Panasonic

Laser Marker

EtherNet/IP Communication Guide

LP-RH series
LP-RF series
LP-RV series
LP-ZV series

ME-LPRF-EIP-5

2024.4 | industry.panasonic.com/

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.

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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.

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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.

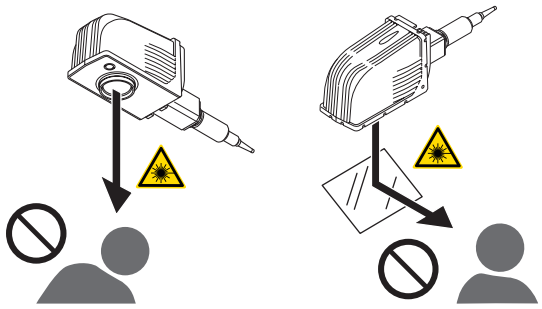
The following symbols are used to classify and describe the type of instructions to be observed.

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

⚠ DANGER

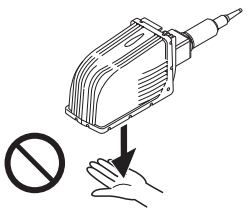
⃠

- 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.



⃠

- 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

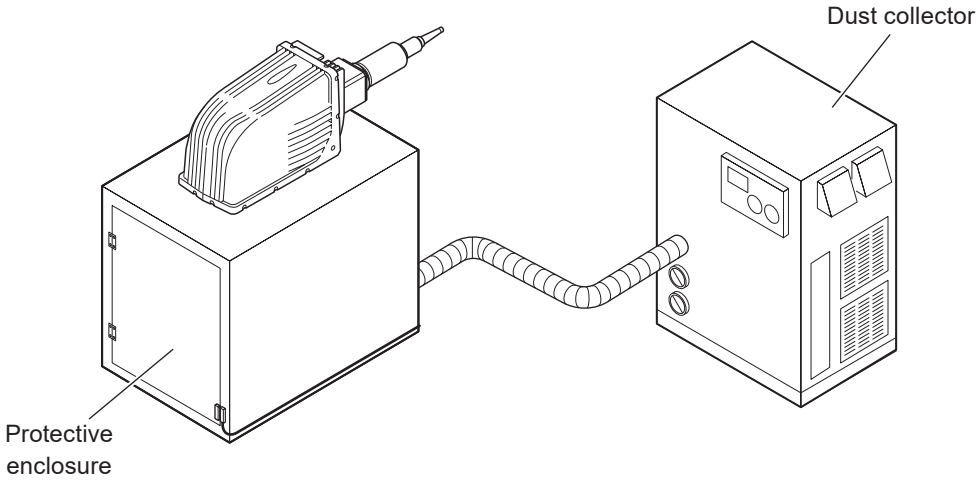
- Do not use this product anywhere where fire is strictly prohibited, near inflammable gas, objects or organic solvents such as thinner or gasoline, or in dusty place. There is a risk of fire.
- Do not use this product except for water-resistant part in wet place. In addition, never conduct wiring or maintenance work with wet hands or when the product surface is wet. Otherwise, electric shock and/or malfunction may result.
- Never disassemble the product.
  Doing so may cause exposure to the laser beam or electric shock.
- 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.
- 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.
- 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.



- Set protective enclosure with proper reflectance, durability and thermal resistance to enclose the laser radiation area without leakage.
- 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.
- Construct an interlock systems such as a function to stop laser radiation for the maintenance door of the protective enclosure.
- After power supply of laser marker is turned off, laser safety manager must remove the key and keep it.
- Be sure to connect the head and controller (for LP-RV/LP-ZV series, the head, controller and oscillator unit) of the laser marker which have the identical serial numbers. Otherwise there is a risk of exposure to laser radiation or failure.
- 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.
- Prior to wiring, cable connecting, and/or maintenance work, ensure that all the power switches are turned off. Otherwise, electrical shock may result.
- The wiring and maintenance must be conducted by the electrical engineers or under their supervision. Incorrect work may cause electrical shock.
- Connect ground wire before using. A failure or electrical leakage that occurs when the unit is not properly grounded may result in electric shock.
- Perform regular maintenance (cleaning, parts replacement) on this product. Using the product with dust or dirt may cause a fire or electric shock.
- For LP-RF/LP-RV/LP-ZV series, be careful neither to give strong power to the fiber cable nor to nip it for installation. Do not install the product to the systems that give excessive load acts on the fiber cable, such as head movement unit. If the fiber cable is damaged, it may cause laser exposures.

⚠ 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 and safety shoes. 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.
- For LP-RC/LP-RF/LP-RV series, carry the controller unit with two persons. Lifting or carrying without assistance may cause of injury.
- Install this product in the stable place without vibration and shock.
- In case it falls down, it may cause injury.

⚠ CAUTION

- Do not touch the head surface of LP-RF/LP-RV series during and right after the operation. It becomes hot and may cause burn injury.

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.

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 manual is subject to the following Laser Marker models.
In this manual, 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-RH200S	
LP-RH200T	
LP-RH100S	
LP-RH100T	
LP-RH301S	
LP-RH301T	
LP-RH101S	
LP-RH101T	
LP-RH305S	
LP-RH305T	
LP-RF200P	LP-RF series
LP-RV200P	LP-RV series
LP-ZV200P	LP-ZV series
LP-ZV205P	
LP-ZV206P	
LP-ZV500P	
LP-ZV505P	
LP-ZV506P	

■ Type of manuals

This manual describes how to control the laser marker with EtherNet/IP communication.

EtherNet/IP Communication Guide (this manual)

It describes the communication settings, connections, and the communication data formats for EtherNet/IP.
Mainly the machine builder and system integrator shall be required for reading this manual.

Together with this manual, read the following manuals attached to the laser marker, 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 the laser marker 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 the laser marker as well as for the maintenance work.
To control the laser marker by Implicit Message of EtherNet/IP, refer to this manual for the I/O details.

- 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

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.
Mainly the users that operate this laser marker for actual marking procedure shall be required for reading this manual.

Serial Communication Command Guide

This manual describes the communication commands to control the laser marker externally. 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.
To control the laser marker by Explicit Message of EtherNet/IP, refer to this manual for the command details.

Reference

- The PDF data of the laser marker manuals can be downloaded from our Internet website.
- To read the PDF manual, Adobe Acrobat Reader of Adobe Inc. is required.

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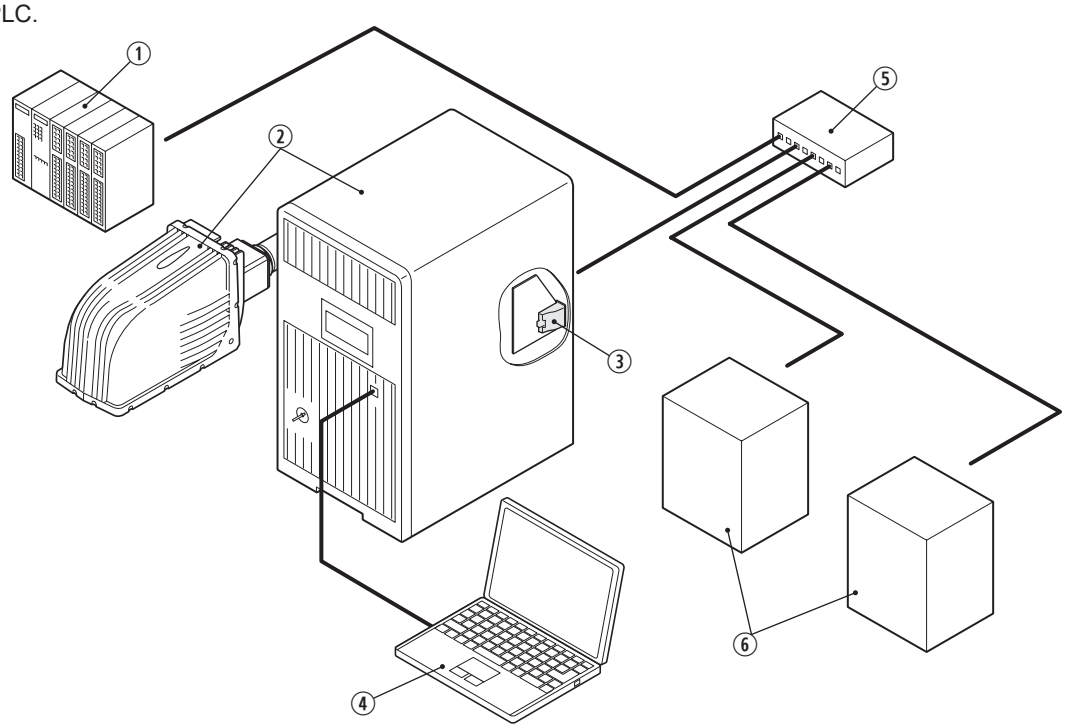
1 Overview of EtherNet/IP Unit

1-1 Product Configuration

This manual describes how to control the laser marker with EtherNet/IP™ (EtherNet/Industrial Protocol) communication. By installing an optional communication unit of the industrial network LP-ANW10 (EtherNet/IP unit) to the specified laser marker, you can control the laser marker with EtherNet/IP.

■ Example of the system configuration

The laser marker is an adapter (target) device of EtherNet/IP.
With a scanner (originator) device such as a PLC (Programmable logic controller), the laser marker performs EtherNet/IP communication.
In this document, “laser marker” is treated as an EtherNet/IP adapter device and “PLC” is treated as an EtherNet/IP scanner device. If you use any devices other than PLC, please substitute your scanner device for PLC.
For the general description of EtherNet/IP communication, please refer to the instruction manuals of your scanner device such as a PLC.



Notice

- The communication control of the laser marker through EtherNet/IP should be performed in a secure network environment.

No.	Name	Description
①	PLC	EtherNet/IP scanner (originator) device. It opens connections and initiates data transfers.
②	Laser marker *1	EtherNet/IP adapter (target) device. In EtherNet/IP communication, the following communication method are used to control the laser marker. • Implicit message to control I/O and monitor the status • Explicit message to write and read the settings
③	EtherNet/IP unit (LP-ANW10)	To control the laser marker via EtherNet/IP communication, you need to install the optional EtherNet/IP unit to the controller.
④	PC configuration software “Laser Marker NAVI smart”	Software to setup the network configuration of the laser marker. It can be used also as a monitor during the operation.
⑤	Network hub or switch	Use it if necessary.
⑥	Other EtherNet/IP adapters	—

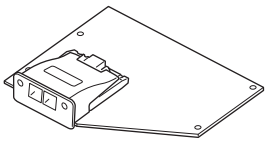
*1 : Illustration images and configurations vary depending on the model.

Reference

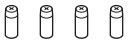
- For the operations and specifications of the laser marker, refer to the manuals attached to the laser marker.

1-2 Product Package

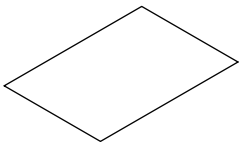
In the package of LP-ANW10, the industrial network unit for EtherNet/IP, following items are included.
Before using this product, make sure all items listed below are included in the package.



EtherNet/IP unit
qty.: 1



M3 screw
qty.: 4



Instructions of network unit
qty.: 1

1-3 Download of EDS File

Before using this product, download the setup files “lp-anw10_setup_ethernetip.zip” from our Internet website.
Visit our Internet website, go to “Downloads” > “Software” and search by “LP-ANW10”.
https://industry.panasonic.com/global/en/downloads/?tab=software
The zip file contains the following files:

- EDS file (for firmware version 1.35): Firmware 1.35\LP-Device.EDS
- EDS file (for firmware version 1.58): Firmware 1.58\LP-Device.EDS
- EtherNet/IP Communication Guide: PDF manual

*1 ： For details on how to check the firmware version of the EtherNet/IP unit, refer to “2-4-3 EtherNet/IP settings” (P. 33).

1-4 Restriction on Combinations

EthernNet/IP unit (LP-ANW10) firmware has been updated since April 2024 production. You may need to update the controller version to use it with this product.

■ LP-RF/LP-RV controller

For LP-RF/LP-RV (until January 2024 production), the firmware versions in the controller needs to update by our service representative. Please contact our sales office. For LP-RF/LP-RV controller (until September 2020 production), contact our sales office for available service.

■ LP-RH/LP-ZV controller

For LP-RH/LP-ZV (until January 2024 production), update the firmware versions in the controller. The software for updating the LP-RH/LP-ZV series, “Laser Marker Firmware Updater”, can be downloaded from the following website: Visit our Internet website, go to “Downloads” > “Software” and search by “LP-ZV”.
https://industry.panasonic.com/global/en/downloads/?tab=software

Reference

- For information on using the “Laser Marker Firmware Updater”, refer to the manual attached with the software.
- To prevent accidental rewriting, we recommend saving the backup file.

1-5 Specifications

■ Device specifications

Model	LP-ANW10 (EtherNet/IP unit)
Applicable laser marker	LP-RF series *1, *2, LP-RV series *1, *2 LP-RH series *3, LP-ZV series *3
Network type	EtherNet/IP
Interface	RJ-45 port (2-port switch) *4
Communication standards	IEEE802.3i (10BASE-T) / IEEE802.3u (100BASE-TX)
Communication type	Implicit Messaging (Cyclic data exchange) Explicit Messaging (Acyclic data exchange)
Baud rate	10 Mbit/s / 100 Mbit/s
Communication method	Full-duplex system / Half-duplex system
Applicable cable	Category 5 or higher
Cable length	Max. 100 m (Distance between Laser marker and switching hub)
Setting method of IP address	DHCP capable
Conformance test	CT14 (Firmware version 1.35) CT19.1 (Firmware version 1.58)
LEDs of connector	Network status LED Module status LED Link/activity LED
Weight	Approx. 95 g

*1 : Produced in September 2019 or later and controller version 1.6.0 or higher.

*2 : For LP-RF/LP-RV (until January 2024 production), the firmware versions in the controller needs to updated by our service representative. Please contact our sales office. For LP-RF/LP-RV controller (until September 2020 production), contact our sales office.

*3 : For LP-RH/LP-ZV (until January 2024 production), update the firmware versions in the controller. The software for updating the LP-RH/LP-ZV series, “Laser Marker Firmware Updater”, can be downloaded from the following website. Visit our Internet website, go to “Downloads” > “Software” and search by “LP-ZV”.
https://industry.panasonic.com/global/en/downloads/?tab=software

*4 : The IP address and MAC address of these two ports are identical.

Reference

- For the installation and usage conditions of EtherNet/IP unit, follow the specifications of the laser marker. Refer to “Setup/Maintenance Guide” of the laser marker.

■ Communication specifications of Implicit Messaging

Application type	Exclusive-Owner connection Input-Only connection
Transport class	Class 1
Number of connections	Max. 4
RPI (Requested packet interval)	1.0ms to 3200.0ms
Maximum data size: Laser marker -> PLC	460 byte
Maximum data size: PLC -> Laser marker	320 byte

■ Communication specifications of Explicit Messaging

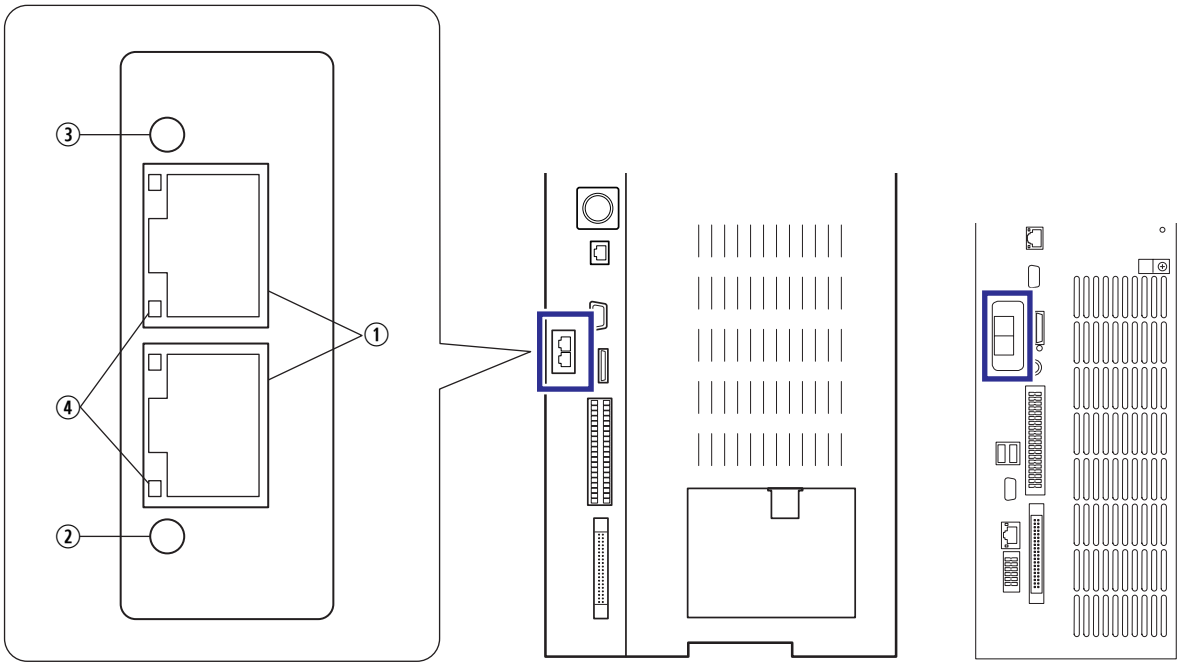
Message type		UCMM (Unconnected message manager) Class 3 (Connection based messages)
Number of connections		Max. 6 (with Class 3)
Maximum data size		1488 byte
Available CIP objects	CIP mandatory objects	Identity Object, Message Router Object, Assembly Object, Connection Manager Object, QoS Object, TCP/IP Interface Object, Ethernet Link Object, LLDP Management Object *1, LLDP Data Table Object *1
	Laser marker specific object	LP Object

*1 : Firmware version 1.58

1-6 Name of Each Component

1-6-1 Communication interfaces

The EtherNet/IP ports are available after the EtherNet/IP unit is installed to the controller of the laser marker.
The EtherNet/IP ports are located on the rear side of the controller.



LP-RF/LP-RV series
Rear of controller

LP-RH/LP-ZV series
Rear of controller

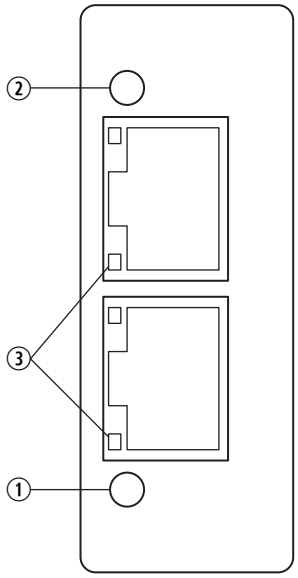
No.	Name	Description
①	EtherNet/IP ports: P1, P2	Communication port (2-port switch) to control the laser marker by EtherNet/IP with the control device such as a PLC. Connect a LAN cable. If you do not install the network unit, there is no port here. Connector: RJ-45 8-pole connector, AUTO-MDIX compatible
②	Network status LED: NS	Indicates the connecting status of the network.
③	Module status LED: MS	Indicates the laser marker status for the communication.
④	Link/activity LED	Indicates the communication status.

Reference

- For the connection of EtherNet/IP ports, refer to “2-3 Connection of LAN Cable” (P. 28).
- The ports labeled “LAN” and “INFO LAN” on the rear of the controller do not function as EtherNet/IP.
- Laser Marker NAVI smart is not able to connect to laser marker via EtherNet/IP port. In order to use Laser Marker NAVI smart, connect to the port labeled “LAN” or connect via USB.
- In the LP-RH/LP-ZV 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.

1-6-2 Status of LED indicator

On the connectors of EtherNet/IP, the LEDs are equipped to monitor the status of the communication.
Meanings of each LED and color are described below.



① Network status LED: NS

Indicates the connecting status of the network.

Display	Description
Green	Online, one or more connections are established between the laser marker and PLC.
Green flashing	Online, no connections are established between the laser marker and PLC.
Red	Duplicate IP address, or fatal error of EtherNet/IP unit. Measures: • Confirm if the IP address is correct. • Confirm if EtherNet/IP unit is correctly installed to the controller. • Restart the laser marker. If the error persists, contact our sales offices or representatives.
Red flashing	One or more connections timed out between the laser marker and PLC. Measures: • Check the connection of LAN cable. • Check the status of PLC.
OFF	LAN cable is disconnected or no IP address. Measures: • Check the connection of LAN cable. • Confirm if the IP address is correct.

② Module status LED: MS

Indicates the laser marker status for the communication.

Display	Description
Green	In communication between the laser marker and PLC.
Green flashing	No communication between the laser marker and PLC.
Red	Major fault of EtherNet/IP unit. Measures: • Confirm if EtherNet/IP unit is correctly installed to the controller. • Restart the laser marker. If the error persists, contact our sales offices or representatives.
Red flashing	Configuration of PLC is incorrect. Measures: Check if the EDS file is correct.

Display	Description
OFF	No power or EtherNet/IP unit is not connected to the controller correctly. Measures: • Confirm if EtherNet/IP unit is correctly installed to the controller. • Restart the laser marker. If the error persists, contact our sales offices or representatives.

③ Link/activity LED

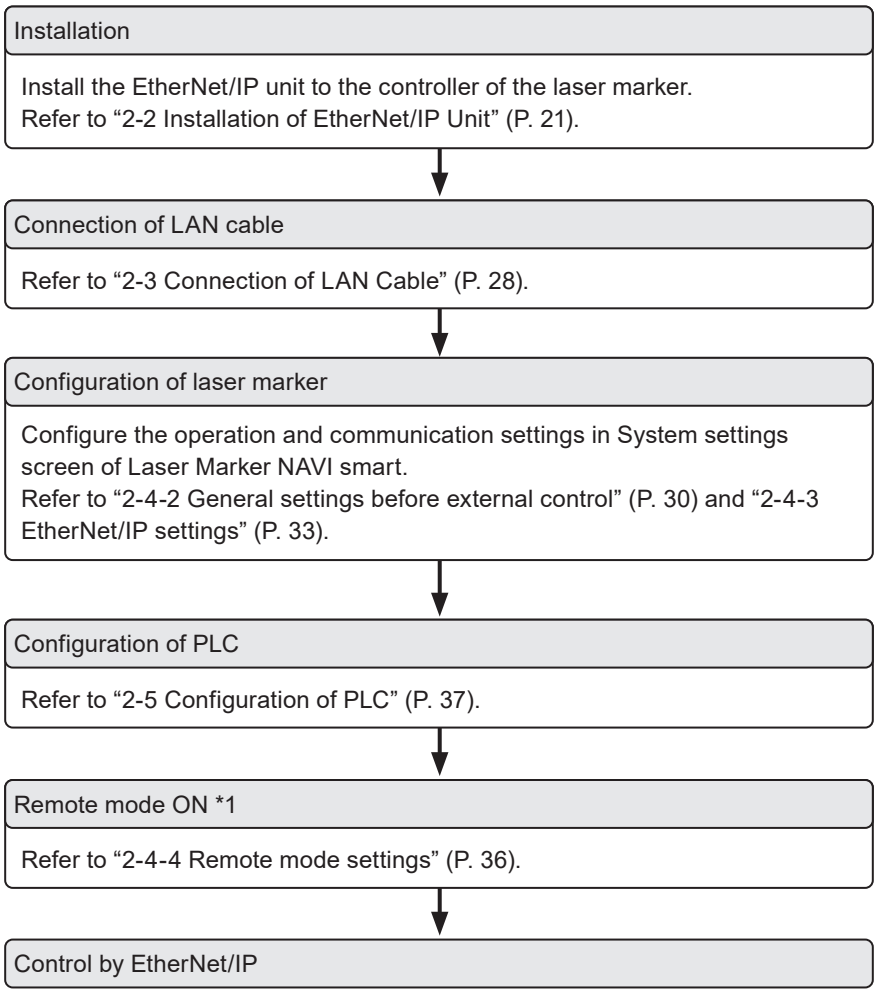
Indicates the communication status.

Display	Description
Green	Link (100 Mbit/s) established
Green flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow flickering	Activity (10 Mbit/s)
OFF	No link, no activity

2 Preparation of EtherNet/IP Communication

2-1 Overview of Preparation

Before starting EtherNet/IP communication, the following installation and settings are required.



*1 : Though it is possible to monitor the laser marker status during remote mode OFF with EtherNet/IP communication, you need to turn on remote mode to control the laser marker or change the marking settings via EtherNet/IP.

2-2 Installation of EtherNet/IP Unit

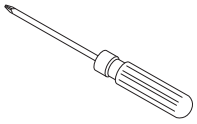
2-2-1 Installation procedures

Install EtherNet/IP unit to the controller of the laser marker by following the procedures below. The procedures vary depending on the model of the laser marker.

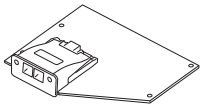
Reference

- For the installation details of the laser marker, refer to “Setup/Maintenance Guide” of the laser marker.

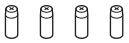
■ What you need



Cross screwdriver (No. 2)



EtherNet/IP unit

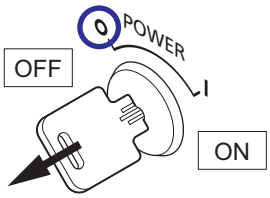


M3 screws x 4
(Attached accessory)

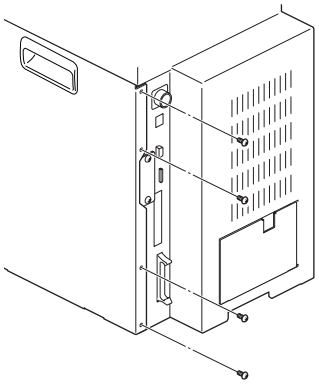
⚠WARNING	• Before the installation work, turn OFF the key switch of the laser marker, and disconnect the AC power cable. Otherwise, it may cause exposure to the laser beam or electrical shock. • Do not insert your hands or objects to the exhaust port of each unit or the gaps between units during the installation work. This may result in injuries, electrical shock, or failure of the laser marker.

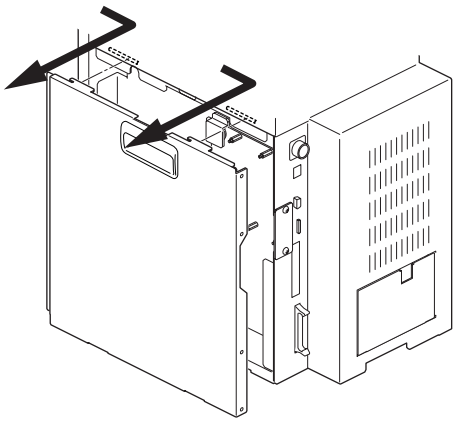
■ Installation procedures: For LP-RF/LP-RV series

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

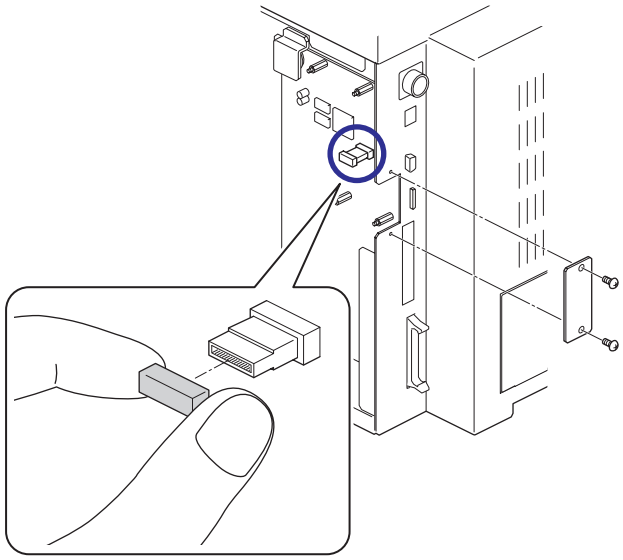


2. Remove four M4 screws on the back of the controller. To remove the side panel from the controller, slide the panel to the back first, then pull it to open.





3. Loosen two M3 screws of the small cover next to SIGNAL connector on the rear of the controller and remove the cover.



Reference

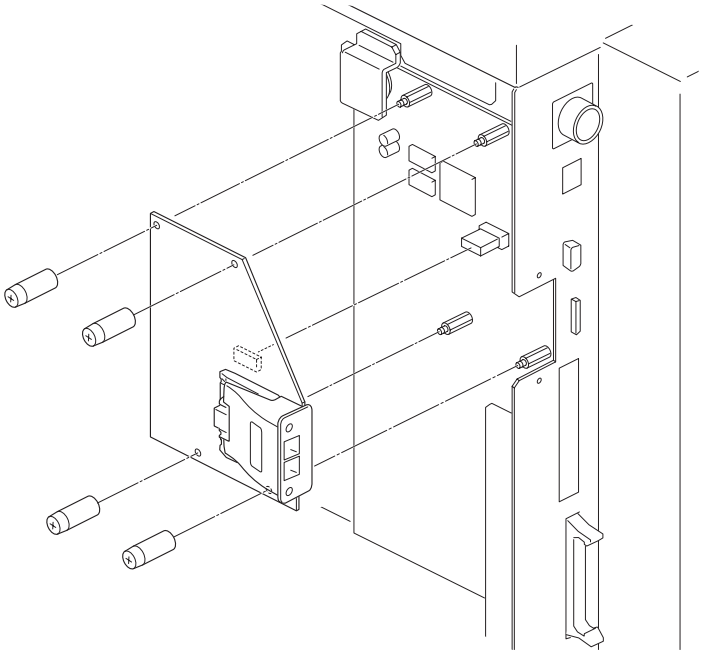
- If the laser marker has no mentioned cover on the rear of the controller, it does not support EtherNet/IP communication.

4. Remove the protection cap of the connector on the board.

5. Install the EtherNet/IP unit to the controller.

Insert the connector located on the center of the EtherNet/IP unit to the controller, and set the attached four M3 screws on the board. Tighten the screws to the controller.

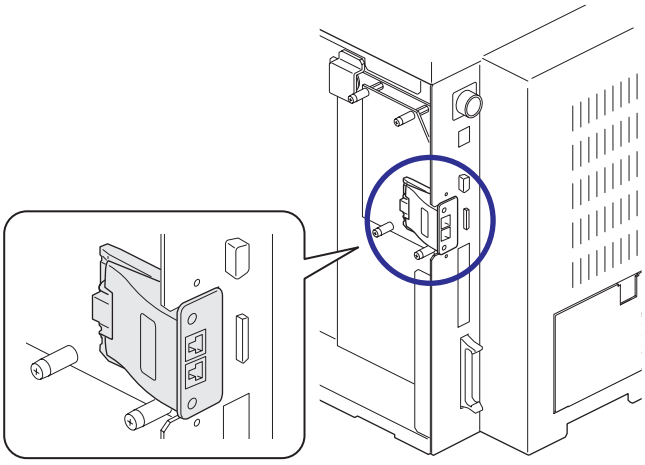
Tightening torque 0.5 N·m



Notice

- Before the installation 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.

6. Make sure that the connector of the communication ports are fit in the back frame of the controller.

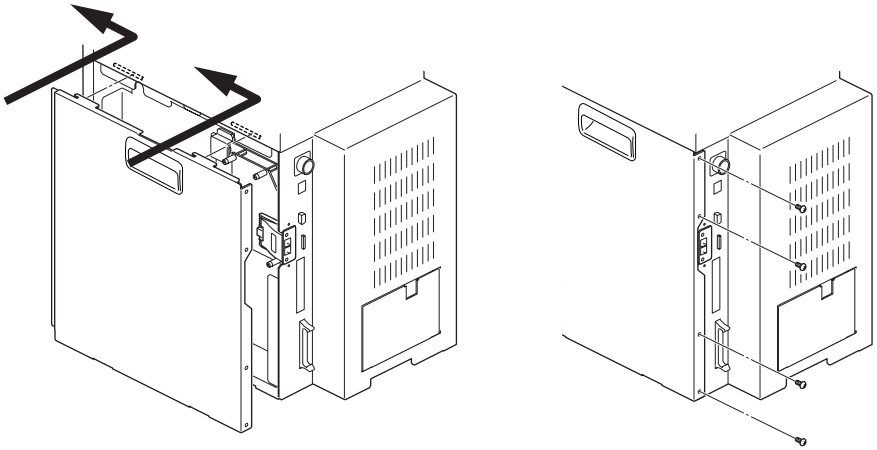


7. Insert the side panel straight. The projecting part of upper and bottom of the side panel should be fit the drain of the controller. Slide the panel to the front of the controller and tighten the screws (M3 screws, four positions) of the back of the controller.

Tightening torque 0.5 N·m

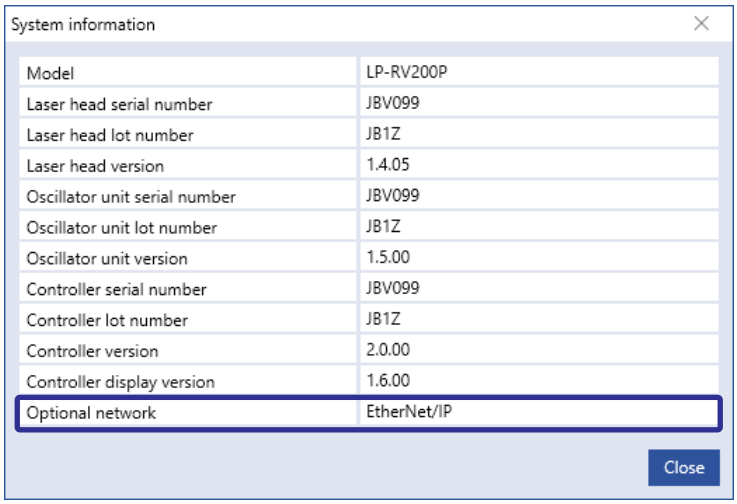
Notice

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



8. Turn on the laser marker and connect the Laser Marker NAVI smart online.

Go to the “System settings” screen and select “System information” in the ribbon. In the dialog, if “EtherNet/IP” is displayed as Optional network, the installation is done successfully.

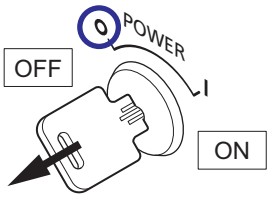


Reference

- In the LP-RF/LP-RV series, the availability of the network unit can be confirmed also by the display panel of the controller. Refer to “2-2-2 Confirmation of EtherNet/IP availability” (P. 27).

■ Installation procedures: For LP-RH/LP-ZV series

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

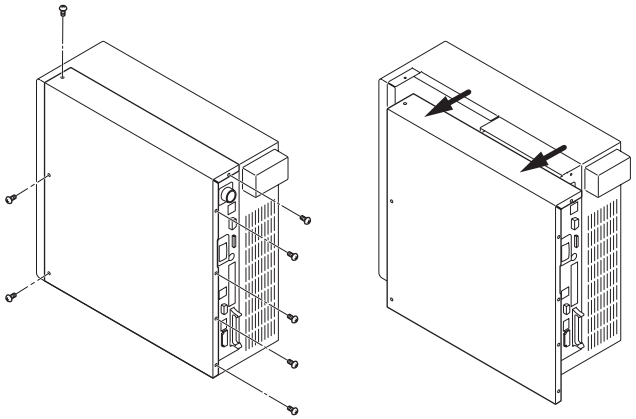


2. Loosen the following screws and remove the side panel of the controller.

Five M3 screws on the back

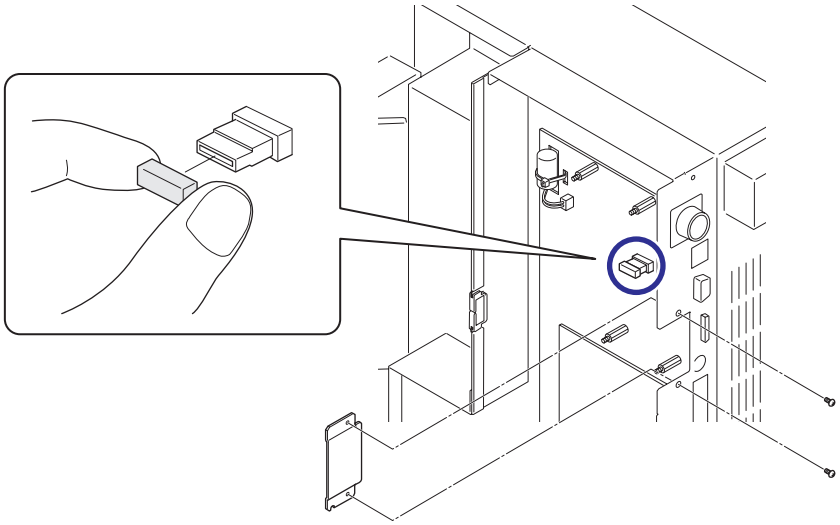
One M3 screw on the top

Two M3 screws on the side



3. Loosen two M3 screws of the small cover next to SIGNAL connector on the rear of the controller and remove the cover.

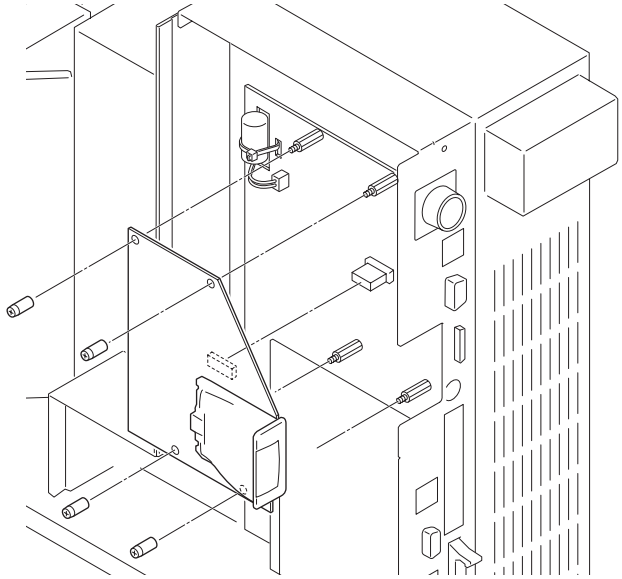
4. Remove the protection cap of the connector on the board.



5. Install the EtherNet/IP unit to the controller.

Insert the connector located on the center of the EtherNet/IP unit to the controller, and set the attached four M3 screws on the board. Tighten the screws to the controller.

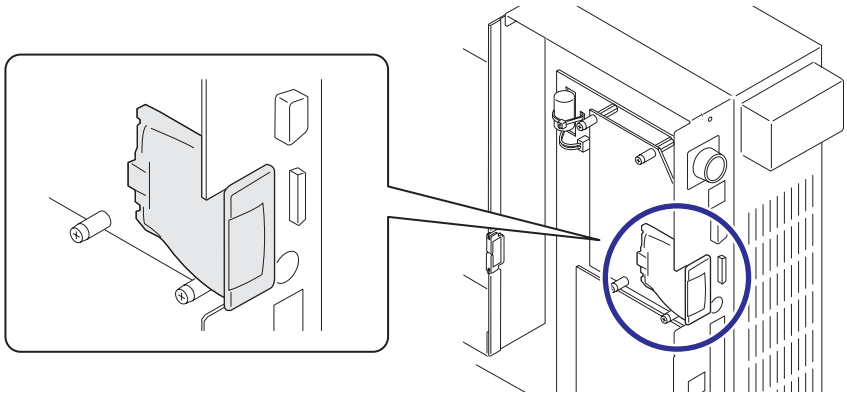
Tightening torque 0.5 N·m



Notice

- Before the installation 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.

6. Make sure that the connector of the communication ports are fit in the back frame of the controller.



7. Install the side panel of the controller and tighten the following screws.

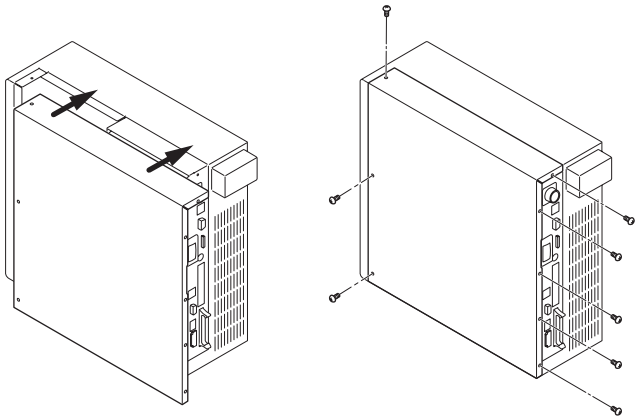
Five M3 screws on the back

One M3 screw on the top

Two M3 screws on the side

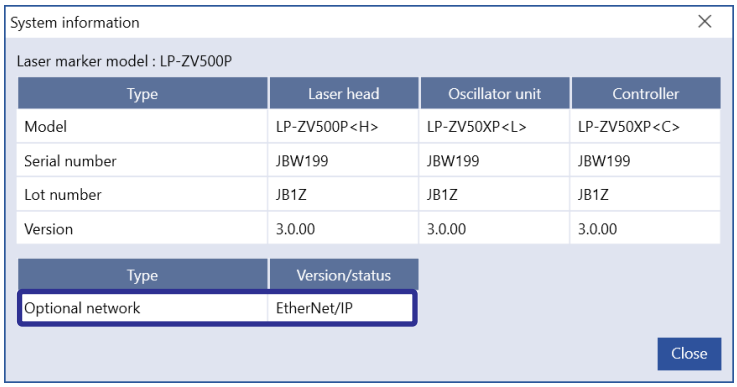
Notice

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



8. Turn on the laser marker and connect the Laser Marker NAVI smart online.

Go to the “System settings” screen and select “System information” in the ribbon. In the dialog, if “EtherNet/IP” is displayed as Optional network, the installation is done successfully.



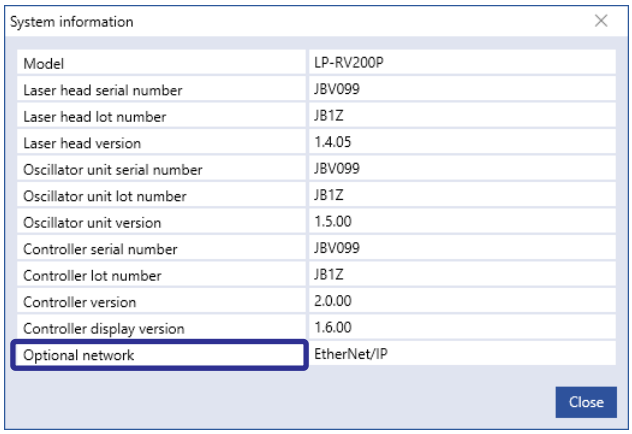
2-2-2 Confirmation of EtherNet/IP availability

You can confirm whether the EtherNet/IP is installed to the laser marker with any of the following methods.

■ Check it on Laser Marker NAVI smart

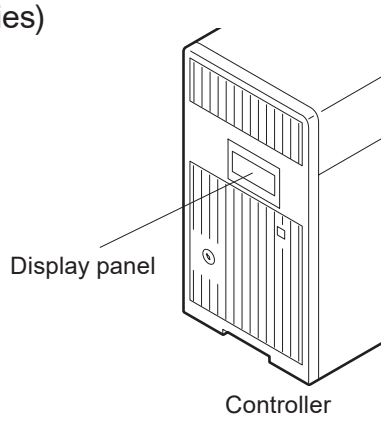
Connect the Laser Marker NAVI smart online.
Go to the “System settings” screen and select “System information” in the ribbon. In the dialog under “Optional network”, the availability of the network unit is displayed.

- EtherNet/IP: EtherNet/IP is available.
- PROFINET: PROFINET is available.
- None: No network unit is installed.
- Not available: The laser marker supports no optional network.
- Unknown: Updating of Laser Marker NAVI smart is required. Please contact our sales office or representatives.

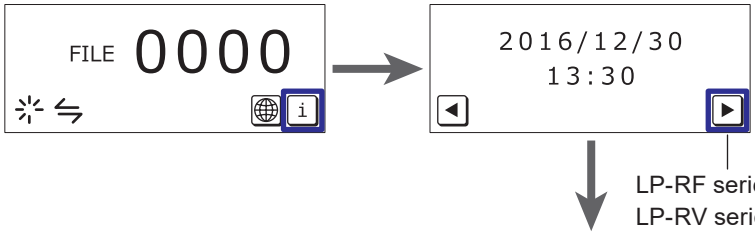


■ Check it on the display panel of the controller (LP-RF/LP-RV series)

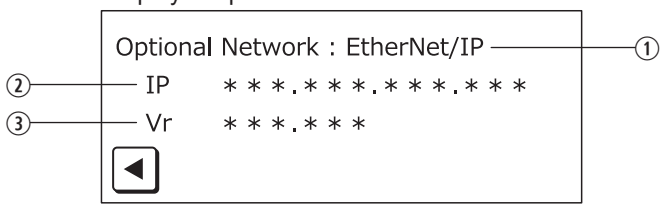
In the LP-RF/LP-RV series, the availability of the network unit can be confirmed by the display panel of the controller.
Touch “i” icon on the display and tap “►” icon until “Optional Network” screen is displayed.
In this screen, the information about the optional network is displayed.



Transition of screens



Display of optional network information



No.	Description
①	Indicates the availability of the optional network. • EtherNet/IP: EtherNet/IP is available. • PROFINET: PROFINET is available. • None: No network unit is installed. • -----: The laser marker supports no optional network.
②	When the optional network unit is installed to the controller, IP address is displayed. If the network link has not been established, IP address is 0.0.0.0.
③	When the optional network unit is installed to the controller, the version of the network unit is displayed.

2-3 Connection of LAN Cable

■ Cable specifications

Use the LAN cable that fulfills the following specifications for the connection of EtherNet/IP.

- Category 5 or higher (Recommended CAT5e or higher)
- 10BASE-T or 100BASE-TX
- STP cable (Shielded twisted pair cable)
- RJ45 connector

Reference

- The EtherNet/IP ports of the laser marker are compatible with both straight cable and cross cable.

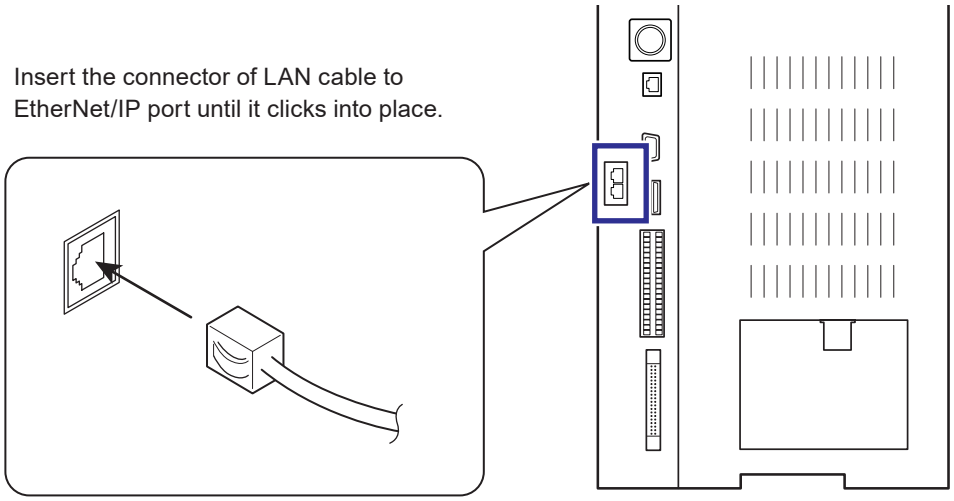
■ Connecting port

WARNING

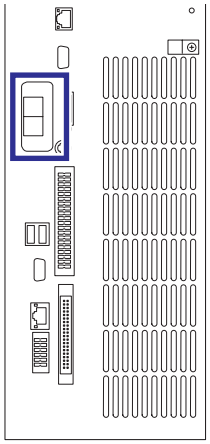
- Be sure to turn the power off before you conduct wiring or connection.

Connect the LAN cable to EtherNet/IP port on the rear of the controller.
The laser marker has two ports of EtherNet/IP and the IP address and MAC address of these two ports are identical. You can use the both connectors.

Insert the connector of LAN cable to EtherNet/IP port until it clicks into place.



LP-RF/LP-RV series
Rear of controller



LP-RH/LP-ZV series
Rear of controller

Reference

- The ports labeled “LAN” and “INFO LAN” on the rear of the controller do not function as EtherNet/IP.
- Laser Marker NAVI smart is not able to connect to laser marker via EtherNet/IP port. In order to use Laser Marker NAVI smart, connect to the port labeled “LAN” or connect via USB.
- It is possible to use the both ports labeled “EtherNet/IP” and “LAN” on the rear of the controller. For them the different IP addresses are configured. Refer to “2-4 Configuration of Laser Marker” (P. 29).

■ Network topology

The laser marker has two ports of EtherNet/IP and these ports can be used as network switches or hub.
The available topologies (configuration of cables) are listed below.

- Star
- Line
- Tree

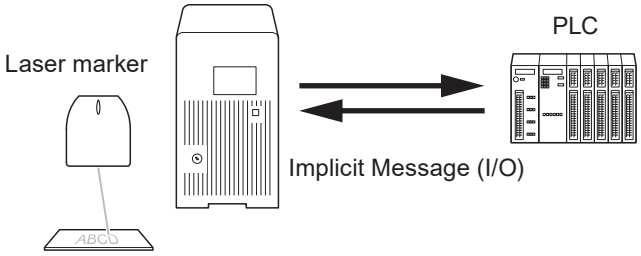
2-4 Configuration of Laser Marker

2-4-1 Basic control method of laser marker

The laser marker can be controlled by external devices mainly via I/O and communication commands.
In EtherNet/IP communication, Implicit messaging is used for I/O control and Explicit messaging is used for the command control.

■ I/O control via Implicit messaging

Implicit messaging is used for I/O control over EtherNet/IP.
For details, refer to “Setup/Maintenance Guide” of the laser marker and “3 Implicit Messaging” (P. 38).

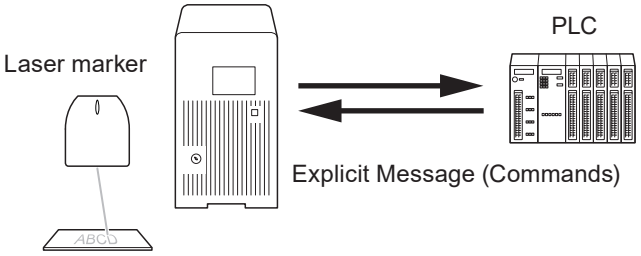


Reference

- It is available to the external control combining I/O and communication commands.
- Before the I/O control, select either “I/O” or “EtherNet/IP” to the control method of each input signal on the I/O terminal and I/O connector in System settings screen of Laser Marker NAVI smart. Refer to “2-4-3 EtherNet/IP settings” (P. 33).
- Besides the I/O control, it is also possible to read the laser marker’s information and set the characters or position via Implicit messaging.

■ Command control via Explicit messaging

Explicit messaging is used to control the laser marker with communication commands.
For details, refer to “Serial Communication Command Guide” of the laser marker and “4 Explicit Messaging” (P. 74).



Reference

- Besides the control with communication commands, it is also possible to access the following data via Explicit messaging. Refer to “4 Explicit Messaging” (P. 74).
  - Read external offset values
  - Read SIN command specified characters
  - Read registered characters
  - Read model name of laser marker
  - Read serial number of laser marker

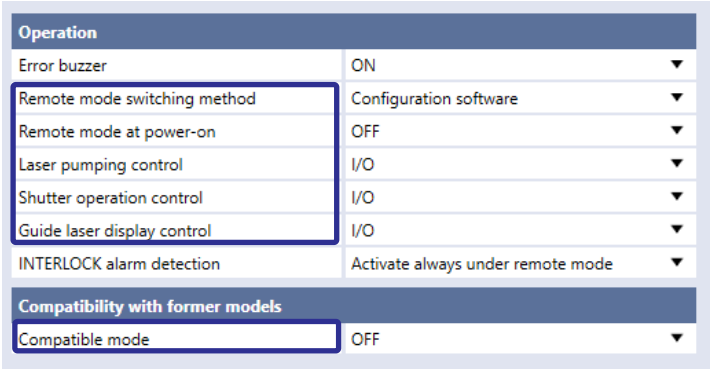
2-4-2 General settings before external control

To control the laser marker via I/O, communication commands, or optional network (EtherNet/IP, PROFINET), 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”.



4. Select the switching method of the remote mode.

- Configuration software (initial setting)
- I/O

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)” (LP-RH/LP-ZV series only), “Power Check Command (PWM)” (LP-ZV series only) 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 or LP-M/LP-S/LP-Z series, select “Compatible mode” according to your former model.

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” or “Serial Communication Command Guide: LP-M/S/Z compatible mode”.
- If you use the optional network (EtherNet/IP or PROFINET) for the command control, set “OFF” to “Compatible mode”.

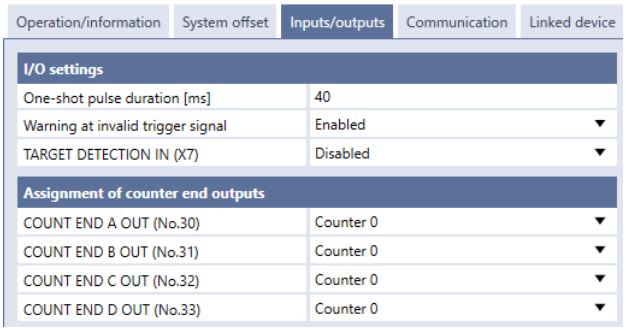
8. Select “Apply to laser marking system” on the left side of the ribbon.



“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.



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.

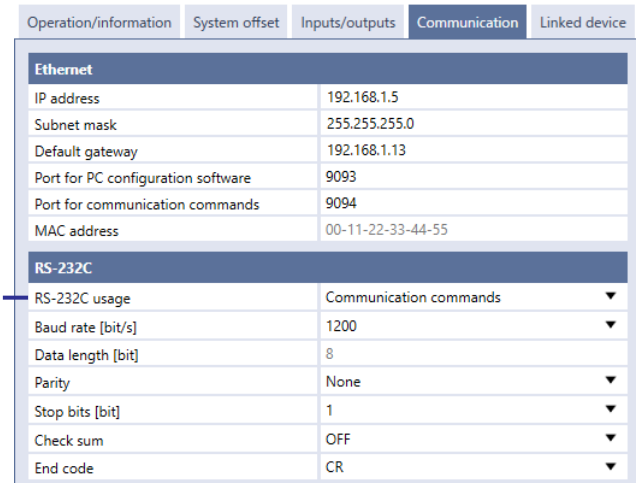


“Apply to laser marking system” tool

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.

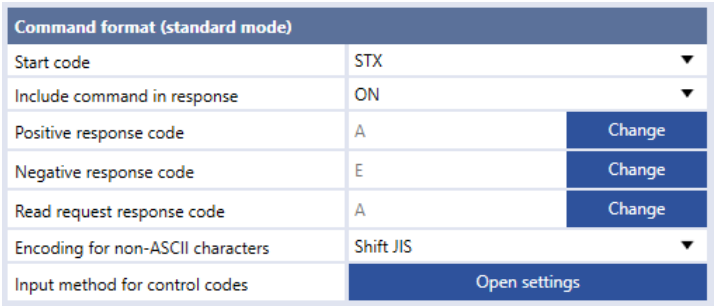


Reference

- This Ethernet setting is applied to the port labeled “LAN” on the rear of the controller. For the settings to EtherNet/IP ports, refer to “2-4-3 EtherNet/IP settings” (P.33).

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



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 and LP-M/LP-S/LP-Z compatible format. For the details of the compatible mode with the former models of LP-400/LP-V series or LP-M/LP-S/LP-Z series, refer to the “Serial Communication Command Guide: LP-400/V compatible mode” or “Serial Communication Command Guide: LP-M/S/Z 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”.
- For the command format used in Explicit Message of EtherNet/IP, the following settings are applied regardless the settings here.
  - Start code: None
  - Include command in response: OFF

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.

Refer to the “Serial Communication Command Guide”.

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”.

2-4-3 EtherNet/IP settings

Configure the communication settings of EtherNet/IP at the system settings of Laser Marker NAVI smart.
For the general operation procedures of Laser Marker NAVI smart, refer to “Laser Marker NAVI smart Operation Manual”.

1. Connect a LAN cable to the EtherNet/IP port of the laser marker.

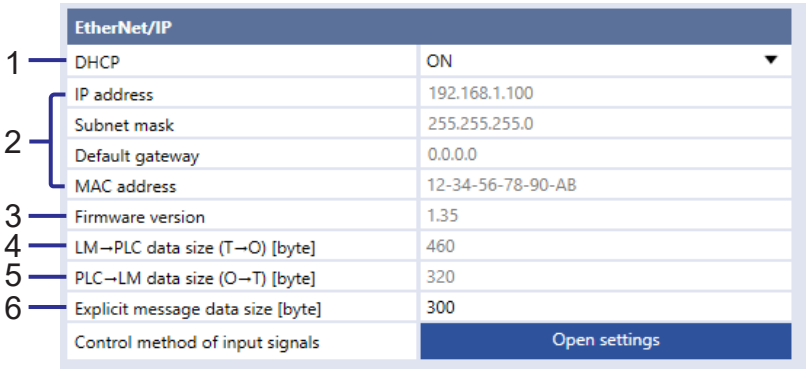
Refer to “2-3 Connection of LAN Cable” (P.28).

2. Turn on the laser marker.

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

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

5. Under “EtherNet/IP”, set or confirm the following items.



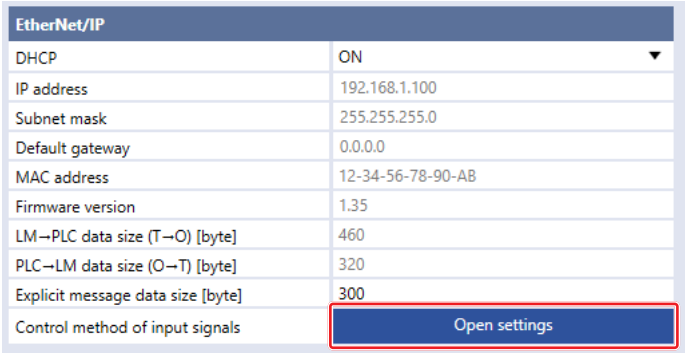
	Item and description
1	DHCP Turning DHCP to “ON”, the settings of IP address, subnet mask, and default gateway are automatically imported from the DHCP server. If you want to specify certain values to IP address, subnet mask, and default gateway, set “OFF” here. Setting entry: ON, OFF Initial setting: ON

Reference

- If the network settings such as IP address are not updated with DHCP ON, check the connecting status of the DHCP server.

	Item and description
2	Network settings With DHCP “ON”, imported values of IP address, subnet mask, and default gateway are displayed. With DHCP “OFF”, specify the value to IP address, subnet mask, and default gateway. • IP address Setting range: 0.0.0.0 to 223.255.255.255 (For the first octet, exclude 127) Initial setting: 0.0.0.0 • Subnet mask Setting range: 0.0.0.0 to 255.255.255.254 Initial setting: 0.0.0.0 • Default gateway Setting range: 0.0.0.0 to 223.255.255.255 (For the first octet, exclude 127) Initial setting: 0.0.0.0 • MAC address Reference • Set the different IP addresses to “Ethernet” and “EtherNet/IP” in System settings screen. • Even the settings of subnet mask is within the configurable range, it may not be available depending on the combination of the numbers.
3	Firmware version Displays the version of the installed EtherNet/IP unit.
4	LM -> PLC data size (T -> O) [byte] Displays the maximum data size of the Implicit Message to input from laser marker to your PLC. Fixed with 460 byte.
5	PLC -> LM data size (O -> T) [byte] Displays the maximum data size of the Implicit Message to input from your PLC to laser marker. Fixed with 320 byte.
6	Explicit message data size [byte] Specifies the maximum size to access LP Object (Class ID: A2 hex) of the Explicit message. Confirm the available data size of your PLC and set the value in this range. Setting range: 64 to 1200 byte *1 Initial value: 300 byte *1 : Though the configurable data size of the explicit message is up to 1448-byte, the maximum data size of the actual data transmission is 1200-byte. If you set 1200-byte or more to the data size, it is treated as 1200-byte in the Explicit Messaging.

6. Select “Open settings” at “Control method of input signals” and the setting dialog opens.



7. Select either “I/O” or “EtherNet/IP” to the control method of each input signal on the I/O terminal and I/O connector.

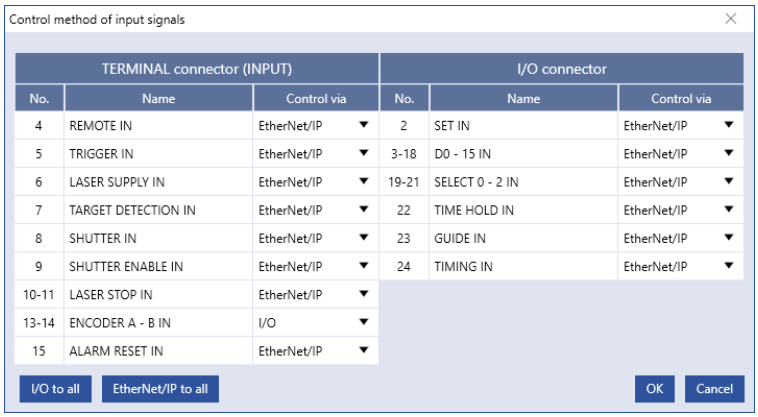
Initial setting: I/O

With “I/O to all” or “EtherNet/IP to all” buttons, all settings are changed at once.

For the following input signals, settings here are activated when the control method is set to “I/O” under “Operation/information” tab in System settings screen.

Refer to “2-4-2 General settings before external control” (P.30).

- REMOTE IN (Remote mode switching method)
- LASER SUPPLY IN (Laser pumping control)
- SHUTTER IN, SHUTTER ENABLE IN (Shutter operation control)
- GUIDE IN (Guide laser display control)



Reference

- The input signals of REMOTE INTERLOCK IN, INTERLOCK 1, and INTERLOCK 2 cannot be controlled via EtherNet/IP.

8. Select “OK” to apply the settings and close the dialog.

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



“Apply to laser marking system” tool

10. Disconnect the online connection with the laser marker.

11. 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.

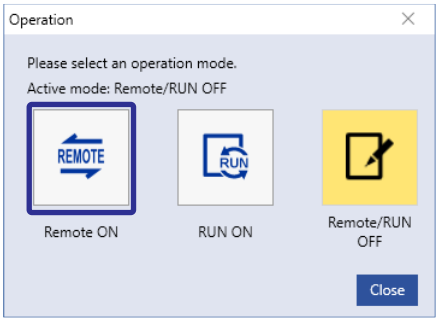
12. The control by the external device starts by switching the laser marker to the remote mode.

2-4-4 Remote mode settings

To control the laser marker externally via I/O, communication commands, or optional network (EtherNet/IP, PROFINET), 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 “2-4-2 General settings before external control” (P.30).

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)

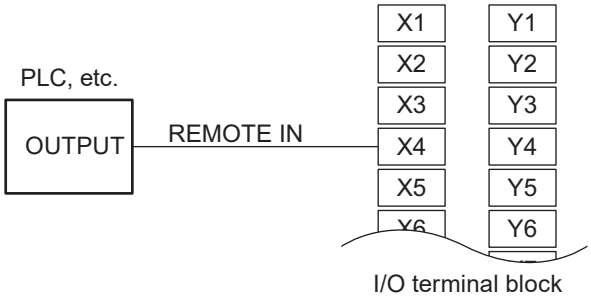
When you turn ON the key switch of the laser marker, the system starts in the remote mode. Use the operation tool of Laser Marker NAVI smart for releasing and resetting the remote mode.

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.
REMOTE IN can also be controlled by the optional network (EtherNet/IP, PROFINET).



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.

2-5 Configuration of PLC

The following settings are required to a PLC as a scanner device of EtherNet/IP communication.
For the setting details, please refer to the instruction manuals of your PLC.

■ Network configuration

Set IP address, subnet mask, and default gateway of the PLC confirming EtherNet/IP settings in System settings screen of Laser Marker NAVI smart.
Refer to “2-4-3 EtherNet/IP settings” (P. 33).

Reference

- In System settings screen of Laser Marker NAVI smart, settings of “Ethernet” and “EtherNet/IP” are different. For EtherNet/IP communication, confirm the “EtherNet/IP” settings.

■ Installation of EDS file

To setup the configuration for the laser marker, install the EDS file of the laser marker to your PLC.
To get the EDS file, refer to “1-3 Download of EDS File” (P. 13).
Check the firmware version of EthernNet/IP and select the EDS file to install.
For details on how to check the firmware version of the EtherNet/IP unit, refer to “2-4-3 EtherNet/IP settings” (P. 33).
After installation, identify the EDS file by the EDS file version or device revision.

Firmware version	1.35	1.58
EDS file version	1.2	1.3
Device revision	1.1	1.2

■ Settings for Implicit massaging

- Assign the address or variables.
- Configure and open connection.
- Set RPI (Requested packet interval) and data size. Set the value in the available range of the laser marker.

Refer to “3 Implicit Messaging” (P. 38).

■ Settings for Explicit massaging

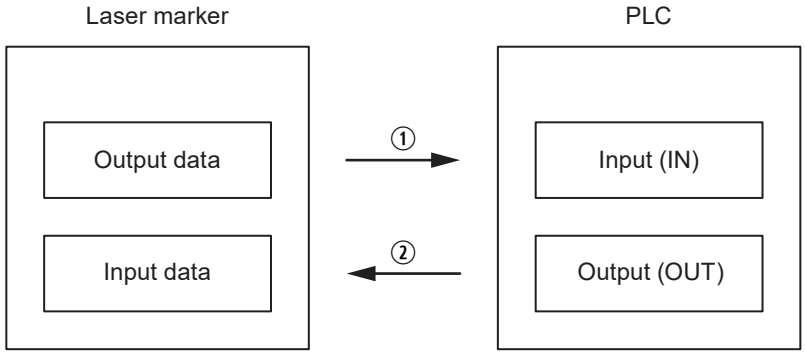
- Create the program.
- Confirm the available data size of your PLC and make sure that the value of “Explicit message data size” in System settings screen of Laser Marker NAVI smart is in this range. Refer to “2-4-3 EtherNet/IP settings” (P. 33).

For the general description and settings for EtherNet/IP communication, please refer to the instruction manuals of your PLC.

3 Implicit Messaging

3-1 General Description of Implicit Messaging

Implicit messaging is a communication method used to exchange the data between a PLC (scanner device) and the laser marker (adapter device) at regular intervals.
Data transmitted from the laser marker to a PLC (scanner device) is represented as “Laser marker -> PLC data” in this manual. In a PLC it is often represented as “Input” or “T -> O”.
Data transmitted from a PLC (scanner device) to the laser marker is represented as “PLC -> Laser marker data” in this manual. In a PLC it is often represented as “Output” or “O -> T”.



① Laser marker -> PLC (T -> O)
② PLC -> Laser marker (O -> T)

Implicit messaging is used for I/O control over EtherNet/IP. Besides the I/O control, it is also possible to read the laser marker's information and set the characters or position via Implicit messaging.
The communication period of Implicit message is called “RPI”, requested packet interval. The available range of the RPI for the laser marker is from 1ms to 3200ms. The RPI is configured by a PLC.

■ Communication specifications of Implicit Messaging

Application type	Exclusive-Owner connection Input-Only connection
Transport class	Class 1
Number of connections	Max. 4
RPI (Requested packet interval) *1	1.0ms to 3200.0ms
Maximum data size: Laser marker -> PLC	460 byte
Maximum data size: PLC -> Laser marker	320 byte

*1 : Considering the data processing time of the laser marker, it is recommended to set the RPI to 10ms or more.

3-2 Connection

3-2-1 Application type

To start Implicit messaging, it is required to open and establish the communication channel called “connection” by a PLC (scanner device).
The laser marker supports two connection application types, Exclusive-Owner connection and Input-Only connection. The connection application type is selected in a PLC.

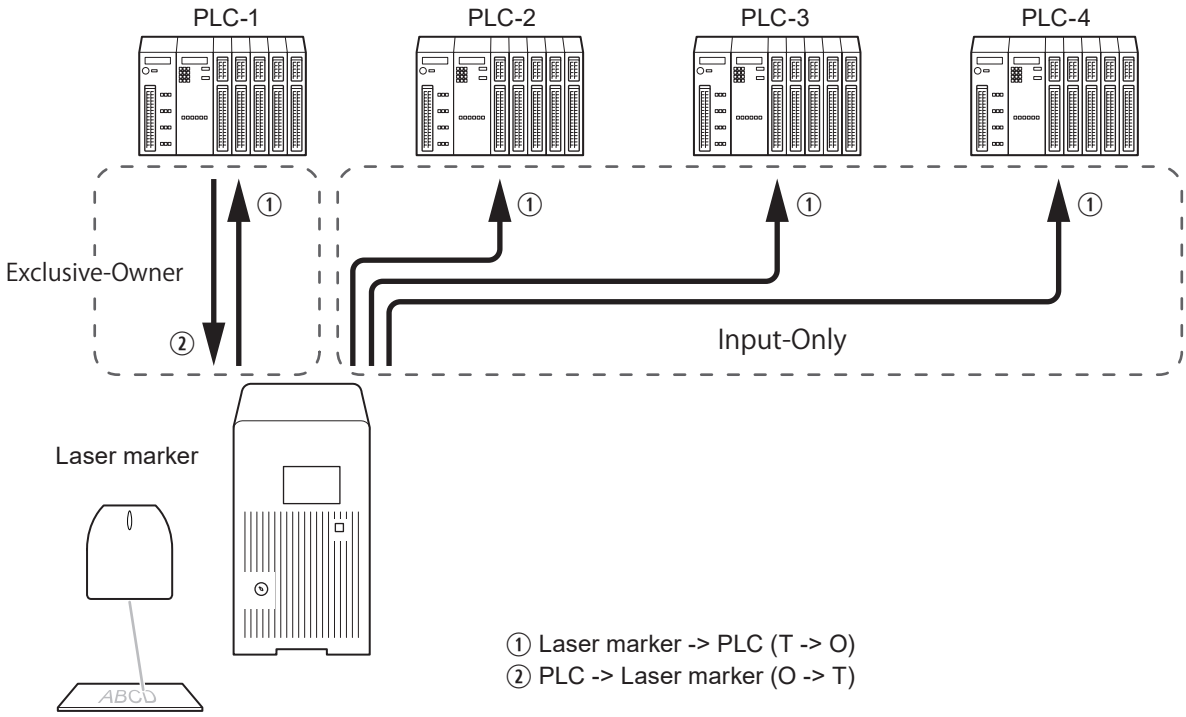
- Exclusive-Owner connection:
  Exclusive-Owner connection is used for interactive communication to transmit the data between the laser marker and a PLC. With this connection, you can control the laser marker by PLC -> Laser marker data, and monitor the laser marker by Laser marker -> PLC data.
- Input-Only connection:
  Input-Only connection is used for one-way communication to transmit the data from the laser marker to a PLC. With this connection, you can monitor the laser marker by Laser marker -> PLC data.

■ Connection establishment with two or more PLCs

Up to 4 connections can be established between the PLCs and the laser marker with either of the following combination.

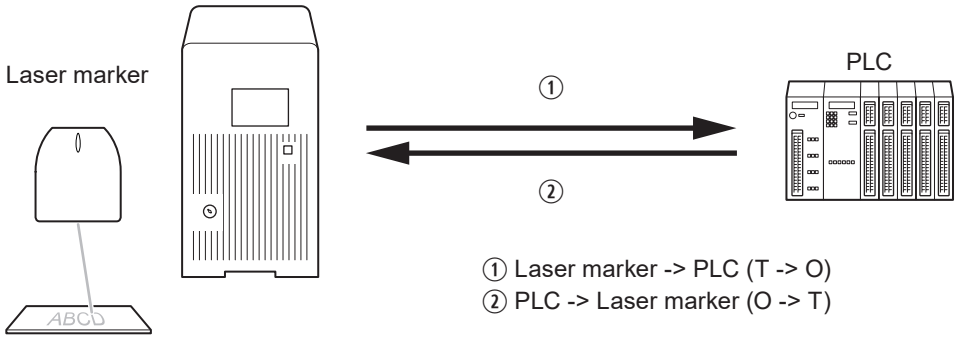
- One Exclusive-Owner connection and three Input-Only connections
- Four Input-Only connections

Exclusive-Owner connection can be established with only one PLC.
With Input-Only connection, maximum 4 connections can be established between the PLCs and laser marker.



3-2-2 Exclusive-Owner connection

Exclusive-Owner connection is used for interactive communication to transmit the data between the laser marker and a PLC. With this connection, you can control the laser marker by PLC -> Laser marker data, and monitor the laser marker by Laser marker -> PLC data.



■ Communication specifications of Exclusive-Owner connection

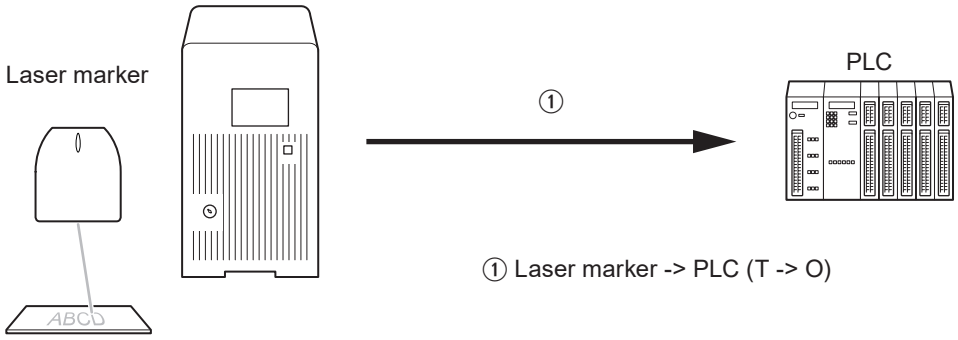
Trigger type			Cyclic, CoS (Change of State)
RPI (Requested packet interval) *1			1–3200ms (Initial value: 10ms)
Laser marker -> PLC	Maximum data size [byte]	Bit data	32
		Word data	428
		Total	460
	Setting range of data size [byte] *2		92–460 (Initial value: 460)
	Byte order		Little Endian
	Connection type		Point-to-point, Multicast
	Instance ID		100
PLC -> Laser marker	Maximum data size [byte]	Bit data	16
		Word data	304
		Total	320
	Setting range of data size [byte] *2		80–320 (Initial value: 320)
	Byte order		Little Endian
	Connection type		Point-to-point
	Instance ID		150

*1 : Considering the data processing time of the laser marker, it is recommended to set the RPI to 10ms or more.

*2 : The data size is specified with numbers of bytes from the top of the data order.

3-2-3 Input-Only connection

Input-Only connection is used for one-way communication to transmit the data from the laser marker to a PLC. With this connection, you can monitor the laser marker by Laser marker -> PLC data.



■ Communication specifications of Input-Only connection

Trigger type			Cyclic, CoS (Change of State)
RPI (Requested packet interval) *1			1–3200ms (Initial value: 10ms)
Laser marker -> PLC	Maximum data size [byte]	Bit data	32
		Word data	428
		Total	460
	Setting range of data size [byte] *2		92–460 (Initial value: 460)
	Byte order		Little Endian
	Connection type		Point-to-point, Multicast
	Instance ID		100

*1 : Considering the data processing time of the laser marker, it is recommended to set the RPI to 10ms or more.

*2 : The data size is specified with numbers of bytes from the top of the data order.

3-3 Data Map and Information

This section describes the data map addresses and information of Implicit message.

3-3-1 Overview of Laser marker -> PLC data

Contents of Laser marker -> PLC data (T -> O) are listed below.
Laser marker -> PLC data are used to monitor the laser marker settings and status.

Address		Data description	Access *1		Byte	Refer to
Word	Byte					
0–1	0–3	I/O terminal block output	Bit	8 bit x 4	4	P. 45
2–3	4–7	I/O connector output	Bit	8 bit x 4	4	P. 46
4–5	8–11	I/O terminal block input monitor	Bit	8 bit x 4	4	P. 47
6–9	12–19	I/O connector input monitor	Bit	8 bit x 8	8	P. 48
10–11	20–23	Control method of input signals	Bit	8 bit x 4	4	P. 50
12–13	24–27	Status for Explicit Message transmission	Bit	8 bit x 4	4	P. 51
14–15	28–31	System reservation A	Bit	8 bit x 4	4	P. 53
16–19	32–39	File number	Word	4 byte x 2	8	P. 53
20–23	40–47	Error code	Word	4 byte x 2	8	P. 53
24–29	48–59	Laser marker information	Word	4 byte x 3	12	P. 54
30–45	60–91	System reservation B	Word	4 byte x 8	32	P. 54
46–109	92–219	Counter value	Word	4 byte x 32	128	P. 55
110–229	220–459	Character strings	Word	1 byte x 240	240	P. 56
					Max. 460 byte	

*1 : The byte order for the word data is little endian.

Reference

- The data size can be specified in the range from 92-byte to 460-byte at your PLC.
- If you do not use “Counter value” and “Character strings”, it is possible to reduce or exclude this data from Laser marker -> PLC data when you set the data size smaller. The data size is specified with numbers of bytes from the top of the data order.
- To access Laser marker -> PLC data of Implicit message via Explicit messaging, use Assembly Object - Instance ID: 100. Refer to “4-4-2 Assembly Object (Class ID: 04 hex)” (P. 96).
- While the remote mode of the laser marker is OFF, the following items of Laser marker -> PLC data are not updated.
  - Status for Explicit Message transmission
  - Character strings

■ Access area by word (16 bit) offset

To access by Word, refer to the list below for the offset.

	Address		
	Offset (word)	Byte	
		bit 15 8	7 bit 0
Bit area	+0	Address 1	Address 0
	+1	Address 3	Address 2
	+2	Address 5	Address 4
	+3	Address 7	Address 6
	+4	Address 9	Address 8
	+5	Address 11	Address 10
	⋮	⋮	⋮
	+15	Address 31	Address 30
Word area	+16	Address 33	Address 32
	+17	Address 35	Address 34
	+18	Address 37	Address 36
	+19	Address 39	Address 38
	⋮	⋮	⋮
	+44	Address 89	Address 88
	+45	Address 91	Address 90
Word area (Variable-length)	+46	Address 93	Address 92
	⋮	⋮	⋮
	+229	Address 459	Address 458

3-3-2 Laser marker -> PLC data details

■ I/O terminal block output (Bit data: 8 bit x 4)

This module is used for monitoring laser marker's I/O terminal block output.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

Address		Bit	Data name	Data description	Terminal No.
Word	Byte				
0	0	0	REMOTE OUT	0: OFF 1: ON	Y4
		1	READY OUT	0: OFF 1: ON	Y5
		2	LASER STANDBY OUT	0: OFF 1: ON	Y6
		3	SYSTEM STANDBY OUT	0: OFF 1: ON	Y7
		4	SHUTTER CLOSE 1 OUT	0: OFF (Open) 1: ON (Close)	Y8
		5	SHUTTER CLOSE 2 OUT	0: OFF (Open) 1: ON (Close)	Y9
		6	PROCESSING OUT	0: OFF 1: ON	Y10
		7	PROCESSING END OUT	0: OFF 1: ON *1	Y11
	1	0	PROCESSING FAIL OUT	0: OFF 1: ON *1	Y12
		1	For LP-RF/LP-RV series: Reserve System reservation	0 (fixed)	—
			For LP-RH/LP-ZV series: MAINTENANCE OUT	0: OFF 1: ON	Y13
		2	WARNING OUT	0: OFF (Warning occurred) 1: ON (No warning)	Y14
		3	ALARM OUT	0: OFF (Alarm occurred) 1: ON (No alarm)	Y15
		4–5	Reserve System reservation	0 (fixed)	—
		6	LASER SUPPLY OUT	0: OFF 1: ON	Y20
		7	Reserve System reservation	0 (fixed)	—
1	2	0–7	Reserve System reservation	0 (fixed)	—
	3	0–7	Reserve System reservation	0 (fixed)	—

*1 : This is One-shot output. Set the output time on the system settings screen of Laser Marker NAVI smart.

■ I/O connector output (Bit data: 8 bit x 4)

This module is used for monitoring laser marker's I/O connector output.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

Address		Bit	Data name	Data description	Terminal No.
Word	Byte				
2	4	0	SET OK OUT	0: OFF 1: ON *1	28
		1	DATE GAP OUT	0: OFF 1: ON	29
		2	COUNT END A OUT *2	0: OFF 1: ON	30
		3	COUNT END B OUT *2	0: OFF 1: ON	31
		4	COUNT END C OUT *2	0: OFF 1: ON	32
		5	COUNT END D OUT *2	0: OFF 1: ON	33
		6	CHECK OK OUT	0: OFF 1: ON *1	34
		7	CHECK NG OUT	0: OFF 1: ON *1	35
	5	0	TIMING WAIT OUT	0: OFF 1: ON	36
		1	SCRIPTING OUT	0: OFF 1: ON	37
		2	DATA WAIT OUT	0: OFF 1: ON	38
		3	SHUTTER OPEN OUT	0: OFF (Shutter closed) 1: ON (Shutter opened)	39
		4	LASING OUT	0: OFF 1: ON	40
		5–7	Reserve System reservation	0 (fixed)	—
3	6	0–7	Reserve System reservation	0 (fixed)	—
	7	0–7	Reserve System reservation	0 (fixed)	—

*1 : This is One-shot output. Set the output time on the system settings screen of Laser Marker NAVI smart.

*2 : Assign the counter No. to COUNT END A OUT to COUNT END D OUT in system settings of Laser Marker NAVI smart. As the default setting, counter No. 0 to 3 are assigned to COUNT END A OUT to COUNT END D OUT respectively.

■ I/O terminal block input monitor (Bit data: 8 bit x 4)

This module is used for monitoring laser marker's I/O terminal block input.
For the input signals whose control methods are selected to EtherNet/IP at "Control method of input signals" in System settings screen of Laser Marker NAVI smart, the status of PLC -> Laser marker data set by EtherNet/IP is monitored.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

Address		Bit	Data name	Data description	Terminal ref. No.
Word	Byte				
4	8	0	REMOTE IN MONITOR	0: REMOTE IN = OFF 1: REMOTE IN = ON	X4
		1	TRIGGER IN MONITOR	0: TRIGGER IN = OFF 1: TRIGGER IN = ON	X5
		2	LASER SUPPLY IN MONITOR	0: LASER SUPPLY IN = OFF 1: LASER SUPPLY IN = ON	X6
		3	TARGET DETECTION IN MONITOR	0: TARGET DETECTION IN = OFF 1: TARGET DETECTION IN = ON	X7
		4	SHUTTER IN MONITOR	0: SHUTTER IN = OFF 1: SHUTTER IN = ON	X8
		5	SHUTTER ENABLE IN MONITOR	0: SHUTTER ENABLE IN = OFF 1: SHUTTER ENABLE IN = ON	X9
		6	LASER STOP IN MONITOR	0: LASER STOP IN = OFF (OPEN) 1: LASER STOP IN = ON (CLOSE)	X10
		7	LASER STOP IN MONITOR	0: LASER STOP IN = OFF (OPEN) 1: LASER STOP IN = ON (CLOSE)	X11
	9	0	ENCODER A IN MONITOR	0: ENCODER A IN = OFF 1: ENCODER A IN = ON	X13
		1	ENCODER B IN MONITOR	0: ENCODER B IN = OFF 1: ENCODER B IN = ON	X14
		2	ALARM RESET IN MONITOR	0: ALARM RESET IN = OFF 1: ALARM RESET IN = ON	X15
		3	INTERLOCK 1 IN MONITOR	0: INTERLOCK 1 = OPEN 1: INTERLOCK 1 = CLOSE	X16 – X17
		4	INTERLOCK 2 IN MONITOR	0: INTERLOCK 2 = OPEN 1: INTERLOCK 2 = CLOSE	X18 – X19
		5	REMOTE INTERLOCK IN MONITOR	0: REMOTE INTERLOCK IN = OFF (OPEN) 1: REMOTE INTERLOCK IN = ON (CLOSE)	X20
		6–7	Reserve System reservation	0 (fixed)	—
5	10	0–7	Reserve System reservation	0 (fixed)	—
	11	0–7	Reserve System reservation	0 (fixed)	—

Reference

- The ON/OFF status monitored by this module indicates the input status by the external device. It does not indicate the ON/OFF status of the laser marker's operation.

■ I/O connector input monitor (Bit data: 8 bit x 8)

This module is used for monitoring laser marker's I/O connector input.
For the input signals whose control methods are selected to EtherNet/IP at "Control method of input signals" in System settings screen of Laser Marker NAVI smart, the status of PLC -> Laser marker data set by EtherNet/IP is monitored.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

Address		Bit	Data name	Data description	Terminal ref. No.
Word	Byte				
6	12	0	SET IN MONITOR	0: SET IN = OFF 1: SET IN = ON	2
		1–7	Reserve System reservation	0 (fixed)	—
	13	0	D0 IN MONITOR	D0 IN to D15 IN MONITOR *1 0: Dn IN = OFF 1: Dn IN = ON	3
		1	D1 IN MONITOR		4
		2	D2 IN MONITOR		5
		3	D3 IN MONITOR		6
		4	D4 IN MONITOR		7
		5	D5 IN MONITOR		8
		6	D6 IN MONITOR		9
		7	D7 IN MONITOR		10
7	14	0	D8 IN MONITOR		11
		1	D9 IN MONITOR		12
		2	D10 IN MONITOR		13
		3	D11 IN MONITOR		14
		4	D12 IN MONITOR		15
		5	D13 IN MONITOR		16
		6	D14 IN MONITOR		17
		7	D15 IN MONITOR		18
	15	0	SELECT 0 IN MONITOR *1	0: SELECT 0 IN = OFF 1: SELECT 0 IN = ON	19
		1	SELECT 1 IN MONITOR *1	0: SELECT 1 IN = OFF 1: SELECT 1 IN = ON	20
		2	SELECT 2 IN MONITOR *1	0: SELECT 2 IN = OFF 1: SELECT 2 IN = ON	21
		3–6	Reserve System reservation	0 (fixed)	—
		7	EX SELECT IN MONITOR *1, *2	0: EX SELECT IN = OFF 1: EX SELECT IN = ON	—
8	16	0	TIME HOLD IN MONITOR	0: TIME HOLD IN = OFF 1: TIME HOLD IN = ON	22
		1	GUIDE IN MONITOR	0: GUIDE IN = OFF 1: GUIDE IN = ON	23
		2	TIMING IN MONITOR	0: TIMING IN = OFF 1: TIMING IN = ON	24
		3–7	Reserve System reservation	0 (fixed)	—

Address		Bit	Data name	Data description	Terminal ref. No.
Word	Byte				
8	17	0–7	Reserve System reservation	0 (fixed)	—
9	18	0–7	Reserve System reservation	0 (fixed)	—
	19	0–7	Reserve System reservation	0 (fixed)	—

*1 : Refer to “I/O connector input (Bit data: 8 bit x 8)” (P. 60) for what the value for D0 IN–D15 IN and SELECT 0 IN–SELECT 2 IN, EX SELECT IN represents.

*2 : EX SELECT IN (Expansion Select Input) is EtherNet/IP-only function. This input does not exist in physical I/O connector.

Reference

- The ON/OFF status monitored by this module indicates the input status by the external device. It does not indicate the ON/OFF status of the laser marker's operation.

■ Control method of input signals (Bit data: 8 bit x 4)

This module is used for monitoring the settings of “Control method of input signals” in System settings screen of Laser Marker NAVI smart.
Refer to “2-4-3 EtherNet/IP settings” (P. 33).

Address		Bit	Data name	Data description
Word	Byte			
10	20	0	REMOTE IN CONFIG	0: I/O 1: EtherNet/IP
		1	TRIGGER IN CONFIG	
		2	LASER SUPPLY IN CONFIG	
		3	Reserve System reservation	0 (fixed)
		4	SHUTTER IN CONFIG	0: I/O 1: EtherNet/IP
		5	SHUTTER ENABLE IN CONFIG	
		6	LASER STOP IN CONFIG	
		7	ENCODER IN CONFIG (ENCODER A, B IN configuration)	
	21	0	ALARM RESET IN CONFIG	
		1	Reserve System reservation	0 (fixed)
		2	TARGET DETECTION IN CONFIG	0: I/O 1: EtherNet/IP
		3–7	Reserve System reservation	0 (fixed)
11	22	0	SET IN CONFIG	0: I/O 1: EtherNet/IP
		1	D IN CONFIG (D0 IN–D15 IN configuration)	
		2	SELECT IN CONFIG (SELECT 0 IN–SELECT 2 IN configuration)	
		3–7	Reserve System reservation	0 (fixed)
	23	0	TIME HOLD IN CONFIG	0: I/O 1: EtherNet/IP
		1	GUIDE IN CONFIG	
		2	TIMING IN CONFIG	
		3–7	Reserve System reservation	0 (fixed)

Reference

- The input signals whose control methods are selected to EtherNet/IP can be controlled by PLC -> Laser marker data set by EtherNet/IP. Refer to “3-3-4 PLC -> Laser marker data details” (P. 58).

■ Status for Explicit Message transmission (Bit data: 8 bit x 4)

In order to access the setting data of the laser marker by explicit messaging, this module is used to monitor the access timing for explicit messaging.
For the details of Explicit messaging, refer to “4-3 LP Object (Class ID: A2 hex)” (P. 77).

Address		Bit	Data name	Data description
Word	Byte			
12	24	0	COMMAND RESPONSE	0: Command not received 1: Command received *1
		1	COMMAND IGNORED	1: Command ignored *2
		2–3	Reserve System reservation	0 (fixed)
		4	OFFSET DATA *3	0: Not set 1: Set
		5	RANK DATA *4	0: Not set 1: Set
		6–7	Reserve System reservation	0 (fixed)
	25	0	SIN00 DATA	Setting status of characters (SIN command specified) *5 0: Not set 1: Set “SIN00 DATA” to “SIN15 DATA” represents the settings status of the character number 0 to 15 respectively.
		1	SIN01 DATA	
		2	SIN02 DATA	
		3	SIN03 DATA	
		4	SIN04 DATA	
		5	SIN05 DATA	
		6	SIN06 DATA	
		7	SIN07 DATA	
13	26	0	SIN08 DATA	
		1	SIN09 DATA	
		2	SIN10 DATA	
		3	SIN11 DATA	
		4	SIN12 DATA	
		5	SIN13 DATA	
		6	SIN14 DATA	
		7	SIN15 DATA	
	27	0–7	Reserve System reservation	0 (fixed)

*1 : When the laser marker receives the command data set by Explicit messaging of LP Object - Instance ID 5000, COMMAND RESPONSE turns to 1. Even if the command is received but not accepted due to the wrong format or conditions, for which the laser marker has a negative response, COMMAND RESPONSE turns to 1.
When COMMAND RESPONSE is 1, you can read out the command response data by Explicit messaging of LP Object - Instance ID 1400. Refer to “4-3-7 Read command response data” (P. 87).

*2 : If the laser marker cannot receive the command request data set by Explicit messaging of LP Object - Instance ID 5000, COMMAND IGNORED turns to 1. In this case, do the followings:
- Turn on the remote mode.
- Set “OFF” to “Compatible mode” in System settings screen of Laser Marker NAVI smart.

*3 : When the external offset value is set from I/O, SEO command, or EtherNet/IP, OFFSET DATA turns to 1.
When OFFSET DATA is 1, you can read out the offset value by Explicit messaging of LP Object - Instance ID 1000 to 1004. Refer to “4-3-3 Read external offset values” (P. 79).

*4 : When the registered characters are set from I/O or EtherNet/IP, RANK DATA turns to 1.
When RANK DATA is 1, you can read out the registered characters by Explicit messaging of LP Object - Instance ID 1200 to 1203. Refer to “4-3-5 Read registered characters” (P. 83).

*5 : When the characters are set from SIN command or Implicit message (Corresponding to SIN command) of EtherNet/IP, SINxx DATA turns to 1.
When SINxx DATA is 1, you can read out SIN command specified characters of the corresponding data number by Explicit messaging of LP Object - Instance ID 1100 to 1115. Refer to “4-3-4 Read SIN command specified characters” (P. 81).

Reference

- While the remote mode of the laser marker is OFF, the data of Status for Explicit Message transmission are not updated.

■ System reservation A (Bit data: 8 bit x 4)

System reserved module.

Address		Bit	Data name	Data description
Word	Byte			
14	28	0–7	Reserve System reservation	0 (fixed)
	29	0–7		
15	30	0–7		
	31	0–7		

■ File number (Word data: 4 byte x 2)

This module is used for monitoring laser marker's file number.

Address		Bit	Data name	Data description
Word	Byte			
16–17	32–35	0–31	FILE NO	0–9999
18–19	36–39	0–31	Reserve System reservation	0 (fixed)

■ Error code (Word data: 4 byte x 2)

This module is used for monitoring laser marker's error status.
If the error occurs, the error code is read.

Address		Bit	Data name	Data description
Word	Byte			
20–21	40–43	0–31	ERROR NO	0: No error 1–999: Error code
22–23	44–47	0–31	SUB ERROR NO *1	0–65535: Sub error code

*1 : Sub error code is used by our service representative only.

■ Laser marker information (Word data: 4 byte x 3)

This module is used to read the identification information of the laser marker.

Address		Bit	Data name	Data description
Word	Byte			
24–25	48–51	0–31	DEVICE TYPE	Model name of laser marker 0: LP-RF series 1: LP-RV series 2: LP-ZV series 3: LP-RH series
26–27	52–55	0–31	DEVICE VERSION	Controller version of laser marker E.g. Version 1.6.01 is read as 1601.
28–29	56–59	0–31	Reserve System reservation	0 (fixed)

■ System reservation B (Word data: 4 byte x 8)

System reserved module.

Address		Bit	Data name	Data description
Word	Byte			
30–31	60–63	0–31	Reserve System reservation	0 (fixed)
32–33	64–67	0–31		
34–35	68–71	0–31		
36–37	72–75	0–31		
38–39	76–79	0–31		
40–41	80–83	0–31		
42–43	84–87	0–31		
44–45	88–91	0–31		

■ Counter value (Word data: 4 byte x 32)

This module is used to monitor the counter values when you use the counter function of the laser marker.
The current values of the counter number 0 to 31 are read respectively.

Address		Bit	Data name	Data description
Word	Byte			
46–47	92–95	0–31	COUNTER 0	Counter value: 0–999999999 The counter value of the unused counter number is indicated 0.
48–49	96–99	0–31	COUNTER 1	
50–51	100–103	0–31	COUNTER 2	
52–53	104–107	0–31	COUNTER 3	
54–55	108–111	0–31	COUNTER 4	
56–57	112–115	0–31	COUNTER 5	
58–59	116–119	0–31	COUNTER 6	
60–61	120–123	0–31	COUNTER 7	
62–63	124–127	0–31	COUNTER 8	
64–65	128–131	0–31	COUNTER 9	
66–67	132–135	0–31	COUNTER 10	
68–69	136–139	0–31	COUNTER 11	
70–71	140–143	0–31	COUNTER 12	
72–73	144–147	0–31	COUNTER 13	
74–75	148–151	0–31	COUNTER 14	
76–77	152–155	0–31	COUNTER 15	
78–79	156–159	0–31	COUNTER 16	
80–81	160–163	0–31	COUNTER 17	
82–83	164–167	0–31	COUNTER 18	
84–85	168–171	0–31	COUNTER 19	
86–87	172–175	0–31	COUNTER 20	
88–89	176–179	0–31	COUNTER 21	
90–91	180–183	0–31	COUNTER 22	
92–93	184–187	0–31	COUNTER 23	
94–95	188–191	0–31	COUNTER 24	
96–97	192–195	0–31	COUNTER 25	
98–99	196–199	0–31	COUNTER 26	
100–101	200–203	0–31	COUNTER 27	
102–103	204–207	0–31	COUNTER 28	
104–105	208–211	0–31	COUNTER 29	
106–107	212–215	0–31	COUNTER 30	
108–109	216–219	0–31	COUNTER 31	

Reference

- If you do not use this function, it is possible to exclude this data from Laser marker -> PLC data when you set the data size smaller at your PLC. In this case “Character strings” data are also excluded.

■ Character strings (Word data: 1 byte x 240)

When the readout of character strings is requested in PLC -> Laser marker data with SELECT 0 IN to SELECT 2 IN and EX SELECT IN, the characters set in the specified object number is read in Laser marker -> PLC data.
For the setting parameters and timing chart to use this function, refer to “3-4-1 Read character strings” (P. 65).
This is applicable to character objects (excluding reference list), bar code/2D code objects.
Characters are assigned from the beginning of the address by 1-byte and can be read up to 240-byte. If the characters are less than 240-byte, the unused filed is filled with 00 (hex).
If readout request was not issued, the value read from this module is all 00 (hex).

Address		Bit	Data name	Data description
Word	Byte			
110	220	0–7	TEXT	Character strings max. 240 byte: In the readout data, ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings are used.
	221	0–7	TEXT	
⋮	⋮	⋮	⋮	
229	458	0–7	TEXT	
	459	0–7	TEXT	

Reference

- It is possible to reduce or exclude this data from Laser marker -> PLC data when you set the data size smaller at your PLC.
- If the object type set in the specified object number is not either the character or the bar code/2D code, SET OK OUT does not turn on and the readout characters are not updated.
- In the readout data, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used.
- If any characters which belong to the non-supported character code are in the data, SET OK OUT in I/O connector does not turn on and the readout characters are not updated.
- For the composite code of the bar code object, only the characters set in 1D side is read with this function.
- Characters in TrueType object and the reference list type character object cannot be read with this function.
- The maximum 240-byte characters can be read. If more than 240-byte characters are set in the specified object number, data over 240-byte is not read.
- The control codes or “FNC1” which are used in the strings of Bar code/2D code objects are read by following the settings of “Input method for control codes” specified in the system settings.
- While the remote mode of the laser marker is OFF, the data of Character strings cannot be read out.
- If you set “Latin-1” for “Encoding for non-ASCII characters” in the system settings screen, “\” (backslash or Yen sign) is replaced to the alternative character “\\” in the read out strings.

3-3-3 Overview of PLC -> Laser marker data

Contents of PLC -> Laser marker data (O -> T) are listed below.
PLC -> Laser marker data are used to control and set the laser marker.

Address		Data description	Address *1		Byte	Refer to
Word	Byte					
0–1	0–3	I/O terminal block input	Bit	8 bit x 4	4	P. 58
2–5	4–11	I/O connector input	Bit	8 bit x 8	8	P. 60
6–7	12–15	System reservation A	Bit	8 bit x 4	4	P. 63
8–23	16–47	External offset (Corresponding to SEO command)	Word	4 byte x 8	32	P. 63
24–39	48–79	System reservation B	Word	4 byte x 8	32	P. 64
40–159	80–319	Character input (Corresponding to SIN command)	Word	1 byte x 240	240	P. 64
					Max. 320 byte	

*1 : The byte order for the word data is little endian.

Reference

- The data size can be specified in the range from 80-byte to 320-byte at your PLC.
- If you do not use “character input (corresponding to SIN command)”, it is possible to reduce or exclude this data from PLC -> Laser marker data when you set the data size smaller. The data size is specified with numbers of bytes from the top of the data order.
- To access PLC -> Laser marker data of Implicit message via Explicit messaging, use Assembly Object - Instance ID: 150. Refer to “4-4-2 Assembly Object (Class ID: 04 hex)” (P. 96).
- Settings via PLC -> Laser marker data are applied to the laser marker basically when the remote mode is ON. As an exception, the some input signals are available during remote mode OFF. Refer to “I/O terminal block input (Bit data: 8 bit x 4)” (P. 58).

■ Access area by word (16 bit) offset

To access by Word, refer to the list below for the offset.

	Address		
	Offset (word)	Bit	
		bit 15 8	7 bit 0
Bit area	+0	Address 1	Address 0
	+1	Address 3	Address 2
	+2	Address 5	Address 4
	+3	Address 7	Address 6
	+4	Address 9	Address 8
	+5	Address 11	Address 10
	+6	Address 13	Address 12
	+7	Address 15	Address 14
Word area	+8	Address 17	Address 16
	+9	Address 19	Address 18
	+10	Address 21	Address 20
	+11	Address 23	Address 22
	⋮	⋮	⋮
	+39	Address 79	Address 78
Word area (Variable-length)	+40	Address 81	Address 80
	⋮	⋮	⋮
	+159	Address 319	Address 318

3-3-4 PLC -> Laser marker data details

■ I/O terminal block input (Bit data: 8 bit x 4)

This module is used for controlling laser marker's I/O terminal block input.
In order to use this function, set "Control method of input signals" to "EtherNet/IP" in System settings screen of Laser Marker NAVI smart. Refer to "2-4-3 EtherNet/IP settings" (P. 33).
For the input signals whose control methods are selected to I/O, the settings in this module are ignored.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

Address		Bit	Data name	Data description	Terminal No.
Word	Byte				
0	0	0	REMOTE IN	0: OFF 1: ON	X4
		1	TRIGGER IN	0: OFF 1: ON *1	X5
		2	LASER SUPPLY IN	0: OFF 1: ON	X6
		3	TARGET DETECTION IN	0: OFF 1: ON	X7
		4	SHUTTER IN	0: OFF 1: ON	X8
		5	SHUTTER ENABLE IN	0: OFF 1: ON	X9
		6	LASER STOP IN	0: OFF (OPEN: Laser stopped) 1: ON (CLOSE)	X10
		7	LASER STOP IN	0: OFF (OPEN: Laser stopped) 1: ON (CLOSE)	X11
	1	0	ENCODER A IN	0: OFF 1: ON *2	X13
		1	ENCODER B IN	0: OFF 1: ON *2	X14
		2	ALARM RESET IN	0: OFF 1: ON *3	X15
		3–7	Reserve System reservation	0 (fixed)	—
1	2	0–7	Reserve System reservation	0 (fixed)	—
	3	0–7	Reserve System reservation	0 (fixed)	—

*1 : The input operation is executed at the timing of the edge of turning ON.

*2 : The speed is detected by ON/OFF cycle.

*3 : Keep ON status for 100ms or more.

Reference

- The input signals of INTERLOCK 1 (X16, X17), INTERLOCK 2 (X18, X19) and REMOTE INTERLOCK IN (X20) cannot be controlled via EtherNet/IP.
- Set 0 for the input signals whose control methods are selected to I/O at “Control method of input signals” in System settings screen of Laser Marker NAVI smart.
- Settings via PLC -> Laser marker data are applied to the laser marker basically when the remote mode is ON. As an exception, the following input signals are available during remote mode OFF.
  - REMOTE IN
  - TARGET DETECTION IN
  - LASER STOP IN
  - ENCODER A IN
  - ENCODER B IN
  - ALARM RESET IN
  - TIME HOLD IN

■ I/O connector input (Bit data: 8 bit x 8)

This module is used for controlling laser marker's I/O connector input.
In order to use this function, set "Control method of input signals" to "EtherNet/IP" in System settings screen of Laser Marker NAVI smart. Refer to "2-4-3 EtherNet/IP settings" (P. 33).
For the input signals whose control methods are selected to I/O, the settings in this module are ignored.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

Address		Bit	Data name	Data description	Terminal No.
Word	Byte				
2	4	0	SET IN	0: OFF 1: ON *1	2
		1–7	Reserve System reservation	0: OFF 1: ON	—
	5	0	D0 IN	Dn: Number input *2 0: OFF 1: ON	3
		1	D1 IN		4
		2	D2 IN		5
		3	D3 IN		6
		4	D4 IN		7
		5	D5 IN		8
		6	D6 IN		9
		7	D7 IN		10
3	6	0	D8 IN		11
		1	D9 IN		12
		2	D10 IN		13
		3	D11 IN		14
		4	D12 IN		15
		5	D13 IN		16
		6	D14 IN		17
		7	D15 IN		18
	7	0	SELECT 0 IN *2	0: OFF 1: ON	19
		1	SELECT 1 IN *2	0: OFF 1: ON	20
		2	SELECT 2 IN *2	0: OFF 1: ON	21
		3–6	Reserve System reservation	0: OFF 1: ON	—
		7	EX SELECT IN *2, *3	0: OFF 1: ON	—
4	8	0	TIME HOLD IN	0: OFF 1: ON	22
		1	GUIDE IN *4	0: OFF 1: ON	23
		2	TIMING IN	0: OFF 1: ON *1	24
		3–7	Reserve System reservation	0 (fixed)	—
	9	0–7	Reserve System reservation	0 (fixed)	—

Address		Bit	Data name	Data description	Terminal No.
Word	Byte				
5	10	0–7	Reserve System reservation	0 (fixed)	—
	11	0–7	Reserve System reservation	0 (fixed)	—

*1 : The input operation is executed at the timing of the edge of turning ON.

*2 : Refer to “SELECT IN and D IN (Number input) details” (P. 62) for what the value for D0 IN–D15 IN and SELECT 0 IN– SELECT 2 IN, EX SELECT IN represents.

*3 : EX SELECT IN (Expansion Select Input) is EtherNet/IP-only function. This input does not exist in physical I/O connector.

*4 : The operation mode for guide laser is specified by SELECT 0 IN to SELECT 2 IN. Refer to “Setup/Maintenance Guide” of the laser marker for details.

SELECT IN and D IN (Number input) details

With SELECT 0 IN to SELECT 2 IN and EX SELECT IN, the setting target of D0 IN to D15 IN are specified as follows.

Dn IN (number input) representation	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN	EX SELECT IN
File number	0	0	0	0
Count increment correction	0	1	0	0
Count decrement correction	1	1	0	0
Counter number to reset	0	0	1	0
Data number of registered characters/ external offset	1	0	0	0
Object number for character string readout	1	0	0	1
Setting parameter of external offset (corresponding to SEO)	0	1	0	1
Character number of input characters (corresponding to SIN)	0	0	0	1

The following functions are same as I/O connector. For the input details and timing chart, refer to “Setup/Maintenance Guide” of the laser marker.

- File number
- Count increment correction / Count decrement correction
- Counter number to reset
- Data number of registered characters/external offset

The following settings are EtherNet/IP-only functions. The setting of D0 IN to D15 IN are indicated below. For details, refer to “3-4 Parameter Details and Timing Chart” (P. 65).

- Read character strings

Data name	Data description
D0 IN to D10 IN	Specify the object number 0 to 1999 in the binary format with D0 to D10. D0 is the least significant bit (LSB).
D11 IN to D15 IN	Set 0 to all.

- External offset (Corresponding to SEO command)

Data name	Data description
D0 IN	Set 1 to specify X-movement.
D1 IN	Set 1 to specify Y-movement.
D2 IN	For LP-RH/LP-RF/LP-RV series: 0 (System reservation)
	For LP-ZV series: Set 1 to specify Z-movement.
D3 IN	Set 1 to specify Rotation movement.
D4 IN	Set 1 to specify Laser power correction.
D5 IN to D15 IN	Set 0 to all.

- Character input (Corresponding to SIN command)

Data name	Data description
D0 IN to D3 IN	Specify the character number 0 to 15 in the binary format with D0 to D3. D0 is the least significant bit (LSB).
D4 IN to D15 IN	Set 0 to all.

■ System reservation A (Bit data: 8 bit x 4)

System reserved module. Do not use.

Address		Bit	Data name	Data description
Word	Byte			
6	12	0–7	Reserve System reservation	0 (fixed)
	13	0–7		
7	14	0–7		
	15	0–7		

■ External offset (Corresponding to SEO command) (Word data: 4 byte x 8)

This module is used to set position and power correction for files in which the external offset function with “Using SEO command” is set.
This module is available when SELECT 0 IN to SELECT 2 IN and EX SELECT IN of I/O connector are set to enable the external offset (corresponding to SEO command).
I/O connector’s number input (Dn IN) is used to specify which parameters to set.
For the setting parameters and timing chart to use this function, refer to “3-4-2 External offset (Corresponding to SEO command)” (P. 67).
If you do not use this function, set all parameters to 0.

Address		Bit	Data name	Data description
Word	Byte			
8–9	16–19	0–31	Parameter 1	X-movement [µm] -999999–999999
10–11	20–23	0–31	Parameter 2	Y-movement [µm] -999999–999999
12–13	24–27	0–31	Parameter 3	For LP-RH/LP-RF/LP-RV series: System reservation 0 (fixed)
				For LP-ZV series: Z-movement [µm] -25000–25000
14–15	28–31	0–31	Parameter 4	Rotation movement [1/1000 degree] -180000–180000
16–17	32–35	0–31	Parameter 5	Laser power correction [%] 0–999
18–19	36–39	0–31	Parameter 6	System reservation 0 (fixed)
20–21	40–43	0–31	Parameter 7	System reservation 0 (fixed)
22–23	44–47	0–31	Parameter 8	System reservation 0 (fixed)

Reference

- This function corresponds to the communication command “SEO” and is used to set the offset value via Implicit messaging without using the command. For the details of SEO command, refer to “Serial Communication Command Guide” of the laser marker.
- The input of this function can be accepted only when the shutter is open.
- When the all required parameters are set properly, SET OK OUT in I/O connector of Laser marker -> PLC data turns on.

■ System reservation B (Word data: 4 byte x 8)

System reserved module. Do not use.

Address		Bit	Data name	Data description
Word	Byte			
24–25	48–51	0–31	Reserve System reservation	0 (fixed)
26–27	52–55	0–31		
28–29	56–59	0–31		
30–31	60–63	0–31		
32–33	64–67	0–31		
34–35	68–71	0–31		
36–37	72–75	0–31		
38–39	76–79	0–31		

■ Character input (Corresponding to SIN command) (Word data: 1 byte x 240)

This module is used to set characters for the character object or bar code/2D code object in which “Characters specified by SIN command” of the functional character is set.
This module is available when SELECT 0 IN to SELECT 2 IN and EX SELECT IN of I/O connector are set to enable the character input (corresponding to SIN command).
I/O connector’s number input (Dn IN) is used to specify which character number to set.
Characters are assigned from the top of the address by 1-byte and can be set up to 198-byte (99 characters). Fill the unused filed all with 00 (hex).
For the setting parameters and timing chart to use this function, refer to “3-4-3 Character input (Corresponding to SIN command)” (P. 71).
If you do not use this function, fill the all data with 00 (hex). Or it is possible to exclude this data from PLC -> Laser marker data when you set the data size smaller at your PLC.

Address		Bit	Data name	Data description
Word	Byte			
40	80	0–7	TEXT	Character strings max. 198 byte (max. 99 characters): Set characters using ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings.
	81	0–7	TEXT	
⋮	⋮	⋮	⋮	
138	276	0–7	TEXT	
	277	0–7	TEXT	
139	278	0–7	TEXT (Not used)	Fill with 00 (hex).
	279	0–7	TEXT (Not used)	
⋮	⋮	⋮	⋮	
159	318	0–7	TEXT (Not used)	
	319	0–7	TEXT (Not used)	

Reference

- This function corresponds to the communication command “SIN” and is used to set the characters via Implicit messaging without using the command. For the details of SIN command, refer to “Serial Communication Command Guide” of the laser marker.
- If any characters which belong to the non-supported character code are in the data, SET OK OUT in I/O connector of Laser marker -> PLC data does not turn on.
- For the bar code/2D code objects to input the control codes or “FNC1” in the code data, follow the settings of “Input method for control codes” specified in the system settings.
- The input of this function can be accepted only when the shutter is open.
- When the all required parameters are set properly, SET OK OUT in I/O connector of Laser marker -> PLC data turns on.
- If you set “Latin-1” for “Encoding for non-ASCII characters” in the system settings screen, replace “\” (backslash or Yen sign) to the alternative character “\\” in the setting strings.

3-4 Parameter Details and Timing Chart

This section explains the input method and timing chart of EtherNet/IP-only functions in Implicit messaging.
The functions not described here work same as I/O control. For them, refer to “Setup/Maintenance Guide” of the laser marker.

3-4-1 Read character strings

When the readout of character strings is requested in PLC -> Laser marker data with SELECT 0 IN to SELECT 2 IN and EX SELECT IN, the characters set in the specified object number is read in Laser marker -> PLC data.

■ How to set the data

PLC -> Laser marker data

Address		Bit	Data name	Value	Description
Word	Byte				
2	4	0	SET IN	0→1	To set the readout request, turn SET IN on holding the input status of Dn INs and SELECT INs.
		1–7	Reserve	0	
	5	0–7	D0 IN–D7 IN	0–1999 (0–07CF hex)	Specify the object number 0 to 1999 in the binary format. D0 is the least significant bit (LSB).
3	6	0–7	D8 IN–D15 IN		
	7	0	SELECT 0 IN	1	To read character strings, set SELECT INs with this combination.
		1	SELECT 1 IN	0	
		2	SELECT 2 IN	0	
		3–6	Reserve	0	
		7	EX SELECT IN	1	

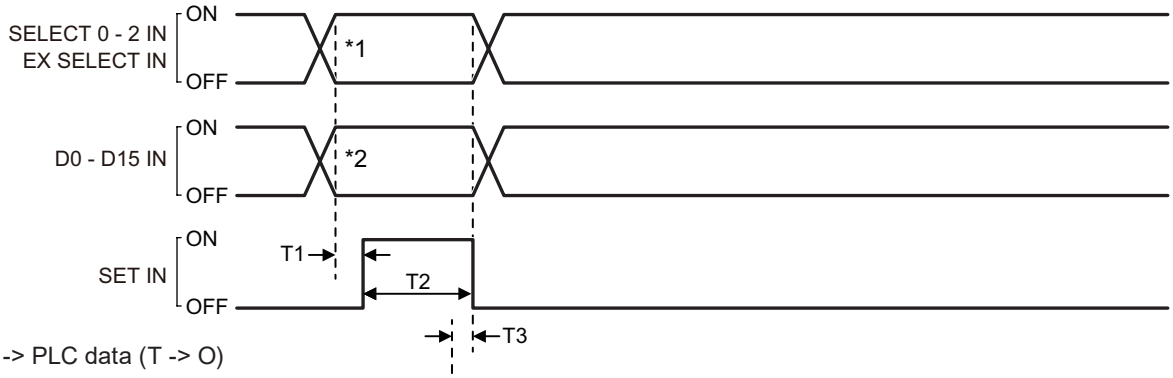
Laser marker -> PLC data

Address		Bit	Data name	Value	Description
Word	Byte				
2	4	0	SET OK OUT	0→1→0	SET OK OUT turns on when the setting by SET IN has completed. *1
110	220	—	TEXT	—	Character strings max. 240-byte: In the readout data, ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings are used. Characters are allocated from the beginning of the address by 1-byte. The unused filed is filled with 00 (hex).
	221	—		—	
⋮	⋮	⋮	⋮	⋮	
229	458	—	TEXT	—	
	459	—		—	

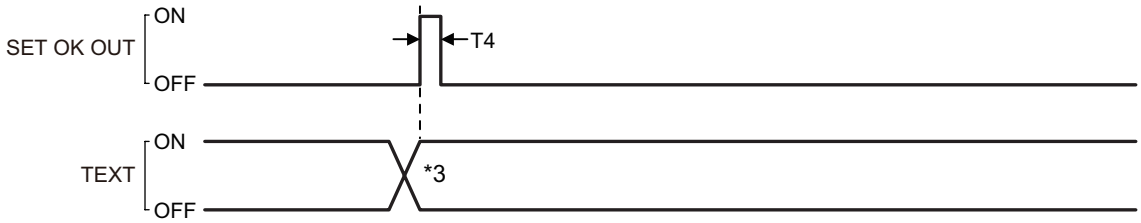
*1 : This is One-shot output. Set the output time on the system settings screen of Laser Marker NAVI smart.

■ Timing chart

PLC -> Laser marker data (O -> T)



Laser marker -> PLC data (T -> O)



Item	Time	Remarks
T1	0.5 ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN, EX SELECT IN and D0 IN to D15 IN, turn on SET IN.
T2	Max. 1 sec.	If you turn on SET IN for 1 second or more, but SET OK OUT does not turn on, there is a reason that the setting cannot be accepted. In this case, the setting by SELECT IN and Dn IN are ignored.
T3	0 ms or more	Keep the input until SET OK OUT turns on.
T4	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.

*1 : To read character strings, set SELECT 0 IN to SELECT 2 IN and EX SELECT IN as follows.

Function	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN	EX SELECT IN
Read character strings	1	0	0	1

*2 : Specify the object number 0 to 1999 in the binary format with D0 to D15.

*3 : Characters set in the specified object number are read.

Reference

- If the Character object or Bar code/2D code object is not set in the selected object number, SET OK OUT does not turn on.
- If any characters which belong to the non-supported character code are in the data, SET OK OUT does not turn on.
- If SET OK OUT does not turn on, the readout characters are not updated.

3-4-2 External offset (Corresponding to SEO command)

For the files in which the external offset function with “Using SEO command” is set, set position and power correction in PLC -> Laser marker data.
Specify the parameter to offset with SELECT 0 IN to SELECT 2 IN, EX SELECT IN and Dn IN for number input, then set the offset value.

■ How to set the data

PLC -> Laser marker data

Address		Bit	Data name	Value	Description
Word	Byte				
2	4	0	SET IN	0→1	To determine the external offset setting, turn SET IN on holding the input status of Dn INs, SELECT INs and Parameters.
		1–7	Reserve	0	
	5	0	D0 IN	0 or 1	Set 1 to specify X-movement.
		1	D1 IN	0 or 1	Set 1 to specify Y-movement.
		2	D2 IN	0 or 1	For LP-RH/LP-RF/LP-RV series: Set 0. (System reservation)
					For LP-ZV series: Set 1 to specify Z-movement.
		3	D3 IN	0 or 1	Set 1 to specify Rotation movement.
		4	D4 IN	0 or 1	Set 1 to specify Laser power correction.
		5–7	D5 IN–D7 IN	0	Set 0 to all.
3	6	0–7	D8 IN–D15 IN	0	Set 0 to all.
	7	0	SELECT 0 IN	0	To set external offset (corresponding to SEO command), set SELECT INs with this combination.
		1	SELECT 1 IN	1	
		2	SELECT 2 IN	0	
		3–6	Reserve	0	
		7	EX SELECT IN	1	
8–9	16–19	—	Parameter 1	-999999–999999	X-movement [μm] When D0 IN is 1, set the value in the binary format. When D0 IN is 0, set 0.
10–11	20–23	—	Parameter 2	-999999–999999	Y-movement [μm] When D1 IN is 1, set the value in the binary format. When D1 IN is 0, set 0.
12–13	24–27	—	Parameter 3	0 or -25000–25000	For LP-RH/LP-RF/LP-RV series: Set 0. (System reservation)
					For LP-ZV series: Z-movement [μm] When D2 IN is 1, set the value in the binary format. When D2 IN is 0, set 0.
14–15	28–31	—	Parameter 4	-180000–180000	Rotation movement [1/1000 degree] When D3 IN is 1, set the value in the binary format. When D3 IN is 0, set 0.
16–17	32–35	—	Parameter 5	0–999	Laser power correction [%] When D4 IN is 1, set the value in the binary format. When D4 IN is 0, set 0.
18–19	36–39	—	Parameter 6	0 (fixed)	Set 0 to all.

Address		Bit	Data name	Value	Description
Word	Byte				
20–21	40–43	—	Parameter 7	0 (fixed)	Set 0 to all.
22–23	44–47	—	Parameter 8	0 (fixed)	Set 0 to all.

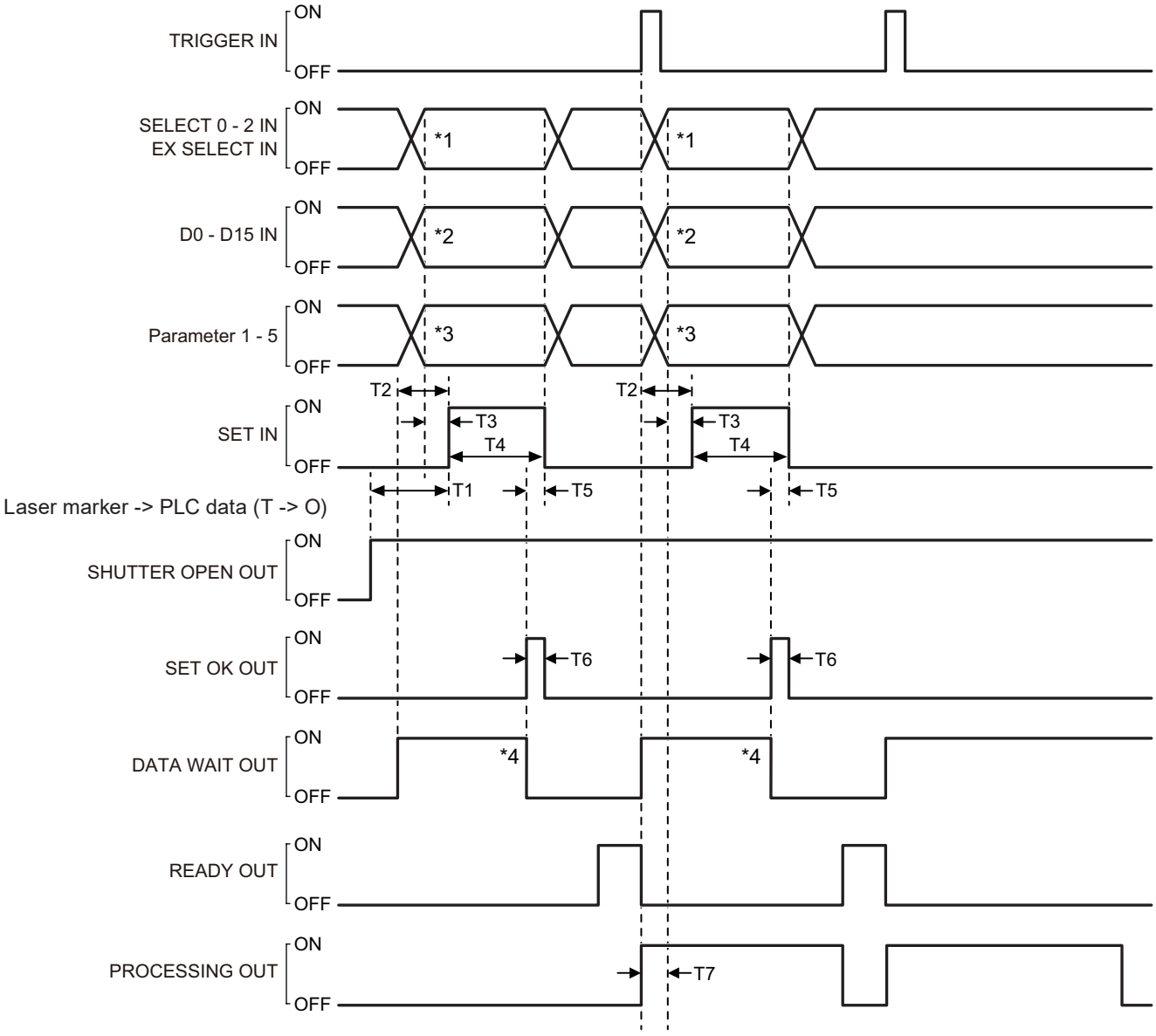
Laser marker -> PLC data

Address		Bit	Data name	Value	Description
Word	Byte				
2	4	0	SET OK OUT	0→1→0	SET OK OUT turns on when the setting by SET IN has completed. *1

*1 : This is One-shot output. Set the output time on the system settings screen of Laser Marker NAVI smart.

■ Timing chart

PLC -> Laser marker data (O -> T)



Item	Time	Remarks
T1	0 ms or more	SET IN is acceptable when the shutter opens.
T2	0 ms or more	Input SET IN after DATA WAIT OUT turns on.
T3	0.5 ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN, EX SELECT IN and D0 IN to D15 IN, turn on SET IN.
T4	Max. 1 sec.	If you turn on SET IN for 1 second or more, but SET OK OUT does not turn on, there is a reason that the setting cannot be accepted. In this case, the setting by SELECT IN and Dn IN are ignored.
T5	0 ms or more	Keep the input until SET OK OUT turns on.
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.
T7	0 ms or more	After confirming either DATA WAIT OUT or PROCESSING OUT is turned on, the next data can be set.

*1 : To set the external offset value in PLC -> Laser marker data, set SELECT 0 IN to SELECT 2 IN and EX SELECT IN as follows.

Function	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN	EX SELECT IN
External offset (Corresponding to SEO)	0	1	0	1

*2 : Specify the parameters for the external offset with D0 IN to D15 IN.

*3 : Set the offset value.

*4 : DATA WAIT OUT turns off when the all required data are set.

Reference

- To use this function, set the external offset function with “Using SEO command” to the file in Laser Marker NAVI smart beforehand.
- SET OK OUT turns on when the offset values are set to the all parameters enabled with D0 IN to D15 IN.
- When the file with external offset function with “Using SEO command” is selected, turn on SET IN by every marking triggers.
- To reset the setting data after turning on SET IN, close the shutter.
- If you use both of the external offset (corresponding to SEO) and character input (corresponding to SIN), DATA WAIT OUT turns off after SET OK OUT turns on for the each setting.

3-4-3 Character input (Corresponding to SIN command)

For the files in which “Characters specified by SIN command” of the functional character is set, set characters in PLC -> Laser marker data.
Specify the character number to input with SELECT 0 IN to SELECT 2 IN, EX SELECT IN and Dn IN for number input, then set the characters.

■ How to set the data

PLC -> Laser marker data

Address		Bit	Data name	Value	Description
Word	Byte				
2	4	0	SET IN	0→1	To determine the character input, turn SET IN on holding the input status of Dn INs, SELECT INs and TEXT.
		1–7	Reserve	0	
	5	0–7	D0 IN–D7 IN	0–15 (0–F hex)	Specify the character number 0 to 15 in the binary format. D0 is the least significant bit (LSB).
3	6	0–7	D8 IN–D15 IN	0	Set 0 to all.
	7	0	SELECT 0 IN	0	To input characters (corresponding to SIN command), set SELECT INs with this combination.
		1	SELECT 1 IN	0	
		2	SELECT 2 IN	0	
		3–6	Reserve	0	
		7	EX SELECT IN	1	
40	80–81	—	TEXT	—	Character strings max. 198 byte (max. 99 characters): Set characters using ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings. Allocate characters from the beginning of the address by 1-byte. Fill the unused filed with 00 (hex).
⋮	⋮	⋮	⋮	⋮	
138	276–277	—	TEXT	—	
139	278–279	—	TEXT	—	Fill with 00 (hex).
⋮	⋮	⋮	⋮	⋮	
159	318–319	—	TEXT	—	

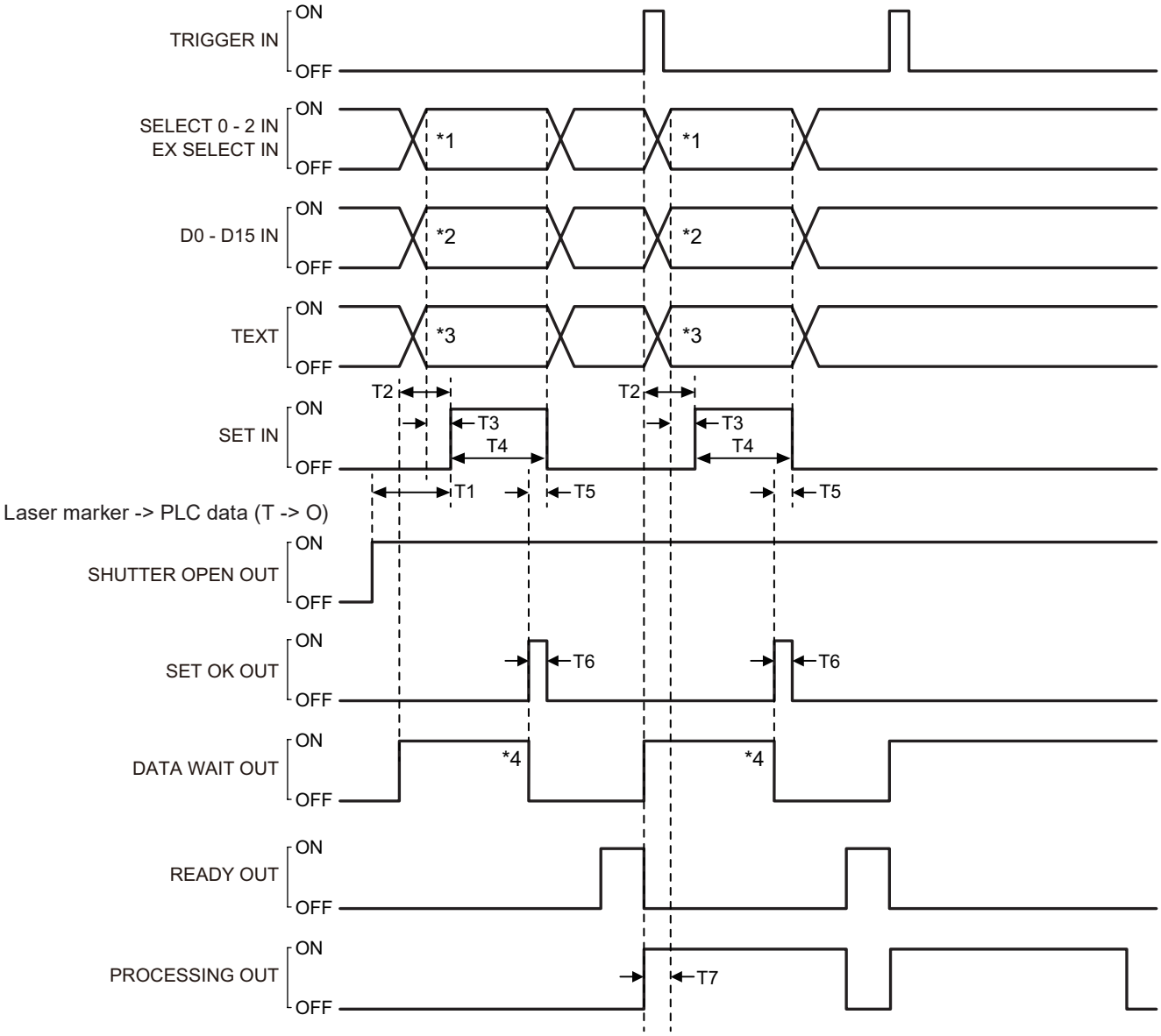
Laser marker -> PLC data

Address		Bit	Data name	Value	Description
Word	Byte				
2	4	0	SET OK OUT	0→1→0	SET OK OUT turns on when the setting by SET IN has completed. *1

*1 : This is One-shot output. Set the output time on the system settings screen of Laser Marker NAVI smart.

■ Timing chart

PLC -> Laser marker data (O -> T)



Item	Time	Remarks
T1	0 ms or more	SET IN is acceptable when the shutter opens.
T2	0 ms or more	Input SET IN after DATA WAIT OUT turns on.
T3	0.5 ms or more	After a lapse of 0.5ms or more from specifying SELECT 0 IN to SELECT 2 IN, EX SELECT IN and D0 IN to D15 IN, turn on SET IN.
T4	Max. 1 sec.	If you turn on SET IN for 1 second or more, but SET OK OUT does not turn on, there is a reason that the setting cannot be accepted. In this case, the setting by SELECT IN and Dn IN are ignored.
T5	0 ms or more	Keep the input until SET OK OUT turns on.
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.
T7	0 ms or more	After confirming either DATA WAIT OUT or PROCESSING OUT is turned on, the next data can be set.

*1 : To set the characters (SIN command specified) in PLC -> Laser marker data, set SELECT 0 IN to SELECT 2 IN and EX SELECT IN as follows.

Function	SELECT 0 IN	SELECT 1 IN	SELECT 2 IN	EX SELECT IN
Character input (Corresponding to SIN)	0	0	0	1

*2 : Specify the character number 0 to 15 in the binary format with D0 to D15.

*3 : Set characters.

*4 : DATA WAIT OUT turns off when the all required data are set.

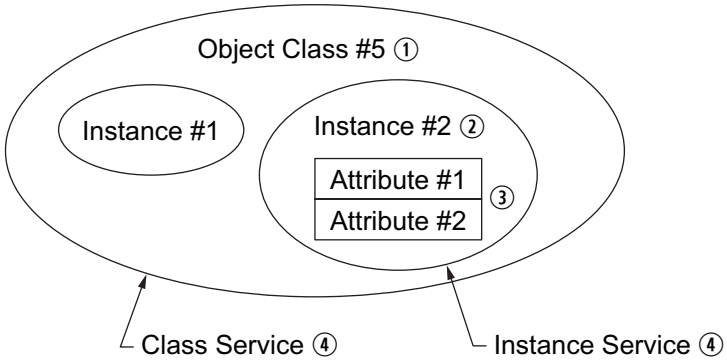
Reference

- To use this function, set “Characters specified by SIN command” of the functional character to the file in Laser Marker NAVI smart beforehand.
- When the file with “Characters specified by SIN command” function is selected, turn on SET IN by every marking triggers.
- To reset the setting data after turning on SET IN, close the shutter.
- If you use both of the external offset (corresponding to SEO) and character input (corresponding to SIN), DATA WAIT OUT turns off after SET OK OUT turns on for the each setting.
- If any characters which belong to the non-supported character code are in the data, SET OK OUT does not turn on.

4 Explicit Messaging

4-1 General Description of Explicit Messaging

With Explicit messaging the data are sent on a specific request, while with Implicit messaging the data are sent at a given interval.
Explicit messaging provides the request/response oriented functions and it is possible to control the laser marker via communication command.
Explicit messaging is performed by invoking a “service” to an “object”, which is defined by CIP.
To address an object from a CIP network, the CIP object has a following configuration for example.



No.	Name	Description
①	Class ID	Class is a set of objects all of which represent a similar system component.
②	Instance ID	Instance is the actual physical presentation of an object within a class.
③	Attribute ID	Attribute is a description of an externally visible characteristic or feature of an object.
④	Service	Operation or function that an object performs upon request from another object.

■ Communication specifications of Explicit Messaging

Message type		UCMM (Unconnected message manager) Class 3 (Connection based messages)
Number of connections		Max. 6 (with Class 3)
Maximum data size		1488 byte
Byte order		Little Endian
Available CIP objects	CIP mandatory objects	Identity Object, Message Router Object, Assembly Object, Connection Manager Object, QoS Object, TCP/IP Interface Object, Ethernet Link Object LLDP Management Object *1, LLDP Data Table Object *1
	Laser marker specific object	LP Object

*1 : Firmware version 1.58

4-2 Available CIP Objects

The available CIP objects for the communication with the laser marker are listed below.

Object name	Class ID	Category	Refer to
LP Object	A2 (hex)	Laser marker specific object	P. 77
Identity Object	01 (hex)	CIP mandatory objects	P. 93
Message Router Object	02 (hex)		
Assembly Object	04 (hex)		
Connection Manager Object	06 (hex)		
QoS Object	48 (hex)		
TCP/IP Interface Object	F5 (hex)		
Ethernet Link Object	F6 (hex)		
LLDP Management Object	109 (hex)		
LLDP Data Table Object	10A (hex)		

■ Data type of CIP objects

The following data types of CIP objects are used for the communication with the laser marker.

Data type	Description	Range
BOOL	Boolean	0 or 1
DINT	Double integer	-2147483648–2147483647
USINT	Unsigned short integer	0–255
UINT	Unsigned integer	0–65535
UDINT	Unsigned double integer	0–4294967295
STRING	Character string (1 byte per character)	—
SHORT_STRING	Character string (1 byte per character, 1 byte length indicator)	—
BYTE	Bit string 8 bits	—
WORD	Bit string 16 bits	—
DWORD	Bit string 32 bits	—
EPATH	CIP path segments	—
ETH_MAC_ADDR	Array of 6 octets	—

4-3 LP Object (Class ID: A2 hex)

LP Object is a specific object to the laser marker. It is used to read and write the settings and status of the laser marker.
With LP Object you can use the following functions.

- Write command request data / Read command response data
- Read external offset values
- Read SIN command specified characters
- Read registered characters
- Read model name of laser marker
- Read serial number of laser marker

4-3-1 Class Attribute of LP Object

The class service and class attributes of LP Object are described below.
For LP Object, the instance IDs are assigned according to the functions of the laser marker.
For the instance services and instance attributes, refer to the description of each function.

■ Class Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class Attributes

Instance ID: 0

Attribute ID	Name	Access	Data type	Value	Description
1	Revision	Get	UINT	0002 (hex)	Revision of LP Object
2	Max Instance	Get	UINT	1388 (hex)	Maximum instance number
3	Number of Instances	Get	UINT	0034 (hex)	

■ Instance IDs

For LP Object, the instance IDs are assigned according to the functions of the laser marker as follows.
To read and write the settings and status of the laser marker, access Attribute ID: 5 of each instance. For the instance services and instance attributes, refer to the description of each function.

Instance ID	Name	Refer to
1000–1004	Read external offset values	P. 79
1100–1115	Read SIN command specified characters	P. 81
1200–1203	Read registered characters	P. 83
5000	Write command request data	P. 84
1400	Read command response data	P. 87
1500	Read model name	P. 91
1501	Read serial number	P. 92

Reference

- The model name and serial number can be read during the remote mode is OFF. Access the other functions during the remote mode is ON.

4-3-2 Data size

The data size of Attribute ID: 5 in LP Object (Class ID: A2 hex) varies depending on Instance IDs.
Since the maximum data size of Explicit message is defined by each device, you need to set the data size to the acceptable value for both the laser marker and PLC.

■ Explicit message data size (System Settings of Laser Marker NAVI smart)

The laser marker can exchange the data up to 1200-byte. Confirm the available data size of your PLC and set the value in this range to “Explicit message data size” in System settings screen of Laser Marker NAVI smart.
Refer to “2-4-3 EtherNet/IP settings” (P. 33).

Setting range	64 to 1200 byte *1
Initial value	300 byte

*1 : Though the configurable data size of the explicit message is up to 1448-byte, the maximum data size of the actual data transmission is 1200-byte. If you set 1200-byte or more to the data size, it is treated as 1200-byte in the Explicit Messaging.

■ Data size of each instance in LP Object (Class ID: A2 hex)

The data size of Attribute ID 5 is fixed by each Instance ID.
To Instance ID 1100 to 1115, 5000, and 1400, the data size is defined by the settings of “Explicit message data size” in System settings screen of Laser Marker NAVI smart.
If the setting value exceeds the maximum size allowed in each Instance ID, the maximum allowed size is applied to the reading/writing data of each instance.

Instance ID	Name	Data size of Attribute ID: 5 [byte]	
1000–1004	Read external offset values	4	Fixed-length
1100–1115	Read SIN command specified characters	64–200	Initial value: 200 byte
1200–1203	Read registered characters	20	Fixed-length
5000	Write command request data	64–1200	Initial value: 300 byte
1400	Read command response data	64–1200	Initial value: 300 byte
1500	Read model name	32	Fixed-length
1501	Read serial number	20	Fixed-length

Reference

- If the readout data is shorter than the specified data size, unused field is filled with 00 (hex).
- If the setting string in Instance ID: 5000 - Attribute ID: 5 is shorter than the specified data size, fill the unused field with 00 (hex).

4-3-3 Read external offset values

If any of the following external offset functions are used, with this instance service you can read out the offset value, i.e. the adjustment value of the position or laser power. The readout data is the value to be applied to the next marking.

- External offset via I/O
- External offset via SEO command
- External offset via Implicit Message (Corresponding to SEO command)

You can confirm the timing of the readout with Implicit Message “Laser marker -> PLC” data - OFFSET DATA. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 1000–1004

To Instance ID 1000 to 1004, the following offset items are assigned respectively.

- Instance ID 1000: X-movement
- Instance ID 1001: Y-movement
- Instance ID 1002: Z-movement (Only available in the LP-ZV series)
- Instance ID 1003: Rotation movement
- Instance ID 1004: Laser power correction

■ Instance Attributes

Access Attribute ID: 5 to read out the offset value to be marked.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_STRING	Refer to *1.	Offset item
2	Data Type	Get	USINT	03 (hex)	Data type 3: DINT
3	Number of Elements	Get	USINT	01 (hex)	1 (fixed)
4	Descriptor	Get	USINT	01 (hex)	Access 1: Read (Get)
5	Value	Get	DINT	Refer to *1.	Offset value (4 byte)
9	Number of Subelements	Get	UINT	0001 (hex)	1 (fixed)

*1 : The attribute value of the each instance is as follows:

Instance ID	Attribute ID: 1 Offset item	Attribute ID: 5 Offset value	Description
1000	“External X Offset”	-999999–999999	X-movement [µm]
1001	“External Y Offset”	-999999–999999	Y-movement [µm]
1002	"External Z Offset"	-25000–25000	Only for the LP-ZV series Z-movement [µm]
1003	“External Rot Offset”	-180000–180000	Rotation movement [1/1000 degree]
1004	“External Power Offset”	0–999	Laser power correction [%]

Reference

- When OFFSET DATA of Implicit Message “Laser marker -> PLC” data is 1, you can read out the offset value. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).
- The readout data is the value to be applied to the next marking.
- Instance ID 1002 "External Z Offset" is available only to LP-ZV series. If you read it with LP-RH/LP-RF/LP-RV series, 0 is readout.
- If the offset value is unset (when OFFSET DATA of Implicit Message is 0), the readout data are as follows;
  - Instance ID 1000–1003: 0
  - Instance ID 1004: 100
- For LP-ZV, it is not possible to specify the Z-movement via I/O connector. To specify the Z-movement externally, use the SEO command or Implicit Message of EtherNet/IP.

4-3-4 Read SIN command specified characters

If any of the following functions are used, with this instance service you can read out the character strings set as SIN characters in the Character object, Bar code object, or 2D code object. The readout data is the characters to be applied to the next marking.

- Character input via SIN command
- Character input via Implicit Message (Corresponding to SIN command)

You can confirm the timing of the readout with Implicit Message “Laser marker -> PLC” data - SIN00 DATA to SIN15 DATA. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 1100–1115

To Instance ID 1100 to 1115, SIN command specified characters of the character number 0 to 15 are assigned respectively.

■ Instance Attributes

Access Attribute ID: 5 to read out the characters specified by SIN command.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_STRING	Refer to *1.	Character number to read
2	Data Type	Get	USINT	04 (hex)	Data type 4: USINT
3	Number of Elements	Get	USINT	40 (hex) to C8 (hex)	Data size [byte] of the readout string: 64 to 200 byte *2
4	Descriptor	Get	USINT	01 (hex)	Access 1: Read (Get)
5	Value	Get	USINT[64–200] *2	Refer to *1.	Characters (SIN command specified)
9	Number of Subelements	Get	UINT	0001 (hex)	1 (fixed)

*1 : The attribute value of the each instance is as follows:

Instance ID	Attribute ID: 1 Character number to read	Attribute ID: 5 Characters (SIN command specified)
1100	“SIN String (00)”	Character strings max. 200 byte (max. 99 characters): SIN command specified characters set in the selected character number are read. In the readout data, ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings are used. “SIN String (00)” to “SIN String (15)” represents the character number 0 to 15 respectively.
1101	“SIN String (01)”	
1102	“SIN String (02)”	
1103	“SIN String (03)”	
1104	“SIN String (04)”	
1105	“SIN String (05)”	
1106	“SIN String (06)”	
1107	“SIN String (07)”	
1108	“SIN String (08)”	
1109	“SIN String (09)”	
1110	“SIN String (10)”	
1111	“SIN String (11)”	
1112	“SIN String (12)”	
1113	“SIN String (13)”	
1114	“SIN String (14)”	
1115	“SIN String (15)”	

*2 : The maximum data size of the readout text in Instance ID 1100 to 1115, Attribute ID 5 is 200-byte. The data size is defined by the settings of “Explicit message data size” in System settings screen of Laser Marker NAVI smart. Refer to “4-3-2 Data size” (P. 78). If the setting value is more than 200-byte, it is treated as 200-byte in Instance ID 1100 to 1115, Attribute ID 5.

Reference

- The readout data is the characters to be applied to the next marking.
- When SINxx DATA of Implicit Message “Laser marker -> PLC” data is 1, you can read out the characters of the corresponding data number. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).
- In the readout data, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used.
- The control codes or “FNC1” which are used in the strings of Bar code/2D code objects are read by following the settings of “Input method for control codes” specified in the system settings.
- The data length of the readout text is fixed. Unused field is filled with 00 (hex).
- If the character string is unset (when SINxx DATA of Implicit Message “Laser marker -> PLC” is 0), the readout data is all filled with 00 (hex).
- If you set “Latin-1” for “Encoding for non-ASCII characters” in the system settings screen, “\” (backslash or Yen sign) is replaced to the alternative character “\\” in the read out strings.

4-3-5 Read registered characters

If “Registered characters” function is used to switch characters by I/O input, with this instance service you can read out the character string set as the registered characters. The readout data is the characters to be applied to the next marking.
You can confirm the timing of the readout with Implicit Message “Laser marker -> PLC” data - RANK DATA. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 1200–1203

To Instance ID 1200 to 1203, the registered characters of the registration table number 0 to 3 are assigned respectively.

■ Instance Attributes

Access Attribute ID: 5 to read out the registered characters to be marked.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_ STRING	Refer to *1.	Registration table number
2	Data type	Get	USINT	04 (hex)	Data type 4: USINT
3	Number of Elements	Get	USINT	14 (hex)	Data size [byte] of the readout string: 20 byte
4	Descriptor	Get	USINT	01 (hex)	Access 1: Read (Get)
5	Value	Get	USINT[20]	Refer to *1.	Registered characters
9	Number of Subelements	Get	UINT	0001 (hex)	1 (fixed)

*1 : The attribute value of the each instance is as follows:

Instance ID	Attribute ID: 1 Registration table number	Attribute ID: 5 Registered characters
1200	“RANK String (00)”	Character strings max. 20 byte (max. 9 characters): Registered characters set in the selected table number are read. In the readout data, ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings are used. “RANK String (00)” to “RANK String (03)” represents the registration table number 0 to 3 respectively.
1201	“RANK String (01)”	
1202	“RANK String (02)”	
1203	“RANK String (03)”	

Reference

- When RANK DATA of Implicit Message “Laser marker -> PLC” data is 1, you can read out the characters. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).
- The readout data is the characters to be applied to the next marking.
- If any characters which belong to the non-supported character code are in the data, they are replaced to 00 (hex) in the readout strings.
- The data length of the readout text is fixed with 20-byte. Unused field is filled with 00 (hex).
- If the character string is unset (when RANK DATA of Implicit Message “Laser marker -> PLC” is 0), the readout data is all filled with 00 (hex).
- If you set “Latin-1” for “Encoding for non-ASCII characters” in the system settings screen, “\” (backslash or Yen sign) is replaced to the alternative character “\\” in the read out strings.

4-3-6 Write command request data

To control the laser marker or change the marking data by communication commands via EtherNet/IP, write the command request data with this instance service.
For the details of the communication command, refer to “Serial Communication Command Guide” of the laser marker.

■ Instance Services

Service code	Service name
0E (hex)	Get_Attribute_Single
10 (hex)	Set_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 5000

■ Instance Attributes

Access Attribute ID: 5 to write the command request data.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_ STRING	“COMMAND Request”	Data name
2	Data Type	Get	USINT	04 (hex)	Data type 4: USINT
3	Number of Elements	Get	USINT	01 (hex)	1 (fixed)
4	Descriptor	Get	USINT	02 (hex)	Access 2: Write (Set)
5	Value	Set	USINT[64–1200] *1	Command data	Request data *2
9	Number of Subelements	Get	UINT	0040 (hex) to 04B0 (hex)	Data size [byte] of the setting string: 64 to 1200 byte *1

*1 : The data size is defined by the settings of “Explicit message data size” in System settings screen of Laser Marker NAVI smart. Refer to “4-3-2 Data size” (P. 78) and “2-4-3 EtherNet/IP settings” (P. 33).

*2 : Do not contain the start code, end code, and check sum. For details, refer to “Data format for Attribute ID: 5” (P. 85).

Reference

- You cannot use the command format in LP-400/V and LP-M/S/Z compatible mode in Explicit Message of EtherNet/IP.
- Following commands are not available in Explicit Message of EtherNet/IP.
  - MST command
  - RSM command
- You can confirm the receipt of the request command with Implicit Message “Laser marker -> PLC” data - COMMAND RESPONSE. When COMMAND RESPONSE is 1, the command request data is received by the laser marker. Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51) and “Timing chart of command data” (P. 90).
- You can 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”. For details, refer to “Laser Marker NAVI smart Operation Manual”.

■ Data format for Attribute ID: 5

Set the command request data in Attribute ID: 5 in the following format.
In the command data of EtherNet/IP, do not contain the start code, end code, and check sum.
The data size of Attribute ID: 5 is defined by the settings of “Explicit message data size” in System settings screen of Laser Marker NAVI smart. This data size is fixed to the all setting data. If the setting string is shorter than the specified data size, fill the unused field with 00 (hex).
For the details of the communication command, refer to “Serial Communication Command Guide” of the laser marker.

Data format

- Setting request data format
  Request data to modify or create the laser marker data or to control the laser marker operations.
  The sub command is “S”.

Command	Sub command “S”	Data defined per command	Fill unused field with 00 (hex).
3-byte	1-byte	Variable length	

Fixed-length specified in the range of 64 to 1200 byte

- Readout request data format
  Request data to read out the status or setting data of the laser marker.
  The sub command is “R”.

Command	Sub command “R”	Data defined per command	Fill unused field with 00 (hex).
3-byte	1-byte	Variable length	

Fixed-length specified in the range of 64 to 1200 byte

Item	Description
Command	The alphabetical characters consisting of three characters (3-byte) representing the control contents. For command types and description, refer to “Serial Communication Command Guide” of the laser marker.
Sub command	One-byte alphabetic character representing the communication data type. The sub command of the request data is fixed to the following alphabetic characters: • Setting request code: “S” • Readout request code: “R”
Data defined per command	The content to specify varies depending on the command. Use ASCII code to input the numeric values or character strings. For the characters which cannot be indicated with ASCII code, use the character code selected for “Encoding for non-ASCII characters” in the system settings of Laser Marker NAVI smart software. If the data consist of more than one item, each item is separated by “,”: 2C (HEX). Some items can be omitted for some commands. For details, refer to “Serial Communication Command Guide” of the laser marker.

Reference

- No separator is placed before or after the command and sub command.

Example of request data

- To change file number

Command “FNO”	Sub command “S”	Data example: File No. “9999”	Unused field *1
46 4E 4F (hex)	53 (hex)	39 39 39 39 (hex)	00 (hex)…

*1 : If “Explicit message data size” is set to 100 byte for example, set 00 (hex) for 92-byte after 8-byte length of the command data.

4-3-7 Read command response data

To read the response data to the command request data written via Instance ID: 5000, access Instance ID: 1400.
You can confirm the timing of the readout with Implicit Message “Laser marker -> PLC” data - COMMAND RESPONSE.
Refer to “Status for Explicit Message transmission (Bit data: 8 bit x 4)” (P. 51).
For the details of the communication command, refer to “Serial Communication Command Guide” of the laser marker.

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 1400

■ Instance Attributes

Access Attribute ID: 5 to read out the command response data.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_STRING	“COMMAND Response”	Data name
2	Data Type	Get	USINT	04 (hex)	Data type 4: USINT
3	Number of Elements	Get	USINT	01 (hex)	1 (fixed)
4	Descriptor	Get	USINT	01 (hex)	Access 1: Read (Get)
5	Value	Get	USINT[64–1200] *1	Command data	Response data *2
9	Number of Subelements	Get	UINT	0040 (hex) to 04B0 (hex)	Data size [byte] of the readout string: 64 to 1200 byte *1

*1 : The data size is defined by the settings of “Explicit message data size” in System settings screen of Laser Marker NAVI smart. Refer to “4-3-2 Data size” (P. 78) and “2-4-3 EtherNet/IP settings” (P. 33).

*2 : The start code, end code, and check sum are not included. For details, refer to “Data format for Attribute ID: 5” (P. 88).

Reference

- You cannot use the command format in LP-400/V and LP-M/S/Z compatible mode in Explicit Message of EtherNet/IP.
- Following commands are not available in Explicit Message of EtherNet/IP.
  - MST command
  - RSM command
- You can 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”. For details, refer to “Laser Marker NAVI smart Operation Manual”.
- If COMMAND RESPONSE of Implicit Message “Laser marker -> PLC” is 0, the readout data of the command response is all filled with 00 (hex).

■ Data format for Attribute ID: 5

The command response data is read out in the following format in Attribute ID: 5.
In the command data of EtherNet/IP, the start code, end code, and check sum are not included.
The data size of Attribute ID: 5 is defined by the settings of “Explicit message data size” in System settings screen of Laser Marker NAVI smart. This data size is fixed to the all readout data. If the readout string is shorter than the specified data size, unused field is filled with 00 (hex).

Data format

- Data format of positive response
  Response data transmitted when the setting request data (sub command “S”) was received normally.
  The positive response will be transmitted when the laser marker processing has been completed for some of the command types.

Command	Sub command “A” or arbitrary one-byte character	Unused field is filled with 00 (hex).
3-byte	1-byte	

Fixed-length specified in the range of 64 to 1200 byte

- Data format of read request response
  Response data to transmit the readout content for the readout request data (sub command “R”).

Command	Sub command “A” or arbitrary one-byte character	Data defined per command	Unused field is filled with 00 (hex).
3-byte	1-byte	Variable length	

Fixed-length specified in the range of 64 to 1200 byte

- Data format of negative response
  Response data to transmit when the request data are not acceptable.
  Response code and sub response code indicate the error cause.

Command	Sub command “E” or arbitrary one-byte character	Response code “01” to “99”	Sub response code “00” to “99”	Unused field is filled with 00 (hex).
3-byte	1-byte	2-byte	2-byte	

Fixed-length specified in the range of 64 to 1200 byte

Item	Description
Command	The alphabetical characters consisting of three characters (3-byte) representing the control contents. In the response data, the same command as the request data is used. For command types and description, refer to “Serial Communication Command Guide” of the laser marker. In the Explicit Message of EtherNet/IP, you cannot remove the command from the response data regardless the configuration of the system settings in Laser Marker NAVI smart.

Item	Description
Sub command	One-byte alphabetic character or arbitrary one-byte character representing the communication data type. You can set an arbitrary one-byte character for the sub command of the response data. The sub command is set to the following alphabetic characters in the initial settings: • Positive response code: “A” • Read request response code: “A” • Negative response code: “E” For the settings of the sub command, refer to “2-4-2 General settings before external control” (P. 30).
Data defined per command	The response content varies depending on the command. Numeric values or character strings are indicated with ASCII code for the response. For the characters which cannot be indicated with ASCII code, they are indicated with the character code selected for “Encoding for non-ASCII characters” in the system settings of Laser Marker NAVI smart software. If the data consist of more than one item, each item is separated by “,”: 2C (HEX). For details, refer to “Serial Communication Command Guide” of the laser marker.
Response code	The error cause is indicated in two numerical characters “01” to “99” in case of invalid request data format or invalid value specified, or when the laser marker cannot accept the request data. For details, refer to “Serial Communication Command Guide” of the laser marker.
Sub response code	The sub response code indicates which data item is incorrect in case of an error with the variable-length or fixed-length data part of the request data using a numerical value from 01 to 99 that represents the data sequence. This value starts from 01 and increments by 1 from the beginning of the variable-length or fixed-length data part of the request data. Return 00 as the sub response code for the response code when the sub response code cannot represent the data item sequence.

Reference

- No separator is placed before or after the command, sub command, response code, and sub response code.

Example of response data

- Positive response to the file number change request (FNO command)

Command “FNO”	Sub command “A”	Unused field *1
46 4E 4F (hex)	41 (hex)	00 (hex)…

- Readout response data to the file number readout request (FNO command)

Command “FNO”	Sub command “A”	Data example: File No. “9999”	Unused field *1
46 4E 4F (hex)	41 (hex)	39 39 39 39 (hex)	00 (hex)…

- Negative response to the file number change request (FNO command)

Command “FNO”	Sub command “E”	Data example: “9801”	Unused field *1
46 4E 4F (hex)	45 (hex)	39 38 30 31 (hex)	00 (hex)…

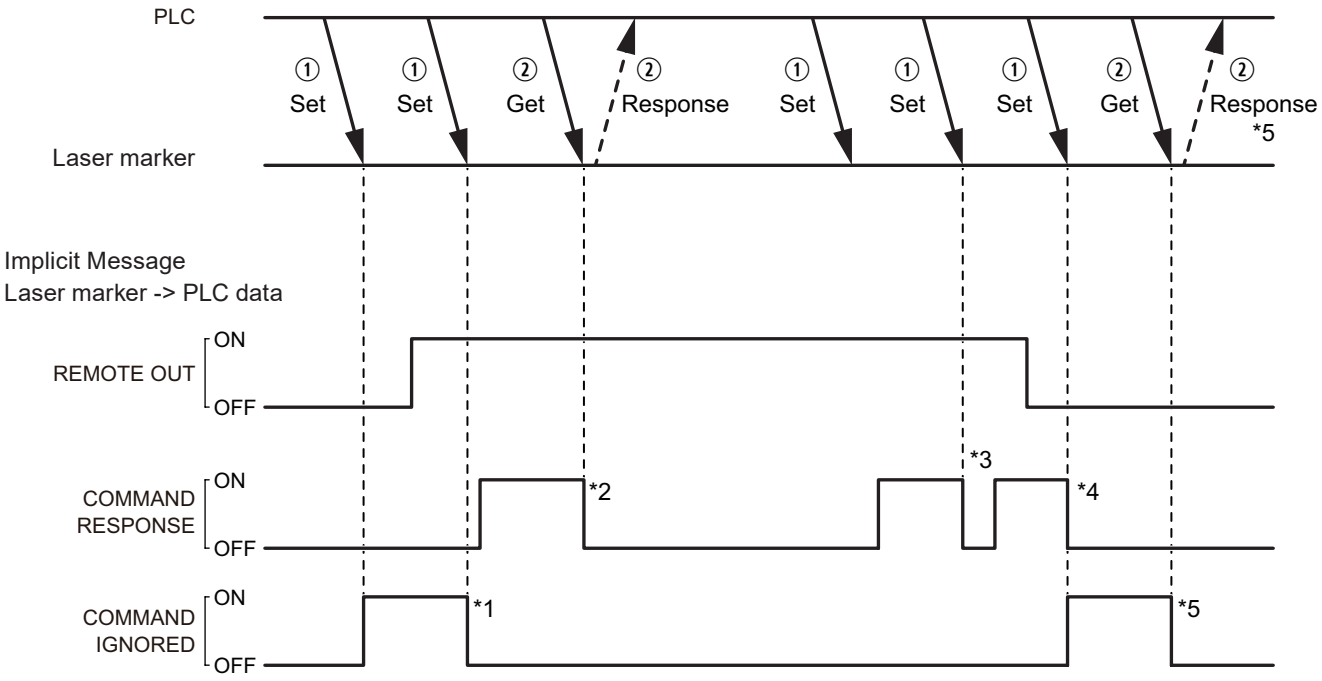
*1 : If the readout string is shorter than the specified data size, unused field is filled with 00 (hex).

■ Timing chart of command data

Explicit Message

① Instance ID 5000: Write command request data (Set)

② Instance ID 1400: Read command response data (Get - Response)



*1 : If the laser marker cannot receive the command request data, COMMAND IGNORED turns on. It turns off when any command is received.

*2 : COMMAND RESPONSE turns on when the laser marker receives the command request data. It turns off when the laser marker receives the read access of the command response data.

*3 : If the laser marker receives a new command request data while COMMAND RESPONSE is ON, COMMAND RESPONSE turns off for a moment and turns on after the response data is updated to the last received request command.

*4 : The status of COMMAND RESPONSE and COMMAND IGNORED are hold during the remote mode is off.

*5 : If the laser marker receives the read access of the command response data while COMMAND IGNORED is ON, COMMAND IGNORED turns off and the response data is read filled with 00 (hex).

4-3-8 Read model name

You can read out the model name of the laser marker with this instance service.

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 1500

■ Instance Attributes

Access Attribute ID: 5 to read out the model name.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_STRING	“Model name”	Data name
2	Data Type	Get	USINT	04 (hex)	Data type 4: USINT
3	Number of Elements	Get	USINT	20 (hex)	Data size [byte] of the readout string: 32 byte
4	Descriptor	Get	USINT	01 (hex)	Access 1: Read (Get)
5	Value	Get	USINT[32]	String *1	Model name of the laser marker head E.g. LP-RF200P
9	Number of Subelements	Get	UINT	0001 (hex)	1 (fixed)

*1 : The model name is read out in ASCII code.

Reference

- The data size of the readout string is fixed with 32-byte. Unused field is filled with 00 (hex).

4-3-9 Read serial number

You can read out the serial number of the laser marker with this instance service.

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class ID: A2 (hex)

■ Instance ID: 1501

■ Instance Attributes

Access Attribute ID: 5 to read out the serial number.

Attribute ID	Name	Access	Data type	Value	Description
1	Name	Get	SHORT_STRING	“Serial number”	Data name
2	Data Type	Get	USINT	04 (hex)	Data type 4: USINT
3	Number of Elements	Get	USINT	14 (hex)	Data size [byte] of the readout string: 20 byte
4	Descriptor	Get	USINT	01 (hex)	Access 1: Read (Get)
5	Value	Get	USINT[20]	String *1	E.g. JJT099 For LP-RF/LP-RV, serial number of the laser marker controller is read. For LP-RH/LP-ZV, serial number of the laser marker head is read
9	Number of Subelements	Get	UINT	0001 (hex)	1 (fixed)

*1 : The serial number is read out in ASCII code.

Reference

- The data size of the readout string is fixed with 20-byte. Unused field is filled with 00 (hex).

4-4 CIP Mandatory Objects

The available CIP mandatory objects for the communication with the laser marker are listed below.
For more information about the CIP mandatory objects, consult the CIP specifications.

Object name	Class ID	Usage	Refer to
Identity Object	01 (hex)	• Read the identification information about the EtherNet/IP unit. • Reset EtherNet/IP configuration such as IP address.	P. 93
Message Router Object	02 (hex)	The Message Router Object is used internally. You do not use this object.	—
Assembly Object	04 (hex)	Read the data of the Implicit Message	P. 96
Connection Manager Object	06 (hex)	Used for establishing connections between the PLC and laser marker.	P. 97
QoS Object	48 (hex)	Provides a means to configure certain QoS related behaviors.	P. 98
TCP/IP Interface Object	F5 (hex)	Provides the mechanism to configure the TCP/IP network interface.	P. 99
Ethernet Link Object	F6 (hex)	Provides the status information of the communication interface.	P. 102
LLDP Management Object	109 (hex)	Read out or set the management information of the LLDP protocol.	P. 106
LLDP Data Table Object	10A (hex)	Read out the LLDP devices information.	P. 107

For the laser marker specific object, refer to “4-3 LP Object (Class ID: A2 hex)” (P. 77).

4-4-1 Identity Object (Class ID: 01 hex)

The Identity Object provides the following information.
- Read the identification of and general information about the EtherNet/IP unit of the laser marker.
- Reset EtherNet/IP configuration such as IP address.

■ Class Services

Service code	Service name
01 (hex)	Get_Attributes_All
0E (hex)	Get_Attribute_Single

■ Class Attributes

Instance ID: 0

Attribute ID	Name	Access	Data type	Value	Description
1	Revision	Get	UINT	0001 (hex) *1	Revision of Identity Object
				0002 (hex) *2	
2	Max Instance	Get	UINT	0001 (hex)	Maximum instance number
3	Number of Instances	Get	UINT	0001 (hex)	Number of Instances

*1 : Firmware version 1.35

*2 : Firmware version 1.58

■ Instance Services

Service code	Service name	Parameter option
01 (hex)	Get_Attributes_All	
03 (hex)	Get_Attribute_List	Refer to *1.
0E (hex)	Get_Attribute_Single	
05 (hex)	Reset	Refer to *2.

*1 : Firmware version 1.58

*2 : The reset service is used to reset the network configuration such as IP address. There are two types of reset as follows:

Value	Description
00 (hex)	Reboot the EtherNet/IP unit.
01 (hex)	Reset the following items to the default value and reboot the EtherNet/IP unit. • DHCP: ON • IP address: 0.0.0.0 • Subnet mask: 0.0.0.0 Reference • Other settings such as the data size and control method of input signals, are not reset by this service. • This reset service does not restart the laser marker.

■ Instance Attributes

Instance ID: 1

This instance is used to read out the identification information about the EtherNet/IP unit in the laser marker.

Attribute ID	Name	Access	Data type	Value	Description
1	Vendor ID	Get	UINT	00D8 (hex)	
2	Device Type	Get	UINT	002B (hex)	Generic Device
3	Product Code	Get	UINT	001E (hex)	
4	Revision	Get	Struct of:	—	Firmware revision
			USINT	0001 (hex)	Major revision
			USINT	0001 (hex) *1	Minor revision
				0002 (hex) *2	
5	Status	Get	WORD	Refer to *3.	Device status
6	Serial Number	Get	UDINT	00000000–FFFFFFFF (hex)	Serial number of EtherNet/IP unit
7	Product Name	Get	SHORT_STRING	“LP-Device”	
11	Active Language	Get	USINT[3]	“eng” (fixed)	
12	Supported Language List	Get	USINT[3]	“eng”	

*1 : Firmware version 1.35

*2 : Firmware version 1.58

*3 : The device status is indicated with the following data.

bit(s)	Value	Description
0	0: No connection 1: Connected	Connection status
1	0 (fixed)	System reserved
2	0 (fixed)	System reserved
3	0 (fixed)	System reserved
4–7	0000: Unknown 0010: Faulted I/O Connection 0011: No I/O connection established 0100: Non volatile configuration bad 0101: Major fault 0110: Connection in Run mode 0111: Connection in Idle mode	Status of EtherNet/IP unit
8–11	0000 (fixed)	Information of faults (Not used)
12–15	0000 (fixed)	System reserved

4-4-2 Assembly Object (Class ID: 04 hex)

This object is used to read out the data of the Implicit Message.

■ Class Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class Attributes

Instance ID: 0

Attribute ID	Name	Access	Data type	Value	Description
1	Revision	Get	UINT	0002 (hex)	Revision of Assembly Object
2	Max Instance	Get	UINT	0096 (hex)	Maximum instance number

■ Instance Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Instance Attributes

Instance ID of Assembly Object is assigned as follows.

- “Laser marker -> PLC” (T -> O) data: Instance ID 100
- “PLC -> Laser marker” (O -> T) data: Instance ID 150

Instance ID: 100

This instance is used to access “Laser marker -> PLC” (T -> O) data.

Attribute ID	Name	Access	Data type	Value	Description
3	Data	Get	BYTE[460]	Refer to *1.	
4	Size	Get	UINT	01CC (hex)	Data size (460 byte)

*1 : Access Attribute ID: 3 to read out Laser marker -> PLC data of Implicit Message. The data size is fixed with 460-byte. Refer to “3-3-2 Laser marker -> PLC data details” (P. 45).

Instance ID: 150

This instance is used to access “PLC -> Laser marker” (O -> T) data.

Attribute ID	Name	Access	Data type	Value	Description
3	Data	Get	BYTE[320]	Refer to *2.	
4	Size	Get	UINT	0140 (hex)	Data size (320 byte)

*2 : Access Attribute ID: 3 to read out PLC -> Laser marker data of Implicit Message. The data size is fixed with 320-byte. Refer to “3-3-4 PLC -> Laser marker data details” (P. 58).

Reference

- Assembly Object does not support the access to write to Implicit Message. It is not possible to control I/O by Explicit Message in the laser marker.

4-4-3 Connection Manager Object (Class ID: 06 hex)

This object is used for establishing connections between the PLC and laser marker. It also provides the communication status.

■ Instance Services

Service code	Service name
01 (hex)	Get_Attributes_All
0E (hex)	Get_Attribute_Single
10 (hex)	Set_Attribute_Single

■ Instance Attributes

Instance ID: 1

Attribute ID	Name	Access *1	Data type	Description
1	Open Requests	Get / Set	UINT	Number of Forward Open service requests received.
2	Open Format Rejects	Get / Set	UINT	Number of Forward Open service requests which were rejected due to bad format.
3	Open Resource Rejects	Get / Set	UINT	Number of Forward Open service requests which were rejected due to lack of resources.
4	Open Other Rejects	Get / Set	UINT	Number of Forward Open service requests which were rejected for reasons other than bad format or lack of resources.
5	Close Requests	Get / Set	UINT	Number of Forward Close service requests received.
6	Close Format Rejects	Get / Set	UINT	Number of Forward Close service requests which were rejected due to bad format.
7	Close Other Rejects	Get / Set	UINT	Number of Forward Close service requests which were rejected for reasons other than bad format.
8	Connection Timeouts	Get / Set	UINT	Total number of connection timeouts that have occurred in connections controlled by this Connection Manager.

*1 : The instance service “Set_Attribute_Single” is available only for the reset of the values (setting 0).

4-4-4 QoS Object (Class ID: 48 hex)

The QoS Object provides a means to configure certain QoS (Quality of Service) related behaviors in EtherNet/IP devices.

■ Class Service

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Class Attribute

Instance ID: 0

Attribute ID	Name	Access	Data type	Value	Description
1	Revision	Get	UINT	0001 (hex)	Revision of QoS Object

■ Instance Services

Service code	Service name
0E (hex)	Get_Attribute_Single
10 (hex)	Set_Attribute_Single

■ Instance Attributes

Instance ID: 1

Attribute ID	Name	Access	Data type	Default value	Description
1	802.1Q Tag Enable	Get / Set	USINT	0	Enables or disables sending 802.1Q frames. 0: Disabled 1: Enabled
2	DSCP PTP Event *1	Get / Set	USINT	59	DSCP value for PTP (IEEE 1588) event messages
3	DSCP PTP General *1	Get / Set	USINT	47	DSCP value for PTP (IEEE 1588) general messages
4	DSCP Urgent	Get / Set	USINT	55	DSCP value for CIP transport class 1 messages with priority Urgent
5	DSCP Scheduled	Get / Set	USINT	47	DSCP value for CIP transport class 1 messages with priority Scheduled
6	DSCP High	Get / Set	USINT	43	DSCP value for CIP transport class 1 messages with priority High
7	DSCP Low	Get / Set	USINT	31	DSCP value for CIP transport class 1 messages with priority Low
8	DSCP Explicit	Get / Set	USINT	27	DSCP value for Explicit message (CIP UCMM and CIP class 3)

*1 : Firmware version 1.58

4-4-5 TCP/IP Interface Object (Class ID: F5 hex)

This object provides the mechanism to configure the TCP/IP network interface.

■ Class Services

Service code	Service name
01 (hex)	Get_Attributes_All
0E (hex)	Get_Attribute_Single

■ Class Attributes

Instance ID: 0

Attribute ID	Name	Access	Data type	Value	Description
1	Revision	Get	UINT	0004 (hex)	Revision of TCP/IP Interface Object
2	Max Instance	Get	UINT	0001 (hex)	Maximum instance number
3	Number of Instances	Get	UINT	0001 (hex)	
6	Maximum ID Number Class Attributes	Get	UINT	0007 (hex)	Maximum attribute number of the class attribute
7	Maximum ID Number Instance Attributes	Get	UINT	000D (hex)	Maximum attribute number of the instance attribute

■ Instance Services

Service code	Service name
01 (hex)	Get_Attributes_All
0E (hex)	Get_Attribute_Single
10 (hex)	Set_Attribute_Single

■ Instance Attributes

Instance ID: 1

Attribute ID	Name	Access	Data type	Description / Value
1	Status	Get	DWORD	Refer to *1.
2	Configuration Capability	Get	DWORD	Refer to *2.
3	Configuration Control	Get / Set	DWORD	0: Configuration from non-volatile memory 2: Configuration from DHCP
4	Physical Link Object	Get	Struct of:	Path to Ethernet Link Object, Instance #3
			UINT	Path size 0002 (hex)
			Padded EPATH	Path 20F62403 (hex)

Attribute ID	Name	Access	Data type	Description / Value
5	Interface Configuration	Get / Set	Struct of:	—
			UDINT	IP address Default value: 0.0.0.0
			UDINT	Subnet mask Default value: 0.0.0.0
			UDINT	Default gateway Default value: 0.0.0.0
			UDINT	Primary DNS Default value: 0.0.0.0
			UDINT	Secondary DNS Default value: 0.0.0.0
			STRING	Default domain Default value: “”
6	Host Name	Get / Set	STRING	Host name of laser marker Default value: “”
8	TTL Value	Get / Set	USINT	TTL value for EtherNet/IP multicast packets Default value: 1
9	Mcast Config	Get / Set	Struct of:	IP multicast configuration
	Alloc Control		USINT	0: Use default allocation algorithm to generate multicast addresses. 1: Allocate multicast addresses according to the values in the “Num Mcast”- and “Mcast Start Addr”-fields.
	Reserved		USINT	0 (fixed)
	Num Mcast		UINT	Number of multicast addresses to allocate for EtherNet/IP Default value: -1
	Mcast Start Addr		UDINT	Starting multicast address from which to begin allocation
10	SelectAcd	Get / Set	BOOL	0: Disable ACD 1: Enable ACD (Default)
11	LastConflictDetected	Get / Set	Struct of:	ACD Diagnostic parameters related to the last conflict detected.
	AcdActiviity		USINT	State of ACD activity when last conflict detected.
	RemoteMAC		USINT[6]	MAC address of remote node form the ARP PDU in which a conflict was detected.
	ArpPdu		USINT[28]	Copy of the raw ARP PDU in which a conflict was detected.
13	Encapsulation Inactivity Timeout	Get / Set	UINT	Number of seconds of inactivity before a TCP connection is closed. 0–3600 (0: Disabled)

*1 : The interface status is indicated with the following data.

bit(s)	Description
0–3	IP address storage 1: DHCP or non-volatile storage 2: Hardware settings
4	1: Multicast pending
5	1: Interface configuration pending
6	1: An address conflict is detected.
7	AcdFault
8–31	System reserved 0 (fixed)

*2 : The configuration capability is indicated with the following data.

bit(s)	Description
0–1	0: (fixed)
2	1: DHCP available
3	0: (fixed)
4	1: (fixed)
5	1: The module is hardware configurable.
6	0: (fixed)
7	1: The device is capable of detecting address conflicts.
8–31	System reserved 0: (fixed)

4-4-6 Ethernet Link Object (Class ID: F6 hex)

This object is used to read out or set the status information of the communication interface.

■ Class Services

Service code	Service name
01 (hex)	Get_Attributes_All
0E (hex)	Get_Attribute_Single

■ Class Attributes

Instance ID: 0

Attribute ID	Name	Access	Data type	Value	Description
1	Revision	Get	UINT	0004 (hex)	Revision of Ethernet Link Object
2	Max Instance	Get	UINT	0003 (hex)	Maximum instance number
3	Number of Instances	Get	UINT	0003 (hex)	
6	Maximum ID Number Class Attributes	Get	UINT	0007 (hex)	Maximum attribute number of the class attribute
7	Maximum ID Number Instance Attributes	Get	UINT	000B (hex)	Maximum attribute number of the instance attribute

■ Instance Services

Service code	Service name
01 (hex)	Get_Attributes_All
0E (hex)	Get_Attribute_Single
10 (hex)	Set_Attribute_Single
4C (hex)	Get_And_Clear

■ Instance Attributes

Instance IDs are assigned by the port as follows.

- Instance ID 1: Port 1 (P1)
- Instance ID 2: Port 2 (P2)
- Instance ID 3: Internal port of the laser marker

Attribute ID	Name	Access	Data type	Description / Value
1	Interface Speed	Get	UDINT	Actual Ethernet interface speed. 10 or 100
2	Interface Flags	Get	DWORD	Interface Flags Refer to *1.
3	Physical Address	Get	USINT[6]	MAC address —

Attribute ID	Name	Access	Data type	Description / Value
4	Interface Counters	Get / Get+Clear	Struct of:	—
	In Octets		UDINT	Octets received on the interface
	In Ucast Packets		UDINT	Unicast packets received on the interface
	In NUcast Packets		UDINT	Nonunicast packets received on the interface
	In Discards		UDINT	Inbound packets with unknown protocol
	In Errors		UDINT	Inbound packets that contain errors (does not include In discards)
	In Unknown Protos		UDINT	Inbound packets with unknown protocol
	Out Octets		UDINT	Octets sent on the interface
	Out Ucast Packets		UDINT	Unicast packets sent on the interface
	Out NUcast Packets		UDINT	Nonunicast packets sent on the interface
	Out Discards		UDINT	Outbound packets with unknown protocol
	Out Errors		UDINT	Outbound packets that contain errors (does not include Out discards)
5	Media Counters	Get / Get+Clear	Struct of:	Media specific counters
	Alignment Errors		UDINT	Frames received that are not an integral number of octets in length
	FCS Errors		UDINT	Frames received that do not pass the FCS check
	Single Collisions		UDINT	Successfully transmitted frames that have experienced exactly one collision
	Multiple Collisions		UDINT	Successfully transmitted frames that have experienced more than one collision
	SQE Test Errors		UDINT	The number of times the SQE test error message is generated (Counter not provided with current PHY interface)
	Deferred Transmissions		UDINT	Frames for which the first transmission attempt is delayed because the medium is busy
	Late Collisions		UDINT	The number of times a collision is detected later than 512 bit-times into the transmission of a packet
	Excessive Collisions		UDINT	Frames for which a transmission fails due to excessive collisions
	MAC Transmit Errors		UDINT	Frames for which a transmission fails due to an internal MAC sublayer receive error
	Carrier Sense Errors		UDINT	The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
	Frame Too Long		UDINT	Frames received that exceed the maximum permitted frame size
	MAC Receive Errors		UDINT	Frames for which reception on an interface fails due to an internal MAC sublayer receive error
6	Interface Control	Get / Set	Struct of:	—
	Control Bits		WORD	Interface control bits
	Forced Interface Speed		UINT	Speed at which the interface shall be forced to operate

Attribute ID	Name	Access	Data type	Description / Value
7	Interface Type	Get	USINT	Interface type 1: Twisted-pair 2: Internal interface Value of the each Instance ID: • Instance ID 1: 2 • Instance ID 2: 2 • Instance ID 3: 1
8	Interface State	Get	USINT	Interface state 0: Unknown interface state. 1: The interface is enabled and is ready to send and receive data. 2: The interface is disabled. 3: The interface is testing.
9	Admin State	Get / Set	USINT	Control of the administrative setting of the interface state 1: Enable the interface. 2: Disable the interface.
10	Interface Label	Get	SHORT_ STRING	Interface label Value of the each Instance ID: • Instance ID 1: “Port 1” • Instance ID 2: “Port 2” • Instance ID 3: “Internal”
11	Interface Capability	Get	Struct of:	Indication of the capabilities of the interface
	Capability Bits		DWORD	Interface capabilities, other than speed/duplex *2 Value of the each Instance ID: • Instance ID 1: 000E (hex) • Instance ID 2: 000E (hex) • Instance ID 3: 0000 (hex)
	Speed/Duplex Options		Struct of:	Indicates speed/duplex pairs supported in the Interface Control Attribute
			USINT	Speed/duplex array count
			Struct of: [0, 4]	Speed/duplex array
			UINT	Interface speed 10 or 100
			USINT	Interface Duplex Mode 0: Half duplex 1: Full duplex

*1 : The interface flags are indicated with the following data.

bit(s)	Description
0	Indicates whether or not the communications interface is connected to an active network. 0: Inactive link 1: Active link
1	Indicates the duplex mode currently in use. 0: Half duplex 1: Full duplex
2–4	Indicates the status of link auto-negotiation. 0: Auto-negotiation in progress. 1: Auto-negotiation and speed detection failed. 2: Auto-negotiation failed but detected speed. 3: Successfully negotiated speed and duplex. 4: Auto-negotiation not attempted.
5	0: Interface can activate changes to link parameters during runtime. 1: Reset is required in order for changes to have effect.
6	0: No local hardware fault detected. 1: Local hardware fault detected.
7–31	System reserved 0 (fixed)

*2 : The interface capability is indicated with the following data.

bit(s)	Description
0	Indicates whether or not the device requires a reset to apply changes made to the Interface Control attribute (#6). 0: The device does not require a reset. 1: The device requires a reset.
1	Auto-negotiation 0: The interface does not support link auto-negotiation. 1: The interface supports link auto-negotiation.
2	Auto-MDIX 0: The interface does not support auto MDIX operation. 1: The interface supports auto MDIX operation.
3	Manual speed/duplex 0: The interface does not support manual setting of speed/duplex. 1: The interface supports manual setting of speed/duplex.
4–31	System reserved 0 (fixed)

4-4-7 LLDP Management Object (Class ID: 109 h)

Available firmware version: 1.58

This object is used to read out or set the management information of the LLDP protocol.

■ Class Services

Service code	Service name
0E (hex)	Get_Attribute_Single
10 (hex)	Set_Attribute_Single

■ Class Attributes

Instance ID: 1

Attribute ID	Name	Access	Data type	Description/ Value
1	LLDP Enable Set	Get / Set	Struct of:	Status of LLDP
	LLDP Enable Array Length		UINT	Number of enable bits for LLDP Enable Array 4
	LLDP Enable Array		Array of BYTE	State of each port for LLDP *1 0: Disable 1: Enable
2	msgTxInterval	Get / Set	UINT	The interval in seconds at which LLDP frames are transmitted. Default value: 30 1-3600
3	msgTxHold	Get / Set	USINT	A multiplier of msgTxInterval to determine the value of the TTL/TLV sent to neighboring devices. Default value: 4 1-100
4	LLDP Datastore	Get	WORD	Retrieval methods for the LLDP Data Table 0001 (hex) *2
5	Last Change	Get	UDINT	A count in seconds from the last time any entry in the LLDP table changed.

*1 : LLDP Enable Array is indicated with the following 8-bits data.

bit	Description
0	Global Enabl
1	Port 1 enable
2	Port 2 enable
3	Internal port 0 (Fixed)
4-7	Reserve 0 (Fixed)

*2 : LLDP Data Table is indicated with the following 16-bits data.

bit	Description
0	LLDP Data Table Object 1 (Fixed)
1-15	Reserve 0 (Fixed)

4-4-8 LLDP Data Table Object (Class ID: 10A h)

Available firmware version: 1.58

This object is used to read out the LLDP devices information.

■ Class Services

Service code	Service name
0E (hex)	Get_Attribute_Single
11 (hex)	Find_Next_Object_Instance

■ Class Attributes

Attribute ID	Name	Access	Data type	Value	Description
2	Max Instance	Get	UINT	0000-0008 (hex)	Maxim instance number
3	Number of Instances	Get	UINT	—	Current number of active neighbors

■ Instance Services

Service code	Service name
0E (hex)	Get_Attribute_Single

■ Instance Attributes

Instance ID: Max.8

Attribute ID	Name	Access	Data type	Description / Value
1	Ethernet Link Instance Number	Get	UINT	Instance number of the Ethernet Link object corresponding to the physical port that received the LLDP frame from the neighbor of this instance 1 or 2
2	MAC Address	Get	ETH_MAC_ADDR	The neighboring MAC Address (CIP MAC Address / Chassis ID / Port ID TLV)
3	Interface Label	Get	SHORT_STRING	The neighboring Interface Label (CIP Interface Label / Chassis ID / Port ID TLV)
4	Time to Live	Get	UINT	The number of seconds the neighboring information is to be considered valid. 0: Reserve 1-65535
5	System Capabilities TLV	Get	Struct of:	System Capabilities TLV
	System Capabilities		WORD	The capabilities which the neighboring device supports based on currently loaded firmware.
	Enabled Capabilities		WORD	The capabilities currently enabled on the neighboring device.
6	IPv4 Management Addresses	Get	Struct of:	IPv4 Management Addresses of the neighboring device.
	Management Address Count		USINT	Number of implemented management addresses.
	Management		ARRAY of UDINT	IPv4 Management Addresses

Attribute ID	Name	Access	Data type	Description / Value
7	CIP Identification	Get	Struct of:	The CIP Identification TLV of neighboring device, if present.
	Vendor ID		UINT	Vendor ID
	Device Type		UINT	Device Type
	Product Code		UINT	Product Code
	Major Revision		BYTE	Firmware Revision (Major)
	Minor Revision		USINT	Firmware Revision (Minor)
	CIP Serial Number		UDINT	Serial Number
8	Additional Ethernet Capabilities	Get	Struct of:	A TLV for Ethernet Preemption Support from the neighboring device.
	Preemption Support		BOOL	Support 0: Non-supported 1: Supported
	Preemption Status		BOOL	Status 0: Disable 1: Enable
	Preemption Active		BOOL	Execution result 0: Failed 1: Succussed
	Additional Fragment Size		USINT	Number of octets to send before preemption 0: 64 octets 1: 128 octets 2: 192 octets 3: 256 octets 4-255: Reserved
9	Last Change	Get	USINT	A count in seconds from the last time any attribute in this instance changed.

Troubleshooting

Troubleshooting

If any problems in EtherNet/IP communication occur, check items below.
When the problems cannot be resolved, please contact our sales office or representatives.
For the errors of the laser marker in general, refer to the troubleshooting of “Setup/Maintenance Guide” of the laser marker.

■ Status LEDs on EtherNet/IP connectors

If you have any problems in EtherNet/IP communication, check the LEDs on the EtherNet/IP connectors located on the rear of the controller at first.
Refer to “1-6-2 Status of LED indicator” (P. 17).

■ Basic settings of EtherNet/IP

Troubles	Causes	Measures
Communication fails.	An error occurs in the laser marker.	Refer to “Setup/Maintenance Guide” and clear the error of the laser marker.
	• The LAN cable is not connected correctly. • The connected LAN cable is wrong.	• Refer to “2-3 Connection of LAN Cable” (P. 28). • Connect the LAN cable to “EtherNet/IP” port. The ports labeled “LAN” and “INFO LAN” on the rear of the controller do not function as EtherNet/IP.
	IP address is incorrect.	• If you use DHCP, confirm the connection of the DHCP server of your network. • Match the network settings in the PLC and laser marker at “EtherNet/IP” settings in System settings screen of Laser Marker NAVI smart. • Set the different IP addresses to “Ethernet” and “EtherNet/IP” under “Communication” tab in System settings screen of Laser Marker NAVI smart.
	EDS file version is incorrect.	• Refer to “2-5 Configuration of PLC” (P. 37). • Check the firmware version of EthernNet/IP and select the EDS file to install. For details on how to check the firmware version of the EtherNet/IP unit, refer to “2-4-3 EtherNet/IP settings” (P. 33).
	The controller version is old and does not support firmware version 1.58 of the EthernNet/IP unit LP-ANW10.	• Update the firmware versions in the controller. • For LP-RF/LP-RV (until January 2024 production), the firmware versions in the controller needs to updated by our service representative. Please contact our sales office. • For LP-RH/LP-ZV (until January 2024 production), update the firmware versions in the controller. The software for updating the LP-RH/LP-ZV series, “Laser Marker Firmware Updater”, can be downloaded from the following website. Visit our Internet website, go to “Downloads” > “Software” and search by “LP-ZV”. https://industry.panasonic.com/global/en/downloads/?tab=software

Troubles	Causes	Measures
I/O control via Implicit messaging fails.	Settings of Laser Marker NAVI smart are incorrect.	• Refer to “2-4 Configuration of Laser Marker” (P. 29). • 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 if the settings of “Control method of input signals” under “Communication” tab in System settings screen are consistent with the actual control method. • Check the I/O settings under “Inputs/outputs” tab in System settings screen. • If any of the above settings are changed in the system settings screen, restart the laser marker.
	Communication parameter settings of PLC are incorrect.	• Check the RPI and data size set in your PLC are the available values for the laser marker. • If you reduce the data size, specify the number of bytes from the top of the data order. • Check if the number of the connections does not exceed the specified maximum number. Exclusive-Owner connection can be established with only one PLC.
	Unavailable character code is used in the character strings to read or write.	• 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.
Control via Explicit messaging fails.	Settings of Laser Marker NAVI smart are incorrect.	• Refer to “2-4 Configuration of Laser Marker” (P. 29). • Set “OFF” to “Compatible mode” under “Operation/information” tab in System settings screen. • Check the settings of the control method under “Operation/information” tab in System settings screen. If “I/O” is selected to the corresponding operation, change it to “command”. • Confirm the value of “Explicit message data size” in System settings screen is the available value for your PLC. • If any of the above settings are changed in the system settings screen, restart the laser marker.
	The command format is incorrect.	• In the command data of EtherNet/IP, do not contain the start code, end code, and check sum. • If the setting command data is shorter than the size specified in “Explicit message data size” in System settings screen, fill the unused field with 00 (hex).
	Unavailable character code is used in the character strings to read.	• 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.

■ External control

Troubles	Causes	Measures
Communication with the external device cannot start.	Laser marker is not in remote mode.	• 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.	• 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.	• 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: • 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.	• 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.	• Check the “Command history” in Maintenance screen of Laser Maker 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.	• 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.	• 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.	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.	• 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.	• 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 ready 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.	• If “Registered characters via I/O”, “External offset” or “Characters specified by SIN command” are used, input respective data at every marking. • 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).
	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.	• 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.
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.	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. • Laser pumping (LSR) • Shutter open/close (SHT) • Guide Laser (GID)
		The following commands are available only when the shutter operation control method is set to communication command. • Laser radiation for measurement (SPT) • Test marking (TST) (LP-RH/LP-ZV series only) • Power check (PWM) (LP-ZV series only)
	“Reception mode ON” is not set for command reception permission (MKM command).	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. • 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.	All commands except the following commands * cannot be accepted while alarm or error is active. When alarm occurred: • Status checking (STS) • I/O monitor (IOM) • Operating data (RTD) • Error history (ERH) • Alarm reset (ARS) • Error code (ENO) • Command mode (RSM) When warning occurred: • 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.
	The character code is wrong.	• 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.

* 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”.

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