Optex-FA
Multi camera Vision Sensor
MVS-OCR

MVS series:

  1. Color pattern matching

  2. Measurement

  3. OCR

(1. 2. are in another document)
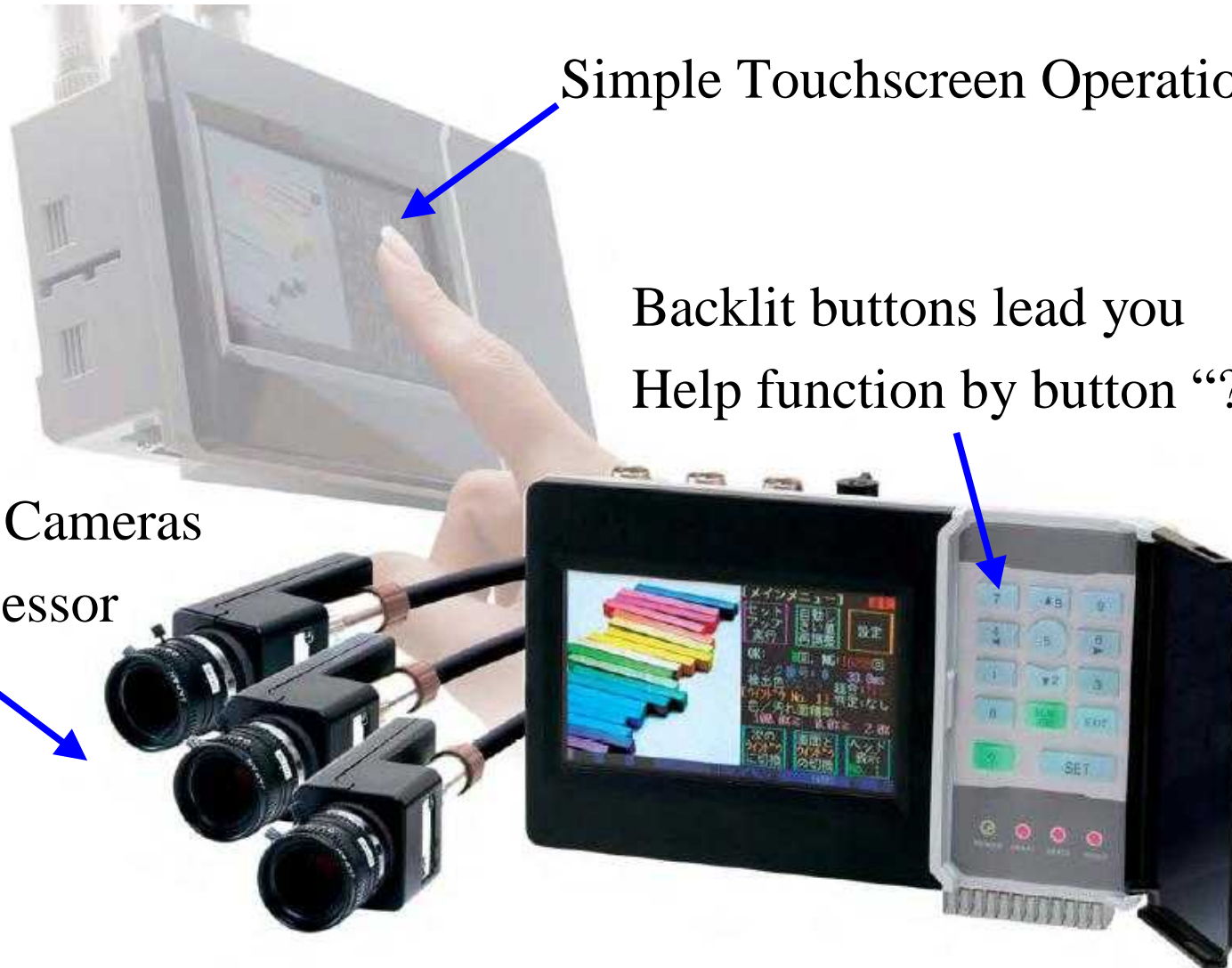
Optex-FA

Mar, 2008

Contents

Overview

Simple Touchscreen Operation

Backlit buttons lead you
Help function by button "?"

Up to three Cameras
Vision processor
built in

MVS-OCR

MVS-DN/DP

Features

1) Camera with built-in Vision Processor

- Each camera has Vision processor and memory for processing

- The processor is developed for high speed color processing dedicatedly for MVS series

2) Up to 3 Cameras per 1 Control unit

- 3 Vision processors can work simultaneously

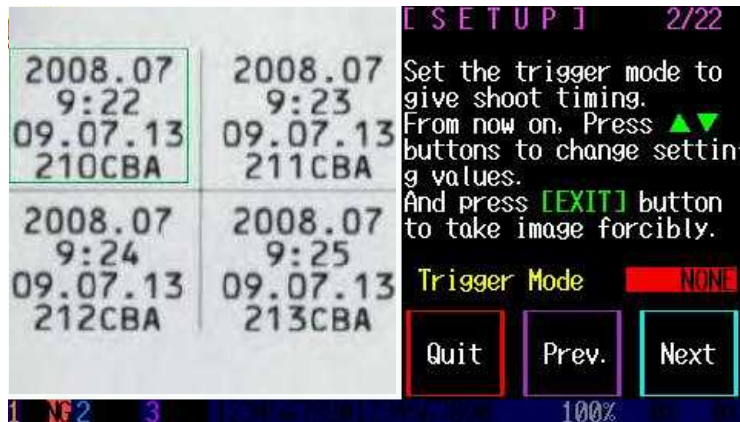- Different type of camera can be connected to one controller

High Speed

High Cost Performance

3) 3 Power source for external lightings

- 12V, Total 24W

- Controllable brightness individually (PWM)

- Set up for each Bank

4) Easy to use   (Concept : manual-less !)

- Setup menu with navigation

- Backlit buttons

- Help functions (" ? ")

- Intelligent troubleshooting

- 4.3 inches wide TFT LCD monitor with touchscreen.

- Multi-language (English/Japanese)

- Displayable 2 head images

5) High performance (Inspection)

What **MVS-OCR** can do?

Optical Character Recognition of
Alphabet, Numeric, Symbol

Standard character:	0~9 A~Z . / :
Registrable character:	! # $ % & ( ) * + - ; < = > ? @ [ ] ^ _ ` a~z ~

All the characters are correct: OK One
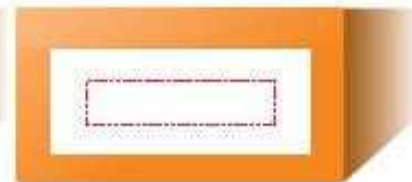character is not correct: NG

Correct print:OK 09.07.13

Wrong print:NG 08.07.13

Lack:NG 09.0 .13

No print:NG

5) High performance (Inspection)

What **MVS-OCR** can do?

Changeable error level

Correct print :OK

Shelf life 0 9 . 0 7 . 1 3   OPEN ▶

Slight lack:OK

Shelf life 0 9 . 0 [7] . 1 3   OPEN ▶

Big lack :NG

Shelf life 0 9 . 0 [7] . 1 3   OPEN ▶

Recognize various printer fonts

2009.02.08
MVS

Thermal printer

2009.04 BBD

Hot printer

R A 0 2
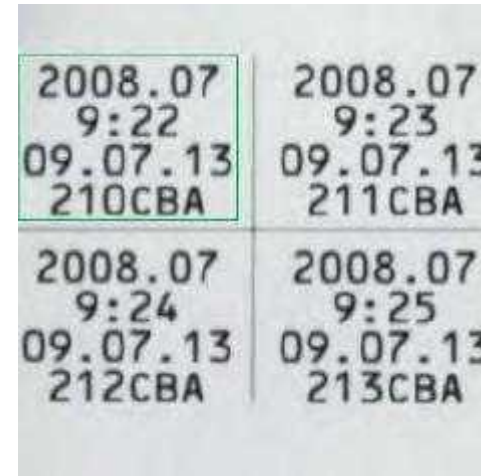0 9 0 4 1 2

Ink jet printer

2009.03
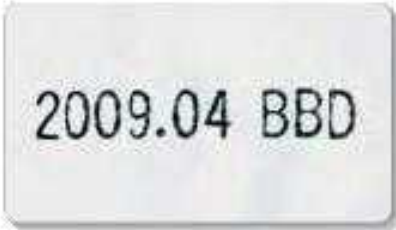
Laser marker

5) High performance (Inspection)
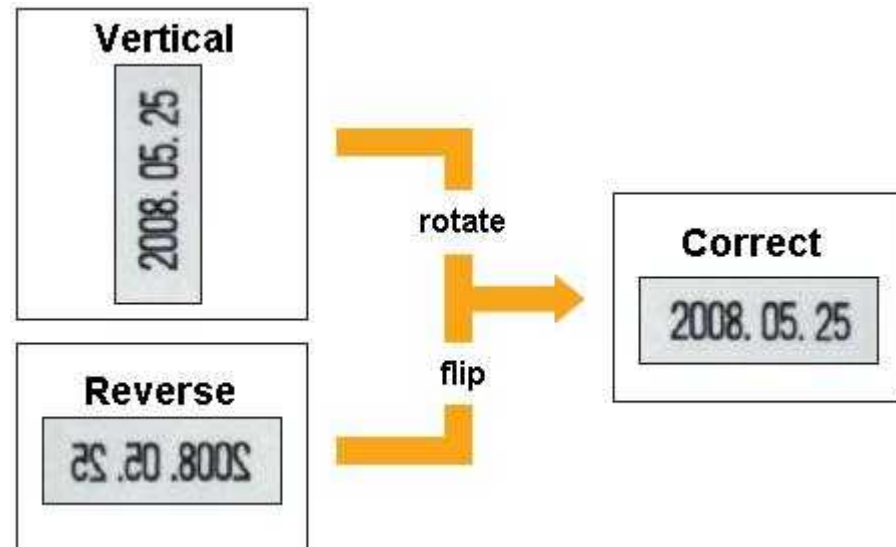
What **MVS-OCR** can do?

Up to 4 inspection windows

- You can set parameters for every inspection window individually

- Up to 2 Form of each date and time are available for one window and up to 4 Form of strings are available (totally up to 4 Forms)

Changeable image direction

- You can set image direction for every bank setting

- It can read reverse print like opposite side view of print on transparent sheet
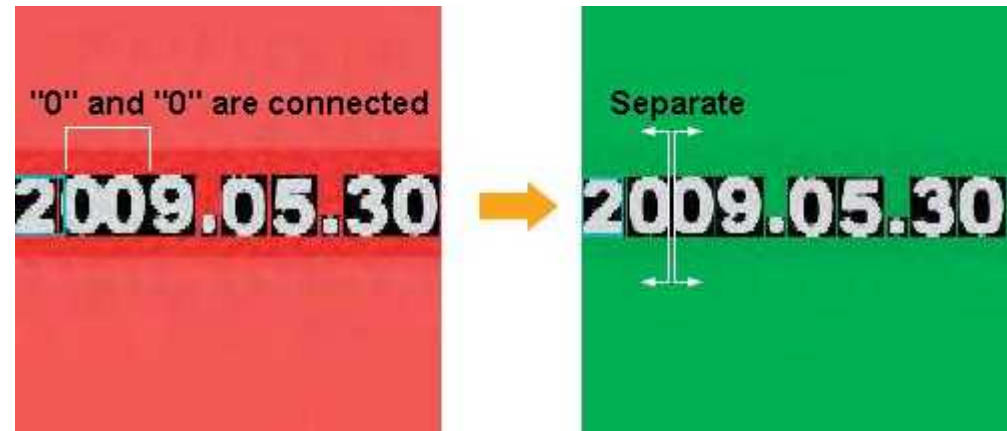
5) High performance (Inspection)

What **MVS-OCR** can do?

Recognize connected characters

- You can separate connected characters

"0" and "0" are connected

2009.05.30

Separate

2009.05.30

Calendar built-in

- You don't have to change date and hour to check. Calendar built-in automatically change them.

- Tolerance of date and hour can be set for their transition timing.

5) High performance (Inspection)

What **MVS-OCR** can do?

Tolerance per character

- You can set tolerance per each character (ex. : "6" and "8" should be checked severely)

OCR by color

- It can detect the character by its color regardless background.

5) High performance (Inspection)
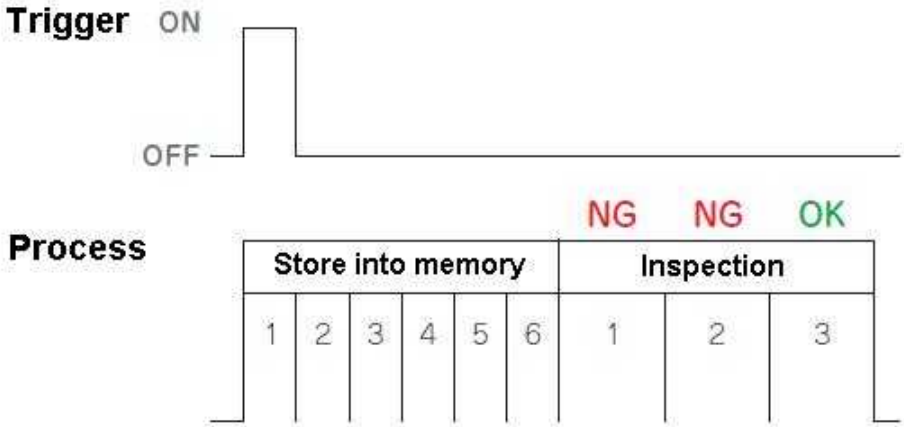
What **MVS-OCR** can do?

Search function

- X-Y and angle (0~±180) search is available.

- Fullcolor pattern matching and matching of extracted character modes are available.

Continuous shooting

- It shoots continuously up to the number set and finish inspection when the result is OK.

5) High performance (Inspection)

What **MVS-OCR** can do?

User dictionary

- It can recognize small letter and symbols by user dictionary.

- It's effective to distinguish "H" and "M" depends on the font for example.

Up to 60 characters

- Up to 4 Inspection windows are available for one camera at a time.

- Up to 6 lines are available for one inspection window.

- Up to 60 characters are recognizable in one inspection window

5) High performance (Inspection)

What **MVS-OCR** can do?

Code recognition

- It can recognize Code of Month/Date/Hour/Minute.

Example: "CAO H" ➡ "March, 15th, 7 O'clock"

Conversion list example   You can modify on the controller.

Month		Date						Hour				Minute						
1	A	1	AA	11	AK	21	AU	0	A	12	M	0	A	C	E	G	I	K
2	B	2	AB	12	AL	22	AV	1	B	13	N	1	A	C	E	G	I	K
3	C	3	AC	13	AM	23	AW	2	C	14	O	2	A	C	E	G	I	K
4	D	4	AD	14	AN	24	AX	3	D	15	P	3	A	C	E	G	I	K
5	E	5	AE	15	AO	25	AY	4	E	16	Q	4	A	C	E	G	I	K
6	F	6	AF	16	AP	26	AZ	5	F	17	R	5	B	D	F	H	J	L
7	G	7	AG	17	AQ	27	BA	6	G	18	S	6	B	D	F	H	J	L
8	H	8	AH	18	AR	28	BB	7	H	19	T	7	B	D	F	H	J	L
9	I	9	AI	19	AS	29	BC	8	I	20	U	8	B	D	F	H	J	L
10	J	10	AJ	20	AT	30	BD	9	J	21	V	9	B	D	F	H	J	L
11	K					31	BE	10	K	22	W		+00	+10	+20	+30	+40	+50
12	L							11	L	23	X							

5) High performance

Compact interface connector

IEEE1284 half pitch 50 pins connector

OK1~3, NG1~3, T11~13

: OK/NG Outputs and Triggers for three cameras

EX1~10

: Input for selecting Bank and Forced capturing

EY1~20

: Output for RUN output, Coordinates and Inspection results of each window

6) Flexible features

- Can communicate with PC through USB I/F

- Automatic Threshold adjusting

- Storable NG object images up to 63 into controller memory

- Offline image analyzing with NG or other images loaded from controller or PC

- Continuous capturing (up to 6 times) changing Shutter speed to get better object image

- Differential Searching for unstable lighting

Application example

Print on Pillow packaging

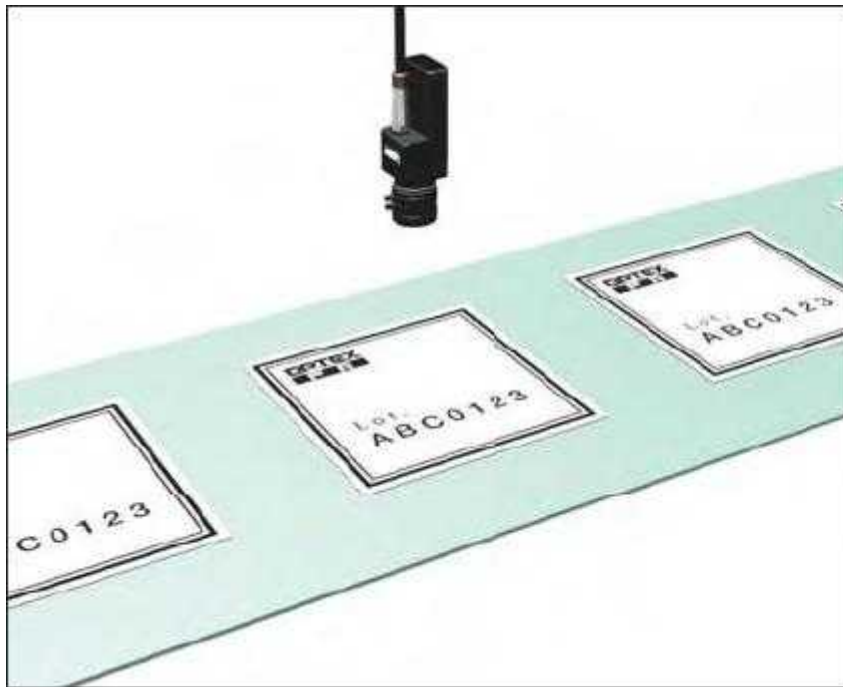Shelf life at box

Application example

Print on cardboard box

Mark on parts for car factory

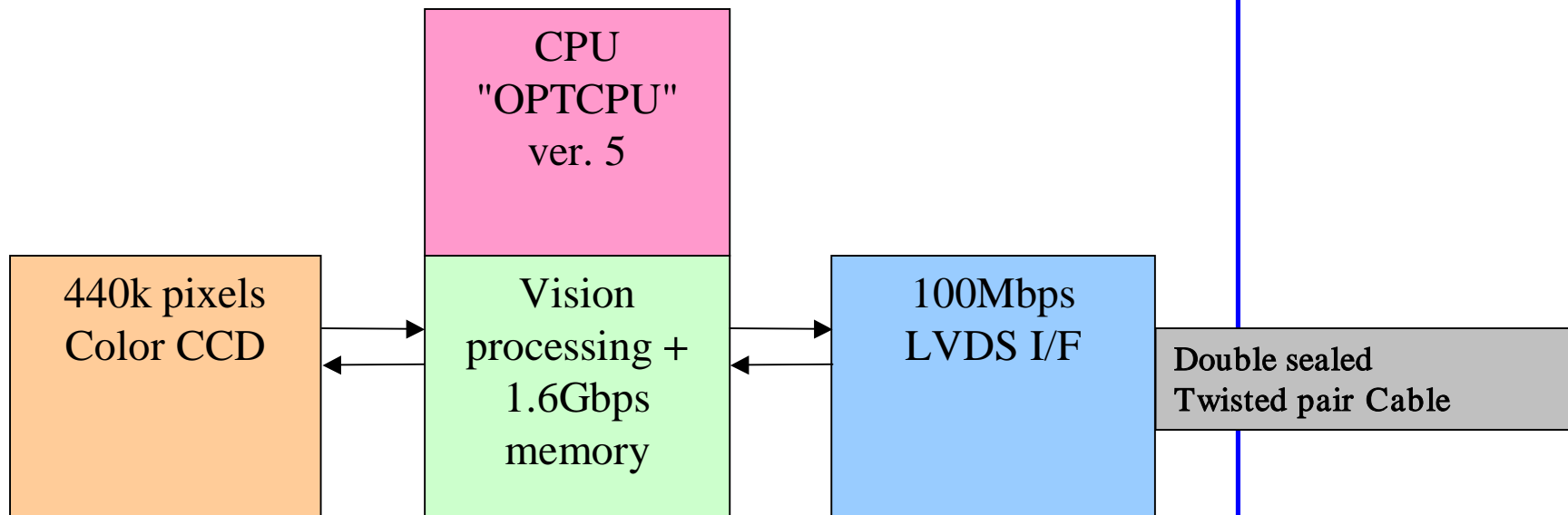# Application example

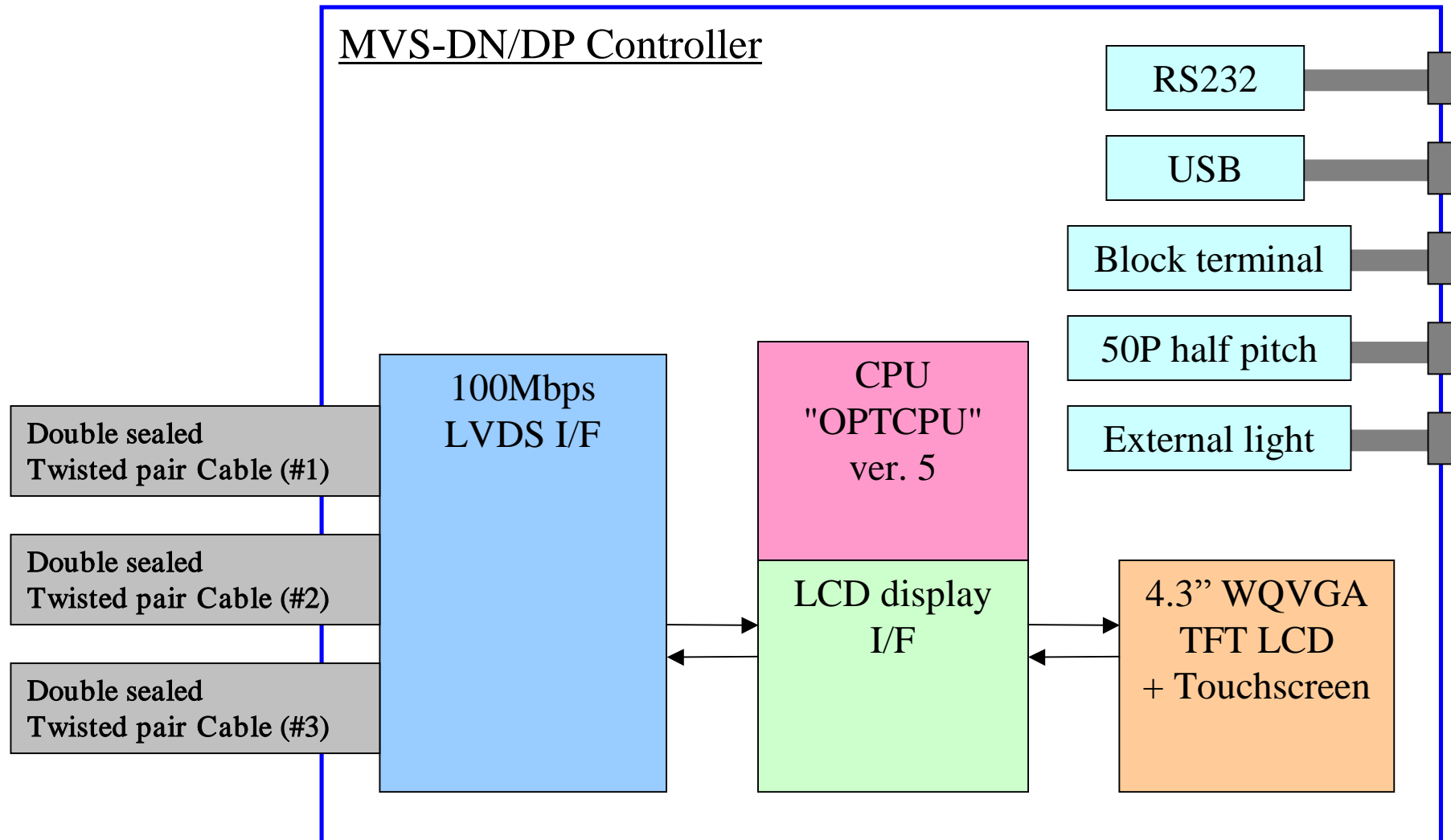Lot number on a label   Shelf life on package of chemical

Block diagram

MVS-OCR Camera head

Block diagram

MVS-DN/DP Controller

RS232

USB

Block terminal

50P half pitch

External light

Double sealed
Twisted pair Cable (#1)

Double sealed
Twisted pair Cable (#2)

Double sealed
Twisted pair Cable (#3)

100Mbps
LVDS I/F

CPU
"OPTCPU"
ver. 5

LCD display
I/F

4.3" WQVGA
TFT LCD
+ Touchscreen

Specification

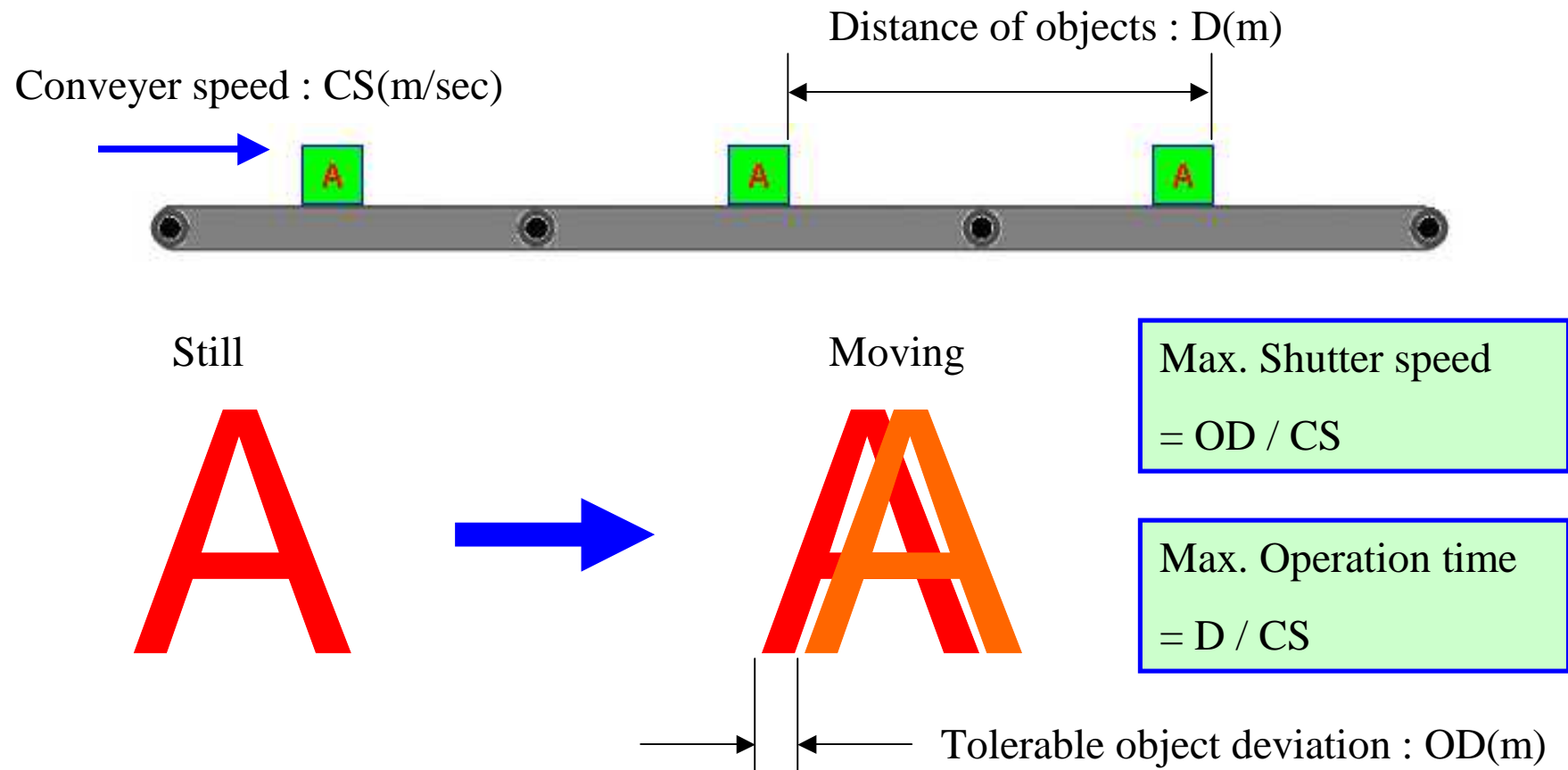| MODEL	MVS-OCR
Supply Voltage	DC 6V ± 10% (From Controller)
Power consumption	Max. 100mA / 24V DC (in Controller)
Image sensor	430000 Pixel 1/3" CCD Color Image Sensor
Resolution	512 X 512 (512 X 256 by interlace processing)
Pixel size	H: 6.5 X V: 6.3μ m (512 X 512 => 3.33 X 3.23 mm)
Lens type	CS mount (C mount adapter is attached)
Communication I/F	LVDS (100Mbps) dedicated for Controller (Max. 10m)
Indicator	LED (Power, Status)
Response time	Approx. 45ms
Operating Temp./Humid.	0~50° C, 35~85%/RH (Non Condensing)
Storage Temp., Humid	-20~70° C, 25~95%/RH (Non Condensing)
Vibration, Shock	Vibration : 10~ 55Hz /1.5mm, Shock : 15G
Approvals	CE (EN55011 Class-A, EN61000-4-2~6), RoHS
Material	Aluminum
Protection category	IP50
Weight	Approx. 90g
Attachment	C mount adapter, mounting bracket

MODEL	MVS-OCR Function
Image processing function	- Searching rotating 0~±180 degree - 4 Inspection Window - Up to 6 lines and up to 60 characters per one inspection window. - Up to 2 DATE and 2 TIME and 4 strings (totally 4) - User dictionary up to 250 characters - Available Date/Time code recognition: Month: 1 character, Date: 2 char., Hour: 1 char., Minutes: 1 char. - Variable shutter speed continuous capturing (up to 6 times) - Automatic Color/Black&White changeover - External Teaching (Auto-Shutter/Threshold/Color Extracting)

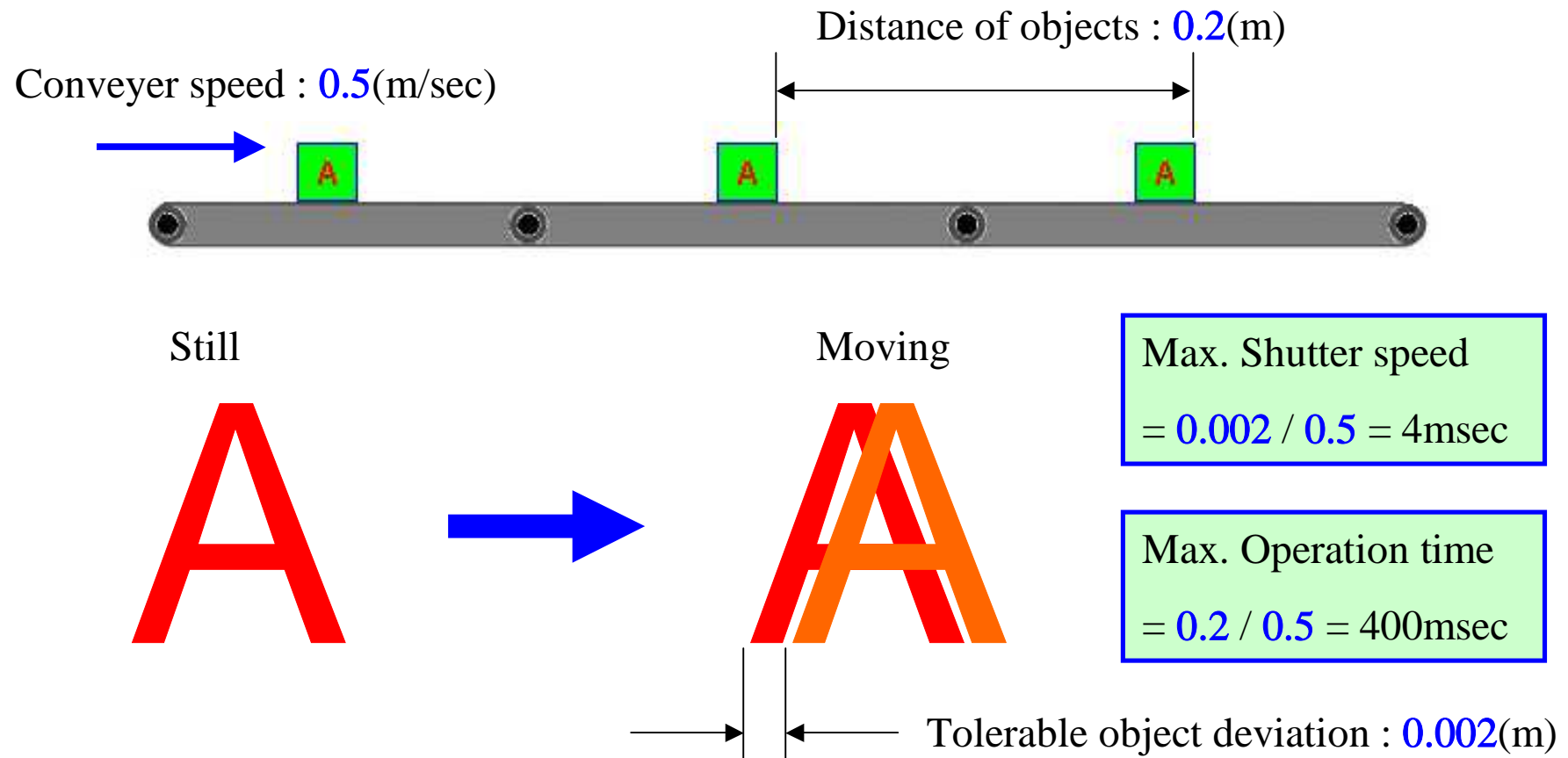| MODEL	MVS-DN/DP
Supply Voltage	DC 24V ± 10% (DC 12V is possible without external Light)
Power consumption	Controller : Max. 80mA / 24V DC With external light : max 1.5A (Light power consumption X 150%) + Power consumption of all camera heads
Number of camera	Max. 3 heads
Output	NPN/PNP open collector Residual voltage is less 1.0V OK, NG : 1 each for every camera head (Total: 6) max. 100mA Extra output : Total 20 max. 50mA
Input	Synchronous: 3, Extra: 10
I/O connector	Power/OK/NG/Synchronous : Terminal block 12P Expansive I/O : IEEE1284 half pitch connector 50P
External Light out	12V PWM control (87kHz, 256steps) Out: 3, Total 24W
Communication I/F	USB1.1 (max 12Mbps) : USB standard connector RS232 (max 500kbps) : D-Sub 9P
Display, Control device	4.3" wide TFT LCD, Touchscreen, Panel SW Indicator : Power, Head No.LED
Timer accuracy	-45sec. ~ +1min. 15sec. Per Month (Typical)
Timer backup battery	primary cell : 5 year with power off (Typical secondary super capacitor : 7.8 year (Typical with 3 days backup)
Operating	0~50° C, 35~85%/RH (Non Condensing)
Storage Temp.,	-20~70° C, 25~95%/RH (Non Condensing)
Vibration, Shock	Vibration : 10~ 55Hz /1.5mm, Shock : 15G
Approvals	CE (EN55011 Class-A, EN61000-4-2~6), RoHS
Material	polycarbonate
Protection	IP20
Weight	Approx. 570g
Attachment	Panel mount attachment

Tips

What you have to set up

1. To know Conveyer speed, Tolerance of object deviation and distance of objects
   => Maximum Shutter speed, Maximum Operation time

Distance of objects : D(m)

Conveyer speed : CS(m/sec)

Still

Moving

Max. Shutter speed
= OD / CS

Max. Operation time
= D / CS

Tolerable object deviation : OD(m)

Tips

What you have to set up

1. To know Conveyer speed, Tolerance of object deviation and distance of objects
   => Maximum Shutter speed, Maximum Operation time

Distance of objects : 0.2(m)

Conveyer speed : 0.5(m/sec)

A   A   A

Still   Moving

A → A

Max. Shutter speed
= 0.002 / 0.5 = 4msec

Max. Operation time
= 0.2 / 0.5 = 400msec

Tolerable object deviation : 0.002(m)

Tips

What you have to set up

2. FOV (Field Of View), WD (Working Distance)
  => Selection of lens and close up ring
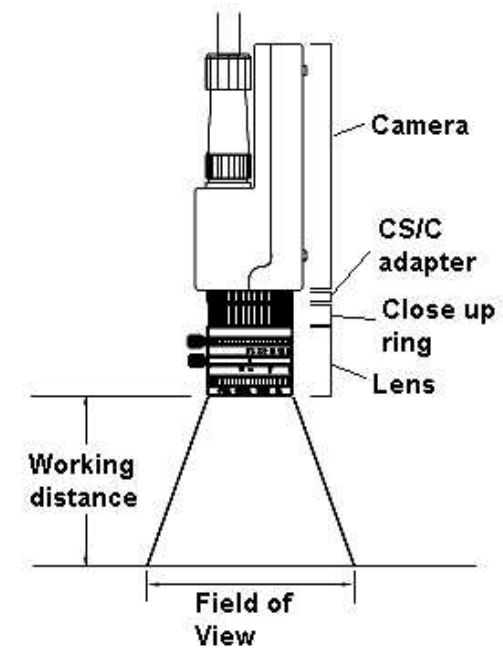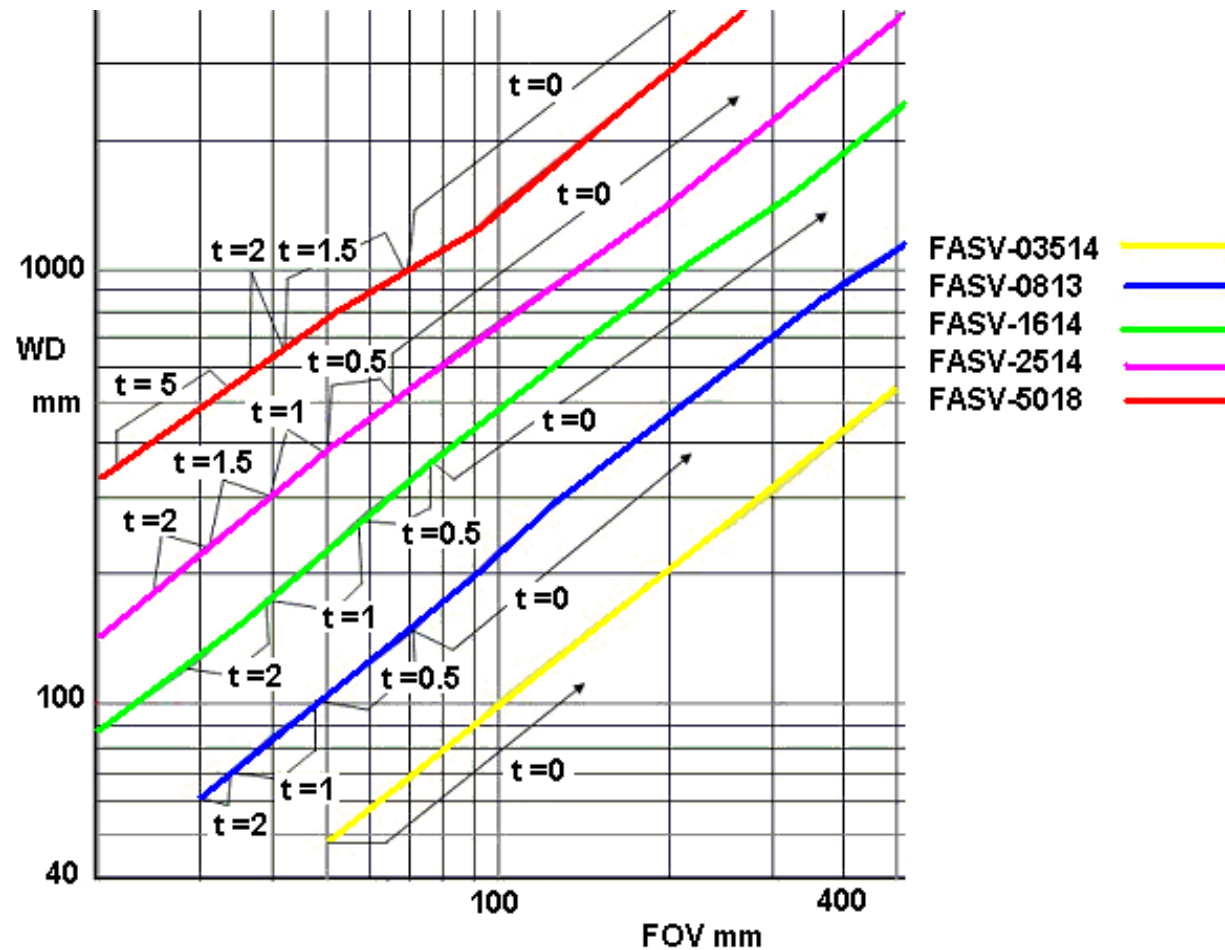
Tips

What you have to set up

Setup →

3. Select Bank to set up

4. Set Trigger mode

5. Set Shutter speed

    - Open lens iris to maximum position and set focus at target object

    - Close iris and find best position between 4 and 8 (set shutter speed automatically by pressing [5] button). When the shutter speed exceeds the max. shutter speed (see previous page) because the brightness is not enough, =>>strengthen light power.

Find best position between 4 and 8

Tips

What you have to set up

6. Image direction, Registering master image,   Color mode, Contour level (only
   for CONTOUR/STAIN mode)

7. Search mode parameter (ON/OFF, Full color/Differential, Accuracy, Angle,
   Angle step, Search image, Search area)

8. Inspection window parameter (Window position, Inspection mode,
   Dark level and Color selection for Color Shape and Color Area mode)

=>> Change parameters according to inspection result to meet required speed
     and required accuracy

Tips

Speed up processing

1. Shorten Shutter speed => image will be darken

2. Make Search area smaller => coverable displacement area will be smaller

3. Make **SearchAccuracy FAST** => search will be unstable

4. Make **Search Angle** smaller => coverable displacement angle will be smaller

5. Make Search **Angle Step** bigger => angle search will be unstable

6. Make **DisplyPrcesImg** (Display Process Image) **NOBACKGD** (no background)

Inspect Accurately

1. Make **Img.Brightness** (Image Brightness: camera gain) smaller

=> image will be darken

2. Make **Color Mode** as **B/W** => can't cover color object

3. Use small distortion lens (longer focal distance) => working distance will be longer

Tips

Getting brighter image

1. Open iris of lens => DOF: Depth Of Field will be shallower

2. Raise Light Power => Light life will be shorter

3. Make shutter speed longer => Can't inspect fast moving object

4. Make **Img.Brightness** bigger => Noise will be bigger

Getting Focus Clearly

1. Open iris of lens

2. Display enlarged image by touching the image

3. Use better object (master object)

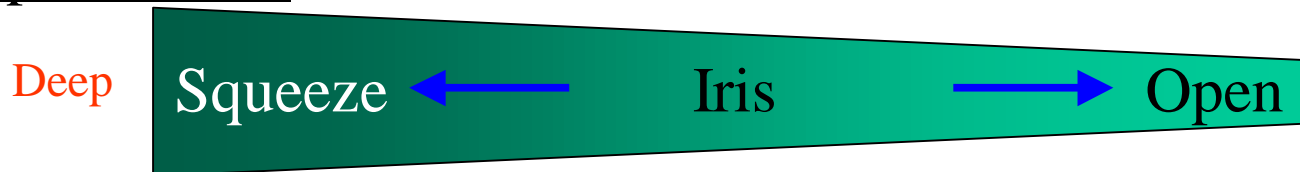** This is just for getting better focus at the first stage of set up

Tips

Captured image

Slow ⬅	Shutter Speed ➡	Fast
Bright ⬅	Light ➡	Dark

Bright

The slower shutter speed the better image you can capture. Shutter Speed should be faster for object moves fast but image gets dark.

Depth of field

Deep

Squeeze ⬅   Iris   ➡ Open

Iris to be squeezed to capture stable image but image gets dark.

Noise level

Big

High ⬅   Camera Gain   ➡ Low

The lower Camera Gain the smaller Noise level but image gets dark.

Tips

Locking buttons

- You can block screen buttons by clicking buttons holding "0" key pressed.

- You can block parameters by pressing "SET" key holding "0" key pressed.

- Effective when preventing operator changing set up accidentally.

Quick mode Changing

- You can switch over the modes below quickly by clicking "4" and "6" buttons to speed up setting up.

Camera Sett-ings ↔ Light Sett-ings ↔ Search Window Generl ↔ Window Jdgmnt No. 1 ↔ Window Color No. 1 ↔ Window Positn Numerc ↔ Input Sett-ings ↔ Output Sett-ings ↔ Other Sett-ings

Tips

Saving/Storing from/to PC

Screen freeze

Saving image from MVS

Saving set up from MVS

Screen monitor

Saving BMP

Storing image to MVS

Storing set up to MVS

Stop

Tips

Saving image to PC

USB
8Mbps

| MVS (Camera) | 1.1Mbps | MVS-DN/DP (Controller) | | PC |

0.9sec   0.13sec
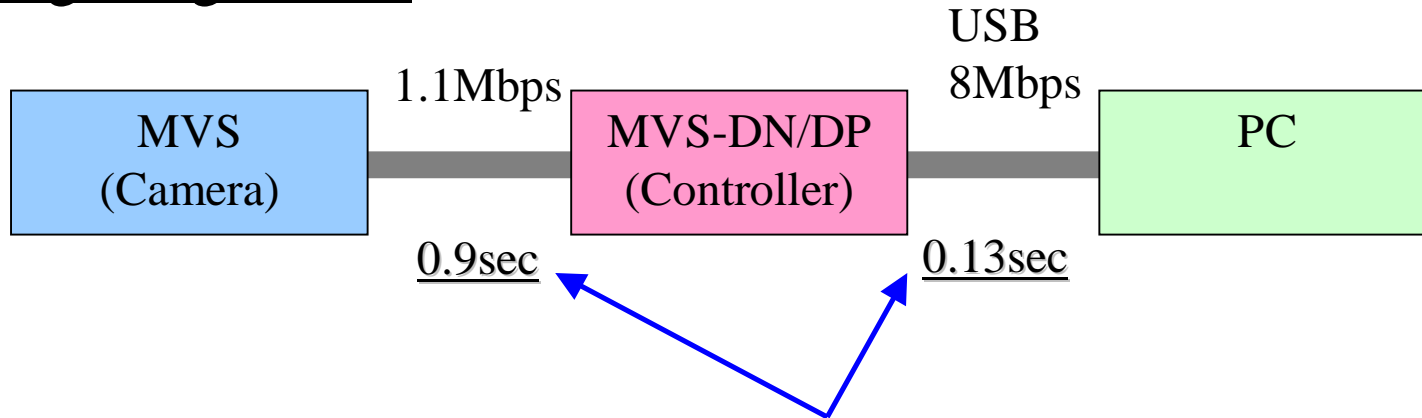
Capacity of image captured : 1Mbit (512 x 256 x 8bit : CCD raw data

Complementary color filtered)

0.13sec/frame

| Bank master image or Memory image or Captured image | NG image | PC |

0.9sec/frame

Tips

Time chart
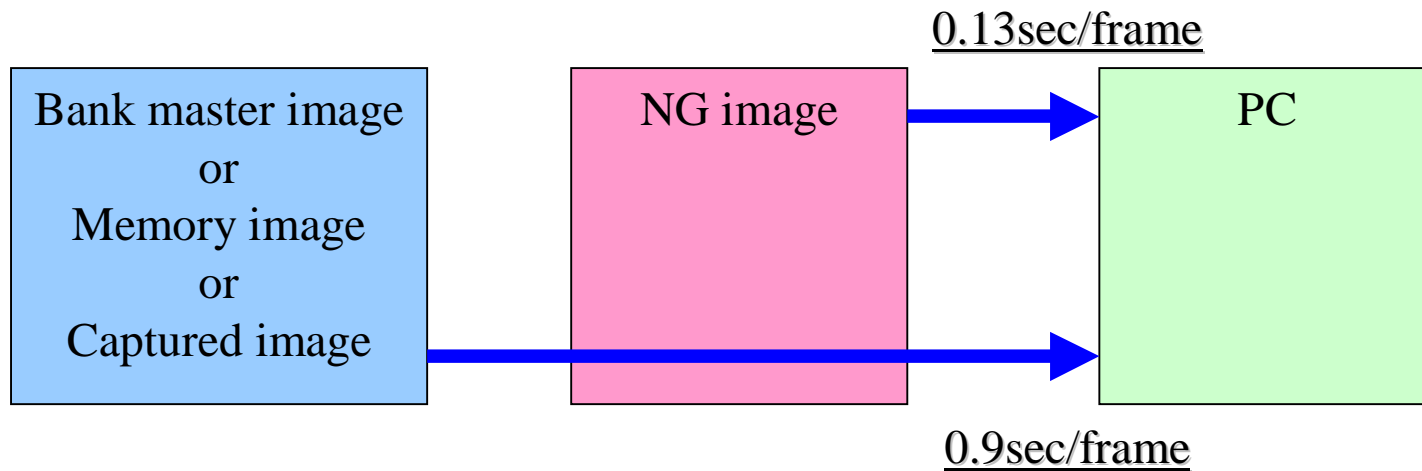
Power supply	
Trigger input	
Light output	70 ~ 120us
Shutter	100us Shutter speed
RUN output	1.7sec ~
BUSY	14.55ms
OK/NG output	
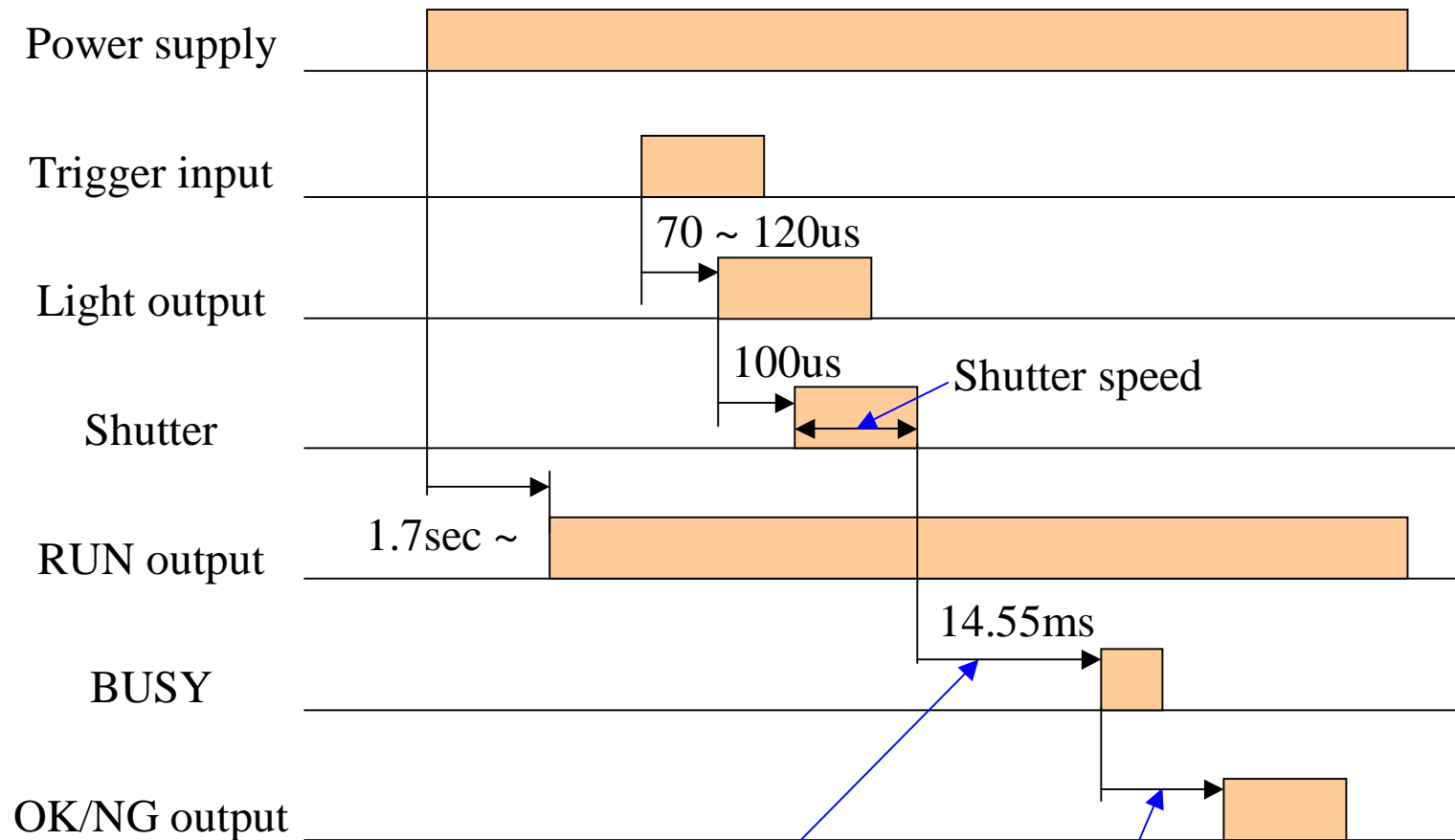
CCD transfer time: 9.31ms +
RGB extraction: 5.24ms

Search (*) + Inspection (*) +
Depiction of processed image (5.24ms)

(*) : depends on the setting

Thank you!