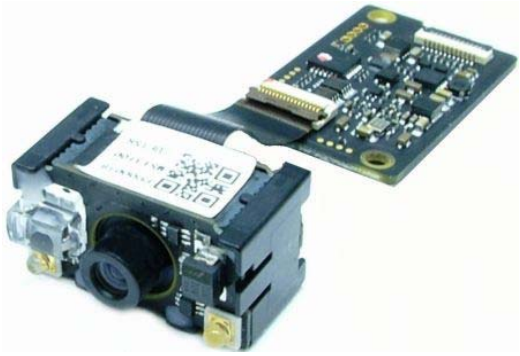
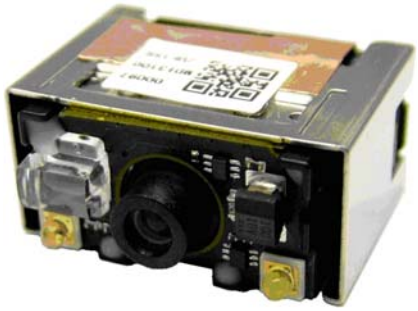
OPTICON

2D Scan Engine

MDI-3x00-Serial



MDI-3000



MDI-3100

This document provides the configuration specifications for the imager scan engine, MDI-3x00

Serial Interface Specifications Manual

All information subject to change without notice.

Document History

Model Number:	**MDI-3x00**	Specification Number:	**SI12017**
Edition:	**First**	Original Spec Number:	**SI11038**
Date:	**2012-09-28**		

Limited Warranty and Disclaimers

PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING OR USING THE PRODUCT.

Serial Number

A serial number appears on all Opticon products. This official registration number is directly related to the device purchased. Do not remove the serial number from your Opticon device. Removing the serial number voids the warranty.

Warranty

Unless otherwise agreed in a written contract, all Opticon products are warranted against defects in materials and workmanship for two years after purchase. Opticon will repair or, at its option, replace products that are defective in materials or workmanship with proper use during the warranty period. Opticon is not liable for damages caused by modifications made by a customer. In such cases, standard repair charges will apply. If a product is returned under warranty and no defect is found, standard repair charges will apply. Opticon assumes no liability for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

Packaging

The packing materials are recyclable. We recommend that you save all packing material to use should you need to transport your scanner or send it for service. Damage caused by improper packaging during shipment is not covered by the warranty.

Trademarks

Trademarks used are the property of their respective owners.
Opticon Inc. and Opticon Sensors Europe B.V. are wholly owned subsidiaries of OPTOELECTRONICS Co., Ltd., 12-17, Tsukagoshi 4-chome, Warabi-shi, Saitama, Japan 335-0002. TEL +81-(0) 48-446-1183; FAX +81-(0) 48-446-1184

SUPPORT

USA

Phone: 800-636-0090

Email: support@opticonusa.com

Web: www.opticonusa.com

Europe

Email: support@opticon.com

Web: www.opticon.com

Revision History

Specification No. : SI12017
Product name : MDI-3x00

Edition	Date	Page	Section	Description of Changes
First	2012/09/28	-	-	Initial release

Table of contents

1. Abstract

This document provides the configuration specifications for the MDI-3x00 imager scan engine (hereafter called “scan engine”).

2. Configuration

This chapter describes the details of how to configure the scan engine and save the settings.

The chapter contains:

2.1. Configuring with Menu Bar Codes

By scanning the menu bar code labels specially designed to configure the required functions, you can set up the scan engine to optimize its performance for your particular application.

The basic procedure is as follows:

Scan SET menu label (ZZ). The scan engine now enters menu mode.

↓

Select and scan the desired option (s).

Multiple menu labels can be read when you want to configure more than one options.

↓

Read END menu label (ZZ). All the settings are saved in non-volatile memory.

* Menu bar codes can be identified by an ID consisting of two to five alphanumeric characters. Menu bar codes have unique encoding specifications developed by OPTOELECTRONICS. Therefore, the scan engine will not acknowledge a menu bar code as a normal bar code.

Example of mnu bar codes

To return to serial interface default and enable startup buzzer (see 7.7.3):

Command	Description	2D Menu Code
ZZ	Start/End menu mode	
U2	Serial interface	
GC	Enable startup buzzer	
ZZ	Start/End Menu mode	

* A font specified by OPTOELECTRONICS needs to be installed to display 1D menu codes.

Some options among various settings are configurable using direct input numeric characters.

Example of numerical setting menu bar codes

Set good read buzzer frequency to 3500 Hz (See 7.7.2):

Command	Description	2D Menu Code
ZZ	Start/End menu mode	
DF0	Buzzer tone (frequency)	
Q3	3	
Q5	5	
Q0	0	
Q0	0	
ZZ	Start/End menu mode	

2.2. Configuring with 2D Menu Codes

A single 2D menu code can contain multiple setting menus and they are processed all at once.
Therefore, you can configure the scan engine with multiple settings by reading only one 2D menu code.

Data format:

@MENU_OPTO@ZZ@ MenuCommand 1@MenuCommand 2@ZZ@OTPO_UNEM@

“@MENU_OPTO”	(Start key)	
“@”	(Separator)	
“ZZ”	(Start menu)	
“@” “Any menu command”	(Separator) (U2 etc)	← Multiple sets allowed
“@”	(Separator)	
“ZZ”	(END menu)	
“@”	(Separator)	
“OTPO_UNEM@”	(Stop key)	

Examples of 2D menu code

Return to custom default (BAP)

Command	Description	2D Menu Code
BAP	Custom defualt	@MENU_OPTO@ZZ@BAP@ZZ@OTPO_UNEM@

Example of 2D multi-menu code

Return to serial interface default and enable startup buzzer (U2) (GC)

Command	Description	2D Menu Code
U2	Serial interface defualt	@MENU_OPTO@ZZ@U2@GC@ZZ@OTPO_UNEM@
GC	Enable startup buzzer	

* The of 2D menu format for Data Editing Programming differs from the above one (see 8.3 for details).
* For 2D menu code, use 2D codes (PDF417, QR code, etc.) typically used as they are.

Example of 2D numerical setting menu code

Set good read buzzer frequency to 3500 Hz (See 7.7.2):

Command	Description	2D Menu Code
DF0	Buzzer tone (frequency)	@MENU_OPTO@ZZ@DF0@Q3@Q5@Q0@Q0@ZZ@OTPO_UNEM@
Q3	3	
Q5	5	
Q0	0	
Q0	0	

➢ Disable 2D multi-menu bar code:

To enable/disable the processing of 2D multi menu codes, use the settings below.
It is recommended to set to 'Disable 2D multi menu bar code' when 2D menu codes are not used.

Item	Command	Description	Default
Enable/Disable 2D multi menu bar code	D1Y	Enable 2D multi menu bar code	○
	D1Z	Disable 2D multi menu bar code	

Command	Description	2D Menu Code
ZZ	Start/End menu mode	
D1Y	Enable 2D multi menu bar code	
D1Z	Disable 2D multi menu bar code	
ZZ	Start/End menu mode	

2.3. Configuring with Commands

By sending the commands via the serial interface, you can configure the function settings for the scan engine. The default command format is as shown below.

2.3.1. Command Format

The command format, from header to terminator, is defined as below, and the commands are executed in packets.

<table>
<tr><th>Command Header *2</th><th colspan="2">Command ID *1</th><th>Command Terminator *2</th></tr>
<tr><td rowspan="3"><ESC>
(1BH)</td><td>none</td><td>1 ~ 2 digits (ASCII)</td><td rowspan="3"><CR>
(ODH)</td></tr>
<tr><td>[(5BH)</td><td>3 digits (ASCII)</td></tr>
<tr><td>](5DH)</td><td>4 digits (ASCII)</td></tr>
</table>

*1 It is possible to send multiple command IDs between a single header and terminator, except for a single command (1-digit) IDs.
*2 A combination of command header <STX>(02H) and terminator <ETX>(03H) is also possible.

Input examples:

1-digit command	: <Esc>△<CR>
2-digit command	: <Esc>△△<CR>
3-digit command	: <Esc>[△△△<CR>
4-digit command	: <Esc>]△△△△<CR>
2 and 3 digits command	: <Esc>△△[△△△<CR>

2.3.2. Command Usage Precautions

When sending multiple commands in a sequence, the subsequent command is not received while the previous command is still being executed. Since the RTS output will be in busy state while a command is executed when the Handshake is set to BUSY/READY or MODEM, it is recommended to refer to this signal for the right timing.

Any settings configured by commands are not retained in the non-volatile memory. Therefore, these will be lost when the scan engine power is turned off. When the power comes back on, the scan engine will be in the configuration state saved in the non-volatile memory. In order to save the settings with commands, send “Z2” to save all the parameters in non-volatile memory.

Command packet maximum buffer size is 1000 characters.
If more characters than maximum limit are sent, lack of a part of command, etc. occurs and the execution will not be performed correctly.

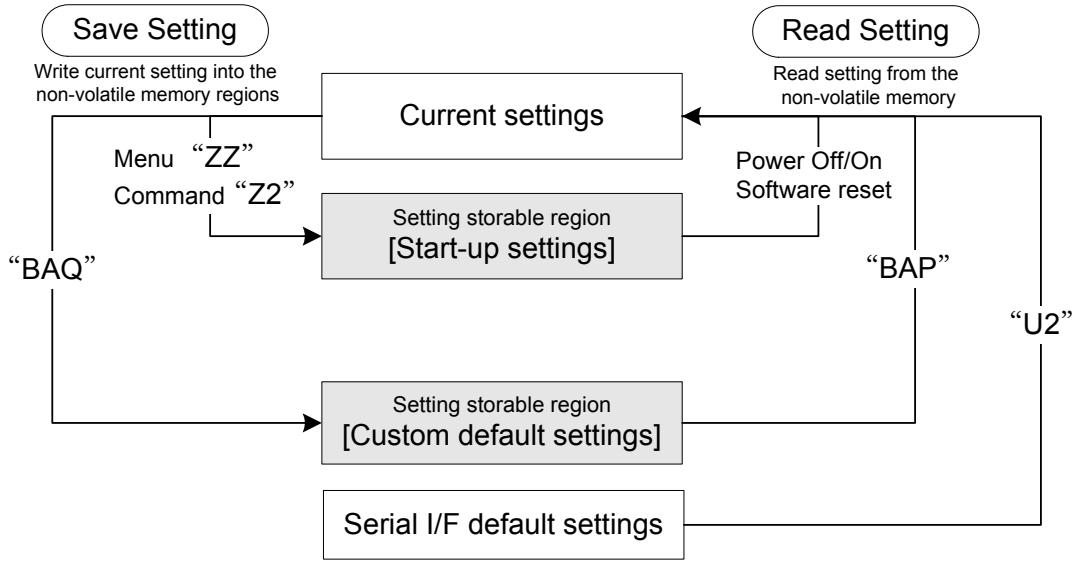
Since there is a possibility to go out of control when the following interface-related settings are configured with commands, it will not be reflected until they are written in the non-volatile memory using Z2.
- Baud rate, Data length, Parity and Stop bit

* Settings made by reading 1D or 2D menu labels (see 2.1. and 2.2.) will be saved in non-volatile memory. Any settings made prior via commands will be saved as well.

2.4. Default Settings and Saving Settings

How to set the scan engine is described below.

<Setting state transition diagram >



Current Settings:
Settings that are currently enabled (including new settings added after the scan engine has been powered on).

Start-up Setttngs:
Settings are loaded when the scan engine is powered on.

Custom Default Settings:
Default settings that are customizable by users.
* Note that the current active settings will be overwritten with the custom default settings when reading or sending the menu "BAQ".

Factory Default Settings:
The default settings are the same as that described in the MDI-3100 Specifications Manual.

2.4.1. Default Settings

The current settings can be returned to the custom or factory default settings.

Item	Command	Description	Remark
Back to defaults	BAP	Set back to custom defaults	
	U2	Set back to seial interface defaults	

2.4.2. Saving Settings

The current settings can be written into the start-up settings and the custom default settings regions.

Item	Command	Description	Remark
Save settings	Z2	Write current settings in start-up setting area	Command only
	BAQ	Write current settings in custom default setting area	

* There are options that will not be enabled until "Saving settings" is sent, such as baud rate setting.

2.5. Basic Commands

2.5.1. Command Trigger

The reading operation can be started / terminated by sending commands. However, when the read time is set to 0 seconds, the read time with the Z command will be 'Indefinitely' and reading will continue until Y command is received.

Item	Command	Description	Default	Remark
Command Trigger	Z	Start reading		Command only
	Y	Stop reading		

2.5.2. Diagnostics

These commands can be used to get diagnostics information from the scan engine.

Item	Command	Description	Default	Remark
Diagnostics	Z1	Transmit software version		
	Z3	Transmit settings		See10.1.1.
	EAR	Transmit only changes from default		See10.1.2.
	ZA	Transmit ASCII printable string		
	YV	Transmit ASCII control string		

* The Z3 output result is subject to change when the firmware version is changed.

2.5.3. ACK/NAK for Serial Commands

When "ACK/NAK for serial commands" is enabled, the scan engine will send an ACK (06H) in case a command is received and accepted. A NAK (15H) will then be send when a command is rejected.

Item	Command	Description	Default	Remark
ACK/NAK	WC	Enable ACK/NAK for serial command		
	WD	Disable ACK/NAK for serial command	○	

2.5.4. Buzzer and Indicator

These commands reflect "7.7. Indicator Settings".

Item	Command	Description	Default	Remark
Buzzer	B	Issue the good read beep		Command only
	E	Issue the error beep		
Indicator	L	Signal the good read LED		

2.5.5. Direct Numerical Input Command

The following commands should be input after the commands which support the numerical input setting according to the specified formats.

Item	Command	Description	Default	Remark
Direct input numerical values	Q0	0		Input in a specified format
	Q1	1		
	Q2	2		
	Q3	3		
	Q4	4		
	Q5	5		
	Q6	6		
	Q7	7		
	Q8	8		
	Q9	9		

3. Interface Specifications

This chapter describes the details of the serial interface for the scan engine.

The configurations available are:

3.1. Input/Output Signals

Input/Output signals of the scan engine are described below.

3.1.1. MDI-3000 Input/Output Signals

MDI-3000 Input/Output Signals

No.	Name	Function	I/O	State	Note
1	DWNLDn	Forced download control signal	In	L: Forced Download mode H: Normal state	Check the signal when the power is supplied and enable rewriting software.
2	V_{CC}	Power input	In	3.0 ~ 5.5V	
3	GND	System ground			
4	RxD	Received data signal	In		
5	TxD	Transmitted data signal	Out		
6	CTS	Communication control signal from host system	In		
7	RTS	Communication control signal to host system	Out		
8	POWERDWN	Shows Low Power state	Out	L: Normal state H: Low Power state	
9	BUZERn	Activate external buzzer signal	Out	L: Active H: No action	Possible to change tones and sound pressure by sending PWM signals.
10	GR_LEDn	Good read LED signal	Out	L: LED on H: LED off	
11	AIM/WAKEn	Recovery signal from Low Power state	In	L: Recover from Low Power state H: No action	
		Aiming control signal in other states than Low Power	In	L: Aiming LED on H: Aiming LED off	
12	TRIGn	Trigger on	In	L: Start operation H: No action	

*1 It is used when software (firmware) is downloaded. Sampling is done shortly after power reset.
* Refer to the “Integration Guide” and “Specifications Manual” for details of the connector, FFC and pin assignment.

3.1.2. MDI-3100 Input/Output Signals

MDI-3100 Input/Output Signals

No.	Name	Function	I/O	State	Note
1	TRIGn	Trigger on	In	L: Start operation H: No action	
2	AIM/WAKEn	Recovery signal from Low Power state	In	L: Recover from Low Power state H: No action	
		Aiming control signal in other states than Low Power	In	L: Aiming LED on H: Aiming LED off	
3	GR_LEDn	Good read LED signal	Out	L: LED on H: LED off	
4	BUZERn	Activate external buzzer signal	Out	L: Active H: No action	Possible to change tones and sound pressure by sending PWM signals.
5	POWERDWN	Shows Low Power state	Out	L: Normal state H: Low Power state	
6	RTS	Communication control signal to host system	Out		
7	CTS	Communication control signal from host system	In		
8	TxD	Transmitted data signal	Out		
9	RxD	Received data signal	In		
10	GND	System ground			
11	V_{CC}	Power input	In	3.0 ~ 5.5V	
12	DWNLDn	Forced download control signal	In	L: Forced Download mode H: Normal state	Check the signal when the power is supplied and enable rewriting software.

*1 It is used when software (firmware) is downloaded. Sampling is done shortly after power reset.
* Refer to the “Integration Guide” and “Specifications Manual” for details of the connector, FFC and pin assignment.

3.2. Baud Rate Setting

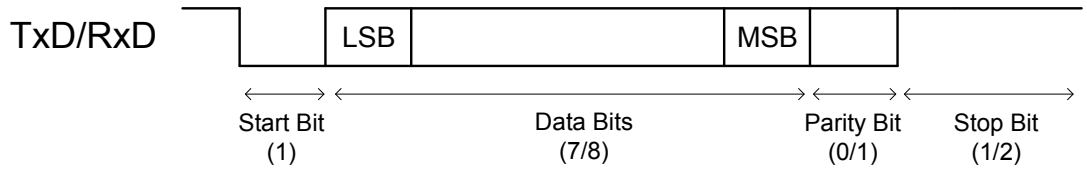
The baud rate is the rate at which bits are transmitted from the scan engine to the host, and vice versa. Both the reader and the host should be set to the same baud rate.

The following menus / commands are provided for the baud rate setting. For the command setting, "Z2" (write command in non-volatile memory) needs be used together.

Item	Command	Description	Default	Remark
Baud rate	K1	300bps		Enabled only with “Z2”
	K2	600bps		Enabled only with “Z2”
	K3	1200bps		Enabled only with “Z2”
	K4	2400bps		Enabled only with “Z2”
	K5	4800bps		Enabled only with “Z2”
	K6	9600bps	○	Enabled only with “Z2”
	K7	19200bps		Enabled only with “Z2”
	K8	38400bps		Enabled only with “Z2”
	K9	57600bps		Enabled only with “Z2”
	SZ	115200bps		Enabled only with “Z2”

3.3. Character Format

The data characters can be transferred in the format shown below. A party bit is added to every character so that the total number of 1’s in the data bits, together with the parity bit, is odd for odd parity or even for even parity.



The following menus / commands are provided for the data bits, parity bit and stop bits. For the command setting, "Z2" (write command in non-volatile memory) needs to be used together.

Item	Command	Description	Default	Remark
Data bit	L0	7 data bits		Enabled only with “Z2”
	L1	8 data bits	○	Enabled only with “Z2”
Parity bit	L2	No parity	○	Enabled only with “Z2”
	L3	Even parity		Enabled only with “Z2”
	L4	Odd parity		Enabled only with “Z2”
Stop bit	L5	1 stop bit	○	Enabled only with “Z2”
	L6	2 stop bits		Enabled only with “Z2”

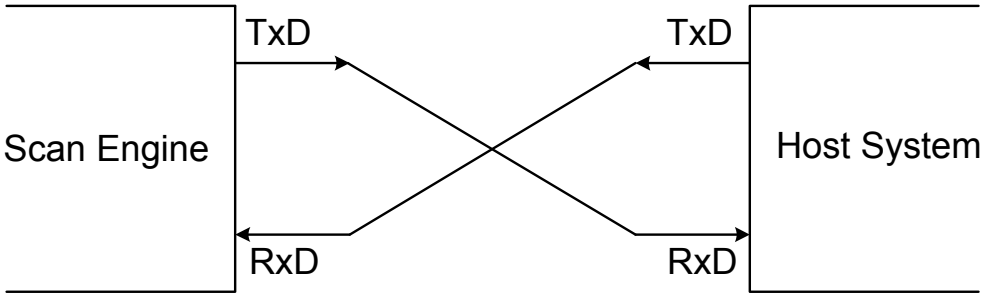
3.4. Handshaking

The communication control method can be set using menu labels / commands. Since there is a possibility to go out of control when the configuration is done by commands, the following items will not be reflected until they are written in the non-volatile memory using Z2.

Item	Command	Description	Default	Remark
Handshaking	P0	No handshake	○	Enabled only with “Z2”
	P1	Busy/ready		Enabled only with “Z2”
	P2	Modem		Enabled only with “Z2”
	P3	ACK/NAK		Enabled only with “Z2”
	P4	ACK/NAK NO RESPONSE		Enabled only with “Z2”

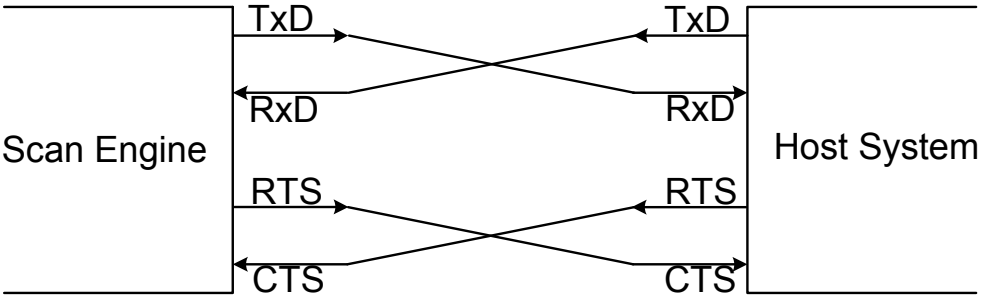
3.4.1. No Handshaking

The scan engine makes communication regardless of the state of the host system.
* In this setting, the commands from the host system may not be received correctly.

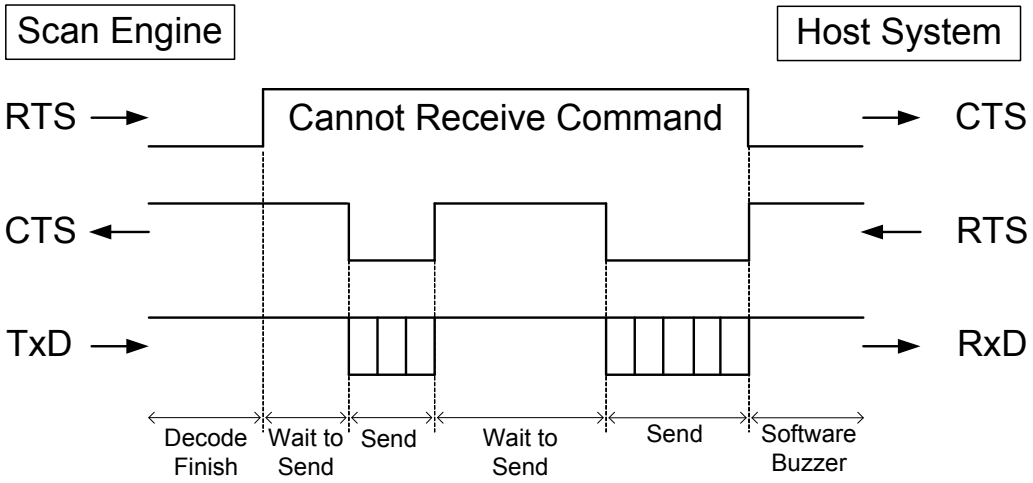


3.4.2. BUSY/RADY

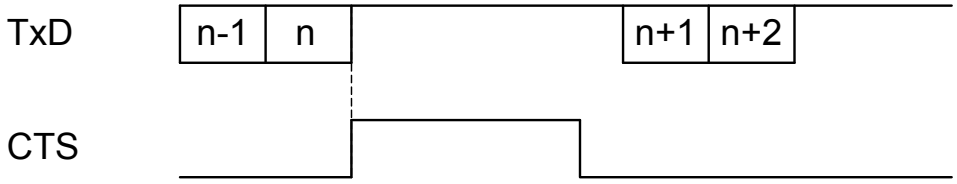
The scan engine and the host system notify each other if they are able to receive data (BUSY/READY) via their RTS line. When they are connected as shown in the figure below, the CTS line can be used to check if the other side is busy (off) or ready to receive data (on).



The scan engine's RTS is normally on (so ready to receive data) except during the processing of received data, while transmitting data, and while it is busy processing menu labels. When the scan engine wants to send data, it first has to check if its CTS line is on (to be sure that the host is ready to receive data) When the CTS line is off, the scan engine does not send the data but waits for a specific timeout period until the CTS line is tuned on. When the CTS line is not turned on within the time specified, the data transmission will be aborted.



<CTS, TxD signal timing>
When the CTS line (RTS signal on the host side) is turned off during a TxD signal transmission, the scan engine stops the transmission. When the CTS signal is turned on during a character transmission, the character will be transmitted.

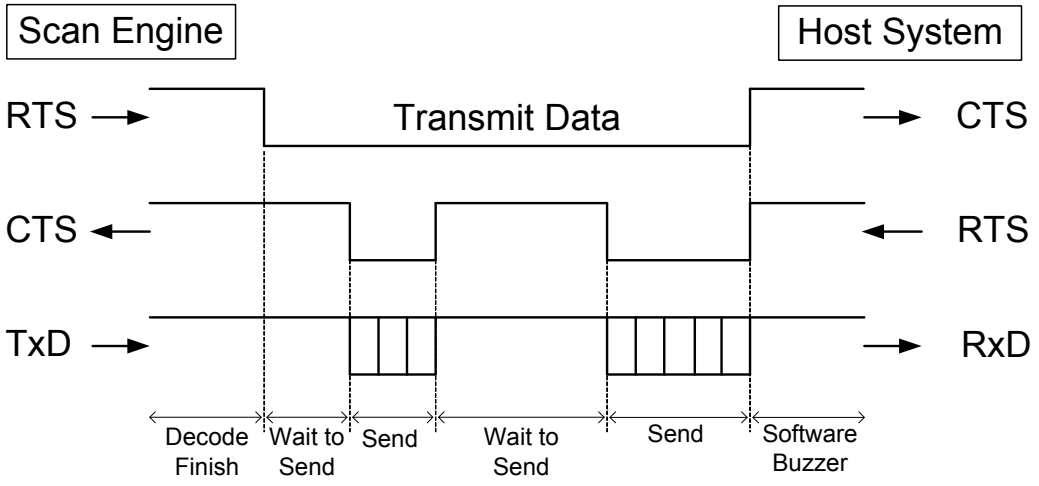


The following menu bar codes / commands are provided for the CTS line timeout setting.

Item	Command	Description	Default	Remark
CTS timeout	I0	Flow Control timeout Indefinitely	○	Enabled only with "Z2"
	I1	Flow Control timeout 100 ms		Enabled only with "Z2"
	I2	Flow Control timeout 200 ms		Enabled only with "Z2"
	I3	Flow Control timeout 400 ms		Enabled only with "Z2"

3.4.3. MODEM

The scan engine's RTS is OFF as soon as power is supplied to the scan engine. The scan engine will turn RTS ON when it wants to transmit data to the host. The host should respond by putting CTS ON when it is ready to receive data. While CTS is ON the scan engine is allowed to transmit data. When all data has been transmitted, the scan engine will turn RTS OFF. In response, the host should turn OFF the scan engine's CTS. If, while RTS is ON, the CTS line is not ON for a certain configurable period, the scan engine will terminate the transmission with an error indication of the buzzer.



3.4.4. ACK/NAK

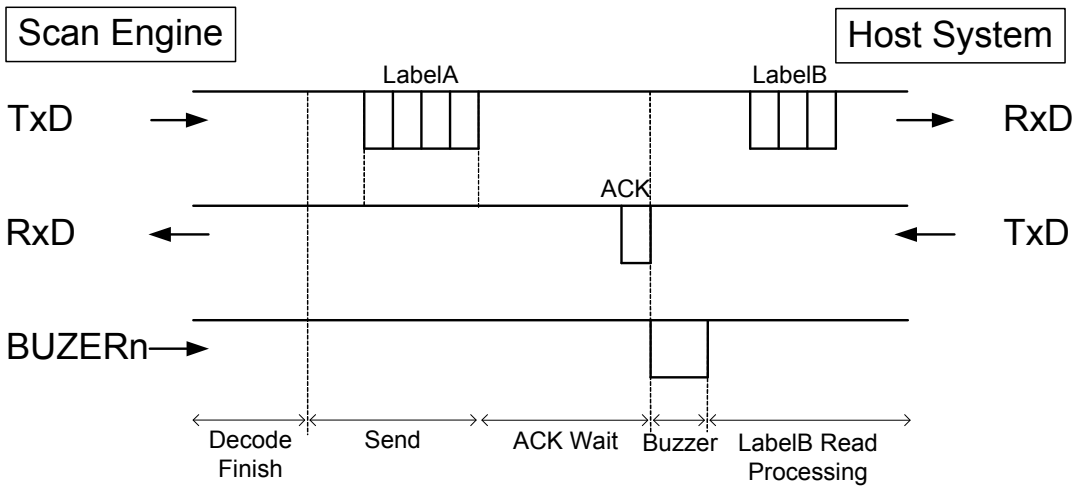
After data has been transmitted, the scan engine expects to receive one of the following responses from the host:

Response: "ACK" (ASCII: Hex 06)
The scan engine terminates transmission with the good-read buzzer.

Response: "NAK" (ASCII: Hex 15)
The scan engine sends the data again and waits for the response from the host.

Response: "DC1" (ASCII: Hex 11)
The scan engine terminates transmission without the good-read or error buzzer.

Response: "None"
If there is no response within one second then the scan engine terminates transmission with the error buzzer.(see figure 1:ACK/NAK flow chart)



ACK/NAK flow chart

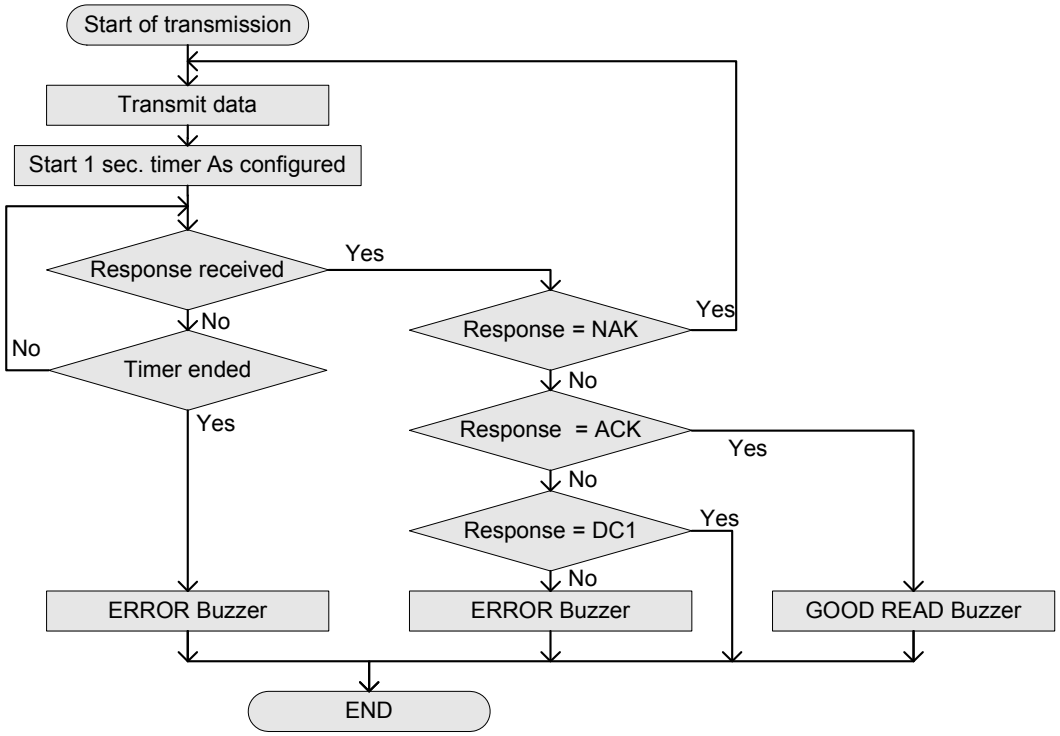


Figure 1: ACK/NAK flow chart

The following menu bar codes / commands are provided for the ACK/NAK timeout setting.

Item	Command	Description	Default
ACK/NAK timeout	XI4	ACK/NAK timeout Indefinitely	○
	XI5	ACK/NAK timeout 100 ms	
	XI6	ACK/NAK timeout 500 ms	
	XI7	ACK/NAK timeout 1s	

3.4.5. ACK/NAK NO RESPONSE

The difference from the ACK/NAK mode is that when no response from the host is received within 100 ms, the scan engine assumes that the data has been received correctly by the host.

Response: "ACK" (ASCII: Hex 06)
The scan engine terminates transmission with the good-read buzzer.

Response: "NAK" (ASCII: Hex 15)
The scan engine sends the data again.

Response: "DC1" (ASCII: Hex 11)
The scan engine terminates transmission without a good-read or error buzzer.

Response: "None"
If there is no response within 100 ms then the scan engine terminates transmission with the good read buzzer. (See figure2: *ACK/NAK no response flow chart*)

ACK/NAK no response flow chart

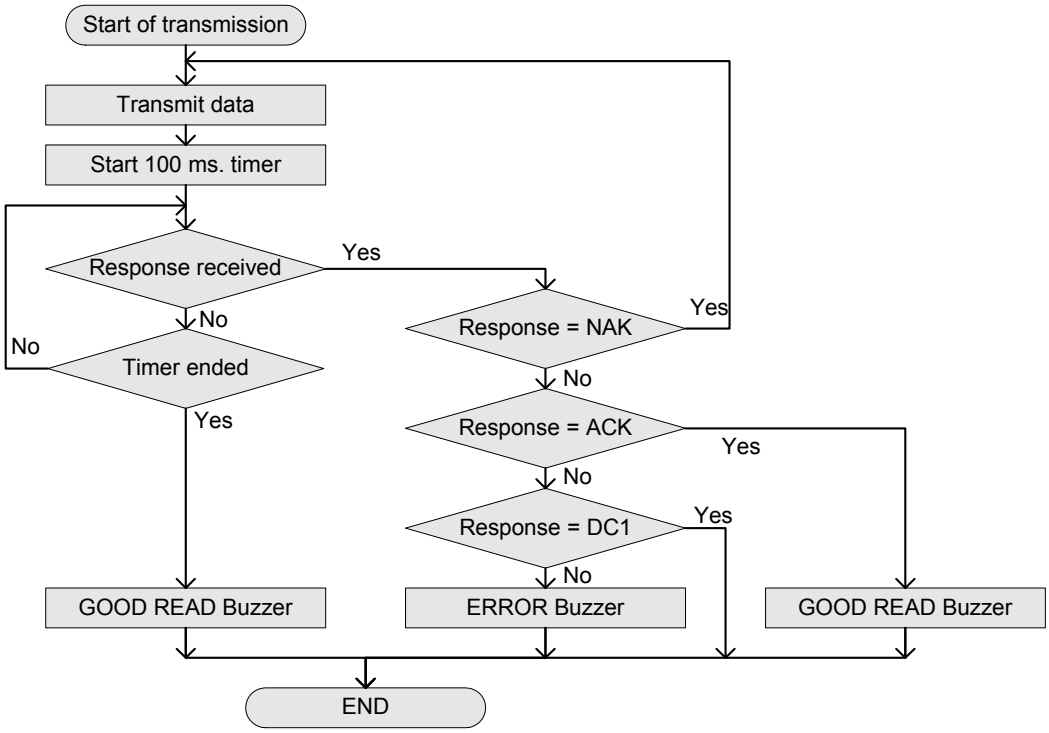


Figure 2: ACK/NAK no response flow chart

3.5. Intercharacter Delay

The intercharacter delay introduces a configurable time delay after each character transmitted. This may be used if the connected computer or terminal does not support flow control and is not capable of handling the received data

The following menu bar codes / commands are provided for the intercharacter delay setting.

Item	Command	Description	Default	Remark
Intercharacter delay	KA	No delay	○	Enabled only with “Z2”
	KB	20 ms delay		Enabled only with “Z2”
	KC	50 ms delay		Enabled only with “Z2”
	KD	10 ms delay		Enabled only with “Z2”

3.6. Data Buffer Mode

This option allows you to specify whether to read an object during data output.
When buffer mode is enabled, the scan engine can perform other operations such as bar code scanning while outputting decoded data. However, the reading performance may degrade during the data output.
When buffer mode is disabled, the scan engine stops other operations until the completion of decoded data output.

The following menu bar codes / commands are provided for the data buffer mode setting.

Item	Command	Description	Default	Remark
Data buffer mode	D80	Disable		
	D81	Enable	○	

∗ When handshaking is configured, this mode is forcibly disabled.

4. Timing and Power Management

This chapter describes the various timings and power management of the scan engine.

The configurations available are:

4.1. Power Mode Transition

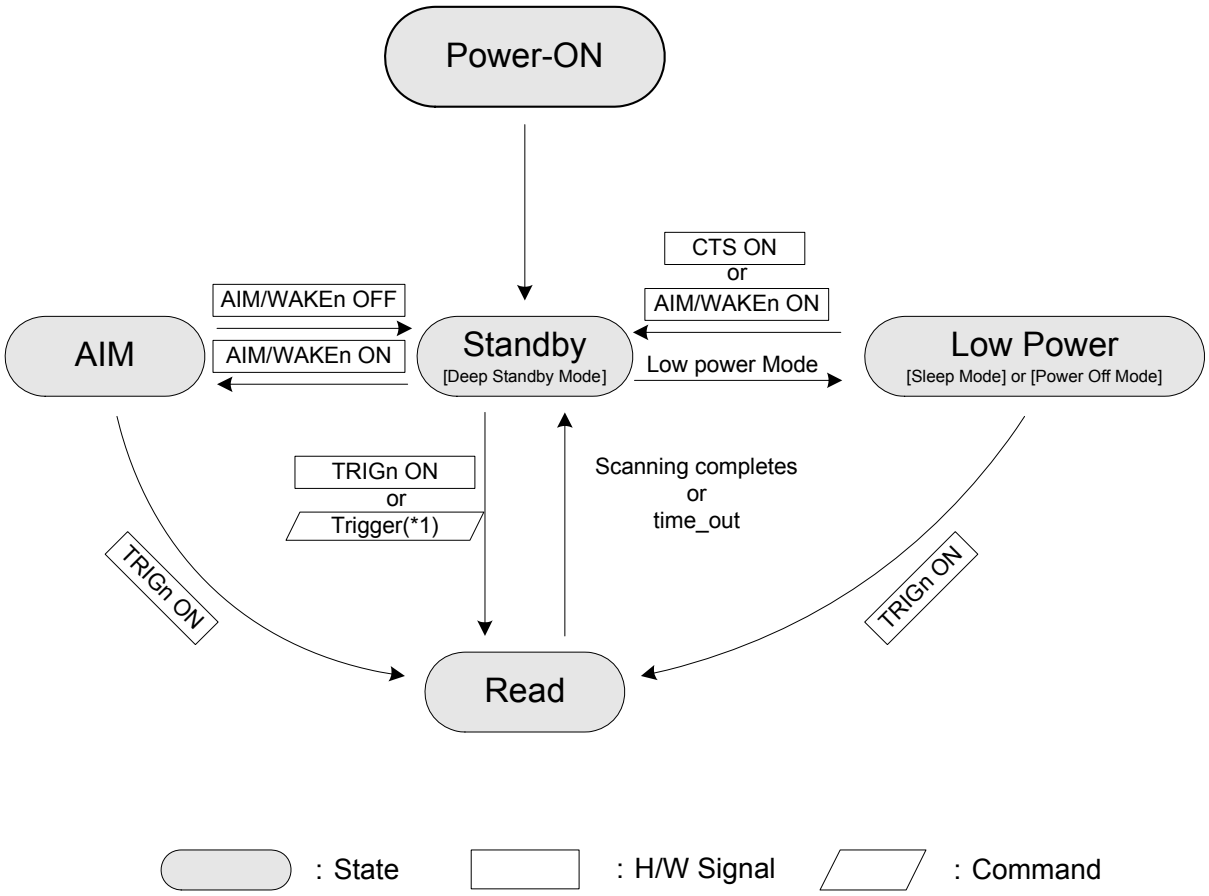


Figure 3: Power Mode Transition

* When deep standby mode is set, there are some control conditions such as command transmission (See 4.5).

* In low power mode, sleep and power off modes are selectable (See 4.6).

* When low power mode is enabled, the MDI-3000 is in standby state and there are no events to move to other states, the MDI-3000 goes to low power state after the timeout period specified by power saving command has expired.

4.2. Current Consumption

The following shows the current consumption in default configuration and power management command settings.

(V_{CC} = 3.3V, T_A = 25℃)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating current	I_{OP}		-	240	390	mA
Standby current (*1)	I_{STB}		-	45	50	mA
Deep standby mode current (*2)	I_{DSB}	Configured	-	27	30	mA
Sleep mode current (*3)	I_{SLP}	Configured	-	0.25	0.3	mA
Power off mode current (*4)	I_{PWO}	Configured	-	0.02	0.03	mA

(V_{CC} = 5.0V, T_A = 25℃)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating current	I_{OP}		-	160	210	mA
Standby current (*1)	I_{STB}		-	35	40	mA
Deep standby mode current (*2)	I_{DSB}	Configured	-	25	28	mA
Sleep mode current (*3)	I_{SLP}	Configured	-	0.22	0.27	mA
Power off mode current (*4)	I_{PWO}	Configured	-	0.04	0.05	mA

*1 Current except the baud rate 115200 bps.
*2 Current when the mode is set by command.
*3 Current when the mode is set by command.
*4 Current when the mode is set by commend.
*3,4 Low power mode has two selectable modes; ‘sleep’ and ‘power off’ modes.

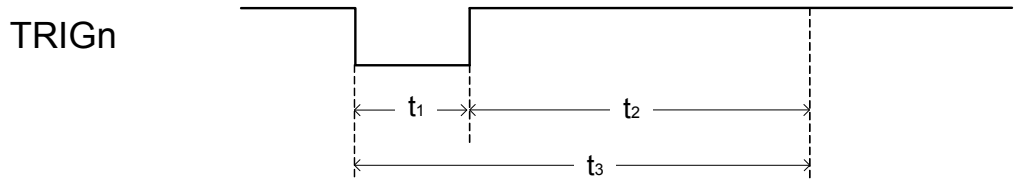
4.3. Code Read Timing

The code read timing of the scan engine is described below.

	Description	Min	Typ	Max	Unit
t_1	TRIGn signal duration	50	-	-	ms
t_2	Extended read time	-	0 (*1)		s
t_3	Read time	-	-	-	-
t_4	GR_LEDn signal duration	-	200 (*2)	-	ms
t_5	BUZERn signal duration	-	75 (*3)	-	ms

*1 Extended read time is configurable (see 7.1.3.)
*2 BUZERn signal duration is configurable (see 7.7.5.)
*3 GR_LEDn signal duration is configurable (see 7.7.2.)

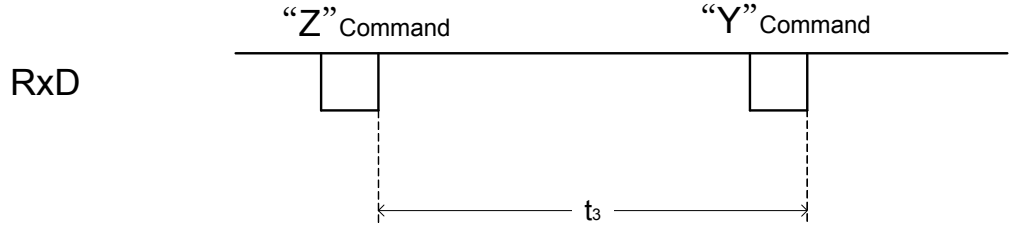
4.3.1. TRIGn Signal Control



* t1 should be at least 50 ms to prevent chattering.
* Read time is for at least 200 ms from the beginning of t1.
* The default setting for t2 is 0 seconds. Refer to 7.1.3 for setting the extended read time.

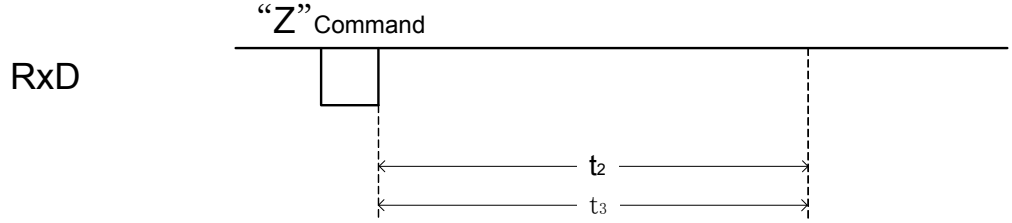
4.3.2. Command Control

[Default setting]



* The extended read time is 0 seconds, and reading stops with "Y" command.

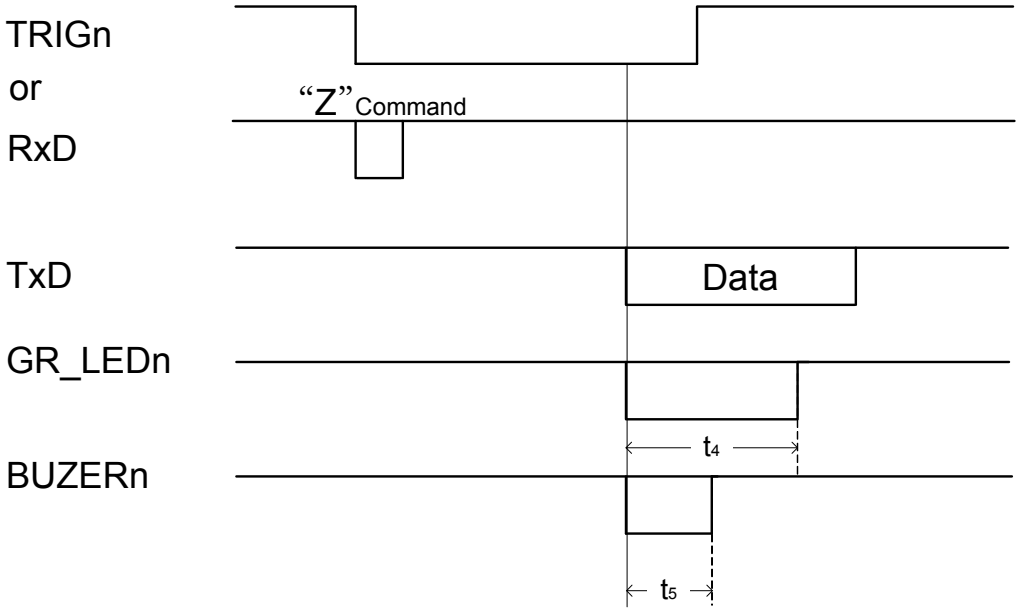
[Extended read time setting]



* When an extended read time is set, reading stops when the specified period of time has elapsed or with "Y" command
* The default setting for t2 is 0 seconds. Refer to 7.1.3 for setting the extended read time.

4.3.3. Successful Read

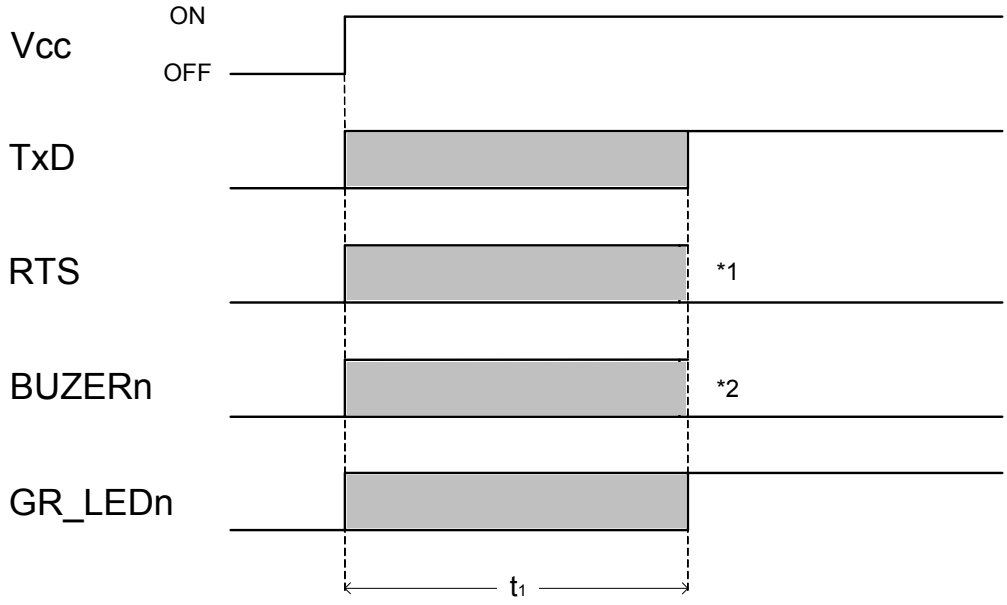
[Successful read (TRIGn synchronization)]



4.4. Power On / Off Timing

The power on/off timing of the scan engine is described below.

4.4.1. Power-On Timing



	Description	Min	Typ	Max	Unit
t_1	Time taken to be accessible after supplying the power	-	550	700	ms

*1 The signal level will be “High: not ready to receive” when the communication control is set to “MODEM”.
*2 The signal level will be “High” when the software buzzer is set to available.
Enabling / Disabling software startup buzzer is configurable (See 7.7.3)

4.4.2. Power-Off Timing

When the power is turned off while an input signal of the scan engine is High, leakage current will be drawn from that signal. Therefore, all input signals of the scan engine should be set to “High impedance” or “Low”.

Power off when saving configurations:
The settings are stored in the scan engine when
1) sending the Z2 command for saving the parameters.
2) reading menu bar codes or 2D menu codes.
The settings are written in the flash ROM and that takes 10 seconds to complete. Make sure the power is not turned off during this period - otherwise the settings may be destroyed.

* For 1), if the option “ACK/NAK for serial command” is enabled (see 2.5.3) in advance, the scan engine will send an ACK after the writing configuration data is completed. This allows you to get the timing right.

4.5. Deep Standby Mode

Deep standby mode helps to further reduce power consumption in standby state.

The following menu bar codes / commands are provided for the deep standby mode setting.

Item	Command		Description	Default
Standby mode	EB7	Q1	Standby	○
		Q2	Deep standby	Enabled only with “Z2”

Note: when the command is received, the scan engine may fail to receive the first data from the host. In order to avoid this, control the scan engine in either of the following ways:

- Send the command in AIM/WUPn = Low state.
- Send the command adding 0x0(NULL) to the head of command format (see 2.3.1.).
  Set the interval time between [null] and [commands] in 1ms to 50ms.

4.6. Low Power Mode

Low power mode of the scan engine is described below.

4.6.1. Transition from Power On to Low Power Mode

In low power mode, sleep and power off modes are selectable.

The following menu bar codes / commands are provided for the low power mode setting.

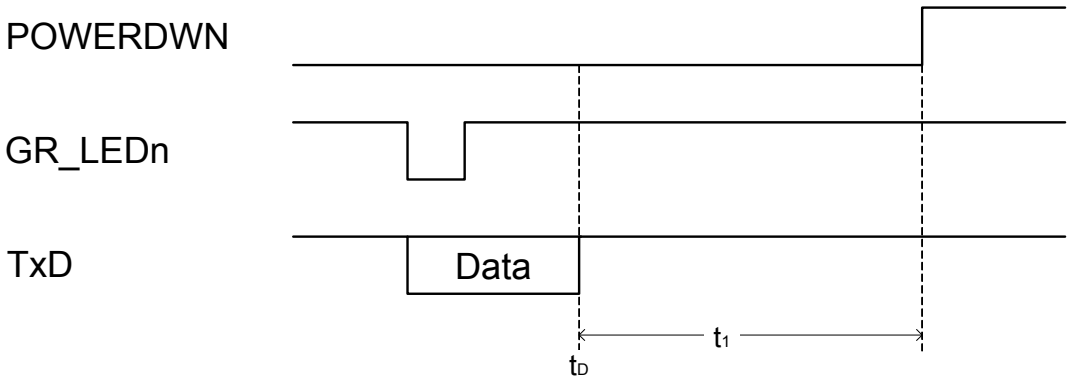
Item	Command	Description	Default
Low power mode	XSC	Disable low power mode	○
	EB8	Enable sleep mode	
	EB9	Enable power off mode	

* When the scan engine goes to low power mode, the current settings is reset. Thus, “Z2” (see 2.4.2.) is required to save the settings.

4.6.2. Transition from Standby Mode to Low Power Mode

The transition time from standby state to sleep mode or power off mode is configurable. The default setting is 5 seconds.

[Successful scanning in “Single Read” setting]



* Standby state means Idle state in which no operation performs such as signal input /output, data transmission or illumination LED/aiming emission. In the above figure, the last operation was ‘data transmission’, so the time to complete the data transmission is defined as t_D.

The following menu bar codes / commands are provided for setting the transition time to low power mode t_1.

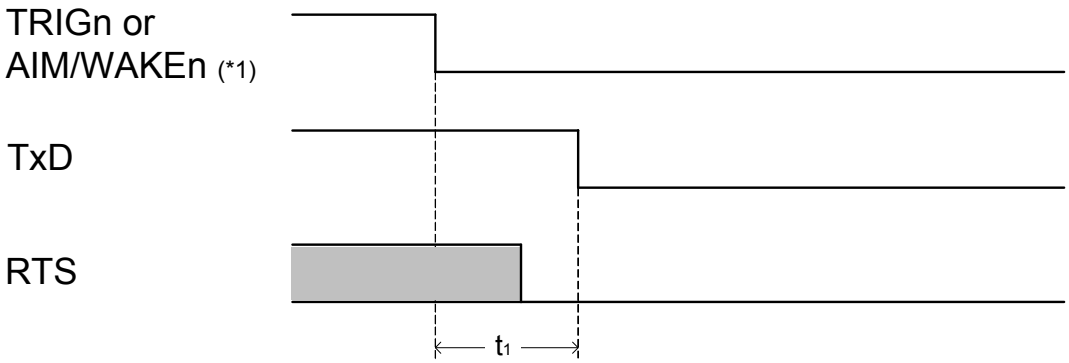
Item	Command					Description	Default
Low power mode transition time	EBA	Qa	Qb	Qc	Qd	Set low power mode transition time with numerical values (1000a+100b+10c+d [s])	5 ms (1~9999)

Example of command input
Set the transition time to low power mode to 15 seconds
<Esc>[EBAQ0Q0Q1Q5<CR>

4.6.3. Recovery from Low Power Mode

The recovery timing from low power mode is described below.

[Return with TRIGn or AIM/WAKEn signal]



	Description	Min	Typ	Max	Unit
t_1	Time to recover from sleep mode	-	75	100	ms
	Time to recover from power off mode	-	550	700	ms

*1 In the “No handshaking” setting (see 3.4.1.), it is possible to recover from power down mode by CTS signal.

5. Code Options

This chapter describes the code options for the scan engine.

The options allow you to configure the required bar code types, code specific options, and number of characters to be read. The settings do not affect the reading of the menu labels.
It is strongly recommended to select only the required codes and options for better reading performance.

The configurations available are:

5.1. Setting of Readable Codes

The following tables show the supported symbologies and the setting command IDs.

Single :Only the specified symbology will be enabled and all other symbologies will be disabled.
Multiple :The specified symbology will be enabled on top of the already enabled symbologies.
Disable :The specified symbology will be disabled, but all other configured symbologies stay enabled.

5.1.1. 1D Codes

Symbologies	Single command	Multiple command	Disable command	Default	Mini length	CD transmission	CD check	Remark
UPC	J1	R1	X4B	○	-	○	○	
UPC Add-on 2 UPC Add-on 5	J2 J3	R2 R3	X4C X4D		-	○		
EAN	J4	R4	X4E	○	-	○	○	
EAN Add-on 2 EAN Add-on 5	J5 J6	R5 R6	X4F X4G		-	○		
EAN-13	JG	JU	DDM		-	○		
EAN-13 Add-on 2 EAN-13 Add-on 5	JH JI	JV JW	X4N X4P		-	○		
EAN-8	JA	JO	DDN		-	○		
EAN-8 Add-on 2 EAN-8 Add-on 5	JB JC	JP JQ	X4M X4O		-	○		
Code 39	A2	B2	VB	○	1	○	×	
Tri-Optic	JD	JZ	DDJ	○	-	-		
Codabar	A3	B3	VC	○	1	○	×	
Industrial 2of 5	J7	R7	X4K	○	5	○	×	
Interleaved 2of 5	J8	R8	X4L	○	6	○	×	
S-Code	RA	R9	DDK	○	5	×		
Code 128	A6	B6	VE	○	1	-	○	GS1 Conversion See 5.5.1.
Code 93	A5	B5	VD	○	1	-	○	
IATA	A4	B4	VH	○	5	×	×	
MSI/Plessey	A7	B7	VF	○	3	○	○	
UK/Plessey	A1	B1	VA	○	2	○	○	
Telepen	A9	B9	VG	○	1	-	○	
Code 11	BLB	BLC	BLA		1	×	○	
Matrix 2 of 5	AB	BB	DDL		5	○	×	
Chinese Post Matrix 2 of 5	JE	JS	JT		-	○	×	
Korean Postal Authority	JL	WH	WI		-	×	○	
Intelligent Mail Barcode	D5H	D5F	D5G		-	-	○	
POSTNET	D6C	D6A	D6B		-	-	○	
JPN（Customer Barcode）	D5R	D5P	D5Q		-	-	○	

5.1.2. GS1-Databar

Symbologies	Single		Multiple		Disable		Default	Remark
GS1 DataBar ・GS1 DataBar Omnidirectional ・GS1 DataBar Truncated ・GS1 DataBar Stacked ・GS1 DataBar Stacked Omnidirectional	J9	BC6	JX	BCI	SJ	BCU	○	GS1 Conversion See 5.5.1.
GS1 DataBar Limited	JJ		JY		SK		○	
GS1 DataBar Expanded ・GS1 DataBar Expanded ・GS1 DataBar Expanded Stacked	JK		DR		SL		○	

5.1.3. Composite Code

Symbologies	Multiple	Disable	Default	Remark
Composite GS1 DataBar ・CC-A ・CC-B ・Limited CC-A ・Limited CC-B ・Expanded CC-A ・Expanded CC-B	BHE	BHF		GS1 Conversion See 5.5.1. (*1)
Composite GS1-128 ・CC-A ・CC-B ・CC-C				
Composite EAN ・EAN-13 CC-A ・EAN-13 CC-B ・EAN-8 CC-A ・EAN-8 CC-B	D1V	D1W		
Composite UPC ・UPC-A CC-A ・UPC-A CC-B ・UPC-E CC-A ・UPC-E CC-B				

*1 When composite EAN/UPC is enabled, a link flag will be enabled, and UPC/EAN only cannot be read.

5.1.4. 2D Codes

Symbologies	Single	Multiple	Disable	Default	Remark
PDF417	BC3	BCF	BCR	○	
Micro PDF417	BC4	BCG	BCS		
Codablock F	D4R	D4P	D4Q		
QR Code	BC1	BCD	BCP	○	GS1 Conversion See 5.5.1.
Micro QR	D38	D2U	D2V	○	
Data Matrix (ECC 200)	BC0	BCC	BCO	○	GS1 Conversion See 5.5.1.
Data Matrix (ECC 000-140)	BG2	BG0	BG1		
Aztec Code	BC5	BCH	BCT	○	
Aztec Runes	BF4	BF2	BF3		
Chinese-sensible code	D4K	D4L	D4M		
Maxi Code	BC2	BCE	BCQ	○	

5.1.5. Other Options

Symbologies	Single	Multiple	Disable		Remark
All codes (1D, 2D)	A0		B0		Excluding add-on
All 1D codes	BCA	BCM	BCY		Including add-on
All 2D codes	BCB	BCN	BCZ		*1, *2

*1 PDF417, QR Code, Data Matrix(ECC 200, ECC 000-140), Maxi Code, Micro PDF417, Aztec Code, GS1-128 Composite bar code, Aztec Runes, Micro QR and Chinese-sensible code
*2 When ‘ALL 2D codes’ is enabled, a link flag will be enabled, and UPC/EAN only cannot be read.

5.2. Setting Code Specific Options

Code options

(1) Specifying Output Format
Select output format for each code.
- GS1 Conversion (GS1-128, GS1 DataBar, Composite GS1 DataBar, GS1 DataMatrix, GS1 QR Code)
- Transmit Start/Stop digits (Code 39, Codabar)
- Transmit check digits (Code 39, Codabar, UPC/EAN, 2of5, IATA)
- Full ASCII conversion (Code 39)

(2) Check Digits Calculation
Specify whether the check digit calculation is enabled or disabled. (Code 39, Codabar, 2of5, IATA)

5.2.1. GS1 conversion

When a GS1 label is read by default, FNC1 which indicates the end of variable length data is not transmitted because FNC1 does not have an ASCII representation.

With GS1 conversion, the end of variable length data FNC1 is converted into GS(0x1D) and output so that the host can analyze the GS1 data. However, when the variable length data is the last AI data, there is not FNC1 and GS is not output.

<Default>

FNC1 (not output)	AI	Data (fixed length)	AI data (variable length)	FNC1 (not output)	…	AI	AI data (variable length)

↓

<After GS1 conversion>

FNC1 (not output)	AI	Data (fixed length)	AI data (variable length)	**GS(0x1D)** (output)	…	AI	AI data (variable length)

Code	Item	Command	Description	Default
GS1-128 GS1-DataBar GS1-DataBar Composite GS1-128 Composite GS1-DataMatrix GS1-QR Code	GS1 Conversion	X/0	Disable GS1 conversion	○
		X/4	Enable GS1 conversion	

* and editing other than those listed above are also available. See “8 Data Editing Programming” for details.

5.2.2. UPC-A, UPC-E

Code	Item	Command	Description	Default
UPC-A	UPC-A Leading zero CD transmission	E3	UPC-A, No leading zero, transmit CD	○
		E5	UPC-A, No leading zero, not transmit CD	
		E2	UPC-A, Leading zero, transmit CD	
		E4	UPC-A, Leading zero, not transmit CD	
UPC-E	UPC-E Leading zero CD transmission	E7	UPC-E , No leading zero, transmit CD	○
		E9	UPC-E , No leading zero, not transmit CD	
		E6	UPC-E , Leading zero, transmit CD	
		E8	UPC-E , Leading zero, not transmit CD	
	UPC-A, E conversion	6Q	Transmit UPC-E	○
		6P	Transmit as UPC-A	
	UPC-E1 conversion	KP	Disable UPC-E1	○
		KQ	Enable UPC-E1	

5.2.3. EAN-13, EAN-8

Code	Item	Command	Description	Default
EAN-13 and EAN-8	CD transmission	6J	Not transmit EAN-13 CD	
		6K	Transmit EAN-13 CD	○
	CD transmission	6H	Not transmit EAN-8 CD	
		6I	Transmit EAN-8 CD	○
	ISBN conversion	IB	Disable ISBN conversion	○
		IA	Enable ISBN conversion	
		IK	Enable ISBN if possible	
	ISSN conversion	HN	Disable ISSN conversion	○
		HO	Enable ISSN conversion	
		4V	Enable ISSN if possible	
	ISMN conversion	IO	Disable ISMN conversion	○
		IP	Enable ISMN conversion	
		IQ	Enable ISMN if possible	
	EAN13 forced add-on 1	-G	Enable EAN forced add-on when EAN13 starts with 378/ 379 / 529	
		-H	Disable EAN forced add-on when EAN13 starts with 378/ 379 / 529	○
	EAN13 forced add-on 2	-C	Enable EAN forced add-on when EAN13 starts with 434 / 439 / 414 / 419 / 977 /978	
		-D	Disable EAN forced add-on when EAN13 starts with 434 / 439 / 414 / 419 / 977/ 978	○

5.2.4. Code 39 and It. Pharm

Code	Item	Command	Description	Default
Code 39 and It.Pharm	Full ASCII conversion	D5	Normal Code 39	○
		D4	Full ASCII Code 39	
		+K	Full ASCII Code 39 if possible	
	It. Pharm conversion	D6	It. Pharm only	D5
		D7	It. Pharm if possible	D5
	CD check	C1	Not check CD	○
		C0	Check CD	
	CD transmission	D8	Not transmit CD	
		D9	Transmit CD	○
	ST/SP transmission	D1	Not transmit ST/SP	○
		D0	Transmit ST/SP	
	Leading A transmission	DA	Not transmit leading A for It. Pharm	○
		DB	Transmit leading A for It. Pharm	
	Concatenation	+M	Disable concatenation	○
		+L	Enable concatenation	

5.2.5. Codabar

Code	Item	Command	Description	Default
Codabar	ABC, CX conversion	HA	Enable only Codabar normal mode	○
		H4	Enable only ABC code	
		H5	Enable only CX code	
		H3	Enable Codabar / ABC and CX	
	CD check	H7	Not check CD	○
		H6	Check CD	
	CD transmission	H9	Not transmit CD	
		H8	Transmit CD	○
	Space insertion	HE	Disable space insertion	○
		HD	Enable space insertion	
	ST/SP transmission	F0	Not transmit ST/SP	○
		F3	ST/SP: ABCD/ABCD	
		F4	ST/SP: abcd/abcd	
		F1	ST/SP: ABCD/TN*E	
		F2	ST/SP: abcd/tn*e	
		HJ	ST/SP: <DC1><DC2><DC3><DC4> /<DC1><DC2><DC3><DC4>	

5.2.6. 2 of 5, S-Code

Code	Item	Command	Description	Default
2 of 5 and S-code	CD transmission	E1	Not transmit CD	
		E0	Transmit CD	○
	CD check	G0	Not check CD	○
		G1	Check CD	
	Space check	GK	Disable space check for Industrial 2of5	
		GJ	Enable space check for Industrial 2of5	○
	S-Code conversion	GH	Not transmit S-Code as Interleaved 2of5	○
		GG	Transmit S-Code as Interleaved 2of5	

5.2.7. Code 128 and GS1-128

Code	Item	Command	Description	Default
Code 128	EAN128 conversion	OF	Disable GS1-128	○
		JF	Enable GS1-128 only	
		OG	Enable EAN-128 if possible	
	Concatenation	MP	Disable concatenation (FNC2 message append)	○
		MO	Enable concatenation (FNC2 message append)	

5.2.8. IATA

Code	Item	Command	Description	Default
IATA	CD check	4H	Not check CD	○
		4I	Check FC / SN only	
		4J	Check FC / CPN / SN	
		4K	Check FC / CPN / AC / SN	
	CD transmission	4M	Not transmit CD	
		4L	Transmit CD	○

5.2.9. MSI/Plessey

Code	Item	Command	Description	Default
MSI/ Plessey	CD check	4A	Not check CD	
		4B	Check 1 CD = MOD 10	○
		4C	Check 2 CD = MOD 10/MOD 10	
		4D	Check 2 CD = MOD 10/MOD 11	
		4R	Check 2 CD = MOD 11/MOD 10	
		4S	Check 2 CD = MOD 11/MOD 11	
	CD transmission	4G	Not transmit CD	
		4E	Transmit CD 1	○
		4F	Transmit CD 1 and CD 2	

5.2.10. UK/Plessey

Code	Item	Command	Description	Default
UK/ Plessey	CD transmission	4O	Not transmit CD	
		4N	Transmit CD	○
	Space insertion	DO	Disable space insertion	○
		DN	Enable space insertion	
	X conversion	DP	Conversion A -> X disable	○
		DQ	Conversion A -> X enable	

5.2.11. Telepen

Code	Item	Command	Description	Default
Telepen	Conversion output mode	D2	Numeric mode	○
		D3	ASCII mode	

5.2.12. Code 11

Code	Item	Command	Description	Default
Code 11	CD check	BLF	Not check CD	
		BLG	Check 1CD	
		BLH	Check 2CD	
		BLI	Check auto 1 or 2 CD	○
	CD transmission	BLJ	Not transmit CD	○
		BLK	CD transmit	

5.2.13. Korean Postal Authority Code

Code	Item	Command	Description	Default
Korean Postal Authority code	CD transmission	*+	CD transmit	
		*-	Not transmit CD	○
	Transmit dash	*.	Transmit dash	○
		*/	Not transmit dash	
	Upside down reading	*9	Upside down reading enabled	
		*8	Upside down reading disabled	○

5.3. Setting of Number of Characters

If you are going to read bar codes of known length, it is recommended to set the scan engine for a fixed number of characters. The scan engine uses this to verify that labels read are of the correct length and reject labels that do not have the specified length. The advantage of setting a fixed length is that it provides protection against short scans of labels, such as Interleaved 2of5, which do not provide sufficient security against partial scan. The length checking is done on the label data and is not affected by options such as (not) transmit start/stop character or check digit. Setting the number of characters does not affect fixed length codes, such as EAN-13. By sending "Z3" command (see 10.1.1.), the setting status of minimum and maximum lengths can be confirmed.

The following options are available:

5.3.1. Fixed Length ON, Mimimum / Maximun Length for Selected Codes

This option enables fixed length and minimum / maximum length checking for different bar code types and will only affects the specified bar code types.

Configuring with commands
<Esc>[XYZQaQbQcQd<CR>

XYZ (see 5.3.2.) : Input command ID for each code
abcd : Up to 8000 decimal

Examples:

Fix Code39 length to 6 digits	: <Esc>[DC1Q6<CR>
Fix Code39 length to 6 digits and 12 digits	: <Esc>[DC1Q6[DC1Q1Q2<CR>
Fix Code39 length to 6 digits and Interleaved 2of5 to 12 digits	: <Esc>[DC1Q6[DC4Q1Q2<CR>
Clear fixed length for Code39	: <Esc>[DC1<CR>
Set minimum length for Interleaved 2of5 to 4 digits	: <Esc>[DB4Q4<CR>
Clear minimum length for Interleaved 2of5	: <Esc>[DB4<CR>
Set maximum length for Code39 to 12 digits	: <Esc>[DA1Q1Q2<CR>
Set max length for PDF417 to 20 digits and QR code 125 digits	: <Esc>[DALQ2Q0[DAJQ1Q2Q5<CR>

Configuring with menu bar codes
Scan ZZ menu label
Scan HK, HL, or HM menu label
(See 5.3.3. for the fixed length on, minimum/maximum length for selected codes.)
Scan a bar code with the required length
Scan a 2nd bar code with the required length (fixed length only)
Scan the ZZ menu label.

Note:

- With 'HK' menu label (Fixed length on for selected codes), fixed lengths for up to two types of codes are configurable.
- If you want to configure the fixed length for more than two types of codes with the HK menu label, repeat the same procedure with the required codes.
- With "HL / HM" menu labels (Minimum / Maximum length for selected codes), only one length is configurable.
- There is the following order of priorities: Fixed length ON for selected codes, Fixed length ON all codes, Minimum / Maximum length for selected codes. When trying to set a lower priority setting after a higher priority setting was once made, the prior setting should be cleared to enable the lower priority setting.
- If a label is checked for fixed length, it will not be checked for minimum or maximum length.
- The maximum number of characters is 8000.
- When only digit is omitted from 4 numerical values of QaQbQcQd, the change will be invalid and the default value will be set.

5.3.2. Command List: Fixed Length ON/Minimum/Maximum Length

Code type	Fixed length	Mini length	Max length
Reset settings	DC0	XQG	XNG
Code-39	DC1	DB1	DA1
Codabar	DC2	DB2	DA2
Industrial 2of5	DC3	DB3	DA3
Interleaved 2of5	DC4	DB4	DA4
Code-93	DCD	DBD	DAD
Code-128	DCB	DBB	DAB
MSI/Plessey	DC8	DB8	DA8
IATA	DC7	DB7	DA7
PDF417	DCL	DBL	DAL
QR code	DCJ	DBJ	DAJ
DataMatrix	DCH	DBH	DAH
Maxi code	DCK	DBK	DAK
Aztec code	DCI	DBI	DAI
microPDF417	DCM	DBM	DAM
RSS-Expanded(GS1 Databar)	DCF	DBF	DAF
Composite	DCG	DBG	DAG
EAN-128(GS1-128)	DCC	DBC	DAC
S-code	DC5	DB5	DA5
UK/Plessey	DCA	DBA	DAA
Matrix 2of5/Cninese Post	DC6	DB6	DA6
Telepen	DC9	DB9	DA9
Codablock-F	DCO	DBO	DAO
Code-11	DCE	DBE	DAE
Chinese Sensible Code	DCN	DBN	DAN

5.3.3. Command List: Setting of Number of Characters

Item	Command	Description	Default	Remark
Setting of number of characters	HK	Fixed length ON for selected codes		Menu only
	HL	Minimum length for selected codes		Menu only
	HM	Maximum length for selected codes		Menu only

6. String Options

This chapter describes the alterations which can be made to the transmitted data string.

The configurations available are:

6.1. Case Conversion

The bar code data may be converted to either lower or upper case or the case may be exchanged. These options may be used if the host requires upper or lower case characters only.

Example of case conversion:

Test String	AbCd	Default
No case conversion	AbCd	○
Convert to upper case	ABCD	
Convert to lower case	abcd	
Exchange case	aBcD	

The following menu bar codes / commands are provided for the case conversion setting.

Item	Command	Description	Default
Case conversion	YZ	No case conversion	○
	YW	Convert to upper case	
	YX	Convert to lower case	
	YY	Exchange case	

6.2. Prefix / Suffix

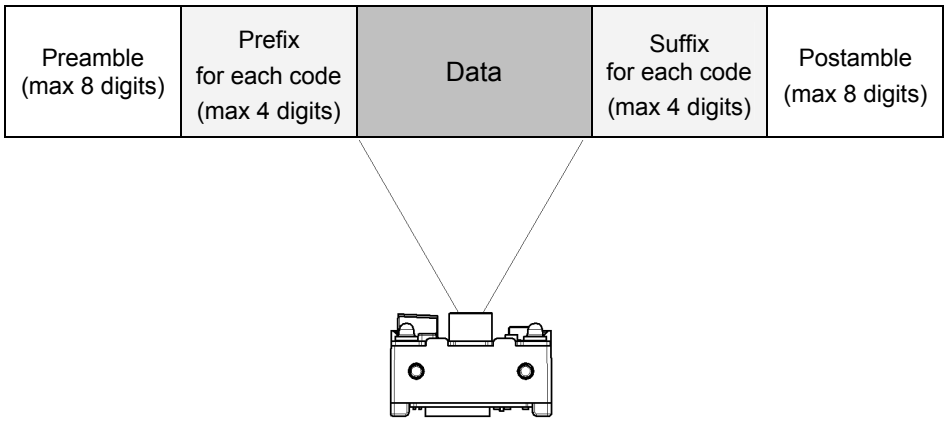
The following additional characters can be included in each code data to be scanned.

Output Format:

(1) Preamble / Postamble (up to 8 digits)
Specified strings can be added in front and at the end of the data for all codes. By default, they are empty.

(2) Prefix / suffix (up to 4 digits)
Specified strings can be added in front and at the end of the data for a specific symbology. By default, the prefix is empty and the suffix is a CR character.

(3) Code identification / Code length
'Code identification' and Code length' can be included in a prefix and/or a suffix. The code length is the number of characters after an output format that is configured with options in "5.2. Setting Code Specific Options".



Note: 'CR' is attached as a suffix for each code by default.

6.2.1. Set Prefix / Suffix

How to add the prefix / suffix is described below.

Configuring with Command:
<Esc>aa11223344bb11223344<CR>

Where:
aa code for the symbology to which a prefix is added (See 6.2.2.).
bb code for the symbology to which a suffix is added (See 6.2.2.).
11 the first prefix / suffix value (See 6.2.3.).
22 the 2nd prefix / suffix value etc (See 6.2.3.).

Example: to set “C39:” as the prefix and “CR” and “LF” as the suffix for Code 39.

<Esc>M40CQ3Q96AO41M1J<CR>

Configuring with menu bar codes:
(1) Scan the SET menu label.
(2) Scan the "6.2.2. Command List: Prefix / Suffix "menu label for the symbology for which you want to set the prefix or suffix.
(3) Scan one or more menu labels for "6.2.3. Prefix / Suffix Values"
(4) Scan the END menu label.

Example: to set “C39:” as the prefix and “CR” and “LF” as the suffix for Code 39.
1. Scan “ZZ” to start.
2. Scan “M4” to set Code 39 prefix.
3. Scan “0C” to set C.
4. Scan “Q3” to set 3.
5. Scan “Q9” to set 9.
6. Scan “6A” to set :.
7. Scan “O4” to set Code 39 suffix.
8. Scan “1M” to set CR.
9. Scan “1J” to set LF.
10. Scan “ZZ” to end.

Note:
- The prefix and suffix setting commands clear the current values and configure new ones. The default suffix CR is also cleared.
- If you want to clear the default suffix CR, it is possible by scanning RZ menu label (Set suffix for all codes) only or PR menu label (Clear suffix).
- When the number of prefix / suffix characters exceeds the maximum limit (4 digits), the configuration will be ignored, so unnecessary characters should be deleted then.

6.2.2. Command List: Prefix / Suffix

Code	Prefix Command	Suffix Command
All code	RY	RZ
UPC-A	N1	N6
UPC-A add-on	M0	O0
UPC-E	N2	N7
UPC-E add-on	M1	O1
EAN-13	N3	N8
EAN-13 add-on	M2	O2
EAN-8	N4	N9
EAN-8 add-on	M3	O3
Code 39	M4	O4
Tri-optic	MC	PN
Codabar	M5	O5
Industrial 2 of 5	M6	O6
Interleaved 2 of 5	M7	O7
S-code	MB	OB
Matrix 2 of 5	GL	GM
IATA	I8	I9
MSI/Plessey	N0	N5
Telepen	L8	L9
UK/Plessey	MA	OA
Code 128	M9	O9
GS1-128	XMX	XOX
Code 11	BLD	BLE
Intelligent Mail Bar Code	D5I	D5J
POSTNET	D6D	D6E
GS1 DataBar	OE	PQ
Composite code	RR	RS
Codablock-F	D4S	D4T
Data Matrix	MD	PO
Aztec	BF0	BF1
Chinese Sensible Code	D4N	D4O
QR Code	MK	PW
Maxicode	ML	PX
PDF417	OC	PY
MicroPDF417	OD	PZ
Clear prefix / suffix	MG	PR
Preamble / Postamble	MZ	PS

6.2.3. ASCII Prefix / Suffix Values

ASCII	Command	ASCII	Command	ASCII	Command	ASCII	Command
<SPACE>	5A	A	0A	a	$A	^@ (NULL)	9G
!	5B	B	0B	b	$B	^A (SOH)	1A
"	5C	C	0C	c	$C	^B (STX)	1B
#	5D	D	0D	d	$D	^C (ETX)	1C
$	5E	E	0E	e	$E	^D (EOT)	1D
%	5F	F	0F	f	$F	^E (ENQ)	1E
&	5G	G	0G	g	$G	^F (ACK)	1F
'	5H	H	0H	h	$H	^G (BEL)	1G
(	5I	I	0I	i	$I	^H (BS)	1H
)	5J	J	0J	j	$J	^I (HT)	1I
*	5K	K	0K	k	$K	^J (LF)	1J
+	5L	L	0L	l	$L	^K (VT)	1K
,	5M	M	0M	m	$M	^L (FF)	1L
-	5N	N	0N	n	$N	^M (CR)	1M
.	5O	O	0O	o	$O	^N (SO)	1N
/	5P	P	0P	p	$P	^O (SI)	1O
:	6A	Q	0Q	q	$Q	^P (DLE)	1P
;	6B	R	0R	r	$R	^Q (DC1)	1Q
<	6C	S	0S	s	$S	^R (DC2)	1R
=	6D	T	0T	t	$T	^S (DC3)	1S
>	6E	U	0U	u	$U	^T (DC4)	1T
?	6F	V	0V	v	$V	^U (NAK)	1U
@	6G	W	0W	w	$W	^V (SYN)	1V
[	7A	X	0X	x	$X	^W (ETB)	1W
\	7B	Y	0Y	y	$Y	^X (CAN)	1X
]	7C	Z	0Z	z	$Z	^Y (EM)	1Y
^	7D	0	Q0			^Z (SUB)	1Z
_	7E	1	Q1			^[(ESC)	9A
`	7F	2	Q2			^\ (FS)	9B
{	9T	3	Q3			^] (GS)	9C
|	9U	4	Q4			^^ (RS)	9D
}	9V	5	Q5			^_ (US)	9E
~	9W	6	Q6			DEL (ASCII127)	9F
		7	Q7				
		8	Q8				
		9	Q9				

6.3. Code ID / Length / Coordinate

The same procedures for the prefix and suffix settings can be used for the code ID, code length and code coordinate settings

6.3.1. Code ID

Code identification OPTICON (see 10.2.1.)
The direct input 'code identifier' provides a quick method of programming in addition to programming a separate prefix or suffix for each bar code type.

Code identification AIM/ISO (see 10.2.2.)
The code identifier is transmitted to ISO 15424 format.]cm

-] is ASCII value, decimal 93
- c is code character
- M is modifier character

Item	Command	Description	Default
Code identification	$2	Code identification using OPTICON ID	
	$1	Code identification using AIM ID	

6.3.2. Code Length

The code length is transmitted as 2 digits, excluding prefix and suffix characters. For 2D codes the code length is transmitted as 6 digits. It is also possible to send the length as 6 digits for both 1D and 2D codes. These direct input characters count as 1 entry of the 4 permissible entries for a prefix and suffix.

Item	Command	Description	Default
Code length	$3	Code length (1D/2D : 2/6 digit)	
	$6	Code length (1D/2D : 6/6 digit)	

Example: to set the all code prefix <code identifier>:<code length>:.

Configuring with Command:
<Esc>RY$26A$36A<CR>

Configuring with menu bar code:

1. Scan "ZZ" to start
2. Scan "RY" to set prefix all codes
3. Scan "$2" to set Code identification using OPTICON ID
4. Scan "6A" to set
5. Scan "$3" to set code length (1D/2D : 2/6 digits)
6. Scan "6A" to set
7. Scan "ZZ" to end.

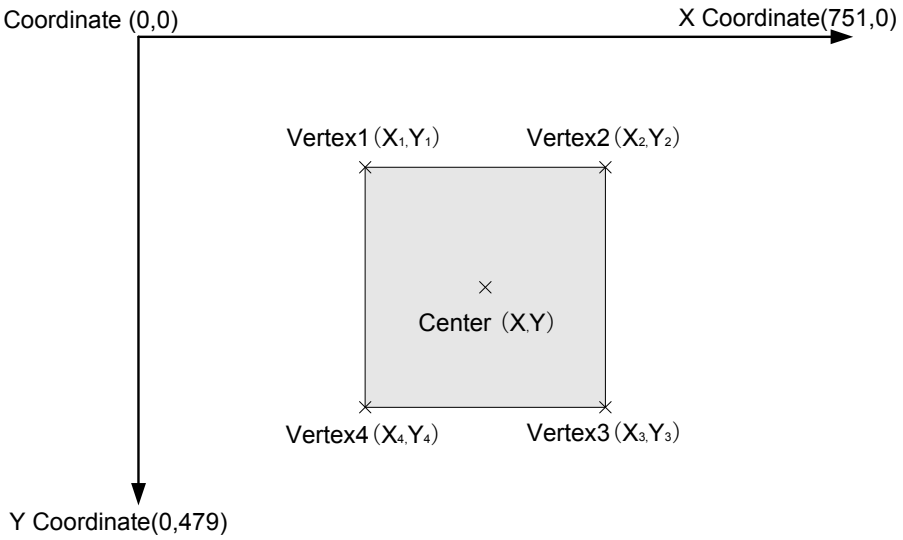
6.3.3. Code Coordinates

The code coordinate is transmitted as the pixel coordinate of the image sensor
It is able to output the vertex and the center of the read code.

Item	Command	Description	Default
Code coordinate	DDX	Code vertex coordinate	
	DDY	Code center coordinate	

- Code vertex coordinate optput format:
  $X_1,Y_1;X_2,Y_2;X_3,Y_3;X_3,Y_3;X_4,Y_4;$
- Code center coordinate output format
  X,Y;
- X Y format
  X : ±4digits
  Y : ±4digits

The range of coordinate is described below.
X : 0 to 751 Y : 0 to 479



7. Read Options

This chapter describes the read options for the scan engine.

The configurations available are:

7.1. Manual Trigger

Code reading starts by pressing trigger or sending the command trigger (see 2.5.1) in manual trigger. The manual trigger includes “single read” and “multiple read” modes.

7.1.1. Single Read

A target code is read each time the trigger is pressed. The reading operation stops when the decoded data of a single code is output or the specified read time has expired.

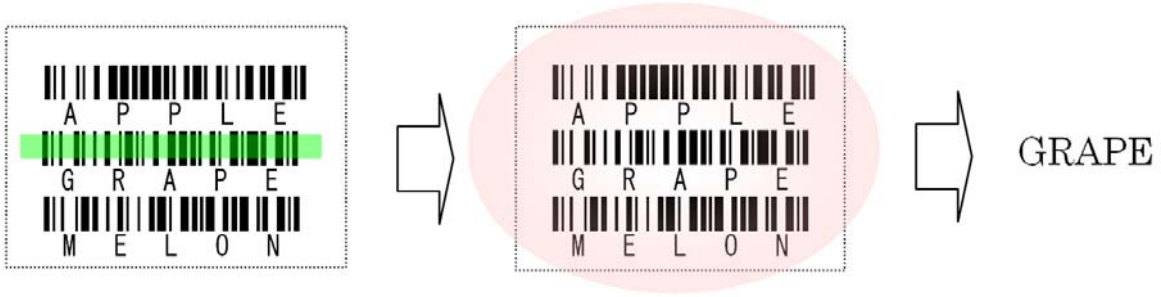
Item	Command	Description	Default
Single read	S0	Single read in a single trigger	○

7.1.2. Trigger Repeat

Only aiming light is emitted to find a target code while the trigger is pressed, and when the trigger is released, the code in the center of an image is read. The read time after releasing the trigger is 1 seconds and Central Reading (see 7.1.5.) is enabled.

Item	Command	Description	Default
Trigger repeat	/K	Disable trigger repeat	○
	/M	Enable trigger repeat	

(E.g.) “During trigger press” “Release trigger” “Output data”



7.1.3. Extended Read Time

Read time in single read, after the trigger is pressed or the read command is sent, can be extended. Reading operation stops when no data is output within the specified time.

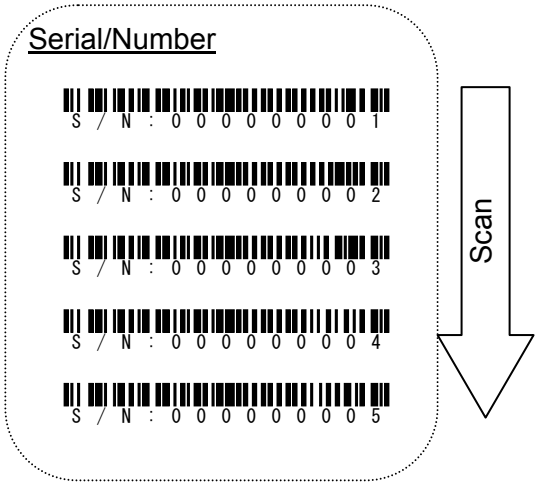
Item	Command	Description	Default	Remark
Extended read time (Single read)	Y0	0 seconds	○	ynchronous with TRIGn signal
	Y1	1 second		
	Y2	2 seconds		
	Y3	3 seconds		
	Y4	4 seconds		
	Y5	5 seconds		
	Y6	6 seconds		
	Y7	7 seconds		
	Y8	8 seconds		
	Y9	9 seconds		
	YL	Read time * 10		
	YM	Indefinitely		

7.1.4. Multiple Read

Multiple target codes are read while the trigger is pressed. When plural codes are within a filed of view as shown in the figure below, a code once decode is stored in the memory and the same code will not be decoded twice during the trigger press. However, when 20 or more codes are read, the memory is reset. When the order of multiple codes is important, it is recommended to enable Central Reading (see 7.1.5.). To read the same code again, press the trigger again.

Item	Command	Description	Default
Multiple read	D3P	Multiple read in a single trigger	○

(E.g.) A series of bar codes is scanned continuously with a single trigger.



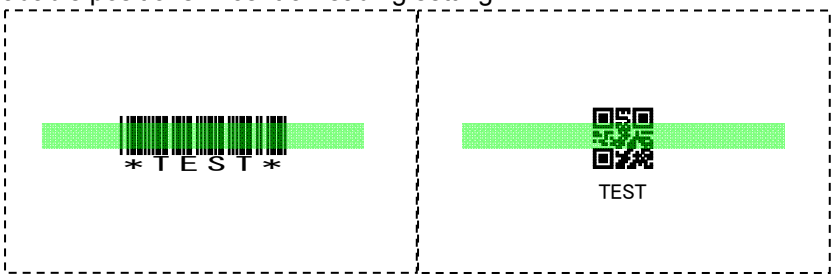
* It is recommended to use “High speed” of “Search Priority Mode” (refer to 7.3.2) function that Improved reading performance.

7.1.5. Central Reading

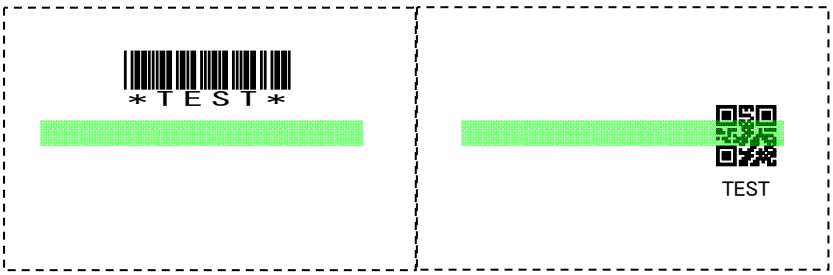
This function is used to read a target code when multiple codes are closely positioned. Reading can be activated only when the code is in the central portion of an image as shown below.

Item	Command	Description	Default
Central reading	D00	Enable central reading; read only a code at the center of aiming LED	
	D0Z	Disable central reading; read an entire image	○

(E.g) Readable positions in central reading setting



(E.g.) Unreadable positions in central reading setting



* When several codes are tightly packed, it is recommended to use Trigger Repeat (refer to 7.1.2) function that Improved reading performance.

7.2. Auto Trigger

The auto trigger is a function that automatically detects a scanned target and starts reading.

These options are used to activate the auto trigger. If you want to use the auto trigger at the time of start-up, make sure to save the setting. When the auto trigger is disabled, manual trigger is used.

Item	Command	Description	Default
Auto trigger	+F	Disable auto trigger	○
	+I	Enable auto trigger	

7.2.1. Detection Mode

There are three methods for detecting a target code.

(1) Green aiming detection
When a target code falls within the aiming range while the green aiming light is emitted, the target is detected. It is recommended to use this mode indoors because the detectability is reduced in an environment of higher illuminance levels than indoor's.

(2) Red illumination detection
When a target code falls within the range of the field of view while the red illumination light is emitted, the target is detected. This mode can be used in a lighted environment.

(3) No illumination detection
A target code is detected without illumination light. The power consumption can be reduced, but the response of detection will also be reduced. Ambient light is used for detection in this mode, so this can not be used in a dark place while it can be used in a lighted environment.

Item	Command	Description	Default
Auto trigger	DDG	Green aiming detection	○
	DDH	Red illumination detection	
	DDI	No illumination detection	

7.2.2. Auto Trigger Conditions

The detection sensitivity can be adjusted. The sensitivity varies with ambient environment and the adjustment may be needed.

Item	Command	Description	Default
Auto trigger conditions	XMF	Sensitive	
	XMH	Normal	○
	XMJ	Insensitive	

7.2.3. Double Read Reset Time

This allows setting of time interval before the same code can be decoded again in auto trigger mode. When 0 second is set, the same code will not be decoded. When a code with different data is read, this will be reset.

Item	Command					Description	Default (valid range)
Double read reset time	D3R	Qa	Qb	Qc	Qd	Double read reset time (1000a+100b+10c+d) [10ms]	700 ms (0 ~ 9999)

7.2.4. Auto Trigger Sleep Mode

When nothing is detected during a specific period in auto trigger mode, the scan engine goes into sleep mode. The time period before going into sleep mode is configurable. The scan engine performs presence detection at specified time intervals in sleep mode, and when a target is detected or any event such as trigger occurs, the mode returns from sleep mode. Setting the time of 0 seconds means that the sleep mode is disabled.

Item	Command					Description	Default (valid range)
Auto trigger sleep mode	EBW	Qa	Qb	Qc	Qd	Transition time to sleep mode (1000a+100b+10c+d) [ms]	300 s (0 ~ 9999)

7.2.5. Detection Intervals in Auto Trigger Sleep Mode

A detection time interval is configurable.

Item	Command				Description	Default (valid range)
Detection interval	EBX	Qa	Qb	Qc	Detection time interval (100a+10b+c) [10ms]	500 ms (1 ~ 9999)

7.3. Details of Decoder

7.3.1. 1D Code Decode Mode

These options allow you to configure prudence to decode linear bar codes.
In Careful mode, it can be easier to read bar codes which are difficult to read, while the reading response degrades. On the contrary, in Quick mode, the reading response improves but it may be difficult to read bar codes which are curved or dirty.

Item	Command	Description	Default
1D code decode mode	DM3	Careful mode	
	DM2	Standard mode	○
	DM1	Semi-quick mode	
	DM0	Quick mode*1	

7.3.2. Search Priority Mode

Either ‘scanning speed’, ‘scanning accuracy’, or ‘scanning accuracy with center code priority’ can be selected. Set to "high precision" when scanning small or bad quality codes.

Item	Command	Description	Default
Search priority mode	DE9	High speed	
	DEA	High precision	
	DEB	High precision - center code priority	○

7.3.3. Quiet Zone

This option allows the scan engine to decode bar codes that have smaller start and/or end margins than specified for the symbologies. Note that this option may increase the possibility of partial and ghost reads, so do not use smaller margin checks than necessary.

Item	Command	Description	Default
Margin check	YN	No margin check	
	YO	Margin check 1/7 nominal	
	YP	Margin check 2/7 nominal	
	YQ	Margin check 3/7 nominal	
	YR	Margin check 4/7 nominal	
	YS	Margin check 5/7 nominal	
	YT	Margin check 6/7 nominal	
	YU	Margin check nominal	○

7.3.4. Redundancy

When redundancy is enabled, a label has to be scanned and decoded multiple times and the results should be the same, before it considered correctly decoded. The redundancy count is the nr of times that the label has to be scanned additional to the first scan. Selecting a higher redundancy count reduces the probability of reading errors, but it makes the output response slower. With high quality printed labels, default setting is enough to ensure the reliability.

Item	Command	Description	Default
Redundancy	X0	Read 1 time, redundancy = 0	
	X1	Read 2 time, redundancy = 1	○
	X2	Read 3 time, redundancy = 2	
	X3	Read 4 time, redundancy = 3	
	BS	Read 5 time, redundancy = 4	
	BT	Read 6 time, redundancy = 5	
	BU	Read 7 time, redundancy = 6	
	BV	Read 8 time, redundancy = 7	
	BW	Read 9 time, redundancy = 8	

7.4. Illumination and Aiming

7.4.1. LED Illumination

Red LED illumination used for scanning can be set to enable / disable.

- Disable illumination
  When disabling the illumination, the reading performance will be degraded.

- Automatic illumination switching
  Floodlight ON and OFF are alternated so that the condition in which a code could be read is memorized and will be priority for scanning.

- Prevention of specular reflection
  Only when specular reflection of LED illumination occurs, the reading is performed with the illumination turned off.

Item	Command	Description	Default
LED illumination mode	D39	Enable LED illumination	○
	D3A	Disable LED illumination	
	D3B	LED illumination alternating	
	D3Q	Prevent specular reflection	
LED illumination brightness	DDB	Brightness "Standard"	○
	DDC	Brightness "Low"	

✧Prevention of flicker
When there is not target to be read, flicker occurs because of the LED illumination, and this flicker can be prevented with setting. However, by enabling the setting, codes on LCD screen will be difficult to be read.

Item	Command	Description	Default
LED illumination flicker prevention	D3J	Enable LCD display reading	○
	D3I	LED illumination flicker prevention	

7.4.2. LED Aiming

Green LED floodlight used for aiming can be set to enable / disable. The brightness is also configurable.

Item	Command	Description	Default
LED aiming ON/OFF	D3D	Enable LED aiming	○
	D3E	Disable LED aiming	
LED aiming brightness	DDD	Brightness "High"	○
	DDE	Brightness "Standard"	
	DDF	Brightness "Low"	

7.5. Scanned Medium

The following settings may be needed depending on the medium to be scanned.

7.5.1. Structured Append Codes

When single data is contained in multiple 2D codes, the concatenated code data can be ouput.

Item	Command	Description	Default
Structured append	EBU	Enable structured append	○
	EBV	Disable structured append	

(E.g.) Two structured append QR Codes

(E.g.) Three structured append QR Codes

7.5.2. Positive and Negative Codes

Usually bar codes are printed black on white, but sometimes white on black. These labels are called positive and negative respectively. In case the 'negative bar codes' option has been selected, positive labels may not be decoded anymore or with difficulty. This also applies to menu labels. In case the ‘positive and 'negative bar codes' option has been selected, the reading speed may be decreased.

Item	Command	Description	Default
Positive and Negative codes	V2	Positive bar codes	○
	V3	Negative bar codes	
	V4	Positive and Negative bar codes	

(E.g.) Positive and negative Data Matrix


Positive Data Matrix

To enable the positive bar codes, use the settings below.

Command	Description	2D Menu Code
ZZ	Start/End menu mode	
V2	Positive bar codes	
ZZ	Start/End menu mode	

7.5.3. Collective Reading

It is possible not to output data unless the specified number of codes is read. That means that the scan engine does not read codes other than the specified number. It is recommended to use “Data Editing Programming” function (see 8.) if the data format has already been decided. It enables simultaneous reading of multiple codes and reading of a single code at a time.

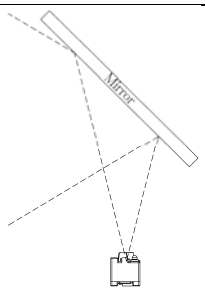
Item	Command	Description	Default
Multiple label read	D01	Multiple label 1	○
	D02	Multiple labels 2	
	D03	Multiple labels 3	
	D04	Multiple labels 4	
	D05	Multiple labels 5	
	D06	Multiple labels 6	
	D07	Multiple labels 7	
	D08	Multiple labels 8	
	D09	Multiple labels 9	
	D0A	Multiple labels 10	
Multiple label read (right and left) *	D0N	Left to right	○
	D0O	Right to left	
Multiple label read (top and bottom) *	D0P	Top to bottom	○
	D0Q	Bottom to top	
Multiple label read (output priority)	D0R	Output priority horizontal	
	D0S	Output priority vertical	○
Same label read	D0T	Disable same label during multiple label read	○
	D0U	Enable same label during multiple label read	
Sorting labels	D0V	Enable sorting decoded labels	○
	D0W	Disable sorting decoded labels	
Buffered mode	D0X	Buffered mode (one image)	
	D0L	Buffered mode (n images)	○

* When the reading order is based on reading directions, it is recommended to set “buffered mode (one image)” to avoid output error.

7.6. Mirror Image

When an external mirror is installed for reading codes as shown below, set to “enable mirror image output”.

Item	Command	Description	Default
Mirror image	E8J	Disable mirror image output	○
	E8I	Enable mirror image output	



* When a mirror is used, there are requirements for installation to prevent a floodlight reflection in the mirror and the transmissive window. Refer to “Integration Guide” for details.

7.7. Buzzer

Buzzer operation settings are described below.

7.7.1. Buzzer Loudness

The buzzer loudness can be set with these options, which is applied to all buzzers.

Item	Command	Description	Default	Remark
Buzzer loudness (*)	T0	Buzzer loudness : Maximum		100%
	T1	Buzzer loudness : Loud	○	70%
	T2	Buzzer loudness : Normal		40%
	T3	Buzzer loudness : Minimum		2%

* The buzzer loudness can be set with numerical numbers by inputting the command followed by a 3-digit numerical command.

Item	Command				Description	Default (valid range)
Buzzer loudness numerical setting	DF4	Qa	Qb	Qc	Numerical setting of buzzer loudness (100a+10b+c) [%]	70% (1 ~ 100)

7.7.2. Good Read Buzzer

The good read buzzer is activated after a bar code was successfully decoded and the data was output. 3 types of tone and 5 types of duration are configurable. Buzzer also can be disabled.

Item	Command	Description	Default
Software buzzer	W0	Disable buzzer	
	W8	Enable buzzer	
Buzzer tone (*)	DF1	Low frequency buzzer(2750Hz)	
	W1	Middle frequency buzzer (3000Hz)	○
	DF2	High frequency buzzer (3250Hz)	
	W2	High - low buzzer	
	W3	Low - high buzzer	
Buzzer duration	W7	Buzzer duration: 50 ms	
	DF3	Buzzer duration: 75 ms	○
	W4	Buzzer duration: 100 ms	
	W5	Buzzer duration: 200 ms	
	W6	Buzzer duration: 400 ms	

* The good read buzzer tone (frequency) can be set with numerical numbers by inputting the command followed by a 4-digit numerical command.

Item	Command					Description	Default (valid range)
Buzzer tone frequency numerical setting	DF0	Qa	Qb	Qc	Qd	Numerical setting of buzzer tone frequency (1000a+100b+10c+d)[Hz]	3000 Hz (1 ~ 9999)

7.7.3. Startup Buzzer

This setting allows for specifying whether or not to activate the startup buzzer when the scan engine is powered on.

Item	Command	Description	Default	Remark
Startup buzzer	GD	Disable startup buzzer	○	Enabled only with “Z2”
	GC	Enable startup buzzer		Enabled only with “Z2”

7.7.4. Read Timeout Buzzer

In case decoding cannot be done within the timeout period, an error buzzer sounds when the read operation ends.

Item	Command	Description	Default	Remark
Read timeout buzzer	EAP	Disable read timeout buzzer	○	
	EAQ	Enable read timeout buzzer		

7.7.5. Intermediate Buzzer

When one label is decoded, an intermediate buzzer sounds to indicate that the label is decoded but it does not yet meet the conditions to output data.

For instance, suppose five-label reading is set in buffer mode, the intermediate buzzer then sounds after the decoding of the 1st, 2nd, 3rd and 4th label and a good read buzzer finally sounds when the last label is decoded after which the data is output. The data is not output when the 1st to 4th labels are decoded but reading of each label can be confirmed by the intermediate buzzer. When the good read buzzer is disabled, this setting will be forcibly disabled.

Item	Command		Description	Default	Remark
Intermediate buzzer	EBY	Q0	Disable intermediate buzzer		
		Q1	Enable intermediate buzzer	○	

* Intermediate buzzer frequency : 5000 Hz (5 KHz) , duration: 10 ms

7.8. Status LED

Status LED settings for successful reading are described below.

7.8.1. Good Read LED

The good read LED lights up after a code was successfully decoded and the data was output. This can be disabled or set for several durations.

Item	Command	Description	Default	Remark
Good read LED	T4	Disable indicator		
	T5	Indicator duration: 0.2 s	○	
	T6	Indicator duration: 0.4 s		
	T7	Indicator duration: 0.8 s		

7.8.2. Inversion of Good Read LED

In good read LED inverted mode, the good read LED stays on when the stand detection is enabled and the scanner is placed in a stand. It turns off for a set period of time described above 7.8.1 when a bar code is successfully decode.

Item	Command	Description	Default	Remark
Inversion of Good Read LED	E6Y	Good Read LED normal mode	○	
	E6Z	Good Read LED inverted mode		

7.9. Indicators

Common settings for both buzzer and good read LED are described below.

7.9.1. Indicator Timing

The indicators can be activated after decoding a code and before or after transmitting the data.

Item	Command	Description	Default	Remark
Indicator timing	VY	Before data transmission	○	soon after decoding
	VZ	After data transmission		

8. Data Editing Programming

This chapter describes the details on how to set the data editing and the simultaneous reading of multiple labels.

“Cut script” and “Paste script” settings in the data editing programming allow various data editing and simultaneous reading of multiple labels under detailed conditions without changing the host system.

* General settings are easily configurable with a program called “Universal Menu Tool 2D”, using the “Data Editing” option. Special settings should be configured in accordance with the following specifications.

8.1. Overview of Data Editing Programming

Data editing programming is a function to edit output data by cutting parts the label data with a “Cut script” and pasting them into output data with a “Paste script”.

[Cut Script]
The ‘Cut script’ specifies the process to cut parts of strings from the scanned label data and register them in the ‘partial string database’.

This script allows for the followings:
(1) Cut parts of strings
(2) Cut strings of application identifiers data
(3) Remove specified strings when cutting a string.
(4) Add specified strings when cutting a string

[Partial String Database]
The ‘partial string database’ manages the part of strings, which were cut with the ‘Cut script’, for later use in the ‘Paste script’ processing. It will hereinafter be described in detail

[Paste Script]
The ‘Paste script’ specifies the process to read out the parts of strings, which were cut with the ‘Cut script’, from the ‘partial string database’ and pastes them into the output data.

This script allows for the followings:
(1) Paste parts of strings
(2) Paste strings of application identifiers data
(3) Insert specified strings

Specific examples of data editing programming are described in the following pages.

8.2. Examples of Data Editing Programming

Four examples of the data editing programming are shown below.

8.2.1. Extract Necessary Information from GS1 AI

This example shows the output of 4 application identifiers. However, the data editing programming actually supports the cut-and-paste editing of up to 64 application identifiers.
In this case, the data can be output with AI: 01 (required) and 17, 30, 10 (optional).

Configuration example:

[Cut Script]:
\Ax+$

[Paste Script]:
\(GTIN\)\A01[0]\Dx\x0DLotNo:(\A10[0]\Dx|??)\x0DExpirationDate:(\A17[0]\Dx|??)\x0DQuantity:(\A30[0]\Dx|??)\x0D

* Additional setting: Enable GS1 composite code (See 5.1.3)

Setting number: 1

[Setting Menu]

(Store in setting 1)	<Setting code data> @MENU_OPTO@ZZ@ED0@'\Ax+$'@ED1@'\(GTIN\)\A01[0]\Dx\x0DLotNo:(\A10[0]\Dx|??)\x0DExpirationDate:(\A17[0]\Dx|??)\x0DQuantity:(\A30[0]\Dx|??)\x0D'@ED2@Q1@BHE@ZZ@OTPO_UNEM@

[Scanned Code] [Output Data」

・GS1-Limited

0104901234567894

(GTIN)04901234567894
LotNo:??
ExpirationDate:??
Quantity:??

・GS1-128

0115012345678907171211033025610EFGH5678

(GTIN)15012345678907
LotNo:EFGH5678
ExpirationDate:121103
Quantity:256

・GS1-CompositeCode

171209013051210ABCD1234
0113579246801237

(GTIN)13579246801237
LotNo:ABCD1234
ExpirationDate:120901
Quantity:512

・GS1-DataMatrix

01123456789012311712040110IJKL8901

(GTIN)12345678901231
LotNo:IJKL8901
ExpirationDate:120401
Quantity:??

8.2.2. Simultaneous Read of GS1 Stacked Labels

When the required data is divided into several labels, the setting as described in (8.2.1.) is also configurable. In this case, the data can be output with AI: 01, 17, 10 (required) and 30 (optional).
A single code of AI 01 and the like cannot be read with this setting, but the GS1-128, GS1-Composite Code and GS1-DataMatrix from the previous page can be read and the output data will be the same.

Configuration example:

[Cut Script]:
\Ax+$

[Paste Script]:
\(GTIN\)\A01[0]\Dx\x0DLotNo:\A10[0]\Dx\x0DExpirationDate:\A17[0]\Dx\x0DQuantity:(\A30[0]\Dx|??)\x0D

Setting number: 2

[Setting Menu]

(Store in setting 2)	<Setting code data> @MENU_OPTO@ZZ@ED0@'\Ax+$'@ED1@'\(GTIN\)\A01[0]\Dx\x0DLotNo:\A10[0]\Dx\x0DExpirationDate:\A17[0]\Dx\x0DQuantity:(\A30[0]\Dx|??)\x0D'@ED2@Q2@BHE@ZZ@OTPO_UNEM@

[Scanned Code] [Output Data」

・GS1-128 stacked labels

(GTIN)15012345678907
LotNo:IJKL8901
ExpirationDate:120901
Quantity:512

＊In order to read the above stacked labels simultaneous, make sure to disable the settings stored in the setting number 1 (8.3.3.). If it is not disabled and the upper label is read first, the data can be output correctly. However, if it is not disabled and the lower label is read first, the output will be ?? other than (GTIN).

8.2.3. Output Necessary Information from Multi Labels

This example shows the simultaneous reading of 4 labels. However, the data editing programming actually supports the reading of up to 16 labels and 8192 characters at a time.

Configuration example:

[Cut Script]:
\SB4[0-9]{12}$/\ST[0-9]{6}"-"[0-9]{2}"-"[0-9]{6}"-"[0-9]$/\ST<L>[0-9A-Z]+$/\ST<S>[0-9A-Z]+$

[Paste Script]:
[0]\x0DIMEI:[1]\x0DLot No:[2]\x0DSerial No:[3]\x0D

Setting number: 3

[Setting Menu]

(Store in setting 3)	<Setting code data> @MENU_OPTO@ZZ@ED0@'\SB4[0-9]{12}$/\ST[0-9]{6}"-"[0-9]{2}"-"[0-9]{6}"-"[0-9]$/\ST<L>[0-9A-Z]+$/\ST<S>[0-9A-Z]+$'@ED1@'GTIN:0[0]\x0DIMEI:[1]\x0DLot No:[2]\x0DSerial No:[3]\x0D'@ED2@Q3@ZZ@OTPO_UNEM@

[Scanned Code] [Output Data」

・Simultaneous reading of 4 product labels

GTIN-13: 123456 789018

IMEI: 123456789012345

Lot No: L 0 1 2 3 A B C D

Serial No: S E F G H I J K 4 5 6 7 8 9 0

GTIN:04123456789018
IMEI:123456-78-901234-5
Lot No:0123ABCD
Serial No:EFGHIJK4567890

8.2.4. Output Necessary Information from Comma Delimited Data

This example shows how to configure 4 fields of delimited data output. However, the data editing programming actually supports the cut-and-paste editing of up to 64 fields.

Configuration example:

[Cut Script]:
(.+?(?:<\,>|$)){4}

[Paste Script]:
[0,1,0]\x0DAddress\: [0,1,1]\x0DPhone\: [0,1,2]\x0DFax: [0,1,3]\x0D

Setting number: 4

[Setting Menu]

(Store in setting 4)	<Setting code data> @MENU_OPTO@ZZ@ED0@'(.+?(?:<\,>|$)){4}'@ED1@'[0,1,0]\x0DAddress\: [0,1,1]\x0DPhone\: [0,1,2]\x0DFax: [0,1,3]\x0D'@ED2@Q4@ZZ@OTPO_UNEM@

[Scanned Code]

・Address Data

European Headquarter,Opaallaan 35 2132 XV Hoofddorp Netherlands,+31 (0)23-5692700,+31 (0)23-5638266

[Outpput]

European Headquarter
Address: Opaallaan 35 2132 XV Hoofddorp Netherlands
Phone: +31 (0)23-5692700
Fax: +31 (0)23-5638266

8.3. Examples of Data Editing Programming

How to program data editing is described below.

8.3.1. Configuring with Commands

The commands based on the following specifications are used to specify the cut-and-paste settings for data editing.

Item	Command	Description	Remark
Set 'Cut script'	ED0	Enter command followed by 'Cut script'	
Set 'Paste script'	ED1	Enter command followed by 'Paste script'	
Set setting number	ED2	Enter command followed by numeric commands	Values: 1 ~ 4

[Input Format]

・Cut setting format <ESC>[ED0' Cut Script'<CR>
the command followed by Cut script enclosed in single quotation marks'・・・'.

・Paste setting format <ESC>[ED1' Paste Script'<CR>
Enter the command followed by Paste script enclosed in single quotation marks'・・・'.

・Set setting number <ESC>[ED2Setting Number<CR>
Enter the command followed by numerical commands. The configurable numbers are Q1 ~ Q4.
With this setting, the Cut/Paste scripts are stored in the number and will be enabled.

* If a single quotation ' is used for the Cut/Paste scripts, enter two single quotations ''.

8.3.2. Configuring with 2D Menu Codes

The format for data editing is the same as that of general 2D menu codes.

[Data Format]

@MENU_OPTO@ZZ@ED0@'Cut Script'@ED1@'Paste Script'@ED2@Setting Number@ZZ@OTPO_UNEM@

"@MENU_OPTO" (start key)	
"@" (separator)	
"ZZ" (set key)	
"@" (separator) "An arbitrary command" (e.g. BHE)	← 0 or multiple sets allowed
"@" (separator) "ED0"	
"@" (separator) "'Cut Script'"	
"@" (separator) "ED1"	
"@" (separator) "'Paste Script'"	
"@" (separator) "ED2"	
"@" (separator) "QN" (setting number N: 1 ~ 4)	
"@" (separator) "An arbitrary command" (e.g. BHE)	← 0 or multiple sets allowed
"@" (separator)	
"ZZ" (end key)	
"@" (separator)	
"OTPO_UNEM@" (stop key)	

8.3.3. Enabling/Disabling Data Editing Programming

There are four setting numbers where the settings can be stored for the data editing programming and each setting number can be enabled and disabled.

Item	Command	Description	Remark
Enable/Disable setting number	ED3	Enable setting number	
	ED4	Disable setting number	

- Enable setting number <ESC>[ED3Setting Number<CR>
  Enter the command followed by the setting number Q1 ~ Q4.

- Disable setting number <ESC>[ED4Setting Number<CR>
  Enter the command followed by the setting number Q1 ~ Q4.

[Enable/Disable setting number]

Setting No.	Method	Enable setting		Disable setting	
1	Command	REGE	Q1	REGD	Q1
	Menu	 @MENU_OPTO@ZZ@ED3@Q1@ZZ@OTPO_UNEM@		 @MENU_OPTO@ZZ@ED4@Q1@ZZ@OTPO_UNEM@	
2	Command	REGE	Q2	REGD	Q2
	Menu	 @MENU_OPTO@ZZ@ED3@Q2@ZZ@OTPO_UNEM@		 @MENU_OPTO@ZZ@ED4@Q2@ZZ@OTPO_UNEM@	
3	Command	REGE	Q3	REGD	Q3
	Menu	 @MENU_OPTO@ZZ@ED3@Q3@ZZ@OTPO_UNEM@		 @MENU_OPTO@ZZ@ED4@Q3@ZZ@OTPO_UNEM@	
4	Command	REGE	Q4	REGD	Q4
	Menu	 @MENU_OPTO@ZZ@ED3@Q4@ZZ@OTPO_UNEM@		 @MENU_OPTO@ZZ@ED4@Q4@ZZ@OTPO_UNEM@	

8.4. Output Setting Strings for Data Editing Programming

The “Cut script” and “Paste script” stored in the setting numbers can be output.

Item	Command	Description	Remark
Get script	ED5	Get scripts in setting numbers	

・Get scripts in setting numbers <ESC>[ED5Setting Number<CR>
Enter the command followed by the setting number Q1 ~ Q4.

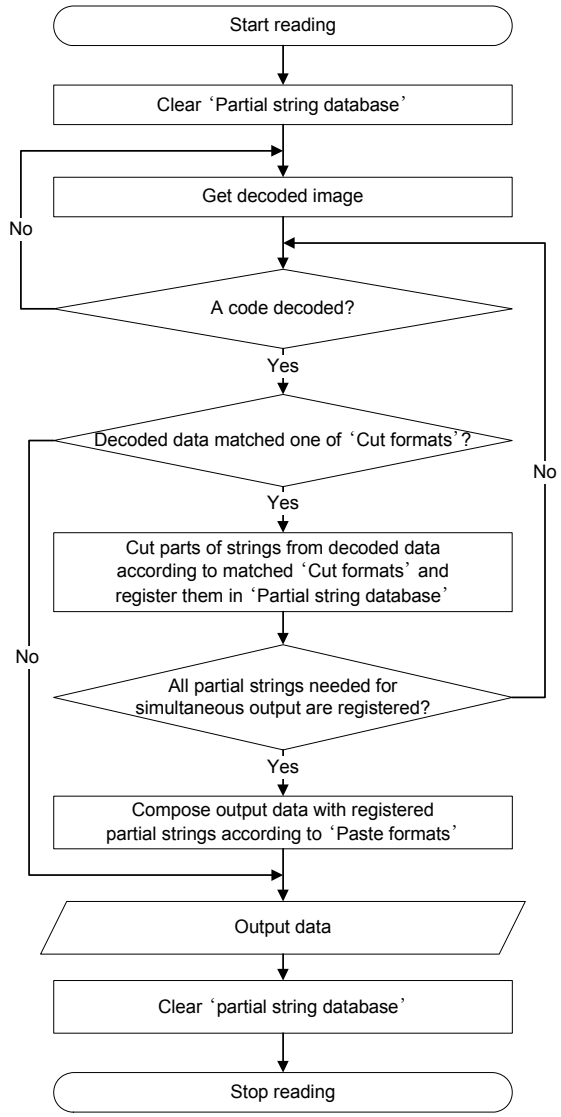
The setting strings are output in the following format.

[Output Format]
Cut Script<CR>Paste Script<CR>

8.5. Specifications for Data Editing Programming

The following flow chart shows the specifications for the data editing programming.

Data editing programming flow



➢ [Cut format]
The format used to cut parts of strings from the decoded data and register them in the "partial string database".

* Plural Cut formats can be registered to control the simultaneous reading operation etc.

➢ [Cut script]
Configuration script represented with a combination of "Cut formats".

➢ [Partial string database]
Database where the parts of strings cut out from label data are registered.

➢ [Paste format]
The format used to compose output data with parts of strings registered in the '"partial string database".

➢ [Paste script]
Configuration script represented in the "Paste format".

8.5.1. Cut Format

➢ Description
"Cut format" is the format used to check and determine whether the decoded data matches a certain pattern. When there is a match, the parts of strings are cut according to this format.
If plural 'cut formats' are registered, the decoded data is checked against the formats in ascending order of format ID. The parts of strings which are cut out will be registered in the "partial string database". When there is no matched data, the data is output according to the normal string options.

There are two ways to take out the parts of strings in the "cut format":
- Type ( ) in the "cut format", and cut the strings that matches the pattern between the (and).
- Type \ ACCCC in the "cut format" and cut the AI strings.

* In the case of AI, "AI + data string" of CCCC located in \ACCCC is cut out. In the case of "x", "any AI + data string" of x located in \Ax is cut out.

Below is an example of label data, cut formats and the strings to be cut out.

Label data	Cut format	Cut string
ABCDEF	AB(CDE)F	CDE
3910JPY1050	\A3910	3910JPY1050
	\A391D	
	\Ax	

* Use "D" in the AI in place of a character to indicate the decimal point position (3910 ~ 3919 can be cut out).

8.5.2. Partial String Database

➢ Description
"Partial string database" is a database to register the parts of strings that are cut from the label data. The parts of strings can be used as reference in composing the output data.

There are two types of partial strings; one is registered by "( ) of the cut format", and the other is registered by "\ACCCC or \Ax of the cut format".

How to manage the partial strings cut by parentheses
In the "partial string database", the following three IDs are used to manage the partial strings that are cut by ( ) in the cut format.

・Cut format ID : L
This indicates which cut format ID among the registered cut formats is used to register the partial string.

・Cut parentheses ID : M
This indicates what number of ( ) that appeared in the same cut format is used to register the partial string, where the first appearance is indicated with 1, the second by 2 etc. The value 0 is used to reference the string that perfectly matches the cut format.

・Cut count ID : N
This indicates what order the partial string was registered among the partial strings registered with the same cut format ID and the same cut parentheses ID.

The partial string registered to the Cut format ID = L, Cut parentheses ID = M and Cut count ID = N is represented as [L, M, N].

Below is an example of Label data, "Cut format" and "Partial string database".

Label data	Cut format (0 and 1 = Cut format ID)	Partial string database
ABCDEF	AB(CDE) GHI([A-Z])*	[0,0,0]=ABCDE [0,0,1]=ABCDEF [0,1,0]=CDE
GHIJK	AB(CDE) GHI([A-Z])*	[1,0,0]=GHIJK [1,1,0]=J [1,1,1]=K

* [A-Z] matches any of uppercase alphabetic characters, and "*" indicates a repeat of ( ).
* The sting that completely matches the 'cut format' is registered as Cut parentheses ID = 0 and Cut count ID = 0.

How to manage the partial strings cut by specifying AI

In the “partial string database”, the following three IDs are used to manage the partial strings that are cut by \A0000 or \Ax in the cut format.

・Application Identifier : CCCC
This indicates the application identifier of the cut partial string.

・Cut format ID : L
This indicates which cut format ID among the registered cut formats is used to register the partial string.

・Cut count ID : N
This indicates what order the partial string was registered among the partial strings registered with the same cut format ID and the same application identifier ID.

The partial string registered to the Application Identifier = CCCC, Cut format ID = L and Cut count ID = N, the AI and the Data field are represented as [\ACCCC[L, N]\I] and [\ACCCC[L, N]\Dx] respectively.

For the AI with multiple data fields like 391D, the nth data field is represented as [\ACCCC[L, N]\Dn] and the string with all data fields combined is represented as [\ACCCC[L, N]\Dx].

Below is an example of Label data, “Cut format” and “Partial string database”.
Any of the following cut formats can be registered to ID = 0 to get the same results.

Label data	Cut format	Partial string database
1712040117120901	\A17\A17	\A17[0,0]\I=17 \A17[0,0]\D1=120401 \A17[0,0]\Dx=120401 \A17[0,1]\I=17 \A17[0,1]\D1=120901 \A17[0,1]\Dx=120901
	\A17*	
	\A17\Ax	
	\Ax\A17	
	\Ax\Ax	
	\Ax*	
3910JPY1050	\A3910	\A3910[0,0]\I=3910 \A3910[0,0]\D1=JPY \A3910[0,0]\D2=1050 \A3910[0,0]\Dx=JPY1050
	\A391D	
	\Ax	

* “*” indicates a repeat of \A17 and \Ax.

8.5.3. Paste Format

➢ Description
"Paste format" is a format to compose the output data based on the parts of strings registered in the "partial string database".

If all the data required for composing the output data is available, the output data will be successfully made and will be sent to the host. If not all the data required for composing the output data is available, the reading operation will continue while the information in the "partial string database" will be retained.

In order to include the parts of strings registered in the "partial string database" in the output data, enter the notations for specifying the partial strings described in the section of "Partial string database" into "the Paste format".

Below is an example of "Partial string database", "Paste format" and Output data.

<table>
<tr><th>Partial string database</th><th>Paste format</th><th>Output data</th></tr>
<tr><td>[0,0,0]=ABCDEF
[0,1,0]=CDE
[1,0,0]=GHIJK
[1,1,0]=J
[1,1,1]=K</td><td>[0,1,0]_[1,1,0]_[1,1,1]</td><td>CDE_J_K</td></tr>
<tr><td rowspan="2">\A3910[0,0]\I=3910
\A3910[0,0]\D1=JPY
\A3910[0,0]\D2=1050
\A3910[0,0]\Dx=JPY1050</td><td>\A3910[0,0]\I_\D1_\D2</td><td rowspan="2">3910_JPY_1050</td></tr>
<tr><td>\A391D[0,0]\I_\D1_\D2</td></tr>
</table>

* Once AI, Cut format ID and Cut count ID have been specified by \A3910[0,0] etc, \I, \1 and \2 etc. can be entered continuously even when any other character such as "_" is put between.

8.6. Cut Script Specifications

“Cut script” is used for the “Cut format”. The specifications for the cut script are based on POSIX regular expressions and the extended function of the label data editing.
* Some of the functions of the POSIX regular expressions are not supported. Also, multiple cut formats can be presented by separating the regular expressions with “/”.

8.6.1. Code Type Matching Syntax

A rule to limit the code types on which the data cut processing is performed. Representing \S followed by OPTICON Code ID (see10.2.1.) allows only the corresponding code type data to be cut.

Notation	Description
\SX	Code types Specify OPTICON Code ID to X. Only the specified code type data is cut. No matter where this notation is represented in the cut setting strings, the operation does not change. To set the multi code types, repeat this notation. E.g. \SC\SF\SG Enable cut processing for the UPC-A, UPC-A + 2, UPC-A + 5 data. If no code type is represented in the regular expressions, the cut processing is performed for all types of code data.

8.6.2. Character Matching Syntaxes

When the conditions are met regarding the target character, the target character is cut and processing will move to the next character. After that, the next processing rule is evaluated. If the conditions are not met, it will result in a cut error.

Notation	Description
x	Matches character x. x is any character. When a target character matches the character x, it is cut and processing will move to the next character. After that, the next processing rule is evaluated. If it does not match, it will result in a cut error.
\	Escape sequence: A meta-character just behind \ is compared as an ordinary character and when it matches, it is cut and processing will move to the next character. After that, the next processing rule is evaluated. In data editing programming, all ASCII characters excluding alphanumeric and space/underscore are reserved as the meta-characters.
^	Matches the head of a string. The target to cut is checked if it is the head of the string. When it is the head of the string, it is cut and then the next processing rule is evaluated. When it is not the head of the string, it will result in a cut error.
$	Matches the end of string The target to cut is checked if it is the end of the string. When it is the end of the string, it is cut and then the next processing rule is evaluated. When it is not the end of the string, it will result in a cut error.
.	Wild card Matches all characters. The target characters are cut and processing will move to the next character. After that, the next processing rule is evaluated.
[a-z0-9]	Matches any single character in [ ] The target character is checked if it is contained in [ ]. When it is contained, it is cut and processing will move to the next character. After that, the next processing rule is evaluated. If it is not contained, it will result in a cut error. The continuous characters, such as [12345] (matches any of 1, 2, 3, 4, 5) and [abcde] (matches any of a, b, c, d, e) can be represented by [1-5] and [a-e]. * When ^ is at the head, it will be the notation for matching the character that is not in the [^] as described below. Therefore, put ^ other than at the head or use the Escape sequence.
[^a-z0-9]	Matches any single character not in [ ] The target character is checked if it is not contained in [ ]. When it is not contained, it is cut and processing will move to the next character. After that, the next processing rule is evaluated. If it is contained, it will result in a cut error. * When ^ is other than at the head, it is interpreted as literal. Therefore, be sure to put it at the head.

8.6.3. AI Matching Syntaxes

This checks whether the string after the target character matches the AI format. If it matches, the matched part of string is cut and the processing moves forward across the cut characters. After that, the next processing rule is evaluated. If it does not match, it will result in a cut error.

Notation	Description
\Ax	Matches AI and the subsequent data. The AI types for matching are not limited. When the string after the target character matches the AI data, the matched AI and data string is cut and the processing moves forward across the cut characters. After that, the next processing rule is evaluated. If it does not match, it will result in a cut error.
\ACCCC	Matches AI CCCC and the subsequent data. This is a rule to limit the AIs of \Ax. E.g. \A01 matches the application identifier 01 and the data string (e.g. matches “0112345678901234”). \A310D matches the application identifier 3100~3109 and the data string (e.g. matches “3101123456”).

8.6.4. Repeat Syntaxes

Rules to repeat the last matching processing rule.
For instance, a* matches a string as long as possible in which “a” is repeated 0 or more times. a*? matches a string as short as possible in which “a” is repeated 0 or more times. (The matched string is cut by the character matching syntax.)
The same applies to the AI matching syntax; \Ax* matches a string as long as possible in which the AI and the AI data is repeated 0 or more times. \Ax*? matches a string as short as possible in which the AI and the AI data is repeated 0 or more times.

Notation	Description
*	Repeat (0 ~) (longest match) Matches 0 or more repeats of character or group just before the *. It tries to match maximum repeats.
+	Repeat (1 ~) (longest match) Matches 1 or more repeats of character or group just before the +. It tries to match maximum repeats.
?	Repeat (0 ~ 1) (longest match) Matches 0 to 1 repeats of character or group just before the ?. It tries to match maximum repeats. .
{n}	Repeat (n) (longest match) Matches n times of repeat of character or group just before the {n}. It tries to match maximum repeats. .
{n,}	Repeat (n ~) (longest match) Matches n or more times of repeat of character or group just before the {n,}. It tries to match maximum repeats. .
{n,m}	Repeat (n ~ m) (longest match) Matches n to m times of repeat of character or group just before the {n,m}. It tries to match maximum repeats. .
*?	Repeat (0 ~) (shortest match) Matches 0 or more repeats of character or group just before the *?. It tries to match minimum repeats.
+?	Repeat (1 ~) (shortest match) Matches 1 or more repeats of character or group just before the +?. It tries to match minimum repeats.
??	Repeat (0 ~ 1) (shortest match) Matches 0 to 1 repeats of character or group just before the ??. It tries to match minimum repeats.
{n}?	Repeat (n) (shortest match) Matches n times of repeat of character or group just before the {n}?. It tries to match minimum repeats.
{n,}?	Repeat (n ~) (shortest match) Matches n or more times of repeat of character or group just before the {n,}?. It tries to match minimum repeats.
{n,m}?	Repeat (n ~ m) (shortest match) Matches n to m times of repeat of character or group just before the {n,m}?. It tries to match minimum repeats.

8.6.5. Grouping Syntaxes

Rules to gather plural matching syntaxes together so that the application range of repeat syntaxes can be organized and the partial strings can be extracted.

Notation	Description
( )	Grouping strings Regular expressions in ( ) are considered a matching rule. Strings that matched the regular expressions in ( ) are cut as partial strings and the Cut parentheses IDs are provided to them from the left in (). E.g. The regular expressions (([0-9]*)[a-z]*)* matches “123abc456def789ghi” and the like, and the partial strings are cut as shown below. [L,1,0]=123abc [L,1,1]=456def [L,1,2]=789ghi [L,2,0]=123 [L,2,1]=456 [L,2,2]=789 Note that L is the Input format ID.
(?:)	Grouping strings Regular expressions in ( ) are considered a matching rule. Strings that matched the regular expressions in ( ) are not cut as partial strings and no Cut parentheses IDs are provided to them. E.g. The regular expressions of (abc(?:def)ghi) matches “abcdefghi” and only “abcdefghi” is cut.
(!:)	Grouping strings Strings that matched the regular expressions in ( ) are cut without being affected by Inclusion/Exclusion rules described later. E.g. The regular expressions of (abc<(!:def”jk”)>ghi) or (abc (!:<def”jk”>) ghi) matches “abcdefghi” and “abcjkghi” and “def” are cut.

8.6.6. Inclusion/Exclusion Syntaxes

The rules are not included in the POSIX regular expressions but newly extended function for replacing strings of label data. The inclusion rules allow for new string insertions into the cut strings. And the exclusion rule allows for removing specific parts of strings from the cut strings.

<table>
<tr><th>Notation</th><th>Description</th></tr>
<tr><td>“ “</td><td>Insertion rules
String in “ “ is inserted in a cut string. For instance, the regular expressions of (abc”def”ghi) matches “abcghi” and “abcdefghi” is cut.
The following rules allow for the insertion of partial strings.
<table>
<tr><td>[n]</td><td>The partial string cut by the Nth ( ) or (!:) is inserted. E.g. the regular expression of ((abc)def”ghi[2]”jkl) matches “abcdefjkl” and “abcdefghiabcjkl” is cut by the first ( ). In the case of [] or [0], the last string cut at that point is inserted regardless of the Nth of ( ). E.g. For the above example, the regular expressions of ((abc)def”ghi[]”jkl) achieves the same result. If no specified string exists, it will result in an insertion error.</td></tr>
<tr><td>\ACCCC</td><td>The insertion target is the data of which AI is CCCC and already has been cut. E.g. with \A01, the target will be the data of the AI 01 that has already been cut. If there is more than one AI 01, the last-cut data will be the target.</td></tr>
<tr><td>\Ax</td><td>Regardless of AI types, the last-cut AI data will be the insertion target.</td></tr>
<tr><td>\I</td><td>The AI string of the currently targeted AI data is inserted. If no data exists, it will result in an insertion error.</td></tr>
<tr><td>\Dx</td><td>The entire data string of the currently targeted AI data is inserted. If no data exists, it will result in an insertion error.</td></tr>
<tr><td>\Dn</td><td>The Nth data field string of the currently targeted AI data is inserted. If no data exists, it will result in an insertion error. For instance, when there are two data fields of ISO currency code and amount payable like the AI 391D, each data can be inserted separately with \D1 and \D2.</td></tr>
<tr><td>|</td><td>OR operator:
The insertion processing is performed by a regular expression on either right or left side that has no insertion error. When there is no insertion error on both sides, the left side is processed preferentially. When there are insertion errors on both sides, it will result in a cut error.</td></tr>
<tr><td>( )</td><td>The parentheses enclosed in “ ” do not cut the partial strings, but it is a syntax to group OR operators.</td></tr>
</table></td></tr>
<tr><td>< ></td><td>Exclusion rule
A string matched the regular expressions in < > is removed from the cut data. E.g. the regular expression of (abc<def>ghi) matches “abcdefghi”.</td></tr>
</table>

8.6.7. Selection Syntaxes

The cut setting strings have the standard OR operator that is a syntax of POSIX regular expressions and the input OR operator "/" that is used for sorting the Cut format IDs.

Notation	Description
|	OR operator: The cut processing is performed by a rule of either right or left side with no cut error. When there is no cut error on both sides, the left side is processed preferentially. When there are cut errors on both sides, it will result in a cut error.
/	Input OR operator: The basic action is the same as OR operator, but the Cut format IDs are provided to the regular expressions separated by this operator starting from the left. The given IDs here are used for the Cut format IDs when cutting the partial strings. E.g. For the regular expression of "abcd/0123", it matches "abcd" and "0123". "abcd" is cut as Cut format ID=0 and "0123" is cut as Cut format ID=1.

8.7. Paste Script Specifications

"Past script" is used for the "Paste format". The syntaxes for the paste setting string comprise Paste characters, Paste partial strings, Paste AI, OR operator and grouping OR operators with ().

All the syntaxes for the paste setting strings are described below.

Notation	Description
x	Paste character: x is any character. The character x is pasted to the output data. After that, the next processing rule is evaluated.
\	Escape sequence: The meta-character just behind \ is pasted as an ordinary character. After that, the next processing rule is evaluated. In data editing programming, all ASCII characters excluding alphanumeric and space/underscore are reserved as the meta-characters.
[L,M,N]	Paste partial string: The partial strings of the Input format ID=L, Cut parentheses ID=M and Cut count ID=N are pasted. After that, the next processing rule is evaluated. If there is no appropriate partial string, it will result in a paste error. The M and N, except for L, can be omitted from the notation. E.g. When N=0, it can be [L,M], and when M=0, N=0, it can be [L].
\ACCCC[L,N]	Select Application Identifier: AI is specified to paste the AI data. The label number, the AI and the index are specified to N, CCCC, and L respectively. After that, the next processing rule is evaluated. The N, except for \ACCCC and L, can be omitted from the notation. E.g. When N=0, it can be \ACCCC[L]
\I	Paste Application Identifier string: The AI string of AI data is pasted. After that, the next processing rule is evaluated. If there is no appropriate data, it will result in a paste error.
\Dn	Paste application data field: The Nth data field string of AI data is formatted and pasted. If there is no appropriate data, it will result in a paste error.
\Dx	Paste application data: The entire string of AI data is formatted and pasted. If there is no appropriate data, it will result in a paste error.
\DfHH	Paste application data option: A flag of enabling / disabling format is specified to the HH part in hex notation. 00: Disable all formats 01: Not output when DD of YYMMDD is 00 02: Enable decimal point 03: Enable all formats
|	OR operator: The paste processing is defined a rule of either right or left side with no paste error. When there is no paste error on both sides, the left side is processed preferentially. When there are paste errors on both sides, it will result in a paste error.
( )	A rule to group OR operators.

8.8. Setting Character Encoding

To select character encoding used for the data editing programming, the scan engine processes the decoded data according to the selected character encoding properly if the values are present in the selected character encoding. In general, country dependent character encoding is used in applications, however, some applications such as Microsoft Word uses UTF.

Below is a format to set the character encodings.

Item	Command	Description	Default	Remark
Select character code	C21 Qa	Set character code a: the following format	-	
	a=0	None	○	Process as binary code
	a=1	Shift JIS		Used in Japanese Notepad, MS Excel etc.
	a=2	GB18030		Used in Chinese Notepad, MS Excel etc.
	a=3	Big 5		Used in Taiwanese Notepad, MS Excel etc.
	a=4	UHC		Used in Korean Notepad, MS Excel etc.
	a=5	UTF-8		Used in Euro-American MS Word
	a=6	UTF-16		Used in Japanese, Chinese, Taiwanese, Korean MS Word *
	a=7	UTF-16LE		
	a=8	UTF-16BE		

* UTF-16 and UTF-8 are standards for MS Word in the countries that use kanji or countries that don't use kanji, respectively. It is possible to open both UTF8 and UTF16 files though.

8.9. Application Identifiers

Typical Application Identifiers (AI)

AI	Item	Description	Format
01	Global Trade Item Number (GTIN)	Trade items (products and services) identification. GTINs may be 8, 12, 13 or 14 digits long. A structure that is less than 14 digits has to be right justified to 14 digits and padded by leading zeros.	n2+n14
10	Batch or Lot Number	A batch or lot number. This can be any batch, lot, shift, or location code (or a combination thereof) used by the manufacturer to identify a batch of products.	(n2+an...20)
21	Serial Number	A serial number is a unique alphanumeric data string assigned by a company to an entity for its lifetime. Serial number, tracking number etc.	(n2+an...20)
410 ~ 415	Global Location Number (GLN)	The GLN of Ship to, Bill to, Purchased from, Ship for, Identification of a Physical location, and the Invoicing party	n3+n13
11	Production Date	The date a product was produced. ISO format: YYMMDD	n2+n6
15	Sell by Date	The best before date for the ideal consumption or best effective use date of a product. ISO format: YYMMDD	n2+n6
17	Expiration Date	A date that determines the limit of consumption or use of a trade item (e.g., the possibility of a direct health risk resulting from use of the product after the date, and the possibility of an indirect health risk resulting from the ineffectiveness of the product after the date). ISO format: YYMMDD	n2+n6
7003	Expiration Date and Time	The expiration date and time, which is relevant only for short duration and for items that will not be sent on long distances and not outside of the time zone. Format: YYMMDDHHMM	(n3+n10)
310*	Container Gross Weight	The net weight in kilograms of a trade item. The fourth digit in the AI "*" indicates the implied decimal point position in the actual encoded value.	(n2+n…8)
392*	Amount payable per single item (local currency)	The amount payable in a single monetary area for a trade item which carries a variable measure GTIN, expressed in local currency. The fourth digit in the AI "*" indicates the implied decimal point position in the actual encoded value.	(n4+…n15)
251	Reference to Source Entity	To refer back to the original item the trade item was derived from (e.g. tracking the original animal from which a carcass of beef is derived).	(n3+n..20)
422	Country of Origin (ISO country code)	To identify the ISO 3166 country code of the country of origin of the trade item.	n3+n3
91 ~ 99	Internal Company Codes	These AI's are reserved for internal company use. A company may use these AI's as they see fit. Likewise, they may determine the format of the data.	(n2＋an..30)

(Reference: Distribution Systems Research Institute)

9. Image Capture Mode

This chapter describes the details of the image capture mode.
The scan engine has an image capture mode and it can take process and transmit the image.

9.1. Functional Overview

The following commands can be used for image capture mode. The transmission of the image is supported by RS-232C and USB-COM interfaces only. Image processing settings contain settings of raw image cropping, subsampling and bit depth change.

Command	Description	Remark
DE6	Show image processing settings	
DE7	Change image processing settings	
DE8	Capture image	

9.1.1. Show Image Processing Settings

Use the “DE6” command to output the current image processing settings in the following format.

[Format]

1	T	r	i	m	(	**2**	,	**3**	,	**4**	,	**5**	)		S	u	b	(	**6**	,	**7**	)										
	B	p	**8**		J	q	**9**		F	f	**10**		T	r	**11**		r	R	e	**12**	**13**											

[Field]

No.	Field	Size [byte]	Effective range	Details
1	Start Character	1	0x3B	‘;’
2	Trimming Left	4	0 ~ 751	The top left and bottom right coordinates of the image part that will be transmitted.
3	Trimming Top	4	0 ~ 479	
4	Trimming Right	4	0 ~ 751	
5	Trimming Bottom	4	0 ~ 479	
6	Sub Sampling Horizontal	1	1, 2, 4	Set subsampling horizontal
7	Sub Sampling Vertical	1	1, 2, 4	Set subsampling vertical
8	Bit per Pixel	2	1, 4, 8, 10	Bits per pixel (depth)
9	Jpeg Quality	3	5 ~ 100	Quality of JPEG compression
10	File Format	4	1, 3	Output format 1: JPEG , 3: BMP
11	Transfer Type	4		Transmission mode PART: Divided ALL: Batch
12	Color Reverse	1	0, 1, 2	Reverse black and white 0: Non-inverted 1: Inverted 2: In status quo
13	End Character	1	0x0D	CR

[Output example]

;Trim(0, 0, 751, 479) Sub(1,1) Bp 8 Jq 65 FfBMP TrPART Re2

9.1.2. Change Image Processing Settings

Use “DE7” command to change the various settings of image processing. Input Q0 ~ Q9 commands six times after the “DE7” command for various configurations.

Command							Description	Default
DE7	Qa	Qb	Qc	Qd	Qe	Qf	Set image processing	
	Q1	Q0	Qc	Qd	Qe	Qf	Set leftmost value for cropping 1000c + 100d + 10e + f = 0 ~ 751	0
	Q1	Q1	Qc	Qd	Qe	Qf	Set top edge value for cropping 1000c + 100d + 10e + f = 0 ~ 479	0
	Q1	Q2	Qc	Qd	Qe	Qf	Set rightmost value for cropping 1000c + 100d + 10e + f = 0 ~ 751	751
	Q1	Q3	Qc	Qd	Qe	Qf	Set bottom edge value for cropping 1000c + 100d + 10e + f = 0 ~ 479	479
	Q2	Q0	Q0	Q0	Q0	Qf	Set horizontal subsampling f = 1, 2, 4	1
	Q2	Q1	Q0	Q0	Q0	Qf	Set vertical subsampling f = 1, 2, 4	1
	Q3	Q0	Q0	Q0	Q0	Qf	Set bit depth (bits per pixel) f = 0: 8 bits (256 values) f = 1: 4 bits (16 values) f = 2: 1 bits (2 values) f = 3: 10 bits (1024 values, raw data)	0
	Q4	Q0	Q0	Qd	Qe	Qf	Set JPEG quality 100d + 10e + f = 5 ~ 100	75
	Q5	Q0	Q0	Q0	Q0	Qf	Output format f = 1: JPEG f = 3: BMP	3
	Q6	Q0	Q0	Q0	Q0	Qf	Transmission mode f = 0: PART f = 1: ALL	0
	Q8	Q0	Q0	Q0	Q0	Qf	Reverse black and white f = 0: Non-inverted f = 1: Inverted f = 2: In status quo	2

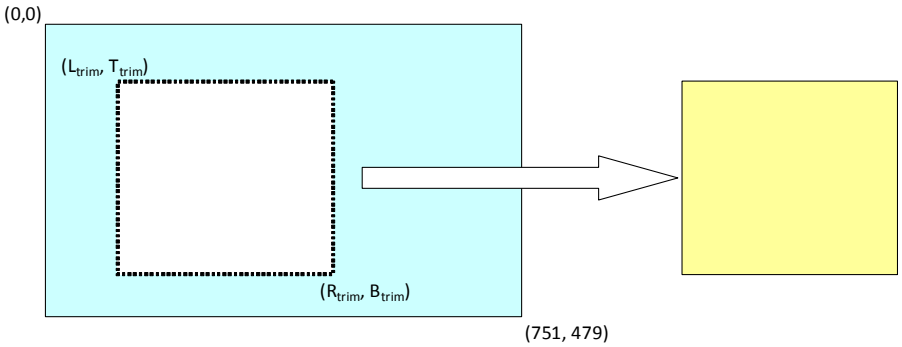
Example of command transmission 1: Set coordinate (left 100, top 100, right 500, bottom 300) for image cropping.
<ESC>[DE7Q1Q0Q0Q1Q0Q0[DE7Q1Q1Q0Q1Q0Q0[DE7Q1Q2Q0Q5Q0Q0[DE7Q1Q3Q0Q3Q0Q0<CR>

Example of command transmission 2: Set horizontal subsampling 1/2, vertical subsampling 1/4.
<ESC>[DE7Q2Q0Q0Q0Q0Q2[DE7Q2Q1Q0Q0Q0Q4<CR>

Example of command transmission 3: Set transmission mode to All and bit depth to 4 bits.
<ESC>[DE7Q6Q0Q0Q0Q0Q1[DE7Q3Q0Q0Q0Q0Q1<CR>

■ Cropping

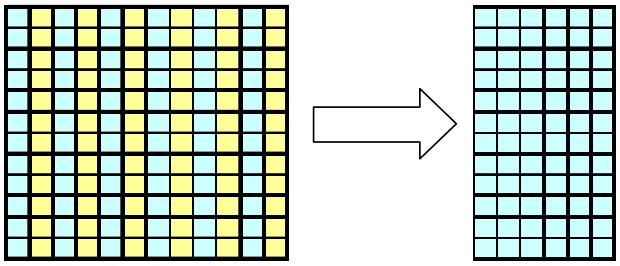
The removal of the outer parts of the original image (light-blue area) in order to retrieve only the necessary part (yellow area).



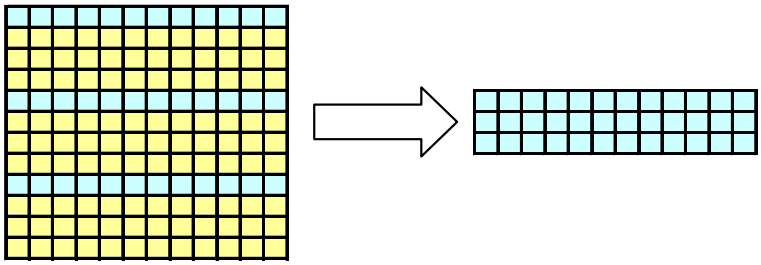
■ Subsampling

Thinning out pixel data in row and column directions to compress the data size.

In the setting of horizontal 2, the data is thinned out by removing one column from each two columns as shown in the figure below. The amount of information per line (in the horizontal direction) will then be 1/2.

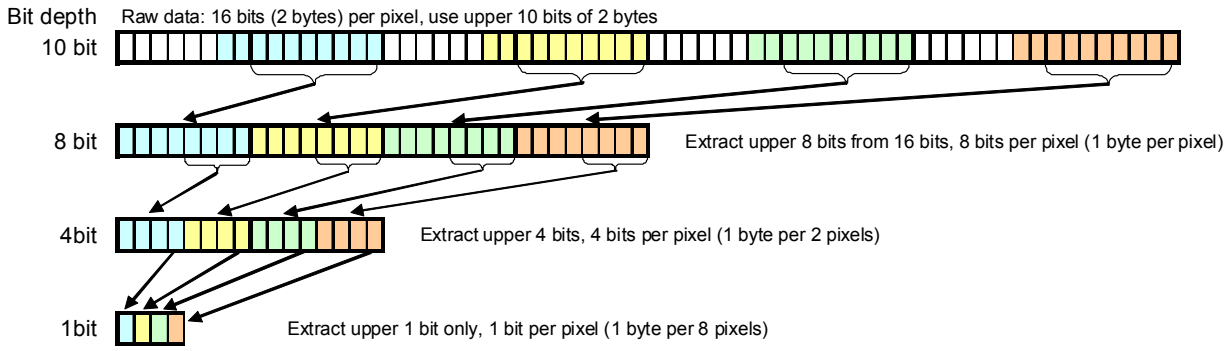


In the setting of vertical 4, the data is thinned out by removing three rows from each four rows as shown in the figure below. The amount of information per line (in the vertical direction) will then be 1/4.



■ Bit depth

Bit depth (bits per pixel) can be configured. When bit depth is set, the amount of information decreases, but the color gradation that can be displayed also decreases.
When the amount of information of 10 bits (raw data) is 1, that of 8 bits, 4 bits and 1bit are 1/2, 1/4 and 1/16 respectively.



■JPEG quality

Quality of JPEG conversion is configured. When lower quality is set, the amount of information decreases, but the image quality also decreases.

■Output format

Output format of JPEG or BMP (bitmap). When JPEG is configured, lossy compression is used and the image is transmitted in standard JPEG format. In BMP mode, only the data (uncompressed color saturation values) is transmitted; the bitmap header is omitted.

9.1.3. Capture Image (DE8)

With the “DE8” command, the scan engine can go to Image Capture mode to take an image.

After capturing an image or the timeout expiration without capturing, Image Capture mode turns off and the scan engine then returns to normal operation.

When the scan engine receives this command, it starts to wait for a trigger. The next trigger then initiates the image capture (no decoding). Immediately after the image is captured, image data is output as described later in “Output protocol” .

There are two additional parameters, ‘selecting capture mode’ and ‘timeout setting’, and those are send in the following formats. Each parameter is specified with “Q0” ~ ”Q9” and the data lengths are fixed. Timeout setting may not be required depending on the configured Capture mode.

Command					Description	Effective value
DE8	Qa	Qb	Qc	Qd	Enter image capture mode	
	m				Select capture mode m = a	0, 1, 2, 3
		n			Set timeout [seconds] n = 100b + 10c + d	0 ~ 999

Example of command transmission: Commands in conjunction mode
<ESC>[DE8Q0<CR>

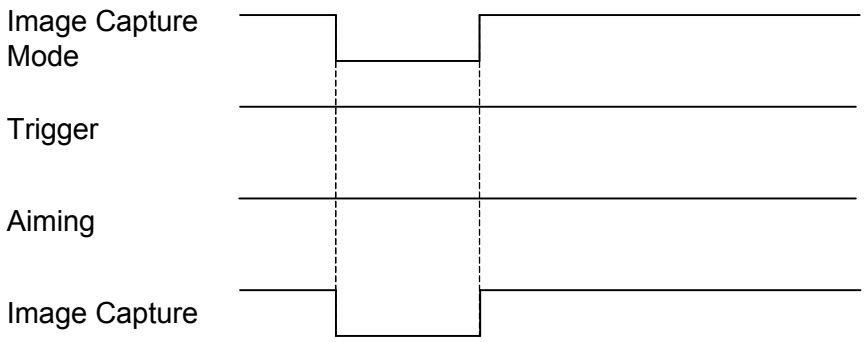
Example of command transmission: Trigger Capture (2) timeout 15 seconds
<ESC>[DE8Q2Q0Q1Q5<CR>

[m: Select capture mode]

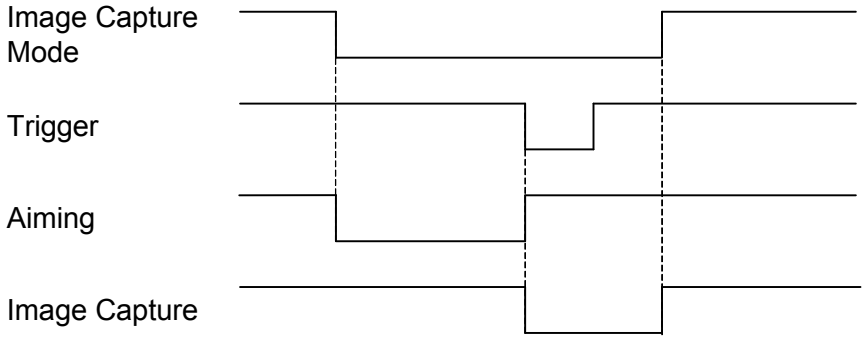
m	Capture mode	Description	Remark
0	Commands in conjunction	Capture image immediately after receiving command.	n (timeout setting is not needed)
1	Trigger capture (1)	Emit aiming immediately after receiving command. Capture image when the trigger is pressed.	
2	Trigger capture (2)	Wait for trigger press after receiving command. Emit aiming as long as the trigger is kept pressed. Capture image when the trigger is released.	
3	Trigger capture (3)	Wait for trigger after receiving command. Emit aiming LED after 1st trigger. Capture image after 2nd trigger.	

Timing chart for each capture mode are described below.
All signals in the following figures are Active Low, and Capture includes Output.

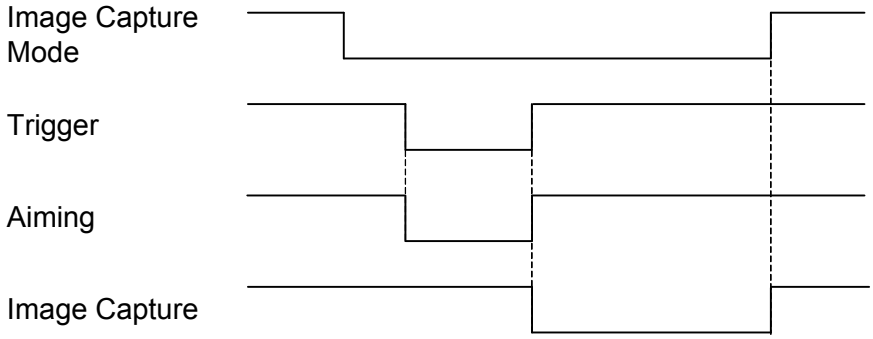
m=0 : Commands in conjunction mode



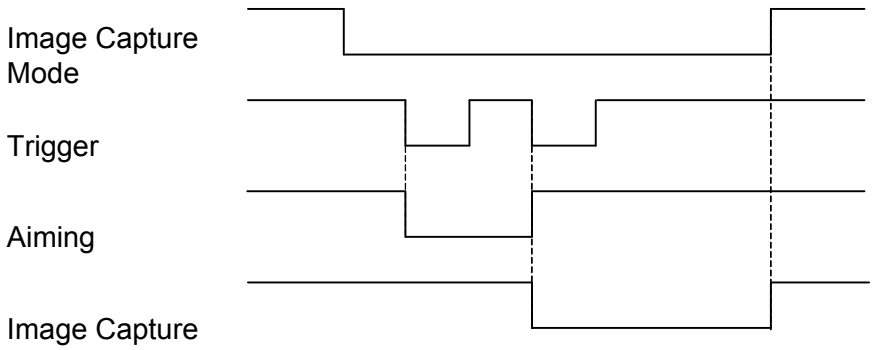
m=1 : Trigger Capture (1)



m=2 : Trigger Capture (2)



m=3 : Trigger Capture (3)

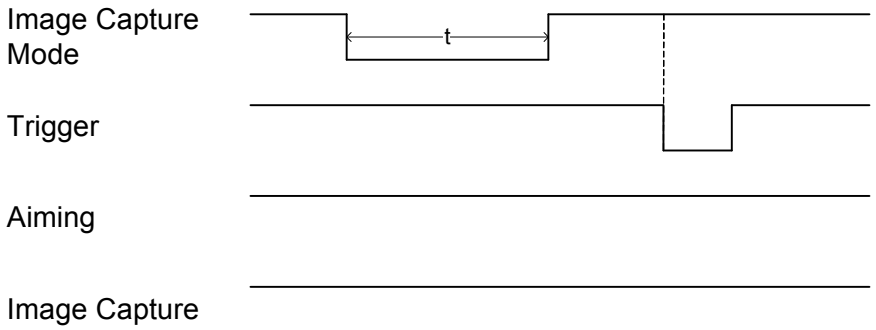


[n: Timeout setting]
Timeout of 'Image Capture mode' can be set in units of seconds. The effective values are 0 (000) ~ 999. For 'Commands in Conjunction mode (m = 0)', the timeout value is ignored. The timeout period is measured from command reception to capturing. When n=0, there is no timeout and the scan engine will wait indefinitely for a trigger input. When n > 0, this value specifies the timeout period in seconds.

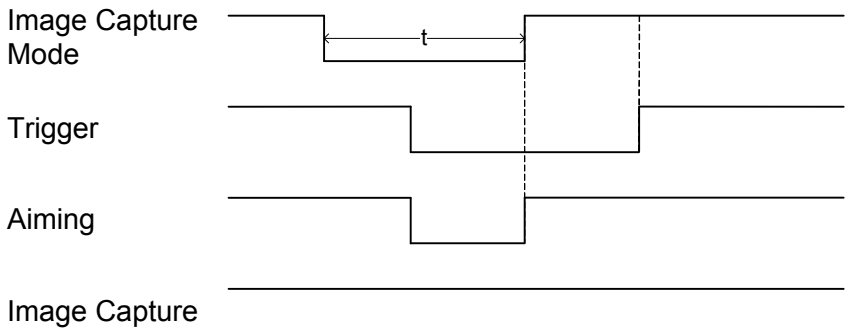
n	Timeout period	Remark
0	None	Wait indefinitely for a trigger
1 – 999	Specified periods [second]	

When there is no trigger input during timeout period 't', image capture mode is turned off after the 't' expires. Normal decoding will then be performed by subsequent trigger inputs.

In Trigger Capture (2) mode, the trigger needs to be released during the period of 't' to take a picture. If it is not released, the aiming stops after 't' expires and Image Capture mode is turned off. If the trigger is released, no operation is performed.

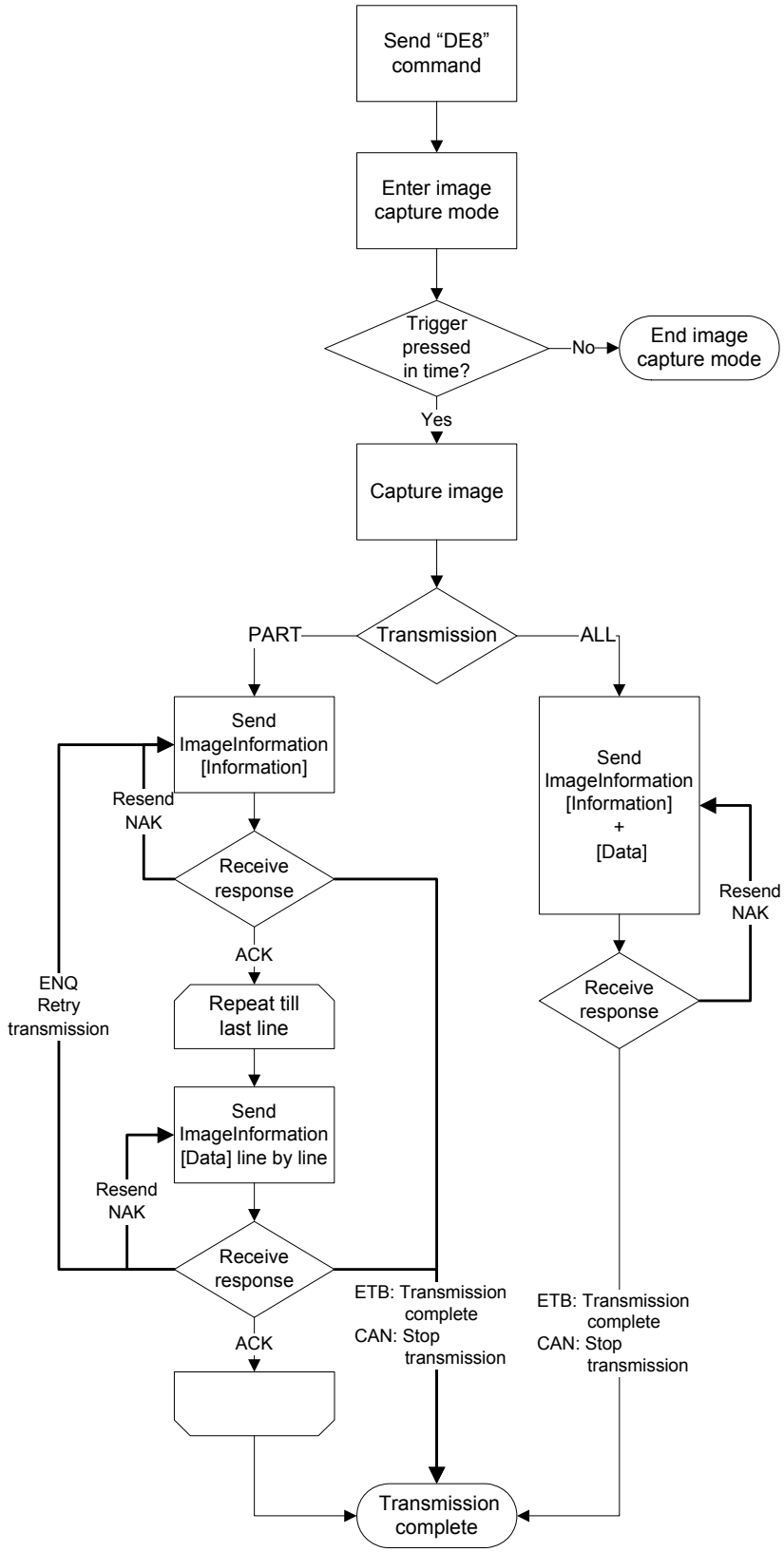


In Trigger Capture (3) mode, the trigger needs to be pressed twice during the period of 't' to take a picture. Aiming will turn on after the first trigger and it will be turned off after 't' expires. Normal decoding will be performed with the second trigger in that case.



9.2. Operation Flow

The following figure shows the flow of image capture operation.



9.3. Output Protocol

Protocol used for output is described below.

9.3.1. Image Information Format

[Function]
This is used for image output. The image information (Information) and the image itself (Data) may be contained in the image output.

[Format]

Start Char	rec No	Length	(A) Information, Data (*)	Check Sum	End Char
0x21					0x0D

* When Transmission mode is ALL, Information is transmitted, followed by Data (entire image).

[Field]

Field		Size [byte]	Details
Start Character		1	'!' (0x21)
rec No		2	Default value is 0. When packets in the same format are sent continuously, this field is incremented sequentially.
Length		4	The size of (A)
(A) *	Information		Information of image
	Data		Image itself PART transmission mode: send line by line ALL transmission mode: send an entire image
Check Sum		2	The least significant 16 bits of the sum of the nth element x (n+1) (n = position number 0, 1, 2, …)
End Character		1	<CR> (0x0D)

* Refer to next page for each format.

a) Details of Information Field
The Information field comprises the following subfields.

[Subfield]

No.	Subfield	Size [byte]	Effective range	Details
1	Identifier	1	00h ~ FFh	Shows field version
2	Image Size	4		Size of output image
3	Image Number	2	0 ~ 9	Image identification number in memory
4	Image Width	2	1 ~ 752	Width of processed image [pixel]
5	Image Height	2	1 ~ 480	Height of processed image [pixel]
6	Trimmed Left	2	0 ~ 751	Leftmost value of processed image
7	Trimmed Top	2	0 ~ 479	Top edge value of processed image
8	Trimmed Right	2	0 ~ 751	Rightmost value of processed image
9	Trimmed Bottom	2	0 ~ 479	Bottom edge value of processed image
10	Sub sampling Horizontal (SW)	1	1, 2, 4	Subsampling value in horizontal direction for output
11	Sub sampling Vertical (SW)	1	1, 2, 4	Subsampling value in vertical direction for output
12	Maximum Brightness	2	0 ~ 1023	Maximal brightness of processed image (1024-level)
13	Bit per Pixel (BPP)	1	1, 4, 8, 10	Bit depth per pixel
14	File format	1	1, 3	File format 1: JPEG, 3: BMP
15	Shot Left	2	0 ~ 751	Leftmost coordinate of raw image
16	Shot Top	2	0 ~ 479	Top edge coordinate of raw image
17	Shot Right	2	0 ~ 751	Rightmost coordinate of raw image
18	Shot Bottom	2	0 ~ 479	Bottom edge coordinate of raw image
19	Binning Horizontal (HW)	1	1	Subsampling value in horizontal direction for capture
20	Binning Vertical (HW)	1	1	Subsampling value in vertical direction for capture
21	Amplification	2	0 ~ 1500	Gain
22	Exposure Time	4	50 ~ 500000	Exposure time
23	Brightness Index Value	2	0 ~ 1023	Brightness index value (1024-level)
24	Total Transfer Count	2	0 ~ 65535	Number of image information transmissions, including this packet
25	Reserved	211 (*)	0	(For expansion)

* The the total size used excluding Reserved is subtracted from 256.

b) Details of Data Field
The Data field comprises the following subfield.

[Subfield]

No.	Subfield	Size [byte]	Effective range	Details
1	Image Data	*	*	Output image data [Part transmission] line by line (horizontal width) [All transmission] entire image

* Those vary depending on the file format type and BPP setting. In the case of JPEG format, the horizontal width of the original image is transmitted (which is different from the real line information because of compression).

9.3.2. Output Image

The Image Information format is used for the image output. The way to output an image varies depending on the transmission modes. The output images in each transmission mode are as shown below.

1. PART transmission
The image information (information) is sent in the first packet, followed by the image itself (Data).

Packet 0

Start Char	rec No = 0	Length = 256	Information	Check Sum	End Char

Packet 1

Start Char	rec No = 1	Length	Data	Check Sum	End Char

.
.
.

Packet n

Start Char	rec No = n	Length	Data	Check Sum	End Char

2. ALL transmission
The image information (information) and the image itself (Data) are all send in the first packet.

Packet 0

Start Char	rec No = 0	Length	Information	Data	Check Sum	End Char

9.4. Use of SDK

An image capturing tool and a programming API contained in a Software Development Kit, both separately provided, allows for easy image capturing. Refer to the SDK document for details.

9.5. Special Instruction

- Bar codes and 2D codes cannot be read in this mode.
- An image which was used for reading is not output.

10. Appendix

10.1. Setting Output Table

10.1.1. Setting table (Z3 Command)

```
MODEL      = MDI-3100
ROM Ver.   = BA01Jxx                          <------------Firmware
I/F        = U2          <------------Interface setting

[ 4]
0001
[ 5]
00000001 00000001 00000BB8 0000004B 00000000 00000000 00000001 00000023
[ 6]
000000C8
[ 7]
00000000 00000000 000002EF 000001DF 01010000 00080000 00410000 00030000
00000000 00020000 01010000 00
[ 8]
010000
[ 9]
00050000 00000000 00000000
[10]
090001E0 02400190 0000000F A0000000 64060001 E0024001 90000000 0FA00000
00640900 01E00240 01900000 000FA000 00006405 0001E002 40019000 00000FA0
00000064 090001E0 02400190 0000000F A0000000 64090001 E0024001 90000000
0FA00000 00640900 01E00240 01900000 000FA000 00006409 0001E002 40019000
00000FA0 00000064 090001E0 02400190 0000000F A0000000 64090001 E0024001
90000000 0FA00000 00640900 01E00240 01900000 000FA000 00006409 0001E002
40019000 00000FA0 00000064
[11]
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000 00000000 000002EF 01DF00BC
00780233 01670001 00010000 00010000 64006400 64006400 0001F400 0007D000
00000002 EF01DF00 BC007802 33016700 01000100 00000100 00640064 00640064
000001F4 000007D0 00000000 02EF01DF 00BC0078 02330167 00010001 00000001
00006400 64006400 64000001 F4000007 D0000000 0002EF01 DF00BC00 78023301
67000100 01000000 01000064 00640064 00640000 01F40000 07D00000 000002EF
01DF00BC 00780233 01670001 00010000 00010000 64006400 64006400 0001F400
0007D000 00000002 EF01DF00 BC007802 33016700 01000100 00000100 00640064
00640064 000001F4 000007D0 00000000 02EF01DF 00BC0078 02330167 00010001
00000001 00006400 64006400 64000001 F4000007 D0000000 0002EF01 DF00BC00
78023301 67000100 01000000 01000064 00640064 00640000 01F40000 07D00000
000002EF 01DF00BC 00780233 01670001 00010000 00010000 64006400 64006400
0001F400 0007D000 00000002 EF01DF00 BC007802 33016700 01000100 00000100
00640064 00640064 000001F4 000007D0 00000000 02EF01DF 00BC0078 02330167
00010001 00000001 00006400 64006400 64000001 F4000007 D0000000 0002EF01
DF00BC00 78023301 67000100 01000000 01000064 00640064 00640000 01F40000
07D005F5 E1000000 000005F5 E1000000 000005F5 E1000000 000005F5 E1000000
000005F5 E1000000 000005F5 E1000000 000005F5 E1000000 000005F5 E1000000
000005F5 E1000000 000005F5 E1000000 000005F5 E1000000 000005F5 E1000000
000005F5 E1000000 000005F5 E1000000 000005F5 E1000000 000005F5 E1000000
000005F5 E1000000 000005F5 E1000000 000005F5 E1000000 000005F5 E1000000
000005F5 E1000000 000005F5 E1000000 000005F5 E1000000 000005F5 E1000000
00000100 000003E8 00000000 00000000 00000000 01000000 07D00100 00000001
00000000 00000100 00000514 00000100 01000001 01010100 01000000 03E80000
00000000 00000000 00000100 000003E8 00000000 00000000 00000000 00000001
F4000005 14000002 EE000003 E8000002 EE000001 F4000001 F4000000 0001
[15]
000000
[16]
00000000 C80000
[17]
00
[18]
00
[19]
0000010A
[21]
010001FF FFFFFF0D FFFFFF
[22]
0000FFFF FFFF0DFF FFFF
[23]
01000100 00FFFFFF FF0DFFFF FF
[24]
0000FFFF FFFF0DFF FFFF
[25]
01010000 00000000 FFFFFFFF 0DFFFFFF 000000
[26]
```

```
0000FFFF FFFF0DFF FFFF
[27]
0101FFFF FFFF0DFF FFFF
[28]
0000FFFF FFFF0DFF FFFF
[29]
01000000 01000000 FFFFFFFF 0DFFFFFF 00010000 FFFFFFFF
[30]
01FFFFFF FF0DFFFF FF
[31]
01010000 00010000 01FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[32]
01010001 FFFFFFFF 0DFFFFFF 00050000 FFFFFFFF
[33]
010001FF FFFFFF0D FFFFFF00 060000FF FFFFFF
[34]
01000001 FFFFFFFF 0DFFFFFF 00050000 FFFFFFFF
[35]
00000001 FFFFFFFF 0DFFFFFF 00050000 FFFFFFFF
[37]
00000101 00FFFFFF FF0DFFFF FF
[38]
00FFFFFF FF0DFFFF FF
[39]
00FFFFFF FF0DFFFF FF
[40]
00FFFFFF FF0DFFFF FF
[41]
010001FF FFFFFF0D FFFFFF00 050000FF FFFFFF
[42]
010101FF FFFFFF0D FFFFFF00 030000FF FFFFFF
[43]
0100FFFF FFFF0DFF FFFF0001 0000FFFF FFFF
[44]
01010000 FFFFFFFF 0DFFFFFF 00020000 FFFFFFFF
[45]
0100FFFF FFFF0DFF FFFF0001 0000FFFF FFFF
[46]
01010000 FFFFFFFF 0DFFFFFF 00010000 FFFFFFFF
[47]
000300FF FFFFFF0D FFFFFF00 010000FF FFFFFF
[48]
01010101 01FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[49]
00FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[50]
0100FFFF FFFF0DFF FFFF0001 0000FFFF FFFF
[51]
0101FFFF FFFF0DFF FFFF0001 0000FFFF FFFF
[52]
00FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[53]
0101FFFF FFFF0DFF FFFF0001 0000FFFF FFFF
[54]
01FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[55]
01FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[56]
01FFFFFF FF0DFFFF FF000100 00FFFFFF FF
[57]
FFFFFFFF 0DFFFFFF 00010000 FFFFFFFF
[58]
00000000 FFFFFFFF 0DFFFFFF 00040000 FFFFFFFF
[68]
00050000 08000000 00000000 00000000 00000000 00010101 0100
[70]
00000000 FF000000 FF000000 FF000000 FF000000 FF000000 FF000000 FF000000
FF000000 FF000000 FF000000 FF000000 FF000000 FF000000 FF000000 FF000000
FFFFFFFF FFFFFFFF FF00
[71]
00000000 00020001 00050007 01010101 00010102 03010200 01
[73]
01010000 02010000 00000000 4C0100
[75]
00000000
[76]
00000001 01000000 00000000 0000001D 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00
[77]
00000000 00050000 0000
```

CODE	ENABLING	PREFIX	/	SUFFIX	MIN	MAX	FIXED
1 UPC-A	1	FF FF FF FF		0D FF FF FF	----	----	---- ----
2 UPC-A Addon	0	FF FF FF FF		0D FF FF FF	----	----	---- ----

ENABLING: Reading enabled / disabled
MIN : Minimum length (in hex)
MAX : Maximum length (in hex)
FIXED : Fixed length (in hex)
"----" : Setting disable （Fixed length）
PREFIX : Max 4 characters (in ASCII / hex)
SUFFIX : Max 4 characters (in ASCII / hex)
FF : Not configured

```
 3 UPC-E                    1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
 4 UPC-E1                   0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
 5 UPC-E  Addon             0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
 6 UPC-E1 Addon             0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
 7 EAN-13                   1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
 8 EAN-13 Addon             0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
 9 EAN-8                    1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
10 EAN-8 Addon              0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
11 CODE 39                  1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
12 Tri-Optic                1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
13 Codabar                  1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
14 Industrial 2of5          1  FF FF FF FF  0D FF FF FF  0005 0000 FFFF FFFF
15 Interleaved 2of5         1  FF FF FF FF  0D FF FF FF  0006 0000 FFFF FFFF
16 S-Code                   1  FF FF FF FF  0D FF FF FF  0005 0000 FFFF FFFF
17 Matrix 2of5              0  FF FF FF FF  0D FF FF FF  0005 0000 FFFF FFFF
18 Chinese Post Matrix 2of5 0  FF FF FF FF  0D FF FF FF  0005 0000 FFFF FFFF
19 Korean Postal Authority  0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
20 Intelligent Mail         0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
21 POSTNET                  0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
22 Japanese Postal          0  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
23 IATA                     1  FF FF FF FF  0D FF FF FF  0005 0000 FFFF FFFF
24 MSI/Plessey              1  FF FF FF FF  0D FF FF FF  0003 0000 FFFF FFFF
25 Telepen                  1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
26 UK/Plessey               1  FF FF FF FF  0D FF FF FF  0002 0000 FFFF FFFF
27 CODE 128                 1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
28 CODE 93                  1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
29 CODE 11                  0  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
30 GS1 DataBar              1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
31 GS1 DataBar Limited      1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
32 GS1 DataBar Expanded     1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
33 Codablock F              0  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
34 DataMatrix ECC200        1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
35 DataMatrix ECC000-140    0  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
36 Aztec Code               1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
37 Aztec Runes              1  FF FF FF FF  0D FF FF FF  ---- ---- ---- ----
38 Chinese Sensible Code    0  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
39 QR Code                  1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
40 Micro QR Code            1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
41 Maxi Code                1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
42 PDF417                   1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
43 Micro PDF417             1  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
44 GS1 128                  0  FF FF FF FF  0D FF FF FF  0001 0000 FFFF FFFF
45 GS1 DataBar Composite    0  FF FF FF FF  0D FF FF FF  0004 0000 FFFF FFFF
46 UPC/EAN Composite        0  FF FF FF FF  0D FF FF FF  0004 0000 FFFF FFFF

47 NL / ND                  FF FF FF FF FF FF FF FF
48 COMMON-PREFIX            FF FF FF FF FF FF FF FF
49 COMMON-SUFFIX            FF FF FF FF FF FF FF FF

END
```

10.1.2. Differential Setting Output Table (EAR Command)

Example 1: “EAR” differential output table by default

```
SAME DATA
```

Example 2: “EAR” differential output table after sending <Esc>T3Z2Y5<CR>

```
[ 5]
RAM  <------------RAM data
00000001 00000001 00000BB8 0000004B 00000000 00000000 00000001 00000005
ROM  <------------Data wes stored in flash ROM
00000001 00000001 00000BB8 0000004B 00000000 00000000 00000001 00000005
DEF <------------Defualt value
00000001 00000001 00000BB8 0000004B 00000000 00000000 00000001 00000023
[71]
RAM
00138800 00020001 00050007 01010101 00010102 03010200 01
ROM
00000000 00020001 00050007 01010101 00010102 03010200 01
DEF
00000000 00020001 00050007 01010101 00010102 03010200 01

END
```

It shows the setting was stored in flash ROM by “Z2”.

It shows the setting data in RAM was changed but it has not been stored in flash ROM.

10.2. Code ID

10.2.1. Opticon Code ID Prefix / suffix Values

Code	Code ID	Code	Code ID
UPC-A	C	MSI/Plessey	Z
UPC-A +2	F	Telepen	d
UPC-A +5	G	UK/Plessey	a
UPC-E	D	Code 128	T
UPC-E +2	H	GS1-128	
UPC-E +5	I	Code 93	U
EAN-13	B	Code 11	b
EAN-13 +2	L	Korean Postal Authority	c
EAN-13 +5	M	Intelligent Mail Bar Code	0
EAN-8	A	POSTNET	3
EAN-8 +2	J	GS1 Databar	y
EAN-8 +5	K	CC-A	m
Code 39	V	CC-B	n
Code 39 Full ASCII	W	CC-C	l
Italian Pharmaceutical	Y	Codablock F	E
Codabar	R	Data Matrix	t
Codabar ABC	S	Aztec	o
Codabar CX	f	Aztec Runes	
Industrial 2of5	O	Chinese Sensible Code	e
Interleaved 2of5	N	QR Code	u
S-Code	g	Micro QR Code	j
Matrix 2of5	Q	Maxi Code	v
Chinese Post	w	PDF417	r
IATA	P	Micro PDF417	s

10.2.2. AIM / ISO 15424 Code ID Prefix / Suffix Values

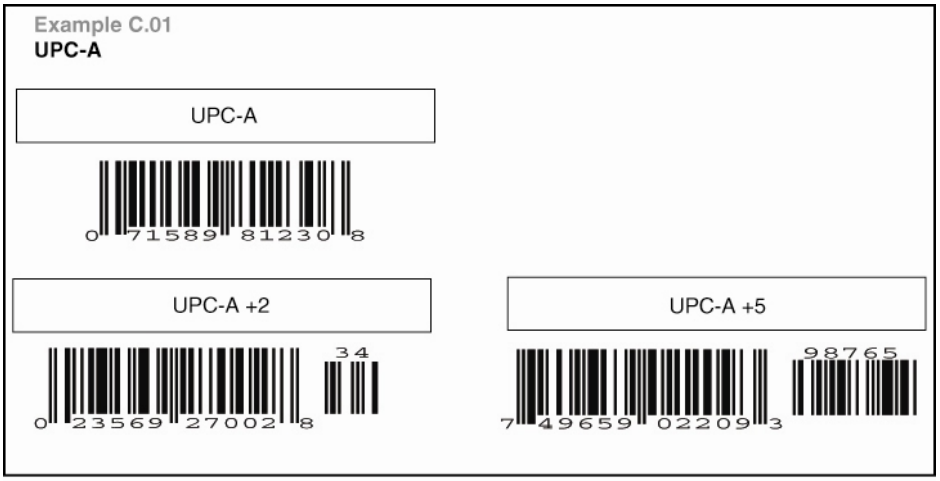
AIM/ISO15424 Code ID			
Code	]AIM-ID	Code	]AIM-ID
UPC-A	]E0	Telepen	]B*
UPC-A +2	]E3	UK/Plessey	]X0
UPC-A +5	]E3	Code 128	]C0
UPC-E	]E0	GS1-128	]C1
UPC-E +2	]E3	Code 93	]G0
UPC-E +5	]E3	Code 11	]H*
EAN-13	]E0		]X0
EAN-13 +2	]E3	Korean Postal Authority	]X0
EAN-13 +5	]E3	Intelligent Mail Bar Code	]X0
EAN-8	]E4	POSTNET	]X0
EAN-8 +2	]E7	GS1 Databar	]e0
EAN-8 +5	]E7	CC-A	]e1
Code 39	]A*	CC-B	]e1
Code 39 Full ASCII	]A*	CC-C	]e1
Tri-Optic	]X0	GS1 Databar with CC-A	]e0
Code 39 It. Pharmaceutical	]X0	GS1 Databar with CC-B	]e0
Codabar	]F*	GS1 Databar with CC-C	]e0
Codabar ABC	]F*	Codablock F	]0*
Codabar CX	]X0	Data Matrix	]d*
Industrial 2of5	]S0	Aztec	]z*
Interleaved 2of5	]I*		]X0
S-Code	]X0	QR Code	]Q*
Matrix 2of5	]X0	Micro QR Code	]Q*
Chinese Post	]X0	Maxi Code	]U*
IATA	]R*	PDF417	]L0
MSI/Plessey	]M*	Micro PDF417	]L0
	]X0		

10.2.3. AIM / ISO 15424 Code Options ID Prefix / Suffix Values

Code option	]AIM-ID	Code option	]AIM-ID
Code 39 option AIM/ISO15424 Code ID : A*			
Normal Code 39 (D5) Not check CD (C1) Transmit CD (D9)	]A0	Full ASCII Code 39 (D4) or Full ASCII Code 39 if pos. (+K) Not check CD (C1) Transmit CD (D9)	]A4
Normal Code 39 (D5) Check CD (C0) Transmit CD (D9)	]A1	Full ASCII Code 39(D4) or Full ASCII Code 39 if pos. (+K) Check CD (C0) Transmit CD (D9)	]A5
Normal Code 39 (D5) Not check CD (C1) Not transmit CD (D8)	]A2	Full ASCII Code 39(D4) or Full ASCII Code 39 if pos. (+K) Not check CD (C1) Not transmit CD (D8)	]A6
Normal Code 39 (D5) Check CD (C0) Not transmit CD (D8)	]A3	Full ASCII Code 39(D4) or Full ASCII Code 39 if pos. (+K) Check CD (C0) Not transmit CD (D8)	]A7
Codabar option AIM/ISO15424 Code ID : I*			
Codabar normal mode (HA) Not check CD (H7) Transmit CD (H8)	]F0	Codabar normal mode(HA) Not check CD (H7) Not transmit CD (H9)	]F4
Codabar ABC (H4) or (H3) Not check CD (H7) Transmit CD (H8)	]F1	Codabar ABC (H4) or (H3) Not check CD (H7) Not transmit CD (H9)	]F5
Codabar normal mode (HA) Check CD (H6) Transmit CD (H8)	]F2	Codabar normal mode (HA) Check CD (H6) Not transmit CD (H9)	]F6
Codabar ABC (H4) or (H3) Check CD (H6) Transmit CD (H8)	]F3	Codabar ABC (H4) or (H3) Check CD (H6) Not transmit CD (H9)	]F7
Interleaved 2of5 option AIM/ISO15424 Code ID : F*			
Not check CD (G0) Transmit CD (E0)	]I0	Not check CD (G0) Transmit CD (E1)	]I3
Check CD (G1) Transmit CD (E0)	]I1	Check CD (G1) Transmit CD (E1)	]I4
IATA option AIM/ISO15424 Code ID : R*			
Not check CD (4H) Transmit CD (4L)	]R0	Not check CD (4H) Not transmit CD (4M)	]X0
Check FC and SN only (4I) or Check CPN, FC and SN (4J) or Check CPN, AC, FC and SN (4K) Transmit CD (4L)	]R1	Check FC and SN only (4I) or Check CPN, FC and SN (4J) or Check CPN, AC, FC and SN (4K) Not transmit CD (4M)	]X0
MSI/Plessey option AIM/ISO15424 Code ID : M*/X0			
Check 1 CD (BLG) or Check auto 1 or 2 CDs (BLI) (length > 12) Transmit $CD_{(s)}$ (BLK)	]H0	Check 1 CD (BLG) or Check 2 CDs (BLH) or Check auto 1 or 2 CDs (BLI) (length > 12) Transmit $CD_{(s)}$ (BLK)	]H0
Check 2 CDs (BLH) or Check auto 1 or 2 CDs (BLI) (length > 12) Transmit $CD_{(s)}$ (BLK)	]H1	Not check CD (BLF) Not transmit CD (BLJ)	]H0

Code option	]AIM-ID	Code option	]AIM-ID
Telepen option AIM/ISO15424 Code ID : B*			
Telepen (numeric or ASCII only): ASCII mode (D3) Numeric mode (D2)	]B0]B1	Telepen (numeric followed by ASCII): ASCII mode (D3) Numeric mode (D2)	]B0]B2
Telepen (ASCII followed by numeric) (not supported): ASCII mode (D3) Numeric mode (D2)	]B0]B2		
Code 11 option AIM/ISO15424 Code ID : H*/X0			
Check 1 CD (BLG) or Check auto 1 or 2 CDs (BLI) (length > 12) Transmit $CD_{(s)}$ (BLK)	]H0	Check 1 CD (BLG) or Check 2 CDs (BLH) or Check auto 1 or 2 CDs (BLI) (length > 12) Transmit $CD_{(s)}$ (BLK)	]H0
Check 2 CDs (BLH) or Check auto 1 or 2 CDs (BLI) (length > 12) Transmit $CD_{(s)}$ (BLK)	]H1	Not check CD (BLF) Not transmit CD (BLJ)	]H0
Codablock F option AIM/ISO15424 Code ID : O*			
FNC1 not used	]O4	FNC1 in 1st position	]O5
Data Matrix option AIM/ISO15424 Code ID : d*			
ECC000 - ECC140	]d0	ECC200, supporting ECI protocol	]d4
ECC200	]d1	ECC200, FNC1 in 1st or 5th position and supporting ECI protocol	]d5
ECC200, FNC1 IN 1st or 5th position	]d2	ECC200, FNC1 in 2nd or 6th position and supporting ECI protocol	]d6
ECC200, FNC1 IN 2nd or 6th position	]d3		
Aztec option AIM/ISO15424 Code ID : z*			
No structure/other	]z0	Structured append header included, FNC1 following an initial letter or pair of digits	]z8
FNC1 preceding 1st message character	]z1		
FNC1 following an initial letter or pair of digits	]z2	Structured append header included and ECI protocol implemented	]z9
ECI protocol implemented	]z3		
FNC1 preceding 1st message character and ECI protocol implemented	]z4	Structured append header included, FNC1 preceding 1st message character, ECI protocol implemented	]zA
FNC1 following an initial letter or pair of digits, ECI protocol implemented	]z5	Structured append header included, FNC1 following an initial letter or pair of digits, ECI protocol implemented	]zB
Structured append header included	]z6		
Structured append header included and FNC1 preceding 1st message character	]z7	Aztec runes	]zC
Maxi code option AIM/ISO15424 Code ID : U*			
Symbol in mode 4 of 5	]U0	Symbol in mode 4 of 5 , ECI protocol implemented	]U2
Symbol in mode 2 of 3	]U1	Symbol in mode 2 of 3 , ECI protocol implemented	]U3

10.3. Sample Codes



Example C.03.
EAN-13 and EAN-8

EAN-13
(ISBN)

ISBN data: 0131103628

EAN-8

EAN-13 +2

EAN-8 +2

EAN-13 +5

EAN-8 +5

Example C.04.
Code 39 and It.Pharm.

Code 39

Code 39 Italian Pharmaceutical
(Full Italian Pharmaceutical)

encoded data: *V2GZD9*

Full Italian Pharmaceutical data: A908557705

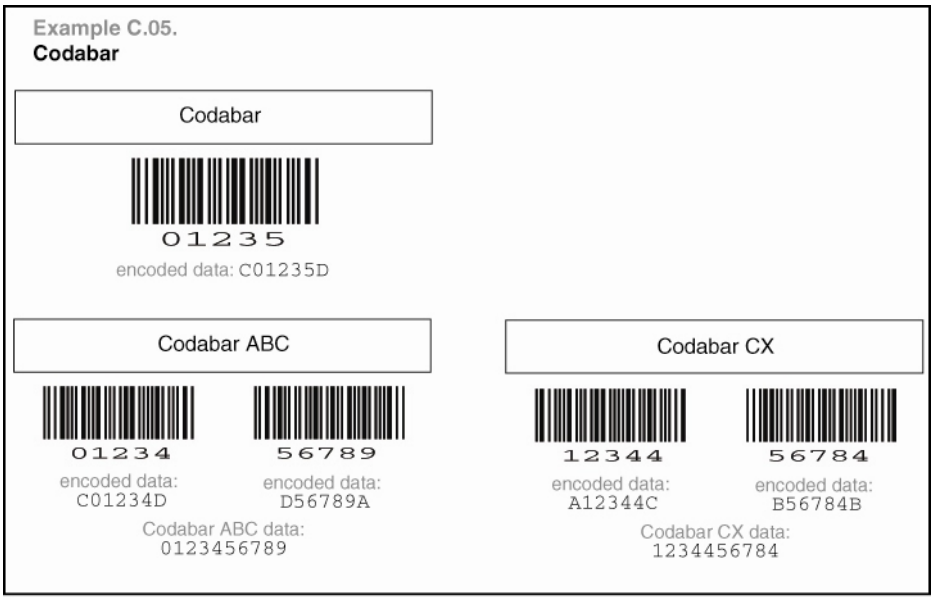
Code 39 Full ASCII

encoded data: *C+O+D+E 39*

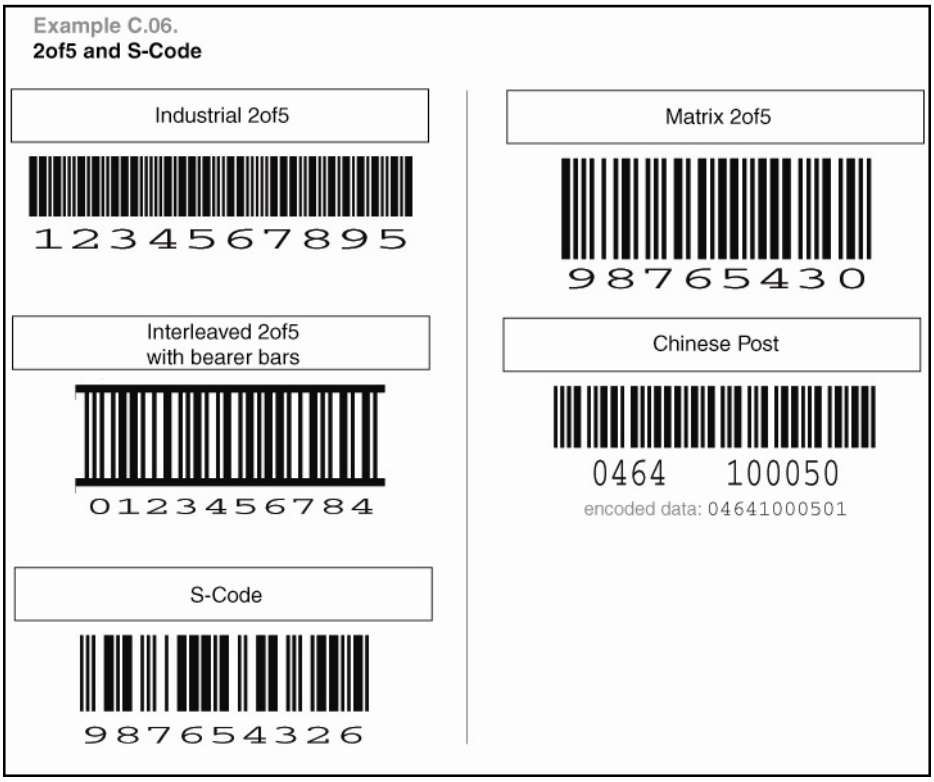
Tri-Optic

encoded data: $260R01$

Example C.05.
Codabar



Example C.06.
2of5 and S-Code



Example C.07.
IATA

Example C.08.
MSI/Plessey (with MOD 10 Checksum)

encoded data: 024687

Example C.09.
Telepen

Telepen numeric
(Telepen ASCII)

Telepen ASCII data: Telepen

Example C.10.
UK/Plessey

encoded data: 02468F8

Example C.11.
Code 128 and GS1-128

Code 128

EAN-128

encoded data: <FNC1>2143658709

Example C.12.
Code 93

Example C.13.
Code 11

encoded data: 1234-56784

Example C.14.
Korean Postal Authority code

Example C.15.
Intelligent Mail Barcode

12 001 987654 321600500 21320 0035

Example C.16.
POSTNET

2132035356

encoded data: 21320-3535

Example C.17.
GS1 Databar

GS1 Databar

0165473728281919

encoded data: 65473728281919

GS1 Databar stacked

0198321456098768

encoded data: 98321456098768

GS1 Databar truncated

0100012345678905

encoded data: 00012345678905

GS1 Databar Limited

0117834783468340

encoded data: 17834783468340

GS1 Databar Expanded

012345ABCDE

encoded data: 012345ABCDE

Example C.18.
Composite Codes

Composite
Component A

encoded RSS-14 data: 01234567891231
encoded CC-A data: CC-A : up to 56 characters

default data:
0101234567891231CC-A : up to 56 characters

Composite
Component B

encoded RSS-14 data: 56128923901255
encoded CC-B data: CC-B:encodes up
to 338 alphanumeric characters

default data:
0156128923901255CC-B:encodes up
to 338 alphanumeric characters

Composite
Component C

encoded EAN-128 data: <FNC1>503012345678
encoded CC-C data: 02130123456789372<GS>
101234567ABCDEFG

default data:
50301234567802130123456789372<GS>
101234567ABCDEFG

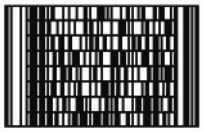
Example C.25.
PDF417

PDF417 sample bar code.

Example C.26.
MicroPDF417

MicroPDF417 sample bar code.

Example C.19.
Codablock F



Codablock F sample bar code

Example C.20.
DataMatrix (ECC200)

DataMatrix sample bar code.

Example C.21.
Aztec (Aztec)

Aztec sample bar code.

(Aztec Runes)

025

encoded data: 25

Example C.22.
Chinese Sensible code

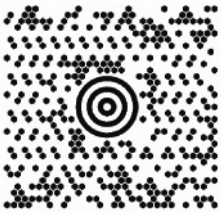
Example C.23.
QR Code (Model 2)

QR Code sample bar code.

Example C.24.
Micro QR Code (Model 4)

1415926535897

Example C.25.
Maxicode (Mode 4)



MaxiCode sample bar code.