

# Banner Vision Inspector Machine Vision Software Operating Manual Version 2.6

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### Introduction

**Banner Vision Inspector** is image processing software for the machine vision industry and is a proprietary product of Banner Engineering. The software platform has been designed to allow engineers or non-programmers to be able to create a solution for any specific requirement without having the need to learn the actual programming skills in the shortest time. When integrated to the appropriate hardware, it offers a complete machine vision solution for any industrial automation's applications.

As the cost of labor is getting higher, it is a big challenge for companies to retain their staff in the long term. It is also difficult to find good replacement too. Machine vision is a complex product as it is largely dependent on the skills & experience of the programmer s to write the entire software for the solution. No one programmer is the same and thus the process in writing the program will never be the same. There will also be the frustration of trying to do software debugging which is very challenging & time consuming when the application is complicated. Business owners are frustrated on the lack of software continuity once the programmer quits the company and no one will be able to take over easily, and this will result in the need to re-write the program. Banner Vision Inspector platform is designed to overcome the concerns of software continuity and helping to modularize the tools, when needed.

Banner Vision Inspector platform allows flexibility in creating many different functions while it does not take too much effort to learn the usage. With the use of the Halcon library for the main inspection tools, the software offers superior & high performance with simple graphical user interfaces (GUIs)

The user can select the number of cameras, and followed by the type of camera, frame grabber or I/Os, integrated to the Banner Vision Inspector within a working menu. Each of the cameras will be running independently & will be running simultaneously. The Banner Vision Inspector platform will then launch a user-interface page which can be easily modified, including the change of the company's logo. The user can access to the configuration page for each camera to build up independent application program recipes.

With the wide suite of software tools, Banner Vision Inspector software covers applications including 1D/2D code reading, OCR/OCV, Filtering, Blob analysis, Robot Guidance, Measurement, Color, etc. The Banner Vision Inspector software does not have any limitation to any new tools to be included to its platform, as new functions or application tools can be created easily using Halcon, OpenCV or any 3<sup>rd</sup> party library, thus adding new features and unlimited possibilities to the software. The configuration page will allow the user to drag & drop required function tools easily into the program editor to build up the final program recipes. The Banner Vision Inspector platform provides an opportunity for apps developer to create applications modules for a diverse industries' requirements.



### **Getting Started with Banner Vision Inspector**

#### System Requirement

The following table specifies the minimum system requirement for Banner Vision Inspector software. In order to optimize the performance, it is preferable to use the hardware better than what is recommended below.

S/N	Description	Specifications
1	Operating System	Windows 7 / 8 / 10 (64 bits)
2	CPU	1.9GHz or faster
3	Memory (RAM)	Minimum 2 GB
4	Storage	64 GB free space
5	Graphic Display	Minimum resolution of 1280 x 800 pixels
6	Licensing	USB security dongle

Preparation for Setup:

1. Make sure that the system system's date & time are set correctly.

- 2. Make sure that there is sufficient storage space where you want to install the application.
- 3. Make sure that your operating system version is up to date and the drivers for your cameras installed.

### Installing Banner Vision Inspector

#### **Steps to install Banner Vision Inspector**

- 1. Download the Banner Vision Inspector software and patch from the links or CD provided.
- 2. Uninstall the **older version** of the Banner Vision Inspector software if you have installed it before.
- 3. Install the updated version of the Banner Vision Inspector software which you have downloaded.
- 4. You may require to disable the firewall or the anti-virus of your computer if you are not able to install the software successfully.
- 5. Copy and paste the Banner Vision Inspector monthly demo license to this path: C:\Program Files\MVTec\HALCON-13.0\license
- 6. Banner Vision Inspector software is ready to be used.

### Licensing

#### Licensing

All **Banner Vision Inspector** licenses are bound to a dongle together with 2 corrsponding files (.dat & .lic files). Place the license files into the specific directory as the following:

#### **Runtime License:**

Step 1: e.g: Copy the 3-xxxxxx.lic to this path: C:\ProgramData\Banner Engineering\licence Step 2: e.g: Copy the 3-xxxxxx.dat to this path: C:\Program Files\MVTec\HALCON-13.0\license

### **Hardware Configurator**

#### Hardware Configurator

Banner Vision Inspector software supports a wide variety brands of cameras and IOs module.

Hardware Configurator			
Current Configurator VIC: <b>Offline</b>	DIO: Offline	LTC: Offline	RA: <b>Offline</b>
Video Input Channel (VIC)	Digital IO (DIO)	Lighting Control (LTC)	Robot Am (RA)
Basler(GigE_USB3) Dahua(GigE) GenICam GigEVision IDS(GigE_USB3) Pylon(GigE_USB3) USB3Vision	Camera Adlink_PCIDask Adlink_USBDask Advantech_PCI JS_DI03216B BVCRS2	CCS_Serial CCS_TCP	Delta_SCARA
Apply Exit			

**Digital IO:** The user can select the brand of digital IO used. **Lighting Control (LTC):** The user can select the brand of digital IO used. **Robot ARM:** The user can select the brand of robot arm to be used.

### **Hardware Supported**

#### List of brands of camera supported:

- Basler (GigE\_USB3)
- Dahua (GigE)
- GenlCam
- GigEVision
- IDŠ (GigE\_USB3)
- Pylon (GigE\_USB3)
- USB3Vision

#### List of IO module supported:

- Camera
- Adlink PCI Dask
- Adlink USB Dask
- Advantech\_PCI
- JS DIO3216B
- BVCRS2

#### List of brands of Lighting Control supported:

CCS\_SerialCCS\_TCP

#### List of Robot Arm supported:

• Delta\_SCARA

### **User Interface**

#### **User Interface**

The Graphical User Interface is the interface between the user and Banner Vision Inspector.

When the Banner Vision Inspector software is launched, the user will be brought into a Process Menu as shown in the below picture.



After user has login the password, he/she is able to access the toolbars on the top panel.

And click the 🔛 button to access to the Configuration Menu as shown in the picture below.





### **Process Menu**

#### **Process Menu**

When the Banner Vision Inspector software is launched, the user will be brought into a GUI within the process mode.

When the security dongle is not inserted to the USB interface on the computer, the Banner Vision Inspector will run on a demo mode for 60mins which will be shown on the bottom left side of the monitor screen. When the demo session expires at 60mins, the application will automatically shut down. User will have to relaunch the Banner Vision Inspector software again to continue.



- a. Run/Stop 2: To control the program to start or stop execution.
- b. Run Once **D** : To execute the program in a single run or cycle.
- c. Configuration Mode 🔛 : To access into the Configuration Menu where user create their inspection program.
- d. Login 上: To login and logout for the software.
- e. Camera Setting 🔯 : To configure the selected cameras index and parameters.
- f. Digital IO 📰 : To diagnose the selected IO status.
- g. Lighting : To configure the selected lighting parameters.
- h Memory 🕮 : To display the Global Memory data (value, point & string).
- i. Mapping : Transform image coordinates to world coordinates.
- j. Reset Static 🖾 : For resetting the static variable created in the program.
- k. Application Setting 🗱 : To configure all the parameters in the software.
- I. Information 🧾 : To show the software version.

To access into the system, the user will have to press the 🚨 button to enter the password code for the operator, engineer, and manager or administrator level. Each level will allow the access to different function tools within the process page.

🚯 Log in - Manag	ger 🗖 🗖 🗮 🗶
USERNAME	manager 🔹
PASSWORD	
	Log out
	Change PASSWORD

#### Viewer:



- (1) To show Viewer name, IM and Program name used for this viewer
  - [IM0: test.dat]: test.dat is the mapping file
  - [PROG0: 22320.viz]: 22320.viz is the program file.
- (2) To display inspection image
- (3) To display the inspection overall result
- (4) To display the inspection result

Double-click on the viewer to display the picture as shown below

	Configure	manager	Proj	ect	Project Nar	ne:			]	_		-					
[IM0: ] [PROG	): Colour Inter	nsity.viz]									$\sim$	Show All		News		Deter	CT(m)
											G	Index		Name		Status	CT(ms)
												2		Color Intenet	hublue	0	3
										CT: 71 ms		3		Color Intensity	/-White	1	6
										Total: 3		4	-	Color Intensit	tv-Red	0	2
										Pass: 1		5		JumpToF	AIL	1	0
										Fail: 2	·	6		Text		1	2
										( 66.66 % )		7		End		1	0
												9		FAIL			
												10		Text		1	5

Double-click on the individual tools content where it shows that particular tool menu which allow user to edit the parameter.

+

### **Configuration Menu**

#### **Configuration Menu**

To access into this menu, the user has to click the 🔛 button.

At this menu, user is allowed to create or edit his/her inspection program. It is using drag and drop concept from the tools menu at the right side into the program editor.

() Banner Vision Inspector		
Process     Project     Project Name:     Project Name:     Project Name:		BANNER
		🛎 T 📼
	PROG0:	limage
	0	Control
	1	Communication
	2	Measurement
	3	CodeReader
		Edge Detection
	4	Color
	5	Object Detection
	6	Delect
	7	
	8	
	9	_
	10	
	11	
	12	
	13	
	14	
Focus: IM 0-14 IM15-29 IM80-44 IM45-59 IM60-74 IM75-89 IM90-99	15	-
	16	
IMO IM1 IM2 IM3 IM4 IM5 IM6 IM7 IM8 IM9 IM10 IM11 IM12 IM13 IM14	17	-
■ T T T T T T T T T T T T T T T T T T T		_
	18	

The Program Editor shows the Banner Vision Inspector command list of your inspection program. The commands will be sequential processed. There can only be one command per line. It is

recommended to use empty lines between commands to get a better overview in the program editor. You can add new empty lines later, if you need them. Commands can be easily put in this list by dragging them out of the command set and dropping them in their new position in the program editor. A new dialog will appear to modify the command for your use. Commands can be updated by clicking with the right mouse button on it and choosing "Quick edit".

Comera Dio manager Project	Lighting Memory Results 2 Mapping.	B Latoric 4 Analysis 5 Static Application Information	•	BANNI
	• 2			🛎 T 📼
				Image     Calibration     Control     Communication     Either
			2	Measurement     CodeReader     i     Testing
			4	Edge Detection
			6	Object Detection     Defect



(1): Return back to Process Menu

(2): Result Viewer: To view all the results e.g. Long, Double, String etc. of the tools used in the Program Editor.

(3): Mapping: Transform image coordinates to world coordinates.

(4): Distortion Correction: Correct the deformation of the images caused by the optical used.

(5): Image Analysis: To extract the key information from the images to display as histogram or profile to allow user to have some idea of the image thresholding value.

(6): Toolbox: The commands that is developed for user to drag and drop into the program editor to create the inspection program.

### Toolbox

#### ToolBox



The commands at the Toolbox that is developed for user to drag and drop into the program editor to create the inspection program.



- Click to get the information of this tool.
- Click to enable the processing of this tool.
- Click to disable the processing of this tool.
- Click to allow processing of this tool at initialization only.
- Click to disable processing of this tool at initialization only.
- Disable the tool ping function.
- ★ Enable the tool ping function.
- I Enable the tool overlay during inspection.
- $\checkmark$  Display the tool overlay when the tool result is pass.
- *𝔞* Display the tool overlay when the tool result is fail.

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#### Creating grouping of commands used in the Program Editor:

Step 1:

When the inspection program is completed. Select and highlight those Tools which you would like to grouping.



#### Step 2:

Right-click to select "Grouping"



#### Step 3:

Selected tools will be gropued accordingly. User can enter a name for this created group.



Right-click on the Grouping Icon and then select "Save group". This apply for the grouping features like the Ungrouping, Copy group & Delete group.



#### Step 5:

To create a name for the group. The software is unable to have duplicate naming for grouping.

Þ	l	-   D   X
To take a nam	ne for the group	•
G_Test		
	ОК	Cancel

#### Step 6:

After the above steps. user will able to see and use the grouping tool in the toolbox. User can drag this grouping tool into your inspection program.



### Toolbar

#### Toolbar

1. Viewer tools' bar (Located at top left horizontal side of configuration mode)



- "c" Zoom out image
- "d" Fit image to screen
- "e" 1:1 ratio aspect
- "f" Live image
- "g" Cross line
- "h" Camera focus
- "i" Camera list
- ≻ "j" Crop
- 2. Cyclic / File management tools' bar (Located at top right horizontal side of configuration mode)



- ➤ "1" Program tab window
- ▶ "2" Run once
- ➤ "3" Run one step
- ➤ "4" Continuous cycle
- ▶ "5" Stop
- ➤ "6" Create new recipe file
- ▶ "7" Open recipe file
- ➤ "8" Save current recipe file
- $\succ$  "9" save all recipe file
- ➤ "10" Save as

### **Program Editor**

#### **Program Editor**

The below picture shown is the Program Editor (Displays inspection procedure of recipe file). This is table where user create the inspection program by drag and drop the commands from the tool table.



#### Cycle Time / Coordinates / Gray scale



- "a" Reflects the total cycle time for the entire process of the recipe within the program editor
- "b" Identify the XY (image or world) coordinates of the current mouse cursor location, of which the 0,0-default position is located at the top left corner of the image before calibration.
- "c" Identify the gray value of the current mouse cursor location. If a color camera is used, the value will be in RGB.

#### **Image Memory**



Click to show or hide the IM bar
Click to save the image from IM
Click to load the image to IM

### **Memory Menu**

#### **Memory Menu**

To display the Global Memory data where the tools results like the value or point or string used in the inspection program, are saved in this memory. This allows IPC, PLC and internal viz program to access this data.

Mem	огу					X
Value	Point	String				
Loc	ation(Index	()	Value(Hex	)	Value(Dec)	•
1	0D0 (0)		0000		0	
1	0D1 (1)		0000		0	
1	0D2 (2)		0000		0	
1	0D3 (3)		0000		0	
1	0D4 (4)		0000		0	
1	0D5 (5)		0000		0	
1	0D6 (6)		0000		0	
1	0D7 (7)		0000		0	
1	10D8 (8)		0000		0	
1	10D9 (9)		0000		0	
10	DA (10)		0000		0	_
10	)DB (11)		0000		0	=
10	DC (12)		0000		0	
10	DD (13)		0000		0	
10	DE (14)		0000		0	
10	DF (15)		0000		0	
10	DEO (16)		0000		0	
10	)E1 (17)		0000		0	
10	)E2 (18)		0000		0	
10	DE3 (19)		0000		0	
10	)E4 (20)		0000		0	
10	DE5 (21)		0000		0	

The **Variable Access** command is used to perform this feature to save the data like value, point or string into the desired memory.

<b>(</b>	? 💌
V	ariable Access
Options Create Put value into variable Put pickup into variable Arithmetic Put value into memory Put memory into value	Index 0  Type Long  Value 0 from pickup list wait status ologa offerstalse



#### Put value into memory:

- > Index: To save the parameter (Long, Double, string, Point) into the memory location of a selected command.
- **From Pickup list:** To select the desired result to save into the memory.
- > Wait Status: When this option is checked, it will wait until the specific memory is cleared before it saves the new data in.

•		? ×
V	ariat	ale Access
Options		
Create	Index	0
Put value into variable	Туре	Long
Put pickup into variable		
<ul> <li>Arithmetic</li> </ul>		
Put value into memory		
Put memory into value		
		<ul> <li>wait status</li> <li>clear after take</li> </ul>
		OK Cancel

#### Put memory into value:

- > Index: To get the parameter (Long, Double, string, Point) from the selected memory location and input into a value.
- Type: To set the format type of value after getting from memory.
   Clear after take: To clear the memory index after getting the result, to allow the next parameter to save into the memory index.

### **Camera Setting**

#### **Camera Setting**

At this Camera Setting Menu, user can change the parameters for the cameras shutter, gain and AIO under the Parameter tab. Under the Assignment tab, user can arrange the sequence of the cameras accordingly.

Camera: Assignment	Parameter Parameter				Camera: Basler Assignment Parameter			
Index	Name	MAC/Serial No.	Status	^	MAC/Senal No.	21438202		
0	acA640-120gm	21438202	Connected		Name	acA640-120gm		
1					Distort Correction			
2		0			Capture Mode	Hardware Trigger	٠	ľ
3					Parallel	Off	-	
4					GainAuto	Off	•	L
5				Е	GainSelector	A	-	
6					GainRaw	433		
7		-			BlackLevelSelector	A	•	
8		_			BlackLevelRaw	64		
9					GammaEnable	0		
10					GammaSelector	User	•	
12		-			Gamma	1		
12					DigitalShift	4		
14					Width	640		
15				-	Height	480		

Double click on your camera's name and the camera properties panel will open in the viewer as shown above. You can use the selections in the camera properties pane to adjust all of the cameras settings such as gain, black level, and exposure.

You can adjust image quality with regard to these criteria by choosing appropriate settings. However, the "best" image quality will partly depend on the specific requirements of your application and therefore no generally applicable "best" setting can be recommended.

The adjustments will involve the following:

- adjusting the brightness of the illumination
- adjusting the focus
- setting the lens aperture
- setting the black level
- setting the shutter
- setting the gain
- adjusting white balance.

In addition, the quality of an image will be affected by other factors, e.g., by the choice of the lens. We recommend carrying out all fine adjustments using the illumination that you want to use in your actual application.

#### Focus:

You will obtain a focused image only if the lens is screwed into the lens adapter of the camera as far as it will go and if the glass surfaces are clean. The object to be imaged must be within the range of focus of the lens. You can obtain a focused image by turning the focal ring on the lens.

#### Depth of Focus:

If the objects you want to image are located at different distances from the camera, you must consider depth of focus. The depth of focus must be sufficiently deep to allow all objects to appear focused in the image. You can change the depth of focus by turning the aperture ring on the lens. Closing the lens aperture (turning the aperture ring to higher f-numbers) increases the depth of focus and vice versa.

Note that closing the aperture decreases the amount of light reaching the camera's sensor and therefore results in a darker image.

#### Brightness:

Among the factors determining the brightness of an image are the intensity of the illumination, the setting of the lens aperture, and the settings for black level, exposure time, and gain.

- We recommend that you choose bright illumination if possible, but avoid excessive intensity. This will prevent you from needing to operate the camera using extreme camera settings. A bright but not excessively bright illumination is of central importance to achieving good image quality.
- In images acquired from CCD sensors, excessive brightness will cause artifacts such as smear (white stripes in the image) and blooming (local over-saturation that destroys contrast). You can decrease the proneness for smear and blooming by choosing a diffuse and less intense illumination.
- If illumination of sufficient brightness is not available, you can select a lens that is optimized for light utilization.
- Opening the lens aperture will allow more light to reach the camera's sensor and will therefore increase the brightness of the image. Note that opening the lens aperture also increases the effects of optical aberrations. This causes image distortions and the intensity of light decreases towards the edges of the sensor (vignetting). In addition, the depth of focus decreases.
- Change the brightness of the image by changing the camera's black level setting normally, you should increase the black level setting only as far as is necessary to make detail visible in the darkest portions of an image. (This is equivalent to avoiding the clipping of the low ray values of noise.)
   Note that high brightness settings will prevent high contrast. We recommend not using rightness settings above 64 when the camera is set for any output format that is greater than 8 bits per pixel.
- Increase the brightness of the image by increasing the camera's exposure time setting. With this method, brightness is increased by increasing the amount of photons collected for pixel readout. Note that increasing the exposure time setting may decrease the acquisition frame rate. If you reacquiring images of moving objects, increasing the exposure time setting may increase motion blur.
- Increase gain will also increase image brightness. Note unless your application requires extreme contrast, you should make sure that detail remains visible in the brightest portions of the image when increasing gain. Note also that noise is increased by increasing gain.

#### Exposure Time:

The exposure time setting determines the time interval during which the sensor is exposed to light.

Choose an exposure time setting that takes account of whether you want to acquire images of still or moving objects.

- If the object is not moving, you can choose a high exposure time setting (i.e., a long exposure interval). Note at high exposure time settings may reduce the camera's maximum allowed acquisition frame rate and may cause artifacts to appear in the image.
- If the object is moving, choose a low exposure time setting to prevent motion blur.

#### Gain:

Gain amplifies each pixel readout by a certain factor. Accordingly, signal and noise are both amplified.

Note that it is not possible to improve the signal-to-noise ratio by increasing gain.

- You can increase the contrast in the image by increasing the camera's gain setting.
- Increasing gain will increase the image brightness.

Unless your application requires extreme contrast, make sure that detail remains visible in the brightest portions of the image when increasing gain. Note also that noise is increased by increasing gain.

- Set the gain only as high as is necessary.

### **Digital IO**

#### **Digital IO**

The digital In-/Output display shows all digital in-/output interfaces that are embedded into the system. Depending on the available interfaces, all virtual LEDs will be displayed. Those displays reflect the real in-/outputs and their conditions. You also can simulate the digital I/O in offline mode without IO connected.



List of IO module supported:

- Adlink PCI Dask
- Adlink USB Dask
- Advantech\_PCI
- JS DIO3216B
- BVCRS2

### **Result Viewer**

#### **Result Viewer**

To view all the results e.g. Long, Double, String etc. of the tools used in the Program Editor.



To view all the results e.g. Long, Double, String etc. of the tools used in the Program Editor.

- > TotalRes: The final result (1/0) of that individual command used
- > Long: The value of a command used e.g. Count Object command number of objects detected
- > Double: A decimal value of a command used e.g. angle where the measurement angle value is 38.54
- > String: A result string of a command used e.g. DataCode the decoded result as shown in the picture above
- > Point: A point result of a X & Y coordinate used in a command e.g. Matching
- > Circle: The radius and X & Y coordinate result of a circle command used
- > Line: The X & Y coordinates of the 2 points that form a line.

Туре	Range	Comment
TotalRes	0-1	The tool's results (Pass/Fail)
Long	2147483647 ~ -2147483648	The value is Integer
Double	1.79769e+308 ~ 2.22507e-308	The value is float
String		The value is string
Point	Px, Py	Point (2 float value)
Circle	Cx,Cy,Cr	Circle (1 point and 1 float value)
Line	Lx1, Ly1, Lx2, Ly2	Line (2 points)

### **Robot Control**

#### **Robot Control**

To control the robot arm position and automatically do the calibration. For now, support Delta SCARA robot arm only.

Control Jog (	Calibration	Inde	x X	Y
S	ervoOff			
S	ervoOn			
Res	set Alarm			
G	o Home			
		Inde	x u	v

#### a. Control:

The robot arm control operations.

b. Jog:

To move the robot arm position operations.

#### c. Calibration:

- Two methods to find the target:
  - 1. Blob: To see the tool Countobject how to use it.
  - 2. Matching: To see the tool Matching how to use it.

#### Methods how to move the robot arm:



• •	•		
	i i		
	i i		44
4 noints	i i	9 points	11 points
4 points	i i	5 points	
l			L

### **Configure Mapping**

#### **Configure Mapping**



- 1. Live the camera with a target glass as the picture above shown and ensure target is upright.
- 2. Disable live image and click Mapping icon and the above menu will appear.

#### Image Coordinate: Calibration method

- Checker Board: Select this option when the above picture's target glass is placed and select Auto option at the World Coordinate with dx & dy value entered. It will then perform automatically do a calculation to transform the image coordinates into world coordinates.
- Manual: When this option is selected, it is to perform a mapping between the vision and robot. Right-clicked on the display which is highlighted orange. A red cross line will after right-clicked. (Min. need 3 points). Then select Manual at the World Coordinate where user can enter the robot arm position accordingly after index to the selected individual cross line.
- > Load from file: Option to allow user to load a file containing details of the world coordinate of the calibration glass.
- Clear: To delete all the data in this menu.

#### World Coordinate:

- > Auto: Perform automatically do a calculation to transform the image coordinates into world coordinates.
- > Manual: Allow user to manually enter the world coordinates corresponding to the image coordinates.
- > Load from file: Option to allow user to load a file containing details of the world coordinate of the calibration glass.
- > Clear: To delete all the data in this menu.

dx & dy: Distance between each point matrix (x and y in world coordinate values).

**Search:** Click the Search button where the software will automatically search all point matrixes from the field of view. The image & world coordinates will be computed automatically onto the 2 result tables.

**Save:** Data computed on the 2 result tables can be saved into a file with a desired path location and name. This file can be used when loaded into the mapping function of the calibration command.

### **Distortion Correction**

#### **Distortion Correction**



This Distortion command corrects image distortion which occurs either by perspective error or by the lens aberration of the lenses used.

The main part of this distortion process consists of acquiring images of the calibration plates in different position and orientations relative to the vision system. These images at different position and orientations (especially the 4 corners) using the calibration plate must cover the complete field of view. Calibration results and accuracy will improve when more images are used in the calculation.

Need to acquire and save images of the calibration plates in different position and orientations relative to the vision system setup.

**Load Image:** Load the saved images of the calibration plates in different position and orientations relative to the vision system setup.

Lens Type: Option to select division, polynomial, tele-centric division & tele-centric polynomial

Calb Tab Type: Option to select based on the calibration size.

**Search:** Click the Search button where the software will automatically compute the distortion calculations basing on those saved images with the calibration plates in different position and orientations relative to the vision system setup.

**Save:** Data computed can be saved into a file with a desired path location and name. This file can be used when loaded into the distortion function of the calibration command.

### **Image Analysis**

#### Image Analysis



To extract the key information from the images to display as histogram or profile to allow user to analysis the image.

Histogram shows very gray value, the number of pixels which have a value. This tool is espcially usefull to check the saturation of the image.

For measuring using amplitude, a one dimensional gray profile is extracted. An edge is detected at a position where the gray value changes very quickily. This parameter is the minnimum amplitude gradient (the steepness) required to accept an edge.

### **Application Setting**

#### **Application Setting**

To configure the parameter for the Banner Vision Inspector software.

Project         Name       Perogram         Name       Destination       file (*viz)         PROG0       Viewer 1 <ul> <li>C:\ProgramData\Banner Engineering\BVI\Program\2</li> <li>PROG1</li> <li>Viewer 2</li> <li>C:\ProgramData\Banner Engineering\BVI\Program\2</li> </ul> PROG2     Viewer 3 <ul> <li>C:\ProgramData\Banner Engineering\BVI\Program\2</li> </ul> PROG2         Viewer 3 <ul> <li>C:\ProgramData\Banner Engineering\BVI\Program\2</li> </ul> PROG3         Viewer 4 <ul> <li>C:\ProgramData\Banner Engineering\BVI\Program\2</li> </ul> Viewer 1         PROG0 <ul> <li>Viewer 1</li> <li>PROG0</li> <li> </li></ul> Name         Source         IM         Total         OK         NG           Newer 1         PROG0 <ul> <li>Q</li> <li>Q</li></ul>	nment Ass	ignment2 Sys	tem	Communi	ication Contro	ILan Update I	User La
Name       Program         Name       Destination       file (*viz)         PROG0       Viewer 1       ▼       C:\ProgramData\Banner Engineering\BVI\Program\A         PROG1       Viewer 2       ▼       C:\ProgramData\Banner Engineering\BVI\Program\A         PROG2       Viewer 3       ▼       C:\ProgramData\Banner Engineering\BVI\Program\A         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\A         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\A         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\A         Viewer 1       PROG0       0       0       0         Viewer 2       PROG1       15       0       0       0         Viewer 3       PROG2       30       0       0       0       0         Viewer 4       PROG3       45       0       0       0       0       0				Pr	oject		
Program         Name       Destination       file (*viz)         PROG0       Viewer 1       C:\ProgramData\Banner Engineering\BVI\Program\G         PROG1       Viewer 2       C:\ProgramData\Banner Engineering\BVI\Program\G         PROG2       Viewer 3       C:\ProgramData\Banner Engineering\BVI\Program\G         PROG3       Viewer 4       C:\ProgramData\Banner Engineering\BVI\Program\G         PROG3       Viewer 4       C:\ProgramData\Banner Engineering\BVI\Program\G         Viewer 1       PROG0       C:\ProgramData\Banner Engineering\BVI\Program\G         Name       Source       IM       Total       OK       NG         Viewer 1       PROG0       Im       0       0       0         Viewer 2       PROG1       15       Im       0       0       0         Viewer 3       PROG2       30       Im       0       0       0         Viewer 4       PROG3       45       0       0       0       0	Name						
Name       Destination       file (*viz)         PROG0       Viewer 1       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG1       Viewer 2       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG2       Viewer 3       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         Viewer 1       PROG0       0       0         Viewer 2       PROG1       15       ▼       0       0         Viewer 3       PROG2       30       ▼       0       0       0         Viewer 4       PROG3       45       0       0       0       0				Pro	gram		
PROG0       Viewer 1       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG1       Viewer 2       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG2       Viewer 3       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         Viewer 1       PROG0       0       0       0         Viewer 2       PROG1       15       ▼       0       0       0         Viewer 3       PROG2       30       ▼       0       0       0       0         Viewer 4       PROG3       45       0       0       0       0       0	Name	Destinatio	n			file (*viz)	
PROG1       Viewer 2       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG2       Viewer 3       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         Viewer 1       PROG0       0       0         Viewer 2       PROG1       15       ▼       0       0         Viewer 3       PROG2       30       ▼       0       0       0         Viewer 4       PROG3       45       0       0       0       0	PROG0	Viewer 1	-	C:\Progra	amData\Banner	r Engineering\BVI	\Program\2
PROG2       Viewer 3       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\C         Name       Source       IM       Total       OK       NG         Viewer 1       PROG0       0       0       0       0       0         Viewer 2       PROG1       15       ▼       0       0       0       0         Viewer 3       PROG2       30       ▼       0	PROG1	Viewer 2	-	C:\Progra	amData\Banner	r Engineering\BVI	\Program\2
PROG3       Viewer 4       ▼       C:\ProgramData\Banner Engineering\BVI\Program\I         Viewer 1       Source       IM       Total       OK       NG         Name       Source       IM       Total       OK       NG         Viewer 1       PROG0       0       ▼       0       0       0         Viewer 2       PROG1       15       ▼       0       0       0         Viewer 3       PROG2       30       ▼       0       0       0         Viewer 4       PROG3       45       ▼       0       0       0	PROG2	Viewer 3	-	C:\Progra	amData\Banner	r Engineering\BVI	\Program\3
Viewer           Name         Source         IM         Total         OK         NG           Newer 1         PROG0         0         ▼         0 <td>PROG3</td> <td>Viewer 4</td> <td>-</td> <td>C:\Progra</td> <td>amData\Banner</td> <td>Engineering\BVI</td> <td>\Program\I</td>	PROG3	Viewer 4	-	C:\Progra	amData\Banner	Engineering\BVI	\Program\I
Mewer 1         PROG0         0          0         0         0         0           Viewer 2         PROG1         15          0         0         0         0           Viewer 3         PROG2         30          0         0         0         0           Viewer 4         PROG3         45          0         0         0         0				Vie	ewer		
Name         Source         IM         Iotal         OK         NG           Mewer 1         PROG0         0         ▼         0<				1.0			
Viewer 2         PROG1         15         •         0         0         0           Viewer 3         PROG2         30         •         0         0         0           Viewer 4         PROG3         45         •         0         0         0	Name	Source	_	Vie	Total	OK	NG
Viewer 3         PROG2         30         ▼         0         0         0           Viewer 4         PROG3         45         ▼         0         0         0	Name Viewer 1	Source PROG0	0		Total	OK 0	NG
Viewer 4 PROG3 45 🔻 0 0 0	Name Viewer 1 Viewer 2	Source PROG0 PROG1	0	M  M  ▼  ▼	Total 0 0	ОК 0 0	NG 0 0
	Name Viewer 1 Viewer 2 Viewer 3	Source PROG0 PROG1 PROG2	0 15 30		Total 0 0 0	ОК 0 0	NG 0 0
	Name Viewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0 0	ОК 0 0 0	NG 0 0 0
	Name Viewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0 0	ОК 0 0 0	NG 0 0 0
	Name Mewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0	OK 0 0 0	NG 0 0 0
	Name Viewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0	OK 0 0 0	NG 0 0 0
	Name Mewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0	OK 0 0 0	NG 0 0 0
	Name Mewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0	OK 0 0 0	NG 0 0
	Name Viewer 1 Viewer 2 Viewer 3 Viewer 4	Source PROG0 PROG1 PROG2 PROG3	0 15 30 45		Total 0 0 0 0	OK 0 0 0	NG 0 0 0

### Assignment

#### Assignment

To assign the viewer and inspection program for the Banner Vision Inspector software.





- > Destination is the program to display the inspection image & result to the respective viewer as defined in the selection provided.
- > PROG1 with the Destination selected as Viewer 2 highlighted green will has the image and result display on Viewer 2.
- > User is allowed to modify the inspection result and images basing on the destination selected.





- > User can modify the Viewer corresponding to the Image Memory (IM).
- > The default is where Viewer1 to IM0, Viewer2 to IM1, Viewer3 to IM2 etc.

### Mapping

#### Assignment 2

ssignment	Assignment2	System	Communication	ControlLan L	Jpdate User	Lan	4
Mapping							
IM	file	name (*d	at)	ScalX	ScalY	Clear	^
0				1	1		
1				1	1		
2				1	1		-
3				1	1		
4				1	1		Ľ
5				1	1		
6				1	1		
7				1	1		
8				1	1		
9				1	1		
10				1	1		
11				1	1		
12				1	1		
13				1	1		
14				1	1		
15				1	1		
16				1	1		
17				1	1		
18				1	1		
19				1	1		
20				1	1		
21				1	1		-

To load the pre-teached or saved mapping from different layer. The dat file is created by calibration mapping to see the <u>Configure</u> <u>Mapping</u> to show the more information on calibration mapping.

### System

#### System

To system parameter for the Banner Vision Inspector software.

🖇 Applicati	ion Setting						? ×
Assignment	Assignment2	System	Communication	ControlLan	Update	User	Lan
Program Setting							
Prog	gram Qty.	4	110				* *
Prog	gram Col.	50					Ť
View	wer Qty.	4					*
Au	to Run	0					-
Stop Ir	mmediately	1					-
То	ol Error	Debug					
Сус	le Time	Image o	apture + process				•
			Memory/ Mo	lbus			
Men	nory Qty.	60					-
He	х. Туре	Integer	(16 bits)				•
		15	System Set	ting			
D	ecimal	4					*
Res	ult Table	Show a	ll tool				
To	ol level	Expert					-
Cam	era Level	Beginne	er				-
C	Guide	0	1.1m1				*
Cu	stom UI	0	*				
			System Rep	oort			
Aut	Auto Save						÷,
					Apply		Close

#### **Program Setting:**

- > Program Qty.: To set the number of inspection program. (Max. 6)
- > Program Col.: Preset the number of inspection lines.
- Viewer Qty.: Number of the Viewer at the Process Menu (Max.9)
- > Auto Run: Automatically load the selected viz program after software is initialized.
- Stop Immediately: To stop process at once(1) or stop process after one cycle(0).
- > Tool Error: To ignore or stop immediately, when tool is error.
- > Cycle Time: Display timing for Image Capture + Image Processing or display timing for Image Processing

#### Memory / Modbus:

- > Memory Qty.: Number of memory assigned for saving value, point and string.
- > Hexadecimal. Type:
- Integer(16bit)
  - Integer(32bit)
  - Floating Point

#### System Setting:

> Decimal: To set the number of decimal points for tools result.

- > Result Table: Display the result at the Process Menu
  - Show all tools used in the inspection program at the Process menu
  - Tools that is PING to be shown at the Process menu.
- > Camera level: Display the camera parameters according to level.
- > Guide: Switch the software to guide mode.

➤ WUI: Not available.

#### System Report:

> System report: To save the log of the software events happening.

>User also can press F10 to open the dialog.

>User can monitor the system report to know the software events.

Syste	n Report	Clear	Save		x
Index	Time		Status	Message	*
0	2017_9_18_13	_59_21_580	Info	license type: DEMO	
1	2017_9_18_13	_59_22_707	Info	Camera status: Basler(GigE_USB3)	
2	2017_9_18_13	_59_22_707	Wam	Cannot found camera: acA2500-60um(22021431)	
3	2017_9_18_13	_59_22_817	Info	DIO status: Offline	
4	2017_9_18_13	_59_23_450	Info	EVD_AccessVariable.dl loading.	
5	2017_9_18_13	_59_23_531	Success	(ID:1006) EVO_AccessVariable.dll loaded	
6	2017_9_18_13	_59_23_532	Info	EVO_AdvanceFilter dll loading.	
7	2017_9_18_13	_59_23_641	Success	(ID:90007) EVO_AdvanceFitter dli loaded	
8	2017_9_18_13	_59_23_641	Info	EV0_ANDOR.dll loading.	

### Communication

#### Communication

To setup standard protocol Modbus, when choose system is Slave, the system cannot be Poll. Below is when user set system is Slave.



Serial: User can add the number of serial COM by changing the setting in this page as shown the above pictures.

Application Setting			? ×
Assignment Assignment2 System	Communication Cor	ntrolLan Update User	Lan 1
Slave			•
Serial TCP Viz buffer			
	TCP		
Enabled 1			÷
<b>O O</b>			
Port		TimeOut	
3000	10000		
		Apply	Close

TCP: User can add the number TCP ports by changing the setting in this page as shown the above pictures.

Application Setting			? ×
Assignment Assignment2	System Communication	ControlLan Update	User Lan
Slave	201. - 201.	n 11 00	•
Serial TCP Viz buffe	er 🛛		
Location	File N	ame	Clear
PROG0: 1060			
PROG0: 1061			
PROG0: 1062			
PROG0: 1063			
PROG0: 1064			
PROG1: 1065			
PROG1: 1066			
PROG1: 1067			
PROG1: 1068			
PROG1: 1069			
PROG2: 106A			
PROG2: 106B			
PROG2: 106C			
PROG2: 106D			
PROG2: 106E			
PROG3: 106F			
PROG3: 1070			
PROG3: 1071			
PROG3: 1072			
PROG3: 1073			
		Apply	Close

Viz Buffer: User can setup the viz program to use Modbus communication to change the program in this page as shown the above pictures.

Function	Location
Run	1000H(06)
Once	1001H(06)
Stop	1002H(06)
Load viz	1060H ~ program qty. (06/10)
Get memory	10D0H ~ memory qty. (06/10)
Set memory	10D0H ~ memory qty. (06/10)
Password	1003H(06)
Get Total count	1004H ~ 1009H(03)
Get Pass count	100AH ~ 100FH(03)
Get Fail count	1010H ~ 1015H(03)
Reset Results count	1016H ~ 101BH(06)
Reset Static	101CH (06)

Slave mode can support modbus protocal ASCII, RTU and TCP standard:

#### 1. Modbus\_ASCII:

#### Read 03:

Send:

	01	03	1010	0002	D۵	
	01	05	1010	0002	DA	
Head	Slave Address	Function	Starting Address	No. of Points	Error Check	

Feedback:

	01	00	0.1	0040	0045	D2	
	01	03	04	0010	0015	D8	CR CL
Head	Slave Address	Function	Byte Count	Data1	Data2	Error Check	

#### Write 06:

Send:

:	01	06	1000	0001	E8	CR CL
Head	Slave Address	Function	Starting Address	Data	Error Check	

Feedback:

:	01	06	1000	0001	E8	CR CL
Head	Slave Address	Function	Starting Address	Data	Error Check	

#### Write 10:

Send:

	01	10	1070	0002	04	0060	0015	F4	CR CL
Head	Slave	Function	Starting	No. of Registers	Byte	Data1	Data2	Error Check	
	Address		Address	rtegisters	Count				

Feedback:

:	01	10	1070	0002	6D	CR CL
Head	Slave Address	Function	Starting Address	No. of Registers	Error Check	

2. Modbus\_RTU:

#### Read 03:

Send:

N.A.	01	03	10D0	0001	8133	CR CL
Head	Slave Address	Function	Starting Address	No. of Points	Error Check	

#### Feedback:

N.A.	01	03	02	000C	4100	CR CL
Head	Slave Address	Function	Byte Count	Data1	Error Check	

#### Write 06:

Send:

N.A.	01	06	10D0	007B	CCD0	CR CL
Head	Slave Address	Function	Starting Address	Data	Error Check	
Feedback:

N.A.	01	06	10D0	007B	CCD0	CR CL
Head	Slave Address	Function	Starting Address	Data	Error Check	
11000	Clare / laal coo	1 dilotion	otarting / taar ooo	Bala		

#### Write 10:

Send:

N.A.	01	10	10D0	0002	04	007B	01C8	432C	CR CL
Head	Slave Address	Function	Starting Address	No. of Registers	Byte Count	Data1	Data2	Error Check	

Feedback:

N.A.	01	10	10D0	0002	44F1	CR CL
Head	Slave Address	Function	Starting Address	No. of Registers	Error Check	

#### 3. Modbus\_TCP:

#### Read 03:

Send:

00 00 00 00 00 06 01 03 10 D0 00 02

Feedback:

00 00 00 00 00 07 01 03 04 00 01 00 01

#### Write 06:

Send:

00 00 00 00 00 06 01 06 10 D0 00 00

Feedback:

00 00 00 00 00 06 01 06 10 D0 00

#### Write 10:

Send: 00 00 00 00 00 0B 01 10 10 D0 00 02 04 00 01 00 01 Feedback: 00 00 00 00 00 0B 01 10 10 D0 00 02

## ControlLan

#### ControlLan

This is a custom communication format used by Banner Vision Inspector to communicate where 3<sup>rd</sup> party software sends instruction via UDP or TCP.

🚯 Applicat	ion Setting						?	x
Assignment	Assignment2	System	Communication	ControlLan	Update	User	Lan	4
			TCP					
En	abled	0						-
	Port	4557						<b>÷</b>
			UDP					
En	abled	1						<b>_</b>
	Port	4660						÷
			DIO					
En	abled	0						÷.
			Protocol	1				
Bun			FIOLOCO					
Once Stop Tool Dialog Login Dialo Cam Setting I/O Dialog Application UI Setting I Info Dialog Load Progra Get Parame Set Parame Get Memory Get Total c Get Pass co	g Dialog am(*.viz) ster y value y value ount ount		Syntax					
					Apply		Close	•

Function	Protocol	Example		
Run	001	001		
Once	002	002		
Stop	003	003		
Dialog	004; <programname>;<toolname></toolname></programname>	004;PROG1;DataCode		
Login	005	005		
Camera setting	006	006		
IO setting DIO	007	007		
App setting	008	008		
Info	009	009		
Load viz	011; <programname>;<folder\viz's name=""></folder\viz's></programname>	011;PROG1;C:\ProgramData\Banner Engineering\BVI\Program\IC.viz		
Get parameter	012; <programname>;<toolname>;<parametername>;<type></type></parametername></toolname></programname>	012;PROG1;Width;NumofSide;long		
Set parameter	013; <programname>;<toolname>;<parametername>;<type>;<value></value></type></parametername></toolname></programname>	013;PROG1;Width;NumofSide;long;2		
Get memory	014; <index>;<type></type></index>	014;0;long		
Set memory	015; <index>;<type>;<value1>;<value2></value2></value1></type></index>	015;0;long;1		
Password	Not available	Not available		
Get total count	017; <programname></programname>	017;PROG1		
Get pass count	018; <programname></programname>	018;PROG1		
Get fail count	019; <programname></programname>	019;PROG1		
Reset result count	020; <programname></programname>	020;PROG1		
Reset static	021	021		
Get user level	022	022		
Camera status	023	023		
Save all program	024	024		
Mapping	027	027		
LiveCam	030	030		
Load vpj	031; <folder\vpj's name=""></folder\vpj's>	031;C:\ProgramData\Banner Engineering\BVI \Program\2D DataCode.vpj		
Lighting setting	032	032		
Ping	999	999		

: Main PROG name

: Tool name

: Parameter name

: long, double, string, point

### Update

#### Update



New added applications or informations for the new version Banner Vision Inspector will be stated and explained here.

## User

#### User

🔇 Applicati	on Setting						? X
Assignment	Assignment2	System	Communication	ControlLan	Update	User	Lan 1
Change Pa	ssword	Show cha	aracters				
					Apply		Close

Administrator can authorise to enable or disable the application functions.

## Language

#### Language

Allow user to change the language type for the software.

Opplication Setting	? X
Assignment2 System Communication ControlLan Update User Lang	juage 🔹 🕨
Current language -> English	
Option	
English	
简体中文	
繁體中文	
Apply	Close

### **Inspection Tools/Command**

#### **Inspection Tools/Command**

This chapter provides detailed information of the graphical user interface of the inbuild commands/inspection tools.



## Image

Topic on Camera Control, Capture, Load and Save Image.

### **Camera Control**

## Camera Control

?
Camera Control
Camera
[0] Empty
dynamic parameter setting     Parameter
Name
Value 0
OK Cancel

#### The Camera Control command is used to change the parameter of channealled camera directly.

Camera: To determine which camera is channelled to this camera control command.

**Dynamic parameter setting:** Refer to the process of choosing and load a complete parameter file anywhere in the computer. **Parameter** 

- Name: Name the shutter paratemer with your own reference
- Value: Set the value for the shutter parameter

### Capture

## Capture

Ca	pture In	nage
Camera		
[0] Empty		
[0]Same with o	camera setting	

#### The Capture command is used for capture images from the camera.

**Camera:** Camera index to determine which camera is channelled to this image capturing command. It will capture an image with the selected cameras at the Hardware Configurator software.

#### Capture mode:

- [0] Same with camera setting: The camera will follow the capture mode with camera setting.
- [1] free run: To force the camera to free run mode.
- [2] Asynchronus: To force the camera to Asynchronus mode.
- [3] Hardware Trigger: To force the camera to Hardware Trigger mode.

### Load

## 회 Load

<b>®</b>	? <b>×</b>
	Load
Option	File
Cyclic	
	OK Cancel

#### The Load command is used to load images from the desired directory to allow offline testing purposes.

#### **Option:**

- **Fixed:** When choosing this option, a name and storage location of an image can be assigned by the file selection button.
- > Cyclic: When choosing this option, the entire selected folder of the location is activated. All images in the selected folder are loaded sequential.

File: Displays of the current file location and name.

### SaveImage

## 🗊 Savelmage



#### The SaveImage command is used to save the current acquired images into a desired directory in bmp or jpeg format.

#### **Option:**

- Fixed: When choosing this option, a name and storage location of an image can be saved and assigned by the file selection button.
- > Cyclic: When choosing this option, all images are saved in the selected folder in sequential.
- > **Pickup:** Able to save the file name basing on the inspection result.
- > File Name / Pickup: To pick up the inspection result and save the image file name basing on the pick-up result.

#### Cyclic type:

- Timestamp: To save the images according to the filename\_date\_time. E.g.: Test\_2017\_7\_6\_14\_31\_14\_684. Need to select the Cyclic option for his feature, enter a name under the File Name text and specific/open a folder name for saving the images.
- Counter: To save the images according to the internal counter. E.g.: Test\_00001. Need to select the Cyclic option for his feature, enter a name under the File Name text and specific/open a folder name for saving the images.

#### Setting:

- > Folder name: Displays of the current file location and name.
- > Bmp/Jpeg: Image format to be saved. (bmp is original image size where else jpeg is compressed image)
- > With Overlay: To save the images with overlay used in the inspection program created.
- > Check disk space: Enable / disable check disk space function.

## Calibration

Topic on Locate, Distortion and Mapping.

### Locate

Discrete

0	? <mark>×</mark>
Cali	bration
Туре	Rotational direction
Point - Angle	Ounter-Clockwise
2 Points	Clockwise
<ul> <li>Single</li> <li>Array</li> <li>New origin</li> </ul>	Pickup
Rotation	
	Pickup
	OK Cancel

The Locate command is used for position tracking in X and Y direction as well as rotation position.

#### Type:

- > **Point-Angle:** Based on a point and an angle to locate the object position.
- > 2 Points: Based on 2 points to locate the object position.

Single: Only pick up one coordinate result.

**Array:** Pick up an array coordinate result within a command. The particular command usually will find at 2 or more coordinate result, e.g. Matching or Count Object command. This array option is selected when using the looping concept in the viz program.

**New Origin:** A new origin of the X & Y can be defined. The X & Y coordinates are updated with a completely new starting point of the coordinate system basing on the new reference origin from the image.

**Rotation:** With this option, a new coordinate origin is defined with turning position traced by an angle with respect to the selected reference.

**Pickup:** The Pickup refers to the process of choosing the result value generated by a command / function anywhere in the inspection program. The Pickup is a global data structure which uses the result values of the different commands into their position and stores them. This allows the user to have a specific access to the result and is not dependent on any possible shifts in the program.

Rotational direction: To set the rotational direction of the coordinate result.

## Distortion

Distortion



This Distortion command corrects image distortion which occurs either by perspective error or by the lens aberration of the lenses used.

## Mapping

Mapping

	Ma	pping	
Data			
Pick up		Manual	
			Select
File			
Pick up		Manual	
			Select
Image Size			
Pick up		Manual	
Width			Save
Height			Save
planar_analytic			•
Description [WorldCoordina WorldCoordina WorldCoordina WorldCoordina WorldCoordina	ate] te0_X=123.456 te0_Y=123.456 te1_X=123.456 te1_Y=123.456 4 data in order to gen	[ImageCoordina ImageCoordina ImageCoordina ImageCoordina ImageCoordina	ate] te0_X=123.456 te0_Y=123.456 te1_X=123.456 te1_Y=123.456
	Test	ОК	Cancel

The Mapping command uses a saved reference file on a projection map which describes the mapping conversion between the image plane and the measured plane in a world coordinate system.

### Control

Topic on Flow Control, Variable Access, ANDOR, Array Variable, CCS Control, Chart, Evaluation, Image Information, Sort String, Stop Watch, String Table, SubProgram and Table.

### **FlowControl**

### FlowControl

0		? <mark>×</mark>
Selection Set Mark Jump to Mark Loop End Program End Loop Set Result "OK" Set Result "NOK"	Flow Con Set up Mark Result © OK © NOK © Always	Reference Total Result
		OK Cancel

#### The Flow Control command provides several options to influence sequential flow of the inspection program.

#### **Selection:**

- Set Mark: Create a new node or mark in a viz program. A Mark is a unique label within the program where the mark name can be defined by user.
- Jump to Mark: A conditional jump to a pre-assign selected available Mark. Executes a conditional jump to a selected mark basing on the inspection tools result.
- Jump to Mark (OK): Jump to selected Mark if reference result is OK. Jump accordingly basing on the total result of the commands used or based on the selected command result.
- Jump to Mark (NOK): Jump to selected Mark if reference result is NOK. Jump accordingly basing on the total result of the commands used or based on the selected command result.
- Loop: Perform a loop with a defined number of cycles at the selected mark before proceeding to next command or action. Able to the set the number of looping manually under the Times textbox or loop the number of times basing on the pick up from the memory (result).
- > End Program: Define termination point of an inspection program. Program will start again at the beginning.
- > End Loop: Define a loop termination point of a mark. Program will start again after the looping process is completed.
- > Set Result OK/NOK: To allow the user to set/force the viz program to be inspection result.

### **Variable Access**

The Variable Access command deals with the system variable like in a programming language with the instruction to access the variable. It is able to establish and save variables and read them or calculate with them. These variables are stored in registers which are available for commands or functions to be used.

**Create:** A variable of the selected type of variable will be created. The user can define the variable name and select the variable type (value, point, line, string). It also has an option to create a static variable.

0		? 🗾 🏹
Options  Create  Put value into variable  Put pickup into variable  Arithmetic  Put value into memory  Put memory into value	type Value Point Line String	Access Pickup Variable PICKUP Pickup Result PICKUP
© Options	ariable	OK Cancel ? × Access
<ul> <li>Create</li> <li>Put value into variable</li> <li>Put pickup into variable</li> <li>Arithmetic</li> <li>Put value into memory</li> <li>Put memory into value</li> </ul>	type Value Point	Value Addition Value Manual Element1 PICKUP Manual Element2 PICKUP Save in variable
		OK Cancel

Put value into variable: Defined value, point, line or string to be input into the variable created.

Put pickup into variable: Selected the command result (value, point, line, string) to be input into the variable created.

#### Arithmetic:

- > Allow user to do Addition, Subtraction, Multiplication, Division basing on the result: value or point
- Value: To manually enter the value to do mathematically calculation after checking the manual option or pick up the particular command result.
- Point: To manually enter the point to do mathematically calculation after checking the manual option or pick up the particular command result.
- > Save in variable: To save the calculated value or point as reference to be used in the viz program.

0	? 🗾 🗙
Options  Create  Put value into variable  Arithmetic  Put value into memory  Put value into memory  Put memory into value	ariable Access Index  Type Long  Value  from pickup list  wait status  clear after take
	OK Cancel
Options Create Put value into variable Put pickup into variable Arithmetic Put value into memory Put memory into value	Index 0
	wait status clear after take

#### Put value into memory:

- > Index: To save the parameter (Long, Double, string, Point) into the memory location of a selected command.
- **From Pickup list:** To select the desired result to save into the memory.
- > Wait Status: When this option is checked, it will wait until the specific memory is cleared before it saves the new data in.

#### Put memory into value:

- > Index: To get the parameter (Long, Double, string, Point) from the selected memory location and input into a value.
- **Type:** To set the format type of value after getting from memory.
- Clear after take: To clear the memory index after getting the result, to allow the next parameter to save into the memory index.

## AND / OR

AND / OR ٠. AND / OR Pickup Example Syntax Pickup<pickup info> 6;25950;3;TotalRes Select AND, OR, NAnd, NOr 1 ٨ Output Data Pickup<6;2095;0;TotalRes> AND Pickup<6;25950;3;TotalRes> Syntax 1 Test ОК Cancel Hide Syntax

The AND / OR command is a basic scripting to set "and" & "or" condition for different commands result.

**Pickup:** To select the particular command result. The syntax will be shown after selecting.

**Syntax:** Manually enter "Pickup" with "< >" and then copy the syntax from the pickup textbox and paste between the "< >" as shown in the above picture.

### **Array Variable**

## Array Variable

Options  Create  Put value into variable  Put pickup into variable  Put value into memory  Put memory into value	Point   Option   Static variable
	OK Cancel

The Array Variable command is used to collect a group of data structure which consisting of elements (values or variables).

The Array Variable command deals with the system variable like in a programming language with the instruction to access the variable. It is able to establish and save variables and read them or calculate with them. These variables are stored in registers which are available for commands or functions to be used.

**Create:** An array variable of the selected type of variable will be created. The user can define the variable name and select the variable type (value, point, line). It also has an option to create a static variable.

Put value into variable: Write a fixed value/point/line and place into a selected pickup array variable.

Put pickup into variable: Select a pickup value/point/line and place into a selected pickup array variable.

Put value into memory: Select a pickup array variable and place into a selected memory index.

Put memory into value: Select a memory index and range to pickup.

Pick value by index: Select a value/point by index from a pickup array variable. This function can be used for looping.

## **CCS** Control

CCS Control

?
CCS Control
Light intensity 👻
Setting
Channel 1 🔹
128
OK Cancel

This CCS Control application command to control the lightning.

**Setting:** Adjust the light intensity from 0 to 255 (dark to bright), able to select the lightning mode and turn on and off of the light.

## Chart

**d** Chart

٥	?
	Chart
Chart Name	
Chart ID	
0 Chart Data	
	PICKUP
	OK Cancel

Chart command to create a chart for the program.

**Chart Nama:** Enter the desired name for the chart.

Chart ID: Set the ID for chart.

**Chart Data:** Pickup the parameter data from program for the chart.

## **Evaluation**

Evaluation     Result to be compare     Tolerance     OK     Cancel     OK <td< th=""><th></th><th></th><th>•</th><th></th><th></th></td<>			•		
Result to be compare Tolerance / Reference    Check for long Check for double Check for string  Array PICKUP OK Cancel Nominal Value +  0.0000  10000.	Evaluation			<b>Evaluation</b>	
Check for long Check for double Check for string Array PICKUP PICKUP OK Cancel OK Canc	Result to be compare Tolerance / Reference		Result to be compare	Tolerance / Reference	
OK       Cancel       OK       Cancel         Image: Conceler of the second sec	<ul> <li>Check for long</li> <li>Check for double</li> <li>Check for</li>     &lt;</ul>	r string PickUp	Tolerance Nominal Value	+ 10000.0000	- 10000.0000 定
Evaluation         Result to be compare       Tolerance / Reference         Sytax : (*=Num;^=Any;#=Char)         Tolerance         Reference string () manual () from pickup         Pick Up	ОК	Cancel		ОК	Cancel
Sytax : (*=Num;^=Any;#=Char) Tolerance Reference string  manual  from pickup  PickUp	Evaluation Result to be compare Tolerance / Reference				
Reference string  manual  from pickup  PickUp	Sytax : (*=Num;^=Any;#=Char) Tolerance				
	Reference string () manual () from pickup	PickUp			

The Evaluation command is to compare the result (long, double or string) of a command with desired reference or tolerance range.

#### Result to be compare:

**Pickup:** To select the particular command result; long, double or string to be compared.

#### **Tolerance / Reference:**

**Nominal value:** Manually enter the value in long or double to be compared with the pickup result. State conditional acceptance of the inspected result.

Reference string: Manually enter the string or picked reference string to be compared with the pickup result.

### **Image Information**

Mage Information

Image Information           ROI         Setting         Tolerance	Image Information           ROI         Setting         Tolerance
Complete         Configuration         Circle         Rectangle         Load Mask	Mode   Average   Gray Value   Deviation   Image   Format     Highlight     Test     OK   Cancel
ROI Setting Tolerance Mode Information Average Gray Value	ROI Setting Tolerance
ROI Setting   Mode   Mode   Average   Gray Value   Deviation   Only Apply to Complete Image	ROI Setting Tolerance

The Image Information command is to determine or computed the various image information of that image.

#### ROI:

To set the region of interest of this command.

#### <u>Setting:</u>

#### Mode:

> Average Gray Value:

Deviation:

> Image Format:

**Tolerance:** Manually enter the value in long or double to be compared with the result. State conditional acceptance of the inspected result.

## **Sort String**

Sort String

•	? ×
So	rtString
Source String	
Compare String	PICKUP
Separator	PICKUP
	OK Cancel

The Sort String command is used for sorting a data in a string.

Source String: Select the source of the string of data.

**Compare String:** Select the string of data to compare.

**Separator:** Define the separator character used in the string of data.

## **StopWatch**

1

0	? <mark>×</mark>
Stop	watch
Mode	Pickup
Wait for time	ms 🔲 us
Wait for key	
Timestamp	
Reset timer	0
Read timer	
Counter	
C	K Cancel

Stop Watch command allows a fixed defined waiting duration or condition to wait for an action from the operator.

#### Mode:

- > Wait for time: The execution of the program stops for a defined waiting duration with value in milliseconds.
- > Wait for key: The execution of the program stops until the user pushes a button on the keyboard.
- **Timestamp:** To get the CPU's date\_time (e.g. 2017\_7\_6-17\_4\_38\_193). To allow delay by day or month.
- > Reset timer: To reset timer.
- > Read timer: To get how many time from reset timer to read timer.

## **String Table**

String Table

?
String Table
Table Name
Table ID
0
Table Data
Value Name
[count]
OK Cancel

This String Table command creates a Table for program with string data.

Table name: Enter the desired name for the table.

Table ID: Set the table ID.

**Table data:** Pickup the parameter data for table.

**Clear table:** Enable the table to be cleared.

Value Name: Enter the desired value name for table.

**Pickup:** Pickup the string data for table.

## SubProgram

\_

SubProgram							
٢	2						
	SubProgram						
	File Name						
	Load						
	OK Cancel						

SubProgram application is command to Load Program in a new program.

### Table

🔳 Table

Ch	art
Chart Name	
Chart ID	
0	* *
Chart Data	
	PICKUP

This Table application command to create a Table for program.

Table name: Enter the desired name for the table.

Table ID: Set the table ID.

**Table data:** Pickup the parameter data for table.

## Communication

Topic on Digital Output/Input, AutoCOM, Script, String Control, ControlLan Send, Ini Access, Mitsubishi, Modbus COM and Text.

### SetOutput

### SetOutput

۲	-	? <mark>×</mark>
	Set Out	out
Setup Line	0	Result
State	0	
Pulse	0 🚔 ms	
	ОК	Cancel

#### All digital I/O output connected to the system are able to be activated.

#### Setup:

- > Line: Select a output index (addressed by 0...N-1 when N-1 is the total number of outputs).
- **State:** Setting the output to the target condition (e.g. High=1 & Low=0).
- > **Pulse:** Set the output ON for the duration set.

#### **Result:**

- **Result (OK):** Output will be set if the total result is OK (for good part).
- > Result (NOK): Output will be set if the total result is NOK (for NG part).

## ReadInput

📀 🔹 🔁				
Read Input				
Setup Line 0 🔿 State 0 🔿				
Mode ievel-triggered				
OK Cancel				

A digital I/O input is checked for the expected condition. The I/O input can be accessed by the line index.

#### Setup:

- > Line: Select a sequential input index (beginning with 0 for the first I/O input).
- > State: Comparing the input with the target I/O condition (e.g. High=1 & Low=0).

#### Mode:

- > Level-triggered: When selected, the I/O announces if the target condition is reached.
- > Wait for state: When selected, the I/O announces if the signal changes from the current condition to the target condition.

### **AutoCom**



)				- 0	X
	Aut	oCorr			
Start of Text	(HEX)				
Separator (H	EX)				
End of Text (	HEX)				
Setting Show + fo Fix Length Data Mode Output Data Output Data String Hex	r positive value 8 Lengt Output Interfer ( 7ype	h (include + (Data)	-/- and de	ecimal)	
Data No.	PickU	p			
				Long Pickup Delete	
	Test	ОК		Can	cel

The AutoCom command allows to append multiple data into user preference order and format

#### Start of Text (HEX):

> HEX code which will be append on the start of the data. Separator (HEX):

HEX code which will be append to separate the data. End of Text (HEX):

> HEX code which will be append on the end of the data.

#### Setting:

- > Show + for positive value : Append additional + symbol for positive value.
- > Fix Length : Fix each output data into same length which included +/- symbol.

#### **Data Mode:**

- > Converting the Pickup data into the format.

#### **Output Data Type:**

> String: Data output in string type of pickup (consist of alphabet, numbers, symbols and special characters).

> Hex: Data output in Hex code.

#### Data:

> Long: Pickup Long type of data.

- > **Double:** Pickup Double type of data.
- > Point: Pickup Point type of data.
- > Total Result: Pickup Total Result type of data.
- > Long Array: Pickup Long Array type of data.
- > **Double Array:** Pickup Double Array type of data.
- > Point Array: Pickup Point Array type of data.

### Script

**Script** 

0				
		Script		
Pickup Long		Output Type Select  Select	Long Double	Point
Output Data				~
Syntax				
				Ŧ
	Test	ОК	Cancel	Show Syntax

#### The Communication command allows simple calculation, scripting or special data arrangements.

#### Pickup:

- > Pickup: Show pickup script of selected tool results.
- > **Select:** Pop-up pickup list window for selection.

#### **Output Type:**

- > String: Data output in string type of pickup (consist of alphabet, numbers, symbols and special characters).
- Long: Data output in long type of pickup (numbers only without decimals).
- > **Double:** Data output in double type of pickup (numbers only with decimals).
- > Point: Data output in point type with X & Y coordinates of pickup (numbers only with decimals).

#### **Output Data (Window):**

> **Output Data:** Show final scripting or calculation results.

#### Syntax (Window):

> Syntax: Allow scripting text, syntax and calculations.

#### Show Syntax:

> Show Syntax: Display sample and syntax available for scripting / calculations as shown below.
| 0                |        |  | -   ¤   ×  |
|------------------|--------|--|--|
|                  | Scrip  | ot   |  |
| Pickup<br>Long 👻 | Select | Output Type<br>String O Long O Double O Poi  | int  |
| Output Data      |        | Example Syntax<br>Pickup < pickup info><br>Str(Data, NumofDecimal, OutDataLen, FillChar, FillLoc) 0=<br>1=forwards<br>SinR(radian), SinD(degree), CosR(radian), CosD(degree),<br>TanD(degree), ASinr(radian), ASind(degree), ACosr(radian<br>ACosd(degree), ATanr(radian), ATand(degree),<br>abs(value), Getstr(StringArr, StringFind), Sqrt(value),<br>SQR(value), TrimL(Data, length), TrimR(Data, length),<br>Plus(value), TrimL(Data, length), TrimR(Data, length),<br>Plus(value), TrimL(Data, length), TrimR(Data, length),<br>Plus(value1, valueN), Minus(value1,valueN), Mult(valu<br>Divide(value1, value2), Pow(value1, value2), RTrim(Data, Co<br>Min(value1, value2valueN), Max(value1, value2value<br>Avg(value1, value2valueN), LTrim(Data,CutLen),<br>Sort(Data,[Spl Data   Spl Array   SortDir   DataType   Dat])<br>0=Asc,1=Desc,0=V,1=P, 0=X,1=Y<br>Repl(Data^ Symbol to be replace^ Replace Symbol)<br>Floor(value), Time(), ConvSensoPart(Data), Len(Data) | =backwards,<br>TanR(radian),<br>n),<br>ue1, valueN),<br>I(value),<br>CutLen)<br>ieN),<br>) |
| Tes              | t OK   | Cancel   | e Syntax   |

#### Example Syntax:

Pickup of single data

Syntax (commands)	Examples	Results
Pickup<>	Pickup<01,00,Number_Of_Object,(LONG),>	2

- "01,00,Number\_Of\_Object,(LONG)," is script from selected pickup list (single data) tool.

Pickup of array data

Syntax (commands)	Examples	Results
PickArray<>	PickArray<01,00,CenterPoint,(PointARRAY), [a b 3]> <u>Original:</u> 134.4124/80.0751, 197.1047/125.4446,	<u>Final:</u> 134.412 <mark>a</mark> 80.075b 197.104 <mark>a</mark> 125.444b

- "01,00,CenterPoint,(PointARRAY), [a|b|3]" is script from selected pickup list (array data) tool;
- "a" is separator between single data;
- "b" is separator between array data;
- "3" is number of decimals.

Convert to string data

Syntax (commands)	Examples	Results
Str()	Str(Pickup,3,10,x,0) Original: 148,1283	<u>Final:</u> 148.128xxx

- "Pickup" is data script pickup;
- "3" is number of decimals; -
- "10" is total string length;
- "x" is fill character if data length is insufficient;
  "0" is fill characters after the string (whereas "1" is fill characters before the string).

Trigonometric functions (Part 1 of 4)

Syntax (commands)	Examples	Results
SinR()	SinR(10)	-0.544021
CosR()	CosR(10)	-0.839072
TanR()	TanR( <mark>10</mark> )	0.648361

- Trigonometric function where "10" is angle in Radians.

Trigonometric functions (Part 2 of 4)

Syntax (commands)	Examples	Results
SinD()	SinD(20)	0.342020
CosD()	CosD(20)	0.939693
TanD()	TanD( <mark>20</mark> )	0.363970

- Trigonometric function where "20" is angle in Degrees.

Trigonometric functions (Part 3 of 4)

Syntax (commands)	Examples	Results
ASinr()	ASinr( <mark>0.1</mark> )	0.100167
ACosr()	ACosr( <mark>0.1</mark> )	1.470629
ATanr()	ATanr(0.1)	0.099669

- Inverse trigonometric function where "0.1" is Radians value.

Trigonometric functions (Part 4 of 4)

Syntax (commands)	Examples	Results
ASind()	ASind(30)	0.551069
ACosd()	ACosr( <mark>30</mark> )	1.019727
ATand()	ATanr( <mark>30</mark> )	0.482348

Inverse trigonometric function where "30" is Degrees value.

Convert value to positive number (absolute)

Syntax (commands)	Examples	Results
abs()	abs(- <mark>5</mark> )	5.000000

- "-5" is value before conversion.

Extract specific string data from selected string array

Syntax (commands)	Examples	Results
Getstr()	Getstr(PickArray,12345)	

- "01,00,Decoded Code,(STRINGARRAY)" is value before conversion.

Mathematics calculations (Part 1 of 7)

Syntax (commands)	Examples	Results
Sqrt()	Sqrt(9)	3.000000
SQR()	SQR(5)	25.000000

- "9" is value before square root,
- "5" is value before square.

Mathematics calculations (Part 2 of 7)

Syntax (commands)	Examples	Results
Plus()	Plus(2,2,2)	6.000000
Minus()	Minus(3,3,3)	-3.000000
Mult()	Mult(4,4,4)	64.000000
Divide()	Divide(5,5,5)	0.200000

- "2" is value before addition,

- "3" is value before subtraction,

- "4" is value before multiplication,

- "5" is value before division.

#### Mathematics calculations (Part 3 of 7)

Syntax (commands)	Examples	Results				
Round()	Round(6.789)	7.000000				
Floor()	Floor(123.987)	123.000000				

- "6.789" is value before rounding Up to whole number,

- "123.987" is value before rounding Down to whole number.

#### Mathematics calculations (Part 4 of 7)

Syntax (commands)	Examples	Results
Rad()	Rad(10)	0.174533
Deg()	Deg( <mark>5</mark> )	286.479140

- "10" is angle in Degrees to be converted to Radians,

- "5" is angle in Radian to be converted to Degrees.

#### Mathematics calculations (Part 5 of 7)

Syntax (commands)	Examples	Results
Mod()	Mod(10,3)	1.000000

- Finds remainder after division between 2 values,

- "10" is main value to be divided,

- "3" is dividing value.

#### Mathematics calculations (Part 6 of 7)

Syntax (commands)	Examples	Results
Pow()	Pow(5,2)	25.000000

- Value to the power of function,

- "5" is main value,

- "2" is power function.

#### Mathematics calculations (Part 7 of 7)

Syntax (commands)	Examples	Results
Min()	Min(10,5,30,3)	3.000000
Max()	Max(10,5,30,3)	30.000000
Avg()	Avg(10,5,30,3)	12.000000

- Finds and return Minimum, Maximum or Average value,
- "10", "5", "30", "3" are value to be compare.

Time function

Syntax (commands)	Examples	Results
Time()	Time()	2017_04_06_ 12_33_03_82 4

- Returns current time in YYYY\_MM\_DD\_hh\_mm\_ss\_sss

Data trim

Syntax (commands)	Examples	Results
TrimL()	TrimL(abcde,4)	Abcd
TrimR()	TrimR(vwxyz,3)	Xyz
LTrim()	LTrim( <mark>fghij,2</mark> )	Hij
RTrim()	RTrim( <mark>qrstu,1</mark> )	Qrst

- "abcde" is data before trimming,

- "4" is length of data starting from Left after trimming,

- "vwxyz" is data before trimming,
- **"3**" is length of data starting from Right after trimming,
- "fghij" is data before trimming,
- "2" is length of data to trim from Left,
- "qrstu" is data before trimming,
- "1" is length of data to trim from Right.

Syntax (commands)	Examples	Results
Sort()	Sort(PickArray,[/ , 0 1 0]) <u>Original:</u> 107.1333/52.2228, 396.4163/80.1496, 212.4862/168.9366, 456.4062/257.5171, 135.8728/258.2039,	<u>Final:</u> 107.1333/52.2228, 135.8728/258.2039, 212.4862/168.9366, 396.4163/80.1496, 456.4062/257.5171,

- "PickArray" is data for sorting,
- "/" is splitting characters between data,
- "," is splitting characters between array,
- "0" is sorting by ascending (whereas "1" is sorting by descending),
- "1" represent data is Point type (whereas "0" represent data is Value type),
- "0" is sorting by X direction (whereas "1" is sorting by Y direction).

Data characters replace

Syntax (commands)	Examples	Results
	Repl(PickArray,/,x)	Final:
Repl()	Original:	107.3233 <mark>x</mark> 52. 0798,212.676



- "PickArray" is original data before replacement,
- "/" is character to be replaced,
- "x" is character replaced with.

Create special characters

Syntax (commands)	Examples	Results
Chr()	Chr( <mark>35</mark> )	#

- "35" is ASCII character decimal code as shown in table below.

<u>Dec</u>	H	Oct	Char	,	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	: Hx	Oct	Html Cl	<u>nr</u>
0	0	000	NUL	(null)	32	20	040	<b>∉#</b> 32;	Space	64	40	100	¢#64;	0	96	60	140	<b>`</b>	1
1	1	001	SOH	(start of heading)	33	21	041	<b>∉#</b> 33;	1.00	65	41	101	<b>A</b>	A	97	61	141	<b></b> ∉#97;	a
2	2	002	STX	(start of text)	34	22	042	<b>∝#34;</b>	"	66	42	102	B	в	98	62	142	<b>b</b>	b
3	3	003	ETX	(end of text)	35	23	043	<b>∝#35;</b>	#	67	43	103	C	С	99	63	143	<b>c</b>	С
4	4	004	EOT	(end of transmission)	36	24	044	<b>∝#</b> 36;	ę.	68	44	104	<b>∝#68;</b>	D	100	64	144	<b>∝#100;</b>	d
5	5	005	ENQ	(enquiry)	37	25	045	∝#37;	*	69	45	105	<b>∝#69;</b>	Ε	101	65	145	e	e
6	6	006	ACK	(acknowledge)	38	26	046	<b>∝#</b> 38;	6	70	46	106	<b>∝#70;</b>	F	102	66	146	<b>f</b>	f
- 7	7	007	BEL	(bell)	39	27	047	<b>∝#</b> 39;	1	71	47	107	G	G	103	67	147	<b>∝#103;</b>	g
8	8	010	BS	(backspace)	40	28	050	∝#40;	(	72	48	110	H	н	104	68	150	∝#104;	h
9	9	011	TAB	(horizontal tab)	41	29	051	<b>∝#41;</b>	)	73	49	111	<b>∉#73;</b>	I	105	69	151	<b>∝#105;</b>	i
10	A	012	LF	(NL line feed, new line)	42	2A	052	<b>‰#42;</b>	*	74	4A	112	¢#74;	J	106	6A	152	<b>∝#106;</b>	Ĵ.
11	В	013	VT	(vertical tab)	43	2B	053	+	+	75	4B	113	<b>∝#75;</b>	K	107	6B	153	<b>∝#107;</b>	k
12	С	014	FF	(NP form feed, new page)	44	2C	054	,	1	76	4C	114	& <b>#</b> 76;	L	108	6C	154	<b>∝#108;</b>	1
13	D	015	CR	(carriage return)	45	2D	055	∝#45;	- N	77	4D	115	M	М	109	6D	155	<b>∝#109;</b>	m
14	E	016	S0 -	(shift out)	46	2E	056	<b>∝#46</b> ;	$\mathbf{x}$	78	4E	116	<b></b> ∉78;	N	110	6E	156	<b>∝#110;</b>	n
15	F	017	SI	(shift in)	47	2F	057	∝#47;		79	4F	117	<b>∝#79;</b>	0	111	6F	157	o	0
16	10	020	DLE	(data link escape)	48	30	060	∝#48;	0	80	50	120	<b></b> ∉#80;	P	112	70	160	<b>∝#112;</b>	р
17	11	021	DC1	(device control 1)	49	31	061	¢#49;	1	81	51	121	<b>∝#81;</b>	Q	113	71	161	<b>∝#113;</b>	q
18	12	022	DC2	(device control 2)	50	32	062	<b>∝#50;</b>	2	82	52	122	<b>∝#</b> 82;	R	114	72	162	r	r
19	13	023	DC3	(device control 3)	51	33	063	& <b>#51;</b>	3	83	53	123	<b>∝#83;</b>	s	115	73	163	s	3
20	14	024	DC4	(device control 4)	52	34	064	<b>∝#52;</b>	4	84	54	124	<b></b> ∉#84;	Т	116	74	164	t	t
21	15	025	NAK	(negative acknowledge)	53	35	065	∝#53;	5	85	55	125	<b></b> ∉#85;	U	117	75	165	u	u
22	16	026	SYN	(synchronous idle)	54	36	066	∝#54;	6	86	56	126	<b>V</b>	V	118	76	166	<b>∝#118;</b>	v
23	17	027	ETB	(end of trans. block)	55	37	067	∝#55;	7	87	57	127	<b></b> ∉#87;	W	119	77	167	w	W
24	18	030	CAN	(cancel)	56	38	070	<b>∝#56;</b>	8	88	58	130	<b>X</b>	Х	120	78	170	<b>∝#120;</b>	х
25	19	031	EM	(end of medium)	57	39	071	∝#57;	9	89	59	131	<b>Y</b>	Y	121	79	171	y	Y
26	1A	032	SUB	(substitute)	58	ЗA	072	<b>∝#58;</b>	:	90	5A	132	<b>Z</b>	Z	122	7A	172	<b>∝#122;</b>	z
27	1B	033	ESC	(escape)	59	ЗB	073	∝#59;	2	91	5B	133	[	[	123	7B	173	<b>∝#123;</b>	- {
28	1C	034	FS	(file separator)	60	ЗC	074	<b>∝#60;</b>	<	92	5C	134	<b></b> ∉#92;	1	124	7C	174	<b>∝#124;</b>	
29	1D	035	GS	(group separator)	61	ЗD	075	<b>∝#6l;</b>	=	93	5D	135	<b>∉#93</b> ;	1	125	7D	175	<b>∝#125;</b>	-}
30	lE	036	RS	(record separator)	62	ЗE	076	<b>∝#62;</b>	>	94	5E	136	<b></b> ∉#94;	^	126	7E	176	<b>∝#126;</b>	~
31	lF	037	US	(unit separator)	63	ЗF	077	<b>∝#63;</b>	2	95	5F	137	<b></b> ∉#95;	_	127	7F	177	<b>∝#127;</b>	DEL

Source: www.LookupTables.com

reference: https://www.asciitable.com/

## **String Control**

## String Control

•	? <b>***</b>
	String Control
Initialization	Pickup from memory
Options	PickUp
Append	Setting
Send	Text
Receive	
	Single Value
	Multi-Value
	Markey States Frank St
Separator	Number of algits Empty fill
No	
	OK Cancel

The String Control command: Append feature allows to add value and string of a result to a new result.

**Pickup from memory:** To pickup the process of choosing the result value generated by a command anywhere in the viz program for adding more data like value or string accordingly.

#### Setting:

- **Text:** When this checkbox is enabled, it is for entering any text string to add to the result pickup from the memory.
- Single Value: When this checkbox is enabled, it is to pick up an inspected result of long, double or string to add to the result pickup from the memory.
- > Multi-Value: To pick up an array of values of a tool for appending purposes.

**Separator:** Space (" "); semicolon(";"), slash("/"); underscore("\_"); hyphen("-"); asterisk("\*"); comma(',"); point('.") will be included to separator data at end of each string.

Number of digits: number of characters to be input in this string.

Empty fill: the characters to be filled in this string accordingly. e.g. "X"

Forward/ Backward: To fill the enter character e.g. "X" at the start of the string or at the end of the string.

٠		and the second second	? ×
	9	tring Control	
		ang control	
	Pickup from m	emory	Picklin
Options	Cotting		Нокор
Send	Destination		
Receive	To File		
	RS232		
	O UDP		
	C TCP		
		Overwrite	
Separator	Decode		
No 👻	Type Integer	👻 Digits 16 bit 👻 Decimal 🛛	high 🔻
		OK	Cancel
			? <b>— X</b>
0			?
•	St	tring Control	?
Initialization	St	tring Control	?
Initialization     Options	Pickup from m	t <mark>ring Control</mark>	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> </ul>	Pickup from m Setting	t <mark>ring Control</mark> emory	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> </ul>	Pickup from m Setting Destination	t <mark>ring Control</mark> emory	? ×
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File	emory	? X
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232	emory	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232 UDP TCP	tring Control emory	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232 UDP TCP	emory	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232 UDP TCP	emory	? ×
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232 UDP TCP	emory	? ×
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232 UDP TCP	emory	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Pickup from m Setting Destination To File RS232 UDP TCP	emory	PickUp
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Setting Destination To File RS232 UDP TCP	emory	? ×
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Pickup from m Setting Destination To File RS232 UDP TCP	emory	? ×
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Pickup from m Setting Destination To File RS232 UDP TCP Decode	emory emory Overwrite	? X
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Pickup from m Setting Destination © To File © RS232 © UDP © TCP © TCP	emory emory Digits 16 bit Decimal 0	?
<ul> <li>Initialization</li> <li>Options</li> <li>Append</li> <li>Send</li> <li>Receive</li> </ul>	Pickup from m Setting Destination © To File © RS232 © UDP © TCP © TCP	emory emory  Digits 16 bit Decimal 0	? × PickUp

This String Control: Send/Receive command allows a global string buffer to be filled with a string which is then transferred/received to an indicated target or destination.

**Pickup from memory:** The Pickup refers to the process of choosing the result value generated by a command / function anywhere in the inspection program. The Pickup is a global data structure which uses the result values of the different commands into their position and stores them. This allows the user to have a specific access to the result and is not dependent on any possible shifts in the program.

#### **Destination:**

- **To File:** Save data string into a txt file with a desired path location with a file name.
- **RS232:** Data string will be transmitted via defined RS232 communication.
- > UDP or TCP: Data string will be transmitted via defined Ethernet using a defined port to an IP address with UDP or TCP. On the target system, the same port number has to be used for reading and sending.

**Separator:** Space (" "); semicolon(";"), slash("/"); underscore("\_"); hyphen("-"); asterisk("\*"); comma(',"); point('.") will be included to separator data at end of each string.

Decode:

This function is used by modbus protocal (Read Code 03)to decode feedback data to get the value.

- **>Type:** the modbus protocal value type.
- > Digits: the modbus protocal one of the data value is 16 or 32 bit.

**>Decimal:** the value decimal.

**Low/High:** the modbus protocal one of the data position.

### **ControlLan Send**

## ControlLan Send

0	?
	ControlLan Send
UDP	•
Text	
	PICKUP
	OK Cancel

#### This ControlLan Send command is to send data to PC or server by UDP/TCP protocol.

**Text:** Enter and include desired text to be displayed.

**Pickup:** Pickup refers to the process of choosing the result value generated by a command / function anywhere in the inspection program.

### Ini Access

Ini Acces	SS	
8	_	
	INI File	
	File	_
Write	<ul> <li>Load from Pickup</li> </ul>	Manual
Read		Select File
O Delete		
	Section	
	Load from Pickup	Manual
		Calaat
		Select
	Entry	
	Load from Pickup	Manual
		Select
	_ Data	
	<ul> <li>Load from Pickup</li> </ul>	Manual
		-
	Long	•
		Select

The Ini Access command has the options to write, read or delete the result of a command into desired ini file. This data can be read for in the program to be used within the inspection program.

## Mitsubishi

👬 Mitsubishi

)				
	Mitsubishi		Mitsubishi	
Data Connection		Data Conn	ection	
Code		Code		
Function	Read	Function	Write	•
Data Address	0	Data Addres	s	0
Data Type	D	Data Type		
Data quantity	1			
Setting		Setting		
Dete Marte Date				
Data Mode Outpu	t Interger (Data)	Data Mode     Number of	Output Interger (Data)	<b>▼</b>
<ul> <li>16 bits</li> </ul>	Integer	I6 bits	Integer	<b>▼</b>
32 bits		<ul> <li>32 bits</li> </ul>		
		Data		
		No.	PickUp	Long 👻
				Pickup
				Delete
	Test OK	Cancel	Test OK	Cancel
	Mitsubishi			
Data Connection	MILISOUNSIII			
Journa				
IP 127.0.0.1				
IP 127.0.0.1 Port 9001				
IP 127.0.0.1 Port 9001				
IP 127.0.0.1 Port 9001				
IP 127.0.0.1 Port 9001 Serial Enabled Setting Serial Port	COM 1			
IP 127.0.0.1 Port 9001 Serial Enabled Setting Serial Port BaudRate	COM 1 4800			
IP 127.0.0.1 Port 9001 Serial Enabled Setting Serial Port BaudRate Parity	COM 1 4800 none			
IP 127.0.0.1 Port 9001 Serial Enabled Setting Serial Port BaudRate Parity DataBits	COM 1 4800 none 8			
IP 127.0.0.1 Port 9001 Serial Enabled Setting Serial Port BaudRate Parity Data Bits FlowControl	COM 1 4800 none 8 none			

Test OK Cancel

The Mitsubish command (MC protocol, format 5) to allow two or more entities of a communication system to transmit data information via any kind of measurement.

#### Code:

➢ Function : Read (03) or Write (06 / 10).

#### Location:

- > Modbus Address : Data address on another side.
- > Slave Address : PLC location address on another side.
- > Data Quantity : Number of Data to be read. (Only for Read function)

#### **Data Mode:**

> Converting the Pickup data into the format.

#### **Output Data Type:**

- **RTU:** Data output in RTU protocol format.
- Ascii: Data output in Ascii protocol format.
- > Ethernet: Data output in Ethernet protocol format.

#### Number of bits:

- > 16 bit: Data output in 16 bit format.
- > 32 bit: Data output in 32 bit format.

#### Arrangement:

- > Low: Data output in Low High format.
- > High: Data output in High Low format.

#### Data:

- Long: Pickup Long type of data.
- Double: Pickup Double type of data.
- > **Point:** Pickup Point type of data.
- > Total Result: Pickup Total Result type of data.
- > Long Array: Pickup Long Array type of data.
- > **Double Array:** Pickup Double Array type of data.
- > Point Array: Pickup Point Array type of data.

#### **Connection:**

- > **TCP/IP:** To use TCP to send data.
- > Serial: To use Serial to send data.

### ModbusCom

ModbusCom

)		<u> </u>	×
ModBusCom		ModBusCom	
Code		Code	
Function Read (03)	<b></b>	Function Write (06 / 10)	•
Location		Location	
Modbus Address	0	Modbus Address	0
Slave Address	0	Slave Address	0
Data quantity	1		
Setting		Setting	
Data Mode Output Interger (Data * 100)	<b></b>	Data Mode Output Interger (Data * 100)	•
Output Data Type Number of bits		Output Data Type Number of bits	
RTU		RTU	
		Data	
		No. PickUp	Long 🔻
			Pickup
			Delete
Test OK	Cancel	Test OK	Cancel

The Modbus Com command to allow two or more entities of a communication system to transmit data information via any kind of measurement.

Code:

➢ Function : Read (03) or Write (06 / 10). Location:

- > Modbus Address : Data address on another side.
- > Slave Address : PLC location address on another side.
- > Data Quantity : Number of Data to be read. (Only for Read function)

#### Data Mode:

> Converting the Pickup data into the format.

#### **Output Data Type:**

- > **RTU:** Data output in RTU protocol format.
- > Ascii: Data output in Ascii protocol format.
- > Ethernet: Data output in Ethernet protocol format.

#### Number of bits:

- > 16 bit: Data output in 16 bit format.
- > 32 bit: Data output in 32 bit format.

#### Arrangement:

- > Low: Data output in Low High format.
- > High: Data output in High Low format.

#### Data:

- Long: Pickup Long type of data.
- > **Double:** Pickup Double type of data.
- > **Point:** Pickup Point type of data.
- > Total Result: Pickup Total Result type of data.
- > Long Array: Pickup Long Array type of data.

- Double Array: Pickup Double Array type of data.
- > **Point Array:** Pickup Point Array type of data.

### Text

## Text

?
Text
Text
PICKUP
Total Result 🔻 Pick Up
Point Font size
X 100 Y 100 Reset
Used World Coordinate
Color
Standard ○ Good ○ Bad
From result Pick Up
OK Cancel

#### Display a text overlay on the viewer image with text, points, values or string.

Text: Enter and include desired text to be displayed.

**Pickup:** The Pickup refers to the process of choosing the result value generated by a command / function anywhere in the inspection program. The Pickup is a global data structure which uses the result values of the different commands into their position and stores them. This allows the user to have a specific access to the result and is not dependent on any possible shifts in the program.

**Point:** The position / location of the text overlay which can be determined either by direct numerical entry or by mouse click on the position / location of the display viewer.

Font Size: Direct numerical input of the font size for the text overlay display.

Colour: Determine the colour condition of the text.

## Filter

Topic on Advanced Filter, Basic Filter, Fill Hole, Mask, PaintRegion, StitchingImage and Zoom.

### **Advanced Filter**

ROI Setting	AdvanceFilter	
Filter Type	Arithmetic	
<ul> <li>Addition</li> <li>Division</li> <li>Multiplication</li> <li>Subtraction</li> </ul>	G=(g1+g2)*Mult (-255 ~ 255) 0.5	2) 0 🚔

#### **Arithmetic Filter:**

**Addition:** Combine 2 images (add each other) or adding a constant grey value to an image. Added values will not be larger than 255.

**Division:** Combine 2 images (division by each other) or divide by a constant grey value to an image. Divided values will not be smaller than 0.

**Multiplication:** Combine 2 images (multiple by each other) or multiply by a constant grey value. Multiplied values will not be larger than 255.

**Subtraction:** Combine 2 images (subtract each other) or subtract by a constant grey value. Subtracted values will not be smaller than 0.

	A due nee Filter	
ROI Setting	Advancermen	
Filter Type	nsity	•
e Binary	One Threshold	•
<ul> <li>Invert</li> <li>Power Law</li> </ul>	Auto	
<ul> <li>Histo-Equalization</li> <li>Shading</li> </ul>		
	Threshold 128	
	Test OK Can	cel

#### Intensity Filter:

**Binary:** Binaries the image with the selected threshold value (selected threshold value will be replaced by 0 whereas the remaining will be replaced by 255).

**Invert:** Inverts the greyscale value of an image.

Power Law: Alter the image by encoding or decoding its gamma value.

Histo-Equalization: Contrast adjustment of the image histogram.

Shading Correction: To compensation non-uniform illumination or non-uniform camera sensitivity.

<u>ې</u>			
	A	dvanceFilter	
ROI Setting			
Filter Type Sp	atial		•
Sharpen	Expert		
Mean			
Median	Filter Size	3x3	-
Gauss			
	Test	ОК Са	ncel

#### **Spatial Filter:**

**Sharpen:** Enhances the contrast in the image by emphasizing high frequency areas of the image edges and corners, resulting sharper images appearance.

**Mean:** Smooths the image by averaging and carries out a linear smoothing with the grey value of the source image.

Median: Compute a median filter with various square or circular masks.

**Gauss:** Smooths the image using the discrete Gaussian function. The smoothing effect increases with increasing filter size.

	A	dvanc	eFilter		
ROI Setting					
Filter Type	Norphological				•
Erosion	Rectangle				•
Oilation	Expert				
Opening					
Closing	Size	3 x 3			-
TopHat Black					
TopHat White					
	Test		OK	Caraa	

#### **Morphological Filter:**

**Erosion:** Erode a region of an image or the complete image where it boundary gets smoothed and also reduced.

**Dilation:** Dilate a region of an image or the complete image where it boundary gets smoothed and also enlarged.

**Opening:** Combination of Erosion and Dilation filters. Denote dilation and erosion respectively.

**Closing:** Combination of Dilation and Erosion filters. Denote erosion and dilation respectively.

**Top Hat Black:** Extracts small black elements and details from the given image. This is used for feature extraction, background equalization and image enhancement.

**Top Hat White:** Extracts small white elements and details from the given image. This is used for feature extraction, background equalization and image enhancement.

٥			<b>— — ×</b>
	А	dvanceFilter	
ROI Setting			
Filter Type Edg	je		•
Sobel			
Robert	Filter type	X and Y	•
Canny			
Laplace	<b>5</b> 1 <b>0</b>	(-	
High Pass	Filter Size	3	<b></b>
	Test	OK Cancel	

#### Edge Filter:

**Sobel:** Detect and filter the edges (amplitude and direction) of the images.

Robert: Detect and filter the edges of the images.

**Canny:** Detect and filter the edges of the images.

Laplace: Calculate the Laplace operator by using finite differences.

High Pass: Extract high frequency components in an image by applying a linear filter.

AdvanceFilter         ROI       Setting         Filter Type       Extract         Threshold       Threshold
Filter Type     Extract       Image: Straight of the shold     Image: Straight of the shold
Threshold
Contour Circle  Highlight  Expert  Result  Target  Result  Target  Result  Target  Result  Target  Result  Target  Result  Target  Result  Comparison  Comparison
Test OK Cancel

#### Extract Filter:

Threshold: Extract the image region by the selected threshold areas / ranges.

**Contour:** Extract the image region by the contour of a reference object shape.

**Circle:** Extract the image region by a circular defined size and location.

٠		
ROI Setting	AdvanceFilter	
Filter Type       Other         Image: Mirror       Mirror         Rotate       Conversion         Copy Image Region       Region         Area Gray Value Define       Define	rs	•
	Test OK Cancel	

#### Others Filter:

**Mirror:** Mirror an image by its horizontal or vertical axis.

**Rotate:** Rotate an image based on a defined angle.

**Conversion:** Convert a RGB image to a greyscale image.

**Copy Image Region:** Copy a defined image region from the source image.

Area Grey Value Define: Define an image region with the desired grey value.

### **Basic Filter**

S. **BasicFilter** ۲  $\geq x$ ROI Setting Filter 1 Off Off Gauss Erosion Dilation Mean Median Range Mirror Rotate Inversion Off Filter 4 Off Ŧ Filter 5 Off Ŧ Test OK Cancel

The Basic Filter command allow up to 5 different filter combinations within a single command and 9 different filter types selection.

**Gauss:** Smooths the image using the discrete Gaussian function. The smoothing effect increases with increasing filter size.

Erosion: Erode a region of an image or the complete image where it boundary gets smoothed and also reduced.

**Dilation:** Dilate a region of an image or the complete image where it boundary gets smoothed and also enlarged.

Mean: Smooths the image by averaging and carries out a linear smoothing with the grey value of the source image.

Median: Compute a median filter with various square or circular masks.

Range: Perform highlighting and outlining contour edges.

Mirror: Mirror an image by its horizontal or vertical axis.

Rotate: Rotate an image based on a defined angle.

**Invert:** Inverts the greyscale value of an image.

### **Fill Hole**

📥 Fill Hole

<u> </u>	×
Fill Holes	
ROI Setting	
Threshold	
0 🚔	128 🌩
Highlight	
Area Filter	
○ Fill up	1000000(
Fill Color : 0	
Test OK	Cancel

The Fill Hole command is filled up the desired area with a desired colour basing on the threshold set.

Threshold: To define the image region by the selected threshold areas / ranges.

#### **Area Filter:**

- **Fill up:** To enable fill up hole feature basing on the search region.
- > Area: Define minimum and maximum area size of detected objects. Values outside this range will be ignored.

Fill Colour: To set the gray value to be filled up basing on the area enter.

### Masking

Mask x ۲ ROI Setting Reference C:\ProgramData\Banner Engineering\BVI\Image\Re S L Grab New Edit Threshold Edit Manual Threshold 0 🌲 255 ≑ Highlight Invert 0 🌲 Fill Color : ОК Cancel Test

The Mask command is a masking tool which uses a pre-configured area to be ignored during the inspection.

#### **Reference:**

- > Grab Reference: Define a teach reference image as masking reference.
- > Edit: Define areas within the teach reference image to be ignored during inspection.
- > L: Load a pre-configured teach reference image.
- > S: Save the current teach reference image.
- > **Invert**: To invert the masking reference result.
- > Fill Colour: To fill the desired grey value colour of the masking result.

### **Paint Region**

## Paint Region

Paint Region		Paint Regio	n
ROI Setting		ROI Setting	
TopLeft :	Pick up	Parameter	
TopRight :	Pick up	Offset Width	5.00 🚔
		Offset Height	5.00 🚔
BottomLeft :	Pick up	Over Paint Area	
BottomRight :	Pick up	Inner	
		Paint Threshold	128 卖
	Canad		Caract

The Paint Region command is a 4 sided masking tool which uses 4 pickup points to configured the area to be ignored during the inspection.

- > **TopLeft:** Define top left point of masking reference.
- > **TopRight:** Define top right point of masking reference.
- > **BottomLeft:** Define bottom left point of masking reference.
- > BottomRight: Define bottom right point of masking reference.

#### **Parameter:**

- > Offset Width: Define additional offset in masking width from the points obtained in ROI.
- > Offset Height: Define additional offset in masking height from the points obtained in ROI.
- > Inner / Outer: Define mask over inner or outer from ROI.
- > Paint Threshold: Define the threshold value to be used over the defined mask areas.

## StitchingImage

# StitchingImage

Stitching Image	Stitching Image
ROI Setting	ROI Setting
Image 1 Image 2 Complete	Image Memory Image Memory Image 2 1
	Manual Offset Pickup
Test OK Cancel	Test OK Cancel

This StitchingImage command to Stitch two images together into one image.

## Zoom

Q Zoom

8				
	Z	loom		
ROI Setting				
Dece of Castor	1			
Base on Factor				-
Base on Size				
ScaleX	10			
JOBICA	1.0			
ScaleY	1.0			
	Test	OK	Ca	ancel

This zoom command to zoom large the region of interest base on factor or base on size.

## Measurement

Topic on Angle, Area Check, Distance, Measurement and Width.

### Angle

Angle

OI S	etting Tolerance	ROI Setting To	
Line1 L	ine2	Line1 Line2	
Find New	Line	Edge Selection Uight -> Dark Dark -> Light	Result points First     Last
X1	100 Y1 200	Expert	
X2	200 Y2 200		
Width	50		
[	Reset	Determine     Ounterclockwise     Clockwise	Result +/- 180 0 - 360

#### The Angle command measures the angle of 2 straight lines formed by 2 rectangular probes.

Line 1 / Line 2: Define the parameters to detect each line and measures the angle accordingly.

Find New Line: Create new line using the defined parameter settings for measurement of the angle.

**Pickup:** The Pickup refers to the process of choosing the result value generated by a command / function anywhere in the inspection program. The Pickup is a global data structure which uses the result values of the different commands into their position and stores them. This allows the user to have a specific access to the result and is not dependent on any possible shifts in the program.

X / Y Axis: Measure angle with respect to the selected X / Y axis.

#### **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

#### **Result Points:**

- > First: First point of the extracted edge points is returned.
- > Last: Last point of the extracted edge points is returned.

#### **Expert:**

- > Denoise: Sigma of the Gaussian functions for smoothing.
- > Amplitude: Minimum edge amplitude changes between edges.
- > Number of point (>2): Define number of detected points to be used within the probe to improve processing time.

Determine: Determine the angle calculated via clockwise or counterclockwise.

**Result:** To choose the angle result range at +/- 180 or 0-360.

**Tolerance:** State conditional acceptance of the inspected result.

## **Area Check**

 Area Check

 R01
 Setting

 Tolerance

 Threshold

 Image: Setting Tolerance

 Image: Threshold

 Image: Threshold

The Area Check command measures a desired area basing on the threshold selected.

**Threshold:** To set the desired threshold to measure the area.

**Tolerance:** State conditional acceptance of the inspected result.

### Distance

#### Distance Type Setting Tolerance Туре Setting Tolerance Measurement Type Point to Point Point to Line Distance Type O Direct Point Axially parallel in X PickUp 📃 Array Axially parallel in Y Point 📃 Array 0; PickUp Test OK Cancel Test OK Cancel

The Distance command is to measure distance between 2 points or a point to a line that are detected using rectangular or circular probe.

#### **Measurement Type:**

- > Point to Point: Measure the distance between 2 selected points.
- > Point to Line: Measure the distance between a selected point and a selected line.

**Pickup:** The Pickup refers to the process of choosing the result value generated by a command / function anywhere in the inspection program. The Pickup is a global data structure which uses the result values of the different commands into their position and stores them. This allows the user to have a specific access to the result and is not dependent on any possible shifts in the program.

Array: To measure multi-points at a single command with multi points detect.

#### **Distance Type:**

- > **Direct:** Measure the shortest distance between the selected pickup.
- > Axially parallel in X/Y: Measure the distance with respect to the selected axis.

#### **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

Tolerance: State conditional acceptance of the inspected result.

### **Measurement**

### Measurement

Measurement	Measurement
ROI Setting Tolerance   From To   Rectangle   X1 100   Y2 200	ROI       Setting       Tolerance         From       To       Edge Select       Expert         Edge Selection       Edge Select       Expert         Ight -> Dark       Ight       First         Dark -> Light       Last         Best Fit Line       Result Point
Width 50	<ul> <li>Prist Middle Last</li> <li>Result Type</li> <li>Point -&gt; Point</li> <li>X Direction</li> <li>Y Direction</li> </ul>
Test OK Cancel	Test OK Cancel

The Measurement command is to measure distance between 2 points or a point to a line that are detected using rectangular probe.

#### **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

#### **Result Points:**

- > **Middle**: Middle point of the extracted edge points is returned.
- > First: First point of the extracted edge points is returned.
- > Last: Last point of the extracted edge points is returned.

#### **Edge Select:**

- > First: First point of the extracted edge points is returned.
- > Last: Last point of the extracted edge points is returned.
- > Best Fit Line: Option to form detected points into a straight line when selected.

#### **Expert:**

- > Sigma: Sigma of the Gaussian functions for smoothing.
- > Threshold: Minimum edge amplitude changes between edges.
- > Number of point (>2): Define number of detected points to be used within the probe to improve processing time.

#### **Result Type:**

- > Point to Point: Measure the distance basing on the 2 points detected.
- > X Direction: Measure the distance with respect to the X axis.
- > Y Direction: Measure the distance with respect to the Y axis.

### Width



Width	Width
R01 Setting Tolerance	ROI Setting Tolerance
Sigma (0.4 ~ 100)         2.5 ÷         Threshold (1 ~ 255)         20 ÷	Save Width Position Width + -
Edge Selection	Nominal Value : 0.0000 🖨 10000.00 🖨 10000.0 🤤
Light -> Dark	Save Pitch Position
Number of Side 1 Number of Pin 3	Pitch +
Width         30         Height         20         Gap         30.00         Image: Compared to the second	Save TiptoTip Position
Check Width 🔽 Check Tip to Tip 🔽 Check Pitch	Tip to Tip
Pitch Selection	Nominal Value : 0.0000 0 10000.00 10000.00
Test OK Cancel	Test OK Cancel

The Width command is to measure distance like width, pitch tip to tip of parts with regular distance apart. This tool is useful for measurement in the connectors industry.

Number of Side: To determine the number of side of the part to be measured. (max. 2 sides)

Number of Pin: To defined the number of pins to be measured of on each side.

Width: To determine the width of each ROI.

Height: To determine the height of each ROI.

Sigma: Sigma of the Gaussian functions for smoothing.

Threshold: Minimum edge amplitude changes between edges.

#### **Edge Selection:**

- Light -> Dark: The greyscale color for the object in demand is set to dark which is defined according to the arrow of the search region.
- Dark -> Light: The greyscale color for the object in demand is set to bright which is defined according to the arrow of the search region.

Check Width: To measure each width of the pins.

Check Tip to Tip: To measure each tip to tip distance of the pins.

Check Pitch: To measure each pitch of the pins.

Pitch Selection: Sigma of the Gaussian functions for smoothing.

> Edge or Center: To determine the edge width of the pin to pin of the or the center width of each pin.

Tolerance: State conditional acceptance of the inspected result.

╺╻╴╸	╫╫╠╫╢╢		Width
		ROI Setting	Tolerance
H		Sigma (0.4 ~ 100	)) 2.5 - Threshold (1 ~ 255) 20 -
		Edge Selection	
			:



Above picture is measuring the width of each pin.



Above picture is measuring the pitch of each pin either from the edge or center.

	ROI Setting Tolerance
	Sigma (0.4 ~ 100) 2.5 - Threshold (1 ~ 255) 20 -
	Edge Selection ○ Light -> Dark
CY7C4831	Number of Side     2 (a)     Number of Pin     16 (a)       Width     18 (b)     Height     28 (c)     Gap     19.04 (c)
-10AC 9719	Check Width 🗹 Check Tip to Tip 📄 Check Pitch
000932	a a
	379.9339 Test OK Cancel

Above picture is measuring the distance of each pin tip.
## CodeReader

Topic on Barcode, Datacode, OCR and OCV.

## Barcode

## Barcode

		x	©	
	Barcode		Barcode	
ROI Setting S	Sorting Backup		ROI Setting Sorting Backup	
Dade Code	- 1 - 1		Enable	
		-	Data	
<ul><li>All</li></ul>	Processing	•		Add
2/5 Industrial			No Pick Ip	Delete
2/5 Interleaved	Min. Element pixels $[1,0 \sim 64]$ : 2.0		Посор	
Code 39				
Code 93	Max. Element pixels [1.0 ~ 256] : 8.0			
Code 128	Element Orientation [-180 ~ 180] : 0			
💿 EAN - 8	Orientation Tolerance (0 ~ 90) : 90			
🔘 EAN - 13				
PhamaCode	Max. Number of Scanlines [0 1000] : 0			
	Min. Threshold [0.001 ~ 1.000] : 0.050			
Check Norm				
Check Code Leng	th :			
Code Content :				
Test	OK Cancel		Test OK Cance	
		×		
	Barcode			
ROI Setting S	forting    Backup			
Text				
Text (SendString)				
🔽 Display Text				

Test	ок	Cancel	

The Barcode command is used to decode barcodes. and generate results describing the barcode data.

**Code Type:** Define the barcode type for reading and decoding.

**Processing/Training:** Allow user to train the command based on the image's environment condition to improve the decoding speed.

	Min. Element pixels	Define minimal size of barcode elements.
	Max. Element pixels	Define maximal size of barcode elements.
Expert	Element Orientation	Define expected barcode orientation or rotation.
	Orientation	Define orientation / rotation tolerance of the
	Tolerance	element orientation.
	Max. Number of Scanlines	Define the number of detection lines for decoding.

### **Result:**

- > Check Code Length: Check the length of the decode barcode.
- > Code Content: Compare the decoded barcode with a defined reference.

Sorting: Enable to read the barcodes in desired arranggement.

### Text:

- > Text (SendString): Save decoded barcode results in result viewer.
- > **Display Text:** Display decoded result on image as overlay.

The idea of bar code reading is quite easy. You initialize the barcode tool and then execute it for reading bar codes. Within this, you specify the desired bar code type.

The result of the reading is a region that contains the bar code and the decoded string. No advanced experience in programming or image processing is required. Bar code reading can be sped up by using a region of interest. The more the region in which the code is searched can be restricted, the faster and more robust the search will be.

## Datacode

Datacode

O		
ROI Setting Display & Backup		
Codetype DMC QR Micro QR Micro QR	T	X
Expert Setting		Datacode         ROI       Setting       Display & Backup         Result       Image: Construct of the second string of the second
Setting       Image: Setting	c Time 🛛	Not found string : Not Found
Test OK	Cancel	Test OK Cancel

The Datacode command currently supports Data Matrix (ECC200), QR Code and PDF417, and it is able to read multiple codes of the same type within a single image. apart from reading the ecoded data, it can alos provide geometric features and feedback for process control.

Note: Possible reasons why a symbol might not be detected at all include severely damaged or distorted finder patterns, inadequate quiet zones around the symbol or strong curvature of the surface.

Code Type: Define the 2D code type for reading and decoding with option of DMC, QR & Micro QR.

**Processing/Training:** Allow user to train the command based on the image's environment condition to improve the decoding speed.

	Mirrored Type	Define whether if code might be mirrored.
	Polarity Type	Define the polarity of the code within the image.
Export	Shape Type	Define module shape of code.
Expert	Module Size	Define minimal and maximal pixel size of modules.
	Symbol Rows	Define minimal and maximal number of rows in symbol.
	Symbol Cols	Define minimal and maximal number of columns in symbol.

Multi DataCode:

- > **Number of code:** Define the maximum number of codes available in the image.
- Timeout (ms): Define the timeout on this tool to ignore current decoding process and continue with remaining commands in the inspection process.
- > **Proc Time:** Define the time taken to process and handle the datacodes.

X/Y Theta: Enable calculation of code location and angle with a defined angle reference.

**Reference Angle:** Define a reference angle of the detected code.

**Result:** 

- > Text (SendString): Save decoded Datacode results in result viewer.
- > **Display Text:** Display decoded Datacode on image as overlay.

**Quality Information:** Select options to check and display printing quality information of the Datacode based on international standards.

## OCR

With Match         C:\ProgramData\Banner Engineering\B'         Grab Reference       Edit         AngleRange       5         Load       Save         X       50       Y       50         W       200       H       200       Reset	ROI I Matching	ROI	Dis	play & Backup	
X     50     Y     50     Used WorldCoordinate       W     200     H     200     Reset		Match		C:\Program Grab Ref AngleRan Loa	mData\Banner Engineering\B' erence Edit ge 5 (1) MinCorr 0.8 (1) ad Save
	x w	50 200	Y H	50 200	Used WorldCoordinate

The OCR command is used to read characters from a defined library or manual teach font library. In this command, there is a matching feature to look for a pre-configured contour pattern in the search form for positioning purposes for the OCR search region to read the characters.

The OCR is performed in two major steps: First, the symbol regions need to be extracted from the image. This requires to find segmentation parameters which allow a robust extraction of all symbols in varying images and is usually the most demanding part of the configuration.

Then, the symbols are read using an OCR font, i.e. each symbol region is assigned a logical symbol name. You can choose from the list of stock OCR fonts, or create your own OCR font. To create your own OCR font, you must train it using a trainfile containing samples of the symbols to read.

### Matching:

Grab Reference: To teach the command to match basing on the reference.

Edit: To allow user to delete certain portion of the grab reference where it will not match during inspection.

Load: To load the grab reference after saving it.

**Save:** To save the grab reference after teaching it.

Min. Corr: Minimum score where command match basing the reference image.

**AngleRange:** To limit the search area for rotating objects by a maximum and a minimum angle. In this case the increment indicates the noise for the search.

<b>O</b>	
00	R
ROI Inspection setting Display & Ba	ackup
General Setting Setup Font Libraries	Parameter
Polarity Type Dark on Light   ▼	Advanced Dotted Slanted Jointed Rotation Correction
Pixel Area Min 50 💭 Max 1001	Ignore Boundary Objects Upper Case Only
Test OK	Cancel

### **Inspection Setting: General Setting:**

**Polarity Type:** Define the polarity of the characters within the image.

### Advanced:

Dotted: Select if characters are dot print.

Slanted: Select if characters are minor slanted.

Jointed: Select if characters are jointed or merged.

Rotation Correction: Select if characters are not upright and enables slight rotation correction in the search region.

**Pixel Area:** Define the minimum and maximum pixel size of a character to be detected. Values outside this range will be ignored.

### Area:

Ignore Boundary Objects: Ignore detected objects or characters which are in direct contact onto the search region.

**Upper Case Only:** Enable detection of upper case characters only.

	OCR	
ROI Inspect	ion setting Display & Backup	
General Setting	Setup Font Libraries Parameter	
Character Seg	Define Character Size	
Auto	X 50 Y 5	50
Manual	W 200 H 2	200
	Tomebold	
	0 🚔	128 🚔
	Highlight	
	Test	Cancel
	Test OK	Cancel

### **Inspection Setting: Setup**

**Mode:** Selection of inspection methods.

Auto: Read characters automatically basing on the software default configuration.

Manual: Read characters manually basing on the user defined setting on the character size and stroke width.

**Define Character Size:** Define maximum possible width and height of the largest available character in the image. **Stroke Width:** Define thickness of a character stroke.

**Pixel Area:** Define the minimum and maximum pixel size of a character to be detected. Values outside this range will be ignored.

٩			
		OCR	
	ROI Inspection	setting Display & Backup	
	General Setting S	etup Font Libraries Parameter	
	Teach <ul> <li>Default</li> <li>Load Fonts</li> <li>Create New Fonts</li> </ul>	Standard Fonts Industrial Reference Forma Industrial_0- Industrial_0- Industrial_0- Industrial_0- Industrial_0- Industrial_A- DotPrint_0-9 DotPrint_	9 9+ 9A-Z Z+ IA-Z Z+ IA-Z 2+ IA-Z 2-
		Document_( Document_/ OCRA OCRB	J-9A-Z 4-Z+



### **Inspection Setting: Font Libraries**

### Teach:

- > **Default:** Select character recognition from standard available font libraries.
- > Load Fonts: Load a user pre-teached font library.
- **Create New Fonts:** Create and teach a new user font library.

Standard Fonts: Select character recognition from a list of available font's library.

**Reference Format:** Define an expected characters types during inspection to improve recognition accuracy (especially between the characters "O" and "0").

Sample example and symbol representations: Inspected Characters: 15MAR2016-E Format to be entered: (\*\*###20\*\*@#)

Symbols:	Representations:	Possible recognized characters:
(	Start of line	- NA -
)	End of line	- NA -
*	Numbers	0 ~ 9
@	Symbols (Vary between font libraries)	- NA -
#	Alphabets	A ~ Z a ~ z

OCR	OCR
ROI Inspection setting Display & Backup	ROI Inspection setting Display & Backup
General Setting Setup Font Libraries Parameter	Results
<ul> <li>✓ Parameters</li> <li>Minimum Score 60  ⇒ No. of Lines 1  ⇒ No. of Characters 1  ⇒</li> <li>Check No. of Lines  □ Check No. of Characters</li> <li>✓ Reference String</li> <li>eg.{***###*^^AB12} where *=Number, #=Alphabet, ^=Any Character, A=A,B=B,1=1,2=2</li> </ul>	✓ Display Result String       ✓ 100 Y 100 Draw         ✓ Display Result Pattem       Font Size       16 €         ✓ Display Result Pattem       Result Image Memory       5 €
Test OK Cancel	Test OK Cancel

### **Inspection Setting: Parameter and Results**

### **Parameters:**

Minimum Score: Accepted characters with minimum recognition score with respect to its selected font libraries.

No. of Lines: Define the expected number of character lines within the search region.

No. of Characters: Define the expected number of characters within the search region.

**Reference String:** Compares reference string with recognized string and return command result.

### **Result:**

- > **Display Result String:** Display character string result on image as overlay.
- > **Display Result Pattern:** Display each character's segmentation results.

Manual/Draw: Define location to display character string result on image.

Font Size: Define font size of character string displayed on image.

**Result Image Memory:** Define desired image memory to display results.

## OCV

## 🔊 осу

OCV
ROI Setting
Reference
C:\ProgramData\Banner Engineering\BVI\Image\R/
Grab Reference Edit
0 🛬
Highlight
Edge Parameter
Test OK Cancel

OCV command to check the quality of signs regarding brightness and legibility or the general existence of an imprint with respect to its position.

Grab Reference: To teach the command to match basing on the reference.

Edit: To allow user to delete certain portion of the grab reference where it will not match during inspection.

L: To load the grab reference after saving it.

S: To save the grab reference after teaching it.

You can choose a threshold that all the pixels belonging to the object.

Min. Correlation Value: Minimum score where command match basing the reference image.

Edge Parameter: Adjust the parameter details where command match basing the reference image.

## ObjectDetection

Topic on Bead, Correlation, Count Object, Deform Matching and Matching.

### Bead

Si Bead

ROI Setting Tolerance & Backup	ROI Setting Tolerance & Backup Parameter Sigma (0.4 ~ 100) 1.0 🖨
Polygon Width       10         Description       Right click to add point         Right click to add point to remove the particular point       Right click in between two point to add point         Left click to shift the point location       Reset	Threshold (1 ~ 255) 30 -   Interval 5 -   Polarity : Light   Target Width : 15.0 -   Search Width : 5 -   Image: Search Width : 5 -
Test OK Cancel	Test OK Cancel

The Bead command uses polygon ROI as search region for detect defects on glue inspection applications.

### Parameter:

Sigma: Sigma of the Gaussian functions for smoothing edges to reduce noise on the object/target.

Threshold: Minimum edge amplitude value changes between edges to be detected.

Interval: Sampling interval per inspection along the ROI.

Polarity: Select detection of object/target to be light or dark.

**Target Width:** Set standard target width of bead to be inspected. Setting can be manually adjusted on the image for the width of the bead or according to the measured average width.

**Search Width:** Set the detection search width within target to find the edges. (As shown in the screenshot above, Target Width is 15 pixels with Search Width as 5 pixels, the Search Width location will be 7.5 pixels from centre line of the sampling point ROI to be the edge search range).

**Display Measure Range:** Enable/Disable measure range **Display Measured Position:** Enable/Disable measured position **Display Measured Result:** Enable/Disable measured result

🔅 💶 🗖 🗖 💆
Bead
ROI Setting Tolerance & Backup
Bead Parameter Width Minus Tolerance : 7.0 Position Tolerance : 20
Test OK Cancel

### **Bead Parameter:**

Width Minus Tolerance: Set allowable inwards tolerance Width Plus Tolerance: Set allowable outward tolerance Position Tolerance: Set allowable shifted centre of bead tolerance

## Correlation

Correlation L 🗕 🗖 🗖 💥 🤅 Tolerance Sort Display & Backup Tolerance Display & Backup ROI Setting ROI Setting Display Position 🔽 Angle Correlation Value Pattern Save in pickup list Position C:\ProgramData\Banner Engineering\BVI\Image\R S L 🔽 Angle Grab Reference Correlation Value Angle Find Objects Auto Scale 0 🚔 Range 360 🌲 Start 0.80 ≑ Min. correlation value [0 ~ 1.0]: Overlap [0 ~ 1.0]: 0.5 ≑ Max. Number: 1 🌲 X 100 Y 100 Draw Specify Origin 0 🌲 1000 ≑ Timeout (ms) Proc Time OK OK Test Cancel Test Cancel

The Correlation command looks for an already configured gray pattern in the search form. If it detects the pattern its position is reported. The correlation with the configured pattern is evaluated.

Grab Reference: To teach the command to match basing on the reference.

Edit: To allow user to delete certain portion of the grab reference where it will not match during inspection.

L: To load the grab reference after saving it.

**S**: To save the grab reference after teaching it.

### Angle:

**Start / Range:** To limit the search area for rotating objects by a maximum and a minimum angle. In this case the increment indicates the noise for the search.

Auto Scale (Step): To finds in comparison with the reference image, highly enlarged/ highly downsized objects. The user can define which minimal/ maximal scaling should be found in the image.

Specify Origin: Set the origin manually to the reference picture grabbed by the user.

Timeout (ms): Define the timeout for this command.

**Proc Time:** Define the time taken to process and handle for this command.

### **Find Objects:**

**Min. Correlation Value:** Minimum score where command match basing the reference image. **Overlap:** the permissible range of overlapping during inspection. **Max Number:** The number of part to match during inspection.

**Display:** To display result basing on the selected check.

Save in pickup list: Allow user to pick up this information.

### **Find Objects:**

Min. Correlation Value: Minimum score where command match basing the reference image.Overlap: the permissible range of overlapping during inspection.Max Number: The number of part to match during inspection.

**Tolerance:** stating the conditional acceptance of the inspected result.

With the "Grab Reference", the so called template is created. The template contains the relevant information to describe the object of interest.

If the objects's rotation may vary in the search images, you can specify the allowed range of angles and angle steps the object at which the model is created. We recommend to limit the allowed range of rotation as much as possible in order to speed up the search process and minimize the required memory.

For "Scale", you can specify the allowed scale with the parameter to locate the object. Again, we recommend to limit the allowed range of scale as much as possible in order to speed up the search process and minimize the required memory. It is recommended to used the default determined scale as it is suitable for most application.

With parameter "Min.Correlaton Value" (Score), yo can determine how much of the object or more precisely: of the model must be visible. When comparing a part of a search image with the model, the matching process calculates the so-called score, which is a measure of how many model points could be matched to points in the search image. A model point may be "invisible" and thus not matched because of multiple reasons:

- Parts of the objects's template are occluded.
- Parts of the template have a constrast lower than specificed in the parameter entered.
- The polarity of the template changes globally or locally.
- The object is deformed, parts of the contour may be visible but appear at an incorrect position and therefore do not fit the model.

### Recommendation: The higher MinScore, the faster the search!

To search for multiple object, all you have to do to search more same objects is to set the parameter "Max Number" accordingly. It will automatically search the objects within the search region.

The parameter "Overlap" lets you specify how much 2 matches may overlap (as a fraction). To speed up the matching as far as possible, the overlap is calulated not for the models but for their smallest surrounding rectangle.

### Restricting the Search Space:

An important concept in the context of finding objects is that of the so-called search space. Quite literally, this term specifies where to search for the object. However, this space encompasses not only the 2 dimensions of the image, but also other parameters like the possible range of scales and orientations or the question of how much of the object must be visible. The more you can restrict the search space, the faster the search will be.

## CountObject

CountObject

	🎽 💮
Count Objects	Count Objects
ROI Setting Backup Tolerance	ROI Setting Backup Tolerance
Threshold         Image: Second structure         Image: Second structure         Image: Second structure         Image: Second structure         Filter Excentricity         Filter Width         Filter Width         Filter Roundness         Filter         Filter	Amount Sorting   Display All Overlay Active   Save limited number    Maximum objects 10 <   Save Area in pickup   Width, Height in pickup    Point in pickup
Min 0 🔄 Max 10000000	Excentricity in pickup
Test OK Cancel	Test OK Cancel

The Count Objects command is a very universally applicable command. It is based on the fact that the image contains various regions of brightness, which are separated clearly from each other. In an image, the pixels of the relevant objects (also called foreground) can be identified by thier gray value.

This command is to classify pixels according to their gray value. You can choose a threshold that all the pixels belonging to the object. There are varoius features like Area, Width or Height etc. to be calculated and with the numeric results which can then be further evaluated.

The results can evaluated by the formulating conditions for the features by specifying values in the Min and Max in each mode. Those features which their condition in green(OK), the others in red(NG). If at least features is not okay, the overall result result for this command is determined as Fail.

For example: if you want to find only objects with a surface around 1400 pixels then you indicate in the object filter the min. value with 1300 and the max. value with 1500. Thus the fluctuations on the surface caused by changing the lighting can be balanced and only objects with the desired size is indicated. In order to use the filter it is important that the filter is activated.

Ignore Boundary object: If this flag is active, objects, whose object color is identical with the window border, are deleted.

**Object Borders:** Marks the bounding box. **Point of balance:** Marks the point of balance of an object.

### **Filter Area:**

**Display:** Display the object areas result. **Filter:** If active only objects, whose area is between these two values, are output.

#### Filter Width:

**Display:** Display the object width result. **Filter:** If width is active, only object whose width lies between the min. and max. are output.

### **Filter Height:**

**Display:** Display the object height result. **Filter:** If height is active, only object whose height lies between the min. and max. are output.

### **Filter Roundness:**

**Display:** Display the object roundness result.

Filter: If roundness is active, only object whose roundness lies between the min. and max. are output.

### **Filter Distance:**

**Display:** Display the object distance result. **Filter:** If distance is active, only object whose distance lies between the min. and max. are output.

### Filter Angle:

**Display:** Display the object angle result. **Filter:** If angle is active, only object whose angle lies between the min. and max. are output.

### **Filter Excentricity:**

**Display:** Display the object excentricity result. **Filter:** If excentricity is active, only object whose excentricity lies between the min. and max. are output.

### Backup:

Since the object command is not defined in the number of produced objects, it can be specified by this option how many objects are transferred e.g. to the point list.

**Display All Overlay:** Able to display out the object which overlayed by other object. **Maximum objects:** Here the number of object-results, which should be saved, is provided. **Save:** Here the user can select, where the object-results should be saved, e.g. in the pickup.

Order & Sort By: Here it can be determined, how the objects should be sorted and in which order.

**Tolerance:** stating the conditional acceptance of the inspected result.

## **Deform Matching**

# Deform Matching

🔁 💶 🗶
Deformable Matching
ROI Setting Display & Backup Tolerance
C:\ProgramData\Banner Engineering\BVI\Image\Reference
Grab Reference Edit
Angle
Start         0 (=)         Range         360 (=)         0.00         0.99 (=)         to         1.01 (=)         2.00
Find Objects Speed vs.
Min. correlation value [0 ~ 1.0]: 0.80 slow; 10: fast but matches may be
Overlap [0 ~ 1.0]: 0.5 - missed)
Max. Number:
Test OK Cancel

The deform matching command match for an already configured gray pattern in the search form. If it detects the deform its position is reported. The deformation with the configured pattern is evaluated.

Grab Reference: To teach the command to match basing on the reference.

Edit: To allow user to delete certain portion of the grab reference where it will not match during inspection.

L: To load the grab reference after saving it.

**S**: To save the grab reference after teaching it.

**Angle:** To limit the search area for rotating objects by a maximum and a minimum angle. In this case the increment indicates the noise for the search.

**Scale:** To finds in comparison with the reference image, highly enlarged/ highly downsized objects. The user can define which minimal/ maximal scaling should be found in the image.

### Find Objects:

- > Min. Correlation Value: Minimum score where command match basing the reference image.
- > **Overlap:** the permissible range of overlapping during inspection.

> Max Number: The number of part to match during inspection.



**Display:** To display result basing on the selected check.

Save in pickup list: Allow user to pick up this information.

Tolerance: stating the conditional acceptance of the inspected result.

## Matching

Matching
Matching
ROI Setting Sort Backup Tolerance
C:\ProgramData\Banner Engineering\BVI\Image\Referen L S Grab Reference Edit Quick Save
Angle Start 0 Range 360 0.00 0.99 to 1.01 2.00
Deform O   Ignore Local Polarity
Image: Specify Origin     X     100     Y     100     Draw       Timeout (ms)     1000 ⊕     Proc Time     0 ⊕
Test OK Cancel

The Matching command looks for an already configured contour pattern in the search form. If it detects the pattern its position is reported. The contour with the configured pattern is evaluated.

### <u>Setting:</u>

Grab Reference: To teach the command to match basing on the reference.

- Edit: To allow user to delete certain portion of the grab reference where it will not match during inspection.
- L: To load the grab reference after saving it.
- S: To save the grab reference after teaching it.

Angle: To limit the search area for rotating objects by a maximum and a minimum angle. In this case the increment indicates the noise for the search.

Scale: To finds in comparison with the reference image, highly enlarged/ highly downsized objects. The user can define which minimal/ maximal scaling should be found in the image.

**Deform:** Define the maximum deform in the command.

**Polarity:** Can be set to use or ignore the polarity in command.

Specify Origin: Set the origin manually to the reference picture grabbed by the user.

**Speed:** Determine the matching speed.

😳	
Matching	Matching
ROI Setting Sort Backup Tolerance	ROI Setting Sort Backup Tolerance
Sorting Order Ascending Descending Sort By X Y	Display Save in pickup list   Position   Angle   Correlation Value   Pattern   Scale   Find Objects   Min. correlation value [0 ~ 1.0]:   Overlap [0 ~ 1.0]:   Overlap [0 ~ 1.0]:   Max. Number:   1     State     Angle   0.55   Max. Number:   0.360 Degree     Y-180 Degree
Test OK Cancel	Test OK Cancel

Order & Sort By: Here it can be determined, how the objects should be sorted and in which order.

**Display:** To display result basing on the selected check.

Save in pickup list: Allow user to pick up this information.

Find Objects:

- > Min. Correlation Value: Minimum score where command match basing the reference image.
- > **Overlap:** the permissible range of overlapping during inspection.
- > Max Number: The number of part to match during inspection.

**Angle:** To choose the angle result range at +/- 180 or 0-360.

**Tolerance:** stating the conditional acceptance of the inspected result.



With the "Grab Reference", the so called model is created. The model contains the relevant information to describe the object of interest where you can use the "Edit" to remove the unwanted noise or reference.

If the objects's rotation may vary in te search images, you can specify the allowed range of angles and angle steps the object at which the model is created. We recommend to limit the allowed range of rotation as much as possible in order to speed up the search process and minimize the required memory.

For "Scale", you can specify the allowed scale with the parameter to locate the object. Again, we recommend to limit the allowed range of scale as much as possible in order to speed up the search process and minimize the required memory. It is recommended to used the default determined scale as it is suitable for most application.

With parameter "Min.Correlaton Value" (Score), yo can determine how much of the object or more precisely: of the model must be visible. When comparing a part of a search image with the model, the matching process calculates the so-called score, which is a measure of how many model points could be matched to points in the search image. A model point may be "invisible" and thus not matched because of multiple reasons:

- Parts of the objects's contour are occluded.
- Parts of the contour have a constrast lower than specificed in the parameter entered.
- The polarity of the contour changes globally or locally.
- The object is deformed, parts of the contour may be visible but appear at an incorrect position and therefore do not fit the model.

Recommendation: The higher MinScore, the faster the search!

To search for multiple object, all you have to do to search more same objects is to set the parameter "Max Number" accordingly. It will automatically search the objects within the search region.

The parameter "Overlap" lets you specify how much 2 matches may overlap (as a fraction). To speed up the matching as far as possible, the overlap is calulated not for the models but for their smallest surrounding rectangle.

### Restricting the Search Space:

An important concept in the context of finding objects is that of the so-called search space. Quite literally, this term specifies where to search for the object. However, this space encompasses not only the 2 dimensions of the image, but also other parameters like the possible range of scales and orientations or the question of how much of the object must be visible. The more you can restrict the search space, the faster the search will be.

## EdgeDetection

Topic on Circle, Contour, EdgeCounter, FreeEdgeAlignment, Point, RectProbe and StraightLine.

### Circle

Circle	Circle
ype Setting Display & Backup Tolerance	Type Setting Display & Backup Tolerance
Find Circle Find Circle 3 Point	Edge Selection Edge Selection
X 100 Y 100	Lighting         Determine           ● Back Light         ● Front Light         ● Diameter         ● Radius
Inner Radius     50     Outer Radius     150       Start Angle     0     End Angle     360	Parameter Roundness
Reset	
Test OK Care	

The Circle command is used to detect edges which might form a circle and return its diameter or radius values. Ability to get 3 points detected to form a circle.

### **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

### **Result Points:**

- > **First**: First point of the extracted edge points is returned.
- > Last: Last point of the extracted edge points is returned.

Lighting: Define lightinhg set up as back light or front light.

Determine: Define measured value and reflect as diameter or radius.

### **Parameter:**

- > **Sigma**: Sigma of the Gaussian functions for smoothing.
- > **Threshold**: Minimum edge amplitude changes between edges.
- > Number of point (>2): Define number of detected points to be used within the probe to improve processing time.

Roundness: Return roundness value of detected circle.

•	_ <b>_ x</b>
Circle	
Type Setting Display & Backup Tolerance	
Save Point     Image: Save Point     Image	
Optimize Result	5
Test OK	Cancel

SavePoint: To save the minimum or maximum measured distance to be pick up.

**Optimize Result:** Percentage of stray points detected/found to be eliminated when forming a circle.

**Tolerance:** State conditional acceptance of the inspected result.

### Contour

Sontour Contour		
٠		X
Contour Length   ROI Setting Tolerance   Threshold Image: Contour Length   Image: Contour Length Image: Cont	128	ROI Setting   Backup   Store in String   XY Separator   Separator between Data   Interval Display Interval 100 Disable display original contour
Test OK	Cancel	Test OK Cancel

The Contour command is used to detect edges which return its X & Y coordinates of which points detect.

### Setting:

Highlight: To set the threshold of the object to detect the contour outline.

Area:

> Filter: To define the area of the object to be detected

Offset:

> Offset value: To define the offset value of the contour points detected.

### Setting:

Store in String: To save all the contour points into string for pickup.

**XY Separator:** The separator e.g. "," or "/" to be used for the X & Y coordinates. (e.g. "X, Y" or "X/Y) **Separator between Data:** The separator e.g. "," or "/" to be used for the 2 or more X & Y coordinates. (X1, X1 / X2, Y2)

Interval: To get only the contour points of the XY coordinates at an interval value.

**Disable display original contour:** Not to display the overlay of the contour points during inspection. Disable this feature will speed up the inspection time of this command.

•				SetOutp	out
 O Pickup viewer		0	_		23
22.00 Contract (Point APPAN)	- 1	Index	Px	Py	*
02,00,Contouro,(PointARRAT),	- 11	0	440.500000	32.500000	
Total Result Long Double String Point Circle Line	1 11	1	447.500000	36.500000	E
		2	453.500000	41.500000	
[1] FreeEdgeAlignment[disabled]		3	460.500000	45.500000	
E [2] Contour		4	466.500000	50.500000	_
		5	472.500000	55.500000	_
{32 500000 36 500000 41 500000 45 500000 50 50		c	479 500000	60 500000	_



The XY coordinates of the edge detected at object contour is basing threshold value of the object .

## EdgeCounter

EdgeCounter

9	
Edge Counter	
ROI Setting Tolerance	
Parameter	
Sigma (0.4 ~ 100)	2.5
Threshold (1 ~ 255)	20 🛫
Edge Selection	
Iight -> Dark	) Al
Distance	
Test OK	Cancel

The EdgeCounter command is used to detect numbers of points or edges.

57

### Setting:

Parameter:

- > **Sigma**: Sigma of the Gaussian functions for smoothing.
- > Threshold: Minimum edge amplitude changes between edges.

### **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

## FreeEdgeAlignment

### FreeEdgeAlignment

Free Edge Alignment         ROI       General Setting         2 Side	Free Edge Alignment         ROI       General Setting       Setting         Probe 1       Probe 2       Probe 3       Probe 4
Probe 1         Probe 2         Probe 3         Probe 4           X1         100         Y1         200           X2         200         Y2         200           Width         50.000002         Reset	Number of Probe Probe per side 1
Test OK Cancel	Test OK Cancel

The FreeEdgeAlignment command is used to detect edges using free-style defined search region which return its X & Y coordinates of which intersection points detect.

### ROI:

To set the region of interest of this command.

2/4 Side: To determine the number of probes to use for this command.

### **General Setting:**

### Number of Probe:

Probe per side: To determine the number of probes of each side to use for this command.

Free Edge Alignment
ROI General Setting Setting
Global Setting
Probe1 Probe2 Probe3 Probe4
Parameter           Sigma (0.4 ~ 100)         2.5            Threshold (1 ~ 255)         20
Edge Selection <ul> <li>Light -&gt; Dark</li> <li>Dark -&gt; Light</li> </ul>
Number of points     Edge Select       Image: All Image: All Image: Set limit Image: Set limag
Test OK Cancel

### <u>Setting:</u>

**Global Setting:** Enable to have the setting for the probes used.

### **Parameter:**

- > Sigma: Sigma of the Gaussian functions for smoothing.
- > Threshold: Minimum edge amplitude changes between edges.

### **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- > Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

### **Edge Select:**

- > First: First point of the extracted edge points is returned.
- > Last: Last point of the extracted edge points is returned.

Number of point: Define number of detected points to be used within the probe to improve processing time.



Detecting (searching) the object edges to correct the position. One or two probes or four probes can be used. It has a feature to set 1 probe or 2 probes at per probe searching region. This tool detects the positions (Point 1 & 2) basing on the intersection lines of the edge detected. The coordinates of the midpoint between these point 1 and 2 is detemined.

### Point

🔖 Point

Point	Point
Create       Point       X 100     Y 100       Reset       Use world coordinate	Create Create Interception of two lines Middle point between 2 points Image center Transformation image coordinate to world coordinate Transformation world coordinate to image coordinate Point to Value Value to Point
OK Cancel	OK Cancel

The Point command allow user to define the points in the image area in different ways

**Create**: The point can be defined either by direct number input or by moving the cursor in the Camera Viewer (by the configuration button).

**Interception of the two lines**: Two straight lines are determined and the intersection point of both of them is defined as the new point.

Middle point between 2 points: The middle point between two selected points is defined.

Image Center: The image center is determined as new point.

**Transformation image coordinate to world coordinate**: The point coordinates are transformed from image coordinates into world coordinates.

**Transformation world coordinate to image coordinate**: The point coordinates are transformed from world coordinates into image coordinates.

Point to Value: The X-value and the Y-value of the point are successively entered into the value register.

Value to point: The value register are successively entered into the X-value and Y-value of the point.

### RectProbe

RectProbe

٥					
	Rect Probe				
ROI Setting	Tolerance				
Methods T Intensity Gradient	hreshold	128			
Parameter Result Point Middle First	Edge Select     Object color       Ight->Dark       Last				
🔘 Last	Number of points           All         Set limit         100				
Fom Line					
Test OK Cancel					

### The Rect Probe command is to find the edges of the inspected part.

The Rect Probe is to extract the object edges from the edge amplitude image; applying threshold to select pixels with a high edge amplitude. The result of this step is a region that contains all edge points.

### **Methods:**

- > Intensity: To detect the edges basing on the grey value.
- > **Gradient:** To detect the edges basing on the amplitude value.

#### **Result Point:**

- > Middle: The middle of the extracted edge points is returned.
- > **First**: The first of the extracted edge points is returned.
- > Last: The last of the extracted edge points is returned.

#### **Object Color:**

- > Light -> Dark: The color for the object in demand is set to dark.
- > Dark -> Light: The color for the object in demand is set to bright.

### **Edge Select:**

- > First: First point of the extracted edge points is returned.
- > Last: Last point of the extracted edge points is returned.

### Number of points: To define the number of points the probe will find.

Best Fit Line: Option to form a straight line when the edges are detected.

Tolerance: stating the conditional acceptance of the inspected result.

### StraightLine

### <u> StraightLine</u>

😵 ? <mark>- × -</mark>
Straight Line
Function
2 points to fit line
2 points to fit line Perpendicular line Parallel line
Point 2 PICKUP
OK Cancel

The Straight-Line command is based on the points detected using Rect Probe where a straight line will be computed.

**2 points to fit line:** A straight line, which fits either through two points taken from the point register or two points determined by the pick-up list, is defined.

**Perpendicular Line:** Determines a perpendicular straight line to an existing straight line and a point.

**Parallel Line**: Determines a parallel straight line to an existing straight line and a point.

## Color

Topic on Color Extract, Color Intensity and White Balance.

## **Color Extract**

		0	
Color Extract		Color	Extract
OI Setting Display		ROI Setting Display	
Display RGB Channel Image			
R Channel	IM 1 🚍	Manual - X 100	Y 100 Draw
✓ G Channel	IM 2 🚔	Used Wo	orld Coordinate
B Channel	IM 3 🚔	Font Size	20
✓ min, max and average values of RGB channel			
Test	Cancel	Test	OK Canad

The Color Extract command is to extract the red or green or blue channels from the color image to fade out pixels for unwanted channels (e.g. red and green), leaving on the selected channel & intensity (e.g. blue) for further image processing.

### Setting:

**Display RGB Channel Image:** 

- > R Channel: Extract the red channel of the color image.
- > G Channel: Extract the green channel of the color image.
- **B Channel**: Extract the blue channel of the color image.

### Min., Max. and average values of RGB channel: The parameter for

### **Display:**

### To position the inspection result of this command and setting the font size.

The idea of color processing is to take advantage of the additional information encoded in color or multispectral images. Processing color images can simplify many machine vision tasks and provide solutions to certain problems that are simply not possible in gray value images. First, the individual channels of a color image can be processed using standard methods like blob analysis. In this approach the channels of the original image have to be decomposed first.

An RGB image is acquired where the image is split into its channels. The red and green and blue channels are subtracted. The purpose of this

process is to fade out pixels with high values in the other channels, leaving pure selected (e.g. blue) pixels only. Using threshold, the blue pixels with a certain intensity are selected.

## **Color Intensity**

ColorIntensity

۵	
Color Intensity	
ROI Setting Tolerance	
Hue	
0	360 🚔
Saturation	
0.000	1.000
Intensity	
0.000	1.000
☑ Display Color 0 🚔 IM 1 🚔	Picker
Paint Result in Grey Image	Pick Color
IM 1 🚔 Good 255 🚔 Bad	0
Test OK	Cancel

The Color Intensity command is to evaluate the number of pixels in the selected color range. It is defined by hue, saturation and the intensity range.

### Setting:

Hue: The color range can be limited either by numerical values or by using the color picker to define the color selection form.

Saturation: To determine the color saturation. It can be adjusted either by direct value input or by color selection form.

Intensity: To determine the color brightness. It can be adjusted either by direct value input or by color selection form.

**Color Picker:** By clicking with the mouse on the eyedropper the cursor can be moved over the Camera Viewer and then can be clicked into the area of the desired color. With the pull-down option an environment of N pixels can be defined for the color characteristic extraction.

Display: If this option is active, the pixels matching the criteria will be displayed in color in the configured image memory (IM).

**Tolerance:** State conditional acceptance of the inspected result.

The idea of color processing is to take advantage of the additional information encoded in color or multispectral images. Processing color images can simplify many machine vision tasks and provide solutions to certain problems that are simply not possible in gray value images. First, the individual channels of a color image can be processed using standard methods like blob analysis. In this approach the channels of the original image have to be decomposed first.

An RGB image is acquired where the user need to set the color hue to be detected basing on the saturation and intensity of the objects to be detected. The task is to specify the object color by using the Color Picker to pick the color for detection.

### WhiteBalance

WhiteBalance ٠ Tolerance Tolerance ROI Setting ROI Setting Mode Training Apply ROI Complete Configuration Circle Rectangle

		Iraining		•
		Fraining		
		nspect		
Test OK	Cancel	Test	OK	Cancel

The White Balance command is to adjust the offset color reference data for color camera.

### ROI:

Training: To set the region of interest for training.

**Apply:** To set the region of interest for apply this command.

### Setting:

Training: Allow user to train the command based on the image's environment condition

**Inspect:** Allow user to inspect the image's environment condition.

Tolerance: State conditional acceptance of the inspected result.

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## Defect

Topic on Defect Circle, Defect Define and Defect Straight Line.
# **Banner Vision Inspector**

## DefectCircle

DefectCircle

 DefectCircle

 ROI
 Setting
 Tolerance

 Edge Selection
 Light -> Dark
 O Dark -> Light

 Parameter

Light -> Dark	🔘 Dark -> Light	
7 Parameter		
Sigma (0.4 ~ 100)		2.5 🚔
Threshold (1 ~ 255)		20 🊔
Offset (+/-)		30.0 🚔

The DefectCircle command is used to aid in detecting burr on circular object after some filtering commands.

## Setting:

## **Parameter:**

- > Sigma: Sigma of the Gaussian functions for smoothing.
- > Threshold: Minimum edge amplitude changes between edges.

## **Edge Selection:**

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- > Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

Offset (+/-): To define an offset value basing on the average points detected, to detect the defect. (value is in pixel format)

Tolerance: stating the conditional acceptance of the inspected result.

## DefectDefine

DefectDefine

>	
Def	ectDefine
ROI Setting Display	Tolerance
Mode	lor Selection
🔘 Auto 🔘 Manual	
Defect Type	ark on light 🔹
Scratch  Dot	
Scratch Max. length of the gap:	50
Max. length of the scale:	10
Max. shift:	100
Max. angle: (0.0 < x <0.78)	0.6
Result line length :	May 99999
Test	OK Cancel

With the Defect Define command, it aids in detecting scratch or dots after some filtering commands.

**Mode:** To select the mode of detection.

**Auto:** To detect the scratches or dot automatically basing on the software default configuration. **Manual:** To detect the scratches or dot manually basing on the threshold set.

**Defect Type:** To detect scratches or dots.

#### Scratch:

**Max. length of the gap:** The maximum accepted absolute distance between two contours. The gap is measured along the regression line of the reference contours. Thus, it is the length of the projection of the gap between the two contours onto the regression line of the reference contour.

**Max. length of the scale:** The maximum accepted relative distance between the two contours. The relative distance is calculated by dividing the distance by the length b of the reference contour.

**Max. shift:** The maximum distance of the second contour from the regression line of the reference contour. This distance is measured perpendicular to the regression line of the reference contour.

Max angle: The maximum angle (in radians) between the regression lines of the two contours.

Result line length: The minimum and maximum value of the line to be detected.

Line:

Result line size: The minimum and maximum size of the dot to be detected.

# **Banner Vision Inspector**

⊕	
DefectDefine	
ROI Setting Display Tolerance	
Disable ROI display	
	Grand
Test OK	Cancel

**Display:** Optional to enable or disable ROI display.

**Tolerance:** stating the conditional acceptance of the inspected result.

With the Defect Define command, it aids in detecting scratch or dots after some filtering commands.

**Mode:** To select the mode of detection.

**Auto:** To detect the scratches or dot automatically basing on the software default configuration. **Manual:** To detect the scratches or dot manually basing on the threshold set.

**Defect Type:** To detect scratches or dots.



Orginal image after Advanced Filter processing.

# **Banner Vision Inspector**



The result to detect the lines after image pre-processing using DefectDefine command.

# DefectStraightLine

DefectStraightLine

<b>O</b>	
DefectStraightLine	
ROI Setting Tolerance	
Edge Selection Light -> Dark      Dark -> Light     Offset (+/-)     Parameter	30.0 🜩
Sigma (0.4 ~ 100)         2.5 ⊕           Threshold (1 ~ 255)         20 ⊕	
Test OK	Cancel

The DefectStraightline command is used to aid in detecting burr on straight object after some filtering commands.

## Setting:

Parameter:

- > **Sigma**: Sigma of the Gaussian functions for smoothing.
- > Threshold: Minimum edge amplitude changes between edges.

**Edge Selection:** 

- Light -> Dark: The greyscale colour for the object in demand is set to dark which is defined according to the arrow of the search region.
- > Dark -> Light: The greyscale colour for the object in demand is set to bright which is defined according to the arrow of the search region.

**Offset (+/-):** To define an offset value basing on the average points detected, to detect the defect. (value is in pixel format)

Tolerance: stating the conditional acceptance of the inspected result.