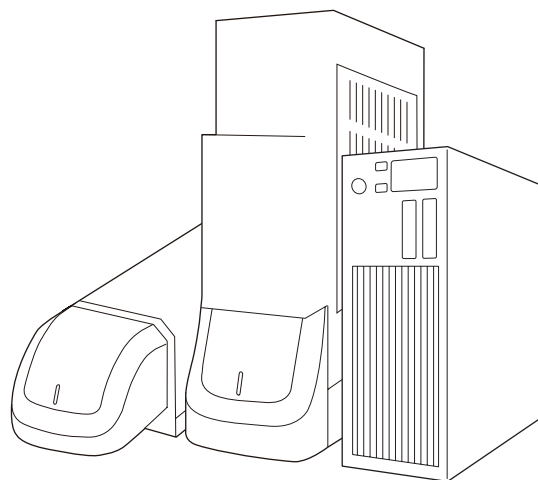


Laser Marker Setup / Maintenance Guide

LP-RH series



Please read these instructions carefully before using this product, and save this manual for future use.

Preface

Thank you for purchasing our product.

For full use of this product safely and properly, please read this document carefully.

This product has been strictly checked and tested prior to its delivery. However, please make sure that this product operates properly before using it. In case that the product becomes damaged or does not operate as specified in this document, contact the dealer you purchased from or our sales office.

The English version of this document is the original instructions. All other languages are translations that are based on the original documentation.

■ General terms and conditions of this document

1. Before using this product, or before every starting operation, please confirm the correct functioning and performance of this product.
2. Contents of this document could be changed without notice.
3. This document must not be partially or totally copied or revised.
4. All efforts have been made to ensure the accuracy of all information in this document. If there are any questions, mistakes, or comments in this document, please notify us.
5. Please remind that we assume no liability for any results arising out of operations regardless of the above clauses.

■ Disclaimer

The applications described in this document are all intended for examples only. The purchase of our products described in this document shall not be regarded as granting of a license to use our products in the described applications. We do NOT warrant that we have obtained some intellectual properties, such as patent rights, with respect to such applications, or that the described application may not infringe any intellectual property rights, such as patent rights, of a third party.

■ Trademark




- Windows is a registered trademark or trademark of Microsoft Corporation in the United States and/or other countries.
- QR Code, iQR Code are registered trademarks of DENSO WAVE INCORPORATED in Japan and in other countries.
- Adobe, Adobe Logo, Adobe Acrobat Reader, and Adobe Illustrator are either registered trademarks or trademarks of Adobe Inc. in the United States and/or other countries.
- EtherNet/IP is a trademark of ODVA, Inc.
- PROFINET is a trademark of PROFIBUS Nutzerorganisation e.V.
- All other product names and companies provided in this document are trademarks or registered trademarks of their respective companies.

Cautions in Handling




ALWAYS FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS!



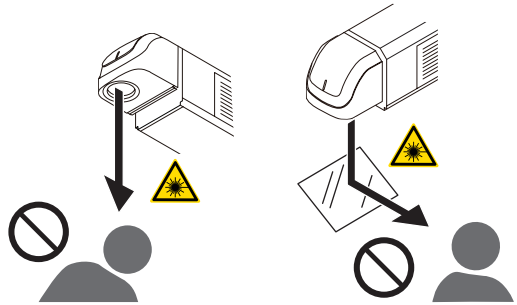

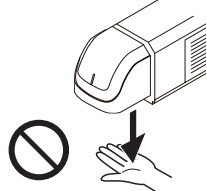
To reduce the risk of injury, loss of life, electric shock, fire, malfunction, and damage to equipment or property, always observe the following safety precautions.

The following symbols are used to classify and describe the level of hazard, injury, and property damage caused when the denotation is disregarded and improper use is performed.


















 DANGER	Denotes a potential hazard that will result in serious injury or death.
 WARNING	Denotes a potential hazard that could result in serious injury or death.
 CAUTION	Denotes a hazard that could result in minor injury.

The following symbols are used to classify and describe the type of instructions to be observed.

	This symbol is used to alert users to a specific operating procedure that must not be performed.
	This symbol is used to alert users to a specific operating procedure that must be followed in order to operate the unit safely.
	This symbol is used to alert users to a specific operating procedure that must be performed carefully.

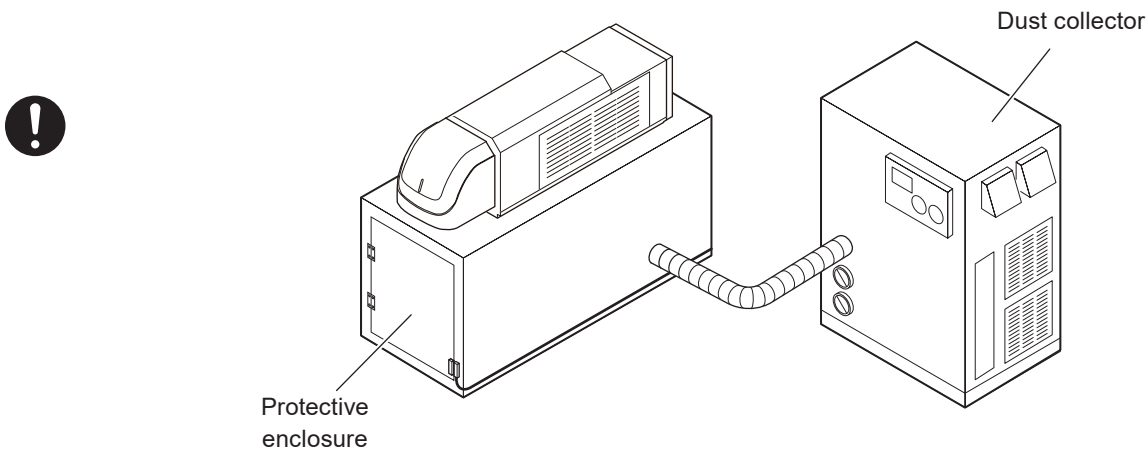
 DANGER	
	<ul style="list-style-type: none"> Never look at laser beam directly, through lens or through any other optical components. Laser beam radiation into the eye causes blindness or serious damage to the eye. Not only the direct beam of laser, but also diffused reflected beam is harmful.
	
	<ul style="list-style-type: none"> Never touch laser beam and avoid human skin, clothing and any other flammable object from laser beam exposure directly. Burning into deep skin might result and there is a risk of fire.
	

WARNING

	<ul style="list-style-type: none">• Do not use this product anywhere where fire is strictly prohibited, near inflammable gas, objects or organic solvents such as thinner or gasoline, or in dusty place. There is a risk of fire.
	<ul style="list-style-type: none">• Do not use this product except for water-resistant part in wet place. In addition, never conduct wiring or maintenance work with wet hands or when the product surface is wet. Otherwise, electric shock and/or malfunction may result.
	<ul style="list-style-type: none">• Never disassemble the product. Doing so may cause exposure to the laser beam or electric shock.
	<ul style="list-style-type: none">• Do not insert hands or objects between the gaps of the exhaust port or intake port. There is a risk of electrical shock or injury.
	<ul style="list-style-type: none">• Take laser protection measures required to use Class 4 laser products subject to the local laws and regulations of the country or region in which this laser product is used.
	<ul style="list-style-type: none">• To protect the operators' eyes, make it mandatory to wear goggles against laser beam within the laser controlled area. The protective goggles can momentarily protect the eyes against the scattered beam. Never look at the direct beam or reflected beam even when you are wearing the protective goggles.
	
	<ul style="list-style-type: none">• Set protective enclosure with proper reflectance, durability and thermal resistance to enclose the laser radiation area without leakage.
	<ul style="list-style-type: none">• Set a workpiece stand and terminating object of the laser beam with a flame-resistant material which has low reflectivity, in case of the radiation of the direct laser beam. Do not use the resin or specular objects for a workpiece stand and terminating object.
	<ul style="list-style-type: none">• Construct an interlock systems such as a function to stop laser radiation for the maintenance door of the protective enclosure.
	<ul style="list-style-type: none">• After power supply of laser marker is turned off, laser safety manager must remove the key and keep it.
	<ul style="list-style-type: none">• Be sure to connect the head and controller of the laser marker which have the identical serial numbers. Otherwise there is a risk of exposure to laser radiation or failure.
	<ul style="list-style-type: none">• Read all guides and manuals thoroughly, and do not operate, install and connect the laser marker with any other methods except the instructions provided in the manuals. If the product is used in a manner not specified by the instruction, the safety protection and functions provided by the device may be impaired and may cause injury, electrical shock or exposure of laser beam.
	<ul style="list-style-type: none">• Prior to wiring, cable connecting, and/or maintenance work, ensure that all the power switches are turned off. Otherwise, electrical shock may result.
	<ul style="list-style-type: none">• The wiring and maintenance must be conducted by the electrical engineers or under their supervision. Incorrect work may cause electrical shock.
	<ul style="list-style-type: none">• Connect ground wire before using. A failure or electrical leakage that occurs when the unit is not properly grounded may result in electric shock.
	<ul style="list-style-type: none">• Perform regular maintenance (cleaning, parts replacement) on this product. Using the product with dust or dirt may cause a fire or electric shock.

WARNING

- Remove the dust and/or gas which may be generated during the laser radiation with dust collector or exhauster. Use an appropriate dust collector or exhauster for dust or gas generated. Depending on the material of the objects, harmful dust and/or gas to the human body and the laser marker may be generated.
- For a nozzle of a dust collector or exhauster, use a flame-resistant material which has low reflectivity. Do not place a nozzle in the path of the laser beam.



- When using the assist gas for laser processing, take safety precautions to protect operators from exposure, ignition, toxic effect, excess or lack of oxygen.



- To carry this product, wear the non-slip gloves. Hold the product with both hands. Do not hold the cables or connectors at carrying.
- To carry this product, do not hold the cut edges of metal parts, the protrusions or corners of the product body. It may cause injury.
- Install this product in the stable place without vibration and shock.
- In case it falls down, it may cause injury.

The following are safety precautions when using the touch panel console.

WARNING



- Never conduct wiring or maintenance work with wet hands or when the product surface is wet. Otherwise, electric shock and/or malfunction may result.

CAUTION



- Do not dismantle or remodel the product. It could lead to excessive exothermic heat or smoke generation.



- Since the touch panel is made of glass, care should be taken so that a hard object may not hit it or an excessive force should not be applied. Do not fall the product from a high place because there is a danger of the glass breaking and causing an injury.



- Do not press more than one point on the touch panel at a time. A switch located in the middle of the plural points pressed (that was not meant to be pressed) will be activated. It could lead to a damage to the facility or an accident.

For the Proper Use of Product



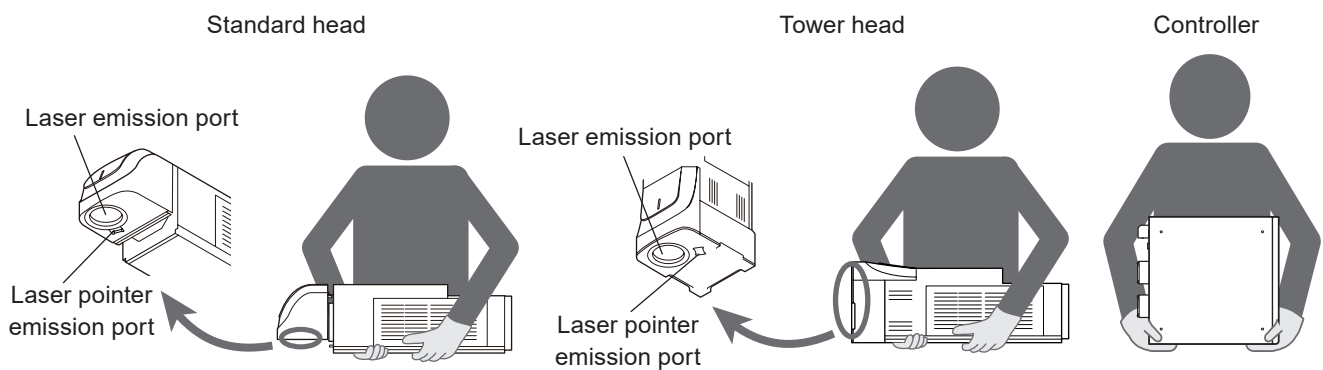
- Be sure to observe the following matters to prevent a failure or a malfunction of this product and to maintain the product performance properly.

■ Operating environment

- Do not use the product in a place with frequent vibrations or shocks. Moreover, please do not drop this product. It may affect the precision component and optical component inside, which could impair the performance or result in a failure.
- Do not use the system outdoors.
- This product uses the air cooling system as the laser cooling method. Please install not to bar the flow of air cooling. Avoid placing heat sources near the product.
- Be sure to use the product within the ambient temperature and humidity defined in the specifications.
- Be careful not to have water, oil, fingerprints, dust, or dirt attached to the laser emission port of the head. This could degrade the marking performance and may result in a failure. If the laser emission port becomes dirty, use a dry soft cloth to clean the port.
- Make sure to replace the air filter on a periodic basis. If the air filter becomes dirt and air flow is obstructed, resulting in failure of this product.
- Ensure that the dust or gas is removed by placing the intake duct of the dust collector or exhauster near the source of dust or gas. Any dust or gas contamination on the laser emission port may cause failure or decrease the laser marking or processing quality. In addition, when the laser beam is blocked by dust or gas, it may cause decrease in laser marking quality.
- Depending on the setting data, the internal temperature of the unit may rise, which may become a cause for a failure. Take measures such as decreasing the laser power and scanning speed.
Example: Applications that repeat marking or processing of short lines at high speed.
Example: Applications that high power lasers are continuously radiated for long periods of time.
- If the laser marker temperature is low, laser radiation may not be started. Perform test marking and check the marking quality before using the product. When the laser radiation does not start after several tries, start using the laser marker only after it gets used to the new temperature environment.

■ Installation

- To carry this product, wear the non-slip gloves. Hold the product with both hands. Do not hold the cables or connectors at carrying.
- Do not touch the laser emission port on the bottom of the head. It may affect the marking quality badly.
- Do not apply strong force to the LP-RH series head or front panel of the controller. When carrying if you hold the front panel, the panel may come off.
- Carry this product as shown in the figure below.



- Do not install the product to the systems that give excessive load acts on the head and cables, such as head movement unit. Failure to do so may damage the head precision parts or disconnect the cables, resulting in a failure.
- Be careful not to apply excess force to the cable or not to nip the cable at the installation.
- Verify the minimum bend radius of each cable and install them without excess forces being applied.
- Do not hit the device with a tool such as a hammer at the installation. Do not use excessive force while tightening the screws (nuts). It may cause a failure.
- Do not insert foreign objects to the exhaust port of each unit or the gaps between units.
- Use anti-reflection material (ex. black paint for metal) for an external shutter or a protective enclosure in a path of laser beam. It may cause a failure of the components inside the laser marker head.
- If any other devices such as a sensor or a camera are installed near the laser marker, make sure that these devices are installed in the place where laser beam and its reflected beam do not damage to them.

For the Proper Use of Product



- Be sure to observe the following matters to prevent a failure or a malfunction of this product and to maintain the product performance properly.

■ Wiring

- Verify that the cables are wired correctly before powering on.
- For the connection of this product, use the dedicated cables attached to the product or the specified optional cables.
- For the AC power cable, use a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used.
- Check the voltage fluctuations of the power supply. Do not input the power supply exceeding the rating.
- If a surge occurs in the power supplied, connect a surge absorber to a source of the surge to absorb it.
- Be sure to take measures against surge before connecting any induction load such as DC relay to the load.
- The output has no protection function for short-circuit; therefore, do not connect the power supply or capacitive load directly.
- Make sure to ground the frame ground (F.G.) terminal and the protective conductor terminal of this product.
- Install such that the housings of the controller and head are at the same electric potential.
- Each connecting cable should not be used in the same raceway or connected in parallel to any device that generates high-tension wires, power lines, large switching surge or the like. There is a risk of malfunction caused by induction.
- USB cable should not be connected in parallel with the AC power cable or the motor power cable.
- Make the wiring as short as possible to prevent a malfunction by the noise.

■ Operation

- Do not power off until the startup has completed since turning on the laser marker power.
- To power on the laser marker again, wait for 5 seconds or more since turning off the power, then turn it on again.
- The following items, Date, Lot, and Expiry Date are marked based on the system clock of the laser marker. The system clock might be deviated due to error of the internal parts or degree of the battery drain, ambient temperature and humidity. Therefore, be sure to check the time of the system clock before the operation without fail.
- Be sure to evaluate the marking quality and operation before starting full-scale operation. Changing parameters may cause unintended results.

■ Others

- Be sure to delete all registered data when transferring or discarding this product. Retained data might result in illegal read out and leaking of information by a third-party with malicious intent.

Network security

As you will use this product connected to a network, your attention is called to the following security risks.

- (1) Leakage or theft of information through this product
- (2) Use of this product for illegal operations by persons with malicious intent
- (3) Interference with or stoppage of this unit by persons with malicious intent

It is your responsibility to take precautions such as those described below to protect yourself against the above network security risks.

- Use this product in a secure network by using protection tools such as a firewall.
- If this product is connected to a network that includes PCs, make sure that the system is not infected by computer viruses or other malicious entities (using a regularly updated antivirus program, anti-spyware program, etc.).
- Use this product in an environment that has LAN, VPN (Virtual Private Network) or leased line network.
- Use this product in an environment where only limited people concerned can enter.
- Use this product and connected devices such as a PC and tablet securing safety.
- Do not install this product in locations where the product or the cables can be destroyed or damaged by persons with malicious intent.

Note that incorrect setting of the connection to the existing LAN might cause malfunction in the devices on the network. Consult your network administrator before connecting.

■ Order Placement Recommendations and Considerations

The Products and Specifications listed in this document are subject to change (including specifications, manufacturing facility and discontinuing the Products) as occasioned by the improvements of Products. Consequently, when you place orders for these Products, Panasonic Industrial Devices SUNX asks you to contact one of our customer service representatives and check that the details listed in the document are commensurate with the most up-to-date information.

SAFETY PRECAUTIONS

Panasonic Industrial Devices SUNX is consistently striving to improve quality and reliability. However, the fact remains that electrical components and devices generally cause failures at a given statistical probability. Furthermore, their durability varies with use environments or use conditions. In this respect, check for actual electrical components and devices under actual conditions before use. Continued usage in a state of degraded condition may cause the deteriorated insulation. Thus, it may result in abnormal heat, smoke or fire. Carry out safety design and periodic maintenance including redundancy design, design for fire spread prevention, and design for malfunction prevention so that no accidents resulting in injury or death, fire accidents, or social damage will be caused as a result of failure of the Products or ending life of the Products.

The Products are designed and manufactured for the industrial indoor environment use. Make sure standards, laws and regulations in case the Products are incorporated to machinery, system, apparatus, and so forth. With regard to the mentioned above, confirm the conformity of the Products by yourself.

Do not use the Products for the application which breakdown or malfunction of Products may cause damage to the body or property.

- i) usage intended to protect the body and ensure security of life
- ii) application which the performance degradation or quality problems, such as breakdown, of the Products may directly result in damage to the body or property

It is not allowed the use of Products by incorporating into machinery and systems indicated below because the conformity, performance, and quality of Products are not guaranteed under such usage.

- i) transport machinery (cars, trains, boats and ships, etc.)
- ii) control equipment for transportation
- iii) disaster-prevention equipment / security equipment
- iv) control equipment for electric power generation
- v) nuclear control system
- vi) aircraft equipment, aerospace equipment, and submarine repeater
- vii) burning appliances
- viii) military devices
- ix) medical devices (except for general controls)
- x) machinery and systems which especially require the high level of reliability and safety

ACCEPTANCE INSPECTION

In connection with the Products you have purchased from us or with the Products delivered to your premises, please perform an acceptance inspection with all due speed and, in connection with the handling of our Products both before and during the acceptance inspection, please give full consideration to the control and preservation of our Products.

WARRANTY PERIOD

Unless otherwise stipulated by both parties, the warranty period of our Products is one year after the purchase by you or after their delivery to the location specified by you.

The consumable items such as battery, relay, filter and other supplemental materials are excluded from the warranty.

SCOPE OF WARRANTY

In the event that Panasonic Industrial Devices SUNX confirms any failures or defects of the Products by reasons solely attributable to Panasonic Industrial Devices SUNX during the warranty period, Panasonic Industrial Devices SUNX shall supply the replacements of the Products, parts or replace and/or repair the defective portion by free of charge at the location where the Products were purchased or delivered to your premises as soon as possible.

However, the following failures and defects are not covered by warranty and we are not responsible for such failures and defects.

- (1) When the failure or defect was caused by a specification, standard, handling method, etc. which was specified by you.
- (2) When the failure or defect was caused after purchase or delivery to your premises by an alteration in construction, performance, specification, etc. which did not involve us.
- (3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time.
- (4) When the use of our Products deviated from the scope of the conditions and environment set forth in the instruction manual and specifications.
- (5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
- (6) When the failure or defect was caused by a natural disaster or other force majeure.
- (7) When the equipment is damaged due to corrosion caused by corrosive gases etc. in the surroundings.

The above terms and conditions shall not cover any induced damages by the failure or defects of the Products, and not cover your production items which are produced or fabricated by using the Products. In any case, our responsibility for compensation is limited to the amount paid for the Products.

SCOPE OF SERVICE

The cost of delivered Products does not include the cost of dispatching an engineer, etc. In case any such service is needed, contact our sales representative.

Related Regulations and Standards

■ Applicable regulations and standards

This product meets the requirements mandated by the following regulations and standards.

Note that our products do not conform to the regulations and standards of the countries and regions not mentioned in this section. When exporting this product by itself or integrated into machine or device, confirm the regulations and standards of the exporting country or region.

Model	Applicable regulations and standards
LP-RH300S LP-RH300T	JIS (Japanese Industrial Standards) <ul style="list-style-type: none"> • JIS C 6802
LP-RH301S LP-RH301T LP-RH305S LP-RH305T LP-RH200S LP-RH200T LP-RH100S LP-RH100T	FDA (Food and Drug Administration) Regulations <ul style="list-style-type: none"> • 21 CFR 1040.10 and 1040.11 (except for conformance with IEC 60825-1 Ed. 3, as described in Laser Notice No. 56 dated May 8, 2019) UL/CSA Standard (UL/CSA Marking) <ul style="list-style-type: none"> • UL 2178 • UL 60950-1 • CSA C22.2 No. 60950-1
LP-RH101S LP-RH101T	EN Standard (CE Marking)*1 <ul style="list-style-type: none"> • 2014/30/EU “EMC Directive” <ul style="list-style-type: none"> • EN 55011 • EN 61000-6-2 • 2006/42/EC “Machinery Directive” (for partly completed machinery)*2 <ul style="list-style-type: none"> • EN ISO 11553-1 • EN 60204-1 • 2011/65/EU as amended by (EU)2015/863 “RoHS Directive” <ul style="list-style-type: none"> • EN IEC 63000 • Technical specification <ul style="list-style-type: none"> • EN 55032 • EN 60825-1 EN Standard (UKCA Marking) *3 <ul style="list-style-type: none"> • 2016 No. 1091 “Electromagnetic Compatibility Regulations 2016” <ul style="list-style-type: none"> • EN 55011 • EN 61000-6-2 • 2008 No. 1597 Supply of Machinery (Safety) Regulations 2008 (for partly completed machinery) *4 <ul style="list-style-type: none"> • EN ISO 11553-1 • EN 60204-1 • 2012 No. 3032 “Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012” <ul style="list-style-type: none"> • EN IEC 63000 • Technical specification <ul style="list-style-type: none"> • EN 55032 • EN 60825-1
	GB (Chinese National Standard) <ul style="list-style-type: none"> • GB 7247.1-2012 (idt IEC 60825-1: 2007)

*1 : Authorized Representative in EU:
Panasonic Marketing Europe GmbH, Panasonic Testing Centre
Winsbergring 15, 22525 Hamburg, Germany

*2 : The printed copy of EU declarations of conformity “EU Declaration of Incorporation of Partly Completed Machinery” is included in the package of this product.

*3 : UK Address:
Panasonic UK, a branch of Panasonic Marketing Europe GmbH
Maxis 2, Western Road, Bracknell, Berkshire, RG12 1RT

*4 : The printed copy of UK declarations of conformity “UK Declaration of Incorporation of Partly Completed Machinery” is included in the package of this product.



- Construct a safety system before using this product as it is a class 4 laser product.
- While constructing the system, check ISO 13849-1 and ISO 11553-1, and take the required safety measures accordingly.
Please see the “Laser Safety Guide” for details.

■ Implementing safety measures for the laser products

This product falls into Class 4 laser product according to IEC 60825-1.

By definition, class 4 lasers are “Laser products for which intrabeam viewing and skin exposure is hazardous and for which the viewing of diffuse reflections may be hazardous. These lasers also often represent a fire hazard.”

To protect the operator from being exposed to a laser beam, be sure to follow the instructions in attached “Laser Safety Guide” and safety regulations in each country or region.

■ Removing and eliminating dust or gas

Depending on the laser radiation objects, noxious dust or gas may generate by the laser radiation, which could harm human body or the environment.

Eliminate dust or gas generated using a dust collector or an exhauster according to the constituent of such dust or gas.

Dispose of the exhaust gas safely and appropriately according to the laws and regulations of the country, region, or area applicable.

■ Attention for the laser marker disposal

For disposal of this product, segregate and dispose of it appropriately according to the laws and regulations of the country, region, or area applicable.

Refer to “7-5 Disposal of Laser Marker” (P.198).

■ To use the laser marker in the European region

This product is designed as a component that is incorporated into the customers' machinery and systems, and this product conforms to 2006/42/EC “Machinery Directive” for partly completed machinery.

Therefore, when this laser marker product is incorporated into the system and it is exported to or used in the European region as a final system, the system designer or the end-customer should take the following measures and verify that the whole system conforms to the Machinery Directive.

- Install the laser maker to the system by following the requirements for the accessibility and maintenance of EN 60204-1.
- Provide the power to the laser marker from the power supply terminals of the system.

Information for use

■ Target readers

This document is intended for the following readers: “System Designer” and “System Administrator” of the system that uses this product. Also, it is necessary to appoint a “Laser Safety Manager” in order to ensure safety regarding laser.

Classification	Description
Laser Safety Manager	A person who has sufficient knowledge to assess and manages the risk of laser damage and who is responsible for managing and overseeing the laser hazard. The requirements required for the Laser Safety Manager are as follows. (They are described in the Laser Safety Guide.)
System Designer	A person who designs a system that incorporates this product. This person is required to be fully familiar with the knowledge and precautions related to system design and laser safety. The person needs to be fully familiar with the knowledge and precautions related to laser and machine safety and to take necessary protective measures.
System Administrator	A person who has the authority to operate and manage the system that incorporates this product. It refers to a person who is fully familiar with operations, troubleshooting and maintenance procedures of laser and machines. This person is required to be fully familiar with the knowledge and precautions related to the safety of laser and machines and to implement protective measures for the operations by the user.

■ Information for use



This document describes information for use on the assumption that our company products are incorporated and operated in the system. The System Designer and System Administrator must consider the safety of the overall system in designing and operating the system.

Life cycle	Description	Chapters containing main descriptions
Overall	Explains general safety precautions.	Separate volume: Laser Safety Guide This document: Cautions in Handling Related Regulations and Standards
Transportation	Explains precautions in handling the product during transportation.	This document: Chapter 2
Assembling and installation	Explains precautions in installing and wiring the product.	This document: Chapter 2 and Chapter 4
Setup and operation	Explains startup and exit procedures, operation mode, and control methods using external devices.	This document: Chapter 3 - 5 *
Cleaning and maintenance	Explains daily cleaning and items that require maintenance such as parts replacement.	This document: Chapter 7
Troubleshooting	Explains methods of resolving problems that may occur during startup or operation.	This document: Back matter
Disuse	Explains precautions related to product disposal.	This document: Chapter 7

* : Depending on the system configuration, refer also to the operation manual or communication manual of the software.

How to Read this Document

■ Symbol description

 Notice	“Notice” denotes any instructions or precautions for using this product. To prevent the damage or malfunction of the product, observe these precautions fully.
 Reference	“Reference” denotes any hints for operation, detail explanations, or references.

■ Target model

This document is subject to the following Laser Marker models.

In this document, this product is called “laser marker”.

If the setting contents or specifications vary by models, the target models are specified in the text.

In the text, multiple models may be described collectively, as shown in the table below.

Please remind that the illustration and the screen image may vary with the model.

Target model	Description in the text
LP-RH300S	LP-RH Series
LP-RH300T	
LP-RH301S	
LP-RH301T	
LP-RH305S	
LP-RH305T	
LP-RH200S	
LP-RH200T	
LP-RH100S	
LP-RH100T	
LP-RH101S	
LP-RH101T	

■ Type of manuals

For this product, the following manuals are prepared. Read each manual and operate this product correctly and safely. Also, save the manuals for future use.

Laser Safety Guide

This manual describes the items required for using this product correctly and safely. All users shall be required for reading this manual.

Setup/Maintenance Guide

This manual describes the items required for introduction and installation of this product as well as for the maintenance work.

- Product specifications, external dimensions
- Installation and connection method
- Signal details, I/O rating, and timing chart when I/O is used for control
- Maintenance details

Mainly the machine builder and system integrator shall be required for reading this manual.

Laser Marker NAVI smart Operation Manual

Instruction manual for the laser marker configuration software "Laser Marker NAVI smart". This manual describes the procedure and method to operate the laser marker, and the screen operations to set marking contents.

Serial Communication Command Guide

This manual describes the communication commands to control this product externally using the serial communication (RS-232C/Ethernet). It describes the communication settings, communication data formats, communication commands, and the control samples.

Mainly the machine builder and system integrator shall be required for reading this manual.

Serial Communication Command Guide: LP-400/V compatible mode

This manual describes the communication commands to control LP-GS/LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series externally using the compatible command format with the former models of LP-400/LP-V series.

Mainly the machine builder and system integrator shall be required for reading this manual.

⬇ Reference

- The PDF data of each manual can be downloaded from our Internet website.
- To read the PDF manual, Adobe Reader (Version X or later) of Adobe Systems Incorporated is required.

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1 Product Overview

1-1 Product Model

CO₂ Laser Marker LP-RH series have the following models.

Model	Marking field	Laser output	Wavelength	Head type	Mode of laser operation
LP-RH300S	110mm x 110mm	30W	10.6 μ m	Standard	CW oscillation
LP-RH300T				Tower	
LP-RH301S	55mm x 55mm			Standard	
LP-RH301T				Tower	
LP-RH305S	160mm x 160mm			Standard	
LP-RH305T				Tower	
LP-RH200S	110mm x 110mm	20W	9.3 μ m	Standard	
LP-RH200T				Tower	
LP-RH100S	55mm x 55mm	10W	10.6 μ m	Standard	
LP-RH100T				Tower	
LP-RH101S				Standard	
LP-RH101T				Tower	

■ Model description

LP-RH 300 S

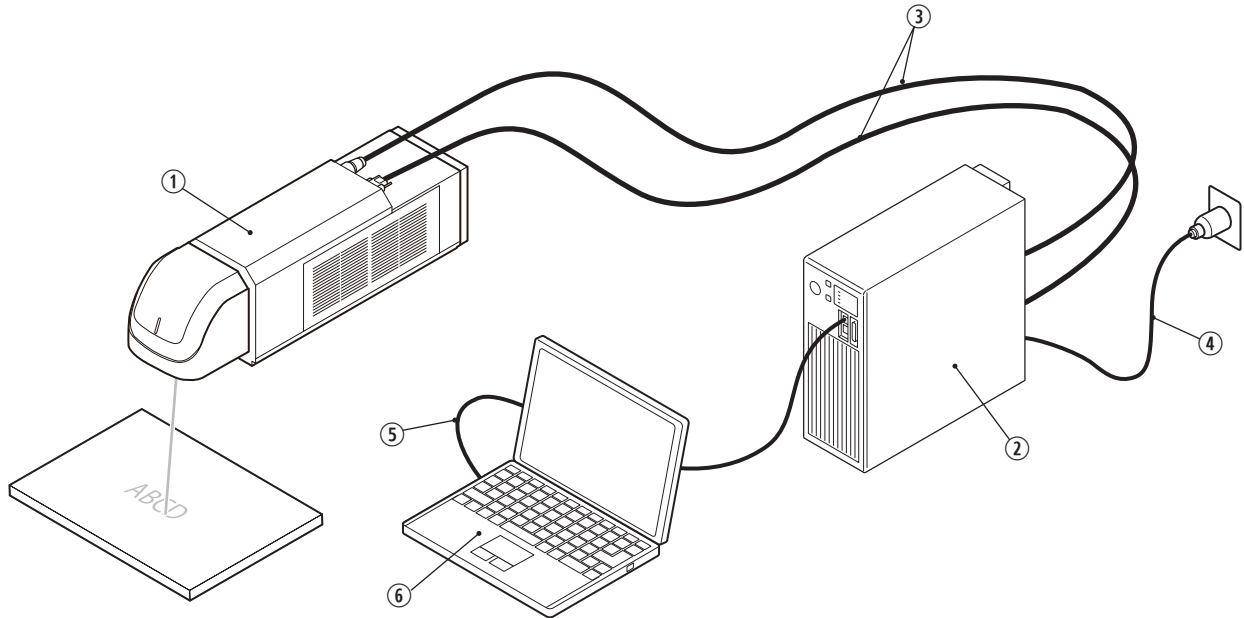
① ② ③ ④

- ① Represents the series name. "LP-RH series" refers to the CO₂ laser marker.
- ② Represents the laser output class. The following types are applicable to this product.
 - 30: Laser oscillator average output 30W
 - 20: Laser oscillator average output 20W
 - 10: Laser oscillator average output 10W
- ③ Represents the marking field size. The following types are applicable to this product.
 - 0: Marking field 110mm x 110mm
 - 1: Marking field 55mm x 55mm
 - 5: Marking field 160mm x 160mm
- ④ Represents the type of the head unit.
 - S: Standard Head
 - T: Tower Head

1-2 Product Configuration

1-2-1 Basic composition

This product is a laser marker designed to mark and process the object by radiating a laser beam to the target. The laser marker LP-RH series consists of the following units mainly.



No.	Name	Description
①	Head	It is the unit that radiates the laser beam. The optical parts and the scanner are loaded inside.
②	Controller	It is the unit that generates the marking data. The main power supply and connection interface with external devices are loaded.
③	Unit power cable (Attached accessory) Signal cable (Attached accessory)	Cables to connect the head and controller.
④	AC power cable (Optional item)	Cable to supply AC power to the controller. Use the specified optional cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used.
⑤	USB cable for Laser Marker NAVI smart (Attached accessory)	When connecting Laser marker NAVI smart and laser marker via USB, connect the controller and PC.
⑥	Commercially available PC (Not included in this product.)	Install the dedicated software "Laser Marker Smart Utility" onto a PC and set the marking data of the laser marker. You can use this PC as a monitor during the operation.

Reference

- Download the laser marker configuration software "Laser Marker NAVI smart" from our Internet website. For details, refer to "1-2-4 Download software and manual" (P.25).

1-2-2 Optional items

The following optional items (sold separately) are available for this product.
For purchasing and the detailed information, please contact our sales office.

Option items	Model
AC power cable: Rating 125V AC, PSE certified cable (For Japan)	LP-ACA10
AC power cable: Rating 250V AC, PSE certified cable (For Japan)	LP-ACA11
AC power cable: Rating 250V AC, CE certified cable (For Europe) *1	LP-ACA12
Air filters for controller (for replacement): 2 filters are included	LP-AFT90
Air filters for head (for replacement): 2 filters are included	LP-AFT91
Cooling fans for controller (for replacement): 2 fans are included.	LP-AFA20
Unit power cable (for replacement): 5m	LP-ACP20-5
Signal cable (for replacement): 5m	LP-ACS10-5
Contactor unit for Interlock (for replacement)	LP-AEC10
Industrial network unit for EtherNet/IP	LP-ANW10
Industrial network unit for PROFINET	LP-ANW11
Touch panel console	LP-ADP50
Expansion board *2	LP-AEB10

*1: Rating 250V AC, CE certified cable (For Europe) plug is compliant with the following standards.
VDE,DEMKO,NEMKO,FIMKO,SEMKO,OVE,KEMA,CEBEC

*2: When the expansion board is installed to the controller, the following functions can be used.

- Connect a console or a commercially available monitor to the Laser marker and use it for monitoring and setting during operation.

Notice

- For the AC power cable, use a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used.

Reference

- Some optional items cannot be sold due to regulations in each country or region. For detailed information, please contact our sales office.
- For the recommended AC power cable for China (rating 250V AC, CCC certified cable), please contact our sales office.

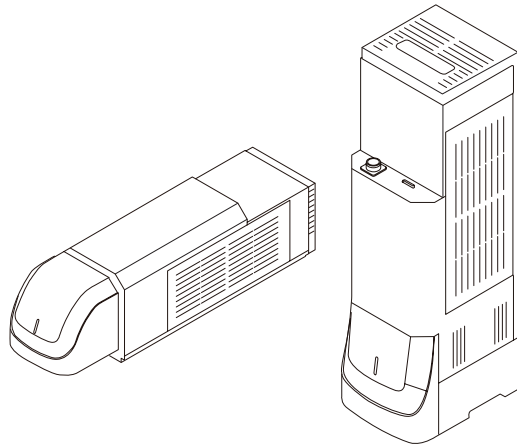
1-2-3 Package

Before using this product, be sure to check the packed objects. This product is packaged in one box with head and one box with controller. Though the package has been checked prior to the delivery, if you find any missing item, please contact the dealer you purchased from or our sales office.

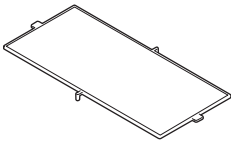
Notice

- Be sure to store the packing material. Since this product is precision machinery, reuse the packing materials to prevent damages during transportation.

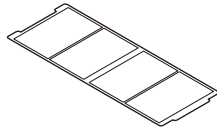
■ Laser marker head



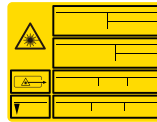
- Laser marker head (either a standard type or a tower type)
1 unit



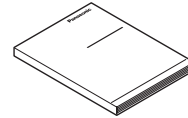
- Air filter for replacement (for controller)
qty.: 1



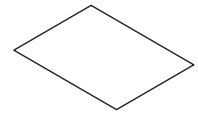
- Air filters for replacement (for head)
qty.: 2



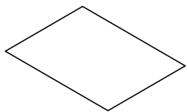
- Warning/ explanation/aperture label
qty.: 1



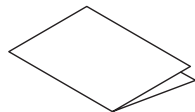
- Laser Safety Guide
qty.: 1



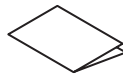
- Sheet of carrying caution
qty.: 1



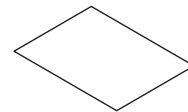
- Information sheet to download software and manuals
qty.: 1



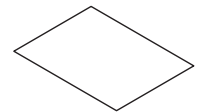
- Package contents
qty.: 1



- General Information for Safety, Compliance, and Instructions
qty.: 1

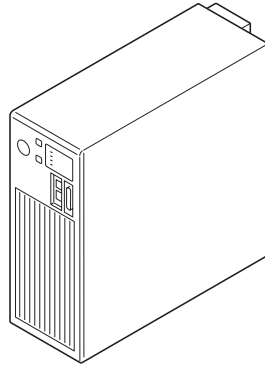


- Copy of EU Declaration of Incorporation
qty.: 1



- Copy of UK Declaration of Incorporation
qty.: 1

■ Laser marker controller

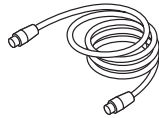


Laser marker controller
1 unit



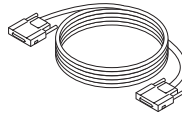
System key

qty.: 2



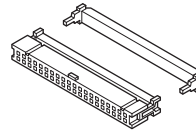
Unit power cable
(5m)

qty.: 1



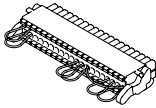
Signal cable (5m)

qty.: 1



I/O connector

qty.: 1



I/O terminal block

qty.: 1

Jumper wire

qty.: 7



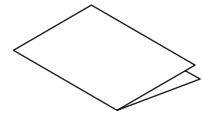
USB cable for Laser
Marker NAVI smart
(2m)

qty.: 1



Ferrite core

qty.: 3 *1



Package contents

qty.: 1

*1: Attach one ferrite core to the LAN cable (Ethernet), one to the I/O lines from the I/O terminal, and one to the I/O lines from the I/O connector.

↓ Reference

- The AC power cable is not included in this product. Use the specified optional cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used. For the optional cables, refer to “1-4-3 Cables” (P.32).
- Download the software and PDF manual necessary to set the laser marker from our Internet website. Refer to “1-2-4 Download software and manual” (P.25).

1-2-4 Download software and manual

■ Download Laser Marker Smart Utility

Please download “Laser Marker Smart Utility” for the drivers, software and manuals of LP-RH series from our Internet website before use. Decompress the downloaded file and install the software to your PC.

https://industrial.panasonic.com/ac/e/fasys/software_info/lasermarker/tol_lm_smart_v3.jsp

The Zip file contains the following data:

PC configuration software
Laser Marker NAVI smart
Logo Data Editing Software
Font Maker

PDF manuals
Laser Safety Guide
Setup/Maintenance Guide
Serial Communication Command Guide
Serial Communication Command Guide: LP-400/V compatible mode
Laser Marker NAVI smart Operation Manual
Logo Data Editing Software Operation Manual
Font Maker Operation Manual

Font files (.FON)
Fonts for alphanumeric characters and symbols: ORG1, ORG2, ORG3, ORG4, ORG5, ORG1S, ORG2S, ORG3S, OCR1, ORG3-L1, DINLIKE1-L1
Fonts for Japanese characters: JIS1 (JIS level 1), JIS2 (JIS level 2)
Fonts for Simplified Chinese characters: GB2312-1 (GB 2312 level 1), GB2312-2 (GB 2312 level 2)
User-defined font: USER1
2D code pattern font: 2DCODE

■ Download ExportVEC

If you use the graphic files in AI or EPS format with the laser marker, download the plug-in software for Adobe® Illustrator® “ExportVEC”. ExportVEC can be used to convert illustration data in .ai or .eps format to .vec, a graphic file format dedicated to laser marker.

Please download ExportVec from our Internet website.

https://industrial.panasonic.com/ac/e/fasys/software_info/lasermarker/exportvec.jsp

The Zip file contains the following data:

- ExportVEC package file for install (zxp file)
- ExportVEC Operation Manual (PDF manual)

Reference

- ExportVEC is compatible with Adobe® Illustrator® versions CC2020, CC2021, CC2022, CC2023.

1-3 Specification

■ Optical specifications / Scanning specification

Item	Model					
	LP-RH300S LP-RH300T	LP-RH200S LP-RH200T	LP-RH100S LP-RH100T	LP-RH301S LP-RH301T	LP-RH101S LP-RH101T	LP-RH305S LP-RH305T
Scanning system	Galvano scanning method					
Marking field (X, Y)	110mm x 110mm		55mm x 55mm		160mm x 160mm	
Work distance *1	185mm		111mm		262mm	
Scan speed *2 *3	Max 12,000 mm/sec.		Max 6,000 mm/sec.		Max 12,000 mm/sec.	
Applicable line speed *2	Max 240 m/min.		Max 120 m/min.		Max 240 m/min.	
Character height/width *2	0.100mm ~ 110.000mm		0.100mm ~ 55.000mm		0.100mm ~ 160.000mm	

■ Laser specifications / Other basic specifications

Item	Model						
	LP-RH300S LP-RH300T	LP-RH200S LP-RH200T	LP-RH100S LP-RH100T	LP-RH301S LP-RH301T	LP-RH101S LP-RH101T	LP-RH305S LP-RH305T	
Marking laser	Laser type	CO ₂ laser, Class 4 laser					
	Wavelength	10.6 μm	9.3 μm	10.6 μm			
	Oscillator average output	30W	20W	10W	30W	10W	30W
	Average output for marking *4	30W+4.5W -3.0W	18.2W ±2.5W	10W±2W	30W+4.5W -3.0W	10W±2W	30W+4.5W -3.0W
	Mode of operation	CW oscillation					
Guide laser, laser pointer	Red semiconductor, Wavelength: 655nm, Class 2 laser Max. output: 1mW or less						
Beam stop	Shutter (Equipped inside of head)						
Workpiece status	Stationary object, Moving object						
No. of registerable files	10,000 files						
No. of marking data pieces (No. of registerable objects)	2,000 objects/file						

Item		Model				
		LP-RH300S LP-RH300T	LP-RH200S LP-RH200T	LP-RH100S LP-RH100T	LP-RH301S LP-RH301T	LP-RH101S LP-RH101T
Marking data	Character	West-European alphabet (A to Z, a to z, Latin-1 characters), numeric, symbol, user defined characters (up to 50 characters can be set) Japanese characters: Katakana, Hiragana, Kanji (JIS level-1 and level-2) Simplified Chinese characters: GB 2312 level-1 and level-2				
	TrueType	TrueType fonts stored in the PC with Laser Marker NAVI smart installed *5				
	Bar code	CODE39, CODE128, ITF, NW-7, EAN/UPC, GS1 DataBar (GS1 DataBar Limited, GS1 DataBar Stacked, GS1 DataBar Expanded, etc.), GS1 composite code (GS1 DataBar Limited CC-A, GS1 DataBar Stacked CC-A, GS1-128 CC-A, etc.)				
	2D code	QR code, Micro QR code, iQR code, Data Matrix, GS1 Data Matrix, PDF417				
	Graphic file *6	VEC, DXF, HPGL, BMP, JPEG, AI, EPS				
	Point and shapes	Point radiation, line, circle, arc				
Character arrangement		Straight line, Arc, Proportional, Justify				
I/O port		I/O terminal block (40-pins), I/O connector (40-pins)				
Communication interface		EIA-RS-232C, Ethernet, EtherNet/IP *8, PROFINET *8				
Dedicated software		Laser Marker NAVI smart, Logo Data Editing Software, ExportVec, Font Maker				
Supported OS *9		Windows® 11 Pro 64bit / Windows® 10 Pro 32bit, 64bit				
Laser marker NAVI smart connection method		USB, Ethernet				
Laser marker NAVI smart display language		Japanese, English, Simplified Chinese, Traditional Chinese, German, Korean				
Required time for system startup		Approx. 10 seconds				
Required time for laser pumping		Approx. 5 to max. 10 second				
Power voltage		90V to 132V AC or 180V to 264V AC (including ±10% voltage fluctuations) Frequency: 50/60Hz *10				
Power consumption (Consumption current) *11	At 100V AC	760VA or less (8.5A or less)	370VA or less (4.1A or less)	760VA or less (8.5A or less)	370VA or less (4.1A or less)	760VA or less (8.5A or less)
	At 200V AC	720VA or less (4.0A or less)	430VA or less (2.4A or less)	720VA or less (4.0A or less)	430VA or less (2.4A or less)	720VA or less (4.0A or less)
Grounding method		Direct earth for the head and controller respectively				
Cooling method	Head	Forced air-cooling				
	Controller	Forced air-cooling				
Operating ambient temperature *12, *13		0°C to +40°C				
Ambient temperature for storage *12		-10°C to +60°C				
Operating ambient humidity *12		35 to 85%RH				
Overvoltage category		II				

Item	Model					
	LP-RH300S LP-RH300T	LP-RH200S LP-RH200T	LP-RH100S LP-RH100T	LP-RH301S LP-RH301T	LP-RH101S LP-RH101T	LP-RH305S LP-RH305T
Pollution degree	2					
Use location	Indoor; at an altitude of 1000 m or below					
Installation direction	Head	In all directions				
	Controller	Vertically or horizontally				
Weight	Head	Approx. 19kg	Approx. 17kg	Approx. 19kg	Approx. 17kg	Approx. 19kg
	Controller	Approx. 12kg				
Battery (mounted in product)	Type	Manganese dioxide lithium primary battery				
	Model	AFP8801 (BR-2/3A)				
	Quantity	1				
	Weight	Approx. 14g				

- *1: There is approx. +/-2mm deviation per product.
- *2: The value shown here is the configuration range that can be input. The setting values that can keep the quality of marking or processing vary depending on the setting details and the target materials.
- *3: Depending on the setting data, the actual movement may not be able to keep up with the scan speed and an error may occur. In that case, decrease the scan speed setting.
Example: Applications that repeat marking or processing of short lines at high speed, etc.
- *4: Average output power from the laser marker at delivery time with the maximum laser power setting.
- *5: Some of the languages or character types are not supported by this laser marker. Characters written from right to left such as Arabic or Hebrew, characters based on ligature such as Indian languages cannot be input.
- *6: VEC is a graphic file format dedicated for the laser marker. To use AI or EPS files, convert them to VEC format with the dedicated software "ExportVEC".
- *7: Available when the optional network unit is installed to the controller.
- *8: The software is available from our Internet website. For details, refer to "1-2-4 Download software and manual" (P.25).
- *9: OS versions of which Microsoft has ended support are excluded.
- *10: The frequency switches automatically.
- *11: The typical value of the inrush current at startup is as follows: (Duration time is 10ms or less.)
At 100V AC: 90A
At 200V AC: 180A
- *12: Common to the controller and head. No condensation or freezing shall be allowed. If there is a gap between the stored temperature and operating temperature, make sure to have the product get used to the operating ambient temperature gradually prior to use to prevent the dew condensation.
- *13: The laser output, etc. may vary depending on the fluctuation of the operating ambient temperature.

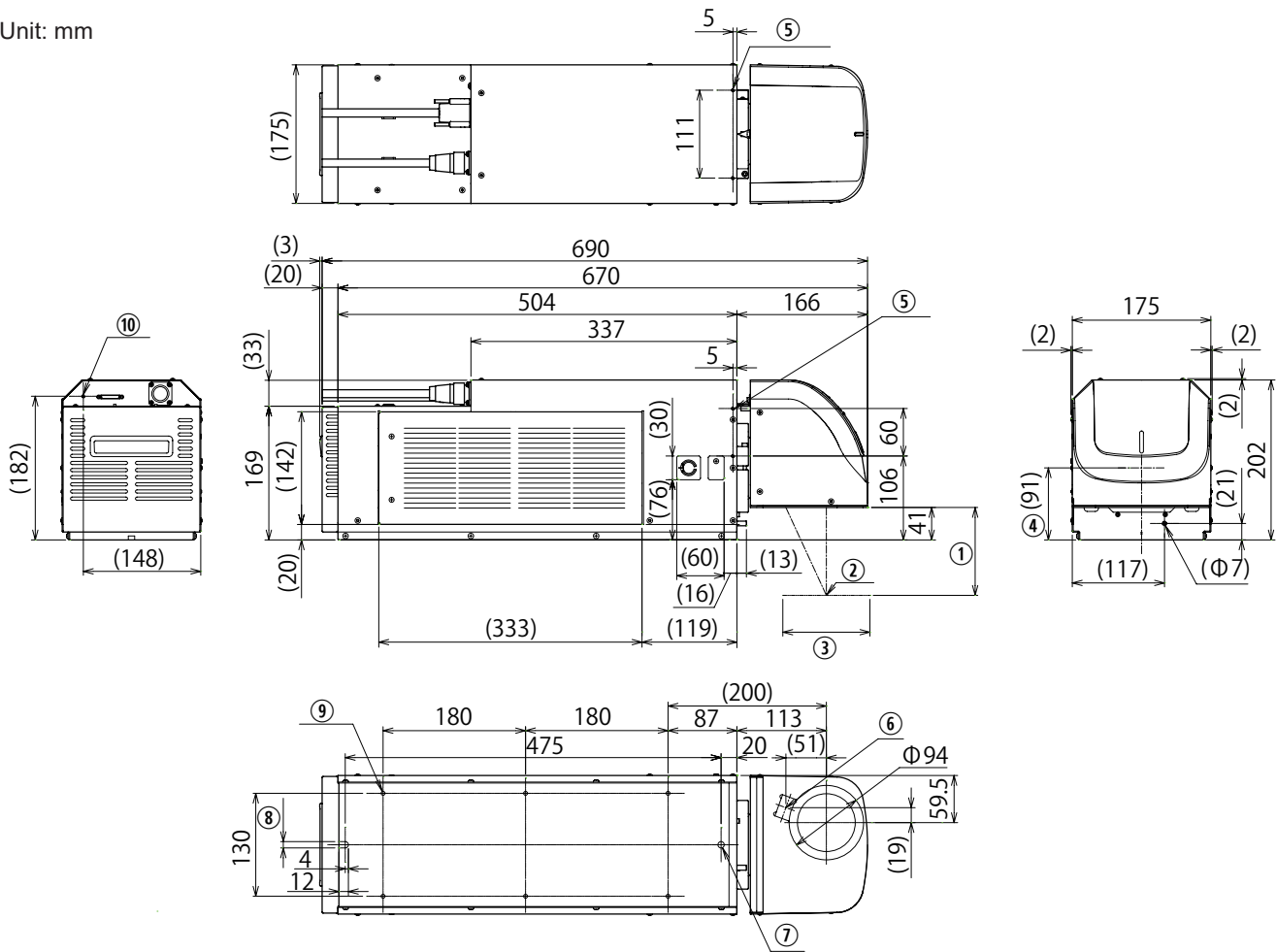
1-4 Outer Dimensional Drawing

1-4-1 Head

■ Standard head model

LP-RH300S / LP-RH200S / LP-RH100S / LP-RH301S / LP-RH101S / LP-RH305S

Unit: mm



No.	Description
①	Work distance: LP-RH300S / LP-RH200S / LP-RH100S : 185mm LP-RH301S / LP-RH101S : 111mm LP-RH305S : 262mm
②	Center of marking field
③	Marking Field (X, Y): LP-RH300S / LP-RH200S / LP-RH100S : 110mm x 110mm LP-RH301S / LP-RH101S: 55mm x 55mm LP-RH305S : 160mm x 160mm
④	Center of the scanner unit rotation
⑤	Screw hole for general purpose (2 holes in each surface of top and both sides): M4 Screw, Depth 10
⑥	Laser pointer emission port: Aperture diameter: ϕ 19mm
⑦	Head positioning pin hole: $\phi 8^{+0.01}_0$, Depth 4
⑧	Head positioning pin hole: $\phi 8^{+0.01}_0$ x 12 Elongated hole, Depth 4
⑨	Head fixing screw hole (6 holes): M6 Screw, Depth 15
⑩	Screw for frame ground: M4 screw, screw hole depth 5

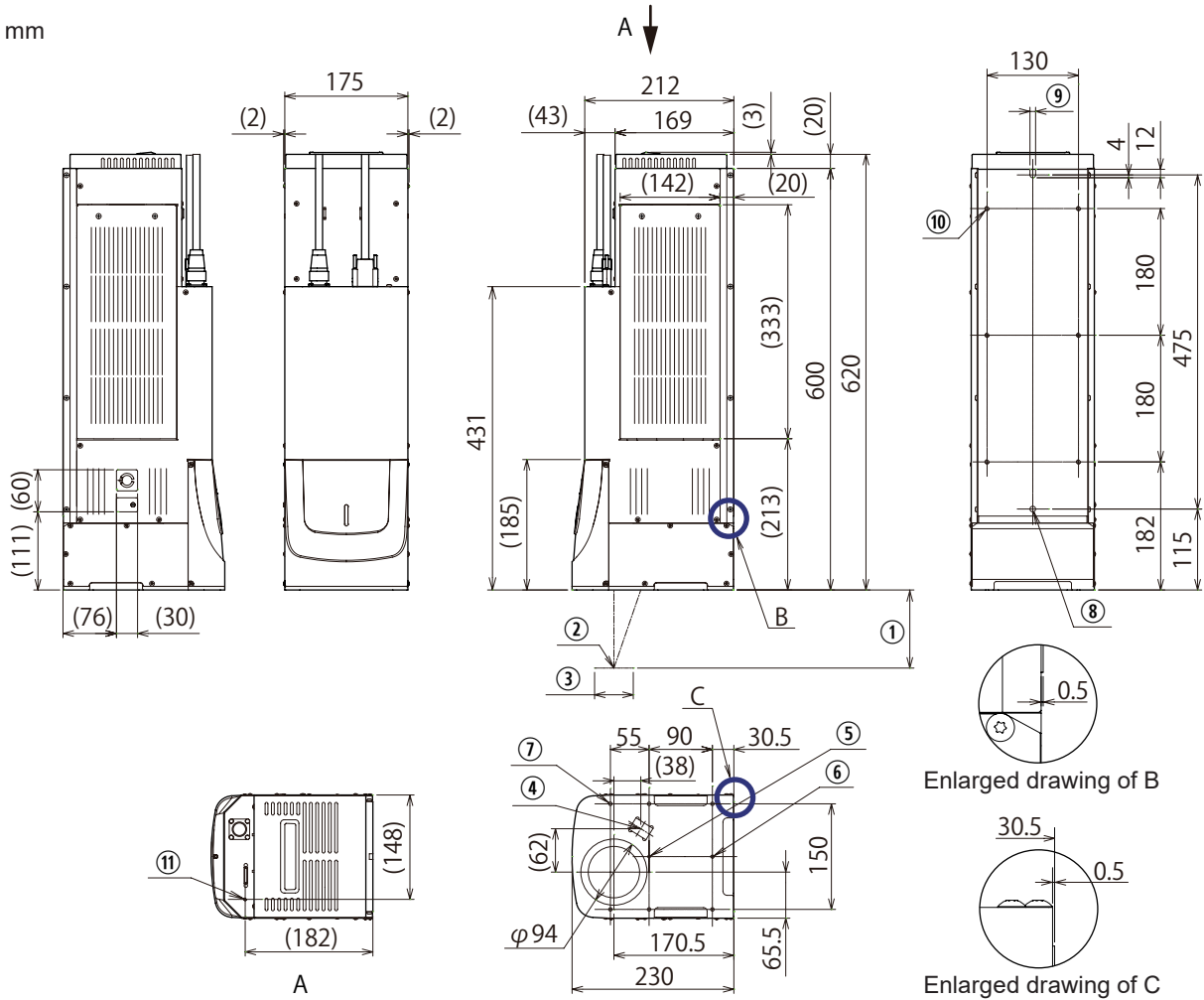
Reference

- For details on the head installation, refer to "2-3-2 Installation method" (P.47).

■ Tower head model

LP-RH300T / LP-RH200T / LP-RH100T / LP-RH301T / LP-RH101T / LP-RH305T

Unit: mm



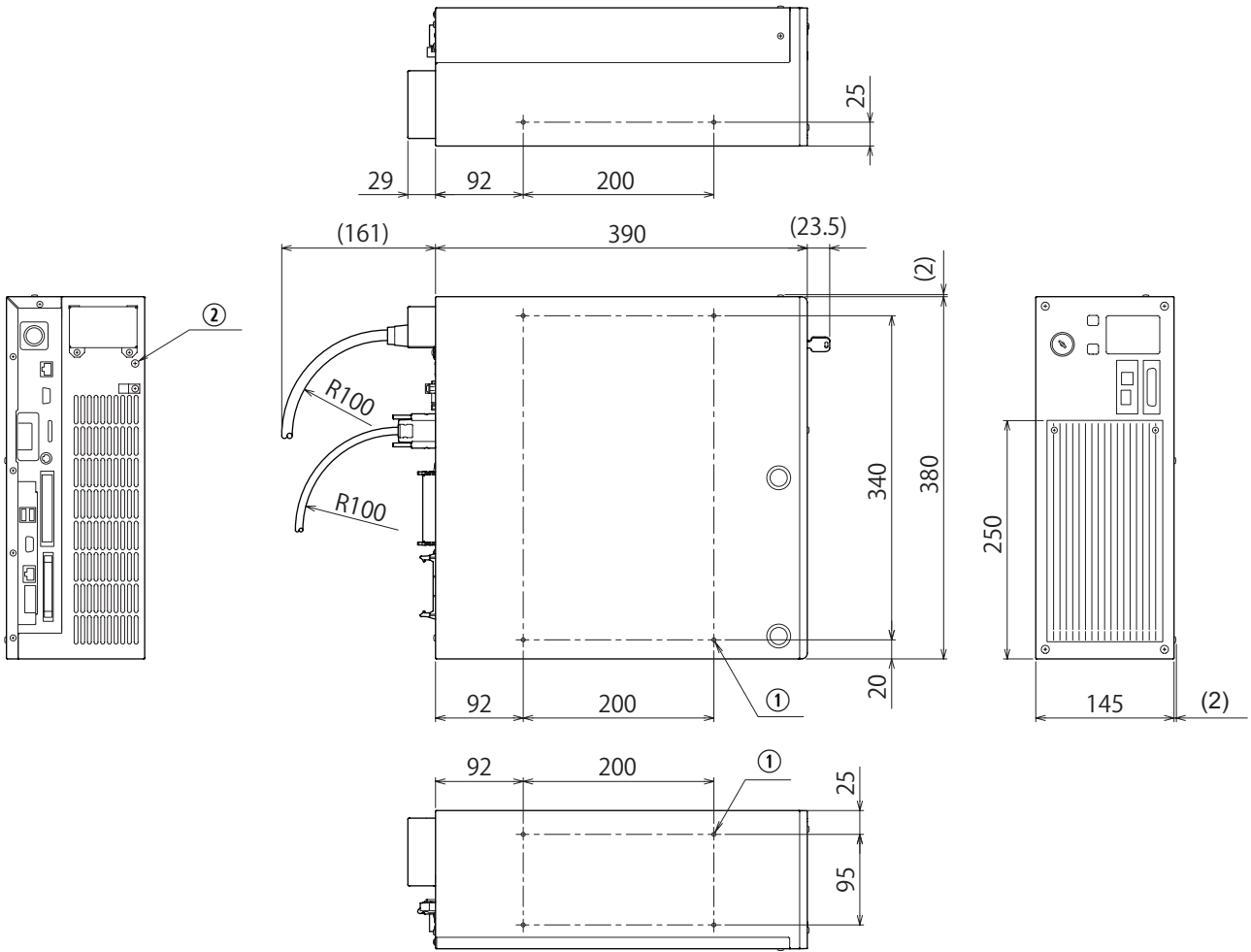
No.	Description
①	Work distance: LP-RH300T/ LP-RH200T / LP-RH100T : 185mm LP-RH301T / LP-RH101T : 111mm LP-RH305T : 262mm
②	Center of marking field
③	Marking Field (X, Y): LP-RH300T/ LP-RH200T / LP-RH100T : 110mm x 110mm LP-RH301T / LP-RH101T: 55mm x 55mm LP-RH305T : 160mm x 160mm
④	Laser pointer emission port: (Aperture diameter: ϕ 19mm)
⑤	Head positioning pin hole of lens side surface: ϕ 4 $^{+0.06}_{+0.02}$, Depth 6.5
⑥	Head positioning pin hole of lens side surface: ϕ 4 $^{+0.06}_{+0.02}$ x 5 Elongated hole, Depth 6.5
⑦	Head fixing screw hole of lens side surface (6 holes): M6 Screw, Depth 7
⑧	Head positioning pin hole of rear side surface: ϕ 8 $^{+0.01}_0$, Depth 4
⑨	Head positioning pin hole of rear side surface: ϕ 8 $^{+0.01}_0$ x 12 Elongated hole, Depth 4
⑩	Head fixing screw hole of rear side surface (6 holes): M6 Screw, Depth 15
⑪	Screw for frame ground: M4 screw, screw hole depth 5

Reference

- For details on the head installation, refer to "2-3-2 Installation method" (P.47).

1-4-2 Controller

Unit: mm



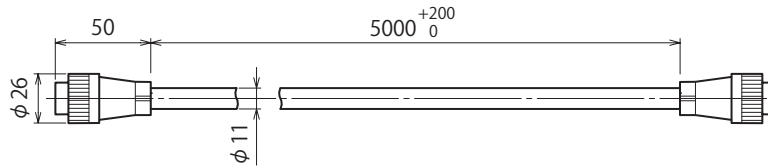
No.	Description
①	Controller fixing screw hole (4 holes each on the bottom and left side facing the front): M5 screw, depth 6
②	Screw for protective conductor terminal: M4 screw, screw hole depth 5

1-4-3 Cables

■ Unit power cable

Unit: mm

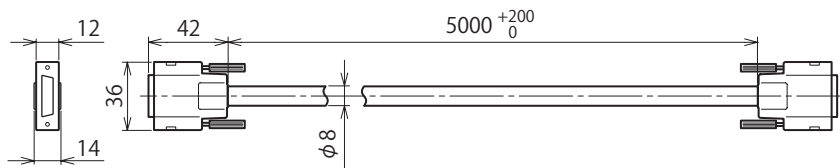
Minimum bent radius 100mm



■ Signal cable

Unit: mm

Minimum bent radius 100mm



■ AC power cable: Optional item on request

The AC power cable is not included in this product. Use the specified optional cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used.

- ① Rating 125V AC, PSE certified cable (For Japan): LP-ACA10
- ② Rating 250V AC, PSE certified cable (For Japan): LP-ACA11
- ③ Rating 250V AC, CE certified cable (For Europe): LP-ACA12

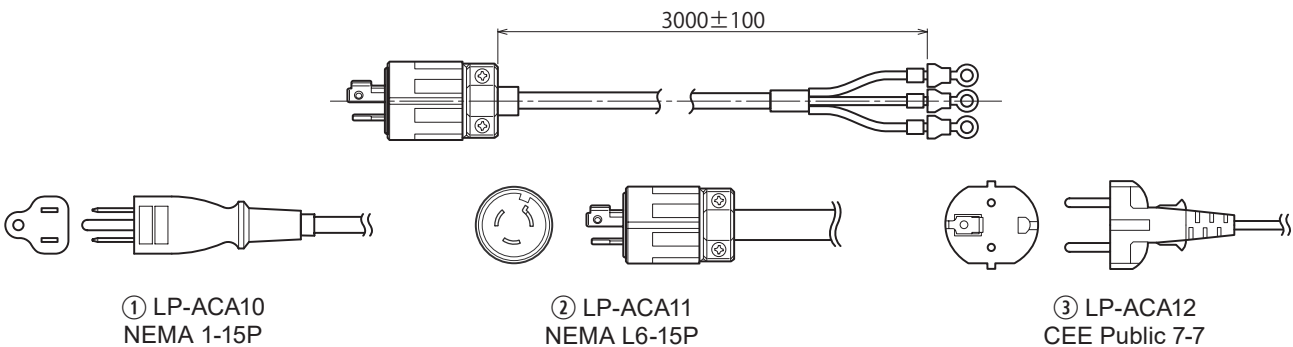
Rating 250V AC, CE certified cable (For Europe) plug is compliant with the following standards.
VDE, DEMKO, NEMKO, FIMKO, SEMKO, OVE, KEMA, CEBEC

Unit: mm

LP-ACA10: Minimum bent radius 50mm

LP-ACA11: Minimum bent radius 70mm

LP-ACA12: Minimum bent radius 50mm



! Notice

- Be sure to connect the ground pin of the AC power cable to earth permanently.

Reference

- For the recommended AC power cable for China (rating 250V AC, CCC certified cable), please contact our sales office.

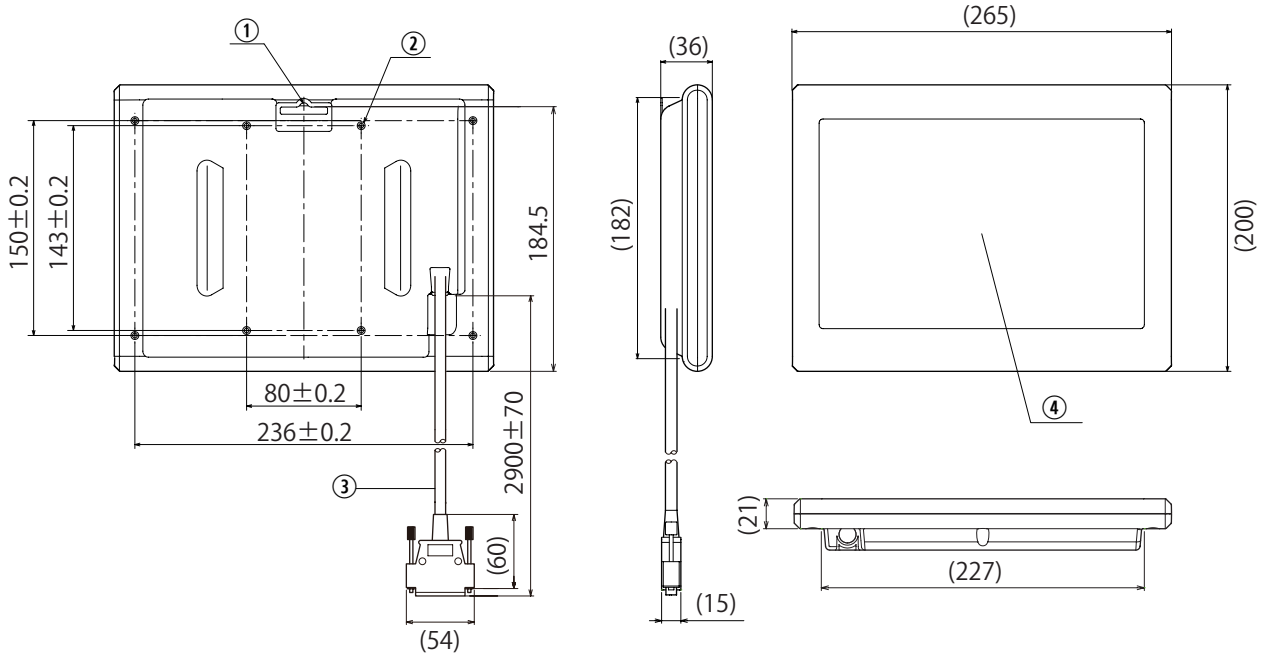
1-4-4 Touch panel console

This product can use the touch panel console LP-ADP50 (sold separately) as a monitor during operation. Touch panel console is available when the optional expansion board is installed to the controller.

Model: LP-ADP50

Weight: Approx. 1.5kg

Unit: mm



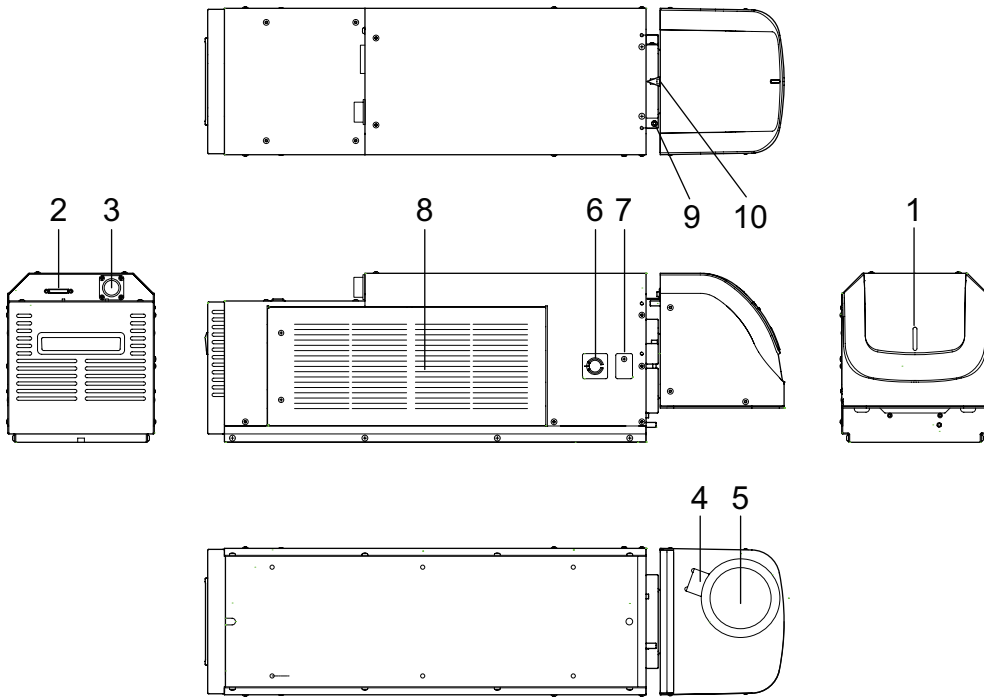
No.	Description
①	Hook hole for wall hanging: hole size 33 mm×5 mm, hook part R3 mm
②	Fixing screw hole (8 holes): M4 screw, depth 5, tightening torque: 0.7±0.1N·m You can use either inside 4 holes or outside 4 holes.
③	Connection cable: minimum bending radius 65 mm, cable diameter φ 8.6 mm
④	Touch panel: indicated area 216mm × 135mm

1-5 Name of Each Component

1-5-1 Head

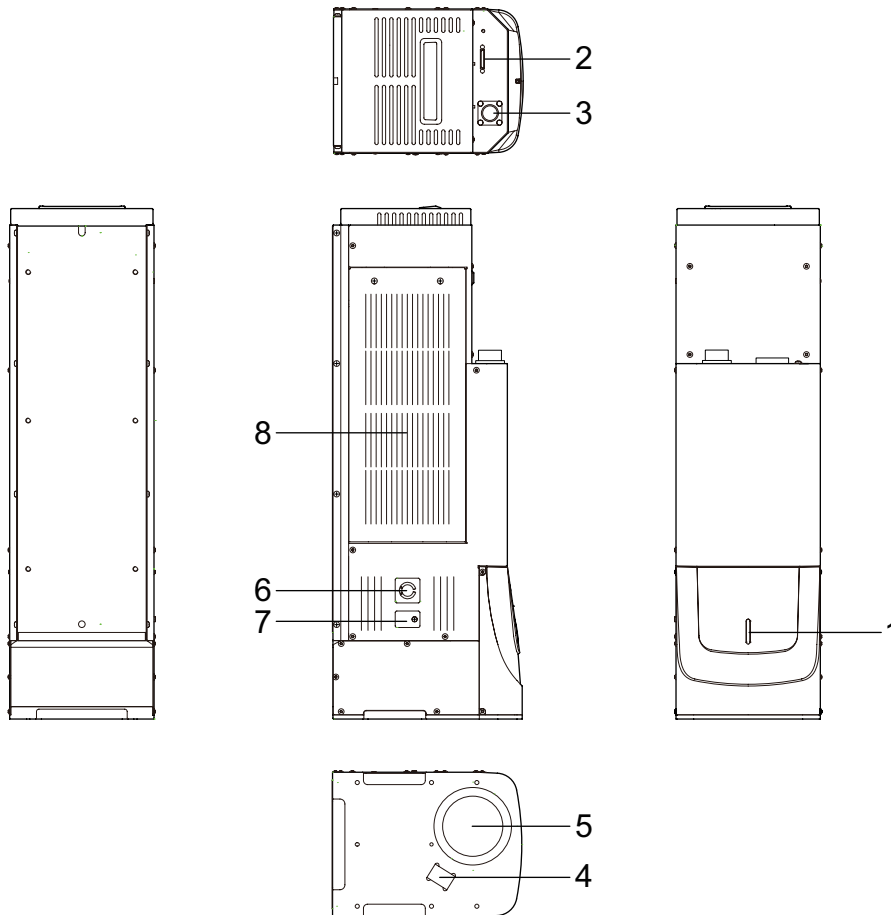
■ Standard model

LP-RH300S / LP-RH200S / LP-RH100S / LP-RH301S / LP-RH101S / LP-RH305S



■ Tower head model



LP-RH300T / LP-RH200T / LP-RH100T / LP-RH301T / LP-RH101T / LP-RH305T



1. Laser radiation indicator

The display that shows the status of laser radiation and the laser marker.

Laser marker status	Head LED status
Being in laser emitting	Orange lighted-up
Laser pumping is completed and internal shutter opened	Green lighted-up
Laser pumping is completed and internal shutter closed	White lighted-up
Laser pumping is in progress (uncompleted) and internal shutter opened	Green flashing
Laser pumping is in progress (uncompleted) and internal shutter closed	White flashing
Laser in non-pumped state	Lights-out

 WARNING	 <ul style="list-style-type: none">• If the laser emission indicator is placed out of the sight of operators, place the external indicator light or warning lamp on the immediately apparent place on the system.
--	--

2. Signal connector: SIGNAL

This is the terminal for communicating between head and controller. Connect the attached signal cable.

 Reference

- For the connecting details, refer to “2-6-1 Connection of head and controller” (P.59).

3. Power connector: POWER

This is the connector for supplying the power to the head.
Connect the attached unit power cable.

 Reference

- For the connecting details, refer to “2-6-1 Connection of head and controller” (P.59).

4. Laser Pointer Emission Port

From this port the red laser pointer radiates in oblique direction when using the work distance indication of the guide laser. Refer to “2-3-5 Marking position check” (P.50).

To use the guide laser, do not seal the laser pointer emission port at the installation.

5. Laser emission port

The emission port of the marking laser.

6. Focus Dial

This is the dial to check the focus adjusting. For the details, refer to “2-3-6 Focus adjustment function” (P.51).

7. Focus Adjusting Control

The control for adjusting the distance from the work. For the details, refer to “2-3-6 Focus adjustment function” (P.51).

8. Intake Vent for Air Cooling

Air inlet for cooling the head. In this vent the filter is installed.

9. Setscrew for Scanning Angle [Only for standard head]

This is the setscrew for rotation of head scanning. Loosen this setscrew for rotating scanner.
For the details, refer to “2-3-3 Rotation of Standard Head Scanner” (P.48).

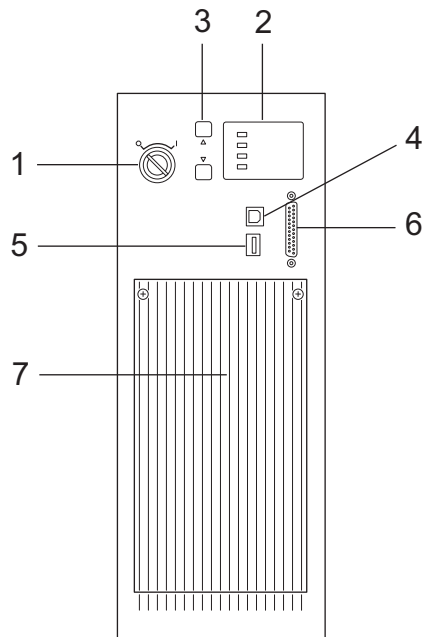
10. Arrow for Indicating Rotation Angle [Only for the standard head]

This is the arrow that indicates rotation angle of the head scanner.

For the details, refer to "2-3-3 Rotation of Standard Head Scanner" (P.48).

1-5-2 Controller

■ Front



1. Key switch: POWER

The main power switch for the laser marker.

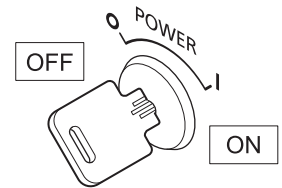
Turn ON (|) the key switch to start-up the system, and turn OFF (O) to shut down the system.

Only when the key switch is turned OFF (in O position), the key can be pulled out.

When the laser marker is not in use, the key should be in safekeeping by a laser safety officer.

In case of turning ON the power supply after turning OFF, leave the interval five seconds or more between ON and OFF.

Do not turn off the power supply while the system starts while MAIN indicator is flashed on the panel.



2. Controller display light

Displays the status of the laser radiation and laser marking system.

- ① — MAIN
- ② — LASER STANDBY
- ③ — LASING
- ④ — ALARM

No.	Display name	Status	Indication
①	MAIN	System is powered on	Green lighted-up
		System under starting up (uncompleted)	Green flashing
②	LASER STANDBY	Laser pumping is completed	White lighted-up
		Laser pumping is in progress (uncompleted)	White flashing
③	LASING	Being in laser emitting	Orange lighted-up
④	ALARM	Alarm status	Red lighted-up
		Alarm status (unable to boot system)	Red flashing

3. Circuit protector: CIRCUIT PROTECTOR

In case of the overcurrent, one or both circuit protectors pop out and cutoff current. Refer to “2-6-3 Restore of circuit protector” (P.62).

4. USB port B: USB

This is the connector for connecting the attached USB cable. When you connect the laser marker configuration software Laser Marker NAVI smart online, connect this cable to the PC.

5. USB port A: USB

The commercially available USB flash drive or USB mouse can be connected when the optional expansion board is installed to the controller.

The USB flash drive is used to register and save the marking data when the touch panel console or monitor is connected to the laser marker and used.

If you use a commercially available monitor when operating the laser marker, the USB mouse can be connected to this terminal.

The USB port is also installed to the rear of the controller.

 Reference

- Do not connect any device except for a USB flash drive or USB mouse to the USB port.
 - USB flash drive with security function cannot be used. The supported format for USB flash drive are FAT32 or exFAT.
 - USB hubs cannot be used.
 - The USB mouse or USB flash drive cannot be used when the optional expansion board is not installed to the controller.
-

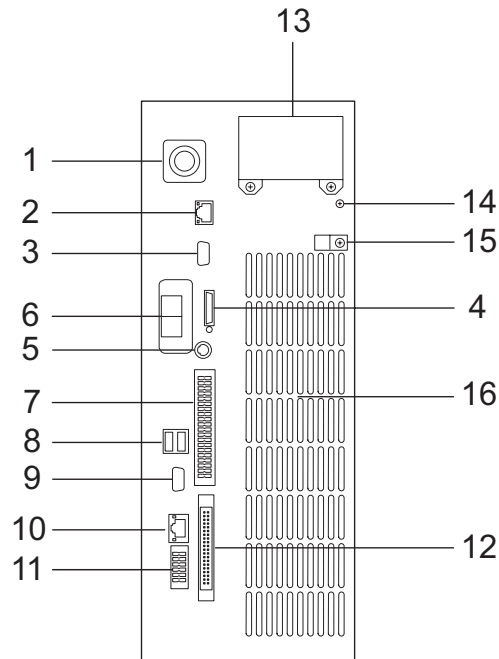
6. Console connector: CONSOLE

When using the optional touch panel console, connect the console to this connector. Touch panel console is available when the expansion board is installed to the controller. Refer to “2-6-5 Connection of Console” (P.65).

7. Controller air-cooling inlet

The air inlet for cooling the controller. Fans and filters are installed.

■ Rear



1. Power connector: POWER

This is the connector for supplying the power to the head. Connect the attached unit power cable.

Reference

- For the connecting details, refer to “2-6-1 Connection of head and controller” (P.59).

2. Ethernet port: LAN

The port to connect the LAN cable used when connecting the laser marker with the following devices via Ethernet.

- The PC with Laser Marker NAVI smart installed
- PLC or PC for control: Externally controls the laser marker using the communication commands.
- Specified external devices: Interfaces the specified external device (image reading equipment) with the laser marker and controls their operations.

Reference

- If you want to perform Ethernet communication for the above multiple purposes, use an expansion hub.

3. RS-232C port: RS-232C

The port to connect the following external devices for the communication control of the laser marker using RS-232C.

- PLC or PC for control: Externally controls the laser marker using the communication commands.
- Code reader compatible with the RS-232C communication: Modifies the data to mark by the laser marker according to the code details read by the code reader.

4. Signal connector: SIGNAL

This is the terminal for communicating between head and controller. Connect the attached signal cable.

Reference

- For the connecting details, refer to “2-6-1 Connection of head and controller” (P.59).

5. Mini DIN connector: MIDI

Not used in this product. Do not connect anything.

6. Ports for industrial network: EtherNet/IP or PROFINET *1
The ports for the optional network unit (EtherNet/IP unit or PROFINET unit).
Communication port (2-port switch) to control the laser marker by the industrial network with the control device such as a PLC.
Connect a LAN cable.
For details, refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”.
If you do not install the network unit, there is no port here.

7. I/O terminal block: TERMINAL
The terminal block to connect I/O signals used for the external control of the laser marker.
Connect the attached terminal block.
Refer to “4-2 Signals and Details of I/O Terminal Block” (P.92) for details.

8. USB port A (2 port): USB *2
The commercially available USB flash drive or USB mouse can be connected when the optional expansion board is installed to the controller.
The USB flash drive is used to register and save the marking data when the touch panel console or monitor is connected to the laser marker and used.
If you use a commercially available monitor when operating the laser marker, the USB mouse can be connected to this terminal.
The USB port is also installed to the front of the controller.

 **Notice**

- Do not connect any device other than a USB flash drive or USB mouse to the USB port.
 - USB flash drive with security function cannot be used. The supported format for USB flash drive are FAT32 or exFAT.
 - USB hubs cannot be used.
-


9. VGA connector: VGA *2
The connector to connect the commercially available monitor when operating the laser marker.
The monitor and mouse are available when the optional expansion board is connected to the controller. Refer to “2-6-6 Connection of Monitor and Mouse” (P.66).

10. LAN port for extensions: INFO LAN *2
Not used in this product. Do not connect anything.

11. Displacement sensor connector: D-SENSOR *2
Not used in this product. Do not connect anything.

12. I/O connector: I/O CONNECTOR
The connector to connect I/O signals used for the external control of the laser marker.
For details, refer to “4-3 Signals and Details of I/O Connector” (P.101).

13. AC power supply terminal: AC INPUT
Terminal for connecting AC power supply.
Power voltage: 90V to 132V or 180V to 264V AC (including +/-10% voltage fluctuations), 50/60Hz (Frequency switches automatically.)
Use the specified optional cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used.
For the optional cables, refer to “1-4-3 Cables” (P.32).

 **Notice**

- Be sure to connect the ground pin of the AC power cable to earth permanently. Refer to “2-6-2 Power connection and earth (Grounding)” (P.60).

14. Protective conductor terminal

The terminal for ground. Connect this terminal to grounding port permanently.

15. Clamp

The clamp to fix the AC power cable.

16. Controller air-cooling outlet

The air-cooling outlet for the controller.

*1: This port is equipped when the optional network unit (EtherNet/IP unit, PROFINET unit) is installed.

*2: This port is equipped when the optional expansion board is installed.

2 Laser Marker Installation

2-1 Installation Environment

Use this product in the following environments.

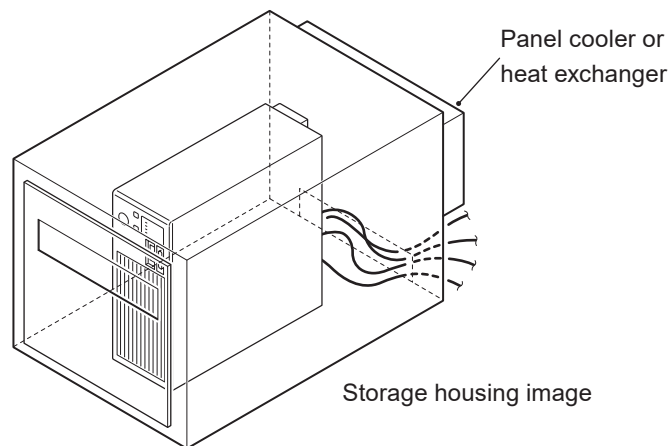
Item	Installation environment conditions
Operating ambient temperature *1	0°C to +40°C
Operating ambient humidity *1	35 to 85%RH
Ambient temperature for storage *1	-10°C to +60°C *2
Pollution degree	2
Use location	Indoor; at an altitude of 1000 m or below

*1 : No condensation or freezing shall be allowed.

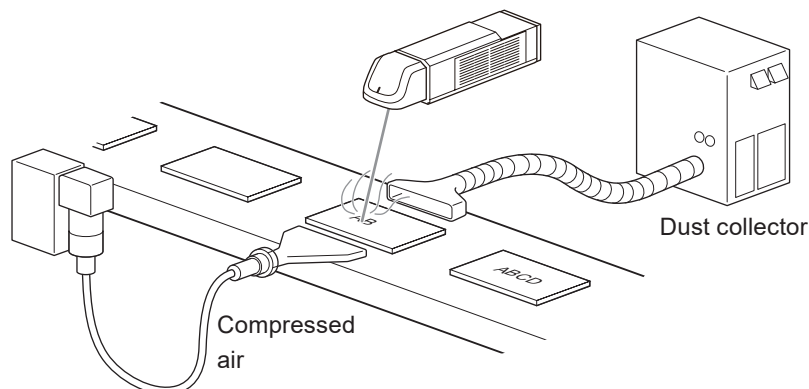
*2 : If there is a gap between the stored temperature and operating temperature, make sure to have the product get used to the operating ambient temperature gradually prior to use to prevent the dew condensation.

! Notice

- Do not install this product at a place where vibrations and shocks can be directly transmitted to it.
- Do not use this product at a place with oil mist.
- In case this product is used in a dusty environment, take measures to prevent dust from entering into the controller, e.g. using a storage housing.
- When installing the controller in the storage housing, use a housing equipped with panel cooler or heat exchanger to maintain the air-cooling performance of the laser marker according to the ambient temperature.



- Remove any dust and smoke from the laser emission port and laser beam path using a dust collector. For effective dust collection, put the suction port of the dust collector near the lasing position. In an environment where dust and smoke that tend to attach to the lens surface, it is recommended to create a compression air flow to ensure thorough dust collection.



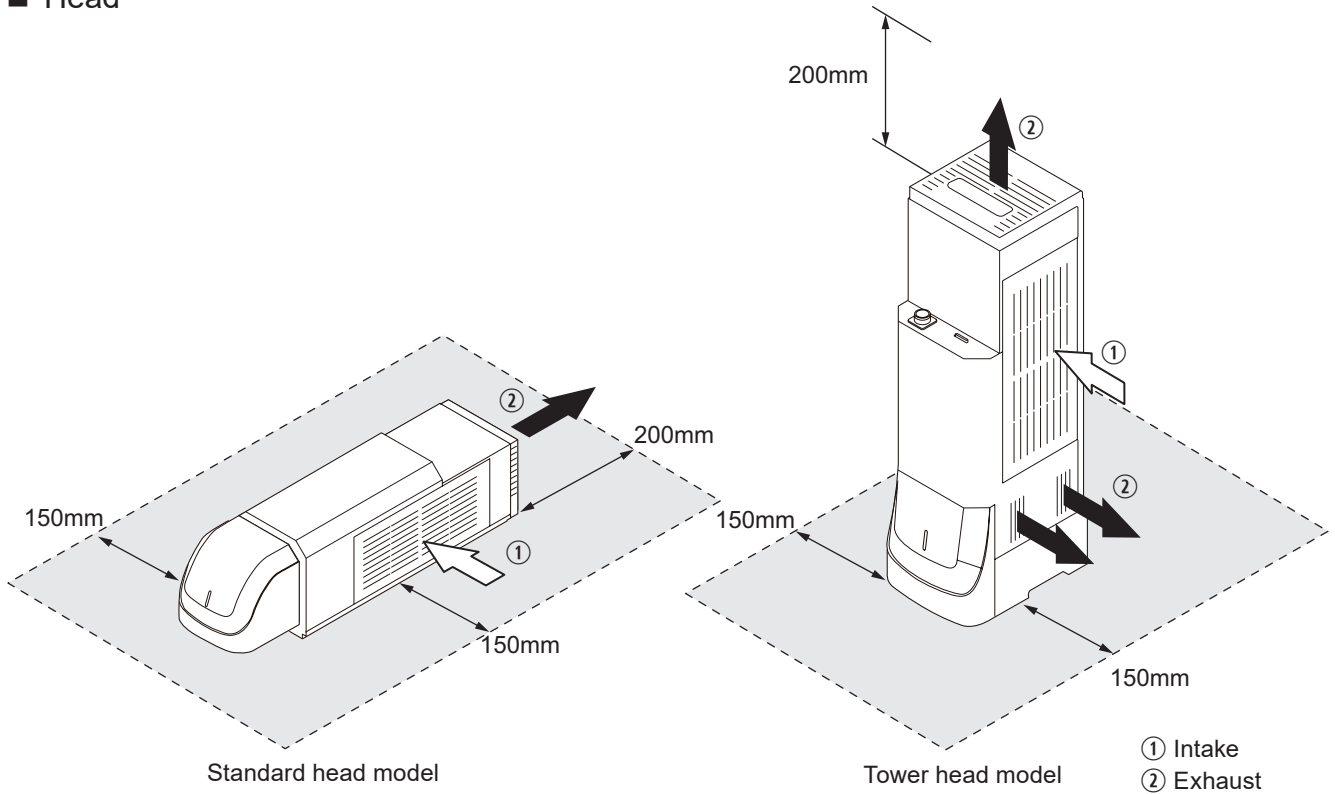
2-2 Installation Space

To keep the appropriate air cooling performance, provide space around the laser marker as shown in the following figure.

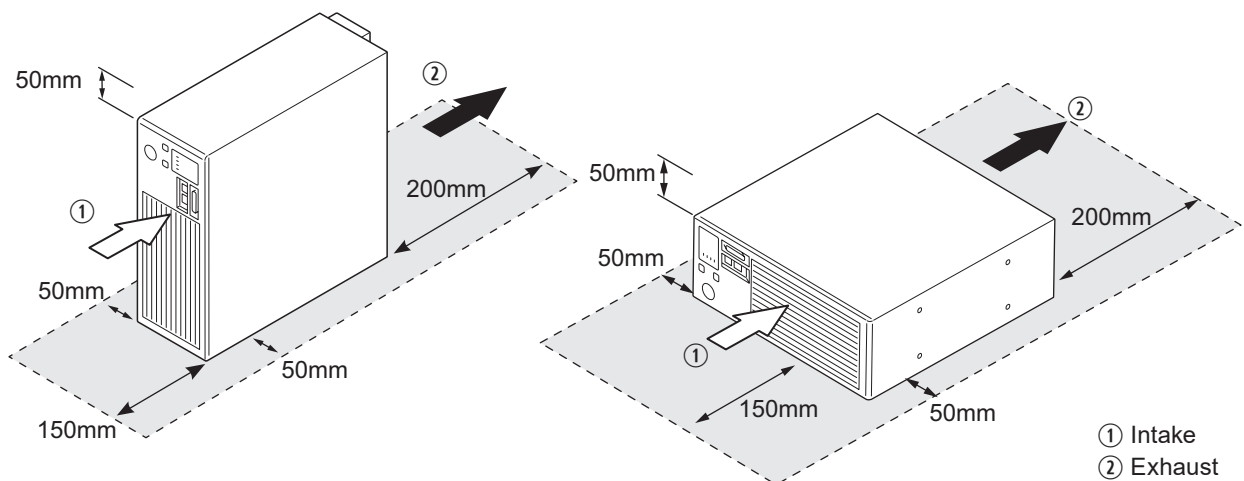
! Notice

- To maintain the air-cooling performance of the laser marker, install the head and controller in a well-ventilated place respectively.
- Installing near a heating element could cause the ambient temperature exceeding the specification range, which may cause malfunction of the product.

■ Head



■ Controller



2-3 Head Installation

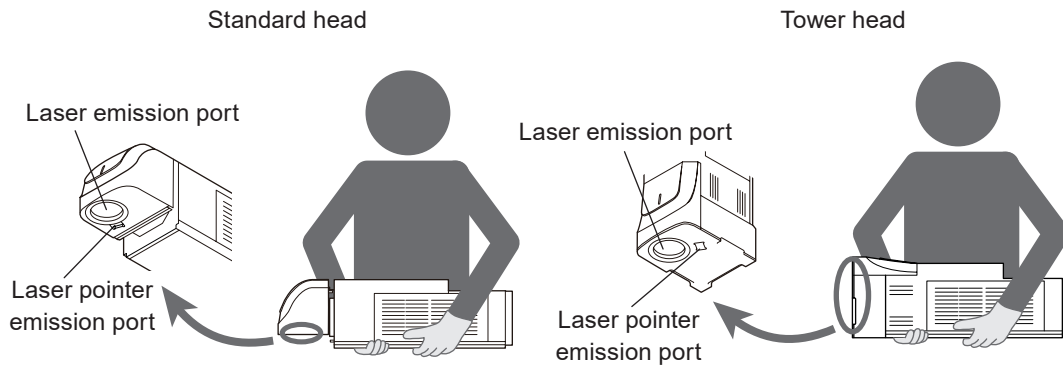
WARNING



- Make sure that the power is turned OFF at installing. Failure to do so may cause electrical shock.
- Install the product so that the laser beam path does not cross the eye height.
- The laser beam path shall be enclosed with protective enclosure and make sure it is not exposed with direct light or reflected light.

■ Carrying head part

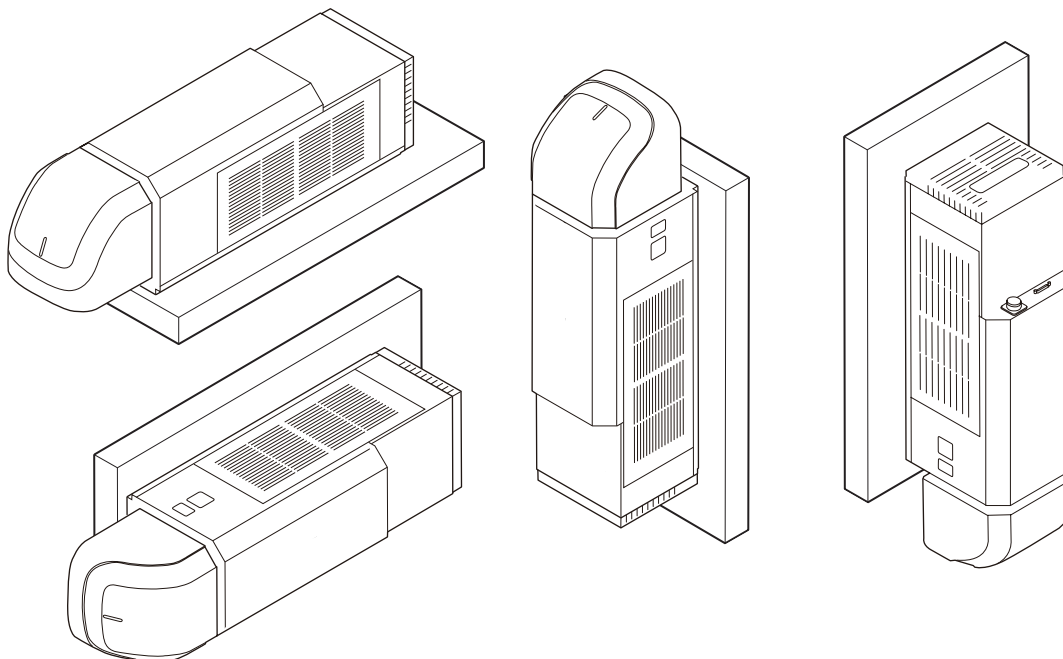
- To carry this product, wear the non-slip gloves. Hold the product with both hands. Do not hold the cables or connectors at carrying.
- Do not touch the laser emission port on the bottom of the head. It may affect the marking quality badly.
- Carry this product as shown in the figure below.



2-3-1 Installation direction

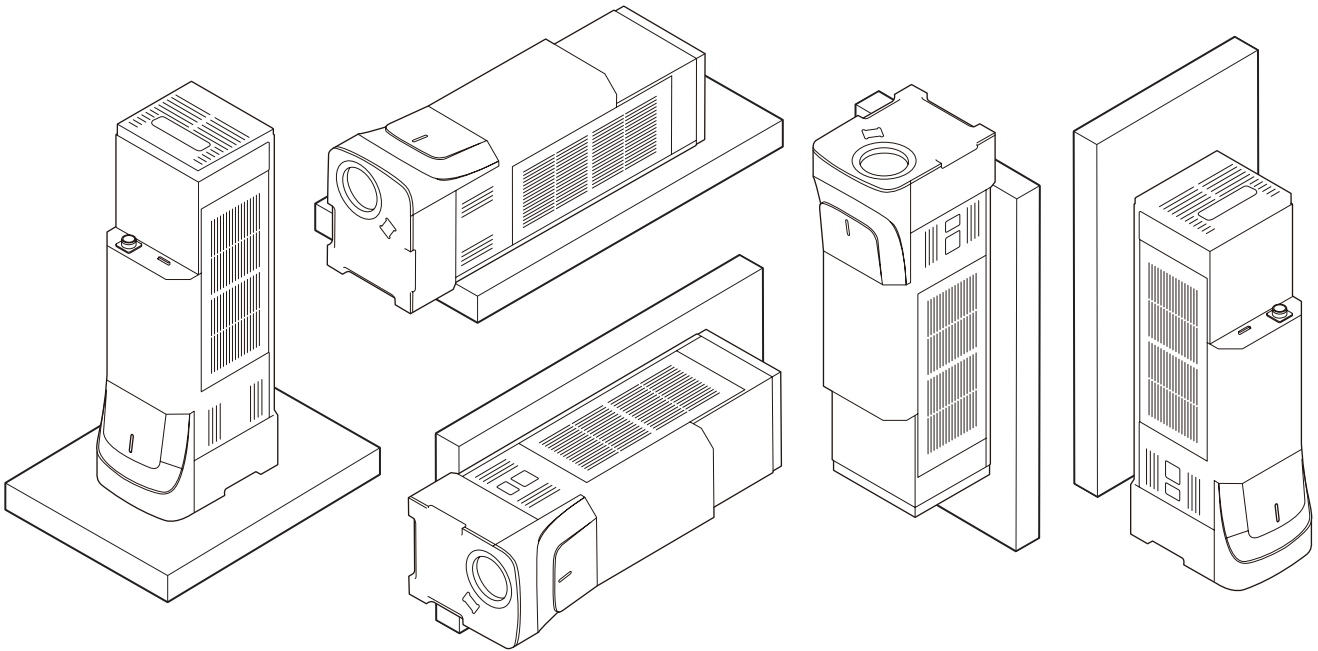
■ Standard head model

The standard head can be mounted in the following direction. After the installation, the scanner unit can be rotate. Refer to "2-3-4 Marking field and marking center position" (P.49).



■ Tower head model

When the mounting surface of the tower head is rear side, it can be mounted in the left, right, top and bottom direction.
When the lens side is mounting surface, install the tower head always with the lens side down.



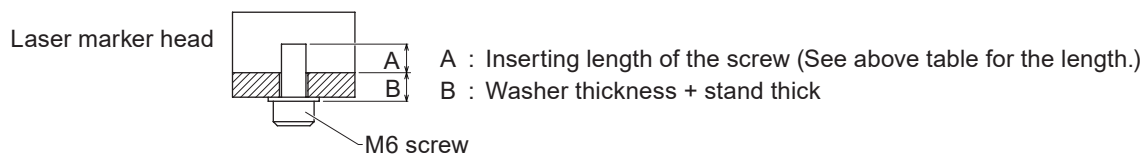
! Notice

- Do not move the head unit during the operation.
- When the product is installed with the laser emission port facing upward, dust generated during marking may attach to the laser emission port, impairing marking quality and damage the product. Clean the laser emission port periodically according to the head installation conditions and environment.
- When fixing the bottom (lens side) of the tower head model, install the model so that the bottom (lens side) faces downward. The model cannot be mounted in any direction other than those shown above. When installing the tower head model sideways or when installing it with the lens side facing upward, be sure to fix it on the rear side.
- Warp may occur in the bottom surface of the standard head model or in the rear surface of the tower head model, but it gives no problem in using the product.

2-3-2 Installation method

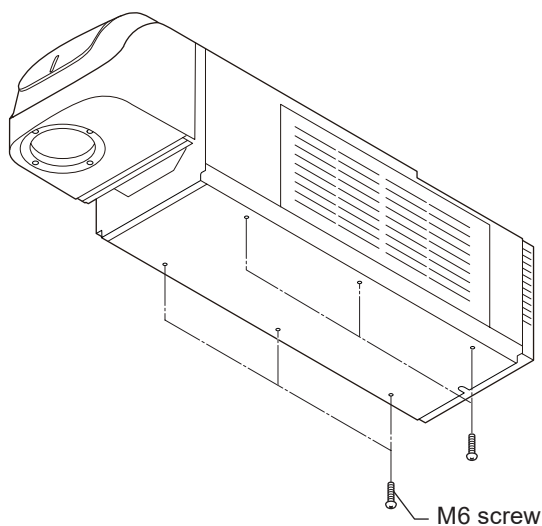
- Install the head on a plate with a thickness of 10 mm to 15 mm which is made of aluminum or other material with radiation performance equivalent to that of aluminum.
- For details of installation, refer to "1-4-1 Head" (P.29).
- Fix the head in the following conditions.

Head type	Fixing surface	Fixing screw	Screw insert length	Tightening torque
Standard head	Bottom	M6 screws at 6 positions	7 mm to 10 mm	3.0N·m
Tower head	Rear		7 mm to 10 mm	
	Bottom (laser emission port side)		5 mm to 7 mm	

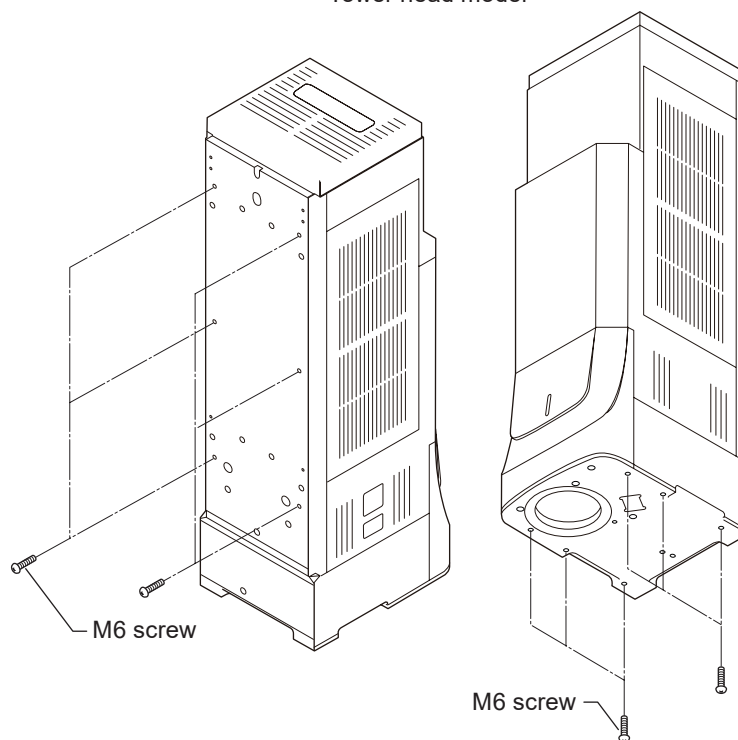


When installing the head, refer to the above table and fix the six M6 screw holes.

Standard head model



Tower head model



! Notice

- Do not insert any screw of length exceeding the specification. Otherwise, the failure of the product may be caused.

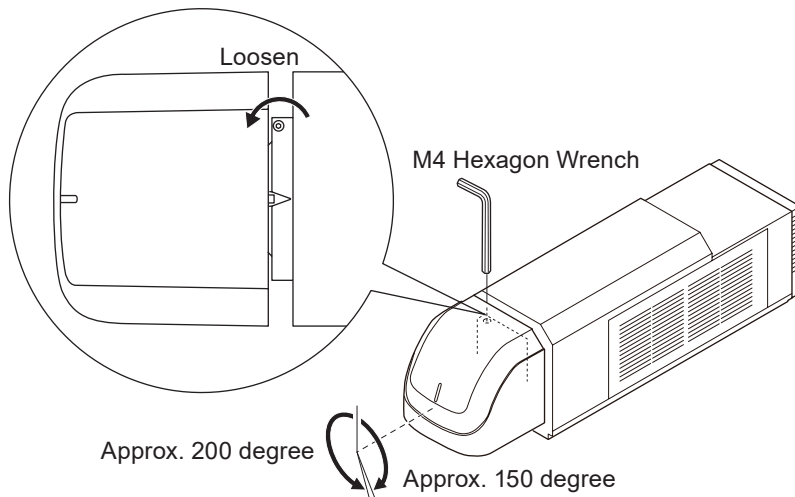
2-3-3 Rotation of Standard Head Scanner

For the standard head models (LP-RH300S / LP-RH200S / LP-RH100S / LP-RH301S / LP-RH101S / LP-RH305S), the angle of the head scanner unit can be set freely.

This function is specific to the standard head model. It is not equipped in the tower head model.

■ Rotation Method

- The head scanner can be rotated up to 350 degrees by loosening the hexagon socket head cap screw (M4). After rotating the scanner unit, fix it tightly.
- The tightening torque shall be 1.5N·m.



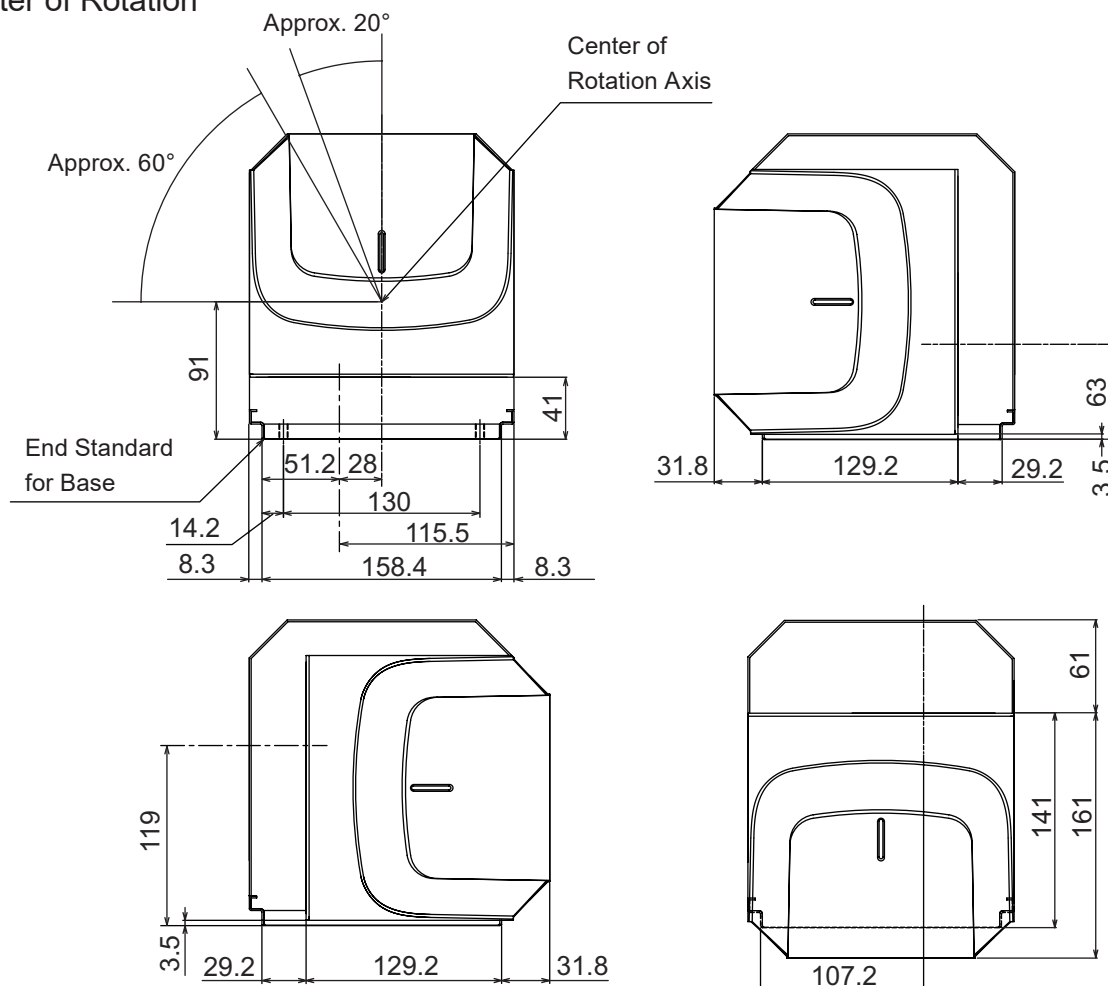
WARNING



- Never use the laser marker with the setscrew for scanner angle loosened. Failure to do so could rotate the head during the operation and cause laser emission to the dangerous direction.

■ Center of Rotation

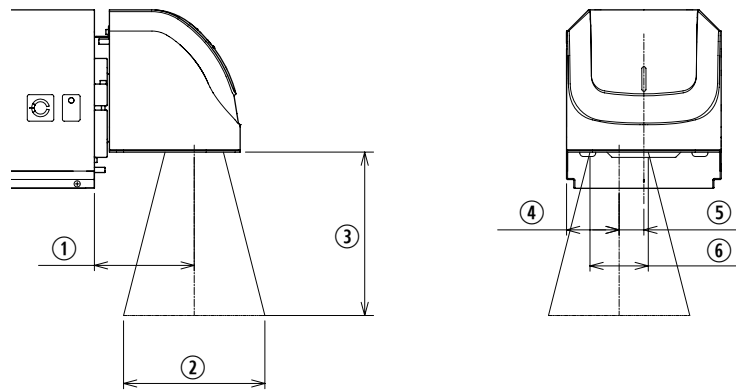
Unit: mm



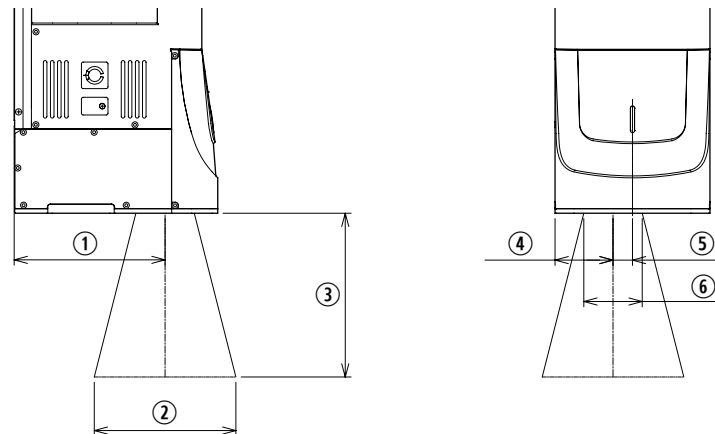
2-3-4 Marking field and marking center position

Specified point	LP-RH300S LP-RH200S LP-RH100S	LP-RH300T LP-RH200T LP-RH100T	LP-RH301S LP-RH101S	LP-RH301T LP-RH101T	LP-RH305S	LP-RH305T
① Distance to center of marking field	113mm	170.5mm	113mm	170.5mm	113mm	170.5mm
② Marking field (X, Y)	110×110mm		55×55mm		160×160mm	
③ Work distance	185mm		111mm		262mm	
④ Distance to center of marking field	59.5mm	65.5mm	59.5mm	65.5mm	59.5mm	65.5mm
⑤ Distance to center of laser emission port	28mm	22mm	28mm	22mm	28mm	22mm
⑥ Diameter of laser output range	φ66mm					

Standard head model



Tower head model



! Notice

- Do not place anything in the area between the laser emission port and workpieces during the lasing operation.
- Use anti-reflection material (ex. black paint for metal) for an external shutter or a protective enclosure in a path of laser beam. It may cause a failure of the components inside the laser marker head.
- If any other devices such as a sensor or a camera are installed near the laser marker, make sure that these devices are installed in the place where laser beam and its reflected beam do not damage to them.

2-3-5 Marking position check

■ Guide laser

The marking position can be checked visually by using the guide function with the red laser beam.

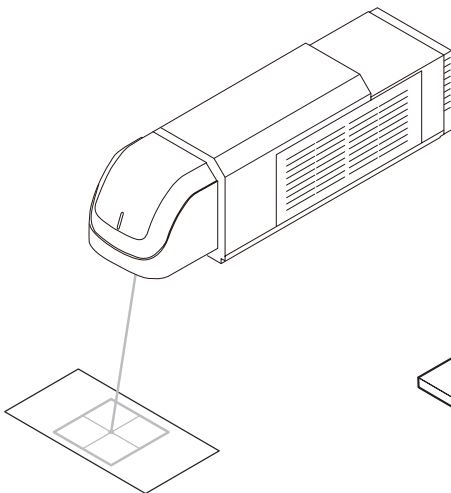
! Notice

- Use the guide display function only as the guideline. For the appropriate marking quality, fine adjust the work distance and setting position of the target object by checking the actual marking results.
- Depending on the marking settings or installation conditions (use of focus adjustment function, etc.), the position indicated in the work distance display mode may not coincide with the appropriate work distance. Using an actual workpiece, check if proper marking can be obtained with the work distance displayed by the guide laser and adjust the distance as necessary.
- When the standard head scanner is rotated, the amount of deviation of the laser pointer position from the center of the guide laser may become larger compared with the case when the laser beam is irradiated directly below the scanner. Use the position where the laser pointer comes closest to the center of the guide laser as a guide for the work distance.

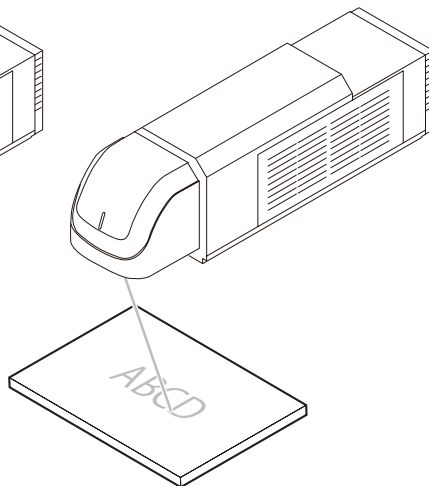
With the guide laser the following data can be indicated.

Display mode	Description
Marking field	Displays the marking field frame and center lines with the guide laser.
Marking image	Displays the setting data in the file. The object data with marking off setting is not displayed.
Masked objects	Displays only the data set to Marking off and enabled guide indication.
Work distance	The guide laser shows the rough indication of the work distance (distance from the head base to the marking surface). The red point emitted in oblique and the red cross emitted perpendicularly from the head are displayed. The distance where the laser point is closest to the center of the cross represents the guide of the work distance.

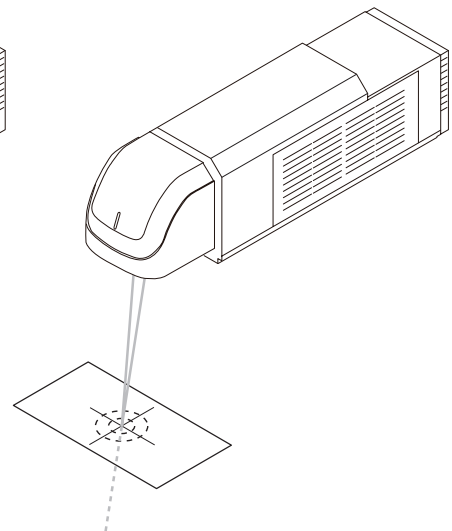
Marking field indication



Marking image indication



Work distance indication



Where the red point is closest to the center of the cross is the rough indication of the work distance.

Reference

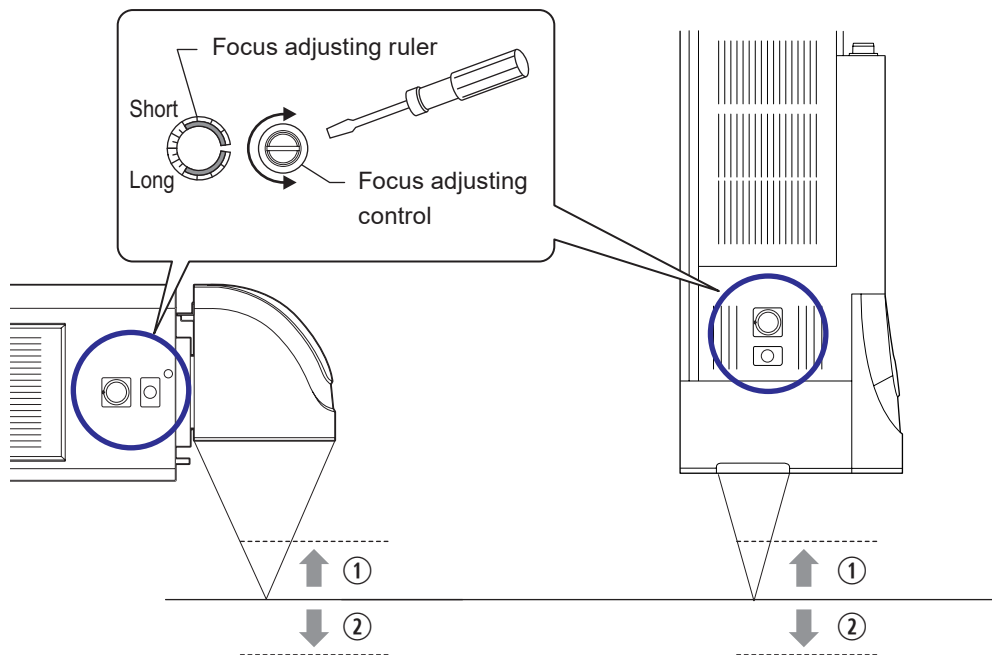
- For details of the guide display function, please refer to the “Laser Marker NAVI smart Operation Manual”.

2-3-6 Focus adjustment function

With this function, the distance from work (focal length) can be adjusted without moving up/down the head. Marking energy density can be reduced by moving the focus point of the laser spot with the specified distance between the works and changing the spot diameter.

! Notice

- Use the focusing ruler as an adjustment guide. Repeat the adjustment and marking test to set the most appropriate work distance.
- Always close the cover after adjusting the focus. The work distance might be changed if the cover is not closed.
- Use the focus adjusting function when the product is installed. Do not use this function for the daily use such as setup change. Excessive use of this function may cause failure of the product.

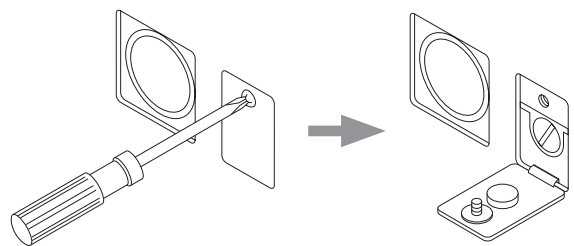


① Turn in the left direction (Short direction) : Makes the work distance (focal length) shorter.

② Turn in the right direction (Long direction) : Makes the work distance (focal length) longer.

1. Use a Phillips screwdriver to remove the focus adjustment cover.

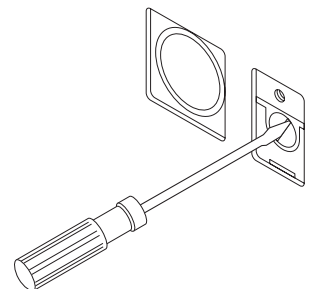
Keep the cover for next use.



2. Turn the focus adjusting control with a flat-blade screwdriver.

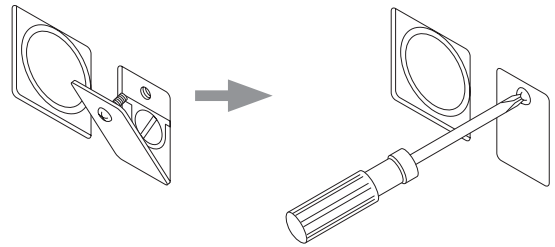
! Notice

- Do not turn the screw beyond the scale markings with an extra force. It may cause the product failure.



3. Reinstall the focus adjustment cover.

Tightening torque for the cover should be 0.65 to 0.75 N • m.



Reference

- Focus adjustment range varies depending on models.
 - LP-RH300S / LP-RH300T / LP-RH200S / LP-RH200T / LP-RH100S / LP-RH100T: Approx. ± 3 mm
 - LP-RH301S / LP-RH301T / LP-RH101S / LP-RH101T: Approx. ± 2 mm
 - LP-RH305S / LP-RH305T: Approx. ± 4 mm
- The ruler is set to "0" at factory.
- Adjusting focus changes the marking field and spot diameter. In addition, the amount of the spot diameter difference between the marking field center and the marking field end becomes large, which may cause uneven marking quality.
- The work distance display mode of the guide display function is adjusted for the default work distance. If the work distance is changed using the focus adjustment function, the position indicated in the work distance display mode is not linked with the work distance changed using the focus adjustment function. Refer to "2-3-5 Marking position check" (P.50).

2-3-7 Marking check

Due to the characteristics of the laser marker, the laser output, focus (work distance), and marking state may vary depending on the temperature environment or operating conditions. Take the following measures to obtain stable results.

- Before full operation, perform test marking to make sure that there is leeway in terms of the marking conditions and also marking performance is stable.
- Take necessary measures for air conditioning, ventilation, and waste heat treatment so as to reduce ambient temperature changes.
- When moving to a place where the ambient temperature is different, start using the laser marker only after it gets used to the new temperature environment.

Reference

The following are some of the cases where the difference of the ambient temperatures or the change in the environment affects the marking results.

- Right after the product is installed after it is transported
- When the product is started for the first time or when it is started at the beginning of the day
- After a long holiday
- Temperature difference between seasons or between days and nights
- When the product layout is changed
- Extreme changes in the operation rate
- Laser marker temperature is low, etc.

2-4 Controller Installation

WARNING

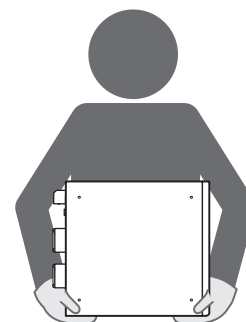


- Make sure that the power is turned OFF at installing. Failure to do so may cause electrical shock.
- To carry this product, wear the non-slip gloves.
- In case it falls down, it may cause injury.

2-4-1 Installation method

■ Carrying the controller

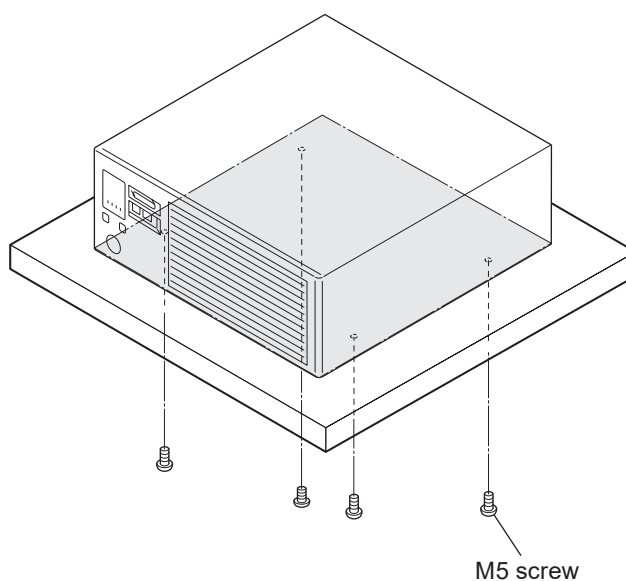
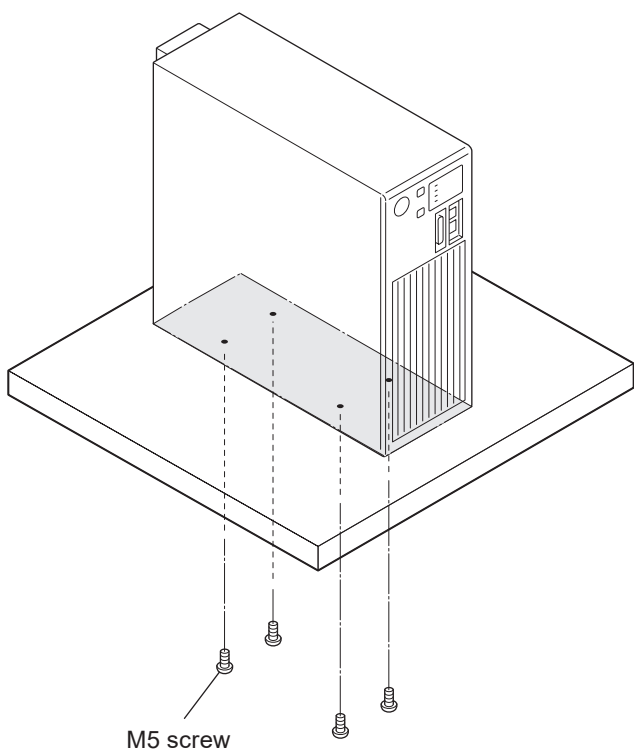
To carry the controller, hold the bottom of the unit with both hands.
Do not hold the cables or connectors at carrying this product.



■ Installation method

- The controller can be installed vertically or horizontally.
- When installing horizontally, install it with the key switch side of the controller down as shown in the figure below.
- For details of installation, refer to “1-4-2 Controller” (P.31).
- Fix the controller in the following conditions.

Fixing surface	Fixing screw	Screw insert length	Tightening torque
Bottom	M5 screws at 4 positions	4 mm to 6 mm	2.0 N·m
Left side (facing the front)			



Notice

- Do not insert any screw of length exceeding the specification. Otherwise, the failure of the product may be caused.
- Do not install the laser marker at a place where vibrations and shocks can be directly transmitted to it. In any environment where effects of vibration are concerned, take measures against vibration on the product.
- Do not install in any direction other than the above.

2-5 Expansion board installation

This section describes the procedure for installing the expansion board to the laser marker controller.

When the expansion board is installed to the controller, the following functions can be used.

- Connect a console or a commercially available monitor to the laser marker and use it for monitoring and setting during operation.

WARNING

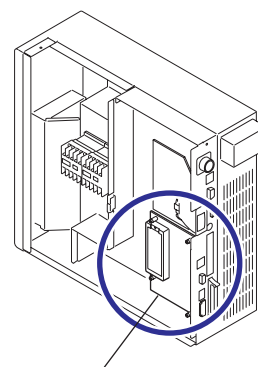
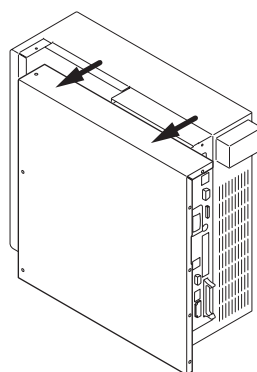
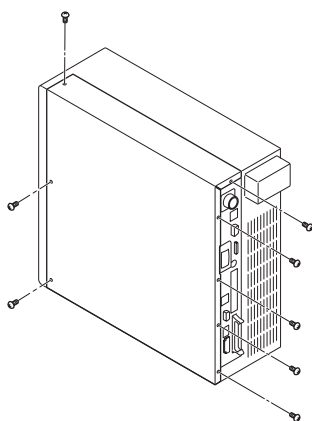


- Installation must be conducted with the power to the laser marker turned OFF, and the AC power cable disconnected. Doing so may cause exposure to the laser beam or electrical shock.
- Do not insert your hands or objects to the exhaust port of each unit or the gaps between units during the installation. This may result in injuries, electrical shock, or failure of the laser marker.

1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

2. Loosen the following screws and remove the side panel of the controller.

Five M3 screws on the back
One M3 screw on the top
Two M3 screws on the side

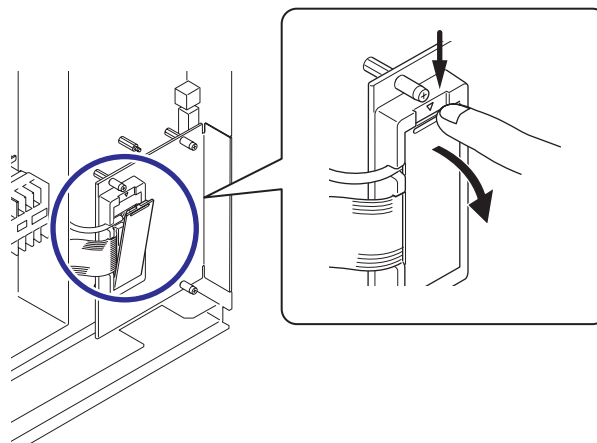


Installation position of the expansion board

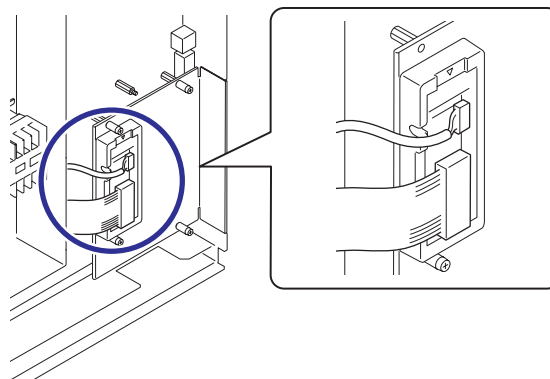
3. Remove the lid from the case at a location to which the expansion board is installed. Remove the lid by pulling it toward you with a ▼ marked portion kept pressed.

Notice

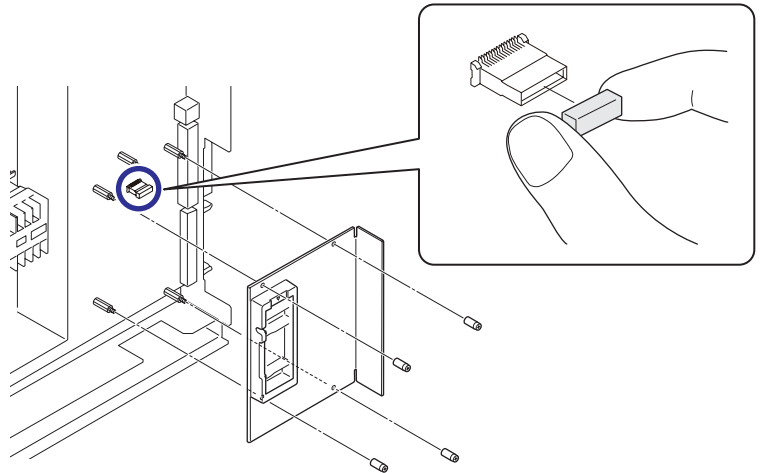
- Before the maintenance work, always discharge the static electricity by touching the grounded metal objects, etc. Static electricity can damage electrical components inside controller.
- Do not touch any other devices on the circuit board.



4. Disconnect the two types of cables that are connected inside the case.



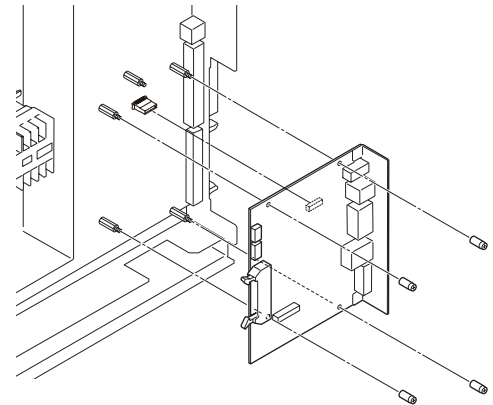
5. Loosen four M3 screws fixing the plate at the location, to which the expansion board is installed, and remove the circuit board from the controller.



6. Remove the protection cap from the connector located under the removed plate.

7. Install the expansion board to the location shown in the figure. Insert the connector on the back of the board into the connector of the laser marker and tighten the four M3 screws removed earlier into screw holes in four corners of the board.

Tightening torque: 0.5N·m

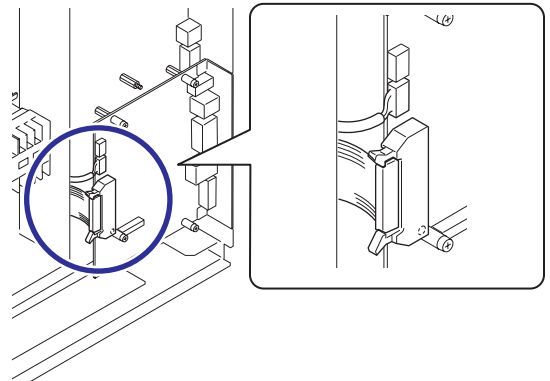


! Notice

- Before the work, always discharge the static electricity by touching the grounded metal objects, etc. Static electricity can damage electrical components inside controller.
- Do not touch any other devices on the circuit board.

8. Connect the cables disconnected earlier to two connectors of the expansion board.

Connect the cables without looseness. If they are not connected properly, the expanded functions cannot be used.

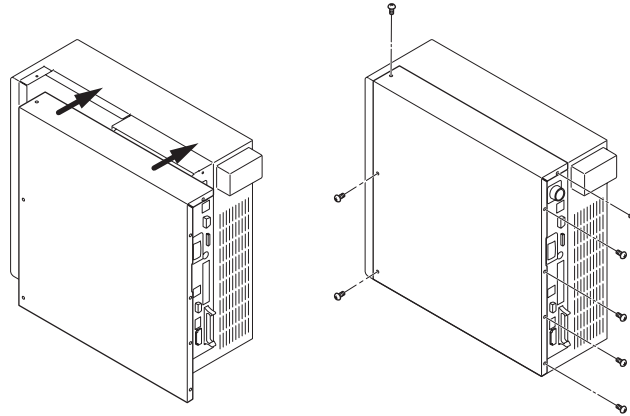


9. Tighten the following screws and install the side panel of the controller.

- Five M3 screws on the back
- One M3 screw on the top
- Two M3 screws on the side
- Tightening torque: 0.5N·m

! Notice

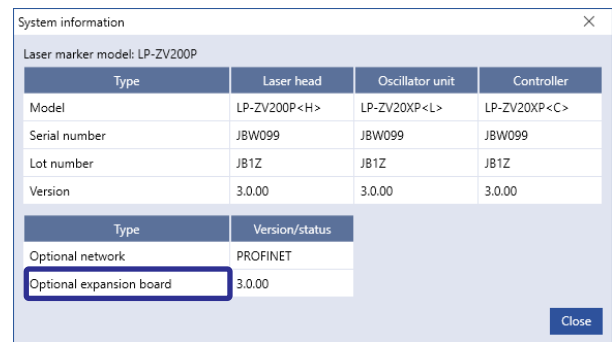
- Be careful not to let the inside cables get caught while installing.



10. Turn ON the power of the laser marking system and establish an online connected between your PC and the laser marking system.

Click the “System information” in the ribbon on the “System settings” screen.

Make sure that the “Optional expansion board” is displayed in the “System information”.



Reference

- If the first and second digits of the controller version number are not the same as the first and second digits of the optional expansion board version number, E783 warning occurs and disables the use of the product.

Item	Optional expansion board version	Controller version
Not available	<u>3.1.05</u>	<u>3.2.03</u>
Not available	<u>3.2.03</u>	<u>3.1.06</u>
Available	<u>3.2.03</u>	<u>3.2.04</u>

Update the firmware in the controller and expansion board. The software for updating the LP-RH/LP-ZV series, Laser Marker Firmware Updater, can be downloaded from the following website:

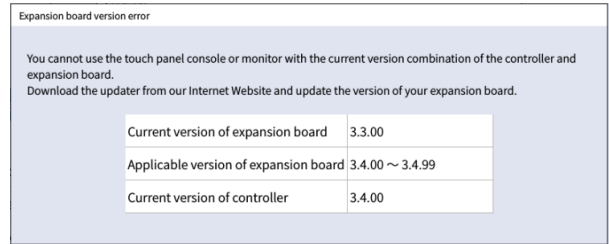
https://www3.panasonic.biz/ac/e/fasys/software_info/lasermarker/toi_lp-zv_firm.jsp

■ Measure to take when “Expansion board version error” dialog appears on the console

This dialog is displayed when the firmware version of the controller LP-RH/LP-ZV is not compatible with the firmware version of the expansion board LP-AEB10.

Update the firmware versions in the controller and expansion board. The software for updating the LP-RH/LP-ZV series, Laser Marker Firmware Updater, can be downloaded from the following website:

https://www3.panasonic.biz/ac/e/fasys/software_info/lasermarker/tol_lp-zv_firm.jsp



Reference

- Install the expansion board LP-AEB10 to the controller LP-RH/LP-ZV before performing the firmware updates.
- The firmware of both controller and expansion board will be updated to the versions bound in Laser Marker Firmware Updater.

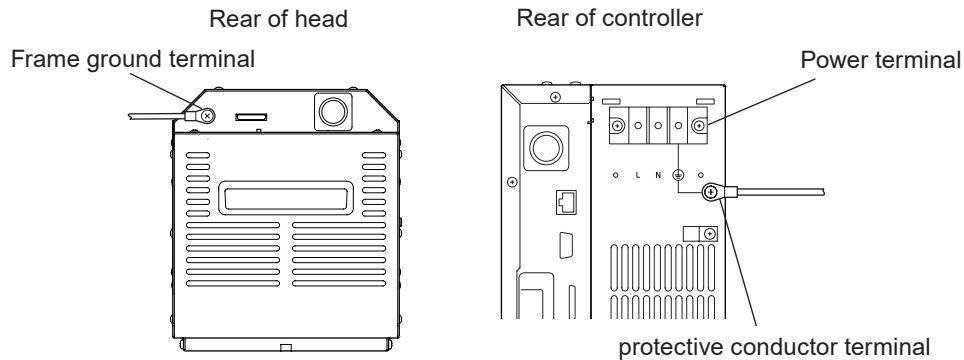
2-6-2 Power connection and earth (Grounding)

When connecting the power supply, be sure to perform earth (grounding) properly. Failure to do so may cause electrical shock in case of a failure or electrical leakage. Further, it may cause malfunction of the device.

The power supply terminal, protective conductor terminal and frame ground terminal are located as indicated below.

Reference

- The AC power cable is not included in this product. Use the specified optional cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product, which is compliant with the regulations and standards in the country or region where it is used. For the optional cables, refer to "1-4-3 Cables" (P.32).



WARNING



- Perform the connection of the Power Terminal with power-off state. Failure to do so may cause electrical shock.

1. Connect the frame ground terminal of the head and protective conductor terminal of the controller to the grounding part respectively.

Screw size: M4

Tightening torque: 1.0N·m

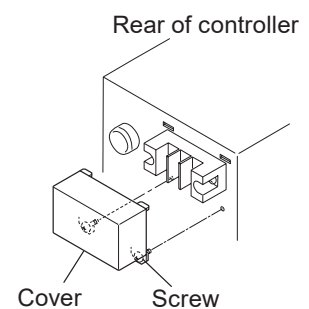
Protective conductor terminal and
Frame ground terminal



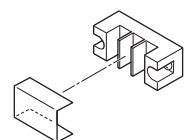
Notice

- Before connecting the power supply, connect the protective conductor terminal and frame ground terminal permanently to the grounding part.
- Connect the frame ground terminal to the negative ground.
- Install such that the housings of the controller and head are at the same electric potential.

2. Loosen two M3 screws of the cover of the power terminal and remove it.



3. Remove the resin cover on the terminal.

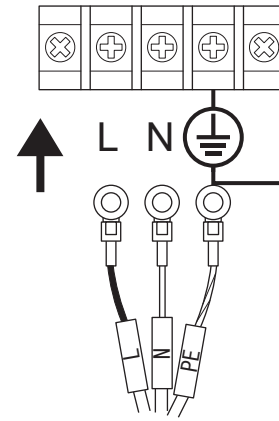


4. Connect the three wires to the terminals.

The signs of “L (black)”, “N (white)” and “PE (GND) (yellow/green)” show in the cables. Connect each cable to the appropriate terminal.

Screw size: M4

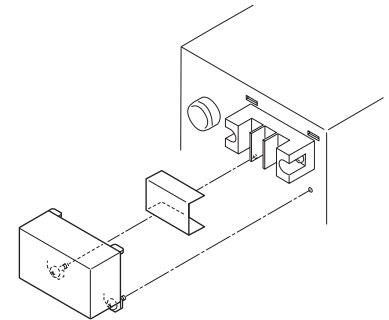
Tightening torque: 1.8N·m



! Notice

- For the AC power supply cable, use the specified optional AC power cable or a cable with the enough rating capacity to fulfil the power voltage specification of this product.
- Use a cable compliant with the regulations and standards in the country or region where it is used.

5. Attach the resin cover to the terminal.



6. Attach the power supply cover.

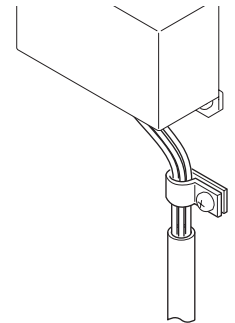
Screw size: M3

Tightening torque: 0.5N·m

7. Fix the AC power cable with the clamp.

Screw size: M4 screw

Tightening torque: 1.0N·m



8. Make sure that the cables and connectors other than the power supply are connected and then connect the AC power cable to the AC power supply.

Power voltage: 90V to 132V or 180V to 264V AC (including $\pm 10\%$ voltage fluctuations)

! Notice

- The earth terminal of the AC power cable must be permanently grounded.
- Set each connecting cable away from the device that generates high voltage, power line, and large switching surge as far as possible. If there may be any noise effect on the power supply, use the noise cut-off transformer.

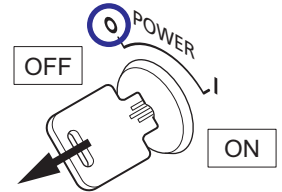
2-6-3 Restore of circuit protector

Two circuit protectors are mounted in front of the controller for the overcurrent protection.

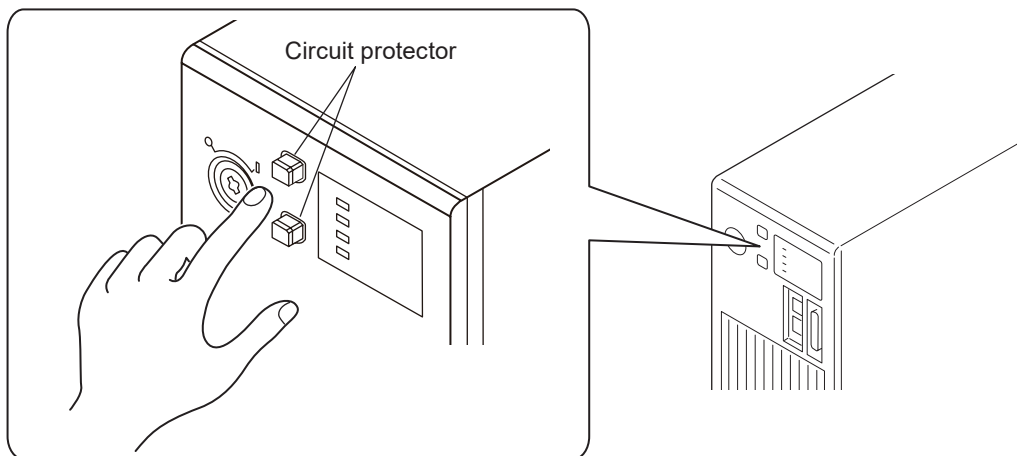
In case of the overcurrent, One or both circuit protectors pop out and cutoff current.

To recover the power supply of the laser marker, turn ON the switch of the circuit protector with the following procedures.

1. Remove causes of the overcurrent.
2. Turn OFF the key switch of the controller, and disconnect the AC power cable.



3. Push in the circuit protector (CIRCUIT PROTECTOR) on the front of the controller.



4. Connect the AC power cable and turn on the key switch. Confirm the laser marker starts up normally.

2-6-4 Connection of PC (Laser marker NAVI smart)

This product is set and operated with the PC with the PC configuration software “Laser Marker NAVI smart” installed and the laser marker connected.

■ Installation of laser marker NAVI smart

- “Laser Marker Smart Utility” that contains the software including Laser Marker NAVI smart and PDF manuals is available from our Internet website. Refer to “1-2-4 Download software and manual” (P.25).
- Install the Laser Marker NAVI smart in the following environment. For details about installation, please refer to the “Laser Marker NAVI smart Operation Manual”.

Item	Installation requirements
OS *1	Microsoft® Windows® 11 Pro 64bit Microsoft® Windows® 10 Pro 32bit, 64bit
Free area on hard disk	512MB or more
USB port *2	USB 2.0
LAN *3	10BASE-T or 100BASE-TX
Memory capacity	2GB or more
CPU	Equivalent to or higher than Intel Core i3
Display resolution	1366 x 768 pixels or above
Display size	10.6 inch or above
Others	Pointing device such as a mouse, character input device such as a keyboard

*1 : OS versions of which Microsoft has ended support are excluded. The CPU type, memory capacity, hard-disk space, and display function required to operate each OS should be provided in accordance with the recommendation of Microsoft. Laser Marker NAVI smart can be installed in English, German, Simplified Chinese or Japanese. It is preferred that the OS language corresponds to the installation language. If the OS language is other than these supported languages, install Laser Marker NAVI smart in English.

*2 : We do not guarantee the connection of all PC and laser marker.

*3 : Specifications to be observed for Ethernet connection.

Reference

- If PC goes into “Sleep” when the laser marker and PC are connected online, the online connection between them is disabled.
If PC goes into sleep state in the REMOTE mode or RUN mode, the PC is disconnected but the operation state of the laser marker (REMOTE mode or RUN mode state) are maintained.
- To maintain the online connection, release the sleep setting of the PC.

■ Connection type

With one of the following methods you can connect a PC with Laser Marker NAVI smart installed and the laser marker.

Reference

- One PC can be connected with multiple laser markers. However, only one laser marker can be connected with Laser Marker NAVI smart online. In this case, switch the online connected model on the Laser Marker NAVI smart and perform setting and control for each laser marker. It is not allowed to set and control multiple laser markers simultaneously from one PC.
- For the procedure to connect the laser marker and Laser Marker NAVI smart online, refer to “3-3-3 How to establish online connection” (P.76).

① USB connection

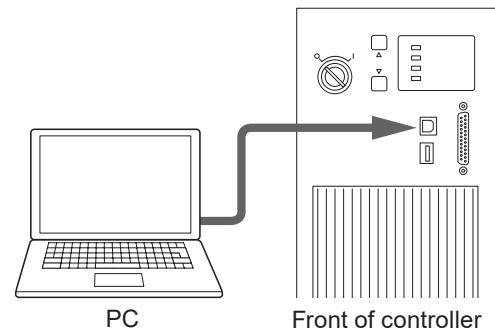
Connect the attached USB cable to the USB port B on the controller.
Multiple laser markers can be connected via a USB hub, etc.

Notice

- Do not disconnect the USB cable when the laser marker is connected online.

Reference

- When grounding the F.G. of the PC, ground it so that it is at the same potential as the F.G. of this product.

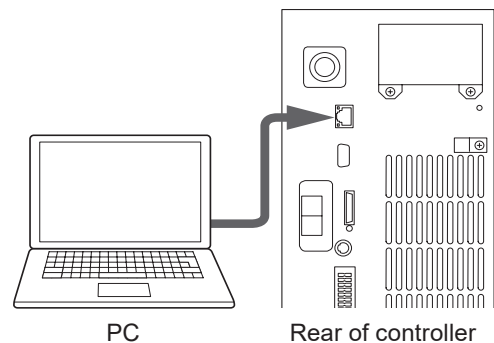


② Ethernet connection

Connect the LAN cable to the Ethernet port on the controller.
For details of specifications and connection of the Ethernet port, refer to “5-3 Ethernet” (P.143).

Reference

- For Ethernet online connection, connect the laser marker and PC via USB cable in advance and configure the laser marker communication settings. Refer to “Setting procedure for Ethernet online connection” (P.77).
- The Ethernet port can be connected with the following devices simultaneously via a HUB or a router.
 - PC configuration software
 - External device for communication command control (PLC and PC for control)
 - Specific image checker
- Connect the LAN cable to the port marked “LAN” on the rear of the controller. The other ports for the optional network unit (EtherNet/IP or PROFINET) and the port on the optional expansion board (INFO LAN) cannot be used to operate Laser Marker NAVI smart.



2-6-5 Connection of Console

This product can be used for monitoring and setting during operation by connecting the touch panel console LP-ADP50 (sold separately). Touch panel console is available when the optional expansion board is installed to the controller. Refer to “2-5 Expansion board installation” (P.55).

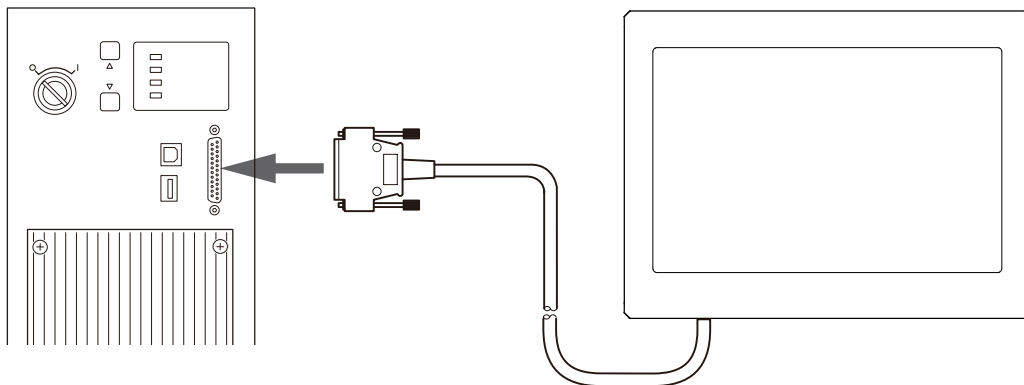
■ Connection procedure

1. Turn off the key switch of the controller.

! Notice

- Do not connect or disconnect the console while the laser marker is powered on.

2. Connect the console to the console connector (CONSOLE) on the front of the controller.



↓ Reference

- When using the console, you need to set it in advance with Laser Marker NAVI smart. For details, refer to “Console Operation Manual”.
- When operating the laser marker using a touch panel console or a commercially available monitor, turn off the power of the laser marker and connect these display devices. If the touch panel console or a commercially available monitor shows nothing after turning on the power of the laser marker, make sure that the cables inside the controller are connected to the expansion board correctly.

2-6-6 Connection of Monitor and Mouse

This product can be used for monitoring and setting during operation by connecting a commercially available monitor and mouse. The monitor and mouse are available when the optional expansion board is installed to the controller. Refer to “2-5 Expansion board installation” (P.55).

■ Available monitor and USB mouse

Use a monitor and mouse that meet the following specifications.

Item	Contents
Monitor resolution	1280 × 1024 or 1440 × 900
Monitor input terminal	VGA terminal (D-sub15 pin)
Mouse	Human interface device (HID) class USB mouse

! Notice

- When using the monitor and mouse, check the operation in advance. We do not guarantee the operation of all VGA monitors and USB mice.
- Do not connect or disconnect the monitor while the power is on.
- The USB hub cannot be used.

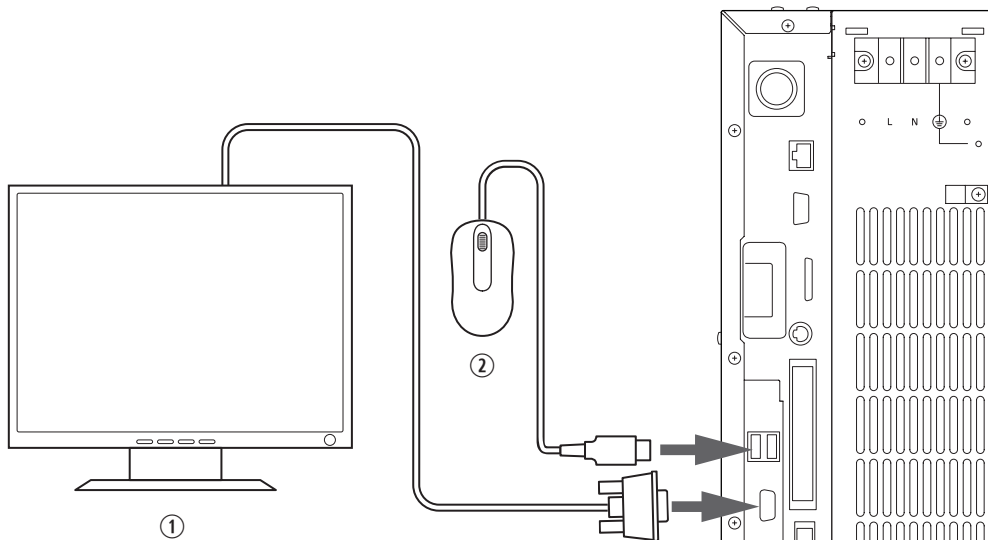
■ Connection procedure

1. Turn off the key switch of the controller.

! Notice

- Do not connect or disconnect the monitor and mouse while the laser marker is powered on.

2. Connect the monitor and mouse to the following connector on the back of the controller.



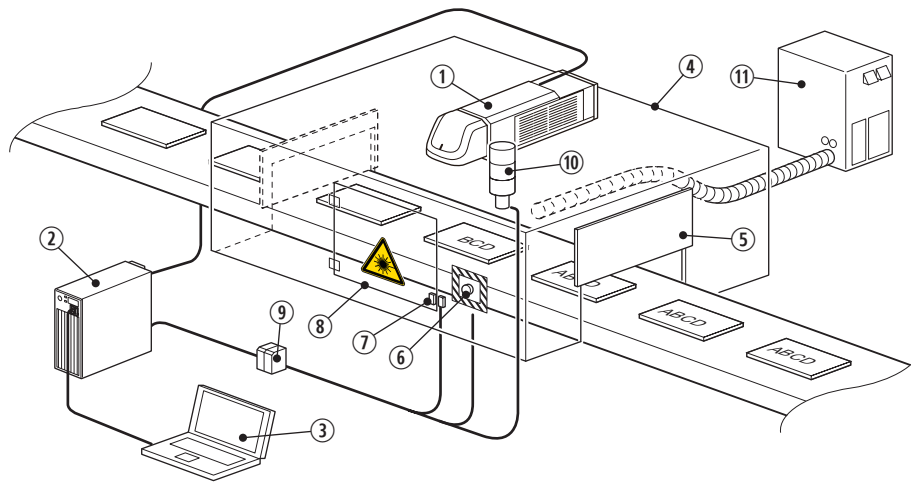
No.	Connected device	Connector
①	Monitor	VGA connector
②	Mouse	USB port A

↓ Reference

- USB connector A has one port on the front and two ports on the rear of the controller. A USB mouse can be connected to either port.

2-7 Construction of System

The following figure shows the construction sample of the system.



No.	Description	Installation and control sample
①	Laser marker head	-
②	Laser marker controller	-
③	PC for laser marker setting/monitoring	-
④	Protective enclosure	-
⑤	Laser protection shutter for workpiece gateway	Construct a control system which will separate (cut off) the laser beams or shut off the laser power when it is opened.
⑥	Emergency stop button	Construct a control system for shutting off the laser power source when it is opened.
⑦	Safety switch	
⑧	Door for the maintenance	
⑨	Safety relay unit or safety PLC, etc.	Connect both INTERLOCK 1 (X16, X17) and INTERLOCK 2 (X18, X19) of the laser marker to the devices ⑤ to ⑧ using the relay output terminal of the safety relay unit or the safety PLC. Besides INTERLOCK terminals, it can also be connected to other I/O signals such as LASER STOP terminals with the devices ⑤ to ⑧ depending on the control specifications.
⑩	Laser radiation warning light	To indicate the laser marker status, connect the output signals such as ALARM OUT (Y15), LASER SUPPLY OUT (Y20) or LASING OUT (No.40) to the light.
⑪	Dust exhauster	Place the intake vent of the exhauster as close as possible to the marking position of the workpieces.

! Notice

- INTERLOCK terminals (X16, X17 and X18, X19) are connected to the operating coil of the internal contactor in the controller. Connect INTERLOCK (+) and INTERLOCK (-) in the I/O terminal with the non-voltage contact (dry contact) such as a relay or a switch. Do not connect with the voltage contact such as a transistor.

Reference

- When constructing a system compatible to ISO11553-1/ISO13849-1, construct the redundant interlock system by using both INTERLOCK 1 (X16, X17) and INTERLOCK 2 (X18, X19) connected to safety PLC or safety relay unit to shut off the laser power supply in accordance with the standards.

3 Operation Method

3-1 Type of Operations

The laser marker can be controlled by the following method:

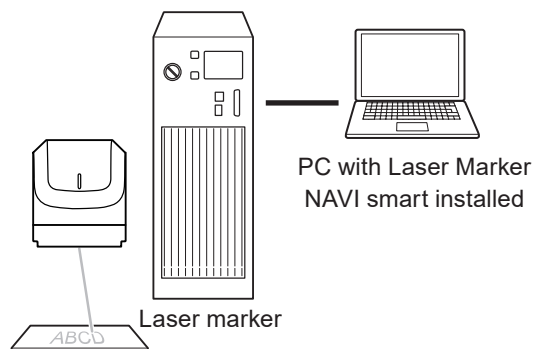
Control by the PC configuration software “Laser Marker NAVI smart”

Establish an online connection of the laser marker and Laser Marker NAVI smart (PC). You can control the operations such as laser pumping or marking on the Laser Marker NAVI smart screen.

To irradiate the laser by the PC configuration software control, select the marking methods from the followings:

- Test marking

The mode where you execute the laser radiation manually. Please use this mode when you configure the marking conditions at the laser marker installation or when you want to irradiate the laser while editing the marking data by Laser Marker NAVI smart, such as during the maintenance work.

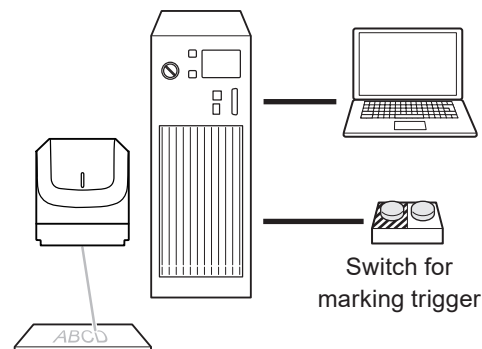


- RUN mode

Run mode is an operation method to configure the settings of the laser marker by Laser Marker NAVI smart and to control the marking start signal from one of the following methods.

- External devices such as switches or sensors connected to I/O terminal
- Clicking the marking start button of the Laser Marker NAVI smart screen

Use this operation mode to configure the laser marker without using the external control devices as PLC.



Reference

- Refer to “3-3-6 Test marking and RUN mode” (P.82).
- You can edit marking data with Laser Marker NAVI smart even when it is not connected to the laser marker (offline).
- For the operation method of Laser Marker NAVI smart, please refer to the “Laser Marker NAVI smart Operation Manual”.

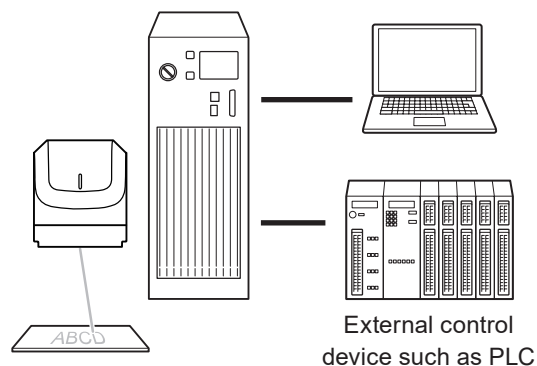
Control by external devices (remote control mode)

The operation method for automatic control.

I/O or communication commands control the operations such as laser pumping and marking by connecting the laser marker to the external control device as PLC.

The following external control methods are available. These controls can be combined.

- I/O control
- Communication command control (RS-232C/Ethernet)
- Link control with image checker (Ethernet)
- Link control with code reader (RS-232C)
- Control by the optional industrial network (EtherNet/IP or PROFINET)



Reference

- For details on the external control, refer to “3-4 Operation by External Devices” (P.84).
- The link control with an image checker is not available at on-the-fly marking.
- Be sure to evaluate the marking quality and operation before starting full-scale operation. Changing parameters may cause unintended results.

3-2 Start-up & Termination

WARNING



- It is obligated by IEC/FDA/JIS that laser products shall incorporate a key-actuated master control. Actuation of this laser marker is basically controlled by the key switch located on the front of the controller box. However, in considering situations when the laser marker is operating as a part of a larger system, the laser marker turns on if the key switch is already in ON position, and power is supplied. In this case, be sure that the external system controls the operation of the laser marker with a key-actuated master control.

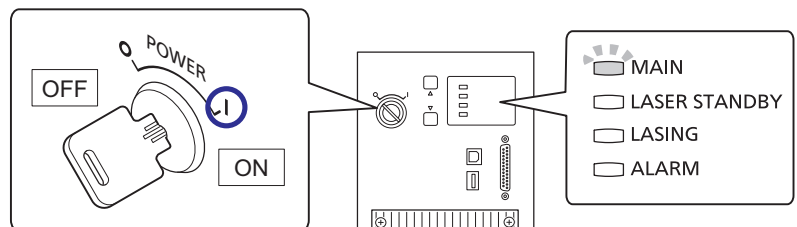
3-2-1 Start-up procedure

1. Setup the laser marker connecting head and controller and interfaces.

Refer to “2-6 Connecting Laser Marker” (P.59).

2. Turn ON the key switch of the controller.

The MAIN power indicator of the controller flashes.



3. The system startup completes approximately after 10 seconds.

The MAIN power indicator of the controller changes from blinking light to steady light.

Notice

- Do not set the key switch to OFF until system startup has been completed.
 - In case of turning ON the power supply after turning OFF, leave the interval five seconds or more between ON and OFF.
 - In case the controller cannot startup with the ALARM indicator flashing (cannot connect online to Laser Marker NAVI smart), contact our sales office or representatives.
4. To configure and control by the PC configuration software, start Laser Marker NAVI smart and establish an online connection with the laser marker.
 - In Windows 11, open the start menu and select “All Apps” - “Panasonic-ID SUNX Laser” - “Laser Marker NAVI smart”.
 - In Windows 10, open the start menu and select “Panasonic-ID SUNX Laser” - “Laser Marker NAVI smart”.Refer to “3-3-3 How to establish online connection” (P.76).

3-2-2 Termination procedure

1. Turn OFF the laser pumping.

- PC configuration software control: Click “Laser pumping” on the ribbon to turn off the laser pumping.
- Remote control: Turn off the laser pumping by LASER SUPPLY IN (X6) of I/O terminal or by the laser pumping command (LSR).

“Laser pumping” tool



ON status



OFF status

2. Overwrite the data as needed.

Click “Save” on the ribbon and select “To laser marking system” or “To PC”.

If turning off the power of the laser marker without saving the file under dealing, the data being edited is deleted. Be sure to check the file saving before turning off the power.



“Save” tool

3. Disconnect the online connection.

Refer to “3-3-4 How to disconnect online connection” (P.78).

! Notice

- Do not turn the laser marker power OFF while being connected to online. When the power gets turned OFF during data communication, it may cause the data to corrupt or system failure.

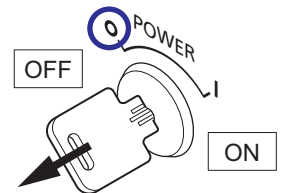
4. Exit from the Laser Marker NAVI smart.

Select “X” in the upper right corner of the screen.

Alternatively, go to the “Startup” screen and select “Exit” from the menu.

5. Turn OFF the key switch of the controller and remove the system key.

Please have the safety manager store the system key properly.



3-3 Operation by PC Configuration Software

You can configure the following settings and operations with Laser Marker NAVI smart respectively when the laser marker is not connected (offline) and when the laser marker is connected (online).

■ Offline editing

The followings are supported in the offline editing.

- Create a new marking file or a backup file.
- Edit the existing marking file or backup file on a local or network drive.

■ Online operations

When you perform the following operations and settings, establish an online connection of the laser marker and Laser Marker NAVI smart.

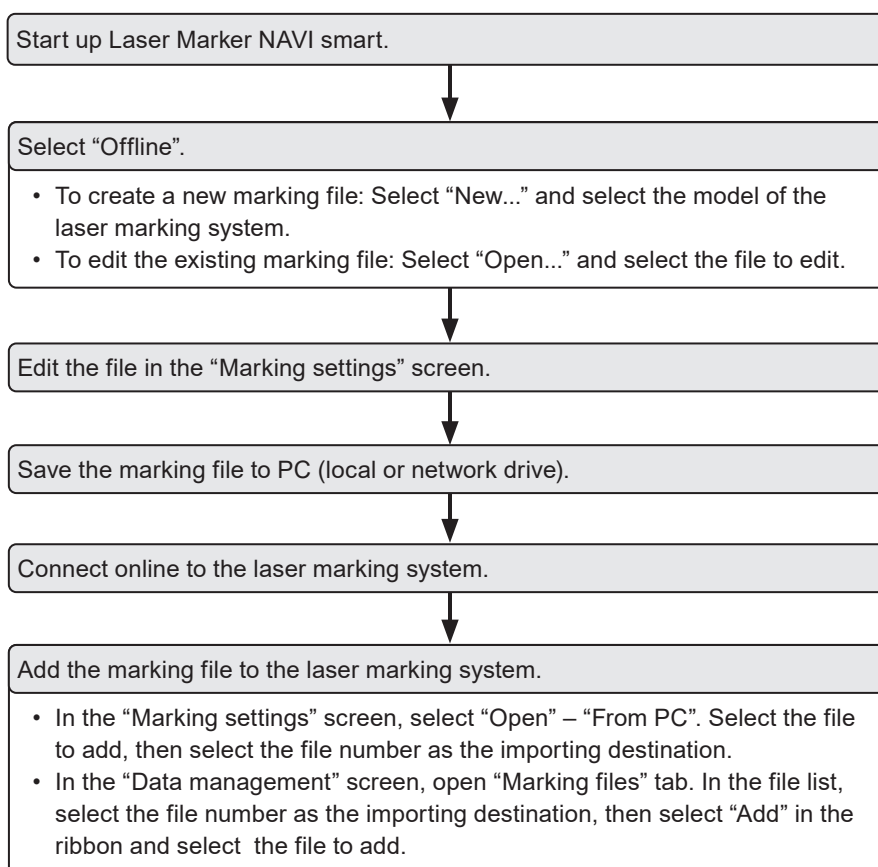
- Control the laser marker by the PC configuration software.
- Edit the data registered to the laser marker.
- Register the marking file created to the laser marker, etc.

Reference

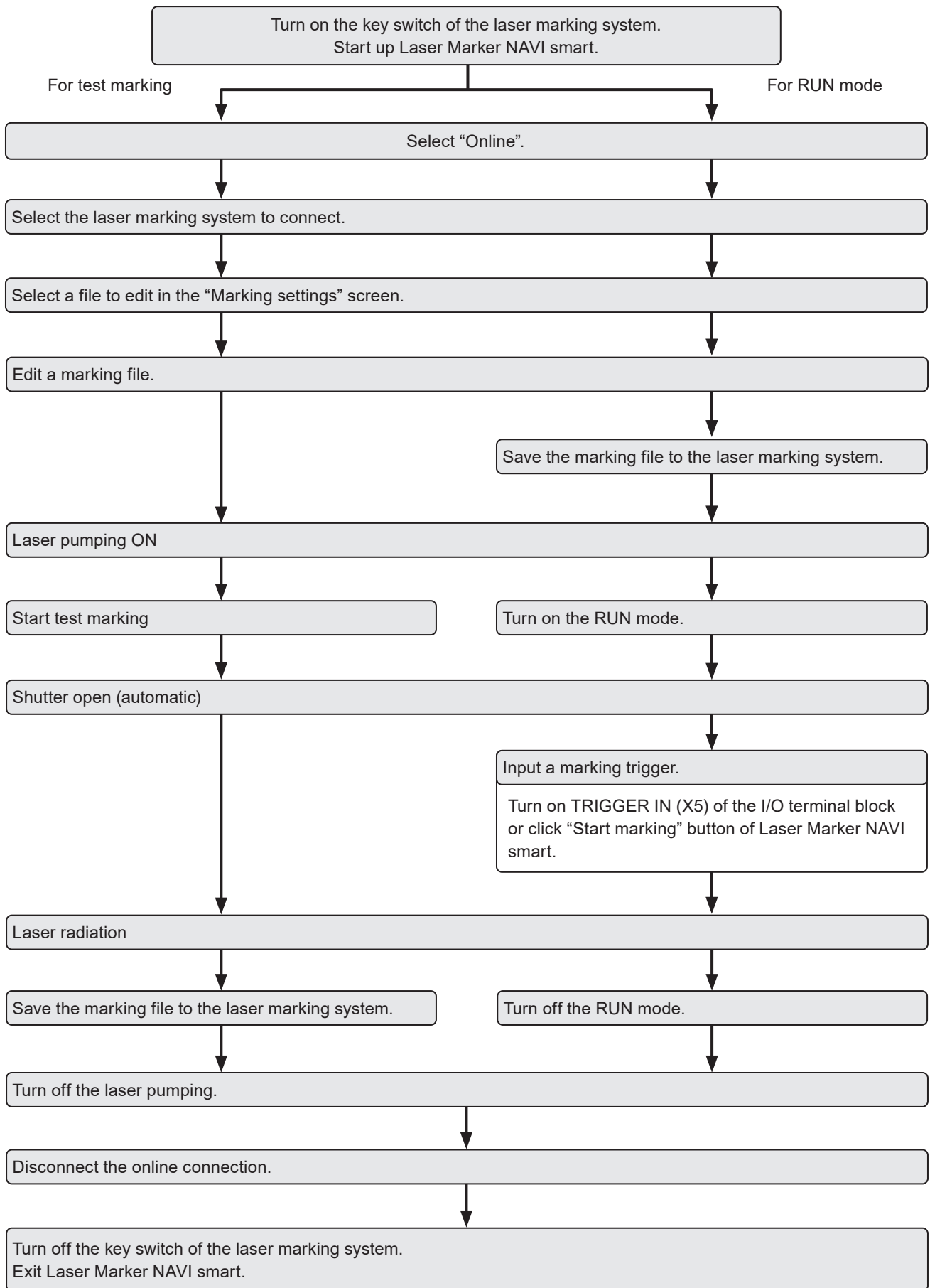
- Only one unit of laser marker can be connected to Laser Marker NAVI smart online at once. If more than one laser marker is connected to one PC, switch the laser marker connected online using Laser Marker NAVI smart to configure/control each laser marker.
- For details of how to operate with the console, monitor, or mouse, refer to the “Console Operation Manual”.

3-3-1 Operation procedure

■ Offline editing: Operation example from offline editing to laser marker data registration



■ Online connection: Operation example from editing to marking



3-3-2 Screen types

Laser Marker NAVI smart has the different screen mode depending on the settings and operation contents.

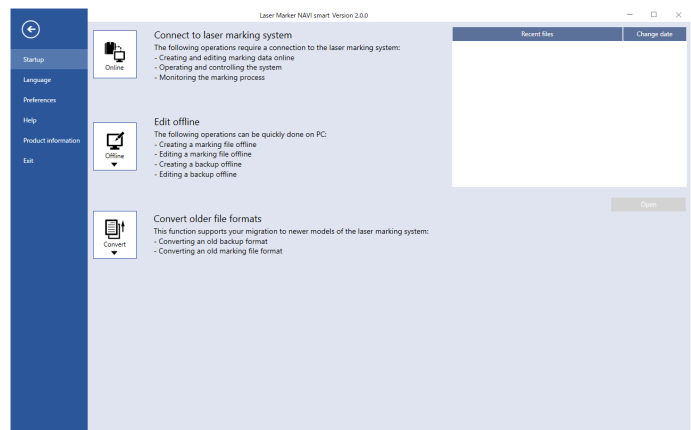
The availability of screens depends on the application mode and the user role (administrator or restricted user) as follows:

- In online mode, the user is “Administrator”:
“Startup”, “Marking settings”, “Monitor”, “Maintenance”, “Data management”, “System settings”
- In online mode, the user is “Restricted user”:
“Startup”, “Marking settings” (for the restricted user), “Monitor”, “Maintenance”
- In online mode, remote mode or RUN mode is ON:
“Startup”, “Monitor”
- In offline mode, at backup editing:
“Startup”, “Marking settings”, “Maintenance”, “Data management”, “System settings”
- In offline mode, at a marking file editing:
“Startup”, “Marking settings”

■ Startup screen

This screen appears when you start up Laser Marker NAVI smart.

Select the usage of Laser Marker NAVI smart from “Online”, “Offline”, or “Convert”.

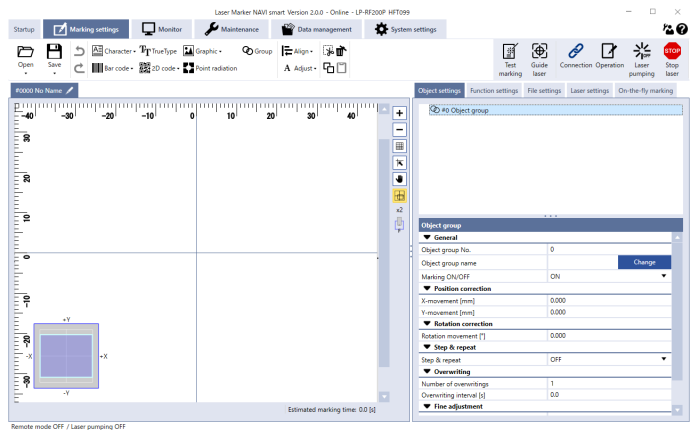


■ Marking settings

In this screen, you can create and edit a marking file. If the user role is “Restricted user”, only the settings allowed to edit are available.

Main usages:

- Create new marking data.
- Edit the marking data (individual files or backup file) saved in external device or local folder. (offline)
- Edit the marking data registered to the laser marker (online).
- Execute the test marking. (online)

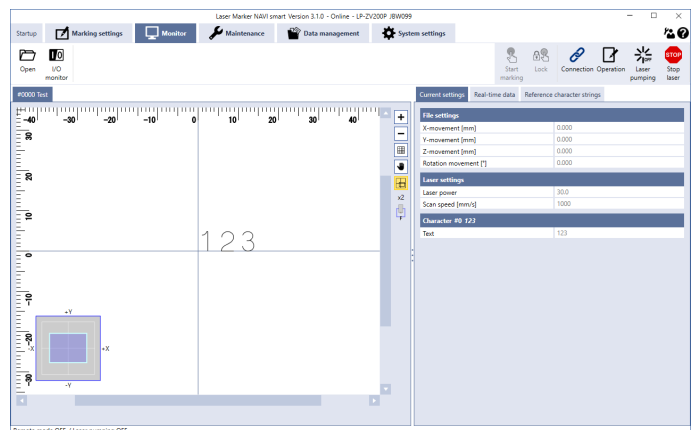


■ Monitor

In this screen, you can monitor the operation status of the laser marking system during remote mode or RUN mode.

Main usages:

- Check the marking image.
- Check the settings.
- Check the ON/OFF state of I/O.



■ Maintenance

This screen is used for the maintenance of the laser marking system.

Main usages:

- Check the operating time data.
- Measure the laser output using a power meter available in stores.
- Simulate ON/OFF operation of the output signals
- Confirm the communication command history.

Type	Status	Reference cycle for maintenance
Controller operating time [h]	117	---
Laser pumping time [h]	17	30000
Laser radiation time [h]	10	---
Number of shutter cycles	1192	2000000
Number of power-on times	354	---
Fused fan operating time [h]	117	---
Controller fan operating time [h]	117	FCGT
Battery status for system clock	Normal	---
Number of marking processes	627	---
Number of switching cycles of INTERLOCK contactors	655	1000000

Type	Announcement	Next maintenance	Done	Change	Last maintenance
Air filter replacement	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	---
Laser emission port cleaning	<input checked="" type="checkbox"/>	In 24 hours of controller operating time	Done	Change	2020-04-01 01:01

■ Data management

This screen lists all files that are currently saved on the laser marking system.

Main usages:

- Add/delete a marking file, graphic or font file.
- Acquire the backup of data saved in the laser marker.
- Restore the backup data to the laser marker.

No.	File name	Size (bytes)	Change date	Preview
0000	test	360	2020-03-11 17:02:07	
0001				
0002				
0003				
0004				
0005				
0006				
0007				
0008				
0009				
0010				
0011				
0012				
0013				
0014				
0015				
0016				
0017				
0018				
0019				

■ System settings

In this screen you set the system properties of the laser marking system.

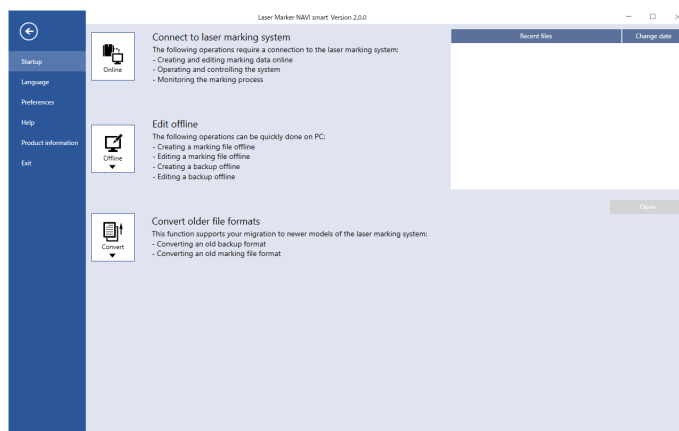
Main usages:

- Change the time of the system clock.
- Configure the input to and output from the external device and the communication settings.
- Select the setting items to display in the "Monitor" screen.
- Select the editable settings for the restricted user.
- Configure the laser power and offset value of the marking position for all the data in the laser marker.

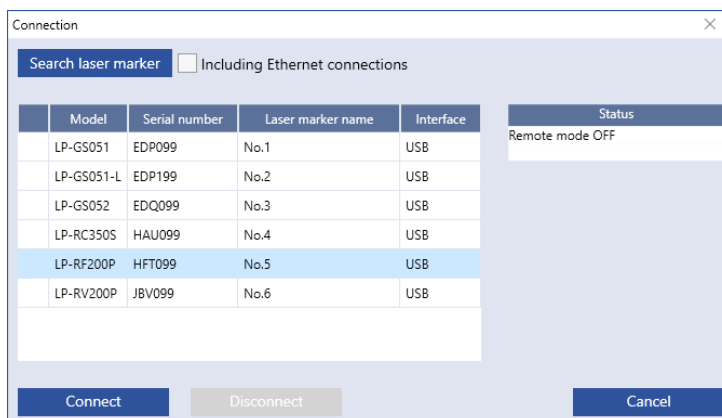
System clock configuration	Inputs/Outputs	Communication	Linked device	Access permissions
System clock System clock: 2020-06-10 16:31:47 Change Time First day of the week: Sunday First week of the year: Week of January 1 Naming of laser marker Laser marker name: Change Advanced system settings Advanced system settings: Open settings Console/monitor User login at startup: Restricted user Screen refresh method of "Monitor" screen: Auto Refresh interval of "Monitor" screen [s]: 0.5 Default layout of "Monitor" screen: Standard Resolution (DGA): 1280x1024 Screen timeout: Disabled				Operation Error handler: ON Remote mode switching method: Configuration software Remote mode at power-on: OFF Laser pumping control: I/O Shutter operation control: I/O Guide laser display control: I/O INTERLOCK alarm detection: Activate always under remote mode Compatibility with former models Compatible mode: OFF

3-3-3 How to establish online connection

1. Connect the laser marker and the PC with a USB cable. Start the laser marker.
2. Start the Laser Marker NAVI smart. The startup screen appears.



3. On the “Startup” screen, select “Online” to open the “Connection” dialog.
Any laser marking system that is ready for an online connection is displayed in the list.
If the desired laser marking system is not in the list, select “Search laser marker”.



4. Select the laser marking system that you want to connect and select “Connect”. When the online connection is established, the “Marking settings” screen appears.

Notice

- Do not remove the USB cable or LAN cable while the online connection with the laser marker is active.
- Do not turn the laser marker power OFF while being connected to online.

Reference

- If PC goes into “Sleep” when the laser marker and PC are connected online, the online connection between them is disabled.
If PC goes into sleep state in the REMOTE mode or RUN mode, the PC is disconnected but the operation state of the laser marker (REMOTE mode or RUN mode state) are maintained.
- To maintain the online connection, release the sleep setting of the PC.
- If the version of using Laser Marker NAVI smart does not support the connecting laser marker model, some functions and operations cannot be set or executed online.

■ Setting procedure for Ethernet online connection

For communication between the laser marker and PC terminal using Ethernet, you need to configure the following communication settings first.

1. Connect Laser Marker NAVI smart and laser marker to online via a USB cable.

2. Go to the “System settings” screen and select “Communication” tab.

Input the Ethernet settings according to the network settings.

Set a separate IP address not to overlap between the laser marker and PC on the network.

Ethernet	
IP address	192.168.1.5
Subnet mask	255.255.255.0
Default gateway	192.168.1.13
Port for PC configuration software	9093
Port for communication commands	9094
MAC address	00-11-22-33-44-55

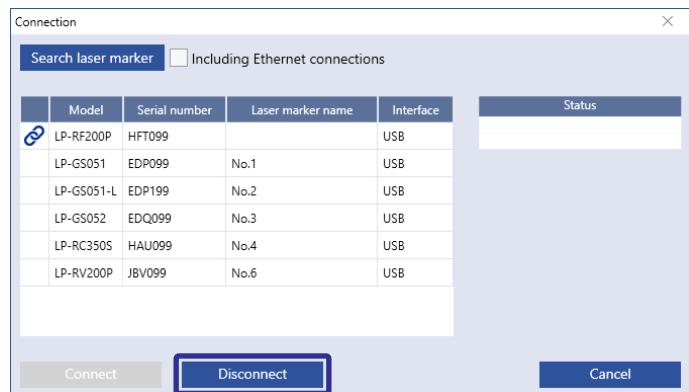
3. Select “Apply to laser marking system” on the left side of the ribbon.



“Apply to laser marking system” tool

4. Select the “Connection” tool in the ribbon.

5. In the “Connection” dialog, select “Disconnect”. The online connection with the laser marking system is now disconnected.

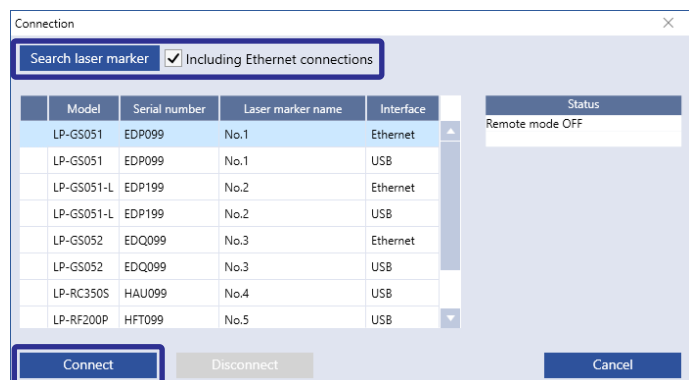


6. Turn off the power of the laser marking system, wait five seconds and then restart the system.

7. On the “Startup” screen, select “Online” to open the “Connection” dialog.

8. To use the Ethernet connection, select “Including Ethernet connections”, and then select “Search laser marker”.

Check that an Ethernet connection appears in the list.



9. Select the laser marking system that you want to connect and select “Connect”. When the online connection is established, the “Marking settings” screen appears.

3-3-4 How to disconnect online connection

Notice

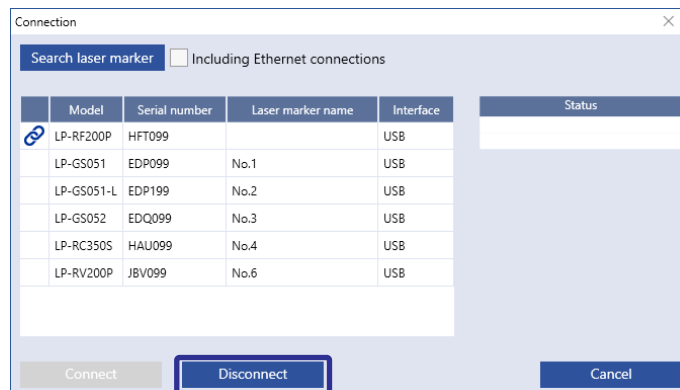
- Disconnect the online connection before turning the laser marker power OFF.

1. Select the “Connection” tool in the ribbon or go to the “Startup” screen and select “Online”.



2. In the “Connection” dialog, select “Disconnect”.

The online connection with the laser marking system is now disconnected.



3-3-5 User selection and password settings

In online mode, you can select between two user roles “Restricted user” or “Administrator”.

If you have configured the password on the “System settings” screen, you are required to enter the password when you log in as an “Administrator”.

As “Administrator” you have access to all screens and settings. As “Restricted user” the access to screens and settings is restricted. The parameters allowed to edit can be configured in the “System settings” screen in advance.

Notice

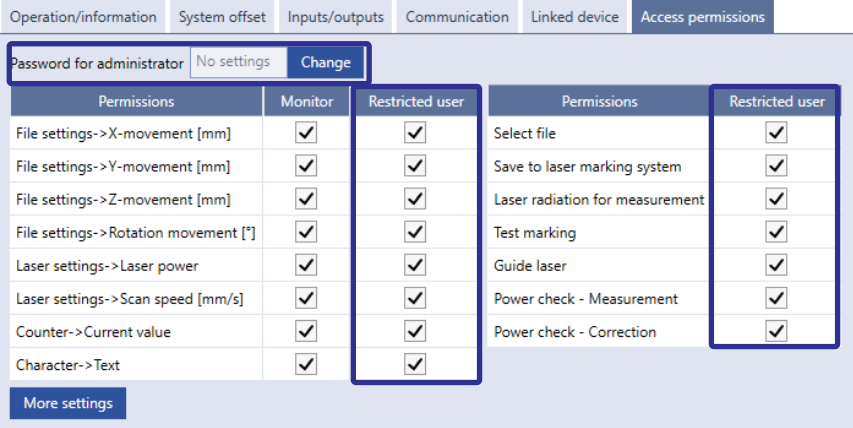
- The password protection of this configuration software is designed for the purpose to prevent a wrong configuration or unintended operation. You cannot use this password for security purpose.

Reference

- In offline mode, the user is fixed to “Administrator”.
- The available screens of Laser Marker NAVI smart vary depending on the user role and operating mode. Refer to “3-3-2 Screen types” (P.74).
- When setting the laser marking system using the optional touch panel console or a commercially available monitor, you can edit only items that permitted to “Restricted user”.

■ Configure permissions for the restricted user

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “System settings” screen.
3. Select “Access permissions” tab and configure the permissions.
 - Set the password for administrator.
 - Add or remove a permission to edit parameters with the “Restricted user” profile.



Permissions	Monitor	Restricted user	Permissions	Restricted user
File settings->X-movement [mm]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Select file	<input checked="" type="checkbox"/>
File settings->Y-movement [mm]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Save to laser marking system	<input checked="" type="checkbox"/>
File settings->Z-movement [mm]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Laser radiation for measurement	<input checked="" type="checkbox"/>
File settings->Rotation movement [°]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Test marking	<input checked="" type="checkbox"/>
Laser settings->Laser power	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Guide laser	<input checked="" type="checkbox"/>
Laser settings->Scan speed [mm/s]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Power check - Measurement	<input checked="" type="checkbox"/>
Counter->Current value	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Power check - Correction	<input checked="" type="checkbox"/>
Character->Text	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Reference

- For details, refer to the “Laser Marker NAVI smart Operation Manual”.
4. Select “Apply to laser marking system” on the left side of the ribbon. The password and permissions will be updated in the laser marking system.



“Apply to laser marking system” tool

■ Switch the user

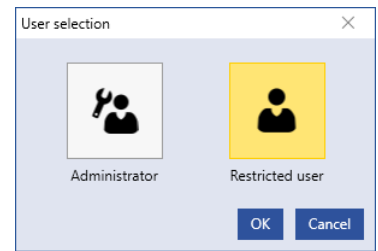
1. Select the user icon on the upper right of the screen.

The “User selection” dialog appears.



2. Select the user from “Restricted user” or “Administrator”, and select “OK”.

To select the “Administrator”, enter the password if it was set and select “OK”.
The password is also required when you establish an online connection between your PC and laser marking system.



■ When password is forgotten

If you have forgotten the password for the administrator, delete the password according to the following procedure:

1. If the laser marker is in the remote mode, turn the remote mode OFF.

To deactivate remote mode, select the “Operation” in the ribbon.
In the dialog, select “Remote/RUN OFF”.

“Operation” tool



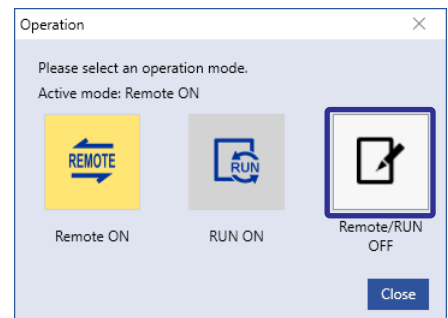
Remote mode ON



Remote mode OFF

! Notice

- Do not delete the password with the remote mode ON.



2. Exit the Laser Marker NAVI smart when it is started up.

3. Double-click and execute “ClearPassword.exe” included in the installation folder (Laser Marker Smart Utility - Tools) of “Laser Marker Smart Utility”.

If you specify the installation destination of Laser Marker NAVI Smart Utility to the default folder, you can find “ClearPassword.exe” at the following location.

C:\Program Files (x86)\Panasonic-ID SUNX Laser\Laser Marker Smart Utility\Tools\ClearPassword\ClearPassword.exe

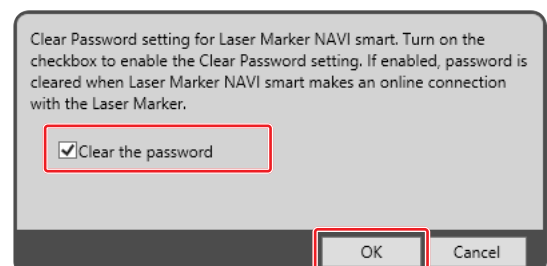
or

C:\ProgramFiles\Panasonic-IDSUNXLaser\LaserMarkerSmartUtility\Tools\ClearPassword\ClearPassword.exe

Reference

- During the “ClearPassword.exe” running, it does not matter whether the laser marker and PC are connected or not.

4. Check the box next to “Clear the password” on the screen displayed, and then, click “OK”.



- Start Laser Marker NAVI smart and establish an online connection with the laser marker of which password setting you want to delete.

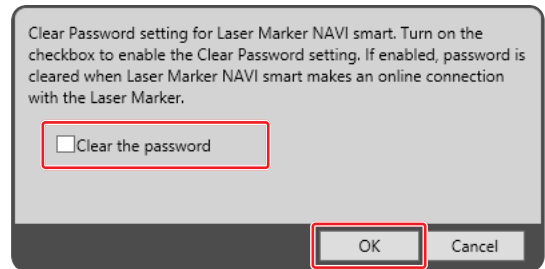
This deletes the password, and the password will not be required to log in as an administrator.

- Exit from the Laser Marker NAVI smart.

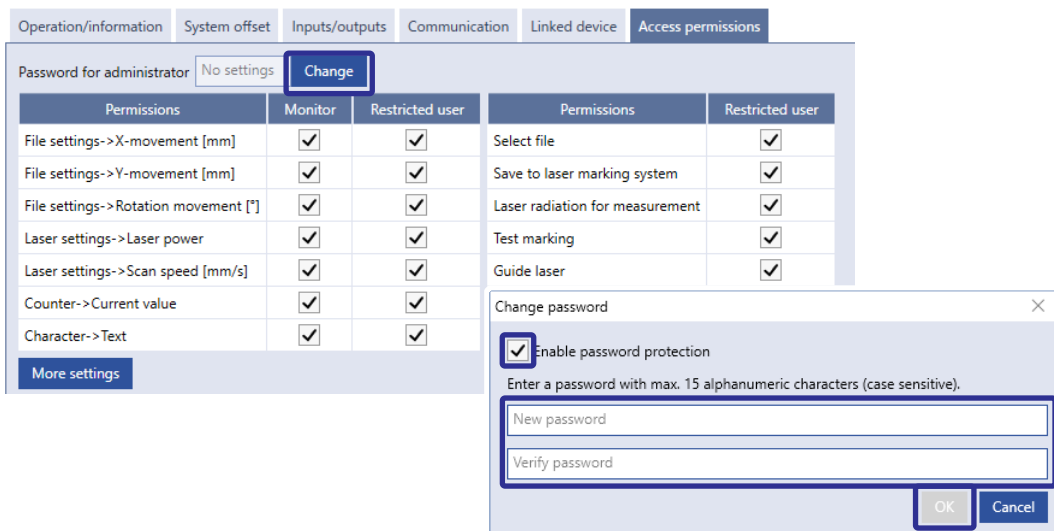
- Execute ClearPassword.exe again. If “Clear the password” remains enabled, then, click “OK”.

Notice

- If “Clear the password” remains enabled, the password will be deleted when connected to online even without executing ClearPassword.exe. Make sure to uncheck the box next to “Clear the password”.



- To reconfigure the password, start Laser Marker NAVI smart and select the “System settings” screen. Select the “Access permissions” tab and enter the password for the administrator.



Reference

- For details on the system settings, please refer to the “Laser Marker NAVI smart Operation Manual”.

- Select “Apply to laser marking system” on the left side of the ribbon. The password protection becomes valid.



“Apply to laser marking system” tool

3-3-6 Test marking and RUN mode

When you execute marking using the PC configuration software control, the laser irradiates in the following methods:

■ Test marking procedure

Test marking is a marking method of radiating laser by the operations on the Laser Marker NAVI smart.

1. Establish an online connection between your PC and the laser marking system and go to the “Marking settings” screen.

2. Select “Laser pumping” in the ribbon to turn on the laser pumping.

“Laser pumping” tool



ON status



OFF status

3. Click “Test marking” in the ribbon.

The “Test marking/guide laser” dialog appears.



“Test marking” tool

4. Specify the laser settings such as “Laser power” and “Scan speed [mm/s]”, then select “Start marking”.

5. A confirmation dialog of the laser radiation appears. Click “Yes” to start radiating the laser.



WARNING



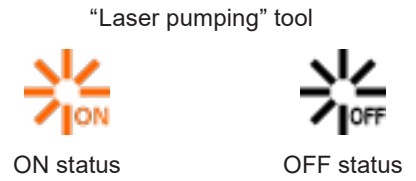
- Take appropriate protective measures during laser radiation such as wearing laser protective goggles or using a protective enclosure.

■ RUN mode procedure

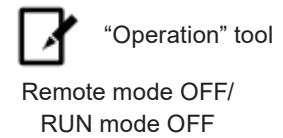
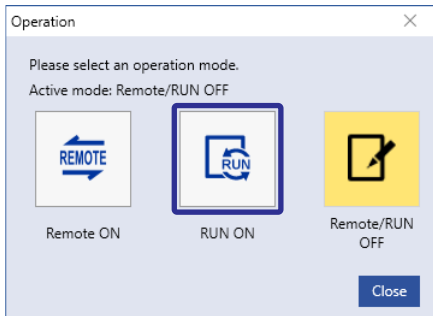
In RUN mode, either a signal from Laser Marker NAVI smart or from an external device starts the laser radiation.

1. Establish an online connection between your PC and the laser marking system.

2. Select “Laser pumping” in the ribbon to turn on the laser pumping.



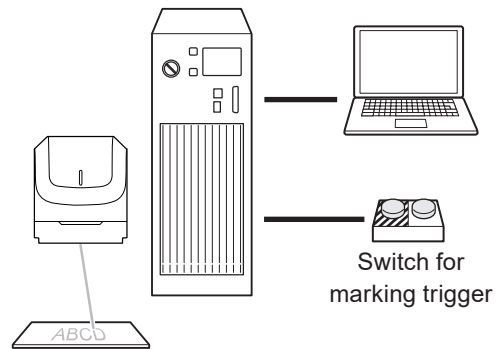
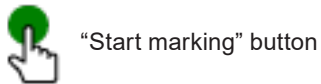
3. Select “Operation” in the ribbon and select “RUN ON”.



4. When you turn ON the RUN mode, the laser marker enters into the marking start signal standby state.

Enter the marking start signal (marking trigger) in any of the following methods to irradiate the laser beam.

- Switches or sensors connected to TRIGGER IN (X5) on the I/O terminal block
- “Start marking” button in Laser Marker NAVI smart



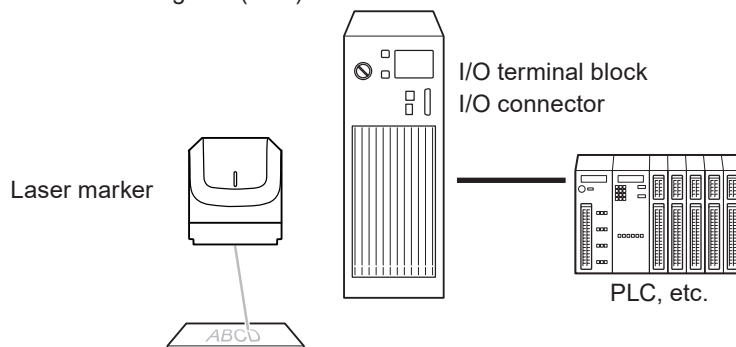
3-4 Operation by External Devices

3-4-1 Operation method using external control device

To control the laser marker with the external control device, the following connecting methods are applicable:

Control by I/O (remote mode)

Controls the laser marker from external devices such as PLC using I/O signals loaded into the laser marker. For details, refer to “4 External Control Using I/O” (P.90).



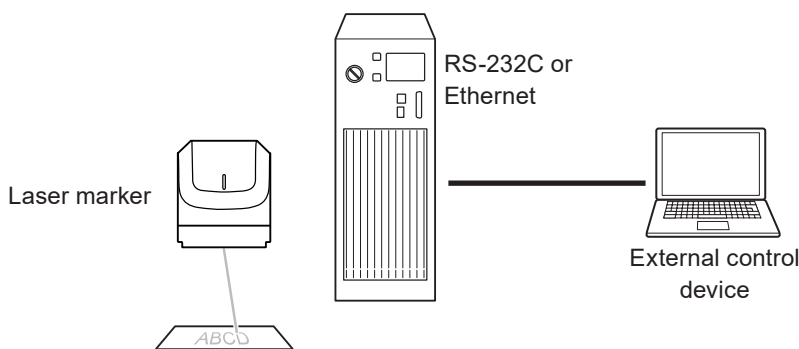
Reference

- To input marking trigger with I/O and configure other settings with a screen operation manually, use Run mode. For details, refer to “3-3-6 Test marking and RUN mode” (P.82).
- When the optional network unit is installed to the controller, controlling the laser marker with EtherNet/IP or PROFINET unit is available. For details, refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”.

Control by communication commands (remote mode)

To control the laser marker by communication commands from external devices such as PLC, use RS-232C or Ethernet connection.

For details, refer to “5 External Control by Communication Commands” (P.138) and “Serial Communication Command Guide”.



Reference

- It is available to the external control combining I/O and communication commands.
- For LP-RH/LP-RF/LP-RV/LP-ZV series, if the optional network unit is installed to the controller, you can send the commands via EtherNet/IP or PROFINET.

Link control with external devices (remote mode or RUN mode)

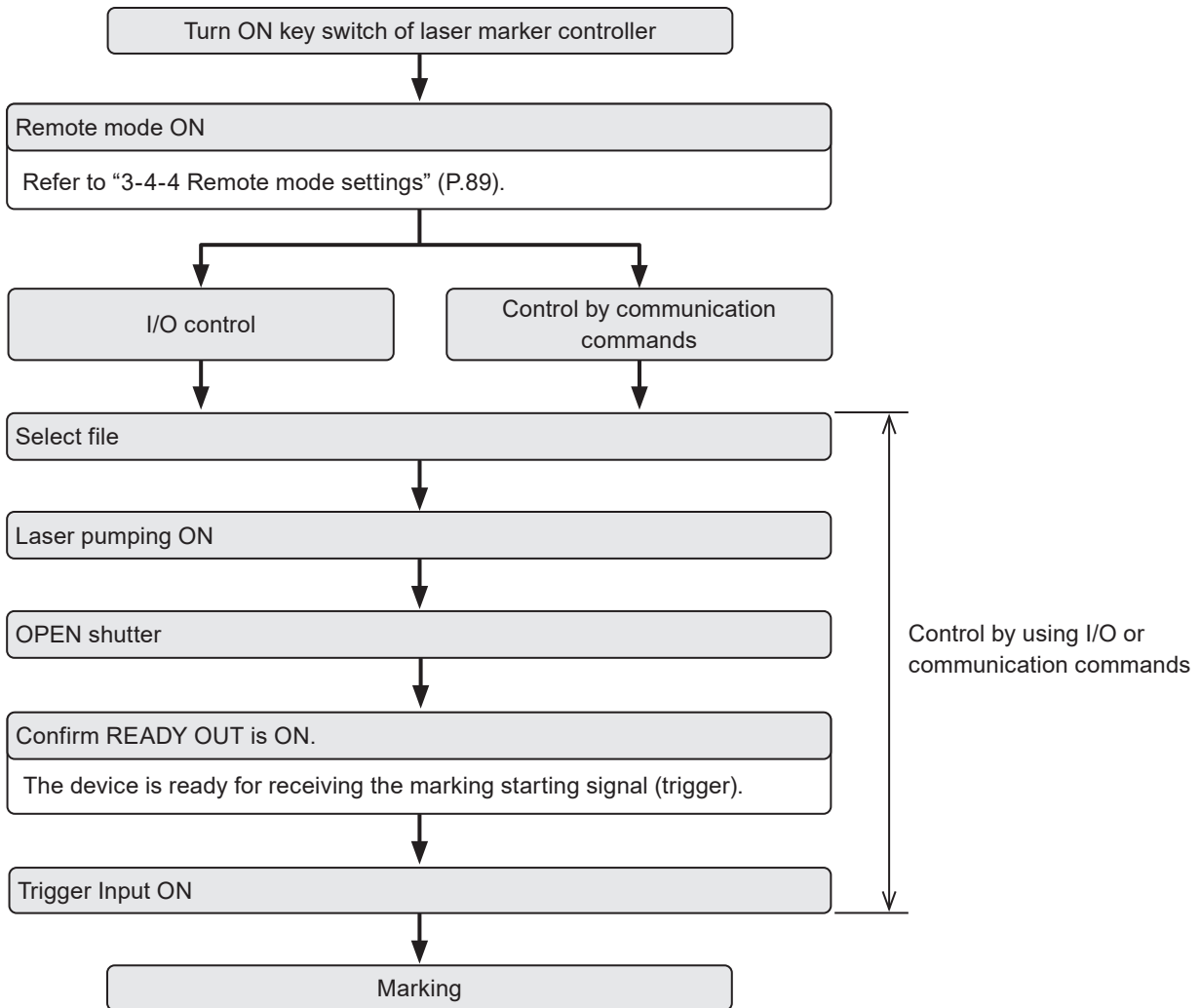
Connect the external devices, such as an image checker or a code reader, to the laser marker and control them together.

- Link control (Ethernet) with specific external devices (i.e. image checker)
- Link control with a code reader (RS-232C)

For details, refer to “6 Link Control with External Devices” (P.147).

3-4-2 Operation procedure with external control

- Operation example when controlling the laser marker from external control devices such as PLC



Reference

- It is available to the external control combining I/O, and communication commands.
- You need to configure the system settings on the I/O communication in advance before using external control. Refer to "3-4-3 General settings before external control" (P.86).
- For details on the operation procedure when you link an image checker or a code reader, refer to "6 Link Control with External Devices" (P.147).

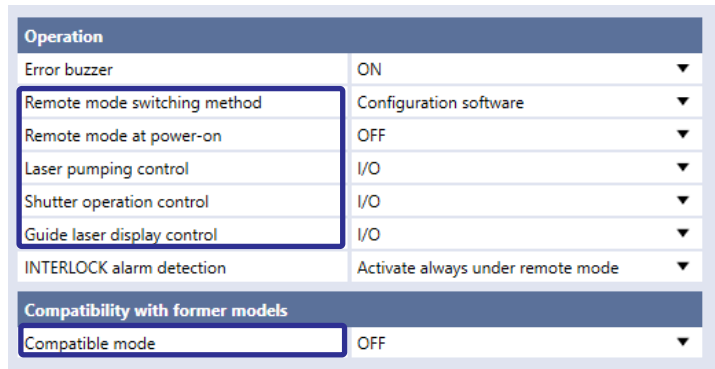
3-4-3 General settings before external control

To control the laser marker via I/O or communication commands, configure the following items in advance at the system settings of Laser Marker NAVI smart.

1. Establish an online connection between your PC and the laser marking system.

2. Go to the “System settings” screen.

3. Select the “Operation/Information” tab.
Configure the settings under “Operation” and “Compatibility with former models”.



Operation	
Error buzzer	ON
Remote mode switching method	Configuration software
Remote mode at power-on	OFF
Laser pumping control	I/O
Shutter operation control	I/O
Guide laser display control	I/O
INTERLOCK alarm detection	Activate always under remote mode

Compatibility with former models	
Compatible mode	OFF

4. Select the switching method of the remote mode.

- Configuration software (initial setting)
- I/O

Reference

- LP-RH/LP-ZV: If “Configuration software” is selected for “Remote mode switching method”, you can switch remote mode on and off by Laser Marker NAVI smart and the touch panel console or commercially available monitor. To use the touch panel console or monitor, the optional expansion board should be installed on the controller.

5. When “Configuration software” is selected, select the remote mode status at power-on.

- Remote mode ON
- Remote mode OFF (initial setting)

6. Select the control method for the following operations between I/O or communication commands.

As the default, I/O control is selected to all settings.

- Laser pumping control
- Shutter operation control
- Guide laser control

Reference

- To use “Test Marking Command (TST)” and “Laser Radiation for Measurement Command (SPT)” of the communication commands, set the shutter operation control method to “communication commands”.
- If you want to control these I/O operations via optional network unit (EtherNet/IP or PROFINET), select “I/O” here.

7. If you use the standard communication commands, set “OFF” to “Compatible mode”. If you want to use the same command format with the former models of LP-400/LP-V series, enable “LP-400/V compatibility”.

Reference

- For the details of the compatible command format with the former models, refer to the “Serial Communication Command Guide: LP-400/V compatible mode”.
- If you use the optional network (EtherNet/IP or PROFINET) for the command control, you cannot use the command format of LP-400/V compatible.

8. Select “Apply to laser marking system” on the left side of the ribbon.



“Apply to laser marking system” tool

9. When using I/O, click the “Inputs/outputs” tab and configure the following items:
- One-shot pulse duration:
Configure the output time of the signal being output as one-shot, such as PROCESSING END OUT (Y11).
Setting range: 2 to 510ms (initial value is 40ms)
 - Warning at invalid trigger signal:
Configure if you will output (Enabled) or will not output (Disabled) the warning for the invalid trigger. With enabling this setting, the warning is output when the marking trigger that cannot be accepted was input.
(Initial setting: Enabled)
 - TARGET DETECTION IN (X7):
Select whether or not to use TARGET DETECTION IN on I/O terminal.
(Initial setting: Disabled)
When enabling this terminal, connect a sensor which detect the workpiece is in position for lasing.
 - Assignment of counter end outputs:
Assign the counter No. to COUNT END A OUT to COUNT END D OUT (I/O pin No. 30 to 33).
As the default setting, counter No. 0 to 3 are assigned to COUNT END A OUT to COUNT END D OUT respectively.

Operation/information	System offset	Inputs/outputs	Communication	Linked device
I/O settings				
One-shot pulse duration [ms]		40		
Warning at invalid trigger signal		Enabled		▼
TARGET DETECTION IN (X7)		Disabled		▼
Assignment of counter end outputs				
COUNT END A OUT (No.30)		Counter 0		▼
COUNT END B OUT (No.31)		Counter 0		▼
COUNT END C OUT (No.32)		Counter 0		▼
COUNT END D OUT (No.33)		Counter 0		▼

Reference

- These settings are also applied to the communication by the optional network (EtherNet/IP or PROFINET).

10. Select “Apply to laser marking system” on the left side of the ribbon.



“Apply to laser marking system” tool

11. When using communication commands, select the “Communication” tab to set communication details of the interfaces you will use.

- For Ethernet:
Configure the communication settings according to the network settings.
- For RS-232C:
Configure the communication settings of the laser marker corresponding to the external control device.

Set “Communication commands” to the RS-232C usage.

Operation/information	System offset	Inputs/outputs	Communication	Linked device
Ethernet				
IP address		192.168.1.5		
Subnet mask		255.255.255.0		
Default gateway		192.168.1.13		
Port for PC configuration software		9093		
Port for communication commands		9094		
MAC address		00-11-22-33-44-55		
RS-232C				
RS-232C usage		Communication commands		▼
Baud rate [bit/s]		1200		▼
Data length [bit]		8		
Parity		None		▼
Stop bits [bit]		1		▼
Check sum		OFF		▼
End code		CR		▼

12. Under “Command format”, specify the communication command format.

- Start code: STX (initial setting) / None
- Include command in response: ON (initial setting) / OFF
- Sub-command for response data: Any single byte character of ASCII code from 01(HEX) to 7F(HEX) can be specified.
 - Initial setting of positive response code: A
 - Initial setting of negative response code: E
 - Initial setting of read request response code: A
- Encoding for non-ASCII characters: Shift-JIS (initial setting) / GB 2312 / Latin-1

Command format (standard mode)		
Start code	STX	
Include command in response	ON	
Positive response code	A	Change
Negative response code	E	Change
Read request response code	A	Change
Encoding for non-ASCII characters	Shift JIS	
Input method for control codes	Open settings	

Reference

- For details of the command format, refer to the “Serial Communication Command Guide”.
- The command format settings here are applied to the standard communication format, but not applied to LP-400/LP-V compatible format. For the details of the compatible mode with the former models of LP-400/LP-V series, refer to the “Serial Communication Command Guide: LP-400/V compatible mode”.
- “Encoding for non-ASCII characters” is used for the European special characters, Japanese and Chinese characters which cannot be specified by the ASCII codes. Select “Shift JIS” for Japanese characters and “GB 2312” for simplified Chinese. If you use European special characters such as À or Ä, select “Latin-1”.

13. To input the control codes in the bar code/2D code strings using the communication commands, click “Open settings” of “Input method for control codes” and select the input method.

14. Select “Apply to laser marking system” on the left side of the ribbon.



“Apply to laser marking system” tool

15. Disconnect the online connection with the laser marker.

16. Turn off the power of the laser marking system, wait five seconds and then restart the system.

The configured items will be reflected to the laser marker.

Notice

- Do not turn the laser marker power OFF while being connected to online.

17. The control by the external device starts by switching the laser marker to the remote mode.

Reference

- For the details of the System settings, refer to the “Laser Marker NAVI smart Operation Manual”.
- For the configuration of the optional network (EtherNet/IP or PROFINET), refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”.

3-4-4 Remote mode settings

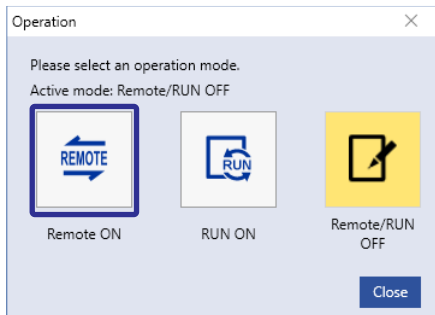
To control the laser marker externally via I/O or communication commands, set the operation mode to the remote mode with one of the following methods.

Select the method to switch to the remote mode on the system settings screen of Laser Marker NAVI smart. Refer to “3-4-3 General settings before external control” (P.86).

Remote mode switching by Laser Marker NAVI smart

Select “Operation” in the ribbon.

In the dialog, select “Remote ON” and select “Yes” to confirm.



“Operation” tool



Remote mode ON



Remote mode OFF

Startup the laser marker in the remote mode (Laser Marker NAVI smart can switch the remote mode)

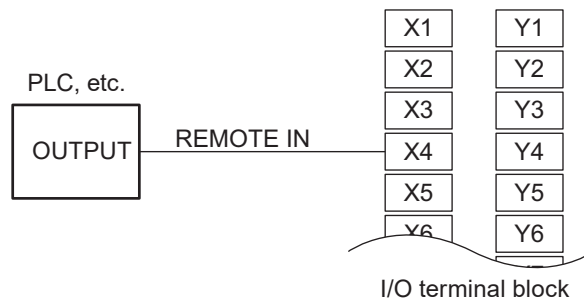
When you turn ON the key switch of the laser marker, the system starts in the remote mode. Use the operation tool of Laser Marker NAVI smart for releasing and resetting the remote mode.

Reference

- If you want to start up the laser marker in the remote mode, you need to configure the settings on the system settings screen of Laser Marker NAVI smart in advance.
- If you have configured the laser marker to start up in the remote mode, you cannot switch the remote mode from I/O.

Remote mode switching using I/O

Turn ON REMOTE IN (X4) of the I/O terminal block on the controller.



Reference

- To enable switching to the remote mode by REMOTE IN (X4) on the I/O terminal block, you need to configure the settings on the system settings screen of Laser Marker NAVI smart in advance.
- If you have configured the remote mode switching method to the I/O terminal block, you cannot switch the remote mode from the Laser Marker NAVI smart screen.



WARNING



- If the laser marker is set to enter the remote mode at startup or by I/O control, construct a manual resetting system to re-pump the laser when the laser pumping is turned to off due to an emergency stop or an interlock.

4 External Control Using I/O

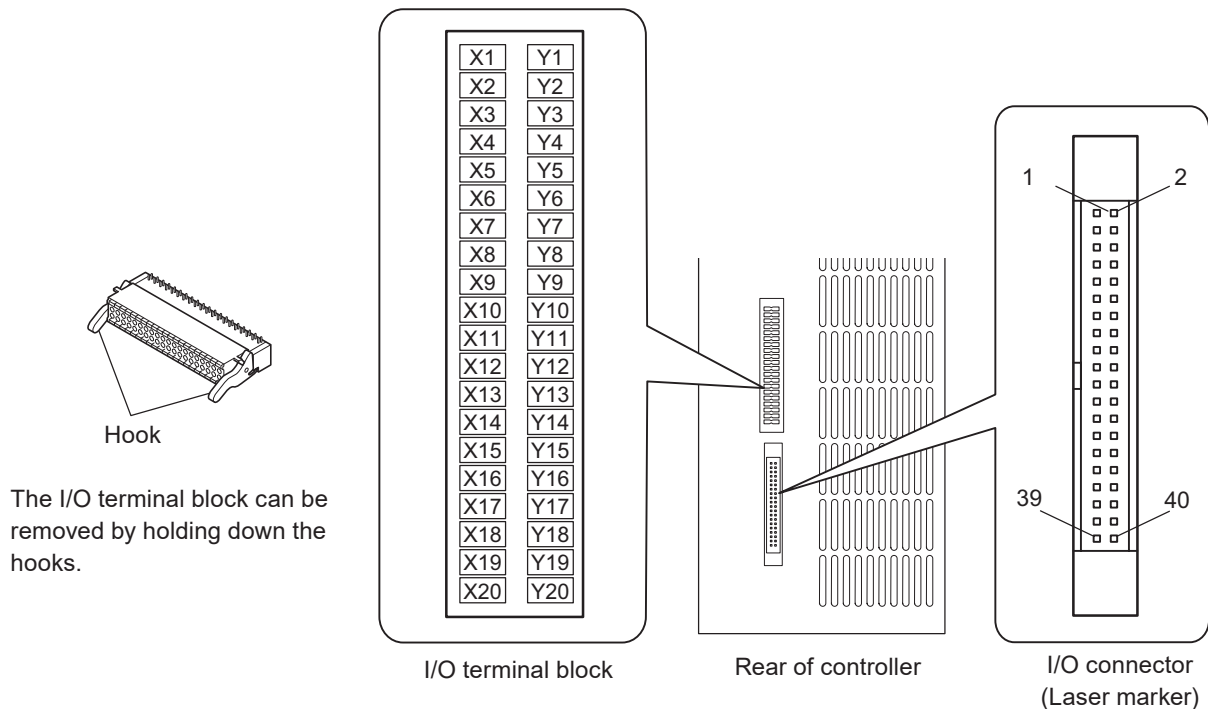
4-1 I/O Interface Specification

The I/O terminal block and the I/O connector are available as the external control I/O interface of this product.

- I/O terminal block: Loaded with the basic input/output to control the laser marker.
- I/O connector: Loaded with the input/output for data configuration such as selecting a file number and the input/output for the specific functions.

Reference

- Before using I/O, configure the system settings. Refer to “3-4-3 General settings before external control” (P.86).



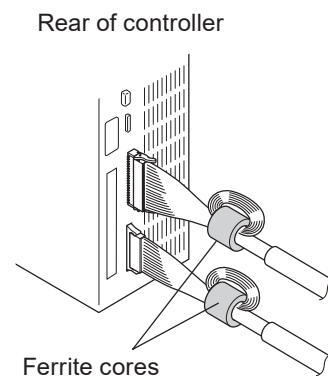
The I/O terminal block can be removed by holding down the hooks.

Connector specifications and models

Connector position		Connector specifications	Model	Manufacturer name
I/O terminal block	On the laser marker side	Dedicated connector	15EDGRHCM-THR-3.5-40P-1	Degson Electronics Co., Ltd
	User side		Accessories: 15EDGKNHG-3.5-40P-14-00A	
I/O Connector	On the laser marker side	MIL connector 40-pin/male	XG4A-4034	OMRON Corporation
	User side	MIL connector 40-pin/female	Accessories: XG4M-4030-T	

Wiring of input/output lines

Install one of the ferrite cores included in this product to the wirings from the I/O terminal and another one to the lines from the I/O connector. If the diameter of the ferrite core is too large, turn the I/O lines around the ferrite core as shown in the figure.



4-2 Signals and Details of I/O Terminal Block

The I/O terminal block is loaded with the basic input/output to control the laser marker.

■ List of signals

No.	Name	No.	Name
X1	24V OUT Internal power 24V	Y1	0V OUT Internal power 0V
X2	IN COM. 1 Input common 1	Y2	OUT COM. 1 Output common 1
X3	0V OUT Internal power 0V	Y3	24V OUT Internal power 24V
X4	REMOTE IN	Y4	REMOTE OUT
X5	TRIGGER IN	Y5	READY OUT
X6	LASER SUPPLY IN	Y6	LASER STANDBY OUT
X7	TARGET DETECTION IN	Y7	SYSTEM STANDBY OUT
X8	SHUTTER IN	Y8	SHUTTER CLOSE 1 OUT
X9	SHUTTER ENABLE IN	Y9	SHUTTER CLOSE 2 OUT
X10	LASER STOP IN	Y10	PROCESSING OUT
X11	LASER STOP IN	Y11	PROCESSING END OUT
X12	OUT COM. 1 Output common 1	Y12	PROCESSING FAIL OUT
X13	ENCODER A IN	Y13	MAINTENANCE OUT
X14	ENCODER B IN	Y14	WARNING OUT
X15	ALARM RESET IN	Y15	ALARM OUT
X16	INTERLOCK 1(+)	Y16	INTERLOCK 1 MONITOR
X17	INTERLOCK 1(-)	Y17	INTERLOCK 1 MONITOR COM.
X18	INTERLOCK 2(+)	Y18	INTERLOCK 2 MONITOR
X19	INTERLOCK 2(-)	Y19	INTERLOCK 2 MONITOR COM.
X20	REMOTE INTERLOCK IN	Y20	LASER SUPPLY OUT

Reference



- Use the internal power (X1, X3, Y1, Y3) as the power supply when operating the laser marker alone. Do not connect anything when using the external power supply.
- Do not connect anything to RESERVE terminals.
- Some terminals are already connected by the jumper wires with shipment. Refer to “4-5-1 Factory default wiring” (P.112).
- For details on the terminal block connection, refer to “4-5 Connecting I/O Terminal Block” (P.112).



■ Input signal operation on the I/O terminal block

Reference

- The ON/OFF listed in this section refers to the ON/OFF operations. It does not refer to the voltage level (High/Low).

No.	Name and description
X1	<p>24V OUT: Internal power (power for input/output) + 24V DC (max. output current 300mA) Power to operate the laser marker independently. X1 and Y3 are the common terminal connected internally.</p> <p>Notice</p> <ul style="list-style-type: none">• Make sure to use X3 or Y1 for the 0V of the internal power 24V OUT (X1 and Y3). Do not mix up with the external and internal power supplies.• Do not connect anything to this terminal when using the external power supply.• When using the internal power supply (X1, X3, Y1, Y3), the total current of the power supply for the external device and the consumption current for the I/O control should be less than 300mA.
X2	<p>IN COM. 1: Input common 1 The common terminal for each input of the I/O terminal block. For NPN connection, this terminal is connected to the “+ (plus)” side of power which is used for control. For PNP connection, this terminal is connected to the “- (minus)” side of power which is used for control. For details, refer to “4-5-2 Connecting common terminals” (P.113).</p>
X3	<p>0V OUT: Internal power (power supply for input/output) 0V Power to operate the laser marker independently. Y1 and X3 are the common terminal connected internally.</p> <p>Notice</p> <ul style="list-style-type: none">• Make sure to use X1 or Y3 for the internal power 0V OUT (X3 and Y1). Do not mix up with the external and internal power supplies.• Do not connect anything to this when using the external power supply.
X4	<p>REMOTE IN: Remote mode input While the input is turned on, the laser marker operates in the remote mode which can be controlled externally by I/O and communication commands. To transit to the remote mode using this terminal, you will need to configure the communication setting of Laser Marker NAVI smart in advance. Refer to “3-4-4 Remote mode settings” (P.89).</p>
X5	<p>TRIGGER IN: Marking trigger input The signal to start marking (laser radiation). Starts marking by edge of input ON. This signal can be accepted while READY OUT (Y5) is turned ON. The operation behavior of TRIGGER IN signal varies depending on Trigger mode settings as follows.</p> <ul style="list-style-type: none">• For marking to static object:<ul style="list-style-type: none">• Single trigger: One lasing operation is executed by the edge of turning on of TRIGGER IN signal.• Continuous trigger: Lasing operation is repeated while TRIGGER IN signal is on.• For on-the-fly marking:<ul style="list-style-type: none">• Single trigger: One lasing operation is executed by the edge of turning on of TRIGGER IN signal.• Marking at regular intervals: Marking operation is executed at regular intervals while TRIGGER IN is ON.• Multiple triggers: It allows to accept the multiple marking triggers in advance. Max. 16 triggers can be accepted while PROCESSING OUT (Y10) is ON.

No.	Name and description
X5	<p> Reference</p> <ul style="list-style-type: none"> You can set the trigger mode with Laser Marker NAVI smart. For the marking to static object, it is specified in "File settings" by each file. For on-the-fly marking, it is specified in "Motion settings to all files" and this one setting is applied to all files. When the trigger delay time is set in the selected file, trigger processing (lasing) operation starts after the delay time. When on-the-fly marking is set, lasing operation starts when the workpiece comes to the preset marking position after TRIGGER IN is accepted. If you are using the link control function with the image checker, the link control (a series of control operations including external device operation, laser radiation, laser marker internal processing) starts by the edge of input ON of TRIGGER IN. Refer to "6-1 Link Control with Image Checker" (P.148).
X6	<p>LASER SUPPLY IN: Laser pumping input</p> <p>While this input is turned on, the laser is pumped to enable the radiation.</p> <p>It takes approximately 5 second from turning on LASER SUPPLY IN to completion of laser pumping (maximum 10 seconds for re-pumping right after turning off the laser pumping).</p> <p>This terminal is available when the laser pumping control method is set to I/O at the system settings of Laser Marker NAVI smart.</p>
X7	<p>TARGET DETECTION IN</p> <p>Connect a sensor which detect the workpiece is in position for lasing.</p> <p>According to the ON/OFF state of this terminal, CHECK OK OUT (No.34) or CHECK NG OUT (No.35) of I/O connector turns on for one-shot pulse duration after the trigger processing (lasing) operation.</p> <ul style="list-style-type: none"> When TARGET DETECTION IN (X7) turns ON for more than 1ms during lasing operation: CHECK OK OUT (No.34) turns ON. When TARGET DETECTION IN (X7) did not turn ON during lasing operation: CHECK NG OUT (No.35) turns ON. <p>This terminal is available when TARGET DETECTION IN (X7) is set to "Enabled" at the system settings of Laser Marker NAVI smart.</p> <p> Reference</p> <ul style="list-style-type: none"> TARGET DETECTION IN is not available when you use the link control with an image checker.
X8	<p>SHUTTER IN: Shutter open input</p> <p>While this input is turned on, the internal shutter opens. The control of this terminal is enabled when SHUTTER ENABLE IN (X9) is ON.</p> <p>There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN for the actual shutter open / close operation time.</p> <p>This terminal is available when the shutter open/close control method is set to I/O at the system settings of Laser Marker NAVI smart.</p>
X9	<p>SHUTTER ENABLE IN: Shutter open enable input</p> <p>Control by SHUTTER IN (X8) is available while SHUTTER ENABLE IN is turned ON. To control opening and closing the shutter by SHUTTER IN (X8) only, short-circuit SHUTTER ENABLE IN (X9) and OUT COM.1 (Y2 or X12).</p>

 WARNING		<ul style="list-style-type: none"> Do not use SHUTTER IN (X8) and SHUTTER ENABLE IN (X9) as an emergency stop or the interlock. Turning OFF these terminals during laser radiation will not close the shutter until the marking completes.
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No.	Name and description
-----	----------------------

X10
X11

LASER STOP IN
LASER STOP IN

Use these terminals when you want to stop the laser radiation or disable the laser radiation temporarily. When between LASER STOP IN and OUT COM. 1 is disconnected, the laser radiation will be disabled. The laser marker operation varies depending on its condition as shown below. For details, refer to “Laser marker operation when functions for safety measures are input” (P.100).

Terminal connection	Status when the terminal is open	Shutter	Laser pumping
LASER STOP IN - OUT COM.1	Laser is not radiating	Close	Hold ON
	Radiating the laser	Close	OFF

Reference

- The function relating to safety must be shut off mechanically. Therefore, wire these terminals at no-voltage contact (dry contact).
- If you need to shut off the laser pumping physically, user INTERLOCK 1 (X16, X17) and INTERLOCK 2 (X18, X19) instead of these terminals.

X12

OUT COM. 1: Output common 1

The common terminal for each output of the I/O terminal block. X12 and Y2 are the common terminal connected internally.

For NPN connection, this terminal is connected to the “- (minus)” side of power which is used for control. For PNP connection, this terminal is connected to the “+ (plus)” side of power which is used for control.

X13
X14

ENCODER A IN
ENCODER B IN

Input the signals from an encoder or two sensors which detect the line speed for on-the-fly marking.

When using an encoder, input A-phase to ENCODER A IN (X13) and B-phase to ENCODER B IN (X14). Up to 100kHz can be input respectively. If only one phase is used, connect the encoder signal to ENCODER A IN (X13) and connect ENCODER B IN (X14) to IN COM. 1 (X2).

When using two sensors for measuring the line speed, connect the upward sensor to ENCODER A IN (X13), and connect the downward sensor to ENCODER B IN (X14).

X15

ALARM RESET IN

The reset input for restoring the system from the alarm status.

Make sure to verify the safety by eliminating the alarm causes before turning this input ON.

The alarm you can restore by using this terminal are as follows:

- E400 to E499
- E500 to E599

For the alarms you are unable to reset such as the ones caused by hardware or system error, restart the laser marker.

No.	Name and description
-----	----------------------

- X16 INTERLOCK 1(+)
- X17 INTERLOCK 1(-)
- X18 INTERLOCK 2(+)
- X19 INTERLOCK 2(-)

The terminal used as the interlock, which is connected to the door or switches of the safety device. When the connection between INTERLOCK (+) and INTERLOCK (-) is opened, the shutter is closed and the laser pumping is turned OFF physically. For details, refer to “Laser marker operation when functions for safety measures are input” (P.100).
 To enable the laser radiation, connect INTERLOCK (+) and INTERLOCK (-) with the non-voltage contact (dry contact) such as a relay or a switch.
 Using both INTERLOCK 1 and INTERLOCK 2 with a safety relay unit, the safety designed system with the double-circuit of the interlock can be constructed.

INTERLOCK connection	Shutter	Laser pumping
X16 - X17: Open	Close	OFF
X18 - X19: Open		

! Notice

- INTERLOCK terminals (X16, X17 and X18, X19) are connected to the operating coil of the internal contactor in the controller. Connect INTERLOCK (+) and INTERLOCK (-) with the non-voltage contact (dry contact) such as a relay or a switch. Do not connect with the voltage contact such as a transistor.

↓ Reference

- Between INTERLOCK(+) and INTERLOCK(-) are wired by a jumper wire for the shipment.
- For the connection of INTERLOCK terminals (X16, X17 and X18, X19), refer to “2-7 Construction of System” (P.67) and “4-5-4 Connection example of interlock terminals and laser stop terminals” (P.114).

X20 REMOTE INTERLOCK IN

Use this terminal when you want to stop the laser radiation or disable the laser radiation temporarily. When between REMOTE INTERLOCK IN (X20) and OUT COM. 1 is disconnected, the internal shutter is closed and laser pumping is turned to off. For details, refer to “Laser marker operation when functions for safety measures are input” (P.100).
 This terminal can be used as the “Remote interlock connector” required by IEC 60825-1.

↓ Reference

- If you need to shut off the laser pumping physically, user INTERLOCK 1 (X16, X17) and INTERLOCK 2 (X18, X19) instead of this terminal.

■ Output signal operation on the I/O terminal block

Reference

- The ON/OFF listed in this section refers to the ON/OFF operations. It does not refer to the voltage level (High/Low).

No.	Name and description
Y1	<p>0V OUT: Internal power (power supply for input/output) 0V Power to operate the laser marker independently. Y1 and X3 are the common terminal connected internally.</p> <p>Notice</p> <ul style="list-style-type: none"> • Make sure to use X1 or Y3 for the internal power 0V OUT (X3 and Y1). Do not mix up with the external and internal power supplies. • Do not connect anything to this when using the external power supply.
Y2	<p>OUT COM. 1: Output common 1 The common terminal for each output of the I/O terminal block. X12 and Y2 are the common terminal connected internally. For NPN connection, this terminal is connected to the “- (minus)” side of power which is used for control. For PNP connection, this terminal is connected to the “+ (plus)” side of power which is used for control. For details, refer to “4-5-2 Connecting common terminals” (P.113).</p>
Y3	<p>24V OUT: Internal power (power for input/output) + 24V DC (max. output current 300mA) Power to operate the laser marker independently. X1 and Y3 are the common terminal connected internally.</p> <p>Notice</p> <ul style="list-style-type: none"> • Make sure to use X3 or Y1 for the 0V of the internal power 24V OUT (X1 and Y3). Do not mix up with the external and internal power supplies. • Do not connect anything to this when using the external power supply. • When using the internal power supply (X1, X3, Y1, Y3), the total current of the power supply for the external device and the consumption current for the I/O control should be less than 300mA.
Y4	<p>REMOTE OUT: Remote mode output The output is ON during the remote mode. Make sure that this terminal is turned ON and start the external control by I/O or communication commands.</p>
Y5	<p>READY OUT: Marking trigger ready output When TRIGGER IN (X5) becomes acceptable (the laser radiation becomes ready), this output turns ON. To turn on READY OUT, the following conditions are required:</p> <ul style="list-style-type: none"> • No error has occurred (Except E700 to E799) • Not in trigger processing operation (Except the multiple triggers of on-the-fly marking) • Laser pumping has completed • Internal shutter is open • The file number switching process has completed • With the file using “registered characters via I/O” or “external offset function”, the data number and SET IN (No.2) of I/O signals have been input. • With the file using “characters specified by SIN command” or external offset function with “Using SEO command”, SIN or SEO command has been sent. • When the command reception permission (MKM command) is used, the reception permission state is turned OFF.
Y6	<p>LASER STANDBY OUT: Laser pumping completion output The output is ON after the laser pumping completes and until the laser pumping turns OFF. The output turns ON approximately 5 second after the laser pumping started (maximum 10 seconds for re-pumping right after turning off the laser pumping).</p>
Y7	<p>SYSTEM STANDBY OUT: System startup completed output After the laser marker is turned ON, the output remains turned ON during the time since the system startup has completed until the power is turned OFF. Output ON in approximately 10 seconds after key switch is turned ON.</p>

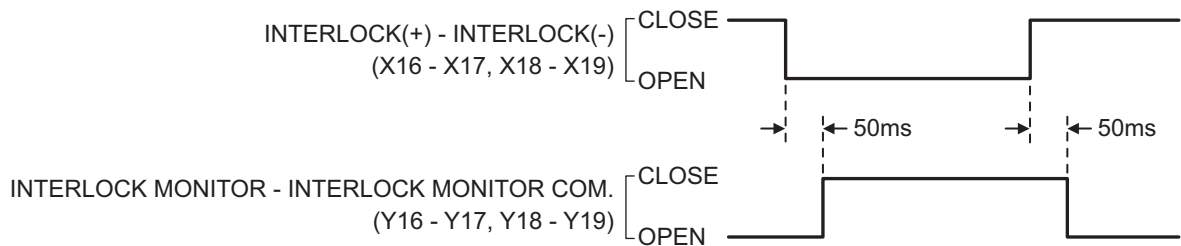
No.	Name and description
Y8	SHUTTER CLOSE 1 OUT
Y9	SHUTTER CLOSE 2 OUT Output ON during internal shutter of the head is closed. The sensor mounted inside of the head detect the shutter status and output them as SHUTTER CLOSE 1 OUT and SHUTTER CLOSE 2 OUT respectively. SHUTTER CLOSE 1 OUT and SHUTTER CLOSE 2 OUT are the same internal shutter sensor output. There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9).
	<p>Reference</p> <ul style="list-style-type: none"> To confirm the shutter open status, use SHUTTER OPEN OUT (No.39) on the I/O connector.
Y10	PROCESSING OUT: Trigger processing output When TRIGGER IN (X5) is accepted, this terminal turns ON. The output time of PROCESSING OUT (Y10) includes the trigger delay time, marking preparation time, laser radiation time, and processing time after marking has completed. In case the trigger processing time is shorter than the set one-shot pulse duration, the trigger processing output remains ON until the one-shot output time ends. *1
	<p>Reference</p> <ul style="list-style-type: none"> When on-the-fly marking with multiple triggers is set, PROCESSING OUT (Y10) remains ON until the all trigger processing operation has been completed. If you are using the link function with external devices, output time of PROCESSING OUT (Y10) includes operation time of the external device, laser radiation time, and internal processing time of the laser marker.
Y11	PROCESSING END OUT: Trigger processing completed output Output ON when the input marking trigger processing (such as laser radiation) is completed. You can use this output for confirmation of the marking completion. This is One-shot output. *1
Y12	PROCESSING FAIL OUT: Trigger processing abnormal end output Output ON when the input marking trigger processing (such as laser radiation) did not end normally. This will be output when the trigger processing operation including marking was stopped by an alarm or a warning during the trigger processing. This is One-shot output. *1
	<p>Notice</p> <ul style="list-style-type: none"> PROCESSING END OUT (Y11) and PROCESSING FAIL OUT (Y12) indicate that the marking processing has ended. They do not mean whether the marking quality is normal or abnormal.
Y13	MAINTENANCE OUT This is the output to announce the maintenance time. Output ON when the internal parts of the laser marker reach the recommended maintenance operating time and number of times. If you turn ON the announcement for regular maintenance on the maintenance screen of Laser Marker NAVI smart, this terminal turns ON when the set maintenance period is reached.
Y14	WARNING OUT Output OFF at warning occurrence. Refer to “What to do if an error occurs” (P.220) for contents of warning.
Y15	ALARM OUT Output OFF at alarm occurrence. When an alarm occurs, laser pumping turns OFF. Refer to “What to do if an error occurs” (P.220) for contents of alarm.

No.	Name and description
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Y16 INTERLOCK 1 MONITOR: Interlock 1 monitoring
Y17 INTERLOCK 1 MONITOR COM.: Interlock 1 monitoring common
Y18 INTERLOCK 2 MONITOR: Interlock 2 monitoring
Y19 INTERLOCK 2 MONITOR COM.: Interlock 2 monitoring common
INTERLOCK 1 MONITOR (Y16 - Y17) monitors the contact status of INTERLOCK 1 (X16 - X17). INTERLOCK 2 MONITOR (Y18 - Y19) monitors the contact status of INTERLOCK 2 (X18 - X19). For details, refer to "4-4-3 Interlock terminal rating and I/O circuit" (P.111).

State of INTERLOCK terminals	Operation of INTERLOCK MONITOR terminals
X16 - X17: OPEN	Y16 - Y17: CLOSE
X16 - X17: CLOSE (Short-circuited)	Y16 - Y17: OPEN
X18 - X19: OPEN	Y18 - Y19: CLOSE
X18 - X19: CLOSE (Short-circuited)	Y18 - Y19: OPEN

Interlock monitor is switched open and closed with a delay of approx. 50ms with reference to each interlock input as shown below.



Y20 LASER SUPPLY OUT
Output ON during LASER SUPPLY IN (X6) is ON including the preparing time of the laser pumping.
To show the on/off state of the laser supply by using the external warning light or other indicator, connect this terminal to them.

Reference

- Use LASER STANDBY OUT (Y6) for the confirmation of laser pumping completion.

*1 : Set the output time of the one-shot output on the system settings screen of Laser Marker NAVI smart. The setting range is 2 to 510ms. The initial setting value is 40ms. One-shot output time has a small margin of error for the setting value.

■ Laser marker operation when functions for safety measures are input

If INTERLOCK (X16, X17, X18, X19) or REMOTE INTERLOCK IN (X20) is opened, regardless laser emission ON/OFF status, the laser is powered OFF and the shutter is closed.

The operation behavior of LASER STOP IN (X10, X11) varies depending on the laser emission ON/OFF status.

Safety function	Laser marker operation	Release method	Remarks
INTERLOCK 1 (X16, X17) INTERLOCK 2 (X18, X19)	<ul style="list-style-type: none"> Laser Pumping: OFF Internal Shutter: CLOSE Status: Alarm E400, E401 *1 	Close both INTERLOCK 1 and INTERLOCK 2 connections respectively and input alarm reset.	The power supply of laser source is shut down by the contactor operation (hardware control).
LASER STOP IN (X10, X11)	Opened during laser emission <ul style="list-style-type: none"> Laser Pumping: OFF Internal Shutter: CLOSE Status: Alarm E402 	Close LASER STOP IN connection and input alarm reset.	The power supply of laser source is shut down through the internal circuit by the software control.
	Opened at non-emitting with opened shutter <ul style="list-style-type: none"> Laser Pumping: Hold ON Internal Shutter: CLOSE Status: Warning E600 	Close LASER STOP IN connection.	
REMOTE INTERLOCK IN (X20)	<ul style="list-style-type: none"> Laser Pumping: OFF Internal Shutter: CLOSE Status: Alarm E405, E503 *1 	Close REMOTE INTERLOCK IN connection and input alarm reset.	

*1 : The error will not occur if the shutter is closed (laser is not radiating) with the PC configuration software control enabled.

Reference

- For the alarm of the interlock functions controlled by I/O signals REMOTE INTERLOCK IN, INTERLOCK 1 and INTERLOCK 2, you can select when an alarm should be detected from “Activate always under remote mode” or “Deactivate while shutter closed”. Configure it in “System settings” > “Operation/information” > “INTERLOCK alarm detection”.

4-3 Signals and Details of I/O Connector

The I/O connector is loaded with the input/output for data setting such as selecting a number and the input/output for the specific functions.

■ List of signals

No.	Name
1	IN COM. 2 Input common 2
2	SET IN
3	D0 IN
4	D1 IN
5	D2 IN
6	D3 IN
7	D4 IN
8	D5 IN
9	D6 IN
10	D7 IN
11	D8 IN
12	D9 IN
13	D10 IN
14	D11 IN
15	D12 IN
16	D13 IN
17	D14 IN
18	D15 IN
19	SELECT 0 IN
20	SELECT 1 IN
21	SELECT 2 IN
22	TIME HOLD IN
23	GUIDE IN Guide laser radiation input
24	TIMING IN
25	RESERVE
26	System reservation

No.	Name
27	OUT COM. 2 Output common 2
28	SET OK OUT
29	DATE GAP OUT
30	COUNT END A OUT
31	COUNT END B OUT
32	COUNT END C OUT
33	COUNT END D OUT
34	CHECK OK OUT
35	CHECK NG OUT
36	TIMING WAIT OUT
37	SCRIPTING OUT
38	DATA WAIT OUT
39	SHUTTER OPEN OUT
40	LASING OUT

Reference

- IN COM. 1, OUT COM. 1 of the I/O terminal block and IN COM. 2, OUT COM. 2 of the I/O connector are independent. If you use the I/O connector terminal, connect input common/output common of the I/O terminal block and the I/O connector to power supply respectively.
- Do not connect anything to RESERVE terminals.
- For the pin arrangement of the I/O connector, refer to “4-1 I/O Interface Specification” (P.91).

■ Input signal operation on the I/O connector

Reference

- The ON/OFF listed in this section refers to the ON/OFF operations. It does not refer to the voltage level (High/Low).

No.	Name and description																																																						
1	<p>IN COM. 2: Input common 2</p> <p>The common terminal for each input of the I/O connector.</p> <p>For NPN connection, this terminal is connected to the “+ (plus)” side of power which is used for control. For PNP connection, this terminal is connected to the “- (minus)” side of power which is used for control.</p> <p>Reference</p> <ul style="list-style-type: none"> • IN COM. 1, OUT COM. 1 of the I/O terminal block and IN COM. 2, OUT COM. 2 of the I/O connector are independent. • If you use the I/O connector terminal, connect input common/output common of the I/O terminal block and the I/O connector to power supply respectively. • For details on the connection, refer to “4-5-2 Connecting common terminals” (P.113). 																																																						
2	<p>SET IN</p> <p>Turn ON this signal when executing the input of D0 IN to D15 IN (No.3 to 18) and SELECT 0 IN to SELECT 2 IN (No.19 to 21).</p> <p>Turn ON SET IN with maintaining the input status of D0 IN to D15 IN and SELECT 0 IN to SELECT 2 IN. The input operation is executed at the timing of the edge of turning ON.</p> <p>SET IN is required to control the following operations by I/O.</p> <ul style="list-style-type: none"> • Select file number • Correct the count-up/count-down value of the counter function • Reset the count value of the counter function • Switch marking characters of the registered characters via I/O • Switch marking position of the external offset function 																																																						
3 to 18	<p>D0 IN to D15 IN : Number input</p> <p>Set the number for one of the following targets selected at SELECT 0 IN to SELECT 2 IN (No.19 to 21).</p> <ol style="list-style-type: none"> ① File No. ② Count-up value correction ③ Count-down value correction ④ Counter number to reset ⑤ Data number for the registered characters/external offset function <p>① File No. (SELECT 0 IN to SELECT 2 IN: All OFF)</p> <p>Input when changing the file number of 0 to 9999.</p> <p>Specify the file number in the binary system as D0 to D15 and turn ON SET IN (No.2).</p> <p>Indicate values in the binary system as ON/OFF of D0 to D15 with D0 being the lowest digit value.</p> <p>Example: When selecting the file No. 618</p> <p>Select “0000 0010 0110 1010”, which represents 618 in a 16-bit binary system, by specifying ON/OFF of D0 to D15 as shown in the below table.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Terminal</th> <th>File No. (binary)</th> <th>Input</th> <th>Terminal</th> <th>File No. (binary)</th> <th>Input</th> </tr> </thead> <tbody> <tr> <td>D0</td> <td>0</td> <td>OFF</td> <td>D8</td> <td>0</td> <td>OFF</td> </tr> <tr> <td>D1</td> <td>1</td> <td>ON</td> <td>D9</td> <td>1</td> <td>ON</td> </tr> <tr> <td>D2</td> <td>0</td> <td>OFF</td> <td>D10</td> <td>0</td> <td>OFF</td> </tr> <tr> <td>D3</td> <td>1</td> <td>ON</td> <td>D11</td> <td>0</td> <td>OFF</td> </tr> <tr> <td>D4</td> <td>0</td> <td>OFF</td> <td>D12</td> <td>0</td> <td>OFF</td> </tr> <tr> <td>D5</td> <td>1</td> <td>ON</td> <td>D13</td> <td>0</td> <td>OFF</td> </tr> <tr> <td>D6</td> <td>1</td> <td>ON</td> <td>D14</td> <td>0</td> <td>OFF</td> </tr> <tr> <td>D7</td> <td>0</td> <td>OFF</td> <td>D15</td> <td>0</td> <td>OFF</td> </tr> </tbody> </table>	Terminal	File No. (binary)	Input	Terminal	File No. (binary)	Input	D0	0	OFF	D8	0	OFF	D1	1	ON	D9	1	ON	D2	0	OFF	D10	0	OFF	D3	1	ON	D11	0	OFF	D4	0	OFF	D12	0	OFF	D5	1	ON	D13	0	OFF	D6	1	ON	D14	0	OFF	D7	0	OFF	D15	0	OFF
Terminal	File No. (binary)	Input	Terminal	File No. (binary)	Input																																																		
D0	0	OFF	D8	0	OFF																																																		
D1	1	ON	D9	1	ON																																																		
D2	0	OFF	D10	0	OFF																																																		
D3	1	ON	D11	0	OFF																																																		
D4	0	OFF	D12	0	OFF																																																		
D5	1	ON	D13	0	OFF																																																		
D6	1	ON	D14	0	OFF																																																		
D7	0	OFF	D15	0	OFF																																																		

No.	Name and description
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② Count-up value correction (SELECT 1 IN: ON)

③ Count-down value correction (SELECT 0 IN, SELECT 1 IN: ON)

Input this number when you change the next marking value of the counter function. The counter value is specified by the step times of count-up or count-down. The step value indicates a value to increase or decrease per one counting-up or counting-down.

Specify the count-up/count-down with SELECT 0 IN to SELECT 2 IN.

Specify the target counter number and step times as D0 to D15 and turn ON SET IN (No.2).

- How to select the counter number:

Select a value from D0 to D7 for the counter number to correct the count-up/count-down value.

The counter No. 0 to 3 is assigned at D0 to D3 and the common counter No. 16 to 19 is assigned at D4 to D7 respectively.

In case two or more counter numbers are specified, counter values of all the specified counter numbers are changed.

- How to specify the step times:

Specify a value in D8 to D15 for the step times of count-up or count-down in the binary system. Indicate values in the binary system as ON/OFF of D8 to D15 with D8 being the lowest digit value.

Example: Count up or count down the counter of the counter number 3 by two steps

- Turn ON D3 which represents the counter number 3.
- Select "0000 0010", which represents the step times 2 in an 8-bit binary system, by specifying ON/OFF of D8 to D15 as shown in the below table.

D0 to D7: Counter No. 0 to 3, 16 to 19

Terminal	Counter No.	Input
D0	0	OFF
D1	1	OFF
D2	2	OFF
D3	3	ON
D4	16	OFF
D5	17	OFF
D6	18	OFF
D7	19	OFF

D8 to D15: Step times

Terminal	Step times (binary)	Input
D8	0	OFF
D9	1	ON
D10	0	OFF
D11	0	OFF
D12	0	OFF
D13	0	OFF
D14	0	OFF
D15	0	OFF

Counter No. 16 to 19 are the common counters you can use with all the files.

④ Counter No. to reset (SELECT 2 IN: ON)

Input this number when you restore the present counter value to the initial value for files with the counter function applied.

Specify the target counter number as D0 to D15 and turn ON SET IN (No.2).

- How to select the counter number:

Select the counter number to reset from D0 to D15.

The following counter numbers are assigned to D0 to D15 respectively.

D0 to D3: Counter No. 0 to 3

D4 to D7: Common Counter No. 16 to 19

D8 to D11: Counter No. 4 to 7

D12 to D15: Common Counter No. 20 to 23

In case two or more counter numbers are specified, all counters specified are reset.

Example: When the counter No. 0 to 3 are reset.

Turn ON D0, D1, D2, and D3 which represent the counter No. 0, 1, 2, and 3.

D0 to D7: Counter No. 0 to 3, 16 to 19

Terminal	Counter No.	Input
D0	0	ON
D1	1	ON
D2	2	ON
D3	3	ON
D4	16	OFF
D5	17	OFF
D6	18	OFF
D7	19	OFF

D8 to D15: Counter No. 4 to 7, 20 to 23

Terminal	Counter No.	Input
D8	4	OFF
D9	5	OFF
D10	6	OFF
D11	7	OFF
D12	20	OFF
D13	21	OFF
D14	22	OFF
D15	23	OFF

Counter Nos. 16 to 23 are the common counters you can use with all the files.

No.	Name and description
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- ⑤ Data number to switch when using the registered characters/external offset function (SELECT 0 IN: ON)
 The registered characters/external offset function is a function that switches marking characters (registered characters) or the position (external offset) using the input terminal D0 to D15. Configure the character or coordinate patterns to the data number corresponding to D0 to D15 in advance. Specify which pattern you will mark from D0 to D15.

Specify the data number in the binary system as D0 to D15 and turn ON SET IN (No.2).

The data numbers corresponding to D0 to D15 are defined as follows according to the settings.

I/O input condition settings *	Terminal	Data number target	Data number
Registered characters: 4-bit × 4	D0 to D3	Registered character table 0	0 to 15
	D4 to D7	Registered character table 1	0 to 15
	D8 to D11	Registered character table 2	0 to 15
	D12 to D15	Registered character table 3	0 to 15
Registered characters: 8-bit × 2	D0 to D7	Registered character table 0	0 to 255
	D8 to D15	Registered character table 1	0 to 255
External offset: Lower 4 bits	D0 to D3	External offset	0 to 15
External offset: Lower 8 bits	D0 to D7	External offset	0 to 255
External offset: Lower 10 bits	D0 to D9	External offset	0 to 1023

* You can also use the registered characters via I/O together with the external offset function. If you use the same terminal for both the registered characters and external offset at this time, the input status will be reflected to the data number of both functions.

Example: Specify data number 15 when using lower 8 bits

Select "0000 1111", which represents 15 in an 8-bit binary system, by specifying ON/OFF of D0 to D7 as shown in the below table. (D0 is the lowest digit number.)

D0 to D7: Data number of registered characters/external offset (the lower 8 bits are used)

Terminal	Data number (binary)	Input
D0	1	ON
D1	1	ON
D2	1	ON
D3	1	ON
D4	0	OFF
D5	0	OFF
D6	0	OFF
D7	0	OFF

No.	Name and description																																												
19 to 21	<p>SELECT 0 IN to SELECT 2 IN With SELECT 0 IN to SELECT 2 IN, the setting target of D0 IN to D15 IN and Guide laser indication target are specified.</p> <ul style="list-style-type: none"> • Select the setting target of D0 IN to D15 IN Specify SELECT 0 IN to SELECT 2 IN corresponding to the setting target shown below. Keeping the input of SELECT 0 IN to SELECT 2 IN and D0 IN to D15 IN (No.3 to 18), turn ON SET IN (No.2). <table border="1"> <thead> <tr> <th>Setting target of D0 IN to D15 IN</th> <th>SELECT 0 IN</th> <th>SELECT 1 IN</th> <th>SELECT 2 IN</th> </tr> </thead> <tbody> <tr> <td>File No.</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Count up value correction</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>Count down value correction</td> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>Counter number to reset</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>Data number of registered characters/ external offset</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Select guide laser indication target Specify SELECT 0 IN to SELECT 2 IN corresponding to the indication target of guide laser as shown below. Keeping the input of SELECT 0 IN to SELECT 2 IN, turn ON GUIDE IN (No.23). <table border="1"> <thead> <tr> <th>Indication by guide laser</th> <th>SELECT 0 IN</th> <th>SELECT 1 IN</th> <th>SELECT 2 IN</th> </tr> </thead> <tbody> <tr> <td>Work distance</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Marking image</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Marking field</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>Masked objects</td> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> </tbody> </table>	Setting target of D0 IN to D15 IN	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN	File No.	OFF	OFF	OFF	Count up value correction	OFF	ON	OFF	Count down value correction	ON	ON	OFF	Counter number to reset	OFF	OFF	ON	Data number of registered characters/ external offset	ON	OFF	OFF	Indication by guide laser	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN	Work distance	OFF	OFF	OFF	Marking image	ON	OFF	OFF	Marking field	OFF	ON	OFF	Masked objects	ON	ON	OFF
Setting target of D0 IN to D15 IN	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN																																										
File No.	OFF	OFF	OFF																																										
Count up value correction	OFF	ON	OFF																																										
Count down value correction	ON	ON	OFF																																										
Counter number to reset	OFF	OFF	ON																																										
Data number of registered characters/ external offset	ON	OFF	OFF																																										
Indication by guide laser	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN																																										
Work distance	OFF	OFF	OFF																																										
Marking image	ON	OFF	OFF																																										
Marking field	OFF	ON	OFF																																										
Masked objects	ON	ON	OFF																																										
22	<p>TIME HOLD IN: Time/date hold input Performs marking of date and lot, reflecting the time when the input is turned ON. While this input is turned on, the laser marker retains the time and date of the system clock at the point when the input was turned ON, then it marks the functional characters for current date, expiry date, and lot. TIME HOLD IN is available even when the remote mode is turned off. If TIME HOLD IN is turned ON when powering on the laser marker, it retains the system startup time.</p>																																												
23	<p>GUIDE IN: Guide laser radiation input The guide laser irradiates while the input is turned ON. (Up to one minute) Determine the guide laser radiation details by the combination of SELECT 0 IN to SELECT 2 IN (No.19 to No.21). Keep the input state of SELECT 0 IN to SELECT 2 IN while GUIDE IN is turned ON. This terminal is available when the guide laser control method is set to I/O at the system settings of Laser Marker NAVI smart. Input this terminal with the shutter closed.</p>																																												
24	<p>TIMING IN This is the terminal you will use when the link control function with the image checker is configured. Turn this terminal ON when you instruct the operation timing to the laser marker or to the target device controlled by the link function. Starts the link control processing by edge of input ON. Input this terminal within 60 seconds from turning ON of TIMING WAIT OUT (No.36). For details, refer to "6-1 Link Control with Image Checker" (P.148).</p>																																												
25, 26	<p>RESERVE: System reservation Do not connect externally.</p>																																												


■ I/O connector output signal operation

Reference

- The ON/OFF listed in this section refers to the ON/OFF operations. It does not refer to the voltage level (High/Low).

No.	Name and description
27	<p>OUT COM. 2: Output common 2 The common terminal for each output of the I/O connector. For NPN connection, this terminal is connected to the “- (minus)” side of power which is used for control. For PNP connection, this terminal is connected to the “+ (plus)” side of power which is used for control.</p> <p>Reference</p> <ul style="list-style-type: none">• IN COM. 1, OUT COM. 1 of the I/O terminal block and IN COM. 2, OUT COM. 2 of the I/O connector are independent. If you use the I/O connector terminal, connect input common/output common of the I/O terminal block and the I/O connector to power supply respectively.• For details on the connection, refer to “4-5-2 Connecting common terminals” (P.113).
28	<p>SET OK OUT: Setting completion output The output turns ON when the setting has completed for SET IN (No.2). Output ON when number inputs such as file No. and counter reset are set. This is one-shot output. *1</p> <p>Reference</p> <ul style="list-style-type: none">• SET OK OUT is a response to SET IN (No.2). To verify if the laser marker has entered into the marking ready state (trigger input acceptance state), check by READY OUT (Y5).
29	<p>DATE GAP OUT: Date gap output This terminal turns ON when the date of the system clock has changed (passed the midnight) while TIME HOLD IN (No.22) is ON. This is the output to notify you that the laser marker is marking the different date from that of the system clock while TIME HOLD IN is turned ON.</p>
30	COUNT END A OUT: Counter end A output
31	COUNT END B OUT: Counter end B output
32	COUNT END C OUT: Counter end C output
33	COUNT END D OUT: Counter end D output
	<p>Each output turns ON when the count value of the specified counter numbers has marked the end value. Assign the counter No. to COUNT END A OUT to COUNT END D OUT in system settings of Laser Marker NAVI smart. The counter end output remains turned ON with the shutter open until the next marking trigger is input. When you close the shutter, the counter end output turns OFF.</p> <p>Reference</p> <ul style="list-style-type: none">• As the default setting, counter No. 0 to 3 are assigned to COUNT END A OUT to COUNT END D OUT respectively.• The counter value will not be updated at test marking.• It starts counting from the initial value again once the counter reaches to the end value.• The counter end output is disabled when “counter update per step” is configured at Step & repeat.• The counter end output is available when you set the functional character of the counter in a string of the objects such as character or barcode.

No.	Name and description
34	CHECK OK OUT: Check OK output
35	<p>CHECK NG OUT: Check NG output</p> <ul style="list-style-type: none"> • These outputs are available when the following functions are configured. This is One-shot output. *1 • When the link control function with the image checker is configured: Check results by the linked image checker, such as a camera or a code reader are output. <ul style="list-style-type: none"> • CHECK OK OUT: Output when the check result is positive • CHECK NG OUT: Output when the check result is negative • When TARGET DETECTION IN (X7) is used: According to the ON/OFF state of TARGET DETECTION IN (X7), CHECK OK OUT (No.34) or CHECK NG OUT (No.35) turns on for one-shot time after the trigger processing (lasing) operation. <ul style="list-style-type: none"> • CHECK OK OUT: Output when TARGET DETECTION IN (X7) turns ON for more than 1ms during lasing operation. • CHECK NG OUT: Output when TARGET DETECTION IN (X7) did not turn ON during lasing operation. <p>Reference</p> <ul style="list-style-type: none"> • When multiple functions that use the CHECK OK OUT/CHECK NG OUT terminals are used at the same time, CHECK OK OUT is output on condition that all the functions are judged OK.
36	<p>TIMING WAIT OUT: Timing wait output</p> <p>This is the terminal you will use when the link control function with the image checker is configured. This terminal turns ON when the laser marker enters into the link function operation trigger (TIMING IN) standby state.</p> <p>Input TIMING IN (No.24) after making sure that this terminal is turned ON.</p>
37	<p>SCRIPTING OUT: Scripting output</p> <p>This is the terminal you will use when the link control function with the image checker is configured. This terminal turns ON while executing scripting (laser marker's internal processing to perform the link control of the external devices) upon receiving TRIGGER IN (X5). The output time of SCRIPTING OUT does not include the laser radiation time.</p>
38	<p>DATA WAIT OUT</p> <p>When using either of the following functions, this terminal turns ON to notify the waiting status of the data input. Confirm this output is ON and then input the corresponding data.</p> <ul style="list-style-type: none"> • Characters specified by SIN command: Waiting for character input by SIN command • External offset function with "Using SEO command" : Waiting for marking position input by SEO command • Registered characters via I/O: Waiting for registered characters input and SET IN (No.2) by I/O • External offset function: Waiting for marking position input and SET IN (No.2) by I/O <p>Reference</p> <ul style="list-style-type: none"> • After inputting the required data, this output turns OFF and then READY OUT (Y5) turns ON.
39	<p>SHUTTER OPEN OUT</p> <p>Output ON during internal shutter of the head is open.</p> <p>There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER OPEN OUT.</p> <p>Reference</p> <ul style="list-style-type: none"> • To monitor the shutter operation for the safety control system, use SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9). • The output timing of SHUTTER OPEN OUT (No.39), SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9) has a margin of error.

No.	Name and description
40	<p>LASING OUT: Laser radiation output Output ON during laser radiation. In case the lasing time is shorter than the set one-shot output time, the lasing output remains ON until the one-shot output time ends. *1</p> <p> Reference</p> <ul style="list-style-type: none"> • Use PROCESSING END OUT (Y11) and PROCESSING FAIL OUT (Y12) for the confirmation of marking completion.

*1 : Set the output time of the one-shot output on the system settings screen of Laser Marker NAVI smart. The setting range is 2 to 510ms. The initial setting value is 40ms. One-shot output time has a small margin of error for the setting value.

4-4 I/O Rating/Circuit

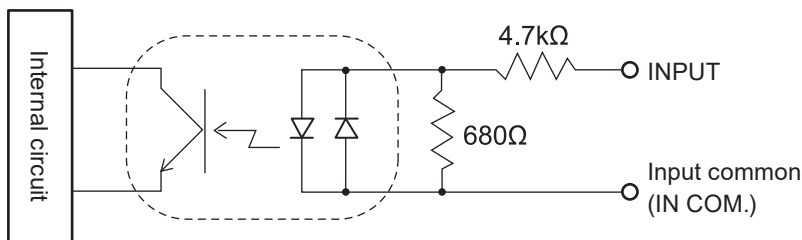
4-4-1 Input rating and input circuit

This section shows the input rating and the input circuit for the I/O terminal block input and the I/O connector input. Note that the input rating and circuit of INTERLOCK terminals (X16, X17, X18, X19) are different from those shown here. Refer to “4-4-3 Interlock terminal rating and I/O circuit” (P.111).

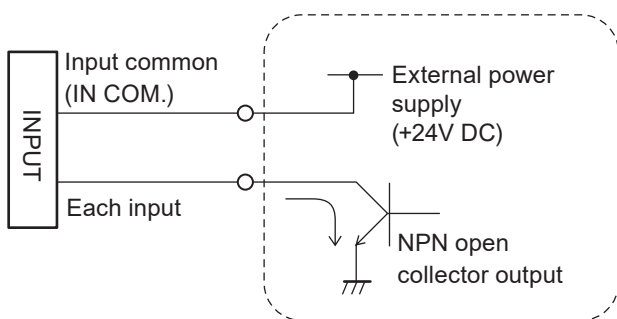
■ Input rating

Item	I/O terminal block input, I/O connector input
Input form	Bidirectional photo coupler insulation input
Input ON voltage	Difference of voltages between input and input common: 19V or more
Input OFF voltage	Difference of voltages between input and input common: No more than 3V or open
Rated input voltage	+24V DC +/-10%

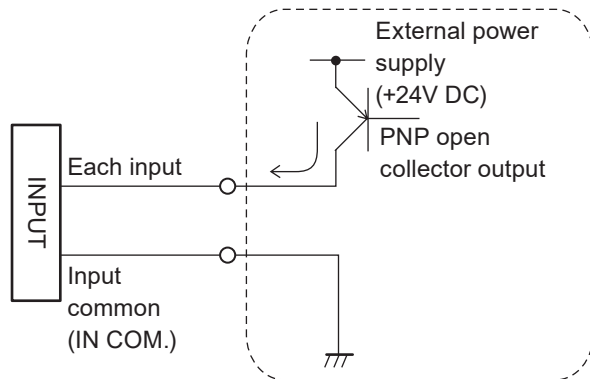
■ Input circuit



■ NPN sample



■ PNP sample



! Notice

- This product supports both the NPN transistor output and the PNP transistor output. However, the wiring from I/O terminal block and the I/O connector respectively cannot be used as NPN/PNP mixed. Operate the product after selecting either NPN or PNP.
- Do not short-circuit 24V OUT (X1, Y3) and 0V OUT (Y1, X3). Also, do not short-circuit IN COM. 1 (X2) and OUT COM.1 (Y2, X12). Starting the laser marker with these terminals short-circuited will cause the laser marker to malfunction.

Reference

- Respective inputs are bidirectional photo-coupler inputs. The regulation for input ON is based on the ON status of photo-coupler.
- IN COM. 1, OUT COM. 1 of the I/O terminal block and IN COM. 2, OUT COM. 2 of the I/O connector are independent. If you use the I/O connector terminal, connect input common/output common of the I/O terminal block and the I/O connector to power supply respectively.
- DC 2-wire sensor cannot be connected to any input.

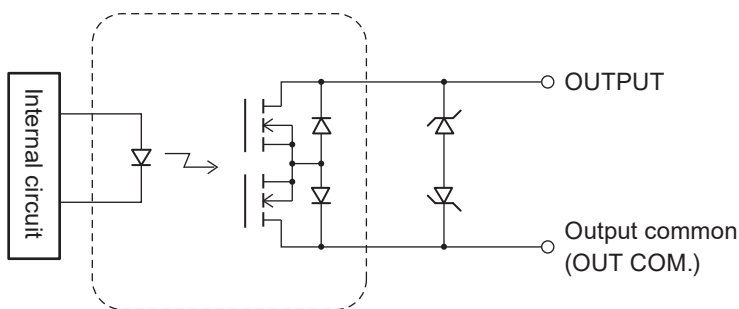
4-4-2 Output rating and output circuit

This section shows the output rating and the output circuit for the I/O terminal block output and the I/O connector output. Note that the output rating and circuit of INTERLOCK MONITOR terminals (Y16, Y17, Y18, Y19) are different from those shown here. Refer to “4-4-3 Interlock terminal rating and I/O circuit” (P.111).

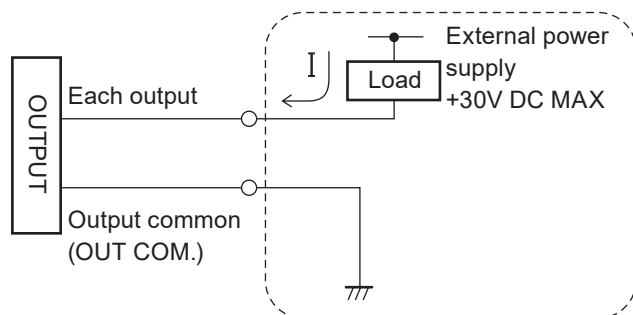
■ Output rating

Item	I/O terminal block output	I/O connector output
Output form	NPN/PNP Photo-coupler (insulated output)	
Protection function for short-circuit	None	
Max. output current	50mA	20mA
Max. applied voltage	+30V DC	
Residual voltage	+2.0V DC or less	

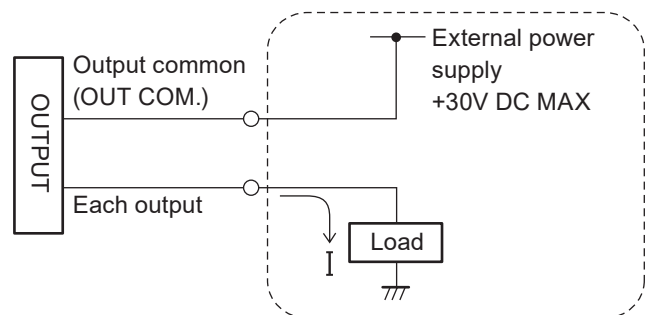
■ Output Circuit



■ NPN Sample



■ PNP Sample



I: I/O terminal block output MAX 50mA
 I/O connector output MAX 20mA

! Notice

- This product supports both the NPN transistor output and the PNP transistor output. However, the wiring from I/O terminal block and the I/O connector respectively cannot be used as NPN/PNP mixed. Operate the product after selecting either NPN or PNP.
- Do not short-circuit 24V (X1, Y3) and 0V (Y1, X3). Also, do not short-circuit IN COM. 1 (X2) and OUT COM.1 (Y2, X12). Starting the laser marker with these terminals short-circuited will cause the laser marker to malfunction.
- The applied voltage and input/output current to each terminal must not exceed each maximum value shown above. Exceeding the maximum applied voltage and the maximum output current will cause the laser marker to malfunction.

Reference

- Respective outputs are photo-coupler outputs. The regulation for output ON is based on the ON status of photo-coupler.
- IN COM. 1, OUT COM. 1 of the I/O terminal block and IN COM. 2, OUT COM. 2 of the I/O connector are independent. If you use the I/O connector terminal, connect input common/output common of the I/O terminal block and the I/O connector to power supply respectively.

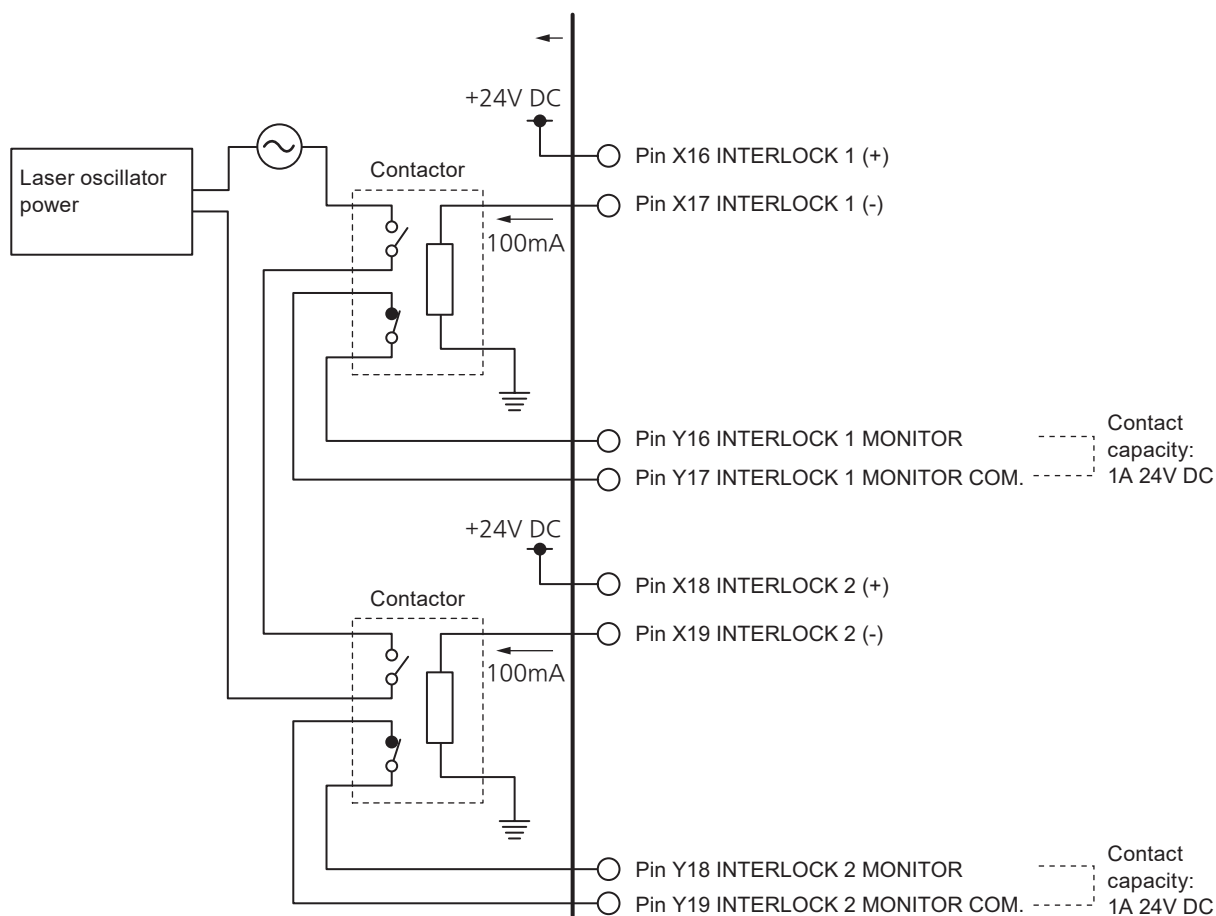
4-4-3 Interlock terminal rating and I/O circuit

This section shows the following interlock terminals and I/O circuit loaded onto the I/O terminal block.

Interlock input terminals:	Interlock monitoring terminals:
INTERLOCK 1(+) (X16)	INTERLOCK 1 MONITOR (Y16)
INTERLOCK 1(-) (X17)	INTERLOCK 1 MONITOR COM. (Y17)
INTERLOCK 2(+) (X18)	INTERLOCK 2 MONITOR (Y18)
INTERLOCK 2(-) (X19)	INTERLOCK 2 MONITOR COM. (Y19)

Notice

- INTERLOCK terminals (X16, X17 and X18, X19) are connected to the operating coil of the internal contactor in the controller. Connect INTERLOCK (+) and INTERLOCK (-) with the non-voltage contact (dry contact) such as a relay or a switch. Do not connect with the voltage contact such as a transistor.



Reference

- For the connection examples of the interlock terminals, refer to "4-5-4 Connection example of interlock terminals and laser stop terminals" (P.114).
- INTERLOCK 1(+) (X16) and INTERLOCK 2(+) (X18) are connected to the interlock dedicated power supply +24DVC internally. This power supply is independent from 24V OUT (X1, Y3) in I/O terminal.

4-5 Connecting I/O Terminal Block



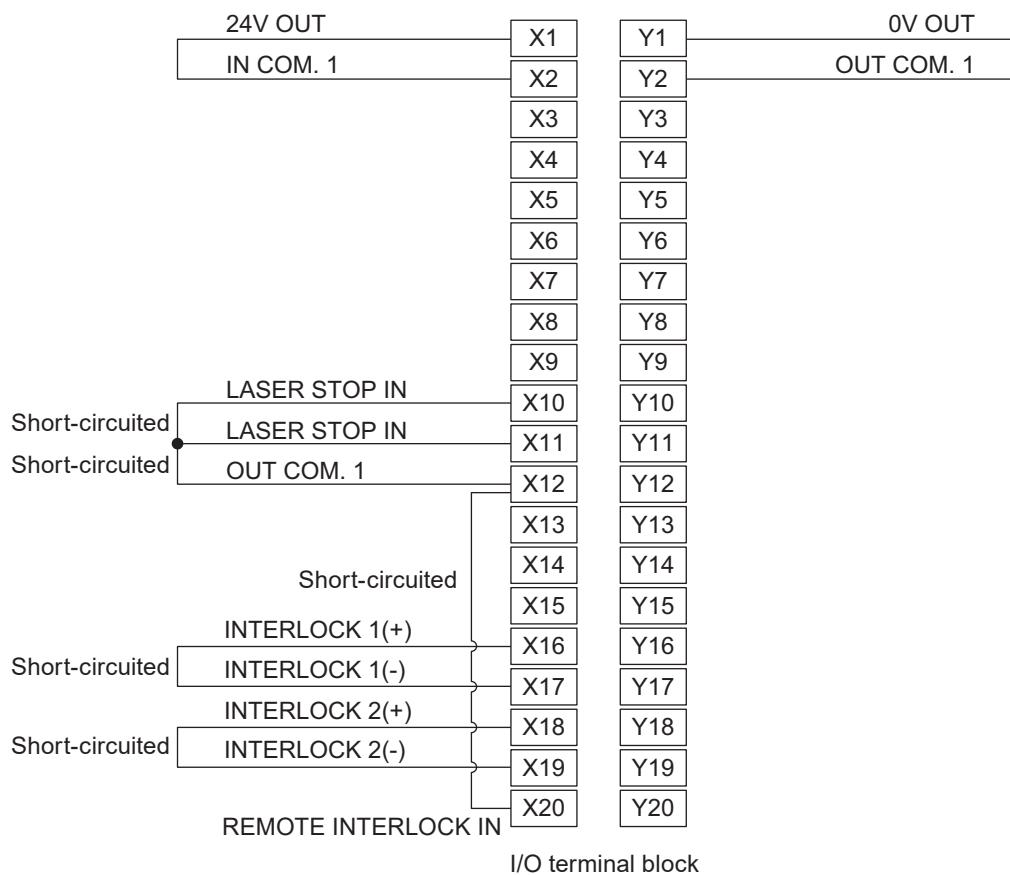
WARNING



• Make sure that the power is turned OFF at wiring.

4-5-1 Factory default wiring

The following terminals are connected by jumper wires at the factory default. Remove these jumper wires when you connect them to an external device.



Notice

- Do not short-circuit 24V OUT (X1, Y3) and 0V OUT (X3, Y1). Also, do not short-circuit IN COM. 1 (X2) and OUT COM.1 (Y2, X12). Starting the laser marker with these terminals short-circuited will cause the laser marker to malfunction.

Reference

- To enable the laser radiation, connect IN COM. 1 (X2) and OUT COM. 1 (Y2) respectively to the internal of external power supply. Refer to “4-5-2 Connecting common terminals” (P.113).
- The following terminals of the I/O terminal block are the common terminals connected internally.
 - X1 and Y3: 24V OUT
 - X3 and Y1: 0V OUT
 - Y2 and X12: OUT COM. 1

4-5-2 Connecting common terminals

Connect IN COM. 1 (X2) and OUT COM. 1 (Y2) respectively to the power supply for input and output.

For the I/O connector terminals, connect IN COM. 2 and OUT COM. 2 respectively to the power supply in the same manner.

	Use the internal power	Use the external power
NPN connection	IN COM. 1 (X2) - 24V OUT (X1)	IN COM. 1 (X2) - 24V
	OUT COM. 1 (Y2) - 0V OUT (Y1)	OUT COM. 1 (Y2) - 0V
PNP connection	IN COM. 1 (X2) - 0V OUT (X3)	IN COM. 1 (X2) - 0V
	OUT COM. 1 (Y2) - 24V OUT (Y3)	OUT COM. 1 (Y2) - 24V

! Notice

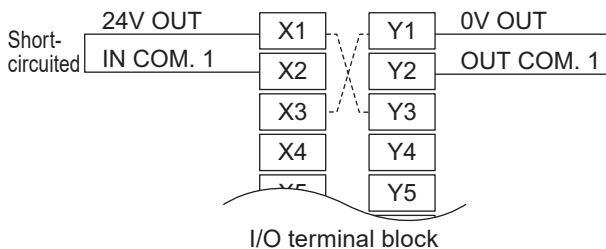
- Do not short-circuit 24V OUT (X1, Y3) and 0V OUT (Y1, X3). Also, do not short-circuit IN COM. 1 (X2) and OUT COM. 1 (Y2, X12). Starting the laser marker with these terminals short-circuited will cause the laser marker to malfunction.
- Do not mix up with the external and internal power supplies.
- Do not mix the NPN and PNP connecting patterns.
- When using the internal power supply (X1, X3, Y1, Y3), the total current of the power supply for the external device and the consumption current for the I/O control should be less than 300mA.
- If you control the laser marker by the external power such as PLC, do not connect anything to the internal power 24V OUT (X1, Y3) or 0V OUT (X3, Y1) of the I/O terminal block. If a jumper wire is installed, remove it.

Reference

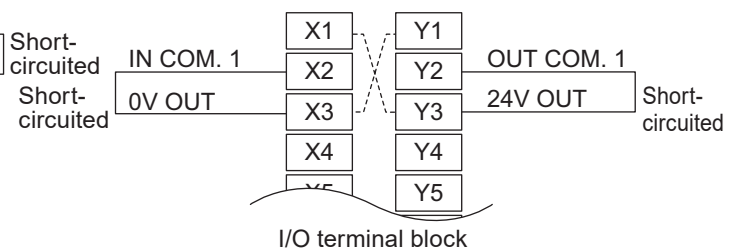
- IN COM. 1 and OUT COM. 1 of the I/O terminal block are independent from IN COM. 2 and OUT COM. 2 of the I/O connector. If you use the I/O connector terminal, connect input common/output common of the I/O terminal block and the I/O connector to power supply respectively.

■ To use the internal power (the I/O terminal block is not connected to an external control device)

NPN connection



PNP connection

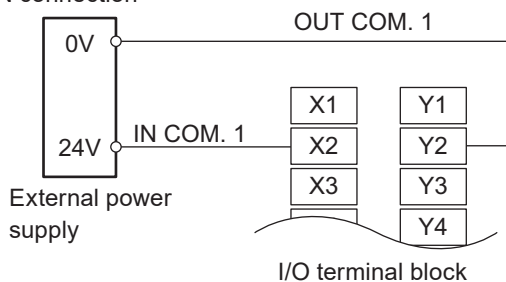


Reference

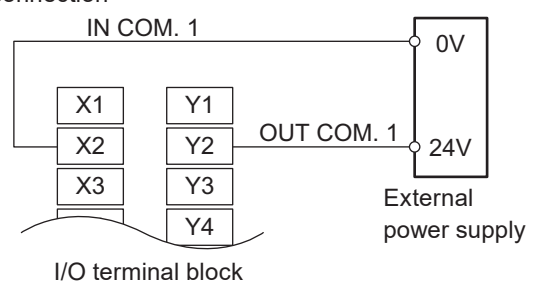
- The dotted line indicates that the terminals are connected inside of the laser marker.
- When connecting the internal power supply to IN COM. 1 and OUT COM. 1, use the attached jumper wires.

■ To use the external power (connected to an external control device such as PLC)

NPN connection



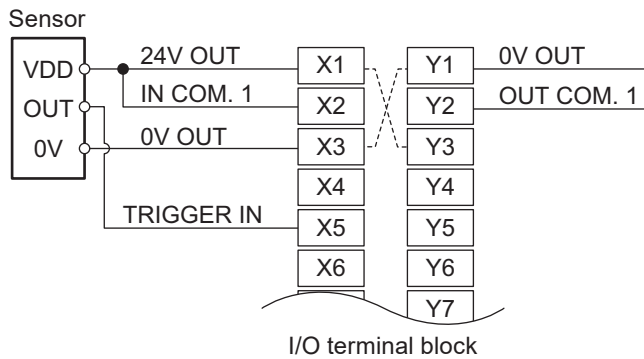
PNP connection



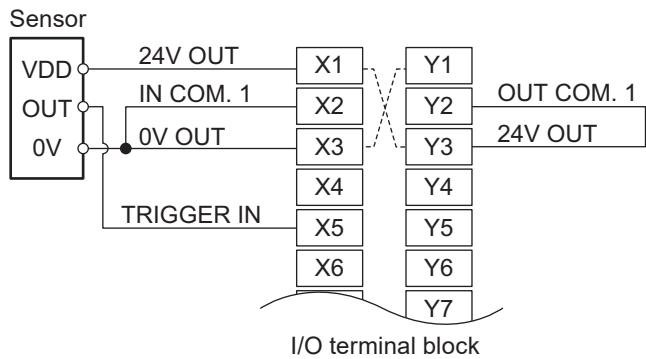
4-5-3 Sensor connection example

- Use the sensor as a marking trigger (operate the sensor by the internal power)

NPN connection



PNP connection



Reference

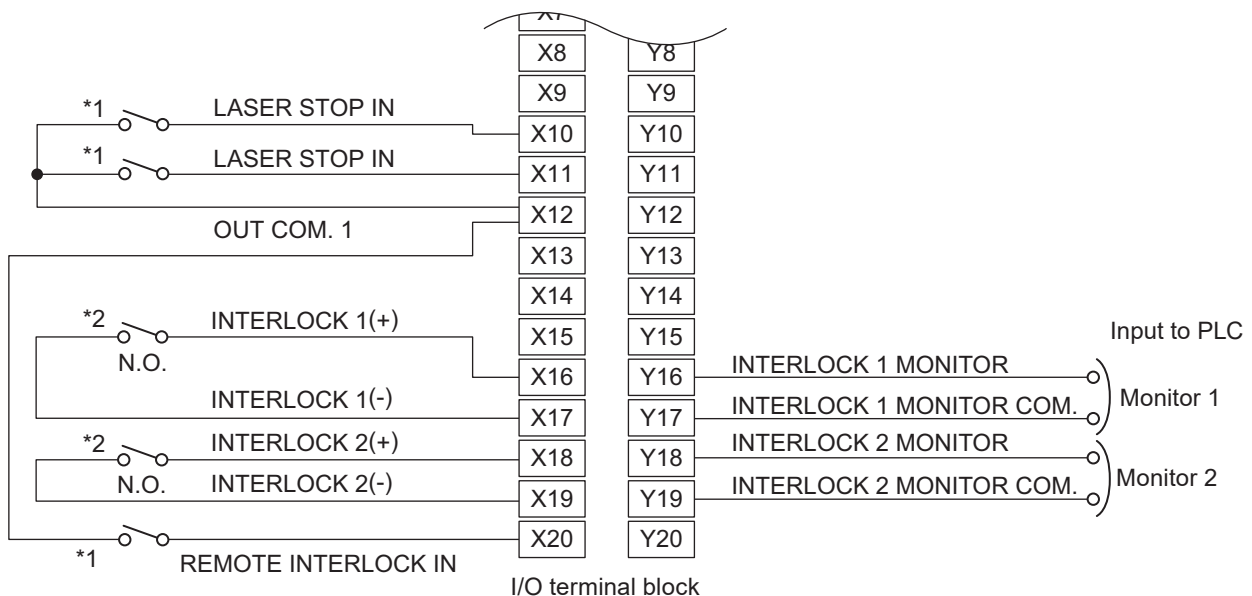
- The dotted line indicates that the terminals are connected inside of the laser marker.

4-5-4 Connection example of interlock terminals and laser stop terminals

The following terminals are used to stop the laser radiation or disable the laser radiation temporarily.

When any of these terminals are disconnected, the laser radiation will be disabled and laser marker becomes in alarm or warning status.

LASER STOP IN (X10)	—	OUT COM. 1 (X12)
LASER STOP IN (X11)	—	OUT COM. 1 (X12)
INTERLOCK 1(+) (X16)	—	INTERLOCK 1(-) (X17)
INTERLOCK 2(+) (X18)	—	INTERLOCK 2(-) (X19)
REMOTE INTERLOCK (X20)	—	OUT COM. 1 (X12)



*1 : Connect stop terminals such as a laser stop switch between LASER STOP IN and OUT COM. 1 as well as REMOTE INTERLOCK IN and OUT COM. 1 respectively.

*2 : Connect non-voltage contact such as a relay output terminal including a safety device door, switches, safety relay units between INTERLOCK 1(+) (X16) and INTERLOCK 1(-) (X17) as well as between INTERLOCK 2(+) (X16) and INTERLOCK 2(-) (X19) respectively.

Reference

- For details on the I/O circuit of the interlock terminals, refer to “4-4-3 Interlock terminal rating and I/O circuit” (P.111).
- For details on the operation of input terminals for safety measurement, refer to “Laser marker operation when functions for safety measures are input” (P.100).

4-5-5 Checking the I/O terminal status

Check the I/O connection status and its operation using the functions in the PC configuration software “Laser Marker NAVI smart” Operation procedure.

■ I/O monitor

I/O monitor indicates ON/OFF status of the I/O terminals on the laser marker. Open the I/O monitor with the following procedure.

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “Monitor” screen.
3. Select “I/O monitor” in the ribbon. The I/O monitor appears.



“I/O monitor” tool

TERMINAL connector (INPUT)			TERMINAL connector (OUTPUT)			I/O connector					
No.	Name	I/O	No.	Name	I/O	No.	Name	I/O	No.	Name	I/O
1	24V OUT	-	1	0V OUT	-	1	IN COM. 2	-	27	OUT COM. 2	-
2	IN COM. 1	-	2	OUT COM. 1	-	2	SET IN	OFF	28	SET OK OUT	OFF
3	0V OUT	-	3	24V OUT	-	3	D0 IN	OFF	29	DATE GAP OUT	OFF
4	REMOTE IN	OFF	4	REMOTE OUT	OFF	4	D1 IN	OFF	30	COUNT END A OUT	OFF
5	TRIGGER IN	OFF	5	READY OUT	OFF	5	D2 IN	OFF	31	COUNT END B OUT	OFF
6	LASER SUPPLY IN	OFF	6	LASER STANDBY OUT	OFF	6	D3 IN	OFF	32	COUNT END C OUT	OFF
7	TARGET DETECTION IN	OFF	7	SYSTEM STANDBY OUT	ON	7	D4 IN	OFF	33	COUNT END D OUT	OFF
8	SHUTTER IN	OFF	8	SHUTTER CLOSE 1 OUT	ON	8	D5 IN	OFF	34	CHECK OK OUT	OFF
9	SHUTTER ENABLE IN	OFF	9	SHUTTER CLOSE 2 OUT	ON	9	D6 IN	OFF	35	CHECK NG OUT	OFF
10	LASER STOP IN	ON	10	PROCESSING OUT	OFF	10	D7 IN	OFF	36	TIMING WAIT OUT	OFF
11	LASER STOP IN	ON	11	PROCESSING END OUT	OFF	11	D8 IN	OFF	37	SCRIPTING OUT	OFF
12	OUT COM. 1	-	12	PROCESSING FAIL OUT	OFF	12	D9 IN	OFF	38	DATA WAIT OUT	OFF
13	ENCODER A IN	OFF	13	RESERVE	-	13	D10 IN	OFF	39	SHUTTER OPEN OUT	OFF
14	ENCODER B IN	OFF	14	WARNING OUT	ON	14	D11 IN	OFF	40	LASING OUT	OFF
15	ALARM RESET IN	OFF	15	ALARM OUT	ON	15	D12 IN	OFF			
16	INTERLOCK 1 (+)	CLOSED	16	INTERLOCK 1 MONITOR	-	16	D13 IN	OFF			
17	INTERLOCK 1 (-)	CLOSED	17	INTERLOCK 1 MONITOR.COM.	-	17	D14 IN	OFF			
18	INTERLOCK 2 (+)	CLOSED	18	INTERLOCK 2 MONITOR	-	18	D15 IN	OFF			
19	INTERLOCK 2 (-)	CLOSED	19	INTERLOCK 2 MONITOR.COM.	-	19	SELECT 0 IN	OFF			
20	REMOTE INTERLOCK IN	ON	20	LASER SUPPLY OUT	OFF	20	SELECT 1 IN	OFF			
						21	SELECT 2 IN	OFF			
						22	TIME HOLD IN	OFF			
						23	GUIDE IN	OFF			
						24	TIMING IN	OFF			
						25	RESERVE	-			
						26	RESERVE	-			

Reference

- The input and output status of the I/O monitor is updated every 500ms.
- There is a margin of error between the actual input/output time and the ON/OFF time displayed on the screen.

4. To close the “I/O monitor” dialog, select “Close” or “X”.

■ Output simulation

With the output simulation you can check the output signals of the laser marker without an actual operation. Use this function to confirm the operation of the external devices connected with the laser marker. Output simulation starts with the following procedure.

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “Maintenance” screen.
3. Select “Output simulation” in the ribbon.



“Output simulation” tool

4. Output simulation dialog appears.

Click the output terminal name to simulate, then the output status of the laser marker changes.

TERMINAL connector (INPUT)			TERMINAL connector (OUTPUT)			I/O connector					
No.	Name	I/O	No.	Name	I/O	No.	Name	I/O	No.	Name	I/O
1	24V OUT	-	1	0V OUT	-	1	IN COM. 2	-	27	OUT COM. 2	-
2	IN COM. 1	-	2	OUT COM. 1	-	2	SET IN	OFF	28	SET OK OUT	OFF
3	0V OUT	-	3	24V OUT	-	3	D0 IN	OFF	29	DATE GAP OUT	OFF
4	REMOTE IN	OFF	4	REMOTE OUT	OFF	4	D1 IN	OFF	30	COUNT END A OUT	OFF
5	TRIGGER IN	OFF	5	READY OUT	OFF	5	D2 IN	OFF	31	COUNT END B OUT	OFF
6	LASER SUPPLY IN	OFF	6	LASER STANDBY OUT	OFF	6	D3 IN	OFF	32	COUNT END C OUT	OFF
7	TARGET DETECTION IN	OFF	7	SYSTEM STANDBY OUT	ON	7	D4 IN	OFF	33	COUNT END D OUT	OFF
8	SHUTTER IN	OFF	8	SHUTTER CLOSE 1 OUT	ON	8	D5 IN	OFF	34	CHECK OK OUT	OFF
9	SHUTTER ENABLE IN	OFF	9	SHUTTER CLOSE 2 OUT	ON	9	D6 IN	OFF	35	CHECK NG OUT	OFF
10	LASER STOP IN	ON	10	PROCESSING OUT	OFF	10	D7 IN	OFF	36	TIMING WAIT OUT	OFF
11	LASER STOP IN	ON	11	PROCESSING END OUT	OFF	11	D8 IN	OFF	37	SCRIPTING OUT	OFF
12	OUT COM. 1	-	12	PROCESSING FAIL OUT	OFF	12	D9 IN	OFF	38	DATA WAIT OUT	OFF
13	ENCODER A IN	OFF	13	RESERVE	-	13	D10 IN	OFF	39	SHUTTER OPEN OUT	OFF
14	ENCODER B IN	OFF	14	WARNING OUT	ON	14	D11 IN	OFF	40	LASING OUT	OFF
15	ALARM RESET IN	OFF	15	ALARM OUT	ON	15	D12 IN	OFF			
16	INTERLOCK 1 (+)	CLOSED	16	INTERLOCK 1 MONITOR	-	16	D13 IN	OFF			
17	INTERLOCK 1 (-)	CLOSED	17	INTERLOCK 1 MONITOR COM.	-	17	D14 IN	OFF			
18	INTERLOCK 2 (+)	CLOSED	18	INTERLOCK 2 MONITOR	-	18	D15 IN	OFF			
19	INTERLOCK 2 (-)	CLOSED	19	INTERLOCK 2 MONITOR COM.	-	19	SELECT 0 IN	OFF			
20	REMOTE INTERLOCK IN	ON	20	LASER SUPPLY OUT	OFF	20	SELECT 1 IN	OFF			
						21	SELECT 2 IN	OFF			
						22	TIME HOLD IN	OFF			
						23	GUIDE IN	OFF			
						24	TIMING IN	OFF			
						25	RESERVE	-			
						26	RESERVE	-			

Reference

- You can use the I/O monitor and output simulation also for the control via optional network unit (EtherNet/IP or PROFINET).

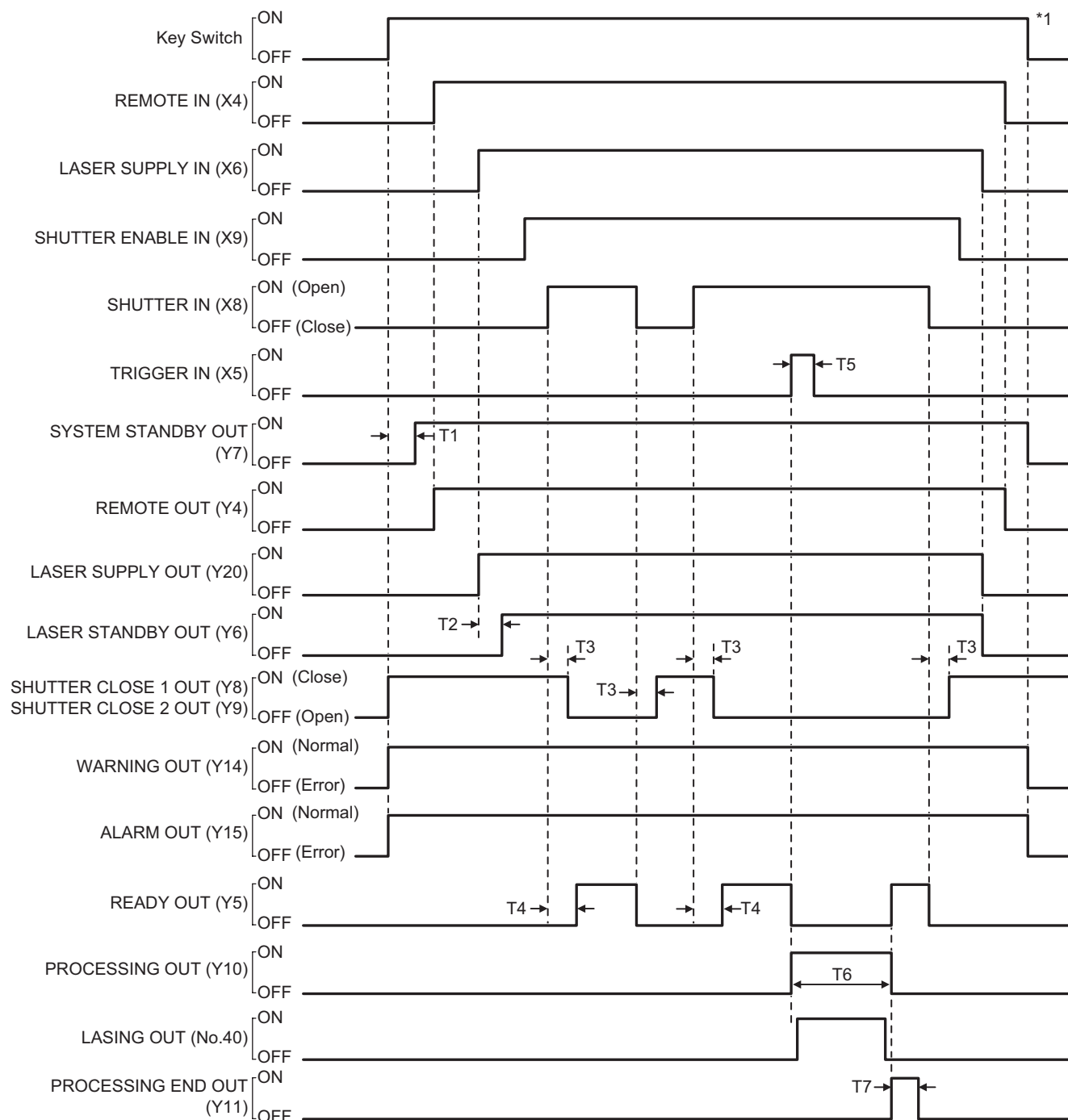
5. Select “Reset” to terminate the output simulation and reset the status of the output signals to the actual settings.
6. To close the “Output simulation” dialog and terminate the simulation, select “Close” or “X”.

4-6 Basic Control Timing Chart

Reference

- ON/OFF on the timing chart refers to ON/OFF operations. It does not refer to the voltage level (High/Low).
- In the following timing charts, the timing of output operation corresponding to each input has a small delay of 0ms or more.

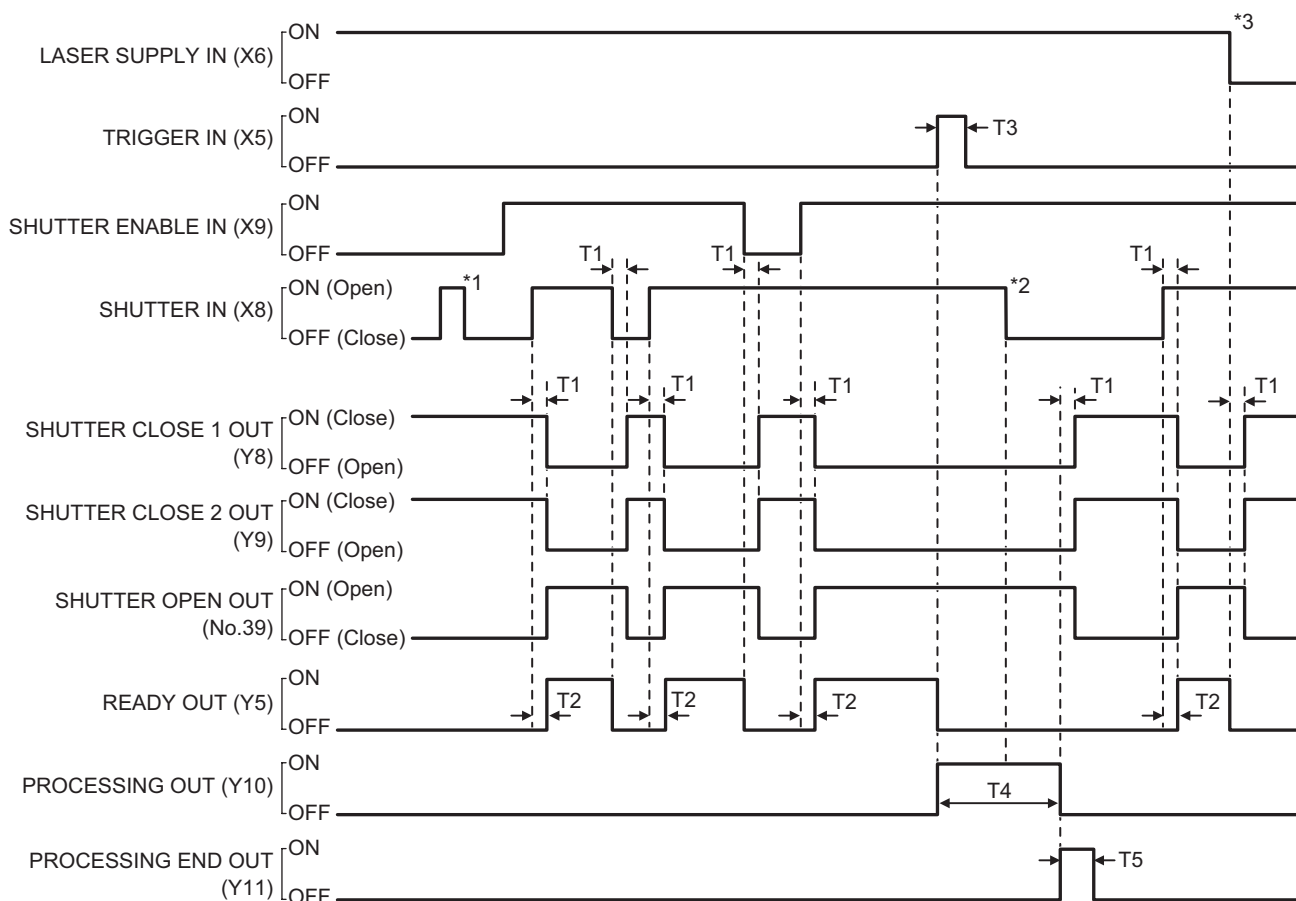
4-6-1 Flow from startup to marking



*1 : Turn off the key switch with the laser pumping turned off or with the shutter closed.

Item	Time	Remarks
T1	Approx. 10 sec.	Time for system startup. Turn ON the remote mode upon verifying SYSTEM STANDBY OUT (Y7).
T2	Approx. 5 sec.	Time for completion of laser pumping. <ul style="list-style-type: none"> • At the usual operation: Approx. 5 sec. • Re-pumping right after turning the laser pumping OFF: Max. 10 sec.
T3	Max. 1 sec.	There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9).
T4	—	Setup time of the laser marker to start the marking trigger processing. <ul style="list-style-type: none"> • In the laser pumping completed state: Total time for shutter opening (T3) and marking data creation. It varies depending on the quantity of the setting data. • When the laser pumping is not completed: Total time for shutter opening (T3) and marking data creation, or time for laser pumping, whichever is longer.
T5	2ms or more	Keep the ON status for 2ms or more.
T6	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT (Y10) includes the trigger delay time, marking preparation time, laser radiation time, and processing time after marking has completed.
T7	2 to 510ms	One-shot output. Set the output time on the environment setting screen. There is a small margin of error for the setting value.

4-6-2 Shutter open/close

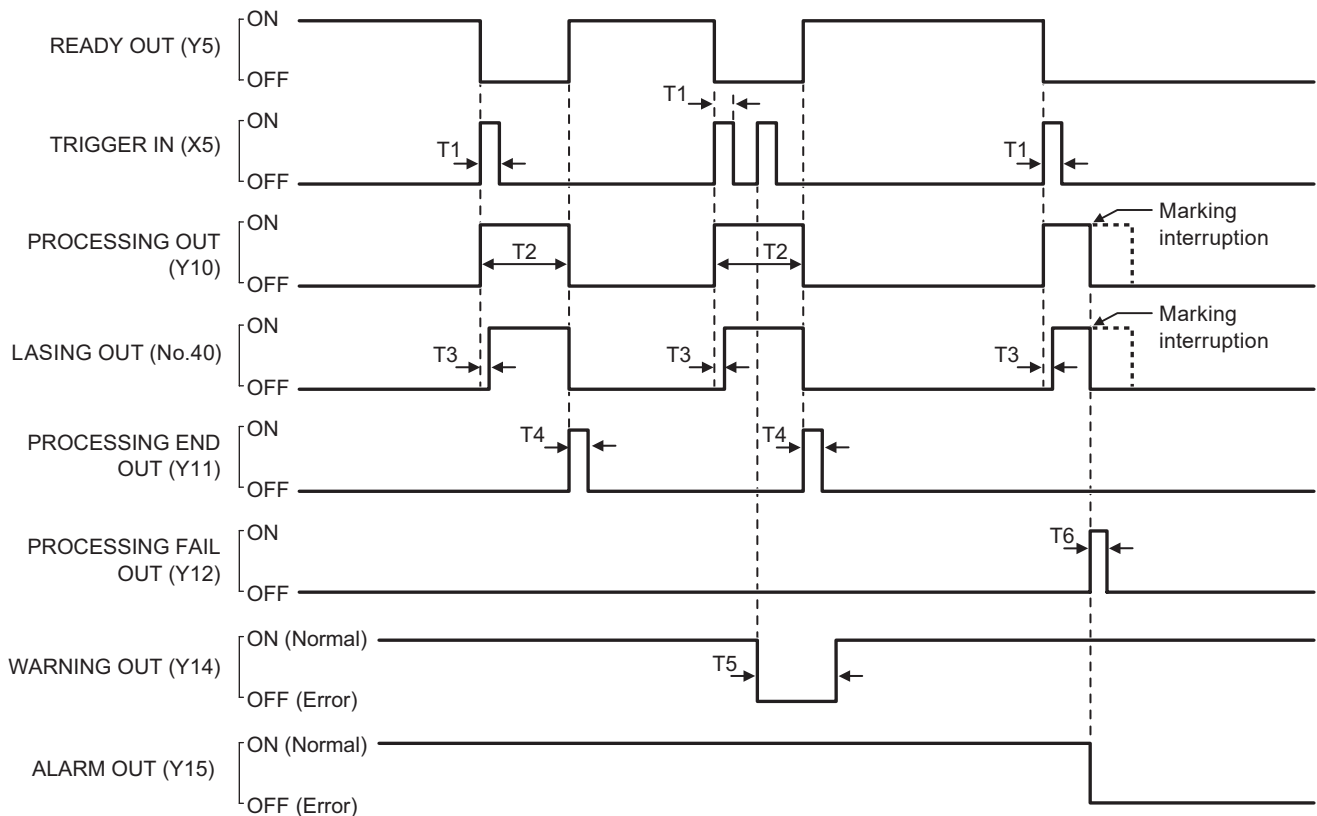


- *1 : SHUTTER IN (X8) is accepted and the shutter opens only when SHUTTER ENABLE IN (X9) is turned on.
- *2 : If SHUTTER IN (X8) was turned off during the trigger processing, the shutter closes after the trigger processing has completed.
- *3 : When the laser pumping is turned to off, the shutter is closed regardless the on/off state of SHUTTER IN (X8).

Item	Time	Remarks
T1	Max. 1 sec.	There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9). Note that the shutter does not open until the laser pumping is completed, i.e., it opens after the laser pumping is completed.
T2	—	Total time for shutter opening (T1) and marking data creation. It varies depending on the quantity of the setting data.
T3	2ms or more	Keep the ON status for 2ms or more.
T4	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT (Y10) includes the trigger delay time, marking preparation time, laser radiation time, and processing time after marking has completed. If you are not using the link function with external devices, output time of PROCESSING OUT (Y10) is almost the same as the total duration of the trigger delay time and LASING OUT (No.40).
T5	2 to 510ms	One-shot output. Set the output time on the environment setting screen. There is a small margin of error for the setting value.

4-6-3 Marking trigger input (to static object): Single trigger

When the trigger mode is set to “single trigger” in the file settings, one lasing operation is executed by the edge of turning on of TRIGGER IN (X5).

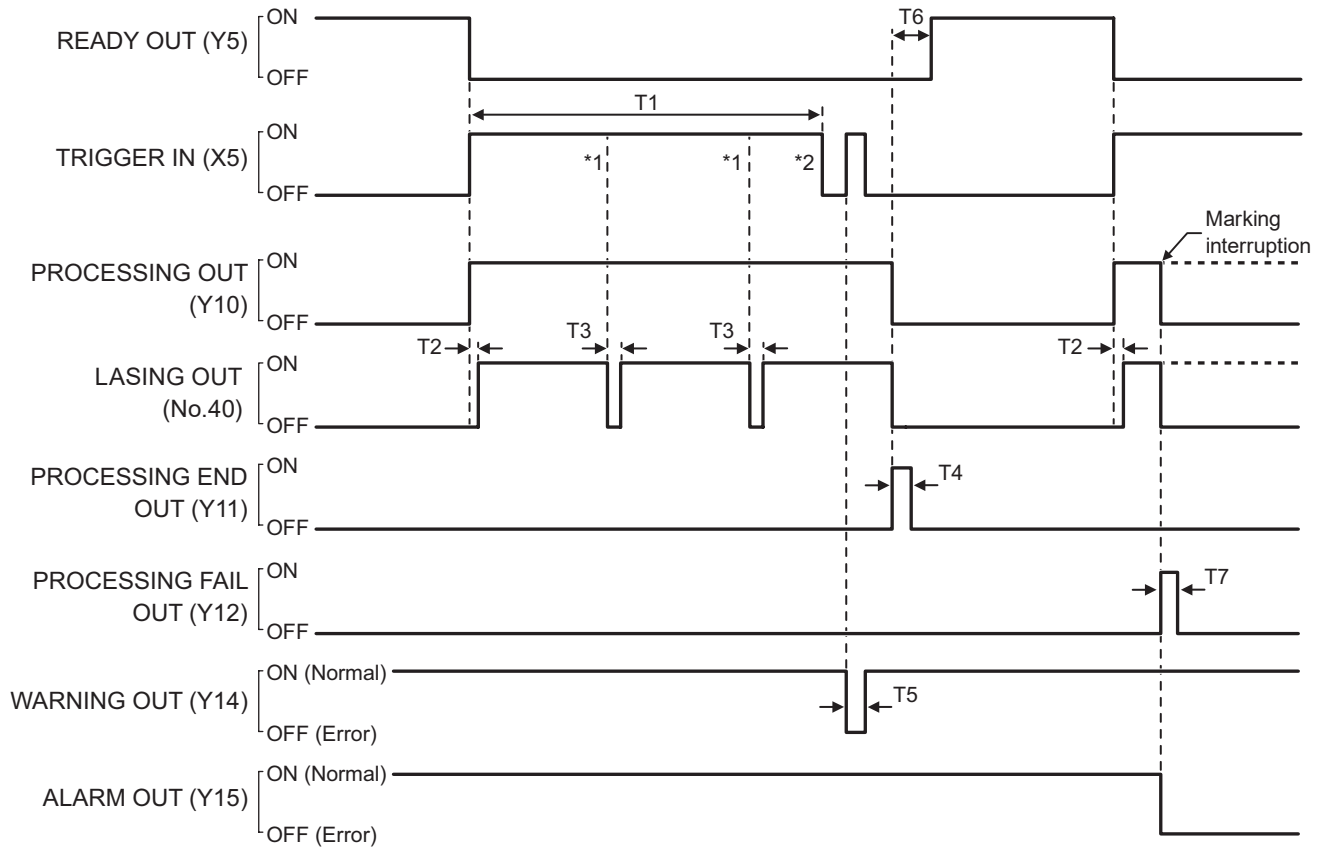


Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT (Y10) includes the trigger delay time, marking preparation time, laser radiation time, and processing time after marking has completed.
T3	0 to 9999ms	When the trigger delay time is set in the selected file, trigger processing (lasing) operation starts after the delay time.
T4	2 to 510ms	This is the output to notify that the marking trigger processing completed normally. This is One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.
T5	Approx. 3 sec.	It outputs a warning to notify that an invalid trigger was input when TRIGGER IN (X5) was input during trigger processing. This is One-shot output. You can turn this warning off by the settings.
T6	2 to 510ms	If the trigger processing was stopped by an alarm or a warning, PROCESSING FAIL OUT (Y12) turns on during the one-shot output period. PROCESSING END OUT (Y11) will not be output at this time.

4-6-4 Marking trigger input: Continuous trigger

■ Without “allow to stop halfway” setting

When the trigger mode is set to “continuous trigger” in the file settings, lasing operation is repeated while TRIGGER IN (X5) is on. Without “allow to stop halfway” setting if TRIGGER IN turns OFF when the lasing operation is running, the lasing operation is terminated after finishing the running operation.



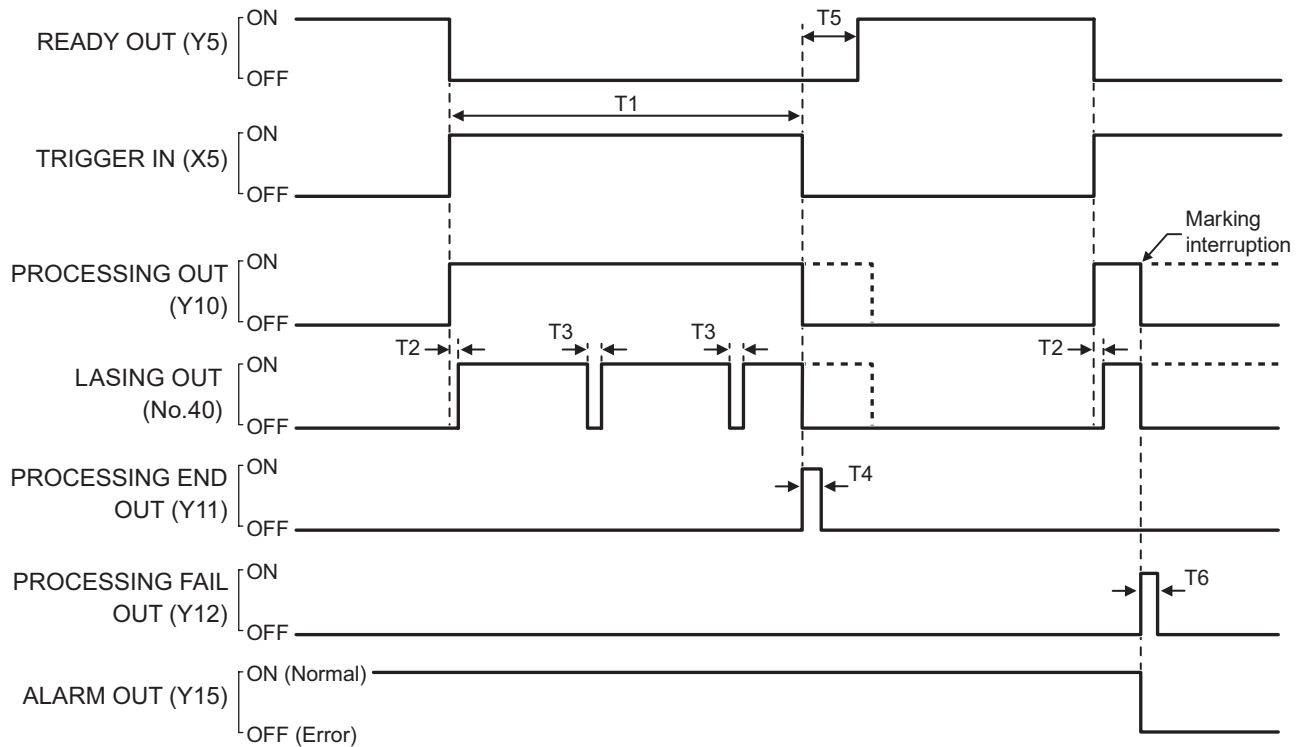
*1 : If TRIGGER IN (X5) is still ON at the completion of the lasing operation, the lasing operation starts again.

*2 : If TRIGGER IN (X5) turns OFF when the lasing operation is running, the lasing operation is terminated after finishing the running operation.

Item	Time	Remarks
T1	2 ms or more	Keep the ON status for the duration of repeating the lasing operation.
T2	0 to 9999 ms	When the trigger delay time is set in the selected file, trigger processing (lasing) operation starts after the delay time.
T3	0.0 to 60.0 sec.	When the scanning interval is set, the next lasing operation starts after a lapse of the setting period.
T4	2 to 510 ms	This is the output to notify that the marking trigger processing completed normally. This is One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.
T5	Approx. 3 sec.	It outputs a warning to notify that an invalid trigger was input when TRIGGER IN (X5) was input during trigger processing. This is One-shot output. You can turn this warning off by the settings.
T6	—	Time for marking data creation. It varies depending on the quantity of the setting data. This time is required at every marking.
T7	2 to 510ms	If the trigger processing was stopped by an alarm or a warning, PROCESSING FAIL OUT (Y12) turns on during the one-shot output period. PROCESSING END OUT (Y11) will not be output at this time.

■ With “allow to stop halfway” setting

When the trigger mode is set to “continuous trigger” in the file settings, lasing operation is repeated while TRIGGER IN (X5) is on. With “allow to stop halfway” setting, the lasing operation is terminated immediately when TRIGGER IN turns OFF.

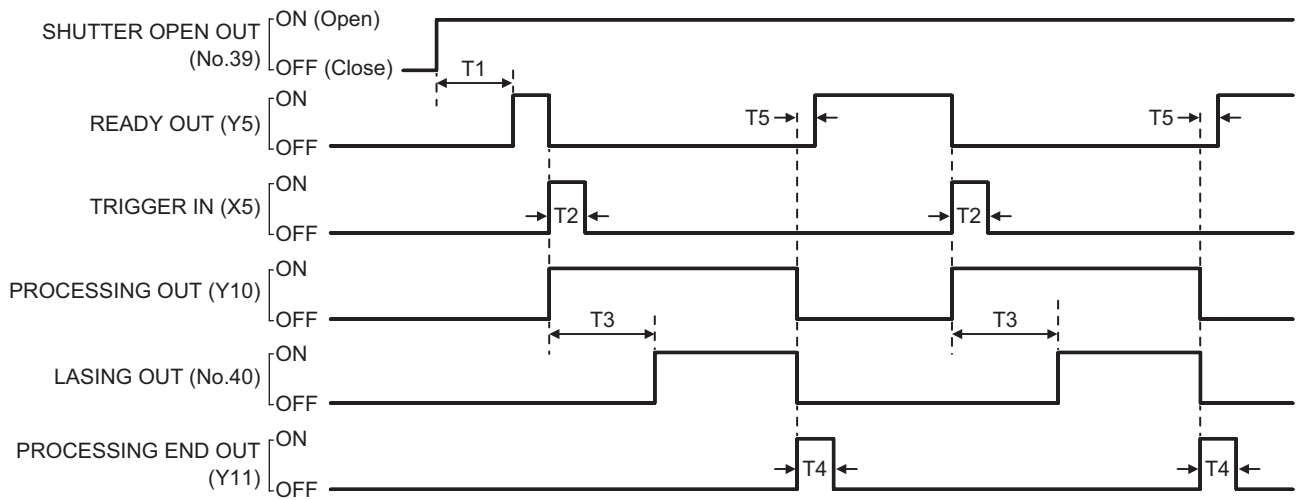


Item	Time	Remarks
T1	2 ms or more	Keep the ON status for the duration of repeating the lasing operation.
T2	0 to 9999 ms	When the trigger delay time is set in the selected file, trigger processing (lasing) operation starts after the delay time.
T3	0.0 to 60.0 sec.	When the scanning interval is set, the next lasing operation starts after a lapse of the setting period.
T4	2 to 510 ms	This is the output to notify that the marking trigger processing completed normally. This is One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value. When the marking operation stops halfway because TRIGGER IN turns OFF, it is treated as normal operation end.
T5	—	Time for marking data creation. It varies depending on the quantity of the setting data. This time is required at every marking.
T6	2 to 510 ms	If the trigger processing was stopped by an alarm or a warning, PROCESSING FAIL OUT (Y12) turns ON during the one-shot output period. PROCESSING END OUT (Y11) will not be output at this time.

Reference

- If the executed number of lasing operation are less than the specified minimum number, warning E630 occurs after the marking operation.
- If TRIGGER IN signal remains ON though the executed number of lasing operation reaches the specified maximum number, warning E631 occurs and the subsequent lasing is canceled.

4-6-5 On-the-fly marking: Single trigger

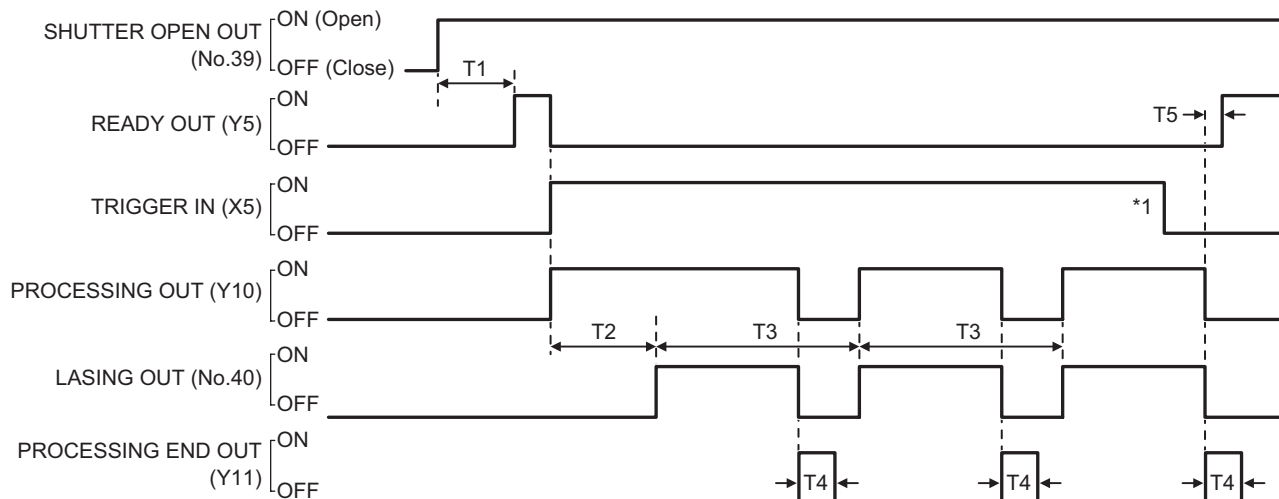


Item	Time	Remarks
T1	—	Time for marking data creation. It varies depending on the quantity of the setting data.
T2	2ms or more	Keep the ON status for 2ms or more.
T3	—	Time from when TRIGGER IN (X5) is turned on till when the workpiece comes to the preset marking position.
T4	2 to 510ms	This is the output to notify that the marking trigger processing completed normally. This is One-shot output. Set the output time on System settings screen. There is a small margin of error for the setting value.
T5	—	Time for marking data creation. When the next marking data is not ready during the marking operation, this is the rest time for data creation. When the next marking data is ready during the marking operation, this takes less than 1ms.

Reference

- If the counter is reset during on-the-fly marking operation, READY OUT (Y5) turns off momentary and there is a case that the next marking could not be executed due to Warning E751.

4-6-6 On-the-fly marking: Marking at regular intervals



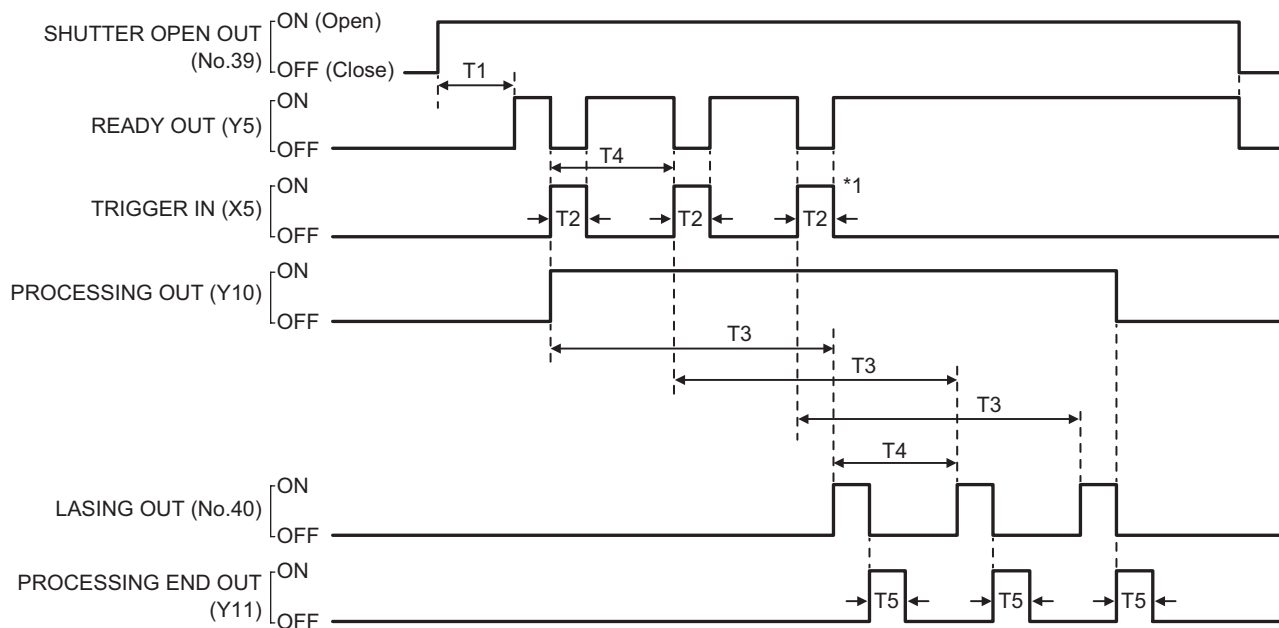
*1 : If TRIGGER IN (X5) turns off when the trigger processing operation is running, on-the-fly marking at regular intervals is terminated after finishing the running operation.

Item	Time	Remarks
T1	—	Time for marking data creation. It varies depending on the quantity of the setting data.
T2	—	Time from when TRIGGER IN (X5) is turned on till when the workpiece comes to the preset marking position.
T3	—	Time it takes the workpiece to move to the setting intervals [mm].
T4	2 to 510ms	This is the output to notify that the marking trigger processing completed normally. This is One-shot output. Set the output time on System settings screen. There is a small margin of error for the setting value.
T5	—	Time for marking data creation. When the next marking data is not ready during the marking operation, this is the rest time for data creation. When the next marking data is ready during the marking operation, this takes less than 1ms.

Reference

- If the counter is reset during on-the-fly marking operation, there is a case that the next marking could not be executed due to Warning E751.

4-6-7 On-the-fly marking: Multiple triggers



*1 : When trigger mode is set to Multiple triggers at on-the-fly marking, max. 16 triggers can be accepted while PROCESSING OUT (Y10) is ON.

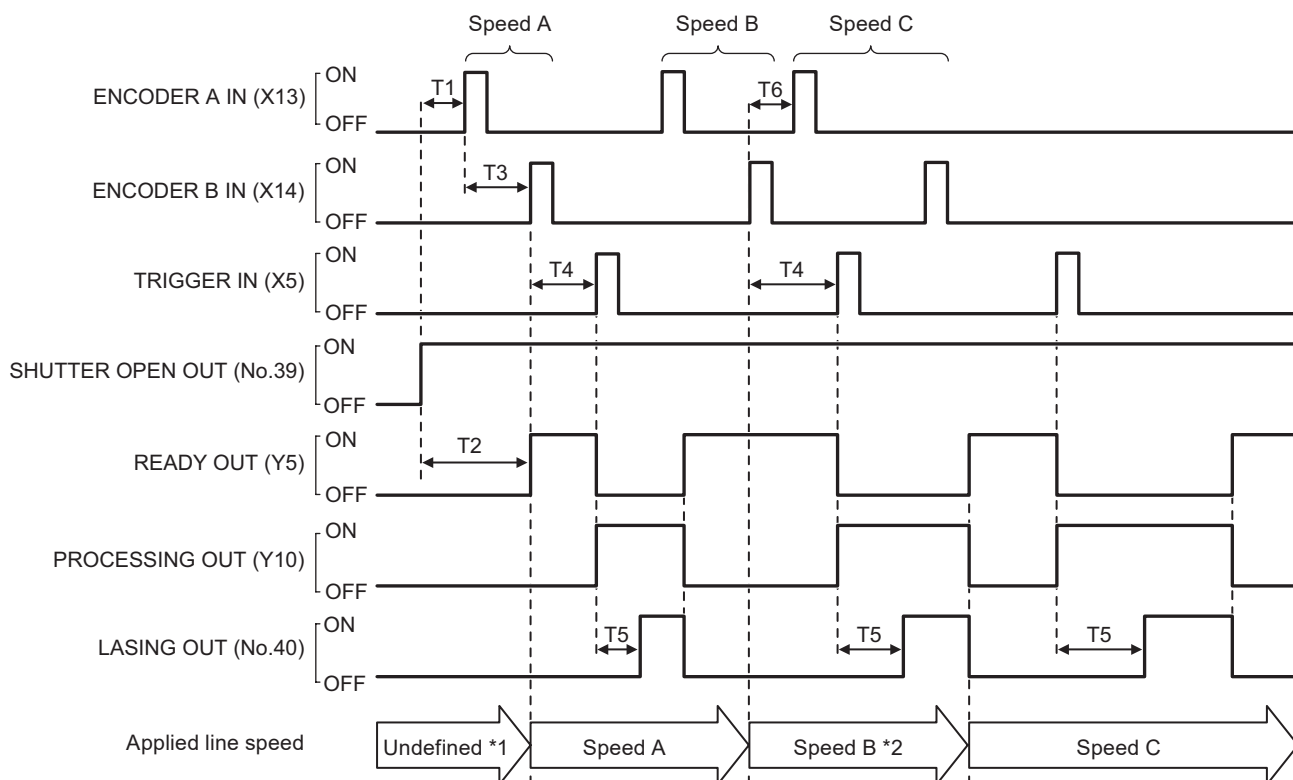
Item	Time	Remarks
T1	—	Time for marking data creation. It varies depending on the quantity of the setting data.
T2	2ms or more	Keep the ON status for 2ms or more.
T3	—	Time from when TRIGGER IN (X5) is turned on till when the workpiece comes to the preset marking position
T4	—	The total time of lasing time and preparing time for next marking is needed for the input interval of TRIGGER IN. If this interval is too short, warning E618 occurs and subsequent marking will be canceled.
T5	2 to 510ms	This is the output to notify that the marking trigger processing completed normally. This is One-shot output. Set the output time on System settings screen. There is a small margin of error for the setting value.

Reference

- If the counter is reset during on-the-fly marking operation, READY OUT (Y5) turns off momentary and there is a case that the next marking could not be executed due to Warning E751.
- If any of the following operations are executed while the trigger processing operations of multiple triggers are running, on-the-fly marking is terminated after finishing the running marking, and subsequent triggers will be canceled.
 - Closing the shutter
 - Sending MKM command with “command reception permission ON”
 - Changing the file
 - Changing the marking characters by code reader linkage function

4-6-8 On-the-fly marking: 2 sensors input

When trigger mode is set to Single trigger



*1 : If TRIGGER IN (X5) is turned ON without proper detection of the line speed, warning E607 occurs.

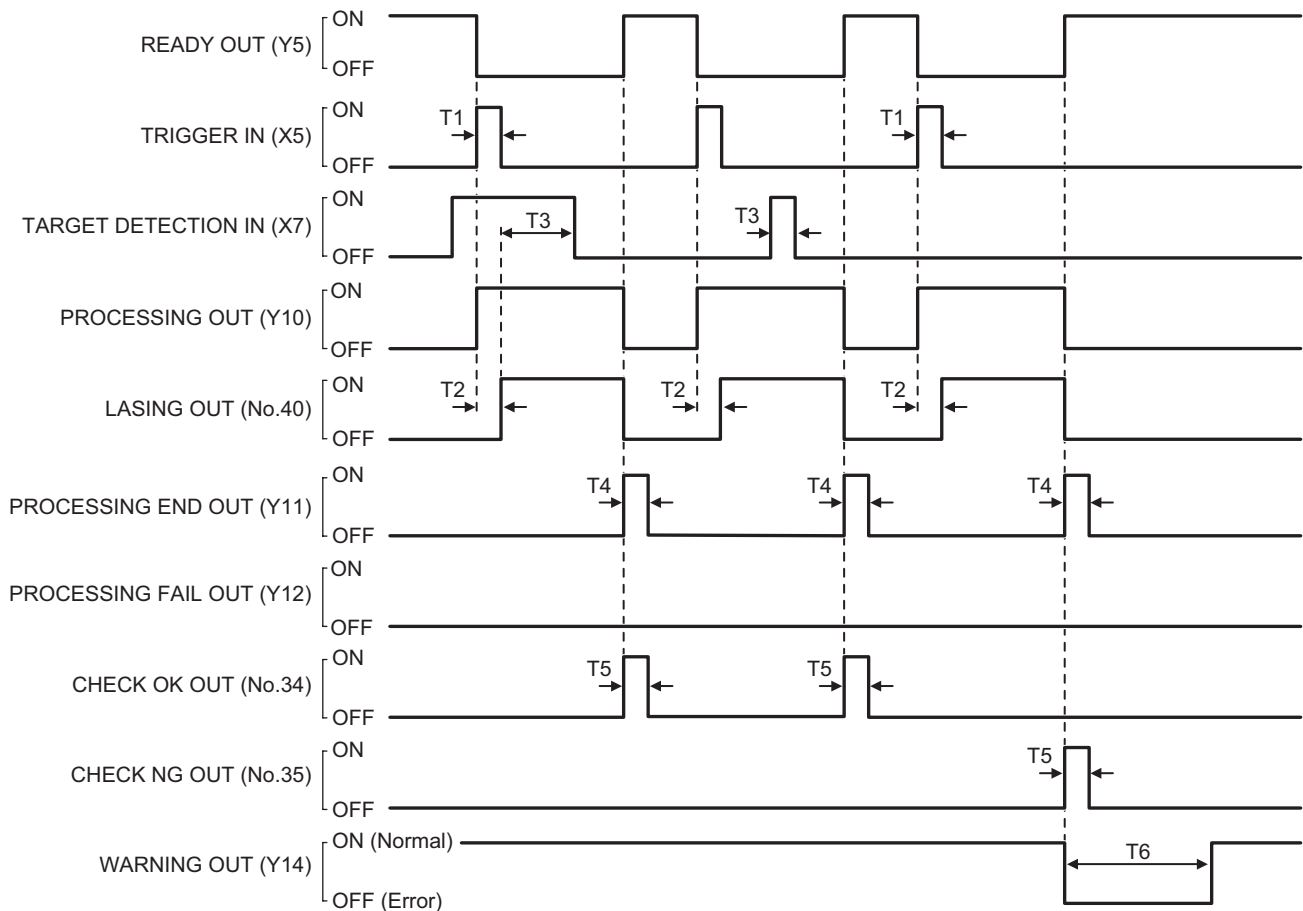
*2 : When ENCODER B IN (X14) is input during the trigger processing operation, the line speed is updated after the running trigger processing.

Item	Time	Remarks
T1	0ms or more	Turn on ENCODER A IN (X13) with the shutter opened.
T2	—	Time for marking data creation. It varies depending on the quantity of the setting data.
T3	Max. 10 sec.	If ENCODER B IN (X14) does not turn on within 10 seconds from turning on of ENCODER A IN (X13), time-out error (E607) occurs when TRIGGER IN (X5) is input.
T4	1 to 10 sec. or Not specified (No time-out)	If TRIGGER IN (X5) is not turned on within the setting time-out period from turning on ENCODER B IN (X14), time-out error (warning E607) occurs. This time-out can be disabled by setting.
T5	—	Time from when TRIGGER IN (X5) is turned on till when the workpiece comes to the preset marking position.
T6	0ms or more	ENCODER A IN (X13) for the next marking can be accepted after inputting ENCODER B IN (X14).

Reference

- It is recommended to set the sensors to detect the line speed and the trigger input position as close as possible to reduce the difference between the detected line speed and the actual line speed at the marking.

4-6-9 Target detection input

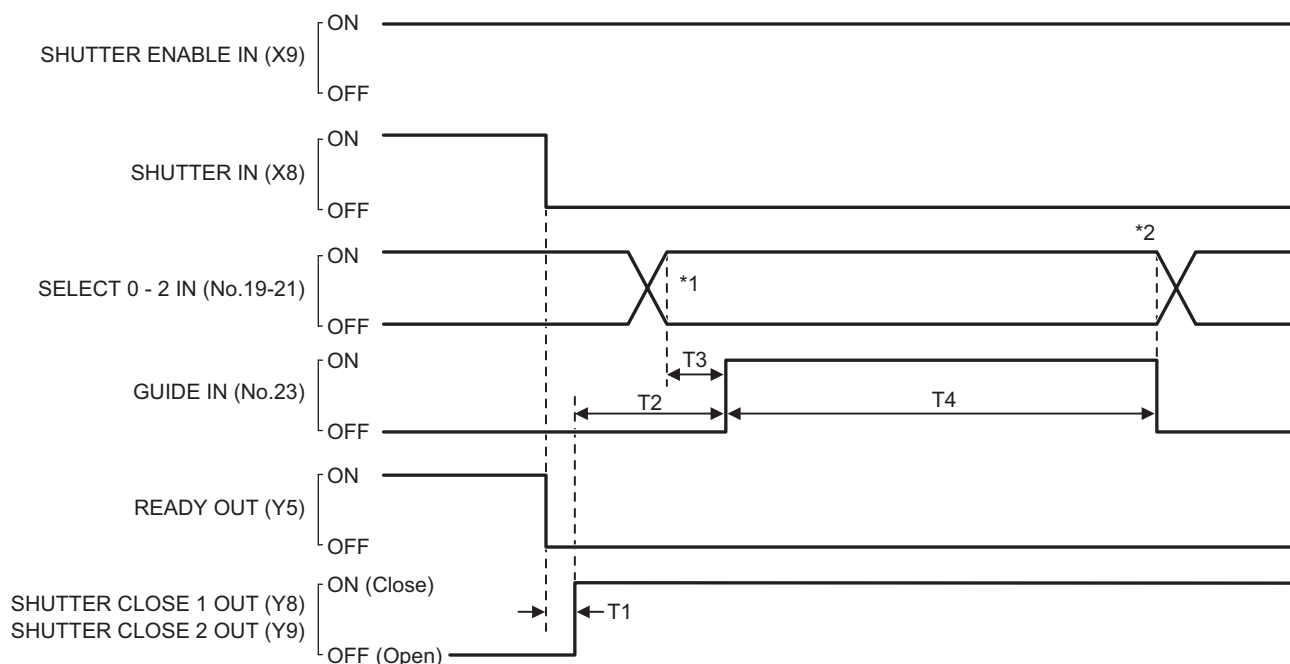


Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	0 to 9999 ms	When the trigger delay time is set in the selected file, trigger processing (lasing) operation starts after the delay time.
T3	1 ms or more	When TARGET DETECTION IN (X7) turns ON for more than 1ms while LASING OUT (No.40) is ON, it is judged as success of the target detection.
T4	2 to 510 ms	This is the output to notify that the marking trigger processing completed normally. Even when the workpiece could not be detected, PROCESSING END OUT (Y11) turns on unless the trigger processing operation is interrupted. This is One-shot output. Set the output time on System settings screen. There is a small margin of error for the setting value.
T5	2 to 510 ms	According to the ON/OFF state of TARGET DETECTION IN (X7), CHECK OK OUT (No.34) or CHECK NG OUT (No.35) turns on for one-shot time after the trigger processing (lasing) operation. The one-shot output time is set on the system settings screen. There is a small margin of error for the setting value. <ul style="list-style-type: none"> • When TARGET DETECTION IN (X7) turns ON for more than 1ms during lasing operation: CHECK OK OUT (No.34) turns ON. • When TARGET DETECTION IN (X7) did not turn ON during lasing operation: CHECK NG OUT (No.35) turns ON.
T6	Approx. 3 sec.	When TARGET DETECTION IN (X7) did not turn ON during lasing operation, the warning E752 is output for 3 seconds.

Reference

- Before using TARGET DETECTION IN (X7), set X7: TARGET DETECTION IN to “Enabled” at the system settings of Laser Marker NAVI smart.

4-6-10 Guide laser radiation input



Item	Time	Remarks
T1	Max. 1 sec.	There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9).
T2	0ms or more	Turn on GUIDE IN (No.23) with the shutter closed.
T3	0.5ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN, turn on GUIDE IN.
T4	Max. 60 sec.	The guide laser is stopped automatically after passing 1 minute from start-up.

*1 : Select the indication contents of the guide laser with SELECT 0 IN to SELECT 2 IN as follows.

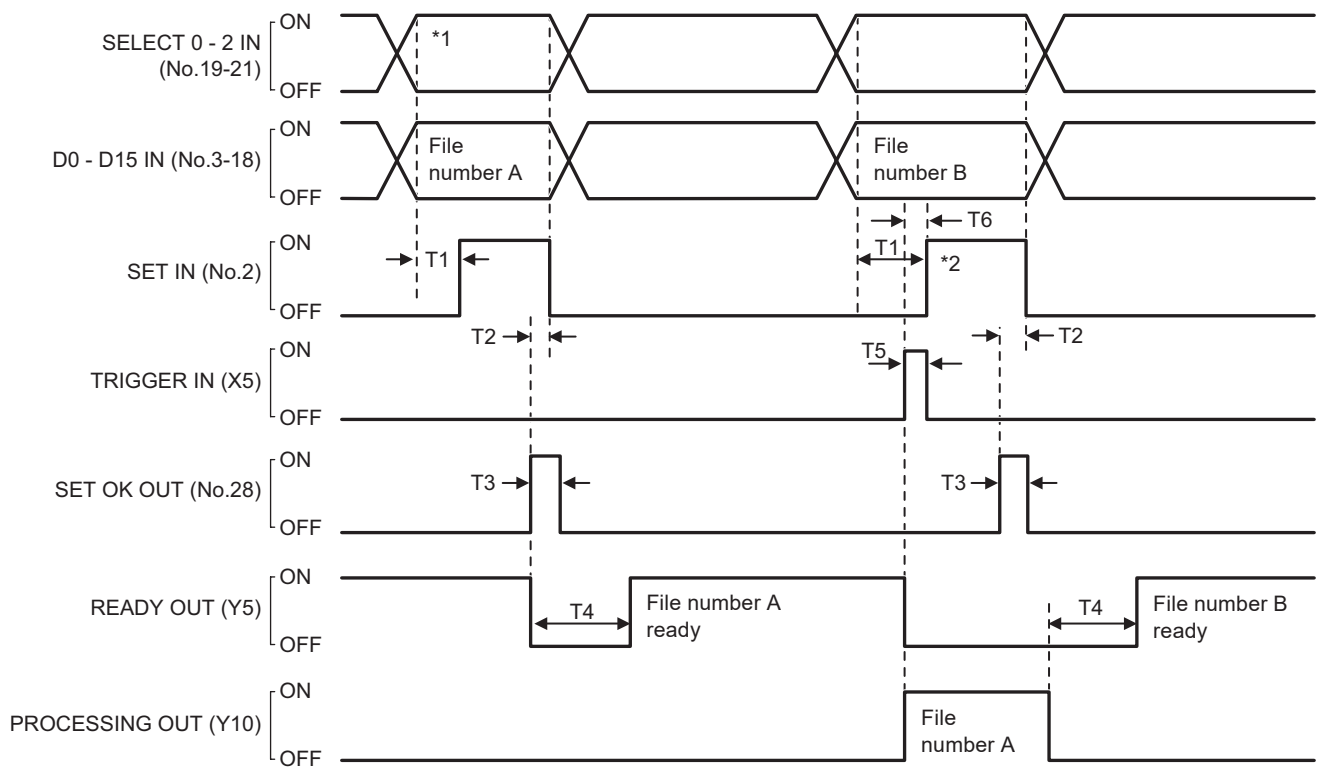
Radiation details	SELECT 0 IN (No. 19)	SELECT 1 IN (No. 20)	SELECT 2 IN (No. 21)
Work distance	OFF	OFF	OFF
Marking image	ON	OFF	OFF
Marking field	OFF	ON	OFF
Masked objects	ON	ON	OFF

*2 : Keep the input state of SELECT 0 IN to SELECT 2 IN (No.19-21) while GUIDE IN (No.23) is turned ON.

Reference

- To use a guide laser in remote mode while any of the INTERLOCK inputs (REMOTE INTERLOCK IN, INTERLOCK 1, INTERLOCK 2) is open, set "Deactivate while shutter closed" in "System settings" > "Operation/information" > "INTERLOCK alarm detection".
- If you have configured the guide laser control method of external control to communication commands by the system settings of Laser Marker NAVI smart, the guide laser radiation by I/O is not possible.
- Do not execute any other operation while the guide laser is emitted.

4-6-11 Select file

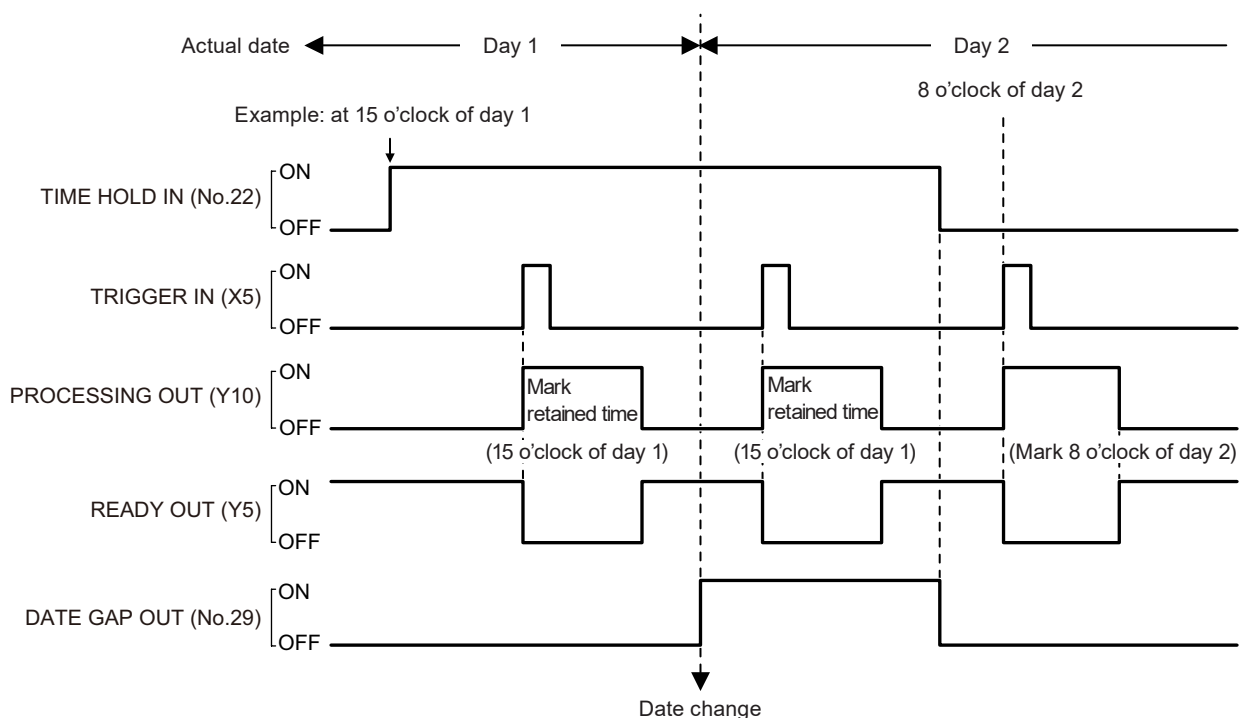


Item	Time	Remarks
T1	0.5ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN and D0 IN to D15 IN, turn on SET IN (No.2).
T2	0ms or more	Keep the input until SET OK OUT (No.28) turns on.
T3	2 to 510ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.
T4	—	<ul style="list-style-type: none"> In the laser pumping completed and shutter opened state: Time for marking data creation. It varies depending on the quantity of the setting data. When the laser pumping is not completed and shutter is closed: Total time for shutter opening and marking data creation, or time for laser pumping, whichever is longer.
T5	2ms or more	Keep the ON status for 2ms or more.
T6	0ms or more	To input the next file number right after TRIGGER IN (X5), input SET IN (No.2) after PROCESSING OUT (Y10) turns ON.

*1 : Turn off SELECT 0 IN to SELECT 2 IN when you specify a file number.

*2 : You can input the next file number during the trigger processing. If the trigger processing was being executed when you turned on SET IN (No.2), the file number changes after the trigger processing completes.

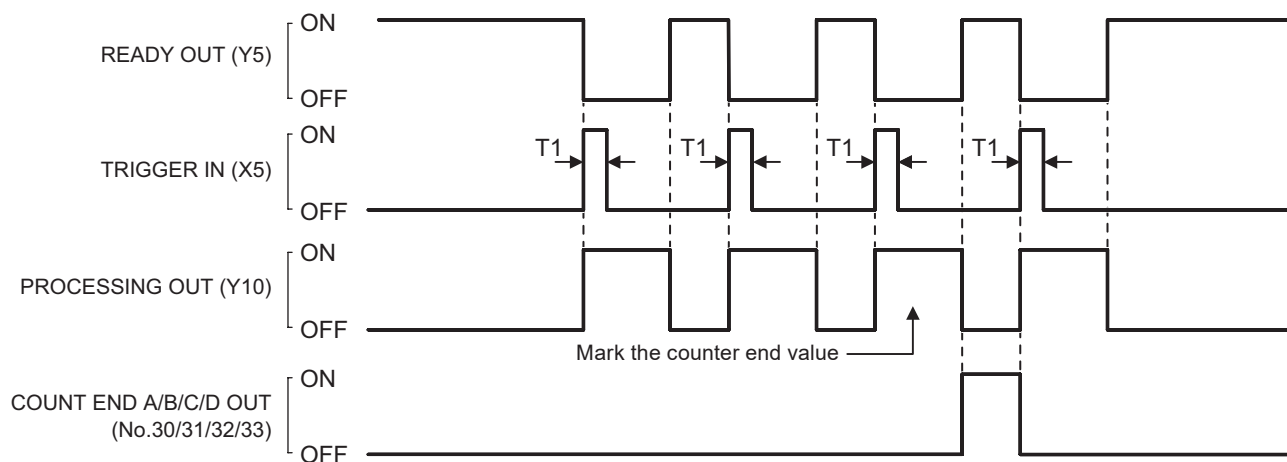
4-6-12 Time/date hold input and date gap output



Reference

- TIME HOLD IN (No.22) is available even when the remote mode is turned OFF.
- If TIME HOLD IN (No.22) is turned ON when powering on the laser marker, it retains the system startup time.
- While TIME HOLD IN (No.22) is turned on, the time will be retained regardless of the file number, remote mode ON/OFF status, or error status.
- If you turn on/off TIME HOLD IN (No.22) continuously, keep the OFF time at least for two seconds.

4-6-13 Counter end output

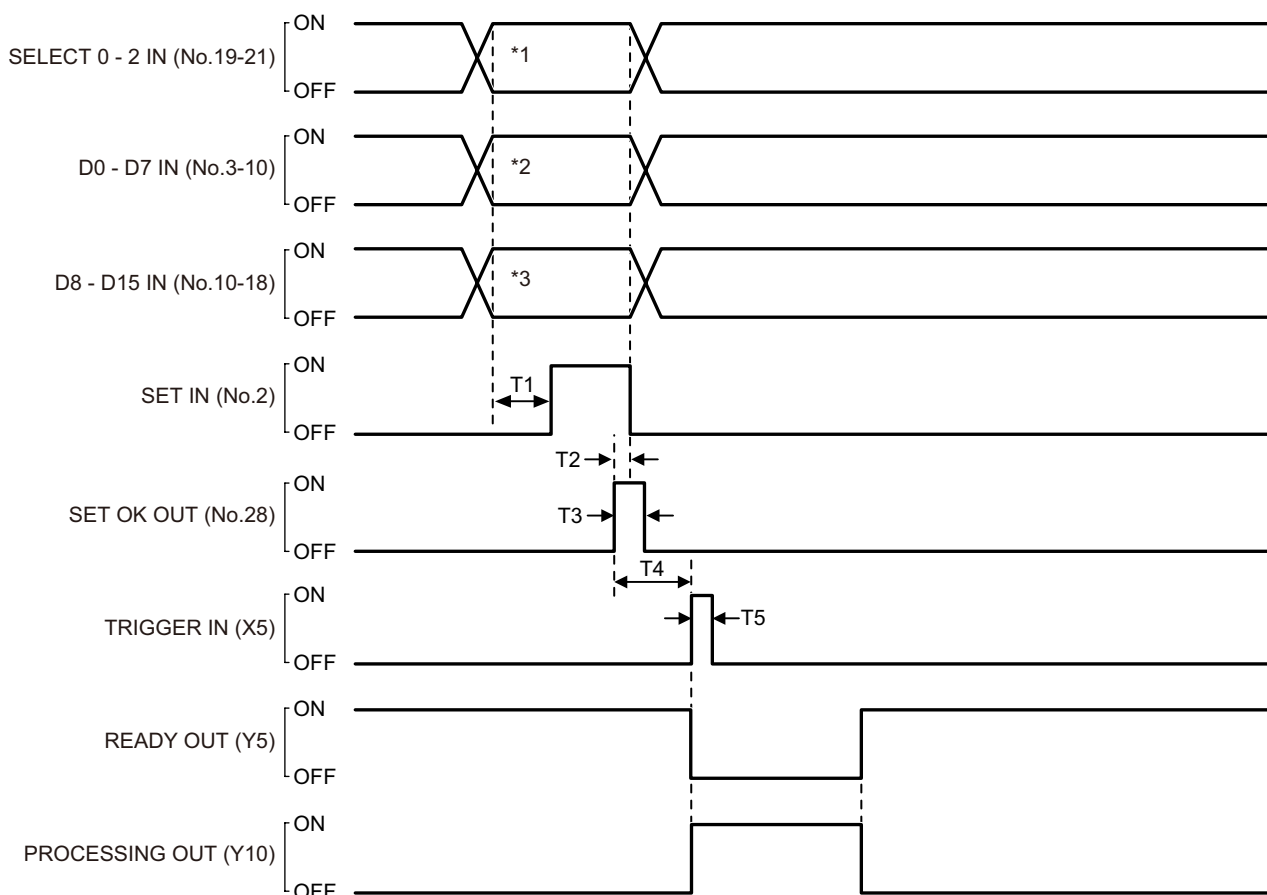


Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.

Reference

- Assign the counter No. to COUNT END A OUT to COUNT END D OUT (No.30 to 33) in system settings of Laser Marker NAVI smart.
- COUNT END A/B/C/D OUT remains turned ON with the shutter open until the next marking trigger is input. When you close the shutter, COUNT END A/B/C/D OUT turns OFF.
- COUNT END A/B/C/D OUT is disabled when “counter update per step” is configured at Step & repeat.

4-6-14 Count-up/count-down value correction



Item	Time	Remarks
T1	0.5ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN and D0 IN to D15 IN, turn on SET IN (No.2).
T2	0ms or more	Keep the input until SET OK OUT (No.28) turns on.
T3	2 to 510ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.
T4	0ms or more	Turn on TRIGGER IN (X5) after SET OK OUT (No.28) turns on.
T5	2ms or more	Keep the ON status for 2ms or more.

*1 : Select the number input target with SELECT 0 IN to SELECT 2 IN as follows.

Number input target	SELECT 0 IN (No. 19)	SELECT 1 IN (No. 20)	SELECT 2 IN (No. 21)
Count-up value correction	OFF	ON	OFF
Count-down value correction	ON	ON	OFF

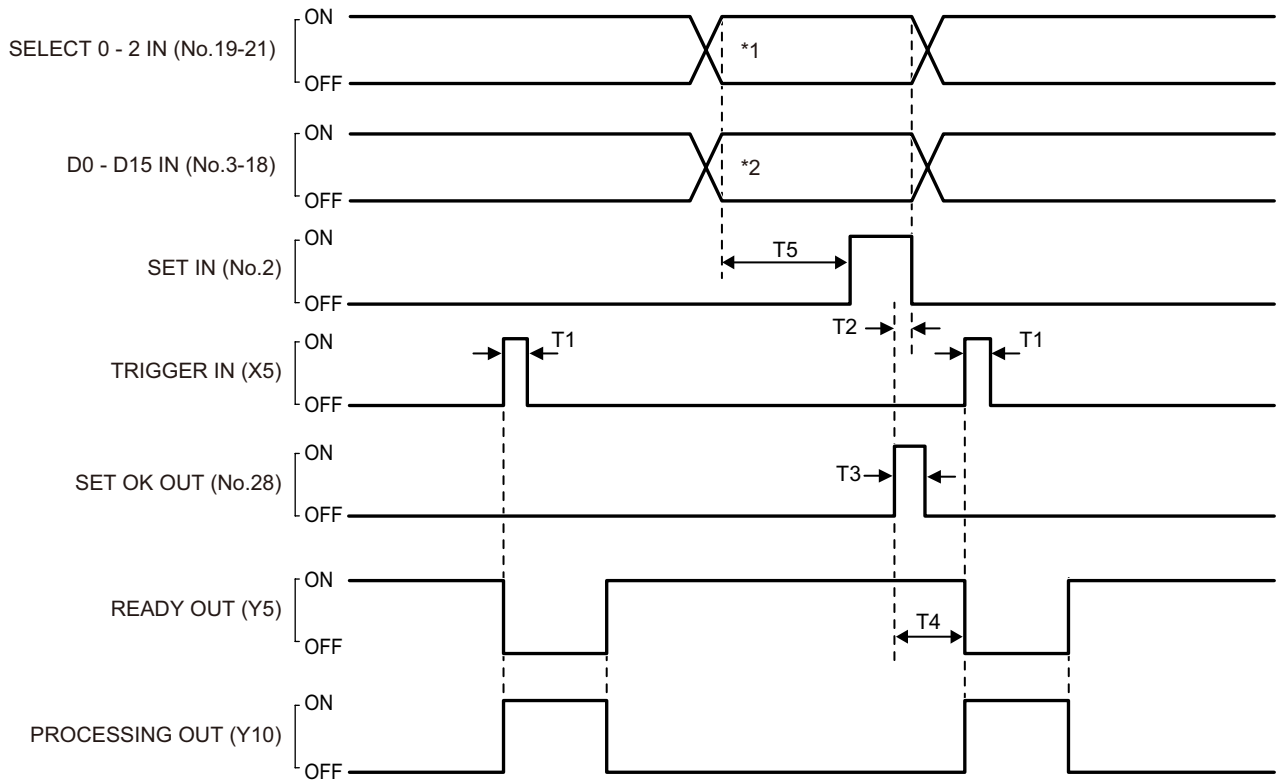
*2 : Select a value from D0 to D7 for the counter number to correct the count-up/count-down value. The counter No. 0 to 3 is assigned at D0 to D3 and the common counter No. 16 to 19 is assigned at D4 to D7 respectively.

*3 : Specify a value in D8 to D15 for the step times of count-up or count-down in the binary system.

Reference

- To specify the next counter value during the trigger processing, input SET IN (No.2) after PROCESSING OUT (Y10) turns ON.
- If the count-up/count-down correction is input during on-the-fly marking operation, READY OUT (Y5) turns off momentarily and there is a case that the next marking could not be executed due to Warning E751.

4-6-15 Counter reset input



Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	0ms or more	Keep the input until SET OK OUT (No.28) turns on.
T3	2 to 510ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.
T4	0ms or more	Turn on TRIGGER IN (X5) after SET OK OUT (No.28) turns on.
T5	0.5ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN and D0 IN to D15 IN, turn on SET IN (No.2).

*1 : To reset the counter, set SELECT 0 IN to SELECT 2 IN as follows.

SELECT 0 IN (No.19): OFF, SELECT 1 IN (No.20): OFF, SELECT 2 IN (No.21): ON

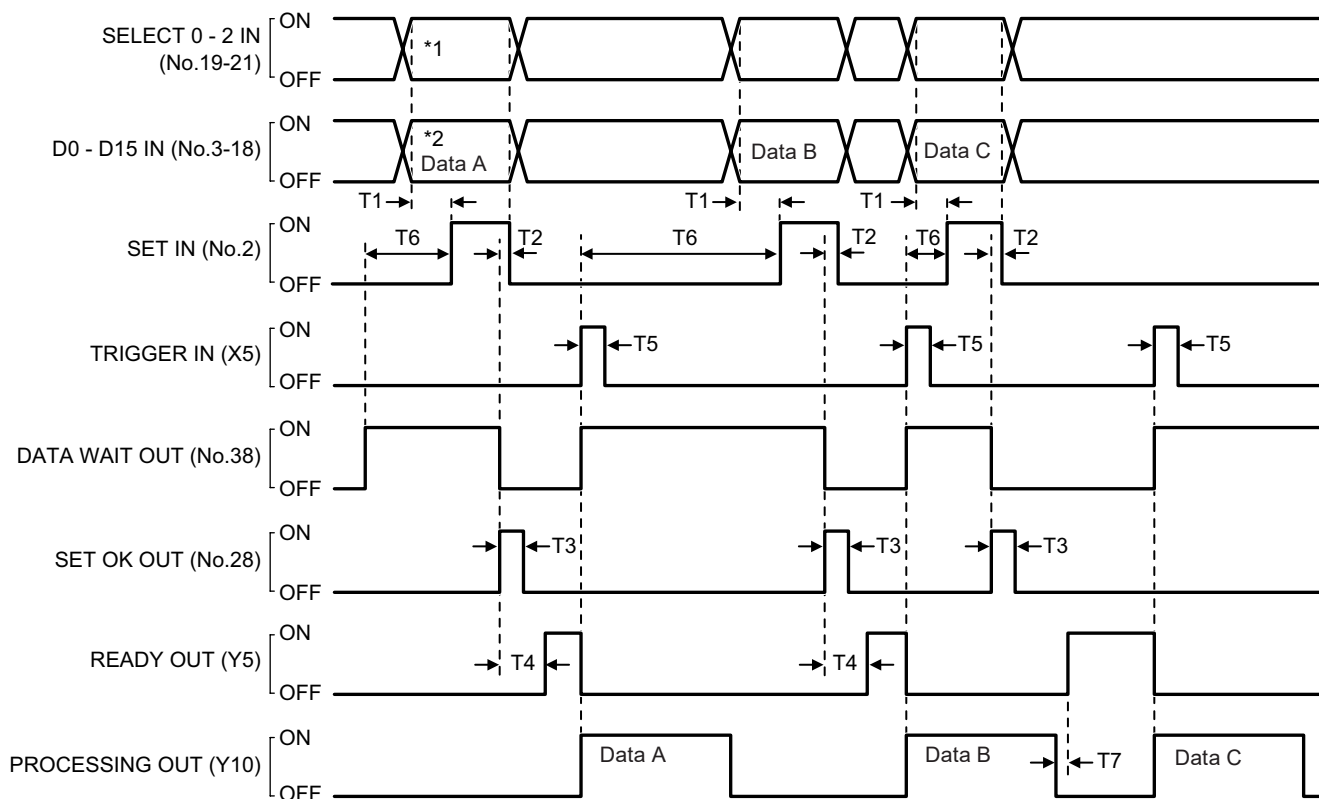
*2 : Specify the counter number to reset by using D0 IN to D15 IN (No.3 to 18). The following counter numbers are assigned to D0 IN to D15 IN respectively.

- D0 to D3: Counter No. 0 to 3
- D4 to D7: Common Counter No. 16 to 19
- D8 to D11: Counter No. 4 to 7
- D12 to D15: Common Counter No. 20 to 23

Reference

- If the counter is reset during on-the-fly marking operation, READY OUT (Y5) turns off momentarily and there is a case that the next marking could not be executed due to Warning E751.

4-6-16 Registered characters/external offset marking



Item	Time	Remarks
T1	0.5ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN and D0 IN to D15 IN, turn on SET IN (No.2).
T2	0ms or more	Keep the input until SET OK OUT (No.28) turns on.
T3	2 to 510ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.
T4	—	Time for data creation. It varies depending on the quantity of the setting data.
T5	2ms or more	Keep the ON status for 2ms or more.
T6	0ms or more	Input SET IN (No.2) after DATA WAIT OUT (No.38) turns ON.
T7	—	<ul style="list-style-type: none"> When the next marking data compiling has finished within the trigger processing time: 1ms or less When the next marking data compiling did not finish within the trigger processing time: The remaining time of the marking data compiling (T4)

*1 : To specify the registered characters/external offset data number, set SELECT 0 IN to SELECT 2 IN as follows.
 SELECT 0 IN (No.19): ON, SELECT 1 IN (No.20): OFF, SELECT 2 IN (No.21): OFF

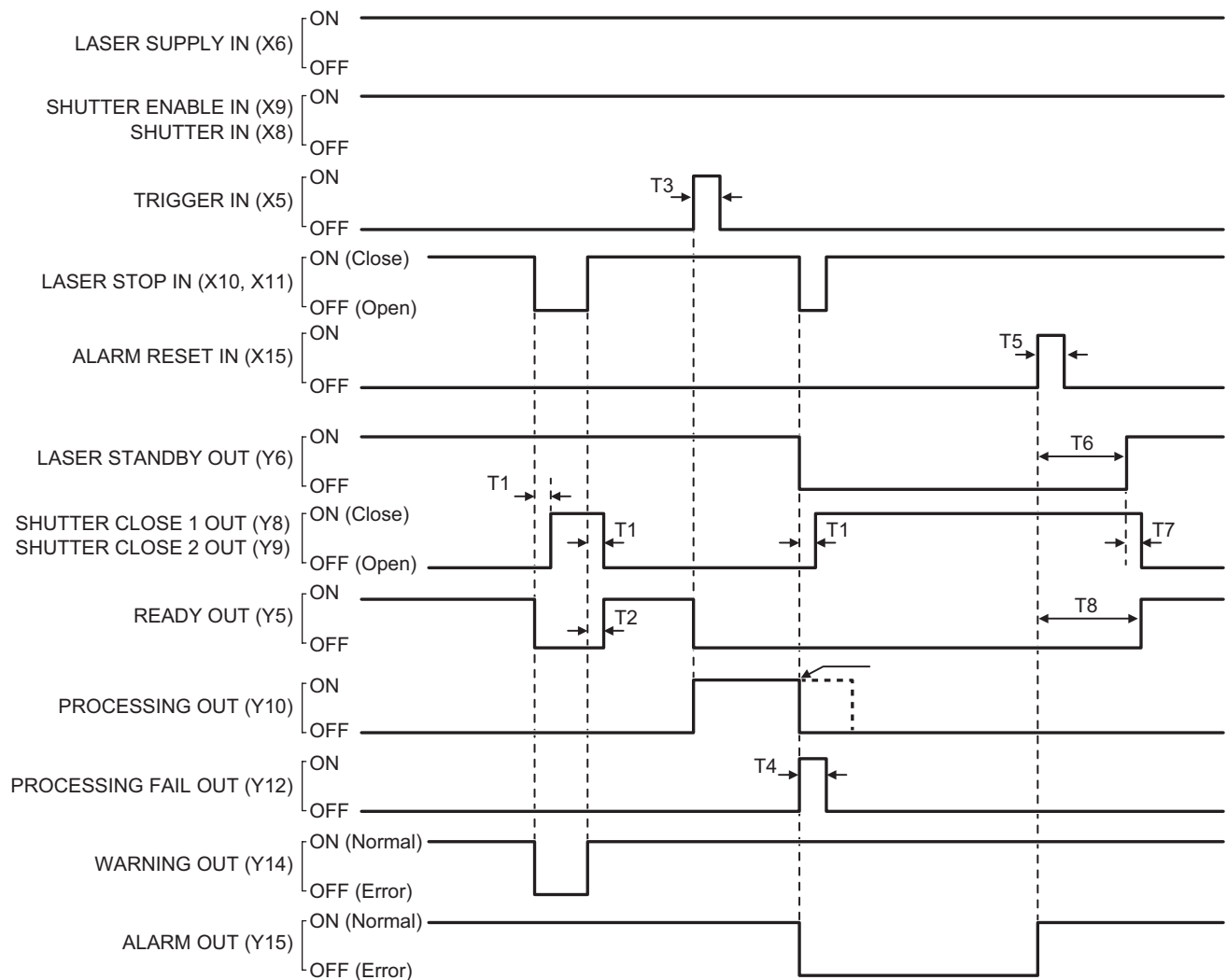
*2 : Specify the data number of registered characters/external offset by using D0 IN to D15 IN. Refer to “4-3 Signals and Details of I/O Connector” (P.101).

Reference

- SET IN (No.2) for the registered characters/external offset is acceptable when the laser pumping is completed, and the internal shutter opens.
- If you have configured the registered characters/external offset function, READY OUT (Y5) will not be output until the data number and SET IN (No.2) are input.
- Enter the data number input and SET IN (No.2) every time for each marking trigger even there is no change to the marking data.
- Close the shutter if you want to reset the data number after turning on SET IN (No.2).
- READY OUT (Y5) will be output even when specified the data number without any settings.

4-6-17 Laser stop input

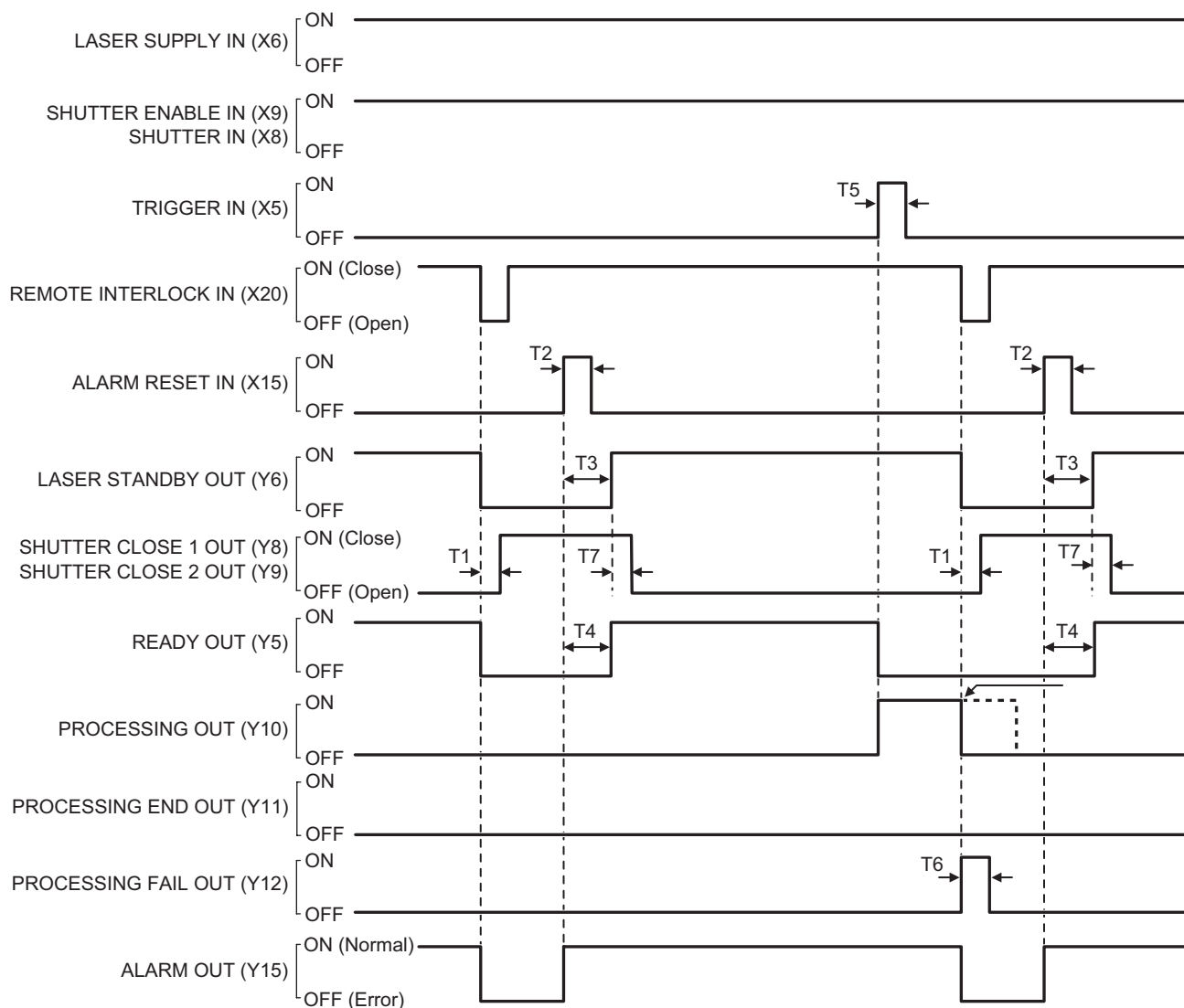
If LASER STOP IN is released when laser is not radiating, the shutter is closed keeping the laser pumping on.
 If LASER STOP IN is released when laser is radiating, the laser pumping is turned off, and the shutter is closed.
 Refer to “Laser marker operation when functions for safety measures are input” (P.100).



Item	Time	Remarks
T1	Max. 1 sec.	There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9). SHUTTER CLOSE 1 OUT and SHUTTER CLOSE 2 OUT will be output by the same operation, but their output timing has a margin of error.
T2	—	Total time for shutter opening and marking data creation. It varies depending on the quantity of the setting data.
T3	2ms or more	Keep the ON status for 2ms or more.
T4	2 to 510ms	This is One-shot output. Set the output time on the environment setting screen. There is a small margin of error for the setting value.
T5	100ms or more	Keep the ON status for 100ms or more.
T6	Approx. 5 to 10 sec.	Time for completion of laser pumping. <ul style="list-style-type: none"> At the usual operation: Approx. 5 sec. Re-pumping right after turning the laser pumping OFF: Max. 10 sec.
T7	Max. 1 sec.	After the laser pumping is completed, there is a delay time of max. 1 second until when SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9) are turned OFF.
T8	—	The time until when the shutter is opened or the total of marking data creation time, whichever is longer.

4-6-18 Remote interlock input

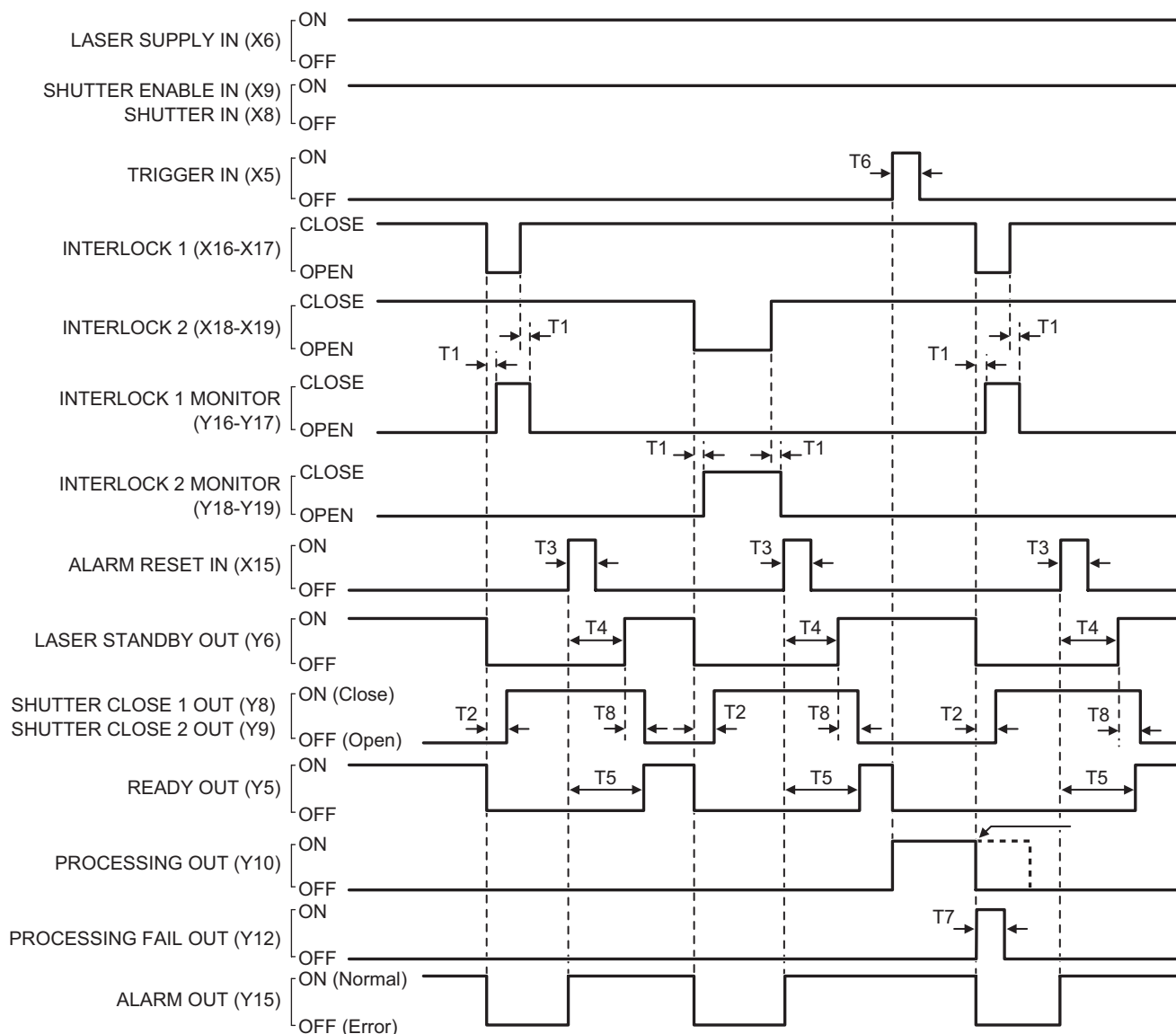
If REMOTE INTERLOCK IN is released, the laser pumping is turned off and the shutter is closed, regardless of whether or not the laser is radiating. Refer to “Laser marker operation when functions for safety measures are input” (P.100).



Item	Time	Remarks
T1	Max. 1 sec.	There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9).
T2	100ms or more	Keep the ON status for 100ms or more.
T3	Approx. 5 to 10 sec.	Time for completion of laser pumping. <ul style="list-style-type: none"> • At the usual operation: Approx. 5 sec. • Re-pumping right after turning the laser pumping OFF: Max. 10 sec.
T4	—	The time until when the shutter is opened or the total of marking data creation time, whichever is longer.
T5	2ms or more	Keep the ON status for 2ms or more.
T6	2 to 510ms	This is One-shot output. Set the output time on the environment setting screen. There is a small margin of error for the setting value.
T7	Max. 1 sec.	After the laser pumping is completed, there is a delay time of max. 1 second until when SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9) are turned OFF.

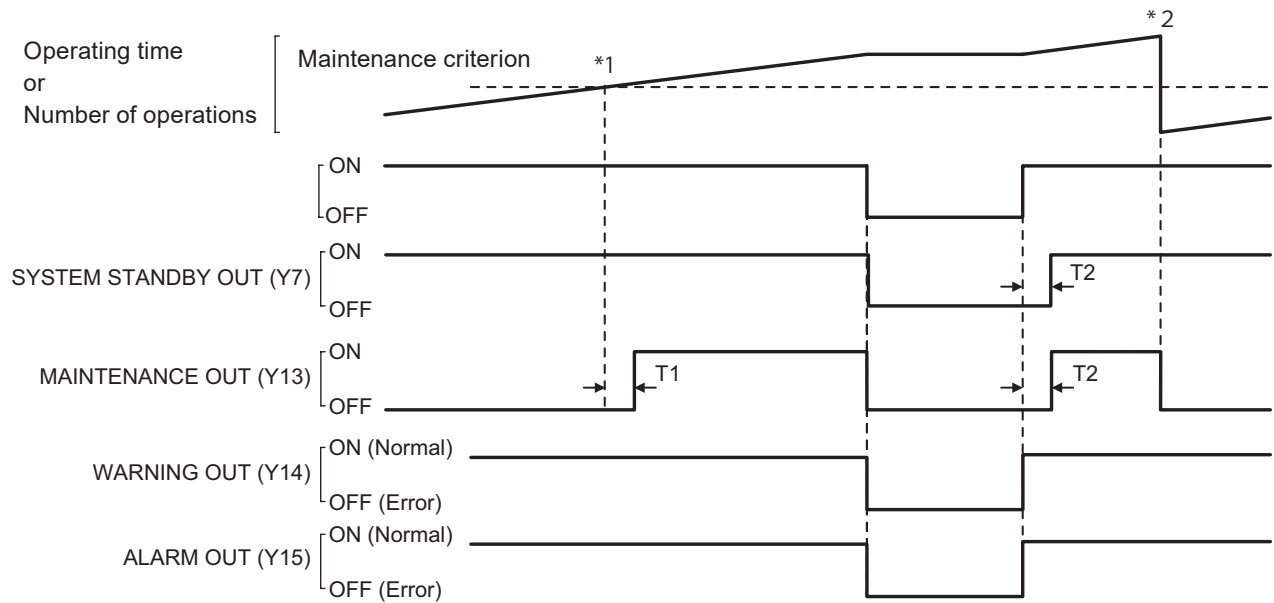
4-6-19 Interlock input

If INTERLOCK (X16 - X17 and X18 - X19) is opened, the laser pumping is turned off and the shutter is closed, regardless of whether or not the laser is radiating. Refer to "Laser marker operation when functions for safety measures are input" (P.100).



Item	Time	Remarks
T1	Approx. 50ms	INTERLOCK MONITOR is switched open and closed with a delay of approx. 50ms with reference to each INTERLOCK input.
T2	Max. 1 sec.	There is a delay time of around 200ms to max. 1 second from turning ON/OFF of SHUTTER IN (X8) to turning ON/OFF of SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9).
T3	100ms or more	Keep the ON status for 100ms or more.
T4	Approx. 5 to 10 sec.	Time for completion of laser pumping. <ul style="list-style-type: none"> At the usual operation: Approx. 5 sec. Re-pumping right after turning the laser pumping OFF: Max. 10 sec.
T5	—	The time until when the shutter is opened or the total of marking data creation time, whichever is longer.
T6	2ms or more	Keep the ON status for 2ms or more.
T7	2 to 510ms	This is One-shot output. Set the output time on the environment setting screen. There is a small margin of error for the setting value.
T8	Max. 1 sec.	After the laser pumping is completed, there is a delay time of max. 1 second until when SHUTTER CLOSE 1 OUT (Y8) and SHUTTER CLOSE 2 OUT (Y9) are turned OFF.

4-6-20 MAINTENANCE OUT



*1 : When the maintenance criterion operating time or number of operations is reached, MAINTENANCE OUT turns ON.

*2 : Entering the maintenance complete on the maintenance screen in Laser Marker NAVI smart, resets the operating time or number of operations.

Item	Time	Remarks
T1	Max. 1 sec.	It takes max. 1 sec. from the instant when the operating time or the number of operations of a part subject to maintenance reaches the maintenance criterion to the instant when MAINTENANCE OUT (Y13) turns ON.
T2	Max. 10 sec.	Time for system startup. If there is any part whose operating time or number of operations has reached the maintenance criterion at the time of startup of the laser marker, MAINTENANCE OUT (Y13) turns ON simultaneously with turning ON of SYSTEMSTANDBY OUT (Y7).

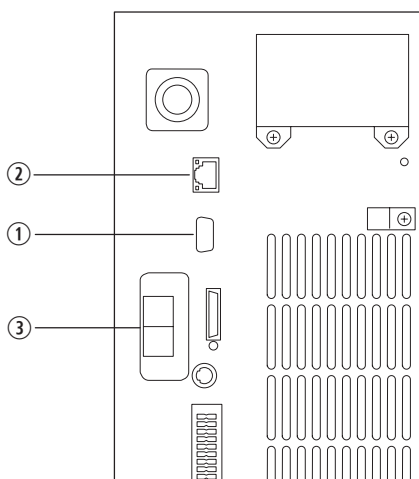
Reference

- The ON/OFF status of MAINTENANCE OUT (Y13) does not affect READY OUT (Y5).
- When “Laser pumping time [h]” and “Number of shutter open/close operations” reach the maintenance time, our service staff will handle maintenance and replacement. Contact our sales agency.

5 External Control by Communication Commands

5-1 Communication Interfaces

This product has the following communication interfaces on the controller.



Rear of Controller

No.	Name	Description
①	RS-232C port	For the connection details, refer to “5-2 RS-232C” (P.140). To use the RS-232C port, select the RS-232C usage from communication command control or code reader linkage function in the system settings screen in advance.
②	Ethernet port	For the connection details, refer to “5-3 Ethernet” (P.143). The Ethernet port can be connected with the following devices simultaneously via a HUB or a router. <ul style="list-style-type: none"> • Laser Marker NAVI smart (PC configuration software) • External device for communication command control (PLC and PC for control) • Specific image checker
③	Ports for industrial network: EtherNet/IP or PROFINET	Available when the optional network unit (EtherNet/IP unit or PROFINET unit) is installed to the controller. Communication port (2-port switch) to control the laser marker by the industrial network with the control device such as a PLC. Connect a LAN cable. For details, refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”. If you do not install the network unit, there is no port here.

Reference

- In the LP-RH series, when the optional expansion board is installed to the controller, there is a port marked “INFO LAN” on the back of the controller, but this port is not used in this product. Do not connect anything.

5-2 RS-232C

To control the laser marker by communication commands, use RS-232C or Ethernet connection.

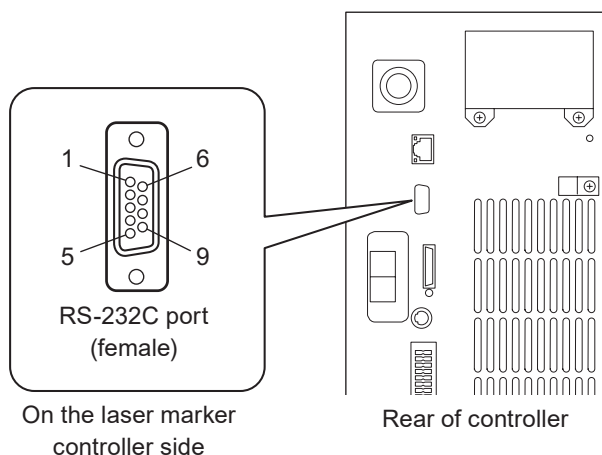
For the control by communication commands, configure the communication settings in advance at the system settings of Laser Marker NAVI smart. Refer to “3-4-3 General settings before external control” (P.86).

Reference

- The laser marker can be controlled by I/O and communication commands combined.
- For communication commands, refer to “Serial Communication Command Guide”.

5-2-1 Interface specifications and connection

To execute command communication control with RS-232C, connect the RS-232C port on the controller to the external control device.



Connector position	Connector specifications	Model	Manufacturer name
On the laser marker side	D-sub 9-pin, female Screw type: No.4-40UNC inch screw, female	-	-
User side	D-sub 9-pin, male Screw type: No.4-40UNC inch screw, male	Recommended connector XM3A-0921	OMRON Corporation
		Recommended connector cover XM2S-0913	

■ Signals and Details of RS-232C connector

Terminal No.	Signal	Description
1	N.C.	Do not use this signal.
2	TxD (SD)	Transmission data: Connect RxD (RD) of the external control device
3	RxD (RD)	Receiving data: Connect TxD (SD) of the external control device
4	N.C.	Do not use this signal.
5	GND (SG)	Signal ground: Connect GND (SG) of the external control device
6	N.C.	Do not use this signal.
7	N.C.	
8	N.C.	
9	N.C.	

! Notice

- Connect the ground wire of an external control device and that of the laser marker to the same point. If a potential difference occurs between the GNDs of different products, it will cause product failure.
- The GND pin of the RS-232C connector is common to the body of the laser marker.

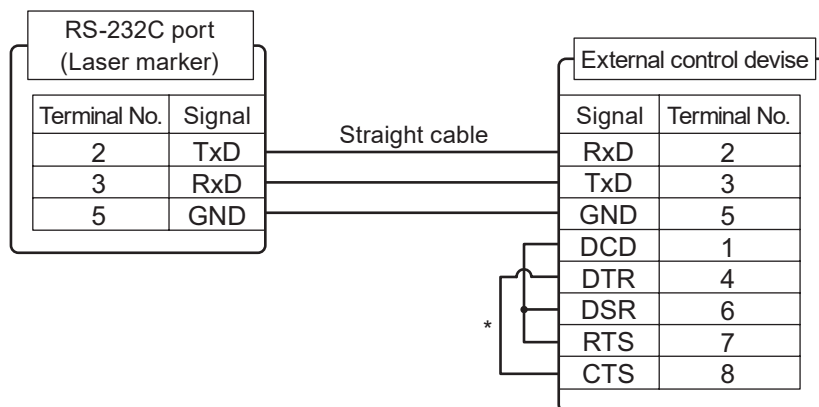
Reference

- On the system settings screen, select communication command control or code reader linkage function that you use with the RS-232C port.

■ Connecting to external control devices

- To connect the laser marker to the PC for control, use a commercially available RS-232C straight cable (laser marker side: 9pin male).
- In case of connecting to PLC, a type of the cable (straight or cross) differs depending on a manufacturer or a model. Please follow the PLC manual.
- To connect RS-232C terminal without using a commercially available RS-232C cable, connect only 3 signals of RxD, TxD and GND and do not use other signals on the laser marker side.
- You may need a signal line connection (loop back line) other than RxD (RD), TxD (SD) or GND on the external control device side depending on the specifications of the external control device. Read the instruction manual of the external control device and connect it to the laser marker appropriately.

Connection example



* The loop back wiring on the external control device side shown in the above figure is just an example. The wiring method varies depending on the specifications of each external control device. Read the instruction manual of the external control device and connect it to the laser marker appropriately.

Reference

- The pin arrangement (No. 2, No. 3) of the conventional model LP-400 is different from that of the RS-232C port.

5-2-2 Communication settings (for command control)

Item	RS-232C communication settings (for command control)
Synchro system	Start-stop method
Communication type	Full-duplex transmission
Baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 bps (initial setting: 9600 bps)
Data length	8-bit fixed
Parity	None / Even / Odd (initial setting: None)
Stop bits	1-bit / 2-bit (initial setting: 1-bit)
Flow control	None
Check sum	OFF / ON (initial setting: OFF)
End code	CR / CR + LF (initial setting: CR)
Start code *	ON (STX) / OFF (initial setting: STX)
Response data command *	ON / OFF (initial setting: ON)
Response data sub command *	Any single byte character of ASCII code from 01 (HEX) to 7F (HEX) can be specified. <ul style="list-style-type: none"> • Initial setting of positive response code: A • Initial setting of negative response code: E • Initial setting of read request response code: A
Character code	ASCII code
Encoding for non-ASCII characters *	Shift-JIS / GB 2312 / Latin-1 (initial setting: Shift-JIS)
Reception timer	Timeout monitoring ON (10 sec.)

* If you select "LP-400/V compatible" for "Compatible mode" in the system settings of Laser Marker NAVI smart, the same command format with the former models of LP-400/LP-V series is applied regardless these settings. For the details, refer to the "Serial Communication Command Guide: LP-400/V compatible mode".

Reference

- For the details of the communication settings, refer to "3-4-3 General settings before external control" (P.86).
- When using RS-232C, specify the "Flow control" to "None" at the communication port settings of the external control device.

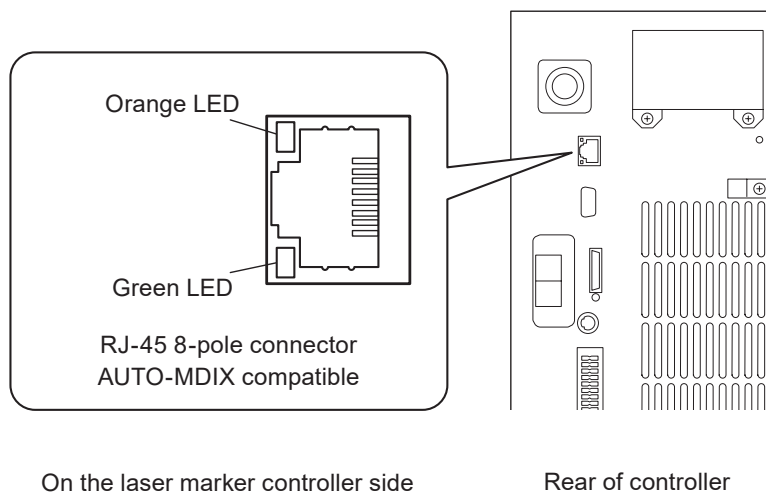
5-3 Ethernet

5-3-1 Port specifications and connection

To control the laser marker by Ethernet communication, use an Ethernet port on the controller.

Reference

- The Ethernet port of this product is compatible with both straight cable and cross cable.
- Although the maximum length of cables connecting devices permitted by the standards of Ethernet is 100 m, in order to prevent communication failure due to noise or breakdown of the device, it is recommended to keep the length to 10 m or less.
- The Ethernet port can be connected with the following devices simultaneously via a HUB or a router.
 - PC configuration software
 - External device for communication command control (PLC and PC for control)
 - Specific image checker

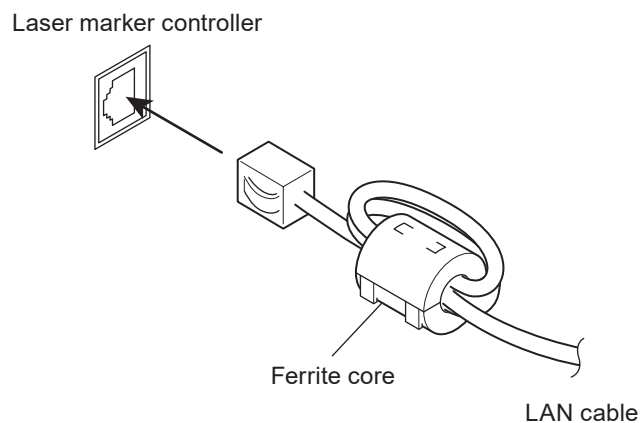


Light up color	Description
Green	The indicator lights up while connected normally. It blinks during communication.
Orange	Lights up only when the baud rate is 100 megabits/sec.

LAN cable connection

When you connect a LAN cable to the Ethernet port, attach the ferrite core included to a position as close as possible to the Ethernet port on the LAN cable controller side.

Turn the LAN cable 3 times around the ferrite core as shown below figure.



5-3-2 Communication settings

Item	Ethernet communication settings
Communication protocol	TCP/IP
Standards	IEEE802.3 (10BASE-T) / IEEE802.3u (100BASE-TX)
Applicable cable	Category 5 or higher
Applicable HUB (or router)	10BASE-T / 100BASE-TX compatible
IP address	1.0.0.0 to 223.255.255.255 * (Initial value: 192.168.1.5)
Subnet mask	128.0.0.0 to 255.255.255.254 (Initial value: 255.255.255.0)
Default gateway	1.0.0.0 to 223.255.255.255 * (Initial value: 0.0.0.0 (Unspecified))
PC configuration software port	1025 to 65534, except 9090 (Initial value: 9093)
Command communication port	1025 to 65534, except 9090 (Initial value: 9094)

* Do not use "127" in the first octet.

Reference

- The communication control of the laser marker through the Ethernet should be performed in a secure network settings.
- Even the IP Address and Subnet Mask values are within the configurable range, they may not be available depending on the combination.
- For the details of the communication settings, refer to "3-4-3 General settings before external control" (P.86).

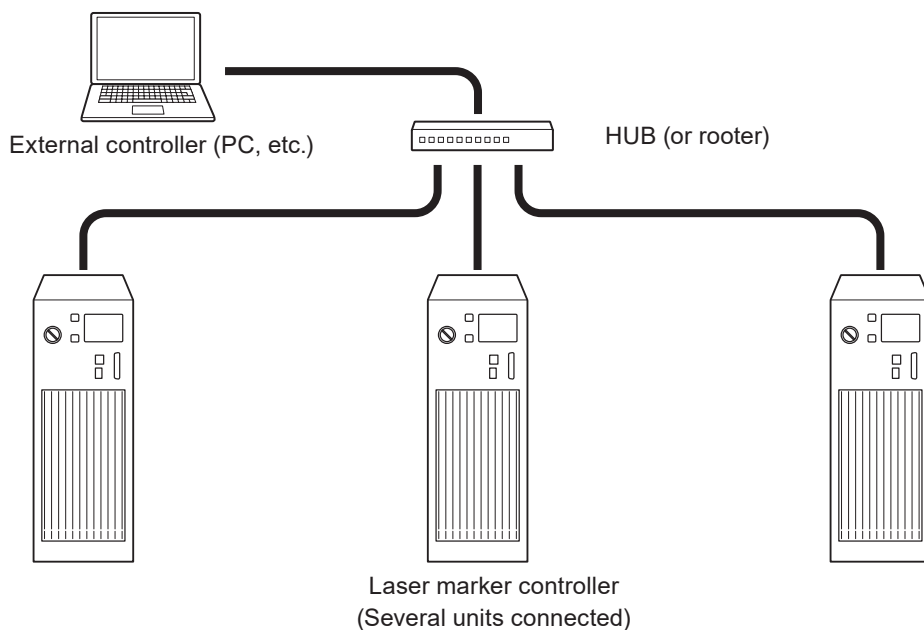
■ Ethernet communication settings for communication command control

Item	Ethernet communication settings
Start code *	ON (STX) / OFF (initial setting: STX)
Response data command *	ON / OFF (initial setting: ON)
Response data sub command *	Any single byte character of ASCII code from 01 (HEX) to 7F (HEX) can be specified. <ul style="list-style-type: none"> • Initial setting of positive response code: A • Initial setting of negative response code: E • Initial setting of read request response code: A
Character code	ASCII code
Encoding for non-ASCII characters *	Shift-JIS / GB 2312 / Latin-1 (initial setting: Shift-JIS)
Check sum	OFF
End code	CR
Reception timer	Timeout monitoring ON (10 sec.)

* If you select "LP-400/V compatible" for "Compatible mode" in the system settings of Laser Marker NAVI smart, the same command format with the former models of LP-400/LP-V series is applied regardless these settings. For the details, refer to the "Serial Communication Command Guide: LP-400/V compatible mode".

5-3-3 Connecting to external control devices and its setting sample

Connect the two or more laser markers and an external device via a HUB or a router:
 Use a HUB (or a router) that supports 100BASE-TX/10BASE-T and a cable of Category 5 or higher for the connection.



Example of communication system settings:

Set a separate IP address not to overlap between the laser marker and PC on the network.

	PC	Laser marker A	Laser marker B	Laser marker C
IP address	192.168.1.10	192.168.1.5	192.168.1.6	192.168.1.7
Subnet mask	255.255.255.0			
Default gateway	None			
Command control port	—	9094		

Reference

- When the laser marker is connected the external control device one to one, no HUB is necessary.

5-4 Checking the communication commands

Check the communication commands transmitted and received by the laser marker using the command history function in the PC configuration software “Laser Marker NAVI smart”.

The command history is displayed with the following procedures.

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “Maintenance” screen.
3. Select “Command history” tab. Up to 100 command messages received or sent by the laser marker are shown in the list.

Date/time	Interface	PLC#LM	File No.	Command message
2020-03-17 15:08:20.197	RS-232C	→	1234	[STX]FNOR[CR]
2020-03-17 15:08:20.199	RS-232C	←	1234	[STX]FNOA1234[CR]
2020-03-17 15:08:21.439	Ethernet	→	1234	[STX]STRS0001,Lorem ipsum dolor sit amet, conseq (...70 byte) olore magna aliqua.[CR]
2020-03-17 15:08:21.441	Ethernet	←	1234	[STX]STRA[CR]
2020-03-17 15:08:21.795	Ethernet	→	1234	[STX]STRS2,いろはにほへとちりぬるをわかよたれそ (...43 byte) ゆめみんあひもせす[CR]
2020-03-17 15:08:21.797	Ethernet	←	1234	[STX]STRA[CR]

Character recording is limited to 64 bytes per entry. Additional characters are shown as "[...xx byte]".
Remote mode OFF / Laser pumping OFF

Reference

- When a code reader is connected to the RS-232C port of the laser marker, the transmitted and received data with the code reader is not recorded in the command history.
- In the command history you can also confirm the commands transmitted via optional network unit (EtherNet/IP or PROFINET).

6 Link Control with External Devices

6-1 Link Control with Image Checker

This product can be connected with specific image checker and code reader via Ethernet and control the laser marker linking with these devices.

The following series of operations related to marking can be controlled from the laser marker when the image checker linkage function is used.

■ Position correction → Marking

According to information imported by the image checker's camera, the marking position of the laser marker is changed.

■ Marking → Image checking (code symbol or character checking)

After the marking by the laser marker, the image checker reads the marked code symbols or characters. The readout data and marking data are collated by the image checker and the checkup result is output from the laser marker.

■ Marking → Image checking (image capturing and inspection)

After the marking by the laser marker, the image checker captures the marked image. The captured image is determined by the image checker and the checkup result is output from the laser marker.

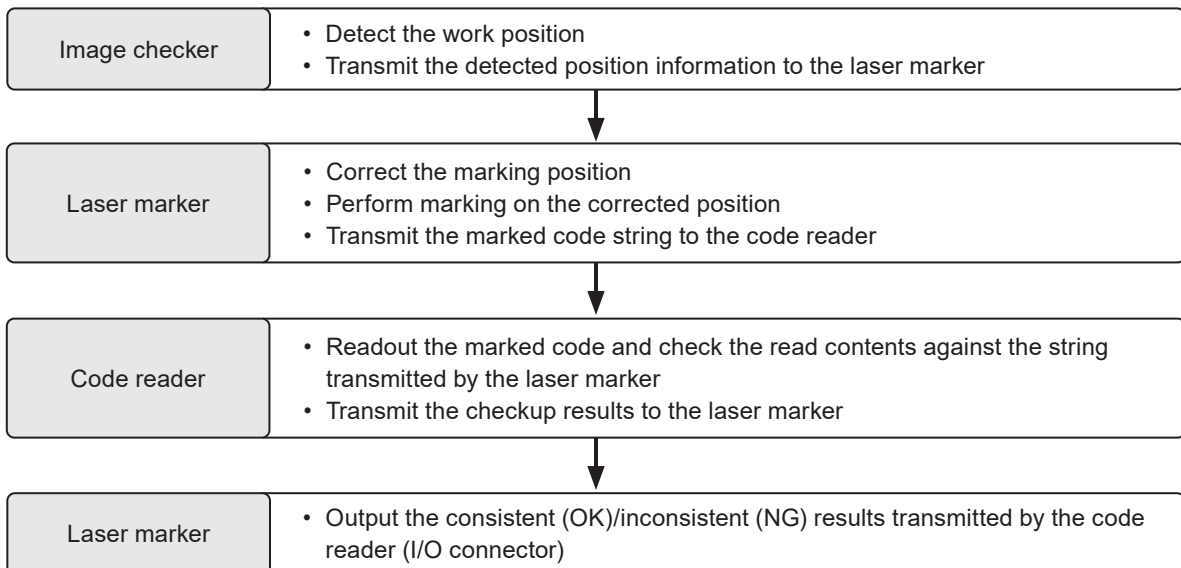
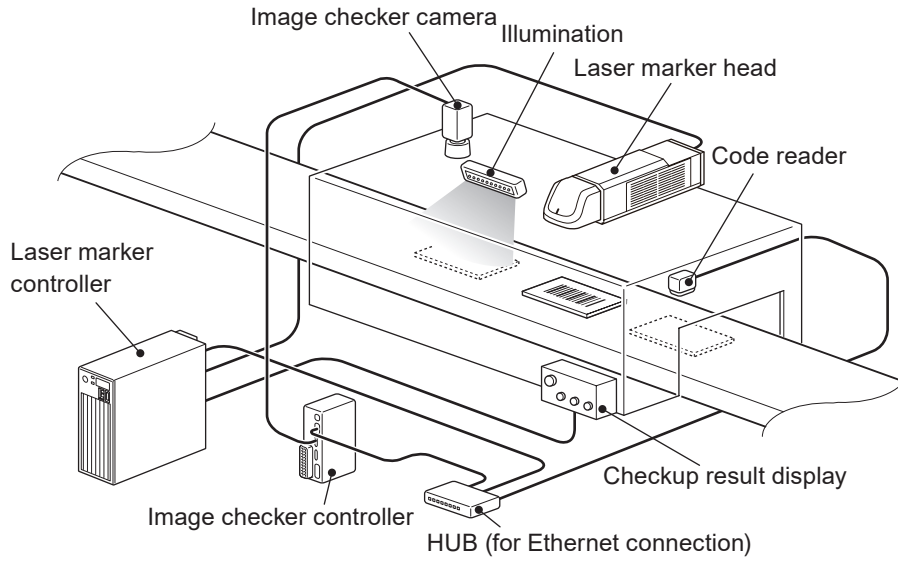
■ Position correction → Marking → Image checking

The image checking operation before marking (position correction) and after marking (code/character checking or image capturing) can be combined.

⬇ Reference

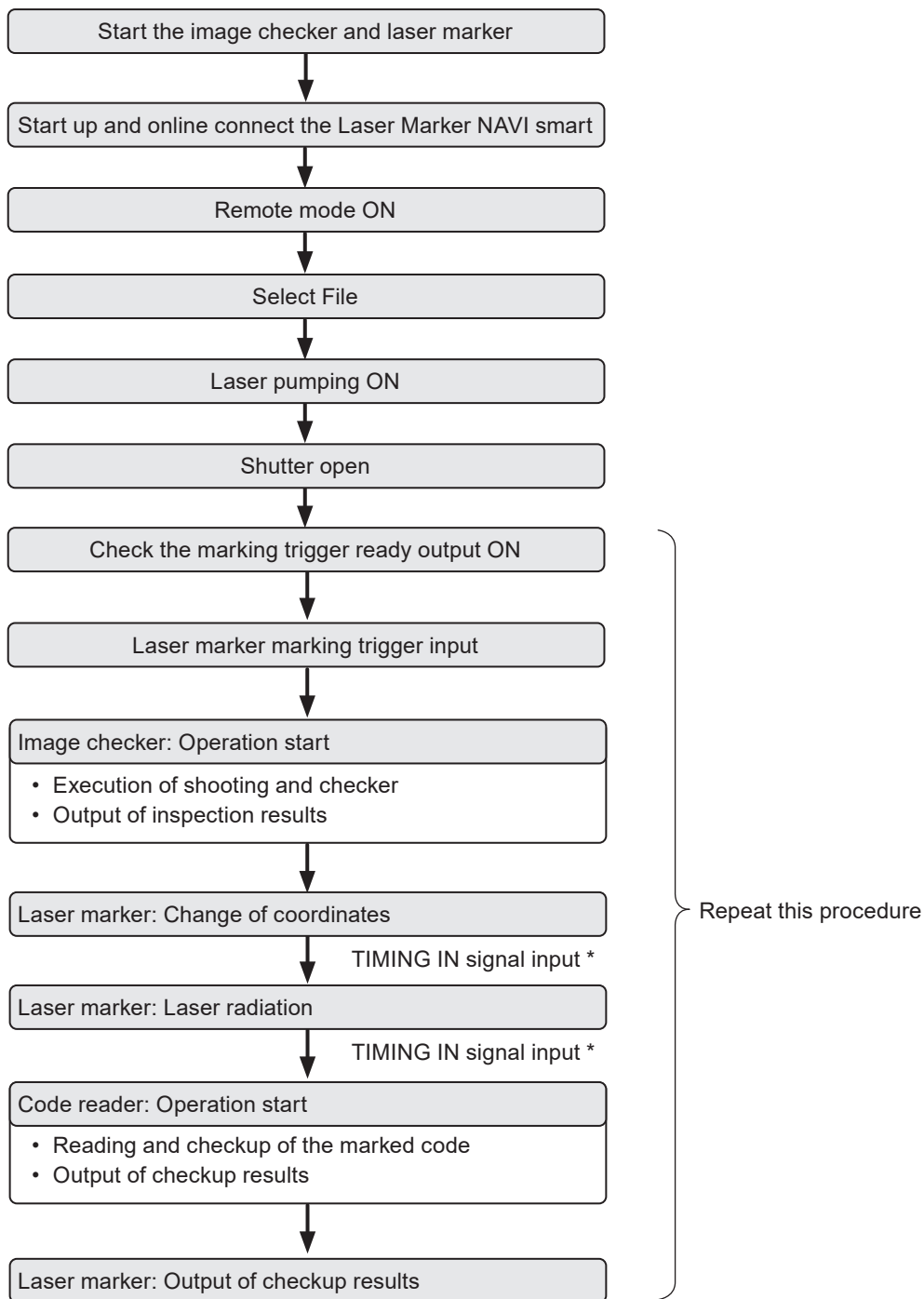
- When you use the link control with an image checker, the following functions are not available.
 - “Continuous trigger” of trigger mode
 - On-the-fly marking
 - TARGET DETECTION IN of the I/O terminal

6-1-1 Example of image checker linkage system



6-1-2 Operation flow

■ Example of operations for Position correction → Marking → Code checking



* If it is set to use the TIMING IN signal, enter TIMING IN as a next operation trigger.

Reference

- Confirm the laser marker and image checker communication settings in advance.
- Set the conditions of files to use the image checker linkage function.
- The image checker linkage function can be used while the laser marker is under the remote control mode.

6-1-3 Connection

! Notice

- To prevent damage of the image checker, do not install the camera in the laser emission area. Besides, take measures to protect the camera against the reflected laser beam, such as installing a shutter in front of the camera lens.

■ Connectable image checker

Image checkers compatible with this product are listed below.

Usage	Model	Manufacturer name
Position correction	PV230 / PV200	Panasonic Devices SUNX Co, Ltd.
Code checking	PV230	
	DataMan series (Ethernet supported model)	Cognex Corporation
Character checking	PV230	Panasonic Devices SUNX Co, Ltd.
Image capturing and inspection	PV230 / PV200	

■ Connection method

Use the Ethernet port on the laser marker controller and connect the image checker to link.

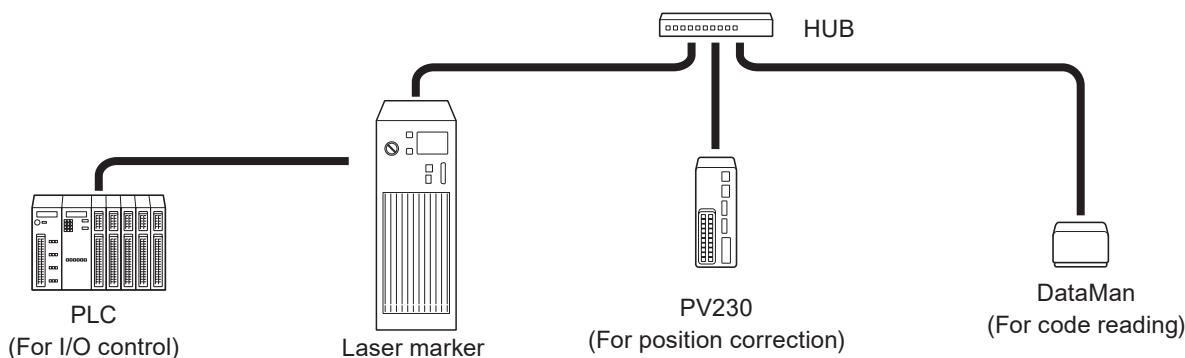
This product can be connected with one device each for position correction and code reading.

↓ Reference

- For details of specifications and connection of the Ethernet port, refer to “5-3 Ethernet” (P.143).

■ Connection example

To connect a position correction device (PV230), code reader (DataMan) and control PLC with the laser marker



Example of communication system settings

To prevent duplication of IP addresses of network devices, set individual addresses.

	Laser marker	PV230 (For position correction)	DataMan (For code reading)
IP address	192.168.1.4	192.168.1.5	192.168.1.10
Subnet mask	255.255.255.0		
Default gateway	192.168.1.1		
Port	—	Fixed value (Result output: 8601) (Command transmission: 8604)	23 (Telnet)

↓ Reference

- Port on the laser marker side is a fixed value when PV230/PV200 is used.
- Align the Port (command transmission) on the laser marker with DataMan's TelnetPort setting value when DataMan is used.
- When the laser marker is connected an image checker one to one, no HUB is necessary.
- The Ethernet port of this product is compatible with both straight cable and cross cable.

6-1-4 Set the laser marker communication settings

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “System settings” screen and select “Communication” tab.
3. Set the Ethernet communication configuration of the laser marker.

Operation/information	System offset	Inputs/outputs	Communication	Linked device
Ethernet				
IP address		192.168.1.5		
Subnet mask		255.255.255.0		
Default gateway		192.168.1.13		
Port for PC configuration software		9093		
Port for communication commands		9094		
MAC address		00-11-22-33-44-55		

4. Open the “Linked device” tab and configure the communication settings of the imagechecker according to the functions to use.

For image checking before marking:

- IP Address

For image checking after marking:

- Model of image checker: PV230/PV200, DataMan
- IP Address
- Port (for DataMan)

Operation/information	System offset	Inputs/outputs	Communication	Linked device
Image checking before marking				
Model		PV230/PV200		
IP address		0.0.0.0		
Port (result output)		8601		
Port (command transmission)		8604		
Image checking after marking				
Model		PV230/PV200		
IP address		0.0.0.0		
Port (result output)		8601		
Port (command transmission)		8604		

Reference

- Specify these values according to communication settings of the image checker to connect.
- The Port number for PV230/PV200 is a fixed value.
- Specify Telnet Port for DataMan port number.

5. Select “Apply to laser marking system” on the left side of the ribbon.



“Apply to laser marking system” tool

6. Disconnect the online connection with the laser marker.

7. Turn off the power of the laser marking system, wait five seconds and then restart the system.
The configured items will be reflected to the laser marker.

6-1-5 Set the laser marker overall file conditions

Set the overall file conditions of the Laser Marker NAVI smart according to the type of the system to establish.

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “Marking settings” screen and select “File settings” tab.
3. Turn ON “Image checking before marking” and “Image checking after marking” depending on the functions to use.

Reference

- When you use the link control with an image checker, the following functions are not available.
 - “Continuous trigger” of trigger mode
 - On-the-fly marking
 - TARGET DETECTION IN of the I/O terminal

4. Select the model of the image checker and application.

For image checking before marking:

- Model: PV230/PV200 (fixed)
- Application: Marking position correction (fixed)

For image checking after marking:

- Model: PV230/PV200, DataMan
- Application: Code checking, Character checking, Image capturing and inspection

Object settings	Function settings	File settings	Laser settings	On-the-fly marking
Image checking before marking				
Image checking before marking		ON		
Model		PV230/PV200		
Response timeout [s]		60.000		
TIMING IN signal input		Disabled		
Application		Marking position correction		
Image checking after marking				
Image checking after marking		ON		
Model		PV230/PV200		
Type No. set on PV		0		
Response timeout [s]		60.000		
TIMING IN signal input		Disabled		
Application		Code checking (PV230)		
Object No. to check		0		
CDR checker No. set on PV		0		
Check human readable text		ON		
OCR checker No. set on PV		0		
Check human readable text of composite code 2D part		ON		
OCR checker No. set on PV (2D)		1		

Reference

- The application of the image checking before marking is fixed to “Marking position correction”.
- For the image checking after marking, specify the type No. used for PV230/PV200 with an external device such as a PLC.
- If you use DataMan for the image checking after marking, the application is fixed to “Code checking”.
- If you use PV200 for the image checking after marking, the application is fixed to “Image capturing and inspection”.
- If you use PV230 for code checking, the human readable text can be also checked with a code symbol.

5. Set the TIMING IN signal input.

Set whether to use the TIMING IN signal as the operation start method of each device for link control.

- Using TIMING IN signal: Input the operation trigger of each device separately.
- Not using TIMING IN signal: Perform a set of link controls by one marking trigger input.

Refer to “Details of TIMING IN signal” (P.155).

Object settings	Function settings	File settings	Laser settings	On-the-fly marking
Image checking before marking				
Image checking before marking		ON		
Model		PV230/PV200		
Response timeout [s]		60.000		
TIMING IN signal input		Disabled		
Application		Marking position correction		

6. When the application of the image checking after marking is set to “Code checking” or “Character checking”, input “Object number to check” that is the same number with the object number you set in barcode/2D code settings or character settings.

Image checking after marking	
Image checking after marking	ON
Model	PV230/PV200
Type No. set on PV	0
Response timeout [s]	60.000
TIMING IN signal input	Disabled
Application	Code checking (PV230)
Object No. to check	0
CDR checker No. set on PV	0
Check human readable text	ON
OCR checker No. set on PV	0
Check human readable text of co...	ON
OCR checker No. set on PV (2D)	1

7. If you use PV230/PV200 for image checking after marking, input the following items, so that the setting values are same with the settings in PV230/PV200.

- Type number set on PV
- For code checking: CDR checker number set on PV
- For character checking: OCR checker number set on PV

Reference

- If there is no type number applicable to the image checker (PV230/PV200) setting data, the linkage function cannot be used. Check that the type specified here is consistent with the image checker (PV230/PV200) setting.
- When the application is set to code checking and if you want to check the code symbol and human readable text at the same time, set CDR checker number for the code symbol and OCR checker number for the human readable text.
- When using one PV230/PV200 for both image checking before marking and image checking after marking, specify the type No. used for image checking before marking with an external device such as PLC each time marking is performed. If the type No. for image checking before marking is not specified, the type No. set for image checking after marking will be applied and image checking before marking cannot be performed properly.

8. Overwrite the file after setting completion.

Select “Save” – “To laser marking system” in the ribbon to save the settings.



“Save” tool

■ Details of TIMING IN signal

TIMING IN signal: Use

TIMING IN signal is used when the laser marker operation trigger and image checker/code reader operation trigger is input separately, e.g. when the camera (code reader) field of view is away from the laser marker marking position.

For image checking before marking	For image checking after marking
<p>① TRIGGER IN ② TIMING IN</p>	<p>① TRIGGER IN ② TIMING IN</p>
① Start work location detection (initial operation)	① Start marking (initial operation)
② Start marking	② Start image checking

Reference

- To control the linkage operation by TIMING IN signal, input TIMING IN signal within 60 seconds after completion of the initial operation.
- For input of TIMING IN signal, refer to “6-1-8 Timing chart” (P.161).
- Input TIMING IN signal by I/O control. Any communication command cannot input TIMING IN.

TIMING IN signal: Not use

TIMING IN signal is not necessary when the series of operations of the laser marker and the image checker/code reader by one trigger, e.g. when the camera (code reader) field of view and the laser marker marking position are the same.

For image checking before marking	For image checking after marking
<p>① TRIGGER IN</p>	<p>① TRIGGER IN</p>
① Start work location detection and start marking after completion of location detection	① Start marking and after completion of marking, start image checking

6-1-6 Image checker setting

Settings to use the image checker PV230/PV200 for link control with the laser marker are described below.

Reference

- For specifications and setting of image checker PV230/PV200, refer to the instruction manual for PV230/PV200.

Communication settings of image checker PV230/PV200

To connect the laser marker with PV230/PV200, configure the PV230/PV200's communication settings as follows.

Item	Ethernet communication specifications	
Communication protocol	Multipurpose communication (TCP/IP)	
Port No. (Fixed)	Result output	8601
	Command transmission	8604
IP address	Initial value: 192.168.1.5 Make sure that the IP address for the laser marker on the network is not overlapping the IP address for the other external devices.	

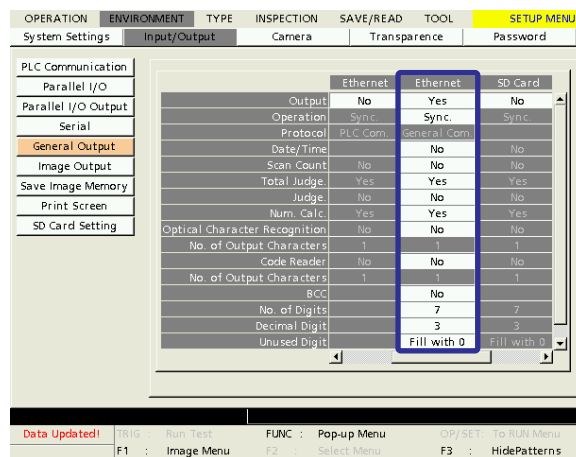
Input/output setting

To use the link control function with the laser marker and PV230/PV200, configure the system settings on the PV230/PV200 as follows.

- From "Environment" - "Input/Output" setting screen of PV230/PV200, select the "General Output".

- Set the items of Ethernet with the protocol setting "General Com." as follows.

- Output: Yes
- Operation: Synchronized
- Date/Time: No
- Scan Count: No
- Total Judge: Yes
- Judge: No *
- Numeric Calculation
For position correction : Yes
For other than position correction : No *
- Optical Character Recognition: No *
- Code Reader: No *
- BCC: No
- Number of Digits: 7
- Decimal Digit: 3
- Unused Digit: Fill with 0
- Error Output: No *



- * : When you use Ethernet with the protocol setting both "PLC Com." and "General Com.", for the items with * you can change the settings according to your PLC configuration. For the items without *, follow the above settings.

Reference

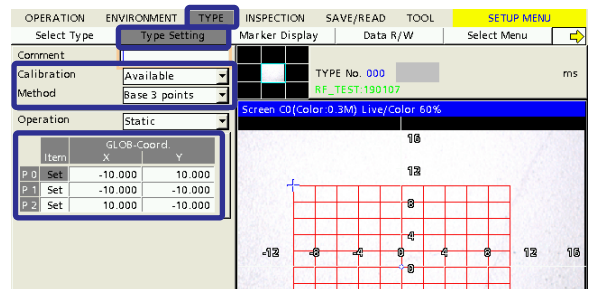
- When the result of the total judgement by PV230/PV200 is "1", the laser marker outputs CHECK OK OUT, and when the result is "0", CHECK NG OUT is output.

■ Settings of PV230/PV200 for position correction

When PV230/PV200 is used for position correction, set the following items:

1. In PV230/PV200 setting software, select “Type” - “Type Setting” - “Camera” - “Calibration” and set the following items.

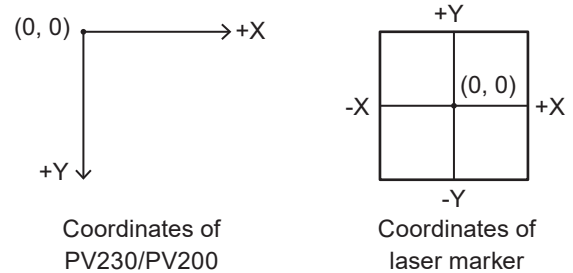
- Calibration: Available
- Method: Base X points



2. Mark the calibration marks with the laser marker and register their coordinates (mm) to the global coordinates of PV230/PV200.

Reference

- The calibration is necessary to convert the coordinates (pixel) of PV230/PV200 to the X-/Y-coordinates (mm) of the laser marker.
- After the calibration, confirm that in PV230/PV200 the CCW direction of the θ -correction is on the positive (+) side.



3. Set one of the followings to detect the correction value of the position for the laser marking.

- “Inspection” - “Position Adjustment”
- “Inspection” - “Checker” - Set “Smart edge (Line)”, “Smart matching”, or other checker that includes the angle value.

4. Select “Inspection” - “Numerical Calculation”. Set the coordinates in the order of X, Y, theta in the expression table, that you want to send to the laser marker for the positional correction. Then, set “Yes” to “Output” of each expression.

No.	Expression	Result	Judge	Maximum	Minimum	Output
CAC000	PAC000_X	0.000	NG	0.000	0.000	Yes
CAC001	PAC000_Y	0.000	NG	0.000	0.000	Yes
CAC002	PAC000_ANG	0.000	NG	0.000	0.000	Yes
CAC003	Unset					
CAC004	Unset					
CAC005	Unset					
CAC006	Unset					

Reference

- The results of the numerical calculation should output to the laser marker in the order of X, Y, and theta.
- The rotation center of PV230/PV200 corresponds to the center of the marking field of the laser marker. (When X- and Y-movement in the file settings of the laser marker are set to 0mm.)
- The correction value of theta, X-and Y-position by PV230/PV200 are added respectively to the rotation movement, X- and Y-movement in the file settings of the laser marker.
- The laser marker corrects the theta-coordinate with the rotation origin of the center of the marking field first. Then, X-/Y-coordinates are corrected.

5. Select “Inspection” - “Judgement” and set “JDC (External)” to “Type”.

No.	Expression	Judge	Comment
JDC000	PAC000_JUDGE	NG	
JDC001	Unset		
JDC002	Unset		
JDC003	Unset		
JDC004	Unset		
JDC005	Unset		
JDC006	Unset		

6. Set the result of the checker for the positional correction in the expression table.

7. Select “Set” of Condition, and set “JDC” to Condition and specify “Checker No.” of Total Judgement.

Condition	Checker No.	Result	Description
Total Judge	JDC	NG	
Save Img Memory	No	No	Save JRC/JDC at NG
Image Output	No	No	Output JRC/JDC at NG

■ Settings of PV230 for code checking

When PV230 is used for code reading, set the following items:

1. In PV230 setting software, select “Inspection” - “Checker” and set “Code Reader” to the checker type.
2. Specify the Checker No.

Reference

- Input the same value with the Checker No. for the code reader set here to “CDR checker number set on PV” in the file settings of the laser marker.
- If you want to check the human readable text together with the code symbol, set “Optical Character Recognition” to the checker type and set the Checker No. Input the same value with the Checker No. for the optical character recognition set here to “OCR checker number set on PV” in the file settings of the laser marker. For the details of the character checking of PV230, refer to “Settings of PV230 for character checking” (P.159).

3. Select “Area Setting” of the checker and specify the arbitrary testing area.

4. Select “Inspection Condition” of the checker and select the code type. The code type should correspond to the code symbol that is marked by the laser marker.

Reference

- Set the other settings in the inspection condition of PV230 so that you can read the marking codes without problem.

“Code Reader Checker” - “Inspection Condition”

Area Setting	Grayscale Preprocess	No
Inspection Condition	Code Type	CODE39
Judgement Limits	Code Model Parameter	Manual
Judgement	Background	Dark
Time(ms)	Recognize Reversed Code	No
	Quality Check	Invalid
	Error Output	

Quality	Length	Decoded Codes

5. Select “Judgement Limits” of the checker and set “Yes” to the “String Judgement”.

Reference

- You do not have to input “Judgement Characters”. The marking data is automatically input to the judgement characters by the laser marker.
- Confirm that marking data does not contain any characters that are not supported by PV230.

“Code Reader Checker” - “Judgement Limits”

Area Setting	String Judgement	Yes
Inspection Condition	Judgement Characters	
Judgement Limits		
Judgement		NG
Time(ms)		0.00

Quality	Length	Decoded Codes

6. Select “Inspection” - “Judgement” and set “JDC (External)” to “Type”.

7. Set the results of the one or more checkers in the expression table, that you want to refer in the total judgement. For the code checking, set the checker No. of “CDR: Code Reader” and for the human readable text checking, set the checker No. of “OCR: Optical Char. Recognition”.

8. Select “Set” of Condition, and set “JDC” to Condition and specify “Checker No.” of Total Judgement.

Reference

- For the link control of the laser marker and PV230, the output of the total judgement is needed. Without total judgement settings, the link control fails.
- If you want to check the code symbol and human readable text at the same time, set the expression of the total judgement to output “OK” when the results of both “CDR: Code Reader” checker and “OCR: Optical Char. Recognition” checker are OK.

■ Settings of PV230 for character checking

When PV230 is used for character checking, set the following items:

1. In PV230 setting software, select “Inspection” - “Checker” and set “Optical Character Recognition” to the checker type.
2. Specify the Checker No. for the optical character recognition.

↓ Reference

- Input the same value with the Checker No. for the optical character recognition set here to “OCR checker number set on PV” in the file settings of the laser marker.

3. Select “Area Setting” of the checker and specify the arbitrary testing area.
4. Select “Judgement Limits 1” of the checker and select “Character String” to “Judgement Type”.

↓ Reference

- Set the other settings in the inspection condition of PV230 so that you can read the marking strings without problem.
- You do not have to input “Judgement Characters”. The marking data is automatically input to the judgement characters by the laser marker.
- At the link control of the laser marker, character strings can be cross checked with the marking data, but the number of the characters and character size are not included in the checking target.
- To use the character recognition function, set the dictionary of PV230 for each marking character beforehand.
- Confirm that marking data does not contain any characters that are not supported by PV230.
- Up to 80 characters can be checked with one checker.

5. Select “Inspection” - “Judgement” and set “JDC (External)” to “Type”.
6. Set the results of the one or more checkers in the expression table, that you want to refer in the total judgement. For the character checking, set the checker No. of “OCR: Optical Char. Recognition”.
7. Select “Set” of Condition, and set “JDC” to Condition and specify “Checker No.” of Total Judgement.

↓ Reference

- For the link control of the laser marker and PV230, the output of the total judgement is needed. Without total judgement settings, the link control fails.

■ Settings of PV230/PV200 for image capturing and inspection

When PV230 or PV200 is used for image capturing and inspection, set the following items:

1. In PV230/PV200 setting software, select “Inspection” - “Checker” and set the desired checker.
2. Select “Inspection” - “Judgement” and set “JDC (External)” to “Type”.
3. Set the results of the one or more checkers in the expression table, that you want to refer in the total judgement.
4. Select “Set” of Condition, and set “JDC” to Condition and specify “Checker No.” of Total Judgement.

↓ Reference

- For the link control of the laser marker and PV230/PV200, the output of the total judgement is needed. Without total judgement settings, the link control fails.
- If you do not use the checkers, select “Numeric value” for the expression of the numeric calculation and set “1” so that the result of the total judgement is output always with “1”.

6-1-7 Code reader (DataMan) setting

If DataMan is used for code checking of image checking after marking, set the following items.

- DataMan IP address and Telnet Port number: Set them according to the network settings.
- Code reading setting: Set the code type, etc. to read the code to be marked by the laser marker.

Reference

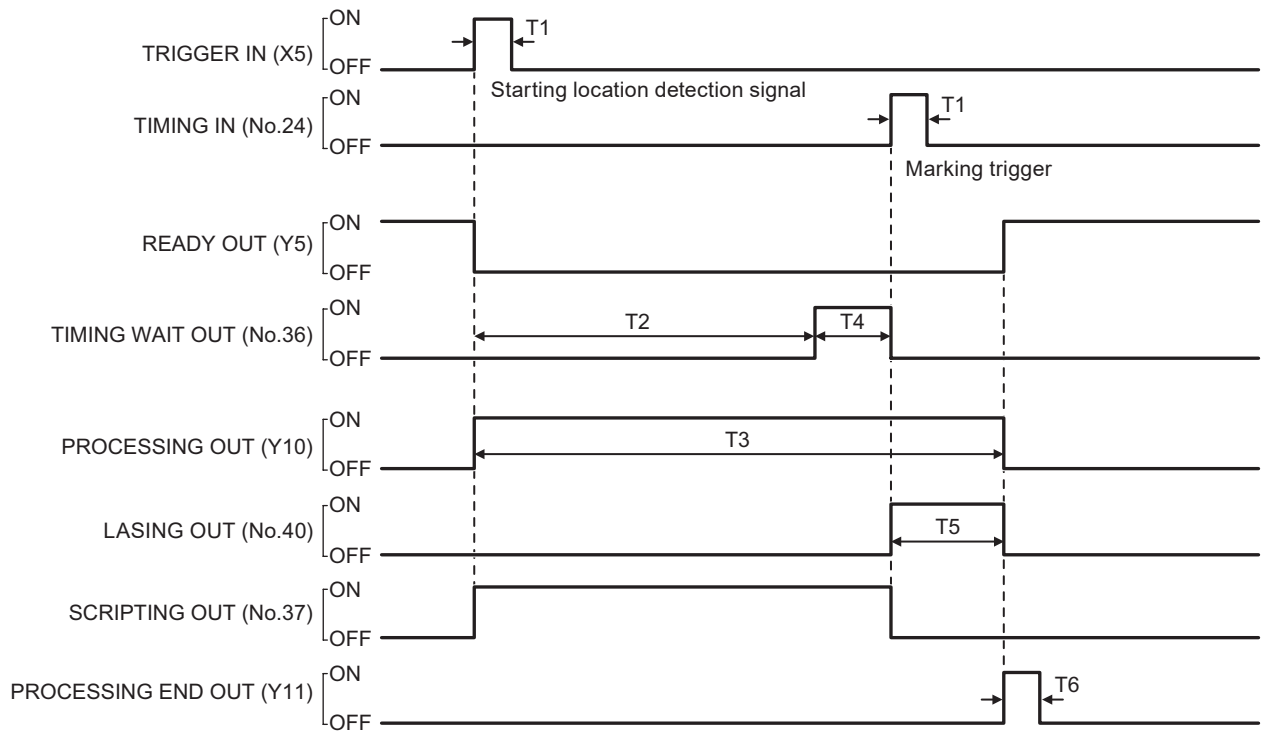
- For specifications and setting of code reader DataMan, refer to the instruction manual for DataMan.
- Ensure that any code other than the readout target is in the DataMan shooting range. Code reading is not performed properly.
- If the code type is UPC-E (6-digits UPC code), set DataMan's "UPC/EAN Properties" as follows:
 - Check off "Expanded"
 - Check on "Delete Leading Zero"

■ DataMan communication settings specification for connection with laser marker

Item	Ethernet communication specifications
Communication protocol	TCP/IP

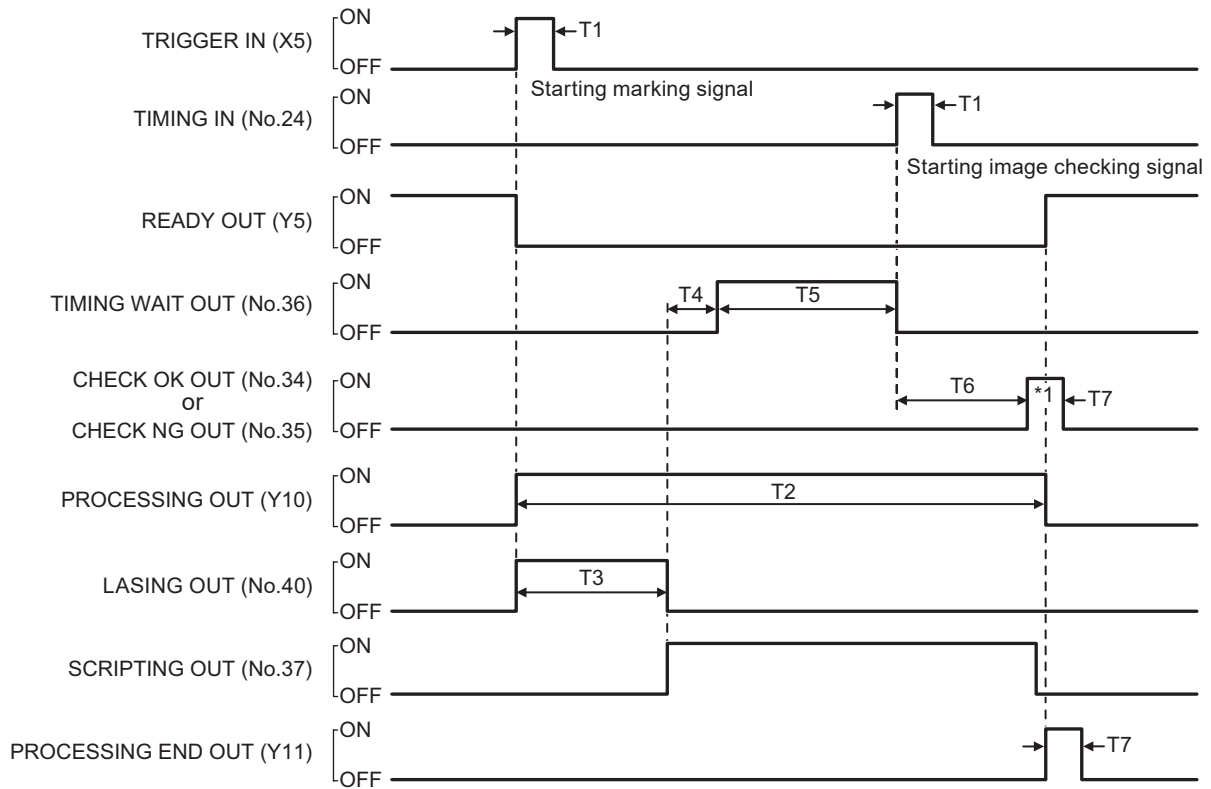
6-1-8 Timing chart

■ Position correction - Marking (when TIMING IN signal is used)



Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	—	Processing time of linkage operations with the image checker. In this case, it is the following time. <ul style="list-style-type: none"> • Time for location detection by image checker • Time for marking position correction by the laser marker
T3	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT includes the trigger delay time, operation time, laser radiation time and laser marker internal processing time of the linkage devices.
T4	Max. 60 sec	Turn on TIMING IN within 60 seconds after TIMING WAIT OUT is turned ON. If there is no input of TIMING IN within 60 seconds, an error occurs and trigger processing is terminated due to the abnormality.
T5	—	Laser radiation time. This varies depending on marking contents.
T6	2 to 510 ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.

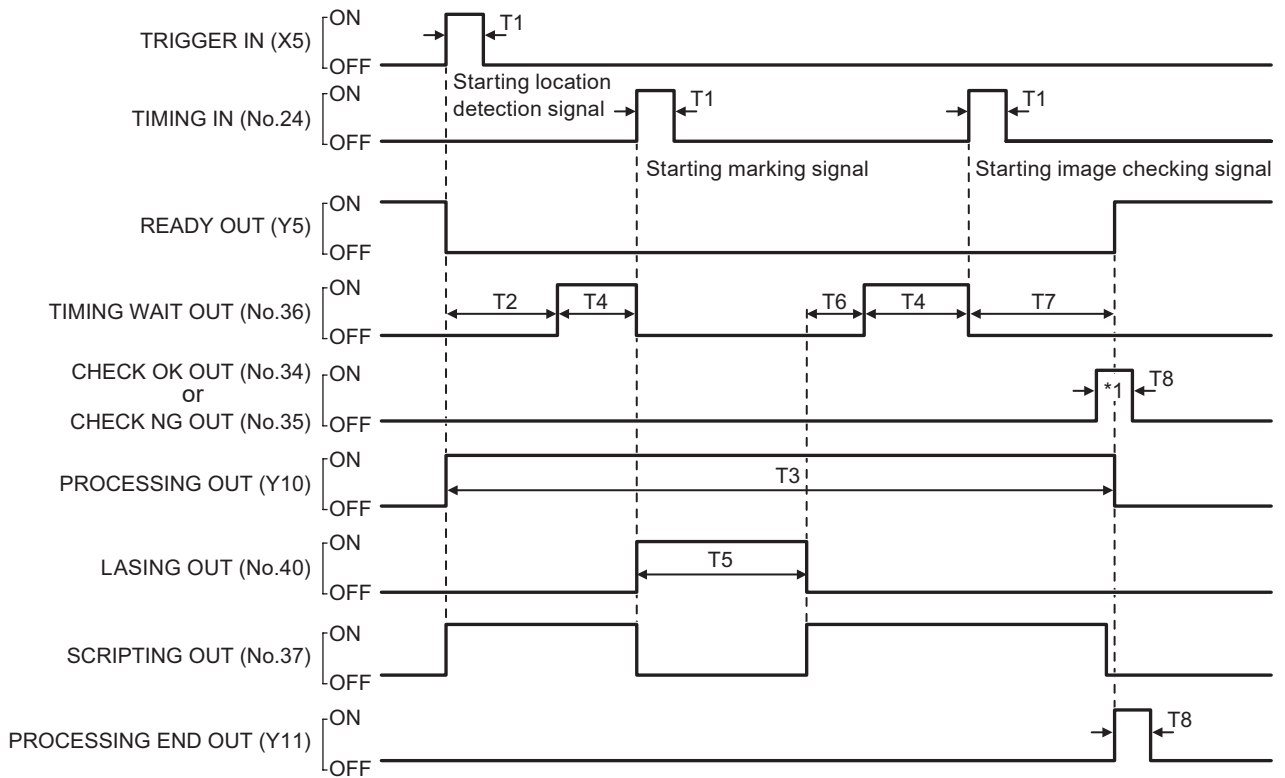
■ Marking - Image checking (when TIMING IN signal is used)



*1: CHECK OK OUT (No.34) / CHECK NG OUT (No.35) outputs before PROCESSING OUT (Y10) is turned OFF.

Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT includes the trigger delay time, operation time, laser radiation time and laser marker internal processing time of the linkage devices.
T3	—	Laser radiation time. This varies depending on marking contents.
T4	—	Processing time of communication and linkage operations with the image checker. For code checking or character checking, time for transferring the marking data to the image checker by the laser marker is included.
T5	Max. 60 sec.	Turn on TIMING IN within 60 seconds after TIMING WAIT OUT is turned ON. If there is no input of TIMING IN within 60 seconds, an error occurs and trigger processing is terminated due to the abnormality.
T6	—	Processing time of linkage operations with the image checker. In this case, it is the following time. <ul style="list-style-type: none"> • Time for reading by the image checker • Time for transferring the checkup results from the image checker to the laser marker
T7	2 to 510 ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.

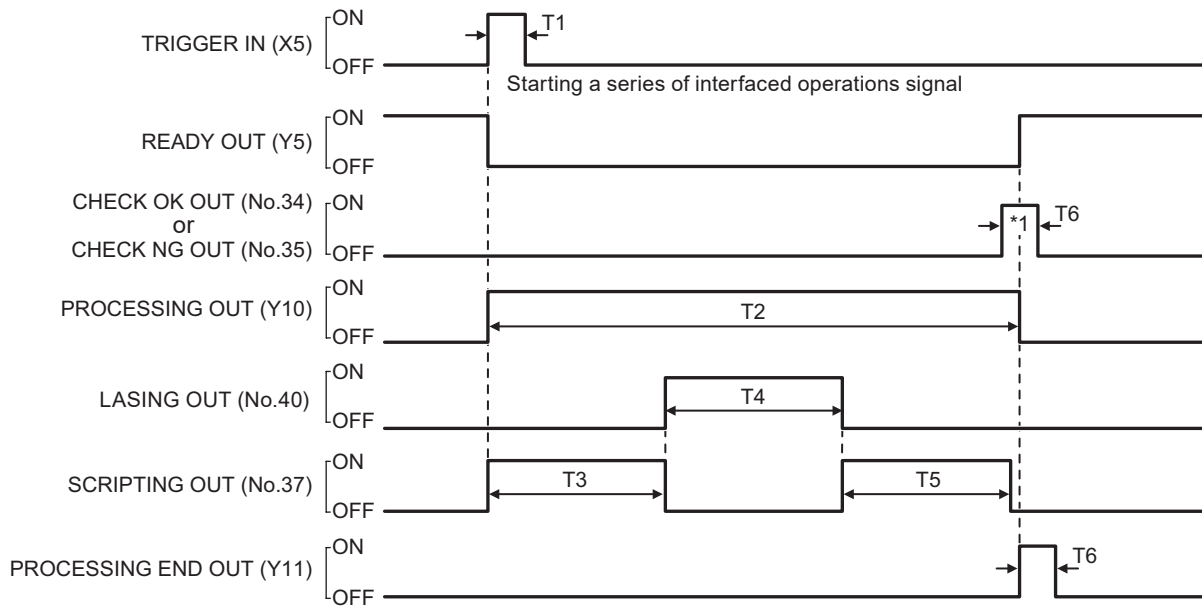
■ Position correction - Marking - Image checking (when TIMING IN signal is used)



*1: CHECK OK OUT (No.34) / CHECK NG OUT (No.35) outputs is output before PROCESSING OUT (Y10) is turned OFF.

Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	—	Processing time of linkage operations with the image checker. In this case, it is the following time. <ul style="list-style-type: none"> • Time for location detection by image checker • Time for marking position correction by the laser marker
T3	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT includes the trigger delay time, operation time, laser radiation time and laser marker internal processing time of the linkage devices.
T4	Max. 60 sec.	Turn on TIMING IN within 60 seconds after TIMING WAIT OUT is turned ON. If there is no input of TIMING IN within 60 seconds, an error occurs and trigger processing is terminated due to the abnormality.
T5	—	Laser radiation time. The time varies depending on marking contents.
T6	—	Processing time of communication and linkage operations with the image checker. For code checking or character checking, time for transferring the marking data to the image checker by the laser marker is included.
T7	—	Processing time of linkage operations with the image checker. In this case, it is the following time. <ul style="list-style-type: none"> • Time for reading by the image checker • Time for transferring the checkup results from the image checker to the laser marker
T8	2 to 510 ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.

■ Position correction - Marking - Image checking (when TIMING IN signal is not used)



*1: CHECK OK OUT (No.34) / CHECK NG OUT (No.35) outputs before PROCESSING OUT (Y10) is turned OFF.

Item	Time	Remarks
T1	2ms or more	Keep the ON status for 2ms or more.
T2	—	When TRIGGER IN (X5) is accepted, PROCESSING OUT (Y10) turns ON. The output time of PROCESSING OUT includes the trigger delay time, operation time, laser radiation time and laser marker internal processing time of the linkage devices.
T3	—	Processing time of linkage operations with the image checker. In this case, it is the following time. <ul style="list-style-type: none"> • Time for location detection by image checker • Time for marking position correction by the laser marker
T4	—	Laser radiation time. The time varies depending on marking contents.
T5	—	Processing time of linkage operations with the image checker. In this case, it is the following time. <ul style="list-style-type: none"> • Time for reading by the image checker • Time for transferring the checkup results from the image checker to the laser marker
T6	2 to 510 ms	One-shot output. Set the output time on the system settings screen. There is a small margin of error for the setting value.

6-2 Link Control with Code Reader

This product can be connected with a commercially available code reader via the RS-232C port. The code reader linkage function allows for control of the laser marker according to the contents of the code read by the code reader. Items to control by the code reader linkage function are listed below.

■ Switch the file

Prepare a code that contains the file number or name.

When you read the code symbol, the file which has the identical number or name with the code strings is selected by the laser marker.

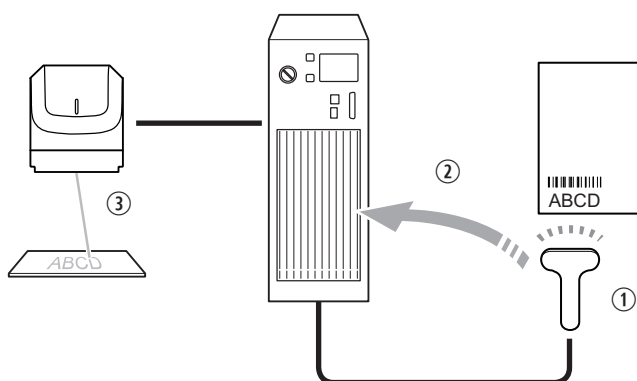
■ Change characters to mark or character data of the bar code/2D code to mark.

Prepare a code that contains the characters to mark.

Once the code is read, transfer the code string to the specified object number and change the characters to mark.

If the bar code/2D code is set for the specified object number, change the input characters of the code to mark.

6-2-1 Example of code reader linkage system



① Use a commercially available code reader and read the code that contains marking characters, or file number or name.

② The marking data or marking file are changed based on the read data

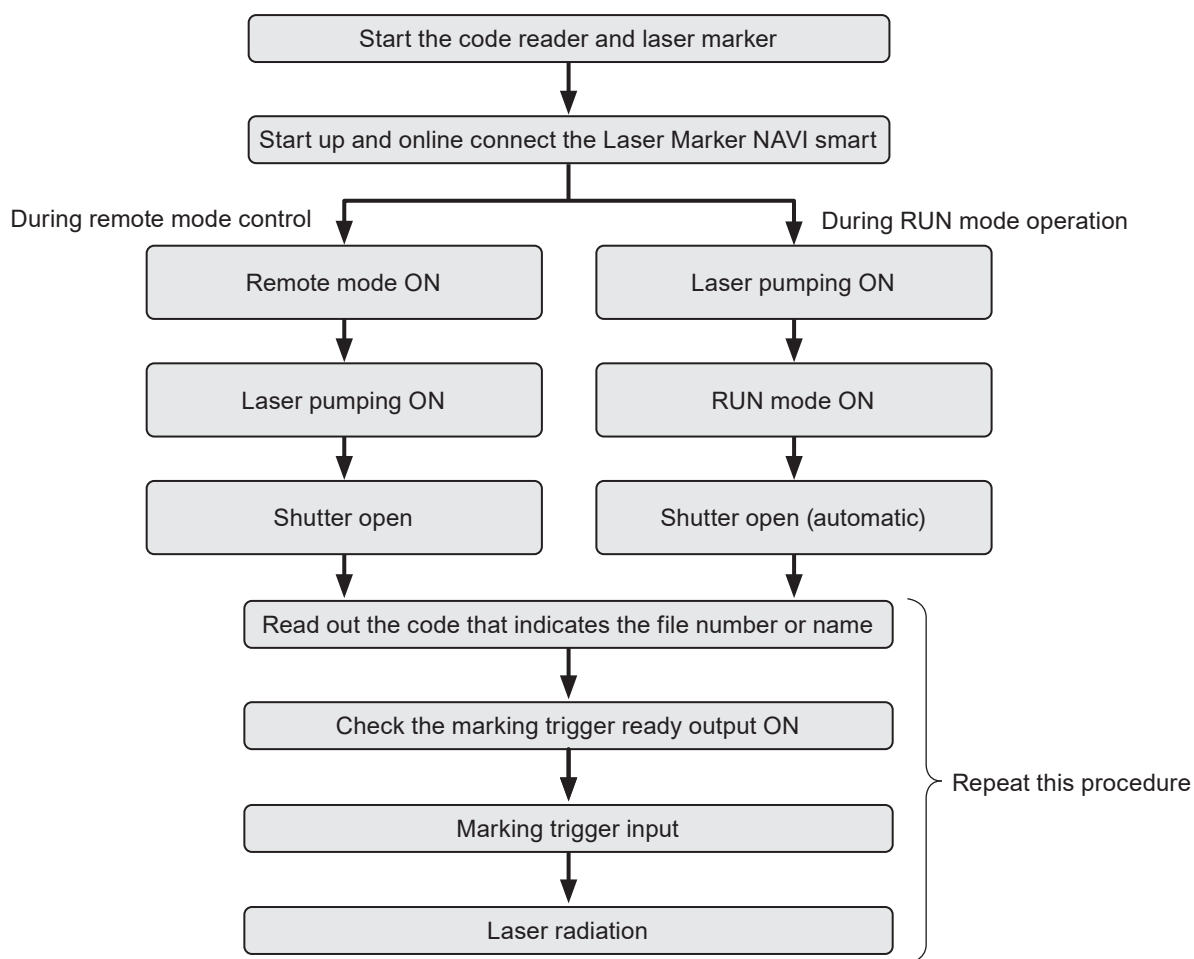
③ When the marking start trigger is input, marking is performed based on the data read by the code reader

Reference

- Characters that can be used for the code to read are alphanumeric characters and symbols in the range of ASCII code 20(HEX) to 7E(HEX).
- It is also possible to extract a part of the read code and transfer to the laser marker. Refer to “6-2-5 Setting of code reader linkage functions” (P.170) for this setting.
- File switching and character transfer of the code reader linkage function cannot be used at the same time.
- The code reader linkage function can be used while the laser marker is under the remote control mode or run mode.

6-2-2 Operation flow

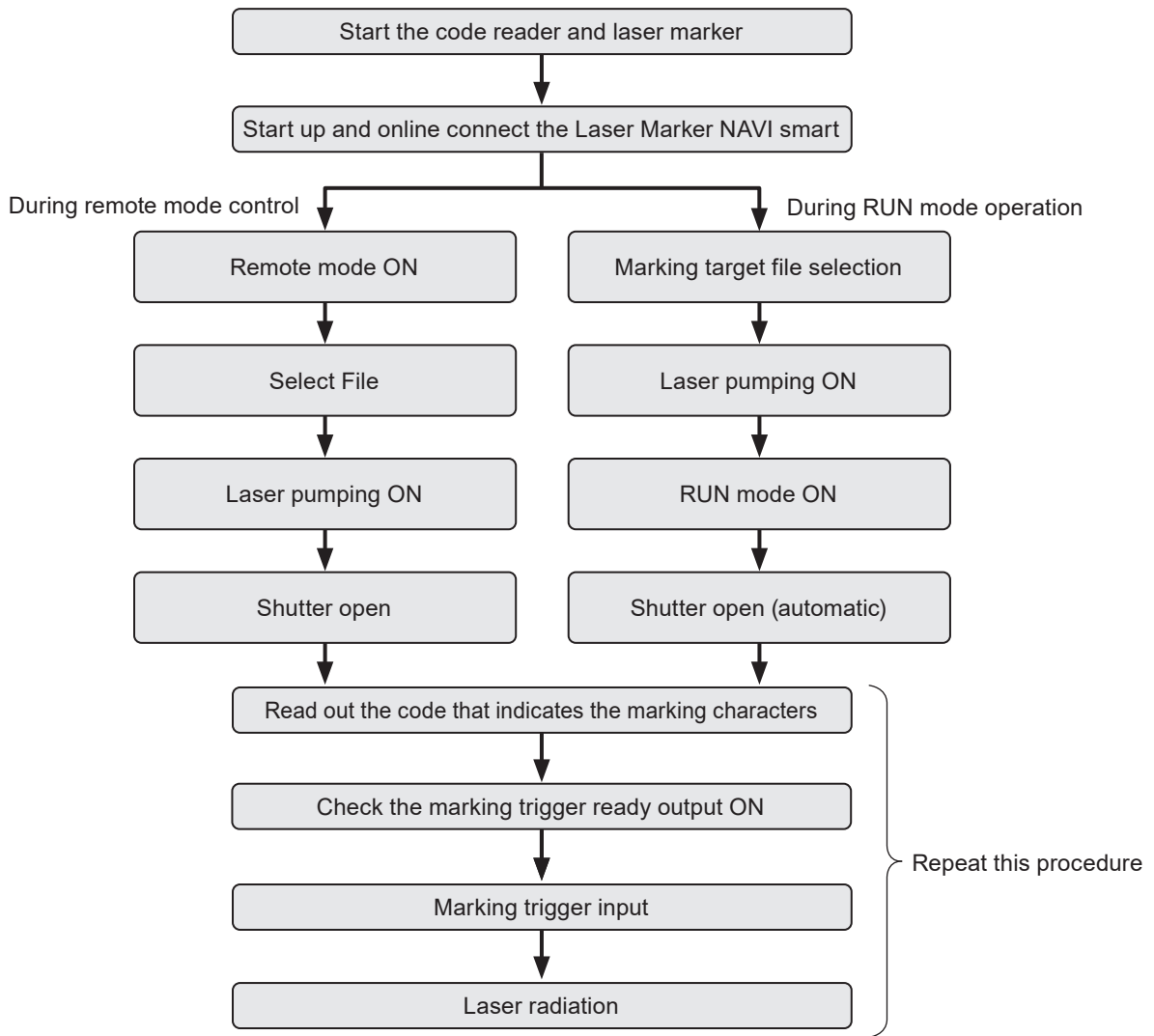
■ Example of operations to change the file



Reference

- Confirm the laser marker and code reader communication settings in advance.

■ Example of operations to change the character data to mark



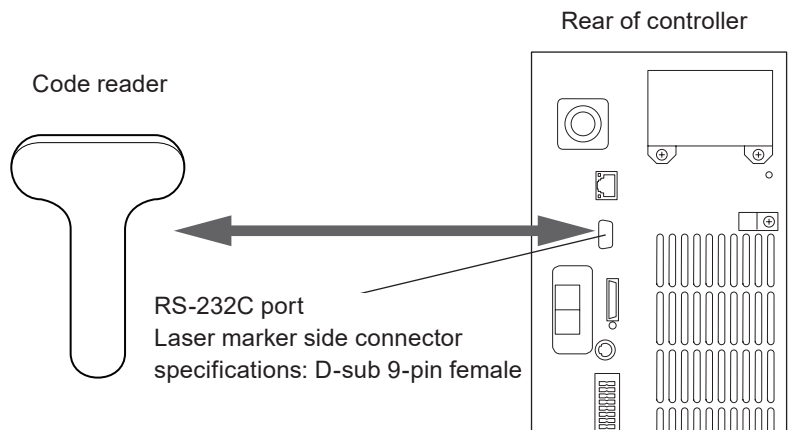
⬇ Reference

- Confirm the laser marker and code reader communication settings in advance.
- Specify the object number to transfer the character data in the system settings screen in advance.

6-2-3 Connection

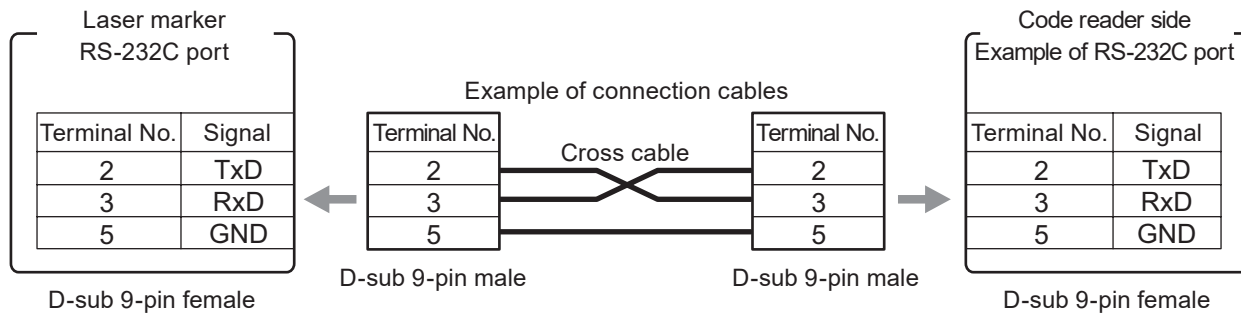
■ Connection method

Connect the code reader to the RS-232C port on the controller.



- Do not connect to other than three lines RxD (RD), TxD (SD) and GND to the laser marker.
- Use the RS-232C cross cable to connect the code reader and laser marker, referring to the example below.

Connection example



Reference

- For RS-232C port specifications, refer to "5-2 RS-232C" (P.140).

■ Connectable code reader

This product can be connected with a code reader that can be operated in the RS-232C communication settings described below.

■ Communication settings (for code reader linkage control)

Communication settings for use of the code reader linkage function are listed below.

Specify the code reader communication settings according to this setting.

Item	RS-232C communication specifications (for code reader linkage control)
Synchro system	Start-stop method
Communication type	Full-duplex transmission
Baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 bps (initial setting: 9600 bps)
Data length	8-bit fixed
Stop bits	1-bit / 2-bit (initial setting: 1-bit)
Parity	None / Even / Odd (initial setting: None)
Flow control	None
Start code	None (fixed)
Check sum	None (fixed)
End code	CR (Fixed)
Reception timer	Timeout monitoring ON (10 sec)

Notice

- This does not guarantee the communication with all code readers. Check the performance and operation before use.
- To connect the RS-232C port with the code reader, the communication command control by RS-232C is disabled.
- The control is enabled only when the laser marker is in the remote or run status.

6-2-4 Preparation of readout code

■ String that can be transferred

To use the code reader linkage function, check that the readout bar code/2D code data to read satisfy the following conditions.

- Generate code data by alphanumeric characters and symbols within the range of ASCII code 20(HEX) to 7E(HEX).
- To set the file number, specify it always with 4-digits.
- Do not contain two-byte characters and/or control codes in the code data.
- When two-byte “%” is used, replace the code data with the following characters.

Characters you want to use	Characters to replace with
%	%%

Reference

- As long as the code data to read satisfy the above conditions, any code type can be used.
- If any character that is not supported is contained in the read code, data cannot be transferred to the laser marker regardless of data extraction setting.
- For the list of ASCII codes, refer to “Serial Communication Command Guide”.

6-2-5 Setting of code reader linkage functions

For use of the code reader linkage function, set the following items in the Laser Marker NAVI smart system settings screen.

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “System settings” screen and select “Communication” tab.
3. Select the usage and communication settings of RS-232C.

Set “Code reader” to the RS-232C usage.

Specify these values according to communication settings of the code reader to connect.

RS-232C	
RS-232C usage	Communication commands ▼
Baud rate [bit/s]	1200 ▼
Data length [bit]	8
Parity	None ▼
Stop bits [bit]	1 ▼
Check sum	OFF ▼
End code	CR ▼

Reference

- For the code reader linkage function, the following items of communication settings are fixed values. Align the code reader side settings with this setting.
 - Start code: None
 - Checksum: OFF
 - End code: CR

4. In the “System settings” screen, select the “Linked device” tab.

5. Under “Code reader”, set “Control function”. Select types of data to be controlled by the code reader linkage function.
 - File switching by name
 - File switching by number
 - Character transmission

Code reader	
Control function	Character transmission ▼
Data extraction	ON ▼
Extraction start position [byte]	1
Extraction length [byte]	127
Target object number	0

Reference

- File switching and character data transmission cannot be used at the same time.

6. To transfer a part of the code string read, set the data extraction.

If "OFF" is selected, the read string is transmitted as is.

To set the data extraction, specify the start position and data length of the code data in bytes.

Setting range:

- Extraction start position: 1 to 299 byte
- Extraction length
 - Character transmission: 1 to 299 byte
 - File switching by name: 1 to 299 byte
 - File switching by number: 4 byte (fixed)

Extraction example: To read code characters "ABCDE" and transfer "BCD" to the laser marker, set as follows:

- Extraction start position [byte]: 2
- Extraction length [byte]: 3

Code reader	
Control function	Character transmission ▼
Data extraction	ON ▼
Extraction start position [byte]	1
Extraction length [byte]	127
Target object number	0

Reference

- Count one single byte character as one byte.
- The data extraction position setting applies to all data read by this function.
- If the read data length is shorter than the string to extract, the code is not read.
- Set the checksum setting of the code reader RS-232C communication settings to "OFF". If the checksum is set to "ON", the communication checksum is transferred to the laser marker as marking data.
- The end code (CR) is not subject to the data extraction.

7. If the control contents are set to character data transmission, specify the object number of destination.

The read character data are transmitted to the object number specified here.

Check the file to use this function and specify an appropriate object number.

Object numbers available as object numbers of destination are as follows.

- Object numbers for which character object is set
- Object numbers for which a bar code or 2D code object is set

Code reader	
Control function	Character transmission ▼
Data extraction	ON ▼
Extraction start position [byte]	1
Extraction length [byte]	127
Target object number	0

Object settings Function settings File settings Laser settings On-the-fly marking

▲ #0 Object group

- #0 Character 123
- #1 QR Code
- #2 Character %02:Y0%02:M0%02:D0

Character

▼ General

Object No. Change

Object name

Reference

- If there is not object number set as an object number of destination other than a character in the file to use this function or code is set for the number, character data cannot be transmitted.

8. Select "Apply to laser marking system" on the left side of the ribbon.



"Apply to laser marking system" tool

9. Disconnect the online connection with the laser marker.

10. Turn off the power of the laser marking system, wait five seconds and then restart the system.

The configured items will be reflected to the laser marker.

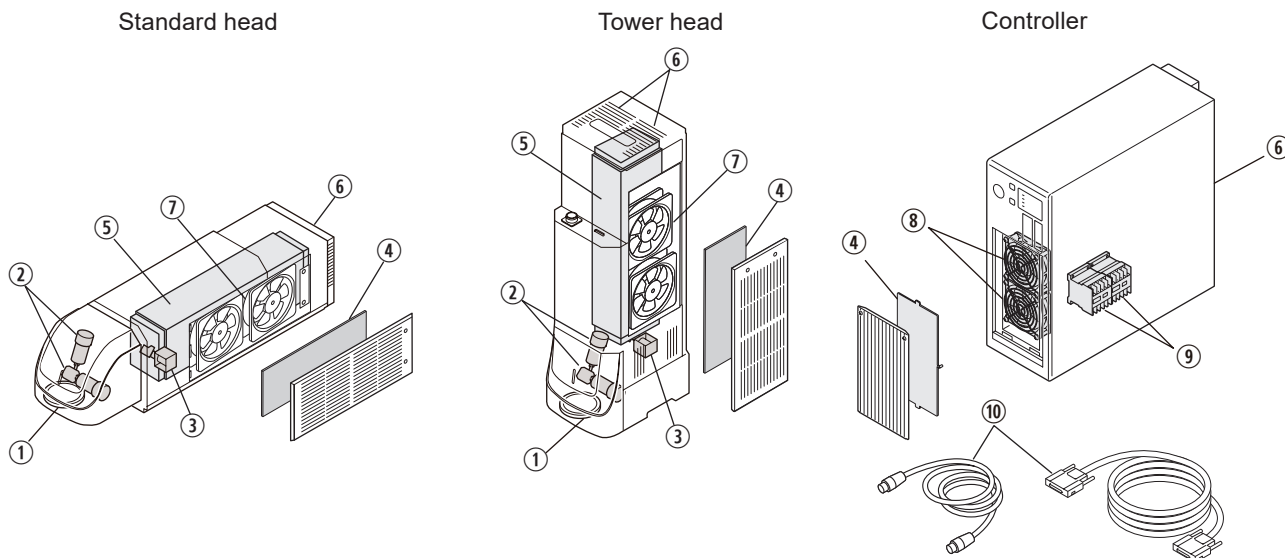
7 Maintenance

7-1 Maintenance Items

Listed below are typical parts that require cleaning or replacement depending on the usage environment or duration of service of the laser marker.

Some parts are maintainable by the customer, and other parts are required to be repaired or replaced by our service representative, depending on the types of parts and the defects.

For purchasing replacement parts or requesting our service representative to repair or replace parts, contact our sales agency.



No.	Parts name	Main cause for degradation	Daily maintenance	Replacement when degraded or defective
①	Laser emission port (f θ lens)	Contamination	Cleaning	By our service representatives
②	Galvano scanner	Aging	—	By our service representatives
③	Internal shutter	Aging	—	By our service representatives
④	Air filter	Contamination	Cleaning	Customer-replaceable
⑤	Laser oscillator	Aging	Check output power	By our service representatives
⑥	Exhaust vent	Contamination	Cleaning	—
⑦	Air-cooling fan (Head)	Contamination	—	By our service representatives
⑧	Air-cooling fan (Controller)	Contamination	Cleaning	Customer-replaceable
⑨	Contactor for interlock	Aging	—	Customer-replaceable
⑩	Cable	Broken	—	Customer-replaceable


! Notice

- Be sure to use our specified replacement parts. If the user applies any other fuses than the specified one, failure might result.

Reference

- Some optional items cannot be sold due to regulations in each country or region. For detailed information, please contact our sales office.

7-2 Maintenance Details of Parts

 WARNING	<ul style="list-style-type: none"> • Maintenance work must be conducted with the power to the laser marker turned OFF, and the AC power cable disconnected. Doing so may cause exposure to the laser beam or electrical shock. • Do not insert your hands or objects to the exhaust port of each unit or the gaps between units during the maintenance work. This may result in injuries, electrical shock, or failure of the laser marker.
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7-2-1 Laser emission port (f θ lens)

An f θ lens is mounted at the laser emission port of the head section. The f θ lens condenses laser irradiated from the oscillator at the position of the work distance. On the lens surface, AR (anti-reflection) coating is applied in order to maintain appropriate transmittance.

■ Effect from deterioration

The surface of the laser emission port may become contaminated by the dust and smoke during the laser marking. Using laser marker with the contaminated laser emission port may cause the lens to get burned in. This may also scratch the lens surface, or even peel off the surface coating depending on how it is used or cleaned.

Operations under these conditions will degrade transmittance of laser, which may lead to deterioration in quality of marking and processing.

■ Replacement interval

- Deterioration in quality of marking and processing (density reduction of the marking, incomplete processing) is observed.
- There is contamination or scratch that cannot be removed by cleaning.

■ Replacement method

Replaced at our service department. Contact our sales office.

■ Cleaning cycle setting

You can set the function to announce the cleaning cycle of the laser emission port with Laser Marker NAVI smart. When you turn ON the announcement setting for regular maintenance for the laser emission port on the "Maintenance" screen, the announcement function is activated and MAINTENANCE OUT (Y13) of the I/O terminal turns ON at the maintenance due date. Also a "!" symbol is displayed on the "Maintenance" screen of Laser Marker NAVI smart.

1. Establish an online connection between your PC and the laser marking system. Go to the "Maintenance" screen - "Operating data" tab.

2. Check the setting of the "Laser emission port cleaning" in the "Announcement for regular maintenance".

Announcement for regular maintenance						
Type	Announcement	Next maintenance			Last maintenance	
Air filter replacement	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56	
Laser emission port cleaning	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56	

- Specify the maintenance cycle based on the controller operating time (operating of the laser marking system). In the initial setting, maintenance is announced every 300 hours of controller operating time.
- If you clear the check box of the "Announcement", the announcement by the output of MAINTENANCE OUT (Y13) will be canceled.

3. If you want to change the maintenance cycle, select "Change" and specify the maintenance cycle based on the controller operating time.

4. Select "OK". The "Next maintenance" time is updated.

Maintenance cycle ×

Set the cleaning period of the laser emission port.

Controller operating time: [h]

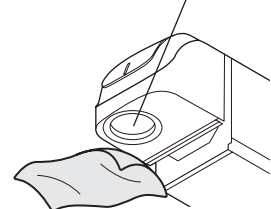
■ Cleaning steps for laser emission port (Daily maintenance)

In order to maintain stable marking quality, the laser emission port needs to be cleaned regularly according to the usage environment.

1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

2. Clean the laser emission port with an air duster for optics, and wipe it lightly with a soft cloth. If a contamination is severe, use a soft cloth immersed in ethanol to wipe it.


Laser emission port




Soft cloth

! Notice

- Do not wipe the laser emission port strongly, or touch it with a sharp pointed object. Laser marker might become faulty.



WARNING



- Never use an inflammable air duster. The laser beam may ignite the gas, resulting in fire.

3. If you want to manage the maintenance history, update the maintenance information in Laser Marker NAVI smart.

Go to the "Runtime data" tabs on the "Maintenance" screen in Laser Marker NAVI smart, and select "Done" on "Laser emission port cleaning" on the announcement for regular maintenance.

The date and time when you selected "Done" is registered in "Last maintenance".

Announcement for regular maintenance						
Type	Announcement	Next maintenance			Last maintenance	
Air filter replacement	☑	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56	
Laser emission port cleaning	☑	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56	

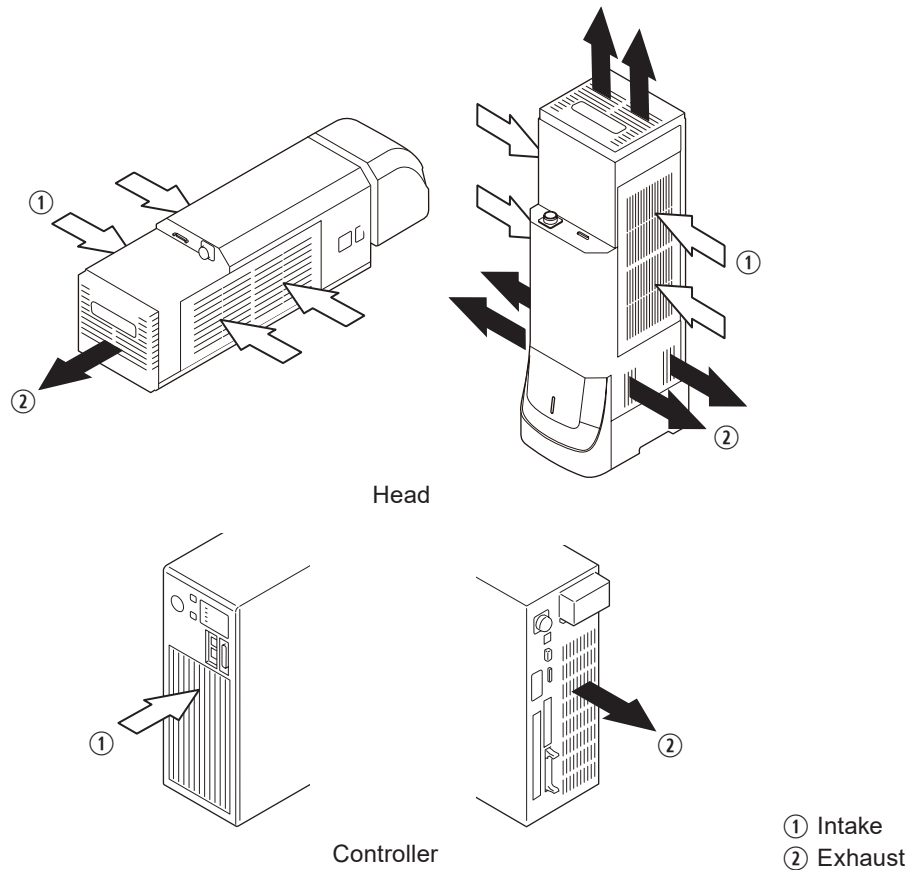
7-2-2 Intake/exhaust vent

Air-cooling system is used in the laser marker, thus the cooling effect will drop if dust is adhered to the intake or exhaust vent and it may result in the failure of the laser marker. Clean them regularly according to the usage environment.

■ Cleaning of the intake/exhaust vent (Daily maintenance)

1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

2. Vacuum the intake/exhaust vent and remove the dust.



! Notice

- Do not blow air to the intake/exhaust vent. If the dust penetrates in the laser marker, it may result in failure.

3. Wipe the vent with a dried cloth. If a contamination is severe, use a cloth wrung out with neutral detergent to wipe it. Then, remove the detergent with a cloth wrung out of water.

! Notice

- Keep water from entering the laser marker inside.

7-2-3 Air filter

The air filter is placed in the air-cooling intake vent of this product. (2 filters on the head, 1 filter on the controller)

■ Effect from deterioration

The air filter soiled with dust may reduce the cooling effect of the air-cooling fan. This may cause the marking performance to degrade, or failure of the laser marker.

■ Replacement interval

- There is a broken part, or contamination.

■ Replacement cycle setting

You can set the function to announce the replacement period for the filter with Laser Marker NAVI smart. When you turn ON the announcement setting for regular maintenance for the air filter on the "Maintenance" screen, the announcement function is activated and MAINTENANCE OUT (Y13) of the I/O terminal turns ON at the maintenance due date. Also a "!" symbol is displayed on the "Maintenance" screen of Laser Marker NAVI smart.

1. Establish an online connection between your PC and the laser marking system. Go to the "Maintenance screen" - "Operating data" tab.

2. Check the setting of the "Air filter replacement" in the "Announcement for regular maintenance".

Announcement for regular maintenance					
Type	Announcement	Next maintenance		Last maintenance	
Air filter replacement	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56
Laser emission port cleaning	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56

- Specify the replacement cycle based on the controller operating time (operating of the laser marking system). In the initial setting, maintenance is announced every 300 hours of controller operating time.
- If you clear the check box of the "Announcement", the announcement by the output of MAINTENANCE OUT (Y13) will be canceled.

3. If you want to change the maintenance cycle, select "Change" and specify the maintenance cycle based on the controller operating time.

4. Select "OK". The time of "Next maintenance" is updated.

Maintenance cycle ✕

Set the replacement period of the filter.

Controller operating time: [h]

■ Models of replacement parts

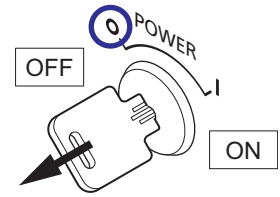
For details of purchasing air filters, please contact our sales agency.

Part name	Model	Remarks
Dedicated air filters	LP-AFT91	Set of 2 for head
Dedicated air filters	LP-AFT90	Set of 2 for controller

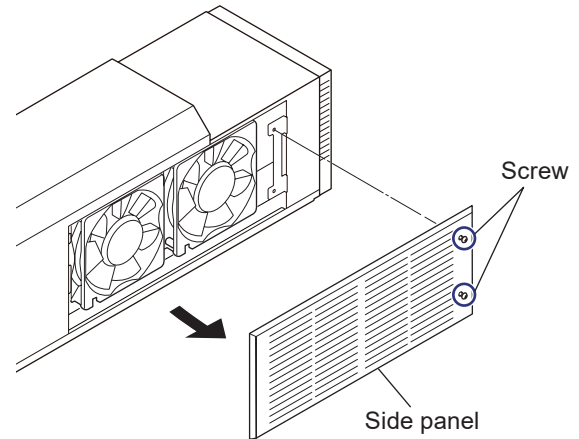
■ Steps for replacement of air filter (head)

Replace air filter regularly according to the usage environment.

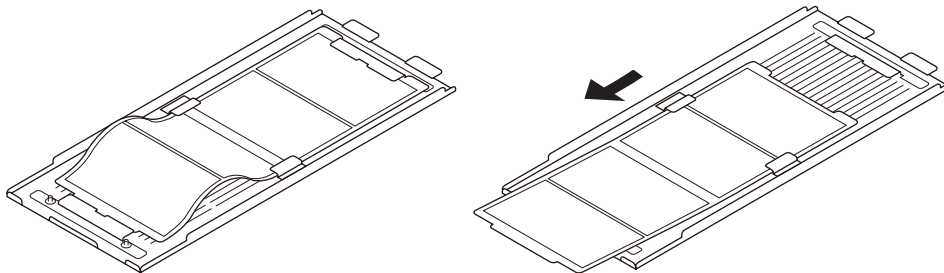
1. Turn OFF the key switch of the controller, and disconnect the AC power cable.



2. Loosen the screws (two M3 screws on each panel) on the side panels and remove the panels (two panels).



3. Bend and slide the filter to remove it from the panel.



4. If the panel or intake vent is contaminated, remove the dust with a vacuum cleaner or a dried cloth.

! Notice

- Do not blow air to the intake/exhaust vent. If the dust penetrates in the laser marker, it may result in failure.

5. Mount a new filter on the panel.

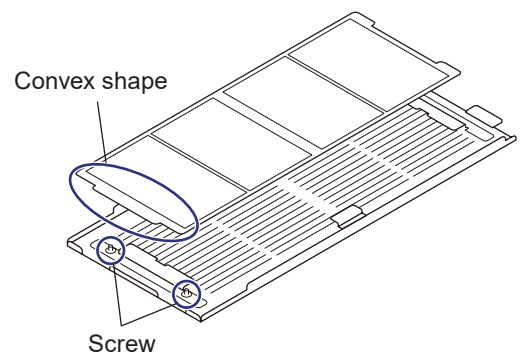
Set the filter side with the convex shape along the screw hole side of the panel.

! Notice

- The air filter of this product is not washable. If it is contaminated, replace it by new one.
- Make sure the filter is clean and free of tears before use. Also, make sure that the tabs on the filter frame are not broken.
- Do not operate the laser marker without the filters. It may cause a product failure.

↓ Reference

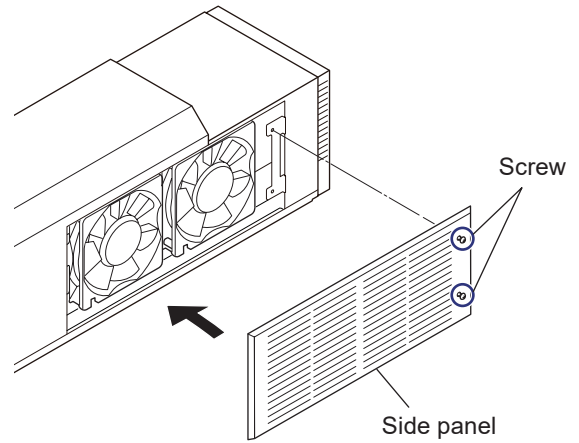
- There is no front and back in the filter.



6. Tighten the screws (two on each panel) to install the panel on each side of the head.

Screw size: M3

Tightening torque: 0.5 N·m



7. If you want to manage the maintenance history, update the maintenance information with the Laser Marker NAVI smart.

Go to the "Runtime data" tabs on the "Maintenance" screen in the Laser Marker NAVI smart, and select "Done" on "Air filter replacement" on the announcement for regular maintenance.

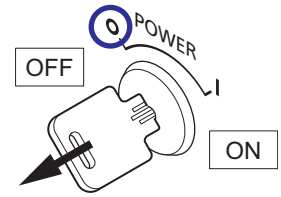
The date and time when you selected "Done" is registered in "Last maintenance".

Announcement for regular maintenance					
Type	Announcement	Next maintenance		Last maintenance	
Air filter replacement	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56
Laser emission port cleaning	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56

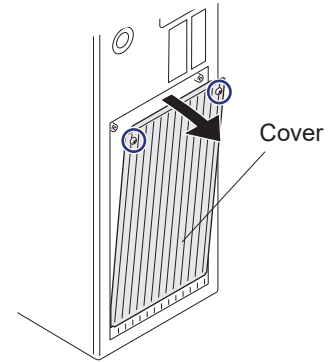
■ Steps for replacement of air filter (controller)

Replace air filter regularly according to the usage environment.

1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

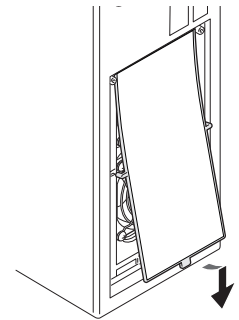


2. Remove the filter cover.
Loosen the two M3 screws on the front and remove the cover.



3. If the cover is contaminated, remove the dust with a vacuum cleaner or a dried cloth.

4. Remove the filter.



5. If the intake vent is contaminated, remove the dust with a vacuum cleaner or a dried cloth.

! Notice

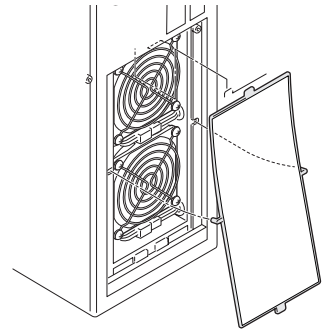
- Do not blow air to the intake/exhaust vent. If the dust penetrates in the laser marker, it may result in failure.

6. Attach the new filter.

Insert protrusions on the top and sides of the filter into grooves in the controller.

Notice

- The air filter of this product is not washable. If it is contaminated, replace it by new one.
- Make sure the filter is clean and free of tears before use. Also, make sure that the tabs on the filter frame are not broken.
- Do not operate the laser marker without the filters. It may cause a product failure.



Reference

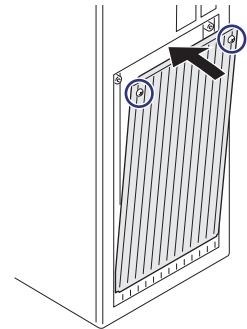
- The filter has upper and lower halves that are the same in size and shape.

7. Attach the filter cover.

Insert the lower part of the cover to the controller and tighten the upper screw. (2 positions)

Screw size: M3

Tightening torque: 0.3 N·m



8. If you want to manage the maintenance history, update the maintenance information with the Laser Marker NAVI smart.

Go to the "Runtime data" tabs on the "Maintenance" screen in the Laser Marker NAVI smart, and select "Done" on "Air filter replacement" on the announcement for regular maintenance.

The date and time when you selected "Done" is registered in "Last maintenance".

Announcement for regular maintenance						
Type	Announcement	Next maintenance			Last maintenance	
Air filter replacement	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56	
Laser emission port cleaning	<input checked="" type="checkbox"/>	In 300 hours of controller operating time	Done	Change	2023-06-19 10:56	

7-2-4 Air-cooling fan

The air-cooling fan cools the laser oscillator and internal power circuit. This product has four fans (intake) on the head and two fans (intake) on the controller. The fans rotate all the time during power on.

■ Effect from deterioration

Depending on the usage environment, any dust or contamination adhered onto the fan may impair air flow rate of the fan or even stop the rotation of the fan. When the cool performance decreases, the temperature in the electric circuit will go up, which may cause an error or stoppage of the product. Also, a temperature rise in the housing will foster deterioration in the internal parts, which may cause the marking performance to degrade, or failure of the equipment.

■ Replacement interval

- The fan does not rotate, or the rotating speed is low.
- There is contamination on the fan that cannot be removed by cleaning.
- Abnormal noise is generated from the fan.
- The fan slowdown warning is occurring.

■ Replacement method

- Air-cooling fan for head: Our service representative handles the maintenance and replacement. Contact our sales office.
- Air-cooling fan for controller: Can be replaced by the customer. Refer to “Steps for cleaning (Daily maintenance) and replacement of controller air-cooling fan” (P.182).

■ Models of replacement parts

For details of purchasing air-cooling fans, please contact our sales agency.

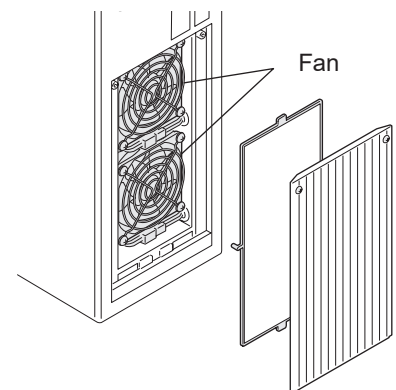
Part name	Model	Remarks
Cooling fans for controller: Set of 2 fans	LP-AFA20	Fan for intake

■ Steps for cleaning (Daily maintenance) and replacement of controller air-cooling fan

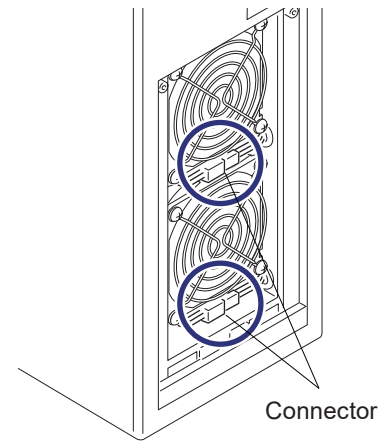
Clean the air-cooling fan regularly according to the usage environment.

1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

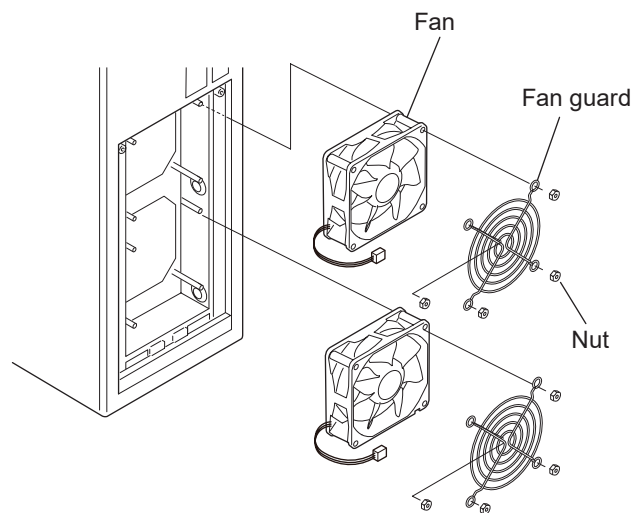
2. Remove the front cover and inside filter of the controller.
Refer to “Steps for replacement of air filter (controller)” (P.180).



3. Remove the two connectors of the fans on the controller. (One connector for one fan)



4. Loosen the M4 nuts (4 nuts for 1 fan) with hexagonal nut driver, and remove the fan guard and the fan itself from the controller.



WARNING



- Do not drop the fan mounting nut inside the controller. It may short-circuit the internal circuits and cause accident or malfunction.

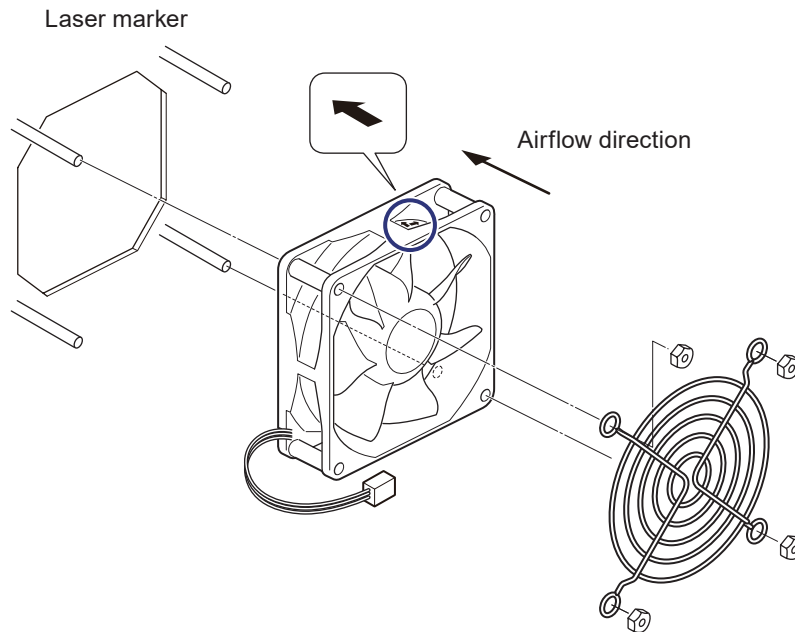
5. Remove dust and dirt adhered onto the fan by air-blowing.

Notice

- Do not rinse the fan. This may cause failure of the electronic parts inside.

-
6. Install the fans in the direction so that the air flow arrow on the fan points to the laser marker and the fan cable is on the bottom side.

Put the fan guard on the fan and attach the nuts (M4, opposite side 7mm) to the screws coming out of the controller side.



! Notice

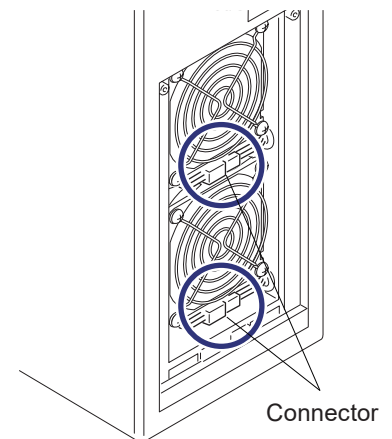
- Install the controller fans in the direction so that the air flow matches the intake direction.
Fan installed in the wrong way causes the flow to go in the wrong way, which may failure of the product.
- Be careful not to let the cable get caught while installing.

-
7. Fasten the screws (4 nuts for 1 fan) from the top of the fan guard to secure the fan to the controller.

Nut size: M4

Tightening torque: 1.0 N·m

-
8. Connect the connector for the fan. (One connector for one fan)



9. Attach the air filter in the front of the fans.

Refer to “Steps for replacement of air filter (controller)” (P.180).

! Notice

- Be careful not to let the cable get caught while installing the air filter.

10. Install the front cover of the controller.

11. If you replaced the fans to new one, reset the operating information in Laser Marker NAVI smart.

Go to the “Maintenance” screen and select “Operating data”.

For “Controller fan operating time [h]”, select “Reset” and confirm with “Yes” to reset the value.

Operating data		
Type	Status	
Controller operating time [h]	117	
Laser pumping time [h]	17	
Laser radiation time [h]	10	
Number of shutter cycles	1192	
Number of power-on times	304	
Head fan operating time [h]	117	Reset
Controller fan operating time [h]	117	Reset
Battery status for system clock	Normal	

7-2-5 Laser oscillator

A CO₂ (carbon dioxide) laser oscillator is installed in the head. The laser beam output from the oscillator is scanned and focused to mark or process the target materials.

■ Effect from deterioration

Laser output characteristics such as laser power will deteriorate over time due to aging of oscillator. As the laser output characteristics deteriorate, symptoms such as ununiform marking density, chipped characters, or unstable processing quality, etc. may occur.

Also, as cooling efficiency of the oscillator decreases because of the usage environment, the electronic parts in the oscillator may become defective and unable to irradiate the laser.

■ Replacement interval

- Deterioration in quality of marking and processing (streaking and density reduction of the marking, incomplete processing) is observed.
- Setting a large value for the laser power is not reflected in the quality of marking and processing.
- The laser power measured with a commercial power meter has decreased by 20%, compared to the delivery status.
- Three to five years have passed since the date of delivery, or the total operating time of laser pumping has exceeded 12,000 hours.*
- Alarm for laser error occurred.

* The replacement interval may differ depending on the usage environment and marking conditions.

Reference

- The laser pumping time exceeds 12,000 hours, the “!” symbol is displayed on the maintenance screen of the Laser Marker NAVI smart and MAINTENANCE OUT (Y13) of I/O terminal block turns ON.

■ How to confirm operating hours

Go to the “Maintenance” screen and select “Operating data”.

“Laser pumping time [h]” is displayed.

Type	Status	Reference cycle for maintenance
Controller operating time [h]	117	--
Laser pumping time [h]	17	12000
Laser radiation time [h]	10	--
Number of shutter cycles	1192	2000000
Number of power-on times	304	--
Head fan operating time [h]	117	--
Controller fan operating time [h]	117	--
Battery status for system clock	Normal	--
Number of marking processes	627	--
Number of switching cycles of INTERLOCK contactors	605	1000000

■ Replacement method

Our service representative handles the maintenance and replacement. Contact our sales office.

■ Confirm laser output (Daily inspection)

Confirm the laser output regularly in order to maintain consistent marking quality.

The laser output should be measured with a commercially available meter using the following steps.

1. Prepare a commercially available power meter.

! Notice

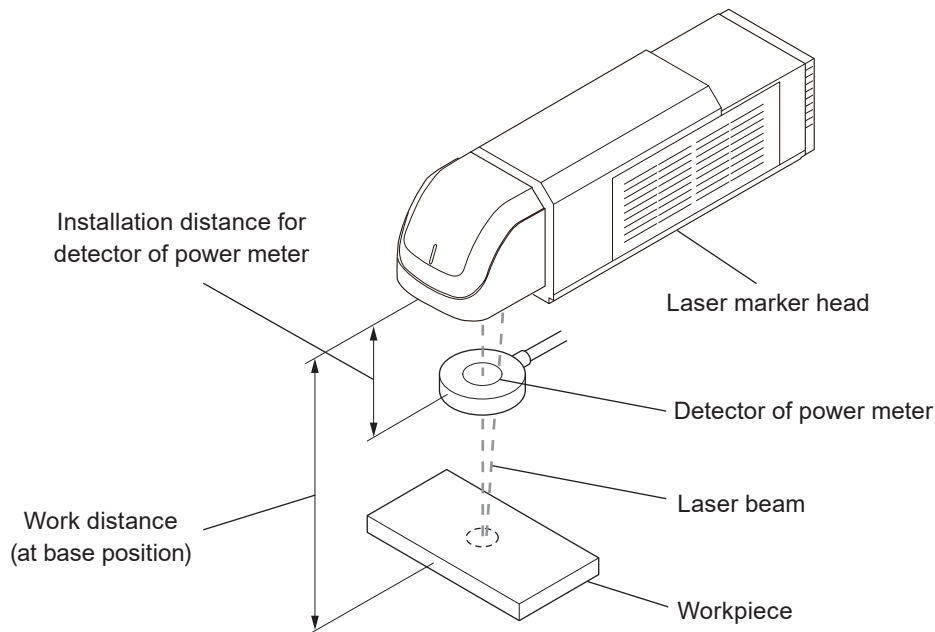
- Be sure to use the calibrated power meter.
- The power meter with the detector having the damage threshold (maximum average power density) of more than $10\text{kW}/\text{cm}^2$ should be used.
- Also the size of the detector should be more than $\phi 10\text{ mm}$.
- A difference may arise under the high/low temperature. Measuring power with normal temperature (20 to 30 Celsius degree) is recommended.
- Before measuring the laser power, make sure there is no contamination in the laser emission port. If the laser emission port is contaminated or damaged, an error may result in the measurement of the laser power.

2. Install the power meter.

Put the detector of the laser power meter vertically down from the center of the laser emission port and place it at the following distance, i.e. one-third to half of the specified work distance of the laser marker.

Laser marker model	Installation distance for detector of power meter *
LP-RH300S / LP-RH300T	90mm
LP-RH200S / LP-RH200T	
LP-RH100S / LP-RH100T	
LP-RH301S / LP-RH301T	50mm
LP-RH101S / LP-RH101T	
LP-RH305S / LP-RH305T	130mm

* The values represent the recommended values for the case where the damage threshold (maximum average power density) of the detector of power meter is $10\text{kW}/\text{cm}^2$.



! Notice

- Do not install the power meter within the focal length of the laser marker. This may cause destruction of the power meter.

3. Establish an online connection between your PC and the laser marking system. Go to the “Maintenance” screen.

4. Click “Laser pumping” in the ribbon to turn on the laser pumping.

“Laser pumping” tool



ON status



OFF status

5. Click “Laser radiation for measurement” in the ribbon.



“Laser radiation for measurement” tool

6. Click “Guide laser ON” to confirm the setting position of the power meter detector. Place the detector so that the cross indication is on the center of the detector.

Setting value	
Laser power	20.0
Laser frequency [kHz]	20
Apply system offset to laser power	<input type="checkbox"/>
Laser power correction [%]	100.0

Buttons: Laser radiation, Stop, Guide laser ON (highlighted), Guide laser OFF, Optimal setting, Close

7. Click “Guide laser OFF”.

8. Enter the laser power and other laser settings, then click “Laser radiation”.

Click “Yes” in the laser radiation confirmation dialog to irradiate the laser.

Setting value	
Laser power	20.0
Laser frequency [kHz]	20
Apply system offset to laser power	<input type="checkbox"/>
Laser power correction [%]	100.0

Buttons: Laser radiation (highlighted), Stop, Guide laser ON, Guide laser OFF, Optimal setting, Close

Reference

- Use the guide laser to confirm the setting position of the power meter detector. Place the detector so that the cross indication is on the center of the detector.
- For stable measurement results, it is recommended to obtain the average output value by measuring the output after about 30 seconds from the start of laser radiation for 10 to 30 seconds.
- The settings of laser radiation for measurement are common in all files.

WARNING

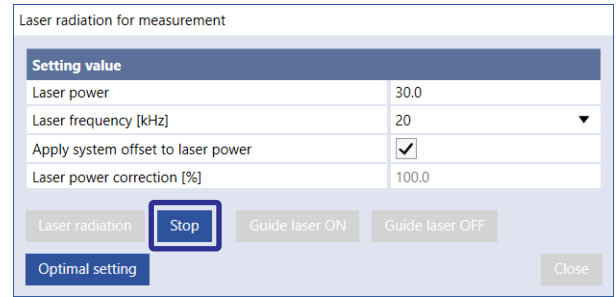
Do you want to emit the laser beam?
It may take a moment to start lasing.

Buttons: Yes, No

WARNING	<ul style="list-style-type: none">• Be sure to wear protective goggles.• During the radiation, the laser energy is concentrated to one point. Use due caution with long period radiation, it may cause a fire or damage to the object.
----------------	---

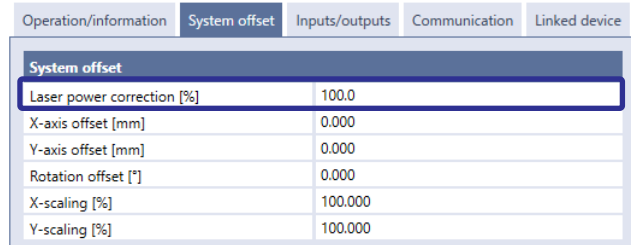
9. Click “Stop” to stop laser radiation.

The laser radiation for measurement will automatically stop after about one minute even without clicking “Stop”.



10. Check the measurement results of the power meter. If the power decays lower than the default setting, correct the laser power setting value in the “System settings” screen – “System offset”.

Setting range of laser power correction: 50 to 200 [%]



Reference

- Laser power correction refers to the function to correct not the maximum laser power [W] value but the laser power setting value.

Notice

- If the power decays more than 20%, compared to the default setting, the laser oscillator needs maintenance. Contact our sales office or representatives.

7-2-6 Galvano scanner

Galvano scanner is a scanner for radiating the laser beam along the coordinates of marking data.

The galvano scanner scans the drawing data by controlling the angle of galvano mirror mounted onto the axis of rotation of motor with two axes to create characters and graphics for marking and processing.

■ Effect from deterioration

Uneven wear may occur on the bearing inside the galvano scanner depending upon marking frequency and conditions. If uneven wear develops, accurate reproducing may become difficult, resulting in skewness or misalignment of marking lines.

■ Replacement interval

- Deterioration in quality of marking and processing (Characters crushed, streaking and density reduction of the marking, incomplete processing) is observed.
- Warning for galvanometer error occurred.
- Galvano scanner has been used for almost five years.*

* The replacement interval may differ depending on the usage environment and marking conditions.

■ Replacement method

Our service representative handles the maintenance and replacement. Contact our sales office.

7-2-7 Internal shutter

The internal shutter is opened and closed by the rotary solenoid to shut off the path of laser beam.

■ Effect from deterioration

When the rotation torque of the rotary solenoid declines, the opening/closing speed of the internal shutter is decreased or the shutter may not work. In this case, an error “Internal shutter failure” occurs in the laser marker and marking cannot be performed.

■ Replacement interval

- Total number of opening/closing operations has exceeded two million.
- Alarm for internal shutter error occurred.

Reference

- If the number of shutter cycles has exceeded two million, the “!” symbol is displayed on the maintenance screen of Laser Marker NAVI smart and MAINTENANCE OUT (Y13) of the I/O terminal turns ON.

■ How to confirm the number of opening/closing operations

Go to the “Maintenance” screen and select “Operating data”. In “Number of shutter cycles” you can check the number of shutter open/close operations.

Type	Status	Reference cycle for maintenance
Controller operating time [h]	117	--
Laser pumping time [h]	17	12000
Laser radiation time [h]	10	--
Number of shutter cycles	1192	2000000
Number of power-on times	304	--
Head fan operating time [h]	117	--

■ Replacement method

Our service representative handles the maintenance and replacement. Contact our sales office.

7-2-8 Replacement of contactor for interlock

INTERLOCK terminals of I/O terminal block is connected with the operation coil of the internal contactor in the controller. With the open and close operation of the contactor, the power of laser oscillator turns off when the INTERLOCK terminal is released.

■ Effect from deterioration

When the drive of the contactor gets deteriorated by the long-term operation, the power of laser oscillator does not turn off correctly with INTERLOCK terminal is released.

By using INTERLOCK MONITOR terminals, you can monitor the contact malfunction.

■ Replacement interval

- Number of switching cycles of INTERLOCK contactor has exceeded one million. (B10d = 1,000,000 times)
- The output status of INTERLOCK MONITOR terminals (Y16-Y17, Y18-Y19) does not correspond to the input status of INTERLOCK terminals (X16-X17, X18-X19).
- Alarm for INTERLOCK open (E400, E401) cannot be released.

⏴ Reference

- If the number of switching cycles of INTERLOCK contactor exceeds one million, the laser radiation time exceeds 30,000 hours, the "!" symbol is displayed on the maintenance screen of the Laser Marker NAVI smart and MAINTENANCE OUT (Y13) of I/O terminal block turns ON.

■ How to confirm the number of opening/closing operations

Go to the "Maintenance" screen and select "Operating data".

"Number of switching cycles of INTERLOCK contactors" is displayed.

Operating data		
Type	Status	Reference cycle for maintenance
Controller operating time [h]	117	--
Laser pumping time [h]	17	12000
Laser radiation time [h]	10	--
Number of shutter cycles	1192	Reset 2000000
Number of power-on times	304	--
Head fan operating time [h]	117	Reset --
Controller fan operating time [h]	117	Reset --
Battery status for system clock	Normal	--
Number of marking processes	627	--
Number of switching cycles of INTERLOCK contactors	605	Reset 1000000

■ Models of replacement parts

For details of purchasing the contactor, please contact our sales agency.

Part name	Model	Remarks
Contacting unit for Interlock	LP-AEC10	Model of the contactor: SK09L-E01 (made by Fuji Electric FA Components & Systems Co., Ltd.) Mechanical life: 10 million times Electrical life: 1 million times

■ Steps for replacement of contactor

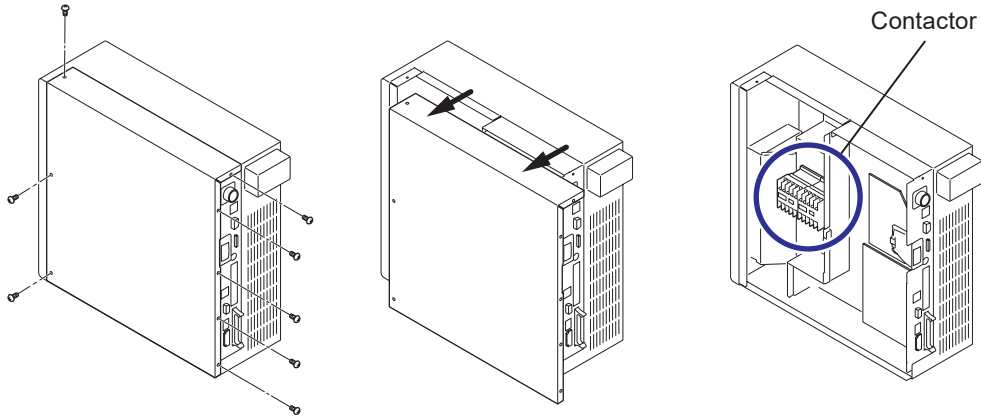
1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

2. Remove the side panel by removing the following screws on the controller.

Five M3 screws on the back

One M3 screws one top

Two M3 screws on the side

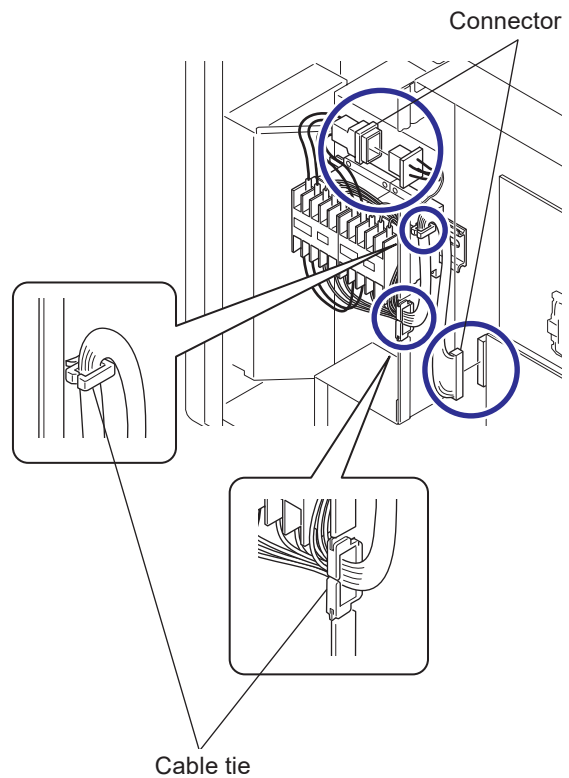


3. Disconnect the two connectors of the contactor.

! Notice

- Before the maintenance work, always discharge the static electricity by touching the grounded metal objects, etc. Static electricity can damage electrical components inside controller.
- Do not touch any other devices on the circuit board.

4. Disconnect the cable of the contactor from the controller cable ties (2 positions).



- Loosen the bolts (M4, two positions) of the contactor with hexagonal screwdriver and remove the contactor unit from the controller.

- Install the new contactor unit. Insert the bolt to the washer and tighten the bolts (two positions) with M4 hexagonal screwdriver to fix the contactor unit to the controller.

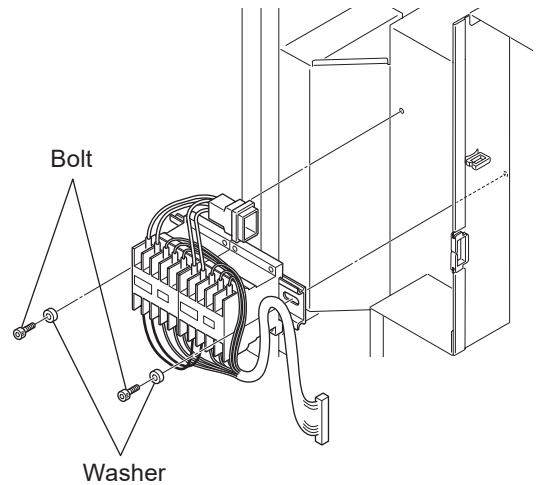
Tightening torque: 1.0 N·m

! Notice

- Be careful not to let the cable get caught while installing.

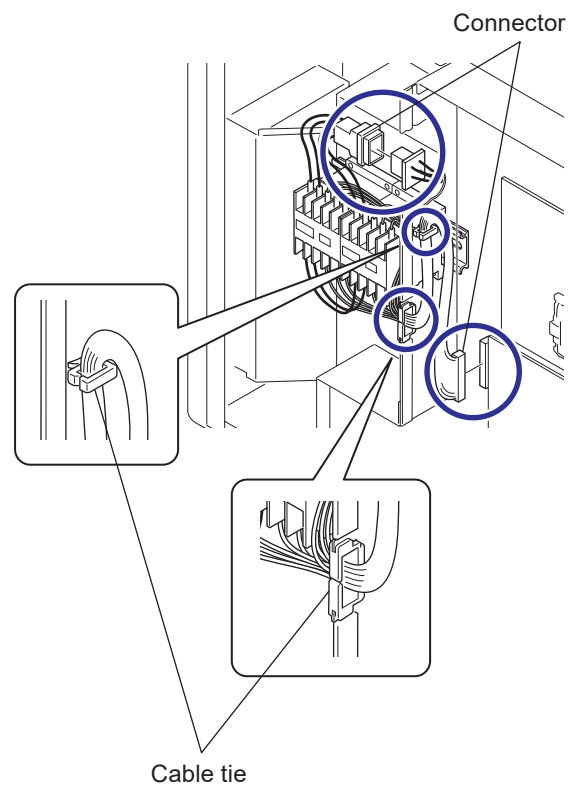
Reference

- To the optional contactor unit, the cables are already connected at the delivery state.



- Connect the two connectors of the contactor to the controller.

- Connect the cable of the contactor to the controller cable ties (2 positions).



- Install the side panel on the controller and tighten the following screws.

Five M3 screws on the back

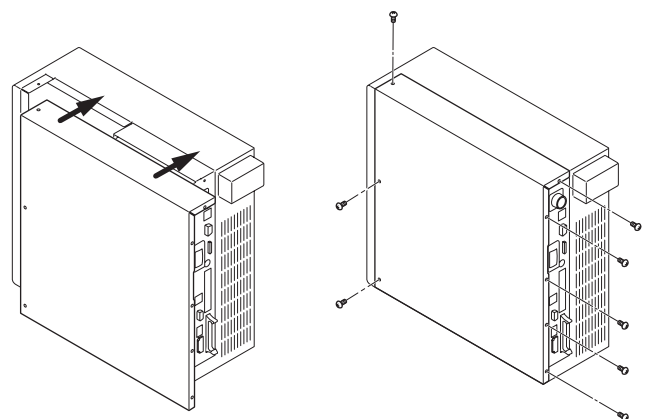
One M3 screw on the top

Two M3 screws on the side

Tightening torque: 0.5 N·m

! Notice

- Be careful not to let the inside cables get caught while installing.



10. If you replaced the contactor, reset the operating data in Laser Marker NAVI smart.

Go to the “Maintenance” screen and select “Operating data”.

For “Number of switching cycles of INTERLOCK contactors”, select “Reset” and confirm with “Yes” to reset the value.

Operating data			Error log	Command history
Type	Status	Reference cycle for maintenance		
Controller operating time [h]	117	--		
Laser pumping time [h]	17	12000		
Laser radiation time [h]	10	--		
Number of shutter cycles	1192	2000000	Reset	
Number of power-on times	304	--		
Head fan operating time [h]	117	--	Reset	
Controller fan operating time [h]	117	--	Reset	
Battery status for system clock	Normal	--		
Number of marking processes	627	--		
Number of switching cycles of INTERLOCK contactors	605	1000000	Reset	

7-2-9 Replacement of cable

If any cables for the head-controller are broken because of the usage conditions and installation environment, they need to be replaced.

■ Models of replacement parts

For details of purchasing cables, contact our sales office.

Part name	Model
Unit power cable	LP-ACP20-5
Signal cable	LP-ACS10-5

■ Steps for replacement

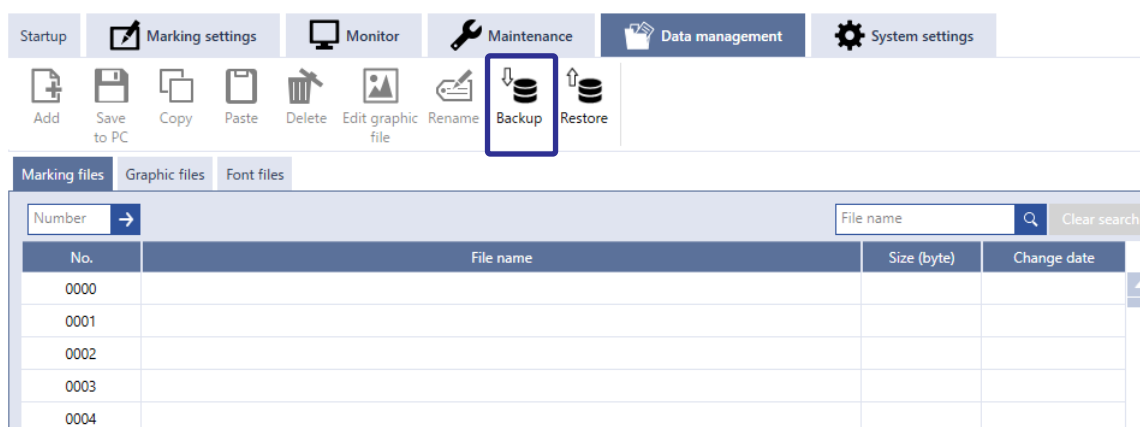
See “2-6-1 Connection of head and controller” (P.59), and connect cables.

7-3 Obtaining Backup Data

Obtain and keep a backup of data registered in the laser marker periodically using the Laser Marker NAVI smart in case of replacing laser markers for repairing and maintaining purposes.

■ Steps for obtaining backup data (Daily maintenance)

1. Establish an online connection between your PC and the laser marking system.
2. Go to the “Data management” screen and select “Backup” in the ribbon.



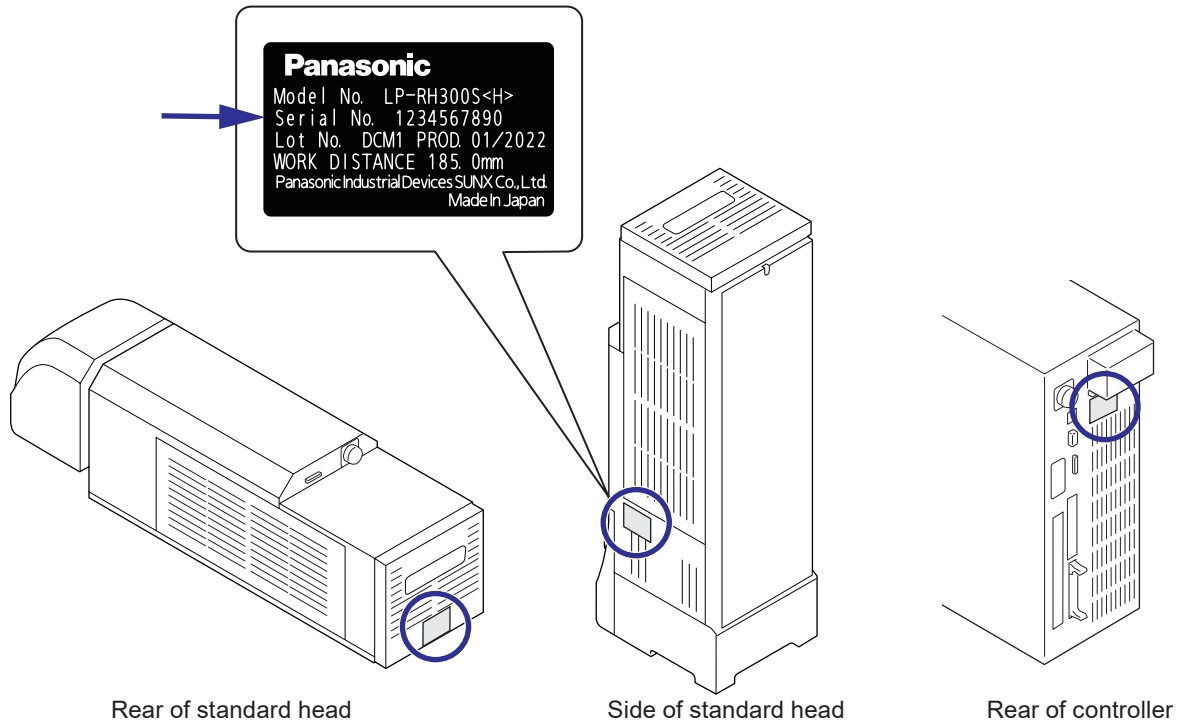
3. Specify the name and storage destination for a backup file.
4. A dialog for entering a comment for the backup file is displayed. Enter a comment if necessary and select OK.
Select “Save” to save the backup file.

7-4 Serial Number Checking Method

Notify our sales office or representatives of the laser marker serial number for inspection or repair.
The head and controller are delivered with the same serial numbers.

■ Check it on laser marker main unit


The serial number of the laser marker is written on the area marked by a circle in the figure below.



■ Check it on Laser Marker NAVI smart

1. Establish an online connection between your PC and the laser marking system.

2. Go to the “System settings” screen and select “System information” in the ribbon.
The serial numbers for the head and controller are displayed in the dialog.

 “System information” tool

System information		
Laser marker model: LP-RH100		
Type	Laser head	Controller
Model	LP-RH100<H>	LP-RH10X<C>
Serial number	JBW199	JBW199
Lot number	JB1Z	JB1Z
Version	3.2.00	3.2.00
Type	Version/status	
Optional network	PROFINET	
Close		

7-5 Disposal of Laser Marker

To dispose of the laser marker, in accordance with the regional regulation, please request the industrial waste disposer. Dispose of the laser marker as industrial waste, and never discard it with regular trash.

! Notice

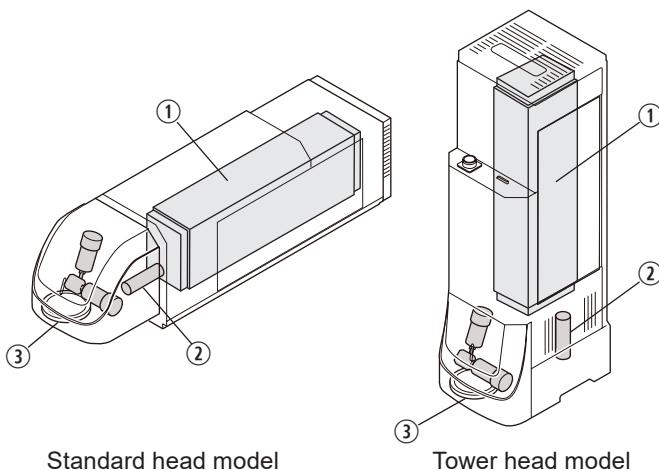
- Be sure to delete all registered data when transferring or discarding the laser marker. Retained data might result in illegal read out and leaking of information by a third-party with malicious intent.
- To initialize the data registered in the laser marker, double-click and execute "DeleteUserData.exe" included in the installation folder (Laser Marker Smart Utility - Tools) of "Laser Marker Smart Utility".
If you specify the installation destination of Laser Marker NAVI Smart Utility to the default folder, you can find "DeleteUserData.exe" at the following location.
C:\Program Files (x86)\Panasonic-ID SUNX Laser\Laser Marker Smart Utility\Tools\DeleteUserData\DeleteUserData.exe
or
C:\ProgramFiles\Panasonic-IDSUNXLaser\LaserMarkerSmartUtility\Tools\DeleteUserData\DeleteUserData.exe
- If the optional function expansion board is installed, make sure that no external storage medium such as a USB flash drive is connected to the USB ports on the controller (1 position on the front and 2 positions on the back) before disposal.

7-5-1 Separate disposal of head section

This laser marker has some parts containing the following chemicals of concern for disposal.

When you request the industrial waste disposer to dispose of this product, inform them that the following chemicals are used in the head, and segregate and dispose them appropriately.

In some countries and regions these chemicals are designated as hazardous substance in some countries and regions. For the correct method of disposal, in accordance with the regional regulation, please contact your local municipality, waste disposal services, or the point of sale where you purchased the products.



Internal parts to be concerned for disposal

No.	Name	Containing materials
①	CO ₂ laser oscillator	ZnSe (zinc selenide)
②	Lens in beam expander	
③	Laser emission port (f θ lens)	

! WARNING



- When the lens is broken, wear gloves, a mask, and protective goggles to prevent swallowing or inhaling broken pieces/dust or the adherence to the skin.

7-5-2 Disposal of old equipment and batteries

Only for European Union and countries with recycling systems



These symbols on the products, packaging, and/or accompanying documents mean that used electrical and electronic products and batteries must not be mixed with general household waste.

For proper treatment, recovery and recycling of old products and batteries, please take them to applicable collection points in accordance with your national legislation.

By disposing of them correctly, you will help to save valuable resources and prevent any potential negative effects on human health and the environment.

For more information about collection and recycling, please contact your local municipality.

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



Note for the battery symbol (bottom symbol)

This symbol might be used in combination with a chemical symbol. In this case it complies with the requirement set by the Directive for the chemical involved.

Reference

- For removing the battery, see “7-5-3 Removal of battery inside the controller” (P.200).

7-5-3 Removal of battery inside the controller

A lithium battery is contained inside the controller as battery for clock or calendar of the laser marker. When disposing of the laser marker in the EU, remove the battery according to the following procedure and perform proper sorting based on the EU Battery Directive (2006/66 / EC).



WARNING



- To remove the battery, disconnect the AC power cable to prevent the power from being supplied. Failure to do so may cause electrical shock.

■ Steps for replacement

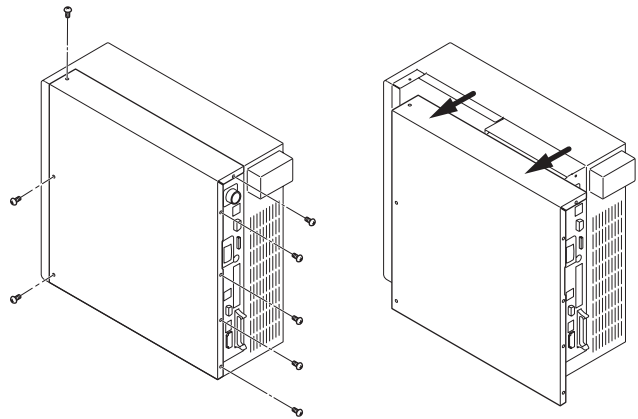
1. Turn OFF the key switch of the controller, and disconnect the AC power cable.

2. Loosen the following screws and remove the side panel of the controller.

Five M3 screws on the back

One M3 screw on the top

Two M3 screws on the side



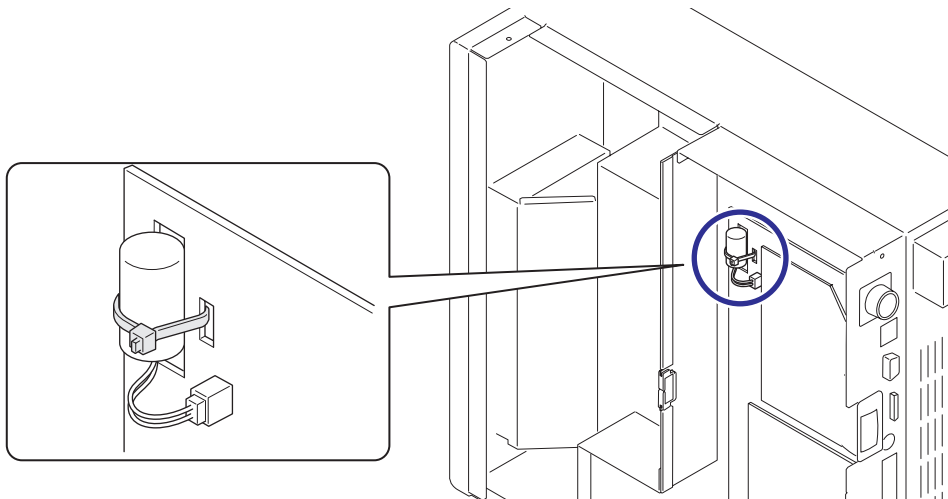
3. Cut the cable tie that secure the battery inside the controller with a diagonal cutter for plastics.



WARNING



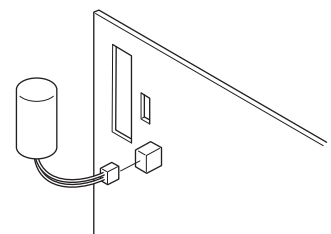
- Wear the protection goggles to cut the cable tie. The cutting piece may fly and hurt your eyes.



4. You can remove the battery by removing the connector for the battery inside the controller.

! Notice

- If you wish to dispose used batteries, please comply with its regional regulation. For the correct method of disposal, please contact your local municipality, waste disposal services, or the point of sale where you purchased the batteries.



Troubleshooting

Troubleshooting

If any operation errors occur, check items below.

When the problems cannot be resolved, please contact our sales office or representatives.

■ Start-up

Troubles	Causes	Measures
<ul style="list-style-type: none"> Power supply is not turned on. The system does not start up. 	Power cable is not connected.	Connect the power supply cable.
	Key switch is not turned on.	Turn on the key switch.
	Power is not supplied.	Check the power supply.
	The internal circuit is faulty.	Check if there is any problem with the external power supply with the laser marker removed. If there is no problem with the external power supply, the internal circuit is assumed to be faulty. Please consult your Panasonic representative. Contact our sales office.
	For LP-GS series: Fuse is blown.	Replace the fuse by following the procedures described in the "Setup/Maintenance Guide".
For LP-RC//LP-RH/LP-RF/LP-RV/LP-ZV series: Circuit protector is OFF.	Turn on the circuit protector by following the procedures described in the "Setup/Maintenance Guide".	

■ Laser pumping

Troubles	Causes	Measures
Laser pumping does not start.	The connection of the following I/O terminals is released. <ul style="list-style-type: none"> INTERLOCK 1(+) - INTERLOCK 1(-) (X16 - X17) INTERLOCK 2(+) - INTERLOCK 2(-) (X18 - X19) For LP-GS series: LASER STOP 2 IN (X11) - OUT COM. 1 For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: REMOTE INTERLOCK IN (X20) - OUT COM. 1 	<ul style="list-style-type: none"> Check the connection of each terminal on the I/O terminal block. If the safety equipment such as door and switch is in released status, restore the original condition.
	The stop laser button of the configuration software is pressed.	<ul style="list-style-type: none"> Solve the safety problem. Then select "Reset" in the error dialog in Laser Marker NAVI smart to finish the laser stop status. For LP-RH/LP-ZV if you use the optional touch panel console or monitor, select "Reset" on its screen.
	Power is not supplied to the common terminal of the I/O terminal block.	Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively.

Troubles	Causes	Measures
Laser pumping does not start in remote mode.	Signals from the external control device are refused.	Refer to “External Control” in Troubleshooting.
	The setting of a laser pumping control method in the system settings screen is not consistent with the actual control method.	<ul style="list-style-type: none"> • Check if the laser pumping control method set in the system settings screen (I/O or communication command) and the actual control method are consistent. • If the laser pumping method is changed in the system settings screen, restart the laser marker.

■ Connection with Laser Marker NAVI smart

Troubles	Causes	Measures
Online connection fails. (The laser marker is not indicated as an available laser marker.)	Laser marker has not been started.	Refer to “Start-up” in Troubleshooting.
	PC and laser marker are not connected.	Connect them with a USB cable or a LAN cable.
	USB driver is not installed properly.	Refer to the “Laser Marker NAVI smart Operation Manual” to install the USB driver to all the laser markers to connect.
Online connection is disconnected.	PC is in the sleep or hibernate state.	To maintain the online connection, disable the sleep setting of the PC.
	The PC stayed no communication state with the laser marker for a certain period of time with the high load (high CPU usage).	To maintain the online connection, terminate the high CPU usage application.
Ethernet online connection fails.	Ethernet communication settings are incorrect.	Establish the USB online connection and confirm the Ethernet communication settings in the system settings. Then, restart the laser marker.
	Ethernet is not listed in the dialog for online connection.	In the dialog for online connection, select the “Including Ethernet” checkbox and search for laser markers.
	The connecting port of the LAN cable to the PC is wrong. (Connected to EtherNet/IP, PROFINET or INFO LAN port by mistake.)	Connect the cable to the port marked “LAN” on the rear of the controller.

Troubles	Causes	Measures
For LP-GS series: Bluetooth online connection fails.	A laser marker of the model not compatible with Bluetooth is used.	Bluetooth function is available for the following laser markers. LP-GS051 / LP-GS051-E / LP-GS051-L / LP-GS051-LE / LP-GS052 / LP-GS052-E
	Bluetooth communication setting is disabled.	Establish the USB online connection and enable the Bluetooth communication in the system settings. Then, restart the laser marker.
	PC's Bluetooth module is apart from the head of the laser marker.	Operate the product with the laser marker head within 5m from the PC.
	<p>The ambient environment is not suited for Bluetooth communication.</p> <ul style="list-style-type: none"> • Wireless LAN or another wireless device is used around. • There is an obstacle between the laser marker head and the PC. • The environment is subject to weaker radio wave signals. 	Establish Bluetooth communication in an environment suited for stable wireless connection.

■ Lasing operation

Troubles	Causes	Measures
Marking cannot be done. (The laser emission indicator blinks but marking is not performed on the workpiece.)	Obstacle hinders laser beam.	<ul style="list-style-type: none"> Remove obstacle between laser emission port of laser marker head and workpiece. For LP-RF/LP-RV series, remove the protection cap of the laser emission port.
	Distance to workpiece is not appropriate.	Adjust distance between bottom surface of laser marker head and the workpiece surface as specified.
	For LP-ZV series, when you use the autofocus function: The workpiece displacement does not match the actual distance.	<ul style="list-style-type: none"> Check if the input values of “Workpiece displacement at 4mA [mm]” and “Workpiece displacement at 20mA [mm]” in the system settings screen are correct. Check if the trigger of the displacement sensor is input after the measurement result is stable. Check if the detecting position of the workpiece surface and the marking surface are consistent.
	For LP-GS/LP-ZV series: The set Z-position does not match the height of the actual target object. (The LP-GSxxx-L type is excluded.)	Set the Z-position according to the workpiece height.
	The workpiece is not in place.	<ul style="list-style-type: none"> Check the marking position using the guide laser or guide pointer to check if the workpiece is out of the specified position. For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: Connecting a sensor to TARGET DETECTION IN (X7) of I/O terminal block, you can check the presence of the workpiece during laser radiation.
	Laser power is insufficient.	<ul style="list-style-type: none"> Increase laser power (including correction factor). Decrease scan speed (including correction factor).
	Laser type (wavelength, output power, etc.) is not appropriate for material of the workpiece.	<p>Materials can be marked differ depending on wavelength and output power of laser marker.</p> <ul style="list-style-type: none"> LP-GS/LP-RC/LP-RH is not suitable for metal material. LP-RF/LP-RV/LP-ZV is not suitable for transparent material.

Troubles	Causes	Measures
Marking is not performed in RUN/REMOTE mode. (The laser emission indicator does not light.)	In RUN mode: The RUN Mode is not active or the marking start signal is not input.	Turn the RUN mode ON, and then input a signal to TRIGGER IN of the I/O terminal block.
	The marking trigger signal of the I/O terminal block is not input.	Check connections with external equipment for misconnection, disconnection or contact failure due to any loose connector. Confirm that TRIGGER IN is input by one-shot signal of more than 2ms per marking cycle.
	The marking trigger is entered while the marking trigger ready is OFF.	Refer to "External Control" in Troubleshooting.
Sometimes laser is emitted unintentionally.	Fumes causes malfunction of photoelectric sensor for marking trigger signal.	<ul style="list-style-type: none"> • Install a dust collector to eliminate the fume (gas) generated during lasing. • Check that dust collector works well.
Marking position is deviated from the expected setting position.	<ul style="list-style-type: none"> • The setting of the laser head direction is not consistent with the actual install direction. • System offset values are input on the system settings screen. 	Check the setting direction of the laser head, X-axis/ Y-axis offset or rotation offset setting of the system settings screen.

■ Marking quality

Troubles	Causes	Measures
Marking is totally faded/ Marking is partially faded.	Laser emission port is not clean.	<ul style="list-style-type: none"> • Clean contaminants off the laser emission port by following the procedures described in "Setup/Maintenance Guide". • For LP-RF/LP-RV/LP-ZV series: If contaminants persist, replace the protection glass of the laser emission port.
	Fumes occurring during lasing hinder laser beam.	<ul style="list-style-type: none"> • Install dust collector. • Check that dust collector works well.
	Distance to the workpiece is not appropriate.	<ul style="list-style-type: none"> • Adjust distance between bottom surface of laser marker head and marking surface of the workpiece. • Due to the characteristics of the laser marker, the focus (work distance) and marking state may vary depending on the temperature environment or operating conditions. For details, refer to the "Marking check" in the "Setup/Maintenance Guide".
	For LP-GS/LP-ZV series: The set Z-position does not match the height of the actual target workpiece. (The LP-GSxxx-L type is excluded.)	Set the Z-position according to the workpiece height.
	For LP-ZV series, when you use the autofocus function: The workpiece displacement does not match the actual distance.	<ul style="list-style-type: none"> • Check if the input values of "Workpiece displacement at 4mA [mm]" and "Workpiece displacement at 20mA [mm]" in the system settings screen are correct. • Check if the trigger of the displacement sensor is input after the measurement result is stable. • Check if the detecting position of the workpiece surface and the marking surface are consistent. • Confirm the installation status and if the displacement sensor is receiving the impact of vibration or the like, perform vibration prevention measures. • Check the output signal of the displacement sensor and if it is affected by noise, protect the sensor against noises.
	For LP-ZV series: The setting of the uniform spot mode is not suitable.	Specify the setting of the uniform spot mode if necessary. If you change this setting, marking quality may change. Adjust the laser power according to the selected uniform spot mode.
	Marking surface of workpiece is inclined.	Make adjustment so that bottom surface of laser marker head and marking surface of the workpiece are parallel with each other.

Troubles	Causes	Measures
Marking is totally faded/ Marking is partially faded.	There are variations in properties of the workpieces. <ul style="list-style-type: none"> • Thickness varies. • Surface roughness varies (including those in gloss). • Material varies (including those in chemical composition). 	Adjust the marking conditions and work distance according to respective workpieces.
	Workpiece feeder is not stable.	Adjust workpiece feeder so that workpiece position becomes stable.
	Performance of laser oscillator deteriorates due to aging.	<ul style="list-style-type: none"> • Increase setting value of laser power. • Decrease scan speed. If it is not possible to get the same marking quality as before even with the max. value of the laser power setting, laser oscillator must be replaced. Contact our sales office.
	Laser power or laser energy density is insufficient.	<ul style="list-style-type: none"> • Increase laser power (including correction factor). • Decrease scan speed (including correction factor). • LP-ZV206P/LP-ZV506P are not suitable for the metal engraving.
	For LP-RV/LP-ZV200P/LP-ZV205P/LP-ZV206P: The setting value of the pulse duration is not appropriate.	Adjust the pulse duration according to the material of the workpiece. For plastic workpieces the pulse duration 4ns or 8ns is a common setting, and for metal, 16ns or 30ns is often selected. For the shallow marking of the metal surface, the pulse duration 120ns or 200ns is often selected.
The marking around edge of the marking field is faded or chipped.	Decrease of the laser energy density in the edge of marking field may affect the marking quality.	<ul style="list-style-type: none"> • For LP-GS/LP-RC/LP-RH series: Set "Power optimization by marking position" in "System offset" in System settings screen. • For LP-RF/LP-RV/LP-ZV series: Set the power correction to the marking objects in the edge of the marking field. • For LP-ZV series: Set the uniform spot mode.
Character is partially chipped.	Obstacle hinders laser beam.	Remove obstacle between laser emission port and workpiece.
	Laser emission port is not clean.	<ul style="list-style-type: none"> • Clean contaminants off the laser emission port by following the procedures described in "Setup/Maintenance Guide". • For LP-RF/LP-RV/LP-ZV series: If contaminants persist, replace the protection glass of the laser emission port.
The marking density of the filling lines in the drawings or characters is uneven.	For LP-ZV series: The drawing speed of the filling lines is too fast and the Z-axis control module cannot follow up the height change.	<ul style="list-style-type: none"> • Decrease the scan speed. • Change the marking order or the line filling directions.

Troubles	Causes	Measures
The filling lines in the drawings, bar code or 2D code are disordered (lines are not straight, but wavy).	The workpiece is shaking during the marking.	Perform vibration prevention measures.
	The marking settings are not appropriate for the drawing pattern of the filling lines.	<ul style="list-style-type: none"> • Change the scan speed. • Adjustment the wait value in laser settings of the “Marking settings” screen.
Marking is disorder. (Characters lose shape or not formed.)	Head lacks fixation strength.	<ul style="list-style-type: none"> • Fix head with the specified torque. • Improve strength of head mounting.
	Constant vibration from surrounding equipment (motor and press, etc.) influences.	Perform vibration prevention measures.
	There are irregular vibrations coming from surrounding equipment (air cylinder and forklift, etc.). (Marking is disturbed at irregular intervals.)	
	Start and/or stop timing of feeder does not match with marking operation.	Disturbed at the beginning of marking: Marking trigger signal is likely to be input before workpiece is fully stopped. Marking may disturb due to remaining vibration even if workpiece is in full stop. Turn the marking trigger signal ON after vibrations are completely damped.
		Disturbed at the end of marking: Workpiece is likely to start moving before completion of marking. Delay start timing of feeder or speed up scan speed so that marking is finished before workpiece starts moving.
There are noises coming from surrounding equipment.	Protect laser marker against noises as follows: <ul style="list-style-type: none"> • Securely ground the frame ground terminal of laser marker or surrounding equipment. • Isolate power and signal lines from each other if they have been routed in parallel. • Shield signal line. • Isolate power supply for laser marker from other equipment. • Use noise cut transformer to absorb noises from power supply. 	
Marking line runs over the intended start or end points.	The setting in lasing quality parameters does not match the other settings.	Adjustment the lasing quality parameters such as starting point, ending point or wait value in laser settings of the “Marking settings” screen.
When the character size is small, the marking characters are not readable.	The setting conditions or font are inadequate for the character size.	<ul style="list-style-type: none"> • Use “Original 2” or “Original 5” font for the small size characters. • Adjust the laser power or scan speed.

Troubles	Causes	Measures
Marking is dotted.	<ul style="list-style-type: none"> For LP-GS/LP-RC/LP-RH series: Setting of laser frequency and scan speed is inadequate. 	Decrease scan speed or increase laser frequency.
	<ul style="list-style-type: none"> For LP-RF/LP-RV/LP-ZV series: Setting of pulse cycle and scan speed is inadequate. 	Decrease scan speed or pulse cycle.

■ Moving objects

Reference

- The on-the-fly marking is not available to LP-GS series.

Troubles	Causes	Measures
Marking is sometimes skipped. (E750 occurs.)	Marking trigger signal is entered before current marking is finished.	<ul style="list-style-type: none"> • Set the trigger mode to Multiple triggers if you want to input next triggers while the trigger processing operation. • Place the trigger sensor closer to the laser marker and set the smaller value to Trigger detecting position. • Reduce the marking time with the measures such as increasing the scan speed and etc. • Reduce feeder speed. • Increase marking interval (interval between objects on feeder).
The start lines of the characters are distorted.	The timing of lasing does not match with the line speed.	Input larger value to Overrun correction.
Characters are distorted. Character pitch is unstable.	The setting of the moving direction is wrong.	<ul style="list-style-type: none"> • Match feed direction with laser marker operation. • Check the setting direction of the laser head of the system settings screen.
	Speed changes at conveyor junction.	If conveyors are coupled, avoid marking near conveyor junction.
	Actual speed and preset speed for feeding objects are different due to slippage of objects.	Remove cause of object slippage.
	Positional misalignment is likely to occur due to meandering motion of conveyor.	Secure objects to prevent misalignment.
	The moving speed of the conveyor is not stable.	<ul style="list-style-type: none"> • Check the conveyor and remove the cause of the speed change. • To keep up the conveyor speed, use encoder to feedback the change of the speed.
	When Line speed control is set to Fixed speed: The setting speed is not consistent with the actual line speed.	Adjust the setting value of the line speed by checking the marking quality. <ul style="list-style-type: none"> • When the Character Spacing is too wide: Increase the setting. • When the character spacing is too narrow: Decrease the setting.

Troubles	Causes	Measures
Characters are distorted. Character pitch is unstable.	When Line speed control is set to Encoder input: The line speed could not be measured correctly by the encoder.	<ul style="list-style-type: none"> • Make sure that the encoder operates properly. • Make sure that the setting value of Encoder resolution is correct. <ul style="list-style-type: none"> • When using A phase only: Encoder resolution = Number of pulses/mm x 2 • When using A and B phases: Encoder resolution = Number of pulses/mm x 4 • When only one phase of the encoder is used, connect the encoder signal to ENCODER A IN (X13) and connect ENCODER B IN (X14) to IN COM. 1 (X2).
	When Line speed control is set to Encoder input: The input speed of the encoder is not consistent with the actual line speed at marking.	<ul style="list-style-type: none"> • Place the encoder closer to the trigger sensor. • Adjust the setting value of Encoder resolution by checking the marking quality. <ul style="list-style-type: none"> • When the character spacing is too wide: Increase the setting. • When the character spacing is too narrow: Decrease the setting. • In some cases, it may reduce the influence of the ups and downs of the line speed to decrease the encoder resolution. However, it is recommended to set more than 25pulses/mm to Encoder resolution.
	When Line speed control is set to 2 sensors input: The line speed could not be measured correctly by the two sensors.	<ul style="list-style-type: none"> • Check the setting value of Distance line speed sensors. • Confirm the sensors for line speed detection operate properly.
	When Line speed control is set to 2 sensors input: The input speed of the 2 sensors is not consistent with the actual line speed at marking.	<ul style="list-style-type: none"> • Place the trigger sensor closer to the line speed detection sensors so that the difference of the speed at detection and at marking may reduce. • Adjust the setting value of Distance line speed sensors by checking the marking quality. <ul style="list-style-type: none"> • When the character spacing is too wide: Increase the setting. • When the character spacing is too narrow: Decrease the setting.

■ External control

Troubles	Causes	Measures
Communication with the external device cannot start.	Laser marker is not in remote mode.	<ul style="list-style-type: none"> • Select the remote mode by following the procedure indicated in "Setup/Maintenance Guide". • Check if the entering method of the remote mode set in the system settings screen (I/O or PC software) and the actual control method are consistent. • If the entering method of the remote mode is changed in the system settings screen, restart the laser marker.
	The connection with external devices is inadequate.	<ul style="list-style-type: none"> • Check connections with external equipment for mis-connection, disconnection or contact failure due to any loose connector. • Check for continuity using tester or the like. • For RS-232C connection, confirm the wiring of the external device including the loop back connection.
	Communication parameter settings are incorrect.	<ul style="list-style-type: none"> • Match communication parameter settings to external equipment. • If any of the communication settings (Ethernet settings, EtherNet/IP settings, or RS-232C usage) in System settings screen are changed, restart the laser marker. • If you use DHCP of EtherNet/IP settings, confirm the connection of the DHCP server of your network. • When using RS-232C, specify the "Flow control" to "None" at the communication port settings of the external control device.
	The communication setting was changed at the time of backup file restoration.	Check the communication setting. If Ethernet or EtherNet/IP is used, check the IP address, etc. When the backup file is restored, the communication setting is overwritten by the backup data.
	There are noises coming from surrounding equipment.	Protect laser marker against noises as follows: <ul style="list-style-type: none"> • Securely ground the frame ground terminal of laser marker or surrounding equipment. • Isolate power and signal lines from each other if they have been routed in parallel. • Shield signal line. • Isolate power supply for laser marker from other equipment. • Use noise cut transformer to absorb noises from power supply.
Control by I/O fails.	The settings in the system settings screen are not consistent with the actual control method.	<ul style="list-style-type: none"> • Check the settings of the control method under "Operation/information" tab in System settings screen. If "command" is selected to the corresponding operation, change it to "I/O". • Check the I/O settings under "Inputs/outputs" tab in System settings screen. • If you use EtherNet/IP or PROFINET, check the "Control method of input signals" under "Communication" tab in System settings screen. • If any of the above settings are changed in the system settings screen, restart the laser marker.
Control by communication command fails.	Command data is not received from external equipment.	<ul style="list-style-type: none"> • Check the command history in the "Maintenance" screen of Laser Marker NAVI smart. • Using commercially available line monitor or protocol analyzer, check if the external equipment transmits data.

Troubles	Causes	Measures
Control by communication command fails.	Communication data format (start code) is inadequate.	<ul style="list-style-type: none"> For RS-232C or Ethernet, check if the start code specified in laser marker system settings screen and start code of the transmitted data are consistent. If you use EtherNet/IP or PROFINET, do not contain the start code in the command data.
	Communication data format (end code) is inadequate.	<ul style="list-style-type: none"> For RS-232C or Ethernet, check if an end code is placed at the end of the transmitted data. For RS-232C, check if the end code is the value specified in the laser marker system settings screen. If you use EtherNet/IP or PROFINET, do not contain the end code in the command data.
	Command mode (setting for the compatible mode) is wrong.	<ul style="list-style-type: none"> If you want to use the same command format with the former models of LP-400/LP-V series, or LP-M/LP-S/LP-Z series, set "Compatible mode" in system settings of Laser Marker NAVI smart. If you want to use the standard command format, switch the mode by RSM command or set "OFF" to "Compatible mode" in system settings of Laser Marker NAVI smart. For LP-GS/LP-RC/LP-RH/LP-RF/LP-RV series, you cannot use the LP-M/S/Z compatible mode. If you use EtherNet/IP or PROFINET, set "OFF" to "Compatible mode" in System settings screen. You cannot use the command format in LP-400/V or LP-M/S/Z compatible mode via EtherNet/IP or PROFINET.
Marking trigger ready does not turn ON.	An error occurs.	Check the error code and cancel the alarm or warning.
	Marking trigger is in progress.	<ul style="list-style-type: none"> Do not input the next marking trigger until the trigger processing is completed. When trigger mode is set to Multiple triggers at on-the-fly marking, max. 16 triggers can be accepted while the trigger processing operation.
	Laser pumping is turned OFF.	Turn ON the laser pumping. If the laser pumping fails, refer to "Laser pumping" in Troubleshooting.
	Internal shutter is closed.	<ul style="list-style-type: none"> Open the internal shutter. Check if the shutter operation control method set in the system settings screen (I/O or communication command) and the actual control method are consistent. If the shutter operation control method is changed in the system settings screen, restart the laser marker.
	File switching is not complete.	If the file number is changed, the marking trigger ready is turned OFF for dozens of ms or seconds to create marking data. Input marking trigger signal after making sure that READY output is ON if you changed the file.
	Either of registered characters via I/O, external offset or characters specified by SIN command are used and marking data is not input from the external control device.	<ul style="list-style-type: none"> If "Registered characters via I/O", "External offset" or "Characters specified by SIN command" are used, input respective data at every marking. For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: Using DATA WAIT OUT (No.38) of I/O connector, you can confirm the laser marker becomes waiting status of input.

Troubles	Causes	Measures
Marking trigger ready does not turn ON.	For communication command control: "reception mode ON" is set for command reception permission (MKM command).	Set "reception mode OFF" for command reception permission (MKM command).
	For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: Counter has been reset during On-the-fly marking operation.	Once the counter is reset during On-the-fly marking operation, READY OUT becomes OFF temporarily and may not accept the trigger. Please check the counter reset timing.
	For LP-ZV series: Autofocus function is activated in Laser Marker NAVI smart, but no input from the sensor.	<ul style="list-style-type: none"> • Check the connection and status of the external displacement sensor. • Using DATA WAIT OUT (No.38) of I/O connector, you can confirm the laser marker becomes waiting status of input. • If you do not use the autofocus function, set "OFF" the settings for "Autofocus" in "File settings".
The sending command is not accepted and negative response is returned.	The requested operation can be controlled only by I/O with the current system settings.	<p>To use the following commands, specify the control method to the communication command in Laser Marker NAVI smart system settings and restart the laser marker.</p> <ul style="list-style-type: none"> • Laser pumping (LSR) • Shutter open/close (SHT) • Guide Laser (GID) (except LP-GS052 type) <hr/> <p>The following commands are available only when the shutter operation control method is set to communication command.</p> <ul style="list-style-type: none"> • Laser radiation for measurement (SPT) • Test marking (TST) (LP-RH/LP-ZV series only) • Power check (PWM) (LP-ZV500P, LP-ZV505P, LP-ZV506P only)
	"Reception mode ON" is not set for command reception permission (MKM command).	<p>Except the following commands *, the laser marker cannot accept the setting request commands unless it is in the "reception mode ON" status. For command transmission, set "reception mode ON" by MKM command.</p> <ul style="list-style-type: none"> • File selection by number (FNO) • File selection by name (FNN) • Shutter open/close (SHT) • Command reception permission (MKM) • Laser pumping (LSR) • Counter reset (CTR) • Marking trigger (MRK) • Character entry per trigger (SIN) • Marking position and laser power adjustment per trigger (SEO)

Troubles	Causes	Measures
The sending command is not accepted and negative response is returned.	Alarm or Warning occurred.	<p>All commands except the following commands * cannot be accepted while alarm or error is active.</p> <p>When alarm occurred:</p> <ul style="list-style-type: none"> • Status checking (STS) • I/O monitor (IOM) • Operating data (RTD) • Error history (ERH) • Alarm reset (ARS) • Error code (ENO) • Command mode (RSM) <p>When warning occurred:</p> <ul style="list-style-type: none"> • Status checking (STS) • I/O monitor (IOM) • Operating data (RTD) • Error history (ERH) • Alarm reset (ARS) • Error code (ENO) • Shutter open/close (SHT) (Only closing and readout request) • Command reception permission (MKM) (readout only) • Command mode (RSM)
	Two or more command data are transmitted at the same time.	After sending the command, confirm the response data from the laser marker. Do not send the next command before receiving the response.
	Command mode (setting for the compatible mode) is wrong.	<ul style="list-style-type: none"> • If you want to use the same command format with the former models of LP-400/LP-V series, or LP-M/LP-S/LP-Z series, set “Compatible mode” in system settings of Laser Marker NAVI smart. • If you want to use the standard command format, switch the mode by RSM command or set “OFF” to “Compatible mode” in system settings of Laser Marker NAVI smart. • For LP-GS/LP-RC/LP-RH/LP-RF/LP-RV series, you cannot use the LP-M/S/Z compatible mode.
	The character code is wrong.	<ul style="list-style-type: none"> • Check the setting for “Encoding for non-ASCII characters” in the “System settings”. • Check if characters in the readout strings can be encoded with ASCII code or the character code specified in “Encoding for non-ASCII characters”. • “Shift JIS”, “GB 2312” and “Latin-1” cannot be used together. • In LP-400/V or LP-M/S/Z compatible mode, only ASCII code and Shift JIS are available.

* These commands are applicable with the standard command mode. For the LP-400/V or LP-M/S/Z compatible mode, refer to the “Serial Communication Command Guide: LP-400/V compatible mode”, or “Serial Communication Command Guide: LP-M/S/Z compatible mode”.

■ Link control with external devices

Troubles	Causes	Measures
Link control with image checker and code reader fails.	The connections with the image checker or code reader are inadequate.	<ul style="list-style-type: none"> Refer to "Setup/Maintenance Guide" for the wiring and communication settings. If the Ethernet communication settings or RS-232C usage are changed, restart the laser marker.
	Communication settings are inadequate.	
	The connecting port of the LAN cable to the image checker is wrong. (Connected to EtherNet/IP, PROFINET or INFO LAN port by mistake.)	Connect the cable to the port marked "LAN" on the rear of the controller.
Marking cannot be done in an appropriate position when the function of position correction is used.	The coordinates of the image checker are not consistent with the marking position of the laser marker.	Set the calibration of the image checker and match the coordinate origin of the image checker to the center point of the marking field of the laser marker.
	Settings of the image checker are inadequate.	Confirm the following settings of PV230/PV200. <ul style="list-style-type: none"> Setting of Ethernet with the protocol General communication Calibration Settings of the positional correction Expression of the numeric calculation
	The setting order of the expression table of PV230/PV200 is inadequate.	The results of the numerical calculation should output to the laser marker in the order of X, Y, and theta.
The results of the code or character checking is NG.	Testing conditions of image checker are inadequate.	Set appropriate testing conditions of the image checker according to marked code type or character settings.
	Unnecessary objects are included in the captured image.	Do not place the code symbols or characters other than the image checking target in the imaging range.
	When PV230 is used: Settings of the total judgement are inadequate.	<ul style="list-style-type: none"> For code checking, confirm the settings of the code reader checker of PV230. For character checking, confirm the settings of the OCR checker of PV230. Confirm the expression of the numeric calculation in the total judgement.
	When PV230 is used: No settings in the character dictionary of PV230.	To use the character recognition function, set the dictionary of PV230 for each marking character beforehand.
	Ghost image of fumes (smoke) occurring during marking is taken in the shooting range.	<ul style="list-style-type: none"> Install a dust collector to get rid of fumes (smoke). Check that the dust collector works well.

Troubles	Causes	Measures
Marking disorder.	Since the work feeding and marking start/end timing are inadequate when TIMING IN signal is used, the vibration affects marking.	Turn TIMING IN signal ON after workpiece is fully stopped.
		To feed works after marking, check that TIMING WAIT OUT is turned ON and start feeding works.

■ Operation by touch panel console / monitor (LP-RH/LP-ZV series only)

Troubles	Causes	Measures
Touch panel console or monitor shows nothing.	Laser marker has not been started.	Start-up the laser marker with the touch panel console or monitor connected.
	Incorrect connection of the touch panel console/monitor.	<ul style="list-style-type: none"> When you use the touch panel console: connect the cable of the touch panel console to the CONSOLE connector on the front of the controller. When you use the monitor: connect the cable of the monitor to the VGA connector on the rear of the controller. The available input terminal of the monitor is only VGA terminal with this product.
	The expansion board is not installed or incorrectly installed to the controller.	<ul style="list-style-type: none"> When you use the touch panel console or monitor, you need to install the optional expansion board LP-AEB10 to the controller of the laser marker. Make sure that the cables inside the controller are connected to the expansion board correctly.
	Online connection between Laser Marker NAVI smart and the laser marker is established.	You cannot operate the touch panel console/monitor while the Laser Marker NAVI smart is online connected to the laser marker.
	When you use the monitor: Monitor is not turned on.	Check power supply of the monitor.
Mouse does not respond.	The mouse is connected to the USB hub.	Connect the USB mouse to the laser marker controller directly without USB hub.
	The mouse type is not supported by the laser marker.	Use the USB mouse with Human interface device (HID) class.
USB flash drive cannot be recognized.	The USB flash drive type is not supported by the laser marker.	You cannot use the USB flash drive with security functions.
	The file system selected when formatting the USB flash drive is not appropriate.	Use a USB flash drive formatted with FAT32 or exFAT.
	The connector of the USB flash drive is not clean.	Clean the connector of the USB flash drive.
	The USB flash drive is connected to the USB hub.	Connect the USB flash drive to the laser marker controller directly without USB hub.
	The expansion board is not installed to the controller.	The USB flash drive can be used only when operating with the touch panel console or monitor. When you use the touch panel console or monitor, you need to install the optional expansion board LP-AEB10 to the controller of the laser marker.
“Expansion board version error” dialog appears on the console.	The firmware version of the expansion board is incompatible.	Update the firmware in the controller and expansion board. The software for updating the LP-RH/LP-ZV series, Laser Marker Firmware Updater, can be downloaded from the following website: https://www3.panasonic.biz/ac/e/fasys/software_info/lasermarker/tol_lp-zv_firm.jsp

What to do if an error occurs

An error may be generated depending on laser marker operation or laser marker status.

The status display section of Laser Marker NAVI smart displays the code of the generated error.

The maintenance screen shows the error history. In the case of an LP-GS, error code is displayed on the head display panel. In the case of an LP-RC/RF/RV, error code is indicated on the display panel on the controller front panel.

Errors can be divided into alarm and warning depending on error types.

When an alarm is generated, Y15 (ALARM OUT) on the I/O terminal block turns ON. When a warning is generated, Y14 (WARNING OUT) on the I/O terminal turns ON.

This chapter describes the details and measures of errors.

Alarm: E001 - E599

Errors that occur when highly emergent safety function is activated or there is any abnormality in laser marker are output as alarm.

When an alarm occurs, the laser supply (laser pumping) is turned OFF, and the laser radiation is stopped if during the lasing process.

■ Release method of alarm

1. Remove a cause of alarm and confirm the safety. (Any alarms due to hardware's problem cannot be released.)
2. For error codes E400 to E599, use any of the following means to input the alarm reset.
 - Click the confirmation button in the error dialog on the configuration software Laser Marker NAVI smart screen.
 - Turn ON ALARM RESET IN (X15) on the I/O terminal block.
 - Transmit the communication command for the alarm reset (ARS).

For the alarms you are unable to reset such as the ones caused by hardware or system error, restart the laser marker.

3. If any alarm occurs during marking of files that use the counter, check the counter value before resuming marking.

ERROR CODE	Description	Measures *1
E001 - E038 E045 - E058 E060 - E094 E101 - E138 E145 - E158 E160 - E194 E202 E208 - E214 E218 - E219 E223 - E224 E230 E245 - E248 E300 - E380	An error has occurred to the internal system of the laser marker.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E039 E044 E139 E144	<ul style="list-style-type: none"> • Incorrect model combination of laser marking system. • Incorrect connection of signal cable or unit power cable. 	<ul style="list-style-type: none"> • For LP-GS/RC/RH/RF series, make sure the correct model numbers of laser head and controller have been connected. • For LP-RV/ZV series, make sure the correct model numbers of laser head, oscillator unit and controller have been connected. Connect the oscillator unit correctly to the laser head and controller. • Check the connection of the cable and various signal lines, and then restart the laser marker.

ERROR CODE	Description	Measures *1
E040 - E043 E140 - E143 E221 - E222 E240 - E243	<ul style="list-style-type: none"> • Incorrect connection of signal cable or unit power cable. • An error has occurred to the internal system of the laser marker. 	<ul style="list-style-type: none"> • Check the connection of the cable and various signal lines, and then restart the laser marker. For LP-GS/RC/RH/RF series, check the connection between laser head and controller. For LP-RV/ZV series, check the connection between laser head and oscillator unit and between oscillator unit and controller. • Replace the cable.
E059 *4, *6 E159 *4, *6 E231 - E236 *4, *6	Network unit error.	Check if the optional network unit is installed to the controller correctly.
E200 - E201 *2	INTERLOCK safety relay is out of order.	Contact our sales office or representatives.
E205 - E207	<ul style="list-style-type: none"> • Abnormality occurs on the internal shutter. • Signal cable is not connected properly. 	Check the connection of the cable and various signal lines, and then restart the laser marker.
E216 - E217 *5, *6	An error occurred in the controller fan.	<ul style="list-style-type: none"> • Clean the air intake and exhaust port and fan located at the air cooling area of the controller. • If the air filter is contaminated, replace it. • Replace the fan.
E220	Laser head housing is open.	Contact our sales office or representatives.
E225 *4	Fiber unit is detached.	Install the fiber unit properly by following the procedures described in the "Setup/Maintenance Guide".
E226-E229 *6	An error occurred in the head fan.	<ul style="list-style-type: none"> • Clean the air intake and exhaust port located at the air cooling area of the head. • If the air filter is contaminated, replace it. • If it happens again, contact our service center or sales offices.
E237 *5, *6	An expansion board error occurred.	Check if the optional expansion board is installed to the controller correctly.
E250 - E255 E260 - E261 E264 - E265	<ul style="list-style-type: none"> • An error has occurred to the laser oscillator. • A power supply voltage error was detected in the laser oscillator. • Incorrect connection of signal cable or unit power cable. 	<ul style="list-style-type: none"> • Check and correct the power status. • Check if the AC power line is affected by noise. • Check the connection of the cable and various signal lines, and then restart the laser marker. • For LP-RC series: Check if the ambient temperature of the laser marker is not exceeding the range of its specification.

ERROR CODE	Description	Measures *1
E262 *4	Temperature error in laser oscillator.	<ul style="list-style-type: none"> • Check if the ambient temperature of the laser marker is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the air-cooling part such as fan and filter. • When not recovered, contact our sales office or representatives.
E263 *4	Detected unintended irradiation.	Contact our sales office or representatives.
E266 *5	Power monitor error.	Contact our sales office or representatives.
E270 - E275 E277 E280 - E285 E287	<ul style="list-style-type: none"> • An error has occurred to the galvano scanner of the head. • Incorrect connection of signal cable or unit power cable. 	<ul style="list-style-type: none"> • Check and correct the power status. • Check if the AC power line is affected by noise. • Check the connection of the cable and various signal lines, and then restart the laser marker.
E276 *2 E286 *2	Marking data are too detailed for the scan speed configured.	Decrease the scan speed.
E290 - E291 *2 E292 *2, *5	An error has occurred to the Z-axis adjustment module.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E400	INTERLOCK 1 of the I/O terminal block was released.	<ul style="list-style-type: none"> • Connect INTERLOCK terminals on the I/O terminal block. • Check the status of the safety equipment connected to INTERLOCK terminal. • Confirm operation logic of connection device. • If you want to deactivate this alarm when the shutter is closed, set "Deactivate while shutter closed" in "System settings" > "Operation/information" > "INTERLOCK alarm detection". • For LP-RC/RH/RF/RV/ZV series: If the error cannot be solved even with the proper connection of INTERLOCK terminals, replace the contactor for INTERLOCK by following the procedures described in the "Setup/Maintenance Guide".
E401	INTERLOCK 2 of the I/O terminal block was released.	<ul style="list-style-type: none"> • Connect the LASER STOP IN terminals of the I/O terminal block. • Check the status of the safety equipment connected to the LASER STOP IN terminals. • Confirm operation logic of connection device. • Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively.
E402 E403 E501	LASER STOP IN of the I/O terminal block was released.	<ul style="list-style-type: none"> • Connect the LASER STOP IN terminals of the I/O terminal block. • Check the status of the safety equipment connected to the LASER STOP IN terminals. • Confirm operation logic of connection device. • Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively.

ERROR CODE	Description	Measures *1
E404 E502	The stop laser button of the configuration software was pressed.	<ul style="list-style-type: none"> • Solve the safety problem. Then select “Reset” in the error dialog in Laser Marker NAVI smart to finish the laser stop status. • For LP-RH/ZV if you use the optional touch panel console or monitor, solve the safety problem then select “Reset” on its screen.
E405 *3, *4, *6 E503 *3, *4, *6	REMOTE INTERLOCK IN is open.	<ul style="list-style-type: none"> • Connect REMOTE INTERLOCK IN of the I/O terminal block. • Check the status of the safety equipment connected to REMOTE INTERLOCK IN terminal. • Confirm operation logic of connection device. • Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively. • If you want to deactivate this alarm when the shutter is closed, set “Deactivate while shutter closed” in “System settings” > “Operation/ information” > “INTERLOCK alarm detection”.
E410	Laser pumping was stopped during the marking process.	<ul style="list-style-type: none"> • Start marking after laser pumping has completed. • Check the procedures and operation logic of laser pumping and trigger input control.
E411 E500	The marking trigger signal or “Start marking” button was entered in the “laser pumping OFF” status.	<ul style="list-style-type: none"> • Check wiring of I/O or communication port to the external control devices. • Check the switch or the sensor connected to TRIGGER IN of I/O terminal operates properly without chattering.
E450 - E453	<ul style="list-style-type: none"> • The date and time of the system clock may be out of synchronization. • For LP-GS/RC/RF/RV: the system clock battery power in the controller died. • Abnormality has occurred on the system clock in the controller. 	<ul style="list-style-type: none"> • Check the system clock time and set it again. • For LP-GS/RC/RF/RV: replace the internal battery by following the “Replacement of Internal Controller Battery” in the “Setup/ Maintenance Guide”. • While laser marker power is on, you can use it after setting the system clock on the system settings screen. When the power is off, set the system clock again.
E460 *2	Temperature error in laser oscillator.	<ul style="list-style-type: none"> • Check if the ambient temperature of the laser marker is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the air-cooling part such as fan and filter. • When not recovered, contact our sales office or representatives.

ERROR CODE	Description	Measures *1
E505 - E509 E550 - E560 E572	Safety functions (INTERLOCK, LASER STOP, etc.) were activated during marking preparation.	<ul style="list-style-type: none"> • Reset the alarm for LASER STOP IN or INTERLOCK of the I/O terminal block or Stop laser button of Laser Marker NAVI smart software. • Check if the signal lines are affected by noise.
E520 - E522 E570	File data or system data were not saved successfully, because the laser marker was turned off while saving data. Unable to read the file data.	<ul style="list-style-type: none"> • Overwrite the data again to the selected file number. • Do not turn off the laser marker while saving the settings.
E530 - E542 E571		<ul style="list-style-type: none"> • Restore the backup file saved before to the laser marker. • Do not turn off the laser marker while saving the settings.

*1 : If the error persists after restart of the laser marker, contact our sales office or representatives.

*2 : Error that may occur for LP-GS series only.

*3 : Error that may occur for LP-RC series only.

*4 : Error that may occur for LP-RF, LP-RV and LP-ZV series only.

*5 : Error that may occur for LP-ZV series only.

*6 : Error that may occur for LP-RH series only.

Warning: E600 - E799

Errors that notify of that the setting data are incorrect or laser radiation conditions are not met are output as warnings. Marking cannot be started while any warning of E600 to E699 is active. Laser pumping maintains the state before the warning.

■ Release method of warning

1. Remove a cause of warning. If the setting is wrong, correct it.
2. In Remote mode, close the inner shutter or input the alarm reset.
 - As the special case, the following errors will be released automatically.
 - E600: The warning is only output while the connection between the LASER STOP IN and OUT COM. 1 is opened and the warning is released when it is closed.
 - E710 - E711: The warning is output during marking and guide laser radiation (except guide pointer operation for LP-GS052) and it is released when these operations are finished.
 - E712 - E717: The warning is output while the cause of error occurs and it is released automatically when the cause is solved.
 - E750 - E783: After output of the warning for 3 seconds, the warning is released.
3. If any warning occurs during marking of files that use the counter, check the counter value before resuming marking.
4. To restart the laser marker operation, make sure that the warning output is turned on, and then open the internal shutter.

ERROR CODE	Description	Measures *1
E600	LASER STOP IN of the I/O terminal block was released.	<ul style="list-style-type: none"> • Connect the LASER STOP IN terminals of the I/O terminal block. • Check the status of the safety equipment connected to the LASER STOP IN terminals. • Confirm operation logic of connection device.
E601	No marking data were registered to the file specified.	Set marking data in the file and overwrite.
E603	No data for laser radiation available.	It is not possible to input TRIGGER IN for the file without valid marking data. Set "marking on" to more than one object and set its laser power correction other than 0%.
E604	No data for guide laser radiation available.	To show the masked objects by the guide laser, enable Guide laser display of the object settings.
E605 E606	The combination of Laser Marker NAVI smart's version and the laser marker model or version is wrong. The function set with Laser Marker NAVI smart cannot be used for this type of the laser marker.	Use the right version of Laser Marker NAVI smart corresponding to the laser marker model or version in use.
E607 *3, *4, *6	Unable to detect the line speed. Input of 2 sensors for line speed detection was wrong.	<ul style="list-style-type: none"> • Make sure the first sensor in moving direction is connected to ENCODER A IN and the second sensor is connected to ENCODER B IN of the I/O terminal. • Turn on ENCODER B IN within 10 seconds from the input of ENCODER A IN. • Input TRIGGER IN after turning on ENCODER B IN within the setting time before time-out error occurs.

ERROR CODE	Description	Measures *1
E608 E720	The counter value was reset to that prior to marking because the power was cut off during data marking including the counter.	<ul style="list-style-type: none"> • Check the current value of counter. • Do not turn off the power during marking.
E609 E721	The laser marker is turned off during saving of file data and setting. The marking data were not saved successfully.	<ul style="list-style-type: none"> • Check the file and the setting values. • Overwrite the file data. • Do not turn off the laser marker while saving the settings.
E610 - E613 E650	Marking data are out of range.	<ul style="list-style-type: none"> • Check the image display screen and adjust the data position and size located outside of the marking field. • Adjust the X-/Y-axis offset value of the system offset (system settings screen). (When the data located outside of the marking field is not displayed on the image display screen.) • If you use "Marking field calibration" in the system settings screen, change the setting values.
E614 - E615 *2 *5 E651 *2 *5	Existed marking data with its Z-position outside of marking field. (The LP-GSxxx-L type is excluded.)	<ul style="list-style-type: none"> • Adjust the Z-movement of the object group settings. • Adjust the Z-movement of the file settings. • Adjust the Z-axis offset value of the system offset (system settings screen). • For LP-ZV series, if you use the autofocus function, check the detected workpiece displacement value is correct.
E616 *3, *4, *6	Unable to detect the line speed. Input of the encoder for line speed detection was wrong.	<ul style="list-style-type: none"> • Confirm the correct input from the encoder to ENCODER A IN and ENCODER B IN of I/O terminal. • When only one phase of the encoder is used, connect the encoder signal to ENCODER A IN (X13) and connect ENCODER B IN (X14) to IN COM. 1 (X2). • Confirm the encoder input is less than 100kHz per phase.
E617 *3, *4, *6	Unable to follow the line speed.	<ul style="list-style-type: none"> • Decrease the line speed. • Set Lasing start boundary to the upward of the moving direction. • Reduce the marking time with the following measures. <ul style="list-style-type: none"> • Increase the scan speed. • Reduce the spacing between the characters. • Reduce the character size, etc.

ERROR CODE	Description	Measures *1
E618 *3, *4, *6	The marking spacing is too small.	<ul style="list-style-type: none"> • When Trigger mode is set to Marking at regular intervals, set the larger value to Marking spacing. • When Trigger mode is set to Multiple triggers, take more time for the trigger input intervals. • Decrease the line speed. • Keep the laser start boundary away from the trigger detecting position. • When Trigger mode is set to Multiple triggers, check the switch or the sensor connected to TRIGGER IN of I/O terminal operates properly without chattering. • Reduce the marking time with the following measures. <ul style="list-style-type: none"> • Increase the scan speed. • Reduce the spacing between the characters. • Reduce the character size. • Set smaller value to the one-shot pulse duration of the I/O settings, etc.
E619 *3, *4, *6	On-the-fly marking is not possible with this trigger detecting position or lasing start boundary.	<ul style="list-style-type: none"> • Place the lasing start boundary downstream of the trigger detecting position. • Check the setting value of Workpiece reference boundary is correct.
E620 - E621	The link control between the laser marker and image checker has failed due to the error of the laser marker. Trigger processing terminated abnormally.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E622	I/O connector TIMING IN was not input within the time specified using the link function with external devices. Trigger processing terminated abnormally.	<ul style="list-style-type: none"> • Input this to TIMING IN terminal within 60 seconds after the I/O connector timing waiting output (TIMING WAIT OUT) is turned ON. • Check the connection of TIMING IN terminal of I/O connector.
E623	Timing input is invalid. When the linkage function with external devices is used, TIMING IN terminal was input while the timing standby output (TIMING WAIT OUT) was OFF.	<ul style="list-style-type: none"> • Check the connection with the external device. • Check the control procedure of the external control.
E624	Unable to communicate with an image checker. Trigger processing terminated abnormally.	<ul style="list-style-type: none"> • Check the status of connection with the laser marker and the Ethernet ports of external devices. • Check the IP address, port number, connecting status of the laser marking system and image checker. • Check the status of the laser marker and external devices in link control. • Confirm if you set the type of the image checker correctly in the system settings screen and file settings of the marking settings screen of the laser marker.

ERROR CODE	Description	Measures *1
E625	No response from the image checker. Trigger processing terminated abnormally.	<ul style="list-style-type: none"> • Check the connecting status of the laser marking system and image checker. • Check if the reading process of the image checker was successful. • If you use PV230/PV200, set the total judgement.
E626	Settings mismatch between image checker and laser marking system. Trigger processing terminated abnormally.	<ul style="list-style-type: none"> • Check the settings of application, type number, and checker number. • Check the conformity of the Ethernet settings with the General communication of PV230/PV200 protocol.
E627	The link control between the laser marker and image checker has failed. No settings for code or character checking available.	<ul style="list-style-type: none"> • Verify "Object number to check" in file settings, and confirm if the number is the same with the object number you set in bar code/2D code settings or character settings. • For the code checking, confirm the code type and settings of bar code/2D code object in the marking data are consistent with the settings of the code reader. • For the character checking, check if the character type and number of characters in the marking data are supported by the image checker.
E628	Code reading failed when the code reading function is used for the link control with external devices.	<ul style="list-style-type: none"> • Check the status of external devices. • Improve the marking quality of the code. • To send the marking strings or to switch the files by using code reader, confirm the followings: <ul style="list-style-type: none"> • Confirm no unavailable characters are in the code data. • When using the data extraction function, confirm the data length in the code data matches the extraction settings. • When you do not use the data extraction function, set the code data less than 299 digits.
E629	File switching by code reader has failed.	<ul style="list-style-type: none"> • Confirm the specified file number or name exactly corresponded to the settings in the laser marker. • To switch the file by the number, specify the number always with 4-digits in the code data. • If no settings in the specified file, set the marking data and save that file to the laser marker.
E630	TRIGGER IN turned off before the minimum number of scans was reached.	<ul style="list-style-type: none"> • Confirm the on/off control of the TRIGGER IN on the I/O terminal. • If TRIGGER IN turns on/off properly, change the setting value of Minimum number of scans of Trigger mode in File settings.
E631	Lasing stopped because the maximum number of scans was reached.	<ul style="list-style-type: none"> • Confirm the on/off control of the TRIGGER IN on the I/O terminal. • If TRIGGER IN turns on/off properly, change the setting value of Maximum number of scans of Trigger mode in File settings.

ERROR CODE	Description	Measures *1
E640 *3 E641 *3	<p>Lasing operation/shutter open operation was cancelled due to a timeout after the laser start-up check. Try again.</p> <p>(Details: For the first operation of opening shutter or lasing after the laser pumping on, warning E640/E641 may occur and the requested operation is canceled in case the laser pumping has been off for more than several days and time for laser start-up check (maximum 30 seconds) is needed.)</p>	<ul style="list-style-type: none"> • When operating with Laser Marker NAVI smart, retry to start test marking/laser radiation for measurement/run mode operation. • When operating in remote mode, close the shutter or input the alarm reset to recover from the warning status, and then retry opening the shutter or laser radiation for measurement.
E652	Font file data are incorrect. Unable to read the font file.	<ul style="list-style-type: none"> • Re-register font data on the data management screen. • Check the font data file format.
E653	Graphic file data are incorrect. Unable to read the graphic file.	<ul style="list-style-type: none"> • Re-register graphic data on the data management screen. • Check the graphic data file format.
E654	Font file is not registered to the font No. specified.	<ul style="list-style-type: none"> • Register the font file on the data management screen. • Using the character conditions, specify the font No. in which the font file is registered.
E655	Insufficient font memory. Font file data capacity is too large.	<ul style="list-style-type: none"> • Reduce the number of characters registered in the font file. • Delete unnecessary font files.
E656	The specified graphic file was not registered.	Register the graphic file in the data management screen.
E657	No font corresponding to set characters were found.	<ul style="list-style-type: none"> • Change characters, or add the font data in use. • To use Japanese or Simplified Chinese characters, set "East Asian characters" in file settings.
E658	Too large number of characters.	<ul style="list-style-type: none"> • Decrease the number of characters. • Set the characters by separating them into several objects.
E659	Existed invalid character for bolding with setting.	<ul style="list-style-type: none"> • Original4 font cannot be displayed in bold. Select another font. • Use Font Maker software provided to create the proper pattern font.
E660	Bold characters cannot be created due to the combination of set bold line width, character height, and character width.	<ul style="list-style-type: none"> • Set the bold line width to half or less of the character height or the character width, whichever is smaller. • When marking the bold character, set the comparison ratio between character height and width at 1/10 to 10.

ERROR CODE	Description	Measures *1
E661	Insufficient marking memory. Marking data in the file are too large.	<ul style="list-style-type: none"> • Reduce the number of characters and segments in the graphic data. • Reduce the number of characters and start/end points of the graphic data. • Reduce the number of markings for Step & repeat. • Separate the long segment into short data.
E662	The number of Step & repeat marking exceeds the upper limit.	Reduce objects to be marked to 10000 or less.
E664	<p>One or more functions that cannot be used together are set. The following combination of the functions are not available in one file.</p> <ul style="list-style-type: none"> • Characters specified by SIN command and registered characters via I/O • Characters specified by SIN command and external offset with I/O • Registered characters via I/O and external offset function with "Using SEO command" • Link control with an image checker and "continuous trigger" of trigger mode • For LP-RC/RH/RF/RV/ZV series: Link control with an image checker and TARGET DETECTION IN • For LP-ZV series: Autofocus function and "continuous trigger" of trigger mode • For LP-ZV series: 3D marking and external offset with I/O • For LP-ZV series when the 3D marking is ON, the bar code/2D code objects cannot be used with the following settings: The shape of the 3D model is "Vertical cone" or "Sphere". The shape of the 3D model is "Cylinder" or "Horizontal cone" and "Projection" is set for "Data mapping". 	Delete any one of these functions from the file.
E665	It contains character(s) that cannot be converted to 2D code.	<ul style="list-style-type: none"> • Set the character that can be converted into 2D code. • Change the mode of the code settings.
E666	<ul style="list-style-type: none"> • Unable to generate 2D code in the condition specified. • The number of 2D code characters is too large relative to the set conditions. 	Check the code settings and the number of characters.
E667	The specified 2D code filling pattern is not registered for the 2D code font (font number: 2D).	<ul style="list-style-type: none"> • Change the 2D code filling pattern. • Add the font data of the pattern used in the data management screen.
E668	The data includes a character that cannot be bar coded.	Set characters that can be bar-coded depending on the code type.

ERROR CODE	Description	Measures *1
E669	<ul style="list-style-type: none"> Unable to generate bar code in the condition specified. The number of bar code characters is incorrect relative to the set conditions. 	Check the code settings and the number of characters.
E670	The dimensions of the narrow element or the module width for the bar code are too small.	Specify the setting value for the narrow element or the module width larger than that of the "line width (calculation value)" specified in the object group settings.
E671	The quiet zone is not configured correctly at the bar code inversion mode settings.	Set the proper value for "Quiet/Narrow Ratio".
E672	The settings for separator height ratio or row height ratio are too small.	<ul style="list-style-type: none"> Correct the separator height ratio or the bar code height ratio so that the height is larger than the "line width (calculation value)" specified in the object group settings. If you want to remove the separator, set 0 to the separator height ratio.
E673	Cannot create bar code due to the invalid number of characters for EAN/UPC/JAN code or GS1 DataBar.	Enter the prescribed number of characters according to the code type.
E674	The string containing "%" is not properly set.	<ul style="list-style-type: none"> If the functional characters such as a counter and date/time are input, delete and re-enter characters after "%". To enter "%" as a character to mark, enter "%%". To enter "+" or "/" as a character to mark after the counter, enter "%+" or "%/".
E678	The string No. specified by the SIN command is not acceptable because the No. has not been set in Laser Marker NAVI smart.	Specify the same No. set in "characters specified by SIN command" setting in Laser Marker NAVI smart to the string No. in SIN command data.
E679 *2, *3	Communication was interrupted. The adjustment value of power optimization by marking position could not apply to the laser marker.	<ul style="list-style-type: none"> Set the adjustment value of power optimization by marking position and apply it to the laser marker again. Do not turn off the power during the application processing. Do not turn on the remote mode during the application processing.
E680	<p>Any of the following functions that are not available with the RUN mode ON are configured.</p> <ul style="list-style-type: none"> Registered characters via I/O External offset (via I/O and SEO command) Characters specified by SIN command Link control with external image checkers 	<ul style="list-style-type: none"> To execute marking in the RUN mode, delete these functions from the marking data. When you use these functions, control the laser marker in the remote mode.

ERROR CODE	Description	Measures *1
E682 *3, *4, *6	<p>Any of the following functions that are not available with on-the-fly marking are configured.</p> <ul style="list-style-type: none"> • Link control with external image checkers • Overwriting interval • Skip marking of 2D code (module marking order) • Autofocus (LP-ZV series only) • Defocusing (LP-ZV series only) <p>When the trigger mode is set to Marking at regular intervals or Multiple triggers, those functions are also not available.</p> <ul style="list-style-type: none"> • Registered characters via I/O • External offset (via I/O and SEO command) • Characters specified by SIN command • Counter reset at date change 	<ul style="list-style-type: none"> • To use on-the-fly marking, delete these functions from the marking file. • Some functions are available when Trigger mode of the on-the-fly settings is set to Single trigger.
E686	<p>Any of the following functions that are not available with the seamless loop setting are configured.</p> <ul style="list-style-type: none"> • Multiple objects • Object consisting of unclosed line(s) • Point radiation object • Step & repeat function 	<ul style="list-style-type: none"> • Deactivate the seamless loop in the laser settings. • If you want to radiate laser continuously without any break, set the closed line by setting the start and end points in the same position.
E687	The graphic object contains an invalid setting.	<ul style="list-style-type: none"> • Reduce the graphic size. The graphic width or height should be less than 999.999 mm. • If the “Graphic presets” is off, set on for “Adjustment of size and filling” in the graphic object settings and specify the graphic parameters in the “Marking settings” screen.
E688 *5	The workpiece displacement exceeds the permissible range.	<ul style="list-style-type: none"> • Check if the workpiece is in the proper position when detecting the displacement. • To avoid the measurement of the unintended height, specify “Upper limit of workpiece displacement [mm]” and “Lower limit of workpiece displacement [mm]” in File settings according to the height of your workpiece. • When you use the autofocus function with an external sensor: Check if the detecting position of the workpiece surface and the marking surface are consistent.
E689 *5	Unable to detect the workpiece displacement.	<ul style="list-style-type: none"> • Check if the displacement sensor can detect the height without problem. • Check if the displacement sensor operates without error. • Check if the trigger of the displacement sensor is input when the workpiece is in the correct position.
E690 *5	The marking data is at an invalid position.	Check the 3D settings and move the marking data on the 3D model to the position where the laser beam can emit.

ERROR CODE	Description	Measures *1
E691 *5	The 3D model contains an invalid setting.	<ul style="list-style-type: none"> • Check the all object groups in the marking file are assigned to the 3D model. • If the 3D model is vertical cone, check the value of the bottom diameter and the upper diameter are set correctly.
E692 *5, *6	There is marking data in a position that cannot be marked.	<ul style="list-style-type: none"> • When you use the 3D marking, check the 3D settings. • Adjust the data position (X/Y/Z) and size located outside of the marking field. • When you use the autofocus function, check the workpiece displacement. • If the marking position or marking data is changed by the external input function such as an external offset (via SEO command) or characters specified by SIN command, check whether the data fits in the marking field.
E699	Some setting fields contain an improper value.	<ul style="list-style-type: none"> • Overwrite the data again to the selected file number. • If the problem persists, save the backup file and contact our sales office or representatives.
E710 - E711 *2, *3	The head air-cooling fan has stopped.	<ul style="list-style-type: none"> • Refer to “Setup/Maintenance Guide” and clean the fan. • Check the connection status of the fan connector. • Replace the fan. • For LP-RC series, confirm the side covers of the head are installed properly.
E712 *5, *6	The power supply voltage exceeds the permissible range.	Check and correct the power status.
E715 *3	The temperature of the laser oscillator is high.	<ul style="list-style-type: none"> • Check if the ambient temperature of the laser marker is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the air-cooling part such as fan and filter.
E716 - E717 *5, *6	The rotation speed of the controller fan is decreasing.	<ul style="list-style-type: none"> • Clean the air intake and exhaust port and fan located at the air cooling area of the controller. • If the air filter is contaminated, replace it. • Replace the fan.
E726-E729 *6	The rotation speed of the head fan is decreasing.	<ul style="list-style-type: none"> • Clean the air intake and exhaust located at the air cooling area of the head. • If the air filter is contaminated, replace it. • If it happens again, contact our service center or sales offices.

ERROR CODE	Description	Measures *1
E750	Invalid trigger signal. TRIGGER IN was input during trigger processing.	<ul style="list-style-type: none"> • Turn ON TRIGGER IN after confirming READY OUT is ON. • Do not input the marking trigger while PROCESSING OUT is ON.
E751	Invalid trigger signal. TRIGGER IN was input while READY OUT is OFF.	<ul style="list-style-type: none"> • Check the switch or the sensor connected to TRIGGER IN of I/O terminal operates properly without chattering. • Check wiring of I/O or communication port to the external control devices.
E752 *3, *4, *6	TARGET DETECTION IN did not turn ON during the lasing process.	<ul style="list-style-type: none"> • Check the marking results before and after the error. • Check the connection and control method of the work detection sensor. • Set the work detection sensor position so that the sensor turns ON more than 1ms during marking. • When you do not use this function, set "Disable" at X7: TARGET DETECTION IN with Laser Marker NAVI smart system settings.
E760	<ul style="list-style-type: none"> • I/O connector terminal No. input was not set successfully. • Before setting completion (SET OK OUT) was output, the set input (SET IN) was input at least twice. 	<ul style="list-style-type: none"> • Keep SET IN turned ON until SET OK OUT turns ON. • To input the No. input again, close the shutter and reset the previous data. • Check the connection with the external controller. • Check the control procedure of the external control.
E770	The connection between laser marker and your PC is disconnected. Unable to communicate with Laser Marker NAVI smart.	<ul style="list-style-type: none"> • Check the Ethernet or USB connection status. • For Bluetooth communication, check for any obstacles and distance between that and the laser marker. • Save files onto your PC local folder, and overwrite and save them when the connection gets back online.
E775	Unable to transmit the response data of MST command.	<ul style="list-style-type: none"> • When the marking interval is too short for transmission time of MST command, MST command is not available. In such case, check the marking completion by I/O. • Check the control procedure of the external control.
E780	Serial number mismatch.	<ul style="list-style-type: none"> • Make sure the connected laser marker components have the correct serial numbers. • For LP-GS/RC/RH series, it is recommended to connect the head and controller that have the same serial numbers. • For LP-RF/RV/ZV series, please connect the head, oscillator unit, and controller that have the same serial numbers. Connecting different combination may degrade the marking performance.

ERROR CODE	Description	Measures *1
E781	<ul style="list-style-type: none"> • Model number mismatch. • Incorrect connection of signal cable or unit power cable. 	<ul style="list-style-type: none"> • Make sure the connected laser marker components have the correct model numbers. • For LP-GS series, it is recommended to connect the head and controller that have the same model numbers. If you combine the different models, the model number of the laser head is applied to the laser marking system. • Check the connection of the cable and various signal lines, and then restart the laser marker.
E782 *4, *6	GSD file version error.	Download the GSD file (XML file) compatible with the version number of the laser marker used and perform updating. If the GSD file version is incorrect, settings by your PLC cannot be imported to the laser marking system correctly.
E783 *5, *6	The version of the expansion board is incorrect.	Update the firmware in the controller and expansion board. The software for updating the LP-RH/LP-ZV series, Laser Marker Firmware Updater, can be downloaded from the following website: https://www3.panasonic.biz/ac/e/fasys/software_info/lasermarker/tol_lp-zv_firm.jsp

*1 : If the error persists after restart of the laser marker, contact our sales office or representatives.

*2 : Error that may occur for LP-GS series only.

*3 : Error that may occur for LP-RC series only.

*4 : Error that may occur for LP-RF, LP-RV and LP-ZV series only.

*5 : Error that may occur for LP-ZV series only.

*6 : Error that may occur for LP-RH series only.

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February, 2024