Panasonic

Laser Marker

Serial Communication Command Guide

LP-M/S/Z compatible mode

LP-ZV series

ME-LPZV-SR-MSZ-4

2024.7 | 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.
- QR Code, iQR Code are registered trademarks of DENSO WAVE INCORPORATED in Japan and in other countries.
- Adobe, Adobe Logo, Adobe Acrobat Reader, and Adobe Illustrator are either registered trademarks or trademarks of Adobe Inc. in the United States and/or other countries.
- Bluetooth is a registered trademark of U.S.A. Bluetooth SIG Inc.
- 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.

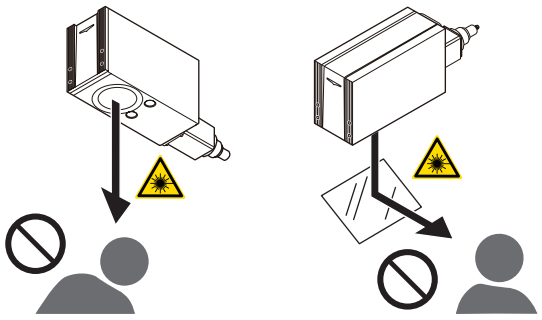
The following symbols are used to classify and describe the type of instructions to be observed.

⃠	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

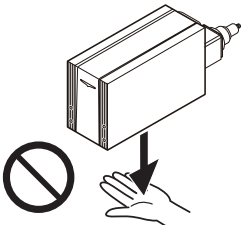
⃠

- 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

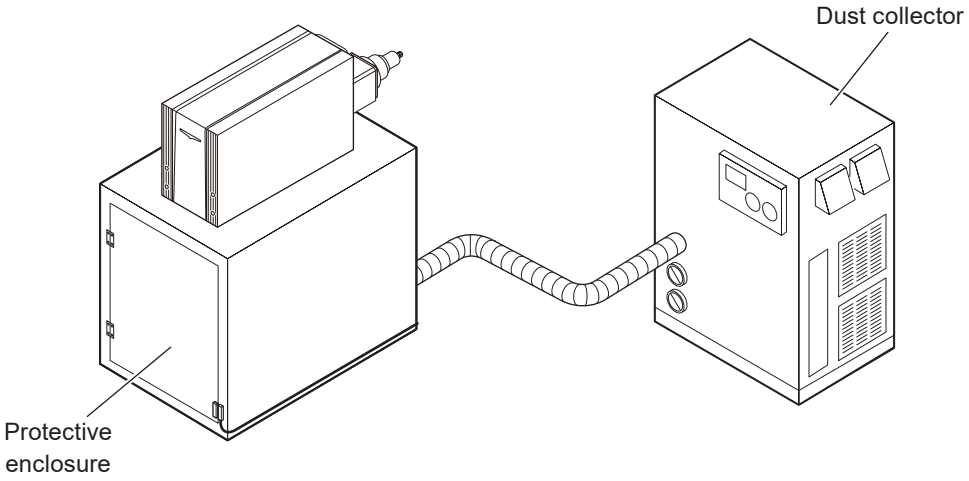
- Do not use this product anywhere where fire is strictly prohibited, near inflammable gas, objects or organic solvents such as thinner or gasoline, or in dusty place. There is a risk of fire.
- Do not use this product except for water-resistant part in wet place. In addition, never conduct wiring or 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. Hold the product with both hands. Do not hold the cables or connectors at carrying.
- To carry this product, do not hold the cut edges of metal parts, the protrusions or corners of the product body. It may cause injury.
- Install this product in the stable place without vibration and shock.
- In case it falls down, it may cause injury.

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

⚠ WARNING

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

⚠ CAUTION

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

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

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

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-ZV200P	LP-ZV200P	LP-ZV series LP-ZV
LP-ZV205P	LP-ZV205P	
LP-ZV206P	LP-ZV206P	
LP-ZV500P	LP-ZV500P	
LP-ZV505P	LP-ZV505P	
LP-ZV506P	LP-ZV506P	

■ Type of manuals

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

Laser Safety Guide

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

Setup/Maintenance Guide

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

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

Laser Marker NAVI smart Quick Reference

This manual describes the basic operation procedure for the laser marker configuration software “Laser Marker NAVI smart”. Please read this when using the laser marker for the first time.

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 this product externally using the serial communication (RS-232C/Ethernet). It describes the communication settings, communication data formats, communication commands, and the control samples.
Mainly the machine builder and system integrator shall be required for reading this manual.

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

This manual describes the communication commands to control LP-GS/LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV externally using the compatible command format with the previous models of LP-400/LP-V series.
Mainly the machine builder and system integrator shall be required for reading this manual.

Serial Communication Command Guide: LP-M/S/Z compatible mode

This manual describes the communication commands to control LP-ZV externally using the compatible command format with the previous models of LP-M/LP-S/LP-Z series.
Mainly the machine builder and system integrator shall be required for reading this manual.

Reference

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

Contents

Preface 2
Cautions in Handling 3
How to Read this Document 6

1 Preparation of Command Control 12

1-1 Operation by External Devices 13
1-1-1 Operation method using external control device 13
1-1-2 Operation procedure with external control 14
1-1-3 General settings before external control 15
1-1-4 Remote mode settings 18
1-2 Communication Interfaces 19
1-3 RS-232C 20
1-3-1 Interface specifications and connection 20
1-3-2 Communication settings (LP-M/S/Z compatible mode) 22
1-4 Ethernet 23
1-4-1 Port specifications and connection 23
1-4-2 Communication settings 24
1-4-3 Connecting to external control devices and its setting sample 25
1-5 Checking the communication commands 26

2 Communication Control Basics 27

2-1 Communication Data Types 28
2-1-1 Request data 28
2-1-2 Response data 28
2-2 Communication Sequence 29
2-3 Communication Data Format 32
2-3-1 Basic data format 32
2-3-2 Request data 33
2-3-3 Response data 34
2-3-4 Character input method 37
2-3-5 Character data input method 38
2-4 Command Reception Condition 43
2-4-1 Commands requiring pre-set 43
2-4-2 Command reception permission 43
2-4-3 Commands acceptable only with the shutter closed 44
2-4-4 Commands acceptable during alarm/warning occurrence 44
2-5 Communication Check 45
2-6 Control Sample 46

3 Data Format for Each Command 51

3-1 Command List 52
3-2 Command Description Details 57
3-3 Operation Control Commands 58
3-3-1 Command reception permission: MKM 58
3-3-2 Laser pumping: LSR 59
3-3-3 Shutter open/close: SHT 60
3-3-4 Marking trigger: MRK 61
3-3-5 Trigger delay: DLY 62
3-3-6 Guide laser: GID 63
3-3-7 Test marking: TST 65
3-3-8 Status checking: STS 67
3-3-9 Marking end verification: MST 68
3-4 File Setting Commands 71
3-4-1 File selection by number: FNO 71
3-4-2 File selection by name: FNN 72
3-4-3 Overwrite file: FOR 73
3-4-4 Save file to different No.: FRG 73
3-4-5 File name: FNM 74
3-5 Character Setting Commands 75
3-5-1 Character entry (by ASCII code): MCS 75
3-5-2 Character entry (by ASCII and Shift-JIS code): STR 76
3-5-3 Character entry per trigger: SIN 78
3-5-4 Character object settings: STC 80
3-5-5 Character object settings (shortened): SPC 84
3-5-6 Character object group fine-adjustment: SCC 85
3-6 Functional Character Commands 86
3-6-1 Counter settings: CNT 86
3-6-2 Counter reset: CTR 87
3-6-3 Expiry date/time settings: LMT 88
3-6-4 Lot settings: LTC 89
3-6-5 Lot period/character: LTS 90
3-6-6 Registered character input method: RKC 92
3-6-7 Registered character strings: RKS 93
3-7 Bar Code/2D Code Settings Commands 94
3-7-1 Bar code/2D code characters (by ASCII code): BCS 94
3-7-2 Bar code/2D code characters (by ASCII code): BBS 96
3-7-3 Bar code/2D code characters (by ASCII and Shift-JIS code): BRS 98
3-7-4 Bar code/2D code object settings: BRF 100
3-7-5 Human readable text settings: BRV 113
3-7-6 Module filling of 2D codes: BRP 117
3-7-7 Module filling of bar codes/module skip marking of 2D codes: BCC 119

3-8 Command for graphic data settings 120
3-8-1 Graphic file (VEC/DXF format file) : CDF 120
3-8-2 Graphic object settings (VEC format file) : CDC 121
3-8-3 Graphic object settings (DXF format file): CDD 123
3-8-4 Shape settings: FIG 125
3-8-5 Shape object settings: LAY 132
3-9 Point Radiation Commands 133
3-9-1 Point radiation parameters: PRD 133
3-9-2 Point radiation correction: PRF 137
3-10 Layout/Position Adjustment Commands 138
3-10-1 File settings: ALC 138
3-10-2 Marking position and laser power adjustment per trigger: SEO 140
3-10-3 External offset input method: OFC 142
3-10-4 External offset values: OFS 143
3-10-5 Step & repeat settings: SRC 144
3-10-6 Step & repeat fine-adjustment: SRA 146
3-10-7 3D model: SUF 151
3-10-8 Marking ON/OFF by layer: LMS 156
3-11 On-the-fly Marking Commands 157
3-11-1 Motion settings: TRG 157
3-11-2 Encoder resolution: ENC 158
3-11-3 Line speed: LSP 159
3-11-4 Workpiece spacing: INT 160
3-12 Laser Setting Commands 161
3-12-1 Laser power: LPW 161
3-12-2 Scan speed: SSP 162
3-12-3 Pulse cycle / pulse duration: MPL 163
3-12-4 Laser fine tune: WTC 165
3-12-5 Line width / uniform spot mode: WDC 167
3-13 Maintenance Commands 168
3-13-1 Laser radiation for measurement: SPT 168
3-13-2 Power check: PWM 169
3-13-3 Low power notice level: PWL 175
3-13-4 Marking energy check: MEN 176
3-13-5 Error code: ECR 177
3-14 System Settings Command 178
3-14-1 System clock: YMD 178
3-14-2 Command mode: RSM 179

Troubleshooting 180

Troubleshooting 181
What to do if an error occurs 199

Alarm: E001 - E599 199
Warning: E600 - E799 204

Character Code Table 215

ASCII Code..... 216
Shift JIS Code.....217

Index 228

1 Preparation of Command Control

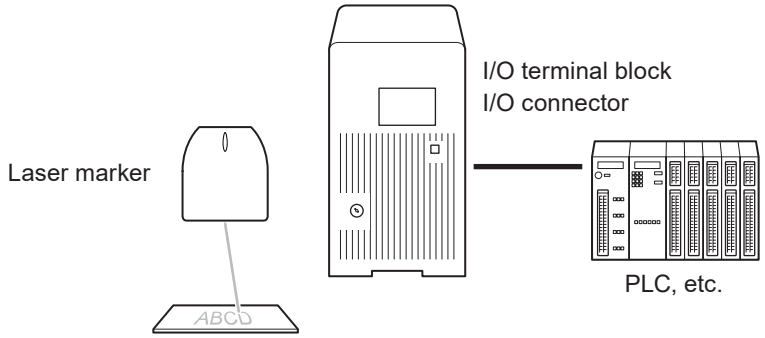
1-1 Operation by External Devices

1-1-1 Operation method using external control device

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

Control by I/O (remote mode)

Controls the laser marker from external devices such as PLC using I/O signals loaded into the laser marker.
For details, refer to “Setup/Maintenance Guide”.

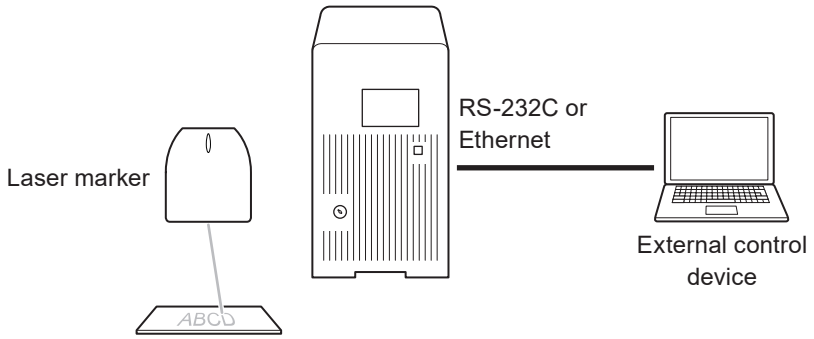


Reference

- To input marking trigger with I/O and configure other settings with a screen operation manually, use Run mode. For details, refer to “Setup/Maintenance Guide”

Control by communication commands (remote mode)

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



Reference

- It is available to the external control combining I/O and communication commands.

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

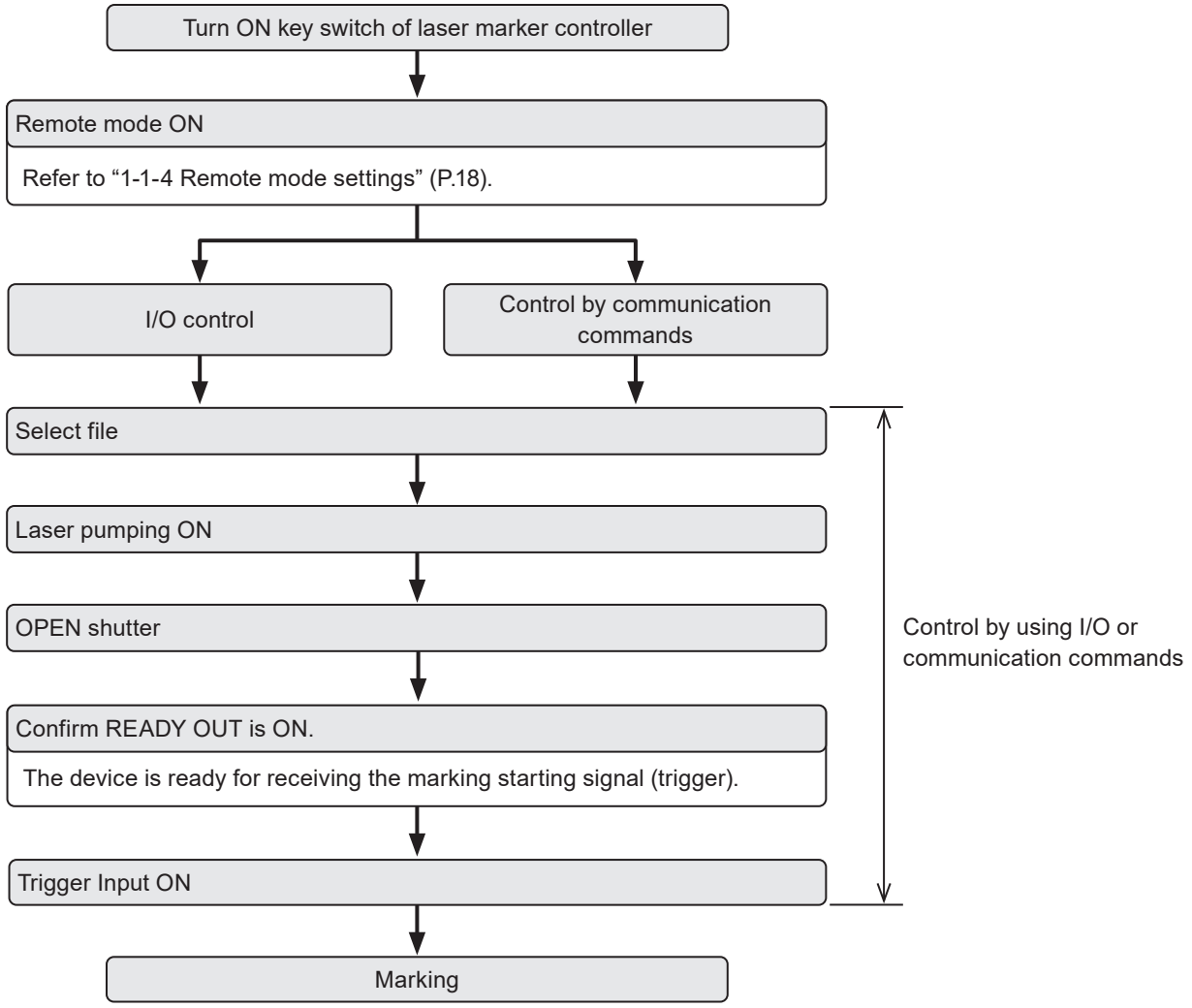
Connect the external devices, such as an image checker or a code reader, to the laser marker and control them together.

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

For details, refer to “Setup/Maintenance Guide”.

1-1-2 Operation procedure with external control

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



Reference

- It is available to the external control combining I/O, and communication commands.
- You need to configure the system settings on the I/O communication in advance before using external control. Refer to “1-1-3 General settings before external control” (P.15).
- For details on the operation procedure when you link an image checker or a code reader, refer to “Setup/Maintenance Guide”.

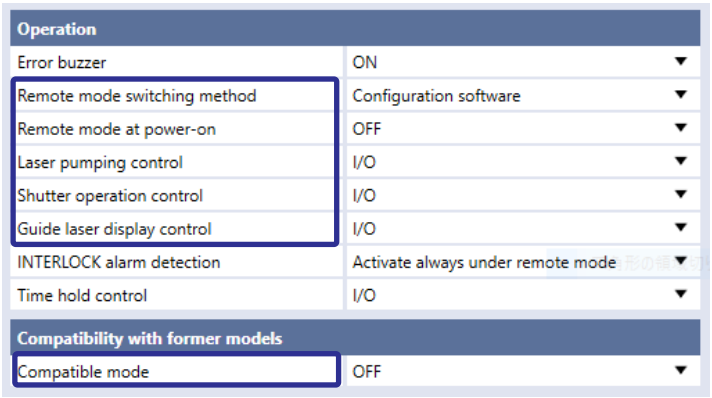
1-1-3 General settings before external control

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

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

2. Go to the “System settings” screen.

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



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

- If you want to maintain the compatibility with LP-M/LP-S/LP-Z series, set the operation settings in system settings screen corresponding with the DIP switch settings on LP-M/LP-S/LP-Z series. For the DIP switch details, refer to “LP-M/LP-S/LP-Z series Safety / Setup / Maintenance Guide”.
- To use “Test Marking Command (TST)”, “Power Check Command (PWM)” and “Laser Radiation for Measurement Command (SPT)” of the communication commands, set the shutter operation control method to “communication commands”.

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

- If you use the optional industrial network (EtherNet/IP or PROFINET), you cannot use the command format of LP-400/V compatible mode and LP-M/S/Z compatible mode.

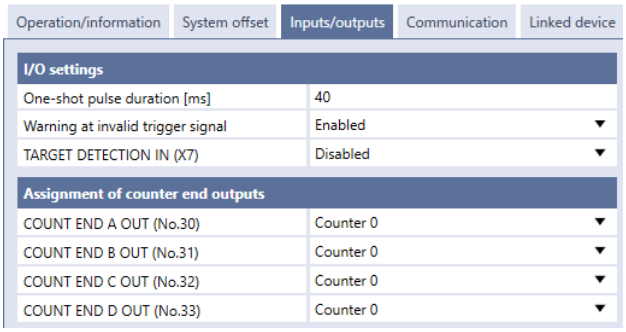
8. Select “Apply to laser marking system” on the left side of the ribbon.



“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 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.



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

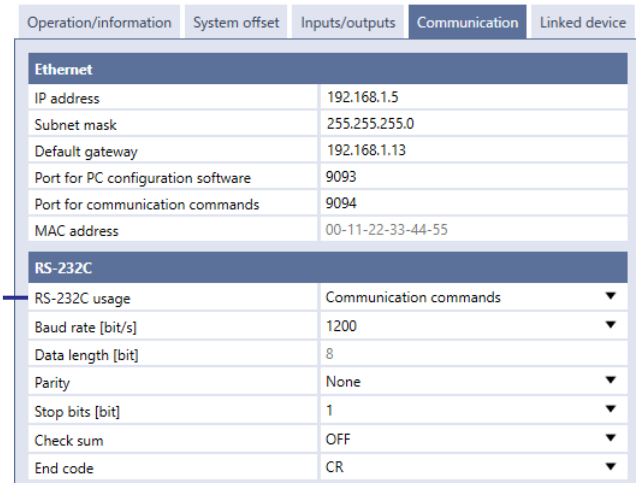


“Apply to laser marking system” tool

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

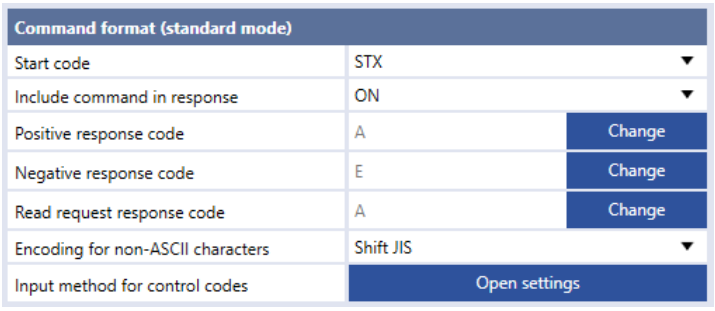
- For Ethernet:
  Configure the communication settings according to the network settings.
- For RS-232C:
  Configure the communication settings of the laser marker corresponding to the external control device.

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



12. If you want to use standard command mode, specify the communication command format under “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
- Input method for control codes



Reference

- 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 standard command format, refer to the “Serial Communication Command Guide”.
- For the command format of LP-M/S/Z compatible mode, refer to “2-3 Communication Data Format” (P.32).

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



“Apply to laser marking system” tool

14. Disconnect the online connection with the laser marker.

15. 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.

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

Reference

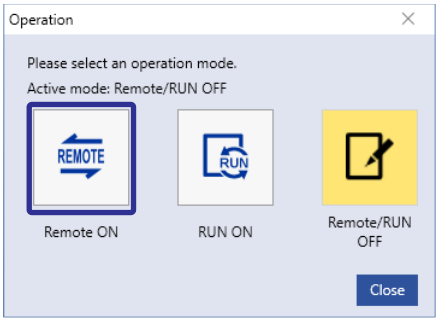
- For the details of the System settings, refer to the “Laser Marker NAVI smart Operation Manual”.

1-1-4 Remote mode settings

To control the laser marker externally via I/O or communication commands, set the operation mode to the remote mode with one of the following methods.
Select the method to switch to the remote mode on the system settings screen of Laser Marker NAVI smart. Refer to “1-1-3 General settings before external control” (P.15).

Remote mode switching by Laser Marker NAVI smart

Select “Operation” in the ribbon.
In the dialog, select “Remote ON” and select “Yes” to confirm.



“Operation” tool



Remote mode ON　　Remote mode OFF

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

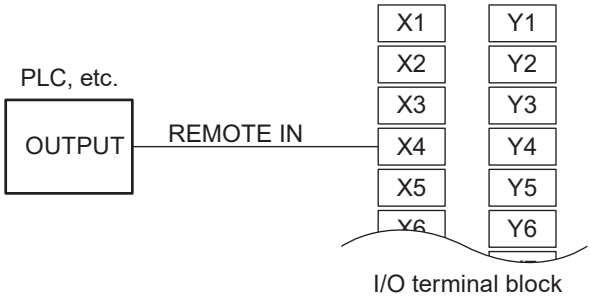
When you turn ON the key switch of the laser marker, the system starts in the remote mode. Use the operation tool of Laser Marker NAVI smart for releasing and resetting the remote mode.

Reference

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

Remote mode switching using I/O

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



Reference

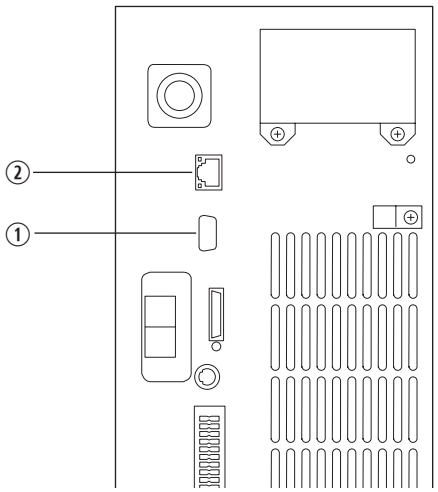
- To enable switching to the remote mode by REMOTE IN (X4) on the I/O terminal block, you need to configure the settings on the system settings screen of Laser Marker NAVI smart in advance.
- If you have configured the remote mode switching method to the I/O terminal block, you cannot switch the remote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

⚠WARNING

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

1-2 Communication Interfaces

This product has the following communication interfaces on the controller.



Rear of Controller

No.	Name	Description
①	RS-232C port	For the connection details, refer to “1-3 RS-232C” (P.20). To use the RS-232C port, select the RS-232C usage from communication command control or code reader linkage function in the system settings screen in advance.
②	Ethernet port	For the connection details, refer to “1-4 Ethernet” (P.23). The Ethernet port can be connected with the following devices simultaneously via a HUB or a router. • Laser Marker NAVI smart (PC configuration software) • External device for communication command control (PLC and PC for control) • Specific image checker

1-3 RS-232C

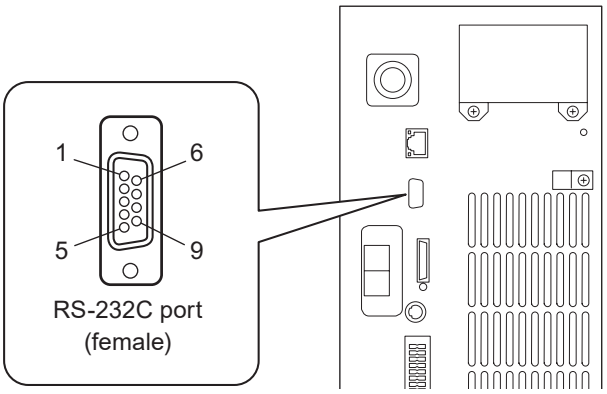
To control the laser marker by communication commands, use RS-232C or Ethernet connection.
For the control by communication commands, configure the communication settings in advance at the system settings of Laser Marker NAVI smart. Refer to “1-1-3 General settings before external control” (P.15).

Reference

- The laser marker can be controlled by I/O and communication commands combined.

1-3-1 Interface specifications and connection

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



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

■ Signals and Details of RS-232C connector

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

Notice

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

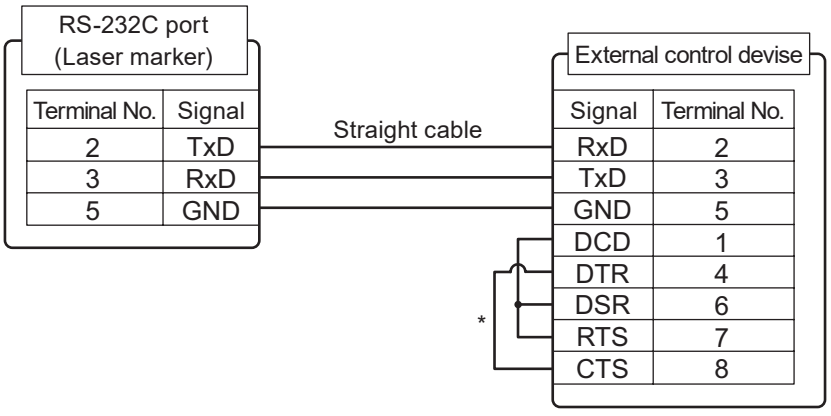
Reference

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

■ Connecting to external control devices

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

Connection example



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

1-3-2 Communication settings (LP-M/S/Z compatible mode)

Item	RS-232C communication settings (LP-M/S/Z compatible mode)
Synchro system	Start-stop method
Communication type	Full-duplex transmission
Baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 bps (initial setting: 9600 bps)
Data length	8-bit fixed
Parity	None / Even / Odd (initial setting: None)
Stop bits	1-bit / 2-bit (initial setting: 1-bit)
Flow control	None
Check sum	OFF / ON (initial setting: OFF)
End code	CR / CR + LF (initial setting: CR)
Start code	• Setting request data, Readout request data, Response data for readout: STX • Positive response code: ACK • Negative response code: NAK
Response data command	Included only in response data for readout
Sub command	• Setting request data: S • Readout request data: R • Response data for readout: A
Character code	ASCII code
Encoding for non-ASCII characters	Shift-JIS code
Reception timer	Timeout monitoring ON (10 sec.)

Reference

- For the details of the communication settings, refer to “1-1-3 General settings before external control” (P.15).
- When using RS-232C, specify the “Flow control” to “None” at the communication port settings of the external control device.

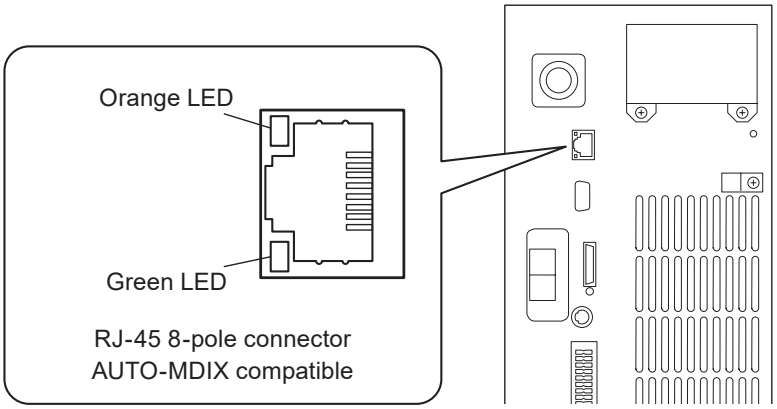
1-4 Ethernet

1-4-1 Port specifications and connection

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

Reference

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

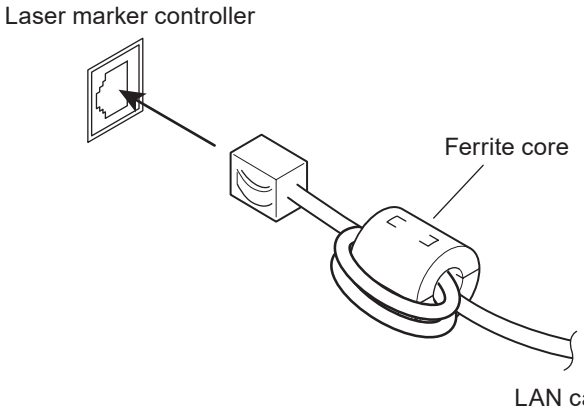


On the laser marker controller side　　Rear of controller

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

■ LAN cable connection

When you connect a LAN cable to the Ethernet port, attach the ferrite core included to a position as close as possible to the Ethernet port on the LAN cable controller side.
For LP-ZV series, turn the LAN cable 3 times around the ferrite core as shown in the figure.



1-4-2 Communication settings

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

* Do not use “127” in the first octet.

Reference

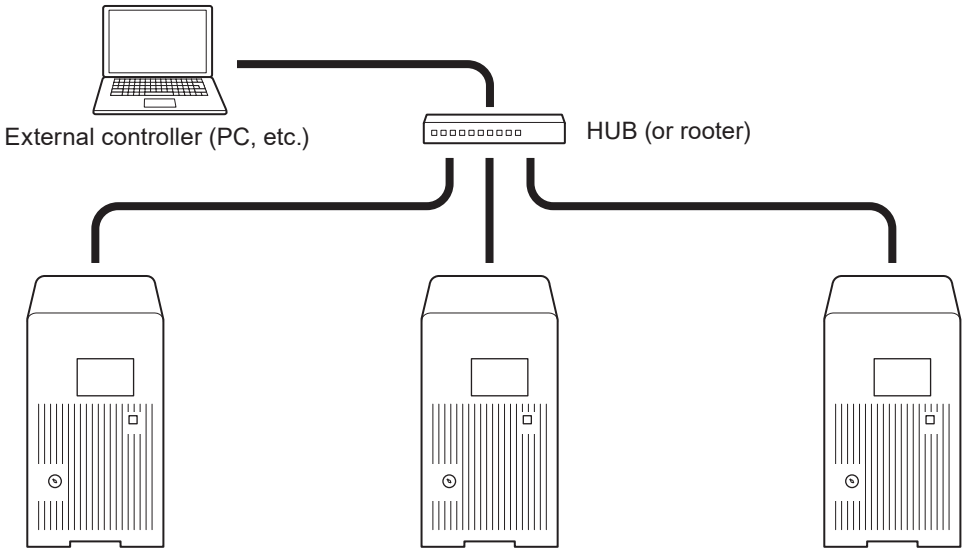
- The communication control of the laser marker through the Ethernet should be performed in a secure network settings.
- Even the IP Address and Subnet Mask values are within the configurable range, they may not be available depending on the combination.
- For the details of the communication settings, refer to “1-1-3 General settings before external control” (P.15).

■ Ethernet communication settings for communication command control

Item	Ethernet communication settings (LP-M/S/Z compatible mode)
Start code	• Setting request data, Readout request data, Response data for readout: STX • Positive response code: ACK • Negative response code: NAK
Response data command	Included only in response data for readout
Sub command	• Setting request data: S • Readout request data: R • Response data for readout: A
Character code	ASCII code
Encoding for non-ASCII characters	Shift-JIS code
Check sum	OFF
End code	CR
Reception timer	Timeout monitoring ON (10 sec.)

1-4-3 Connecting to external control devices and its setting sample

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



Example of communication system settings:
Set a separate IP address not to overlap between the laser marker and PC on the network.

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

Reference

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

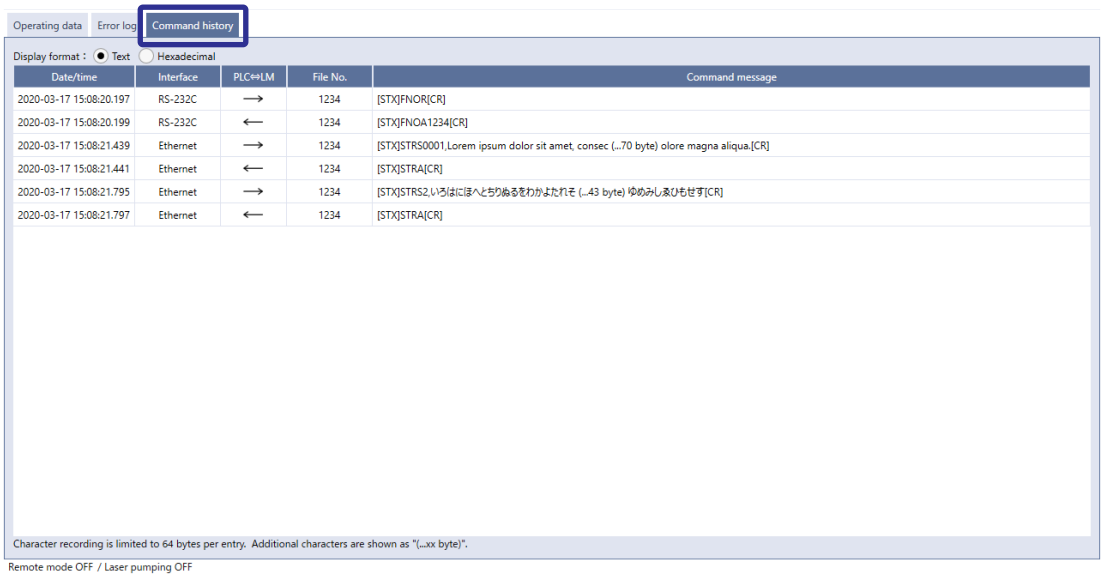
1-5 Checking the communication commands

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

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

2. Go to the “Maintenance” screen.

3. Select “Command history” tab. Up to 100 command messages received or sent by the laser marker are shown in the list.



Reference

- When a code reader is connected to the RS-232C port of the laser marker, the transmitted and received data with the code reader is not recorded in the command history.

2 Communication Control Basics

2-1 Communication Data Types

To control this product by communication commands, the external device transmits request data to the laser marker. After the laser marker receives request data, it transmits the response data to the external device.

2-1-1 Request data

The request data is sent from the external device to the laser marker. The following types are applicable to the request data.

■ Setting request

Request data to modify or create the laser marker data or to control the laser marker operations.

■ Readout request

Request data to read out the status or setting data of the laser marker.

2-1-2 Response data

The response data is sent from the laser marker to the external device. The following types are applicable to the response data:

■ Positive response

Response data transmitted when the setting request data were received normally.
The positive response will be transmitted when the laser marker processing has been completed for some of the command types.

■ Readout response

Response data to transmit the readout content for the readout request data.

■ Negative response

Response data to transmit when the request data are not acceptable.

2-2 Communication Sequence

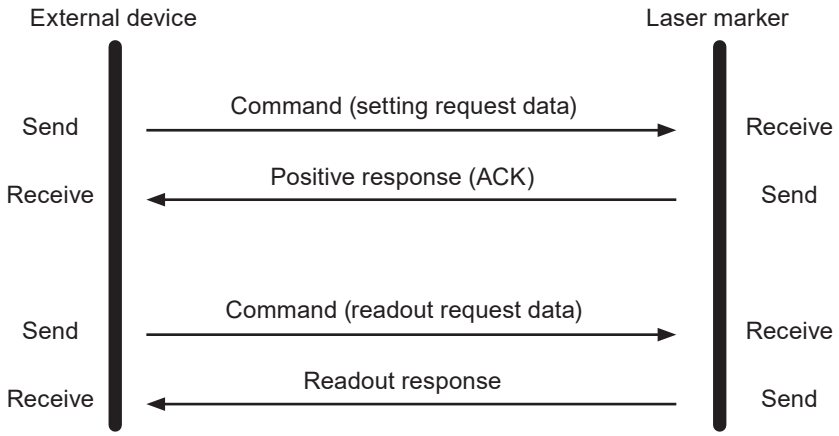
The communication sequence of this product mainly consists of the sequence where the laser marker transmits the response data for the (command) data requested from external devices.
As an exception, the laser marker transmits the response data automatically if you have set the response permission of the marking end verification (MST) command.

■ Reception timeout

The time-out duration of this product is set to 10 seconds from receiving the telegraphic message from the head till the end transmitted from the external device.
If a reception timeout occurs, the telegraphic message transmitted will be discarded and the laser marker will not transmit the response data.
To resume the communication, transmit the correct telegraphic message once again.

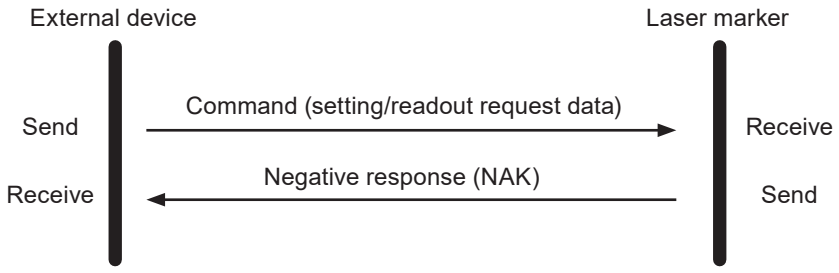
■ Communication sequence of setting/readout request data

When the requested data was received normally from the external device, the laser marker transmits positive response to the setting request data and transmits readout data to the readout request data.
After sending the command, confirm the response data from the laser marker. Do not send the next command before receiving the response.



■ Communication sequence when the request data for setting/readout cannot be accepted

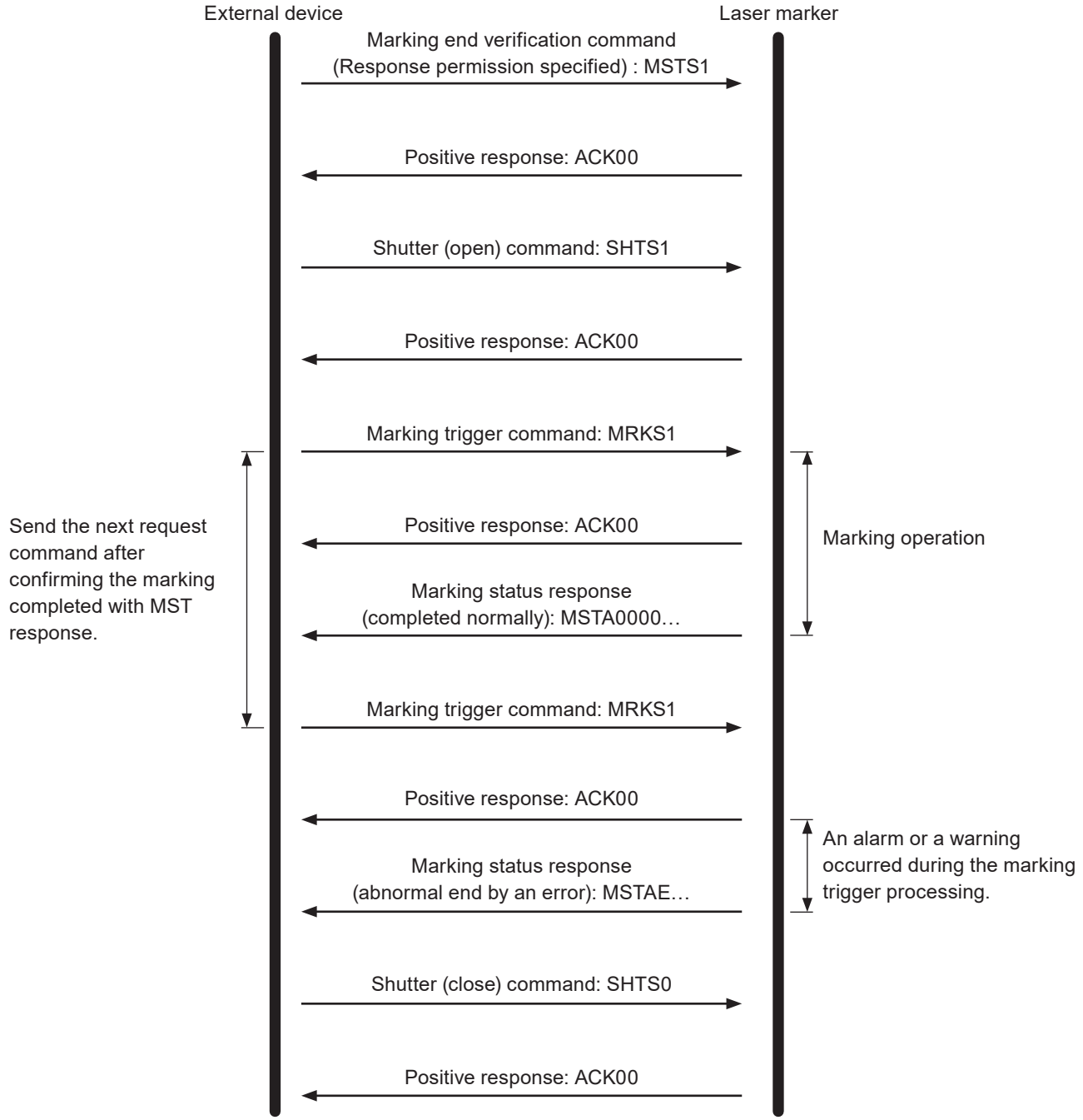
When the request data transmitted from the external device to the laser marker are not acceptable, the laser marker transmits negative response.



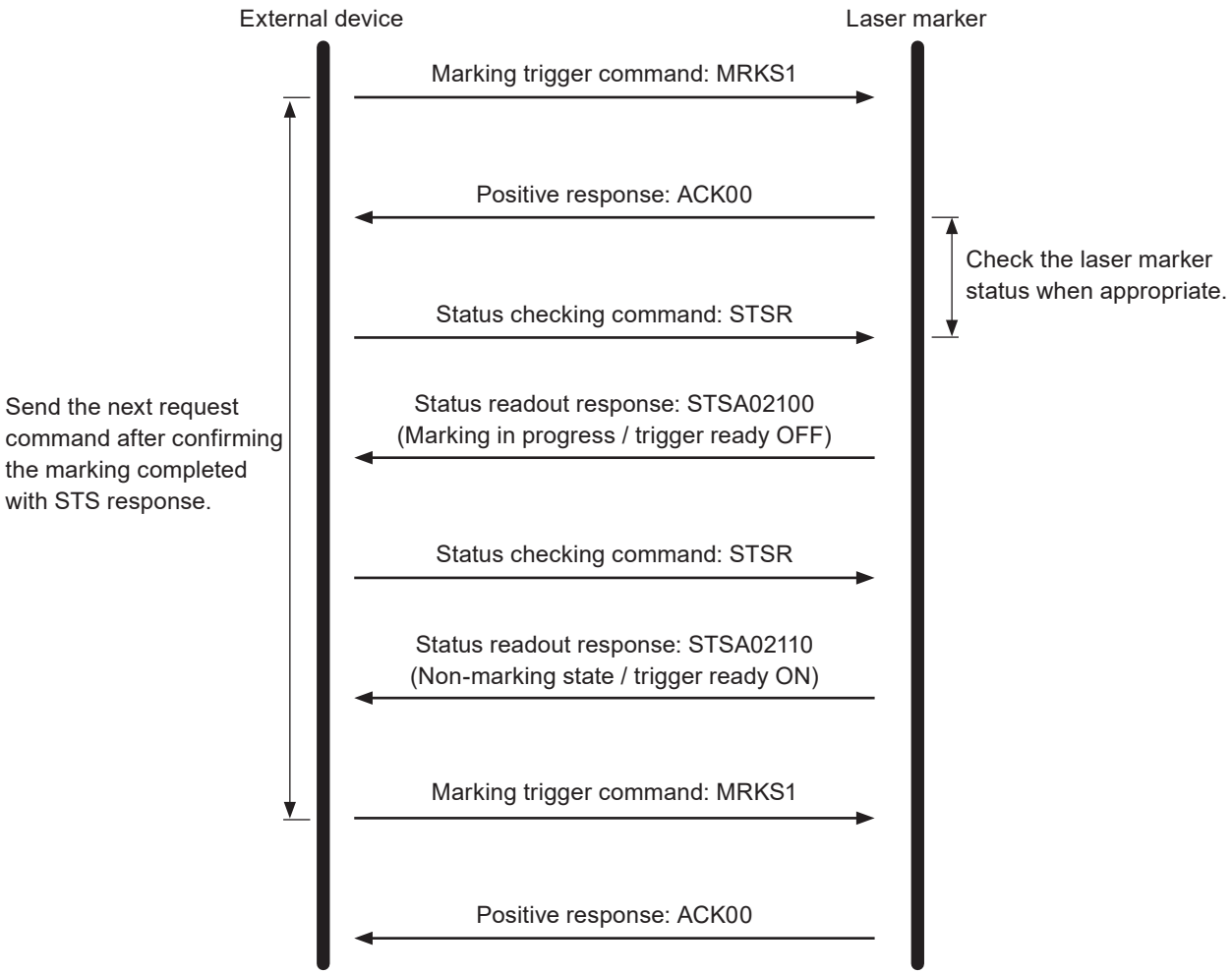
■ Communication sequence when the marking end verification (MST) command response is enabled

The laser marker transmits the response data automatically upon completing the marking trigger processing (at the end of marking) with the response permission setting of the marking end verification (MST) command.
This response data indicate that the marking trigger processing of the laser marker completed normally or ended abnormally by an error.
For more information on this command, refer to “3-3-9 Marking end verification: MST” (P.68).

- When the response permission of the marking end verification (MST) command is set



• When the response permission of the marking end verification (MST) command is not set



2-3 Communication Data Format

Use the ASCII code basically for the communication data.
For the characters which cannot be indicated with ASCII code, use Shift JIS code.
The characters enclosed with double quotation marks (“ ”) in the description below indicate the ASCII code. The characters enclosed with [ ] indicate the control codes. For the case that you may use the character code other than ASCII code, it is described in each case.

2-3-1 Basic data format

■ Basic data format

Head End

Start code	Command *1	Sub command *1	Data defined per data and command type	Check sum	End code
1-byte	3-byte	1-byte		2-byte or N/A	1-byte or 2-byte

Item	Description
Start code	A start code is a code to identify the data head. Depending on the data type, the start code is fixed as follows: • Setting request code, readout request code, response code for readout: [STX] 02 (HEX) • Positive response code: [ACK] 06 (HEX) • Negative response code: [NAK] 15 (HEX)
Command *1	The alphabetical characters consisting of three characters (3-byte) representing the control contents. For command types and description, refer to “3-1 Command List” (P.52).
Sub command *1	One-byte alphabetic character representing the communication data type. The sub command is fixed to the following alphabetic characters: • Setting request code: “S” • Readout request code: “R” • Response code for readout: “A”
Check sum (RS-232C only)	Check sum is the value to detect an error during data communication. You can enable or disable the check sum. It is disabled in the initial settings. Check sum cannot be enabled with Ethernet communication.
End code	End code is a code to identify the end of data. • To use RS-232C, select either [CR]: 0D (HEX) or [CR][LF]: 0D0A (HEX). • To user Ethernet, it is fixed to [CR]: 0D (HEX).

*1 : Included only in the setting request data, readout request data and response data for readout.

Reference

- Set the check sum and end code on the “system settings” screen of Laser Marker NAVI smart. Refer to “1-1-3 General settings before external control” (P.15).
- There is no separating character among each terms.
- When using the external device set by 2-byte, [NUL]: 00 (HEX) can be used. Add [NUL] before the start code or after the end code.

■ How to calculate the check sum

Convert the data from the start code to those before the check sum into the hexadecimal values according to the ASCII code table and add them all together.
When the character code other than ASCII code is used in the data, convert them into the hexadecimal values according to each character code table.
Check sum is the value calculated by converting the lower one-byte of the total value into two characters in the ASCII code.

Calculation example

- Calculating the check sum of the following setting request data

Start code STX	Command “LPW”	Sub command “S”	Data example: [Laser power] “042.5”	Check sum	End code CR
02	4C 50 57	53	30 34 32 2E 35	34 31	0D (HEX)

- Convert the start code to the end of data into hexadecimal values and add them all together. Include the start code for the addition.
  02 + 4C + 50 + 57 + 53 + 30 + 34 + 32 + 2E + 35 = 241 (HEX)
- “41”, which is the lower one-byte (lower two-digit) characters of 241 (HEX), is converted to 34 31 (HEX) in the two-character ASCII code.

2-3-2 Request data

Request data in the following format will be transmitted when you control the laser marker from the external device.

■ Setting request data format

Request data to modify or create the laser marker data or to control the laser marker operations.
The start code is [STX]: 02 (HEX). The sub command is “S”.

Start code [STX]	Command	Sub command “S”	Variable-length data or fixed-length data	Check sum	End code
1-byte	3-byte	1-byte	The maximum data length is defined per command	2-byte or N/A	1-byte or 2-byte

■ Readout request data format

Request data to read out the status or setting data of the laser marker.
The start code is [STX]: 02 (HEX). The sub command is “R”.

Start code [STX]	Command	Sub command “R”	Variable-length data or fixed-length data	Check sum	End code
1-byte	3-byte	1-byte	The maximum data length is defined per command	2-byte or N/A	1-byte or 2-byte

Content of variable-length data/fixed-length data part

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 Shift JIS code.
There is no separating character among each terms. Input them in a row.
Some items can be omitted for some commands.

Reference

- For details on how to input variable-length data or fixed-length data, refer to “2-3-4 Character input method” (P.37) and “2-3-5 Character data input method” (P.38).

Example of Request Data

- To change file number

Start code STX	Command “FNO”	Sub command “S”	Data example: File No. “2047”	Check sum	End code CR
02	46 4E 4F	53	32 30 34 37	30 35	0D (HEX)

2-3-3 Response data

The laser marker transmits response data in the following format for the command transmitted from the external device.

■ 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.
The start code is [ACK]: 06 (HEX).
The response code is always “00”.

Start code [ACK]	Response code “00”	Check sum	End code
1-byte	2-byte	2-byte or N/A	1-byte or 2-byte

■ Data format of read request response

Response data to transmit the readout content for the readout request data (sub command “R”).
The start code is [STX]: 02 (HEX).
The sub command is “A”.

Start code [STX]	Command	Sub command “A”	Variable-length data or fixed-length data	Check sum	End code
1-byte	3-byte	1-byte	The maximum data length is defined per command	2-byte or N/A	1-byte or 2-byte

Content of variable-length data/fixed-length data part

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 Shift JIS code.
There is no separating character among each terms.

Example of positive response

Start code ACK	Response code “00”	Check sum	End code CR
06	30 30	36 36	0D (HEX)

Example of readout response data

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

Start code STX	Command “FNO”	Sub command “A”	Data example: File No. “2047”	Check sum	End code CR
02	46 4E 4F	41	32 30 34 37	46 33	0D (HEX)

■ Data format of negative response

Response data to transmit when the request data are not acceptable.
The start code is [NAK]: 15 (HEX).
Response code indicates the error cause.

Start code [NAK]	Response code “01”–“99”	Check sum	End code
1-byte	2-byte	2-byte or N/A	1-byte or 2-byte

Reference

- If the laser marker transmitted negative response to the request data, all the contents instructed by the request data will be invalidated.

Response code details

The error cause is displayed in two numerical characters in case of invalid request data format or invalid value specified, or when the laser marker cannot accept the request data.

Response code	Error cause
“01”	Incorrect start code.
“02”	Incorrect end code.
“03”	Unacceptable command with the current laser marker status. • The internal shutter is open or the MKM command is not set to “command reception permission ON”. • The command was sent during the guide laser emission or laser radiation for measurement. • LP-ZV500P/LP-ZV505P/LP-ZV506P: The command was sent during the test marking (TST command) or power check (PWM command). • SIN command or SEO command was sent while the internal shutter was closed or when the MKM command was set to “command reception permission ON”.
“04”	• No applicable command. • Not available command with LP-M/S/Z compatible command mode.
“05”	Incorrect check sum.
“06”	Incorrect data length.
“07”	Unacceptable command for the I/O terminal control settings.
“08”	Incorrect sub command.
“09”	Invalid variable-length or fixed-length data part. • You have specified a value that cannot be combined in that command. • You have specified an invalid character for the character data part. • Unsupported character code other than ASCII code and Shift JIS code is used in the character data part. • Too many number of characters in the character data part.
“10”	Unacceptable command because of an alarm or a warning occurred.
“11”	SIN command or SEO command is not acceptable. • The internal shutter status is closed. • The MKM command is set to “command reception permission ON”. • SIN command has been already transmitted to the specified string No. • SEO command was sent without “Using SEO command” setting in external offset function. • SEO commands were sent more than twice for one marking.
“12”	Unable to register data due to a lack of memory capacity.

Response code	Error cause
“13”	The target of the requested setting or readout does not exist. • There is no corresponding file. • No marking data is set in the selected file. (when the shutter is opened)
“14”	Not available command with this laser marker model.
“15”	• Not available settings with LP-M/S/Z compatible command mode are included. • Unable to readout because the unsupported settings by LP-M/S/Z compatible mode are included.
“18”	Unacceptable command because laser pumping is off or not completed. • SPT command for starting radiation request is sent when laser pumping is not ready. • LP-ZV500P/LP-ZV505P/LP-ZV506P: TST or PWM command is sent when laser pumping is not ready.
“19”	The requested command is conflicting with the higher settings. • Unacceptable command with current settings of trigger mode. • Unacceptable command with the on-the-fly marking.
“99”	• Specified object No. does not belong to the object group No. 1000 to 1016. • The command cannot be used for the settings in the specified object No. • Characters that cannot be indicated with ASCII code or Shift JIS code are used in the readout strings. • Others

Example of negative response

Start code NAK	Data example: “06”	Check sum	End code CR
15	30 36	37 42	0D (HEX)

2-3-4 Character input method

■ Input data

Use the ASCII code to input numeric data.
The content and the number of digits (data length) of numeric values vary for each command.

Data type	Input data	ASCII code
Integer part	“0”–“9”	30 (HEX) to 39 (HEX)
Decimal part	“0”–“9”	30 (HEX) to 39 (HEX)
Decimal point	“.”	2E (HEX)
Sign	“+”	2B (HEX)
	“-”	2D (HEX)

Reference

- For details on the ASCII code, refer to “Character Code Table” (P.215).
- You cannot shorten the numeric data length. It is not allowed to omit “+” and “0” in upper digit.
- For numeric data including a decimal point, the number of digits of the integer part and the decimal part must correspond to the value defined as the specified data length.

Example of variable-length numeric data input

- To input “+010.000” (8-byte data length), use ASCII code as follows *:
  2B 30 31 30 2E 30 30 30
- To input “0158” (4-byte data length), use ASCII code as follows *:
  30 31 35 38

* Spaces in the example above are not included in the input data.

2-3-5 Character data input method

■ Target commands

To specify marking characters or a file name with the following commands, enter character data.

- File selection by name: FNN
- File name: FNM
- Character entry (by ASCII code): MCS
- Character entry (by ASCII/Shift JIS code): STR
- Character entry per trigger: SIN
- Bar code/2D code characters (by ASCII code): BCS
- Bar code/2D code characters (by ASCII code): BBS
- Bar code/2D code characters (by ASCII/Shift JIS code): BRS
- Lot character: LTS
- Registered character strings: RKS
- Graphic file: CDF

■ Input data

Use the ASCII code to input alphanumeric characters (single byte character).
Use the Shift JIS code to input two-byte characters (double byte characters).
Depending on the command, the availability of the ASCII code and Shift JIS code varies. In LP-M/S/Z compatible mode, character codes other than ASCII code and Shift JIS code are not available.
The following restrictions apply to the input characters depending on the data type to input:

Command	Content to be specified	Restrictions on the input characters
MCS	Marking character of reference list (by ASCII code)	• Only the ASCII code is available. • Functional characters cannot be used. • For marking characters, control codes cannot be used. • For bar code/2D code characters, only FNC1 is available in the control codes. FNC1 can be set by inputting [GS]: 1D (HEX). • No line feed is allowed.
BCS	Bar code/2D code character (by ASCII code)	
BBS	Bar code/2D code character (by ASCII code)	• Only the ASCII code is available. • Functional characters cannot be used. • For the control codes EOT, FS, GS, RS, or US you can set by using ASCII code. The other control codes cannot be used with this command. • [GS]: 1D (HEX) cannot be used as “FNC1” for the separator of the Application Identifier of the variable-length data. • No line feed is allowed.
STR	Marking character of reference list (by ASCII and Shift-JIS code)	• The ASCII code and Shift JIS code can be mixed. • In the response data for readout, all characters except the functional characters are readout in Shift JIS code. • To input the functional characters, use the ASCII code. • For marking characters, control codes cannot be used. • To input the control codes in the bar code/2D code data, refer to “Inputting control codes to bar code/2D code character strings” (P.40). • For marking characters, no linefeed is allowed. • For bar code/2D code characters, to input the linefeed in the code data, use the two-byte alternative codes of the linefeed control code, if the code symbol supports the control code. • To input “%” with ASCII code, use the alternative character.
BRS	Bar code/2D code character (by ASCII and Shift-JIS code)	

Command	Content to be specified	Restrictions on the input characters
SIN	• Character input with SIN command • Bar code/2D code character input with SIN command	• Use either ASCII code or Shift JIS code, but not both. The ASCII code and Shift JIS code cannot be mixed. • For marking characters, control codes cannot be used. • To input the control codes in the bar code/2D code data, refer to “Inputting control codes to bar code/2D code character strings” (P.40). • Functional characters cannot be used. • For marking characters, no linefeed is allowed. • For bar code/2D code characters, to input the linefeed in the code data, use the two-byte alternative codes of the linefeed control code, if the code symbol supports the control code.
LTS	Lot character	• The ASCII code and Shift JIS code can be mixed. • Control codes cannot be used. • Functional characters cannot be used. • No line feed is allowed.
RKS	Registered character strings	
FNN	File name	
FNM	File name	
CDF	Graphic file name	

Reference

- For details of the character codes, refer to “Character Code Table” (P.215).
- The one-byte and two-byte represent the data input method, and there is no distinction between the one-byte and two-byte for marking characters.
- For the input character to Bar code/2D code object, depending on the code type, the acceptable character type is restricted to either one-byte or two-byte character. In this case, the input character is converted automatically to the acceptable type.
- If the data contains any characters which belong to the non-supported character code, it cannot be set or read out.
- Characters in TrueType object cannot be set with communication command.
- With LP-M/S/Z compatible command mode, you cannot set the characters of the character objects other than the reference list type.

Example of character input

- To input “ABCD”
  Input using the ASCII codes*: 41 42 43 44
  Input using the Shift JIS codes*: 8260 8261 8262 8263

* Spaces in the example above are not included in the input data.

■ Selection of the marking symbols

Characters indicated with ASCII code 5C (HEX), 60 (HEX) and 7E (HEX) are defined by the settings in Laser Marker NAVI smart software. Select the desired characters in the “System settings” screen - “Operation/information” tab - “Advanced system settings”.

ASCII code	Selectable characters	Setting after LP-M/S/Z backup is converted
5C (HEX)	\ (Backslash) or ¥ (Yen sign)	¥ (Yen sign)
60 (HEX)	` (Grave accent) or ‘ (Left single quotation mark)	‘ (Left single quotation mark)
7E (HEX)	~ (Tilde) or ¯ (Overline)	¯ (Overline)

■ Symbols and special characters input as the alternative

To use the following symbols in STR or BRS commands, replace them with the specified alternative characters to distinguish the functional characters.

Characters you want to use	Alternative characters	Remarks
%	%%	
+	%+	Only when inputting "/" or "+" right after the counter function, use these alternative characters.
/	%/	

■ Inputting control codes to bar code/2D code character strings

To input the control codes in the bar code/2D code strings, set the code data as follows:

- The following control codes EOT, FS, GS, RS, or US you can set with BBS or SIN command by using ASCII code. In this case, set the other characters by using ASCII code, too.

Control code	EOT	FS	GS	RS	US
ASCII code (HEX)	04	1C	1D	1E	1F

- To include the control codes other than EOT, FS, GS, RS, or US in the strings, set the all control codes with BRS or SIN command by using these alternate codes instead of ASCII code. In this case, set the other characters including alphanumeric by using Shift-JIS code.

Command	Control code	Alternative code
BRS, SIN	NUL to US: 00 (HEX) to 1F (HEX)	F050 (HEX) to F06F (HEX)
	DEL: 7F (HEX)	F071 (HEX)
	FNC1	F072 (HEX)

- In BCS command you can use GS: 1D (HEX) as "FNC1" and as the separator of the Application identifiers. In the code data it is shown as "FNC1". For the response data for readout, it is readout as "GS".
  To set other control codes than GS or FNC1, use BRS command.

Command	Control code	Alternative code
BCS	FNC1	[GS]: 1D (HEX)

- In BBS command or SIN command, "FNC1" cannot be accepted.

■ To input functional characters

To set functional characters such as the counter or date/time with STR command (character entry) or BRS command (bar code/2D code character), input them in the following methods:

- Input functional characters using the ASCII codes.
- The following character strings starting with the one-byte % represent functional characters.

To input the counter function to character strings

%0N:CnY/Z: Counter with Zero fill
%_N:CnY/Z: Counter without Zero fill, right align (the underscore (_) represents a space.)
%N_:CnY/Z: Counter without Zero fill, left align (the underscore (_) represents a space.)
%N-:CnY/Z: Counter without Zero fill stop

Item	Input characters	Description
N	1 to 9	Represents the number of digits.
n	Represents the counter number.	
	0 to 3, 8, 9	Counter No. 0 to Counter No. 3, Counter No. 8, Counter No. 9
	A to F	Counter No. 10 to Counter No. 15
	4 to 7 G to V	Global counter No. 16 to Global counter No. 19 * Global counter No. 16 to Global counter No. 31
Y	+1 to +9	Represents the counter offset. This character is used if the offset is not set.
Z	1 to 9, A to Z	Represents the counter numbering system. Input the (numbers -1) value. “/Z” can be omitted for the decimal number.

* At LP-M/S/Z compatible command mode, G to J are converted to 4 to 7 when the settings are readout.

To input the current date/time and expiry time function to character strings

%0N:Xn: Date and time with Zero fill
%_N:Xn: Date and time without Zero fill, right align (the underscore (_) represents a space.)
%N_:Xn: Date and time without Zero fill, left align (the underscore (_) represents a space.)
%N-:Xn: Date and time without Zero fill stop
%APM:n: Forenoon (AM)/Afternoon (PM)

Item	Input characters	Description
N	1 to 9	Represents the number of digits.
X	Represents the unit of date and time.	
	Y	Year
	i	Year (week-based)
	M	Month
	D	Date
	H	Hour (24-hour time)
	h	Hour (12-hour time)
	m	Minute
	s	Second
	w	Week
	J	365 days
n	Represents the type of date and time.	
	0	Current date/time
	1 to 4, 9	Expiry time No. 1 to Expiry time No. 4, Expiry time No. 9
	A to G	Expiry time No. 10 to Expiry time No. 16
	5 to 8 H to W	Global expiry time No. 17 to Global expiry time No. 20 * Global expiry time No. 17 to Global expiry time No. 32

* At LP-M/S/Z compatible command mode, H to K are converted to 5 to 8 when the settings are readout.

To input the lot function to character strings
%SFT:n: Lot character

Item	Input characters	Description
n	Represents the lot function number.	
	0 to 3, 8, 9	Lot No. 0 to Lot No. 3, Lot No. 8, Lot No. 9
	A to F	Lot No. 10 to Lot No. 15
	4 to 7 G to V	Global lot No. 16 to Global lot No. 19 * Global lot No. 16 to Global lot No. 31

* At LP-M/S/Z compatible command mode, G to J are converted to 4 to 7 when the settings are readout.

To input the registered characters (via I/O) to character strings
%INP:n: Registered characters via I/O

Item	Input characters	Description
n	Represents the table number of the registered characters function.	
	0 to 3	Registration table No. 0 to Registration table No. 3

To input “Characters specified by SIN command” to character strings
%MM:Sn: Characters specified by SIN command

Item	Input characters	Description
MM	00 to 99	Represents the number of max. character digits to be input as characters specified by SIN command.
n	Represents the string number of characters specified by SIN command	
	0 to 9	String No. 0 to String No. 9
	A to F	String No. 10 to String No. 15

To input marking settings (laser parameters) to character strings
%POWER: Laser power
%SPEED: Scan speed
%PULSE: Pulse cycle

Reference

- When the character strings set with the functional character are read out by STR command or BRS command, the data with the functional character set to start with % are read out. The characters to mark as the functional characters, such as the counter or date and time values, are not read out.
- Functional characters cannot be specified with character entry per trigger (SIN command), the lot characters (LTS command) and registered character strings (RKS command).
- To enter “+” or “/” as a character to mark after the counter, enter “%+” or “%/”.
- It is not possible to set the functional characters of %POWER, %SPEED and %PULSE (laser parameters) to the character strings of bar code and 2D code objects.
- With LP-M/S/Z compatible command mode, any of the following numbers of functional characters cannot be set.
  - Counter No. 4 to Counter No. 7
  - Expiry time No. 5 to Expiry time No. 7
  - Lot No. 4 to Lot No. 7

Example of functional character input
- To input the counter function (Counter Number 0, Six Digits, Zero Fill, No Offset, Decimal Number)
  Input “%06:C0” using the ASCII code*: 25 30 36 3A 43 30
- To input the current date function and characters “YYYY. MM. DD”
  Input “%04:Y0._%02:M0._%02:D0” using the ASCII code* (the underscore (_) represents a space.)
  25 30 34 3A 59 30 2E 20 25 30 32 3A 4D 30 2E 20 25 30 32 3A 44 30

* Spaces in the example above are not included in the input data.

2-4 Command Reception Condition

2-4-1 Commands requiring pre-set

To control the laser marker by using the following commands, set the control methods of each operation to “communication commands” by the PC configuration software Laser Marker NAVI smart.

- Laser pumping (LSR)
- Shutter open/close (SHT)
- Guide Laser (GID)
- Laser radiation for measurement (SPT) *1
- Test marking (TST) *1 (LP-ZV500P/LP-ZV505P/LP-ZV506P only)
- Power check (PWM) *1 (LP-ZV500P/LP-ZV505P/LP-ZV506P only)

*1 : The laser radiation for measurement (SPT), test marking (TST) and power check (PWM) commands are available only when the shutter operation control method is set to “communication commands”.

Reference

- When the control methods of these operations are set to “I/O”, the setting request by command cannot be accepted, but the readout request can be accepted.

2-4-2 Command reception permission

When transmitting the communication command including an action to update the laser marker data, commands are refused in the marking trigger ready ON status or the shutter open. If “reception mode ON” is set for “command reception permission (MKM command)” before transmitting a command, marking trigger ready is set to OFF and commands get acceptable. Set “reception mode OFF” for “command reception permission (MKM command)” to set the marking trigger ready ON before marking.

Reference

- Commands are acceptable by closing the shutter instead of “command reception permission (MKM command)”. However, it is recommended to use the “command reception permission (MKM command)” when the number of open and close of the shutter is a lot.
- The command reception permission (MKM command) does not include opening/closing operation of the shutter.
- With LP-M/S/Z compatible command mode, the command reception permission is also required for readout requests (the sub command is specified to “R”).

■ Commands that do not need the command reception permission (MKM command)

The following commands are accepted without setting “reception mode ON” by MKM command.

- Command reception permission (MKM)
- Shutter open/close (SHT)
- Laser pumping (LSR)
- Status checking (STS)
- Marking trigger (MRK)
- File selection by number (FNO)
- File selection by name (FNN)
- Counter reset (CTR)
- Character entry per trigger (SIN)
- Marking position and laser power adjustment per trigger (SEO)
- Guide Laser: stop request (GID)
- Stop request of laser radiation for measurement (SPT)
- Stop request of test marking (TST) (LP-ZV500P/LP-ZV505P/LP-ZV506P only)
- Error code (ECR)

Reference

- SIN / SEO commands can be accepted only when the shutter is opened.
- SIN / SEO commands cannot be accepted when “reception mode ON” is set by MKM command.

2-4-3 Commands acceptable only with the shutter closed

The following commands can be transmitted only while the shutter is closed.
(Commands are not acceptable when “reception mode ON” is set by MKM command.)

- Guide Laser: start request (GID)
- Start request of laser radiation for measurement: (SPT)
- Start request of test marking (TST) (LP-ZV500P/LP-ZV505P/LP-ZV506P only)
- Start request of power check (PWM) (LP-ZV500P/LP-ZV505P/LP-ZV506P only)

2-4-4 Commands acceptable during alarm/warning occurrence

The laser marker accepts only the following commands while an alarm or warning occurs.

■ Alarm

- Status checking (STS)
- Command mode (RSM)
- Error code (ECR)

■ Warning

- Status checking (STS)
- Shutter open/close (SHT): Shutter close request only
- Command reception permission (MKM):Reception mode ON request and reception permission state readout only
- Error code (ECR)
- Command mode (RSM)

Reference

- For release method of alarm and warning, refer to “What to do if an error occurs” (P.199).
- With LP-M/S/Z compatible command mode, it is not possible to reset the alarm status by using a communication command.
- To reset the warning status, close the shutter with SHT command or set “reception mode ON” with MKM command, and then clear the warning causes.

2-5 Communication Check

Verify if the communications between the laser marker and external control device have been established properly in the following procedure:

1. Turn ON the power of the external control device

2. Turn ON the key switch of laser marker.

3. Coordinate the communication settings between laser marker and external control device

Refer to “1-1-3 General settings before external control” (P.15).
If the communication settings are changed, restart the laser marker.

4. Set the laser marker to the remote mode

Refer to “1-1-4 Remote mode settings” (P.18).

5. Change the file number of the laser marker (transmit the FNO command)

Start code STX	Command “FNO”	Sub command “S”	Data: File No. “2047”	Check sum*1	End code CR
02	46 4E 4F	53	32 30 34 37	30 35	0D (HEX)

The transmission data above is just a sample. Start code, check sum ON/OFF, and end code content vary depending on the communication system settings.

*1 : For the command above, calculate the check sum value as follows:
Convert the data from the start code to those before the check sum into the hexadecimal values according to the ASCII code table and add them all together. Check sum is the value calculated by converting the lower two digits of the total value into two characters in the ASCII code.

- 02 (HEX) + 46 (HEX) + 4E (HEX) + 4F (HEX) + 53 (HEX) + 32 (HEX) + 30 (HEX) + 34 (HEX) + 37 (HEX) = 205 (HEX)
- 30 35 (HEX) is the value converted the lower two digits character (lower one-byte) 05 (HEX) into two characters in the ASCII code

6. Check the response from the laser marker

When the connection and communication settings are appropriate, the laser marker returns response data.
Example of positive response

Start code ACK	“00”	Check sum	End code
06	30 30	36 36	0D (HEX)

Example of negative response

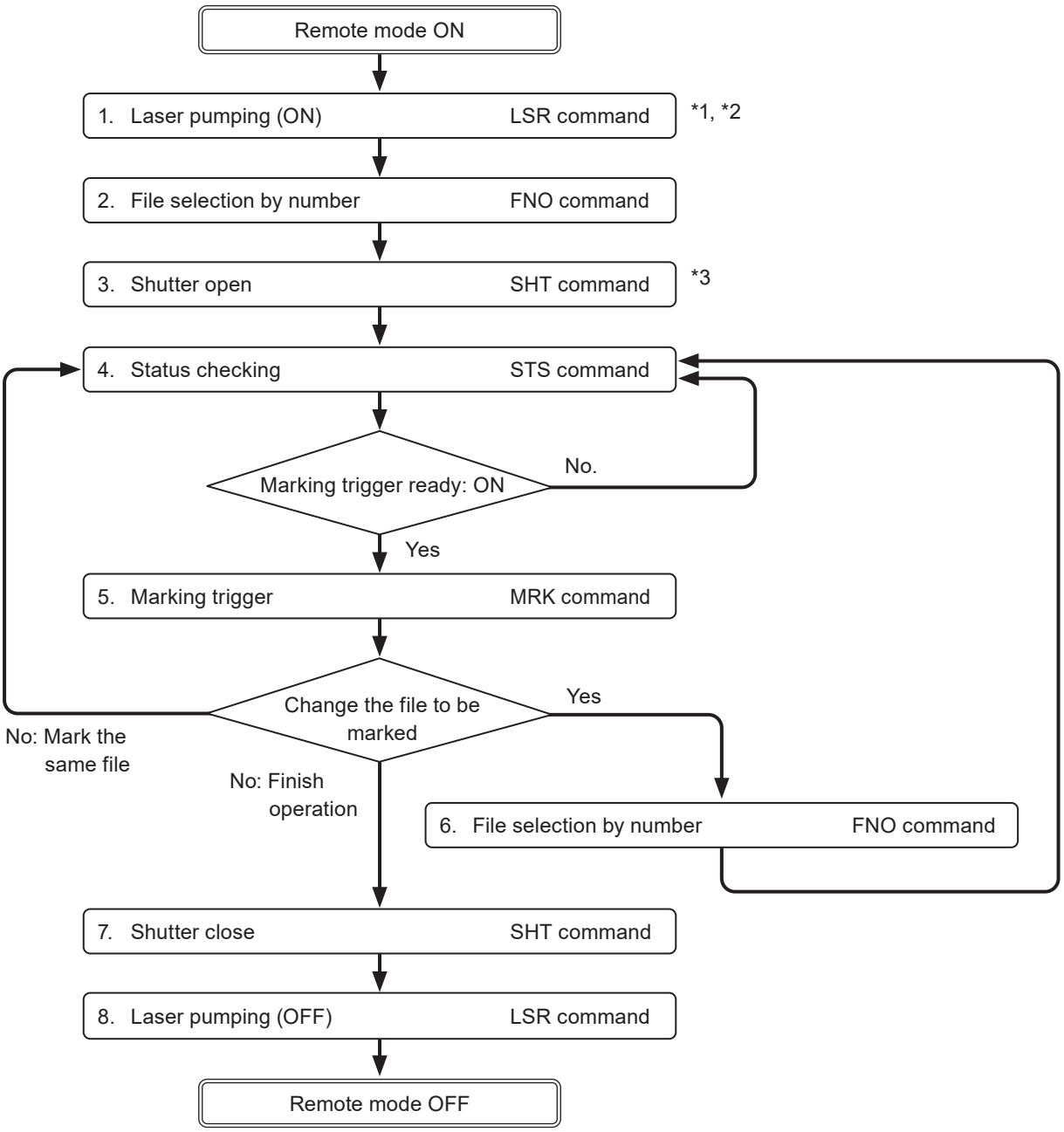
Start code NAK	“06”	Check sum	End code
15	30 36	37 42	0D (HEX)

Reference

- To use Ethernet, the end code is [CR] fixed. To use RS-232C, select either [CR] or [CR][LF].
- Check sum cannot be added with Ethernet communication.

2-6 Control Sample

■ To switch the file and start marking

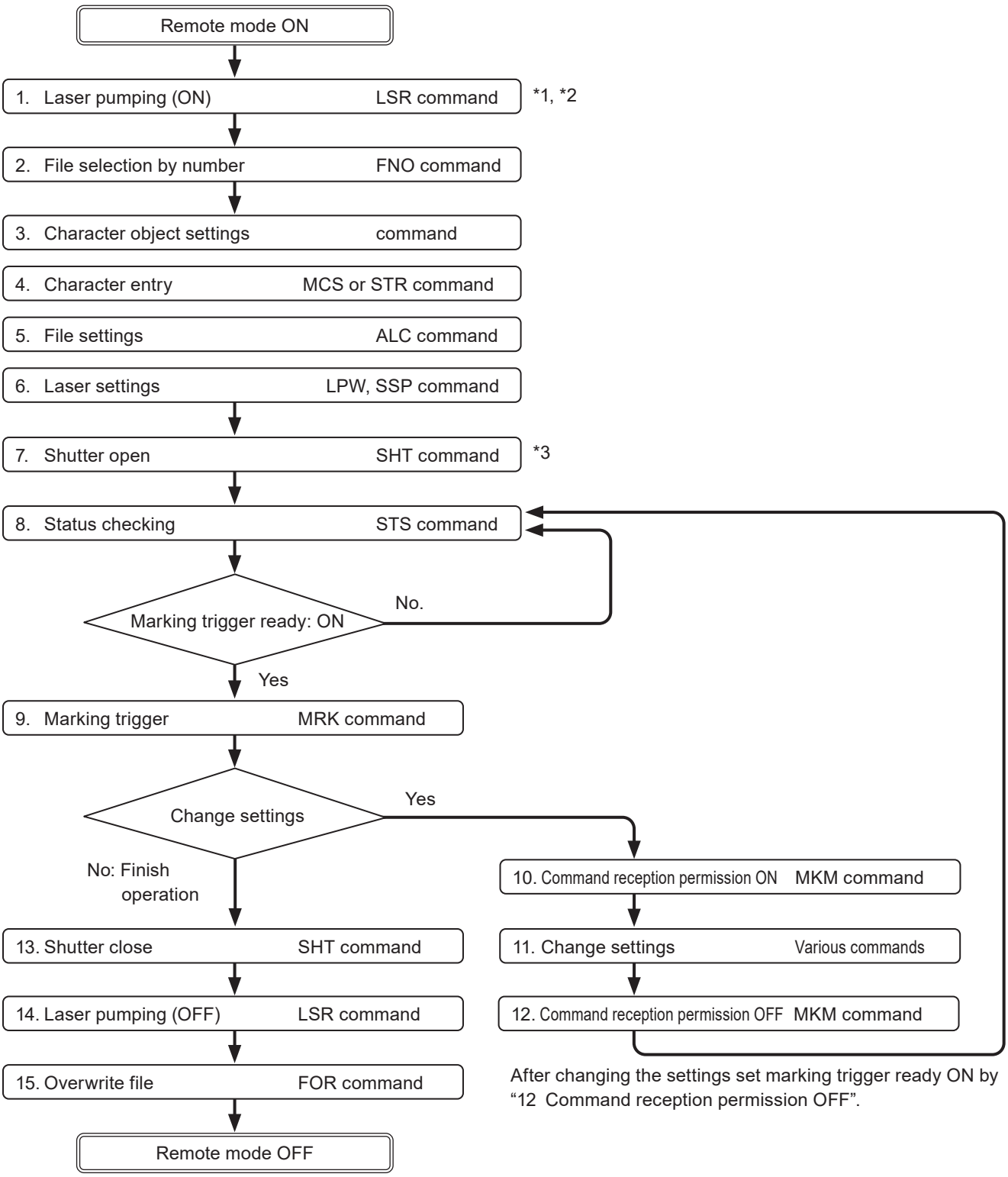


*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-ZV series: about 1 second

*2 : Commands from No. 2 to No. 4 above chart can be sent right after turning on laser pumping without waiting for the laser pumping completion.

*3 : There is a delay time of around 200ms to max. 1 second from sending shutter open/close command for the actual shutter open/close operation time.

■ Create marking data and start marking

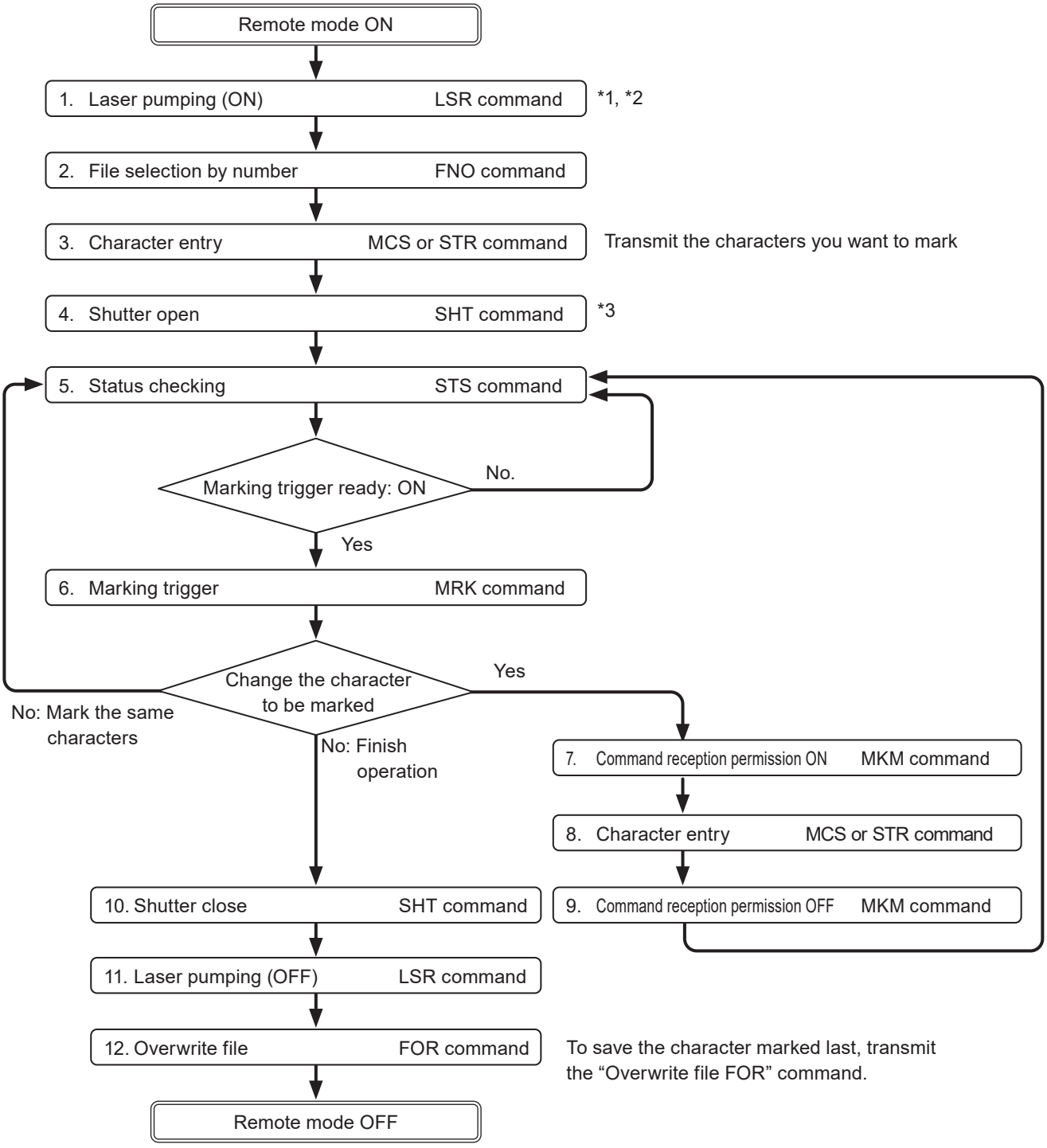


*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-ZV series: about 1 second

*2 : Commands from No. 2 to No. 8 above chart can be sent right after turning on laser pumping without waiting for the laser pumping completion.

*3 : There is a delay time of around 200ms to max. 1 second from sending shutter open/close command for the actual shutter open/close operation time.

■ Change the marking characters and start marking

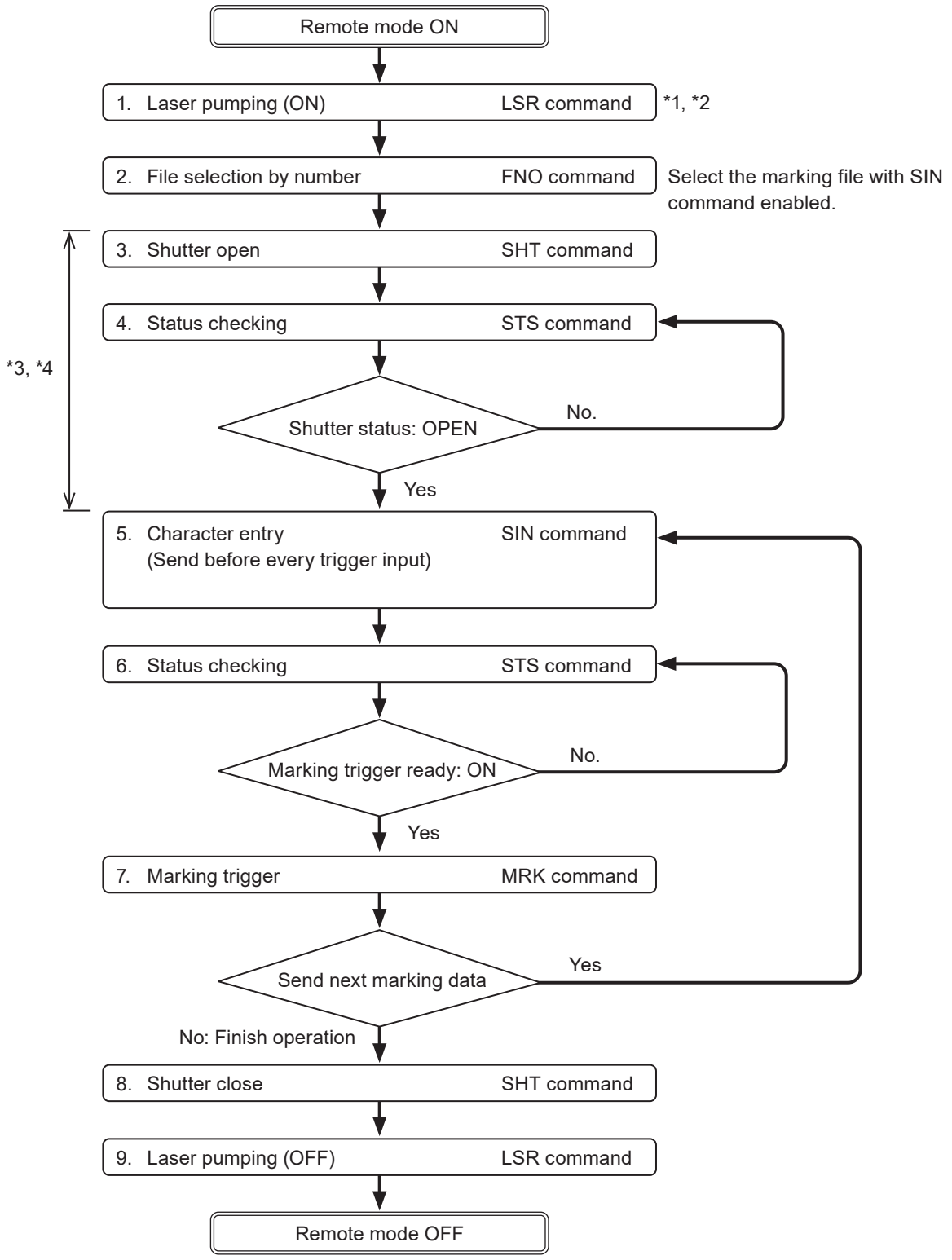


*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-ZV series: about 1 second

*2 : Commands from No. 2 to No. 5 above chart can be sent right after turning on laser pumping without waiting for the laser pumping completion.

*3 : There is a delay time of around 200ms to max. 1 second from sending shutter open/close command for the actual shutter open/close operation time.

■ Change the marking characters for each marking



*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
  • LP-ZV series: about 1 second

*2 : Commands from No. 2 to No. 5 above chart can be sent right after turning on laser pumping without waiting for the laser pumping completion.

*3 : SIN command can be accepted only when the shutter is opened. There is a delay time of around 200ms to max. 1 second from sending shutter open/close command for the actual shutter open/close operation time.

*4 : You can know the timing of SIN command input by confirming DATA WAIT OUT (No.38) signal of I/O connector is ON.

Reference

- To use SIN command, set “Characters specified by SIN command” of the functional character to the file in Laser Marker NAVI smart beforehand.
- Send SIN command by every marking triggers. READY OUT will not turn on until SIN command is sent.

3 Data Format for Each Command

3-1 Command List

The following commands are available with LP-M/S/Z compatible command mode.

■ Prior to use of compatible command mode

- Even with the use of LP-M/S/Z compatible command mode, there is a difference in communication processing time and I/O operation timing between LP-M/S/Z series and LP-ZV series. After sending the command, always confirm the response data from the laser marker. Do not send the next command before receiving the response.
- In some commands the setting range of the parameter differs from the original commands of LP-M/S/Z series. Before using the LP-M/S/Z compatible command mode, confirm the setting parameter in each command.
- When install the LP-M/S/Z control program to LP-GS/LP-RC/LP-RF series, confirm the command format and data transfer sequence to follow the rule described in “2-3 Communication Data Format” (P.32).
- To use the command related to the marking quality such as the laser power, confirming the actual marking quality and adjust the settings from the original settings of LP-M/S/Z series.
- To control with LP-M/S/Z compatible command mode, the marking data should belong to the object group No. 1000 to 1016.

Type	Name	Code	Functions	Refer
Operation Control	Command reception permission	MKM	Controls the reception permission for the settings by communication commands.	(P.58)
	Laser pumping	LSR	Controls the laser pumping ON/OFF.	(P.59)
	Shutter open/close	SHT	Controls the internal shutter opening/closing.	(P.60)
	Marking trigger	MRK	Inputs marking trigger (laser radiation startup signal).	(P.61)
	Trigger delay	DLY	Sets the delay time from trigger input to starting trigger processing (lasing) operation.	(P.62)
	Guide laser	GID	Controls radiation of red guide laser for marking position confirmation.	(P.63)
	Test Marking *1	TST	Inputs test marking trigger (laser radiation startup signal). After the test marking, the marking results can be readout.	(P.65)
	Status checking	STS	Reads out the laser marker status including marking trigger ready status and error occurrence status.	(P.67)
	Marking end verification	MST	Enables automatic response of marking result (e.g. normal end, and error occurrence, etc.) at the end of marking.	(P.68)
File	File selection by number	FNO	Specifies the file number to change the file.	(P.71)
	File selection by name	FNN	Specifies the file name to change the file.	(P.72)
	Overwrite file	FOR	Overwrites the current file onto the laser marker.	(P.73)
	Save file to different number	FRG	Saves the current file to the specified file number in the laser marker.	(P.73)
	File name	FNM	Sets the file name of the number selected.	(P.74)

Type	Name	Code	Functions	Refer
Character Setting	Character entry (by ASCII code)	MCS	Sets the characters of the character objects (reference list type) by the ASCII code. Alpha-numeric characters and symbols are available.	(P.75)
	Character entry (by ASCII and Shift-JIS code)	STR	Sets the characters of the character objects (reference list type). Characters including alpha-numeric, functional characters and Japanese characters are available.	(P.76)
	Character entry per trigger	SIN	When “Characters specified by SIN command” is set for character objects or bar code/2D code objects, input characters with this command. Send this command per each marking.	(P.78)
	Character object settings	STC	Sets the position and size of the character object (reference list type) and conditions including text characteristics.	(P.80)
	Character object settings (shortened)	SPC	Sets only X-/Y-position and laser power correction in the character object settings.	(P.84)
	Character object fine-adjustment	SCC	Specifies the filling line spacing when you use the bold characters and proportional type when you use the “Proportional” as the character spacing type.	(P.85)
Functional characters	Counter settings	CNT	Configures the “counter” function used to mark consecutive numbers.	(P.86)
	Counter reset	CTR	Resets the current value to the starting value.	(P.87)
	Expiry date/time settings	LMT	Configures the “expiry” function used to mark the date with a specified period added or subtracted to/from the current date.	(P.88)
	Lot settings	LTC	Configures the “Lot” function used to change characters depending on the date/time and counter values.	(P.89)
	Lot character	LTS	Sets the characters used with the “Lot” function to change characters depending on the date/time and counter values.	(P.90)
	Registered character input method	RKC	Sets the input method of the “Registered characters” function used to switch characters by I/O input.	(P.92)
	Registered character strings	RKS	Sets the character string used with the “Registered characters” function that switches characters by I/O input.	(P.93)

Type	Name	Code	Functions	Refer
Bar Code/2D Code	Bar code/2D code characters (by ASCII code)	BCS	Sets the characters to encode of the bar code/2D code objects by the ASCII code. Alpha-numeric characters and symbols are available.	(P.94)
	Bar code/2D code characters (by ASCII code)	BBS	Sets the characters to encode of the bar code/2D code objects by the ASCII code. Alpha-numeric characters, symbols, and specified control codes (EOT/FS/GS/RS/US) are available.	(P.96)
	Bar code/2D code characters (by ASCII and Shift-JIS code)	BRS	Sets the characters to encode of the bar code/2D code objects. Characters including control codes (specified with 2-byte alternative codes), alpha-numeric, functional characters, and Japanese characters are available.	(P.98)
	Bar code/2D code object settings	BRF	Sets the conditions such as the position and size of the bar code/2D code as well as code characteristics.	(P.100)
	Human readable text settings	BRV	Sets the character conditions to mark the character strings of bar code/2D code as the human readable text.	(P.113)
	Module filling of 2D codes	BRP	Sets the laser settings and filling details with a font by each element of the 2D code.	(P.117)
	Module filling of bar codes/module skip marking of 2D codes	BCC	Sets the bar code filling line spacing, marking direction and module skip marking of 2D code.	(P.119)
Graphic Data	Graphic file (VEC/DXF format file)	CDF	Sets the graphic file (VEC/DXF format) used for the graphic object.	(P.120)
	Graphic object settings (VEC format file)	CDC	Sets the parameters such as the position and size of the graphic object (VEC format file).	(P.121)
	Graphic object settings (DXF format file)	CDD	Sets the parameters such as the position, size and filling lines of the graphic object (DXF format file).	(P.123)
	Shape settings	FIG	Creates shapes with line, circle, and arc by specifying their sizes and positions.	(P.125)
	Shape object settings	LAY	Specifies the offset value of the position and laser power to the all shapes set in the selected object no.	(P.132)
Point	Point radiation parameters	PRD	Sets the position, time and laser power correction ratio of the point radiation.	(P.133)
	Point radiation correction	PRF	Specifies the offset value of the position and laser power to the all points set in the selected object no.	(P.137)
Layout/Position Adjustment	File settings	ALC	Adjusts the marking position and layout for each file. These settings are applied to all marking data in the selected file.	(P.138)
	Marking position and laser power adjustment per trigger	SEO	When the external offset function with “Using SEO command” is set, this command specifies the offset value of marking position and laser power for all marking data in the file. Send this command per marking trigger.	(P.140)
	External offset input method	OFC	Sets input methods between I/O or SEO command for “External Offset Function” to adjust the marking position and laser power for the entire marking data in the file.	(P.142)

Type	Name	Code	Functions	Refer
Layout/Position Adjustment	External offset values	OFS	Sets offset value of marking position and laser power used for “External Offset Function” with I/O input.	(P.143)
	Step & repeat settings	SRC	Sets the condition of “Step & repeat” to mark the same marking contents on multiple locations in one file.	(P.144)
	Step & repeat fine-adjustment	SRA	Sets the fine-adjustment of “Step & repeat” to mark the same marking contents on multiple locations in one file.	(P.146)
	3D model	SUF	Sets the shape and position of the 3D workpiece.	(P.151)
	Marking on/off by layer	LMS	Specifies whether mark the setting data or not by each layer No.	(P.156)
On-the-fly Marking	Motion settings	TRG	Sets the basic configuration of the on-the-fly marking, such as moving direction and etc. The settings are applied to all marking files.	(P.157)
	Encoder resolution	ENC	Sets the encoder resolution value used for the on-the-fly marking. This setting is applied to all marking files.	(P.158)
	Line speed	LSP	Sets the line speed of on-the-fly marking for the selected marking file.	(P.159)
	Workpiece spacing	INT	Sets the workpiece spacing of on-the-fly marking at regular intervals for the selected marking file.	(P.160)
Laser settings	Laser power	LPW	Sets the laser power for the current file.	(P.161)
	Scan speed	SSP	Sets the scan speed for the current file.	(P.162)
	Pulse cycle / pulse duration	MPL	Sets the pulse cycle, pulse duration for the current file.	(P.163)
	Laser fine tune	WTC	Fine-tunes lasing quality such as starting and ending point by each file.	(P.165)
	Line width / uniform spot mode	WDC	Sets the line width necessary to avoid crossing at marking intersection and the uniform spot mode.	(P.167)
Maintenance	Laser radiation for measurement	SPT	Controls “laser radiation for measurement” used to measure laser output by a commercially available power meter.	(P.168)
	Error code	ECR	Reads out the error code of alarm or warning when an error has occurred.	(P.177)
	Power check *1	PWM	Measures and corrects the laser power by using the internal power monitor in the laser marking system.	(P.169)
	Low power notice level *1	PWL	Specifies the notice level of the “Power compared to delivery state” which is shown as the measurement results for the power check (PWM command) to detect the laser power degradation.	(P.175)
	Marking energy check *1	MEN	Specifies the limit values to check the marking energy [mJ], which is measured at every marking.	(P.176)

Type	Name	Code	Functions	Refer
System settings	System clock	YMD	Sets the date and time of the system clock of the laser marker.	(P.178)
	Command mode	RSM	Switches the command mode between LP-M/LP-S/LP-Z compatible mode and the standard one. This command is available when LP-400/V compatibility setting is enabled in system settings.	(P.179)

*1 : LP-ZV500P, LP-ZV505P, LP-ZV506P only

Reference

- The following commands used in LP-M/LP-S/LP-Z series cannot be available with this product.
  - MWT: Flying object wait
  - ERA: Era year
  - WKM: Week setting
  - ENV: I/O environment
  - WRD: Work distance
  - PWR: Power check (Use the PWM command as an alternative command.)
  - MEM: Marking energy indicating

3-2 Command Description Details

■ How to read command format

- The command format is defined for setting request data, readout request data, and response data for readout respectively.
- Some commands have unsupported data format. In that case, such data format is not listed.

Start code	SRA	S	[Adjustment No.] [Adjustment object] [Number of adjustment settings to delete] 6-byte or 3-byte	(Check sum)	End code

- Indicates variable-length or fixed-length data items.
- Data content varies for each command.
- [ ] indicates each data item. The [ ] is not included in the input data.
- If there is more than one item, input them in a row. There is no separating character among each terms.

■ How to view the data description table

The data description table explains the content of variable-length or fixed-length data items.

- Data length of each item.
- If the data length shows “Max.”, it refers to variable-length data.
- If the command includes data that can be omitted, the data length is written in ( ).

It indicates the value at the setting/readout.
Characters enclosed in “ ” represent the characters input in the ASCII code.

Name	Data length [byte]	Data contents	Remarks
Adjustment No. (From which the deletion starts)	2	“00”–“99”	Specifies the number to delete or the number from which the deletion starts.
Adjustment object (Delete command)	1	“0”: Delete settings	
Number of adjustment settings to delete *	(3)	“001”–“100”	• Specifies the number of conditions to delete before deleting consecutive adjustment settings after the specified adjustment number. • If you omit this item, only the settings of the specified adjustment number will be deleted. (The setting to delete one row.)
Total data length	6 (3)	Fixed length. • When Number of adjustment settings to delete is not omitted: 6-byte • When Number of adjustment settings to delete is omitted: 3-byte	

It is the total data length of the variable-length or fixed-length data part.
If the data length shows “Max.”, it refers to variable-length data.
If there is another variation of the total data length depending on the setting contents, it is written in ( ).

3-3 Operation Control Commands

3-3-1 Command reception permission: MKM

Controls the reception permission (reception mode ON/OFF) of the settings by communication commands.
In the shutter open or marking trigger ready ON status, set “command reception permission ON” when transmitting the command including an action to update the laser marker data.
To resume the marking trigger ready ON status after command transmission, set “command reception permission OFF”.

■ Setting request data / response data for readout

Start code	MKM	Sub command	[Command reception permission] 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	MKM	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Command reception permission	1	“0”: Command reception permission ON “1”: Command reception permission OFF	Setting “command reception permission ON” turns OFF the marking trigger ready to start receiving commands. Setting “command reception permission OFF” ends the command reception to resume the marking trigger ready ON status.
Total data length	1	The data length is fixed.	

Reference

- Refer to “2-4 Command Reception Condition” (P.43) for details on the command reception permission.
- Send MKM command with the shutter opened state.
- When the command reception status is readout during the shutter closed, the response data indicates the status as “command reception permission ON”.
- MKM command is not acceptable during the guide laser emission or laser radiation for measurement.
- MKM command is not acceptable during the test marking (TST command) or power check (PWM command).
- It is possible to recover from the warning status by sending “command reception permission ON” of the MKM command.

■ Example of command settings

Condition: Command reception permission = 0

- Setting

Transmission data	[STX]	MKM	S	0	[CR]

- Readout

Transmission data	[STX]	MKM	R	[CR]

Response data	[STX]	MKM	A	0	[CR]

3-3-2 Laser pumping: LSR

Controls the laser pumping ON/OFF.

■ Setting request data / response data for readout

Start code	LSR	Sub command	[Laser pumping control] 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LSR	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Laser pumping control	1	“0”: Laser pumping OFF “1”: Laser pumping ON	
Total data length	1	The data length is fixed.	

Reference

- This command is available only when the laser pumping control method is set to “communication commands” by Laser Marker NAVI smart.
- From sending the laser pumping on request to completion of laser pumping, the following time will be required.
  - LP-ZV series: about 1 seconds
- Response data when reading out this command returns the laser pumping control status. If you want to check the laser pumping ON/OFF status, use the status checking (STS) command.
- When you turn OFF the laser pumping during marking laser processing (laser radiation), an error occurs and this interrupts the marking trigger processing.

■ Example of command settings

Condition: Laser pumping control = 1

- Setting

Transmission data	[STX]	LSR	S	1	[CR]

- Readout

Transmission data	[STX]	LSR	R	[CR]

Response data	[STX]	LSR	A	1	[CR]

3-3-3 Shutter open/close: SHT

Controls the internal shutter opening/closing.

■ Setting request data / response data for readout

Start code	SHT	S	[Shutter status] 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Shutter status	1	“0”: Shutter close “1”: Shutter open	
Total data length	1	The data length is fixed.	

Reference

- This command is available only when the shutter control method is set to “communication commands” by Laser Marker NAVI smart.
- When you transmit the shutter open request command with the shutter already open, the laser marker returns the negative response.
- If the shutter close command is transmitted during marking, the internal shutter is closed after the marking is completed.
- There is a delay time of around 200ms to max. 1 second from sending shutter open/close command for the actual shutter open/close operation time.
- SHT command is not acceptable during the guide laser emission or laser radiation for measurement.
- SHT command is not acceptable during the test marking (TST command) or power check (PWM command).
- It is possible to recover from the warning status by closing the shutter.

■ Example of command settings

Condition: Shutter status = 1

- Setting

Transmission data	[STX]	SHT	S	1	[CR]

3-3-4 Marking trigger: MRK

Inputs marking trigger (laser radiation startup signal). For the on-the-fly marking at regular intervals, this command controls to start and to stop marking.

Reference

- Marking (laser radiation) starts upon receiving this command. If you are using the link function with image checkers, the link control starts upon receiving this command.
- When on-the-fly marking is set, lasing operation starts when the workpiece comes to the preset marking position after this command is accepted.
- If this command was transmitted while the marking trigger was not acceptable (the marking trigger ready OFF), the laser marker returns negative response. Before sending this command, confirm that the marking trigger ready status by using STS command.
- When the trigger delay time is set in the selected file, trigger processing (lasing) operation starts after the delay time.
- This command can be accepted when the trigger mode is set to “single trigger”. When the trigger mode is set to “continuous trigger”, input the marking trigger by using TRIGGER IN signal in I/O terminal.
- When trigger mode is set to Multiple triggers at on-the-fly marking, max. 16 triggers can be accepted during trigger processing (lasing) operation.
- If any of the following operations are executed while the on-the-fly marking at regular intervals or with multiple triggers are running, the marking operation is terminated after finishing the running marking and subsequent triggers are canceled.
  - Closing the shutter
  - Sending MKM command with “command reception permission ON”
  - Changing the file
  - Changing the marking characters by code reader linkage function
- For the on-the-fly marking at regular intervals, if the marking stop request is transmitted when the trigger processing operation is running, on-the-fly marking at regular intervals is terminated after finishing the running operation.
- For the on-the-fly marking at regular intervals, if both this command and TRIGGER IN (X5) signal of I/O terminal are used, the marking at regular intervals is executed with turning on of either of them. Even the stop request of this command is transmitted, the marking is executed while TRIGGER IN (X5) turns on.

■ Setting request data

Start code	MRK	S	[Marking trigger] 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Marking trigger	1	Except the marking at regular intervals “0” or “1”: Trigger ON	• Setting both “0” and “1” allows to start marking when the trigger mode is other than the marking at regular intervals. • For the on-the-fly marking at regular intervals, setting “1” allows to start the first marking operation. • For the on-the-fly marking at regular intervals, once setting “1”, the marking operation is repeated at regular intervals until “0” is set.
		When the marking at regular intervals “0”: Trigger OFF (End marking) “1”: Trigger ON (Start marking)	
Total data length	1	The data length is fixed.	

■ Example of command settings

Condition: Marking trigger = 1

• Setting

Transmission data	[STX]	MRK	S	1	[CR]

3-3-5 Trigger delay: DLY

Sets the delay time from trigger input to starting trigger processing (lasing) operation. Trigger delay setting is applied to only the selected file.

■ Setting request data / response data for readout

Start code	DLY	Sub command	[Delay time] 6-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	DLY	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Delay time	6	“000000”–“009999” [ms]	
Total data length	6	The data length is fixed.	

Reference

- Trigger delay setting is applied to only the selected file. When you use several files, set the trigger delay for each file.
- When in the selected file the link control with an image checker is set, the link control starts after the trigger delay time. There is no delay time before TIMING IN.
- The delay time setting is applied only to the marking to static object. When the on-the-fly marking is set, you cannot use DLY command.
- The delay time setting is not applied to the laser radiation for measurement and test marking.
- The “Delay distance” which was specified in LP-M/S/Z series is corresponding to “Trigger detecting position” and “Workpiece reference boundary” in this product. If you want to set those parameters, switch the command mode to the standard mode by RMS command.

■ Example of command settings

Condition: Delay time = 75

- Setting

Transmission data	[STX]	DLY	S	000075	[CR]

- Readout

Transmission data	[STX]	DLY	R	[CR]

Response data	[STX]	DLY	A	000075	[CR]

3-3-6 Guide laser: GID

Controls radiation of red guide laser for marking position confirmation.

■ Setting request data

Start code	GID	S	[Guide laser display] [Guide laser scan speed] [Guide laser Z-movement] 14-byte, 6-byte or 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents (> Name in LP-M/S/Z)	Remarks
Guide laser display	1	“0”: Stop display “1”: Marking field “2”: Marking image (> Marking character) “3”: Masked objects (> Work image display) “4”: Work distance (> Dual pointer)	• “1” to “4” can be used only when the shutter is closed. • To set guide laser scan speed or Z-movement without guide laser radiation, set the guide laser display to “0”.
Guide laser scan speed	(5)	Model / Setting range [mm/s] LP-ZV200P, LP-ZV205P, LP-ZV500P, LP-ZV505P: “00001”–“06000” LP-ZV206P, LP-ZV506P: “00001”–“04000”	• When on-the-fly marking is set, this setting is not applied to the guide laser of the marking image and the masked objects. To them the on-the-fly speed is applied. • This item can be omitted.
Guide laser Z-movement	(8)	“-025.000”–“+025.000” [mm]	• Enabled only when the guide laser display is set to marking field or work distance. • This setting can be omitted. • If you omit the “Guide laser scan speed”, also omit the “Guide laser Z-movement”.
Total data length	14 (6) (1)	The data length is fixed. • When setting the guide laser scan speed and guide laser Z-movement: 14-byte • When you omit the guide laser Z-movement: 6-byte • When you omit the guide laser scan speed and guide laser Z-movement: 1-byte	

Reference

- To radiate the guide laser with this command, set the guide laser display control method to “communication commands” by Laser Marker NAVI smart.
- You can start the guide laser radiation only with the internal shutter closed.
- To use a guide laser in remote mode while any of the INTERLOCK inputs (REMOTE INTERLOCK IN, INTERLOCK 1, INTERLOCK 2) is open, set “Deactivate while shutter closed” in “System settings” > “Operation/information” > “INTERLOCK alarm detection”.
- The guide laser stops automatically after about one minute has passed from the startup.
- When on-the-fly marking is set, the guide laser of the marking image operates with the on-the-fly behavior.
- Do not execute any other operation including the shutter opening/closing and sending MKM command while the guide laser is emitted.
- For LP-ZV series even if you use the auto focus function, the workpiece displacement is not applied to the guide laser radiation by this command.
- If you omit the guide laser scan speed, also omit the guide laser Z-movement. Only the guide laser scan speed cannot be omitted.
- If you omit the guide laser scan speed and guide laser Z-movement, the same values as when the guide laser was radiated last time are applied to these settings.
- The settings of guide laser scan speed and guide laser Z-movement are common in all files.
- The settings of guide laser scan speed and guide laser Z-movement are saved in the laser marker without overwriting operation.

■ Example of command settings

Condition: Guide laser display = 1, Guide laser scan speed=200, Guide laser Z-movement=2

- Setting

Transmission data	[STX]	GID	S	100200+002.000	[CR]

3-3-7 Test marking: TST

Supported model: LP-ZV500P / LP-ZV505P / LP-ZV506P

Inputs test marking trigger (laser radiation startup signal). After the test marking, the marking results can be readout.

■ Setting request data

Start code	TST	S	[Test marking] 1-byte or 0-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Test marking	1	“0”, “1” or omit: Start marking	• The internal shutter is automatically opened and closed at the time of start and end of test marking. • At LP-M/S/Z compatible command mode, specify “0” or “1” to start marking. • This item can be omitted.
Total data length	1 or 0	The data length is fixed. • When Test marking is not omitted: 1-byte • When Test marking is omitted: 0-byte	

Reference

- To start the test marking with this command, set the shutter operation control method to “communication commands” by Laser Marker NAVI smart.
- You can start the test marking only when the laser pumping is completed and the shutter is closed.
- The delay time setting is not applied to the test marking.
- Do not execute any other operation including the shutter opening/closing and sending MKM command while the test marking is performed.
- The counter value is not updated in test marking mode.
- In the test marking, characters set as “Characters specified by SIN command” are replaced with “○”.
- If “Trigger mode” is set to “Continuous trigger”, the setting value of “Minimum number of scans” is used for the test marking.
- If you use a SEO command for the external offset, in the test marking “0” is set for the offset values.
- If you use the external offset function with I/O, in the test marking offset values set in the data number “0” are used.
- If you use the registered characters, in the test marking characters set in the data number “0” are used.
- If you use a MST command to verify the marking end, the response data of MST command is automatically sent also after the test marking is executed by TST command. Refer to “3-3-9 Marking end verification: MST” (P.68).
- If you use the autofocus function, in the test marking by this command 0mm is set for the workpiece displacement value.
- At LP-M/S/Z compatible command mode, you cannot terminate the test marking forcibly in the middle of marking.
- It is possible to check whether the marking energy after test marking is within the threshold value by the response data of the Check OK/CHECK NG of the I/O terminal and the MST command.

■ Readout request data

Start code	TST	R	(Check sum)	End code

■ Response data for readout

Start code	TST	A	[Marking energy] [Marking time] 15-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Marking energy	9	“000000000”–“999999999” [mJ] “000000000”: Measurement failed	• If the test marking cannot be executed to the end due to an error or interruption request, the marking time and marking energy cannot be readout. • When the marking time is 9999.9 seconds or longer, the response data is “9999.9”.
Marking time	6	• When the marking time is 100 seconds or longer: “0100.0”–“9999.9” [s] • When the marking time is 100 seconds or shorter: “000.01”–“099.99” [s] • When the measurement failed: “000.00”	
Total data length	15	The data length is fixed.	

Reference

- Send the readout request command for the test marking results after the test marking is completed. If you use a MST command to verify the marking end, the response data of MST command is automatically sent after the power measurement or correction test marking is executed by TST command.
- If the actual marking time is shorter than the time set for “One-shot pulse duration [ms]”, the result of the marking time measurement is the same as the time set for “One-shot pulse duration [ms]”.
- For on-the-fly marking, the following time periods add up to the marking time measurement result:
  - Time between the input of the marking start signal (trigger) and the arrival of the workpiece at the preset marking position
  - Laser radiation time

■ Example of command settings

Condition: Test marking = 1

- Setting

Transmission data	[STX]	TST	S	1	[CR]

- Readout

Marking energy = 2500, Marking time = 12.5

Transmission data	[STX]	TST	R	[CR]

Response data	[STX]	TST	A	000002500012.50	[CR]

3-3-8 Status checking: STS

Reads out the laser marker status, such as marking trigger ready status and error occurrence status.

■ Readout request data

Start code	STS	R	(Check sum)	End code

■ Response data for readout

Start code	STS	A	[Error occurrence status] [Laser pumping status] [Command reception status] [Marking trigger ready state] [Marking at regular intervals ON/OFF] 5-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Error occurrence status	1	“0”: No error “1”: Error occurrence	To the warnings from E700 to E799, “0” (No error) is read out.
Laser pumping status	1	“0”: Laser pumping OFF “1”: Laser pumping in preparing “2”: Laser pumping completed	
Command reception status	1	“0”: Command reception permission ON “1”: Command reception permission OFF	• Indicates the command reception permission (MKM command) status. Use this for determination of whether various commands can be transmitted. For details, refer to “2-4 Command Reception Condition” (P.43). • When the shutter is closed, the response data is “0”. • When the shutter is opened and no MKM command is sent, the response data is “1”.
Marking trigger ready state	1	“0”: Marking trigger ready OFF “1”: Marking trigger ready ON	Marking trigger can be input only with the marking trigger ready ON.
Marking at regular intervals ON/OFF	1	“0”: Marking at regular intervals OFF “1”: Marking at regular intervals ON (Trigger ON state)	• When the on-the-fly marking at regular intervals is set, this response data indicates the marking trigger ON/OFF state. • When the marking at regular intervals is not used, the response data is always “0”.
Total data length	5	The data length is fixed.	

Reference

- “02110” is the response data for status checking with the marking trigger ready ON.

3-3-9 Marking end verification: MST

Enables automatic response of marking result (e.g. normal end, and error occurrence, etc.) at the end of marking.
For the communication sequence of this command, refer to “Communication sequence when the marking end verification (MST) command response is enabled” (P.30).

■ Setting request data / response data for readout

Start code	MST	Sub command	[Response setting] 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	MST	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Response setting	1	“0”: Response prohibited “1”: Response permitted	
Total data length	1	The data length is fixed.	

Reference

- Once you set the response settings of the marking end verification, they are valid during the remote mode.
- When the marking end verification is used, set the response permission before every shifting to the remote mode. This command setting will be restored to the response prohibited state once you deactivate the remote mode.

■ Automatic response data with response permitted

The following response data transmit normal end or abnormal end at the end of the trigger processing (marking) with the marking end verification response permitted.

LP-ZV200P/LP-ZV205P/LP-ZV206P

Start code	MST	A	[Status] 4-byte	(Check sum)	End code

LP-ZV500P/LP-ZV505P/LP-ZV506P

Start code	MST	A	[Status] [Marking energy check] [Marking energy] 14-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Status	4	“0000”: Normal end “E001”–“E999”: Error code (abnormal end)	• It returns the error code occurred in case of an abnormal end by an error during marking trigger processing. • When the warning that does not interrupt the marking operation (E700 to E799) occurs, the response data indicates “0000” as the normal end.
(LP-ZV500P/ LP-ZV505P/ LP-ZV506P only) Marking energy check	1	“0”: OK or Check OFF “1”: Out of range “2”: Measurement failed	• If the marking cannot be completed due to the error or stop request, the marking energy cannot be measured. • In the response data after the test marking (TST command), the marking energy check is always “0”. • In the response data after the power measurement or correction of the power check (PWM command), always the marking energy check is “2” and the marking energy is “000000000”.
(LP-ZV500P/ LP-ZV505P/ LP-ZV506P only) Marking energy	9	“000000000”–“999999999” [mJ] “000000000”: Measurement failed	
Total data length	4 or 14	The data length is fixed. • LP-ZV200P/LP-ZV205P/LP-ZV206P: 4-byte • LP-ZV500P/LP-ZV505P/LP-ZV506P series: 14-byte	

Reference

- Refer to “What to do if an error occurs” (P.199) for error codes details.
- The automatic response data of the error code will not be transmitted in case of errors occurred when the marking trigger processing is not in progress.
- When on-the-fly marking with multiple triggers or at regular intervals are set, the response data is transmitted at the timing of each marking completion.
- When the marking interval is too short for transmission time of MST command, MST command is not available. In such case, check the marking completion by I/O.
- You can set the marking energy limit values by Laser Marker NAVI smart or MEN command. Refer to “3-13-4 Marking energy check: MEN” (P.176).

■ Example of command settings

Condition: Response setting = 1

- Setting

Transmission data	[STX]	MST	S	1	[CR]

- Readout

Transmission data	[STX]	MST	R	[CR]

Response data	[STX]	MST	A	1	[CR]

Condition: LP-ZV500P/LP-ZV505P/LP-ZV506P, Status = 0000 (normal end), Marking energy check = 0, Marking energy = 123456

- Response data with response permitted

Response data	[STX]	MST	A	00000000123456	[CR]

Condition: When the alarm E400 occurred at the marking. LP-ZV500P/LP-ZV505P/LP-ZV506P, Status = E400, Marking energy check = 2, Marking energy = 0

- Response data with response permitted

Response data	[STX]	MST	A	E4002000000000	[CR]

3-4 File Setting Commands

3-4-1 File selection by number: FNO

Specifies the file number to change the file.

■ Setting request data / response data for readout

Start code	FNO	Sub command	[File number] 4-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	FNO	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
File number	4	“0000”–“9999”	Response data for readout returns the file number currently selected.
Total data length	4	The data length is fixed.	

Reference

- The file change operation turns off the marking trigger ready momentarily.
- If you want to select a file which has no marking data, close the shutter before sending this command.

■ Example of command settings

Condition: File number = 10

- Setting

Transmission data	[STX]	FNO	S	0010	[CR]

- Readout

Transmission data	[STX]	FNO	R	[CR]

Response data	[STX]	FNO	A	0010	[CR]

3-4-2 File selection by name: FNN

Specifies the file name to change the file.

■ Setting request data

Start code	FNN	S	[File name] Max. 20-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
File name	Min. 1 Max. 20	The number of input characters allowed is 1 to 20 characters. Input Method: ASCII code or Shift JIS code (can be mixed)	• Use the ASCII code to specify one-byte characters (single byte characters). • Use the Shift JIS code to specify two-byte characters (double byte characters).
Total data length	Max. 20	Variable length.	

Reference

- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- Specifies a case-sensitive alphabetical file name.
- If the file name contains both the ASCII code (one-byte characters) and Shift JIS code (two-byte characters), specify them exactly as they are in the ASCII code and Shift JIS code.
- If the file name contains any characters which belong to the non-supported character code, the file cannot be selected by the command.
- When two or more of the same file names exists, the file with the smaller number is selected.
- Use the file name (FNM) command when you want to read out the file name currently selected.
- The file change operation turns off the marking trigger ready momentarily.
- Unnamed files (0-byte name) cannot be selected with this command.
- At LP-M/S/Z compatible command mode, you cannot select the file name with more than 21-byte length.

■ Example of command settings

Condition: File name = ABCD

- Setting

Transmission data	[STX]	FNN	S	ABCD	[CR]

3-4-3 Overwrite file: FOR

Overwrites the current file onto the laser marker.

■ Setting request data

Start code	FOR	S	(Check sum)	End code

■ Example of command settings

• Setting

Transmission data	[STX]	FOR	S	[CR]

Reference

- By this command, in addition to the editing file contents, the settings of the global functional characters such as global counter, date and lot are saved to the laser marker.
- When the setting is changed by the following commands, the modified data is saved in the laser marker without overwriting operation.
  - Guide laser scan speed and guide laser Z-movement (GID)
  - Current counter value of counter settings (CNT)
  - Counter reset (CTR)
  - Motion settings (TRG)
  - Encoder resolution (ENC)
  - Power check (PWM) (LP-ZV500P/LP-ZV505P/LP-ZV506P only)
  - Power degradation notice level (PWL) (LP-ZV500P/LP-ZV505P/LP-ZV506P only)
  - System clock (YMD)

3-4-4 Save file to different No.: FRG

Saves the current file to the specified file number in the laser marker.

■ Setting request data

Start code	FRG	S	[File number] 4-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
File number	4	“0000”–“9999”	When you save files by this command, the active file number is switched to the selected number.
Total data length	4	The data length is fixed.	

■ Example of command settings

Condition: File number = 1234

• Setting

Transmission data	[STX]	FRG	S	1234	[CR]

3-4-5 File name: FNM

Sets the file name of the file number selected.

■ Setting request data / response data for readout

Start code	FNM	Sub command	[File name] Max. 20-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	FNM	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
File name	Min. 1 Max. 20	The number of input characters allowed is 1 to 20 characters. Input Method: ASCII code or Shift JIS code (can be mixed)	• Use the ASCII code to specify one-byte characters (single byte characters). • Use the Shift JIS code to specify two-byte characters (double byte characters).
Total data length	Max. 20	Variable length.	

Reference

- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- If the file name contains any characters which belong to the non-supported character code, the file name cannot be readout.
- Set one or more characters for this command. You cannot delete file names.
- At LP-M/S/Z compatible command mode, you cannot readout the file name with more than 21-byte length.

■ Example of command settings

Condition: File name = abcd

- Setting

Transmission data	[STX]	FNM	S	abcd	[CR]

- Readout

Transmission data	[STX]	FNM	R	[CR]

Response data	[STX]	FNM	A	abcd	[CR]

3-5 Character Setting Commands

3-5-1 Character entry (by ASCII code): MCS

Sets the characters of the character objects (reference list type) by the ASCII code. Alpha-numeric characters and symbols are available.

■ Setting request data / response data for readout

Start code	MCS	Sub command	[String No.] [Marking character] At setting: Max. 32-byte At readout: Max. 62-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	MCS	R	[String No.] 2-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
String No.	2	“01”–“99”: string No. 1 to 99 (for current file)	• Select the string No. of the reference list to set characters.
Marking character	Min. 0 Max. 30	Input Method: ASCII code from 20 (HEX) to 7E (HEX)	• Functional characters cannot be used. • Specify 0-byte for data length to delete characters. • If the readout data includes characters that cannot be expressed in ASCII code such as Japanese characters (2-byte character), only these 2-byte characters are read out in shift JIS code. • If the marking character string contains any functional characters or 2-byte characters, the maximum readout data can be 60-byte.
Total data length	Max. 32	Variable length. • Setting request data: Max. 32-byte • Response data for readout: Max. 62-byte	

Reference

- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- Characters in TrueType object cannot be set with communication command.
- The characters input by this command are converted to the 2-byte characters automatically.
- If the readout data includes characters that cannot be expressed in ASCII code such as Japanese characters (2-byte character), only these 2-byte characters are read out in shift JIS code.
- When the character strings set with the functional character are readout, the setting of the functional character starting with % are read out. The characters to mark as the functional characters, such as the counter or date and time values, are not read out.
- With LP-M/S/Z compatible command mode, you cannot readout the character strings with more than 61-byte length.
- With LP-M/S/Z compatible command mode, the character object other than the reference list type cannot be set.
- With LP-M/S/Z compatible command mode, the character strings that can be used for common in all files (common character strings) cannot be set or read.

■ Example of command settings

Condition: String No. = 51, Marking character = abcd

• Setting

Transmission data	[STX]	MCS	S	51abcd	[CR]

• Readout

Transmission data	[STX]	MCS	R	51	[CR]

Response data	[STX]	MCS	A	51abcd	[CR]

3-5-2 Character entry (by ASCII and Shift-JIS code): STR

Sets the characters of the character objects (reference list type). Characters including alpha-numeric, functional characters and Japanese characters are available.

■ Setting request data / response data for readout

Start code	STR	Sub command	[String No.] [Marking character] Max. 62-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	STR	R	[String No.] 2-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
String No.	2	“01”–“99”: string No. 1 to 99 (for current file)	• Select the string No. of the reference list to set characters.
Marking character	Min. 0 Max. 60	Input Method: ASCII code or Shift JIS code (can be mixed)	• Use the ASCII code to specify functional characters. • Use the Shift JIS code to specify two-byte characters (double byte characters). • For the characters that can be specified in ASCII code, you can use both ASCII code and Shift-JIS code. • Specify 0-byte for data length to delete characters. • For response data for readout, all characters except the functional characters are readout in 2-byte characters (Shift-JIS code) regardless the settings.
Total data length	Max. 62	Variable length.	

Reference

- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- Characters in TrueType object cannot be set with communication command.
- For response data for readout, all characters except the functional characters are readout in 2-byte characters (Shift-JIS code) regardless the settings.
- The characters input by this command are converted to the 2-byte characters automatically. (except Functional characters)
- When the character strings set with the functional character are readout, the setting of the functional character starting with % are read out. The characters to mark as the functional characters, such as the counter or date and time values, are not read out.
- With LP-M/S/Z compatible command mode, you cannot readout the character strings with more than 61-byte length.
- With LP-M/S/Z compatible command mode, the character object other than the reference list type cannot be set.
- With LP-M/S/Z compatible command mode, the character strings that can be used for common in all files (common character strings) cannot be set or read.

■ Example of command settings

Condition: String No. = 51, Marking character (counter function and character “abcd”) = %06:C0abcd

- Setting

Transmission data	[STX]	STR	S	51%06:C0abcd	[CR]

- Readout

Transmission data	[STX]	STR	R	51	[CR]

Response data	[STX]	STR	A	51%06:C0 a b c d	[CR]

3-5-3 Character entry per trigger: SIN

When “Characters specified by SIN command” is set for character objects or bar code/2D code objects, input characters with this command. Send this command per each marking.

■ Setting request data

Start code	SIN	S	[String No.] [Marking character] Max. 200-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
String No. (> Serial data No.)	2	“00”–“15”	If the string No. is not set in the selected file, the SIN command cannot be accepted.
Marking character	Min. 0 Max. 198	The number of input characters allowed is max. 99 characters. Input Method: either ASCII code or Shift JIS code (cannot be mixed)	• The ASCII code and Shift JIS code cannot be mixed in one command. • Including these characters, max. 299 digits of characters in total can be set in one character object or bar code/2D code object.
Total data length	Max. 200	Variable length.	

Reference

- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- For the bar code/2D code objects to input the control codes in the code data, follow the input method described in “Inputting control codes to bar code/2D code character strings” (P.40).
- To use this SIN command, 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, transmit this command by every marking triggers. Otherwise marking trigger ready does not turn ON, and marking is not available.
- Characters specified by SIN command cannot be set together with the following functions in one file.
  - Registered characters (via I/O)
  - External offset function by I/O
  - On-the-fly marking at regular intervals
  - On-the-fly marking with multiple triggers
- SIN command can be accepted even without marking character data.
- When marking characters of the number of digits different from the number of digits set on the screen for input of characters specified by command are sent, the characters of the sent number of digits are marked regardless of the number of digits set on the screen.

■ Example of command settings

Condition: String No. = 0, Marking character = abcd

- Setting

Transmission data	[STX]	SIN	S	00abcd	[CR]

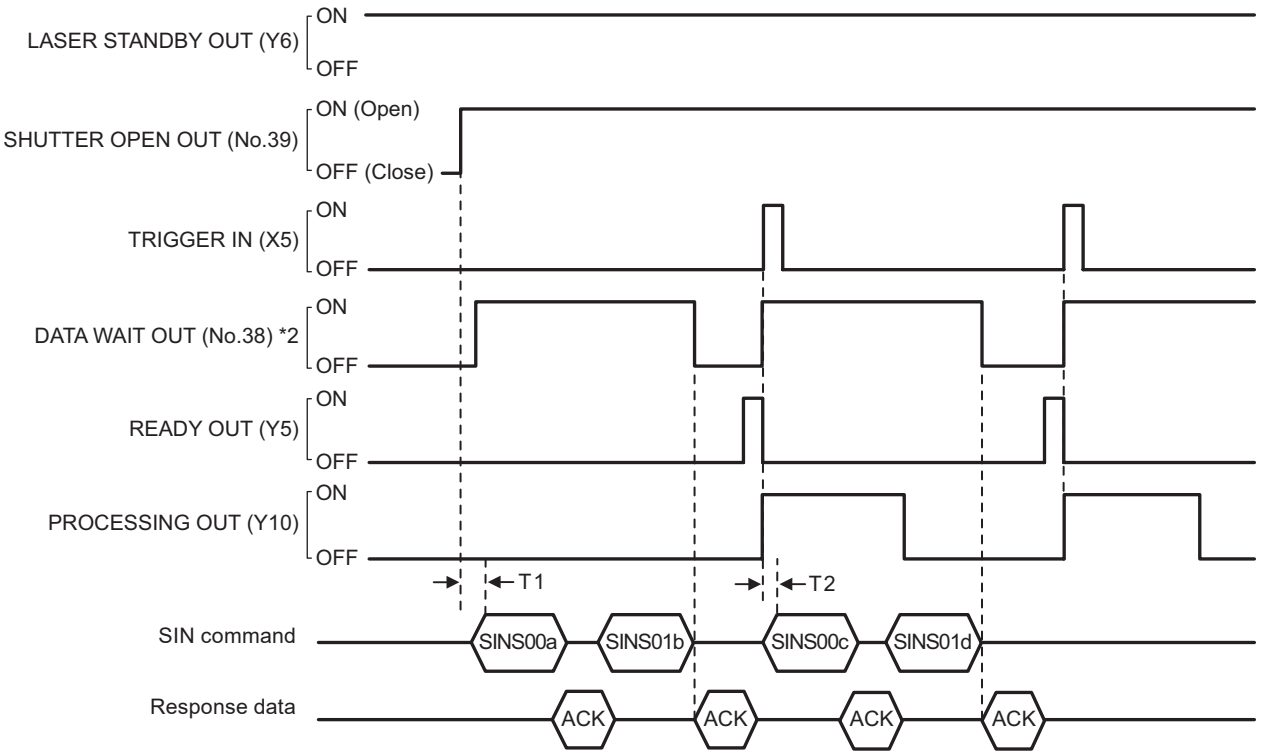
Condition: String No. = 0, No marking character (blank)

- Setting

Transmission data	[STX]	SIN	S	00	[CR]

■ Timing chart for SIN command transmission

Ex. When “Characters specified by SIN command” is set to string No. 0 and 1



Item	Time	Remarks
T1	0 ms or more	Before sending SIN command, confirm that the shutter is opened. You can use either SHUTTER OPEN OUT signal or DATA WAIT OUT (No.38) to know the timing of SIN command input.
T2	0 ms or more	After confirming PROCESSING OUT (Y10) is turned ON, the next SIN command data can be sent. You can use either PROCESSING OUT signal or DATA WAIT OUT (No.38) to know the timing of SIN command input.

Reference

- SIN command can be accepted only when the shutter is open. The shutter status can be confirmed by using SHUTTER OPEN OUT signal of I/O.
- When “command reception permission ON” is set by MKM command, SIN command cannot be accepted.
- When SIN command will be sent right after file change (FNO/FNN command) or command reception permission OFF (MKM command) setting, set the wait time of 1 second or more after FNO/FNN/MKM command reception.
- You can know the timing of SIN command input by confirming DATA WAIT OUT (No.38) signal of I/O connector is ON.
- When the file with “Characters specified by SIN command” function is selected, transmit this command by every marking triggers. Otherwise marking trigger ready does not turn ON, and marking is not available.
- It is not possible to send SIN command twice or more to one string number for one marking trigger.
- To reset the transmitted SIN command data, either close the shutter, or set “command reception permission ON” for MKM command.

3-5-4 Character object settings: STC

Sets the position and size of the character object (reference list type) and conditions including text characteristics.

Reference

- This command is applied to the character objects (reference list type).
- If you want to change the position and laser power correction value of the character object only, use SPC command as a shortened command.
- Configurations of TrueType object cannot be set with communication command.
- With LP-M/S/Z compatible command mode, the character object other than the reference list type cannot be set.
- With LP-M/S/Z compatible command mode, the character strings that can be used for common in all files (common character strings) cannot be set or read.
- With LP-M/S/Z compatible command mode, it is not possible to set the desired value to “Space width”. When you use this setting request command, 0mm is set to the space width automatically.
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- “Layer No.” is a setting item that can be available only with LP-M/S/Z command mode. When not using 3D marking, the layer No. 0 to 15 belong to the object group No. 1000. When using 3D marking, the layer No. 0 to 15 are assigned to the object group No. 1001 to 1016, respectively.
- When the setting request data by this command is accepted, the marking order is changed according to the layer No..

■ Setting request data / response data for readout

Start code	STC	Sub command	[Object No.] [Layer No.] [First string No. to apply] [Last string No. to apply] ... (varies by character arrangement)	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	STC	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

1. When the character arrangement is “Straight line”

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Character condition No.)	2	“01”–“99”: Object No. 1001 to 1099	
Layer No.	2	“00”–“15”	
First string No. to apply	2	“01”–“99”: string No. 1 to 99 (for current file)	• Select the string number from the preset reference list. • Applies all strings from the first string No. to the last string No. to the specified object. • Specify the smaller no. to the starting row no. than the last string No. • To set only one string, set the same string No. to the first and last string No. • If the string No. without setting is specified, that string is included in the marking layout as a blank line.
Last string No. to apply	2		

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Character spacing type</td><td>1</td><td>“0”: Fixed spacing
“1”: Proportional
“2”: Justify</td><td>• With “Justify” setting in straight line, if the value of character width x digit number is smaller than the character string width, the character width is adjusted narrower automatically.
• When the proportional is set, select the proportional type in SCC command.</td></tr>
<tr><td>Horizontal and vertical alignment</td><td>1</td><td>“0”: Left and first baseline
“1”: Center and first baseline
“2”: Right and first baseline</td><td>• Specifies which point in the character strings is the origin for the character object.
• With LP-M/S/Z compatible command mode, the vertical alignment is always set to “first baseline”.</td></tr>
<tr><td>Character height</td><td>7</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.100”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.100”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.100”–“330.000”</td></tr></table></td><td rowspan="2">To make the characters bold, set the ratio of the character height and width not to be other than the range from 1/10 to 10.</td></tr>
<tr><td>Character width</td><td>7</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">Specifies the origin coordinate of character strings.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Character spacing or Character string width</td><td>7</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td><td>Specifies a character spacing for fixed spacing/proportional, and a character string width for justify.</td></tr>
<tr><td>Linefeed spacing</td><td>7</td><td></td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td><td>The rotation center is the origin of the character strings.</td></tr>
<tr><td>Font No.</td><td>2</td><td>“01”–“50”</td><td></td></tr>
<tr><td>Bold line width</td><td>5</td><td>“0.000”–“6.000” [mm]</td><td>• If you do not make characters bold, set 0.000.
• If you make characters bold, set the bold line width to 1/2 or less of the character height or width, whichever is smaller.</td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Total data length</td><td>77</td><td colspan="2">The data length is fixed.</td></tr>
</table>

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

2. When the character arrangement is “Arc outside, character spacing by angle” and “Arc inside, character spacing by angle”

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Character condition No.)</td><td>2</td><td>“01”–“99”: Object No. 1001 to 1099</td><td></td></tr>
<tr><td>Layer No.</td><td>2</td><td>“00”–“15”</td><td></td></tr>
<tr><td>First string No. to apply</td><td>2</td><td rowspan="2">“01”–“99”: string No. 1 to 99 (for current file)</td><td rowspan="2">• Select the string number from the preset reference list.
• Applies all strings from the first string No. to the last string No. to the specified object.
• Specify the smaller no. to the starting row no. than the last string No.
• To set only one string, set the same string No. to the first and last string No.
• If the string No. without setting is specified, that string is included in the marking layout as a blank line.</td></tr>
<tr><td>Last string No. to apply</td><td>2</td></tr>
<tr><td>Character arrangement</td><td>1</td><td>“3”: Arc outside, character spacing by angle
“4”: Arc inside, character spacing by angle</td><td>• With LP-M/S/Z compatible command mode, the character spacing type of the arc is always set to “fixed spacing”. The proportional of arc cannot be set and readout.
• With LP-M/S/Z compatible command mode, “Arc outside, character spacing by length” and “Arc inside, character spacing by length” cannot be set and readout.</td></tr>
<tr><td>Horizontal and vertical alignment</td><td>1</td><td>“0”: Left and first baseline
“1”: Center and first baseline
“2”: Right and first baseline</td><td>• Specifies which point in the character strings is the origin for the character object.
• The horizontal alignment is the base position of the start angle of an arc.
• With LP-M/S/Z compatible command mode, the vertical alignment is always set to “first baseline”.</td></tr>
<tr><td>Character height</td><td>7</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.100”–“123.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.100”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.100”–“330.000”</td></tr></table></td><td rowspan="2">To make the characters bold, set the ratio of the character height and width not to be other than the range from 1/10 to 10.</td></tr>
<tr><td>Character width</td><td>7</td></tr>
<tr><td>Center X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">Specifies coordinates of the center of a circle to form an arc.</td></tr>
<tr><td>Center Y-position</td><td>8</td></tr>
<tr><td>Arc radius</td><td>8</td><td>“+000.000”–“+999.999” [mm]</td><td></td></tr>
</table>

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Linefeed spacing</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td><td></td></tr>
<tr><td>Start angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td><td>Sets the position specified by the horizontal alignment to a starting position, and specifies the angle.</td></tr>
<tr><td>Character spacing angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td><td>With LP-M/S/Z compatible command mode, the character spacing type of the arc is always set to “fixed spacing”.</td></tr>
<tr><td>Font No.</td><td>2</td><td>“01”–“50”</td><td></td></tr>
<tr><td>Bold line width</td><td>5</td><td>“0.000”–“6.000” [mm]</td><td>• If you do not make characters bold, set 0.000.
• If you make characters bold, set the bold line width to 1/2 or less of the character height or width, whichever is smaller.</td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Total data length</td><td>85</td><td colspan="2">The data length is fixed.</td></tr>
</table>

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Example of command settings

Condition: When the character arrangement is straight line
Object No. = 01, Layer No. = 00, First string No. to apply = 01, Last string No. to apply = 03,
Character spacing type = 0, Horizontal and vertical alignment = 0,
Character height = 4.5, Character width = 4, X-position = -10, Y-position = 2.5, Character spacing = 4.2,
Linefeed spacing = 5, Rotation angle = -180, Font No. = 2, Bold line width = 0.3,
Laser power correction = 120, Scan speed correction = 80, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	STC	S	0100010300004.500004.000-010.000+002.500 004.200005.000-180.00020.300120080100	[CR]

• Readout

Transmission data	[STX]	STC	R	01	[CR]	
Response data	[STX]	STC	A	0100010300004.500004.000-010.000+002.500 004.200005.000-180.00020.300120080100	[CR]	

3-5-5 Character object settings (shortened): SPC

Sets only X-/Y-position and laser power correction in the character object settings.

Reference

- You can use this command as a shortened command consisting only of X-/Y-positions and laser power correction of the character object settings (STC) command.
- This command is applied to the character objects (reference list type).
- With LP-M/S/Z compatible command mode, it is not possible to set the desired value to “Space width”. When you use this setting request command, 0mm is set to the space width automatically.
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- When the setting request data by this command is accepted, the marking order is changed according to the layer No. set for the target object No..

■ Setting request data / response data for readout

Start code	SPC	Sub command	[Object No.] [X-position] [Y-position] [Laser power correction] 21-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	SPC	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Character condition No.)	2	“01”–“99”: Object No. 1001 to 1099	
X-position	8	“-999.999”–“+999.999” [mm]	Specifies the origin coordinate of character strings.
Y-position	8		
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Total data length	21	Fixed length.	

■ Example of command settings

Condition: Object No. = 01, X-position = 15, Y-position = -10, Laser power correction = 80

- Setting

Transmission data	[STX]	SPC	S	01+015.000-010.000080	[CR]

- Readout

Transmission data	[STX]	SPC	R	01	[CR]

Response data	[STX]	SPC	A	01+015.000-010.000080	[CR]

3-5-6 Character object group fine-adjustment: SCC

Specifies the filling line spacing when you use the bold characters and proportional type when you use the “Proportional” as the character spacing type.

Reference

- “Bold filling line spacing” setting by this command is applied to the object group No. 1000 (when the 3D marking is OFF) or 1001 to 1016 (when the 3D marking is ON). For response data at the readout request, settings for the object group No. 1000 are read out when the 3D marking is OFF, and settings for the smallest number among the object group No. 1001 to 1016 are read out when the 3D marking is ON. To the object group No. 1000 to 1016 the marking data converted from LP-M/S/Z files and the data set by LP-M/S/Z compatible command mode belong.
- “Proportional type” set by this command is applied to the file settings.

■ Setting request data / response data for readout

Start code	SCC	Sub command	[Bold filling line spacing] [Proportional type] 6-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	SCC	R	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Bold filling line spacing	5	“0.010”–“2.000” [mm]	
Proportional type (> Kerning)	1	“1”: Proportional 1 “2”: Proportional 2 “3”: Proportional 3	When “proportional” is set to the character spacing type in the character object settings, select the level of spacing. The lower the number is, the smaller the spacing is.
Total data length	6	The data length is fixed.	

■ Example of command settings

Condition: Bold filling line spacing = 0.5, Proportional type = 1

- Setting

Transmission data	[STX]	SCC	S	0.5001	[CR]

- Readout

Transmission data	[STX]	SCC	R	[CR]

Response data	[STX]	SCC	A	0.5001	[CR]

3-6 Functional Character Commands

3-6-1 Counter settings: CNT

Configures the “counter” function used to mark consecutive numbers.

■ Setting request data / response data for readout

Start code	CNT	Sub command	[Counter No.] [Current value] [Starting value] [End value] [Step value] [Count timing] [Reset at date change] 27-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	CNT	R	[Counter No.] 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Counter No.	1	“0”–“3”: Counter 0 to 3 “4”–“7”: Global counter 16 to 19	
Current value	6	“000000”–“999999” Minus numbers cannot be specified.	• The current value is the value to be marked from now. • The counter current value change is saved to the laser marker without overwriting operation.
Starting value	6		If the starting value is larger than the end one, it works as a subtraction counter.
End value	6		
Step value	6		The step value indicates a value to increase or decrease per one counting-up or counting-down.
Count timing	1	“0”–“3”: When the counter 0 to 3 has reached to the end value. “4”–“7”: When the global counter 16 to 19 has reached to the end value. “8”: When marking trigger is input.	It is the timing to update the current value of the counter.
Reset at date change	1	“0”: No auto reset setting “1”: Resets when the date is updated	• It is the setting to reset the counter when the system clock date of the laser marker is updated. • The counter reset at date change cannot be used with on-the-fly marking at regular intervals or on-the-fly marking with multiple triggers.
Total data length	27	The data length is fixed.	

■ Example of command settings

Condition: Counter No. = 0, Current value = 1234, Starting value = 0, End value = 9999, Step value = 1, Count timing = 8, Reset at date change = 1

• Setting

Transmission data	[STX]	CNT	S	000123400000000999900000181	[CR]

• Readout

Transmission data	[STX]	CNT	R	0	[CR]

Response data	[STX]	CNT	A	000123400000000999900000181	[CR]

Reference

- If the counter is reset at date change during on-the-fly marking operation (single trigger mode), the marking trigger ready status turns off momentary and there is a case that the next marking could not be executed due to Warning E751.
- With LP-M/S/Z compatible command mode, the counter numbers 4 to 15 and global counter numbers 20 to 31 cannot be set and readout.
- With LP-M/S/Z compatible command mode, the counter value larger than 999999 cannot be set and readout.

3-6-2 Counter reset: CTR

Resets the current value to the starting value.

■ Setting request data

Start code	CTR	S	[Counter 0] [Counter 1] [Counter 2] [Counter 3] [Global counter 16] [Global counter 17] [Global counter 18] [Global counter 19] 8-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Counter 0	1	“0”: Do not reset “1”: Reset	
Counter 1	1		
Counter 2	1		
Counter 3	1		
Global counter 16	1		
Global counter 17	1		
Global counter 18	1		
Global counter 19	1		
Total data length	8	The data length is fixed.	

Reference

- The setting changed by this command is saved in the laser marker without overwriting to the file.
- If the counter is reset during on-the-fly marking operation, the marking trigger ready status turns off momentary and there is a case that the next marking could not be executed due to Warning E751.
- With LP-M/S/Z compatible command mode, the counter numbers 4 to 15 and global counter numbers 20 to 31 cannot be reset.

■ Example of command settings

Condition: To reset counter 0 and 16

• Setting

Transmission data	[STX]	CTR	S	10001000	[CR]

3-6-3 Expiry date/time settings: LMT

Configures the “expiry” function used to mark the date with a specified period added or subtracted to/from the current date.

■ Setting request data / response data for readout

Start code	LMT	Sub command	[Expiry time No.] [Periods] [Expiry time unit] [Today included] 7-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request

Start code	LMT	R	[Expiry time No.] 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Expiry time No.	1	“1”–“4”: Expiry date/time 1 to 4 “5”–“8”: Global expiry date/time 17 to 20	
Periods	4	“-999”–“+999”	It is the period added or subtracted to/from the current date and time.
Expiry time unit	1	“0”: Year “1”: Month “2”: Date “3”: Hour “4”: Minute	It is the unit of the period added or subtracted to/from the current date and time.
Today included	1	“0”: Today not included “1”: Today included	• Specifies whether to include today in the base date for addition or subtraction. • It is valid when the expiry time unit is year or month. • When the expiry time unit is set to other than year or month, this setting is not used for the marking, though it is included in the readout data.
Total data length	7	The data length is fixed.	

■ Example of command settings

Condition: Expiry time No. = 1, Periods = 6, Expiry time unit = 2, Today included = 0

• Setting

Transmission data	[STX]	LMT	S	1+00620	[CR]

• Readout

Transmission data	[STX]	LMT	R	1	[CR]

Response data	[STX]	LMT	A	1+00620	[CR]

Reference

- With LP-M/S/Z compatible command mode, the expiry time numbers 5 to 16 and global expiry time numbers 21 to 32 cannot be set and readout.

3-6-4 Lot settings: LTC

Configures the “Lot” function used to change characters depending on the date/time and counter values.

■ Setting request data / response data for readout

Start code	LTC	Sub command	[Lot No.] [Lot type] [Lot unit] 4-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LTC	R	[Lot No.] 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Lot No.	1	“0”–“3”: Lot 0 to 3 “4”–“7”: Global lot 16 to 19	
Lot type	2	“00”: Current date/time “01”–“04”: Expiry date/time 1 to 4 “05”–“08”: Global expiry date/time 17 to 20 “10”–“13”: Counter 0 to 3 “14”–“17”: Global counter 16 to 19	Specifies which function you are referencing, the current date/time, expiry date, or counter, to switch lot characters.
Lot unit	1	“0”: Year or counter “1”: Month “2”: Day “3”: Year and month “4”: Month and date “5”: Day of the week “6”: Hour “7”: Week “8”: Minute “9”: Hour and minute “A”: Year (week-based)	It is the unit of period to switch lot characters.
Total data length	4	The data length is fixed.	

Reference

- When the lot unit of the lot settings (LTC command) is changed, the lot period and lot character (LTS command) settings registered to that lot number are deleted.
- With LP-M/S/Z compatible command mode, the lot numbers 4 to 15 and global lot numbers 20 to 31 cannot be set and readout.

■ Example of command settings

Condition: Lot No. = 0, Lot type = 00, Lot unit = 8

- Setting

Transmission data	[STX]	LTC	S	0008	[CR]

- Readout

Transmission data	[STX]	LTC	R	0	[CR]

Response data	[STX]	LTC	A	0008	[CR]

3-6-5 Lot period/character: LTS

Sets the characters used with the “Lot” function to change characters depending on the date/time and counter values.

■ Setting request data / response data for readout

Start code	LTS	Sub command	[Lot No.] [Period No.] [Start period] [End period] [Lot character] Max. 33-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LTS	R	[Lot No.] [Period No.] 3-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Lot No.	1	“0”–“3”: Lot 0 to 3 “4”–“7”: Global lot 16 to 19	You cannot select the lot No. without any settings by LTC command or by Laser Marker NAVI smart.
Period No.	2	Lot unit / Setting range: Year, Year (week-based): “01”–“60” Month: “01”–“12” Date: “01”–“31” Year and month: “01”–“60” Month and date: “01”–“60” Day of week: “01”–“07” Hour: “01”–“24” Week: “01”–“54” Minute: “01”–“60” Hour and minute: “01”–“60” Counter: “01”–“60”	• It is the number that separates periods to switch lot characters. • The setting range varies by the lot unit.

<table>
<tr><th>Name</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Start period</td><td>6</td><td rowspan="2"><table>
<tr><th>Lot unit</th><th colspan="2">Setting range</th></tr>
<tr><td>Year, Year (week-based) (YYYY00)</td><td colspan="2">“198000”–“209900”</td></tr>
<tr><td>Month</td><td colspan="2">“000001”–“000012”</td></tr>
<tr><td>Date</td><td colspan="2">“000001”–“000031”</td></tr>
<tr><td>Year and month (YYYYMM)</td><td colspan="2">“198001”–“209912”</td></tr>
<tr><td>Month and date (00MMDD)</td><td colspan="2">“000101”–“001231”</td></tr>
<tr><td rowspan="8">Day of week</td><td>Sun.</td><td>“000000”</td></tr>
<tr><td>Mon.</td><td>“000001”</td></tr>
<tr><td>Tue.</td><td>“000002”</td></tr>
<tr><td>Wed.</td><td>“000003”</td></tr>
<tr><td>Thur.</td><td>“000004”</td></tr>
<tr><td>Fri.</td><td>“000005”</td></tr>
<tr><td>Sat.</td><td>“000006”</td></tr>
<tr><td>Hour</td><td colspan="2">“000000”–“000023”</td></tr>
<tr><td>Week</td><td colspan="2">“000001”–“000054”</td></tr>
<tr><td>Minute</td><td colspan="2">“000000”–“000059”</td></tr>
<tr><td>Hour and minute (00HHmm)</td><td colspan="2">“000000”–“002359”</td></tr>
<tr><td>Counter</td><td colspan="2">“000000”–“999999”</td></tr>
</table></td><td rowspan="2">• It is the range of periods to mark the same lot characters.
• The setting range varies by lot unit.
• Set “??????” with the start/end periods to delete it.
• If the period is not set at the time of readout, “??????” is returned.
• To delete the period, end the data here.
• The period that the end period comes before the start period cannot be set.</td></tr>
<tr><td>End period</td><td>6</td></tr>
<tr><td>Lot character</td><td>Min. 0
Max. 18</td><td>The number of input characters allowed: Max. 9 characters
Input Method: ASCII code or Shift JIS code (can be mixed)</td><td>• Use the ASCII code to specify one-byte characters (single byte characters).
• Use the Shift JIS code to specify two-byte characters (double byte characters).
• Specify 0-byte for data length to delete characters.</td></tr>
<tr><td>Total data length</td><td>Max. 33</td><td colspan="2">Variable length.</td></tr>
</table>

Reference

- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- When the lot unit of the lot settings (LTC command) is changed, the lot period (start/end periods) and lot character (LTS command) settings registered to that lot number are deleted.
- With LP-M/S/Z compatible command mode, the lot numbers 4 to 15 and global lot numbers 20 to 31 cannot be set.

■ Example of command settings

Condition: Lot unit = Year and month
Lot No. = 0, Period No. = 01, Start period = January 2014, End period = December 2014,
Lot character = abcd

- Setting

Transmission data	[STX]	LTS	S	001201401201412abcd	[CR]

- Readout

Transmission data	[STX]	LTS	R	001	[CR]

Response data	[STX]	LTS	A	001201401201412abcd	[CR]

3-6-6 Registered character input method: RKC

Sets the input method of the “Registered characters” function used to switch characters by I/O input.

■ Setting request data / response data for readout

Start code	RKC	Sub command	[I/O input method] 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	RKC	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
I/O input method	1	“1”: 4-bit x 4 “2”: 8-bit x 2	It is the assignation method of the data number for I/O terminal.
Total data length	1	The data length is fixed.	

■ Example of command settings

Condition: I/O input method = 1

- Setting

Transmission data	[STX]	RKC	S	1	[CR]

- Readout

Transmission data	[STX]	RKC	R	[CR]

Response data	[STX]	RKC	A	1	[CR]

Reference

- Registered characters (via I/O) cannot be set together with the following functions in one file.
  - Characters specified by SIN command
  - External offset function with “Using SEO command”
  - On-the-fly marking at regular intervals
  - On-the-fly marking with multiple triggers

3-6-7 Registered character strings: RKS

Sets the character string used with the “Registered characters” function that switches characters by I/O input.

■ Setting request data / response data for readout

Start code	RKS	Sub command	[Data number] [Registered characters] Max. 21-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	RKS	R	[Data number] 3-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Data number	3	I/O input format: 4-bit x 4 — D0 to 3: “000”–“015”; D4 to 7: “016”–“031”; D8 to 11: “032”–“047”; D12 to 15: “048”–“063” I/O input format: 8-bit x 2 — D0 to 7: “000”–“255”; D8 to 15: “256”–“511”	Data number which sets characters. The setting range varies depending on the I/O input format.
Registered characters	Min. 0 Max. 18	The number of input characters allowed: Max. 9 characters Input Method: ASCII code or Shift JIS code (can be mixed)	• Use the ASCII code to specify one-byte characters (single byte characters). • Use the Shift JIS code to specify two-byte characters (double byte characters). • Specify 0-byte for data length to delete characters.
Total data length	Max. 21	Variable length.	

Reference

• Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.

■ Example of command settings

Condition: Data number = 4, Registered characters = abcd

• Setting

Transmission data	[STX]	RKS	S	004abcd	[CR]

• Readout

Transmission data	[STX]	RKS	R	004	[CR]

Response data	[STX]	RKS	A	004abcd	[CR]

3-7 Bar Code/2D Code Settings Commands

3-7-1 Bar code/2D code characters (by ASCII code): BCS

Sets the characters to encode of the bar code/2D code objects by the ASCII code. Alpha-numeric characters and symbols are available.

■ Setting request data / response data for readout

Start code	BCS	Sub command	[Object No.] [String No.] [Code data] At setting: Max. 34-byte At readout: Max. 64-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	BCS	R	[Object No.] [String No.] 3-byte or 4-byte (2D side of composite code)	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
String No.	1 or 2	For bar code/ 1D side of composite code: “1”–“2”	• The string No. is applied to the linefeed of the human readable character. The linefeed is not included in the code data. • If the code data length is more than 30-byte, set the character in the several string No. They are connected together in numerical order without linefeed to create the code data. • For EAN/UPC/JAN or 1D side of GS1 DataBar Limited/Stacked, set “1” always. • Only for 2D side of the composite code, set this item with 2-byte length.
		For 2D code: “1”–“9”	
		For 2D side of composite code: “01”–“09”	
Code data	Min. 0 Max. 30	Input Method: ASCII code	• Functional characters cannot be used. • Specify 0-byte for data length to delete characters. • If the readout data includes characters that cannot be expressed in ASCII code such as Japanese characters (2-byte character), only these 2-byte characters are read out in shift JIS code. • If the code data contains any functional characters or 2-byte characters, the maximum readout data can be 60-byte.
Total data length	Max. 33 or Max. 34	Variable length. • For bar code/2D code/1D side of composite code: Max. 33-byte • For 2D side of composite code: Max. 34-byte • Response data for readout: Max. 64-byte	

Reference

- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- The characters input by this command are converted to the 2-byte characters automatically.
- Depending on the bar code/2D code type, acceptable characters may be restricted to either single-byte characters or double-byte characters. In this case, the input characters are automatically converted to the accepted type.
- When the code data is set in the several string No., the characters in each string No. are connected together in numerical order without linefeed to create the code data.
- When the code data is set in the several string No., the total input characters should be 299 digits or less.
- In BCS command you can use GS: 1D (HEX) as “FNC1” and as the separator of the Application identifiers. In the code data it is shown as “FNC1”. For the response data for readout, it is readout as “GS”.
- To set other control codes than FNC1, use BBS command or BRS command.
- If the readout data includes characters that cannot be expressed in ASCII code such as Japanese characters (2-byte character), only these 2-byte characters are read out in shift JIS code.
- When the character strings set with the functional character are readout, the setting of the functional character starting with % are read out. The characters to mark as the functional characters, such as the counter or date and time values, are not read out.
- With LP-M/S/Z compatible command mode, you cannot readout the character strings with more than 61-byte length.
- With LP-M/S/Z compatible command mode, you cannot set and readout the strings for PDF417, iQR code, QR code for Chinese characters (GB/T 18284), and CODE93.
- With LP-M/S/Z compatible command mode, you cannot set and readout the strings for QR code with the mode setting “Auto”.

■ Example of command settings

Condition: Object No. = 0, String No. = 1, Code data = abcd

- Setting

Transmission data	[STX]	BCS	S	01abcd	[CR]

- Readout

Transmission data	[STX]	BCS	R	01	[CR]

Response data	[STX]	BCS	A	01abcd	[CR]

3-7-2 Bar code/2D code characters (by ASCII code): BBS

Sets the characters to encode of the bar code/2D code objects by the ASCII code. Alpha-numeric characters, symbols, and specified control codes (EOT/FS/GS/RS/US) are available.

■ Setting request data / response data for readout

Start code	BBS	Sub command	[Object No.] [String No.] [Code data] At setting: Max. 34-byte At readout: Max. 64-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	BBS	R	[Object No.] [String No.] 3-byte or 4-byte (2D side of composite code)	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
String No.	1 or 2	For bar code/ 1D side of composite code: “1”–“2”	• The string No. is applied to the linefeed of the human readable character. The linefeed is not included in the code data. • If the code data length is more than 30-byte, set the character in the several string No. They are connected together in numerical order without linefeed to create the code data. • For EAN/UPC/JAN or 1D side of GS1 DataBar Limited/Stacked, set “1” always. • Only for 2D side of the composite code, set this item with 2-byte length.
		For 2D code: “1”–“9”	
		For 2D side of composite code: “01”–“09”	
Code data	Min. 0 Max. 30	Input Method: ASCII code	• Functional characters cannot be used. • Specify 0-byte for data length to delete characters. • If the readout data includes characters that cannot be expressed in ASCII code such as Japanese characters (2-byte character), only these 2-byte characters are read out in shift JIS code. • If the code data contains any functional characters or 2-byte characters, the maximum readout data can be 60-byte.
Total data length	Max. 33 or Max. 34	Variable length. • For bar code/2D code/1D side of composite code: Max. 33-byte • For 2D side of composite code: Max. 34-byte • Response data for readout: Max. 64-byte	

Reference

- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- The characters input by this command are converted to the 2-byte characters automatically.
- Depending on the bar code/2D code type, acceptable characters may be restricted to either single-byte characters or double-byte characters. In this case, the input characters are automatically converted to the accepted type.
- When the code data is set in the several string No., the characters in each string No. are connected together in numerical order without linefeed to create the code data.
- When the code data is set in the several string No., the total input characters should be 299 digits or less.
- For the control codes EOT, FS, GS, RS, or US you can set by using ASCII code. The other control codes cannot be used with this command.
- To include the control codes other than EOT, FS, GS, RS, or US in the strings, set the all control codes with BRS command by using the 2-byte alternate codes instead of ASCII code.
- In BBS command,”FNC1” cannot be accepted. To set “FNC1”, use BCS or BRS command.
- If the readout data includes characters that cannot be expressed in ASCII code such as Japanese characters (2-byte character), only these 2-byte characters are read out in shift JIS code.
- When the character strings set with the functional character are readout, the setting of the functional character starting with % are read out. The characters to mark as the functional characters, such as the counter or date and time values, are not read out.
- With LP-M/S/Z compatible command mode, you cannot readout the character strings with more than 61-byte length.
- With LP-M/S/Z compatible command mode, you cannot set and readout the strings for PDF417, iQR code, QR code for Chinese characters (GB/T 18284), and CODE93.
- With LP-M/S/Z compatible command mode, you cannot set and readout the strings for QR code with the mode setting “Auto”.

■ Example of command settings

Condition: Object No. = 0, String No. = 1, Code data = abcd

- Setting

Transmission data	[STX]	BBS	S	001abcd	[CR]

- Readout

Transmission data	[STX]	BBS	R	001	[CR]

Response data	[STX]	BBS	A	001abcd	[CR]

3-7-3 Bar code/2D code characters (by ASCII and Shift-JIS code): BRS

Sets the characters to encode of the bar code/2D code objects. Characters including control codes (specified with 2-byte alternative codes), alpha-numeric, functional characters, and Japanese characters are available.

■ Setting request data / response data for readout

Start code	BRS	Sub command	[Object No.] [String No.] [Code data] Max. 63-byte or Max. 64-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	BRS	R	[Object No.] [String No.] 3-byte or 4-byte (2D side of composite code)	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
String No.	1 or 2	For bar code/ 1D side of composite code: “1”–“2”	• The string No. is applied to the linefeed of the human readable character. The linefeed is not included in the code data. • If the code data length is more than 60-byte, set the character in the several string No. They are connected together in numerical order without linefeed to create the code data. • For EAN/UPC/JAN or 1D side of GS1 DataBar Limited/Stacked, set “1” always. • Only for 2D side of the composite code, set this item with 2-byte length.
		For 2D code: “1”–“9”	
		For 2D side of composite code: “01”–“09”	
Code data	Min. 0 Max. 60	Input Method: ASCII code or Shift JIS code (can be mixed)	• Use the ASCII code to specify functional characters. • Use the Shift JIS code to specify two-byte characters (double byte characters). • For the characters that can be specified in ASCII code, you can use both ASCII code and Shift-JIS code. • Specify 0-byte for data length to delete characters. • For response data for readout, all characters except the functional characters are readout in 2-byte characters (Shift-JIS code) regardless the settings.
Total data length	Max. 63 or Max. 64	Variable length. • For bar code/2D code/1D side of composite code: Max. 63-byte • For 2D side of composite code: Max. 64-byte	

Reference

- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- Depending on the bar code/2D code type, acceptable characters may be restricted to either single-byte characters or double-byte characters. In this case, the input characters are automatically converted to the accepted type.
- When the code data is set in the several string No., the characters in each string No. are connected together in numerical order without linefeed to create the code data.
- When the code data is set in the several string No., the total input characters should be 299 digits or less.
- To input the control codes in the bar code/2D code data, refer to “Inputting control codes to bar code/2D code character strings” (P.40).
- For response data for readout, all characters except the functional characters are readout in 2-byte characters (Shift-JIS code) regardless the settings.
- When the character strings set with the functional character are readout, the setting of the functional character starting with % are read out. The characters to mark as the functional characters, such as the counter or date and time values, are not read out.
- With LP-M/S/Z compatible command mode, you cannot readout the character strings with more than 61-byte length.
- With LP-M/S/Z compatible command mode, you cannot set and readout the strings for PDF417, iQR code, QR code for Chinese characters (GB/T 18284), and CODE93.
- With LP-M/S/Z compatible command mode, you cannot set and readout the strings for QR code with the mode setting “Auto”.

■ Example of command settings

Condition: Object No. = 0, String No. = 1, Code data (counter function and character “abcd”) = %06:C0abcd

- Setting

Transmission data	[STX]	BRS	S	001%06:C0abcd	[CR]

- Readout

Transmission data	[STX]	BRS	R	001	[CR]

Response data	[STX]	BRS	A	001%06:C0 a b c d	[CR]

3-7-4 Bar code/2D code object settings: BRF

Sets the conditions such as the position and size of the bar code/2D code as well as code characteristics.

Reference

- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- The laser power correction and the scan speed correction set by this command will not apply to the human readable text.
- With LP-M/S/Z compatible command mode, you cannot set and readout the settings for PDF417, iQR code, QR code for Chinese characters (GB/T 18284), and CODE93.
- With LP-M/S/Z compatible command mode, the response data for readout for CC-A/CC-B is always CC-A and number of rows has no effect.
- For LP-ZV series when the 3D marking is ON with the “Vertical cone” or “Sphere” shape settings, the bar code/2D code objects cannot be used.
- For LP-ZV series when the 3D marking is ON with the “Cylinder” or “Horizontal cone” shape settings and “Projection” is set for “Data mapping”, the bar code/2D code objects cannot be used.
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- “Layer No.” is a setting item that can be available only with LP-M/S/Z command mode. When not using 3D marking, the layer No. 0 to 15 belong to the object group No. 1000. When using 3D marking, the layer No. 0 to 15 are assigned to the object group No. 1001 to 1016, respectively.
- When the setting request data by this command is accepted, the marking order is changed according to the layer No..

■ Setting request data / response data for readout

Start code	BRF	Sub command	[Object No.] [Layer No.] [Code type] ... (vary depending on code type)	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	BRF	R	[Object No.] ([1D/2D selection]) 2-byte or 3-byte (2D side of composite code)	(Check sum)	End code

Specify [1D/2D selection] when the target code is a composite code. Specify “1” when 1D side of the composite code is read out and “2” when 2D side of the composite code is read out.

■ Data description

1. When the code type is CODE39, ITF, or NW-7

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
Layer No.	2	“00”–“15”	
Code type	2	“00”: CODE39 “01”:ITF “03”: NW-7	
System reservation value	1	“0”: (Fixed)	
Invert	1	“0”: Do not invert “1”: Invert	Set “0” to mark a bar, “1” to mark a space.

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Check character
(and Start/stop
character for NW-7)</td><td>1</td><td>For CODE39 and ITF
“0”: Check character OFF
“1”: Check character ON

For NW-7
“A”–“D”: Check character OFF
“a”–“d”: Check character ON</td><td>• For CODE39 and ITF, specify the existence of check character.
• For NW-7, select start and stop characters from A, B, C or D and specify the existence of check character.</td></tr>
<tr><td>Bar code height</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.050”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.050”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.050”–“330.000”</td></tr></table></td><td></td></tr>
<tr><td>Narrow element width</td><td>5</td><td>“0.050”–“1.000” [mm]</td><td>Specify a larger value than the line width in the object group settings.</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">It is the center coordinate of the code.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td><td>The rotation center is the center of the code symbol.</td></tr>
<tr><td>Quiet/narrow ratio</td><td>4</td><td>“00.0”–“20.0”</td><td>Ratio of the quiet zone width to narrow element width.</td></tr>
<tr><td>Wide/narrow ratio</td><td>3</td><td>“1.8”–“3.4”</td><td>Ratio of the wide element width to narrow element width.</td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Total data length</td><td>60</td><td colspan="2">The data length is fixed.</td></tr>
</table>

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

Reference

- With LP-M/S/Z compatible command mode, the automatic setting of the human readable text to CODE39, ITF, and NW-7 codes is not available. Even enabling the human readable text by Laser Marker NAVI smart, it is disabled when this command is used.
- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Filling line spacing” and “Code marking direction” of the bar code object.

2. When the code type is CODE128, EAN/UPC/JAN, or GS1-128

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Bar code No.)</td><td>2</td><td>“00”–“15”: Object No. 1100 to 1115</td><td></td></tr>
<tr><td>Layer No.</td><td>2</td><td>“00”–“15”</td><td></td></tr>
<tr><td>Code type</td><td>2</td><td>“02”: CODE128
“04”: EAN/UPC/JAN
“46”, ”56”: EAN/JAN/UPC CC-A/CC-B
“47”, ”57”: GS1-128 CC-A/CC-B
“67”: GS1-128 CC-C</td><td></td></tr>
<tr><td>Human readable text</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>When the human readable text is set to “ON”, auto-positioning of the human readable text will be OFF. To specify the position of the human readable text, use BRV command.</td></tr>
<tr><td>Invert</td><td>1</td><td>“0”: Do not invert
“1”: Invert</td><td>Set “0” to mark a bar, “1” to mark a space.</td></tr>
<tr><td>System reserved value</td><td>1</td><td>“0” (Fixed)</td><td></td></tr>
<tr><td>Bar code height</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.050”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.050”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.050”–“330.000”</td></tr></table></td><td></td></tr>
<tr><td>Narrow element width</td><td>5</td><td>“0.050”–“1.000” [mm]</td><td>Specify a larger value than the line width in the object group settings.</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">It is the center coordinate of the code.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td><td>The rotation center is the center of the code symbol.</td></tr>
<tr><td>Quiet/narrow ratio</td><td>4</td><td>“00.0”–“20.0”</td><td>Ratio of the quiet zone width to narrow element width.</td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Total data length</td><td>57</td><td colspan="2">The data length is fixed.</td></tr>
</table>

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

Reference

- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Filling line spacing” and “Code marking direction” of the bar code object.

3. When the code type is QR code or Micro QR code

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Bar code No.)</td><td>2</td><td>“00”–“15”: Object No. 1100 to 1115</td><td></td></tr>
<tr><td>Layer No.</td><td>2</td><td>“00”–“15”</td><td></td></tr>
<tr><td>Code type, model</td><td>2</td><td>“10”: QR code, model 1 (ISO/IEC 18004)
“11”: QR code, model 2 (ISO/IEC 18004)
“12”: micro QR code</td><td></td></tr>
<tr><td>System reserved value</td><td>1</td><td>“0” (Fixed)</td><td></td></tr>
<tr><td>Version</td><td>2</td><td><table><tr><th>Code type</th><th>Setting range</th></tr><tr><td>QR code, model 1</td><td>“00”–“14”</td></tr><tr><td>QR code, model 2</td><td>“00”–“22”</td></tr><tr><td>Micro QR code</td><td>“00”–“04”</td></tr></table></td><td>• The number of input characters allowed will vary depending on the version.
• With “00” specified, the version will be determined automatically by the number of characters contained in the QR code and its content.</td></tr>
<tr><td>Mode</td><td>1</td><td>“0”: Number
“1”: Alphanumeric
“2”: 8-bit byte (binary)
“3”: Kanji</td><td></td></tr>
<tr><td>Error correction level
(CC-C only)</td><td>1</td><td>“0”: L
“1”: M
“2”: Q
“3”: H</td><td>For the micro QR code, “H” is not available.</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">It is the center coordinate of the code.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td><td>The rotation center is the center of the code symbol.</td></tr>
<tr><td>Module height
(vertical)</td><td>5</td><td rowspan="2">“0.001”–“9.999” [mm]</td><td rowspan="2"></td></tr>
<tr><td>Module width
(horizontal)</td><td>5</td></tr>
<tr><td>Total data length</td><td>44</td><td colspan="2">The data length is fixed.</td></tr>
</table>

Reference

- With LP-M/S/Z compatible command mode, you cannot set and readout the settings for QR code for Chinese characters (GB/T 18284) and iQR code.
- With LP-M/S/Z compatible command mode, you cannot set and readout the settings for QR code with the mode setting “Auto” by this command.
- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Module marking order” of the 2D code object.
- With the LP-M/S/Z compatible mode, “Code marking direction” of the 2D code object cannot be set. To this item the setting by Laser Marker NAVI smart or the initial value if it was not set, is applied.
- With LP-M/S/Z compatible command mode, the automatic setting of the human readable text to QR codes and micro QR codes is not available. Even enabling the human readable text by Laser Marker NAVI smart, it is disabled when this command is used.

4. When the code type is Data Matrix or GS1 DataMatrix

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
Layer No.	2	“00”–“15”	
Code type	2	“20”: Data Matrix “21”: GS1 DataMatrix	
Human readable text (GS1 DataMatrix)	1	“0”: OFF “1”: ON	The human readable text can only be added to GS1 DataMatrix. Specify “0” for Data Matrix.
Character type	1	“0”: Alphanumeric “1”: Kanji	Specify “0” for GS1 DataMatrix.
Symbol size (vertical)	2	“00”, “08”–“88” (Combination of vertical and horizontal is limited *1)	• The number of characters that can be input varies depending on the symbol size. • Specifying “00” for the symbol size (both for horizontal and vertical) encodes by the minimum size (square).
Symbol size (horizontal)	2		
X-position	8	“-999.999”–“+999.999” [mm]	It is the center coordinate of the code.
Y-position	8		
Rotation angle	7	“-180.00”–“+180.00” [°]	The rotation center is the center of the code symbol.
Module height (vertical)	5	“0.001”–“9.999” [mm]	
Module width (horizontal)	5		
Total data length	45	The data length is fixed.	

*1 : Available combinations for the number of horizontal and vertical symbol modules (vertical X horizontal)

Auto	00×00
Square:	10×10, 12×12, 14×14, 16×16, 18×18, 20×20, 22×22, 24×24, 26×26, 32×32, 36×36, 40×40, 48×48, 52×52, 64×64, 72×72, 80×80, 88×88
Rectangle	08×18, 08×32, 12×26, 12×36, 16×36, 16×48

Reference

- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Module marking order” of the 2D code object.
- With the LP-M/S/Z compatible mode, “Code marking direction” of the 2D code object cannot be set. To this item the setting by Laser Marker NAVI smart or the initial value if it was not set, is applied.
- With LP-M/S/Z compatible command mode, the automatic setting of the human readable text to Data Matrix codes is not available. Even enabling the human readable text by Laser Marker NAVI smart, it is disabled when this command is used.

5. When the code type is GS1 DataBar Limited, Omnidirectional, or Expanded

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Bar code No.)</td><td>2</td><td>“00”–“15”: Object No. 1100 to 1115</td><td></td></tr>
<tr><td>Layer No.</td><td>2</td><td>“00”–“15”</td><td></td></tr>
<tr><td>Code type</td><td>2</td><td>“30”: GS1 DataBar Omnidirectional
“40”, “50”: GS1 DataBar Omnidirectional CC-A/CC-B
“33”: GS1 DataBar Limited
“43”, “53”: GS1 DataBar Limited CC-A/CC-B
“34”: GS1 DataBar Expanded
“44”, “54”: GS1 DataBar Expanded CC-A/CC-B</td><td>For the composite codes, this setting is applied to both 1D and 2D side.</td></tr>
<tr><td>Human readable text</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>When the human readable text is set to “ON”, auto-positioning of the human readable text will be OFF. To specify the position of the human readable text, use BRV command.</td></tr>
<tr><td>Invert
and
left/right guard pattern width to module width ratio</td><td>1</td><td>Omnidirectional
<table><tr><th>Setting</th><th>Invert</th><th>Left/right guard width to module ratio</th></tr><tr><td>“0”</td><td>Not invert</td><td>1.0, 1.0</td></tr><tr><td>“1”</td><td>Invert</td><td>1.0, 1.0</td></tr><tr><td>“2”</td><td>Invert</td><td>3.0, 2.0</td></tr></table>Limited
<table><tr><th>Setting</th><th>Invert</th><th>Left/right guard width to module ratio</th></tr><tr><td>“0”</td><td>Not invert</td><td>1.0, 1.0</td></tr><tr><td>“1”</td><td>Invert</td><td>1.0, 1.0</td></tr><tr><td>“2”</td><td>Invert</td><td>3.0, 2.0</td></tr></table>Expanded
<table><tr><th>Setting</th><th>Invert</th><th>Left/right guard width to module ratio</th></tr><tr><td>“0”</td><td>Not invert</td><td>1.0, 1.0</td></tr><tr><td>“1”</td><td>Invert</td><td>1.0, 1.0</td></tr><tr><td>“2”</td><td>Invert</td><td>3.0, 3.0</td></tr></table></td><td>• Set “0” to mark a bar, “1” or “2” to mark a space.
• When the inversion is enabled, select the left/right guard pattern width to module width ratio.
• The readout value is always “2” when the inversion is enabled, regardless the settings of left/right guard pattern.</td></tr>
<tr><td>Bar code height</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.050”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.050”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.050”–“330.000”</td></tr></table></td><td>In Laser Marker NAVI smart, this setting is converted to the ratio of the code height to module width and displayed as “Bar code height to module width ratio”.</td></tr>
<tr><td>Module width</td><td>5</td><td>“0.050”–“1.000” [mm]</td><td>Specify a larger value than the line width in the object group settings.</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="3">• It is the center coordinate of the code.
• The rotation center is the center of the code symbol.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td></tr>
</table>

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	3	“001”–“999” [%]	
Pulse cycle correction *	3	“001”–“999” [%]	
Total data length	52	The data length is fixed.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

Reference

- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Filling line spacing” and “Code marking direction” of the bar code object.
- With LP-M/S/Z compatible command mode, it is not possible to set the arbitrary value to “Left guard width to module width ratio” and “Right guard width to module width ratio”.

6. When the code type is GS1 DataBar Stacked or Stacked Omnidirectional

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Bar code No.)</td><td>2</td><td>“00”–“15”: Object No. 1100 to 1115</td><td></td></tr>
<tr><td>Layer No.</td><td>2</td><td>“00”–“15”</td><td></td></tr>
<tr><td>Code type</td><td>2</td><td>“31”: GS1 DataBar Stacked
“32”: GS1 DataBar Stacked Omnidirectional
“41”, “51”: GS1 DataBar Stacked CC-A/CC-B
“42”, “52”: GS1 DataBar Stacked Omnidirectional CC-A/CC-B</td><td>For the composite codes, this setting is applied to both 1D and 2D side.</td></tr>
<tr><td>Human readable text</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>When the human readable text is set to “ON”, auto-positioning of the human readable text will be OFF. To specify the position of the human readable text, use BRV command.</td></tr>
<tr><td>Invert
and
left/right guard pattern width to module width ratio</td><td>1</td><td><table><tr><th>Setting</th><th>Invert</th><th>Left/right guard width to module ratio</th></tr><tr><td>“0”</td><td>Not invert</td><td>1.0, 1.0</td></tr><tr><td>“1”</td><td>Invert</td><td>1.0, 1.0</td></tr><tr><td>“2”</td><td>Invert</td><td>2.0, 2.0</td></tr></table></td><td>• Set “0” to mark a bar, “1” or “2” to mark a space.
• When the inversion is enabled, select the left/right guard pattern width to module width ratio.
• The readout value is always “2” when the inversion is enabled, regardless the settings of left/right guard pattern.</td></tr>
<tr><td>Lower bar code height</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.050”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.050”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.050”–“330.000”</td></tr></table></td><td>In Laser Marker NAVI smart, this setting is converted to the height ratio of the lower side to module width and displayed as “Lower bar code height to module width ratio”.</td></tr>
<tr><td>Separator height to module width ratio</td><td>4</td><td>“00.0”–“10.0”</td><td>Specifies the ratio of separator to module width.</td></tr>
<tr><td>Module width</td><td>5</td><td>“0.050”–“1.000” [mm]</td><td>Specify a larger value than the line width in the object group settings.</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="3">• It is the center coordinate of the code.
• The rotation center is the center of the code symbol.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">• The correction ratio is calculated using the value set at the laser settings as 100%.
• At LP-M/S/Z compatible command mode, the same correction values are applied to the separator.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *</td><td>3</td><td>“001”–“999” [%]</td></tr>
</table>

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Total data length	56	The data length is fixed.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

Reference

- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Filling line spacing” and “Code marking direction” of the bar code object.
- With LP-M/S/Z compatible command mode, it is not possible to set the arbitrary value to “Left guard width to module width ratio” and “Right guard width to module width ratio”.

7. When the code type is GS1 DataBar Expanded Stacked

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Bar code No.)</td><td>2</td><td>“00”–“15”: Object No. 1100 to 1115</td><td></td></tr>
<tr><td>Layer No.</td><td>2</td><td>“00”–“15”</td><td></td></tr>
<tr><td>Code type</td><td>2</td><td>“35”: GS1 DataBar Expanded Stacked
“45”, “55”: GS1 DataBar Expanded Stacked CC-A/CC-B</td><td>For the composite codes, this setting is applied to both 1D and 2D side.</td></tr>
<tr><td>Human readable text</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>When the human readable text is set to “ON”, auto-positioning of the human readable text will be OFF. To specify the position of the human readable text, use BRV command.</td></tr>
<tr><td>Invert
and
left/right guard pattern width to module width ratio</td><td>1</td><td><table><tr><th>Setting</th><th>Invert</th><th>Left/right guard width to module ratio</th></tr><tr><td>“0”</td><td>Not invert</td><td>1.0, 1.0</td></tr><tr><td>“1”</td><td>Invert</td><td>1.0, 1.0</td></tr><tr><td>“2”</td><td>Invert</td><td>2.0, 2.0</td></tr></table></td><td>• Set “0” to mark a bar, “1” or “2” to mark a space.
• When the inversion is enabled, select the left/right guard pattern width to module width ratio.
• The readout value is always “2” when the inversion is enabled, regardless the settings of left/right guard pattern.</td></tr>
<tr><td>Lower bar code height</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.050”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.050”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.050”–“330.000”</td></tr></table></td><td>In Laser Marker NAVI smart, this setting is converted to the height ratio of the lower side to module width and displayed as “Lower bar code height to module width ratio”.</td></tr>
<tr><td>Separator height to module width ratio</td><td>4</td><td>“00.0”–“10.0”</td><td>Specifies the ratio of separator to module width.</td></tr>
<tr><td>Segments per row
(> Symbol characters in a row)</td><td>2</td><td>“02”–“20” (Even)</td><td>Specify the number of data segments per row.</td></tr>
<tr><td>Module width</td><td>5</td><td>“0.050”–“1.000” [mm]</td><td>Specify a larger value than the line width in the object group settings.</td></tr>
<tr><td>X-position</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="3">• It is the center coordinate of the code.
• The rotation center is the center of the code symbol.</td></tr>
<tr><td>Y-position</td><td>8</td></tr>
<tr><td>Rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">• The correction ratio is calculated using the value set at the laser settings as 100%.
• At LP-M/S/Z compatible command mode, the same correction values are applied to the separator.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Total data length</td><td>58</td><td colspan="2">The data length is fixed.</td></tr>
</table>

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

Reference

- Use the BCC command (Module filling of bar codes/module skip marking of 2D codes) to set the “Filling line spacing” and “Code marking direction” of the bar code object.
- With LP-M/S/Z compatible command mode, it is not possible to set the arbitrary value to “Left guard width to module width ratio” and “Right guard width to module width ratio”.

8. When the code type is GS1 DataBar, EAN/UPC/JAN, or GS-128 and specify its 2D side settings

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
Layer No.	2	“00”–“15”	
Code type	2	“40”, “50”: GS1 DataBar Omnidirectional CC-A/CC-B “41”, “51”: GS1 DataBar Stacked CC-A/CC-B “42”, “52”: GS1 DataBar Stacked Omnidirectional CC-A/CC-B “43”, “53”: GS1 DataBar Limited CC-A/CC-B “44”, “54”: GS1 DataBar Expanded CC-A/CC-B “45”, “55”: GS1 DataBar Expanded Stacked CC-A/CC-B “46”, “56”: EAN/JAN/UPC CC-A/CC-B “47”,”57”: GS1-128 CC-A/CC-B “48”,”58”: EAN/JAN/UPC CC-A/CC-B “49”,”59”: GS1-128 CC-A/CC-B “67”: GS1-128 CC-C	For the composite codes, this setting is applied to both 1D and 2D side.
2D side human readable text	1	“2”: OFF “3”: ON	When the human readable text is set to “ON”, auto-positioning of the human readable text will be OFF. To specify the position of the human readable text, use BRV command.
Row height for 2D side	5	“0.050”–“9.999” [mm]	• Specifies the height for one row of the 2D side. • In Laser Marker NAVI smart, this setting is converted to the ratio to the module width of 1D side and displayed as “Row height to module width ratio for 2D side”.
Number of rows for 2D side	2	For CC-A/CC-B: Select either Auto (Minimize setting) or the settable number of rows by code type shown on the separate table (*1).	“00”: Auto sets the minimum value depending on the code data settings.
		For CC-C: Select either “00”: Auto (Minimize setting) or “03”–“90”	
Number of columns for 2D side	2	For CC-A/CC-B: “00”: Auto (Fixed value)	
		For CC-C: Select either “00”: Auto or “01”- “30”	
Separator height to module width ratio	4	“00.0”–“10.0”	• Specifies the height of the separator placed between 1D and 2D. • Specifies the ratio to the module width of 1D side.
Horizontal quiet zone to module width ratio for 2D side	4	“00.0”–“20.0”	• Specifies the quiet zone width of the 2D side. • Specifies the ratio to the module width of 1D side.

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
System reserved value (> Error correction level)	1	“0”	
2D side laser power correction	3	“000”–“999” [%]	• The correction ratio is calculated using the value set at the laser settings as 100%. • At LP-M/S/Z compatible command mode, the same correction values are applied to the separator.
2D side scan speed correction	3	“001”–“999” [%]	
2D side pulse cycle correction *	3	“001”–“999” [%]	
Total data length	34	The data length is fixed.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

*1 : Settable range of the number of rows

1D side composite code type	Settable number of rows for CC-A	Settable number of rows for CC-B
GS1 DataBar Stacked UPC-E GS1 DataBar Stacked Omnidirectional	“05”, “06”, “07”, “08”, “09”, “10”, “12”	“17”, “20”, “23”, “26”
GS1 DataBar Limited EAN-8 (JAN-8)	“04”, “05”, “06”, “07”, “08”	“15”, “20”, 26”, “32”, “38”, “44”
EAN-13 (JAN-13) UPC-A GS1-128 GS1 DataBar Omnidirectional GS1 DataBar Expanded GS1 DataBar Expanded Stacked	“03”, “04”, “05”, “06”, “07”	“10”, “12”, “15”, “20”, “26”, “32”, “38”, “44”

Due to the specifications of this product, UPC-E/UPC-A/EAN-8/EAN-13 are distinguished only by the number of digits of the code data and, therefore, all the following are received at the time of setting commands: “03”, “04”, “05”, “06”, “07”, “08”, “09”, “10”, “12”, “15”, “17”, “20”, “23”, “26”, “32”, “38”, and “44”. Note that a warning is output during marking if the combination with the number of digits of the code data actually input is incorrect.

■ Example of command settings

Condition: Code type = Data Matrix
Object No. = 1, Layer No. = 00, Code type = 20, Human readable text = 0,
Character type = 0, Symbol size (vertical) = 24, Symbol size (horizontal) = 24,
X-position = 15, Y-position = -20, Rotation angle = 0, Module height = 1, Module width = 1

• Setting

Transmission data	[STX]	BRF	S	010020002424+015.000-020.000+000.00 1.0001.000	[CR]

• Readout

Transmission data	[STX]	BRF	R	01	[CR]

Response data	[STX]	BRF	A	010020002424+015.000-020.000+000.00 1.0001.000	[CR]

3-7-5 Human readable text settings: BRV

Sets the character conditions to mark the character strings of bar code/2D code as the human readable text.

Reference

- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- If the character strings of bar code/2D code contain a control code, the control code is not included in the human readable text.
- For the composite codes, the settings from “character height” are applied to both 1D and 2D side.
- With LP-M/S/Z compatible command mode, you cannot set and readout the settings of the human readable text for PDF417, iQR code, QR code for Chinese characters (GB/T 18284), and CODE93.
- With LP-M/S/Z compatible command mode, you cannot set and readout the settings of the human readable text for QR code with the mode setting “Auto”.

■ Setting request data / response data for readout: When the code type is other than EAN/UPC/JAN

Start code	BRV	Sub command	[Object No.] [Positional offset target] [Relative X-position] [Relative Y-position] [Character height] [Character width] [Character spacing] [Font No.] [Bold line width] [Laser power correction] [Scan speed correction] [Pulse cycle correction] ([Linefeed] [Linefeed spacing]) 64-byte, 57-byte or 56-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data: When the code type is other than EAN/UPC/JAN

Start code	BRV	R	[Object No.] [Positional offset target] 3-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
Positional offset target	1	“1”: Bar code / 2D code / 1D side of the composite codes “2”: 2D side of the composite codes	Select to which code the settings of the relative X-/Y-position are applied.
Relative X-position	8	“-999.999”–“+999.999” [mm]	• It is the relative position to the code center. • Specifies the left lower position of the first character. • For the composite codes, the positions of 1D and 2D side can be separately specified. • With LP-M/S/Z compatible command mode, “Auto-positioning” cannot be set and readout.
Relative Y-position	8		

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Character height</td><td>7</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.100”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.100”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.100”–“330.000”</td></tr></table></td><td rowspan="4">For the composite codes, the settings from “character height” are applied to both 1D and 2D side.</td></tr>
<tr><td>Character width</td><td>7</td></tr>
<tr><td>Character spacing</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td></tr>
<tr><td>Font No.</td><td>2</td><td>“01”–“50”</td></tr>
<tr><td>Bold line width</td><td>5</td><td>“0.000”–“6.000” [mm]</td><td></td></tr>
<tr><td>Laser power correction</td><td>3</td><td>“000”–“999” [%]</td><td rowspan="3">• The correction ratio is calculated using the value set at the laser settings as 100%.
• For the composite codes, these settings are applied to both 1D and 2D side.</td></tr>
<tr><td>Scan speed correction</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Pulse cycle correction *1</td><td>3</td><td>“001”–“999” [%]</td></tr>
<tr><td>Linefeed *2</td><td>(1)</td><td>“0”: OFF
“1”: ON</td><td rowspan="2">• Applied only to the 2D code and 2D side of the composite code. When the code data is set in the several strings, set whether the linefeed is applied to the human readable text or not.
• When the linefeed is omitted, linefeed is set to OFF.
• When the linefeed is ON, the linefeed spacing cannot be omitted.
• When the linefeed is OFF, do not set the linefeed spacing.
• When the linefeed is OFF, the linefeed spacing is not included in the response data for readout.</td></tr>
<tr><td>Linefeed spacing *2</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td></tr>
<tr><td>Total data length</td><td>64
(57), (56)</td><td colspan="2">The data length is fixed.
• When linefeed is enabled: 64-byte
• When linefeed is disabled: 57-byte or 56-byte</td></tr>
</table>

*1 : If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

*2 : When the linefeed is disabled, these items can be omitted.

■ Example of command settings

Condition: When the linefeed is enabled
Object No. = 1, Positional offset target = 1, Relative X-position = 10, Relative Y-position = -5.5, Character height = 3, Character width = 3, Character spacing = 3, Font No. = 2, Bold line width = 0, Laser power correction = 100, Scan speed correction = 200, Pulse cycle correction = 100, Linefeed = 1, Linefeed spacing = 3.5

• Setting

Transmission data	[STX]	BRV	S	011+010.000-005.500003.000003.000003.000 020.0001002001001003.500	[CR]

• Readout

Transmission data	[STX]	BRV	R	011	[CR]

Response data	[STX]	BRV	A	011+010.000-005.500003.000003.000003.000 020.0001002001001003.500	[CR]

Condition: When the linefeed is disabled
Object No. = 1, Positional offset target = 1, Relative X-position = 10, Relative Y-position = -5.5, Character height = 3, Character width = 3, Character spacing = 3, Font No. = 2, Bold line width = 0, Laser power correction = 100, Scan speed correction = 200, Pulse cycle correction = 100, Linefeed = 0

• Setting

Transmission data	[STX]	BRV	S	011+010.000-005.500003.000003.000003.000 020.000100200100	[CR]

• Readout

Transmission data	[STX]	BRV	R	011	[CR]

Response data	[STX]	BRV	A	011+010.000-005.500003.000003.000003.000 020.0001002001000	[CR]

■ Setting request data / response data for readout: When the code type is EAN/UPC/JAN

Start code	BRV	Sub command	[Object No.] [Positional offset target] [Font No.] [Bold line width] [Laser power correction] [Scan speed correction] [Pulse cycle correction] 19-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: When the code type is EAN/UPC/JAN

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
Positional offset target	1	“1”: Bar code / 2D code / 1D side of the composite codes “2”: 2D side of the composite codes	Select to which code the settings of the relative X-/Y-position are applied.
Font No.	2	“01”–“50”	
Bold line width	5	“0.000”–“6.000” [mm]	
Laser power correction	3	“000”–“999” [%]	• The correction ratio is calculated using the value set at the laser settings as 100%. • For the composite codes, these settings are applied to both 1D and 2D side.
Scan speed correction	3	“001”–“999” [%]	
Pulse cycle correction *	3	“001”–“999” [%]	
Total data length	19	The data length is fixed.	

* : If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Example of command settings

Condition: Object No. = 1, Positional offset target = 1, Font No. = 2, Bold line width=0.2,
Laser power correction = 100, Scan speed correction = 200, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	BRV	S	011020.200100200100	[CR]

• Readout

Transmission data	[STX]	BRV	R	011	[CR]

Response data	[STX]	BRV	A	011020.200100200100	[CR]

3-7-6 Module filling of 2D codes: BRP

Sets the laser settings and filling details with a font by each element of the 2D code (QR codes and Data Matrix codes).

Reference

- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- The settings by this command are applied only to QR codes, micro QR codes, Data Matrix codes and GS1 DataMatrix codes. To specify the module fill spacing of the other codes, use BCC command.
- With LP-M/S/Z compatible command mode, you cannot set and readout the settings for QR code for Chinese characters (GB/T 18284) and iQR code by this command.
- With LP-M/S/Z compatible command mode, you cannot set and readout the settings for QR code with the mode setting “Auto” by this command.
- With LP-M/S/Z compatible command mode, the other filling patterns than the font cannot be set and readout.
- With LP-M/S/Z compatible command mode, it is not possible to set the desired value to “Number of overwritings”. When you use this setting request command, 1 is set to “Number of overwritings” automatically.

■ Setting request data / response data for readout

Start code	BRP	Sub command	[Object No.] [Code element] [Character code] [Laser power correction] [Scan speed correction] [Pulse cycle correction] 16-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	BRP	R	[Object No.] [Code element] 3-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Bar code No.)	2	“00”–“15”: Object No. 1100 to 1115	
Code element	1	QR code: “0”: Quiet zone outline “1”: Dark module “2”: Light module “3”: Alignment “4”: Finder	When the code type is micro QR code, you do not need to set “alignment”.
		Data Matrix code: “0”: Quiet zone outline “1”: Dark module “2”: Light module “3”: Border	
Character code (JIS Code)	4	“2230”–“2239” “8121”–“8152” “0000”: Do not mark, or use the same setting with the dark/light module for the alignment, finder or border.	• Specifies the character code of the font used as a filling pattern in JIS code. • To the quiet zone outline, dark module or light module, inputting the character code “0000” encodes the 2D code with blank for the specified part. • To the alignment, finder or border, inputting the character code “0000” allows to use the same filling pattern of the dark/light module.

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	3	“001”–“999” [%]	
Pulse cycle correction *	3	“001”–“999” [%]	
Total data length	16	The data length is fixed.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Example of command settings

Condition: Object No. = 1, Code element = 2, Character code = 2231, Laser power correction = 150, Scan speed correction = 80, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	BRP	S	0122231150080100	[CR]

• Readout

Transmission data	[STX]	BRP	R	012	[CR]

Response data	[STX]	BRP	A	0122231150080100	[CR]

3-7-7 Module filling of bar codes/module skip marking of 2D codes: BCC

Sets the filling line spacing for bar codes, marking direction and module skip marking of 2D codes.

Reference

- The “Code marking direction” and “Module skip marking of 2D code” settings are applied to the file settings by this command.
- “Bar code filling line spacing” setting by this command is applied to the object group No. 1000 (when the 3D marking is OFF) or 1001 to 1016 (when the 3D marking is ON). For response data at the readout request, settings for the object group No. 1000 are read out when the 3D marking is OFF, and settings for the smallest number among the object group No. 1001 to 1016 are read out when the 3D marking is ON. To the object group No. 1000 to 1016 the marking data converted from LP-M/S/Z files and the data set by LP-M/S/Z compatible command mode belong.

■ Setting request data / response data for readout

Start code	BCC	Sub command	[Bar code filling line spacing] [Code marking direction] [Module skip marking of 2D code] 7-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	BCC	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Bar code filling line spacing	5	“0.010”–“2.000” [mm]	The bar code filling line spacing specifies the spacing of the marking lines for bar codes and PDF417 modules.
Code marking direction	1	“0”: One direction “1”: Alternate	
Module skip marking of 2D code	1	“0”: OFF “1”: ON (Skip one)	• The filling order for the module is indicated. Select if you will mark the modules next to each other consecutively or skip the one next to it. • When on-the-fly marking is set, set always “0”: No skip.
Total data length	7	Fixed length.	

■ Example of command settings

Condition: Bar code filling line spacing = 0.1, Code marking direction =0, module skip marking of 2D code =0

- Setting

Transmission data	[STX]	BCC	S	0.10000	[CR]

- Readout

Transmission data	[STX]	BCC	R	[CR]

Response data	[STX]	BCC	A	0.10000	[CR]

3-8 Command for graphic data settings

3-8-1 Graphic file (VEC/DXF format file) : CDF

Sets the graphic file (VEC/DXF format) used for the graphic object.

■ Setting request data / response data for readout

Start code	CDF	Sub command	[Object No.] [Graphic file name] Max. 256-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	CDF	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Logo No.)	2	“00”–“99”: Object No. 1200 to 1299	
Graphic file name	0 or Min. 1 Max. 254	The number of input characters allowed: 0 or 5 to 127 characters (including the extension “.VEC” or “.DXF”) Input Method: ASCII code or Shift JIS code (can be mixed)	• For VEC files, the file extension “.VEC” can be omitted. • For DXF files, the file extension “.DXF” cannot be omitted. • In the response data for readout the file extension “.VEC” or “.DXF” is included. • Use the ASCII code to specify one-byte characters (single byte characters). • Use the Shift JIS code to specify two-byte characters (double byte characters). • When the graphic file name is specified as 0-byte, the graphic file is in unset state.
Total data length	Max. 256	Variable length.	

Reference

- Files configurable with this command are the graphic files (VEC/DXF format) saved in the laser marker.
- When you set the graphic file in DXF format with this command, the all layers in the DXF file are marked regardless the setting of “Layer to mark” in Laser Marker NAVI smart software.
- If the object type set in the specified object number is not the graphic (VEC/DXF), the laser marker returns the negative response.
- This command cannot be used for other than VEC/DXF format graphic, such as BMP, JPEG or HPGL etc. The graphic files whose file extension cannot be recognized are set as VEC format graphics, so do not omit the file extension for graphic files other than VEC format.
- Refer to “2-3-5 Character data input method” (P.38) for details on the character input method and character types with input restrictions.
- Graphic file names are not case-sensitive.
- If the graphic file name contains both the one-byte characters and two-byte characters, specify them exactly as they are in the ASCII code and the Shift JIS code.
- If the file name contains any characters which belong to the non-supported character code, the file cannot be selected by the command.
- If you want to execute marking with the 0-byte graphic file name setting (no graphic), deselect the check box “Warning if no graphic file is specified” in the system settings of Laser Marker NAVI smart.
- If there is a graphic object for which a graphic file has not been set, the warning E656 will be output when the shutter opens. When creating a marking file using communication commands, if you prefer to ignore this warning for convenience in creation or control procedures, deselect the check box “Warning if no graphic file is specified” in the system settings of Laser Marker NAVI smart.

■ Example of command settings

Condition: Object No. = 1, Graphic file name = Abcd.VEC

• Setting

Transmission data	[STX]	CDF	S	01Abcd	[CR]

• Readout

Transmission data	[STX]	CDF	R	01	[CR]

Response data	[STX]	CDF	A	01Abcd.VEC	[CR]

3-8-2 Graphic object settings (VEC format file) : CDC

Sets the parameters such as the position and size of the graphic objects (VEC format file).

Reference

- This command cannot be used for other than VEC format graphic, such as DXF, BMP, JPEG or HPGL etc.
- The VEC format is a graphic format converted for the laser marker use.
- If the object type set in the specified object number is not the graphic (VEC), the laser marker returns the negative response.
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- “Layer No.” is a setting item that can be available only with LP-M/S/Z command mode. When not using 3D marking, the layer No. 0 to 15 belong to the object group No. 1000. When using 3D marking, the layer No. 0 to 15 are assigned to the object group No. 1001 to 1016, respectively.
- When the setting request data by this command is accepted, the marking order is changed according to the layer No..

■ Setting request data / response data for readout

Start code	CDC	Sub command	[Object No.] [Layer No.] [X-scaling] [Y-scaling] [X-position] [Y-position] [Rotation angle] [Laser power correction] [Scan speed correction] [Pulse cycle correction] 52-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	CDC	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Logo No.)	2	“00”–“99”: Object No. 1200 to 1299	
Layer No.	2	“00”–“15”	
X-scaling	8	“0010.000”–“1000.000” [%]	The correction ratio is calculated using the size of the saved graphic data as 100%.
Y-scaling	8		
X-position	8	“-999.999”–“+999.999” [mm]	Specifies the origin coordinate of the graphic. The graphic origin is the position specified when converting the graphic data into a VEC file.
Y-position	8		

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Rotation angle	7	“-180.00”–“+180.00” [°]	The rotation center is the origin of the graphic.
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	3	“001”–“999” [%]	
Pulse cycle correction *	3	“001”–“999” [%]	
Total data length	52	The data length is fixed.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Example of command settings

Condition: Object No. = 1, Layer No. = 00, X-scaling = 200, Y-scaling = 200,
X-position = 15, Y-position = -20, Rotation angle = 120,
Laser power correction = 50, Scan speed correction = 100, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	CDC	S	01000200.0000200.000+015.000-020.000+120.00 050100100	[CR]

• Readout

Transmission data	[STX]	CDC	R	01	[CR]

Response data	[STX]	CDC	A	01000200.0000200.000+015.000-020.000+120.00 050100100	[CR]

3-8-3 Graphic object settings (DXF format file): CDD

Sets the parameters such as the position, size and filling lines of the graphic object (DXF format file).

Reference

- When you use this setting request command, “Adjustment of size and filling” in Laser Marker NAVI smart is automatically set to “ON”.
- If the object type set in the specified object number is not the graphic (DXF), the laser marker returns the negative response.
- This command cannot be used for other than DXF format graphic file, such as VEC, BMP, JPEG or HPGL etc.
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- “Layer No.” is a setting item that can be available only with LP-M/S/Z command mode. When not using 3D marking, the layer No. 0 to 15 belong to the object group No. 1000. When using 3D marking, the layer No. 0 to 15 are assigned to the object group No. 1001 to 1016, respectively.
- When the setting request data by this command is accepted, the marking order is changed according to the layer No..

■ Setting request data / response data for readout

Start code	CDD	Sub command	[Object No.] [Layer No.] [Origin] [X-position] [Y-position] [Rotation angle] [Size specification] [Width] [Height] [Font No.] [Filling line spacing] [Filling angle] [Laser power correction] [Scan speed correction] [Pulse cycle correction] 60-byte, 53-byte or 46-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	CDD	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Logo No.)	2	“00”–“99”: Object No. 1200 to 1299	
Layer No.	2	“00”–“15”	
Origin	1	“0”: Center “1”: Bottom left “2”: Bottom right “3”: Top left “4”: Top right “5”: As original graphic	
X-position	8	“-999.999”–“+999.999” [mm]	Specifies the origin coordinate of the graphic.
Y-position	8		
Rotation angle	7	“-180.00”–“+180.00” [°]	The rotation center is the origin of the graphic.
Size specification	1	“0”: Height/width “1”: Width (aspect ratio fixed) “2”: Height (aspect ratio fixed) “3”: As original size	

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Width	(7)	“000.100”–“999.999” [mm]	• Specify when the size specification is “Height/width” or “Width (aspect ratio fixed)”. • When the size specification is “Height (aspect ratio fixed)” or “As original size”, do not send this item.
Height	(7)		• Specify when the size specification is “Height/width” or “Height (aspect ratio fixed)”. • When the size specification is “Width (aspect ratio fixed)” or “As original size”, do not send this item.
Font No.	2	“01”–“50”	Text in a DXF file is replaced with a selected font.
Filling line spacing	5	“0.010”–“2.000” [mm]	• If SOLID or HATCH functions were used to create the filling lines in the DXF file, you can make settings for the filling lines. • With LP-M/S/Z compatible command mode, it is not possible to set the desired value to “Filling angle”. • With LP-M/S/Z compatible command mode, the filling line type is fixed to “Straight line (alternate)”.
Filling angle	1	“0”: 0 degree (Horizontal) “1”: 90 degree (Vertical)	
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	3	“001”–“999” [%]	
Pulse cycle correction*	3	“001”–“999” [%]	
Total data length	60 (53) (46)	The data length is fixed. • When “Size specification” is “Height/width”: 60-byte • When “Size specification” is “Width (aspect ratio fixed)” or “Height (aspect ratio fixed)”: 53-byte • When “Size specification” is “As original size”: 46-byte	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Example of command settings

Condition: Object No. = 1, Layer No. = 00, Origin = 5, X-position = 15, Y-position = -20,
Rotation angle = 120, Size specification = 0, Width = 40, Height = 20, Font No. = 1,
Filling line spacing = 0.2, Filling angle = 0,
Laser power correction = 50, Scan speed correction = 100, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	CDD	S	01005+015.000-020.000+120.000040.000020.000 010.2000050100100	[CR]

• Readout

Transmission data	[STX]	CDD	R	01	[CR]

Response data	[STX]	CDD	A	01005+015.000-020.000+120.000040.000020.000 010.2000050100100	[CR]

3-8-4 Shape settings: FIG

Creates shapes with line, circle, and arc by specifying their sizes and positions.

Reference

- The data items of FIG command vary depending on the setting details.
- If the object type set in the specified object number is not the shape object, the laser marker returns the negative response.
- To adjust the position or laser settings of the all shapes set in the object number, use LAY command (shape object settings).
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- When the setting request data by this command is accepted, the marking order is changed according to the layer No. set for the target object No..

■ Readout request data

Start code	FIG	R	[Object No.] [Shape setting No.] 5-byte	(Check sum)	End code

■ Setting request data / response data for readout: When the shape type is “Line”

Start code	FIG	Sub command	[Object No.] [Shape setting No.] [Shape type] [X-position of start point] [Y-position of start point] [X-position of end point] [Y-position of end point] [Dash length] [Gap length] 52-byte or 38-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: When the shape type is “Line”

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Object No. (> Processing No.)	2	“00”–“15”: Object No. 1300 to 1315	
Shape setting No.	3	“000”–“031”	• Specifies the shape setting no. to create or edit a shape. • Max. 32 shapes can be set in one object no.
Shape type	1	“0”: Line	
X-position of start point	8	“-999.999”–“+999.999” [mm]	If the shape cannot be created because of the wrong combination of the setting values, this command cannot be accepted and the negative response returns.
Y-position of start point	8		
X-position of end point	8		
Y-position of end point	8		

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Dash length</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.010”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.010”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.010”–“330.000”</td></tr></table></td><td rowspan="2">• Specify when you make the dash line.
• When dash line is not used, do not send these items.</td></tr>
<tr><td>Gap length</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td></tr>
<tr><td>Total data length</td><td>52
or
38</td><td colspan="2">The data length is fixed.
• When the dash line is used: 52-byte
• When the dash line is not used: 38-byte</td></tr>
</table>

■ Example of command settings

Condition: When the shape type is “Line”
Object No. = 1, Shape setting No. = 0, Shape type = 0,
X-position of start point = -10, Y-position of start point = 2.5,
X-position of end point = 5, Y-position of end point = 2,
Dash length = 1, Gap length = 0.5

• Setting

Transmission data	[STX]	FIG	S	010000-010.000+002.500+005.000+002.000 001.000000.500	[CR]

• Readout

Transmission data	[STX]	FIG	R	01000	[CR]

Response data	[STX]	FIG	A	010000-010.000+002.500+005.000+002.000 001.000000.500	[CR]

■ Setting request data / response data for readout: When the shape type is “Circle”

Start code	FIG	Sub command	[Object No.] [Shape setting No.] [Shape type] [X-position of center] [Y-position of center] [Radius] [Dash length] [Gap length] 43-byte or 29-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: When the shape type is “Circle”

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Processing No.)</td><td>2</td><td>“00”–“15”: Object No. 1300 to 1315</td><td></td></tr>
<tr><td>Shape setting No.</td><td>3</td><td>“000”–“031”</td><td>• Specifies the shape setting no. to create or edit a shape.
• Max. 32 shapes can be set in one object no.</td></tr>
<tr><td>Shape type</td><td>1</td><td>“1”: Circle</td><td></td></tr>
<tr><td>X-position of center</td><td>8</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">Set the center of the circle.</td></tr>
<tr><td>Y-position of center</td><td>8</td></tr>
<tr><td>Radius</td><td>7</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.010”–“062.500”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.010”–“110.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.010”–“165.000”</td></tr></table></td><td></td></tr>
<tr><td>Dash length</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.010”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.010”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.010”–“330.000”</td></tr></table></td><td rowspan="2">• Specify when you make the dash line.
• When dash line is not used, do not send these items.</td></tr>
<tr><td>Gap length</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td></tr>
<tr><td>Total data length</td><td>43
or
29</td><td colspan="2">The data length is fixed.
• When the dash line is used: 43-byte
• When the dash line is not used: 29-byte</td></tr>
</table>

■ Example of command settings

Condition: When the shape type is “Circle”
Object No. = 1, Shape setting No. = 0, Shape type = 1,
X-position of center = -10, Y-position of center = 2.5, Radius = 2,
Dash length = 1, Gap length = 0.5

• Setting

Transmission data	[STX]	FIG	S	010001-010.000+002.500002.000001.000000.500	[CR]

• Readout

Transmission data	[STX]	FIG	R	01000	[CR]

Response data	[STX]	FIG	A	010001-010.000+002.500002.000001.000000.500	[CR]

■ Setting request data / response data for readout: When the shape type is “Arc”

Start code	FIG	Sub command	[Object No.] [Shape setting No.] [Shape type] [X-position of start point] [Y-position of start point] [X-position of end point] [Y-position of end point] [Radius] [Direction] [Angle] [Dash length] [Gap length] 61-byte or 47-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: When the shape type is “Arc”

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.
(> Processing No.)</td><td>2</td><td>“00”–“15”: Object No. 1300 to 1315</td><td></td></tr>
<tr><td>Shape setting No.</td><td>3</td><td>“000”–“031”</td><td>• Specifies the shape setting no. to create or edit a shape.
• Max. 32 shapes can be set in one object no.</td></tr>
<tr><td>Shape type</td><td>1</td><td>“2”: Arc</td><td></td></tr>
<tr><td>X-position of start point</td><td>8</td><td rowspan="4">“-999.999”–“+999.999” [mm]</td><td rowspan="5">If the shape cannot be created because of the wrong combination of the setting values, this command cannot be accepted and the negative response returns.</td></tr>
<tr><td>Y-position of start point</td><td>8</td></tr>
<tr><td>X-position of end point</td><td>8</td></tr>
<tr><td>Y-position of end point</td><td>8</td></tr>
<tr><td>Radius</td><td>7</td><td>“000.010”–“999.999” [mm]</td></tr>
<tr><td>Direction</td><td>1</td><td>“0”: CCW (counterclockwise)
“1”: CW (clockwise)</td><td>Set the marking direction of the arc.</td></tr>
<tr><td>Angle</td><td>1</td><td>“0”: <180°
“1”: ≥180°</td><td>Select the angle of the arc.</td></tr>
<tr><td>Dash length</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.010”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.010”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.010”–“330.000”</td></tr></table></td><td rowspan="2">• Specify when you make the dash line.
• When dash line is not used, do not send these items.</td></tr>
<tr><td>Gap length</td><td>(7)</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td></tr>
<tr><td>Total data length</td><td>61
or
47</td><td colspan="2">The data length is fixed.
• When the dash line is used: 61-byte
• When the dash line is not used: 47-byte</td></tr>
</table>

■ Example of command settings

Condition: When the shape type is “Arc”
Object No. = 1, Shape setting No. = 0, Shape type = 2,
X-position of start point = -10, Y-position of start point = 2.5,
X-position of end point = 5, Y-position of end point = 2, Radius = 10, Direction = 0, Angle = 0,
Dash length = 1, Gap length = 0.5

• Setting

Transmission data	[STX]	FIG	S	010002-010.000+002.500+005.000+002.000010.000 00001.000000.500	[CR]

• Readout

Transmission data	[STX]	FIG	R	01000	[CR]

Response data	[STX]	FIG	A	010002-010.000+002.500+005.000+002.000010.000 00001.000000.500	[CR]

■ Setting request data / response data for readout: When deleting shape setting

Start code	FIG	Sub command	[Object No.] [Shape setting No.] [Shape type] [X-position of start point] [Y-position of start point] [X-position of end point] [Y-position of end point] 38-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Processing No.)	2	“00”–“15”: Object No. 1300 to 1315	
Shape setting No.	3	“000”–“031”	Specify the No. to delete.
Shape type	1	“0”: Line	To delete the shape setting, specify “0” always.
X-position of start point	8	“+000.000” [mm]	• To delete the shape setting, specify “+000.000” to the all positions. • This command is accepted even if there is no setting in the specified shape setting No.
Y-position of start point	8		
X-position of end point	8		
Y-position of end point	8		
Total data length	38	The data length is fixed.	

■ Data example

Condition: Object No. = 1, Shape setting No. = 5, Shape type = 0,
X-position of start point = 0, Y-position of start point = 0,
X-position of end point = 0, Y-position of end point = 0

• Setting

Transmission data	[STX]	FIG	S	010050+000.000+000.000+000.000+000.000	[CR]

Condition: Object No. = 1, Shape setting No. = 5, when there is no setting in the specified No.

• Readout

Transmission data	[STX]	FIG	R	01005	[CR]

Response data	[STX]	FIG	A	010050+000.000+000.000+000.000+000.000	[CR]

3-8-5 Shape object settings: LAY

Specifies the offset value of the position and laser power to the all shapes set in the selected object no.

- “Layer No.” is a setting item that can be available only with LP-M/S/Z command mode. When not using 3D marking, the layer No. 0 to 15 belong to the object group No. 1000. When using 3D marking, the layer No. 0 to 15 are assigned to the object group No. 1001 to 1016, respectively.
- When the setting request data by this command is accepted, the marking order is changed according to the layer No..

■ Setting request data / response data for readout

Start code	LAY	Sub command	[Object. No.] [Layer No.] [X-offset] [Y-offset] [Rotation angle] [Laser power correction] [Scan speed correction] [Pulse cycle correction] 36-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LAY	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Processing No.)	2	“00”–“15”: Object No. 1300 to 1315	
Layer No.	2	“00”–“15”	
X-offset	8	“-999.999”–“+999.999” [mm]	Moves the all shapes set in the selected object no. from currently set position.
Y-offset	8		
Rotation angle	7	“-180.00”–“+180.00” [°]	
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	3	“001”–“999” [%]	
Pulse cycle correction *	3	“001”–“999” [%]	
Total data length	36	Fixed length.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Data example

Condition: Object No. = 1, Layer No. = 00, X-offset = 0, Y-offset = -5.6, Rotation angle = 90,
Laser power correction = 130, Scan speed correction = 100, Pulse cycle correction = 100

- Setting

Transmission data	[STX]	LAY	S	0100+000.000-005.600+090.00130100100	[CR]

- Readout

Transmission data	[STX]	LAY	R	01	[CR]

Response data	[STX]	LAY	A	0100+000.000-005.600+090.00130100100	[CR]

3-9 Point Radiation Commands

3-9-1 Point radiation parameters: PRD

Sets the position, time and laser power correction ratio of the point radiation.
Point radiation is a function lasing at a point of the specified coordinate.

Reference

- The data items of PRD command vary depending on the setting details.
- If the object type set in the specified object number is not the point radiation, the laser marker returns the negative response.
- To adjust the position and laser power of the all radiation points set in the object number, use PRF command (point radiation correction).
- For LP-ZV series when the 3D marking is ON, the positions specified with this command define the coordinates on a 3D model (local position).
- When the setting request data by this command is accepted, the marking order is changed according to the layer No. set for the target object No..

■ Setting request data: When setting the radiation points

Start code	PRD	S	[Object No.] [Point No.] [Radiation time] [Laser power correction] [X-position] [Y-position] ([X-position] [Y-position] …) 15 + 16n-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Point radiation No.)	2	“00”–“15”: Object No. 1400 to 1415	
Point No. (First No. for setting)	3	“000”–“049”	• Max. 50 points can be set in one object no. • Specifies the point no. to be set. • When setting two or more points, this no. indicates the first no. to be set.
Radiation time	7	“00000.1”–“99999.9” [ms]	• Radiation time and laser power correction settings apply to all points specified in this command. • The unit of the radiation time is always [ms]. • The correction ratio of the laser power is calculated using the value set at the laser settings as 100%.
Laser power correction	3	“000”–“999” [%]	
X-position	8	“-999.999”–“+999.999” [mm]	• Specifies the position of the selected point no. • When setting the position of only one point, do not send further data. • Specify both X- and Y-position. It is not accepted to specify only one side.
Y-position	8		
⋮	⋮		• When setting two or more points, specify the position of the following point no. • Max. 50 points of positions can be set.
X-position	(8)		
Y-position	(8)		

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Total data length	Min. 31 Max. 815	Variable length within 15 + 16n-byte n=Count of the points to set position (n ≦ 50) • When setting only one point: 31-byte • When setting 50 points: 815-byte	

■ Data example

Condition: Object No. = 1, Point No. = 5, Radiation time = 2000, Laser power correction = 100,
X-position = 25.5, Y-position = -7

• Setting

Transmission data	[STX]	PRD	S	0100502000.0100+025.500-007.000	[CR]

Condition: When setting 4 points:
Object No. = 1, Point No. = 0, Radiation time = 2000, Laser power correction = 100,
X-position = 25.5, Y-position = 7, X-position = 25.5, Y-position = -7,
X-position = -25.5, Y-position = -7, X-position = -25.5, Y-position = 7

• Setting

Transmission data	[STX]	PRD	S	0100002000.0100+025.500+007.000+025.500 -007.000-025.500-007.000-025.500+007.000	[CR]

■ Setting request data : When specifying radiation time and laser power correction ratio for each point

Start code	PRD	S	[Object No.] [Point No.] [Radiation time] [Laser power correction] 15-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Point radiation No.)	2	“00”–“15”: Object No. 1400 to 1415	
Point No.	3	“000”–“049”	Specifies the radiation time and laser power correction ratio by a point. It is not possible to specify the radiation time and laser power correction ratio for the multiple points at once.
Radiation time	7	“00000.1”–“99999.9” [ms]	The unit of the radiation time is always [ms].
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Total data length	15	Fixed-length data.	

■ Data example

Condition: Object No. = 1, Point No. = 3, Radiation time = 2000, Laser power correction = 100

• Setting

Transmission data	[STX]	PRD	S	0100302000.0100	[CR]

■ Setting request data : When deleting point setting

Start code	PRD	S	[Object No.] [Point No.] [Last point No. to delete] 8-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Point radiation No.)	2	“00”–“15”: Object No. 1400 to 1415	
Point No. (First point No. to delete)	3	“000”–“049”	• Specify the point no. to delete. • To delete two or more points, this number is the start point number to delete. • Specify the smaller no. to the first point no. than the last point no.
Last point No. to delete	3	“000”–“049”	• Deletes all points from the specified first point no. to the last point no. • To delete the only one point, specify the same no. to the first and last point no. • This command is accepted even if there is no setting in the specified point no.
Total data length	8	The data length is fixed.	

■ Data example

Condition: Object No. = 1, Point No. = 5, Last point No. to delete = 10

• Setting

Transmission data	[STX]	PRD	S	01005010	[CR]

■ Readout request data

Start code	PRD	R	[Object No.] [Point No.] 5-byte	(Check sum)	End code

■ Response data for readout

Start code	PRD	A	[Object No.] [Point No.] [Radiation time] [Laser power correction] [X-position] [Y-position] 31-byte or 5-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Point radiation No.)	2	“00”–“15”: Object No. 1400 to 1415	
Point No.	3	“000”–“049”	Reads out the point radiation setting by a point. It is not possible to readout settings for the multiple points at once.
Radiation time	7	“00000.1”–“99999.9” [ms]	• If there is no setting in the specified point no., these items are not included in the response data for readout. • The correction ratio of laser power is calculated using the value set at the laser settings as 100%.
Laser power correction	3	“000”–“999” [%]	
X-position	8	“-999.999”–“+999.999” [mm]	
Y-position	8		
Total data length	31 or 5	The response data length is fixed. • When the specified point no. has settings : 31-byte • When the specified point no. has no settings : 5-byte	

■ Data example

Condition: Object No. = 1, Point No. = 5, Radiation time = 2000,
Laser power correction = 100, X-position = 25.5, Y-position = -7

• Readout

Transmission data	[STX]	PRD	R	01005	[CR]

Response data	[STX]	PRD	A	0100502000.0100+025.500-007.000	[CR]

Reference

• If the unit of the radiation time is set to other than [ms], you cannot readout these settings by LP-400/V compatible command mode.

3-9-2 Point radiation correction: PRF

Specifies the offset value of the position and laser power to the all points set in the selected object no.

Reference

- “Layer No.” is a setting item that can be available only with LP-M/S/Z command mode. When not using 3D marking, the layer No. 0 to 15 belong to the object group No. 1000. When using 3D marking, the layer No. 0 to 15 are assigned to the object group No. 1001 to 1016, respectively.
- When the setting request data by this command is accepted, the marking order is changed according to the layer No..

■ Setting request data / response data for readout

Start code	PRF	Sub command	[Object. No.] [Layer No.] [X-offset] [Y-offset] [Laser power correction] [Pulse cycle correction] 26-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	PRF	R	[Object No.] 2-byte	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data content	Remarks
Object No. (> Point radiation No.)	2	“00”–“15”: Object No. 1400 to 1415	
Layer No.	2	“00”–“15”	
X-offset	8	“-999.999”–“+999.999” [mm]	Moves the all points set in the selected object no. from currently set position.
Y-offset	8		
Laser power correction	3	“000”–“999” [%]	• The correction ratio is calculated using the value of laser power for each point as 100%. • When laser power correction ratio is set to “000”, all points set in the specified point radiation no. are not scanned at lasing.
Pulse cycle correction *	3	“001”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Total data length	26	Fixed length.	

* If you are using LP-S500W/LP-S505W, add “100” as the pulse cycle correction to the original command data.

■ Data example

Condition: Object No. = 1, Layer No. = 00, X-offset = 0, Y-offset = -5.6, Laser power correction = 130, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	PRF	S	0100+000.000-005.600130100	[CR]

• Readout

Transmission data	[STX]	PRF	R	01	[CR]

Response data	[STX]	PRF	A	0100+000.000-005.600130100	[CR]

3-10 Layout/Position Adjustment Commands

3-10-1 File settings: ALC

Adjusts the marking position and layout for each file. These settings are applied to all marking data in the selected file.

Reference

- “Number of overwritings” and “Overwriting interval” settings by this command are applied to the object group No. 1000 (when the 3D marking is OFF) or 1001 to 1016 (when the 3D marking is ON). For response data at the readout request, settings for the object group No. 1000 are read out when the 3D marking is OFF, and settings for the smallest number among the object group No. 1001 to 1016 are read out when the 3D marking is ON. To the object group No. 1000 to 1016 the marking data converted from LP-M/S/Z files and the data set by LP-M/S/Z compatible command mode belong.
- 3D marking cannot be used together with the following functions in one file.
  - External offset function with I/O
  - Z-movement in the step & repeat fine-adjustment settings (SRA command)

■ Setting request data / response data for readout

Start code	ALC	Sub command	[X-movement] [Y-movement] [Z-movement] [Number of overwritings] [Overwriting interval] [Rotation movement] [Y-axis mirroring] [X-axis mirroring] [3D marking] 41-byte or 40-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	ALC	R	(Check sum)	End code

■ Data description

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
X-movement	8	“-999.999”–“+999.999” [mm]	• Moves the all marking data in the file by the specified value (absolute value). The reference position of the movement is the center of the marking field. • The rotation center is the center of the marking field.
Y-movement	8		
Z-movement	8	“-025.000”–“+025.000” [mm]	
Rotation movement	7	“-180.00”–“+180.00” [°]	
Number of overwritings	4	“0001”–“9999” [times]	
Overwriting interval	3	“0.0”–“9.9” [s] “000”–“060” [s]	When on-the-fly marking is set, set always 0 second to overwriting interval.
Y-axis mirroring	1	“0”: Do not invert “1”: Invert	It is an inversion to Y-axis.
X-axis mirroring	1	“0”: Do not invert “1”: Invert	It is an inversion to X-axis.
3D marking	(1)	“0”: OFF “1”: ON	• To enable 3D marking, select “ON”. • When this item is omitted, “0”: OFF will be applied.
Total data length	41 (40)	Fixed length. • When 3D marking is not omitted: 41-byte • When 3D marking is omitted: 40-byte • Response data for readout: 41-byte	

* This item can be omitted.

■ Example of command settings

Condition: X-movement = 10, Y-movement = -5.5, Z-movement = 2, Rotation movement = 120,
Number of overwritings = 2, Overwriting interval = 0.5,
Y-axis mirroring = 0, X-axis mirroring = 1, 3D marking = 0

• Setting

Transmission data	[STX]	ALC	S	+010.000-005.500+002.000+120.0000020.5010	[CR]

• Readout

Transmission data	[STX]	ALC	R	[CR]

Response data	[STX]	ALC	A	+010.000-005.500+002.000+120.0000020.5010	[CR]

3-10-2 Marking position and laser power adjustment per trigger: SEO

When the external offset function with “Using SEO command” is set, this command specifies the offset value of marking position and laser power for all marking data in the file. Send this command per marking trigger.

■ Setting request data

Start code	SEO	S	[X-movement] [Y-movement] [Z-movement] [Rotation movement] [Laser power correction] 34-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
X-movement	8	“-999.999”–“+999.999” [mm]	• Moves the all marking data in the file by the specified value (absolute value). The reference position of the movement is the center of the marking field. • The rotation center is the center of the marking field.
Y-movement	8		
Z-movement	8	“-025.000”–“+025.000” [mm]	
Rotation movement	7	“-180.00”–“+180.00” [°]	
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%. Corrects the laser power of the all marking data in the file.
Total data length	34	The data length is fixed.	

Reference

- To use this SEO command, set the external offset function with “Using SEO command” to the file in Laser Marker NAVI smart beforehand.
- When the file with external offset function with “Using SEO command” is selected, transmit this command by every marking triggers. Otherwise marking trigger ready does not turn ON, and marking is not available.
- “Using SEO command” setting in external offset function cannot be set together with the following functions in one file.
  - Registered characters (via I/O)
  - On-the-fly marking at regular intervals
  - On-the-fly marking with multiple triggers

■ Example of command settings

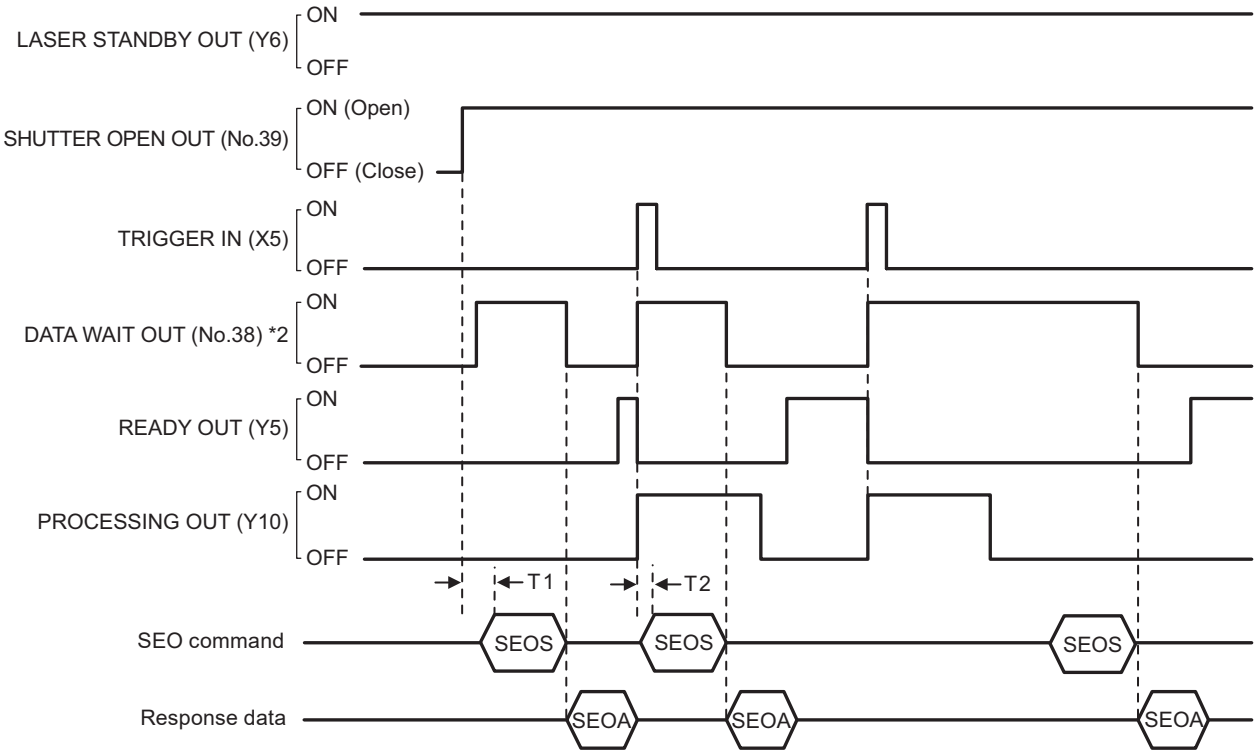
Condition: X-movement = 10, Y-movement = -5.5, Z-movement = -2, Rotation movement = 120, Laser power correction = -80

• Setting

Transmission data	[STX]	SEO	S	-010.000-005.500+002.000+120.00080	[CR]

■ Timing chart for SEO command transmission

When the file set external offset function with “Using SEO command” is selected



Item	Time	Remarks
T1	0 ms or more	Before sending SEO command, confirm that the shutter is opened. You can use either SHUTTER OPEN OUT signal or DATA WAIT OUT (No.38) to know the timing of SEO command input.
T2	0 ms or more	After confirming PROCESSING OUT (Y10) is turned ON, the next SEO command data can be sent. You can use either PROCESSING OUT signal or DATA WAIT OUT (No.38) to know the timing of SEO command input.

Reference

- SEO command can be accepted only when the shutter is open. The shutter status can be confirmed by using SHUTTER OPEN OUT signal of I/O or STS command.
- When “command reception permission ON” is set by MKM command, SEO command cannot be accepted.
- When SEO command will be sent right after file change (FNO/FNN command) or command reception permission OFF (MKM command) setting, set the wait time of 1 second or more after FNO/FNN/MKM command reception.
- You can know the timing of SEO command input by confirming either of the following status.
  - DATA WAIT OUT (No.38) signal of I/O connector is ON.
  - Data waiting status in the response data of STS command is “1”.
- When the file with external offset function with “Using SEO command” is selected, transmit this command by every marking triggers. Otherwise marking trigger ready does not turn ON, and marking is not available.
- To reset the transmitted SEO command data, either close the shutter, or set “command reception permission ON” for MKM command.
- SEO commands cannot be sent more than twice for one marking trigger.

3-10-3 External offset input method: OFC

Sets input methods between I/O or SEO command for “External Offset Function” to adjust the marking position and laser power for the entire marking data in the file.

■ Setting request data / response data for readout

Start code	OFC	Sub command	[Input method] 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	OFC	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Input method	1	“0”: OFF “1”: Low 4-bit “2”: Low 8-bit “3”: Low 10-bit “4”: Using SEO command	It is the input method (I/O or communication command) of the offset value.
Total data length	1	The data length is fixed.	

Reference

- Characters specified by SIN command and external offset function with I/O cannot be set together in one file.
- Registered characters (via I/O) and “Using SEO command” setting in external offset function cannot be set together in one file.
- External offset function cannot be used with on-the-fly marking at regular intervals or on-the-fly marking with multiple triggers.
- For LP-ZV series, 3D marking and external offset function with I/O cannot be set together in one file.

■ Example of command settings

Condition: Input method = 2

- Setting

Transmission data	[STX]	OFC	S	2	[CR]

- Readout

Transmission data	[STX]	OFC	R	[CR]

Response data	[STX]	OFC	A	2	[CR]

3-10-4 External offset values: OFS

Sets offset value of marking position and laser power used for “External Offset Function” with I/O input.

■ Setting request data / response data for readout

Start code	OFS	Sub command	[Data number] [X-movement] [Y-movement] [Z-movement] [Rotation movement] [Laser power correction] 38-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	OFS	R	[Data number] 4-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Data number	4	When “Input method” is “Low 4-bit”: “0000”–“0015”	Specifies the data number for which the external offset is set.
		When “Input method” is “Low 8-bit”: “0000”–“0255”	
		When “Input method” is “Low 10-bit”: “0000”–“1023”	
X-movement	8	“-999.999”–“+999.999” [mm]	• Moves the all marking data in the file by the specified value (absolute value). The reference position of the movement is the center of the marking field. • The rotation center is the center of the marking field.
Y-movement	8		
Z-movement	8	“+000.000” [mm]	
Rotation movement	7	“-180.00”–“+180.00” [°]	
Laser power correction	3	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%. Corrects the laser power of the all marking data in the file.
Total data length	38	Fixed length.	

Reference

- This command can be used when the input method of the external offset is I/O input setting.
- For LP-ZV series, it is not possible to specify the Z-movement via I/O connector. To specify the Z-movement externally, use the SEO command.

■ Example of command settings

Condition: Data number = 5, X-movement = 10, Y-movement = -5.5, Z-movement = 0, Rotation movement = 90
Laser power correction = 120

- Setting

Transmission data	[STX]	OFS	S	0005+010.000-005.500+000.000+090.00120	[CR]

- Readout

Transmission data	[STX]	OFS	R	0005	[CR]

Response data	[STX]	OFS	A	0005+010.000-005.500+000.000+090.00120	[CR]

3-10-5 Step & repeat settings: SRC

Sets the condition of “Step & repeat” to mark the same marking contents on multiple locations in one file.

Reference

- Settings by this command are applied to the object group No. 1000. To the object group No. 1000 the marking data converted from LP-M/S/Z files and the data set by LP-M/S/Z compatible command mode belong.
- With LP-M/S/Z compatible command mode, “same as base position” of the counter stating position cannot be set and readout.

■ Setting request data / response data for readout

Start code	SRC	Sub command	[Step & repeat ON/OFF] [Number of rows] [Number of columns] [Row step] [Column step] ([X-movement] [Y-movement]) [Counter starting position] [Counter behavior] 41-byte, 25-byte or 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	SRC	R	(Check sum)	End code

■ Data description

<table>
<tr><th>Name</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Step & repeat ON/OFF</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>• Specify “1” to enable Step & repeat.
• If you specify “0”: OFF, end the data here. It is not necessary to transmit the subsequent data.
• When the step & repeat is set to OFF, the subsequent data do not exist in the response data for readout.</td></tr>
<tr><td>Number of rows</td><td>3</td><td rowspan="2">“001”–“400”</td><td rowspan="2">• The number of rows indicates the making data repeat count for Y-direction, and the number of columns indicates that for X-direction.
• The upper limit of “Row x Column” is 10,000.</td></tr>
<tr><td>Number of columns</td><td>3</td></tr>
<tr><td>Row step</td><td>7</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-ZV200P
LP-ZV500P</td><td>“000.000”–“125.000”</td></tr><tr><td>LP-ZV205P
LP-ZV505P</td><td>“000.000”–“220.000”</td></tr><tr><td>LP-ZV206P
LP-ZV506P</td><td>“000.000”–“330.000”</td></tr></table></td><td rowspan="2">These are the interval for placing the marking data of Step & repeat. The row step is the interval for Y-direction while the column step is that for X-direction.</td></tr>
<tr><td>Column step</td><td>7</td></tr>
</table>

<table>
<tr><th>Name</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>X-movement *</td><td>(8)</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">• Moves the step & repeat data (the all marking data in the object group No. 1000 to 1016) by the specified value (absolute value). The reference position of the movement is the center of the marking field.
• When these settings are omitted, “+000.000” is applied to each.
• When the step & repeat is OFF, these values are always “+000.000”.</td></tr>
<tr><td>Y-movement *</td><td>(8)</td></tr>
<tr><td>Counter starting position</td><td>2</td><td>“00”: Top left
“01”: Top right
“10”: Left bottom
“11”: Bottom right</td><td>When using the step & repeat and counter functions in combination, specify the start position of the counting. This is effective for the count individually setting.</td></tr>
<tr><td>Counter behavior</td><td>2</td><td>“00”: Disable “Count individually”

When “Count individually” is enabled;<table><tr><th>Setting</th><th>Count “Mark OFF”</th><th>Count direction</th></tr><tr><td>“11”</td><td>ON</td><td>Horizontal</td></tr><tr><td>“12”</td><td>ON</td><td>Vertical</td></tr><tr><td>“21”</td><td>OFF</td><td>Horizontal</td></tr><tr><td>“22”</td><td>OFF</td><td>Vertical</td></tr></table></td><td>• When the counter function is used in the step & repeat, specify how the counter value is updated.
• When the counter function is not used in the step & repeat, set “00”.
• When “Count individually” is disabled, the all counter values are the same in one step & repeat operation.
• When “Mark OFF” is set in the step & repeat fine-adjustment to a specified data in the step & repeat, the “count Mark OFF” specifies if the counter value of the unmarked data turns out the vacant number (ON) or not (OFF).</td></tr>
<tr><td>Total data length</td><td>41
(25)
(1)</td><td colspan="2">Fixed length.
• When X-movement and Y-movement are not omitted: 41-byte
• When X-movement and Y-movement are omitted: 25-byte
• When step & repeat is OFF: 1-byte
• Response data for readout: 41-byte or 1-byte</td></tr>
</table>

* These items can be omitted when the both values are 0. It is not possible to omit one side of them.

■ Example of command settings

Condition: Step & repeat ON/OFF = 1,
Number of rows = 12, Number of columns = 4, Row step = 4, Column step = 8.5,
X-movement = 0, Y-movement =0, Counter starting position = 0, Counter behavior = 11

• Setting

Transmission data	[STX]	SRC	S	1012004004.000008.5000011 or 1012004004.000008.500+000.000+000.0000011	[CR]

• Readout

Transmission data	[STX]	SRC	R	1	[CR]

Response data	[STX]	SRC	A	1012004004.000008.500+000.000+000.0000011	[CR]

3-10-6 Step & repeat fine-adjustment: SRA

Sets the fine-adjustment of “Step & repeat” to mark the same marking contents on multiple locations in one file.
Setting request data / response data for readout vary by the setting subject to fine-adjustment.

Reference

- Settings by this command are applied to the object group No. 1000. To the object group No. 1000 the marking data converted from LP-M/S/Z files and the data set by LP-M/S/Z compatible command mode belong.
- With LP-M/S/Z compatible command mode, only 400 settings of Step & repeat fine-adjustment are available.
- With LP-M/S/Z compatible command mode, “rectangle range” of the adjustment object cannot be set and readout.

■ Readout request data

Start code	SRA	R	[Adjustment No.] 4-byte	(Check sum)	End code

■ Setting request data / response data for readout: position/power adjustment for single step

Start code	SRA	Sub command	[Adjustment No.] [Adjustment object] [Target row] [Target column]] [X-movement] [Y-movement] [Z-movement] ([Rotation movement] [Laser power correction]) 45-byte or 35-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description

Name	Data length [byte]	Data contents	Remarks
Adjustment No.	4	“0000”–“0399”	
Adjustment object	1	“1”: Single step	
Target row	3	“001”–“400”	Enables the adjustment item for the selected row/column.
Target column	3		
X-movement	8	“-999.999”–“+999.999” [mm]	• Moves the marking data in the selected range of rows/columns by the specified value (absolute value). • It is the movement for the coordinate after executing Step & repeat. • When the 3D marking is ON, Z-movement cannot be used. Though you can set and read the value, it is not used for the marking. • When the rotation movement is omitted, “+000.00” is set.
Y-movement	8		
Z-movement	8	“-025.000”–“+025.000” [mm]	
Rotation movement *	(7)	“-180.00”–“+180.00” [°]	
Laser power correction *	(3)	“-50”–“+50” [+/-%]	• Corrects the laser power of the marking data in the range of rows/columns specified. Specify the correction ratio in the range of 100±50% relative to the laser power for the object to which Step & repeat applies. • When this item is omitted, “+00” is set.
Total data length	45 (35)	Fixed length. • When Rotation movement and Laser power correction are not omitted: 45-byte • When Rotation movement and Laser power correction are omitted: 35-byte • Response data for readout: 45-byte	

* These items can be omitted when the both values are 0. It is not possible to omit one side of them.

■ Example of command settings

Condition: Adjustment No. = 0, Adjustment object = 1, Target row = 2, Target column = 3,
X-movement = 0.1, Y-movement = -0.2, Z-movement = 2, Rotation movement = 0,
Laser power correction = 0

• Setting

Transmission data	[STX]	SRA	S	00001002003+000.100-000.200+002.000 or 00001002003+000.100-000.200+002.000+000.00+00	[CR]

• Readout

Transmission data	[STX]	SRA	R	0000	[CR]

Response data	[STX]	SRA	A	00001002003+000.100-000.200+002.000+000.00+00	[CR]

■ Setting request data / response data for readout: position/power adjustment for row or column

Start code	SRA	Sub command	[Adjustment No.] [Adjustment object] [Target row/column] [X-movement] [Y-movement] [Z-movement] ([Rotation movement] [Laser power correction]) 42-byte or 32-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description

Name	Data length [byte]	Data contents	Remarks
Adjustment No.	4	“0000”–“0399”	
Adjustment object	1	“3”: All columns “4”: All rows “5”: Column “6”: Row	
Target row or Target column	3	“001”–“400”	• Enables the adjustment item for the data at the row/column specified. • When “all columns” or “all rows” is set to the adjustment object, the fine-adjustment is applied to the all settings from the specified column/row.
X-movement	8	“-999.999”–“+999.999” [mm]	• Moves the marking data in the selected range of rows/columns by the specified value (absolute value). • It is the movement for the coordinate after executing Step & repeat. • When the 3D marking is ON, Z-movement cannot be used. Though you can set and read the value, it is not used for the marking. • When the rotation movement is omitted, “+000.00” is set.
Y-movement	8		
Z-movement	8	“-025.000”–“+025.000” [mm]	
Rotation movement *	(7)	“-180.00”–“+180.00” [°]	
Laser power correction *	(3)	“-50”–“+50” [+/-%]	• Corrects the laser power of the marking data in the range of rows/columns specified. Specify the correction ratio in the range of 100±50% relative to the laser power for the object to which Step & repeat applies. • When this item is omitted, “+00” is set.
Total data length	42 (32)	Fixed length. • When Rotation movement and Laser power correction are not omitted: 42-byte • When Rotation movement and Laser power correction are omitted: 32-byte • Response data for readout: 42-byte	

* These items can be omitted when the both values are 0. It is not possible to omit one side of them.

■ Example of command settings

Condition: Adjustment No. = 0, Adjustment object = 4, Target row = 2, X-movement = 0.1, Y-movement = -0.2, Z-movement =2, Rotation movement = 0, Laser power correction = 0

• Setting

Transmission data	[STX]	SRA	S	00004002+000.100-000.200+002.000 or 00004002+000.100-000.200+002.000+000.00+00	[CR]

• Readout

Transmission data	[STX]	SRA	R	0000	[CR]

Response data	[STX]	SRA	A	00004002+000.100-000.200+002.000+000.00+00	[CR]

■ Setting request data / response data for readout: when mark OFF setting

Start code	SRA	Sub command	[Adjustment No.] [Adjustment object] [Target row] [Target column] ([Target row] [Target column] …) At setting: 5 + 6n-byte At readout: 11-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description

Name	Data length [byte]	Data contents	Remarks
Adjustment No.	4	“0000”–“0399”	If the several pairs of the target row and target column are specified, each setting is set in the subsequent No. from the specified No.
Adjustment object	1	“2”: Mark OFF	
Target row	3	“001”–“400”	• When the mark OFF setting is applied to only one data, do not send the further data. • Specify both row and column. It is not possible to omit one side of them.
Target column	3		
⋮	⋮		• When the mark OFF is set to two or more data, set the next row and column in series. These settings are set in the subsequent adjustment No. • Max. 100 pairs of row and column can be set.
Target row	(3)		
Target column	(3)		
Total data length	Min. 11 Max. 605	Variable length with 5 + 6n-byte n = number of the setting pairs of row and column (n ≦ 100) • When setting only one pair of row and column: 11-byte • When setting 100 pairs of row and column: Max. 605-byte • Response data for readout: 11-byte	

■ Example of command settings

Condition: Adjustment No. = 01, Adjustment object = 2,
Target row = 4, Target column = 4, Target row = 8, Target column = 8

• Setting

Transmission data	[STX]	SRA	S	00012004004008008	[CR]

• Readout

Transmission data	[STX]	SRA	R	0001	[CR]

Response data	[STX]	SRA	A	00012004004	[CR]

Reference

- With LP-M/S/Z compatible command mode, the Mark OFF cannot be set to the unit of whole rows and columns.
- With LP-M/S/Z compatible command mode, the setting cannot be readout if the Mark OFF is set to other than the single step.

■ Setting request data: Setting deletion

Start code	SRA	S	[Adjustment No.] [Adjustment object] [Number of adjustment settings to delete] 9-byte or 5-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Adjustment No. (From which the deletion starts)	4	“0000”–“0399”	Specifies the number to delete or the number from which the deletion starts.
Adjustment object (Delete command)	1	“0”: Delete settings	
Number of adjustment settings to delete *	(4)	“0001”–“0400”	• Specifies the number of conditions to delete before deleting consecutive adjustment settings after the specified adjustment number. • If you omit this item, only the settings of the specified adjustment number will be deleted. (The setting to delete one row.)
Total data length	9 (5)	Fixed length. • When Number of adjustment settings to delete is not omitted: 9-byte • When Number of adjustment settings to delete is omitted: 5-byte	

* When only one adjustment No. is deleted, this item can be omitted.

Reference

- If the sum of the adjustment number from which the deletion starts and the number of adjustment settings to delete exceeds 400, the laser marker returns the negative response.
- In the readout response data when no settings are in the selected adjustment number, the adjustment object is readout as “0” and the subsequent data do not exist.

■ Example of command settings

Condition: Adjustment No. = 0, Adjustment object = 0 (delete the settings of adjustment number 0000)

• Setting

Transmission data	[STX]	SRA	S	00000	[CR]

Condition: Adjustment No. = 2, Adjustment object = 0, Number of adjustment settings to delete = 10
(delete the settings of the adjustment number 0002 to 0011)

• Setting

Transmission data	[STX]	SRA	S	000200010	[CR]

Condition: Adjustment No. = 2 (if there is no setting for the adjustment number read out)

• Readout

Transmission data	[STX]	SRA	R	0002	[CR]

Response data	[STX]	SRA	A	00020	[CR]

3-10-7 3D model: SUF

Sets the shape and position of the 3D workpiece.

Reference

- Settings by this command are activated when the 3D marking (ALC command) is set to ON. Even when the 3D marking is OFF, you can use this command, but it is not applied to the marking.
- It is not possible to delete a 3D model with this command. To delete a 3D model from the marking file, use Laser Marker NAVI smart.
- If you specify only “3D model No. and object group No.” with this command and send a setting request data, a 3D model of the plane shape is added. (Length = 20mm, width = 20mm, all other parameters are set to 0.)

■ Readout request data

Start code	SUF	R	[3D model No. and object group No.] 2-byte	(Check sum)	End code

■ Setting request data / response data for readout: when shape is “Plane” or “Cylinder”

Start code	SUF	Sub command	[3D model No. and object group No.] [Shape] [Center X-position] [Center Y-position] [Center Z-position] [X-rotation angle] [Y-rotation angle] [Z-rotation angle] [Length] [Width] [Defocusing] 70-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: when shape is “Plane” or “Cylinder”

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>3D model No. and object group No.
(> Layer No.)</td><td>2</td><td>“00”–“15”: Combination of 3D model No. and object group No.
<table><tr><th>Setting</th><th>3D model No.</th><th>Object group No.</th></tr><tr><td>"00"</td><td>1</td><td>1001</td></tr><tr><td>"01"</td><td>2</td><td>1002</td></tr><tr><td>⋮</td><td>⋮</td><td>⋮</td></tr><tr><td>"15"</td><td>16</td><td>1016</td></tr></table></td><td></td></tr>
<tr><td>Shape</td><td>1</td><td>“0”: Plane
“1”: Cylinder convex
“2”: Cylinder concave</td><td></td></tr>
<tr><td>Center X-position</td><td>8</td><td rowspan="3">“-999.999”–“+999.999” [mm]</td><td rowspan="3">Specifies the center position of the 3D model.</td></tr>
<tr><td>Center Y-position</td><td>8</td></tr>
<tr><td>Center Z-position</td><td>8</td></tr>
<tr><td>X-rotation angle</td><td>7</td><td rowspan="2">“-090.00”–“+090.00” [°]</td><td rowspan="3">• Specify the rotation angle for the X-, Y-, Z-axes.
• The origin of the rotation is the center of the 3D model.</td></tr>
<tr><td>Y-rotation angle</td><td>7</td></tr>
<tr><td>Z-rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td></tr>
</table>

Name (> Name in LP-M/S/Z)	Data length [byte]	Data contents	Remarks
Length	7	“001.000”–“999.999” [mm]	Specifies the length in the Y-axis direction.
Width or Diameter	7		• When shape is “Plane”, specifies the length in the X-axis direction as the “Width”. • When shape is “Cylinder”, specify the “Diameter”.
Defocusing	8	“-025.000”–“+025.000” [mm]	When on-the-fly marking is set, set always 0 mm to defocusing.
Total data length	70	The data length is fixed.	

■ Example of command settings

Condition: When the shape is plane:
3D model No. and object group No. = 01, Shape = 0, Center X-position = -1, Center Y-position = 0, Center Z-position = 15, X-rotation angle = 20, Y-rotation angle = 10, Z-rotation angle = 90, Length = 30, Width = 40, Defocusing = 0

• Setting

Transmission data	[STX]	SUF	S	010-001.000+000.000+015.000+020.00+010.00 +090.00030.000040.000+000.000	[CR]

• Readout

Transmission data	[STX]	SUF	R	01	[CR]

Response data	[STX]	SUF	A	010-001.000+000.000+015.000+020.00+010.00 +090.00030.000040.000+000.000	[CR]

■ Setting request data / response data for readout: when shape is “Cone”

Start code	SUF	Sub command	[3D model No. and object group No.] [Shape] [Center X-position] [Center Y-position] [Center Z-position] [X-rotation angle] [Y-rotation angle] [Z-rotation angle] [Height] [Top diameter] [Bottom diameter] [Defocusing] 77-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: when shape is “Vertical cone”

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>3D model No. and object group No.
(> Layer No.)</td><td>2</td><td>“00”–“15”: Combination of 3D model No. and object group No.
<table><tr><th>Setting</th><th>3D model No.</th><th>Object group No.</th></tr><tr><td>"00"</td><td>1</td><td>1001</td></tr><tr><td>"01"</td><td>2</td><td>1002</td></tr><tr><td>⋮</td><td>⋮</td><td>⋮</td></tr><tr><td>"15"</td><td>16</td><td>1016</td></tr></table></td><td></td></tr>
<tr><td>Shape</td><td>1</td><td>“3”: Horizontal cone convex
“4”: Horizontal cone concave
“5”: Vertical cone convex
“6”: Vertical cone concave</td><td>When “Vertical cone” is set, bar code/2D code object cannot be used.</td></tr>
<tr><td>Center X-position</td><td>8</td><td rowspan="3">“-999.999”–“+999.999” [mm]</td><td rowspan="3">Specifies the center position of the 3D model.</td></tr>
<tr><td>Center Y-position</td><td>8</td></tr>
<tr><td>Center Z-position</td><td>8</td></tr>
<tr><td>X-rotation angle</td><td>7</td><td rowspan="2">“-090.00”–“+090.00” [°]</td><td rowspan="3">• Specify the rotation angle for the X-, Y-, Z-axes.
• The origin of the rotation is the center of the 3D model.</td></tr>
<tr><td>Y-rotation angle</td><td>7</td></tr>
<tr><td>Z-rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td></tr>
<tr><td>Height</td><td>7</td><td rowspan="3">“001.000”–“999.999” [mm]</td><td>Specifies the height in the Z-axis direction.</td></tr>
<tr><td>Top diameter</td><td>7</td><td rowspan="2">• The diameter on the positive (+) direction of the Z-axis is top diameter, and the diameter on the negative (-) direction is bottom diameter.
• If the surface is set to convex, specify the larger value to the bottom diameter than the value to the upper diameter. For the concave surface, specify the larger value to the upper diameter than the value to the bottom diameter.</td></tr>
<tr><td>Bottom diameter</td><td>7</td></tr>
<tr><td>Defocusing</td><td>8</td><td>“-025.000”–“+025.000” [mm]</td><td>When on-the-fly marking is set, set always 0 mm to defocusing.</td></tr>
<tr><td>Total data length</td><td>77</td><td colspan="2">The data length is fixed.</td></tr>
</table>

■ Example of command settings

Condition: When the shape is horizontal cone convex:
3D model No. and object group No. = 01, Surface = 0, Center X-position = -1,
Center Y-position = 0, Center Z-position = 15, X-rotation angle = 20, Y-rotation angle = 10,
Z-rotation angle = 90, Height = 30, Top diameter = 40, Bottom diameter = 50, Defocusing = 0

• Setting

Transmission data	[STX]	SUF	S	010-001.000+000.000+015.000+020.00+010.00 +090.00030.000040.000050.000+000.000	[CR]

• Readout

Transmission data	[STX]	SUF	R	01	[CR]

Response data	[STX]	SUF	A	013-001.000+000.000+015.000+020.00+010.00 +090.00030.000040.000050.000+000.000	[CR]

■ Setting request data / response data for readout: when shape is “Sphere”

Start code	SUF	Sub command	[3D model No. and object group No.] [Shape] [Center X-position] [Center Y-position] [Center Z-position] [X-rotation angle] [Y-rotation angle] [Z-rotation angle] [Diameter] [Defocusing] 63-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Data description: when shape is “Sphere”

<table>
<tr><th>Name
(> Name in LP-M/S/Z)</th><th>Data length
[byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>3D model No. and object group No.
(> Layer No.)</td><td>2</td><td>“00”–“15”: Combination of 3D model No. and object group No.
<table><tr><th>Setting</th><th>3D model No.</th><th>Object group No.</th></tr><tr><td>"00"</td><td>1</td><td>1001</td></tr><tr><td>"01"</td><td>2</td><td>1002</td></tr><tr><td>⋮</td><td>⋮</td><td>⋮</td></tr><tr><td>"15"</td><td>16</td><td>1016</td></tr></table></td><td></td></tr>
<tr><td>Shape</td><td>1</td><td>“7”: Sphere convex
“8”: Sphere concave</td><td>When “Sphere” is set, bar code/2D code object cannot be used.</td></tr>
<tr><td>Center X-position</td><td>8</td><td rowspan="3">“-999.999”–“+999.999” [mm]</td><td rowspan="3">Specifies the center position of the 3D model.</td></tr>
<tr><td>Center Y-position</td><td>8</td></tr>
<tr><td>Center Z-position</td><td>8</td></tr>
<tr><td>X-rotation angle</td><td>7</td><td rowspan="2">“-090.00”–“+090.00” [°]</td><td rowspan="3">• Specify the rotation angle for the X-, Y-, Z-axes.
• The origin of the rotation is the center of the 3D model.</td></tr>
<tr><td>Y-rotation angle</td><td>7</td></tr>
<tr><td>Z-rotation angle</td><td>7</td><td>“-180.00”–“+180.00” [°]</td></tr>
<tr><td>Diameter</td><td>7</td><td>“001.000”–“999.999” [mm]</td><td></td></tr>
<tr><td>Defocusing</td><td>8</td><td>“-025.000”–“+025.000” [mm]</td><td>When on-the-fly marking is set, set always 0 mm to defocusing.</td></tr>
<tr><td>Total data length</td><td>63</td><td colspan="2">The data length is fixed.</td></tr>
</table>

■ Example of command settings

Condition: When the shape is sphere convex:
3D model No. and object group No. = 01, Shape = 7, Center X-position = -1, Center Y-position = 0, Center Z-position = 15, X-rotation angle = 20, Y-rotation angle = 10, Z-rotation angle = 90, Diameter = 40, Defocusing = 0

• Setting

Transmission data	[STX]	SUF	S	017-001.000+000.000+015.000+020.00+010.00 +090.00040.000+000.000	[CR]

• Readout

Transmission data	[STX]	SUF	R	01	[CR]

Response data	[STX]	SUF	A	017-001.000+000.000+015.000+020.00+010.00 +090.00040.000+000.000	[CR]

3-10-8 Marking ON/OFF by layer: LMS

Specifies whether mark the setting data or not by each layer No.
Without this setting, the data in all layers in a file is marked. If there is a layer that should not be marked, send this command and set it to mark off.

■ Setting request data / response data for readout

Start code	LMS	Sub command	[Marking on/off by layer] 16-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LMS	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Marking on/off by layer	1	Send “0” or “1” for 16 layers. “0”: Marking OFF “1”: Marking ON	Marking on/off setting for all layers (layer No. 0 to No. 15). In the order of the layer No. from 0 to 15, send “0: mark off” or “1: mark on” for every 16 layers. Even not all layers are used, send 16 digits with “0” or “1”.
Total data length	16	The data length is fixed.	

Reference

- If there is a layer desired not to be marked, send this command every time when the file No. is changed and when remote mode is turned on.
- When the laser marker power or the remote mode is turned off, or when the file No. is changed, this setting is cleared and all layers are set to “mark on”.
- This setting is not saved to the laser marker.
- The data in a layer set to mark off is not scanned by guide laser.
- This setting cannot be confirmed in the marking image screen.

■ Example of command settings

Condition: Not marking the layer No. 2 and 3, there is no data in the layer No. 4 to 16.

- Setting

Transmission data	[STX]	LMS	S	1100111111111111	[CR]

- Readout

Transmission data	[STX]	LMS	R	[CR]

Response data	[STX]	LMS	A	1100111111111111	[CR]

3-11 On-the-fly Marking Commands

3-11-1 Motion settings: TRG

Sets the basic configuration of the on-the-fly marking, such as moving direction and etc. The settings are applied to all marking files.

■ Setting request data / response data for readout

Start code	TRG	Sub command	[Moving direction] [Line speed control] [Trigger mode] 3-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	TRG	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Moving direction	1	“0”: Marking to static object “1”: +X to -X (Left) “2”: -X to +X (Right) “3”: +Y to -Y (Front) “4”: -Y to +Y (Back)	• Specify “0” to disable on-the-fly marking. • The direction of X/Y axis is defined by the head direction setting in System settings.
Line speed control	1	“0”: Fixed speed “1”: Encoder input	With LP-M/S/Z compatible command mode, “2 sensors input” cannot be set and readout.
Trigger mode	1	“0”: Single trigger “1”: Marking at regular intervals	• “Single trigger” corresponds to “trigger marking” of LP-M/LP-S/LP-Z series. • With LP-M/S/Z compatible command mode, “multiple triggers” cannot be set and readout.
Total data length	3	Fixed length.	

Reference

- Any of the following functions that are not available with on-the-fly marking are configured.
  - Link control with external image checkers
  - Overwriting interval
  - Skip marking of 2D code (Setting of module marking order)
  - Auto focus function
  - Defocusing
- When the trigger mode is set to Marking at regular intervals, those functions are also not available.
  - Registered characters (via I/O)
  - External Offset including SEO command
  - Characters specified by SIN command
  - Counter reset at date change
- The setting changed by this command is saved in the laser marker without overwriting to the file.
- The “Delay distance” which was specified in LP-M/LP-S/LP-Z series is corresponding to “Trigger detecting position” and “Workpiece reference boundary” in this product. If you want to set those parameters, switch the command mode to the standard mode by RMS command.

■ Example of command settings

Condition: Moving direction = 2, Line speed control = 1, Trigger mode = 0

• Setting

Transmission data	[STX]	TRG	S	210	[CR]

• Readout

Transmission data	[STX]	TRG	R	[CR]

Response data	[STX]	TRG	A	210	[CR]

3-11-2 Encoder resolution: ENC

Sets the encoder resolution value used for the on-the-fly marking. This setting is applied to all marking files.

■ Setting request data / response data for readout

Start code	ENC	Sub command	[Encoder resolution] 6-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	ENC	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Encoder resolution	6	“005.00”–“600.00” [pulses/mm]	Only when line speed control is set to “encoder input”, set this value.
Total data length	6	Fixed length.	

Reference

• The setting changed by this command is saved in the laser marker without overwriting to the file.

■ Example of command settings

Condition: Encoder resolution = 120.5

• Setting

Transmission data	[STX]	ENC	S	120.50	[CR]

• Readout

Transmission data	[STX]	ENC	R	[CR]

Response data	[STX]	ENC	A	120.50	[CR]

3-11-3 Line speed: LSP

Sets the line speed of on-the-fly marking for the selected marking file.

■ Setting request data / response data for readout

Start code	LSP	Sub command	[Line speed] 7-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LSP	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Line speed	7	Model: LP-ZV200P, LP-ZV205P, LP-ZV500P, LP-ZV505P — Setting range [m/min.]: “000.060”–“170.000” Model: LP-ZV206P, LP-ZV506P — Setting range [m/min.]: “000.060”–“120.000”	Only when line speed control is set to “fixed speed”, set this value.
Total data length	7	Fixed length.	

■ Example of command settings

Condition: Line speed = 80

• Setting

Transmission data	[STX]	LSP	S	080.000	[CR]

• Readout

Transmission data	[STX]	LSP	R	[CR]

Response data	[STX]	LSP	A	080.000	[CR]

3-11-4 Workpiece spacing: INT

Sets the distance between the workpieces for the on-the-fly marking at regular intervals for the selected marking file.

■ Setting request data / response data for readout

Start code	INT	Sub command	[Workpiece spacing] 6-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	INT	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Workpiece spacing	6	“0000.0”–“4000.0” [mm]	Only when trigger mode is set to “Marking at regular intervals”, set this value.
Total data length	6	Fixed length.	

■ Example of command settings

Condition: Workpiece spacing = 200

- Setting

Transmission data	[STX]	INT	S	0200.0	[CR]

- Readout

Transmission data	[STX]	INT	R	[CR]

Response data	[STX]	INT	A	0200.0	[CR]

3-12 Laser Setting Commands

3-12-1 Laser power: LPW

Sets the laser power for the current file.

Reference

- The settings by this command are applied to all objects in the file. If you want to change the laser power correction value of the specified object only, set the laser power correction by each object setting.

■ Setting request data / response data for readout

Start code	LPW	Sub command	[Laser power] 5-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	LPW	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Laser power	5	“012.0”–“100.0”	
Total data length	5	Fixed length.	

■ Example of command settings

Condition: Laser power = 80

- Setting

Transmission data	[STX]	LPW	S	080.0	[CR]

- Readout

Transmission data	[STX]	LPW	R	[CR]

Response data	[STX]	LPW	A	080.0	[CR]

3-12-2 Scan speed: SSP

Sets the scan speed for the current file.

Reference

- The settings by this command are applied to all objects in the file. If you want to change the scan speed correction value of the specified object only, set the scan speed correction by each object setting.

■ Setting request data / response data for readout

Start code	SSP	Sub command	[Scan speed] 5-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	SSP	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Scan speed	5	Model: LP-ZV200P, LP-ZV500P, LP-ZV205P, LP-ZV505P — Setting range [mm/s]: “00001”–“12000” Model: LP-ZV206P, LP-ZV506P — Setting range [mm/s]: “00001”–”08000”	
Total data length	5	Fixed length.	

■ Example of command settings

Condition: Scan speed = 2000

- Setting

Transmission data	[STX]	SSP	S	02000	[CR]

- Readout

Transmission data	[STX]	SSP	R	[CR]

Response data	[STX]	SSP	A	02000	[CR]

3-12-3 Pulse cycle / pulse duration: MPL

Sets the pulse cycle, pulse duration for the current file.

Reference

- The settings by this command are applied to all objects in the file. If you want to change the pulse cycle correction value of the specified object only, set the pulse cycle correction by each object setting.
- With LP-M/S/Z compatible command mode, the available setting range of the pulse cycle is limited. If the setting value exceeds the limit, it is not possible to readout the settings by this command.

■ Setting request data / response data for readout

Start code	MPL	Sub command	[Pulse cycle] [Pulse duration] LP-ZV200P/LP-ZV205P/LP-ZV206P: 5-byte LP-ZV500P/LP-ZV505P/LP-ZV506P: 4-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	MPL	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Pulse cycle	4	Model: LP-ZV200P, LP-ZV205P, LP-ZV206P — Setting range: Refer to *1 Model: LP-ZV500P, LP-ZV505P, LP-ZV506P — Setting range: “02.0”–“20.0” [µs]	For LP-ZV200P/LP-ZV205P/LP-ZV206P, the setting range of the pulse cycle varies depending on the pulse duration. If you change the pulse duration, re-adjust the pulse cycle.
(LP-ZV200P/LP-ZV205P/LP-ZV206P only) Pulse duration	1	“0”: 30ns or 50ns “1”: 120ns “2”: 200ns	• If you specify “0”, the pulse duration is 30 ns when the former model is set to “LP-Z130” in the System settings, and is 50 ns when the former model setting is “LP-Z250/LP-Z256” or “LP-M/LP-S”. • For LP-ZV500P/LP-ZV505P/LP-ZV506P, do not send this field.
Total data length	4 or 5	Fixed length. • LP-ZV200P/LP-ZV205P/LP-ZV206P: 5-byte • LP-ZV500P/LP-ZV505P/LP-ZV506P: 4-byte	

*1 : For LP-ZV200P/LP-ZV205P/LP-ZV206P, the setting range of the pulse cycle varies depending on the setting of the pulse duration as follows.

Pulse duration [ns]	Pulse cycle [µs]
30	“01.2”–“99.9”
50	“01.7”–“99.9”
120	“03.0”–“99.9”
200	“05.0”–“99.9”

■ Example of command settings

Condition: LP-ZV200P, Pulse cycle = 20, Pulse duration = 0

• Setting

Transmission data	[STX]	MPL	S	20.00	[CR]

• Readout

Transmission data	[STX]	MPL	R	[CR]

Response data	[STX]	MPL	A	20.00	[CR]

Condition: LP-ZV500P, Pulse cycle = 20

• Setting

Transmission data	[STX]	MPL	S	20.0	[CR]

• Readout

Transmission data	[STX]	MPL	R	[CR]

Response data	[STX]	MPL	A	20.0	[CR]

3-12-4 Laser fine tune: WTC

Fine-tunes lasing quality such as starting and ending point by each file.

■ Setting request data

Start code	WTC	S	[Starting point] [Ending point] [Corners] [Curve] [Waiting time] [Pre-scan time] [Jump] [System reserved value] [System reserved value] 33-byte, 25-byte or 22-byte	(Check sum)	End code

■ Readout request data

Start code	WTC	R	(Check sum)	End code

■ Response data for readout

Start code	WTC	A	[Starting point] [Ending point] [Corners] [Curve] [Waiting time] [Pre-scan time] [Jump] [System reserved value] [System reserved value] 33-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Starting point	4	“-100”–“+100”	
Ending point	4	“-100”–“+100”	
Corners	3	“000”–“100”	• With a larger value, lasing time becomes longer. • Jump and system reserved values can be omitted. • If the jump is omitted, omit the system reserved values, too. • If the jump is omitted, the value set last (the initial value if it was not set) is applied.
Curve	3	“000”–“100”	
Waiting time	3	“000”–“100”	
Pre-scan time	5	“00.00”–“10.00” [ms]	
Jump *	(3)	“000”–“100”	
System reserved value *	(4)	“0.00”–“9.99”	• These settings correspond to “point radiation on wait” and “point radiation off wait” at LP-M/S/Z series. These values do not affect the settings. • It is not possible to omit one side of the system reserved values.
System reserved value *	(4)	“0.00”–“9.99”	
Total data length	33 (25) (22)	Fixed length. • When sending all data and response data for readout: 33-byte • When system reserved values are omitted: 25-byte • When jump and system reserved values are omitted: 22-byte	

* These items can be omitted.

■ Data example

Condition: Starting point = -5, Ending point = 10, Corners = 10, Curve = 0, Waiting time = 20,
Pre-scan time = 1, Jump = 0, System reserved value = 0.00, System reserved value = 0.00

• Setting

Transmission data	[STX]	WTC	S	-005+01001000002001.000000.000.00 or -005+01001000002001.00000 or -005+01001000002001.00	[CR]

• Readout

Transmission data	[STX]	WTC	R	[CR]	
Response data	[STX]	WTC	A	-005+01001000002001.000000.000.00	[CR]

3-12-5 Line width / uniform spot mode: WDC

Sets the line width necessary to avoid crossing at marking intersection and the uniform spot mode.

Reference

- “Line width” setting by this command is applied to the object group No. 1000 (when the 3D marking is OFF) or 1001 to 1016 (when the 3D marking is ON). For response data at the readout request, settings for the object group No. 1000 are read out when the 3D marking is OFF, and settings for the smallest number among the object group No. 1001 to 1016 are read out when the 3D marking is ON. To the object group No. 1000 to 1016 the marking data converted from LP-M/S/Z files and the data set by LP-M/S/Z compatible command mode belong.
- At LP-M/S/Z compatible mode, “Arbitrary” cannot be specified to the uniform spot mode.

■ Setting request data / response data for readout

Start code	WDC	Sub command	[Line width] [Uniform spot mode] 6-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	WDC	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Line width	5	“0.010”–“2.000” [mm]	It is the segment width for the purpose of calculation. Applies to the value of the width for creating the clearance at the intersection of lines comprising characters.
Uniform spot mode	1	“0”: OFF “1”: Near field aligning “2”: Base field aligning “3”: Far field aligning	
Total data length	6	Fixed length.	

■ Example of command settings

Condition: Line width = 0.2, Uniform spot mode = 2

- Setting

Transmission data	[STX]	WDC	S	0.2002	[CR]

- Readout

Transmission data	[STX]	WDC	R	[CR]

Response data	[STX]	WDC	A	0.2002	[CR]

3-13 Maintenance Commands

3-13-1 Laser radiation for measurement: SPT

Controls “laser radiation for measurement” used to measure laser output by a commercially available power meter.

■ Setting request data

Start code	SPT	S	[Radiation on/off] 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Radiation on/off	1	“0” or “2”: Stop radiation “1”: Start radiation	• The internal shutter is automatically opened and closed at the time of start and stop of radiation. • Though with LP-M/S/Z series “2” was “Stop radiation temporarily”, with this product “2” represents just “Stop radiation”.
Total data length	1	The data length is fixed.	

Reference

- To start the laser radiation for measurement with this command, set the shutter control method to “communication commands” by Laser Marker NAVI smart.
- You can start the laser radiation for measurement only when the laser pumping is completed and the shutter is closed.
- The laser radiation is automatically stopped after about one minute even if the stop request command was not sent. At this time the internal shutter is automatically closed.
- The laser settings (laser power / laser frequency / pulse duration) set in the selected file are applied to the laser radiation for measurement. Even if you have set the different settings for the laser radiation for measurement by using Laser Marker NAVI smart, the radiation settings are overwritten with the laser settings in the selected file when you execute the radiation by this command.
- If you correct the laser power in the system settings, this correction is always applied to the laser radiation for measurement when you execute the radiation by this command.
- The laser for measurement is radiated at the center of marking field. The system offset of X-/Y-position in the system settings are not applied to this function.
- Do not execute any other operation including the shutter opening/closing and sending MKM command during the laser radiation for measurement.
- If you want to radiate the laser to the arbitrary points, use “Point radiation” function instead of this function.

■ Example of command settings

Condition: Radiation on/off = 1

- Setting

Transmission data	[STX]	SPT	S	1	[CR]

3-13-2 Power check: PWM

Supported model: LP-ZV500P, LP-ZV505P, LP-ZV506P

Measures and corrects the laser power by using the internal power monitor in the laser marking system.

Notice

- When using the power check function, refer to “Setup/Maintenance Guide” in advance to confirm the usage and characteristics.

Reference

- To use this command, set the shutter operation control method to “communication commands” by Laser Marker NAVI smart.
- You can start the power measurement and correction with this command only when the laser pumping is completed and the shutter is closed.
- During the measurement and correction of the power check function, the laser is radiated without opening the shutter.
- Do not execute any other operation including the shutter opening/closing and sending MKM command during the power measurement and correction.
- If you use a MST command to verify the marking end, the response data of MST command is automatically sent also after the power measurement or correction is executed by PWM command. Refer to “3-3-9 Marking end verification: MST” (P.68).

■ Setting request data

Start code	PWM	S	[Power check indication] [Laser power setting] 6-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Power check indication	1	“0”: Start measurement	It takes about 21 seconds from the start to the end of the measurement.
Laser power setting	5	“012.0”-“100.0”	• Before the laser power correction, perform the power measurement with power setting 80. • If you want to check the power compared to delivery state in the readout data of the measurement result, perform the power measurement with power setting 80.
Total data length	6	The data length is fixed.	

■ Example of command settings

Condition:
- Setting

Power check indication = 0, Laser power setting = 80

Transmission data	[STX]	PWM	S	0080.0	[CR]

■ Readout request data

Start code	PWM	R	[Readout contents] 1-byte	(Check sum)	End code

■ Response data for readout: when reading the measurement result

Start code	PWM	A	[Readout contents] [Output power] [Power compared to delivery state] [Low power notice] 10-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Readout contents	1	“0”: Measurement result	
Output power	5	“000.0”-”090.0” [W]	• Indicates the measurement result with the specified laser power. • When reading after measurement, the value without applying the “Laser power correction rate” is readout. • When reading after correction, the value with the “Laser power correction rate” applied is readout.
Power compared to delivery state	3	“000”-“999” [%] “000”: cannot be displayed	• Shows the current power percentage relative to the initial power. It is calculated based on the laser power at the delivery state is 100%. This value is displayed only when the measurement is performed with the laser power setting 80. • If the laser power setting at measurement is other than 80, “000” is readout.
Low power notice	1	“0”: OK or unable to check “1”: Lower than the low power notice level	• If “Power compared to delivery state” is lower than specified “Low power notice level”, “1” is readout. • If “Power compared to delivery state” is “000”, “0” is readout. • If you readout the measurement result after the power correction, “0” is readout.
Total data length	1 or 10	The data length is fixed. • Readout request: 1-byte • Response data for readout: 10-byte	

Notice

- If “Power compared to delivery state” is lower than 80%, the laser oscillator unit requires maintenance. Contact our sales offices or representatives.

Reference

- Send the readout request command for the power measurement results after the power measurement or correction is completed. It takes about 21 seconds to complete the power check measurement. If you use a MST command to verify the marking end, the response data of MST command is automatically sent after the power measurement or correction is executed by PWM command.
- The determination reference value of the low power notice can be defined by PWL command. Refer to “3-13-3 Low power notice level: PWL” (P.175).

■ Example of command settings

Condition:
- Readout

Readout contents = 0, Output power = 13.6, Power compared to delivery state = 95, Low power notice = 0

Transmission data	[STX]	PWM	R	0	[CR]

Response data	[STX]	PWM	A	0013.60950	[CR]

■ Setting request data: when correcting the laser power

Start code	PWM	S	[Power check indication] [Laser power correction rate] 4-byte or 1-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Power check indication	1	“1”: Start automatic correction “2”: Start manual correction	• Send the setting request command for the power correction after the power measurement with the power setting 80. • If you specify “1” : Start automatic correction, end the data here. • It takes about 11 seconds from the start to the end of the correction.
Laser power correction rate	3	“050”–“200” [%]	• When the power check indication is “2” : Start manual correction, you cannot omit this parameter. • When the power check indication is “1” : Start automatic correction, though you can specify this parameter, it is not used for the correction. • The laser power correction rate 100% means no correction is performed to the laser power.
Total data length	1 or 4	The data length is fixed. • When the automatic correction: 1-byte • When the manual correction: 4-byte	

■ Example of command settings

Condition:
• Setting
To start automatic correction:
Power check indication = 1

Transmission data	[STX]	PWM	S	1	[CR]

Condition:
• Setting
To start manual correction:
Power check indication = 2, Laser power correction rate = 120

Transmission data	[STX]	PWM	S	2120	[CR]

Reference

- Send the setting request command for the power correction after the power measurement with the power setting 80. Otherwise, the correction request command is not accepted with a negative response.
- Note that the laser power correction is a function that corrects the setting value of the laser power. The laser power correction does not change the maximum laser power [W] value.
- When you send a setting request command for the power correction, the correction result is applied to the laser marker immediately and you do not need to overwrite a marking file.

■ Readout request data

Start code	PWM	R	[Readout contents] 1-byte	(Check sum)	End code

■ Response data for readout: when reading the correction data

Start code	PWM	A	[Readout contents] [Laser power correction] [Date/time of correction] [Laser radiation time] 27-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Readout contents	1	“1”: Correction data	
Laser power correction	3	“050”-“200” [%] “100”: uncorrected	• It indicates the correction rate applied to the power correction. • If you have not corrected power before, “100” is readout.
Date/time of correction	14	“YYYYMMDDHHmmss” *1	• It indicates the correction date/time (YYYYMMDDHHmmss) of the last correction. • If you have not corrected power before, “00000000000000” is readout.
Laser radiation time	9	“0000000.0”-“1000000.0” [h]	• It indicates the total radiation time at the time of the performing laser correction. • If you have not corrected power before, “0000000.0” is readout.
Total data length	1 or 27	The data length is fixed. • Readout request: 1-byte • Response data for readout: 27-byte	

*1 : The contents of the date/time of correction “YYYYMMDDHHmmss” are as follows:

Data format	Data contents
“YYYYMMDDHHmmss” YearMonthDateTime MinuteSecond	YYYY: “1980”–“2099”
	MM: “01”–“12”
	DD: “01”–“31”
	HH: “00”–“23”
	mm: “00”–“59”
	ss: “00”–“59”

Reference

- Send the readout request command for the power correction results after the power measurement or correction is completed. It takes about 11 seconds to complete the power check correction. If you use a MST command to verify the marking end, the response data of MST command is automatically sent after the power measurement or correction is executed by PWM command.

■ Example of command settings

Condition:
• Readout

Readout contents = 1, Laser power correction = 105, Date/time of correction = 2021-10-01 9:00:00, Laser radiation time = 300

Transmission data	[STX]	PWM	R	1	[CR]

Response data	[STX]	PWM	A	1105202110010900000000300.0	[CR]

3-13-3 Low power notice level: PWL

Supported model: LP-ZV500P, LP-ZV505P, LP-ZV506P

Specifies the notice level of the “Power compared to delivery state” which is shown as the measurement results for the power check (PWM command) to detect the laser power degradation.

■ Setting request data / response data for readout

Start code	PWL	Sub command	[Low power notice level] 2-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	PWL	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Low power notice level	2	“00”–“99” [%]	As the output power at the delivery time is 100%, specify the criteria of the power level. You can check with PWM command if the current power is lower than the specified level or not.
Total data length	2	The data length is fixed.	

Reference

- The setting by this command is used for the readout data of the power check measurement results (PWM command) to specify the notice level of the “Power compared to delivery state”. Refer to “3-13-2 Power check: PWM” (P.169).
- The initial setting for “Low power notice level” is 80%. If “Power compared to delivery state” is lower than 80%, the laser oscillator unit requires maintenance.
- The setting changed by this command is saved in the laser marker without overwriting to the file.

■ Example of command settings

Condition: Low power notice level = 85

- Setting

Transmission data	[STX]	PWL	S	85	[CR]

- Readout

Transmission data	[STX]	PWL	R	[CR]

Response data	[STX]	PWL	A	85	[CR]

3-13-4 Marking energy check: MEN

Supported model: LP-ZV500P, LP-ZV505P, LP-ZV506P

Specifies the limit values to check the marking energy [mJ], which is measured at every marking.

■ Setting request data / response data for readout

Start code	MEN	Sub command	[Upper limit] [Lower limit] 18-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	MEN	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Upper limit	9	“000000100”-“999999999” [mJ] “000000000”: Check OFF	• Set the value of “Upper limit” to a value larger than “Lower limit”. • If you want to activate only one setting of “Upper limit” or “Lower limit”, set “000000000” to the unused parameter.
Lower limit	9		
Total data length	18	The data length is fixed.	

■ Example of command settings

Condition: Upper limit = 2500, Lower limit = 2000

• Setting

Transmission data	[STX]	MEN	S	000002500000002000	[CR]

• Readout

Transmission data	[STX]	MEN	R	[CR]

Response data	[STX]	MEN	A	000002500000002000	[CR]

Condition: Upper limit = Not used, Lower limit = 2000

• Setting

Transmission data	[STX]	MEN	S	000000000000002000	[CR]

• Readout

Transmission data	[STX]	MEN	R	[CR]

Response data	[STX]	MEN	A	000000000000002000	[CR]

Reference

- The settings by this command are applied to the output signal of CHECK OK OUT/CHECK NG OUT in the I/O connector and response data of MST command. Refer to “3-3-9 Marking end verification: MST” (P.68).
- If you set “-” to both “Upper limit” and “Lower limit”, the marking energy check is deactivated. In this case, CHECK OK OUT/CHECK NG OUT in the I/O connector do not operate and the response data of MST command shows “Check OFF” as a result of the marking energy check.
- The settings by this command are applied to only the selected file. When you use several files, set the limit values for each file.
- If you change the marking data or laser settings, the measurement value of the marking energy also changes. If you set the marking energy limits, change the limit values according to the new settings.

3-13-5 Error code: ECR

Reads out the error code of alarm or warning when an error has occurred.

■ Readout request data

Start code	ECR	R	(Check sum)	End code

■ Response data for readout

Start code	ECR	A	[Error code] [Error type] 5-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Error code	4	“0000”: No error “E001”–“E999”: Error codes	For LP-ZV series (Lower than Version 3.2.0): To the warnings from E600 and E700 to E799, “0000” (No error) is read out.
Error type	1	“0”: No error “1”: Alarm (due to system abnormality) “2”: Alarm (due to control or settings) “3”: Warning	
Total data length	5	The data length is fixed.	

■ Example of command settings

Condition:
- Readout

When error E610 occurs

Transmission data	[STX]	ECR	R	[CR]	
Response data	[STX]	ECR	A	E6103	[CR]

Reference

- Refer to “What to do if an error occurs” (P.199) for details on error codes.

3-14 System Settings Command

3-14-1 System clock: YMD

Sets the date and time of the system clock of the laser marker. Functional characters such as the current date/time, expiry date/time, and lot date/time are marked based on this system clock.

■ Setting request data / response data for readout

Start code	YMD	Sub command	[Year] [Month] [Date] [Hour] [Minute] [Second] 14-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	YMD	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Year	4	“1980”–“2099” [Year]	
Month	2	“01”–“12” [Month]	
Date	2	“01”–“31” [Day]	
Hour	2	“00”–“23” [Hour]	
Minute	2	“00”–“59” [Minute]	
Second	2	“00”–“59” [Second]	
Total data length	14	The data length is fixed.	

Reference

- The setting changed by this command is saved in the laser marker without overwriting to the file.

■ Example of command settings

Condition: Year = 2014, Month = 12, Date = 10, Hour = 18, Minute = 45, Second = 00

- Setting

Transmission data	[STX]	YMD	S	20141210184500	[CR]

- Readout

Transmission data	[STX]	YMD	R	[CR]

Response data	[STX]	YMD	A	20141210184500	[CR]

3-14-2 Command mode: RSM

Switches the command mode between LP-M/LP-S/LP-Z compatible mode and the standard one. This command is available when LP-M/S/Z compatibility setting is enabled in system settings.

■ Setting request data / response data for readout

Start code	RSM	Sub command	[Command mode] 1-byte	(Check sum)	End code

Sub command is “S” for the setting request data and “A” for the response data for readout.

■ Readout request data

Start code	RSM	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Command mode	1	“1”: LP-M/S/Z command mode “2”: Standard command mode	
Total data length	1	The data length is fixed.	

Reference

- This command is available only when “LP-M/S/Z compatible” is selected for “Compatible mode” in system settings of Laser Marker NAVI smart.
- When “LP-M/S/Z compatible” is selected for “Compatible mode” in system settings of Laser Marker NAVI smart, the command mode is always “LP-M/S/Z command mode” at the time of starting the remote control mode. To use standard command mode, always send this command at first or disable “LP-M/S/Z compatibility” in system settings.
- To switch the command mode from “LP-M/S/Z command mode” to “standard command mode” by RSM command, the communication format (start code, sub-command and etc.) of the setting request data should be followed by LP-M/S/Z compatible format. The response data to this setting request is returned also in LP-M/S/Z compatible format. The standard command format is applied afterward.
- The setting by this command is not saved in the laser marker.
- The LP-F10/F10W mode cannot be available with this product.

■ Example of command settings

Condition: Command mode = 1

- Setting

Transmission data	[STX]	RSM	S	1	[CR]

- Readout

Transmission data	[STX]	RSM	R	[CR]

Response data	[STX]	RSM	A	1	[CR]

Troubleshooting

Troubleshooting

If any operation errors occur, check items below.
When the problems cannot be resolved, please contact our sales office or representatives.

■ Start-up

Troubles	Causes	Measures
• Power supply is not turned on. • The system does not start-up.	Power cable is not connected.	Connect the power supply cable.
	Key switch is not turned on.	Turn on the key switch.
	Power is not supplied.	Check the power supply.
	The internal circuit is faulty.	Check if there is any problem with the external power supply with the laser marker removed. If there is no problem with the external power supply, the internal circuit is assumed to be faulty. Please consult your Panasonic representative. Contact our sales office.
	For LP-GS series: Fuse is blown.	Replace the fuse by following the procedures described in the “Setup/Maintenance Guide”.
	For LP-RC//LP-RH/LP-RF/LP-RV/LP-ZV series: Circuit protector is OFF.	Turn on the circuit protector by following the procedures described in the “Setup/Maintenance Guide”.

■ Laser pumping

Troubles	Causes	Measures
Laser pumping does not start.	The connection of the following I/O terminals is released. • INTERLOCK 1(+) - INTERLOCK 1(-) (X16 - X17) • INTERLOCK 2(+) - INTERLOCK 2(-) (X18 - X19) • For LP-GS series: LASER STOP 2 IN (X11) - OUT COM. 1 • For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: REMOTE INTERLOCK IN (X20) - OUT COM. 1	• Check the connection of each terminal on the I/O terminal block. • If the safety equipment such as door and switch is in released status, restore the original condition.
	The stop laser button of the configuration software is pressed.	• Solve the safety problem. Then select “Reset” in the error dialog in Laser Marker NAVI smart to finish the laser stop status. • For LP-RH/LP-ZV if you use the optional touch panel console or monitor, select “Reset” on its screen.
	Power is not supplied to the common terminal of the I/O terminal block.	Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively.

Troubles	Causes	Measures
Laser pumping does not start in remote mode.	Signals from the external control device are refused.	Refer to “External Control” in Troubleshooting.
	The setting of a laser pumping control method in the system settings screen is not consistent with the actual control method.	• Check if the laser pumping control method set in the system settings screen (I/O or communication command) and the actual control method are consistent. • If the laser pumping method is changed in the system settings screen, restart the laser marker.

■ Connection with Laser Marker NAVI smart

Troubles	Causes	Measures
Online connection fails. (The laser marker is not indicated as an available laser marker.)	Laser marker has not been started.	Refer to “Start-up” in Troubleshooting.
	PC and laser marker are not connected.	Connect them with a USB cable or a LAN cable.
	USB driver is not installed properly.	Refer to the “Laser Marker NAVI smart Operation Manual” to install the USB driver to all the laser markers to connect.
Online connection is disconnected.	PC is in the sleep or hibernate state.	To maintain the online connection, disable the sleep setting of the PC.
	The PC stayed no communication state with the laser marker for a certain period of time with the high load (high CPU usage).	To maintain the online connection, terminate the high CPU usage application.
Ethernet online connection fails.	Ethernet communication settings are incorrect.	Establish the USB online connection and confirm the Ethernet communication settings in the system settings. Then, restart the laser marker.
	Ethernet is not listed in the dialog for online connection.	In the dialog for online connection, select the “Including Ethernet” checkbox and search for laser markers.
	The connecting port of the LAN cable to the PC is wrong. (Connected to EtherNet/IP, PROFINET or INFO LAN port by mistake.)	Connect the cable to the port marked “LAN” on the rear of the controller.

Troubles	Causes	Measures
For LP-GS series: Bluetooth online connection fails.	A laser marker of the model not compatible with Bluetooth is used.	Bluetooth function is available for the following laser markers. LP-GS051 / LP-GS051-E / LP-GS051-L / LP-GS051-LE / LP-GS052 / LP-GS052-E
	Bluetooth communication setting is disabled.	Establish the USB online connection and enable the Bluetooth communication in the system settings. Then, restart the laser marker.
	PC's Bluetooth module is apart from the head of the laser marker.	Operate the product with the laser marker head within 5m from the PC.
	The ambient environment is not suited for Bluetooth communication. • Wireless LAN or another wireless device is used around. • There is an obstacle between the laser marker head and the PC. • The environment is subject to weaker radio wave signals.	Establish Bluetooth communication in an environment suited for stable wireless connection.

■ Lasing operation

Troubles	Causes	Measures
Marking cannot be done. (The laser emission indicator blinks but marking is not performed on the workpiece.)	Obstacle hinders laser beam.	• Remove obstacle between laser emission port of laser marker head and workpiece. • For LP-RF/LP-RV series, remove the protection cap of the laser emission port.
	Distance to workpiece is not appropriate.	Adjust distance between bottom surface of laser marker head and the workpiece surface as specified.
	For LP-ZV series, when you use the autofocus function: The workpiece displacement does not match the actual distance.	• Check if the input values of “Workpiece displacement at 4mA [mm]” and “Workpiece displacement at 20mA [mm]” in the system settings screen are correct. • Check if the trigger of the displacement sensor is input after the measurement result is stable. • Check if the detecting position of the workpiece surface and the marking surface are consistent.
	For LP-GS/LP-ZV series: The set Z-position does not match the height of the actual target object. (The LP-GSxxx-L type is excluded.)	Set the Z-position according to the workpiece height.
	The workpiece is not in place.	• Check the marking position using the guide laser or guide pointer to check if the workpiece is out of the specified position. • For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: Connecting a sensor to TARGET DETECTION IN (X7) of I/O terminal block, you can check the presence of the workpiece during laser radiation.
	Laser power is insufficient.	• Increase laser power (including correction factor). • Decrease scan speed (including correction factor).
	Laser type (wavelength, output power, etc.) is not appropriate for material of the workpiece.	Materials can be marked differ depending on wavelength and output power of laser marker. • LP-GS/LP-RC/LP-RH is not suitable for metal material. • LP-RF/LP-RV/LP-ZV is not suitable for transparent material.

Troubles	Causes	Measures
Marking is not performed in RUN/REMOTE mode. (The laser emission indicator does not light.)	In RUN mode: The RUN Mode is not active or the marking start signal is not input.	Turn the RUN mode ON, and then input a signal to TRIGGER IN of the I/O terminal block.
	The marking trigger signal of the I/O terminal block is not input.	Check connections with external equipment for misconnection, disconnection or contact failure due to any loose connector.
		Confirm that TRIGGER IN is input by one-shot signal of more than 2ms per marking cycle.
	The marking trigger is entered while the marking trigger ready is OFF.	Refer to “External Control” in Troubleshooting.
Sometimes laser is emitted unintentionally.	Fumes causes malfunction of photoelectric sensor for marking trigger signal.	• Install a dust collector to eliminate the fume (gas) generated during lasing. • Check that dust collector works well.
Marking position is deviated from the expected setting position.	• The setting of the laser head direction is not consistent with the actual install direction. • System offset values are input on the system settings screen.	Check the setting direction of the laser head, X-axis/ Y-axis offset or rotation offset setting of the system settings screen.

■ Marking quality

Troubles	Causes	Measures
Marking is totally faded/ Marking is partially faded.	Laser emission port is not clean.	• Clean contaminants off the laser emission port by following the procedures described in “Setup/Maintenance Guide”. • For LP-RF/LP-RV/LP-ZV series: If contaminants persist, replace the protection glass of the laser emission port.
	Fumes occurring during lasing hinder laser beam.	• Install dust collector. • Check that dust collector works well.
	Distance to the workpiece is not appropriate.	• Adjust distance between bottom surface of laser marker head and marking surface of the workpiece. • Due to the characteristics of the laser marker, the focus (work distance) and marking state may vary depending on the temperature environment or operating conditions. For details, refer to the “Marking check” in the “Setup/Maintenance Guide”.
	For LP-GS/LP-ZV series: The set Z-position does not match the height of the actual target workpiece. (The LP-GSxxx-L type is excluded.)	Set the Z-position according to the workpiece height.
	For LP-ZV series, when you use the autofocus function: The workpiece displacement does not match the actual distance.	• Check if the input values of “Workpiece displacement at 4mA [mm]” and “Workpiece displacement at 20mA [mm]” in the system settings screen are correct. • Check if the trigger of the displacement sensor is input after the measurement result is stable. • Check if the detecting position of the workpiece surface and the marking surface are consistent. • Confirm the installation status and if the displacement sensor is receiving the impact of vibration or the like, perform vibration prevention measures. • Check the output signal of the displacement sensor and if it is affected by noise, protect the sensor against noises.
	For LP-ZV series: The setting of the uniform spot mode is not suitable.	Specify the setting of the uniform spot mode if necessary. If you change this setting, marking quality may change. Adjust the laser power according to the selected uniform spot mode.
	Marking surface of workpiece is inclined.	Make adjustment so that bottom surface of laser marker head and marking surface of the workpiece are parallel with each other.

Troubles	Causes	Measures
Marking is totally faded/ Marking is partially faded.	There are variations in properties of the workpieces. • Thickness varies. • Surface roughness varies (including those in gloss). • Material varies (including those in chemical composition).	Adjust the marking conditions and work distance according to respective workpieces.
	Workpiece feeder is not stable.	Adjust workpiece feeder so that workpiece position becomes stable.
	Performance of laser oscillator deteriorates due to aging.	• Increase setting value of laser power. • Decrease scan speed. If it is not possible to get the same marking quality as before even with the max. value of the laser power setting, laser oscillator must be replaced. Contact our sales office.
	Laser power or laser energy density is insufficient.	• Increase laser power (including correction factor). • Decrease scan speed (including correction factor). • LP-ZV206P/LP-ZV506P are not suitable for the metal engraving.
	For LP-RV/LP-ZV200P/LP-ZV205P/LP-ZV206P: The setting value of the pulse duration is not appropriate.	Adjust the pulse duration according to the material of the workpiece. For plastic workpieces the pulse duration 4ns or 8ns is a common setting, and for metal, 16ns or 30ns is often selected. For the shallow marking of the metal surface, the pulse duration 120ns or 200ns is often selected.
The marking around edge of the marking field is faded or chipped.	Decrease of the laser energy density in the edge of marking field may affect the marking quality.	• For LP-GS/LP-RC/LP-RH series: Set “Power optimization by marking position” in “System offset” in System settings screen. • For LP-RF/LP-RV/LP-ZV series: Set the power correction to the marking objects in the edge of the marking field. • For LP-ZV series: Set the uniform spot mode.
Character is partially chipped.	Obstacle hinders laser beam.	Remove obstacle between laser emission port and workpiece.
	Laser emission port is not clean.	• Clean contaminants off the laser emission port by following the procedures described in “Setup/Maintenance Guide”. • For LP-RF/LP-RV/LP-ZV series: If contaminants persist, replace the protection glass of the laser emission port.
The marking density of the filling lines in the drawings or characters is uneven.	For LP-ZV series: The drawing speed of the filling lines is too fast and the Z-axis control module cannot follow up the height change.	• Decrease the scan speed. • Change the marking order or the line filling directions.

Troubles	Causes	Measures
The filling lines in the drawings, bar code or 2D code are disordered (lines are not straight, but wavy).	The workpiece is shaking during the marking.	Perform vibration prevention measures.
	The marking settings are not appropriate for the drawing pattern of the filling lines.	• Change the scan speed. • Adjustment the wait value in laser settings of the “Marking settings” screen.
Marking is disorder. (Characters lose shape or not formed.)	Head lacks fixation strength.	• Fix head with the specified torque. • Improve strength of head mounting.
	Constant vibration from surrounding equipment (motor and press, etc.) influences.	Perform vibration prevention measures.
	There are irregular vibrations coming from surrounding equipment (air cylinder and forklift, etc.). (Marking is disturbed at irregular intervals.)	
	Start and/or stop timing of feeder does not match with marking operation.	Disturbed at the beginning of marking: Marking trigger signal is likely to be input before workpiece is fully stopped. Marking may disturb due to remaining vibration even if workpiece is in full stop. Turn the marking trigger signal ON after vibrations are completely damped.
		Disturbed at the end of marking: Workpiece is likely to start moving before completion of marking. Delay start timing of feeder or speed up scan speed so that marking is finished before workpiece starts moving.
	There are noises coming from surrounding equipment.	Protect laser marker against noises as follows: • Securely ground the frame ground terminal of laser marker or surrounding equipment. • Isolate power and signal lines from each other if they have been routed in parallel. • Shield signal line. • Isolate power supply for laser marker from other equipment. • Use noise cut transformer to absorb noises from power supply.
Marking line runs over the intended start or end points.	The setting in lasing quality parameters does not match the other settings.	Adjustment the lasing quality parameters such as starting point, ending point or wait value in laser settings of the “Marking settings” screen.
When the character size is small, the marking characters are not readable.	The setting conditions or font are inadequate for the character size.	• Use “Original 2” or “Original 5” font for the small size characters. • Adjust the laser power or scan speed.

Troubles	Causes	Measures
Marking is dotted.	• For LP-GS/LP-RC/LP-RH series: Setting of laser frequency and scan speed is inadequate.	Decrease scan speed or increase laser frequency.
	• For LP-RF/LP-RV/LP-ZV series: Setting of pulse cycle and scan speed is inadequate.	Decrease scan speed or pulse cycle.

■ Moving objects

Reference

• The on-the-fly marking is not available to LP-GS series.

Troubles	Causes	Measures
Marking is sometimes skipped. (E750 occurs.)	Marking trigger signal is entered before current marking is finished.	• Set the trigger mode to Multiple triggers if you want to input next triggers while the trigger processing operation. • Place the trigger sensor closer to the laser marker and set the smaller value to Trigger detecting position. • Reduce the marking time with the measures such as increasing the scan speed and etc. • Reduce feeder speed. • Increase marking interval (interval between objects on feeder).
The start lines of the characters are distorted.	The timing of lasing does not match with the line speed.	Input larger value to Overrun correction.
Characters are distorted. Character pitch is unstable.	The setting of the moving direction is wrong.	• Match feed direction with laser marker operation. • Check the setting direction of the laser head of the system settings screen.
	Speed changes at conveyor junction.	If conveyors are coupled, avoid marking near conveyor junction.
	Actual speed and preset speed for feeding objects are different due to slippage of objects.	Remove cause of object slippage.
	Positional misalignment is likely to occur due to meandering motion of conveyor.	Secure objects to prevent misalignment.
	The moving speed of the conveyor is not stable.	• Check the conveyor and remove the cause of the speed change. • To keep up the conveyor speed, use encoder to feedback the change of the speed.
	When Line speed control is set to Fixed speed: The setting speed is not consistent with the actual line speed.	Adjust the setting value of the line speed by checking the marking quality. • When the Character Spacing is too wide: Increase the setting. • When the character spacing is too narrow: Decrease the setting.

Troubles	Causes	Measures

Characters are distorted.
Character pitch is unstable.
	When Line speed control is set to Encoder input:
	The line speed could not be measured correctly by the encoder.
		• Make sure that the encoder operates properly.
		• Make sure that the setting value of Encoder resolution is correct.
		  • When using A phase only:
		  Encoder resolution = Number of pulses/mm x 2
		  • When using A and B phases:
		  Encoder resolution = Number of pulses/mm x 4
		• When only one phase of the encoder is used, connect the encoder signal to ENCODER A IN (X13) and connect ENCODER B IN (X14) to IN COM. 1 (X2).

	When Line speed control is set to Encoder input:
	The input speed of the encoder is not consistent with the actual line speed at marking.
		• Place the encoder closer to the trigger sensor.
		• Adjust the setting value of Encoder resolution by checking the marking quality.
		  • When the character spacing is too wide:
		  Increase the setting.
		  • When the character spacing is too narrow:
		  Decrease the setting.
		• In some cases, it may reduce the influence of the ups and downs of the line speed to decrease the encoder resolution. However, it is recommended to set more than 25pulses/mm to Encoder resolution.

	When Line speed control is set to 2 sensors input: The line speed could not be measured correctly by the two sensors.	• Check the setting value of Distance line speed sensors. • Confirm the sensors for line speed detection operate properly.

	When Line speed control is set to 2 sensors input:
	The input speed of the 2 sensors is not consistent with the actual line speed at marking.
		• Place the trigger sensor closer to the line speed detection sensors so that the difference of the speed at detection and at marking may reduce.
		• Adjust the setting value of Distance line speed sensors by checking the marking quality.
		  • When the character spacing is too wide:
		  Increase the setting.
		  • When the character spacing is too narrow:
		  Decrease the setting.

■ External control

Troubles	Causes	Measures
Communication with the external device cannot start.	Laser marker is not in remote mode.	• 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 the “Maintenance” screen of Laser Marker NAVI smart. • Using commercially available line monitor or protocol analyzer, check if the external equipment transmits data.

Troubles	Causes	Measures
Control by communication command fails.	Communication data format (start code) is inadequate.	• 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 want to use the same command format with the former models of LP-400/LP-V series, or LP-M/LP-S/LP-Z series, set “Compatible mode” in system settings of Laser Marker NAVI smart. • If you want to use the standard command format, switch the mode by RSM command or set “OFF” to “Compatible mode” in system settings of Laser Marker NAVI smart. • For LP-GS/LP-RC/LP-RH/LP-RF/LP-RV series, you cannot use the LP-M/S/Z compatible mode. • If you use EtherNet/IP or PROFINET, set “OFF” to “Compatible mode” in System settings screen. You cannot use the command format in LP-400/V or LP-M/S/Z compatible mode via EtherNet/IP or PROFINET.
Marking trigger ready does not turn ON.	An error occurs.	Check the error code and cancel the alarm or warning.
	Marking trigger is in progress.	• 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 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. • For LP-RC/LP-RH/LP-RF/LP-RV/LP-ZV series: Using DATA WAIT OUT (No.38) of I/O connector, you can confirm the laser marker becomes waiting status of input.

Troubles	Causes	Measures
Marking trigger ready does not turn ON.	For communication command control: “reception mode ON” is set for command reception permission (MKM command).	Set “reception mode OFF” for command reception permission (MKM command).
	For LP-RC/LP-RH/LP-RF/ LP-RV/LP-ZV series: Counter has been reset during On-the-fly marking operation.	Once the counter is reset during On-the-fly marking operation, READY OUT becomes OFF temporarily and may not accept the trigger. Please check the counter reset timing.
	For LP-ZV series: Autofocus function is activated in Laser Marker NAVI smart, but no input from the sensor.	• Check the connection and status of the external displacement sensor. • Using DATA WAIT OUT (No.38) of I/O connector, you can confirm the laser marker becomes waiting status of input. • If you do not use the autofocus function, set “OFF” the settings for “Autofocus” in “File settings”.
The sending command is not accepted and negative response is returned.	The requested operation can be controlled only by I/O with the current system settings.	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) (except LP-GS052 type)
		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-ZV500P/LP-ZV505P/LP-ZV506P 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.
	Command mode (setting for the compatible mode) is wrong.	• If you want to use the same command format with the former models of LP-400/LP-V series, or LP-M/LP-S/LP-Z series, set “Compatible mode” in system settings of Laser Marker NAVI smart. • If you want to use the standard command format, switch the mode by RSM command or set “OFF” to “Compatible mode” in system settings of Laser Marker NAVI smart. • For LP-GS/LP-RC/LP-RH/LP-RF/LP-RV series, you cannot use the LP-M/S/Z compatible mode.
	The character code is wrong.	• Check the setting for “Encoding for non-ASCII characters” in the “System settings”. • Check if characters in the readout strings can be encoded with ASCII code or the character code specified in “Encoding for non-ASCII characters”. • “Shift JIS”, “GB 2312” and “Latin-1” cannot be used together. • In LP-400/V or LP-M/S/Z compatible mode, only ASCII code and Shift JIS are available.

* These commands are applicable with the standard command mode. For the LP-400/V or LP-M/S/Z compatible mode, refer to the “Serial Communication Command Guide: LP-400/V compatible mode”, or “Serial Communication Command Guide: LP-M/S/Z compatible mode”.

■ Link control with external devices

Troubles	Causes	Measures
Link control with image checker and code reader fails.	The connections with the image checker or code reader are inadequate.	• Refer to “Setup/Maintenance Guide” for the wiring and communication settings. • If the Ethernet communication settings or RS-232C usage are changed, restart the laser marker.
	Communication settings are inadequate.	
	The connecting port of the LAN cable to the image checker is wrong. (Connected to EtherNet/IP, PROFINET or INFO LAN port by mistake.)	Connect the cable to the port marked “LAN” on the rear of the controller.
Marking cannot be done in an appropriate position when the function of position correction is used.	The coordinates of the image checker are not consistent with the marking position of the laser marker.	Set the calibration of the image checker and match the coordinate origin of the image checker to the center point of the marking field of the laser marker.
	Settings of the image checker are inadequate.	Confirm the following settings of PV230/PV200. • Setting of Ethernet with the protocol General communication • Calibration • Settings of the positional correction • Expression of the numeric calculation
	The setting order of the expression table of PV230/ PV200 is inadequate.	The results of the numerical calculation should output to the laser marker in the order of X, Y, and theta.
The results of the code or character checking is NG.	Testing conditions of image checker are inadequate.	Set appropriate testing conditions of the image checker according to marked code type or character settings.
	Unnecessary objects are included in the captured image.	Do not place the code symbols or characters other than the image checking target in the imaging range.
	When PV230 is used: Settings of the total judgement are inadequate.	• For code checking, confirm the settings of the code reader checker of PV230. • For character checking, confirm the settings of the OCR checker of PV230. • Confirm the expression of the numeric calculation in the total judgement.
	When PV230 is used: No settings in the character dictionary of PV230.	To use the character recognition function, set the dictionary of PV230 for each marking character beforehand.
	Ghost image of fumes (smoke) occurring during marking is taken in the shooting range.	• Install a dust collector to get rid of fumes (smoke). • Check that the dust collector works well.

Troubles	Causes	Measures
Marking disorder.	Since the work feeding and marking start/end timing are inadequate when TIMING IN signal is used, the vibration affects marking.	Turn TIMING IN signal ON after workpiece is fully stopped.
		To feed works after marking, check that TIMING WAIT OUT is turned ON and start feeding works.

■ Built-in camera (LP-ZV series only)

Troubles	Causes	Measures
The camera does not display.	Incorrect connection of USB cable for camera display.	Connect the USB port on the rear of the laser head to your PC with a USB cable.
	Though connect the cable with a USB hub, the power supply is insufficient.	• Connect your PC to the laser marker without using a USB hub. • When you use a USB hub, use a product with a power supply (self-powered USB hub).
Workpiece is not displayed properly.	When the material of the workpiece is metal or glossy: Settings of the lighting and the camera are inadequate.	• Change the brightness of the lighting. • Turn off “Auto-exposure“ and adjust “Gain“ and “Exposure time“.
	The installation position and angle of the workpiece are inadequate for the lighting direction.	• Change the workpiece position. • If the workpiece is a metal of other glossy material and lighting is reflected on it, change the angle of the workpiece position. • Change the brightness of the lighting. • Turn off “Auto-exposure“ and adjust “Gain“ and “Exposure time“.
The size of the workpiece taken by the camera is incorrect.	Settings of “Z-movement of camera [mm]” is inadequate.	Measure the work distance and enter the value of the difference from the base position. Enter a positive value to reduce the work distance and a negative value to increase the work distance.

■ Operation by touch panel console / monitor (LP-RH/LP-ZV series only)

Troubles	Causes	Measures
Touch panel console or monitor shows nothing.	Laser marker has not been started.	Start-up the laser marker with the touch panel console or monitor connected.
	Incorrect connection of the touch panel console/monitor.	• When you use the touch panel console: connect the cable of the touch panel console to the CONSOLE connector on the front of the controller. • When you use the monitor: connect the cable of the monitor to the VGA connector on the rear of the controller. The available input terminal of the monitor is only VGA terminal with this product.
	The expansion board is not installed or incorrectly installed to the controller.	• When you use the touch panel console or monitor, you need to install the optional expansion board LP-AEB10 to the controller of the laser marker. • Make sure that the cables inside the controller are connected to the expansion board correctly.
	Online connection between Laser Marker NAVI smart and the laser marker is established.	You cannot operate the touch panel console/monitor while the Laser Marker NAVI smart is online connected to the laser marker.
	When you use the monitor: Monitor is not turned on.	Check power supply of the monitor.
Mouse does not respond.	The mouse is connected to the USB hub.	Connect the USB mouse to the laser marker controller directly without USB hub.
	The mouse type is not supported by the laser marker.	Use the USB mouse with Human interface device (HID) class.
USB flash drive cannot be recognized.	The USB flash drive type is not supported by the laser marker.	You cannot use the USB flash drive with security functions.
	The file system selected when formatting the USB flash drive is not appropriate.	Use a USB flash drive formatted with FAT32 or exFAT.
	The connector of the USB flash drivel is not clean.	Clean the connector of the USB flash drive.
	The USB flash drive is connected to the USB hub.	Connect the USB flash drive to the laser marker controller directly without USB hub.
	The expansion board is not installed to the controller.	The USB flash drive can be used only when operating with the touch panel console or monitor. When you use the touch panel console or monitor, you need to install the optional expansion board LP-AEB10 to the controller of the laser marker.

Troubles	Causes	Measures
Version error appears on the touch panel console or monitor.	Incorrect firmware version combination of controller and expansion board.	Update the firmware of your laser marking system. Download the software package Laser Marker Firmware Updater from the following Web site: https://industry.panasonic.com/global/en/downloads/?tab=software In “Download Center” > “Software”, use the “Part Number Search” with your laser marking system series name, like LP-ZV, to find the relevant software.

What to do if an error occurs

An error may be generated depending on laser marker operation or laser marker status.
The status display section of Laser Marker NAVI smart displays the code of the generated error.
The maintenance screen shows the error history. In the case of an LP-GS, error code is displayed on the head display panel. In the case of an LP-RC/RF/RV, error code is indicated on the display panel on the controller front panel.
Errors can be divided into alarm and warning depending on error types.
When an alarm is generated, Y15 (ALARM OUT) on the I/O terminal block turns ON. When a warning is generated, Y14 (WARNING OUT) on the I/O terminal turns ON.
This chapter describes the details and measures of errors.

Alarm: E001 - E599

Errors that occur when highly emergent safety function is activated or there is any abnormality in laser marker are output as alarm.
When an alarm occurs, the laser supply (laser pumping) is turned OFF, and the laser radiation is stopped if during the lasing process.

■ Release method of alarm

1. Remove a cause of alarm and confirm the safety. (Any alarms due to hardware's problem cannot be released.)
2. For error codes E400 to E599, use any of the following means to input the alarm reset.
   - Click the confirmation button in the error dialog on the configuration software Laser Marker NAVI smart screen.
   - Turn ON ALARM RESET IN (X15) on the I/O terminal block.
   - Transmit the communication command for the alarm reset (ARS).

   For the alarms you are unable to reset such as the ones caused by hardware or system error, restart the laser marker.
3. If any alarm occurs during marking of files that use the counter, check the counter value before resuming marking.

ERROR CODE	Description	Measures *1
E001 - E038 E045 - E058 E060 - E094 E101 - E138 E145 - E158 E160 - E194 E202 E208 - E214 E218 - E219 E223 - E224 E230 E245 - E248 E300 - E380	An error has occurred to the internal system of the laser marker.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E039 E044 E139 E144	• Incorrect model combination of laser marking system. • Incorrect connection of signal cable or unit power cable.	• For LP-GS/RC/RH/RF series, make sure the correct model numbers of laser head and controller have been connected. • For LP-RV/ZV series, make sure the correct model numbers of laser head, oscillator unit and controller have been connected. Connect the oscillator unit correctly to the laser head and controller. • Check the connection of the cable and various signal lines, and then restart the laser marker.

ERROR CODE	Description	Measures *1
E040 - E043 E140 - E143 E221 - E222 E240 - E243	• Incorrect connection of signal cable or unit power cable. • An error has occurred to the internal system of the laser marker.	• Check the connection of the cable and various signal lines, and then restart the laser marker. For LP-GS/RC/RH/RF series, check the connection between laser head and controller. For LP-RV/ZV series, check the connection between laser head and oscillator unit and between oscillator unit and controller. • Replace the cable.
E059 *4, *6 E159 *4, *6 E231 - E236 *4, *6	Network unit error.	Check if the optional network unit is installed to the controller correctly.
E200 - E201 *2	INTERLOCK safety relay is out of order.	Contact our sales office or representatives.
E205 - E207	• Abnormality occurs on the internal shutter. • Signal cable is not connected properly.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E216 - E217 *5, *6	An error occurred in the controller fan.	• Clean the air intake and exhaust port and fan located at the air cooling area of the controller. • If the air filter is contaminated, replace it. • Replace the fan.
E220	Laser head housing is open.	Contact our sales office or representatives.
E225 *4	Fiber unit is detached.	Install the fiber unit properly by following the procedures described in the “Setup/Maintenance Guide”.
E226-E229 *6	An error occurred in the head fan.	• Clean the air intake and exhaust port located at the air cooling area of the head. • If the air filter is contaminated, replace it. • If it happens again, contact our service center or sales offices.
E237 *5, *6	An expansion board error occurred.	Check if the optional expansion board is installed to the controller correctly.
E250 - E255 E260 - E261 E264 - E265	• An error has occurred to the laser oscillator. • A power supply voltage error was detected in the laser oscillator. • Incorrect connection of signal cable or unit power cable.	• Check and correct the power status. • Check if the AC power line is affected by noise. • Check the connection of the cable and various signal lines, and then restart the laser marker. • For LP-RC series: Check if the ambient temperature of the laser marker is not exceeding the range of its specification.

ERROR CODE	Description	Measures *1
E262 *4	Temperature error in laser oscillator.	• Check if the ambient temperature of the laser marker is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the air-cooling part such as fan and filter. • When not recovered, contact our sales office or representatives.
E263 *4	Detected unintended irradiation.	Contact our sales office or representatives.
E266 *5	Power monitor error.	Contact our sales office or representatives.
E270 - E275 E277 E280 - E285 E287	• An error has occurred to the galvano scanner of the head. • Incorrect connection of signal cable or unit power cable.	• Check and correct the power status. • Check if the AC power line is affected by noise. • Check the connection of the cable and various signal lines, and then restart the laser marker.
E276 *2 E286 *2	Marking data are too detailed for the scan speed configured.	Decrease the scan speed.
E290 - E291 *2 E292 *2, *5	An error has occurred to the Z-axis adjustment module.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E400	INTERLOCK 1 of the I/O terminal block was released.	• Connect INTERLOCK terminals on the I/O terminal block. • Check the status of the safety equipment connected to INTERLOCK terminal. • Confirm operation logic of connection device. • If you want to deactivate this alarm when the shutter is closed, set “Deactivate while shutter closed” in “System settings” > “Operation/ information” > “INTERLOCK alarm detection”. • For LP-RC/RH/RF/RV/ZV series: If the error cannot be solved even with the proper connection of INTERLOCK terminals, replace the contactor for INTERLOCK by following the procedures described in the “Setup/Maintenance Guide”.
E401	INTERLOCK 2 of the I/O terminal block was released.	
E402 E403 E501	LASER STOP IN of the I/O terminal block was released.	• Connect the LASER STOP IN terminals of the I/O terminal block. • Check the status of the safety equipment connected to the LASER STOP IN terminals. • Confirm operation logic of connection device. • Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively.

ERROR CODE	Description	Measures *1
E404 E502	The stop laser button of the configuration software was pressed.	• Solve the safety problem. Then select “Reset” in the error dialog in Laser Marker NAVI smart to finish the laser stop status. • For LP-RH/ZV if you use the optional touch panel console or monitor, solve the safety problem then select “Reset” on its screen.
E405 *3, *4, *6 E503 *3, *4, *6	REMOTE INTERLOCK IN is open.	• Connect REMOTE INTERLOCK IN of the I/O terminal block. • Check the status of the safety equipment connected to REMOTE INTERLOCK IN terminal. • Confirm operation logic of connection device. • Connect the internal or external power supply to IN COM.1 and OUT COM.1 in the I/O terminal respectively. • If you want to deactivate this alarm when the shutter is closed, set “Deactivate while shutter closed” in “System settings” > “Operation/ information” > “INTERLOCK alarm detection”.
E410	Laser pumping was stopped during the marking process.	• Start marking after laser pumping has completed. • Check the procedures and operation logic of laser pumping and trigger input control. • Check wiring of I/O or communication port to the external control devices. • Check the switch or the sensor connected to TRIGGER IN of I/O terminal operates properly without chattering.
E411 E500	The marking trigger signal or “Start marking” button was entered in the “laser pumping OFF” status.	
E450 - E453	• The date and time of the system clock may be out of synchronization. • For LP-GS/RC/RF/RV: the system clock battery power in the controller died. • Abnormality has occurred on the system clock in the controller.	• Check the system clock time and set it again. • For LP-GS/RC/RF/RV: replace the internal battery by following the “Replacement of Internal Controller Battery” in the “Setup/ Maintenance Guide”. • While laser marker power is on, you can use it after setting the system clock on the system settings screen. When the power is off, set the system clock again.
E460 *2	Temperature error in laser oscillator.	• Check if the ambient temperature of the laser marker is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the air-cooling part such as fan and filter. • When not recovered, contact our sales office or representatives.

ERROR CODE	Description	Measures *1
E505 - E509 E550 - E560 E572	Safety functions (INTERLOCK, LASER STOP, etc.) were activated during marking preparation.	• Reset the alarm for LASER STOP IN or INTERLOCK of the I/O terminal block or Stop laser button of Laser Marker NAVI smart software. • Check if the signal lines are affected by noise.
E520 - E522 E570	File data or system data were not saved successfully, because the laser marker was turned off while saving data. Unable to read the file data.	• Overwrite the data again to the selected file number. • Do not turn off the laser marker while saving the settings.
E530 - E542 E571		• Restore the backup file saved before to the laser marker. • Do not turn off the laser marker while saving the settings.

*1 : If the error persists after restart of the laser marker, contact our sales office or representatives.
*2 : Error that may occur for LP-GS series only.
*3 : Error that may occur for LP-RC series only.
*4 : Error that may occur for LP-RF, LP-RV and LP-ZV series only.
*5 : Error that may occur for LP-ZV series only.
*6 : Error that may occur for LP-RH series only.

Warning: E600 - E799

Errors that notify of that the setting data are incorrect or laser radiation conditions are not met are output as warnings. Marking cannot be started while any warning of E600 to E699 is active. Laser pumping maintains the state before the warning.

■ Release method of warning

1. Remove a cause of warning. If the setting is wrong, correct it.
2. In Remote mode, close the inner shutter or input the alarm reset.
   As the special case, the following errors will be released automatically.
   - E600: The warning is only output while the connection between the LASER STOP IN and OUT COM. 1 is opened and the warning is released when it is closed.
   - E710 - E711: The warning is output during marking and guide laser radiation (except guide pointer operation for LP-GS052) and it is released when these operations are finished.
   - E712 - E717: The warning is output while the cause of error occurs and it is released automatically when the cause is solved.
   - E750 - E783: After output of the warning for 3 seconds, the warning is released.
3. If any warning occurs during marking of files that use the counter, check the counter value before resuming marking.
4. To restart the laser marker operation, make sure that the warning output is turned on, and then open the internal shutter.

ERROR CODE	Description	Measures *1
E600	LASER STOP IN of the I/O terminal block was released.	• Connect the LASER STOP IN terminals of the I/O terminal block. • Check the status of the safety equipment connected to the LASER STOP IN terminals. • Confirm operation logic of connection device.
E601	No marking data were registered to the file specified.	Set marking data in the file and overwrite.
E603	No data for laser radiation available.	It is not possible to input TRIGGER IN for the file without valid marking data. Set “marking on” to more than one object and set its laser power correction other than 0%.
E604	No data for guide laser radiation available.	To show the masked objects by the guide laser, enable Guide laser display of the object settings.
E605 E606	The combination of Laser Marker NAVI smart's version and the laser marker model or version is wrong. The function set with Laser Marker NAVI smart cannot be used for this type of the laser marker.	Use the right version of Laser Marker NAVI smart corresponding to the laser marker model or version in use.
E607 *3, *4, *6	Unable to detect the line speed. Input of 2 sensors for line speed detection was wrong.	• Make sure the first sensor in moving direction is connected to ENCODER A IN and the second sensor is connected to ENCODER B IN of the I/O terminal. • Turn on ENCODER B IN within 10 seconds from the input of ENCODER A IN. • Input TRIGGER IN after turning on ENCODER B IN within the setting time before time-out error occurs.

ERROR CODE	Description	Measures *1
E608 E720	The counter value was reset to that prior to marking because the power was cut off during data marking including the counter.	• Check the current value of counter. • Do not turn off the power during marking.
E609 E721	The laser marker is turned off during saving of file data and setting. The marking data were not saved successfully.	• Check the file and the setting values. • Overwrite the file data. • Do not turn off the laser marker while saving the settings.
E610 - E613 E650	Marking data are out of range.	• Check the image display screen and adjust the data position and size located outside of the marking field. • Adjust the X-/Y-axis offset value of the system offset (system settings screen). (When the data located outside of the marking field is not displayed on the image display screen.) • If you use “Marking field calibration” in the system settings screen, change the setting values.
E614 - E615 *2 *5 E651 *2 *5	Existed marking data with its Z-position outside of marking field. (The LP-GSxxx-L type is excluded.)	• Adjust the Z-movement of the object group settings. • Adjust the Z-movement of the file settings. • Adjust the Z-axis offset value of the system offset (system settings screen). • For LP-ZV series, if you use the autofocus function, check the detected workpiece displacement value is correct.
E616 *3, *4, *6	Unable to detect the line speed. Input of the encoder for line speed detection was wrong.	• Confirm the correct input from the encoder to ENCODER A IN and ENCODER B IN of I/O terminal. • When only one phase of the encoder is used, connect the encoder signal to ENCODER A IN (X13) and connect ENCODER B IN (X14) to IN COM. 1 (X2). • Confirm the encoder input is less than 100kHz per phase.

E617 *3, *4, *6	Unable to follow the line speed.	• Decrease the line speed.
		• Set Lasing start boundary to the upward of the moving direction.
		• Reduce the marking time with the following measures.
		  • Increase the scan speed.
		  • Reduce the spacing between the characters.
		  • Reduce the character size, etc.

ERROR CODE	Description	Measures *1

E618 *3, *4, *6	The marking spacing is too small.	• When Trigger mode is set to Marking at regular intervals, set the larger value to Marking spacing.
		• When Trigger mode is set to Multiple triggers, take more time for the trigger input intervals.
		• Decrease the line speed.
		• Keep the laser start boundary away from the trigger detecting position.
		• When Trigger mode is set to Multiple triggers, check the switch or the sensor connected to TRIGGER IN of I/O terminal operates properly without chattering.
		• Reduce the marking time with the following measures.
		  • Increase the scan speed.
		  • Reduce the spacing between the characters.
		  • Reduce the character size.
		  • Set smaller value to the one-shot pulse duration of the I/O settings, etc.

E619 *3, *4, *6	On-the-fly marking is not possible with this trigger detecting position or lasing start boundary.	• Place the lasing start boundary downstream of the trigger detecting position. • Check the setting value of Workpiece reference boundary is correct.
E620 - E621	The link control between the laser marker and image checker has failed due to the error of the laser marker. Trigger processing terminated abnormally.	Check the connection of the cable and various signal lines, and then restart the laser marker.
E622	I/O connector TIMING IN was not input within the time specified using the link function with external devices. Trigger processing terminated abnormally.	• Input this to TIMING IN terminal within 60 seconds after the I/O connector timing waiting output (TIMING WAIT OUT) is turned ON. • Check the connection of TIMING IN terminal of I/O connector. • Check the connection with the external device. • Check the control procedure of the external control.
E623	Timing input is invalid. When the linkage function with external devices is used, TIMING IN terminal was input while the timing standby output (TIMING WAIT OUT) was OFF.	
E624	Unable to communicate with an image checker. Trigger processing terminated abnormally.	• Check the status of connection with the laser marker and the Ethernet ports of external devices. • Check the IP address, port number, connecting status of the laser marking system and image checker. • Check the status of the laser marker and external devices in link control. • Confirm if you set the type of the image checker correctly in the system settings screen and file settings of the marking settings screen of the laser marker.

ERROR CODE	Description	Measures *1
E625	No response from the image checker. Trigger processing terminated abnormally.	• Check the connecting status of the laser marking system and image checker. • Check if the reading process of the image checker was successful. • If you use PV230/PV200, set the total judgement.
E626	Settings mismatch between image checker and laser marking system. Trigger processing terminated abnormally.	• Check the settings of application, type number, and checker number. • Check the conformity of the Ethernet settings with the General communication of PV230/PV200 protocol.
E627	The link control between the laser marker and image checker has failed. No settings for code or character checking available.	• Verify “Object number to check” in file settings, and confirm if the number is the same with the object number you set in bar code/2D code settings or character settings. • For the code checking, confirm the code type and settings of bar code/2D code object in the marking data are consistent with the settings of the code reader. • For the character checking, check if the character type and number of characters in the marking data are supported by the image checker.

E628	Code reading failed when the code reading function is used for the link control with external devices.	• Check the status of external devices.
		• Improve the marking quality of the code.
		• To send the marking strings or to switch the files by using code reader, confirm the followings:
		  • Confirm no unavailable characters are in the code data.
		  • When using the data extraction function, confirm the data length in the code data matches the extraction settings.
		  • When you do not use the data extraction function, set the code data less than 299 digits.

E629	File switching by code reader has failed.	• Confirm the specified file number or name exactly corresponded to the settings in the laser marker. • To switch the file by the number, specify the number always with 4-digits in the code data. • If no settings in the specified file, set the marking data and save that file to the laser marker.
E630	TRIGGER IN turned off before the minimum number of scans was reached.	• Confirm the on/off control of the TRIGGER IN on the I/O terminal. • If TRIGGER IN turns on/off properly, change the setting value of Minimum number of scans of Trigger mode in File settings.
E631	Lasing stopped because the maximum number of scans was reached.	• Confirm the on/off control of the TRIGGER IN on the I/O terminal. • If TRIGGER IN turns on/off properly, change the setting value of Maximum number of scans of Trigger mode in File settings.

ERROR CODE	Description	Measures *1
E640 *3 E641 *3	Lasing operation/shutter open operation was cancelled due to a timeout after the laser start-up check. Try again. (Details: For the first operation of opening shutter or lasing after the laser pumping on, warning E640/E641 may occur and the requested operation is canceled in case the laser pumping has been off for more than several days and time for laser start-up check (maximum 30 seconds) is needed.)	• When operating with Laser Marker NAVI smart, retry to start test marking/laser radiation for measurement/run mode operation. • When operating in remote mode, close the shutter or input the alarm reset to recover from the warning status, and then retry opening the shutter or laser radiation for measurement.
E652	Font file data are incorrect. Unable to read the font file.	• Re-register font data on the data management screen. • Check the font data file format.
E653	Graphic file data are incorrect. Unable to read the graphic file.	• Re-register graphic data on the data management screen. • Check the graphic data file format.
E654	Font file is not registered to the font No. specified.	• Register the font file on the data management screen. • Using the character conditions, specify the font No. in which the font file is registered.
E655	Insufficient font memory. Font file data capacity is too large.	• Reduce the number of characters registered in the font file. • Delete unnecessary font files.
E656	The specified graphic file is not available.	• Add the graphic file in the “Data management” screen. • When creating a marking file using communication commands, if you prefer to ignore this warning for convenience in creation or control procedures, deselect the check box “Warning if no graphic file is specified” in “System settings” > “Advanced system settings”.
E657	No font corresponding to set characters were found.	• Change characters, or add the font data in use. • To use Japanese or Simplified Chinese characters, set “East Asian characters” in file settings.
E658	Too large number of characters.	• Decrease the number of characters. • Set the characters by separating them into several objects.
E659	Existed invalid character for bolding with setting.	• Original4 font cannot be displayed in bold. Select another font. • Use Font Maker software provided to create the proper pattern font.

ERROR CODE	Description	Measures *1
E660	Bold characters cannot be created due to the combination of set bold line width, character height, and character width.	• Set the bold line width to half or less of the character height or the character width, whichever is smaller. • When marking the bold character, set the comparison ratio between character height and width at 1/10 to 10.
E661	Insufficient marking memory. Marking data in the file are too large.	• Reduce the number of characters and segments in the graphic data. • Reduce the number of characters and start/end points of the graphic data. • Reduce the number of markings for Step & repeat. • Separate the long segment into short data.
E662	The number of Step & repeat marking exceeds the upper limit.	Reduce objects to be marked to 10000 or less.
E664	One or more functions that cannot be used together are set. The following combination of the functions are not available in one file. • Characters specified by SIN command and registered characters via I/O • Characters specified by SIN command and external offset with I/O • Registered characters via I/O and external offset function with “Using SEO command” • Link control with an image checker and “continuous trigger” of trigger mode • For LP-RC/RH/RF/RV/ZV series: Link control with an image checker and TARGET DETECTION IN • For LP-ZV series: Autofocus function and “continuous trigger” of trigger mode • For LP-ZV series: 3D marking and external offset with I/O • For LP-ZV series when the 3D marking is ON, the bar code/2D code objects cannot be used with the following settings: The shape of the 3D model is “Vertical cone” or “Sphere”. The shape of the 3D model is “Cylinder” or “Horizontal cone” and “Projection” is set for “Data mapping”.	Delete any one of these functions from the file.
E665	It contains character(s) that cannot be converted to 2D code.	• Set the character that can be converted into 2D code. • Change the mode of the code settings.
E666	• Unable to generate 2D code in the condition specified. • The number of 2D code characters is too large relative to the set conditions.	Check the code settings and the number of characters.

ERROR CODE	Description	Measures *1
E667	The specified 2D code filling pattern is not registered for the 2D code font (font number: 2D).	• Change the 2D code filling pattern. • Add the font data of the pattern used in the data management screen.
E668	The data includes a character that cannot be bar coded.	Set characters that can be bar-coded depending on the code type.
E669	• Unable to generate bar code in the condition specified. • The number of bar code characters is incorrect relative to the set conditions.	Check the code settings and the number of characters.
E670	The dimensions of the narrow element or the module width for the bar code are too small.	Specify the setting value for the narrow element or the module width larger than that of the “line width (calculation value)” specified in the object group settings.
E671	The quiet zone is not configured correctly at the bar code inversion mode settings.	Set the proper value for “Quiet/Narrow Ratio”.
E672	The settings for separator height ratio or row height ratio are too small.	• Correct the separator height ratio or the bar code height ratio so that the height is larger than the “line width (calculation value)” specified in the object group settings. • If you want to remove the separator, set 0 to the separator height ratio.
E673	Cannot create bar code due to the invalid number of characters for EAN/UPC/JAN code or GS1 DataBar.	Enter the prescribed number of characters according to the code type.
E674	The string containing “%” is not properly set.	• If the functional characters such as a counter and date/time are input, delete and re-enter characters after “%”. • To enter “%” as a character to mark, enter “%%”. • To enter “+” or “/” as a character to mark after the counter, enter “%+” or “%/”.
E678	The string No. specified by the SIN command is not acceptable because the No. has not been set in Laser Marker NAVI smart.	Specify the same No. set in “characters specified by SIN command” setting in Laser Marker NAVI smart to the string No. in SIN command data.
E679 *2, *3	Communication was interrupted. The adjustment value of power optimization by marking position could not apply to the laser marker.	• Set the adjustment value of power optimization by marking position and apply it to the laser marker again. • Do not turn off the power during the application processing. • Do not turn on the remote mode during the application processing.

ERROR CODE	Description	Measures *1
E680	Any of the following functions that are not available with the RUN mode ON are configured. • Registered characters via I/O • External offset (via I/O and SEO command) • Characters specified by SIN command • Link control with external image checkers	• To execute marking in the RUN mode, delete these functions from the marking data. • When you use these functions, control the laser marker in the remote mode.
E682 *3, *4, *6	Any of the following functions that are not available with on-the-fly marking are configured. • Link control with external image checkers • Overwriting interval • Skip marking of 2D code (module marking order) • Autofocus (LP-ZV series only) • Defocusing (LP-ZV series only) When the trigger mode is set to Marking at regular intervals or Multiple triggers, those functions are also not available. • Registered characters via I/O • External offset (via I/O and SEO command) • Characters specified by SIN command • Counter reset at date change	• To use on-the-fly marking, delete these functions from the marking file. • Some functions are available when Trigger mode of the on-the-fly settings is set to Single trigger.
E686	Any of the following functions that are not available with the seamless loop setting are configured. • Multiple objects • Object consisting of unclosed line(s) • Point radiation object • Step & repeat function	• Deactivate the seamless loop in the laser settings. • If you want to radiate laser continuously without any break, set the closed line by setting the start and end points in the same position.
E687	The graphic object contains an invalid setting.	• Reduce the graphic size. The graphic width or height should be less than 999.999 mm. • If the “Graphic presets” is off, set on for “Adjustment of size and filling” in the graphic object settings and specify the graphic parameters in the “Marking settings” screen.
E688 *5	The workpiece displacement exceeds the permissible range.	• Check if the workpiece is in the proper position when detecting the displacement. • To avoid the measurement of the unintended height, specify “Upper limit of workpiece displacement [mm]” and “Lower limit of workpiece displacement [mm]” in File settings according to the height of your workpiece. • When you use the autofocus function with an external sensor: Check if the detecting position of the workpiece surface and the marking surface are consistent.
E689 *5	Unable to detect the workpiece displacement.	• Check if the displacement sensor can detect the height without problem. • Check if the displacement sensor operates without error. • Check if the trigger of the displacement sensor is input when the workpiece is in the correct position.

ERROR CODE	Description	Measures *1
E690 *5	The marking data is at an invalid position.	Check the 3D settings and move the marking data on the 3D model to the position where the laser beam can emit.
E691 *5	The 3D model contains an invalid setting.	• Check the all object groups in the marking file are assigned to the 3D model. • If the 3D model is vertical cone, check the value of the bottom diameter and the upper diameter are set correctly.
E692 *5, *6	There is marking data in a position that cannot be marked.	• When you use the 3D marking, check the 3D settings. • Adjust the data position (X/Y/Z) and size located outside of the marking field. • When you use the autofocus function, check the workpiece displacement. • If the marking position or marking data is changed by the external input function such as an external offset (via SEO command) or characters specified by SIN command, check whether the data fits in the marking field.
E699	Some setting fields contain an improper value.	• Overwrite the data again to the selected file number. • If the problem persists, save the backup file and contact our sales office or representatives.
E710 - E711 *2, *3	The head air-cooling fan has stopped.	• Refer to “Setup/Maintenance Guide” and clean the fan. • Check the connection status of the fan connector. • Replace the fan. • For LP-RC series, confirm the side covers of the head are installed properly.
E712 *5, *6	The power supply voltage exceeds the permissible range.	Check and correct the power status.
E715 *3	The temperature of the laser oscillator is high.	• Check if the ambient temperature of the laser marker is not exceeding the range of its specification. • Make sure air-cooling fan operates. • Remove the dust and contamination in the air intake and exhaust port, and clean the air-cooling part such as fan and filter.
E716 - E717 *5, *6	The rotation speed of the controller fan is decreasing.	• Clean the air intake and exhaust port and fan located at the air cooling area of the controller. • If the air filter is contaminated, replace it. • Replace the fan.
E726-E729 *6	The rotation speed of the head fan is decreasing.	• Clean the air intake and exhaust located at the air cooling area of the head. • If the air filter is contaminated, replace it. • If it happens again, contact our service center or sales offices.

ERROR CODE	Description	Measures *1
E750	Invalid trigger signal. TRIGGER IN was input during trigger processing.	• Turn ON TRIGGER IN after confirming READY OUT is ON. • Do not input the marking trigger while PROCESSING OUT is ON. • Check the switch or the sensor connected to TRIGGER IN of I/O terminal operates properly without chattering. • Check wiring of I/O or communication port to the external control devices.
E751	Invalid trigger signal. TRIGGER IN was input while READY OUT is OFF.	
E752 *3, *4, *6	TARGET DETECTION IN did not turn ON during the lasing process.	• Check the marking results before and after the error. • Check the connection and control method of the work detection sensor. • Set the work detection sensor position so that the sensor turns ON more than 1ms during marking. • When you do not use this function, set “Disable” at X7: TARGET DETECTION IN with Laser Marker NAVI smart system settings.
E760	• I/O connector terminal No. input was not set successfully. • Before setting completion (SET OK OUT) was output, the set input (SET IN) was input at least twice.	• Keep SET IN turned ON until SET OK OUT turns ON. • To input the No. input again, close the shutter and reset the previous data. • Check the connection with the external controller. • Check the control procedure of the external control.
E770	The connection between laser marker and your PC is disconnected. Unable to communicate with Laser Marker NAVI smart.	• Check the Ethernet or USB connection status. • For Bluetooth communication, check for any obstacles and distance between that and the laser marker. • Save files onto your PC local folder, and overwrite and save them when the connection gets back online.
E775	Unable to transmit the response data of MST command.	• When the marking interval is too short for transmission time of MST command, MST command is not available. In such case, check the marking completion by I/O. • Check the control procedure of the external control.
E780	Serial number mismatch.	• Make sure the connected laser marker components have the correct serial numbers. • For LP-GS/RC/RH series, it is recommended to connect the head and controller that have the same serial numbers. • For LP-RF/RV/ZV series, please connect the head, oscillator unit, and controller that have the same serial numbers. Connecting different combination may degrade the marking performance.

ERROR CODE	Description	Measures *1
E781	• Model number mismatch. • Incorrect connection of signal cable or unit power cable.	• Make sure the connected laser marker components have the correct model numbers. • For LP-GS series, it is recommended to connect the head and controller that have the same model numbers. If you combine the different models, the model number of the laser head is applied to the laser marking system. • Check the connection of the cable and various signal lines, and then restart the laser marker.
E782 *4, *6	GSD file version error.	Download the GSD file (XML file) compatible with the version number of the laser marker used and perform updating. If the GSD file version is incorrect, settings by your PLC cannot be imported to the laser marking system correctly.
E783 *5, *6	The version of the expansion board is incorrect.	Update the firmware of your laser marking system. Download the software package Laser Marker Firmware Updater from the following Web site: https://industry.panasonic.com/global/en/downloads/?tab=software In “Download Center” > “Software”, use the “Part Number Search” with your laser marking system series name, like LP-ZV, to find the relevant software.

*1 : If the error persists after restart of the laser marker, contact our sales office or representatives.
*2 : Error that may occur for LP-GS series only.
*3 : Error that may occur for LP-RC series only.
*4 : Error that may occur for LP-RF, LP-RV and LP-ZV series only.
*5 : Error that may occur for LP-ZV series only.
*6 : Error that may occur for LP-RH series only.

Character Code Table

ASCII Code

Use the ASCII Code shown below for the communication data.
The characters described with [ ] denote control code.

Top / Bottom	00	10	20	30	40	50	60	70
0	[NUL]	[DLE]	(SP)	0	@	P	(*1)	p
1	[SOH]	[DC1]	!	1	A	Q	a	q
2	[STX]	[DC2]	”	2	B	R	b	r
3	[ETX]	[DC3]	#	3	C	S	c	s
4	[EOT]	[DC4]	$	4	D	T	d	t
5	[ENQ]	[NAK]	%	5	E	U	e	u
6	[ACK]	[SYN]	&	6	F	V	f	v
7	[BEL]	[ETB]	’	7	G	W	g	w
8	[BS]	[CAN]	(	8	H	X	h	x
9	[HT]	[EM]	)	9	I	Y	i	y
A	[LF]	[SUB]	*	:	J	Z	j	z
B	[VT]	[ESC]	+	;	K	[	k	{
C	[FF]	[FS]	,	<	L	(*1)	l	|
D	[CR]	[GS]	−	=	M	]	m	}
E	[SO]	[RS]	.	>	N	^	n	(*1)
F	[SI]	[US]	/	?	O	_	o	[DEL]

*1 : Characters indicated with ASCII code 5C (HEX), 60 (HEX) and 7E (HEX) are defined by the settings in Laser Marker NAVI smart software. Select the desired characters in the “System settings” screen - “Operation/information” tab - “Advanced system settings”.

ASCII code	Selectable characters	Setting after LP-M/S/Z backup is converted
5C (HEX)	\ (Backslash) or ¥ (Yen sign)	¥ (Yen sign)
60 (HEX)	` (Grave accent) or ‘ (Left single quotation mark)	‘ (Left single quotation mark)
7E (HEX)	~ (Tilde) or ¯ (Overline)	¯ (Overline)

Reference

- When using the external device set by 2-byte, NUL00 (HEX) can be used. Please add NUL00 (HEX) before the start code or after end code.
- To input the control codes in the bar code/2D code data, use the following alternative codes.
  - The control codes EOT, FS, GS, RS, or US you can set with BBS or SIN command by using ASCII code. In this case, set the other characters by using ASCII code, too.
  - To include the control codes other than EOT, FS, GS, RS, or US in the strings, set the all control codes with BRS or SIN command by using these 2-byte alternate codes instead of ASCII code. In this case, set the other characters including alphanumeric by using shift-JIS code.

Command	Control code	Alternative code
BRS, SIN	NUL to US: 00 (HEX) to 1F (HEX)	F050 (HEX) to F06F (HEX)
	DEL: 7F (HEX)	F071 (HEX)
	FNC1	F072 (HEX)
BCS	FNC1	[GS]: 1D (HEX)

Shift JIS Code

■ Alphanumeric, symbols

	Shift JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Symbols	813F	2120			、	。	,	.	・	:	;	?	!	゛	°	´	`	¨
	814F	2130	^	￣	_	ヽ	ヾ	ゝ	ゞ	〃	仝	々	〆	〇	―	—	-	／
	815F	2140	＼	～	∥	|	…	‥	‘	’	“	”	(	)	〔	〕	[	]
	816F	2150	{	}	〈	〉	《	》	「	」	『	』	【	】	＋	－	±	×
	8180	2160	÷	＝	≠	＜	＞	≦	≧	∞	∴	♂	♀	°	′	″	℃	¥
	8190	2170	$	¢	£	%	#	&	*	@	§	☆	★	○	●	◎	◇	
	819E	2220		◆	□	■	△	▲	▽	▼	※	〒	→	←	↑	↓	=	
	81AE	2230											∈	∋	⊆	⊇	⊂	⊃
	81BE	2240	∪	∩									∧	∨	¬	⇒	⇔	∀
	81CE	2250	∃												∠	⊥	⌒	∂
	81DE	2260	∇	≡	≒	≪	≫	√	∽	∝	∵	∫	∬					
	81EE	2270			Å	‰	♯	♭	♪	†	‡	¶						
Alphanumeric	824F	2330	0	1	2	3	4	5	6	7	8	9						
	825F	2340		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	826F	2350	P	Q	R	S	T	U	V	W	X	Y	Z					
	8280	2360		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	8290	2370	p	q	r	s	t	u	v	w	x	y	z					

* JIS code “2121” is a blank character (space), and any characters are not registered into the blank.

* The following symbols are registered in white.

Shift JIS	JIS	Symbols
8179	215A	【
817A	215B	】
819A	217A	★
819C	217C	●
819F	2221	◆
81A1	2223	■
81A3	2225	▲
81A5	2227	▼
81AC	222E	=

■ User-defined character font

The character which can be registered as a user-defined character is 50 kinds to 8121-8152 of JIS code.
In the pre-installed font, the following symbols are registered in JIS code 8121 to 8122.

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F13F	8120		□ U1	□ U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	U13	U14	U15
F14F	8130	U16	U17	U18	U19	U20	U21	U22	U23	U24	U25	U26	U27	U28	U29	U30	U31
F15F	8140	U32	U33	U34	U35	U36	U37	U38	U39	U40	U41	U42	U43	U44	U45	U46	U47
F16F	8150	U48	U49	U50													

■ JIS 第一水準文字 / Japanese characters of JIS level-1

JIS X 0208:1997

	Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
平仮名 Hiragana	829E	2420		ぁ	あ	ぃ	い	ぅ	う	ぇ	え	ぉ	お	か	が	き	ぎ	く
	82AE	2430	ぐ	け	げ	こ	ご	さ	ざ	し	じ	す	ず	せ	ぜ	そ	ぞ	た
	82BE	2440	だ	ち	ぢ	っ	つ	づ	て	で	と	ど	な	に	ぬ	ね	の	は
	82CE	2450	ば	ぱ	ひ	び	ぴ	ふ	ぶ	ぷ	へ	べ	ぺ	ほ	ぼ	ぽ	ま	み
	82DE	2460	む	め	も	ゃ	や	ゅ	ゆ	ょ	よ	ら	り	る	れ	ろ	ゎ	わ
	82EE	2470	ゐ	ゑ	を	ん												
片仮名 Katakana	833F	2520		ァ	ア	ィ	イ	ゥ	ウ	ェ	エ	ォ	オ	カ	ガ	キ	ギ	ク
	834F	2530	グ	ケ	ゲ	コ	ゴ	サ	ザ	シ	ジ	ス	ズ	セ	ゼ	ソ	ゾ	タ
	835F	2540	ダ	チ	ヂ	ッ	ツ	ヅ	テ	デ	ト	ド	ナ	ニ	ヌ	ネ	ノ	ハ
	836F	2550	バ	パ	ヒ	ビ	ピ	フ	ブ	プ	ヘ	ベ	ペ	ホ	ボ	ポ	マ	ミ
	8380	2560	ム	メ	モ	ャ	ヤ	ュ	ユ	ョ	ヨ	ラ	リ	ル	レ	ロ	ヮ	ワ
	8390	2570	ヰ	ヱ	ヲ	ン	ヴ	ヵ	ヶ									
ギリシア文字 Greek characters	839E	2620		Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο
	83AE	2630	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω							
	83BE	2640		α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	ο
	83CE	2650	π	ρ	σ	τ	υ	φ	χ	ψ	ω							
ロシア文字 Russian characters	843F	2720		А	Б	В	Г	Д	Е	Ё	Ж	З	И	Й	К	Л	М	Н
	844F	2730	О	П	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э
	845F	2740	Ю	Я														
	846F	2750		а	б	в	г	д	е	ё	ж	з	и	й	к	л	м	н
	8480	2760	о	п	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э
	8490	2770	ю	я														
あ	889E	3020		亜	唖	娃	阿	哀	愛	挨	姶	逢	葵	茜	穐	悪	握	渥
	88AE	3030	旭	葦	芦	鯵	梓	圧	斡	扱	宛	姐	虻	飴	絢	綾	鮎	或
あ / い	88BE	3040	粟	袷	安	庵	按	暗	案	闇	鞍	杏	以	伊	位	依	偉	囲
い	88CE	3050	夷	委	威	尉	惟	意	慰	易	椅	為	畏	異	移	維	緯	胃
	88DE	3060	萎	衣	謂	違	遺	医	井	亥	域	育	郁	磯	一	壱	溢	逸
	88EE	3070	稲	茨	芋	鰯	允	印	咽	員	因	姻	引	飲	淫	胤	蔭	
い / う	893F	3120		院	陰	隠	韻	吋	右	宇	烏	羽	迂	雨	卯	鵜	窺	丑
う	894F	3130	碓	臼	渦	嘘	唄	欝	蔚	鰻	姥	厩	浦	瓜	閏	噂	云	運
う / え	895F	3140	雲	荏	餌	叡	営	嬰	影	映	曳	栄	永	泳	洩	瑛	盈	穎
え	896F	3150	頴	英	衛	詠	鋭	液	疫	益	駅	悦	謁	越	閲	榎	厭	円
	8980	3160	園	堰	奄	宴	延	怨	掩	援	沿	演	炎	焔	煙	燕	猿	縁
え / お	8990	3170	艶	苑	薗	遠	鉛	鴛	塩	於	汚	甥	凹	央	奥	往	応	
お	899E	3220		押	旺	横	欧	殴	王	翁	襖	鴬	鴎	黄	岡	沖	荻	億
お / か	89AE	3230	屋	憶	臆	桶	牡	乙	俺	卸	恩	温	穏	音	下	化	仮	何
か	89BE	3240	伽	価	佳	加	可	嘉	夏	嫁	家	寡	科	暇	果	架	歌	河
	89CE	3250	火	珂	禍	禾	稼	箇	花	苛	茄	荷	華	菓	蝦	課	嘩	貨
	89DE	3260	迦	過	霞	蚊	俄	峨	我	牙	画	臥	芽	蛾	賀	雅	餓	駕
	89EE	3270	介	会	解	回	塊	壊	廻	快	怪	悔	恢	懐	戒	拐	改	
	8A3F	3320		魁	晦	械	海	灰	界	皆	絵	芥	蟹	開	階	貝	凱	劾
	8A4F	3330	外	咳	害	崖	慨	概	涯	碍	蓋	街	該	鎧	骸	浬	馨	蛙
	8A5F	3340	垣	柿	蛎	鈎	劃	嚇	各	廓	拡	撹	格	核	殻	獲	確	穫
	8A6F	3350	覚	角	赫	較	郭	閣	隔	革	学	岳	楽	額	顎	掛	笠	樫
	8A80	3360	橿	梶	鰍	潟	割	喝	恰	括	活	渇	滑	葛	褐	轄	且	鰹
	8A90	3370	叶	椛	樺	鞄	株	兜	竈	蒲	釜	鎌	噛	鴨	栢	茅	萱	
	8A9E	3420		粥	刈	苅	瓦	乾	侃	冠	寒	刊	勘	勧	巻	喚	堪	姦

	Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
か	8AAE	3430	完	官	寛	干	幹	患	感	慣	憾	換	敢	柑	桓	棺	款	歓
	8ABE	3440	汗	漢	澗	潅	環	甘	監	看	竿	管	簡	緩	缶	翰	肝	艦
	8ACE	3450	莞	観	諌	貫	還	鑑	間	閑	関	陥	韓	館	舘	丸	含	岸
か / き	8ADE	3460	巌	玩	癌	眼	岩	翫	贋	雁	頑	顔	願	企	伎	危	喜	器
き	8AEE	3470	基	奇	嬉	寄	岐	希	幾	忌	揮	机	旗	既	期	棋	棄	
	8B3F	3520		機	帰	毅	気	汽	畿	祈	季	稀	紀	徽	規	記	貴	起
	8B4F	3530	軌	輝	飢	騎	鬼	亀	偽	儀	妓	宜	戯	技	擬	欺	犠	疑
	8B5F	3540	祇	義	蟻	誼	議	掬	菊	鞠	吉	吃	喫	桔	橘	詰	砧	杵
	8B6F	3550	黍	却	客	脚	虐	逆	丘	久	仇	休	及	吸	宮	弓	急	救
	8B80	3560	朽	求	汲	泣	灸	球	究	窮	笈	級	糾	給	旧	牛	去	居
	8B90	3570	巨	拒	拠	挙	渠	虚	許	距	鋸	漁	禦	魚	亨	享	京	
	8B9E	3620		供	侠	僑	兇	競	共	凶	協	匡	卿	叫	喬	境	峡	強
	8BAE	3630	彊	怯	恐	恭	挟	教	橋	況	狂	狭	矯	胸	脅	興	蕎	郷
	8BBE	3640	鏡	響	饗	驚	仰	凝	尭	暁	業	局	曲	極	玉	桐	粁	僅
	8BCE	3650	勤	均	巾	錦	斤	欣	欽	琴	禁	禽	筋	緊	芹	菌	衿	襟
き / く	8BDE	3660	謹	近	金	吟	銀	九	倶	句	区	狗	玖	矩	苦	躯	駆	駈
く	8BEE	3670	駒	具	愚	虞	喰	空	偶	寓	遇	隅	串	櫛	釧	屑	屈	
	8C3F	3720		掘	窟	沓	靴	轡	窪	熊	隈	粂	栗	繰	桑	鍬	勲	君
く / け	8C4F	3730	薫	訓	群	軍	郡	卦	袈	祁	係	傾	刑	兄	啓	圭	珪	型
け	8C5F	3740	契	形	径	恵	慶	慧	憩	掲	携	敬	景	桂	渓	畦	稽	系
	8C6F	3750	経	継	繋	罫	茎	荊	蛍	計	詣	警	軽	頚	鶏	芸	迎	鯨
	8C80	3760	劇	戟	撃	激	隙	桁	傑	欠	決	潔	穴	結	血	訣	月	件
	8C90	3770	倹	倦	健	兼	券	剣	喧	圏	堅	嫌	建	憲	懸	拳	捲	
	8C9E	3820		検	権	牽	犬	献	研	硯	絹	県	肩	見	謙	賢	軒	遣
	8CAE	3830	鍵	険	顕	験	鹸	元	原	厳	幻	弦	減	源	玄	現	絃	舷
け / こ	8CBE	3840	言	諺	限	乎	個	古	呼	固	姑	孤	己	庫	弧	戸	故	枯
こ	8CCE	3850	湖	狐	糊	袴	股	胡	菰	虎	誇	跨	鈷	雇	顧	鼓	五	互
	8CDE	3860	伍	午	呉	吾	娯	後	御	悟	梧	檎	瑚	碁	語	誤	護	醐
	8CEE	3870	乞	鯉	交	佼	侯	候	倖	光	公	功	効	勾	厚	口	向	
	8D3F	3920		后	喉	坑	垢	好	孔	孝	宏	工	巧	巷	幸	広	庚	康
	8D4F	3930	弘	恒	慌	抗	拘	控	攻	昂	晃	更	杭	校	梗	構	江	洪
	8D5E	3940	浩	港	溝	甲	皇	硬	稿	糠	紅	紘	絞	綱	耕	考	肯	肱
	8D6F	3950	腔	膏	航	荒	行	衡	講	貢	購	郊	酵	鉱	砿	鋼	閤	降
	8D80	3960	項	香	高	鴻	剛	劫	号	合	壕	拷	濠	豪	轟	麹	克	刻
	8D90	3970	告	国	穀	酷	鵠	黒	獄	漉	腰	甑	忽	惚	骨	狛	込	
	8D9E	3A20		此	頃	今	困	坤	墾	婚	恨	懇	昏	昆	根	梱	混	痕
こ / さ	8DAE	3A30	紺	艮	魂	些	佐	叉	唆	嵯	左	差	査	沙	瑳	砂	詐	鎖
さ	8DBE	3A40	裟	坐	座	挫	債	催	再	最	哉	塞	妻	宰	彩	才	採	栽
	8DCE	3A50	歳	済	災	采	犀	砕	砦	祭	斎	細	菜	裁	載	際	剤	在
	8DDE	3A60	材	罪	財	冴	坂	阪	堺	榊	肴	咲	崎	埼	碕	鷺	作	削
	8DEE	3A70	咋	搾	昨	朔	柵	窄	策	索	錯	桜	鮭	笹	匙	冊	刷	
	8E3F	3B20		察	挿	撮	擦	札	殺	薩	雑	皐	鯖	捌	錆	鮫	皿	晒
	8E4F	3B30	三	傘	参	山	惨	撒	散	桟	燦	珊	産	算	纂	蚕	讃	賛
さ / し	8E5F	3B40	酸	餐	斬	暫	残	仕	仔	伺	使	刺	司	史	嗣	四	士	始
し	8E6F	3B50	姉	姿	子	屍	市	師	志	思	指	支	孜	斯	施	旨	枝	止
	8E80	3B60	死	氏	獅	祉	私	糸	紙	紫	肢	脂	至	視	詞	詩	試	誌
	8E90	3B70	諮	資	賜	雌	飼	歯	事	似	侍	児	字	寺	慈	持	時	
	8E9E	3C20		次	滋	治	爾	璽	痔	磁	示	而	耳	自	蒔	辞	汐	鹿
	8EAE	3C30	式	識	鴫	竺	軸	宍	雫	七	叱	執	失	嫉	室	悉	湿	漆
	8EBE	3C40	疾	質	実	蔀	篠	偲	柴	芝	屡	蕊	縞	舎	写	射	捨	赦

	Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	8ECE	3C50	斜	煮	社	紗	者	謝	車	遮	蛇	邪	借	勺	尺	杓	灼	爵
	8EDE	3C60	酌	釈	錫	若	寂	弱	惹	主	取	守	手	朱	殊	狩	珠	種
	8EEE	3C70	腫	趣	酒	首	儒	受	呪	寿	授	樹	綬	需	囚	収	周	
	8F3F	3D20		宗	就	州	修	愁	拾	洲	秀	秋	終	繍	習	臭	舟	蒐
	8F4F	3D30	衆	襲	讐	蹴	輯	週	酋	酬	集	醜	什	住	充	十	従	戎
	8F5F	3D40	柔	汁	渋	獣	縦	重	銃	叔	夙	宿	淑	祝	縮	粛	塾	熟
	8F6F	3D50	出	術	述	俊	峻	春	瞬	竣	舜	駿	准	循	旬	楯	殉	淳
	8F80	3D60	準	潤	盾	純	巡	遵	醇	順	処	初	所	暑	曙	渚	庶	緒
し	8F90	3D70	署	書	薯	藷	諸	助	叙	女	序	徐	恕	鋤	除	傷	償	
	8F9E	3E20		勝	匠	升	召	哨	商	唱	嘗	奨	妾	娼	宵	将	小	少
	8FAE	3E30	尚	庄	床	廠	彰	承	抄	招	掌	捷	昇	昌	昭	晶	松	梢
	8FBE	3E40	樟	樵	沼	消	渉	湘	焼	焦	照	症	省	硝	礁	祥	称	章
	8FCE	3E50	笑	粧	紹	肖	菖	蒋	蕉	衝	裳	訟	証	詔	詳	象	賞	醤
	8FDE	3E60	鉦	鍾	鐘	障	鞘	上	丈	丞	乗	冗	剰	城	場	壌	嬢	常
	8FEE	3E70	情	擾	条	杖	浄	状	畳	穣	蒸	譲	醸	錠	嘱	埴	飾	
	903F	3F20		拭	植	殖	燭	織	職	色	触	食	蝕	辱	尻	伸	信	侵
	904F	3F30	唇	娠	寝	審	心	慎	振	新	晋	森	榛	浸	深	申	疹	真
	905F	3F40	神	秦	紳	臣	芯	薪	親	診	身	辛	進	針	震	人	仁	刃
し / す	906F	3F50	塵	壬	尋	甚	尽	腎	訊	迅	陣	靭	笥	諏	須	酢	図	厨
す	9080	3F60	逗	吹	垂	帥	推	水	炊	睡	粋	翠	衰	遂	酔	錐	錘	随
	9090	3F70	瑞	髄	崇	嵩	数	枢	趨	雛	据	杉	椙	菅	頗	雀	裾	
す / せ	909E	4020		澄	摺	寸	世	瀬	畝	是	凄	制	勢	姓	征	性	成	政
	90AE	4030	整	星	晴	棲	栖	正	清	牲	生	盛	精	聖	声	製	西	誠
	90BE	4040	誓	請	逝	醒	青	静	斉	税	脆	隻	席	惜	戚	斥	昔	析
	90CE	4050	石	積	籍	績	脊	責	赤	跡	蹟	碩	切	拙	接	摂	折	設
せ	90DE	4060	窃	節	説	雪	絶	舌	蝉	仙	先	千	占	宣	専	尖	川	戦
	90EE	4070	扇	撰	栓	栴	泉	浅	洗	染	潜	煎	煽	旋	穿	箭	線	
	913F	4120		繊	羨	腺	舛	船	薦	詮	賤	践	選	遷	銭	銑	閃	鮮
せ / そ	914F	4130	前	善	漸	然	全	禅	繕	膳	糎	噌	塑	岨	措	曾	曽	楚
	915F	4140	狙	疏	疎	礎	祖	租	粗	素	組	蘇	訴	阻	遡	鼠	僧	創
	916F	4150	双	叢	倉	喪	壮	奏	爽	宋	層	匝	惣	想	捜	掃	挿	掻
そ	9180	4160	操	早	曹	巣	槍	槽	漕	燥	争	痩	相	窓	糟	総	綜	聡
	9190	4170	草	荘	葬	蒼	藻	装	走	送	遭	鎗	霜	騒	像	増	憎	
	919E	4220		臓	蔵	贈	造	促	側	則	即	息	捉	束	測	足	速	俗
そ / た	91AE	4230	属	賊	族	続	卒	袖	其	揃	存	孫	尊	損	村	遜	他	多
	91BE	4240	太	汰	詫	唾	堕	妥	惰	打	柁	舵	楕	陀	駄	騨	体	堆
	91CE	4250	対	耐	岱	帯	待	怠	態	戴	替	泰	滞	胎	腿	苔	袋	貸
た	91DE	4260	退	逮	隊	黛	鯛	代	台	大	第	醍	題	鷹	滝	瀧	卓	啄
	91EE	4270	宅	托	択	拓	沢	濯	琢	託	鐸	濁	諾	茸	凧	蛸	只	
	923F	4320		叩	但	達	辰	奪	脱	巽	竪	辿	棚	谷	狸	鱈	樽	誰
	924F	4330	丹	単	嘆	坦	担	探	旦	歎	淡	湛	炭	短	端	箪	綻	耽
た / ち	925F	4340	胆	蛋	誕	鍛	団	壇	弾	断	暖	檀	段	男	談	値	知	地
	926F	4350	弛	恥	智	池	痴	稚	置	致	蜘	遅	馳	築	畜	竹	筑	蓄
	9280	4360	逐	秩	窒	茶	嫡	着	中	仲	宙	忠	抽	昼	柱	注	虫	衷
ち	9290	4370	註	酎	鋳	駐	樗	瀦	猪	苧	著	貯	丁	兆	凋	喋	寵	
	929E	4420		帖	帳	庁	弔	張	彫	徴	懲	挑	暢	朝	潮	牒	町	眺
	92AE	4430	聴	脹	腸	蝶	調	諜	超	跳	銚	長	頂	鳥	勅	捗	直	朕
ち / つ	92BE	4440	沈	珍	賃	鎮	陳	津	墜	椎	槌	追	鎚	痛	通	塚	栂	掴
つ	92CE	4450	槻	佃	漬	柘	辻	蔦	綴	鍔	椿	潰	坪	壺	嬬	紬	爪	吊
つ / て	92DE	4460	釣	鶴	亭	低	停	偵	剃	貞	呈	堤	定	帝	底	庭	廷	弟

	Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	92EE	4470	悌	抵	挺	提	梯	汀	碇	禎	程	締	艇	訂	諦	蹄	逓	
て	933F	4520		邸	鄭	釘	鼎	泥	摘	擢	敵	滴	的	笛	適	鏑	溺	哲
	934F	4530	徹	撤	轍	迭	鉄	典	填	天	展	店	添	纏	甜	貼	転	顛
て / と	935F	4540	点	伝	殿	澱	田	電	兎	吐	堵	塗	妬	屠	徒	斗	杜	渡
	936F	4550	登	菟	賭	途	都	鍍	砥	砺	努	度	土	奴	怒	倒	党	冬
	9380	4560	凍	刀	唐	塔	塘	套	宕	島	嶋	悼	投	搭	東	桃	梼	棟
	9390	4570	盗	淘	湯	涛	灯	燈	当	痘	祷	等	答	筒	糖	統	到	
と	939E	4620		董	蕩	藤	討	謄	豆	踏	逃	透	鐙	陶	頭	騰	闘	働
	93AE	4630	動	同	堂	導	憧	撞	洞	瞳	童	胴	萄	道	銅	峠	鴇	匿
	93BE	4640	得	徳	涜	特	督	禿	篤	毒	独	読	栃	橡	凸	突	椴	届
	93CE	4650	鳶	苫	寅	酉	瀞	噸	屯	惇	敦	沌	豚	遁	頓	呑	曇	鈍
な	93DE	4660	奈	那	内	乍	凪	薙	謎	灘	捺	鍋	楢	馴	縄	畷	南	楠
な / に	93EE	4670	軟	難	汝	二	尼	弐	迩	匂	賑	肉	虹	廿	日	乳	入	
に / ぬ / ね	943F	4720		如	尿	韮	任	妊	忍	認	濡	禰	祢	寧	葱	猫	熱	年
ね / の	944F	4730	念	捻	撚	燃	粘	乃	廼	之	埜	嚢	悩	濃	納	能	脳	膿
の / は	945F	4740	農	覗	蚤	巴	把	播	覇	杷	波	派	琶	破	婆	罵	芭	馬
	946F	4750	俳	廃	拝	排	敗	杯	盃	牌	背	肺	輩	配	倍	培	媒	梅
	9480	4760	楳	煤	狽	買	売	賠	陪	這	蝿	秤	矧	萩	伯	剝	博	拍
	9490	4770	柏	泊	白	箔	粕	舶	薄	迫	曝	漠	爆	縛	莫	駁	麦	
は	949E	4820		函	箱	硲	箸	肇	筈	櫨	幡	肌	畑	畠	八	鉢	溌	発
	94AE	4830	醗	髪	伐	罰	抜	筏	閥	鳩	噺	塙	蛤	隼	伴	判	半	反
	94BE	4840	叛	帆	搬	斑	板	氾	汎	版	犯	班	畔	繁	般	藩	販	範
は / ひ	94CE	4850	釆	煩	頒	飯	挽	晩	番	盤	磐	蕃	蛮	匪	卑	否	妃	庇
	94DE	4860	彼	悲	扉	批	披	斐	比	泌	疲	皮	碑	秘	緋	罷	肥	被
	94EE	4870	誹	費	避	非	飛	樋	簸	備	尾	微	枇	毘	琵	眉	美	
ひ	953F	4920		鼻	柊	稗	匹	疋	髭	彦	膝	菱	肘	弼	必	畢	筆	逼
	954F	4930	桧	姫	媛	紐	百	謬	俵	彪	標	氷	漂	瓢	票	表	評	豹
	955F	4940	廟	描	病	秒	苗	錨	鋲	蒜	蛭	鰭	品	彬	斌	浜	瀕	貧
ひ / ふ	956F	4950	賓	頻	敏	瓶	不	付	埠	夫	婦	富	冨	布	府	怖	扶	敷
	9580	4960	斧	普	浮	父	符	腐	膚	芙	譜	負	賦	赴	阜	附	侮	撫
ふ	9590	4970	武	舞	葡	蕪	部	封	楓	風	葺	蕗	伏	副	復	幅	服	
	959E	4A20		福	腹	複	覆	淵	弗	払	沸	仏	物	鮒	分	吻	噴	墳
ふ / へ	95AE	4A30	憤	扮	焚	奮	粉	糞	紛	雰	文	聞	丙	併	兵	塀	幣	平
へ	95BE	4A40	弊	柄	並	蔽	閉	陛	米	頁	僻	壁	癖	碧	別	瞥	蔑	箆
へ / ほ	95CE	4A50	偏	変	片	篇	編	辺	返	遍	便	勉	娩	弁	鞭	保	舗	鋪
	95DE	4A60	圃	捕	歩	甫	補	輔	穂	募	墓	慕	戊	暮	母	簿	菩	倣
	95EE	4A70	俸	包	呆	報	奉	宝	峰	峯	崩	庖	抱	捧	放	方	朋	
	963F	4B20		法	泡	烹	砲	縫	胞	芳	萌	蓬	蜂	褒	訪	豊	邦	鋒
ほ	964F	4B30	飽	鳳	鵬	乏	亡	傍	剖	坊	妨	帽	忘	忙	房	暴	望	某
	965F	4B40	棒	冒	紡	肪	膨	謀	貌	貿	鉾	防	吠	頬	北	僕	卜	墨
	966F	4B50	撲	朴	牧	睦	穆	釦	勃	没	殆	堀	幌	奔	本	翻	凡	盆
	9680	4B60	摩	磨	魔	麻	埋	妹	昧	枚	毎	哩	槙	幕	膜	枕	鮪	柾
ま	9690	4B7O	鱒	桝	亦	俣	又	抹	末	沫	迄	侭	繭	麿	万	慢	満	
ま / み	969E	4C20		漫	蔓	味	未	魅	巳	箕	岬	密	蜜	湊	蓑	稔	脈	妙
み / む / め	96AE	4C30	粍	民	眠	務	夢	無	牟	矛	霧	鵡	椋	婿	娘	冥	名	命
め / も	96BE	4C40	明	盟	迷	銘	鳴	姪	牝	滅	免	棉	綿	緬	面	麺	摸	模
も	96CE	4C50	茂	妄	孟	毛	猛	盲	網	耗	蒙	儲	木	黙	目	杢	勿	餅
も / や	96DE	4C60	尤	戻	籾	貰	問	悶	紋	門	匁	也	冶	夜	爺	耶	野	弥
や / ゆ	96EE	4C70	矢	厄	役	約	薬	訳	躍	靖	柳	薮	鑓	愉	愈	油	癒	
ゆ	973F	4D20		諭	輸	唯	佑	優	勇	友	宥	幽	悠	憂	揖	有	柚	湧

	Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
ゆ / よ	974F	4D30	涌	猶	猷	由	祐	裕	誘	遊	邑	郵	雄	融	夕	予	余	与
よ	975F	4D40	誉	輿	預	傭	幼	妖	容	庸	揚	揺	擁	曜	楊	様	洋	溶
	976F	4D50	熔	用	窯	羊	耀	葉	蓉	要	謡	踊	遥	陽	養	慾	抑	欲
よ / ら	9780	4D60	沃	浴	翌	翼	淀	羅	螺	裸	来	莱	頼	雷	洛	絡	落	酪
ら / り	9790	4D70	乱	卵	嵐	欄	濫	藍	蘭	覧	利	吏	履	李	梨	理	璃	
り	979E	4E20		痢	裏	裡	里	離	陸	律	率	立	葎	掠	略	劉	流	溜
	97AE	4E30	琉	留	硫	粒	隆	竜	龍	侶	慮	旅	虜	了	亮	僚	両	凌
	97BE	4E40	寮	料	梁	涼	猟	療	瞭	稜	糧	良	諒	遼	量	陵	領	力
り / る	97CE	4E50	緑	倫	厘	林	淋	燐	琳	臨	輪	隣	鱗	麟	瑠	塁	涙	累
る / れ	97DE	4E60	類	令	伶	例	冷	励	嶺	怜	玲	礼	苓	鈴	隷	零	霊	麗
れ	97EE	4E70	齢	暦	歴	列	劣	烈	裂	廉	恋	憐	漣	煉	簾	練	聯	
れ / ろ	983F	4F20		蓮	連	錬	呂	魯	櫓	炉	賂	路	露	労	婁	廊	弄	朗
ろ	984F	4F30	楼	榔	浪	漏	牢	狼	篭	老	聾	蝋	郎	六	麓	禄	肋	録
ろ / わ	985F	4F40	論	倭	和	話	歪	賄	脇	惑	枠	鷲	亙	亘	鰐	詫	藁	蕨
わ	986F	4F50	椀	湾	碗	腕												

■ JIS 第二水準文字 / Japanese characters of JIS level-2

JIS X 0208:1997

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
989E	5020		弋	丐	丕	个	丱	丶	丼	丿	乂	乖	乘	亂	亅	豫	事
98AE	5030	舒	弍	于	亞	亟	亠	亢	亰	亳	亶	从	仍	仄	仆	仂	仗
98BE	5040	仞	伃	仟	价	伉	佚	估	佛	佝	佗	佇	佶	侈	侏	侘	佻
98CE	5050	佩	佰	侑	佯	來	侖	儘	俔	俟	俎	俘	俛	俑	俚	俐	俤
98DE	5060	俥	倚	倨	倔	倪	倥	倅	伜	俶	倡	倩	倬	俾	俯	們	倆
98EE	5070	偃	假	會	偕	偐	偈	做	俸	俺	偸	傀	傚	傅	傴	傲	
993F	5120		僉	僊	傳	僂	僖	僞	僥	僭	僣	僮	價	僵	儉	儁	儂
994F	5130	儖	儕	儔	儚	儡	儺	儷	儼	儻	儿	兀	兒	兌	兔	兢	競
995F	5140	兩	兪	兮	冀	冂	冏	册	冉	冏	冑	冓	冕	冖	冤	冠	冢
996F	5150	冩	冪	冫	决	冱	冲	冰	况	冽	凅	凉	凛	几	處	凩	凭
9980	5160	凰	凵	函	刃	刋	刔	刎	刧	刪	刮	刳	刹	剏	剄	剋	剌
9990	5170	剞	剔	剪	剴	剩	剳	剿	剽	劍	劒	劔	劔	劈	劑	辨	
999E	5220		辦	劬	劭	劼	劵	勁	勍	勗	勞	勣	勦	飭	勠	勳	勵
99AE	5230	勸	勹	匆	匈	甸	匍	匐	匏	匕	匚	匣	匯	匱	匳	匸	區
99BE	5240	卆	卅	卋	卉	卍	凖	卞	卩	卮	夘	卻	卷	厂	厖	厠	厦
99CE	5250	厥	厮	厰	厶	參	簒	雙	叟	曼	燮	叮	叨	叭	叺	吁	吽
99DE	5260	呀	听	吭	吼	吮	吶	吩	吝	呎	咏	呵	咎	咳	呱	呷	呰
99EE	5270	咒	呻	咀	呪	咄	咐	咆	哇	唘	咸	啀	咬	哄	哈	咨	
9A3F	5320		咫	哂	咤	咾	哽	哘	哥	哦	唏	唔	哽	哮	哭	哺	哢
9A4F	5330	唹	唯	唧	唾	售	啜	啅	啖	啗	唸	唳	唧	喙	喀	咯	喊
9A5F	5340	喟	啻	啾	喘	喞	單	啼	喃	喩	喇	喨	嗚	嗅	嗟	嗄	嗜
9A6F	5350	嗤	嗔	嘔	嗷	嘖	嗾	嗽	嘛	嗹	噎	噐	營	嘴	嘶	嘲	嘸
9A80	5360	噫	噤	噦	噬	噪	噤	噞	噱	噭	噠	噢	噸	噲	嚶	嚴	嚊
9A90	5370	嚼	嚆	嚥	嚮	嚶	嚴	嚀	嚊	口	囘	囹	圀	囿	圄	圉	圈
9A9E	5420		圈	國	圍	圓	團	圖	嗇	圜	圠	圻	坎	圻	址	坏
9AAE	5430	坩	垂	垈	坡	坿	垉	垓	垠	垳	垤	垪	垉	埃	埆	埔	埒
9ABE	5440	埒	埜	垉	埣	堋	堙	堝	塲	堡	塢	塋	塗	毀	塒	堲	塹
9ACE	5450	墅	墹	墟	墫	墺	壞	墻	墸	墮	壅	壓	壑	壗	壙	壘	壜
9ADE	5460	壡	壤	壟	壯	壺	壹	壻	壺	壽	夂	夊	夐	夛	梦	夥	夬
9AEE	5470	夭	本	夸	夾	竒	奕	奐	奎	奚	奘	奢	奠	奧	奬	奩	
9B3F	5520		奸	妁	妝	佞	佚	妣	妲	姆	姨	姜	妍	姙	姚	娥	娟
9B4F	5530	娑	娜	娉	娚	婀	娙	婉	娵	娶	婢	婪	媚	媼	媾	嫋	嫂
9B5F	5540	媽	嫣	嫗	嫦	嫩	嫖	嫺	嫻	嬌	嬋	嬖	嬲	嫐	嬪	嬶	嬾
9B6F	5550	孃	孅	孀	孑	孕	孚	孛	孥	孩	孰	孳	孵	學	斈	孺	宀
9B80	5560	它	宦	宸	寃	寇	寉	寔	寐	寤	實	寢	寞	寥	寫	寰	寶
9B90	5570	寳	尅	將	專	對	尓	尠	尢	尨	尸	尹	屁	屆	屎	屓	
9B9E	5620		屐	屏	孱	屬	屮	山	岑	屹	岌	岑	岔	妛	岫	岻	岼
9BAE	5630	岷	峅	峇	峩	峽	峺	峙	峩	峽	峺	峭	嶌	峪	崋	崕	崗
9BBE	5640	崙	崛	崑	崔	崢	崚	崙	崘	嵌	嵒	嵎	嵋	嵬	嵳	嵷	嶇
9BCE	5650	嶄	嶂	嶢	嶝	嶬	嶮	嶽	嶸	嵺	嶼	嶷	巍	巓	巒	巖	巛
9BDE	5660	巫	已	巵	帋	帚	帙	帑	帛	帶	帷	幄	幃	幀	幎	幗	幔
9BEE	5670	幟	幢	幣	幇	幵	并	幺	麼	广	庠	廁	廂	廈	廐	廏	
9C3F	5720		廖	廣	廝	廚	廛	廢	廡	廨	廩	廬	廱	廳	廰	廴	廸
9C4F	5730	廾	弃	弉	彝	彜	弋	弍	弖	弩	弭	弸	弼	彈	彌	彎	弯
9C5F	5740	彑	彖	彗	彙	彡	彭	彳	彷	徃	徂	彿	徊	很	徑	徇	從
9C6F	5750	徙	徘	徠	徨	徭	徼	忖	忻	忤	忸	忱	忝	悳	忿	怡	恠
9C80	5760	怙	怐	怩	怎	怱	怛	怕	怫	怦	怏	悵	悷	悖	悗	悩	悮

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
9C90	5770	協	恒	恍	恣	恃	恤	恂	恬	恫	恙	悁	悍	悧	悩	悴	
9C9E	5820		悄	悛	悖	悗	悃	悚	悋	惡	悸	惠	惓	悴	忰	悽	惆
9CAE	5830	悵	惘	慍	愕	愆	惶	惷	愀	惴	惺	愰	愾	惻	惱	愍	愎
9CBE	5840	慇	慊	慤	愧	慴	愿	愼	愬	愴	愽	慂	慄	慳	慷	慘	憖
9CCE	5850	慚	慫	慱	傷	慥	慱	慟	慝	慓	慵	憙	憖	憩	憬	憔	憚
9CDE	5860	憊	憑	憫	憮	懌	懊	應	懷	懈	懃	懆	憺	懋	罹	懍	懦
9CEE	5870	懣	懶	懺	懴	懿	懽	懼	攝	戀	戈	戉	戍	戌	戔	戛	
9D3F	5920		戞	戡	截	戮	戰	戲	戳	扁	扎	扞	扣	扛	扠	扨	扼
9D4F	5930	抂	抉	找	抒	抓	抖	拔	抃	抔	拗	拑	抻	挲	拿	拆	擔
9D5F	5940	拈	拜	拌	拊	拂	拇	抛	拉	挌	拮	拱	挧	挂	挈	拯	拵
9D6F	5950	捐	挾	捍	搜	捏	掖	掎	掀	掫	捶	掣	掏	掉	掟	掵	捫
9D80	5960	捩	掾	揩	揀	揆	揣	揉	插	揶	揄	搖	搴	搆	搓	搦	搶
9D90	5970	攝	搗	搦	搏	搉	摯	搶	摎	攪	撕	撓	撥	撩	撈	撼	
9D9E	5A20		據	擒	擅	擇	撻	擘	擂	擱	擧	舉	擠	擡	抬	擣	擯
9DAE	5A30	攬	擶	擴	擲	擺	攀	攅	攘	攜	攅	攤	攣	攫	攴	攵	攷
9DBE	5A40	收	攸	畋	效	敖	敕	敍	敘	敞	敝	敲	數	斂	斃	變	斛
9DCE	5A50	斟	斫	斷	旃	旆	旁	旄	旌	旒	旛	旙	无	旡	旱	杲	昊
9DDE	5A60	昃	昇	昉	昵	昶	昴	昜	晏	晄	晉	晁	晞	晝	晤	晧	晨
9DEE	5A70	晟	晢	晰	暃	暈	暎	暉	暄	暘	暝	曁	暹	曉	暾	暼	
9E3F	5B20		曄	暸	曖	曚	曠	昿	曦	曩	曰	曵	曷	朏	朖	朞	朦
9E4F	5B30	朧	霸	朮	朿	朶	杁	朸	杓	杏	杞	杠	杙	杣	杤	杼	杰
9E5F	5B40	杴	杼	杪	杤	方	杵	枒	枏	柯	枴	柬	枳	柩	枸	柤	
9E6F	5B50	柞	柝	柢	柮	枹	柎	柆	柧	檜	栞	框	栩	桀	桍	栲	桎
9E80	5B60	梳	栫	桙	档	桷	桿	梟	梏	梭	梔	條	梛	梃	檮	栜	桴
9E90	5B70	梵	梠	梹	桾	椁	梮	椁	棊	椥	棘	椢	椦	棡	椌	棍	
9E9E	5C20		棔	棧	棕	椶	椒	椄	棗	棣	椥	棹	棠	棯	椨	椪	椚
9EAE	5C30	椀	椥	棆	楹	楷	楜	楸	楫	楔	楾	楮	椹	楴	椽	楙	椰
9EBE	5C40	楡	楞	楝	榁	楪	榲	榮	槐	榿	槁	槓	榾	槎	寨	槊	榻
9ECE	5C50	榻	槃	榠	槞	槫	榠	榜	榕	榴	槍	榻	樂	樛	槿	權	槨
9EDE	5C60	槲	槧	樅	榱	樞	槭	樔	槫	樊	樒	櫁	槾	樓	橄	樌	橲
9EEE	5C70	橸	橚	橇	橢	橙	橦	橈	樸	樢	檐	檍	檠	檄	檢	檣	
9F3F	5D20		檗	蘗	檻	櫃	櫂	檸	檳	檬	櫺	櫑	櫟	櫪	欄	櫪	欅
9F4F	5D30	欟	蘗	櫺	欒	欖	鬱	欟	欽	歃	盜	欹	飮	歇	歃	歉	歐
9F5F	5D40	歙	歔	歛	歟	歡	歸	歹	歿	殀	殄	殃	殍	殘	殕	殞	殤
9F6F	5D50	殪	殫	殯	殲	殱	殳	殷	殼	毆	毋	毓	毟	毬	毫	毳	毯
9F80	5D60	麾	氈	氓	气	氛	氤	氣	汞	汕	汢	汪	沂	沍	沚	沁	沛
9F90	5D70	汾	汨	汳	沒	沐	泄	泱	泓	沽	泗	泅	泝	沮	沱	沾	
9F9E	5E20		泔	泛	泯	泙	泪	洩	衍	洶	洫	洽	洸	洙	洵	洳	洒
9FAE	5E30	洌	浣	涓	浤	浚	浹	浙	涎	涕	濤	涅	淹	渕	渊	涵	淇
9FBE	5E40	淦	涸	淆	淬	淞	淌	淨	淒	淅	淺	淙	淤	淶	淪	淮	渭
9FCE	5E50	湮	渟	渙	湲	湟	渾	渣	湫	湛	渌	淵	渟	湃	渺	湎	渤
9FDE	5E60	滿	渝	游	溂	溪	溘	滉	溷	滓	溽	溯	滄	溲	滔	滕	溏
9FEE	5E70	溥	滂	溟	潁	漑	灌	滬	滸	滾	漿	滲	漱	滯	漲	滌	
E03F	5F20		漾	漓	滷	澆	潺	潸	澁	澀	潯	潛	濳	潭	澂	潼	潘
E04F	5F30	澎	澑	濂	潦	澳	澣	澡	澤	澹	濆	澪	濟	濕	濬	濔	濘
E05F	5F40	濱	濮	濛	瀉	瀋	濺	瀑	濯	瀏	濾	瀛	瀚	瀦	瀝	瀘	瀟
E06F	5F50	瀰	瀾	瀲	灑	灣	炙	炒	炯	烱	炬	炸	炳	炮	烟	烋	烝
E080	5F60	烙	焉	烽	焜	焙	煥	煕	熙	煦	煢	煌	煖	煬	熏	燻	熄
E090	5F70	熕	熨	熬	燗	熹	熾	燒	燉	燔	燎	燠	燬	燧	燵	燼	
E09E	6020		燹	燿	爍	爐	爛	爨	爭	爬	爰	爲	爻	爼	爿	牀	牆

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E0AE	6030	牋	牘	牴	牾	犂	犁	犇	犒	犖	犢	犧	犹	狃	狆	狄	狎
E0BE	6040	狒	狢	狠	狡	狹	狷	倏	猗	猊	猜	猖	猝	猴	猯	猩	
E0CE	6050	猥	猾	獎	獏	默	獗	獪	獨	獰	獸	獵	獻	獺	珈	玳	珎
E0DE	6060	玻	珀	珥	珮	珞	璢	琅	瑯	琥	珸	琲	琺	瑕	琿	瑟	瑙
E0EE	6070	瑁	瑜	瑩	瑰	瑣	瑪	瑶	瑾	璋	璞	璧	瓊	瓏	瓔	珱	
E13F	6120		瓠	瓣	疋	疐	疼	皖	皙	皓	皴	皤	瓷	甄	甃	皸	甌	甎
E14F	6130	甍	甕	甓	甞	甦	甬	甼	畄	畤	畦	畉	畛	畚	畎	畤	
E15F	6140	畧	畫	畭	畸	當	疆	疇	畴	疊	疂	疔	疚	疝	疥	疣	
E16F	6150	痂	疳	痃	疵	疽	疸	疼	疱	痍	痊	痒	痙	痣	痞	痾	痿
E180	6160	痼	痰	痺	痲	痳	痲	瘋	瘍	瘉	瘟	瘧	瘠	瘡	瘢	瘤	瘴
E190	6170	瘰	瘻	癇	癈	癆	癘	癘	癡	癢	癨	癩	癪	癧	癬	癰	
E19E	6220		癲	癶	癸	發	皂	皃	皈	皋	皎	皖	皓	晢	皚	皰	皴
E1AE	6230	皸	皹	皺	盂	盍	盖	盒	盞	盡	盥	盧	盪	蘯	盼	眈	眇
E1BE	6240	眄	眩	眤	眞	眥	眦	眛	眷	眸	睇	睚	睨	睫	睛	睥	睿
E1CE	6250	睾	睹	瞎	瞋	瞑	瞠	瞞	瞰	瞶	瞹	瞿	瞼	瞽	瞻	矇	矍
E1DE	6260	矗	矚	矜	矣	矮	矼	砌	砒	礦	砠	礪	硅	碎	硼	碆	硼
E1EE	6270	碚	碌	碣	碵	碪	磑	磆	磋	磔	碾	碼	磅	磊	磬		
E23F	6320		磧	磚	磽	磴	礫	礒	礑	礙	礬	礫	祀	祠	祗	祟	祚
E24F	6330	祕	祓	祺	祿	禊	禝	禧	齋	禪	禮	禳	禹	禺	秉	秕	秧
E25F	6340	秬	秡	秣	稈	稍	稘	稙	稠	稟	禀	稱	稻	稾	稷	稼	穂
E26F	6350	穉	穡	穢	穩	龝	穰	穹	穿	窈	窗	窕	窘	窖	窩	竈	窰
E280	6360	竅	竄	竊	窿	邃	竇	竊	竚	竡	竚	竝	竡	竢	竦	竭	竰
E290	6370	竸	竭	端	笂	笏	笊	笆	笳	笘	笙	笞	笵	笨	笶	筐	
E29E	6420		筺	笄	筍	笋	筌	筅	筵	筥	筴	筧	筰	筱	筳	筴	箚
E2AE	6430	箘	箟	箍	箜	箚	箋	箒	箏	筝	箙	箙	篁	篌	篏	箴	篆
E2BE	6440	篝	篩	簔	簔	篦	篥	籠	簀	簇	簑	篳	篷	簗	簍	篶	簀
E2CE	6450	簧	簪	簟	簷	簫	簽	籌	籃	籔	籏	籀	籐	籘	籟	籤	籖
E2DE	6460	籥	籬	粁	粗	粭	粤	粭	粢	粨	粡	粨	粳	粲	粱	粮	粹
E2EE	6470	粽	糀	糅	糘	糘	糯	糜	糢	鬻	糯	糲	糲	糲	糺	紆	
E33F	6520		紂	紜	紕	紊	絅	紘	紮	絏	紿	紵	絆	絳	絖	絎	絲
E34F	6530	絨	絮	絏	絣	經	綉	絛	綏	絽	綛	綺	綮	綣	綵	緇	綽
E35F	6540	綫	總	綱	綯	縣	綸	綟	綰	緘	緝	緤	緞	緻	緲	緡	縅
E36F	6550	縊	縣	縡	縒	縱	縟	縉	縋	縢	繆	繦	縻	縵	縹	繃	縷
E380	6560	縲	縺	繧	繝	繖	繞	繙	繚	繹	繪	繩	繼	繻	纃	緕	繽
E390	6570	辮	纈	纈	纉	續	纏	纈	纓	纔	纖	纎	纛	纜	缸	缺	
E39E	6620		罅	罌	罍	罎	罐	网	罕	罔	罘	罟	罠	罨	罩	罸	罰
E3AE	6630	翩	罷	罸	羈	羇	羌	羔	羞	羝	羚	羣	羯	羲	羹	羮	羶
E3BE	6640	羸	譱	翅	翠	翊	翕	翔	翡	翦	翩	翳	翹	飜	耆	耄	耋
E3CE	6650	耒	耘	耙	耜	耡	耨	耿	耻	聊	聆	聒	聘	聚	聟	聢	聯
E3DE	6660	聳	聲	聰	聶	聹	聽	聿	肄	肆	肅	肛	肓	肚	肭	冐	肬
E3EE	6670	胛	胥	胙	胝	胄	胚	胖	脉	胯	胱	脛	脩	脣	脯	腋	
E43F	6720		隋	腆	脾	腓	腑	胼	腱	腮	腥	腦	腴	膃	膈	膊	膀
E44F	6730	膂	膠	膕	膤	膣	腟	膓	膩	膰	膵	膾	膸	膽	臀	臂	膺
E45F	6740	臉	臍	臑	膿	臘	臈	臚	臟	臠	臧	臺	臻	臾	舁	舂	舅
E46F	6750	與	舊	舍	舐	舗	舩	舫	舸	舳	艀	艙	艘	艝	艚	艟	艤
E480	6760	艢	艨	艩	艫	艸	艱	艶	艸	艾	芍	芒	芫	芟	芻	芬	苡
E490	6770	苣	苟	苒	苴	苳	苺	莓	范	荐	荜	荀	茆	茘	茉	苣	
E49E	6820		茵	茴	荅	荳	茱	萄	茹	荐	荅	茯	茫	茗	荔	莅	莚
E4AE	6830	莪	莟	莢	莖	莫	莎	莇	莊	荼	莵	荳	荵	莠	莉	莨	菴
E4BE	6840	萓	菫	菎	萩	萃	萩	萋	菁	菷	萇	菠	菲	萍	萢	萠	莽

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E4CE	6850	萸	蔆	莇	葭	莉	萼	蓎	蒛	葷	葫	蓼	葯	蒂	葩	葆	萬
E4DE	6860	葯	蒔	蔦	蓊	蓋	蒹	蔦	蒟	蓙	著	翡	蓔	蓴	蓁	蓆	蓖
E4EE	6870	蒡	蔡	蓿	蓴	蔗	蓼	蔬	蔟	蒂	蔔	蓼	蘇	蘞	蕘	蓴	
E53F	6920		蓴	藥	蓙	蓿	薀	薙	薈	薑	薹	薊	薨	蕭	薔	薛	藪	薇
E54F	6930	薜	蘋	蕾	蘂	藉	薺	藏	薹	藐	藕	藝	藥	藜	藹	蘊	蘇
E55F	6940	蘋	藾	藺	蘆	蘢	蘚	蘰	蘿	虍	乕	虔	號	虧	虱	蚓	蚣
E56F	6950	蚩	蚪	蚋	蚌	蚶	蚯	蛄	蛆	蚰	蛉	蠣	蚫	蛔	蛞	蛩	蛬
E580	6960	蛟	蛛	蛯	蜒	蜆	蜈	蜀	蜃	蛻	蜑	蜉	蜍	蛹	蜊	蜴	蜿
E590	6970	蜷	蜻	蜥	蜩	蜚	蝠	蝟	蝸	蝌	蝎	蝴	蝗	蝨	蝮	蝙	
E59E	6A20		蝓	蝣	蝪	蠅	螢	螟	螂	螯	蟋	蠊	蠏	蠍	雖	螯	蟄
E5AE	6A30	螳	蟇	蟆	螻	蟯	蟲	蟠	蠑	蠍	蟾	蟶	蟷	蠣	蟒	蠑	蠖
E5BE	6A40	蠕	蠢	蠡	蠱	蠶	蠹	蠧	蠻	衄	衂	衒	衙	衛	衢	衫	袁
E5CE	6A50	衾	袞	袒	袵	袮	袙	袂	袗	袒	袮	袍	袢	袍	袤	袈	袿
E5DE	6A60	袱	袴	袲	裔	裘	裙	裝	裹	褂	裼	裨	裲	褄	褌	福	
E5EE	6A70	褓	褒	褞	褥	褪	褫	襁	襄	褻	褶	褸	襌	褝	襠	襞	
E63F	6B20		襦	襤	襭	襪	襴	襷	襾	覃	覈	覊	覓	覘	覡	覩	覦
E64F	6B30	覯	覬	覿	覲	覺	覽	覿	觀	觚	觜	觝	觧	觴	觸	訃	訖
E65F	6B40	訐	訌	訛	訝	訥	訶	詁	詛	詒	詆	詈	詼	詭	詬	詢	誅
E66F	6B50	誂	誄	誨	誡	誑	誥	誦	誚	誣	諄	諍	諂	諚	諫	諳	諧
E680	6B60	諤	諱	謔	諠	諢	諷	諞	諛	諮	謇	謚	謦	謨	謐	謗	謠
E690	6B70	謳	鞫	謦	謫	謾	謨	譁	譌	譏	譎	證	譖	譛	譚	譫	
E69E	6C20		譟	譬	譯	譴	譽	讀	讌	讎	讒	讓	讖	讙	讚	谺	豁
E6AE	6C30	谿	豈	豌	豎	豐	豕	豢	豬	豸	豺	貂	貉	貅	貊	貍	貎
E6BE	6C40	貔	貘	貌	貶	貭	貪	貽	貲	貳	貳	貶	賈	賁	賤	賣	賚
E6CE	6C50	賽	賺	賻	贄	贅	贊	贇	贏	贍	贐	齎	贓	賍	贔	贖	赧
E6DE	6C60	赭	赱	赴	趁	趙	跂	趾	趺	跏	跚	跖	跌	跛	跋	跪	跫
E6EE	6C70	跟	跣	跼	踈	踉	跿	踝	踞	踐	踟	蹂	踵	踰	踴	蹊	
E73F	6D20		蹇	蹉	蹌	踏	蹈	蹙	蹤	蹠	踪	蹣	蹕	蹶	蹲	蹼	躁
E74F	6D30	躇	躅	躔	躋	躊	躓	躑	躡	躙	躪	躦	躰	躬	躰	體	躱	躾
E75F	6D40	軅	軆	軋	軛	軼	軻	軫	軾	輊	輅	輕	輒	輙	輓	輜	
E76F	6D50	輟	輛	輌	輦	輳	輻	輹	轅	轂	輾	轌	轉	轆	轎	轗	轜
E780	6D60	轣	轤	轤	辜	辟	辣	辭	辯	辶	迚	迥	迢	迪	迯	邇	迴
E790	6D70	逅	迹	迺	逑	逕	逡	逍	逞	逖	逋	逧	逶	逵	達	逝	
E79E	6E20		遏	遐	遑	遒	逎	遉	逾	遖	遘	遞	遨	遯	遶	隨	遲
E7AE	6E30	邂	遽	邁	邀	邊	邉	邏	邨	邯	邱	邵	郢	郤	扈	郛	鄂
E7BE	6E40	鄒	鄙	鄲	鄰	酊	酖	酘	酣	酥	酩	酳	酲	醋	醉	醂	醢
E7CE	6E50	醫	醯	醪	醵	醴	醺	釀	釁	釉	釋	釐	釖	釟	釜	釗	釙
E7DE	6E60	釵	釶	鈞	釿	鈔	鈬	鈕	鈑	鉞	鉗	鉅	鉉	鉤	鉈	銕	鈿
E7EE	6E70	鉋	鉐	銜	銖	銓	銛	鉚	鋏	銹	銷	鍇	鋩	鋺	鍔	鍋	
E83F	6F20		錙	錢	錚	錣	錻	鍜	鍠	鍛	鍠	鍼	鍮	鍖	鎰	鎬	鎭
E84F	6F30	鎔	鎹	鏖	鏗	鏨	鏥	鐓	鐔	鐓	鐃	鏈	鏤	鐐	鐔	鐓	鐃
E85F	6F40	鐇	鐐	鐶	鐫	鐵	鐡	鐺	鑁	鑒	鑄	鑛	鑠	鑢	鑞	鑪	鈩
E86F	6F50	鑰	鑵	鑷	鑽	鑚	鑼	鑾	钁	鑿	門	閇	閊	閔	閖	閘	閙
E880	6F60	閏	閨	閧	閭	閖	閻	閹	閾	闊	濶	闃	闇	闌	闕	闔	闖
E890	6F70	關	闡	闥	闢	阡	阨	阮	阯	陂	陌	陏	陋	陷	陜	陞	
E89E	7020		陝	陟	陦	陲	陬	隍	隘	隕	隗	險	隧	隱	隲	隰	隴
E8AE	7030	隶	隷	隹	雎	雋	雉	雍	襍	雜	霍	雕	雹	霄	霆	霈	霓
E8BE	7040	霎	霑	霏	霖	霙	霤	霪	霰	霹	霽	霾	靄	靆	靈	靂	靉
E8CE	7050	靜	靠	靤	靦	靨	勒	靼	靭	靹	鞅	靸	鞁	鞜	鞆	鞋	鞏
E8DE	7060	靺	鞳	鞴	鞦	鞣	鞳	鞴	韃	韆	韈	韋	韜	韭	齏	齪	竟

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E8EE	7070	韶	韵	頇	颂	頸	頤	頡	頷	頹	顆	顏	顋	顫	顯	顰	
E93F	7120		顱	顴	飁	風	颯	颱	颶	飄	飇	飩	飫	餃	餉	餒	
E94F	7130	餔	餘	餡	餱	餞	餤	餅	餬	餮	餽	餾	饁	饉	饅	饈	饋
E95F	7140	饑	饒	饌	饕	馗	馘	馥	馭	馮	馼	駆	駛	駝	駘	駑	駭
E96F	7150	駮	駱	駲	駸	駿	騁	騏	騅	騒	騙	騫	騒	驅	驂	驀	驃
E980	7160	驟	驕	驍	驛	驗	驟	驢	驥	驤	驩	驫	驪	骭	骰	骼	髀
E990	7170	髏	髑	髓	體	髞	髟	髡	髣	髦	髯	髫	髪	髷	髻	鬆	
E99E	7220		鬟	鬆	鬘	鬚	鬟	鬢	鬣	鬥	鬧	鬨	鬩	鬮	鬻	魃	鬲
E9AE	7230	魄	魅	魏	魍	魎	魑	魘	魴	鮓	鮃	鮑	鮖	鮗	鮟	鮠	鮨
E9BE	7240	鮴	鮹	鯊	鯏	鯑	鯒	鯖	鯛	鯣	鯢	鯤	鯔	鯡	鰺	鰯	鰲
E9CE	7250	鰥	鰕	鰔	鰉	鰓	鰌	鰆	鰈	鰒	鰊	鰔	鰛	鰡	鰰	鰲	鰡
E9DE	7260	鰤	鰡	鰲	鰳	鰾	鱚	鱠	鱧	鱶	鱸	鳧	鳬	鳰	鴉	鴈	鴬
E9EE	7270	鴟	鴣	鴪	鴦	鶯	鴯	鴬	鴨	鴪	鴿	鴾	鴿	鵁	鵜	鵝	
EA3F	7320		鵞	鵞	鵆	鵑	鵐	鵙	鵲	鶉	鶇	鶫	鵺	鶚	鶻	鶸	鶺	鷁
EA4F	7330	鷄	鷁	鷂	鶻	鶸	鶺	鷁	鷆	鷂	鷙	鷆	鷭	鷯	鷽	鸚	鸛	鸞
EA5F	7340	鸚	鸛	鸞	鹵	鹹	鹽	麁	麈	麋	麕	麒	麕	麑	麝	麥	麩
EA6F	7350	麸	麪	麭	靡	黌	黎	黏	黝	黜	點	黝	黠	黥	黨	黯	
EA80	7360	黴	黶	黷	黹	黻	黼	黽	鼇	鼈	皷	鼕	鼬	鼬	鼾	齊	齒
EA90	7370	齔	齣	齟	齠	齡	齦	齧	齬	齪	齷	齲	齶	龕	龜	龠	
EA9E	7420		堯	槇	遙	瑤	凜	熙									

Index

Command Code

ALC 138
BBS 96
BCC 119
BRF 100
BRP 117
BRV 113
CDC 121
CDD 123
CDF 120
CNT 86
CTR 87
DLY 62
ECR 177
ENC 158
FIG 125
FNM 74
FNN 72
FNO 71
FOR 73
FRG 73
GID 63
INT 160
LAY 132
LMS 156
LMT 88
LPW 161
LSP 159
LSR 59
LTC 89
LTS 90
MEN 176
MKM 58
MRK 61
MST 68
OFC 142
OFS 143
PRD 133
PRF 137
PWL 175
PWM 169
RKC 92
RKS 93
RSM 179
SCC 85
SEO 140
SHT 60
SIN 78
SPC 84
SPT 168
SRA 146
SRC 144
STC 80
STR 76
STS 67
SUF 151
TRG 157
TST 65
WDC 167
WTC 165
YMD 178

A

Alarm 199
alternative characters 40
ASCII Code 216

C

Character Code Table 215
Check sum 32
Command 32, 52
Command reception permission 43
Communication Command Control 24
Communication Data Format 32
Communication Sequence 29
Communication settings 22, 24
control codes 40

E

End code 32
Ethernet 23
External control 13

F

Functional characters 41

I

Interface specifications 20

J

JIS level-1 218
JIS level-2 223

N

negative response 35

P

positive response 34

R

Reception timeout 29
Remote mode 13, 18
Request data 28, 33
Response code 35
Response data 28, 34
RS-232C 20

S

Setting request 33
Shift JIS Code 217

Start code 32
Sub command 32

U

User-defined character font 217

W

Warning 204

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. 2023-2024

July, 2024