and "PRINT" and some operations related to "SETTINGS" are possible. Password setting is required.

[NOTE] In old versions of the software, "Supervisor" is displayed as "Supervisor 1" and "Maintenance" is displayed as "Supervisor 2".

Refer to the table below for the functions that can be used at each access level. The functions with a check in the table below can be used.

HOME	MENU	SUB MENU	User	Supervisor	Maintenance
FILE	NEW			✓	✓
	LOAD			✓	✓
	SAVE			✓	✓
	SAVE AS			✓	✓
	DELETE			✓	✓
	PROPERTIES			✓	✓
	LAYERS			✓	✓
	EXPIRY			✓	✓
EDIT	DATE + TIME			✓	✓
	USER MESSAGE			✓	✓
	QR CODE			✓	✓
	TIME SHIFT			✓	✓
	GS1			✓	✓
	EAN 13			✓	✓
	CUSTOM	TEXT		✓	✓
		ARC		✓	✓
		CIRCLE		✓	✓
		POLYLINE (POLYGON)		✓	✓
		RECTANGLE		✓	✓
		LINE		✓	✓
		GROUPED TEXT (GROUP. TEXT)		✓	✓
		DAY		✓	✓
		MONTH		✓	✓
		YEAR		✓	✓
		WEEK		✓	✓
		HOUR		✓	✓
		MINUTES		✓	✓
		SECONDS		✓	✓
		SHIFT (SEQ. MESSAGE)		✓	✓
		SEQ. NUM (SEQ.NUMBER)		✓	✓
		USER MESSAGE		✓	✓
	EXP DATE(US)			✓	✓
	EXP. DATE			✓	✓
	DM CODE			✓	✓
PRINT	TEST		✓	✓	✓
	PRINT		✓	✓	✓
	STOP		✓	✓	✓
	USER MESSAGE		✓	✓	✓
	SEQ.NUM.		✓	✓	✓
	GLOB.NUM		✓	✓	✓
	ALARMS		✓	✓	✓
	POINTER		✓	✓	✓
	OFFSET		✓	✓	✓
	UPDATE		✓	✓	✓
	CENTER		✓	✓	✓
	ZOOM IN		✓	✓	✓
	ZOOM UP		✓	✓	✓
SETTINGS (SETUP)	LASER & SCANNER	LASER			
		DIMENSIONS & CORRECTIONS			
		SCANNERS			
		Scanners Adjust			
	DINAMIC & PHOTOCELL				✓
	ALARMS				✓
	OPTIONS	POINTER & AXIS			✓
		END SIGNAL			✓
		FIRST PULSE（CO2 LASER）			
		OPTIONS EXTRA			✓
		USB TOOLS			✓
		SYSTEM INFORMATION			
		Message Table			✓

[NOTE] For older versions of software, there are no items in blue. And there may be displayed with the words written in parentheses.

3.9. MODIFYING EXISTING MESSAGES

There are three ways to modify an existing message by editing the field. (Access level is "Supervisor" or higher for the Touch Screen, and "Advanced User" or higher for Laser Application.)

    (1) How to add a new field into a message.

    (2) How to edit or move a field.

    (3) How to delete a field from a message.

3.9.1. ADDING A NEW FIELD

This chapter explains how to add a new text field to an existing message as an example.

To add a date or time field, refer to "3.9.4 INSERTING A DATE OR TIME". To learn how you can add other types of field to your message, please refer to Software Manual.

Touch Screen:

To add a new field to an existing message using the Touch Screen, follow the procedure below.

    (1) Select "FILE" on the main screen.

    (2) Select "LOAD" on the right side of the screen, and select the message to which you want to add a field from the existing message list on the left side of the screen.

    (3) Press "Edit", then "CUSTOM" and select "Text".

      [NOTE 1] If you slide the icons to the left, icons that are not on this screen will be displayed.

      [NOTE 2] The screen differs depending on the software version. For example, after pressing the "EDIT" button this screen may look like the one on the right side figure above.

    (4) Touch where you want to add a field in the working area on screen and the keyboard will appear.

    (5) After entering the text you want to add using the keyboard, press "RETURN" to add the text field.

    (6) Save the message. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

If you want to insert a field other than text (e.g. data or time field), the procedure is the same, but change the type of icon selected in (3). The field options that you can set on the items that you can change in the field edit menu depend on the selected icon.

[NOTE] If you want to move the field you just added because it overlaps an existing field, move the field using the following procedure. If you want to delete a field, refer to "3.9.5 DELETING A FIELD".

(1) Access the field editing menu. Refer to "3.9.3 ACCESSING THE FIELD EDIT MENU".

(2) Select "GENERAL" and change the values of "Position X [mm]:" and "Position Y [mm]:".
The changed value will be reflected when the value is changed and "RETURN" is pressed.

Laser Application:

To edit or modify an existing message with Laser Application, follow the procedure below.

(1) Click on the icon [   ]. Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. From the list, select the file to which you want to add a new field.

(3) When the file is opened, select the icon on the right side of the screen.
Or select "Static figures" → "Text" from the menu toolbar "Draw".

(4) If you place the cursor on the position (A) where you want to add a field in the working area and click, a text input dialogue will be displayed. (Position (A) is the position of the lower left corner)
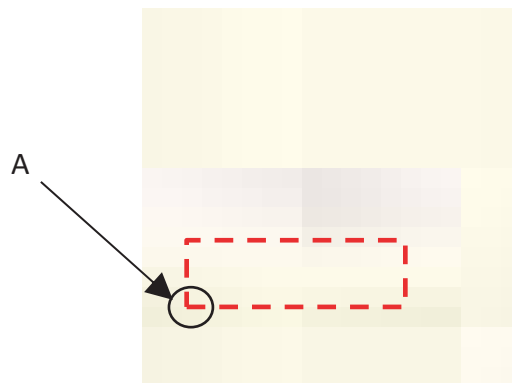
(5) Enter the text you want. Select one from the code selection buttons (3 types: "Normal", "2 Byte Unicode", and "1 Byte ANSI") displayed on the right side of the dialogue.
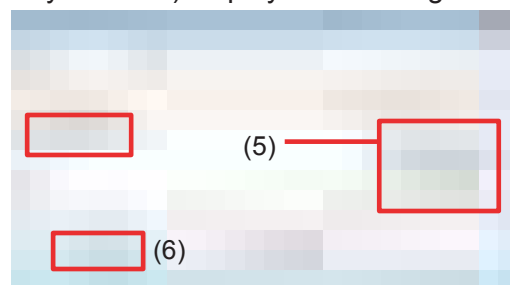
(6) When you press the "OK" button, the entered text is inserted at the selected position.

(7) Save the message when the field addition is complete. Refer to "3.2.3 SAVING YOUR MESSAGE" for details on saving.

If you want to insert another field type that is not text (e.g. a Data or Time field), you must follow the same steps. But in step (3), change the type of icon selected from the editing tool on the right side of the screen. Items that can be changed in "Properties" at the bottom left of the screen depend on the type of field selected.

[NOTE] If you want to move the field you just added because it overlaps an existing field, move the field using the following procedure. If you want to delete a field, refer to "3.9.5 DELETING A FIELD".

(1) Access the field editing menu. Refer to "3.9.3 ACCESSING THE FIELD EDITING MENU")

(2) Select "General" from the "Properties" menu and change the values for "Position X:" and "Position Y:". (In each case, the changed value is reflected when the numerical value is changed and the "Enter" key is pressed.)

[NOTE] Depending on the application version, there is an "Apply" button. In that case, click the "Apply" button, and the changed value will be reflected in the screen of the working area.

3.9.2. EDITING AN EXISTING FIELD

This section explains how to edit the contents of the existing message field.

Touch Screen:

To edit an existing message field using the Touch Screen, follow the procedure below.

Example: Editing a text field

(1) Select "FILE" on the main screen.

(2) Select "LOAD" on the right side of the screen.

(3) Select the message to edit from the existing message list displayed on the left side of the screen.

(4) Press "EDIT" displayed on the lower left side of the screen, and press the Text field to be edited this time displayed on the upper left side of the screen.

(5) The field editing menu (GENERAL, TRANS., TEXT, FONT/1, FONT/2, etc. selection screen) is displayed on the left of the screen.

(6) After selecting "TEXT", scroll the screen and press [   ] area in "String:".
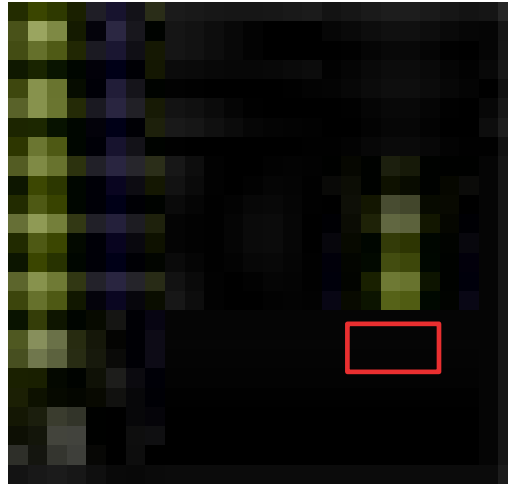
(7) When the keyboard screen opens, edit the text content and press "RETURN".

(8) Save the message that contains the edited field. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

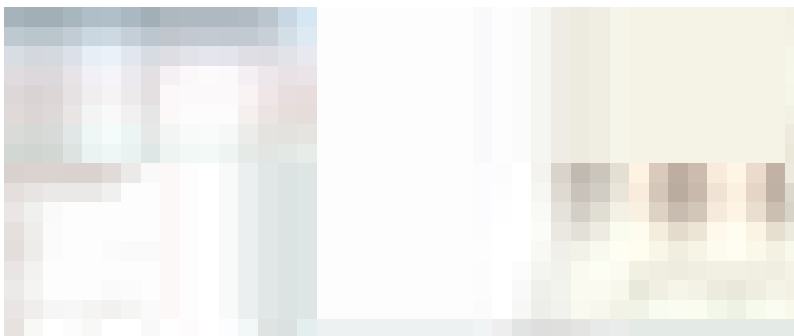The procedure is the same when editing non-text fields. In that case, the field options that can be set and the items that can be changed in the field edit menu depend on the type of field selected.

Laser Application:

To modify an existing field with Laser Application, follow the procedure below.

(1) Click on the icon [   ]. Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. From the list, select the file to which you want to modify the field.

(3) When the message is displayed, click the field where you want to modify the text.

(4) Select "General" from the "properties" menu, and Left-click the area where the text content of the item "Text" is described.

(5) The text input dialogue is displayed and the text contents are displayed. Change the text content with the keyboard and press "OK" to complete the editing.

(6) Save the modified field. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

If you want to insert another field type that is not text, you must follow the same steps.

But the items that can be changed in the field options and field edit menu depend on the type of field selected.

3.9.3. ACCESSING THE FIELD EDITING MENU

Access to these menus is different for Touch Screen and Laser Application.

There are mainly five menus for field editing menus as follows:

- GENERAL: Change the field position
- TRANS. : Change the field angle
- TEXT : Change the text field position and orientation
- FONT/1 : Change text dimensions etc.
- FONT/2 : Change text alignment, rotation, etc.

Touch Screen:

To access the field editing menu using the Touch Screen, follow the procedure below.

(1) Select "FILE" on the main screen.

(2) Select "LOAD" on the right side of the screen.

(3) Select the message you want to edit from the list of existing messages displayed on the left side of the screen.

(4) Press "EDIT" displayed in the lower left of the screen, and press the field you want to edit from the fields displayed in the working area on the right of the screen.

(5) The field editing menu (GENERAL, TRANS., TEXT, FONT/1, Font/2, etc. selection screen) is displayed on the left side of the screen.
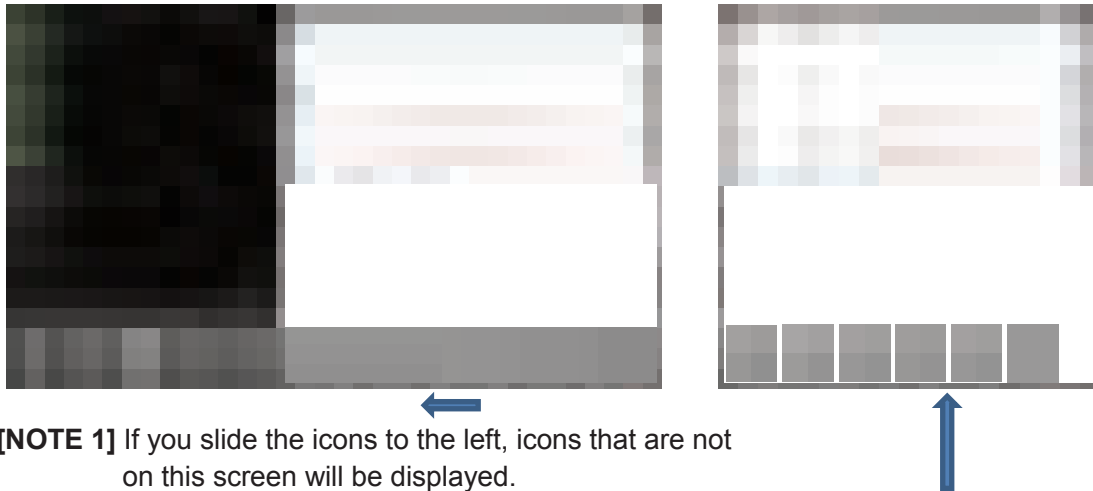
[NOTE 1] If you slide the icons to the left, icons that are not on this screen will be displayed.

[NOTE 2] The screen differs depending on the software version. For example, this screen may look like the one on the right side figure above.

(6) Select the menu that corresponds to the item you want to edit and change the setting value.

(7) Press "RETURN" and press "FILE" displayed at the bottom left of the screen to save the changed settings. Refer to "3.2.3 SAVING YOUR MESSAGE" for details on saving.

[NOTE] After pressing "EDIT" in step (4), select the field you want to edit from the list of fields displayed on the upper left of the screen, and the field edit menu can be displayed directly.

Laser Application:

To access the field editing menu ("Properties") in Laser Application, follow the procedure below.

    (1) Click on the icon   . Or select the "File" menu and choose the "Open" option.

    (2) A list of file names will be displayed. From the list, select the file which you want to modify a field.

    (3) When the message is displayed, click the field where you want to modify the text.

    (4) "Properties" (field editing menu) is displayed at the bottom left of the screen.

    (5) Select the tab corresponding to the item you want to modify and change the setting value.

    (6) Depending on the software version, some items may have an "Apply" button in the tab. In this case, press the "Apply" button to decide the change and save the message. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

"Properties" displays tabs (font size etc.) for editing the appearance of the selected field. There are tabs that are always displayed ("GENERAL", "TRANS.") regardless of the type of field selected, and tabs specific to each field.

3.9.4. INSERTING A DATE OR A TIME

In this section you will learn how to use a Date or a Time field in your message. The current data and time, which are stored in the internal clock of the Laser Marker are used for these field. You can use an offset to change the data or time to be printed.

[NOTE] The print contents of the date / time field is updated at the following timing.

- Immediately after printing

- Update once every 10 seconds when waiting for print trigger

Therefore, the time displayed on the screen and the time displayed on the print may be different.

3.9.4.1 INSERTING A DATE OR TIME FIELD

To insert a Date or a Time field in your message, follow the procedures below.

Touch Screen:

To insert a Date or a Time field in your message using the Touch Screen, follow the procedure below.

(1) Select "FILE" on the main screen.

(2) Select "LOAD" on the right side of the screen.
To create a new field, select "NEW" and go to step (4).

(3) Select the message you want to add a Date or a Time field, from the existing message list displayed on the left of the screen.

(4) Select "EDIT" displayed at the bottom left of the screen.

(5) If you select "CUSTOM" displayed at the bottom right of the screen, the text and figure icons will be displayed at the bottom right of the screen. If you slide these icons to the left, the icons for "DAY", "MONTH", "YEAR", "WEEK", "HOUR", "MINUTES", and "SECONDS" will be displayed. Select one of them.

[Right side of touch screen]

Slide to show date / time icons
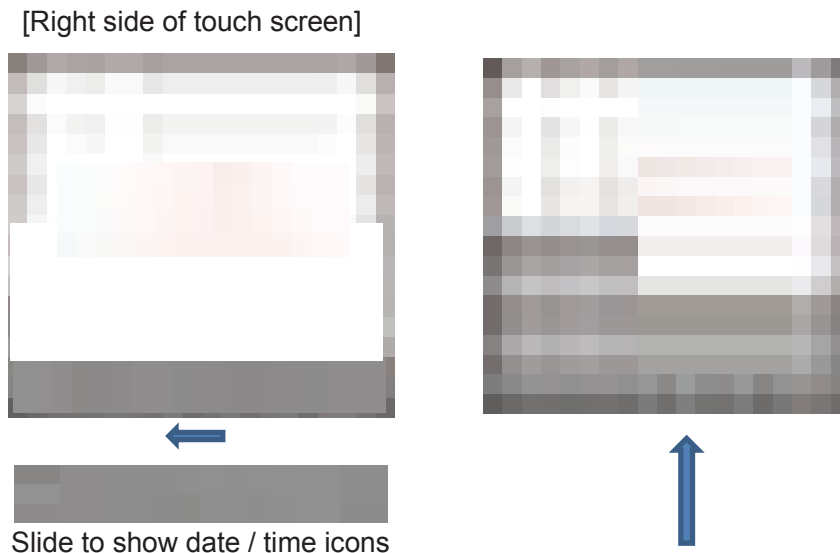
**[NOTE]** The screen differs depending on the software version. For example, after pressing the "EDIT" button this screen may look like the one on the right side figure above.

(6) Touch the screen at the position where you want to insert a new Date or Time field, and the field selected in step (5) will be inserted.

(7) Save the message that contains the inserted field. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

Laser Application:

To insert a date / time field in a message using Laser Application, follow the procedure below.

(1) Click the icon ▇. Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. From the list, select the file to which you want to insert a date / time field.

(3) From the editing tools on the right side of the screen, select one of the icons for "Day", "Month", "Year", "Week", "Hour", "Minutes", and "Seconds". Or select "Computed field" from "Draw" on the Menu Toolbar, and select one from "Day", "Month", "Year", "Week", "Hour", "Minutes", and "Seconds".

Day
Week   Month
Year   Hour
Minutes   Seconds
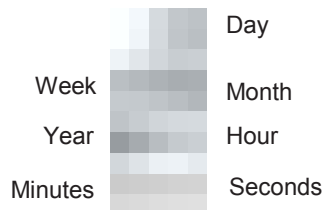
(4) Left-click on the field in the working area where you want to display the date / time field selected in step (3).

(5) Save the message including the inserted field. Refer to "3.2.3 SAVE YOUR MESSAGE" for saving.

3.9.4.2 SELECTING A FORMAT

Touch Screen:

When you select the field type you want to insert into the message, a series of options for configuring the field will appear. One of them is the format that will be used. The format option cannot be configured in all the fields (only in the day, month, year, week and time fields).

For example, in the case of the "Month" field, after inserting into the field, press "Month [*]" (* is a number) → "MONTH" → "Format" displayed at the top left of the screen. "MM (1..12)", "MMM (JAN ... DEC)", and "MHex (1, .. 9, A, B, C)" are displayed as display formats. Select the desired display format from these.

To choose the format you must modify when it is first inserted in the field, because once it has been inserted into the message, the format cannot be changed.

Laser Application:

When you insert a field, "Properties" contains a set of options to configure it. One option is the format and this is not available for all fields (only for the day, month, year and time fields).

For example, if you select the "Month" field, the "Properties" displays "Month" tab. There is "Format:" in this tab, and select one of "MM(1..12)", "MMM (JAN ... DEC)", "MHex (1, .. 9, A, B, C)" as the display format.

With Laser Application, after entering the field, you may be able to change its format.

3.9.4.3 SET THE OFFSET DATE

Use this option to add a fixed number of days (weeks, months, years) to the actual date. You can use this option to print a "Sell-by" date etc. The date offset will be printed in the message. For example, if the actual date is September 2 and the date offset is +10 days, the date that is printed in the message is September 12.

Touch Screen:

To set an offset for the date in an existing field on the Touch Screen, follow the procedures below.

(1) Select "FILE" on the main screen.

(2) Select "LOAD" on the right side of the screen.

(3) Select the message that contains the field where offset is to be set from the list of existing messages displayed on the left side of the screen.

(4) Select "EDIT", click on the field you want to set the offset, and press "RETURN" on the left side of the screen.

(5) Pressing "EXPIRY" displayed on the left side of the screen, the offset setting menus of "Offset [days]" and "Offset [minutes]" will be displayed.

> **[NOTE]** If you select the grouped text as the field you want to set the offset in step (4), the procedures to display the offset setting menu are as follows:
> - Click on the field you want to set the offset, and press "RETURN" on the left side of the screen.
> - Press "MEMBERS" displayed on the left side of the screen and a list of elements that compose the grouped text is displayed on the left side of the screen.
> - When you select the element which you want to set the offset for, the offset setting menu is displayed.

(6) Select the item for offset setting.

(7) Change the offset setting value by increasing / decreasing the value with the arrow keys or pressing the numerical value in the center to move to the numeric keypad screen and directly enter the value.

(8) Pressing "RETURN" on the screen that displays the arrow keys will apply the modified offset value to the field.

(9) Save the settings after completing the settings. Refer to "3.2.3 SAVING YOUR MESSAGE" for details.
- Be sure to set the [Offset [Day]] in units of days, not units of months or years.
- Offset settings can be adjusted within existing fields as well as new fields.

Laser Application:

To set an offset for an existing field data using Laser Application, follow the procedures below.

(1) Click the icon [   ]. Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. From the list, select an existing message file with a field you want to set the offset.

(3) Select the field to set the offset.

(4) Select the "Expiry" tab from the "Properties" menu at the bottom left of the screen to display the offset setting menu ("Offset [days]", "Offset [minutes]").
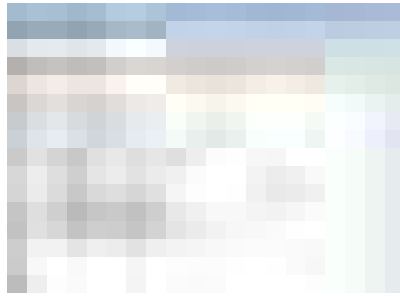

[NOTE] If you select the grouped text as the field you want to set the offset in step (3), the procedures to display the offset setting menu are as follows:
- Click on the field you want to set the offset and select the "Grouped Text" tab from the "Properties" menu at the bottom left of the screen.
- From the type list, select the element which you want to set the offset for and press "Edit member".
- Select the "Expiry" tab from the "Properties" menu at the bottom left of the screen to display the offset setting menu.

(5) Select the item for which you want to set the offset.

(6) Enter the offset setting value and press the "Enter" key to apply the offset value change to the field.

[NOTE] Depending on the application version, there may be "Apply" button at the bottom right of the "Properties" menu. In this case, after entering the offset setting value, press "Apply" to decide the offset value.

(7) Save the settings after completing the settings. Refer to "3.2.3 SAVING YOUR MESSAGE" for details.

- Be sure to set the [Offset [Day]] setting in units of days, not units of months or years.

- Offset settings can be adjusted within existing fields as well as new fields.

3.9.5. DELETING A FIELD

This section explains how to delete an existing message field.

Touch Screen:

To delete an existing message field on the Touch Screen, follow the procedure below.

    (1) Select "FILE" on the main screen.

    (2) Select "LOAD" on the right side of the screen.

    (3) Select the message that contains the field you want to delete, from the list of created messages displayed on the left side of the screen.

    (4) Press "EDIT".

    (5) Select the field you want to delete from the fields displayed in the working area on the right side of the screen.

    (6) Press "DELETE" on the right of the screen to delete the selected field.
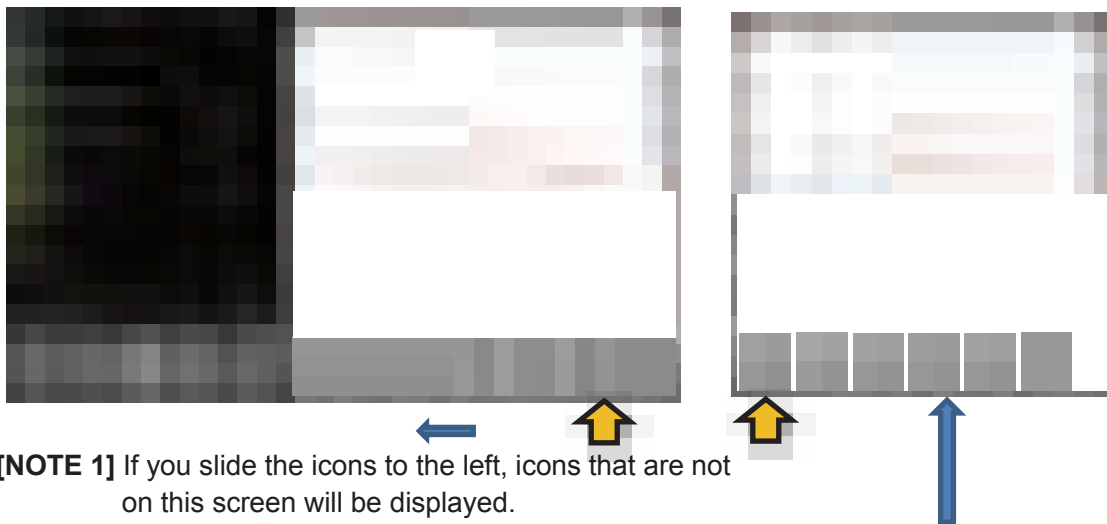
    [NOTE 1] If you slide the icons to the left, icons that are not on this screen will be displayed.

    [NOTE 2] The screen differs depending on the software version. For example, this screen may look like the one on the right side figure above.

    (7) Save the message when the field is deleted. Refer to "3.2.3 SAVING YOUR MESSAGE" for saving.

Laser Application:

To delete an existing message field using Laser Application, follow the procedure below.

    (1) Click the icon ▢ . Or select the "File" menu and choose the "Open" option.

    (2) A list of file names will be displayed. From the list, select the existing message file with the field you want to delete.

    (3) Move the cursor to the field you want to delete and left-click.

    (4) Press the "Delete" key on the keyboard or select "Edit" → "Delete" from the menu toolbar to delete the field.

    (5) Save the message when the field is deleted. Refer to "3.2.3 SAVE YOUR MESSAGE" for saving.

3.10. MANAGING YOUR MESSAGES

This section describes how to manage the messages that are stored in the Laser Marker. You can make a copy of a message and use the copy as the basis for a new message. You can change the name of the message (Laser Application) or delete the message that is not needed.

3.10.1. DELETING A MESSAGE

To delete the message you have to follow these steps:

Touch Screen:

To delete a message on the Touch Screen, follow the procedure below.

(1) Select "FILE" on the main screen.

(2) Press "DELETE" on the right of the screen.

   [NOTE] Depending on the software version, the number of icons displayed on the right side of the screen varies.

(3) Select the message you want to delete from the list of existing messages displayed on the left side of the screen.

(4) When the message "Are you sure you want to delete file <xxx>?" appears, press "YES" to execute the deletion.

If "DELETE" is selected with the file opened, "File <xxx> is being modified. Are you sure you want to delete it?" is displayed. Press "YES" to delete the message.

Laser Application:

To delete a message using Laser Application.

(1) Click the icon ▭ . Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. Select the file you want to delete from the list.

(3) Right-click on the file name you want to delete and select "Delete" from the drop-down menu.

3.10.2. COPYING A MESSAGE (Laser Application)

This option is available only with Laser Application. To copy an existing message, follow the procedure below.

(1) Click the icon [   ] . Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. Select the message file you want to copy from the list.

(3) Right-click on the selected file name and select "Copy" from the drop-down menu. Or press "CONTROL" + "C" on the keyboard.

(4) Then right-click and select "Paste" from the drop-down menu. Or press "CONTROL" + "V" on the keyboard.

3.10.3. CHANGING THE NAME OF THE MESSAGE (Laser Application)

This option is available only with Laser Application. To rename an existing message file, follow the procedure below.

(1) Click the icon [   ] . Or select the "File" menu and choose the "Open" option.

(2) A list of file names will be displayed. Select the message file you want to change the name.

(3) Right-click on the selected file name and use the drop-down menu to change the name.

(4) Enter the new name.

Another way to change the name of a message file is:

(1) Select the "File" menu and choose "Open".

(2) Select the message file you want to rename from the list.

(3) Once the message file is opened, return to the "File" menu and select the "Save As" option to save the message file where you wish with a new name. Enter the new name and press "Save".
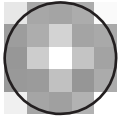
4. TECHNICAL DESCRIPTION

4.1. INTRODUCTION

4.1.1. THE BASIC PRINCIPLE OF THE LASER

The generation of laser light is the phenomenon of the stimulated emission of light. LASER is the acronym of Light Amplification by Stimulated Emission of Radiation. Stimulated emission of light is a phenomenon in which atoms are excited by photons (light corpuscles) to emit photons, which in turn amplify light continuously by the electron avalanche effect that excites other atoms. In order to excite these atoms, external energy suitable for amplification of stimulated emission of light is required.

4.1.2. PRODUCT DESCRIPTION

The LM-C300 Laser Marker is a fast and reliable system capable of marking barcodes, logos and variable information to a wide range of product in a production line.
There are three laser emission wavelength: 9.3, 10.2 and 10.6 microns.

They corresponds to the infrared zone of the spectrum, which means that the laser emission is invisible. The objective is to send this emission to the surface to be marked, so that it makes marking possible.

4.1.3. PRODUCT SERIES DESCRIPTION

This Manual is provided for the LM-C310S, LM-C310P, LM-C311P, LM-C330S, LM-C330P, LM-C331S and LM-C331P.

4.2. TECHNICAL DATA

4.2.1. BLOCK DIAGRAM

Top Cover

Rear Panel

SM270 or SM170 Board
SM271 or SM171 Board
(CPU, DSP, FPGA)

SM172 Board
(I/O Board)

Power Board

Base of Head

Touch Screen
(Option)

Beam
Expander

Optics

Front
assembly

Laser Tube

Lens

Scanners X/Y

Beam Pointer (Option)

Galvos & Mirrors

[NOTE] The SM270 / SM271 board is for LM-C311 / LM-C331, and the SM170 / SM171 board is for LM-C310 / LM-C330. There is no compatibility between boards.

4.2.2. TECHNICAL SPECIFICATIONS

MODEL	LM-C310S LM-C310P	LM-C311P	LM-C330S LM-C330P	LM-C331S LM-C331P
WAVELENGH/ POWER	10.6µm / 10W		9.3µm / 20W 10.2µm / 25W 10.6µm / 30W	
MAX POWER	30W		75W	
CLASS	Class 4 CO_2 laser			
MAINS SUPPLY	AC 100 to 120V / 200 to 240V 50/60 Hz (1 Fase + N)		AC 100 to 120V / 200 to 240V 50/60 Hz (1 Fase + N)	
POWER CONSUMPTION	300VA		600VA	
DIMENSIONS (WxLxH) *1	196x698x148mm	196x728.5x148mm	216x709x179mm	216x747x179mm
WEIGHT	Net: 18kg Gross: 21kg		Net: 22kg Gross: 25kg	

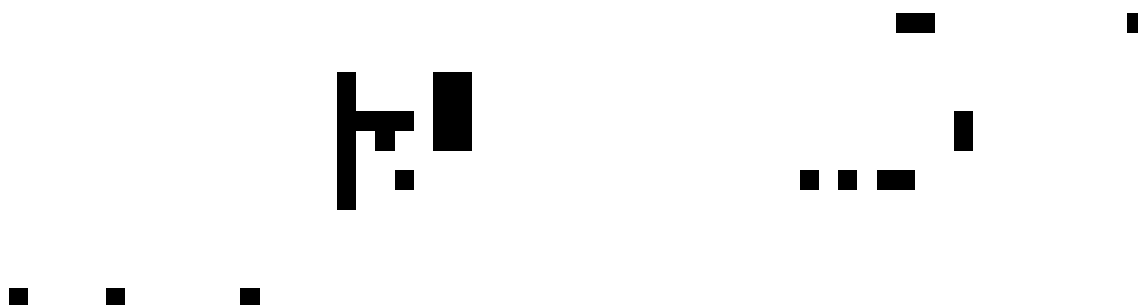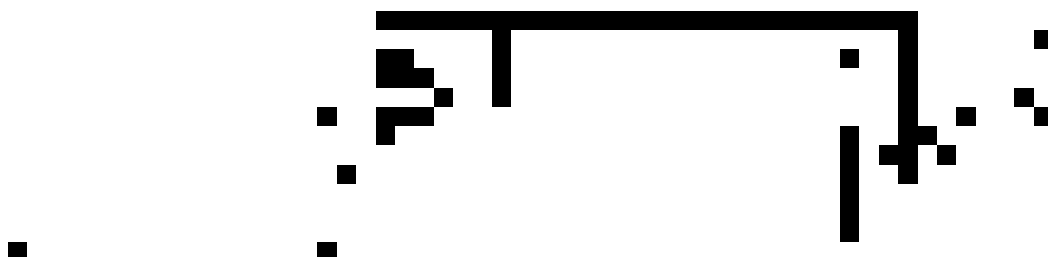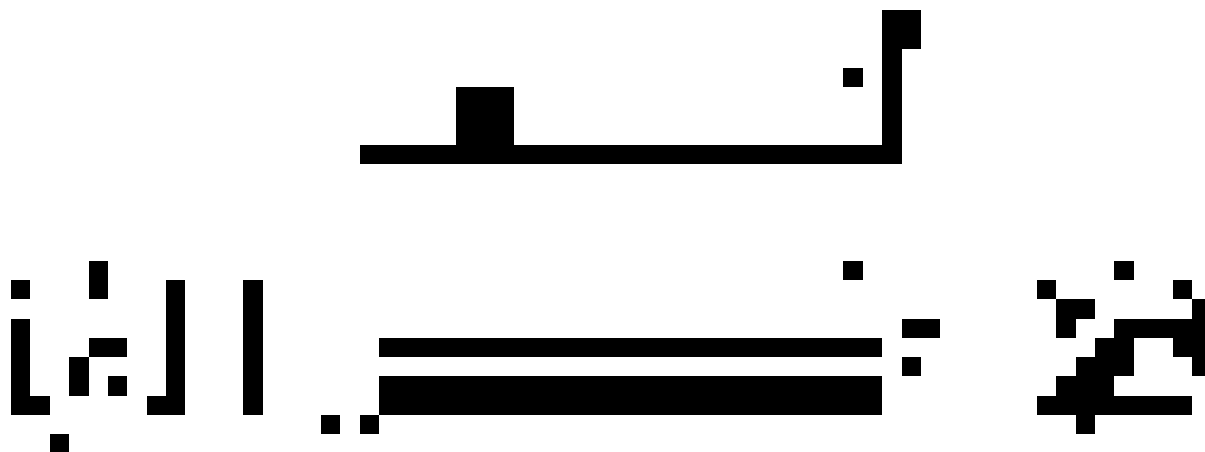| FOCAL SPECIFICATIONS	Type	Work distance (MODEL P) *2		Marking area	MODEL S (Without beam expander)	MODEL P (With beam expander)
		10W	30W			
	40 Lens	60mm	60mm	40x40mm	Optional	Optional
	60 Lens	95mm	95mm	60x60mm	Standard	Optional
	75 Lens	115mm	120mm	75x75mm	Optional	Optional
	100 Lens	165mm	165mm	100x100mm	Optional	Standard
	150 Lens	235mm	235mm	150x150mm	Optional	Optional
	200 Lens	320mm	320mm	200x200mm	Optional	Optional
	250 Lens	430mm	435mm	250x250mm	Optional	Optional

USER INTERFACE	Touch Screen / PC
OPTIONS	LM-TS10: Touch Screen (for LM-C310 and LM-C330) * 3 LM-TS11: Touch Screen (for LM-C311 and LM-C331) * 3 LM-FULLSOFT-001: Laser application PC software (full set) LM-FULLSOFT-002: Laser application PC software (License only) LM-CONNECTER-001: Customer connector DB44 (Connector for PI / O connection) SAL-8-RSC3-S5: Photocell connector M8 (Connector for sensor connection) SAL-12-RSC8-S: Encoder connector M12 (Encoder connection connector) LM-ZDLK-001: 0°Lens kit
AMBIENT TEMPERATURE	Operation: 5-40 deg C (No dew condensation or freezing allowed.) Same range of operation, transportation and storage.
AMBIENT HUMIDITY	Operation: 35-95%RH; Storage: 10-95%RH; Transportation: 10-95%RH (No dew condensation or freezing allowed.)
ATMOSPHERE	No corrosive gas density level: 1ppm or less
VIBRATION	No vibration

*1: The H dimension excludes the dimensions of the emergency stop switch and lens fixing cover.

*2: The values in the table are approximate values. The actual work distance is indicated on the sticker attached near the lens on the head base surface.

*3: LM-TS10 and LM-TS11 are not compatible.

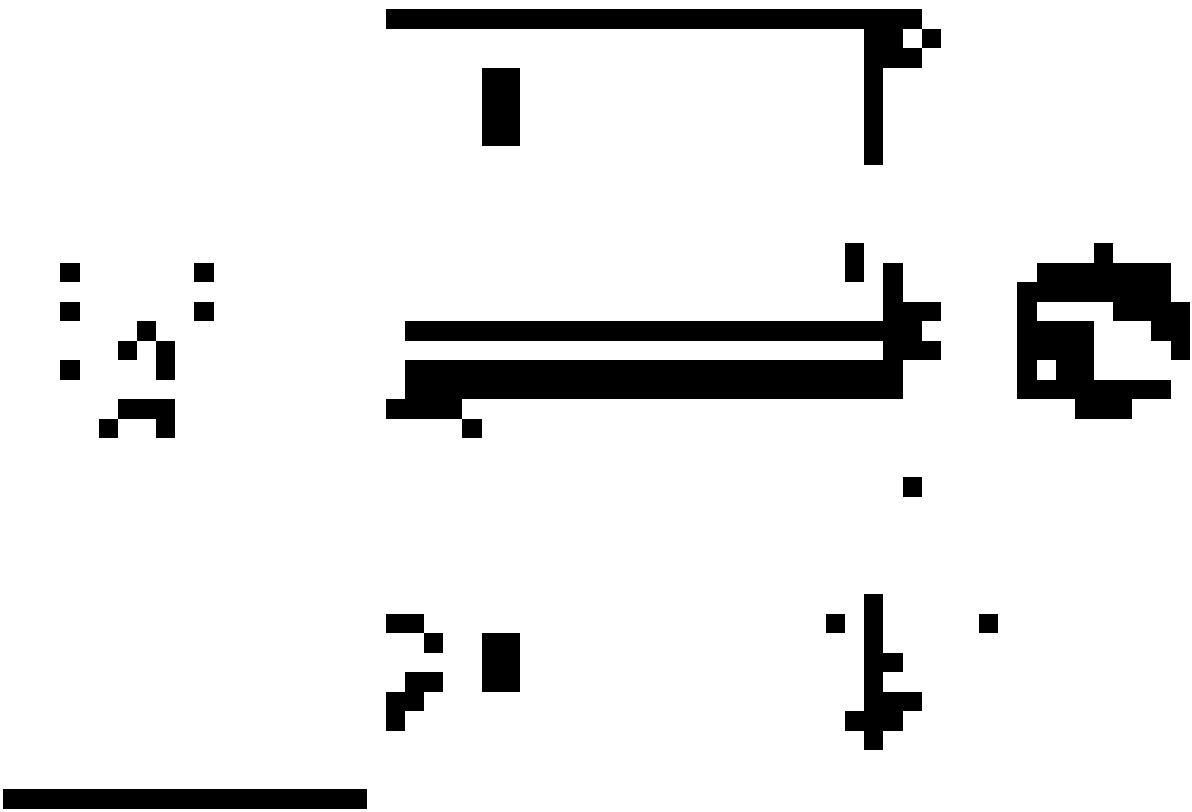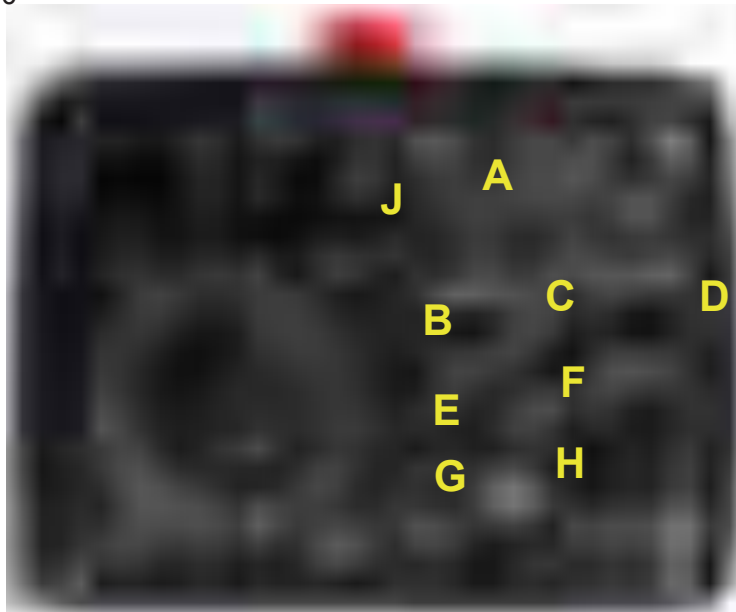## 4.2.3. DIMENSIONS
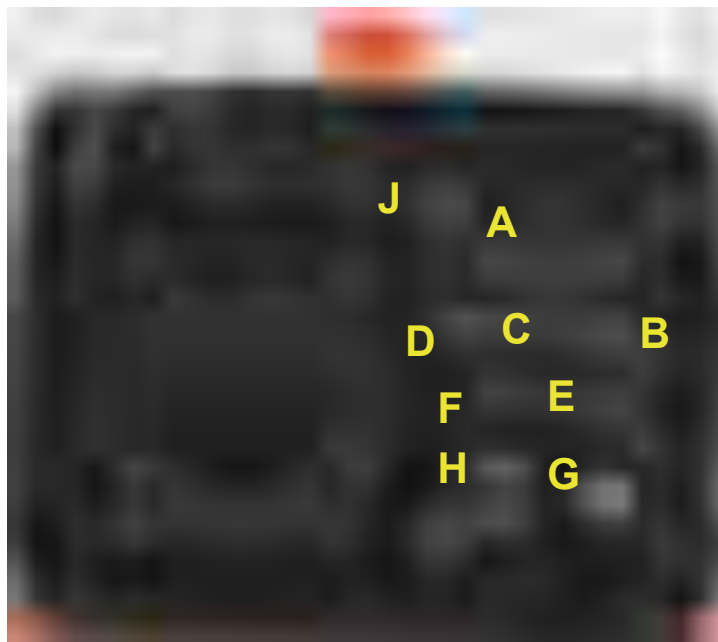
LM-C310S/P

LM-C330S/P

LM-C311P

LM-C331S/P

4.2.4. REAR PANEL CONNECTORS

This section is the summary of the connector on the back cover of the Laser Marker.

LM-C310, LM-C330

LM-C311, LM-C331

A: CUSTOMER connector

B: USB port connector

C: PHOTOCELL connector

D: INTERLOCK connector

E: ETHERNET connector

F: ENCODER connector

G KEY switch

H: USER INTERFACE connector
    (For touch screen)

J: SHUTTER

PHOTOCELL (START MARKING):

The photocell is typically used to detect the presence of the object to be marked on the production line. Once the object is detected, the photocell delivers a signal to the Laser Marker so that it sends the command to start marking. By appropriately setting the delay time from the detection signal to the actual printing start, it is possible to control the position of the message in the product.

The trigger / photocell signal comes from the photocell connector. This connector is located on the rear panel of the Laser Marker.
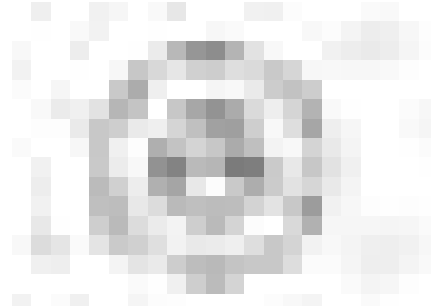
Photocell connector (Option)

Pin Number	Function	Description
#1	Vcc	Power (+12V)
#3	GND	Ground
#4	Photocell	Photocell signal

ENCODER:

The encoder is used when the speed of the production line that transports the object to be printed fluctuates.

Encoder connector (Option)

Pin Number	Function	Description
#1	GND	Ground
#2	Vcc	Power (+12V)
#3	-	-
#4	ENCBEXT	B
#5	/ENCBEXT	B (-)
#6	ENCAEXT	A
#7	/ENCAEXT	A (-)
#8	-	-

CUSTOMER CONNECTOR:

This is the connector for controlling Laser Marker by external signals.

In some applications it is necessary to control the Laser Marker externally. It shall be able to detect alarms, externally select the message number to be printed, start the marking or stop the laser automatically in case of an error in the production line.

The Laser Marker can automatically perform all these functions, among others, without operator interventions. The signals are alarm output, print complete output, message selection input, etc. The pin assignment is as follows:

Customer connector (Option)

Pin Number	Function	Signal	Descriptions
#1	PLC Startmark+	Input, PLC Startmark+	It functions as a print start signal. It becomes effective when the sensor type is selected as PLC in system setup.
#2	PLC Startmark-	PLC Startmark+ reference signal	Input: photocoupler isolated (DC12V-24V input)
#3	AlarmReset+	Input, AlarmReset+	This signal turns CmpReady signal on when the alarm is released.
#4	AlarmReset-	AlarmReset+ reference signal	Input: photocoupler isolated (DC12V-24V input)
#5	CmpReady NO	Output, CmpReady NO	This signal is output when the Laser Marker is in print ready mode.
#6	CmpReady C	CmpReady C	Closed when preparing for printing. (The signal is ON.) Output: solid state relay
#7	Endsignal NO	Output, Endsignal NO	This signal is output when printing is completed.
#8	Endsignal C	Endsignal C	Closed when printing is complete. (The signal is ON.) Output: solid state relay
#9	Marking NO	Output, Marking NO	This signal is output when printing.
#10	Marking C	Marking C	Closed when printing. (The signal is ON.) Output: solid state relay
#11	Startup NO	Output, Startup NO	This signal is output when the Laser Marker starts up normally.
#12	Startup C	Startup C	Closed at system initialization. (The signal is ON.) Output: solid state relay
#13	Alarm NO	Output, Alarm NO	This signal is output when a system alarm occurs.
#14	Alarm C	Alarm C	Closed when alarm activated. (The signal is ON.) Output: solid state relay
#15	Reserved	-	Unused. Please do not connect.
#16	In Bit 0+	Input, In Bit 0+	-Bit 0 – 11
#17	In Bit 1+	Input, In Bit 1+	Message selection signal (Bit 0-7)
#18	In Bit 2+	Input, In Bit 2+	Print stop signal (Bit 0-11)
#19	In Bit 3+	Input, In Bit 3+	Print direction selection signal (Bit 0-11)
#20	In Bit 4+	Input, In Bit 4+	Set these signals at the system setup.
#21	In bit 5+	Input, In bit 5+	Input: photocoupler isolated (DC12V-24V input)
#22	In Bit 6+	Input, In Bit 6+	
#23	In Bit 7+	Input, In Bit 7+	
#24	In Bit 8+	Input, In Bit 8+	
#25	In Bit 9+	Input, In Bit 9+	
#26	In Bit 10+	Input, In Bit 10+	
#27	In Bit 11+	Input, In Bit 11+	

Pin Number	Function	Signal	Descriptions
#28	GND	GND,	Ground of DC12V and DC24V
#29	+24V	Power supply, DC24V	Power supply (DC24V, max. 1 Amp)
#30	Reserved	-	Unused. Please do not connect.
#31	Out10 NO	-	Unused. Please do not connect.
#32	Out10 C	-	Unused. Please do not connect.
#33	Out11 NO	-	Unused. Please do not connect.
#34	Out11 C	-	Unused. Please do not connect.
#35	Out12 NO	-	Unused. Please do not connect.
#36	Out12 C	-	Unused. Please do not connect.
#37	Out13 NO	-	Unused. Please do not connect.
#38	Out13 C	-	Unused. Please do not connect.
#39	Reserved	-	Unused. Please do not connect.
#40	Reserved	-	Unused. Please do not connect.
#41	+12V	Power supply, DC12V	+12V, max 0.5 Amp
#42	+12V	Power supply, DC12V	+12V, max 0.5 Amp
#43	Ref In Bit0-11	In Bit 0-11 reference signal	In Bit 0-11 reference signal
#44	Ref In Bit0-11	In Bit 0-11 reference signal	In Bit 0-11 reference signal

[NOTE] Wait at least one second after turning on the power of the Laser Marker before use of signals.

(The reason is to use signals after the input / output signal circuits are stabilized.)

MESSAGE TABLE:

This is a function that can call each print file by connecting the customer connector and inputting the signal. The print file is selected by inputting the bits in the table below. For the input specifications, refer to the table on page 71 of this manual. For how to use, refer to "4.3 Message table...(Message Table)" in the software manual.

Bit 8 (MSB)	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1 (LSB)	TABLE POSITION *
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	0	1	1	3
.		.		.		.	.	.
.		.		.		.	.	.
1	1	1	1	1	1	1	0	254
1	1	1	1	1	1	1	1	255

*: Table position is input in binary.

PLC CONNECTION:

Connection of PLC enables the user to carry out some operation automatically:

Select the number of the message to be printed (External Message):

These inputs are used to select the position of the message in the message table. This position is selected by entering the relevant binary code.

The message selection bits are 8 bits from Bit 0 to Bit 7.

Voltage supply:

The customer connector provides different output voltages (+12 and +24V) for connecting peripherals to the Laser Marker.

Interlock:

The Interlock connector allows security control over the laser beam. The interlock uses a relay to detect the activation of a safety lock.

Serial communication:

This connector provides a method to control some functions of the Laser Marker from the remote device, such as a PC, a Touch Screen or PLC.

Marking finished:

When printing of the message on the product is complete, the Laser Marker outputs the Marking finished signal and notifies the production line.

PLC Start Mark:

This acts as a photocell. Therefore, the photocell type must be configured before starting the markings using system set-up program. This signal is activated at a high level between 5 and 24 V DC and should remain active (high level) for a period of time.

CmpReady (Printable mode):

This connector outputs this signal when the Laser Marker can be printed. This signal is controlled via a relay (Normally Open and Normally Closed).

ETHERNET CONNECTOR NYD (RJ45):

This connector is used to control the operation of the Laser Marker by control software from Laser Application.

You can also connect the Laser Marker to any type of ETHERNET network via this connector.
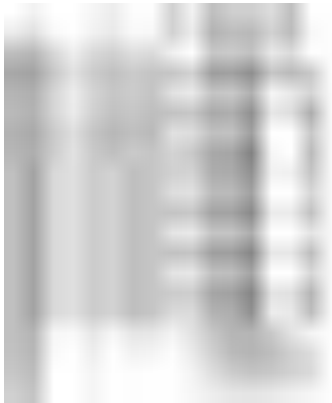
Pin Number	Signal name	Descriptions
#1	TX+	Transmission Data +
#2	TX-	Transmission Data -
#3	RX+	Received Data +
#4	CT	-
#5	CT	-
#6	RX-	Received Data -
#7	CT	-
#8	CT	-

INTERLOCK:

The interlock input is a 4-Pin connector that enables or disables the security lock of the laser. The interlock works with a solid state relay, and the enabled or disabled security depends if the customer connector is connected (disable the block) or disconnected (enable the block).

Internal (Wiring connections area)   Interlock appearance

Pin assignment
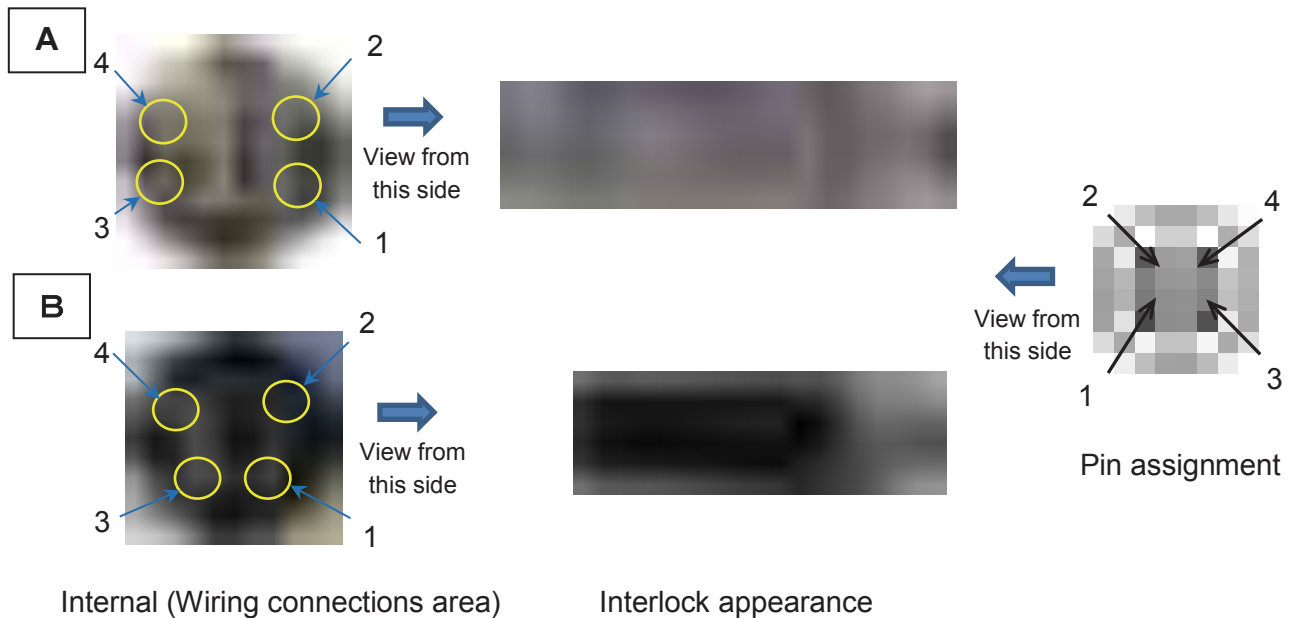
*Either A or B is attached to the Laser Marker body. (There is no difference between the functions.)

| Pin Number	Function	Description
#1	+24V	+24V
#2	+24V	+24V
#3	ShutterIn	+24V (No laser emission when left open)
#4	InterlockIn	+24V (No laser emission when left open)

4.3. LENSES

The relationship between the marking area and the work distance is as follows.

Model	Marking area (mm x mm)	Work distance (mm) (approximate)	
		10W	30W
LM-C300P （with beam expander）	40x40	60	60
	60x60	95	95
	75x75	115	120
	100x100	165	165
	150x150	235	235
	200x200	320	320
	250x250	430	435

* The values in the table are approximate values. The actual work distance is indicated on the sticker attached near the lens on the head base surface.

Work distance:
The distance between the Laser Marker base and the surface to be marked.

The Laser Marker base

Work distance

The object to be marked
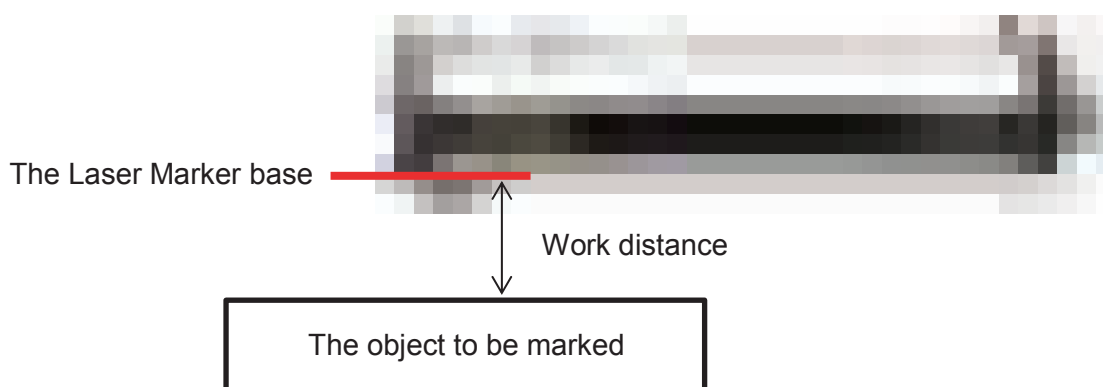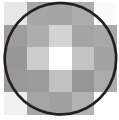
5. MAINTENANCE & TROUBLESHOOTING

ATTENTION
Before replacing any component, the end user should read Chapters 0 and 1 of this Manual.

To get maximum performance from the laser marking system and avoid damage, it is very important to perform preventive maintenance in all components.

A maintenance plan for all components should always be established, and the working level and characteristics of the surfaces of the product to be marked must be considered.

It is very important that the electrical power of the system be shutdown before any maintenance procedure, to prevent any hazardous exposure to laser emissions. After the Laser Marker is turned off, it is recommended to wait a minimum of 30 seconds before turning it on again. This action allows the capacitors to discharge to an acceptable level before power is applied again.

This chapter also describes some of the system event message and what to do if the Laser Marker displays a warning or a print failure message. The Laser Marker displays these messages in the user interfaces if any problem occurs. In case the Laser Marker displays an event that is not described in this chapter, you should inform your supervisor or contact your local HITACHI distributor.

Top cover

Air filter

Lens
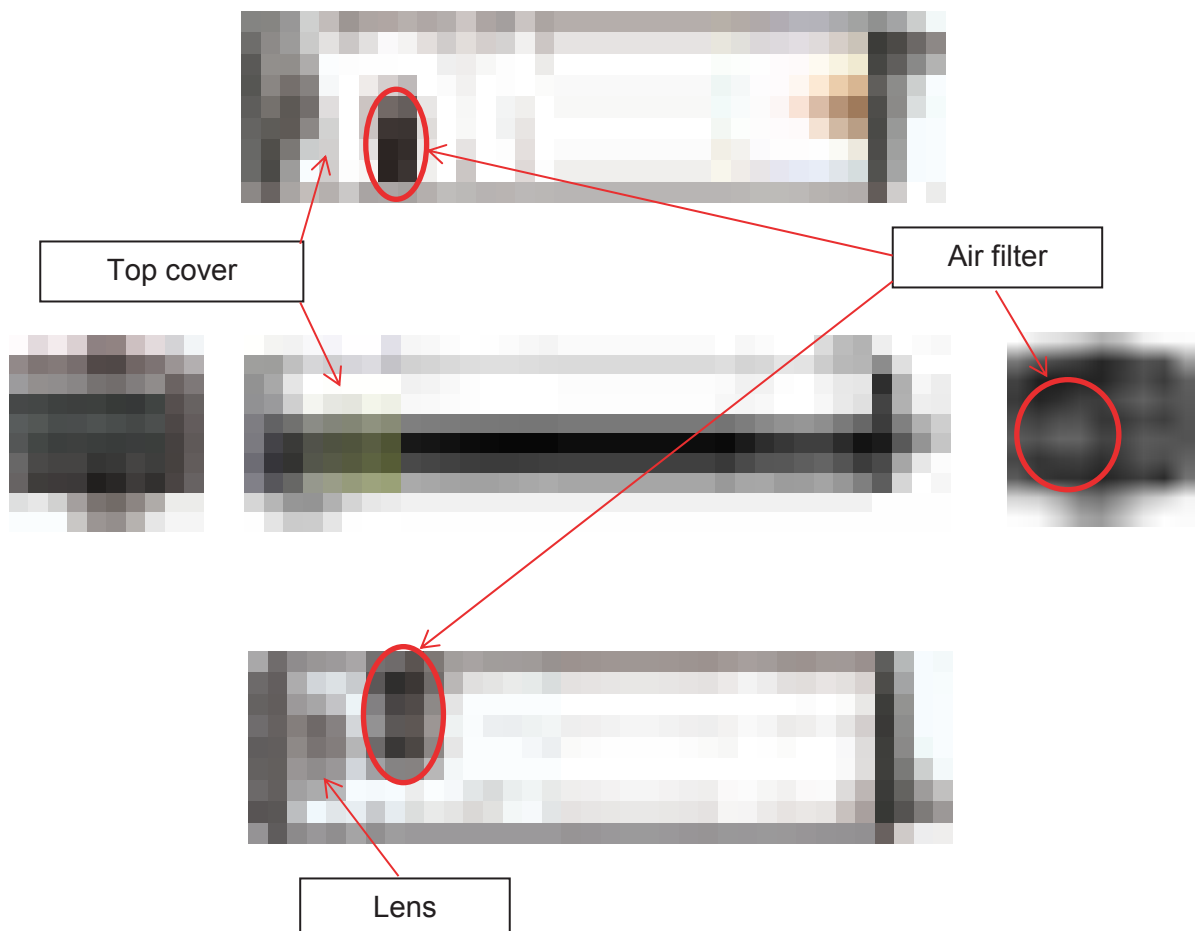
5.1. PREVENTIVE MAINTENANCE

To prevent damage to the Laser Marker and maximize performance, perform preventive maintenance on all components.

WARNING
The following maintenance operation must be carried out with Laser Marker isolated from the main power supply unless specifically stated otherwise.

CAUTION
Only authorized personnel should do system maintenance. The procedures outlined below do not present any laser emission hazard. The procedures must be followed carefully; failure to do so could cause laser emission or seriously damage the Laser Marker.

TASK	PROCEDURE	TIMING
Check the condition of the lens.	Visually inspect the lens.	Weekly
Check the condition of the Laser Marker surface.	Visually inspect the Laser Marker surface for clean the grit and dust.	
Check all connections.	Check that all the connectors are correct and in good condition.	
Examine the air filters of the Laser Marker.	Visually inspection the state of the air filters.	
Clean the lens.	Remove the grit and dust of the lens.	Monthly
Clean the air filters.	Remove the grit and dust of the air filters.	Quarterly

5.1.1. CLEANING THE LASER MARKER

Follow the steps below to clean the covers:

(1) Stop and turn off the Laser Marker. Refer to "3.7 STOPPING AND TURNING OFF THE LASER MARKER". Remove the laser key and disconnect the Laser Marker from the AC power supply.

(2) Use a soft, damp, lint-free cloth around the cover, avoiding contact with the lens.

(3) Use a dry, lint-free cloth to dry the cover. Avoid touching the lens with the cloth.

5.1.2. CLEANING THE FILTERS

If the filter is dusty and dirty, the air cooling effect will drop, so clean the filter regularly (once a quarter).

5.1.3. LENS CLEANING PRECAUTIONS

ATTENTION
Pay special attentions when handling the lens to ensure the lens surface is not touched by any other device.

Clean all lenses with acetone and lens cleaning paper.

During the marking process, the surface of the product being marked is vaporized and the particles and fumes are generated, that are absorbed by the extractor system. The problem occurs when these particles deposit on the lens surfaces. Deposits of particles on the lens may cause two different problems:

- A decrease in power due to the lack of transmittance of the lens.
- A damage of lens when the deposited particles are burned by the laser.

For these reasons, the lens should be cleaned periodically. The lens is very fragile and their maintenance requires extreme care. The lens must be carefully handled and proper maintenance supplies must be used. Set of basic materials required to clean the lens is listed below:

- Lens cleaning paper
- Pure acetone, **never use water or soap for lens cleaning.**

CAUTION
・ Wear protective gloves to prevent direct contact between the skin and pure acetone during cleaning, refilling and filling. In case of skin contact, use soap and rinse thoroughly with lukewarm water or water.   ・ Remove the Laser Marker power cable before cleaning.

WARNING
・ Be careful not to spill pure acetone when working with pure acetone. If you accidentally spill pure acetone, wipe it off with wipe paper as soon as possible. Also, do not turn on the Laser Marker until you have confirmed that the wiped part is completely dry.   ・ Be careful not to place a Laser Marker near flammable materials (pure acetone) as it may cause a fire.

5.1.4. CLEANING THE LENS

Wear rubber gloves when cleaning the lens. The cleaning procedure is as follows:

(1) Make sure the laser is not starting up. Remove the key and disconnect the Laser Marker from the AC power supply. (In any case, it is advisable to turn the system off during cleaning the lens).

(2) Fold the lens cleaning paper twice or three times, to avoid sharp corners.

(3) Gently rub the surface of the lens in a circular motion with the lens cleaning paper.

(4) Repeat this procedure (changing the paper each time) until the lens becomes clean.

5.2. TROUBLESHOOTING

5.2.1. SYSTEM ALARMS

- If a system alarm occurs, follow the corrective action below.
- If the problem is not resolved after processing the following, contact your HITACHI distributor.

CODE	FAULT	CAUSE	SOLUTION
0x01	Init Alarms	Indicates when the firmware starts to log the alarms. (This code number is not an alarm.)	
0x02	Laser is off	1. The interlock connector is not connected correctly. (Interlock connector #2-#4 is open.) 2. The top cover is open. (The cover switch is off.)	1. Check that the interlock connector is correctly plugged. 2. Check that interlock connector has the circuit closed. (between PIN4 and PIN1 / PIN2) 3. Check that internal cover safety switch is closed. 4. Check voltage on PIN1 / PIN2 of interlock connector.
0x0A	encoder stopped	1. When "Encoder type" is set to "External" and then "Min. beltspeed" of "Alarms" is set, the detected speed of the encoder becomes slower than the set minimum speed.	1. Check if the conveyor belt is stopped. 2. Check mechanical couplings if encoder axis not moving. 3. Check electrical connections. 4. Check the voltage of PIN2. (PIN1 is GND.)
0x0D	NO MEMORY AVAILABLE	1. This alarm can occur in case of corrupted messages, corrupted memory or program errors. The alarm is cleared every 10 seconds or when a new message is loaded.	1. Select other message and delete corrupted one. 2. Update Scanlinux firmware.
0x0E	alarms cleared	Indicates when all the alarms has been cleared. (This code number is not an alarm.)	
0x10	File not found	1. The file selected in the previous print does not exist in the laser memory. 2. The auto startup mode configuration selects the file that does not exist in the laser memory. 3. The file selected in the message table is not in the list. 4. Displayed when using a touch screen and no default file is selected.	1. Select the file that exists in the laser memory. 2. Specify the file that exists in the laser memory in the configuration of the auto startup mode. 3. Select the file in the message table, that exists in the list. 4. If you are using a touch screen, select the file you want to work with.
0x15	Invalid Font	1. The font currently used in the message does not exist inside the Laser Marker.	1. Create the message using available fonts. 2. Verify which fonts are used for the current message and manually send the missing fonts to the Laser Marker.
0x16	Overtemperature	1. The laser type is selected incorrectly. 2. The laser tube cooling is insufficient.	1. Select the correct laser type. - For 10W, select CO_2 and Type1. - For 30W, select CO_2 and Type2. 2. The laser tube is not sufficiently cooled. - Check whether the cooling fan is operating. - Please lower the processing tact.

CODE	FAULT	CAUSE	SOLUTION
0x25	Shutter closed	1. Interlock connector #1-#3 is open. 2. The shutter switch is closed. ("○" position) (Shutter switch is off.) 3. The mechanical shutter is not working. (The mechanical shutter remains closed.)	1. Check if the interlock connector is connected properly. (Check if the bridge between pins #1 and #3 is closed.) 2. Check if the shutter switch position is closed. 3. Check voltage on PIN1/2 of interlock connector.
0x26	Laser not ready	**1.** The laser type is selected incorrectly. 2. The interlock connector is not properly connected. (Interlock connector #2-#4 is open.) 3. The top cover is open. (The cover switch is off.) 4. No voltage is applied to the laser tube. 5. The laser tube fuse is blown, 6. The laser tube does not work normally.	1. Select the correct laser type. - For 10W, select CO2 and Type1. - For 30W, select CO2 and Type2. 2. Check if the interlock connector is connected properly. 3. Check that the top cover is closed and the cover SW is in proper contact. 4. Make sure that voltage is applied to the laser tube. 5. Check if the laser tube fuse is not blown. 6. If there is no problem with the above, the laser tube may be damaged. Please contact your HITACHI distributor.
0x27	OEM shutter closed!	1. The shutter switch is closed. (Shutter switch is off.) 2. Interlock connector #1-#3 or #2-#4 is open. 3. The top cover is open. (Cover switch is off.)	1. Open the shutter switch. ("|" position) (Turn on the shutter switch.) 2. Check if the interlock connector is connected properly. (Check if the interlock connectors #1-#3 and #2-#4 are closed.) 3. Check that the top cover is closed and the cover SW is in proper contact.
0x28	YAG DC-power/MO failure/absorber overheat	1. Incorrect laser type selection.	1. Select the correct laser type. - For 10W, select CO2 and Type1. - For 30W, select CO2 and Type2.
0x30	Overspeed	1. The moving speed of the conveyor is too fast. 2. The scanner speed is too slow. 3. The message size is too large and there is not enough time to print everything. 4. The space between the current print object and the next print object is too narrow. 5. The signal to the photocell is not sent correctly. (Chattering is occurring.)	1. Reduce the conveyor speed. 2. Increase the scanner speed. 3. Reduce the size of the message to be printed. 4. Increase the space between the current print object and the next print object. 5. Review the photocell and its location.
0x32	File not allowed to be printed	1. The file is damaged. 2. The file is not the laser file format.	1. Load a new message compatible with the Laser Marker. 2. Update Scanlinux firmware.
0x33	Barcode Parameters	1. Barcode data must be created internally by the laser and some barcode parameters (usually the text to be codified) is not conform to the barcode rules.	1. Check if the text of the field that must be represented as a 1D or 2D code is correct. 2. Check that the quantity of characters of the 1D code can be represented on the defined element. 3. Check that the quantity of characters of the 2D code can be fitted on the defined matrix dimensions.

CODE	FAULT	CAUSE	SOLUTION
0x34	License not valid	1. There is no internal barcode license and the message contains some variable barcode data.	1. Activate the barcode license to be used.
0x36	Multiple triggersignal	1. The parameter value set in "Trigger" is not correct. 2. The space between products is too narrow. 3. The photocell signal is chattering.	1. Readjust the "Trigger" set value. 2. Reduce the conveyer speed. 3. Increase the space between products. 4. Change the photocell type. 5. Change the position of the photocell. 6. In order to avoid vibrations during product movement, improve the installation at the customer site.
0x37	Error in Database	1. The database does not exist.	1. Send the corresponding file to the database.
0x38	Distance alarm	1. The distance between workpieces is smaller than the minimum distance which is set.	1. Increase the maximum distance set value or reduce the distance between workpieces on the production line from the current state.
0x39	Min. distance not reached	1. The distance between workpieces is smaller than the minimum distance which is set.	1. Reduce the minimum distance set value or increase the distance between workpieces on the production line from the current state.
0x40	CUSTOMER TIME OUT	1. The network connectors and/or the cable is not connected properly. 2. There is a problem with the network board.	1. Click "Start"-> "Run" on the Windows toolbar and enter the following commands to "ping (check network communication)" the laser: ping 192.168.0.180 Port 3490 2. If you cannot receive a response, there is a problem with the connection to the laser. Check the cable and the connectors. 3. Make sure that the network board is installed correctly. Check the properties of the TCP / IP protocol.
0x41	Failure Scanner X	1. The item "Alarms" -> "Alarm on scanner failure" is enabled.	1. Disable the item "Alarms" -> "Alarm on scanner failure".
0x42	Failure Scanner Y	1. The item "Alarms" -> "Alarm on scanner failure" is enabled.	1. Disable the item "Alarms" -> "Alarm on scanner failure".
0x43	Empty file	1. The message loaded and sent for printing does not contain any content. 2. The message field to be printed is empty. 3. You are trying to print an internal user message with an empty string. 4. The communication buffer for the user message is empty.	1. Enter the message to enable marking. 2. Make sure that the field of the message to be printed is not empty. 3. Make sure that the internal user message is not an empty string. 4. Transmit the new next data and buffer it.
0x44	Initialization failed	1. Hardware configuration does not match software configuration. 2. The scan card was not detected by scanlinux. 3. The firmware tried to initialize the Laser Marker but failed.	1. Make sure that the laser system settings are correct and that all configuration parameters are set. (For laser type, select CO_2 and type1 for 10W, and CO_2 and type2 for 30W.) 2. Check that the scanner board is connected correctly. 3. Restart the laser system.

CODE	FAULT	CAUSE	SOLUTION
0x48	XY out of range	1. There is a message outside the print area. 2. The encoder signal may contain noise.	1. Move messages so that all messages are placed in the print area. 2. Check if there is a noise source arround. If there is a noise source, remove the noise. Please read "Chapter 0. WARNING" to improve noise resistance.
0x54	RTC battery failure	1. The voltage of the coin battery is low.	1. Replace the coin battery.
0x63	FPGA failure	1. It may have been affected by external noise during use.	1. Please restart the Laser Marker. 2. In this environment, the same error may occur again. Read "Chapter 0. WARNING" to improve noise resistance and do not touch the connector on the back of the LM during operation. (The human body is also a source of electrostatic noise.)
0x65	Shutter not open	1. The shutter is closed.	1. Check if the sensor lamp of the optical box is switched by opening and closing the shutter. If not, the board may be damaged. Please contact your HITACHI distributor.

The user is not always informed of all alarms when there is a failure. The user needs to decide whether or not to have the system report the following alarms:

- Belt Stop
- Over Speed
- Trigger signal
- Laser Interlock
- Shutter closed
- Empty message
- OEM Shutter
- Maximum distance alarm
- Minimum distance alarm

The alarms other than the above always report failures to the user.

5.2.2. **WHAT TO DO WHEN DEFECTIVE PRINTING OCCURS**

- If defective printing occurs, follow the procedure below for each phenomenon.

- If the defect is not recovered even after processing the following, the board may be faulty. If that is the case, contact your HITACHI distributor.

FAULT	CAUSE	SOLUTION
No straight lines are drawn.	1. The resolution selected is too low. 2. The scan speed is too high. 3. Scanner failure.	1. Increase marking resolution. 2. Decrease the scan speed via the user interface. 3. Contact your HITACHI distributor.
Incomplete characters and figures.	1. If it happened in a high-speed marking process, the Maximum inertia may be too low. 2. If it happened in a low-speed marking process, the Inertia R value may be too high.	1. Increase the Maximum inertia value. 2. Decrease the Inertia R value.
There are burned areas at the connection between lines.	1. If it happened in a high-speed marking process, the Maximum inertia may be too high. 2. If it happened in a low-speed marking process, the Inertia R value may be too low.	1. Decrease the Maximum inertia value. 2. Increase the Inertia R value.
The laser only prints one horizontal or vertical line several times.	1. The scanner damage, the scanner misalignment, the cable damage.	1. Contact your HITACHI distributor.
The marking area is not a square or does not measure 100x100mm. (depending on installation)	1. The marking head is not completely perpendicular to the marking surface. 2. The work distance is different from the distance between the product and the lens. 3. Scanners misaligned.	1. Place the marking head completely perpendicular to the marking surface. 2. Adjust the work distance. 3. Adjust the gain of the scanners. 4. If the problem still remains, contact your HITACHI distributor.
The first line of the message starts late or missing.	1. The Laser Marker is not adjusted property. 2. The photocell is not installed correctly.	1. Readjust the laser and wait at least 5 seconds before printing. 2. Install the photocell in the correct position.

5.2.3. **IF YOU THINK IT IS A MALFUNCTION**

If it does not work properly, check the following before considering it as broken.

FAULT	CAUSE	SOLUTION
System does not run.	1. The key switch is not turned on. 2. The power plug is not properly connected to the outlet. 3. The emergency stop switch is not reset. 4. The fuse is blown.	1. Set the key switch to ON. 2. Turn off the key switch, make sure that the power is supplied to the outlet, and insert the power plug. 3. Reset the emergency stop switch. 4. Check the fuse.
The Ready LED is not on.	1. Ready LED is blown. 2. During the boot process, the Hi-Scan internal software did not load correctly. 3. The Laser Marker is not correctly configured. 4. The Customer connector is not connected.	1. Connect the Laser Marker to the external controller. If there is communication, the LED is failed. 2. Check the Ready LED. 3. Restart the Laser Marker. 4. Connect the Customer connector to the system.
The Laser LED is not on.	1. The fuse is blown. 2. The LED is disconnected. 3. The Laser Marker is not emitting laser beam.	1. Check the fuse. 2. Check the LED. 3. Check whether the Laser Marker is actually emitting laser beam or not. 4. If the Laser Marker is emitting laser beam and the LED is not lit, contact your HITACHI distributor.
The Alarm LED is activated.	1. The Laser Marker overheats.	1. Replace the air filters. 2. Turn off the Laser Marker and allow it to cool down for a while.
The laser source does not work, although there is no alarm.	1. Bad contact of the cable between the SM271 / SM171 board and the laser source.	1. Contact your HITACHI distributor.
The laser will not stop.	1. Bad contact of the cable between the SM271 / SM171 board and the laser source. 2. The Gate signal level is always high (the tickle signal being generated is not correct). 3. SM271 / SM171 board failure. 4. Misalignment or the laser failed.	1. Select "Configuration" -> "Laser", and check the tickle pulse and tickle period. Inform HITACHI distributor of the numerical values displayed on the screen. 2. Contact your HITACHI distributor.
When printing, the following message is displayed: "Message not found".	1. The External Message of the print menu is selected.	1. Disable the External Message select option.
The Laser Marker does not emit laser beam.	1. The shutter is closed. 2. Shutter failure.	1. Open the Shutter. 2. Check if the shutter circuit is closed.
The Laser Application displays the message: "no valid key found".	1. The dongle key is not connected to the PC.	1. Connect the dongle key to the PC.
The Touch Screen does not connect.	1. The Touch Screen is not connected properly. 2. The Touch Screen is not working.	1. Check the connection between the Touch Screen and the Laser Marker. 2. Check the cable and connectors.
The message LASER LOCKED is displayed and it cannot be restarted.	1. The Laser On signal is not received. 2. Interlock PINs failure.	1. Check the interlock PINs. 2. Contact your HITACHI distributor.
TCP-timeout no communication with the Hi-Scan protocol.	1. Bad connectors, cable or external network board. 2. Incorrect TCP/IP communication parameter configuration.	1. Check the connection between the Laser Marker and the PC. 2. Check the TCP/IP properties.