Panasonic

Laser Marker

Serial Communication Command Guide

LP-GS series
LP-RC series
LP-RF series
LP-RV series

ME-LPGS-SR-8

2020.10 | panasonic.net/id/pidsx/global

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 version. All other languages are translations that are based on the original documentation.

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Cautions in Handling

ALWAYS FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS!

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

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

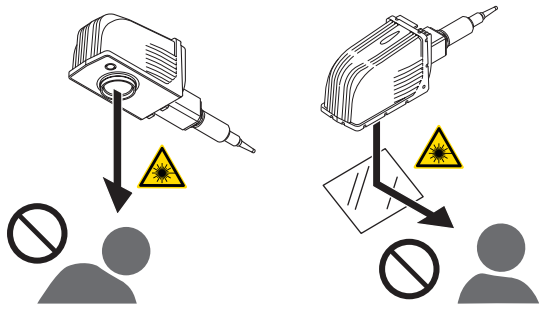
⚠ DANGER	Denotes a potential hazard that will result in serious injury or death.
⚠ WARNING	Denotes a potential hazard that could result in serious injury or death.
⚠ CAUTION	Denotes a hazard that could result in minor injury.

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

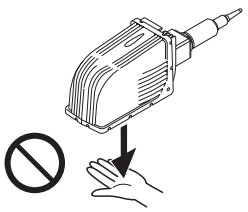
⃠	This symbol is used to alert users to a specific operating procedure that must not be performed.
❗	This symbols is used to alert users to a specific operating procedure that must be followed in order to operate the unit safely.
⚠	This symbols is used to alert users to a specific operating procedure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

⚠ DANGER

- Never look at laser beam directly, through lens or through any other optical components. Laser beam radiation into the eye causes blindness or serious damage to the eye.
  Not only the direct beam of laser, but also diffused reflected beam is harmful.



- Never touch laser beam and avoid human skin, clothing and any other flammable object from laser beam exposure directly.
  Burning into deep skin might result and there is a risk of fire.



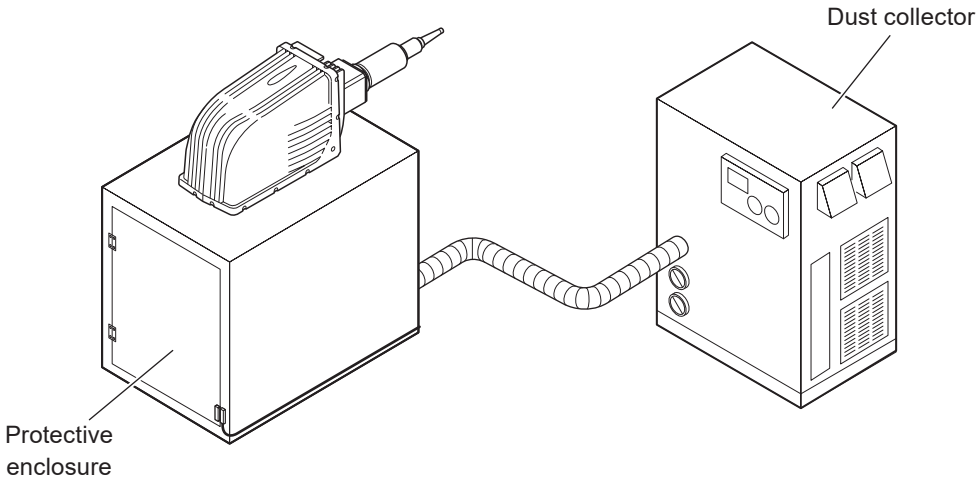
⚠ WARNING

- Do not use this product anywhere where fire is strictly prohibited, near inflammable gas, objects or organic solvents such as thinner or gasoline, or in dusty place. There is a risk of fire.
- Do not use this product except for water-resistant part in wet place. In addition, never conduct wiring or maintenance work with wet hands or when the product surface is wet. Otherwise, electric shock and/or malfunction may result.
- Never disassemble the product.
  Doing so may cause exposure to the laser beam or electric shock.
- Do not insert hands or objects between the gaps of the exhaust port or intake port. There is a risk of electrical shock or injury.
- Take laser protection measures required to use Class 4 laser products subject to the local laws and regulations of the country or region in which this laser product is used.
- To protect the operators' eyes, make it mandatory to wear goggles against laser beam within the laser controlled area. The protective goggles can momentarily protect the eyes against the scattered beam. Never look at the direct beam or reflected beam even when you are wearing the protective goggles.

- Set protective enclosure with proper reflectance, durability and thermal resistance to enclose the laser radiation area without leakage.
- 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 series, the head, controller and oscillator unit) of the laser marker which have the same model number. Otherwise there is a risk of exposure to laser radiation or failure.
- Read all packaged 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.
- For LP-RF/LP-RV 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.



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

- To carry this product, wear the non-slip gloves and safety shoes. Hold the product with both hands. Do not hold the cables or connectors at carrying.
- For LP-RC/LP-RF/LP-RV series, carry the controller unit with two persons. Lifting or carrying without assistance may cause of injury.
- Install this product in the stable place without vibration and shock.
- In case it falls down, it may cause injury.

⚠ CAUTION

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

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-GS051	LP-GS051-E		LP-GS051	LP-GS051(-L)	LP-GS series
LP-GS051-F	LP-GS051-FE	LP-GS051-FN			
LP-GS051-L	LP-GS051-LE		LP-GS051-L		
LP-GS051-LF	LP-GS051-LFE	LP-GS051-LFN			
LP-GS052	LP-GS052-E		LP-GS052		
LP-GS052-F	LP-GS052-FE	LP-GS052-FN			
LP-RC350S			LP-RC350S		LP-RC series
LP-RF200P			LP-RF200P		LP-RF series
LP-RV200P			LP-RV200P		LP-RV series

■ 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 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 this product 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.

Reference

- The PDF data of each manual is included on an attached CD-ROM “Laser Marker Smart Utility”.
- To read the PDF manual, Adobe Reader (Version X or later) of Adobe Systems Incorporated is required.

Contents

1 Preparation of Command Control

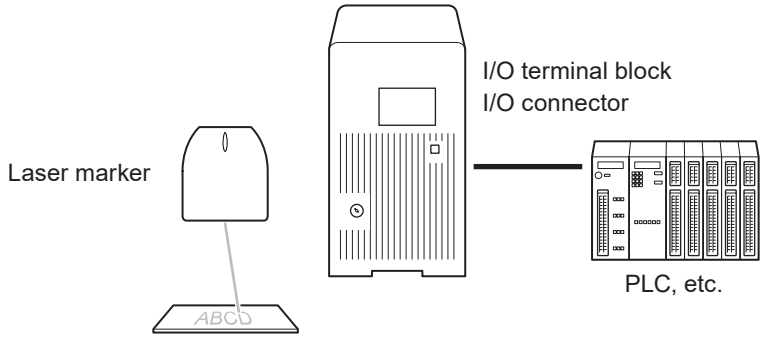
1-1 Operation by External Devices

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”.

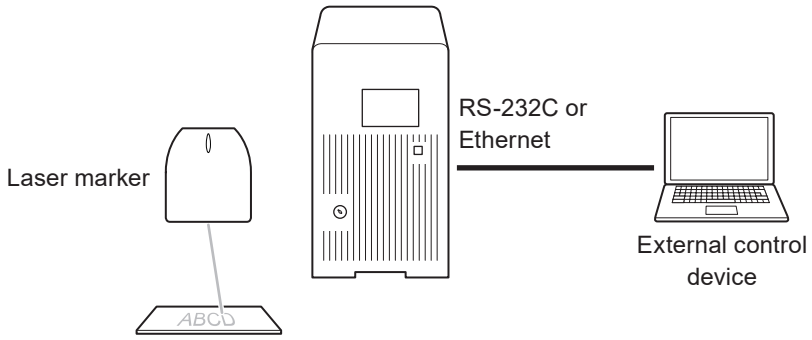


Reference

- 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”.
- When the optional network unit is installed to the controller of LP-RF and LP-RV series, controlling the laser marker with EtherNet/IP or PROFINET unit is available. For details, refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”.

Control by communication commands (remote mode)

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



Reference

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

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

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

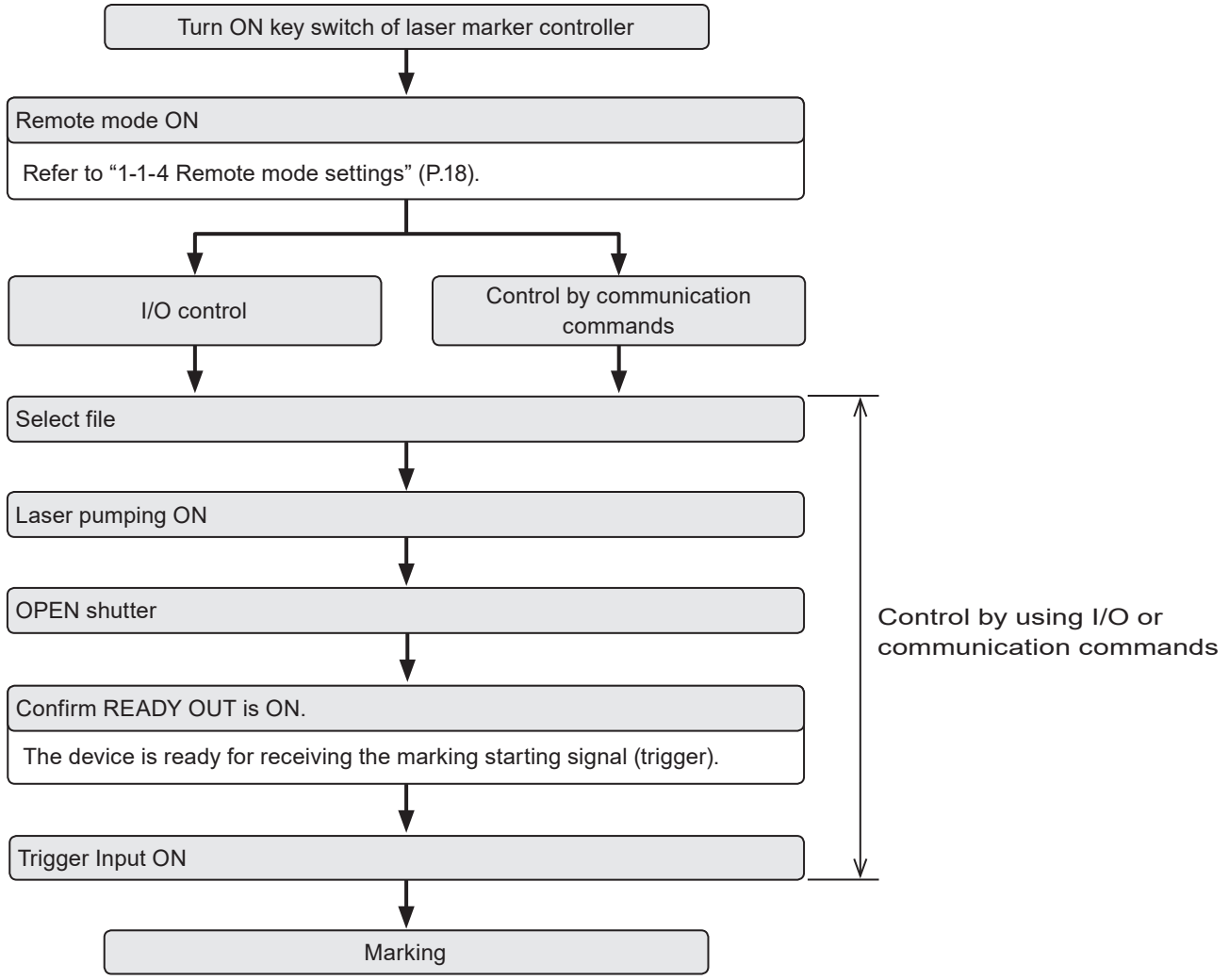
- Link control (Ethernet) with specific external devices (i.e. image checker) *1
- Link control with a code reader (RS-232C)

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

*1 : The link control with an image checker is not available at on-the-fly marking.

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”.

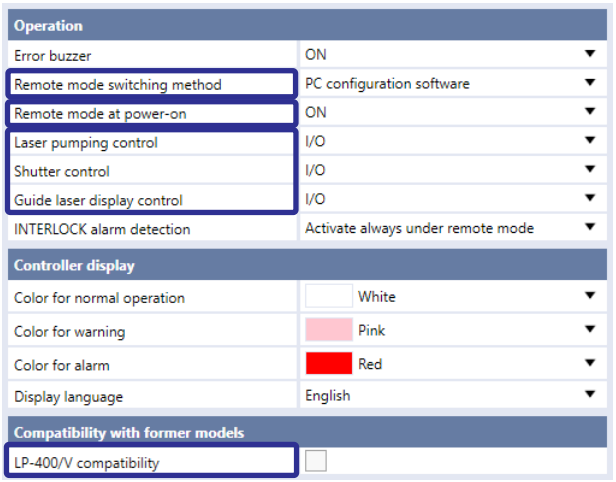
1-1-3 General settings before external control

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.

- PC configuration software (initial setting)
- I/O

5. When PC 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 control
- Guide laser control (except LP-GS052 type)

Reference

- To use “Laser Radiation for Measurement Command (SPT)” of the communication commands, set the shutter control method to “communication commands”.
- For LP-RF/LP-RV series if you want to control these I/O operations via optional network unit (EtherNet/IP or PROFINET), select “I/O” here.

7. If you want to use the same command format with the former models of LP-400/LP-V series, enable “LP-400/V compatibility”.

Reference

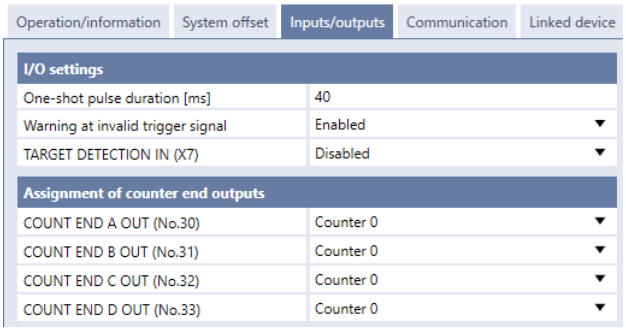
- For the details of the compatible command format with the former models, refer to the “Serial Communication Command Guide: LP-400/V compatible mode”.
- For LP-RF/LP-RV series if you use the optional network (EtherNet/IP or PROFINET) for the command control, deactivate “LP-400/V compatibility” here.

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) (LP-RC/LP-RF/LP-RV series only):
  Select whether or not to use TARGET DETECTION IN on I/O terminal.
  (Initial setting: Disabled)
  When enabling this terminal, connect a sensor which detect the work piece is in position for lasing.
- Terminal assignment X11 (LP-GS series only):
  Select the behavior of the input signal X11 on I/O terminal from LASER STOP 1 IN or LASER STOP 2 IN. (Initial setting: LASER STOP 2 IN)
  For the operation details of LASER STOP, refer to “Setup/Maintenance Guide”.
- Assignment of counter end outputs:
  Assign the counter No. to COUNT END A OUT to COUNT END D OUT (I/O pin No. 30 to 33).
  As the default setting, counter No. 0 to 3 are assigned to COUNT END A OUT to COUNT END D OUT respectively.



Reference

- These settings are also applied to the communication by the optional network (EtherNet/IP or PROFINET) for LP-RF and LP-RV series.

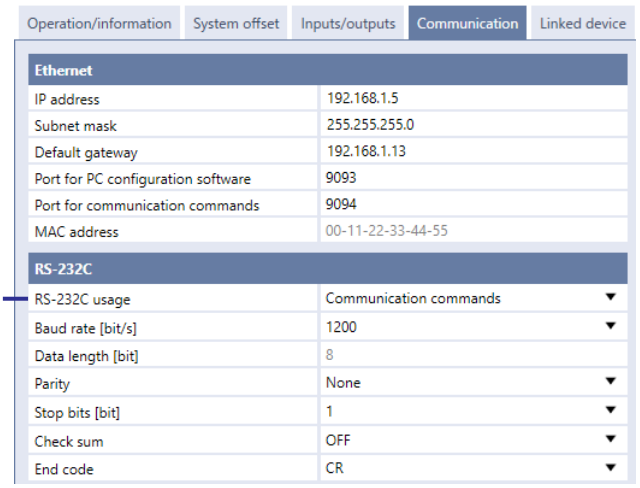
10. Select “Apply to laser marking system” on the left side of the ribbon.

“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.

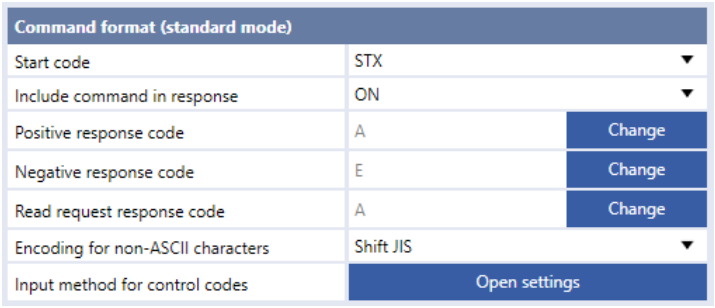
- For Ethernet:
  Configure the communication settings according to the network settings.
- For RS-232C:
  Configure the communication settings of the laser marker corresponding to the external control device.

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



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

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



Reference

- For details of the command format, refer to the “2-3 Communication Data Format” (P.32).
- The command format settings here are applied to the standard communication format and not applied to LP-400/LP-V compatible format. For the details of the compatible mode with the former models of LP-400/LP-V series, refer to the “Serial Communication Command Guide: LP-400/V compatible mode”.
- “Encoding for non-ASCII characters” is used for the European special characters, Japanese and Chinese characters which cannot be specified by the ASCII codes. Select “Shift JIS” for Japanese characters and “GB 2312” for simplified Chinese. If you use European special characters such as À or Ä, select “Latin-1”.

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

Refer to “Inputting control codes to bar code/2D code character strings” (P.41) for details.

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

“Apply to laser marking system” tool

15. Disconnect the online connection with the laser marker.

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

The configured items will be reflected to the laser marker.

Notice

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

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

Reference

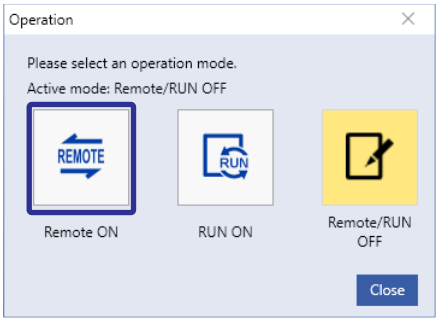
- For the details of the System settings, refer to the “Laser Marker NAVI smart Operation Manual”.
- For the configuration of the optional network (EtherNet/IP or PROFINET) for LP-RF and LP-RV series, refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”.

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)

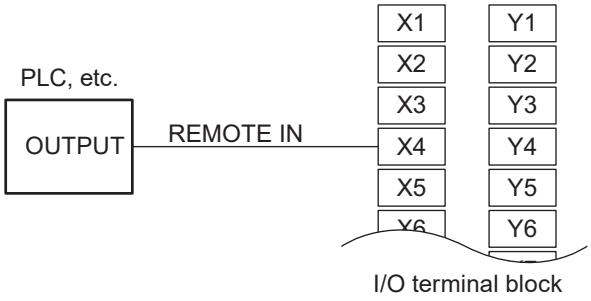
When you turn ON the key switch of the laser marker, the system starts in the remote mode. Use the operation tool of Laser Marker NAVI smart for releasing and resetting the remote mode.

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

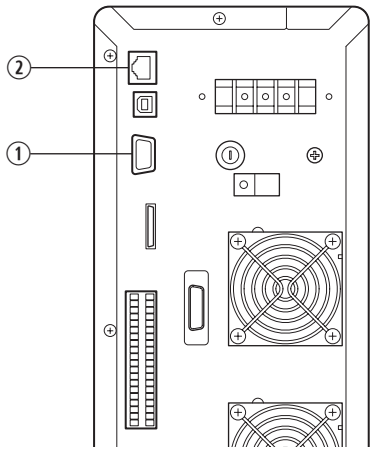
- To enable switching to the remote mode by REMOTE IN (X4) on the I/O terminal block, you need to configure the settings on the system settings screen of Laser Marker NAVI smart in advance.
- If you have configured the remote mode switching method to the I/O terminal block, you cannot switch the remote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

⚠WARNING

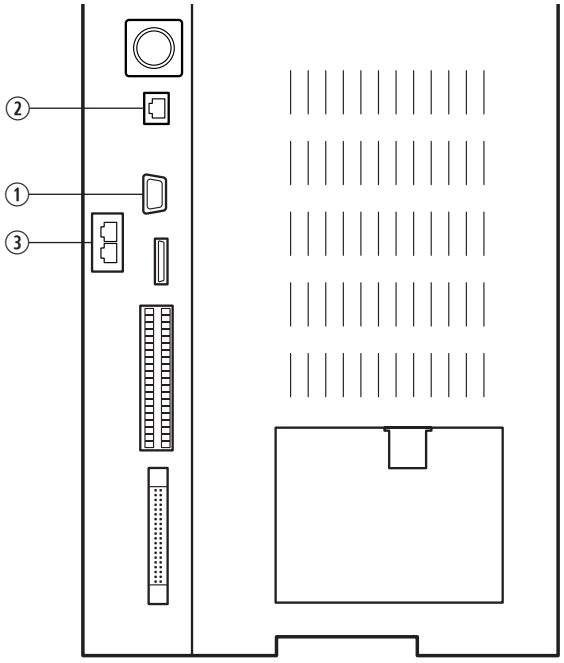
- If the laser marker is set to enter the remote mode at startup or by I/O control, construct a manual resetting system to re-pump the laser when the laser pumping is turned to off due to an emergency stop or an interlock.

1-2 Communication Interfaces

This product has the following communication interfaces on the controller.



LP-GS series
Rear of Controller



LP-RC/LP-RF/LP-RV series
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
③	Ports for industrial network: EtherNet/IP or PROFINET	Available for LP-RF/LP-RV series when the optional network unit (EtherNet/IP unit or PROFINET unit) is installed to the controller. Communication port (2-port switch) to control the laser marker by the industrial network with the control device such as a PLC. Connect a LAN cable. For details, refer to “EtherNet/IP Communication Guide” or “PROFINET Communication Guide”. If you do not install the network unit, there is no port here.

1-3 RS-232C

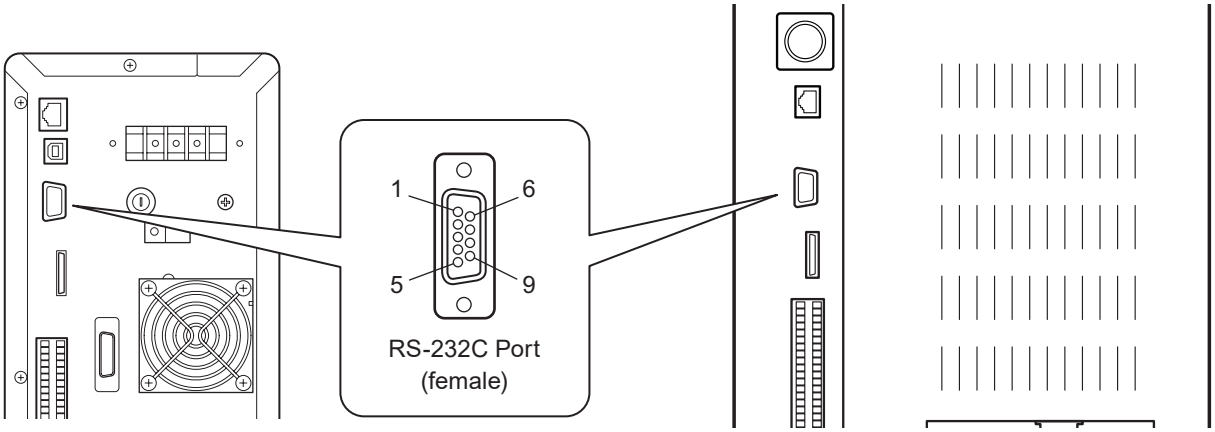
To control the laser marker by communication commands, use RS-232C or Ethernet connection.
For the control by communication commands, configure the communication settings in advance at the system settings of Laser Marker NAVI smart. Refer to “1-1-3 General settings before external control” (P.15).

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.



LP-GS series
Rear of Controller

On the laser marker
controller side

LP-RC/LP-RF/LP-RV series
Rear of Controller

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.	

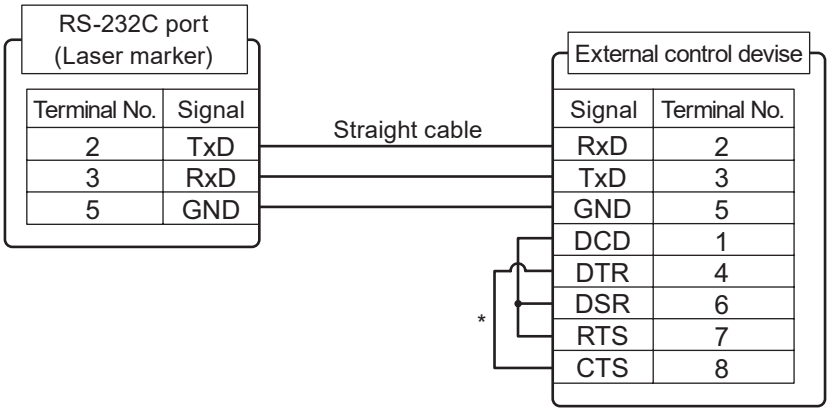
Reference

- On the system settings screen, select communication command control or code reader linkage function that you use with the RS-232C port.
- The GND pin of the RS-232C connector is common to the body of the laser marker.

■ 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 (for command control)

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

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

Reference

- For the details of the communication settings, refer to “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.

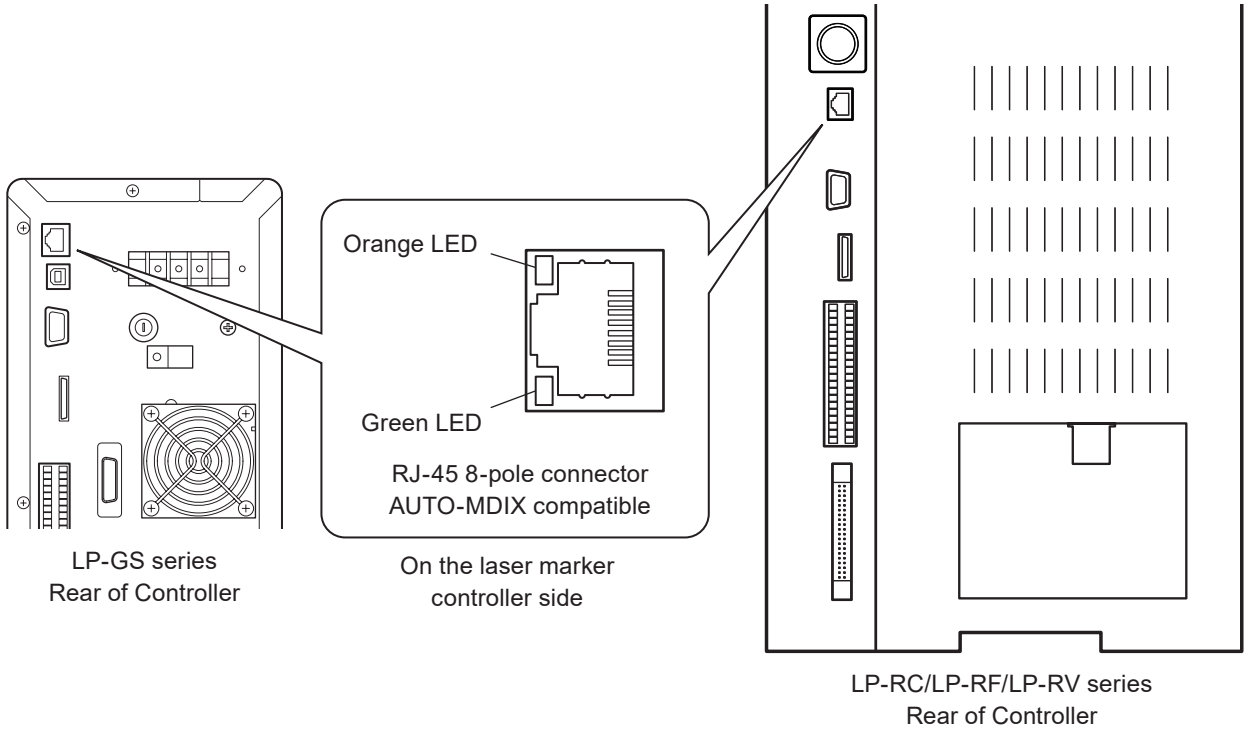
1-4 Ethernet

1-4-1 Port specifications and connection

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

Reference

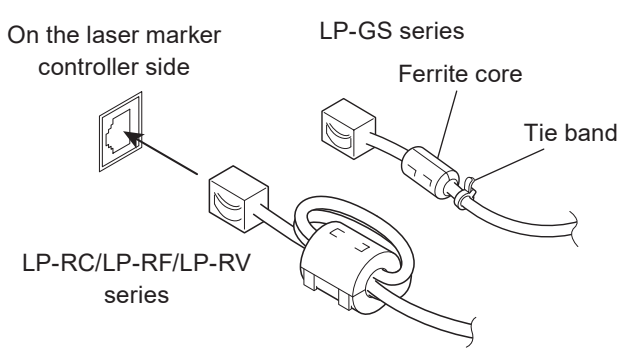
- The Ethernet port of this product is compatible with both straight cable and cross cable.
- Although the maximum length of cables connecting devices permitted by the standards of Ethernet is 100 m, in order to prevent communication failure due to noise or breakdown of the device, it is recommended 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



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-GS series, if the ferrite core diameter is too large for the cable width, fix the ferrite core using a tie band.
For LP-RC/LP-RF/LP-RV 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).

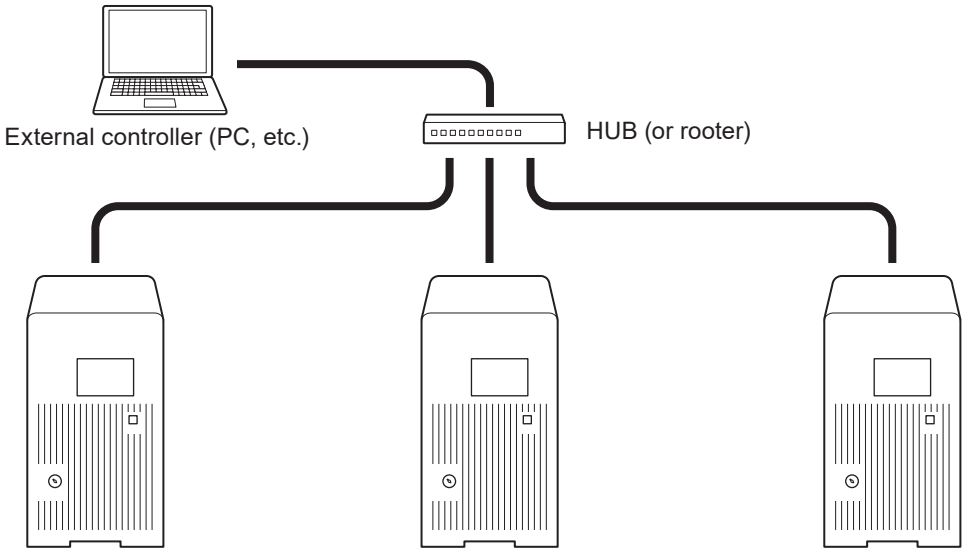
■ Ethernet communication settings for communication command control

Item	Ethernet communication settings
Start code *	ON (STX) / OFF (initial setting: STX)
Response data command *	ON / OFF (initial setting: ON)
Response data sub command *	Any single byte character of ASCII code from 01 (HEX) to 7F (HEX) can be specified. • Initial setting of positive response code: A • Initial setting of negative response code: E • Initial setting of read request response code: A
Character code	ASCII code
Encoding for non-ASCII characters *	Shift-JIS / GB 2312 / Latin-1 (initial setting: Shift-JIS)
Check sum	OFF
End code	CR
Reception timer	Timeout monitoring ON (10 sec.)

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

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.

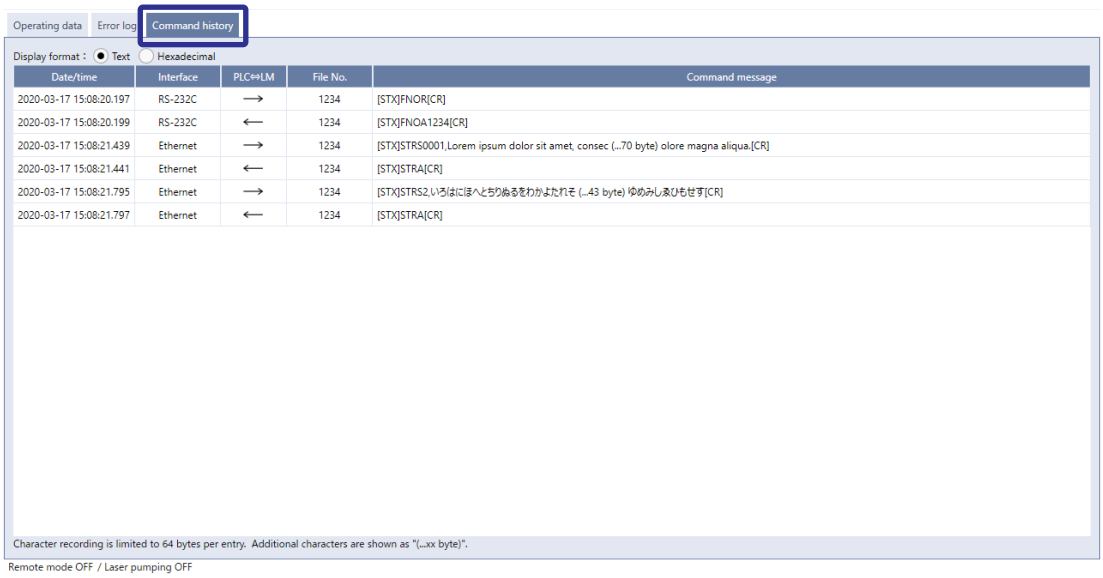
1-5 Checking the communication commands

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.
- For LP-RF/LP-RV series, in the command history you can also confirm the commands transmitted via optional network unit (EtherNet/IP or PROFINET).

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

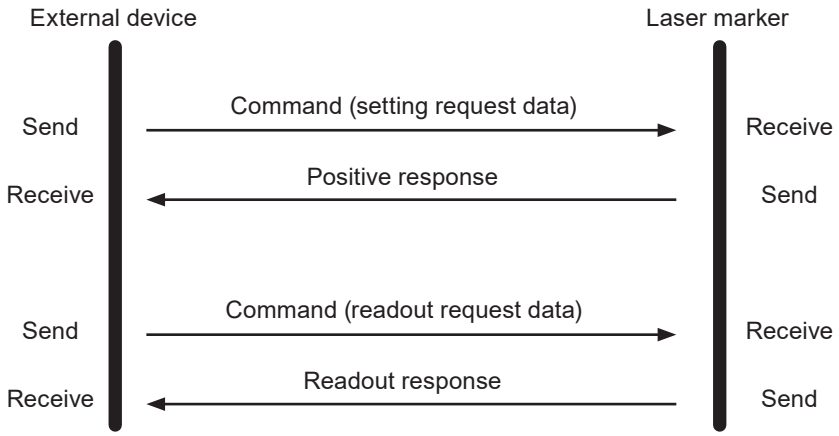
The communication sequence of this product mainly consists of the sequence where the laser marker transmits the response data for the (command) data requested from external devices.
As an exception, the laser marker transmits the response data automatically if you have set the response permission of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

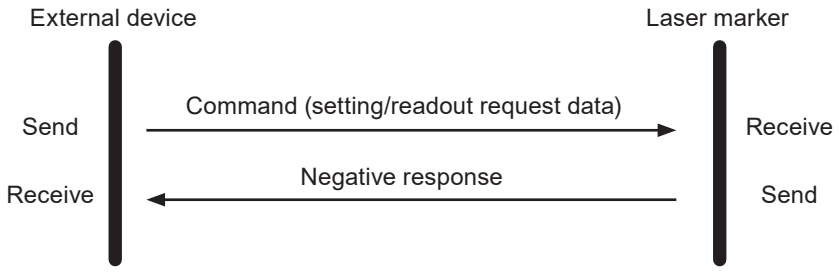
■ Communication sequence of setting/readout request data

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

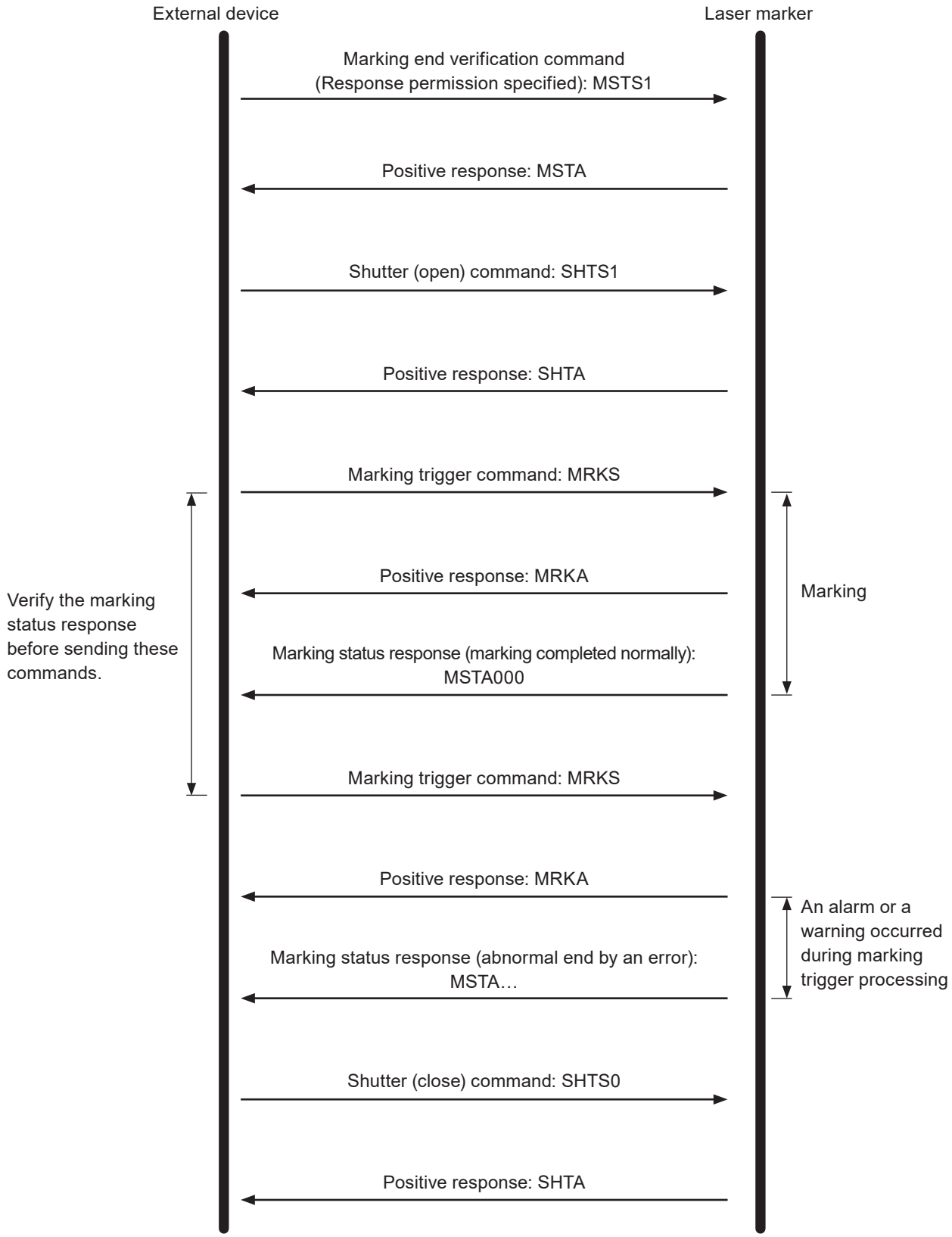
When the request data transmitted from the external device to the laser marker are not acceptable, the laser marker transmits negative response.



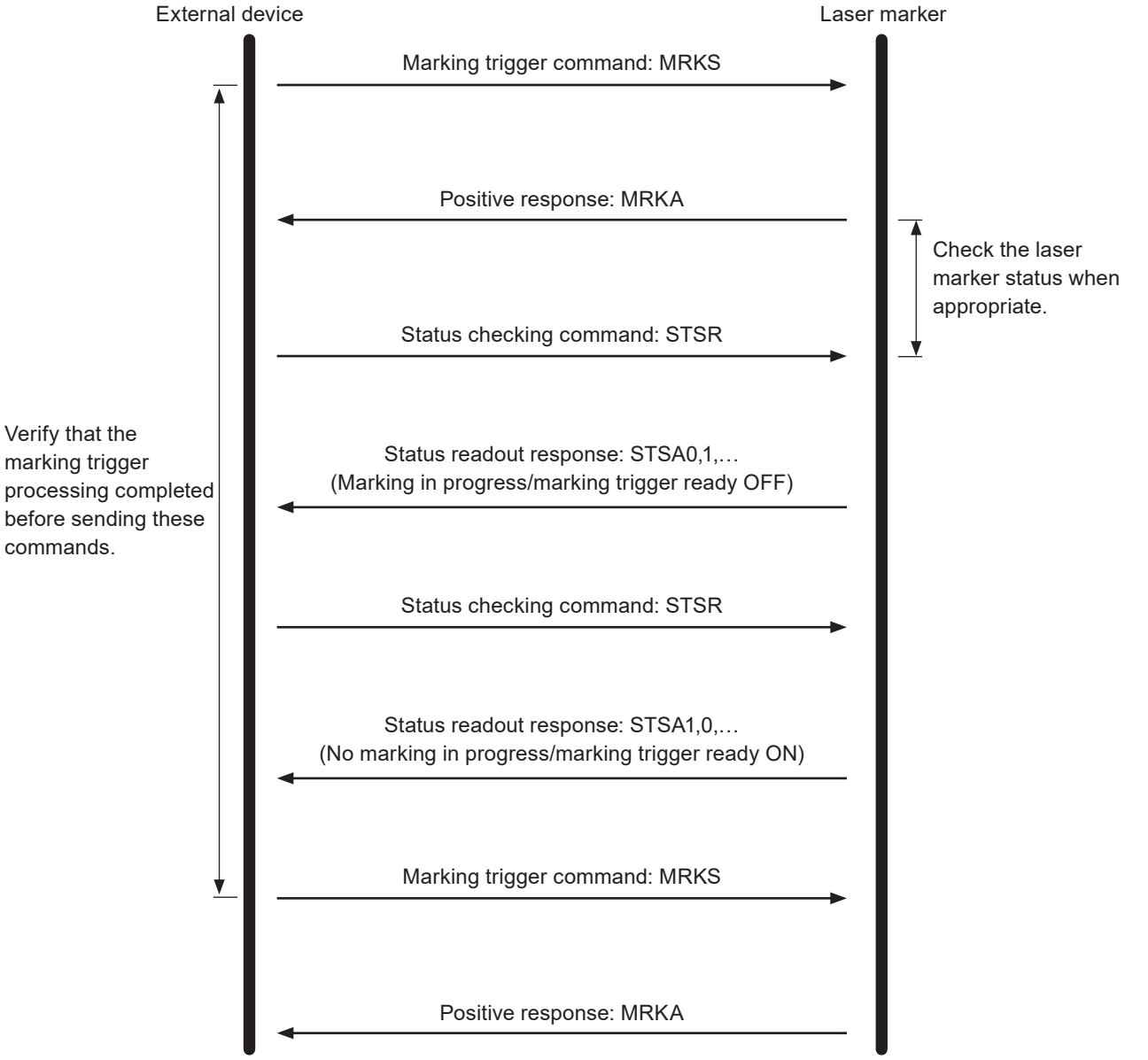
■ Communication sequence when the marking end verification (MST) command response is enabled

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 “3-3-10 Marking end verification: MST” (P.70).

- 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



Reference

- The marking end verification (MST) command is not available when you use the optional industrial network (EtherNet/IP or PROFINET) for the command control.

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 the character code, Latin-1, Shift JIS or GB 2312, selected for “Encoding for non-ASCII characters” in the system settings screen of Laser Marker NAVI smart software.
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	Sub command	Data defined per data and command type	Check sum	End code
1-byte or N/A	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. You can enable or disable the start code. The start code is enabled in the initial settings. When the start code is enabled, the code is [STX]: 02 (HEX) fixed.
Command	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.54). You can enable or disable the response data command. It is enabled in the initial settings. When the response data command is enabled, the same command as the request data will be added to the response data.
Sub command	One-byte alphabetic character or arbitrary one-byte character representing the communication data type. The sub command of the request data is (fixed to) the following alphabetic characters: • Setting request code: “S” • Readout request code: “R” You can set an arbitrary one-byte character for the sub command of the response data. The sub command is set to the following alphabetic characters in the initial settings: • Positive response code: “A” • Read request response code: “A” • Negative response code: “E”
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).

Reference

- Set the data format on the “system settings” screen of Laser Marker NAVI smart. Refer to “1-1-3 General settings before external control” (P.15).
- No separator is placed before or after the start code, command, sub command, check sum, or end code. Enter it right after the precedent data.
- When using the external device set by 2-byte, [NUL]: 00 (HEX) can be used. Add [NUL] before the start code (before the command if there is no 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 the 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 “LSC”	Sub command “S”	Data example: [Laser power],[Scan speed] “50.5,1000”	Check sum	End code CR
02	4C 53 43	53	35 30 2E 35 2C 31 30 30 30	45 43	0D (HEX)

- Convert the start code to the end of data into hexadecimal values and add them all together. Include the start code and the one-byte comma “,” used as a separator for the addition.
  02 + 4C + 53 + 43 + 53 + 35 + 30 + 2E + 35 + 2C + 31 + 30 + 30 + 30 = 2EC (HEX)
- “EC”, which is the lower one-byte (lower two-digit) characters of 2EC (HEX), is converted to 45 43 (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 sub command is “S”.

Start code	Command	Sub command “S”	Variable-length data or fixed-length data	Check sum	End code
1-byte or N/A	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 sub command is “R”.

Start code	Command	Sub command “R”	Variable-length data or fixed-length data	Check sum	End code
1-byte or N/A	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 the character code selected for “Encoding for non-ASCII characters” in the system settings screen of Laser Marker NAVI smart software.
If the data consist of more than one item, each item is separated by “,”: 2C (HEX).
Some items can be omitted for some commands.

Reference

- For details on how to input variable-length data or fixed-length data, refer to “2-3-5 Character input method” (P.38) and “2-3-6 Character data input method” (P.39).
- For details on omitting data items, refer to “2-3-4 Omitting request data” (P.37).

Example of Request Data

- To change file number

Start code STX	Command “FNO”	Sub command “S”	Data example: File No. “9999”	Check sum	End code CR
02	46 4E 4F	53	39 39 39 39	31 43	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.

Start code	Command	Sub command “A” or arbitrary one-byte character	Check sum	End code
1-byte or N/A	3-byte or N/A	1-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”).

Start code	Command	Sub command “A” or arbitrary one-byte character	Variable-length data or fixed-length data	Check sum	End code
1-byte or N/A	3-byte or N/A	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 the character code selected for “Encoding for non-ASCII characters” in the system settings screen of Laser Marker NAVI smart software.
If the data consist of more than one item, each item is separated by “,”: 2C (HEX).

Example of positive response

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

Start code STX	Command “FNO”	Sub command “A”	Check sum	End code CR
02	46 4E 4F	41	32 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. “9999”	Check sum	End code CR
02	46 4E 4F	41	39 39 39 39	30 41	0D (HEX)

■ Data format of negative response

Response data to transmit when the request data are not acceptable.
Response code and sub response code indicate the error cause.

Start code	Command	“E” or arbitrary one-byte character	Response code “01”–“99”	Sub response code “00”–“99”	Check sum	End code
1-byte or N/A	3-byte or N/A	1-byte	2-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.
- If the response code is “01”, “02”, “04”, or “05”, the command part will be returned as “???”.

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.

Sub response code details

The sub response code indicates which data item is incorrect in case of an error with the variable-length or fixed-length data part of the request data using a numerical value from 01 to 99 that represents the data sequence.
This value starts from 01 and increments by 1 from the beginning of the variable-length or fixed-length data part of the request data.
If the data number exceeds 99, it returns 99.
Return 00 as the sub response code for the response code when the sub response code cannot represent the data item sequence.

Response code	Sub response code	Error cause
“01”	“00”	Incorrect start code.
“02”	“00”	Incorrect end code.
“03”	“00”	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. • MRK command was sent while the marking trigger ready is OFF.
“04”	“00”	No applicable command.
“05”	“00”	Incorrect check sum.
“06”	“00”	Incorrect data length.
“07”	“00”	Unacceptable command for the I/O terminal control settings.
“08”	“00”	Incorrect sub command.
“09”	“00”	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. • Too many number of characters in the character data part. • Input character code is not consistent with the setting of “Encoding for non-ASCII characters” in the system settings. • It has exceeded the maximum number of objects configurable at once.
“10”	“00”	Unacceptable command because of an alarm or a warning occurred.

Response code	Sub response code	Error cause
“11”	“00”	SIN 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”	“00”	Unable to register data due to a lack of memory capacity.
“13”	“00”	The target of the requested setting or readout does not exist. • Nothing is set to the object number/object group number specified.
“14”	“00”	Not available command with this laser marker model.
“16”	“00”	The command not allowed for the marking data of the object number specified. • Object type is unfit for the command. • To use CDF, CDC or CDD commands, the graphic object in VEC or DXF format must be set in the specified object No. • The selected object number is available only to the specific type of barcode or 2D code.
“17”	“00”	Not available command with this laser marker version.
“18”	“00”	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-RC series only: SHT command for opening shutter request is sent when laser pumping is off.
“19”	“00”	The requested command is conflicting with the higher settings. • Unacceptable command with current settings of trigger mode. • Unacceptable command with the current command mode.
“20”	“00”	Unacceptable command with the current communication port.
“94” *1	“01”–“99”	Not available data item with this laser marker model.
“95” *1	“01”–“99”	Unnecessary data item is included. (Too many data items in the command.)
“96” *1	“01”–“99”	Necessary data item is omitted.
“97” *1	“01”–“99”	Incorrect value (out of setting range) is included in the variable-length or fixed-length data part.
“98” *1	“01”–“99”	Invalid value was specified in the variable-length or fixed-length data part. • It has exceeded the maximum data length. • It includes a character that is not allowed. • The data item value including the decimal point is invalid. • The data item value including the plus (+)/minus (-) sign is invalid.
“99”	“00”	Others

*1 : For this response code, the data number with an error will be displayed at the sub response code.

Example of negative response

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

Start code STX	Command “FNO”	Sub command “E”	Data example: “9801”	Check sum	End code CR
02	46 4E 4F	45	39 38 30 31	46 43	0D (HEX)

↳ It indicates that the first line (01) of the data part is invalid.

2-3-4 Omitting request data

Some of the data items can be omitted depending on the command if you specify more than one data item to the variable-length data part of the request data.
The data set last (the initial value if it was not set) will be maintained for the data item omitted. Any other operations are explained at each command description.

■ How to omit data item

- Enter a separator "," only for the data item you want to omit.
- Do not specify any data including the separator "," if you want to omit all the subsequent items. (Set 0 byte)

Example of data omission

- When you specify certain items of the following format data items and omit the rest

Start code	ALC	S	[X-movement],[Y-movement], [Z-movement],[Rotation movement], [Y-axis mirroring],[X-axis mirroring]	End code

When you specify X-movement = 10 mm only and maintain the last specified value (or the initial value) for the rest

[STX]	ALC	S	10	[CR]

When you specify Rotation movement = 180° only and maintain the last set value (or the initial value) for the rest

[STX]	ALC	S	,,,180	[CR]

2-3-5 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.
The data length of variable-length numeric data can be shortened according to the value specified.

Data type	Input data	ASCII code	Remarks
Integer part	“0”–“9”	30 (HEX) to 39 (HEX)	If the integer part is 0, this can be omitted
Decimal part	“0”–“9”	30 (HEX) to 39 (HEX)	For the integer, this can be omitted
Decimal point	“.”	2E (HEX)	For the integer, this can be omitted
Sign	“+”	2B (HEX)	For the plus “+” sign , this can be omitted
	“-”	2D (HEX)	

Reference

- For details on the ASCII code, refer to “Character Code Table” (P.206).
- You cannot include more than one decimal point in one numeric data item.
- 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 maximum data length.

Example of variable-length numeric data input

- To input “+010.000” (the maximum data length is 8-byte)
  “+010.000”, “010.000”, “10.000”, “+10.0”, “10.0”, “+10”, “10.”, “10”
- To input “-000.010” (the maximum data length is 8-byte)
  “-000.010”, “-0.01”, “-.01”

2-3-6 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: STR
- Character entry per trigger: SIN
- Reference character: SST
- Lot character: LTS
- Registered character strings: RKS
- Graphic file: CDF

■ Input data

Use the ASCII code to input alphanumeric characters (single byte character).
For the characters which cannot be indicated with ASCII code, use the other specified character code, Latin-1, Shift JIS or GB 2312, selected in the system settings of Laser Marker NAVI smart software as the “Encoding for non-ASCII characters” setting. For the setting of the character code, refer to “1-1-3 General settings before external control” (P.15).
ASCII code and the character code selected for “Encoding for non-ASCII characters” in the system settings can be mixed. “Shift JIS”, “GB 2312” and “Latin-1” cannot be used together.
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
STR	Marking character	• For marking characters, control codes cannot be used. • To start a new line, input alternative characters “¥n” for the line feed symbol. • “,”, “%”, “¥”: Input alternative characters.
	Bar code/2D code character	• To input the control codes in the barcode/2D code data, follow the input method specified in the system settings. Refer to “Inputting control codes to bar code/2D code character strings” (P.41). • The linefeed character “¥n” is used for the human readable text, but not for the code data. • “,”, “%”, “¥”: Input alternative characters.
SIN	Marking character input with SIN command	• For marking characters, control codes cannot be used. • Functional characters cannot be used. • No line feed is allowed. • “,”, “¥”: Input alternative characters.
	Bar code/2D code character input with SIN command	• To input the control codes in the barcode/2D code data, follow the input method specified in the system settings. Refer to “Inputting control codes to bar code/2D code character strings” (P.41). • Functional characters cannot be used. • No line feed is allowed. • “,”, “¥”: Input alternative characters.
SST	Reference character	• Control codes cannot be used. • No line feed is allowed. • “,”, “%”, “¥”: Input alternative characters.
LTS	Lot character	• Control codes cannot be used. • Functional characters cannot be used. • No line feed is allowed. • “,”, “¥”: Input alternative characters.
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.206).
- 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.

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
  Input using the GB 2312 codes*: A3C1 A3C2 A3C3 A3C4
- To inout “España”
  Input using the Latin-1 codes*: 45 73 70 61 F1 61

* 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	Initial setting
5C (HEX)	\ (Backslash) or ¥ (Yen sign)	\ (Backslash)
60 (HEX)	` (Grave accent) or ‘ (Left single quotation mark)	` (Grave accent)
7E (HEX)	~ (Tilde) or ¯ (Overline)	~ (Tilde)

■ Symbols and special characters input as the alternative

Replace the symbols and special characters listed here with the specified alternative characters.

Characters you want to use	Alternative characters	Remarks
, (one-byte comma)	¥,	
%	%%	For STR command and SST command only
¥	¥¥	
Line feed symbol	¥n	For STR command only

- Enter a yen sign or back slash: 5C (HEX) before the comma “,” to distinguish from the separator when you want to input the one-byte character comma “,” as a character.
- To enter one-byte character “%” or “¥” as a character, input “%%” and “¥¥” respectively.
- To begin a new line, input “¥n” (n after the yen symbol or back slash: 5C (HEX)).
- Enter “%/” or “%+” if you want to enter “/” or “+” as a character right after the counter function.

Example of character input

- If you want to mark “ABCD Co.,Ltd.”, enter “ABCD Co.¥,Ltd.”.
  Input using the ASCII codes*: 41 42 43 44 20 43 6F 2E 5C 2C 4C 74 64 2E

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

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

To input the control codes in the barcode/2D code strings using the communication commands (STR or SIN command), select the input method for control codes at the system settings of Laser Marker NAVI smart.

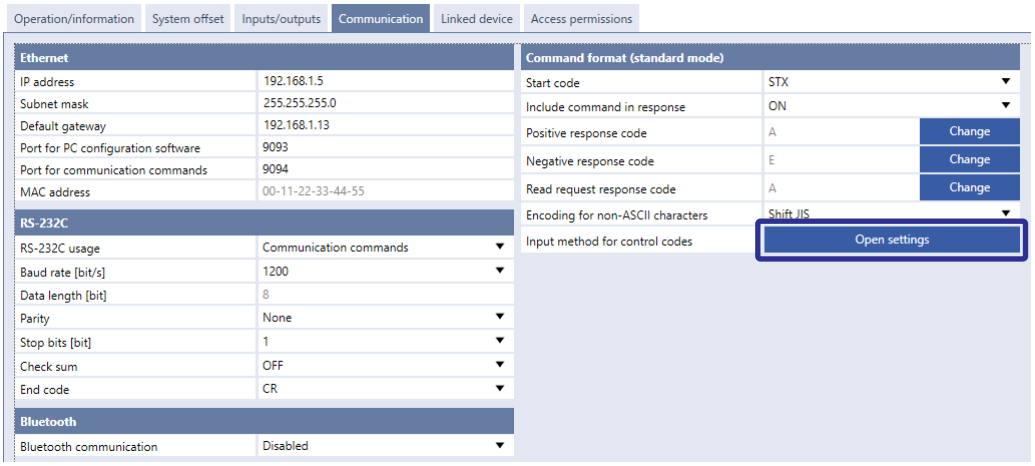
Reference

- This setting is used only for the control codes in the barcode/2D code strings, but not for the general control codes used for the command format such as STX and CR.

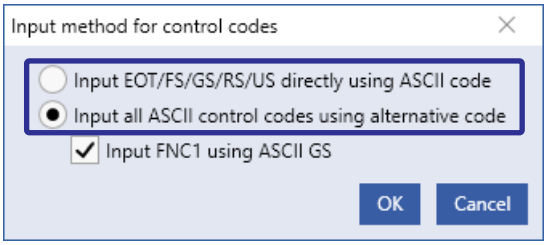
1. Establish an online connection between your PC and the laser marking system.

2. Go to the “System settings” screen.

3. Select the “Communication ” tab and click “Open settings” of “Input method for control codes”.



4. Select the input method.



- Input EOT/FS/GS/RS/US directly using ASCII code:
  For the control codes EOT, FS, GS, RS, or US you can set by using ASCII code. For the other control codes, use the alternative codes.

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

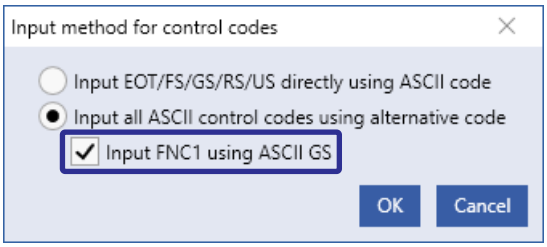
- Input all ASCII control codes using alternative code (Initial setting):
  Input the alternative code (HEX) for the all ASCII control codes. The alternative code is defined by the setting of “Encoding for non-ASCII characters” as follows.

Control code		NUL to US	DEL
ASCII code (HEX)		00 to 1F	7F
Alternative code	when Shift JIS is selected (HEX)	F050 to F06F	F071
	when GB 2312 is selected (HEX)	AAB1 to AAD0	AAD2
	when Latin-1 is selected	\C00 (5C433030 (HEX)) to \C1F (5C433146 (HEX))	\C7F (5C433746 (HEX))

Reference

- This setting is applied also to the response data for the readout.

5. When you select “Input all ASCII control codes using alternative code” at the input method for control codes, set the input method of “FNC1”.



- ON (Initial setting):
  “GS” in the ASCII code 1D (HEX) can be used as “FNC1”.
- OFF:
  Input the alternative code (HEX) for “FNC1”. The alternative code is defined by the setting of “Encoding for non-ASCII characters” as follows.

Control code		FNC1
Alternative code	when Shift JIS is selected (HEX)	F072
	when GB 2312 is selected (HEX)	AAD3
	when Latin-1 is selected	\F1 (5C4631 (HEX))

Reference

- “FNC1” is used mainly as the separator for the variable-length AI data in the code data of GS1 DataMatrix, GS1 DataBar codes and EAN-128 (CODE 128).
- When you select “Input EOT/FS/GS/RS/US directly using ASCII code” at the input method for control codes, “FNC1” should be input with the alternative code.
- In the readout response data, “FNC1” is always indicated with the alternative code.

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

The configured items will be reflected to the laser marker.

“Apply to laser marking system” tool

■ To input functional characters

To set functional characters such as the counter or date/time with character entry command (STR) or reference character command (SST), 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 9	Counter No. 0 to Counter No. 9
	A to F	Counter No. 10 to Counter No. 15
	G to V	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” is omitted for the decimal number.

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 9	Expiry time No. 1 to Expiry time No. 9
	A to G	Expiry time No. 10 to Expiry time No. 16
	H to W	Global expiry time No. 17 to Global expiry time No. 32

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

Item	Input characters	Description
n	Represents the lot function number.	
	0 to 9	Lot No. 0 to Lot No. 9
	A to F	Lot No. 10 to Lot No. 15
	G to V	Global lot No. 16 to Global lot No. 31

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 (LP-RF/LP-RV series only)

Reference

- When the character strings set with the functional character are read out by STR command or SST command, the data with the functional character set to start with % described earlier 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.

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) *1
- Laser radiation for measurement (SPT) *2

*1 : Guide laser command (GID) cannot be used with LP-GS052 type.

*2 : The laser radiation for measurement (SPT) commands are available only when the shutter open/close 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

- The command reception permission is not necessary for readout requests (the sub command is specified to “R”).
- 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.

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

For the readout request (with the sub command “R”), the command reception permission is not required.
For the setting request commands (with the sub command “S”), the following commands are accepted without setting “reception mode ON” by MKM command.

- Command reception permission (MKM)
- Shutter open/close (SHT)
- Laser pumping (LSR)
- 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)
- Laser radiation for measurement: stop request (SPT)

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)
- Laser radiation for measurement: start request (SPT)
- Laser pumping ON (LSR) (LP-RC series only)

Reference

- For LP-RC series, the shutter open request can be accepted after turning on the laser pumping.

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)
- I/O monitor (IOM)
- Operating data (RTD)
- Error history (ERH)
- Alarm reset (ARS)
- Error code (ENO)

■ Warning

- Status checking (STS)
- I/O monitor (IOM)
- Operating data (RTD)
- Error history (ERH)
- Alarm reset (ARS)
- Error code (ENO)
- Shutter open/close (SHT): Shutter close request and shutter status readout only
- Command reception permission (MKM): Reception permission state readout only

Reference

- For release method of alarm and warning, refer to “Error Indication” (P.193).

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. “9999”	Check sum*1	End code CR
02	46 4E 4F	53	39 39 39 39	31 43	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) + 39 (HEX) + 39 (HEX) + 39 (HEX) + 39 (HEX) + 21C (HEX)
- 31 43 (HEX) is the value converted the lower two digits character (lower one-byte) 1C (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	“FNO”	“A”	Check sum	End code
02	46 4E 4F	41	32 36	0D (HEX)

Example of negative response

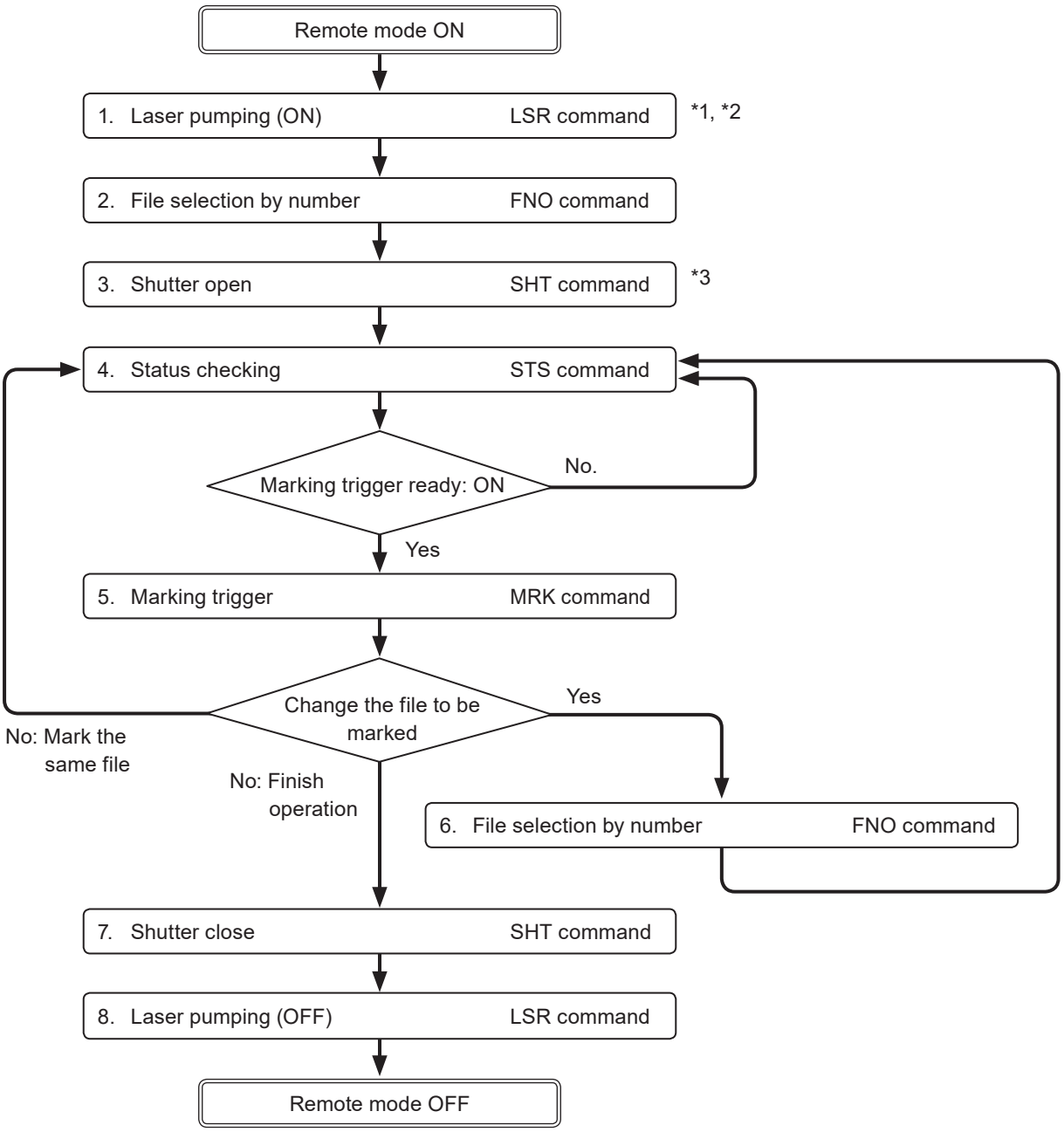
Start code	“FNO”	“E”	“9801”	Check sum	End code
02	46 4E 4F	45	39 38 30 31	46 43	0D (HEX)

Reference

- Select [STX] for the start code or no start code.
- 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

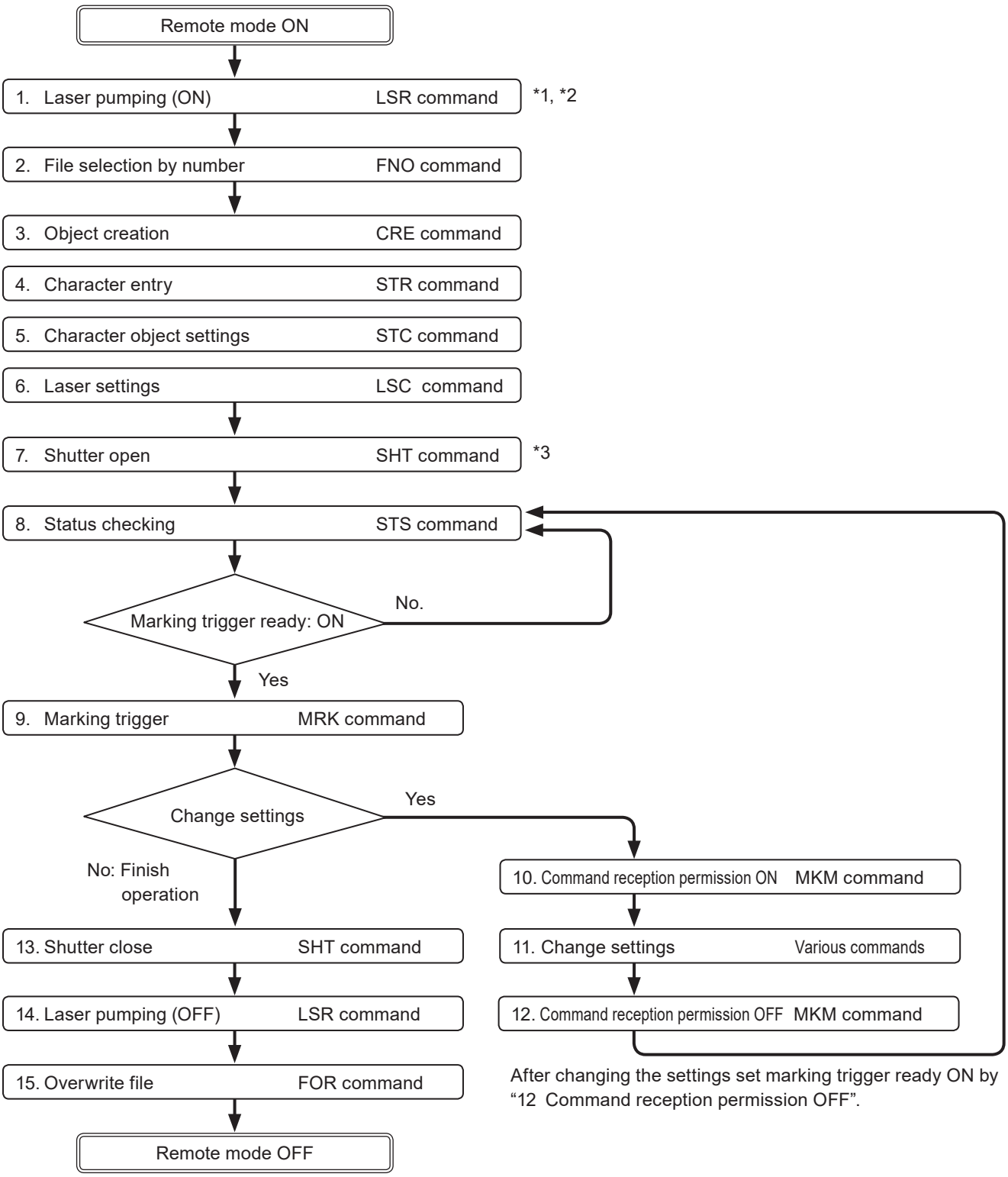


*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-GS series: about 8 to 15 seconds
- LP-RC series: about 10 seconds
- LP-RF series: about 7 seconds
- LP-RV series: about 1 second

*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.
Besides, with LP-RC series for the first operation of opening shutter after the laser pumping on, it takes around 300ms to max. 4 seconds.

■ Create marking data and start marking

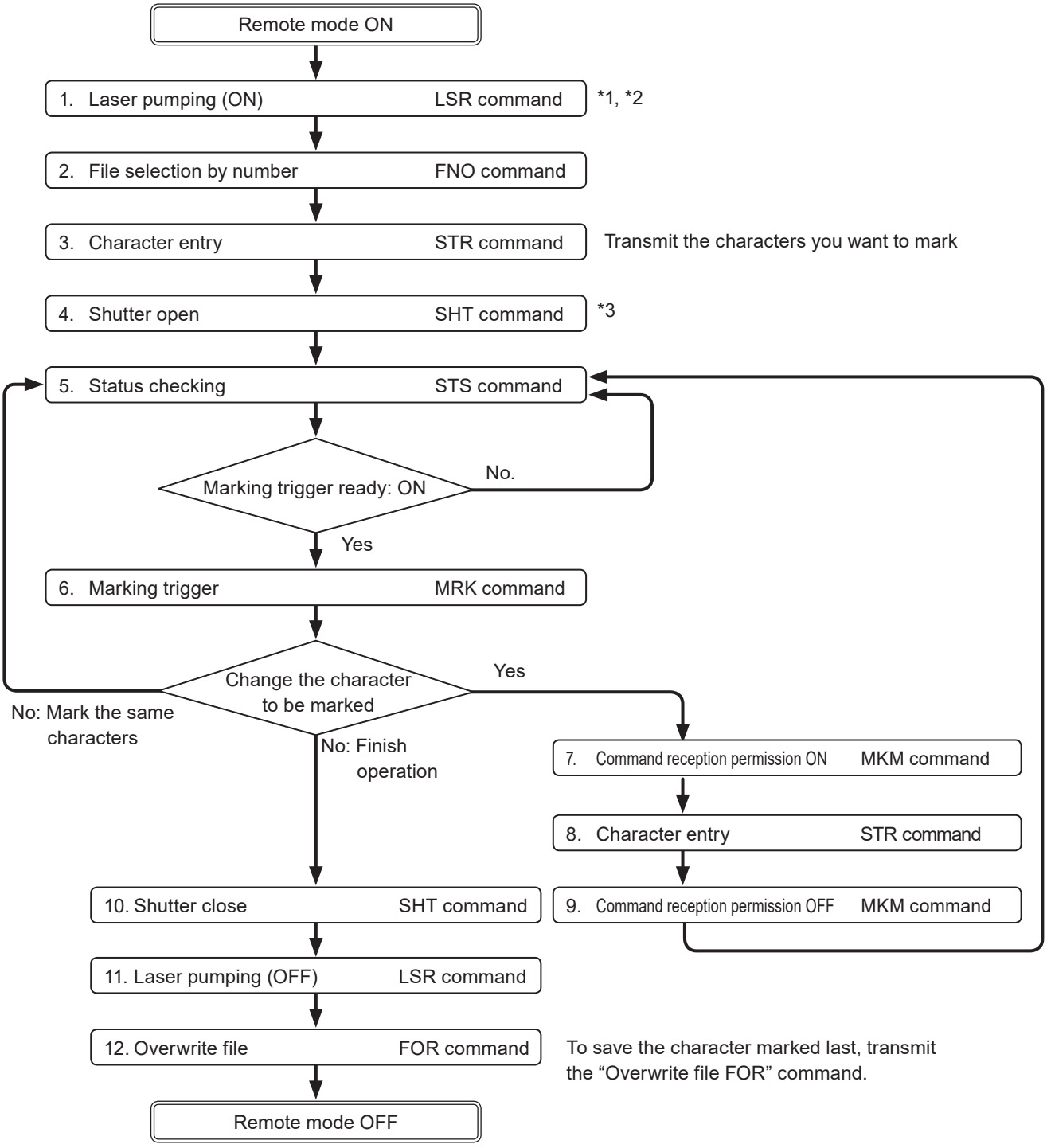


*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-GS series: about 8 to 15 seconds
- LP-RC series: about 10 seconds
- LP-RF series: about 7 seconds
- LP-RV series: about 1 second

*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.
Besides, with LP-RC series for the first operation of opening shutter after the laser pumping on, it takes around 300ms to max. 4 seconds.

■ Change the marking characters and start marking

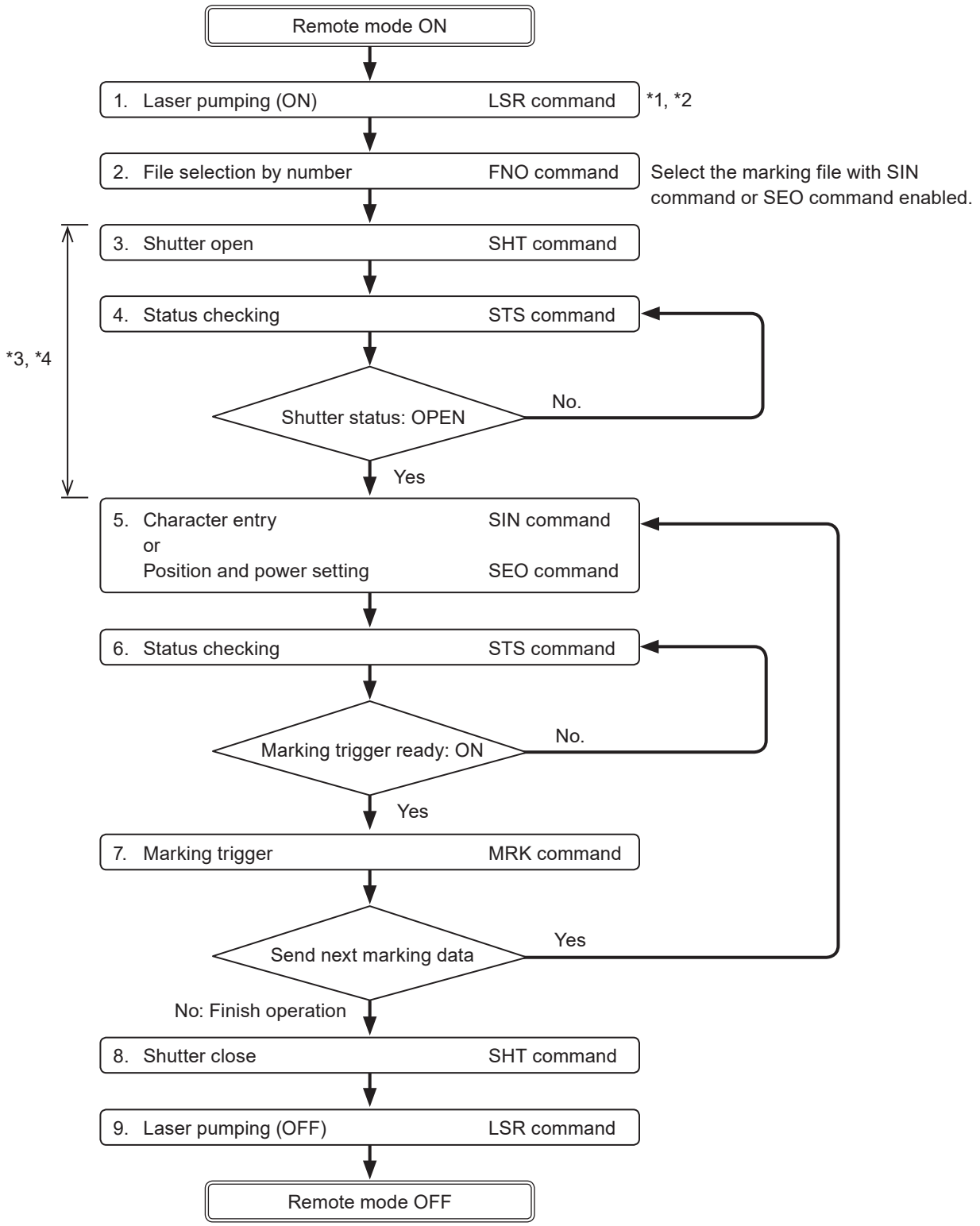


*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-GS series: about 8 to 15 seconds
- LP-RC series: about 10 seconds
- LP-RF series: about 7 seconds
- LP-RV series: about 1 second

*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.
Besides, with LP-RC series for the first operation of opening shutter after the laser pumping on, it takes around 300ms to max. 4 seconds.

■ Change the marking characters or position for each marking



*1 : From sending the laser pumping on request to completion of laser pumping, the following time will be required.
- LP-GS series: about 8 to 15 seconds
- LP-RC series: about 10 seconds
- LP-RF series: about 7 seconds
- LP-RV 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 / SEO commands 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.
Besides, with LP-RC series for the first operation of opening shutter after the laser pumping on, it takes around 300ms to max. 4 seconds.

*4 : For LP-RC/LP-RF/LP-RV series, you can know the timing of SIN command or 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”.

Reference

- To use SIN command, set “Characters specified by SIN command” of the functional character to the file in Laser Marker NAVI smart beforehand.
- To use this SEO command, set the external offset function with “Using SEO command” to the file in Laser Marker NAVI smart beforehand.
- Send SIN or SEO commands by every marking triggers. READY OUT will not turn on until SIN or SEO commands are sent.

3 Data Format for Each Command

3-1 Command List

Type	Name	Code	Functions	Refer
Operation Control	Command reception permission	MKM	Controls the reception permission for the settings by communication commands.	(P.59)
	Laser pumping	LSR	Controls the laser pumping ON/OFF.	(P.60)
	Shutter open/close	SHT	Controls the internal shutter opening/closing.	(P.61)
	Marking trigger	MRK	Inputs marking trigger (laser radiation startup signal).	(P.62)
	Marking trigger (at regular intervals) *1	MRK	Controls to start or to stop the on-the-fly marking at regular intervals.	(P.63)
	Trigger mode	TMS	Specifies how you will input TRIGGER IN (marking start signal) by selecting “single trigger” or “continuous trigger”.	(P.64)
	Trigger delay	DLY	Sets the delay time from trigger input to starting trigger processing (lasing) operation.	(P.66)
	Guide laser *2	GID	Controls radiation of red guide laser for marking position confirmation.	(P.67)
	Status checking	STS	Reads out the laser marker status including marking trigger ready status and error occurrence status.	(P.69)
	Marking end verification	MST	Enables automatic response of marking result (e.g. normal end, and error occurrence, etc.) at the end of marking.	(P.70)
	I/O monitor	IOM	Reads out the ON/OFF status of the I/O signals.	(P.72)
File	File selection by number	FNO	Specifies the file number to change the file.	(P.73)
	File selection by name	FNN	Specifies the file name to change the file.	(P.74)
	Overwrite file	FOR	Overwrites the current file onto the laser marker.	(P.75)
	Save file to different number	FRG	Saves the current file to the specified file number in the laser marker.	(P.75)
	File name	FNM	Sets the file name of the number selected.	(P.76)

Type	Name	Code	Functions	Refer
Character Setting	Character entry	STR	Sets the characters of the character objects, bar code/2D code objects.	(P.77)
	Character entry per trigger	SIN	When “Characters specified by SIN command” is set for character objects or barcode/2D code objects, input characters with this command. Send this command per each marking.	(P.79)
	Character object settings	STC	Sets the position and size of the character object and conditions including text characteristics.	(P.82)
	Reference character	SST	Sets the characters strings as the “reference character” which can be used in several character objects commonly.	(P.88)
	Applying reference character	LNO	Applies the preset reference characters to the specified character object.	(P.89)
Functional characters	Counter settings	CNT	Configures the “counter” function used to mark consecutive numbers.	(P.90)
	Counter reset	CTR	Resets the current value to the starting value.	(P.91)
	Counter reset timing	CRC	Sets the timing to reset the counter automatically.	(P.92)
	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.93)
	Lot settings	LTC	Configures the “Lot” function used to change characters depending on the date/time and counter values.	(P.94)
	Lot character	LTS	Sets the characters used with the “Lot” function to change characters depending on the date/time and counter values.	(P.95)
	Registered character input method	RKC	Sets the input method of the “Registered characters” function used to switch characters by I/O input.	(P.97)
	Registered character strings	RKS	Sets the character string used with the “Registered characters” function that switches characters by I/O input.	(P.98)
Bar Code/2D Code	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.99)
	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.109)
	Module filling of 2D codes	BRT	Sets the filling details of the 2D code modules.	(P.111)
	Laser settings by 2D code elements	BRP	Sets the laser settings and filling details by each element of the 2D code.	(P.114)
	Quiet zone filling of 2D codes	BRQ	Sets the filling details of the 2D code quiet zone.	(P.116)

Type	Name	Code	Functions	Refer
Graphic Data	Graphic file (VEC/DXF format file)	CDF	Sets the graphic file (VEC/DXF format) used for the graphic object.	(P.118)
	Graphic object settings (VEC format file)	CDC	Sets the parameters such as the position and size of the graphic object (VEC format file).	(P.119)
	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.121)
	Shape settings	FIG	Creates shapes with line, circle, and arc by specifying their sizes and positions.	(P.123)
Point	Point radiation parameters	PRD	Sets the position, time and laser power correction ratio of the point radiation.	(P.130)
Object Management	Object creation	CRE	Creates a new object by specifying the object number, object group to which the object belongs, and object type.	(P.134)
	Object deletion	DEL	Deletes a marking object.	(P.135)
	Object marking specification	ENA	Sets whether or not to mark the object of the specified number or data in the object group.	(P.136)
Layout/Position Adjustment	Object coordinate	POS	Sets the base position of the marking object.	(P.137)
	Object movement	POR	Moves the base position of the marking object using the relative value from the current position.	(P.138)
	Object group settings	GRP	Sets the marking position and over-marking by object group. It is also used to specify the filling line spacing for bold characters and bar codes.	(P.139)
	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.141)
	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.142)
	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.145)
	External offset values	OFS	Sets offset value of marking position and laser power used for “External Offset Function” with I/O input.	(P.146)
	Step & repeat settings	SRC	Sets the condition of “Step & repeat” to mark the same marking contents on multiple locations in one file.	(P.148)
	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.150)

Type	Name	Code	Functions	Refer
On-the-fly Marking	Motion settings for all files *1	FLY	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.156)
	Motion settings for current file *1	FLF	Sets the detailed parameters of on-the-fly marking for the selected marking file, such as the line speed, lasing start boundary and etc.	(P.157)
Laser settings	Laser settings	LSC	Sets the laser settings for the current file such as laser power and scan speed.	(P.159)
	Laser correction by object	MOD	Sets the correction value if you change laser settings for each object.	(P.161)
	Pulse cycle correction by object *3	PCC	Sets the correction value of pulse cycle for LP-RF/ LP-RV series by each object.	(P.163)
Maintenance	Laser radiation for measurement	SPT	Controls “laser radiation for measurement” used to measure laser output by a commercially available power meter.	(P.165)
	Operating data	RTD	Reads out the total operating time and total number of operation of the main parts in the laser marker.	(P.167)
	Error history	ERH	Reads out the error log saved in the laser marking system.	(P.169)
	Error code	ENO	Reads out the error code of alarm or warning when an error has occurred.	(P.172)
	Alarm reset	ARS	The reset input for restoring the system from the alarm or warning status.	(P.172)
System settings	System clock	YMD	Sets the date and time of the system clock of the laser marker.	(P.173)
	System offset	SOF	Fine-tunes the marking position and laser power of the system. The settings apply to all files in the laser marking system.	(P.174)
	Command mode	RSM	Switches the command mode between LP-400/ LP-V compatible mode and the standard one. This command is available when LP-400/V compatibility setting is enabled in system settings.	(P.176)

*1 : Only LP-RC series, LP-RF series, LP-RV series

*2 : Only LP-GS051(-L) type, LP-RC350S, LP-RF series, LP-RV series

*3 : Only LP-RF series, LP-RV series

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.
- The initial value settings are listed for the following items within each command format.
  - Sub command of readout response data: A
  - Command of response data: ON

Start code	POS	S	[Object No.],[X-position],[Y-position],[Rotation angle] (,[Object No.],[X-position],[Y-position],[Rotation angle]...)	(Check sum)	End code

- Indicates variable-length or fixed-length data items.
- Data contents varies for each command.
- [ ] indicates each data item. The [ ] is not included in the input data.
- If there is more than one item, use "," to separate them. The "," is included in the input data.
- The item in ( ) indicates a data item when you set more than one target object by one command.

■ How to view the data description table

This is the table that explains the content of variable-length or fixed-length data items.

If the command includes data that can be omitted, this field indicates to that effect.
The data set last (the initial value if it was not set) will be maintained for the data item omitted. The remarks column explains any other cases.
"Y" indicates the data item that can be omitted at the settings.
"(Y)" indicates the data item that can be omitted if there is no subsequent item.
"-" indicates the data item that cannot be omitted.

- Data length of each item. It does not include the separator ",".
- If the data length shows "Max.", it refers to variable-length data.
- If the data length has * mark, request data will be variable-length data and the maximum data length will be read out for readout response data.

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

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	-	Max. 4*	"0000"–"1999"	
X-position	Y	Max. 8*	"-999.999"–"+999.999" [mm]	The coordinate of the item omitted remains to be the value set last (the initial value if it was not set).
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	"-180.000"–"+180.000" [°]	
Total data length		Max. 31	It is the length including the separator ",". The maximum value that can be set to one object number. Max. 32 objects can be set at once.	

It is the total data length including the separator "," of the variable-length or fixed-length data part.
If the data length shows "Max.", it refers to variable-length data.

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 the initial setting “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.45) 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.

■ 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 the initial setting “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-GS series: about 8 to 15 seconds
  - LP-RC series: about 10 seconds
  - LP-RF series: about 7 seconds
  - LP-RV series: about 1 second
- For LP-RC series, the shutter can be opened after turning on the laser pumping. When the laser pumping is turned to off, the shutter is closed automatically.
- 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	Sub command	[Shutter status] 1-byte	(Check sum)	End code

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

■ Readout request data

Start code	SHT	R	(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.
- With LP-RC series for the first operation of opening shutter after the laser pumping on, it takes around 300ms to max. 4 seconds.
- For LP-RC series, the shutter can be opened after turning on the laser pumping. When the laser pumping is turned to off, the shutter is closed automatically.
- With LP-RC series for the first operation of opening shutter after the laser pumping on, warning E641 may occur in case the laser pumping has been off for more than several days. In this case, send the shutter close request or input alarm reset to recover from the warning status, and then retry opening the shutter.
- SHT command is not acceptable during the guide laser emission or laser radiation for measurement.
- 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]

- Readout

Transmission data	[STX]	SHT	R	[CR]

Response data	[STX]	SHT	A	1	[CR]

3-3-4 Marking trigger: MRK

Inputs marking trigger (laser radiation startup signal). This command is used for the trigger input (single trigger) of the marking to the static workpiece or on-the-fly marking with the single trigger or multiple triggers.
To input the trigger for on-the-fly marking at regular intervals, refer to “3-3-5 Marking trigger (at regular intervals): MRK” (P.63).

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 trigger processing operations of multiple triggers are running, on-the-fly marking is terminated after finishing the running marking, and subsequent triggers will be canceled.
  - Closing the shutter
  - Sending MKM command with “command reception permission ON”
  - Changing the file
  - Changing the marking characters by code reader linkage function

■ Setting request data

Start code	MRK	S	(Check sum)	End code

■ Example of command settings

- Setting

Transmission data	[STX]	MRK	S	[CR]

3-3-5 Marking trigger (at regular intervals): MRK

Supported model: LP-RC series / LP-RF series / LP-RV series

Controls to start or to stop the on-the-fly marking at regular intervals.

Reference

- Lasing operation starts when the workpiece comes to the preset marking position after start request of this command is accepted, and afterward the marking operation is executed at regular intervals.
- 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.
- The readout request of this command is available only when the marking at regular intervals is set.
- 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.
- 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.
- If any of the following operations are executed while the on-the-fly marking at regular intervals are running, on-the-fly marking operation is terminated after finishing the running marking.
  - Closing the shutter
  - Sending MKM command with “command reception permission ON”
  - Changing the file
  - Changing the marking characters by code reader linkage function

■ Setting request data / response data for readout (for on-the-fly marking at regular intervals)

Start code	MRK	Sub command	[Marking at regular intervals ON/OFF] 1-byte	(Check sum)	End code

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

■ Readout request data (for on-the-fly marking at regular intervals)

Start code	MRK	R	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Marking at regular intervals ON/OFF	1	“0”: Stop marking “1”: Start marking at regular intervals	• Setting “1” allows to start the first marking operation. • Once setting “1”, the marking operation is repeated at regular intervals until “0” is set. • The readout response data indicates the setting status of MRK command only. The input status of the I/O signal TRIGGER IN (X5) cannot be readout with this command.
Total data length	1	The data length is fixed.	

■ Example of command settings

Condition: Marking at regular intervals ON/OFF = 1

• Setting

Transmission data	[STX]	MRK	S	1	[CR]

• Readout

Transmission data	[STX]	MRK	R	[CR]

Response data	[STX]	MRK	A	1	[CR]

3-3-6 Trigger mode: TMS

Specifies how you will input TRIGGER IN (marking start signal) to a static object by selecting “single trigger” or “continuous trigger”. According to this setting, the behavior of TRIGGER IN signal in I/O terminal is defined. Trigger mode setting is applied to only the selected file.

■ Setting request data / response data for readout

Start code	TMS	Sub command	[Trigger mode],[Allow to stop halfway], [Minimum number of scans],[Maximum number of scans], [Scan interval] With single trigger: 1-byte With continuous trigger: Max. 18-byte	(Check sum)	End code

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

■ Readout request data

Start code	TMS	R	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data content	Remarks
Trigger mode	–	1	“0”: Single trigger “1”: Continuous trigger	• With “single trigger”, one lasing operation is executed by each input of TRIGGER IN. • With “continuous trigger”, lasing operation is repeated while TRIGGER IN is on. • With setting “0”: Single trigger, end the data here. Do not send any subsequent data including a separator “,”.
Allow to stop halfway	Y	1	“0”: Do not allow “1”: Allow to stop	• Specify these values only when the trigger mode is continuous trigger. When the trigger mode is single trigger, do not input anything. • Without “allow to stop halfway” setting if TRIGGER IN turns OFF when the lasing operation is running, the lasing operation is terminated after finishing the running operation. • With “allow to stop halfway” setting when the marking operation stops halfway because TRIGGER IN turns OFF, it is counted as one normal scanning. • Minimum number of scans should be less than or equal to maximum number of scans.
Minimum number of scans	Y	Max. 4*	“0001”–“9999” [times]	
Maximum number of scans	Y	Max. 4*	“0001”–“9999” [times] “0000”: No upper limit	
Scan interval	Y	Max. 4*	“00.0”–“60.0” [sec.]	
Total data length		1 or Max. 18	• When the trigger mode is single trigger: 1-byte (Fixed-length) • When the trigger mode is continuous trigger: Max. 18-byte (Length including separator “,”)	

* Setting request data are variable length.

Reference

- Trigger mode setting is applied to only the selected file. When using several files, set the trigger mode for each file.
- The default setting of the trigger mode is “single trigger”.
- These settings are not applied to on-the-fly marking. Set the trigger mode of on-the-fly marking with FLY command (motion settings for all files).
- MRK command can be used 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.

■ Data example

Condition: Trigger mode = 1, Allow to stop halfway = 0, Minimum number of scans = 8, Maximum number of scans = 10, Scan interval = 0.1

- Setting

Transmission data	[STX]	TMS	S	1,0,8,10,0.1	[CR]

- Readout

Transmission data	[STX]	TMS	R	[CR]

Response data	[STX]	TMS	A	1,0,0008,0010,00.1	[CR]

Condition: Trigger mode = 0

- Setting

Transmission data	[STX]	TMS	S	0	[CR]

- Readout

Transmission data	[STX]	TMS	R	[CR]

Response data	[STX]	TMS	A	0	[CR]

3-3-7 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] Max. 4-byte	(Check sum)	End code

Sub command is “S” for the setting request data and the initial setting “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	Max. 4 *	“0000”–“9999” [ms]	
Total data length	Max. 4		

* Setting request data are variable length.

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 not applied to the on-the-fly marking.

■ Example of command settings

Condition: Delay time = 75

- Setting

Transmission data	[STX]	DLY	S	75	[CR]

- Readout

Transmission data	[STX]	DLY	R	[CR]

Response data	[STX]	DLY	A	0075	[CR]

3-3-8 Guide laser: GID

Supported model: LP-GS051(-L) type / LP-RC350S / LP-RF series / LP-RV series

Controls radiation of red guide laser for marking position confirmation.

■ Setting request data / response data for readout

Start code	GID	Sub command	[Guide laser display],[Guide laser scan speed], [Guide laser Z-movement] Max. 16-byte	(Check sum)	End code

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

■ Readout request data

Start code	GID	R	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Guide laser display	–	1	“0”: Stop display “1”: Marking field “2”: Marking image “3”: Masked objects “4”: Work distance	• “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	Y	Max. 5*	Model / Setting range [mm/s] LP-GS051: “00001”–“03000” LP-GS051-L: “00001”–“02000” LP-RC350S, LP-RF200P, LP-RV200P: “00001”–“06000”	When on-the-fly marking is set for LP-RC/LP-RF/LP-RV series, 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.
Guide laser Z-movement	Y	Max. 8*	Model / Setting range [mm] LP-GS051: “-003.000”–“+003.000” LP-GS051-L, LP-RC350S, LP-RF200P, LP-RV200P: “+000.000” or omit	• Enabled only when the guide laser display is set to marking field or work distance. • Z-movement can be specified with LP-GS051 (exclude LP-GS051-L).
Total data length		Max. 16	It is the length including the separator “,”.	

* Setting request data are variable length.

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 for LP-RC/LP-RF/LP-RV series, the guide laser of the marking image and the masked objects operates with the on-the-fly behavior.
- For LP-GS052 type, guide laser command (GID) cannot be used.
- Do not execute any other operation including the shutter opening/closing and sending MKM command while the guide laser is emitted.
- 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	1,200,2	[CR]

- Readout

Transmission data	[STX]	GID	R	[CR]

Response data	[STX]	GID	A	1,00200,+002.000	[CR]

Condition: Stop the guide laser radiation

- Setting

Transmission data	[STX]	GID	S	0	[CR]

3-3-9 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	[Marking trigger ready state],[Laser radiation status], [Laser pumping status],[Shutter status],[Command reception status], [Error occurrence status],[Data waiting status *] LP-GS: 11-byte LP-RC/LP-RF/LP-RV: 13-byte	(Check sum)	End code

* This data is included only in the response data of LP-RC/LP-RF/LP-RV series.

■ Data description

Name	Data length [byte]	Data contents	Remarks
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.
Laser radiation status	1	“0”: Laser radiation OFF (no marking operation) “1”: Laser radiation ON (marking is in progress)	
Laser pumping status	1	“0”: Laser pumping OFF “1”: Laser pumping in preparing “2”: Laser pumping completed	
Shutter status	1	“0”: Shutter close “1”: Shutter open	
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.45).
Error occurrence status	1	“0”: No error “1”: Error occurrence	To the warnings from E700 to E799, “0” (No error) is read out.

(LP-RC/LP-RF/ LP-RV only) Data waiting status	1	“0”: Not in data input waiting
		“1”: In data input waiting
			• When using either of the following functions, this response data indicates the waiting status of the data input. Confirm this response data is “1” and then input the corresponding data.
			  • SIN command
			  • SEO command
			  • Registered characters (via I/O)
			  • External offset
			• When the above functions are not used, the response data is always “0”.

Total data length	11 or 13	It is the length including the separator “,”. The data length is fixed. • LP-GS series: 11-byte • LP-RC/LP-RF/LP-RV series: 13-byte	

Reference

- For LP-GS series: “1,0,2,1,1,0” is the response data for status checking with the marking trigger ready ON.
- For LP-RC/LP-RF/LP-RV series “1,0,2,1,1,0,0” is the response data for status checking with the marking trigger ready ON.

3-3-10 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 the initial setting “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.
- MST command is not available when you use the optional industrial network (EtherNet/IP or PROFINET) for the command control.

■ 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.

Start code	MST	A	[Status],[Number of scans *] 3-byte With continuous trigger setting: 8-byte	(Check sum)	End code

* This data is included only when the trigger mode is set to “continuous trigger”.

■ Data description

Name	Data length [byte]	Data contents	Remarks
Status	3	“000”: Normal end “001”–“999”: 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 “000” as the normal end.

Name	Data length [byte]	Data contents	Remarks
(Only with continuous trigger setting) Number of scans	4	“0001”–“9999” [times] “0000” : Unknown due to error occurrence	• Only when the trigger mode is continuous trigger, the executed number of scanning operation with one trigger is returned. • With “allow to stop halfway” setting when the marking operation stops halfway because TRIGGER IN turns OFF, this operation is counted as one normal scanning. • If an error other than E630 and E631 occurs and lasing operation stops, the response data is “0000”. • When the executed number of scans are 9999 or more, the response data is “9999”.
Total data length	3 or 8	The data length is fixed. • When the trigger mode is other than “continuous trigger”: 3-byte • When the trigger mode is “continuous trigger”: 8-byte (Length including the separator “,”)	

Reference

- Refer to “Error Indication” (P.193) 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.

■ 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: Status = 000 (normal end)

- Response data with response permitted

Response data	[STX]	MST	A	000	[CR]

Condition: With continuous trigger setting
Status = 000 (normal end), Number of scans = 5

- Response data with response permitted

Response data	[STX]	MST	A	000,0005	[CR]

3-3-11 I/O monitor: IOM

Reads out the ON/OFF status of the I/O signals.

■ Readout request data

Start code	IOM	R	(Check sum)	End code

■ Response data for readout

Start code	IOM	A	[I/O terminal X1–X20],[I/O terminal Y1–Y20], [I/O connector No. 1–40] 82-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
I/O terminal X1–X20	20	“0”: OFF “1”: ON “-”: No data	• Indicates the input status of each signal in the order from X1 to X20. • For the INTERLOCK terminals, “0” represents they are closed and “1” represents they are opened.
I/O terminal Y1–Y20	20	“0”: OFF “1”: ON “-”: No data	• Indicates the output status of each signal in the order from Y1 to Y20.
I/O connector No. 1–40	40	“0”: OFF “1”: ON “-”: No data	• Indicates the input and output status of each signal in the order from No.1 to 40.
Total data length	82	It is the length including the separator “,”. The data length is fixed.	

Reference

- The I/O status (“ON”/“OFF”) at a time when the readout request command is accepted by the laser marking system is readout.
- For details about the I/O terminals, refer to the “Setup and Maintenance Guide” of your laser marking system.
- The following terminals that cannot be monitored are indicated with “-”:
  IN COM, OUT COM, Power terminals (24V OUT and 0V OUT), RESERVE, INTERLOCK MONITOR
- With this command you can also monitor the I/O status controlled via optional network unit (EtherNet/IP or PROFINET).

■ Example of command settings

Condition: For LP-RC/LP-RF/LP-RV series

- Readout

Transmission data	[STX]	IOM	R	[CR]	
Response data	[STX]	IOM	A	---10000000-00000000,---100111000-11----0, -00000000000000000000000---0000000000000	[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] Max. 4-byte	(Check sum)	End code

Sub command is “S” for the setting request data and the initial setting “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	Max. 4*	“0000”–“9999”	Response data for readout returns the file number currently selected.
Total data length	Max. 4		

* Setting request data are variable length.

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	10	[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. 254-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
File name	Min. 1 Max. 254	The number of input characters allowed is 1 to 127 characters.	
Total data length	Max. 254		

Reference

- Refer to “2-3-6 Character data input method” (P.39) 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 one-byte characters (in ASCII code) and two-byte characters (in Shift JIS or GB 2312 code), specify them exactly as they are by using two types of the character 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.

■ Example of command settings

Condition:
- Setting

File name = ABCD

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, and reference list characters for all files 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 for all files (FLY)
  - Laser radiation for measurement (SPT)
  - System offset (SOF)
  - 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] Max. 4-byte	(Check sum)	End code

■ Data description

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

* Setting request data are variable length.

■ 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. 254-byte	(Check sum)	End code

Sub command is “S” for the setting request data and the initial setting “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. 254	The number of input characters allowed is 1 to 127 characters.	
Total data length	Max. 254		

Reference

- Refer to “2-3-6 Character data input method” (P.39) 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.

■ 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: STR

Sets the characters of the character objects (except reference list type), bar code/2D code objects.

■ Setting request data

Start code	STR	S	[Object No.],[Marking character] (,[Object No.],[Marking character]...)	(Check sum)	End code

■ Readout request data

Start code	STR	R	[Object No.] Max. 6-byte	(Check sum)	End code

■ Response data for readout

Start code	STR	A	[Object No.],[Marking character] Max. 605-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 6*	For character objects, bar code/2D code objects excepting 2D side of composite code: “0000”–“1999” or “0000.0”–“1999.0”	• Excepting 2D side of the composite codes, you do not need to specify the number after the decimal point. • To set the character to 2D side of the composite codes, add “.1” after the object number. • Only “0” or “1” can be specified after the decimal point.
		For 2D side of composite codes: “0000.1”–“1999.1”	
Marking character	Min. 0 Max. 598	The number of input characters allowed is max. 299 characters.	• Specify 0-byte for data length to delete characters. • For the bar code/2D code objects, depending on the symbol type or module numbers, the available number of input characters can be less than 299 characters.
Total data length	Max. 605	It is the length including the separator “,”. The maximum value that can be set to one object number. Max. 32 objects can be set at once. Note that the total data length of one request data should be less than 4096-byte.	

* Setting request data are variable length.

Reference

- Refer to “2-3-6 Character data input method” (P.39) for details on the character input method and character types with input restrictions.
- If the object type set in the specified object number is not either the character or the bar code/2D code, the laser marker returns the negative response.
- For the reference list type character objects, use reference character (SST) command and applying reference character (LNO) command to specify the character strings.
- Characters in TrueType object cannot be set with communication command.
- Use the object creation (CRE) command if you want to create new character objects or bar code/2D code objects.
- For response data for readout, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used. If any characters which belong to the non-supported character code are in the data, the readout request cannot be accepted.
- For the barcode/2D code objects to input the control codes in the code data, follow the input method specified in the system settings. Refer to “Inputting control codes to bar code/2D code character strings” (P.41).
- For the barcode/2D code objects, the linefeed character “¥n” is used only for the human readable text. It does not allow to contain the linefeed in the code data.
- 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.
- Depending on the barcode/2D code type, input 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.
- Only when the request data contains the object number with the value after the decimal point, the object number of the response data contains the value after the decimal point.

■ Example of command settings

Condition:
- Setting

Object No. = 0, Marking character = abcd, Object No. = 1, Marking character = efgh

Transmission data	[STX]	STR	S	0,abcd,1,efgh	[CR]

Condition:
- Readout

Object No. = 0, Marking character = abcd

Transmission data	[STX]	STR	R	0	[CR]

Response data	[STX]	STR	A	0000,abcd	[CR]

3-5-2 Character entry per trigger: SIN

When “Characters specified by SIN command” is set for character objects or barcode/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] (,[String No.],[Marking character]...)	(Check sum)	End code

■ Readout request data

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

■ Response data for readout

Start code	SIN	A	[String No.],[Marking character] Max. 201-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
String No.	Max. 2*	“00”–“15”	If the string No. is not set in the selected file, the SIN command can not be accepted.
Marking character	Min. 0 Max. 198	The number of input characters allowed is max. 99 characters.	Including these characters, max. 299 digits of characters in total can be set in one character object or barcode/2D code object.
Total data length	Max. 201	It is the length including the separator “,”. The maximum value that can be set to one string number. Max. 16 string No. can be set at once. (Max. 3231 byte)	

* Setting request data are variable length.

Reference

- Refer to “2-3-6 Character data input method” (P.39) for details on the character input method and character types with input restrictions.
- 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 by I/O
  - On-the-fly marking at regular intervals
  - On-the-fly marking with multiple triggers
- For response data for readout, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used. If any characters which belong to the non-supported character code are in the data, the readout request cannot be accepted.
- SIN command can be accepted even without marking character data.
- For the barcode/2D code objects to input the control codes in the code data, follow the input method specified in the system settings. Refer to “Inputting control codes to bar code/2D code character strings” (P.41).

■ Example of command settings

Condition: String No. = 0, Marking character = abcd, String No. = 1, Marking character = efgh

• Setting

Transmission data	[STX]	SIN	S	0,abcd,1,efgh	[CR]

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

• Readout

Transmission data	[STX]	SIN	R	0	[CR]

Response data	[STX]	SIN	A	0000,abcd	[CR]

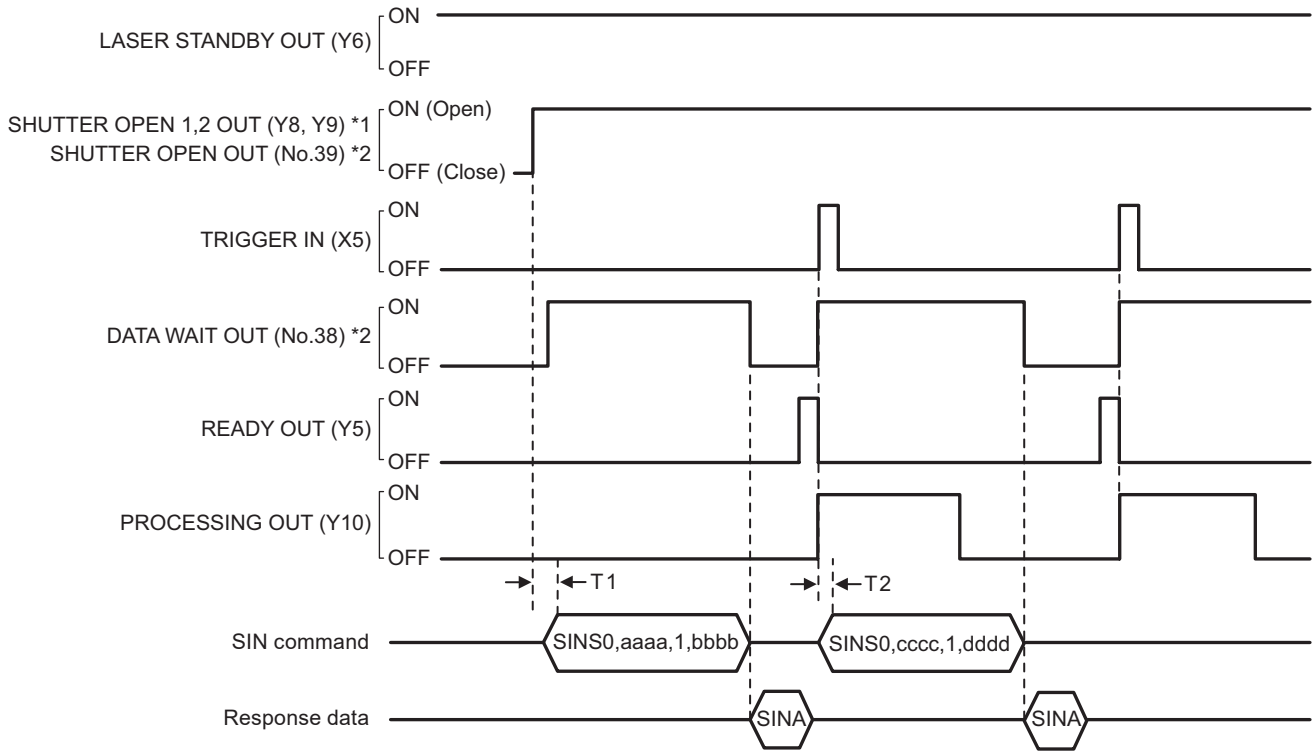
Condition: String No. = 0, No marking character (blank)

• Setting

Transmission data	[STX]	SIN	S	0,	[CR]

■ Timing chart for SIN command transmission

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



*1 : LP-GS series only

*2 : LP-RF/LP-RC/LP-RV series only

Item	Time	Remarks
T1	0 ms or more	Before sending SIN command, confirm that the shutter is opened. For LP-RC/LP-RF/LP-RV series, 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. For LP-RC/LP-RF/LP-RV series, 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 or STS command.
- When “command reception permission ON” is set by MKM command, SIN command can not 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.
- For LP-RC/LP-RF/LP-RV series, you can know the timing of SIN 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 “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.

3-5-3 Character object settings: STC

Sets the position and size of the character object and conditions including text characteristics.

Reference

- This command is available to the character objects including the reference list type.
- If you want to change the object position only, use the object coordinate (POS) command or object movement (POR) command as a shortened command.
- If you want to change the laser power/scan speed correction value of the object only, use the laser correction by object (MOD) command as a shortened command.
- Configurations of TrueType object cannot be set with communication command.

■ Setting request data / response data for readout

Start code	STC	Sub command	[Object No.],[X-position],[Y-position], [Character height],[Character width],[Horizontal alignment], [Vertical alignment],[Bold line width], [Font No.],[Character spacing type], [Character arrangement], ... (varies by character arrangement)	(Check sum)	End code

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

■ Readout request data

Start code	STC	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

1. When the character arrangement is “Straight line”

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	Specifies the origin coordinate of character strings.
Y-position	Y	Max. 8*		
Character height	Y	Max. 7*	Model / Setting range [mm]: LP-GS051(-L): “000.100”–“055.000” LP-GS052: “000.060”–“030.000” LP-RC350S: “000.100”–“085.000” LP-RF200P / LP-RV200P: “000.100”–“090.000”	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.
Character width	Y	Max. 7*		
Horizontal alignment	Y	1	“0”: Left “1”: Center “2”: Right	Specifies which point in the character strings is the origin for the character object.
Vertical alignment	Y	1	“0”: First baseline “1”: Top “2”: Center “3”: Bottom	
Bold line width	Y	Max. 5*	“0.000”–“6.000” [mm]	• If you do not make characters bold, select 0 mm. • If you make characters bold, set the bold line width to 1/2 or less of the character height or width, whichever is smaller.

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Font No.</td><td>Y</td><td>Max. 2*</td><td>“01”–“50”</td><td></td></tr>
<tr><td>Character spacing type</td><td>Y</td><td>1</td><td>“0”: Fixed spacing
“1”: Proportional 1
“2”: Proportional 2
“3”: Proportional 3
“4”: 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.</td></tr>
<tr><td>Character arrangement</td><td>(Y)</td><td>1</td><td>“0”: Straight line (horizontal)</td><td></td></tr>
<tr><td>Rotation angle</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td><td>The rotation center is the origin of the character strings.</td></tr>
<tr><td>Character spacing or Character string width</td><td>Y</td><td>Max. 7*</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</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>Y</td><td>Max. 7*</td><td></td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td rowspan="2">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>Y</td><td>Max. 3*</td><td>“001”–“999” [%]</td></tr>
<tr><td>Space width</td><td>Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td><td>• This setting is valid only when the character spacing type is “Proportional 1”.
• For the character spacing types other than “Proportional 1”, omit this setting. In this case, though the setting value can be read, it is not used for marking.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 96</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

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

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td></td></tr>
<tr><td>Center X-position</td><td>Y</td><td>Max. 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>Y</td><td>Max. 8*</td></tr>
<tr><td>Character height</td><td>Y</td><td>Max. 7*</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.100”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.060”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.100”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.100”–“090.000”</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>Y</td><td>Max. 7*</td></tr>
<tr><td>Horizontal alignment</td><td>Y</td><td>1</td><td>“0”: Left
“1”: Center
“2”: Right</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.</td></tr>
<tr><td>System reserved value</td><td>Y</td><td>1</td><td>“0” or omit</td><td></td></tr>
<tr><td>Bold line width</td><td>Y</td><td>Max. 5*</td><td>“0.000”–“6.000” [mm]</td><td>• If you do not make characters bold, select 0 mm.
• 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>Font No.</td><td>Y</td><td>Max. 2*</td><td>“01”–“50”</td><td></td></tr>
<tr><td>Character spacing type</td><td>Y</td><td>1</td><td>“0”: Fixed spacing
“1”: Proportional 1
“2”: Proportional 2
“3”: Proportional 3
“4”: Justify</td><td></td></tr>
<tr><td>Character arrangement</td><td>(Y)</td><td>1</td><td>“2”: Arc outside, character spacing by angle
“3”: Arc inside, character spacing by angle</td><td></td></tr>
<tr><td>Start angle</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td><td>Sets the position specified by the horizontal alignment to a starting position, and specifies the angle.</td></tr>
<tr><td>Arc radius</td><td>Y</td><td>Max. 7*</td><td>“000.000”–“999.999” [mm]</td><td></td></tr>
<tr><td rowspan="2">Character spacing angle
or
Arc angle</td><td rowspan="2">Y</td><td rowspan="2">Max. 8*</td><td>When character spacing type is “0”–“3”:
“-180.000”–“+180.000” [°]</td><td rowspan="2">Specifies a character spacing angle for fixed spacing/proportional, and an arc angle for justify.</td></tr>
<tr><td>When character spacing type is “4”:
“-360.000”–“+360.000” [°]</td></tr>
</table>

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Linefeed spacing</td><td>Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td><td></td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td rowspan="2">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>Y</td><td>Max. 3*</td><td>“001”–“999” [%]</td></tr>
<tr><td>Space width</td><td>Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td><td>• This setting is valid only when the character spacing type is “Proportional 1”.
• For the character spacing types other than “Proportional 1”, omit this setting. In this case, though the setting value can be read, it is not used for marking.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 105</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

3. When the character arrangement is “Arc outside, character spacing by length” and “Arc inside, character spacing by length”

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td></td></tr>
<tr><td>Center X-position</td><td>Y</td><td>Max. 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>Y</td><td>Max. 8*</td></tr>
<tr><td>Character height</td><td>Y</td><td>Max. 7*</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.100”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.060”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.100”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.100”–“090.000”</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>Y</td><td>Max. 7*</td></tr>
<tr><td>Horizontal alignment</td><td>Y</td><td>1</td><td>“0”: Left
“1”: Center
“2”: Right</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.</td></tr>
<tr><td>System reserved value</td><td>Y</td><td>1</td><td>“0” or omit</td><td></td></tr>
<tr><td>Bold line width</td><td>Y</td><td>Max. 5*</td><td>“0.000”–“6.000” [mm]</td><td>• If you do not make characters bold, select 0 mm.
• 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>Font No.</td><td>Y</td><td>Max. 2*</td><td>“01”–“50”</td><td></td></tr>
<tr><td>Character spacing type</td><td>Y</td><td>1</td><td>“0”: Fixed spacing
“1”: Proportional 1
“2”: Proportional 2
“3”: Proportional 3</td><td></td></tr>
<tr><td>Character arrangement</td><td>(Y)</td><td>1</td><td>“4”: Arc outside, character spacing by length
“5”: Arc inside, character spacing by length</td><td></td></tr>
<tr><td>Start angle</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td><td>Sets the position specified by the horizontal alignment to a starting position, and specifies the angle.</td></tr>
<tr><td>Arc radius</td><td>Y</td><td>Max. 7*</td><td>“000.000”–“999.999” [mm]</td><td></td></tr>
<tr><td>Character spacing</td><td>Y</td><td>Max. 7*</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td><td rowspan="2"></td></tr>
<tr><td>Linefeed spacing</td><td>Y</td><td>Max. 7*</td></tr>
</table>

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td rowspan="2">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>Y</td><td>Max. 3*</td><td>“001”–“999” [%]</td></tr>
<tr><td>Space width</td><td>Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td><td>• This setting is valid only when the character spacing type is “Proportional 1”.
• For the character spacing types other than “Proportional 1”, omit this setting. In this case, though the setting value can be read, it is not used for marking.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 104</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

■ Example of command settings

Condition: When the character arrangement is “Straight line”
Object No. = 1, X-position = -10, Y-position = 2.5, Character height = 4.5, Character width = 4, Horizontal alignment = 0, Vertical alignment = 3, Bold line width = 0.3, Font No. = 2, Character spacing type = 0, Character arrangement = 0, Rotation angle = -180, Character spacing = 4.2, Linefeed spacing = 5, Laser power correction = 120, Scan speed correction = 80

• Setting

Transmission data	[STX]	STC	S	1,-10,2.5,4.5,4,0,3,0.3,2,0,0,-180,4.2,5,120,80	[CR]

• Readout

Transmission data	[STX]	STC	R	1	[CR]

Response data	[STX]	STC	A	0001,-010.000,+002.500,004.500,004.000,0,3,0.300,02,0,0, -180.000,004.200,005.000,120,080,001.250	[CR]

3-5-4 Reference character: SST

Sets the characters strings as the “reference character” which can be used in several character objects commonly.

■ Setting request data

Start code	SST	S	[String No.],[Reference character] (,[String No.],[Reference character]...)	(Check sum)	End code

■ Readout request data

Start code	SST	R	[String No.] Max. 3-byte	(Check sum)	End code

■ Response data for readout

Start code	SST	A	[String No.],[Reference character] Max. 202-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
String No.	Max. 3*	“001”–“200”	• Specifies the row number in the reference list to input character strings. • “101” to “200” are the global character strings that can be used in another files commonly.
Reference character	Min. 0 Max. 198	The number of input characters allowed is max. 99 characters.	Specify 0-byte for data length to delete characters.
Total data length	Max. 202	It is the length including the separator “,”. The maximum value that can be set to one string number. Max. 32 strings can be set at once. Note that the total data length of one request data should be less than 4096-byte.	

* Setting request data are variable length.

Reference

- Refer to “2-3-6 Character data input method” (P.39) for details on the character input method and character types with input restrictions.
- For response data for readout, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used. If any characters which belong to the non-supported character code are in the data, the readout request cannot be accepted.
- To set the reference character in the character object, use LNO command (Applying reference character).

■ Example of command settings

Condition: String No. = 1, Reference character = abcd, String No. = 101, Reference character = %06:CG (counter function)

• Setting

Transmission data	[STX]	SST	S	1,abcd,101,%06:CG	[CR]

Condition: String No. = 1, Reference character = abcd

• Readout

Transmission data	[STX]	SST	R	1	[CR]

Response data	[STX]	SST	A	001,abcd	[CR]

3-5-5 Applying reference character: LNO

Applies the preset reference characters to the specified character object.

■ Setting request data / response data for readout

Start code	LNO	Sub command	[Object No.],[First string No. to apply], [Last string No. to apply] Max. 12-byte	(Check sum)	End code

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

■ Readout request data

Start code	LNO	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	The object type set in the specified object number should be the character (Reference list type).
First string No. to apply	–	Max. 3*	“001”–“200”	• 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. • If you omit the last string No., only the string set in the first string No. is applied to the object.
Last string No. to apply	Y	Max. 3*		
Total data length		Max. 12	It is the length including the separator “,”.	

* Setting request data are variable length.

Reference

- If the object type set in the specified object number is not the character (Reference list type), the laser marker returns the negative response.
- Use the object creation (CRE) command if you want to create new character objects (Reference list type).
- The reference characters cannot be used in character objects other than reference list type and bar code/2D code objects.

■ Example of command settings

Condition: Object No. = 1, First string No. to apply = 101

- Setting

Transmission data	[STX]	LNO	S	1,101	[CR]

- Readout

Transmission data	[STX]	LNO	R	1	[CR]

Response data	[STX]	LNO	A	0001,101,101	[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] Max. 45-byte	(Check sum)	End code

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

■ Readout request data

Start code	CNT	R	[Counter No.] Max. 2-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Counter No.	–	Max. 2*	“00”–“31”	“16” to “31” are the global counters.
Current value	Y	Max. 9*	“000000000”–“999999999” 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	Y	Max. 9*		If the starting value is larger than the end one, it works as a subtraction counter.
End value	Y	Max. 9*		
Step value	Y	Max. 9*		The step value indicates a value to increase or decrease per one counting-up or counting-down.
Count timing	Y	Max. 2*	“00”–“31”: When the counter 0 to 31 has reached to the end value. “32”: When marking trigger is input.	It is the timing to update the current value of the counter.
Total data length		Max. 45	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Counter No. = 0, Current value = 1234, Starting value = 0, End value = 9999, Step value = 1, Count timing = 32

• Setting

Transmission data	[STX]	CNT	S	0,1234,0,9999,1,32	[CR]

• Readout

Transmission data	[STX]	CNT	R	0	[CR]

Response data	[STX]	CNT	A	00,000001234,000000000,00009999,000000001,32	[CR]

Condition: Counter No. = 0, Current value = 1234, hold the last setting data for the other values

• Setting

Transmission data	[STX]	CNT	S	0,1234	[CR]

3-6-2 Counter reset: CTR

Resets the current value to the starting value.

■ Setting request data

Start code	CTR	S	[Counter No.] (,[Counter No], ...)	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Counter No.*	Max. 2*	“00”–“31”	• “16” to “31” are the global counters. • Two or more counter numbers can be specified using a separator “,”.
Total data length	Max. 2	The maximum value to reset one counter number. Max. 32 counters can be reset at once. (Max. 95 byte)	

* Setting request data are variable length.

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.

■ Example of command settings

Condition:
- Setting

To reset counter 0, 1, 2, 3

Transmission data	[STX]	CTR	S	0,1,2,3	[CR]

3-6-3 Counter reset timing: CRC

Sets the timing to reset the counter automatically.

■ Setting request data / response data for readout

Start code	CRC	Sub command	[Counter No.],[System reserved value], [Reset at date change] Max. 6-byte	(Check sum)	End code

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

■ Readout request data

Start code	CRC	R	[Counter No.],[System reserved value] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Counter No.	Max. 2*	“00”–“31”	“16” to “31” are the global counters.
System reserved value	1	“0”: Fixed	
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	Max. 6	It is the length including the separator “,”.	

* Setting request data are variable length.

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.

■ Example of command settings

Condition: Counter No. = 10, System reserved value = 0, Reset at date change = 1

- Setting

Transmission data	[STX]	CRC	S	10,0,1	[CR]

- Readout

Transmission data	[STX]	CRC	R	10,0	[CR]

Response data	[STX]	CRC	A	10,0,1	[CR]

3-6-4 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] Max. 11-byte	(Check sum)	End code

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

■ Readout request

Start code	LMT	R	[Expiry time No.] Max. 2-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Expiry time No.	–	Max. 2*	“01”–“32”	“17” to “32” are the global expiry date/time.
Periods	Y	Max. 4*	“-999”–“+999”	It is the period added or subtracted to/from the current date and time.
Expiry time unit	Y	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	Y	1	“0”: Today not included “1”: Today included	Specifies whether or not to include today in the base date for addition or subtraction. It is valid when the expiry time unit is year or month.
Total data length		Max. 11	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

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

• Setting

Transmission data	[STX]	LMT	S	1,6,2,0	[CR]

• Readout

Transmission data	[STX]	LMT	R	1	[CR]

Response data	[STX]	LMT	A	01,+006,2,0	[CR]

3-6-5 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 unit], [Lot type] Max. 8-byte	(Check sum)	End code

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

■ Readout request data

Start code	LTC	R	[Lot No.] Max. 2-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Lot No.	Max. 2*	“00”–“31”	“16” to “31” are the global lot numbers.
Lot unit	Max. 2*	“00”: Year “01”: Month “02”: Day “03”: Year and month “04”: Month and date “05”: Day of the week “06”: Hour “07”: Week “08”: Minute “09”: Hour and minute “10”: Counter “11”: Year (week-based)	It is the unit of period to switch lot characters.
Lot type	Max. 2*	When the lot unit is “00” to “09” and “11” “00”: Current date/time “01”–“32”: Expiry time No. When the lot unit is “10” “00”–“31”: Counter No.	Specifies which function you are referencing, the current date/time, expiry date, or counter, to switch lot characters.
Total data length	Max. 8	It is the length including the separator “,”.	

* Setting request data are variable length.

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.

■ Example of command settings

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

- Setting

Transmission data	[STX]	LTC	S	0,8,0	[CR]

- Readout

Transmission data	[STX]	LTC	R	0	[CR]

Response data	[STX]	LTC	A	00,08,00	[CR]

3-6-6 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. 44-byte	(Check sum)	End code

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

■ Readout request data

Start code	LTS	R	[Lot No.],[Period No.] Max. 5-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Lot No.	–	Max. 2*	“00”–“31”	“16” to “31” are the global lot numbers.
Period No.	–	Max. 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>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Start period</td><td>Y</td><td>Max. 9*</td><td rowspan="2"><table>
<tr><th>Lot unit</th><th colspan="2">Setting range</th></tr>
<tr><td>Year, Year (week-based)</td><td colspan="2">“000001980”–“000002099”</td></tr>
<tr><td>Month</td><td colspan="2">“000000001”–“000000012”</td></tr>
<tr><td>Date</td><td colspan="2">“000000001”–“000000031”</td></tr>
<tr><td>Year and month (000YYYYMM)</td><td colspan="2">“000198001”–“000209912”</td></tr>
<tr><td>Month and date (00000MMDD)</td><td colspan="2">“000000101”–“000001231”</td></tr>
<tr><td rowspan="7">Day of week</td><td>Sun.</td><td>“000000000”</td></tr>
<tr><td>Mon.</td><td>“000000001”</td></tr>
<tr><td>Tue.</td><td>“000000002”</td></tr>
<tr><td>Wed.</td><td>“000000003”</td></tr>
<tr><td>Thur.</td><td>“000000004”</td></tr>
<tr><td>Fri.</td><td>“000000005”</td></tr>
<tr><td>Sat.</td><td>“000000006”</td></tr>
<tr><td>Hour</td><td colspan="2">“000000000”–“000000023”</td></tr>
<tr><td>Week</td><td colspan="2">“000000001”–“000000054”</td></tr>
<tr><td>Minute</td><td colspan="2">“000000000”–“000000059”</td></tr>
<tr><td>Hour and minute (00000HHmm)</td><td colspan="2">“000000000”–“000002359”</td></tr>
<tr><td>Counter</td><td colspan="2">“000000000”–“999999999”</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. It is not necessary to transmit the subsequent data including a separator “,”.
• The period that the end period comes before the start period cannot be set.</td></tr>
<tr><td>End period</td><td>Y</td><td>Max. 9*</td></tr>
<tr><td>Lot character</td><td>–</td><td>Min. 0
Max. 18</td><td>The number of input characters allowed: Max. 9 characters</td><td>Specify 0-byte for data length to delete characters.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 44</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

Reference

- Refer to “2-3-6 Character data input method” (P.39) for details on the character input method and character types with input restrictions.
- For response data for readout, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used. If any characters which belong to the non-supported character code are in the data, the readout request cannot be accepted.
- 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.

■ Example of command settings

Condition: Lot unit = Year and month
Lot No. = 0, Period No. = 1, Start period = January 2014, End period = December 2014,
Lot character = abcd

• Setting

Transmission data	[STX]	LTS	S	0,1,201401,201412,abcd	[CR]

• Readout

Transmission data	[STX]	LTS	R	0,1	[CR]

Response data	[STX]	LTS	A	00,01,000201401,000201412,abcd	[CR]

3-6-7 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 the initial setting “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	“0”: 4-bit x 4 “1”: 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

3-6-8 Registered character strings: RKS

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

■ Setting request data

Start code	RKS	S	[Registration table No.],[Data number],[Registered characters] (,[Data number],[Registered characters]...)	(Check sum)	End code

■ Readout request data

Start code	RKS	R	[Registration table No.],[Data number] Max. 5-byte	(Check sum)	End code

■ Response data for readout

Start code	RKS	A	[Registration table No.],[Data number],[Registered characters] Max. 24-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Registration table No.	1	I/O input method: 4-bit x 4 — Setting range: “0”–“3” I/O input method: 8-bit x 2 — Setting range: “0”–“1”	The setting range varies depending on the I/O input method.
Data number	Max. 3*	I/O input method: 4-bit x 4 — Setting range: “000”–“015” I/O input method: 8-bit x 2 — Setting range: “000”–“255”	Data number which sets characters. The setting range varies depending on the I/O input method.
Registered characters	Min. 0 Max. 18	The number of input characters allowed: Max. 9 characters	Specify 0-byte for data length to delete characters.
Total data length	Max. 24	It is the length including the separator “,”. The maximum value that can be set to one data number. Character strings for max. 32 sets of data numbers can be set at once. (Max. 737 byte)	

* Setting request data are variable length.

Reference

- Refer to “2-3-6 Character data input method” (P.39) for details on the character input method and character types with input restrictions.
- For response data for readout, ASCII code is used for the single-byte alphanumeric characters. For the characters that cannot be indicated with ASCII code, the character code selected for “Encoding for non-ASCII characters” in the system settings is used. If any characters which belong to the non-supported character code are in the data, the readout request cannot be accepted.

■ Example of command settings

Condition: Registration table No. = 2, Data number = 4, Registered characters = abcd, Data number = 11, Registered characters = efgh

- Setting

Transmission data	[STX]	RKS	S	2,4,abcd,11,efgh	[CR]

Condition: Registration table No. = 2, Data number = 4, Registered characters = abcd

- Readout

Transmission data	[STX]	RKS	R	2,4	[CR]

Response data	[STX]	RKS	A	2,004,abcd	[CR]

3-7 Bar Code/2D Code Settings Commands

3-7-1 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 you want to change the object position only, use the object coordinate (POS) command or object movement (POR) command as a shortened command.
- If you want to change the laser power or scan speed correction value of the bar code/2D code objects (except QR codes and Data matrix codes) only, use the laser correction by object (MOD) command as a shortened command.
- To specify the module fill spacing of the bar codes or PDF417, use object group settings (GRP) command.
- If the object type set in the specified object number is not the bar code/2D code, the laser marker returns the negative response.
- Use the object creation (CRE) command if you want to create new bar code/2D code objects.
- The laser power correction and the scan speed correction set by this command will not apply to the human readable text.

■ Setting request data / response data for readout

Start code	BRF	Sub command	[Object No.],[X-position],[Y-position], [Rotation angle],[Code type],[Various setting data (vary depending on code type)]	(Check sum)	End code

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

■ Readout request data

Start code	BRF	R	[Object No.] Max. 4-byte or Max. 6-byte (2D side of composite code)	(Check sum)	End code

■ Data description

1. When the code type is CODE39/ITF

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	It is the center coordinate of the code.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	The rotation center is the center of the code symbol.
Code type	(Y)	2	“00”: CODE39 “01”:ITF	
Bar code height	Y	Max. 7*	Model / Setting range [mm] LP-GS051(-L): “000.050”–“055.000” LP-GS052: “000.050”–“030.000” LP-RC350S: “000.050”–“085.000” LP-RF200P, LP-RV200P: “000.050”–“090.000”	
Narrow element width	Y	Max. 5*	“0.050”–“1.000” [mm]	Specify a larger value than the line width in the object group settings.

Name	Omit	Data length [byte]	Data contents	Remarks
Quiet/narrow ratio	Y	Max. 4*	“00.0”–“20.0”	Ratio of the quiet zone width to narrow element width.
Wide/narrow ratio	Y	Max. 3*	“1.8”–“3.4”	Ratio of the wide element width to narrow element width.
Check character	Y	1	“0”: OFF “1”: ON	
Invert	Y	1	“0”: Do not invert “1”: Invert	Set “0” to mark a bar, “1” to mark a space.
Human readable text	Y	1	“0”: OFF “1”: ON	
Code marking direction	Y	1	“0”: One-way direction “1”: Alternate	
Laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 73	It is the length including the separator “,”.	

* Setting request data are variable length.

2. When the code type is CODE128, EAN/UPC/JAN and CODE93

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td></td></tr>
<tr><td>X-position</td><td>Y</td><td>Max. 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>Y</td><td>Max. 8*</td></tr>
<tr><td>Rotation angle</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td><td>The rotation center is the center of the code symbol.</td></tr>
<tr><td>Code type</td><td>(Y)</td><td>2</td><td>“02”: CODE128
“04”: EAN/UPC/JAN
“05”: CODE93</td><td></td></tr>
<tr><td>Bar code height</td><td>Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.050”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.050”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.050”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.050”–“090.000”</td></tr></table></td><td></td></tr>
<tr><td>Narrow element width</td><td>Y</td><td>Max. 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>Quiet/narrow ratio</td><td>Y</td><td>Max. 4*</td><td>“00.0”–“20.0”</td><td>Ratio of the quiet zone width to narrow element width.</td></tr>
<tr><td>Invert</td><td>Y</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>Human readable text</td><td>Y</td><td>1</td><td>“0”: OFF
“1”: ON</td><td></td></tr>
<tr><td>Code marking direction</td><td>Y</td><td>1</td><td>“0”: One-way direction
“1”: Alternate</td><td></td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td rowspan="2">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>Y</td><td>Max. 3*</td><td>“001”–“999” [%]</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 67</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

3. When the code type is NW-7

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td></td></tr>
<tr><td>X-position</td><td>Y</td><td>Max. 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>Y</td><td>Max. 8*</td></tr>
<tr><td>Rotation angle</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td><td>The rotation center is the center of the code symbol.</td></tr>
<tr><td>Code type</td><td>(Y)</td><td>2</td><td>“03”: NW-7</td><td></td></tr>
<tr><td>Bar code height</td><td>Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.050”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.050”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.050”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.050”–“090.000”</td></tr></table></td><td></td></tr>
<tr><td>Narrow element width</td><td>Y</td><td>Max. 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>Quiet/narrow ratio</td><td>Y</td><td>Max. 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>Y</td><td>Max. 3*</td><td>“1.8”–“3.4”</td><td>Ratio of the wide element width to narrow element width.</td></tr>
<tr><td>Check character</td><td>Y</td><td>1</td><td>“0”: OFF
“1”: ON</td><td></td></tr>
<tr><td>Start/stop character</td><td>Y</td><td>1</td><td>“A”: Start/Stop Character A
“B”: Start/Stop Character B
“C”: Start/Stop Character C
“D”: Start/Stop Character D</td><td></td></tr>
<tr><td>Invert</td><td>Y</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>Human readable text</td><td>Y</td><td>1</td><td>“0”: OFF
“1”: ON</td><td></td></tr>
<tr><td>Code marking direction</td><td>Y</td><td>1</td><td>“0”: One-way direction
“1”: Alternate</td><td></td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td rowspan="2">The correction ratio is calculated using the value set at the laser settings as 100%.</td></tr>
<tr><td>Scan speed correction</td><td>Y</td><td>Max. 3*</td><td>“001”–“999” [%]</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 75</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

4. When the code type is QR code, Micro QR code, or iQR code

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td></td></tr>
<tr><td>X-position</td><td>Y</td><td>Max. 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>Y</td><td>Max. 8*</td></tr>
<tr><td>Rotation angle</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td><td>The rotation center is the center of the code symbol.</td></tr>
<tr><td>Code type</td><td>(Y)</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
“13”: iQR code (Square)
“14”: iQR code (Rectangle)
“15”: QR code, GB/T 18284</td><td>• For QR code, select model and standard type.
• When the code data contains the simplified Chinese characters, select “15”.</td></tr>
<tr><td>Module height</td><td>Y</td><td>Max. 5*</td><td rowspan="2">“0.001”–“9.999” [mm]</td><td rowspan="2"></td></tr>
<tr><td>Module width</td><td>Y</td><td>Max. 5*</td></tr>
<tr><td>Version</td><td>Y</td><td>Max. 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 /
QR code, GB/T 18284</td><td>“00”–“22”</td></tr><tr><td>Micro QR code</td><td>“00”–“04”</td></tr><tr><td>iQR code (Square)</td><td>“00”–“31”</td></tr><tr><td>iQR code (Rectangle)</td><td>“01”–“15”</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>Y</td><td>1</td><td>“0”: Number
“1”: Alphanumeric (texts for the iQR code)
“2”: 8-bit byte (binary)
“3”: Kanji
“4”: Auto</td><td>• “4” is not available for iQR code.
• If the different kind of characters are in the code data, select “4” to encode the data with the mixed data mode.</td></tr>
<tr><td>Error correction level (CC-C only)</td><td>Y</td><td>1</td><td>“0”: L
“1”: M
“2”: Q
“3”: H (QR code and iQR code only)
“4”: S (iQR code only)</td><td></td></tr>
<tr><td>Human readable text</td><td>Y</td><td>1</td><td>“0”: OFF
“1”: ON</td><td></td></tr>
<tr><td>Code marking direction</td><td>Y</td><td>1</td><td>“0”: One-way direction
“1”: Alternate</td><td>When “Alternate” is selected, the marking order inverts by module row or column.</td></tr>
<tr><td>Module marking order</td><td>Y</td><td>1</td><td>“0”: No skip
“1”: Skip one
“2”: Skip two</td><td>• 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.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 59</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

5. When the code type is data matrix/GS1 data matrix

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	It is the center coordinate of the code.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	The rotation center is the center of the code symbol.
Code type	(Y)	2	“20”: Data matrix “21”: GS1 data matrix	
Module height	Y	Max. 5*	“0.001”–“9.999” [mm]	
Module width	Y	Max. 5*		
Character type	Y	1	“0”: Alphanumeric “1”: Kanji	Specify “0” for GS1 data matrix.
Symbol size (vertical)	Y	Max. 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)	Y	Max. 2*		
Human readable text	Y	1	“0”: OFF “1”: ON	
Code marking direction	Y	1	“0”: One-way direction “1”: Alternate	When “Alternate” is selected, the marking order inverts by module row or column.
Module marking order	Y	1	“0”: No skip “1”: Skip one “2”: Skip two	• 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		Max. 60	It is the length including the separator “,”.	

* Setting request data are variable length.

*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

6. When the code type is PDF417

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	It is the center coordinate of the code.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	The rotation center is the center of the code symbol.
Code type	(Y)	2	“70”: PDF417	
Compaction mode	Y	1	“0”: Auto “1”: Text “2”: Byte “3”: Numeric	• Select the mode according to the character type in the code data. • “0”: Auto sets the mode automatically depending on the code data.
Error correction level	Y	1	“A”: Auto “0”–“8”	“A”: Auto sets the recommended correction level depending on the code data and the compaction mode settings.
Number of columns	Y	Max. 2*	“01”–“30” [columns]	
Number of rows	Y	Max. 2*	“00”: Minimize setting “03”–“90” [rows]	• “00”: Minimize setting sets the minimum value depending on the code data and column number settings. • Do not exceed 928 as the results of multiplying columns by rows.
Module width	Y	Max. 5*	“0.050”–“1.000” [mm]	Specify a larger value than the line width in the object group settings.
Row height to module width ratio	Y	Max. 5*	“01.00”–“10.00”	Specifies the ratio of the height for one row to module width.
Vertical quiet zone to module width ratio	Y	Max. 4*	“00.0”–“20.0”	Specifies the ratio of the quiet zone to module width. Vertical setting refers the height and horizontal setting refers the width.
Horizontal quiet zone to module width ratio	Y	Max. 4*		
Invert	Y	1	“0”: Do not invert “1”: Invert	Set “0” to mark a bar, “1” to mark a space.
Human readable text	Y	1	“0”: OFF “1”: ON	
Code marking direction	Y	1	“0”: One-way direction “1”: Alternate	
Laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 80	It is the length including the separator “,”.	

* Setting request data are variable length.

7. When the code type is GS1 DataBar Stacked/GS1 DataBar Limited
When the code type is GS1 DataBar Stacked CC-A/GS1 DataBar Limited CC-A and specify its 1D side settings

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	• It is the center coordinate of the code. • The rotation center is the center of the code symbol. • For the composite codes, these settings are applied to both 1D and 2D side.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Code type	(Y)	2	“31”: GS1 DataBar Stacked “33”: GS1 DataBar Limited “41”: GS1 DataBar Stacked CC-A “43”: GS1 DataBar Limited CC-A	For the composite codes, this setting is applied to both 1D and 2D side.
Module width	Y	Max. 5*	“0.050”–“1.000” [mm]	Specify a larger value than the line width in the object group settings.
Bar code height to module width ratio or Lower barcode height to module width ratio	Y	Max. 6*	“001.00”–“100.00”	• Specifies the ratio of the code height to module width. • For GS1 DataBar Stacked (CC-A), it specifies the height ratio of the lower side.
Separator height to module width ratio	Y	Max. 4*	“00.0”–“10.0”	• Only when code type is set to GS1 DataBar Stacked (CC-A), set the value. For other codes, omit this setting. • Specifies the ratio of GS1 DataBar Stacked separator to module width.
Invert	Y	1	“0”: Do not invert “1”: Invert	Set “0” to mark a bar, “1” to mark a space.
Left guard width to module width ratio	Y	Max. 4*	“01.0”–“20.0”	Specifies the ratio of guard pattern width to module width.
Right guard width to module width ratio	Y	Max. 4*		
Human readable text	Y	1	“0”: OFF “1”: ON	
Code marking direction	Y	1	“0”: One-way direction “1”: Alternate	
Laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Laser power correction to separator	Y	Max. 3*	“000”–“999” [%]	• Only when the code type is set to GS1 DataBar Stacked (CC-A), set the value. For other codes, omit these settings. • The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction to separator	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 84	It is the length including the separator “,”.	

* Setting request data are variable length.

8. When the code type is GS1 DataBar Stacked CC-A/GS1DataBar Limited CC-A and specify its 2D side settings

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 6*	“0000.1”–“1999.1”	• To set the 2D side of the composite codes, add “.1” after the object number. • Only “1” can be specified after the decimal point. • Without “.1”, the settings are applied to 1D side of the composite codes.
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	• It is the center coordinate of the code. • The rotation center is the center of the code symbol. • For the composite codes, these settings are applied to both 1D and 2D side.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Code type	(Y)	2	“41”: GS1 DataBar Stacked CC-A “43”: GS1 DataBar Limited CC-A	For the composite codes, this setting is applied to both 1D and 2D side.
System reserved value	Y	Max. 2*	“00” or omit	
Number of rows for 2D side	Y	Max. 2*	GS1 DataBar Stacked CC-A “00”: Auto (minimize setting) “05”–“10”, “12” [rows]	“00”: Auto sets the minimum value depending on the code data settings.
			GS1 DataBar Limited CC-A “00”: Auto (minimize setting) “04”–“08” [rows]	
Row height to module width ratio for 2D side	Y	Max. 5*	“01.00”–“10.00”	• Specifies the height for one row of the 2D side. • Specifies the ratio to the module width of 1D side.
Separator height to module width ratio	Y	Max. 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	Y	Max. 4*	“00.0”–“20.0”	• Specifies the quiet zone width of the 2D side. • Specifies the ratio to the module width of 1D side.
System reserved value	Y	Max. 4*	“00.0” or omit	
System reserved value	Y	1	“0” or omit	
2D side human readable text	Y	1	“0”: OFF “1”: ON	
2D side laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
2D side scan speed correction	Y	Max. 3*	“001”–“999” [%]	

Name	Omit	Data length [byte]	Data contents	Remarks
Laser power correction to separator	Y	Max. 3*	“000”–“999” [%]	• These settings are applied to the separator placed between 1D and 2D. • The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction to separator	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 83	It is the length including the separator “,”.	

* Setting request data are variable length.

Reference

- Only when the request data contains the object number with the value after the decimal point, the object number of the response data contains the value after the decimal point.

■ Example of command settings

Condition: Code type = Data matrix
Object No. = 1, X-position = 15, Y-position = -20, Rotation angle = 0, Code type = 20, Module height = 1, Module width = 1, Character type = 0, Symbol size (vertical) = 24, Symbol size (horizontal) = 24, Human readable text = 0, Code marking direction = 0, Module marking order = 2

- Setting

Transmission data	[STX]	BRF	S	1,15,-20,0,20,1,1,0,24,24,0,0,2	[CR]

- Readout

Transmission data	[STX]	BRF	R	1	[CR]

Response data	[STX]	BRF	A	0001,+015.000,-020.000,+000.000,20,1.000,1.000,0, 24,24,0,0,2	[CR]

3-7-2 Human readable text settings: BRV

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

■ Setting request data / response data for readout

Start code	BRV	Sub command	[Object No.],[Relative X-position], [Relative Y-position],[Character height], [Character width],[Character spacing], [Linefeed spacing],[Font No.], [Bold line width],[Laser power correction], [Scan speed correction],[Linefeed] Max. 75-byte	(Check sum)	End code

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

■ Readout request data

Start code	BRV	R	[Object No.] Max. 6-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 6*	For bar code/2D code objects excepting 2D side of composite code: “0000”–“1999” or “0000.0”–“1999.0”	• Excepting 2D side of the composite codes, you do not need to specify the number after the decimal point. • To set the human readable text to 2D side of the composite codes, add “.1” after the object number. • Only “0” or “1” can be specified after the decimal point.
			For 2D side of composite codes: “0000.1”–“1999.1”	
Relative X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm] To set “Auto-positioning”: “A” or “AAAAAAAA”	• It is the relative position to the code center. • Specifies the left lower position of the first character. • If you use “Auto-positioning”, set “A” or “AAAAAAAA” to both “Relative X-position” and “Relative Y-position”. • If you do not use “Auto-positioning” for the composite codes, the positions of 1D and 2D side can be separately specified. • If you set “Auto-positioning” for either 1D or 2D side of the composite codes, the auto-positioning is applied to both 1D and 2D side.
Relative Y-position	Y	Max. 8*		

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Character height</td><td>Y</td><td>Max. 7*</td><td rowspan="4"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.100”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.060”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.100”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.100”–“090.000”</td></tr></table></td><td rowspan="6">• For the composite codes, the settings from “character height” are applied to both 1D and 2D side. If these settings were already set in either 1D or 2D settings, end the data here. No subsequent data including a separator “,” is required.
• The linefeed spacing is valid only when “Linefeed” is set “ON”.</td></tr>
<tr><td>Character width</td><td>Y</td><td>Max. 7*</td></tr>
<tr><td>Character spacing</td><td>Y</td><td>Max. 7*</td><td rowspan="4"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td></tr>
<tr><td>Linefeed spacing</td><td>Y</td><td>Max. 7*</td></tr>
<tr><td>Font No.</td><td>Y</td><td>Max. 2*</td><td>“01”–“50”</td></tr>
<tr><td>Bold line width</td><td>Y</td><td>Max. 5*</td><td>“0.000”–“6.000” [mm]</td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td rowspan="2">• 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>Y</td><td>Max. 3*</td><td>“001”–“999” [%]</td></tr>
<tr><td>Linefeed</td><td>Y</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>Applied only to the 2D code and 2D side of the composite code. When the code data contains the linefeed “¥n”, set whether this linefeed is applied also to the human readable text or not.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 75</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

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.
- Use the object creation (CRE) command if you want to create new bar code/2D code objects.
- 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.
- Only when the request data contains the object number with the value after the decimal point, the object number of the response data contains the value after the decimal point.

■ Example of command settings

Condition: Object No. = 1, Relative X-position = 10, Relative Y-position = -5.5, Character height = 3, Character width = 3, Character spacing = 3, Linefeed spacing = 3.5, Font No. = 2, Bold line width = 0, Laser power correction = 100, Scan speed correction = 200, Linefeed = 0

• Setting

Transmission data	[STX]	BRV	S	1,10,-5.5,3,3,3,3.5,2,0,100,200,0	[CR]

• Readout

Transmission data	[STX]	BRV	R	1	[CR]

Response data	[STX]	BRV	A	0001,+010.000,-005.500,003.000,003.000,003.000, 003.500,02,0.000,100,200,0	[CR]

3-7-3 Module filling of 2D codes: BRT

Sets the filling details of the 2D code (QR codes and Data matrix codes) modules.

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, iQR codes , Data matrix codes and GS1 Data matrix codes. To specify the module fill spacing of the other codes, use object group settings (GRP) command.

■ Setting request data / response data for readout

Start code	BRT	Sub command	[Object No.],[Code element],[Fill type], [Filling details (varies depending on fill type)] Max. 26-byte	(Check sum)	End code

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

■ Readout request data

Start code	BRT	R	[Object No.],[Code element] Max. 6-byte	(Check sum)	End code

■ Data description

1. Fill type is horizontal line/vertical line/horizontal raster/vertical raster

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 4*	“0000”–“1999”	
Code element	1	“0”: Same in all elements	This item is fixed to “0” except when the fill type is fonts.
Fill type	Max. 2	“01”: Horizontal line “02”: Vertical line “05”: Horizontal raster “06”: Vertical raster	
Module marking direction	1	For horizontal line/horizontal raster “0”: Left to Right “1”: Right to Left “2”: Alternate (Left to Right)	
		For vertical line/vertical raster “0”: Top to Bottom “1”: Bottom to Top “2”: Alternate (Top to Bottom)	
Number of filling lines	Max. 2 *	“01”–“99” [modules]	
Module line length X	Max. 5 *	“0.001”–“9.999” [mm]	
Module line length Y	Max. 5 *		
Total data length	Max. 26	It is the length including the separator “,”.	

* Setting request data are variable length.

2. Fill type is dots

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 4 *	“0000”–“1999”	
Code element	1	“0”: Same in all elements	This item is fixed to “0” except when the fill type is fonts.
Fill type	Max. 2*	“03”: Dot	
Radiation period	Max. 7*	“000.001”–“999.999” [ms]	
Total data length	Max. 17	It is the length including the separator “,”.	

* Setting request data are variable length.

3. Fill type is a circle

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 4*	“0000”–“1999”	
Code element	1	“0”: Same in all elements	This item is fixed to “0” except when the fill type is fonts.
Fill type	Max. 2*	“04”: Circle	
Circle diameter	Max. 5*	“0.001”–“9.999” [mm]	
Total data length	Max. 15	It is the length including the separator “,”.	

* Setting request data are variable length.

4. Fill type is fonts

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 4*	“0000”–“1999”	
Code element	1	QR code: “1”: Quiet zone outline “2”: Dark module “3”: Light module “4”: Alignment “5”: Finder	• When the code type is micro QR code or iQR code, you do not need to set “alignment”. • When the fill type is font, you cannot set “0” to the code element.
		Data Matrix code: “1”: Quiet zone outline “2”: Dark module “3”: Light module “4”: Border	
Fill type	Max. 2*	“00”: Font	Use fonts for the filling shape for the selected code element.
Character code (JIS Code)	Max. 4*	“2230”–“2239” “8121”–“8152” “0000”: Do not mark	• Specifies the character code of the font used as a filling pattern in JIS code. • Inputting the character code “0000” encodes the 2D code with blank for the specified part.
Total data length	Max. 14	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Fill type is a horizontal line
Object No. = 1, Code element = 0, Fill type = 1, Module marking direction = 2,
Number of filling lines = 4, Module line length X = 0.5, Module line length Y = 0.5

• Setting

Transmission data	[STX]	BRT	S	1,0,1,2,4,0.5,0.5	[CR]

• Readout

Transmission data	[STX]	BRT	R	1,0	[CR]

Response data	[STX]	BRT	A	0001,0,01,2,04,0.500,0.500	[CR]

3-7-4 Laser settings per 2D code pattern: BRP

Sets the laser settings and filling details 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 not applied to other codes than QR codes, micro QR codes, iQR codes, Data matrix codes and GS1 Data matrix codes.

■ Setting request data / response data for readout

Start code	BRP	Sub command	[Object No.],[Code element], [Marking ON/OFF or Custom pattern ON/OFF], [Laser power correction],[Scan speed correction], [Number of overwritings] Max. 19-byte	(Check sum)	End code

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

■ Readout request data

Start code	BRP	R	[Object No.],[Code element] Max. 6-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Code element	–	1	QR code: “1”: Quiet zone outline “2”: Dark module “3”: Light module “4”: Alignment “5”: Finder Data Matrix code: “1”: Quiet zone outline “2”: Dark module “3”: Light module “4”: Border	• For “alignment”, “finder”, and “border”, the following settings will be reflected to marking only when the fill type is “font”. • When the code type is micro QR code or iQR code, you do not need to set “alignment”.

Name	Omit	Data length [byte]	Data contents	Remarks
Marking ON/OFF or Custom pattern ON/ OFF	–	1	With code element “1”, “2” or “3”: “0”: Marking OFF “1”: Marking ON	• Marking on/off of the selected element in the 2D code. With this setting, the inversion of black and white for the 2D code marking is specified. • Switching the on/off setting of the dark and light module inverts black and white for the marking. • With setting “0”: Mark OFF, end the data here. No subsequent data including a separator “,” is required.
			With code element “4” or “5”: “0”: Custom pattern OFF “1”: Custom pattern ON	• If the alignment/finder/border is marked using the other custom pattern than the module, set “ON” here. • When the alignment/finder pattern of QR code is set to “Custom pattern OFF”, marking is performed using the filling pattern of the dark/light module. • When the border pattern of data matrix is set to “Custom pattern OFF”, marking is performed using the filling pattern of the dark module/ light module. • With setting “0”: Custom pattern OFF, end the data here. No subsequent data including a separator “,” is required.
Laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Number of overwritings	Y	Max. 2*	“01”–“99”	
Total data length		Max. 19	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Object No. = 1, Code element = 2, Marking ON/OFF = 1, Laser power correction = 150, Scan speed correction = 80, Number of overwritings = 1

• Setting

Transmission data	[STX]	BRP	S	1,2,1,150,80,1	[CR]

• Readout

Transmission data	[STX]	BRP	R	1,2	[CR]

Response data	[STX]	BRP	A	0001,2,1,150,080,01	[CR]

3-7-5 Quiet zone filling of 2D codes: BRQ

Specifies the quiet zone filling method of 2D codes (QR codes and Data matrix codes).
The quiet zone filling is used when the code symbol is inverted.

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 not applied to other codes than QR codes, micro QR codes, iQR codes , Data matrix codes and GS1 Data matrix codes.

■ Setting request data / response data for readout

Start code	BRQ	Sub command	[Object No.],[Number of quiet modules], [Fill type],[Filling lines per module], [Laser power correction],[Scan speed correction] Max. 19-byte	(Check sum)	End code

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

■ Readout request data

Start code	BRQ	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Number of quiet modules	Y	1	“0”: Auto “1”–“9” [modules]	“0”: Auto sets the specified minimum value depending on the code type.
Fill type	Y	1	“0”: Marking OFF “1”: Light module “2”: Pattern 1 “3”: Pattern 2 “4”: Pattern 3	• The subsequent settings are applied only when the light module is set to Marking on by BRP command. • Specifies with which pattern the quiet zone is filled. • With setting “0”: Mark OFF or “1”: Light module, end the data here. No subsequent data including a separator “,” is required.
Filling lines per module	Y	Max. 2*	“01”–“99”	• Specifies only when the fill type is set to “2”, “3” or “4”. • Specifies with how many lines in one module the quiet zone is filled. The total filling lines are the results of multiplying the number of quiet modules by the filling lines per module.
Laser power correction	Y	Max. 3*	“000”–“999” [%]	• Specifies only when the fill type is set to “2”, “3” or “4”. • The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 19	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Object No. = 1, Number of quiet modules = 5, Fill type = 2, Filling lines per module = 3, Laser power correction = 150, Scan speed correction = 80

• Setting

Transmission data	[STX]	BRQ	S	1,5,2,3,150,80	[CR]

• Readout

Transmission data	[STX]	BRQ	R	1	[CR]

Response data	[STX]	BRQ	A	0001,5,2,03,150,080	[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. 259-byte	(Check sum)	End code

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

■ Readout request data

Start code	CDF	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 4*	“0000”–“1999”	
Graphic file name	Min. 5 Max. 254	The number of input characters allowed: 5 to 127 characters (including the extension “.VEC” or “.DXF”)	Specify a file name including the file extension “.VEC” or “.DXF”.
Total data length	Max. 259	It is the length including the separator “,”.	

* Setting request data are 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 file, such as BMP, JPEG or HPGL etc.
- Refer to “2-3-6 Character data input method” (P.39) for details on the character input method and character types with input restrictions.
- Graphic file names are not case-sensitive.
- If the file name contains both one-byte characters (in ASCII code) and two-byte characters (in Shift JIS or GB 2312 code), specify them exactly as they are by using two types of the character code.
- If the file name contains any characters which belong to the non-supported character code, the file cannot be selected by the command.
- Use the object creation (CRE) command if you want to create new graphic objects.

■ Example of command settings

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

- Setting

Transmission data	[STX]	CDF	S	1,Abcd.VEC	[CR]

- Readout

Transmission data	[STX]	CDF	R	1	[CR]

Response data	[STX]	CDF	A	0001,Abcd.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

- If you want to change the object position only, use the object coordinate (POS) command or object movement (POR) command as a shortened command.
- If you want to change the laser power/scan speed correction value of the object only, use the laser correction by object (MOD) command as a shortened command.
- If the object type set in the specified object number is not the graphic (VEC), the laser marker returns the negative response.
- This command cannot be used for other than VEC format graphic file, such as DXF, BMP, JPEG or HPGL etc.
- The VEC format is a graphic format converted for the laser marker use.

■ Setting request data / response data for readout

Start code	CDC	Sub command	[Object No.],[X-position],[Y-position], [Rotation angle],[X-scaling],[Y-scaling], [Laser power correction],[Scan speed correction] Max. 57-byte	(Check sum)	End code

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

■ Readout request data

Start code	CDC	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 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	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	The rotation center is the origin of the graphic.
X-scaling	Y	Max. 8*	“0001.000”–“1000.000” [%]	The correction ratio is calculated using the size of the saved graphic data as 100%.
Y-scaling	Y	Max. 8*		
Laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 57	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

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

• Setting

Transmission data	[STX]	CDC	S	1,15,-20,120,200,200,50,100	[CR]

• Readout

Transmission data	[STX]	CDC	R	1	[CR]

Response data	[STX]	CDC	A	0001,+015.000,-020.000,+120.000,0200.000,0200.000, 050,100	[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 you want to change the object position only, use the object coordinate (POS) command or object movement (POR) command as a shortened command.
- If you want to change the laser power/scan speed correction value of the object only, use the laser correction by object (MOD) command as a shortened command.
- 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.

■ Setting request data / response data for readout

Start code	CDD	Sub command	[Object No.],[X-position],[Y-position], [Rotation angle],[Origin],[Size specification], [Width],[Height],[Font No.],[Filling line], [Filling line spacing],[Filling angle], [Laser power correction],[Scan speed correction] Max. 79-byte	(Check sum)	End code

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

■ Readout request data

Start code	CDD	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	Specifies the origin coordinate of the graphic.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	The rotation center is the origin of the graphic.
Origin	Y	1	“0”: Center “1”: Bottom left “2”: Bottom right “3”: Top left “4”: Top right “5”: As original graphic	
Size specification	Y	1	“0”: Height/width “1”: Width (aspect ratio fixed) “2”: Height (aspect ratio fixed) “3”: As original size	

Name	Omit	Data length [byte]	Data contents	Remarks
Width	Y	Max. 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”, omit this setting. In this case, though the setting value can be read, it is not used for marking.
Height	Y	Max. 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”, omit this setting. In this case, though the setting value can be read, it is not used for marking.
Font No.	Y	Max. 2*	“01”–“50”	Text in a DXF file is replaced with a selected font.
Filling line	(Y)	1	“0”: Straight line (alternate) “1”: Straight line (one direction)	If SOLID or HATCH functions were used to create the filling lines in the DXF file, you can make settings for the filling lines.
Filling line spacing	Y	Max. 5*	“0.010”–“2.000” [mm]	
Filling angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Laser power correction	Y	Max. 3*	“000”–“999” [%]	The correction ratio is calculated using the value set at the laser settings as 100%.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 79	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Object No. = 1, X-position = 15, Y-position = -20, Rotation angle = 120, Origin = 1,
Size specification = 0, Width = 40, Height = 20, Font No. = 1,
Filling line = 0, Filling line spacing = 0.2, Filling angle = 45,
Laser power correction = 50, Scan speed correction = 100

• Setting

Transmission data	[STX]	CDD	S	1,15,-20,120,1,0,40,20,1,0,0.2,45,50,100	[CR]

• Readout

Transmission data	[STX]	CDD	R	1	[CR]

Response data	[STX]	CDD	A	0001,+015.000,-020.000,+120.000,1,0,040.000,020.000, 01,0,0.200,+045.000,050,100	[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.
- Use the object creation (CRE) command if you want to create new shape objects.
- To adjust the position of the all shapes set in the object number, use POS command (object coordinates) or POR command (object movement).
- To change the laser power/scan speed correction value of the all shapes set in the object number, use MOD command (laser correction by object).

■ Readout request data

Start code	FIG	R	[Object No.],[Shape setting No.] Max. 7-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.],[Setting/Deleting], [Shape type],[X-position of start point],[Y-position of start point], [X-position of end point],[Y-position of end point], [Dash line],[Dash length],[Gap length] (,[X-position of start point],[Y-position of start point], [X-position of end point],[Y-position of end point], [Dash line],[Dash length],[Gap length]...)	(Check sum)	End code

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

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

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Shape setting No. (First No. for setting)	–	Max. 2*	“00”–“31”	• Specifies the shape setting no. to create or edit a shape. • Max. 32 shapes can be set in one object no. • When setting two or more lines, this no. indicates the first no. to be set.
Setting/ Deleting	–	1	“1”: Setting	To add or edit the shapes, specify “1”.
Shape type	–	1	“0”: Line	
X-position of start point	–	Max. 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. • When setting two or more lines at once, send the all settings from “X-position of start point” repeatedly with your desired number of lines. In this case, the specified setting No. is the start number to set.
Y-position of start point	–	Max. 8*		
X-position of end point	–	Max. 8*		
Y-position of end point	–	Max. 8*		

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Dash line</td><td>–</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>With setting “0”: OFF, end the data here. No subsequent data including a separator “,” is required.</td></tr>
<tr><td>Dash length</td><td>Dash line is ON: –

Dash line is OFF: Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.010”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.010”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.010”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.010”–“090.000”</td></tr></table></td><td rowspan="2">• Specify when dash line is set ON.
• When dash line is OFF, omit these settings. In this case, though the setting values can be read, they are not used for marking.</td></tr>
<tr><td>Gap length</td><td>Dash line is ON: –

Dash line is OFF: Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 65</td><td colspan="2">It is the length including the separator “,”.
The maximum value that can be set to one shape setting number.
If the type of the shapes are all line, max. 32 lines can be set at once. (Max. 1739-byte)</td></tr>
</table>

* Setting request data are variable length.

■ Example of command settings

Condition: When the shape type is “Line”
Object No. = 1, Shape setting No. = 0, Setting/Deleting = 1, 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 line = 1, Dash length = 1, Gap length = 0.5

• Setting

Transmission data	[STX]	FIG	S	1,0,1,0,-10,2.5,5,2,1,1,0.5	[CR]

• Readout

Transmission data	[STX]	FIG	R	1,0	[CR]

Response data	[STX]	FIG	A	0001,00,1,0,-010.000,+002.500,+005.00,+002.00, 1,001.000,000.500	[CR]

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

Start code	FIG	Sub command	[Object No.],[Shape setting No.],[Setting/Deleting], [Shape type],[X-position of center],[Y-position of center], [Radius],[Dash line],[Dash length],[Gap length] (,[X-position of center],[Y-position of center], [Radius],[Dash line],[Dash length],[Gap length]...)	(Check sum)	End code

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

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

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td></td></tr>
<tr><td>Shape setting No.
(First No. for setting)</td><td>–</td><td>Max. 2*</td><td>“00”–“31”</td><td>• Specifies the shape setting no. to create or edit a shape.
• Max. 32 shapes can be set in one object no.
• When setting two or more circles, this no. indicates the first no. to be set.</td></tr>
<tr><td>Setting/ Deleting</td><td>–</td><td>1</td><td>“1”: Setting</td><td>To add or edit the shapes, specify “1”.</td></tr>
<tr><td>Shape type</td><td>–</td><td>1</td><td>“1”: Circle</td><td></td></tr>
<tr><td>X-position of center</td><td>–</td><td>Max. 8*</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="2">• Set the center of the circle.
• When setting two or more circles at once, send the all settings from “X-position of center” repeatedly with your desired number of circles. In this case, the specified setting No. is the start number to set.</td></tr>
<tr><td>Y-position of center</td><td>–</td><td>Max. 8*</td></tr>
<tr><td>Radius</td><td>–</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.010”–“027.500”</td></tr><tr><td>LP-GS052</td><td>“000.010”–“015.000”</td></tr><tr><td>LP-RC350S</td><td>“000.010”–“042.500”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.010”–“045.000”</td></tr></table></td><td></td></tr>
<tr><td>Dash line</td><td>–</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>With setting “0”: OFF, end the data here. No subsequent data including a separator “,” is required.</td></tr>
</table>

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Dash length</td><td>Dash line is ON: –
Dash line is OFF: Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.010”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.010”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.010”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.010”–“090.000”</td></tr></table></td><td rowspan="2">• Specify when dash line is set ON.
• When dash line is OFF, omit these settings. In this case, though the setting values can be read, they are not used for marking.</td></tr>
<tr><td>Gap length</td><td>Dash line is ON: –
Dash line is OFF: Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 55</td><td colspan="2">It is the length including the separator “,”.
The maximum value that can be set to one shape setting number.
If the type of the shapes are all circle, max. 32 circles can be set at once. (Max. 1419-byte)</td></tr>
</table>

* Setting request data are variable length.

■ Example of command settings

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

• Setting

Transmission data	[STX]	FIG	S	1,0,1,1,-10,2.5,2,1,1,0.5	[CR]

• Readout

Transmission data	[STX]	FIG	R	1,0	[CR]

Response data	[STX]	FIG	A	0001,00,1,1,-010.000,+002.500,002.00,1,001.000,000.500	[CR]

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

Start code	FIG	Sub command	[Object No.],[Shape setting No.],[Setting/Deleting], [Shape type],[Direction],[Angle], [X-position of start point],[Y-position of start point], [X-position of end point],[Y-position of end point], [Radius],[Dash line],[Dash length],[Gap length] (,[Direction],[Angle],[X-position of start point], [Y-position of start point],[X-position of end point], [Y-position of end point],[Radius],[Dash line], [Dash length],[Gap length]...)	(Check sum)	End code

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

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

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Shape setting No. (First No. for setting)	–	Max. 2*	“00”–“31”	• Specifies the shape setting no. to create or edit a shape. • Max. 32 shapes can be set in one object no. • When setting two or more arcs, this no. indicates the first no. to be set.
Setting/ Deleting	–	1	“1”: Setting	To add or edit the shapes, specify “1”.
Shape type	–	1	“2”: Arc	
Direction	–	1	“0”: CCW (counterclockwise) “1”: CW (clockwise)	• Set the marking direction of the arc. • When setting two or more arcs at once, send the all settings from “Direction” repeatedly with your desired number of arcs. In this case, the specified setting No. is the start number to set.
Angle	–	1	“0”: <180° “1”: ≥180°	Select the angle of the arc.
X-position of start point	–	Max. 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	–	Max. 8*		
X-position of end point	–	Max. 8*		
Y-position of end point	–	Max. 8*		
Radius	–	Max. 7*	“000.010”–“999.999” [mm]	
Dash line	–	1	“0”: OFF “1”: ON	With setting “0”: OFF, end the data here. No subsequent data including a separator “,” is required.

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Dash length</td><td>Dash line is ON: –
Dash line is OFF: Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.010”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.010”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.010”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.010”–“090.000”</td></tr></table></td><td rowspan="2">• Specify when dash line is set ON.
• When dash line is OFF, omit these settings. In this case, though the setting values can be read, they are not used for marking.</td></tr>
<tr><td>Gap length</td><td>Dash line is ON: –
Dash line is OFF: Y</td><td>Max. 7*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</td></tr></table></td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 77</td><td colspan="2">It is the length including the separator “,”.
The maximum value that can be set to one shape setting number.
If the type of the shapes are all arc, max. 32 arcs can be set at once. (Max. 2123-byte)</td></tr>
</table>

* Setting request data are variable length.

■ Example of command settings

Condition: When the shape type is “Arc”
Object No. = 1, Shape setting No. = 0, Setting/Deleting = 1, Shape type = 2,
Direction = 0, Angle = 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, Radius = 10,
Dash line = 1, Dash length = 1, Gap length = 0.5

• Setting

Transmission data	[STX]	FIG	S	1,0,1,2,0,0,-10,2.5,5,2,10,1,1,0.5	[CR]

• Readout

Transmission data	[STX]	FIG	R	1,0	[CR]

Response data	[STX]	FIG	A	0001,00,1,2,0,0,-010.000,+002.500,+005.00,+002.00, 010.000,1,001.000,000.500	[CR]

■ Setting request data : When deleting shape setting

Start code	FIG	S	[Object No.],[Shape setting No.], [Setting/Deleting],[Last shape setting No. to delete] Max. 12-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data content	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Shape setting No. (First No. to delete)	–	Max. 2*	“00”–“31”	• Specify the No. to delete. • To delete two or more shape settings, this number is the start number to delete. • Specify the smaller no. to the first No. than the last No.
Setting/Deleting	–	1	“0”: Deleting	To delete the shape setting, specify “0”.
Last shape setting No. to delete	Y	Max. 2*	“00”–“49”	• Deletes all shapes from the specified first No. to the last No. • To delete the only one shape, omit the last No. or specify the same number to the first and last No. • This command is accepted even if there is no setting in the specified shape setting No.
Total data length		Max. 12	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Data example

Condition: Object No. = 1, Shape setting No. = 5, Setting/Deleting = 0, Last shape setting No. to delete = 10

• Setting

Transmission data	[STX]	FIG	S	1,5,0,10	[CR]

Reference

• If you want to delete all shape settings in the specified object No., it is also possible to use DEL (object deletion) command to eliminate the shape object.

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.
- Use the object creation (CRE) command if you want to create new point radiation objects.
- To adjust the position of the all radiation points set in the object number, use POS command (object coordinates) or POR command (object movement).

■ Setting request data: When setting the radiation points

Start code	PRD	S	[Object No.],[Point No.],[Setting/Deleting], [Time unit],[Radiation time],[Laser power correction], [X-position],[Y-position] (,[X-position],[Y-position]…) Max. 23 + 18n-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data content	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Point No. (First No. for setting)	–	Max. 2*	“00”–“49”	• 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.
Setting/Deleting	–	1	“1”: Setting	To add or edit the radiation point, specify “1”.
Time unit	–	1	“0”: ms “1”: s “2”: min “3”: h	• Radiation time and laser power correction settings apply to all points specified in this command. • The correction ratio of the laser power is calculated using the value set at the laser settings as 100%. • When setting only the radiation time and laser power correction, end the data here. No subsequent data including a separator “,” is required.
Radiation time	–	Max. 7*	With time unit “ms” or “s”: “00000.1”–“99999.9” [ms], [s]	
			With time unit “min”: “00000.1”–“02880.0” [min]	
			With time unit “h”: “00000.1”–“00048.0” [h]	
Laser power correction	–	Max. 3*	“000”–“999” [%]	

Name	Omit	Data length [byte]	Data content	Remarks
X-position	Y	Max. 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	Y	Max. 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	Y	(Max. 8*)		
Y-position	Y	(Max. 8*)		
Total data length		Max. 23 + 18n	It is the length including the separator ",". Variable length within Max. 23 + 18n-byte n=Count of the points to set position (n ≦ 50) • When setting only one point: Max. 41-byte • When setting 50 points: Max. 923-byte	

* Setting request data are variable length.

■ Data example

Condition: Object No. = 1, Point No. = 5, Setting/Deleting = 1, Time unit = 0,
Radiation time = 2000, Laser power correction = 100,
X-position = 25.5, Y-position = -7

• Setting

Transmission data	[STX]	PRD	S	1,5,1,0,2000,100,25.5,-7	[CR]

Condition: When setting 4 points:
Object No. = 1, Point No. = 0, Setting/Deleting = 1, Time unit = 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	1,0,1,0,2000,100,25.5,7,25.5,-7,-25.5,-7,-25.5,7	[CR]

■ Setting request data : When deleting point setting

Start code	PRD	S	[Object No.],[Point No.], [Setting/Deleting],[Last point No. to delete] Max. 12-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data content	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
Point No. (First point No. to delete)	–	Max. 2*	“00”–“49”	• 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.
Setting/Deleting	–	1	“0”: Deleting	To delete the radiation point, specify “0”.
Last point No. to delete	Y	Max. 2*	“00”–“49”	• Deletes all points from the specified first point no. to the last point no. • To delete the only one point, omit the last point no. or 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		Max. 12	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Data example

Condition: Object No. = 1, Point No. = 5, Setting/Deleting = 0, Last point No. to delete = 10

• Setting

Transmission data	[STX]	PRD	S	1,5,0,10	[CR]

Reference

• If you want to delete all point elements, it is also possible to use DEL (object deletion) command to eliminate the point radiation object.

■ Readout request data

Start code	PRD	R	[Object No.],[Point No.] Max. 7-byte	(Check sum)	End code

■ Response data for readout

Start code	PRD	A	[Object No.],[Point No.],[Settings status], [Time unit],[Radiation time], [Laser power correction],[X-position],[Y-position] 41-byte or 9-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data content	Remarks
Object No.	Max. 4*	“0000”–“1999”	
Point No.	Max. 2*	“00”–“49”	Reads out the point radiation setting by a point. It is not possible to readout settings for the multiple points at once.
Settings status	1	“0”: No settings “1”: Settings exist	
Time unit	1	“0”: ms “1”: s “2”: min “3”: h	• 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%.
Radiation time	7	With time unit “ms” or “s”: “00000.1”–“99999.9” [ms], [s]	
		With time unit “min”: “00000.1”–“02880.0” [min]	
		With time unit “h”: “00000.1”–“00048.0” [h]	
Laser power correction	3	“000”–“999” [%]	
X-position	8	“-999.999”–“+999.999” [mm]	
Y-position	8		
Total data length	41 or 9	It is the length including the separator “,”. The response data length is fixed. • When the specified point no. has settings : 41-byte • When the specified point no. has no settings : 9-byte	

* Readout request data are variable length.

■ Data example

Condition: Object No. = 1, Point No. = 0, Setting status = 1, Time unit = 1, Radiation time = 2000,
Laser power correction = 100, X-position = 25.5, Y-position = -7

• Readout

Transmission data	[STX]	PRD	R	1,0	[CR]

Response data	[STX]	PRD	A	0001,00,1,1,02000.0,100,+025.500,-007.000	[CR]

3-10 Object Management Commands

3-10-1 Object creation: CRE

Creates a new object by specifying the object number, object group that the object belongs, and the object type.
After creating a new object, specify the marking settings of the corresponding object by using other commands such as STR, CDF etc.

■ Setting request data / response data for readout

Start code	CRE	Sub command	[Object type],[Object No.], [Object group No.] Max. 11-byte	(Check sum)	End code

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

■ Readout request data

Start code	CRE	R	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object type	–	1	“0”: Character “1”: Graphic “2”: Bar code/2D code “3”: Character (Reference list type) “4”: Point radiation “5”: Shape	
Object No.	Y	Max. 4*	“0000”–“1999”	• If another object already exists at the specified object number, the laser marker returns the negative response. • If you omit this field, the object will be created at the smallest object number that is not in use.
Object group No.	Y	Max. 4*	“0000”–“1999”	• Specifies the object group number that the created object belongs to. • If you omit this field, the object group number 0 will be set.
Total data length		Max. 11	It is the length including the separator “,”.	

* Setting request data are variable length.

Reference

- The readout request is valid only right after creating an object by the setting request.
- At the readout request, the laser marker returns the object number created last.
- TrueType objects cannot be created with this command.

■ Example of command settings

Condition:
• Setting

Transmission data	[STX]	CRE	S	0,5,1	[CR]

• Readout

Transmission data	[STX]	CRE	R	[CR]

Response data	[STX]	CRE	A	0,0005,0001	[CR]

3-10-2 Object deletion: DEL

Deletes a marking object.

■ Setting request data

Start code	DEL	S	[Object No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 4*	“0000”–“1999”	Deletes the object of the specified number.
Total data length	Max 4		

* Setting request data are variable length.

Reference

• When you delete an object by this command, the marking data and its object condition will be deleted together.

■ Example of command settings

Condition:
• Setting

Transmission data	[STX]	DEL	S	1	[CR]

3-10-3 Object marking specification: ENA

Sets whether or not to mark the object of the specified number or data in the object group.

■ Setting request data

Start code	ENA	S	[Object category],[Object (group) No.], [Marking ON/OFF] (,[Object (group) No.],[Marking ON/OFF])	(Check sum)	End code

■ Readout request data

Start code	ENA	R	[Object category],[Object (group) No.] Max. 6-byte	(Check sum)	End code

■ Response data for readout

Start code	ENA	A	[Object category],[Object (group) No.], [Marking ON/OFF] 8-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Object category	1	“0”: Object “1”: Object group	
Object (group) No.	Max. 4*	“0000”–“1999”	
Marking ON/OFF	1	“0”: Marking OFF “1”: Marking ON	
Total data length	Max. 8	It is the length including the separator “,”. The maximum value that can be set to one object number or object group number. Max. 32 objects or object groups can be set at once. (Max. 225 byte)	

* Setting request data are variable length.

■ Example of command settings

Condition:
• Setting

Object category = 0, Object No. = 5, Marking ON/OFF = 0, Object No. = 6, Marking ON/OFF = 1

Transmission data	[STX]	ENA	S	0,5,0,6,1	[CR]

Condition:
• Readout

Object category = 0, Object No. = 5

Transmission data	[STX]	ENA	R	0,5	[CR]

Response data	[STX]	ENA	A	0,0005,0	[CR]

3-11 Layout/Position Adjustment Commands

3-11-1 Object coordinates: POS

Sets the base position of the marking object.

Reference

- You can use this command as a shortened command consisting only of X-/Y-positions and Rotation angle of the character/bar code/graphic object settings (STC/BRF/CDC) commands.
- For the point radiation object and shape object, the position of the all points or shapes set in the specified object number is adjusted by this command.

■ Setting request data

Start code	POS	S	[Object No.],[X-position],[Y-position],[Rotation angle] (,[Object No.],[X-position],[Y-position],[Rotation angle]...)	(Check sum)	End code

■ Readout request data

Start code	POS	R	[Object No.] Max. 4-byte	(Check sum)	End code

■ Response data for readout

Start code	POS	A	[Object No.],[X-position],[Y-position],[Rotation angle] 31-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-position	Y	Max. 8*	“-999.999”–“+999.999” [mm]	• The coordinate of the item omitted remains to be the value set last (the initial value if it was not set). • For the point radiation object and shape object, specify X-/Y-offset and rotation angle applied to the all points or shapes set in the specified object number.
Y-position	Y	Max. 8*		
Rotation angle	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Total data length		Max. 31	It is the length including the separator “,”. The maximum value that can be set to one object number. Max. 32 objects can be set at once. (Max. 1023 byte)	

* Setting request data are variable length.

■ Example of command settings

Condition: Object No. = 0, X-position = 15, Y-position = -10, Rotation angle = 90,
Object No. = 1, X-position = 15, Y-position = 5, Rotation angle = 0

• Setting

Transmission data	[STX]	POS	S	0,15,-10,90,1,15,5,0	[CR]

Condition: Object No. = 0

• Readout

Transmission data	[STX]	POS	R	0	[CR]

Response data	[STX]	POS	A	0000,+015.000,-010.000,+090.000	[CR]

3-11-2 Object movement: POR

Moves the base position of the marking object using the relative value from the current position.

■ Setting request data

Start code	POR	S	[Object No.],[X-movement], [Y-movement],[Rotation movement] (,[Object No.],[X-movement], [Y-movement],[Rotation movement]...)	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 4*	“0000”–“1999”	
X-movement (Relative value)	Y	Max. 8*	“-999.999”–“+999.999” [mm]	• Moves the selected marking object by the specified value (relative value) from the current position. • The movement of the item omitted will be set to 0. • For the point radiation object and shape object, specify the movement value from the current X-/Y-offset and rotation angle applied to the all points or shapes set in the specified object number.
Y-movement (Relative value)	Y	Max. 8*		
Rotation movement (Relative value)	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Total data length		Max. 31	It is the length including the separator “,”. The maximum value that can be set to one object number. Max. 32 objects can be set at once. (Max. 1023 byte)	

* Setting request data are variable length.

■ Example of command settings

Condition: Object No. = 1, X-movement = 5, Y-movement = -0.5, Rotation movement = 180,
Object No. = 2, X-movement = 5, Y-movement = -2, Rotation movement = 180

• Setting

Transmission data	[STX]	POR	S	1,5,-0.5,180,2,5,-2,180	[CR]

3-11-3 Object group settings: GRP

Sets the marking position and over-marking by object group. It is also used to specify the filling line spacing for bold characters and bar codes.

■ Setting request data / response data for readout

Start code	GRP	Sub command	[Object group No.],[X-movement],[Y-movement], [Z-movement],[Rotation movement],[Number of overwritings], [Overwriting interval],[Bold filling line spacing], [Bar code filling line spacing],[Line width] Max. 68-byte	(Check sum)	End code

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

■ Readout request data

Start code	GRP	R	[Object group No.] Max. 4-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object group No.	–	Max. 4*	“0000”–“1999”	
X-movement	Y	Max. 8*	“-999.999”–“+999.999” [mm]	• Moves the all marking data in the specified object group by the specified value (absolute value) from the setting coordinate of each marking object. • Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052. • The rotation center is the center of the marking field.
Y-movement	Y	Max. 8*		
Z-movement	Y	Max. 8*	Model / Setting range [mm]: LP-GS051: “-003.000”–“+003.000” LP-GS052: “-001.500”–“+001.500” LP-GS051-L, LP-RC350S, LP-RF200P, LP-RV200P: “+000.000” or omit	
Rotation movement	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Number of overwritings	Y	Max. 4*	“0001”–“9999” [times]	
Overwriting interval	Y	Max. 4*	“00.0”–“60.0” [s]	When on-the-fly marking is set, set always 0 second to overwriting interval.
Bold filling line spacing	Y	Max. 5*	“0.010”–“2.000” [mm]	
Bar code filling line spacing	Y	Max. 5*	“0.010”–“2.000” [mm]	Specifies the spacing of the marking lines for bar codes and PDF417 modules.
Line width	Y	Max. 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.
Total data length		Max. 68	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Object group No. = 1, X-movement = 10, Y-movement = -5, Z-movement = -1, Rotation movement = 0, Number of overwritings = 2, Overwriting interval = 0.5, Bold filling line spacing = 0.2, Bar code filling line spacing = 0.2, Line width = 0.1

• Setting

Transmission data	[STX]	GRP	S	1,10,-5,-1,0,2,0.5,0.2,0.2,0.1	[CR]

• Readout

Transmission data	[STX]	GRP	R	1	[CR]

Response data	[STX]	GRP	A	0001,+010.000,-005.000,-001.000,+000.000, 0002,00.5,0.200,0.200,0.100	[CR]

3-11-4 File settings: ALC

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

■ Setting request data / response data for readout

Start code	ALC	Sub command	[X-movement],[Y-movement],[Z-movement], [Rotation movement], [Y-axis mirroring],[X-axis mirroring] Max. 39-byte	(Check sum)	End code

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

■ Readout request data

Start code	ALC	R	(Check sum)	End code

■ Data description

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>X-movement</td><td>Y</td><td>Max. 8*</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="4">• 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.
• Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052.
• The rotation center is the center of the marking field.</td></tr>
<tr><td>Y-movement</td><td>Y</td><td>Max. 8*</td></tr>
<tr><td>Z-movement</td><td>Y</td><td>Max. 8*</td><td>
<table>
<tr><th>Model</th><th>Setting range [mm]</th></tr>
<tr><td>LP-GS051</td><td>“-003.000”–“+003.000”</td></tr>
<tr><td>LP-GS052</td><td>“-001.500”–“+001.500”</td></tr>
<tr><td>LP-GS051-L
LP-RC350S
LP-RF200P
LP-RV200P</td><td>“+000.000” or omit</td></tr>
</table>
</td></tr>
<tr><td>Rotation movement</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td></tr>
<tr><td>Y-axis mirroring</td><td>Y</td><td>1</td><td>“0”: Do not invert
“1”: Invert</td><td>It is an inversion to Y-axis.</td></tr>
<tr><td>X-axis mirroring</td><td>Y</td><td>1</td><td>“0”: Do not invert
“1”: Invert</td><td>It is an inversion to X-axis.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 39</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

■ Example of command settings

Condition: X-movement = 10, Y-movement = -5.5, Z-movement = -2, Rotation movement = 120,
Y-axis mirroring = 0, X-axis mirroring = 1

• Setting

Transmission data	[STX]	ALC	S	10,-5.5,-2,120,0,1	[CR]

• Readout

Transmission data	[STX]	ALC	R	[CR]

Response data	[STX]	ALC	A	+010.000,-005.500,-002.000,+120.000,0,1	[CR]

Reference

• When any of the data item is omitted, the data set last (the initial value if it was not set) will be maintained for the omitted field.

3-11-5 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 / response data for readout

Start code	SEO	Sub command	[X-movement],[Y-movement],[Z-movement], [Rotation movement],[Laser power correction] Max. 39-byte	(Check sum)	End code

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

■ Readout request data

Start code	SEO	R	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
X-movement	Y	Max. 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 movement value of the omitted item will be set to 0. • Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052. • The rotation center is the center of the marking field.
Y-movement	Y	Max. 8*		
Z-movement	Y	Max. 8*	Model / Setting range [mm]: LP-GS051: “-003.000”–“+003.000” LP-GS052: “-001.500”–“+001.500” LP-GS051-L, LP-RC350S, LP-RF200P, LP-RV200P: “+000.000” or omit	
Rotation movement	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Laser power correction	Y	Max. 3*	“000”–“999” [%]	• Corrects the laser power of the all marking data in the file. • The correction ratio is calculated using the value set at the laser settings as 100%. • When this item is omitted, it will be set to 100.
Total data length		Max. 39	It is the length including the separator “,”.	

* Setting request data are variable length.

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	10,-5.5,-2,120,80	[CR]

• Readout

Transmission data	[STX]	SEO	R	[CR]	
Response data	[STX]	SEO	A	+010.000,-005.500,-002.000,+120.000,080	[CR]

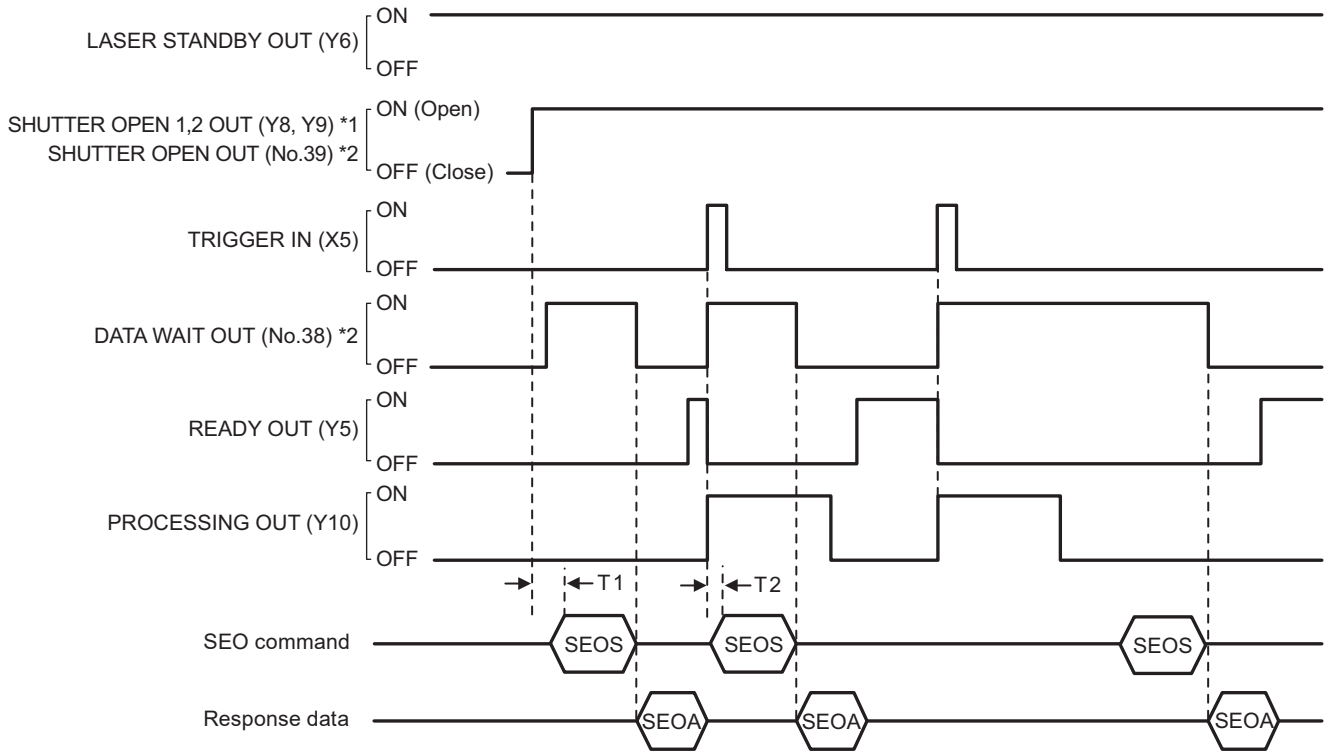
Condition: Sending SEO command without any change of position and power

• Setting

Transmission data	[STX]	SEO	S	[CR]

■ Timing chart for SEO command transmission

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



*1 : LP-GS series only

*2 : LP-RF/LP-RC/LP-RV series only

Item	Time	Remarks
T1	0 ms or more	Before sending SEO command, confirm that the shutter is opened. For LP-RC/LP-RF/LP-RV series, 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. For LP-RC/LP-RF/LP-RV series, 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 can not 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.
- For LP-RC/LP-RF/LP-RV series, 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.

3-11-6 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 the initial setting “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.

■ 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]

3-11-7 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] Max. 44-byte	(Check sum)	End code

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

■ Readout request data

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

■ Data description

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td rowspan="3">Data number</td><td rowspan="3">–</td><td rowspan="3">Max. 4*</td><td>When “Input method” is “Low 4-bit”: “0000”–“0015”</td><td rowspan="3">Specifies the data number for which the external offset is set.</td></tr>
<tr><td>When “Input method” is “Low 8-bit”: “0000”–“0255”</td></tr>
<tr><td>When “Input method” is “Low 10-bit”: “0000”–“1023”</td></tr>
<tr><td>X-movement</td><td>Y</td><td>Max. 8*</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="4">• 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.
• Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052.
• The rotation center is the center of the marking field.</td></tr>
<tr><td>Y-movement</td><td>Y</td><td>Max. 8*</td></tr>
<tr><td>Z-movement</td><td>Y</td><td>Max. 8*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051</td><td>“-003.000”–“+003.000”</td></tr><tr><td>LP-GS052</td><td>“-001.500”–“+001.500”</td></tr><tr><td>LP-GS051-L
LP-RC350S
LP-RF200P
LP-RV200P</td><td>“+000.000” or omit</td></tr></table></td></tr>
<tr><td>Rotation movement</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“000”–“999” [%]</td><td>Corrects the laser power of the all marking data in the file.
It is the correction ratio relative to the setting laser power.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 44</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

Reference

- This command can be used when the input method of the external offset is I/O input setting. If “Using SEO command” is set, refer to “3-11-5 Marking position and laser power adjustment per trigger: SEO” (P.142) for entering the offset values.
- When any of the data item is omitted, the data set last (the initial value if it was not set) will be maintained for the omitted field.

■ Example of command settings

Condition: Data number = 5, X-movement = 10, Y-movement = -5.5, Z-movement = 2, Rotation movement = 90, Laser power correction = 120

• Setting

Transmission data	[STX]	OFS	S	5,10,-5.5,2,90,120	[CR]

• Readout

Transmission data	[STX]	OFS	R	5	[CR]

Response data	[STX]	OFS	A	0005,+010.000,-005.500,+002.000,+090.000,120	[CR]

3-11-8 Step & repeat settings: SRC

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

■ Setting request data / response data for readout

Start code	SRC	Sub command	[Object group No.],[Step & repeat ON/OFF], [Base position],[Number of rows], [Number of columns],[Row step],[Column step], [Count individually],[Count direction], [Count “Marking OFF”],[Counter starting position] Max. 42-byte	(Check sum)	End code

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

■ Readout request data

Start code	SRC	R	[Object group No.] Max. 4-byte	(Check sum)	End code

■ Data description

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Object group No.</td><td>–</td><td>Max. 4*</td><td>“0000”–“1999”</td><td>Specifies an object group number with Step & repeat set.</td></tr>
<tr><td>Step & repeat ON/OFF</td><td>–</td><td>1</td><td>“0”: OFF
“1”: ON</td><td>• Specify ON to enable Step & repeat.
• If you specify “0”: OFF, end the data here. It is not necessary to transmit the subsequent data including a separator “,”.</td></tr>
<tr><td>Base position</td><td>Y</td><td>1</td><td>“0”: Top left
“1”: Top right
“2”: Bottom left
“3”: Bottom right</td><td>Specifies the marking data position used as the base point of Step & repeat.</td></tr>
<tr><td>Number of rows</td><td>Y</td><td>Max. 4*</td><td rowspan="2">“0001”–“0400”</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 10000.</td></tr>
<tr><td>Number of columns</td><td>Y</td><td>Max. 4*</td></tr>
<tr><td>Row step</td><td>Y</td><td>Max. 7*</td><td rowspan="2"><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051(-L)</td><td>“000.000”–“055.000”</td></tr><tr><td>LP-GS052</td><td>“000.000”–“030.000”</td></tr><tr><td>LP-RC350S</td><td>“000.000”–“085.000”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“000.000”–“090.000”</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>Y</td><td>Max. 7*</td></tr>
</table>

Name	Omit	Data length [byte]	Data contents	Remarks
Count individually	Y	1	“0”: OFF (same count value) “1”: ON (count individually)	If you set ON, the counter value will be updated for each marking data of Step & repeat. If you set OFF, the counter value of Step & repeat will be the same value for all data in a single marking operation.
Count direction	Y	1	“0”: Horizontal “1”: Vertical	Specifies the count direction within the marking data when “Count individually” is ON.
Count “Marking OFF”	Y	1	“0”: No “1”: Yes	Specifies if the product will or will not count the counter value of the marking data with Marking OFF specified by Step & repeat fine-adjustment when “Count individually” is ON.
Counter starting position	Y	1	“0”: Top left “1”: Top right “2”: Bottom left “3”: Bottom right “A”: Base position	When “Count individually” is ON, specify the start position of the counting.
Total data length		Max. 42	It is the length including the separator “,”.	

* Setting request data are variable length.

Reference

- When Step & repeat ON/OFF is set to “OFF”, the following data do not exist in the response data for readout.

■ Example of command settings

Condition: Object group No. = 1, Step & repeat ON/OFF = 1, Base position = 0,
Number of rows = 12, Number of columns = 4, Row step = 4, Column step = 8.5,
Count individually = 1, Count direction = 1, Count “Marking OFF” = 0, Counter starting position = 0

- Setting

Transmission data	[STX]	SRC	S	1,1,0,12,4,4,8.5,1,1,0,0	[CR]

- Readout

Transmission data	[STX]	SRC	R	1	[CR]

Response data	[STX]	SRC	A	0001,1,0,0012,0004,004.000,008.500,1,1,0,0	[CR]

3-11-9 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.

■ Readout request data

Start code	SRA	R	[Adjustment No.] Max. 3-byte	(Check sum)	End code

■ Setting request data / response data for readout: when adjustment object is single step

Start code	SRA	Sub command	[Adjustment No.],[Adjustment object], [Object group No.],[Target row],[Target column], [Adjustment item],[X-movement],[Y-movement],[Z-movement], [Rotation movement],[Laser power correction] Max. 60-byte	(Check sum)	End code

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

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Adjustment No.	–	Max. 3*	“000”–“999”	
Adjustment object	–	1	“1”: Single step	
Object group No.	–	Max. 4*	“0000”–“1999”	Specifies an object group number with Step & repeat set.
Target row	–	Max. 3*	“001”–“400”	Enables the adjustment item for the selected row/column.
Target column	–	Max. 3*		
Adjustment item	–	1	“0”: Position/Power “1”: Mark OFF	If you specify “1”: Mark OFF, end the data here. It is not necessary to transmit the subsequent data including a separator “,”.
X-movement	Y	Max. 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. • Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052.
Y-movement	Y	Max. 8*		
Z-movement	Y	Max. 8*	Model / Setting range* [mm] LP-GS051: “-003.000”–“+003.000” LP-GS052: “-001.500”–“+001.500” LP-GS051-L, LP-RC350S, LP-RF200P, LP-RV200P: “+000.000” or omit	
Rotation movement	Y	Max. 8*	“-180.000”–“+180.000” [°]	

Name	Omit	Data length [byte]	Data contents	Remarks
Laser power correction	Y	Max. 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.
Total data length		60	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Adjustment No. = 0, Adjustment object = 1, Object group No. = 0, Target row = 2, Target column = 3, Adjustment item = 0, X-movement = 0.1, Y-movement = -0.2, Z-movement = 0.3, Rotation movement = 2.1, Laser power correction = -20

• Setting

Transmission data	[STX]	SRA	S	0,1,0,2,3,0,0.1,-0.2,0.3,2.1,-20	[CR]

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,1,0000,002,003,0,+000.100, -000.200,+000.300,+002.100,-20	[CR]

Condition: Adjustment No. = 0, Adjustment object = 1, Object group No. = 3, Target row = 3, Target column = 3, Adjustment item = 1

• Setting

Transmission data	[STX]	SRA	S	0,1,3,3,3,1	[CR]

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,1,0003,003,003,1	[CR]

Reference

• When the adjustment item is set to Mark OFF, the following data do not exist in the response data for readout.

■ Setting request data / response data for readout: when adjustment object is row or column

Start code	SRA	Sub command	[Adjustment No.],[Adjustment object],[Object group No.], [Start row/column],[Last row/column],[Adjustment item], [X-movement],[Y-movement],[Z-movement], [Rotation movement],[Laser power correction] Max. 60-byte	(Check sum)	End code

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

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Adjustment No.	–	Max. 3*	“000”–“999”	
Adjustment object	–	1	“2”: Row “3”: Column	
Object group No.	–	Max. 4*	“0000”–“1999”	Specifies an object group number with Step & repeat set.

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Start row
or
Start column</td><td>–</td><td>Max. 3*</td><td rowspan="2">“001”–“400”</td><td rowspan="2">Enables the adjustment item for the data at the row/column specified.</td></tr>
<tr><td>Last row
or
Last column</td><td>–</td><td>Max. 3*</td></tr>
<tr><td>Adjustment item</td><td>–</td><td>1</td><td>“0”: Position/Power
“1”: Mark OFF</td><td>If you specify “1”: Mark OFF, end the data here. It is not necessary to transmit the subsequent data including a separator “,”.</td></tr>
<tr><td>X-movement</td><td>Y</td><td>Max. 8*</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="4">• 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.
• Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052.</td></tr>
<tr><td>Y-movement</td><td>Y</td><td>Max. 8*</td></tr>
<tr><td>Z-movement</td><td>Y</td><td>Max. 8*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-GS051</td><td>“-003.000”–“+003.000”</td></tr><tr><td>LP-GS052</td><td>“-001.500”–“+001.500”</td></tr><tr><td>LP-GS051-L
LP-RC350S
LP-RF200P
LP-RV200P</td><td>“+000.000” or omit</td></tr></table></td></tr>
<tr><td>Rotation movement</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 3*</td><td>“-50”–“+50” [+/-%]</td><td>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.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 60</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

■ Example of command settings

Condition: Adjustment No. = 0, Adjustment object = 2, Object group No. = 0, Start row = 2, Last row = 3, Adjustment item = 0, X-movement = 0.1, Y-movement = -0.2, Z-movement = 0.3, Rotation movement = 2.1, Laser power correction = -20

• Setting

Transmission data	[STX]	SRA	S	0,2,0,2,3,0,0.1,-0.2,0.3,2.1,-20	[CR]

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,2,0000,002,003,0,+000.100, -000.200,+000.300,+002.100,-20	[CR]

Condition: Adjustment No. = 0, Adjustment object = 3, Object group No. = 0, Start column = 4, Last column = 4, Adjustment Item = 1

• Setting

Transmission data	[STX]	SRA	S	0,3,0,4,4,1	[CR]

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,3,0000,004,004,1	[CR]

Reference

- When the adjustment item is set to Mark OFF, the following data do not exist in the response data for readout.

■ Setting request data / response data for readout: when adjustment object is rectangle

Start code	SRA	Sub command	[Adjustment No.],[Adjustment object],[Object group No.], [Start row],[Start column],[Last row],[Last column], [Adjustment item],[X-movement],[Y-movement], [Z-movement],[Rotation movement],[Laser power correction] Max. 68-byte	(Check sum)	End code

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

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Adjustment No.	–	Max. 3*	“000”–“999”	
Adjustment object	–	1	“4”: Rectangle	
Object group No.	–	Max. 4*	“0000”–“1999”	Specifies an object group number with Step & repeat set.
Start row	–	Max. 3*	“001”–“400”	• Enables the adjustment item for the data at the row/column specified. • The settings that the last row/column comes before the start row/column are not allowed.
Start column	–	Max. 3*		
Last row	–	Max. 3*		
Last column	–	Max. 3*		
Adjustment item	–	1	“0”: Position/Power “1”: Mark OFF	If you specify “1”: Mark OFF, end the data here. It is not necessary to transmit the subsequent data including a separator “,”.
X-movement	Y	Max. 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. • Z-movement can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052.
Y-movement	Y	Max. 8*		
Z-movement	Y	Max. 8*	Model / Setting range [mm] LP-GS051: “-003.000”–“+003.000” LP-GS052: “-001.500”–“+001.500” LP-GS051-L, LP-RC350S, LP-RF200P, LP-RV200P: “+000.000” or omit	
Rotation movement	Y	Max. 8*	“-180.000”–“+180.000” [°]	
Laser power correction	Y	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.
Total data length		Max. 68	It is the length including the separator “,”.	

* Setting request data are variable length.

■ Example of command settings

Condition: Adjustment No. = 0, Adjustment object = 4, Object group No. = 0, Start row = 4, Start column = 4, Last row = 8, Last column = 8, Adjustment item = 0, X-movement = 0.1, Y-movement = -0.2, Z-movement = 0.3, Rotation movement = 2.1, Laser power correction = -20

• Setting

Transmission data	[STX]	SRA	S	0,4,0,4,4,8,8,0,0.1,-0.2,0.3,2.1,-20	[CR]

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,4,0000,004,004,008,008,0,+000.100, -000.200,+000.300,+002.100,-20	[CR]

Condition: Adjustment No. = 0, Adjustment object = 4, Object group No. = 0, Start row = 4, Start column = 4, Last row = 8, Last column = 8, Adjustment item = 1

• Setting

Transmission data	[STX]	SRA	S	0,4,0,4,4,8,8,1	[CR]

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,4,0000,004,004,008,008,1	[CR]

Reference

• When the adjustment item is set to Mark OFF, the following data do not exist in the response data for readout.

■ Setting request data: Setting deletion

Start code	SRA	S	[Adjustment No.],[Adjustment object], [Number of adjustment settings to delete] Max. 10-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Adjustment No. (From which the deletion starts)	–	Max. 3*	“000”–“999”	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	Y	Max. 4*	“0001”–“1000”	• 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		Max. 10	It is the length including the separator “,”.	

* Setting request data are variable length.

Reference

- If the sum of the adjustment number from which the deletion starts and the number of adjustment settings to delete exceeds 1000, 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 000)

• Setting

Transmission data	[STX]	SRA	S	0,0	[CR]

Condition: Adjustment No. = 2, Adjustment object = 0, Number of adjustment settings to delete = 10
(delete the settings of the adjustment number 002 to 011)

• Setting

Transmission data	[STX]	SRA	S	2,0,10	[CR]

Condition: Adjustment No. = 0 (if there is no setting for the adjustment number read out)

• Readout

Transmission data	[STX]	SRA	R	0	[CR]

Response data	[STX]	SRA	A	000,0	[CR]

3-12 On-the-fly Marking Commands

3-12-1 Motion settings for all files: FLY

Supported model: LP-RC series / LP-RF series / LP-RV series

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	FLY	Sub command	[On-the-fly marking ON/OFF],[Moving direction], [Trigger mode],[Trigger detecting position], [Line speed control],[Encoder resolution], [Distance line speed sensors], [2 Sensors input time-out] Max. 35-byte	(Check sum)	End code

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

■ Readout request data

Start code	FLY	R	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
On-the-fly marking ON/OFF	–	1	“0”: OFF “1”: ON	• Specify ON to enable on-the-fly marking. • If you specify “0” : OFF, end the data here. It is not necessary to transmit the subsequent data including a separator “,”.
Moving direction	Y	1	“0”: +X to -X “1”: -X to +X “2”: +Y to -Y “3”: -Y to +Y	The direction of X/Y axis is defined by the head direction setting in System settings.
Trigger mode	Y	1	“0”: Single trigger “1”: Marking at regular intervals “2”: Multiple triggers	
Trigger detecting position	Y	Max. 8*	“0000.000”–“1000.000” [mm]	Specifies the distance from the center of the marking field to the detecting position of the trigger sensor.
Line speed control	Y	1	“0”: Fixed speed “1”: Encoder input “2”: 2 sensors input	If you specify “0”: fixed speed, end the data here. It is not necessary to transmit the subsequent data including a separator “,”.
Encoder resolution	Y	Max. 7 *	“005.000”–“600.000” [pulses/mm]	Only when line speed control is set to “encoder input”, set this value. For other line speed controls, omit this setting.

Name	Omit	Data length [byte]	Data contents	Remarks
Distance line speed sensors	Y	Max. 7 *	“001.000”–“999.999” [mm]	Only when line speed control is set to “2 sensors input”, set this value. For other line speed controls, omit this setting.
2 Sensors input time-out	Y	Max. 2 *	“00”: None “01”–“10” [sec.]	
Total data length		Max. 35	It is the length including the separator “,”.	

* Setting request data are variable 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)
- 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 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.

■ Example of command settings

Condition: On-the-fly marking ON/OFF = 1, Moving direction = 0, Trigger mode = 0, Trigger detecting position = 200, Line speed control = 1, Encoder resolution = 120.5

- Setting

Transmission data	[STX]	FLY	S	1,0,0,200,1,120.5	[CR]

- Readout

Transmission data	[STX]	FLY	R	[CR]

Response data	[STX]	FLY	A	1,0,0,0200.000,1,120.500,010.000,10	[CR]

3-12-2 Motion settings for current file: FLF

Supported model: LP-RC series / LP-RF series / LP-RV series

Sets the detailed parameters of on-the-fly marking for the selected marking file, such as the line speed, lasing start boundary and etc.

■ Setting request data / response data for readout

Start code	FLF	Sub command	[Line speed],[Workpiece reference boundary], [Workpiece spacing],[Lasing start boundary], [Overrun correction] Max. 40-byte	(Check sum)	End code

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

■ Readout request data

Start code	FLF	R	(Check sum)	End code

■ Data description

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Line speed</td><td>Y</td><td>Max. 7*</td><td>“000.060”–“240.000” [m/min.]</td><td>Only when line speed control is set to “fixed speed”, set this value.
For other line speed controls, omit this setting.</td></tr>
<tr><td>Workpiece reference boundary</td><td>Y</td><td>Max. 9*</td><td>“-2000.000”–“+2000.000” [mm]</td><td></td></tr>
<tr><td>Workpiece spacing</td><td>Y</td><td>Max. 8*</td><td>“0000.000”–“4000.000” [mm]</td><td>Only when trigger mode is set to “Marking at regular intervals”, set this value.
For other trigger modes, omit this setting.</td></tr>
<tr><td>Lasing start boundary</td><td>Y</td><td>Max. 8*</td><td><table><tr><th>Model</th><th>Setting range [mm]</th></tr><tr><td>LP-RC350S</td><td>“-042.500”–“+042.500”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“-045.000”–“+045.000”</td></tr></table></td><td>• Specifies the boundary position in the marking field. When the workpiece reaches this boundary, the lasing starts.
• The plus value indicates the upstream of the moving direction and the negative value indicates the downstream side.</td></tr>
<tr><td>Overrun correction</td><td>Y</td><td>Max. 4*</td><td>“-100”–“+100”</td><td>If the start position of the character are distorted, set the larger value.
The larger the setting value result in the longer marking time.</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 40</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

■ Example of command settings

Condition: Line speed = 80, Workpiece reference boundary = 5, Lasing start boundary = 20, Overrun correction = 0

• Setting

Transmission data	[STX]	FLF	S	80,5,,20,0	[CR]

• Readout

Transmission data	[STX]	FLF	R	[CR]

Response data	[STX]	FLF	A	080.000,+0005.000,0100.000,+020.000,+000	[CR]

3-13 Laser Setting Commands

3-13-1 Laser settings: LSC

Sets the laser settings for the current file such as laser power and scan speed.

Reference

- The settings by this command are applied to all objects in the file. If you want to change the laser power/scan speed correction value of the specified object only, use the laser correction by object (MOD) command.

■ Setting request data / response data for readout

LP-GS/LP-RC/LP-RF series

Start code	LSC	Sub command	[Laser power],[Scan speed], [Laser frequency/Pulse cycle] LP-GS/LP-RC: Max. 14-byte LP-RF: Max. 17-byte	(Check sum)	End code

LP-RV series

Start code	LSC	Sub command	[Laser power],[Scan speed], [Pulse cycle],[Pulse duration] LP-RV: Max. 21-byte	(Check sum)	End code

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

■ Readout request data

Start code	LSC	R	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Laser power	Y	Max. 5*	Model: LP-GS051(-L), LP-GS052, LP-RC350S — Setting range: “000.1”–“100.0” Model: LP-RF200P, LP-RV200P — Setting range: “012.0”–“100.0”	
Scan speed	Y	Max. 5*	Model: LP-GS051, LP-GS052 — Setting range [mm/s]: “00001”–“03000” Model: LP-GS051-L — Setting range [mm/s]: “00001”–“02000” Model: LP-RC350S, LP-RF200P, LP-RV200P — Setting range [mm/s]: “00001”–“12000”	

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Laser frequency
or
Pulse cycle</td><td>Y</td><td>Max. 2*
or
Max. 5*</td><td><table><tr><th>Model</th><th>Setting range</th></tr><tr><td>LP-GS051(-L)
LP-GS052</td><td>“05”, “10”, “20” [kHz]</td></tr><tr><td>LP-RC350S</td><td>“40” [kHz]</td></tr><tr><td>LP-RF200P</td><td>“005.0”–“050.0” [µs]</td></tr><tr><td>LP-RV200P</td><td>Refer to *1</td></tr></table></td><td>• For LP-GS/LP-RC series, set the laser frequency (Max. 2-byte).
• For LP-RF/LP-RV series, set the pulse cycle (Max. 5-byte).
• For LP-RV series, the setting range of the pulse cycle varies depending on the pulse duration. If you change the pulse duration, re-adjust the pulse cycle.</td></tr>
<tr><td>(LP-RV only)
Pulse duration</td><td>Y</td><td>Max. 3*</td><td>“001”, “004”, “008”, “016”, “030”, “120”, “200” [ns]</td><td>For LP-GS/LP-RC/LP-RF series, do not send this field.</td></tr>
<tr><td>Total data length</td><td></td><td>Max. 14
or
Max. 17
or
Max. 21</td><td colspan="2">It is the length including the separator “,”.
• LP-GS/LP-RC series: Max. 14-byte
• LP-RF series: Max. 17-byte
• LP-RV series: Max. 21-byte</td></tr>
</table>

* Setting request data are variable length.

*1 : For LP-RV series, the setting range of the pulse cycle varies depending on the setting of the pulse duration as follows.

Pulse duration [ns]	Pulse cycle [µs]
1	“000.5”–“005.0”
4	“000.5”–“016.6”
8	“000.5”–“033.3”
16	“000.7”–“062.5”
30	“001.2”–“111.1”
120	“003.0”–“333.3”
200	“005.0”–“500.0”

■ Example of command settings

Condition: LP-GS series
Laser power = 80, Scan speed = 2000, Laser frequency = 20

• Setting

Transmission data	[STX]	LSC	S	80,2000,20	[CR]

• Readout

Transmission data	[STX]	LSC	R	[CR]

Response data	[STX]	LSC	A	080.0,02000,20	[CR]

Condition: LP-RV series
Laser power = 80, Scan speed = 2000, Pulse cycle = 1.6, Pulse duration = 4

• Setting

Transmission data	[STX]	LSC	S	80,2000,1.6,4	[CR]

• Readout

Transmission data	[STX]	LSC	R	[CR]

Response data	[STX]	LSC	A	080.0,02000,001.6,004	[CR]

3-13-2 Laser correction by object: MOD

Sets the correction value if you change laser settings for each object.

Reference

- This command is a shortened command consisting only of laser power correction and scan speed correction of the character/bar code/2D code/graphic object settings (STC/BRF/CDC) commands.
- If you want to change the laser power/scan speed correction value of QR codes or Data matrix codes, use the laser settings by 2D code elements (BRP) command. The value set by this command will not be applied to QR codes or Data matrix codes marking.
- When the target object is bar codes/2D codes, the laser power and scan speed for human readable texts do not change.
- Only when the request data contains the object number with the value after the decimal point, the object number of the response data contains the value after the decimal point.
- For the point radiation object, the laser power of the all radiation points set in the specified object number is adjusted by this command. To specify the laser power correction value of the each radiation point, use PRD command (point radiation parameters).

■ Setting request data

Start code	MOD	S	[Object No.],[Laser power correction], [Scan speed correction] (,[Object No.],[Laser power correction], [Scan speed correction] ...)	(Check sum)	End code

■ Readout request data

Start code	MOD	R	[Object No.] Max. 6-byte	(Check sum)	End code

■ Response data for readout

Start code	MOD	A	[Object No.],[Laser power correction], [Scan speed correction] 12-byte or 14-byte	(Check sum)	End code

■ Data description

Name	Omit	Data length [byte]	Data contents	Remarks
Object No.	–	Max. 6*	For character objects, graphic objects, TrueType objects, point radiation objects and bar code/2D code objects excepting 2D side of composite code: “0000”–“1999” or “0000.0”–“1999.0”	• Excepting 2D side of the composite codes, you do not need to specify the number after the decimal point. • To set the character to 2D side of the composite codes, add “.1” after the object number. • Only “0” or “1” can be specified after the decimal point.
			For 2D side of composite codes: “0000.1”–“1999.1”	

Name	Omit	Data length [byte]	Data contents	Remarks
Laser power correction	Y	Max. 3*	“000”–“999” [%]	• The correction ratio is calculated using the value set at the laser settings as 100%. • For the point radiation object, the scan speed correction is not applied to the marking and its readout value is always “100” in the response data for readout regardless the settings.
Scan speed correction	Y	Max. 3*	“001”–“999” [%]	
Total data length		Max. 14	It is the length including the separator “,”. The maximum value that can be set to one object number. Max. 32 objects can be set at once. (Max. 479 byte)	

* Setting request data are variable length.

■ Example of command settings

Condition: Object No. = 0, Laser power correction = 150, Scan speed correction = 80,
Object No. = 1, Laser power correction = 200, Scan speed correction = 100

• Setting

Transmission data	[STX]	MOD	S	0,150,80,1,200,100	[CR]

Condition: Object No. = 0

• Readout

Transmission data	[STX]	MOD	R	0	[CR]

Response data	[STX]	MOD	A	0000,150,080	[CR]

3-13-3 Pulse cycle correction by object: PCC

Supported model: LP-RF series / LP-RV series

Sets the correction value of pulse cycle for LP-RF/LP-RV series by each object.

■ Setting request data

Start code	PCC	S	[Object No.],[Pulse cycle correction], (,[Object No.],[Pulse cycle correction] ...)	(Check sum)	End code

■ Readout request data

Start code	PCC	R	[Object No.] Max. 6-byte	(Check sum)	End code

■ Response data for readout

Start code	PCC	A	[Object No.],[Pulse cycle correction] 8-byte or 10-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Object No.	Max. 6*	For character objects, graphic objects, TrueType objects and point radiation objects: “0000”–“1999” or “0000.0”–“1999.0”	• Excepting bar code/2D code objects, you do not need to specify the number after the decimal point. • For bar code/2D code objects, specifies the correction value by each element of the code. The number after the decimal point represents the code element to be set.
		For bar code/2D code objects: “0000.0”–“1999.9” (Refer to table *1 for fractional portion.)	
Pulse cycle correction	Max. 3*	“001”–“999” [%]	• The correction ratio is calculated using the value set at the laser settings as 100%.
Total data length	Max. 10	It is the length including the separator “,”. The maximum value that can be set to one object number. Max. 32 objects can be set at once. (Max. 351 byte)	

* Setting request data are variable length.

*1 : According to the code type, set the number after the decimal point by following the table below.

Code type	Content
QR code Data matrix code	“.0” or “.2”: Dark module “.1”: Quiet zone outline “.3”: Light module “.4”: Alignment pattern (QR codes) / Border (Data matrix codes) “.5”: Finder pattern (QR codes only) “.7”: Quiet zone filling (Only when filling pattern 1 to 3 is used) “.8”: Human readable text
Bar code (excluding GS1 DataBar) PDF417	“.0”: Code symbol “.8”: Human readable text

Code type	Content
GS1 DataBar Composite code	".0": Code symbol (For composite code, 1D side setting) ".1": Code symbol of 2D side (Composite code only) ".2": Separator of Stacked (GS1 DataBar Stacked (CC-A) only) ".3": Separator of composite code (Composite code only) ".8": Human readable text

Reference

- Only when the request data contains the object number with the value after the decimal point, the object number of the response data contains the value after the decimal point.
- For the point radiation object, the pulse cycle of the all radiation points set in the specified object number is adjusted by this command. It is not possible to specify the pulse cycle correction value of the each radiation point.

■ Example of command settings

Condition: Object No. = 0, Pulse cycle correction = 80
Object No. = 1, Pulse cycle correction = 100

• Setting

Transmission data	[STX]	PCC	S	0,80,1,100	[CR]

Condition: Object No. = 0

• Readout

Transmission data	[STX]	PCC	R	0	[CR]

Response data	[STX]	PCC	A	0000,080	[CR]

3-14 Maintenance Commands

3-14-1 Laser radiation for measurement: SPT

Controls “laser radiation for measurement” used to measure laser output by a commercially available power meter.

■ Setting request data / response data for readout

LP-GS/LP-RC/LP-RF series

Start code	SPT	Sub command	[Radiation on/off],[Laser power], [Laser frequency/Pulse cycle], [Apply system offset to laser power] LP-GS/LP-RC: Max. 12-byte LP-RF: Max. 15-byte	(Check sum)	End code

LP-RV series

Start code	SPT	Sub command	[Radiation on/off],[Laser power], [Pulse cycle],[Pulse duration], [Apply system offset to laser power] LP-RV: Max. 19-byte	(Check sum)	End code

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

■ Readout request data

Start code	SPT	R	(Check sum)	End code

■ Data description

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Radiation on/off</td><td>–</td><td>1</td><td>“0”: Stop radiation (Radiation OFF)
“1”: Start radiation (Radiation ON)</td><td>• The internal shutter is automatically opened and closed at the time of start and stop of radiation.
• In the readout data this field indicates the emission on/off of the laser radiation for measurement.
• To set the subsequent settings without laser radiation, set the radiation on/off to “0”.</td></tr>
<tr><td>Laser power</td><td>Y</td><td>Max. 5*</td><td><table><tr><th>Model</th><th>Setting range</th></tr><tr><td>LP-GS051(-L)
LP-GS052
LP-RC350S</td><td>“000.1”–“100.0”</td></tr><tr><td>LP-RF200P
LP-RV200P</td><td>“012.0”–“100.0”</td></tr></table></td><td>When this data is omitted, laser is radiated with the power used in the last settings (or the initial value 20 if the power has not been specified).</td></tr>
<tr><td>Laser frequency
or
Pulse cycle</td><td>Y</td><td>Max. 2 *
or
Max. 5 *</td><td><table><tr><th>Model</th><th>Setting range</th></tr><tr><td>LP-GS051(-L)
LP-GS052</td><td>“05”, “10”, “20” [kHz]</td></tr><tr><td>LP-RC350S</td><td>“40” [kHz]</td></tr><tr><td>LP-RF200P</td><td>“005.0”–“050.0” [µs]</td></tr><tr><td>LP-RV200P</td><td>Refer to *1</td></tr></table></td><td>• For LP-GS/LP-RC series, set the laser frequency (Max. 2-byte).
• For LP-RF/LP-RV series, set the pulse cycle (Max. 5-byte).
• For LP-RV series, the setting range of the pulse cycle varies depending on the pulse duration. If you change the pulse duration, re-adjust the pulse cycle.</td></tr>
</table>

Name	Omit	Data length [byte]	Data contents	Remarks
(LP-RV only) Pulse duration	Y	Max. 3*	“001”, “004”, “008”, “016”, “030”, “120”, “200” [ns]	For LP-GS/LP-RC/LP-RF series, do not send this field.
Apply system offset to laser power	Y	1	“0”: Do not apply “1”: Apply	Specifies whether the system offset value of laser power applies to the power settings of this function or not.
Total data length		Max. 12 or Max. 15 or Max. 19	It is the length including the separator “,”. • LP-GS/LP-RC series: Max. 12-byte • LP-RF series: Max. 15-byte • LP-RV series: Max. 19-byte	

* Setting request data are variable length.

*1 : For LP-RV series, the setting range of the pulse cycle varies depending on the setting of the pulse duration as follows.

Pulse duration [ns]	Pulse cycle [µs]
1	“000.5”–“005.0”
4	“000.5”–“016.6”
8	“000.5”–“033.3”
16	“000.7”–“062.5”
30	“001.2”–“111.1”
120	“003.0”–“333.3”
200	“005.0”–“500.0”

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 setting value specified with the laser settings (LSC) command is not applied to the radiation power of the laser radiation for measurement.
- 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.
- With LP-RC series, it takes around 300ms to max. 4 seconds to start laser radiation after sending the radiation request.
- With LP-RC series for the first laser radiation after the laser pumping on, warning E640 may occur in case the laser pumping has been off for more than several days. In this case, send the shutter close request or input alarm reset to recover from the warning status, and then retry lasing operation.
- 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.
- The settings of laser radiation for measurement are common in all files. The setting changed by this command is saved in the laser marker without overwriting to the file.

■ Example of command settings

Condition: Radiation on/off = 1, Laser power = 50

• Setting

Transmission data	[STX]	SPT	S	1,50	[CR]

Condition: LP-RV series

• Setting Radiation on/off = 1, Laser power = 50, Pulse cycle = 1.6, Pulse duration = 4, Apply system offset to laser power = 1

Transmission data	[STX]	SPT	S	1,50,1.6,4,1	[CR]

• Readout

Transmission data	[STX]	SPT	R	[CR]

Response data	[STX]	SPT	A	1,050.0,001.6,004,1	[CR]

3-14-2 Operating data: RTD

Reads out the total operating time and total number of operation of the main parts in the laser marker.

■ Readout request data

Start code	RTD	R	[Item] (,[Item] ...) LP-GS/LP-RC: Max. 29-byte LP-RF/LP-RV: Max. 26-byte	(Check sum)	End code

■ Data description of readout request

Name	Data length [byte]	Data contents	Remarks
Item	Max. 2*	“01”: Controller operating time “02”: Laser pumping time “03”: Laser radiation time “04”: Number of shutter cycles “05”: Number of power-on times “06”: Head fan operating time (only LP-GS/LP-RC) “07”: Controller fan operating time “08”: Battery status for system clock “09”: Number of marking processes “10”: Number of INTERLOCK cycles	• Specify the desired items to readout. • You can specify multiple items regardless of selecting order. • The order of the items in the response data corresponds to the specifying order in the readout request. • You cannot specify the same item twice or more in one command. • Do not specify “06”: Head fan operating time with LP-RF/LP-RV series.
⋮	⋮		
Item	(Max. 2*)		
Total data length	Max. 29 or Max. 26	It is the length including the separator “,”. • LP-GS/LP-RC series: Max. 29-byte • LP-RF/LP-RV series: Max. 26-byte	

* Readout request data are variable length.

■ Response data for readout

Start code	RTD	A	[Item],[Operating data] (,[Item],[Operating data] ...) LP-GS/LP-RC: Max. 105-byte LP-RF/LP-RV: Max. 96-byte	(Check sum)	End code

■ Data description of response data for readout

Name	Data length [byte]	Data contents	Remarks
Item	2	“01”: Controller operating time “02”: Laser pumping time “03”: Laser radiation time “04”: Number of shutter cycles “05”: Number of power-on times “06”: Head fan operating time (only LP-GS/LP-RC) “07”: Controller fan operating time “08”: Battery status for system clock “09”: Number of marking processes “10”: Number of INTERLOCK cycles	• The response data is composed of the set of [Item], [Operating data]. • The length of the operating data varies depending on the items and the length is fixed for each item.
Operating data	10 or 5 or 1	Contents vary depending on the selected item. Refer to *1.	

Name	Data length [byte]	Data contents	Remarks
⋮	⋮	Same as above	When you specified multiple items, the order of the items in the response data corresponds to the specifying order in the readout request.
Item	(2)		
Operating data	(10) or (5) or (1)		
Total data length	Max. 105 or Max. 96	It is the length including the separator ",". • LP-GS/LP-RC series: Max. 105-byte • LP-RF/LP-RV series: Max. 96-byte	

*1 : The contents of the operating data are as follows:

Item		Data length [byte]	Data contents
"01"	Controller operating time	5	"00000"–"99999" [hour]
"02"	Laser pumping time	5	
"03"	Laser radiation time	5	
"04"	Number of shutter cycles	10	"0000000000"–"2000000000" [cycle]
"05"	Number of power-on times	10	
"06"	(only LP-GS/LP-RC) Head fan operating time	5	"00000"–"99999" [hour]
"07"	Controller fan operating time	5	
"08"	Battery status for system clock	1	"0": Abnormal "1": Normal
"09"	Number of marking processes	10	"0000000000"–"2000000000" [cycle]
"10"	Number of INTERLOCK cycles	10	

■ Example of command settings

Condition: Readout Number of marking processes (1000 times) and Number of shutter cycles (200 cycles)

• Readout

Transmission data	[STX]	RTD	R	9,4	[CR]	
Response data	[STX]	RTD	A	09,0000001000,04,0000000200	[CR]	

3-14-3 Error history: ERH

Reads out the error log saved in the laser marking system.

■ Readout request data

Start code	ERH	R	[Record No.],[Number of errors to read] Max. 7-byte	(Check sum)	End code

■ Data description of readout request

Name	Omit	Data length [byte]	Data contents	Remarks
Record No. (Start No. to read)	Y	Max. 3*	“001”–“100”: Record No. of errors. The latest error is “001”. “000”: To read how many errors are recorded.	• Specify the desired record No. to readout. • Errors are numbered in the order of the occurrence date and time. The latest error is assigned to No. 001. • When you omit this item, “001” is set. • If you read two or more error information, this number is the start number to readout. • When you specify “000”, you can read how many errors are saved in the laser marking system.
Number of errors to read	Y	Max. 3*	“001”–“100”	• The specified number of errors following from the specified record No. are readout. • When you omit this item, the all readable error information is read. • When you specify “000” to the record No., omit this item. • Via optional industrial network (EtherNet/IP or PROFINET), max. 25 errors can be read.
			when the error history is read via optional industrial network (EtherNet/IP or PROFINET): “001”–“025”	
Total data length		Max. 7	It is the length including the separator “,”. • To read specified record No. of errors: Max. 7-byte • To read all errors: Min. 0-byte	

* Readout request data are variable length.

■ Response data for readout

Start code	ERH	A	[Number of errors],[Record No.],[Error information] (,[Record No.],[Error information]...) Max. 4103-byte	(Check sum)	End code

■ Data description of response data for readout

Name	Data length [byte]	Data contents	Remarks
Number of errors	3	“000”–“100”	• Indicates how many errors are saved in the laser marking system. • When you specified “000” to the record No. in the readout request data, only this item is in the response data and the following data do not exist.
Record No.	3	“001”–“100”: Record No. of errors. The latest error is “001”.	
Error information	36	“YYYY-MM-DD HH:mm:ss Exxx (eeeee) nnnn” Refer to *1.	The following information is indicated: date and time of occurrence in the format YYYY-MM-DD hh:mm:ss, error code, suberror code, and file number.
⋮	⋮	Same as above	When you requested to read two or more errors, [Record No.],[Error information] of the subsequent record No. follow.
Record No.	(3)		
Error information	(36)		
Total data length	3 or Max. 3 + 41n	It is the length including the separator “,”. • To read only how many errors are recorded: 3-byte • To read error information: Variable length within Max. 3 + 41n-byte n=Number of errors to read (n ≦ 100) When reading only one error information: 44-byte When reading 100 error information: 4103-byte	

*1 : The contents of the error information “YYYY-MM-DD HH:mm:ss Exxx(eeeee) nnnn” are as follows:

Data format	Data contents	Remarks
“YYYY-MM-DD ” Year, month, date	YYYY: “1980”–“2099”	After “DD”, a space (20 (HEX)) is added.
	MM: “01”–“12”	
	DD: “01”–“31”	
“HH:mm:ss ” Time, minute, second	HH: “00”–“23”	After “ss”, a space (20 (HEX)) is added.
	mm: “00”–“59”	
	ss: “00”–“59”	
“Exxx(eeeee) ” Error code (Suberror code)	Exxx: “E001”–“E999”	• After “(eeeee)”, a space (20 (HEX)) is added. • The suberror code is used for our service representatives.
	eeeee: “00000”–“65535”	
“nnnn” File No.	“0000”–“9999”	The file No. selected when the error was occurred is indicated.

Reference

- If no error is recorded in the laser marking system, in the response data the number of errors is represented with “000” and the subsequent data do not exist.
- The error information that can be read via optional industrial network (EtherNet/IP or PROFINET) is max. 1028-byte (max. 25 errors).

■ Example of command settings

Condition: Total 3 errors are recorded, to read the latest one error:

• Readout

Transmission data	[STX]	ERH	R	1,1	[CR]

Response data	[STX]	ERH	A	003,001,2020-07-31 14:03:25 E750(00000) 0001	[CR]

Condition: Total 3 errors are recorded, to read the all errors:

• Readout

Transmission data	[STX]	ERH	R	[CR]

Response data	[STX]	ERH	A	003,001,2020-07-31 14:03:25 E750(00000) 0001, 002,2020-07-22 09:10:55 E750(00000) 0005, 003,2020-06-18 12:05:41 E400(00000) 0001	[CR]

3-14-4 Error code: ENO

Reads out the error code of alarm or warning when an error has occurred.

■ Readout request data

Start code	ENO	R	(Check sum)	End code

■ Response data for readout

Start code	ENO	A	[Error code] 3-byte	(Check sum)	End code

■ Data description

Name	Data length [byte]	Data contents	Remarks
Error code	3	“000”: No error “001”–“999”: Error codes	To the warnings from E700 to E799, “000” (No error) is read out.
Total data length	3	The data length is fixed.	

■ Example of command settings

Condition:
- Readout

When error E610 occurs

Transmission data	[STX]	ENO	R	[CR]

Response data	[STX]	ENO	A	610	[CR]

Reference

- Refer to “Error Indication” (P.193) for details on error codes.

3-14-5 Alarm reset: ARS

The reset input for restoring the system from the alarm or warning status. Make sure to verify the safety by eliminating the alarm or warning causes before transmitting this command.

■ Setting request data

Start code	ARS	S	(Check sum)	End code

■ Example of command settings

- Setting

Transmission data	[STX]	ARS	S	[CR]

Reference

- ARS command cannot reset the alarm E001 to E399 that is caused by hardware or system error. For these alarms, restart the laser marker.
- ARS command is not required for the warning E600 and E700 to E715. They are cleared automatically when the cause of error is solved.
- ARS command is not required for the warning E750 to E799. They are cleared automatically after 3 seconds.

3-15 System Settings Command

3-15-1 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] Max. 19-byte	(Check sum)	End code

Sub command is “S” for the setting request data and the initial setting “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	Max. 2*	“01”–“12” [Month]	
Date	Max. 2*	“01”–“31” [Day]	
Hour	Max. 2*	“00”–“23” [Hour]	
Minute	Max. 2*	“00”–“59” [Minute]	
Second	Max. 2*	“00”–“59” [Second]	
Total data length	Max. 19	It is the length including the separator “,”.	

* Setting request data are variable length.

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	2014,12,10,18,45,0	[CR]

- Readout

Transmission data	[STX]	YMD	R	[CR]

Response data	[STX]	YMD	A	2014,12,10,18,45,00	[CR]

3-15-2 System offset: SOF

Fine-tunes the marking position and laser power of the system. The settings apply to all files in the laser marking system.

■ Setting request data / response data for readout

Start code	SOF	Sub command	[Laser power correction],[X-axis offset], [Y-axis offset],[Z-axis offset], [Rotation offset],[X-scaling],[Y-scaling] Max. 57-byte	(Check sum)	End code

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

■ Readout request data

Start code	SOF	R	(Check sum)	End code

■ Data description

<table>
<tr><th>Name</th><th>Omit</th><th>Data length [byte]</th><th>Data contents</th><th>Remarks</th></tr>
<tr><td>Laser power correction</td><td>Y</td><td>Max. 5*</td><td>“050.0”–“200.0” [%]</td><td>It is the correction ratio relative to the current laser power.</td></tr>
<tr><td>X-axis offset</td><td>Y</td><td>Max. 8*</td><td rowspan="2">“-999.999”–“+999.999” [mm]</td><td rowspan="4">• Moves the marking field by the specified value (absolute value). The reference position of the movement is the center of the marking field.
• Z-axis offset can be specified with LP-GS051 (exclude LP-GS051-L) and LP-GS052.
• The rotation center is the center of the marking field.</td></tr>
<tr><td>Y-axis offset</td><td>Y</td><td>Max. 8*</td></tr>
<tr><td>Z-axis offset</td><td>Y</td><td>Max. 8*</td><td>
<table>
<tr><th>Model</th><th>Setting range [mm]</th></tr>
<tr><td>LP-GS051</td><td>“-003.000”–“+003.000”</td></tr>
<tr><td>LP-GS052</td><td>“-001.500”–“+001.500”</td></tr>
<tr><td>LP-GS051-L
LP-RC350S
LP-RF200P
LP-RV200P</td><td>“+000.000” or omit</td></tr>
</table>
</td></tr>
<tr><td>Rotation offset</td><td>Y</td><td>Max. 8*</td><td>“-180.000”–“+180.000” [°]</td></tr>
<tr><td>X-scaling</td><td>Y</td><td>Max. 7*</td><td rowspan="2">“070.000”–“130.000” [%]</td><td rowspan="2">Enlarge or reduce the size of the marking field by a specific percentage. The scaling center is the center of the marking field.</td></tr>
<tr><td>Y-scaling</td><td>Y</td><td>Max. 7*</td></tr>
<tr><td colspan="2">Total data length</td><td>Max. 57</td><td colspan="2">It is the length including the separator “,”.</td></tr>
</table>

* Setting request data are variable length.

Reference

- When you shift the position of the marking field coordinates with the system offset settings, you cannot use the whole marking field, because the available marking field is restricted to the area that overlaps the original position of the marking field.
- When any of the data item is omitted, the data set last (the initial value if it was not set) will be maintained for the omitted field.
- The setting changed by this command is saved in the laser marker without overwriting to the file.

■ Example of command settings

Condition: Laser power correction = 120, X-axis offset = 10, Y-axis offset = -5.5, Z-axis offset = 2, Rotation offset = 90, X-scaling = 100, Y-scaling = 100

• Setting

Transmission data	[STX]	SOF	S	120,10,-5.5,2,90,100,100	[CR]

• Readout

Transmission data	[STX]	SOF	R	[CR]

Response data	[STX]	SOF	A	120.0,+010.000,-005.500,+002.000,+090.000,100.000,100.000	[CR]

3-15-3 Command mode: RSM

Switches the command mode between LP-400/LP-V compatible mode and the standard one. This command is available when LP-400/V 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 the initial setting “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	“0”: LP-400/V command mode “1”: Standard command mode	
Total data length	1	The data length is fixed.	

Reference

- This command is available only when “LP-400/V compatibility” is enabled in system settings of Laser Marker NAVI smart.
- When “LP-400/V compatibility” is enabled in system settings of Laser Marker NAVI smart, the command mode is always “LP-400/V 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-400/V compatibility” in system settings.
- To switch the command mode from “LP-400/V 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-400/V compatible format. The response data to this setting request is returned also in LP-400/V compatible format. The standard command format is applied afterward.
- The setting by this command is not saved in the laser marker.
- RSM command is not available when you use the optional industrial network (EtherNet/IP or PROFINET) for the command control. You cannot use the command format in LP-400/V compatible mode via EtherNet/IP or PROFINET.

■ 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]

MEMO

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.
	For LP-GS series: Fuse is blown.	Replace the fuse by following the procedures described in the “Setup/Maintenance Guide”.
	For LP-RC/LP-RF/LP-RV 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-RF/LP-RV 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 Laser Marker NAVI smart is pressed.	Solve the safety problem. Then select “Reset” in the error dialog in Laser Marker NAVI smart to finish the laser stop status.
	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.
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 or PROFINET port by mistake.)	Connect the cable to the port marked “LAN” on the rear of the controller.
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 other 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 work piece.)	Obstacle hinders laser beam.	• Remove obstacle between laser emission port of laser marker head and work piece. • For LP-RF/LP-RV series, remove the protection cap of the laser emission port.
	Distance to work piece is not appropriate.	Adjust distance between bottom surface of laser marker head and the work piece surface as specified.
	For LP-GS 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 work piece height.
	The work piece is not in place.	• Check the marking position using the guide laser or guide pointer to check if the work piece is out of the specified position. • For LP-RC/LP-RF/LP-RV series: Connecting a sensor to TARGET DETECTION IN (X7) of I/O terminal block, you can check the presence of the work piece 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 work piece.	Materials can be marked differ depending on wavelength and output power of laser marker. • LP-GS/LP-RC is not suitable for metal material. • LP-RF/LP-RV is not suitable for transparent material.
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 mis-connection, 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 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.

Troubles	Causes	Measures
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 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 work piece is not appropriate.	Adjust distance between bottom surface of laser marker head and marking surface of the work piece.
	For LP-GS series: The set Z-position does not match the height of the actual target work piece. (The LP-GSxxx-L type is excluded.)	Set the Z-position according to the work piece height.
	Marking surface of work piece is inclined.	Make adjustment so that bottom surface of laser marker head and marking surface of the work piece are parallel with each other.
	There are variations in properties of the work pieces. • 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 work pieces.
	Work piece feeder is not stable.	Adjust work piece feeder so that work piece 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.
	For LP-RV series: The setting value of the pulse duration is not appropriate.	Adjust the pulse duration according to the material of the work piece. For plastic work pieces the pulse duration 4ns or 8ns is a common setting, and for metal, 16ns or 30ns is often selected.

Troubles	Causes	Measures
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 series: Set “Power optimization by marking position” in “System offset” in System settings screen. • For LP-RF/LP-RV series: Set the power correction to the marking objects in the edge of the marking field.
Character is partially chipped.	Obstacle hinders laser beam.	Remove obstacle between laser emission port and work piece.
	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 series: If contaminants persist, replace the protection glass of the laser emission port.
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 work piece is fully stopped. Marking may disturbed due to remaining vibration even if work piece is in full stop.Turn the marking trigger signal ON after vibrations are completely damped.
		Disturbed at the end of marking: Work piece 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 work piece 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.

Troubles	Causes	Measures
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.
Marking is dotted.	• For LP-GS series: Setting of laser frequency and scan speed is inadequate.	Decrease scan speed or increase laser frequency.
	• For LP-RF/LP-RV 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.	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 (LP-400/V compatibility setting) is wrong.	• If you want to use the same command format with the former models of LP-400/LP-V series, enable “LP-400/V compatibility” in system settings of Laser Marker NAVI smart. • If you want to use the standard command format, switch the mode by RSM command or disable “LP-400/V compatibility” in system settings of Laser Marker NAVI smart. • If you use EtherNet/IP or PROFINET, deactivate “LP-400/V compatibility” in System settings screen. You cannot use the command format in LP-400/V compatible mode via EtherNet/IP or PROFINET.
Marking 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 open/close control method set in the system settings screen (I/O or communication command) and the actual control method are consistent. • If the shutter open/close 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 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-RF/LP-RV 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 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-RF/LP-RV 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.
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 open/close control method is set to communication command. • Laser radiation for measurement (SPT)
	“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)
	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) 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)

Troubles	Causes	Measures
The sending command is not accepted and negative response is returned.	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 (LP-400/V compatibility setting) is wrong.	• If you want to use the same command format with the former models of LP-400/LP-V series, enable “LP-400/V compatibility” in system settings of Laser Marker NAVI smart. • If you want to use the standard command format, switch the mode by RSM command or disable “LP-400/V compatibility” in system settings of Laser Marker NAVI smart.
	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 compatible mode, only ASCII code and Shift JIS are available.

* These commands are applicable with the standard command mode. For the LP-400/V compatible mode, refer to the “Serial Communication Command Guide: LP-400/V 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 or PROFINET 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. • Cofirm 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 work piece is fully stopped.
		To feed works after marking, check that TIMING WAIT OUT is turned ON and start feeding works.

Error Indication

When an error occurs, an error code appears on the display panel of the laser marker.
Errors are categorized into alarm and warning depending on their details.
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 - E094 E101 - E138 E145 - E158 E160 - E194 E202 E208 - E214 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/RF series, make sure the correct model numbers of laser head and controller have been connected. • For LP-RV 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.
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/RF series, check the connection between laser head and controller. For LP-RV series, check the connection between laser head and oscillator unit and between oscillator unit and controller. • Replace the cable.

ERROR CODE	Description	Measures *1
E159 *4 E231 - E236 *4	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.
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”.
E250 - E252 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 effected 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.
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.
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 effected by noise. • Check the connection of the cable and various signal lines, and then restart the laser marker.
E276 *2, *3 E286 *2, *3	Marking data are too detailed for the scan speed configured.	Decrease the scan speed.
E290 - E292 *2	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.

ERROR CODE	Description	Measures *1
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/LP-RF/LP-RV 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.
E404 E502	The stop laser button of the Laser Marker NAVI smart was pressed.	Solve the safety problem. Then select “Reset” in the error dialog in Laser Marker NAVI smart to finish the laser stop status.
E405 *3, *4 E503 *3, *4	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.	

ERROR CODE	Description	Measures *1
E450 - E453	• The date and time of the system clock may be out of synchronization. • 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. • 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.
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 effected 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 series and LP-RV 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.
   - E715: The warning is output while the cause of error occurs and it is released automatically when the cause is solved.
   - E750 - E782: 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	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 aving 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.)
E614 - E615 *2 E651 *2	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).
E616 *3, *4	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	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	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.
		• Set Lasing start boundary to the upward of the moving direction.
		• 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	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. • While the laser marker and LP-ABR series are connected for the linkage control, do not start-up Configurator LP-ABR software.

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 barcode/2D code settings or character settings. • For the code checking, confirm the code type and settings of barcode/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 was not registered.	Register the graphic file in the data management screen.
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.
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.

ERROR CODE	Description	Measures *1
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/LP-RF/LP-RV series: Link control with an image checker and TARGET DETECTION IN	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.
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”.

ERROR CODE	Description	Measures *1
E672	The settings for separator height ratio or row height ratio are too small.	• Correct the separator height ratio or the barcode 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.
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	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) 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.

ERROR CODE	Description	Measures *1
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	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.
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.
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.
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	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.

ERROR CODE	Description	Measures *1
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/RF series, it is recommended to connect the head and controller that have the same serial numbers. • For LP-RV series, it is recommended to connect the head, oscillator unit, and controller that have the same serial numbers.
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	GSD file version error.	To use PROFINET, download the GSD file (.XML file) corresponding to the controller version of your laser marking system. If the GSD file version is incorrect, settings by your PLC cannot be imported to the laser marking system correctly.

*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 series and LP-RV 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	Initial setting
5C (HEX)	\ (Backslash) or ¥ (Yen sign)	\ (Backslash)
60 (HEX)	` (Grave accent) or ‘ (Left single quotation mark)	` (Grave accent)
7E (HEX)	~ (Tilde) or ¯ (Overline)	~ (Tilde)

Reference

- When using the external device set by 2-byte, NUL00 (HEX) can be used. Please add NUL00 (HEX) before the start code (if the start code is not used, before the command) or after end code.
- For the barcode/2D code objects to input the control codes in the code data by using STR command or SIN command, follow the input method specified in the system settings. Refer to “Inputting control codes to bar code/2D code character strings” (P.41).

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

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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

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	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
	8F90	3D70	署	書	薯	藷	諸	助	叙	女	序	徐	恕	鋤	除	傷	償	
し	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

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	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		弌	丐	丕	个	丱	丶	丼	丿	乂	乖	乘	亂	亅	豫	亊
98AE	5030	舒	弍	于	亞	亟	亠	亢	亰	亳	亶	从	仍	仄	仆	仂	仗
98BE	5040	仞	仭	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	偖	偬	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	竸
995F	5140	兩	兪	兮	冀	冂	囘	册	冉	冏	冑	冓	冕	冖	冤	冦	冢
996F	5150	冩	冪	冫	决	冱	冲	冰	况	冽	凅	凉	凛	几	處	凩	凭
9980	5160	凰	凵	凾	刄	刋	刔	刎	刧	刪	刮	刳	刹	剏	剄	剋	剌
9990	5170	剞	剔	剪	剴	剩	剳	剿	剽	劍	劔	劒	剱	劈	劑	辨	
999E	5220		辧	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	丗	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	呟	呱	呷	呰
99EE	5270	咒	呻	咀	呶	咄	咐	咆	哇	咢	咸	咥	咬	哄	哈	咨	
9A3F	5320		咫	哂	咤	咾	咼	哘	哥	哦	唏	唔	哽	哮	哭	哺	哢
9A4F	5330	唹	啀	啣	啌	售	啜	啅	啖	啗	唸	唳	啝	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	嘯	噬	噪	嚆	嚀	嚊	嚠	嚔	嚏	嚥	嚮	嚶	嚴	囂
9A90	5370	嚼	囁	囃	囀	囈	囎	囑	囓	囗	囮	囹	圀	囿	圄	圉	
9A9E	5420		圈	國	圍	圓	團	圖	嗇	圜	圦	圷	圸	坎	圻	址	坏
9AAE	5430	坩	埀	垈	坡	坿	垉	垓	垠	垳	垤	垪	垰	埃	埆	埔	埒
9ABE	5440	埓	堊	埖	埣	堋	堙	堝	塲	堡	塢	塋	塰	毀	塒	堽	塹
9ACE	5450	墅	墹	墟	墫	墺	壞	墻	墸	墮	壅	壓	壑	壗	壙	壘	壥
9ADE	5460	壜	壤	壟	壯	壺	壹	壻	壼	壽	夂	夊	夐	夛	梦	夥	夬
9AEE	5470	夭	夲	夸	夾	竒	奕	奐	奎	奚	奘	奢	奠	奧	奬	奩	
9B3F	5520		奸	妁	妝	佞	侫	妣	妲	姆	姨	姜	妍	姙	姚	娥	娟
9B4F	5530	娑	娜	娉	娚	婀	婬	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	乢	屶	屹	岌	岑	岔	妛	岫	岻	岶
9BAE	5630	岼	岷	峅	岾	峇	峙	峩	峽	峺	峭	嶌	峪	崋	崕	崗	嵜
9BBE	5640	崟	崛	崑	崔	崢	崚	崙	崘	嵌	嵒	嵎	嵋	嵬	嵳	嵶	嶇
9BCE	5650	嶄	嶂	嶢	嶝	嶬	嶮	嶽	嶐	嶷	嶼	巉	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	幤	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	弑	弖	弩	弭	弸	彁	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	怺	恚	恁	恪	恷	恟

Shift-JIS	JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
9C90	5770	恊	恠	恍	恣	恃	恤	恂	恬	恫	恙	悁	悍	惧	悃	悚	
9C9E	5820		悄	悛	悖	悗	悒	悧	悋	惡	悸	惠	惓	悴	忰	悽	惆
9CAE	5830	悵	惘	慍	愕	愆	惶	惷	愀	惴	惺	愃	愡	惻	惱	愍	愎
9CBE	5840	慇	愾	愨	愧	慊	愿	愼	愬	愴	愽	慂	慄	慳	慷	慘	慙
9CCE	5850	慚	慫	慴	慯	慥	慱	慟	慝	慓	慵	憙	憖	憇	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	懾	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	拏	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	搨	搏	摧	摯	摶	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	擽	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	旻	杳	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	朷	杆	杞	杠	杙	杣	杤	枉	杰
9E5F	5B40	枩	杼	杪	枌	枋	枦	枡	枅	枷	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	梹	桴
9E90	5B70	梵	梠	梺	椏	梍	桾	椁	棊	椈	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	椣	椡	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	槝
9ECE	5C50	榻	槃	榧	樮	榑	榠	榜	榕	榴	槞	槨	樂	樛	槿	權	槹
9EDE	5C60	槲	槧	樅	榱	樞	槭	樔	槫	樊	樒	櫁	樣	樓	橄	樌	橲
9EEE	5C70	樶	橸	橇	橢	橙	橦	橈	樸	樢	檐	檍	檠	檄	檢	檣	
9F3F	5D20		檗	蘗	檻	櫃	櫂	檸	檳	檬	櫞	櫑	櫟	檪	櫚	櫪	櫻
9F4F	5D30	欅	蘖	櫺	欒	欖	鬱	欟	欸	欷	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		沺	泛	泯	泙	泪	洟	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	淕	淪	淮	渭
9FCE	5E50	湮	渮	渙	湲	湟	渾	渣	湫	渫	湶	湍	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	瀁	瀏	濾	瀛	瀚	潴	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	熈	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

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E0AE	6030	牋	牘	牴	牾	犂	犁	犇	犒	犖	犢	犧	犹	犲	狃	狆	狄
E0BE	6040	狎	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	瓧	瓩	瓮	瓲	瓰	瓱	瓸	瓷	甄	甃	甅	甌	甎
E14F	6130	甍	甕	甓	甞	甦	甬	甼	畄	畍	畊	畉	畛	畆	畚	畩	畤
E15F	6140	畧	畫	畭	畸	當	疆	疇	畴	疊	疉	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	瘁	痰	痺	痲	痳	瘋	瘍	瘉	瘟	瘧	瘠	瘡	瘢	瘤	瘴
E190	6170	瘰	瘻	癇	癈	癆	癜	癘	癡	癢	癨	癩	癪	癧	癬	癰	
E19E	6220		癲	癶	癸	發	皀	皃	皈	皋	皎	皖	皓	皙	皚	皰	皴
E1AE	6230	皸	皹	皺	盂	盍	盖	盒	盞	盡	盥	盧	盪	蘯	盻	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	硴	碆	硼
E1EE	6270	碚	碌	碣	碵	碪	碯	磑	磆	磋	磔	碾	碼	磅	磊	磬	
E23F	6320		磧	磚	磽	磴	礇	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	穃	穗
E26F	6350	穉	穡	穢	穩	龝	穰	穹	穽	窈	窗	窕	窘	窖	窩	竈	窰
E280	6360	窶	竅	竄	窿	邃	竇	竊	竍	竏	竕	竓	站	竚	竝	竡	竢
E290	6370	竦	竭	竰	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	筬	筮	箝
E2AE	6430	箘	箟	箍	箜	箚	箋	箒	箏	筝	箙	篋	篁	篌	篏	箴	篆
E2BE	6440	篝	篩	簑	簔	篦	篥	籠	簀	簇	簓	篳	篷	簗	簍	篶	簣
E2CE	6450	簧	簪	簟	簷	簫	簽	籌	籃	籔	籏	籀	籐	籘	籟	籤	籖
E2DE	6460	籥	籬	籵	粃	粐	粤	粭	粢	粫	粡	粨	粳	粲	粱	粮	粹
E2EE	6470	粽	糀	糅	糂	糘	糒	糜	糢	鬻	糯	糲	糴	糶	糺	紆	
E33F	6520		紂	紜	紕	紊	絅	絋	紮	紲	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	綢	綯	緜	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	繿	纈	纉	續	纒	纐	纓	纔	纖	纎	纛	纜	缸	缺	
E39E	6620		罅	罌	罍	罎	罐	网	罕	罔	罘	罟	罠	罨	罩	罧	罸
E3AE	6630	羂	羆	羃	羈	羇	羌	羔	羞	羝	羚	羣	羯	羲	羹	羮	羶
E3BE	6640	羸	譱	翅	翆	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	聨
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	臙	臘	臈	臚	臟	臠	臧	臺	臻	臾	舁	舂	舅
E46F	6750	與	舊	舍	舐	舖	舩	舫	舸	舳	艀	艙	艘	艝	艚	艟	艤
E480	6760	艢	艨	艪	艫	舮	艱	艷	艸	艾	芍	芒	芫	芟	芻	芬	苡
E490	6770	苣	苟	苒	苴	苳	苺	莓	范	苻	苹	苞	茆	苜	茉	苙	
E49E	6820		茵	茴	茖	茲	茱	荀	茹	荐	荅	茯	茫	茗	茘	莅	莚
E4AE	6830	莪	莟	莢	莖	茣	莎	莇	莊	荼	莵	荳	荵	莠	莉	莨	菴
E4BE	6840	萓	菫	菎	菽	萃	菘	萋	菁	菷	萇	菠	菲	萍	萢	萠	莽

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E4CE	6850	萸	蔆	菻	葭	萪	萼	蕚	蒄	葷	葫	蒭	葮	蒂	葩	葆	萬
E4DE	6860	葯	葹	萵	蓊	葢	蒹	蒿	蒟	蓙	蓍	蒻	蓚	蓐	蓁	蓆	蓖
E4EE	6870	蒡	蔡	蓿	蓴	蔗	蔘	蔬	蔟	蔕	蔔	蓼	蕀	蕣	蕘	蕈	
E53F	6920		蕁	蘂	蕋	蕕	薀	薤	薈	薑	薊	薨	蕭	薔	薛	藪	薇
E54F	6930	薜	蕷	蕾	薐	藉	薺	藏	薹	藐	藕	藝	藥	藜	藹	蘊	蘓
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	螽	蟀	蟐	雖	螫	蟄
E5AE	6A30	螳	蟇	蟆	螻	蟯	蟲	蟠	蠏	蠍	蟾	蟶	蟷	蠎	蟒	蠑	蠖
E5BE	6A40	蠕	蠢	蠡	蠱	蠶	蠹	蠧	蠻	衄	衂	衒	衙	衞	衢	衫	袁
E5CE	6A50	衾	袞	衵	衽	袵	衲	袂	袗	袒	袮	袙	袢	袍	袤	袰	袿
E5DE	6A60	袱	裃	裄	裔	裘	裙	裝	裹	褂	裼	裴	裨	裲	褄	褌	褊
E5EE	6A70	褓	襃	褞	褥	褪	褫	襁	襄	褻	褶	褸	襌	褝	襠	襞	
E63F	6B20		襦	襤	襭	襪	襯	襴	襷	襾	覃	覈	覊	覓	覘	覡	覩
E64F	6B30	覦	覬	覯	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	謌	謇	謚	諡	謖	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	豼	貘	戝	貭	貪	貽	貲	貳	貮	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	赳	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	蹐	蹈	蹙	蹤	蹠	踪	蹣	蹕	蹶	蹲	蹼	躁
E74F	6D30	躇	躅	躄	躋	躊	躓	躑	躔	躙	躪	躡	躬	躰	軆	躱	躾
E75F	6D40	軅	軈	軋	軛	軣	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	轢	轣	轤	辜	辟	辣	辭	辯	辷	迚	迥	迢	迪	迯	邇	迴
E790	6D70	逅	迹	迺	逑	逕	逡	逍	逞	逖	逋	逧	逶	逵	逹	迸	
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	釡	釛	釼
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	鋩	錏	鋺	鍄	錮	
E83F	6F20		錙	錢	錚	錣	錺	錵	錻	鍜	鍠	鍼	鍮	鍖	鎰	鎬	鎭
E84F	6F30	鎔	鎹	鏖	鏗	鏨	鏥	鏘	鏃	鏝	鏐	鏈	鏤	鐚	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	閂	閇	閊	閔	閖	閘	閙
E880	6F60	閠	閨	閧	閭	閼	閻	閹	閾	闊	濶	闃	闍	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	隸	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	靫	靱	靹	鞅	靼	鞁	靺	鞆	鞋	鞏
E8DE	7060	鞐	鞜	鞨	鞦	鞣	鞳	鞴	韃	韆	韈	韋	韜	韭	齏	韲	竟

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E8EE	7070	韶	韵	頏	頌	頸	頤	頡	頷	頽	顆	顏	顋	顫	顯	顰	
E93F	7120		顱	顴	顳	颪	颯	颱	颶	飄	飃	飆	飩	飫	餃	餉	餒
E94F	7130	餔	餘	餡	餝	餞	餤	餠	餬	餮	餽	餾	饂	饉	饅	饐	饋
E95F	7140	饑	饒	饌	饕	馗	馘	馥	馭	馮	馼	駟	駛	駝	駘	駑	駭
E96F	7150	駮	駱	駲	駻	駸	騁	騏	騅	駢	騙	騫	騷	驅	驂	驀	驃
E980	7160	騾	驕	驍	驛	驗	驟	驢	驥	驤	驩	驫	驪	骭	骰	骼	髀
E990	7170	髏	髑	髓	體	髞	髟	髢	髣	髦	髯	髫	髮	髴	髱	髷	
E99E	7220		髻	鬆	鬘	鬚	鬟	鬢	鬣	鬥	鬧	鬨	鬩	鬪	鬮	鬯	鬲
E9AE	7230	魄	魃	魏	魍	魎	魑	魘	魴	鮓	鮃	鮑	鮖	鮗	鮟	鮠	鮨
E9BE	7240	鮴	鯀	鯊	鮹	鯆	鯏	鯑	鯒	鯣	鯢	鯤	鯔	鯡	鰺	鯲	鯱
E9CE	7250	鯰	鰕	鰔	鰉	鰓	鰌	鰆	鰈	鰒	鰊	鰄	鰮	鰛	鰥	鰤	鰡
E9DE	7260	鰰	鱇	鰲	鱆	鰾	鱚	鱠	鱧	鱶	鱸	鳧	鳬	鳰	鴉	鴈	鳫
E9EE	7270	鴃	鴆	鴪	鴦	鶯	鴣	鴟	鵄	鴕	鴒	鵁	鴿	鴾	鵆	鵈	
EA3F	7320		鵝	鵞	鵤	鵑	鵐	鵙	鵲	鶉	鶇	鶫	鵯	鵺	鶚	鶤	鶩
EA4F	7330	鶲	鷄	鷁	鶻	鶸	鶺	鷆	鷏	鷂	鷙	鷓	鷸	鷦	鷭	鷯	鷽
EA5F	7340	鸚	鸛	鸞	鹵	鹹	鹽	麁	麈	麋	麌	麒	麕	麑	麝	麥	麩
EA6F	7350	麸	麪	麭	靡	黌	黎	黏	黐	黔	黜	點	黝	黠	黥	黨	黯
EA80	7360	黴	黶	黷	黹	黻	黼	黽	鼇	鼈	皷	鼕	鼡	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									

GB2312 编码表 / GB2312 Character Code

■ GB 2312 第一级、第二级字符 / Simplified Chinese characters of GB 2312 level-1 and level-2

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
A1A0			、	。	·	‒	ˇ	¨	〃	々	—	～	‖	…	‘	’
A1B0	“	”	〔	〕	〈	〉	《	》	「	」	『	』	〖	〗	【	】
A1C0	±	×	÷	∶	∧	∨	∑	∏	∪	∩	∈	∷	√	⊥	//	∠
A1D0	⌒	⊙	∫	∮	≡	≌	≈	∽	∝	≠	≮	≯	≤	≥	∞	∵
A1E0	∴	♂	♀	°	′	″	℃	$	¤	¢	£	‰	§	№	☆	★
A1F0	○	●	◎	◇	◆	□	■	△	▲	※	→	←	↑	↓	=	
A2B0		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
A2C0	16.	17.	18.	19.	20.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A2D0	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	①	②	③	④	⑤	⑥	⑦
A2E0	⑧	⑨	⑩			㈠	㈡	㈢	㈣	㈤	㈥	㈦	㈧	㈨	㈩	
A2F0		Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ	Ⅵ	Ⅶ	Ⅷ	Ⅸ	Ⅹ	Ⅺ	Ⅻ			
A3A0		!	"	#	¥	%	&	'	(	)	*	+	,	−	.	／
A3B0	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
A3C0	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
A3D0	P	Q	R	S	T	U	V	W	X	Y	Z	[	＼	]	^	_
A3E0	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
A3F0	p	q	r	s	t	u	v	w	x	y	z	{	|	}	‾	
A4A0		ぁ	あ	ぃ	い	ぅ	う	ぇ	え	ぉ	お	か	が	き	ぎ	く
A4B0	ぐ	け	げ	こ	ご	さ	ざ	し	じ	す	ず	せ	ぜ	そ	ぞ	た
A4C0	だ	ち	ぢ	っ	つ	づ	て	で	と	ど	な	に	ぬ	ね	の	は
A4D0	ば	ぱ	ひ	び	ぴ	ふ	ぶ	ぷ	へ	べ	ぺ	ほ	ぼ	ぽ	ま	み
A4E0	む	め	も	ゃ	や	ゅ	ゆ	ょ	よ	ら	り	る	れ	ろ	ゎ	わ
A4F0	ゐ	ゑ	を	ん												
A5A0		ァ	ア	ィ	イ	ゥ	ウ	ェ	エ	ォ	オ	カ	ガ	キ	ギ	ク
A5B0	グ	ケ	ゲ	コ	ゴ	サ	ザ	シ	ジ	ス	ズ	セ	ゼ	ソ	ゾ	タ
A5C0	ダ	チ	ヂ	ッ	ツ	ヅ	テ	デ	ト	ド	ナ	ニ	ヌ	ネ	ノ	ハ
A5D0	バ	パ	ヒ	ビ	ピ	フ	ブ	プ	ヘ	ベ	ペ	ホ	ボ	ポ	マ	ミ
A5E0	ム	メ	モ	ャ	ヤ	ュ	ユ	ョ	ヨ	ラ	リ	ル	レ	ロ	ヮ	ワ
A5F0	ヵ	ヶ	ヲ	ン	ヴ	ヵ	ヶ									
A6A0		Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο
A6B0	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω							
A6C0		α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	ο
A6D0	π	ρ	σ	τ	υ	φ	χ	ψ	ω							
A7A0		А	Б	В	Г	Д	Е	Ё	Ж	З	И	Й	К	Л	М	Н
A7B0	О	П	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э
A7C0	Ю	Я														
A7D0		а	б	в	г	д	е	ё	ж	з	и	й	к	л	м	н
A7E0	о	п	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э
A7F0	ю	я														
A8A0		ā	á	ǎ	à	ē	é	ě	è	ī	í	ǐ	ì	ō	ó	ǒ
A8B0	ò	ū	ú	ǔ	ù	ǖ	ǘ	ǚ	ǜ	ü	ê					
A8C0						ㄅ	ㄆ	ㄇ	ㄈ	ㄉ	ㄊ	ㄋ	ㄌ	ㄍ	ㄎ	ㄏ
A8D0	ㄐ	ㄑ	ㄒ	ㄓ	ㄔ	ㄕ	ㄖ	ㄗ	ㄘ	ㄙ	ㄚ	ㄛ	ㄜ	ㄝ	ㄞ	ㄟ
A8E0	ㄠ	ㄡ	ㄢ	ㄣ	ㄤ	ㄥ	ㄦ	ㄧ	ㄨ	ㄩ						

A1A1: Space

A9A4–A9EF: Not supported for the marking characters.

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B0A0		啊	阿	埃	挨	哎	唉	哀	皑	癌	蔼	矮	艾	碍	爱	隘
B0B0	鞍	氨	安	俺	按	暗	岸	胺	案	肮	昂	盎	凹	敖	熬	翱
B0C0	袄	傲	奥	懊	澳	芭	捌	扒	叭	吧	笆	八	疤	巴	拔	跋
B0D0	靶	把	耙	坝	霸	罢	爸	白	柏	百	摆	佰	败	拜	稗	斑
B0E0	班	搬	扳	般	颁	板	版	扮	拌	伴	瓣	半	办	绊	邦	帮
B0F0	梆	榜	膀	绑	棒	磅	蚌	镑	傍	谤	苞	胞	包	褒	剥	
B1A0		薄	雹	保	堡	饱	宝	抱	报	暴	豹	鲍	爆	杯	碑	悲
B1B0	卑	北	辈	背	贝	钡	倍	狈	备	惫	焙	被	奔	苯	本	笨
B1C0	崩	绷	甭	泵	蹦	迸	逼	鼻	比	鄙	笔	彼	碧	蓖	蔽	毕
B1D0	毙	毖	币	庇	痹	闭	敝	弊	必	辟	壁	臂	避	陛	鞭	边
B1E0	编	贬	扁	便	变	卞	辨	辩	辫	遍	标	彪	膘	表	鳖	憋
B1F0	别	瘪	彬	斌	濒	滨	宾	摈	兵	冰	柄	丙	秉	饼	炳	
B2A0		病	并	玻	菠	播	拨	钵	波	博	勃	搏	铂	箔	伯	帛
B2B0	舶	脖	膊	渤	泊	驳	捕	卜	哺	补	埠	不	布	步	簿	部
B2C0	怖	擦	猜	裁	材	才	财	睬	踩	采	彩	菜	蔡	餐	参	蚕
B2D0	残	惭	惨	灿	苍	舱	仓	沧	藏	操	糙	槽	曹	草	厕	策
B2E0	侧	册	测	层	蹭	插	叉	茬	茶	查	碴	搽	察	岔	差	诧
B2F0	拆	柴	豺	搀	掺	蝉	馋	谗	缠	铲	产	阐	颤	昌	猖	
B3A0		场	尝	常	长	偿	肠	厂	敞	畅	唱	倡	超	抄	钞	朝
B3B0	嘲	潮	巢	吵	炒	车	扯	撤	掣	彻	澈	郴	臣	辰	尘	晨
B3C0	忱	沉	陈	趁	衬	撑	称	城	橙	成	呈	乘	程	惩	澄	诚
B3D0	承	逞	骋	秤	吃	痴	持	匙	池	迟	弛	驰	耻	齿	侈	尺
B3E0	赤	翅	斥	炽	充	冲	虫	崇	宠	抽	酬	畴	踌	稠	愁	筹
B3F0	仇	绸	瞅	丑	臭	初	出	橱	厨	躇	锄	雏	滁	除	楚	
B4A0		础	储	矗	搐	触	处	揣	川	穿	椽	传	船	喘	串	疮
B4B0	窗	幢	床	闯	创	吹	炊	捶	锤	垂	春	椿	醇	唇	淳	纯
B4C0	蠢	戳	绰	疵	茨	磁	雌	辞	慈	瓷	词	此	刺	赐	次	聪
B4D0	葱	囱	匆	从	丛	凑	粗	醋	簇	促	蹿	篡	窜	摧	崔	催
B4E0	脆	瘁	粹	淬	翠	村	存	寸	磋	撮	搓	措	挫	错	搭	达
B4F0	答	瘩	打	大	呆	歹	傣	戴	带	殆	代	贷	袋	待	逮	
B5A0		怠	耽	担	丹	单	郸	掸	胆	旦	氮	但	惮	淡	诞	弹
B5B0	蛋	当	挡	党	荡	档	刀	捣	蹈	倒	岛	祷	导	到	稻	悼
B5C0	道	盗	德	得	的	蹬	灯	登	等	瞪	凳	邓	堤	低	滴	迪
B5D0	敌	笛	狄	涤	翟	嫡	抵	底	地	蒂	第	帝	弟	递	缔	颠
B5E0	掂	滇	碘	点	典	靛	垫	电	佃	甸	店	惦	奠	淀	殿	碉
B5F0	叼	雕	凋	刁	掉	吊	钓	调	跌	爹	碟	蝶	迭	谍	叠	
B6A0		丁	盯	叮	钉	顶	鼎	锭	定	订	丢	东	冬	董	懂	动
B6B0	栋	侗	恫	冻	洞	兜	抖	斗	陡	豆	逗	痘	都	督	毒	犊
B6C0	独	读	堵	睹	赌	杜	镀	肚	度	渡	妒	端	短	锻	段	断
B6D0	缎	堆	兑	队	对	墩	吨	蹲	敦	顿	囤	钝	盾	遁	掇	哆
B6E0	多	夺	垛	躲	朵	跺	舵	剁	惰	堕	蛾	峨	鹅	俄	额	讹
B6F0	娥	恶	厄	扼	遏	鄂	饿	恩	而	儿	耳	尔	饵	洱	二	
B7A0		贰	发	罚	筏	伐	乏	阀	法	珐	藩	帆	番	翻	樊	矾
B7B0	钒	繁	凡	烦	反	返	范	贩	犯	饭	泛	坊	芳	方	肪	房
B7C0	防	妨	仿	访	纺	放	菲	非	啡	飞	肥	匪	诽	吠	肺	废
B7D0	沸	费	芬	酚	吩	氛	分	纷	坟	焚	汾	粉	奋	份	忿	愤
B7E0	粪	丰	封	枫	蜂	峰	锋	风	疯	烽	逢	冯	缝	讽	奉	凤
B7F0	佛	否	夫	敷	肤	孵	扶	拂	辐	幅	氟	符	伏	俘	服	
B8A0		浮	涪	福	袱	弗	甫	抚	辅	俯	釜	斧	脯	腑	府	腐
B8B0	赴	副	覆	赋	复	傅	付	阜	父	腹	负	富	讣	附	妇	缚

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
B8C0	咐	嘎	嘎	该	改	概	钙	盖	溉	干	甘	杆	柑	竿	肝	赶
B8D0	感	秆	敢	赣	冈	刚	钢	缸	肛	纲	岗	港	杠	篙	皋	高
B8E0	膏	羔	糕	搞	镐	稿	告	哥	歌	搁	戈	鸽	胳	疙	割	革
B8F0	葛	格	蛤	阁	隔	铬	个	各	给	根	跟	耕	更	庚	羹	
B9A0		埂	耿	梗	工	攻	功	恭	龚	供	躬	公	宫	弓	巩	汞
B9B0	拱	贡	共	钩	勾	沟	苟	狗	垢	构	购	够	辜	菇	咕	箍
B9C0	估	沽	孤	姑	鼓	古	蛊	骨	谷	股	故	顾	固	雇	刮	瓜
B9D0	剐	寡	挂	褂	乖	拐	怪	棺	关	官	冠	观	管	馆	罐	惯
B9E0	灌	贯	光	广	逛	瑰	规	圭	硅	归	龟	闺	轨	鬼	诡	癸
B9F0	桂	柜	跪	贵	刽	辊	滚	棍	锅	郭	国	果	裹	过	哈	
BAA0		骸	孩	海	氦	亥	害	骇	酣	憨	邯	韩	含	涵	寒	函
BAB0	喊	罕	翰	撼	捍	旱	憾	悍	焊	汗	汉	夯	杭	航	壕	嚎
BAC0	豪	毫	郝	好	耗	号	浩	呵	喝	荷	菏	核	禾	和	何	合
BAD0	盒	貉	阂	河	涸	赫	褐	鹤	贺	嘿	黑	痕	很	狠	恨	哼
BAE0	亨	横	衡	恒	轰	哄	烘	虹	鸿	洪	宏	弘	红	喉	侯	猴
BAF0	吼	厚	候	后	呼	乎	忽	瑚	壶	葫	胡	蝴	狐	糊	湖	
BBA0		弧	虎	唬	护	互	沪	户	花	哗	华	猾	滑	画	划	化
BBB0	话	槐	徊	怀	淮	坏	欢	环	桓	还	缓	换	患	唤	痪	豢
BBC0	焕	涣	宦	幻	荒	慌	黄	磺	蝗	簧	皇	凰	惶	煌	晃	幌
BBD0	恍	谎	灰	挥	辉	徽	恢	蛔	回	毁	悔	慧	卉	惠	晦	贿
BBE0	秽	会	烩	汇	讳	诲	绘	荤	昏	婚	魂	浑	混	豁	活	伙
BBF0	火	获	或	惑	霍	货	祸	击	圾	基	机	畸	稽	积	箕	
BCA0		肌	饥	迹	激	讥	鸡	姬	绩	缉	吉	极	棘	辑	籍	集
BCB0	及	急	疾	汲	即	嫉	级	挤	几	脊	己	蓟	技	冀	季	伎
BCC0	祭	剂	悸	济	寄	寂	计	记	既	忌	际	妓	继	纪	嘉	枷
BCD0	夹	佳	家	加	荚	颊	贾	甲	钾	假	稼	价	架	驾	嫁	歼
BCE0	监	坚	尖	笺	间	煎	兼	肩	艰	奸	缄	茧	检	柬	碱	硷
BCF0	拣	捡	简	俭	剪	减	荐	槛	鉴	践	贱	见	键	箭	件	
BDA0		健	舰	剑	饯	渐	溅	涧	建	僵	姜	将	浆	江	疆	蒋
BDB0	桨	奖	讲	匠	酱	降	蕉	椒	礁	焦	胶	交	郊	浇	骄	娇
BDC0	嚼	搅	铰	矫	侥	脚	狡	角	饺	缴	绞	剿	教	酵	轿	较
BDD0	叫	窖	揭	接	皆	秸	街	阶	截	劫	节	桔	杰	捷	睫	竭
BDE0	洁	结	解	姐	戒	藉	芥	界	借	介	疥	诫	届	巾	筋	斤
BDF0	金	今	津	襟	紧	锦	仅	谨	进	靳	晋	禁	近	烬	浸	
BEA0		尽	劲	荆	兢	茎	睛	晶	鲸	京	惊	精	粳	经	井	警
BEB0	景	颈	静	境	敬	镜	径	痉	靖	竟	竞	净	炯	窘	揪	究
BEC0	纠	玖	韭	久	灸	九	酒	厩	救	旧	臼	舅	咎	就	疚	鞠
BED0	拘	狙	疽	居	驹	菊	局	咀	矩	举	沮	聚	拒	据	巨	具
BEE0	距	踞	锯	俱	句	惧	炬	剧	捐	鹃	娟	倦	眷	卷	绢	撅
BEF0	攫	抉	掘	倔	爵	觉	决	诀	绝	均	菌	钧	军	君	峻	
BFA0		俊	竣	浚	郡	骏	喀	咖	卡	咯	开	揩	楷	凯	慨	刊
BFB0	堪	勘	坎	砍	看	康	慷	糠	扛	抗	亢	炕	考	拷	烤	靠
BFC0	坷	苛	柯	棵	磕	颗	科	壳	咳	可	渴	克	刻	客	课	肯
BFD0	啃	垦	恳	坑	吭	空	恐	孔	控	抠	口	扣	寇	枯	哭	窟
BFE0	苦	酷	库	裤	夸	垮	挎	跨	胯	块	筷	侩	快	宽	款	匡
BFF0	筐	狂	框	矿	眶	旷	况	亏	盔	岿	窥	葵	奎	魁	傀	
C0A0		馈	愧	溃	坤	昆	捆	困	括	扩	廓	阔	垃	拉	喇	蜡
C0B0	腊	辣	啦	莱	来	赖	蓝	婪	栏	拦	篮	阑	兰	澜	谰	揽
C0C0	览	懒	缆	烂	滥	琅	榔	狼	廊	郎	朗	浪	捞	劳	牢	老
C0D0	佬	姥	酪	烙	涝	勒	乐	雷	镭	蕾	磊	累	儡	垒	擂	肋

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C0E0	类	泪	棱	楞	冷	厘	梨	犁	黎	篱	狸	离	漓	理	李	里
C0F0	鲤	礼	莉	荔	吏	栗	丽	厉	励	砾	历	利	傈	例	俐	
C1A0		痢	立	粒	沥	隶	力	璃	哩	俩	联	莲	连	镰	廉	怜
C1B0	涟	帘	敛	脸	链	恋	炼	练	粮	凉	梁	粱	良	两	辆	量
C1C0	晾	亮	谅	撩	聊	僚	疗	燎	寥	辽	潦	了	撂	镣	廖	料
C1D0	列	裂	烈	劣	猎	琳	林	磷	霖	临	邻	鳞	淋	凛	赁	吝
C1E0	拎	玲	菱	零	龄	铃	伶	羚	凌	灵	陵	岭	领	另	令	溜
C1F0	琉	榴	硫	馏	留	刘	瘤	流	柳	六	龙	聋	咙	笼	窿	
C2A0		隆	垄	拢	陇	楼	娄	搂	篓	漏	陋	芦	卢	颅	庐	炉
C2B0	掳	卤	虏	鲁	麓	碌	露	路	赂	鹿	潞	禄	录	陆	戮	驴
C2C0	吕	铝	侣	旅	履	屡	缕	虑	氯	律	率	滤	绿	峦	挛	孪
C2D0	滦	卵	乱	掠	略	抡	轮	伦	仑	沦	纶	论	萝	螺	罗	逻
C2E0	锣	箩	骡	裸	落	洛	骆	络	妈	麻	玛	码	蚂	马	骂	嘛
C2F0	吗	埋	买	麦	卖	迈	脉	瞒	馒	蛮	满	蔓	曼	慢	漫	
C3A0		谩	芒	茫	盲	氓	忙	莽	猫	茅	锚	毛	矛	铆	卯	茂
C3B0	冒	帽	貌	贸	么	玫	枚	梅	酶	霉	煤	没	眉	媒	镁	每
C3C0	美	昧	寐	妹	媚	门	闷	们	萌	蒙	檬	盟	锰	猛	梦	孟
C3D0	眯	醚	靡	糜	迷	谜	弥	米	秘	觅	泌	蜜	密	幂	棉	眠
C3E0	绵	冕	免	勉	娩	缅	面	苗	描	瞄	藐	秒	渺	庙	妙	蔑
C3F0	灭	民	抿	皿	敏	悯	闽	明	螟	鸣	铭	名	命	谬	摸	
C4A0		摹	蘑	模	膜	磨	摩	魔	抹	末	莫	墨	默	沫	漠	寞
C4B0	陌	谋	牟	某	拇	牡	亩	姆	母	墓	暮	幕	募	慕	木	目
C4C0	睦	牧	穆	拿	哪	呐	钠	那	娜	纳	氖	乃	奶	耐	奈	南
C4D0	男	难	囊	挠	脑	恼	闹	淖	呢	馁	内	嫩	能	妮	霓	倪
C4E0	泥	尼	拟	你	匿	腻	逆	溺	蔫	拈	年	碾	撵	捻	念	娘
C4F0	酿	鸟	尿	捏	聂	孽	啮	镊	镍	涅	您	柠	狞	凝	宁	
C5A0		拧	泞	牛	扭	钮	纽	脓	浓	农	弄	奴	努	怒	女	暖
C5B0	虐	疟	挪	懦	糯	诺	哦	欧	鸥	殴	藕	呕	偶	沤	啪	趴
C5C0	爬	帕	怕	琶	拍	排	牌	徘	湃	派	攀	潘	盘	磐	盼	畔
C5D0	判	叛	乓	庞	旁	耪	胖	抛	咆	刨	炮	袍	跑	泡	呸	胚
C5E0	培	裴	赔	陪	配	佩	沛	喷	盆	砰	抨	烹	澎	彭	蓬	棚
C5F0	硼	篷	膨	朋	鹏	捧	碰	坯	砒	霹	批	披	劈	琵	毗	
C6A0		啤	脾	疲	皮	匹	痞	僻	屁	譬	篇	偏	片	骗	飘	漂
C6B0	瓢	票	撇	瞥	拼	频	贫	品	聘	乒	坪	苹	萍	平	凭	瓶
C6C0	评	屏	坡	泼	颇	婆	破	魄	迫	粕	剖	扑	铺	仆	莆	葡
C6D0	菩	蒲	埔	朴	圃	普	浦	谱	曝	瀑	期	欺	栖	戚	妻	七
C6E0	凄	漆	柒	沏	其	棋	奇	歧	畦	崎	脐	齐	旗	祈	祁	骑
C6F0	起	岂	乞	企	启	契	砌	器	气	迄	弃	汽	泣	讫	掐	
C7A0		恰	洽	牵	扦	钎	铅	千	迁	签	仟	谦	乾	黔	钱	钳
C7B0	前	潜	遣	浅	谴	堑	嵌	欠	歉	枪	呛	腔	羌	墙	蔷	强
C7C0	抢	橇	锹	敲	悄	桥	瞧	乔	侨	巧	鞘	撬	翘	峭	俏	窍
C7D0	切	茄	且	怯	窃	钦	侵	亲	秦	琴	勤	芹	擒	禽	寝	沁
C7E0	青	轻	氢	倾	卿	清	擎	晴	氰	情	顷	请	庆	琼	穷	秋
C7F0	丘	邱	球	求	囚	酋	泅	趋	区	蛆	曲	躯	屈	驱	渠	
C8A0		取	娶	龋	趣	去	圈	颧	权	醛	泉	全	痊	拳	犬	券
C8B0	劝	缺	炔	瘸	却	鹊	榷	确	雀	裙	群	然	燃	冉	染	瓤
C8C0	壤	攘	嚷	让	饶	扰	绕	惹	热	壬	仁	人	忍	韧	任	认
C8D0	刃	妊	纫	扔	仍	日	戎	茸	蓉	荣	融	熔	溶	容	绒	冗
C8E0	揉	柔	肉	茹	蠕	儒	孺	如	辱	乳	汝	入	褥	软	阮	蕊
C8F0	瑞	锐	闰	润	若	弱	撒	洒	萨	腮	鳃	塞	赛	三	叁	

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
C9A0		伞	散	桑	嗓	丧	搔	骚	扫	嫂	瑟	色	涩	森	僧	莎
C9B0	砂	杀	刹	沙	纱	傻	啥	煞	筛	晒	珊	苫	杉	山	删	煽
C9C0	衫	闪	陕	擅	赡	膳	善	汕	扇	缮	墒	伤	商	赏	晌	上
C9D0	尚	裳	梢	捎	稍	烧	芍	勺	韶	少	哨	邵	绍	奢	赊	蛇
C9E0	舌	舍	赦	摄	射	慑	涉	社	设	砷	申	呻	伸	身	深	娠
C9F0	绅	神	沈	审	婶	甚	肾	慎	渗	声	生	甥	牲	升	绳	
CAA0		省	盛	剩	胜	圣	师	失	狮	施	湿	诗	尸	虱	十	石
CAB0	拾	时	什	食	蚀	实	识	史	矢	使	屎	驶	始	式	示	士
CAC0	世	柿	事	拭	誓	逝	势	是	嗜	噬	适	仕	侍	释	饰	氏
CAD0	市	恃	室	视	试	收	手	首	守	寿	授	售	受	瘦	兽	蔬
CAE0	枢	梳	殊	抒	输	叔	舒	淑	疏	书	赎	孰	熟	薯	暑	曙
CAF0	署	蜀	黍	鼠	属	术	述	树	束	戍	竖	墅	庶	数	漱	
CBA0		恕	刷	耍	摔	衰	甩	帅	栓	拴	霜	双	爽	谁	水	睡
CBB0	税	吮	瞬	顺	舜	说	硕	朔	烁	斯	撕	嘶	思	私	司	丝
CBC0	死	肆	寺	嗣	四	伺	似	饲	巳	松	耸	怂	颂	送	宋	讼
CBD0	诵	搜	艘	擞	嗽	苏	酥	俗	素	速	粟	僳	塑	溯	宿	诉
CBE0	肃	酸	蒜	算	虽	隋	随	绥	髓	碎	岁	穗	遂	隧	祟	孙
CBF0	损	笋	蓑	梭	唆	缩	琐	索	锁	所	塌	他	它	她	塔	
CCA0		獭	挞	蹋	踏	胎	苔	抬	台	泰	酞	太	态	汰	坍	摊
CCB0	贪	瘫	滩	坛	檀	痰	潭	谭	谈	坦	毯	袒	碳	探	叹	炭
CCC0	汤	塘	搪	堂	棠	膛	唐	糖	倘	躺	淌	趟	烫	掏	涛	滔
CCD0	绦	萄	桃	逃	淘	陶	讨	套	特	藤	腾	疼	誊	梯	剔	踢
CCE0	锑	提	题	蹄	啼	体	替	嚏	惕	涕	剃	屉	天	添	填	田
CCF0	甜	恬	舔	腆	挑	条	迢	眺	跳	贴	铁	帖	厅	听	烃	
CDA0		汀	廷	停	亭	庭	挺	艇	通	桐	酮	瞳	同	铜	彤	童
CDB0	桶	捅	筒	统	痛	偷	投	头	透	凸	秃	突	图	徒	途	涂
CDC0	屠	土	吐	兔	湍	团	推	颓	腿	蜕	褪	退	吞	屯	臀	拖
CDD0	托	脱	鸵	陀	驮	驼	椭	妥	拓	唾	挖	哇	蛙	洼	娃	瓦
CDE0	袜	歪	外	豌	弯	湾	玩	顽	丸	烷	完	碗	挽	晚	皖	惋
CDF0	宛	婉	万	腕	汪	王	亡	枉	网	往	旺	望	忘	妄	威	
CEA0		巍	微	危	韦	违	桅	围	唯	惟	为	潍	维	苇	萎	委
CEB0	伟	伪	尾	纬	未	蔚	味	畏	胃	喂	魏	位	渭	谓	尉	慰
CEC0	卫	瘟	温	蚊	文	闻	纹	吻	稳	紊	问	嗡	翁	瓮	挝	蜗
CED0	涡	窝	我	斡	卧	握	沃	巫	呜	钨	乌	污	诬	屋	无	芜
CEE0	梧	吾	吴	毋	武	五	捂	午	舞	伍	侮	坞	戊	雾	晤	物
CEF0	勿	务	悟	误	昔	熙	析	西	硒	矽	晰	嘻	吸	锡	牺	
CFA0		稀	息	希	悉	膝	夕	惜	熄	烯	溪	汐	犀	檄	袭	席
CFB0	习	媳	喜	铣	洗	系	隙	戏	细	瞎	虾	匣	霞	辖	暇	峡
CFC0	侠	狭	下	厦	夏	吓	掀	锨	先	仙	鲜	纤	咸	贤	衔	舷
CFD0	闲	涎	弦	嫌	显	险	现	献	县	腺	馅	羡	宪	陷	限	线
CFE0	相	厢	镶	香	箱	襄	湘	乡	翔	祥	详	想	响	享	项	巷
CFF0	橡	像	向	象	萧	硝	霄	削	哮	嚣	销	消	宵	淆	晓	
D0A0		小	孝	校	肖	啸	笑	效	楔	些	歇	蝎	鞋	协	挟	携
D0B0	邪	斜	胁	谐	写	械	卸	蟹	懈	泄	泻	谢	屑	薪	芯	锌
D0C0	欣	辛	新	忻	心	信	衅	星	腥	猩	惺	兴	刑	型	形	邢
D0D0	行	醒	幸	杏	性	姓	兄	凶	胸	匈	汹	雄	熊	休	修	羞
D0E0	朽	嗅	锈	秀	袖	绣	墟	戌	需	虚	嘘	须	徐	许	蓄	酗
D0F0	叙	旭	序	畜	恤	絮	婿	绪	续	轩	喧	宣	悬	旋	玄	
D1A0		选	癣	眩	绚	靴	薛	学	穴	雪	血	勋	熏	循	旬	询
D1B0	寻	驯	巡	殉	汛	训	讯	逊	迅	压	押	鸦	鸭	呀	丫	芽

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D1C0	牙	蚜	崖	衙	涯	雅	哑	亚	讶	焉	咽	阉	烟	淹	盐	严
D1D0	研	蜒	岩	延	言	颜	阎	炎	沿	奄	掩	眼	衍	演	艳	堰
D1E0	燕	厌	砚	雁	唁	彦	焰	宴	谚	验	殃	央	鸯	秧	杨	扬
D1F0	佯	疡	羊	洋	阳	氧	仰	痒	养	样	漾	邀	腰	妖	瑶	
D2A0		摇	尧	遥	窑	谣	姚	咬	舀	药	要	耀	椰	噎	耶	爷
D2B0	野	冶	也	页	掖	业	叶	曳	腋	夜	液	一	壹	医	揖	铱
D2C0	依	伊	衣	颐	夷	遗	移	仪	胰	疑	沂	宜	姨	彝	椅	蚁
D2D0	倚	已	乙	矣	以	艺	抑	易	邑	屹	亿	役	臆	逸	肄	疫
D2E0	亦	裔	意	毅	忆	义	益	溢	诣	议	谊	译	异	翼	翌	绎
D2F0	茵	荫	因	殷	音	阴	姻	吟	银	淫	寅	饮	尹	引	隐	
D3A0		印	英	樱	婴	鹰	应	缨	莹	萤	营	荧	蝇	迎	赢	盈
D3B0	影	颖	硬	映	哟	拥	佣	臃	痈	庸	雍	踊	蛹	咏	泳	涌
D3C0	永	恿	勇	用	幽	优	悠	忧	尤	由	邮	铀	犹	油	游	酉
D3D0	有	友	右	佑	釉	诱	又	幼	迂	淤	于	盂	榆	虞	愚	舆
D3E0	余	俞	逾	鱼	愉	渝	渔	隅	予	娱	雨	与	屿	禹	宇	语
D3F0	羽	玉	域	芋	郁	吁	遇	喻	峪	御	愈	欲	狱	育	誉	
D4A0		浴	寓	裕	预	豫	驭	鸳	渊	冤	元	垣	袁	原	援	辕
D4B0	园	员	圆	猿	源	缘	远	苑	愿	怨	院	曰	约	越	跃	钥
D4C0	岳	粤	月	悦	阅	耘	云	郧	匀	陨	允	运	蕴	酝	晕	韵
D4D0	孕	匝	砸	杂	栽	哉	灾	宰	载	再	在	咱	攒	暂	赞	赃
D4E0	脏	葬	遭	糟	凿	藻	枣	早	澡	蚤	躁	噪	造	皂	灶	燥
D4F0	责	择	则	泽	贼	怎	增	憎	曾	赠	扎	喳	渣	札	轧	
D5A0		铡	闸	眨	栅	榨	咋	乍	炸	诈	摘	斋	宅	窄	债	寨
D5B0	瞻	毡	詹	粘	沾	盏	斩	辗	崭	展	蘸	栈	占	战	站	湛
D5C0	绽	樟	章	彰	漳	张	掌	涨	杖	丈	帐	账	仗	胀	瘴	障
D5D0	招	昭	找	沼	赵	照	罩	兆	肇	召	遮	折	哲	蛰	辙	者
D5E0	锗	蔗	这	浙	珍	斟	真	甄	砧	臻	贞	针	侦	枕	疹	诊
D5F0	震	振	镇	阵	蒸	挣	睁	征	狰	争	怔	整	拯	正	政	
D6A0		帧	症	郑	证	芝	枝	支	吱	蜘	知	肢	脂	汁	之	织
D6B0	职	直	植	殖	执	值	侄	址	指	止	趾	只	旨	纸	志	挚
D6C0	掷	至	致	置	帜	峙	制	智	秩	稚	质	炙	痔	滞	治	窒
D6D0	中	盅	忠	钟	衷	终	种	肿	重	仲	众	舟	周	州	洲	诌
D6E0	粥	轴	肘	帚	咒	皱	宙	昼	骤	珠	株	蛛	朱	猪	诸	诛
D6F0	逐	竹	烛	煮	拄	瞩	嘱	主	著	柱	助	蛀	贮	铸	筑	
D7A0		住	注	祝	驻	抓	爪	拽	专	砖	转	撰	赚	篆	桩	庄
D7B0	装	妆	撞	壮	状	椎	锥	追	赘	坠	缀	谆	准	捉	拙	卓
D7C0	桌	琢	茁	酌	啄	着	灼	浊	兹	咨	资	姿	滋	淄	孜	紫
D7D0	仔	籽	滓	子	自	渍	字	鬃	棕	踪	宗	综	总	纵	邹	走
D7E0	奏	揍	租	足	卒	族	祖	诅	阻	组	钻	纂	嘴	醉	最	罪
D7F0	尊	遵	昨	左	佐	柞	做	作	坐	座						
D8A0		亍	丌	兀	丐	廿	卅	丕	亘	丞	鬲	孬	噩	丨	禺	丿
D8B0	匕	乇	夭	爻	卮	氐	囟	胤	馗	毓	睾	鼗	丶	亟	鼐	乜
D8C0	乩	亓	芈	孛	啬	嘏	仄	厍	厝	厣	厥	厮	靥	赝	匚	叵
D8D0	匦	匮	匾	赜	卦	卣	刂	刈	刎	刭	刳	刿	剀	剌	剞	剡
D8E0	剜	蒯	剽	劂	劁	劐	劓	冂	罔	亻	仃	仉	仂	仨	仡	仫
D8F0	仞	伛	仳	伢	佤	仵	伥	伧	伉	伫	佞	佧	攸	佚	佝	
D9A0		佟	佗	伲	伽	佶	佴	侑	侉	侃	侏	佾	佻	侪	佼	侬
D9B0	侔	俦	俨	俪	俅	俚	俣	俜	俑	俟	俸	倩	偌	俳	倬	倏
D9C0	倮	倭	俾	倜	倌	倥	倨	偾	偃	偕	偈	偎	偬	偻	傥	傧
D9D0	傩	傺	僖	儆	僭	僬	僦	僮	儇	儋	仝	氽	佘	佥	俎	龠

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
D9E0	汆	籴	兮	巽	黉	馘	冁	夔	勹	匍	訇	匐	凫	夙	兕	亠
D9F0	兖	亳	衮	袤	亵	脔	裒	禀	嬴	蠃	羸	冫	冱	冽	冼	
DAA0		凇	冖	冢	冥	讠	讦	讧	讪	讴	讵	讷	诂	诃	诋	诏
DAB0	诎	诒	诓	诔	诖	诘	诙	诜	诟	诠	诤	诨	诩	诮	诰	诳
DAC0	诶	诹	诼	诿	谀	谂	谄	谇	谌	谏	谑	谒	谔	谕	谖	谙
DAD0	谛	谘	谝	谟	谠	谡	谥	谧	谪	谫	谮	谯	谲	谳	谵	谶
DAE0	卩	卺	阝	阢	阡	阱	阪	阽	阼	陂	陉	陔	陟	陧	陬	陲
DAF0	陴	隈	隍	隗	隰	邗	邛	邝	邙	邬	邡	邴	邳	邶	邺	
DBA0		邸	邰	郏	郅	邾	郐	郄	郇	郓	郦	郢	郜	郗	郛	郫
DBB0	郯	郾	鄄	鄢	鄞	鄣	鄱	鄯	鄹	酃	酆	刍	奂	劢	劬	劭
DBC0	劾	哿	勐	勖	勰	叟	燮	矍	廴	凵	凼	鬯	厶	弁	畚	巯
DBD0	坌	垩	垡	塾	墼	壅	壑	圩	圬	圪	圳	圹	圮	圯	坜	圻
DBE0	坂	坩	垅	坫	垆	坼	坻	坨	坭	坶	坳	垭	垤	垌	垲	埏
DBF0	垧	垴	垓	垠	埕	埘	埚	埙	埒	垸	埴	埯	埸	埤	埝	
DCA0		堋	堍	埽	埭	堀	堞	堙	塄	堠	塥	塬	墁	墉	墚	墀
DCB0	馨	鼙	懿	艹	艽	艿	芏	芊	芨	芄	芎	芑	芗	芙	芫	芸
DCC0	芾	芰	苈	苊	苣	芘	芷	芮	苋	苌	苁	芩	芴	芡	芪	芟
DCD0	苄	苎	芤	苡	茉	苷	苤	茏	茇	苜	苴	苒	苘	茌	苻	苓
DCE0	茑	茚	茆	茔	茕	苠	苕	茜	荑	荛	荜	茈	莒	茼	茴	茱
DCF0	莛	荞	茯	荏	荇	荃	荟	荀	茗	荠	茭	茺	茳	荦	荥	
DDA0		荨	茛	荩	荬	荪	荭	荮	莰	荸	莳	莴	莠	莪	莓	莜
DDB0	莅	荼	莶	莩	荽	莸	荻	莘	莞	莨	莺	莼	菁	萁	菥	菘
DDC0	堇	萘	萋	菝	菽	菖	萜	萸	萑	萆	菔	菟	萏	萃	菸	菹
DDD0	菪	菅	菀	萦	菰	菡	葜	葑	葚	葙	葳	蒇	蒈	葺	蒉	葸
DDE0	萼	葆	葩	葶	蒌	蒎	萱	葭	蓁	蓍	蓐	蓦	蒽	蓓	蓊	蒿
DDF0	蒺	蓠	蒡	蒹	蒴	蒗	蓥	蓣	蔌	甍	蔸	蓰	蔹	蔟	蔺	
DEA0		蕖	蔻	蓿	蓼	蕙	蕈	蕨	蕤	蕞	蕺	瞢	蕃	蕲	蕻	薤
DEB0	薨	薇	薏	蕹	薮	薜	薅	薹	薷	薰	藓	藁	藜	藿	蘧	蘅
DEC0	蘩	蘖	蘼	廾	弈	夼	奁	耷	奕	奚	奘	匏	尢	尥	尬	尴
DED0	扌	扪	抟	抻	拊	拚	拗	拮	挢	拶	挹	捋	捃	掭	揶	捱
DEE0	捺	掎	掴	捭	掬	掊	捩	掮	掼	揲	揸	揠	揿	揄	揞	揎
DEF0	摒	揆	掾	摅	摁	搋	搛	搠	搌	搦	搡	摞	撄	摭	撖	
DFA0		摺	撷	撸	撙	撺	擀	擐	擗	擤	擢	攉	攥	攮	弋	忒
DFB0	甙	弑	卟	叱	叽	叩	叨	叻	吒	吖	吆	呋	呒	呓	呔	呖
DFC0	呃	吡	呗	呙	吣	吲	咂	咔	呷	呱	呤	咚	咛	咄	呶	呦
DFD0	咝	哐	咭	哂	咴	哒	咧	咦	哓	哔	呲	咣	哕	咻	咿	哌
DFE0	哙	哚	哜	咩	咪	咤	哝	哏	哞	唛	哧	唠	哽	唔	哳	唢
DFF0	唣	唏	唑	唧	唪	啧	喏	喵	啉	啭	啁	啕	唿	啐	唼	
E0A0		唷	啖	啵	啶	啷	唳	唰	啜	喋	嗒	喃	喱	喹	喈	喁
E0B0	喟	啾	嗖	喑	啻	嗟	喽	喾	喔	喙	嗪	嗷	嗉	嘟	嗑	嗫
E0C0	嗬	嗔	嗦	嗝	嗄	嗯	嗥	嗲	嗳	嗌	嗍	嗨	嗵	嗤	辔	嘞
E0D0	嘈	嘌	嘁	嘤	嘣	嗾	嘀	嘧	嘭	噘	嘹	噗	嘬	噍	噢	噙
E0E0	噜	噌	噔	嚆	噤	噱	噫	噻	噼	嚅	嚓	嚯	囔	囗	囝	囡
E0F0	囵	囫	囹	囿	圄	圊	圉	圜	帏	帙	帔	帑	帱	帻	帼	
E1A0		帷	幄	幔	幛	幞	幡	岌	屺	岍	岐	岖	岈	岘	岙	岑
E1B0	岚	岜	岵	岢	岽	岬	岫	岱	岣	峁	岷	峄	峒	峤	峋	峥
E1C0	崂	崃	崧	崦	崮	崤	崞	崆	崛	嵘	崾	崴	崽	嵬	嵛	嵯
E1D0	嵝	嵫	嵋	嵊	嵩	嵴	嶂	嶙	嶝	豳	嶷	巅	彳	彷	徂	徇
E1E0	徉	後	徕	徙	徜	徨	徭	徵	徼	衢	彡	犭	犰	犴	犷	犸
E1F0	狃	狁	狎	狍	狒	狨	狯	狩	狲	狴	狷	猁	狳	猃	狺	

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
E2A0		狻	猗	猓	猡	猊	猞	猝	猕	猢	猹	猥	猬	猸	猱	獐
E2B0	獍	獗	獠	獬	獯	獾	舛	夥	飧	夤	夂	饣	饧	饨	饩	饪
E2C0	饫	饬	饴	饷	饽	馀	馄	馇	馊	馍	馐	馑	馓	馔	馕	庀
E2D0	庑	庋	庖	庥	庠	庹	庵	庾	庳	赓	廒	廑	廛	廨	廪	膺
E2E0	忄	忉	忖	忏	怃	忮	怄	忡	忤	忾	怅	怆	忪	忭	忸	怙
E2F0	怵	怦	怛	怏	怍	怩	怫	怊	怿	怡	恸	恹	恻	恺	恂	
E3A0		恪	恽	悖	悚	悭	悝	悃	悒	悌	悛	惬	悻	悱	惝	惘
E3B0	惆	惚	悴	愠	愦	愕	愣	惴	愀	愎	愫	慊	慵	憬	憔	憧
E3C0	憷	懔	懵	忝	隳	闩	闫	闱	闳	闵	闶	闼	闾	阃	阄	阆
E3D0	阈	阊	阋	阌	阍	阏	阒	阕	阖	阗	阙	阚	丬	爿	戕	氵
E3E0	汔	汜	汊	沣	沅	沐	沔	沌	汨	汩	汴	汶	沆	沩	泐	泔
E3F0	沭	泷	泸	泱	泗	沲	泠	泖	泺	泫	泮	沱	泓	泯	泾	
E4A0		洹	洧	洌	浃	浈	洇	洄	洙	洎	洫	浍	洮	洵	洚	浏
E4B0	浒	浔	洳	涑	浯	涞	涠	浞	涓	涔	浜	浠	浼	浣	渚	淇
E4C0	淅	淞	渎	涿	淠	渑	淦	淝	淙	渖	涫	渌	涮	渫	湮	湎
E4D0	湫	溲	湟	溆	湓	湔	渲	渥	湄	滟	溱	溘	滠	漭	滢	溥
E4E0	溧	溽	溻	溷	滗	溴	滏	溏	滂	溟	潢	潆	潇	漤	漕	滹
E4F0	漯	漶	潋	潴	漪	漉	漩	澉	澍	澌	潸	潲	潼	潺	濑	
E5A0		濉	澧	澹	澶	濂	濡	濮	濞	濠	濯	瀚	瀣	瀛	瀹	瀵
E5B0	灏	灞	宀	宄	宕	宓	宥	宸	甯	骞	搴	寤	寮	褰	寰	蹇
E5C0	謇	辶	迓	迕	迥	迮	迤	迩	迦	迳	迨	逅	逄	逋	逦	逑
E5D0	逍	逖	逡	逵	逶	逭	逯	遄	遑	遒	遐	遨	遘	遢	遛	暹
E5E0	遴	遽	邂	邈	邃	邋	彐	彗	彖	彘	尻	咫	屐	屙	孱	屣
E5F0	屦	羼	弪	弩	弭	艴	弼	鬻	屮	妁	妃	妍	妩	妪	妣	
E6A0		妗	姊	妫	妞	妤	姒	妲	妯	姗	妾	娅	娆	姝	娈	姣
E6B0	姘	姹	娌	娉	娲	娴	娑	娣	娓	婀	婧	婊	婕	娼	婢	婵
E6C0	胬	媪	媛	婷	婺	媾	嫫	媲	嫒	嫔	媸	嫠	嫣	嫱	嫖	嫦
E6D0	嫘	嫜	嬉	嬗	嬖	嬲	嬷	孀	尕	尜	孚	孥	孳	孑	孓	孢
E6E0	驵	驷	驸	驺	驿	驽	骀	骁	骅	骈	骊	骐	骒	骓	骖	骘
E6F0	骛	骜	骝	骟	骠	骢	骣	骥	骧	纟	纡	纣	纥	纨	纩	
E7A0		纭	纰	纾	绀	绁	绂	绉	绋	绌	绐	绔	绗	绛	绠	绡
E7B0	绨	绫	绮	绯	绱	绲	缍	绶	绺	绻	绾	缁	缂	缃	缇	缈
E7C0	缋	缌	缏	缑	缒	缗	缙	缜	缛	缟	缡	缢	缣	缤	缥	缦
E7D0	缧	缪	缫	缬	缭	缯	缰	缱	缲	缳	缵	幺	畿	巛	甾	邕
E7E0	玎	玑	玮	玢	玟	珏	珂	珑	玷	玳	珀	珉	珈	珥	珙	顼
E7F0	琊	珩	珧	珞	玺	珲	琏	琪	瑛	琦	琥	琨	琰	琮	琬	
E8A0		琛	琚	瑁	瑜	瑗	瑕	瑙	瑷	瑭	瑾	璜	璎	璀	璁	璇
E8B0	璋	璞	璨	璩	璐	璧	瓒	璺	韪	韫	韬	杌	杓	杞	杈	杩
E8C0	枥	枇	杪	杳	枘	枧	杵	枨	枞	枭	枋	杷	杼	柰	栉	柘
E8D0	栊	柩	枰	栌	柙	枵	柚	枳	柝	栀	柃	枸	柢	栎	柁	柽
E8E0	栲	栳	桠	桡	桎	桢	桄	桤	梃	栝	桕	桦	桁	桧	桀	栾
E8F0	桊	桉	栩	梵	梏	桴	桷	梓	桫	棂	楮	棼	椟	椠	棹	
E9A0		椤	棰	椋	椁	楗	棣	椐	楱	椹	楠	楂	楝	榄	楫	榀
E9B0	榘	楸	椴	槌	榇	榈	槎	榉	楦	楣	楹	榛	榧	榻	榫	榭
E9C0	槔	榱	槁	槊	槟	榕	槠	榍	槿	樯	槭	樗	樘	橥	槲	橄
E9D0	樾	檠	橐	橛	樵	檎	橹	樽	樨	橘	橼	檑	檐	檩	檗	檫
E9E0	猷	獒	殁	殂	殇	殄	殒	殓	殍	殚	殛	殡	殪	轫	轭	轱
E9F0	轲	轳	轵	轶	轸	轷	轹	轺	轼	轾	辁	辂	辄	辇	辋	
EAA0		辍	辎	辏	辘	辚	軎	戋	戗	戛	戟	戢	戡	戥	戤	戬
EAB0	臧	瓯	瓴	瓿	甏	甑	甓	攴	旮	旯	旰	昊	昙	杲	昃	昕

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
EAC0	昀	炅	曷	昝	昴	昱	昶	昵	耆	晟	晔	晁	晏	晖	晡	晗
EAD0	晷	暄	暌	暧	暝	暾	曛	曜	曦	曩	贲	贳	贶	贻	贽	赀
EAE0	赅	赆	赈	赉	赇	赍	赕	赙	觇	觊	觋	觌	觎	觏	觐	觑
EAF0	牮	犟	牝	牦	牯	牾	牿	犄	犋	犍	犏	犒	挈	挲	掰	
EBA0		搿	擘	耄	毪	毳	毽	毵	毹	氅	氇	氆	氍	氕	氘	氙
EBB0	氚	氡	氩	氤	氪	氲	攵	敕	敫	牍	牒	牖	爰	虢	刖	肟
EBC0	肜	肓	肼	朊	肽	肱	肫	肭	肴	肷	胧	胨	胩	胪	胛	胂
EBD0	胄	胙	胍	胗	朐	胝	胫	胱	胴	胭	脍	脎	胲	胼	朕	脒
EBE0	豚	脶	脞	脬	脘	脲	腈	腌	腓	腴	腙	腚	腱	腠	腩	腼
EBF0	腽	腭	腧	塍	媵	膈	膂	膑	滕	膣	膪	臌	朦	臊	膻	
ECA0		臁	膦	欤	欷	欹	歃	歆	歙	飑	飒	飓	飕	飙	飚	殳
ECB0	彀	毂	觳	斐	齑	斓	於	旆	旄	旃	旌	旎	旒	旖	炀	炜
ECC0	炖	炝	炻	烀	炷	炫	炱	烨	烊	焐	焓	焖	焯	焱	煳	煜
ECD0	煨	煅	煲	煊	煸	煺	熘	熳	熵	熨	熠	燠	燔	燧	燹	爝
ECE0	爨	灬	焘	煦	熹	戾	戽	扃	扈	扉	礻	祀	祆	祉	祛	祜
ECF0	祓	祚	祢	祗	祠	祯	祧	祺	禅	禊	禚	禧	禳	忑	忐	
EDA0		怼	恝	恚	恧	恁	恙	恣	悫	愆	愍	慝	憩	憝	懋	懑
EDB0	戆	肀	聿	沓	泶	淼	矶	矸	砀	砉	砗	砘	砑	斫	砭	砜
EDC0	砝	砹	砺	砻	砟	砼	砥	砬	砣	砩	硎	硭	硖	硗	砦	硐
EDD0	硇	硌	硪	碛	碓	碚	碇	碜	碡	碣	碲	碹	碥	磔	磙	磉
EDE0	磬	磲	礅	磴	礓	礤	礞	礴	龛	黹	黻	黼	盱	眄	眍	盹
EDF0	眇	眈	眚	眢	眙	眭	眦	眵	眸	睐	睑	睇	睃	睚	睨	
EEA0		睢	睥	睿	瞍	睽	瞀	瞌	瞑	瞟	瞠	瞰	瞵	瞽	町	畀
EEB0	畎	畋	畈	畛	畲	畹	疃	罘	罡	罟	詈	罨	罴	罱	罹	羁
EEC0	罾	盍	盥	蠲	钅	钆	钇	钋	钊	钌	钍	钏	钐	钔	钗	钕
EED0	钚	钛	钜	钣	钤	钫	钪	钭	钬	钯	钰	钲	钴	钶	钷	钸
EEE0	钹	钺	钼	钽	钿	铄	铈	铉	铊	铋	铌	铍	铎	铐	铑	铒
EEF0	铕	铖	铗	铙	铘	铛	铞	铟	铠	铢	铤	铥	铧	铨	铪	
EFA0		铩	铫	铮	铯	铳	铴	铵	铷	铹	铼	铽	铿	锃	锂	锆
EFB0	锇	锉	锊	锍	锎	锏	锒	锓	锔	锕	锖	锘	锛	锝	锞	锟
EFC0	锢	锪	锫	锩	锬	锱	锲	锴	锶	锷	锸	锼	锾	锿	镂	锵
EFD0	镄	镅	镆	镉	镌	镎	镏	镒	镓	镔	镖	镗	镘	镙	镛	镞
EFE0	镟	镝	镡	镢	镤	镥	镦	镧	镨	镩	镪	镫	镬	镯	镱	镲
EFF0	镳	锺	矧	矬	雉	秕	秭	秣	秫	稆	嵇	稃	稂	稞	稔	
F0A0		稹	稷	穑	黏	馥	穰	皈	皎	皓	皙	皤	瓞	瓠	甬	鸠
F0B0	鸢	鸨	鸩	鸪	鸫	鸬	鸲	鸱	鸶	鸸	鸷	鸹	鸺	鸾	鹁	鹂
F0C0	鹄	鹆	鹇	鹈	鹉	鹋	鹌	鹎	鹑	鹕	鹗	鹚	鹛	鹜	鹞	鹣
F0D0	鹦	鹧	鹨	鹩	鹪	鹫	鹬	鹱	鹭	鹳	疒	疔	疖	疠	疝	疬
F0E0	疣	疳	疴	疸	痄	疱	疰	痃	痂	痖	痍	痣	痨	痦	痤	痫
F0F0	痧	瘃	痱	痼	痿	瘐	瘀	瘅	瘌	瘗	瘊	瘥	瘘	瘕	瘙	
F1A0		瘛	瘼	瘢	瘠	癀	瘭	瘰	瘿	瘵	癃	瘾	瘳	癍	癞	癔
F1B0	癜	癖	癫	癯	翊	竦	穸	穹	窀	窆	窈	窕	窦	窠	窬	窨
F1C0	窭	窳	衤	衩	衲	衽	衿	袂	袢	裆	袷	袼	裉	裢	裎	裣
F1D0	裥	裱	褚	裼	裨	裾	裰	褡	褙	褓	褛	褊	褴	褫	褶	襁
F1E0	襦	襻	疋	胥	皲	皴	矜	耒	耔	耖	耜	耠	耢	耥	耦	耧
F1F0	耩	耨	耱	耋	耵	聃	聆	聍	聒	聩	聱	覃	顸	颀	颃	
F2A0		颉	颌	颍	颏	颔	颚	颛	颞	颟	颡	颢	颥	颦	虍	虔
F2B0	虬	虮	虿	虺	虼	虻	蚨	蚍	蚋	蚬	蚝	蚧	蚣	蚪	蚓	蚩
F2C0	蚶	蛄	蚵	蛎	蚰	蚺	蚱	蚯	蛉	蛏	蚴	蛩	蛱	蛲	蛭	蛳
F2D0	蛐	蜓	蛞	蛴	蛟	蛘	蛑	蜃	蜇	蛸	蜈	蜊	蜍	蜉	蜣	蜻

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
F2E0	蜞	蜥	蜮	蜚	蜾	蝈	蜴	蜱	蜩	蜷	蜿	螂	蜢	蝽	蝾	蝻
F2F0	蝠	蝰	蝌	蝮	螋	蝓	蝣	蝼	蝤	蝙	蝥	螓	螯	螨	蟒	
F3A0		蟆	螈	螅	螭	螗	螃	螫	蟥	螬	螵	螳	蟋	蟓	螽	蟑
F3B0	蟀	蟊	蟛	蟪	蟠	蟮	蠖	蠓	蟾	蠊	蠛	蠡	蠹	蠼	缶	罂
F3C0	罄	罅	舐	竺	竽	笈	笃	笄	笕	笊	笫	笏	筇	笸	笪	笙
F3D0	笮	笱	笠	笥	笤	笳	笾	笞	筘	筚	筅	筵	筌	筝	筠	筮
F3E0	筻	筢	筲	筱	箐	箦	箧	箸	箬	箝	箨	箅	箪	箜	箢	箫
F3F0	箴	篑	篁	篌	篝	篚	篥	篦	篪	簌	篾	篼	簏	簖	簋	
F4A0		簟	簪	簦	簸	籁	籀	臾	舁	舂	舄	臬	衄	舡	舢	舣
F4B0	舭	舯	舨	舫	舸	舻	舳	舴	舾	艄	艉	艋	艏	艚	艟	艨
F4C0	衾	袅	袈	裘	裟	襞	羝	羟	羧	羯	羰	羲	籼	敉	粑	粝
F4D0	粜	粞	粢	粲	粼	粽	糁	糇	糌	糍	糈	糅	糗	糨	艮	暨
F4E0	羿	翎	翕	翥	翡	翦	翩	翮	翳	糸	絷	綦	綮	繇	纛	麸
F4F0	麴	赳	趄	趔	趑	趱	赧	赭	豇	豉	酊	酐	酎	酏	酤	
F5A0		酢	酡	酰	酩	酯	酽	酾	酲	酴	酹	醌	醅	醐	醍	醑
F5B0	醢	醣	醪	醭	醮	醯	醵	醴	醺	豕	鹾	趸	跫	踅	蹙	蹩
F5C0	趵	趿	趼	趺	跄	跖	跗	跚	跞	跎	跏	跛	跆	跬	跷	跸
F5D0	跣	跹	跻	跤	踉	跽	踔	踝	踟	踬	踮	踣	踯	踺	蹀	踹
F5E0	踵	踽	踱	蹉	蹁	蹂	蹑	蹒	蹊	蹰	蹶	蹼	蹯	蹴	躅	躏
F5F0	躔	躐	躜	躞	豸	貂	貊	貅	貘	貔	斛	觖	觞	觚	觜	
F6A0		觥	觫	觯	訾	謦	靓	雩	雳	雯	霆	霁	霈	霏	霎	霪
F6B0	霭	霰	霾	龀	龃	龅	龆	龇	龈	龉	龊	龌	黾	鼋	鼍	隹
F6C0	隼	隽	雎	雒	瞿	雠	銎	銮	鋈	錾	鍪	鏊	鎏	鐾	鑫	鱿
F6D0	鲂	鲅	鲆	鲇	鲈	稣	鲋	鲎	鲐	鲑	鲒	鲔	鲕	鲚	鲛	鲞
F6E0	鲟	鲠	鲡	鲢	鲣	鲥	鲦	鲧	鲨	鲩	鲫	鲭	鲮	鲰	鲱	鲲
F6F0	鲳	鲴	鲵	鲶	鲷	鲺	鲻	鲼	鲽	鳄	鳅	鳆	鳇	鳊	鳋	
F7A0		鳌	鳍	鳎	鳏	鳐	鳓	鳔	鳕	鳗	鳘	鳙	鳜	鳝	鳟	鳢
F7B0	靼	鞅	鞑	鞒	鞔	鞯	鞫	鞣	鞲	鞴	骱	骰	骷	鹘	骶	骺
F7C0	骼	髁	髀	髅	髂	髋	髌	髑	魅	魃	魇	魉	魈	魍	魑	飨
F7D0	餍	餮	饕	饔	髟	髡	髦	髯	髫	髻	髭	髹	鬈	鬏	鬓	鬟
F7E0	鬣	麽	麾	縻	麂	麇	麈	麋	麒	鏖	麝	麟	黛	黜	黝	黠
F7F0	黟	黢	黩	黧	黥	黪	黯	鼢	鼬	鼯	鼹	鼷	鼽	鼾	齄	

■ 用户登录字符 / User defined characters

GB code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
ACA0		□ U1	□ U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	U13	U14	U15
ACB0	U16	U17	U18	U19	U20	U21	U22	U23	U24	U25	U26	U27	U28	U29	U30	U31
ACC0	U32	U33	U34	U35	U36	U37	U38	U39	U40	U41	U42	U43	U44	U45	U46	U47
ACD0	U48	U49	U50													

Latin-1 (ISO/IEC 8859-1)

Characters from 00 (HEX) to 7F (HEX) are identical with the ASCII code. Characters indicated with ASCII code 5C (HEX), 60 (HEX) and 7E (HEX) are defined by the settings in Laser Marker NAVI smart software. Refer to the ASCII code table for details.

00 (HEX) ～ 7F (HEX) までは ASCII コードと同一です。5C (HEX)、60 (HEX)、7E (HEX) が表す文字は、Laser Marker NAVI smart の設定により変わります。詳しくは ASCII コード表を参照してください。

00 (HEX) 至 7F (HEX) 是同一个 ASCII 码。 5C (HEX)，60 (HEX) 和 7E(HEX) 所表示的字符会因 Laser Marker NAVI smart 的设置而改变。详情请参见 ASCII 码表。

	0	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	[NUL]	[DLE]	(SP)	0	@	P	`	p	€			°	À	Đ	à	ð
1	[SOH]	[DC1]	!	1	A	Q	a	q		‘	¡	±	Á	Ñ	á	ñ
2	[STX]	[DC2]	”	2	B	R	b	r	,	’	¢	²	Â	Ò	â	ò
3	[ETX]	[DC3]	#	3	C	S	c	s	*ƒ*	“	£	³	Ã	Ó	ã	ó
4	[EOT]	[DC4]	$	4	D	T	d	t	„	”	¤	´	Ä	Ô	ä	ô
5	[ENQ]	[NAK]	%	5	E	U	e	u	…	•	¥	µ	Å	Õ	å	õ
6	[ACK]	[SYN]	&	6	F	V	f	v	†	–	¦	¶	Æ	Ö	æ	ö
7	[BEL]	[ETB]	’	7	G	W	g	w	‡	—	§	·	Ç	×	ç	÷
8	[BS]	[CAN]	(	8	H	X	h	x	ˆ	˜	¨	¸	È	Ø	è	ø
9	[HT]	[EM]	)	9	I	Y	i	y	‰	™	©	¹	É	Ù	é	ù
A	[LF]	[SUB]	*	:	J	Z	j	z	Š	š	ª	º	Ê	Ú	ê	ú
B	[VT]	[ESC]	+	;	K	[	k	{	‹	›	«	»	Ë	Û	ë	û
C	[FF]	[FS]	,	<	L	\	l	|	Œ	œ	¬	¼	Ì	Ü	ì	ü
D	[CR]	[GS]	-	=	M	]	m	}				½	Í	Ý	í	ý
E	[SO]	[RS]	.	>	N	^	n	~	Ž	ž	®	¾	Î	Þ	î	þ
F	[SI]	[US]	/	?	O	_	o	[DEL]		Ÿ	¯	¿	Ï	ß	ï	ÿ

■ User defined characters / ユーザ登録文字 / 用户登录字符

The user defined characters “U1” to “U50” are indicated “\D01” to “\D50” with Latin-1 code.

Latin-1 コードを使用している場合は、ユーザ登録文字 U1 ～ U50 は “\D01” ～ “\D50” に置き換えて表します。

使用 Latin-1 代码时，将把用户登录字符 U1 至 U50 替换为 ”\D01” 至 “\D50”。

Latin-1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
/D01–/D15		□ U1	□ U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	U13	U14	U15
/D16–/D31	U16	U17	U18	U19	U20	U21	U22	U23	U24	U25	U26	U27	U28	U29	U30	U31
/D32–/D47	U32	U33	U34	U35	U36	U37	U38	U39	U40	U41	U42	U43	U44	U45	U46	U47
/D48–/D50	U48	U49	U50													

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Command Code

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R

S

U

W

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