



A GUIDE TO 2 DIMENSIONAL INSPECTION

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SCOPE

This manual assumes that the reader has previously gained knowledge to be able to setup and print a board on the printing machine. The user should be familiar with the graphical icons, parameter definitions and other advanced features available in the DEK User Interface - Instinctiv™.

The user should be able to demonstrate knowledge of the general rules for producing good quality and consistent print. These rules include: machine, stencil and board cleanliness; correct tooling placement; an appropriate applicator that is in good condition for the task; optimised printer set up for cleaning cycles and the correct print medium deposit.

MANUAL OVERVIEW

This manual utilises many aspects of the Instinctiv™ style. The functionality embodied within this interface allows the inspection process to be easily understood and remembered. The process is fully explained along with appropriate techniques to optimise performance for production.



A GUIDE TO 2 DIMENSIONAL INSPECTION

PROCESS OVERVIEW

The Process 2Di monitors the print process by inspecting areas on the board and/or the stencil, these areas are known as inspection sites. It determines if the quality of the printed product is deteriorating, if so it can automatically instigate a stencil clean cycle, or it may determine when more paste should be applied. These actions are carried out either manually or automatically dependent upon how the system is programmed.

The camera takes an image of the board and/or stencil before printing, which can be compared to all subsequent image captures after products are printed.

The system is a licensable option and the features available depend upon the level of inspection installed.

Inspection Licensing		
	Board	Stencil
Basic	Paste on Pad	Blockage
Advanced	Paste on Pad	Blockage
	Bridging	Smear
	Alignment	
	Volume	

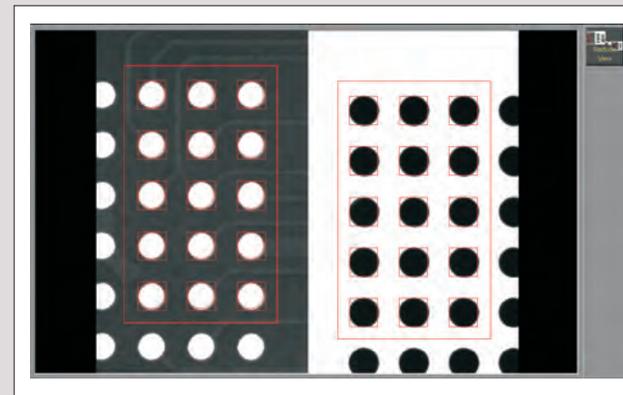
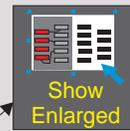


Practical Limitations of the System

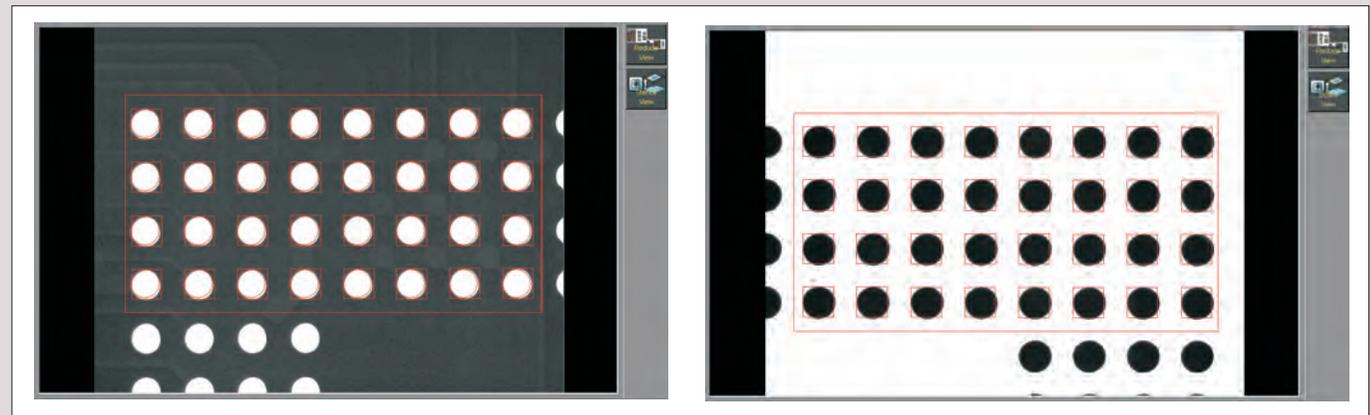
Camera Types There are two types of camera, designated Split View (the display of board and screen are shown in separate selectable vision windows), or Combined View (both the board and the screen are displayed simultaneously). Both camera types can show an enlarged view of the selected image if the user selects the Show Enlarged button.



Location of the Vision Window
on the Running Page and Large View
Button



Vision Window (combined view)



Vision Window Single Screen (split view)
Select Stencil View/Board View to change view mode



Vision Window Sizes

The available vision window to view programmed devices or sites is shown in the table below.

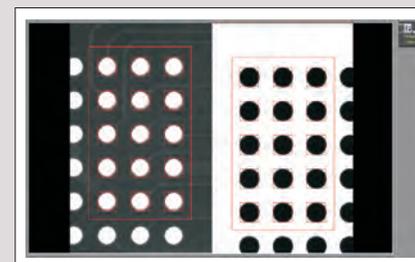
Vision Window Size - Split View Camera Types		Vision Window Size - Combined View Camera Types	
HE 1700	10 mm x 7.5 mm	Graphite	4 mm x 6.5 mm
HE 1200	10 mm x 7.5 mm	Green	4 mm x 6.5 mm
Gold	10 mm x 7.5 mm	HE 400	4 mm x 6.5 mm
		HE 750	4 mm x 6.5 mm

View Orientation

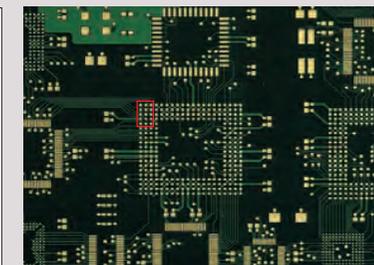
The vision system works differently for both camera types. The combined view camera system displays the inverse view with respect to the board, whereas the split view camera system shows the board image from the natural viewpoint.

In the graphic, the combined view vision window shows the board image on the left of the stencil image.

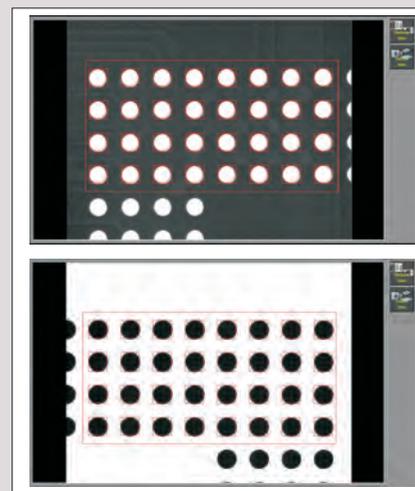
With the board in the correct print feed orientation, the “BGA Frame Showing Start Location”, shows the device learn location (a red rectangle) at the top left-hand side of the BGA Frame device. This is the start location for the system to learn this type of device. This is the start location for the system to learn this type of device. It should be noted that in the vision window the board image shows this start location as if it is on the right-hand side. This is an anomaly of the combined view camera system, and setup should always occur with respect to the stencil, as this is the correct orientation; the opposite is true for the split view camera system.



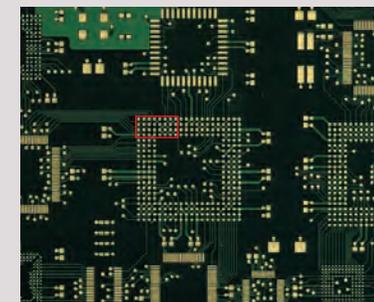
Vision Window (combined view)



BGA Frame Showing Start Location



Vision Window Single Screen (split view)



BGA Frame Showing Start Location



Pre-Verification
Scan Offset
Elimination

Before devices or sites are added for inspection, the user must ensure that a board's print offsets are known and applied. For example prior to printing the printer aligns the stencil to the board. On a board, the stencil aperture is designed to align to the centre of the pad; as shown by the red and blue centroids in Figure 1 Board to Stencil Alignment.

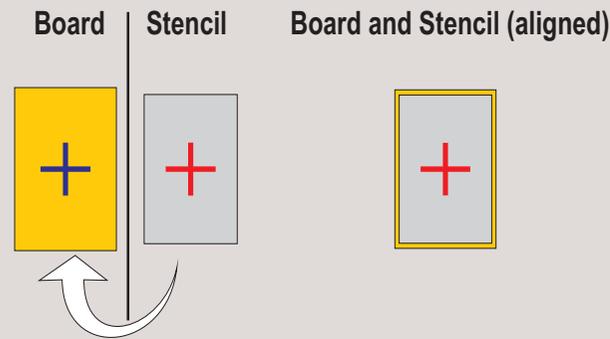


Figure 1 Board to Stencil Alignment

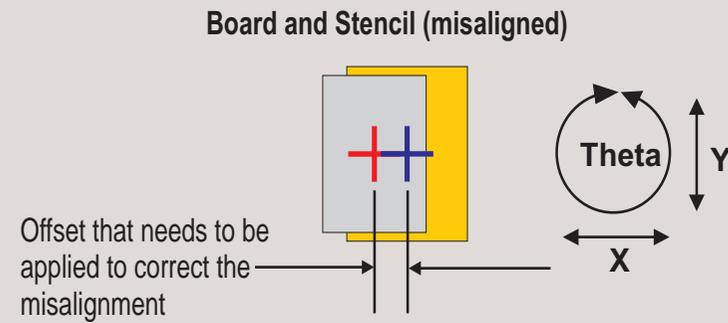


Figure 2 Recoverable Board to Stencil Misalignment

Figure 2 Recoverable Board to Stencil Misalignment, shows offsets in X (also in Y and Theta) which need to be applied. The user programs these offsets into the product file. They become known to the inspection system when inspection sites are created. However a board's design may include irregular shaped features as shown in Figure 3 Non Recoverable Board to Stencil Misalignment. The board and stencil features are not designed to align with each other. In these situations the print offsets may be difficult to establish, and in extreme cases the verification system is unable to resolve any alignment issues, ruling them out of the inspection setup. In Figure 3 the blue centroid is in the centre of the pad, the red centroid is in the centre of the aperture, and the hashed area denotes the location where the pad would have been printed had it aligned correctly.

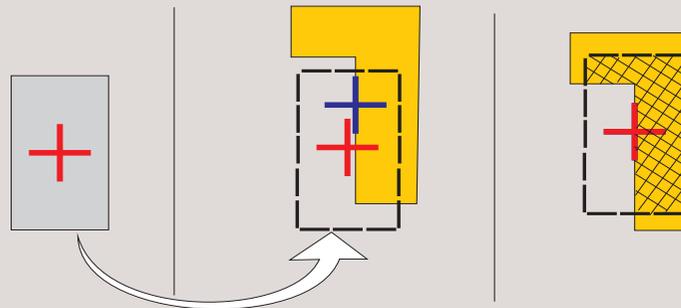


Figure 3 Non Recoverable Board to Stencil Misalignment



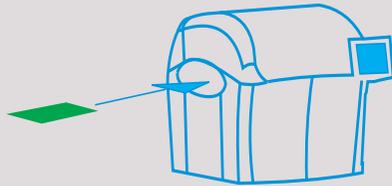
The Print and Inspection Cycle Explained

NOTE
2D Inspection Rate has been set to 1 and Pre-Image Mode set to One.

Select **Print**.

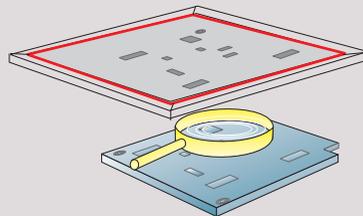


Select a load board option - **Auto** or **Manual** to load a board.



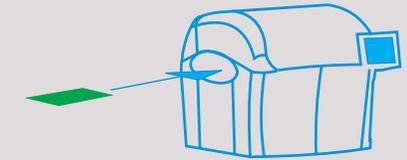
The first board in the batch is fed into the printer. Prior to printing the camera captures an image of all the sites which have been setup for inspection. This is known as the pre-image capture sequence.

The board and screen images are inspected prior to printing (pre) and after printing (post).



Inspection continues until all of the programmed sites have been inspected.

The print and inspection cycles continue until the complete batch of boards have been printed and the print cycle stops.



OR...



An inspection alarm is raised.

During the inspection cycle if a site has fallen outside of the limits that have been set, the printer issues an alarm and displays appropriate action buttons for the operator to take remedial action if required.

An operator can select one of the options detailed overleaf.



Selecting the buttons below result in the following actions:



Accept Board
The board is fed to the output rail and printing continues



Reject Board
The board is fed to the output rail and printing stops



Recovery Actions
- Add print medium
- Clean screen
- Reprint board



Inspect Remaining Sites
Complete the inspection regime for the current cycle



Re-inspect All Sites
Restart the inspection regime



Inspection Options
- Obtain site results
- Adjust inspection
- Inspect site



Adjust Process
Adjust process parameters



Alarm and warning messages and associated actions are explained later in the manual.



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THE STATUS PAGE
Navigation



Product Running Page							
1	2D Status Tab	3	Machine Mimic and Inspection Indicator	5	Prompt/History Bar	7	Navigation Panel
2	Vision Window	4	Machine Commands Panel	6	Board Representation View		

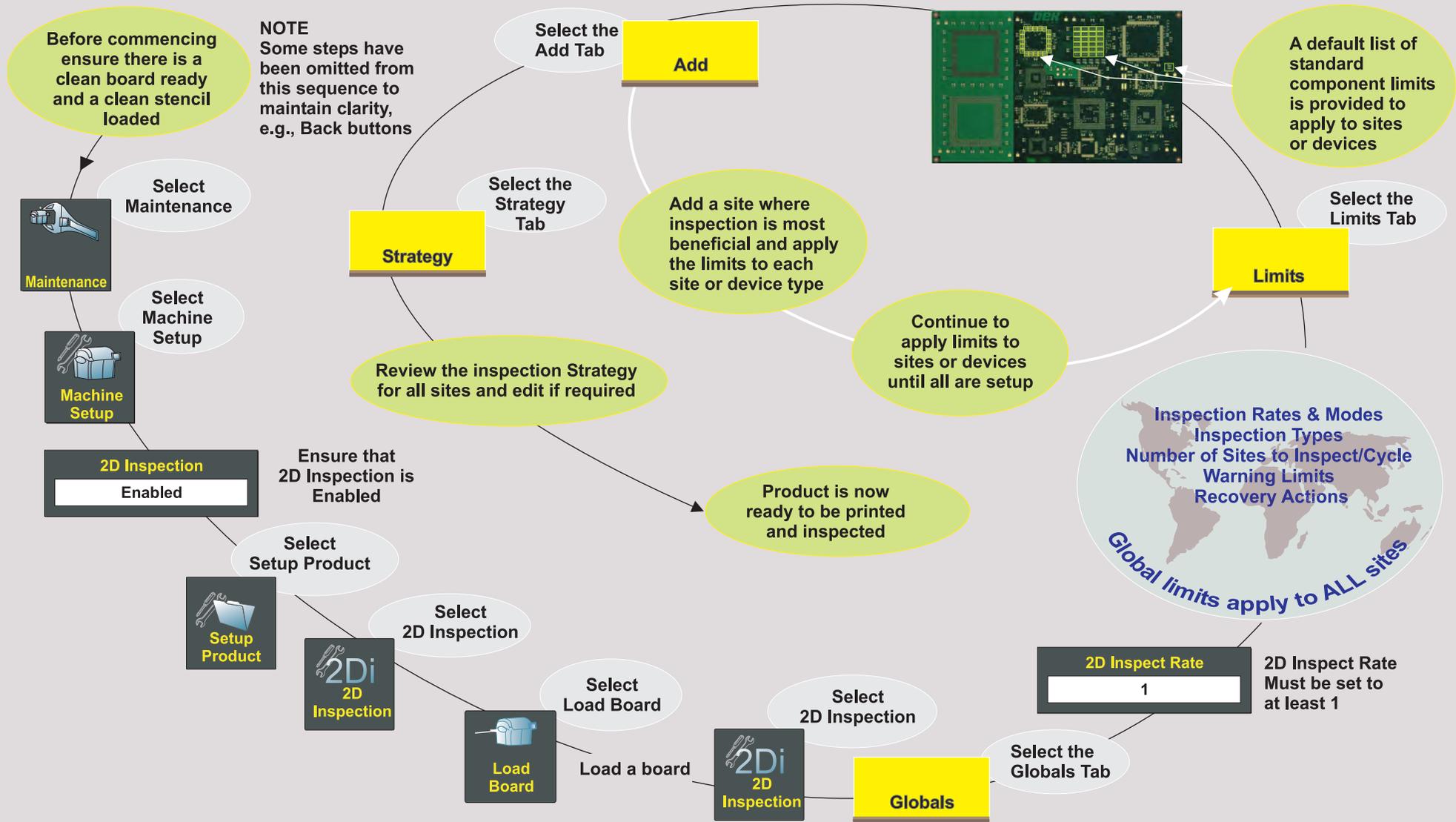


2D Status Tab	At any time during product running the user can select the status tab to view the current status of the inspection process.
Vision Window	The vision window displays camera data captured from the board and screen during inspection. How its output is displayed depends upon which camera system is used; the previous section on practical limitations of the system gives details.
Machine Mimic and Inspection Indicator	<p>The machine mimic represents the board as it is processed by the printer. A series of graphic images are displayed as representations of the board being fed from the inroad conveyor through the print station. A printing mimic shows the print mode and print direction during the printing phase, before the board is finally fed to the outroad conveyor. The mimic is synchronized with actual events which occur during the print process.</p> <p>The inspection indicator located above the centre of the mimic, alerts the user when the inspection segment of the print cycle is occurring.</p>
Machine Commands Panel	This panel houses a series of buttons which the operator can access to control the process or replenish consumable items.
Prompt /History Bar	<p>Several prompts are displayed to aid the user in the setting up, running, maintenance, and consumable replenishment tasks. The prompts should be used in conjunction with other information presented during a particular task or operation.</p> <p>Additional information on the prompt history can be obtained by selecting the history icon at the right-hand side of the bar.</p>
Board Representation View	This is a graphical representation of the board being printed. The image can be a view of the sites and devices programmed or additionally the Gerber data or Bitmap image of the board. A set of cross-hair, traverse the programmed sites during the inspection sequence to indicate which site is currently being inspected. Inspection continues and the programmed sites change colour in both fill and outline, giving the user specific site information about the quality of the printing operation at that site.
Navigation Panel	<p>With the machine in running mode, the Adjust and 2Di Adjust buttons are used to access the available adjustable parameters for the product, or the 2Di process. These adjustments can be password protected to give only key personnel access.</p> <p>For Adjust, operation continues while adjustments are being made.</p> <p>For 2Di Adjust, the print operation pauses while adjustments are being made and resumes when control returns to the ready page.</p>



SETTING LIMITS AND ADDING INSPECTION SITES

Setup Overview - Pre Print





Globals

If a global parameter is set it applies to every site which is in use.



Quick Setup Tip

To instigate a quick setup, make sure that 2D Inspect Rate is set to a value of 1 or more. This allows inspection to take place. All other global parameters can remain in their default state and can be altered if necessary after an initial print and inspection cycle.

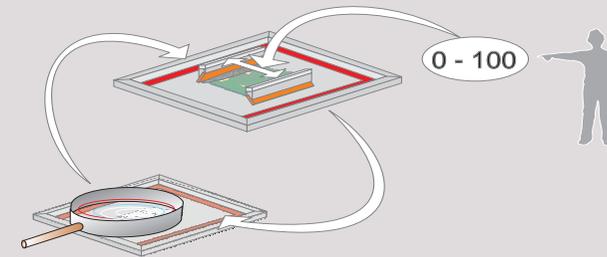
2D Inspect Rate

The user defined number of print cycles between inspections, with zero indicating no inspection.

Decide how often to carry out inspection.

For example to print 3 boards followed by a board inspection, set the value for 2D Inspect Rate to 3. Inspection occurs on the first board, the fourth, the seventh, the tenth and so on.

0 = no inspection. **100** is the maximum limit.



NOTE

In the parameters glossary at the rear of this manual, parameter definitions are shown along with their associated states.



Limits Page

The limits which can be applied to individual sites or devices depend upon the level of inspection available (Basic or Advanced). The limits page for advanced is shown below.



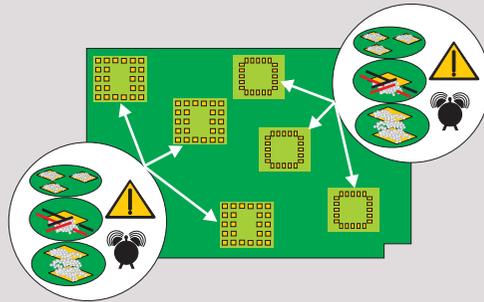
Limits Page	
1	Board - Stencil - Alignment tabs, use these to access the limit parameters for editing.
2	Delete Limit Set. Delete the limit set which is selected in the table. Default, In-Use, and Template limit sets cannot be deleted.
3	Rename Limit Set. This button provides a facility to rename the limit set.
4	New Limit Set From Template. This button is used to create a new limit based on a template. There are 15 device types available.
5	New Limit Set From Selected. This button is used to create a new limit based on the one selected in the table.
6	Tabular view, all limits that have been programmed. Limits become 'In-Use' when associated with a device or site in the strategy page.



Limit Set

To apply parameter limits to each site or device, create limit sets.

A limit set is a collection of warning and alarm settings, which relate to board, stencil or alignment parameters that can be applied to a number of different sites. This enables sites of a particular type to be inspected using the same set of limits.



Limit Set Name

The limit set name is a unique name that is given to a set of limits, warning, and alarm settings which can be applied to any site. The identity can have a maximum of 20 characters.

Limit set names should be meaningful, corresponding to something that can be referred to for future reference such as a device type, location or other unique identifier.

Limit Name:

Template Limit Set

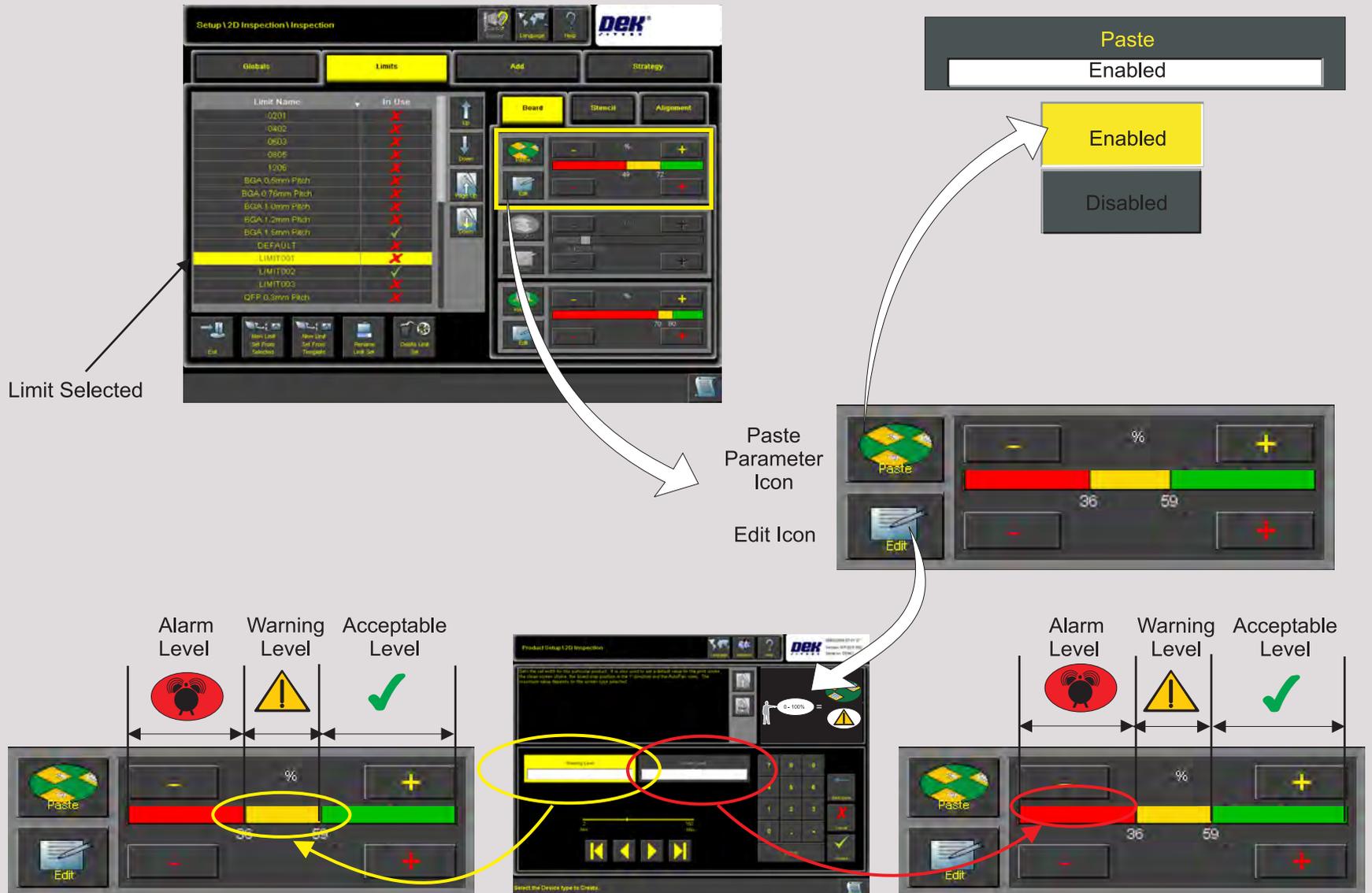
The software provides a library of limits that correspond to the most common device types. This is the template limit set which can be used as the default for most device types and modified to suit individual requirements.





Adjusting Limits

The graphic below is an example of an editable limit parameter, it shows the paste parameter. This is representative of the way that all limit parameters are edited.



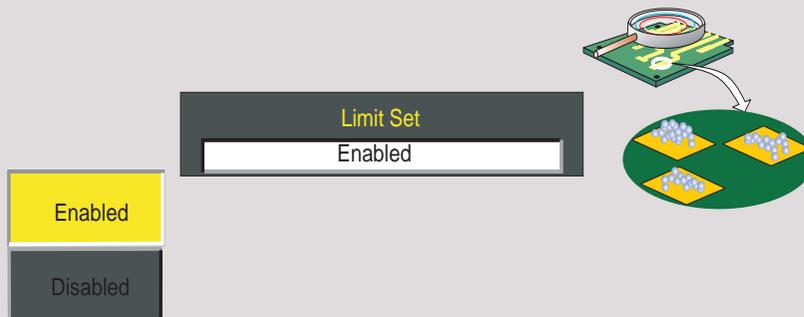


The named limit to be setup is selected from the limits table. When selected the named limit is shown highlighted in yellow.

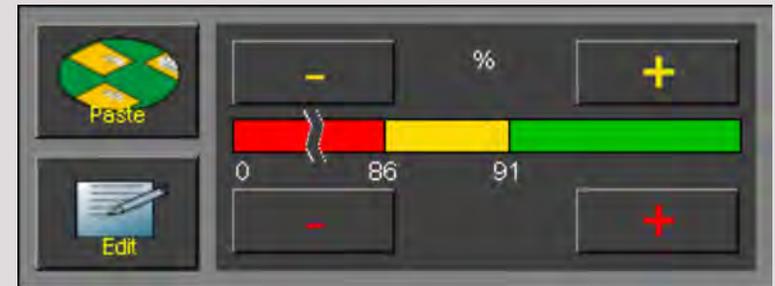
Parameter Limits are accessible via the tabs - Board, Stencil, and Alignment. The board tab is shown selected in the graphic below. There are several editable parameters: Paste on Pad, Bridging, Paste Volume, Stencil Blockage, Stencil Smear, and Alignment.



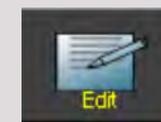
Selecting the icon button for the parameter opens an Enable/Disable page. This function can be used to turn the limit ON or OFF.



In some circumstances the data becomes confined to either end of the scale. Information is difficult to read and display as it is confined to a relatively small portion of the bar. In the graphic below, the data has been manipulated to give the best fit. Two break lines are shown at approximately the 80% point; all data below this point is compressed on the chart and the data above this level is shown extended.



Selecting a '+' or a '-' symbol adjusts the limit level. The yellow symbols are used to adjust the warning level, whilst the red symbols are used to adjust the alarm level. An alternative method of adjustment is to select the Edit button.



Selecting the Edit button opens the Edit page to set the alarm and warning levels.

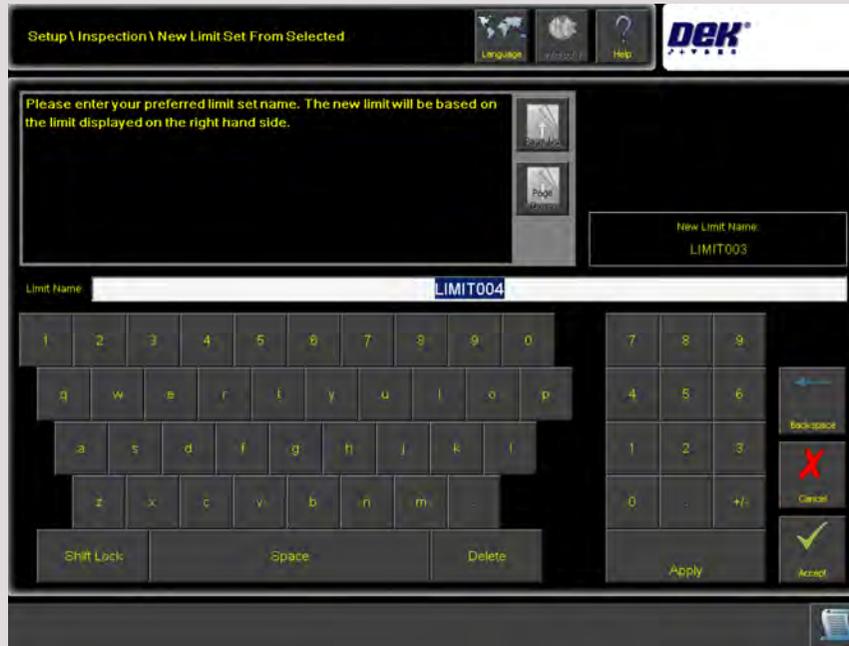


Adding New,
Modifying
Existing and
Renaming Limits

Three buttons on the interface are available for editing limits.



The New Limit Set From Selected button is used to make a copy of an existing limit set. In the example shown, the LIMIT004 has been created from LIMIT003 the system automatically creates a name for the limit. However, users can rename it.



The New Limit Set From Template button is used to access a page that allows users to select a pre-programmed template to apply its limits to a device or site. There are several templates available from the drop down menu; to access, select **Template Limit Set**.



Limit sets can be renamed by selecting the Rename Limit Set button and entering a preferred name in the dialogue box.



ADDING SITES AND DEVICES

The Add Functionality

Selecting the **Add** tab opens the page for adding sites or devices.



There are two methods for adding sites or devices for inspection, use an image file for reference, or by inputting coordinates.



Add Sites Using Image Files To add a site using image files, select **Load Image**.



Select the image file to be loaded from the list. The image view pane shows a representation of the Gerber image to be loaded.



NOTE

1. The following are usable image formats:
Windows meta file (.wmf.emf.), Bitmap (.bmp.jpg.png.tif.gif), and extended GERBER(.gbx).
2. The Gerber directory is setup in Maintenance/Machine Setup/ Network.

There are images in the bottom right-hand corner of the Add page which depict the start location for the inspection system to learn sites or devices. These images act as a placement guide to the learning start point of the most common board features: Single Site, Column, Row, Quad Flat Pack (QFP) and Ball Grid Array (BGA). The (QFP) device is highlighted with a yellow outline.

The cross-hair for start point placement should be located at the left corner of the QFP top row, in the board representation view.

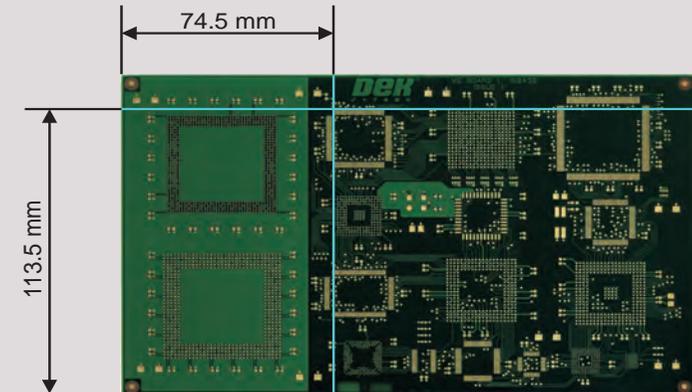


The zoom controls located to the side of the board representation view, can be used to locate the precise position of the starting point for the autolearn process.



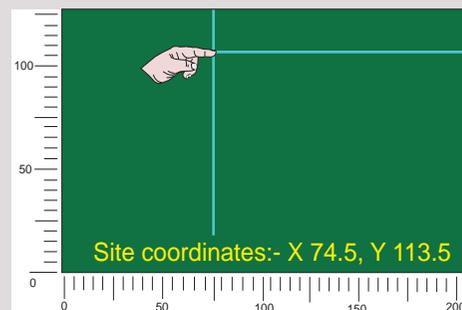
Add Sites Using Coordinates

Selecting the **Add** tab opens the page for adding sites or devices.



Sites are placed using coordinates. With a board as an example, measure the distance to the top left location of the site, place the site using the touch screen or via the Site X and Site Y coordinates buttons.

On the board select the device type to be programmed, in this case it is a QFP, note that the coordinates relate to the top left hand corner of the device.



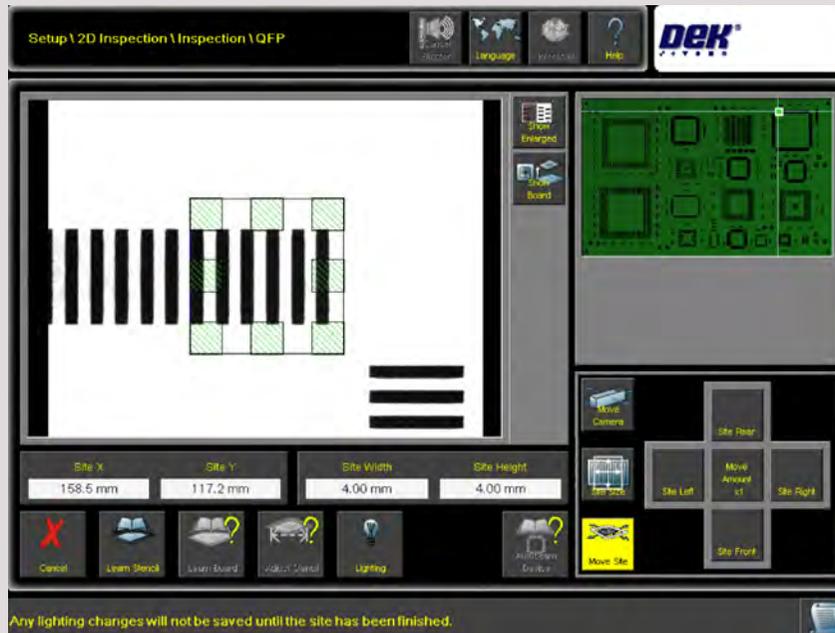


Adding a Device

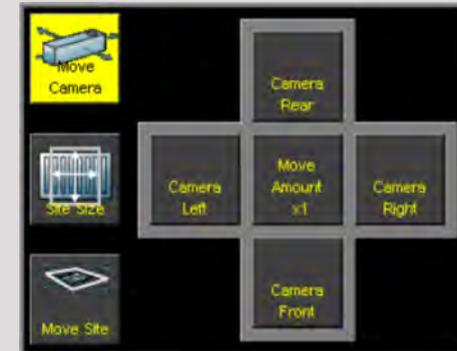
Select the device type to create, in this example a QFP has been selected.



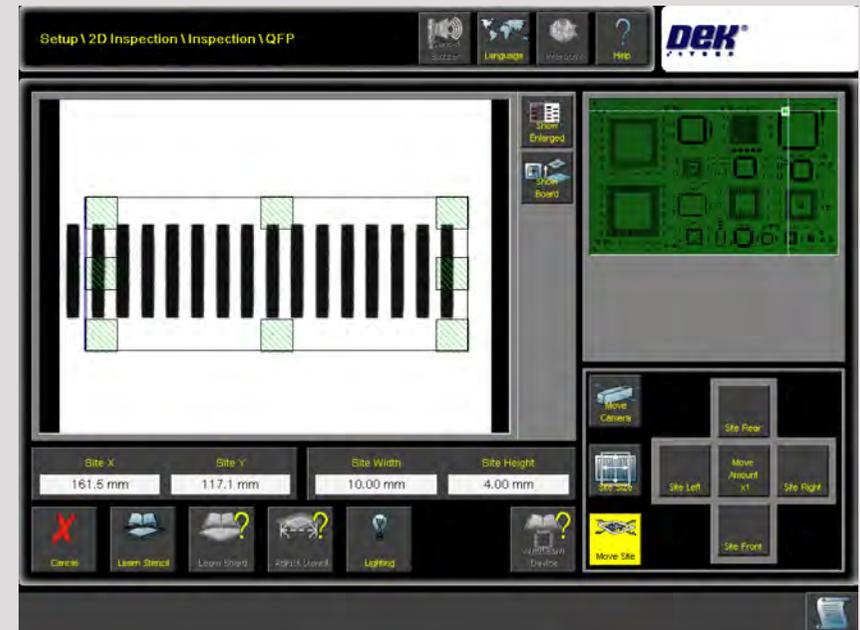
The page below is displayed.



Use the Move Camera option to centralise the apertures or double click on the camera image to centralise on a point.



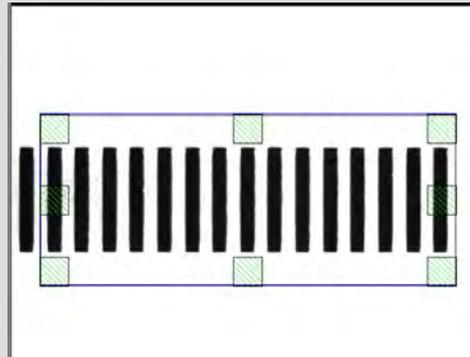
Select **Site Width/Site Height**. Adjust the width to maximum. This reduces the number of sites created.





The site setup rectangle (blue outlined) can be aligned and centralised by any of the following actions:

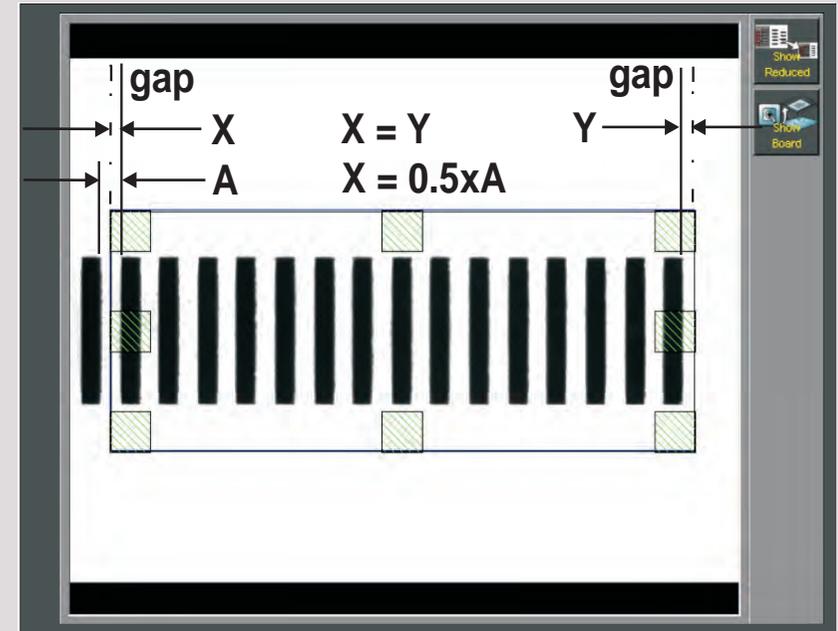
- Dragging its grab handles (green hashed rectangles)
- Moving its centre on the touch screen
- Using the 'Move Camera', 'Site Size', or 'Move Site' positioning options
- Double clicking over the image, this centralizes the image in the camera field of view



By selecting the 'Move Amount' button in the centre of this control, the amount of site or camera movement, or the site size is increased or decreased from x1, to x10, to x100.



Position the setup rectangle to encompass the site as shown below.



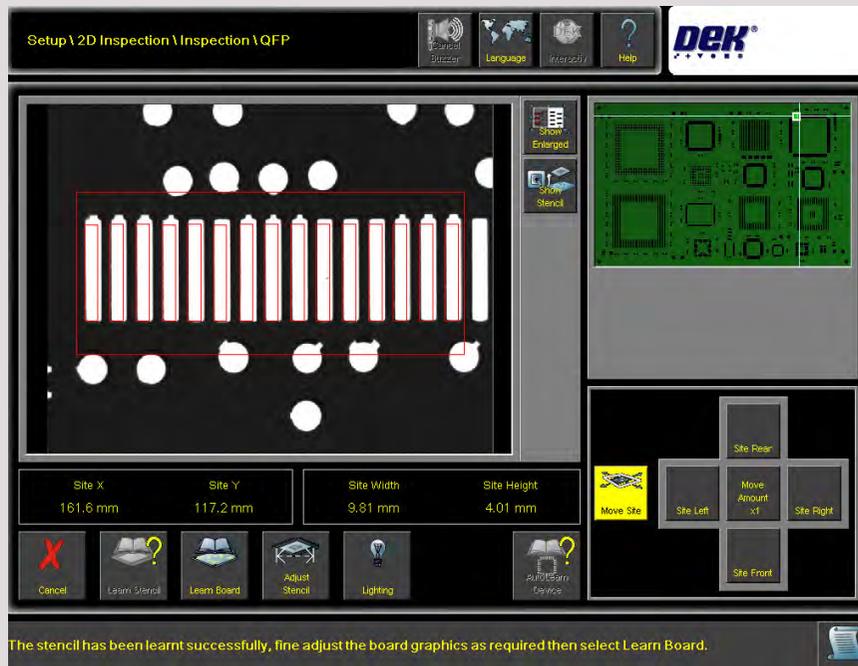
Stencil apertures should not be near to or be cut-through by the setup rectangle outline. Any features close to the site that are not inspected must be excluded from inside the setup rectangle. The gap size is equal to half the distance between adjacent apertures as shown in the graphic. This gap is identical for both the left and the right-hand edges of the setup rectangle.



Select **Learn Stencil**.

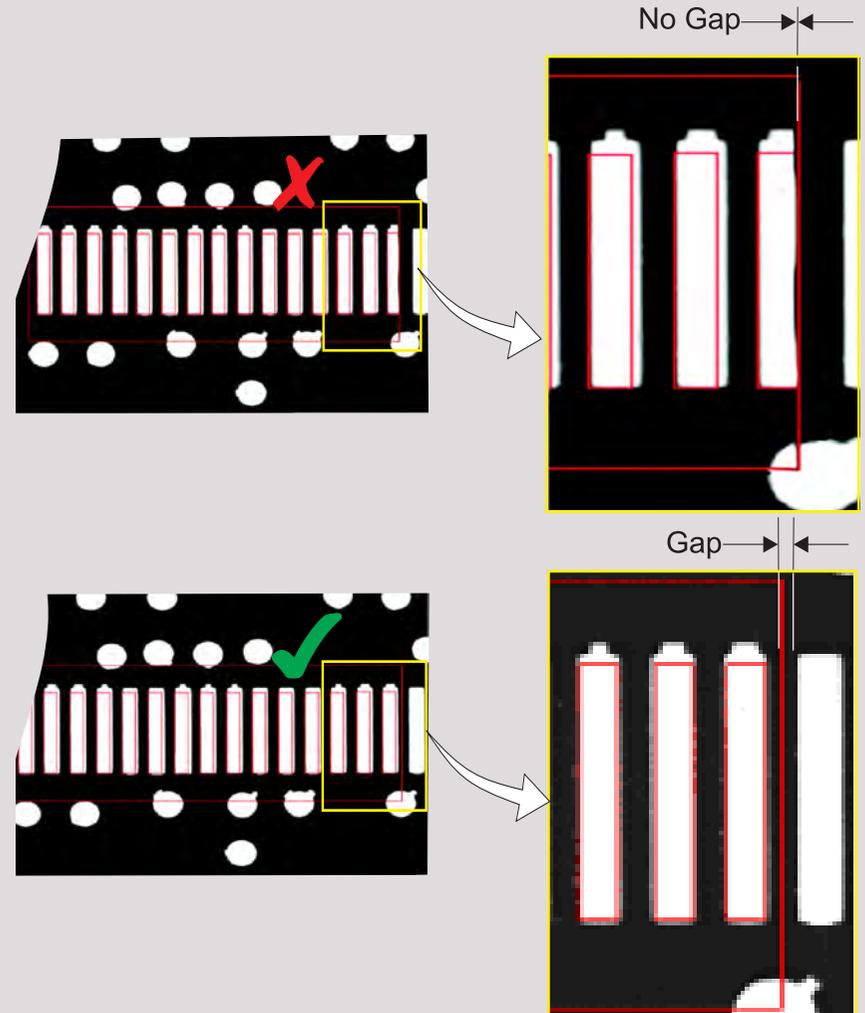


The page below is displayed showing the board view with the stencil overlay on the corresponding board feature.



Use the Move Site functionality to centralise the stencil overlay if it is outside the pad area.

A check should be carried out to ensure that there is a gap between the edge of the stencil overlay graphic, the edge of the board pad, and that the stencil graphic does not cut-through the board pad image. If the gap is incorrect, the stencil size and position must be relearnt.



Select **Learn Board**. (Except where stencil only inspection is requested.)





Select **Auto Learn Device**.



A Device Name page is presented.



The user can opt to either use the name supplied by the system or rename the device.

As limit sets have previously been setup, they can now be applied to the devices that are programmed for inclusion in the inspection regime.

Select the **Site Limit Set** parameter button.



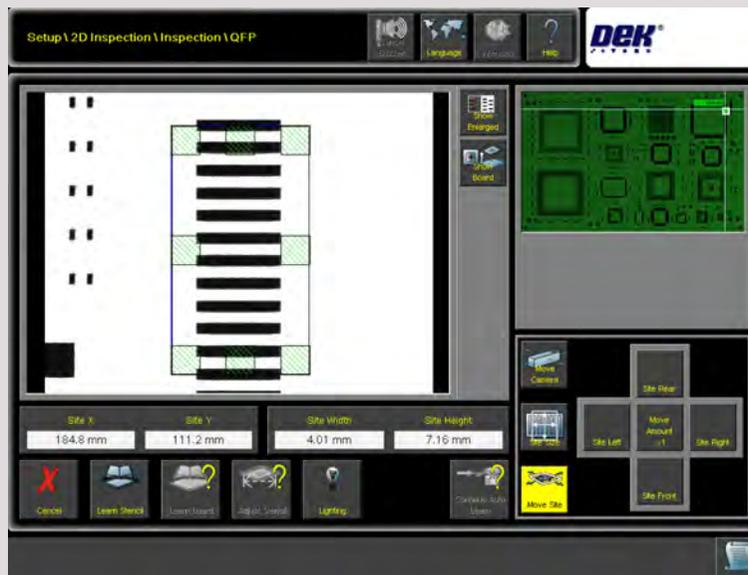
From the table, select the limit set that is to be used by the device being programmed. Select **Accept**.

The QFP row segment is learnt.



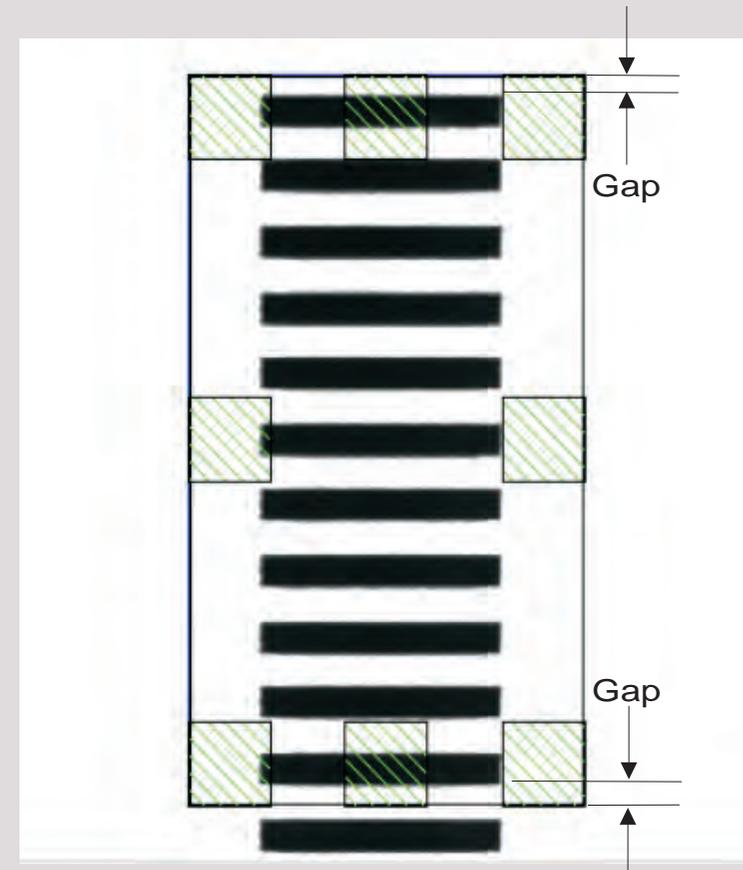
Having previously learnt the top row segment of the QFP, the vision system needs to know the start point for the column segment of the device.

Centralise the apertures by using a move function or by double clicking the camera image to centralise a point.



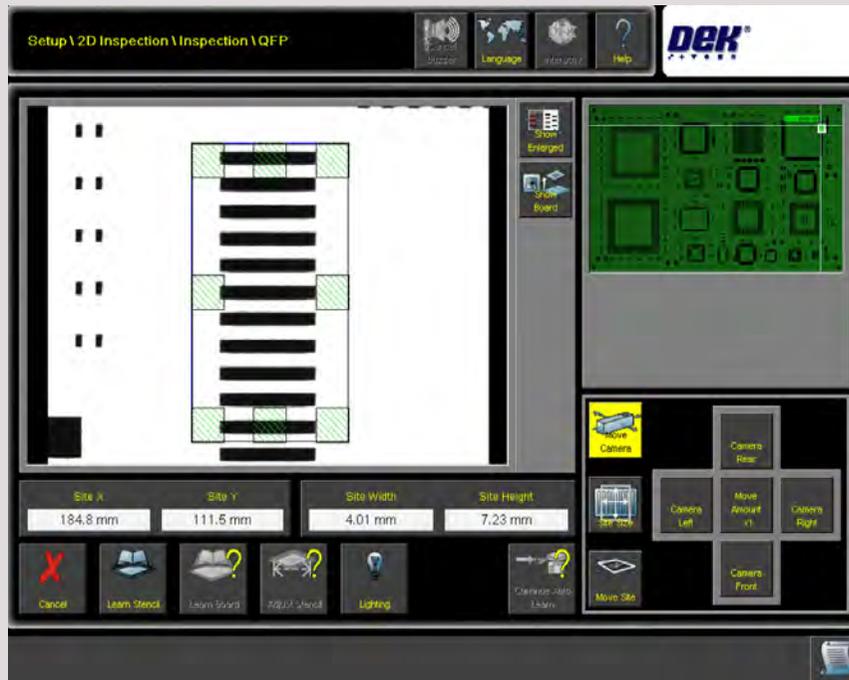
Select **Site Width/Site Height**. Adjust the height to maximum.

As for the row segment, align the site setup rectangle so that it encompasses the site without including other nearby features or cutting through components. The gap size is equal to half the distance between adjacent apertures as shown in the graphic opposite. This gap is identical for both the top and the bottom edges of the setup rectangle.

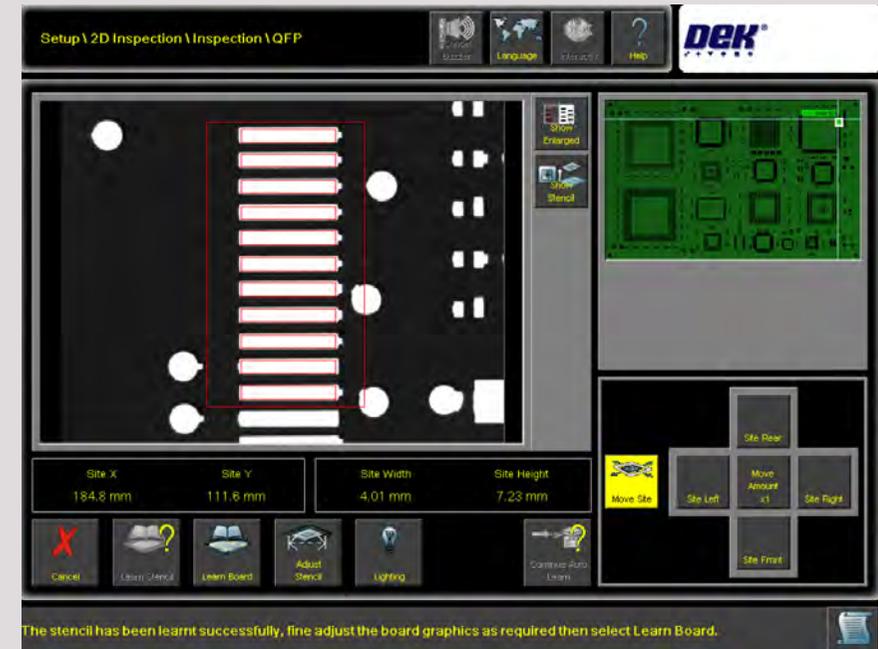




Select **Learn Stencil**.



The graphic overlays onto the board image.



Centralise the stencil overlay on the board pads as detailed previously.

Ensure that there are gaps between the edge of the overlay boundary and the edge of the board pads. If necessary, adjust the site size or position and relearn the site.

Select **Learn Board**.





Select **Continue AutoLearn**.



The device learning process can now be completed by the system as it knows both the row and the column data.

NOTE

For a single site the user selects Finish to complete the learn operation. For Rows, Columns and BGA's the learn process ends when the device has been learnt. For QFP's the stencil and board top row is learnt followed by the column and the user selects Continue Auto Learn to complete the learning process.

A Handy Setup Tip

If the device is difficult to learn automatically, divide it up so that it becomes rows and columns, they are easier to learn.



Lighting Setup

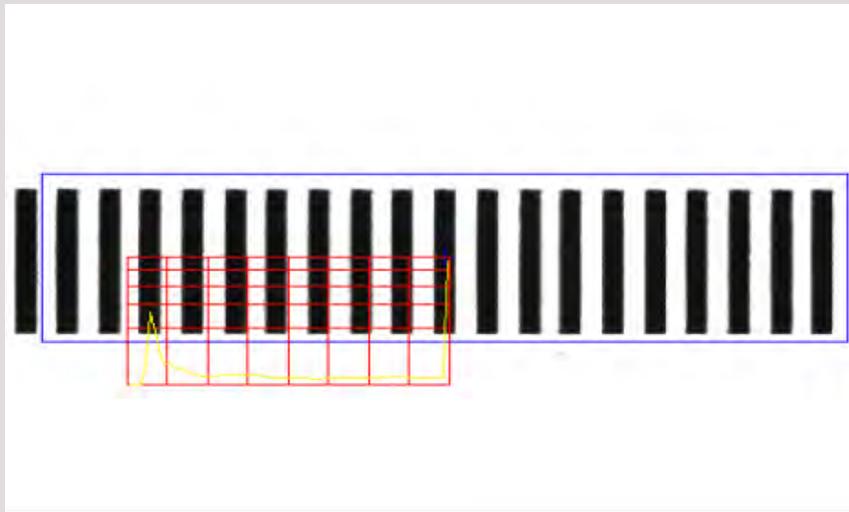
NOTE

Generally, lighting does not need adjustment.

Select **Lighting**.



A blue setup rectangle surrounds the site. Board or Stencil Vertical or Oblique lighting can be selected. A histogram (the yellow graph line within the red scale) is displayed. It is a representation of the grey-scale image in the camera field of view and shows two well separated peaks at either end of the black/white scale.

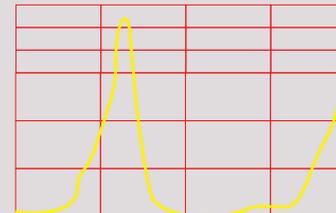
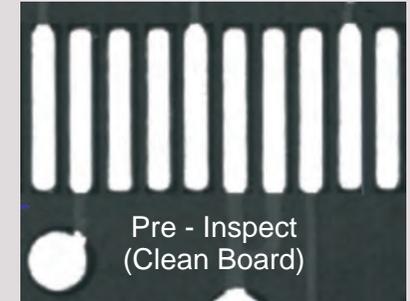


Pre - Image Capture



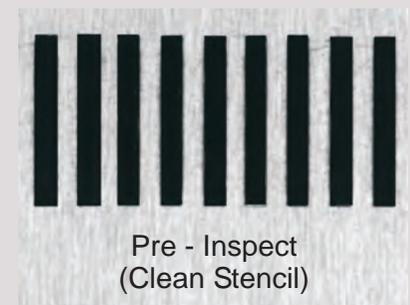
Black

White



Black

White



When site lighting is adjusted, ensure that the lighting levels are adjusted such that stencil and board pads are just whitening and not blooming. High brightness levels can cause a board feature to appear larger than it really is or make an aperture seem smaller.



INSPECTION STRATEGY

Reviewing the Inspection Strategy

The Strategy Page is shown in the graphic below. Individual devices can be edited at site level to give optimised inspection where it is needed the most.

Strategy

Site/Device	Priority	Board	Stencil	Limit Set	Alignment Type	Paste Scaling
MRM_1002						
MRM_1002-001	Every	Advanced	Advanced	QFP 0.5mm Pitch	X Only	1.00
MRM_1002-002	Every	Advanced	Advanced	QFP 0.5mm Pitch	X Only	1.00
MRM_1002-003	Every	Advanced	Advanced	QFP 0.5mm Pitch	Y Only	1.00
MRM_1002-004	Every	Advanced	Advanced	QFP 0.5mm Pitch	Y Only	1.00
MRM_1002-005	Every	Advanced	Advanced	QFP 0.5mm Pitch	Y Only	1.00
MRM_1002-006	Every	Advanced	Advanced	QFP 0.5mm Pitch	X Only	1.00
MRM_1002-007	Every	Advanced	Advanced	QFP 0.5mm Pitch	X Only	1.00
MRM_1002-008	Every	Advanced	Advanced	QFP 0.5mm Pitch	Y Only	1.00
MRM_1002-009	Every	Advanced	Advanced	QFP 0.5mm Pitch	Y Only	1.00

Description		Description	
1	Vision Window	4	Operator Command Bar
2	Board Representation View	5	Device/Site Table Listing
3	Navigation Controls		



Device/Site
Table Listing

The table listing is populated with the devices that have been programmed. The user can select a device (it becomes highlighted in yellow), the selected device is reproduced in both the vision window and the board representation view.

If the '+' sign to the left is selected, more information is available about the individual sites that make up the programmed device as shown below.



The navigation controls allow the user to page up or page down through the list, and expand or collapse from device to site levels. The list shows individual sites which have been appended to the device and the current status of each. If a site is selected, the Edit function is available in the navigation controls for editing sites; the camera moves to the site, it is displayed in the vision window and in the board representation view.



The Edit Function

If the Edit function is selected the edit page is displayed.

See the Applying Edit Function section for details.



The list of available editable controls:

- Site Name
- Site Priority
- Site Board 2Di Type
- Paste Scaling
- Site Limit Set
- Site Stencil 2Di Type
- Site Alignment

A non-editable display indicator shows if the site is supported (True). If a site has been created on a machine with a different camera system, and the product file has been transferred to the

current system, this indicator is used to show if the site is supported by the current system.

NOTE

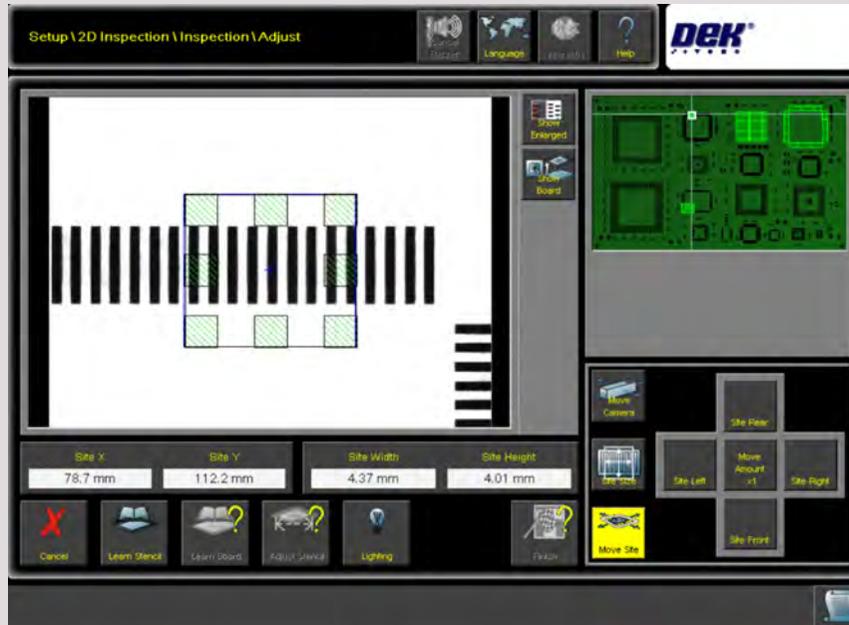
If the sites' name is changed as it is part of the device, this action separates the site from the device. For example a device has a site called "Device 03~002" that is renamed to "Site 51", the site ~002 is removed from the device completely and a stand-alone site, Site 51 is created. If at a later date Site 51 is deleted, Device 03 must be relearnt for inspection to take place on all sites.



Operator
Command Bar

Operator commands are a set of control buttons which allow the user to adjust parameters, delete devices or sites, and locate devices.

Adjust Page



Selecting Adjust Site opens the adjustment page, and all the controls previously described are available for the user to make site adjustments.

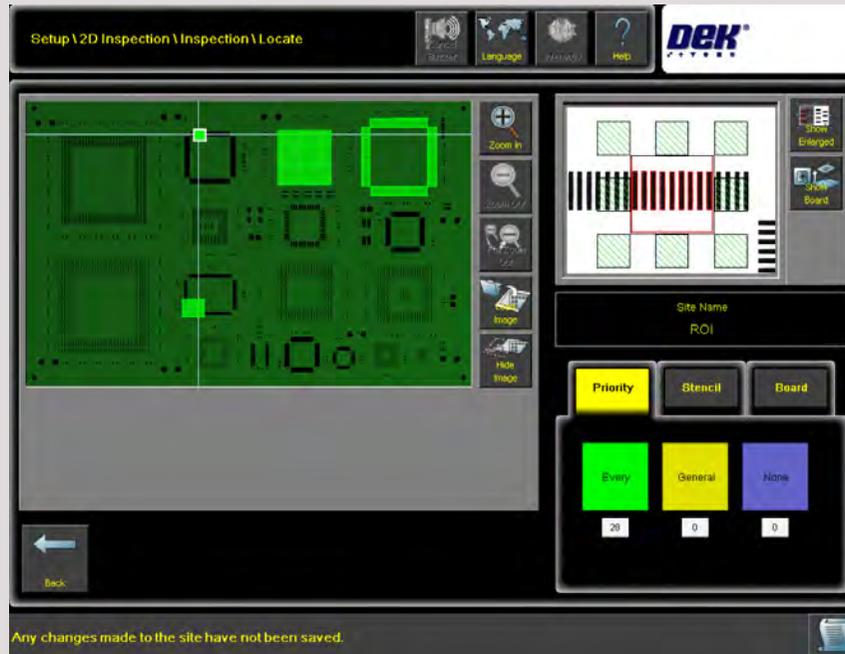
Delete Page



Selecting Delete opens the page for deleting single sites and devices or for deleting all. If an option is selected a deletion confirmation page is displayed.



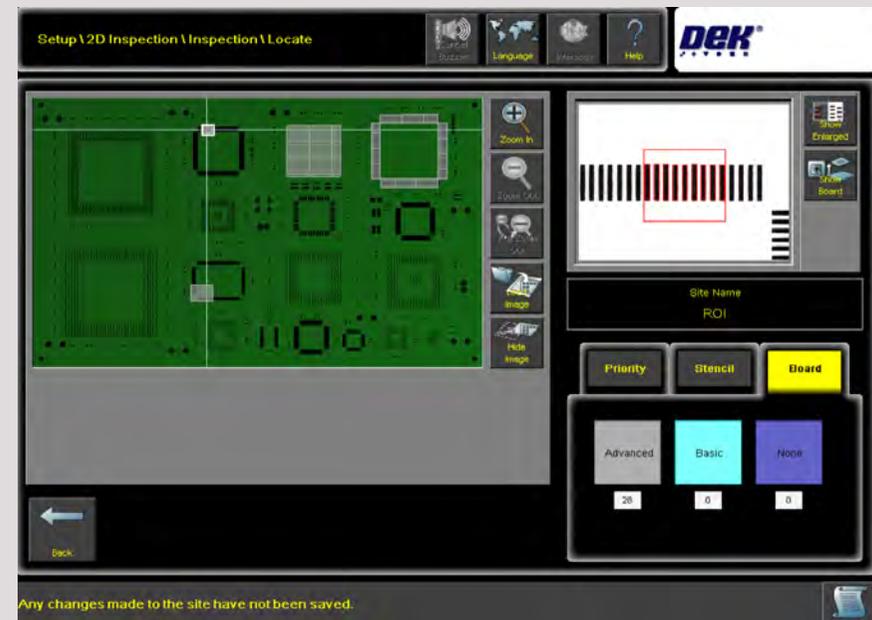
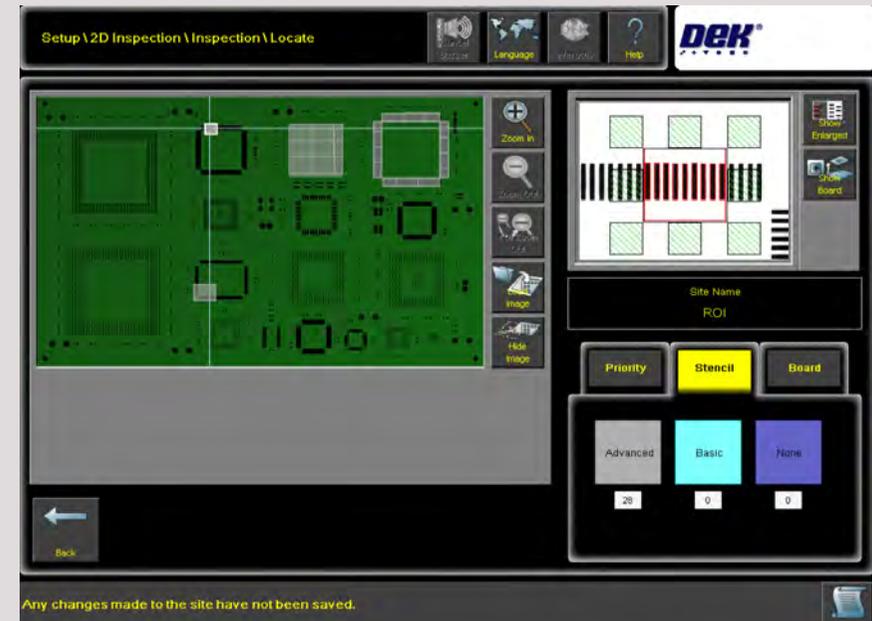
Site Locator Page



The site locator filters items to aid recognition of specific sites.

There is a series of tabs in the bottom right-hand corner of the page: Priority, Stencil and Board. Each of these tabs allows access to a set of buttons which are used to switch the relevant function ON or OFF, (where OFF is shown in a darker shade of the colour). For example on the priority tab, if 'Every' is selected this turns off all of the sites that have been set to 'Every'. In the board representation the sites are shown greyed to indicate they are present but turned off. Any site that has been set to 'General' or 'None' can therefore be easily recognised.

The priority tab has buttons for 'Every', 'General' and 'None' indicating the site status. The stencil and board tabs have buttons for 'Advanced', 'Basic' and 'None' indicating the inspection status.





Applying Edit
Functions

The Edit Page

Site Name DEVICE001~004		
Site Priority Every	Site Board 2Di Type Advanced	Paste Scaling 1.00
Site Limit Set DEFAULT	Site Stencil 2Di Type Advanced	Site Alignment X and Y
Site Supported True		

The site name can be changed by selecting it for renaming.

Site Name

Setup \ 2D Inspection \ Inspection \ Edit

Using the keyboard the user inputs a Site Name. By selecting the Limit Set parameter button and choosing a limit set from the menu, the limit set is applied to the named site.

Site Name: Site XYZ

Site Name: DEVICE001~004

1	2	3	4	5	6	7	8	9	0	7	8	9
q	w	e	r	t	y	u	i	o	p	-	5	6
a	s	d	f	g	h	j	k	l		1	2	3
z	x	c	v	b	n	m	.			0	.	+/-
Shift Lock	Space		Delete		Apply			Backspace	Cancel	Accept		



Site Priority



The site priority function allows the user to determine the inspection regime for the site.

Site inspection priority can be set: Not Inspected - inspection does not take place, General - inspection is dependent upon the current value of the setting; Minimum Sites Per Cycle, Every - site inspection takes place every cycle.

Site Board 2Di Type (inset graphic) and Site Stencil 2Di Type



The inspection level licensed, determines the site type functionality.

In both cases (board and stencil) the user can set up inspection for Basic/Advanced or None - no inspection. For Volume prediction both Board and Stencil must be set to advanced inspection.



Site Limit Set



Any of the available limits can be applied to the site.

Paste Scaling



A Paste Scaling factor can be applied to normalise the paste

results. The paste scaling functionality is detailed later in this manual.

Site Alignment

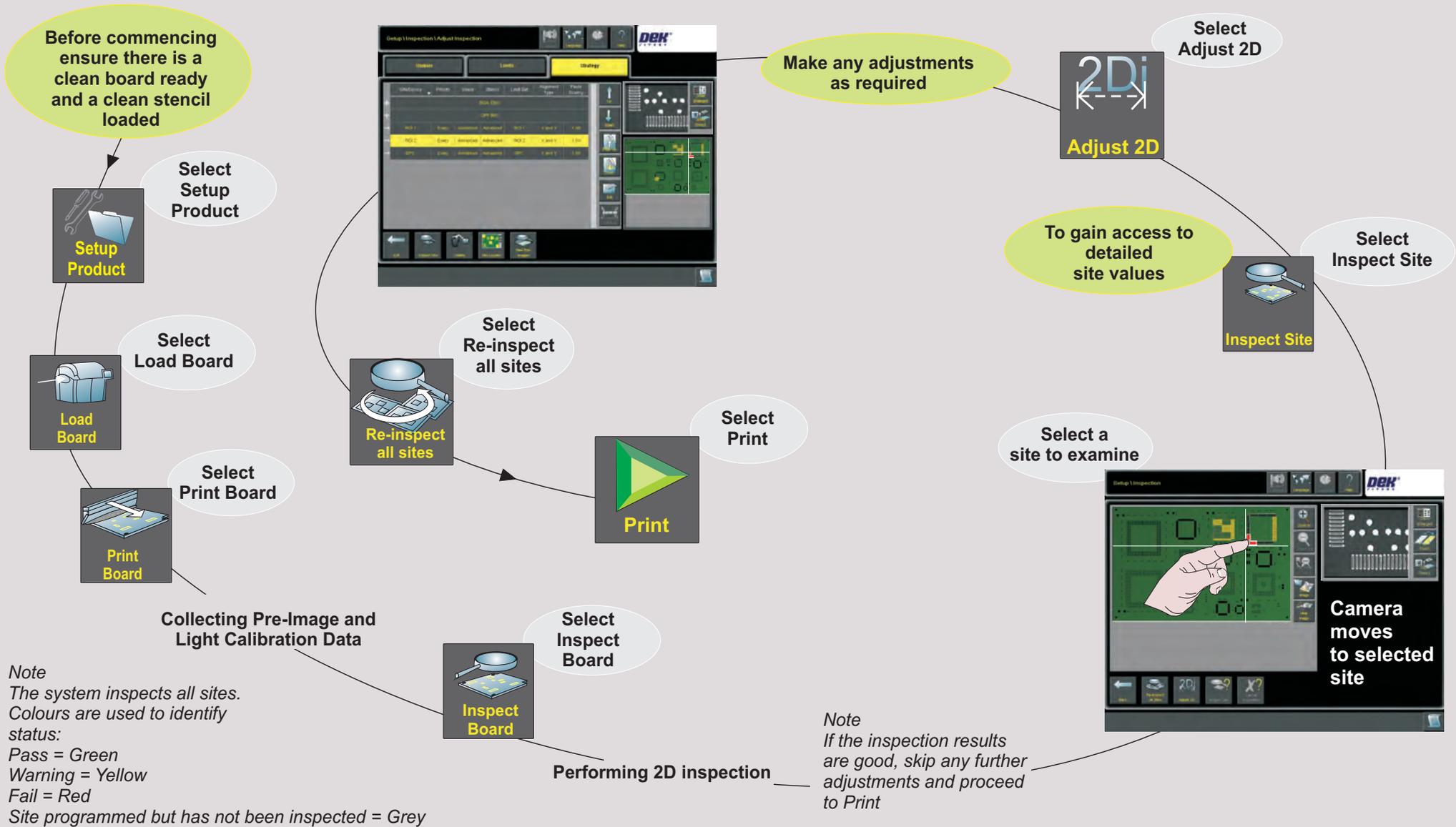


Site alignment monitors the alignment of the site. For example, to monitor the alignment of a row this function should be set up to monitor the X axis.



POST PRINT SETTINGS

Setup Overview - Post Print





Post Print Inspection

Having previously setup inspection the next step is to print a board. A clean board and stencil are loaded. Select **Print Board**.



The machine collects stencil light calibration and pre-image data, before printing a board ready for inspection.

Select **Inspect Board**.



All sites that are detailed in the strategy page are inspected. The camera moves around the programmed sites.

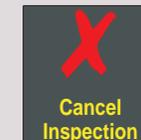


Select **Re-inspect All Sites**.



This instigates a re-inspection of all sites; it is used when one or more sites have been modified or deleted.

It is only possible to select **Cancel Inspection**,



during the inspection cycle. This is a useful function if for example, inspection results are indicating that all or the majority of sites are in the alarm state. Inspection halts after the current site has been inspected.

The site to be examined is selected directly from the board representation view. The camera moves to the selected site; features can be examined in the vision window.



Select **Inspect Site**.



Setup \ Inspection \ Inspect Site

Cancel Dryzer Language Interactiv Help **DEK**

Site Name	QFP 500-005			
Site Limit Set	QFP 500			
Limit Type	Value	Status	Warning	Alarm
Paste Present	80 %	Warning	87 %	59 %
Bridging	0.210 mm	Pass	0.080 mm	0.040 mm
Blockage	1 %	Pass	28 %	44 %
Smear	0.01 mm ²	Pass	0.48 mm ²	0.98 mm ²
Volume	80 %	Pass	59 %	36 %
X Alignment	Not Inspected			
Y Alignment	0.039 mm	Alarm	0.019 mm	0.037 mm

Global Board 2Di Type: Advanced | Site Board 2Di Type: Advanced
Global Stencil 2Di Type: Advanced | Site Stencil 2Di Type: Advanced

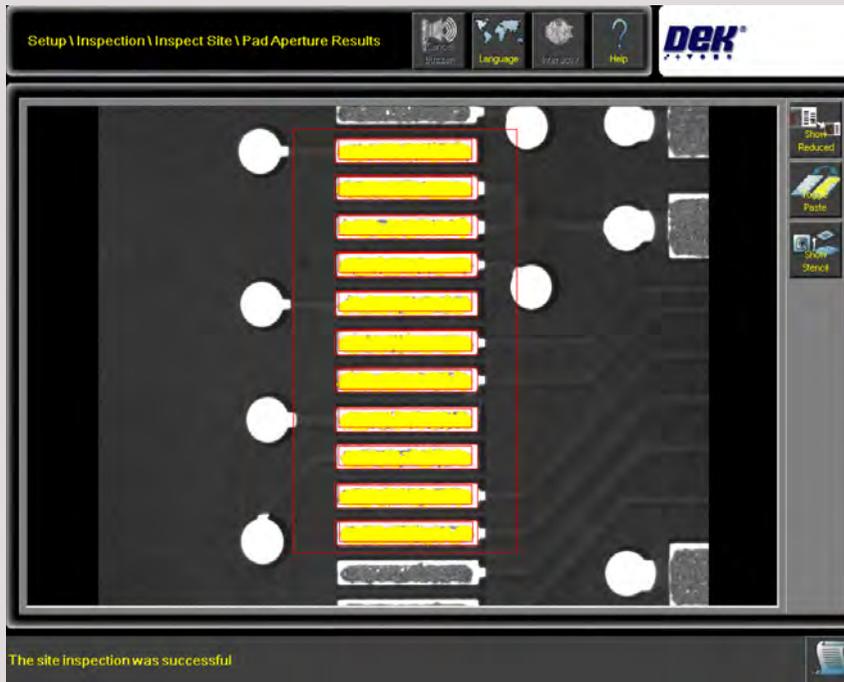
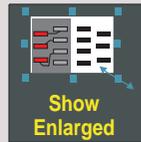
Back Pad Aperture Results Save Image Re-inspect Site Set Limit Levels to Accept Edit

The site inspection was successful

Two non-editable parameter indicators at the top of the table show the Site Name and its associated Site Limit Set. To the bottom right of the table, four further indicators show the global and site types that apply to the site. In the table, the paste present limit is highlighted (yellow). The edit limit control at the bottom right-hand side of the page reflects this and displays the appropriate limit.



Select **Show Enlarged**.



Paste painting is only available with the advanced inspection option.

Selecting **Toggle Paste** turns ON or OFF the paste painting function.

Paste Painting OFF



Paste Painting ON



Paste painting can help in the identification of paste on the pad. This is particularly useful where image contrast is poor and other similar features may be present.



The painted areas (highlighted in yellow) are representative of what the system interprets as the pasted area. In the enlarged view the user can examine individual pads in more detail.

Selecting **Set Level to Accept**,



automatically sets the warning levels to 5% and the error levels to 10% of the measured value. A grey bar running through the centre represents the measured value, and indicates graphically the value stated in the limits table.



Selecting the button for the parameter, opens an Enable/Disable page. The function is used to turn the limit ON or OFF.

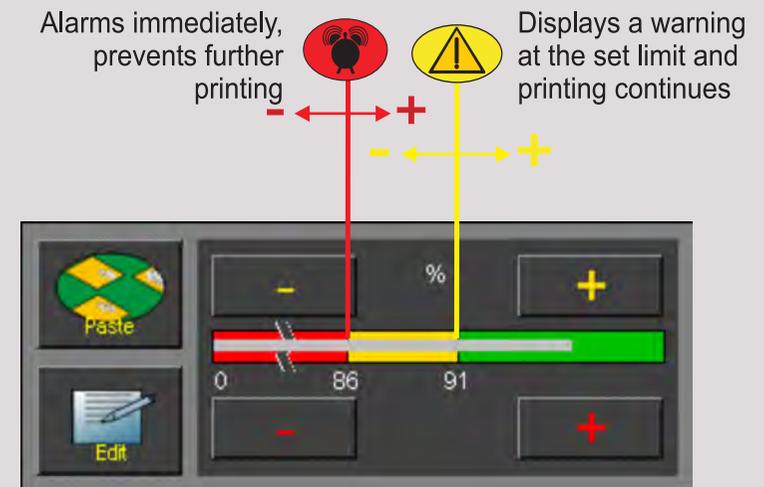
The '+' or '-' controls can be used to adjust the limit. The top control, (yellow +/-) is used to adjust the warning level whilst the lower control (red +/-) is used to adjust the alarm levels.

Selecting Edit, opens the edit page for setting alarm and warning levels. The controls allow the parameters to be edited to a set value.

The Effect of Adjustment on the Limit

Control limits should be set around what is considered the acceptable working range for each of the inspection parameters. Therefore a good working knowledge of the process for the product is essential.

When a product is printed the control limits may need adjustment. Deciding which way to make the adjustment can be confusing to inexperienced users.

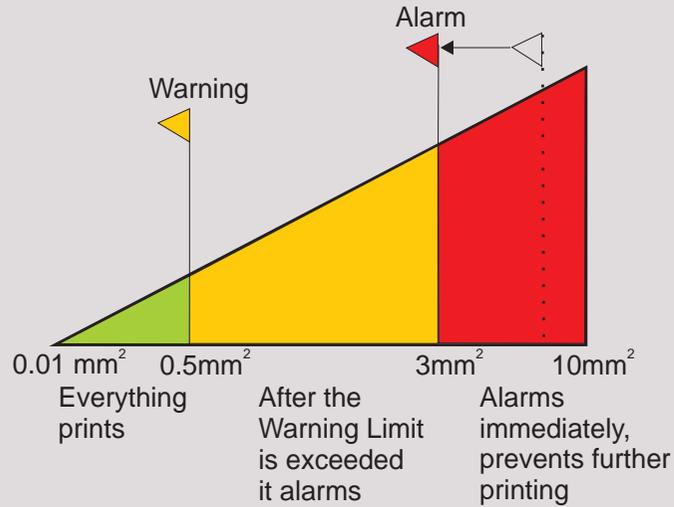


NOTE

When the warning limit, a global parameter, value has been reached the warning is automatically upgraded to an alarm.



Smear Limit (decreasing an alarm)



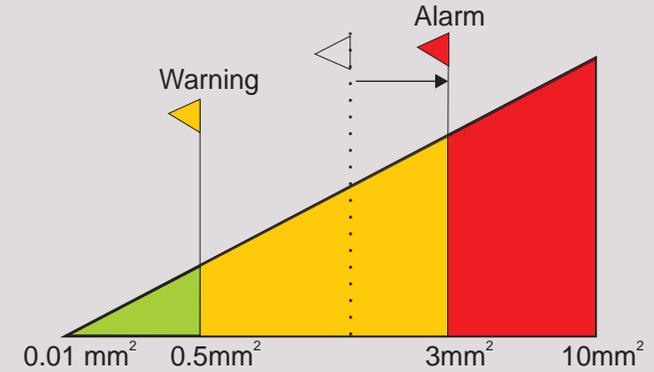
If the alarm level is decreased (dotted arrow flag represents the previous location of the alarm flag) there is more likelihood of a print fault being detected as more alarms are reported.

Smear Limit (decreasing a warning)



Decreasing the warning level increases the level where error reporting commences, and broadens the band where an alarm is raised; due to the warning limit being exceeded.

Smear Limit (increasing an alarm)



Where an alarm level is increased, the user is prepared to accept a larger warning band, but decreased protection at the higher end where alarms are reported and production is stopped.

Smear Limit (increasing a warning)

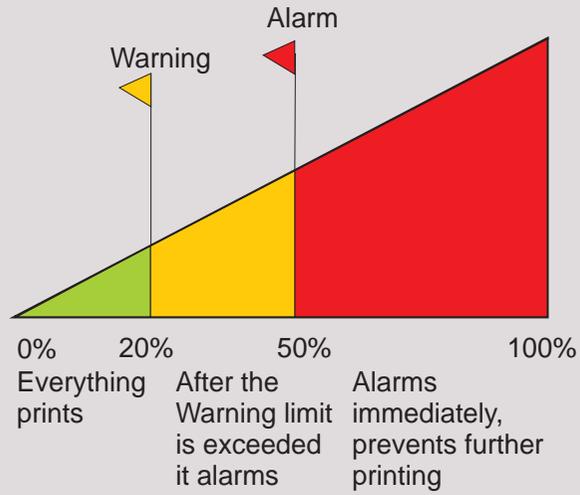


If the warning level is increased, the user is accepting a higher level of smearing risk before a warning is reported.

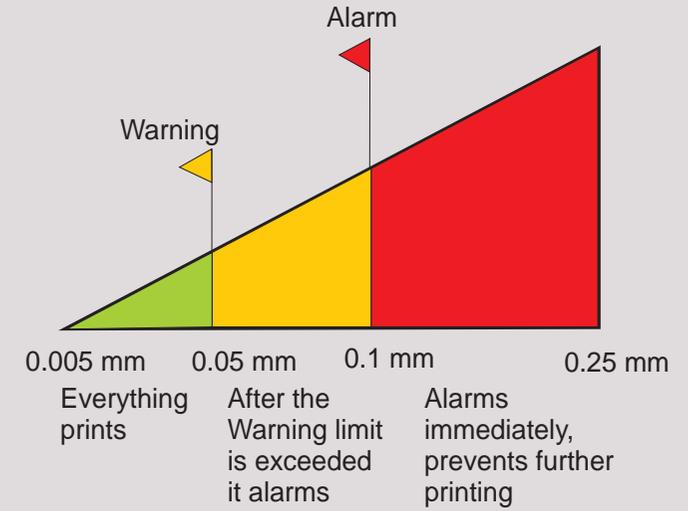


Blockage and alignment limits work in the same way as the smear limit, ie, lower results are better.

Blockage Limit

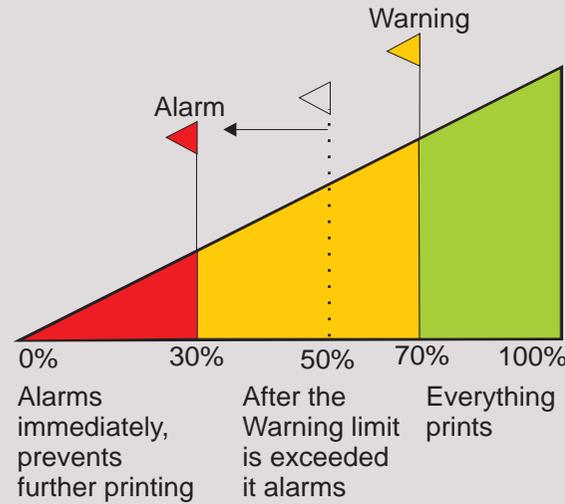


Alignment Limit



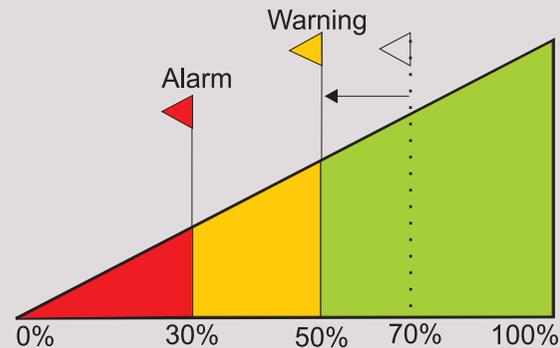


Paste Limit (decreasing an alarm)



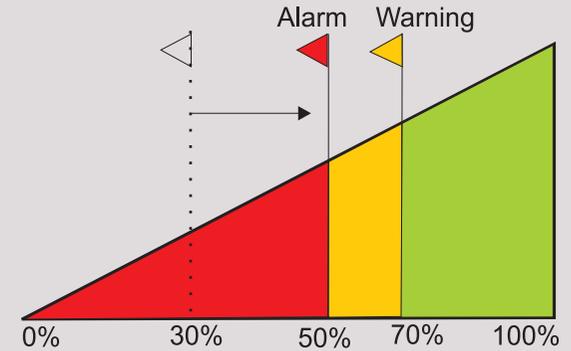
If the alarm limit is decreased, the user is decreasing the level where error reporting commences, and broadening the band where a warning is reported.

Paste Limit (decreasing a warning)



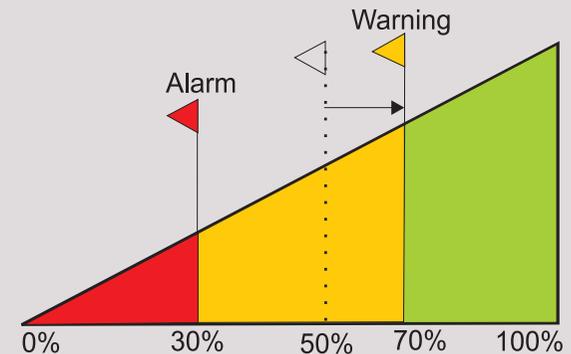
If the warning limit is decreased, the user accepts a higher level of paste risk before a warning is reported.

Paste Limit (increasing an alarm)



Where an alarm level is increased there is more likelihood of a print fault being detected as more alarms are reported.

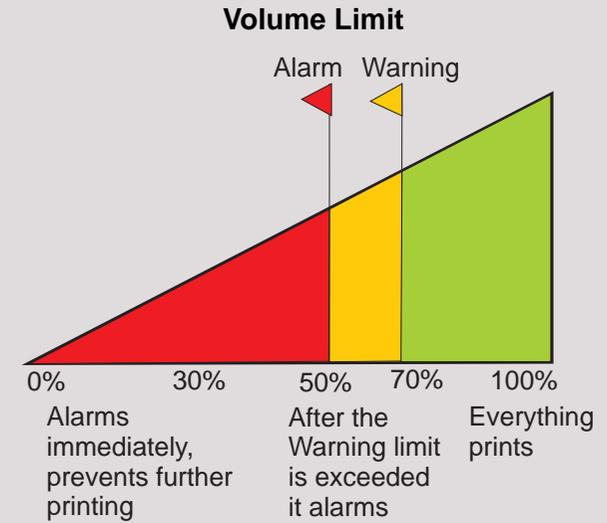
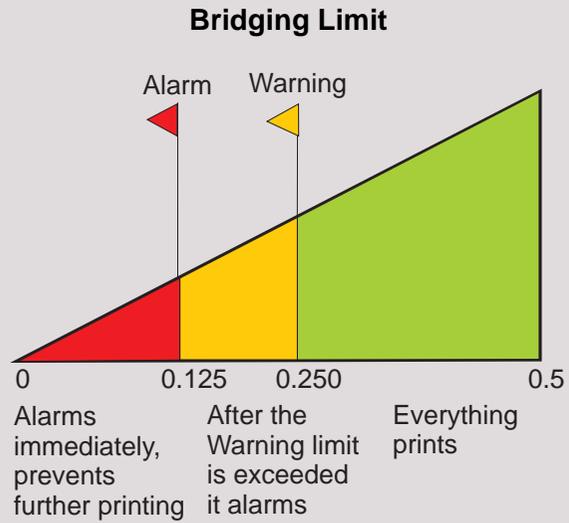
Paste Limit (increasing a warning)



If the warning level is increased, the user is increasing the level where error reporting commences, and broadening the band where an alarm is raised due to the warning limit being exceeded.



Bridging and volume limits work in the same way as the smear limit, ie, higher results are better.





Selecting **Re-inspect Site**, performs another inspection of the site.



Selecting **Save Image**, saves the current image to the PC.



The vision window image can be saved to the default directory - E:\log\insp(append number).bmp.

The prompt bar displays a message confirming that the image has been saved. This image can be used to compare with others or sent to DEK Customer Support. Data can be extracted in the event of an unresolved error.



Select **Pad Aperture Results**.



Pad Number	Paste	Blockage	Y Alignment
1	66 %	2 %	0.112 mm
2	67 %	3 %	0.110 mm
3	61 %	0 %	0.116 mm
4	54 %	0 %	0.113 mm
5	54 %	2 %	0.113 mm
6	47 %	3 %	0.127 mm
7	49 %	2 %	0.127 mm
8	56 %	0 %	0.119 mm
9	55 %	0 %	0.122 mm
10	58 %	1 %	0.121 mm
11	63 %	0 %	0.116 mm

The pad/aperture results are shown in table view.

In this view the results are presented in an easily quantified format. The results include Paste deposit, Blockage, Volume and Alignment values.

The items in the table include the following:

- Pad Number (unique identifier for the pad)
- Paste (an indication of how much paste has been deposited on the selected pad)
- Blockage (an indication of by how much the paste is blocking the selected stencil aperture)

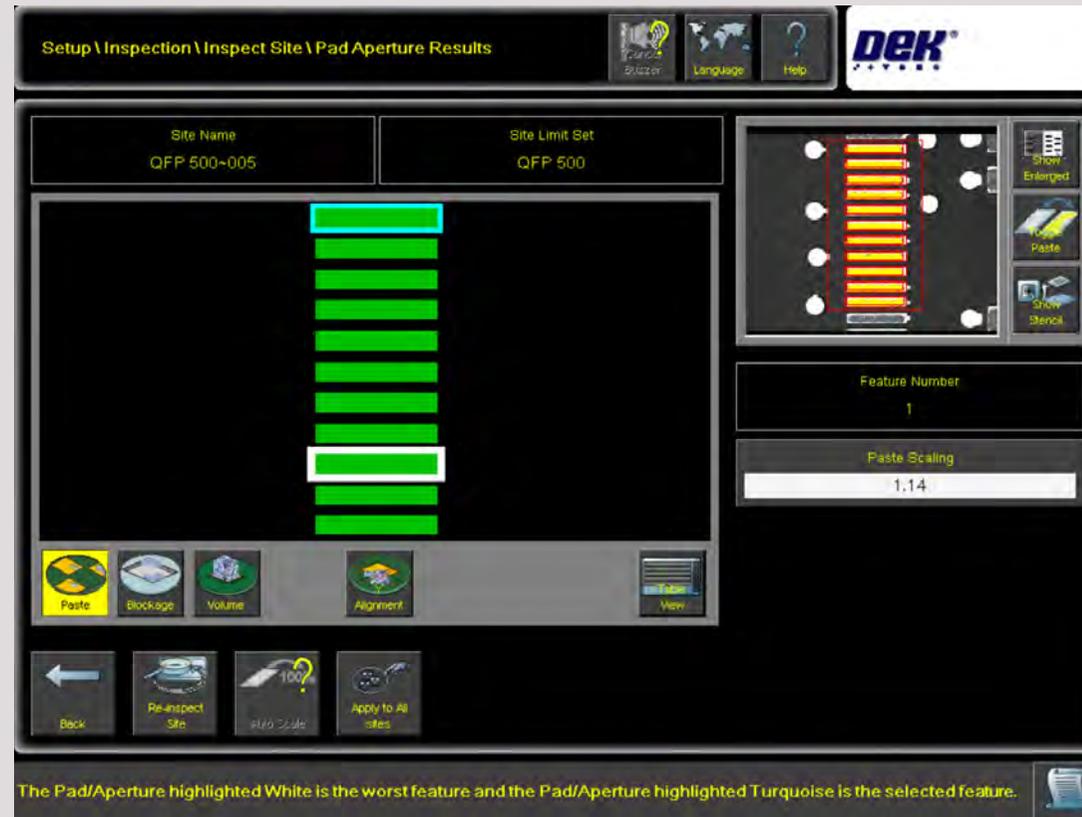
- Volume (Advanced inspection only - indicates predicted volume of paste deposited)
- X Alignment (Advanced inspection only - paste to pad misalignment in the X plane)
- Y Alignment (Advanced inspection only - paste to pad misalignment in the Y plane)



A useful feature for reordering the table hierarchy is to select the white triangle to the right of the Pad Number table header. This places the last site in the list first.



Select **Graphical View**.



Graphical view is used to visualise and identify specific pads. The pad/aperture highlighted white is the worst case feature and the currently selected feature is highlighted turquoise.

Additional information is available dependent upon the level of licensed inspection - Basic or Advanced.

All sites are shown graphically in their respective pass/warn/fail colours.

Results can be obtained for all inspection types by selecting the available buttons: Paste, Blockage, Volume, and Alignment.



Auto Scale and
Paste Scaling
Functions

Depending on the type of inspection performed, Basic or Advanced, and the printing process, paste on pad results can appear different than expected. This can be due to the inspection modes or printing styles as listed below.

Basic Mode

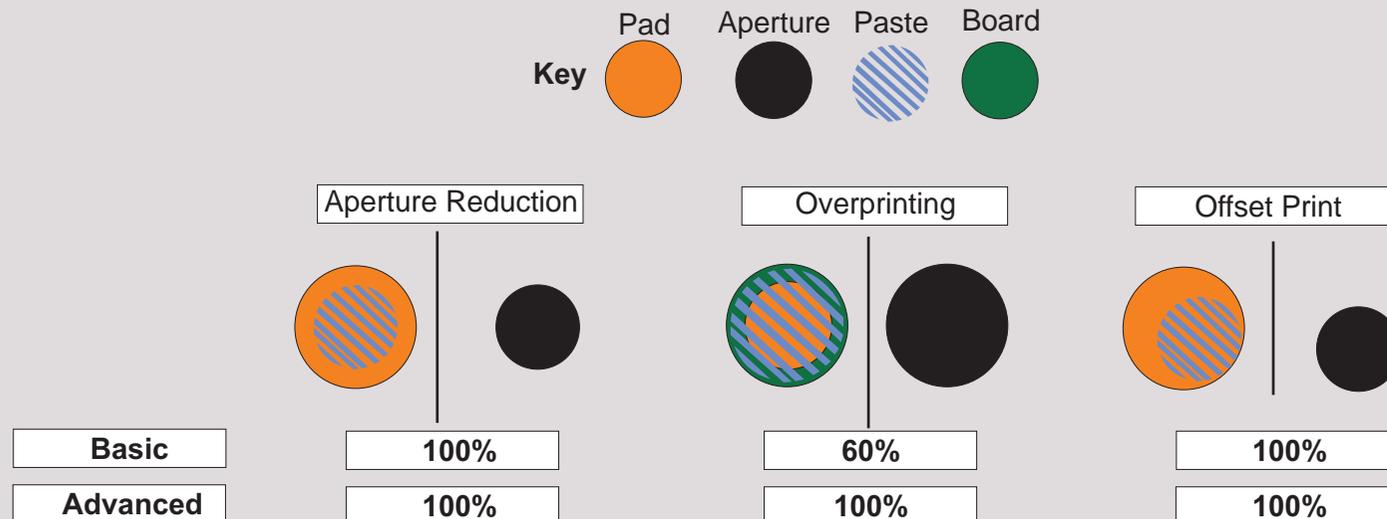
Basic inspection looks at paste on pad only and reports the amount of paste on the pad with respect to the size of the aperture.

For example, a deposit of paste the same size as the aperture, printed onto a pad that is the same size or larger than the aperture, results in 100% detection.

In this mode, the inspection system only looks at the paste on the pad. If the paste is overprinting the pad, the result equals the area of the pad compared to the area of the aperture and is indicated as a percentage.

Advanced
Mode

Advanced inspection looks at the pad and board, and reports the amount of paste on the board with respect to the size of aperture. Therefore, wherever paste is detected, it is proportional to the size of the aperture. For a good print, all deposits are closer to 100%.





Auto Scale

Auto scale can be used to normalise the results.

Select **Auto Scale**.



The selected pad is automatically scaled to 100%, the factor that is needed to do this is called the paste scaling factor; it can be modified if **Paste Scaling** is selected.

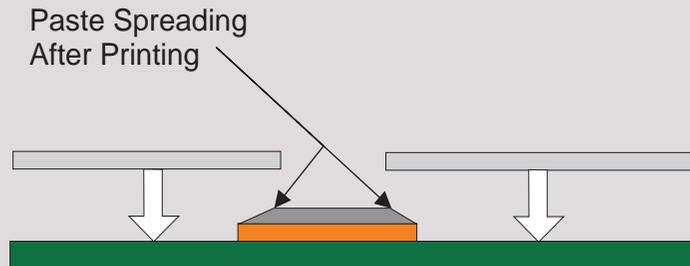


The paste scaling factor is applied to all pads within the site, it can also be applied to other sites within the device.

Select **Apply to All Sites** to apply scaling to other sites.



Autoscale can be used to normalize the pad results when the paste has extended outside of the stencil aperture. In the example opposite, the paste has spread outside the stencil boundary, the system reports this as 120%. Selecting Auto Scale applies a paste scaling factor to normalize the pad result to 100%. In this case a factor of 0.83 is applied.



Paste spreads after printing.
The system reports this paste level as 120%.
Paste scaling is applied to normalize this at 100%.

Example Showing Paste Spread



The table view updates to show the result of the paste scaling.

Setup \ Inspection \ Inspect Site \ Pad Aperture Results

15/07/2008 14:12:42
09 SP03 (1010 B04)
Serial No: 285751

Site Name: QFP 500-005
Site Limit Set: QFP 500

Pad Number	Paste	Blockage	Volume	Y Alignment
1	95 %	0 %	95 %	0.051 mm
2	96 %	0 %	96 %	0.054 mm
3	94 %	1 %	94 %	0.048 mm
4	93 %	0 %	93 %	0.060 mm
5	92 %	0 %	92 %	0.061 mm
6	96 %	1 %	95 %	0.061 mm
7	98 %	0 %	98 %	0.052 mm
8	95 %	0 %	95 %	0.051 mm
9	91 %	0 %	91 %	0.061 mm
10	96 %	0 %	95 %	0.061 mm
11	93 %	1 %	93 %	0.070 mm

Feature Number: 1
Paste Scaling: 1.14

Buttons: Back, Re-inspect Site, Auto Scale, Apply to All sites, Up, Down, Page Up, Page Down, Graphical View, Show Enlarged, Toggle Paste, Show Stencil

The site inspection was successful

Select **Re-inspect Site**.



The system performs another inspection of the site.

**A GUIDE TO 2 DIMENSIONAL INSPECTION
POST PRINT SETTINGS**



Select **Adjust 2D**.



This opens the strategy page.



Select **Site Locator**.



The Site Locator in post print mode has an additional tab for results. This control is used to turn the site graphics in the board representation view ON or OFF. The sites are categorised as either having passed inspection or are in a warning or alarm state. To locate a specific category the user turns categories off and leaves the required selection(s) on. In the graphic above the pass category has been turned off.



Setup \ Inspection \ Adjust Inspection

Cancel Buzzer Language Interactiv Help

DEK

Globals Limits Strategy

Site/Device	Priority	Board	Stencil	Limit Set	Alignment Type	Paste Scaling
QFP 500						
QFP 500~001	Every	Advanced	Advanced	QFP 500	X Only	1.20
QFP 500~002	Every	Advanced	Advanced	QFP 500	X Only	1.20
QFP 500~003	Every	Advanced	Advanced	QFP 500	X Only	1.20
QFP 500~004	Every	Advanced	Advanced	QFP 500	Y Only	1.20
QFP 500~005	Every	Advanced	Advanced	QFP 500	Y Only	1.20
QFP 500~006	Every	Advanced	Advanced	QFP 500	Y Only	1.20
QFP 500~007	Every	Advanced	Advanced	QFP 500	Y Only	1.20
QFP 500~008	Every	Advanced	Advanced	QFP 500	X Only	1.20
QFP 500~009	Every	Advanced	Advanced	QFP 500	X Only	1.20

Up Down Page Up Page Down Edit Expand / Collapse

Show Enlarged Show Stencil

Exit Inspect Site Delete Site Locator New Pre-Images

Selecting a list item in the table causes the camera to move to the site and display it in the vision window.

Selecting **New Pre-Images** instigates a pre-image data capture sequence when the next board is fed into the printer. This facility can be useful if conditions change, for example if during a batch print the background colour of the board changes. Taking new image data may prevent errors occurring.



PRODUCT RUNNING

Run Mode Select **Print**.



Select the 2D Status tab to view the 2D Status page.

The machine mimic and the inspection indicator are both active at various stages of the print cycle.

During the inspection phase, the vision window and board representation views show the programmed sites being actively inspected.





Adjustment is password protectable and may not be available to all users.

Select **Adjust 2D**.



This functionality is only allowed during the point in the cycle, where a clean board has been loaded into the machine, and fiducials have been captured. During a print run the machine pauses to allow adjustments to be made.

As the machine is in the run mode, the 2D Inspect Rate is a read-only parameter indicator.



All other adjustments: Globals, Limits, and Strategy are carried out in accordance with the procedures described previously.



Alarms

There are two ways that the system can generate an inspection alarm. Either an alarm limit has been exceeded, or the number of consecutive warnings that have been setup in the Globals - Warning Limit parameter, has been exceeded.

The screenshot displays the 'Inspection Alarm' screen. At the top, there are control buttons for 'Cancel Buzzer', 'Language', 'Interactiv', and 'Help', along with the DEK logo. The main area is divided into several sections:

- Site Information:** 'Site Name' is 'ROI 2' and 'Site Limit Set' is 'ROI 2'.
- Limit Table:** A table showing inspection results for 'Paste Present' and 'Volume'.
- Visuals:** A 'Show Enlarged' view of a grid and a 'Show Stencil' view of a PCB layout.
- Bottom Bar:** Action buttons for 'Accept Board', 'Reject Board', 'Recovery Actions', 'Inspect Remaining Sites', 'Re-inspect All Sites', 'Inspection Options', and 'Adjust Process'.
- Status Bar:** A message at the bottom states 'The minimum number of sites have been inspected'.

Limit Type	Value	Status	Warning	Alarm
Paste Present	41 %	Alarm	80 %	64 %
Volume	41 %	Alarm	59 %	50 %



On receiving an alarm the following options become available:

- **Accept Board** - The user checks the alarm condition and determines that the print is acceptable
- **Reject Board** - The quality of the print is unacceptable
- **Recovery Actions** - Options available depend upon system setup:
 - **Add Paste** - Manually/automatically add more paste
 - **Clean Mode 1 and 2** - Instigate an underscreen clean based on the modes programmed
 - **Reprint Board** - Reprinting may solve low paste issues. Try adding paste before reprinting
- **Inspect Remaining Sites** - Complete the inspection cycle to determine if the problem is local or general
- **Re-Inspect All Sites** - Recheck the inspection data, if the results are close to a pass a second scan may pass the board
- **Inspection Options** - Are password protectable:
 - **Pad Aperture Results** - This is an option to inspect board and stencil in graphic view or table view
 - **Adjust 2D** - Opens the adjustment page for Globals, Limits, and Strategy
 - **Inspect Site** - Recheck inspection data for the site
 - **New Pre-Images** - Collect new pre-image data on the next board in the batch. Useful if conditions have changed, for example the board background colour is different
- **Adjust Process** - If necessary make adjustment to the print process. This option is password protectable

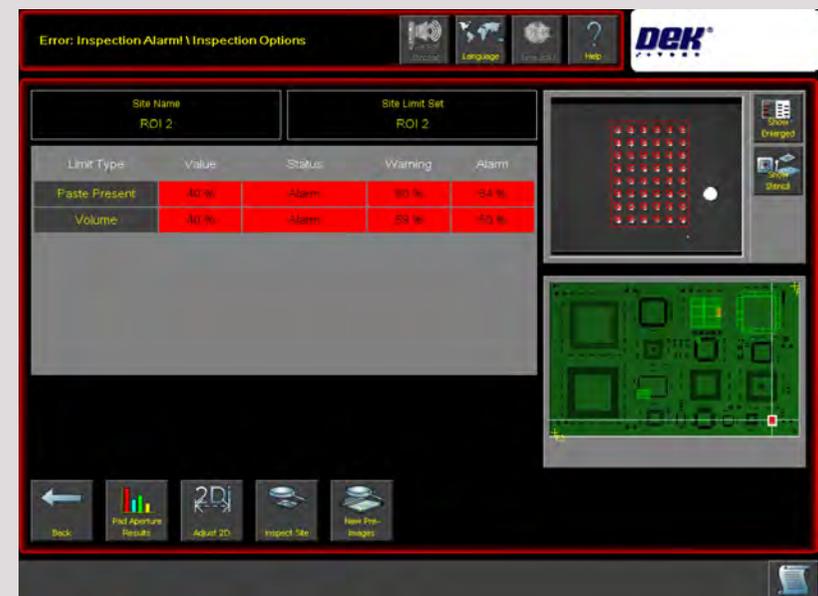
NOTE

In recovery actions the vision window is out of focus because the rising table has been lowered to allow for the screen cleaner pick-up.

Recovery Actions



Inspection Options





Alarm Caused by Consecutive Warnings

Limit Type	Value	Status	Warning	Alarm
Paste Present	79 %	Warning	80 %	64 %

The alarm above has been generated as a result of three consecutive warnings on the same site during the printing of a batch of boards. This parameter, Warning Limit, is set in the Globals page.

Warning Limit



OPTIMISING FOR PRODUCTION

Setting Limits for Device Types

Information on limit settings for a variety of device types is available on the DEK Process Engineering website. Refer to the limits' calculator spreadsheet, the 2Di Limits Calculator (Limit 20Calculator.xls.) Select the Process Technology tab/Process Engineering/Calculators to gain access to the spreadsheet.

This spreadsheet is used to calculate the theoretical limits for devices, these limits can be programmed into their respective limits parameters to optimise inspection results for the product.



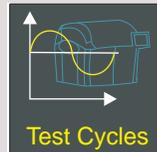
MONITORING OUTPUT

Data Logging Data can be output to a file by turning data logging on.

From the ready page select **Maintenance**.



Select **Test Cycles**.



Select **Data Logging On**.



A message in the prompt bar confirms that Data Logging has been turned ON. The Data Logging button on the button changes to display Data Logging OFF. The printer does not store this setting. If the printer is switched off at any time this function needs to be setup again.

During a print run, data is output to a file on the E drive, E:\Log\INSPECT.DAT

The INSPECT.DAT log can be loaded into an Microsoft Excel spreadsheet.

The procedure to load the spreadsheet is shown below:

- In Excel select **File Open** (Ctrl+O) and open the INSPECT.DAT file.
- The Text Import Wizard is opened.
- Select **Delimited**.
- Select **Next**.
- Tick the **Comma** delimiters box.
- Select **Finish**.

The spreadsheet opens automatically.

- Select Row 1, left-hand-side, top square. Right-click to show the menu options and select **Insert**. Select **Entire row** to insert a new row at the top of the spreadsheet. Select **OK**.
- Ensure that the left-hand-side, top square is still selected.
- From the top menu bar - Select **Data**, Select **Filter**, Select **AutoFilter**. The drop down menu arrows are displayed in all the columns of row 1, where parameter data is available.



All columns can have filters set, allowing relevant data to be displayed. The identities for the columns are shown in the result table below.

Product File	Result Type	Identifier for Stencil or Board Result	Minimum Paste	Maximum Blockage	Smear	X Align Average	Y Align Average
LOGANS VGB B02	23 Short Results	BGA 1200~001	Stencil Results	1	0.87	0	0
LOGANS VGB B02	23 Short Results	BGA 1200~002	Stencil Results	1	0.87	0	0
LOGANS VGB B02	23 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	0 0.495	0 0.008
LOGANS VGB B02	24 Short Results	BGA 1200~002	Stencil Results	1	0.63	0	0
LOGANS VGB B02	24 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	0 0.51	0 0.007
LOGANS VGB B02	25 Short Results	BGA 1200~002	Stencil Results	1	0.75	0 0.0142	0
LOGANS VGB B02	25 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	0 0.525	0 0.007
LOGANS VGB B02	26 Short Results	BGA 1200~002	Stencil Results	1	0.69	0	0
LOGANS VGB B02	26 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	0 0.51	0 0.007
LOGANS VGB B02	27 Short Results	BGA 1200~002	Stencil Results	1	0.86	0	0
LOGANS VGB B02	27 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	1 0.525	0 0.007
LOGANS VGB B02	27 Short Results	BGA 1200~002	Stencil Results	1	0.81	0 0.0075	0
LOGANS VGB B02	27 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	1 0.51	0 0.007
LOGANS VGB B02	28 Short Results	BGA 1200~002	Stencil Results	1	0.75	0 0.0056	0
LOGANS VGB B02	28 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	0 0.51	0 0.008
LOGANS VGB B02	28 Short Results	BGA 1200~002	Stencil Results	1	1.1	0 0.0002	0
LOGANS VGB B02	28 Short Results	BGA 1200~002	Board Results Preimage Only One	1	81	0 0.51	0 0.007
LOGANS VGB B02	29 Short Results	BGA 1200~002	Stencil Results	1	0.8	0 0.0018	0
LOGANS VGB B02	29 Short Results	BGA 1200~002	Board Results Preimage Only One	1	82	0 0.525	0 0.007

SPC

With QC Calc turned on, Statistical Process Control (SPC) data can be monitored. For more information on SPC results, contact DEK Customer Support for assistance.



PARAMETERS GLOSSARY

Global Parameters



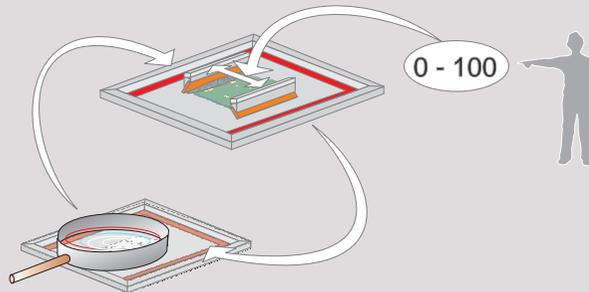
2D Inspect Rate

A user-defined number of print cycles between inspection, with zero indicating no inspection.

Decide how often to carry out inspection.

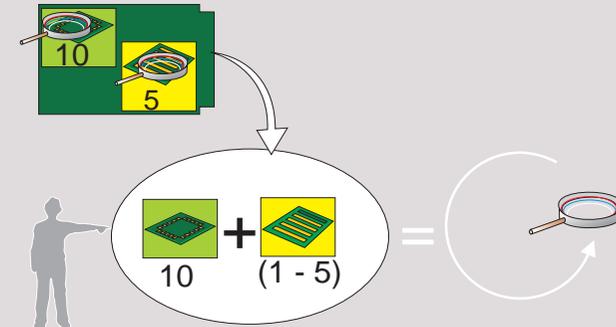
For example to print 3 boards and inspect a board, set the value for 2D Inspect Rate to 3.

0 = no inspection. 100 is the maximum limit.



Min Sites/Cycle

During the 2Di setup, inspection sites are given an inspection priority of either 'Every' (shown as a green rectangle on the board representation view) or 'General' (shown as a yellow rectangle on the board representation view). This parameter sets the number of sites inspected during an inspection cycle. The minimum value of this parameter is automatically set to be at least the number of 'Every' sites plus one 'General'. The maximum value of this parameter is equal to the total number of 'Every' sites plus the total number of 'General' sites.



NOTE

At initial setup this parameter cannot be edited as sites need to be added first.

In the example shown, the minimum sites per cycle is 10 every sites plus 1 general site which equals 11 sites. On the first board the 10 every sites plus the first general site are inspected. On the second board the 10 every sites plus the second general site are inspected,

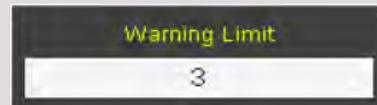
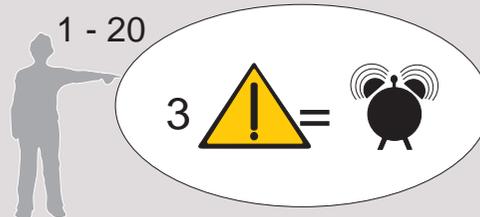
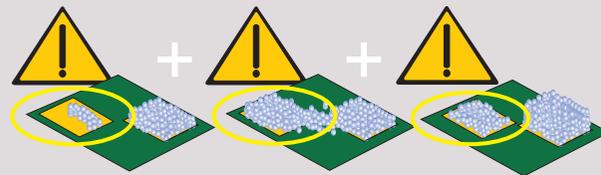


and so on.

Warning Limit

This parameter sets how many consecutive warnings on the same site constitute an alarm.

In the example shown below, the warning limit is set to 3; when a given site has any warning on three consecutive boards an alarm is displayed.



Pre- Image Mode

Pre-image is the board inspection taken prior to printing and used as a comparison with the printed board.

This parameter sets when a pre-image is taken:

One = The pre-image is captured on the first board of the batch.

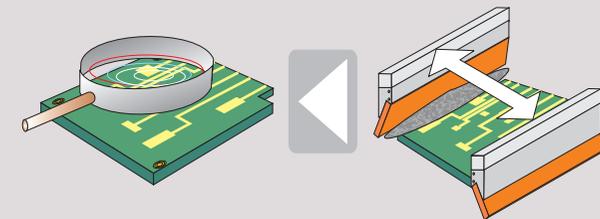
Advantage - The time taken to pre-image is the same as the time taken to inspect therefore it is quicker to only pre-image on the first board.

Disadvantage - Assumes that all boards are identical, however board tolerances exist.

Every = The pre-image is taken prior to every board printed.

Advantage - All boards are inspected and compared to their own pre-image.

Disadvantage - The time taken to pre-image is the same as the time taken to inspect therefore the inspection time is doubled.





Global Board 2Di Type

Decide what level of board inspection is required to apply to the inspection strategy.

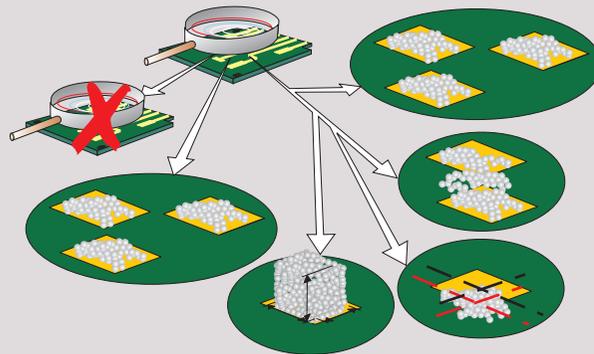
NOTE

Inspection types are licensable features of the software and some levels of inspection may not be available. See the table on Page one - 'Inspection Licensing' for details.

NONE - No Inspection.

BASIC - Paste on Pad(s).

ADVANCED - Paste on Pad(s), Bridging and Paste Alignment.



Global Board 2Di Type
Advanced



Paste

This parameter enables the facility to inspect the board for paste on pad.

When disabled, the local paste parameter in the board limits tab is disabled for all limits, therefore paste detection is not measured. Volume detection is also disabled for all limits.

When enabled the local paste parameter in the board limits tab is enabled for all limits therefore paste detection is measured.

If there is less paste on a pad than required this contributes to printing defects.

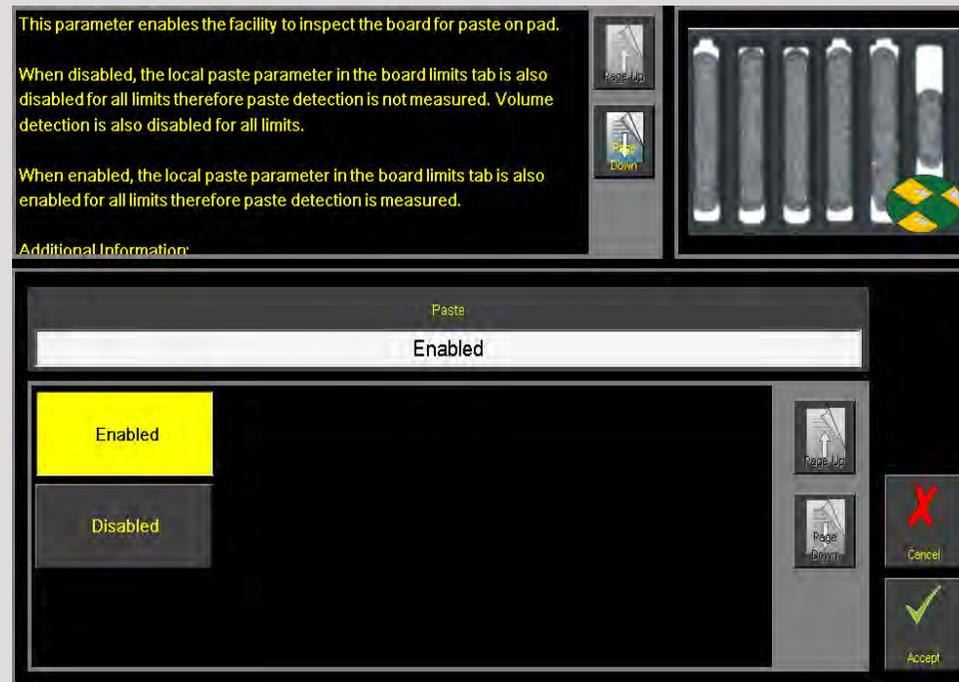
Possible causes of insufficient paste on pad, include the following:

Machine related -

- Print speed too high
- Squeegee/ProFlow pressure too low
- Separation speed too high
- Temperature setting too low
- Paste knead setup parameter modification
- Stencil blockage

For non machine related issues see www.dek.com

Recommended Under Screen Cleaner setup: use wet/vac/dry combination.





Bridging

This parameter enables the facility for bridging detection.

When disabled, the local bridging parameter in the board limits tab is also disabled for all limits therefore bridging detection is not measured.

When enabled, the local bridging parameter in the board limits tab is also enabled for all limits therefore bridging detection is measured.

Bridging is where an amount of stray paste spans the gap between adjacent pads and could cause a short circuit or other related defects.

Bridging is frequently attributed to an excess volume of solder paste.

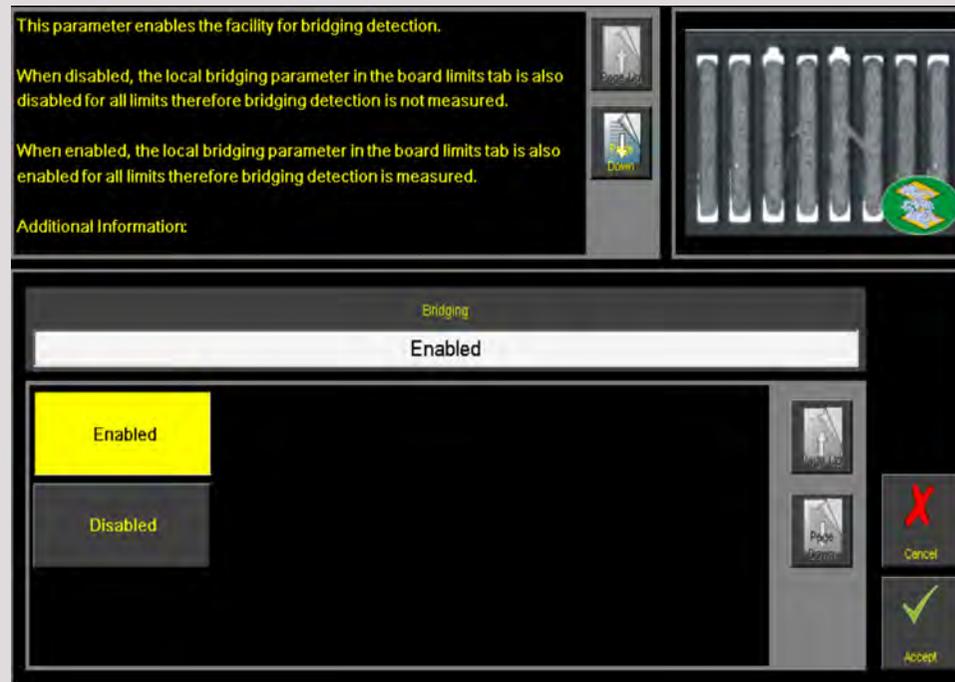
Possible causes of bridging include the following:

Machine related -

- Squeegee pressure/ProFlow pressure too high
- Print speed too low
- Print gap
- Programmed offsets
- Temperature setting too high
- Poor under screen cleaner settings

For non machine related issues see www.dek.com

Recommended Under Screen Cleaner setup: use wet/dry combination.





Alignment

This parameter enables the facility for alignment verification.

When disabled, the local alignment parameter in the alignment limits tab is also disabled for all limits therefore alignment verification is not measured.

When enabled, the local alignment parameter in the alignment limits tab is also enabled for all limits therefore alignment verification is measured.

The paste deposit is required to be accurately placed on the pad. Any paste deposit which is not correctly aligned, could contribute to printing defects.

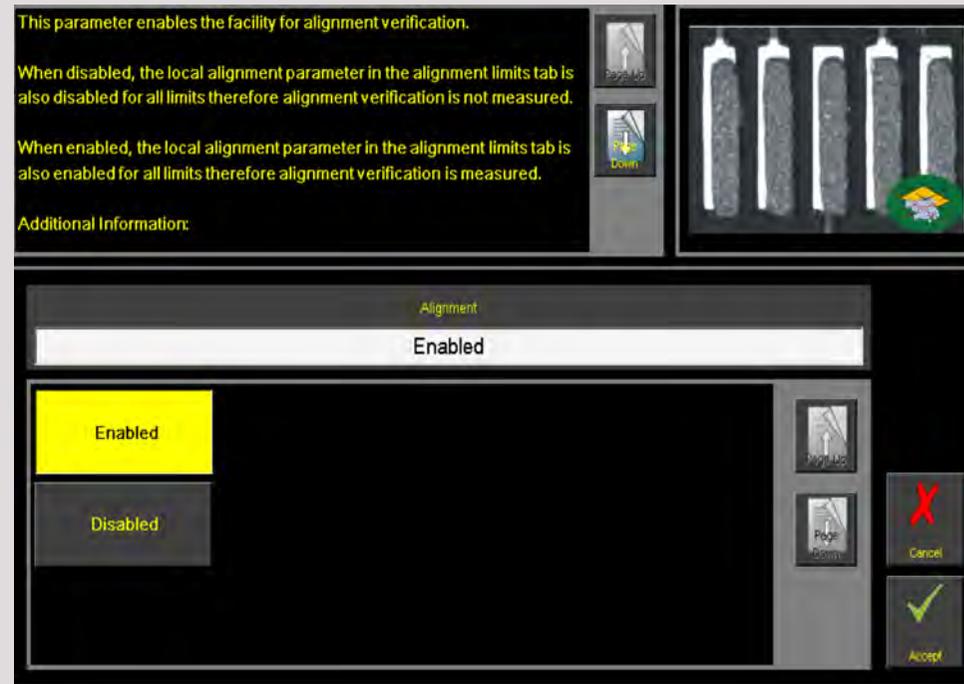
Possible causes of misalignments include the following:

Machine related -

- Fiducial setup not accurate
- Light settings not optimal
- Programmed offsets
- Alignment weighting
- Machine calibrations

For non machine related issues see www.dek.com

Recommended Under Screen Cleaner setup: use wet/dry combination.





Global Stencil 2Di Type

This sets the type of inspection to be carried out. The options are listed below.

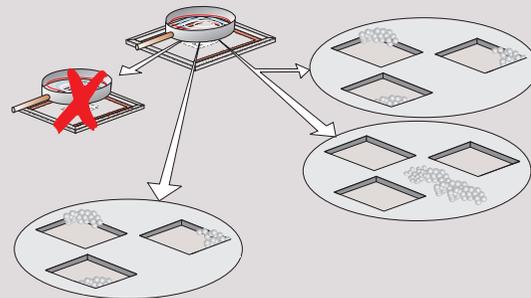
NOTE

Inspection types are licensable features of the software and some levels of inspection may not be available. See the table - 'Inspection Licensing' for details. Having advanced board and stencil selected enables volume prediction.

NONE - No Inspection.

BASIC - Stencil Blockage - detects the paste remaining in the apertures.

ADVANCED - Stencil Blockage and Smear - Blockage inspection detects the paste remaining in the apertures and Smear inspection detects the paste present on the stencil.





Blockage

This parameter enables the facility to inspect the stencil image for aperture blockage.

When disabled, the local blockage parameter in the stencil limits tab is also disabled for all limits therefore blockage is not measured. Volume detection is also disabled for all limits.

When enabled, the local blockage parameter in the stencil limits tab is also enabled for all limits therefore blockage detection is measured.

Blocked stencil apertures could contribute to printing defects. A blockage does not necessarily compromise the next print stroke; however, it may require monitoring.

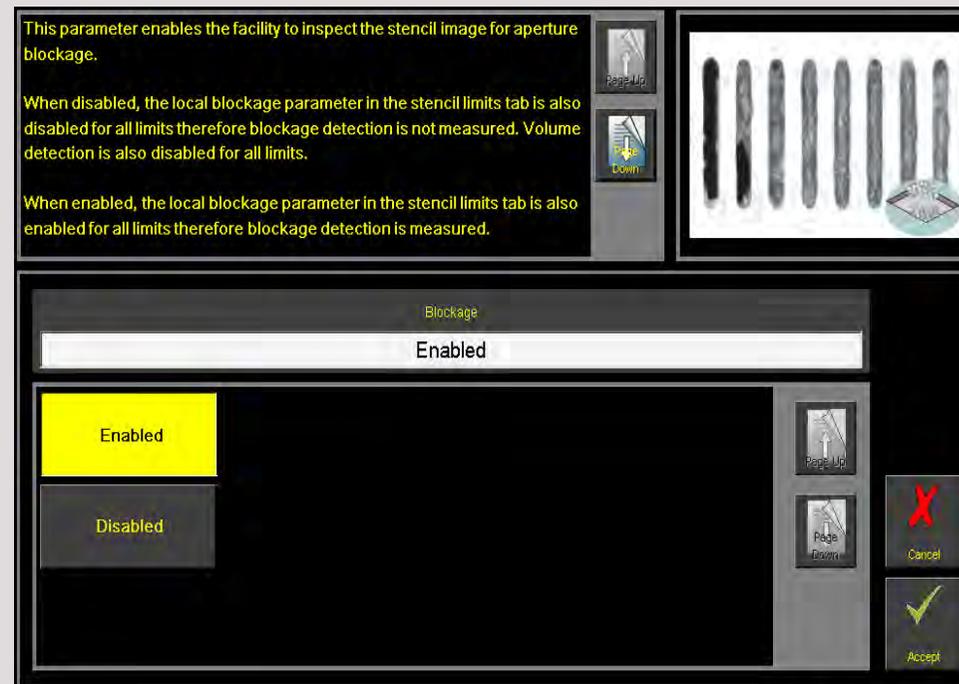
Possible blockage causes include the following:

Machine related -

- Print speed too high
- Squeegee pressure/ProFlow pressure too low
- Separation speed too high
- Paste knead not frequent enough

For non-machine related issues see www.dek.com.

Recommended Under Screen Cleaner setup: use vacuum.





Smear

This parameter enables the facility to inspect the stencil image for smear detection.

When disabled, the local smear parameter in the stencil limits tab is also disabled for all limits therefore smear detection is not measured.

When enabled, the local smear parameter in the stencil limits tab is also enabled for all limits therefore smear detection is measured.

Smearing of the underside of the stencil could contribute to printing defects. Smearing is the cause of cross contamination and may result in bridging defects.

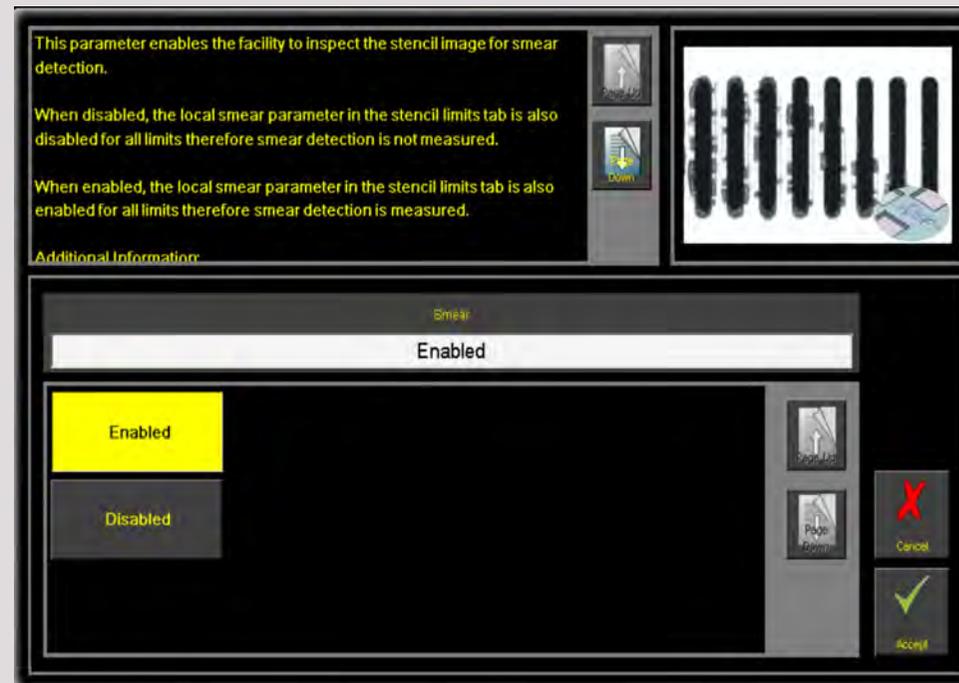
Possible causes of smear include the following:

Machine related -

- Print pressure too high
- Programmable offsets

For non-machine related issues see www.dek.com

Recommended Under Screen Cleaner setup: use wet.





Volume

This parameter enables the facility for paste volume prediction.

When disabled, the local volume parameter in the board limits tab is also disabled for all limits therefore volume prediction is not measured.

When enabled, the local volume parameter in the board limits tab is also enabled for all limits therefore volume prediction is measured.

If there is too little paste on a pad, it results in a weak solder joint. Too much paste can cause bridging defects and poorly formed solder joints.

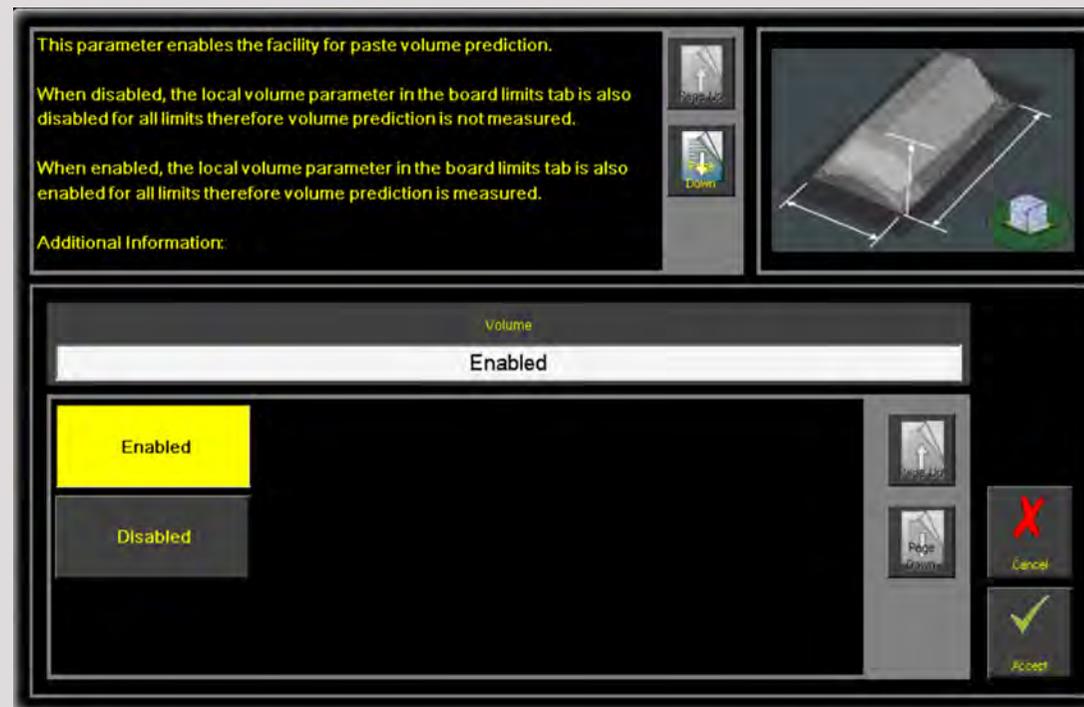
Possible low volume causes include the following:

Machine related -

- Squeegee pressure/ProFlow pressure too high
- Print speed too low
- Print gap
- Programmed offsets
- Temperature setting too high
- Poor under screen cleaner settings

For non machine related issues see www.dek.com

Recommended Under Screen Cleaner setup: use wet/vac/dry combination.





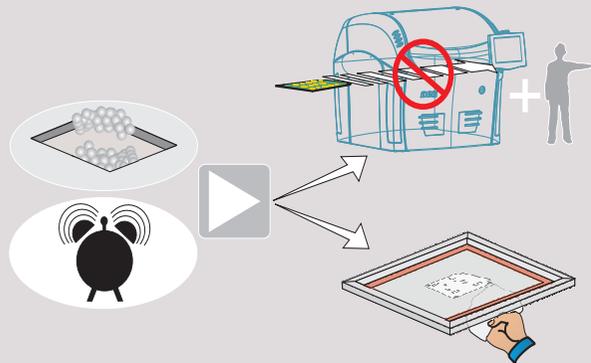
If stencil apertures become blocked, or the surface is smeared, the stencil needs to be cleaned to prevent process degradation. This action can be programmed to be either a manual or an automatic action. Where paste has been left for a period of time and has dried hard the stencil should be manually removed for cleaning.

Blockage Action

This parameter sets the action to be performed on receipt of a blockage alarm:

Manual - The machine stops and operator intervention is required.

Automatic - This mode initiates a screen cleaning operation.

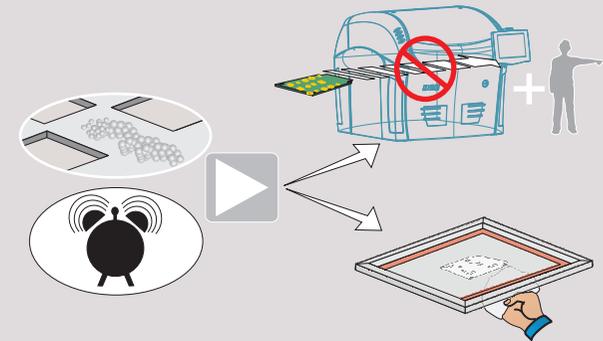


Smear Action

This parameter sets the action to be performed on receipt of a smear alarm:

Manual - The machine stops and operator intervention is required.

Automatic - This mode initiates a screen cleaning operation.



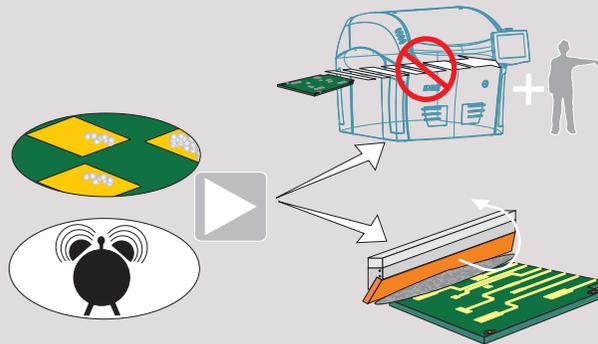


Low Paste Action

This parameter sets the action to be performed on receipt of a low paste alarm:

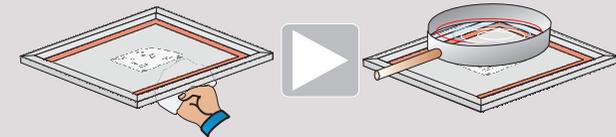
Manual - The machine stops and operator intervention is required.

Re-print - This mode initiates an automatic re-print of the board.



Inspect After Clean

This parameter provides the facility to carry out stencil inspection before the next board is printed, following a screen cleaning operation instigated by an alarm.





Limit Parameters

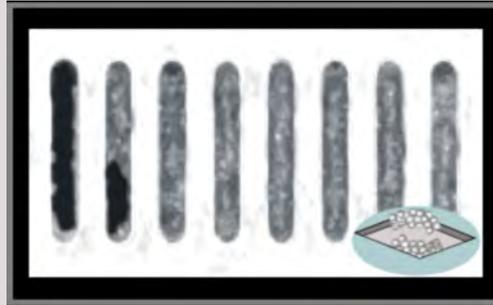
Limit Sets

Blockage Enabled

This parameter enables the facility to inspect the stencil image for aperture blockage.

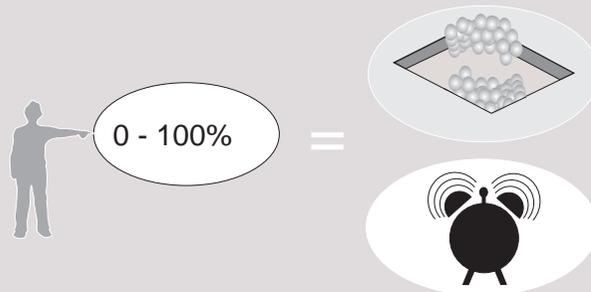
When disabled blockage detection for the selected limit is not measured. Volume detection is also disabled.

When enabled blockage detection for the selected limit is measured.



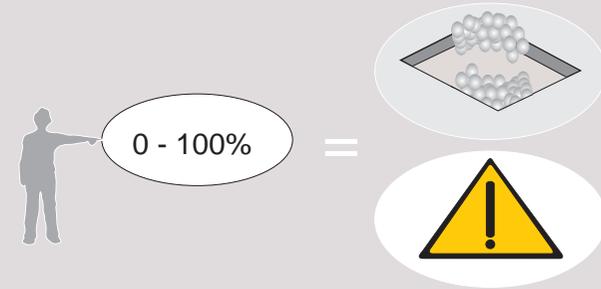
Blockage Alarm

Sets the limit of aperture blockage required to initiate a blockage alarm. This value must exceed the Blockage Warning parameter.



Blockage Warning

Sets the limit of aperture blockage required to initiate a blockage warning.



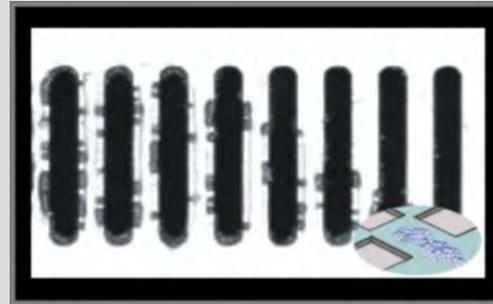


Smear Enabled

This parameter enables the facility to inspect the stencil image for smear detection.

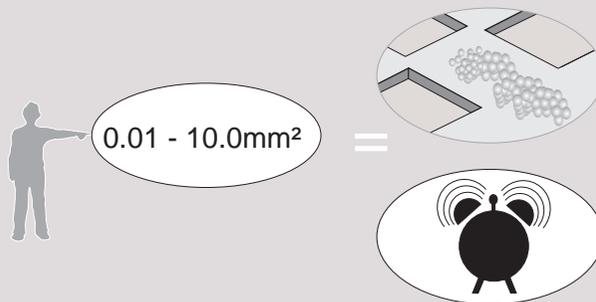
When disabled smear detection for the selected limit is not measured.

When enabled smear detection for the selected limit is measured.



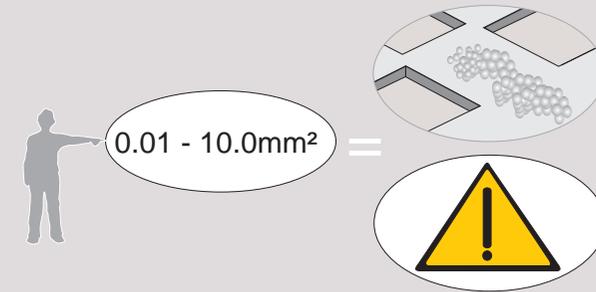
Smear Alarm

Sets the limit of stencil smear required to initiate a smear alarm. This value must exceed the Smear Warning parameter.



Smear Warning

Sets the limit of stencil smear required to initiate a smear warning.





Paste Enabled

This parameter enables the facility to inspect the board for paste on pad. Volume detection is also disabled for the selected limit.

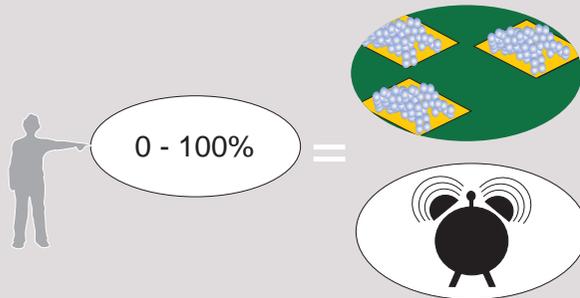
When disabled paste detection for the selected limit is not measured.

When enabled paste detection for the selected limit is measured.



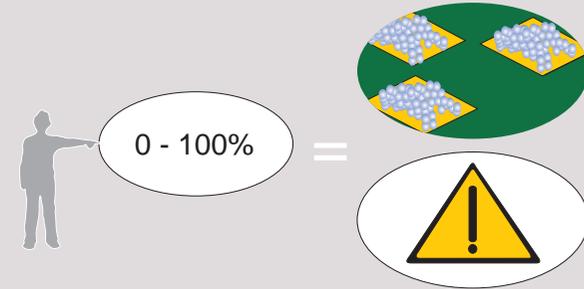
Paste Alarm

Sets the limit of paste on pad required to initiate a paste alarm. This value must be less than the Paste Warning parameter.



Paste Warning

Sets the limit of paste on pad required to initiate a paste warning.





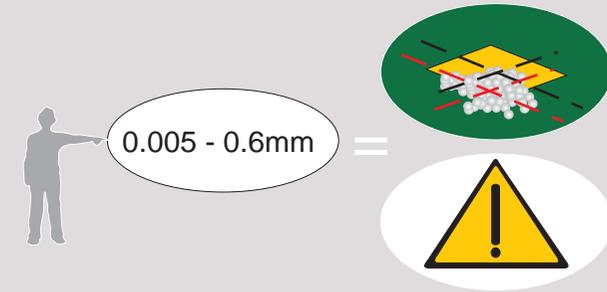
Alignment Enabled

This parameter enables alignment inspection of the paste deposits upon the board.



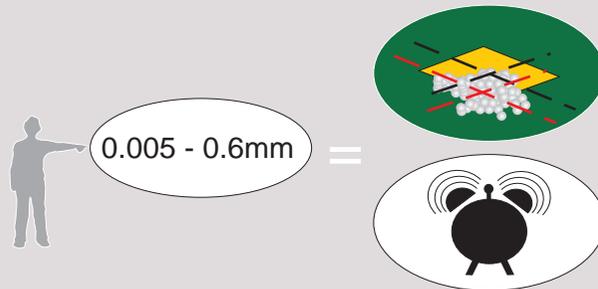
Alignment Warning

Sets the limit of X and Y alignment error of the paste deposit to initiate an alignment warning.



Alignment Alarm

Sets the limit of X and Y alignment error of the paste deposit to initiate an alignment alarm. This value must exceed the Alignment Warning parameter.





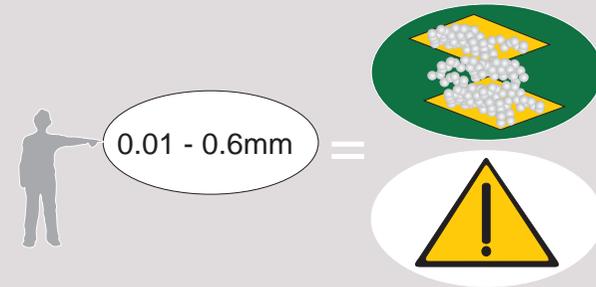
Bridging Enabled

This parameter enables bridging inspection of adjacent paste deposits.



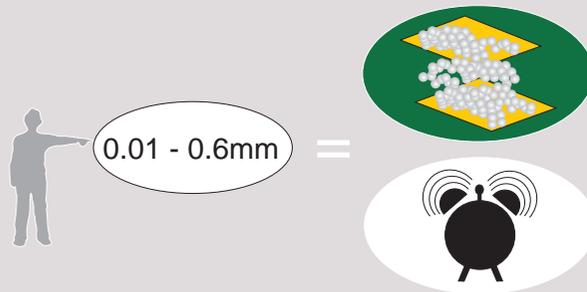
Bridging Warning

Sets the distance between paste deposits that, if not exceeded, initiate a bridging warning.



Bridging Alarm

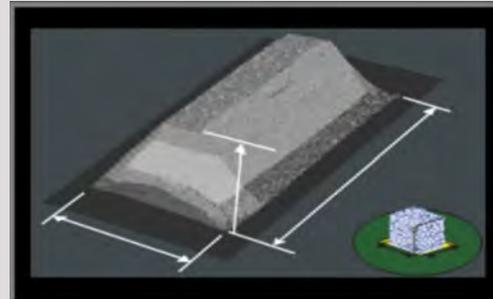
Sets the distance between paste deposits that, if not exceeded, initiate a bridging alarm. This value must be less than the Bridge Warning parameter.





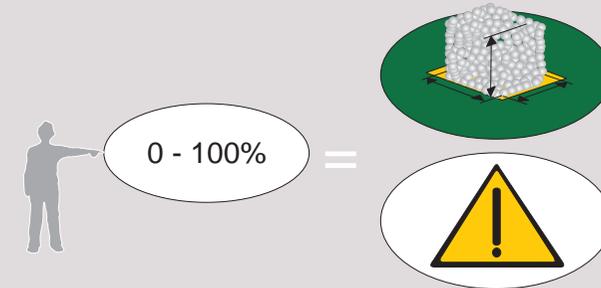
Volume Enabled

This parameter enables paste volume prediction. The volume of paste is calculated using blockage and paste on pad results.



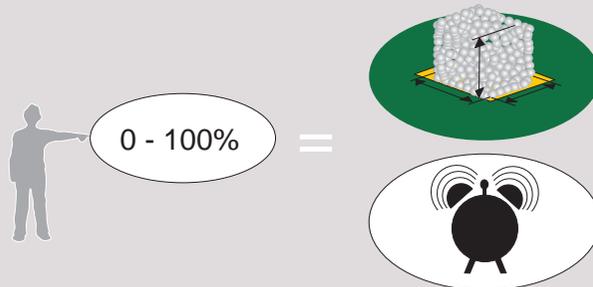
Volume Warning

Sets the limit of predicted paste volume on pad required to initiate a volume warning.



Volume Alarm

Sets the limit of predicted paste volume on pad required to initiate a volume alarm. This value must be less than Volume Warning parameter.



Having created one limit set it may be necessary to create a new set based on the current limit set. In this way, a variety of limits can be pre-programmed and applied to specific sites. For instance, a limit set with tight tolerances may apply to an 'Every' site whilst a loosely defined set may apply to 'General' sites. Similarly, the user can create limit sets for specific devices and apply these sets to all devices of this type.

Each inspection site can be given a unique name to make it traceable.

Global limits enable inspection parameters to be set and limit sets apply to individual sites. When using 2Di as a tool, it is commonplace to try to reduce the number of sites that require inspection to a minimum.



A QUICK SETUP GUIDE

The graphic below is designed to aid the user in remembering the sequences required to setup and run 2D inspection.

