Panasonic

Code Reader

Setup / Operation Manual

LP-ABR10 series

Please read these instructions carefully before using this product, and save this manual for future use.

ME-LPABR10-SO-5

2020.11 | panasonic.net/id/pidsx/global

Preface

Thank you for purchasing our product.
For full use of this product safely and properly, please read this manual carefully.
This product has been strictly checked and tested prior to its delivery. However, please make sure that this product operates properly before using it. In case that the product becomes damaged or does not operate as specified in this manual, contact the dealer you purchased from or our sales office.

■ General terms and conditions of this manual

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

■ Disclaimer

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

■ Trademark

- Windows is a registered trademark or trademark of Microsoft Corporation in the United States and/or other countries.
- All other product names and companies provided in this manual are trademarks or registered trademarks of their respective companies.

Cautions in Handling

ALWAYS FOLLOW THESE IMPORTANT SAFETY PRECAUTIONS!

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

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

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

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

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

Safety notices

⚠WARNING

This product is intended for use in general electronics equipment (electronic computer, OA equipment, communications equipment, test and measurement equipment, machine tools, industrial robots, AV equipment, home appliances etc.). Appropriate measures should be taken at use of unit/system related to safety and operation of transportation equipment (aircraft, train, automobile), traffic signal, gas leak detector and safety devices.

This product is not designed or intended for the use as a component in life support appliances or as surgical implants nor in any other application where failure of the product could cause personal injury or death. The use of this product shall indemnify and hold harmless to Panasonic Industrial Devices SUNX's and its shareholders against any claims of injury or death associated with unintended authorized use.

DO NOT disassemble. Disassembly will void the warranty and could cause damage or personal injury.

Avoid the following locations that could cause an accident or damage to the product.

- Exposed to ambient temperature outside the rating
- Exposed to relative humidity outside the rating
- Exposed to rapid temperature fluctuations (causing condensation)
- Exposed to direct sunlight or near heaters
- Exposed to direct vibration or shock
- In the presence of dust, salt, or iron particles
- In environments where static electricity can build into siginificant charges
- In the presence of flammable or explosive gases
- In the presence of corrosive gas

Handle with care

- This product has a memory backup function. This backup data restoration cannot be guaranteed if repair, reconstruction, or upgrades are performed on this product.
- DO NOT use this product at temperature or humidity ranges beyond that documented in the product specifications, or in direct sunlight.
- DO NOT expose this product to water, moisture, oil, etc.
- This product may be damaged in environments containing corrosive gas.
- DO NOT use any chemicals when cleaning.
- To clean the reading window, wipe lightly with cloth or swab.
- This is a high-precision optical device, avoid exposing this product to excessive force such as that sustained by a drop.
- Do not install electrical wiring or plugin/unplug of cable (except LAN cable) when this product is powered on. These may result in an electrical damage to this product.
- To minimize the risk of data loss, make sure to backup the hard drive before install the software. Our company shall not be responsible for any troubles such as data loss or damages.
- If this product is installed near the laser marker, make sure that it is installed in the place where laser beam and its reflected beam do not damage to this product.
- Store away from direct sunlight and direct vibration or shock for long term storage. Do not store this product at temperature or humidity ranges beyond that documented in the product specifications.

Order Placement Recommendations and Considerations

The Products and Specifications listed in this document are subject to change (including specifications, manufacturing facility and discontinuing the Products) as occasioned by the improvements of Products. Consequently, when you place orders for these Products,
Panasonic Industrial Devices SUNX asks you to contact one of our customer service representatives and check that the details listed in the document are commensurate with the most up-to-date information.

SAFETY PRECAUTIONS

Panasonic Industrial Devices SUNX is consistently striving to improve quality and reliability. However, the fact remains that electrical components and devices generally cause failures at a given statistical probability. Furthermore, their durability varies with use environments or use conditions. In this respect, check for actual electrical components and devices under actual conditions before use.
Continued usage in a state of degraded condition may cause the deteriorated insulation. Thus, it may result in abnormal heat, smoke or fire. Carry out safety design and periodic maintenance including redundancy design, design for fire spread prevention, and design for malfunction prevention so that no accidents resulting in injury or death, fire accidents, or social damage will be caused as a result of failure of the Products or ending life of the Products.

The Products are designed and manufactured for the industrial indoor environment use. Make sure standards, laws and regulations in case the Products are incorporated to machinery, system, apparatus, and so forth. With regard to the mentioned above, confirm the conformity of the Products by yourself.

Do not use the Products for the application which breakdown or malfunction of Products may cause damage to the body or property.

i) usage intended to protect the body and ensure security of life

ii) application which the performance degradation or quality problems, such as breakdown, of the Products may directly result in damage to the body or property

It is not allowed the use of Products by incorporating into machinery and systems indicated below because the conformity, performance, and quality of Products are not guaranteed under such usage.

i) transport machinery (cars, trains, boats and ships, etc.)

ii) control equipment for transportation

iii) disaster-prevention equipment / security equipment

iv) control equipment for electric power generation

v) nuclear control system

vi) aircraft equipment, aerospace equipment, and submarine repeater

vii) burning appliances

viii) military devices

ix) medical devices (except for general controls)

x) machinery and systems which especially require the high level of reliability and safety

ACCEPTANCE INSPECTION

In connection with the Products you have purchased from us or with the Products delivered to your premises, please perform an acceptance inspection with all due speed and, in connection with the handling of our Products both before and during the acceptance inspection, please give full consideration to the control and preservation of our Products.

WARRANTY PERIOD

Unless otherwise stipulated by both parties, the warranty period of our Products is one year after the purchase by you or after their delivery to the location specified by you.
The consumable items such as battery, relay, filter and other supplemental materials are excluded from the warranty.

SCOPE OF WARRANTY

In the event that Panasonic Industrial Devices SUNX confirms any failures or defects of the Products by reasons solely attributable to Panasonic Industrial Devices SUNX during the warranty period, Panasonic Industrial Devices SUNX shall supply the replacements of the Products, parts or replace and/or repair the defective portion by free of charge at the location where the Products were purchased or delivered to your premises as soon as possible.
However, the following failures and defects are not covered by warranty and we are not responsible for such failures and defects.

(1) When the failure or defect was caused by a specification, standard, handling method, etc. which was specified by you.
(2) When the failure or defect was caused after purchase or delivery to your premises by an alteration in construction, performance, specification, etc. which did not involve us.
(3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time.
(4) When the use of our Products deviated from the scope of the conditions and environment set forth in the instruction manual and specifications.
(5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
(6) When the failure or defect was caused by a natural disaster or other force majeure.
(7) When the equipment is damaged due to corrosion caused by corrosive gases etc. in the surroundings.

The above terms and conditions shall not cover any induced damages by the failure or defects of the Products, and not cover your production items which are produced or fabricated by using the Products. In any case, our responsibility for compensation is limited to the amount paid for the Products.

SCOPE OF SERVICE

The cost of delivered Products does not include the cost of dispatching an engineer, etc.
In case any such service is needed, contact our sales representative.

Applicable standards

This product conforms to the following standards.

Note that our products do not conform to the safety standards of the countries and regions not listed in the applicable standards section. When exporting the product by itself or integrated into machine or device, confirm the regulations and standards of the exporting country or region.

Model	Applicable standards
LP-ABR11 LP-ABR12	EN/IEC Standard (CE Marking) ・2014/30/EU "EMC Directive" ・EN 55032 ・EN 55024 ・2011/65/EU "RoHS Directive" ・EN 50581
	KC Mark (Korean Radio Waves Act)

Unpacking

Before unpacking the LP-ABR series Code Reader check that there has been no damage to the packaging.

Check that the box includes the items listed below. If any items are missing or damaged, contact our local sales representative.

Included items

Item	Qty.
LP-ABR series Code Reader	1
Quick Reference (English, Chinese and Japanese)	1 for each language
General information for safety (for EU users)	1
Sheet for "China RoHS Policy"	1

Optional items

Unit Name	Model	Note
Control Cable	LP-ABR10-C5	5m
LAN Cable	LP-ABR10-L5	5m

Lineup

Model umber LP-ABR-1 1

Notation Column	Notation	Description of Notation
1	1	Regular type : Decodable distance 100mm
	2	Long range type : Decodable distance 200mm

Download Information

The user manuals, software, and device drivers are available from:

http://industrial.panasonic.com/ac/e/fasys/lasermarker/lasermarker/lp-abr10/index.jsp

1. LP-ABR10 series Setup/Operation Manual: Describes the features, specifications, configuration and operation of the Fixed mount 2D Code Reader LP-ABR.
2. Configurator LP-ABR: Is a software for the various settings and decoding check on your computer.
3. Configurator LP-ABR Operation Manual: Describes the operation of Configurator LP-ABR software.

Table of Contents

1 Overview

(1) This products is fixed mount (stationary type) Code Reader capable of two-dimensional (2D) codes. These units incorporate the most innovative digital camera technologies, related image recognition, and processing software. A powerful high-speed processing engine equipped with a dual-core CPU is adopted on the Fixed mount 2D Code Reader LP-ABR. This manual may also refer to 2-dimensional barcodes as “symbols”.

(2) LP-ABR series provides the function appropriate to the decoding of direct marking printed by laser marker.

-Image Preprocessing Function:

Preprocesses the image to import and improves the image quality.

-Table Mode:

Maximum 8 types of decoding parameter can be set. This mode allows you to try the decodes one by one.

-Illuminaton Unit:

This unit has two types of illumination: diffuse and direct. The light emission pattern can be set depending on the object to decode.

-Symbol Printing Check:

Checks the symbol printing in in-line.

(3) Cycle Buffer Function(MAXIMG) allows the decode processing while high-speed continuous imaging and saving the image to the memory.

(4) High resolution image sensor (1.2 million pixels) is equipped.

(5) Protection degree: IP65

(6) The mounted LAN interface allows you to connect the LAN port of the computer with working Windows. (You may not establish a connection with a computer depending on its setting, spec and so on.)

Reference

Be sure to check the operation status when connecting a computer beforehand. This connection status does not warrant all operations of the computer.

1.1 Supported Symbologies

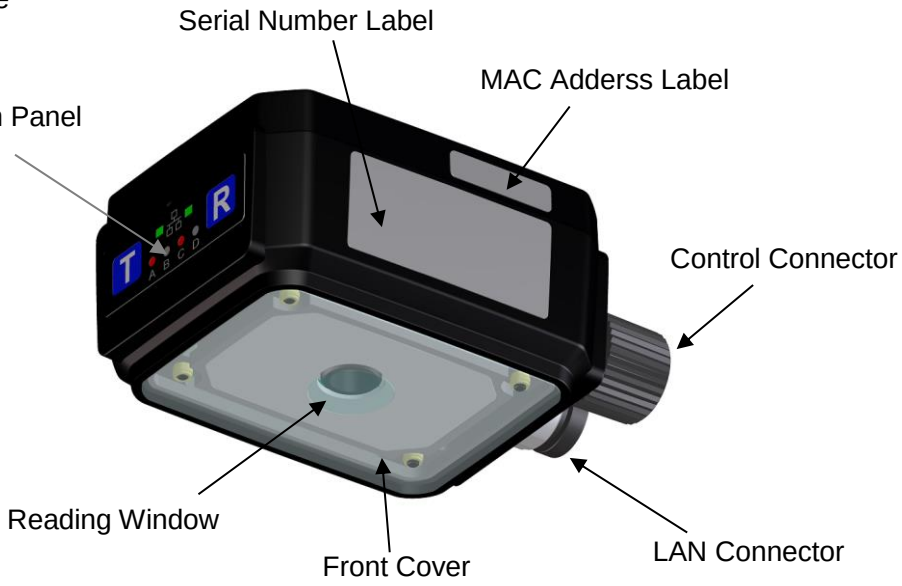
2D Codes

Data Matrix (ECC200)

QR Code

1.2 Product Description

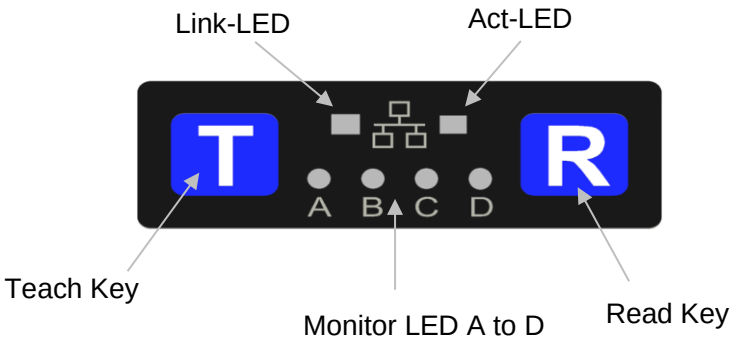
Regular Type



Long Range Type

1.2.1 Operation Panel

The operation panel consists of an action display monitor and 2 operation keys.



- Fucntion of Monitor LED

LED	Color	Name	Description of Function
A	Red	Ready	Turns on when Code Reader is operatable. Blinking when the "SYNC IN by trigger area" setting of the PLC link is enabled
B	Green	SYNC	Turns on at a synchronizing input.
C	Green	GO	Turns on when the reader successfully reads symbols or chractrers.
D	Red	NG	Turns on whenthe reader fails to read.
Link	Green	LINK	Turns on when the LAN is connected.
Act	Orange	ACTIVE	Turns on at the data transmission/reception.

For the monitor LED display at automatic tuning,
refer to section “4.1 Configuration parameters”.

- Teach Key

Teach Key is used in auto-tuning function.

- Read Key

Read Key is used for a test/verification. When the Read Key is pressed, the reader acts the same as when the external synchronizing input signal is entered. Read Key is also used for an automatic tuning in a combination with Teach Key.

1.2.2 Code Reader Connector (17 pins)

Code Reader Connector is used for connecting the power supply and digital input/output with your Code Reader.

- Power Input

  Power input of LP-ABR supplies DC24V.

- 4 Digital Outputs: LIGHT, OUT1, OUT2 and OUT3

  The 4 Digital outputs are digital signal outputs with photo-coupler isolation. It outputs a control timing of the illumination control and the reader.

  LIGHT output is a timing signal to activate the external illumination synchronizing with the camera's image timing.

  The outputs OUT1 to OUT3 are the signals for the external output of reading action's status or reading result's status. Allocation of signals to each output and output time (setting time) can be configured by setting commands.

  Each of the following signal outputs can be configured to OUT1 to OUT3.

Signal	Default Setting	Description
GO signal	OUT1 output	GO signal is associated with Good Read, which is ON during the specified time set by the GOOUT command when the symbol is decoded successfully. And also this signal is OFF when starting the next reading.
NG signal	OUT2 output	NG signal is associated with No Read, which is ON during the specified time set by the NGOUT command when the symbol is not decoded successfully. And also this signal is OFF when starting the next reading.
Ready signal	OUT3 output	Ready signal is ON when the reader is ready for reading.
Busy #1 signal		Busy #1 signal is ON during a reading (except switch chattering delay), and this signal turns OFF after decoding.

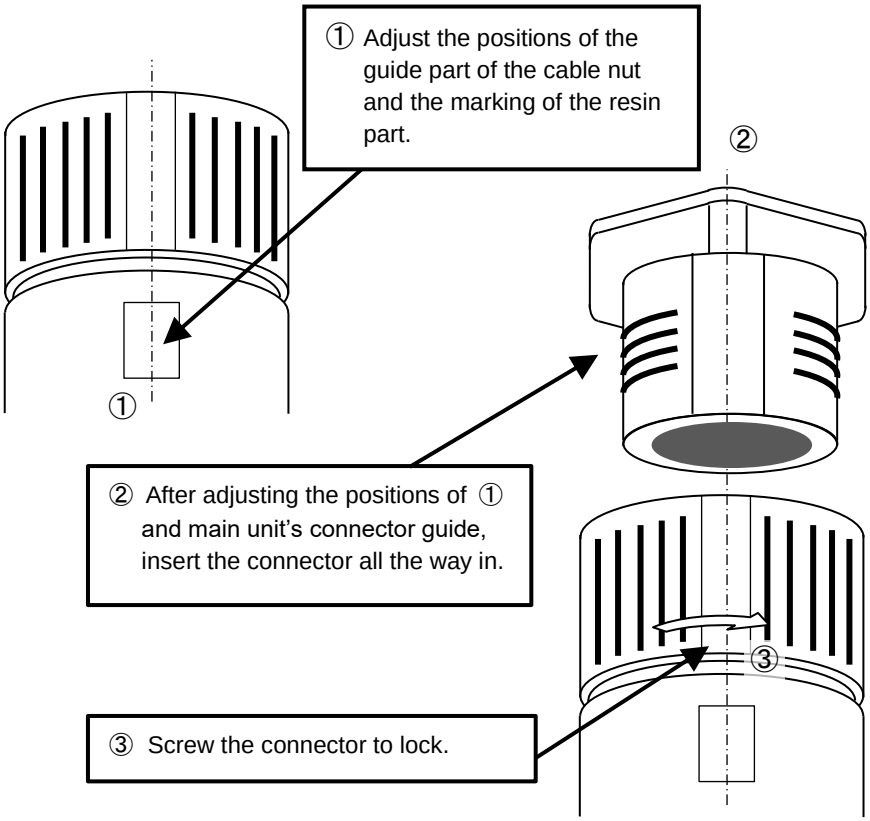
Reference

In the factory default settings the signals are as below:
OUT1 output → GO signal,
OUT2 output → NG signal,
OUT3 output → Ready signal
When changing these parameters, save the settings to the internal flash memory (using the WSETS command) and restart the reader.

- Digital input (SYNC input):

This signal is a photo coupler isolated input which is used for synchronous inputs.

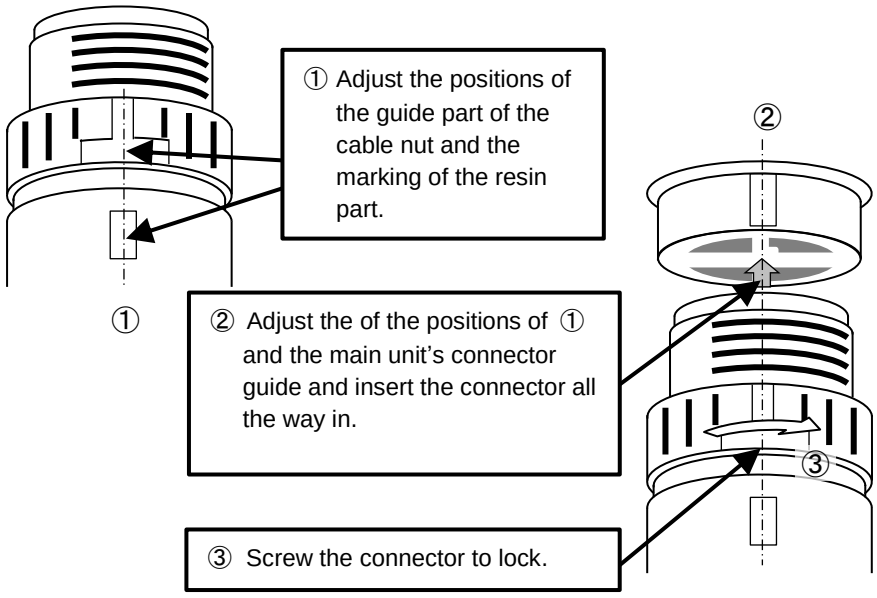
[Plug the connector]



1.2.3 LAN Connector (8 pins)

This connector is used for connecting the LAN cable (optional) of LP-ABR series with your Code Reader.

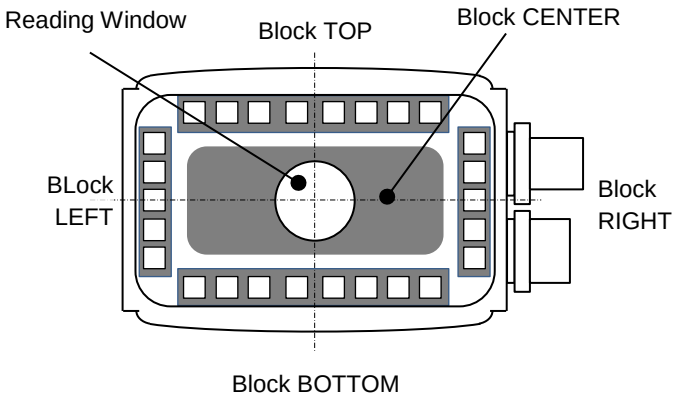
[Plug the connector]



1.2.4 Internal illumination unit

Internal illumination unit illuminates the central part of Code Reader from inside the front cover.

- Illumination unit consists of a block: CENTER which is adjacent to reading window and four blocks: TOP, BOTTOM, LEFT, and RIGHT. Each block's illumination brightness and light on/off are controlable.
- The block CENTER is a blurry diffused illumination with no directivity. This illumination is suitable for a reading of symbols with strong reflectivity (e.g. symbols on mirror)
- The four blocks around the CENTER are direct illuminations with directivity and illuminate far in front of Code Reader.



* The position of the illumination blocks switches in the image rotating function. Refer to the section “5.7 Image Rotation” for more detail.

- You can configure the best illumination condition easily by the configuration tool Configurator LP-ABR. Adjust the illumination area and illumination’s intensity for a clear view.
- An external illumination may be required when the view is still not clear. Consult with our sales representative for the configuration or selection of illumination.

1.2.5 Reading Window

Is an entrance of light for imaging.

1.2.6 Front Cover

Is an acrylic cover to protect the front surface.

1.2.7 MAC Address Seal

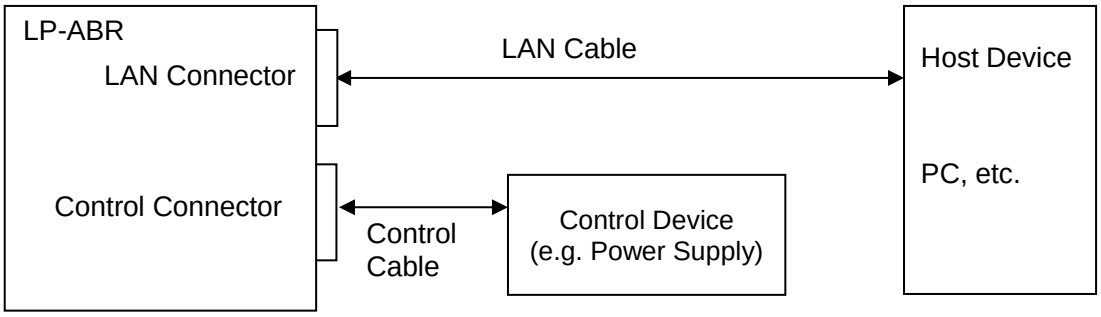
Indicates the MAC address of the LAN port.

2 How to use

2.1 Preparation

① Establish a communication between the reader and the host device through RS-232C interface/LAN interface. Connect a control device as needed.

＜Example of Connection＞



Notice

Connecting devices when the power is supplied to the cable may cause a malfunction.

② Supply power from the interface cable to the reader. The LED-A (Ready) turns on (red) if the reader is correctly powered. A combination of 2 long beeps and 3 short beeps will indicate that the reader has started up correctly.

③ Communication port selection (RS232C, LAN)

The communication port, which can be either RS232C and/or LAN as selected by the “COMFROM” command, is used for the following purposes:

-Receiving serial commands such as reading trigger (SYNC input)

-Reading result transmission

† RS232C interface is selected as default.

Command	Description
COMFROM=0	Only RS-232C (default)
COMFROM=1	Only LAN
COMFROM=2	RS-232C and LAN

2.2 Reading Flow (Default)

1. Good Read
   - 1 short beep
   - Symbol's data will be sent through the interface (RS232C, LAN).
   - Digital output "GO" is ON.
   - LED-C (GO) turns on (green).

   Note: The activated period of "GO" and the monitor LED-C can be configured through serial commands.

2. No Read
   - No beep
   - Error code will be sent through the interface (RS232C, LAN).
   - Digital output "NG" is ON.
   - LED-D (NG) turns on (red).

2.3 Configuration

LP-ABR can be configured by sending the serial command through the communication port selected.

2.4 Transfer Image Data

Downloaded images by Code Reader can be transfered using "Configurator LP-ABR" software from the communication port to the host computer. By the setting of Configurator LP-ABR, the images can be picked at the standby time or can be transtered after the finish of reading. By the setting of Configurator LP-ABR, the images can be picked at the standby time or can be transfered after the end of reading. Images are converted into bmp files and are transfered through LAN interface. The transfer of a full-resolution image takes approx one second.

Command	Description
MODE=0	No image data sending **(*)**
MODE=1	Test Mode: DO NOT USE
MODE=2	
MODE=3	Transfers image data every time (Continuous transfer)
MODE=4	Transfers image data when the reading is "NG" (Continuous transfer)
MODE=5	Transfers image data when the reading is "OK" (Continuous transfer)

*: Default setting

3 Operation Mode

LP-ABR has can be operated in following 2 modes.

Operational Mode	Command	Description
Single Reading Mode	SYNCMODE=0	Single read for each SYNC input.
Reading Timeout Mode	SYNCMODE=1	After SYNC input, the reader continues reading during the duration time set by “TOTALLIM”. The reader sends an error code when it fails in reading when the duration time passes.
External Trigger Mode	SYNCMODE=2	The reader continues reading during the SYNC input is active. It receives no g command (start reading command) .

"Read” includes capturing and decoding an image.

The Diagnostic Mode is available when the operation mode is in Single Reading Mode.

Diagnostic Mode	Command	Description
Normal Mode	TEST=0	For normal use and to return to Normal Mode
Test Mode	TEST=1	For measurement of reading rate of symbols.
Continuous Reading Mode	continue	For camera adjustment. To release the reader from Continuous Reading Mode, send a “stop” command.

Diagnostic Mode is used to configure the reader. Do not use the Diagnostic Mode in normal operation.

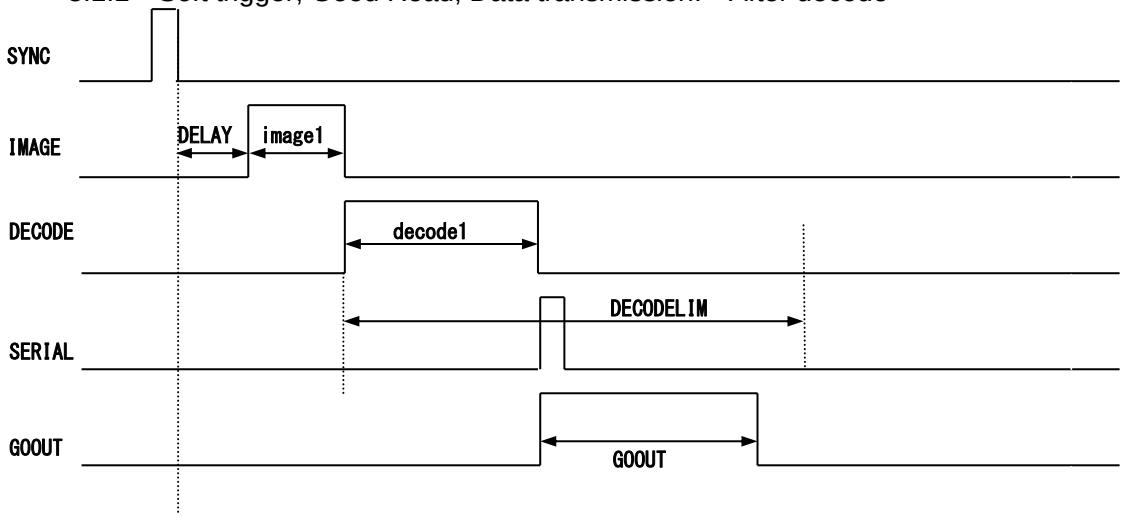
Timing Chart

DELAY:	The time from SYNC ON to reading.
CHATT:	The time needed for eliminating the chattering.
IMAGE:	The time duration for capturing an image.
DECODE:	The time duration for decoding.
DECODELIM:	The maximum time limit for decoding.
GOOUT:	The length of time the GO signal is asserted.
NGOUT:	The length of time the NG signal is asserted.
SERIAL:	The time the data is output through the serial interface.
MAXIMG:	The maximum number of images in the buffer.
WAITIMG:	The interval time between capturing images.
Soft Trigger:	The SYNC issued by serial command input.
Hard Trigger:	The SYNC issued by digital input or Read Key.

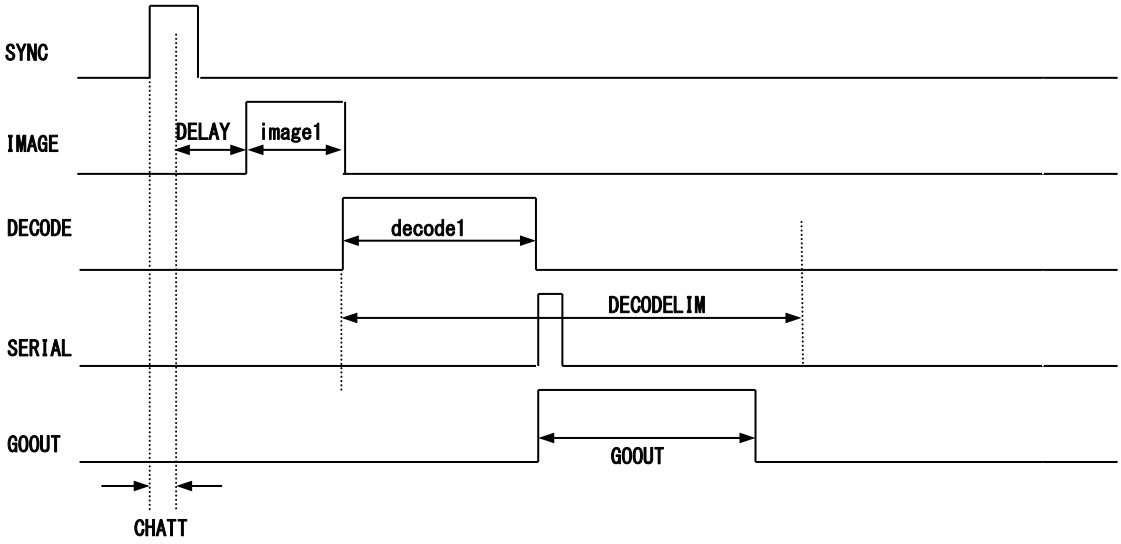
3.1 Single Reading Mode

Code Reader performs a single read for each SYNC input.

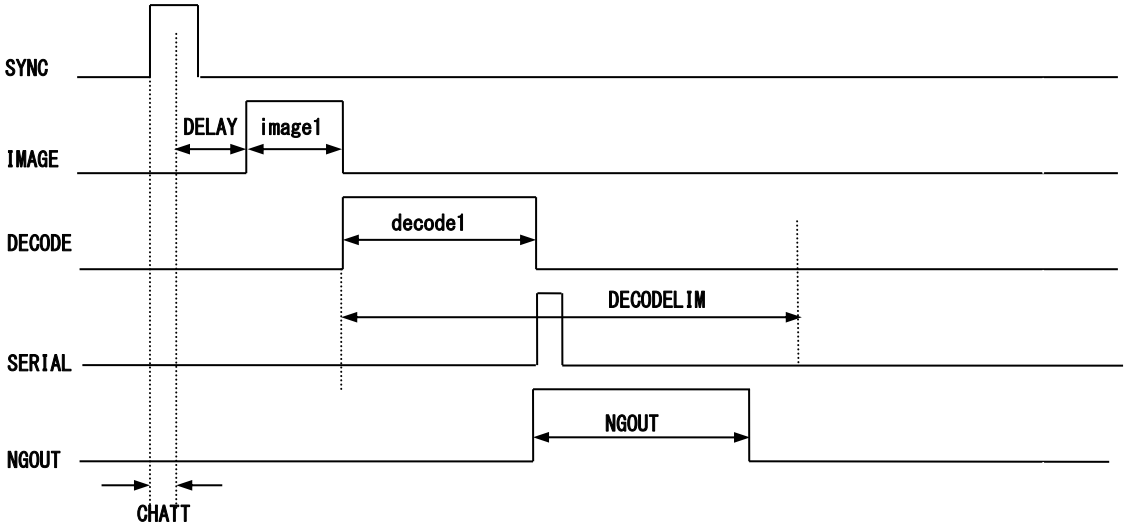
3.1.1 Soft trigger, Good Read, Data transmission: After decode



3.1.2 Hard trigger, Good Read, Data transmission: After decode



3.1.3 Hard trigger, No Read, Data transmission: After decode

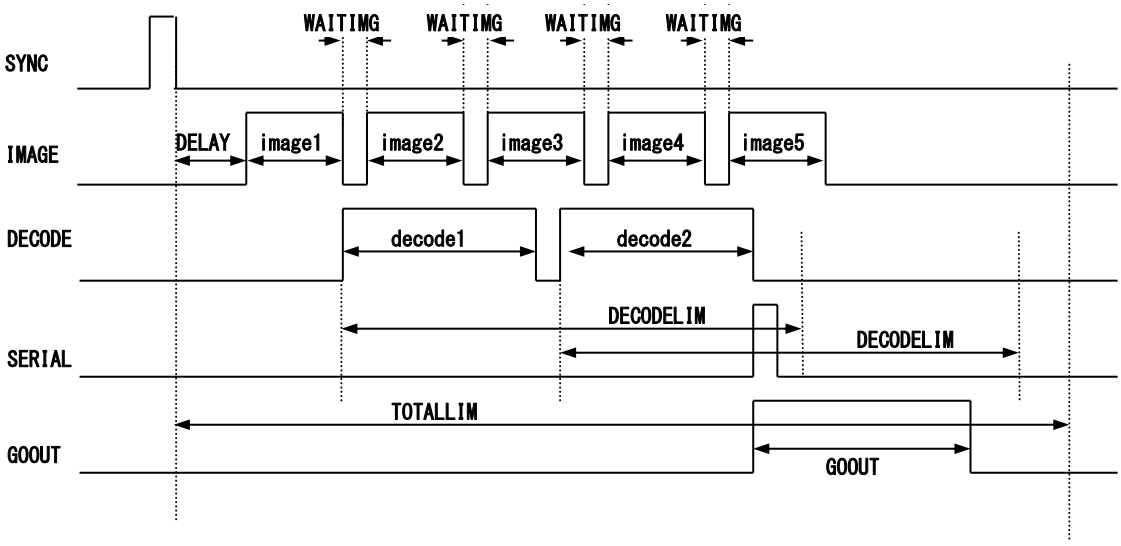


3.2 Reading Timeout Mode

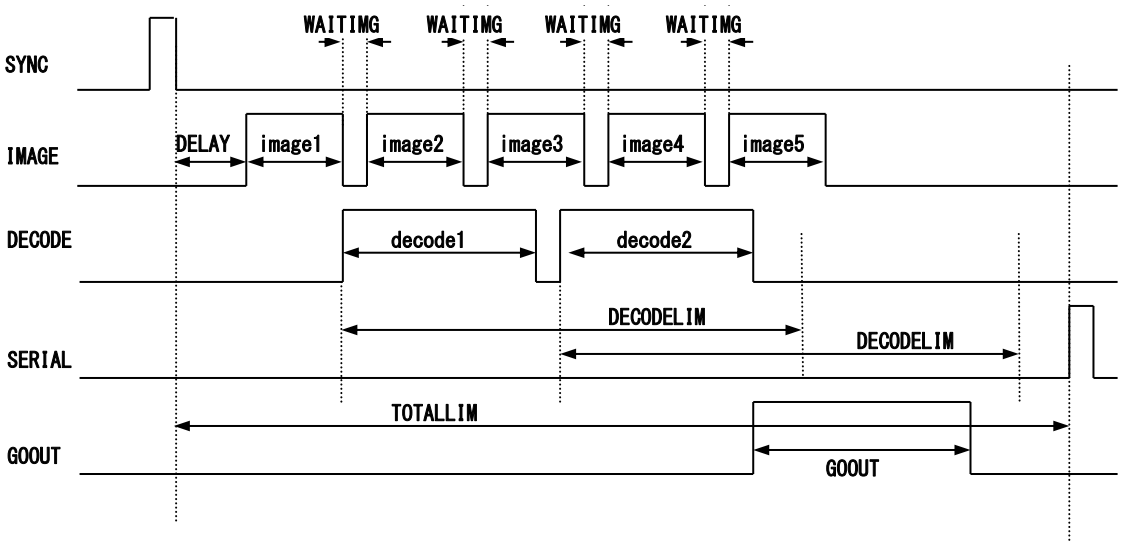
Code Reader reads the symbol repeatedly during the duration time, set by “TOTALLIM” after the SYNC input, or continues reading until the decoding is successful. If the reader cannot decode successfully in the duration time, it stops reading and sends an error code to the host. Typically MAXIMG is set to a number greater than one. The multiple MAXIMG enables the Cycle Buffer Function and the simultaneous parallel processing between image import and decoding. This may shorten the processing time.

The timing charts below are drawn referring to the enabled cycle buffer function.

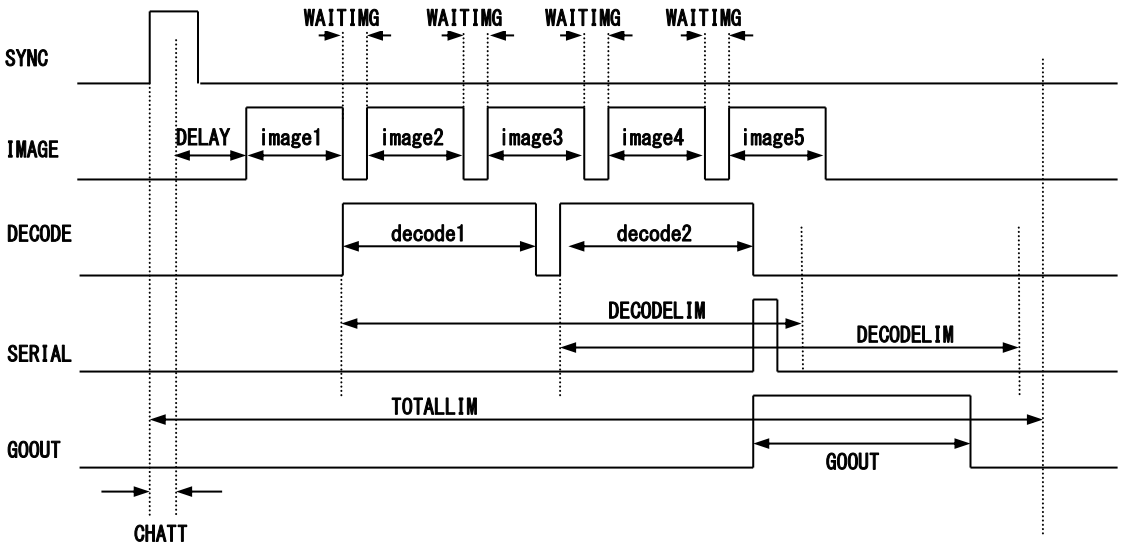
3.2.1 Soft trigger, Good Read, Data transmission: After decode



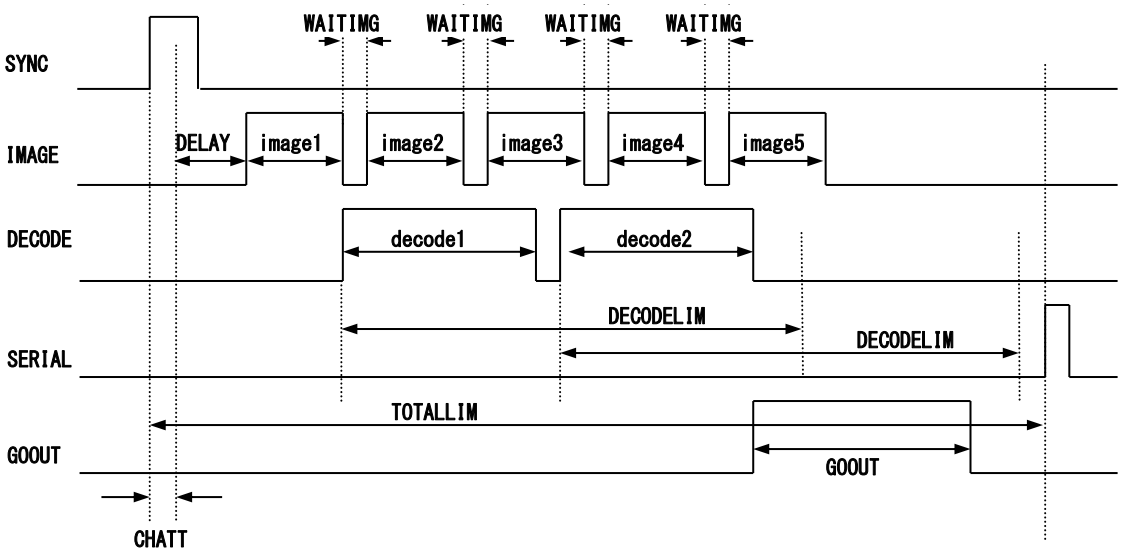
3.2.2 Soft trigger, Good Read, Data transmission: After SYNC OFF



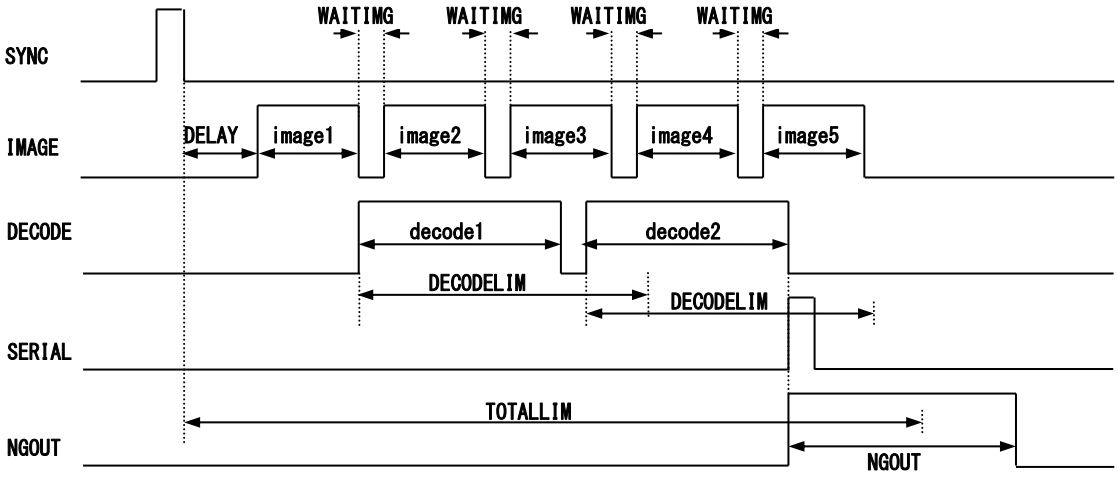
3.2.3 Hard trigger, Good Read, Data transmission: After decode



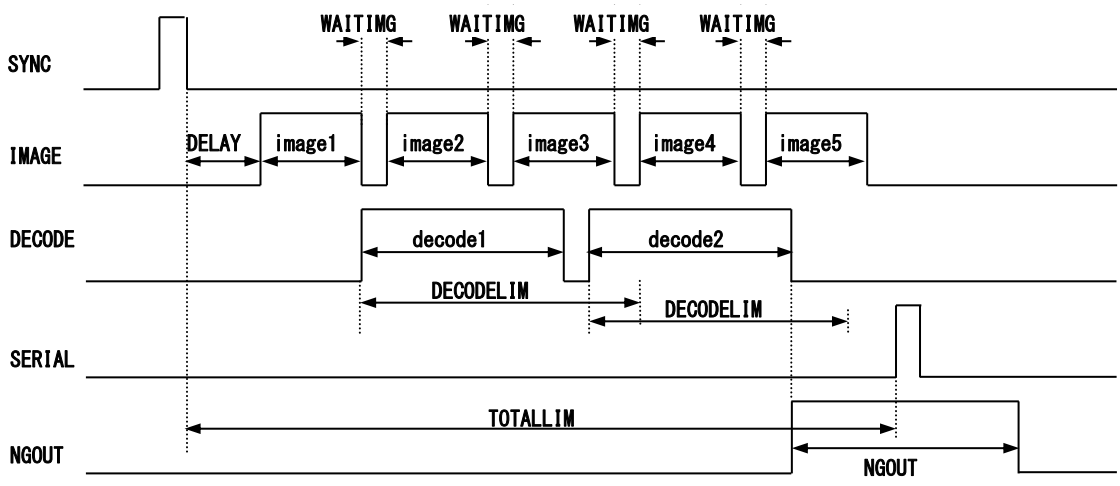
3.2.4 Hard trigger, Good Read, Data transmission: After SYNC OFF



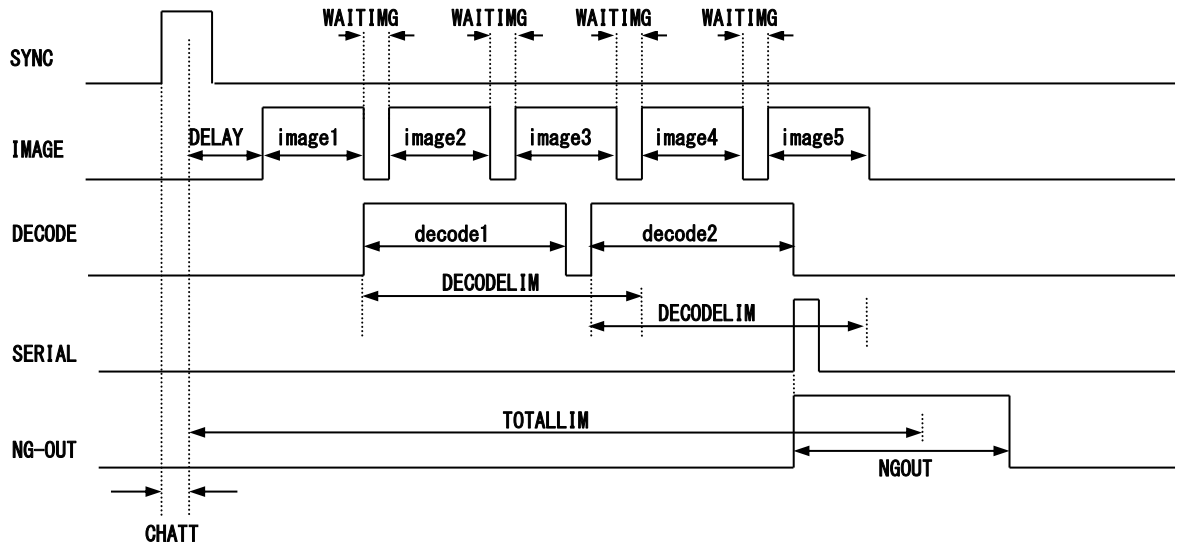
3.2.5 Soft trigger, No Read, Data transmission: After decode



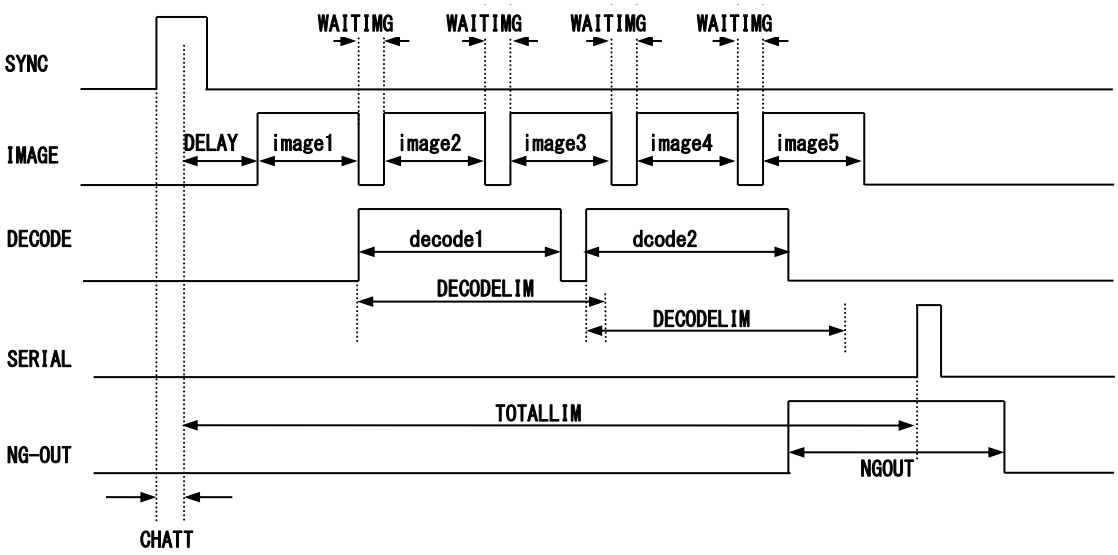
3.2.6 Soft trigger, No Read, Data transmission: After SYNC OFF



3.2.7 Hard trigger, No Read, Data transmission: After decode



3.2.8 Hard trigger, No Read, Data transmission: SYNC OFF

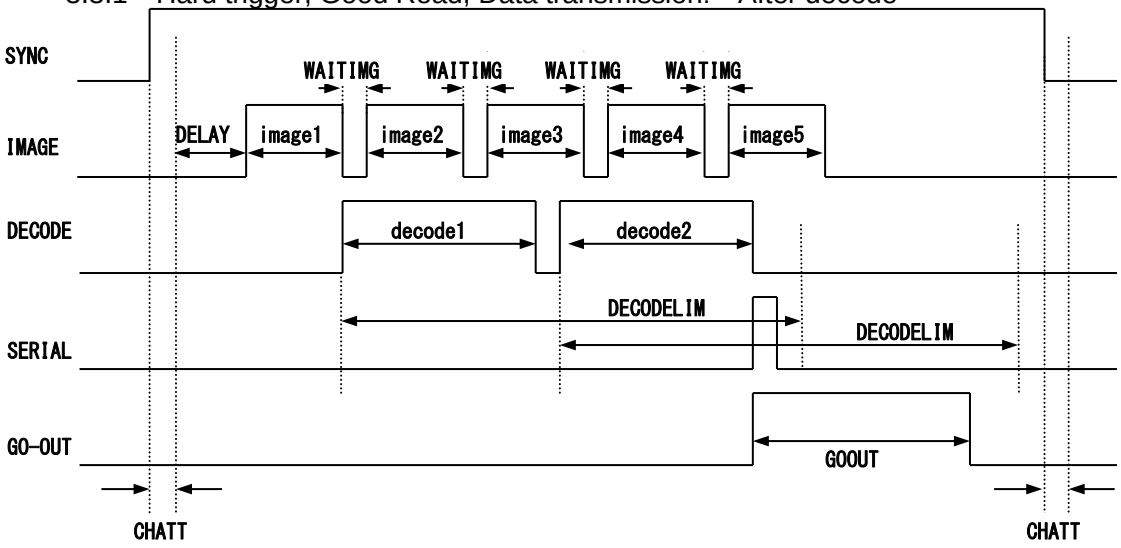


3.3 External Trigger Mode

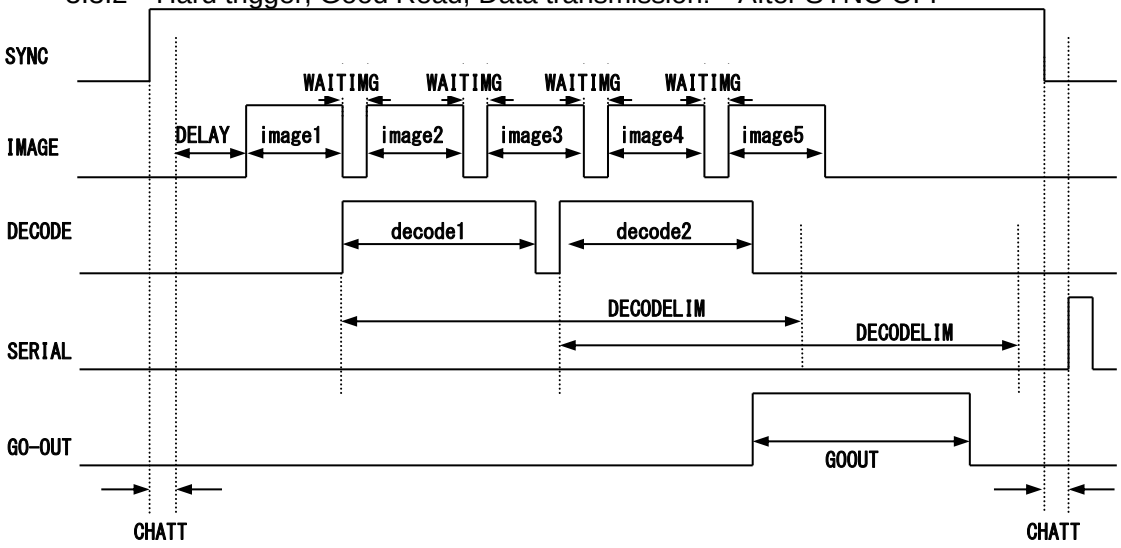
Code Reader reads the symbol repeatedly during the SYNC input is active. Typically MAXIMG is set to a number greater than one. The multiple MAXIMG enables the Cycle Buffer Function and the simultaneous parallel processing between image import and decoding. This may shorten the processing time.

The timing charts below are drawn referring to the enabled cycle buffer function.

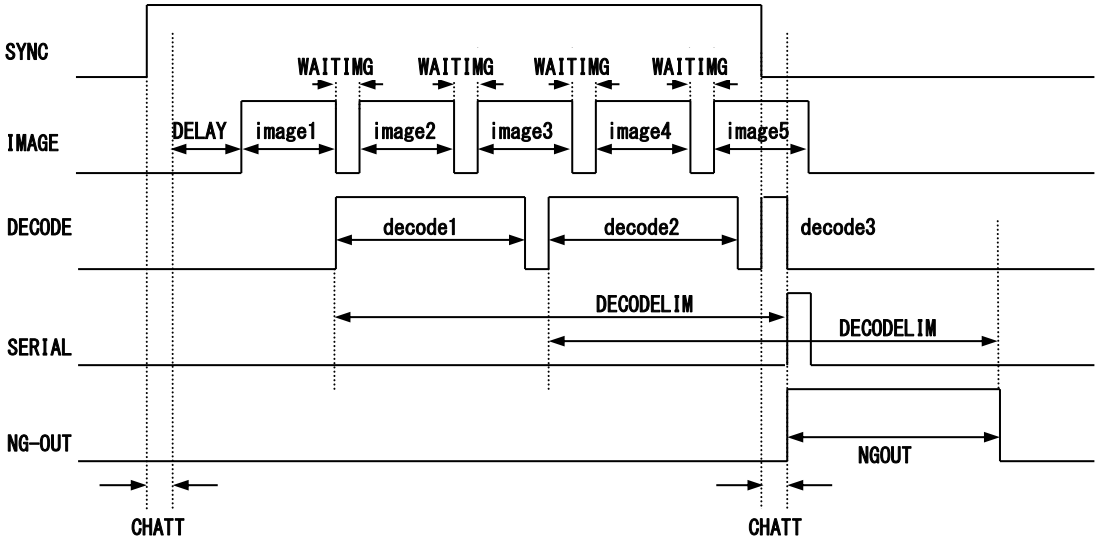
3.3.1 Hard trigger, Good Read, Data transmission: After decode



3.3.2 Hard trigger, Good Read, Data transmission: After SYNC OFF



3.3.3 Hard trigger, No Read, Data transmission: After decode or SYNC OFF



3.4 Continuous Reading Mode

In Continuos Reading Mode the reader read repeatedly. It is used for camera tunings.

To put the reader in Continuous Reading Mode, send the serial command “continue” to the reader, and then send the serial command “g” to start reading.

To exit the Continuous Reading Mode, send the serial command “stop” to the reader.

3.5 Test Mode

In Test Mode the reader can measure the reading ratio. It is used for checking of the reading condition and stability.

To put the reader in Test Mode and start reading, send the serial command “TEST=1” to the reader.

To exit the Test Mode, send the serial command “TEST=0” to the reader.

With Test Mode, the reader will output an asterisk (*) to the host for each 10% of total number of reading. The reader will stop the Test Mode after output an asterisk 10 times.

(Example output)

*** TEST MODE ***

1 2 3 4 5 6 7 8 9 10

* * * * * * * * * *

NG 1: OK 99/SYNC 100

NG 1.00%: OK 99.00%

(Output format)

NGaaaaa: OKbbbbb/SYNCccccc[CR]

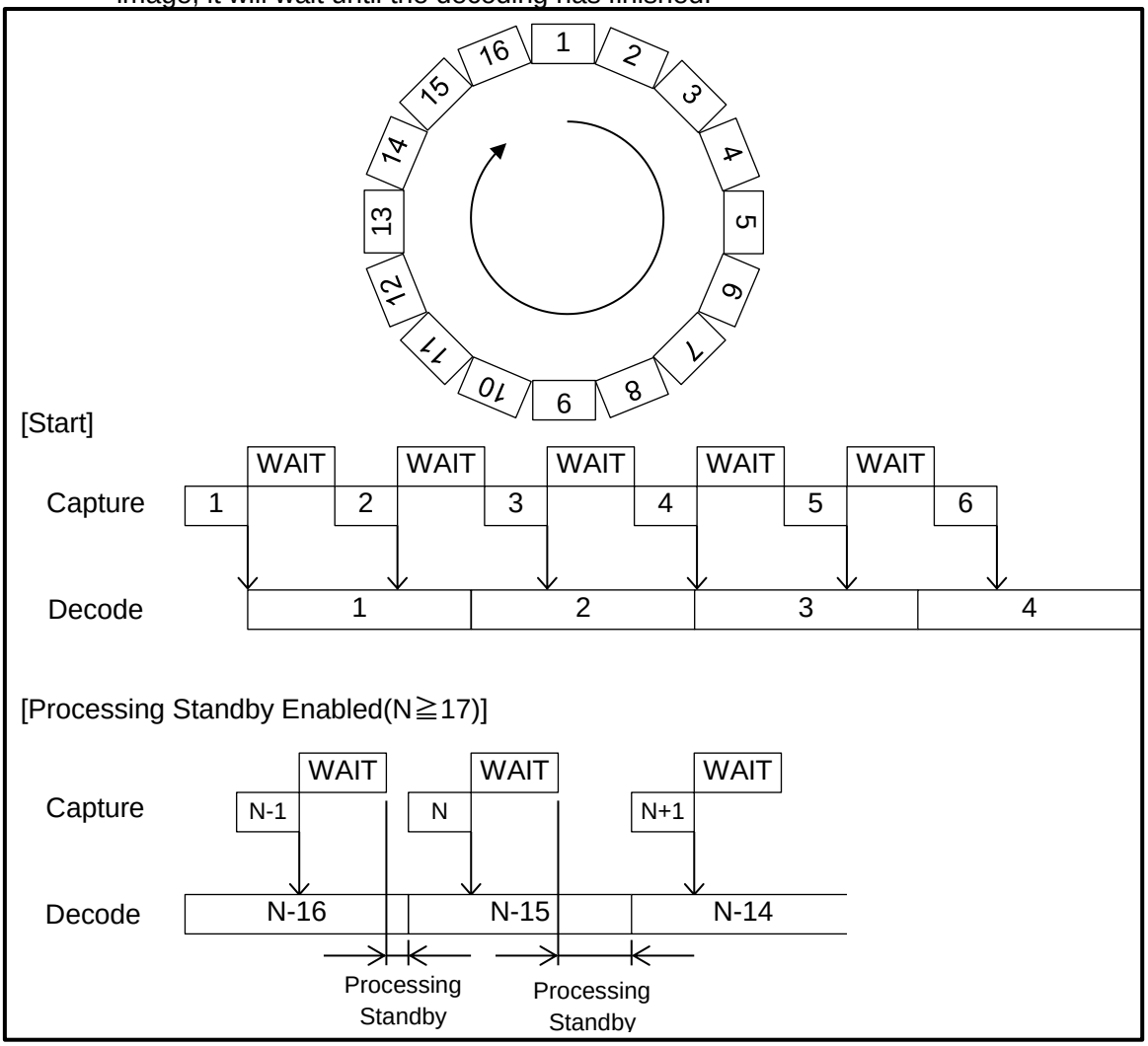
NGddd.dd%: Okeee.ee%[CR]

aaaaa :	NG Count (0 - 65535, maximum number is 65535)	
bbbbb :	OK Count (0 - 65535, maximum number is 65535)	
ccccc :	SYNC Input	(NOT displayed more than 65535)
ddd.dd:	NG Rate	(0.00-100.00, Displayed to the second decimal place)
eee.ee:	OK Rate	(0.00-100.00, Displayed to the second decimal place)

3.6 Cycle Buffer Function

With cycle buffer function, the reader images the target serially when the positions of moving targets are scattered against the SYNC.

In SYNCMODE=1 (Reading Timeout Mode) or SYNCMODE=2 (External Trigger Mode), the Cycle Buffer Function is enabled when the MAXIMG number is greater than 1one (default is four 4). Set with the MAXIMG command. If the Cycle Buffer Function is enabled, the reader captures multiple images after receiving the SYNC signal and then saves the images to the buffer memory (up to 4 images). The reader starts decoding from memory location #1, if it is not successful, the reader will attempt to read the image saved in memory location #2. The decoding is attempted during the interval between capturing images. When the buffer memory reaches the final location, the next image will be saved into buffer memory location #1 if the reader has finished decoding that image. If the reader has not finished with that image, it will wait until the decoding has finished.



[Concept of using Cycle Buffer]

The greatest feature of this function is the imaging of the predetermined number at a constant time interval unrelated to reading processing time. Set the number of imaging within the MAXIMG　setting (16 sheets maximum) for the imaging at regular intervals. Otherwise the imaging interval will vary depending on the reading processing time after the number of imaging.

Shortening the capture time by reducing the capture resolution (number of pixels) can shorten the imaging interval.

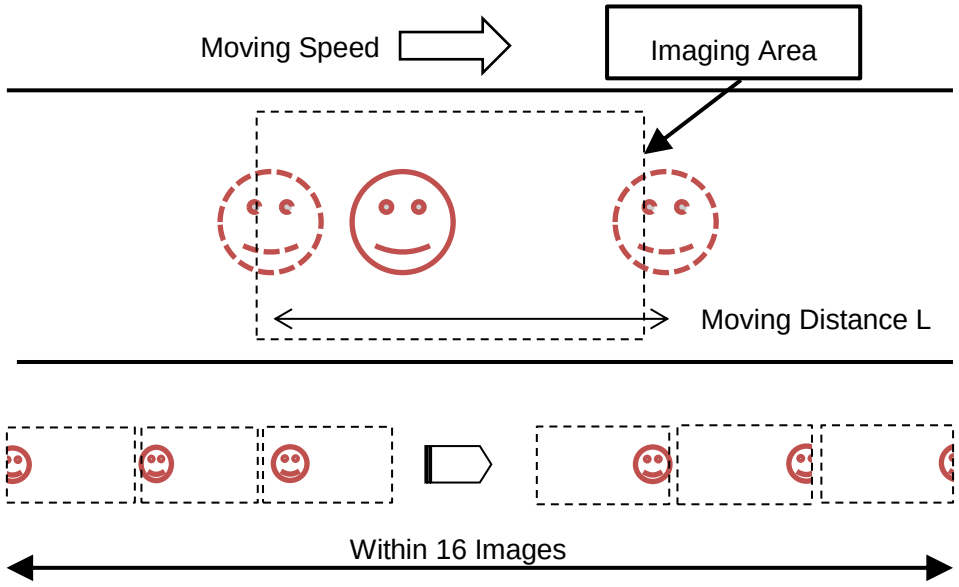
[Configration Example]

The relation among Shutter Time (SHUTT) , Capture Time (CAPIMG), Imaging Interval (WAITIMG) and Total Imaging Cycle (CAPCYC) are as follows.

CAPCYC ＝ SHUTT + CAPIMG + WAITIMG

Set the Moving Time T = L / V　< (16 × CAPCYC)

when the moving object's speed is V and the object's moving distance is L.



MAXIMG=16、SHUTT=1/1000s=1ms、CAPIMG=16ms、WAITIMG=10ms
　Imaging Cycle is CAPCYC=SHUTT+CAPIMG+WAITIMG=1ms+16ms+10ms=27ms.
(1)Moving speed V when the imaging range is L=100mm is:
　L/V < 16 × CAPCYC
　⇒ V > L/(16 × CAPCYC) = 100mm/(16 × 27ms) = 0.231mm/s = 14(m/min.) ∴ V > 14m/min.
(2)Imaging range L when the moving speed is V=30m/min.(= 500mm/s = 0.5mm/ms)is:
　L/V < 16(CAPCYC)
　⇒ L < 16 × CAPCYC × V = 16 × 27ms × 0.5mm/ms = 216mm　∴ L < 216mm

4 Configuration for Symbol Reading

4.1 Configuration parameters

This function is for automatic confituration of reading parameter. With this function, you can configure a lot of complex parameters automatically.This function is available by the communication from the host device as well as an easy key operation on a lone Code Reader.

4.1.1 How to operate Auto-Tuning function

First, place a symbol for automatic setting near the center axis of the lens in the reading distance range. Code Reader performs imaging repeatedly during the tuning.

Fix the target to the position to place the symbol securely.

When all the preparation above is done, execute Auto-Configuration according to the following procedure on the operation panel.

Marks for Monitor LED

■and■	Illuminate
□	Extinguish
□□□□	These 4 white squares are called A, B, C and D from the left in following instructions.

① Press Teach key for more than one second to blink LED-A in standby state.

*LED blinks(■□□□⇔□□□□)

↓ [Press Teach key for more than a second again to cancel the operation.]

② To start auto-tuning by Code Reader, press Read key while LED-A is blinking.

↓

③ The result is displayed when the auto-tuning is finished.

Auto-tuning successful:
-LED illumination □■■□
-3 long buzzers

Auto-tuning failed:
-LED illumination ■□□□
-7 short buzzers

The display of results will return to the stand-by state after a certain time.

↓

④ Press Read key while the result is displayed to save the result of successful auto tuning. The result of setting changes depending on the length of time you press the button.

Less than 2 seconds (Table Mode):
Saves 3 types of settings and uses them switching as needed.
More than 2 seconds (Manual Mode):
Saves 1 setting and uses it.
(Refer to the section “4.3 Camera Control Mode”.)
* You may receive less than 2 or less types of settings even if in Table Mode.
* Save the setting in Manual Mode when you decode moving objects.

When the operation above is accepted, Code Reader becomes the following state for a certain period of time and returns to the stand-by state.
*LEDs illuminate ■□□□
*Buzzer sound
-in Table Mode: 3 short buzzers
-in Manual Mode: 4 short buzzers

Notice

DO NOT turn off power during auto-tuning operation.

DO NOT send serial commands during auto-tuning operation.

4.1.2 Commands Related to Auto-Tuning

In Auto-Tuning, you can configure auto-tuning operation, reference of tuning result, selection of storing method and setting of tuning condition by communicating with the host.

- Set the shutter speed lower limit of auto-tuning.

*SHUTTLIM=a	a:	0	Shutter speed	1/60 (Default)
		1	Shutter speed	1/125
		2	Shutter speed	1/250
		3	Shutter speed	1/500
		4	Shutter speed	1/1000
		5	Shutter speed	1/2000
		6	Shutter speed	1/4000
		7	Shutter speed	1/6000
		8	Shutter speed	1/8000
		9	Shutter speed	1/10000

Setting lower limit of shutter speed is required when you read a moving object.

† Setting the moving distance of the reading object less than 25% of the cell size is recommended.

e.g.) When a reading target moves at 15m/min of speed in 0.5 mm square of cell size

$0.5 \times 10\text{-}3 \times 25\% \geqq 15 / 60 \times Ts$

$Ts \leqq 0.5 \times 10\text{-}3$ [s] = 1/2000 [s] (*SHUTTLIM=5)

- Start Auto-tuning

*setup

This command is used for starting auto-tuning. The operation after the start is the same as the one executed by the operation panel.

- Force-quit running auto-tuning

  *cancel

  Auto-tuning takes a lot of time. This command is used for canceling an auto-tuning. Code Reader force-quits the auto-tuning.

- Check the condition of LP-ABR

  *?state

  This command is used for checking the condition of your Code Reader. The answers from Code Reader are as follows.

Condition	Answer
Reading standby	STANDBY[CR]
Auto-tuning	RECEIVED[CR]
Waiting data save	SAVEWAIT(a)[CR]
Reading	(No answer)

  † (a) is the number of tuning results that can be saved. (a: 1 to 3)

- Save Tuning Result

  This command is used for saving a result of auto-tuning to the table mode. The save destination table differs depending on the serial command. When Code Reader receives this command within 40 seconds after the completion of auto-tuning, the result of the tuning is saved to the table mode. If no command is received, Code Reader times out and returns to reading standby state.

  *save

  This command is used for saving results of auto-tuning to the table mode. Save the results into Table 1 to 3.

  *save2

  This command is used for saving a result of auto-tuning to the manual mode.

  *save3=a,b

  a: Start position (1 to 8)

  b: Number of entries (1 to 3)

  This command is used for saving results of auto-tuning to the table mode. Save number of the “b” results from table “a”.

- Refer to saved result of tuning
  ?ddmtbl
  This command is used for saving a result of auto-tuning to the manual mode.

Output Example of ?ddmtbl

```
<SID=0>[My Reader]
******** STATUS ******** LP-ABR
 last table number=-1(read only)
 next table number=1(read only)
 STARTDDMTBL1=1 (0: OFF 1: ON)
 ENABLEDDMTBL=8 (1-8)
 EDITDDMTBL=0 (1-8)
 TBLTX=0 (0: OFF 1: ON)
 +++++ table 0 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 1 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 2 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 3 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
```

*Continues to the upper right ↗

```
 +++++ table 4 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 5 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 6 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 7 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
 +++++ table 8 +++++
 DDMcapmode=0,0,1920,1200
 DDMlight=3
 DDMled=1,1,1,1,1,1
 DDMbrightness=80,80,80,80,80,80
 DDMshutt=2
 DDMgain=3
 DDMblack=0
 DDMexgain=1
 DDMpreproc=0,0,0,0,0
 DDMmirror=0
********* END ********** LP-ABR
System version = M66C-M001a
Decode version = M66A-M001a
```

4.2 Reading Parameter

Configure the following parameter if Auto-tuning does not work or when you want to tune Code Reader manually. This parameter exists for each table of the table mode which is described later. Set this parameter to the table of your Code Reader. Code Reader operates referring to the parameter in table 0 if the setting is configured to not use the table mode.

The following parameters are set to get decodable images:

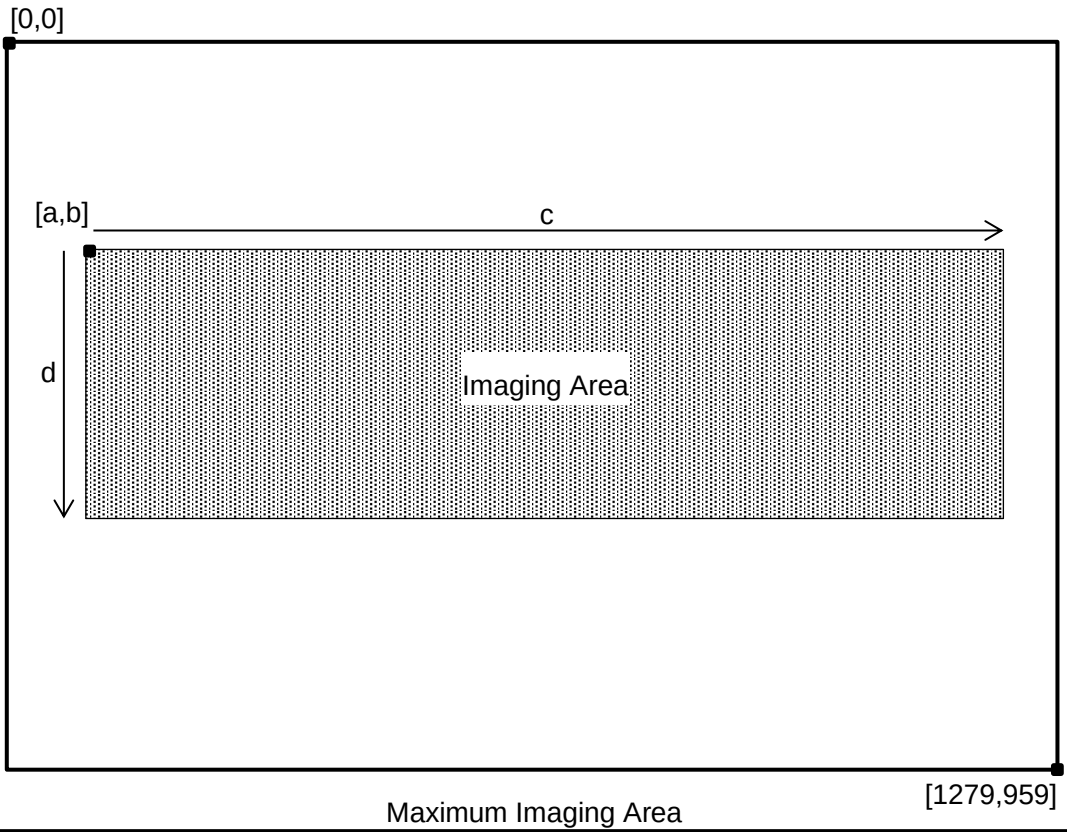
① Reading Area [DDMcapmode]
② Illumination Control (ON/OFF) [DDMlight]
③ Advanced Setting of internal Illumination [DDMled]
④ Internal Illumination intensity [DDMbrightness]
⑤ Shutter Speed [DDMshutt]
⑥ Analog Gain [DDMgain]
⑦ Digital Gain [DDMexgain]
⑧ Black level adjustment [DDMblack]
⑨ Image Preprocessing [DDMpreproc]
⑩ Mirrored Image [DDMmirror]

4.2.1 Reading Area

(1) Reading Area [DDMcapmode]

This function is used for specifying a readable area from an image.

The reading area is specified depending on the X origin, y-coordinate, width and height.



Maximum Imaging Area

DDMcapmode=a,b,c,d

a: Coordinate origin X (0-1275) b: Coordinate origin Y(0-955)

c: Width (4-1280) d: Height(4-960)

-Specify the full screen

DDMcapmode=0,0,1280,960

-Specify the 50 % of the center

DDMcapmode=320,240,640,480

† Configuring the reading area too narrow may deviate the symbol from the reading area and may cause a read error. Make sure that the size of reading area fits the symbol.

4.2.2 Illumination

(2) llumination control (ON/OFF) [DDMlight]

This command is used for configuring how the internal/external illumination illuminate.

DDMlight=a (a: 2,3)

2: Internal illumination OFF when capturing an image

3: Internal illumination ON (with pulsed operation) when capturing an image

4: External Illumination ON when capturing an image

5: External Illumination ON always

6: External Illumination ON during synchronization

7: External Illumination ON when capturing an image

8: For Test, DO NOT USE

9: Internal illumination ON, External Illumination during synchronization

10: For Test, DO NOT USE

11: Internal illumination ON during synchronization

† "Synchronization" stands for periods of time described below. Monitor LED-B turns on during synchronization.

1) Single Reading Mode : Synchronization ON - Decode completion

2) Reading Timeout Mode : Synchronization ON - Set synchronization time(TOTALLIM)

3) External Trigger Mode: During External Input Signal is ON

(3) Advanced Setting of internal Illumination [DDMled]

Sets the internal illumination to be used.

DDMled=a,b,c,d,e

0: No use 1: Use

a: Internal illumination TOP b: Internal illumination LEFT

c: Internal illumination RIGHT d: Internal illumination BOTTOM

e: Internal illumination CENTER

(4) Illumination Brightness [DDMbrightness]

Sets the brightness of the internal illumination.

(Brightness of external lillumination cannot be set)

DDMbrightness=a

0 to 100 (0: Extinguish100: Maximum Brightness)

4.2.3 Shutter Speed

(5) Shutter Speed [DDMshutt]

Configures the shutter speed.

If the image is still dark even with the illumination, configure the shutter speed slower to brighten the image. Note that this may cause a blur. The following 10 speeds can be specified.

DDMshutt=a

0: 1/60	1: 1/125
2: 1/250	3: 1/500,
4: 1/1000	5: 1/2000
6: 1/4000	7: 1/6000,
8: 1/8000	9: 1/10000

4.2.4 Extra Gain Values

(6) Analog Gain [DDMgain]

Specifies the analog gain to be configured on the camera.

Higher value will increased the camera analog gain which will produce a brighter image.

The following values can be specified.

DDMgain=a

1 (Low) to 4(high)

(7) Digital Gain [DDMexgain]

Specifies the digital gain to be configured on the camera.

Higher value will increased the camera digital gain which will produce a brighter image.

The following values can be specified.

DDMexgain=a

1 (Low) to 15(High)

4.2.5 Black Level Adjustment

(8) Black Level Adjustment [DDMblack]

This is a reserved parameter. Set it to 0 always.

DDMblack=0

4.2.6 Image Preprocessing

(9) Image Preprocessing [DDMpreproc]

If the image quality is low, by using an appropriate image filter at the image preprocessing may improve the reading accuracy

4.2.7 Mirrored Image

(10) Mirrored Symbol [DDMmirror]

Configures the reading of normal typed labels and mirrored image labels.

DDMmirror=a

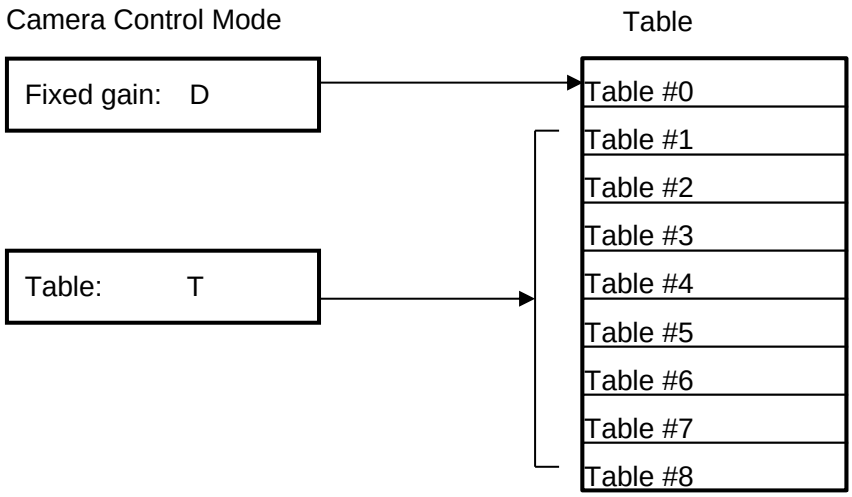
0: Read only normal type (not mirrored)

1: Read only mirrored type

2: Read both of normal type and mirrored type

4.3 Camera Control Mode

Camera Control Parameter consists of tables whose reading parameters are stored in and a camera control mode which operates tables.



Select one from the 2 types of camera control mode (AGC).

Fixed Gain Mode [AGC=D] (Default)

In Fixed Gain Mode, the reader uses only Table #0 settings. The settings in Table #0 will not be changed automatically.
Use this mode to decode a moving object. You can configure this mode even to a motionless object.

Table Mode [AGC=T]

In Table Mode, the reader configures some combinations of pre-set parameters and uses in turn. The combination of settings are used after being stored in a table.
The detail of Table Mode is described in the next section.

Reference

Table Mode is suitable for reading of motionless symbol.

4.4 Detail of Table Mode

Up to 8 tables can be used while the trigger is activated.

ENABLEDDMTBL=a (a: 1 to 8)

e.g.1) Use 3 tables (a=3)

Table #1, #2 and #3 are enabled and Table #4 through #8 will not be used. If the reader successfully decodes a symbol with Table #1, Table #1 will be used in the next reading. If the reader failed to decode a symbol with Table #1, the settings will switch to Table #2, etc.

If the reader failed to decode with Table #3, the settings will switch back to Table #1.

e.g.2) Use 1 table (a=1)

Only Table #1 is enabled. Table #2 through #8 will not be used. As the result, Table #1 is always used every reading.

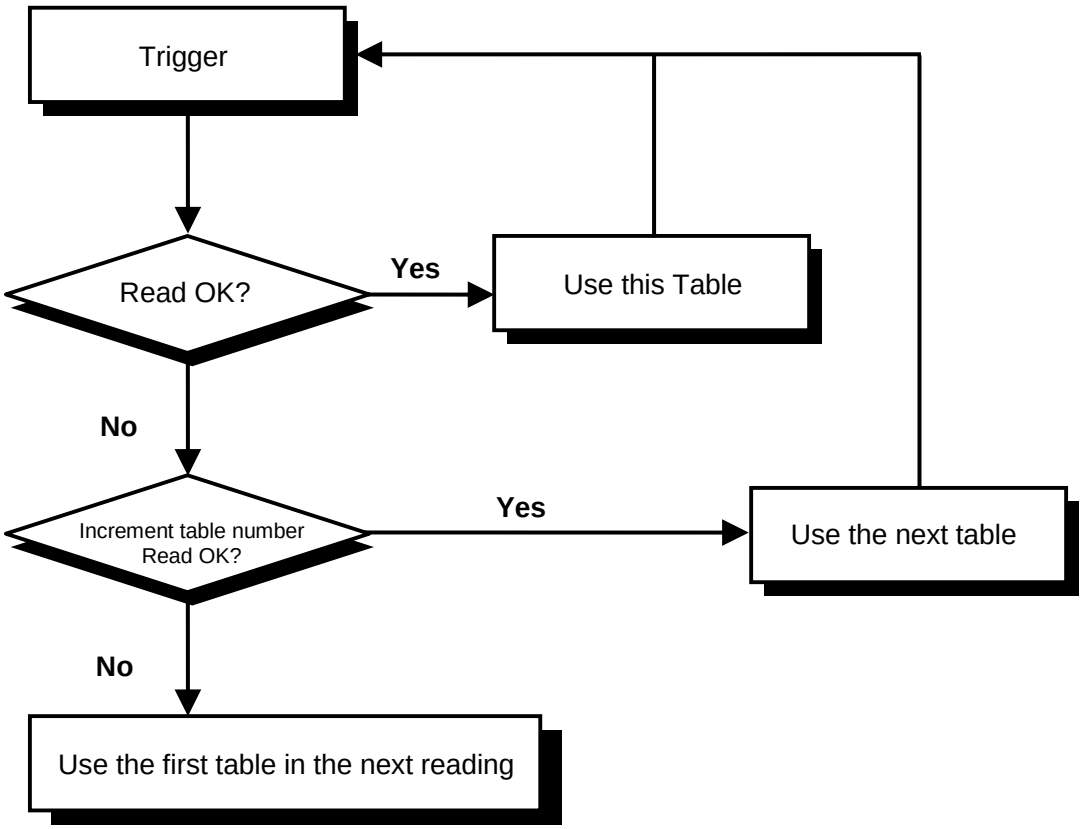
The following shows the structure of the Table. Each table has 9 types of parameters:

(1)	DecodeArea	[DDMcapmode]
(2)	Illumination Control	[DDMlight]
(3)	Internal Illumination	[DDMled]
(4)	Illumination Intensity	[DDMbrightness]
(5)	Shutter Speed	[DDMshutt]
(6)	Analog Gain	[DDMgain]
(7)	Digital Gain	[DDMexgain]
(8)	Black Level Illumination	[DDMblack]
(9)	Image Preprocessing	[DDMpreproc]
(10)	Mirrored Image	[DDMmirror]

When the reading is successful, the reader uses the table setting in the next reading.
When the reading is failure, the reader attempts to read using the next table setting.

The flow chart of Table mode is shown below.

< Flow char of Table Mode >



4.4.1 Edit Table

Edit tables using serial commands.

(1) Set the target Table #.
Send the serial command below to assign the table number to be edited.
EDITDDMTBL=a (a: 1 to 8)

(2) Configure the parameters.
Refer to section “4.1 Configuration parameters” for detailed information.

(3) Edit another table
Repeat the step 1 & 2.

(4) Check the target Table
You can check the target table status using the following command.
?ddmtbl

5 Advance Features

5.1 Preset Mode

In Preset mode, LP-ABR series read only the symbols whose data match the preset data.

This function has 2 modes whose registration method and data collation method of preset data are different.

PREM=0[CR](*): Preset Mode 0 (Preset Mode is disabled)

PREM=1[CR]: Preset Mode 1 (Preset data is the first decoded one after power up)

PREM=2[CR]: Preset Mode 2 (Preset data is registered in advance)

*: Default

To disable Preset Mode, send the command “PREM=0”.

5.1.1 Preset Mode 1

In this mode, the preset data is the first decoded data after power up.

Data comparison is only successful when the code matches completely.

The preset data must be set as every time the reader is powered on because the data is not saved to internal flash memory.

Setup procedure of Preset Mode 1

1. Send the following commands

   PREM=1[CR]

   WSETS[CR] : Save the settings to internal flash memory.
2. Power-on reset
3. Read the symbol that contains the data to be used as the preset data.

5.1.2 Preset Mode 2

In this mode, the preset data is configured by the serial command. Data comparison is completed by both complete and partial matching. It is possible to save the preset data to internal flash memory.

Send the following command to set this mode:

PREM=2[CR]

SET=PREDabcd[CR] : Set the preset data (data is “abcd”)

SET=PRENa[CR] : Set the number of digits (a: 0 to 100)

WSETS[CR] : Save the settings to internal flash memory

e.g.1) Example 1: Only ”12345” is valid

12345 : match

1234 : mismatch

123456 : mismatch

012345 : mismatch

PREM=2[CR]

SET=PRED12345[CR] : Set the preset data (data is “12345”)

SET=PREN5[CR] : Set the number of digits (5 digits)

WSETS[CR] : Save the settings to internal flash memory

e.g.2) Example 2: Valid when first 4 digits are “ABCD”.

ABCD : match

ABCD333 : match

ABCD777777 : match

ABC : mismatch

DABC333 : mismatch

77**ABCD**77777 : mismatch

PREM=2[CR]

SET=PREDABCD[CR] : Set the preset data (data is “ABCD”)

SET=PREN0[CR] : Set the number of digits (no count)

WSETS[CR] : Save the settings to internal flash memory

e.g.3) Example 3: Valid when the length is 10 digits and the data from 3rd-digits to 6th-digits are “ALFA”.

00**ALFA1**234 : match
AA**ALFA**AAAA : match
00**ALFA**12345 : mismatch
0**ALFA**12345 : mismatch

PREM=2[CR]
SET=PRED??ALFA????[CR]: Set the preset data (data is “??ALFA????” and “?” is mask.)
SET=PREN10[CR]: Set the number of digits (10 digits)
WSETS[CR]: Save the settings to internal flash memory

5.1.3 Output the status of Preset Mode

?pre[CR] : Output the preset status

(Example output)
PREM=0 (0: non 1: power on 2: saved)
PRESET LENGTH: 13
DATA(HEX):
34 39 3F 3F 3F 3F 3F 3F 3F 3F
3F 3F 3F
DATA(ASCII):
49????????????

(Output format)
PREM=a (0: non 1: power on 2: saved)[CR]
PRESET LENGTH: b[CR]
DATA(HEX): [CR]
XX XX XX XX XX XX XX XX XX XX[CR]
XX XX XX XX XX XX XX XX XX XX[CR]
XX XX XX XX [CR]
DATA(ASCII): [CR]
xxxxxxxxxxxxxxxxxxxxxxxx

a	:	Preset Mode
b	:	The digit of the length of the preset data
XX XX …	:	Preset data character (in hex)
xxxxxx…	:	Preset data character (in ASCII/JIS)

If the preset data include control code, it is transferred to “*”.

5.2 Output Additional Information

5.2.1 Output the scanned data adding Code Reader's individual name

It can be used for multi-configuration with the reader. Host computer can recognize the data which reader has sent.

- Set an individual name to each reader

  MYNAME=aaaa aaaa: (Alphanumeric strings from 1 to 31 digits)

The name of all Code Readers is "My Reader" in default setting. Make sure to set an individual name to each Code Reader before using this function.

- Configure to output individual name.

  The output method is selectable by the connection with the host device.

NAMETX=a,b a=0: No Code Reader name will be included on the reading result (RS-232C)

1: Code Reader name will be included on the reading result (RS-232C)

b= 0: No Code Reader name will be included on the reading result (LAN)

1: Code Reader name will be included on the reading result (LAN)

Skip b: Configure LAN same with RS-232C

5.2.2 Warning Information to avoid No Read

Add a Warning Information to the symbol data for monitoring the reading condition.

Output format: (CcccEeeeDddd)

ccc: Contrast Information for the captured image

eee: Unused Error Correction rate

ddd: Decodability margin

e.g.1) Good Read

Data Output: (C082E100D091)A123456A

Calculate contrast value of a symbol including quiet zone. The decoder determines a rectangular area for the symbol and calculates the contrast value from its brightness level. If there are multiple symbols, the calculated value is for the first decoded symbol.

e.g.2) No Read

Data Output: (C000E000D000) BR

“000” is added in case of No Read.

5.2.3 Symbol Type Information

Add symbol type information (decoded symbol type) to the head of decoded symbol and output is in serial. Symbol Type is not added at No Read.

Symbol Type	Code Type Information
Data Matrix	]d1
QR Code	]Q1

5.2.4 Decoding Time

Add decoding time to the symbol data.

5.2.5 Total Reading Time Information

Add number of images captured after trigger input and Total time from trigger input to serial data output. Total Reading Time is not added at No Read.

Output format: (aa, bbbbbms)

aa: Number of images, bbbbb: Total time [ms]

5.2.6 Contrast Information

Add the Contrast Information of the last decoded image.

Good Read

Calculate contrast value of a symbol including quiet zone. The decoder determines a rectangular area for the symbol and calculates the contrast value from its brightness level.

If there are multiple symbols, the calculated value is for the first decoded symbol.

No Read

Calculate contrast value for the whole image.

Output format: (aaa, bbb, ccc) 13 bytes

aaa : Maximum value of reflectance (000 to 255)

bbb : Minimum value of reflectance (000 to 255)

ccc : Contrast [%] =100 x (aaa - bbb) / 255 (000 to 100)

5.2.7 Quality Information

The percentage of the Unused Error Correction codeword of the 2D code is added to the decoded data.

For example, if the decoder does not use any error correction, this value would be 100. The reader outputs the quality information individually if there are multiple symbols. Quality Information is not added at Reading Error.

Output format: (QT: ddd) 8 bytes

ddd: Quality (000 to 100)

5.2.8 Symbol Coordinates

The positional data of the symbol in the image is output along with the decoded data.There are two types of output information; barycentric coordinates and rectangular coordinates.

(1) Barycentric coordinates

The origin (+0000, +0000) is the left-top edge of a field of view.

(Example output)

10000000099070(+0122,+0024)

Output format: Header + Data + (abbbb,acccc) + Terminator

a : + or -

bbbb: X coordinate of a symbol's barycenter (9999 to +9999)

cccc: Y coordinate of a symbol's barycenter (-9999 to +9999)

(2) Rectangular coordinates

The origin (+0000, +0000) is the left-top edge of a field of view.

(Example output)

10000000099070(+0269,+0011)(+0455,+0086)(+0386,+0270)(+0198,+0199)

(Output format)

Header + Data + (A1) + (A2) + (A3) + (A4) + Terminator

A1 – A4 : (abbbb,acccc)

a : + or -

bbbb: X coordinates of four corners of a symbol (-9999 to +9999)

cccc: Y coordinates of four corners of a symbol (-9999 to +9999)

(3) Barycentric / Rectangular coordinates

Outputs coordinates of both barycenter and four corners of a symbol.

(Example output)

10000000099070(+0007,+0103)(+0269,+0011)(+0455,+0086)(+0386,+0270)(+0198,+0199)

(Output format)

Header + Data +(B) + (A1) + (A2) + (A3) + (A4) + Terminator

(B): Barycentric coordinate

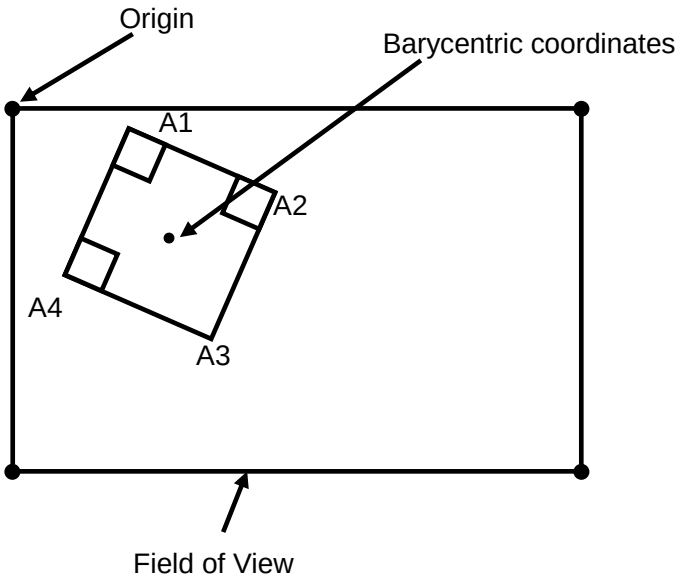
(A1)(A2)(A3)(A4): Rectangular coordinates

B, A1-A4: (abbbb,acccc)

a : + or -

bbbb: X coordinate of barycenter and X coordinate of four corners of a symbol (-9999 to +9999)

cccc: Y coordinate of barycenter and Y coordinate of four corners of a symbol (-9999 to +9999)



5.2.9 Table Number

Table numbers given at read are added to sybmol data.

(Example output)

10000000099070 (ddmtbl=3)

(Output format)

Header + Data + (ddmtbl=a) + Terminator

a : Table number

5.2.10 BCC (Back Check Charactor)

Calculates BCC (backcheck character) to detect errors. The calculated BCC is added to the symbol data. There are three calculation methods, LRC (BCC), SUM128, and CRC16. The data length of BCC to be added changes depending on the calculation method. Make sure to set the header to add BCC.

(Output format)

Header + Data + Terminator + BCC

(Calculate Method)

1) LRC(BCC)

Calculates all the characters (data for each 1 byte) excluding the header by exclusive OR.

2) SUM128

1. Calculates total value of all characters excluding headers.
2. Calculates the total value in 1. and [0xFF] by logical conjunction.

CRC16

Calculates with all characters (excluding headers) by following method.
CRC characters are used for the calculation. (Initial value: [0x00])

1. The character is logically shifted 8 bits to the left
2. Calculates the total value in 1. and the CRC character by the exclusive OR.The calculated value is assigned to the CRC character.
3. Repeats the following calculation for 8 times.
    3-1. Calculates the CRC character and [0x8000] by the logical conjunction.
    3-2. The CRC character is logically shifted 1 bit to the left.
    3-3. When the result of (3) is other than 0, calculates the CRC character and [0x1021] by the exclusive OR and assigns the calculated value to the CRC character.
    3-4. Calculates the CRC character and the logical AND of [0xFFFF]. The calculated value is assigned to the CRC character.
4. Calculates the values of “1.” – “3.” with all the characters excluding headers.
5. The calculated CRC character is devided into upper 8 bits and lower 8 bits.

(Output Example)

The output sample contains binary data. Therefore it is written in hexadecimal.
The data used in this output example is as follows.
(Hexadecimal notation is shown in parentheses.)

Data : 123 ([0x30][0x31][0x32])
Header : SX ([0x02])
Terminator : CR ([0x0D])

1. LRC(BCC)

[0x02][0x31][0x32][0x33][0x0D]**[0x3D]**

2. SUM128

[0x02][0x31][0x32][0x33][0x0D]**[0xA3]**

3.CRC16

[0x02][0x31][0x32][0x33][0x0D]**[0x70][0xF3]**

5.2.11 Output data length

Adds output data length given at reading excluding the header, terminator and BCC to sybmol data. There are two types of output digits: 4 digits and 5 digits. If the number of digits of output data is less than 4 digits or 5 digits, add 0 to the beginning.

(Output format)

Header + Output data length + Data + Terminator

(Example output)

4 digits

001410000000099070

5 digits

0001410000000099070

5.3 Save Image

Up to 16 captured images can be stored by increasing the number of cycle buffers memory. Set number of cycle buffer memory is the number of storable images.

MAXIMG=a[CR] a=1-16 Specifies number of cycle buffer memory.

MAXIMG=1[CR] (*)

*: Default

5.3.1 Save Preprocessed Image

Selects an image to save from the 2 images captured before or after preprocessing. (This function is only valid for latest images)

IMGSEL=0[CR]	Saves captured images (Raw images)
IMGSEL=1[CR] (*)	Saves decoded images (*)

*: Default

5.3.2 Overwrite save

When the number of save images exceeds the cycle buffer memory's, the oldest image will be overwritten.

5.3.3 Preparation for transmitting the saved image

The saved image whose preparation of transmission is completed can be transferred to the host using the "Configurator LP-ABR" software.

† When the Camera Control Mode is other than Table Mode

IMGFRAME=0,a[CR] a=1 to 16

1: Preparation for last saved image.

2 to 16: Preparation for (a-1) previous image from the latest

† When the Camera Control Mode is Table Mode

IMGFRAME=1,b[CR] b=1 to 8

Prepare an image taken in table No. (b) for transmitting.

5.3.4 Output status of image storage condition

?IMG[CR] Output setting status

(Output Example)

<SID=0>[My Reader]
******** STATUS ******** LP-ABR
IMODE=0 PX=0 PY=0 WX=1920 WY=1200
CAPMODE=0,0,1920,1200
DECMODE=0,0,0,1920,1200
IMGSEL=1 (0: captured image 1: decoded image)
CAPDLY=0
MAXIMG=1 (1-16) WAITIMG=100 (0-1000)
CAPLIM=0 (0: OFF 1: ON)
********* END ********** LP-ABR
System version = M66C-V0.1q
Decode version = M66A-V0.1q

(Output format)

<SID=0>[My Reader]
******** STATUS ******** LP-ABR
IMODE=a PX=b PY=c WX=d WY=e
CAPMODE=f,g,h,i
DECMODE=j,k,l,m,n
IMGSEL=o (0: captured image 1: decoded image)
CAPDLY=p
MAXIMG=q (1-16) WAITIMG=100 (0-1000)
CAPLIM=r (0: OFF 1: ON)
********* END ********** LP-ABR
System version = M66C-V0.1q
Decode version = M66A-V0.1q

a	:	Trimming
b,c,d,e	:	Trimming position (Left, Top, Width, Height)
f,g,h,i	:	Capture area (Left, Top, Width, and Height)
j	:	Not link/link with capture area
k,l,m,n	:	Decode area (Left, Top, Width, and Height)
o	:	Image type (Captured image, Decoded image)
p	:	Delay time after SYNC-ON to capture start (ms)
q	:	Number of cycle buffer memory
r	:	Overwrite/not overwrite the cycle buffer memory when the number ofcaptured imaga exceeds the number of cycle buffer memory
s	:	Image rotation (0 degree / 180 degree)

5.4 PLC Link

With PLC link, you can write a reading result of symbols directly to the PLC internal data memory (programable logic controller) through RS-232C or LAN interface.

5.5 Simultaneous reading of multiple labels

In symbol reading mode, multiple (up to 10) labels can be read simultaneously.

The order of reading data output can be configured under following conditions.

1. In order of processing completion
2. In order of preset number of digits
3. In order of preset matching characters
4. In order of preset symboligies

† Setting more symbols in an image than the number of preset symbols causes output failure.

5.6 Symbol Printing Check

This function judges a printing quality of a two-dimensional symbol captured by Code Reader using in-line. It verifies the print quality and output the result by using evaluation parameters of ISO15415 or AIM DPM-1-2006.

Printing quality of symbols flowing on manufacturing line is maintained at a certain level by being checked in-line. By checking the printing quality soon after marking, detailed time-dependent change of a marking system can be seen based on the evaluation parameter.

Reference

- Notice that this function is for a simple check that outputs the evaluation result in the same format with standard evaluation parameter. It cannot be used as a proper two-dimensional symbol verifier.

- Verification results of this function may be affected by the change of imaging conditions of Code Reader. To prevent a variance of evaluation result, use this function under the same imaging condition (especially following conditions) as much as possible.
  - Reading distance
  - Illumination condition (Light ON/OFF configuration of internal/external illumination, illumination brightness)
  - Shutter speed
  - Analog gain
  - Digital gain
  - Black level adjustment
  - Inclination of the symbol surface against Code Reader (tilt, skew, pitch)
  - Amount of light around Code Reader

- Processing time becomes longer than regular symbol reading when this function is active. Turn off when this function is not necessary.

5.6.1 Supported Symbologies

2D Codes

Data Matrix (ECC200)

QR Code

5.6.2 Symbol Printing check Items to be output

The evaluation values are output on a scale of 5 levels (0 to 4) by each evaluation items."Overall Quality" means a value of each element's lowest grade. (If there are 5 evaluation items and the determination value was 4,3,2,3,4, the overall quality is 2. Evalutation items to be used for overall determination is selectable.

① 2D Codes(Select an evaluation item from ISO and AIM.)

No.	Evaluation Items
0	Overall Quality(Lowest value of selected evaluation item)
1	Contrast (ISO) / Cell Contrast (AIM)
2	Modulation (ISO) / Cell Modulation (AIM)
3	Fixed Pattern Defection
4	Decode
5	Non-uniformity of Axis
6	Non-uniformity of Grid
7	Unused Error Correction

5.6.3 Digital Output of Determination in Symbol Printing Check

When Print Check Output is enabled, the determination can be output digitally in check result. Configure a threshold to determine whether the overall judgment is OK (GOOUT) or NG (NGOUT).

If a threshold is configured 2:

Outputs OK when an overall quality is 2,3, and 4

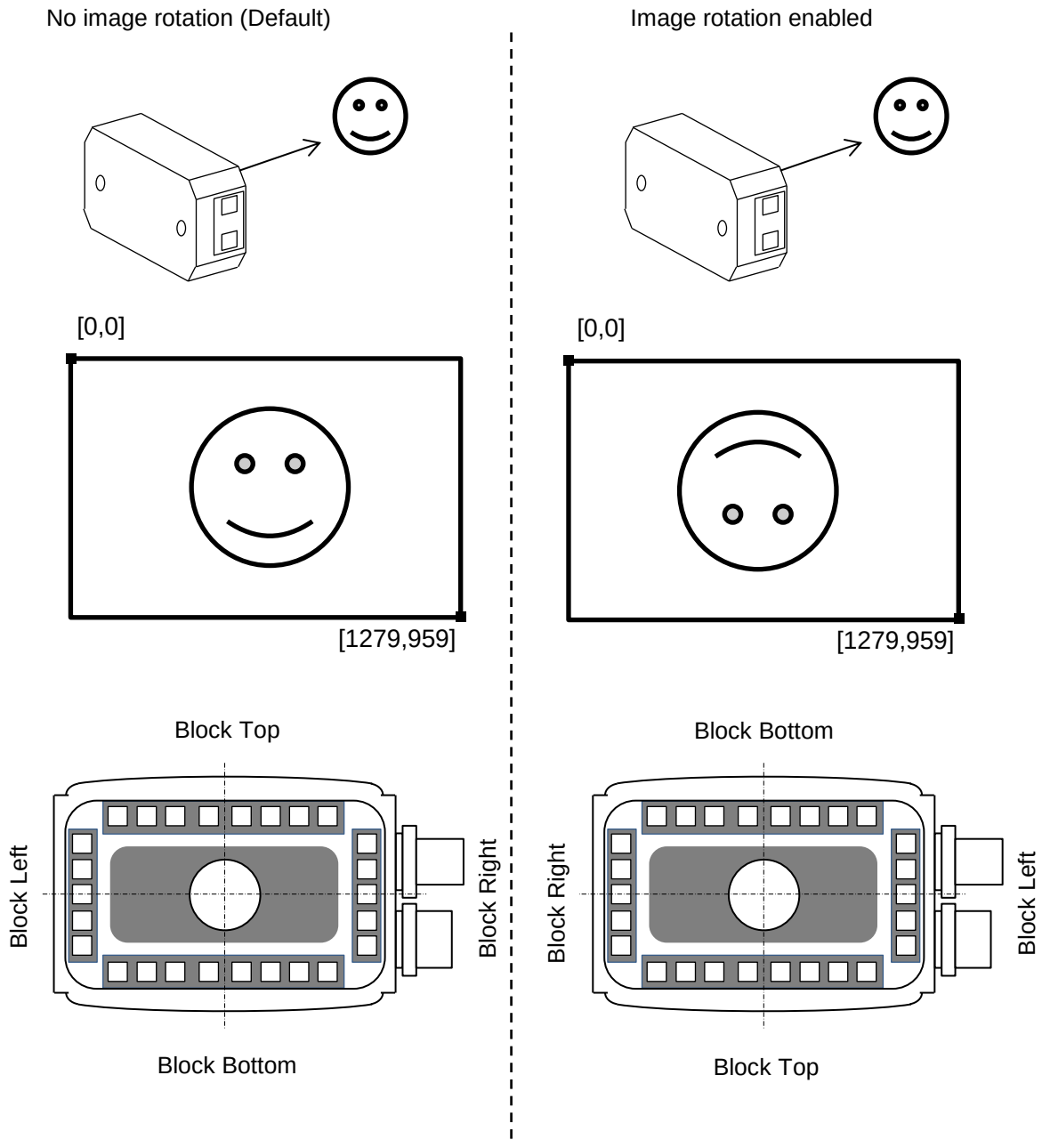
Outputs NG when an overall quality is 0 and 1

If a thredhold is configured 0, the determination is output in a determination of regular symbol reading without a determination in check result.

5.7 Image Rotation

Rotates an image 180 degrees before a capture. The rotated image is used in all the process (decoding, saving data, etc) after the rotation.

After the rotation, the layout of illumination blocks will be replaced as shown below.



5.8 Internal flash memory recovery process

If the power is turned off while saving the settings in the internal flash memory, the area where the settings are saved may be damaged.

Image reader checks the status of the internal flash memory at startup and performs recovery processing if it is damaged.

The recovery process takes approximately 3 minutes.

Do not turn off image reader during the recovery process.

The operation of image reader at the time of recovery is as follows.

1. Image reader start buzzer sounds
   -2 long buzzers(The second buzzer sound has a higher pitch than normal)
2. Blink LED-A,B,C,D(■■■■⇔□□□□)
3. Start internal flash memory recovery processing(about 3 minutes)
4. Finish internal flash memory recovery processing
   -LED illumination(■□□□)
5. Image reader start processing completion buzzer sounds
   -3 shot buzzers

6 LAN (TCP/IP) connection

6.1 Preparation

Configure the network setting to use the LAN interface.

6.2 Configure IP address

6.2.1 Configure through RS232C interface

Connect the reader to a PC through a RS232C cable.
Start a terminal software “Configurator LP-ABR” on a host computer.
Operate entering various commands from the terminal software.

IPADR: Configures an IP address and number of sub net mask bits in command.

```
IPADR=192.168.209.10/24
```

* The number of mask bit can be omitted if you do not want to change the sub net mask.

Enter "IPPORT =" command to configure a service port (for reading result transmission) in TCP server connection.
Enter "IPPORT2 =" command to configure a service port (for image data transmission) in TCP server connection. (Another port also can be specified.)

```
IPPORT=27110
IPPORT2=27110
```

Configure the default gateway address by the command below.

```
GWADR =192.168.209.254
```

*Set the same network as IP address.

Confirm the LAN settings by the command below.

```
?LAN
```

Save the settings to internal flash memory by the command below.

```
WSETS
```

* “Write OK” is sent when the settings are saved Write OK.

Turn off power and restart the reader

6.2.2 Configure through LAN interface

Configure settings through LAN interface, if the IP address and the port number of the reader are known. Make sure the IP address of the superior computer is set into the same network as the reader.
- Configuration procedure is same as RS232C.

Connect the LP-ABR and the PC for setting with a LAN cable.
Start the terminal software "Configurator LP-ABR" in the host PC.
Specify the IP address / port number of this product as the connection point of the terminal software.
The subsequent operation is the same as the setting from the RS-232C connection.

† If the IP address of this product is in a different network, reconfigure the IP address of the PC.

6.3 Default Settings

IP address	: 192.168.209.10
Sub net mask	: /24(same as 255.255.255.0)
Port number (only for reading result transmission)	: 27110
Port number(only for image data transmission)	: 27110
Default gateway address	: 192.168.209.254

e.g.) Settings example

```
IPADR=192.168.0.101/24
IPPORT=60000
GWADR=192.168.0.1
?LAN

<SID=10>[My Reader]
******** STATUS ******** LP-ABR
IP address          (IPADR) : 192.168.209.010    [>> 192.168.0.101]
Sub net mask        (/n)    : 255.255.255.000    [>> 255.255.255.000]
Default gateway (GWADR) : 192.168.209.254    [>> 192.168.0.1]
Barcode port     (IPPORT) : 27110    [>> 60000]
Image     port    (IPPORT2) : 27110    [>> 27110]
Send Barcode IP (IPBAR) : 000.000.000.000:27120
Send Image     IP (IPIMG) : 000.000.000.000:27130
connection-retry(RTIME) : 0
session-timeout (STOUT) : 0
MAC address                    : 00:16:fc:07:ff:f5
********* END ********** LP-ABR
System version = M66C-V0.1q
Decode version = M66A-V0.1q
```

Setup value is displayed enclosed in “ [>> “ and ”] ”.

The dump screen of the computer and Code Reader is displayed as described in the box above. The contents of the communication is set as follows:

[Current operating status]

IP address : 192.168.209.10

Sub net mask : /24

Default gateway : 192.168.209.254

Port number (only for reading result transmission) : 27110

[Setting (Effective at next activation)]

IP address : 192.168.0.101

Sub net mask : /24

Default gateway : 192.168.0.1

Port number (only for reading result transmission) : 60000

† To enable the setting, save to flash memory in WSETS command and power off to reset.

6.4 Check for LAN settings

6.4.1 Through RS-232C interface

LAN setting can be confirmed through RS-232C interface anytime.

?Confirm the LAN settings by the command below.

?LAN

The following parameters are sent to the host:

- IP address
- Sub net mask
- Default gateway
- Port number of TCP server connection (only for reading result transmission)
- Port number of TCP server connection (only for image data transmission)
- Destination of TCP client communication (only for reading result transmission)
- Destination of TCP client communication (only for image data transmission)
- Connection request interval (only for TCP client communication)
- Detection timer (only for TCP client communication)

6.4.2 Through LAN interface

Communication state can be checked by UDP (User Datagram Protocol), if the network address is already known.

Set IP address of the host into the same network as the reader.

Connect LP-ABR series to the PC for configuration with a LAN cable.

Specify the broadcast / port number as a UDP communication destination.

† The port number is 49460 fixed.

† If multiple LP-ABR are connected in a same network, respective devices will respond.

Confirm the settings by the command below.

?who

The following parameters are output in a line:

- Local IP address (IP address of TFIR-31LAN)
- Local port number (Port number of TCP/IP server of LP-ABR series)
- Sub net mask
- Default gateway
- MAC address (last 3 bytes)

6.5 Connect to LAN

Use a dedicated LP-ABR series LAN cable to connect. Auto-negotiation function which can automatically configure both communication speed (1Gbps, 100Mbps, 10Mbps) and communication mode (Full Duplex, Half Duplex) is mounted on the cable. Therefore, configure the LAN setting (communication speed and communucation mode) of your computer to auto-setting at a one-to-one communication through a crossover cable.

6.6 Manage Commnunication Status

The LP-ABR series supports 4 types of communication method:

- TCP server communication (for all commands)
- TCP client communication (for reading result transmission)
- TCP client communication (for image data transmission)
- UDP communicatoin (for administration)

[TCP/IP connection]

The reader works as a TCP/IP server whose port number can be set to any value. Only one client can be connected at a time.

The reader will disconnect in the following situations:

- Receive close request from the client
- Detect transmission error

In the following cases, the reader cannot detect disconnect state:

- A UTP cable was removed before the client sent close request.
- The client aborted the system without sending close request.

To recover the connection, send the command “discon” through RS232C interface for forced termination, and then retry the connection.

e.g.)

(Command) → discon　27110

[TCP client connection for transmission of reading result]

The reader also works as a TCP/IP client whose access point (IP address: port number) can be set. Configure the connection timing by the command RTIME (Connection request interval).

- Connect every time when you send data
- Connect automatically every time the reader is powered on

Once a connection is established, the reader will disconnect in the following cases.

- The duration time passes (always-on connection is also possible)
- The reader receives a disconnect request from the server/client
- The LP-ABR detects a send error

You can disconnect at any time with discon (forced disconnection) command.

e.g.)

(Command) → discon IPBAR

[TCP client connection for transmission of image data]

The reader also works as a TCP/IP client whose access point (IP address: port number) can be set. Configure the connection timing by the command RTIME (Connection request interval).

- Connect every time when you send data
- Connect automatically every time the reader is powered on

Once a connection is established, the reader will disconnect in the following cases.

- The duration time passes (always-on connection is also available)
- The reader receives a disconnect request from the server/client
- The LP-ABR detects a send error

You can disconnect at any time with discon (forced disconnection) command.

e.g.)

(Command) → discon IPIMG

[UDP Communication]

Code Reader also works as an UDP server with a fixed port number (49460). The connectionless UDP communication can communicate with multiple superior PCs.

When you send data in a broadcast from the superior PC, all devices on the LAN will respond. With broadcast, you can:

- Get a list of LP-ABR that is running normally on the LAN.
- Get port number/terminal information of unknown IP address/TCP server communication

You can shut down TCP server communication using UDP communication.

6.7 Serial command for LAN settings

?LAN

Get a list of settings for LAN connection.

IPADR=<IP address in dotted notation>/<Bit number of subnet mask>

Set IP address and subnet mask of the reader.

† If you do not change the subnet mask, the mask bit numer can be omitted.

GWADR=<IP address in dotted notation>

Set default gateway address of the reader.

† Set the same network with the IP address.

IPPORT=<TCP/IP port number>

Set TCP/IP port number of the reader.

IPBAR=xxx.xxx.xxx.xxx: nnnn

Destination IP address of reading results: set the port number.

Sends reading results from the TCP server when the destination IP address is 0.0.0.0.

Sends reading results from the TCP client when the destination IP address is other than 0.0.0.0.

xxx.xxx.xxx.xxx Destination IP address

nnnn Destination port nimber (1 to 63335)

IPIMG=xxx.xxx.xxx.xxx: nnnn

Destination IP address of image data: Configure the port number.

Sends reading results from the TCP server when the destination IP address is 0.0.0.0.

Sends reading results from the TCP client when the destination IP address is other than 0.0.0.0.

xxx.xxx.xxx.xxx Destination IP address

nnnn Destination port nimber (1 to 63335)

RTIME=<Connection request interval>

Set the interval time that the TCP client communication attempts to reconnect to 0 to 100 seconds.

When the interval time is 0, Code Reader connects every time when you send data.

When the interval time is other than 0, Code Reader connects automatically (at the same time the reader is powered on).

This configuration change is enabled at the next connection.

STOUT=<Duration time>

Set the interval time that Code Reader requests a disconnection in 0 to 100 seconds after the lost of data to transmit and receive from the TCP client.

When the interval time is other than 0, Code Reader does not send the disconncetion request.(Always-on connection).

TCPCS=a (a=0; Disable a=1; Enable)

Set the function of data arrival confirmation. If enabled, the reader will wait to send the next data until receiving “Ack”, which is associated with the previous data, from the host.

?who

Get the following status: .

Local IP address (IP address of the reader)

Local port number (TCP server port number of the reader)

Subnet mask

Deffault gateway

MAC address (last 3 bytes)

?netstat

Outputs following information in a line.
Local IP address (IP address of the reader)
Local Port number (TCP server port number of the reader)
Remote IP address (IP address of the connected PC)
Remote Port number (Port number of the connected PC)
TCP/IP server socket status

?netstat IPBAR

Outputs information about the destination of reading result in a line.
Local IP address (IP address of the imager)
Local Port number (TCP client port number of the imager)
Remote IP address (IP address to send reading results)
Remote Port number (Port number to send reading results)
Status of TCP client communication to send reading results

?netstat IPIMG

Outputs information about the destination of reading result in a line.
Local IP address (IP address of the imager)
Local Port number (TCP client port number of the imager)
Remote IP address (IP address to send image data)
Remote Port number (Port number to send image data)
Status of TCP client communication to send image data

?version (*)

Outputs following information in a line.
Local IP address (IP address of the reader)
Local Port number (TCP server port number of the reader)
System version
Decoder version
Model name

discon<TCP/IP Port number>

Shut down TCP/IP connection of the specified port number.
* <TCP/IP port number> should be set in decimal.
e.g.) discon 27110

6.8 Iinitialize LAN address

If the configured address is unknown, send commands to start the reader with default setting through RS-232C im following steps:

- Send a command SET=LAN.
- Send a command WSETS.
- Restart the reader.

Default settings

IP address	:	192.168.209.10
Sub net mask	:	/24
Port number of TCP server	:	27110 (only for sending captured data)
	:	27110 (only for image data transmission)
Default Gateway	:	192.168.209.254

7 Serial Command (RS-232C, LAN)

- The following serial commands can be used through both RS232C and LAN (TCP/IP) interface unless otherwise specified.

  Serial command format
  Serial command + [CR] Default (Backward compatible)
  [Header] + Serial command + [Terminator]

- To add header and terminator characters to a serial command, send the command "CMDFORM=1".
  The header and terminator characters are same with the ones to add to captured data. This is a compatible operation without the terminator.

- To return the input format of the configuration commands to compatible (configuration command + [CR]), send the command “CMDFORM=0”.

7.1 Communication

Term	Command	Description (*)=Default
Baud rate	BAUD=aaaa	Baud rate of RS-232C aaaa=1200; 1200bps, aaaa=2400; 2400bps, aaaa=4800; 4800bps, aaaa=9600; 9600bps, **(*),** aaaa=19200; 19200bps, aaaa=38400; 38400bps, aaaa=57600; 57600bps, aaaa=115200; 115200bps,
Frame	FRAME=0 FRAME=1 FRAME=2 FRAME=3 FRAME=4 FRAME=5 FRAME=6 FRAME=7 FRAME=8 FRAME=9	7 bits, Odd, Stop bit 1 7 bits, Odd, Stop bit 2 7 bits, Even, Stop bit 1 7 bits, Even, Stop bit 2 8 bits, None, Stop bit 1 (*) 8 bits, None, Stop bit 2 8 bits, Odd, Stop bit 1 8 bits, Odd, Stop bit 2 8 bits, Even, Stop bit 1 8 bits, Even, Stop bit 2
Header	HEAD=a	Header character a=0; None (*) a=1; [SX] a=2; [EC]
Terminator	TERM=a	Terminator character a=0; None a=1; [EX] a=2; [EX][CR] a=3; [CR][LF] **(*)** a=4; [CR] a=5; [CR][TAB] a=6; [TAB][CR]
Command Format	CMDFORM=0 CMDFORM=1	Command+[CR] or Command+[CR][LF] (*) [Header]+Command+[Terminator]
Separator	SEPA=a	Character code a=0; None a=1; & a=2; , (Comma) (*) a=3; [FS] (1C hex) a=4; [GS] (1D hex) a=5; [SP] (20 hex)
Prefix	PREFIX=a =a,\bb	Prefix character a=0; Disable (*) a=1; Enable bb; Suffix character(Hexadecimal code (*1) bb=00**(*) [NUL]** When omitting “bb”, configured identifier will not changed.
Suffix	SUFFIX=a =a,\bb	Suffix character a=0; Disable (*) a=1; Enable bb; Suffix character(Hexadecimal code (*1) bb=00**(*) [NUL]** When omitting “bb”, configured identifier will not changed.
RS/CS control	RSCS=0 RSCS=1	Disable RTS/CTS flow control (*) Enable RTS/CTS flow control
TCP/IP arrival confirmation	TCPCS=0 TCPCS=1	Disable data arrival confirmation (*) Enable data arrival confirmation
COM Port (Sync command, Data output)	COMFROM=0 COMFROM=1 COMFROM=2	RS-232C only **(*)** LAN only RS-232C and LAN
Control Code	LABELTX=0 LABELTX=1	Pass through **(*)** Change Control code to ASCII code within [hex].
Timeout period	TXWAIT=a	Timeout period for decoded data a=1000 to 2500 [ms]; 10[ms] step 1000[ms] (*)

(*1) Refer to “7.16 Table of Character Code”

7.2 Symbologies

Term	Command	Description (*)=Default
Common	SET=#M0	Disable all symbologies
	SET=#M1	Enable all symbologies
	SYMHEAD=#a =#a,\bb	Header character for all symbologies a=0; Disable (*) a=1; Enable bb; Identifying character (Hexadecimal code (*1)) When omitting “bb”, configured identifier will not changed.
	SYMFOOT=#a =#a,\bb	Footer character for all symbologies a=0; Disable **(*)**, a=1; Enable、 bb; Identifying character (Hexadecimal code (*1)) When omitting “bb”, configured identifier will not changed.
	GS1GS=a =a,\bb	Convert characters which indicate the data delimiter of GS1 related symbols(FNC1) a=0; Not convert, a=1; convert**(*)**、 bb; Delimiter after conversion (Hexadecimal code (*1)) bb=1D **(*) [GS]** When omitting “bb”, configured identifier will not changed.
	GS1AI=a	Set the output method of GS1 AI (AI: application identifier) a=0; Output GS1 AI as is (*) a=1; Output GS1 AI enclosed in brackets
Multi-Labels	LABELS=a	Number of labels a=1 to 10; a=1(*)
	OUTFORM=0 OUTFORM=1 OUTFORM=2 OUTFORM=3	Output in the order of decoding (*) Output in the order of the specified digit-number Output in the order of the specified characters Output in the order of the specified symbologies
	SET=$Na-b	Set label number and verification digit number a=1 to 10; Label number b=0 to 9999; Digit number
	SET=$Ca-bbcc	Set label number and verification character a=1 to 10; Label number bb; The first character in Hexadecimal cc; The second character inHexadecimal (Hexadecimal code (*1))
	SET=$Sa-b	Set label number and verification symbologies a=1 to 0; Label number b; Symbol identifier

(*1) Refer to “7.16 Table of Character Code”

Term	Command	Description (*)=Default
DataMatrix	SET=dM0	Disable DataMatrix
	SET=dM1	Enable only for square shaped and normal DataMatrix
	SET=dM2	Enable only for square shaped and inverse DataMatrix
	SET=dM3	Enable only for square shaped and normal/inverse DataMatrix
	SET=dM5	Enable only for square/rectangle shaped and normal DataMatrix
	SET=dM6	Enable only for square/rectangle shaped and inverse DataMatrix
	SET=dM7	Enable all types of DataMatrix (*)
	DIGIT=db,c	Set minimum (b) and maximum (c) digit numbers of DataMatrix
	EDIT=db,c	Output DataMatrix data within a range of b-digits to c-digits
	SYMHEAD=da =da,\bb	Set header character of DataMatrix a=0; Disable (*) a=1; Enable bb; Delimiter (Hexadecimal code (*1)) bb=64 **(*) character"d"** When omitting "bb", configured identifier will not changed.
	SYMFOOT=da =da,\bb	Set footer character of DataMatrix a=0; Disable (*) a=1; Enable bb; Delimiter (Hexadecimal code (*1)) bb=64 (*) character"d" When omitting "bb", configured identifier will not changed.
QR-Code	SET=QM0	Disable QR-Code & MicroQR **(*)**
	SET=QM1	Enable only for normal QR-Code & MicroQR
	SET=QM2	Enable only for inverse QR-Code & MicroQR
	SET=QM3	Enable QR-Code & MicroQR (normal/inverse)
	SET=QM4	Enable only for normal QR-Code
	SET=QM5	Enable only for inverse QR-Code
	SET=QM6	Enable QR-Code (normal/inverse)
	SET=QM7	Enable only for normal MicroQR
	SET=QM8	Enable only for inverse MicroQR
	SET=QM9	Enable MicroQR (normal/inverse)
	DIGIT=Qb,c	Set minimum (b) and maximum (c) digit numbers of QR-Code
	EDIT=Qb,c	Output QR-Code data within a range of b-digits to c-digits
	SYMHEAD=Qa =Qa,\bb	Set header character of QR-Code a=0; Disable (*) a=1; Enable bb; Delimiter (Hexadecimal code (*1)) bb=51**(*) character"Q"** When omitting "bb", configured identifier will not changed.
	SYMFOOT=Qa =Qa,\bb	Set footer character of QR-Code a=0; Disable (*) a=1; Enable bb; Delimiter (Hexadecimal code (*1)) bb=51(*) character"Q" When omitting "bb", configured identifier will not changed.

(*1) Refer to "7.16 Table of Character Code"

7.3 Symbol Reading (Operating mode, adjustment and diagnostic)

Term	Command	Description (*)=Default
Reading	g BR=a DECODELIM=a	Start reading (SYNC ON) † The default setting is valid only RS-232C interface No read message a=0 None, a=1 "BR"**(*),** a=2 "ERROR", a=3 "?" Set the time limit for decoding process a=100 to 10000 [ms], 10[ms] step a=1000 [ms]**(*)**
Operation Mode	SYNCMODE=a VOUT=a TOTALLIM=a	a=0; Normal Mode a=1; Reading Timeout Mode (*) a=2; External Trigger Mode Output timing a=0,1 (0: After decoding (*), 1: After SYNC off) Decode timeout、a=XXXX [ms],10[ms]step, Default: 3000[ms] **(*)**
Continuous Reading Mode	continue stop contintvl=a ?contintvl	Enable Continuous Reading Mode Stop Continuous Reading Mode (back to Normal Mode) (*) Set a time interval of reading a= 0 to 9 [Unit: s] a=1 [s] (*) a=10 to 999 [Unit: ms] Check the value of contintvl
Test Mode	TEST=a TMN=a	a=0; Normal Mode **(*),** a=1; Test Mode Number of reading times in Test Mode a=10 **(*)** -1000 (10 steps)
I/O Test	IOTEST=a,b	Turn on I/O output during specified time a=D1 ;DOUT1 port D2 ;DOUT2 port D3 ;DOUT3 port b=0 OFF**(*)** **(Output OFF in any port)** 1 to 1000 Turn on during specified time [ms]、 -1 Remain ON
Reading Statistics	?total	Check number of times for SYNC, Good Read, No Read from Power-on reset
	clrtotal	Clear the value of number of times
Display Reading Time	?dect	Check decoding time of Good Read, No Read (Minimum, maximum and average)
	clrdect	Clear the value of decoding time
Warning Information	CHKBCR=a (,b)	a=0; Disable addition for RS232C (*) a=1; Enable addition for RS232C b=0; Disable addition for LAN (*) b=1; Enable addition for LAN Omit (,b): Set RS-232C and LAN in the same way (=a)
Symbology Information	SYMBOLTX=a	a=0; Disable addition of SYMBOLTX (*) a=1; Enable addition of SYMBOLTX
Decoding time	DTTX=a (,b)	a=0; Disable addition of DTTX for RS-232C**(*)** a=1; Enable addition of DTTX for RS-232C b=0; Disable addition of DTTX for LAN**(*)** b=1; Enable addition of DTTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a)

Term	Command	Description (*)=Default
Total time of decoding	TTTX=a (,b)	a=0; Disable addition of TTTX for RS-232C(*) a=1; Enable addition of TTTX for RS-232C b=0; Disable addition of TTTX for LAN(*) b=1; Enable Disable addition of TTTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a)
Swing Value	AGCTX=a (,b)	a=0; Disable addition of AGCTX for RS-232C(*) a=1; Enable addition of AGCTX for RS-232C b=0; Disable addition of AGCTX for LAN(*) b=1; Enable addition of AGCTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a) Imaging condition: The value of shutter speed and analog gain settings
Table Number	TBLTX=a (,b)	a=0; Disable addition for RS232C (*) a=1; Enable addition for RS232C b=0; Disable addition for LAN (*) b=1; Enable addition for LAN Omit (,b): Set RS-232C and LAN in the same way (=a)
Individual name	MYNAME=a	Set individual name (31 characters or less) **(*)** My Reader
Add individual name to output data	NAMETX=a (,b)	a=0; Disable addition of NAMETX for RS-232C **(*)** a=1; Enableaddition of NAMETX for RS-232C b=0; Disable addition of NAMETX for LAN **(*)** b=1; Enable addition of NAMETX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a)
Contrast Information	CONTTX=a (,b)	a=0; Disable addition of CONTTX for RS-232C(**(*)** a=1; Enableaddition of CONTTX for RS-232C b=0; Disable addition of CONTTX for LAN **(*)** b=1; Enableaddition of CONTTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a)
	CSX=aaa	X-coordinate point of caluculation (Origin) a=0 to 1270 a=0 (*)
	CSY=aaa	Y-coordinate point of caluculation (Origin) a=0 to 950 a=0(*)
	CWX=aaa	X-coordinate point of caluculation (Width) a=10 to 1280 a=1280(*)
	CWY=aaa	Y-coordinate point of caluculation (Width) a=10 to 960 a=960(*)
Quality Information	QTTX=a	a=0; Disable addition of QTTX (*) a=1; Enable addition of QTTX
Mirrored Image Information	MRTX=a (,b)	a=0; Disable addition of MRTX for RS-232C (*) a=1; Enable addition of MRTX for RS-232C b=0; Disable addition of MRTX for LAN b=1; Enable addition of MRTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a) If it is a mirrored image, add MIRROR_ON If it is not a mir rored image, add MIRROR_OFF

Term	Command	Description (*)=Default
Symbol Position Information	XYTX=a (,b)	a=0; Disable output coordinate data to RS-232C (*) a=1 to 3; Enable output coordinate data to RS-232C b=0; ; Disable output coordinate data to LAN (*) b=1 to 3; Enable output coordinate data to LAN Omit (,b): Set RS-232C and LAN in the same way (=a) a=1; Barycentric coordinates a=2; Rectangular coordinates a=3; Barycentric and Rectangular coordinates
Delay Time	DELAY=a	Delay time between SYNC input and start capturing a=0 to 30000 [ms], 10ms step a=0 [ms] (*)
Cycle Buffer Function	MAXIMG=a	Number of captured images a=1 to 16 a=1 (*)
	WAITIMG=a	Capture interval of time when MAXIMG is greater than 1 a=10 to 1000 [ms] 1ms steps a=10 [ms] (*)
BCC	BCCTX=a(,b)	a=0; Disable addition o BCCTX for RS-232C (*) a=1 to 3; Enable addition of BCCTX for RS-232C b=0; Disable addition of BCCTX for LAN b=1 to 3; Enable addition of BCCTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a) a=1;LRC(BCC) a=2;SUM128 a=3;CRC16
Output data length	LENTX=a(,b)	a=0; Disable addition o LENTX for RS-232C (*) a=1 to 2; Enable addition of LENTX for RS-232C b=0; Disable addition of LENTX for LAN b=1 to 2; Enable addition of LENTX for LAN Omit (,b): Set RS-232C and LAN in the same way (=a) a=1;4digits a=2;5digits

7.4 Auto-Tuning

Term	Command	Description (*)=Default
Auto-Tuning	*setup	Start Auto-tuning
Cancel	*cancel	Cancel the running Auto-tuning
Auto-Tuning Status	*?state	Get status the running Auto-tuning STANDBY Reading standby RECEIVDED Auto-tuning SAVEWAIT(a) Waiting data save † (None) Reading † (a) is the number of tuning results that can be saved. (a:1-3)
Save Tuning Result (Table Mode)	*save	Save the tuning result to table 1 to 3
Save Tuning Result (Manual Mode)	*save2	Save the tuning result to the specified table 0

Save Tuning Result (Specify)	*save3=a,b	Save number of b tuning results from table a.
		a=1-8;
		b=1-3;

7.5 Camera Control (1) (for Fixed Gain and Automatic Gain Control Mode)

Term	Command	Description (*)=Default
Camera Control Mode	AGC=D AGC=T	Set in fixed Set in Fixed Gain Mode **(*)** Set in Automatic Gain Control Mode
Capture area	CAPMODE= Left, Top, Width, Height	Capture area Left 0 to 1275 0 **(*)** Top 0 to 955 0 **(*)** Width 4 to 1280 1280 **(*)** Height 4 to 960 960 **(*)**
Decode area	DECMODE= Mode, Left, Top, Width, Height	Decode area Mode 0: Not link with capture area **(*)** 1: Link with capture area Left 0 to 1215 0 **(*)** Top 0 to 959 0 **(*)** Width 64 to 1280 1280 **(*)** Height 1 to 960 960 **(*)**
Illumination Control	LIGHT=a	Set ON/OFF of illumination output a=2; Internal illumination OFF [Fixed] a=3; Internal illumination ON [Fixed](At imaging) **(*)** a=4; External illumination ON (At imaging) a=5; External illumination ON(Always) a=6; External illumination ON(During attempting to read: SYNCMODE=for 1 or 2) a=7; Interenal and External illumination ON (at imaging) a=8; For test † DO NOT USE a=9; Interenal and External illumination ON(During attempting to read) a=10; For test † DO NOT USE a=11; Internal illumination ON (During attempting to read)
Internal Illumination	CAMled= a,b,c,d,e	Set the type of internal illumination source a: Internal illumination TOP b: Internal illumination LEFT c: Internal illumination RIGHT d : Internal illumination BOTTOM e: Internal illumination CENTER Setting of a to e = 0: Illumination OFF1: Illumination ON a,b,c,d,e = 1,1,1,1,1 **(*)**
Illumination Intensity	CAMbrightness= a,b,c,d,e	Set the brightness of internal illumination source a: Internal illumination TOP b: Internal illumination LEFT c: Internal illuminatio RIGHT d: I nternal illumination BOTTOM e: Internal illumination CENTER Setting of a to e = 0 (Illumination OFF) to 100 (Brightest) a,b,c,d,e = 80,80,80,80,80 **(*)**
Shutter Speed	SHUTT=a	a=: 0 to 8 0: 1/60 [sec] 1: 1/125 2: 1/250 **(*)**、 3: 1/500 4: 1/1000 5: 1/2000 6: 1/4000 7: 1/6000 8: 1/8000 9: 1/10000
Analog Gain	GCV=a	a=1 (Dark) to 4 (Bright) a=3 **(*)**
Digital Gain	CAMexgain=a	a=1 (Dark) to 15(Bright) a=1 **(*)**
Black Level adjustment	CAMblack=a	This is a parameter for test. Set it 0 always. a=0 **(*)**

Term	Command	Description (*)=Default
Image Preprocessing	IPFUNC0= a,b,c,d,e	Set the type of preprocessing to captured images a,b,c,d,e : Preprocessing commands(Described later) a,b,c,d,e =0,0,0,0,0 **(*)** Up to 5 stage of function can be set by CSV
Mirrored image	MIRROR=a	a=0; Read only normal type (not mirrored) (*) a=1; Read only mirrored type a=2; Read normal type and mirrored type
Thinning captures	SKIPCAP=a	Thinning process of captures a = 0 Disable thinning captures**(*)** a = 1 Enable thinning captures (no interpolating) a = 2 Enable thinning captures (with interpolating)
Image rotation	ROTATE=a	Enable/disable image rotating (180a) at capturing images a=0 : Disable rotating **(*)** a=1 : Enable rotating

7.6 Camera Control (2) (for Table Mode 1)

Term	Command	Description (*)=Default
Camera COntrol Mode	AGC=D AGC=T	Set in Table Mode **(*)** Use the camera setting in Table Mode
Number of Tables	ENABLEDDMTBL=a	a : 0 to 8 a=8 **(*)** In case of a=3, Table #1, #2, #3 are enabled and Table #4 through $8 are disabled. In case of a=1, Table #1 is enabled. The shutter speed, digital gain, and setting of the illumination are fixed to one and it operates equivalent to the AGC = D.
Editing Table number	EDITDDMTBL=a	Edit a table with specified number. a : 0 to 8 a=0 **(*)** e.g.) To set the DDMwindow of table #3 to (1,1), enter the following command. EDITDDMTBL=3 DDMwindow=1,1 Subsequently, to set the DDMshutt to 5, enter the following command. DDMshutt=5 To change the table to edit to #4, enter the following command. EDITDDMTBL=4
Copy Table settings	CPDDMTBL=a,b or a,b-c	The settings of Table #a are copied to Table #b. The settings of Table #a are copied from Table #b through Table #c.
Operation of Table Mode	STARTDDMTBL1=a	Specify the operation of Table Mode a = 0; Start reading from the table number that decoded last. If the decode failed, start reading from the next table number. **(*)** a = 1; Start reading always from Table #1

7.7 Camera Control (3) (for table Mode 2)

Term	Command	Description (*)=Default
Capturing area	DDMcapmode= Left, Top, Width, Height	Specify capturing area of the table Left 0 to 1275 0 **(*)** Top 0 to 955 0 **(*)** Width 4 to 1280 1280 **(*)** Height 4 to 960 960 **(*)**
Illumination Control	DDMlight=a	Set ON/OFF of illumination output a=2; Internal illumination OFF [Fixed] a=3; Internal illumination ON [Fixed](At imaging) (*) a=4; External illumination ON (At imaging) a=5; External illumination ON(Always) a=6; External illumination ON(During attempting to read: SYNCMODE=for 1 or 2) a=7; Interenal and External illumination ON (at imaging) a=8; For test † DO NOT USE a=9; Interenal and External illumination ON(During attempting to read) a=10; For test † DO NOT USE a=11; Internal illumination ON (During attempting to read)
Internal Illumination	DDMled= a,b,c,d,e	Set the type of internal illumination source Set the type of internal illumination source a: Internal illumination TOP b: Internal illumination LEFT c: Internal illumination RIGHT d : Internal illumination BOTTOM e: Internal illumination CENTER Setting of a to e = 0: Illumination OFF1: Illumination ON a,b,c,d,e = 1,1,1,1,1 (*)
Internal Illumination Brightness	DDMbrightness= a,b,c,d,e	Set the brightness of internal illumination source a: Internal illumination TOP b: Internal illumination LEFT c: Internal illumination RIGHT d : Internal illumination BOTTOM e: Internal illumination CENTERSetting of a to e = 0 (OFF) to 100 (Brightest) a,b,c,d,e = 80,80,80,80,80 **(*)**
Shutter Speed	DDMshutt=a	Set the shutter speed of the Table a : 0 to 8 a= 0; 1/60 [sec] 1; 1/125 2; 1/250 (*) 3; 1/500 4; 1/1000 5; 1/2000 6; 1/4000 7; 1/6000 8; 1/8000 9: 1/10000
Analg Gain	DDMgain=a	Set the Analog gain of the table a= 1 (Dark) to 4 (Bright) a=3 **(*)**
Digital Gain	DDMexgain=a	Set the Analog gain of the table a= 1 (Dark) to 15 (Bright) a=1 **(*)**
Black Level adjustment	DDMblack=a	This is a parameter for test. Set it 0 always. a=0 **(*)**
Image Preprocessing	DDMpreproc= a,b,c,d,e	Set the type of preprocessing a,b,c,d,e : Command for Preprocessing (Described later) a,b,c,d,e =0,0,0,0,0 **(*)** Up to 5 stage of function can be set by CSV
Mirrored image	DDMmirror=a	Set the mirrored image of Table. a=0; Read only normal type (not mirrored) (*) a=1; Read only mirrored type a=2; Read normal type and if it fails, try to read it as mirrored type

† The default value is same in Table 0 to 8.

7.8 Image Preprocessing

Term	Command	Description (*)=Default
None	0	No Image Preprocessing
Black Erosion	1	Erosion 2x2
	3	Erosion 3x3
	5	Erosion 5x5
	7	Erosion 2x1 (w)
	9	Erosion 1x2 (h)
White Dilation	2	Dilation 2x2
	4	Dilation 3x3
	6	Dilation 5x5
	8	Dilation 2x1 (w)
	10	Dilation 1x2 (h)
Reverse	20	White & Black Reverse
Contrast Enhancement	21	Cont(L12cut) : Trancates the 12% of dark side
	22	Cont(L22cut): Tranvulates the 25% of dark side
	23	Cont(H23cut): Rounds up the 12% of bright side
	24	Cont(H24cut): Rounds up the 25% of bright side
	25	Cont(LH12cut): Tranculates the 12% of dark side and rounds up the 12% of bright side
	26	Cont(LH22cut): Tranculate the 25% of dark side and rounds up the 25% of bright side
Gamma Correction	27	Gamma(r=0.5) Perform a Gamma Correction (0.5)
Smoothing Filter	40	Low pass 3x3 Smoothing Filter Average value
Median Filter	41	Median filter 3x3 Median value
Down Size	70	Down Size (Quick) Reduction of the whole image (speed priority)
Down Size	71	Down Size (Average) Reduction of the whole image (luminance average)

7.9 Preset Mode

Term	Command	Description (*)=Default
Presert	?pre	Get the status of Preset Mode settings
	PREM=0	Preset Mode 0: Disable Preset Mode (*)
	PREM=1	Enable Preset Mode 1 Preset data is the first decoded one after power up
	PREM=2	Enable Preset Mode 2 Preset data is registered in advance
	SET=PRENa	Set the number of digits for comparing a=0 to 100 a=0; No count
	clrpren	Initialize number of digits (No count)
	SET=PREDa	Set the preset data
	clrpred	Initialize preset data

7.10 PLC Link

Term	Command	Description (*)=Default
IP address and port number of Destination PLC	IPPLC=xxx.xxx.xxx.xxx: nnnn	Set the IP address and port number of Destination PLC 192.168.0.10: 9600 **(*)**
PLC Link Start/Exit	PLCMODE=a	Start/Stop PLC Link function a=0; Exit PLC link mode **(*)** a=1; Mitsubishi MELSEC Q/L SeriesUDP MC protocol QnA compatible 3E frame(binary code) a=2; Mitsubishi MELSEC Q/L Series 232C MC protocol QnA compatible 3C frame(ASCII code) a=3; OMRON SYSMAC series UDP FINS command a=4; OMRON SYSMAC series 232C C mode command a=5; Mitsubishi MELSEC FX series UDP MC protocol A compatible1E frame(binary code) a=6; Mitsubishi MELSEC FX series 232C MC protocol A compatibleC frame(ASCII code) a=7; KV series UDP KV command mode a=8; KEYENCE KV series 232C KV command mode
Initial address	PLCDTA=a	Set the initial address a=0-32767 0**(*)**
Padding character	PLCPAD=a	Set the padding character to add when the captured data digits is odd a=0 (NULL[0x00]) **(*)** a=1(blank [0x20])
SYNC IN by trigger area	PLCTRIG=a	Set the presence or absence of SYNC IN by PLC using trigger area a=0 Enable the SYNC IN by trigger area **(*)** a=1 Unable the SYNC IN by trigger area
Trigger area Moniroting time	PLCINTVL=a	Set the time interval from the monitoring completion of the trigger area until the start of next monitoring a=10 to 500 ; [Unit: ms] 10**(*)**
Wait time of Trigger area monitoring time	PLCTIM=a	Set the time interval until the start of monitoring after the trigger area monitoring is enabled. a=5 to 20 ; [Unit: s] 10**(*)**
Endian	PLCMCEND=a	Set the endian when PLCMODE=1 is set a=0 Little endian**(*)** a=1Big endian
Satus transmission	?PLC	Status transmission (Settings for PLC link mode)

7.11 Configuration Reference

Term	Command	Description (*)=Default
Configuration Reference	?	Status transmission (First page)
	?2	Status transmission (Second page)
	??	Status transmission (Second page) † Old model-compatible command
	?3	Status transmission (Third page)
	???	Status transmission (Third page) † Old model-compatible command
	?4	Status transmission (Fourth page)
	?5	Status transmission (Fifth page)
	?6	Status transmission (Sixth page)
	?IMG	Status transmission (Settings for image output and image storage)
	?ddmtbl	Status transmission (Settings for Table mode)

7.12 Image Output and Image Storage

Term	Command	Description (*)=Default
Output target of image	MODE=a	Set the image transfer after reading a=0 : Disable **(*)** a=1-2: For test NO NOT USE a=3 : Binary output of NG/OK (Continuous transfer) a=4 : Binary output of NG (Continuous transfer) a=5 : Binary output of OK (Continuous transfer)
Output image size	GOUTSIZE=a	Set the output image size at continuous transfer a=0 to 3 0 : 1280x960 **(*)** 1 : 640x480 2 : 320x240 3 : 160x120
Image selection	IMGSEL=a	Select save image/transfer image a=0 to1 0 : Captiured image 1 : Decoded image **(*)**
	IMGFRAME=a,b	Select save image/transfer image a=0 to 1, b=0 to 16 a=0: Cycle buffer memory a=1:Table mode b=0: Last decoded image b=1 to 16: Image of specified cycle buffer memory / table mode
Trimming	IMODE=a	a=0; Disable (*) a=1; Enable
Trimming position		Set the area to trim
	PX=aaa	Trimming start position (X coordinate) aaa=0-1269 aaa=0 **(*)**
	PY=aaa	Trimming start position (Y coordinate) aaa=0-949 aaa=0 **(*)**
	WX=aaa	Trimming width (X direction) aaa=10-1280 aaa=1280 **(*)**
	WY=aaa	Trimming height (Y direction) aa=10-960 aaa=960 **(*)**

7.13 LAN Settings

Term	Command	Description (*)=Default
LAN Settings	SET=LAN	Set to default for all LAN settings
	?LAN	Get the list of settings for LAN connection
	IPADR=aaa.bbb.ccc.ddd/ee	Set IP address and subnet mask 192.168.209.10/24 **(*)**
	IPPORT=aaaaa	Set Port number (Only for reading result transmission) aaaaa=1-65535, aaaaa=27110 **(*)**
	IPPORT2=aaaaa	Set Port number (Only for image data transmission) aaaaa=1-65535, aaaaa=27110 **(*)**
	GWADR =aaa.bbb.ccc.ddd	Set the default gateway 192.168.209.254 **(*)**
	IPBAR=xxx.xxx.xxx.xxx: nnnn	IP address of reading result destination: port number 0.0.0.0: 27120 **(*)**
	IPIMG=xxx.xxx.xxx.xxx: nnnn	IP address of image data destination: port number 0.0.0.0: 27130 **(*)**
	RTIME=aaa	Conection request interval (sec) aaa=0 to100, aaa=0 **(*)**
	STOUT=bbb	Session interval time (sec) bbb=0 to100, bbb=0 **(*)**
	?who	Get the status for LAN settings
	?netstat ?netstat IPBAR ?netstat IPIMG	Get the status for TCP/IP connection Get the status for TCP client connection (reading result destination) Get the status for TCP client connection (image data destination)
	?version	Get the model name and firmware version
	discon aaaaa	Disconnect the specified TCP/IP connection forcibly aaaaa : TCP server connection (port number: decimal) IPBAR : TCP client connection (reading result destination) IPIMG : TCP client connection (image data destination)

7.14 Symbol Printing Check

Term	Command	Description (*)=Default
Printing check output	PQTX=a,b	Set the printing check output a= 1: Output the printing check to RS-232C 0: Do not output the printing check to RS-232C **(*)** b= 1: Output the printing check to LAN 0: Do not output the printing check to LAN **(*)** † A=B if b is omitted.
Items of 2-D Codes check output	PQTYPE2D=a	Set the tems of 2-D Codes check output a= 1: Output the overall quality for 2-D codes ISO **(*)** 2: Output the overall quality for 2-D codes AIM 3: Output all the detailed quality for the 2-D codes ISO 4: Output all the detailed quality for the 2-D codes AIM
Select an element of comprehensive quality confirmation item for 2-D codes	PQITEM2D=a,b,c,・・	Set the item of comprehensive qualityfor symbols a,b,c... : describes all the required items in CSV. It is output as 0 and ignores the other items if it contains 0. 0: Comprehensive judgment (The value of the item of the lowest grade in 1 to 7) **(*)** 1: Contrast (ISO) / Cell contrast (AIM) 2: Modulation (ISO) / Cell modulation (AIM) 3: Fixed pattern defect 4: Decode 5: Non-uniformity of axis 6: Non-uniformity of grids 7: Unused error correction
Outputs OK (GOOUT) or NG (NGOUT) depending on the checking result	PQOKTH=a	Outputs OK (GOOUT) or NG (NGOUT) depending on the result of Symbol Printing Check. a: 0**(*)**, 1, 2, 3, 4 Threshould value to determine if the comprehensive judgement is OK (GOOUT) or NG (NGOUT). If the value is 0, the judgement is not performed. Setting value is more than a → OK Less than a → NG † This is available only when the setting value of the item PQTX is PTQX = 1 ,? or PTQX = ?, 1

† Symbol printing check is an optional function. (Only for -V type)

7.15 General Operation

Term	Command	Description (*)=Default
Initialization	SET=DFT	Reset to factory default
Save	WSETS	Save settings to internal flash memory
Buzzer	buz=a	a=0; Buzzer OFF, a=1; Buzzer ON **(*)**
Digital I/O	CHATT=a	Debouncing time a=0; None (*) a=1; 10ms a=2; 20ms
	GOOUT=a	a=0; GO output is holded until next SYNC input a=100 to 20000; GO output time [Unit: ms] a=300 (*)
	NGOUT=a	a=0; NG output is holded until next SYNC input a=100 to 20000; NG output time [Unit: ms] a=300 (*)
Digital I/O signal assignment	DOUT1=a	Assign the signal to output to DOUT1 a=0; Disable a=1; GO (Good read) **(*)** a=2; NG (No read) a=3; Ready a=4; Busy1
	DOUT2=a	Assign the signal to output to DOUT2 a=0; Disable a=1; GO(Good Read) a=2; NG(No Read) (*) a=3; Ready a=4; Busy1
	DOUT3=a	Assign the signal to output to DOUT3 a=0; Disable a=1; GO(Good Read) a=2; NG(No Read) (*) a=3; Ready**(*)** a=4; Busy1

7.16 Table of Character Code

Upper 4bits

Lower 4bits	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	DLE	SP	0	@	P	`	p				ー	タ	ミ		
1	SOH	DC1	!	1	A	Q	a	q			。	ア	チ	ム		
2	STX	DC2	”	2	B	R	b	r			「	イ	ツ	メ		
3	ETX	DC3	#	3	C	S	c	s			」	ウ	テ	モ		
4	EOT	DC4	$	4	D	T	d	t			、	エ	ト	ヤ		
5	ENQ	NAK	%	5	E	U	e	u			・	オ	ナ	ユ		
6	ACK	SYN	&	6	F	V	f	v			ヲ	カ	ニ	ヨ		
7	BEL	ETB	’	7	G	W	g	w			ァ	キ	ヌ	ラ		
8	BS	CAN	(	8	H	X	h	x			ィ	ク	ネ	リ		
9	HT	EM	)	9	I	Y	i	y			ゥ	ケ	ノ	ル		
A	LF	SUB	*	:	J	Z	j	z			ェ	コ	ハ	レ		
B	VT	ESC	+	;	K	[	k	{			ォ	サ	ヒ	ロ		
C	FF	FS	,	<	L	¥	l	|			ャ	シ	フ	ワ		
D	CR	GS	−	=	M	]	m	}			ュ	ス	ヘ	ン		
E	SO	RS	.	>	N	^	n	―			ョ	セ	ホ	゛		
F	SI	US	/	?	O	_	o	DEL			ッ	ソ	マ	゜		

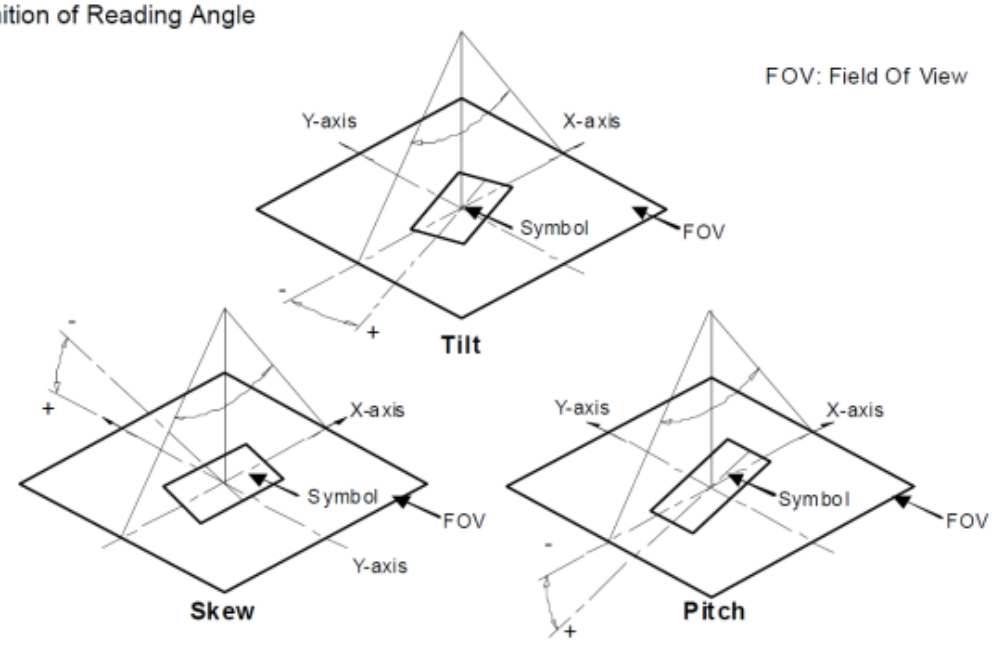
20120514b

8 Specifications

8.1 Specifications

Supported Symbols		2-D Codes Data Matrix (ECC200), QR Code
Reading Angle		PITCH: ± 35° SKEW: ± 35° TILT: 360°
Image Sensor		1/3 inches CMOS monochrome
Effective Pixels		1280 (X) × 960 (Y) (approx 1.2 million pixels)
Internal Illumination Source		White LED
Power rating	Power-supply voltage	DC24V+/-10%
	Consumption current	Command (SYNC) standby : approx. 140mA During reading operation : approx. 400mA
Digital Input		Photo-coupler isolation × 1 Input resisutance: 1kp OFF voltage: 0V to 0.8V, ON voltage : 6V to 28V
Digital output		Photo-coupler isolation × 4 Maximum rating DC30V 50mA
Interface	For host connection	Ethernet (10Base-T,100Base-TX,1000Base-T)
		RS-232C (1200bps to 115.2kbps)
Data format		ASCII
Environmental tolerance	Operating temperature	0℃ to +40℃
	Operating humidity	35%R.H. to 85%R.H. (non condensing)
	Storage temperature	-20℃ to +65℃
	Storage humidity	35%R.H. to 85%R.H. (non condensing)
	Vibration tolerance	10Hz to 55Hz amplitude 1.5mm (total width) / X,Y,Z 2hours for every direction
	Protective structure	IP65 (IEC)
External dimensions [mm]		Regular type : 70(H) × 55(W) × 35(D) Long range type : 70(H) × 55(W) × 50.5(D)
Mass		Approx. 200g

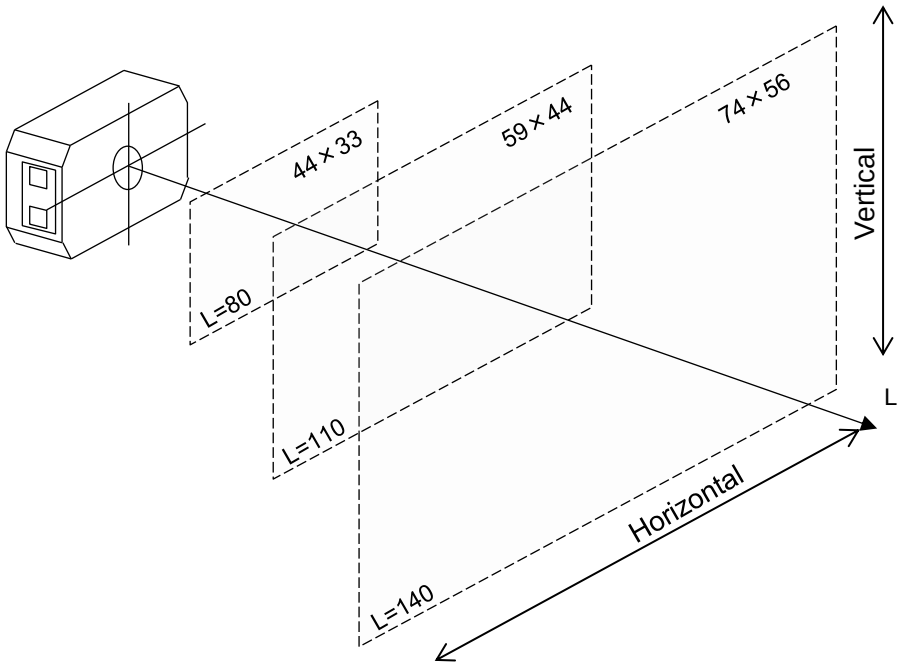
Definition of Reading Angle



8.2 Reading Specifications

8.2.1 Field of View (Regular Type)

Reference of distance: Centering around the reading window (Surface)



Unit: mm

Distance L	70	80	90	100	110	120	130	140	150
Hosizontal	38	44	49	54	59	64	69	74	79
Vertical	29	33	36	40	44	48	52	56	60

8.2.2 Reading Range (Regular type)

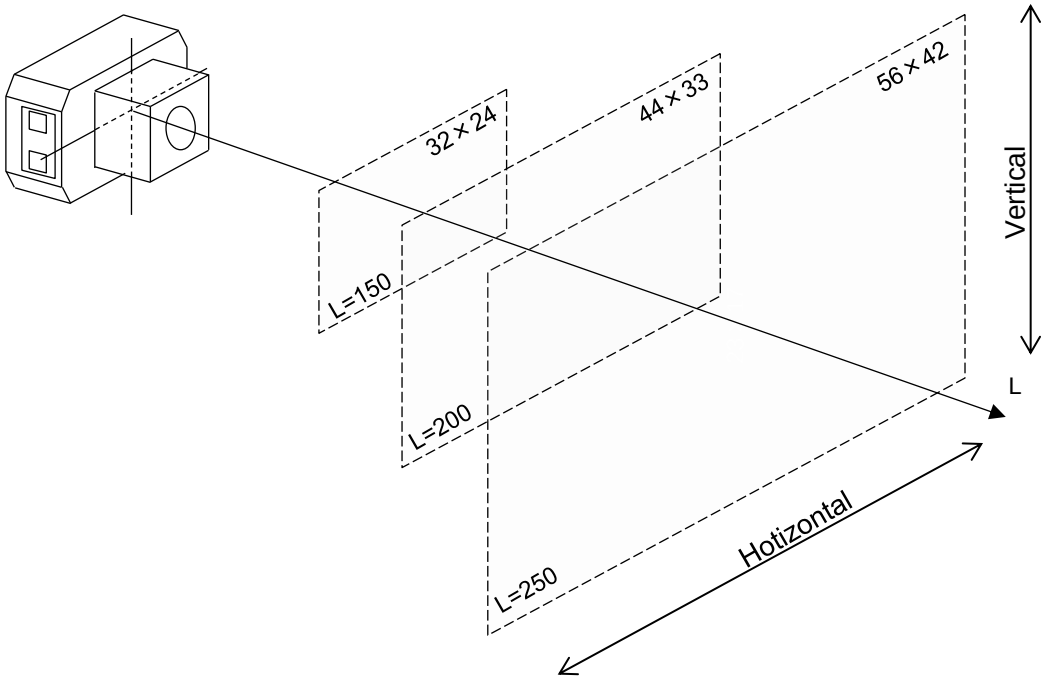
Code	Cell Size	Proximal	Distal
Data Matrix	0.167	85	125
	0.25	70	150
QR Code	0.167	85	125
	0.25	70	150

Unit: mm

† Cell size 0.25 mm or bigger is recommended at the use of Symbol Printing Check.

8.2.3 Field of view (Long range type)

Reference of distance: Center of Front cover



Unit: mm

Distance L	150	160	170	180	190	200	210	220	230	240	250
Hosizontal	32	35	37	39	42	44	47	49	51	54	56
Vertical	24	26	28	29	31	33	35	37	38	40	42

8.2.4 Reading Range (Long Range Type)

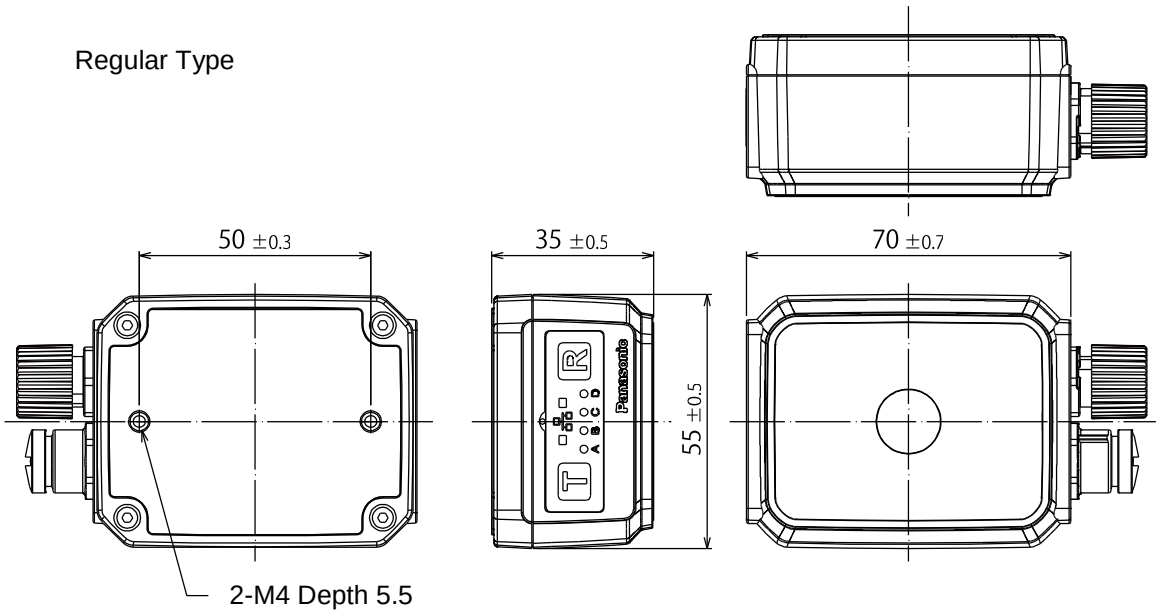
Code	Cell Size	Proximal	Distal
Data Matrix	0.167	185	220
	0.25	175	230
QR Code	0.167	190	215
	0.25	180	225

Unit: mm

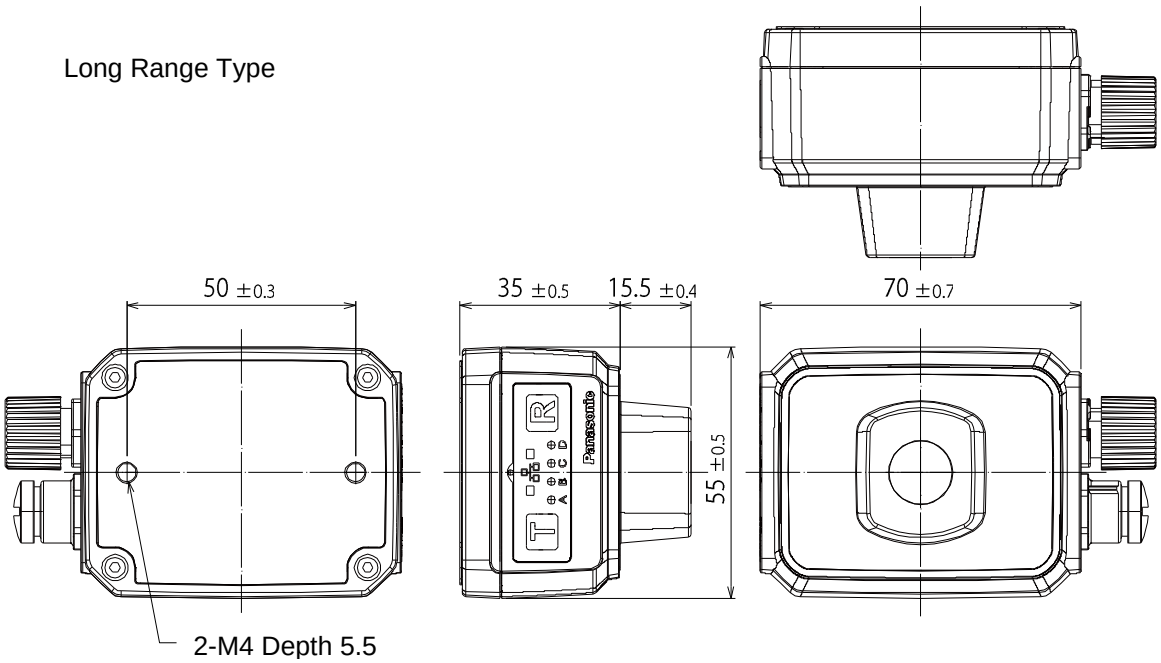
† Cell size 0.25 mm or bigger is recommended at the use of Symbol Printing Check.

8.3 Dimensions

Regular Type



Long Range Type



Unit: mm

Notice

Tightening torque of M4 mounting screw is for a maximum of 1.78N・m.

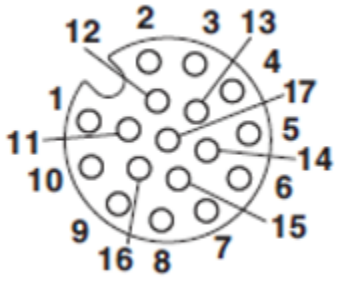
To avoid damage to the screws or screw holes, do not screw the screws more than the screw depth of the mounting holes.

8.4 Interface

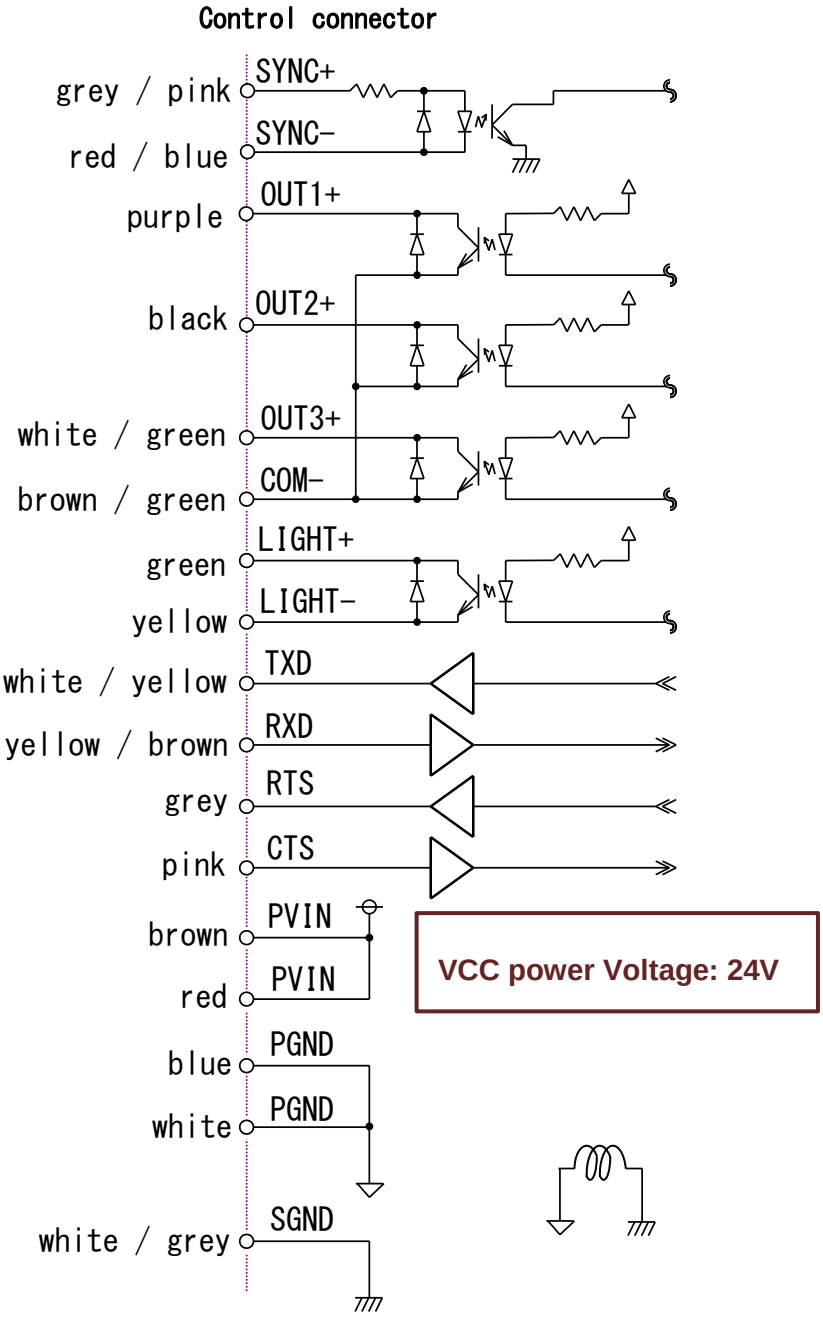
8.4.1 Control Connector

(1) Control Interface

Pin	Color	Name	Function
11	grey / pink	SYNC+	SYNC Input (+ Side of Photo coupler)
12	red / blue	SYNC-	SYNC Input (- Side of Photo coupler)
10	purple	OUT1+	Digital Output 1 (+ Side of Photo coupler)
7	black	OUT2+	Digital Output 2 (+ Side of Photo coupler)
13	white / green	OUT3+	Digital Output 3 (+ Side of Photo coupler)
14	brown / green	COM-	Digital Output COM (- Side of Photo coupler)
4	green	LIGHT+	External Illumination Timing (+ Side of Photo coupler)
6	yellow	LIGHT-	External Illumination Timing (+ Side of Photo coupler)
15	white / yellow	TXD	Transmitted Data (RS-232C, for host device)
16	yellow / brown	RXD	Received Data (RS-232C, for host device)
8	grey	RTS	Transmission Request (RS-232C, for host device)
5	pink	CTS	Transmission Permission (RS-232C, for host device)
1	brown	PVIN	+24V Power Input
9	red	PVIN	+24V Power Input
2	blue	PGND	Power Ground
3	white	PGND	Power Ground
17	white / grey	SGND	Signal Ground



(2) I/O Interface internal circuit



† Use "SGND" for RS-232C.

8.4.2 LAN Connector

LAN Interface (Ethernet) is installed on LP-ABR.

To establish a connection, use LAN cable for LP-ABR series.

- Network Form : 10BASE-T / 100BASE-TX / 1000BASE-T
- Maximum Transmission Speed : 1000M bps

9 Troubleshooting

If any problem occurs during the operation, try following methods to recover.
The host device which is the access point may cause a problem. Refer to the instruction manual of your host device.

9.1 The reader does not start up or cannot communicate with a PC.

- Is power supply voltage within the specifications?

  Power supply voltage should be DC 24V ± 10%.
  If the DC voltage is not within the specified range, the reader may not work properly and there is a possibility of damaging the reader.

- Is the LP-ABR connected with the host device properly?

  Make sure the LP-ABR is connected with the host device properly.
  In RS-232C interface, all the communication conditions, such as baud rate must be consistent.

- Is the format of serial command correct?

  Serial commands input are effective in stand-by state.
  Add a carriage return code [CR] at the end of the serial command.
  Push Enter key at the end to input the serial command by typing on Terminal software.

  Transmit the serial command “WSETS” to save the settings to internal flash memory. If the reader is turned off the power without saving settings, the reader will start up in the previous settings next time.

  An interval of 500ms between each command will avoid unwanted error during settings.

- Is the host port settings the same as the reader port settings?

  Make sure the connection and the communication settings (e.g. Baud rate, Character format, COM port number for RS232C settings).

  The reader port is set by the serial command “COMFROM”. If the port is set to RS232C (COMFROM=0), both way LAN data communication between the reader and the host would not work.

9.2 Symbol cannot be decoded

- Is the symbol-code settings correct?

  Make sure that the symbologies and the digit number are set up correctly. If the settings differ from the input symbologies, the reader would not decode the image.

- Are the reading distance and the print quality suitable?

  To ensure the reading distance from the code to the reading window must be within the specified reading distance.
  If the code is damaged or the print quality is low, it may not be decodable even if the reading depth requirements have been met.

- Is the reading window clean?

  The quality of captured image is affected by the condition of the reading window. Dust, dirt, etc. on the reading window may alter the reading performance. Clean with a lens cleaner or similar non-abrasive method.

- Is the print quality of the symbol good?

  Make sure the quality of the symbol (1D: Module width and Wide/Narrow bar width ratio, 2D: Cell size) meet the standards.

9.3 Fail to communicate through TCP/IP protocol

Fail to communicate through TCP/IP protocol due to accidental unplug/plugin of the LAN cable while the reader is in working mode.

- Retry the connection process after disconnection.

  To recover the connection, send the command “discon” through RS232C interface for forced termination, and then retry the connection.
  Refer to the section “6.6 Manage Commnunication Status”

If there is anything unclear or if you have any problems that can not be resolved by the above check, contact our sales representative.

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