Panasonic

Laser Marker

PROFINET Communication Guide

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

ME-LPRF-PNET-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.

■ General terms and conditions of this document

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

■ Disclaimer

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

■ Trademark

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

Cautions in Handling

ALWAYS FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS!

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

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

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

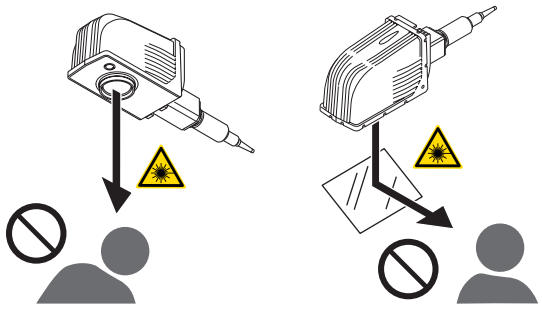
The following symbols are used to classify and describe the type of instructions to be observed.

⃠	This symbol is used to alert users to a specific operating procedure that must not be performed.
❗	This 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

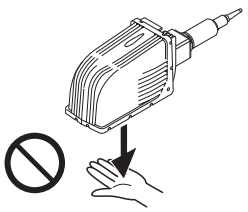
⃠

- 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

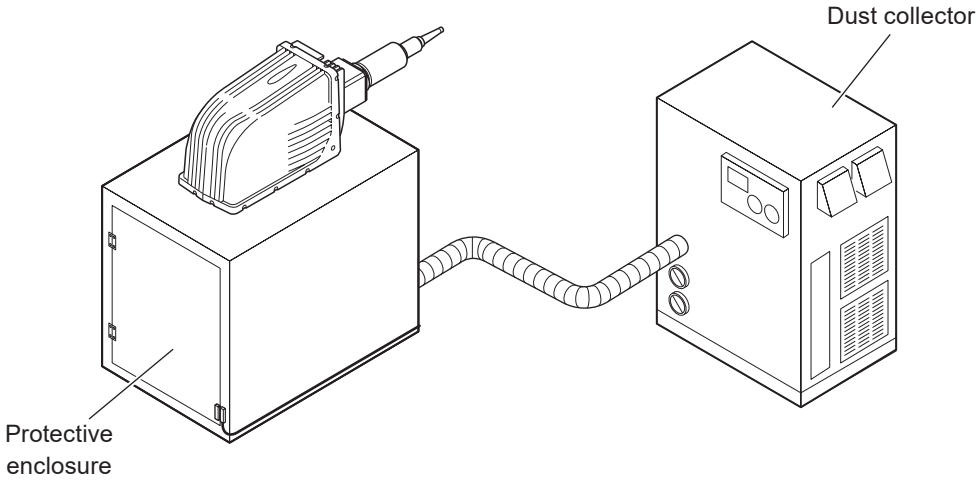
- Do not use this product anywhere where fire is strictly prohibited, near inflammable gas, objects or organic solvents such as thinner or gasoline, or in dusty place. There is a risk of fire.
- Do not use this product except for water-resistant part in wet place. In addition, never conduct wiring or 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 PROFINET communication.

PROFINET Communication Guide (this manual)

It describes the communication settings, connections, and the communication data formats for PROFINET.
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 cyclic data exchanging of PROFINET, 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 record data of PROFINET, 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.

Contents

Preface 2

Cautions in Handling 3

How to Read this Document 7

1 Overview of PROFINET Unit 11

1-1 Product Configuration 12

1-2 Product Package 13

1-3 Download of GSD File 13

1-4 Specifications 14

1-5 Name of Each Component 15

1-5-1 Communication interfaces 15

1-5-2 Status of LED indicator 16

2 Preparation of PROFINET Communication 18

2-1 Overview of Preparation 19

2-2 Installation of PROFINET Unit 20

2-2-1 Installation procedures 20

2-2-2 Confirmation of PROFINET availability 26

2-3 Connection of LAN Cable 27

2-4 Configuration of Laser Marker 28

2-4-1 Basic control method of laser marker 28

2-4-2 General settings before external control 29

2-4-3 PROFINET settings 32

2-4-4 Remote mode settings 34

2-5 Configuration of PLC 35

2-5-1 Network and communication settings 35

2-5-2 Slot assignment 36

3 Cyclic Data Exchanging 38

3-1 General Description of Cyclic Data Exchanging 39

3-2 Input Modules (Laser Marker -> PLC) 40

3-2-1 Summary of input modules 40

3-2-2 I/O terminal block output 41

3-2-3 I/O terminal block input monitor 42

3-2-4 I/O connector output 43

3-2-5 I/O connector input monitor 44

3-2-6 Character strings 46

3-2-7 File number 48

3-2-8 Error code 48
3-2-9 Status for record data transmission 49
3-2-10 Counter value 51
3-2-11 Control method of input signals 52
3-2-12 Laser marker information 53
3-3 Output Modules (PLC -> Laser Marker) 54
3-3-1 Summary of output modules 54
3-3-2 I/O terminal block input 55
3-3-3 I/O connector input 57
3-3-4 Character input (Corresponding to SIN command) 60
3-3-5 External offset (Corresponding to SEO command) 62
3-4 Parameter Details and Timing Chart 63
3-4-1 Read character strings 63
3-4-2 Character input (Corresponding to SIN command) 65
3-4-3 External offset (Corresponding to SEO command) 68
4 Record Data Exchanging 72
4-1 General Description of Record Data Exchanging 73
4-2 Record Data 74
4-2-1 List of record data 74
4-2-2 Read external offset values 75
4-2-3 Read SIN command specified characters 76
4-2-4 Read registered characters 78
4-2-5 Write command request data 79
4-2-6 Read command response data 81
4-2-7 Read model name 85
4-2-8 Read serial number 86
Troubleshooting 87
Troubleshooting 88

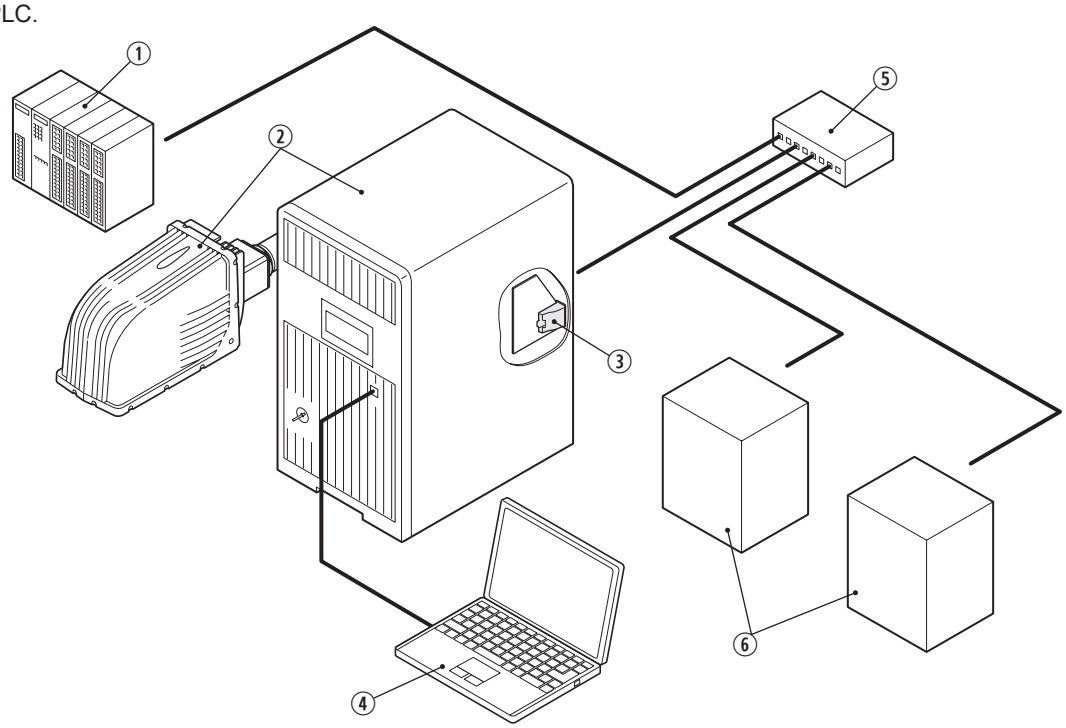
1 Overview of PROFINET Unit

1-1 Product Configuration

This manual describes how to control the laser marker with PROFINET communication.
By installing an optional communication unit of the industrial network LP-ANW11 (PROFINET unit) to the specified laser marker, you can control the laser marker with PROFINET.

■ Example of the system configuration

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



Notice

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

No.	Name	Description
①	PLC	PROFINET master device. It initiates data transferring.
②	Laser marker *1	PROFINET slave device. In PROFINET communication, the following communication method are used to control the laser marker. • Cyclic data exchanging to control I/O and monitor the status • Record data exchanging (acyclic) to write and read the settings
③	PROFINET unit (LP-ANW11)	To control the laser marker via PROFINET communication, you need to install the optional PROFINET 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 PROFINET slaves	—

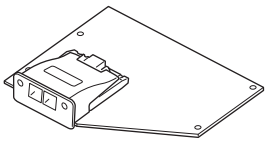
*1 : Illustration images and configurations vary depending on the model.

Reference

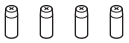
- For the operations and specifications of the laser marker, refer to the manuals attached to the laser marker.

1-2 Product Package

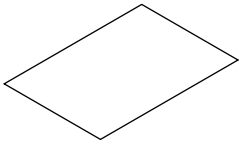
In the package of LP-ANW11, the industrial network unit for PROFINET, following items are included.
Before using this product, make sure all items listed below are included in the package.



PROFINET unit
qty.: 1



M3 screw
qty.: 4



Instructions of network unit
qty.: 1

1-3 Download of GSD File

Before using this product, download the setup files “lp-anw11_setup_profinet.zip” from our Internet website.
Visit our Internet website, go to “Downloads” > “Software” and search by “LP-ANW11”.
https://industry.panasonic.com/global/en/downloads/?tab=software
The zip file contains the following files:

- GSD file (in XML format): GSDML-V2.33-PID-LMP-20xxxxxx.xml
- BMP file for GSD file: GSDML-0342-0001-PID-LMP-Device.bmp
- PROFINET Communication Guide: PDF manual

1-4 Specifications

■ Device specifications

Model	LP-ANW11 (PROFINET unit)
Applicable laser marker	LP-RF series *1, LP-RV series *1 LP-RH series, LP-ZV series
Network type	PROFINET
Interface	RJ-45 port (2-port switch)
Communication standards	IEEE802.3u (100BASE-TX)
Communication functions	Cyclic data exchanging Record data exchanging (acyclic data exchanging) I&M 1 to 3 MRP (Client)
Baud rate	100 Mbit/s
Communication method	Full-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	DCP
Conformance class	Class B
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.

Reference

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

■ Communication specifications of cyclic data exchanging

Communication period	Min. 4.0ms
Data size of input modules (Laser marker -> PLC)	Max. 424 byte
Data size of output modules (PLC -> Laser marker)	Max. 284 byte

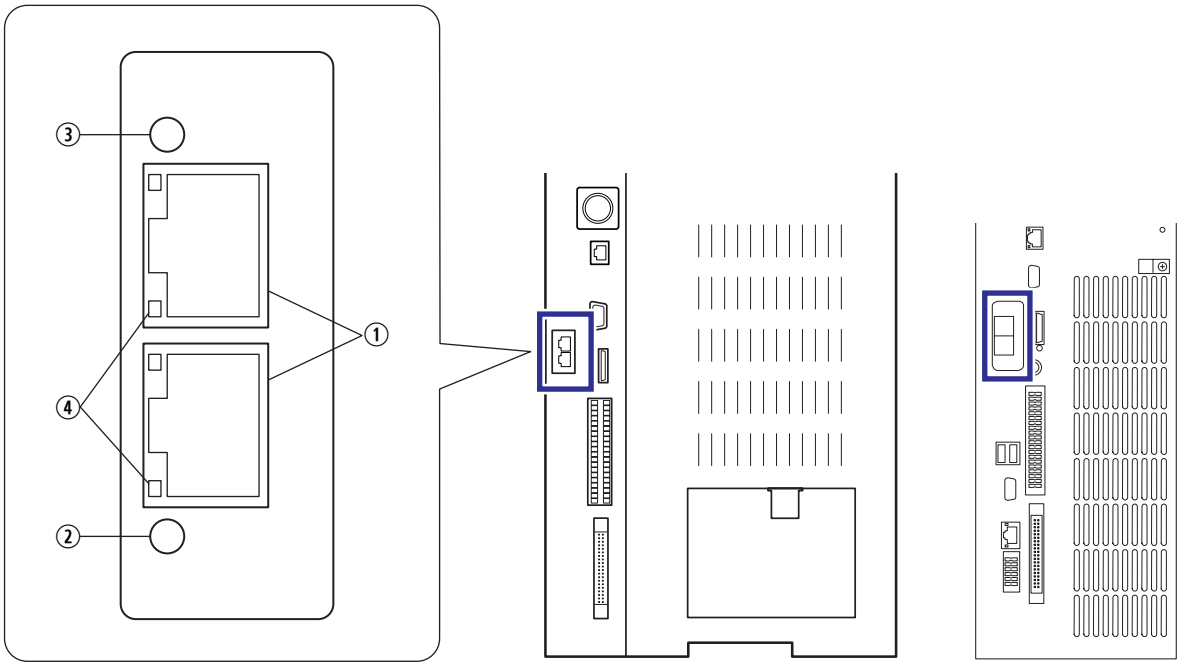
■ Communication specifications of record data exchanging

Record data size for reading (Laser marker -> PLC)	Max. 1200 byte
Record data size for writing (PLC -> Laser marker)	3 to 1200 byte

1-5 Name of Each Component

1-5-1 Communication interfaces

The PROFINET ports are available after the PROFINET unit is installed to the controller of the laser marker.
The PROFINET 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

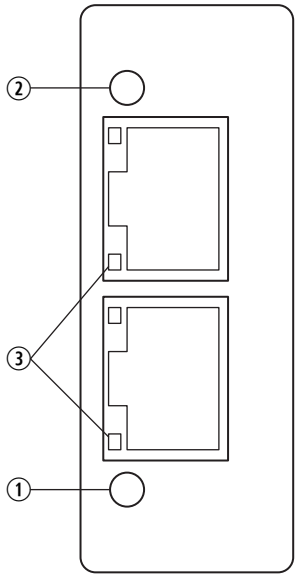
No.	Name	Description
①	PROFINET ports: P1, P2	Communication port (2-port switch) to control the laser marker by PROFINET with the control device such as a PLC. Connect a LAN cable. If you do not install the network unit, there is no port here. Connector: RJ-45 8-pole connector, AUTO-MDIX compatible
②	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 PROFINET ports, refer to “2-3 Connection of LAN Cable” (P. 27).
- The ports labeled “LAN” and “INFO LAN” on the rear of the controller do not function as PROFINET.
- Laser Marker NAVI smart is not able to connect to laser marker via PROFINET 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.

1-5-2 Status of LED indicator

On the connectors of PROFINET, 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	PLC connection established, PLC is in RUN state.
Green, 1 flash	PLC connection established, PLC is in STOP state.
Green, blinking (1 Hz)	Used by PROFINET engineering tools to identify the node of the laser marker on the network.
Red	PROFINET unit error. Measures: • Confirm if PROFINET unit is correctly installed to the controller. • Restart the laser marker. If the error persists, contact our sales offices or representatives.
Red, 1 flash	No device name. Measures: Set the device name by PROFINET engineering tools of the PLC.
Red, 2 flashes	No IP address. Measures: Set the IP address by PROFINET engineering tools of the PLC.
Red, 3 flashes	Configuration of PLC is incorrect. Measures: Check if the GSD file is correct.
OFF	No power or no connection established to PLC. Measures: • Check the connection of LAN cable. • Check the status of PLC.

② Module status LED: MS

Indicates the laser marker status for the communication.

Display	Description
Green	Normal operation.
Red	PROFINET unit error. Measures: • Confirm if PROFINET unit is correctly installed to the controller. • Restart the laser marker. If the error persists, contact our sales offices or representatives.
OFF	No power or PROFINET unit is under preparing communication.

③ Link/activity LED

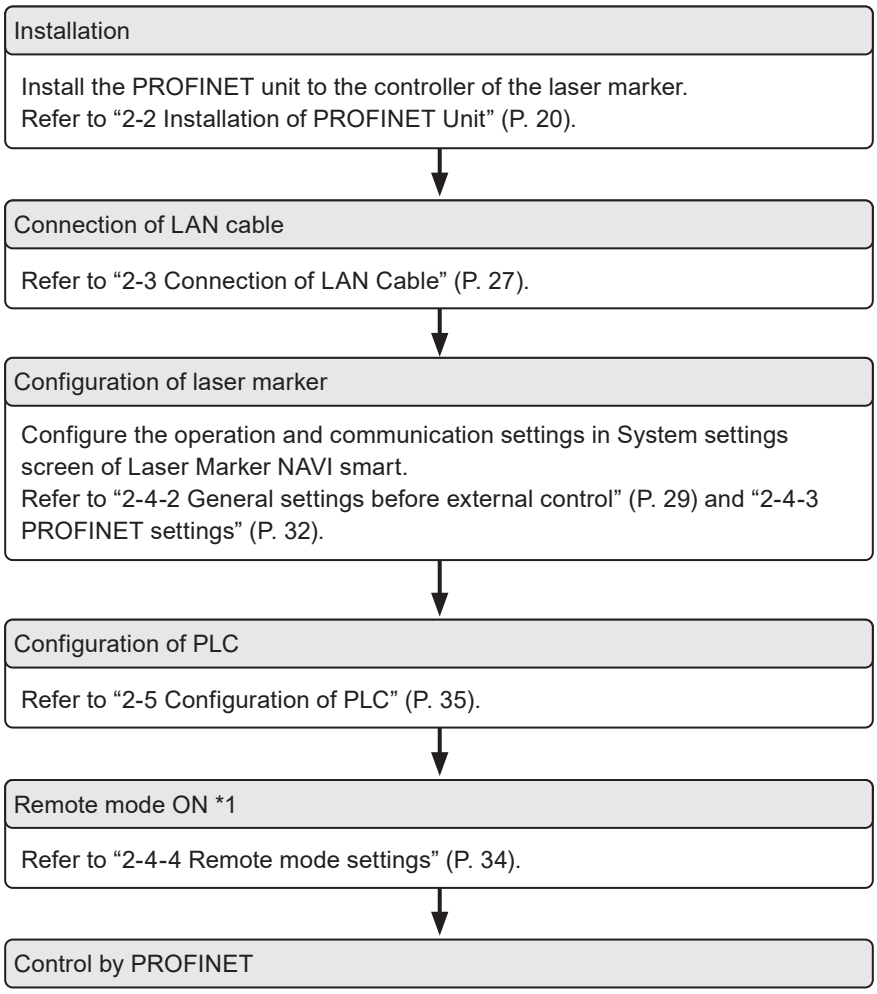
Indicates the communication status.

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

2 Preparation of PROFINET Communication

2-1 Overview of Preparation

Before starting PROFINET communication, the following installation and settings are required.



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

2-2 Installation of PROFINET Unit

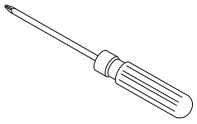
2-2-1 Installation procedures

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

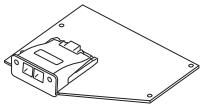
Reference

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

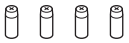
■ What you need



Cross screwdriver (No. 2)



PROFINET unit

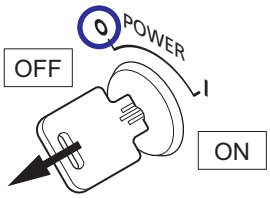


M3 screws x 4
(Attached accessory)

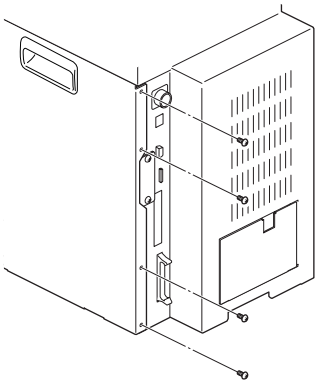
⚠WARNING	• Before the installation work, turn OFF the key switch of the laser marker, and disconnect the AC power cable. Otherwise, it may cause exposure to the laser beam or electrical shock. • Do not insert your hands or objects to the exhaust port of each unit or the gaps between units during the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

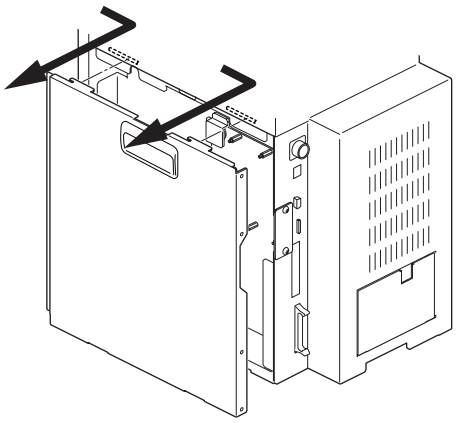
■ Installation procedures: For LP-RF/LP-RV series

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

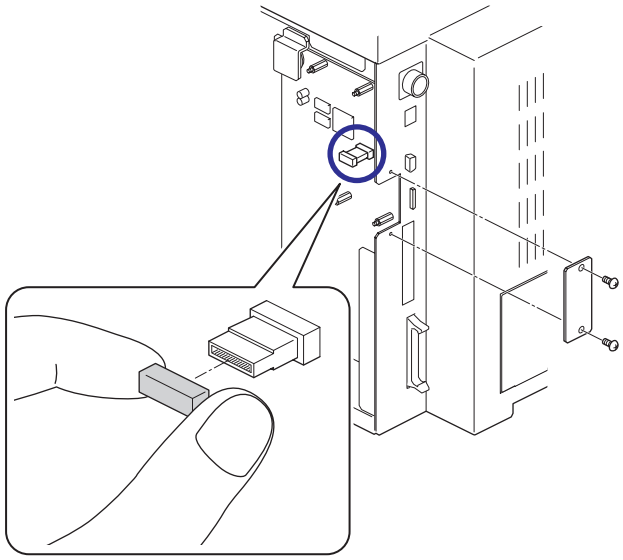


2. Remove four M4 screws on the back of the controller. To remove the side panel from the controller, slide the panel to the back first, then pull it to open.





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



Reference

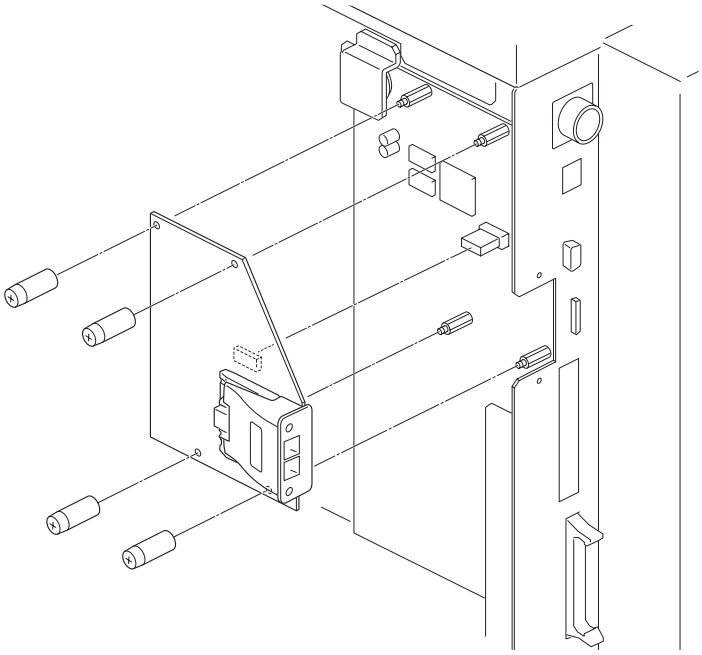
- If the laser marker has no mentioned cover on the rear of the controller, it does not support PROFINET communication.

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

5. Install the PROFINET unit to the controller.

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

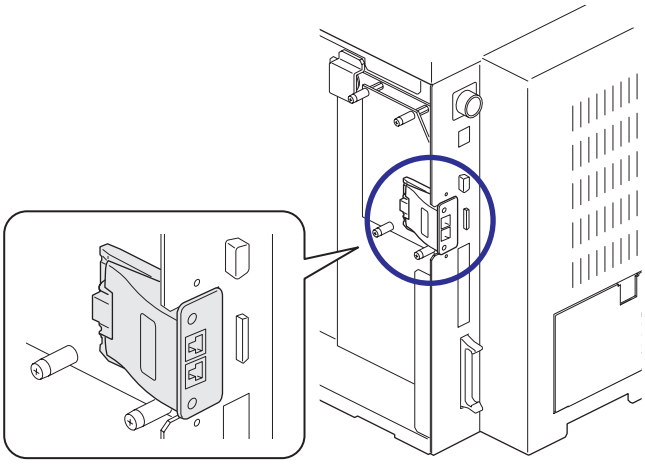
Tightening torque 0.5 N·m



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.

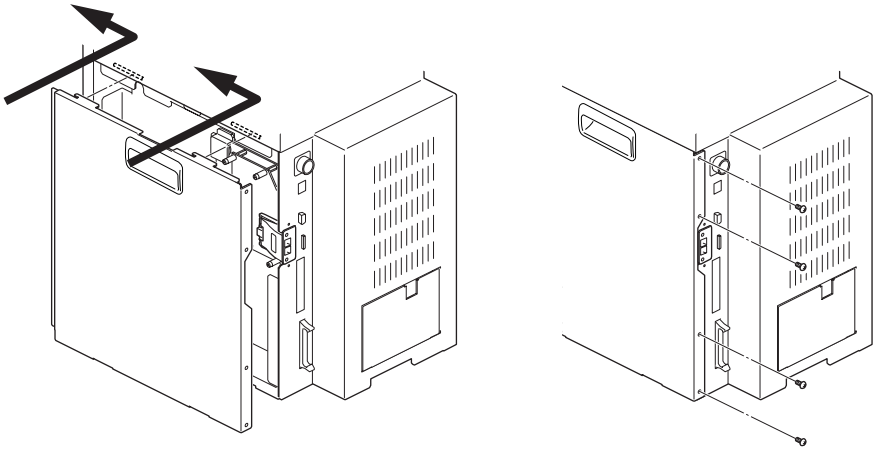


7. Insert the side panel straight. The projecting part of upper and bottom of the side panel should be fit the drain of the controller. Slide the panel to the front of the controller and tighten the screws (M3 screws, four positions) of the back of the controller.

Tightening torque 0.5 N·m

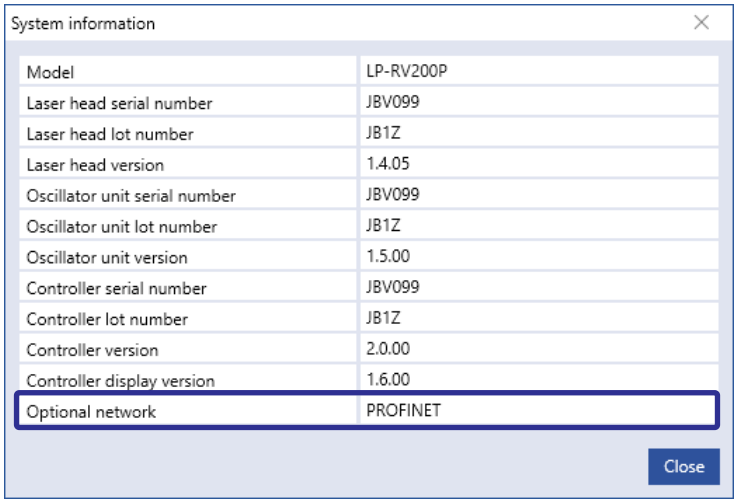
Notice

- 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 “PROFINET” is displayed as Optional network, the installation is done successfully.

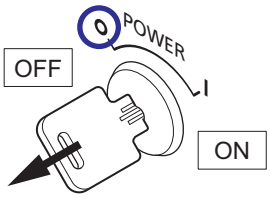


Reference

- 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 PROFINET availability” (P. 26).

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

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

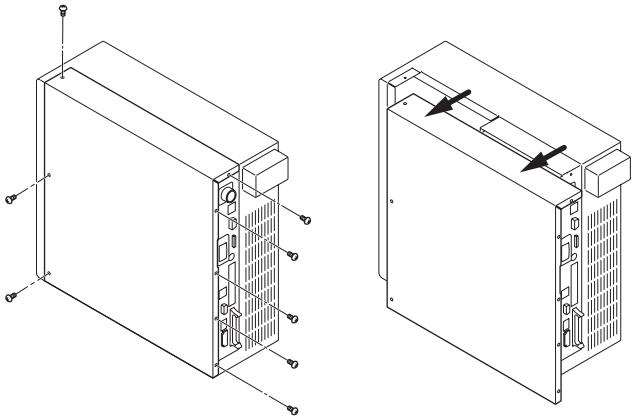


2. Loosen the following screws and remove the side panel of the controller.

Five M3 screws on the back

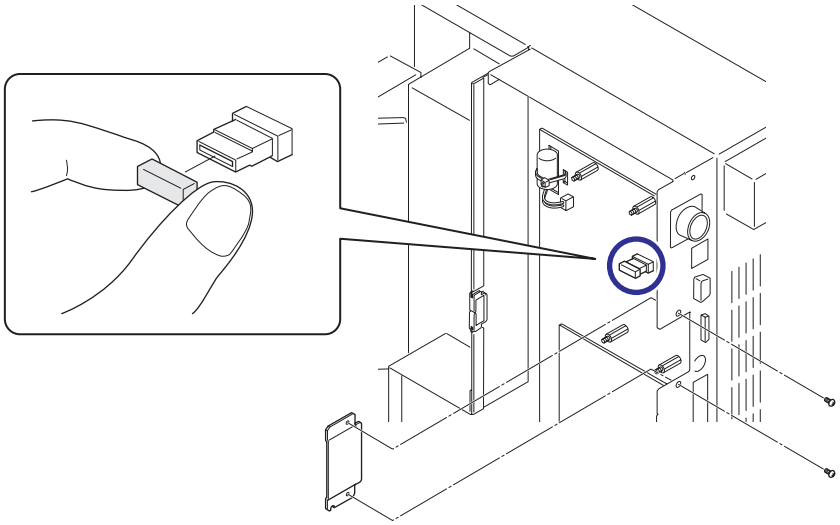
One M3 screw on the top

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.

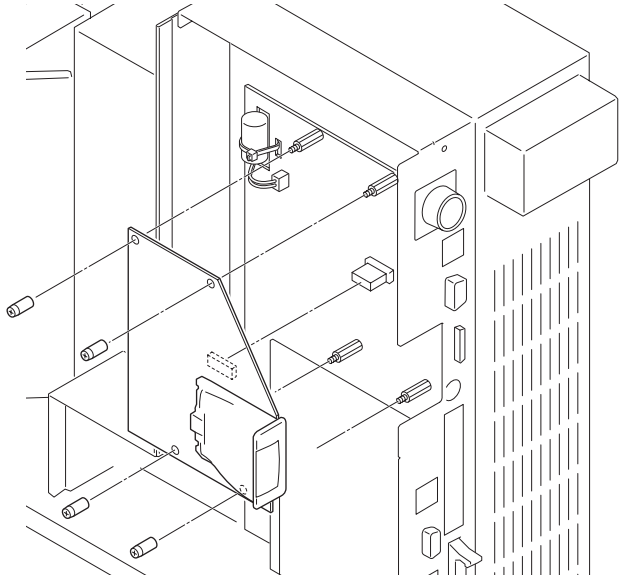
4. Remove the protection cap of the connector on the board.



5. Install the PROFINET unit to the controller.

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

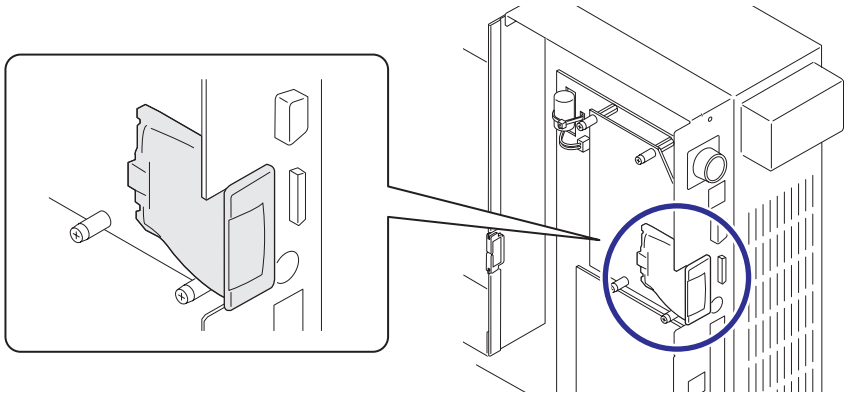
Tightening torque 0.5 N·m



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.

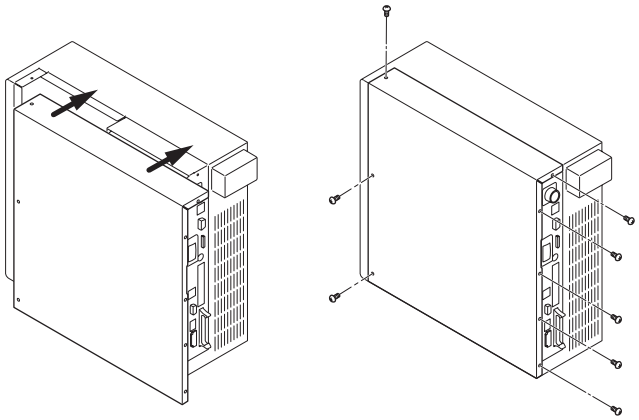
Five M3 screws on the back

One M3 screw on the top

Two M3 screws on the side

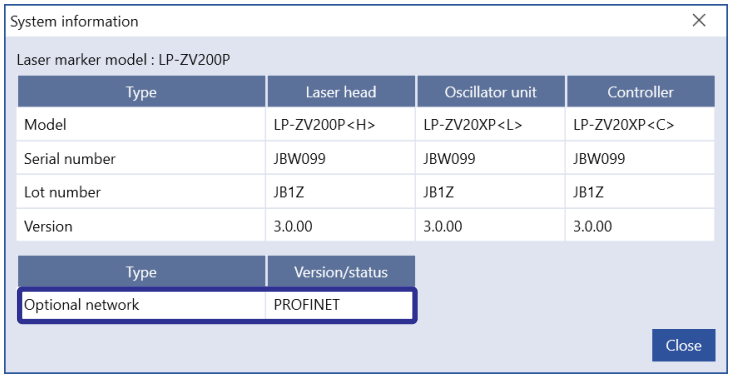
Notice

- 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 “PROFINET” is displayed as Optional network, the installation is done successfully.



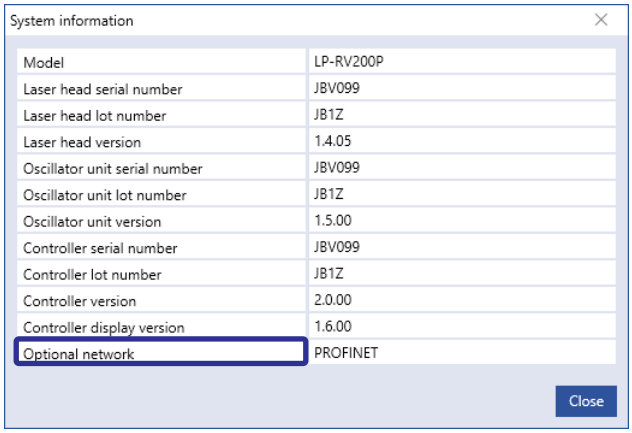
2-2-2 Confirmation of PROFINET availability

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

■ Check it on Laser Marker NAVI smart

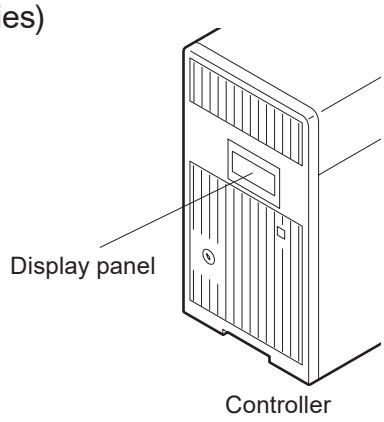
Connect the Laser Marker NAVI smart online.
Go to the “System settings” screen and select “System information” in the ribbon. In the dialog under “Optional network”, the availability of the network unit is displayed.

- 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.

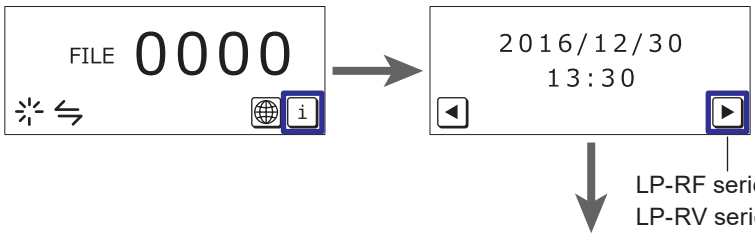


■ Check it on the display panel of the controller (LP-RF/LP-RV series)

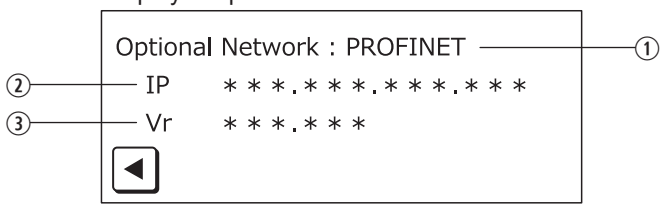
In the LP-RF/LP-RV series, the availability of the network unit can be confirmed by the display panel of the controller.
Touch “i” icon on the display and tap “►” icon until “Optional Network” screen is displayed.
In this screen, the information about the optional network is displayed.



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 PROFINET.

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

Reference

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

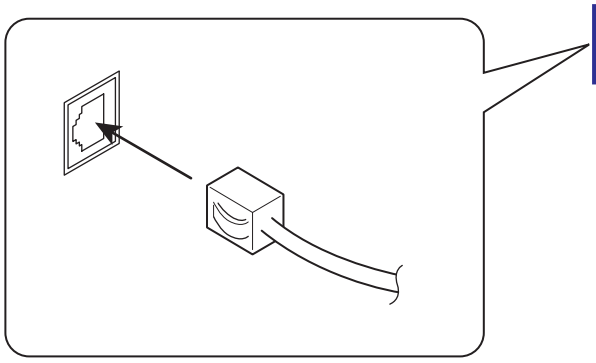
■ Connecting port

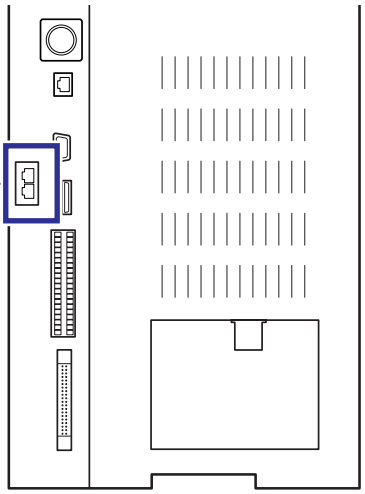
WARNING

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

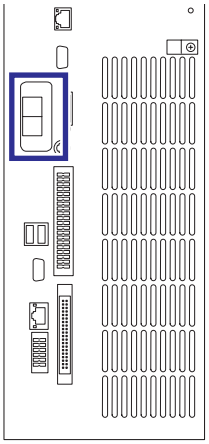
Connect the LAN cable to PROFINET port on the rear of the controller.
The laser marker has two ports of PROFINET and they are the same connector. You can use the both connectors.

Insert the connector of LAN cable to PROFINET 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 PROFINET.
- Laser Marker NAVI smart is not able to connect to laser marker via PROFINET 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 “PROFINET” 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. 28).

■ Network topology

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

- Star
- Line
- Tree
- Ring

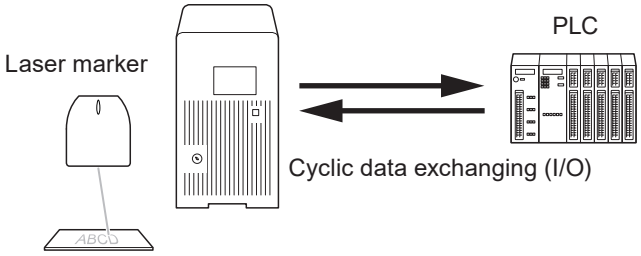
2-4 Configuration of Laser Marker

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 PROFINET communication, cyclic data exchanging is used for I/O control and record data exchanging (acyclic data exchanging) is used for the command control.

■ I/O control via cyclic data exchanging

Cyclic data exchanging is used for I/O control over PROFINET.
For details, refer to “Setup/Maintenance Guide” of the laser marker and “3 Cyclic Data Exchanging” (P. 38).

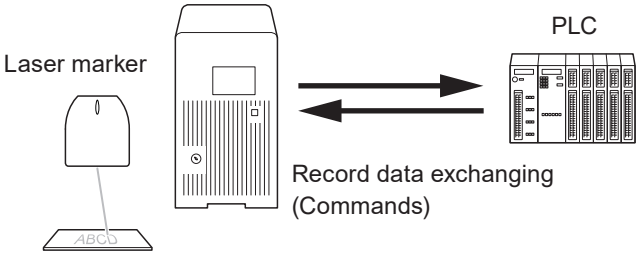


Reference

- It is available to the external control combining I/O and communication commands.
- Before the I/O control, select either “I/O” or “PROFINET” 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 PROFINET settings” (P. 32).
- Besides the I/O control, it is also possible to read the laser marker’s information and set the characters or position via cyclic data exchanging.

■ Command control via record data exchanging

Record data exchanging (acyclic data exchanging) is used to control the laser marker with communication commands.
For details, refer to “Serial Communication Command Guide” of the laser marker and “4 Record Data Exchanging” (P. 72).



Reference

- Besides the control with communication commands, it is also possible to access the following data via record data exchanging. Refer to “4 Record Data Exchanging” (P. 72).
  - Read external offset values
  - Read SIN command specified characters
  - Read registered characters
  - Read model name of laser marker
  - Read serial number of laser marker

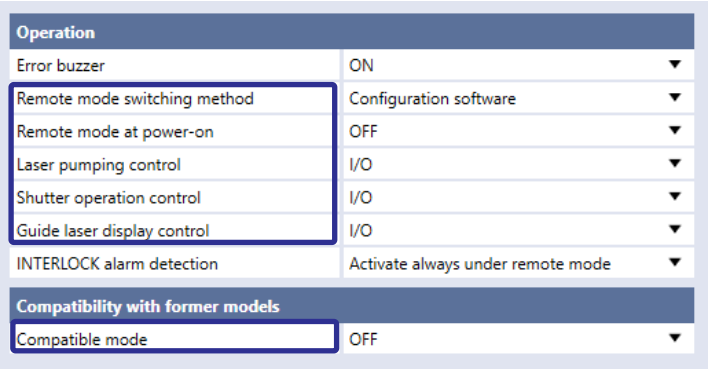
2-4-2 General settings before external control

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”.

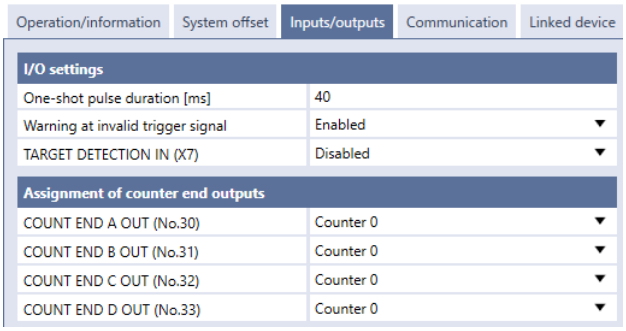
8. Select “Apply to laser marking system” on the left side of the ribbon.



“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.

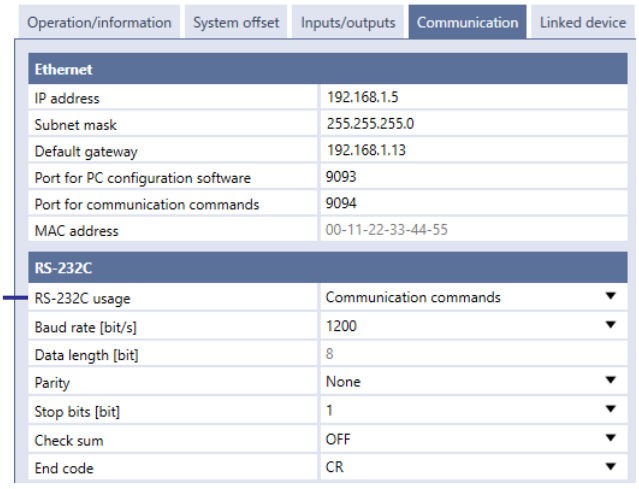


“Apply to laser marking system” tool

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.

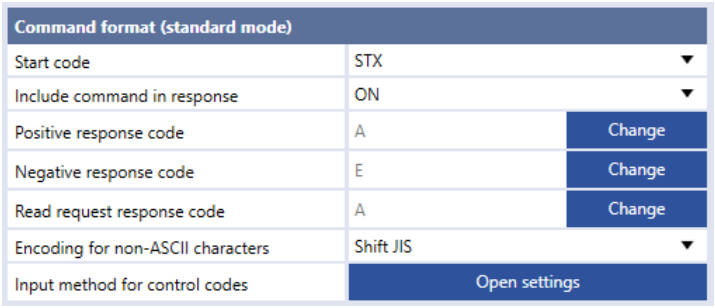


Reference

- This Ethernet setting is applied to the port labeled “LAN” on the rear of the controller. For the settings to PROFINET ports, refer to “2-4-3 PROFINET settings” (P.32).

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 record data of PROFINET, 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 PROFINET settings

Configure the communication settings of PROFINET 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 PROFINET port of the laser marker.

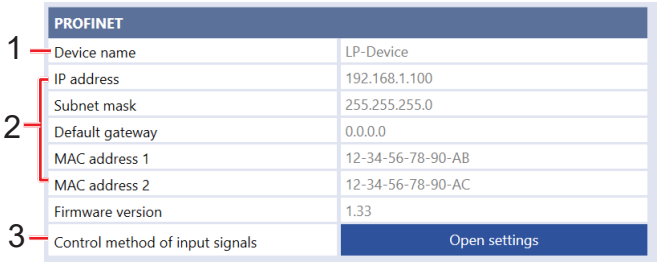
Refer to “2-3 Connection of LAN Cable” (P.27).

2. Turn on the laser marker.

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

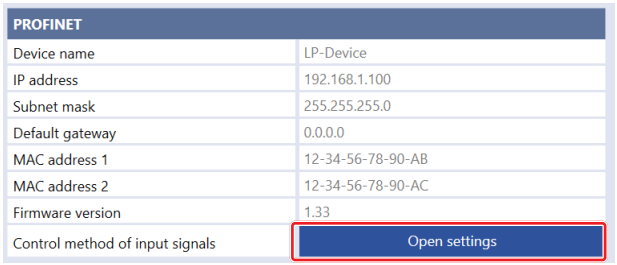
4. Go to the “System settings” screen and select the “Communication” tab.

5. Under “PROFINET”, confirm the following items.



	Item and description
1	Device name Displays the device name of PROFINET. The name can be changed via PROFINET with your controlling device such as a PLC. For the naming rules, follow the specifications of PROFINET communication. Initial setting: LP-Device
2	Network settings Displays the current settings of the network. IP address and subnet mask can be changed via PROFINET with your controlling device such as a PLC. • IP address Display range: 0.0.0.0 to 223.255.255.255 • Subnet mask Display range: 128.0.0.0 to 255.255.255.254 • Default gateway • MAC address 1 • MAC address 2
3	Firmware version Displays the version of the installed PROFINET unit.

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



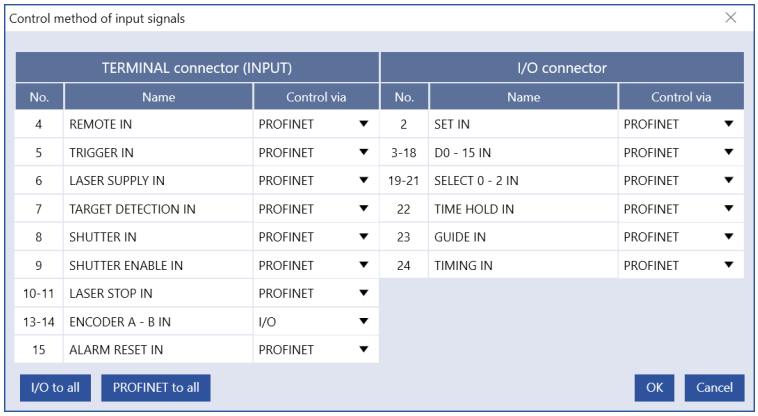
7. Select either “I/O” or “PROFINET” to the control method of each input signal on the I/O terminal and I/O connector.

Initial setting: I/O

With “I/O to all” or “PROFINET 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.29).

- 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 PROFINET.

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.

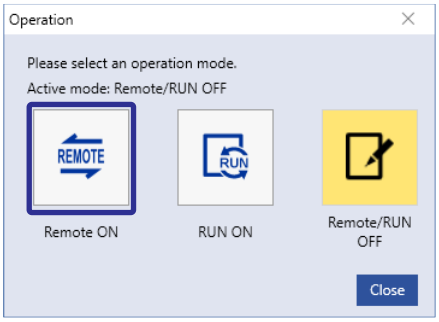
12. The control by the external device starts by switching the laser marker to the remote mode.

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.29).

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)

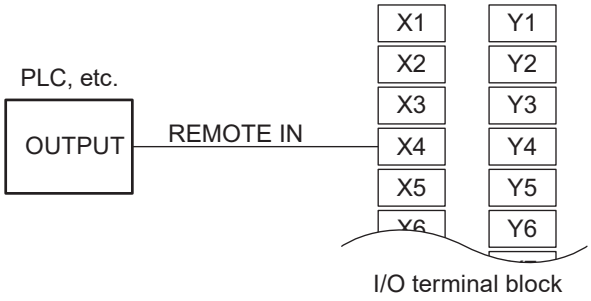
When you turn ON the key switch of the laser marker, the system starts in the remote mode. Use the operation tool of Laser Marker NAVI smart for releasing and resetting the remote mode.

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 master device of PROFINET communication.
For the setting details, please refer to the instruction manuals of your PLC.

2-5-1 Network and communication settings

■ Installation of GSD file

To setup the configuration for the laser marker, install the GSD file of the laser marker to your PLC by PROFINET engineering tools.
To get the GSD file, refer to “1-3 Download of GSD File” (P. 13).
The laser marker is registered with the following information:

Vendor		Panasonic Industry Co., Ltd.
Vendor ID		0342 (hex)
Main family		General
Product family		Laser Marking and Processing Device
Device ID		0001 (hex)
Device Access Points	Name	LP Series

■ Device name setting

In order to identify the laser marker over the network, set the device name. As a default setting, “LP-Device” is set to the laser marker.

■ IP address setting

IP address for PROFINET is assigned automatically over PROFINET Discovery and Configuration Protocol (DCP) from the PLC.
The assigned value can be confirmed in System settings screen of Laser Marker NAVI smart. Refer to “2-4-3 PROFINET settings” (P. 32).

■ Communication period setting

Set the communication period in the available range (4ms or more) of the laser marker.
Considering the data processing time of the laser marker, it is recommended to set 10ms or more.

■ Settings for record data exchanging

Create the program to access the record data for the functions to use.
Refer to “4 Record Data Exchanging” (P. 72) and “Serial Communication Command Guide” of the laser marker.

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

2-5-2 Slot assignment

For cyclic data exchanging, data for controlling or monitoring the laser marker are defined in the modules according to the functions.
Plug these modules into slot 1 to 64 of the PLC in order to use the respective functions.

■ Fixed modules

Following modules are plugged into slot 1 to 12 as a default.
To slot 7 and 8 you can select the module among the specified text buffers of different data size.
For other slots from 1 to 12, the modules are fixed and you cannot replace or delete them.

Slot	Module name	Module type *1	Size [byte]	Description
1	IO_A_out	Output modules	4	I/O terminal block input
2	IO_A_in	Input modules	4	I/O terminal block output
3	IO_A_Monitor_in	Input modules	4	I/O terminal block input monitor
4	IO_B_out	Output modules	8	I/O connector input
5	IO_B_in	Input modules	4	I/O connector output
6	IO_B_Monitor_in	Input modules	8	I/O connector input monitor
7	TextBuffer60_out	Output modules	60	Character input (Corresponding to SIN command) (60 byte) *2
	TextBuffer120_out	Output modules	120	Character input (Corresponding to SIN command) (120 byte) *2
	TextBuffer240_out	Output modules	240	Character input (Corresponding to SIN command) (240 byte) *2
8	TextBuffer60_in	Input modules	60	Character strings (60 byte) *3
	TextBuffer120_in	Input modules	120	Character strings (120 byte) *3
	TextBuffer240_in	Input modules	240	Character strings (240 byte) *3
9	FileNo_in	Input modules	8	File number
10	ErrorNo_in	Input modules	8	Error code
11	DataParam_out	Output modules	32	External offset (Corresponding to SEO command)
12	RecordDataState_in	Input modules	4	Status for record data transmission

*1 : The data in the output modules are transmitted from a PLC (master device) to the laser marker. The data in the input modules are transmitted from the laser marker to a PLC (master device).

*2 : To slot 7 select the module among TextBuffer60_out, TextBuffer120_out and TextBuffer240_out depending on the data size (60-byte, 120-byte or 240-byte) of the characters you use. As a default setting, TextBuffer120_out module is plugged into slot 7.

*3 : To slot 8 select the module among TextBuffer60_in, TextBuffer120_in and TextBuffer240_in depending on the data size (60-byte, 120-byte or 240-byte) of the characters you use. As a default setting, TextBuffer120_in module is plugged into slot 8.

■ Optional modules

You can use slot 13 to 64 if needed.
The following modules are available to slot 13 to 64.
As a default setting, no modules are plugged in to slot 13 to 64.

Pluggable slot	Module name	Module type *1	Size [byte]	Description
13 to 64	CounterNo_in	Input modules	128	Counter value
13 to 64	IO_configuration_in	Input modules	4	Control method of input signals
13 to 64	LaserMarkerInfo_in	Input modules	12	Laser marker information

*1 : The data in the input modules are transmitted from the laser marker to a PLC (master device).

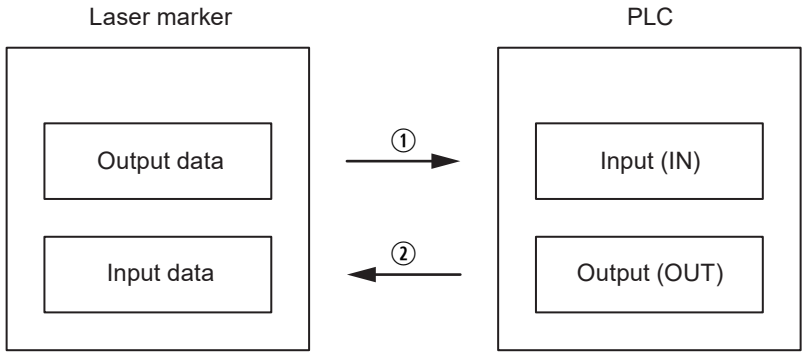
Reference

- Following modules are system reserved. Do not plug these modules in.
  - Extension_8_4_out
  - Extension_32_8_out
  - Extension_8_4_in
  - Extension_32_8_in

3 Cyclic Data Exchanging

3-1 General Description of Cyclic Data Exchanging

Cyclic data exchanging is a communication method used to exchange the data between a PLC (master device) and the laser marker (slave device) at regular intervals.
For the cyclic data exchanging, the data in the input modules and output modules are used.
The data in the input modules are transmitted from the laser marker to a PLC (master device). In a PLC it is often represented as “Input”.
The data in the output modules are transmitted from a PLC (master device) to the laser marker. In a PLC it is often represented as “Output”.



① Input modules: Laser marker -> PLC
② Output modules: PLC -> Laser marker

Cyclic data exchanging is used for I/O control over PROFINET. Besides the I/O control, it is also possible to read the laser marker's information and set the characters or position via cyclic data exchanging.
The communication period of cyclic data exchanging is configured by a PLC.

■ Communication specifications of cyclic data exchanging

Communication period *1	Min. 4.0ms
Data size of input modules (Laser marker -> PLC)	Max. 424 byte
Data size of output modules (PLC -> Laser marker)	Max. 284 byte

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

3-2 Input Modules (Laser Marker -> PLC)

This section describes the data map and information of the input modules.

3-2-1 Summary of input modules

Contents of input modules transmitted from laser marker to PLC are listed below.
The input modules are used to monitor the laser marker settings and status.
The maximum data size is 424-byte.

Slot	Module name	Data description	Access *1	Size [byte]	Refer to
2	IO_A_in	I/O terminal block output	8 bit x 4	4	P. 41
3	IO_A_Monitor_in	I/O terminal block input monitor	8 bit x 4	4	P. 42
5	IO_B_in	I/O connector output	8 bit x 4	4	P. 43
6	IO_B_Monitor_in	I/O connector input monitor	8 bit x 8	8	P. 44
8	TextBuffer60_in	Character strings (60 byte) *2	1 byte x 60	60	P. 46
	TextBuffer120_in	Character strings (120 byte) *2	1 byte x 120	120	
	TextBuffer240_in	Character strings (240 byte) *2	1 byte x 240	240	
9	FileNo_in	File number	4 byte x 2	8	P. 48
10	ErrorNo_in	Error code	4 byte x 2	8	P. 48
12	RecordDataState_in	Status for record data transmission	8 bit x 4	4	P. 49
13–64	CounterNo_in	Counter value	4 byte x 32	128	P. 51
	IO_configuration_in	Control method of input signals	8 bit x 4	4	P. 52
	LaserMarkerInfo_in	Laser marker information	4 byte x 3	12	P. 53
—	Extension_8_4_in	System reservation A	—	—	—
—	Extension_32_8_in	System reservation B	—	—	—

*1 : Byte order is big endian.

*2 : To slot 8 select the module among TextBuffer60_in, TextBuffer120_in and TextBuffer240_in depending on the data size (60-byte, 120-byte or 240-byte) of the characters you use. As a default setting, TextBuffer120_in module is plugged into slot 8.

Reference

- Extension_8_4_in and Extension_32_8_in modules are system reserved. Do not plug these modules in.
- While the remote mode of the laser marker is OFF, data in the following input modules (Laser marker -> PLC) are not updated.
  - RecordDataState_in: Status for record data transmission
  - TextBuffer60_in / TextBuffer120_in / TextBuffer240_in: Character strings (60 byte / 120 byte / 240 byte)

3-2-2 I/O terminal block output

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.

■ Module name: IO_A_in

Address (byte)	Bit	Data name	Data description	Terminal No.
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)	—
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.

3-2-3 I/O terminal block input monitor

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

■ Module name: IO_A_Monitor_in

Address (byte)	Bit	Data name	Data description	Terminal ref. No.
0	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
1	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)	—
2	0–7	Reserve System reservation	0 (fixed)	—
3	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.

3-2-4 I/O connector output

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.

■ Module name: IO_B_in

Address (byte)	Bit	Data name	Data description	Terminal No.
0	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
1	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)	—
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.

*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.

3-2-5 I/O connector input monitor

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

■ Module name: IO_B_Monitor_in

Address (byte)	Bit	Data name	Data description	Terminal ref. No.
0	0	SET IN MONITOR	0: SET IN = OFF 1: SET IN = ON	2
	1–7	Reserve System reservation	0 (fixed)	—
1	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
2	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
3	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	—
4	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 (byte)	Bit	Data name	Data description	Terminal ref. No.
5	0–7	Reserve System reservation	0 (fixed)	—
6	0–7	Reserve System reservation	0 (fixed)	—
7	0–7	Reserve System reservation	0 (fixed)	—

*1 : Refer to “3-3-3 I/O connector input” (P. 57) 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 PROFINET-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.

3-2-6 Character strings

When the readout of character strings is requested in IO_B_out module with SELECT 0 IN to SELECT 2 IN and EX SELECT IN, the characters set in the specified object number is read in TextBufferXXX_in module.
This is applicable to character objects (excluding reference list), bar code/2D code objects.
Select the module among the following three modules depending on the data size of the characters you use and plug it into slot 8. As a default setting, TextBuffer120_in module is plugged in.

- TextBuffer60_in: Character strings (60 byte)
- TextBuffer120_in: Character strings (120 byte)
- TextBuffer240_in: Character strings (240 byte)

For the setting parameters and timing chart to use this function, refer to “3-4-1 Read character strings” (P. 63).
If readout request was not issued in IO_B_out module, the value read from this module is all 00 (hex).

■ Module name: TextBuffer60_in

Characters are allocated from the beginning of the address by 1-byte and can be read up to 60-byte.
If the characters are less than 60-byte, the unused filed is filled with 00 (hex).

Address (byte)	Size [byte]	Data name	Data description
0	1	TEXT	Character strings max. 60 byte: In the readout data, ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings are used.
⋮	⋮	⋮	
59	1	TEXT	

■ Module name: TextBuffer120_in

Characters are allocated from the beginning of the address by 1-byte and can be read up to 120-byte.
If the characters are less than 120-byte, the unused filed is filled with 00 (hex).

Address (byte)	Size [byte]	Data name	Data description
0	1	TEXT	Character strings max. 120 byte: In the readout data, ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings are used.
⋮	⋮	⋮	
119	1	TEXT	

■ Module name: TextBuffer240_in

Characters are allocated 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).

Address (byte)	Size [byte]	Data name	Data description
0	1	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.
⋮	⋮	⋮	
239	1	TEXT	

Reference

- If readout request was not issued in IO_B_out module, the value read from this module is all 00 (hex).
- If the object type set in the specified object number is not either the character or the bar code/2D code, SET OK OUT of IO_B_in module 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 IO_B_in module 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 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.

3-2-7 File number

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

■ Module name: FileNo_in

Address (byte)	Size [byte]	Data name	Data description
0	4	FILE NO	0–9999
4	4	Reserve System reservation	0 (fixed)

3-2-8 Error code

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

■ Module name: ErrorNo_in

Address (byte)	Size [byte]	Data name	Data description
0	4	ERROR NO	0: No error 1–999: Error code
4	4	SUB ERROR NO *1	0–65535: Sub error code

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

3-2-9 Status for record data transmission

In order to access the setting data of the laser marker via record data, this module is used to monitor the access timing for record data exchanging.
For the details of record data exchanging, refer to “4-2 Record Data” (P. 74).

■ Module name: RecordDataState_in

Address (byte)	Bit	Data name	Data description
0	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)
1	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	
2	0	SIN08 DATA	
	1	SIN09 DATA	
	2	SIN10 DATA	
	3	SIN11 DATA	
	4	SIN12 DATA	
	5	SIN13 DATA	
	6	SIN14 DATA	
	7	SIN15 DATA	
3	0–7	Reserve System reservation	0 (fixed)

*1 : When the laser marker receives the command data set by record data - Index 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 record data - Index 1400.
Refer to “4-2-6 Read command response data” (P. 81).

*2 : If the laser marker cannot receive the command request data set by record data - Index 5000, COMMAND IGNORED turns to 1. In this case, do either of 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 PROFINET, OFFSET DATA turns to 1.
When OFFSET DATA is 1, you can read out the offset value by record data - Index 1000 to 1004. Refer to “4-2-2 Read external offset values” (P. 75).

*4 : When the registered characters are set from I/O or PROFINET, RANK DATA turns to 1.
When RANK DATA is 1, you can read out the registered characters by record data - Index 1200 to 1203. Refer to “4-2-4 Read registered characters” (P. 78).

*5 : When the characters are set from SIN command or TextBufferXXX_out module of PROFINET (Corresponding to SIN command), SINxx DATA turns to 1.
When SINxx DATA is 1, you can read out SIN command specified characters of the corresponding data number by record data - Index 1100 to 1115. Refer to “4-2-3 Read SIN command specified characters” (P. 76).

Reference

- While the remote mode of the laser marker is OFF, the data in RecordDataState_in module are not updated.

3-2-10 Counter value

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.

■ Module name: CounterNo_in

Address (byte)	Size [byte]	Data name	Data description
0	4	COUNTER 0	Counter value: 0–999999999 The counter value of the unused counter number is indicated 0.
4	4	COUNTER 1	
8	4	COUNTER 2	
12	4	COUNTER 3	
16	4	COUNTER 4	
20	4	COUNTER 5	
24	4	COUNTER 6	
28	4	COUNTER 7	
32	4	COUNTER 8	
36	4	COUNTER 9	
40	4	COUNTER 10	
44	4	COUNTER 11	
48	4	COUNTER 12	
52	4	COUNTER 13	
56	4	COUNTER 14	
60	4	COUNTER 15	
64	4	COUNTER 16	
68	4	COUNTER 17	
72	4	COUNTER 18	
76	4	COUNTER 19	
80	4	COUNTER 20	
84	4	COUNTER 21	
88	4	COUNTER 22	
92	4	COUNTER 23	
96	4	COUNTER 24	
100	4	COUNTER 25	
104	4	COUNTER 26	
108	4	COUNTER 27	
112	4	COUNTER 28	
116	4	COUNTER 29	
120	4	COUNTER 30	
124	4	COUNTER 31	

3-2-11 Control method of input signals

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 PROFINET settings” (P. 32).

■ Module name: IO_configuration_in

Address (byte)	Bit	Data name	Data description
0	0	REMOTE IN	0: I/O 1: PROFINET
	1	TRIGGER IN	
	2	LASER SUPPLY IN	
	3	Reserve System reservation	0 (fixed)
	4	SHUTTER IN	0: I/O 1: PROFINET
	5	SHUTTER ENABLE IN	
	6	LASER STOP IN	
	7	ENCODER IN (ENCODER A, B IN configuration)	
1	0	ALARM RESET IN	
	1	Reserve System reservation	0 (fixed)
	2	TARGET DETECTION IN	0: I/O 1: PROFINET
	3–7	Reserve System reservation	0 (fixed)
2	0	SET IN	0: I/O 1: PROFINET
	1	D IN (D0 IN–D15 IN configuration)	
	2	SELECT IN (SELECT 0 IN–SELECT 2 IN configuration)	
	3–7	Reserve System reservation	0 (fixed)
3	0	TIME HOLD IN	0: I/O 1: PROFINET
	1	GUIDE IN	
	2	TIMING IN	
	3–7	Reserve System reservation	0 (fixed)

Reference

- The input signals whose control methods are selected to PROFINET can be controlled by IO_A_out and IO_B_out modules set by PROFINET. Refer to “3-3-2 I/O terminal block input” (P. 55) and “3-3-3 I/O connector input” (P. 57).

3-2-12 Laser marker information

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

■ Module name: LaserMarkerInfo_in

Address (byte)	Size [byte]	Data name	Data description
0	4	DEVICE TYPE	Model name of laser marker 0: LP-RF series 1: LP-RV series 2: LP-ZV series 3: LP-RH series
4	4	DEVICE VERSION	Controller version of laser marker E.g. Version 1.6.01 is read as 1601.
8	4	Reserve System reservation	0 (fixed)

3-3 Output Modules (PLC -> Laser Marker)

This section describes the data map and information of the output modules.

3-3-1 Summary of output modules

Contents of output modules transmitted from PLC to laser marker are listed below.
The output modules are used to control and set the laser marker.
The maximum data size is 284-byte.

Slot	Module name	Data description	Access *1	Size [byte]	Refer to
1	IO_A_out	I/O terminal block input	8 bit x 4	4	P. 55
4	IO_B_out	I/O connector input	8 bit x 8	8	P. 57
7	TextBuffer60_out	Character input (Corresponding to SIN command) (60 byte) *2	1 byte x 60	60	P. 60
	TextBuffer120_out	Character input (Corresponding to SIN command) (120 byte) *2	1 byte x 120	120	
	TextBuffer240_out	Character input (Corresponding to SIN command) (240 byte) *2	1 byte x 240	240	
11	DataParam_out	External offset (Corresponding to SEO command)	4 byte x 8	32	P. 62
—	Extension_8_4_out	System reservation A	—	—	—
—	Extension_32_8_out	System reservation B	—	—	—

*1 : Byte order is big endian.

*2 : To slot 7 select the module among TextBuffer60_out, TextBuffer120_out and TextBuffer240_out depending on the data size (60-byte, 120-byte or 240-byte) of the characters you use. As a default setting, TextBuffer120_out module is plugged into slot 7.

Reference

- Extension_8_4_out and Extension_32_8_out modules are system reserved. Do not plug these modules in.
- Settings via output modules (PLC -> Laser marker) 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 “3-3-2 I/O terminal block input” (P. 55).

3-3-2 I/O terminal block input

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 "PROFINET" in System settings screen of Laser Marker NAVI smart. Refer to "2-4-3 PROFINET settings" (P. 32).
For the input signals whose control methods are selected to I/O, the settings in this module (IO_A_out) are ignored.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

■ Module name: IO_A_out

Address (byte)	Bit	Data name	Data description	Terminal No.
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)	—
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 PROFINET.
- 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.
- Data in output modules (PLC -> Laser marker) 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

3-3-3 I/O connector input

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 "PROFINET" in System settings screen of Laser Marker NAVI smart. Refer to "2-4-3 PROFINET settings" (P. 32).
For the input signals whose control methods are selected to I/O, the settings in this module (IO_B_out) are ignored.
Refer to "Setup/Maintenance Guide" of the laser marker for details of each of the signals.

■ Module name: IO_B_out

Address (byte)	Bit	Data name	Data description	Terminal No.
0	0	SET IN	0: OFF 1: ON *1	2
	1–7	Reserve System reservation	0: OFF 1: ON	—
1	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
2	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
3	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	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)	—

Address (byte)	Bit	Data name	Data description	Terminal No.
5	0–7	Reserve System reservation	0 (fixed)	—
6	0–7	Reserve System reservation	0 (fixed)	—
7	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 (IO_B_out module)” (P. 59) 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 PROFINET-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 (IO_B_out module)

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 PROFINET-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. 63).

- 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.

- 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.

- 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.

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

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.
Select the module among the following three modules depending on the data size of the characters you use and plug it into slot 7. As a default setting, TextBuffer120_out module is plugged in.

- TextBuffer60_out: Character input (Corresponding to SIN command) (60 byte)
- TextBuffer120_out: Character input (Corresponding to SIN command) (120 byte)
- TextBuffer240_out: Character input (Corresponding to SIN command) (240 byte)

This module is available when SELECT 0 IN to SELECT 2 IN and EX SELECT IN of IO_B_out module are set to enable the character input (corresponding to SIN command).
The number input (Dn IN) of IO_B_out module is used to specify which character number to set.
For the setting parameters and timing chart to use this function, refer to “3-4-2 Character input (Corresponding to SIN command)” (P. 65).
If you do not use this function, fill the all data with 00 (hex).

■ Module name: TextBuffer60_out

Allocate characters from the beginning of the address by 1-byte and the characters can be set up to 60-byte.
If the characters are less than 60-byte, fill the unused filed with 00 (hex).

Address (byte)	Size [byte]	Data name	Data description
0	1	TEXT	Character strings max. 60 byte: Set characters using ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings.
⋮	⋮	⋮	
59	1	TEXT	

■ Module name: TextBuffer120_out

Allocate characters from the beginning of the address by 1-byte and the characters can be set up to 120-byte (99 characters).
If the characters are less than 120-byte, fill the unused filed with 00 (hex).

Address (byte)	Size [byte]	Data name	Data description
0	1	TEXT	Character strings max. 120 byte (max. 99 characters): Set characters using ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings.
⋮	⋮	⋮	
119	1	TEXT	

■ Module name: TextBuffer240_out

Allocate characters from the beginning of the address by 1-byte and the characters can be set up to 198-byte (99 characters).
The addresses for 199 to 240 byte are not used. Fill them all with 00 (hex).
If the characters are less than 198-byte, fill the unused filed with 00 (hex).

Address (byte)	Size [byte]	Data name	Data description
0	1	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.
⋮	⋮	⋮	
197	1	TEXT	
198	1	TEXT (Not used)	Fill with 00 (hex).
⋮	⋮	⋮	
239	1	TEXT (Not used)	

Reference

- This function corresponds to the communication command “SIN” and is used to set the characters via cyclic data exchanging 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 IO_B_in module 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 IO_B_out module 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.

3-3-5 External offset (Corresponding to SEO command)

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 IO_B_out module are set to enable the external offset (corresponding to SEO command).
The number input (Dn IN) of IO_B_out module is used to specify which parameters to set.
For the setting parameters and timing chart to use this function, refer to “3-4-3 External offset (Corresponding to SEO command)” (P. 68).
If you do not use this function, set all parameters to 0.

■ Module name: DataParam_out

Address (byte)	Size [byte]	Data name	Data description
0	4	Parameter 1	X-movement [µm] -999999–999999
4	4	Parameter 2	Y-movement [µm] -999999–999999
8	4	Parameter 3	For LP-RH/LP-RF/LP-RV series: System reservation 0 (fixed)
			For LP-ZV series: Z-movement [µm] -25000–25000
12	4	Parameter 4	Rotation movement [1/1000 degree] -180000–180000
16	4	Parameter 5	Laser power correction [%] 0–999
20	4	Parameter 6	System reservation 0 (fixed)
24	4	Parameter 7	System reservation 0 (fixed)
28	4	Parameter 8	System reservation 0 (fixed)

Reference

- This function corresponds to the communication command “SEO” and is used to set the characters via cyclic data exchanging 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 IO_B_in module turns on.

3-4 Parameter Details and Timing Chart

This section explains the input method and timing chart of PROFINET-only functions in cyclic data exchanging.
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 IO_B_out module with SELECT 0 IN to SELECT 2 IN and EX SELECT IN, the characters set in the specified object number is read in TextBufferXXX_in module.

■ How to set the data

Output modules (PLC -> Laser marker)

Slot	Module name	Address Byte	Bit	Data name	Value	Description
4	IO_B_out	0	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	
		1	0–7	D0 IN to D7 IN	0–1999 (0–7CF hex)	Specify the object number 0 to 1999 in the binary format. D0 is the least significant bit (LSB).
		2	0–7	D8 IN to D15 IN		
		3	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	

Input modules (Laser marker -> PLC)

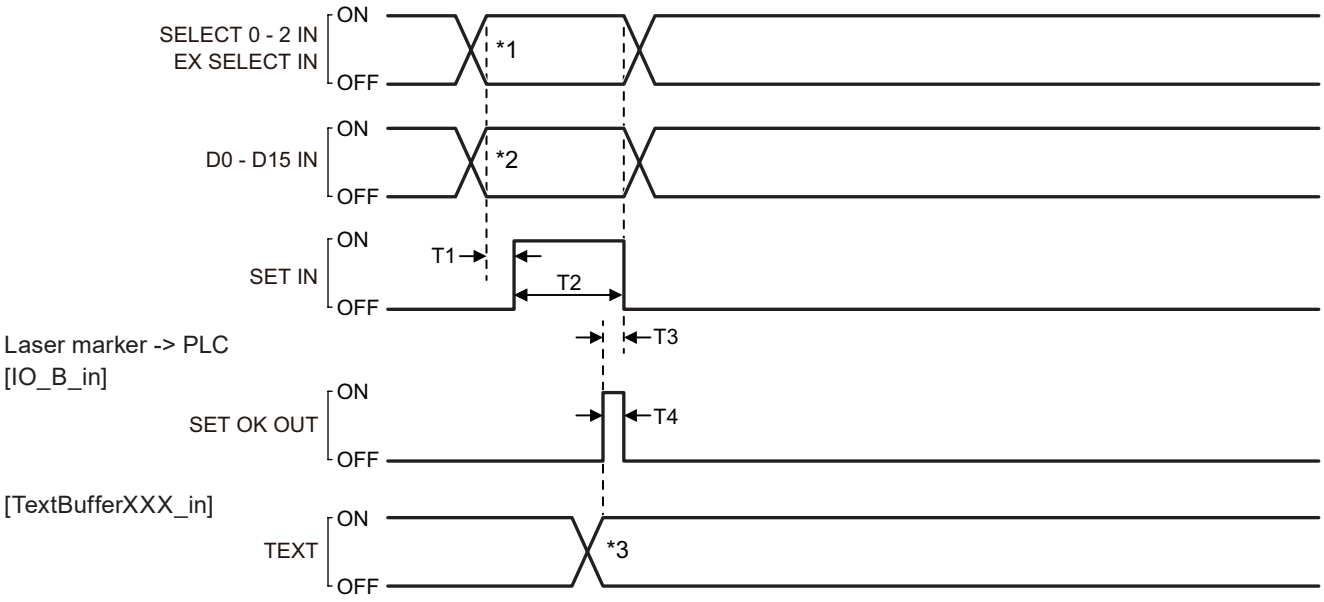
Slot	Module name	Address Byte	Bit	Data name	Value	Description
5	IO_B_in	0	0	SET OK OUT	0→1→0	SET OK OUT turns on when the setting by SET IN has completed. *1
8	TextBuffer60_in	0–59	—	TEXT	—	Character strings max. 60/120/240 byte *2: In the readout data, ASCII code and the character code selected for “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).
	TextBuffer120_in	0–119	—	TEXT	—	
	TextBuffer240_in	0–239	—	TEXT	—	

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

*2 : To slot 8 select the module among TextBuffer60_in, TextBuffer120_in and TextBuffer240_in depending on the data size (60-byte, 120-byte or 240-byte) of the characters you use. As a default setting, TextBuffer120_in module is plugged into slot 8.

■ Timing chart

PLC -> Laser marker
[IO_B_out]



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 Character input (Corresponding to SIN command)

For the files in which “Characters specified by SIN command” of the functional character is set, set characters.
Specify the character number to input with SELECT 0 IN to SELECT 2 IN, EX SELECT IN and Dn IN for number input in IO_B_out module, then set the characters in TextBufferXXX_out module.

■ How to set the data

Output modules (PLC -> Laser marker)

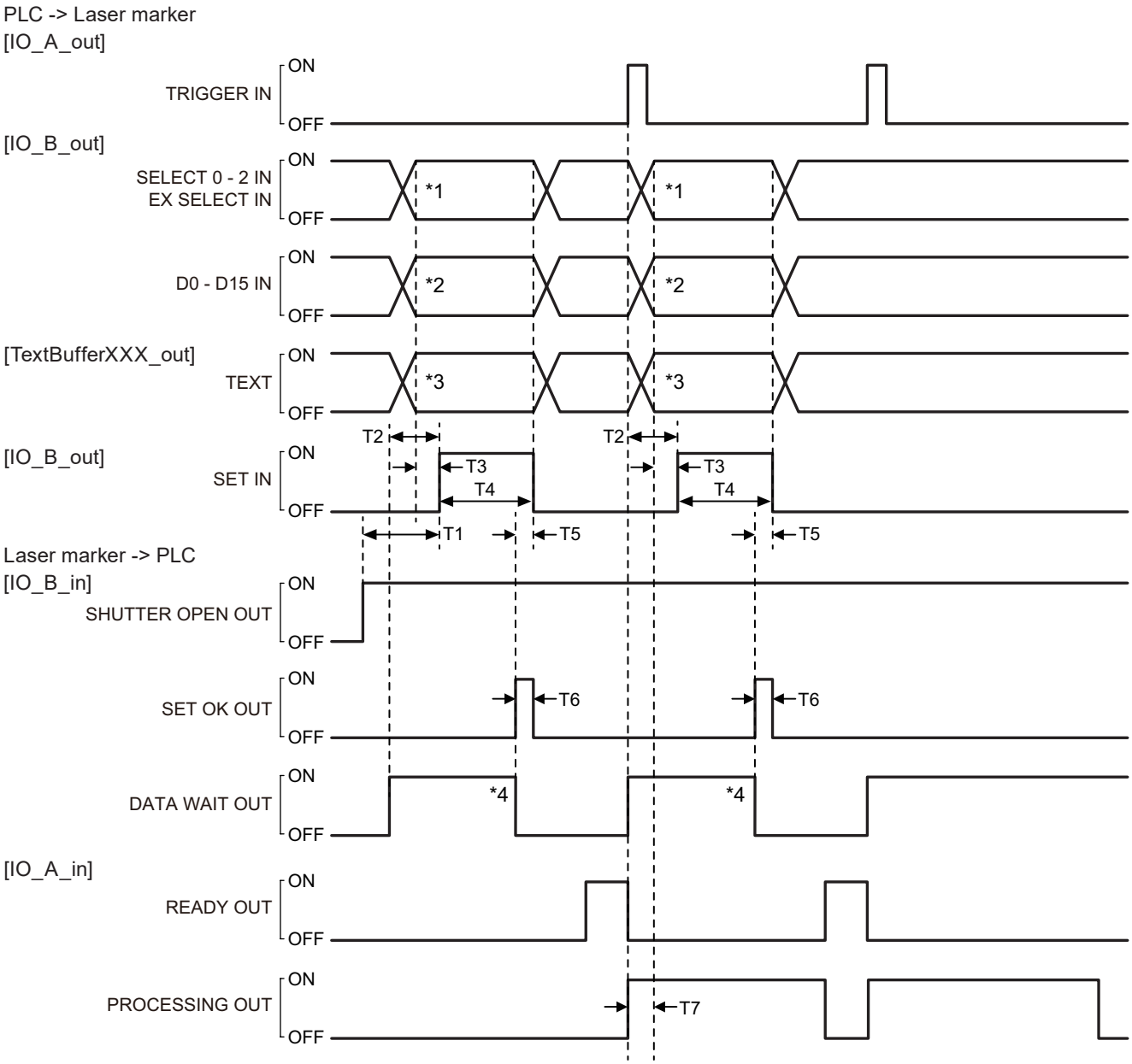
Slot	Module name	Address	Bit	Data name	Value	Description
		Byte				
4	IO_B_out	0	0	SET IN	0→1	To determine the character input, turn SET IN on holding the input status of Dn INs, SELECT INs and TEXT.
			1–7	Reserve	0	
		1	0–7	D0 IN to D7 IN	0–15 (0–F hex)	Specify the character number 0 to 15 in the binary format. D0 is the least significant bit (LSB).
		2	0–7	D8 IN to D15 IN	0	Set 0 to all.
		3	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	
7	TextBuffer60_out	0–59	—	TEXT	—	Character strings max. 60/120/240 byte *1: 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).
	TextBuffer120_out	0–119	—	TEXT	—	
	TextBuffer240_out	0–239	—	TEXT	—	

*1 : To slot 7 select the module among TextBuffer60_out, TextBuffer120_out and TextBuffer240_out depending on the data size (60-byte, 120-byte or 240-byte) of the characters you use. As a default setting, TextBuffer120_out module is plugged into slot 7.

Input module (Laser marker -> PLC)

Slot	Module name	Address	Bit	Data name	Value	Description
		Byte				
5	IO_B_in	0	0	SET OK OUT	0→1→0	SET OK OUT turns on when the setting by SET IN has completed. This is One-shot output. Set the output time on the system settings screen of Laser Marker NAVI smart.

■ Timing chart



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 TextBufferXXX_out module, 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.

3-4-3 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. Specify the parameter to offset with SELECT 0 IN to SELECT 2 IN, EX SELECT IN and Dn IN for number input in IO_B_out module, then set the offset value in DataParam_out module.

■ How to set the data

Output modules (PLC -> Laser marker)

Slot	Module name	Address Byte	Bit	Data name	Value	Description
4	IO_B_out	0	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	
		1	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 to D7 IN	0	Set 0 to all.
		2	0–7	D8 IN to D15 IN	0	Set 0 to all.
		3	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	

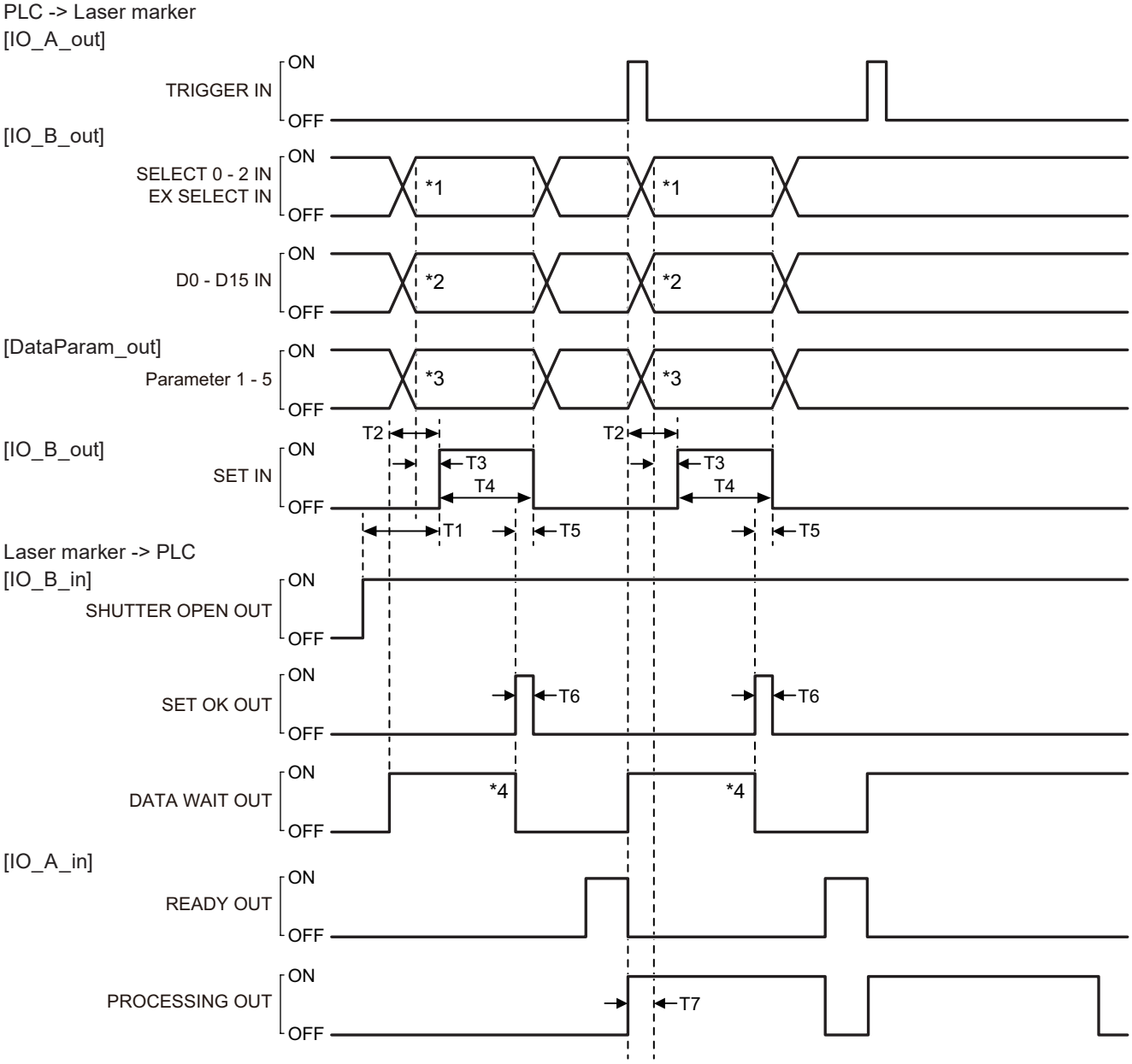
Slot	Module name	Address	Bit	Data name	Value	Description
		Byte				
11	DataParam_out	0	—	Parameter 1	-999999 to 999999	X-movement [µm] When D0 IN is 1, set the value in the binary format. When D0 IN is 0, set 0.
		4	—	Parameter 2	-999999 to 999999	Y-movement [µm] When D1 IN is 1, set the value in the binary format. When D1 IN is 0, set 0.
		8	—	Parameter 3	0 or -25000 to 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.
		12	—	Parameter 4	-180000 to 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	—	Parameter 5	0 to 999	Laser power correction [%] When D4 IN is 1, set the value in the binary format. When D4 IN is 0, set 0.
		20	—	Parameter 6	0 (fixed)	Set 0 to all.
		24	—	Parameter 7	0 (fixed)	Set 0 to all.
		28	—	Parameter 8	0 (fixed)	Set 0 to all.

Input module (Laser marker -> PLC)

Slot	Module name	Address	Bit	Data name	Value	Description
		Byte				
5	IO_B_in	0	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



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 DataParam_out module, 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

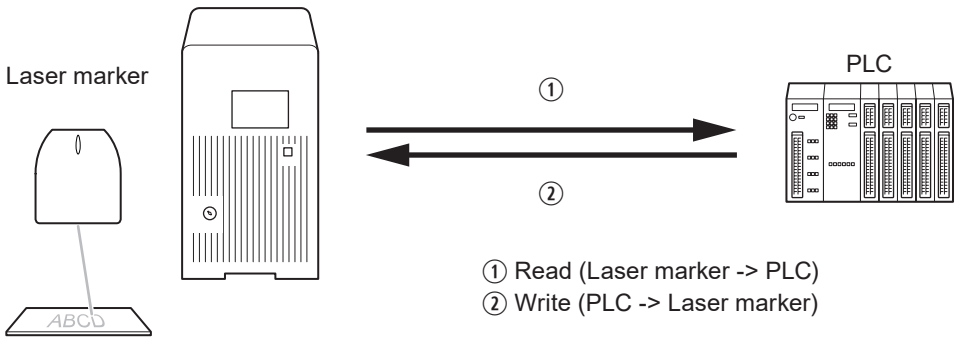
- To use this function, set the external offset function with “Using SEO command” to the file in Laser Marker NAVI smart beforehand.
- SET OK OUT turns on when the offset values are set to the all parameters enabled with D0 IN to D15 IN.
- When the file with external offset function with “Using SEO command” 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.

4 Record Data Exchanging

4-1 General Description of Record Data Exchanging

With record data exchanging (acyclic data exchanging) the data are sent on a specific request, while with cyclic data exchanging the data are sent at a given interval.
Record data exchanging provides the request/response oriented functions and it is possible to control the laser marker via communication command.
With record data exchanging 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



■ Communication specifications of record data exchanging

Record data size for reading (Laser marker -> PLC)	Max. 1200 byte
Record data size for writing (PLC -> Laser marker)	3 to 1200 byte

4-2 Record Data

To control or monitor the settings or status of the laser marker via record data exchanging, access the record data in the laser marker by following the data format described in this section.

4-2-1 List of record data

To access the record data in the laser marker, specify the slot, subslot and index.
For the record data exchanging, always the slot is 0 and subslot is 1. The index varies depending on the functions as follows.
The byte order is big endian.
When reading the data, specify the data size with the maximum value defined in each index.
For details, refer to the description of each function.

Slot	Subslot	Index	Name	Access	Data size [byte]	Refer to
0	1	1000–1004	Read external offset values	READ	4	P. 75
		1100–1115	Read SIN command specified characters	READ	Max. 198	P. 76
		1200–1203	Read registered characters	READ	Max. 18	P. 78
		5000	Write command request data	WRITE	3 to 1200	P. 79
		1400	Read command response data	READ	Max. 1200	P. 81
		1500	Read model name	READ	9 to 32	P. 85
		1501	Read serial number	READ	6 to 20	P. 86

Reference

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

4-2-2 Read external offset values

If any of the following external offset functions are used, with this record data 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 DataParam_out module of cyclic data exchanging (Corresponding to SEO command)

You can confirm the timing of the readout with the RecordDataState_in module of the cyclic data exchanging. When OFFSET DATA of RecordDataState_in module is 1, you can read the offset value. Refer to “3-2-9 Status for record data transmission” (P. 49).

■ Index: 1000–1004

To Index 1000–1004, the following offset items are assigned respectively

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

■ Access: READ

■ Record data

Slot	Subslot	Index	Readout data (Offset value)	Data size *1	Description
0	1	1000	-999999–999999	4 byte	X-movement [µm]
		1001	-999999–999999	4 byte	Y-movement [µm]
		1002	-25000–25000	4 byte	Only for LP-ZV series: Z-movement [µm]
		1003	-180000–180000	4 byte	Rotation movement [1/1000 degree]
		1004	0–999	4 byte	Laser power correction [%]

*1 : Data size is fixed with 4-byte.

Reference

- When OFFSET DATA in RecordDataState_in module of the cyclic data exchanging is 1, you can readout the offset value. Refer to “3-2-9 Status for record data transmission” (P. 49).
- The readout data is the value to be applied to the next marking.
- Index 1002 "Z-movement" 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 in RecordDataState_in module is 0), the readout data are as follows;
  - Index 1000–1003: 0 (4-byte)
  - Index 1004: 100 (4-byte)
- 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 PROFINET cyclic data exchanging.

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A0 (hex)	read error	Wrong access. (WRITE access to READ data)
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The data size should be 4 byte length.

4-2-3 Read SIN command specified characters

If any of the following functions are used, with this record data 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 TextBufferXXX_out module of cyclic data exchanging (Corresponding to SIN command)

You can confirm the timing of the readout with the RecordDataState_in module of the cyclic data exchanging. When SINxx DATA of RecordDataState_in module is 1, you can read the character strings of the specified character number. Refer to “3-2-9 Status for record data transmission” (P. 49).

■ Index: 1100–1115

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

■ Access: READ

■ Record data

Slot	Subslot	Index	Character number to read: 0 to 15 (RecordDataState_in module)	Readout data / Data size
0	1	1100	SIN00 DATA	Character strings max. 198 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.
		1101	SIN01 DATA	
		1102	SIN02 DATA	
		1103	SIN03 DATA	
		1104	SIN04 DATA	
		1105	SIN05 DATA	
		1106	SIN06 DATA	
		1107	SIN07 DATA	
		1108	SIN08 DATA	
		1109	SIN09 DATA	
		1110	SIN10 DATA	
		1111	SIN11 DATA	
		1112	SIN12 DATA	
		1113	SIN13 DATA	
		1114	SIN14 DATA	
		1115	SIN15 DATA	

Reference

- The readout data is the characters to be applied to the next marking.
- When SINxx DATA in RecordDataState_in module of cyclic data exchanging is 1, you can read out the characters of the corresponding data number. Refer to “3-2-9 Status for record data transmission” (P. 49).
- 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 variable length.
- If the character string is unset (when SINxx DATA in RecordDataState_in module is 0), there is no data (0-byte) in the readout data.
- 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.

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A0 (hex)	read error	Wrong access. (WRITE access to READ data)
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The specified data size is too small to the readout strings.

4-2-4 Read registered characters

If “Registered characters” function is used to switch characters by I/O input, with this index 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 the RecordDataState_in module of the cyclic data exchanging. When RANK DATA in RecordDataState_in module is 1, you can read the characters of the specified registration table number. Refer to “3-2-9 Status for record data transmission” (P. 49).

■ Index: 1200–1203

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

■ Access: READ

■ Record data

Slot	Subslot	Index	Registration table number	Readout data / Data size
0	1	1200	Number 0	Character strings max. 18 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.
		1201	Number 1	
		1202	Number 2	
		1203	Number 3	

Reference

- When RANK DATA in RecordDataState_in module of the cyclic data exchanging is 1, you can read out the characters. Refer to “3-2-9 Status for record data transmission” (P. 49).
- The readout data is the characters to be applied to the next marking.
- If the registered character is unset (when RANK DATA in RecordDataState_in module is 0), there is no data (0-byte) in the readout data.
- 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.

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A0 (hex)	read error	• Wrong access. (WRITE access to READ data) • Unsupported character code is used in the readout strings.
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The specified data size is too small to the readout strings.

4-2-5 Write command request data

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

■ Index: 5000

■ Access: WRITE

■ Record data

Slot	Subslot	Index	Setting data	Data size
0	1	5000	Command data (Request data) *1	3 to 1200 byte (Variable-length)

*1 : Do not contain the start code, end code, and check sum. For details, refer to “Data format for Index 5000” (P. 80).

Reference

- You cannot use the command format in LP-400/V and LP-M/S/Z compatible mode in record data exchanging of PROFINET.
- Following commands are not available in record data exchanging of PROFINET.
  - MST command
  - RSM command
- You can confirm the receipt of the request command with RecordDataState_in module - COMMAND RESPONSE. When COMMAND RESPONSE is 1, the command request data is received by the laser marker. Refer to “3-2-9 Status for record data transmission” (P. 49) and “Timing chart of command data” (P. 84).
- 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”.

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A1 (hex)	write error	Wrong access. (READ access to WRITE data)
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The specified data size is incorrect. It should be in the range of 3 to 1200 byte.

■ Data format for Index 5000

Set the command request data in Index 5000 in the following format.
In the command data of PROFINET, do not contain the start code, end code, and check sum.
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
3-byte	1-byte	Variable length

- 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
3-byte	1-byte	Variable length

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“
46 4E 4F (hex)	53 (hex)	39 39 39 39 (hex)

4-2-6 Read command response data

To read the response data to the command request data written via Index 5000, access the record data with Index 1400. You can confirm the timing of the readout with the RecordDataState_in module of the cyclic data exchanging. When COMMAND RESPONSE of RecordDataState_in module is 1, you can read the response data. Refer to “3-2-9 Status for record data transmission” (P. 49).
For the details of the communication command, refer to “Serial Communication Command Guide” of the laser marker.

■ Index: 1400

■ Access: READ

■ Record data

Slot	Subslot	Index	Readout data	Data size
0	1	1400	Command data (Response data) *1	Max. 1200 byte (Variable-length)

*1 : The start code, end code, and check sum are not included. For details, refer to “Data format for Index 1400” (P. 82).

Reference

- You cannot use the command format in LP-400/V and LP-M/S/Z compatible mode in the record data of PROFINET.
- Following commands are not available in the record data of PROFINET.
  - 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 RecordDataState_in module is 0, there is no data (0-byte) in the readout data.

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A0 (hex)	read error	• Wrong access. (WRITE access to READ data) • No response data because the command request is refused. (COMMAND IGNORED of RecordDataState_in module is ON.)
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The specified data size is too small to the readout strings.

■ Data format for Index 1400

The command response data is read out in the following format in Index 1400.
In the command data of PROFINET, the start code, end code, and check sum are not included.

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
3-byte	1-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
3-byte	1-byte	Variable length

- 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”
3-byte	1-byte	2-byte	2-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 record data of PROFINET, you cannot remove the command from the response data regardless the configuration of the system settings in Laser Marker NAVI smart.
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. 29).

Item	Description
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 variablelength 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 fixedlength 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”
46 4E 4F (hex)	41 (hex)

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

Command “FNO”	Sub command “A”	Data example: File No. “9999”
46 4E 4F (hex)	41 (hex)	39 39 39 39 (hex)

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

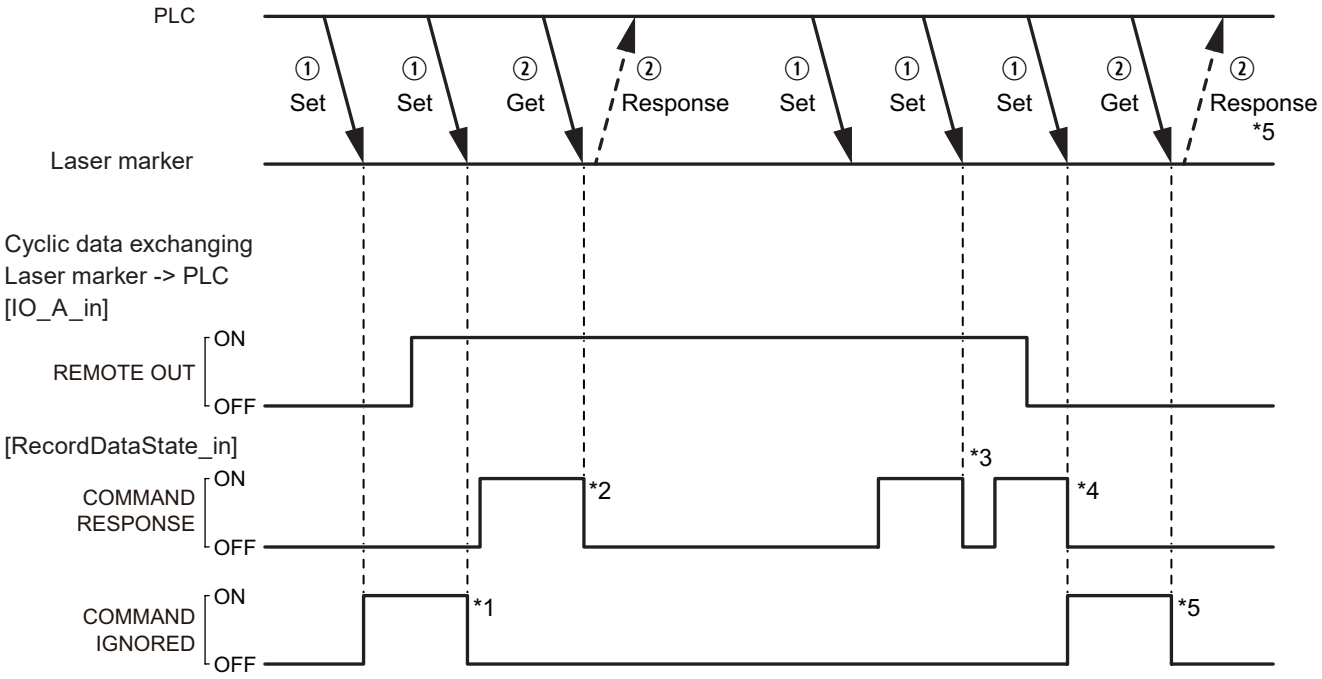
Command “FNO”	Sub command “E”	Data example: “9801”
46 4E 4F (hex)	45 (hex)	39 38 30 31 (hex)

■ Timing chart of command data

Record data exchanging (acyclic data exchanging)

① Index 5000: Write command request data (Set)

② Index 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 there is no data (0-byte) in the readout data of Index 1400.

4-2-7 Read model name

You can read out the model name of the laser marker to access this record data.

■ Index: 1500

■ Access: READ

■ Record data

Slot	Subslot	Index	Readout data	Data size	Description
0	1	1500	Character string (ASCII code)	9 to 32 byte (Variable-length)	Model name of the laser marker head E.g. LP-RF200P

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A0 (hex)	read error	Wrong access. (WRITE access to READ data)
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The specified data size is too small to the readout strings.

4-2-8 Read serial number

You can read out the serial number of the laser marker to access this record data.

■ Index: 1501

■ Access: READ

■ Record data

Slot	Subslot	Index	Readout data	Data size	Description
0	1	1501	Character string (ASCII code)	6 to 20 byte (Variable-length)	E.g. JJT099 For LP-RF/LP-RV series: Serial number of the laser marker controller For LP-RH/LP-ZV series: Serial number of the laser marker head

■ Access errors to the record data

If the record data access is incorrect, the laser marker returns the following error codes.

ErrorCode1	Meaning	Description
A0 (hex)	read error	Wrong access. (WRITE access to READ data)
B0 (hex)	invalid index	Index is wrong.
B1 (hex)	write length error	The specified data size is too small to the readout strings.

Troubleshooting

Troubleshooting

If any problems in PROFINET 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 PROFINET connectors

If you have any problems in PROFINET communication, check the LEDs on the PROFINET connectors located on the rear of the controller at first.
Refer to “1-5-2 Status of LED indicator” (P. 16).

■ Basic settings of PROFINET

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. 27). • Connect the LAN cable to “PROFINET” port. The ports labeled “LAN” and “INFO LAN” on the rear of the controller do not function as PROFINET.
	No setting of IP address.	• Check the network settings of the PLC. • Set the different IP addresses to “Ethernet” and “PROFINET” under “Communication” tab in System settings screen of Laser Marker NAVI smart.
I/O control via cyclic data exchanging fails.	Settings of Laser Marker NAVI smart are incorrect.	• Refer to “2-4 Configuration of Laser Marker” (P. 28). • 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 communication period set in your PLC is the available values for the laser marker. • Check if the modules are plugged into the correct slot.
	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.

Troubles	Causes	Measures
Control via record data exchanging fails.	Settings of Laser Marker NAVI smart are incorrect.	• Refer to “2-4 Configuration of Laser Marker” (P. 28). • 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”. • 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 PROFINET, do not contain the start code, end code, and check sum.
	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”.

Panasonic Industry Co., Ltd.
1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8506, Japan
https://industry.panasonic.com/

Please visit our website for inquiries and about our sales network.

© Panasonic Industry Co., Ltd. 2019-2024

April, 2024