EM 220

Mobile Printer Command Manual
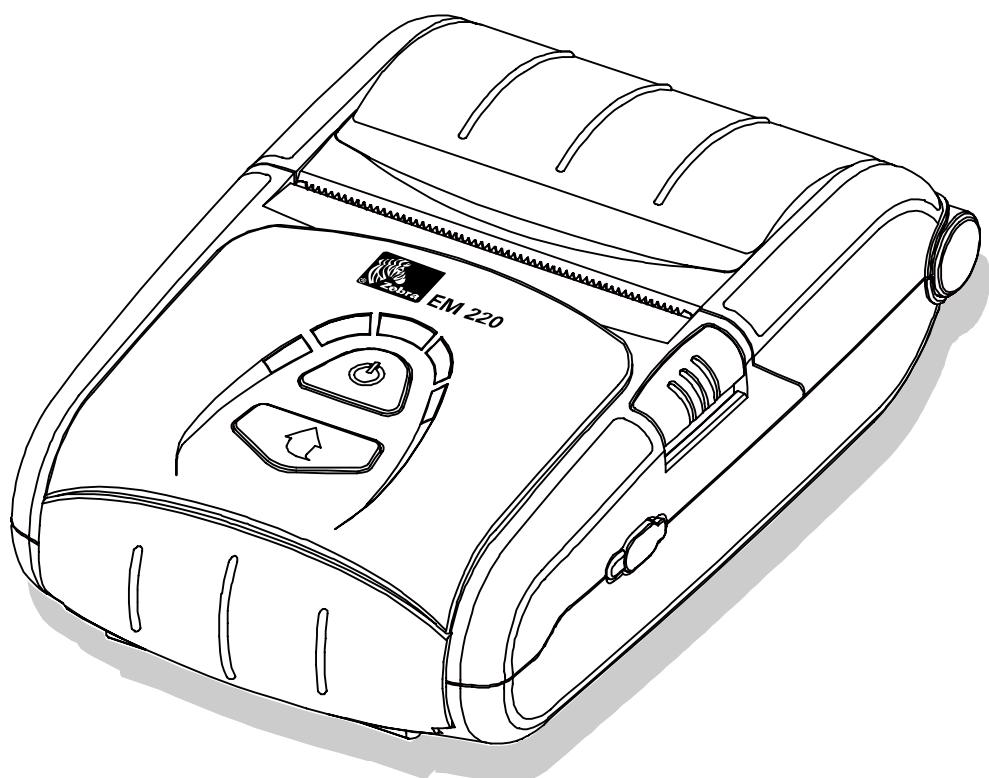
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• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet or circuit different from that to which the receiver is connected.

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1. Notice

This Control Commands Manual contains information on the protocol and functions of all control commands that can be used with this printer (EM 220).

2. Control Commands List

No	Command	Name	Function Type
1	HT	Horizontal tab	*Print Position*
2	LF	Print and line feed	*Print*
3	FF	Print and return to standard mode (in page mode)	*Print*
4	CR	Print and carriage return	*Print*
5	CAN	Cancel print data in page mode	*Character*
6	DLE	Set real-time command mode	*Status*
7	EOT n	Transmit status	*Status*
8	ESC FF	Print data in page mode	*Print*
9	ESC SP n	Set right-side character spacing	*Character*
10	ESC ! n	Select print mode(s)	*Character*
11	ESC $	Set absolute print position	*Print Position*
12	ESC *	Select bit-image mode	*Bit-image*
13	ESC - n	Turn underline mode on/off	*Character*
14	ESC 2	Select default line spacing	*Line Spacing*
15	ESC 3 n	Set line spacing	*Line Spacing*
16	ESC @	Initialize printer	*Misc.*
17	ESC D n	Set horizontal tab positions	*Print Position*
18	ESC E n	Turn emphasized mode on/off	*Character*
19	ESC G n	Turn double-strike mode on/off	*Character*
20	ESC J n	Print and feed paper	*Print*
21	ESC L	Select page mode	*Misc.*
22	ESC M n	Select character font or Set card reader mode	*Character/MSR*
23	ESC R n	Select an international character set	*Character*
24	ESC S	Select standard mode	*Misc.*
25	ESC T n	Select print direction in page mode	*Print Position*
26	ESC W n	Set print area in page mode	*Print Position*
27	ESC \	Set relative print position	*Print Position*
28	ESC a n	Select justification	*Print Position*
29	ESC d n	Print and feed n lines	*Print*
30	ESC t n	Select character code table	*Character*

No	Command	Name	Function Type
31	ESC {	Turn upside-down print mode on/off	*Character*
32	GS ! n	Select character size	*Character*
33	GS $ n	Set absolute vertical print position in page mode	*Print Position*
34	GS (A	Execute test print	*Misc.*
35	BS ^ E	Set user setup commands	*Customize*
36	BS ^ L or BS ^ 7	Set graphics data	*Bit-image*
37	GS (k	Select print control method(s)	*Two dimension*
38	GS :	Start/end macro definition	*Macro*
39	GS B n	Turn white/black reverse print mode on/off	*Character*
40	GS H n	Select print position of HRI characters	*Bar code*
41	GS I b	Transmit battery power	*Misc.*
42	GS I n	Transmit printer ID	*Misc.*
43	GS L	Set left margin	*Print Position*
44	GS W	Set print area width	*Print Position*
45	GS \	Set relative vertical print position in page mode	*Print Position*
46	GS ^	Execute macro	*Macro*
47	GS f n	Select font for HRI characters	*Bar code*
48	GS h n	Set bar code height	*Bar code*
49	GS k	Print bar code	*Bar code*
50	GS r n	Transmit status	*Status*
51	GS v 0	Print raster bit image	*Bit-image*
52	GS w n	Set bar code width	*Bar code*
53	FS .	Cancel Kanji character mode	*2bytes code*
54	FS &	Select Kanji character mode	*2bytes code*
55	US L R	Change Receipt mode	*Misc.*
56	US L L	Change Label mode	*Misc.*
57	US L A	Execute auto calibration in label mode	*Misc.*

3. Control Commands Details

3-1 Command Notation

[Name]   The name of the command.

[Format]   The code sequence: ASCII indicates the ASCII character equivalents.
              Hex indicates the hexadecimal equivalents.
              Decimal indicates the decimal equivalents.

[Range]   [ ] k indicates that the content of the [ ] should be repeated k times.
              Provides the allowable ranges for the arguments.

[Description] Describes the function of the command.

3-2 Explanation of Terms

LSB   Least Significant Bit

3-3 Control Commands Details

HT	
[Name]	Horizontal tab.
[Format]	ASCII　　　HT Hex　　　　09 Decimal　　 9
[Description]	▪ Moves the print position to the next horizontal tab position.

LF	
[Name]	Print and line feed.
[Format]	ASCII　　　LF Hex　　　　0A Decimal　　10
[Description]	▪ In standard mode, prints the data in the print buffer and feeds one line based on the current line spacing. ▪ In page mode, only the print position moves, and the printer does not perform actual printing

FF	
[Name]	If in page mode, after printing, the printer is returned to standard mode. If the label function is set, the paper is fed to the next printing position.
[Format]	ASCII　　　FF Hex　　　　0C Decimal　　12
[Description]	▪ All data collected to the current point is printed, and then the printer is converted from page mode to standard mode. ▪ After printing, the printer does not clear the buffer data of page mode. ▪ If the label function is set, the paper is fed to the next printing position.

CR	
[Name]	Print and carriage return.

[Format]	ASCII	CR
	Hex	0D
	Decimal	13

[Description]　　　▪ This command is ignored CR.

CAN	
[Name]	Cancel print data in page mode.

[Format]	ASCII	CAN
	Hex	18
	Decimal	24

[Description]　　　▪ In page mode, deletes all the print data in the current print area.

DLE	
[Name]	Set real-time command mode.

[Format]	ASCII	DLE
	Hex	10
	Decimal	16

[Description]　　　▪ Set real-time command mode.
　　　　　　　　　▪ A single command following this command is regarded as a real time command that the printer executes upon receiving it.
　　　　　　　　　▪ The real time command mode using DLE is activated for following commands.

Command	Function
EOT	Transmit printer status
GS r	Transmit status
GS I	Transmit printer ID

EOT n	

[Name]	Transmit status

[Format]	ASCII EOT N Hex 04 n Decimal 4 n

[Range]	$1 \le n \le 4$

[Description]	▪ Transmits the status specified by n as follows:

n	Function
1	Transmit printer status
2	Transmit off-line status
3	Transmit error status
4	Transmit paper roll sensor status

▪ This printer transmits the following status.

n=1: Printer status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed
1	On	02	2	Fixed
2	Off	00	0	Fixed
3	Off	00	0	On-Line
	On	08	8	Off-Line
4	On	10	16	Fixed
5	Off	00	0	Off line waiting status
	On	20	32	On line waiting status
6	Off	00	0	Paper FEED button is turned Off
	On	40	64	Paper FEED button is turned On
7	Off	00	0	Fixed

n=2: Off-line status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed
1	On	02	2	Fixed
2	Off	00	0	Cover is closed
	On	04	4	Cover is open
3	Off	00	0	Paper is not being fed by using the paper FEED button
	On	08	8	Paper is being fed by the paper FEED button
4	On	10	16	Fixed
5	Off	00	0	No paper-end stop
	On	20	32	Printing is being stopped
6	Off	00	0	No error
	On	40	64	Error has occurred
7	Off	00	0	Fixed

n=3: Error status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed
1	On	02	2	Fixed
2	Off	00	0	Fixed
3	Off	00	0	Fixed
4	On	10	16	Fixed
5	Off	00	0	Fixed
6	Off	00	0	Fixed
7	Off	00	0	Fixed

n=4: Continuous paper sensor status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed
1	On	02	2	Fixed
2	Off	00	0	Fixed
3	Off	00	0	Fixed
4	On	10	16	Fixed
5	Off	00	0	Paper end sensor; paper present
	On	20	32	Paper end sensor; paper not present
6	Off	00	0	Paper end sensor; paper present
	On	40	64	Paper end sensor; paper not present
7	Off	00	0	Fixed

[Notes]   This is a status request command to determine if the printer is off-line or if an error condition has occurred. Take the following into consideration:
• If this command interrupts the code string of another command, this command is processed as a parameter of the other command; therefore, the print result will not be correct.
• If a command such as graphics data or defined data has a code string that is the same as a code string in a parameter, the printer processes and then continues with the bit-image or other command.
• This command following DLE can be executed in real-time command mode.

This command is ignored when transmitting block data (Header ~ NUL).

ESC FF		

[Name]   Print data in page mode.

[Format]
ASCII	ESC	FF
Hex	1B	0C
Decimal	27	12

[Description]   ▪ In page mode, prints all buffered data in the print area.
▪ After printing, the printer does not clear the buffer data.
▪ This command is used when the page mode data is printed repeatedly.

ESC SP n			

[Name]   Set right-side character spacing.

[Format]
ASCII	ESC	SP	n
Hex	1B	20	n
Decimal	27	32	n

[Range] $0 \le n \le 255$

[Default]   n=0

[Description]   ▪ Sets the character spacing for the right side of the character to
  [n ×horizontal or vertical motion units].
▪ The maximum right-side character spacing is:
   - 31.875mm.

ESC ! n

[Name]　　　　　Select print mode(s).

[Format]　　　　ASCII　　　ESC　　　!　　　n
　　　　　　　　　Hex　　　　1B　　　21　　　n
　　　　　　　　　Decimal　　27　　　33　　　n

[Range]　　　　　0 ≤ n ≤ 255

[Default]　　　　n=0

[Description]　　▪ Selects print mode(s) using n as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (12 × 24) selected.
	On	01	1	Character font B (9 x 24) selected.
1,2	Off	00	0	Reserved.
3	Off	00	0	Emphasized mode not selected.
	On	08	8	Emphasized mode selected.
4	Off	00	0	Double-height mode not selected.
	On	10	16	Double-height mode selected.
5	Off	00	0	Double-width mode not selected.
	On	20	32	Double-width mode selected.
6	Off	00	0	Reserved.
7	Off	00	0	Underline mode not selected.
	On	80	128	Underline mode selected.

ESC $ nL nH

[Name]　　　　　Set absolute print position.

[Format]　　　　ASCII　　　ESC　　　$　　　nL　　　nH
　　　　　　　　　Hex　　　　1B　　　24　　　nL　　　nH
　　　　　　　　　Decimal　　27　　　36　　　nL　　　nH

[Range]　　　　　0 ≤ (nL + nH x 256) ≤ 65535 (0 ≤ nH ≤ 255, 0 ≤ nL ≤ 255)

[Description]　　▪ Sets the next print starting position, and the absolute print position, in reference to the left margin. The distance from the beginning of the line to the left margin is [(nL + nH x 256) x (vertical or horizontal motion units)].

ESC * m nL nH d1...dk

[Name]　　　　Select bit image mode.

[Format]　　　ASCII　　ESC　　　*　　　m　　nL　　nH　　d1...dk
　　　　　　　　Hex　　　1B　　2A　　m　　nL　　nH　　d1...dk
　　　　　　　　Decimal　27　　42　　m　　nL　　nH　　d1...dk

[Range]　　　　m=0, 1, 32, 33
　　　　　　　　$1 \leq (nL + nH \times 256) \leq 1023$ $(0 \leq nL \leq 255, 0 \leq nH \leq 3)$
　　　　　　　　$0 \leq d \leq 255$

[Description]　▪ Specifies the bit image in m mode for the number of dots specified by nL
　　　　　　　　and nH.

　　　　　　　　　　　　　　　　　　　　　　　　　* dpi : dots per 25.4mm {1"}

m	Mode	Number of dots in vertical direction	Vertical dot density	Horizontal dot density	Number of bytes (k)
0	8-dot single-density	8	203/3 dpi	203/2 dpi	nL + nH x 256
1	8-dot double-density	8	203/3 dpi	203 dpi	nL + nH x 256
32	24-dot single-density	24	203 dpi	203/2 dpi	(nL + nH x 256) x 3
33	24-dot double-density	24	203 dpi	203 dpi	(nL + nH x 256) x 3

ESC – n

[Name]　　　　Turn underline mode on/off.

[Format]　　　ASCII　　ESC　　　-　　　n
　　　　　　　　Hex　　　1B　　2D　　n
　　　　　　　　Decimal　27　　45　　n

[Range]　　　$0 \leq n \leq 2, 48 \leq n \leq 50$

[Default]　　　n=0

[Description]　▪ Turn underline mode on or off, based on the following values of n:

n	Function
0,48	Turns off underline mode.
1,49	Turns on underline mode, set at 1-dot width.
2,50	Turns on underline mode, set at 2-dot width.

ESC 2

[Name]	Select default line spacing.

[Format]
ASCII	ESC	2
Hex	1B	32
Decimal	27	50

[Description] ▪ The default line spacing is approximately 3.75 mm, which is equivalent to 30 dots.

ESC 3 n

[Name]	Set line spacing

[Format]
ASCII	ESC	3	n
Hex	1B	33	n
Decimal	27	51	n

[Range] $0 \le n \le 255$

[Default]   n = 30

[Description] ▪ The vertical or horizontal motion unit is approximately 0.125 mm {1/203 inches}. This value equals one dot pitch.
▪ Sets the current line spacing to [n x vertical motion units] inches.
▪ The maximum settable line spacing is 31.875mm.

ESC @

[Name]	Initialize printer.

[Format]
ASCII	ESC	@
Hex	1B	40
Decimal	27	64

[Range] $32 \le n \le 126$

[Description] ▪ Clears the data in the print buffer and resets the printer mode to the mode that was in effect when the power was turned on.

ESC D n1… nk NUL

| [Name] | Set horizontal tab positions. |

[Format]

	ASCII	ESC	D	n1...nk	NUL
	Hex	1B	44	n1...nk	00
	Decimal	27	68	n1...nk	0

[Range]   1 ≤ n ≤ 255 , 0 ≤ k ≤ 32

[Default]   n=8, 16, 24, 32, 40,....., 232, 240, 248
              (for font A in a standard character size width)

[Description] ▪ Sets horizontal tab positions.
              - n specifies the number of digits from the setting position to the left
                margin or the beginning of the line.
              - k specifies the number of bytes set for the horizontal tab position.
              ▪ The horizontal tab position is stored as a value of [character width x n]
                measured form the beginning of the line.

ESC E n

| [Name] | Turn emphasized mode on / off. |

[Format]

	ASCII	ESC	E	n
	Hex	1B	45	n
	Decimal	27	69	n

[Range]   0 ≤ n ≤ 255

[Default]   n=0

[Description] ▪ Turns emphasized mode on or off.
              - When the LSB of n is 0, emphasized mode is turned off.
              - When the LSB of n is 1, emphasized mode is turned on.

ESC G n				
[Name]	Turn double-strike mode on/off.			
[Format]	ASCII	ESC	G	n
	Hex	1B	47	n
	Decimal	27	71	n
[Range]	0 ≤ n ≤ 255			
[Default]	n=0			
[Description]	▪ Turns double-strike mode on or off.			

- When the LSB of n is 0, double-strike mode is turned off.
- When the LSB of n is 1, double-strike mode is turned on.

ESC J n				
[Name]	Print and feed paper.			
[Format]	ASCII	ESC	J	n
	Hex	1B	4A	n
	Decimal	27	74	n
[Range]	0 ≤ n ≤ 255			
[Description]	▪ Prints the data in the print buffer and feeds the paper [n X vertical motion unit].			

ESC L			
[Name]	Select page mode.		
[Format]	ASCII	ESC	L
	Hex	1B	4C
	Decimal	27	76
[Description]	▪ Switches from standard mode to page mode.		

ESC M n	
[Name]	Select character font./ MSR card read

[Format]	ASCII	ESC	M	n
	Hex	1B	4D	n
	Decimal	27	77	n

[Range] n = 0, 1, 48, 49 , 67, 68, 69, 70, 71, 72, 73

[Default] n=0

[Description] ▪ Selects only-byte character fonts
▪ Selects Card reader mode

n	Function
0, 48	Character font A (12 × 24) selected
1, 49	Character font B (9 × 24) selected
70	Set 1 track card reader mode
71	Set 2 track card reader mode
72	Set 1,2 track card reader mode
73	Transmits the MSR setting value(s)
67	Set 2 track card reader mode
68	Set 3 track card reader mode
69	Set 2,3 track card reader mode
66	Set 1,2,3 track card reader mode
99	Cancel MSR reader mode

Magnetic card read out put format

Track 1

02H 41H 31H 31H 1CH	DATA 76 characters	03H 0DH 0AH

Track 2

02H 42H 31H 31H 1CH	DATA 37 characters	03H 0DH 0AH

Track 1,2

02H 43H 31H 31H 1CH 1CH	DATA 76 characters	1CH	DATA 37 Characters	03H 0DH 0AH

Track 3

02H 44H 31H 31H 1CH	DATA104characters	03H 0DH 0AH

Track 2,3

02H 45H 31H 31H 1CH 1CH	DATA 37 characters	1CH	DATA104Characters	03H 0DH 0AH

Track 1,2,3

02H 46H 31H 31H 1CH 1CH	DATA76 characters	1CH	DATA37 characters	1CH	DATA104 characters	03H 0DH 0AH

Transmits the setting value format

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	80H	128	1 byte
Data	41H ~ 48H	65 ~ 72	1 bytes
NUL	00H	0	1 byte

MSR Setting value

Hex.	Function
41	Track 1/2/3 read mode command (3 Track case)
42	Track 1 read mode AUTO trigger (3 Track case)
43	Track 2 read mode AUTO trigger (3 Track case)
44	Track 3 read mode AUTO trigger (3 Track case)
45	Track 1/2 read mode AUTO trigger (3 Track case)
46	Track 2/3 read mode AUTO trigger (3 Track case)
47	Track 1/2/3 read mode AUTO trigger (3 Track case)
48	MSR not used

ESC R n

[Name] Select an international character set.

[Format]
ASCII	ESC	R	n
Hex	1B	52	n
Decimal	27	82	n

[Range] $0 \le n \le 13$

[Default] n=0

[Description] ▪ Selects international character set in from the following table:

n	Character set	n	Character set
0	U.S.A	7	Spain I
1	France	9	Norway
2	Germany	10	Denmark II
3	U.K		
4	Denmark I		
5	Sweden		
6	Italy		

ESC S

[Name] Select standard mode.

[Format]
ASCII	ESC	S
Hex	1B	53
Decimal	27	83

[Description] ▪ Switches from page mode to standard mode.

ESC T n

[Name]	Select print direction in page mode.

[Format]

ASCII	ESC	T	n
Hex	1B	54	n
Decimal	27	84	n

[Range]   0 ≤ n ≤ 3, 48 ≤ n ≤ 51

[Default]   n=o

[Description]   ▪ Selects the print direction and starting position in page mode.

n	Print Direction	Starting Position
0,48	Left right	Upper left
1,49	Bottom to top	Lower left
2,50	Right left	Lower right
3,51	Top bottom	Upper right

ESC W xL xH yL yH dxL dxH dyL dyH

[Name]	Set relative print position.

[Format]

ASCII	ESC	W	xL	xH	yL	yH	dxL	dxH	dyL	dyH
Hex	1B	57	xL	xH	yL	yH	dxL	dxH	dyL	dyH
Decimal	27	87	xL	xH	yL	yH	dxL	dxH	dyL	dyH

[Range] $0 ≤ (xL + xH \times 256) ≤ 65535$ ($0 ≤ xL ≤ 255$, $0 ≤ xH ≤ 255$)
$0 ≤ (yL + yH \times 256) ≤ 65535$ ($0 ≤ yL ≤ 255$, $0 ≤ yH ≤ 255$)
$1 ≤ (dxL + dxH \times 256) ≤ 65535$ ($0 ≤ dxL ≤ 255$, $0 ≤ dxH ≤ 255$)
$1 ≤ (dyL + dyH \times 256) ≤ 65535$ ($0 ≤ dyL ≤ 255$, $0 ≤ dyH ≤ 255$)

[Default]   Horizontal logical origin and vertical logical origin = 0
  xL=0, xH =0, yL=0, yH=0
  dxL = 128, dxH = 1, dyL = 72, dyH = 3

[Description]   ▪ When paper width of 58mm is selected:
  $(xL + xH \times 256) = 0$ (xL=0, xH=0)
  $(dyL + dyH \times 256) = 840$ (dyL=72, dyH=3)
▪ Set the position and the size of the printing area.
  - Horizontal starting position = [(xL + xH x 256) x (horizontal motion units)].
  - Vertical starting position = [(yL + yH x 256) x (vertical motion units)].
  - Horizontal printing area width = [(dxL + dxH x 256) x (horizontal motion units)].
  - Vertical printing area width = [(dyL + dyH x 256) x (vertical motion units)].
▪ The printer ignores any setting that exceeds the print area.

ESC ╲ nL nH

[Name]	Set relative print position.

[Format]

	ASCII	ESC	╲	nL	nH
	Hex	1B	5C	nL	nH
	Decimal	27	92	nL	nH

[Range]   0 ≤ (nL + nH x 256) ≤ 65535 (0 ≤ nL 255, 0 ≤ nH ≤ 255)

[Description]   ▪ Set the print starting position based on the current position to [(nL + nH × 256) × horizontal or vertical motion unit]
      - When (nL + nH × 256 is a positive number, the print starting position is specified to the right based on the current position.
      - When (nL + nH × 256) is a negative number, the print starting position is specified to the left based on the current position.
    ▪ The printer ignores any setting that exceeds the print area.

ESC a n

[Name]	Select justification.

[Format]

	ASCII	ESC	a	n
	Hex	1B	61	n
	Decimal	27	97	n

[Range]   0 ≤ n ≤2, 48 ≤ n ≤50

[Default]   n=0

[Description]   ▪ In standard mode, aligns all the data in one line to the position specified by n as follows:

n	Justification
0, 48	Left justification
1, 49	Centering
2, 50	Right justification

ESC d n

[Name]	Print and feed n lines.

[Format]

	ASCII	ESC	d	n
	Hex	1B	64	n
	Decimal	27	100	n

[Range]   0 ≤ n ≤ 255

[Description]   ▪ Prints the data in the print buffer and feeds n lines.

ESC t n	
[Name]	Select character code table.

[Format]	ASCII	ESC	t	n
	Hex	1B	74	n
	Decimal	27	116	n

[Range]   0 ≤ n ≤ 5, 16 ≤ n ≤ 19, 21 ≤ n ≤ 24, 27 ≤ n ≤ 29, n=21, n=33, 36 ≤ n ≤37
n=255

[Default]   n=0

[Description] For model without Thai character support: n=0
▪ Selects a page n from the character code table.

n	Page	STD	Other
0	Page 0 437 (USA, Standard Europe)	○	○
1	Page 1 Katakana	○	○
2	Page 2 850 (Multilingual)	○	○
3	Page 3 860 (Portuguese)	○	○
4	Page 4 863 (Canadian-French)	○	○
5	Page 5 865 (Nordic)	○	○
16	Page 16 1252 (Latin I)	○	○
17	Page 17 866 (Cyrillic #2)	○	○
18	Page 18 852 (Latin 2)	○	○
19	Page 19 858 (Euro)	○	○
21	Page 21 862 (Hebrew DOS code)	○	X
22	Page 22 864 (Arabic)	○	○
23	Page 23 Thai42	○	○
24	Page 24 1253 (Greek)	○	○
25	Page 25 1254 (Turkish)	○	X
26	Page 26 1257 (Baltic)	○	X
27	Page 27 Farsi	○	○
28	Page 28 1251 (Cyrillic)	○	○
29	Page 29 737 (Greek)	○	○
30	Page 30 775 (Baltic)	○	X
31	Page 31 Thai14	○	○
33	Page 33 1255 (Hebrew New code)	○	○
34	Page 34 Thai 11	○	X
35	Page 35 Thai 18	○	X
36	Page 36 855 (Cyrillic)	○	○
37	Page 37 857 (Turkish)	○	○
38	Page 38 928 (Greek)	○	X
39	Page 39 Thai 16	○	X
40	Page 40 1256 (Arabic)	○	X

- Character codes support all the above listed code pages in the STD version,
and in all remaining versions, only the character codes displayed in Other are
supported.

ESC { n

[Name]   Turns upside-down printing mode on/off.

[Format]   ASCII   ESC   {   n
                 Hex   1B   7B   n
                 Decimal   27   123   n

[Range] $0 \le n \le 255$

[Default]   n=0

[Description]   ▪ Turns upside-down printing mode on or off.
                   - When the LSB of n is 0, upside-down printing mode is turned off.
                   - When the LSB of n is 1, upside-down printing mode is turned on.
             ▪ The upside-down print mode has no effect in page mode. If this command
               is processed in page mode, upside-down printing mode is enabled when
               the printer returns to standard mode.
             ▪ When upside-down print mode is turned on, the printer prints 180°
               rotated characters from right to left.

GS ! n

| [Name] | Select character size. |

[Format]
	ASCII	GS	!	n
	Hex	1D	21	n
	Decimal	29	33	n

[Range]   0 ≤ n ≤ 255
(where 1 ≤ Enlargement in vertical direction ≤ 8, 1 ≤ Enlargement in horizontal direction ≤ 8)

[Default]   n=0

[Description]   ▪ Selects character size (enlargement in vertical and horizontal directions).

Bit	Function	Setting
0	Specifies the number of times enlarged in the vertical direction	Refer to Table 2 [Enlarged in vertical direction]
1		
2		
3		
4	Specifies the number of times enlarged in the horizontal direction	Refer to Table 1 [Enlarged in horizontal direction]
5		
6		
7		

- Table 1 [Enlarged in horizontal direction]

Hex	Decimal	Enlargement
00	0	1 time (standard)
10	16	2 times
20	32	3 times
30	48	4 times
40	64	5 times
50	80	6 times
60	96	7 times
70	112	8 times

- Table 2 [Enlarged in vertical direction]

Hex	Decimal	Enlargement
00	0	1 time (standard)
01	1	2 times
02	2	3 times
03	3	4 times
04	4	5 times
05	5	6 times
06	6	7 times
07	7	8 times

GS $ nL nH

[Name]	Set absolute vertical print position in page mode.

[Format]

	ASCII	GS	$	nL	nH
	Hex	1D	24	nL	nH
	Decimal	29	36	nL	nH

[Range]   0 ≤ (nL + nH x 256) ≤ 65535 (0 ≤ nL ≤ 255, 0 ≤ nH ≤ 255)

[Description] ▪ Sets the absolute vertical print starting position to [(nL + nH × 256) × (vertical or horizontal motion units)].

GS (A pL pH n m

[Name]	Execute test print.

[Format]

	ASCII	GS	(	A	pL	pH	n	m
	Hex	1D	28	41	pL	pH	n	m
	Decimal	29	40	65	pL	pH	n	m

[Range]   (pL + pH x 256) = 2 (pL=2, pH=0)
0 ≤ n ≤ 2, 48 ≤ n ≤ 50
1 ≤ m ≤ 3, 49 ≤ m ≤ 51

[Description] ▪ Executes a test print with a specified test pattern on a specified paper type (roll paper).
  - n specifies the paper type as listed below to be tested:

m	Paper type
0, 48	
1, 49	Paper roll
2, 50	

  - m specifies a test pattern as listed below:

m	Test pattern
1, 49	Hexadecimal dump
2, 50	Self Test Printing
3, 51	Self Test rolling pattern

[Notes]

▪ If this command is processed while a macro is being defined, the printer cancels macro definition and starts processing this command. At that time, the macro becomes undefined.
▪ After processing this command, the printer performs a software reset.

BS ^ E pL pH fn [parameter]

[Name]   Customize NV memory area.

[Description]   ▪ Customize the NV user memory area. The table below explains the
                functions available in this command. Executes commands related to the
                user setting mode by specifying the function code fn.

fn	Format	No.	Function
1	BS ^ E pL pH fn	1	Changes into the user setting mode.
2	BS ^ E pL pH fn	2	Ends the user setting mode session. (Performs a soft reset.)
3	BS ^ E pL pH fn [b18...b11]... [bk8...bk1]	3	Sets value(s) for the memory switch.
4	BS ^ E pL pH fn a	4	Transmits the settings of the memory switch to the host.
11	BS ^ E pL pH fn d1...dk	11	Sets the communication conditions for the serial interface.
12	BS ^ E pL pH fn a	12	Transmits the communication conditions for the serial interface.

[Notes]   ▪ pL, pH specifies (pL + pH x 256) the number of bytes after pH (fn and
                [parameter]).
                ▪ The user setting mode is a special mode to change the values in the NV
                user memory with this command.
                ▪ In Function 2, the printer performs software reset. Therefore, the printer
                clears the receive and print buffers, and resets all settings (user-defined
                characters, macros, and the character style) to the mode in effect at power
                on.
                ▪ Frequent write commands by this command, may damage the NV memory.
                Therefore, it is recommended to write to NV memory no more than 10
                times a day.
                ▪ While processing this command, the printer is BUSY when writing data to
                the user NV memory and stops receiving data. Therefore, it is prohibited to
                transmit data including real-time commands during the execution of this
                command.

<Function 1> BS ^ E pL pH fn (fn=1)

[Format]	ASCII	BS	^	E	pL	pH	fn
	Hex	08	5E	45	pL	pH	fn
	Decimal	08	94	69	pL	pH	fn

[Range] (pL + pH x 256) = 1   (pL=1, pH=0)
fn=1

[Description] ▪ Enter the user setting mode and notifies that the mode has changed.

	Hexadecimal	Decimal	Number of Data
Header	37H	55	1 byte
Flag	20H	32	1 byte
NUL	00H	0	1 byte

▪ The following commands are enabled in the user setting mode.
<Function 2> through

<Function 2> BS ^ E pL pH fn d1 d2 d3   (fn=2)

[Format]	ASCII	GS	(	E	pL	pH	fn
	Hex	1D	28	45	pL	pH	fn
	Decimal	29	40	69	pL	pH	fn

[Range] (pL + pH x 256) = 1   (pL=1, pH=0)
fn=2

[Description] ▪ Ends the user setting mode and performs a software reset. Therefore, the printer clears the receive and print buffers, and resets all (downloaded bit images, macros, and the print mode) to the mode that was in effect at power on.
▪ This function code (fn=2) is enabled only in the user setting mode.

<Function 3> BS ^ E pL pH fn [b18...b11]...[bk8...bk1]   (fn=3)

[Format] ASCII BS ^ E pL pH fn [b18...b11]... [bk8...bk1]
          Hex   08 5E 45 pL pH fn [b18...b11]... [bk8...bk1]
          Decimal 08 94 69 pL pH fn [b18...b11]... [bk8...bk1]

[Range] $9 \leq$ (pL + pH x 256) $\leq$ 65535
          fn=3
          b=48, 49, 50

[Default]

[Description] ▪ All switches are set to Off (b=48).
               ▪ Changes all the Memory Switch 1~8 to the value specified by b at a time.
                 - When b=48, the applicable bit is turned to Off.
                 - When b=49, the applicable bit is turned to On.
                 - When b=50, the applicable bit is not changed.

▪ b1 value is set the memory switch 1 as follows:

Msw	Set Value			Function
	3	2	1	
1-1~3	48	48	48	print density 130%
	48	48	49	print density 120%
	48	49	48	print density 110%
	48	49	49	print density 150%
	49	48	48	print density 100%
	49	48	49	print density 140%
	49	49	48	print density 90%
	49	49	49	print density 80%
1-4	48			2 byte character mode not selected
	49			2 byte character mode selected
1-5	48			print speed 80mm/s
	49			print speed 50mm/s
1-6	48			not used

▪ b2 value is set the memory switch 2 as follows:

Msw	Set Value	Function
2-1	48	not used
2-2	48	not used
2-3	48	not used

▪ Code Page Settings

Msw2-8	Msw2-7	Msw2-6	Msw2-5	Msw2-4	Character Table	STD	Other
48	48	48	48	48	PC437	○	○
48	48	48	48	49	Katakana	○	○
48	48	48	49	48	PC850	○	○
48	48	48	49	49	PC860	○	○
48	48	49	48	48	PC863	○	○
48	48	49	48	49	PC865	○	○
48	48	49	49	48	WPC1252	○	○
48	48	49	49	49	PC866	○	○
48	49	48	48	48	PC852	○	○
48	49	48	48	49	PC858	○	○
48	49	48	49	48	PC862	○	×
48	49	48	49	49	PC864	○	○
48	49	49	48	48	Thai42	○	○
48	49	49	48	49	WPC1253	○	○
48	49	49	49	48	WPC1254	○	×
48	49	49	49	49	WPC1257	○	×
49	48	48	48	48	Farsi	○	○
49	48	48	48	49	WPC1251	○	○
49	48	48	49	48	PC737	○	○
49	48	48	49	49	PC775	○	×
49	48	49	48	48	Thai 14	○	○
49	48	49	48	49	not used	○	○
49	48	49	49	48	WPC1255	○	○
49	48	49	49	49	Thai 11	○	×
49	49	48	48	48	Thai 18	○	×
49	49	48	48	49	PC855	○	○
49	49	48	49	48	PC857	○	○
49	49	48	49	49	PC928	○	×
49	49	49	48	48	Thai 16	○	×
49	49	49	48	49	WPC1256	○	×
49	49	49	49	48	not used		
49	49	49	49	49	not used		

For versions other than the STD version, only code pages displayed in Other can be selected.

▪ b3 value is set the memory switch 3 as follows:

Msw	Set Value	Function
3-1	48	PDF417 not selected
	49	PDF417 selected
3-2	48	DATAMATRIX not selected
	49	DATAMATRIX selected
3-3	48	MAXI CODE not selected
	49	MAXI CODE selected
3-4	48	QR CODE not selected
	49	QR CODE selected

▪ b4 value is set the memory switch 5 as follows:

Specify the length of idle time before the printer enters the power-down mode.

When memory switch value is 0, the power-down mode is not active.

MSW5-8	MSW5-7	MSW5-6	MSW5-5	MSW5-4	MSW5-3	MSW5-2	MSW5-1	Value
48	48	48	48	48	48	48	48	0
48	48	48	48	48	48	48	49	1
48	48	48	48	48	48	49	48	2
48	48	48	48	48	48	49	49	3
48	48	48	48	48	49	48	48	4
.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	
48	49	48	49	49	48	49	48	90

▪ b5 value is set the memory switch 6 as follows:

Minimum = 10 seconds

Maximum = 255 seconds
Set the standby time before the printer enters the power saving mode.
When memory switch value is 0, the power saving mode does not work.

MSW6-8	MSW6-7	MSW6-6	MSW6-5	MSW6-4	MSW6-3	MSW6-2	MSW6-1	Value
48	48	48	48	49	48	49	48	10
48	48	48	48	49	48	49	49	11
48	48	48	48	49	49	48	48	12
48	48	48	48	49	49	48	49	13
48	48	48	48	49	49	49	48	14
.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	
.	.	.	.	.	.	.	.	
49	49	49	49	49	49	49	49	255

▪ b6 value is set the memory switch 7 as follows:

MSW	8	7	6	5	Function
7-5~8	48	48	48	49	Track 1/2/3 read mode command
	48	48	49	48	Track 1 read mode AUTO trigger
	48	48	49	49	Track 2 read mode AUTO trigger
	48	49	48	48	Track 3 read mode AUTO trigger
	48	49	48	49	Track 1/2 read mode AUTO trigger
	48	49	49	48	Track 2/3 read mode AUTO trigger
	48	49	49	49	Track 1/2/3 read mode AUTO trigger
	49	48	48	48	MSR not used

▪ b7 value is set the memory switch 8 as follows:

Msw	Setting Value	Function
8-1	48	Reserved
8-2	48	12X24 font
	49	9X24 font
8-3	48	No beeps for roll paper end
	49	Beeps for roll paper end
8-4	48	Beeps for low battery status
	49	No beeps low battery status
8-5	48	Label function deactivated
	49	Label function activated
8-6	48	Reserved
8-7	48	Reserved
8-8	48	Reserved

<Function 4> BS ^ E pL pH fn a   (fn=4)

[Format]	ASCII	BS	(	E	pL	pH	fn	a
	Hex	08	5E	45	pL	pH	fn	a
	Decimal	08	94	69	pL	pH	fn	a

[Range]   (pL + pH x 256) = 2   (pL=2, pH=0)
fn=4
a=1, 2, 3, 5, 6, 7, 8

[Description]   ▪ Transmits the setting value(s) of the memory switch specified by a.

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	21H	33	1 byte
Data	30H or 31H	48 or 49	8 bytes
NUL	00H	0	1 byte

▪ Data for the setting is transmitted as 8 bytes or a data string in the order from bit 8 to bit 1, as follows:
- Off : Hexadecimal = 30H / Decimal = 48
- On : Hexadecimal = 31H / Decimal = 49

<Function 11>BS ^ E pL pH fn a d1….dk (fn=11)

[Format]	ASCII	BS	^	E	pL	pH	fn	d1	dk
	Hex	08	5E	45	pL	pH	0B	d1	dk
	Decimal	08	94	69	pL	pH	11	d1	dk

[Range] $8<=(pL + pH \times 256) <=10$ ($8<=pL<=10, 0<= pH<=255$)
fn=11,
$48<=d<=57$
$7<=k<=9$

[Default]   Baud rate: 115200,   Parity: 48, Flow control: 48, Data length: 56

[Description]   When (pL+pH x256) =10
d1~d6 is Baud rate value
d7 is parity setting value
d8 is Flow control setting value
d9 is Data length setting value

When (pL+pH x256) =9
d1~d5 is Baud rate value
d6 is parity setting value
d7 is Flow control setting value
d8 is Data length setting value

When (pL+pH x256) =8
d1~d4 is Baud rate value
d5 is parity setting value
d6 is Flow control setting value
d7 is Data length setting value

Sets the configuration item for the serial interface specified by d1..dk

Setting Oder	Configuration item
1	Transmission speed
2	Parity
3	Flow control
4	Data length

Example : When defining 19200 bps and Noparity, DTR/DSR, 8bit Data length : d1~dk(Hexadecimal = 32H,30H,30H,30H,30H,38H /Decimal= 49,57,50,48,48,48,48,56)

Baud rate is specified by d1~dk-3 as follows:

d1~dk-3	Function
"115200"	Baud rate 115200
"57600"	Baud rate 57600
"38400"	Baud rate 38400
"19200"	Baud rate 19200
"9600"	Baud rate 9600
"4800"	Baud rate 4800
"2400"	Baud rate 2400

Parity is specified by dk-2 as follows:

dk-2	Function
48	Select no parity
49	Select odd parity
50	Select even parity

Flow control is specified by dk-1 as follows:

dk-1	Function
48	Select Flow control DTR/DSR
49	Select Flow control XON/XOFF

Data Length(a=4) is specified by dk as follows:

dk	Function
55	Select 7bit length
56	Select 8bit length

<Function 12> BS ^ E pL pH fn a   (fn=12)

[Format]	ASCII	BS	^	E	pL	pH	fn	a
	Hex	08	5E	45	pL	pH	fn	a
	Decimal	08	94	69	pL	pH	fn	a

[Range]   (pL + pH x 256) = 2 (pL=2, pH=0)
fn=12, 1 ≤ a ≤ 4

[Description]   ▪ Transmits the communication conditions of the serial interface specified by a.

a	Communication Condition
1	Baud rate
2	Parity
3	Flow control
4	Data length

	Hexadecimal	Decimal	Amount of Data
Header	37H	55	1 byte
Flag	33H	39	1 byte
Type of communication condition	31H - 34H	49 - 52	1 byte
Separator	1FH	31	1 byte
Setting value	30H - 39H	48 - 57	1 - 6 bytes
NUL	00H	0	1 byte

▪ Configuration of the setting value
  - When the baud rate (a=1) is specified:

Baud rate (bps)	d1	d2	d3	d4	d5	d6
2400	50	52	48	48	--	--
4800	52	56	48	48	--	--
9600	57	54	48	48	--	--
19200	49	57	50	48	48	--
38400	51	56	52	48	48	--
57600	53	55	54	48	48	--
115200	49	49	53	50	48	48

▪ When the parity setting (a=2) is specified:

d1	Parity
48	No parity
49	Odd parity
50	Even parity

  - When the flow control setting (a=3) is specified:

d1	Flow control
48	DTR / DSR (Fixed)
49	XON / XOFF

  - When the data length setting (a=4) is specified:

d1	Data length
55	7 bits
56	8 bits

▪ If a is out of range, this command ignores the value which is specified with a.

BS ^ L pL pH fn   [parameter], BS ^ 7 p1 p2 p3 p4 fn [parameter]

[Name]   Select graphics data.

[Format]   ASCII   BS   ^   L   pL   pH   fn   [parameter]
                Hex   08   5E   4C   pL   pH   fn   [parameter]
                Decimal   08   94   76   pL   pH   fn   [parameter]

                ASCII   BS   ^   7   p1   p2   p3   p4   fn   [parameter]
                Hex   08   5E   37   p1   p2   p3   p4   fn   [parameter]
                Decimal   08   94   55   p1   p2   p3   p4   fn   [parameter]

[Description]   ▪ In the description below, BS ^ L is used for the explanation.
                ▪ Processes graphics data according to the function code fn.

fn	Format	Function No.	Function
2, 50	BS ^ L pL pH fn	Function 50	Prints the graphics data in the print buffer.
65	BS ^ L pL pH fn	Function 65	Deletes all NV graphics data.
66	BS ^ L pL pH fn c	Function 66	Deletes the specified NV graphics data.
67	BS ^ 7 p1 p2 p3 p4 fn N {b xL xH yL yH [c d1...dk]1}...{ b xL xH yL yH [c d1 dk]N}	Function 67	Defines the graphics data in the non-volatile memory.
69	BS ^ L pL pH fn c x y	Function 69	Prints the specified NV graphics data.
112	BS ^ L pL pH fn a bx by c xL xH yL yH d1...dk	Function 112	Stores the graphics data in the print buffer memory.

        ▪ pL, pH specifies (pL + pH x 256) the number of bytes after pH(m, fn, and
          [parameter]).
        ▪ Frequent write command executions may damage the NV memory.
          Therefore, it is recommended to write to the NV memory no more than
          10 times a day.
        ▪ While processing this command, the printer is BUSY writing data to the
          NV graphics memory and stops receiving data. Therefore, it is prohibited
          to transmit data including the real-time commands during the execution of
          this command.

<Function 50> BS ^ L pL pH fn   (fn=2, 50)

[Format]   ASCII   BS   ^   L   pL   pH   fn
                Hex   08   5E   4C   pL   pH   fn
                Decimal   08   94   76   pL   pH   fn

[Range]   (pL + pH x 256) = 1 (pL=2, pH=0)
                m=48, fn=2, 50

[Description]   ▪ Prints the buffer graphics that are stored by the process of Function 112.
                ▪ Feeds paper by the amount corresponding to the number of dots in the y
                  direction of the buffered graphics.

<Function 65> BS ^ L pL pH fn (fn=65)						

[Format]

	ASCII	BS	^	L	pL	pH	fn
	Hex	08	5E	4C	pL	pH	fn
	Decimal	08	94	76	pL	pH	fn

[Range]   (pL + pH x 256) = 1 (pL=1, pH=0)
             fn=65

[Description]   ▪ Deletes all defined NV graphics data.

<Function 66> BS ^ L pL pH fn c (fn=66)						

[Format]

	ASCII	BS	^	L	pL	pH	fn	c
	Hex	08	5E	4C	pL	pH	fn	c
	Decimal	08	94	76	pL	pH	fn	c

[Range]   (pL + pH x 256) = 2 (pL=2, pH=0)
              fn=66
             0 ≤ c ≤ 77

[Description]   ▪ Deletes the NV graphics data defined by the key codes c

<Function 67> BS ^ 7 p1 p2 p3 p4 fn N {b xL xH yL yH [c d1...dk]1}...{b xL xH yL yH [c d1...dk]N}(fn=67)

[Format]

	ASCII	BS	^	7	P1 p2 p3 p4 fn N {b xL xH yL yH [c d1...dk]1}
					...{b xL xH yL yH [c d1...dk]N}
	Hex	08	5E	37	P1 p2 p3 p4 fn N {b xL xH yL yH [c d1...dk]1}
					...{b xL xH yL yH [c d1...dk]N}

[Range]

	Decimal	08	94	55	P1 p2 p3 p4 fn N {b xL xH yL yH [c d1...dk]1}
					...{b xL xH yL yH [c d1...dk]N}

▪ BS ^ 7 parameter
   $3 \le (p1 + p2 \times 256 + p3 \times 65536 + p4 \times 16777216) \le 262144$
   $(0 \le p1 \le 255, 0 \le p2 \le 255, 0 \le p3 \le 255, 0 \le p4 \le 255)$
    fn=67
    $1 \le c \le 255$
    b=1
    $1 \le (xL + xH \times 256) \le 1024$
    $1 \le (yL + yH \times 256) \le 1200$
    c=49
    $0 \le d \le 255$
    $k = (int ((xL + xH \times 256) + 7) / 8) \times (yL + yH \times 256)$
    $0 \le N \le 77$

[Description]   ▪ The total capacity of the NV graphic memory is only 256K bytes
                  ▪ Defines the raster graphics data in the NV graphics area.
                    - b specifies the number of the color of the defined data.
                    - N specifies the number of the NV graphics data.
                    - xL, xH specifies the defined data in the horizontal direction to (xL + xH x 256) dots.

- yL, yH specifies the defined data in the vertical direction to (yL + yH x 256) dots.

[Notes]   - c specifies the color of the defined data.

C	Defined data color
49	Color 1

- Color 1 means black
- When NV graphics data is saved, existing data in NV memory is removed and updated with new one.
- When NV graphics data are saved, Key codes are given automatically.

<Function 69> BS ^ L pL pH fn c x y   (fn=69)

[Format]   ASCII   BS   ^   L   pL   pH   fn   c   x   y
           Hex   08   5E 4C pL   pH   fn   c   x   y
           Decimal   08   94 76 pL   pH   fn   c   x   y

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
           fn=69
           0 ≤ c ≤ 77
           x=1, 2
           y=1, 2

[Description]   ▪ Prints the NV graphics data defined by the key codes c. The graphics data is enlarged by x and y in the horizontal and vertical directions.

<Function 112> BS ^ L pL pH fn a bx by c xL xH yL yH d1...dk   (fn=112)

[Format]   ASCII   BS   ^   L   pL pH fn a bx by c xL xH yL yH d1...dk
           Hex   08   5E 4C   pL pH fn a bx by c xL xH yL yH d1...dk
           Decimal   08   94 76   pL pH fn a bx by c xL xH yL yH d1...dk

[Range]   ▪ BS ^ L parameter
           11 ≤ (pL + pH x 256) ≤ 65535 (0 ≤ pL ≤ 255, 0 ≤ pH ≤ 255)
           fn=112, a=48
           bx=1, 2
           by=1, 2
           c=49
           1 ≤ (xL + xH x 256) ≤ 1024
           1 ≤ (yL + yH x 256) ≤ 1200 (when by = 1)

           k = (int ((xL + xH x 256) + 7) / 8) x (yL + yH x 256)

[Description]   ▪ Stores the raster graphics data, enlarged by bx and by in the horizontal and vertical directions to the print buffer.
           - xL, xH specifies the raster graphics data in the horizontal direction as (xL + xH x 256) dots.
           - yL, yH specifies the raster graphics data in the vertical direction to (yL + yH x 256) dots.
           - c specifies the color of the defined data.

c	Printing color
49	Color 1

- Color 1 means black

[Notes]   ▪ In standard mode, each color can be defined only once.

GS (k pL pH cn fn   [parameter]

[Name]   Specify and print the symbol.

[Description] ▪ Processes the data concerning two-dimensional code.
         - Symbol type is specified by cn.
         - Function is specified by fn.

cn	Type of Symbol
48	PDF417 (2-dimensional code)
49	QR CODE (2-dimensional code)
50	MAXI CODE(2-dimensional code)
51	DATAMATRIX(2-dimensional code)

cn	fn		Function
48	65	Function 065	PDF417 : Specify the number of columns
	66	Function 066	PDF417 : Specify the number of rows
	67	Function 067	PDF417 : Specify the width of module
	68	Function 068	PDF417 : Specify the module height
	69	Function 069	PDF417 : Specify the error correction level
	70	Function 070	PDF417 : Specify the option
	80	Function 080	PDF417 : Store the received data in the symbol save area
	81	Function 081	PDF417 : Print the symbol data in the symbol save area
	82	Function 082	PDF417 : Send the size information of the symbol data in the symbol save area
49	65	Function 165	QR CODE: module selection
	67	Function 167	QR CODE: module size selection
	69	Function 169	QR CODE: error level setting
	80	Function 180	QR CODE: saving of symbol data in storage area
	81	Function 181	QR CODE: printing of symbol data saved in storage area
	82	Function 182	QR CODE: transmission of size information of symbol data saved in storage area
50	65	Function 265	MAXI CODE: mode selection
	80	Function 280	MAXI CODE: saving of symbol data in storage area
	81	Function 281	MAXI CODE: printing of symbol data saved in storage area
51	67	Function 367	DATAMATRIX: module size selection
	80	Function 380	DATAMATRIX: saving of symbol data in storage area
	81	Function 381	DATAMATRIX: printing of symbol data saved in storage area

[Notes]   <u>For PDF417 symbol data (when cn=48)</u>

▪ The symbol data specified by Function 080 d1...dk is stored in the printer and is printed by the specification of Function 081. The symbol data in the save area is reserved until the following processing is performed:

  - Function 080 is executed
  - ESC @ is executed
  - The printer is reset or the power is turned off

▪ When processing Function 081 or 082, the setting values of Functions 065 to 070 are used. If the printable area is not large enough, the symbol may not be printed.

▪ Executing Function 081 after executing Function 080 repeatedly prints the same symbol data.

▪ By using Functions 065 to 070 combined with Function 081, the same symbol data d1...dk is printed differently.

▪ By using Function 082, the symbol size printed by Function 081 is available.

<u>QRCODE Symbol Data (cn = 49)</u>

▪ Symbol data is saved according to <Function 180> and printed according to <Function 181>. The symbol data in the storage area is saved until the following actions:

  - Execution of Function 180
  - Execution of ESC @
  - Turn off printer power

▪ When either Function 181 or Function 182 is executed, the setting values of Functions 165~169 are used. If the printable area is insufficient in size, the symbol data is not printed.

▪ According to the settings of <Function 165> to <Function 169>, <Function 181> has and prints the same data d1….dk.

▪ <Function 182> uses the size printed by <Function 181>.

<u>MAXI CODE Symbol Data (cn = 50)</u>

▪ Symbol data is saved according to <Function 280> and printed according to <Function 281>. The symbol data in the storage area is saved until the following actions:

   - Execution of Function 280
   - Execution of ESC @
   - Turn off printer power

▪ When either <Function 281> or <Function 282> is executed, the setting value of <Function 265> is used.

<u>DATAMATRIX Symbol Data (cn=51)</u>

▪ Symbol data is saved according to <Function 380> and printed according to <Function 381>. The symbol data in the storage area is saved until the following actions:
   - Execution of Function 380
   - Execution of ESC @
   - Turn off printer power

▪ When <Function 381> is executed, the setting value of <Function 367> is used.

<Function 065> GS (k pL pH cn fn n   (fn=65)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n
	Hex	1D	28	6B	03	00	30	41	n
	Decimal	29	40	107	3	0	48	65	n

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=48,   fn=65
0 ≤ n ≤ 30

[Default]   n=0

[Description] Specifies the number of columns of the data area of PDF417.
- n=0 specifies auto processing
- When n is not 0, specifies the number of columns of the data area as n code word.

[Notes]   ▪ Settings of this function affect the processing of Functions 081 and 082.
▪ When auto processing (n=0) is specified, the maximum number of columns in the data area is 30 columns.
▪ The following data is not included in the number of columns :
- Start pattern and stop pattern
- Indicator code word of left and right
▪ When auto processing (n=0) is specified, the number of columns is calculated by the printing area when processing Functions 081, 082, module width (Function 067), and option setting (Function 070).
▪ This function is effective until ESC @ is executed, the printer is reset, or the power is turned off.

<Function 066> GS (k pL pH cn fn n   (fn=66)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n
	Hex	1D	28	6B	03	00	30	42	n
	Decimal	29	40	107	3	0	48	66	n

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=48,   fn=66
n=0, 3 ≤ n ≤ 90

[Default]   n=0

[Description] Specifies the number of rows of data area of PDF417.
- n=0 specifies auto processing
- When n is not 0, specifies the number of rows of the symbol as n rows.

[Notes]   ▪ Settings of this function effect the processing of Functions 081 and 082.
▪ When auto processing (n=0) is specified, the maximum number of rows is 90.
▪ When auto processing (n=0) is specified, the number of rows is calculated by the printing area when processing Functions 081, 082, module height (Function 068).
▪ This function is effective until ESC @ is executed, the printer is reset, or the power is turned off.

| <Function 067> GS (k pL pH cn fn n   (fn=67) |

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n
	Hex	1D	28	6B	03	00	30	43	n
	Decimal	29	40	107	3	0	48	67	n

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
               cn=48
               fn=67
               2 ≤ n ≤ 3

[Default]   n=3

[Description] Specifies the width of a module of PDF417 symbol.

[Notes]   ▪ Settings of this function affect the processing of Functions 081 and 082.
               ▪ The setting unit differs, depending on the printer models.
               ▪ This function is effective until ESC @ is executed, the printer is reset, or
                 the power is turned off.

| <Function 068> GS (k pL pH cn fn n   (fn=68) |

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n
	Hex	1D	28	6B	03	00	30	44	n
	Decimal	29	40	107	3	0	48	68	n

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
               cn=48
               fn=68
               2 ≤ n ≤ 8

[Default]   n=3

[Description] Specifies the module height of PDF417 symbol.
                  - Specify the height to [a module width x n].

[Notes]   ▪ Settings of this function affect the processing of Functions 081 and 082.
               ▪ This function is effective until ESC @ is executed, the printer is reset, or
                 the power is turned off.

<Function 069> GS (k pL pH cn fn m n   (fn=69)

[Format]	ASCII	GS	(	k	pL	pH	Cn	fn	m	n
	Hex	1D	28	6B	04	00	30	45	m	n
	Decimal	29	40	107	4	0	48	69	m	n

[Range]   (pL + pH x 256) = 4 (pL=4, pH=0)
cn=48
fn=69
m=48
$48 \leq n \leq 8$ [m=48]

[Default]   n=1

[Description]   Specifies the error correction level of PDF417.

M	Function
48	The error correction level is specified by "level"

[Notes]   ▪ Settings of this function affect the processing of Functions 081 and 082.
▪ Error correction level is specified by "level".
▪ Error correction level specified by "level" (m=48) is as follows:
The number of the error correction code word is fixed regardless of the number of code words in the data area.

M	Function	Number of error correction code word
48	Error correction level 0	2
49	Error correction level 1	4
50	Error correction level 2	8
51	Error correction level 3	16
52	Error correction level 4	32
53	Error correction level 5	64
54	Error correction level 6	128
55	Error correction level 7	256
56	Error correction level 8	512

<Function 070> GS (k pL pH cn fn m   (fn=70)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m
	Hex	1D	28	6B	03	00	30	46	m
	Decimal	29	40	107	3	0	48	70	m

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=48
fn=70
m=0,1

[Default]   m=0

[Description]   Set or cancels the option of PDF417.

M	Function
0	Cancels the processing of simplified PDF417 symbol.
1	Sets the processing of simplified PDF417 symbol.

- m=0 cancels the processing of simplified PDF417 symbol.
- m=1 sets the processing of simplified PDF417 symbol.

[Notes]   ▪ Settings of this function affect the processing of Functions 081 and 082.
▪ When simplified PDF417 symbol is canceled, standard PDF417 symbol is automatically selected.
▪ This function is effective until ESC @ is executed, the printer is reset, or the power is turned off.

<Function 080> GS (k pL pH cn fn m d1...dk   (fn=80)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m	d1...dk
	Hex	1D	28	6B	pL	pH	30	50	30	d1...dk
	Decimal	29	40	107	pL	pH	48	80	48	d1...dk

[Range]   4 ≤ (pL + pH x 256) ≤ 65535 (0 ≤ pL ≤ 255, 0 ≤ pH ≤ 255)
cn=48
fn=80
m=48
0 ≤ d ≤ 255
k = (pL + pH x 256) - 3

[Description]   Stores the PDF417 symbol data (d1...dk) in the symbol save area.

[Notes]   ▪ Data stored in the symbol save area by this function are processed by Function 081 and 082. The data in the symbol save area are reserved after processing Function 081 or 082.
▪ k bytes of d1...dk are processed as symbol data.
▪ Specify only the data code word of the symbol with this function. Do not include the following data in the data d1..dk as this information is automatically added by the printer:
  - Start pattern and stop pattern.
  - Indicator code word of left and right.
  - The descriptor of symbol length. (the first code word in the data area)
  - The error correction code word calculated by modulus 929.
▪ This function is effective until the following processing is performed:
  - Function 080 or 180 is executed.
  - ESC @ is executed.
  - The printer is reset or the power is turned off.

<Function 081> GS (k pL pH cn fn m   (fn=81)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m
	Hex	1D	28	6B	03	00	30	51	m
	Decimal	29	40	107	3	0	48	81	m

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=48
fn=81
m=48

[Description]   Encodes and prints the PDF417 symbol data in the symbol save area.

[Notes]   ▪ In standard mode, use this function when printer is "at the beginning of a line," or "there is no data in the printer buffer."
▪ A symbol with a size that exceeds the printing area can not be printed.
▪ If there is any error described below in the data of the symbol save area, it cannot be printed.
  - There is no data (Function 080 is not processed).
  - If [(number of columns x number of rows) < number of code word] when auto processing is specified for number of columns and number of rows.
  - Number of code word exceeds 928 in the data area.

▪ The following data is added automatically by the encode processing:
  - Start pattern and stop pattern.
  - Indicator code word of left and right.
  - The descriptor of symbol length. (the first code word in the data area)
  - The error correction code word calculated by modulus 929.
  - Pad codeword.
▪ The data area includes the following code words:
  - Data specified by Function 080.
  - The descriptor of symbol length. (the first code word in the data area)
  - The error correction code word calculated by modulus 929.
  - Pad codeword.
▪ When auto processing (Function 065) is specified, the number of columns is calculated by the current printing area, module width (Function 067), option setting (Function 070), and the code word in the data area. The maximum number of columns is 30.
▪ When auto processing (Function 066) is specified in page mode, the number of rows is calculated by the current printing area, module height (Function 068), and the code word in the data area. The maximum number of rows is 90.
▪ Printing of symbol is not affected by print mode (emphasized, double-strike, underline, white/black reverse printing, or 90° clockwise-rotated), except for character size and upside-down printing mode.
▪ In standard mode, this command executes paper feeding for the amount needed for printing the symbol, regardless of the paper feed amount set by the paper feed setting command. The printing position returns to the left side of the printable area after printing the symbol, and printer is in the status "beginning of the line," or " there is no data in the print buffer."
▪ In page mode, the printer stores the symbol data in the print buffer without executing actual printing. The printer moves printing position to the next dot of the last data of the symbol.
▪ The quiet zone is not included in the printing data. Be sure to include the quiet zone when using this function.

<Function 082> GS (k pL pH cn fn m   (fn=82)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m
	Hex	1D	28	6B	03	00	30	52	m
	Decimal	29	40	107	3	0	48	82	m

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=48
fn=82
m=48

[Description] Encodes and sends size information of the PDF417 symbol data in the symbol save area.

[Notes]   ▪ In standard mode, use this function when the printer is "at the beginning of a line," or "there is no data in the printer buffer."

▪ The size information for each data is as follows:

Send data	Hex	Decimal	Data
Header	37H	55	1 byte
Flag	2FH	47	1 byte
Width	30H – 39H	48 – 57	1 – 5 byte
Separator	1FH	31	1 byte
Height	30H – 39H	48 – 57	1 – 5 byte
Separator	1FH	31	1 byte
Fixed value	31H	49	1 byte
Separator	1FH	31	1 byte
Other information	30H or 31H	48 or 49	1 byte
NUL	00H	0	1 byte

▪ Description of the width and height of the data sent:
  - The height and width values of the symbol data are in dot units.

▪ Description of the other information data sent:

Hex	Decimal	Condition
30H	48	Printing is possible
31H	49	Printing is impossible

▪ This command does not print the PDF417 symbols.

▪ Users must consider the quiet zone for the PDF417 symbols (upward and downward spaces and left and right spaces for the PDF417 symbols specified in the specifications for the PDF417 symbols.)

| <Function 165> GS (k pL pH cn fn n1 n2   (fn=65) |

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n1	n2
	Hex	1D	28	6B	04	00	31	41	n1	0
	Decimal	29	40	107	3	0	49	65	n1	0

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
              cn=49
              fn=65
[Defaults]   n1 = 49, 50
              n2 =0
              n1=50, n2 =0

[Description] Sets the QR code model

N1	Function
49	Model 1
50	Model 2

[Notes]

▪ The setting of this function impacts <Function 181> and <Function 182>.
▪ This function is effective until ESC @ is executed or the printer power is turned off.

| <Function 167> GS (k pL pH cn n   (fn=67) |

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n
	Hex	1D	28	6B	03	00	31	43	n
	Decimal	29	40	107	3	0	49	67	n

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
              cn=49
              fn=67
              0<=n<9

[Default]   n=3

[Description] Sets the size of the QR code module
▪ It impacts the execution of <Function 181> and <Function 182>.
▪ This function is effective until ESC @ is executed or the printer power is turned off.
▪ n becomes the value for the module width and height.
  (The QR CODE module is square-shaped.)

<Function 169> GS (k pL pH cn n   (fn=69)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n
	Hex	1D	28	6B	03	00	31	45	n
	Decimal	29	40	107	3	0	49	69	n

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=49
fn=69
48≤n≤51

[Default]   n=48

[Description]   Sets the error correction level of the QR code

N	Function	Recovery Amount (%)
48	Error Correction Level L	7
49	Error Correction Level M	15
50	Error Correction Level Q	25
51	Error Correction Level H	30

▪ The setting of this function impacts the execution of <Function 181> and
<Function 182>.
▪ This function is effective until ESC @ is executed or the printer power is
turned off.
▪ For correction with regard to the continuous error correction of the QR
code, the Reed-Solomon correction method is used.

<Function 180> GS (k pL pH cn fn m d1...dk   (fn=80)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m	d1...dk
	Hex	1D	28	6B	pL	pH	31	50	30	d1...dk
	Decimal	29	40	107	pL	pH	49	80	48	d1...dk

[Range] $4 \leq (pL + pH \times 256) \leq 7092$ $(0 \leq pL \leq 255, 0 \leq pH \leq 27)$
cn=49
fn=80
m=48
$0 \leq d \leq 255$
$k = (pL + pH \times 256) - 3$

[Description] Saves symbol data of the QR CODE to the symbol storage area

[Notes]   ▪ Execution of this command saves data to the data storage area and
                 executes Functions 181 and 182.   Following execution of Functions 181
                 and 182, the data remains saved in the symbol storage area.
               ▪ k byte represents the symbol data of d1...dk.

Character Type	Usable Characters
Numeric Data	"0" ~ "9"
Alphanumeric Data	"0" ~ "9", "A" ~ "Z", SP, $, %, *, +, -, ., /, :
Kanji Data	Shift JIS value
8bit Byte Data	00H ~ FFH

               ▪ The setting impacts the function until the following actions are carried out:
                 - Execution of Function 180
                 - Execution of ESC @
                 - Turning off of printer power

<Function 181> GS (k pL pH cn fn m (fn=81)								
[Format]	ASCII	GS	(	k	pL	pH	cn	fn	M
	Hex	1D	28	6B	03	00	31	51	M
	Decimal	29	40	107	3	0	49	81	M

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=49
fn=81
m=48

[Description]   Encodes and prints QR CODE symbol data saved in the storage area

[Notes]   ▪ This function is used in regular mode when the printer is at the first line or
no data is present in the printer buffer.
▪ If the size of any one symbol is larger than the print area, printing cannot
be done:
▪ If any of the following errors is present in the symbol storage area, printing
cannot be done.
- There is no data. (Function 180 cannot be executed)
- If [(number of columns x number of rows) < number of code words], the
numbers of columns and rows are automatically processed.
- The four types of data compression mode are as follows:
*Numeric Data Code
*Alphanumeric Data mode
*Kanji Data mode
*8 bit Data mode

Note: According to the symbol data in the data storage area, automatic
conversion to optimal compression is done.

▪ The following data is automatically added during encoding:
- Position sensor pattern
- Segregator for the position sensor pattern
- Timing pattern
- Format information
- Version information
- Error correction code text
- Pad code text
- Indicator for counting bits of bytes
- Mode indicator
- Concluder
- Queue pattern (when model 2 is selected)
- Expansion pattern (when model 1 is selected)
▪ During symbol printing, the printer mode has no effect (bold, underline,
reverse direction, contrast).
▪ In regular mode, this command supplies enough paper required for
symbol printing. If the paper supply is not sufficient, the paper supply
command is executed. When printing, the printing position is to the left
of the print area. After symbol printing, the printer returns to the start
position of the line, and the buffer is emptied.

<Function 182> GS (k pL pH cn fn m (fn=82)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m
	Hex	1D	28	6B	03	00	31	52	m
	Decimal	29	40	107	3	0	49	82	m

[Range] (pL + pH x 256) = 3 (pL=3, pH=0)
cn=49
fn=82
m=48

[Description] ▪ Transmits size information of the QR CODE symbols encoded via Function 180 to the host

▪ In regular mode, this function is executed when the printer is on standby or the buffer is empty.

▪ The information size of each data item is as follows:

Transmission Data	Hex	Decimal	Data
Header	37H	55	1 byte
Flag	36H	54	1 byte
Width	30H – 39H	48 – 57	1 – 5 byte
Separator	1FH	31	1 byte
Height	30H – 39H	48 – 57	1 – 5 byte
Separator	1FH	31	1 byte
Fixed Value	31H	49	1 byte
Separator	1FH	31	1 byte
Other Information	30H or 31H	48 or 49	1 byte
NUL	00H	0	1 byte

▪ Description of Width & Height Transmission Data
  - Height and width are dot unit values for symbol data.

▪ Description of Other Information

Hex	Decimal	Condition
30H	48	Can be printed
31H	49	Cannot be printed

▪ The user quiet zone is not included in size information.

<Function 265> GS (k pL pH cn fn n1 n2   (fn=65)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	n1	n2
	Hex	1D	28	6B	04	00	32	41	n1	0
	Decimal	29	40	107	3	0	50	65	n1	0

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
cn=50
fn=65
$50 \leq n \leq 52$

[Default]   n = 50

[Description]   Maxi Code Mode Settings

n	Function
50	Mode 2 Setting
51	Mode 3 Setting
52	Mode 4 Setting

[Notes]   ▪ The setting of this function impacts <Function 281> and <Function 282>.
▪ This function is effective until ESC @ is executed or the printer power is turned off.

<Function 280> GS (k pL pH cn fn m d1...dk   (fn=80)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m	d1...dk
	Hex	1D	28	6B	pL	pH	32	50	30	d1...dk
	Decimal	29	40	107	pL	pH	5	50	48	d1...dk

[Range] $4 \leq (pL + pH \times 256) \leq 141$ ($4 \leq pL \leq 141$, $0 \leq pH \leq 0$)
cn=50
fn=80
m=48
$0 \leq d \leq 255$
$k = (pL + pH \times 256) - 3$

[Description]   Saves MAXI CODE symbol data in the symbol storage area

[Notes]   ▪ Execution of this command saves data to the data storage area and executes Functions 281 and 282.   Following execution of Functions 281 and 282, the data remains saved in the symbol storage area.
▪ k byte represents the symbol data of d1...dk.
▪ The setting impacts the function until the following actions are carried out:
  - Execution of Function 280
  - Execution of ESC @
  - Turning off of printer power

<Function 281> GS (k pL pH cn fn m   (fn=81)

[Format]   ASCII   GS   (k   pL   pH   cn   fn   m
             Hex   1D   28   6B   03   00   32   51   m
             Decimal   29   40   107   3   0   50   81   m

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
             cn=50
             fn=81
             m=48

[Description]   Encodes and prints QR CODE symbol data saved in the storage area

[Notes]   ▪ This function is used in regular mode when the printer is at the first line or
               no data is present in the printer buffer.

             ▪ If the size of any one symbol is larger than the print area, printing cannot
               be done.

             ▪ If any of the following errors is present in the symbol storage area, printing
               cannot be done.
               - There is no data. (Function 280 cannot be executed)
               - The number of numeric characters exceeds 138.
               - The number of alphanumeric characters exceeds 93.
               - When mode 2 is selected, the primary message does not include all of
                 the following:

Primary Message	Data Number	Character
Postal Code	1~9	Numeric
ISO Country Code	1~3	Numeric
Service Type Code	1~3	Numeric

               - When mode 3 is selected, the primary message does not include all of
                 the following:

Primary Message	Data Number	Character
Postal Code	1~6	Setting Code A
ISO Country Code	1~3	Numeric
Service Type Code	1~3	Numeric

             ▪ Modes 2 and 3 are executed according to the following procedures:
              (RS, GS indicate the control code of MAXI CODE.   y indicates the 2byte
                numeric data.)
                  a) 9 byte data including ”[]>”,”RS”,”01”,”GS”,”yy” are regarded as the
                     Header.
                      - The next data item after the Header is the Primary Message.
                      - When printing, the Header is inserted at the beginning of the
                        Secondary Message.
                  b) When Header data is absent, the Primary Message is regarded as
                     the first data item.
                  c) In the Primary Message, GS is regarded as the separator that divides

the postal code, ISO country code, and service type code.   The GS text is ignored.
d) All data of the Secondary Message is regarded as symbol data.

▪ Mode 4 does not distinguish between the Primary Message and the Secondary Message.

▪ In the detection and correction of errors, MAXI CODE uses the Reed-Solomon algorithm.

▪ The following data is automatically added during the encoding process:
- Position sensor pattern
- Position pattern
- Error correction code text
- Mode separator
- Pad code text

▪ During symbol printing, the printer mode has no effect (bold, underline, reverse direction, contrast).

▪ In regular mode, this command supplies enough paper required for symbol printing. If the paper supply is not sufficient, the paper supply command is executed. When printing, the printing position is to the left of the print area. After symbol printing, the printer returns to the start position of the line, and the buffer is emptied.

| <Function 367> GS (k pL pH cn n   (fn=67) | | | | | | | | |

[Format]

ASCII	GS	(	k	pL	pH	cn	fn	n
Hex	1D	28	6B	03	00	33	43	n
Decimal	29	40	107	3	0	51	67	n

[Range] (pL + pH x 256) = 3 (pL=3, pH=0)
cn=51
fn=67
$2<=n<7$

[Default] n=3

[Description] Sets the DATAMATRIX code size
▪ It impacts the execution of <Function 381>.
▪ This function is effective until ESC @ is executed or the printer power is turned off.
▪ n becomes the value for the module width and height.
  (The DATAMATRIX module is square-shaped.)

<Function 380> GS (k pL pH cn fn m d1...dk   (fn=80)

[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m	d1...dk
	Hex	1D	28	6B	pL	pH	32	50	30	d1...dk
	Decimal	29	40	107	pL	pH	5	50	48	d1...dk

[Range] $0 \le (pL + pH \times 256) \le 3116$ $(0 \le pL \le 255, 0 \le pH \le 13)$
cn=51
fn=80
m=48
$0 \le d \le 255$
$k = (pL + pH \times 256) - 3$

[Description] Saves DATAMATRIX symbol data to the symbol storage area

[Notes] ▪ Execution of this command saves data to the data storage area and executes Function 281. Following execution of Function 281, the data remains saved in the symbol storage area.

▪ k byte represents the symbol data of d1...dk.

▪ The setting impacts the function until the following actions are carried out:
 - Execution of Function 380
 - Execution of ESC @
 - Turning off of printer power

<Function 381> GS (k pL pH cn fn m (fn=81)								
[Format]	ASCII	GS	(	k	pL	pH	cn	fn	m
	Hex	1D	28	6B	03	00	33	51	m
	Decimal	29	40	107	3	0	51	81	m

[Range]   (pL + pH x 256) = 3 (pL=3, pH=0)
               cn=51
               fn=81
               m=48

[Description]   Encodes and prints DATAMATRIX symbol data saved in the storage area

[Notes]

▪ This function is used in regular mode when the printer is at the first line or no data is present in the printer buffer.

▪ If the size of any one symbol is larger than the print area, printing cannot be done.

▪ If any of the following errors is present in the symbol storage area, printing cannot be done:
   - There is no data. (Function 380 cannot be executed)
   - The number of alphanumeric characters exceeds 2334.
   - The number of 8bit byte characters exceeds 1558.
   - The number of numeric characters exceeds 3116.

▪ DATAMATRIX uses ECC 200 symbols.

▪ In the detection and correction of errors, DATAMATRIX uses the Reed-Solomon algorithm.

▪ The following data is automatically added during the encoding process:
   - Position pattern
   - Error correction code text
   - Mode separator
   - Pad code text

▪ During symbol printing, the printer mode has no effect (bold, underline, reverse direction, contrast).

▪ In regular mode, this command supplies enough paper required for symbol printing. If the paper supply is not sufficient, the paper supply command is executed. When printing, the printing position is to the left of the print area. After symbol printing, the printer returns to the start position of the line, and the buffer is emptied.

GS :

[Name]   Start/end macro definition.

[Format]

ASCII	GS	:
Hex	1D	3A
Decimal	29	58

[Description]   ▪ Starts or ends macro definition.
-    The contents of the macro can be defined up to 2048 bytes.

GS B n

[Name]   Turns white/black reverse printing mode on / off.

[Format]

ASCII	GS	B	n
Hex	1D	42	n
Decimal	29	66	n

[Range]   0 ≤ n ≤ 255

[Default]   n=0

[Description]   ▪ Turns white/black reverse printing mode on or off.
- When the LSB of n is 0, white/black reverse mode is turned off.
- When the LSB of n is 1, white/black reverse mode is turned on.

GS H n

[Name]	Selects the printing position of HRI characters.

[Format]

	ASCII	GS	H	n
	Hex	1D	48	n
	Decimal	29	72	n

[Range]　　　0 ≤ n ≤ 3, 48 ≤ n ≤ 51

[Default]　　　n=0

[Description]　▪ Selects the printing position of HRI characters when printing a bar code.
　　　　　　　- n selects the execution of printing and the printing position as follows:

n	Printing position
0, 48	Not printed.
1, 49	Above the bar code.
2, 50	Below the bar code.
3, 51	Both above and below the bar code.

GS I b

[Name]	Transmits battery status.

[Format]

	ASCII	GS	I	b
	Hex	1D	49	62
	Decimal	29	73	98

[Description]　Transmits the battery power status of the printer

[Notes]　　　The transmitted battery status from this printer is constructed by [Header ~ NUL] as shown in the table below.

Transmitted data	Hex	Decimal	Amount of data
Header	37H	55	1byte
Identifier	45H	69	1byte
Battery remaining	30h-34H	48-52	1byte
NUL	00H	0	1byte

"Battery remaining amount" is as indicated in the following table:

Battery remaining amount		Information
Hex	Decimal	
30H	48	Battery remaining amount : H level
31H	49	Battery remaining amount : M level
32H	50	Battery remaining amount : L level
33H	51	Battery remaining amount : S level

▪ You can confirm the battery remaining amount by looking at the battery LED.
▪ When battery remaining amount is S level, the red LED of battery LED is blinking.
• This command following DLE can be executed in real-time command mode.

GS I n

[Name]   Transmits printer ID.

[Format]

	ASCII	GS	I	n
	Hex	1D	49	n
	Decimal	29	73	n

[Range]   1 ≤ n ≤ 69,

[Description]   ▪ Transmits the printer ID specified.
- Transmits 1 byte of printer ID, using n as follows:

n	Printer ID	ID
1,49	Printer model ID	65
2,50	Type ID	0(2byte character is not supported) or 1(2byte character is supported)
3, 51	Version ID	111

- Transmits specified printer information, using n as follows:

n	Printer ID type	ID
65	Firmware version	Depends on firmware version
66	Manufacturer	Zebra
67	Printer name	EM 220
69	Font of Language for each country	Chinese : GB2312 or BIG5 Korea n : KS-5601 Japanese : SHIFT-JIS Each default code page

-Printer information (When n = 65, 66, 67, 69) consist of[Header ~ NULL] as Shown in the following table:

Transmitted data	Hex	Decimal	Amount of data
Header	5FH	95	1byte
Printer information	Depends on the model	Depends on the model	1byte
NUL	00H	0	1byte

• This command following DLE can be executed in real-time command mode.


GS L nL nH

[Name]	Set left margin.			
[Format]	ASCII	GS	L	nL	nH
	Hex	1D	4C	nL	nH
	Decimal	29	76	nL	nH

[Range]   0 ≤ nL ≤ 255, 0 ≤ nH ≤ 255

[Default]   (nL + nH x 256)=0 (nL=0, nH=0)

[Description]   ▪ Sets the left margin specified by nL and nH.
  - The left margin is [(nL + nH x 256) x (horizontal motion units)].

Printable area

Left margin   Printing area width
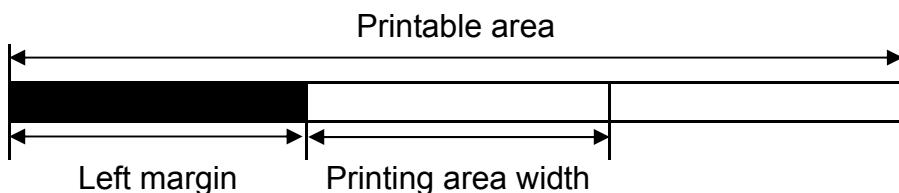
GS W nL nH

[Name]	Set printing area width.			
[Format]	ASCII	GS	W	nL	nH
	Hex	1D	57	nL	nH
	Decimal	29	87	nL	nH
[Range]	0 ≤ nL ≤ 255, 0 ≤ nH ≤ 255			
[Default]	(nL + nH x 256)=384 (nL=128, nH=1) (for 58mm of the paper width)			

[Description]   ▪ Sets the printing area width specified with nL and nH.
  - The printing area width is [(nL + nH x 256) x (horizontal motion units)].

Printable area

Left margin   Printing area width
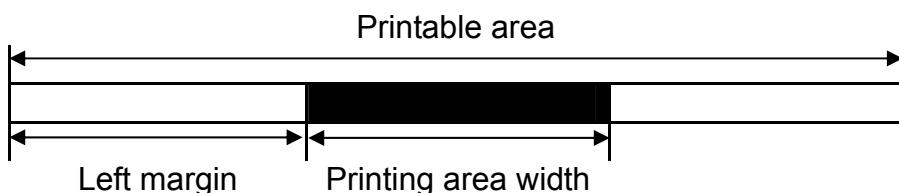
GS \ nL nH

[Name]	Set relative vertical print position in page mode.			
[Format]	ASCII	GS	\	nL	nH
	Hex	1D	5C	nL	nH
	Decimal	29	92	nL	nH

[Range]   0 ≤ nL ≤ 255, 0 ≤ nH ≤ 255

[Description]   ▪ Sets the relative vertical print starting position from the current position in page mode. The distance from the current position to the starting position is [(nL + nH x 256) x (vertical or horizontal motion units)].

GS ^ r t m

[Name]   Execute macro.

[Format]

ASCII	GS	^	r	t	m
Hex	1D	5E	r	t	m
Decimal	29	94	r	t	m

[Range] $0 \le r \le 255$
               $0 \le t \le 255$
               m=0, 1

[Description]   ▪ Executes a macro.
           - r specifies the number of times to execute the macro.
           - t specifies the waiting time for executing the macro.
           - m specifies macro executing mode from the table below.

m	Function
0	Executes the macro r times at the interval specified by t.
1	After waiting for the time specified by t, the FEED button must be pressed. After the button is pressed, the macro is executed once. This operation is then repeated r times.

GS f n

[Name]   Select font for HRI characters.

[Format]

ASCII	GS	f	n
Hex	1D	66	n
Decimal	29	102	n

[Range]   n=0, 1, 48, 49

[Default]   n=0

[Description]   ▪ Selects a font for the HRI characters used when printing a bar code.
           - n specifies the font of the HRI characters as follows:

n	Font
0, 48	Font A (12 x 24)
1, 49	Font B (9 x 17)

GS h n

[Name]   Selects bar code height.

[Format]

ASCII	GS	h	n
Hex	1D	68	n
Decimal	29	104	n

[Range] $1 \le nL \le 255$
[Default]   n=162
[Description]   ▪ Selects the height of the bar code as n dots.

① GS k m d1...dk NUL
② GS k m n d1...dn

[Name]   Print bar code.

[Format]

①	ASCII	GS	k	m	d1...dk	NUL
	Hex	1D	6B	m	d1...dk	NUL
	Decimal	29	107	m	d1...dk	NUL
②	ASCII	GS	k	m	n	d1...dn
	Hex	1D	6B	m	n	d1...dn
	Decimal	29	107	m	n	d1...dn

[Range]   ① $0 \leq m \leq 6$ (k and d depend on the bar code system used)

           ② $65 \leq m \leq 73$ (n and d depend on the bar code system used)

[Description] ▪ Selects a bar code system and prints the bar code.

For ①

m	Bar Code System	Range of k	Range of d
0	UPC-A	$11 \leq k \leq 12$	$48 \leq d \leq 57$
1	UPC-E	$11 \leq k \leq 12$	$48 \leq d \leq 57$
2	JAN13(EAN)	$12 \leq k \leq 13$	$48 \leq d \leq 57$
3	JAN8(EAN)	$7 \leq k \leq 8$	$48 \leq d \leq 57$
4	CODE39	$1 \leq k$	$48 \leq d \leq 57$, $65 \leq d \leq 90$, d=32,36,37,43,45,46,47
5	ITF	$1 \leq k$ (even number)	$48 \leq d \leq 57$
6	CODABAR	$1 \leq k$	$48 \leq d \leq 57$, $65 \leq d \leq 68$, d=36,43,45,46,47,58

For ②

m	Bar Code System	Range of k	Range of d
65	UPC-A	$11 \leq n \leq 12$	$48 \leq d \leq 57$
66	UPC-E	$11 \leq n \leq 12$	$48 \leq d \leq 57$
67	JAN13(EAN)	$12 \leq n \leq 13$	$48 \leq d \leq 57$
68	JAN8(EAN)	$7 \leq n \leq 8$	$48 \leq d \leq 57$
69	CODE39	$1 \leq n \leq 255$	$48 \leq d \leq 57$, $65 \leq d \leq 90$, d=32,36,37,43,45,46,47
70	ITF	$1 \leq n \leq 255$ (even number)	$48 \leq d \leq 57$
71	CODABAR	$1 \leq n \leq 255$	$48 \leq d \leq 57$, $65 \leq d \leq 68$, d=36,43,45,46,47,58
72	CODE93	$1 \leq n \leq 255$	$0 \leq d \leq 127$
73	CODE128	$2 \leq n \leq 255$	$0 \leq d \leq 127$

[Notes]   ▪ The user must consider the quiet zone of the bar code (left and right spaces of the bar code)

GS r n

| [Name] | Transmit status. |

[Format]

	ASCII	GS	r	n
	Hex	1D	72	n
	Decimal	29	114	n

[Range]   n=1, 2, 49, 50

[Description] ▪ Transmits the normal status specified by n as follows:

n	Function
1, 49	Transmits paper sensor status.

▪ Paper sensor status (n=1, 49) :

Bit	Off/On	Hex	Decimal	Function
0, 1	Off	00	0	Reserved.
	On	03	3	Reserved.
2, 3	Off	00	0	Paper roll end sensor; paper present.
	On	0C	12	Paper roll end sensor; paper not present.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

  - Bits 2 and 3: This command can not be executed when the printer is offline due to the lack of paper. Therefore, the status of bit 2 (1) and bit 3 (1) is not transmitted.

• This command following DLE can be executed in real-time command mode.

GS v 0 m xL xH yL yH d1...dk

| [Name] | Print raster bit image. |

[Format]

	ASCII	GS	v	0	M	xL	xH	yL	yH	d1...dk
	Hex	1D	76	30	M	xL	xH	yL	yH	d1...dk
	Decimal	29	118	48	M	xL	xH	yL	yH	d1...dk

[Range] $0 \leq m \leq 3$, $48 \leq m \leq 51$
$1 \leq (xL + xH \times 256) \leq 128$ $(0 \leq xL \leq 128, xh=0)$
$1 \leq (yL + yH \times 256) \leq 4095$ $(0 \leq yL \leq 255, 0 \leq yH \leq 15)$
$0 \leq d \leq 255$
$k = (xL + xH \times 256) \times (yL + yH \times 256)$

[Description] ▪ Prints a raster bit image in m mode.
    - m specifies the bit image mode.

m	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	203 dpi	203 dpi
1, 49	Double-width	203 dpi	203/2 dpi
2, 50	Double-height	203/2 dpi	203 dpi
3, 51	Quadruple	203/2 dpi	203/2 dpi

dpi : dots per 25.4mm {1"}

  - xL, xH specifies (xL + xH x 256) byte(s) in the horizontal direction for the bit image.
  - yL, yH specifies (yL + yH x 256) dot(s) in the vertical direction for the bit image.
  - d specifies the definition data of the bit image data.

GS w n

[Name]   Set bar code width.

[Format]

	ASCII	GS	w	n
	Hex	1D	77	n
	Decimal	29	119	n

[Range]   2 ≤ n ≤ 6 , n=3

[Description] ▪ Set the horizontal size of the bar code, using n as follows:

n	Multi-level Bar Code Module Width (mm)	Binary-level Bar Code	
		Thin element width (mm)	Thick element width (mm)
2	0.250	0.250	0.625
3	0.375	0.375	1.000
4	0.500	0.500	1.250
5	0.625	0.625	1.625
6	0.750	0.750	2.000

[Notes]   ▪ Multi-level bar codes are as follows:
        - UPC-A, UPC-E, JAN13, HAN8, CODE93, CODE128
       ▪ Binary-level bar codes are as follows:
        - CODE39, ITF, CODABAR

FS .

[Name]   Cancel Kanji character mode.

[Format]

	ASCII	FS	.
	Hex	1C	2E
	Decimal	28	45

[Range]   n=0

[Description] ▪ Cancels Kanji character mode.

FS &

[Name]   Select Kanji character mode.

[Format]

	ASCII	FS	&
	Hex	1C	26
	Decimal	28	38

[Description] ▪ Select Kanji character mode.

US L R	

[Name]	Change receipt mode.

[Format]	ASCII	US	L	R
	Hex	1F	4C	52
	Decimal	31	76	82

[Description] ▪ Change from label mode to receipt mode.
[Notes] ▪ The memory switch setting is changed.

US L L	

[Name]	Change label mode.

[Format]	ASCII	US	L	L
	Hex	1F	4C	4C
	Decimal	31	76	76

[Description] ▪ Change from receipt mode to Label mode.
[Notes] ▪ The memory switch setting is changed.

US L A	

[Name]	Execute auto calibration in label mode.

	ASCII	US	L	A
[Format]	Hex	1F	4C	41
	Decimal	31	76	65

[Description] ▪ Execute auto calibration in label mode.
[Notes] ▪ Store the value for the liner into NV memory during three-label feed process without printing.
▪ The leading edge of the label is positioned at the print line by the use of the stored value.