INTELLISPEC™

Programming Guide

Pressco Technology Inc.

4.4 Software

Part Number 59630 Rev. 01

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Chapter 1

INTRODUCTION

WELCOME!

Congratulations on your purchase of an Intellispec system! The Intellispec is a high-speed machine vision system designed specifically for product and online process monitoring. It is a very powerful tool that provides inspection much more reliably than the human eye or sampling methods. The latest PC technology, powerful new inspection algorithms, online adjustment capability, and inspection data storage allow the Intellispec to automatically inspect parts with extreme accuracy on high-speed lines.

The Intellispec will help you provide the highest quality of products shipped to your customers.

WHAT'S NEW IN INTELLISPEC™ VERSION 4.4 SOFTWARE?

The following are the changes to 4.4 software from 4.3. This list does not include all the changes, which may include new parameters and updated menus. This list provides an overview of most major changes in the software.

CATE-GORY	FEATURE	DESCRIPTION
New Feature	Color Camera support	System supports ***color cameras*** (see "Color Camera Options" on page 40). Benefits include: ▪ Ability to perform inspections that were not possible using monochrome cameras
Algorithm Enhancement	Circular Region for color images	***Circular Region for Retro-Spec*** (on page 301) enhanced for color images.
New Algorithm	Retro-Spec color spray dot correlation	New Retro-Spec inspection for ***color dot correlation*** (see "Using Color Dot Correlation" on page 578). Benefits include: ▪ Ability to inspect for color features ▪ Allows sorting of objects previously impossible
Algorithm Enhancement	Optimizer	***Optimize button*** (see "Using the Optimize button" on page 574) in Retro-Spec Contrast inspection automatically sets some inspection parameters for you.

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CATE-GORY	FEATURE	DESCRIPTION
Algorithm Enhancement	Concavity	***Draw Mark filter*** (see "Using the Draw Mark Filter" on page 583) in Retro-Spec Contrast inspection allows Intellispec to locate draw marks on cans, but not to reject parts just because they have draw marks.
New Feature	Eight digital cameras	System support for up to ***eight digital cameras*** (see "Configuration Terminology" on page 129). Benefits include: ▪ More lanes of inspection per system ▪ No multiplexing, full speed, full image
System Enhancement	Job limit removed	Benefits include: ▪ ***100 job limit removed*** (see "About job limits" on page 109) ▪ Reduced memory overhead ▪ Backward compatible; older databases can still be used.
New Feature	Acronis Backup	New 3rd party Acronis True-Image Echo software introduced for ***system backup*** (see "How to Back Up or Restore the Intellispec" on page 218) and restore. Benefits include: ▪ Significantly faster backup and restore ▪ Simpler operation; backup initiated without exiting Intellispec (no manual reboot) ▪ Replaces Norton Ghost based Rescue CD ▪ Works with newer hardware
New Feature	Display burst rate	Statistics area displays burst rate and max burst rate in addition to ***part rate*** (see "Displaying part rate" on page 249)
System Enhancement	Help	New HTML format ***help files*** (on page 15), as well as PDF format.
System Enhancement	Database Compare	***Database compare*** (on page 239) utility allows you to view databases side by side and highlights differences.

ABOUT THIS MANUAL

Typographical Conventions

Following is a list of typographical conventions used in this manual:

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- **Bold type** indicates a topic heading or an important item or statement.
- *Italicized type* indicates emphasis.
- Names of main components and system control signals have the first letter of each word capitalized. For example: Processor Cabinet.
- Danger messages appear as shown below:

DANGER

Danger messages alert you to specific conditions that can cause serious or fatal personal injury. Danger messages give you important information which must be observed to prevent injury. These messages are set off from the body text as shown here.

- Caution messages appear as shown below:

CAUTION

Caution messages indicate important information which must be observed to prevent: loss of data, poor system performance, or equipment damage. These messages are set off from the body text as shown here.

- Notes appear as shown below:

❖ *Note: Notes contain special information that warrants being set off from the body text as shown here.*

SAFETY CONSIDERATIONS

Observe the following safety warnings when operating the Intellispec system or working near it:

Warning

Potential for projectiles to strike persons and cause injury. Keep clear of reject devices.

Warning

Sensitive electronics and High Voltages may be exposed. Keep Processor Cabinet door closed.

STATIC DISCHARGE PROTECTION

Caution

Electronic components can be damaged by static electricity discharge.

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Always observe the following precautions before removing, installing or handling any electronic components within the Inspection System:

- Wear an anti-static wristband which is grounded to the Inspection System.
- Stand on an anti-static, grounded floor mat, and lay circuit boards on the mat during any board replacement.
- Keep circuit boards in static shield bags when storing and transporting. Ensure the bag is sealed.

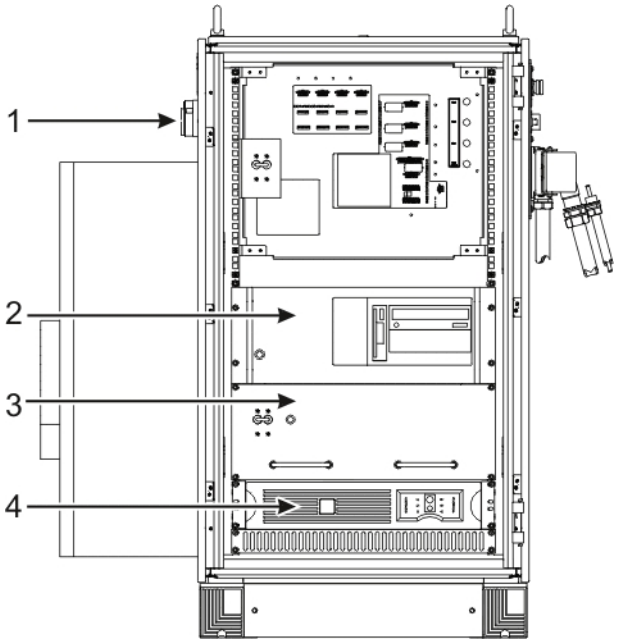
HOW TO POWER UP THE INTELLISPEC

To power up the Intellispec, simply switch on the rotary switch (item 1) on the left side of the Processor Cabinet. After approximately 1 ½ minutes, the boot-up process will be complete.

The following three switches must be in the ON position:

- The breaker on the front of the AC/DC power drawer (item 3) (Up position for ON)
- The power switch on the right front of the UPS (item 4)
- The power switch on the left front of the computer (item 2)

Normally, these three switches can be left in their ON positions all the time.



1	On/ off switch
2	Vision processor computer
3	AC/ DC power drawer
4	Uninterruptible Power Supply (UPS)

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HOW TO SHUT DOWN THE INTELLISPEC

The Intellispec must be shut down properly, depending how the UPS is set up.

To see whether your system's UPS is configured:

USER LEVEL: ADMINISTRATOR

1) Log in. The system must be offline.
2) Click the button.
3) Under the System tab, check the Show All Advanced Parameters button. The UPS is configured if the box next to 'UPS Configured' is checked.

If the UPS is configured

(All user levels) If the UPS is configured, simply switch off the rotary switch on the left side of the Processor Cabinet.

If the UPS is not configured

To shut down the Intellispec system, you must be logged in as an Administrator, and system must be Offline.

Warning

Do not shut off the power switch while the Intellispec is still running. The system must go through its proper shutdown sequence. This prevents loss of production data as well as possible program corruption.

To shut down Intellispec:

1) Click the button.
2) Click Shutdown.
3) Switch off the rotary switch on the left side of the Processor Cabinet.

HARDWARE COMPONENT OVERVIEW

The main hardware components include the Processor Cabinet, Inspection Modules for one to four production process channels, and the User Interface.

Inspection Modules

The Inspection Modules are usually installed on or near the users' production equipment. The Inspection Modules include the vision system cameras and part lighting devices. Part-present detectors, conveyor encoders, correlation sensors (optional), and part reject mechanisms are installed to track parts and reject defective product.

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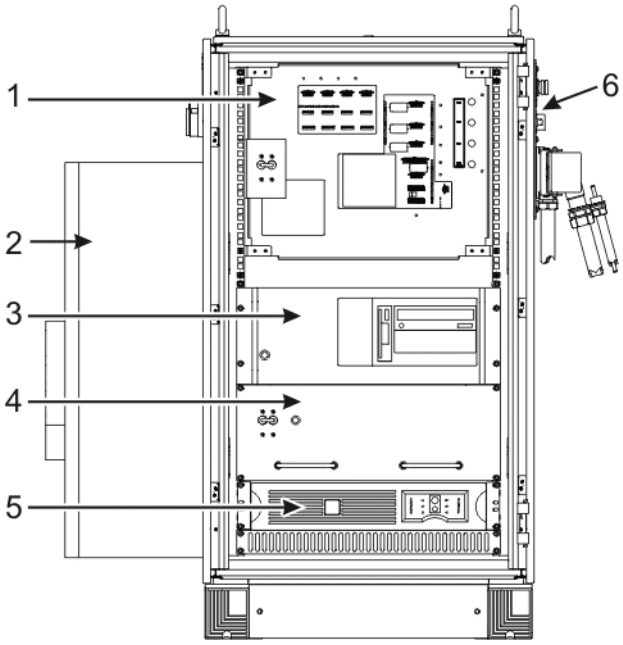
Processor Cabinet

The Processor Cabinet houses the System Computer, AC Transformer and DC Power Supplies, an Uninterruptible Power Supply, and the Main I/O Board. The Vision Processor Computer is an industrial PC with additional image acquisition and part tracking boards.



1	Main I/O board
2	Air conditioner
3	Vision processor computer
4	AC/DC power drawer
5	Uninterruptible Power Supply (UPS)
6	Gland plate

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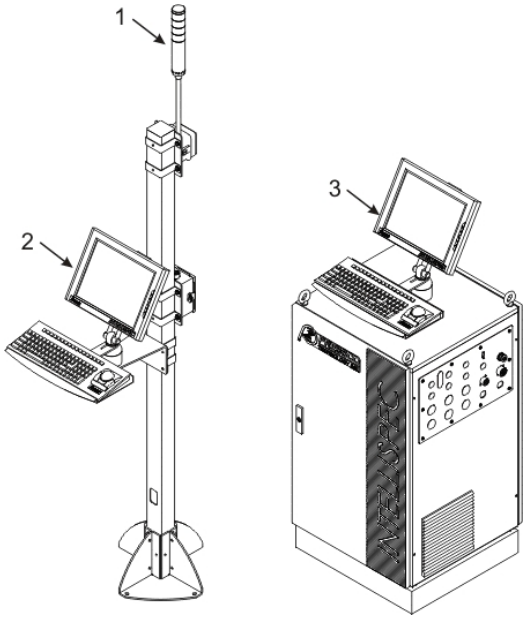
User Interface

The User Interface is mounted on a support caddy with adjustable arm. It includes a flat-screen monitor and a keyboard with trackball. It can be mounted either on top of the cabinet or on a light tree pole.



1	Optional light tree
2	Pole mount user interface
3	Cabinet mount user interface

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Chapter 2

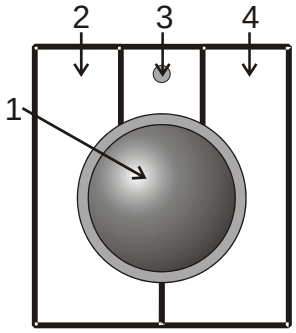
NAVIGATING THROUGH THE SYSTEM

HOW TO CHANGE THE LANGUAGE

Click the button and select the desired language from the drop-down menu.

USER INTERFACE HARDWARE

The hardware user interface consists of a ***monitor and keyboard*** (see "User Interface" on page 11) with a built-in trackball.



1	The trackball moves the cursor
2	The left trackball button selects items on the screen
3	The middle button brings up tool tips (names of buttons, etc.)
4	The right trackball button calls up additional menus in some places on the screen

HOTKEYS

Several hotkeys are available to simplify viewing images and running inspections.

- **F1** - Snap new image on current channel. Also runs job or inspection if already in that mode.
- **F3** - Run job on current channel.
- **F4** - Remove graphics from image.

❖ *Note: The above three hotkeys are available offline only. The next three are available offline or online.*

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- **F6** - Bring up the ***Image Manager*** (see "Online Image Manager" on page 209)
- **S** - Save all images in Image Manager Buffer
- **Alt-S** - Save all images plus images with graphics in Image Manager Buffer

AREAS OF THE SCREEN

Menu Toolbar

This toolbar provides system access, system setup, camera configuration, and more. You may notice some buttons grayed out at certain times. This depends on whether a user is logged in, the access level of that user, and the operation currently being performed. The basic functions of the toolbar buttons are described below.

TOOLBAR ICON	USER LEVEL	FUNCTIONS
Login/ Logoff	All users [Operator, Mechanic, Administrator]	Enter password to access different areas of system. Click this button to log in or log off. Select your user name from the drop-down list or type the first letter of your user name, and enter your password. Depending on your user access level, other menu options become available to you when you log in. The button is “locked” and outlined in red if no user is logged in. It is “unlocked” and outlined in green if someone is logged in.
Snap image (offline only) Right-click to change modes	All users	**Single snap**: Click to snap an image. The current camera takes one image. This is useful for testing a parameter change in a job. **Continuous snap**: Right-click to put into this mode. The current camera takes images continuously. This is useful for testing a job or changes to a job on several images. It is also useful for adjusting the imaging tools - lighting, camera control, etc. **Live Images**: Displays in real-time mode. This mode is useful for setting focus and camera positioning.
Part management (offline only)	All users Administrator	Part Changeover – select part to run (if enabled), Group reporting Right-click button to enable or disable. Enable part management, load database. Add, modify, delete parts.
System configuration (offline only)	Mechanic & Administrator	Part Tracking – Calibrate reject, part present, part width

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TOOLBAR ICON	USER LEVEL	FUNCTIONS
	Administrator	All other system setup – scheduled printing, defective part logging, correlation, channel setup, camera & lighting setup
Alarm setup (offline only)	Mechanic Administrator	View alarm setup Configure alarms. Right-click button to quickly disable alarms.
Diagnostics tools (offline only)	Mechanic & Administrator	Computer diagnostics, correlation sensor diagnostics, I/O Testing
Database tools (offline only)	Mechanic & Administrator Administrator	Load/ Save Vision database, Database Detective [Process sheet, database compare, copy job to another database, online/offline history, SmartCAL, copy files to floppy] Load System database, Windows Explorer, TSTool, repair options
Miscellaneous (offline only)	All users Administrator	Change password User account setup, view log files, clear jobs & configuration, burn CDs, software upgrades, date/time adjust, disk backup
Language selection (offline only)	All users	Select language
Online/ Offline	All users	Green light = online. Online mode is used for everyday inspecting of a product. Red light = offline (you may be required to log in to go offline). Offline mode is used to train the system to a particular product and to configure the system.
Help (offline only)	All users	Manuals, ***Smart Support*** (see "Remote Support" on page 603) access

Help files

In 4.4 software, several manuals are available in HTML format. This means that they open in a simple browser on your Intellispec system. This format makes it easy for you to find information quickly.

To use the HTML manuals on the Intellispec or Intellitrainer:

1) Click the button.
2) Choose the desired manual. In version 4.4, the following manuals are in HTML* format:

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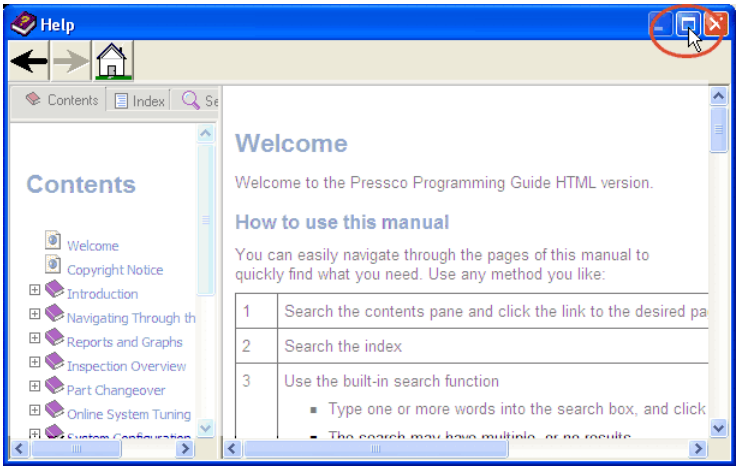
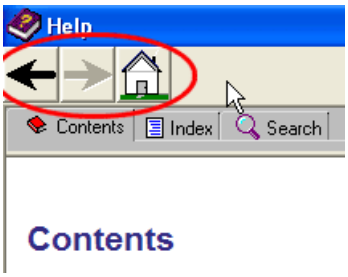
- Programming Guide (English)
- Operator's Guide (English only as of this publishing)

3) Click the Maximize button to view the browser full-screen.



4) Use the instructions provided on the Welcome page. The standard Internet browser features do not apply. The Intellispec browser has a Home button and forward and back buttons to help you navigate.



*The remaining manuals, such as Hardware Guides and some localized manuals are available in PDF. In these cases, the Intellispec or Intellitrainer displays those manuals in Adobe Acrobat Reader.

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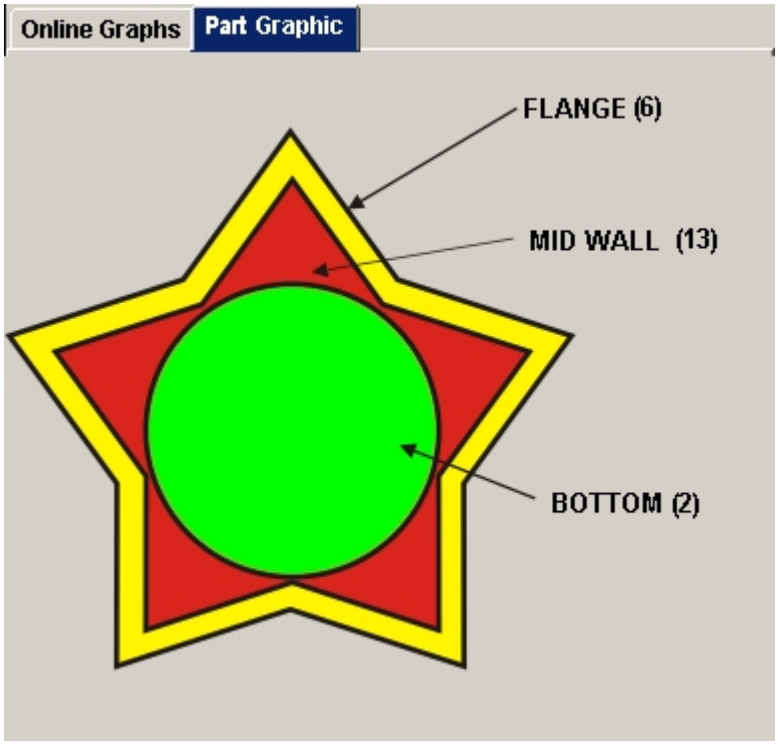
About the Part Graphic

This feature uses a graphic representation of a part so that you can quickly identify which area of the part is failing.



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Features

- Can be displayed in full screen mode to see from a distance. If more than one lane has Part Graphic enabled, all enabled lanes are displayed in ***full screen mode*** (see "About the Part Graphic Options" on page 23).
- **Green** areas indicate that parts are passing inspection.
- **Yellow** warning areas notify you that the spoilage rate is approaching, but has not yet reached a critical level. This allows you to make necessary changes to the manufacturing process before the failure rate gets too high.
- **Red** areas indicate the spoilage rate has exceeded user defined limits.
- View reject rate by either percentage or quantity.

Notes about usage

- The graphic may not look exactly like your part. It is a representation.
- This feature is not available for all types of parts.
- The graphic must be ***enabled*** (see "How to Enable the Part Graphic" on page 19) for each lane or channel group.
- The graphic uses Inspection Grouping to identify the areas of the part. Groups are pre-assigned. ***Assign inspections to those groups*** (see "How to Assign Inspections to Groups in the Part Graphic" on page 20).

Using the part graphic

- Move your cursor over the part graphic to see the associated group names highlighted
- Right-click to bring up the inspection for that area
- Click an area to see individual inspection statistics for that group
    - Double-click the name of the inspection to modify it

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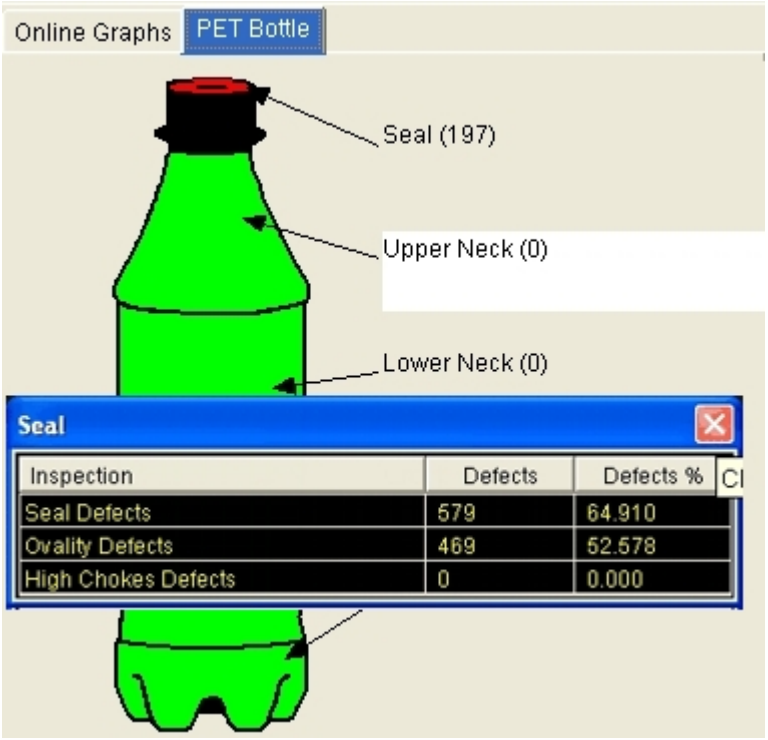
- Click the ‘X’ in the upper right corner of the statistics box to remove from screen



How to Enable the Part Graphic

USER LEVEL: ADMINISTRATOR

To enable the Part Graphic:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.

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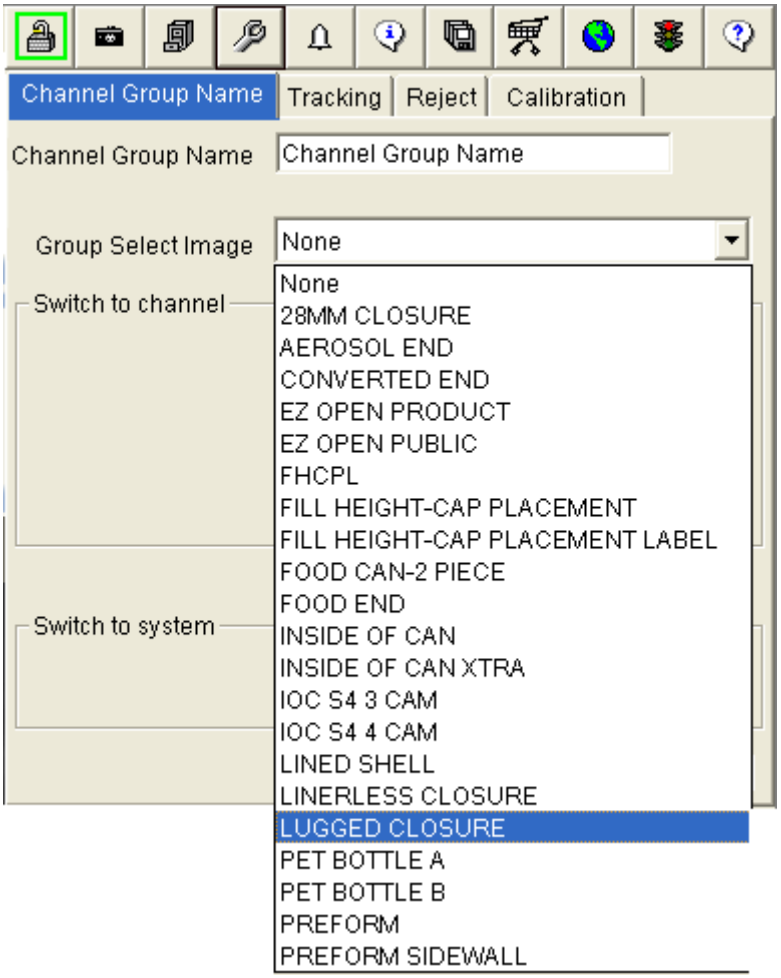
4) Choose an image that matches your part from the Group Select Image drop-down menu.



5) Click ☑ and exit. The part graphic is displayed in the lower right corner of the screen.

How to Assign Inspections to Groups in the Part Graphic

USER LEVEL: ADMINISTRATOR

To assign inspections to groups:

1) Make sure the system is offline ( ).
2) Log in.
3) Make sure appropriate job(s) are programmed and selected for the appropriate channel group:
   - If Part Management is active, click the button and Select a Part to Run or Load a Vision Database.
   - If Part Management is not active, right-click the statistics tabs for each camera and Select a Job.

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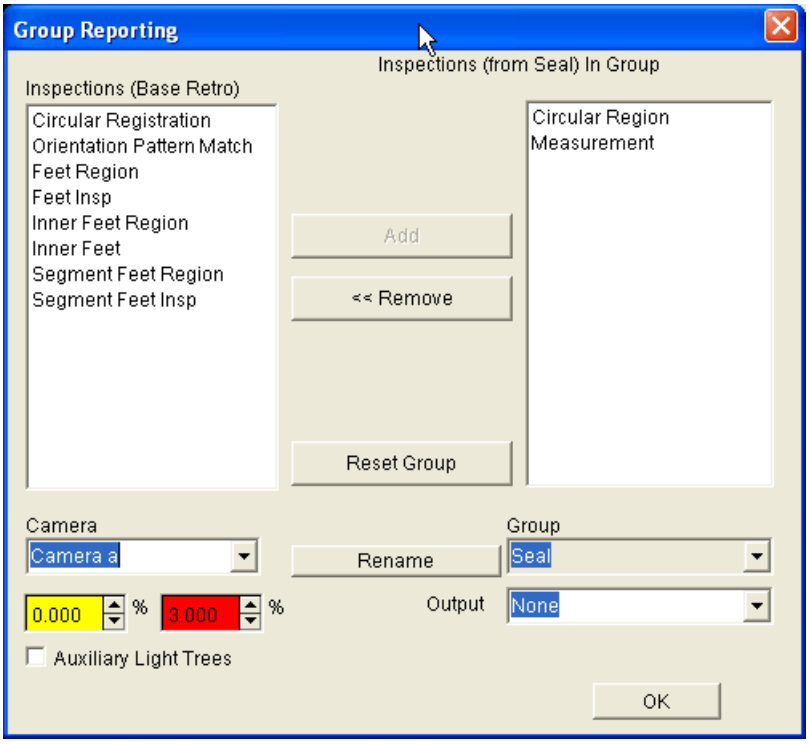
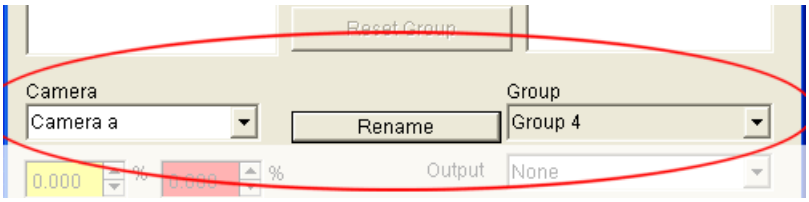
4) Right-click [Part Graphic]* tab and choose Setup... The Group Reporting screen is displayed.



5) Select the desired camera and the desired group. Rename group if desired.



6) From the Inspections column, select all the registrations and inspections you want in the selected group. (to de-select an inspection name, click it again).
7) Click Add.
8) In the yellow box, type a warning percentage. These numbers are used in the part graphic for quick defect percentage identification.
9) In the red box, type a failure percentage.
10) Repeat steps 5-9 for all groups in the part graphic.
11) Repeat steps 5-9 for all cameras.
12) Click OK when finished.

The ***Groups tab*** (on page 35) in the statistics area displays the total parts, total defects, defect percentage, last N defects, and last N percentage. Defects are computed as an OR function: If you have three inspections assigned to Group 1, a defect will be counted if Inspection 1, Inspection 2, OR Inspection 3 (or a combination of all three) found a defect.

❖ *Note: In the Part Graphic, these groups have already been assigned to part area. If you select a non-assigned group (example - Group 8), it will NOT be displayed on the part graphic.*

---

*The tab has the name of the part graphic assigned to it.

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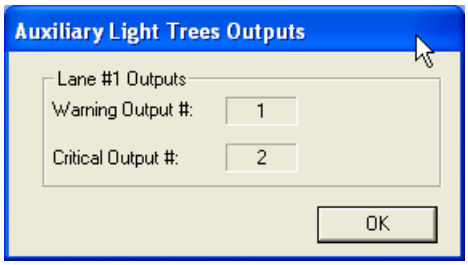
Auxiliary Light Trees (optional)

This feature is to be used with auxiliary light trees that provide an alternate visual output of whether parts are good or failing inspections. ***Contact Pressco*** (see "How to Contact Pressco" on page 633) to purchase, or for more information about auxiliary light trees.

When the Auxiliary Light Trees box is checked at the bottom of the Groups setup box, a Show I/O button becomes available. Clicking this button displays the hard-coded outputs used by the auxiliary light trees.



WHAT IT DOES

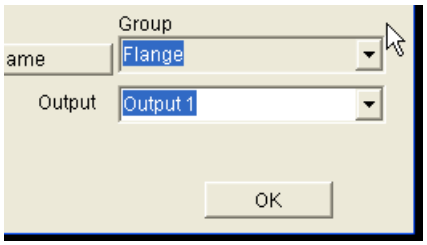
The auxiliary light tree has green, yellow, and red lights. These colors correspond to the color of the part graphic.

This feature overrides Outputs 1 through 8, depending on configuration. Your system may have only one lane, using Outputs #1 and #2, for example. It assigns the warning value to Output #1 (the yellow box in the Groups Setup screen), and the critical value to Output #2 (the red box in the Groups Setup screen). The remaining lanes use the next outputs - #3 and #4 for Lane 2, #5 and #6 for Lane 3, etc. The auxiliary light trees illuminate the yellow (or amber) light when the warning limit is exceeded, or the red light when the critical limit is exceeded. Otherwise, the auxiliary light tree illuminates the green light.

See more about ***using group outputs*** (on page 77).

HOW IT IS DIFFERENT FROM STANDARD GROUPS OUTPUTS

In the **standard** groups outputs, the group must be included in the setup to trigger the output. In the example below, if any inspection in the group Flange fails, then Output #1 becomes active. Inspections that are in other groups have no effect on Output #1.



In the **auxiliary light tree setup**, the warning and critical status is tied to the part graphic. If ANY group reaches warning status (any portion of the part graphic turns yellow) the yellow light is illuminated. If ANY group reaches critical status (any portion of the part graphic turns red), the red light is illuminated.

Note the outputs used by clicking the Show I/O Used button. If you try to assign the same Output value in the Groups Setup screen to something else, it will have no effect. That is, if Lane #1 Outputs show Warning Output #1 and Critical Output #2 already used, then you will not be able to use outputs #1 and #2 for any other purpose.

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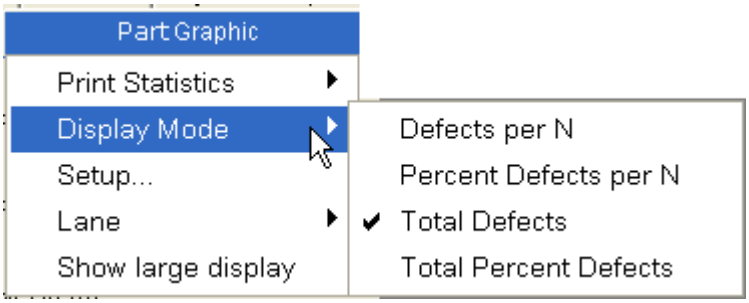
About the Part Graphic Options

Right-click the Part Graphic tab to see options.



Print Statistics

Print to printer, file, or both, online or offline. Printing to file creates a Groups_*date_time*.txt file to the Intellispec hard drive at C:\Intellispec\Reports.

Display Mode

Defects per N - Displays the number of defects per group up to the ***last N parts*** (see "Last N Defect Count" on page 76).

Percent Defects per N - Displays the percentage of defects per group up to the last N parts.

Total Defects - Displays the number of defects per group since the statistics were last reset.

Total Percent Defects - Displays the percentage of defects per group since the statistics were last reset.

Setup...

(Offline only. Administrator only.) Brings up ***Group Reporting*** (see "How to Assign Inspections to Groups in the Part Graphic" on page 20) screen.

Lane

Displays the part graphic associated with the lane or channel group selected. Part Graphic must be enabled separately for each lane.

Show large display

Displays the part graphic **full screen**. This is a feature you would use while the system is online inspecting parts. It allows you to see, from a distance, if any areas of the part are failing. If you have more than one lane, it displays the part graphic for each lane that has an enabled part graphic.

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To exit the large display, press the ESC key.

About the Statistics Area

This area displays inspection results. The tabs at the top of this section will vary depending on your system configuration. Use the arrows on the top right of the tables to scroll through the tabs.

System Overview | Lane 1 Overview | Camera 1 | Camera 2 | Camera 3 | Camera 4 | Machine Part 1

Part Rate: 401	Total	Defect	Defect %	Last (10000)	Last (10000)%
Camera 1	1812	141	7.781	141	7.781
Camera 2	1813	54	2.978	54	2.978
Camera 3	1813	227	12.521	227	12.521
Camera 4 <No Job Assigned>	0	0	0.000	0	0.000
Totals	1825	413	22.630		

Date/Time	Machine Part 1	Machine Part 2	Machine Part 3	Machine Part 4	C1	C2	C3	C4
2007-09-27 13:28:52	16	1	1	1	O	X	O	O
2007-09-27 13:28:51	12	1	1	1	X	O	X	O
2007-09-27 13:28:51	11	1	1	1	X	O	X	O
2007-09-27 13:28:50	8	1	1	1	X	O	O	O
2007-09-27 13:28:50	3	1	1	1	O	O	X	O

The order of tabs is as follows (from left to right):

1) ***System Overview*** (see "System Overview tab" on page 25) - only if your system has multiple lanes [Example: one production line making part *red*, and one production line making part *blue]*
2) ***Lane 1 Overview*** (see "Lane Overview tab" on page 27) - only if your system has multiple cameras in one lane of inspection [Example: three cameras inspecting neck, body, and flange on one production line of parts.]
3) ***Cameras for Lane 1*** (see "Camera tabs" on page 30) - every system has at least one camera for inspection, to a maximum of eight cameras.
4) ***Correlation for Lane 1*** (see "Correlation tabs" on page 34) - if applicable. These tabs immediately follow the tabs for cameras to which they are correlated.
5) Lane 2 Overview - if applicable
6) Cameras for Lane 2 - if applicable
7) Correlation for Lane 2 - if applicable
8) Remaining Lanes, Cameras, and Correlation tabs - if applicable
9) ***Groups tab*** (on page 35)

The Administrator can ***customize*** (see "Customizing the Statistics Tabs" on page 74) the names of all tabs except System Overview and Groups.

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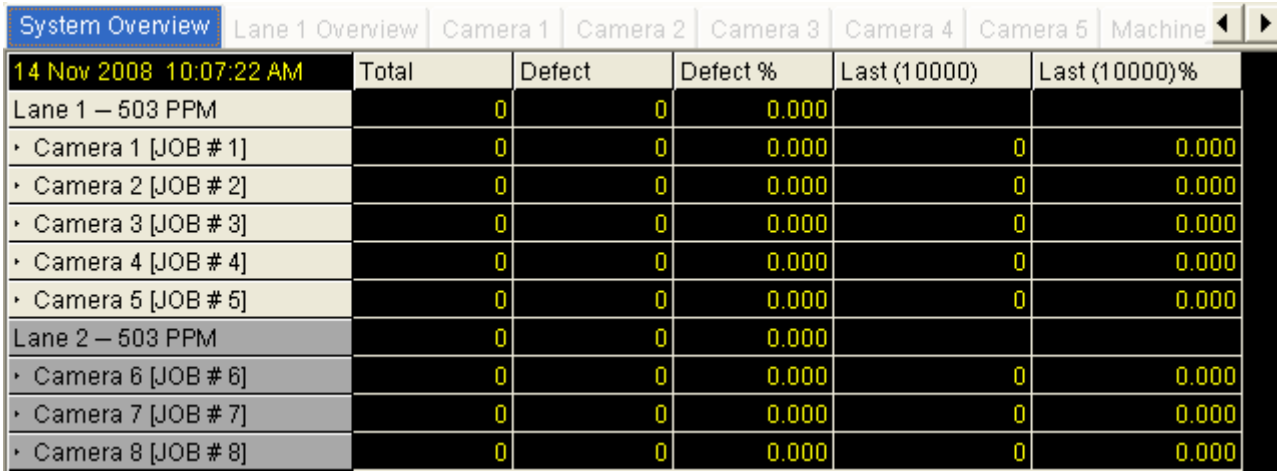
System Overview tab

The System Overview tab displays inspection results for all cameras. This tab is only displayed if your system is configured with more than one channel group (lane).



14 Nov 2008 10:07:22 AM	Total	Defect	Defect %	Last (10000)	Last (10000)%
Lane 1 – 503 PPM	0	0	0.000		
Camera 1 [JOB # 1]	0	0	0.000	0	0.000
Camera 2 [JOB # 2]	0	0	0.000	0	0.000
Camera 3 [JOB # 3]	0	0	0.000	0	0.000
Camera 4 [JOB # 4]	0	0	0.000	0	0.000
Camera 5 [JOB # 5]	0	0	0.000	0	0.000
Lane 2 – 503 PPM	0	0	0.000		
Camera 6 [JOB # 6]	0	0	0.000	0	0.000
Camera 7 [JOB # 7]	0	0	0.000	0	0.000
Camera 8 [JOB # 8]	0	0	0.000	0	0.000

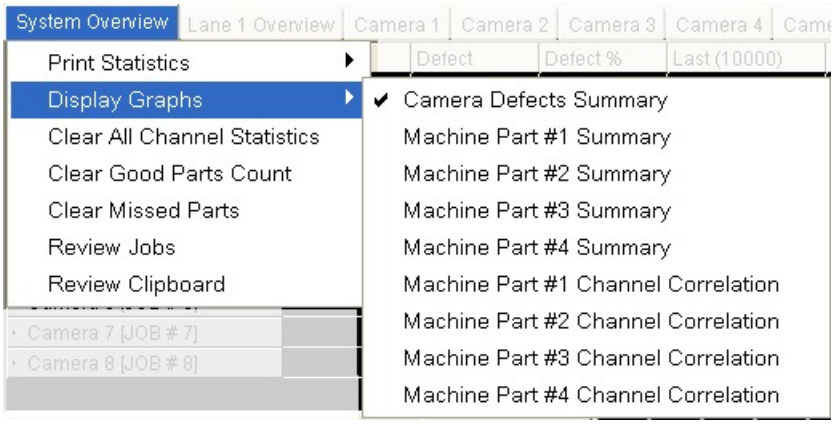
- Each lane is grouped and shaded so that you can easily distinguish between lanes
- Double-click on a lane n cell

to display the corresponding lane tab
- Double-click on a camera name cell

to display the corresponding camera tab
- In addition to ***displaying part rate*** (on page 249) (PPM), you can display burst rate or max burst rate

STATISTICS OPTIONS

Select the System Overview tab, then right-click to view the options.



Print Statistics

Print to printer, file, or both, online or offline. Printing to file saves it as a text (.txt) file on the Intellispec hard drive at C:\Intellispec\Reports.

Display Graphs

Choose which graph to be displayed on the System Graphs tab.

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Clear All Channel Statistics

Clears the defect statistics for all channels.

Clear Good Parts Count

(Only if Good Parts Alarm is active) Clears the ***Good Parts alarm*** (see "Good Parts" on page 196) counter.

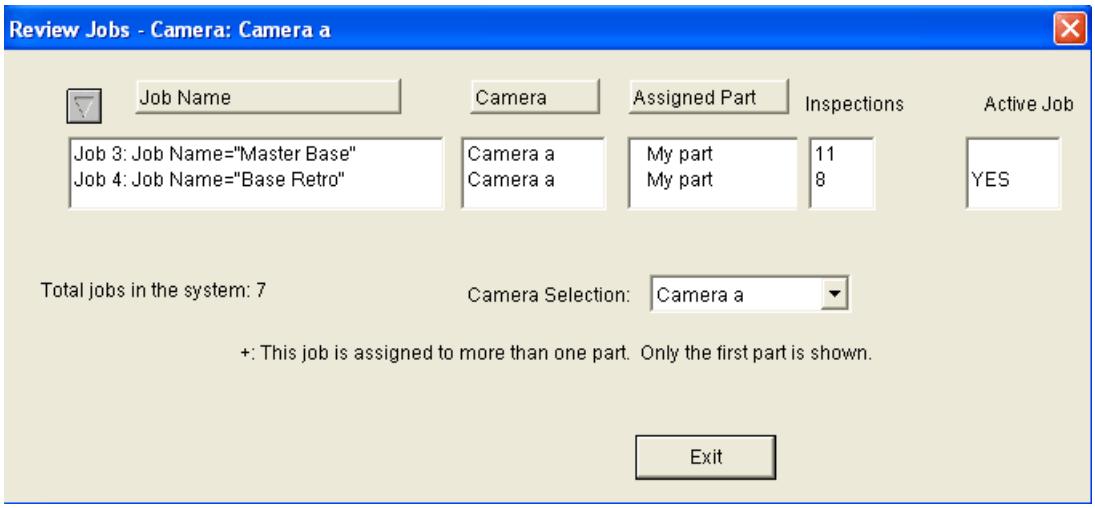
Clear Missed Parts

Clears the ***Missed Parts*** (see "About Missed Parts" on page 135) statistics for all channels.

Review Jobs

Offline only. This displays a list of all jobs in the current database. This includes:

- Job name
- Which camera the job is on
- Whether the job is assigned to a Part
- Number of inspections in each job
- Whether the job is the active job (currently selected)



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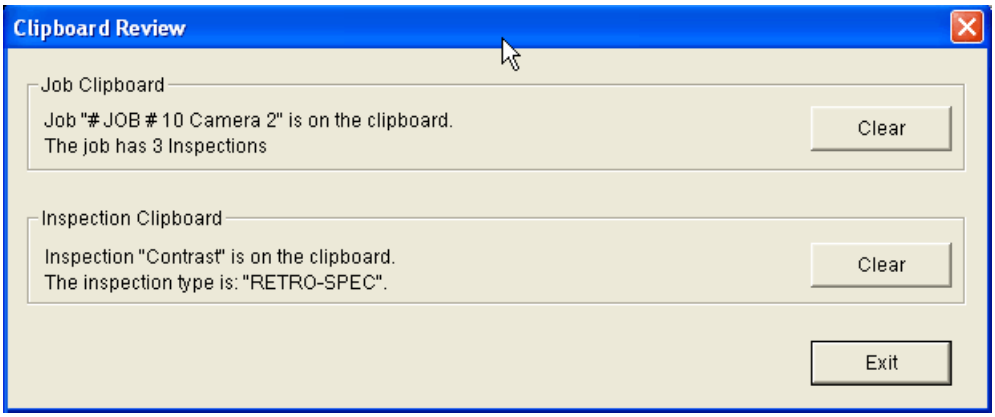
Review Clipboard

(Administrator only) Displays the jobs or inspections you have put on the clipboard by using the Copy or Cut functions. An example is shown below.



Lane Overview tab

This tab reports statistics for a group of cameras that inspect the same product. The name of this tab varies depending on your system configuration, and can be ***customized*** (see "Customizing the Statistics Tabs" on page 74). It is only available if you have more than one camera.

System Overview | Lane 1 Overview | Camera 1 | Camera 2 | Camera 3 | Camera 4 | Machine Part 1

Part Rate: 401	Total	Defect	Defect %	Last (10000)	Last (10000)%
Camera 1	1812	141	7.781	141	7.781
Camera 2	1813	54	2.978	54	2.978
Camera 3	1813	227	12.521	227	12.521
Camera 4 <No Job Assigned>	0	0	0.000	0	0.000
Totals	1825	413	22.630		

Date/Time	Machine Part 1	Machine Part 2	Machine Part 3	Machine Part 4	C1	C2	C3	C4
2007-09-27 13:28:52	16	1	1	1	O	X	O	O
2007-09-27 13:28:51	12	1	1	1	X	O	X	O
2007-09-27 13:28:51	11	1	1	1	X	O	X	O
2007-09-27 13:28:50	8	1	1	1	X	O	O	O
2007-09-27 13:28:50	3	1	1	1	O	O	X	O

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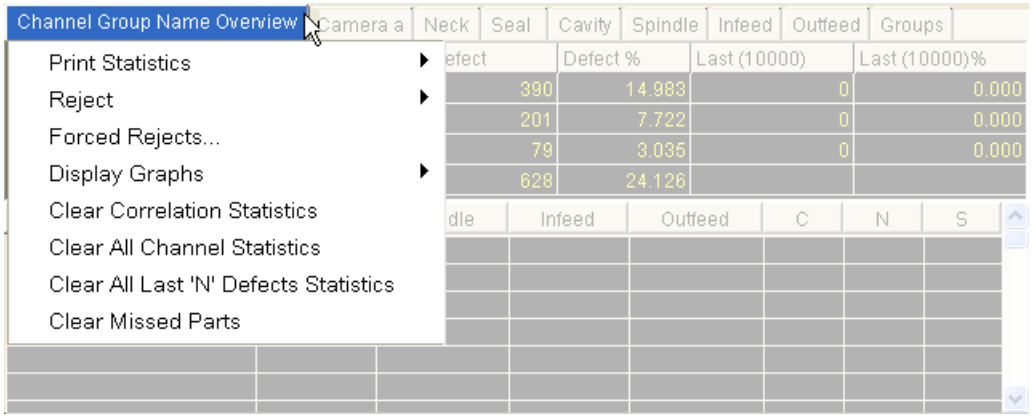
LANE OVERVIEW OPTIONS



Right-click the overview tab to see the available options:

Print Statistics

Print to printer, file, or both, online or offline. Printing to file saves it as a text (.txt) file on the Intellispec hard drive at C:\Intellispec\Reports.

Reject

Disable or Enable the rejecter for the lane. This works in conjunction with the Reject menu in System Configuration. If you disable the rejecter from the lane tab, it also becomes disabled in the System Configuration menu for that lane.

Forced Rejects (see "Forced Reject Menu" on page 29)

This menu is only valid if you have the correlation option installed.

Display Graphs

Choose which graph to be displayed on the System Graphs tab.

Clear Correlation Statistics

Resets the correlation statistics for all cameras in the channel group.

Clear All Channel Statistics

Resets the statistics for all cameras in the channel group.

Clear Last 'N' Defects Statistics

Clears the ***last N defects statistics*** (see "Last N Defect Count" on page 76). This is the most recent production data.

Clear Missed Parts

Clears the ***Missed Parts*** (see "About Missed Parts" on page 135) statistics for all cameras in the channel group.

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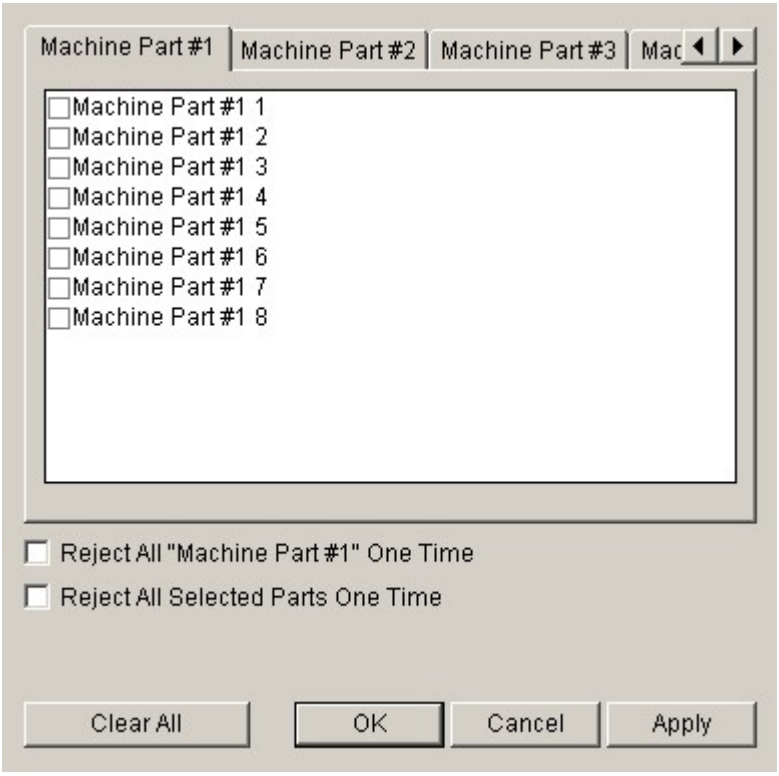
FORCED REJECT MENU

This allows you to force any part associated with a particular machine component to be rejected. The system will reject all parts associated with the checked components, regardless of the condition of those parts. The names of the tabs in your system will match the customized names programmed in the ***Correlation*** (see "Correlation Configuration" on page 126) menu.



This feature provides a means of handling an emergency situation until repairs on a blow-molder or other machine can be made. If you know there is a serious problem with a particular component, you can use this method to ensure that no part from the defective machine component passes the inspection process.

Clear All

Clears the check marks from all components at once (Machine Part #1, Machine Part #2, etc.). Click the Apply button to make the changes you have made to this menu.

Reject All “Machine Part #1” One Time

Check this box to purge Machine Part #1 of all parts. Click Apply One Shot to reject these parts. The menu will automatically close.

Reject All Selected Parts One Time

Check this box to reject the parts associated with all the components you have checked in any of the tabs (Machine Part #1, Machine Part #2, etc.). Click Apply One Shot to reject these parts. The menu will automatically close.

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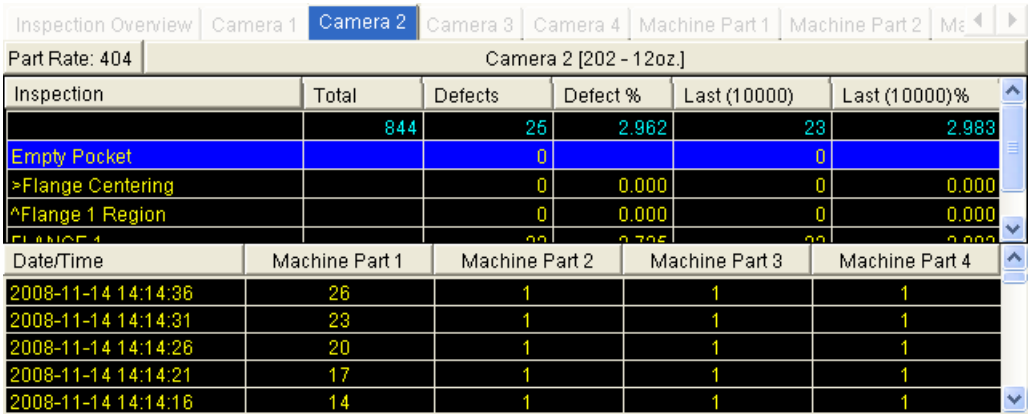
Camera tabs

These tabs display defect information by camera. The name of the tab may be ***customized*** (see "Customizing the Statistics Tabs" on page 74) by the Administrator. If your system has the correlation option, Machine Part data is displayed at the bottom. Each correlation defect occurrence is listed by time (most recent first).



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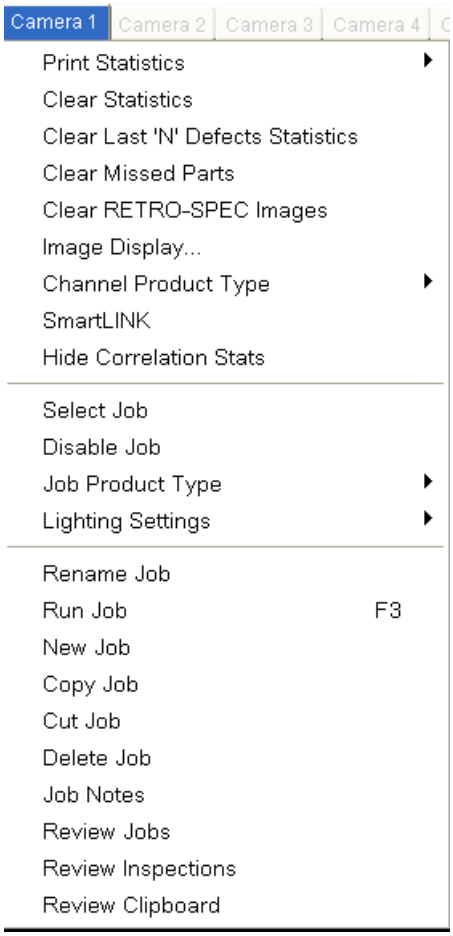
JOB OPTIONS (CAMERA TAB)

This drop-down menu contains some items that are similar to those in the Overview tabs, but these tasks apply to the selected camera only. This menu also contains job tasks and lighting options. The name of this tab can be ***customized*** (see "Customizing the Statistics Tabs" on page 74).



Right-click the Camera *n* tab to see the job options. Some options are only available to Mechanic or Administrator user levels.

Print Statistics

Print to printer, file, or both, online or offline. Printing to file saves it as a text (.txt) file on the Intellispec hard drive at C:\Intellispec\Reports.

Clear Statistics

Clears statistics for this camera. Also clears statistics for cameras within the same Channel Group.

Clear Last ‘N’ Defects Statistics

Clears the ***last N defects statistics*** (see "Last N Defect Count" on page 76). This is the most recent production data.

Clear Missed Parts

Clears the ***Missed Parts*** (see "About Missed Parts" on page 135) statistics for the selected camera only.

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Clear RETRO-SPEC Images

If the job uses Retro-Spec inspections, this function clears all the images.

Image Display

Opens the ***Image Display*** (see "Image Display Menu" on page 116) (freeze frame) menu.

Channel Product Type

(Administrator only) Offline only. Change the default product type for the current camera. Product Type limits the available inspections to those that are most commonly used for a certain type of part.

SmartLINK

Takes you to the ***SmartLINK*** (on page 110) screen. Available only when SmartLINK is enabled for a camera.

Hide Correlation Stats

Only available if system has correlation option enabled. Toggles with Show Correlation Stats. Hiding the correlation statistics allows you to see more inspection data.

❖ *Note: if the Part Management dialog box is open, then the following parameters do not appear in the options list: Select Job, Disable Job, Job Product Type, and Rename Job.*

Select Job

Offline only. Select the job to run on the current camera. Note that if Part Management is available, all jobs are loaded for all cameras by choosing one part name.

Disable Job

(Mechanic and Administrator) Disable the current job. This can be done online so that other cameras continue to inspect while you make changes to this job.

Job Product Type

(Mechanic and Administrator) Offline only. Change the Default Product Type for the current job. This should only be done if you need an inspection type that is not available in the camera's Default Product Type.

Lighting Settings

(Administrator only) Allows you to select between the default camera lighting setup and job only lighting.

Rename Job

(Mechanic and Administrator) Offline only. Select any job from the drop-down menu to rename it.

Run Job [F3]

Offline only. Select a job to run. The system will run all inspections for the selected job once and report the results on the Results screen. The rejecter is not activated.

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New Job

(Administrator only) Offline only. Create a new job. First name the new job, then right-click on the black statistics area (in Inspection column) for the appropriate camera, and Add registrations, orientations, and inspections.

Copy Job

(Administrator only) Offline only. Select a job to copy to the clipboard. Then use Paste Job to place a copy of the job into either the current camera or another camera.

Cut Job

(Administrator only) Offline only. Select a job to remove it from the list of jobs from the selected camera. This places the job on the clipboard. Then use Paste Job to place the job into any camera.

Paste Job

(Administrator only) Offline only. Available if a job has been cut or copied to the clipboard. Place the job from the clipboard into any camera.

Delete Job

(Administrator only) Offline only. Removes a job from the selected camera. This removes it completely from memory. It will also remove the job from the current database if you save the database again.

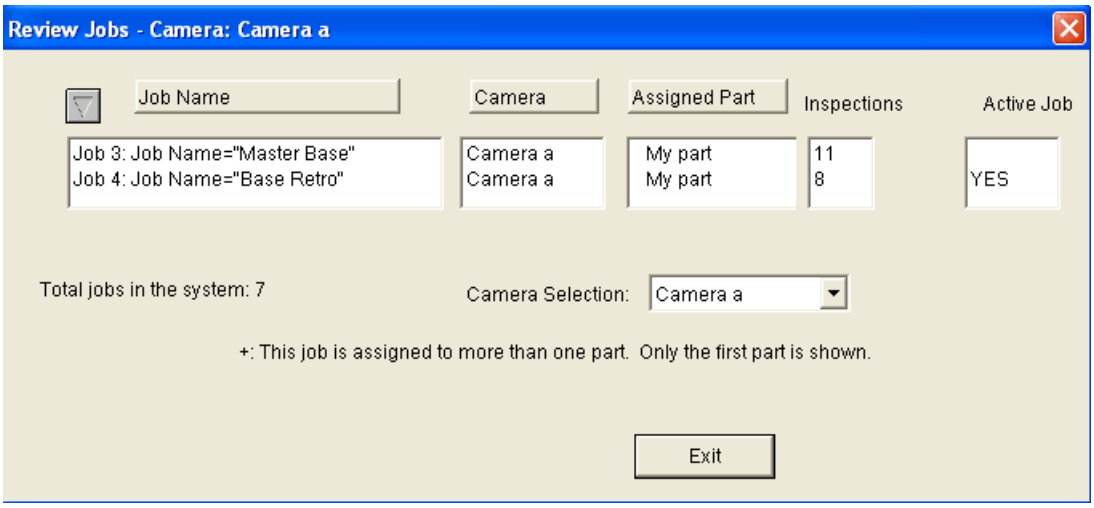
Job Notes

Enter notes about the job (example: the part it inspects, the system setup – anything that one needs to know about the job). This is a courtesy to other users, and a reminder if you need to edit the job in the future.

Review Jobs

Offline only. This displays a list of all jobs in the current database. This includes:

- Job name
- Which camera the job is on
- Whether the job is assigned to a Part
- Number of inspections in each job
- Whether the job is the active job (currently selected)



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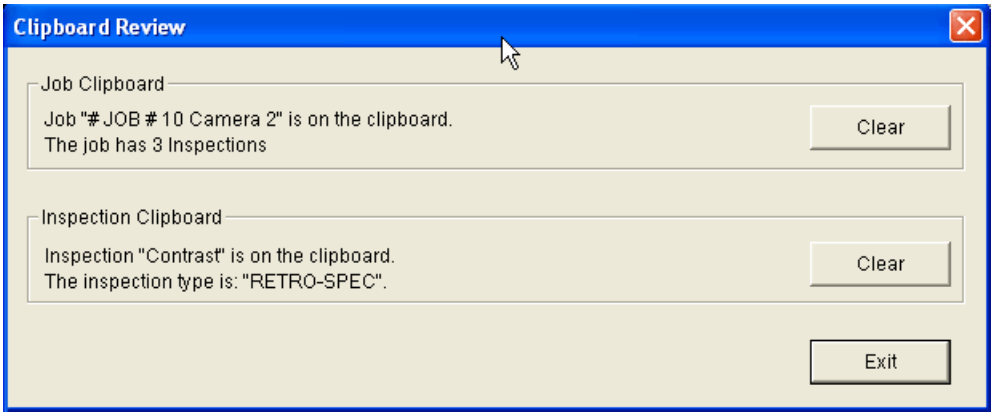
Review Inspections

Offline only. This displays all the inspections within the selected job, and the type of inspections. This is useful when you want to display inspection graphs, as they are listed by inspection type (example, Polygon, Circle, etc.). You may have re-named inspections to make more sense to your application (example, Panel, Base, Flange inspection).

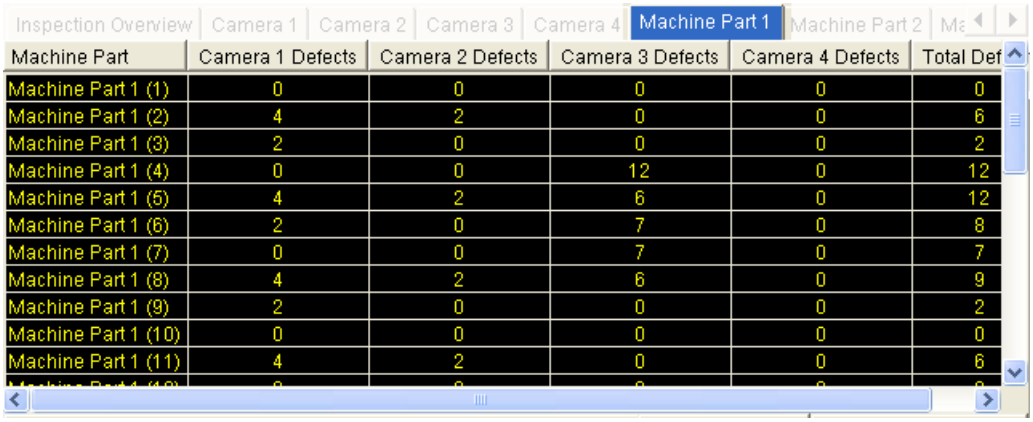
Review Clipboard

(Administrator only) Displays the jobs or inspections you have put on the clipboard by using the Copy or Cut functions. An example is shown below.



Correlation tabs

Available if your system has the correlation option. These tabs display the number of defects per camera correlated to the machine part. The name of the tab may be ***customized*** (see "Customizing the Statistics Tabs" on page 74) by the Administrator.



Machine Part	Camera 1 Defects	Camera 2 Defects	Camera 3 Defects	Camera 4 Defects	Total Def
Machine Part 1 (1)	0	0	0	0	0
Machine Part 1 (2)	4	2	0	0	6
Machine Part 1 (3)	2	0	0	0	2
Machine Part 1 (4)	0	0	12	0	12
Machine Part 1 (5)	4	2	6	0	12
Machine Part 1 (6)	2	0	7	0	8
Machine Part 1 (7)	0	0	7	0	7
Machine Part 1 (8)	4	2	6	0	9
Machine Part 1 (9)	2	0	0	0	2
Machine Part 1 (10)	0	0	0	0	0
Machine Part 1 (11)	4	2	0	0	6

Correlation is configured in the ***System Configuration*** (see "Correlation Configuration" on page 126) menus.

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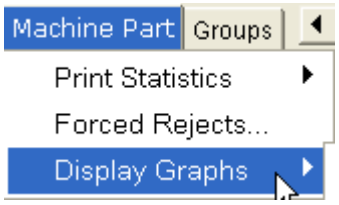
MACHINE PART OPTIONS

This menu contains options that are similar to those in other tabs, but apply to the selected correlation machine part.



Print Statistics

Print to printer, file, or both, online or offline. Printing to file saves it as a text (.txt) file on the Intellispec hard drive at C:\Intellispec\Reports.

Forced Rejects **(see "Forced Reject Menu" on page 29)**

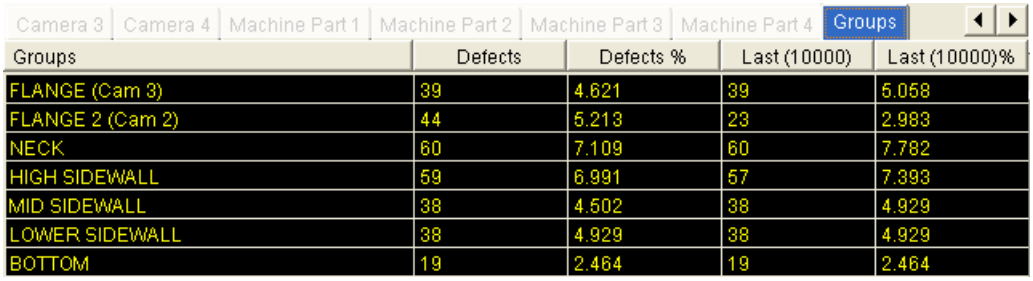
This menu is only valid if you have the correlation option installed.

Display Graphs

Choose which graph to be displayed on the System Graphs tab.

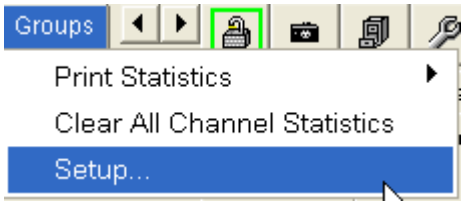
Groups Tab

Scroll all the way to the right to see the Groups tab. This tab displays the total parts, total defects, defect percentage, last N defects, and last N percentage. Defects are computed as an OR function: If you have three inspections assigned to Group 1, a defect will be counted if Inspection 1, Inspection 2, OR Inspection 3 (or a combination of all three) found a defect.



Groups	Defects	Defects %	Last (10000)	Last (10000)%
FLANGE (Cam 3)	39	4.621	39	5.068
FLANGE 2 (Cam 2)	44	5.213	23	2.983
NECK	60	7.109	60	7.782
HIGH SIDEWALL	59	6.991	57	7.393
MID SIDEWALL	38	4.502	38	4.929
LOWER SIDEWALL	38	4.929	38	4.929
BOTTOM	19	2.464	19	2.464

The Groups tab allows you to display user-defined statistics. When this tab is selected, the drop-down menu contains a ***setup*** (see "How to Assign Inspections to Groups in the Part Graphic" on page 20) selection where you can define which statistics get displayed on this tab.You can configure up to 64 groups.



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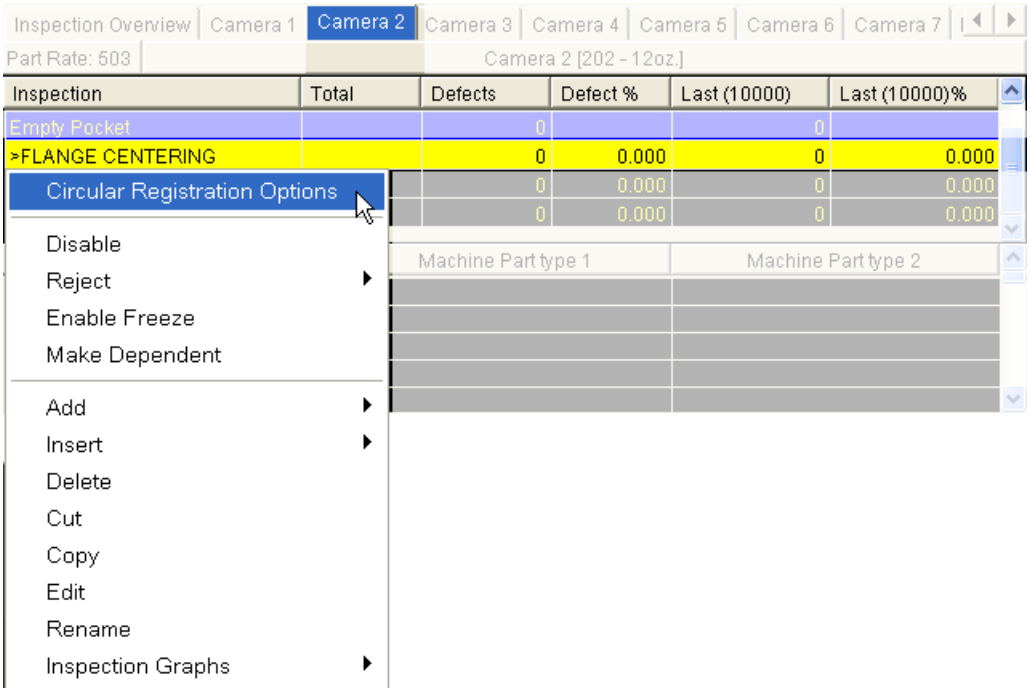
Inspection Options

When the individual camera statistics are displayed, you can modify a job (Mechanic user level and higher) or use other inspection options. Right-click over an inspection name to display the inspection options.



❖ *Note: Your user access level may limit available menu options.*

Disable

(Administrator only) Disables the selected inspection, registration, or orientation. This can be done online or offline.

❖ *Note: Disabling a registration can seriously affect inspection.*

Reject

(Administrator only) Disable the rejecter for only that particular inspection. This allows the system to run an individual inspection and collect inspection data without rejecting any parts that fail that inspection.

To disable the rejecter for an individual inspection:

1) Right-click the inspection name on which you want the reject device disabled.
2) Select Reject >> Disable Reject.

The inspection name is highlighted in blue to remind you that parts will not be rejected on this inspection.

To enable the rejecter for an individual inspection:

1) Right-click the inspection name.
2) Select Reject >>Enable Reject.

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Enable Freeze **(see "Freeze on Inspection" on page 118)**

Make Dependent/ Make Independent

These options appear when you right-click over registrations. The '>' and '^' symbols represent whether a job's registration is ***dependent or independent*** (see "Registrations – Independent/ Dependent" on page 256).

Add

Offline only. Add a Registration, Orientation, or Inspection to the job. The item is added as the last element of the job.

Insert

Offline only. Insert a Registration, Orientation, or Inspection *before* the inspection over which you right-clicked to see this menu.

Delete

Offline only. Removes the selected inspection from the job. This removes it completely from memory. It will also be deleted from the database if you save the database again.

Cut

Offline only. Remove the selected inspection to the clipboard. Then use Paste to place the inspection in a different order within the job, or place it into another job.

Copy

Offline only. Copy the selected inspection to the clipboard. Then use Paste to place a copy of the inspection in another part of the job, or place it into another job.

Paste

Offline only. Available if an inspection has been copied or cut to the clipboard. Place the inspection from the clipboard into the current job or into another job. To paste, click an inspection name, right-click, and select Paste. The inspection gets placed *after* the inspection over which you right-clicked to see this menu.

Edit

The inspection menus are displayed on screen right, and the proper camera's image is displayed. If the inspection is a Retro-Spec inspection, that interface is displayed.

❖ *Tip: Instead of using Edit in menu: double-click the desired inspection name in the black area.*

Rename

Offline only. Rename the currently selected inspection.

Inspection Graphs

Select an inspection graph to display on the Online Graphs screen. (not applicable for Retro-Spec inspections)

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Resizing columns in the statistics area

- You can re-size a column by clicking and dragging between columns. Your cursor will change shape in the sections where this is available.
- You could also double-click between columns to automatically size the column to fit the data.
- If you re-size the correlation columns for one camera, those same correlation cells are displayed the same way for all the cameras in the same lane

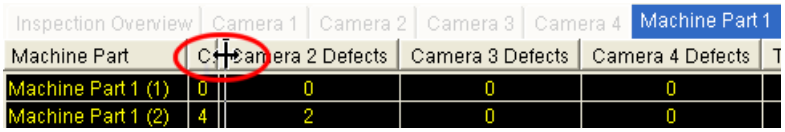
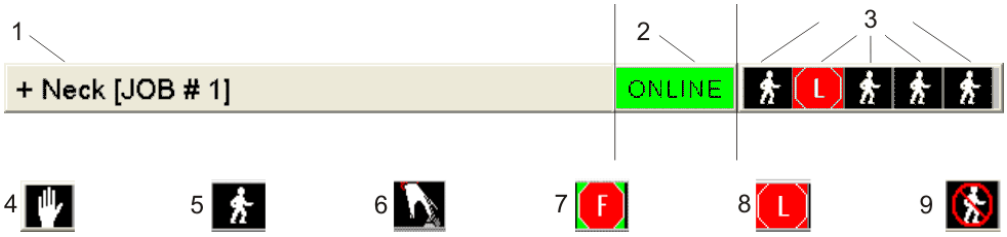


Image Toolbar

This toolbar allows you to easily select a channel to display, release frozen images (online), and see the active camera and job.



1	Camera / job indicator
2	Right-click to release all frozen images online
3	▪ Click to select camera ▪ Right-click to release frozen image online ▪ The number of icons matches the number of cameras in your system
4	Offline
5	Online
6	Held image
7	Frozen image - first part to meet freeze frame condition
8	Frozen image - last part to meet freeze frame condition
9	No job selected for that camera

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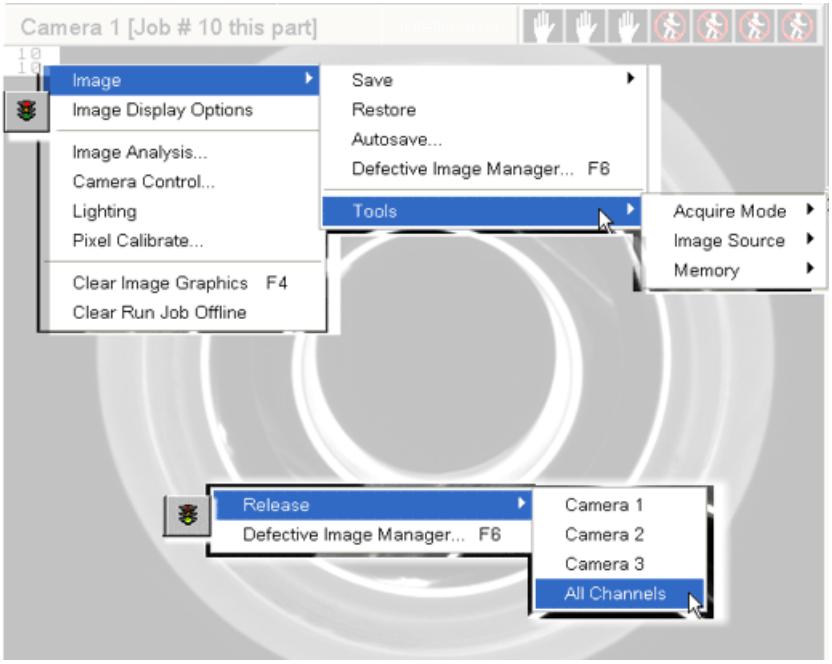
Image Area

One image at a time is displayed here, along with inspection regions if you are programming a job or displaying windows on freeze frame images online.



Right-click on the image area for image options. The available options depend on user level and whether the system is in online or offline mode. See also ***color camera options*** (on page 40).

OFFLINE OPTIONS

Image

This sub-menu allows you to ***save and restore images*** (see "Image Archive" on page 41), and access the ***Online Image Manager*** (on page 209).

Image Display Options

This can be used to change the freeze-frame settings. It opens the ***Image Display menu*** (on page 116) in the upper right corner of the screen.

Image Analysis

(Mechanic and Administrator) The ***Image Analysis tool*** (see "About the Image Analysis tool" on page 185) displays the gray shade value for any group of pixels in your image. This is useful in programming jobs or setting up lighting. You can measure gray shade values of pixels in horizontal or vertical lines, or over a circle.

Camera Control

(Administrator only) The ***camera control*** (on page 171) tool controls camera focus when inspection modules are mounted inside part conveying systems (example, blow molder, or inside a preform conveying system).

Lighting

(Administrator only) Brings up the ***Light Control tool*** (on page 150).

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Pixel Calibrate

(Administrator only) Brings up the ***Pixel Scale Calibration*** (on page 182) tool that allows you to program the system to translate pixels into your desired units of measure (mm, for example).

Clear Image Graphics [F4]

Removes inspection/ orientation/ registration graphics from the grayscale image.

Clear Run Job Offline

(Mechanic and Administrator) Only available when you have run a job offline through modifying an inspection or have pressed [F3]. Clears the graphics from the image and inspection results.

ONLINE OPTIONS

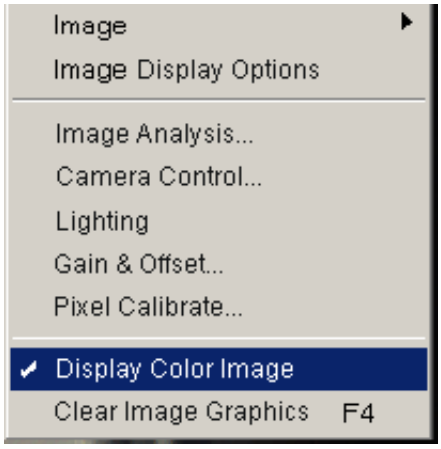
Release

Release an image that was frozen on screen.

Defective Image Manager **(see "Online Image Manager" on page 209)**

Color Camera Options

If your system has color cameras installed, the image menu has additional options. The software automatically detects color cameras and displays the options accordingly. Right-click the image area to display the menu. The color options are described below.



Gain & Offset

This brings up a Gain and Offset menu. See below.

Display Color Image

In standard operation, the Intellispec displays the image in grayscale. When this option is checked, the image is displayed in color. When the image is displayed in grayscale, this does not affect color inspection. If images are displayed in color, this may use additional system processing power in some systems. If you notice that your system is operating slower than normal, try turning off the Display Color Image option.

GAIN AND OFFSET MENU

In addition to the standard gain found in the ***imaging configuration*** (on page 181), there are gain and offset adjustments available for the color cameras.

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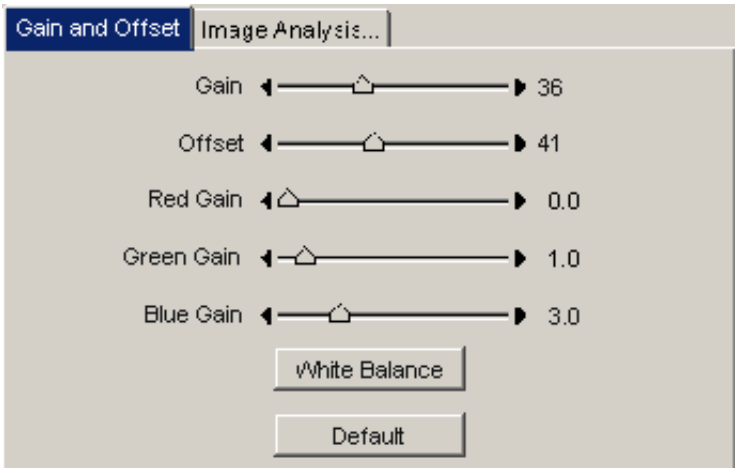
The easiest way to properly balance the camera before inspection is to use the **White Balance** button in the Gain and Offset menu. This acquires a few images and makes adjustments to create a properly balanced image.

- ❖ *Note: you must have sample parts present to acquire their images. The white light on metallic parts provides the white regions used during color balancing.*



Gain

Amount of increase.

Offset

Amount of compensation to balance the circuit.

White Balance

Click this button to allow the system to adjust the camera's white balance. See note above.

Default

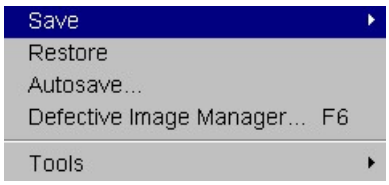
Click this button to set the camera settings to their original values.

Image Archive

USER LEVEL: MECHANIC AND ADMINISTRATOR

To get to this menu:

1) Log in.
2) Right-click over the image area.
3) Select Image.



Save

This is used to save the current image in the “Data” folder.

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Restore

This is used to restore an image from a saved file. It can be used with the Intellispec but is generally used with the Intellitrainer.

Autosave **(see "Using Autosave" on page 213)**

This is used to save any number of images in the “Data” folder. Select the number (n) of images to save and give the images a name. The system will then save an image of the next “n” parts that are produced.

Defective Image Manager **(see "Online Image Manager" on page 209)**

Saves an image of the last 100 rejects. This can also be selected by pressing F6.

Tools

The following options are available from the Tools sub-menu:

Acquire Mode **(on page 188)**

Chooses either part present or immediate mode.

Image Source

Chooses either SmartCAL or frame grabber.

Memory

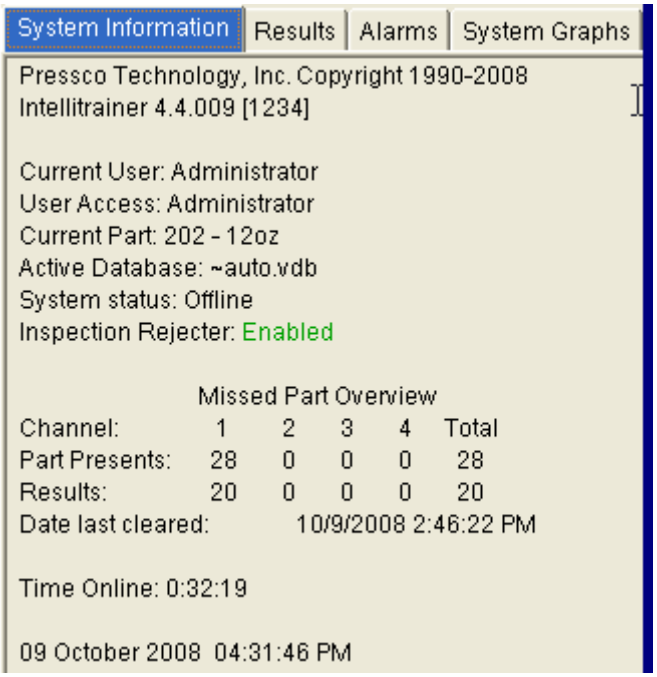
Allows transfer of images to/from the buffer.

Menus, Graphs, Results Area

This area displays most of the system information. Menus from inspections or other toolbar functions are displayed on the upper right screen.

More information about ***Inspection Graphs*** (on page 84).

System Information Tab



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This screen displays information such as the current software version, system serial number, the user currently logged in, the name of the part being inspected, and whether the system is online or offline.

Software version

Displayed under Pressco Technology. Your system will display "Intellispec 4.4.xxx". Refer to this software version when consulting Pressco service or technical support.

Serial number

The Intellispec system serial number is provided in brackets after the software version. In our example, the serial number is [1234].

Rejecters

The status for the rejecters is displayed on this screen. If you have ***dual rejecters*** (see "Dual Rejecter (optional)" on page 135), it displays the status for Rejecter #1 and Rejecter #2 for each channel group. The Administrator can ***enable or disable the rejecter*** (see "Reject Settings" on page 132) for each channel group.

Missed Parts

The ***Missed Part*** (see "About Missed Parts" on page 135) Overview shows the number of missed parts that have occurred in the system since the last power-up, or since the last time these were cleared.

Time Online

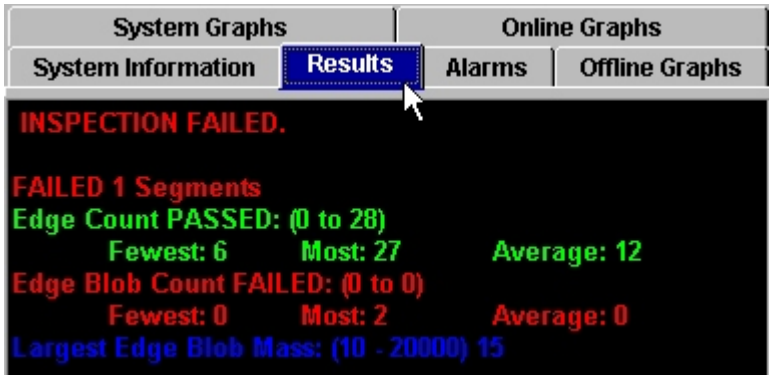
The cumulative duration of the Intellispec online time since the last power-up.

Date and Time

Date and Time (see "Adjusting date and time" on page 250) are displayed at the bottom of the System Information screen.

Results Tab

This screen displays inspection results, and whether individual inspections passed (displayed in green) or failed (displayed in red). If you are editing an inspection, this displays information about whether the different portions of inspections passed or failed (example - ambient, edge, zone, etc.).



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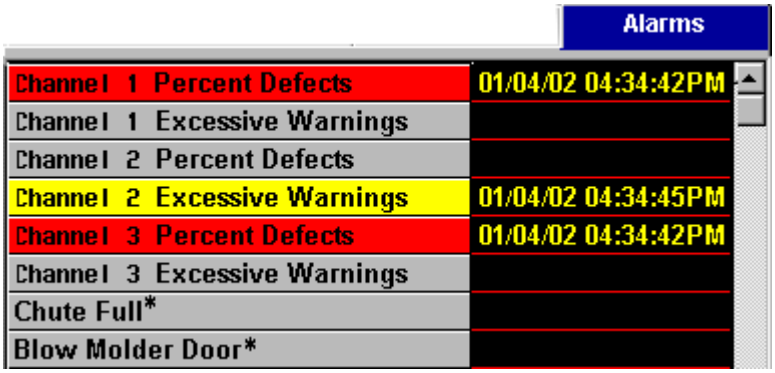
Alarms Tab

This screen displays the status of all enabled alarms. If an alarm has been triggered, it is displayed in red. If an alarm has reached warning status, it is displayed in yellow. If an alarm has not been triggered, it is displayed in gray. The time and date that the alarms were triggered are also listed.

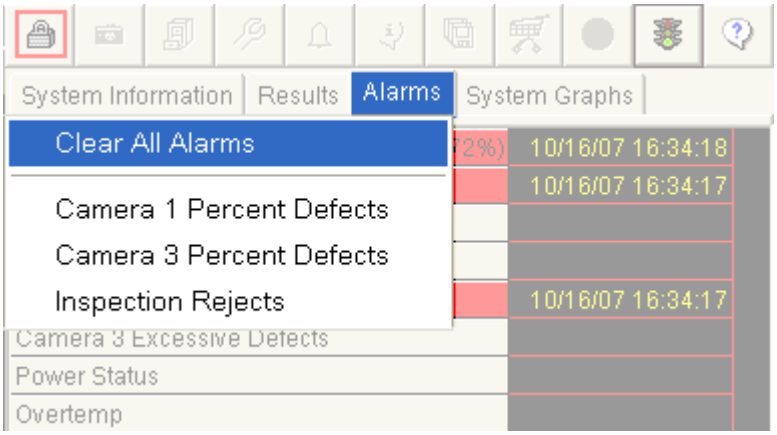


HOW TO CLEAR AN ALARM

If an alarm has been triggered, the light tree (optional) may flash and/or the horn may sound, depending on configuration.

To clear an alarm:

1) Right-click the Alarms tab.
2) Choose an alarm to clear, or choose Clear All Alarms.



> ❖ *Note: If no alarms have been triggered, there will be no list.*

System Graphs

This screen displays graphs that show statistics for all channels, or more than one channel. Examples are: defects from all channels or correlation graphs.

To select a graph:

1) Right-click the System Graphs tab.

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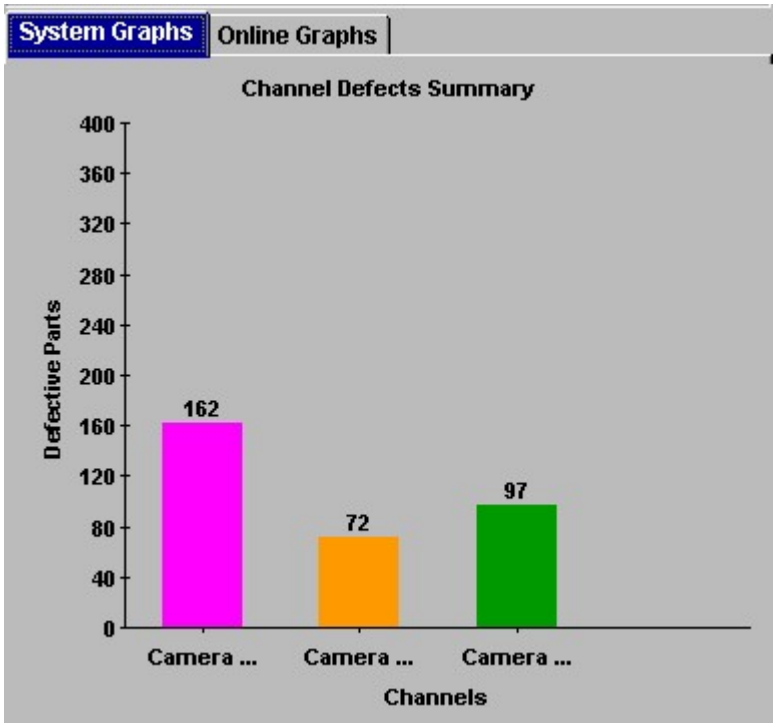
2) Select one of the available graphs.



Online Graphs

These are the inspection graphs available when the system is online. They remain on screen when the system is offline, but the graphs will not update while offline. The inspection graphs can help you adjust the performance of an inspection. For example, they can help you set the minimum and maximum ambient allowed for a specific inspection. These graphs also show statistical information about how well the process is performing.

To select a graph:

1) Right-click the inspection name in the Statistics area
2) Click Inspection Graphs*.
3) Select the desired graph. The graphs available for each inspection depend on which portions of the inspection are enabled. For example, various Edge graphs are only available if an inspection has edge detection capabilities, and Edge Inspection is enabled.

*If the inspection is a Retro-Spec inspection, it displays all graphs within the Retro-Spec interface.

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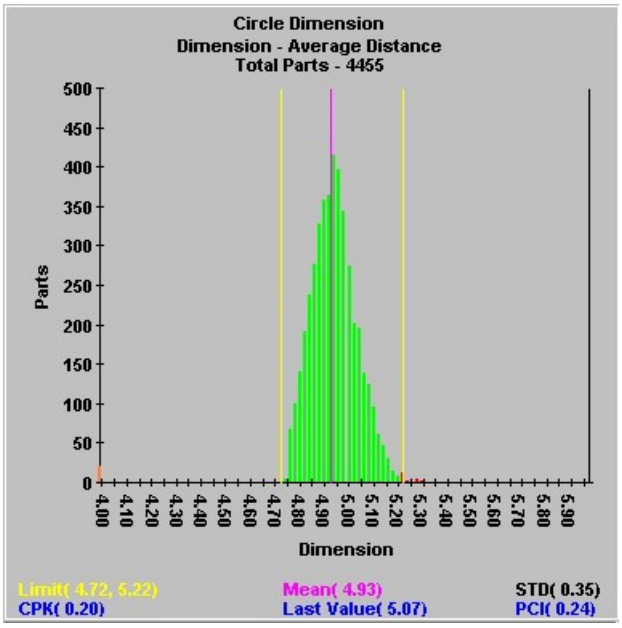
More information about graphs. (see "Information Displayed on Inspection Graphs" on page 86)



Offline Graphs

These are inspection graphs available when you are editing, setting up, or testing an inspection. You can adjust parameter limits while viewing the test data on the graph.

To view an Offline graph while editing an inspection, click one of the buttons.

To view another Offline graph:

1) Double-click the inspection name in the statistics area.
2) Right-click the Offline Graphs tab.
3) Select an available graph.

Offline graphs are only updated when you re-test inspection during inspection editing. When you exit from editing an inspection, offline graphs are removed from screen.

How to Exit Menus

To exit menus, use the choices on the bottom of the menu to save and exit. In some menus, such as Calibrate Part Present, you may be required to finish the operation before exiting the menu.

If you have made any changes to the menu, all three choices will be available. Click the appropriate box depending on your choice.

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- OK will save the changes you have made. It will not close the menu.
- Cancel will ask you if you want to save your changes. If no, then the parameters will revert to the values they were when you entered this menu. It will not close the menu.
- Exit will ask you if you want to save your changes. If yes, the changes will be saved and the menu will close. If no, the parameters will revert to the values they were when you entered this menu, and the menu will close. If cancel, the parameters will remain at their current values and the menu will stay open.

Instead of using the above boxes, you can open another inspection or configuration menu. You will be asked whether to save any changes you have made in the menu that is closing.

What do the >, ^, and + Symbols Mean?

You may see these symbols in the statistics areas and job indicator sections.

Independent / dependent registrations

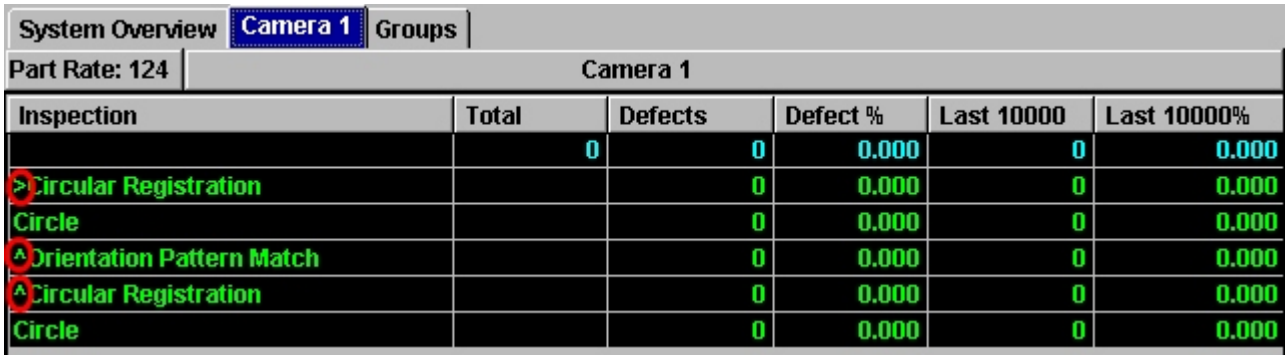
'>' and '^' represent whether a job's registration is ***dependent or independent.*** (see "Registrations – Independent/ Dependent" on page 256)

[> symbol]

Indicates that the registration is independent. That is, it starts from scratch to find the center of the part or feature.

[^ symbol]

Indicates that the registration is dependent. That is, it uses information from the previous registration and/or orientation to find a new center or feature.



Channel specific lighting

[+ symbol]

If the plus sign (+) is present in front of the channel/ job indicator, it means that the job is using **channel-specific** lighting instead of job-specific lighting. This can be set through the job options.

- **Job-specific lighting**: the light settings will automatically be loaded each time the current job is loaded.

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- **Channel-specific lighting**: the light settings will automatically be loaded for any job on that channel. This may save you time in the future when you are setting up jobs that require similar lighting for the same channel.

+ MyCamera 1 [Panel 10]

PASSWORDS / USER LEVELS

To protect system configuration and parameters from being changed by unauthorized users, the Intellispec has multiple user levels to allow different privileges. Some areas of the system require you to log in with your user name and password. The ***Toolbar table*** (see "Menu Toolbar" on page 14) illustrates many of the functions available to the various user levels.

When you try to enter an area of the system to which you do not have privileges, a pop-up message appears.

Additional privileges

- Mechanics and Administrators can edit inspections
- Built-in Pressco Technician account for use by Pressco Service Engineers

How to Log In

You must log in to access most system functions. When you try to enter an area that is not available to your access level, a pop-up screen will appear that tells you that access is denied.

> ❖ *Note: If you do not have a valid User account and password, ask your Administrator to provide you with an account.*

Offline login

When the system is offline, many functions are not available until you log in.

Online login

When the system is online, you will be required to log in if you want to edit a job, or if your system requires a ***password*** (see "How to Enable or Disable the Offline Password" on page 52) to take the system offline.

To log in:

1) Click the button.
2) From the dialog box, select your User account name from the drop-down menu or type the first letter of your user name, and enter your password.

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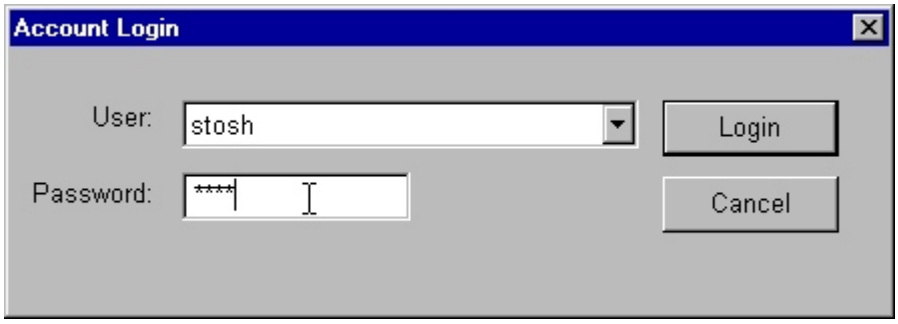
3) Click Login.



You have three chances to enter the correct password. If you do not enter the correct password by the third try, the dialog box automatically closes, and you will not be logged in.

You will remain logged into the system until:

- You put the system online. The system automatically logs you out when the system goes online. This prevents you from accidentally leaving yourself logged in.
- You click the button
- The ***Auto Logout*** (on page 49) feature logs you out

How to Log Out

Log out of the system when you are finished performing system changes. This prevents unauthorized users from altering the system setup. To log out, simply click the button.

Automatic log out

- If you put the system online, the system automatically logs you out
- The system logs you out after a specified period of time if the ***Auto Logout*** (on page 49) feature is enabled

Auto Logout

After a user-defined period of time that the Intellispec remains idle, it will automatically log out the current user. This prevents unauthorized users from accessing the system.

This feature must be enabled by the Administrator.

To enable Auto Logout:

1) Log in as Administrator.
2) Click the button.
3) Click the Users tab.
4) Check the Auto Logout box.
5) Set the number of minutes of inactivity after which the system will log out the current user.
6) Click the Exit button.

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To disable Auto Logout:

Follow steps 1-3 above, then un-check the Auto Logout box.

How to Determine Your User Level

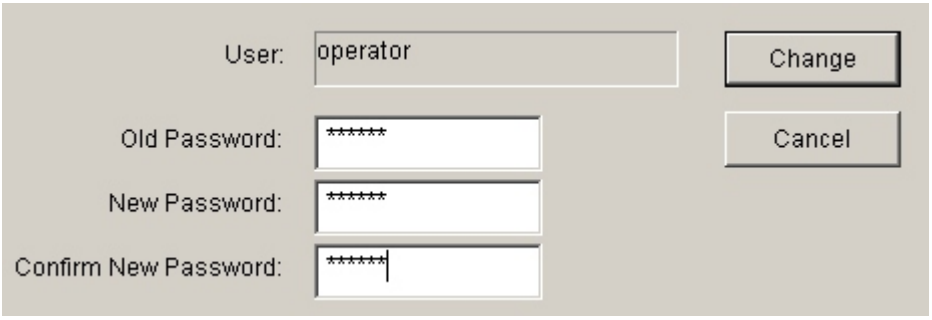
To determine your user level *(see "Passwords/ User Levels" on page 48):*

1) Log in.
2) Click the System Information tab. This screen displays your user name and level.

How to Change Your Password

To change your password:

1) ***Log in*** (see "How to Log In" on page 48).
2) Click the button.
3) Click the Users tab.
4) Click Change Password.
5) Enter your current password (Old Password).
6) Move the cursor and enter the New Password.
7) Move the cursor and re-type the new password in the Confirm New Password box.
8) Click Change to complete the changing of your password, or Cancel if you decide not to change your password.



How to Manage User Accounts

The Administrator of the Intellispec has the rights to manage user accounts. He or she can create or delete users, change passwords, or change user level rights for authorized system users.

USER LEVEL: ADMINISTRATOR

To manage user accounts:

1) Make sure the system is offline.
2) Log in.
3) Click the button.
4) Click the Users tab.

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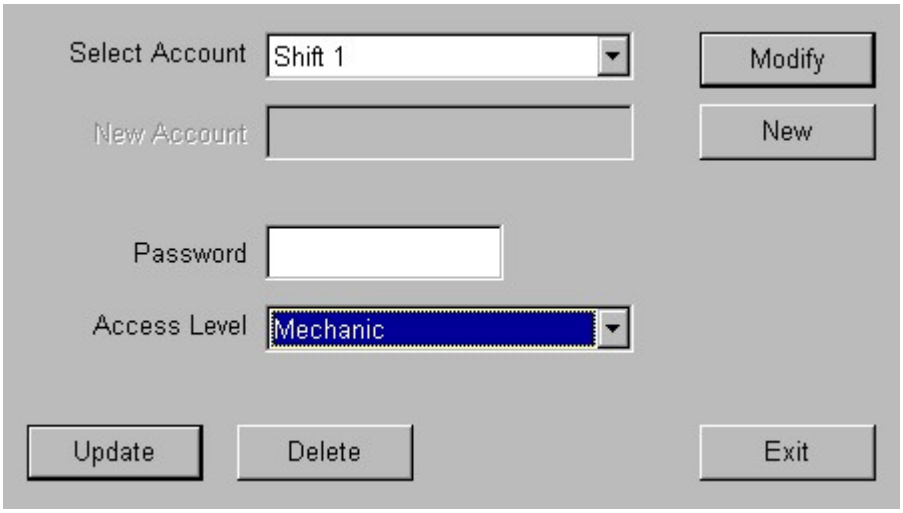
5) Click the Account Setup button. Set the different options as described below.



Create New Users

To add a new user account:

1) Click the New button.
2) Type a name for the new user in the New Account box.
3) Move the cursor and type a Password from one to 10 digits in length.
4) Choose an Access Level for the user from the drop-down menu.
5) Click the Create button. The system will verify that a new user account has been created.
6) Click Exit to close the menu.

If you want a group of people to operate the system through the same account, password, and access level, then name the account a group name (example, Shift 1), and give the password to the group of authorized users.

Change a User Access Level or Password

To change the user Access Level or password for an existing user:

1) Click the Modify button.
2) Choose an account from the Select Account drop-down menu.
3) Type a new password, or change the Access Level for that user.
4) Click the Update button. The system will verify that the account has been changed.
5) Click Exit to close the menu.

Delete a User

To delete an existing user:

1) Select an Account from the drop-down menu.
2) Click the Delete button. The system will ask if you are sure you want to do this.
3) Click Yes. The system will verify that the account has been deleted.
4) Click Exit to close the menu.

How to View All User Accounts

The Administrator can view a list of all current users and their access levels.

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USER LEVEL: ADMINISTRATOR

To view all user accounts:

1) Make sure the system is offline.
2) Log in.
3) Click the button.
4) Click the Users tab.
5) Click the Show All User Accounts button. The Intellispec displays a list of all users and access levels.

How to Enable or Disable the Offline Password

Determine whether you need a password to take the system offline.

USER LEVEL: ADMINISTRATOR

To enable the Offline password:

1) Make sure the system is offline .
2) Log in.
3) Click the button.
4) Click the System tab.
5) Check the Show All Advanced Parameters box.
6) Check the Offline Password Required box.
7) Save the changes and exit the menu.

To disable the Offline password:

1) Follow steps 1-5 above.
2) Un-check the Offline Password Required box. Save the changes and exit the menu.

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MENU FLOWCHARTS

Menu Flowcharts page 1

Statistics area

System Overview (only for multiple lanes)

- X Print Statistics >
- X Display Graphs >
- O Clear all channel statistics
- O Clear good parts count (when alarm enabled)
- O Clear missed parts
- O Review Jobs
- A Review Clipboard

Lane Statistics (Sidel Overview)

- X Print Statistics >
- A Reject >
- O Forced Rejects...
- X Display Graphs >
- O Clear Correlation Statistics
- O Clear All Channel Statistics
- O Clear All Last 'N' Defects Statistics
- O Clear Missed Parts

Channel *n* Statistics

- X Print Statistics >
- O Clear Statistics
- O Clear Last 'N' Defects Statistics
- O Clear Missed Parts
- O Clear Retro-Spec Images
- X Image Display... (Freeze Frame, Display Control)
- A Channel Product Type >
- O Hide Correlation Statistics (with correlation option)
- M SmartLINK (when enabled)
- O Select Job*
- M Disable Job*
- M Job Product Type >*
- A Lighting Settings >
- M Rename Job*
- O Run Job **F3**
- A New Job
- A Copy Job
- A Cut Job
- A Paste Job
- A Delete Job
- O Job Notes
- O Review Jobs
- O Review Inspections
- A Review Clipboard

[*if Part Management is open, these items available from menus]

Machine Part #x Statistics

- X Print Statistics >
- O Forced Rejects...
- X Display Graphs

Groups Statistics

- X Print Statistics >
- O Clear All Channel Statistics
- A Setup...

Access level key

- X = anyone can access
- O = Operator level and higher
- M = Mechanic level and higher
- A = Administrator only

highest access level

4.4 Software Menu tree page 1 of 5

Information/ Graphs area

- X System Information
- X Results
- X Alarms
  - Clear All Alarms (if triggered)
  - Clear Individual Alarms (if triggered)
- X Online Graphs
  - Clear
  - Rescale
  - Print
  - Save
- X System Graphs
  - Channel Defects Summary
  - Machine Part #1-4 Summary
  - Machine Part #1-4 Channel Correlation
  - Print
- M Offline Graphs
  - available inspection graphs
  - Clear
  - Rescale
  - Print
  - Save
  - Save All
- X Part Graphic (option)
  - Print Statistics >
  - Display Mode >
  - A Setup... (Groups)
  - Lane >
  - Show Large Display

Image area

- X Select
  - Channel *n*
- M Image
  - Save >
  - Restore
  - Autosave...
  - O Image Manager... **F6**
  - Tools >
- O Image Display Options
- M Image Analysis...
- A Camera Control...
- A Lighting...
- A Pixel Calibrate...
- O Clear Image Graphics **F4**
- O Clear Run Job Offline

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Menu Flowcharts page 2

4.4 Software Menu tree page 2 of 5

Inspections

Inspection Options (right-click on inspection name in black area)

- A Disable
- A Reject
  - Disable Reject
- O Enable Freeze (in some Image Display modes)
- A Make Dependent/ Independent (Registrations)
- A Add
  - Registration
  - Orientation
  - Inspection
- A Insert
  - Registration
  - Orientation
  - Inspection
- A Delete
- A Cut
- A Copy
- A Paste
- M Edit
- M Rename
- X Inspection Graphs

Registrations*

- Blob
- Circular
- Finish
- Fixed
- Shape Adapt
- X-Y
- Tracker
- Circular Region
- Polygon Region
- Shape Adapt Region

Orientations*

- Orientation Pattern Match
- Orientation Edge
- Midline Orientation
- Orientation Stealer

*availability dependent on Product Type

Inspections*

- Clipout
- Circle
- Circle Dimension
- Radial Line Integration
- Dimension
- Polygon
- Shape Adapt
- Notch
- Rectangle Binary
- Rectangle Grayscale
- Side Fold
- Tracker
- Circle Width Dimension
- Light Meter
- Harmonic
- Rectangular Tracker
- Line Integration
- Thread Inspection**
- Tracker Line Integration
- Label Skew
- Correlation Inspection
- Alphanumeric Correlation
- Fill Height
- Label Skew Dimension
- RETRO-SPEC
  - Contrast
  - Intensity
  - Measurement
  - RETRO-SPEC Wizard Dialog...

**Documented in a separate Inspection supplement

Toolbar menus

- X Login/ Logoff
- X Single snap/ Continuous Snap
  - Continuous Snap
  - Snap Interval
  - Live Images

Part Management

- Part Management tab
- A Enable Part Management
- O Select Part to Run
- O Load Vision Database
- M Load System Database
- A Group Reporting
  - Setup
- A Add Part
  - New Part Name
  - Channel n Job Select
  - Review Jobs
- A Modify Part
  - Select Part to Modify
  - Part Name
  - Channel n Job Select
  - Review Jobs
- A Delete Part
  - Select Part to Delete
  - Delete Part

Access level key

- X = anyone can access
- O = Operator level and higher
- M = Mechanic level and higher
- A = Administrator only highest access level

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Menu Flowcharts page 3

System Configuration

- A System
  - Offline Acquire Mode
    - Immediate
    - Part Present
  - Online At powerup
  - Online Region Sizing (Advanced parameter)
  - Offline Password Required (Advanced parameter)
  - Auto Run Stock Change (Advanced parameter)
  - Camera File Name (Advanced parameter)
  - Strobe Delay Override (Advanced parameter)
    - Strobe Delay
  - UPS Configured (Advanced parameter)
    - UPS model
    - UPS Shutdown Time
    - UPS Interruption Time
  - Periodic Refresh Rate (Advanced parameter)
  - Dialog Advanced Mode (Advanced parameter)
  - Last 'N' Defect Count (Advanced parameter)
  - Camera Control Type (Advanced parameter)
- Reports
  - Print Now
  - Print Destination
  - Print File Type
  - Keep File Name
  - Reset Statistics After Print
  - Print on Scheduled Interval
    - Next Scheduled Print
    - Time Between Prints
  - Print on Job Change
  - Print on Shutdown
  - Defective Part Logging
    - Compact Defective Parts Database
    - Clear Defective Parts Database
    - Back up Defective Parts Database
  - Machine Status Logging
- Correlation
  - Track Machine Parts
  - Total Machine Parts
  - Disable Machine Offsets
  - Machine Part # 1-4 Name
    - Number
    - Offset
  - Outfeed Transfer Sequential (Advanced parameter)
  - Dual Cavity System (Advanced parameter)
  - Forced Reject... (Advanced parameter)
- Channel Groups (see next column)

4.4 Software Menu tree page 3 of 5

- Channel Groups (from System Configuration button)
  - Choose channel group
    - <Channel Group Name>
    - A Re-name channel group
    - Group Select Image
    - Switch to channel...
    - Switch to System (returns to System Configuration)
    - Switch to Channel Group (if other channel groups present)
    - A Tracking
      - Part Width
      - Disable Part Present
      - Encoder (Advanced parameter)
        - Divider Mode
        - Divide Factor
      - Simulated (Advanced parameter)
        - Encoder enable
          - Simulated Encoder frequency
        - Part Present enable
          - Simulated Part Rate
    - A Reject
      - Adaptive Reject
        - Reject Turn on Time
        - Max Encoder frequency
      - Missed Parts
      - Reject Dwell Type
      - Dual Rejecter enable
      - Reject 1
        - Reject Enabled
        - Pulse Width
        - Delay
        - Pass Pulse Width
        - Complete Pulse Width
        - Reject Confirm Enable
        - M Confirm Delay
      - Reject 2 (if Dual Reject = Enabled)
        - Reject Enabled
        - Pulse Width
        - Delay
        - Pass Pulse Width
        - Complete Pulse Width
        - Reject Confirm Enable
        - M Confirm Delay
    - Calibration (see next page)

Access level key

- X = anyone can access
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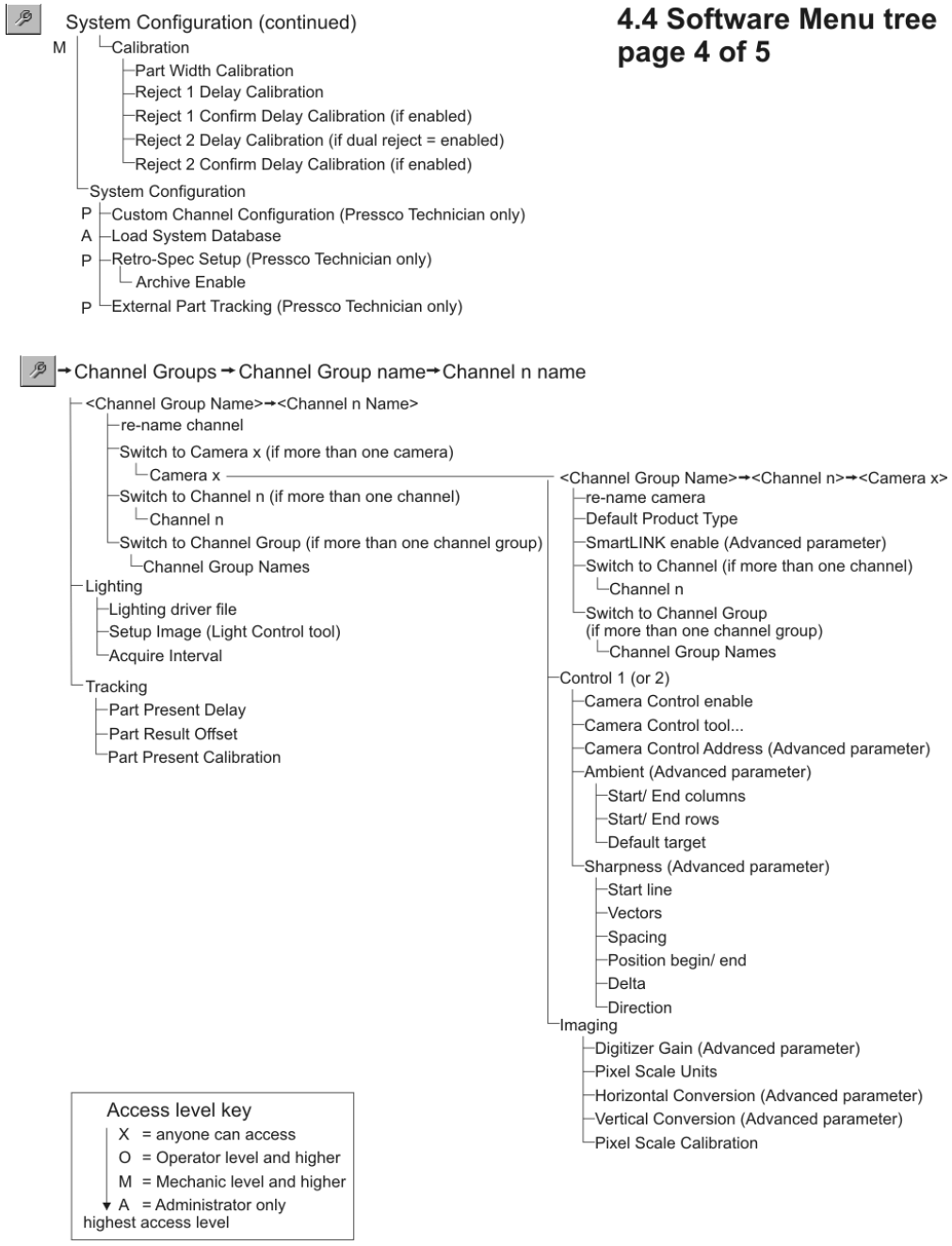
Menu Flowcharts page 4

4.4 Software Menu tree page 4 of 5



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Menu Flowcharts page 5

4.4 Software Menu tree page 5 of 5

Alarm Configuration (viewable by Mechanic)

- A System Alarms
  - System Status
  - Chute Full
  - Blow Molder Door
  - Power Status
  - Good Parts
- A Group Alarms
  - Group Percent Defects
  - Missed Reject #1 and #2 (if enabled)
- A Channel Alarms
  - Channel n
    - Missed Parts
    - Missed Results
- A Camera Alarms
  - Camera x
    - Percent Rejects
    - Excessive Defects
    - Excessive Warnings
    - Consecutive Defects
- M Paging
  - Setup...

Diagnostics Tools

- M General
  - M Computer
  - A Check Calibration
  - A OPC Test Client (optional)
- M Correlation (if Correlation enabled)
  - Correlation Sensors Diagnostic
- M I/O
  - I/O Testing
    - I/O Diagnostics Viewer
  - Show I/O Rates
    - Part Rate
    - Encoder frequency
    - Encoder Counts

Database Tools

- M Database Tools
  - Vision Database
    - Load
    - Save
  - System Database
    - A Load
    - M Save
- Database Utilities
  - M Vision Repair
  - M Configuration Repair
  - M Alarm Repair
  - M Database Detective (Wombat)
  - M Tech Support Tool (TSTool)
  - A Windows Explorer
  - A Delete Files
  - M Format Floppy

A **Miscellaneous**

- System
  - View log files
  - Shutdown (only if UPS not configured)
- Utilities
  - CD Burner Software
  - Software Upgrade
  - Clear All Jobs
  - Clear Configuration
  - Disk Imaging Software
- Users
  - O Change Password
  - A Account Setup
  - A Auto Logout
  - A Show All User Accounts
- A Date/ Time adjust

O **Language Selection**

- Select a Language

X **Online/ Offline**

X **Help**

- Manuals
- SmartSupport

Access level key

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Chapter 3

REPORTS AND GRAPHS

The Intellispec generates graphs and inspection results for the overall system, individual channels, and machine correlation (if applicable). These statistics can be printed or saved to disk.

The Intellispec can save statistics automatically at intervals programmable by your Administrator. Statistics graphs can also be printed or saved on demand.

WHAT DATA IS COLLECTED?

The following data is collected by the Intellispec:

- **Job statistics** (on page 75) – parts inspected, parts rejected, which inspections failed.
- **Correlation data** (on page 79) – how many defects were associated with each machine part. Only available if you have the correlation option.
- **Individual inspection graphs** (on page 84) – graphically shows how many parts passed or failed each inspection. Can show you if a process is moving out of specification, or whether there were just a few parts that did not pass certain inspections.
- **Event reports** (on page 89) – Online/ Offline history, system event logs.
- **Databases** (on page 94) – Defective Parts database, Machine Logging database, Dimension inspections database.
- **System setup parameters** (on page 96).

TERMINOLOGY

To help you understand what is included in the reports, the following is a list of terms used throughout the Intellispec:

Camera

Just as it sounds, the camera is the imaging device that takes pictures of one view on a part.

Channel

A channel is an acquisition point. In most cases a channel is an inspection module, consisting of one or more cameras and a light source. The camera and lighting triggers must occur at the same time to be considered part of the same channel. An example channel is a CP4412E module with three digital cameras and a lighting source that are all triggered at the same time.

Channel Group

Includes a channel or channels that share the same encoder, part present, and reject devices.

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Defect

A part that did not pass inspection. Note that one part may fail more than one inspection.

Inspection

An inspection analyzes the pixel shade information within a region and compares it to programmed reference values. The inspection passes or fails based on these comparisons. You may have many inspections in a job for each camera.

Jobs

The jobs are the programs that inspect each part within the field of view of each camera.

- A job is made up of several inspections
- Each camera runs a different job

Lane

Also referred to as Channel Group. A lane usually refers to one production line, and can contain multiple channels.

Reject

A part that failed one or more inspections from any camera. The part can be physically rejected, or simply counted in the statistics.

For a more complete list of terms, please refer to the Glossary of Terms.

REPORTS SETUP

USER LEVEL: ADMINISTRATOR

This menu allows you to configure automatic printing of the statistics, saving a database of defective parts, and saving a database of online/offline status.

To get to this menu:

1) Click the button.

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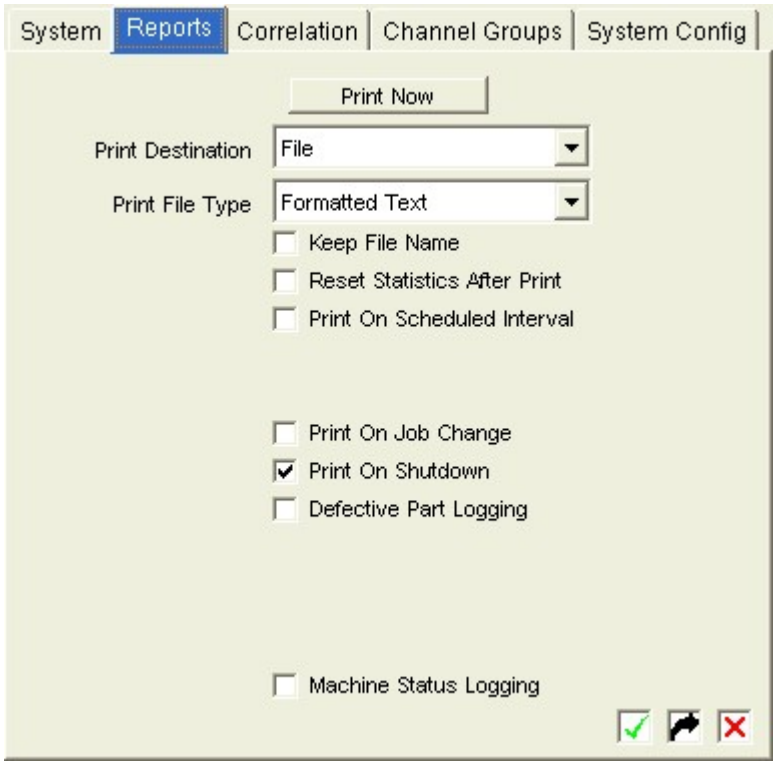
2) Click the Reports tab.



Print Now

Print the job statistics for all configured cameras. This report prints the total parts rejected, percent rejected, total passing parts, and passing percentage. A separate report is generated for each camera. The destination of the printed reports depends on the setting of Scheduled Print Destination.

Print Destination

Choose between Printer, File, or Printer & File. A file is saved in the C:\Intellispec\Reports folder.

Print File Type

Select from three file types:

- **Formatted text** - The system prints the inspection statistics data to a text (.txt) file. One file is created for each camera (and a file for Correlation, if it is enabled). It can be opened simply as a text file, in Notepad, for example. This file can also be imported into a spreadsheet, such as Microsoft® Excel. It is tab delimited. In Excel, you can Open the statistics file, choose delimited (tab), and it will place the statistics into columns, much like it prints the statistics to a printer. You can chart your own graphs and trend data from this information.

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- **Comma Separated Variable** - The system prints the inspection statistics to a .csv file. This is simply another type of text file, but the data is separated by commas instead of tabs. You may easily open this type of file in a spreadsheet application such as Microsoft Excel. When you open the file in Excel, select Text files (.txt or .csv) in the "Files of Type" box so the application sees the file. This file contains the inspection information for all cameras in the active database, plus the Channel Group (Lane) information. Correlation is not included.
- **Excel .xls** - Already formatted to open easily in Microsoft Excel, this file contains the inspection information for all cameras in the active database, plus the Channel Group (Lane) information. Correlation is not included.

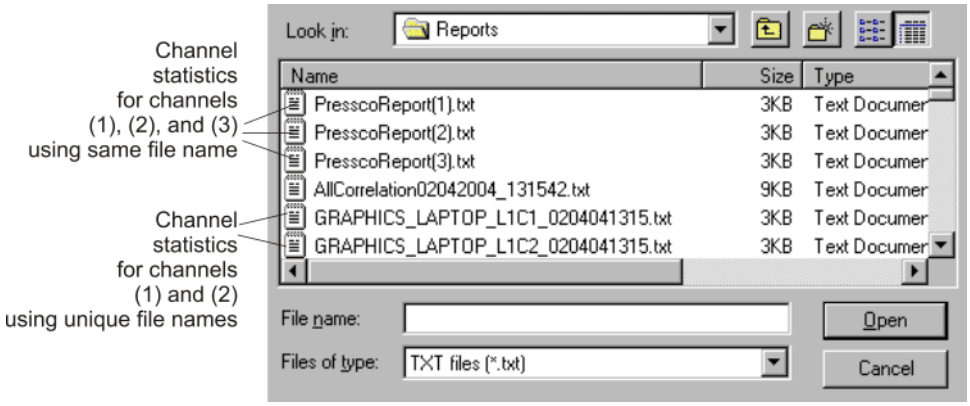
❖ *Note: The .csv or .xls formats are only used when the report is printed from scheduled interval, or by using Print Now from this menu. When statistics are printed from the statistics tabs, .txt format is used.*

Keep File Name

When a report is printed to file and this feature is enabled, the system will write the inspection statistics to the same file name each time, rather than creating new files with unique names. The system overwrites the file each time. The default file name is *PresscoReport.txt (or .csv, or .xls).*

An example of where this feature might be used is a plant where the Intellispec is networked. Say the office computer is programmed to poll the Intellispec at regular intervals to get the latest statistics report. With the same file name, the office computer just needs to request the same file name each time, regardless of the date and time the report was saved.

The screen below shows files that were saved with unique file names, and with the same file names (one per camera).



Reset Statistics After Print

The Intellispec statistics are cleared after each print. The statistics are only cleared after a scheduled interval print, or by using Print Now from this menu, not after printing from a ***statistics tab*** (see "Saving or Printing Reports Manually" on page 67).

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Print on Scheduled Interval

Set the time for the next print, using 24 hour clock. Also set the Time Between Prints, using number of hours and minutes. Example: Next Scheduled Print is 18:23 and Time Between Prints is 1:00. This indicates that the next scheduled print will occur at 6:23pm, and the time between prints is one hour, so the following print will occur at 7:23pm.

Print on Job Change

Prints the statistics if a different job is selected.

Print on Shutdown

Prints the statistics if the Intellispec is shut down.

Defective Part Logging **(see "Defective Parts Database" on page 94)**

This is a Microsoft Access database stored in the C:\Intellispec\Data folder as DefectiveParts.mdb. If enabled, it saves information for each defective part as it occurs online.

Machine Status Logging **(on page 95)**

This tracks the online/ offline status of the Intellispec. If enabled, it saves information in the C:\Intellispec\Data folder as MachineStatusDB.mdb.

ABOUT STATISTICS PRINTED TO FILE

Use the table below to see what statistics are printed when you print them to file.

❖ ***Notes:*** *items in [brackets] are available on systems with the correlation option. Your system's tabs may have different labels than listed below as they can be customized by the Administrator in the System Configuration menus.*

USER LEVEL	WHEN YOU SELECT THIS:	WHAT IS IT?	THIS FILE IS PRINTED:
Operator level and higher	Right-click System Overview tab >> Print Statistics to File	***System Overview statistics file*** (on page 67)	System Summary Date_time.txt [no correlation]
Operator level and higher	Right-click Lane Overview tab >> Print Statistics to File	***Lane Overview Statistics file*** (on page 68)	▪ Lane n Channels Summary Date_Time.txt ▪ [Last_50_Correlation_Defects _Date_Time.txt]
Operator level and higher	Right-click Camera *n* tab >> Print Statistics to File	***One camera statistics file*** (on page 69), and [***Last 50 correlation defects*** (see "About the Last 50 Correlation Defects" on page 83) for one channel.]	▪ SysID_Camera n _Date_Time.txt ▪ [SysID_Camera n _ Last_50_Correlation_Defects _Date_Time.txt]
Operator level and higher	[Right-click Machine Part #n tab >> Print Statistics	[***One machine part statistics file*** (on page	[Machine Part #n_Date_ Time.txt]

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USER LEVEL	WHEN YOU SELECT THIS:	WHAT IS IT?	THIS FILE IS PRINTED:
	to File]	71)]	
Operator level and higher	Right-click Groups tab >> Print Statistics to File	***Groups Statistics file*** (on page 71)	Groups_Date_Time.txt
Administrator	System Configuration >> Reports tab >> Scheduled Print or Print Now	***System statistics files*** (on page 65), including total correlation defects, includes Last Statistics Reset date and time.	**If Print File Type = Formatted text:** ▪ SysID_Camera n_Date_Time.txt (one file generated for each active camera) ▪ Groups_Date_Time.txt ▪ Inspection Channels Summary_Date_Time.txt ▪ [Machine Part #n_Date_ Time.txt] ▪ [AllCorrelation_Date _Time.txt] **If Print File Type = Comma Separated Variable:** SysID_Date_Time.csv – Channel data (All channels & channel group info. Included. No correlation.) **If Print File Type = Excel xls:** SysID_Date_Time_Ch.xls (All channels & channel group info. Included. No correlation.)

Where Is the File Printed?

When you right-click one of the tabs and select Print Statistics to File, that file is printed to the C:\Intellispec\Reports folder.

The Scheduled Print or Print Now function from the Reports menu also prints the data to the same \Reports folder as mentioned above.

SAVING OR PRINTING REPORTS AUTOMATICALLY

You can use ***Reports setup*** (on page 60) to configure how and when the reports are printed or saved automatically.

❖ *Tip: if you want your network to poll the statistics regularly to get a statistics reports, use the* Keep File Name *feature.*

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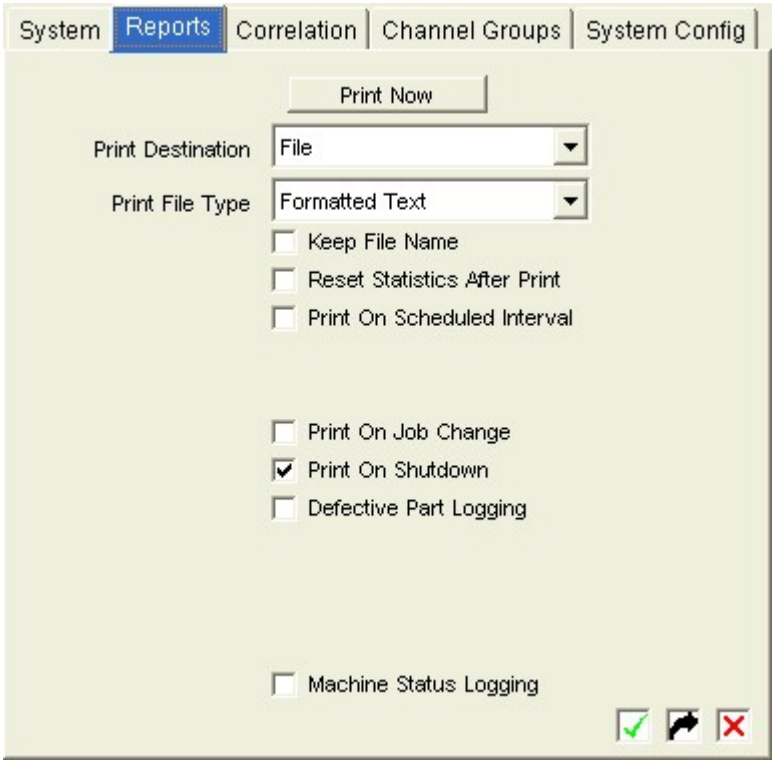
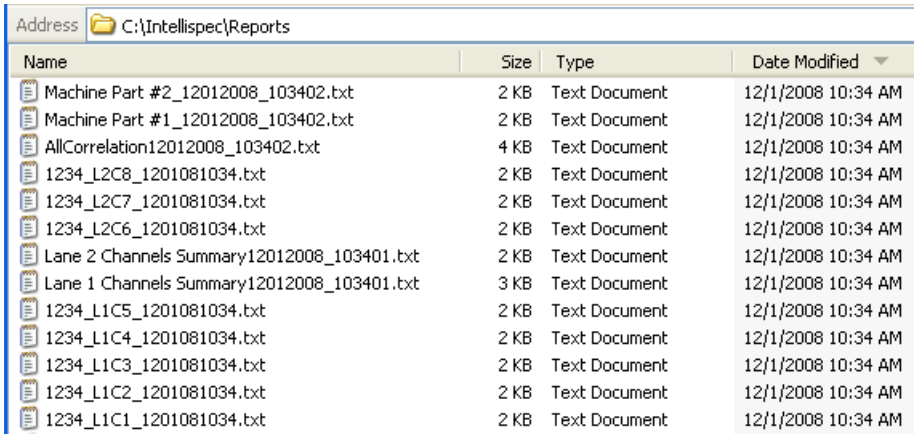
System Statistics Files

These files are saved through scheduled printing, or by using the Print Now button in the System Configuration menu >> Reports tab.



When a file is printed, it is saved on the Intellispec hard drive under C:\Intellispec\Reports. The following is an example of all the reports saved on scheduled interval. The example shows a system configured with eight cameras, two machine parts, and two lanes. These reports are generated when File Type = Formatted Text.



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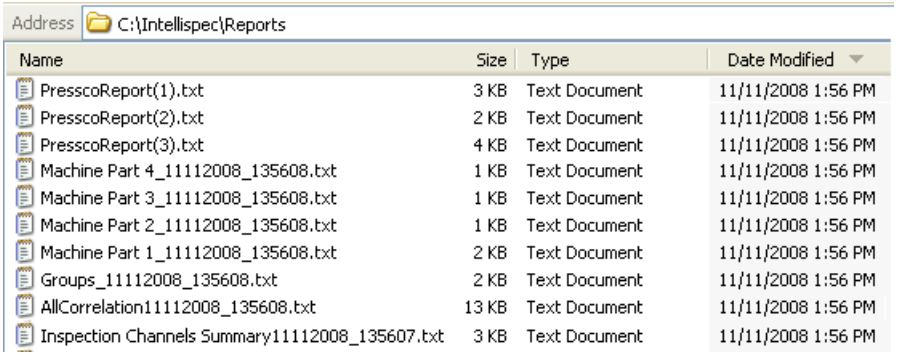
The following is an example of similar data saved as above, except that Keep File Name was checked, and the system was configured with three cameras and four machine parts. The three camera statistics reports are called "PresscoReport(x).txt".



Address C:\Intellispec\Reports

Name	Size	Type	Date Modified
PresscoReport(1).txt	3 KB	Text Document	11/11/2008 1:56 PM
PresscoReport(2).txt	2 KB	Text Document	11/11/2008 1:56 PM
PresscoReport(3).txt	4 KB	Text Document	11/11/2008 1:56 PM
Machine Part 4_11112008_135608.txt	1 KB	Text Document	11/11/2008 1:56 PM
Machine Part 3_11112008_135608.txt	1 KB	Text Document	11/11/2008 1:56 PM
Machine Part 2_11112008_135608.txt	1 KB	Text Document	11/11/2008 1:56 PM
Machine Part 1_11112008_135608.txt	2 KB	Text Document	11/11/2008 1:56 PM
Groups_11112008_135608.txt	2 KB	Text Document	11/11/2008 1:56 PM
AllCorrelation11112008_135608.txt	13 KB	Text Document	11/11/2008 1:56 PM
Inspection Channels Summary11112008_135607.txt	3 KB	Text Document	11/11/2008 1:56 PM

The following is an example of the AllCorrelation statistics file.

Correlation Statistics

System ID: 1234
Date: November 11, 2008 01:56:08 PM

Total Machine Part 1 Defects

Machine Part 1	Defects
1	48
2	81
3	14
4	1
5	45
6	16
7	1

...

Total Machine Part 2 Defects

Machine Part 2	Defects
1	1358

Total Machine Part 3 Defects

Machine Part 3	Defects
1	1358

Total Machine Part 4 Defects

Machine Part 4	Defects
1	1358

Last 50 Defects Correlation Statistics

Date/Time	Machine Part 1	Machine Part 2	Machine Part 3	Machine Part 4	Camera 1	Camera 2
2008-11-11 10:48:40	8	1	1	1	O	X
2008-11-11 10:48:39	1	1	1	1	O	O
2008-11-11 10:48:39	30	1	1	1	O	O
2008-11-11 10:48:38	22	1	1	1	O	O
2008-11-11 10:48:37	18	1	1	1	O	O
2008-11-11 10:48:36	9	1	1	1	O	O
2008-11-11 10:48:36	8	1	1	1	O	O
2008-11-11 10:48:35	6	1	1	1	X	O
2008-11-11 10:48:35	5	1	1	1	X	X
2008-11-11 10:48:35	2	1	1	1	X	O
2008-11-11 10:48:33	21	1	1	1	O	O
2008-11-11 10:48:33	20	1	1	1	O	O
2008-11-11 10:48:32	12	1	1	1	O	O
2008-11-11 10:48:31	8	1	1	1	O	O
2008-11-11 10:48:30	2	1	1	1	O	X
2008-11-11 10:48:30	29	1	1	1	O	O
2008-11-11 10:48:30	28	1	1	1	O	O
2008-11-11 10:48:30	27	1	1	1	X	O
2008-11-11 10:48:29	26	1	1	1	X	O

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When File Type = ***.csv or .xls*** (see "About Statistics printed to a .csv or .xls file" on page 73), one file is printed or saved. This contains system statistics. No correlation information included.

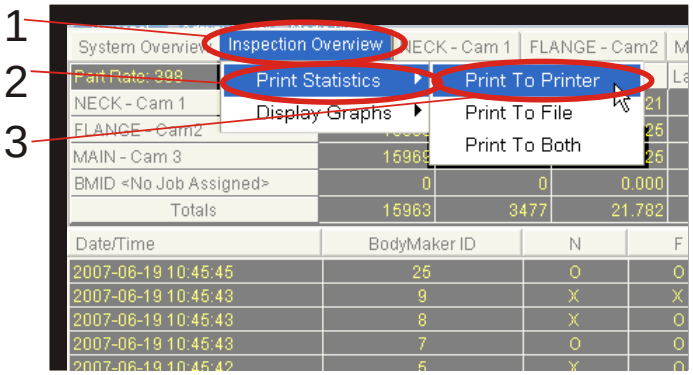
See examples of ***lane overview statistics file*** (on page 68), ***camera statistics file*** (see "One Camera Statistics File" on page 69), ***machine part statistics file*** (see "One Machine Part Statistics File" on page 71), and ***groups statistics file*** (on page 71).

SAVING OR PRINTING REPORTS MANUALLY

You can right-click any of the statistics tabs in the upper left section of the screen to print reports. Depending which tab you have selected, a different report is printed.

To print the inspection statistics to either a file or a printer:

1) In the upper left of the screen, click the Inspection Overview* tab.
2) Right-click the Inspection Overview tab, select Print Statistics.

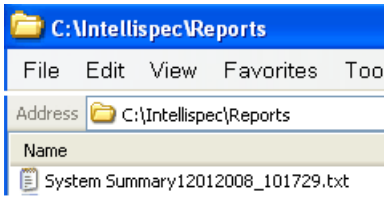


3) Choose a destination.
   - **Print to Printer** prints to the default connected printer.
   - **Print to File** prints two text files to the Intellispec hard drive at C:\Intellispec\Reports.
   - **Print to Both** prints both to a printer and to the text files.

*name of tab may be different on your system.

System Overview Statistics File

This file is printed when you print the statistics from the System Overview tab. If your system does not contain more than one lane it does not have a System Overview tab.



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The following is an example of a System Summary report, with two lanes and eight cameras configured.

System Summary12012008_101729.txt - Notepad

File Edit Format View Help

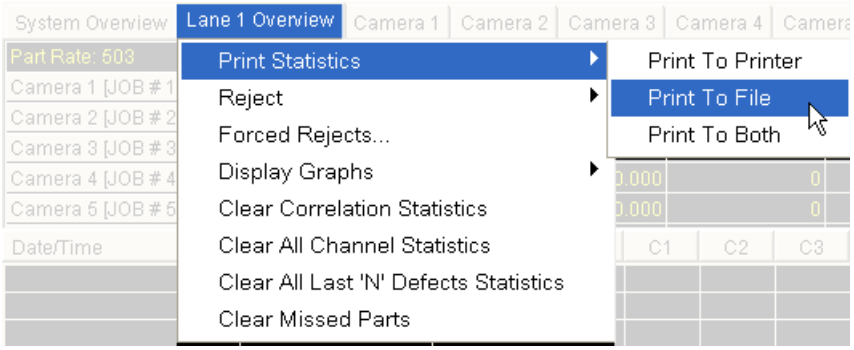
System Summary Statistics

System ID: 1234
Date: December 01, 2008 10:17:29 AM

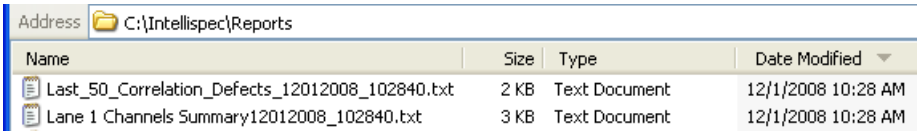
Channel	Total	Defect	Defect %	Last (10000)	Last (10000)%
Lane 1 -- 499 PPM	0	0	0.000		
Camera 1 [JOB #1]	0	0	0.000	0	0.000
Camera 2 [JOB #2]	0	0	0.000	0	0.000
Camera 3 [JOB #3]	0	0	0.000	0	0.000
Camera 4 [JOB #4]	0	0	0.000	0	0.000
Camera 5 [JOB #5]	0	0	0.000	0	0.000
Lane 2 -- 499 PPM	0	0	0.000		
Camera 6 [JOB #6]	0	0	0.000	0	0.000
Camera 7 [JOB #7]	0	0	0.000	0	0.000
Camera 8 [JOB #8]	0	0	0.000	0	0.000

Lane Overview Statistics File

This file is printed when you print the statistics from the Lane Overview tab.



When a file is printed, it is saved on the Intellispec hard drive under C:\Intellispec\Reports. The picture below shows the names of the files printed from the Lane Overview tab. If your system does not have correlation, the Last_50_Correlation... file does not get saved.



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The following is an example of the channel group (Lane) summary statistics, with four cameras configured.

Inspection Channels Summary Statistics

System ID: 1234
Date: November 11, 2008 10:49:05 AM

Channel	Total	Defect	Defect %	Last (10000)	Last (10000)%
Camera 1 [202 - 12oz.]	5733	441	7.692	441	7.692
Camera 2 [202 - 12oz.]	5733	174	3.035	174	3.035
Camera 3 [202 - 12oz.]	5733	860	15.001	860	15.001
Camera 4 <No Job Assigned>0		0	0.000	0	0.000
Totals	5739	1362	23.732		

The following is an example of the Last 50 correlation statistics.

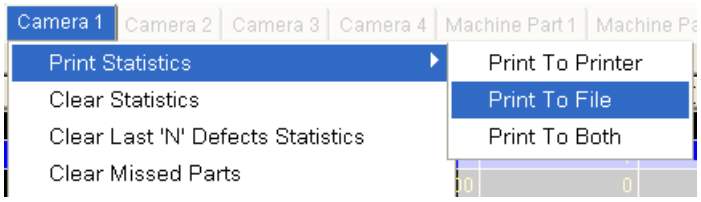
Last 50 Defects Correlation Statistics

System ID: 1234
Date: November 11, 2008 10:49:05 AM

Date/Time	MachinePart1	MachinePart2	MachinePart3	MachinePart4	Camera1	Camera2	Camera3	Camera4
2008-11-11 10:48:40	8	1	1	1	O	X	O	O
2008-11-11 10:48:39	1	1	1	1	O	O	X	O
2008-11-11 10:48:39	30	1	1	1	O	O	X	O
2008-11-11 10:48:38	22	1	1	1	O	O	X	O
2008-11-11 10:48:37	18	1	1	1	O	O	X	O
2008-11-11 10:48:36	9	1	1	1	O	O	X	O
2008-11-11 10:48:36	8	1	1	1	O	O	X	O
2008-11-11 10:48:35	6	1	1	1	X	O	O	O
2008-11-11 10:48:35	5	1	1	1	X	X	O	O
2008-11-11 10:48:35	2	1	1	1	X	O	O	O
2008-11-11 10:48:33	21	1	1	1	O	O	X	O
2008-11-11 10:48:33	20	1	1	1	O	O	X	O
2008-11-11 10:48:32	12	1	1	1	O	O	X	O
2008-11-11 10:48:31	8	1	1	1	O	O	X	O
2008-11-11 10:48:30	2	1	1	1	O	X	O	O
2008-11-11 10:48:30	29	1	1	1	O	O	X	O
2008-11-11 10:48:30	28	1	1	1	O	O	X	O
2008-11-11 10:48:30	27	1	1	1	X	O	O	O
2008-11-11 10:48:29	26	1	1	1	X	O	O	O
2008-11-11 10:48:29	23	1	1	1	X	O	O	O
2008-11-11 10:48:27	11	1	1	1	O	O	X	O
2008-11-11 10:48:27	10	1	1	1	O	O	X	O
2008-11-11 10:48:26	2	1	1	1	O	O	X	O
2008-11-11 10:48:25	29	1	1	1	O	X	O	O
2008-11-11 10:48:25	28	1	1	1	O	O	X	O
2008-11-11 10:48:24	19	1	1	1	O	O	X	O
2008-11-11 10:48:24	18	1	1	1	X	O	X	O
2008-11-11 10:48:24	17	1	1	1	X	O	O	O
2008-11-11 10:48:23	14	1	1	1	X	O	O	O
2008-11-11 10:48:21	1	1	1	1	O	O	X	O

One Camera Statistics File

This file is printed when you print the statistics from any Camera statistics tab.



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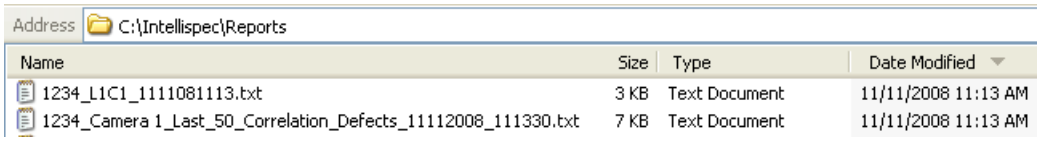
When a file is printed, it is saved on the Intellispec hard drive under C:\Intellispec\Reports. The picture below shows the names of the files printed from a camera statistics tab. If your system does not have correlation, the ...Last_50_Correlation.. file does not get saved.



The following is an example of one camera's statistics. The number of inspections listed depends on the number of inspections in the active job.

Intellispec Statistics Report

System ID: 1234
Job[Camera]: 202 - 12oz. [Camera 1]
Current Time: November 11, 2008 11:13 AM
Last Reset: November 03, 2008 04:28 PM
Time Online: 0:14

Inspection Name	Total	Reject	Reject %	Last 10000	Last 10000%
Empty Pocket	5734	1	0.017	1	0.017
CENTERING	5733	0	0.000	0	0.000
Circular Region1	5733	0	0.000	0	0.000
Inspection 1	5733	294	5.128	294	5.128
Circular Region2	5733	0	0.000	0	0.000
Inspection 2	5733	441	7.692	441	7.692
Circular Region3	5733	0	0.000	0	0.000
Inspection 3	5733	0	0.000	0	0.000
Total	5733	441	7.692	441	7.692
Totals Inspection:	5739	1362	23.732		

Definitions:
Total: Total number of parts inspected.
Reject: Number of inspections reporting a Reject.
Last 10000: Number of inspections failing in the last 10000 parts.

Note: Totals under the Reject column may not reflect a sum of that column since one part may trigger a reject for more than one inspection.

The following is an example of a file for one camera correlated to all machine parts.

Last 50 Camera 1 Defects Correlation Statistics

System ID: 1234
Date: November 11, 2008 11:13:30 AM

Date/Time	MachinePart1	MachinePart2	MachinePart3	MachinePart4
2008-11-11 10:48:35	6	1	1	1
2008-11-11 10:48:35	5	1	1	1
2008-11-11 10:48:35	2	1	1	1
2008-11-11 10:48:30	27	1	1	1
2008-11-11 10:48:29	26	1	1	1
2008-11-11 10:48:29	23	1	1	1
2008-11-11 10:48:24	18	1	1	1
2008-11-11 10:48:24	17	1	1	1
2008-11-11 10:48:23	14	1	1	1
2008-11-11 10:48:18	9	1	1	1
2008-11-11 10:48:18	8	1	1	1
2008-11-11 10:48:17	5	1	1	1
2008-11-11 10:48:12	30	1	1	1
2008-11-11 10:48:12	29	1	1	1
2008-11-11 10:48:11	26	1	1	1
2008-11-11 10:48:06	21	1	1	1
2008-11-11 10:48:06	20	1	1	1
2008-11-11 10:48:05	17	1	1	1
2008-11-11 10:48:00	12	1	1	1
2008-11-11 10:48:00	11	1	1	1
2008-11-11 10:48:00	8	1	1	1
2008-11-11 10:47:54	3	1	1	1
2008-11-11 10:47:54	2	1	1	1

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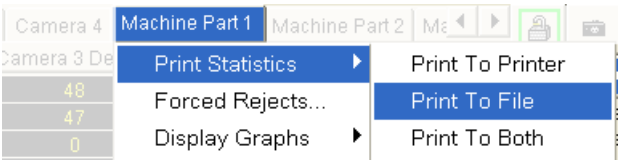
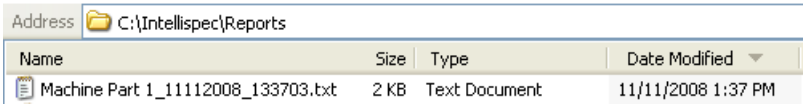
One Machine Part Statistics File

This file is printed when you print the statistics from any machine part (correlation) tab.



When a file is printed, it is saved on the Intellispec hard drive under C:\Intellispec\Reports.



The following is an example of the statistics file for one machine part.

Machine Part 1 Statistics

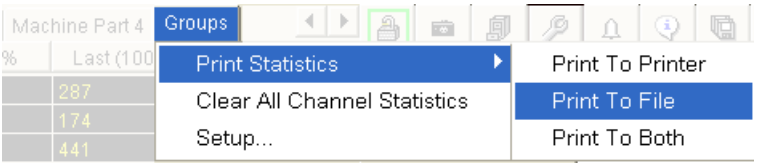
System ID: 1234
Date: November 11, 2008 01:37:03 PM

Total Machine Part 1 Defects

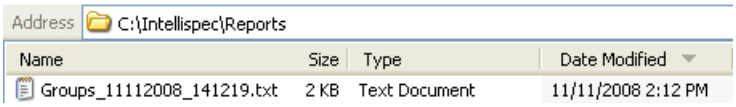
Machine Part 1	Defects
1	48
2	81
3	14
4	1
5	45
6	16
7	1
8	118
9	59
10	47
11	81
12	58
13	0
14	44
15	14
16	0
17	43

Groups Statistics File

This file is printed when you print the statistics from the Groups tab.



When a file is printed, it is saved on the Intellispec hard drive under C:\Intellispec\Reports.



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The following is an example of a groups statistics file. The number of groups listed depends on the number of ***groups configured*** (see "How to Assign Inspections to Groups in the Part Graphic" on page 20).

Groups Statistics

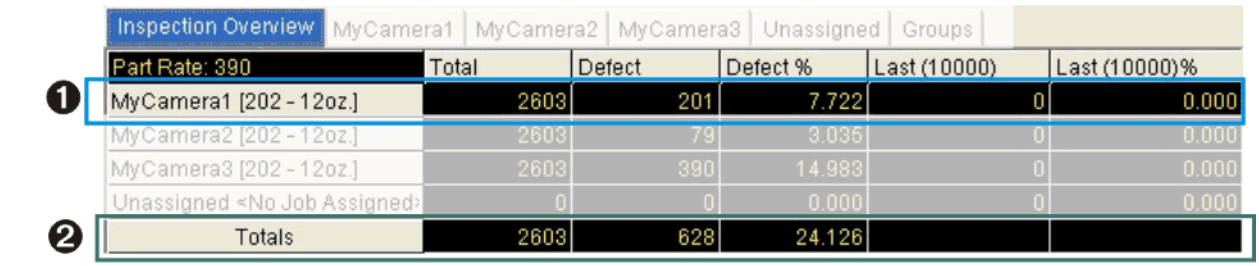
System ID: 1234
Date: November 11, 2008 01:56:08 PM

Groups	Defects	Defects %	Last 10000	Last 10000%
FLANGE (Cam 3)	287	5.000	287	5.005
FLANGE 2 (Cam 2)	174	3.000	174	3.035
NECK	441	7.000	441	7.691
HIGH SIDEWALL	430	7.000	430	7.499
MID SIDEWALL	287	5.000	287	5.005
LOWER SIDEWALL	287	5.000	287	5.005
BOTTOM	144	2.000	144	2.511

INTELLISPEC STATISTICS REPORT COMPARISON

Below are examples of overall system statistics from screen, a saved text (.txt) file, and an Excel (.xls) file (same information as .csv).

screen



.txt file

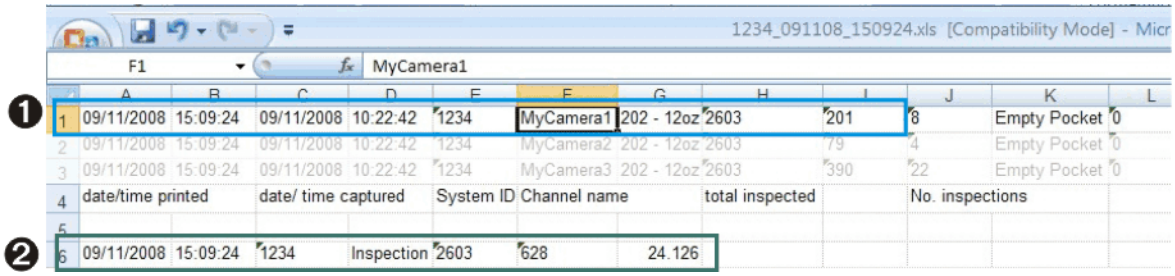
spection Channels Summary Statistics

System ID: 1234
Date: September 11, 2008 03:20:57 PM

Channel	Total	Defect	Defect %	Last (10000)	Last (10000)%
MyCamera1 [202 - 12oz.]	2603	201	7.722	0	0.000
MyCamera2 [202 - 12oz.]	2603	79	3.035	0	0.000
MyCamera3 [202 - 12oz.]	2603	390	14.983	0	0.000
Unassigned <No Job Assigned>0		0	0.000	0	0.000
Totals	2603	628	24.126		

1 2

.xls or .csv file



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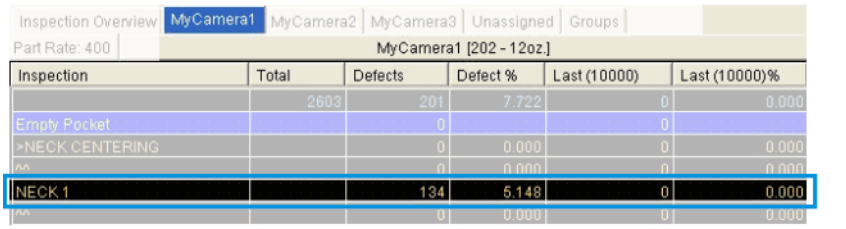
1	Total parts inspected [2603], number of defects for one channel [201], percentage of defects for one channel [7.722]
2	Total parts inspected [2603], total defects for all channels [628], percentage of defects for all channels [24.126]

Below are examples of statistics for one camera from screen, a saved text (.txt) file, and a .csv file (same information as .xls). The screen and text file examples highlight statistics for one inspection, while the .xls or .csv example highlights all the inspections for one job. The number of inspections included depends on the number of inspections in the job. The example .csv file is truncated for illustration purposes.

screen



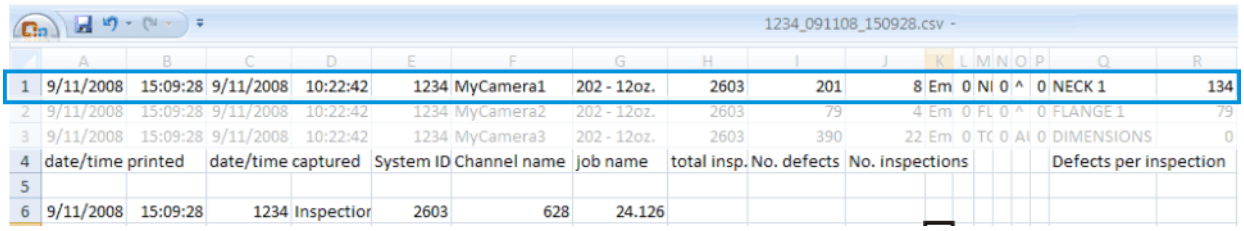
.txt file

Intellitrainer Statistics Report

System ID: 1234
Job[Camera]: 202 - 12oz. [MyCamera1]
Current Time: September 11, 2008 03:09 PM
Last Reset: September 11, 2008 10:22 AM
Time Online: 0:00

Inspection Name	Total	Reject	Reject %	Last 10000	Last 10000%
Empty Pocket	2603	0	0.000	0	0.000
NECK CENTERING	2603	0	0.000	0	0.000
Region 1	2603	0	0.000	0	0.000
NECK 1	2603	134	5.148	0	0.000
Region 2	2603	0	0.000	0	0.000
NECK 2	2603	201	7.722	0	0.000
Region 3	2603	0	0.000	0	0.000
NECK 3	2603	0	0.000	0	0.000
Total	2603	201	7.722	0	0.000
Totals Inspection:	2603	628	24.126		

.xls or .csv file



About Statistics printed to a .csv or .xls file

The information presented in either of these formats is the same. This report includes:

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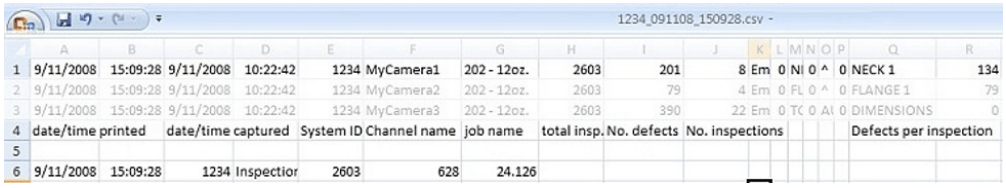
- Inspection statistics for all cameras - all inspections in each active job are included
- Last Statistics Reset date and time
- Time system was online
- Lane overview information - number of inspected parts, number of defects, and percentage of defects



1234_091108_150928.csv -

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	9/11/2008	15:09:28	9/11/2008	10:22:42	1234	MyCamera1	202 - 12oz.	2603	201	8	Em	0	Ni	0	^	0	NECK 1	134
2	9/11/2008	15:09:28	9/11/2008	10:22:42	1234	MyCamera2	202 - 12oz.	2603	79	4	Em	0	FL	0	^	0	FLANGE 1	79
3	9/11/2008	15:09:28	9/11/2008	10:22:42	1234	MyCamera3	202 - 12oz.	2603	390	22	Em	0	TC	0	Al	0	DIMENSIONS	0
4	date/time printed		date/time captured		System ID	Channel name	job name	total insp.	No. defects	No. inspections							Defects per inspection	
5																		
6	9/11/2008	15:09:28		1234 Inspectior	2603	628	24.126											

❖ *Note: .csv or .xls files do **not** contain correlation data*

.csv (comma separated variable)

This is similar information to a text (.txt) file, but presented in a comma separated text format.

.xls (Microsoft Excel)

This is similar information to a text (.txt) file, but presented in spreadsheet format.

STATISTICS DISPLAYED ON SCREEN

You can view most of the Intellispec production statistics in the upper left portion of the screen. For a description of what is displayed on each of these tabs, see more ***about the statistics area*** (on page 24).

Customizing the Statistics Tabs

The names of the following tabs may be customized by the **Administrator**.

To customize the Sidel Overview or Lane n Overview tab:

1) Log in.
2) Click the button.
3) Click the Channel Groups tab.
4) Select a channel group.
5) Type a new channel group name. The name is displayed on the Lane Overview tab.

To customize the Camera Name tab:

1) Log in.
2) Click the button.
3) Click the Channel Groups tab.
4) Select a channel group.
5) Under the Switch to Channel section, select a channel.
6) Under the Switch to Camera section, select a camera.
7) Type a new camera name and click OK. The name is displayed on the selected camera's statistics tab.

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To customize the Machine Part (Correlation) tabs:

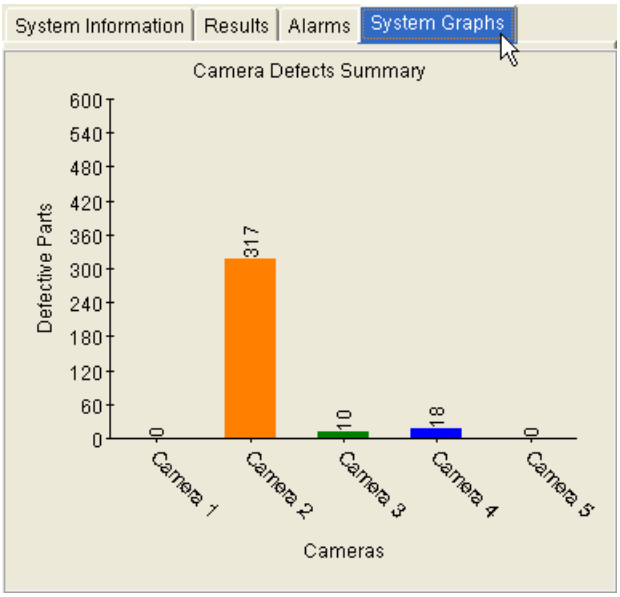
1) Log in.
2) Click the button.
3) Click the Correlation tab.
4) Make sure the Track Machine Parts box is checked.
5) Type new machine part names. The names are displayed on the machine part statistics tabs.

JOB STATISTICS

This consists of the number of parts inspected, parts rejected, percent rejected, and the number of rejects or warnings that occurred with each inspection. A report is generated for each channel, either on demand or at scheduled intervals.

Viewing Job Statistics on Screen

The Camera Defects Summary graph displays the number of defects for all cameras. There is a vertical color-coded bar for each of the cameras. This can be displayed whether the system is offline or online.



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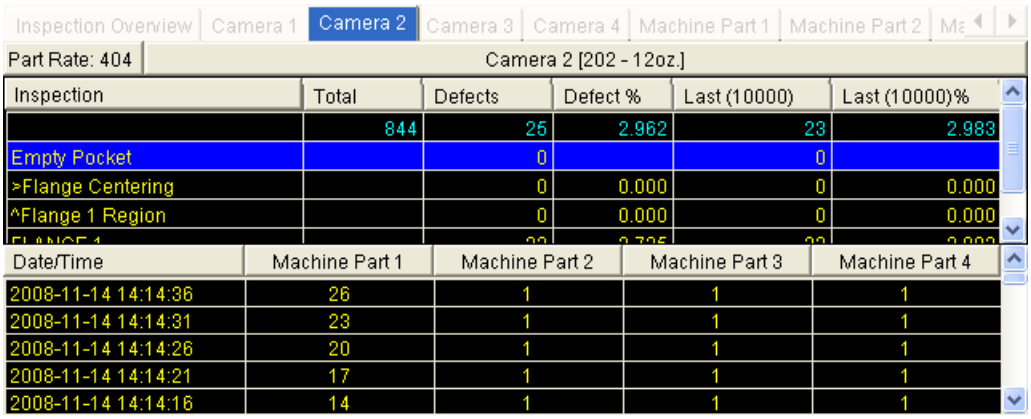
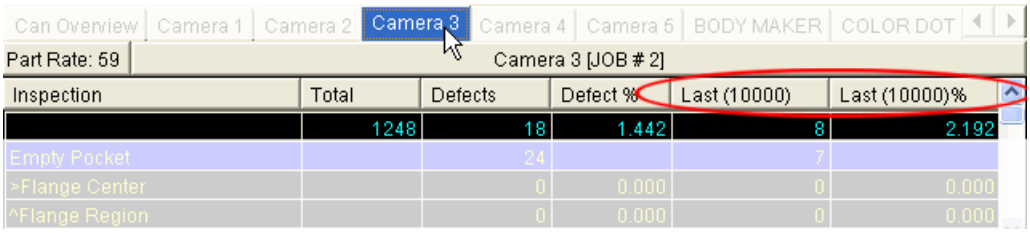
The Statistics area displays detailed job information in a table. This table displays the part rate, job name, total number of inspected parts for each camera, number of defective parts, percentage of defective parts, and Last *n* defects. The results for each inspection of the active job are also displayed.



Last N Defect Count



View the most recent production data under the Lane Overview, Channel Statistics, or Groups tabs. Last N Defect displays the number and percentage of defective parts within the last N parts. This feature allows you to continue to collect inspection data (Total inspected, total defects, and defect %) without clearing the statistics to see how the most recent batch of parts has done.

N is defined by the Administrator (see "System tab details" on page 123) – it can be set between 100 and 100,000. It is a sliding window, like a ring buffer, where the oldest information is pushed out when new information is gathered.

Warning

When you change this number, the Last N defects count is reset.

Grouping Inspections

This feature allows you to assemble inspection data into groups. ***You may define up to 16 groups*** (see "How to Assign Inspections to Groups in the Part Graphic" on page 20). Also see information about the ***groups statistics file*** (on page 71).

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A Groups tab in the statistics area will display inspection results by group instead of by inspection. Scroll all the way to the right to see the Groups tab.

System Overview | Inspection Overview | NECK - Cam 1 | FLANGE - Cam2 | MAIN - Cam 3 | BMID | Groups

Groups	Defects	Defects %	Last (10000)	Last (10000)%
FLANGE (Cam 3)	0	0.000	0	0.000
FLANGE 2 (Cam 2)	0	0.000	0	0.000
NECK	0	0.000	0	0.000
HIGH SIDEWALL	0	0.000	0	0.000
MID SIDEWALL	0	0.000	0	0.000
LOWER SIDEWALL	0	0.000	0	0.000
BOTTOM	0	0.000	0	0.000

Typically, the inspections in a group should cover a particular region of the part. This allows you to monitor specific regions and it can help you isolate changes in your process.

Note the following about grouping:

- Each group must be assigned inspections from one camera. No mixing inspections from camera 1, camera 2, etc.
- Inspections must be programmed before you enter group setup
- If using Part Graphic, groups are already assigned to part areas

Using Group Outputs

USER LEVEL: ADMINISTRATOR

You can assign each group to one of several outputs. The outputs are active when any inspection within any assigned group fails. You can use these outputs to monitor the process within your plant, and make adjustments as necessary.

- You can assign multiple groups to one output
- Multiple groups can be from different cameras, and can be assigned to one output.
- Group outputs are found on terminals 64-72 and 12-18.

To assign a group to an output:

1) Right-click the Groups tab.
2) Select Setup.
3) Select a group from the Groups drop-down menu.
4) Select an output number from the Output drop-down menu.
5) Click OK.

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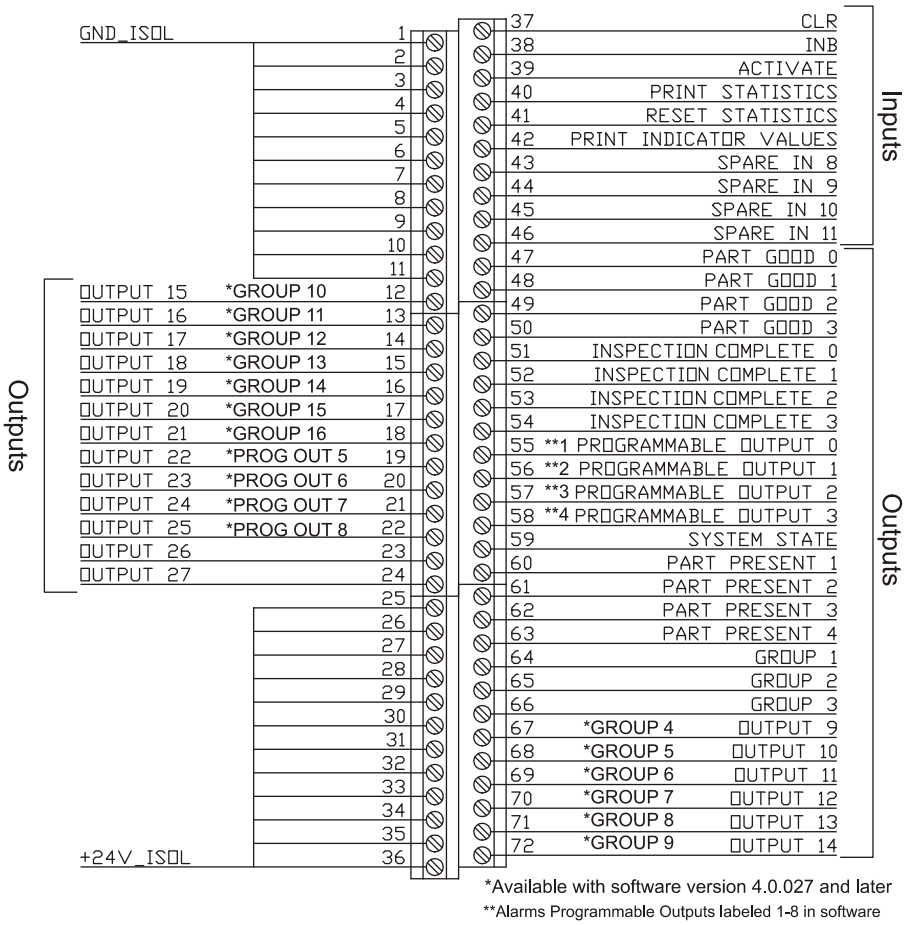
In **standard Series IV** systems, 16 group outputs are available. They are accessed from the Extended I/O terminal block TB1. Pinouts are shown below.

Extended I/O terminal block TB1



Details and sample circuits are found in the Hardware section.

If your **Series IV** system is equipped with the Ultra I/O option, up to 64 group outputs are available.

If you have a **Series III** system with the Extended I/O option, three outputs (Groups 1, 2, and 3) may be accessed from the Extended I/O assembly Rack 2. They are labeled OUT18 (terminals 19, 20), OUT19 (terminals 21, 22), and OUT20 (terminals 23, 24).

How to Save Job Statistics to Floppy Diskette

USER LEVEL: MECHANIC AND ADMINISTRATOR

To save statistics to floppy:

1) Log in. System must be offline.
2) Use the ***Database Detective*** (see "Database Detective Functions" on page 230) tool to quickly select files and copy them to diskette. Click >> Database Utilities >> select Database Detective.
3) Click the Other tab >> select Copy Files >> click Next.
4) Click the Reports button. Scroll to the appropriate folder if necessary. Most reports are located at C:\Intellispec\Reports.

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5) Select the appropriate files to copy.
   - The job statistics file names contain the date and time the file was created in this order: Month, date, year, time
   - The correlation statistics mention 'correlation' in the name
6) Click Open. Make sure all the reports you want copied are highlighted in the dialog box.
7) Insert a floppy diskette, and click Next. The files are copied.

These text files can be imported into a spreadsheet such as Microsoft® Excel, so you can plot trend data. The files are tab delimited. In Excel, simply open the text file, choose delimited (tab), and the file will import into several columns, much as it appears when you print the file to a printer.

How to Clear Statistics

You can clear the Intellispec screen statistics for one channel group or all channels, whether the system is online or offline. This clears the number of parts inspected, defects, percent defects, etc.

If ***scheduled print*** (see "Reports Setup" on page 60) is enabled, the current statistics are printed to the default printer before they are reset.

To clear all inspection and correlation statistics:

1) Log in .
2) Click System Overview* tab.
3) Right-click the tab.
4) Select Clear All Channel Statistics. All inspection and correlation statistics are cleared.

*Your system may not have a System Overview tab if there is just one channel or one lane. In that case, clear statistics as described below.

To clear a channel group's statistics:

1) Log in .
2) Click a camera's statistics (or the Lane n statistics) tab.
3) Right-click the tab.
4) Select Clear Statistics (or Clear All Channel Statistics). All cameras that are part of the same channel group will have their statistics cleared as well.

❖ *Note: clearing a channel group's statistics does not clear correlation statistics.*

The system updates screen statistics every few seconds, so you might have to wait to see the results on the screen.

CORRELATION DATA

Correlation data associates defects to certain machine parts. This data can be generated by the Intellispec only if you have the correlation option installed.

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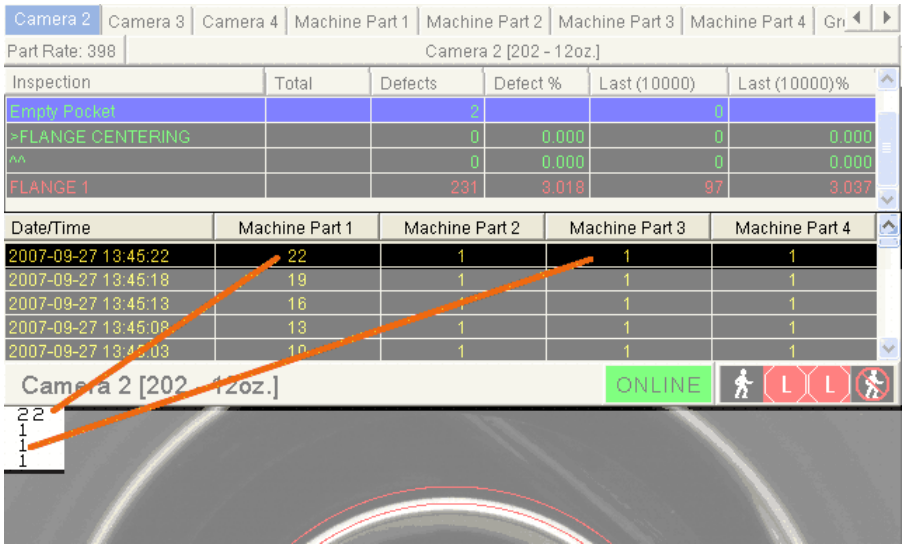
❖ *Note: Correlation is configured through the* **System Configuration** *(see "Correlation Configuration" on page 126) menus.*

Correlation – Images with Machine Part Numbers

This feature is available for systems that have the correlation option. When the system goes online, it will automatically mark all images with the machine part numbers to which that part was associated. The Administrator must enable correlation, the proper hardware must be attached, and the system must be calibrated (part tracking) to mark the images.

Images can be reviewed, saved (use F6 – Image Manager, for example), and analyzed for process monitoring. An example of these marked images is shown below.



Viewing Correlation Statistics on Screen

There are several correlation graphs and tables available to view correlation statistics.

How to Display a Correlation Graph

To display a correlation graph:

1) In the upper right of the screen, click the System Graphs tab.
2) Right-click the System Graphs tab, and select the desired correlation graph. The correlation graph is displayed.

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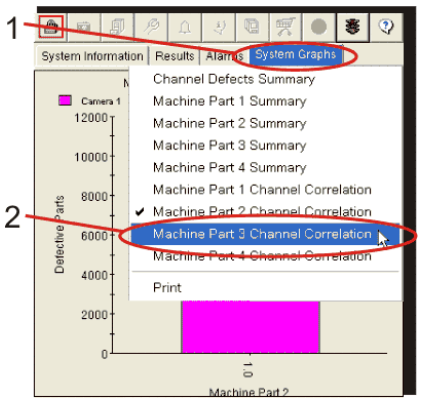
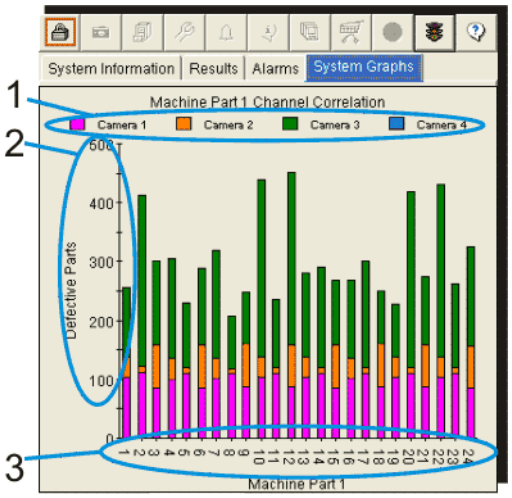


About the Correlation Graph

The Correlation graph is easy to read. Refer to the following illustration and explanation below:



1	The graph is color-coded by Camera name. The number of defects for each machine part is represented in each bar.
2	The height of the bars shows the number of defective parts correlated to each machine part.
3	The graph can display up to 24 machine parts. To scroll to lower or higher numbers, left-click or right-click over the graph.

SCROLLING THROUGH CORRELATION GRAPHS

Up to 24 machine parts can be displayed on one graph. Sometimes it is necessary to scroll through the graphs.

- To scroll to the higher number machine parts, right-click over the correlation graph
- To scroll to the lower number machine parts, left-click over the correlation graph

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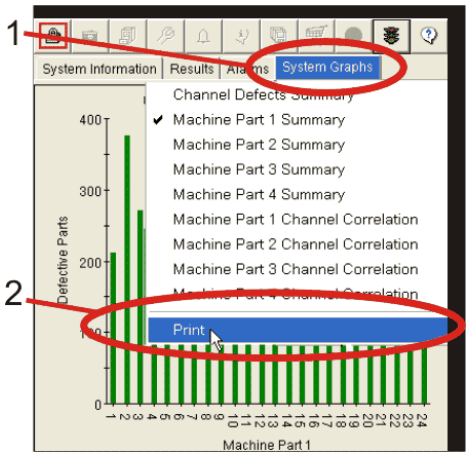
HOW TO PRINT A CORRELATION GRAPH

If your Intellispec has a printer connected with the appropriate drivers, you can print the currently displayed graph. You may print these graphs whether the system is offline or online.

To print a Correlation graph:

1) Click the System Graphs tab.
2) Right-click the System Graphs tab, and select Print. The graph is printed to the default connected printer.



About the Correlation Tables

You can view correlation data in the statistics area of the screen, while the system is offline or online.

Click the desired tab in the statistics area. Choose from Lane *n* Overview, or Machine Part *n* for correlation data. These are described next. The names of these tabs may be ***customized*** (see "Customizing the Statistics Tabs" on page 74) on your system.

Lane *n* Overview

The lower part of the table lists the correlation data for all cameras within the channel group (most recent first). There is an X in the column for the camera that failed.

System Overview | Lane 1 Overview | Camera 1 | Camera 2 | Camera 3 | Camera 4 | Machine Part 1

Part Rate: 401	Total	Defect	Defect %	Last (10000)	Last (10000)%
Camera 1	1812	141	7.781	141	7.781
Camera 2	1813	54	2.978	54	2.978
Camera 3	1813	227	12.521	227	12.521
Camera 4 <No Job Assigned>	0	0	0.000	0	0.000
Totals	1825	413	22.630		

Date/Time	Machine Part 1	Machine Part 2	Machine Part 3	Machine Part 4	C1	C2	C3	C4
2007-09-27 13:28:52	16	1	1	1	O	X	O	O
2007-09-27 13:28:51	12	1	1	1	X	O	X	O
2007-09-27 13:28:51	11	1	1	1	X	O	X	O
2007-09-27 13:28:50	8	1	1	1	X	O	O	O
2007-09-27 13:28:50	3	1	1	1	O	O	X	O

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Machine Part #n Summary

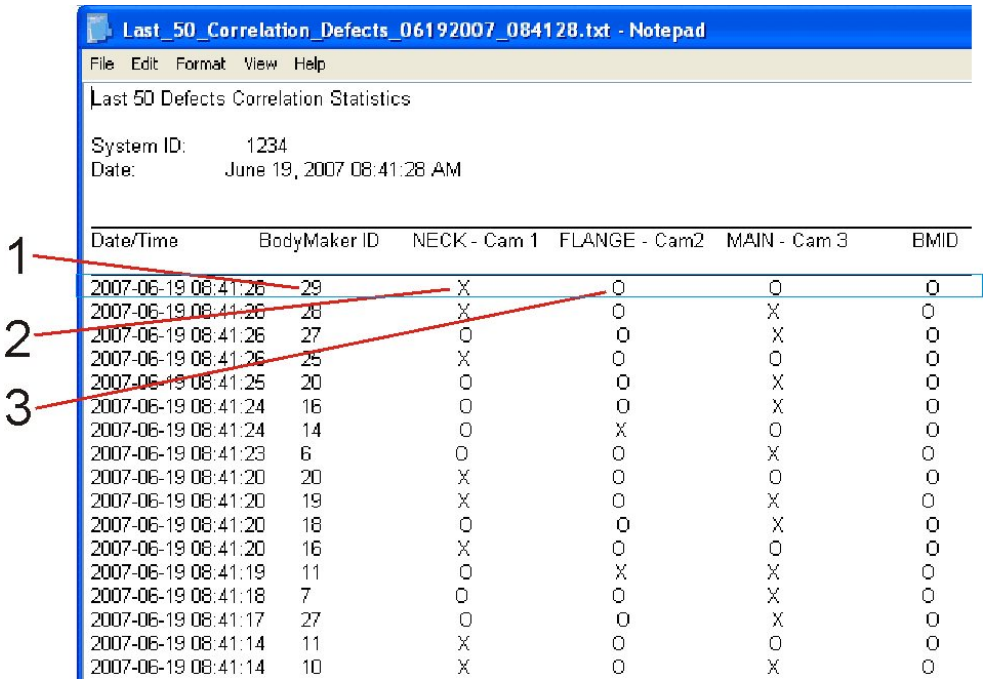
This table shows how many defects were correlated to the machine part. Parts are listed by Part ID, and the table shows whether a defect was detected in any of the cameras, correlated to this machine part. This is useful for determining failure trends on specific components, especially if one machine part in particular generated a large number of defects.

Camera 2 | Camera 3 | Camera 4 | **Machine Part 1** | Machine Part 2 | Machine Part 3 | Machine Part 4 | Gr

Machine Part	Camera 1 De...	Camera 2 De...	Camera 3 Def...	Camera 4 Defects	Total Defects
Machine Part 1 (20)	3	0	22	0	23
Machine Part 1 (21)	0	0	0	0	0
Machine Part 1 (22)	7	4	11	0	17
Machine Part 1 (23)	3	0	11	0	13
Machine Part 1 (24)	0	0	11	0	11
Machine Part 1 (25)	7	4	0	0	11
Machine Part 1 (26)	4	0	0	0	4
Machine Part 1 (27)	0	0	0	0	0
Machine Part 1 (28)	6	4	0	0	10
Machine Part 1 (29)	3	0	0	0	3
Machine Part 1 (30)	0	0	21	0	21

About the Last 50 Correlation Defects

This text file is created when you print statistics to **file (see "**About Statistics Printed to File**" on page 63).**



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1	The list shows the most recent defective parts, in descending order. The example shows the most recent defective part was correlated to Body Maker 29.
2	An "X" indicates that the camera found a defect. If there is more than one "X", then multiple cameras found defects on that part.
3	An "O" indicates that the camera did not find a defect.

How to save correlation statistics to floppy diskette

USER LEVEL: MECHANIC AND ADMINISTRATOR

To save statistics to floppy:

1) Log in. System must be offline.
2) Use the ***Database Detective*** (see "Database Detective Functions" on page 230) tool to quickly select files and copy them to diskette. Click >> Database Utilities >> select Database Detective.
3) Click the Other tab >> select Copy Files >> click Next.
4) Click the Reports button. Scroll to the appropriate folder if necessary. Most reports are located at C:\Intellispec\Reports.
5) Select the appropriate files to copy.
   - The job statistics file names contain the date and time the file was created in this order: Month, date, year, time
   - The correlation statistics mention 'correlation' in the name
6) Click Open. Make sure all the reports you want copied are highlighted in the dialog box.
7) Insert a floppy diskette, and click Next. The files are copied.

These text files can be imported into a spreadsheet such as Microsoft® Excel, so you can plot trend data. The files are tab delimited. In Excel, simply open the text file, choose delimited (tab), and the file will import into several columns, much as it appears when you print the file to a printer.

INSPECTION GRAPHS

Online graphs

These are the inspection graphs available when the system is online. They remain on screen when the system is offline, but the graphs will not update while offline. The inspection graphs can help you adjust the performance of an inspection. For example, they can help you set the minimum and maximum ambient allowed for a specific inspection. These graphs also show statistical information about how well the process is performing.

To select a graph:

1) Right-click the inspection name in the Statistics area
2) Click Inspection Graphs*.

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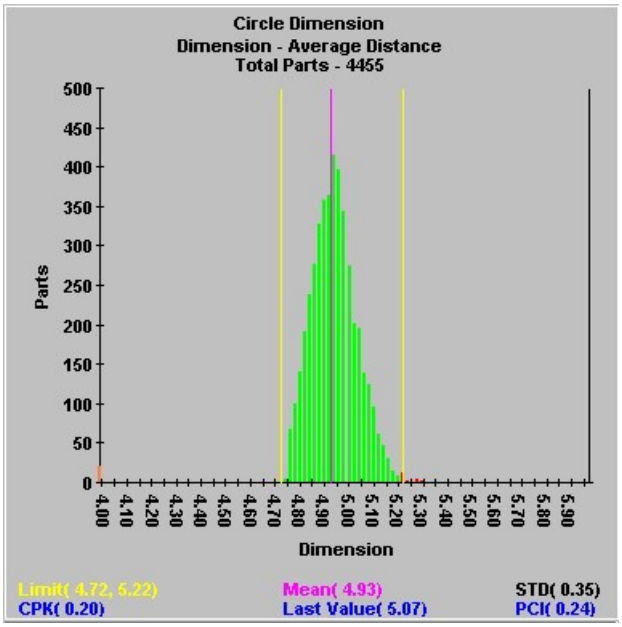
3) Select the desired graph. The graphs available for each inspection depend on which portions of the inspection are enabled. For example, various Edge graphs are only available if an inspection has edge detection capabilities, and Edge Inspection is enabled.

*If the inspection is a Retro-Spec inspection, it displays all graphs within the Retro-Spec interface.

More information about graphs. (see "Information Displayed on Inspection Graphs" on page 86)



Offline graphs

These are inspection graphs available when you are editing, setting up, or testing an inspection. You can adjust parameter limits while viewing the test data on the graph.

To view an Offline graph while editing an inspection, click one of the buttons.

To view another Offline graph:

1) Double-click the inspection name in the statistics area.
2) Right-click the Offline Graphs tab.
3) Select an available graph.

Offline graphs are only updated when you re-test inspection during inspection editing. When you exit from editing an inspection, offline graphs are removed from screen.

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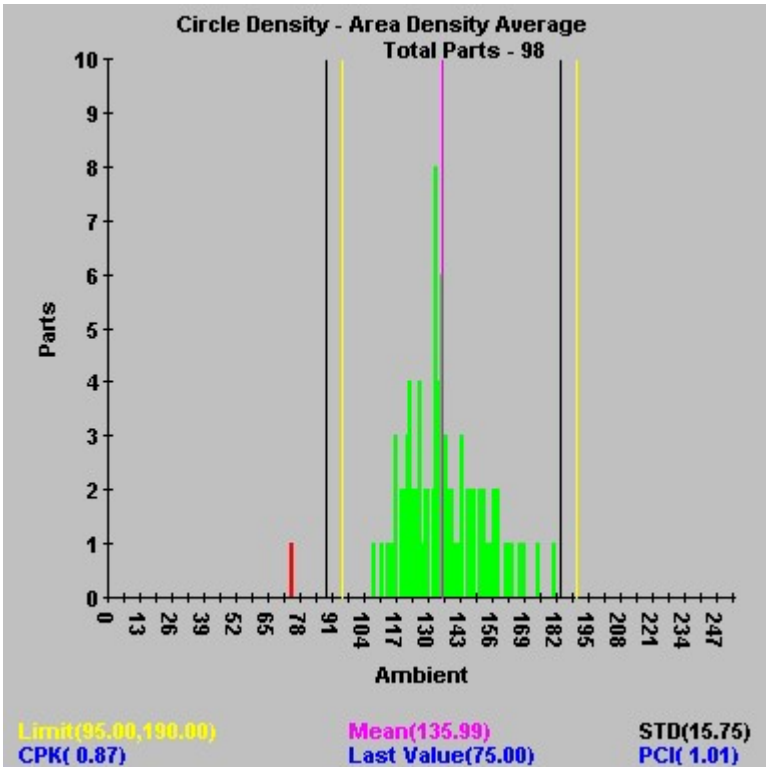
Information Displayed on Inspection Graphs

The inspection graphs have much data displayed. This data is color-coded to help you identify the features of each graph. Below is a sample graph followed by a description of the available graph features. Note that not all of these features will be enabled for every inspection graph.



Total Parts

This number shows how many parts' data have been added to the graph.

Y-axis

The Y scale of the graph – typically the number of parts inspected.

X-axis

The X scale of the graph – This is specific to the type of inspection result being plotted. In the example graph shown above, it represents the gray scale value of the ambient found for each inspected part.

Passed part data (Green)

Values that are within the yellow limits (reject specifications) of the inspection.

Failed part data (Red)

Values that fall outside of the yellow limits (reject specifications) of the inspection.

Underflow and Overflow data (Orange)

Values that do not fit within the x-axis scale of values are shown at either end of the graph. Underflow data is displayed on the left, and Overflow data is displayed on the right of the graph. (Not shown in above example)

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Information data (Blue)

In some types of inspection graphs, we do not have any limits (reject specifications). For these types of graphs, the information is displayed in blue. (Not shown in above example)

Limits (Yellow)

These are the reject specifications for an inspection. The limit values are displayed in yellow at the bottom of the graph, and as bars on the graph itself.

Mean (Magenta)

This is the average of all the inspection graph values that have been plotted. This value is shown in magenta at the bottom of the graph, and as a vector in the graph (if the value is within the range of the graph).

Standard Deviation (Black)

This is computed from the set of inspection graph values that have been plotted. This value is shown in black at the bottom of the graph. The black bars in the graph represent three sigma – three times the standard deviation – on either side of the mean.

Last Value (Blue)

This is the last value that was added to the graph, from the last part inspected. This number is useful while programming a job offline, to see how the most recent changes to job parameters have affected the graph. The value is shown at the bottom of the graph in blue, but not represented as a vector within the graph.

CPK (Blue)

This is a statistical value computed from the inspection data values, displayed at the bottom of the graph. This value shows how well-centered the data population is within the reject specification.

The CPK value is a ratio. Generally, the higher the CPK, the better the product or process. Values below one indicate that variations in the process are too great to consistently produce acceptable products.

❖ *Note: If you originally set up the reject limits to be centered on the data population, this value can show when a process is moving out of tolerance before it actually exceeds a specification limit.*

PCI (Blue)

This is a statistical process value computed from the inspection data values, displayed at the bottom of the graph. This shows you how well the data population falls within the reject specification.

The PCI value is a ratio. Generally, the higher the PCI, the better the product or process. Values below one indicate that variations in the process are too great to consistently produce acceptable products.

Inspection Graphs with Error Details

These graphs display a summary of the total number of defective parts found within each enabled portion of an inspection. For example, an inspection has Ambient, Edge, and Zone analysis enabled. This graph will display the number of defective parts that failed the Ambient, Edge, and Zone portions of that inspection.

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To view the error details, make sure inspection graphs are displayed. Select the Online Graphs or Offline Graphs tab, right-click, and select Error Details. The Error Details graphs are described with their respective ***inspections*** (see "Registrations, Orientations, Inspections" on page 253).

How to Clear an Inspection Graph

To clear data from an inspection graph:

1) Select, then right-click the Online Graphs or Offline Graphs tab.
2) Select Clear. The graph data is reset to zero parts.

How to Re-scale an Inspection Graph

You can re-scale some graphs to zoom in on data.

> ❖ *Note: The graph is reset to zero parts when you re-scale it.*

To re-scale a graph:

1) Select, then right-click the Online Graphs or Offline Graphs tab.
2) Click Rescale to zoom in.

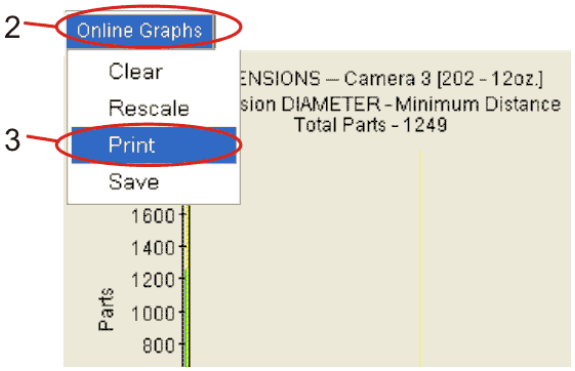
> ❖ *Note: You may not see a graph change if it is at the highest zoom level.*

How to Print an Inspection Graph

If your Intellispec has a printer connected with the appropriate drivers, you can print the currently displayed graph. You can print these graphs whether the system is offline or online.

To print a graph:

1) ***Display the desired graph*** (see "Inspection Graphs" on page 84).
2) Right-click the Online Graphs or Offline Graphs tab.
3) Click Print.



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How to Save Inspection Graph Data

You may save the inspection graph data as a text (.txt) file. From this file, you can generate your own graphs in an application such as Microsoft Excel. The files are tab delimited.

To save the data:

1) Click the Online Graphs or Offline Graphs tab.
2) Right-click the tab, and select Save.
3) Name the file. The data is saved as a text file. The default folder is C:\Intellispec\Reports.
    - To save to floppy diskette, scroll up to the A: drive. Insert diskette and name the file.

Save All

With ***Offline Graphs*** (see "Inspection Graphs" on page 84), you have the option to Save All graphs' data. This saves the data from all available inspection graphs associated with the inspection you are currently editing.

EVENT REPORTS

Online / Offline History Report

USER LEVEL: MECHANIC AND ADMINISTRATOR

The Database Detective (Wombat) tool allows you to view or print a simple report that lists when the Intellispec went online, when it was taken offline, and when inspections were added, disabled, or deleted. It also lists which user was logged into the system when the event occurred. This information is displayed in reverse order, with the most recent information first.

To create the Online/ Offline History Report:

1) Take the system offline .
2) Click the button.
3) Click the Database Utilities tab.
4) Click the Database Detective button.

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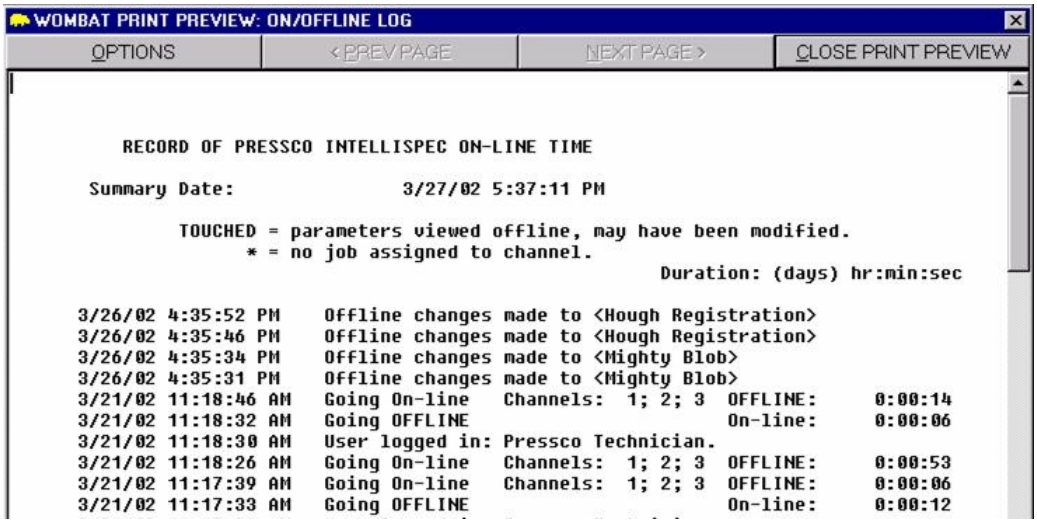
5) Press Ctrl+H. The report is displayed on screen.

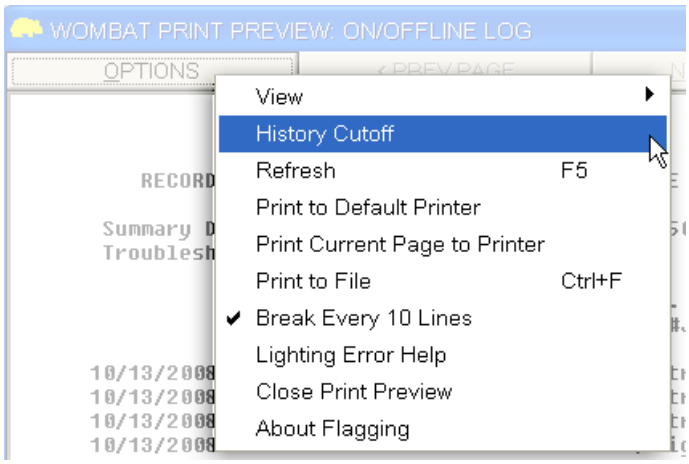


Online / Offline History Details

It is possible to have this report open while you program the Intellispec and put it online. To return to the report, hold the [Alt] key while pressing the [Tab] key until you see the [Wombat Print Preview On/Offline...] selection highlighted, then release the [Alt+Tab] keys.

Wombat prints or saves the history since the last time the System Log was cleared. If the system has not been online since the System Log was cleared, no report will be created.

Click the Options button to customize or print the report.



View

Choose a page to view. The number of pages depends on the size of the history log.

History Cutoff

You can choose how far back the online/ offline history report goes. Enter the earliest date from which you want to see the data.

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Refresh

Since this report can be open while you make other adjustments to the Intellispec, click Refresh or [F5] to update the report while it is displayed. To return to the report, hold the [Alt] key while pressing the [Tab] key until you see the [Wombat Print Preview On/Offline...] selection highlighted.

Print to Default Printer

Prints the report to the default connected printer.

Print Current Page to Printer

Prints the current page to the default connected printer.

Print to File

Wombat saves the Online/ Offline History as a text (.txt) file to the default Reports folder.

Break every 10 lines

Inserts a space every 10 lines (or another number you specify) to make the report easier to read.

Lighting Error Help

If your system has a standard BNS (Base, Neck, Seal) configuration, Wombat will check the file for lighting errors. If your system has any other configuration, ***Make a Process Sheet*** (on page 232) to view the lighting settings in that file (Wombat will not check that file for lighting errors).

Close Print Preview

Closes the report. It is not saved to disk.

About Flagging

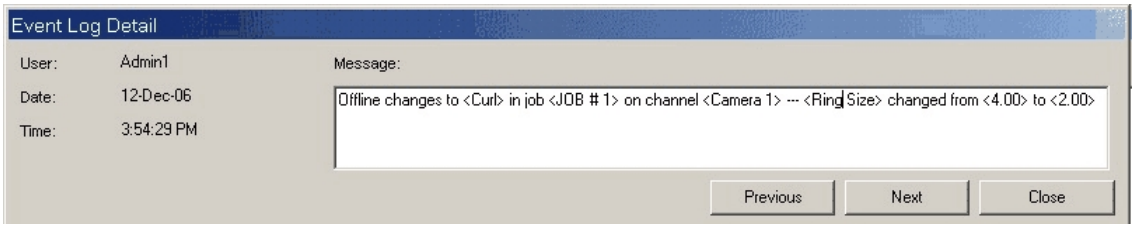
Information about emphasized text in the report.

Event Logs

There are four types of logs that are automatically recorded and saved to the Intellispec hard drive:

- The **Alarm** log records all alarms that were triggered or reached warning status. It also records when alarms were cleared and by whom.
- The **Change** log records all changes to the system including configuration, lighting, camera, and parameter changes. It records when these changes were made and by whom.
- The **System** log records when users logged in and out, and when the system was put online or offline.
- The **Lighting** log is a placeholder for future functionality.

To see details about any event, click the line in the event viewer.



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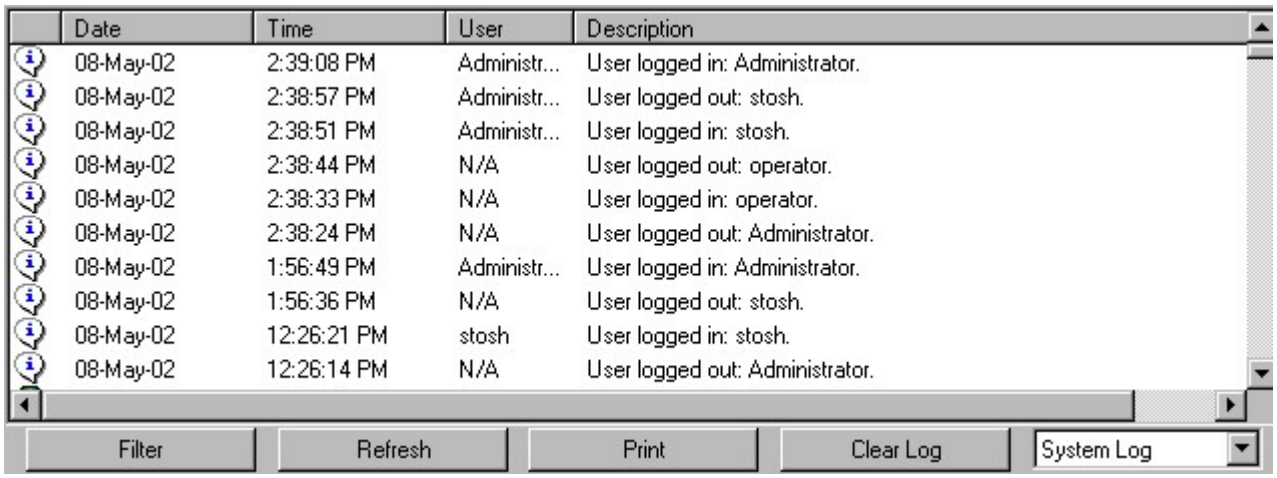
Viewing Log Files

USER LEVEL: ADMINISTRATOR

To view the log files:

1) Log in.
2) Click the button.
3) Click the System tab.
4) Click the View log files button.
5) Choose between Alarm, Change, System, or Lighting logs in the lower right corner.



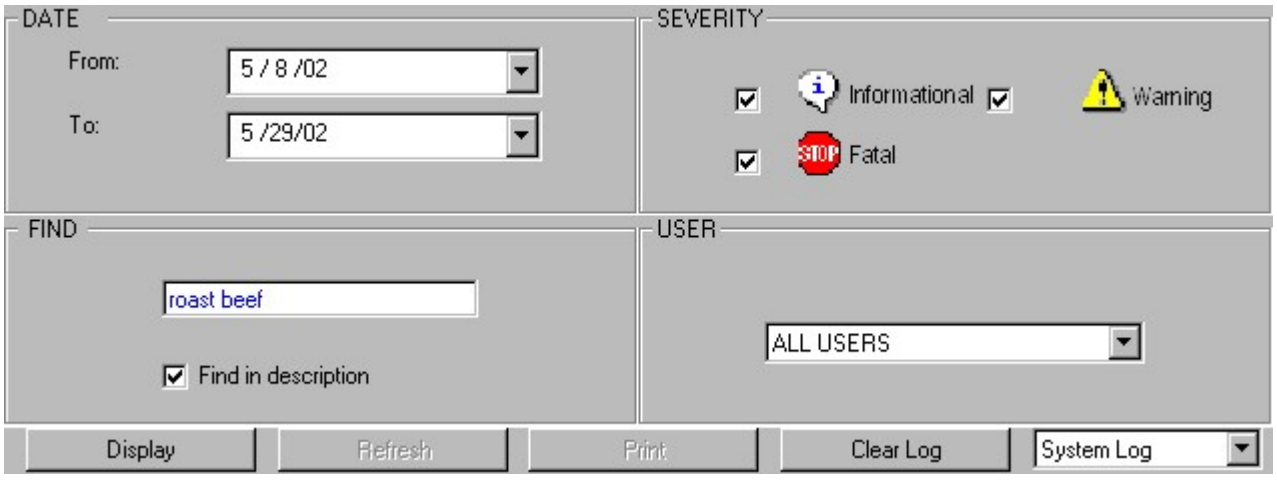
Click Date, Time, User, or Description at the top of the log screen to sort the data from the lowest to the highest or highest to lowest (click again to toggle).

To exit from the log files:

Click the X in the upper right corner of the event viewer.

Filtering Log Files

There are several filtering devices that allow you to view portions of the log files based on date, severity, text, or user. This only affects the display on screen - it does not stop the system from collecting data outside the filters.



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Date

Choose to view a log file recorded between certain dates. Click the down arrow to display a monthly calendar.

Severity

Informational Severity

Check this box to view the Information messages, such as Going Online or Offline.

Warning Severity

Check this box to view the system Warning messages, such as hardware communication errors.

Fatal Severity

Check this box to view Fatal system errors.

Find

Type a word or set of characters to match and filter the log file. To turn the search off, highlight the text, click Backspace on the keyboard, and un-check the Find in Description box.

User

Choose a user or all users to filter the log file.

Display button

Click the Display button to see the log file after choosing a filter.

Refresh button

Displays the most current information, especially if your filter specifies today's date and some events have occurred since you entered this screen.

Print button

Print the log that is currently on screen to the default connected printer.

Clear Log button

Clears the events in the log file that is currently being displayed. We recommend that, before you clear the log, you ***save the data to disk*** (see "Saving Log Files to USB device" on page 94).

Caution
Once the log is cleared, it cannot be restored on Intellispec

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Saving Log Files to USB device

Use Windows Explorer to copy the files. The system event logs are located in the c:\Intellispec\Logs folder.

The Machine Status log is saved as c:\Intellispec\Data\MachineStatus.mdb.

USER LEVEL: ADMINISTRATOR

Use Windows Explorer to copy files.

To copy data to a USB device:

1) Log in.
2) Click the button.
3) Click the Database Utilities tab.
4) Click the Windows Explorer button.
5) Select the correct file name(s) and copy the file.

DATABASES

There are three optional databases generated by Intellispec:

- ***Defective Parts*** (see "Defective Parts Database" on page 94) database
- ***Machine Logging*** (see "Machine Status Logging" on page 95) database
- ***Dimension inspections*** (see "Dimension Database" on page 95) database

They are saved as Microsoft Access databases, and must be enabled to collect data.

Defective Parts Database

USER LEVEL: ADMINISTRATOR

This is a Microsoft Access database that can be generated by the system, if enabled. The database saves the information for each defective part as it occurs when the system is online. A sample of the database is shown below:

ReasonInspectionFailed : Table

ID	InspectionID	FailureReason	IndicatorValue
1	1	Edge Count	145
2	2	Edge Count	69
3	3	Edge Count	63
4	4	Edge Count	24
5	5	Edge Count	142
6	5	Absolute Gradient	113
7	6	Edge Count	71
8	6	Absolute Gradient	113
9	7	Edge Count	99
10	8	Edge Count	34

Part : Table

ID	JobNum	JobName	ChannelN	ChannelName	TotalParts	ISPECPartID	Cavity	Spindle	InfeedTA	OutfeedTA	DateTime
316	5	Base Inspectior	0	Base	301	1692	9	98	4	5	2/3/2004 9:13:34 AM
317	6	Neck inspection	1	Neck	829	1692	9	98	4	5	2/3/2004 9:13:34 AM
318	7	Seal Defects 7	2	Seal	4384	1692	9	98	4	5	2/3/2004 9:13:34 AM
umber)	0		0		0	0	0	0	0	0	

To enable the Defective Parts Database:

1) Log in.
2) Click the button.

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3) Click the Reports tab.
4) Check the Defective Parts Logging box.
5) Save changes and exit the menu.

Copying Defective Parts Database to your PC

Defective Parts Database is saved as c:**Intellispec\Data\DefectiveParts.mdb**. Since this file can get larger than what will fit on a floppy disk, we recommend that you ***burn it to CD*** (see "Burning a CD" on page 97), or ***copy it to USB device*** (see "Copying Files to USB Device" on page 97) to transport to your PC.

Machine Status Logging

This is similar to the Online/ Offline status report that you can obtain through the Database Detective, except this one is automatically generated and updated (if the feature is enabled).

MachineStatus : Table

	ID	DateTime	Status	User
▶	1	003 3:00:01 PM	Green Off	--- No user logged in ---
	2	003 3:00:11 PM	Red Off	--- No user logged in ---
	3	003 3:00:11 PM	Yellow Off	--- No user logged in ---
	4	003 3:55:10 PM	Online	Admin1
	5	003 3:55:11 PM	Green On	--- No user logged in ---
	6	003 3:55:11 PM	Red On	--- No user logged in ---
	7	003 3:55:15 PM	Offline	--- No user logged in ---
	8	003 3:55:15 PM	Green Off	--- No user logged in ---
	9	04 11:10:45 AM	Green Off	No User Logged In
	10	04 11:10:58 AM	Red Off	No User Logged In

This report shows what would be happening if there was a light tree present. Green Off indicates that the green light would have been shut off at the recorded time, or the Red Off, or Yellow Off, etc.

Copying Machine Status Logging Database to your PC

The Machine Status log is saved as C:\Intellispec\Data**MachineStatusDB.mdb**. You can ***burn it to CD*** (see "Burning a CD" on page 97), or ***copy it to a USB device*** (see "Copying Files to USB Device" on page 97) to transport to your PC.

Dimension Database

The Dimension inspections offer a database that logs dimension information. This feature is useful for Process Monitoring so that you can view the average dimension measurements of a part over time.

The inspections that create the Dimension database are:

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- ***Circle Dimension inspection*** (on page 366)
- ***Circle Width Dimension inspection*** (on page 448)
- ***Dimension inspection*** (on page 396)
- ***Fill Height inspection*** (on page 531)
- ***Label Skew Dimension inspection*** (on page 543)

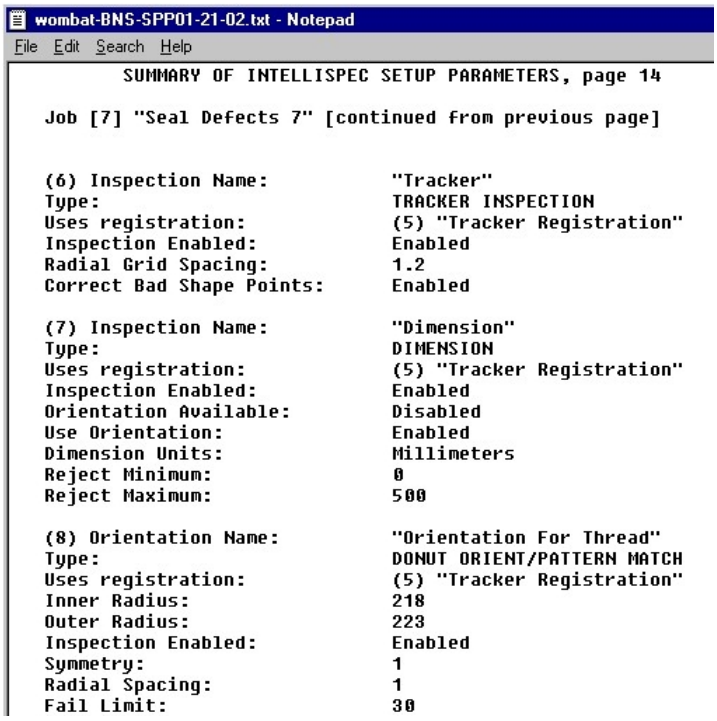
Copying the Dimension Database to your PC

The Dimension database is saved as C:\Intellispec\Data**Dimension.mdb**. You can ***burn it to CD*** (see "Burning a CD" on page 97), or ***copy it to a USB device*** (see "Copying Files to USB Device" on page 97) to transport to your PC.

SYSTEM SETUP PARAMETERS

The Database Detective tool can generate a list of the inspections and parameters for a database – some system configuration settings, and the inspection parameters for one job on each camera. To create a report of system setup parameters, create a ***Process Sheet*** (see "Make a Process Sheet" on page 232).

Displayed below is an example file:



ACCESSING DATA VIA A NETWORK, USB DEVICE, CD, OR FLOPPY DISK

To locate files, see ***Where is the file printed?*** (on page 64)

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Networking

Configuring the Intellispec with a network is beyond the scope of this manual. Work with your IT department to set networking permissions, and to connect the Intellispec computer with your network. The Intellispec computer has ethernet capability built-in, and an ethernet connection available.

Windows Explorer

USER LEVEL: ADMINISTRATOR

Access the file structure of Intellispec.

To access Windows Explorer:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click the Windows Explorer button.

Copying Files to USB Device

USER LEVEL: ADMINISTRATOR

Use Windows Explorer to copy files.

To copy data to a USB device:

1) Log in.
2) Click the button.
3) Click the Database Utilities tab.
4) Click the Windows Explorer button.
5) Select the correct file name(s) and copy the file.

Burning a CD

USER LEVEL: ADMINISTRATOR

You may need to copy images, reports, or databases to CD to use them on your own PC.

What You Need

- A blank (or recordable session) CD

To burn the CD:

1) Take the system offline ( ). Do not put the system back online until you have finished burning the CD.
2) Make sure you have already saved all the desired images (or files) to the Intellispec hard disk.
3) Log in.
4) Click the button.
5) Click the Utilities tab.

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6) Click the CD Burner Software button. A CD burner software interface will appear. This software may vary on different systems.
7) When the software appears, it asks you what kind of CD to compile. Choose Data Disc.
8) Choose Add and select files to copy.
    - The command names on the CD burner software may vary based on version of CD burner software installed in your system. Follow instructions on screen.
    - If copying images, default image directory = C:\Intellispec\DefectiveImages.
    - To save all the files in one folder, simply highlight the folder name.
    - To choose specific files, browse to the desired folder and highlight all the files you want to copy.
9) Follow the instructions on screen to continue.
10) Click the Burn button.
11) **WAIT** until the burn process is **finished** (even if one of the progress bars says 100% – don't click any buttons at this time).
12) When a message pops up that says "Burn Process Completed Successfully," click OK.
13) Press the Enter key or click Discard to end the burn process. Your CD will be ejected.
14) Click the x in the upper right of the CD program window to close the program. It will ask you whether you want to save changes.
    - If you do not need to remember which files you have just burned onto your CD, click No
    - If you intend to burn another CD sometime in the future with exactly the same files, save the program changes

How to Save Job Statistics to Floppy Diskette

USER LEVEL: MECHANIC AND ADMINISTRATOR

To save statistics to floppy:

1) Log in. System must be offline.
2) Use the ***Database Detective*** (see "Database Detective Functions" on page 230) tool to quickly select files and copy them to diskette. Click >> Database Utilities >> select Database Detective.
3) Click the Other tab >> select Copy Files >> click Next.
4) Click the Reports button. Scroll to the appropriate folder if necessary. Most reports are located at C:\Intellispec\Reports.
5) Select the appropriate files to copy.
    - The job statistics file names contain the date and time the file was created in this order: Month, date, year, time
    - The correlation statistics mention 'correlation' in the name
6) Click Open. Make sure all the reports you want copied are highlighted in the dialog box.
7) Insert a floppy diskette, and click Next. The files are copied.

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These text files can be imported into a spreadsheet such as Microsoft® Excel, so you can plot trend data. The files are tab delimited. In Excel, simply open the text file, choose delimited (tab), and the file will import into several columns, much as it appears when you print the file to a printer.

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Chapter 4

INSPECTION OVERVIEW

The Intellispec system uses the latest machine vision technology to acquire images of parts at high production speeds, digitizes those images, and makes a decision of whether the part is acceptable or not.

To set up the system, you place a part in the camera's field of view. The vision system acquires an image. You define inspection parameters for this image, allowing each test to have its own requirements and pass/fail sensitivity.

There are up to eight separate digital cameras on the Intellispec. Each camera inspects a different location on each part, and the jobs you program for each camera determine whether the part is acceptable.

INSPECTION TERMINOLOGY

The following terms are used throughout this manual and the software. A basic understanding of this terminology will help you understand how the system operates.

Pixels

Pixel is an acronym for **Pic**ture **El**ement and is the smallest element in a digitized image. The layout of pixels is known as the Cartesian grid system.

Each pixel has an X, Y address that corresponds to its location on the grid. Software uses these coordinates to inspect the image against the inspection algorithm.

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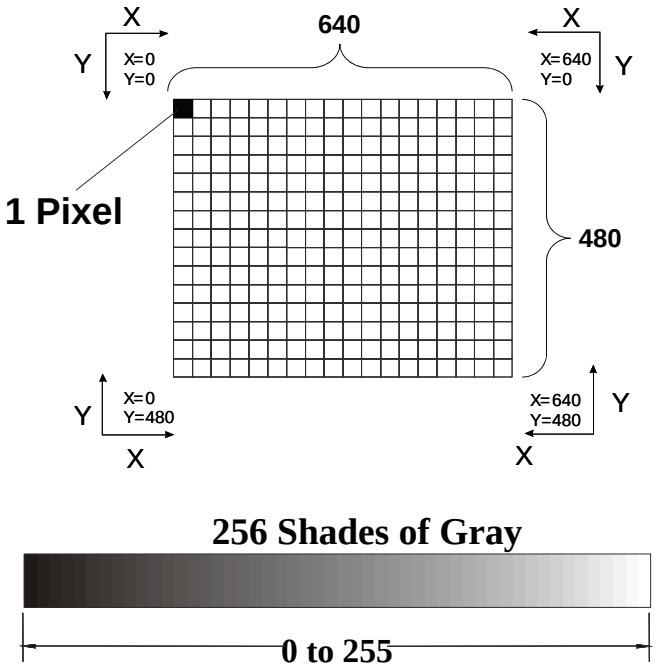
Each pixel is assigned a gray scale or gray shade value that is proportional to its brightness. **Gray shade** is a value between 0-255 where 0 is black, 255 is white, and every other number is some shade of gray.



Gray shades

When the image is digitized, each pixel is assigned a gray shade number between 0 and 255 depending on its brightness. The number 0 represents black. The lighter the value the higher the number. The number 255 represents white. The value for each pixel of the image is stored in memory.

Lighting is critical in machine vision as it creates the differences in pixel gray shades that distinguish an acceptable part from an unacceptable part. The human eye cannot see gray shade differences close in shade, but the imaging equipment can.

Jobs

The jobs are the programs that inspect each part within the field of view of each camera.

- A job is made up of several inspections
- Each camera runs a different job

Registration

Registration allows you to inspect parts whose placement varies slightly in the camera's field of view. With registration, the software finds a reference point on each part, and places the inspection regions relative to that reference point.

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❖ *Note: Some applications cannot use registration because of physical limitations or requirements of the test. If you choose not to use registration, the tests are performed relative to the camera's field of view, not relative to the part. Note that this requires perfect part handling. If the position of the part varies, the inspection regions remain where they were originally programmed and the job will fail.*

Orientation

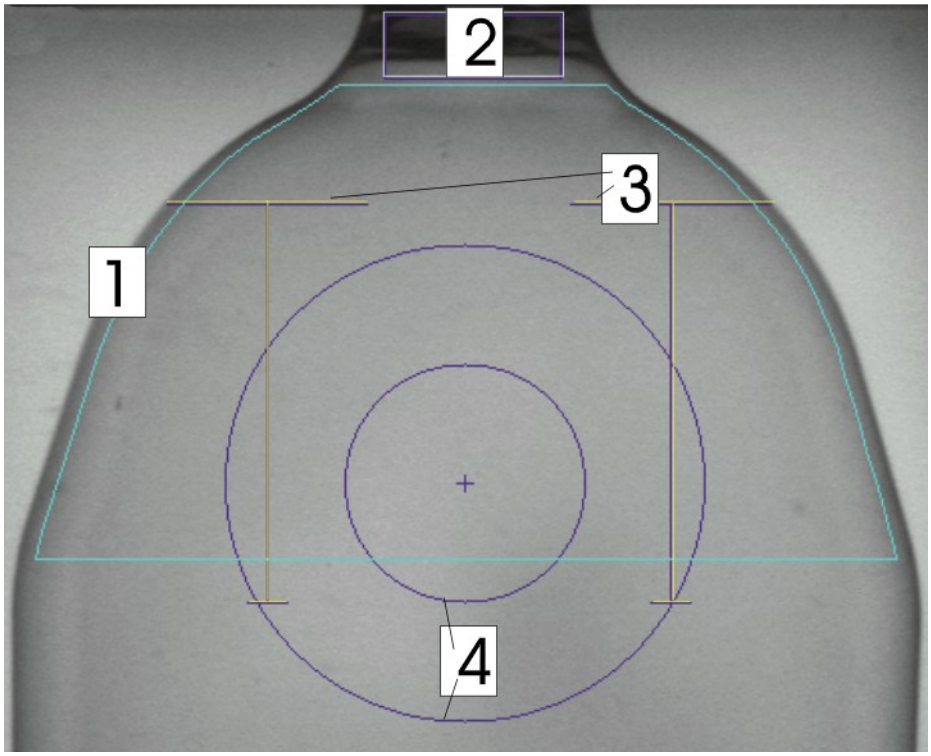
Related to registration, orientation is used to properly place inspections on parts, regardless of their rotation in the camera's field of view.

Inspection

An inspection analyzes the pixel shade information within a region and compares it to programmed reference values. The inspection passes or fails based on these comparisons. You may have many inspections in a job for each channel.

Inspection Region

Regions let you section off a portion of an image to analyze.



The above illustration shows four inspections. Some can take the shape of the part (1), have a rectangular shape (2), have vectors that search from a location (3), or be donut-shaped (4). There are other shapes, and many types of inspections in the Intellispec.

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BEFORE PROGRAMMING JOBS

1 - Configure the system

Before you begin programming jobs, the system must be configured. This needs to be done only once, but may be changed whenever necessary. Your system has been set up at installation. Please make a record of these settings.

❖ *Note: To make a record of settings, use the Database Detective's* **Make Process Sheet** *(see "Make a Process Sheet" on page 232) utility, and print to file or printer.*

Items to check:

- ***Online and offline conditions, display settings*** (see "System tab details" on page 123)
- ***Channel Groups menus, including part tracking*** (see "Channel Groups (Lane) Configuration" on page 128)

After the system has been configured, you are ready to program the jobs. Jobs are easily created, modified, and deleted.

2 - Decide how to capture a part image

Many times, it is not practical to stop the production line to acquire images on a still part. Set the Offline Acquire Mode to capture an image based on your present conditions. The ***Acquire Image at Part Present*** (see "System tab details" on page 123) feature captures an image and keeps it on the screen until you choose to acquire a new image.

3 - Consider the number of inspections to use on each camera

The Intellispec is a high speed machine vision system, and can inspect parts online at very high speeds. However, too many inspections on a part can slow down inspection, and possibly cause the system to miss parts. Keep in mind that there are up to eight cameras (depending on configuration), and each of these use processing time. When you run a job, look at the **Results** screen to see how much time each inspection uses. See hardware Sequence of Events topic for more information about processing time.

4 - Define objectives

Before you start programming the jobs, define your objectives. The first question to ask yourself is: What defects am I trying to find? The types and regions of possible defects will determine what types of inspections to use on your part. A training course at ***Pressco and our Service group*** (see "How to Contact Pressco" on page 633) are available to help you program effective inspections. See a ***step-by-step*** (see "Creating a New Job" on page 105) example on how to create a job.

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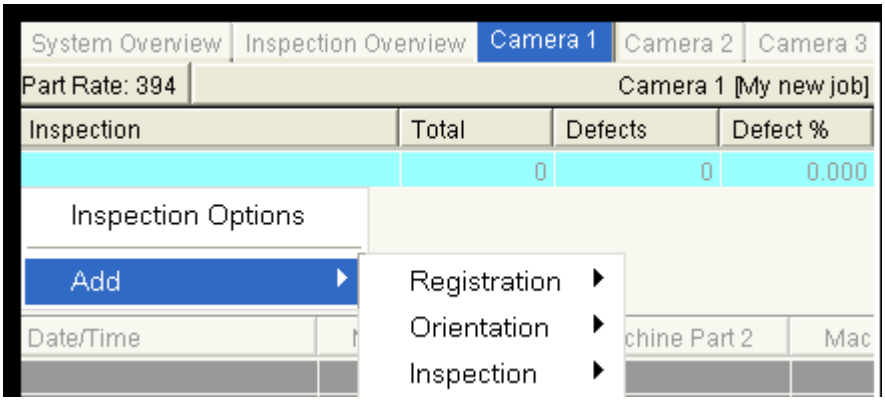
CREATING A NEW JOB

USER LEVEL: ADMINISTRATOR

To create a new job:

1) Log in. System must be offline.
2) ***Load a SmartCAL image*** (see "Using the SmartCAL File" on page 216) from disk, or click to obtain an image.
3) Click the Statistics tab for the channel you want to program (example: Camera 2 tab).
4) Right-click the tab and select New Job.
5) Name the new job. You will see the new job name in the statistics area.
6) Right-click in the black statistics area under Inspection. Choose Add, and select a Registration, Orientation, or Inspection.



   - You will probably want to add a registration first.
   - The registrations, orientations, and inspections that are available depend on the channel's ***Product Type*** (see "Selecting Product Type" on page 105). These are each described in detail in other parts of this manual.

7) Use the Region menu (if available) to place the inspection region for your chosen registration/ orientation/ inspection.
8) Adjust the registration/ orientation/ inspection parameters.

Repeat steps 6-7 and continue adding registrations/ orientations/ and inspections as necessary for your job.

SELECTING PRODUCT TYPE

Product Type is a configuration option in the Intellispec that provides the most commonly-used registrations, orientations, and inspections for different types of parts. This simplifies part inspection.

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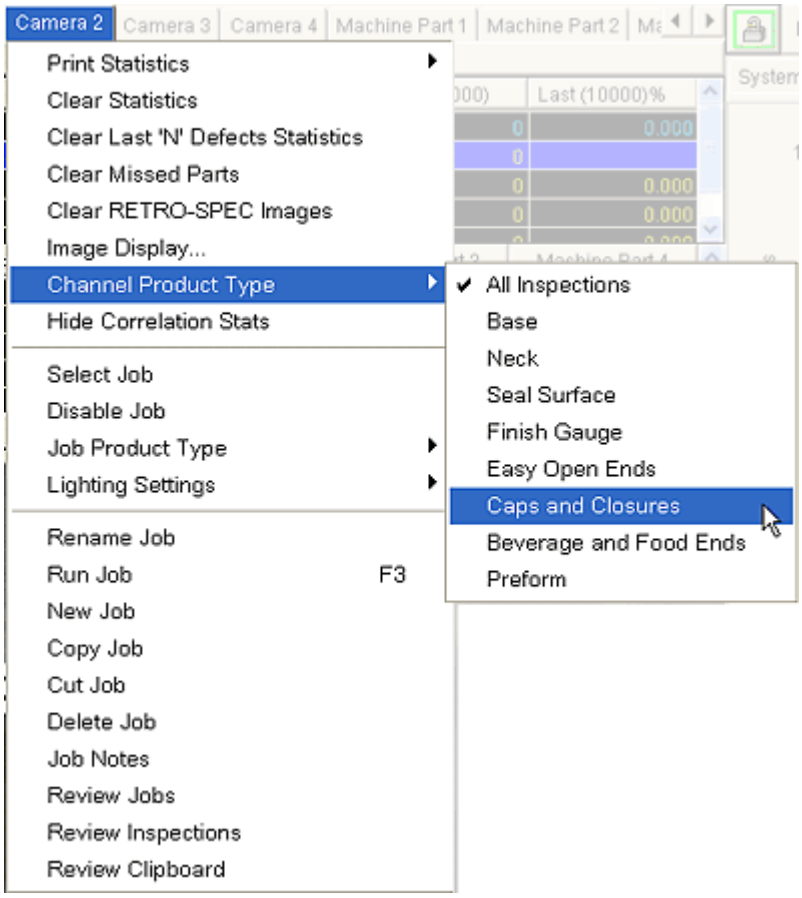
To view or change the product type for any camera (Mechanic and Administrator), click the camera's statistics tab and right-click for the menu. Select Channel Product Type, and change if necessary.



If **Channel Product Type** is changed, all *new* jobs for that camera will use that product type. This means that the available registrations/ orientations/ inspections will be based on that product type. It does not change product type for an existing job.

If **Job Product Type** is changed, it affects the available registrations/ orientations/ inspections for the current job only.

Each job has an assigned product type. This usually matches the camera's product type. However, on occasion, you may need an inspection that is not included in the camera's product type.

❖ *Note: if Part Management* *is currently selected in the toolbar, some options will not appear in the drop-down menu as shown above, including Job Product Type.*

USER LEVEL: MECHANIC AND ADMINISTRATOR

To change Job Product Type:

1) Log in.
2) Select the camera's statistics tab.
3) Right-click the statistics tab to see the menu.
4) Select Job Product Type, and select a new product type.
   - The All Inspections type has every available inspection type.

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SELECTING A JOB

Offline only. You must log in.

- If Part Management is enabled (button is active): Click the button and select a part to run. The system will load the proper jobs for each camera.
- If Part Management is not enabled (Part Management button is grayed out): Click the desired camera's statistics tab, right-click for menu. Click Select Job, and select a job from the drop-down list. Click OK. Repeat for all cameras.

❖ *Note: If Part Management is enabled and a Part is selected, the system will only run the job (online) assigned to each camera through Part Management. To run a different job, select No Part from Part Management, exit Part Management, then select a job for each camera under the statistics tabs.*

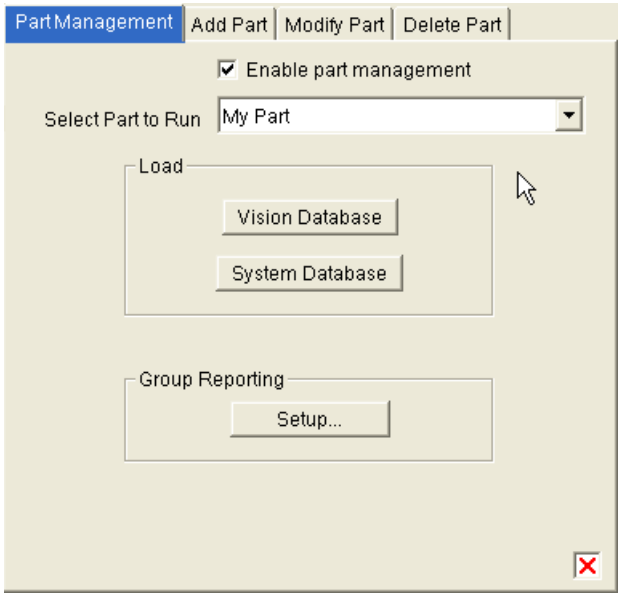
SETTING UP PART MANAGEMENT

Part Management simplifies the Job assignments for each type of part that you inspect. With this feature, simply choose a part to inspect, and the system will assign the appropriate jobs and make any necessary channel configuration changes.

USER LEVEL: ADMINISTRATOR

To enable Part Management:

- Right-click the button and select Enable Part Management. Or:
- Click the button and check the Enable Part Management box in the menu.



If Part Management is enabled and a part is assigned, the system will run the part's assigned jobs when it is put online.

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❖ *Note: You must have programmed jobs for each camera before you can assign them to parts.*

Select Part to Run

Choose what type of part you are inspecting. The system will load all the proper jobs for each camera.

Load Vision or System Database **(see "How to Load a Database" on page 226)**

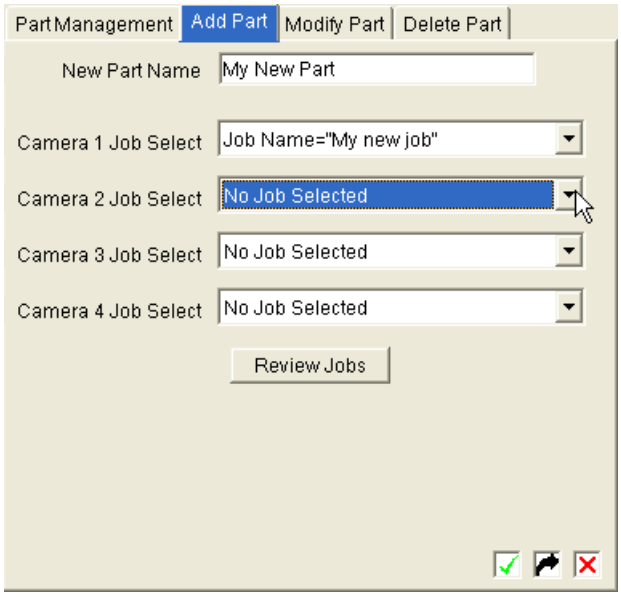
For your convenience these buttons are available to load a different vision or system database if necessary.

Group Reporting

This is the same screen that you can access from the Groups tab or through the ***Part Graphic*** (see "How to Assign Inspections to Groups in the Part Graphic" on page 20).

Adding Parts

You can add a part management assignment. Setting up a part allows users to quickly change inspection programs between production runs.



To add a new part to Part Management:

1) Click the button.
2) Click the Add Part tab.
3) Type a new part name.
4) Select a job for each camera.
   - You may assign No Job to a camera, and perhaps create a new job for that camera later. For certain parts, you may disable certain cameras. This is useful if you do not need inspection from certain camera views.
5) Click ☑ to finish.

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Use the Review Jobs button to see the available jobs in the current database. You will also be able to see whether any jobs are assigned to parts. If a job is assigned to more than one part, a plus sign is displayed next to the first assigned part name.

Deleting Parts

You can delete a part management assignment from the system's memory.

To delete a part from Part Management:

1) Click the button.
2) Choose the Delete Part tab.
3) Select the part to delete.
4) Click the Delete Part button to complete the task.

Modifying Parts

You can make changes to a part management assignment, such as changing a camera's job assignment, or enabling or disabling a camera.

To modify a part through Part Management:

1) Click the button.
2) Choose the Modify Part tab.
3) Select the part to modify.
4) Make changes as necessary.
5) Click to complete the changes.

❖ *Note: If you have not created any parts, there will be no Modify options.*

RUNNING A JOB OFFLINE

Press **F3** to test inspections without rejecting any parts. The system will run the selected job once and display the results on the Results screen.

- To run the job again, press F3 or click the button.
- If the button is in Single Snap mode, the job will run once each time you click the Snap button.
- If the button is in mode (right-click the button to change modes), the system will run the job continuously until you click the button again.

ABOUT JOB LIMITS

In Intellispec systems prior to version 4.4 software, the job limit is 100 jobs. In Intellispec 4.4.004 software and higher, there is no job limit.

The Intellispec loads the current jobs into memory and are part of the [~auto.vdb] running database. The other jobs that are part of the database, but not currently running, are stored in the [~main.vdb] database on the Intellispec hard drive. You will only notice these names if you are exploring the directory: [C:\Intellispec\Data\~auto]. Otherwise, you will ***save*** (see "How to Save a Database" on page 225) and load your databases using the Vision or System database names that you assigned.

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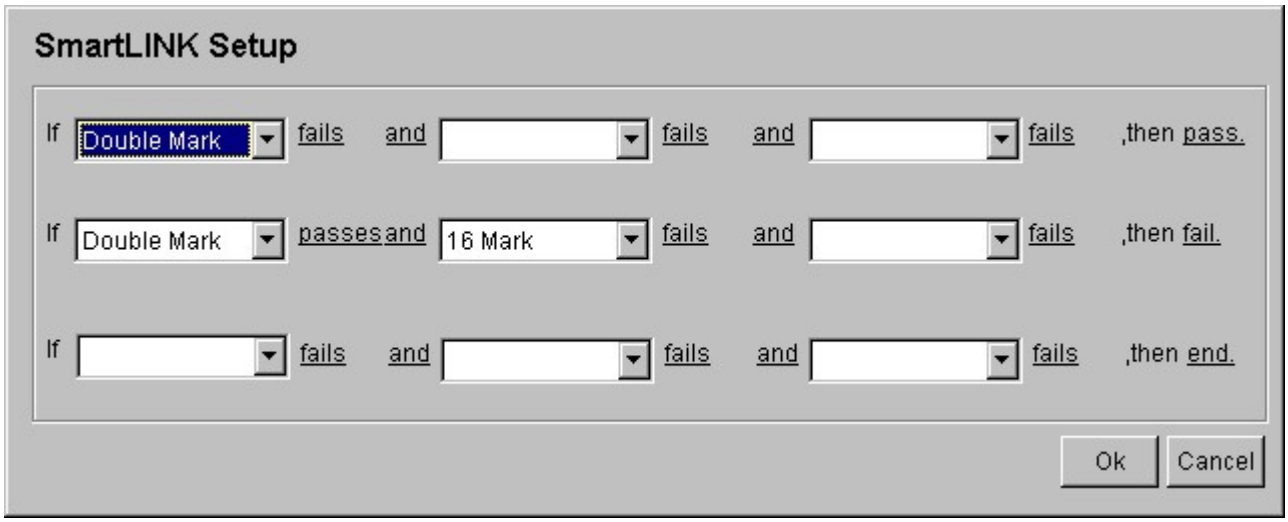
SMARTLINK

SmartLINK logic allows you to use the results of individual inspections of the job in conditional logic. You can (1) accept the test results, (2) force the part to pass, (3) force fail a part, or (4) pulse the SmartLINK output, based on the pass or fail condition of an individual inspection. This function uses Boolean algebra and adds power to the capabilities of the Intellispec system.

- *Note: You might not use this feature when programming certain jobs; it may have been disabled upon installation of your system. If disabled, this menu does not appear on your system.*
- *Note: jobs that fail due to this logic are NOT counted as part of system statistics.*

An example

A manufacturer made parts with different body ID (identification) marks. They wished to reject all parts with body ID #16 and pass all other parts. We set up inspections to distinguish the #16 ID mark. Below is the logic used to identify and reject those parts. The "double mark" inspection helped to identify the other body ID numbers – it was set up for a reject condition through the job. The first line was necessary so that when the "double mark" inspection failed, the part still passed; it did not contain the #16 mark. The second line indicates that when "double mark" is not found, but a #16 mark is, the part fails.



Enabling SmartLINK

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Under the Switch to Camera section, select a camera.
6) Check the Show All Advanced Parameters box.

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7) Check the SmartLINK box.
8) Save changes and exit the menu.

SmartLINK Setup

USER LEVEL: MECHANIC AND ADMINISTRATOR

To set up the SmartLINK screen:

1) Click a channel's statistics tab.
2) Right-click the tab to view the job options menu.
3) Select SmartLINK.
4) Program each line as needed for your job.

SmartLINK uses Boolean algebra logic.

- Each of the three boxes on each line can contain an inspection. Choose an inspection from the drop-down menu.
- Blank boxes are ignored
- The word to the immediate right of each box can be 'passes' or 'fails'. This indicates what you want to happen for a true statement. Click the word to toggle between choices.
- The words between boxes are the logic operators. These can be 'and' or 'or'. Click the word to toggle between 'and' and 'or'.
  - 'And' means that the box to the right and left of it must be true to make the statement true
  - 'Or' means that either inspection box to the right or left of it must be true to make the statement true
  - Since there are three inspection boxes per line, you can make a conditional 'and' and a conditional 'or' within the same statement
- The last word on the right is the action you want to happen
- Each statement is evaluated to a true or false condition based on the pass/ fail results of the individual region
  - If line 1 comes out true, the action specified is executed and lines 2 and 3 are not evaluated.
  - If line 1 comes out false, line 2 is evaluated.
  - If line 2 is false, line 3 is evaluated.
  - If they are all false, the job results are used (that is, 'end')

SmartLINK Actions

The actions are what the system does if the statement (each line) is evaluated as true. There are four different choices.

ACTION	DOES	DESCRIPTION
END	Use job results	If the statement evaluates true, the whole job results are used for the output. This is also a default condition if all three statements are evaluated as false.

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FAIL	Force fail the job	If the statement evaluates true, the job fails.
PASS	Force pass the job	If the statement evaluates true, the job passes.
OUT	Pulse the SmartLINK hardware output. The output is pulsed as soon as a result is known, not at reject time.	If the statement evaluates true, the SmartLINK output is pulsed for 15 ms. The job results are not affected. Use this output to indicate failure of a critical inspection.

Results

When you have the logic as you want it, click OK. This stores the current values as the SmartLINK logic. After a job is run online, this logic is executed.

The first line is evaluated component by component left to right. If the statement is true the action is taken and the other lines are ignored. If one part of a statement is false, the whole statement becomes false. This line is abandoned and the system begins evaluating the next line. If all lines are false, the job results are output as the final result.

- *Note: since you cannot see what the logical results will be by running a job offline, this logic is difficult to test offline.*

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Chapter 5

PART CHANGEOVER

Changeover from one product to another can be accomplished using either ***JOB Management*** (see "Using JOB Management" on page 113) or ***PART Management*** (see "Using PART Management" on page 113).

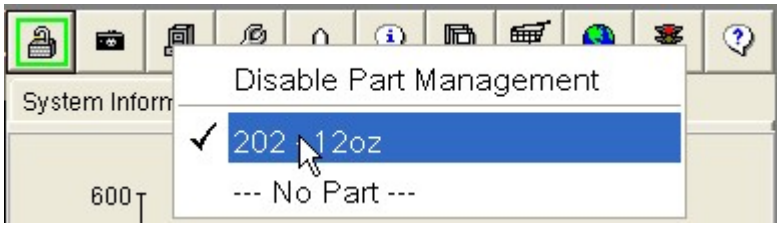
- In **Job** Management, the correct job has to be chosen for each camera individually.
- In **Part** Management, parts are loaded into the software so that changing from one part (product) to another will automatically assign the proper job to all cameras.
  - The Operator access level and above can use either part management or job management to change parts. However, an Administrator access level is needed to program new jobs or parts.
  - If Part Management is enabled, it overrides job management even if you select a different job for a specific camera.

USING PART MANAGEMENT

If the button is active, you can use part management.

To change parts:

1) Right-click the button.
2) Select the proper part from the drop-down menu. This will assign the proper job for all cameras.



USING JOB MANAGEMENT

To change parts:

1) Select one of the camera-specific tabs in the Statistics area of the screen.
2) Right-click on the tab and choose Select Job.
3) Choose the proper job from the drop-down menu.

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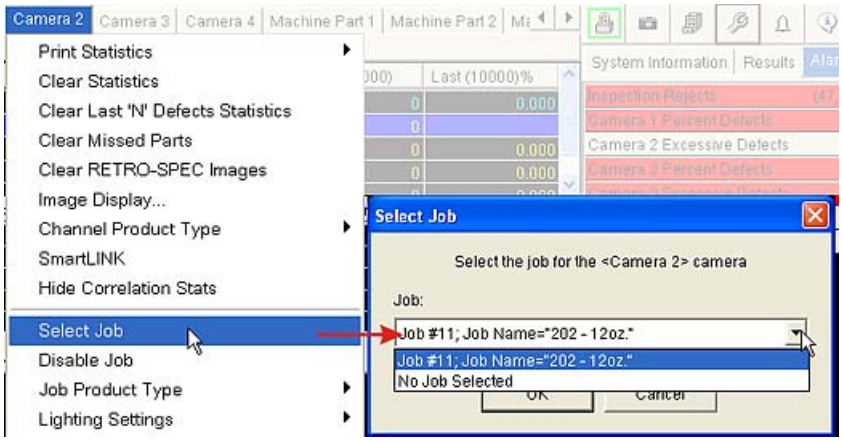
4) Repeat this for all cameras.



Selecting No Job

Selecting **No Job** disables the camera. In the event of a hardware error on a camera (such as a camera that got knocked out of alignment), this allows the system to continue to inspect without causing system errors. You may also disable a camera if you run a different type of product, and want the system to ignore a certain camera's inspection view.

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Chapter 6

ONLINE SYSTEM TUNING

Online mode is where the system actually inspects and rejects parts. This is the normal operating mode of Intellispec.

BEFORE GOING ONLINE

Before you put the system Online to begin testing parts, make sure you have completed the following tasks:

- ***Program a job*** (see "Creating a New Job" on page 105) for a good part – for each camera. Jobs are normally programmed and loaded for you during installation.
- ***Choose a job or part to run*** (see "Part Changeover" on page 113)
- Program ***SmartLINK*** (on page 110) logic if needed
- ***Calibrate the part width*** (on page 141) – for each channel group
- ***Calibrate the reject delay*** (on page 143) – for each channel group

TO GO ONLINE

Click the button. When the light turns green, the system is online. It waits for the first part present signal, and then begins inspecting parts.

Using the Image Toolbar

The ***Image Toolbar*** (on page 38) allows you to select cameras, freeze images, and release frozen images. It also provides the status of inspection images for each camera.

Freeze Frame Indicators

These indicators change depending on the system mode. There is one indicator for each of eight possible cameras.

In Freeze frame conditions online, these indicators change based on your freeze choices. If you choose to have the First Failed part frozen, the indicators for any camera that has a failed part will have a First (F) indicator displayed with a red background. Likewise, if you choose to display the Last failed part, an L icon with a red background will appear.

Icon	*Description*
“F”- red background	First failed part frozen
“F” - green background	First good part frozen
“L” - red background	Last failed part frozen
“L” - green background	Last good part frozen

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Holding an Image

Click on the image to hold it. When you manually hold an image, this image stays on screen until you release it. The system continues to inspect all parts in the background.

The indicator becomes active when you hold an image.

Releasing an Image

Right-click the camera's indicator on the ***image toolbar*** (on page 38) to release a held or frozen image. Or right-click the function button to release all cameras. Note that a freeze frame setting might cause another image to freeze.

Image Display Menu

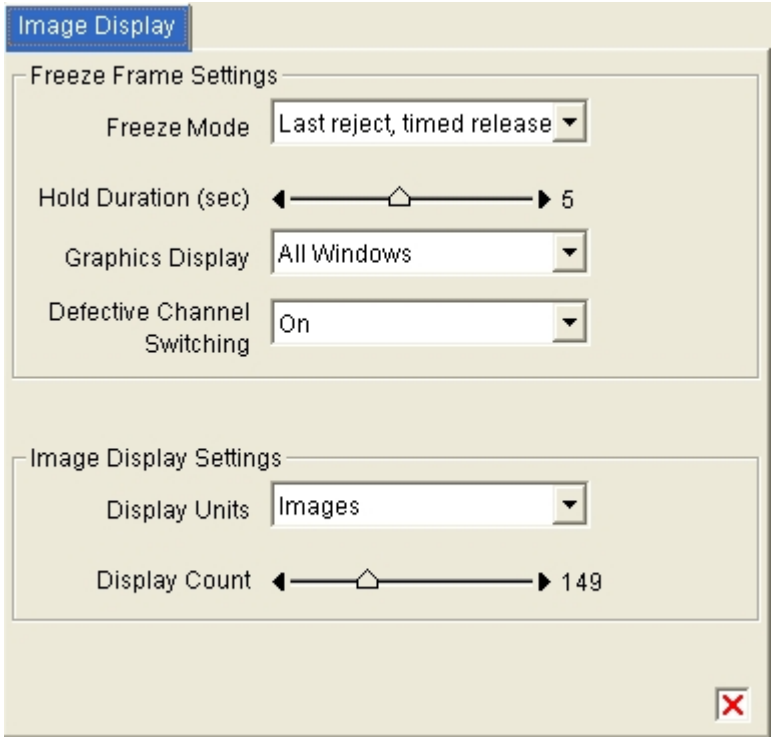
To get to this menu:

1) Right-click on the image.
2) Select Image Display Options. The menu is displayed on the screen right.

Freezing an Image:

A Freeze Frame occurs when the system automatically holds the image of a part when that part's inspection meets some criteria. For example, it can freeze the last defective part's image.

The menu is displayed on screen right. Selecting a freeze frame mode affects all cameras. Click OK [✓] for it to take effect.



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Freeze Frame overrides the Image Display settings in the lower section of the menu. For example, if you choose Last Pass under Freeze Frame, the last passing images will be frozen on the screen. The image will update only if another part passes, even if you specified that the image should update every six seconds, for example, under Image Display Settings.

The Freeze Frame indicators will show when an image is being held, whether it is the First or Last image, and whether it is a Rejected or Good part.

This feature also works with ***Enable Freeze*** (see "Inspection Options" on page 36), found in the Inspection Options menu.

Freeze Mode

Disabled

If you choose Disabled, the system will not automatically hold an image. Part images will be updated on the screen continuously. The length of time between image updates is set under Image Display settings.

Last Reject, timed release

Holds the last defective image for up to the specified number of seconds (set by **Hold Duration**). For example, if Hold Duration = 7 seconds, the last defective image will stay on screen for seven seconds if no other defects occur during that time. However, if another defect occurs during those seven seconds, its image is displayed on screen and the Hold Duration resets.

Last Reject

The system freezes the image of the last part to be rejected. Each subsequent part that fails will have its image frozen on the screen until another part fails.

Last Good

The system freezes the image of the last good part.

First Reject

The system freezes the image of the first part to be rejected after going online.

First Good

The system freezes the image of the first good part.

Graphics Display

Show Failed Regions

Displays only the inspection regions that caused the job to meet the Freeze Frame condition.

All Windows

Displays all the inspection regions on the Freeze Frame image.

No Windows

Displays only the Freeze Frame image.

Defective Channel Switching

If set to On, this allows the system to display the defective images from one camera, then switch to another camera if that camera has a defective part. If set to Off, then the system will only display the defective images from one camera, even if the other cameras had defective parts.

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Display Units

This part of the menu allows you to choose the order and length of time that the images are displayed online.

Seconds

Choose Seconds if you want the system to update the display every so many seconds. The number of seconds between image updates is set by Display Count.

Images

Choose Images if you want the system to update the display every so many processed images. The number of acquired images between display updates is set by Display Count.

Display Count

Choose how many images or seconds will elapse before the next image is displayed.

Freeze on Inspection

This feature allows you to select a particular inspection to freeze the image when a defect occurs. It works in conjunction with ***Freeze Frame settings*** (see "Image Display Menu" on page 116). Certain conditions apply to use Freeze on Inspection:

- Only one inspection may be selected at a time to Freeze on Inspection. If you select another inspection, the first one will be de-selected for you.
- Freeze Frame mode must use a valid Defect condition; that is,
  - Last Reject, Timed Release
  - Last Reject, or
  - First Reject

How to Set Freeze Frame Condition

To set a Freeze Frame Condition:

1) Log in.
2) Right-click on the image.
3) Select Image Display Options.
4) For ***Freeze Mode*** (see "Image Display Menu" on page 116), select one of the defect conditions.
5) Click OK and Exit the Image Display menu.

How to set Freeze on Inspection

This feature causes the image to freeze when a specific inspection fails.

To set Freeze on Inspection:

1) Log in.
2) In the statistics area, right-click the name of the inspection you want to freeze.
3) Select Enable Freeze. The inspection row is highlighted in green.

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Inspection	Total	Defects	Defect %	Last 10000	Last 10000%
	0	0	0.000	0	0.000
>Circular Registration		0	0.000	0	0.000
Circle		0	0.000	0	0.000
^Orientation Pattern Match		0	0.000	0	0.000
^Circular Registration		0	0.000	0	0.000
Circle		0	0.000	0	0.000

When you put the system online, and a defect is detected by the highlighted inspection, the image is frozen on the screen until you release it (right-click), or for as long as the ***Freeze Frame*** (see "Image Display Menu" on page 116) mode dictates:

- If system is in Last Reject, Timed Release mode – the held image will be released after the Hold Duration.
- If system is in Last Reject mode – the held image will be replaced if and when another defect is detected by the selected inspection.
- If system is in First Reject mode – the held image will be held indefinitely until you release it (right-click).

You may wish to edit the selected inspection (Mechanic or Administrator) while the image is held. Double-click the inspection name in the statistics area to edit.

To disable Freeze on Inspection:

1) Right-click the inspection name (highlighted in green).
2) Select Disable Freeze.

CHANGING A JOB ONLINE

USER LEVEL: MECHANIC AND ADMINISTRATOR

When you change a job online, the system continues to inspect parts in the background. However, not all changes are available while the system is online.

Notes about online changes:

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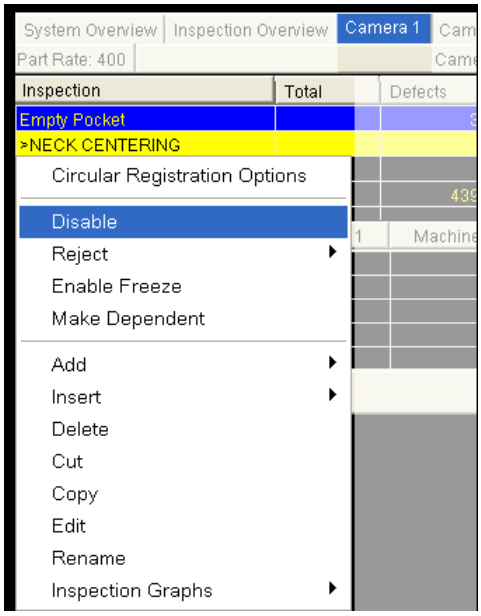
- The system will hold an image while you adjust the parameters. Adjust the parameters as necessary. Note that not all parameters or settings are available online.
- Exit the parameters menus, clicking OK to save your changes if desired. The system releases the image and resumes inspection, using the new parameters.
- If using Retro-Spec inspections, simply right-click an area of Part Graphic (if available) to edit the inspection.

Modifying inspections

To modify an inspection (cut, paste, or disable), right-click the inspection name for the ***available options*** (see "Inspection Options" on page 36).



To edit an inspection (change parameters):

- Right-click the inspection name and select Edit. Or:
- Double-click the inspection name. Or:
- If you have a ***Part Graphic*** (see "About the Part Graphic" on page 17), click an area to bring up Group statistics, and double-click the inspection name. Or right-click an area to bring up Retro-Spec interface (if available).

DISABLING A JOB ONLINE

USER LEVEL: MECHANIC AND ADMINISTRATOR

You may wish to disable a job on a particular camera in the event of a hardware failure on a camera, or if you need to stop inspection for that camera temporarily.

To disable the job:

1) Click the statistics tab for the desired camera.
2) Right-click for the menu.
3) Select Disable Job.

The system will stop inspecting with that camera. The camera indicator becomes grayed out to indicate that it is disabled.

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To enable the job again:

1) Right-click the statistics tab to see the options menu.
2) Select Enable Job. The system resumes inspection with that camera.

GOING OFFLINE

To take the system offline, click the button. The light on the button turns red to indicate that the system is offline.

You may be required to ***log in*** (see "How to Log In" on page 48) to take the system offline.

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Chapter 7

SYSTEM CONFIGURATION

❖ *Note: Most System Configuration menus are available to* ***Administrators*** *only.*

This set of menus allows you to perform advanced system and channel setup, and program the details about your blow molder or other machine (if applicable). If you make any changes to these menus, you must click OK [✓], and the system may need to restart to reflect the configuration changes.

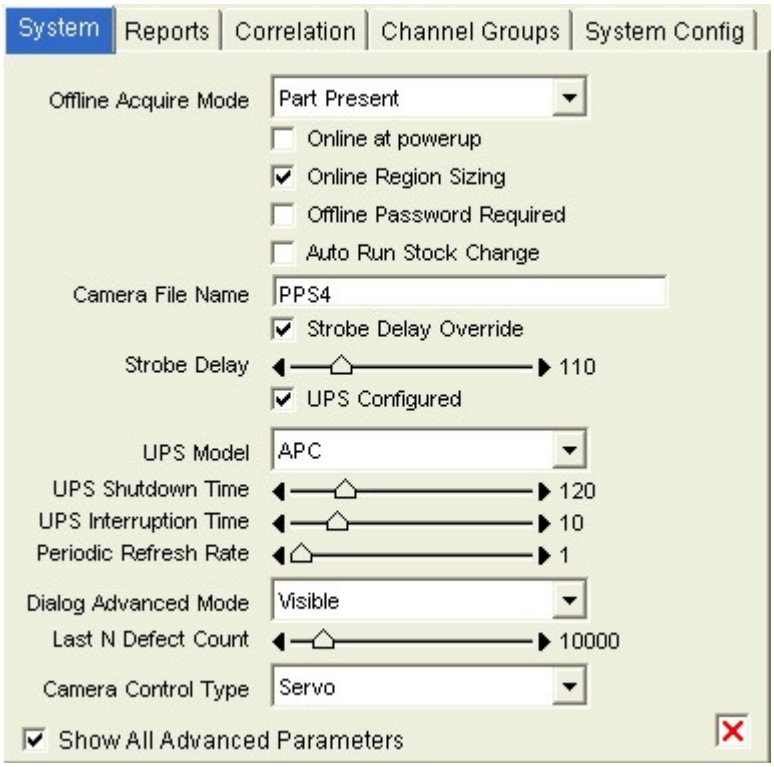
SYSTEM TAB DETAILS

USER LEVEL: ADMINISTRATOR

This menu controls system-level settings such as acquisition settings, system display settings, and UPS settings.

To get to this menu:

1) Log in.
2) Click the button.
3) Select the System tab. The parameters from this menu are described below.



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Offline Acquire Mode

When programming your system, many times it is difficult to stop production while you try to program inspections on an image. Other occasions allow you to program with no part movement. This mode allows you to have the system acquire a part image based on your present situation.

❖ *Tip: This feature is also available by right-clicking on the image and choosing Image >> Tools >> Acquire Mode.*

If the production line is moving, use Part Present. If the production line is stopped, use Immediate.

- The **Immediate** setting will take a picture of what is presently under the camera. If you are able to program your Intellispec system without the production line moving, choose Immediate.
- The **Part Present** setting takes a picture of the next part that triggers the part present sensor. If your production line must continue to move, use this setting for offline programming. [If there is no part present, click Cancel on the "Waiting for Part Detect" box, or wait for it to time out (approximately 10 seconds). The system will use the existing image, if one is available.]

Online at Powerup

- If checked: In the event of a power loss, the Intellispec will re-boot when power is restored and go online automatically to start inspecting product. This eliminates the need for any operator intervention after a power loss.
- If un-checked: The system will re-boot, but someone will have to click the button to put the system online.

Check the Show All Advanced Parameters box to see the following:

Online Region Sizing

When this is checked, the region menu is available for online programming to adjust the size of the inspection region. To make other adjustments to the region, such as position in field of view, or adjustments to polygon regions, you must take the system offline.

Offline Password Required

When this is checked, all users must log in to the system with their user name and password to take the system offline. If un-checked, users can simply click the button to take the system offline.

Auto Run Stock Change

This feature is used in Multi-Void Tube inspection. It provides a means for the operator to quickly adjust lighting to compensate for sudden changes in the reflective properties of the product being inspected.

Camera Filename

At this time, there is only one camera filename from which to choose. These are settings the system uses to acquire an image correctly.

Strobe Delay Override

Allows the system to override the default strobe delay. Default = checked.

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Caution
Changing this setting may cause errors in image acquisition.

Strobe Delay

Change the strobe delay by a number of encoder counts. This value is only used if Strobe Delay Override is checked.

The following parameters allow you to configure settings for the UPS (uninterruptible power supply). In the event of an AC power outage, the UPS will provide battery backup to the Intellispec so that the software can shut down properly, and save data before the system loses power. These parameters are all Advanced parameters.

UPS Configured

If this box is checked, the UPS will provide battery backup as described above. Also, to shut down the Intellispec, simply turn off the power switch on the side of the cabinet. There will be no shutdown menu item.

If this box is un-checked, the UPS will not provide battery backup. To shut down the Intellispec, you must click Shutdown from >> System menu.

UPS Model

Specify which UPS model is present in your system. This should be set during installation only.

UPS Shutdown Time

Specify the number of seconds (up to 600) that the UPS will provide battery backup before it initiates system shutdown.

UPS Interruption Time

Specify the number of seconds (up to 60) that a power outage or weak battery condition must be present before a ***Power Status*** (on page 196) alarm is issued. This ensures that alarms are not triggered by short power glitches.

Periodic Refresh Rate

Specify the number of seconds between screen updates. This affects how quickly the statistics and other information are updated on screen.

Warning
Using a number less than 10 seconds may cause missed parts or missed results.

Dialog Advanced Mode

Specify whether the Advanced parameters are automatically shown in menus by default.

Last N Defect Count (on page 76)

This feature allows you to collect inspection data without clearing the statistics to see how the most recent batch of parts has done.

Camera Control Type

Select between Stepper and Servo control – the ***Camera Control*** (on page 171) interface changes based on selection. You must have the correct hardware to support this function.

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REPORTS SETUP

This menu allows you to configure automatic printing of the statistics, save a database of defective parts, and save a database of online/offline status. The Reports chapter has a full description of the ***Reports Setup*** (on page 60) screen.

CORRELATION CONFIGURATION

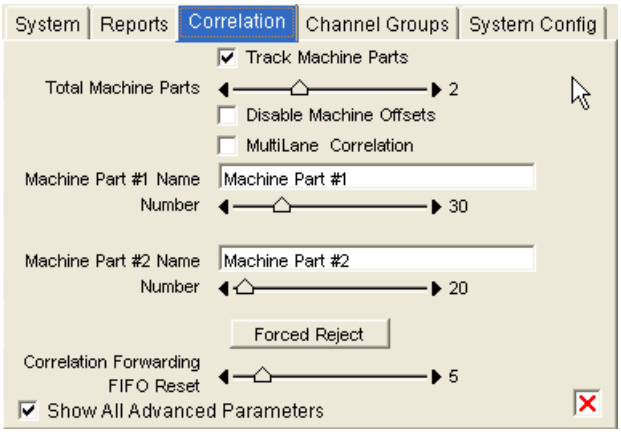
USER LEVEL: ADMINISTRATOR

The Correlation screen allows you to name and set the number of machine components based on your application. This allows correlation setup in blow molder or other machine part applications. Your system must have the proper hardware attached for this function.

- In blow molders, you may have correlation sensors to track parts associated with Cavities, Spindles, Infeed Transfer Arms, and Outfeed Transfer Arms.
- Non-blow molder examples: lined shell liner guns, can body-maker ID, can liner spray heads.

How to get to this menu:

1) Click the button.
2) Click the Correlation tab.
3) Check the Track Machine Parts box.



Track Machine Parts

Enable this if your system has the correlation option installed. Then check the Show All Advanced Parameters box to set the following parameters.

Total Machine Parts

Select the number of correlation sensors in your system (1-4). If you are using Multi-lane Correlation, you may use up to two machine parts, and this slider bar is not present.

Disable Machine Offsets

This is only used when you use ***Correlation Inspection*** (on page 511) in your jobs. Otherwise leave this box un-checked.

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Multi-Lane Correlation

Only available when two lanes and two machine parts are configured. Enables Machine Part #1 and #3. This tells the Intellispec that Machine Part #1 and #3 are on different lanes, and therefore they use different part tracking and rejection systems.

Machine Part #n name

Rename each machine part to something more recognizable to you (examples: Cavity, Spindle, or Liner Gun #1). This name will be displayed on its own statistics tab and used throughout correlation reports.

Number

Set the number of components in each machine part (example, number of pockets in a starwheel).

Offset

This allows you to change the mapping between what the inspection system considers part #1 (or pocket #1) and the actual parts. For example, if you try to reject a part from cavity #1, and the system rejects the part from cavity #2, then you would set offset at 1. This information is required to be correct for the inspection system to track components properly.

Outfeed Transfer Sequential

(Advanced parameter, only available when four sensors are used, and only applicable to blow molder installations) Specify whether the infeed and outfeed transfer arms are numbered Independently or Sequentially. For example, say your machine has 10 infeed transfer arms and 10 outfeed transfer arms. If they are numbered Independently, the infeed transfer arms would be numbered 1 - 10, and the outfeed transfer arms would be numbered 1 - 10 as well. If they are numbered Sequentially, the infeed transfer arms would be numbered 1 - 10, and the outfeed transfer arms would be numbered 11 - 20.

Dual Cavity System

(Advanced parameter, only available when four sensors are used, and only applicable to blow molder installations) Enable this if your system is a dual cavity machine.

Forced Reject

Click this button to open the ***Forced Reject*** (see "Forced Reject Menu" on page 29) menu.

Correlation Forwarding

This forwards the results of the inspection to another inspection lane. This is only used in specific applications where multiple lane systems are used.

FIFO Reset

This is expressed in number of seconds. If the system does not see a part in *n* number of seconds, the Correlation Forwarding FIFO is reset. A setting of zero disables this feature.

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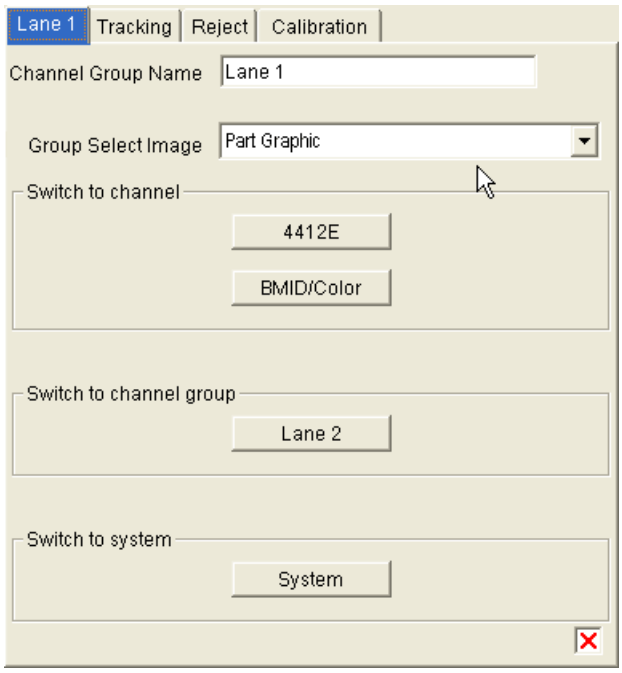
CHANNEL GROUPS (LANE) CONFIGURATION

These menus configure part tracking for the entire system, as well as the imaging and part present delay for each channel.



How to get to this menu:

1) Click the button.
2) Click the Channel Groups tab.
3) Select a channel group to configure.

USER LEVEL: ADMINISTRATOR

Channel Group Name

Name the group of channels. These channels all share the same part present sensor and reject device. Also referred to as a Lane.

Group Select Image

This chooses a ***Part Graphic*** (see "About the Part Graphic" on page 17) so that you can quickly identify which area of the part is failing. Choose an image that best represents the part you are inspecting. Not available for all types of parts.

Switch to channel

Select a different channel to configure its lighting and part present tracking.

Switch to channel group

Select a different channel group to configure its part tracking, rejecters, and part tracking calibration.

Switch to system

Returns to the main system configuration menus.

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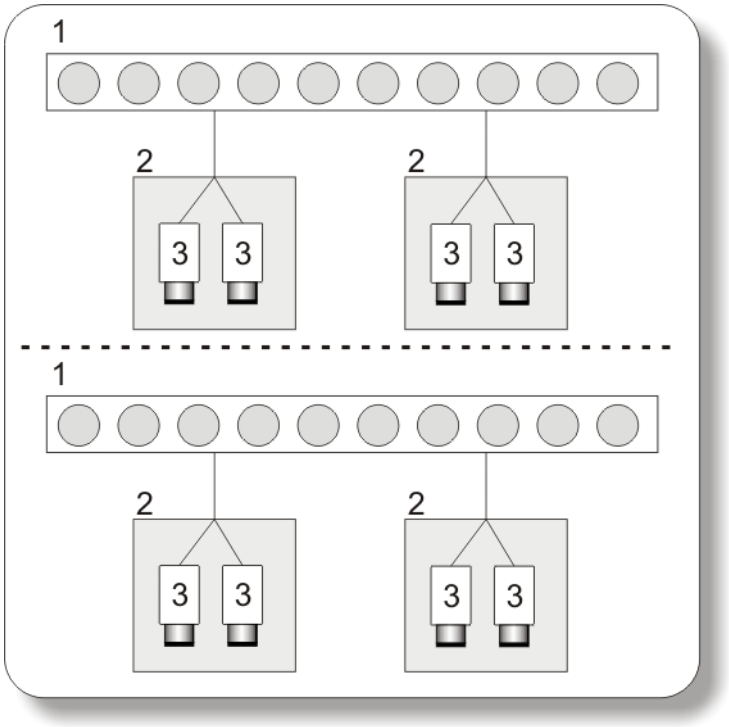
Configuration Terminology

There are several terms used to identify cameras, groups of cameras, and their relationship with one another. Use the following table to identify each term.

1	Channel Group = Lane	Think of this as one production line. Maximum number of lanes = 4 (depends on configuration) All channels within the channel group use the same part detect, tracking, and reject system.
2	Channel	Think of this as one inspection module. May contain up to 4 cameras and light source. Maximum number of channels per lane = 4 (depends on configuration). This is considered one acquisition point - all cameras and the light source are triggered at the same time.
3	Camera	Just as it sounds, the camera is the imaging device that takes pictures of one view on a part. In version 4.4 software, the Intellispec can accommodate up to eight digital cameras. If your system has analog cameras, the limit is four cameras.

There are configurations available for numerous applications. Your system will be configured for you.

Example 1: the following illustration shows 2 lanes, 4 channels, and 8 digital cameras. The numbers correspond to the above table.



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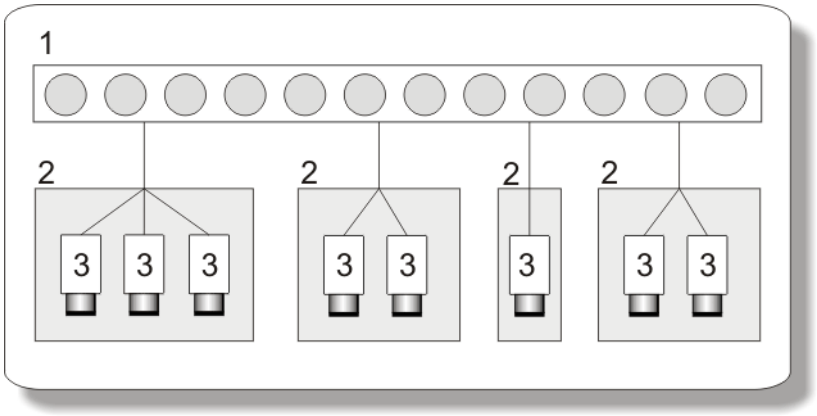
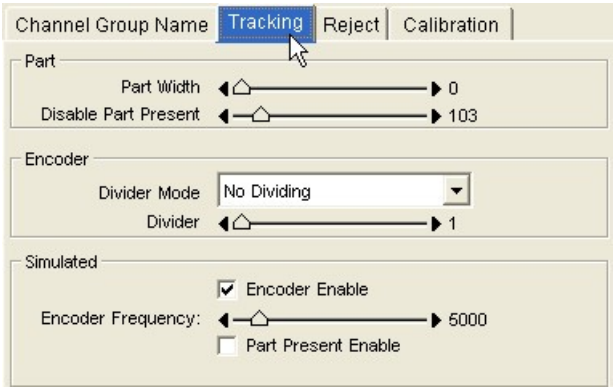
Example 2: the following illustration shows 1 lane, 4 channels, and 8 digital cameras. The numbers correspond to the above table.



Part Tracking Tab

USER LEVEL: ADMINISTRATOR

This menu sets the timing for the sensors so that the system can properly count parts and reject the correct parts.



To get to this menu:

1) Click the button.
2) Click the Channel Groups tab.
3) Select a channel group.
4) Click the Tracking tab.

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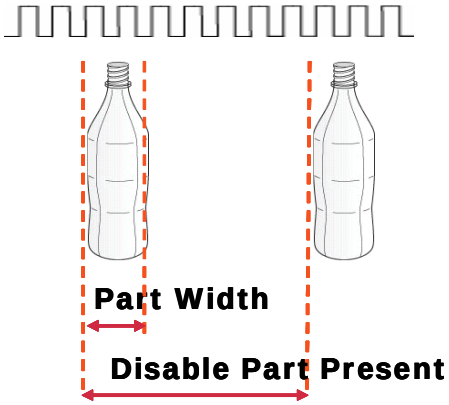
Part Width

This specifies the number of encoder ticks that would happen throughout the width of the part. The number that you specify here overrides the number that is determined in the ***Part Width Calibration*** (see "Calibrate the Part Width" on page 141).



Disable Part Present

A part present signal to the Intellispec is caused by a part breaking a photo sensor beam. The length of the part present signal is usually the amount of time that the part is breaking the beam. Disable Part Present temporarily disables receipt of the part present signal when the beam is broken. This number is specified as a percentage of the Part Width.

Encoder settings (Advanced parameters)

Divider Mode

Enables dividing the encoder output to the reject part tracking.

- **No Dividing** does not divide the encoder frequency.
- **Divide to Reject** divides the encoder frequency only to the reject station. The part present encoder signal is not affected. This is useful if parts need to be rejected at a long distance. If you do not have enough encoder ticks available between inspection and part rejection, you can divide the encoder signal. This allows a longer time for the system to track the parts until they are rejected.
- **Divide to Both** divides the encoder signal for both part present and part reject. Use this only if you need additional time to track parts from part present to inspection. It also allows a longer time for the system to reject parts.

Divider

The encoder frequency will be divided by this number if Encoder Divider Mode is enabled.

❖ *Note: The resulting encoder frequency, even after dividing, should not be less than 400Hz. Check* *>> I/O >> Show I/O Rates >> Encoder Frequency >> Start Diag for resulting frequency.*

Simulated hardware settings (Advanced parameters)

These settings are generally used for diagnostics or setup, where parts are not moving through the system.

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Encoder Enable

If not checked, the system uses the actual encoder pulses for part imaging and tracking.

If checked, the system generates a constant signal to process and track parts. This is useful if your conveyor or belt speed does not vary.

Encoder Frequency

Set the frequency of the Simulated Encoder in Hertz.

Part Present Enable

Enable this for diagnostics or setup purposes, where the parts are not moving through the system. Disable this feature during normal online operation.

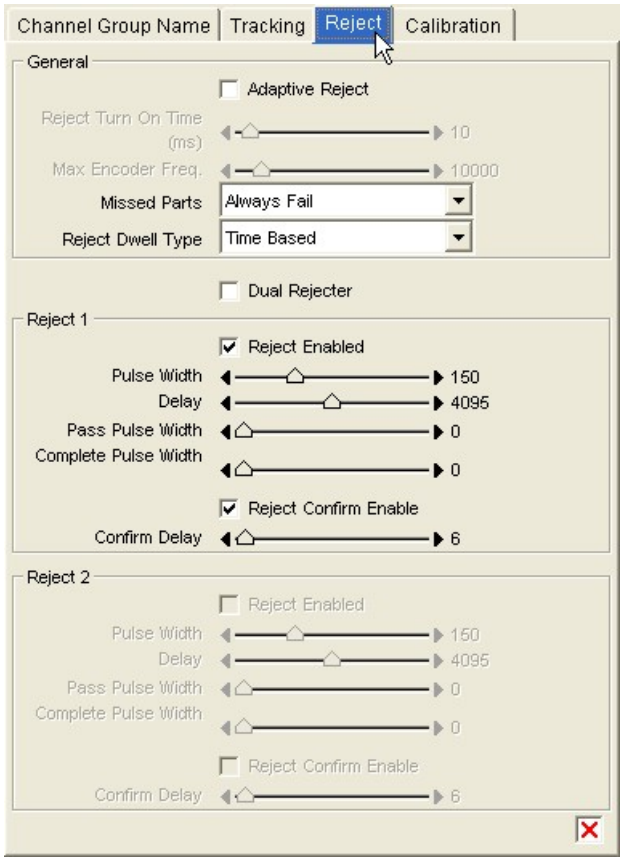
Part Rate

Set the Simulated Part Present rate in parts per minute.

Reject Settings

❖ *Note: Mechanic user level can change reject Delay and Confirm Delay. Otherwise, all parameters are accessible by Administrator only.*

This menu sets the timing for the reject device, so that the proper part gets rejected in time.



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To get to this menu:

1) Click the button.
2) Click the Channel Groups tab.
3) Select a channel group.
4) Click Reject tab.

To enable the rejecter for the channel group:

1) Click the button.
2) Click the Channel Groups tab.
3) Choose a channel group.
4) Click the Reject tab.
5) Check the Reject Enabled box for Reject 1. The rejecter for the channel group is enabled.

To disable the rejecter for the channel group:

Follow steps 1-4 above, then un-check the Reject Enabled box.

Adaptive Reject (optional)

The ***Adaptive Reject*** (see "Adaptive Reject (optional)" on page 134) will delay the activation of the reject device as a function of encoder speed. As the belt (or production line) slows down, more delay is added.

Missed Parts - Reject

Enable or disable the reject mechanism if the system “misses a part.” Always Pass disables the reject device in the event of a missed part. Always Fail enables the reject device any time a ***missed part*** (see "About Missed Parts" on page 135) occurs.

Reject Dwell Type

Choose Time Based (milliseconds) or Encoder Based, and then specify the value through the Pulse Width slider. This setting applies to Reject 1 and 2 if both are enabled. This feature can be selected independently from the Adaptive Reject function.

Dual Rejecter

This feature allows up to two reject devices per channel. The system will reject parts based on certain inspections. For example, in a converted end application, parts can be rejected at one rejecter from rivet defects, or they can be rejected at a second reject station from panel defects. ***More information*** (see "Dual Rejecter (optional)" on page 135).

Reject #1 or #2 Enabled

Enable or Disable the reject device for the current channel group. This applies to all channels within the group, and all associated inspections within those jobs.

Rejecter may be enabled or disabled for individual inspections by right-clicking the inspection name, then selecting Disable Reject. The inspection name becomes highlighted in blue to remind you that parts will not be rejected on this inspection.

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To enable the reject device again, right-click the inspection name, and choose Enable Reject. Of course, the reject device must also be enabled through the above Reject setup menu.

Pulse Width

The number of milliseconds or encoder ticks that the rejecter will be activated.

Delay

This number overrides the value determined in the reject delay calibration. It is the number of milliseconds or encoder ticks between the inspection station and the reject station.

Pass Pulse Width

This number can be used as an output to determine that a part passed inspection. See the "Part Good" output referenced in the Intellispec Hardware Guide.

Complete Pulse Width

This number can also be used as an output to determine that an inspection was completed on the part. See the "Inspection Complete" output referenced in the Intellispec Hardware Guide.

Reject Confirm Enable

This feature can detect missed rejects. Coupled with the Missed Reject Alarm, ***Reject Confirm*** (see "Reject Confirm (optional)" on page 138) will reliably detect and notify you of any missed reject condition.

Confirm Delay

The number of encoder ticks where the Reject Confirm Sensor is located after the rejecter. This number can be calibrated using ***Reject Confirm Calibration*** (see "Calibrate the Reject Confirm Delay" on page 144).

Adaptive Reject (optional)

This feature is used to compensate for the reject device's turn-on time delay with varying speeds of machine operation. An example where this is used is on a Belvac machine. The turn-on time of the reject device might be over one-half of a can width at high machine speeds. The Adaptive Reject will delay the activation of the reject device as a function of encoder speed. As the belt (or production line) slows down, more delay is added.

Your system must have the proper hardware attached for this function. If using this feature, enable Adaptive Reject before calibrating the reject delay.

- *Note: Adaptive Reject will not function properly if the reject device delay is greater than the spacing between parts.*

The table below shows the computed value of the delay based on encoder speed and how the resultant delay (in encoder ticks) is the same regardless of speed.

Note that if part rate exceeds 3000 PPM, a positional error will occur because the computed delay cannot be less than zero.

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PARTS PER MINUTE	ENCODER (HZ.)	COMPUTED DELAY (ENCODER TICKS) (A)	REJECT DEVICE TURN-ON DELAY (ENCODER TICKS) (B)	TOTAL MOVEMENT (ENCODER TICKS) (A + B)
150	500	95	5	100
300	1000	90	10	100
600	2000	80	20	100
900	3000	70	30	100
1200	4000	60	40	100
1500	5000	50	50	100
1800	6000	40	60	100
2100	7000	30	70	100
2400	8000	20	80	100
2700	9000	10	90	100
3000	10000	0	100	100

❖ *Note: The next two parameters are applicable to Belvac systems only.*

Reject Turn On Time

Latency of the rejecter mechanism in milliseconds.

Max Encoder Frequency

Maximum encoder frequency of the starwheel.

About Missed Parts

A Missed Part is defined in two ways:

- Missed Part Present Signal indicates that the system was busy processing other parts when this part present inspection request came in.
- Missed Part Results indicates that the inspection was still being processed when the part made it to the reject station.

Effectively, these parts were *not* inspected.

To clear missed parts statistics:

1) Click the System Overview tab.
2) Right-click the tab to see the drop-down menu.
3) Select Clear Missed Parts. The Missed Parts statistics are cleared.

Dual Rejecter (optional)

USER LEVEL: ADMINISTRATOR

In this discussion, Channel Group = Lane. This is one production line (flow) of parts. See more about ***configuration terminology*** (on page 129).

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This feature allows up to two reject devices per channel group. The system will reject parts based on certain inspections. For example, in a converted end application, parts can be rejected at one rejecter from rivet defects, or they can be rejected at a second reject station from panel defects.

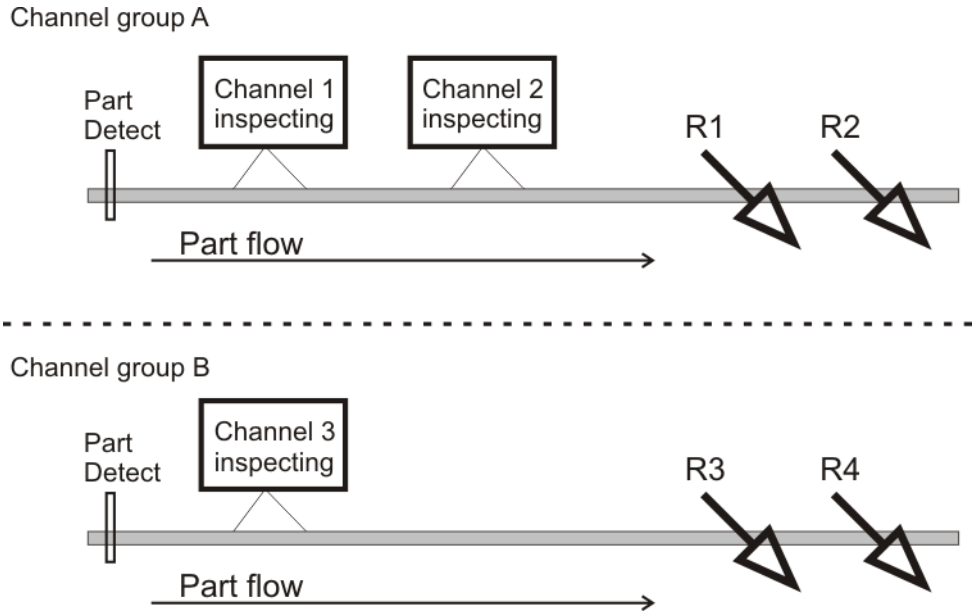
The Intellispec must be equipped with the proper hardware, including the proper cabling, lane distribution boxes and reject devices.

Certain conditions apply to Dual Reject usage:

- Four reject outputs are present in the Intellispec hardware.
- No more than two rejects per channel group of inspection.
- First reject (of Dual Reject) must be on either Channel 1 or Channel 3. The second channel reject output must immediately follow the first rejecter (that is, you can use the reject output from Channel 2 or Channel 4, respectively).

Dual Reject may be used when:

- You have one channel of inspection. You may have Dual Rejects for that channel.
- You have two channels of inspection which are in different channel groups. You may have Dual Rejects for both channels.
- You have three channel groups (lanes) of inspection, and use Dual Reject for either Channel 1 or Channel 3. The other two lanes of inspection can only use single rejecter.
- You have three channels of inspection, Channels 1 & 2 are in one channel group, and Channel 3 is in another channel group, as in the illustration below. R = Rejecter.



Dual Reject may NOT be used when:

- You have four channel groups (lanes) of inspection. All those reject outputs are already being used.

Please ***contact Pressco*** (see "How to Contact Pressco" on page 633) if you are unsure whether your system may use the Dual Reject feature, and to purchase the additional hardware.

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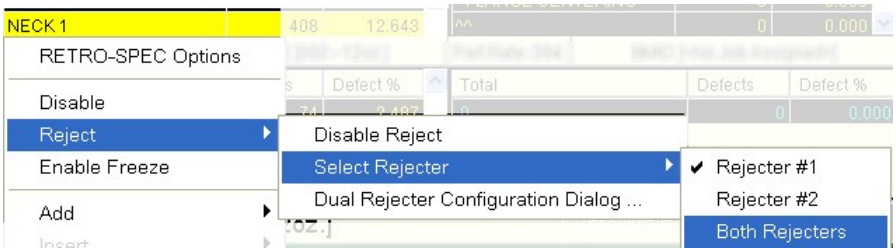
To enable Dual Rejecter:

1) Log in.
2) Click button.
3) Click Channel Groups tab.
4) Select a channel group.
5) Click Reject tab.
6) Check Dual Rejecter box.
7) Set the Pulse Width (length of time the reject signal is active) for Reject 1.
8) Set the Delay (number of encoder ticks between inspection station and reject station) for Reject 1.
9) If desired, set ***Reject Confirm*** (see "Reject Confirm (optional)" on page 138).
10) For Reject 2, check the Reject Enabled box.
11) Set the Pulse Width (length of time the reject signal is active) for Reject 2.
12) Set the Delay (number of encoder ticks between inspection station and reject station) for Reject 2.
13) Click to apply the menu changes. The system will restart.
14) Use the Calibration feature (under Calibration tab) to make sure the rejecters are firing at the desired time.

To assign inspections to a specific rejecter:

Make sure you have the desired jobs selected for each camera.

- To assign one inspection to a rejecter: Right-click the inspection name >> select Reject >> Select Rejecter, and choose Reject #1 or Reject #2, or Both Rejecters.



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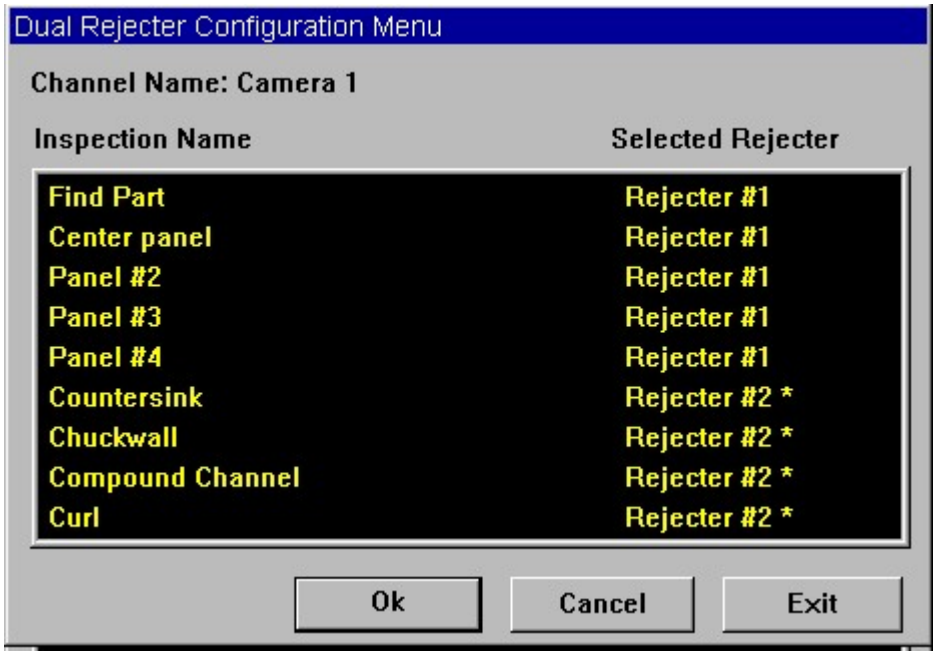
- To assign all inspections from one job to Rejecter #1 or #2: Right-click the inspection name >> select Reject >> Dual Rejecter Configuration Dialog...



  - This menu allows you to configure all the inspections for the current job at once. Click the name Rejecter #1 or #2 or Both Rejecters for any listed inspection to toggle the rejecter. You will see an asterisk next to the name to indicate your changes.
  - Click OK to accept your changes, or Cancel to undo the changes, or Exit. The system asks whether you want to save your changes.

After the hardware has been installed, the system is ready to use the Dual Rejecters.

Reject Confirm (optional)

USER LEVEL: ADMINISTRATOR

This feature can detect missed rejects. Coupled with the Missed Reject Alarm, Reject Confirm will reliably detect and notify you of any missed reject condition. Reject Confirm is an optional feature, and an additional sensor must be installed at your site.

Reject Confirm uses a part detect sensor positioned at a calibrated and defined distance (Confirm Delay) past the normal reject mechanism to determine whether the defective part was actually rejected. Confirm Delay must be a value of 1024 or less.

After the rejecter fires (meaning the reject delay for a part has passed), the Confirm Delay starts. Once the Confirm Delay has passed, the system examines the reject confirm sensor for a period of time equal to the Pulse Width of the part. If the reject confirm sensor "sees" a part within that time, it means that the reject was missed. If the reject confirm sensor does not see a part, it means the part was rejected successfully.

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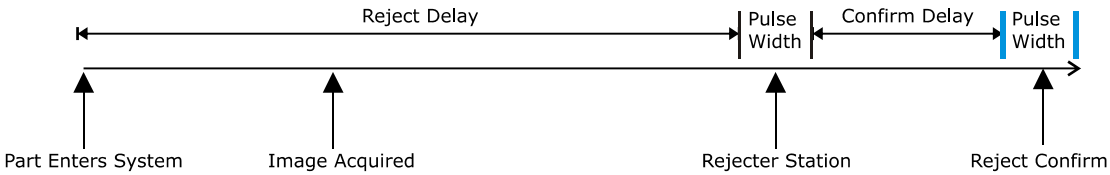
If the reject was missed, the Missed Reject Alarm will be triggered. However, the Missed Reject Alarm must first be enabled and configured.

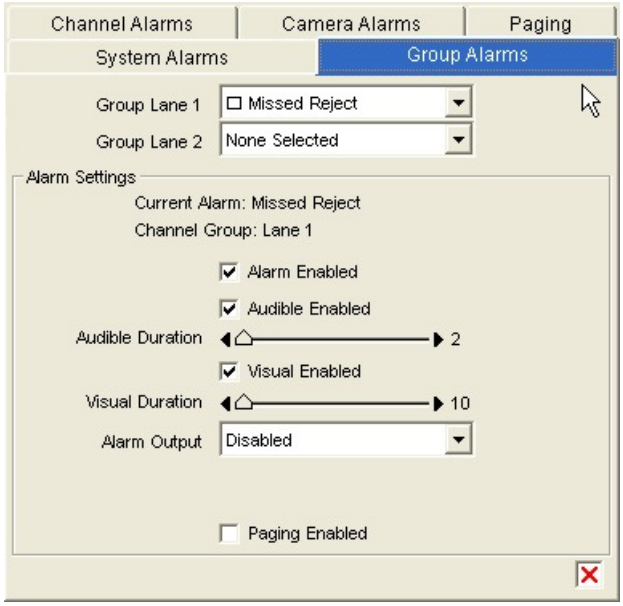
Part Tracking in system with Reject Confirm



1 - ENABLE THE MISSED REJECTS ALARM

To enable the Missed Rejects alarm:

1) Log in.
2) Click button.
3) Click Group Alarms tab.
4) Select Missed Reject alarm for the appropriate channel group.
5) Check Alarm Enabled box.
6) Set up the desired audible, visual, programmable outputs, and paging, if desired.
7) Exit the Alarms menu.



2 - CALIBRATE STANDARD REJECT DELAY

Calibrate the standard ***reject delay*** (see "Calibrate the Reject Delay" on page 143) using normal procedures.

3 - SET UP REJECT CONFIRM

To set up Reject Confirm:

1) Click button.
2) Click Channel Groups tab.
3) Select a Channel Group.
4) Click Reject tab.
5) Check Reject Confirm Enable box.

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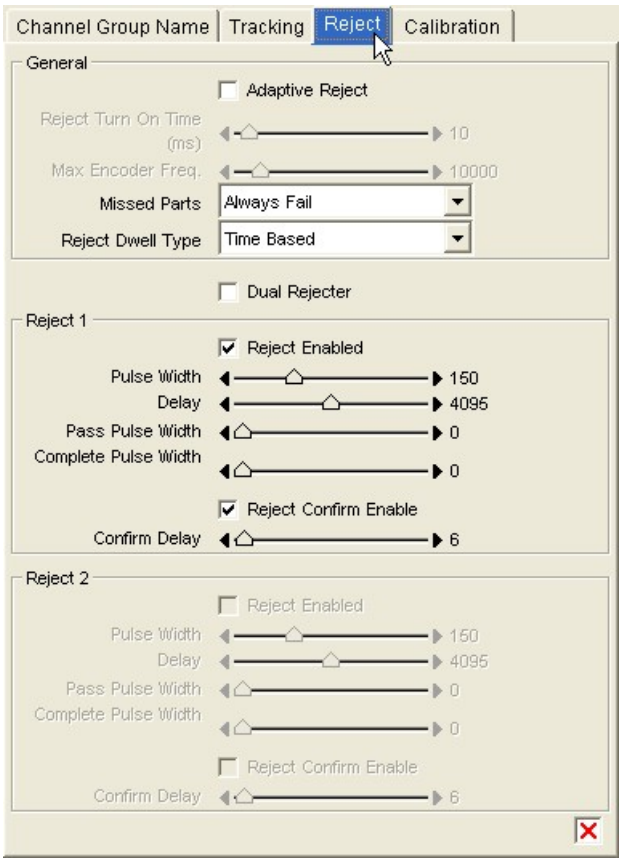
6) Mount the Reject Confirm sensor at “X” distance beyond the rejecter where “X” is distance in encoder ticks. For example, if there are 70 encoder pulses per inch, and the sensor is mounted five inches beyond the rejecter, the Confirm Delay would be set to 350.



❖ *Note: The maximum setting for Confirm Delay is 1024. Mount the Reject Confirm sensor within that range of encoder ticks.*

When the Reject Confirm sensor sees a part that is not supposed to be there, it triggers the Missed Reject alarm.

Calibration of Part Tracking

USER LEVEL: MECHANIC AND ADMINISTRATOR

Through this menu, calibrate the channel group (or lane) for part tracking and reject timing.

❖ *Note: Part Width must be calibrated before Reject Delay*

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.

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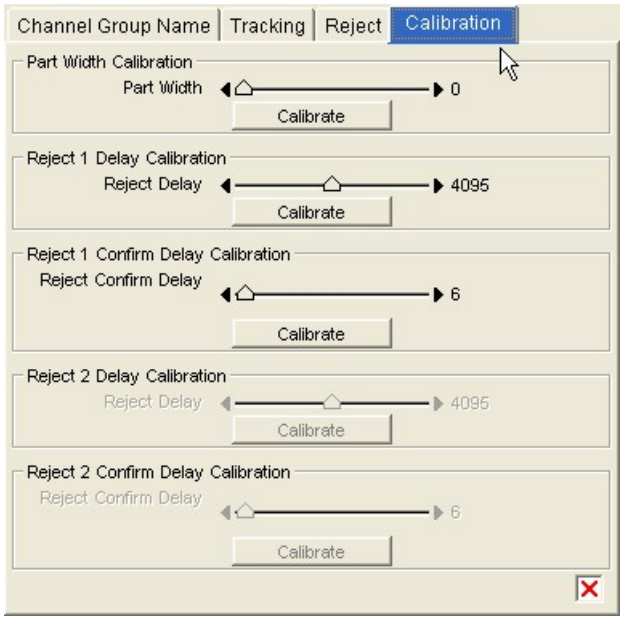
4) Click Calibration tab.

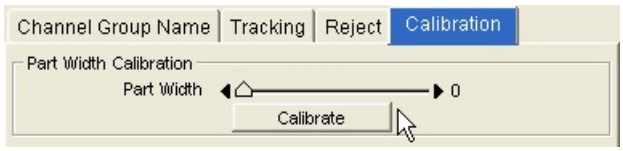


We recommend that you calibrate features in a particular order:

1) ***Part Width*** (see "Calibrate the Part Width" on page 141)
2) ***Part Present Delay*** (see "Calibrate the Part Present Delay" on page 141)
3) ***Reject Delay*** (see "Calibrate the Reject Delay" on page 143)
4) ***Reject Confirm Delay*** (see "Calibrate the Reject Confirm Delay" on page 144) (optional)

Calibrate the Part Width

Part Width is the number of encoder ticks that a part will be present in front of the part present sensor.



To calibrate Part Width:

1) Click the Calibrate button under Part Width.
2) Run several parts through the system, enough for a good sampling of parts.
3) Click OK. The system displays the old number of encoder ticks, the new number of encoder ticks that parts are present in front of the part present sensor, and the statistics.
    - If you want to change this number click Yes.
    - To keep the old number of encoder ticks, click No.
    - You can change the Part Width value later through the slider bar above the Calibrate button.

Calibrate the Part Present Delay

Part Present Delay must be calibrated so that the camera snaps a part image in the center.

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Part Present Delay

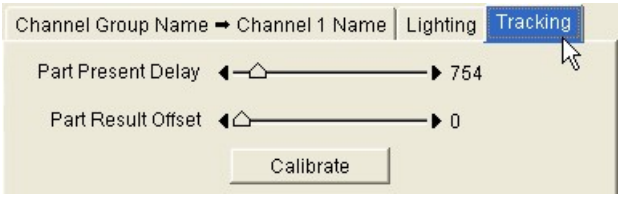
The number of encoder ticks between the part present signal and when the part is directly centered in the camera's field of view. Each channel's part present delay is calibrated separately.

Part Result Offset

This is only used with an RT6 Light Tester. It sets the results RAM on the PRIO to *n* offset position(s) upstream.

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the [Channel Group name] tab, select a channel from the Switch to Channel section.
5) Click Tracking tab.



❖ *Note:* **Part Width** *(see "Calibrate the Part Width" on page 141) must be calibrated before Part Present Delay.*

To calibrate the part present delay:

1) Click the Calibrate button.
2) Run parts through the system to observe their position on the screen.
3) The system displays a target over an image. Click the left or right arrows on the slider bar until the part is centered in the image.

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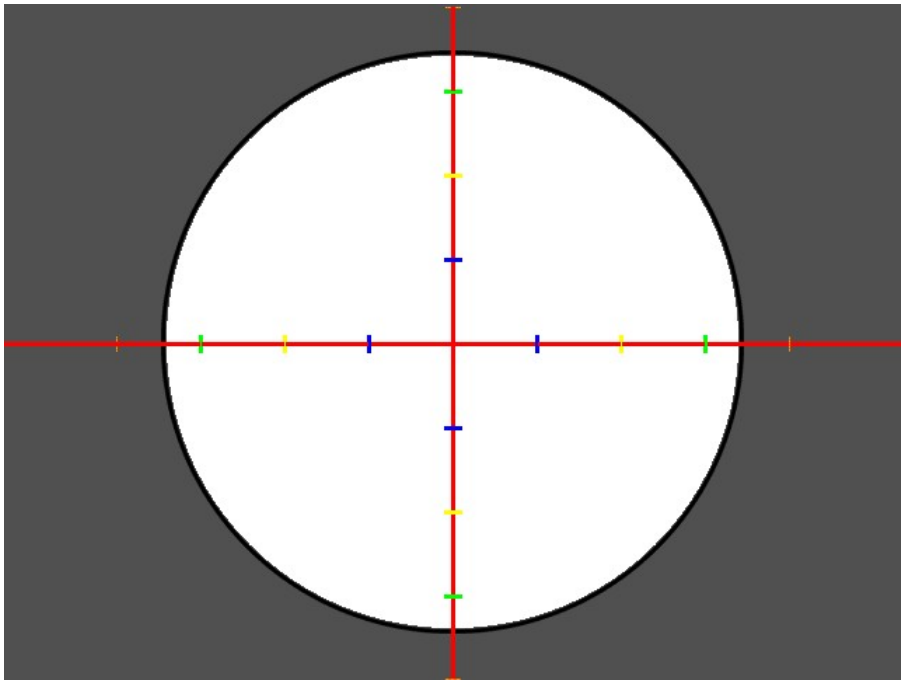
4) Click the Calibrate button again when the desired position is achieved.



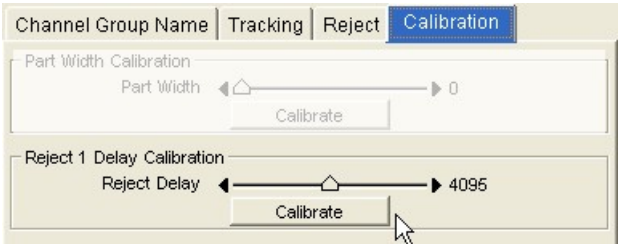
You can make changes to the Part Present Delay setting, at a later time, by using the slider bar. However, the image and target are not displayed when you just use the slider bar.

Calibrate the Reject Delay

Reject Delay is the number of encoder ticks between the part present sensor and the reject station.

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Click the Calibration tab.



Caution

When you enter the Reject Delay calibration, the reject mechanism will attempt to reject all parts.

To calibrate Reject Delay:

1) Click the Calibrate button under Reject Delay.

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2) Run parts through the system, preferably slow enough so that you can ensure each part is rejected at the proper time.
3) Click the right or left arrows on the slider bar to increase or decrease the reject delay. Make sure that each part is rejected at the correct time and position.
4) When the correct position is achieved, click the Calibrate button again.
    - You can make changes to the Reject Delay at a later time by using the slider bar.
5) Click OK to save changes.

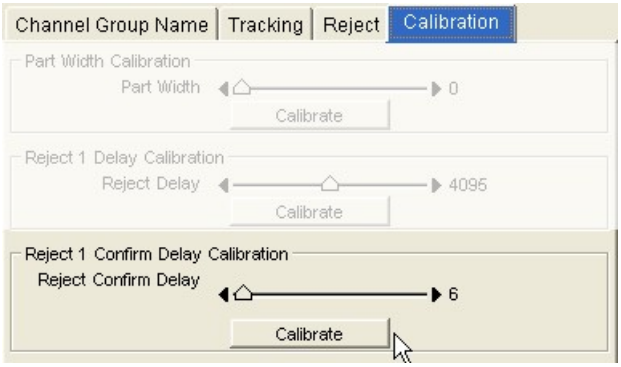
Calibrate the Reject Confirm Delay

This feature can detect missed rejects. Coupled with the Missed Reject Alarm, ***Reject Confirm*** (see "Reject Confirm (optional)" on page 138) will reliably detect and notify you of any missed reject condition. Enable Reject Confirm through the ***Reject Settings*** (on page 132).

Important
Reject must be calibrated *before* Reject Confirm Delay.

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Click the Calibration tab.



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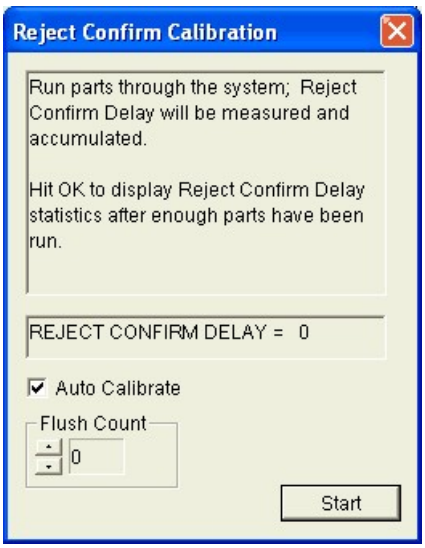
To calibrate Reject Confirm Delay:

1) Click the Calibrate button under Reject *n* Confirm Delay Calibration. Instructions are displayed. The options in this menu are described below.



2) Click Start.
3) Run several parts through the system, enough for a good sampling of parts. The Reject Confirm Delay will be measured.
4) After enough parts have been run, click Stop. The system displays the results.
   - Click Yes if you want to use the new value computed by the system.
   - Click No if you want to keep the old value.

The calibration offers a couple options, described below.

Auto Calibrate

Allows the system to compute Flush Count.

Flush Count

The maximum number of parts that can fit between the rejecter and reject confirm sensor. Intellispec computes this number by dividing the maximum Reject Confirm Delay (1024) by Part Width. This number is important to keep track of the correct parts.

Channel Configuration

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.

These menus will configure the current channel, select the light type, and choose camera settings. The menus for each channel are the same.

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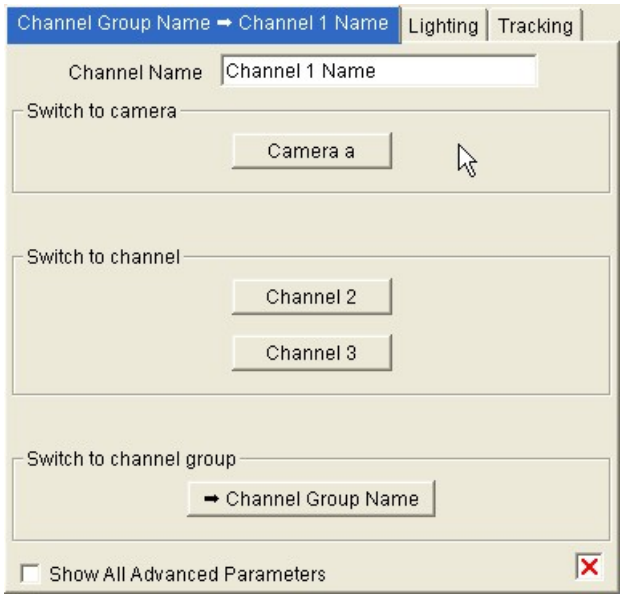
Channel Group >> Channel n tab



Channel Name

Name the current channel. This name identifies the channel in the alarms and the Process Sheet.

Switch to Camera

Select from the other available cameras (if other cameras are configured).

Switch to Channel

Select from the other available channels (if other channels are configured).

Switch to Channel Group

Select from the other available channel groups (if other channel groups are configured).

Camera Configuration

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Under the Switch to Camera section, select a camera.

These menus allow you to re-name the camera, enable SmartLINK, and access the camera control and imaging features for the current camera. The menus for each camera are the same.

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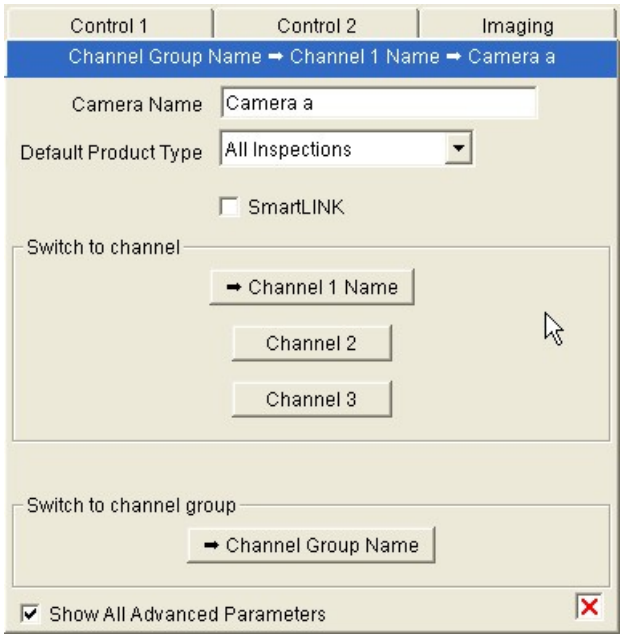
Channel Group >> Channel n tab >> Camera x tab



Camera Name

Name the current camera. It is helpful to name the camera for the area it is inspecting. For example, Neck, Rivet, or Base. This name will be used on the statistics tabs and the system graphs.

Default Product Type

This selection should only be done during installation of the system. The Default ***Product Type*** (see "Selecting Product Type" on page 105) simplifies part inspection setup by listing only those registrations, orientations, and inspections commonly used on a specific product.

SmartLINK

(Advanced parameter) Enable or disable the ***SmartLINK*** (on page 110) feature.

Switch to Channel

Select from the other available channels (if other channels are configured).

Switch to Channel Group

Select from the other available channel groups (if other channel groups are configured).

See information about ***Camera Control*** (on page 171) and ***Imaging*** (see "Imaging Configuration" on page 181) tabs.

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Chapter 8

LIGHTING, CAMERAS, AND IMAGING

LIGHTING CONFIGURATION

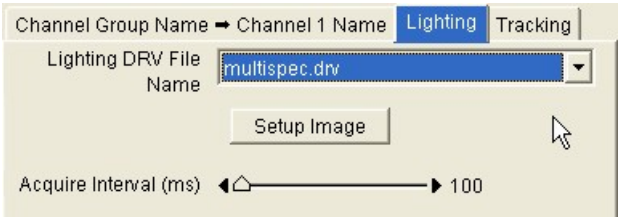
USER LEVEL: ADMINISTRATOR

This menu allows you to choose the type of lighting configuration for each channel. This affects the operation of the Light Control program. It allows you to select the appropriate lighting configuration for each channel.

Warning
The lighting configuration is performed during system installation and should not be changed.

To open this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Click Lighting tab.



Lighting Driver File Name

Select the appropriate driver for the selected channel.

Setup Image

This is the same as right-clicking on an image and selecting Lighting (except that this does not activate Image Analysis). See ***Light Control*** (see "Light Control Tool" on page 150).

Acquire Interval (ms)

Define a time interval between updated images during lighting control. The number you enter is in milliseconds, so a setting of 1000 equals one second.

Job- or Channel-specific lighting

You can set the Intellispec to use job-specific or channel-specific lighting.

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- **Job-specific lighting**: the light settings will automatically be loaded each time the current job is loaded.
- **Channel-specific lighting**: the light settings will automatically be loaded for any job on that channel. This may save you time in the future when you are setting up jobs that require similar lighting for the same channel. The plus sign (+) in front of the channel/ job indicator means that the job is using channel-specific lighting.

To change the status of the lighting (Administrator only):

1) Right-click the statistics tab for the desired channel. The Job Options menu is displayed.
2) Choose Lighting Settings.
3) Select either Use Channel or Use Job.

LIGHT CONTROL TOOL

Lighting is programmed during installation and should not need adjustment unless you are inspecting a different type of part (and/ or creating a new job). Once lighting is adjusted, it is saved with the inspection jobs, and the correct lighting for each job is loaded when you load a job.

Before Adjusting Lighting

1) The channel's ***light type*** (see "Lighting Configuration" on page 149) should have been configured during installation. Light type should be set up for each channel in your system.
2) To see the effects of your lighting adjustments, the system must acquire images. The system can be set to snap upon detection of a part present signal, or to snap continuously. Before you enter the SmartLight interface, determine whether you will adjust the lighting with parts moving through the system, or adjust the lighting with a stationary part.
    - If parts are moving through the system, select Part Present Acquire mode: right-click image >> select Image >> Tools >> Acquire Mode >> Part Present.
    - If parts are not moving, select Immediate: right-click image >> select Image >> Tools >> Acquire Mode >> Immediate.
3) You are ready to control the lighting. Right-click on the image and select Lighting. The ***Image Analysis*** (see "About the Image Analysis tool" on page 185) program will assist you with achieving optimum gray levels.

What Does It Control?

The light control program, known as SmartLight, is the interface that allows you to control the lighting of each channel. Each channel has a camera and lighting array. This lighting array is composed of a number of zones (rings) of lights. These lights may be either infrared, red, blue, or green LEDs.

Each zone of lights may be controlled individually, or as groups. You control the intensity of each of these zones for proper image acquisition.

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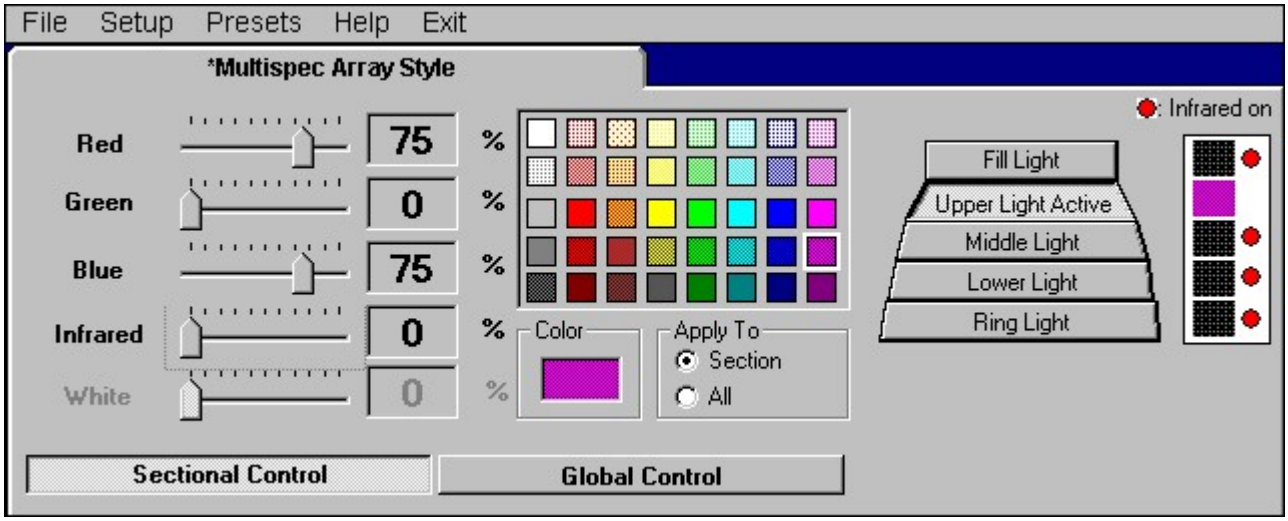
❖ *Note: See the Intellispec Hardware Guide for specific zone information for each type of inspection module.*

To get to Light Control:

1) Right-click over the image.
2) Select Lighting. The appropriate light control for that channel is displayed.

CHROMAPULSE LIGHTING

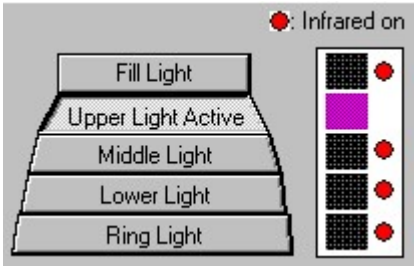
If your system is using the Multispec ***Light Type*** (see "Lighting Configuration" on page 149) driver, your SmartLight screen will look similar to the one shown below.



You will make most of the lighting adjustments from this screen, when the **Sectional Control** button is pressed.

Lighting Sections

There are several sections of light that inspect products from different directions. Each application has a specific configuration to best illuminate your product. All sections may not be available for all applications.



You must select at least one section to change its lighting. To control multiple sections at one time, click the ***Global Control button*** (on page 156).

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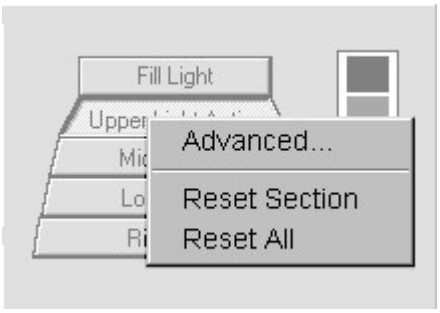
Color

Located to the right of Section control shown above, this vertical row of color blocks displays the current color setting for each section. A red dot will appear next to the color block for any section using infrared light. Also, the single rectangular box located below the color preset grid displays the color for the currently selected light section.

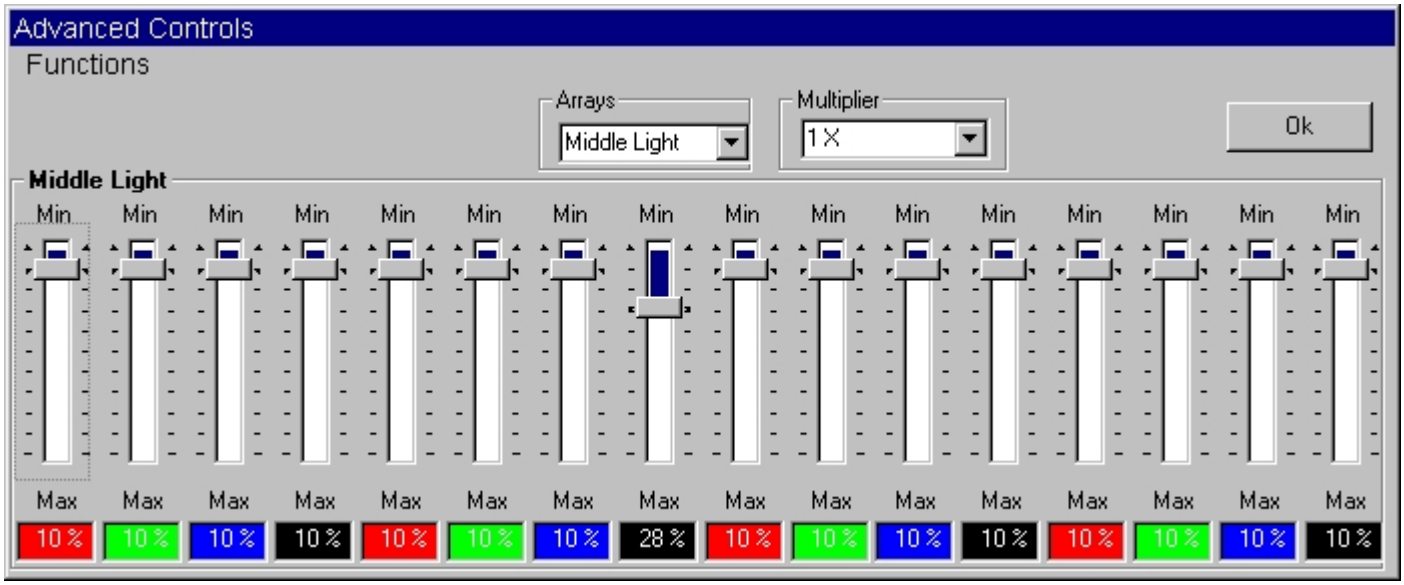
Pop-up Menu (from Lighting sections)



When you right-click on the Lighting sections area, the pop-up menu shown above will appear.

Advanced Control

The Advanced Controls screen allows you to control each light zone independently. A zone is the smallest independently controllable portion of a light section. A lighting section must be selected for the Advanced feature to become active.



> ❖ *Note: The Advanced Controls are for experienced users. Generally you should not need to use them.*

In the screen above, the Middle Light section is selected. Notice that it has 16 zones. The first four zone colors are, from left to right, red, green, blue and infrared. This color sequence repeats three more times for the remaining zones.

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The number of zones and colors within a light section may vary depending on application.

Array

Choose a lighting section to view and adjust individual zones.

To change the intensity of a zone:

Click and drag a slider towards Min or Max to increase or decrease the intensity setting. A single click above or below a slider will increase or decrease the setting by 5%.

Multiplier

The Multiplier parameter provides two options: 1X and 2X. 1X is the normally used setting. 2X will cause all light intensity settings to be doubled. This applies to all settings in all windows. 2X is used when high lighting intensity is required.

Caution

A combination of high light intensity and high conveyor speed can cause image blur. Using the 2X Multiplier may increase risk of image blur. When image blur occurs, the image will appear slightly out of focus. As a check, you can compare an image from a stationary part to that from a moving part. If image blur occurs, you may have to decrease light intensity or conveyor speed.

Click OK to exit Advanced Controls.

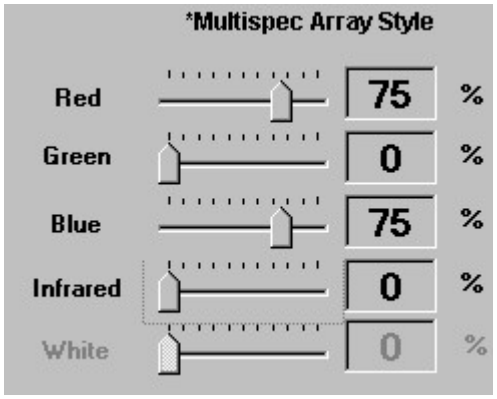
Reset Section

Sets all lights in the selected section (and additional locked sections, if applicable) to zero.

Reset All

Sets all lights in all sections to zero.

Intensity Control Sliders



These sliders control the light intensity of each color within the selected light section (fill light, middle light, etc.). They only affect one light section at a time. You must first select the desired section before making adjustments with the sliders. Note the following:

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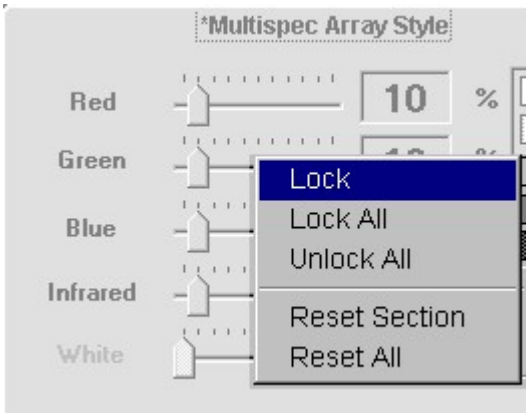
- There is a slider for each color within a section. The number to the right of each slider reports the current intensity setting for each color (0 to 100 percent). A setting of 100 percent is the maximum or brightest intensity setting. By clicking to the right or left of a slider, you can increment or decrement the value by 1.
- You can lock two or more sliders together so they will move together. When you drag one slider, all locked sliders move in proportion. Lock the sliders with the pop-up menu (right-click for pop-up menu, which is described below).
- You can mix colors to create colors other than the basic red, green and blue. (Some applications don't require all colors; your system may not have all the colors shown in the screen above.)

Pop-up Menu (from Intensity Control)

When you right-click on the intensity sliders, the pop-up menu shown below will appear.



Lock, Lock All, Unlock All

You can lock two or more sliders so they will move together. When you drag one locked slider, all locked sliders move in proportion.

To lock two or three sliders together:

1) Right-click on a slider to display the pop-up menu.
2) Select the Lock option.
3) Do the same for each slider you want to lock. A lock symbol will appear to the right of any slider that is locked.
    - The Lock All option will cause all sliders to be locked together.
    - The Unlock All option will cause all locked sliders to be unlocked.

❖ *Note: If, after locking some sliders, you select a color preset from the grid, the sliders will be unlocked and the **preset** color selection will override the previous slider settings.*

Reset Section

Sets all lights in the selected section (and additional locked sections, if applicable) to zero.

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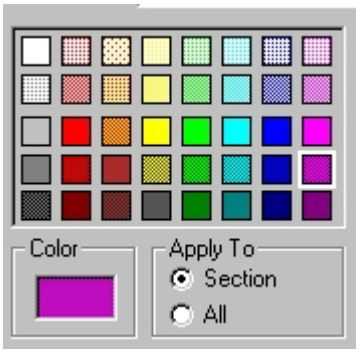
Reset All

Sets all lights in all sections to zero.

Selecting a Light Color



The color grid provides 40 preset colors.

To choose a light color:

1) Select the desired light section.
2) Click the desired color box.

To create a custom color:

1) Select the desired light section.
2) Click the color closest to the desired color.
3) Move the intensity sliders to create the desired color.

Apply To

There are two options located under "Apply To": Section and All. These options affect the way the system responds to selections made in the color grid.

- **Section** is the most commonly used option. When Section is selected, a preset color is applied only to the selected section (Fill Light, Lower Light, etc.).
- When **All** is selected, the selected color is applied to all sections. The All option is handy if you want to quickly set all light sections to the same color.

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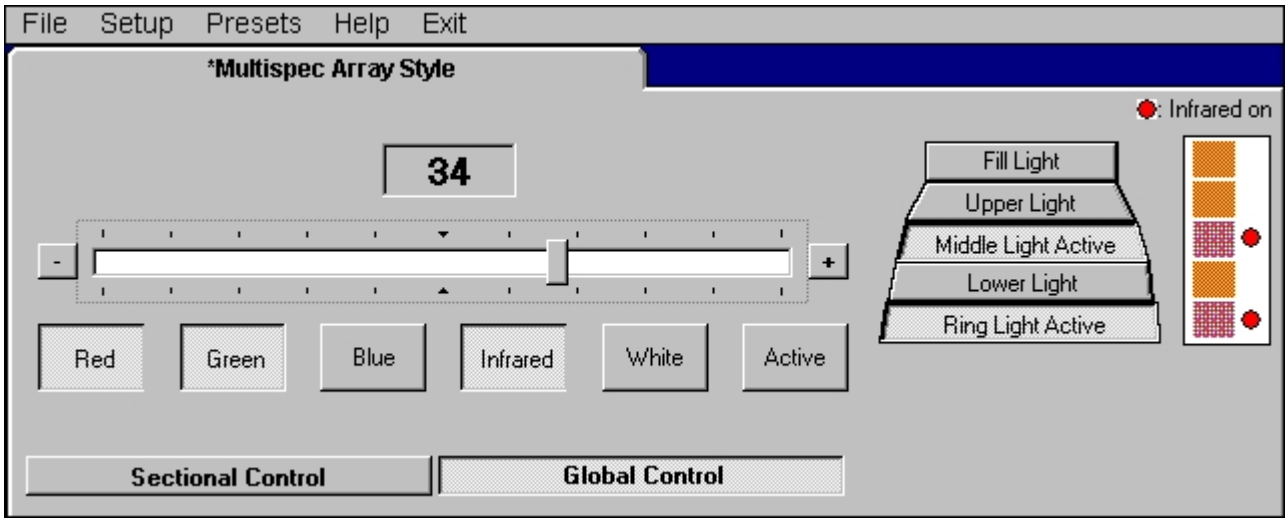
Global Control Button

When the Global Control button is pressed from the Light Control screen, it selects the Global Control screen. This screen allows you to make lighting adjustments that affect multiple or all light sections simultaneously.



To use the Global Control screen:

1) Select the light sections you want to adjust simultaneously.
2) Select the color or colors you want to increase or decrease. You can select any combination of colors.
3) Click and drag the slider to the right to increase the color intensity, or drag to the left to decrease intensity.

White Button

Selecting the White button is the same as selecting Red, Green and Blue simultaneously.

Active Button

When the Active button is selected, any change you make with the slider bar only affects zones or sections that already have a setting greater than zero. Zones or sections that have a zero setting are not affected; they remain at zero.

SMARTLIGHT MENUS

SmartLight File Menu

New

Start a new lighting setup.

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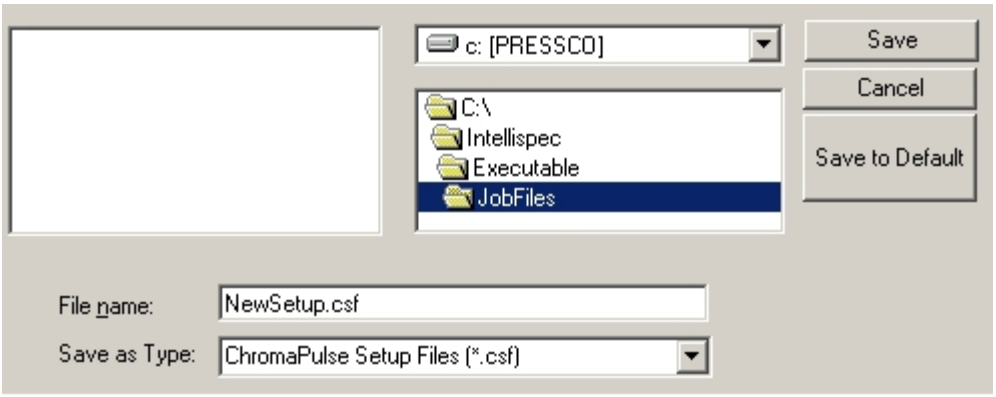
Open

Open an existing .csf (Chromapulse Setup File). When you open a .csf file, you can see the effects of the light settings on your inspection job. After opening a .csf file, you can save the light settings to your inspection job when you exit SmartLight.

When you open a .csf file, you are not opening an inspection job; you are just opening the light settings and applying them to the current job.

Save

Save your light settings. A dialog box will be displayed, allowing you to choose the file name. Select an existing file name, or move your cursor to the File Name box and type a new name.

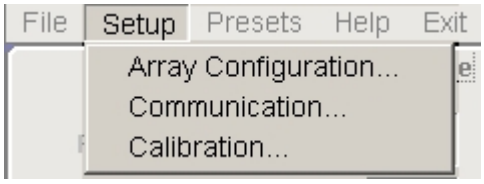


Save to Default

This option allows you to save a lighting configuration as the default light setting for that channel. The next time you program a new job, the system will use the new default light settings. This feature is useful when you have several parts that use similar light setups.

Any time you click the Save to Default button, the default setting is overwritten.

Lighting Setup Menus



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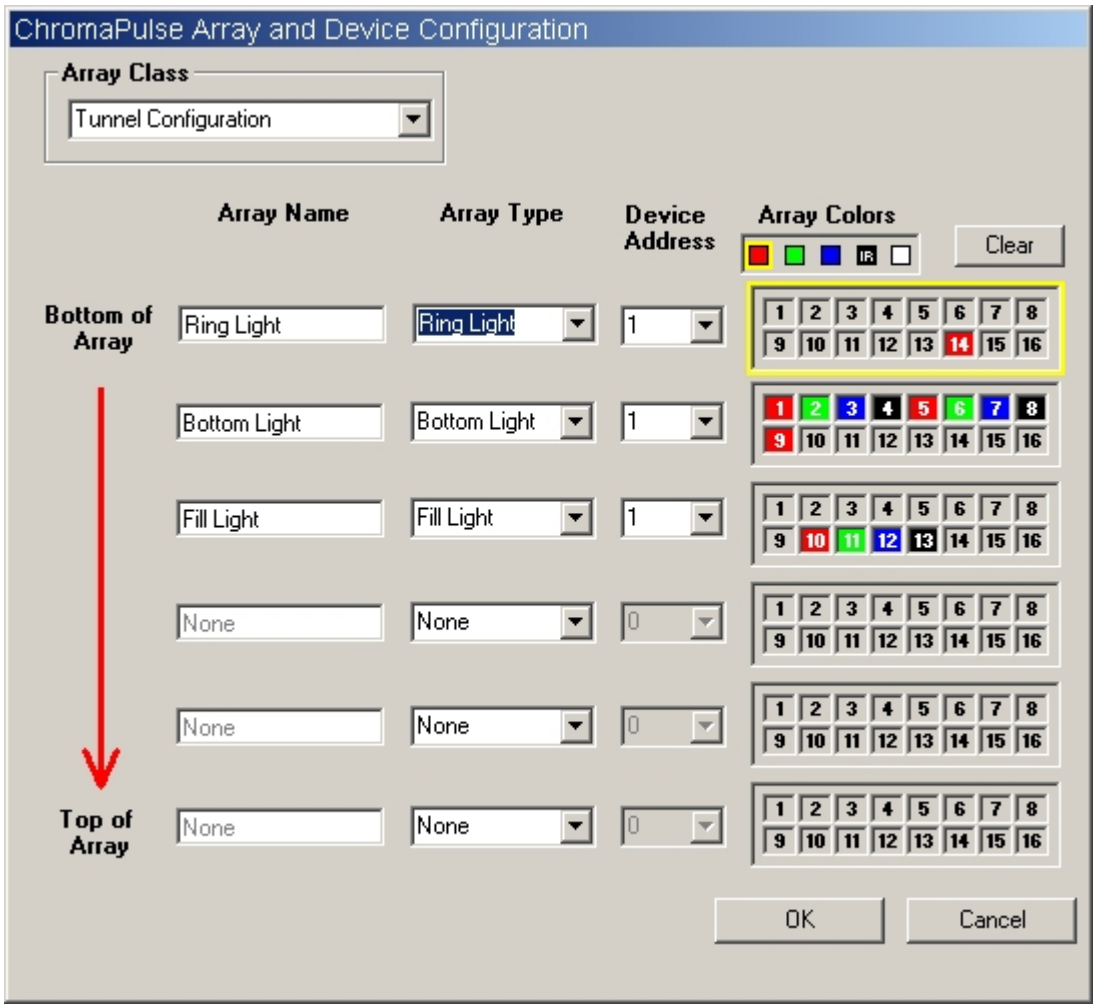
Array Configuration

Warning

These settings should only be changed during inspection module installation.



This screen defines the type of array, address, and array color for each inspection module. It should match the zone information and lighting array color for your application.

To make changes to this screen, make a selection from any of the drop-down menus to change the array type. To change an array color, highlight the desired color in the box labeled “Array Colors”. Then click the zone number in one of the arrays. The Clear button removes all assigned colors from the highlighted array.

Click OK when finished, or Cancel to discard changes and exit.

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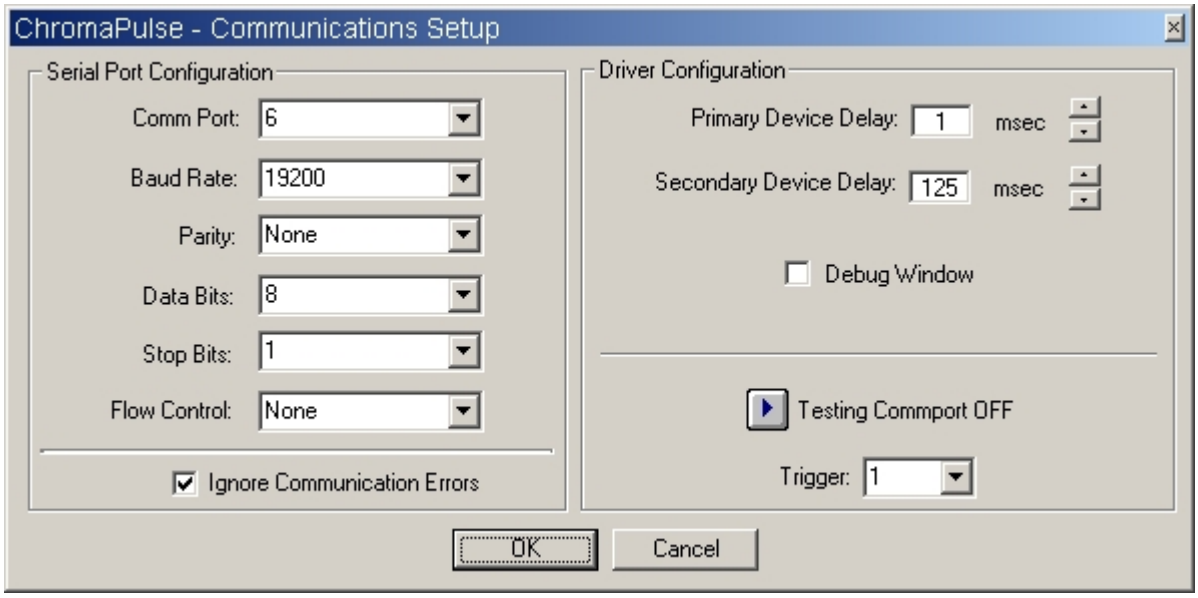
Communication...

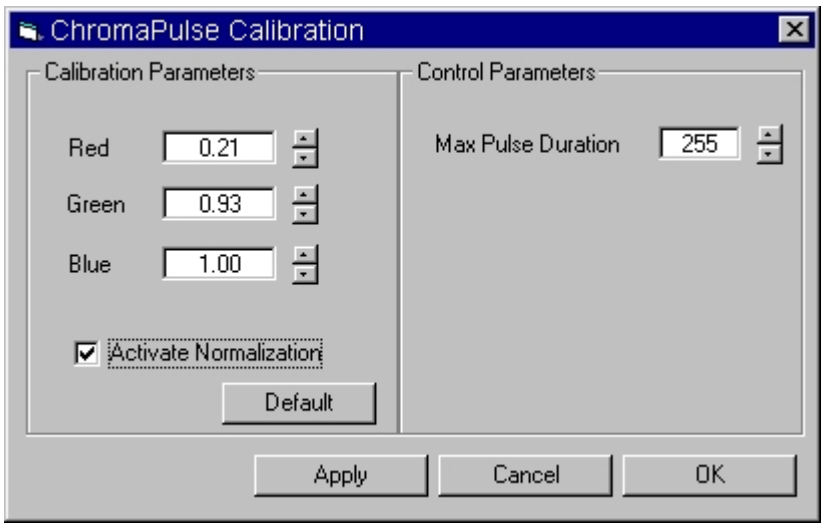
The Communications Setup menu allows you to select the serial port that the light control circuitry is connected to, and specify communications settings for the port. These settings should be left as they are upon system installation.



Calibration...

The Calibration menu (shown below) provides the capability to balance the light intensity between red, green and blue lights. Normally, these settings should be left as they are upon system installation.

- If your system has Base, Neck, and Seal Surface modules, they do not use this type of lighting; the calibration parameters remain grayed out.
- If your system is using the Chromapulse light type, these parameters are active.



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Activate Normalization [Chromapulse Light Type]

In 4.2 and later software, the default setting is un-checked. When checked, the appropriate intensity proportion factors are applied to red, green, and blue so the light intensities between the colors will be balanced. That is, for example, if you set red, green, and blue all to 50%, they will all be the same intensity. If you un-check this box, you can enter other values for each color.

Max Pulse Duration

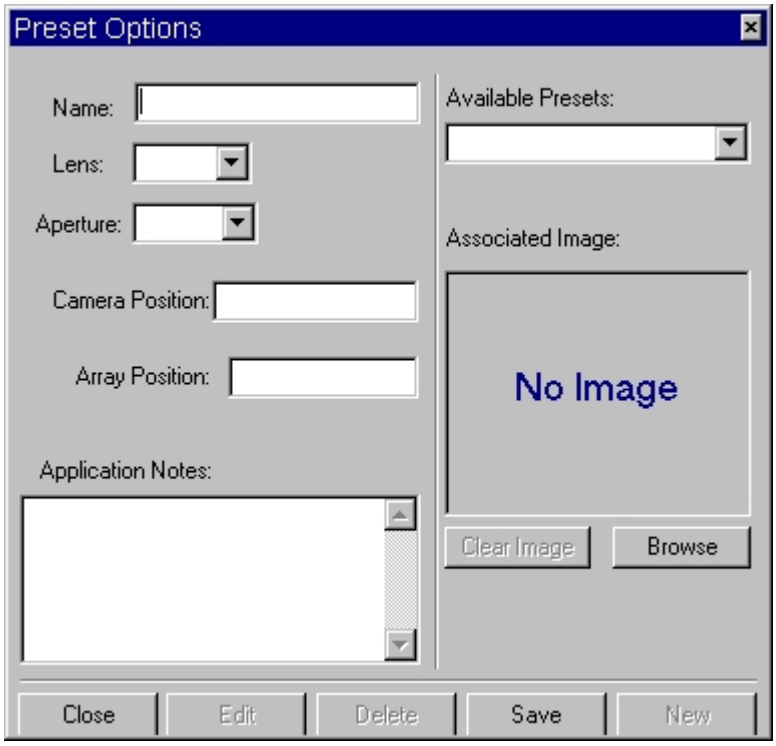
This can be used to set a limit on the maximum intensity setting for any and all lights. It may be useful to limit the max pulse duration in applications where image blur is a problem due to very fast line speeds. This could prevent someone from accidentally setting a light configuration that results in image blur. The maximum setting is 255.

Note: If the Multiplier parameter in the ***Advanced Controls menu*** (see "Lighting Sections" on page 151) is set to 2X, pulse durations will be doubled, resulting in higher intensity settings and risk of image blur.

Presets

Presets are similar to .csf (Chromapulse setup file) files. A preset contains the lighting setup parameters plus additional information in the form of application notes. These additional application notes can help you re-create an inspection setup that was used in the past.

To create a new preset or edit an existing preset, click the Edit option from the Presets menu. The window shown below will be displayed.



From this window, you can:

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- Create a new preset by selecting the New button at the bottom right of the screen.
- Edit an existing preset from the Available Presets drop-down menu.

Each field is defined below:

Name

Reports the name of the selected preset. If you are creating a new preset, type a name here.

Lens

Reports the type of lens used in the setup. If you are creating a new preset, click the down arrow to list the lens options and select the appropriate option.

Aperture

Reports the aperture setting used in the setup. If you are creating a new preset, click the down arrow to list the aperture options and select the appropriate option.

Camera Position

Log the camera height used in the setup. You can note the camera height from the vertical scale located on some inspection modules.

Array Position

Log the height of the light assembly. You can note the light assembly height from the vertical scale located on some inspection modules.

Application Notes

Type additional application notes. Use this area for any important information that would help you re-create the inspection setup.

Available Presets

Select an existing preset from the drop-down menu. When the desired preset is displayed, click Edit to make changes to it.

Associated Image

This area is used for displaying a sample image of the inspection setup. This can be used as a reference when setting up the inspection. If you are creating or editing a setup, click the Browse button to select an image file to display.

Browse to the directory in which you saved your image. The image must be a bitmap (.bmp) image that was already saved by the Intellispec system.

Close Button

Close the preset window without saving any changes you have made.

Edit Button

Make changes to the selected preset.

Delete Button

Delete the selected preset.

Save Button

Save a new preset you have created, or save changes you have made to an existing preset.

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New Button

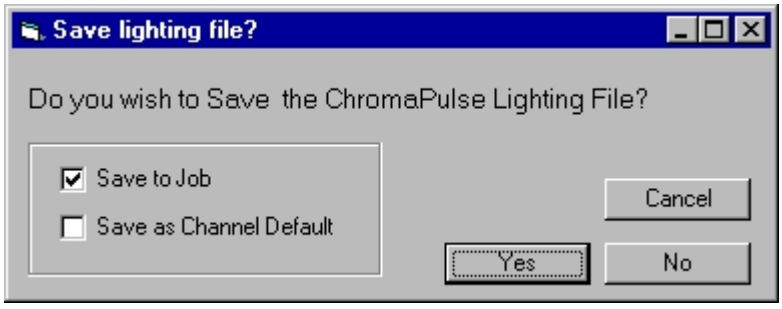
Use the New button to create a new preset.

Help

Shows the version of Chromapulse SmartLight software. Pressco Tech Support or Service may need this information to help you troubleshoot.

Exiting SmartLight

Click Exit from the menu. The system asks whether you want to save the changes you made. If the Preset or one of the Setup menus is open, you must close it first before exiting SmartLight.



Your choices when exiting SmartLight are as follows:

- **Cancel** returns to SmartLight
- **No** discards any changes you made and exits
- **Yes** saves changes. Choose whether to save the changes to the current job, save as Channel Default settings, or both.
  - If you **Save to Job**, the light settings will automatically be loaded each time the current job is loaded.
  - If you **Save as Channel Default**, the light settings will automatically be loaded for any job on that channel. This may save you time in the future when you are setting up future jobs that require similar lighting for the same channel.

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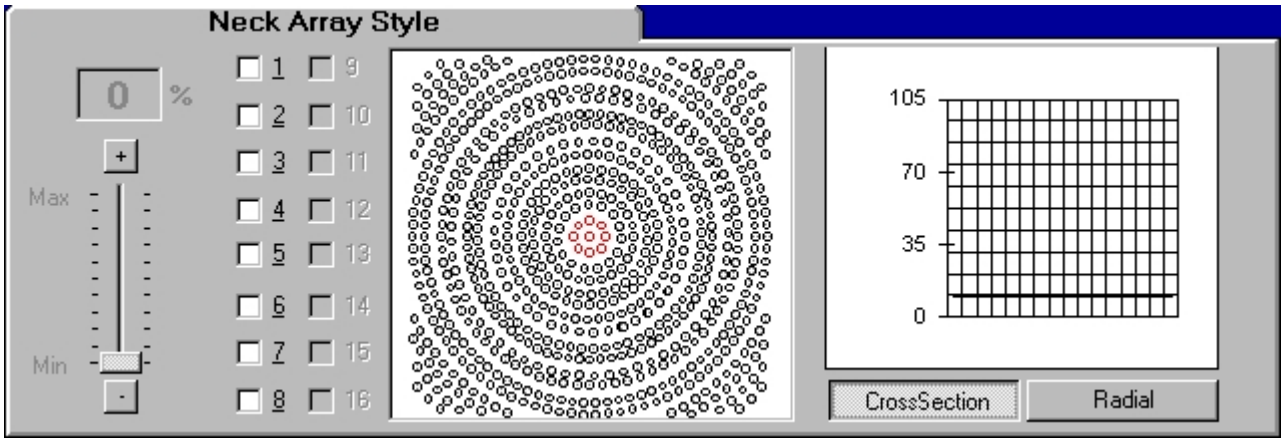
PET APPLICATION LIGHTING

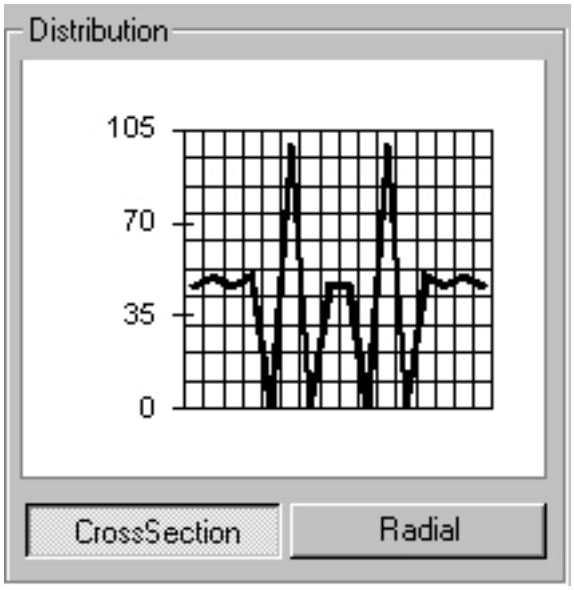
If your system is using Base, Neck, or Seal Surface lighting configurations, SmartLight will look similar to the screen shown below.



Lighting Distribution

This graph shows the current pattern of light in either a cross-section or radial view. View these as though you are looking eye-level across the array.

- The Cross-Section area shows the intensity of each zone. View the middle of the graph as the center of the array, with the peaks on either side representing the intensity of the surrounding zones.



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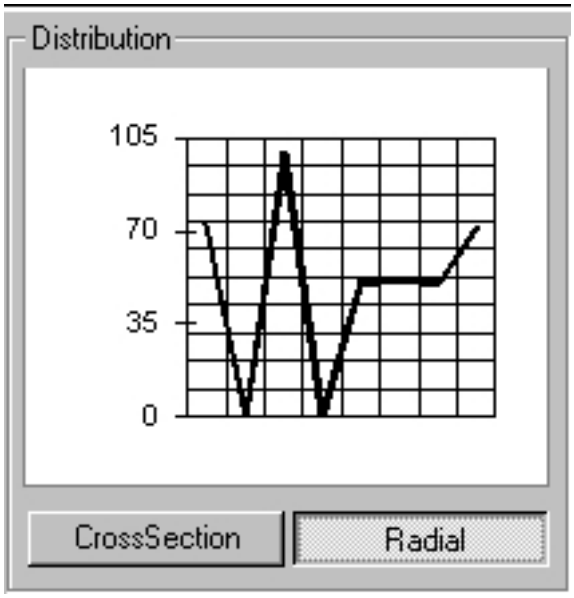
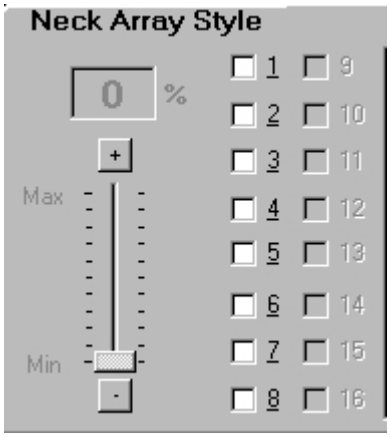
- The Radial view shows the intensity of the zones along a radial. View this as looking from the center of the array (left side of the graph) outwards to any edge of the array (right side of the graph).



Intensity Control

This area of the light control program allows you to make adjustments for separate zones of the lighting array.



The slider controls the light intensity of the different zones. You must first select the desired zone(s) before making adjustments with the slider. Note the following:

- The zone you want to control must be active. That is, select each zone so there is a check in its box to make it active.
- The number at the top of the slider reports the current intensity setting (0 to 100 percent). A setting of 100 percent is the maximum or brightest intensity setting. By clicking to the top or bottom of the slider, you can increment or decrement the value by 1. You can also click the + or - signs to increment or decrement the value.

You can adjust the intensity of one or more zones at the same time, as long as they are all active when you adjust the slider.

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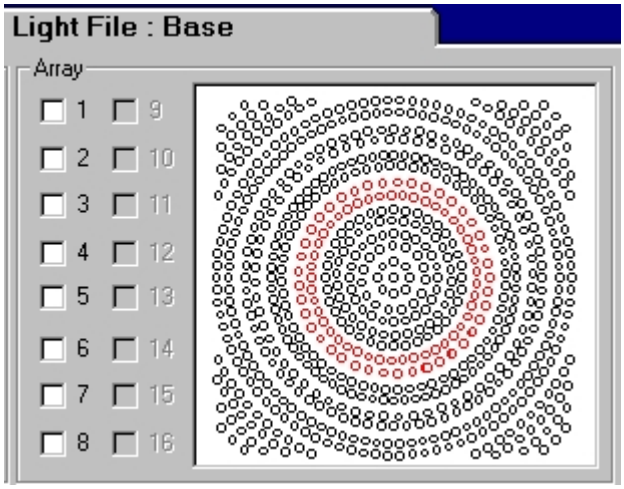
Base Lighting Zones

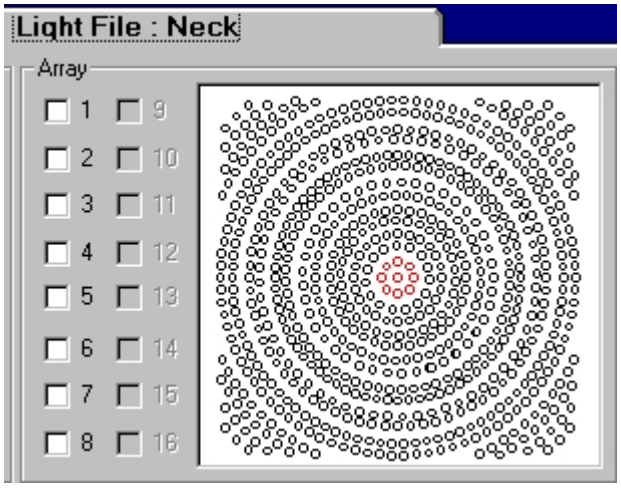
The Base lighting array has eight zones. Seven of the zones are made up of infrared LEDs; these are shown in black on the lighting array diagram (shown below). One zone is made of red LEDs, shown in red on the diagram. These red LEDs form a darker ring of light around the outside of the base. This ring is used during inspections to determine proper bottle color.



When you check a zone, the Intellispec highlights it, so you can see which parts of the array you are controlling. The LEDs illustrated in the array become more intense as you increase the light intensity.

Neck Lighting Zones

The Neck array has eight zones, seven of which are infrared LEDs. The middle zone is made up of red LEDs. The dark spot you may see in the middle of a neck image, particularly on green bottles, is the result of these red LEDs. This feature is useful to determine proper bottle color.



When you check a zone, the Intellispec highlights it, so you can see which parts of the array you are controlling. The LEDs illustrated in the array become more intense as you increase the light intensity.

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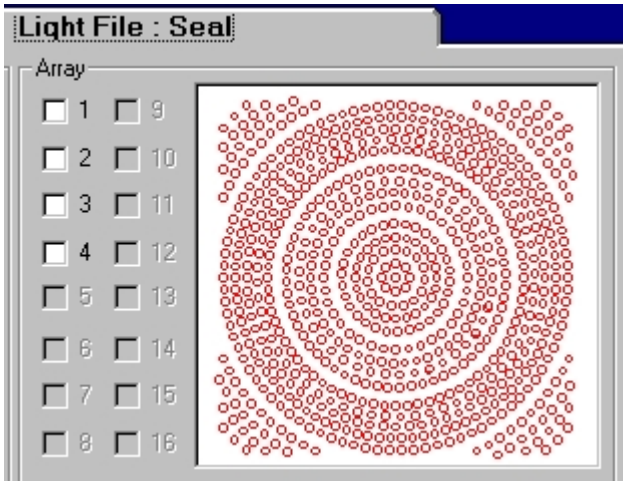
Seal Surface Lighting Zones

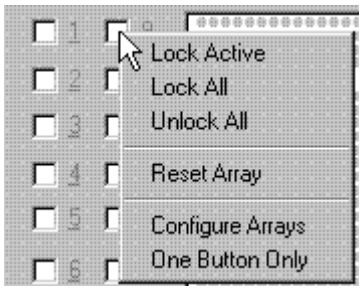
The Seal Surface array is made up of four zones of red LEDs.



When you check a zone, the Intellispec highlights it, so you can see which parts of the array you are controlling. The LEDs illustrated in the array become more intense as you increase the light intensity.

Pop-up Menu (from Intensity Control)

When you right click on the slider bar area or zone area, and a zone is active, the pop-up menu shown below will appear.



This menu provides several functions:

Lock Active

This option locks all the active (set greater than zero) zones together so that you can make changes to them all at once.

Sometimes you might have several zones that are active, but you may not be using all the zones in the array. Say you are using zones 1, 3, 6, and 8, and want to increase the overall intensity of your lighting. You could click the Lock Active option, and Smartlight would select zones 1, 3, 6, and 8 for you. You do not have to know which zones are active – the system does. You could then make your adjustments to all the active zones at once.

Lock All

You can lock all the zones together so the intensity of all zones can be adjusted together. This allows you to shift the intensity of the entire array up or down.

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Unlock All

This removes the lock from all the zones so that the intensity of the zones can be adjusted individually.

Reset Array

Selecting Reset Array will set all zones to zero.

Configure Arrays (Preform only)

This option allows you to identify which LED section belongs to which zone. This procedure should be done only during installation, and should not be changed under normal operating conditions.

To assign a section of LEDs to a zone:

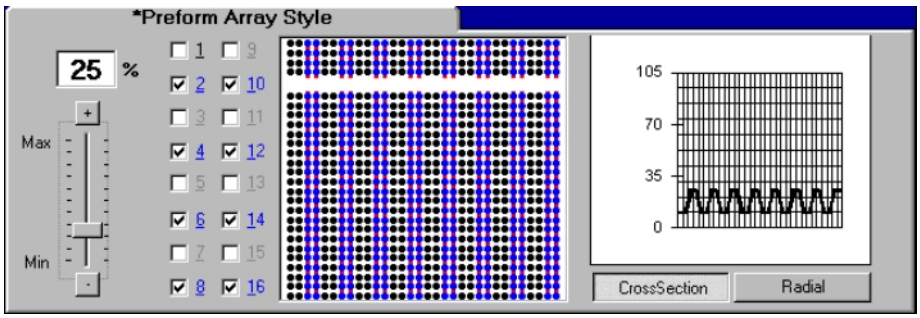
1) Check the Configure Arrays option. A check mark will appear next to it while you are configuring the arrays.
2) Check a Zone to configure. Click each LED section that you want to be included in a zone. Note that clicking a section that was already assigned will turn that section off.
3) Repeat step 2 until all zones are configured properly.
4) Right-click the zone area to see the pop-up menu. Un-check the Configure Arrays option.

One Button Only

When you select this option, only one zone at a time can be adjusted with the intensity slider. You must click on this option again to de-select it.

PET PREFORM OR SIDEWALL LIGHTING

If your system has preform or sidewall inspection modules, your light control screen will look like the screen shown below.



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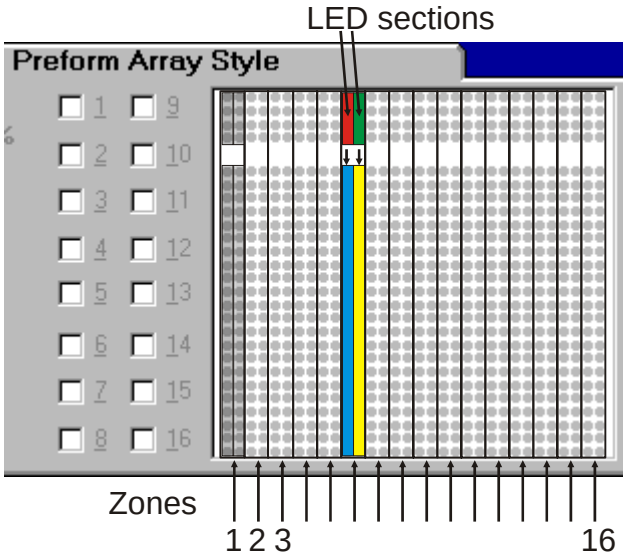
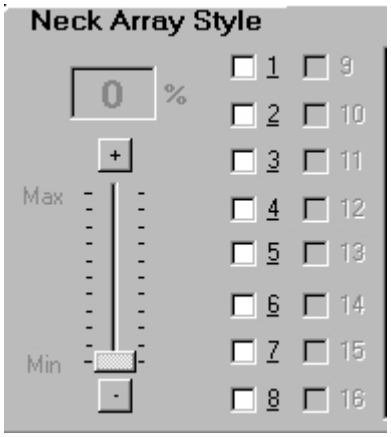
Zones for PET Preform or Sidewall Applications

The Preform Sidewall array has 16 zones, made of infrared and blue LEDs. The odd-numbered zones have infrared LEDs and the even-numbered zones have blue LEDs. Each zone has four separate sections of LEDs that can be configured (see Configure Arrays below) for light intensity. However, once configured, all those four sections are controlled as one zone at a time.



Intensity Control for BNS, Preform

This area of the light control program allows you to make adjustments for separate zones of the lighting array.



The slider controls the light intensity of the different zones. You must first select the desired zone(s) before making adjustments with the slider. Note the following:

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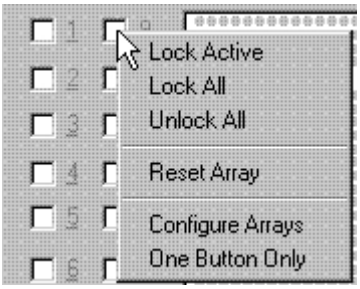
- The zone you want to control must be active. That is, select each zone so there is a check in its box to make it active.
- The number at the top of the slider reports the current intensity setting (0 to 100 percent). A setting of 100 percent is the maximum or brightest intensity setting. By clicking to the top or bottom of the slider, you can increment or decrement the value by 1. You can also click the + or - signs to increment or decrement the value.
- You can adjust the intensity of one or more zones at the same time, as long as they are all active when you adjust the slider.

Pop-up Menu (from Intensity Control)

When you right click on the slider bar area or zone area, and a zone is active, the pop-up menu shown below will appear.



This menu provides several functions:

Lock Active

This option locks all the active (set greater than zero) zones together so that you can make changes to them all at once.

Sometimes you might have several zones that are active, but you may not be using all the zones in the array. Say you are using zones 1, 3, 6, and 8, and want to increase the overall intensity of your lighting. You could click the Lock Active option, and Smartlight would select zones 1, 3, 6, and 8 for you. You do not have to know which zones are active – the system does. You could then make your adjustments to all the active zones at once.

Lock All

You can lock all the zones together so the intensity of all zones can be adjusted together. This allows you to shift the intensity of the entire array up or down.

Unlock All

This removes the lock from all the zones so that the intensity of the zones can be adjusted individually.

Reset Array

Selecting Reset Array will set all zones to zero.

Configure Arrays (Preform only)

This option allows you to identify which LED section belongs to which zone. This procedure should be done only during installation, and should not be changed under normal operating conditions.

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To assign a section of LEDs to a zone:

1) Check the Configure Arrays option. A check mark will appear next to it while you are configuring the arrays.
2) Check a Zone to configure. Click each LED section that you want to be included in a zone. Note that clicking a section that was already assigned will turn that section off.
3) Repeat step 2 until all zones are configured properly.
4) Right-click the zone area to see the pop-up menu. Un-check the Configure Arrays option.

One Button Only

When you select this option, only one zone at a time can be adjusted with the intensity slider. You must click on this option again to de-select it.

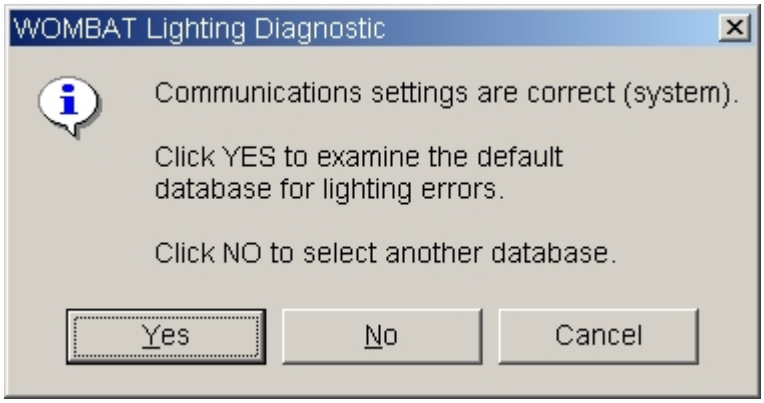
LIGHTING DIAGNOSTIC

USER LEVEL: MECHANIC AND ADMINISTRATOR

The Database Detective (Wombat) will check the database for lighting errors. Follow the steps shown below to run the diagnostic.

To check for lighting errors:

1) Click button.
2) Click Database Utilities tab.
3) Click Database Detective.
4) Press CTRL+L.
5) Choose a database to examine:
    - **Yes** examines the active (default) database
    - **No** allows you to select a different database



- If no error is found, no message is displayed.
- If an error is found, an appropriate message is displayed. To see the errors, make a ***Process Sheet*** (see "Make a Process Sheet" on page 232). The process sheet highlights the errors.
    - Most lighting errors come from copying a job from another database or machine where the hardware is different

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- Adjustments can be made to the job to correct it and use the proper settings for that machine
- ***Contact Pressco*** (see "How to Contact Pressco" on page 633) Technical Support for assistance in correcting these errors

CAMERA CONTROL

USER LEVEL: ADMINISTRATOR

This tool makes it easier for you to modify camera focus (and aperture, where available) when inspection modules are mounted inside part conveying systems. The camera control utility is available for several, but not all inspection modules.

On some inspection modules, there may be hardware support for software-controlled focus, but there may not be hardware support for software-controlled aperture. Check for information in your Inspection Module section.

Before Using Camera Control

1 - Select camera type

Each camera must be configured to use software camera control. Normally, these settings are configured during installation and do not need to be changed.

To set camera type:

1) Click button.
2) Click the Show All Advanced Parameters box.
3) Choose Camera Control Type (Stepper or Servo).
4) Click ☑. System must re-start.

2 - Enable camera control

Each camera must be individually configured to use camera control.

To enable camera control:

1) Click button.
2) Select Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Under the Switch to Camera section, select a camera.
6) Select the Camera Control tab.
7) Check the Camera Control box.
8) Click ☑. Camera control is enabled for the selected camera.

> Note: when you enable Camera Control, the Camera Control 2 tab becomes available. This second camera control is only for older, upgraded systems that had multiplexed images (two views of a part on one image).

9) Repeat for remaining cameras:
   - If you have another camera, click the [Channel Group > Channel > Camera] tab. If applicable, select a different channel group under the Switch to Channel Group section. Then go to step 4.

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- If you do not have another camera to configure, go to step 10.

10) Click ⊠ to exit.

3 - Set image acquisition mode

To see the effects of your lighting adjustments, the system must acquire images. The system can be set to snap upon detection of a part present signal, or to snap continuously.

To set camera acquisition mode:

- If your parts are moving through the system:
  1) Right-click on image.
  2) Select Image >> Tools >> Acquire Mode.
  3) Select Part Present.

- If your parts are not moving:
  1) Right-click on image.
  2) Select Image >> Tools >> Acquire Mode.
  3) Select Immediate.

4 - Select jobs or parts

- If Part Management is active:
  1) Click button.
  2) From the Select Part to Run drop-down menu, select the desired part. All appropriate jobs for the part are loaded.
  3) Click the ⊠ button to exit.

- If Part Management is not active (the button is unavailable or no parts have been set up):
  - ***Select a job*** (see "Using JOB Management" on page 113) for each camera you want to modify with the Camera Control tool.

5 - Set camera control parameters

Next, set up the camera control parameters for either ***Servo*** (see "Setting up Camera Control – Servo Cameras" on page 172) or ***Stepper*** (see "Setting up Camera Control – Stepper Cameras" on page 178) cameras.

Setting up Camera Control – Servo Cameras

USER LEVEL: ADMINISTRATOR

The following parameters are used to set up the search region for the ***Camera Control tool*** (see "Using Camera Control Tool – Servo Cameras" on page 175).

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.

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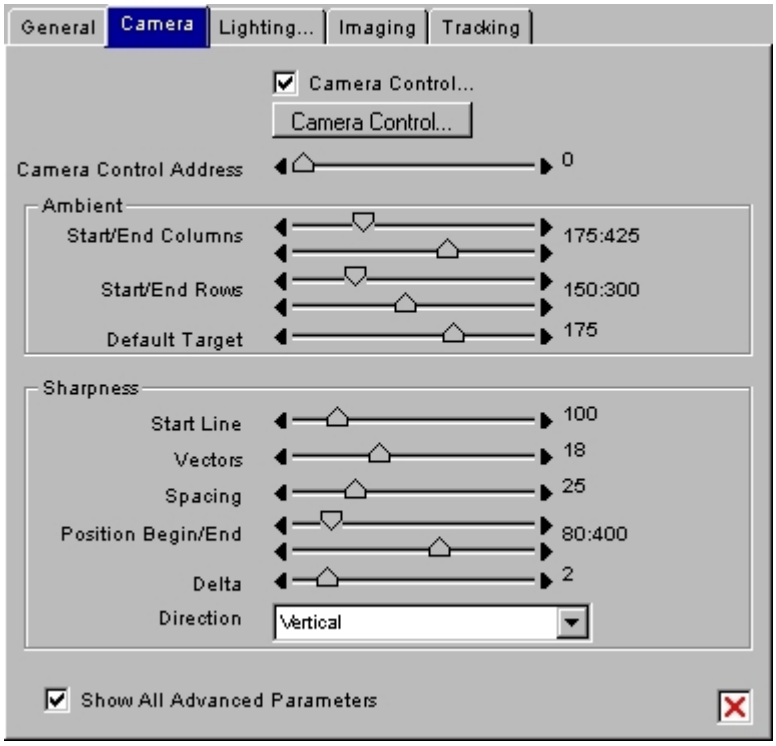
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Under the Switch to Camera section, select a camera.
6) Click the Control 1 (or Control 2) tab.
7) Check Show All Advanced Parameters box.



Camera Control...

Indicates whether there is a controllable camera attached to the current channel.

❖ *Note: Some system configurations (hardware) do not support software camera control. Check the Inspection Module information to see whether your camera is software-controllable.*

Camera Control Address

This is the address of the Camera Control board. There is one board for each controllable camera in the system. The typical setup is Channel 1 = address 0, Channel 2 = address 1, etc.

❖ *Note: This should be set up during installation and should not be changed.*

Ambient settings

The Camera Control tool automatically computes the ambient of a newly acquired image. This helps you set the camera aperture or lighting to the appropriate setting.

To determine the ambient, the system uses a rectangular area on the image. You can change the size and position of this rectangular area through the Ambient Start/End Columns and Rows parameters. The ambient search region is shown in magenta on the image when you activate the Camera Control tool (click the Start button).

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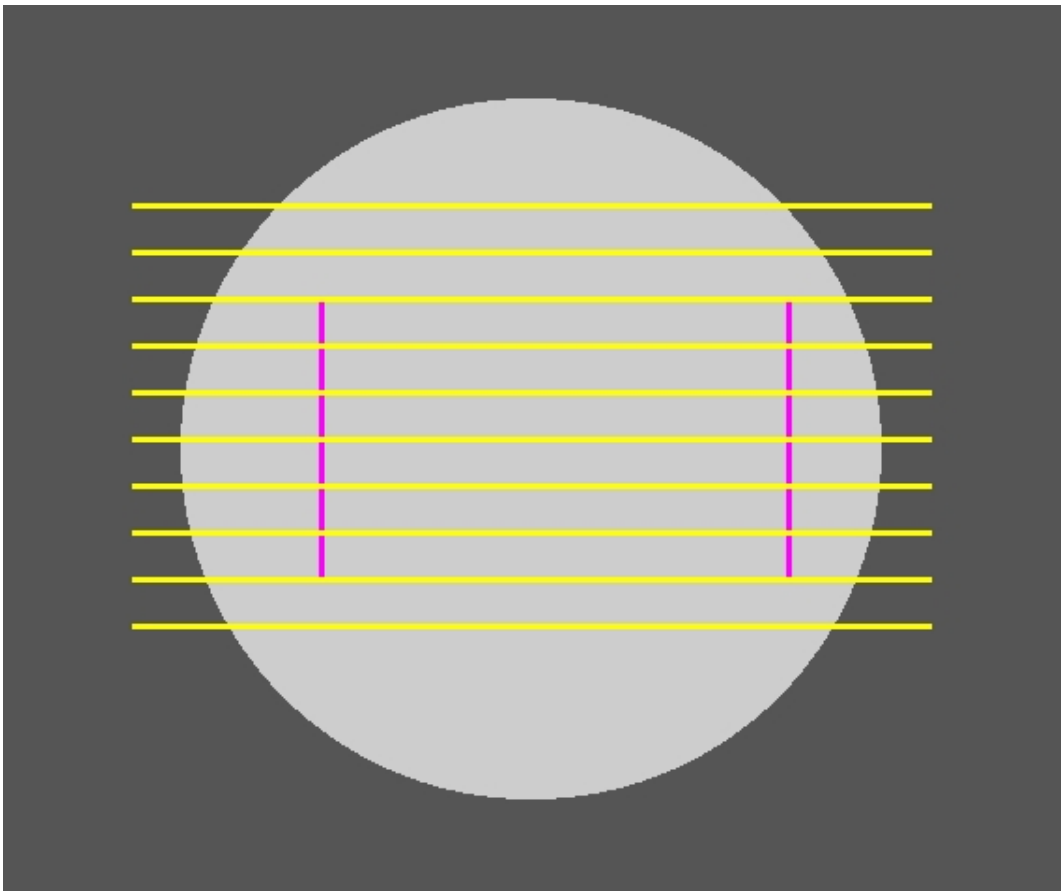
Ambient Start/ End columns

Indicates the top left and right coordinates of the rectangular ambient search region for the Camera Control tool.



Ambient Start/ End rows

Indicates the top and bottom coordinates of the rectangular ambient search region for the Camera Control tool.

Default Target

This is a guide for setting the aperture or lighting to achieve desired image intensity. This is just a target and has no effect on the operation of the Camera Control tool or the system.

Sharpness settings

The Camera Control tool automatically computes the sharpness of a newly acquired image. This will help you set the camera focus.

To determine the sharpness, the system places several search vectors on the image (either horizontal or vertical) and averages the maximum gradient found in those vectors. The sharpness parameters are used to generate the search vectors. These vectors are shown in yellow on the image when you activate the Camera Control tool.

Start Line

Indicates the row (if horizontal searches) or column (if vertical searches) to begin placing search vectors.

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Vectors

The number of vectors used to compute sharpness.

Spacing

The number of pixels between search vectors.

Position Begin/ End

The beginning and ending coordinates of the sharpness search vectors. These are the vertical or horizontal coordinates depending on whether Direction is vertical or horizontal.

Delta

The distance between pixels in each search vector to search for the largest gradient.

❖ *Note: Be careful with this parameter – increasing it may result in better looking sharpness values, but it may not be a true indication of focus.*

Direction

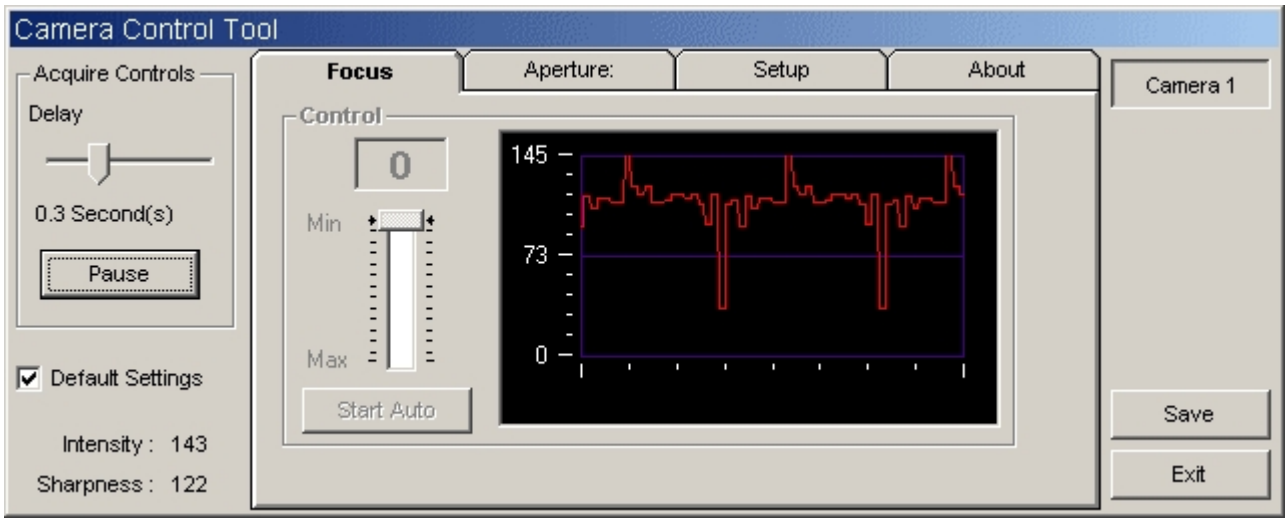
Indicates whether the search vectors are horizontal or vertical. This allows you to locate edges that might have a specific orientation in the image.

Using Camera Control Tool – Servo Cameras

USER LEVEL: ADMINISTRATOR

To access camera control:

1) Right-click image.
2) Select Camera Control.



Acquire Controls

This allows you to configure how often the system will acquire images while you adjust the camera. You can set a delay, in seconds, between acquisitions on the slider. Clicking on either side of the slider decreases or increases the delay by 0.1 seconds.

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Start Button

Causes the system to start acquiring images. When you click it, the button changes to Pause, which you can use to pause image acquisition.

When the system updates the images on the screen, it also displays the Ambient and Sharpness search vectors on the images.

Default Settings

The system is designed to allow you to set different focus positions for each job. However, most of the time, we recommend you use the same settings for all jobs on one channel. The Default settings box indicates whether the current job is using the default settings for focus or not.

If the Default Settings box is checked:

- You can make changes to the focus setting for a job. When you save this setting, it saves this new focus setting as the default for all jobs.
- Any other job for that channel can use the same default settings to simplify setup.

Caution

Saving changes with the Default Settings box checked changes the settings for all jobs in that channel that use the default settings.

If the Default Settings box is not checked:

- You can make changes to the focus setting for a job. You can save these changes for the current job only.

The following four tabs are considered the Control Tool:

Focus Tab

This tool allows you to set the best focus position of the camera. Press Start to acquire images, and then move the slider up and down for the best focus position. The goal is to achieve the highest focus position possible.

The graph area is a plot of the focus sharpness over time.

You can move the slider with the keyboard arrows (this is fine control), clicking above or below the current location (moves the slider in increments of 10 in either direction), or by grabbing the bar and dragging it up or down.

The Start Auto button allows the system to try to achieve the best focus position. If you press Start Auto, the system prompts you that this process can take approximately 90 seconds, during which you cannot control the system. If you allow the Auto test to proceed, the system goes through all the available focus servo positions and looks for the best focus response. Note that the Pause button to the left of the tool will not stop the Auto process.

Aperture Tab

The current hardware does not support changes to the aperture through the Camera Control tools. You must make changes at the camera itself, or change the lighting through the ***Light Control tool*** (on page 150).

Setup Tab

This is where the system is configured to talk to the Camera Control tool.

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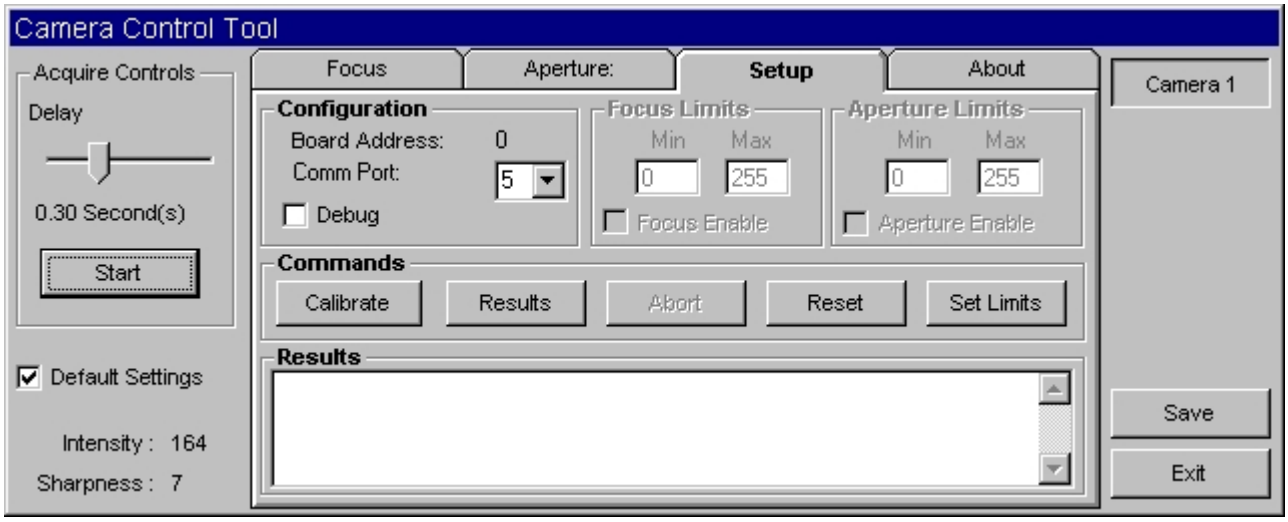
Caution
The tool is set up during initial installation, and should not be altered.

The following descriptions are provided for reference:

Board Address – The address of the camera control board. Address is 0 for Channel 1 and 1 for Channel 2.

Comm Port – The communications port used to communicate to the camera control board.



Commands

Calibrate – This causes the camera control servos to test the limit range and report the results to the system. This prevents you from entering an illegal servo position for the cameras.

Results – Pressing this button shows you the current servo limits used by the camera control board, displayed in the results area of the screen.

Abort – Allows you to stop a calibration task.

Reset – Sends a reset command to the camera control board.

Set Limits – Allows you to modify the calibration limits and sends them to the camera control board.

Caution
If you enter a value outside of the system's calibrated limits, this may cause camera malfunction.

About Tab

Shows the current version of the Camera Control Tool.

Camera *n* Buttons

Each camera that has Camera Control enabled will have a button. If the name of the camera is too long, the name will be truncated.

You must select one of these buttons before the Camera Control tool is activated. If you switch between cameras, you will be prompted whether to save the changes from the camera which you were previously using.

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In some systems, you will see multiple buttons for the same camera name (example, Camera #1a and #1b). This is only for older, upgraded systems that use multiplexed camera images for one image view.

Save

This allows you to save changes made with the Camera Control tool. You can then exit or continue to use the camera control tool.

- If the Default Settings box is checked, changes are saved for the channel. All other jobs that use the currently selected channel will use these default settings for focus and aperture.
- If the Default Settings box is not checked, the Camera Control settings are saved with the current job. The system will also ask whether you want to save these settings as the default settings for the current channel. Click Yes to save the changes as the Default Settings. Otherwise, click No.

Exit

This allows you to abort any changes you have made in the Camera Control tool and exit the tool.

Setting up Camera Control – Stepper Cameras

USER LEVEL: ADMINISTRATOR

The system must be configured for stepper cameras in the ***System Configuration menu*** (see "System tab details" on page 123). The system must be re-started.

❖ *Note: Camera Control is usually set up during manufacturing or installation and normally does not need to be changed.*

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Under the Switch to Camera section, select a camera.
6) Click the Control 1 (or Control 2) tab.

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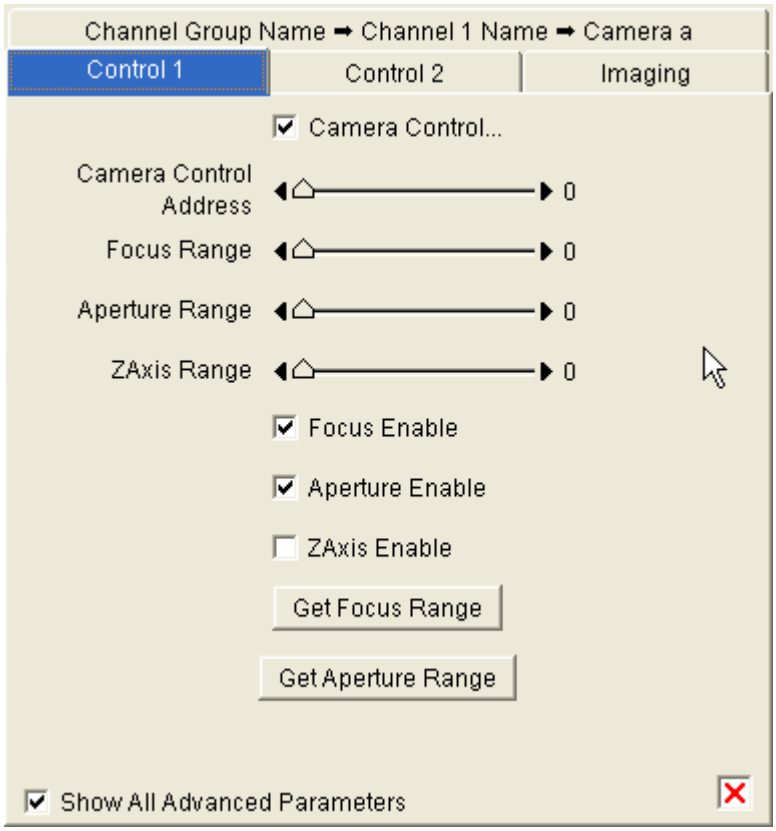
7) Check Show All Advanced Parameters box.



Some system configurations (hardware) do not support software camera control, or it may support focus but not aperture control. Check your Inspection Module chapters for information about your specific inspection modules. Enable Focus and/ or Aperture based on your hardware configuration.

Camera Control Address

This is the address of the Camera Control board. There is one board for each controllable camera in the system. The typical setup is Channel 1 = address 0, Channel 2 = address 1, etc.

❖ *Note: This should be set up during installation and should not be changed.*

Focus Range

Dependent on hardware. Click the Get Focus Range button (if Focus Enable checked). This allows the software to determine the focus range for your camera lens.

Aperture Range

Dependent on hardware. Click the Get Aperture Range button (if Aperture Enable checked). This allows the software to determine the aperture range for your camera lens.

Z Axis Range

Dependent on hardware. Click the Get Z-Axis Range button (if Z Axis Range checked). This allows the software to determine the Z axis range for your camera lens.

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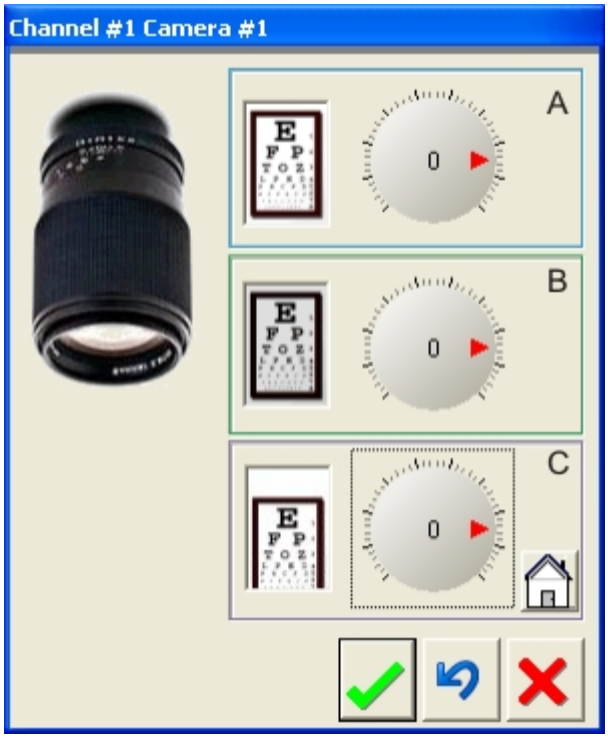
Click ☑ to accept settings. Repeat for other control tab for the camera (if applicable).

Using Camera Control Tool – Stepper Cameras

USER LEVEL: ADMINISTRATOR

To use Camera Control:

1) Select a camera.
2) Right-click on the image.
3) Select Camera Control >> select a camera.
4) Make appropriate changes.
5) Repeat for each applicable channel.



A	focus adjust
B	aperture adjust
C	Z-axis adjust

Focus

The box indicates change of focus. Click and drag the arrow to change focus while viewing image on screen.

Aperture

The box indicates change of aperture. Click and drag the arrow to change aperture while viewing image on screen.

Z-Axis

The box indicates change of camera height. Click and drag the arrow to change the camera height while viewing image on screen. To re-set camera height to its default position, click .

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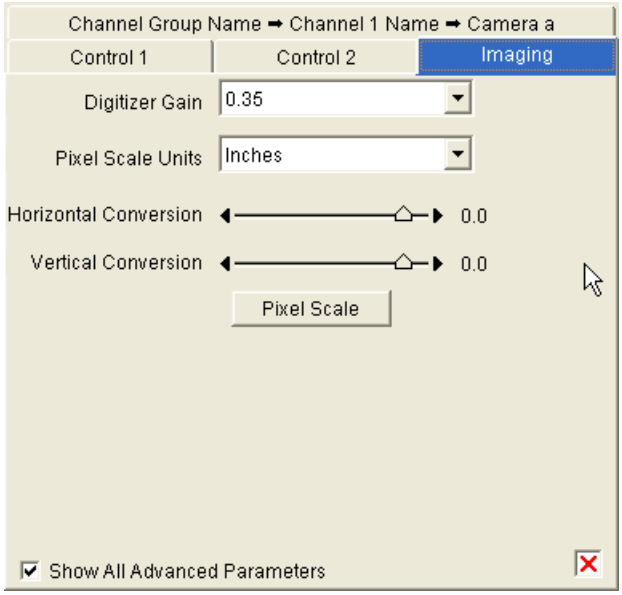
- When satisfied with the image, click to save.
- To undo all changes, click .
- To exit, click . If you have not yet saved changes, the system prompts you to save, not save, or cancel (go back to Camera Control tool).

IMAGING CONFIGURATION

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.
2) Click Channel Groups tab.
3) Select a channel group.
4) Under the Switch to Channel section, select a channel.
5) Under the Switch to Camera section, select a camera.
6) Click Imaging tab.



Digitizer Gain

(Advanced parameter) Change the gain of the current camera from the available choices. This should only be performed during installation.

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Pixel scale conversion

The next three parameters allow you to set up pixel-to-real world measurements for each channel. Any algorithms that perform measurements can use these conversion settings.

Caution

These settings override those set in ***Pixel Scale Calibration*** (on page 182).

Pixel Scale Units

Choose to have measurements reported in millimeters, inches, pixels, or custom. Custom allows any measurement conversion.

Horizontal Conversion

(Advanced parameter) Specify how many pixels horizontally convert to one Pixel Scale Unit (e.g., 1 pixel = 1 millimeter, or 10.78 pixels = 1 inch). Enter the appropriate number of pixels.

Vertical Conversion

(Advanced parameter) Specify how many pixels vertically convert to one Pixel Scale Unit (example, 1 pixel = 1 millimeter, or 10.78 pixels = 1 inch). Enter the appropriate number of pixels.

Pixel Scale Calibration

USER LEVEL: ADMINISTRATOR

Pixel Scale Calibration allows you to program the system to translate pixels into your desired units of measure (mm, for example). A pixel to unit of measurement ratio is important to determine when dimension inspections are used. You can use Dimension or Circle Dimension inspections to measure the diameter of a seal surface, the diameter of a rivet, or the length of a gate on a preform, as a few examples.

The dimension inspections that use these settings are:

- ***Dimension inspection*** (on page 396)
- ***Circle Dimension inspection*** (on page 366)
- ***Circle Width Dimension inspection*** (on page 448)
- ***Fill Height inspection*** (on page 531)
- ***Label Skew Dimension inspection*** (on page 543)

Before Entering Pixel Scale Calibration

Before entering Pixel Scale Calibration, acquire an image for the camera on which you are calibrating the pixel scale.

To acquire an image:

1) Stop the production line. The calibration must be done on a still part.
2) Put a calibrated part, of which you know the exact measurements, in the camera's field of view.
3) Select the camera.
4) Right-click on the image.
5) Select Image >> Tools >> Acquire Mode.
6) Select Immediate.

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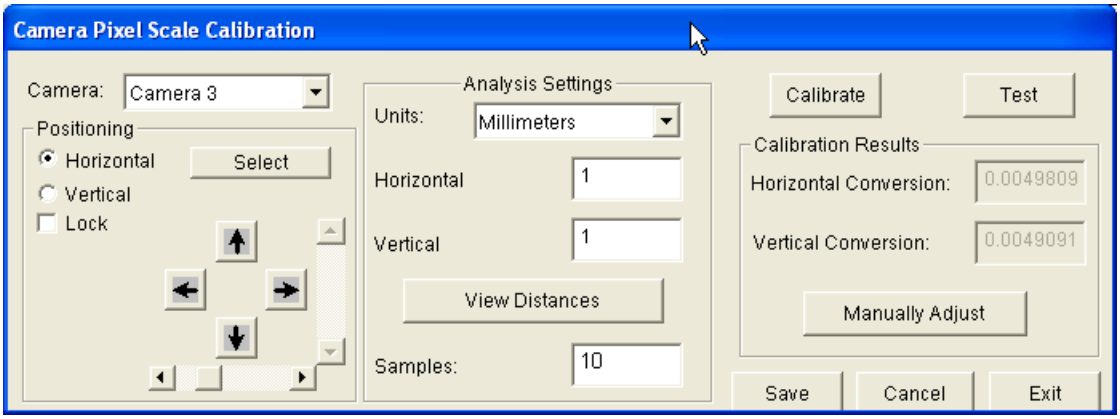
7) Click the button to acquire an image. The new image is displayed on the screen.

Calibrating the Pixel Scale

To get to this menu:

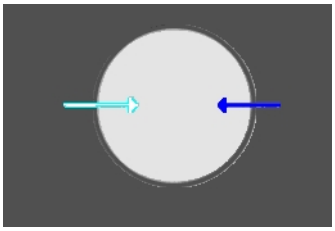
1) Select a camera. Each camera must be done separately because the hardware adjustments for each camera may be slightly different from each other.
2) Right-click on the image.
3) Select Pixel Calibrate. The Pixel Scale Calibration screen will display.
4) Select a camera within the Pixel Scale Calibration menu. After you calibrate one camera, you can select another camera directly from this menu.



Next set the positioning arrows. These find areas on an image where the system will calibrate the pixel scale.

To set positioning:

1) Click the Horizontal button. The system displays an image with two horizontal arrows.



2) Move the arrows to a place on the part where you know its exact horizontal measurement. The body of the arrows must cross over the edge transition that you want the system to find.
   - To move the arrows, click the arrow buttons under Positioning.
   - To move the arrows quickly, hold the left trackball button down on an arrow button.
   - **Lock** – The Lock button indicates that these two arrows will move together with the up and down arrow buttons. Un-check the Lock button to move the arrows separately.
   - **Select** – the cyan (light blue) arrow on screen is the one currently selected. To select the other arrow, toggle the Select button. Note that if the Lock button is checked, both arrows will move.

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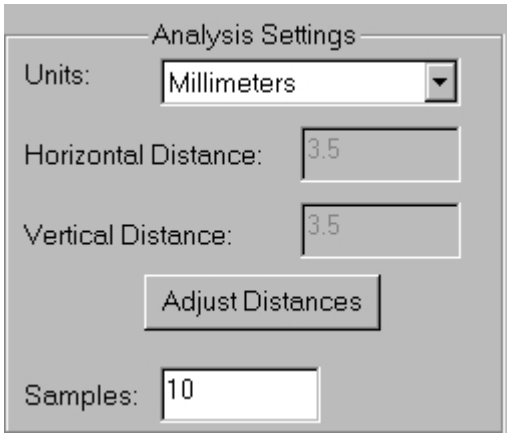
3) Click the Vertical button. Move the vertical arrows to a place on the part where you know its exact vertical measurement. The body of the arrows must cross over the edge transition that you want the system to find.

Next, set the Analysis settings – this is where you tell the system your desired units of measure, and your part's exact vertical and horizontal measurements.

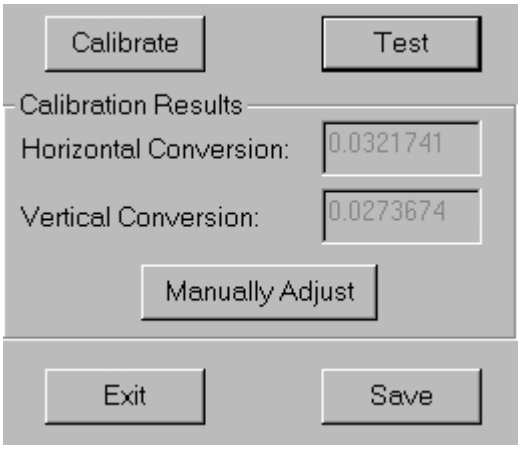


- **Units** – choose the unit of measure you used to measure your part. Choose from millimeters, inches, pixels, or custom. Custom allows any measurement values.
- **Adjust distances** – click this button, and then enter the exact measurements of your calibrated part. Click View Distances.
- **Samples** – this is the number of images the system will take to compute the measurements. It will use the average value of all the samples.

Next, perform the calibration.

To calibrate the pixel scale:

1) Click the Calibrate button. The system acquires the number of images specified in the Samples box.



- From the arrow search vectors, the system finds the strongest edge transitions, and computes the unit of measurement per pixel.
- The system displays the search vectors and displays green crosses where the strongest edge transition was found.

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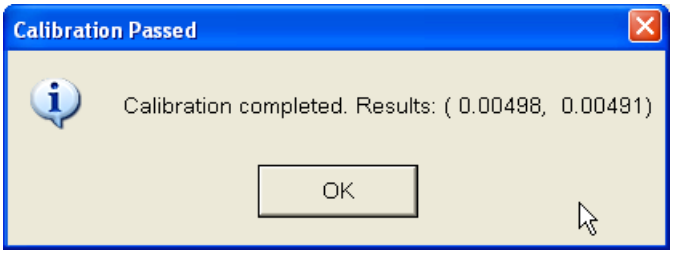
2) Click OK.



- If you encounter an error, check the positioning settings. Make sure the Horizontal and Vertical search arrows are positioned correctly on the image to find an edge.

3) Click the Test button to see the number of pixels that translate into your desired unit of measure. Click OK.

- If you do not agree with the system's calibration results, you can adjust the number of units per pixel. Click Manually Adjust. You can then change the Horizontal or Vertical conversion factors reported in these boxes. If you make changes, click Save to allow the system to accept the changes, then click View Only.
- If you click Calibrate again, the system will re-compute the horizontal and vertical conversion factors based on the edges it found with the search vectors.
- Click Save to keep the calibration results for this camera, then click Exit. If you click Exit before you click Save, all calibration adjustments will return to those values that were present when you entered this screen.

4) Perform all above procedures for all cameras on which you want to calibrate the pixel scale.

Put the system back in normal inspection mode.

To put the system in normal inspection mode:

1) Click the Exit button to remove Pixel Scale Calibration from screen.
2) Right-click on the image.
3) Select Image >> Tools >> Acquire Mode.
4) Select Part Present.

ABOUT THE IMAGE ANALYSIS TOOL

USER LEVEL: MECHANIC AND ADMINISTRATOR

This tool displays the gray shade value for any group of pixels in your image. This is useful in programming jobs or setting up lighting. You can measure grayscale values of pixels in horizontal or vertical lines, or over a circle.

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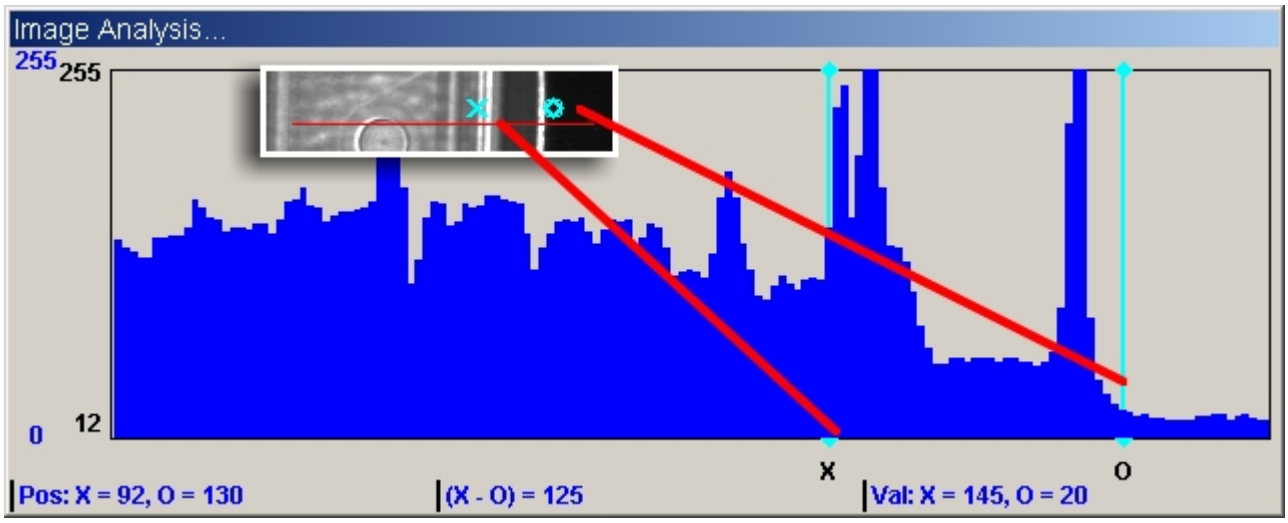
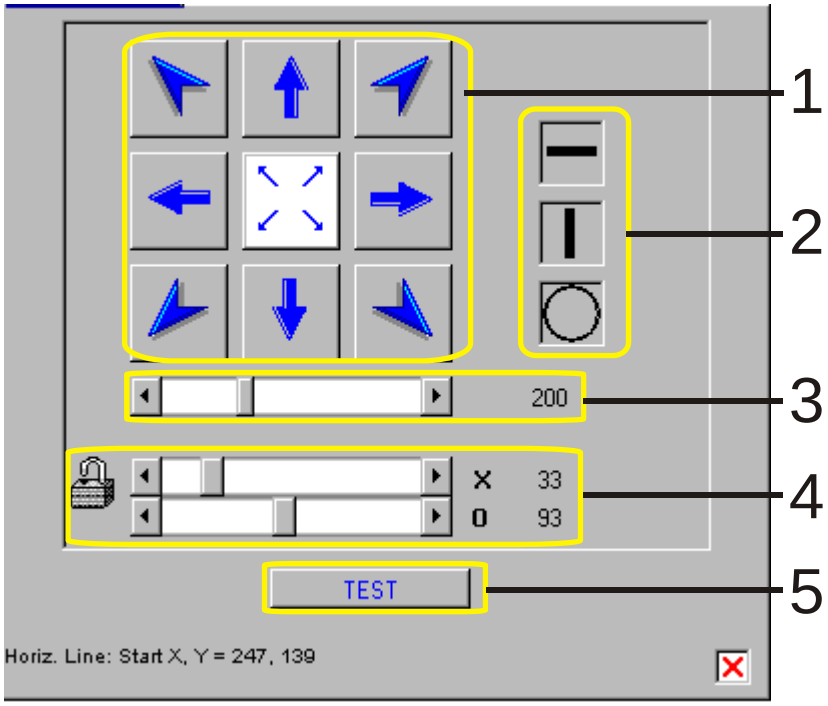
To activate Image Analysis:

1) Select a channel.
2) Right-click on the image and choose Image Analysis from the menu.

Moving the cursors (X and O) through the control panel (shown below) provides gray shade information on specific areas, sets a delta, and determines the gradient.



Control Panel



1	Position of line or circle on image
2	Shape
3	Length of line or diameter of circle
4	Position of X and O cursors on image

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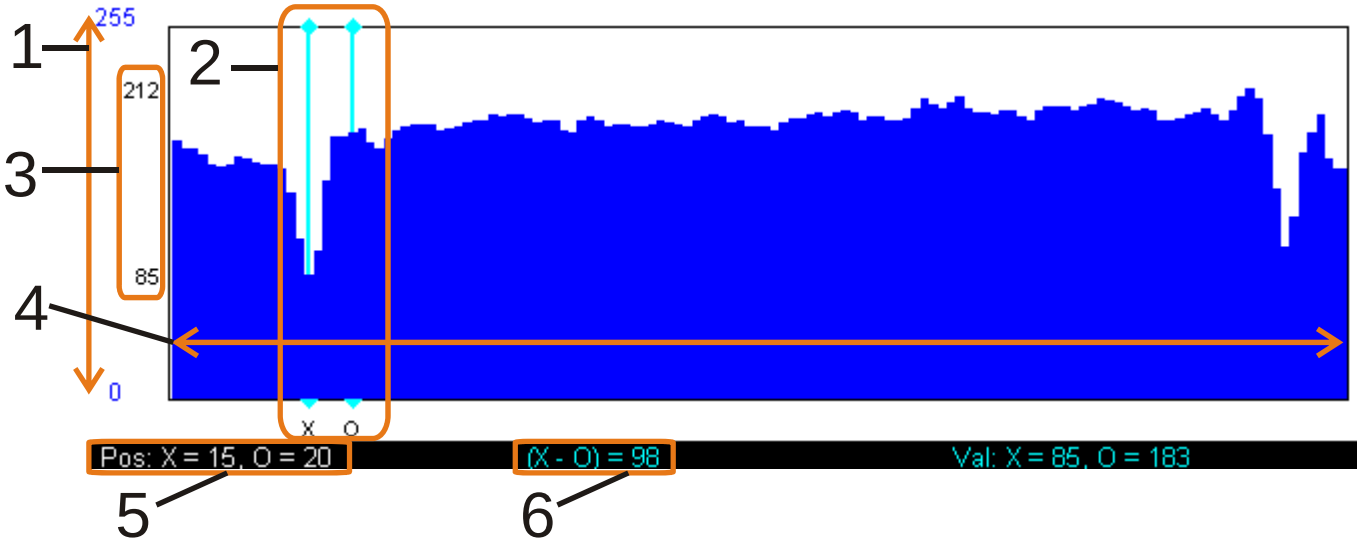
5	Acquire another image

Image Analysis Plot



1	Gray shade
2	Cursors
3	Maximum and Minimum gray shade values along line or circle
4	Pixels along line or circle
5	X and O positions along line or circle. Difference in position=Delta. If X=15 and O=20, then Delta = 5.
6	X-O=Gradient. If the gray shade value of X=85 and O=183, then Gradient =98.

Exiting Image Analysis

Click the X in the lower right corner of the Image Analysis Control Panel to remove this tool from the screen.

ABOUT THE IMAGE TOOLS

USER LEVEL: MECHANIC AND ADMINISTRATOR

The image tools provide different ways of displaying images on screen, such as from memory, or from the camera.

To access these tools:

1) Right-click image.
2) Select Image >> Tools.
3) Select the desired tool:
   - ***Acquire mode*** (on page 188)
   - ***Image source*** (on page 188)
   - ***Memory*** (on page 188)

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Acquire Mode

When programming your system, many times it is difficult to stop production while you try to program inspections on an image. Other occasions allow you to program with no part movement. This option allows you to have the system acquire a part image based on your present situation.

To set Acquire Mode:

1) Log in.
2) Right-click on the image.
3) Select Image >> Tools >> Acquire Mode.
4) Select the desired mode - choose from the options below.

❖ *Tip: If the production line is moving, use Part Present. If the production line is stopped, use Immediate.*

Part Present

The Part Present setting takes a picture of the next part that triggers the part present sensor. If your production line must continue to move, use this setting for offline programming. [If there is no part present, click Cancel on the "Waiting for Part Detect" box, or wait for it to time out (approximately 10 seconds). The system will use the existing image, if one is available.]

Immediate

The Immediate setting will take a picture of what is presently under the camera. If you are able to program your Intellispec system without the production line moving, choose Immediate.

Image Source

These functions allow you to view an image restored from a disk, or to view images being acquired and updated by the camera.

Frame Grabber

Reads a new image from the camera sensor whenever the system is asked to acquire an image.

SmartCAL Images (see "About SmartCAL" on page 214)

Displays images from disk instead of from camera.

Memory

The **Work Buffer** is an allocated area in memory that holds a stored image. The **Frame Buffer** is the live digitized image from the camera.

Restore Grayscale from Work Buffer

Copies the image from the work buffer into the frame buffer. When you restore an image from disk, the image is copied to the frame buffer and the work buffer at the same time. If the system captures another image, the frame buffer contains that new image.

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Save Grayscale to Work Buffer

Copies the image from frame buffer to the work buffer. This allows you to take an image the system has just acquired and move it to the work buffer so that it does not get overwritten by the next part image acquisition.

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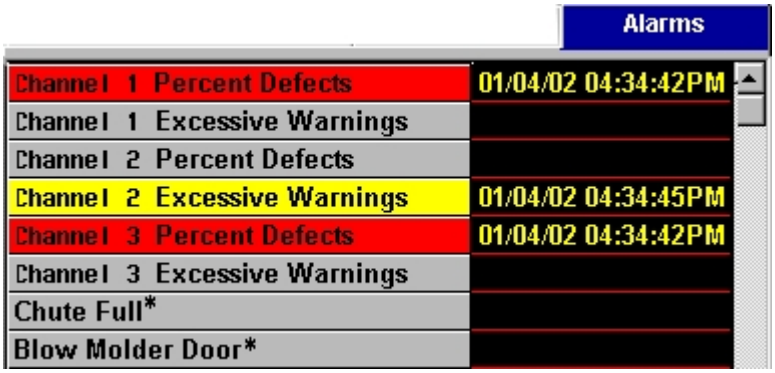
Chapter 9

ALARMS

There are 14 alarms available in the Intellispec system. Most of these alarms are configurable. That is, you can enable or disable an alarm, choose whether or not an audible alarm is sounded, or choose to trigger a programmable output signal, for example. There are a number of system alarms, group alarms, and channel alarms available. The only non-configurable alarm is ***Overtemp*** (on page 197). Some alarms may not apply to your system. Mechanic user level may view alarm settings. Administrator may change alarm settings.

ENABLED ALARMS

❖ *Tip: You can quickly see which alarms are enabled by looking at the Alarms screen.*



- **Red** alarms - triggered alarms. The time the alarm was triggered is displayed to the right of the triggered alarm.
- **Yellow** alarms - warning status.
- **Gray** alarms - enabled, but not triggered.

Each triggered alarm is also recorded in the system's ***Alarm Log*** (see "Event Logs" on page 91), which can be viewed or saved to disk for record-keeping or servicing purposes.

The □ symbol within the alarms menus indicate that an alarm is enabled.

DISABLED ALARMS

If an alarm is disabled, no events are logged, other than when you disable the alarm. Disabled alarms do not appear in the Alarms tab.

HOW TO CLEAR AN ALARM

If an alarm has been triggered, the light tree (optional) may flash and/or the horn may sound, depending on configuration.

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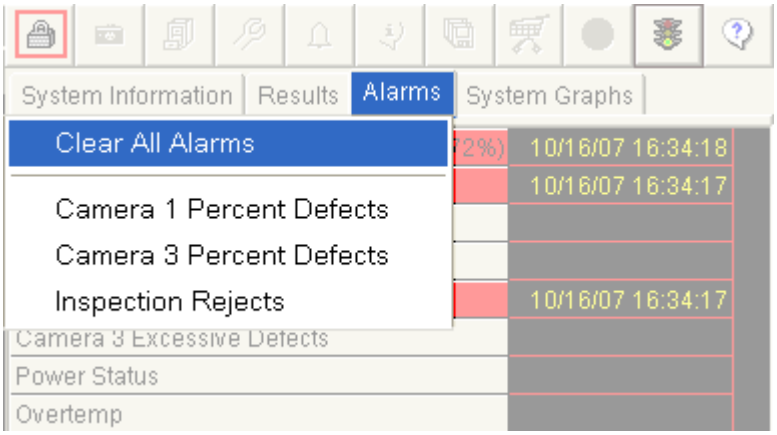
To clear an alarm:

1) Right-click the Alarms tab.
2) Choose an alarm to clear, or choose Clear All Alarms.



❖ *Note: If no alarms have been triggered, there will be no list.*

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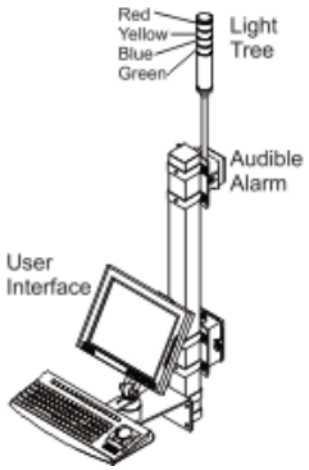
ALARM DEFAULTS

The following chart lists the default status of each of the alarms, as well as the color of the corresponding light in the (optional) light tree.

Alarm Configuration 4.4

- System Alarms
  - System Status = Green
    - Alarm = enabled
    - Audible = disabled
    - Audible Duration = 5
    - Alarm Output = disabled
    - Paging = disabled
  - Chute Full = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Paging = disabled
  - Blow Molder Door = Red
    - Alarm = enabled
    - Audible = disabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Paging = disabled
  - Power Status
    - Red light = AC fail
    - Yellow light = weak battery
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Paging = disabled
  - Good Parts = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Good Parts Trigger = 5000
    - Paging = disabled
- Group Alarms
  - Group Percent Defects = Red
    - Alarm = enabled
    - Audible Enabled = enabled
    - Audible Duration = infinite
    - Visual Enabled = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Minimum Parts = 100
    - Percent Trigger = 5
    - Paging = disabled
  - Missed Reject #1 and #2 = Red
    - Alarm = disabled
    - Audible = enabled
    - Audible Duration = 2
    - Visual = enabled
    - Visual Duration = 10
    - Alarm Output = disabled
    - Paging = disabled
- Channel Alarms
  - Select channel
  - Missed Part = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = 2
    - Visual = enabled
    - Visual Duration = 10
    - Alarm Output = disabled
    - Paging = disabled
  - Missed Result = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = 2
    - Visual = enabled
    - Visual Duration = 10
    - Alarm Output = disabled
    - Paging = disabled
- Camera Alarms
  - Select camera
  - Percent Rejects = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Minimum Parts = 100
    - Percent Trigger = 5
    - Paging = disabled
  - Excessive Defects = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Sample Size = 100
    - Percent Trigger = 2
    - Paging = disabled
  - Excessive Warnings = Yellow
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Sample Size = 100
    - Percent Trigger = 5
    - Paging = disabled
  - Consecutive Defects = Red
    - Alarm = enabled
    - Audible = enabled
    - Audible Duration = infinite
    - Visual = enabled
    - Visual Duration = infinite
    - Alarm Output = disabled
    - Consecutive Trigger = 25
    - Paging = disabled



SYSTEM ALARMS

USER LEVEL: ADMINISTRATOR

Select an alarm from the System Alarms tab to view or change options.

To get to this menu:

1) Log in.

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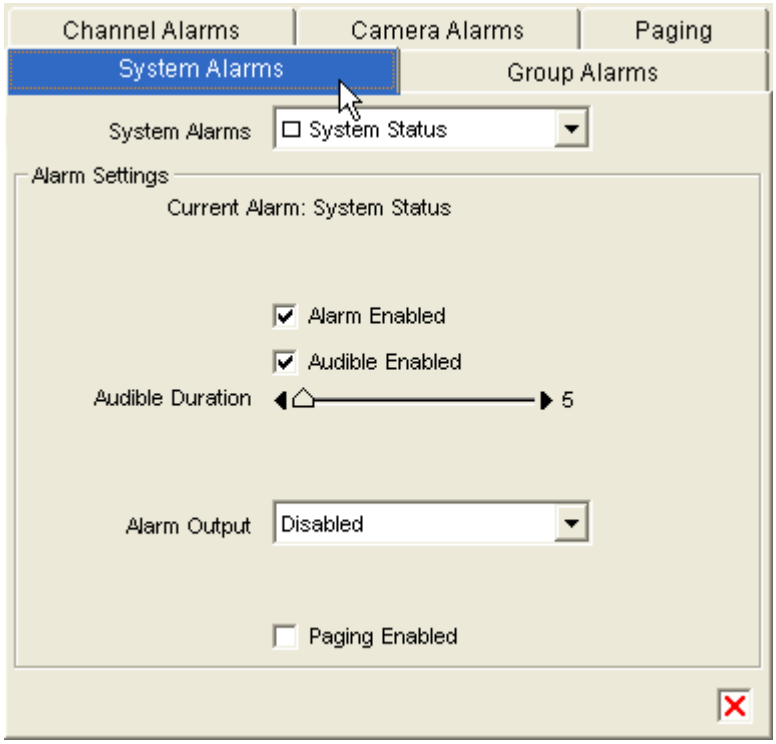
2) Click the button.



System Status

This alarm indicates whether the system is online or offline. It uses the green light of the light tree as a visual indicator. The green light turns on when the system is online, and turns off when the system goes offline.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Chute Full

This alarm is used for systems that have inspection modules installed within a blow molder. It is triggered when the blow molder door is opened. It will remain triggered until the door is closed. This alarm may not apply to your system.

- *Note: In PET Preform applications, this alarm is triggered when the Bypass Gate opens.*

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Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Blow Molder Door

This alarm is used for systems that have inspection modules installed within a blow molder. It is triggered when the blow molder door is opened. It will remain triggered until the door is closed. This alarm may not apply to your system.

❖ *Note: In PET Preform applications, this alarm is triggered when the Bypass Gate opens.*

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

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Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Power Status

This alarm is triggered when AC power is lost or the UPS (Uninterruptible Power Supply) battery is weak. It remains triggered until AC power is restored, or the battery is re-charged or replaced. If AC power remains off for an extended period of time, the system will shut down.

The red light of the light tree will switch on when AC power is lost. The yellow light will switch on when the UPS battery is weak. The blue light should remain on as long as the Intellispec power is on.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

If this parameter is Enabled and AC power is lost, this alarm will sound the audible alarm. Also, if this parameter is Enabled and the UPS battery is low, this alarm will sound the audible alarm.

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

If this parameter is Enabled and AC power is lost, this alarm will switch on the red light of the light tree. Also, if this parameter is Enabled and the UPS battery is low, this alarm will switch on the yellow light of the light tree.

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Good Parts

This alarm can be used as a part counter. For example, say you are inspecting preforms, and have a box at the end of the conveyor (after inspection) that holds 5000 preforms. This alarm will count the number of good inspected parts, and notify you when 5000 good parts have reached that box. The programmable output can be used to stop the conveyor from moving parts into the inspection system. You can then install a new box at the end of the conveyor, reset this alarm, and start counting the next 5000 parts.

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This alarm is triggered when a number of good inspected parts (Good Parts Trigger) has been reached. It will remain triggered until you clear the alarm from the alarms tab. Note that clearing this alarm also clears the Good Parts count.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Good Parts Trigger

The number of parts that must pass inspection to trigger the alarm.

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Overtemp

This alarm is not configurable. It is triggered when the temperature inside the Intellispec cabinet exceeds its maximum recommended temperature.

The system issues an alarm status in the alarms tab when triggered. It remains triggered until you repair the condition in the cabinet and press ***Clear Alarm*** (see "Alarms" on page 191) from the alarms tab. If you clear the alarm and the cabinet is still too hot, the alarm will trigger again.

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GROUP ALARMS

Choose a group to configure its alarm.

Group Percent Rejects

This alarm is triggered when the percentage of rejected parts from a group of channels exceeds the Percent Trigger. It will remain triggered until you clear the alarm from the alarms tab.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Minimum Parts

The minimum number of parts that must run through the group before the alarm is triggered.

Percent Trigger

Set the percentage of parts that are either bad or warning parts. This is a percentage of all the parts inspected in the group of channels.

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Missed Reject

This alarm works in conjunction with ***Reject Confirm*** (see "Reject Confirm (optional)" on page 138). It is triggered when a missed reject occurs.

There will be two Missed Reject alarms available if Dual Rejecter and Reject Confirm #2 are ***enabled*** (see "Reject Settings" on page 132).

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

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Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

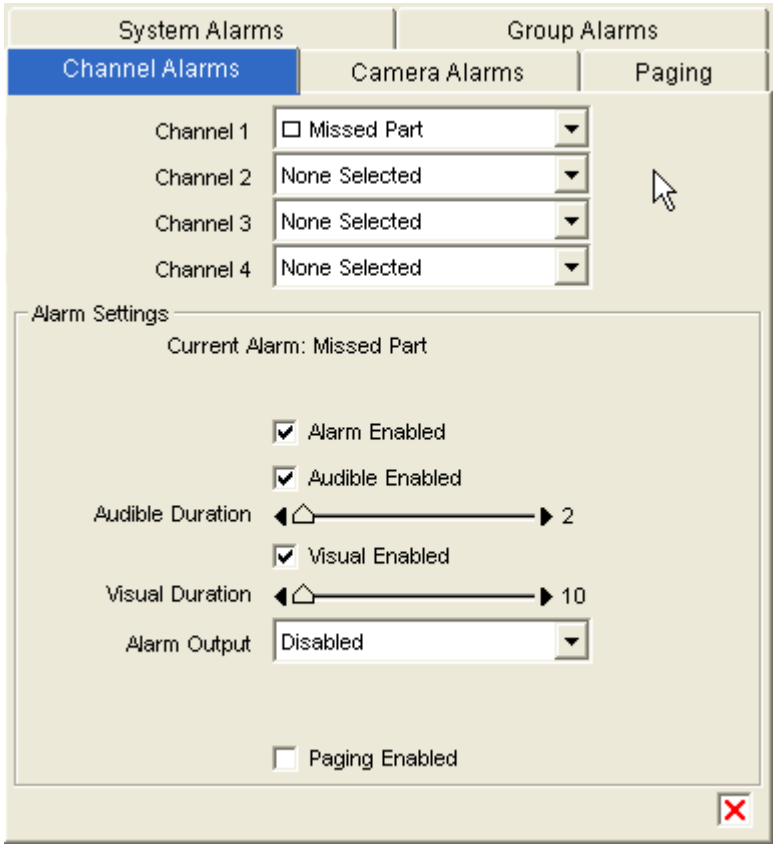
The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

CHANNEL ALARMS

Each channel has a set of alarms with several parameters. Choose a channel and its associated alarm.



Missed Part

This alarm is triggered if the system misses a part present signal. It will remain triggered until you clear the alarm from the alarms tab.

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Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

❖ *Note: You can determine whether parts are* **rejected based on Missed Part** *(see "Reject Settings" on page 132) status.*

Missed Result

This alarm is triggered if the system misses the inspection results of a part. It will remain triggered until you clear the alarm from the alarms tab.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

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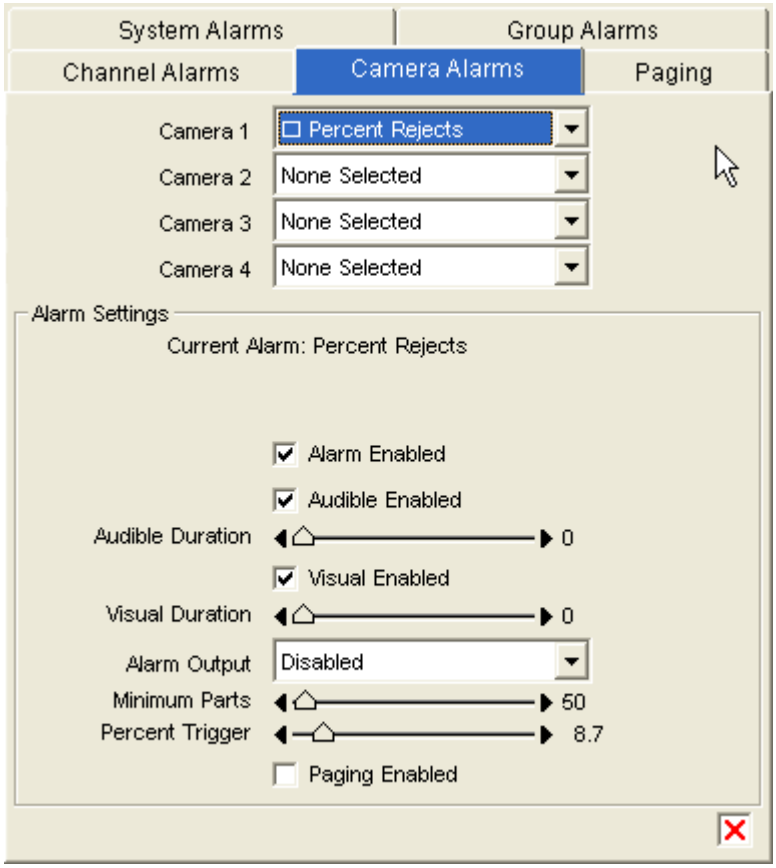
CAMERA ALARMS

Each camera has a set of alarms with several parameters. Choose a camera and its associated alarm.



Percent Rejects

This alarm is triggered when the total percentage of defects for the current channel exceeds a defined percentage. This percentage is defined with the Percent Trigger parameter.

This alarm will remain triggered until you clear it from the alarms tab.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is Enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound when the alarm is triggered. The default value of zero indicates an infinite duration, until you clear the alarm from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).

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Visual Enabled

If this parameter is Enabled, this alarm will switch on the red light of the light tree when triggered.

Visual Duration

The number of seconds the red light will remain on when the alarm is triggered. The default value of zero indicates an infinite duration, until you clear the alarm from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Minimum Parts

The minimum number of parts that must run through the group before the alarm is triggered.

Percent Trigger

Define the percentage of parts inspected that must fail to trigger the total percent defects alarm. This number is selectable between zero and 100. The default value is five percent.

Paging **(see "Alarms – Paging" on page 206)**

Excessive Defects

This alarm is triggered when a percentage of the last *n* parts have been found defective. *n* = Sample Size. It will remain triggered until you clear it from the alarms tab.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is Enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound when the alarm is triggered. The default value of zero indicates an infinite duration, until you clear the alarm from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is Enabled, this alarm will switch on the red light of the light tree when triggered.

Visual Duration

The number of seconds the red light will remain on when the alarm is triggered. The default value of zero indicates an infinite duration, until you clear the alarm from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).

Sample Size

Define the number of parts that must be inspected to determine the defect percentage. This is a sliding window: for example, if three percent of the last 1000 parts have been defective, the alarm is triggered. This number is selectable between zero and 10,000. The default value is 100.

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Percent Trigger

Define the percentage of the Sample Size that must be defective to trigger the alarm. This percentage is selectable between zero and 100 percent. The default value is two percent.

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

Excessive Warnings

This alarm is triggered when a percentage of the last *n* parts have been found with a warning status. *n* = Sample Size. It will remain triggered until you clear it from the alarms tab. Some inspections have warning limits to trigger this alarm. These inspections include: Dimension, Rectangular Tracker, and Rectangle Binary inspections.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is Enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound when the alarm is triggered. A value of zero indicates an infinite duration, until you clear the alarm from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is Enabled, this alarm will switch on the yellow light of the light tree when triggered.

Visual Duration

The number of seconds the yellow light will remain on when the alarm is triggered. The default value of zero indicates an infinite duration, until you clear the alarm from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).

Sample Size

Define the number of parts that must be inspected to determine the excessive warning percentage. This number is selectable between zero and 10,000. The default value is 100. This is a sliding window: for example assume Sample Size = 1,000 and Percent Trigger = 3. If three percent of the last 1000 parts have had a warning status, the alarm is triggered.

Percent Trigger

Define the percentage of the Sample Size that must have a warning status to trigger the alarm. This percentage is selectable between zero and 100 percent. The default value is five percent.

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

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Consecutive Defects

This alarm is triggered when the system has had too many consecutive defects. The number of defects is defined by the Consecutive Trigger parameter. It will remain triggered until you clear it from the alarms tab.

Alarm Enabled

Enables alarm.

Audible Enabled

If this parameter is enabled, the audible alarm will sound when triggered.

Audible Duration

The number of seconds the audible alarm will sound if triggered. A value of zero indicates an infinite duration, until the system goes back online. Or, you can enter values up to 3600 seconds (60 minutes).

Visual Enabled

If this parameter is enabled, this alarm will switch on the appropriate light on the light tree when triggered. See Alarm Defaults for light tree color.

Visual Duration

The number of seconds the light will remain on when the alarm is triggered. A value of zero indicates an infinite duration. Or, you can enter values up to 3600 seconds (60 minutes).

Consecutive Trigger

Define the number of defects in a row that the system must have to trigger the alarm. This number is selectable between zero and 340,000. The default value is 25. If this parameter is set to zero, the alarm is disabled.

Alarm Output **(see "Alarms - Programmable Output" on page 205)**

Paging **(see "Alarms – Paging" on page 206)**

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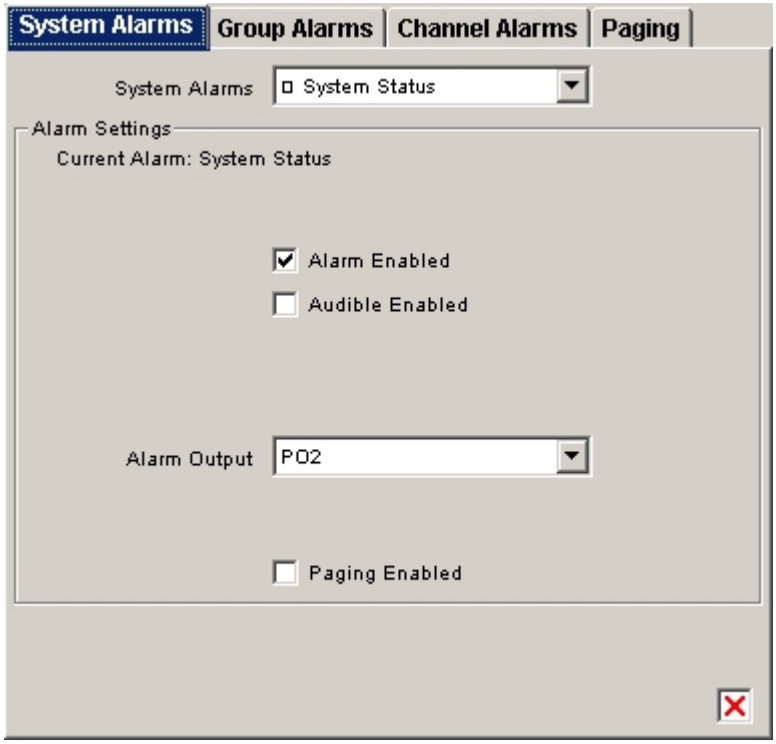
ALARMS - PROGRAMMABLE OUTPUT

The Alarms offer several Programmable Outputs.



There are eight **Programmable Outputs** (PO1 - PO8) available on standard Series IV systems that allow you to send a signal to your equipment if any of the programmed outputs is triggered. These outputs go active when the alarm is triggered, and go inactive when the alarm is cleared. The outputs are available on the Extended I/O board.

For example, you might assign the Power Status alarm to PO1 and the Group Percent Defects alarm to PO2. You may assign more than one alarm to any of the eight outputs. The programmable output will go active when any of the assigned alarms is triggered (example, Power Status OR System Status).

Outputs PO1 through PO8 can be monitored by your plant equipment, such as a PLC, to notify you when certain alarms are triggered.

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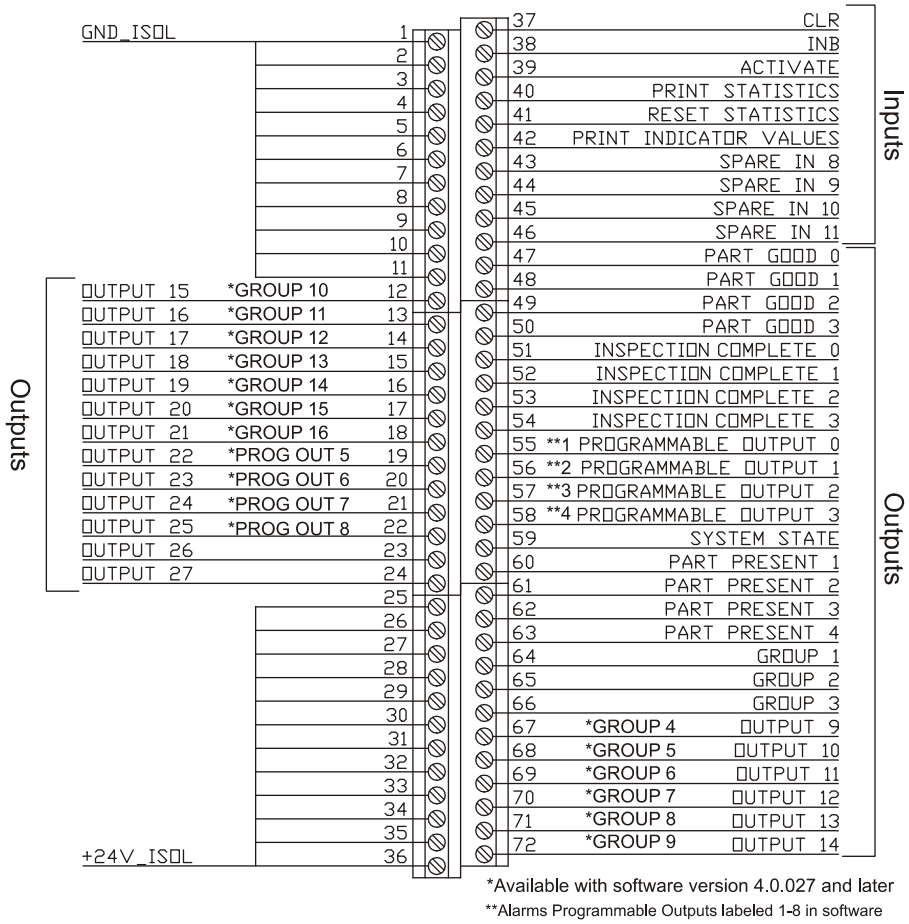
❖ *Note: If your system is equipped with the Ultra I/O option, check the Ultra I/O Terminal Block pinout sheet for information.*

Extended I/O terminal block TB1



Sample circuits found in the hardware section.

ALARMS – PAGING

This is an option that provides text messaging to specified users when an alarm is triggered. This option requires additional hardware – a cellular modem (must be purchased from and installed by Pressco), and a local service package for the cellular modem. Please contact Pressco Sales or Service for information about the hardware.

Note the following features of paging:

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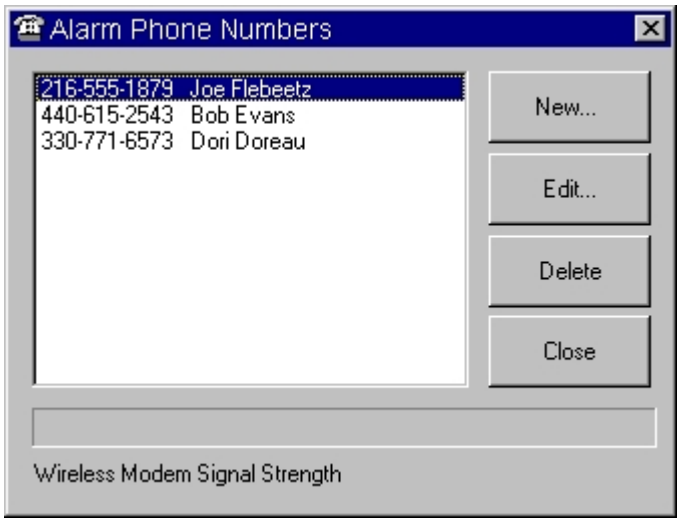
- This feature supports a US (CDMA) standard modem – compatible only in USA
- Intellispec generates a text message denoting the alarm and machine on which it was triggered. This is the same concept as generating a text message on a cell phone.
- Intellispec will page everyone on the setup list each time a configured alarm is triggered
- Multiple alarms may be configured for paging. They operate as an OR function: any alarm configured for paging will generate a message when the alarm is triggered.

To set up the paging recipients, follow the steps shown below to get to the setup screen:

1) Click button.
2) Click Paging tab.
3) Setup...



New

To add a paging recipient, click New... Type a name and phone number. Click OK.

Edit

To edit a paging recipient's name or number, highlight that person in the list. Then click Edit... and make changes.

Delete

To delete a paging recipient: highlight that person in the list. Then click Delete.

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Chapter 10

SOFTWARE UTILITIES

This section includes some of the most commonly used utilities found in Intellispec. These utilities help to simplify system setup, transfer data and images to another PC, and help with troubleshooting.

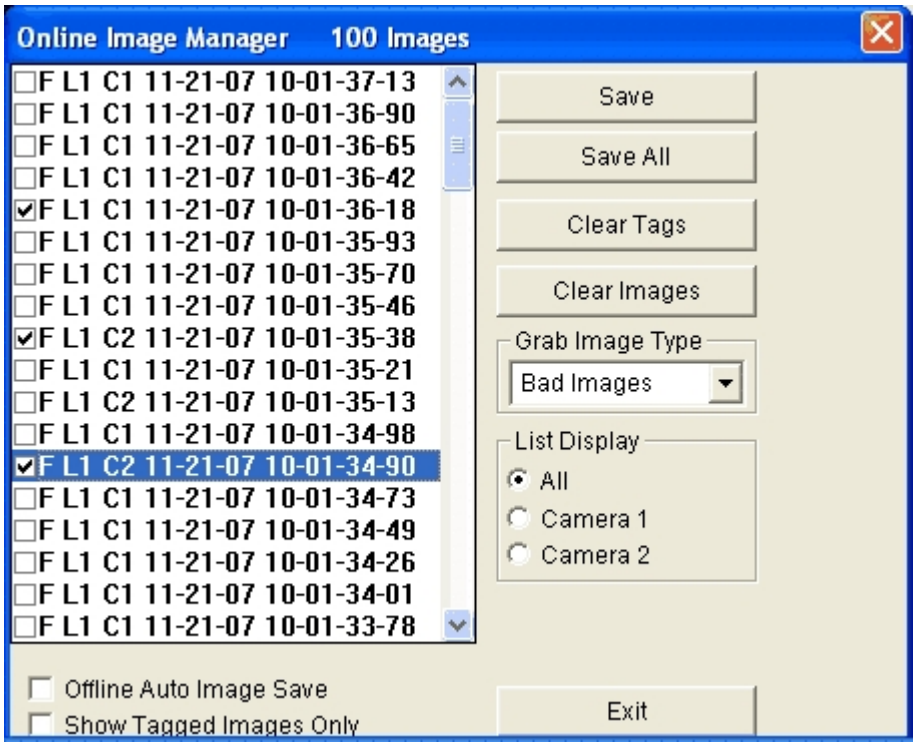
ONLINE IMAGE MANAGER

USER LEVEL: OPERATOR AND HIGHER

❖ *Note: Also called **Defective Image Manager** when you right-click image.*

This feature provides an easy way to review and save images of defective and/ or good parts. The system automatically stores the last 100 images in memory while the system is online. The memory operates in ring buffer configuration. That is, the oldest image will be overwritten after 100 images have been stored. The system continuously updates the images (online).

Press F6 to bring up the Online Image Manager. If the system is online, the system stops writing defective images to memory as soon as you press F6. Inspection continues in the background. The screen is shown below.



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This screen lists the names of up to the last 100 images from most recent (top of list) to oldest (bottom of list). The images are named as follows:

P (pass) or **F** (fail) **Lane** *n* **Channel** *n* **Date Time** (including hundredths of seconds)

Capturing Images

Select whether to collect defective images, good images, or both. The system must be put online to collect images.

Reviewing Images

- Highlight any file name to view it in the image area of the screen
- Right-click a highlighted file name to see the job run on the image
- Use the Page Up/ Page Down keys to scroll through the list, or use the scroll bars with the trackball

Filtering Images

Select which images (select by channel) to review, save, or tag under the **List Display** options.

- Select All to show all files in memory
- Select Channel *n* (your label may be different) to display or review only the images from Channel *n*

Tagging Images

Review and select certain images from the list by checking the box next to each desired image. This allows you to filter the images by choosing only the ones you want.

If you tag some images, then exit the Online Image Manager to collect more images, the tagged images will not be overwritten. The system keeps those tagged images in the buffer until you clear their tags. That is, if you have tagged three images, the system has room to write up to 97 more defective images to the buffer.

Show Tagged Images Only

(at bottom of window) If you have several tagged images, you may display the list showing only those images.

Clear Tags button

Click this button to un-check all the boxes from the entire image list (all channels).

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Saving Images

When you click the Save button, the system will save images as .bmp (bitmap format) to the C:\Intellispec\DefectiveImages folder.

If you save images to that folder, then save images again later, and there are any images with the same name (that is, you try to save the same image again), the image will be overwritten.

Offline Auto Image Save

(at bottom of window) Check this box to automatically save all images in the buffer when the system goes offline. It saves both images and images with graphics (up to 200 images total).

Quickly Save All Images

Press "S" to quickly save all images currently in memory to disk. This saves the last (up to) 100 images in grayscale format to the C:\Intellispec\DefectiveImages folder. You do not need to enter the Online Image Manager to save in this manner.

This saves images based on your Grab Image Type setting. For example, if set to Good Images, only the good images are saved to disk.

This is useful if you want an operator on the floor to periodically save images for you to sample. You can copy them to diskette or CD later to view and use them.

Quickly Save All Images plus Images with Graphics

Press "Alt" + "S" to save all images currently in memory to disk. This saves both the grayscale images (filename.bmp), plus each image with graphics (filename_c.bmp) to the C:\Intellispec\DefectiveImages folder. This equals a total of up to 200 images saved. You do not need to enter the Image Manager to save in this manner.

Save Selected Images

The following options are available when you bring up the Online Image Manager (F6).

Save button

Saves only the image you have highlighted.

Save All

Saves all images in the list.

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- If you select All from the List Display options (if your system has more than one channel), all images in the buffer are saved.
- If you have one channel selected in List Display options, all images from only that channel are saved.

Caution

Each bitmap image is 302KB. If you Save All images often, this can quickly add up to several Megabytes, taking up valuable hard disk space.

Save Tagged

This button is available when you have tagged images and check the Show Tagged Images Only box.

- If you select All from the List Display options, all tagged images from all channels are saved.
- If you select one channel in the List Display options, only tagged images from the selected channel are saved.

Save Selected Images with Graphics

To save selected images with graphics:

1) Press F6 to bring up the Online Image Manager.
2) Highlight the name of an image.
3) Right-click on that image name. The current job for that channel will run on that image, and you will see the graphics on screen. Note that the Results tab also displays the job results with each inspection's pass/fail status, as well as the reason each inspection failed.
4) Click the Save button. The image on the screen is saved, in both grayscale and grayscale with graphics formats.

Using Images

The Online Image Manager allows you to quickly review images so that you can see what types of defects the Intellispec is catching. You can then take appropriate action to prevent further defects from occurring.

After you have saved images, you might want to use them for examples in setting up future jobs. To use the images, create a ***SmartCAL*** (see "About SmartCAL" on page 214) file. This file is a list of images that the system can load so that you do not need parts running through the system. Remember to use the CH *n* number in the image file names to assign images to each different channel in the SmartCAL file.

❖ *Note: We recommend that you copy or move the desired images into different folders before creating the SmartCAL file. This is because the DefectiveImages folder is the first place from which images would get deleted, as they begin to take up valuable disk space.*

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SAVING IMAGES OFFLINE

You can save images that the cameras snap offline, to use in programming jobs.

Saving Single Images

USER LEVEL: MECHANIC AND ADMINISTRATOR

Images can be saved one at a time while the system is offline.

To save an image:

1) Log in.
2) Right-click on the image.
3) Select Image >> Save.
4) Select the type of image from the choices listed below. The currently displayed image will be saved.
    - **Grayscale** - Saves only the grayscale part image, with no graphics.
    - **Graphics** - Saves only the graphics generated by the system – the inspection regions, orientations, or registrations.
    - **Combined** - This is the grayscale part image with the graphics – inspection regions, orientations, or registrations. The Combined image is saved with a "_c" after its file name.
    - **Both** - Saves the grayscale part image, and the part image combined with its graphics to two separate files. The Combined image is saved with a "_c" after its file name.
5) Scroll to the desired folder and type a file name.
6) Click Save. The images are saved as Windows® bitmap ".bmp" files.

Using Autosave

USER LEVEL: MECHANIC AND ADMINISTRATOR

You can save a set of images while the system is offline and while your production line is running.

To save images (one channel at a time):

1) Log in.
2) Select a channel.
3) Right-click on the image.
4) Select Image >> Autosave.
    - Note that most images are saved under the C:\Intellispec\Data folder.
    - If you want to create a folder for each channel, click the [...] button. Then click the [Create New Folder] button. Name the new folder (example, Camera 1), press Enter, and then double-click the Camera 1 folder to open it. Click Select. Make sure your folder name is displayed in the Autosave box.
5) Name the image(s) in the File Name box. The system will add a number extension to the name to create several image names (example, image001, image002, etc.).
6) Select the number of images to save.

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7) Click Start. The system saves the number of images you have specified to the directory that you specified, in bitmap (.bmp) format. It will display "Done" on the Autosave screen when finished.
    - If you intend to create a ***SmartCAL*** (see "About SmartCAL" on page 214) (.pvl) file, save images for the remaining channels.
    - If you created a new folder for one channel, browse to the \Data folder and create another new folder for each remaining channel as described in step 4.

Restoring Images

USER LEVEL: MECHANIC AND ADMINISTRATOR

This option allows you to display one or more images that were previously saved to disk.

To restore a previously saved image:

1) Log in.
2) Select the desired channel.
3) Right-click the image.
4) Select Image >>Restore.
5) Browse for the desired image or SmartCAL (.pvl) file.
6) Click Open. The image will be displayed on the current channel.

❖ *Note: If you restore a .bmp image, that image will remain on screen until you go online, or restore another image. If you want the system to scroll through multiple images, use a* **SmartCAL** *(see "About SmartCAL" on page 214) file.*

ABOUT SMARTCAL

A SmartCAL (.pvl) file is a special Intellispec text file that contains a list of bitmap (.bmp) images for up to eight cameras. To create the SmartCAL file, you must have saved bitmap images on the Intellispec hard drive. These images can then be used on an Intellispec or Intellitrainer, or saved for any other use. When a SmartCAL file is loaded, the Intellispec scrolls through the list of images each time a job is run, or the button is clicked.

Creating a SmartCAL File

USER LEVEL: MECHANIC AND ADMINISTRATOR

To create a SmartCAL file:

1) Log in.
2) Click the button.
3) Click the Database Utilities tab.
4) Click the Database Detective button.
5) Click the Other tab.
6) Select SmartCAL.
7) Click Next.
8) In the Stored Image Operations screen, enter a name for your SmartCAL file.

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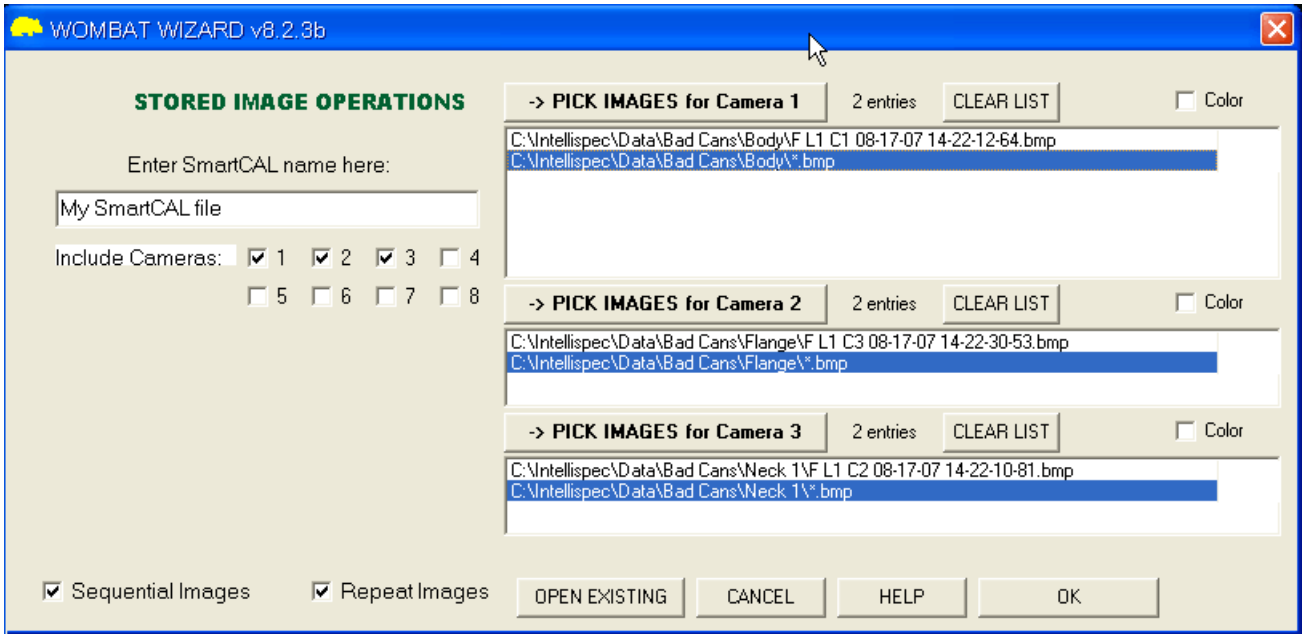
9) Pick Images (see options below).
10) Click OK.
11) When asked if you want to create this PVL file, click Yes. Your SmartCAL file will be written to the Data folder.
12) Click OK.
13) Exit from the Database Detective and Database Tools screens.

Stored Image Operations screen



Include Cameras

Select all the cameras for which you want to have images loaded through one SmartCAL file.

Pick Images

You may choose several image files for each camera, regardless of the folders where they are stored, and the SmartCAL file will reference all your selected images.

Click the appropriate Pick Images button for each camera. Browse to the folder(s) where the images are stored, and select the desired files.

- If you used ***Online Image Manager*** (on page 209) to save images, be sure to select images marked C1 for camera 1, C2 for camera 2, etc.
- Click the Clear List button if you want to remove all the files from the camera's list.

Color

This is only used in special applications where a color camera is used. Check the Color box to display color images for that camera. Otherwise the images will be displayed in grayscale.

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Sequential Images

When a SmartCAL file is loaded, Sequential Images displays the images in the order that they appear in the image list. If this box is un-checked, images are displayed in random order.

Repeat Images

When a SmartCAL file is loaded, Repeat Images allows the images to be displayed more than once. For example, if you click the button, the images can be displayed an indefinite number of times. If this box is un-checked and the end of the SmartCAL list is reached, the images stop updating.

Open Existing

Open a previously created SmartCAL file.

Help

Brings up additional help for Wombat. Includes special keystrokes and tips that are not included on this documentation page.

To select all files within one folder for one camera:

1) Click the Pick Images for camera *n* button.
2) Browse to the desired folder.
3) Select one image in the folder.
4) Click Open.
5) Right-click that file name in the Stored Image Operations screen. You will see an asterisk in the file name, indicating that all .bmp files in that folder will be used for that camera.

To select more than one contiguous file while browsing in a folder:

1) Select the first file >> hold the Shift key >> scroll to the last desired file.
2) Click Open. All selected files will be included in the SmartCAL file.

To select more than one non-contiguous file while browsing in a folder:

1) Select the first file >> hold the Control (Ctrl) key >> select the remaining desired images.
2) Click Open. All selected files will be included in the SmartCAL file.

Using the SmartCAL File

USER LEVEL: MECHANIC AND ADMINISTRATOR

To load a SmartCAL file:

1) Log in.
2) Right-click on the image area.
3) Select Image >> Restore.
4) Scroll through the Data folder and highlight the desired SmartCAL file name.
5) Click Open. The Intellispec will ask whether you want to make that file your default SmartCAL file.
6) Answer Yes or No. The SmartCAL images are loaded into memory.

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To scroll through the SmartCAL images:

- Click the button.OR:
- Right-click the button. Select Continuous Snap. OR:
- Press F3. This runs the current job on the image.

BURNING A CD

USER LEVEL: ADMINISTRATOR

You may need to copy images, reports, or databases to CD to use them on your own PC.

What You Need

- A blank (or recordable session) CD

To burn the CD:

1) Take the system offline ( ). Do not put the system back online until you have finished burning the CD.
2) Make sure you have already saved all the desired images (or files) to the Intellispec hard disk.
3) Log in.
4) Click the button.
5) Click the Utilities tab.
6) Click the CD Burner Software button. A CD burner software interface will appear. This software may vary on different systems.
7) When the software appears, it asks you what kind of CD to compile. Choose Data Disc.
8) Choose Add and select files to copy.
    - The command names on the CD burner software may vary based on version of CD burner software installed in your system. Follow instructions on screen.
    - If copying images, default image directory = C:\Intellispec\DefectiveImages.
    - To save all the files in one folder, simply highlight the folder name.
    - To choose specific files, browse to the desired folder and highlight all the files you want to copy.
9) Follow the instructions on screen to continue.
10) Click the Burn button.
11) **WAIT** until the burn process is **finished** (even if one of the progress bars says 100% – don't click any buttons at this time).
12) When a message pops up that says "Burn Process Completed Successfully," click OK.
13) Press the Enter key or click Discard to end the burn process. Your CD will be ejected.
14) Click the x in the upper right of the CD program window to close the program. It will ask you whether you want to save changes.

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- If you do not need to remember which files you have just burned onto your CD, click No
- If you intend to burn another CD sometime in the future with exactly the same files, save the program changes

HOW TO BACK UP OR RESTORE THE INTELLISPEC

USER LEVEL: ADMINISTRATOR

New to Intellispec version 4.4 software is the ability to back up the entire Intellispec system without exiting Intellispec.

The Acronis True-Image Echo software is installed on your system to make a complete hard disk backup. A full hard disk backup is important in the event of:

- hard disk failure
- system configuration changes

Backing up the Intellispec

We recommend that you back up your Intellispec system at least once a month. See ***Acronis disk backup instructions*** (on page 218).

❖ *Note: System backup can only be done while the Intellispec is offline. The Intellispec will prevent you from going online if you begin the backup process. The process may take approximately five minutes or longer depending on the amount of data on your system.*

Restoring the Intellispec

In the event of a system failure, you can use a Rescue CD to try to restore your system. See ***Acronis disk recovery instructions*** (on page 220).

Acronis disk backup instructions

Use these instructions with the Acronis Echo software.

What you need:

- Intellispec Rescue CD Rev 8.018 provided by Pressco Technology
- A CD or DVD as backup media
  - If this is the first backup, use a blank CD or DVD
    - Series III Intellispec systems use CD media
    - Series III Plus or Series IV Intellispec systems use DVD media
- If you have previously backed up the Intellispec system, use the same CD or DVD previously used to back up the same system serial number

❖ *Note: Rev 8.018 Intellispec Echo rescue disks are NOT compatible with Rev. 8 Intellispec* ***Ghost*** *rescue disks.*

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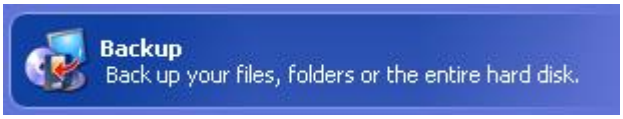
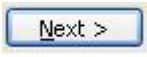
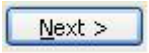
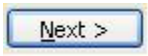
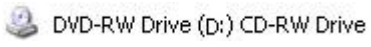
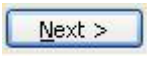
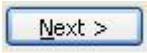
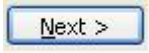
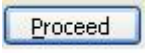
System backup can only be done while the Intellispec is offline. The Intellispec will prevent you from going online if you begin the backup process. The process may take 30 minutes or longer depending on the amount of data on your system.

To get to the backup software screen:

1) Log in as Administrator.
2) Click the button.
3) Click the Utilities tab.
4) Click the Disk Imaging Software button.
5) Follow the disk backup and onscreen instructions.

BACKUP INSTRUCTIONS - INSERT THE INTELLISPEC RESCUE CD REV 8.018		
1	Pick A Task	Click 
2	Create Backup Wizard	Click  to Continue
3	Select Backup Type	Choose and click 
4	Partitions Selected	Check Click 
5	Information	Click
6	Backup Archive Location	Click to highlight your CD/DVD drive  Under File Name, type in your four digit Intellispec system number for a backup name. Click 
7	Select Backup Mode	Choose and click 
8	Backup Creation Options Archive Protection	Do not enter a password, click 
9	Archive Comments	No comments are needed, click
10	Summary	Click 
11	Insert DVD	The DVD drawer will automatically open. Insert the DVD and click Note: If a few minutes pass without the progress bar starting, the DVD media may be bad.
12	Information	Click Label the DVD with the date and system serial number.

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Acronis disk recovery instructions

In the event of a system failure, you can use a Rescue CD to try to restore your system.

Use these instructions with the Acronis Echo software.

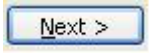
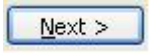
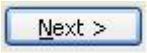
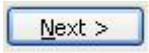
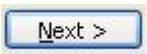
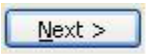
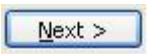
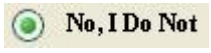
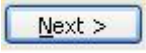
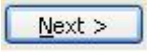
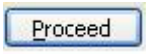
What you need:

- Intellispec Rescue CD Rev 8.018
- The backup CD or DVD you have created by the ***backup*** (see "Acronis disk backup instructions" on page 218) procedure. Use the data from the appropriate system serial number.

❖ *Note: Rev 8.018 Intellispec Echo rescue disks are NOT compatible with Rev. 8 Intellispec **Ghost** rescue disks.*

To restore the Intellispec:

Insert the Intellispec Rescue CD Rev. 8.018, reboot, and choose Echo True Image.

RECOVERY		
1	Pick A Task	Click
2	Welcome	Click  to Continue.
3	Archive Selection	Insert previously created backup DVD with machine image. Click and highlight your saved backup file (system number) on your DVD drive. You may need to double click the DVD drive and wait for the disk to read to see your saved file. Click 
4	Restoration Type Selection	Choose and Click 
5	Partition or Disk to Restore	Check Click  (Note: All items under Disk1 will auto check)
6	Restored Partitions Resizing	Choose Click 
7	Restored Hard Disk Location	Highlight Disk 1 with a single click to choose and click 
8	Non-Empty Destination	Choose Click 
9	Next Selection	Choose  Click 
10	Restore Operation Option	Check Click 
11	Summary	Click 

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12	Information	Click OK

If the Intellispec does not recover as expected, ***contact Pressco*** (see "How to Contact Pressco" on page 633).

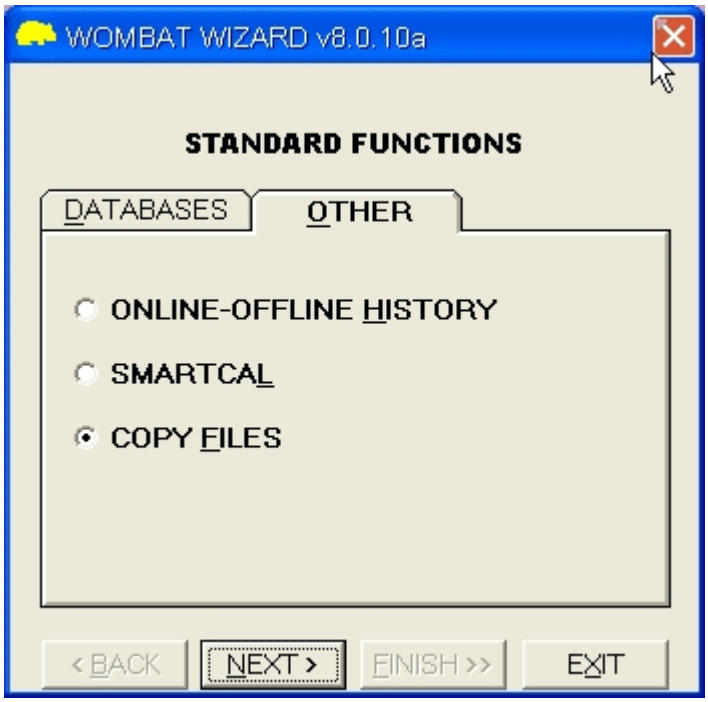
COPYING FILES TO FLOPPY

USER LEVEL: MECHANIC AND ADMINISTRATOR

This is a useful, all-purpose tool for copying images, reports, or logs to floppy diskette. You can use this information outside of the Intellispec to generate reports, spreadsheets, or to troubleshoot the system.

To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click Database Detective.
5) Click Other tab.
6) Select Copy Files.
7) Click Next.



To copy files:

1) Click any of the buttons - Images, Reports, Logs, or Databases. You will see a dialog box in which you can browse for image files. The default folder will be opened for you, or you can browse to the desired folder.
2) Highlight the desired file(s) and click Open.
    - To select more than one contiguous file, select one file and hold down the left trackball button (or Shift key) and move the cursor over all the files you want to copy.

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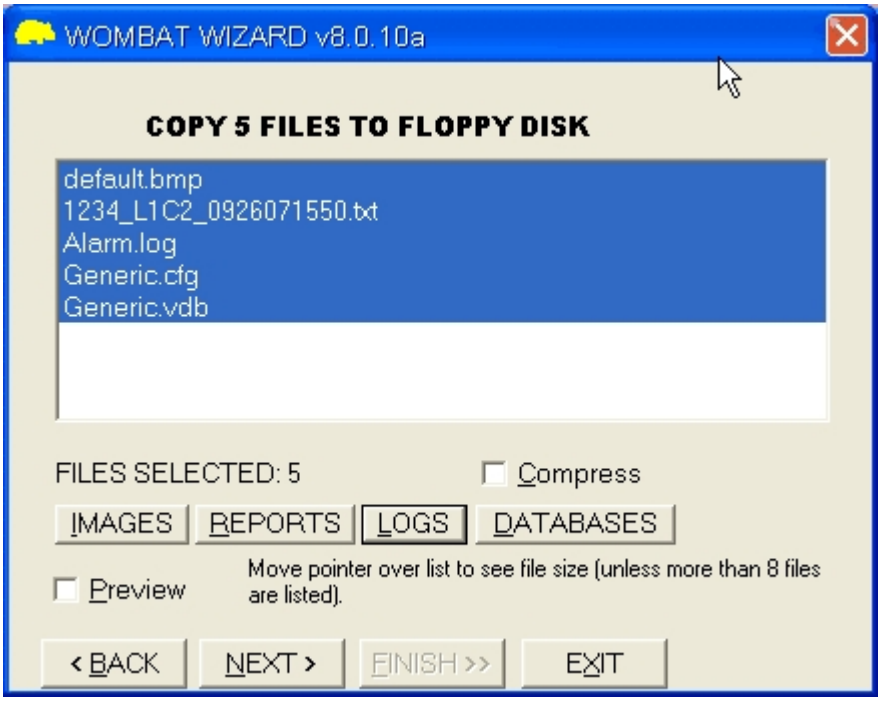
- To select more than one non-contiguous file, select one file, hold the Control (Ctrl) key, and select the remaining desired files.

3) Make sure all the files you want to copy are highlighted in the upper window of the dialog box (click the first file name, hold Shift key, and move cursor to last file name), and click Next.
   - To remove any file from the list, Shift+right-click the file name.



4) Insert a diskette into Intellispec floppy drive, and Wombat will copy these files to your diskette.

About File Size

The bitmap image files in the Intellispec are approximately 302KB each, so you will be able to copy about four uncompressed images to a blank floppy diskette at one time. Move your cursor over each file name to view file size. If you encounter a disk error, make sure that you have enough room on your diskette.

Compress

Use the Compress option to copy more files to one disk at a time, especially if the total file size exceeds the free space of the floppy. It will compress up to seven (302KB) Intellispec images to fit on one floppy.

Click the Compress box to create a single zipped file, using all the files highlighted in the upper window of the dialog box. Insert a floppy disk. Click Next. Enter a name for the zipped file. Click OK.

❖ *Note: You must have a compression program (such as WinZip) on your PC to extract the zipped files.*

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COPYING FILES TO USB DEVICE

USER LEVEL: ADMINISTRATOR

Use Windows Explorer to copy files.

To copy data to a USB device:

1) Log in.
2) Click the button.
3) Click the Database Utilities tab.
4) Click the Windows Explorer button.
5) Select the correct file name(s) and copy the file.

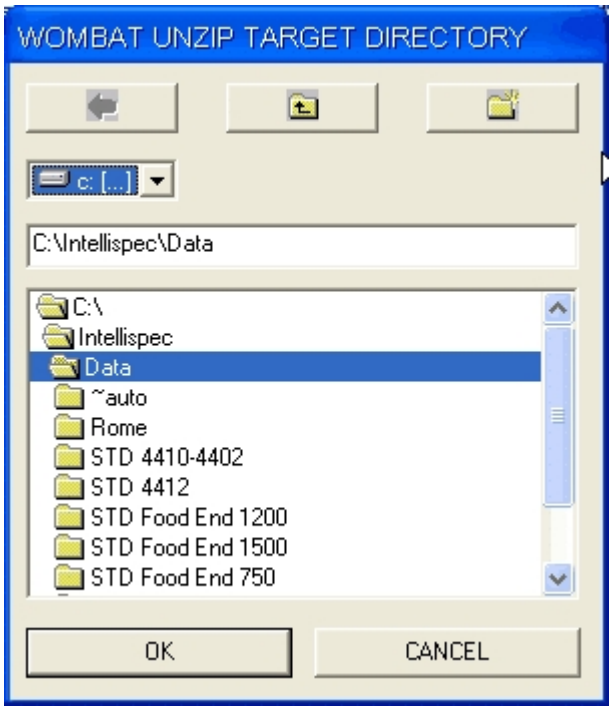
UNZIPPING COMPRESSED FILES

USER LEVEL: MECHANIC AND ADMINISTRATOR

If you have a zipped file in the Intellispec, this tool will extract the file.

To get to this menu:

1) Click button.
2) Click Database Utilities tab.
3) Click Database Detective.
4) Press CTRL+Z.
5) Browse to the directory where the zipped file is stored.
6) Select the zipped file.
7) Click Open.



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To unzip the compressed file:

1) Browse to the directory where you want the files unzipped.
2) Click OK.
3) Click OK again to unzip the files.
4) Click OK again when completed.

DATABASE – SAVING AND LOADING

We recommend that you ***save your database*** (see "How to Save a Database" on page 225) regularly for backup. This ensures that you have all the latest system settings and part program information saved to disk. You may need this information to restore onto your system in the event of a system failure, or you may need to send it to Pressco Service or Tech Support for assistance with your Intellispec. See also Tech Support Tool (***TSTool*** (see "TSTool (Tech Support Tool)" on page 226)).

Easy Save and Reminder

USER LEVEL: MECHANIC AND ADMINISTRATOR

The Database Detective remembers when you last saved your database. It tells you how many hours have elapsed, and recommends a backup if necessary. Simply open the Database Detective following the steps shown below. A pop-up screen will prompt you how to save it.

To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click the Database Detective button.
5) Follow the instructions on screen.

How to Back Up the Current Database

USER LEVEL: MECHANIC AND ADMINISTRATOR

If you choose not to use the ***Wombat Saved Database Monitor*** (see "Easy Save and Reminder" on page 224), this tool will back up your current database.

To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click the Database Detective button.
5) Press CTRL+K.
6) Choose to back up your database to floppy diskette, the C:\Intellispec\Data directory (default), or a removable drive.
7) Enter a new name for the database or check the Use Previous Name box. If you use a previous name, the previous database will be overwritten.

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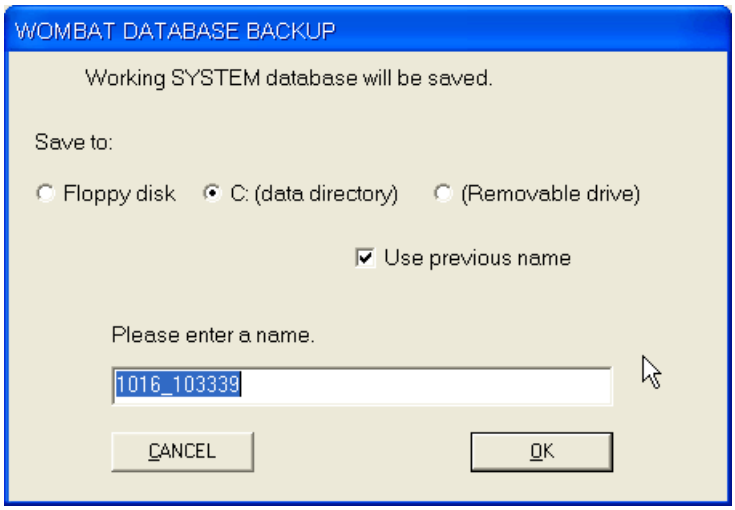
- If you do not enter a new name, Wombat names the database as date_time (default) as shown in the screen below.



- To create a new folder, enter a directory and file name such as "NewDirectory\mydb". A new folder will be created as "C:\Intellispec\Data\NewDirectory". The files mydb.vdb and mydb.cfg will be saved in that folder.
- To save to a different drive, type the drive letter and path. Example: "d:\mynewdir\mydb"
- The files saved are "*filename*.vdb" and "*filename*.cfg"

8) Click OK to complete the backup.
9) Click Exit in the Wombat screen.

How to Save a Database

USER LEVEL: MECHANIC AND ADMINISTRATOR

There are two types of Intellispec databases:

- The **Vision** database contains job and inspection information.
- The **System** database contains calibration and system configuration information. Saving the System database saves both the System database and associated Vision database all at once.

This procedure allows you to save either the Vision or System database. It allows you to save the databases as a different name, if desired.

To save a Vision or System database:

1) Log in.
2) Click button.
3) Click the Save button for either Vision or System database. The dialog box will prompt you to save in the default folder, or allow you to scroll to a different folder. It assigns the correct file extension, depending which type of database you are saving.
4) Type a file name and click Save.

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❖ *Note: If you save the database to a floppy diskette, it is **not** automatically saved to the hard disk. If you want to be able to load this database from hard disk at a later time, you must also save it to hard disk.*

How to Load a Database

USER LEVEL: MECHANIC AND ADMINISTRATOR

Load a previously created database into the Intellispec memory. Note that the system and channel configuration may be different from that which you were previously running. The system may have to be re-booted depending on configuration changes. A database consists of a file folder, and several files within that folder, including the configuration file, a vision database file, and statistics files.

❖ *Note:* **Save your current database** *(see "How to Save a Database" on page 225) before loading a different one.*

To load a database:

1) Log in.
2) Click the button.
3) Click Load under either Vision or System database. (Only **Administrators** may load System databases)
4) Browse through the folders if necessary. Vision databases have a .vdb extension and System databases have a .cfg extension.
5) Click Open.
   - If you use a similar System database with multiple Vision databases, load the System database first, then load Vision database.
   - If you load a database from a floppy disk, it will be loaded into memory, but not saved on hard disk. You should ***save the database*** (see "How to Save a Database" on page 225) to hard disk after loading it from floppy, so that you may find it later on the hard disk.
   - If you encounter an error while restoring the database, try the Vision Repair or Configuration Repair under the Database Utilities tab. These will go through the database and attempt to correct errors.

TSTOOL (TECH SUPPORT TOOL)

USER LEVEL: MECHANIC AND ADMINISTRATOR

This is a tool that creates packets of information that Pressco's Technical Support department can use to help troubleshoot your system. It copies your current database, inspection parameters, and other pertinent system configuration information. You can create these packets, save them to floppy disk or hard drive, and then send them to Tech Support via mail, e-mail, or by using Remote Diagnostics.

To create the packet:

1) Make sure the system is offline .
2) Log in.
3) Click the button.

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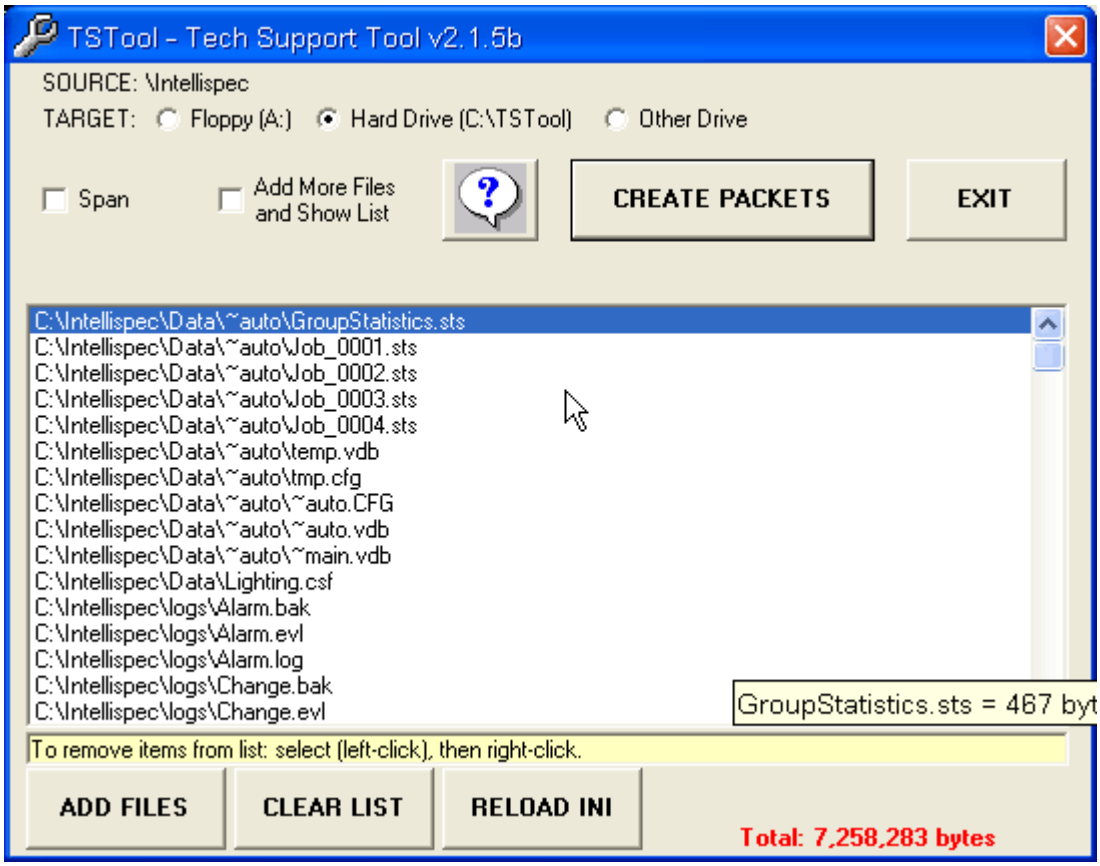
4) Click the Database Utilities tab.
5) Click the Tech Support Tool (TSTool) button.
6) Select a drive to save the packets.
   - If A: drive, then insert a blank floppy diskette into Intellispec's A: drive. Click the Span box to ensure that all information is copied if the packet is larger than one floppy diskette's capacity.
   - If you plan to send the packet to Tech Support via e-mail, we recommend that you save the packet to the C: drive. This will create one .zip file that you can e-mail.
7) Click Create Packets. TSTool will create the packets, and post the status when finished.



   - Click the button for more information about the tool.
8) E-mail the packet to ***Tech Support*** (see "How to Contact Pressco" on page 633) for help.

WHERE THE FILE IS SAVED ON THE HARD DRIVE

When you save the file to the hard drive, the file is saved as C:\TSTool\TSTool.zip. The .zip file is what you e-mail to the tech support department.

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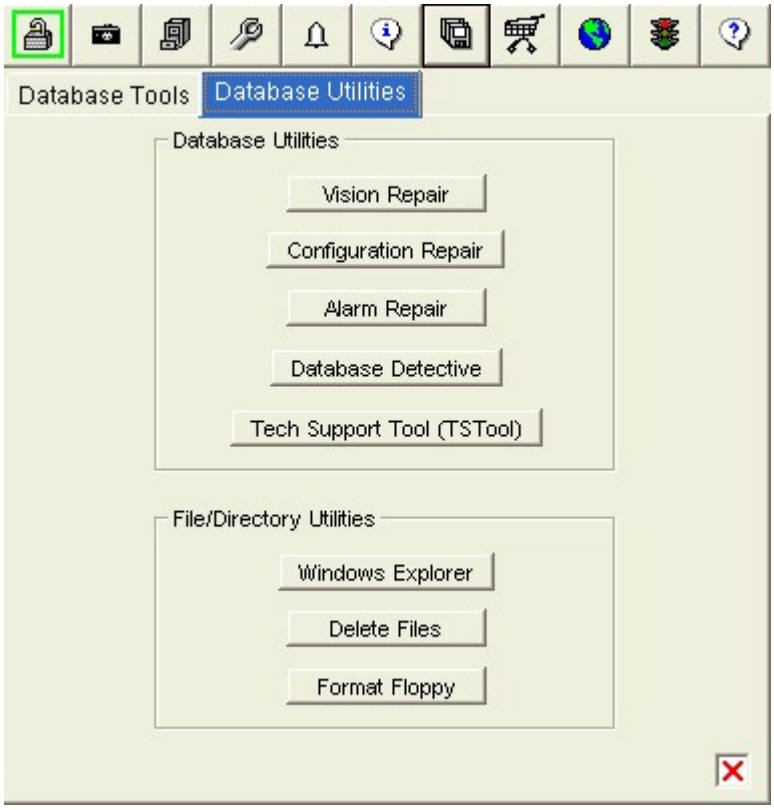
DATABASE UTILITIES

USER LEVEL: MECHANIC AND ADMINISTRATOR

This menu has tools to troubleshoot the Intellispec setup.

To get to this menu:

1) Click button.
2) Click Database Utilities tab.



Vision Repair

This tool checks and repairs vision test parameters or values that are illogical to the computer. When you power up or reset the system, a database check is done on all programmed vision job information in the system. If the values or parameters do not fall within legal limits, a warning sign will appear on the screen.

When you see the warning sign, you may repair the database, clear all jobs and reload the database from a backup disk, or clear and re-enter tests. First try to repair the database. This may be an easy fix and will save a lot of time and effort.

To repair the vision database:

1) Click the button.
2) Click the Database Utilities tab.
3) Click the Vision Repair button.
    - If everything in this database checks OK, it will report that the repair was successful.

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- If it finds a value that does not make sense, it will ask a question such as: "OK to set to 25?" This value is usually a default value for the parameter that is out of logical limits. The system may ask you if it is OK to delete the whole inspection. If you do not want to change the parameters the way the vision system suggests, the parameter value will remain as it was. The system will respond "Database repair unsuccessful", and discontinue checking subsequent jobs. Then it is up to you to modify the inspection.

Configuration Repair

This tool checks and repairs the system's configuration database. This only needs to be performed if a warning is displayed at power-up. The warning is displayed if any parameters do not fall within the correct limits.

To repair the system's configuration:

1) Click the button.
2) Click the Database Utilities tab.
3) Click the Configuration Repair button. The system will report the repair status when finished.

Alarm Repair

This checks and repairs alarm values that are illogical to the system. This only needs to be performed if a warning is displayed at power-up.

To repair the alarm configuration:

1) Click the button.
2) Click the Database Utilities tab.
3) Click the Alarm Repair button. The system will report the status of the repair when finished.

FILE/DIRECTORY UTILITIES

This menu provides access to the Intellispec disk drives.

Windows Explorer

USER LEVEL: ADMINISTRATOR

Access the file structure of Intellispec.

To access Windows Explorer:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click the Windows Explorer button.

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Delete Files

USER LEVEL: ADMINISTRATOR

This feature provides a means of deleting files on the Intellispec.

Warning
This action cannot be undone.

To delete files:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click the Delete Files button.
5) Browse to the desired folder and select the files to delete.
6) Click Delete button. Intellispec automatically empties the recycle folder for you.

Format Floppy

USER LEVEL: MECHANIC AND ADMINISTRATOR

This feature erases all files on a floppy disk and prepares it for data storage.

Warning
This erases all data on the diskette. The procedure cannot be undone.

To format a floppy disk:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Insert a floppy diskette into the Intellispec drive.
5) Click the Format Floppy button. The Intellispec formats the diskette.

DATABASE DETECTIVE FUNCTIONS

USER LEVEL: MECHANIC AND ADMINISTRATOR

The Database Detective is a valuable tool that allows you to print and save system information such as inspection parameters and online/ offline history. It also allows you to copy jobs from one database to another, or copy files to diskette so that you can use them outside of the Intellispec. This tool can help you maintain your process, and it can help you understand the settings in your system.

The program itself is referred to as Wombat as you will see on your Intellispec screen. It is a simple interface that guides you easily to perform your desired tasks.

To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.

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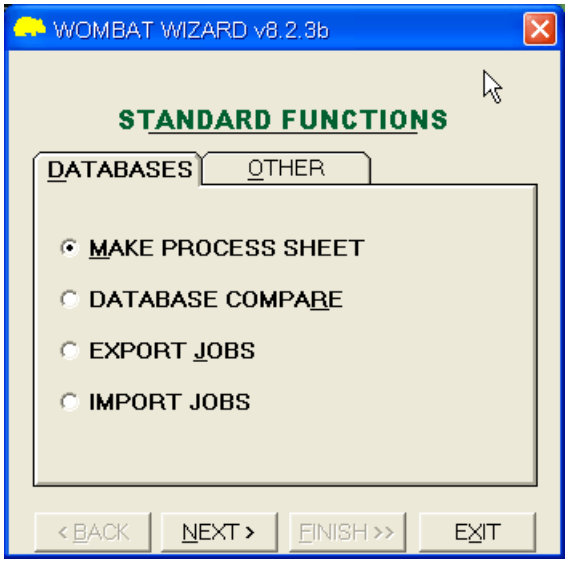
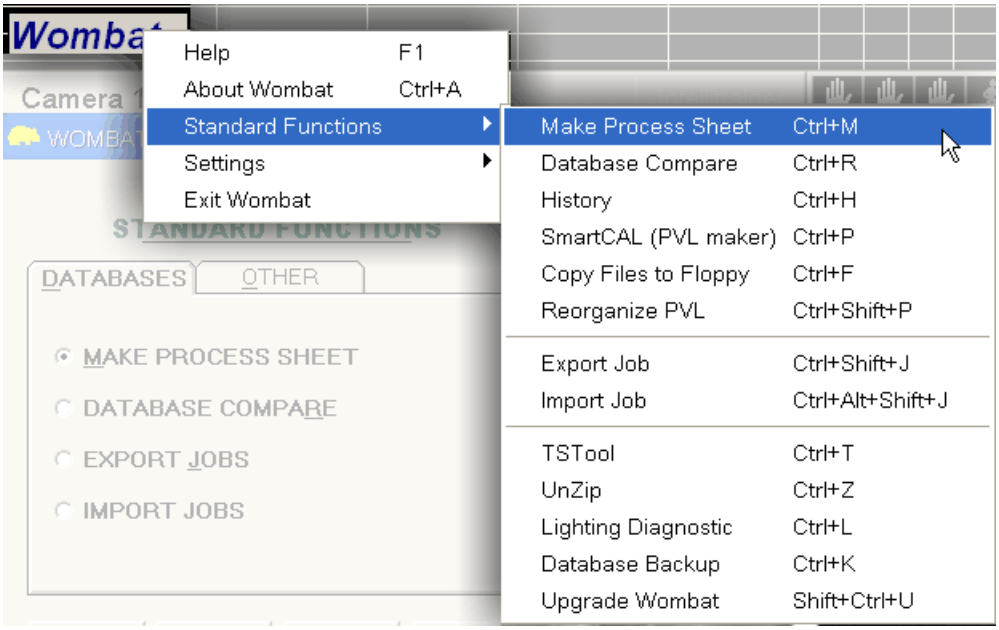
4) Click Database Detective button.



Database Detective Standard Functions

This list of functions, many of which are included in the main Database Detective menu tabs, is accessed by right-clicking the Wombat button, and moving your cursor over Standard Functions. Below is a list of these functions:



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Make a Process Sheet **(on page 232)**

Database Compare **(on page 239)**

History **(see "Online/ Offline History Report" on page 89)**

SmartCAL (PVL maker) **(see "About SmartCAL" on page 214)**

Copy Files to Floppy **(see "Copying Files to Floppy" on page 221)**

Reorganize PVL

If a SmartCAL (PVL file) was made to reference the bitmap files within the DefectiveImages folder, and some images were subsequently deleted, the PVL would not run correctly. When you run the Reorganize PVL function, Wombat copies the images into folders where they would not be as easily deleted, and re-writes the PVL file at the same time.

Export a Job **(on page 236)**

Import a Job **(on page 237)**

TSTool **(see "TSTool (Tech Support Tool)" on page 226)**

UnZip **(see "Unzipping Compressed Files" on page 223)**

Lighting Diagnostic **(on page 170)**

Database Backup **(see "How to Back Up the Current Database" on page 224)**

Upgrade Wombat

If you have received a disk or removable media with a Wombat upgrade, this utility guides you through the process.

Make a Process Sheet

USER LEVEL: MECHANIC AND ADMINISTRATOR

A process sheet is composed of two parts: a summary of the system and camera settings on the first page, followed by an abbreviated listing of the inspection parameters for the **active** jobs within the specified database. Inactive jobs are omitted from the process sheet. Active jobs are those that are selected for online use – assigned to cameras.

To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click Database Detective.

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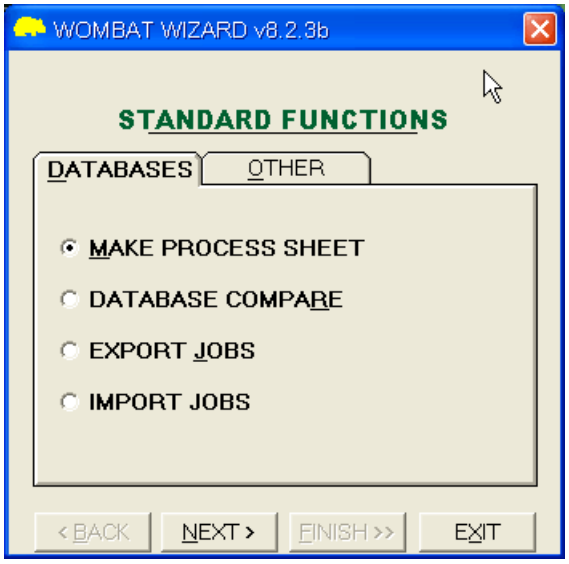
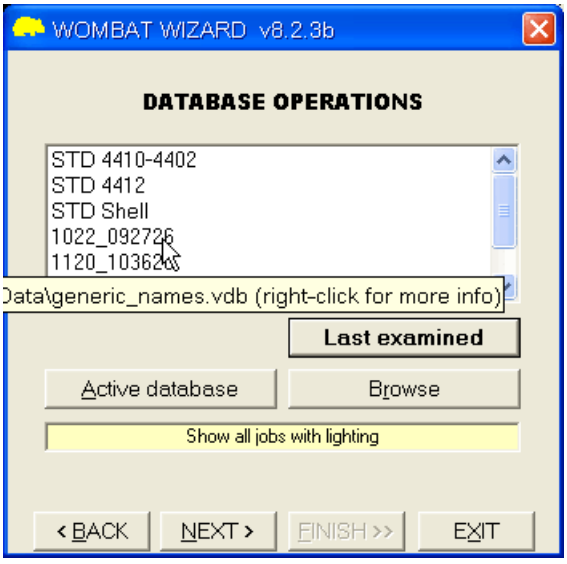
5) Select the Make Process Sheet button.



To make a process sheet:

1) Click Next.
2) Choose a database to create the process sheet. Move your cursor over the option buttons to see a description of each button.
   - Active database – This is the database that is currently running on the Intellispec. If you choose this option, you are assured of the most up-to-date information. Go to step 3.
   - If your database is saved somewhere other than the "C:\Intellispec\Data" directory, click the Browse button to locate your database. Select the desired database and click Open. Go to step 3.

Note: if you choose a system database [.cfg] file that does not have a matching vision database [.vdb] file, the process sheet will not be created



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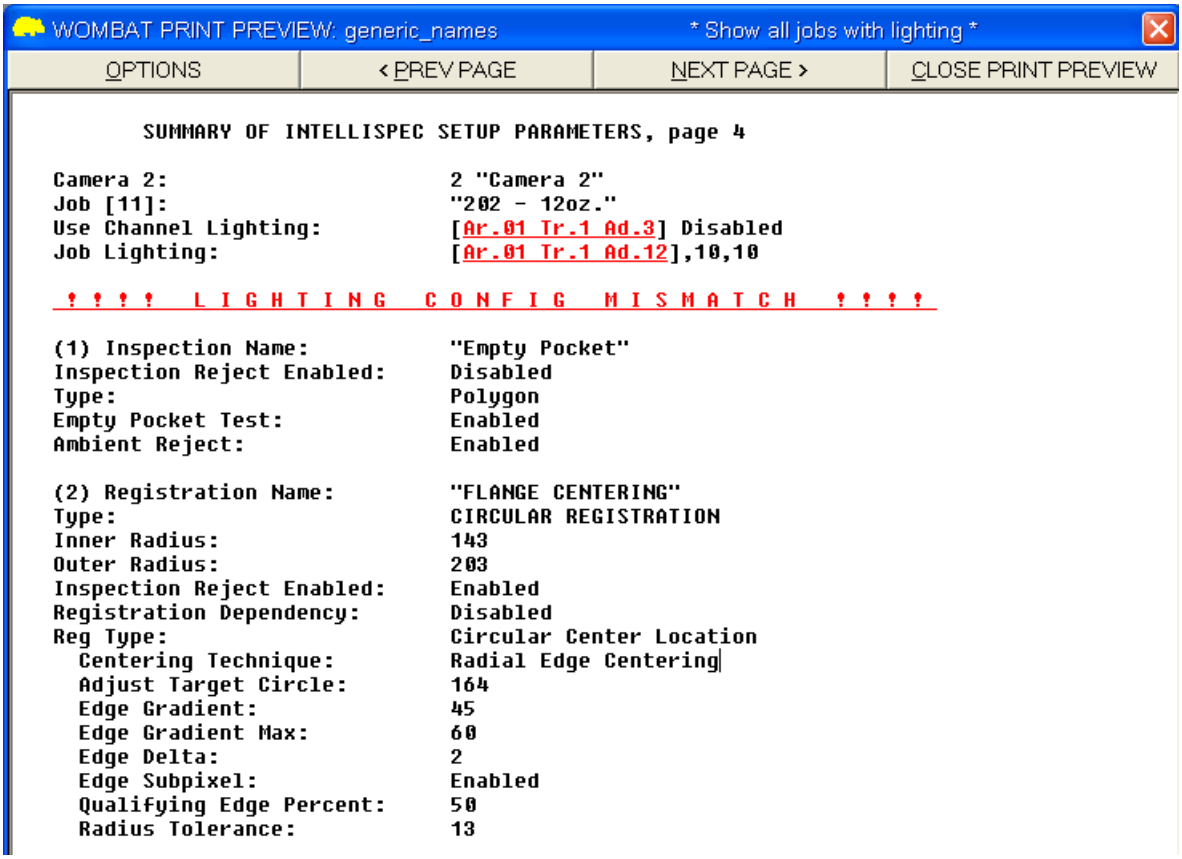
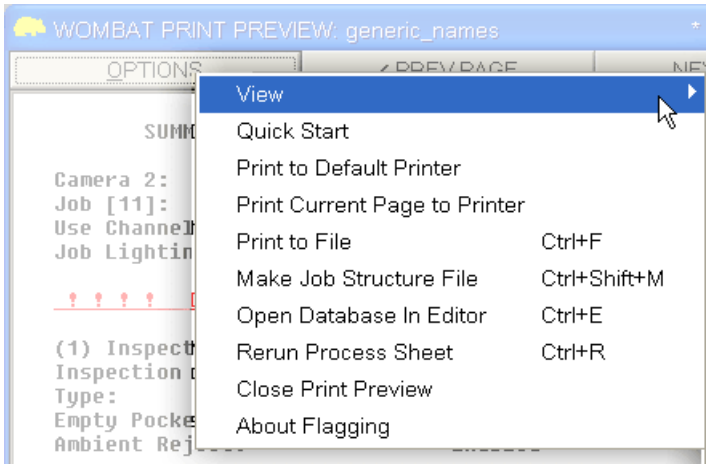
3) Click Next. The system creates the Process Sheet and displays the information as a print preview, so you can view it, print it, or save it. If any errors are encountered, they are displayed before the process sheet is displayed.



Process Sheet Options

Click the Options button to make your choice. The choices are described below.



View

This displays a list of pages. Choose one to view. The number of pages will vary depending on the size of your database.

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Quick Start

If this is checked, a Process Sheet begins as soon as you enter Wombat.

Print to Default Printer

Prints the report to the attached printer (if you have one already set up).

Print Current Page to Printer

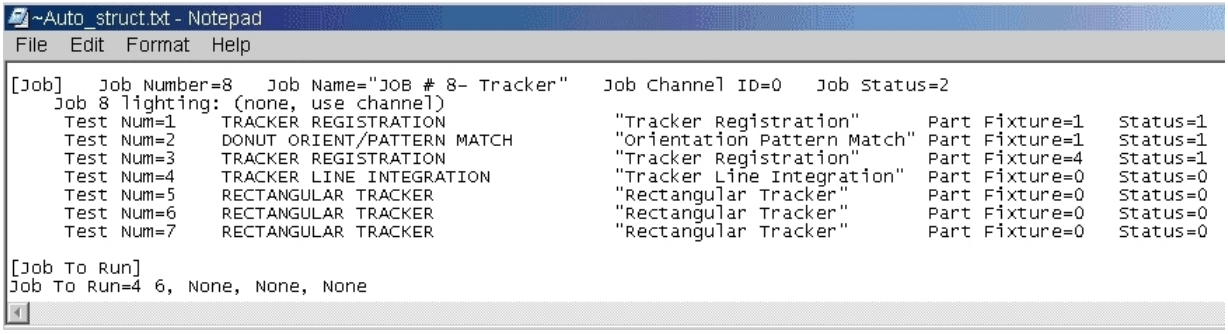
Prints the current page to the attached printer.

Print to File

Wombat saves the report as a text (.txt) file to the default Reports folder, which is the same folder where the system statistics are printed. If you would like to save this data to floppy disk instead, scroll up to the A: drive and allow Wombat to save it to a floppy disk. Or, you can save it to the Reports folder and ***copy them to floppy*** (see "Copying Files to Floppy" on page 221) at a later time.

Make Job Structure File

Creates a text file in the Reports folder. This report summarizes all the inspections of all the jobs in the database. Also lists whether any parts (Part Management) are selected.



Open Database in Editor

Opens the database in a text editor (selectable in ***settings*** (see "Database Detective Settings" on page 239)) so that you can view or change the settings.

Warning
Only advanced users should use the editor feature.

Rerun Process Sheet

Creates a new Process Sheet. This is useful if you have changed settings through the editor mentioned above.

Close Print Preview

Closes the report.

About Flagging

Some text in the Process Sheet may be 'flagged' or highlighted in red. Select About Flagging from the menu option to see the full description.

See ***Process Sheet Settings*** (see "Database Detective Settings" on page 239)

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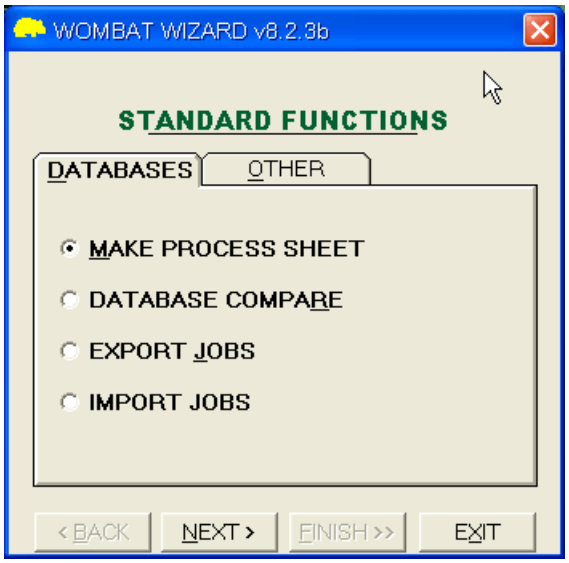
Export a Job

USER LEVEL: MECHANIC AND ADMINISTRATOR

This option allows you to take a job you have already created, and use it within another database.

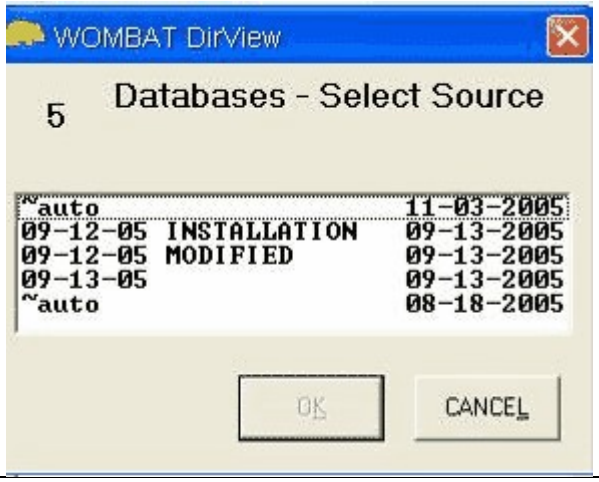
To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.
4) Click Database Detective.
5) Select Export Jobs.



To export a job for another database:

1) Click Next.
   - If exporting to floppy disk, insert a disk when prompted.
   - If exporting to the hard drive, click No. Wombat will search your Intellispec and display all available databases.
2) Choose the source database that contains the job you want to copy. Click OK.



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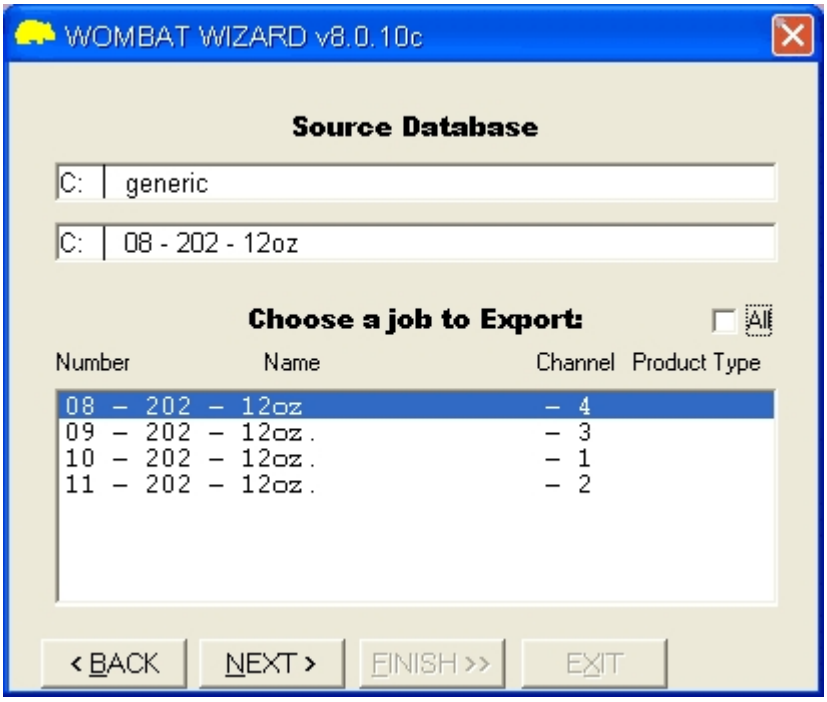
3) Choose a job to export.



4) Click Next, then OK. Wombat tells you that it is about to copy a job.
5) Click OK to continue.

After the job has been copied, use the ***Import a Job*** (on page 237) feature to import it into another database.

Import a Job

USER LEVEL: MECHANIC AND ADMINISTRATOR

Imports a job into an existing database. First the job must be ***exported*** (see "Export a Job" on page 236) through Wombat. It is saved as a .job file.

To get to this menu:

1) Log in.
2) Click button.
3) Click Database Utilities tab.

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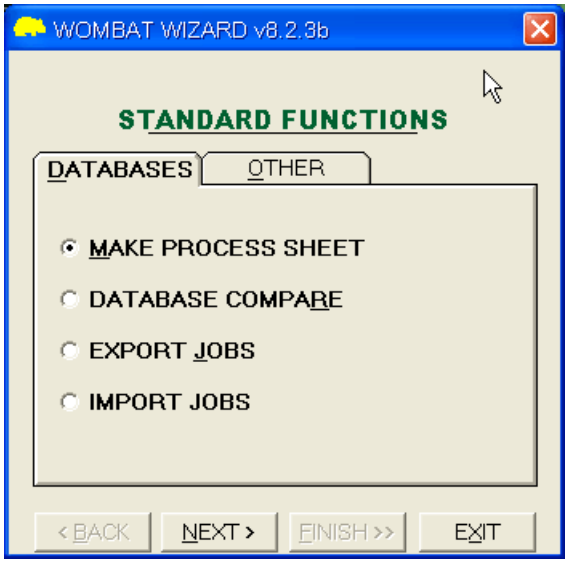
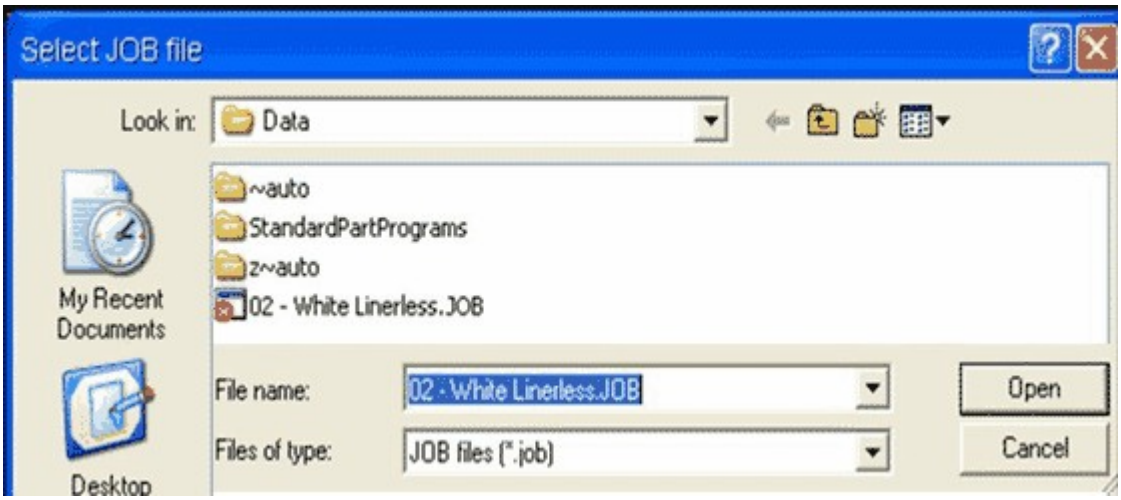
4) Click Database Detective.



To import a job:

1) Click Import Jobs.
2) Click Next.
   - If importing from floppy disk, insert a disk when prompted.
   - If importing from the hard drive, click No. Wombat will search your Intellispec and display all available databases.
3) Select a job file from the available .job files and click Open.



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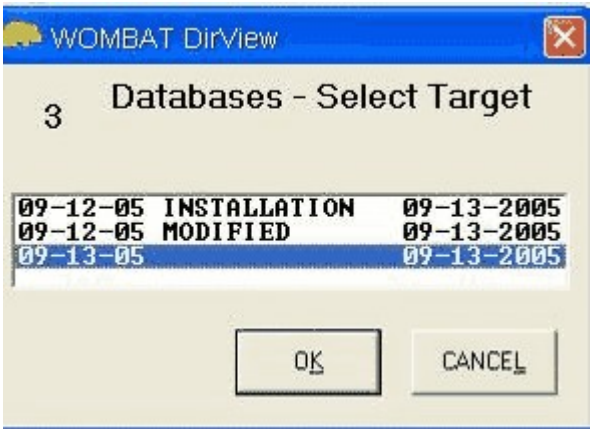
4) Select a database into which you want to import the job. Click OK. Wombat tells you it is about to import a job.



5) Click OK to continue. The job is imported into the target database.

Database Compare

USER LEVEL: MECHANIC AND ADMINISTRATOR

The ability to compare databases can be highly useful. With Wombat's new Compare function it is easy to:

- View a pair of structure files, for an overview of jobs and inspections
- View file pairs in their entirety, with differences highlighted
- In your text editor, view a streamlined report listing exactly which lines have changed.

Database Compare information

The Database Compare feature is explained in detail in Wombat's online help. Click the ? button for information.

DATABASE DETECTIVE SETTINGS

USER LEVEL: MECHANIC AND ADMINISTRATOR

These settings determine the way information is presented in Wombat.

To get to this menu:

1) Click the button.
2) Click the Database Utilities tab.
3) Click the Database Detective button.

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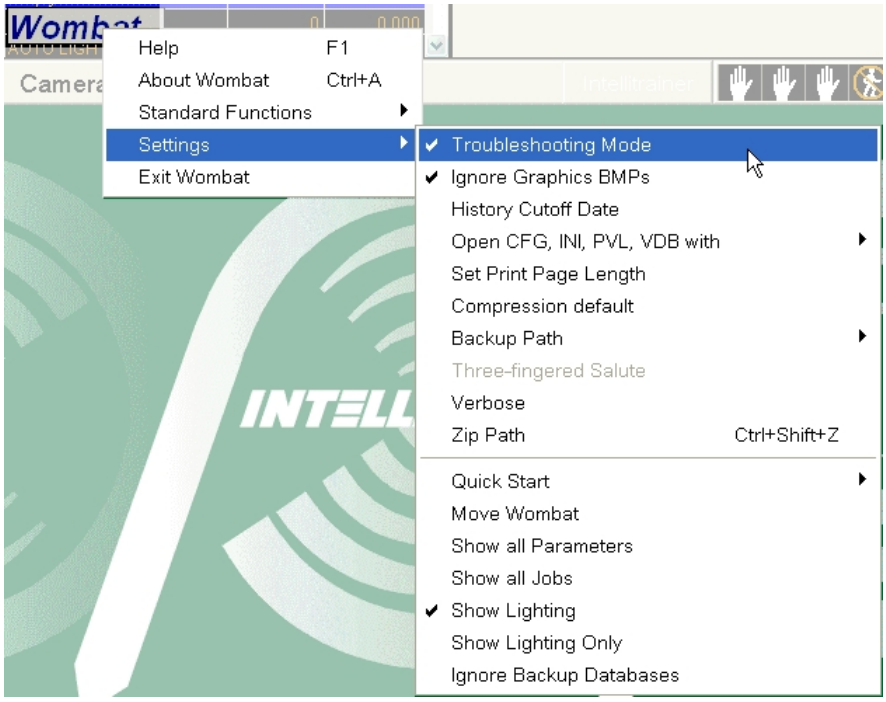
4) Right-click the Wombat button >> select Settings >> select the desired setting. These are described below.



❖ *Note: Many of these settings allow you to enable or disable them. They are enabled if there is a ✔ next to them.*

Troubleshooting Mode

More information is displayed in the ***online/offline history*** (see "Online/ Offline History Report" on page 89). This information includes Missed Parts, Missed Results, and inspections that were modified online. Also, inspections that were changed offline are listed.

Ignore Graphics BMPs

Used for creating ***SmartCAL*** (see "About SmartCAL" on page 214) files, this helps filter out .bmp images that have the Intellispec graphic overlays on them.

History Cutoff Date

Choose how far back the ***online/ offline history*** (see "Online/ Offline History Report" on page 89) report goes. Enter the earliest date from which you want to see the data.

Open CFG, INI, PVL, VDB with

Choose the default text editor in which to open the database files. This is used in functions like Process Sheet or Database Review when you use the Open Database in Editor function.

- If you choose Other, you must specify the path to the program.

Set Print Page Length

Change setting if your printer is not printing complete pages of Database Detective reports as expected. Follow instructions on screen.

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Compression Default

If checked, then the Compression box will automatically be checked by default. This box appears in screens such as the Copy to Floppy function.

Backup Path

Choose a folder where backup databases can be stored if Wombat needs to make changes to the original databases.

Zip Path

If checked, then the file's path information is included in the zipped file.

Quick Start

Allows you to choose a function to automatically start when you enter the Database Detective. Choose between ***Process Sheet*** (see "Make a Process Sheet" on page 232), ***SmartCAL,*** (see "About SmartCAL" on page 214) or ***TSTool.*** (see "TSTool (Tech Support Tool)" on page 226) You must exit and re-enter the Database Detective to see this action.

To cancel Quick Start:

1) When you enter Database Detective, one of the Quick Start functions will appear. Choose the correct action based on your settings. This will return you to the main Database Detective screen.
   - If Process Sheet, click the Back button
   - If SmartCAL, click Cancel button
   - If TSTool, click Exit
2) Right-click the Wombat name >> choose Settings >> Quick Start >> choose a new Quick Start or Disabled.

Move Wombat

Moves the Wombat title bar to one of several places on the screen. Click Move Wombat again to move it to the next position. It maintains the current position the next time you open the Database Detective.

- You can move the title bar by clicking and dragging it with the trackball.
- To see the Wombat control panel, hold the CTRL key while clicking and dragging the Wombat title bar. This is useful if a screen such as lighting control is covering the control panel.

Process Sheet settings

The next several parameters refer to creating a ***Process Sheet*** (see "Make a Process Sheet" on page 232).

Show All Parameters

If checked, all parameters (even those disabled), are shown in Process Sheet.

Show All Jobs

If checked, the information for all jobs within the database is included. If un-checked, only the information from the active job is included.

Show Lighting

Choose whether to include the lighting information.

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Show Lighting Only

Only available if Show Lighting is checked. Omits the inspection information and only shows the part tracking and lighting information.

Ignore Backup Databases

When Wombat does certain database operations, it can ignore backup files such as "backup of MyDatabase.vdb" to save time.

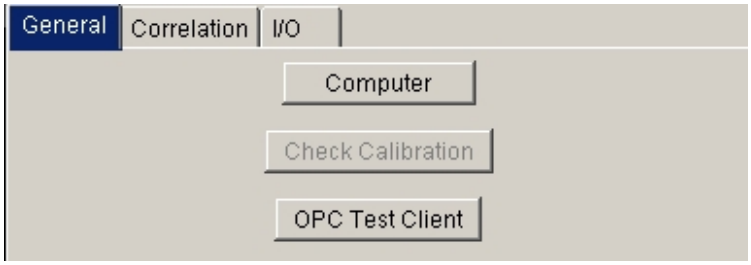
DIAGNOSTICS TOOLS

USER LEVEL: MECHANIC AND ADMINISTRATOR

These tools are available to troubleshoot different parts of the Intellispec.

Click button.

General tab



Computer

Displays information about your computer system. Technical support representatives may request this information for assistance in troubleshooting.

Check Calibration **(on page 242)**

OPC Test Client **(see "The Intellispec OPC test client" on page 609)**

(Only available when optional OPC server is installed) The Intellispec provides a test client to make sure that the OPC server is properly working.

Check Calibration

USER LEVEL: ADMINISTRATOR

This feature allows you to see how well the current part program is performing. You load a set of images, and the system runs the jobs for the selected part. You can compare the results to statistics saved previously. You can also load a set of "Golden Part" images to make sure the part program is running as expected. If you have a set of defects you want the system to catch, use a "Master Set" of images that includes examples of each of these defects.

While calibration is running, the system goes online temporarily and performs inspection on a set of saved images. It then returns offline.

Before using Check Calibration

1) Make sure you have jobs properly programmed on each calibration channel*.

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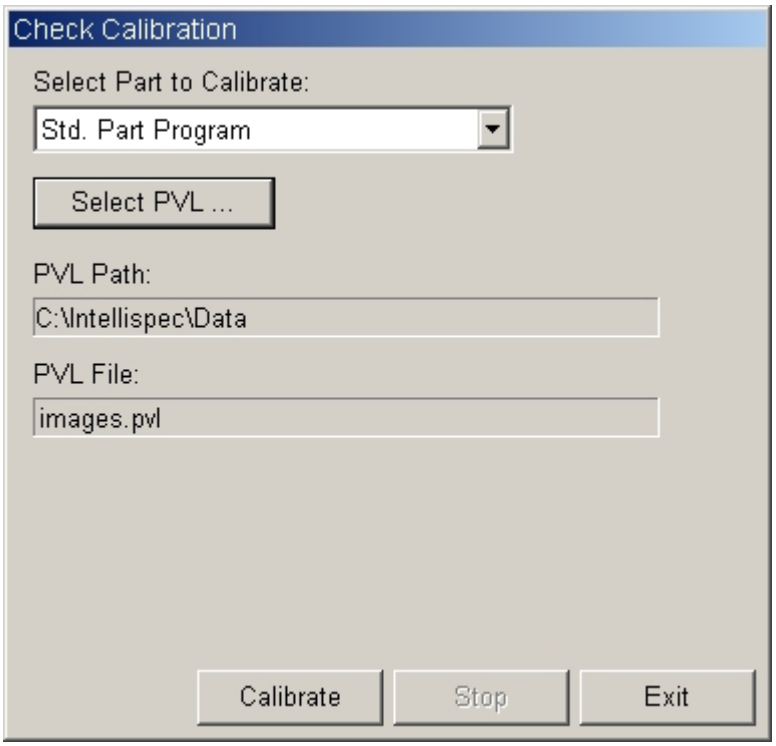
2) This feature works with Part Management. Make sure you have ***Part Management enabled*** (see "Setting up Part Management" on page 107), and have a part programmed with assigned jobs from all applicable channels.
3) Make sure you have a set of ***SmartCAL*** (see "About SmartCAL" on page 214) (.pvl) images saved for each calibration channel.

❖ *Note: *Check Calibration only checks the first* **channel group** *(on page 619).*

Using Check Calibration

To use Check Calibration:

1) Click the button.
2) Click the Check Calibration button.
3) Select a Part to Calibrate from the drop-down box (will display available parts from the current database).



4) Click the Select PVL... button. The system searches for available PVL files in a default directory. To locate a file not in the default folder, click Change Search Directory and allow the system to search for available files. Highlight the desired PVL file. Click Done.
5) Click Calibrate. The system will run calibration on the number of images in your PVL file. While this is running, only the Stop button is available; you will not be able to do anything else within the system.
6) Click Exit.

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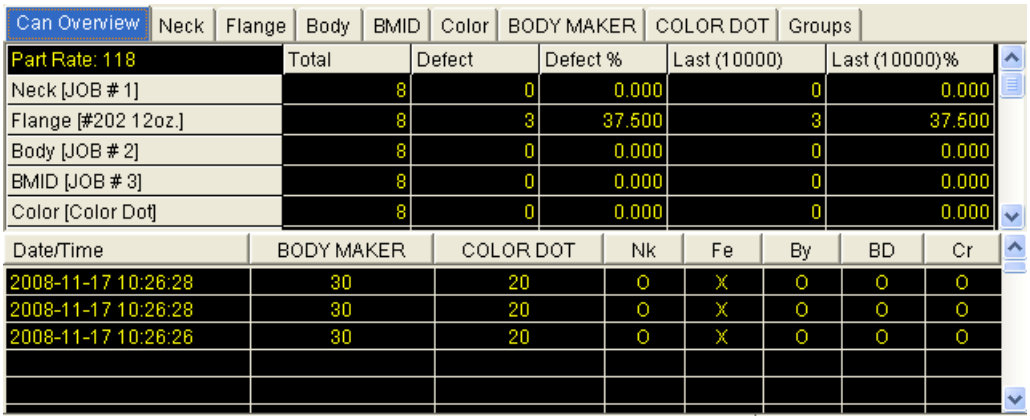
7) When the process is done, look at the statistics tables. This displays statistics for the number of parts in your PVL file, and how each inspection performed.



- To save all statistics: Right-click System Overview tab >> Print Statistics. Print them to Printer, File, or both.

You can use the results of Check Calibration to compare them to a previously saved set of statistics. Or, if running set of "Golden" or "Master" part images through this calibration, make sure the proper inspections are catching defects as expected.

Correlation Diagnostics

USER LEVEL: MECHANIC AND ADMINISTRATOR

This screen can help you verify sensor operation if you have the correlation option installed.

To get to this menu:

1) Click button.
2) Select Correlation tab.
3) Click Correlation button.
4) Click Start to begin the diagnostic.
5) Look at the values on screen to see if they change or increment as you expect. The categories are described below.

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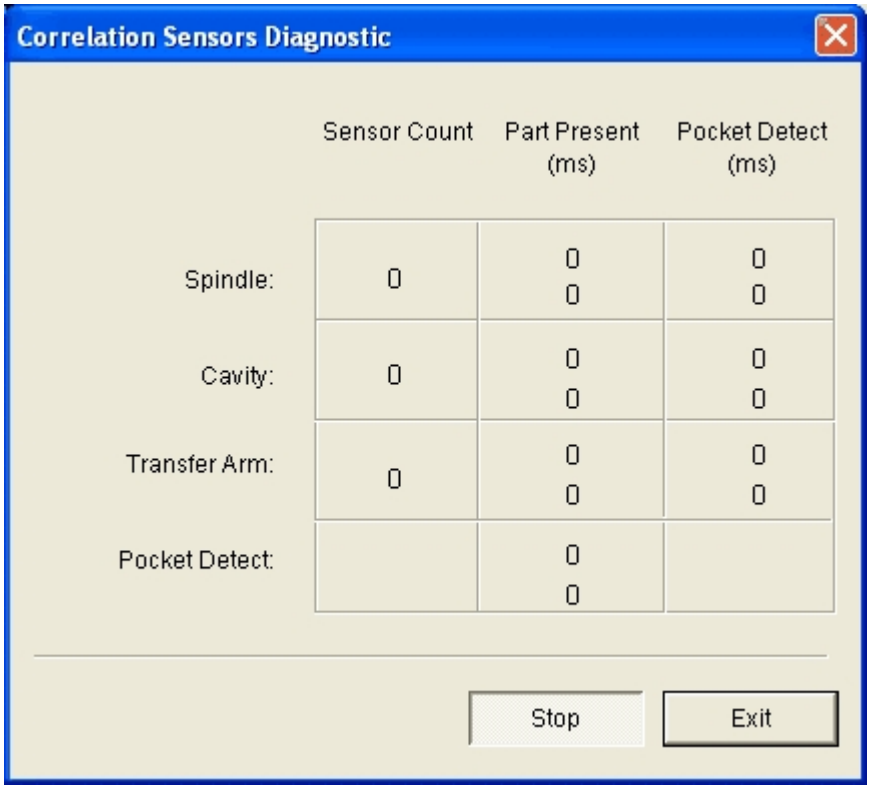
6) Click Stop when finished.



Sensor Count

This is used to determine that the correlation sensors are being counted properly. For example, on an SBO-16, there are 16 cavities, 8 transfer arms, and 160 spindles. The correlation counters should run from 1-16 for Cavities, 1-8 for Transfer Arms, and 1-160 for Spindles. If you see values other than the ones that define your blow molder, this indicates a problem in the placement or connection of the correlation sensors.

Part Present and Pocket Detect Count

This is used during sensor setup to review the sensor positions. Use this to verify that the sensors are set up properly and that they follow setup guidelines. The spindle, cavity, and transfer arms sensors should **not** occur within less than 0.5 milliseconds of either a Part Present signal or a Pocket detect signal.

I/O Testing

USER LEVEL: MECHANIC AND ADMINISTRATOR

Verify that the system is able to view and control the digital I/O channels.

Warning

This test will activate outputs that may result in personal injury or damage to the machinery. Make sure the Output areas are clear before testing.

To view the input and output signals:

1) Click the button.
2) Click the I/O tab.

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3) Click the I/O Testing button.
4) Click Yes to continue.
5) Move your cursor over each button to see each signal name. The name is displayed in the title bar. Below shows a map of all signals. The physical connection of each input or output is a channel on the I/O boards. All of these channels are assigned and may not be changed.

To test the outputs:

1) When you are ready, click the desired output channel button to toggle the output.
2) Check the output through the hardware; for example, check the reject device if you toggle a reject output.

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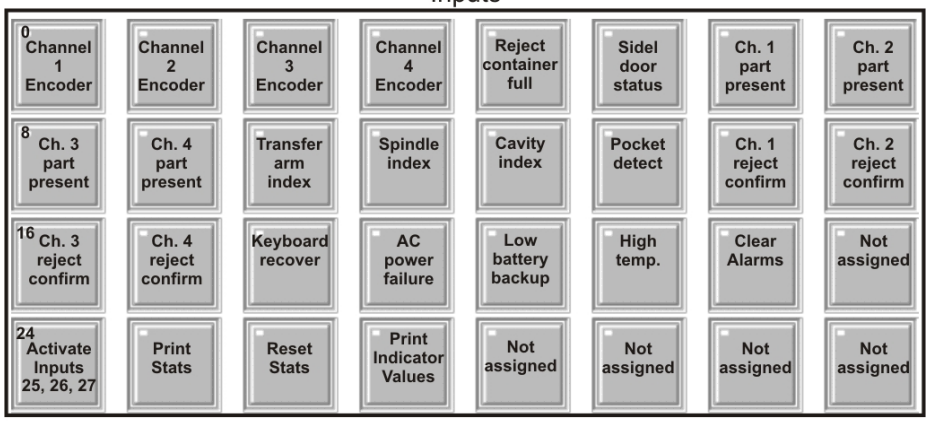
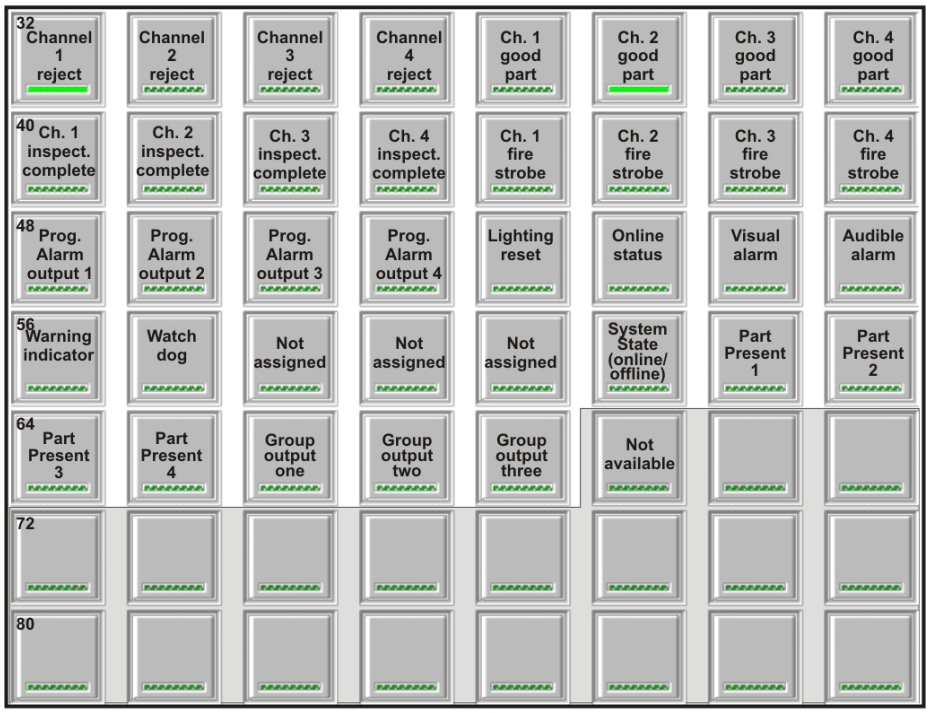
3) Click the small x in the upper corner of the I/O screen to exit this diagnostic.

Inputs





Outputs

Show I/O Rates

USER LEVEL: MECHANIC AND ADMINISTRATOR

This diagnostic displays current information about part or encoder rates. The Part Rate diagnostic provides the time available for part programs.

To show I/O Rates:

1) Click the button.
2) Click the I/O tab.
3) Click the Show I/O Rates button.

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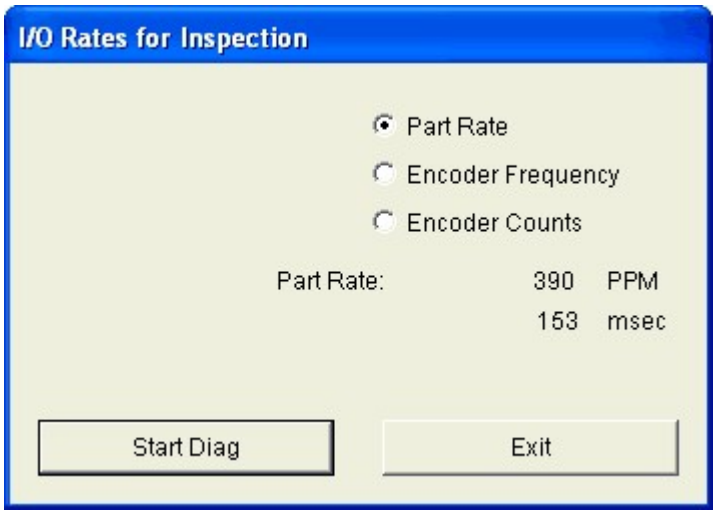
To check Part Rate:

1) Select the Part Rate button.
2) Click the Start Diag [diagnostic] button.
3) Run parts through the part present sensor. The time between part present signals is timed and averaged. The time period for each part is also displayed, which helps determine how much time is available for part programs (in milliseconds).
4) Run enough parts through for a good average.
5) Click Stop Diag to finish.



To check Encoder Frequency:

1) Select the Encoder Frequency button.
2) Click the Start Diag button.
   - The Encoder Frequency, as well as time period is displayed.
   - If there is no encoder attached to your system, this will read 0 Hz.
   - If you are using the ***encoder divider*** (see "Part Tracking Tab" on page 130), this rate will read the speed after it has been divided. Be sure to compensate when determining production speed.
3) Click Stop Diag to finish.

❖ *Note: The encoder input signal should not be more than 10 kHz. This is true even when using an encoder divider. You can, however, use encoder simulation to simulate a higher frequency.*

Encoder Counts is used as a diagnostic tool. It allows you to determine how many encoder counts are between two points in your production line.

For example, it can be used when you manually crank a blow molder to determine how many encoder counts are between inspection module and rejecter.

To check Encoder Counts:

1) Select the Encoder Counts button.
2) Click the Start Diag buttton. The encoder counts are displayed.
3) If desired, click Reset to reset the encoder counts.
4) Click Stop Diag to finish.
5) Click Exit to remove the I/O Rates screen.

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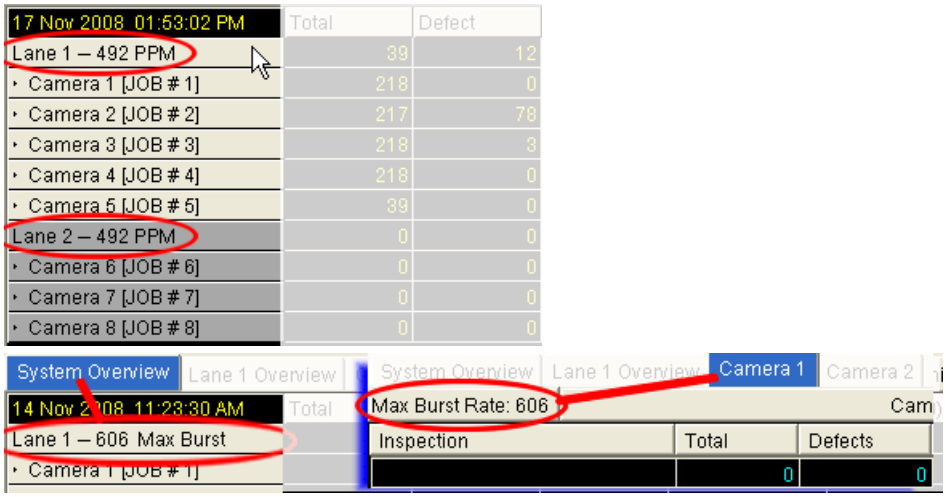
Displaying part rate

The lane's **part rate** is displayed in the statistics area. It is displayed in parts per minute (PPM) in the upper right corner of:

- Lane Overview tab (if configured)
- Camera tabs, and
- System Overview tab (if configured)

You can click on the part rate to toggle to **burst rate** and **max burst rate**.



Burst rate

Instantaneous, current part rate.

Max burst rate

The fastest part rate encountered since the last time the statistics were reset.

UPGRADING THE SOFTWARE

USER LEVEL: ADMINISTRATOR

Use this utility if you receive a disk with a software upgrade from Pressco.

To upgrade the software:

1) Log in.
2) Click the button.
3) Click the Utilities tab.
4) Click the Software Upgrade button.
5) Follow the instructions on screen. The system will properly configure the new version of software.
    - Near the end of the upgrade process, there may be two messages that mention logo verification. Click the Continue Anyway button.
6) When the reboot prompt appears, click OK to restart, but **do not remove the CD** until Windows shuts down. The system will restart and run with the new version of software.

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❖ *Note: Some software upgrades require upgrading your software license key. If your upgrade will not run for this or any other reason,* **contact Pressco Technical Support** *(see "How to Contact Pressco" on page 633).*

CLEARING ALL JOBS

USER LEVEL: ADMINISTRATOR

If you are completely redefining the vision system, clear all of the jobs from memory. System configuration stays the same, but it erases all jobs and statistics.

Warning
Clearing memory erases all vision database information.

To clear all jobs:

1) Log in.
2) Click the button.
3) Click the Utilities tab.
4) Click the Clear All Jobs button.
5) Click Yes to continue. All vision job information is erased.

The only way to retrieve vision database information is if you have ***saved it to disk*** (see "How to Save a Database" on page 225).

CLEARING THE SYSTEM CONFIGURATION

USER LEVEL: ADMINISTRATOR

Use this utility only if you are completely purging the vision system of everything for a new installation. This erases the entire database. Everything, including system configuration, is reset to default conditions. The only way to retrieve anything is if you ***saved it to disk*** (see "How to Save a Database" on page 225).

Warning
This utility completely erases all configuration data from the system.

To clear the system configuration:

1) Log in.
2) Click the button.
3) Click the Utilities tab.
4) Click the Clear Configuration button.
5) Click Yes to continue. The entire system is reset to default conditions.

ADJUSTING DATE AND TIME

USER LEVEL: ADMINISTRATOR

To get to this menu:

1) Click button.
2) Click Date/Time tab.
3) Click the Adjust Date and Time button.

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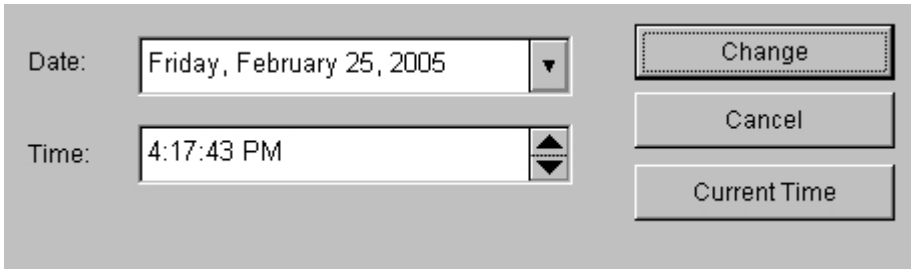
4) Choose the date from the calendar provided (click the arrow next to date). Today's date is chosen by clicking Today at the bottom of the calendar.
5) Set the time in 12 hour format.
    - To quickly set time, click the Current Time button.
    - To manually set time, highlight the hour/ minute/ second/ or AM/PM. Type the new value or use the up/ down arrow buttons to adjust.
6) Click Change to accept the new settings.
7) Click the 'x' in the upper right corner of the Date and Time Editor to exit.



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Chapter 11

REGISTRATIONS, ORIENTATIONS, INSPECTIONS

OVERVIEW

USER LEVEL: MECHANIC CAN EDIT. ADMINISTRATOR CAN ADD REGISTRATIONS, ORIENTATIONS, AND INSPECTIONS.

This chapter is a collection of all the registrations, orientations, and inspections in Intellispec software. Not all channels or applications will have all these registrations or inspections available, due to the default product type set for each channel. The default product type is important because it allows only inspections that make sense for that type of product.

This chapter discusses the detailed parameters. For background information, see the section about ***programming inspections*** (see "Inspection Overview" on page 101).

The registrations, orientations, and inspections in this chapter are discussed in the order in which they appear in the software, as shown below.

Registrations*
- Blob
- Circular
- Finish
- Fixed
- Shape Adapt
- X-Y
- Tracker
- Circular Region
- Polygon Region
- Shape Adapt Region

Orientations*
- Orientation Pattern Match
- Orientation Edge
- Midline Orientation
- Orientation Stealer

*availability dependent on Product Type

Inspections*
- Clipout
- Circle
- Circle Dimension
- Radial Line Integration
- Dimension
- Polygon
- Shape Adapt
- Notch
- Rectangle Binary
- Rectangle Grayscale
- Side Fold
- Tracker
- Circle Width Dimension
- Light Meter
- Harmonic
- Rectangular Tracker
- Line Integration
- Thread Inspection**
- Tracker Line Integration
- Label Skew
- Correlation Inspection
- Alphanumeric Correlation
- Fill Height
- Label Skew Dimension
- RETRO-SPEC
  - Contrast
  - Intensity
  - Measurement
  - RETRO-SPEC Wizard Dialog...

**Documented in a separate Inspection supplement

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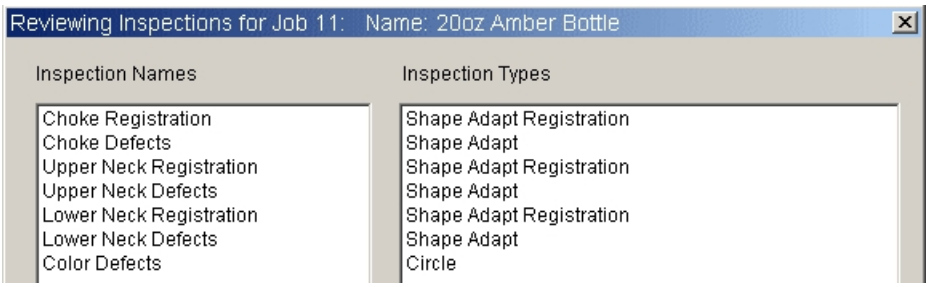
Which Registration / Orientation / Inspection am I Using?

Most often, you will be ***modifying a job*** (see "Changing a Job Online" on page 119) that already exists. This chapter refers to each registration, orientation, and inspection by the default system name. In your jobs, these can be re-named to make more sense to your application. You can identify the default system names in one of three ways:

- Right-click the inspection name. In the example below, a Circular Registration (default system name) has been re-named Center.

- Edit the inspection and look at the image toolbar (online or offline): Double-click the inspection name in the statistics area to edit. Note: a *Retro-Spec* inspection is different – it brings up a full screen interface.

- Look at the default system names for the whole job: Right-click the camera's statistics tab >> Review Inspections >> Select a job >> Click OK >> see Inspection Types. These names correspond to those described in this chapter.



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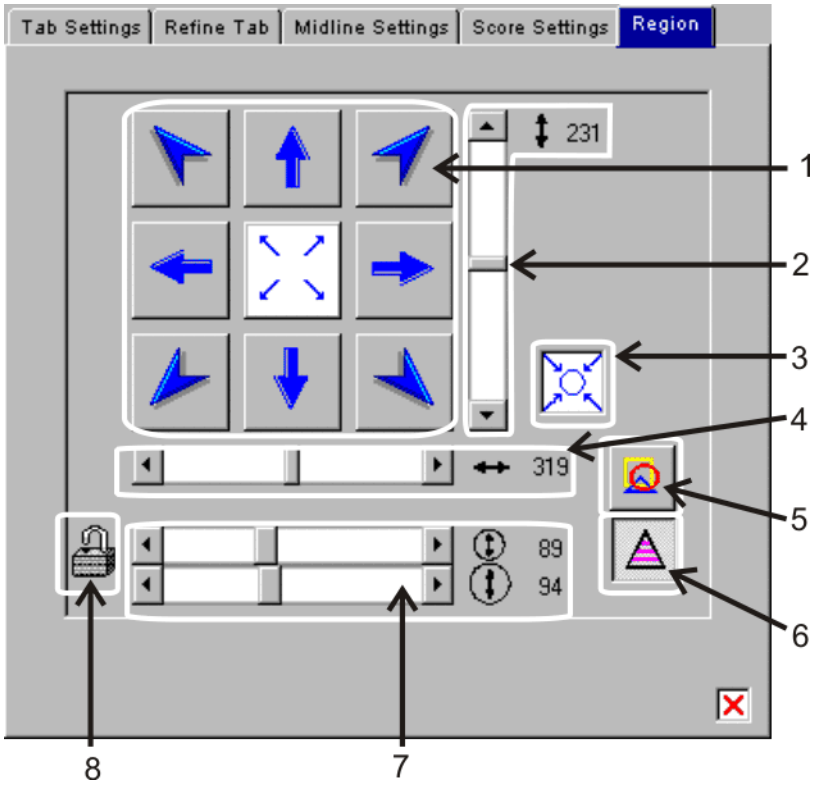
Using Region Menus

Almost all registrations/ orientations/ inspections have similar Region menus to place the search region. The common elements are described below. Some inspections have slightly different Region menus, and they are discussed within the specific inspection topics.



1	position of selected region on image
2	vertical position of selected region
3	horizontal position of selected region
4	center
5	show all regions from all other registrations/ orientations/ inspections in job
6	show inspection graphics from current inspection
7	inner and outer radii of region
8	lock inner and outer radii together (size similarly)

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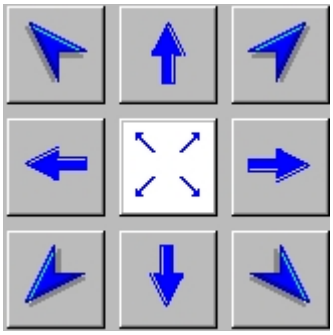
Using arrow buttons

The arrow buttons move the entire region at once. The center arrow button is used as a coarse adjustment. Click the center arrow button, and hold the left trackball button while moving the region with the trackball. Clicking any of the surrounding arrow buttons moves the region in the selected direction one increment at a time.

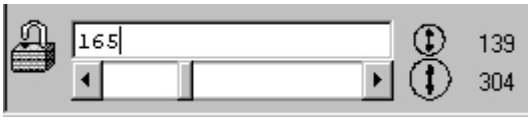


- Holding <<Ctrl>> key while clicking an arrow moves the region in increments of 15
- Holding left trackball button on an arrow causes it to go into auto-repeat mode
- You may combine the above two functions

Using slider bars

The slider bars can be used as both coarse and fine adjustments. Click and hold the middle button of a slider bar while moving it with the trackball – this is coarse adjustment. Clicking on the white area of any slider bar is also coarse adjustment. Clicking the end arrows of any slider bar is fine adjustment – they move or size the region one increment at a time. The number displayed near the slider bar reports the radius or position of the region.

Right-click on a slider to enter a numerical value. This allows very precise and quick changes.



Click the Lock icon to lock the movement of the inner and outer regions together.

Center button

Clicking the Center button re-positions the region to the center of the image if no registration is already present. If you are placing an inspection with a registration present, the region will be centered with respect to the last registration reference point.

Registrations – Independent / Dependent

With this feature, you can program subsequent registrations to use the information from the previous one.

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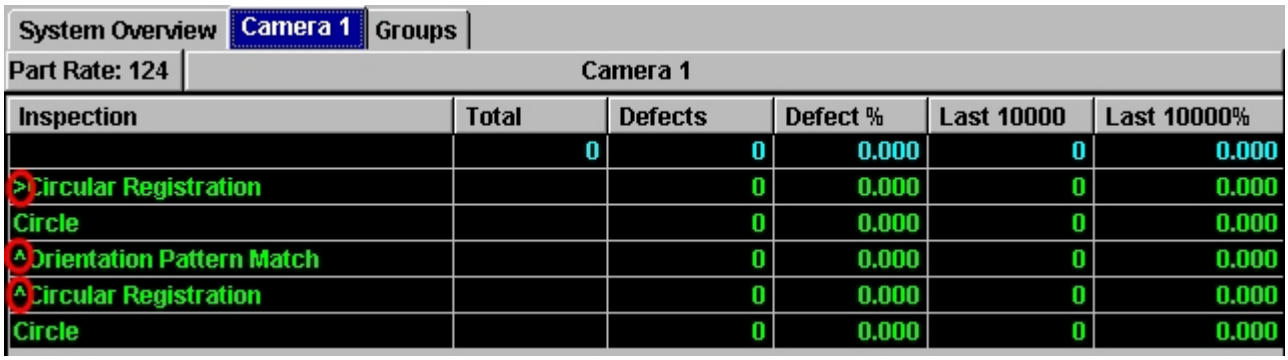
❖ *Note: All **Orientations** are dependent on the previous Registration. You cannot make them independent.*

To make a registration dependent:

1) Select the name of a registration that you want to make dependent on the previous one.
2) Right-click on the name, and choose Make Dependent from the drop-down menu. You will see a '^' mark next to the dependent registration name.

An independent registration is indicated by a '>' mark.



To make a registration independent, right-click its name, and select Make Independent from the drop-down menu.

All new Registrations added to the job will be Independent unless you right-click the Registration's name and Make Dependent.

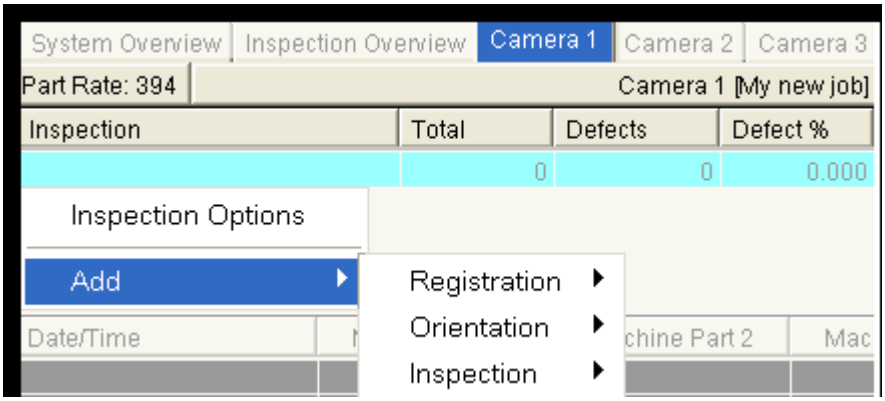
BLOB REGISTRATION

The purpose of the Blob registration is to find the largest connected set of pixels. The pixels are defined as a range of image gray levels.

Adding the Blob registration

To add the Blob registration:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



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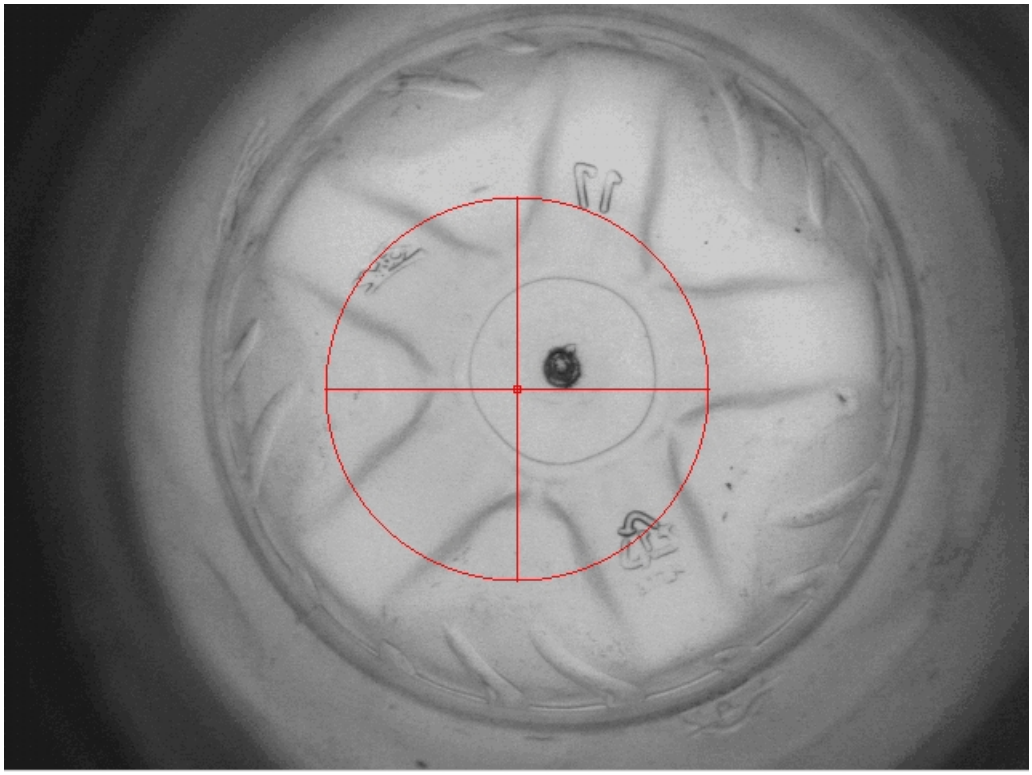
4) Select Add >> Registration >> Blob registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Setting the Blob registration region

Go to the Region menu to place the search region. Place this region to find the desired feature, leaving enough room to locate this feature, even if the parts have slight movement in the system's field of view.



An example of region placement: use the gate or petaloids on the base of a bottle as the area to determine the registration.

Choosing a Centering method

Go to the Centering menu and choose a centering method. Your choices are Largest Blob or Blob Circle Fit. The parameters in the Ambient and Blob menus may need to be adjusted to find the proper center.

There are two centers to consider:

1	The **registration** center is the center point of the Blob registration region (shown by light green '+', see picture below)
2	The **center of the part** is calculated by one of two centering methods: Largest Blob or Blob Circle Fit. It is calculated from the blobs found, and is shown by the larger, dark green '+'.

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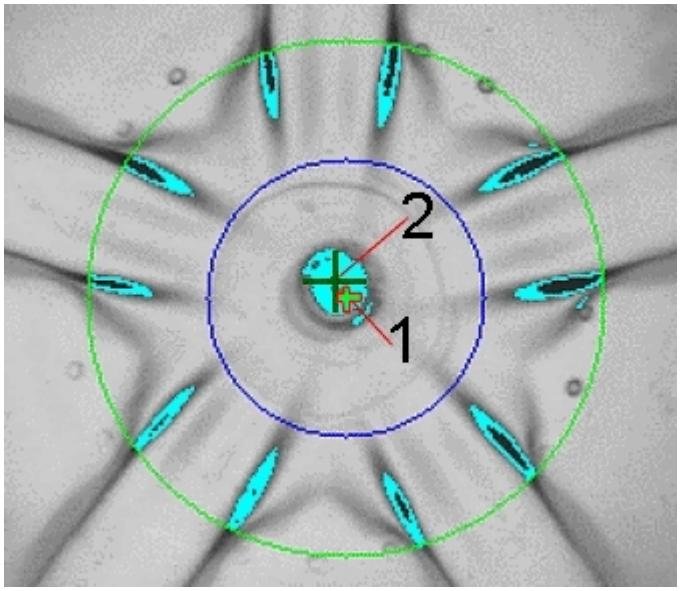


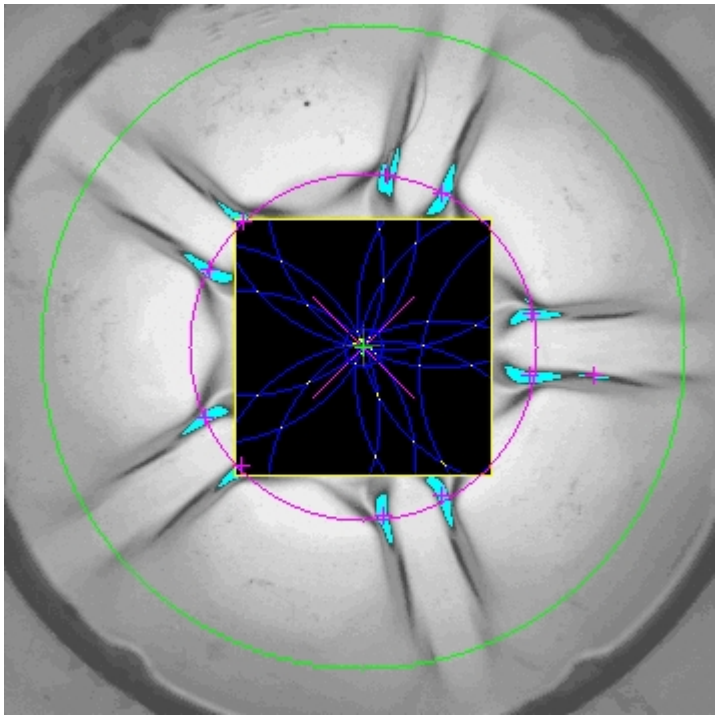
Largest Blob

The center of the part will be set to the center of mass of the largest valid blob found (example: the gate in PET Base applications).

Blob Circle Fit

The center of the part is computed by fitting the center of mass of each valid blob to a circle.

The image below shows the target circle (magenta) intersecting all the blobs between the feet. The center of the part is marked by the large magenta ‘x’.



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Target Circle

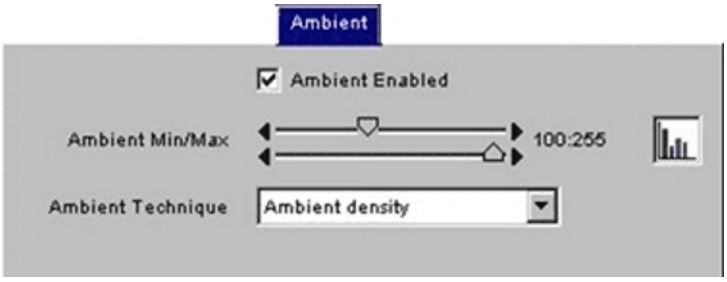
If the centering method is Blob Circle Fit, adjust the size of the circle in which you expect the center to fall.

Show Circle Fit

Displays the circle fit lines.

Adjusting the Blob registration parameters

Blob Registration Ambient Menu



The ambient is a gray level value that represents the gray levels of a region. This menu allows you to configure how the system adapts to image intensity shifts. It can be used to reject grossly different part colors. However, its primary purpose is to allow the system to correct for gray level changes within the inspection regions.

The Ambient that is determined through the settings in this menu can be used in the Blob analyses.

Ambient Enabled

This determines whether the found ambient is used as a reject criteria. You can choose whether to reject based on the gray shade found on each new image. If this is not checked, the Ambient Min/ Max parameters are not used. However, the ambient is still calculated for use in other inspection areas (blob), and you can choose an ambient technique.

Ambient Min/ Max

The minimum and maximum acceptable ambient gray level values. Any computed ambient found lower than or higher than these values will cause the registration to fail.

Ambient Technique

This method determines the region's ambient. Choose the method through the drop-down menu.

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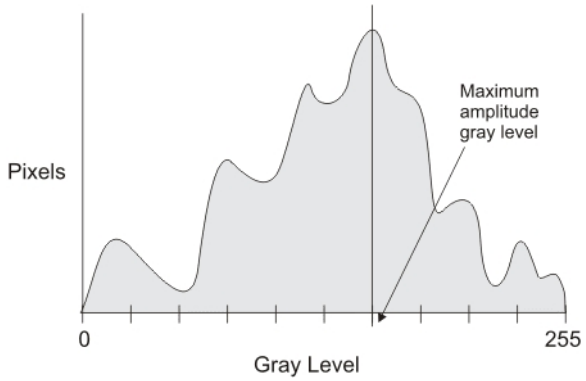
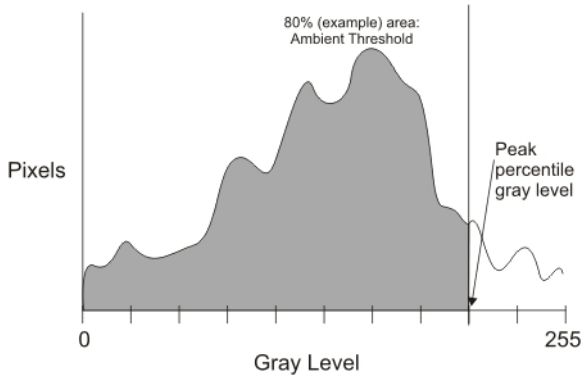
- **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.



- **Peak Percentile** locates the gray shade value that exceeds the **threshold.**
  - **Threshold** defines what percentage of the search area to use.



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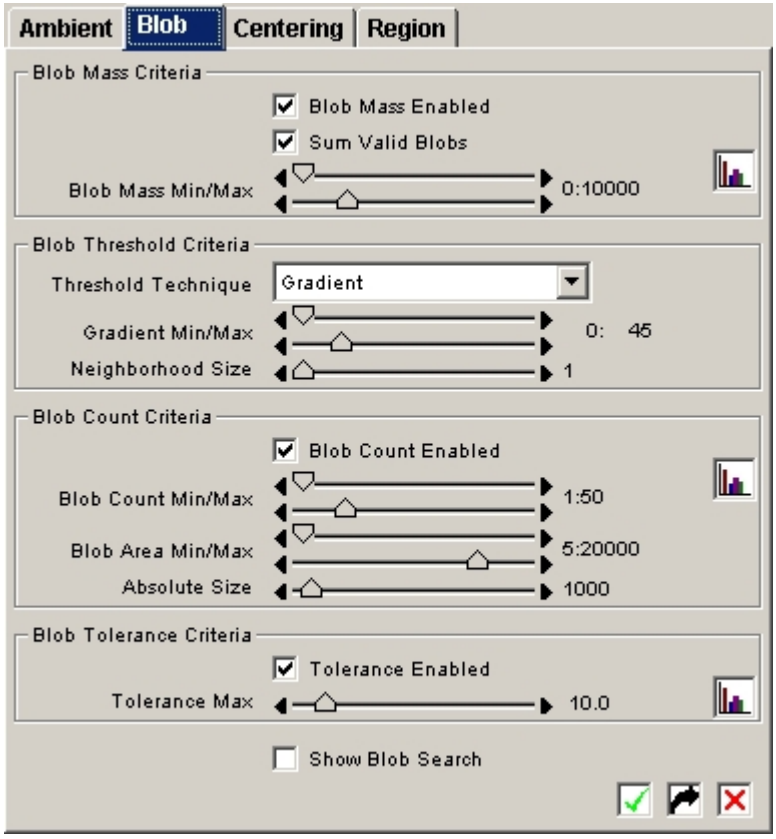
- **Ambient Density** computes the average of all the pixel gray levels — total gray level divided by pixels.

Blob Registration Blob Menu



The purpose of the blob inspection is to find connected sets of pixels, defined as ranges of gray levels.

The Blob inspection will calculate the mass, and the total number of objects found in the search regions. You can specify the maximum qualifying size and the maximum number of blobs required to fail the registration.

BLOB MASS CRITERIA

Blob Mass Enabled

This determines whether the total blob mass is used as a reject criteria.

Sum Valid Blobs

When this is checked, the Blob Mass Total is the sum of the valid blobs only. The valid blobs must meet the Blob Area Min/ Max qualification. For example, say that within the inspection area, you can tolerate several little blobs, but want to reject the part of it has too many of these little blobs, or if it has one large blob.

When this is un-checked, every set of pixels that meets the Blob Threshold Criteria is counted in the Blob Mass Total, regardless of size.

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Blob Mass Min/ Max

The minimum and maximum allowable total pixel count of all the located blobs combined. If the total blob area is less than or greater than these numbers, the registration fails.

BLOB THRESHOLD CRITERIA

Threshold Technique

Choose whether to use a percentage of the Ambient, or use an actual gray shade value to define the gray shade limits of a blob.

Percent of Ambient technique

This technique uses a percentage of the found Ambient to define the low and high thresholds.

❖ *Note: The blob pixels are those with gray levels that fall between the Minimum and Maximum gray levels. These pixels must also be connected.*

Threshold Min/ Max

This percentage is used to compute the minimum and maximum gray levels considered as blob pixel candidates. The system computes the thresholds as follows:

- Minimum Gray Level = Ambient x (Threshold Min / 100)
  - For example, if the Ambient is 200, and Threshold Min percentage is 20, the Minimum Gray Level is 40. [200 x (20/100)] = 40.
- Maximum Gray Level = Ambient x (Threshold Max / 100)
  - For example, if the Ambient is 200, and Threshold Max Percentage is 80, the Maximum Gray Level is 160. [200 x (80/100)] = 160.

In the examples stated above, if the Minimum Gray Level is 40, and the Maximum Gray Level is 160, all pixels in the search area with gray levels between 40 and 160, *and are connected*, are considered Blob pixels. The larger the Threshold Max, the more lighter-colored material will be included in each blob.

Gradient technique

This technique allows you to choose an actual gray shade value to determine the low and high thresholds.

Gradient Min/ Max

The lowest and highest gray shade values allowed within the blob.

Neighborhood Size

Determines how far apart blob pixels may be to be considered connected. A setting of one indicates that the blob pixels must be next to each other. A setting of 10 indicates that pixels that match the blob threshold criteria, and are within 10 pixels of each other, are considered connected and therefore blob pixels.

BLOB COUNT CRITERIA

The following parameters are common to both Percent of Ambient and Gradient Techniques:

Blob Count Enabled

This determines whether the number of qualifying blobs is used as reject criteria.

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Blob Count Min/ Max

The minimum and maximum number of blobs expected to be found. If the number of blobs found is less than or greater than these numbers, the registration fails.

Blob Area Min/ Max

The minimum and maximum blob size qualification. Any blob that has fewer or a greater number of pixels than these numbers is not considered in the blob count total.

BLOB TOLERANCE CRITERIA

Tolerance Enabled

This determines whether the largest blob center is compared to the registration center.

Tolerance Max

The maximum distance (in pixels) that the largest blob should be from the registration center. If the distance is greater than this number, the registration fails.

Absolute Size

Allows the system to reject a part if one blob (its number of connected pixels) exceeds this value.

DIAGNOSTICS

Show Blob Search

Displays the blob pixels.

Graphs - Blob Registration

These are the graphs available for this registration.

Blob Center X

Indicates the horizontal position of the found center (X coordinate). This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

Blob Center Y

Indicates the vertical position of the found center (Y coordinate). This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

Blob Ambient

Represents the average image intensity over the entire search region.

Blob Total Area

The total number of pixels considered as part of the blob (a range of gray shades).

Blob Count

The number of blobs that were within the expected size tolerances for the blobs. This indicates the number of features found in the search area. Having too many or not enough features may indicate a problem.

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Largest Blob

The number of pixels in the largest blob found in the search area. Large blobs may indicate a problem with the image. It is also possible that small blob areas may indicate missing features.

Center Offset

(Only if Tolerance enabled) The distance from the center of mass of the largest blob to the found center.

CIRCULAR REGISTRATION

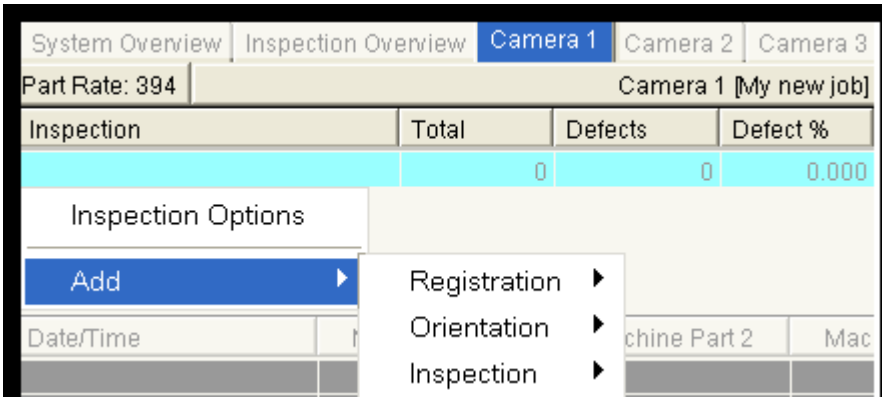
Circular Registration is good for locating edges on circular parts. In this registration, you may choose either Radial Edge or Hough centering, and the system searches for a circular feature using edge transitions. This registration also features optional subpixel location, which locates edges within hundredths of a pixel, rather than rounding off to the nearest pixel, offering greater centering accuracy (mostly used with Radial Edge centering).

Circular Registration replaces both Radial Edge and Hough registrations found in earlier versions of Intellispec software. If your jobs from previous versions of software used either Radial Edge or Hough registrations, they were automatically converted to Circular registration in 3.1 and later software. Because of this, databases saved in 3.1 software and later will *not* be backwards compatible with Intellispec version 3.0 or earlier software.

Adding the Circular Registration

To add the Circular registration:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Registration >> Circular registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

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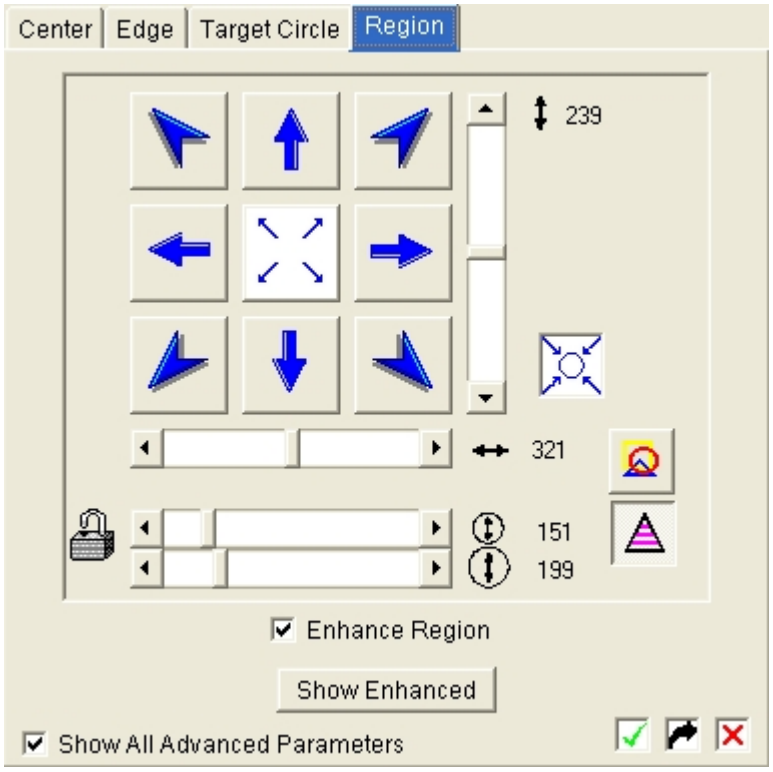
Setting the Circular Registration Region

Circular Registration Region Menu

This menu is similar to other ***region menus*** (see "Using Region Menus" on page 255), but has an added feature, described below.



Enhance Region

(Advanced parameter) Increases the contrast of the search region. This does not change the inspection.

Show Enhanced

Displays the search region with enhanced contrast. If the search region circles fall outside of the field of view, you will not see an enhanced region.

To set the region for the registration:

1) Using the Region menu, adjust the two circles to surround the feature that the registration should find. This is the range that the part may move within and still be located.
   - The circles may fall outside of the image.
   - Use the Center button to quickly move the entire region to the center of the image.
2) Go to the Edge menu and select a **Search Direction**. Choose between Search Outward and Search Inward. Search for the edge that is best defined, with the least amount of noise or other features in the image.
3) Select an **Edge Transition**. If searching for a light edge against a dark background, choose Dark to Light.

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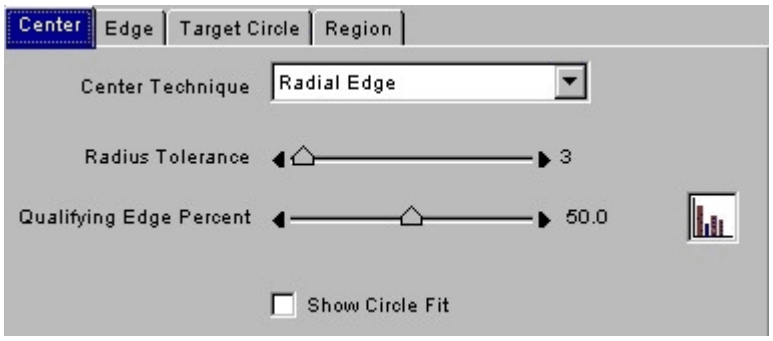
4) Go to the Target Circle menu and click **Set Target**. If the Edge parameters are set correctly, the system will automatically detect the proper target circle size. The system uses the radius of this circle to calculate the center. You may need to adjust the parameters in the Center and Edge menus to find the desired feature accurately. These menus are discussed next.

Adjusting the Circular Registration Parameters

Circular Registration Center Menu



Center Technique

Choose a technique to find the center of your part. If your part has clean edges and the feature you want to find usually falls completely within the camera's field of view, choose Radial Edge. If the feature for which you are searching has less defined edges, or part of it falls outside the camera's field of view, choose Hough.

RADIAL EDGE

Radial Edge Centering

Radial Edge registration is good for circular parts that have a distinct edge either on the inside or outside of the part.

This type of registration allows you to determine an area (a donut) where you would expect the edges of the part to fall. The system searches for edges from the inner to the outer radius (or outer to inner radius), searching for a transition from light to dark or dark to light pixels.

Each search vector tries to detect an edge, using the edge menu parameters. Found edges are marked with a green or red x for pass or fail points.

Radius Tolerance

The number of pixels in either direction of the target circle that the system will consider an edge (that is, the size range allowed for the part). A radius tolerance of two allows a four pixel wide area in which the edge of the part may fall.

Qualifying Edge Percent

The percentage of edges that must be part of the target circle. If there are not enough found edges on the target circle, this registration will fail. This can be set lower if you expect large changes in sample size (less sensitive). It can be set higher if the size of your product should not vary (more sensitive).

Show Circle Fit

Displays the Target Circle (magenta) and the Radius Tolerance (yellow circles).

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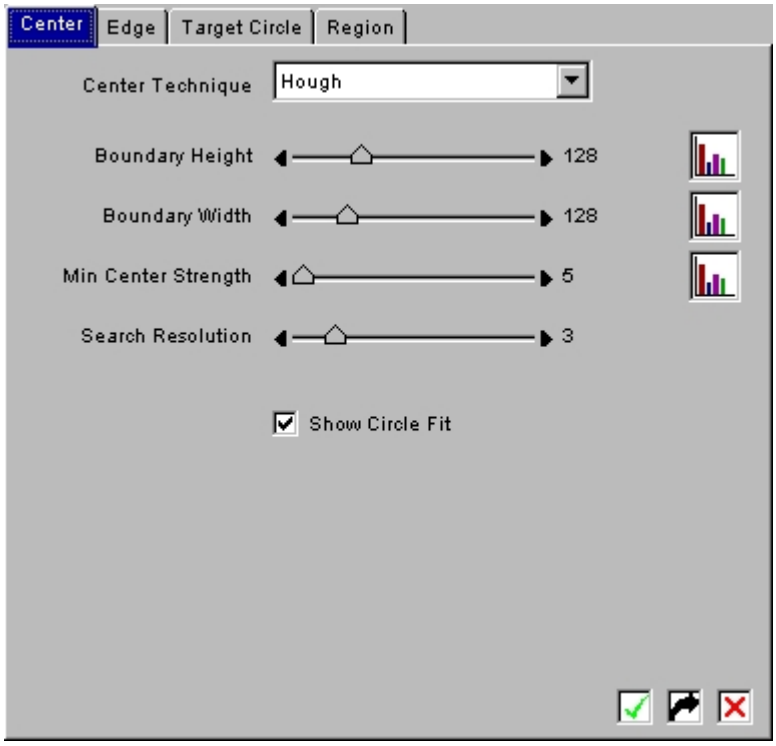
Hough Centering



This registration locates a circular feature within an image and computes the center point of that feature. An important strength of this registration is that the feature you wish to find does not need to fit completely within the camera image. As long as a good portion of the feature can be found within the image, the computed center point is accurate. It also works well if the feature you wish to find is not clearly defined for 360 degrees.

Hough registration locates edges on the desired feature and applies a Hough (pronounced Huff) transform to predict the best center position based on these edges.

Define the search region on the image in which to search for a circular feature. Then place the target circle over the feature you want the system to find.

Each search vector tries to detect an edge, using the Edge menu parameters. Found edges are marked with a cyan x.

Boundary Height/ Width (or Bounding Box)

Adjust the size of the area where you would expect the center of the feature to be found, even with slight movement of parts in the camera's field of view. The system uses only this area to calculate the Hough center. If the calculated center falls outside of this bounding area, the registration fails.

Min Center Strength

The number of arcs that must intersect the center point. When the system draws circles around each found edge on the feature, it calculates the center where most of those circles intersect. The system uses arcs of these circles as determined by the bounding area. The more arcs that intersect the center, the stronger the center. Any calculated center with a strength less than this number causes the registration to fail.

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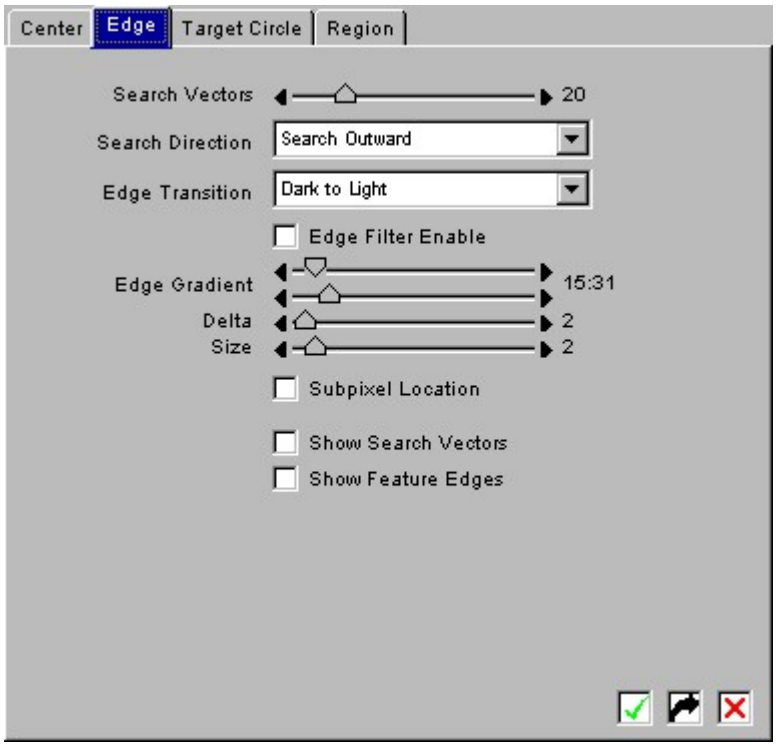
Resolution

The area (in pixels) within the bounding box that the arcs must intersect to determine the found center. A larger resolution allows a larger area – the arcs do not all have to cross at the same point – and increases the strength. This allows the system to more accurately locate the center on parts that are not perfectly round.

Show Circle Fit

Displays the bounding area (yellow box), the arcs projected by the found edges (yellow arcs), and the predicted center (large magenta X). The magenta circle is generated by the system, calculated by the found edges, based on the Target Circle.

Circular Registration Edge Menu



Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

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Edge Filter Enable

This filter is normally disabled. If disabled, the system uses Edge Gradient to qualify an edge. If enabled, the system binarizes the search vectors, using the Edge Filter value as the threshold.

Edge Filter value

(Only used when Edge Filter enabled) This is the threshold at which the system binarizes the search vector. For example, if the filter is set at 128, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Subpixel Location

Finds edges based on their subpixel location (down to hundredths of a pixel), rather than rounding off to the nearest pixel. This gives greater centering accuracy. This feature works best with Radial Edge centering.

To view this subtle difference in edge locations, un-check Show Circle Fit in the Center menu. In the Edge menu, check the Show Feature Edges box. Then toggle the Subpixel Location parameter on and off to see the difference in location of the found edges.

- In Radial Edge centering, the center is computed to subpixel values regardless of whether Subpixel Location is enabled or disabled. Subpixel Location refers to the located edges of the feature.
- In Hough centering, the located edges are computed to subpixel values (if Subpixel Location is enabled), and the center is computed as the pixel in which most arcs cross.

Graphs - Circular Registration

If using Radial Edge centering, these are the graphs available.

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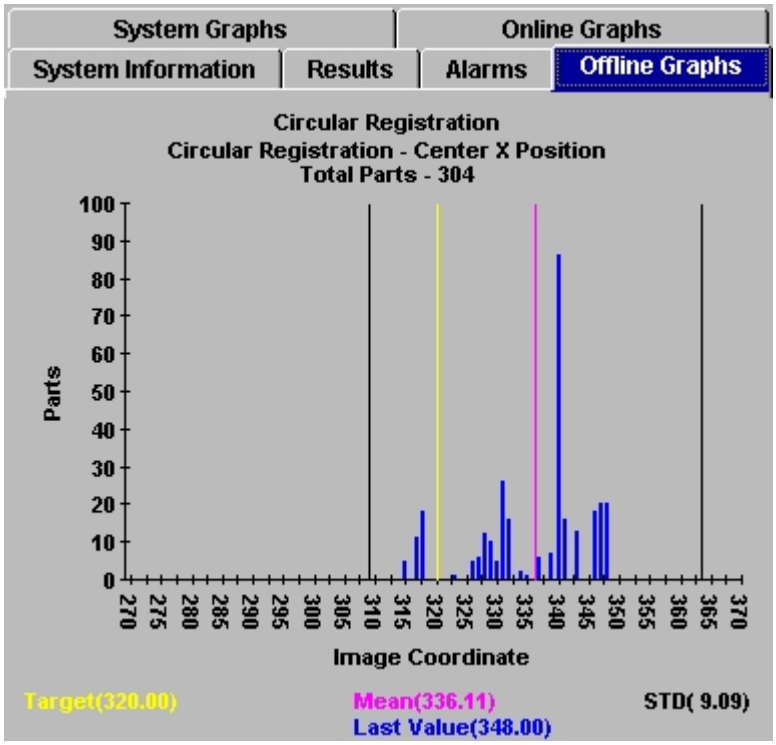
Center X Position

This indicates the horizontal center point of the part. This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).



Center Y Position

This indicates the vertical center point of the part. This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

Qualified Edges

This indicates how many of the search edges found actually qualified as edges on the feature circle.

If using Hough centering, Center X and Center Y Position graphs are available, as well as Center Strength.

Center Strength

Plots the center strength found over a number of acquired images. This can assist you in adjusting the value for center strength.

FINISH REGISTRATION

This registration accurately locates the position of a finish profile of a container within the camera's field of view. The system searches for the top of the container with a long search vector. Then the corners are located by searching to the right and left of the original search vector.

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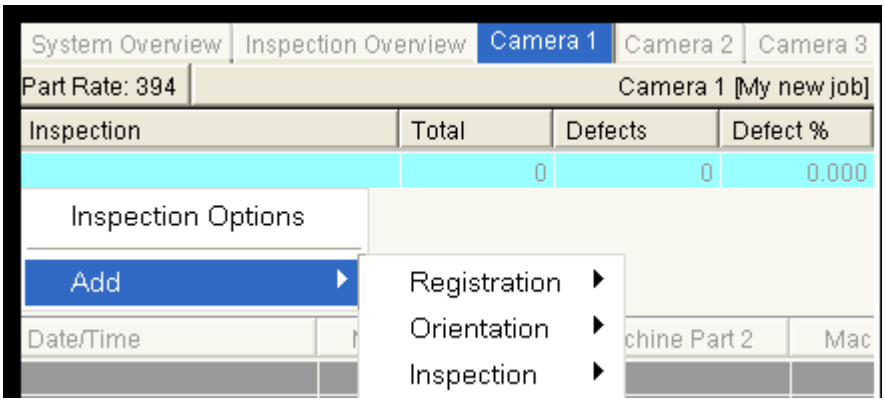
Adding the Finish registration

To add the Finish registration:

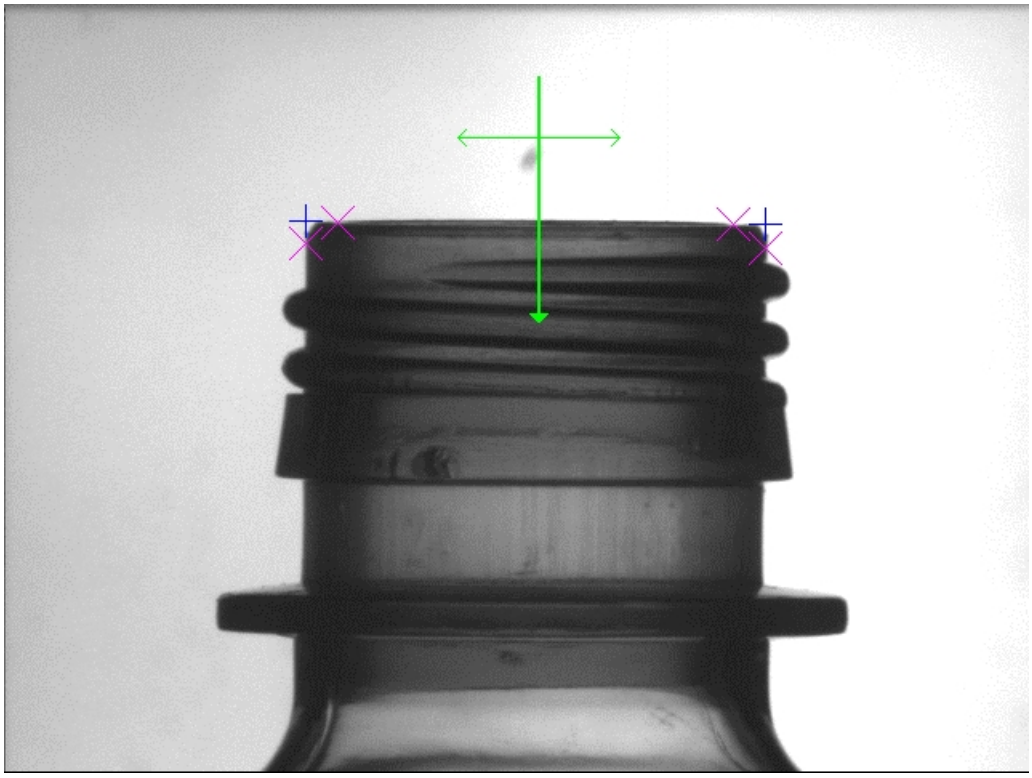
1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Registration >> Finish registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Setting the search region

Using the Region menu, position the large search vector to find the top of the container. The system searches in the direction of the arrow on the body of the "T." If the image is oriented differently on your system, change Search Direction in the Search menu.



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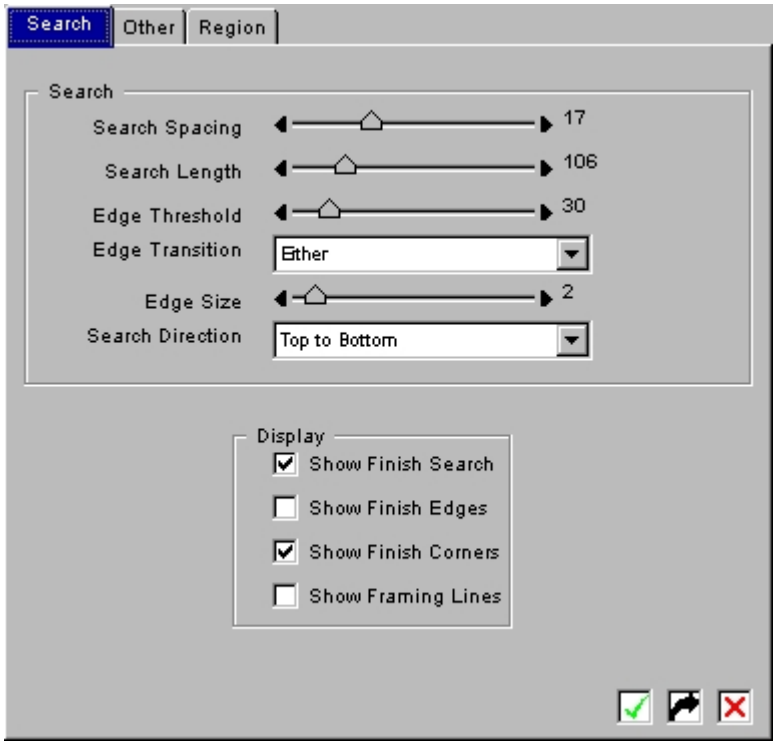
Then go to the Search menu to set the remaining search vector parameters.

Adjusting the Finish registration parameters

Finish Registration Search Menu



Search Spacing

Set the number of pixels between each search vector.

Search Length

The length (in pixels) of the vectors that search for the corners of the container. A smaller vector length will reduce the time required for this registration. However; allow enough length to always locate the finish in the image, even if the part moves slightly in the camera's field of view.

Edge Threshold

This is the threshold used to locate an edge within a search vector. The larger the threshold, the stronger the edge must be. This number is a percentage of the minimum and maximum gray level within the vector, so it changes for each image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

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Search Direction

This allows you to change the direction of the search arrow that searches for the top of the container. This is useful if, in your application, the image is oriented differently from the example shown in this section.

Show Finish Search

Displays the vectors that search for the corners of the container.

Show Finish Edges

Displays the found edges. Turn off Show Finish Search to view these edges.

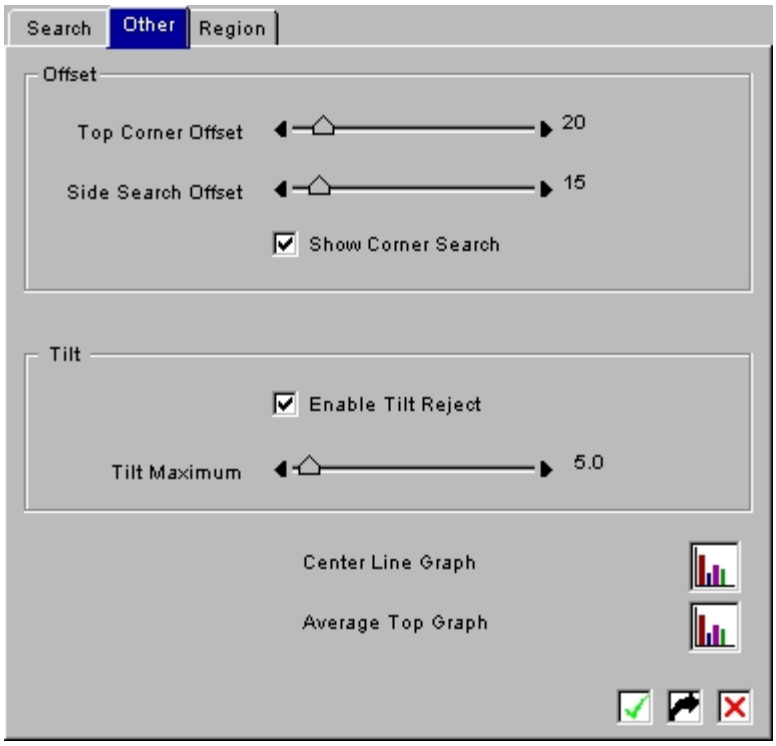
Show Finish Corners

Displays the located the corners of the container.

Show Framing Lines

Displays the projected the top and sides of the container.

Finish Registration Other Menu



This menu allows you to fine tune the corner search and also to program reject limits based on the tilt of the container.

OFFSET

Top Corner Offset

This moves the magenta X that marks the top of the container near the corner. Once the side of the container is located, the position of the top of the container must be located accurately. This offset ensures that this top corner location can be found even if the container moves slightly within the camera's field of view.

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Side Search Offset

This moves the magenta X that marks the side of the container near the corner. Once the sides of the container are located (the search vectors fall off the top edge), the corner must be determined accurately. This offset indicates how far down below the top of the container that the side search vectors are placed.

Show Corner Search

Displays the magenta X's that indicate the Top Corner and Side Search offsets.

TILT

Enable Tilt Reject

Allows the system to reject containers if they are tilted (i.e., a bent finish).

Tilt Maximum

Total amount of tilt (percentage) allowed in the container position in the image. Tilt is determined by the found edges of the search vectors. If the container is tilted more than this value, the registration fails.

Graphs - Finish Registration

These are the graphs available for this registration.

Tilt

The measured tilt angle of each container.

Center Line

The sub-pixel position of the calculated centerline of each part. This is useful in positioning the camera or part present sensor.

Top Location

The sub-pixel position of the top of each container. This is useful in positioning the camera or part present sensor.

FIXED REGISTRATION

This type of registration specifies a position on the image to reference. It does not find any edges or the center of parts; it should only be used as a reference. For example, inspections such as Dimension allow you to compute the distance between a found edge and a registration point. If you want this registration reference point at the exact same location on every image, use Fixed Registration.

Adding the Fixed registration

To add the Fixed registration:

1) Log in as Administrator.
2) Select the desired channel.

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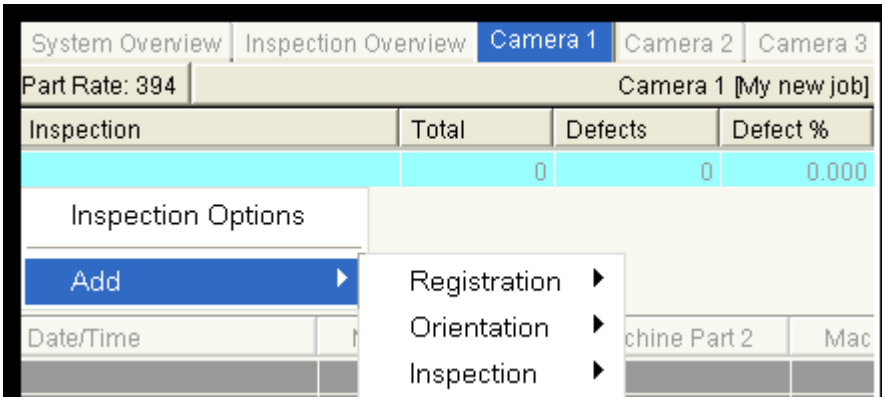
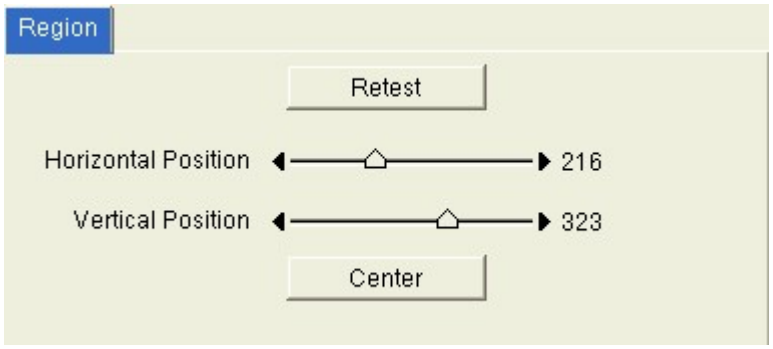
3) Right-click in the statistics area.



4) Select Add >> Registration >> Fixed registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Adjusting the Fixed registration parameters

From the Region menu, change the horizontal or vertical pixel position. Click the Center button to quickly place the registration in the center of the screen.



SHAPE ADAPT REGISTRATION

Shape Adapt is a registration that finds the sides of a part, its shape and angles. The ***Shape Adapt Inspection*** (on page 416) uses the part edges found in Shape Adapt Registration to create a custom inspection region that follows the shape of each part.

Adding the Shape Adapt registration

To add the Shape Adapt registration:

1) Log in as Administrator.
2) Select the desired channel.

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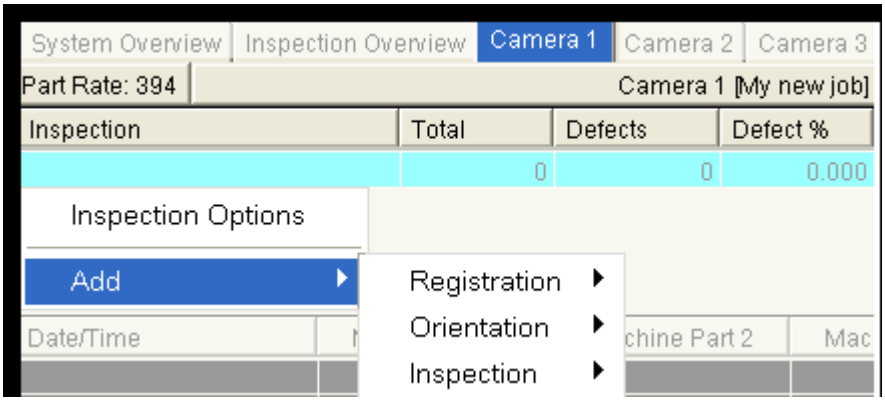
3) Right-click in the statistics area.



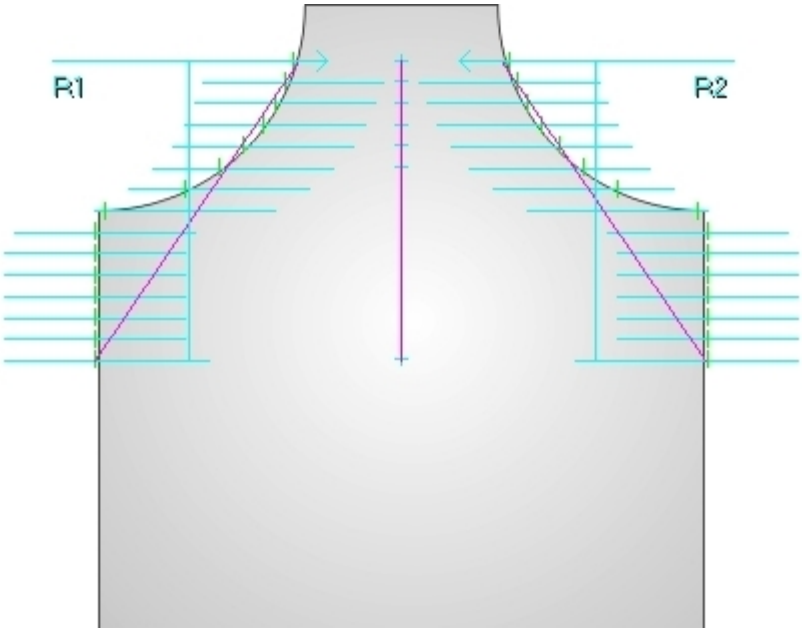
4) Select Add >> Registration >> Shape Adapt registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Setting the Shape Adapt region

The following are basic instructions for using the Region menu. The menu parameters are described below.

To set the region:

1) Set Region Length.
2) Set Horizontal and Vertical positions so that each search vector crosses an edge of your part. The search vectors should all be cyan color.
3) Adjust other parameters as necessary to find the desired region.
4) Snap several images to make sure the registration is finding the desired region on each part.



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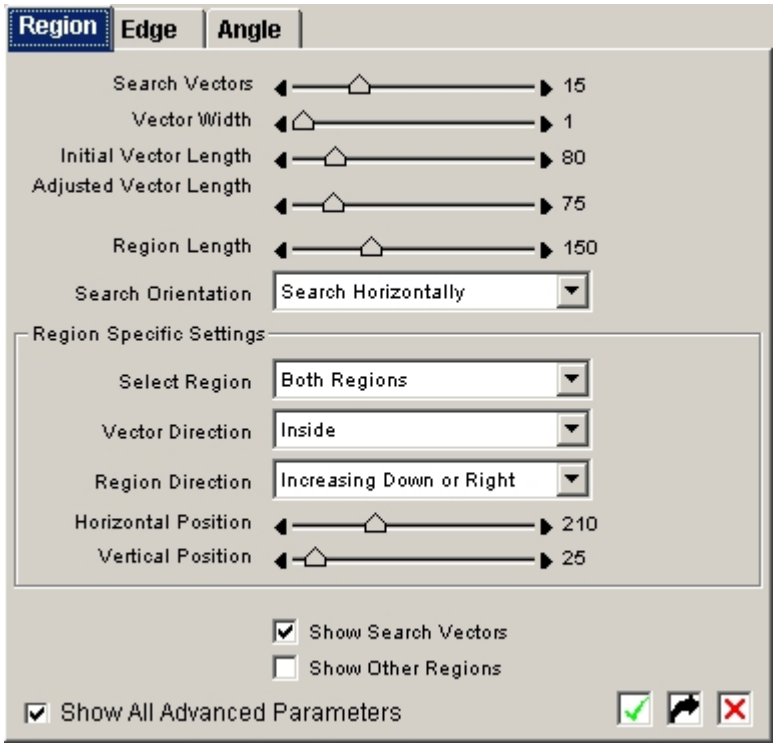
Shape Adapt Region Menu



❖ *Note: Enable Show Search Vectors to see the vectors described next. Some of the parameters below are Advanced Parameters.*

Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Vector Width

Adds a number of search vectors at each search point to filter out noise and to help eliminate false edge locations. Note that a larger width may add time to the inspection.

Initial Vector (or Search) Length

The length of the first search vector (the length of the top of the "T"). This is typically longer than the remaining search vectors, to assure that the side of the container is located.

Adjusted Vector Length

The length of the remaining search vectors. The shorter length is used to optimize the analysis by taking less inspection time. The alignment of these vectors is based on the previous vectors' edge intersection point.

Region Length

The length of the body of the "T". Adjust this so that it covers the area you want to inspect.

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Search Orientation

Search Horizontally or Vertically depending on the orientation of your part in the image.

REGION SPECIFIC SETTINGS

Select Region

Allows you to move both regions together or separately.

Vector Direction

Choose whether to have the search vectors search Inside or Outside. The vectors will follow the direction of the arrow on the top of the "T".

Region Direction

Allows you to change the initial search vector from the top to bottom or bottom to top of the search area, or left to right or right to left.

Horizontal Position

Moves the search regions left or right.

Vertical Position

Moves the search regions up or down.

DISPLAY SETTINGS

Show Search Vectors (or Search Lines)

Displays the search vectors.

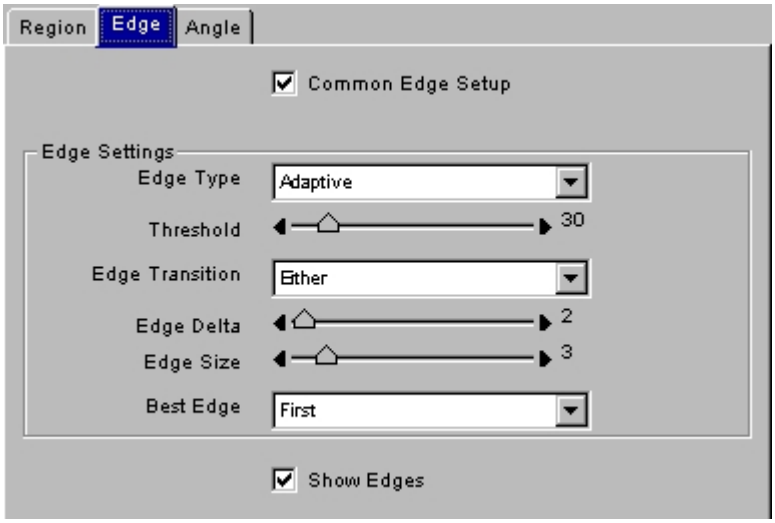
Show Other Regions

Display all other registrations/ orientations/ inspections from the job on the image.

Adjusting the Shape Adapt registration parameters

These settings determine what edges the search vectors are supposed to find.

Shape Adapt Edge Menu



❖ *Note: Enable Show Edges to see the results of the Edge parameters we will describe next.*

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Common Edge Setup

This allows you to have common edge search parameters for both sides of the part, or create individual edge search parameters for each side. Individual setup is used if each side of the container looks different.

For example, in Preform sidewall inspections, there is a dark area on either side of the preform from the images of cameras one and three. You can create different search areas for each side of the preform.

Current Region

Choose one region to program the search vectors.

EDGE SETTINGS

Edge Type

This allows you to choose between a Simple gray level and an Adaptive percentage gray level search.

Simple: **Threshold = Gradient (or Edge Gradient)**

- The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Adaptive: **Threshold = Edge Threshold**

- This is the threshold used to locate an edge within a search vector. The larger the threshold, the stronger the edge must be. This number is a percentage of the minimum and maximum gray level within the vector, so it changes for each image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Best Edge

Indicates whether to use the First edge that is above the threshold or the Strongest edge. The Strongest edge has the maximum contrast from the threshold.

Show Edges

Displays the found edges in the search regions.

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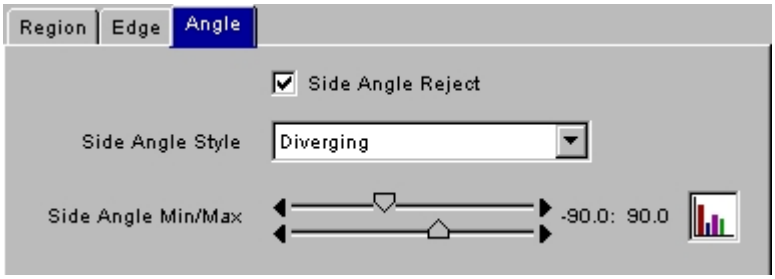
Shape Adapt Angle Menu



The Shape Adapt angle is the computed by averaging the two side angles.

Side Angle Reject

This determines whether the computed angle of the sides of the container is used as reject criteria.

Side Angle Style

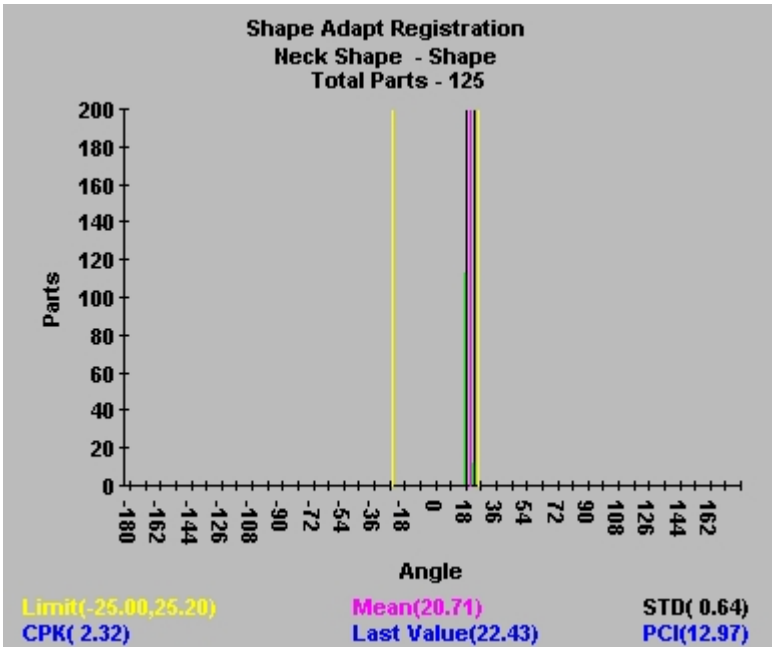
Choose Parallel or Diverging. This depends on the shape of the part. If the part is straight on both sides, such as the sides of a can, use Parallel style. If the part is tapered, such as the neck of a bottle, use Diverging.

Side Angle Min/ Max

The minimum and maximum angles allowed for the sides of the part. The angle is computed by averaging the two side angles.

Graphs - Shape Adapt Registration

There is one graph available for Shape Adapt registration. It is called Shape, and it shows the computed side angles of the container. It is a rough approximation of whether the sides of the container are well-formed or not.



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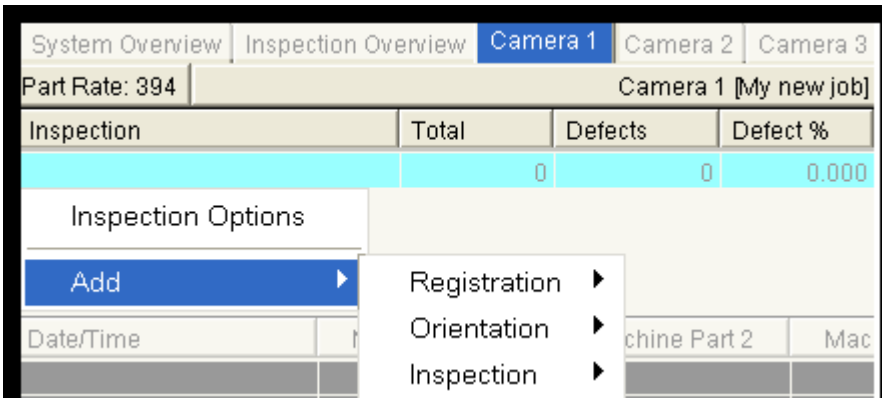
X-Y REGISTRATION

This registration finds one edge of a part (vertically and/or horizontally) and places inspections relative to this edge.

Adding the X-Y registration

To add the X-Y registration:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Registration >> X-Y registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Setting the X-Y registration region

To set the region:

1) Click the Horizontal Setup or Vertical Setup tab. Cursors are placed on the image.
2) Under Registration Type, select a type. If selecting both, the order in which the type is named is the order in which the search vectors are applied. Apply the one that is most reliable for your part image first.
3) Click the Horizontal Region or Vertical Region tab.
4) Use the arrows and sliders near the top of the menu to adjust position.

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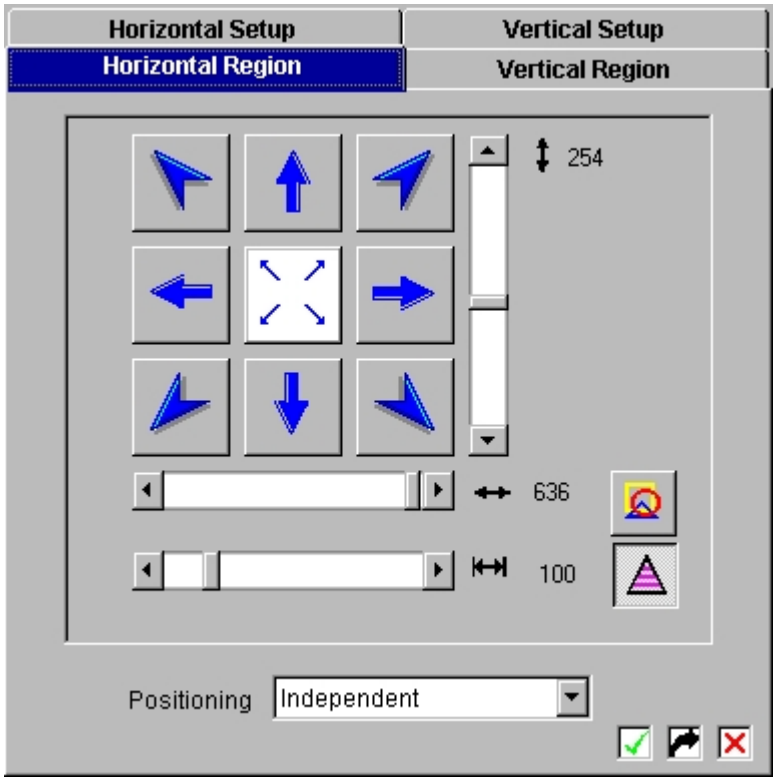
5) Use the slider at the bottom of the menu to adjust length.



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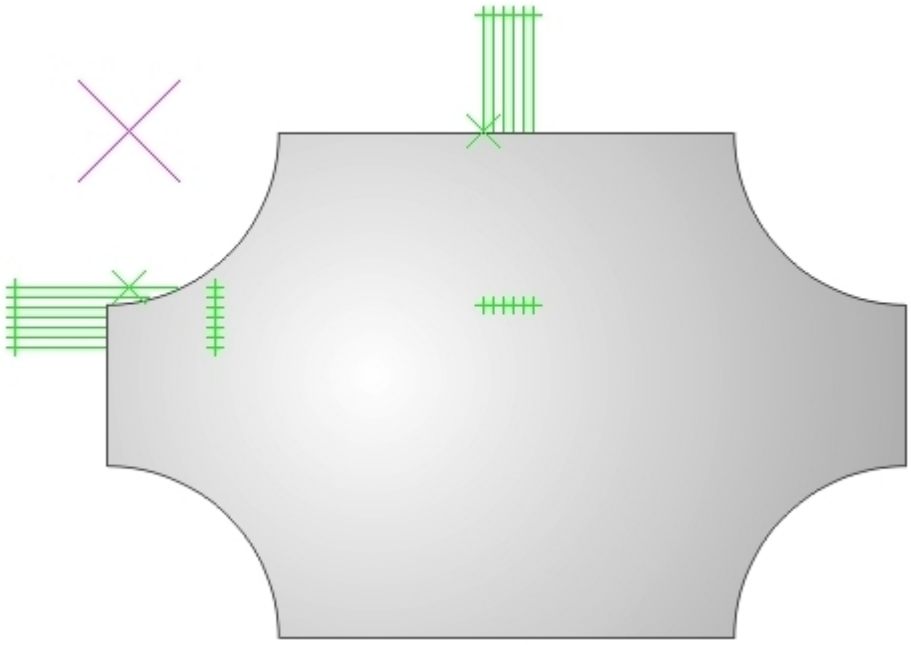
- When **Dependent** positioning is selected, the second search vector starts its search based on where the first vector found its edges.
- When **Independent** positioning is selected, the second search vector will search based on its own parameters regardless of whether or where the first search vector found its edges. This is useful to more accurately find the edges in non-round parts.

The registration point is found between the X and Y found edges – not the center of the part.



Adjusting the X-Y registration parameters

Adjust the parameters to find the desired edges.

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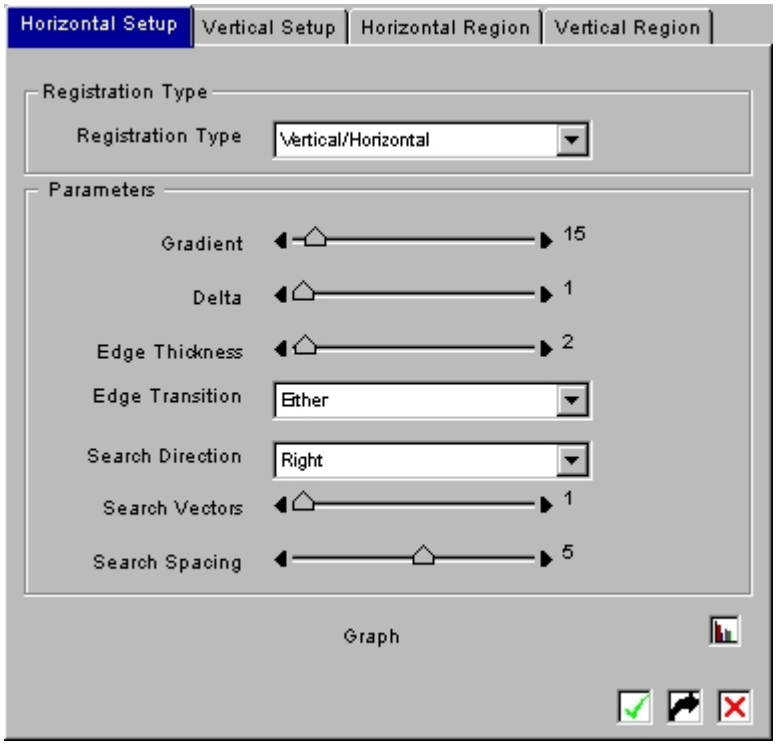
Horizontal Setup or Vertical Setup Menu



Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Search Spacing

Set the number of pixels between each search vector.

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Graphs - X-Y Registration

Depending on the setup of X-Y registration, you will have one or two graphs available.

Located Y Position

This shows where the part is found vertically in the image. This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

Located X Position

This shows where the part is found horizontally in the image. This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

TRACKER REGISTRATION

This registration locks on to a feature and tracks its shape.

The result of the Tracker Registration is a series of edge points that the system can use to place inspections on the part. You then use the ***Tracker Inspection*** (on page 438) to use these points to generate the inspection region.

❖ *Note: You could use a Tracker Registration to find the center of a part, and then use any other standard inspection. However, the other standard inspections do not create a tracker shape.*

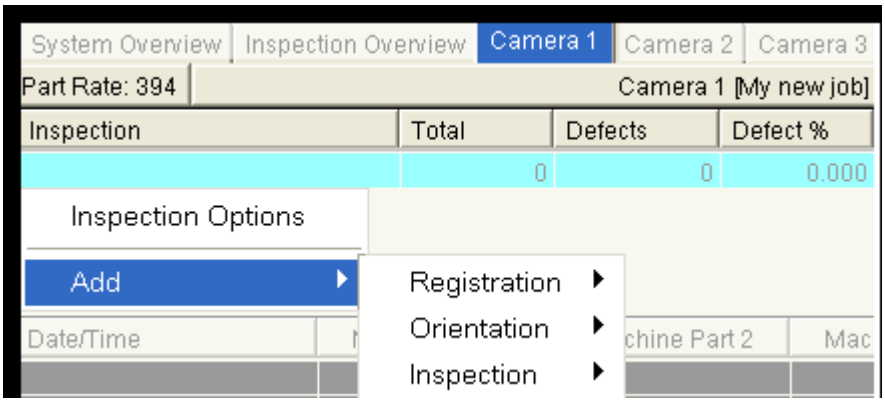
The benefit of this registration is that the inspections that use it will be placed more accurately, and follow the actual shape of the part. The inspection regions are not limited to standard circular donut-shapes or other standard shapes that other inspections offer.

You can also have the system generate a center point of the tracked feature by applying one of several available centering methods.

Adding the Tracker registration

To add the Tracker registration:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



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4) Select Add >> Registration >> Tracker registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Follow the instructions for Tracker registration for either ***round*** (see "Tracker Registration for Round Parts" on page 287) or ***non-round*** (see "Tracker Registration for Non-round Parts" on page 292) parts.

Graphs - Tracker Registration

These are the graphs available for this registration

Center X Position

(Tracker Centering must be enabled) This is a plot of the center X position found in each image. This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

Center Y Position

(Tracker Centering must be enabled) This is a plot of the center Y position found in each image. This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).

Qualified Edges

(Available when Tracker Centering enabled, centering technique is Radial Edge Centering, and tracker search shape is Circular) The number of search vectors that have found edges on the target circle. This is helpful in adjusting the Qualifying Edge Percent and other edge parameters. The Minimum Passing notation on the graph is the Qualifying Edge Percent times the number of search vectors.

Center Strength

(Available when Tracker Centering enabled, centering technique is Hough Center Strength, and tracker search shape is Circular) The number of arcs that intersected the center. It indicates how accurate the center is. Larger numbers indicate better center confidence. The Minimum Passing notation on the graph is the Minimum Center Strength found.

Tracker Edges Found

This is a plot of the number of edges found during the Tracker search.

Tracker Edges Missed

This is a plot of the number of edges missed during the Tracker search. This indicates whether there was a problem locating the feature. If there are too many edges missed, the part may be rejected.

After you have adjusted the Tracker registration parameters to successfully track your parts, add a Tracker inspection which will use this registration to create the inspection area.

Tracker Registration for Round Parts

Tracker registration for round parts at-a-glance

The following is a basic overview of how to set up Tracker registration for round parts.

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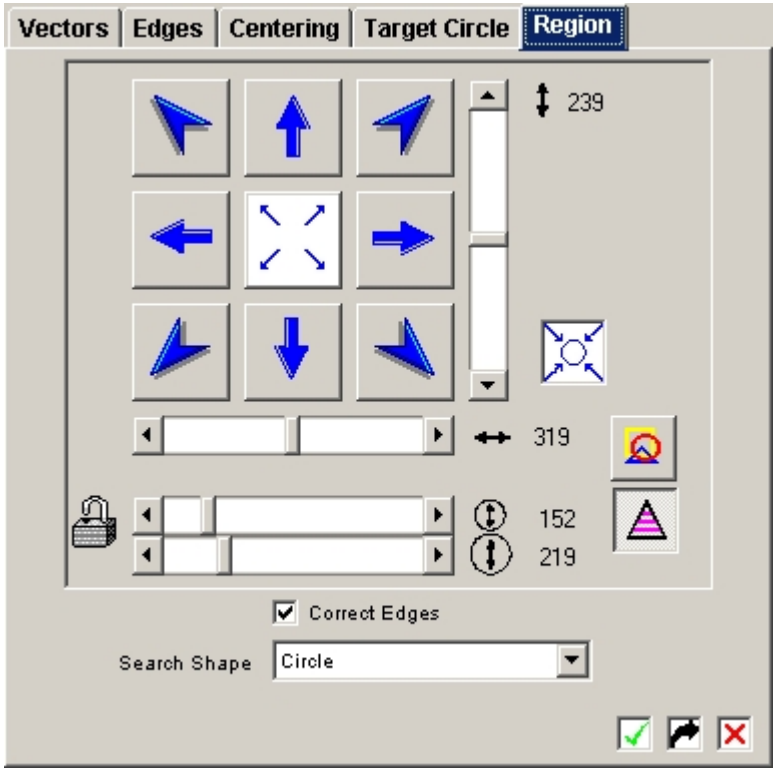
1) Region menu
   - Adjust region size and position
   - Set Search Shape = Circle
2) Vectors menu
   - Set number of vectors
   - Set start angle (if applicable)
3) Edges menu
   - Set search type
   - Set other edge parameters
4) Centering menu
   - Choose center technique
   - Go to Target Circle menu and Set Target
   - Set other center parameters
5) Go back to Edges, Centering, and/or other menus to adjust parameters.

1 - Place the Tracker region

Place the region of interest using the Region menu. Adjust the two circles to surround the edges that you want to find. Allow enough room for the part to move within the image and still be located. It is OK allow parts of a search circle to fall outside the image area.



Correct Edges

Enables Edge Correction, where the system uses a smoothing filter and gap filling technique to correct missing or false edges.

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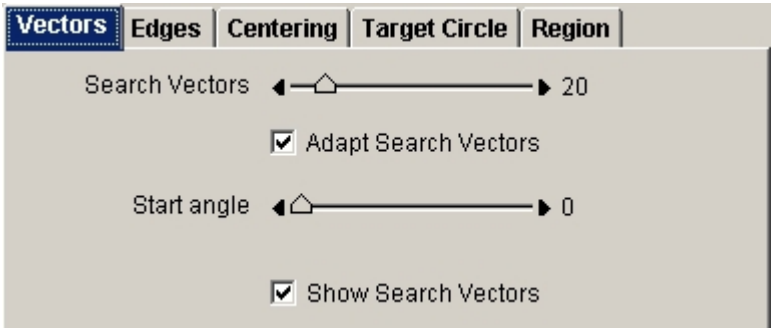
Search Shape

Select Circle shape.

2- Set search vectors

From the Vectors menu, set the number of search vectors. You can also set a start angle.



Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Adapt Search Vectors

(Only if Search Shape = Circle in Region menu) Adjusts the position of the search vectors so that they remain centered on the feature itself, instead of keeping centered within the search region. This is used mainly for non-round parts, like elliptical or rectangular shapes. It is usually not necessary for round parts.

Start Angle

(Only if Search Shape = Circle in Region menu) This is the start angle where the system begins to search for the desired feature. This can be used on images that have a distinct feature. Use with an orientation in place to assure that the search region starts at the same location regardless of the part's orientation in the camera's field of view.

Show Search Vectors (or Search Lines)

Displays the search vectors.

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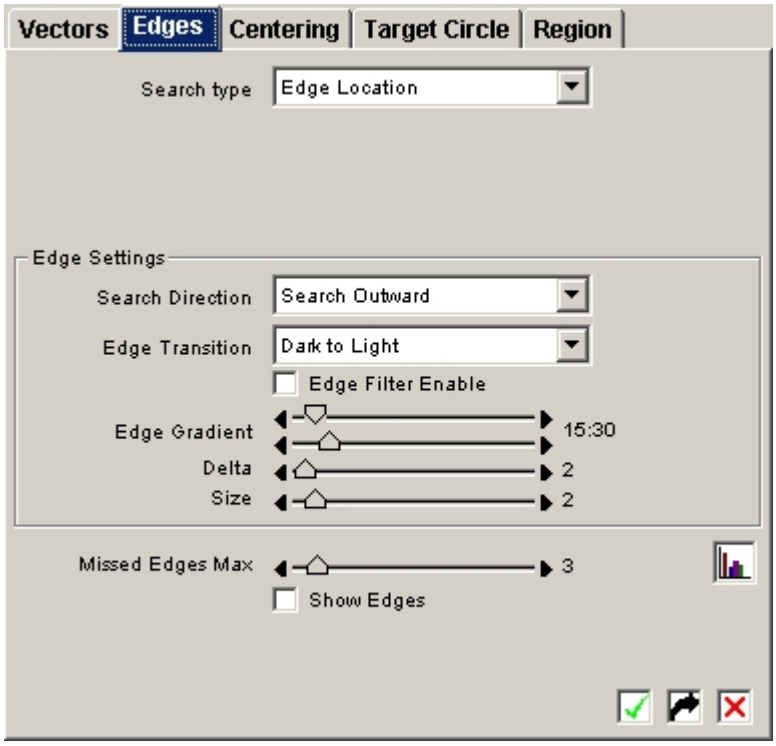
3- Set edges

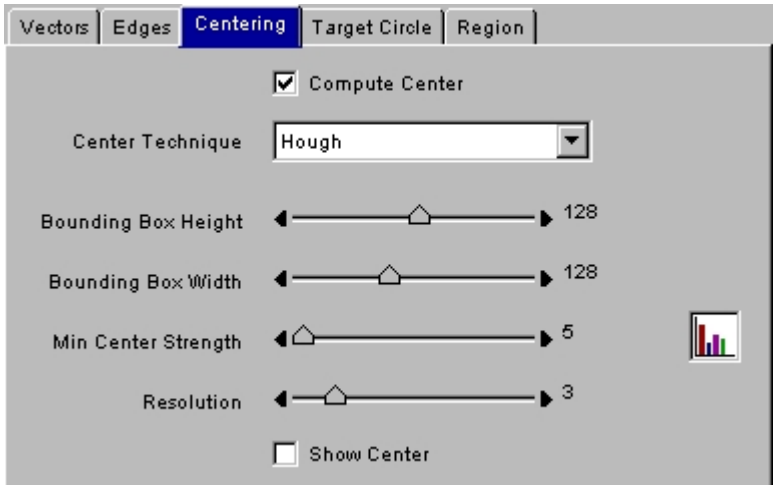
Go to the Edges menu and select a **Search Direction**. The search can be Inward or Outward. Use the edge that is best defined, with the least amount of noise or other features in the image.



See more information about the ***Edge menu.*** (see "Tracker Registration Edge Menu" on page 296)

4- Set centering

The Centering menu appears as shown below when you choose Circle as the search shape in the Region menu. This menu determines whether or not the system should compute a center point from the found edges. It also determines the technique used to compute the center point.



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Compute Center

This allows you to enable or disable the centering feature of this registration. If enabled, the system will calculate a center point of the found feature.

Center Technique

Choose a technique to find the center of your part. If your part has clean edges and the feature you want to find usually falls completely within the camera's field of view, choose Radial Edge. If the feature for which you are searching has less defined edges, or part of it falls outside the camera's field of view, choose Hough.

HOUGH CENTER TECHNIQUE

This technique uses a Hough calculation to determine the center point. The system draws a circle (the radius = target circle) around each found edge, and finds the point where most of these circles intersect.

Adjust Target Circle – Go to the Target Circle menu and click Set Target. If the Edge parameters are set correctly, the system will automatically detect the proper target circle size. The system uses the radius of this circle to calculate the Hough center. Then set the remaining parameters in the Centering menu.

Boundary Height/ Width (or Bounding Box)

Adjust the size of the area where you would expect the center of the feature to be found, even with slight movement of parts in the camera's field of view. The system uses only this area to calculate the Hough center. If the calculated center falls outside of this bounding area, the registration fails.

Min Center Strength

The number of arcs that must intersect the center point. When the system draws circles around each found edge on the feature, it calculates the center where most of those circles intersect. The system uses arcs of these circles as determined by the bounding area. The more arcs that intersect the center, the stronger the center. Any calculated center with a strength less than this number causes the registration to fail.

Resolution

The area (in pixels) within the bounding box that the arcs must intersect to determine the found center. A larger resolution allows a larger area – the arcs do not all have to cross at the same point – and increases the strength. This allows the system to more accurately locate the center on parts that are not perfectly round.

Show Center

Displays the center point and associated graphics.

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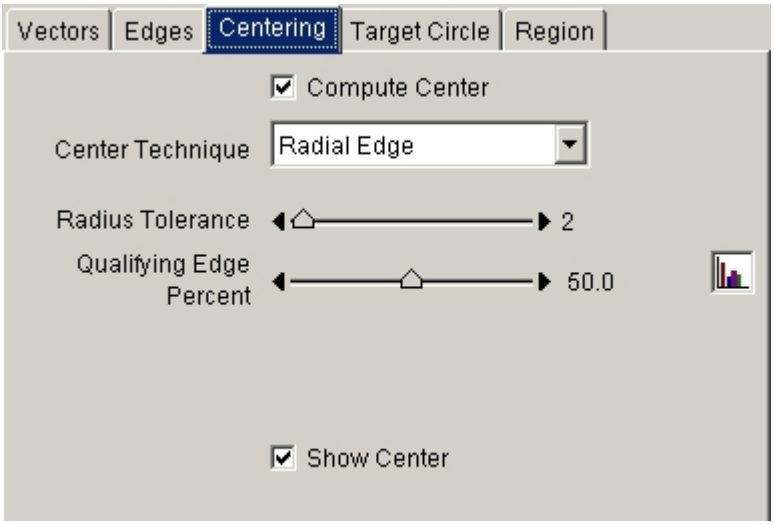
RADIAL EDGE CENTERING TECHNIQUE



With Radial Edge technique, you define a target circle where you would expect the system to find the edge of the desired feature. The system plots the calculated center and the target circle. If everything is configured correctly, the target circle will overlay the desired feature.

Adjust Target Circle – Go to the Target Circle menu and click Set Target. If the Edge parameters are set correctly, the system will automatically detect the proper target circle size. The system uses the radius of this circle to calculate the center. Then set the remaining parameters in the Centering menu.

Radius Tolerance

The number of pixels in either direction of the target circle that the system will consider an edge (that is, the size range allowed for the part). A radius tolerance of two allows a four pixel wide area in which the edge of the part may fall.

Qualifying Edge Percent

The percentage of edges that must be part of the target circle. If there are not enough found edges on the target circle, this registration will fail. This can be set lower if you expect large changes in sample size (less sensitive). It can be set higher if the size of your product should not vary (more sensitive).

Show Center

Displays the center point and associated graphics.

AVERAGE CENTERING TECHNIQUE

This technique uses the found edges of the feature, and simply calculates the average center of those edges. This technique is normally only used for non-round parts.

Tracker Registration for Non-round Parts

Use the following settings if your part is oval, rectangular, or another non-round shape.

Tracker registration for non-round parts at-a-glance

The following is a basic overview of how to set up Tracker registration for non-round parts.

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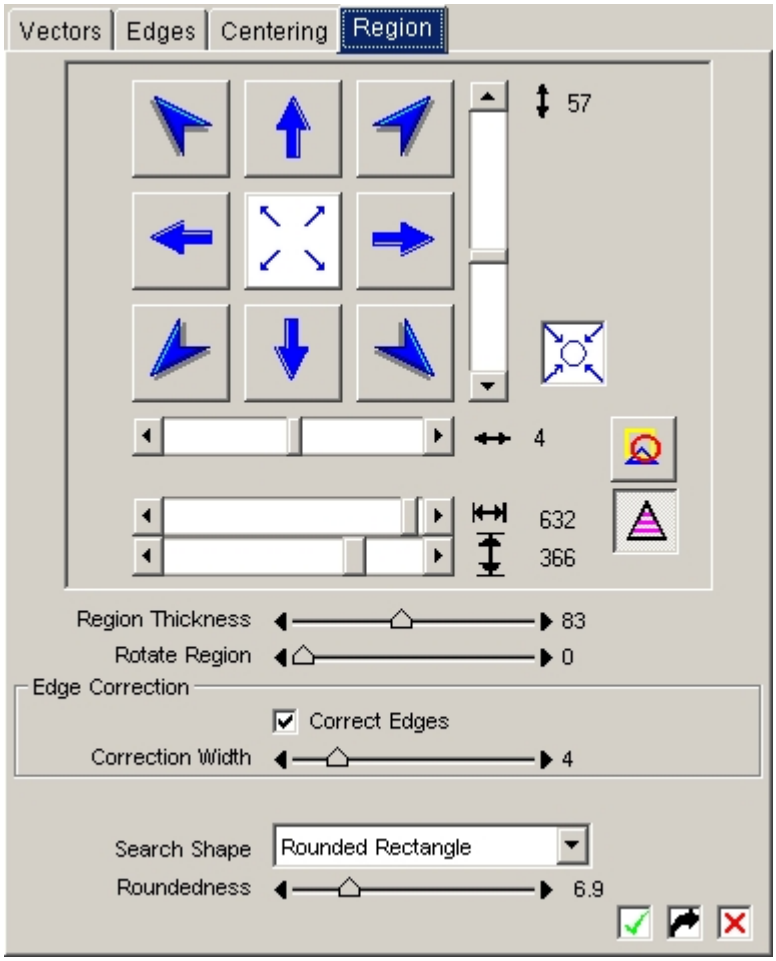
1) Region menu
    - Adjust region size and position
    - Set Search Shape = Rectangle or Rounded Rectangle
2) Vectors menu
    - Set number of vectors
3) Edges menu
    - Set search type
    - Set other edge parameters
4) Centering menu
    - Set region area limits
5) Go back to Edges, Centering, and/or other menus to adjust parameters.

The system searches between the inner and outer boundaries. Go to the Vectors menu, then Edge and Centering menus to adjust their parameters.

1 - Place the tracker region



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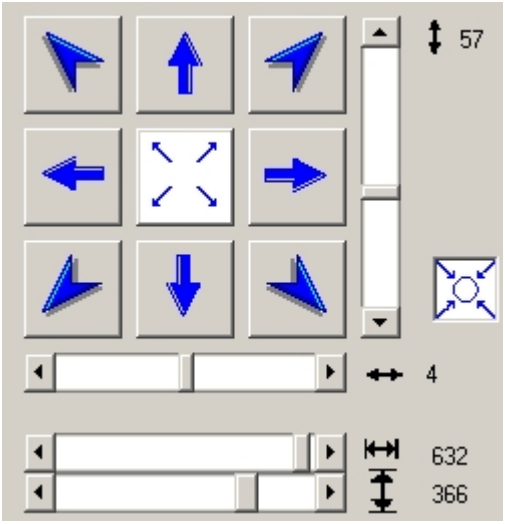
The arrows move the entire region. The two sliders at the bottom of this area control the height and width of the outer rectangle.



Region Thickness

Controls the size of the inner rectangle.

Rotate Region

Align the search region with a rectangle that is not aligned with the camera axis.

❖ *Note: for parts that travel in random orientation through production, use an orientation prior to this registration. Make this registration dependent on that orientation: right-click on Tracker Registration name >> select Make Dependent. If a '^" appears before the registration name, it is dependent.*

EDGE CORRECTION

Correct Edges

Enables Edge Correction, where the system uses a smoothing filter and gap filling technique to correct missing or false edges. Corrected edges are displayed as a magenta '+'.

Correction Width

Specify how many vectors around the current point are used to figure out a correction. The neighbor positions help find bad positions and correct them.

This illustration shows a bad edge position. Assume Correction Width =2. The system uses the two points on the left and the two points on the right to correct the bad position, and re-assign it to the grayed position.

Search Shape

Select Rectangle or Rounded Rectangle shape.

Roundedness

Only available if Rounded Rectangle shape is selected. With this parameter, you can adjust the shape of the rectangle from oval to slightly rounded rectangle.

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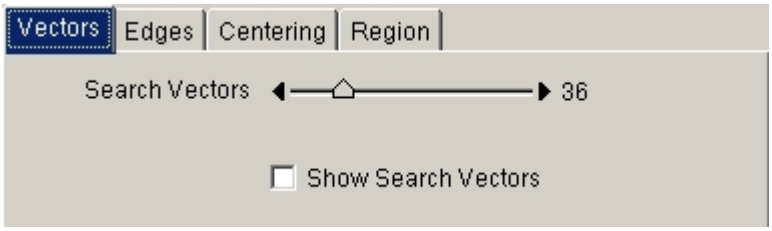
2 - Set search vectors

From the Vectors menu, set the number of search vectors.



Search Vectors

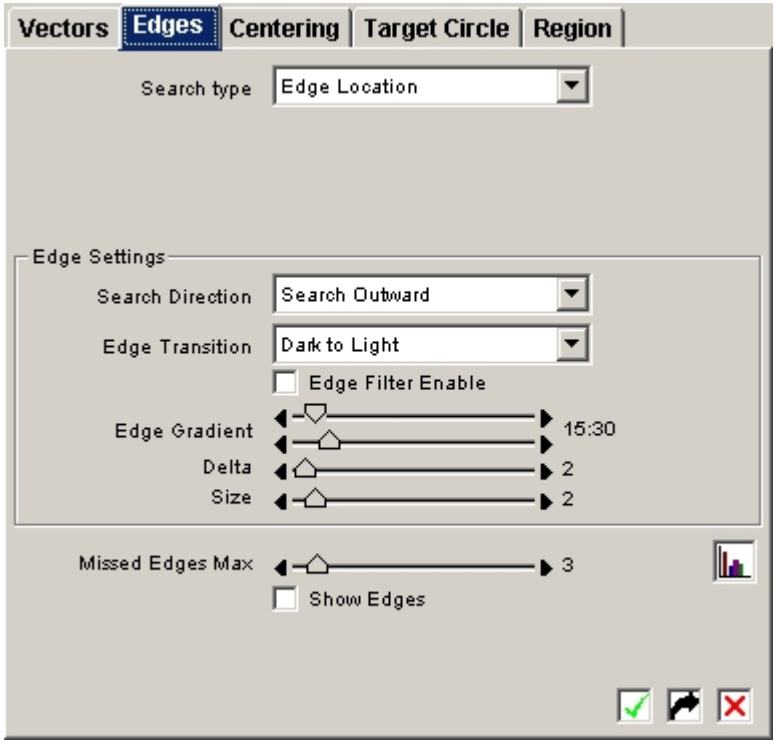
Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Show Search Vectors (or Search Lines)

Displays the search vectors.

3 - Set edges

Go to the Edges menu and select a **Search Direction**. The search can be Inward or Outward. Use the edge that is best defined, with the least amount of noise or other features in the image.



See more information about the ***Edge menu*** (see "Tracker Registration Edge Menu" on page 296).

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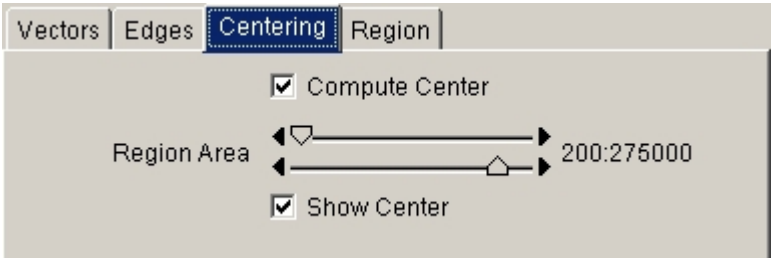
4 - Set centering

The Centering menu appears as shown below when you choose Rectangle or Rounded Rectangle as the search shape in the Region menu. This is the Average Centering technique, where the system uses the found edges of the feature, and simply calculates the average center of those edges. Set the parameters based on your part.



Compute Center

This allows you to enable or disable the centering feature of this registration. If enabled, the system will calculate a center point of the found feature.

Region Area Min/ Max

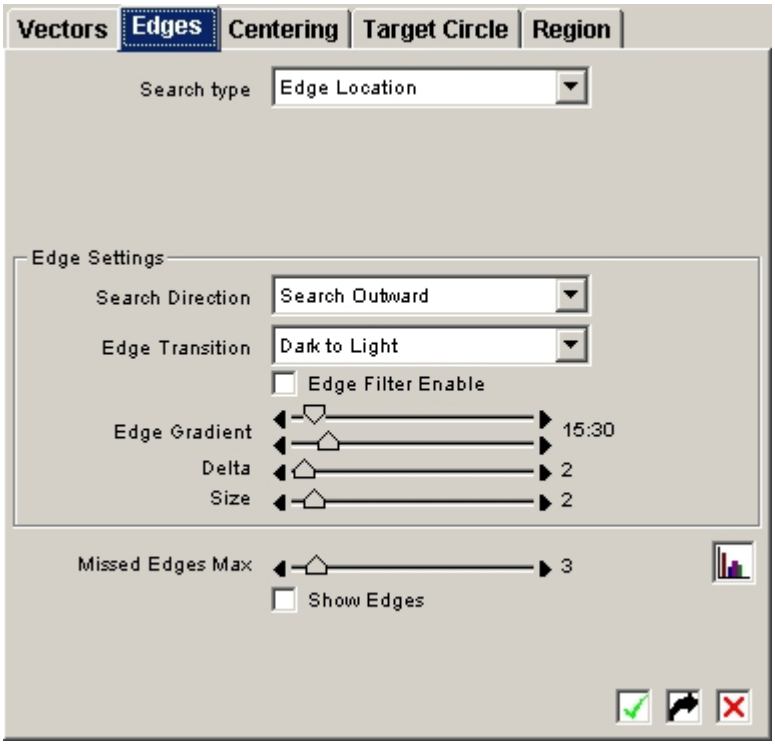
The system computes the area within the found edges. You can set these limits to reject a part if the area does not fall within your specifications.

Show Center

Displays the center point and associated graphics.

Tracker Registration Edge Menu

Set the search criteria to find the edges of the desired feature.



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Show Search Vectors (or Search Lines)

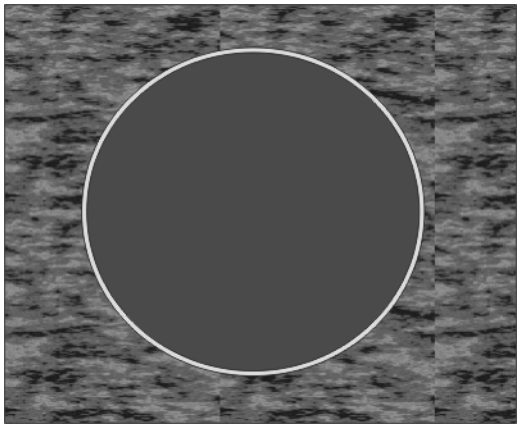
Displays the search vectors.

Search Type

Choose the type of edge for which to search. The three types of searches are explained below.

EDGE LOCATION SEARCH TYPE

This search type is useful for finding a narrow edge transition area that has a definite change in gray shade from the pixels surrounding it.



Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Edge Filter Enable

This filter is normally disabled. If disabled, the system uses Edge Gradient to qualify an edge. If enabled, the system binarizes the search vectors, using the Edge Filter value as the threshold.

Edge Filter value

(Only used when Edge Filter enabled) This is the threshold at which the system binarizes the search vector. For example, if the filter is set at 128, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

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Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Missed Edges Max

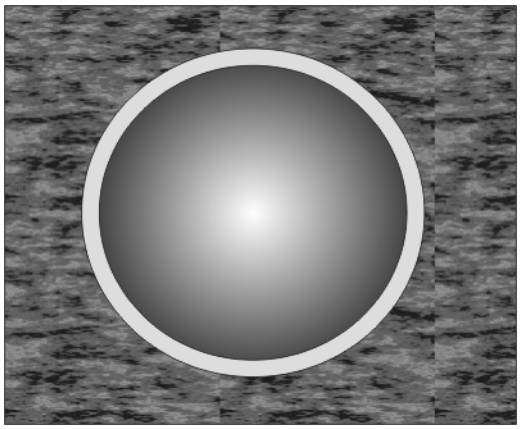
The number of search vectors that are allowed to fail without causing the inspection to fail.

Show Edges

Displays the found edges in the search regions.

FEATURE LOCATION SEARCH TYPE

This search type is useful when you are locating a specific feature, such as a seal surface, that has a definite width and gray shade.



With Feature Location, you specify the number of pixels expected before the edge transition, the width of the feature in pixels, and the number of pixels expected after the feature. Think of this as a mini pattern match. The system searches for that pattern all around the search region.

Before Feature

The number of pixels expected before the edge of the feature.

Feature Width

The feature size, in pixels.

After Feature

The number of pixels expected after the edge of the feature.

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

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Edge Filter Enable

This filter is normally disabled. If disabled, the system uses Edge Gradient to qualify an edge. If enabled, the system binarizes the search vectors, using the Edge Filter value as the threshold.

Edge Filter value

(Only used when Edge Filter enabled) This is the threshold at which the system binarizes the search vector. For example, if the filter is set at 128, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail.

Show Edges

Displays the found edges in the search regions.

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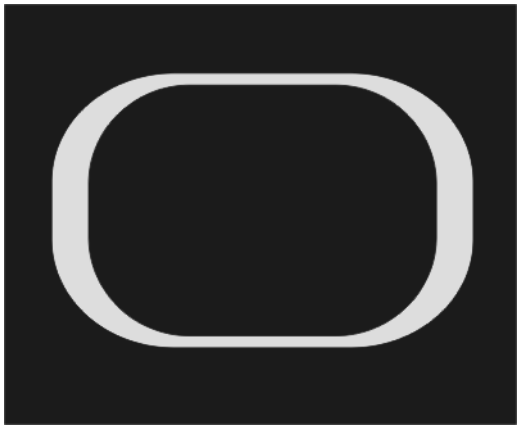
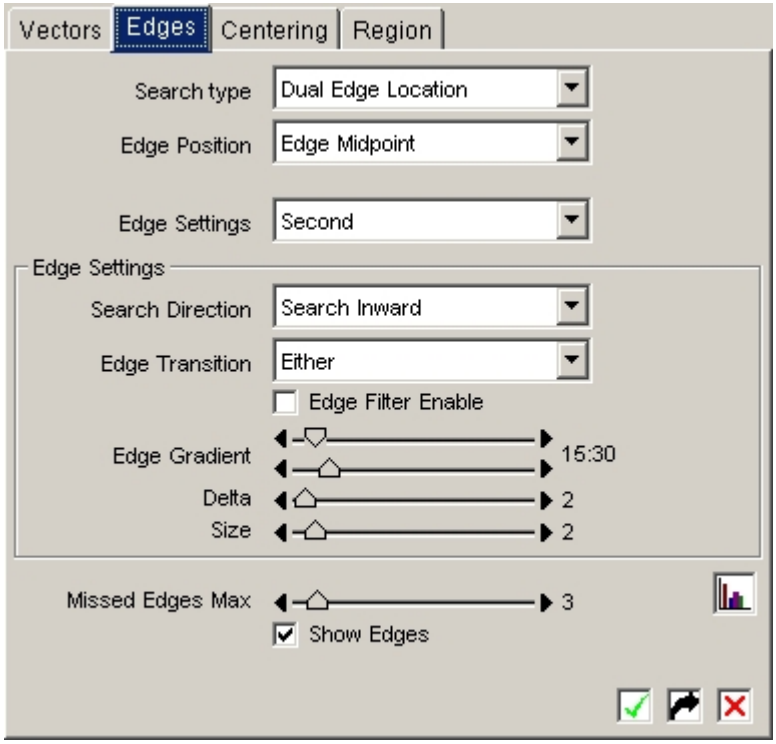
DUAL EDGE LOCATION SEARCH TYPE

This search type is useful when you are locating a surface that has good edge transitions on either side of the surface.





Edge Position

Choose whether the registration reference points will be determined by the First edge found, the Second edge, or the Midpoint of those two edges.

❖ *Note: if you plan to use Feature Width inspection in the Tracker Inspection, then use First Edge or Second Edge, not Midpoint.*

Edge Settings

Set the edge transition type and values separately for the first and second edges.

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Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Edge Filter Enable

This filter is normally disabled. If disabled, the system uses Edge Gradient to qualify an edge. If enabled, the system binarizes the search vectors, using the Edge Filter value as the threshold.

Edge Filter value

(Only used when Edge Filter enabled) This is the threshold at which the system binarizes the search vector. For example, if the filter is set at 128, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail.

Show Edges

Displays the found edges in the search regions.

CIRCULAR REGION FOR RETRO-SPEC

The Retro-Spec inspections use the Circular Region to place the region of interest. Placing the region of interest separately from the inspection allows you to have more than one inspection in that region of interest. It also keeps inspection time very short.

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Before adding Circular Region

Before adding a Circular Region to your job, use a part registration, such as Circular Registration, to locate the part or feature. The Circular Region will use the reference points from the registration. If you have a part on which the Retro-Spec inspection needs to be oriented, place an Orientation, such as Orientation Pattern Match, to locate the orientation feature.

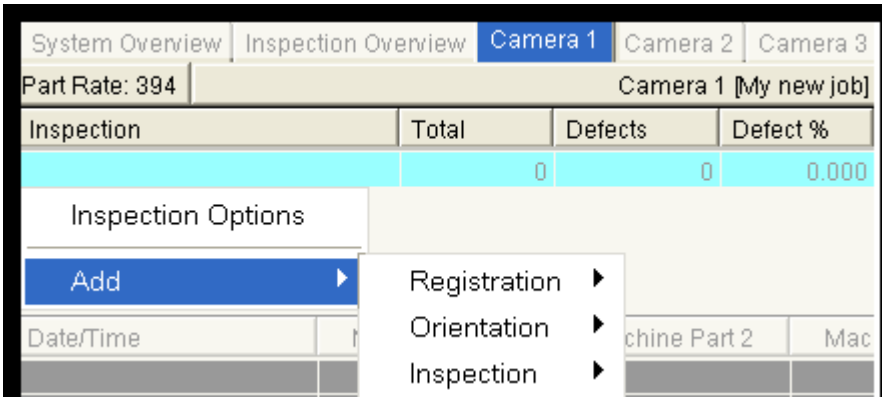
Sample inspection order:

1) Circular Registration
2) Orientation
3) Circular Region
4) Retro-Spec

Adding a Circular Region

To add the Circular Region registration:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Registration >> Circular Region registration. The default region is placed on the image, and the registration menus are displayed in the upper right screen.
5) Using the Region menu, place the circles over the desired inspection area.
    - If you are going to add a Retro-Spec **Contrast** or **Intensity** inspection, place the region exactly where you want the inspection to take place
    - If you are going to add a **Measurement** inspection, the circles should fall on either side of the actual inspection area – the inspection needs to find the feature's edges
    - From the Options menu, you can set up arcs or change the sampling pattern. See below.

How to create an arc region

This is for parts where you do not want to inspect the full circle.

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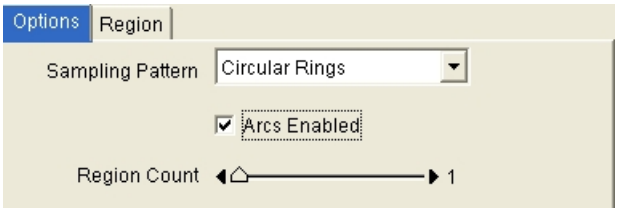
To create an arc region:

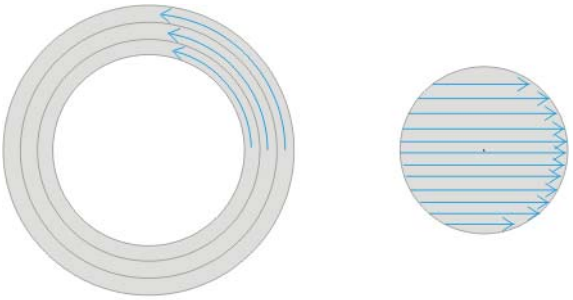
1) Make sure you have an ***Orientation*** (see "Orientation/ Pattern Match" on page 318) set up in the job. If not, add one.
2) Add the Circular Region as described above.
3) From the Options menu, check the Arcs Enabled box.



4) From the Region menu, place the circles over the desired inspection area.
5) In the Region menu, move the Arc Size slider to create the arc.
6) Move the Start Angle slider to re-position the arc.
7) Alternately move the Arc Size and Start Angle sliders until the arc is positioned the way you want it on the image.
8) Click the button a few times to make sure the region follows the part's orientation correctly.
9) Click OK and exit.

About Circular Region Sampling Pattern

From the Options menu, you can choose a sampling pattern. This is used for changing the inspection direction based on the shape of your region.



1 2

1	Circular
2	Linear

Circular Rings

This is good for inspecting donut shaped areas.

Linear Stripes

This is good inspecting circle shaped areas, particularly in the center of a part.

- You cannot use a Retro-Spec *Measurement* inspection with Linear Stripes.

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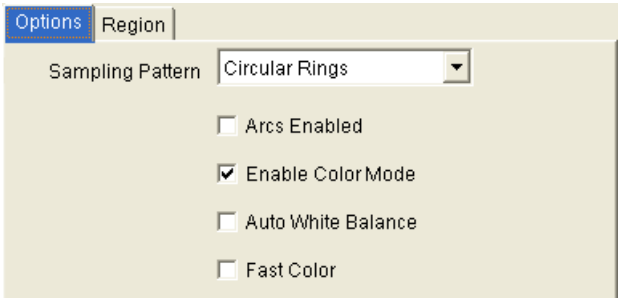
About Color Mode

Retro-Spec Contrast inspection has the capability of detecting color ID marks to correlate parts to the machine parts where they were made. This feature must be enabled in the Circular Region Options menu.



Arcs Enabled

If using Color Mode, you may have an arc region, but only one. Therefore, the Region Count slider is not available when Color Mode is enabled.

Enable Color Mode

Check this box to enable the color detection features in Retro-Spec Contrast inspection.

- This is used in specific applications, such as correlating color dots to specific spray heads
- A color camera must be installed in your system
- This feature is available with Circular Rings sampling pattern only

Auto White Balance

Use this parameter only if you are using the inspection on images from which the camera was not white balanced. On most Intellispec systems with color cameras, there is a white balance option that will ensure proper white balancing. This feature within Circular Region is mostly used for images used on Intellitrainer systems, where the images used are from cameras that were not white balanced.

Fast Color

Check this only if your system is experiencing speed performance issues for color dot inspection. The Retro-Spec inspection normally performs color detection accurately. Fast Color is only used on specific systems.

See more information about ***using color dot correlation*** (on page 578).

POLY REGION FOR RETRO-SPEC

The Poly (polygon) Region is similar to ***Polygon Inspection*** (on page 409), but only uses the region. The region can be inspected by a **Retro-Spec** inspection **[Contrast**, **Measurement**, or **Intensity]**. We recommend that you place a registration and an orientation (if applicable) prior to the Poly Region, to locate the part. This type of region is used for:

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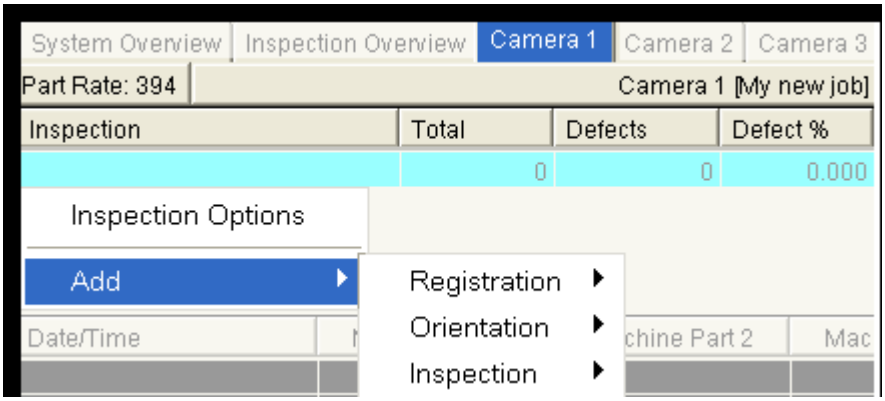
- Free-form inspection areas on parts
- Areas that do not fit a circle or other standard inspection region

To add the Poly Region:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



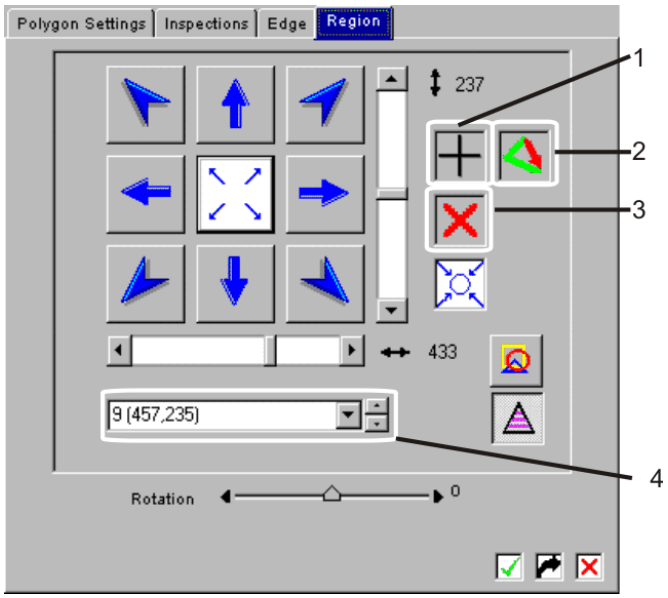
4) Select Add >> Registration >> Poly Region. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Setting a Polygon region

The polygon will be placed with respect to the registration, or you may need an orientation in place to assure correct placement of the polygon.

The system displays the starting point of the first polygon. Its X-Y coordinates are displayed in the Region menu. This menu allows you to draw additional points to create the polygon.

Polygon Region Menu



1	Add a polygon point between selected point and next point

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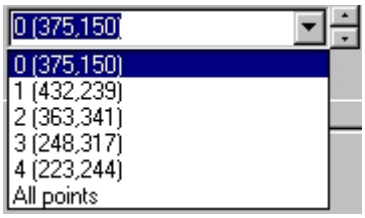
2	Close polygon
3	Delete selected point
4	X-Y coordinates of selected point

Polygon's Region menu is slightly different than most inspections.

To create the first polygon:

1) Move the cyan dot to the first desired point of your polygon with the arrow buttons or X-Y sliders. The first point's position is displayed in the box – see 'XY coordinates of selected point' in illustration above.
2) Add another polygon point by clicking the '+' button. Move that cyan dot to the next desired point.
3) Continue to add as many points as desired by following step 2, but leave a space between the last point and the beginning point.
4) When you have added enough points, click the 'close' button. The system will draw a line between the last point and the beginning point, closing the polygon.

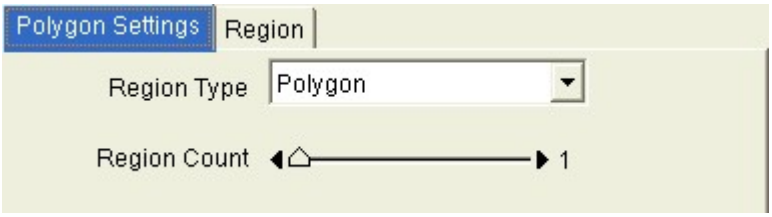


- To edit the polygon, choose a point to modify from point selection drop-down menu. Move the position of the point or add or delete points. If you click the Delete button, the currently selected point is deleted. If you add a point, it will be added between the currently selected point and the next point.
- To rotate the polygon (with respect to the registration center), use the Rotation slide bar.
- To create multiple polygons, go to the Polygon Settings menu.

Adjusting the number and type of polygons

Polygon settings menu

Use this menu to duplicate the polygon or change the region type. The settings are explained below.



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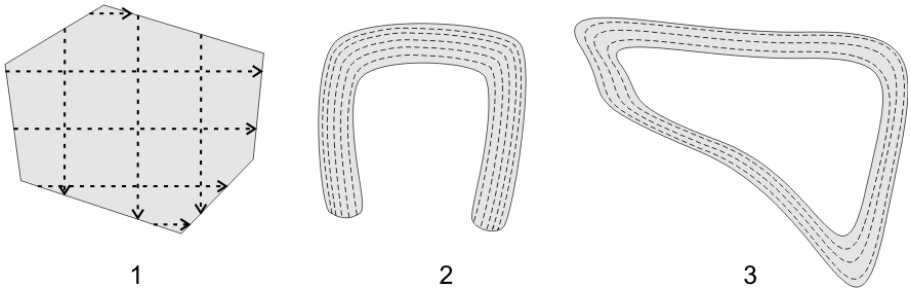
Region Type

Region Type defines how the area is inspected. There are three choices:



1 2 3

1	Polygon
2	Ribbon
3	Loop

- **Polygon** - the area is inspected in linear, X-Y direction.
- **Ribbon** - the area is inspected is a free-form area, but the ends do not meet. Picture this area like a rubber band that has been cut. Almost any way the rubber band can be shaped, so can a ribbon inspection area.
- **Loop** - the area is inspected is a free-form area, and the ends meet. Picture this area as a rubber band. Almost any way the rubber band can be shaped, so can a loop inspection area.

❖ *Note: For Retro-Spec **Measurement** inspection, you can use a Polygon region, but only with Ribbon or Loop region type.*

Region Count

Duplicate the region as many times as the part requires. A common use for this feature is to inspect the feet of a PET bottle. You can create one polygon, and allow the system to duplicate it around the base of the part.

Viewing the Poly Region on the Retro-Spec interface

You can view the region after you have added the Retro-Spec inspection. The Retro-Spec inspection with a Poly Region is similar to that with a Circular Region, but there are a few differences:

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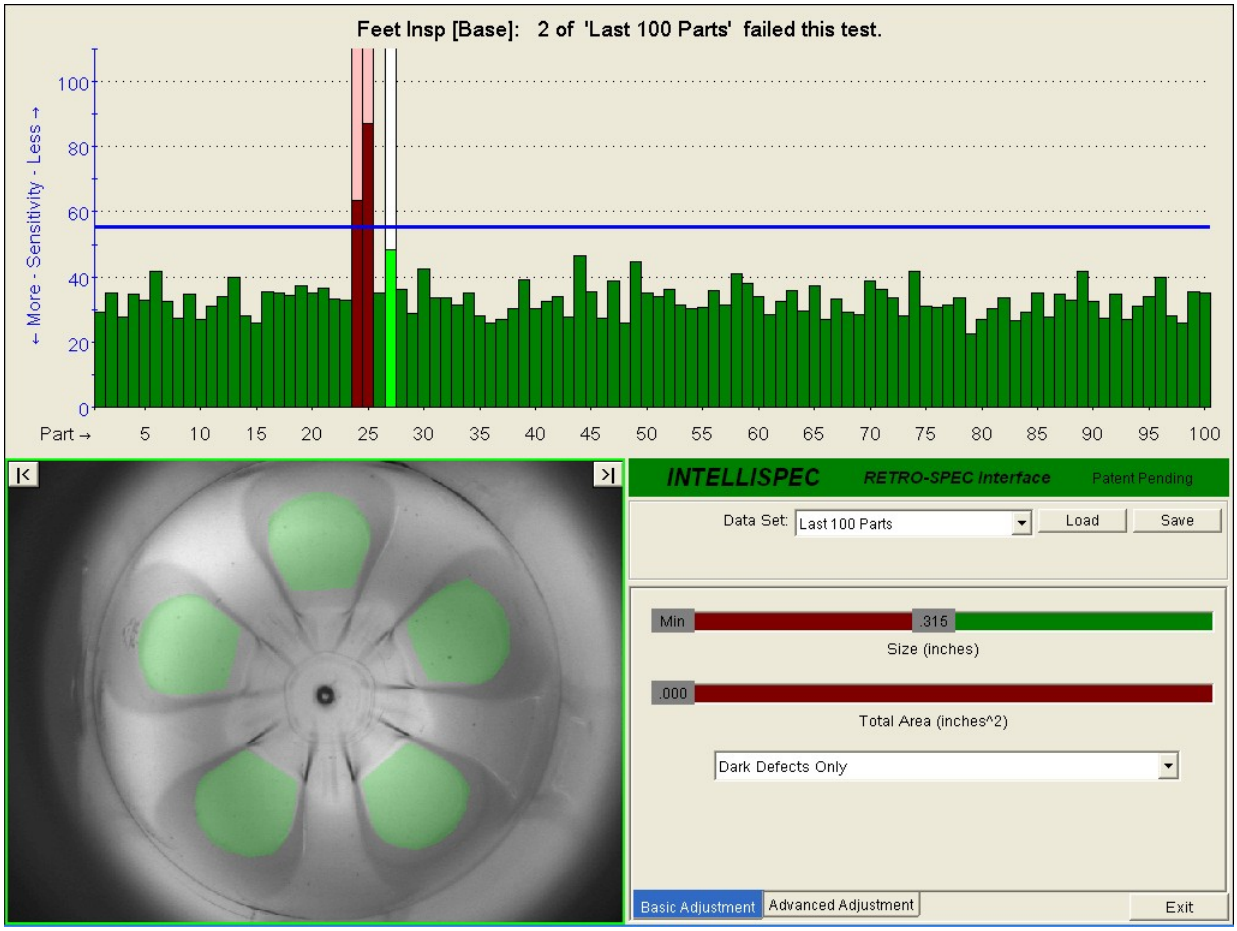
- The unwrapped region is *not* present for Polygon region type.
- The Part Detail Graph view is *not* available for Polygon region type.
- The defect area is measured in units squared. In the example below, the area is measured in inches squared.



SHAPE ADAPT REGION FOR RETRO-SPEC

The Shape Adapt Region is similar to ***Shape Adapt Registration*** (on page 276), but has a couple ***Shape Adapt Inspection*** (on page 416) features built in. The region can be inspected by a **Retro-Spec** inspection **[Contrast** or **Intensity]**. This type of region is used for free-form inspection areas between the sides of a part.

Adding the Shape Adapt Region

To add the Shape Adapt Region:

1) Log in as Administrator.
2) Select the desired channel.

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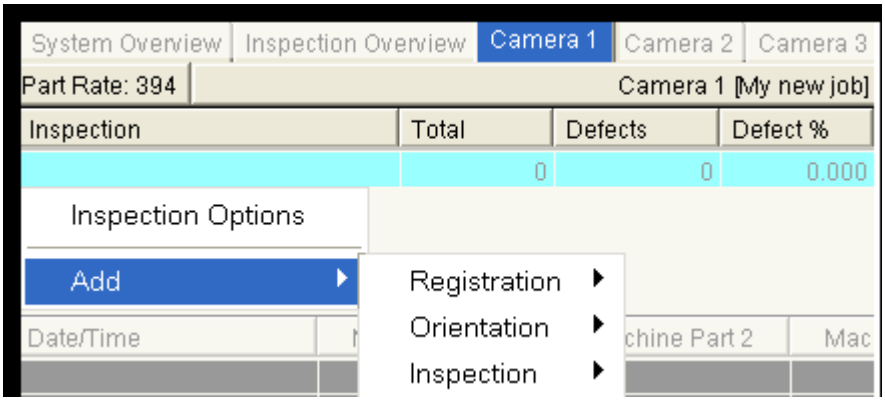
3) Right-click in the statistics area.



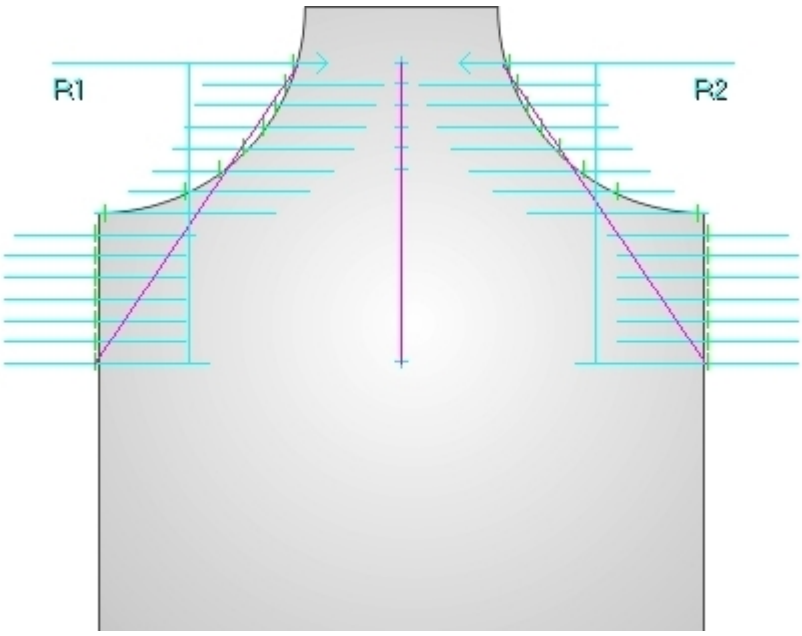
4) Select Add >> Registration >> Shape Adapt Region. The default region is placed on the image, and the registration menus are displayed in the upper right screen.

Setting the Shape Adapt region

The following are basic instructions for using the Region menu. The menu parameters are described below.

To set the region:

1) Set Region Length.
2) Set Horizontal and Vertical positions so that each search vector crosses an edge of your part. The search vectors should all be cyan color.
3) Adjust other parameters as necessary to find the desired region.
4) Snap several images to make sure the registration is finding the desired region on each part.



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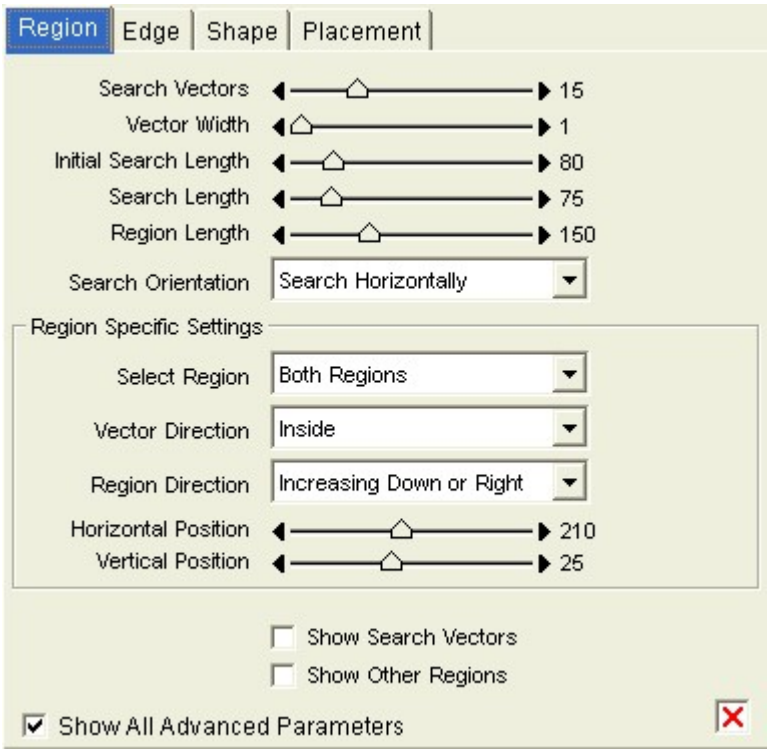
Shape Adapt Region Menu



❖ *Note: Enable Show Search Vectors to see the vectors described next. Some of the parameters below are Advanced Parameters.*

Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Vector Width

Adds a number of search vectors at each search point to filter out noise and to help eliminate false edge locations. Note that a larger width may add time to the inspection.

Initial Vector (or Search) Length

The length of the first search vector (the length of the top of the "T"). This is typically longer than the remaining search vectors, to assure that the side of the container is located.

Search Length

The length of the remaining search vectors. The shorter length is used to optimize the analysis by taking less inspection time. The alignment of these vectors is based on the previous vectors' edge intersection point.

Region Length

The length of the body of the "T". Adjust this so that it covers the area you want to inspect.

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Search Orientation

Search Horizontally or Vertically depending on the orientation of your part in the image.

REGION SPECIFIC SETTINGS

Select Region

Allows you to move both regions together or separately.

Vector Direction

Choose whether to have the search vectors search Inside or Outside. The vectors will follow the direction of the arrow on the top of the "T".

Region Direction

Allows you to change the initial search vector from the top to bottom or bottom to top of the search area, or left to right or right to left.

Horizontal Position

Moves the search regions left or right.

Vertical Position

Moves the search regions up or down.

DISPLAY SETTINGS

Show Search Vectors (or Search Lines)

Displays the search vectors.

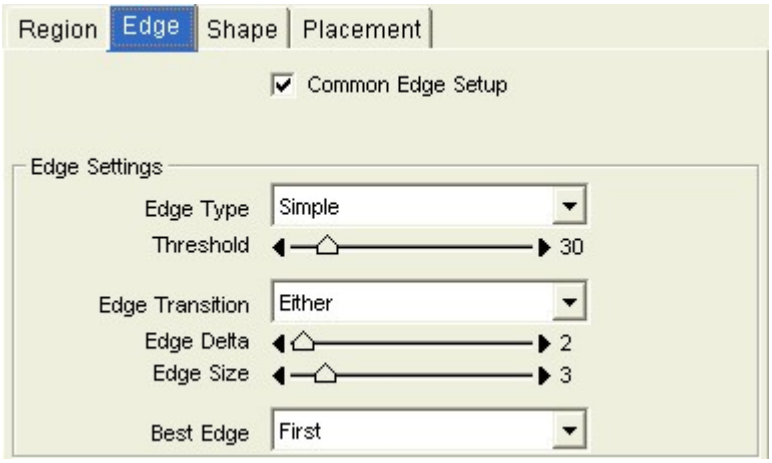
Show Other Regions

Display all other registrations/ orientations/ inspections from the job on the image.

Adjusting the Shape Adapt Region parameters

These settings determine what edges the search vectors are supposed to find.

Shape Adapt Region Edge Menu



❖ *Note: Enable Show Edges to see the results of the Edge parameters we will describe next.*

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Common Edge Setup

This allows you to have common edge search parameters for both sides of the part, or create individual edge search parameters for each side. Individual setup is used if each side of the container looks different.

For example, in Preform sidewall inspections, there is a dark area on either side of the preform from the images of cameras one and three. You can create different search areas for each side of the preform.

Current Region

Choose one region to program the search vectors.

EDGE SETTINGS

Edge Type

This allows you to choose between a Simple gray level and an Adaptive percentage gray level search.

Simple: **Threshold = Gradient (or Edge Gradient)**

- The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Adaptive: **Threshold = Edge Threshold**

- This is the threshold used to locate an edge within a search vector. The larger the threshold, the stronger the edge must be. This number is a percentage of the minimum and maximum gray level within the vector, so it changes for each image.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Best Edge

Indicates whether to use the First edge that is above the threshold or the Strongest edge. The Strongest edge has the maximum contrast from the threshold.

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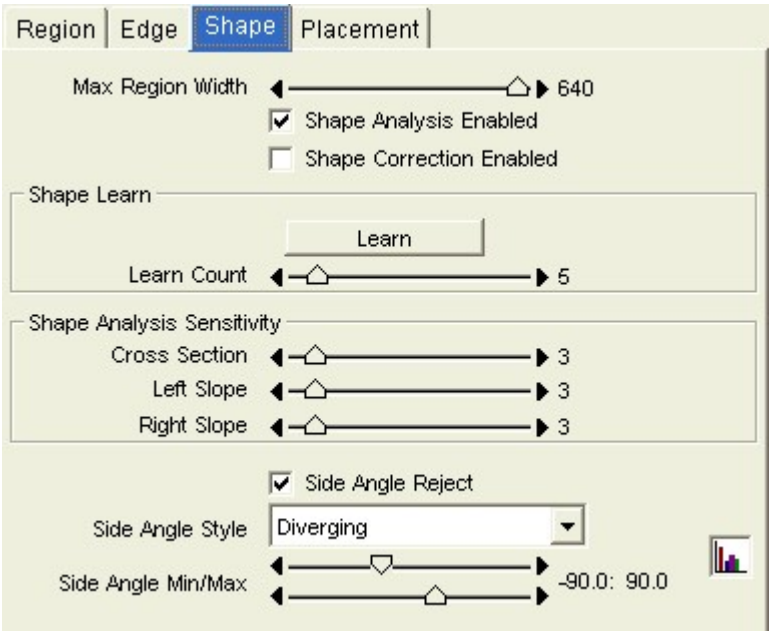
Shape Adapt Region Shape menu

This menu allows the system to learn the shape of the part. It can fail parts if it finds irregularly-shaped containers.



Max Region Width

The maximum allowable width of the region. Note that the system sets this automatically if Learn is used.

Shape Analysis Enabled

If checked, the search region's points are used as reject criteria. It looks at opposing search region points to ensure that the distance between them does not change by more than some acceptable limit. This feature helps ensure that the custom search region does not get fooled by an irregularly shaped container.

Shape Correction Enabled

Allows the system to fill in missed edges based on the learned shape of the part. This can be useful in cases where there are noisy edges in the part image. Only available when Shape Analysis is enabled.

❖ *Note: You must run Learn first, so that the system finds the basic shape of the part.*

SHAPE LEARN

This feature allows the system to learn the shape of a number of parts, and then draw the search region based on the shape of those parts. It determines the normal range of the shape and shape deviation. Based on this, the system recommends limits for the Max Region Width and Shape Analysis.

Learn button

Click this to begin the learn process. Make sure you have parts moving through the inspection module so that the system can detect and inspect the necessary number of parts.

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Learn Count

Set the number of images from which the system can learn the part. More images will give a better example of the overall inspection population. When the system is finished learning, it sets Max Region Width automatically.

SHAPE ANALYSIS SENSITIVITY

Adjust the sensitivity for the Shape Analysis reject criteria. A smaller number means more sensitive.

Cross Section

The system measures between two opposite points in the search region and compares it to the learned region. Adjust the sensitivity.

Left Slope

The system measures the pixel deviation of the left side of the part and compares it to the learned region. Adjust the sensitivity.

Right Slope

The system measures the pixel deviation of the right side of the part and compares it to the learned region. Adjust the sensitivity.

On the image, the magenta lines show the range of sensitivity. The green X indicates that a good edge was found.

Side Angle Reject

This determines whether the computed angle of the sides of the container is used as reject criteria.

Side Angle Style

Choose Parallel or Diverging. This depends on the shape of the part. If the part is straight on both sides, such as the sides of a can, use Parallel style. If the part is tapered, such as the neck of a bottle, use Diverging.

Side Angle Min/ Max

The minimum and maximum angles allowed for the sides of the part. The angle is computed by averaging the two side angles.

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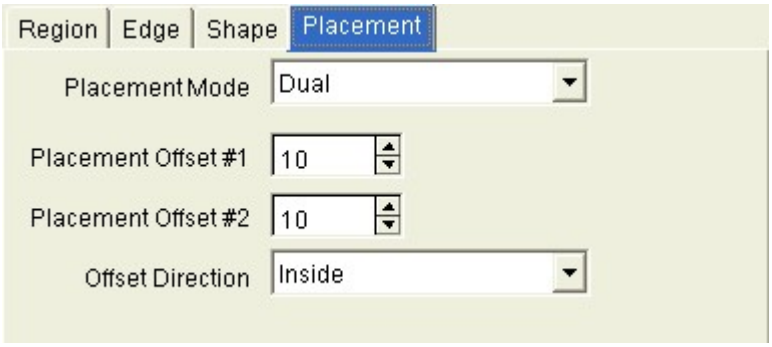
Shape Adapt Region Placement menu

This menu allows you to modify how the system places the automatically generated search region.



Placement Mode

An Offset is a number of pixels away from the found edge where you want the inspection region to begin.

- **Single offset** indicates that the system will use one number of offset pixels on both sides of the part to create the inspection region. This is good to use if the part image has uniform lighting, such as in a Neck image, or from the center sidewall camera in Preform inspection.
- **Dual offset** indicates that you can define two different numbers of offset pixels on either side of the part to create the inspection region. This is useful for the outer sidewall cameras in Preform inspection, where there is a dark area that needs to be inspected separately. Use Placement Offset #1 on one side of the part, and Placement Offset #2 on the other side of the part.
- **Special** placement allows offsetting individual points in the region of interest. This allows you to change the shape of the inspection region of interest. Select the Offset Direction, then go to the Offsets menu.

Placement Offset

Adjust the size of the search region with respect to the found Shape Adapt registration edges. Set this in number of pixels. The direction of the offset depends on the next parameter, whether Inside or Outside. This parameter is very helpful in allowing the system to avoid noise near the edge of the container.

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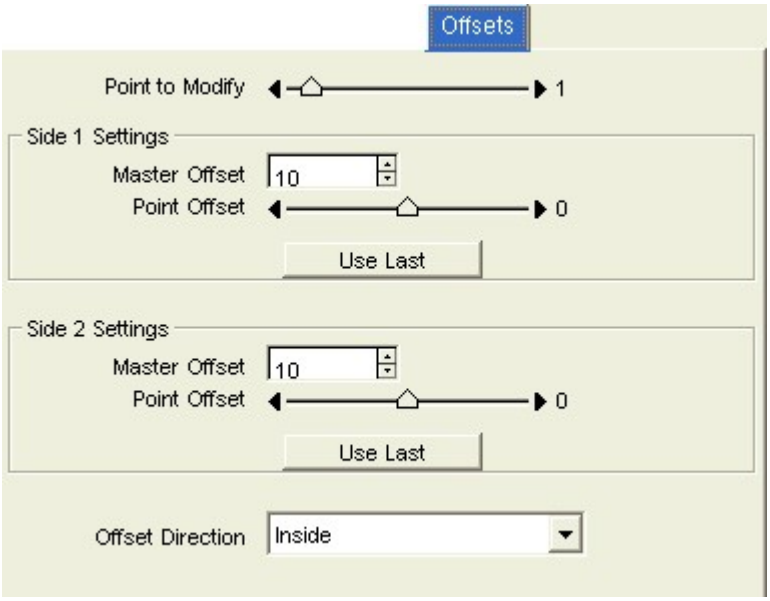
Offset Direction

- **Inside** causes the search region to shrink the number of Offset pixels towards the inside of the container.
- **Outside** enlarges the size of the search region the number of Offset pixels outside of the container.

Shape Adapt Region Offsets menu

This menu only appears if Placement Mode = Special in the Region menu.



The Special Placement feature is useful in applications such as preform sidewall inspection where the preforms have a smooth outer sidewall and a stepped inner sidewall. The shape adapt region would normally conform to the shape of the part (the smooth outer sidewall). With Special Placement, you can modify the shape adapt region to follow the shape of the stepped inner sidewall, while still tracking the smooth outer sidewall with Shape Adapt registration.

Point to Modify

The number of points equals the number of search vectors that created the Shape Adapt region.

Select the point to modify. The active point is highlighted in cyan. The points on both sides of the region are highlighted, which you can modify separately under the Side 1 Settings or Side 2 Settings section of the menu.

Side 1 Settings or Side 2 Settings

Similar to Dual Offset, these allow you to place the region a certain distance from the edge on one side, and another distance from the edge on the other side.

Master Offset

The number of pixels away from Side 1 or Side 2 that the inspection region will begin.

Point Offset

Move the search region point a number of pixels inwards or outwards.

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Use Last

This makes it easier to create the desired shape. For example, say you set Point 10 to -3 Point Offset. When adjusting Point 11, click the Use Last button to set it to -3 Point Offset also. You can then change its offset by another one or two as needed. This feature eliminates the need for setting each point to a large offset, and eliminates the need to remember what the last point's offset was.

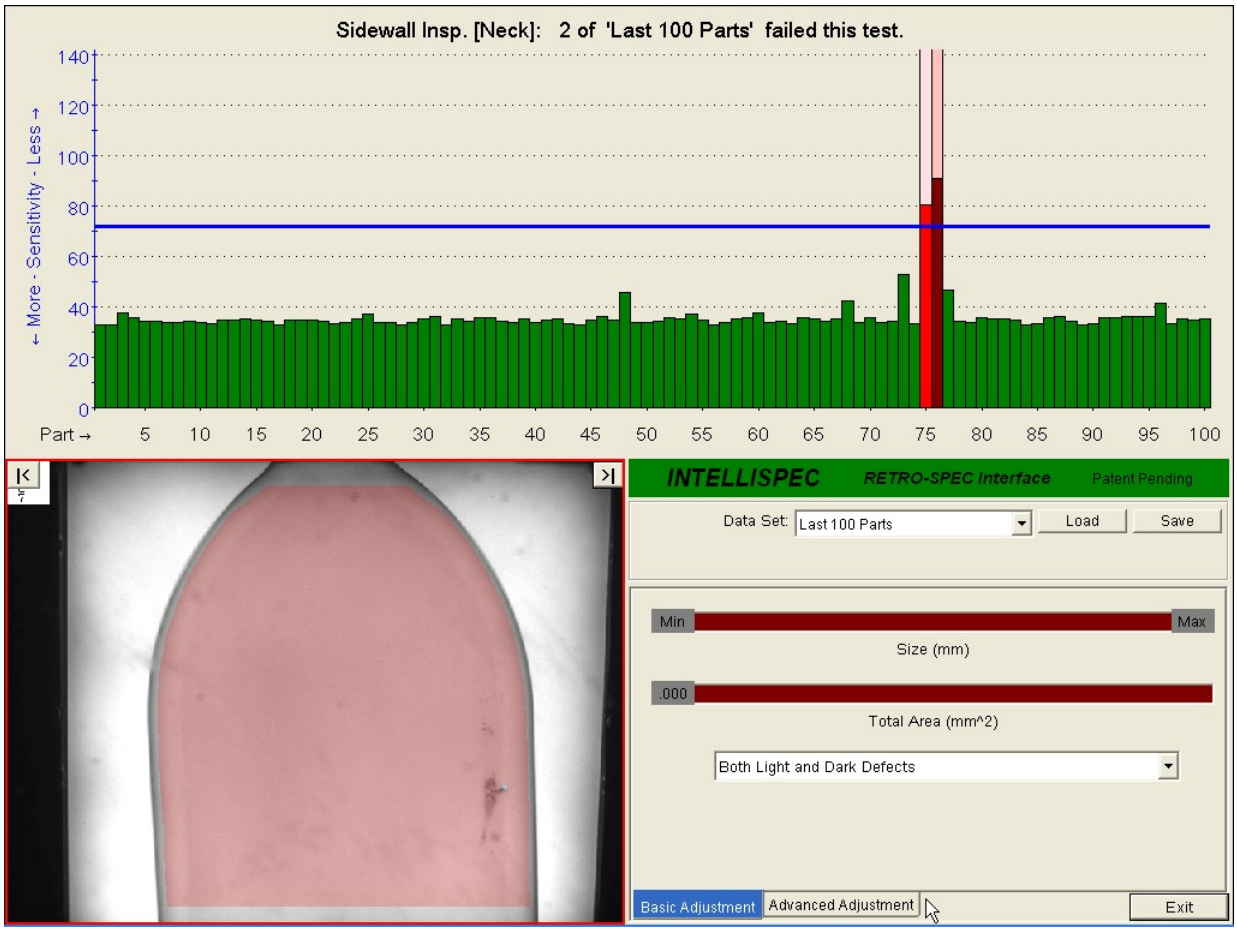
Offset Direction

- **Inside** causes the search region to shrink the number of Offset pixels towards the inside of the container.
- **Outside** enlarges the size of the search region the number of Offset pixels outside of the container.

Viewing the Shape Adapt Region on the Retro-Spec interface

The Retro-Spec Contrast or Intensity inspections are much the same as when using a Circular Region, but there are a few differences:

- The unwrapped region is *not* present with a Shape Adapt region.
- The Part Detail Graph view is *not* available with a Shape Adapt region.
- The defect area is measured in units squared. In the example below, it is measured in millimeters squared.



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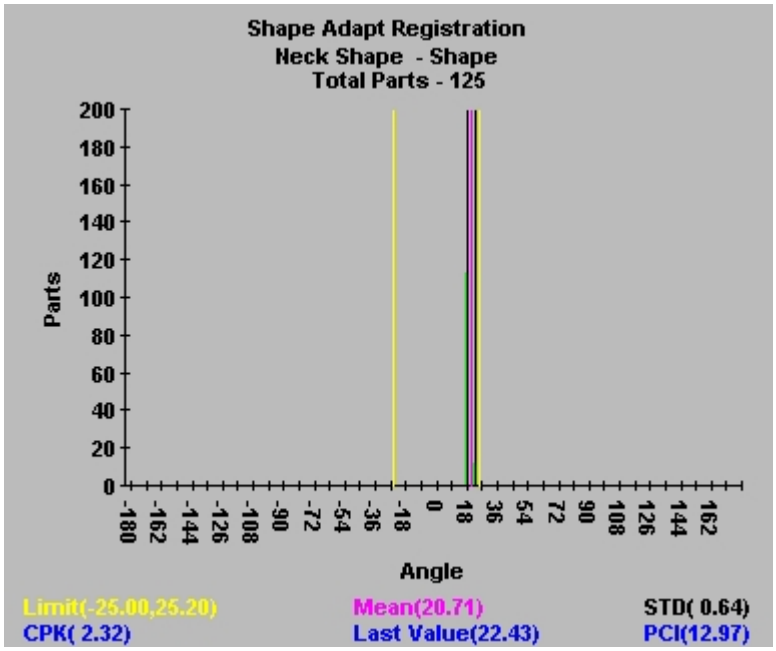
Graphs - Shape Adapt Region

There is one graph available for Shape Adapt Region registration. It is called Shape, and it shows the computed side angles of the container. It is a rough approximation of whether the sides of the container are well-formed or not.



ORIENTATION / PATTERN MATCH

This method of orientation finds a pattern of gray shades within a search region. When it matches this pattern on a part, it rotates the inspections that follow. This way, inspections can be placed correctly on each part, regardless of their orientation in the camera field of view.

The system analyzes each radial in the donut area that you specify. It takes the average gray shade of each radial, and generates a single circle to be analyzed. It records this pattern of gray shades as a reference pattern. This reference pattern indicates what zero degrees of rotation looks like. All inspections added to the job after performing this orientation pattern match are referenced to this position.

Before adding an orientation

A registration should be placed prior to creating an orientation (preferable, but not mandatory). The orientation will be centered on the registration reference point.

Adding the Orientation / Pattern Match

To add the Orientation Pattern Match:

1) Log in as Administrator.
2) Select the desired channel.

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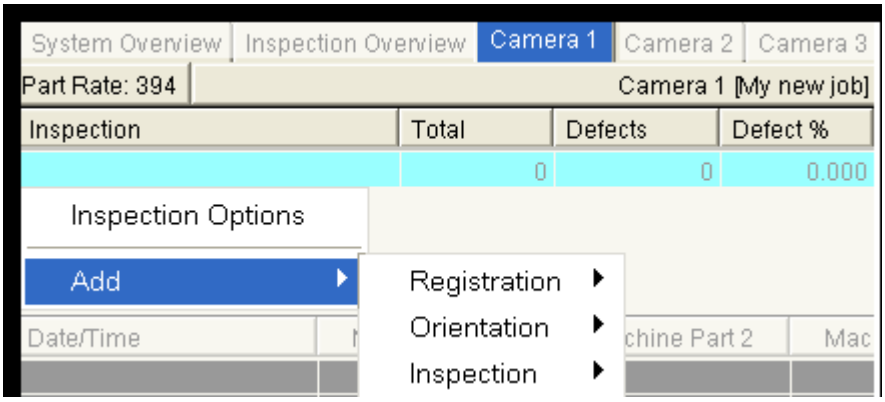
3) Right-click in the statistics area.



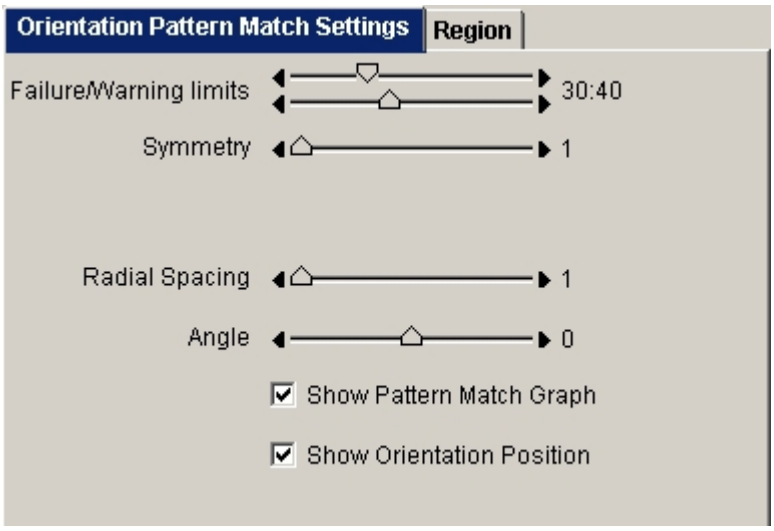
4) Select Add >> Orientation >> Orientation Pattern Match. The default region is place on the image, and the orientation menus are displayed in the upper right screen.

Setting the Orientation / Pattern Match Region

Using the Region menu, place the orientation region (donut) so that it crosses through several distinct features – this makes it easier to determine the part's orientation. Move, enlarge, or shrink the circles to surround the area where you would like the system to perform the orientation. If you expand the inner circle to the full size of the outer circle, only that single pixel-wide ring of information is used.

Adjusting the Orientation / Pattern Match Parameters

Set up the Orient/ Pattern match parameters to best inspect your product, as recommended by your instructor or service engineer.



[Pattern] Failure Limit

The system computes the probability of a pattern match at any degree of rotation of the part.

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When you view the pattern match graph, the failure limit is displayed in red. The highest spike (on the left) represents a perfect pattern match. As the pattern rotates 360 degrees, it may find other pattern matches (similar gray shades) that are significant but smaller. As a rule, set the failure limit just below the peak of a smaller, but significant spike on the graph.

The system always uses the strongest pattern match generated. However, if all peaks fall below the limit, the inspection fails – no pattern match.

Some patterns generated may wrap around and be continued on the lower part of the image (especially if the region is large). Keep this in mind when placing the failure limit. If you have symmetry set greater than one, the system does not need to generate a pattern for all 360 degrees. Therefore, its graph is shorter.

❖ *Note: Enable Show Pattern Match Graph to see this graph on the image.*

Warning Limit

Set the yellow line a bit higher than the red line to indicate that the pattern found on an image is not quite perfect (that is, incorrect gray shades found because of a part defect or change in color). The system will issue a warning status for a part if the pattern match falls within the warning limit.

Symmetry

This is the amount of rotational symmetry in the area of the image where the region is placed. This allows you to divide the donut into a number of pie-shaped sections. The system need only match the gray shade pattern in one of these sections to determine proper orientation.

A good use for symmetry is when you are inspecting the base of a bottle that has five feet; use a symmetry of five. The system uses a gray shade pattern in one-fifth of the region, and you are assured proper orientation because these gray shade patterns are identical in the other four sections of the region.

This feature can speed up this orientation greatly. The time required for the orientation is reduced by 1/symmetry squared. If you have a symmetry of five, this orientation takes 1/25th the amount of time it would take with a symmetry of one.

Radial Spacing

This is the number of pixels between search circles. It can be used to increase the speed of this inspection, especially if the region is large.

Angle

Allows you to rotate the inspections on an image. Go to the Region menu and click the button. Then, in the Orientation Pattern Match Settings menu, use Angle to rotate them as necessary to match the current orientation of the part. This features saves you from modifying regions during slight changes that might affect region placement.

Show Pattern Match Graph

Displays the graph on the image. See Failure Limit and Warning Limit to see how the graph is used.

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Show Orientation Position

Displays the found orientation position in blue on the image.

Graphs - Orient / Pattern Match

These are the graphs available for Orientation/ Pattern Match.

Peak Correlation

This shows the strength of the correlation (pattern match) found in the orientation search. If the inspected image matched the reference pattern by 100 percent, it records that strength as 100.

Peak Index

This shows the index (degree of rotation) where the pattern was best matched.

ORIENTATION EDGE

Orientation Edge locates edge transitions to determine orientation. Once orientation is determined, it rotates the inspections that follow to match each part's orientation in the camera's field of view.

Orientation Edge or Orientation / Pattern Match?

Use Orientation Edge instead of Orientation Pattern/ Match when the edges you need to search for may fluctuate in size. For example, on a three piece Inside of Can application, we would find the orientation of the weld. This weld may vary a couple of pixels in either direction, in which case, Orientation/ Pattern Match would not find a consistent pattern.

Another application to use Orientation Edge would be EZ Open Ends where you could find the orientation of the EZ Open tab by searching for the tab edge transitions.

Object Detection

From the orientation circle, an edge detection search is made. This search uses the gradient, delta, and edge thickness defined in the parameters. The orientation finds light-to-dark or dark-to-light transitions in pairs, depending on whether you have chosen to search for a dark or light object.

Define which object(s) to detect by eliminating all other shapes or spaces. When an object is found that meets all the parameters, the beginning is marked with a plus (+) and the end with an x. This search continues around the circle and, ideally, finds the number of objects desired.

Deciding Orientation

Whether searching for the first of many or the midpoint between two objects, when an acceptable number of properly sized objects are found, they are marked with a green plus (+) and x. Otherwise, the objects are marked with a red plus (+) and x. Found objects that do not satisfy size criteria are marked with a black plus (+) and x.

An arrow is drawn from the center of the inspection circle through the first of *n* found objects, or between two found objects.

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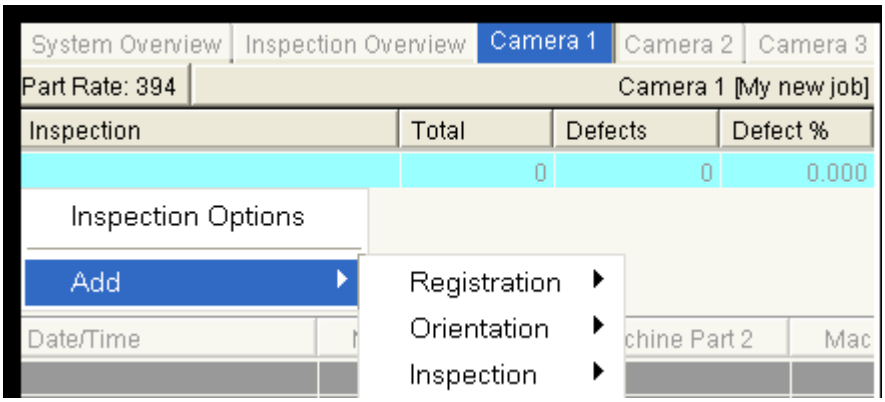
Adding Orientation Edge

To add the Orientation Edge:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Orientation >> Orientation Edge. The default region is place on the image, and the orientation menus are displayed in the upper right screen.

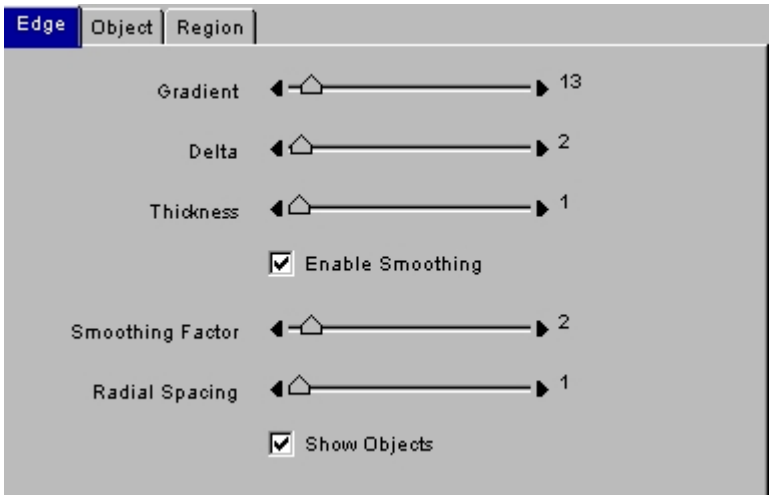
Setting the Orientation Edge region

Using the Region menu, place the orientation region. Adjust so that it crosses through the desired objects. Make sure it crosses through a clean section of the image where only the needed objects will be detected.

Adjusting the Orientation Edge parameters

Adjust the parameters for your application.

Edge menu



Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

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Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Enable Smoothing

Smoothing is used to de-emphasize sudden changes in gray levels and reduce the effect of noise.

Smoothing Factor

Least amount of smoothing is 1. Maximum setting is 20.

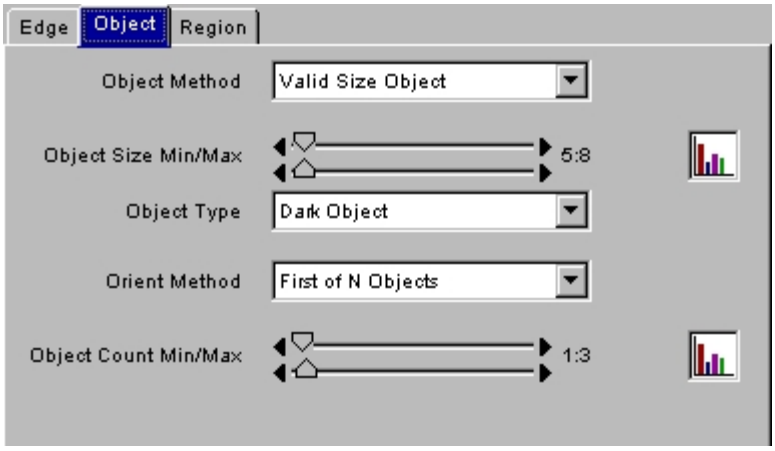
Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Show Objects

Displays the objects for which the orientation is searching.

Object menu



Object Method

Choose whether to locate Any Size object or a Valid Size Object. A Valid Size Object must meet minimum and maximum size qualifications.

Object Size Min/ Max

(Available when Object Method = Valid Size Object) Defines the minimum and maximum number of pixels in a group that may be considered an object. Set these values between 2 and 600.

Object Type

Defines whether a light group of pixels or a dark group of pixels, or either, will be considered an object. Use the least cluttered part of the image as the object.

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Orientation Method

Orients the inspections that follow relative to the first of *n* objects found, or the midpoint between two found objects.

Object Count Min/ Max

Defines how many objects you expect the system to find. If it finds less than or a greater number of objects than these numbers, the orientation fails.

Graphs - Orientation Edge

These are the graphs available for this orientation.

Acceptable Object Size

(Available when Object Method = Valid Size Object) Plots the number of parts where the object(s) found met the Object Size Min/ Max criteria.

Found Object Location

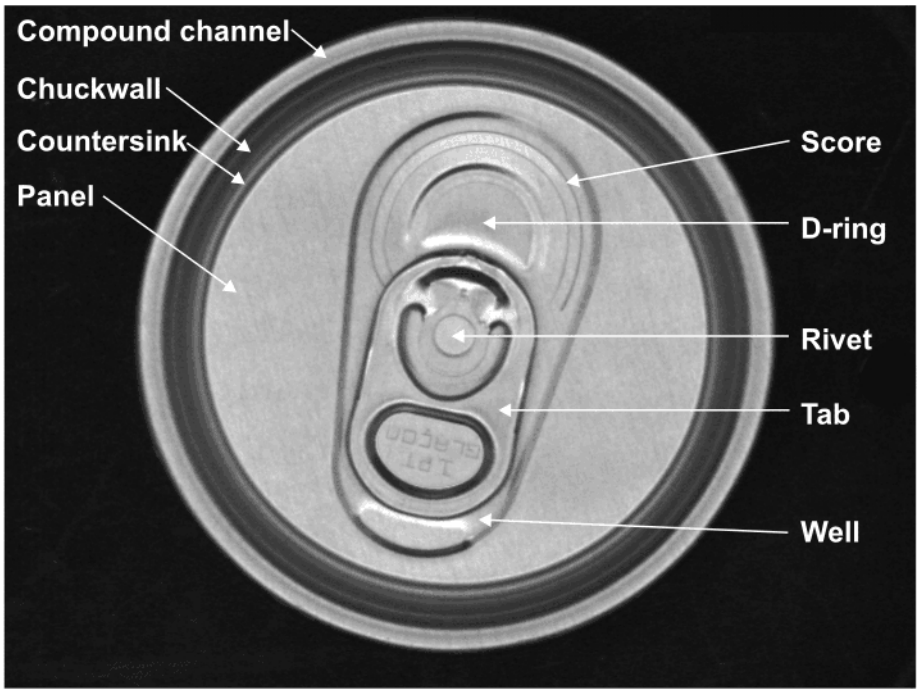
Plots the degree of rotation of the found object.

Acceptable Objects

Plots the number of objects found that meet the Object Count Min/ Max criteria.

MIDLINE ORIENTATION INSPECTION

This inspection is mainly used for parts such as converted ends, where it computes the rotation of the tab and score with respect to the well embossment. This discussion will reference how this orientation is placed with respect to components of a converted end, but the orientation can be adapted to other applications if necessary. The illustration below shows the names of the various parts of the converted end as they are used in this section.



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Midline Orientation finds the orientation of the well, or on some parts, the strengtheners, of the converted end.

❖ *Note: It is very important that the lighting is set such that the well (or strengtheners) has good contrast from the panel. To check lighting, right-click on the image and select Light Control. However, if you change lighting now, you may have to change some parameters in previous inspections – especially if the contrast has changed.*

One of two techniques can be used to find both sides of the well. In this section, we use the Pattern Match technique to locate both sides of the well. Additionally, edge detection techniques are used to locate the edges on both the sides of the tab as well as the score. The midline of the well, tab, and score are determined. The reject limits of this inspection allow you to determine how many degrees of rotation that the tab and/or score may be with respect to the well.

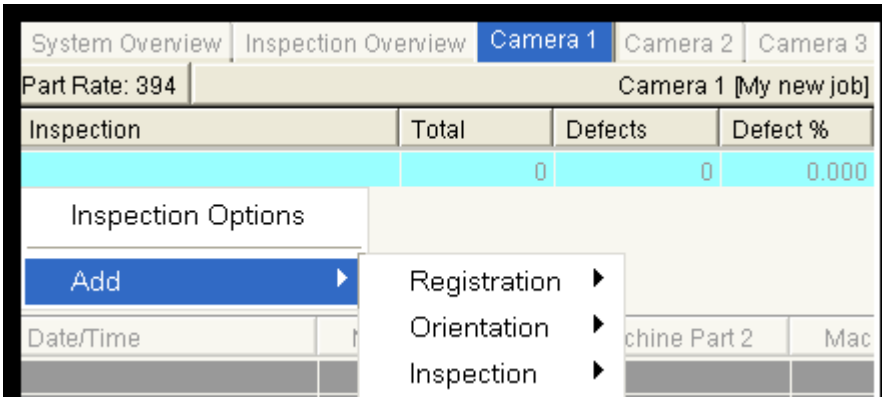
Before adding Midline Orientation

Make sure you have a good registration, such as Circular Registration, in place.

Adding the Midline Orientation

To add the Midline Orientation:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Orientation >> Midline Orientation. The default region is place on the image, and the orientation menus are displayed in the upper right screen.

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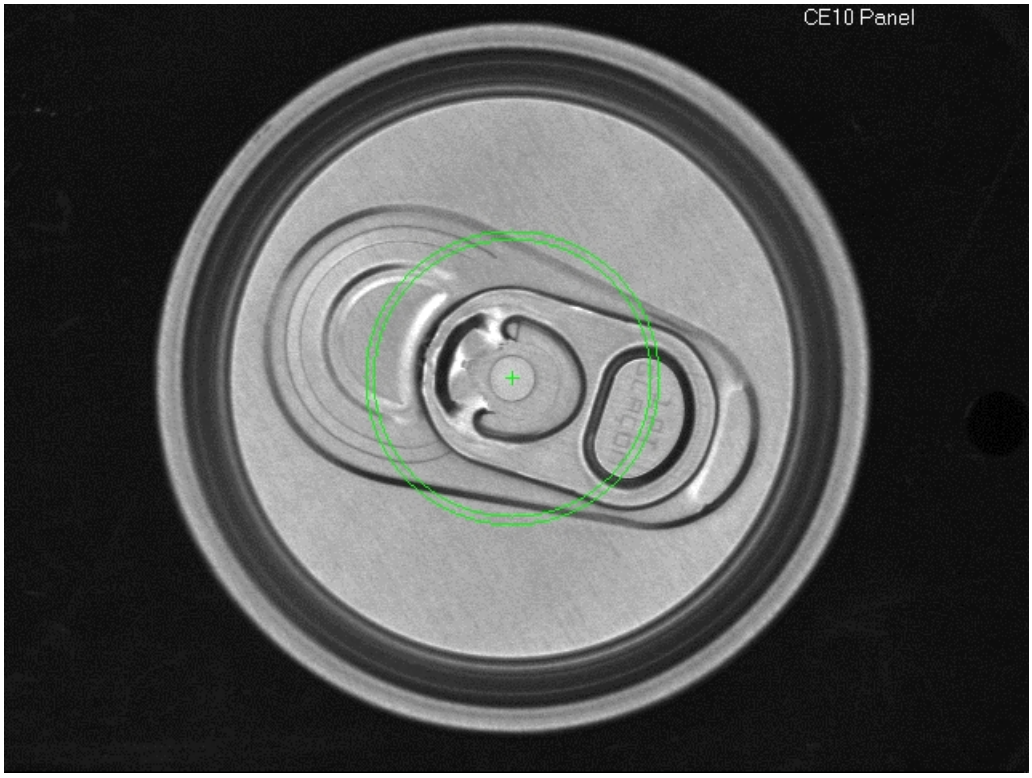
Setting the Orientation Region



Place the orientation region so that it crosses through the well transitions, and also through the dark transitions of the inside of the tab (if possible, through the straightest portions of the inside of the tab). This will ensure a good pattern match for orientation. Make the region about five pixels wide. Then adjust the orientation parameters.

Adjusting the Midline Orientation Parameters

To program a Midline Orientation on a converted end, we recommend the following sequence:

1) Disable Refine Tab Position in the Refine Tab menu. We will enable it later when we find tab rotation.
2) Go to Tab Settings menu and set Tab Search Technique.
3) Click Pattern Reference (if Tab Search Technique = Pattern Match). This acquires a new image, and finds the pattern of gray shades in the inspection region.
4) Adjust Tab Alignment Angle so that the orientation line is approximately in the center of the tab
5) Go to Midline Settings menu. Adjust parameters to determine the midline of the well.
6) Go to the Refine Tab menu. Enable Refine Tab Position (if desired). Adjust parameters to determine the rotation of the tab with respect to the well.
7) Make other parameter adjustments as necessary

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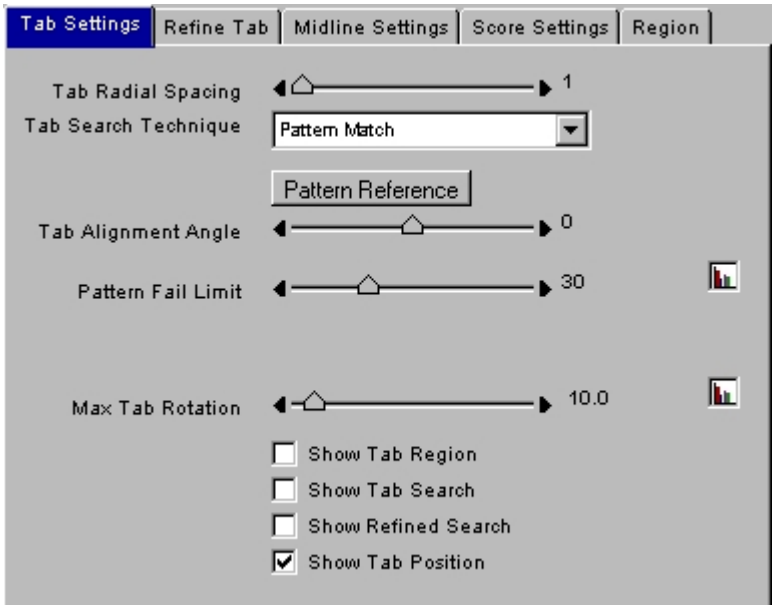
Tab Settings menu



This menu sets the orientation reference pattern of the part, and can determine whether the tab is rotated with respect to the well.

Tab Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Tab Search Technique

Choose between Pattern Match and Edge Search techniques to find the tab. The parameters associated with each technique are discussed below.

❖ *Note: When searching for the well area of a converted end, we recommend Pattern Match.*

PATTERN MATCH

The following parameters are available when Tab Search Technique = Pattern Match.

Pattern Reference

Allows you to acquire a new image and use that image as the standard reference pattern for the pattern search.

Tab Alignment Angle

Set the reference orientation to approximately the center of the tab. This will give the reference pattern that was set previously a starting reference point.

[Pattern] Failure Limit

The system computes the probability of a pattern match at any degree of rotation of the part.

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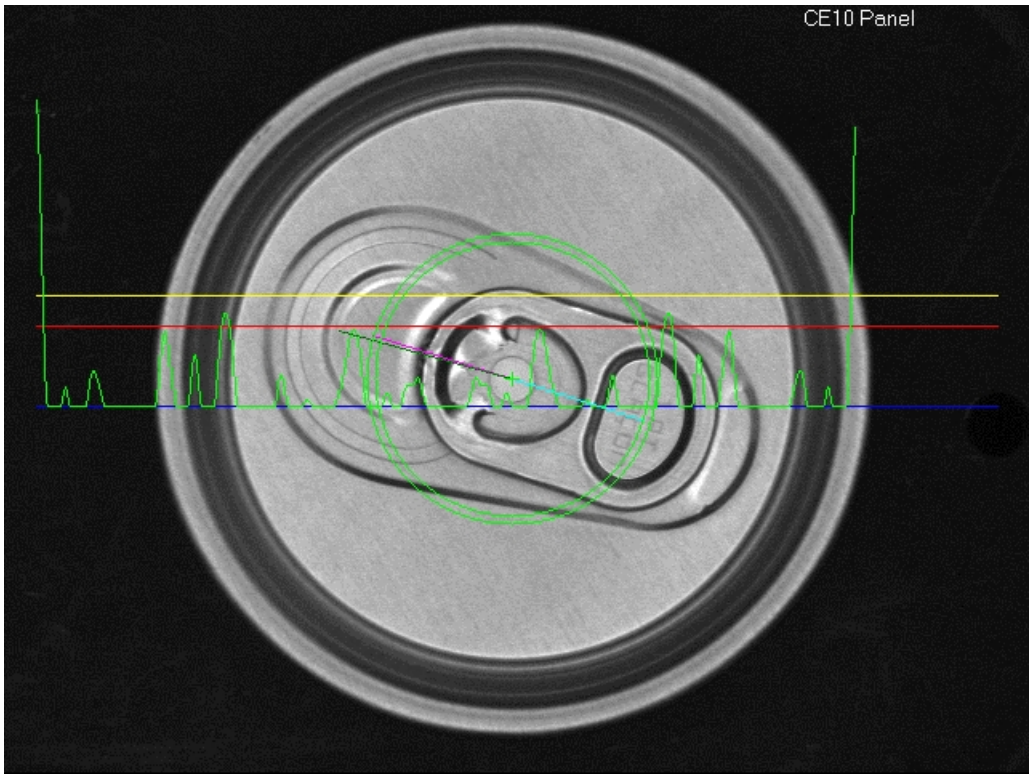
When you view the pattern match graph, the failure limit is displayed in red. The highest spike (on the left) represents a perfect pattern match. As the pattern rotates 360 degrees, it may find other pattern matches (similar gray shades) that are significant but smaller. As a rule, set the failure limit just below the peak of a smaller, but significant spike on the graph.

The system always uses the strongest pattern match generated. However, if all peaks fall below the limit, the inspection fails – no pattern match.



❖ *Note: Enable Show Tab Search to see the graph.*

Max Tab Rotation

This specifies the number of degrees in either direction from the reference midline that the found midline of the tab may fall. If the tab is rotated greater than this number, the orientation fails.

Show Tab Region

Displays the tab search region.

Show Tab Search

Displays the Pattern Match fail limit information, or edge location position if Tab Search Technique = Edge Search.

Show Refined Search

Displays the found tab edge positions with cyan x's.

Show Tab Position

Displays the found tab midline in cyan.

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EDGE SEARCH

The following parameters are available when Tab Search Technique = Edge Search

Tab Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

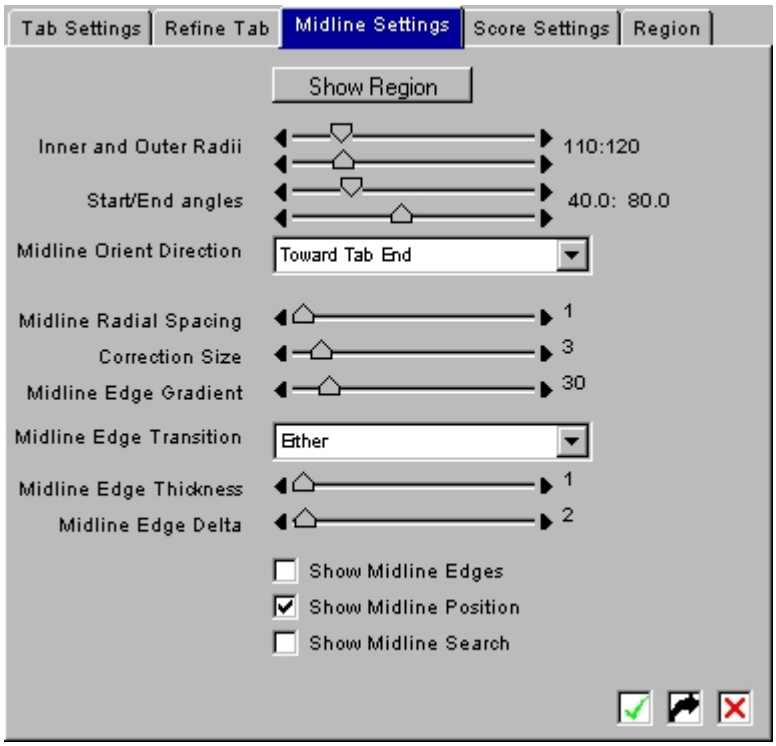
Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Midline Setting menu



This menu sets the parameters that find the sides of the well, and computes the midline of the well.

Show Region

Displays the search region that finds the sides of the well.

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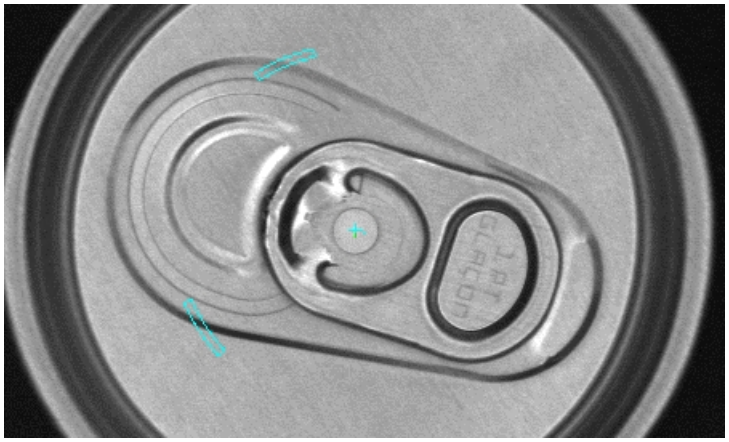
❖ *Note: Set Midline Orient Direction prior to adjusting Midline Region. For a converted end, we recommend using Opposite Tab End.*

Inner/ Outer Radii and Start/End Angles

Adjust the search area in which you want to find the outside edges of the well. The search vectors start outside, and search inwards. Make the search area just large enough to find the well transitions, without having interference from the score transitions. Position the search area so that it does not cross over text, stamps, or other edge transitions on the part. (See example below)



❖ *Note: Pattern Reference and Tab Alignment Angle in the Tab menu must be done before adjusting the midline region.*

Midline Orient Direction

Indicates which direction along the midline to use as the orientation position (Tab End or Opposite Tab End). For converted end inspection, we recommend Opposite Tab End.

Midline Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

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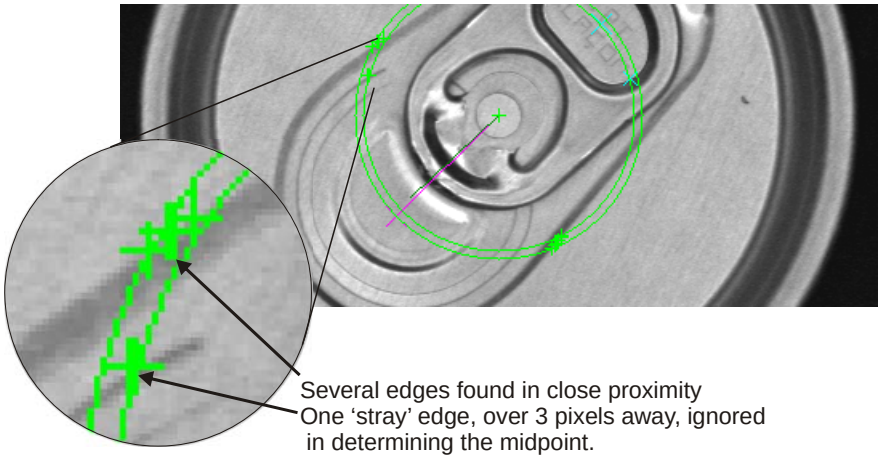
Correction size

The system finds a number of edge transitions in the search area. Sometimes it finds transitions a number of pixels away. In the midline computation, the system can ignore these edges that would normally skew the midline value. Default value of three usually works well.



Midline Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

To find the well edges, use a high enough gradient to distinguish the well from other possible noise edges in the image.

❖ *Note: Enable Show Midline Edges to see the effect of this parameter.*

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

In the example above, the search vectors are searching from a light area to the dark well transition. We are using Light to Dark.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Set Edge Thickness large enough (we are using 3) to distinguish the well transitions from any other noise in the image.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Set this high enough, say 5, to accurately capture the edge transition.

Show Midline Edges

Displays the edges used to compute the midline as green x's. The midline position is displayed as a magenta x.

Show Midline Position

Displays the found midline in magenta.

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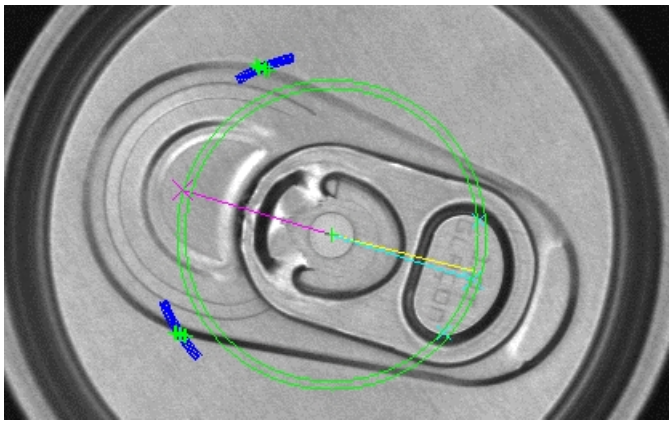
Show Midline Search

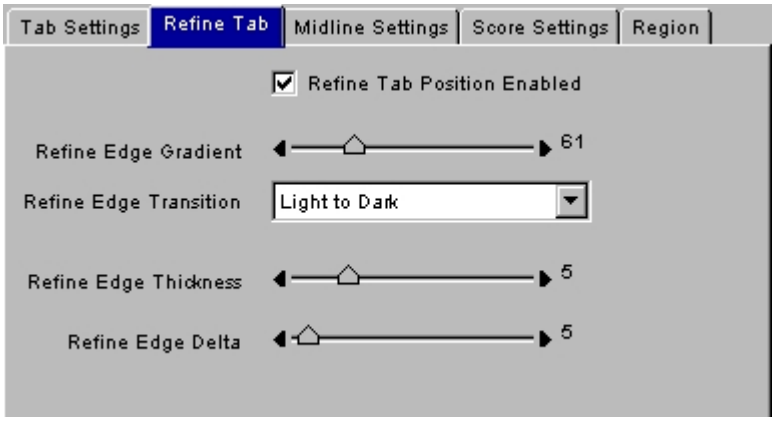
Displays the position of the midline search in blue.

After the midline menu parameters have been set, the midline of the well is found.



Next go to the Refine Tab menu to adjust its parameters. This will find the rotation of the tab with respect to the well.

Refine Tab menu



Refine Tab Position Enabled

Enable or Disable a search to determine the rotation of the tab with respect to the well. The parameters below will find the inside dark edges of the tab.

❖ *Note: Enable this only after you set the Midline parameters in the Midline menu.*

Refine Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

❖ *Note: Enable Show Refined Search to see the edges found.*

To find the dark tab edges, set this to a relatively high number. We are using ~60 in our example. The tab edges are usually a drastic change in gray shade from the area underneath. Make sure the system is finding the inside edges of the tab (large cyan x's).

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Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

In searching for a tab, we use Light to Dark. We want to find the dark tab edges.

Refine Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

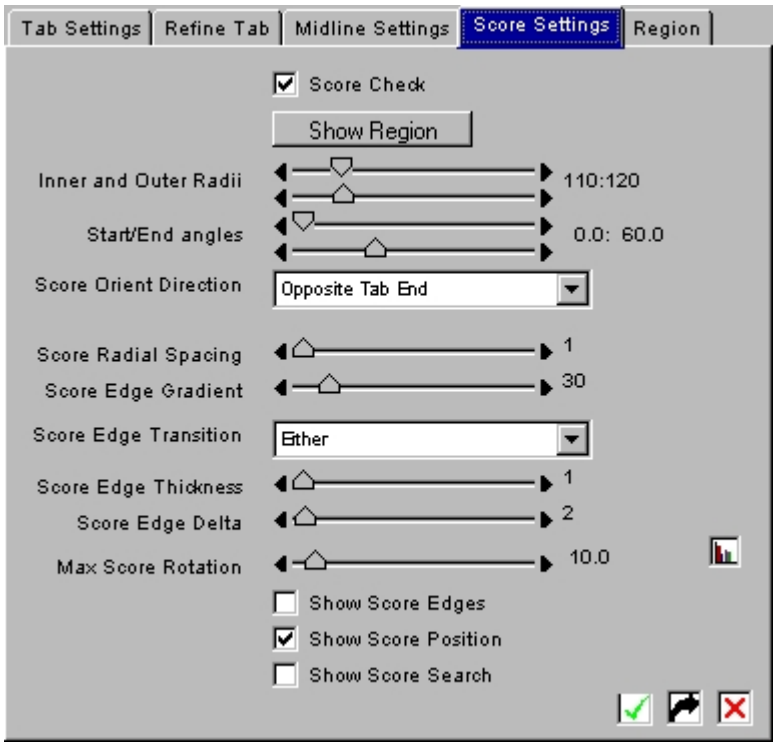
In our example, we are using a value of 5. Set this high enough to find a well-defined edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

In our example, we are using a value of 5. Set this high enough to find a large transition.

Score Settings menu



This menu allows you to program the system to locate the score and determine whether it is rotated with respect to the well.

Score Check

Enable or Disable the search for the score position.

Show Region

Displays the score search region.

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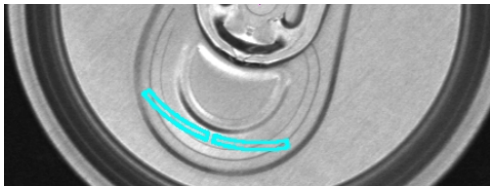
Inner/ Outer Radii and Start/ End Angles

Adjust the search region in which you want to find the score. The search vectors start at the midline and search outward.

❖ *Note: Set Score Orient Direction (usually Opposite Tab End) before adjusting the search region.*

Choose the score or D-ring on your part – whichever has the greatest contrast. In our example, we use the lower edge of the score where the search region does not cross the D-ring.



Score Orient Direction

Indicates which direction along the midline is used to find the score (Opposite Tab End or Toward Tab End). The score is generally located opposite the tab end.

❖ *Note: Enable Show Score Search to see the effects of this parameter.*

Score Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Score Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Make this high enough to consistently find the score edges (green x's).

❖ *Note: Enable Show Score Edges to see edges.*

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

In the above example, we are searching from a light area to the dark score. We are using Light to Dark transition.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Set this high enough, say 5, to accurately capture the edge transition.

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Max Score Rotation

This specifies the number of degrees in either direction from the reference midline that the found midline of the score may fall. If the score is rotated greater than this number, the orientation fails.

Show Score Edges

Displays the score edges as green x's. The midpoint of the score is displayed as a large green x.

Show Score Position

Displays the found midline position of the score as a dark green line.

Show Score Search

Displays the score search area in blue.

Graphs – Midline Orientation

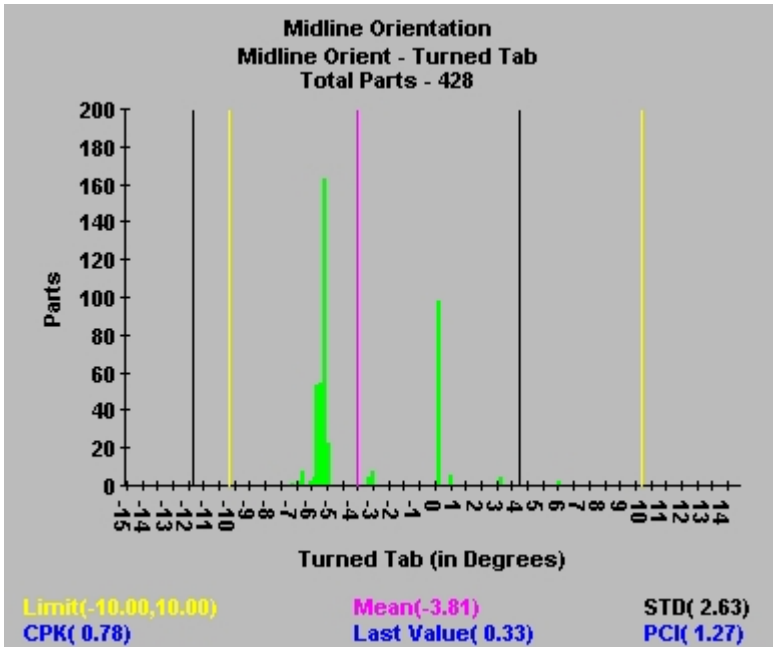
These are the graphs available for this inspection.

Found Location

This plots the degree of orientation of the found midline for each part.

Turned Tab

This plots the degree of rotation of the tab found for each part.



Turned Score

(If Score Check is Enabled) This plots the degree of rotation of the score found for each part.

Pattern Confidence

(If Tab Search Technique = Pattern Match) This plots the percentage of matching patterns of gray shades found for each part. This is with respect to the reference pattern set in the Tab menu.

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ERROR DETAILS GRAPH

No Midline

The number of parts that failed because the midline feature was not found.

No Score

The number of parts that failed because the score was not found.

No Tab

The number of parts that failed because the tab was not found.

Turned Tab

The number of parts that failed because the tab was rotated more than the acceptable limits.

Turned Score

The number of parts that failed because the score was rotated more than the acceptable limits.

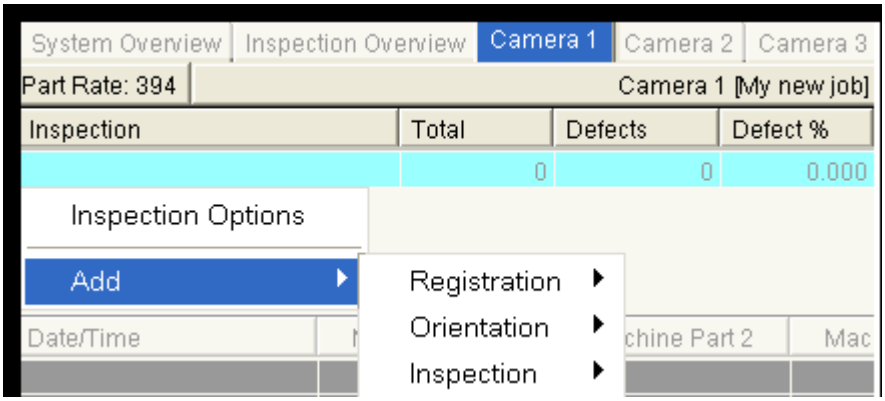
ORIENTATION STEALER

This orientation option allows you to use information from a previous orientation even after a new registration has been run.

Adding the Orientation Stealer

To add the Orientation Stealer:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Orientation >> Orientation Stealer. The default region is place on the image, and the orientation menus are displayed in the upper right screen. The region is based on the most recent orientation.

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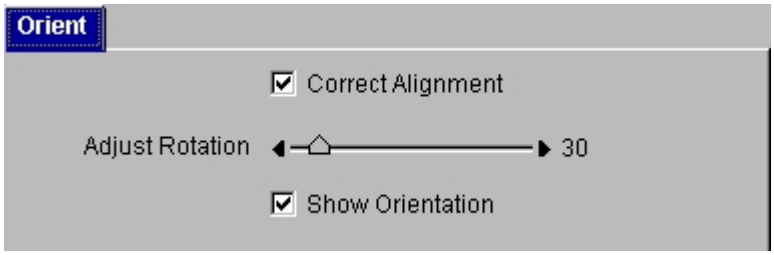
Adjusting the Orientation Stealer parameters



Correct Alignment

This assumes that a fixed offset exists between the previous orientation and the area you are about to inspect. That is, the registration just before Orientation Stealer has a different center than the registration used for the previous orientation. Correct Alignment allows the orientation to be corrected and centered according to the new registration.

Adjust Rotation

The degree of rotation begins with the previous orientation position as zero degrees. Adjust the new orientation the number of degrees as desired for the next inspection.

Show Orientation

Displays the orientation line as adjusted for alignment and rotation from Orientation Stealer.

CLIPOUT INSPECTION

Clipout inspection detects flaws in the curl of a can end. The curl is the turned up edge of the can end. A Clipout inspection will detect missing, bent, or otherwise damaged parts of the curl.

The inspection uses grayscale edge detection techniques to detect abnormal edge transitions on the curl. The Clipout inspection divides the inspection region into four (default) segments along diagonal lines. Each segment is searched for a dark-to-light and a light-to-dark edge from the outside in. The inspection then calculates the width of the curl and compares it to a minimum and maximum curl size.

Adding the Clipout inspection

To add the Clipout inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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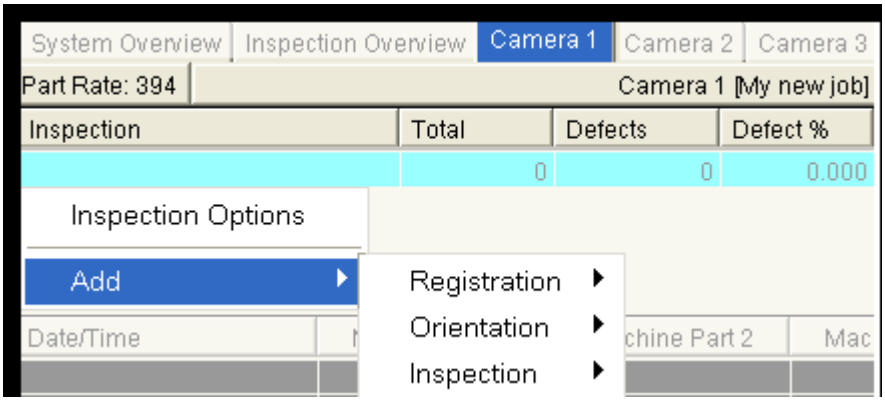
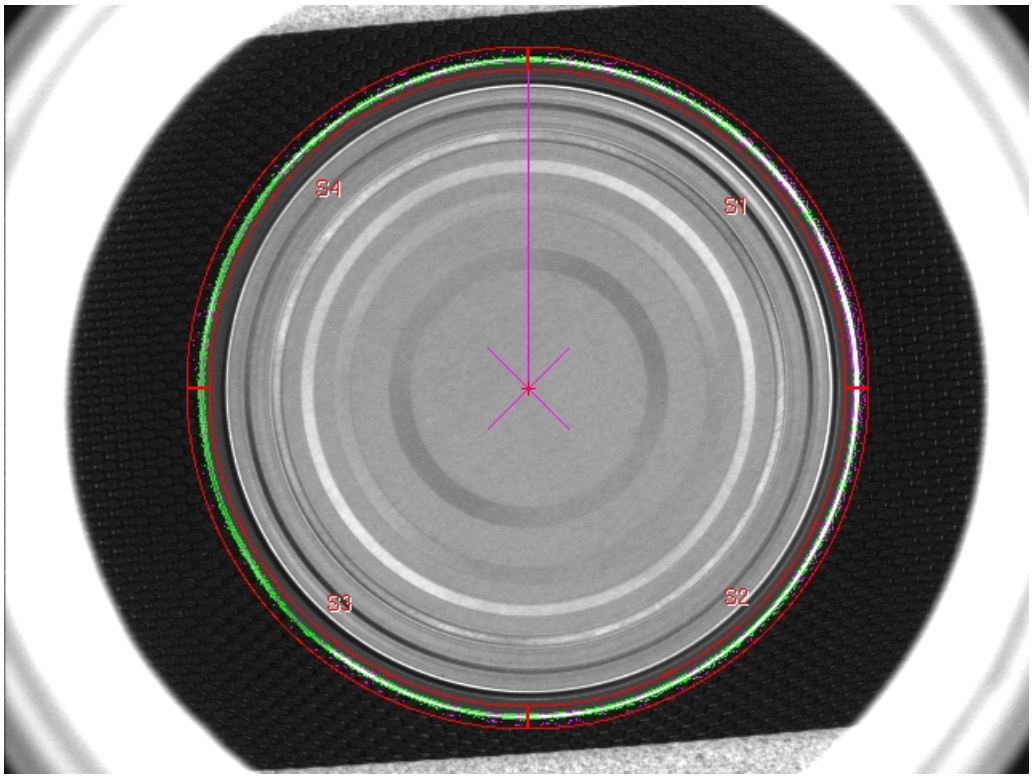
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Clipout inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Clipout inspection region

Using the Region menu, place the inspection region to surround the curl area. Make sure it is larger than the curl on either side by a few pixels. The inspection region cannot go outside of the image.



Start Angle/ End Angle

You can inspect just an arc instead of the whole circle. Define the arc as a number of degrees from Start Angle to End Angle. Zero degrees is the top of the circle.

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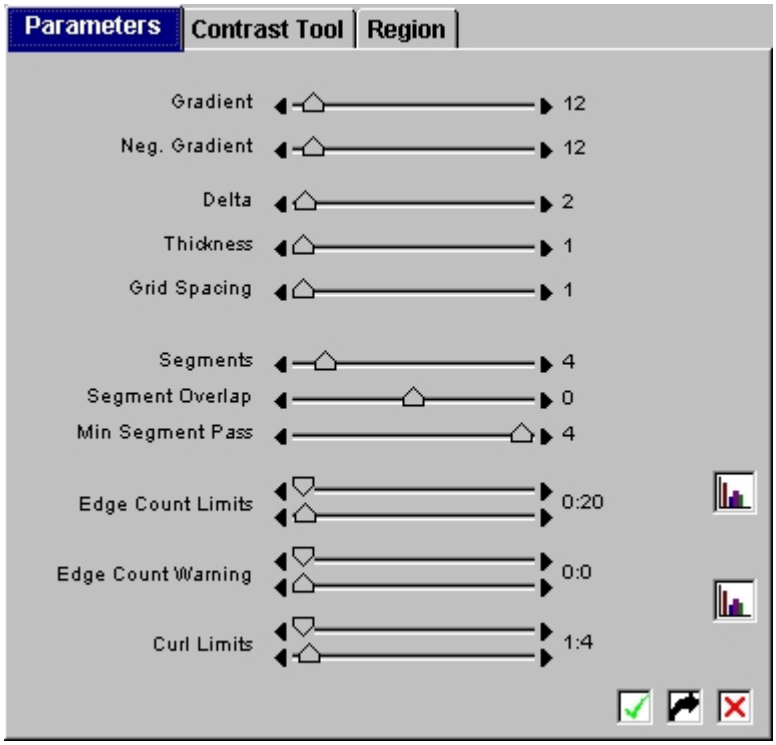
We recommend using an orientation prior to Clipout inspection if you are inspecting arcs. This will ensure that the correct portion of the part gets inspected regardless of the orientation of the part in the camera's field of view.

Then adjust the parameters to best inspect your part, as recommended by your instructor or Pressco Service Engineer.

Adjusting the Clipout parameters

- *Note: Use the* **Image Analysis** *(see "About the Image Analysis tool" on page 185) tool to view the gray levels of the inspection region, to assist in setting up the parameters.*



Gradient

Finds the dark-to-light transition.

Negative Gradient

Finds the light-to-dark transition.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

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Segments

Divide the region into a number of segments between one and 32.

Segment Overlap

Specify the number of pixels by which each segment will overlap each other. Overlapping ensures that pixels are not missed during inspection. The overlap is highlighted on the image. The segments can overlap between -15 and 15 pixels.

If negative overlap is used, each segment becomes independent and has a gap between neighboring segments. This helps in avoiding certain patterns that are symmetrical. The negative overlap is displayed in cyan on the image. This area will *not* be inspected. This would be beneficial if you had a pattern under those areas. Using other negative overlap values and other numbers of segments results in different patterns.

Min. Segment Pass

Specify how many segments must pass for the whole inspection to pass. The system automatically assigns four segments within the inspection area. Define how many segments of these four must pass.

Edge Count Limits

Specify the minimum and maximum number of pixels expected to be counted in the inspection region. If the number of counted pixels is less than or greater than these values, the inspection fails.

Edge Count Warning Limits

Warning limit % lets you set portions at each end of the passing range as warning ranges. If the number of edges counted falls within one of these two ranges, the part still passes, but it is recorded in memory as a warning part. The accumulation of warning parts can flag an output to warn you that the manufacturing process is going out of tolerance. This parameter is adjustable to any percentage, as long as the sum of Upper warning % and Lower warning % does not exceed 100%.

Curl Limits

The minimum and maximum number of pixels wide that the curl can be. Anything outside these parameters is considered a defect.

Graphs - Clipout Inspection

There is one graph available for Clipout inspection. It is called Largest Edge Count, and it displays the largest number of edges found for each part.

CIRCLE INSPECTION

This inspection allows you to define a circle (or donut) inspection area. This area can be inspected as one continuous region, or in segments (user-definable). You can also specify that the system inspect only a portion (an arc) of the circle.

The system uses edge detection techniques to find defects. The ambient of the part can be computed to locate incorrect color parts. Additional edge, blob, zone, and pattern learn analyses can be performed to find specific defects.

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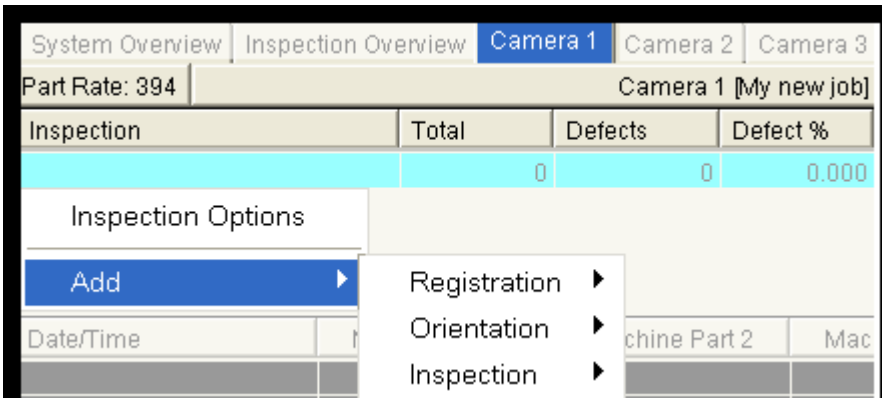
Adding the Circle inspection

To add the Circle inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Circle inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Circle inspection region

Place the inspection region through the Region menu.

Arcs Enabled

Allows you to inspect an arc instead of the whole region. The system will inspect a portion of the region between the Start and Stop angles. Make sure you have an Orientation in the job prior to using arcs. This will ensure that the inspection region is placed on the same location of the part regardless of the part's orientation. Zero degrees is the top of the circle.

Adjusting the Circle inspection parameters

Go to the Circle Settings menu to determine whether to use segments, and to specify segment conditions. Then set up the remaining inspection parameters. Use the Inspections menu to add the desired types of inspections.

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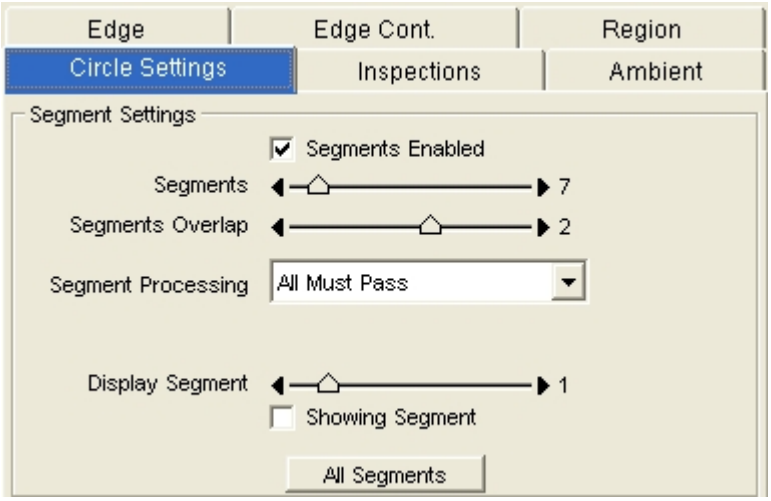
Circle Settings Menu



Segments Enabled

Divides the circle into a number of segments. If this is not checked, the circle will be inspected as one continuous inspection region.

Segments

Divide the region into a number of segments between one and 72.

Segment Overlap

Specify the number of pixels by which each segment will overlap each other. Overlapping ensures that pixels are not missed during inspection. The overlap is highlighted on the image. The segments can overlap between -10 and +10 pixels.

If negative overlap is used, each segment becomes independent and has a gap between neighboring segments. This helps in avoiding certain patterns that are symmetrical. The negative overlap is displayed in cyan on the image. This area will *not* be inspected. This would be beneficial if you had a pattern under those areas. Using other negative overlap values and other numbers of segments results in different patterns.

Segment Processing

Specify how many segments must pass for the whole inspection to pass.

- **All must pass** - all segments must pass inspection.
- **Minimum passing** - specify the minimum number of segments that must pass (through Passing Minimum parameter).
- **Special Conditions** - allows you to specify that a segment pass, fail, or be ignored.

To use Special Conditions:

1) Use the Conditions menu.
2) Click the segment selector to highlight a segment. The corresponding condition is listed in the upper left of the menu.

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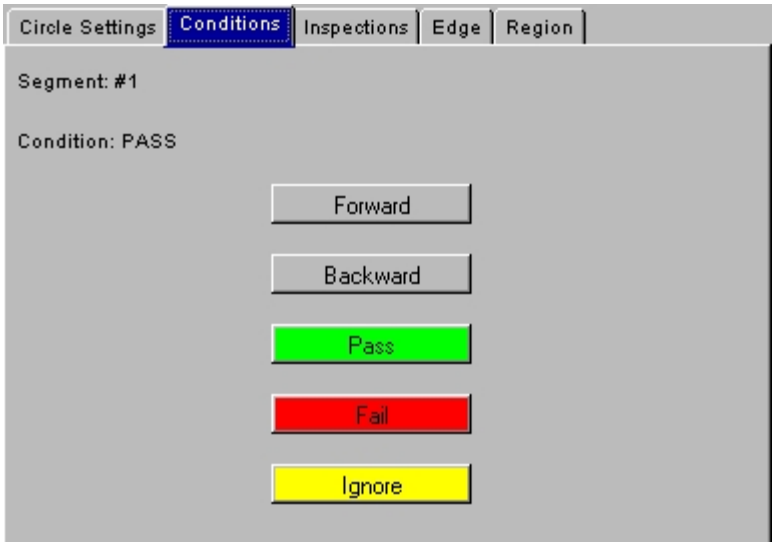
Use the PASS, FAIL, or IGNORE buttons to change the segment condition. During inspection, if the segment matches the specified condition, the inspection passes. You might use PASS or IGNORE on segments that have a recycle logo, for example, that would normally not pass inspections.



Display Segment

Displays one segment at a time.

All Segments

Shows all segments on screen (after using Display Segment).

Circle inspection Test Parameters

From the Inspections menu, choose which portions of the Circle inspection to use to detect different types of defects. The inspections menu consists of several components that are common to many inspection types. Below are links to each inspection type.

- ***Ambient inspection*** (on page 347)
- ***Edge inspection*** (on page 348)
- ***Edge Blob inspection*** (on page 352)
- ***Zones inspection*** (on page 354)
- ***Blob inspection*** (on page 356)
- ***Pattern Learn inspection*** (on page 358)

Graphs - Circle Inspection

AMBIENT GRAPHS

The following graphs are available if Ambient inspection is enabled.

Ambient Average

The average ambient value of the whole inspection region.

Ambient Minimum

The minimum ambient found in the whole inspection region.

Ambient Maximum

The maximum ambient found in the whole inspection region.

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EDGE GRAPHS

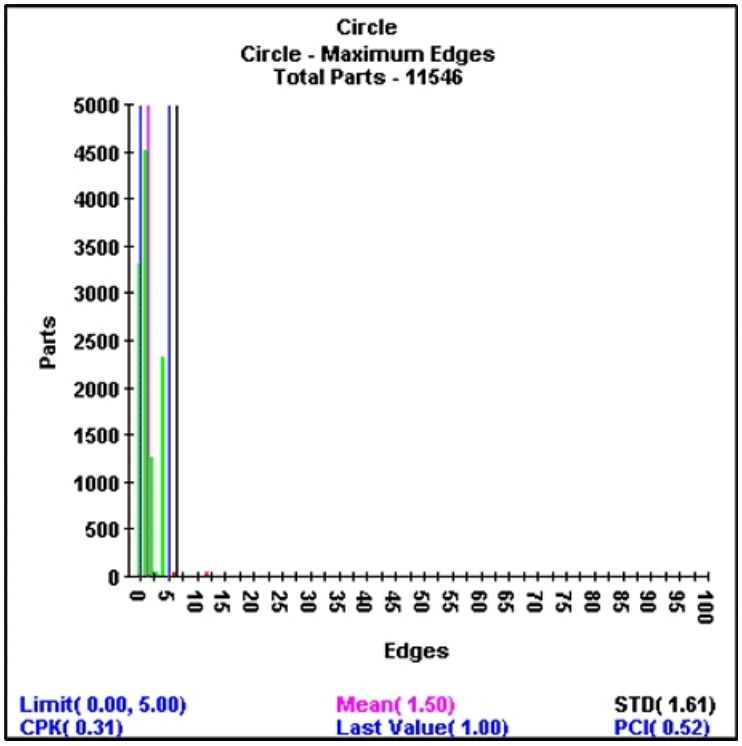
The following graphs are available if Edge inspection is enabled.

Total Edges

The total number of edges found in the inspection region.

Maximum Edges

The maximum number of edges found in the inspection region. The limits are set by Edges Min/ Max parameters.



Largest Absolute Gradient

(If Absolute Gradient enabled in Edge cont. menu) This plots the largest gradient change for each inspected part. The yellow limit is set by the Absolute Gradient parameter.

EDGE BLOB GRAPHS

The following graphs are available if Edge Blob inspection is enabled.

Largest Edge Blob Area

The largest connected set of pixels considered to be an edge blob in the inspection region.

Average Edge Blob Count

The average number of edge blobs found in the inspection region.

Minimum Edge Blob Count

The minimum number of edge blobs found in the inspection region.

Maximum Edge Blob Count

The maximum number of edge blobs found in the inspection region.

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Edge Blob Valid Area

(If Blob Valid Area enabled) The area found for each edge blob.

ZONE GRAPHS

Available if Zone inspection is enabled.

Zone *n* Area Maximum

The maximum number of pixels found in the inspection region. The limits are set by the Area Min/ Max parameters.

BLOB GRAPHS

The following graphs are available if Blob inspection is enabled.

Largest Blob Area

The number of pixels in the largest blob found in the inspection region.

Blob Average Total Area

The average number of pixels considered to be part of a blob throughout the inspection region. The limits are set by Blob Mass Min/ Max parameters.

Blob Minimum Total Area

The minimum number of pixels considered to be part of a blob throughout the inspection region. The limits are set by Blob Mass Min/ Max parameters.

Blob Maximum Total Area

The minimum number of pixels considered to be part of a blob throughout the inspection region. The limits are set by Blob Mass Min/ Max parameters.

Average Blob Count

The average number of blobs found in the inspection region. The limits are set by Blob Count Min/ Max parameters.

Minimum Blob Count

The minimum number of blobs found in the inspection region. The limits are set by Blob Count Min/ Max parameters.

Maximum Blob Count

The maximum number of blobs found in the inspection region. The limits are set by Blob Count Min/ Max parameters.

PATTERN LEARN GRAPHS

Area Deviation

(If Pattern Learn inspection enabled and Analysis Technique = Deviation Maximum) The number of pixels the current part's inspection area falls outside of the learned limits.

Percent Deviation

(If Pattern Learn inspection enabled and Analysis Technique = Deviation Percent) The percentage the current part's inspection area falls outside of the learned limits.

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ERROR DETAILS GRAPH

Ambient

(If Ambient inspection is enabled) The number of parts that failed the Ambient inspection criteria.

Edge Count

(If Edge inspection is enabled) The number of parts that failed the Edges Min/ Max limits.

Edge Blob Count

(If Edge Blob inspection is enabled) The number of parts that failed the Blob Count Min/ Max limits.

Edge Blob Area

(If Edge Blob inspection is enabled) The number of parts that failed the Blob Area Min/ Max limits.

Blob

(If Blob inspection is enabled) The number of parts that failed the Blob inspection criteria.

Blob Area

(If Blob Mass is enabled) The number of parts that failed the Blob Mass Min/ Max limits.

Blob Count

(If Blob Count is enabled) The number of parts that failed the Blob Count Min/ Max criteria.

Zone

(If Zones are enabled) The number of parts that failed the Zone criteria.

Segment

(If Segments are enabled) The number of parts that failed because at least one segment did not meet inspection criteria.

COMMON INSPECTION COMPONENTS

Several inspections have common inspection components, which you enable through the Inspections menu. The inspection types to which these components are common include:

- ***Circle inspection*** (on page 340)
- ***Polygon inspection*** (on page 409)
- ***Shape Adapt inspection*** (on page 416)

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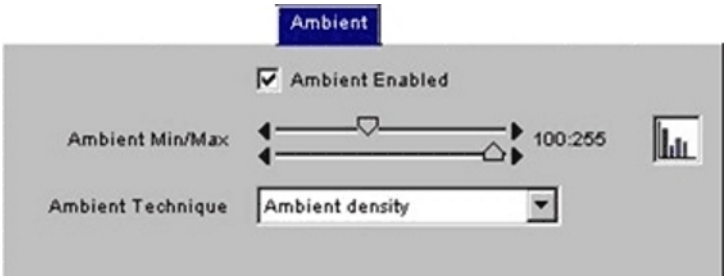
Ambient Inspection



The Ambient is a gray level value that is representative of the gray levels of a region. This menu allows you to configure how the system adapts to image intensity shifts. It can be used to reject grossly different part colors. However, its primary purpose is to allow the system to correct for gray level changes within the inspection regions.

The Ambient that is determined through the settings in this menu can be used in the calculations of the Zone and Blob analyses - if applicable to this inspection.

Ambient Enabled

This determines whether the found ambient is used as a reject criteria. You can choose whether to reject based on the gray shade found on each new image. If this is not checked, the Ambient Min/ Max parameters are not used. However, the ambient is still calculated for use in other inspection areas (blob), and you can choose an ambient technique.

Ambient Min/ Max

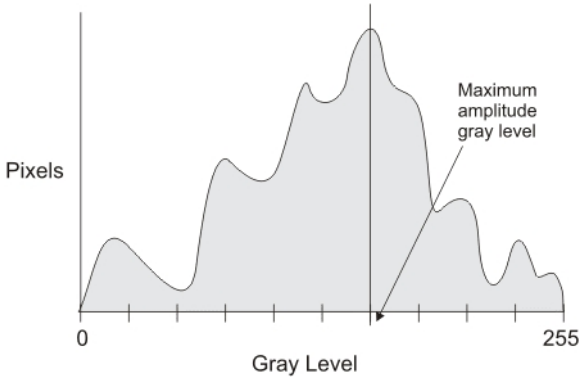
The minimum and maximum acceptable ambient gray level values. Any computed ambient found lower than or greater than these values will cause the inspection to fail.

❖ *Tip: Click the graph box to view the Ambient Average graph. The yellow limits are set by Ambient Min/ Max.*

Ambient Technique

This method determines the region's ambient. Choose the method through the drop-down menu.

- **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.



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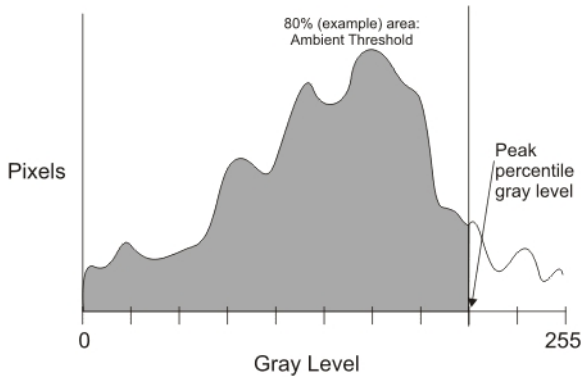
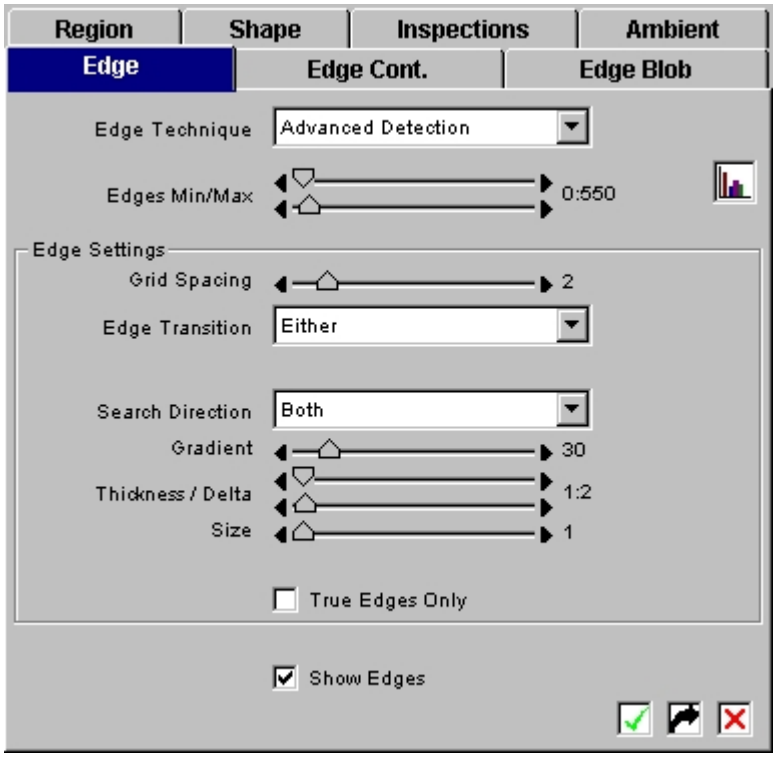
- **Peak Percentile** locates the gray shade value that exceeds the **threshold.**
  - **Threshold** defines what percentage of the search area to use.



- **Ambient Density** computes the average of all the pixel gray levels — total gray level divided by pixels.

Edge Inspection



The Edge menu is used to qualify differences in gray shades between pixels within the inspection region.

Edge Technique

Indicates what type of edge detection to use. Each technique is described in following sections.

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- **Advanced Detection** qualifies edges by adding extra parameters.
- **Adapting Detection** allows the inspection to adapt to the gray level changes of each image.
- **Object Fill** locates objects within the inspection region and fills them in.

The following parameters are common to all edge detection techniques.

EDGE SETTINGS

Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Edge Transition

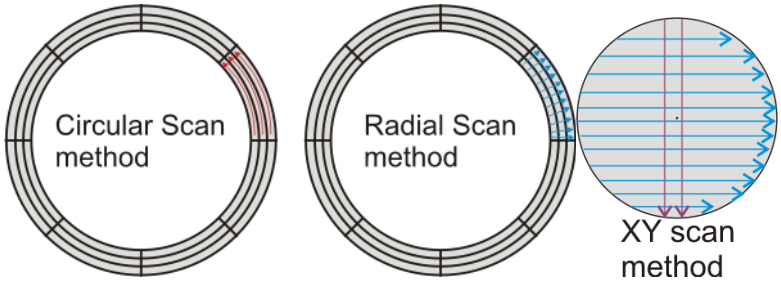
The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Scan Method (Circle Inspection only)

- Circular Scan inspects and compares pixels in concentric circles.
- Radial Scan inspects pixels in a radius, or line, to another radius. Radial scanning is useful in applications where acceptable anomalies like draw marks occur in a radial direction. It will reduce false rejects from these acceptable marks.
- X-Y Scan inspects left to right and top to bottom. This is good for flat areas of the part.



Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

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True Edges Only

Uses only the actual edge, not all the pixels that passed the gradient change.

Show Edges

Displays the found edges in the search regions.

ADVANCED EDGE DETECTION TECHNIQUE:

The Advanced technique uses a gradient and delta to find edges, but it qualifies the edges. You can specify that the system find only dark or only light edges, and find edges that meet a certain size and thickness.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

ADAPTING EDGE DETECTION TECHNIQUE:

The Adapting technique replaces the gradient with a threshold, which is a percentage of the gray level range in the search vector. This allows the inspection to adapt to the gray level changes of each image.

Edge Threshold

This is the threshold used to locate an edge within a search vector. The larger the threshold, the stronger the edge must be. This number is a percentage of the minimum and maximum gray level within the vector, so it changes for each image.

OBJECT FILL EDGE DETECTION TECHNIQUE:

This technique finds an edge transition, and continues to search in the same direction, for an opposite transition. It fills in the edges between these transitions, thus revealing an object. The objects are marked with cyan x's (if Show Edges is enabled). The following parameters are added for this edge detection technique:

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Fill Average Enabled

When this is checked, the system computes the average gray level of each search vector. The system finds the first edge transition (in whatever direction it is searching) by using the normal Gradient, Delta, etc., parameters. The fill pixels after that are based on the difference between the pixel being examined, and the average gray level of the vector.

If you find that, when using Object Fill, the pixels tend to get filled in all the way to the end of the search vector, try Enabling Edge Fill Average.

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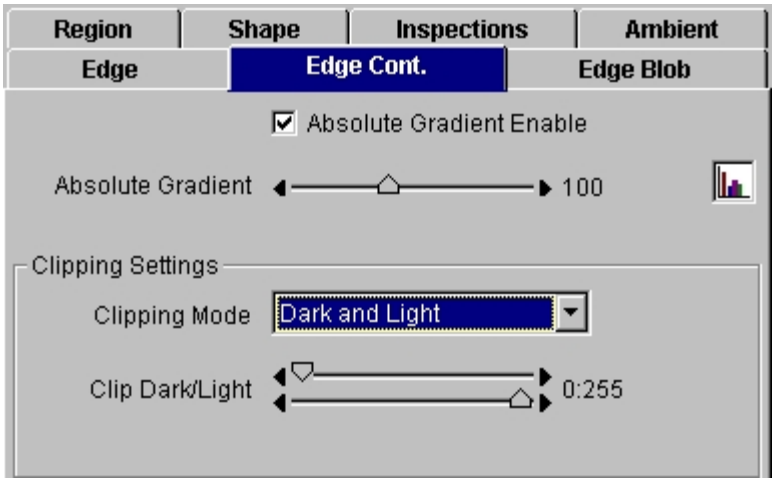
Edge Continued Menu

Extends the edge inspection parameters.



Absolute Gradient

Allows the system to reject a part if any edge comparison exceeds a certain gradient. This feature can be enabled or disabled.

Use the Absolute Gradient slider to set the maximum gradient change allowed between inspected pixels. The pixels being compared continue to use the delta and grid spacing as specified in the Edge menu. If the difference in gray shades between any two compared pixels exceeds the Absolute Gradient, the inspection fails.

Clipping mode

Clipping is used to change gray shades to a specified value. It allows the system to ignore light reflections or normal grain in a part, to provide easier defect detection. The available modes are as follows:

- **Disabled** – no clipping.
- **Dark Only** – lets you set a dark gray shade value. A dark clipping value of 100 would take all pixels with gray levels of 0-99 and make them a gray level of 100.
- **Light Only** – Lets you set a light gray shade value. A light clipping value of 150 would take all pixels with gray levels of 151-255 and make them 150.
- **Dark and Light** – Lets you set both dark and light levels. The dark value cannot exceed the light value, and the light value cannot be less than the dark value.

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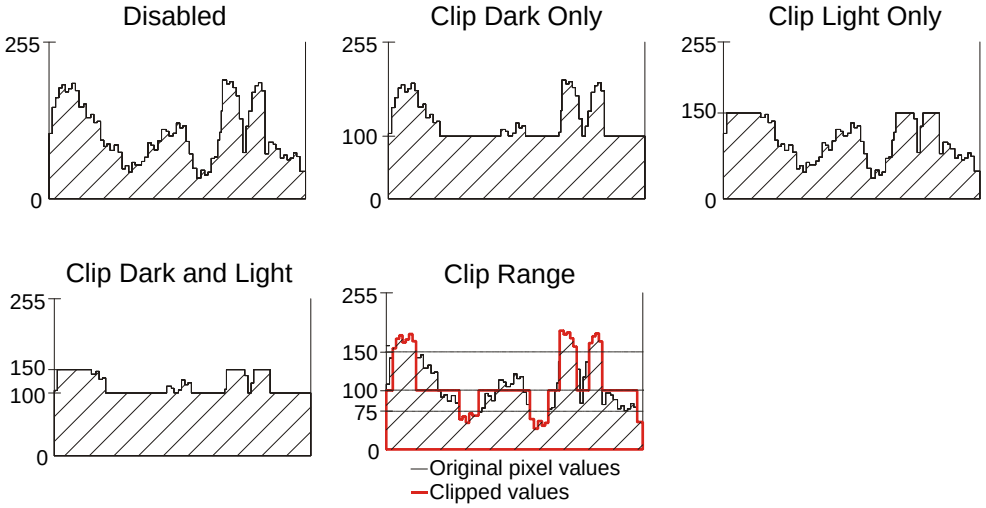
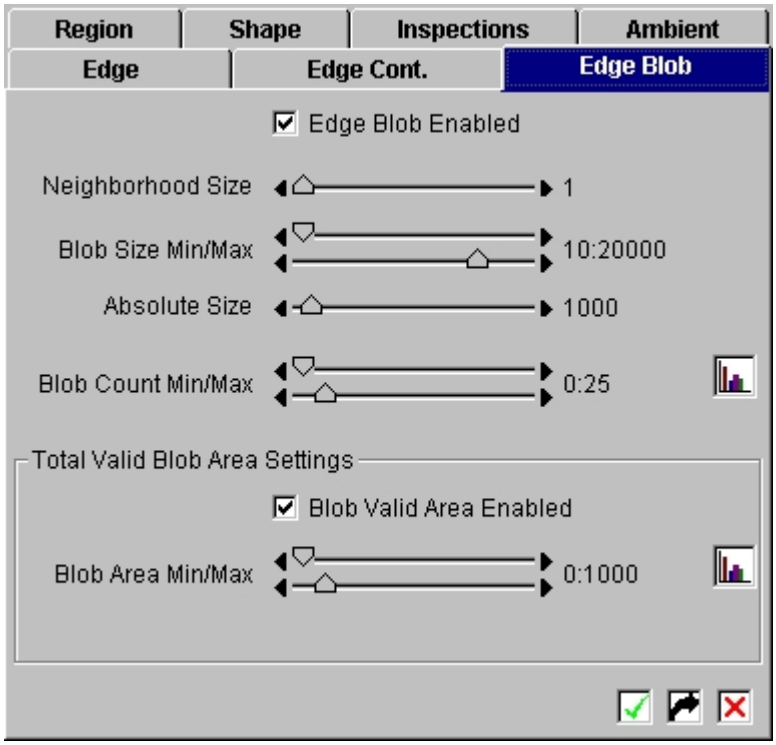
- **Clip Range** – Lets you set a clipping value, but the pixel values are only clipped if they fall within the Clip Range values.



Edge Blob Inspection



Edge Blob Enabled

If this is checked, the located edges will be checked for blob connectivity. A blob is defined as a connected set of pixels. It determines whether the edges found in the inspection are connected or not. This will allow you to ignore small or large defects. This is useful in cases where you might have a grain, a pattern, or a feature you wish to ignore.

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Neighborhood Size

Determines what is considered connected. A setting of one indicates that the located edge pixels must be next to each other to be considered connected. A setting of five indicates that edge pixels can be located as far as five pixels apart, but still be considered part of the same edge blob.

Blob Size Min/ Max

The smallest and largest connected set of pixels considered to be a blob.

Absolute Size

Allows the system to reject a part if one edge blob (its number of connected pixels) exceeds this value.

Blob Count Min/ Max

The minimum and maximum number of blobs expected in the search region. Too few or too many blobs will cause the inspection to fail.

TOTAL VALID BLOB AREA SETTINGS

Blob Valid Area Enabled

If enabled, the blob area is qualified to determine whether it falls within certain limits. For example, say that within the inspection area, you can tolerate several little blobs, but want to reject the part if it has too many of these little blobs or if it has one large blob.

Blob Area Min/ Max

The minimum and maximum blob areas that qualify a valid blob.

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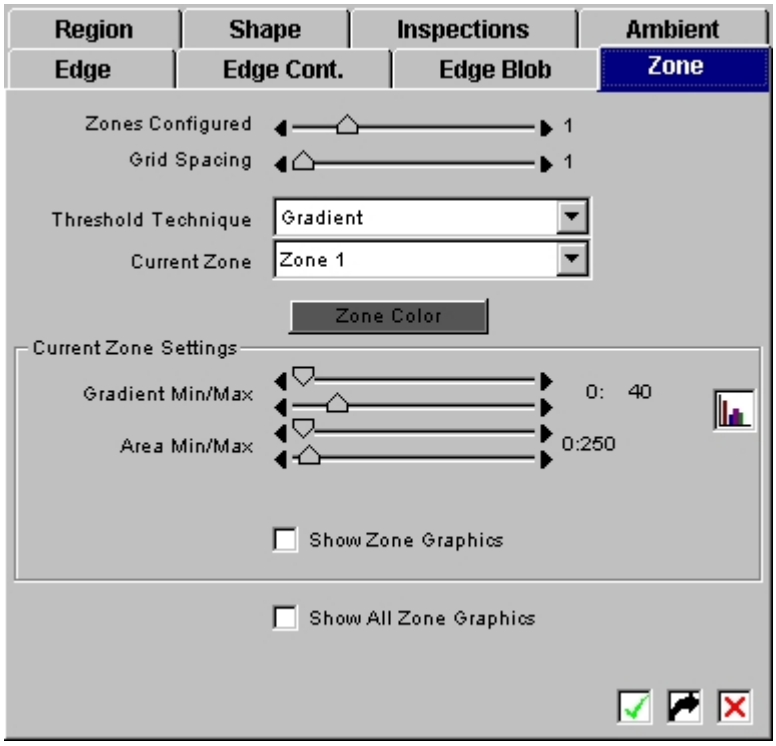
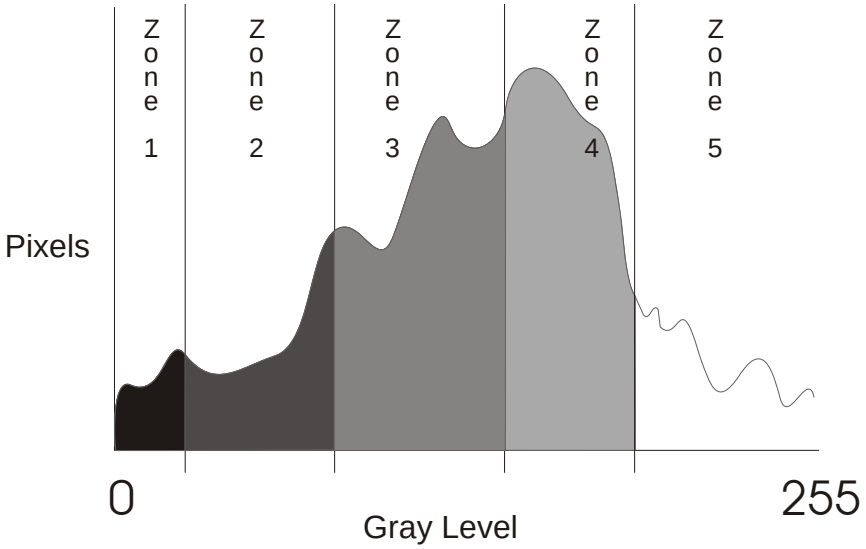
Zones Inspection

Zone inspection can be used to detect defects of specific gray shade ranges.



The use of zones is a type of diagnostic based on the histogram of the inspection regions. The zones refer to part of a histogram – not the regions themselves.



There are up to five zones of the image histogram for this inspection. Each zone may be independently enabled, disabled, and programmed. Each zone has a unique color to distinguish it. If a zone inspection fails, it is displayed in red.

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Zones Configured

Identifies how many histogram zones are enabled. A value of zero indicates that none of the zone checks are performed. The system allows up to five zones to be checked. If no zones are enabled, none of the other zone parameters are applied.

Grid Spacing

This is used to define the inspection density. A value of one searches each line, a value of two searches every other line, etc. The smaller the grid spacing, the more accurate the inspection. The larger the grid spacing, the faster the inspection.

Threshold Technique

Choose whether to use a percentage of the Ambient, or use an actual gray shade value to define the thresholds. The thresholds define the gray shade limits of a zone. The techniques are described below.

Current Zone

Identifies which zone is currently being adjusted. The parameters are set in the Current Zone Settings section of the menu.

PERCENT OF AMBIENT TECHNIQUE:

This technique uses a percentage of the found Ambient to define the low and high thresholds. The Ambient is determined through the Ambient inspection menu, regardless of whether Ambient inspection is enabled.

Threshold Min/ Max

These numbers are used to compute the Minimum and Maximum Gray Levels for the current zone. The system will count the number of pixels that fall between the minimum and maximum gray levels. You can set Threshold Max up to 300.

- Minimum Gray Level = Ambient x (Threshold Min / 100)
  - For example, if the Ambient is 200, and Threshold Min is 20, the Minimum Gray Level is 40. [200 x (20/100)] = 40.
- Maximum Gray Level = Ambient x (Threshold Max / 100)
  - For example, if the Ambient is 200, and Threshold Max is 80, the Maximum Gray Level is 160. [200 x (80/100)] = 160.

GRADIENT TECHNIQUE:

This technique allows you to choose an actual gray shade value to determine the low and high thresholds.

Gradient Min/ Max

Enter the lowest and highest gray shade values allowed within the current zone.

The following parameters are common to both Threshold Techniques:

Area Min/ Max

The minimum and maximum number of pixels that should be located within the Minimum and Maximum Gray Levels (or between Gradient Min/ Max). If the system counts a number lower or higher than these numbers, the inspection fails.

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Show Zone Graphics

Displays the zone graphics for the current zone. All pixels that fall within the Minimum and Maximum Gray Levels (or between Gradient Min/ Max) are color-coded for easy viewing. If the number of pixels in a zone exceeds the Area Max, that result is displayed in red.

The system allows for up to five different zones to be defined. The zone data and pixels in each zone are color-coded. Refer to the button on the zone menu to see the current zone color. The colors are as follows:

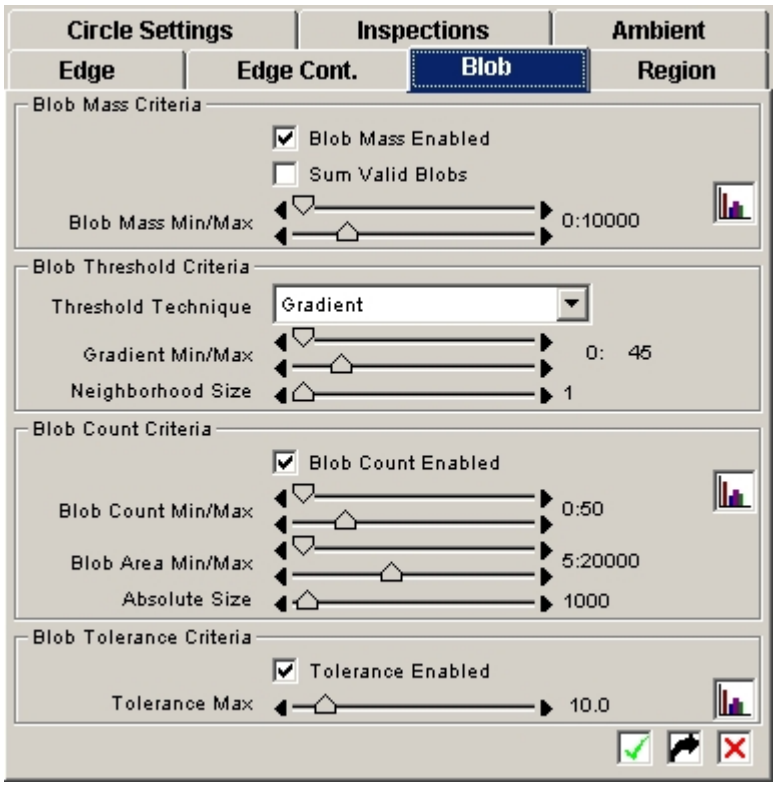
- Zone 1 - Orange
- Zone 2 - Cyan
- Zone 3 - Magenta
- Zone 4 - Yellow
- Zone 5 - Blue

Show all Zone Area Graphics

Displays the zone graphics for all the zones. If un-checked, the system allows you to enable the graphics for each zone independently.

Blob Inspection

The purpose of the Blob inspection is to find connected sets of pixels, defined as ranges of gray levels. The Blob inspection will calculate the mass, and the total number of objects found in the search regions. You can specify the maximum qualifying size and the maximum number of blobs required to fail the inspection.



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Blob Mass Enabled

This determines whether the total blob mass is used as a reject criteria or not.

Sum Valid Blobs

When this is checked, the Blob Mass Total is the sum of the valid blobs only. The blob area is qualified to determine whether it falls within certain limits. For example, say that within the inspection area, you can tolerate several little blobs, but want to reject the part of it has too many of these little blobs, or if it has one large blob. The valid blobs must meet the Blob Area Min/ Max qualification.

When this is un-checked, every set of pixels that meets the Blob Threshold Criteria is counted in the Blob Mass Total, regardless of size.

Blob Mass Min/ Max

The minimum and maximum allowable total pixel count of all the located blobs combined. If the total blob area is less than or greater than these numbers, the inspection fails.

BLOB THRESHOLD CRITERIA

Threshold Technique

Choose whether to use a percentage of the Ambient, or use an actual gray shade value to define the thresholds. The thresholds define the gray shade limits of a blob. The techniques are described below.

PERCENT OF AMBIENT TECHNIQUE:

This technique uses a percentage of the found Ambient to define the low and high thresholds. The Ambient is determined through the Ambient inspection menu, regardless of whether Ambient inspection is enabled.

❖ *Note: The blob pixels are those with gray levels that fall within the Threshold Min/ Max values. These pixels must also be connected.*

Threshold Min/ Max

This percentage is used to compute the minimum and maximum gray levels considered to be blob pixel candidates.

- Minimum Gray Level = Ambient x (Threshold Min / 100)
  - For example, if the Ambient is 200, and Threshold Min percentage is 20, the Minimum Gray Level is 40. [200 x (20/100)] = 40.
- Maximum Gray Level = Ambient x (Threshold Max / 100)
  - For example, if the Ambient is 200, and Threshold Max Percentage is 80, the Maximum Gray Level is 160. [200 x (80/100)] = 160.

❖ *Note: In the examples above, if the Minimum Gray Level is 40 and the Maximum Gray Level is 160, pixels in the search area with gray levels between 40 and 160,* ***and are connected****, are considered Blob pixels. The larger the Threshold max, the more lighter-colored material will be included in each blob.*

GRADIENT TECHNIQUE:

This technique allows you to choose an actual gray shade value to determine the low and high thresholds.

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Gradient Min/ Max

The lowest and highest gray shade values allowed within the blob.

The following parameters are common to both Threshold Techniques:

Neighborhood Size

Determines how far apart blob pixels may be to be considered connected. A setting of one indicates that the blob pixels must be next to each other. A setting of 10 indicates that pixels that match the blob threshold criteria, and are within 10 pixels of each other, are considered connected and therefore blob pixels.

BLOB COUNT CRITERIA

Blob Count Enabled

This determines whether the number of qualifying blobs is used as reject criteria or not.

Blob Count Min/ Max

This is the minimum and maximum number of blobs expected to be found. If the number of blobs found is less than or greater than these numbers, the inspection fails.

Blob Area Min/ Max

This is the minimum and maximum blob size qualification. Any blob that has fewer or more pixels than these numbers is not considered in the blob count total.

Absolute Size

Allows the system to reject a part if one blob (its number of connected pixels) exceeds this value.

BLOB TOLERANCE CRITERIA

These two parameters are available in Circle and Polygon inspections.

Tolerance Enabled

This determines whether the largest blob center is compared to the registration center or not.

Tolerance Max

The maximum distance (in pixels) that the largest blob should be from the registration center. If the distance is greater than this number, the inspection fails.

Pattern Learn Inspection

Pattern Learn allows the system to learn a correct pattern of grayscale values of a region of interest and reject parts that do not match that pattern. You may wish to disable the Edge inspection type when using Pattern Learn.

How Pattern Learn works

You define an inspection region on your part (in Shape Adapt inspections, the inspection region is created by the Shape Adapt registration). Then you specify a number of parts (samples) that the system can use to create upper and lower limits within which each inspected part must fall. Adjust the Pattern Learn inspection parameters to fit your part, and tell the system to learn the pattern.

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The system creates an **envelope** that is the upper and lower limits of the learned pattern. If the **signature** does not fall within the learned envelope, the inspection fails.

Terminology Used in this Section

The following are terms we use in the description of the Pattern Learn inspection:

Signature

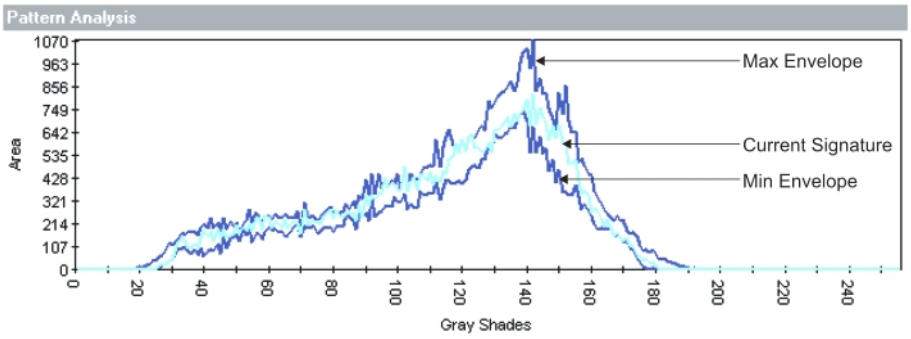
This is the data from one inspected part. The Intellispec counts the number of pixels for each gray shade in the inspection region and displays the signature in cyan (if Display Pattern is enabled). The signature must fall within the learned envelope (shown in blue), or the inspection fails.

Bin/ Bin Size

A bin is simply a gray shade for which the system has counted a certain number of pixels. Each pixel in the inspection region has a gray shade value between zero and 255. The system evaluates each pixel and adds up pixel count in the corresponding gray shade bins.

Envelope

This is the upper and lower limit of pixel counts for each gray shade as determined in the learn process. See Learn Technique parameter to see how the system determines these limits. The envelope is displayed in blue on the Pattern Analysis display.



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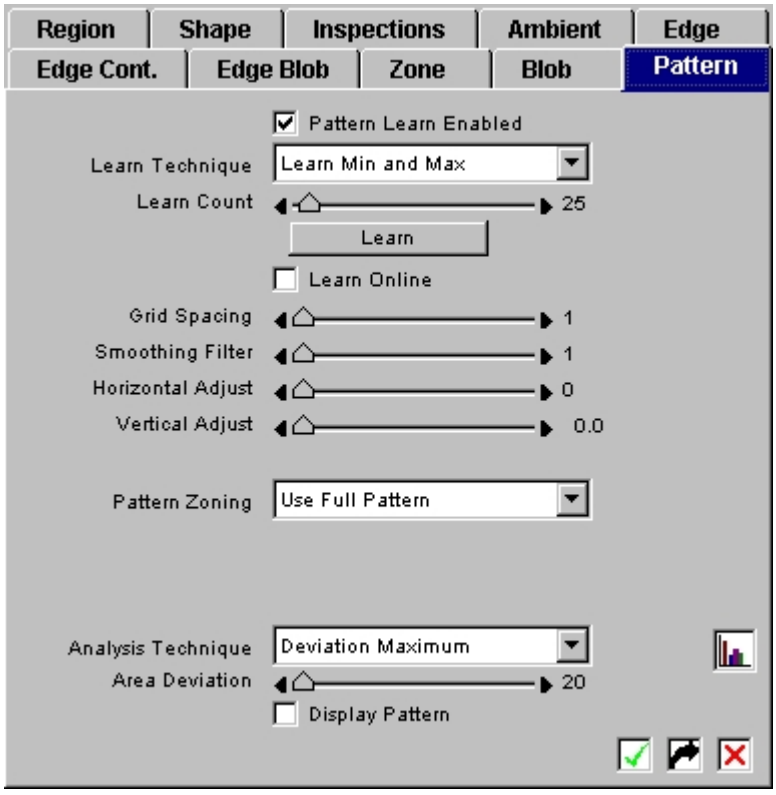
Pattern Learn parameters



> ❖ *Tip: Check the Display Pattern box to see the inspection signature and the learned envelope. You will also see the effects of certain parameters (like Horizontal Adjust) on this display.*

Pattern Learn Enabled

Enable or Disable the Pattern Learn inspection.

Learning the Pattern

Through the Pattern Learn parameters, tell the system how to learn the pattern and how many parts it should sample. It is important to learn from as many good images as possible. The larger the sample population, the better the results. However, learning from bad parts will skew the results.

You may run the learn process as many times as you wish. If, for instance, you think some bad parts got through production during a learn process, you may want to re-learn another set of parts before you begin inspecting.

USING LIVE IMAGES VS. SMARTCAL IMAGES

You can use either live or SmartCAL images to learn the desired pattern. There are advantages and some slight disadvantages from using either.

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- By using Live images, there is an advantage that the learned images will reflect your current production run and environment. The disadvantage is that you cannot control whether bad parts will go through production during the learn process.
- By using ***SmartCAL*** (see "About SmartCAL" on page 214) images, there is an advantage that you do control which images are included in the learn process. If you have saved a set of images from a production run, you can remove any bad images from that set. Another advantage is that the learn process will be identical from one learn to the next, the only difference would be in the changes in inspection parameters you may make. The disadvantage to this technique is that the learned envelope is not representative of your current production run – your current run may have slightly different stock, and therefore slightly different lighting, for example.

Setting the Learn Parameters

Learn Technique

Define the way the system learns the acceptable pattern for a part. There are two techniques from which to choose that offer slightly different parameter settings. Choose the learn technique that best fits your learn environment.

❖ *Note: If you change the Learn Technique, re-learn the pattern. This affects the learned envelope.*

LEARN MIN & MAX

Learns the envelope, or minimum and maximum pixel limits for a part. This technique will accept ALL of the learn population. That is, this technique works best when you know that no bad parts will go through your learn process.

The minimum limits are the fewest number of pixels found for each gray shade. The maximum limits are the greatest number of pixels found for each gray shade.

If your learn population has any bad parts, the envelope will be affected. You will not reject similar bad parts if another passes through production again.

LEARN MEAN & STANDARD DEVIATION

The system inspects the specified number of parts and creates an envelope that may or may not reject some of your learn population. This technique creates an envelope based on each gray shade, along with the standard deviation. This technique works best if you have one or more parts that are defective in your learn population.

If you have one bad part out of 100, then the mean will be slightly affected, and the standard deviation will increase slightly. But the overall results will most resemble the 99 good parts learned.

Learn Count

Set the number of images from which the system can learn the part. More images will give a better example of the overall inspection population.

Learn button

Click this to begin the learn process. Make sure you have parts moving through the inspection module so that the system can detect and inspect the necessary number of parts. Or use SmartCAL images to learn. The system will sample as many parts as specified in Learn Count, and report the results when finished.

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Learn Online

If enabled, this allows the system to learn the envelope from online images the next time you go online. If Learn Count = 50, the first 50 images (good or bad) would create the envelope for the inspection.

PATTERN LEARN PARAMETERS

Grid Spacing

Used to define search density. A value of one searches each radial line, a value of two searches every other line, etc. The smaller the grid spacing, the more accurate the inspection. The larger the grid spacing, the faster the inspection.

❖ *Note: If you change Grid Spacing, re-learn the pattern. This affects the learned envelope.*

Horizontal Adjust

This controls the envelope generation process. It expands the envelope in the right and left directions. A value greater than zero decreases the sensitivity of the learned envelope to allow a slight variation in gray shades from part to part. The higher the number, the less sensitive the inspection.

Sigma Min Factor/ Sigma Max Factor

(When Learn Technique = Learn Mean & Std.) This factor widens the envelope by this factor times the Standard Deviation. It adjusts the learned envelope in the vertical direction. The higher the number, the less sensitive the inspection. Sigma Min Factor controls the lower envelope values; Sigma Max Factor controls the upper envelope values.

Vertical Adjust

(When Learn Technique = Learn Min & Max) Like Horizontal Adjust, this adjusts the learned envelope, but in the vertical direction. The higher the number, the less sensitive the inspection.

Smoothing Filter

This defines the bin size that is used to compare gray shades. A bin size of one compares each gray shade to the next. A higher number smoothes out the signature by comparing two bins to the next two bins, or three bins to the next three bins, etc., depending on the smoothing filter number you have set. A higher number results in a smoother envelope.

❖ *Note: If you change Smoothing Filter, re-learn the pattern. This affects the learned envelope.*

Pattern Zoning

Define the number of zones to analyze. You may choose to analyze the Full Pattern, One Pattern Zone, or Two Pattern Zones.

Full Pattern zoning looks at all gray shades (0 to 255) and analyzes the deviation (see Analysis Technique) from the entire signature.

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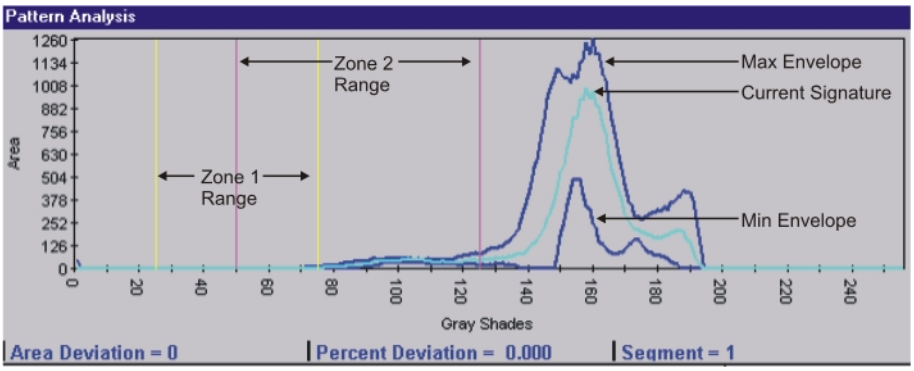
One Pattern Zone or **Two Pattern Zones** allow you to specify certain gray shade ranges, if desired (e.g., 100 - 150). The system then only analyzes the deviation from the pattern within the specified gray shade ranges. In Two Pattern Zones, you specify two gray shade ranges (example, 100 - 150 and 175 - 225). You may overlap the two zones.

This is the same type of zone analysis used in ***Zones inspection*** (on page 354).

If you choose One Pattern Zone or Two Pattern Zones, you may view the Zone limits on the inspection pattern if you have Display Pattern enabled. Zone 1 grayscale limits are displayed in yellow, and Zone 2 grayscale limits are displayed in magenta.



Analysis Technique

There are three techniques to determine pass/ fail status. These are discussed below.

SIMPLE DEVIATION

If a signature falls outside of the learned envelope, the inspection fails.

DEVIATION MAX

Allows the signature to fall slightly outside of the learned envelope. Set this number as an area, in number of pixels, with the Area Deviation parameter.

DEVIATION PERCENT

Allows the signature to fall outside of the learned limits by a specified percentage. Specify this percentage through the Percent Deviation parameter.

Display Pattern

When this is checked, the Pattern Analysis graph is displayed in the upper left of the screen. To remove this display, un-check the Display Pattern box or exit from editing the inspection.

Graphs - Pattern Learn Inspection

Percent Deviation

(When Analysis Technique = Deviation Percent) Plots the percentage of deviation for each inspected part.

Area Deviation

(When Analysis Technique = Deviation Max) Plots the area (in pixels) that each part deviated from the learned envelope.

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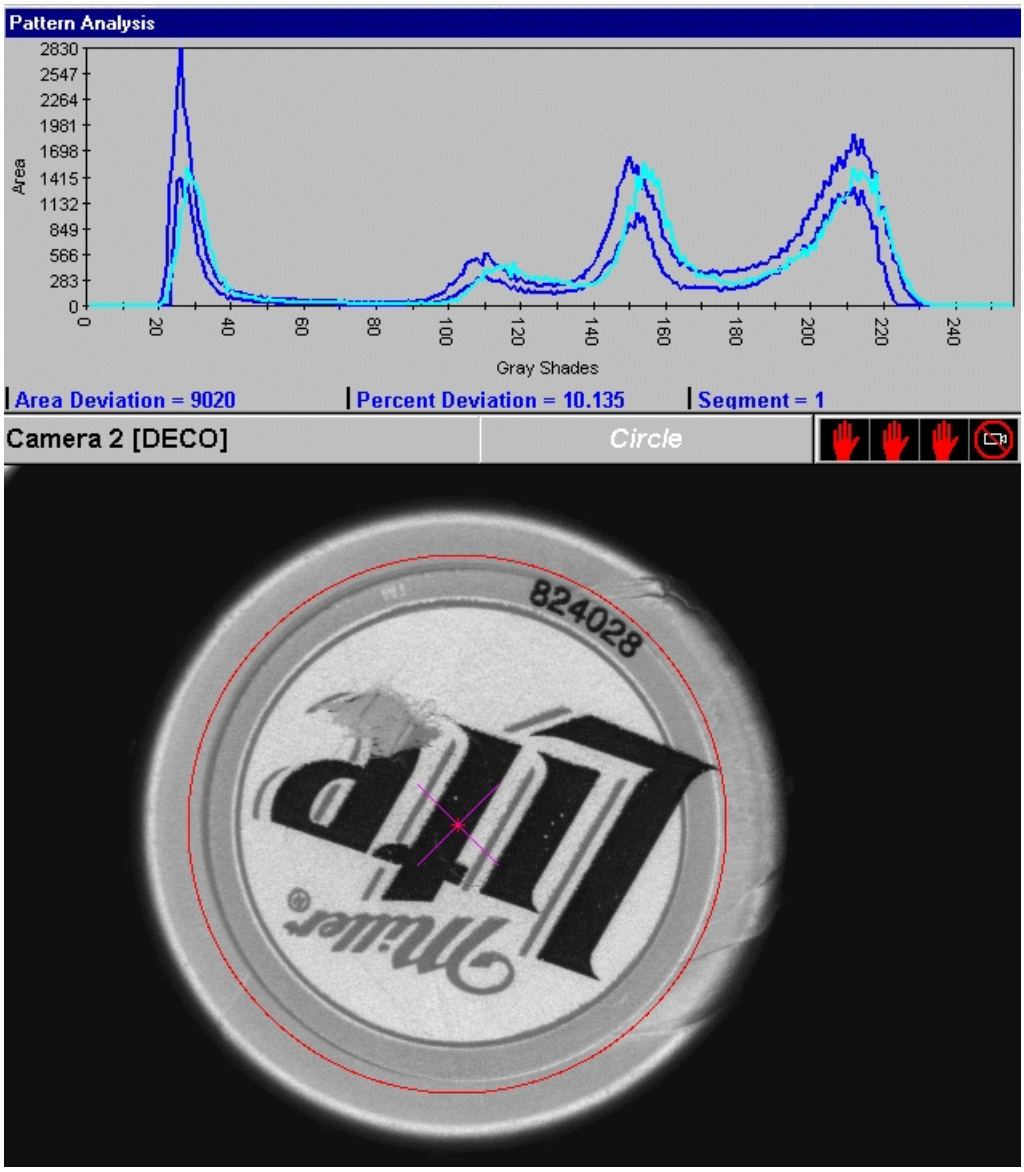
Pattern Learn inspection examples

The Pattern Learn inspection can be used for finding several types of defects, such as the examples below:

The example below shows partially missing print. The part is rejected because the signature falls outside of the learned limits.



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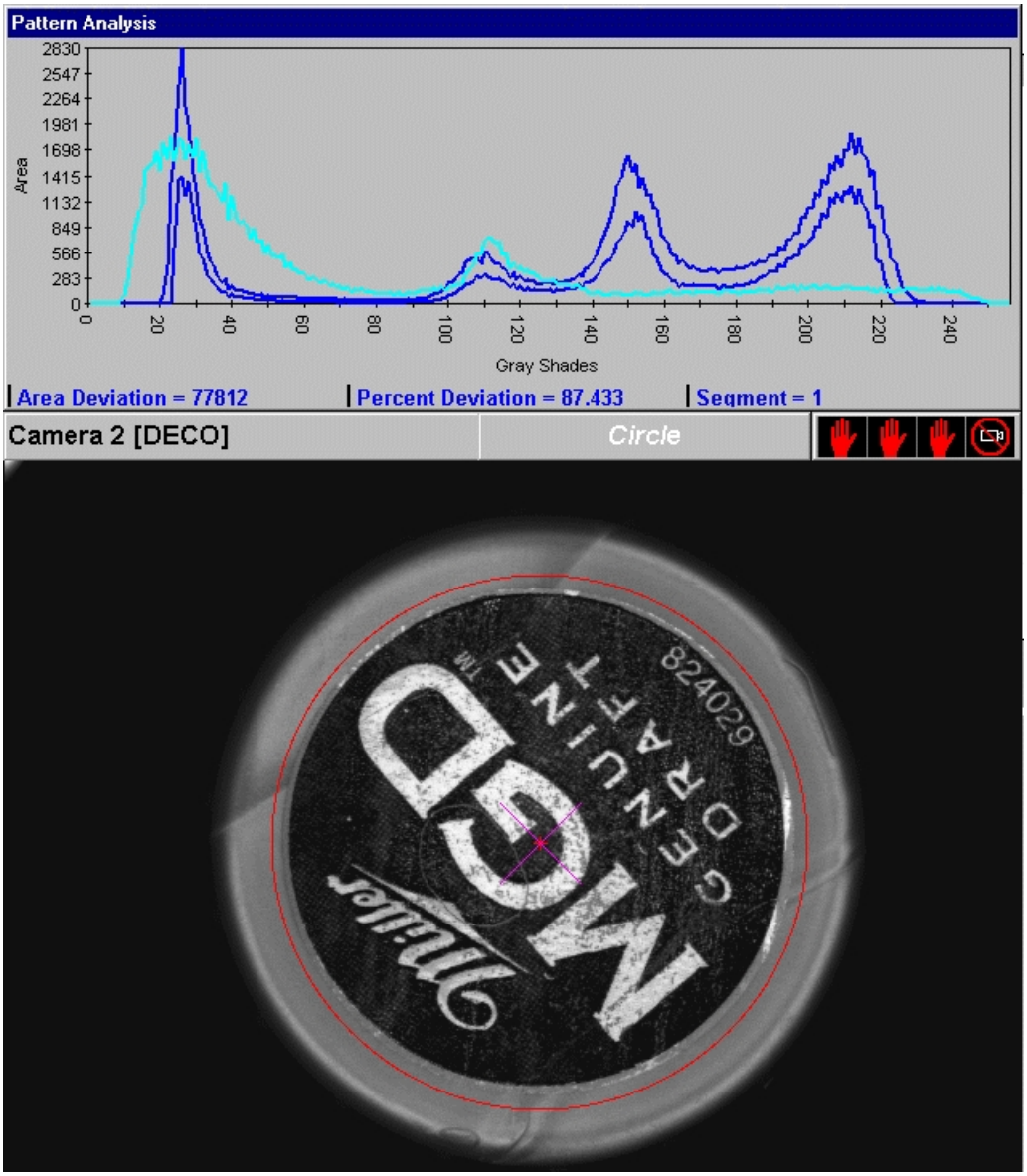
The example below shows a mixed label in production. The system sees a different pattern (than the Lite label), so the part is rejected.



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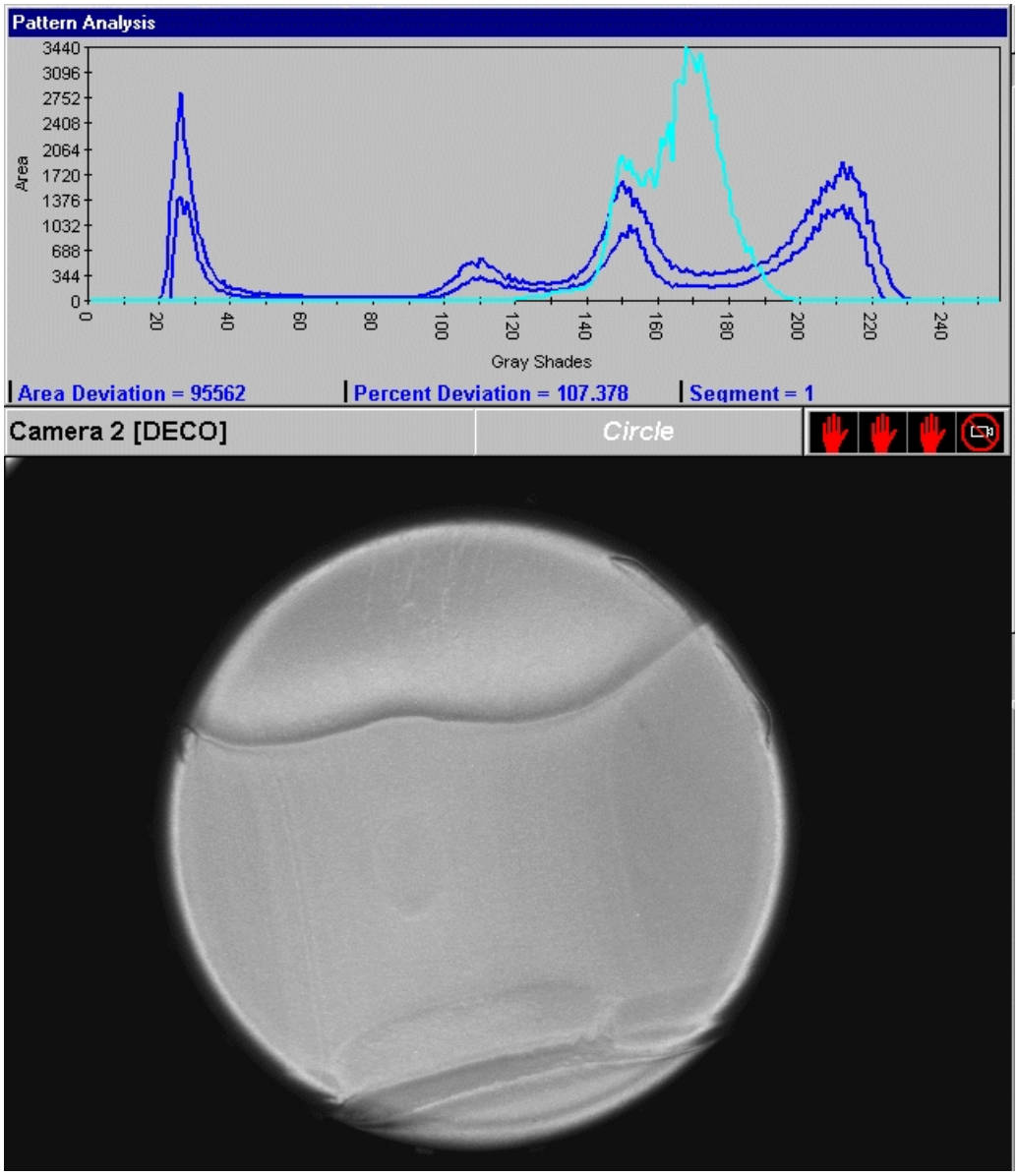
The example below shows no print on the part. The part is rejected.



CIRCLE DIMENSION INSPECTION

The system makes dimension measurements across a circle in your choice of millimeters, inches, pixels, or custom units. You define an inner and outer circle (search region) in which the system will search for an edge transition. The system computes the distance (or dimension) between opposing edges and compares these values to the reject criteria.

Adding the Circle Dimension inspection

To add the Circle Dimension inspection:

1) Log in as Administrator.
2) Select the desired channel.

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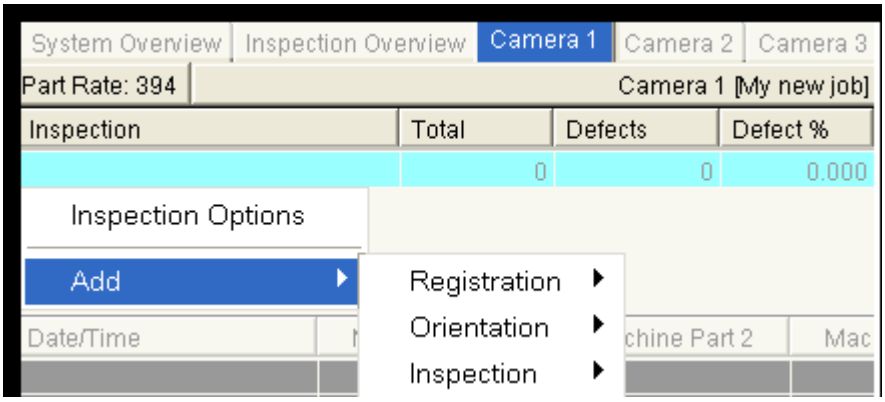
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Circle Dimension inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

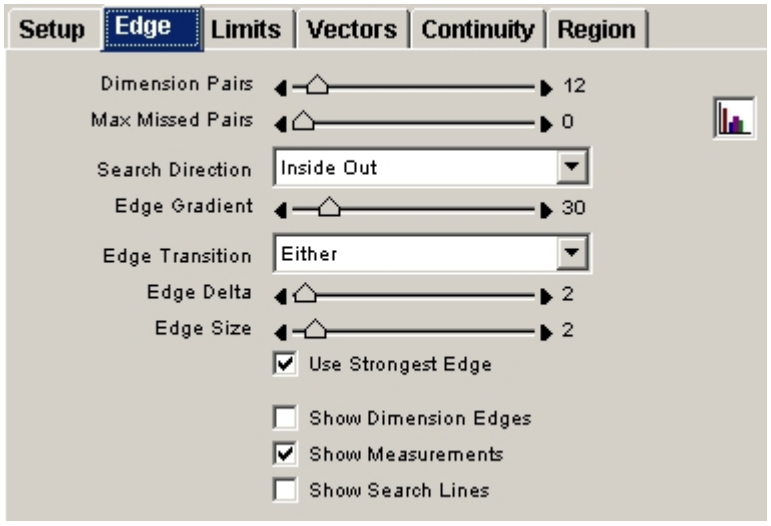
Setting the Circle Dimension region

Using the Region menu, place the inspection region to surround the desired area, allowing enough room for the inspection to search for edge transitions. The inner radius can be a value of one.

Adjusting the Circle Dimension Inspection Parameters

Go to the Edge menu and select a Search Direction. Then set the remaining parameters based on your part.

Edge menu



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Dimension Pairs

The inspection sends a search vector in both directions from the registration reference point. These search vectors find an edge, and the system computes the distance between the edges. One Dimension Pair sends a search vector in two directions. Check Show Search Lines to see these Dimension Pairs. This inspection supports up to 180 Dimension Pairs.

Max Missed Pairs

The maximum number of Dimension Pairs allowed to fail before the whole inspection fails.

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Use Strongest Edge

Indicates whether the system should locate the first edge or the strongest edge that meets the gradient criteria. The strongest edge is the greatest change in grayscale value found above the gradient.

Show Dimension Edges

Displays the found dimension edges.

Show Measurements

Displays where the measurement calculations are being made.

Show Search Vectors (or Search Lines)

Displays the search vectors.

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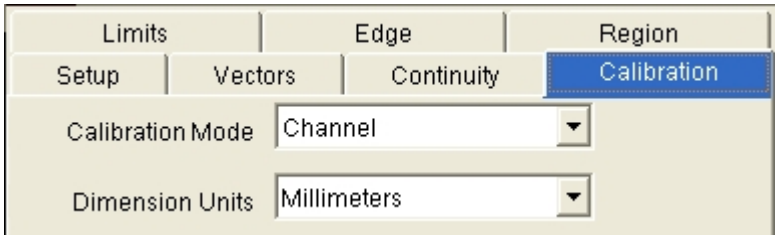
Calibration menu



This menu allows you to choose the dimension units in which the measurements are reported.

Calibration Mode

The system will convert the pixel dimensions into your preferred unit of measurement.

- **Channel** - the inspection will use the channel calibration parameters to convert the dimensions into real world values. The system Administrator can specify the units of measurement by right-clicking on the image and selecting ***Pixel Calibrate*** (see "Pixel Scale Calibration" on page 182). If you have calibrated the system to a carefully measured or Golden Part, the system will use those calibrated units.
- **Individual Inspection** - use this option to convert a pixel-to-unit of measurement ratio, and calibrate the system through the parameters below.

Dimension Units

Choose your preference in the reporting of the dimension calculations. Choose from millimeters, inches, pixels, and custom. Custom allows any conversion factor to be used.

❖ *Note: The following parameters are available for Individual Inspection calibration mode. It is best to set these parameters after you have placed the inspection regions, and after you have set up the Edge parameters.*

Horizontal/ Vertical Conversion

This indicates the pixel size and is used to convert one pixel into the units selected. The initial conversion will be controlled by the Calibrate Scale results. From this parameter, you can override this calibration factor or choose to calibrate the dimension using the result of a specific measurement.

After adjusting the horizontal or vertical conversion factor, click the **Accept** button.

Calibrated Size

This is used to calibrate the pixel scale of the current inspection. A setting of [-1] disables this parameter.

Use a part, such as one on which you are currently programming a job, and measure it (with calipers or a ruler) exactly where you would have the inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Enter your measured value.

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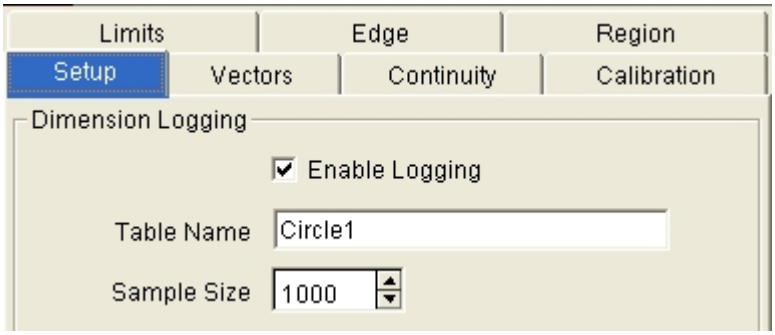
Calibrate Scale

Press this after you have entered the correct Calibrated Size. The system will use the pixel-to-unit of measurement ratio as specified in the Horizontal and Vertical Calibration parameters. If you see an error, make sure you have your inspection regions properly placed on the image. Also make sure the Edge parameters are set up correctly.

Setup Menu



DIMENSION LOGGING

Enable Logging

This inspection offers a database that logs dimension information. This feature is useful for process monitoring so that you can view the average measurements over time.

Table Name

Rename the *TableName* to something more meaningful to you. The name is limited to 19 characters.

Sample Size

The number of parts' data that are averaged before the information is written to the database. Note: Defective parts data is not included in the average calculations.

To generate the Dimension database:

Put the system online to inspect parts. The database will start collecting data when enough good dimension measurements have been taken (example: if Sample Size = 1000, the system will wait until it has collected data from 1000 parts with good dimension inspections).

To view the Dimension database:

1) Take the Intellispec offline. The database is saved as C:\Intellispec\Data**Dimension.mdb**.
2) Use the Windows Explorer function to copy it to a floppy diskette or ***USB device*** (see "Copying Files to USB Device" on page 97).

A new record is created for each sample set (when the Intellispec collects data from *n* number of parts with inspections that passed).

If the Intellispec has not yet found enough parts to create an average, no database information is saved. That is, if Sample Size = 1000, and only 970 parts have passed inspection, no database information is saved.

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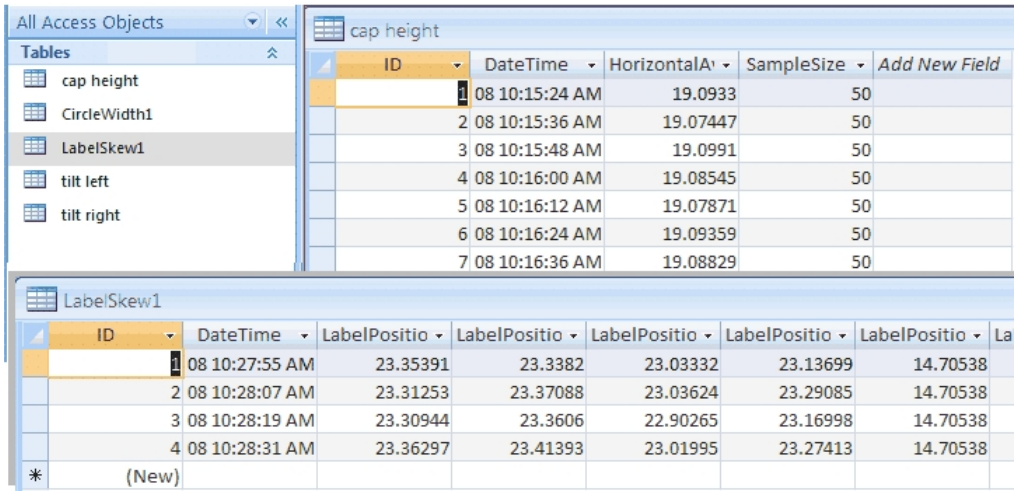
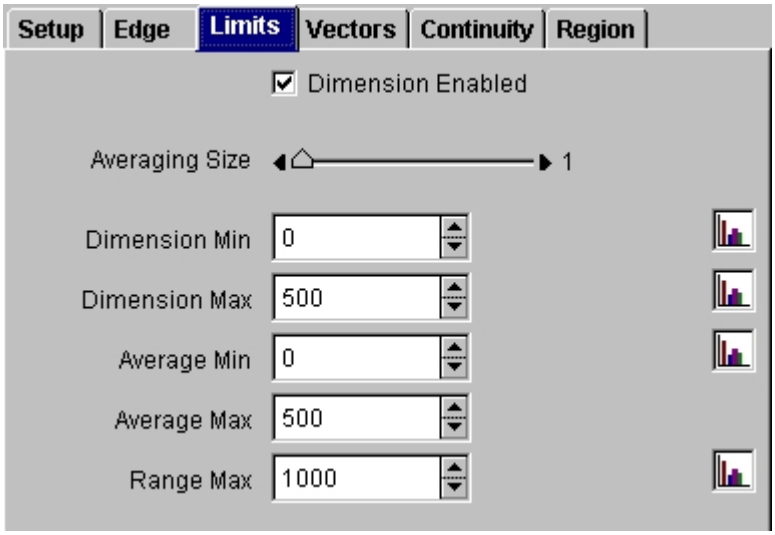
❖ *Note: If you have more than one Dimension-type inspection, a separate table will be created for each inspection within the Dimension.mdb file. You will have a different TableName for each inspection. The Dimension-type inspections include: Dimension, Circle Dimension, Circle Width Dimension, Fill Height, and Label Skew Dimension inspections.*

A sample database with two different inspection tables is shown below:



Limits Menu



This menu determines the tolerance of the dimension measurements.

Dimension Enabled

In Circle Dimension inspection, you can choose to make Dimension measurements, Continuity checks, or both. This option allows you to disable the Dimension portion of the inspection if desired.

Averaging Size

This is a sliding window that averages the dimensions of *n* vectors. This allows the inspection to filter the data and ignore spikes or small changes between vectors, and catch changes that happen over several vectors.

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- If *n* = 1, there is no averaging.
- If *n* = 2, then it averages the measurements of vectors 2 and 3, then 3 and 4, 4 and 5, etc.
- If *n* = 10, then it averages the measurements of vectors 1 through 10, then 2 through 11, 3 through 12, etc.

Dimension Min

The smallest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup.

Dimension Max

The largest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup.

Average Min

The smallest acceptable value for the average dimension (diameter) measured across the circle.

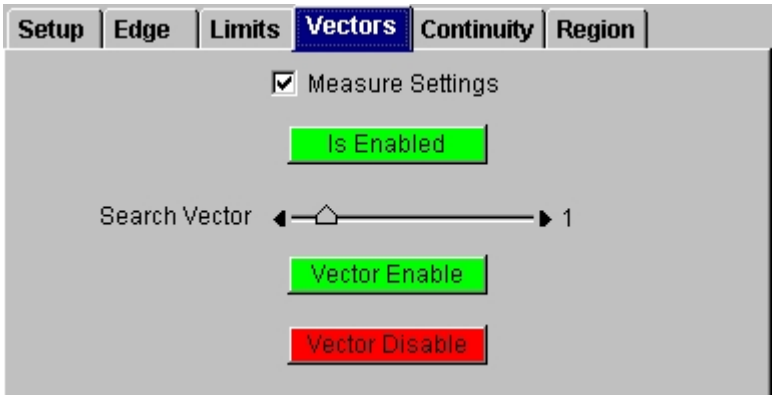
Average Max

The largest acceptable value for the average dimension (diameter) measured across the circle.

Range Max

The largest acceptable difference between the Minimum distance measured, and the Maximum distance measured across the circle. This parameter checks for ovality.

Vectors Menu



This menu allows you to selectively enable or disable individual vectors. You might choose to disable certain vectors where they cross an acceptable process anomaly, such as a logo, mold line, etc. If you do this, be sure to insert an Orientation prior to this inspection to ensure consistent placement from part to part.

Disabling vectors is also useful to ignore conveyors or other machine components if they are intrusive in the image.

Note that vectors are enabled and disabled in their dimension pairs.

❖ *Note: If you want all search vectors to inspect your part, you do not have to enter this menu or change anything.*

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Measure settings

Enables the ability to enable or disable individual vectors. If you disable vectors and then un-check this box, all vectors become enabled again.

Is Enabled

Indicates the status of the current vector.

Search Vector

Scroll through each vector – each one will be highlighted on the image. Choose Vector Enable or Vector Disable for that vector.

Vector Enable

Enable the currently selected vector.

Vector Disable

Disable the currently selected vector.

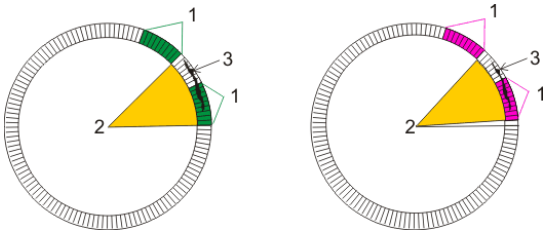
Continuity Menu

This feature checks for changes in edge position between vectors. This allows detection of defects where the part may be crushed or bent.

This inspection looks for variations in edge position between one group of inspection vectors and another – a profile check.

The system finds the edge position of each radial vector. It then compares the average position of a group of vectors to that of another group of vectors. The system determines whether the difference in edge position between the groups is greater than the reject limit (Change Max). If the difference is greater than Change Max, the inspection fails.

The comparisons of edge positions are performed in a sliding window concept. The system compares the average edge positions of the first two groups of vectors. Then it moves to the next vector and compares the edge positions of the next two groups of vectors. It repeats this process around the entire inspection region.



1	continuity group = 10
2	offset = 16
3	defect

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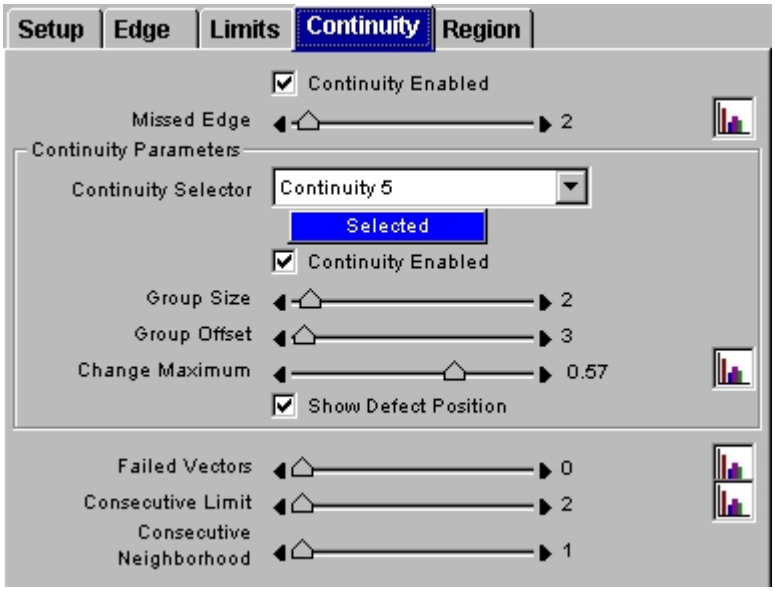
You can apply up to five continuity inspections. Set each to look for different size defects, different position defects, etc. Use the Continuity Selector to determine which continuity check is being configured. Check the Continuity Enabled box for each continuity check (each must be independently enabled and configured). Set the inspection parameters for each continuity check:



Continuity Enabled

Enables or disables the continuity portion of the inspection.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail.

CONTINUITY PARAMETERS

Continuity Selector

Use the Continuity Selector to determine which continuity check is being configured – each one must be enabled and configured independently.

Selected

Shows the color of the selected continuity check. #1 = orange, #2 = cyan, #3 = magenta, #4 = yellow, and #5 = blue.

Continuity Enabled

Enables the individual continuity checks (one through five).

Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

Group Offset (or Delta Offset)

The number of vectors away to begin the next group. For larger defects, use a larger offset. For smaller defects, use a smaller Group Size and Group Offset.

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Change Maximum

The maximum allowable change between two groups. This is entered as a number of units specified in the setup menu (for example, millimeters).

Show Defects (or Show Defect Position)

Displays the failed vectors. They are displayed in the various colors of the continuity checks.

COMMON CONTINUITY PARAMETERS

Using both **Failed Vectors** and **Consecutive Limit** together allows you to control the size of defects you want to catch.

Failed Vectors

The number of vectors allowed to fail before the whole inspection fails. This feature allows the inspection to detect small defects and only fail if there are too many of them.

Consecutive Limit (or Consecutive Failed)

The number of consecutive vectors allowed to fail before the whole inspection fails. This feature ensures that any defect larger than this number of vectors will fail. This is a total number of vectors throughout all continuity checks (could be from failing continuity checks 3, 2, and 1 consecutively).

Consecutive Neighborhood

Defines what Consecutive means. Examples:

- 1 = consecutive vectors must be next to each other
- 5 = consecutive vectors can be up to 5 vectors apart

Graphs - Circle Dimension Inspection

These are the graphs available for the Circle Dimension inspection.

Minimum Distance

This plots the smallest distance measured across the circle for each part.

Maximum Distance

This plots the largest distance measured across the circle for each part.

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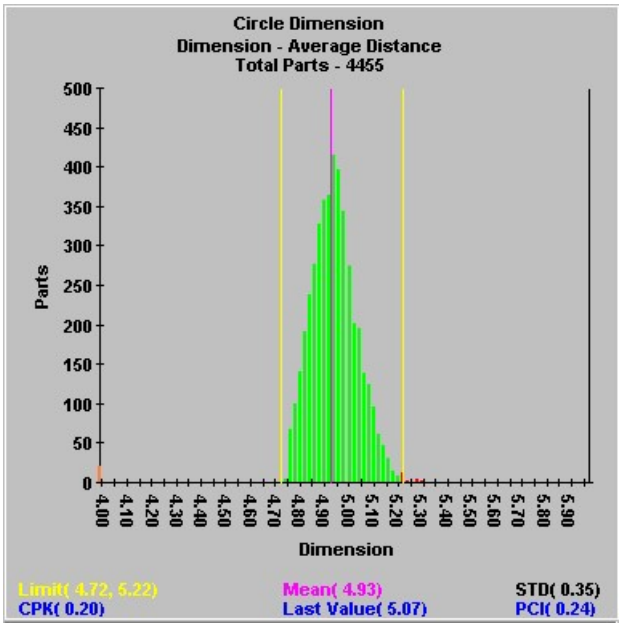
Average Distance

This plots the average distance measured across the circle for each part.



Dimension Range

This plots the difference between the smallest and largest distances measured across the circle for each part.

Missed Edge Pairs

This plots the number of Dimension Pairs that failed inspection for each part.

CONTINUITY GRAPHS

Radius Continuity

Graph for Change Maximum parameter, this shows the change in edge position between the two vector groups.

Missed Edges

Shows how many search vectors failed to find the edges in the continuity inspection.

Failed Vectors

Shows the number of vectors that failed the continuity checks.

Consecutive Failures

Shows the number of consecutive vectors that failed the continuity checks.

ERROR DETAILS GRAPH

No Edge

The number of parts that failed because at least one set of Dimension Pairs did not find edges of the part.

Missed Pairs

The number of parts that failed because the Dimension Pairs exceeded the Max Missed Pairs criteria.

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Minimum Limit

The number of parts that failed because the dimension measurement failed the Dimension Min criteria.

Maximum Limit

The number of parts that failed because the dimension measurement failed the Dimension Max criteria.

Average Limit

The number of parts that failed because the dimension measurement failed the Average Max criteria.

Range Limit

The number of parts that failed because the dimension measurement exceeded the acceptable difference between the maximum and minimum differences across the circle.

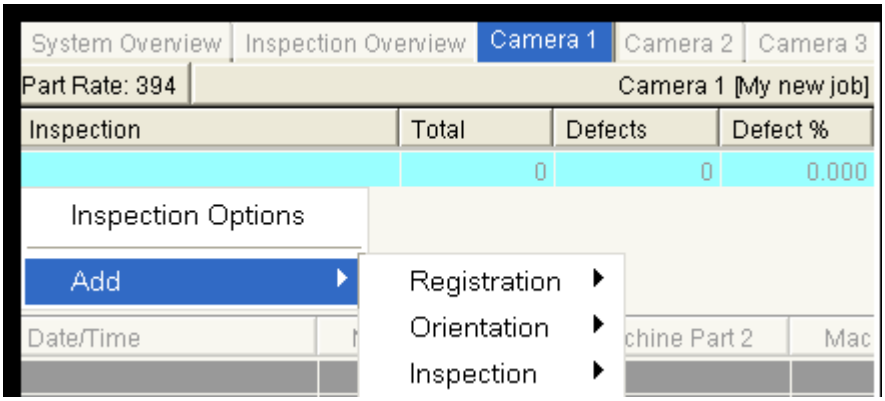
RADIAL LINE INTEGRATION (RLI)

This inspection compares the average gray level of one or more radial sample lines with the average gray level of another radial sample line. It can inspect repeating symmetrical features on circular products. See ***how Radial Line Integration (RLI) works*** (see "About Radial Line Integration" on page 387).

Adding an RLI inspection

To add the Radial Line Integration inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Radial Line Integration inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

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Programming a Radial Line Integration inspection

The sequence of parameter adjustment will vary by application, but for a general guide, proceed in the following sequence:

1) Region menu
2) RLI parameters menu
3) Radial Edge menu
4) Orient menu (if applicable)
5) Lug menu (if applicable)
6) Wrinkle menu (if applicable)

Pay special attention to the following parameters, which are the limits and the final decision-makers of the inspection:

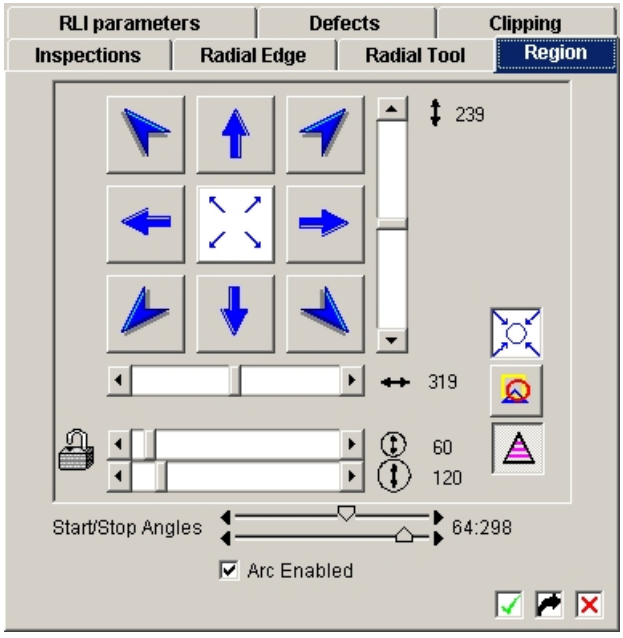
- Moment Max
- Peak Max
- Count Max

Fine-tuning usually involves going back and forth between the menus. Re-check the Moment, Peak, and Count Max settings after other parameters have been changed. Use the Inspections menu to add the desired types of inspections.

Setting the RLI region

Place the inspection region, exactly where you want the system to inspect, using the ***Region menu*** (see "Using Region Menus" on page 255). The Region menu is the same as used in most other inspections, with the exception of Arc setup.

RLI Region Menu



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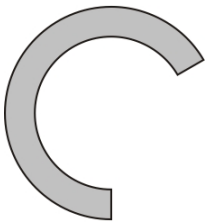
Arcs Enabled

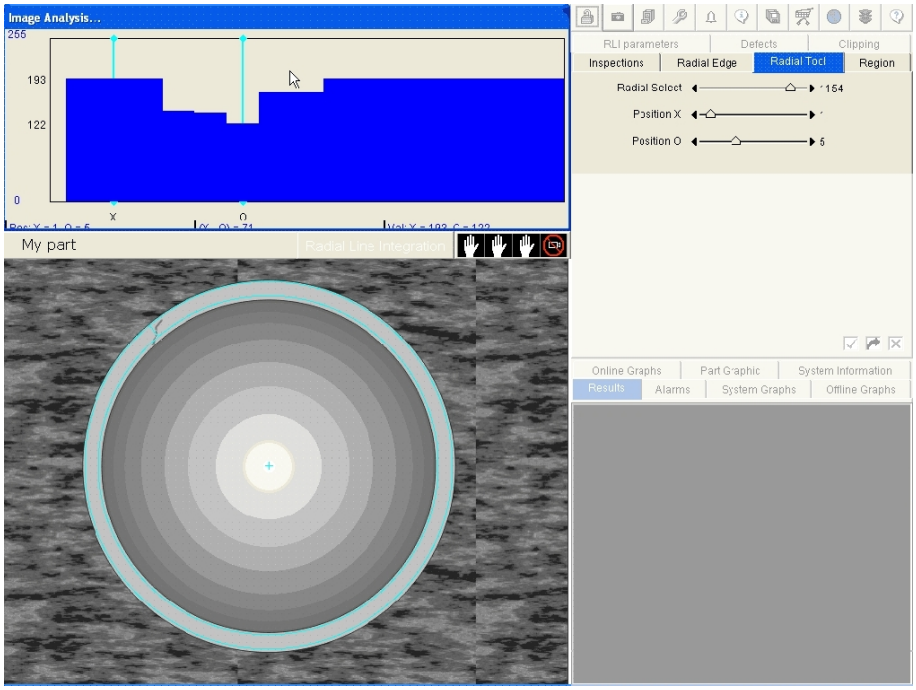
Allows you to inspect an arc instead of the whole region. The system will inspect a portion of the region between the Start and Stop angles. Make sure you have an Orientation in the job prior to using arcs. This will ensure that the inspection region is placed on the same location of the part regardless of the part's orientation. Zero degrees is the top of the circle.



Arc inspection

RLI Radial Tool Menu

This is just like the Image Analysis tool, except that the graph displays the gray levels along each inspection radial instead of one line or circle. You can use this tool to help set the parameters in this inspection.



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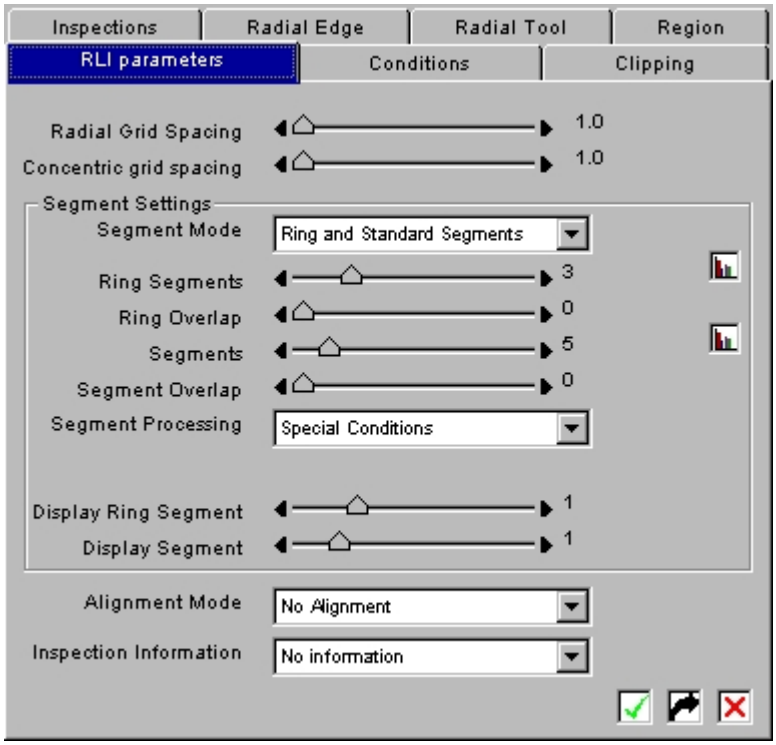
RLI Parameters Menu

This menu has settings which further modify the inspection region. In most cases, the default values of Radial Grid Spacing and Concentric Grid Spacing will suffice and can be left unchanged. The only reason to change those settings would be to decrease inspection time. This is also the menu where you can set up segments.



Radial Grid Spacing

Specifies spacing *between* radial sample lines. The default value is one. Increasing for speed can reduce sensitivity to smaller defects.

Concentric Grid Spacing

Spacing of pixels *along* sample lines. The default value is one. Increasing for speed can reduce sensitivity to smaller defects.

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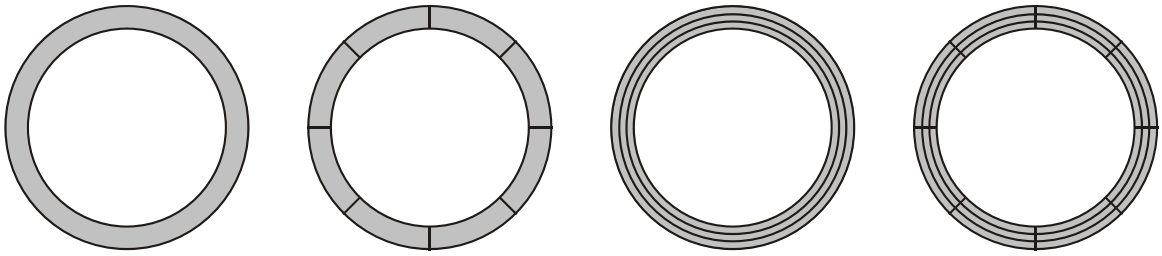
Segment Settings



Inspection region (no segments) | 8 Standard segments (no overlap shown) | 3 Ring segments (no overlap shown) | Ring and Standard Segments

Segment Mode

Choose if and what type of segments to divide the search region.

- **Segments Disabled** – The inspection region will be inspected as one continuous region.
- **Ring Segments** – The inspection region will be divided into concentric circles (or shapes).
- **Standard Segments** – The inspection region will be divided into wedge-shaped segments.
- **Ring and Standard Segments** – The inspection region will be divided into both concentric circles and wedge-shaped segments. Use both the Ring and Standard Segments parameters to define the number of segments.

Ring Segments

Divide the inspection region into a number of concentric circles.

Ring Segment Overlap

Specify the number of pixels by which each segment will overlap each other. Overlapping ensures that pixels are not missed during inspection. The overlap is highlighted on the image. The segments can overlap between zero and 10 pixels.

Standard Segments

Divide the region into a number of segments between one and 72.

Segment Overlap

Specify the number of pixels by which each segment will overlap each other. Overlapping ensures that pixels are not missed during inspection. The overlap is highlighted on the image. The segments can overlap between -10 and +10.

If negative overlap is used, each segment becomes independent and has a gap between neighboring segments. This helps in avoiding certain patterns that are symmetrical. The negative overlap is displayed in cyan on the image. This area will *not* be inspected. This would be beneficial if you had a pattern under those areas. Using other negative overlap values and other numbers of segments results in different patterns.

Segment Processing

Specify how many segments must pass for the whole inspection to pass.

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- **All must pass** - all segments must pass inspection.
- **Minimum passing** - specify the minimum number of segments that must pass (through Passing Minimum parameter).
- **Special Conditions** - allows you to specify that a segment pass, fail, or be ignored.

To use Special Conditions:

1) Use the Conditions menu.
2) Click the segment selector to highlight a segment. The corresponding condition is listed in the upper left of the menu.

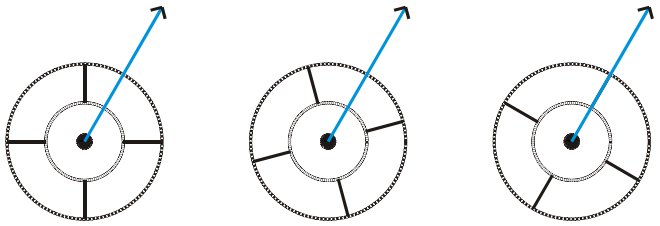
   Use the PASS, FAIL, or IGNORE buttons to change the segment condition. During inspection, if the segment matches the specified condition, the inspection passes. You might use PASS or IGNORE on segments that have a recycle logo, for example, that would normally not pass inspections.

Display (Ring) Segment

Highlights the selected segment on screen. It also displays information for the highlighted segment on the Results tab.

Alignment Mode

Aligns the segments to the orientation in the present job. If you do not have an orientation programmed prior to this inspection, the system uses zero degrees (the top of the circle) as a reference point. Your choices are shown below:



1 2 3

1	No Alignment
2	Segment Midpoint
3	Segment Boundary

Inspection information

Display graphs to see the effects of parameters.

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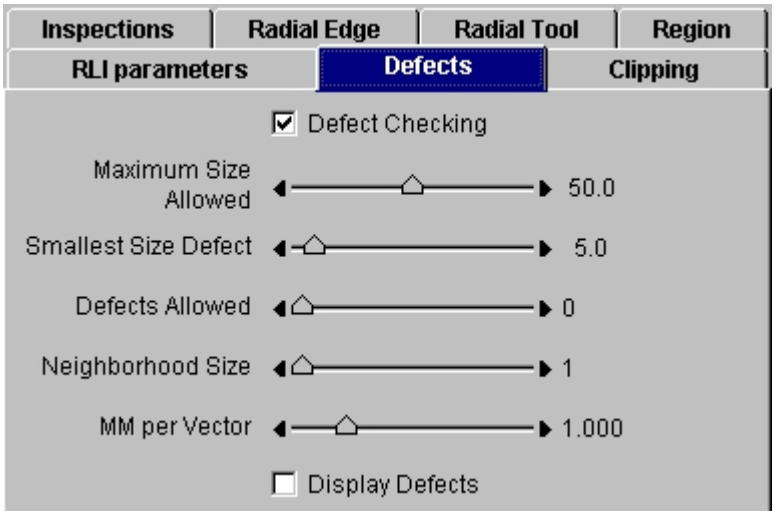
RLI Defects Menu

This menu allows you to set limits for specific sized defects.



Defect Checking

Allows the inspection to pass defects that are small, and/ or allow it to pass a number of defects within a size range.

Maximum Size Allowed

Specify the largest size defect allowed.

Smallest Size Defect

Specify the smallest size defect allowed.

Defects Allowed

Specify how many defects between the minimum and maximum size are allowed to pass before the entire inspection fails.

Neighborhood Size

Specify the number of vectors apart that defects can be to be considered connected.

MM per Vector

Specify the number of millimeters wide to consider each vector. A smaller setting makes the inspection less sensitive, and a larger setting makes the inspection more sensitive. This is an arbitrary number. It is not calibrated, nor does it refer to the system's Pixel Calibration.

Display Defects

Highlights the group(s) of vectors that the inspection considers defects.

Color Coding: Maximum Size = red, Smallest Defect Size = yellow, Neighborhood Size = cyan.

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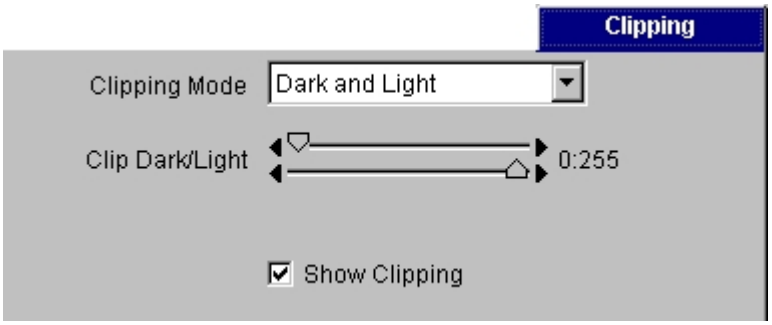
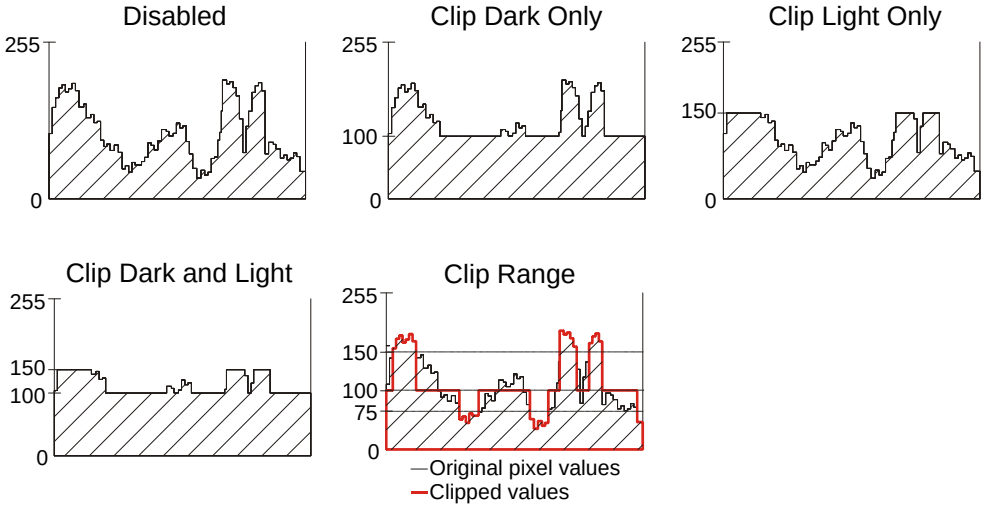
RLI Clipping Menu



Clipping mode

Clipping is used to change gray shades to a specified value. It allows the system to ignore light reflections or normal grain in a part, to provide easier defect detection. The available modes are as follows:

- **Disabled** – no clipping.
- **Dark Only** – lets you set a dark gray shade value. A dark clipping value of 100 would take all pixels with gray levels of 0-99 and make them a gray level of 100.
- **Light Only** – Lets you set a light gray shade value. A light clipping value of 150 would take all pixels with gray levels of 151-255 and make them 150.
- **Dark and Light** – Lets you set both dark and light levels. The dark value cannot exceed the light value, and the light value cannot be less than the dark value.
- **Clip Range** – Lets you set a clipping value, but the pixel values are only clipped if they fall within the Clip Range values.



Show Clipping

- Displays the clipping gray shade value on the image.

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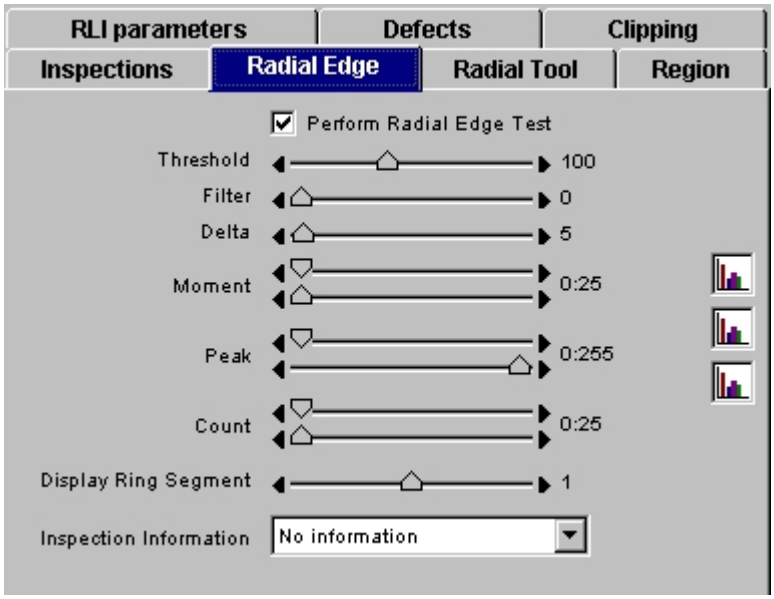
RLI Radial Edge Menu

This menu is contains the Moment, Peak, and Count parameters, which are the limits and the final decision-makers of the inspection.



Radial Edge excludes the lugs and inspects between them if Lug inspection is enabled. This allows the inspection to be more finely tuned to the area between the lugs. If Lug is disabled, Radial Edge inspects the full circle. Radial Edge is generally less sensitive to narrow abrupt changes in contrast than Wrinkle inspection. (Wrinkle is designed to be sensitive to very narrow and abrupt changes in contrast typically caused by wrinkle defects.)

Perform Radial Edge Test

Radial Edge test looks for edges along the radial spokes.

Threshold

The lowest gray level value that will be considered a hit.

- All gray level values equal to or greater than Threshold are ***hits*** (see "About Radial Line Integration" on page 387). These are used in Moment, Count, and Peak value calculations.
- All gray levels below Threshold are ignored.

Filter

This is a smoothing filter used to decrease sensitivity to high frequency gray level variance. For example, if normal good metal stock has a visible grain, the Filter can be used to eliminate false rejects of good product. A higher value decreases sensitivity.

❖ *Note: See the After Filter graph under Inspection Information to see the effects of this parameter.*

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

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Moment Min/ Max

The Min value is usually left at zero (default). The Max value is the most likely parameter to adjust when tuning the inspection. (***Moment - definition*** (see "About Radial Line Integration" on page 387))

Peak Min/ Max

The minimum and maximum allowable difference between the sum of gray levels of any two compared sample lines. The Min value is usually left at zero (default). Reducing the Max value from 255 increases sensitivity.

Count Min/ Max

The minimum and maximum allowable number of ***hits*** (see "About Radial Line Integration" on page 387). The Min value is usually left at zero (default). If the Max number of hits is exceeded, the inspection fails. All hits above the Threshold are counted, regardless of Moment.

Display Segment or Display Ring Segment

Highlights the selected segment on screen. It also displays information on Results tab about the selected segment.

Inspection information

Choose a graph to see the gray level values of the inspection area as affected by certain parameters.

- RLI provides raw data over the inspection area.
- After Filter and After Gradient show the gray levels after those parameters are applied.
- Histogram shows the average gray level value of each inspection radial.

RLI INSPECTION RESULTS – COLOR CODING

The inspection vectors are color coded based on how close they are to peak value.

- Red vectors have the most severe moment - they are between 95 and 100 percent of the peak value.
- Yellow vectors have a moment between 90 and 95 percent of the peak value.
- Magenta vectors have a moment below 90.

Graphs - Radial Line Integration

These are the graphs available for this inspection.

Radial Line Integration Ring Segment Error

(If Ring Segmenting is enabled in RLI Parameters menu) Plots the number of errors (parts that failed inspection, for example) that occurred within each ring segment. Segment number is displayed across the bottom of the graph.

Radial Line Integration Segment Error

(If Segmenting is enabled in RLI Parameters menu) Plots the number of errors (parts that failed inspection, for example) that occurred within each segment. Segment number is displayed across the bottom of the graph.

Radial Data

This plots the gray level information for all the radials in the inspection region.

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Radial Moment

(Available when Rad. Edge inspection is enabled) The yellow lines represent the Moment Min/ Max limits. This graph plots the total moment for each part – the total difference in gray levels for hits found above the specified threshold. The moment is the primary failure criterion for a part.

Radial Count

(Available when Rad. Edge inspection is enabled) The yellow lines represent the Count Min/ Max limits. This graph plots the number of hits – the sample lines in the search area that were found to have a higher gray level than the specified threshold.

Radial Peak

(Available when Rad. Edge inspection is enabled) This graph plots the peak for each part – the largest difference in gray level between any two compared sample lines.

Radial Filter

This plots the radial information after the filters are applied.

Radial Derivative

This plots the radial information after Threshold, Filter, and Delta parameters are applied.

Radial Histogram

This plots the average gray level of the inspection radials. The yellow line represents Threshold.

About Radial Line Integration

This section provides some background information about how Radial Line Integration (RLI) works. Some key terms and concepts are explained.

How RLI Works

CONCEPTS AND TERMINOLOGY

Radial Line Integration (or RLI) is a suite of four inspections:

- Orient
- Lug
- Wrinkle
- Radial Edge

These inspections provide the following features:

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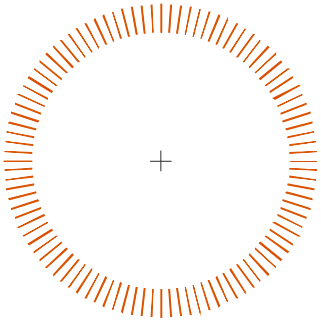
- Ability to inspect repeating symmetrical features (such as lugs) on a circular product.
- Ability to ignore such features and inspect between them with little or no desensitization.
- Sensitivity to defects such as rim wrinkles that are oriented in a radial fashion (along the radius of the part).
- Ability to ignore uniform circular features such as beads on a food end, counter sinks and outside edge of the part. Testing such areas with other inspection types often require desensitization, or positioning the boundaries away from these features.

Radial Sample Line

RLI inspection is made up of many radial sample lines. (See illustration below) The word radial is derived from the word radius. Radius is the straight line distance from the center of a circle to its periphery. Each radial sample line lies on the part's radius. The inner and outer boundaries of the inspection region define the length and position of each radial sample line. Radial sample line may be referred to as "sample line" for short.



Radial sample lines

The average gray level of each sample line is compared to another, typically 3 or 4 lines away. The difference in average gray level between each pair of compared sample lines constitutes the data values used in the inspection analysis.

Count

The total number of hits.

Hit

In RLI, "hit" refers to occurrences of sample line differences which are greater than the Threshold. Every hit has a specific data value. The size of the hit value as well as the count is important.

Moment

A value which RLI calculates based on the size of each hit and the total count. Hits are said to be weighted because all hits are not of equal value. Higher hit values are an indication of more contrast and hence a more severe defect. Moment Max Limit is the most common parameter to adjust when tuning for defect detection.

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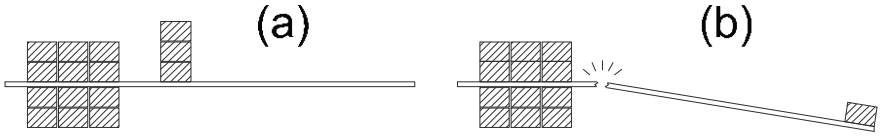
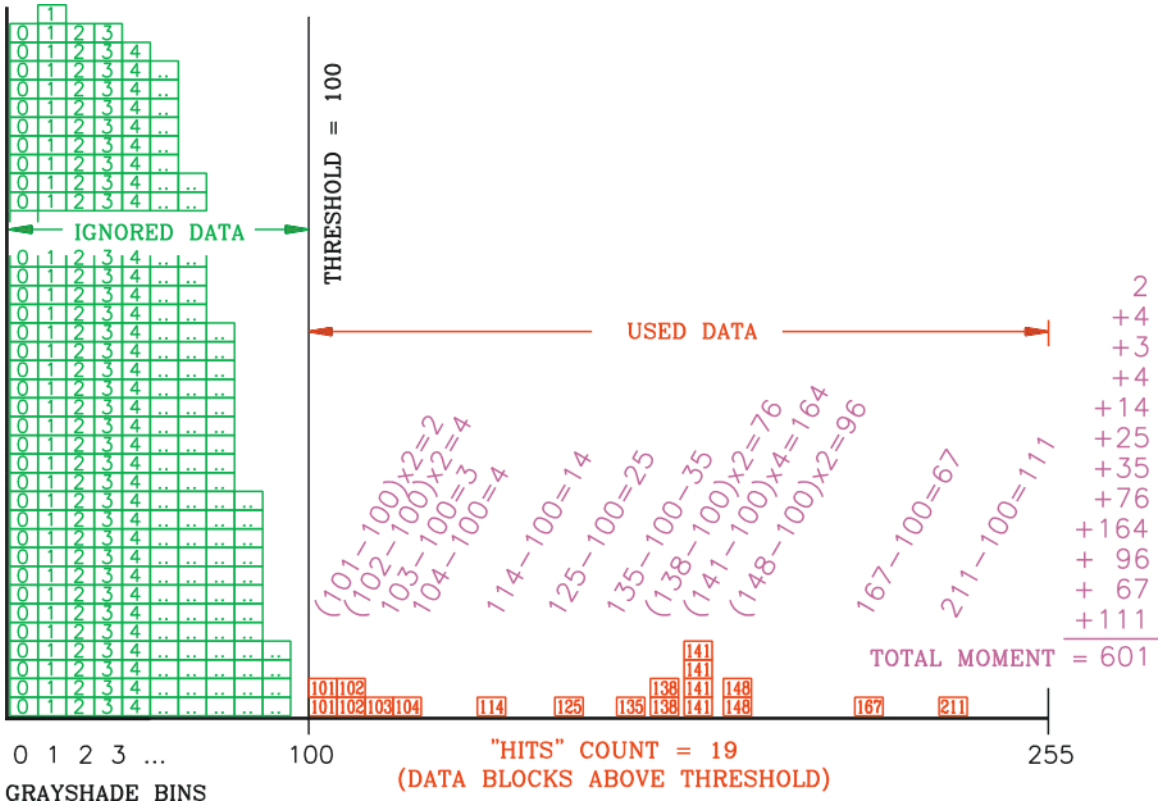
Picture a board fixed at one end with the other end suspended as shown below. Several bricks placed as shown (a) can be supported, but a single brick placed at the free end of the board (b) exceeds the board's load-bearing capacity. The single brick's position of greater leverage boosts its weighting factor, giving it greater moment.



The histogram shown below is an illustration of a typical data distribution. Each unit of data (difference between two radial sample lines) is shown as a box, positioned on the X– axis according to its value. Each value position is called a bin – as if a container for a specific value of data blocks.

The horizontal bottom line is analogous to the board shown above. The higher-value data contribute more to the total moment than the lower-value data – like the brick towards the board's end having more leverage. The angled mathematical statements show how the values contribute to the total moment.



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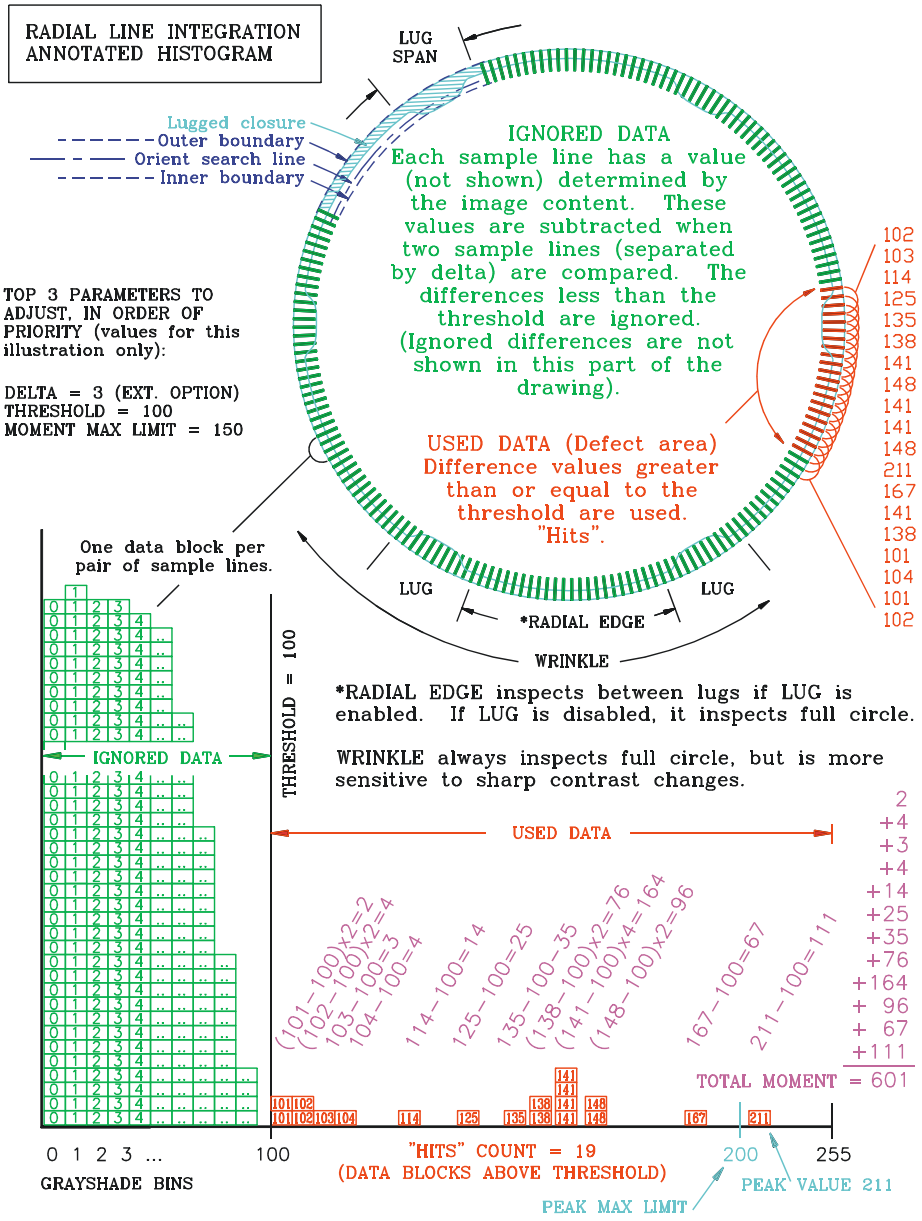
Moment Summary:

- Difference values from compared sample lines are placed in bins.
- Data in bins above the threshold are called hits and applied toward the moment.
- Data below the threshold is ignored.
- Inspection failure occurs when the Moment Max Limit has been exceeded.
- Failure can also be caused by an individual hit value exceeding the Peak Max Limit.
- Failure can also be caused by the number of hits exceeding the Count Max Limit.

See the figure below for a more detailed drawing showing radial sample lines, delta, hits and moment.



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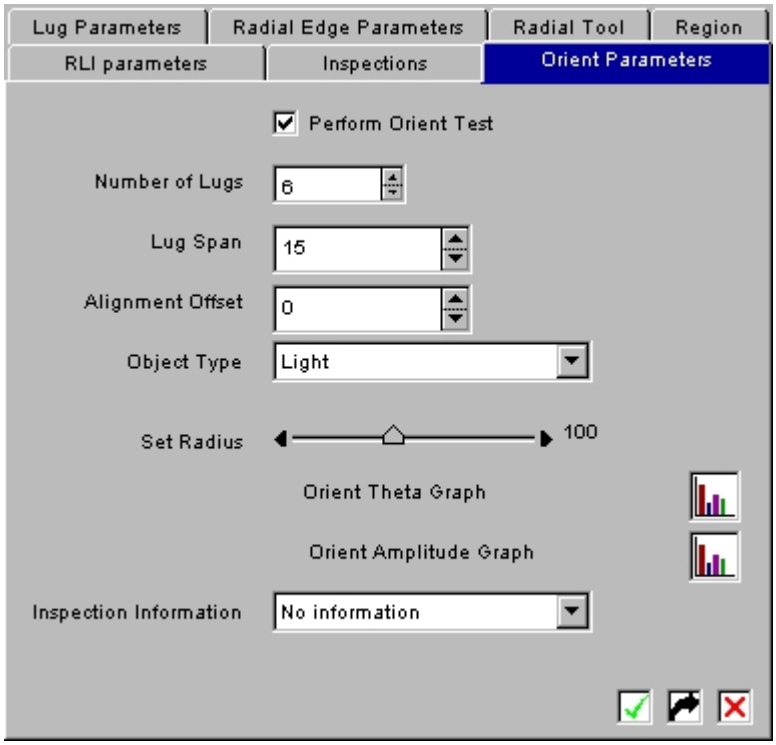
RLI Orient Menu

Orient is commonly used with (but not limited to) lugged closures. It can be applied to two or more objects that are placed symmetrically on a circular part. Orient finds and counts these objects. It operates on a single circular scan line.



Perform Orient Test

Enables or disables the Orient feature. Orient must be enabled for Lug inspection to work, but can be used without Lug inspection.

Number of Lugs

Specify how many objects/lugs should be found.

Lug Span

Angular size of lug area. Cyan lines between the inner and outer boundaries (circles) show the extent of the lug span. Area within lug span is ignored by Radial Edge.

Alignment Offset

Allows angular offset of lug inspection area, relative to where Orient finds the lug midpoint. Designed for tapered or otherwise asymmetrical lugs.

Object Type

Specifies contrast of lugs relative to the background of where the circle is placed. Choose from Light or Dark. Use the Radial Tool if unsure of light or dark. In the example below, the lugs are dark compared to the background (inside of part).

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Set Radius

Set the radial position of the orientation search. It is best to locate the search circle so that it intersects the lug tips (or objects) without touching the rim (or other circular features).

Orient Theta Graph

This plots the angle midpoint of the inspection area between the lugs, relative to where the system finds the midpoint of the lugs.

Orient Amplitude Graph

The orient amplitude varies when you change the Orient Radius. This plots the found amplitude on each part.

Inspection Information

Choose No Information, or Orientation Data, which displays the histogram of the orient search.

Radial Line Integration Graphs

Orient Theta

(Available when Orient menu is enabled) This plots the angle midpoint of the inspection area between the lugs, relative to where the system finds the midpoint of the lugs.

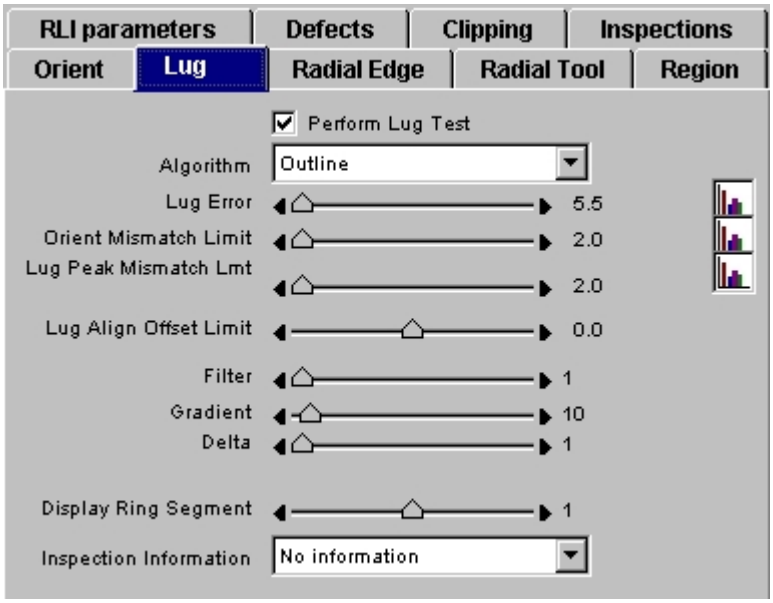
Orient Amplitude

(Available when Orient menu is enabled) The orient amplitude varies when you change the Orient Radius. This plots the found amplitude on each part.

Orientation Data

This plots the histogram of the Orientation circle.

RLI Lug Menu



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Lug inspection is most commonly used to inspect lugs on a lugged closure. It checks the size, position and shape of lugs. Lug can also be applied to any two or more symmetrical objects that are evenly spaced around a circular part.

❖ *Note: The Lug menu initially appears with default values automatically entered. In many cases, the default values can be left unchanged and Lug inspection will perform satisfactorily.*

Orient must be enabled to use Lug inspection because Lug inspection uses the parameters set in the Orient menu. Lug operates from the single circular scan line specified in the Orient menu and picks up where Orient left off by doing further inspection of the lugs. Lug makes three measurements:

- Lug Error (checks lug size)
- Orient Mismatch (checks lug position)
- Lug Peak Mismatch (checks lug shape or uniformity)

You can set limits for each of these. If a limit is exceeded, the inspection fails.

Perform Lug Test

Both Lug and Orient must be enabled to use Lug inspection.

Algorithm

Allows you to choose Solid or Outline depending on lug characteristics.

Use **Solid** on parts that have uniform intensity across the lugs and maintain contrast with the compound.

Outline searches for the outer shape of the lug and ignores the inner area. Use Outline on parts that do not have uniform intensity across the lugs. These are typically highly reflective parts or parts with random litho patterns. In such cases, you may need to adjust the lighting to create or enhance a dark outline around the inside of the rim and lugs.

Lug Error

The inspection calculates a Lug Error value. Missing or abnormally small lugs will cause the lug error value to increase. In Outline mode, the found lug error is a whole integer; in Solid mode, the found Lug Error may be fractional. A Lower setting for lug error increases sensitivity to missing or mis-sized lugs. Typical settings you should use are .5 to .8.

Orient Mismatch Limit

Detects mis-positioned or damaged lugs. Specifies the tolerance for lug mis-positioning in degrees. On a “perfect” part, lugs should be equally & symmetrically positioned about the part. A lower setting increases sensitivity to mis-positioned lugs.

Lug Peak Mismatch Limit

Checks lug shape or uniformity by checking the location of the lug peak relative to the overall position of the lug. A lower setting increases sensitivity to misshaped lugs. Specified in degrees.

Lug Alignment Offset Limit

Allows angular offset of lug inspection area, relative to where Lug finds the lug midpoint. Designed for tapered or otherwise asymmetrical lugs. Specified in degrees.

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Auto Filter Enable

(Available when Algorithm is Solid) Filtering is a method of ignoring certain data by cutting off that data at a certain frequency.

Under most circumstances the default values should suffice. The two parameters below are not shown in automatic mode.

Low Frequency Cutoff

(Available when Algorithm is Solid) Only appears when Auto Filter is disabled. Specifies low cutoff value for filter. Is used to eliminate high frequency data from lug analysis.

High Frequency Cutoff

(Available when Algorithm is Solid) Only appears when Auto Filter is disabled. Specifies high frequency cutoff value. Typically double the low frequency value. Is used to eliminate low frequency data from lug analysis.

Filter

(Available when Algorithm is Outline) Filtering is a method of ignoring certain data by cutting off that data at a certain frequency. The number specified here eliminates certain data. See the Orient Outline Filter graph under Inspection Information to see the effects of this parameter.

Gradient

Gradient only appears when Algorithm is set to Outline. This setting controls the gradient used to detect the start and end locations of the lugs. Gradient specifies a difference in gray level between compared pixels. A typical setting is 10.

Delta

Delta only appears when Algorithm is set to Outline. This setting controls the delta used to detect the start and end locations of the lugs. Delta is the distance between compared pixels. A typical setting is 1.

Display Segment or Display Ring Segment

Highlights the selected segment on screen. It also displays the results on the Results tab screen about the selected segment.

Inspection information

Display graphs to see the effects of parameters after they are applied.

Radial Line Integration Graphs

These are the graphs available when Lug inspection is used.

Lug Error

This plots the errors found in lug size for each part.

Lug Mismatch Orient

This plots changes in position of lugs (lugs that are found in the wrong place on a part), or damaged lugs.

Lug Mismatch Peak

This plots changes in the position of the peak of the lugs relative to the overall position of the lug. Values found outside the limits indicate mis-shaped lugs.

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Lug Low Pass Data

This plots the lug information after the low frequency cutoff filter is applied.

Lug High Pass Data

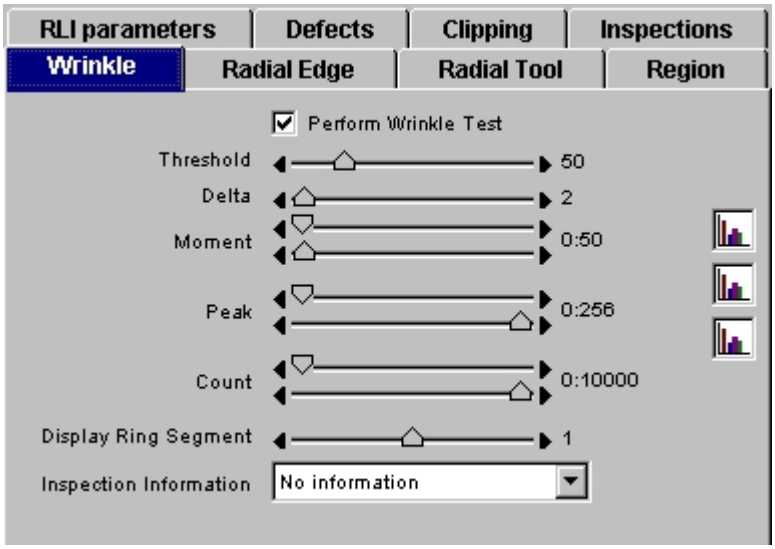
This plots the lug information after the high frequency cutoff filter is applied.

Lug High Pass 2 Data

This plots the lug information after the second high frequency cutoff filter is applied.

RLI Wrinkle Menu

Wrinkle is designed to be sensitive to very sharp, narrow and abrupt changes in contrast typically caused by wrinkle defects. Wrinkle inspects the entire circumference of the region. On lugged parts, it does not exclude the lugs or the area between the lugs.



Perform Wrinkle Test

Enable to search for small, high-contrast defects.

Threshold

Specifies the smallest gray level that will be considered a ***hit*** (see "About Radial Line Integration" on page 387). All gray level values equal to or greater than Threshold are “hits”, and are used in Moment, Count, and Peak value calculations. All data below the threshold is ignored. The setting range is 0 to 255.

Delta

Specifies the separation between compared radial sample lines. The range of settings is 1 to 180. Increasing this value increases sensitivity to gradual (low-frequency) gray level variance.

Moment Min/ Max Limit

Specifies the minimum and maximum allowable ***moment.*** (see "About Radial Line Integration" on page 387) The Min value is usually left at zero (default). Exceeding the Max value causes inspection to fail.

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❖ *Note: Moment is the primary failure criterion and thus the most likely parameter to adjust when tuning the inspection.*

Peak Min/ Max

Specifies the minimum and maximum allowable difference between any two compared sample lines. The Min value is usually left at zero (default). Exceeding the Max value causes inspection to fail. Use to detect extreme fail conditions. Reducing the setting increases sensitivity.

Count Min/ Max Limit

Specifies the minimum and maximum allowable number of hits. The Min value is usually left at zero (default). Exceeding the Max value causes inspection to fail. All hits above the threshold are applied to this, regardless of moment.

Display Segment or Display Ring Segment

Highlights the selected segment on screen. It also displays the results on the Results tab screen about the selected segment.

Inspection information

Display graphs to see the effects of different parameters after they are applied.

Radial Line Integration Graphs

These are the graphs available when Wrinkle inspection is enabled.

Wrinkle Moment

The yellow lines represent Moment Min/ Max limits. This graph plots the total moment for each part – the total difference in gray levels for hits found above the specified threshold. The moment is the primary failure criterion for a part.

Wrinkle Count

The yellow lines represent the Count Min/ Max limits. This graph plots the number of hits – the sample lines in the search area that were found to have a higher gray level than the specified threshold.

Wrinkle Peak

The yellow lines represent the Peak Min/ Max limits. This graph plots the peak for each part – the largest difference in gray level between any two compared sample lines.

Wrinkle Histogram

This plots the average gray level of the inspection radials. The yellow line represents Threshold.

DIMENSION INSPECTION

The system makes dimension measurements on a part in your choice of millimeters, inches, pixels, or custom. You define one or two search regions between which the dimension is calculated. Within the search region(s), edge detection techniques are used to determine the point where the dimension(s) are calculated.

There are a number of options available for search regions. Each region can be simply a line, or an area. The system searches for edges in the line(s) or within the area(s). You can choose how the system computes the dimension.

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The system can report and reject parts based on up to 12 dimension measurements, depending on inspection setup.

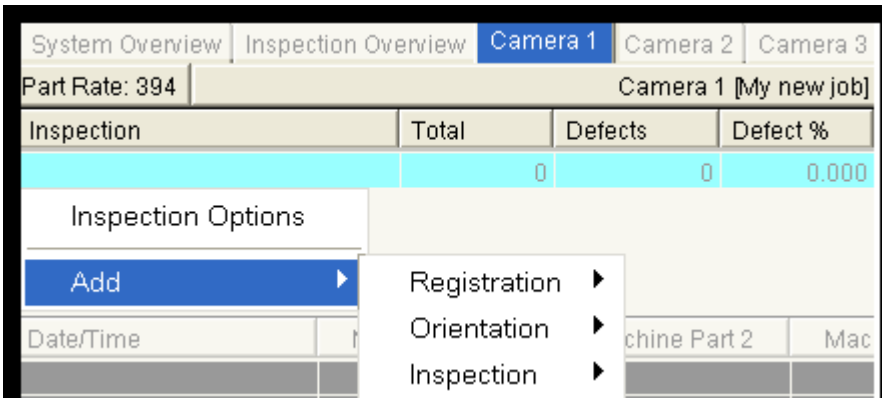
Before Adding a Dimension inspection inspection

If your part rotates in the image, consider adding an ***Orientation*** (see "Orientation/ Pattern Match" on page 318) before adding the Dimension inspection inspection. This will ensure that the region rotates along with the part.

Adding a Dimension inspection

To add the Dimension inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Dimension inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting a Dimension inspection region

To create a Dimension inspection:

1) Go to the Measurement menu and select a Dimension method.
2) Go to the Region menu and place the inspection region(s).
3) Adjust the other Dimension parameters as necessary.

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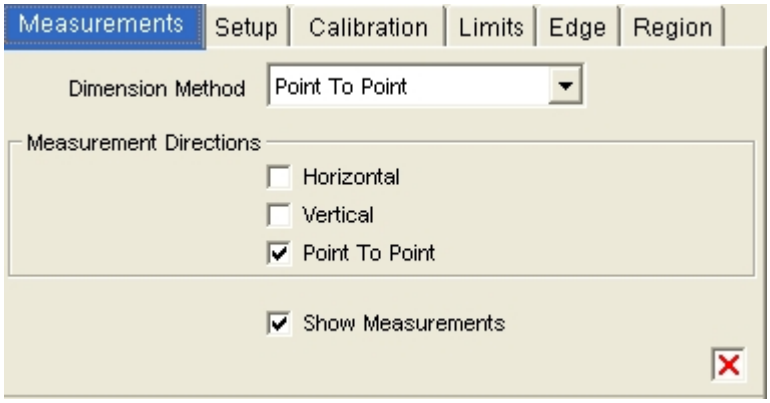
Dimension Inspection Measurements Menu



First pick a Dimension method from this menu before placing the search regions.

Dimension Method

This determines the type of dimension calculation. Choose from the following:

- **Point to Point** – This is the most common type of dimension. You will place two search regions on the image and the system will make dimensional measurements between the two points.
- **Point Only**– This allows you to place one inspection region and compare the minimum edge point position to the maximum edge point position (or average edge point position). A practical use for this method is for measuring the end of a preform.
- **Point to Registration** – This requires a part registration. You will place a single search region, which can be a line or a region. The dimension calculation is made from the search region to the registration center. A practical use for this method is for measuring from the center of the rivet to the tab on the rivet image of a converted end.

MEASUREMENT DIRECTIONS

Horizontal

This is the horizontal component of the dimension points. The system will report a horizontal distance, and reject parts if the measurement is out of limits. You can set the reject criteria in the Limits menu.

Vertical

This is the vertical component of the dimension points. The system will report a vertical distance, and reject parts if the measurement is out of limits. You can set the reject criteria in the Limits menu.

Point to Point

This is the distance between the two dimension points. The system will report the point to point distance, and reject parts if the measurement is out of limits. You can set the reject criteria in the Limits menu.

❖ *Note: Point to Point is a commonly used distance measurement.*

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MEASUREMENT ENDPOINTS

Minimum

This is only available when the search region(s) is a wide arrow, not just a line arrow. The system will report the minimum distance of the located edges between the two regions, and reject parts if the measurement is out of limits. Set the reject criteria in the Limits menu.

Maximum

This parameter is only available when the search region(s) is a wide arrow, not just a line arrow. When this is enabled, the system will report the maximum distance of the located edges between the two regions, and reject parts if the measurement is out of limits. Set the reject criteria in the Limits menu.

Average

This parameter is only available when the search region(s) is a wide arrow, not just a line arrow. When this is enabled, the system will report the average distance of the located edges between the two regions, and reject parts if the measurement is out of limits. Set the reject criteria in the Limits menu.

SPECIAL MODE SELECTION

Enable Special Mode

(Available only with Point to Point Dimension Method) This allows you to make measurements between two regions, Region 1 and Region 2, that are not standard. (Standard measurements are made from the Minimum to Minimum points, Maximum to Maximum points, etc.) With the Special Search Type, you can choose to measure from the Minimum point in Region 1 to the Maximum point in Region 2, for example.

Region 1

Choose the type of Region 1 measurements – Minimum, Maximum, or Average.

Region 2

Choose the type of Region 2 measurements – Minimum, Maximum, or Average.

Show Measurements

Displays where the measurement calculations are being made.

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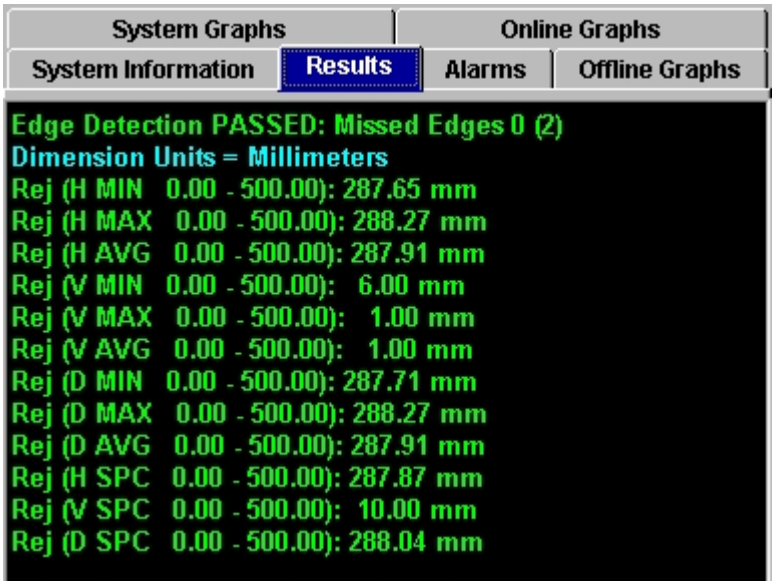
The dimension inspection can generate between one and 12 measurements, depending on the type of dimension chosen and the enabled measurements.



To enable all the available measurements for Horizontal Distance, for example, enable the Horizontal Direction, enable Special Mode, and enable Minimum, Maximum, and Average End Points.

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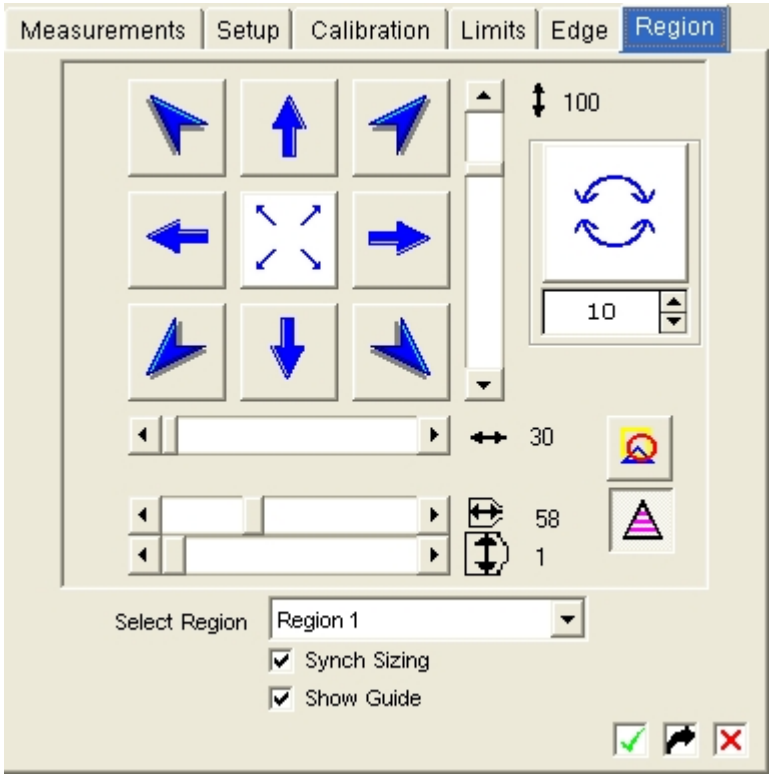
DIMENSION MEASUREMENT COLOR-CODING

- **Orange** - Special Mode points
- **Magenta** - Minimum points
- **Cyan** - Maximum points
- **Blue** - Average points

Dimension Inspection Region Menu



Place the search regions. Dimension inspection's region menu is slightly different than other inspections' region menu. This is due to the different kind of inspection regions and the possibility of more than one region.

Use the two slider bars near the bottom of the menu to adjust the height and width of the search region(s).

Select Region

(Only if Point to Point method chosen in Measurements menu) Select a region from the drop-down menu to adjust one or both regions.

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- If you enable Synch Sizing, both regions will be sized by the same amount.
- Region 1 (or 2) + Horizontal Lock – allows you to move Region 1 alone, but the horizontal distance between the two regions remains constant.
- Region 1 (or 2) + Vertical Lock – allows you to move Region 1 alone, but the vertical distance between the two regions remains constant.
- Regions 1 and 2 - moves both regions at the same time.

Rotation

Rotate the selected search region. This is only available if an orientation is in place before you add the Dimension inspection. This assures proper rotation of the search regions regardless of the orientation of the part in the camera's field of view.

- Click and drag on the button with the rotation arrows to create the desired rotation.
- Right-click the number below the rotation arrows to quickly type a rotation degree.

Synch Sizing

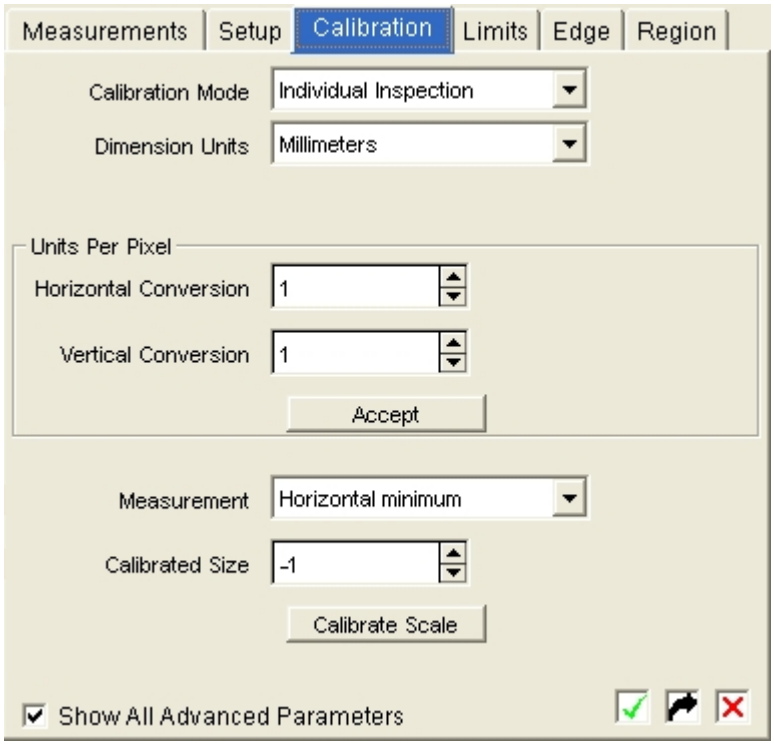
Change the size of each region by the same amount, when adjusting through the Region menu.

Show Guide

Displays where the dimension calculations are made. Displayed in magenta for Point to Point dimension type only.

Adjusting the Dimension inspection parameters

Dimension Inspection Calibration Menu



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Determine the type of dimension calculation that the system will report and your preference of units of measurement.

Calibration Mode

The system will convert the pixel dimensions into your preferred unit of measurement.

- **Channel** - the inspection will use the channel calibration parameters to convert the dimensions into real world values. The system Administrator can specify the units of measurement by right-clicking on the image and selecting ***Pixel Calibrate*** (see "Pixel Scale Calibration" on page 182). If you have calibrated the system to a carefully measured or Golden Part, the system will use those calibrated units.
- **Individual Inspection** - use this option to convert a pixel-to-unit of measurement ratio, and calibrate the system through the parameters below.

Dimension Units

Choose your preference in the reporting of the dimension calculations. Choose from millimeters, inches, pixels, and custom. Custom allows any conversion factor to be used.

❖ *Note: The following parameters are available for Individual Inspection calibration mode. It is best to set these parameters after you have placed the inspection regions, and after you have set up the Edge parameters.*

Horizontal/ Vertical Conversion

This indicates the pixel size and is used to convert one pixel into the units selected. The initial conversion will be controlled by the Calibrate Scale results. From this parameter, you can override this calibration factor or choose to calibrate the dimension using the result of a specific measurement.

After adjusting the horizontal or vertical conversion factor, click the **Accept** button.

Calibrated Size

This is used to calibrate the pixel scale of the current inspection. A setting of [-1] disables this parameter.

Use a part, such as one on which you are currently programming a job, and measure it (with calipers or a ruler) exactly where you would have the inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Enter your measured value.

Calibrate Scale

Press this after you have entered the correct Calibrated Size. The system will use the pixel-to-unit of measurement ratio as specified in the Horizontal and Vertical Calibration parameters. If you see an error, make sure you have your inspection regions properly placed on the image. Also make sure the Edge parameters are set up correctly.

Measurement

Identifies which measurement is active when defining the known dimension size. The available measurements depend on which measurements are enabled in the Measurements menu.

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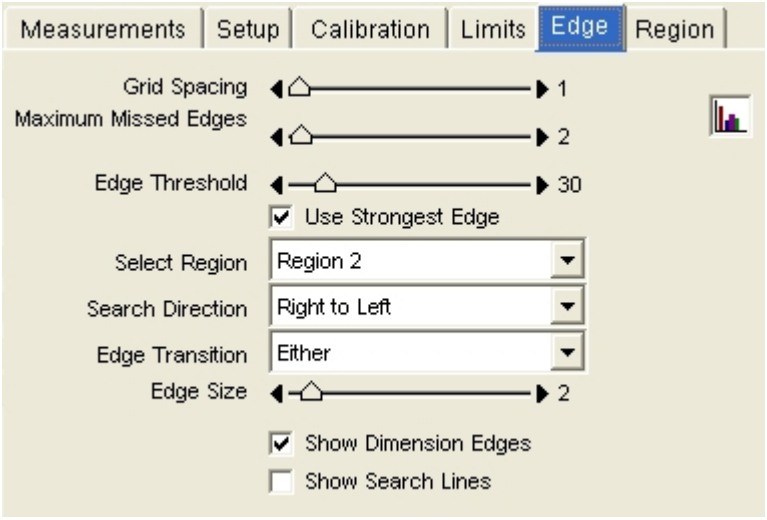
Dimension Inspection Edge Menu



This menu allows you to define the edge qualifications for the search regions.

❖ *Tip: Enable Show Dimension Edges or Show Search Lines to see the results of the edge search.*

Grid Spacing

(Only when the search area is a wide arrow, not just a line arrow) The number of lines until the next line inspected within the region. This value may be set between 1 and 10. The smaller the Grid Spacing, the more accurate the inspection. The larger the Grid Spacing, the faster the inspection.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail. (Only when the search area is a wide arrow, not just a line arrow)

Edge Threshold

This is the threshold used to locate an edge within a search vector. The larger the threshold, the stronger the edge must be. This number is a percentage of the minimum and maximum gray level within the vector, so it changes for each image.

Use Strongest Edge

Indicates whether the system should locate the first edge or the strongest edge that meets the gradient criteria. The strongest edge is the greatest change in grayscale value found above the gradient.

Select Region

Allows you to set the search direction and transition for each region.

Search Direction

Set the direction of search for either region.

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Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

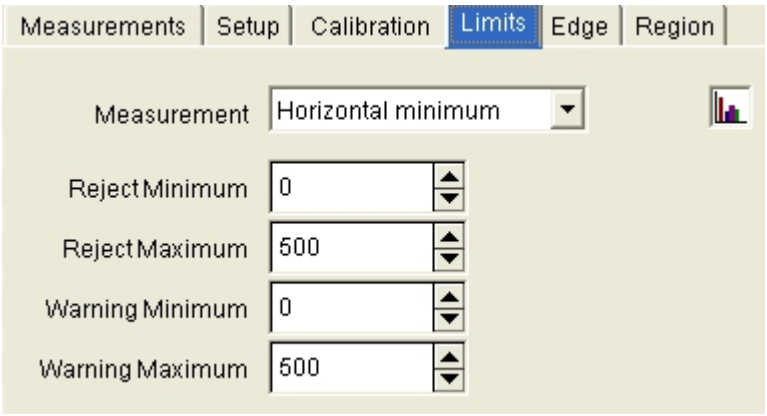
Show Dimension Edges

Displays the found dimension edges.

Show Search Vectors (or Search Lines)

Displays the search vectors.

Dimension Inspection Limits Menu



This menu allows you to set reject and warning limits for parts.

Measurement

Because this inspection can report multiple measurements for one dimension search, this parameter allows you to choose the current measurement to configure. The reject and warning limits can be configured differently for each type of dimension measurement.

Horizontal measurements are available if Horizontal direction is enabled in the Measurements menu. Vertical measurements are available if Vertical direction is enabled in the Measurements menu. If Special Mode is enabled in the Measurements menu, the Special distance measurements are available.

Reject Minimum

The smallest acceptable dimension. Enter the value in a number of Dimension Units you chose in the Calibration menu.

Reject Maximum

The largest acceptable dimension. Enter the value in a number of Dimension Units you chose in the Calibration menu.

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Warning Minimum

This sets a warning flag when the dimension is approaching the Reject Minimum. Any dimension that is between the Warning Minimum and Reject Minimum is given a warning status, but not rejected.

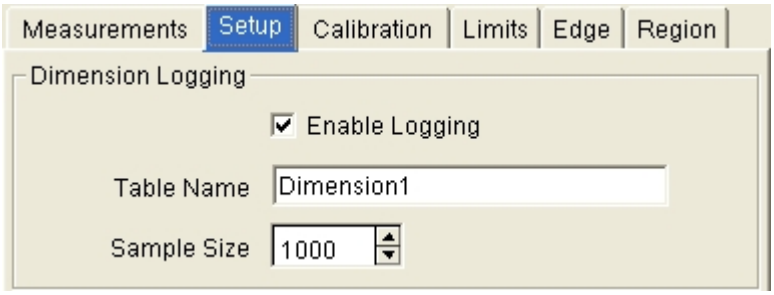
Warning Maximum

This sets a warning flag when the dimension is approaching the Reject Maximum. Any dimension that is between the Warning Maximum and Reject Maximum is given a warning status, but not rejected.

❖ *Note: Warnings are used in alarms, shown by the yellow light on the light tree, and also used in Groups.*

Dimension Inspection Setup Menu

This menu allows you to set up a Dimension database which logs dimension data over time.



DIMENSION LOGGING

Enable Logging

This inspection offers a database that logs dimension information. This feature is useful for process monitoring so that you can view the average measurements over time.

Table Name

Rename the *TableName* to something more meaningful to you. The name is limited to 19 characters.

Sample Size

The number of parts' data that are averaged before the information is written to the database. Note: Defective parts data is not included in the average calculations.

To generate the Dimension database:

Put the system online to inspect parts. The database will start collecting data when enough good dimension measurements have been taken (example: if Sample Size = 1000, the system will wait until it has collected data from 1000 parts with good dimension inspections).

To view the Dimension database:

1) Take the Intellispec offline. The database is saved as C:\Intellispec\Data**Dimension.mdb**.
2) Use the Windows Explorer function to copy it to a floppy diskette or ***USB device*** (see "Copying Files to USB Device" on page 97).

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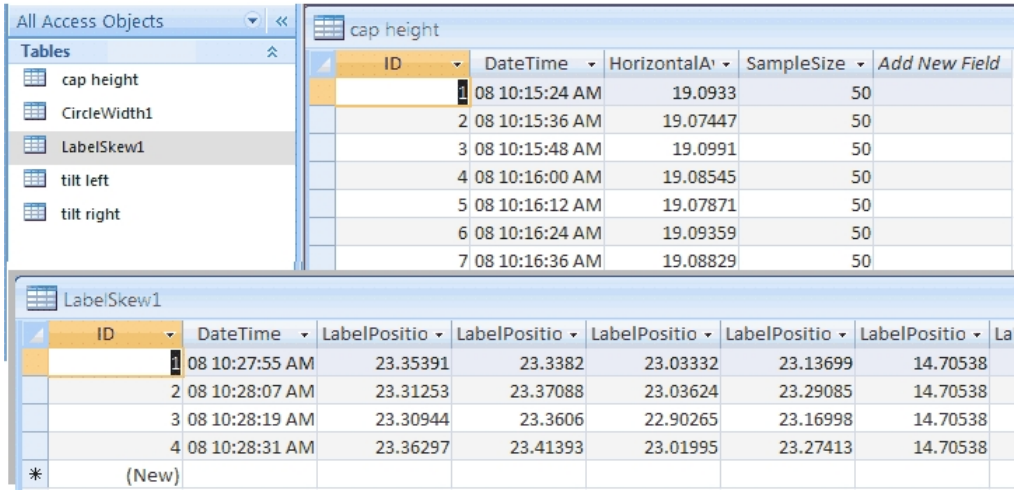
A new record is created for each sample set (when the Intellispec collects data from *n* number of parts with inspections that passed).

If the Intellispec has not yet found enough parts to create an average, no database information is saved. That is, if Sample Size = 1000, and only 970 parts have passed inspection, no database information is saved.

❖ *Note: If you have more than one Dimension-type inspection, a separate table will be created for each inspection within the Dimension.mdb file. You will have a different TableName for each inspection. The Dimension-type inspections include: Dimension, Circle Dimension, Circle Width Dimension, Fill Height, and Label Skew Dimension inspections.*

A sample database with two different inspection tables is shown below:



Graphs - Dimension Inspection

It is possible to have any combination of the graphs listed below for this inspection. It depends what type of dimension is chosen, and what measurements are enabled.

Horizontal Minimum

This plots the smallest horizontal distance between the search regions found for each part.

Horizontal Maximum

This plots the largest horizontal distance between the search regions found for each part.

Horizontal Average

This plots the average horizontal distance between the search regions found for each part.

Horizontal Special

This plots the horizontal distance chosen between Regions 1 and 2 for each part.

Vertical Special

This plots the vertical distance chosen between Regions 1 and 2 for each part.

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Vertical Minimum

This plots the smallest vertical distance between the search regions found for each part.

Vertical Maximum

This plots the largest vertical distance between the search regions found for each part.

Vertical Average

This plots the average of the vertical distance between the search regions found for each part.

Distance Average

This plots the average distance (point to point) between the search regions found for each part.

Distance Special

This plots the distance (point to point) chosen between Regions 1 and 2 for each part.

Distance Minimum

This plots the smallest distance (point to point) between the search regions found for each part.

Distance Maximum

This plots the largest distance (point to point) between the search regions found for each part.

ERROR DETAILS GRAPH

No Edge

The number of parts that failed because the search vectors did not find edges that could be used as a reference for measuring.

Missed Edges

The number of parts that failed the Maximum Missed Edges criteria.

Limit Error

The number of parts that failed because a dimension measurement exceeded the Reject criteria.

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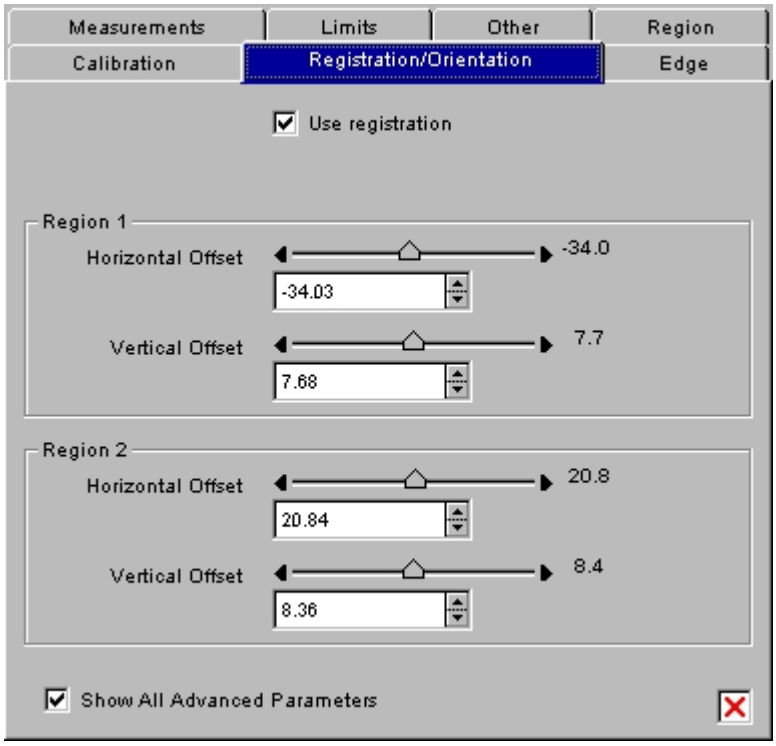
Dimension Inspection Finish Measurements

Dimension Inspection Registration / Orientation Menu



The following parameters are generally used for finish gauge dimension calculations. They are advanced parameters.

Use Registration

This parameter is available only if there is a Finish registration available. You can choose to use the available registration (Enabled), or place the dimension search regions without respect to the registration (Disabled).

Region 1 and Region 2 Horizontal and Vertical Offsets

These parameters are available only when a registration is available for this inspection. The value is in the dimension units specified, and it allows you to position the search regions with respect to the registration numerically. In some cases, you may want to measure a specific location a certain distance from the finish. In this case, it is much easier to enter a numerical value rather than trying to place it graphically on the image where you think it should be.

Use the sliders to change the value rapidly, or the up/ down arrows to adjust by a small amount, or just highlight the value and type a new one.

POLYGON INSPECTION

This inspection allows you to inspect one or more free-form regions on a part. You can use the various menus (edge, ambient, blob, zone, and pattern learn) to detect many types of defects. Use the Inspections menu to add the desired types of inspections.

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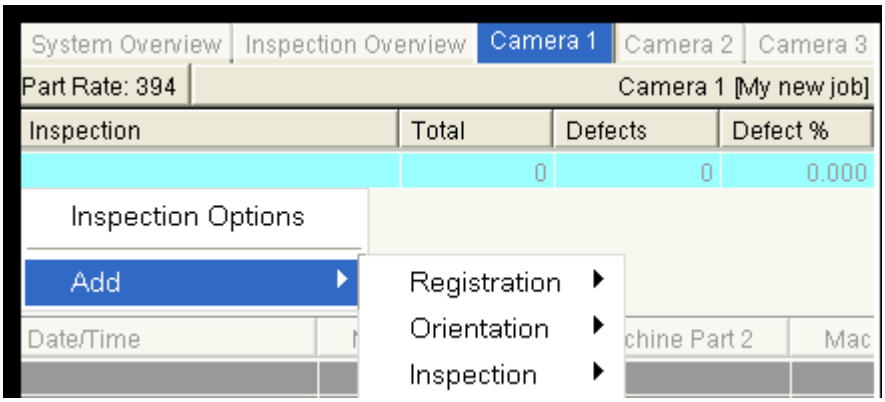
Before Adding a Polygon inspection inspection

If your part rotates in the image, consider adding an ***Orientation*** (see "Orientation/ Pattern Match" on page 318) before adding the Polygon inspection inspection. This will ensure that the region rotates along with the part.

Adding a Polygon inspection

To add the Polygon inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Polygon inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting a Polygon region

The polygon will be placed with respect to the registration, or you may need an orientation in place to assure correct placement of the polygon.

The system displays the starting point of the first polygon. Its X-Y coordinates are displayed in the Region menu. This menu allows you to draw additional points to create the polygon.

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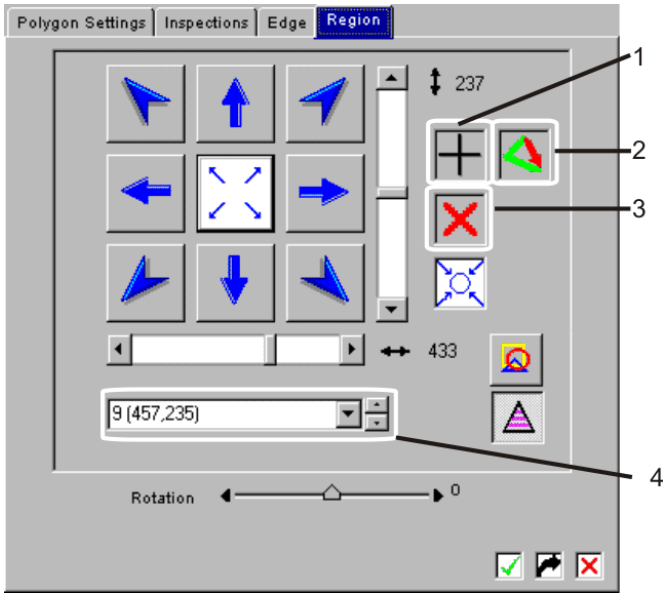
Polygon Region Menu

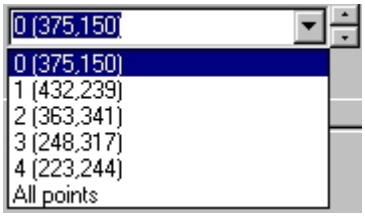


1	Add a polygon point between selected point and next point
2	Close polygon
3	Delete selected point
4	X-Y coordinates of selected point

Polygon's Region menu is slightly different than most inspections.

To create the first polygon:

1) Move the cyan dot to the first desired point of your polygon with the arrow buttons or X-Y sliders. The first point's position is displayed in the box – see 'XY coordinates of selected point' in illustration above.
2) Add another polygon point by clicking the '+' button. Move that cyan dot to the next desired point.
3) Continue to add as many points as desired by following step 2, but leave a space between the last point and the beginning point.
4) When you have added enough points, click the 'close' button. The system will draw a line between the last point and the beginning point, closing the polygon.



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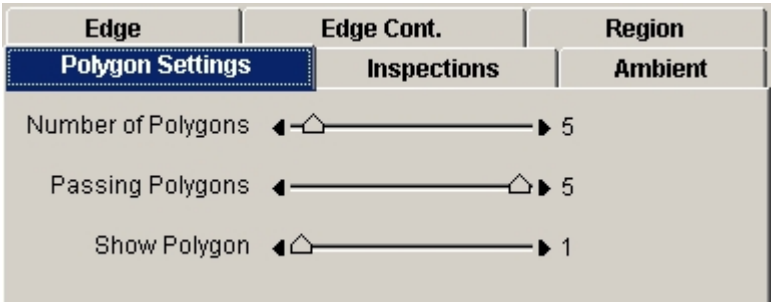
- To edit the polygon, choose a point to modify from point selection drop-down menu. Move the position of the point or add or delete points. If you click the Delete button, the currently selected point is deleted. If you add a point, it will be added between the currently selected point and the next point.
- To rotate the polygon (with respect to the registration center), use the Rotation slide bar.
- To create multiple polygons, go to the Polygon Settings menu.

Adjusting the Polygon inspection parameters

Polygon Settings Menu

Use this menu to duplicate the polygon. A common use for this feature is to inspect the feet of a PET bottle. You can create one polygon, and allow the system to duplicate it around the base of the part.



Number of Polygons

Specify the number of polygons. If you are inspecting a bottle with five feet, for example, use five polygons. The system automatically rotates the polygons around the image.

Passing Polygons

Specify the number of polygons that must pass inspection for the whole inspection to pass.

Show Polygon

Displays the inspection results for a specific polygon.

Empty Pocket Enabled

This is used for specific applications where you must determine whether a part is present in a pocket before proceeding with inspection.

A common use for this test is in Starwheel applications where the encoder is used, based on pocket position, rather than a part present signal. Locating an empty pocket is important for production numbers to be accurate. If an empty pocket is found, no inspection takes place for that pocket. Otherwise, an empty pocket would be recorded as a defect.

Polygon inspection Test Parameters

From the Inspections menu, choose which portions of the Polygon inspection to use to detect different types of defects. The inspections menu consists of several components that are common to many inspection types. Below are links to each inspection type.

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- ***Ambient inspection*** (on page 347)
- ***Edge inspection*** (on page 348)
- ***Edge Blob inspection*** (on page 352)
- ***Zones inspection*** (on page 354)
- ***Blob inspection*** (on page 356)
- ***Pattern Learn inspection*** (on page 358)

Graphs - Polygon Inspection

There are a number of graphs from which you can choose to help modify the Polygon inspection. The available graphs depend on what parts of the inspection are enabled.

AMBIENT GRAPHS

The following three graphs are available if Ambient inspection is enabled.

Ambient Average

The average ambient value of all the configured polygons.

Ambient Minimum

The minimum ambient found in all the configured polygons.

Ambient Maximum

The maximum ambient found in all the configured polygons.

EDGE GRAPHS

The following graphs are available if Edge inspection is enabled.

Edges Total

The total number of edges found in all the configured polygons.

Edges Maximum

The maximum edge count found in all the configured polygons.

Largest Absolute Gradient

(If Absolute Gradient enabled in Edge cont. menu) This plots the largest gradient change for each inspected part. The yellow limit is set by the Absolute Gradient parameter.

EDGE BLOB GRAPHS

The following graphs are available if Edge Blob inspection is enabled.

Largest Edge Blob Area

The largest connected set of pixels considered to be an edge blob in all the configured polygons.

Average Edge Blob Count

The average number of edge blobs found in all the configured polygons.

Minimum Edge Blob Count

The minimum number of edge blobs found in all the configured polygons.

Maximum Edge Blob Count

The maximum number of edge blobs found in all the configured polygons.

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Average Edge Blob Valid Area

(If Blob Valid Area enabled) The average area found for the edge blobs.

Minimum Edge Blob Valid Area

(If Blob Valid Area enabled) The minimum area found for the edge blobs.

Maximum Edge Blob Valid Area

(If Blob Valid Area enabled) The maximum area found for the edge blobs.

ZONE GRAPHS

The following graphs are available if Zone inspection is enabled.

Zone n Area Total

The total pixel area found in the nth zone inspected over all the configured polygons. Since there may be zero to five zones enabled, there may be zero to five instances of this graph available.

Zone *n* Area Maximum

The maximum pixel area found in the nth zone inspected of all the configured polygons. Since there may be zero to five zones enabled, there may be zero to five instances of this graph available.

BLOB GRAPHS

The following graphs are available if Blob inspection is enabled.

Blob Average Total Area

The average number of pixels considered to be part of a blob in all the configured polygons.

Blob Minimum Total Area

The minimum number of pixels considered to be part of a blob in all the configured polygons.

Blob Maximum Total Area

The maximum number of pixels considered to be part of a blob in all the configured polygons.

Largest Blob Area

The number of pixels in the largest blob found in all the configured polygons.

Average Blob Count

The average number of blobs found in all the configured polygons.

Minimum Blob Count

The minimum number of blobs found in all the configured polygons.

Maximum Blob Count

The maximum number of blobs found in all the configured polygons.

Largest Blob Offset

(If Blob Tolerance enabled) The distance from the center of mass that the largest blob is from the registration reference point.

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PATTERN LEARN GRAPHS

Area Deviation

(If Pattern Learn inspection enabled and Analysis Technique = Deviation Maximum) The number of pixels the current part's inspection area falls outside of the learned limits.

Percent Deviation

(If Pattern Learn inspection enabled and Analysis Technique = Deviation Percent) The percentage the current part's inspection area falls outside of the learned limits.

ERROR DETAILS GRAPH

Ambient

(If Ambient inspection is enabled) The number of parts that failed the Ambient inspection criteria.

Edge Count

(If Edge inspection is enabled) The number of parts that failed the Edges Min/ Max limits.

Edge Blob Count

(If Edge Blob inspection is enabled) The number of parts that failed the Blob Count Min/ Max limits.

Edge Blob Area

(If Edge Blob inspection is enabled) The number of parts that failed the Blob Area Min/ Max limits.

Blob

(If Blob inspection is enabled) The number of parts that failed the Blob inspection criteria.

Blob Area

(If Blob Mass is enabled) The number of parts that failed the Blob Mass Min/ Max limits.

Blob Count

(If Blob Count is enabled) The number of parts that failed the Blob Count Min/ Max criteria.

Zone

(If Zones are enabled) The number of parts that failed the Zone criteria.

Segment

(If Segments are enabled) The number of parts that failed because at least one segment did not meet inspection criteria.

ROI

The number of parts that failed inspection because the system could not generate a polygon. This could be due to a failed registration, a grossly misshapen part, or other factors.

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Pattern

(If Pattern Learn inspection enabled) The number of parts that failed the Pattern Learn inspection.

SHAPE ADAPT INSPECTION

This inspection looks for defects in the part, between the sides. The system automatically creates the search region for each image, by using information gathered with the ***Shape Adapt registration*** (on page 276). A Shape Adapt Registration is required for this inspection.

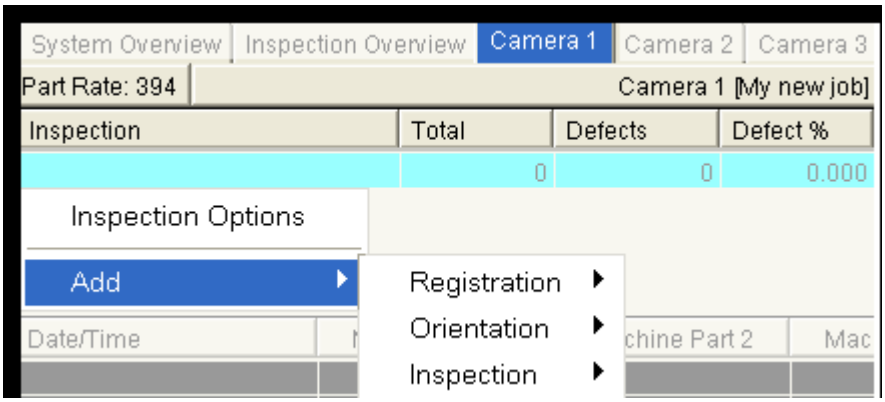
You can use the Shape Adapt inspection to detect squeezed, bent, and malformed parts. It also performs Ambient, Blob, Edge, Edge Blob, Zone, and Pattern Learn analyses to detect multiple types of defects such as dirt, bubbles, or contamination. Use the Inspections menu to add the desired types of inspections.

Set up the Shape Adapt parameters to best inspect your products, as recommended by your instructor or service engineer.

Adding a Shape Adapt inspection

To add the Shape Adapt inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Shape Adapt inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

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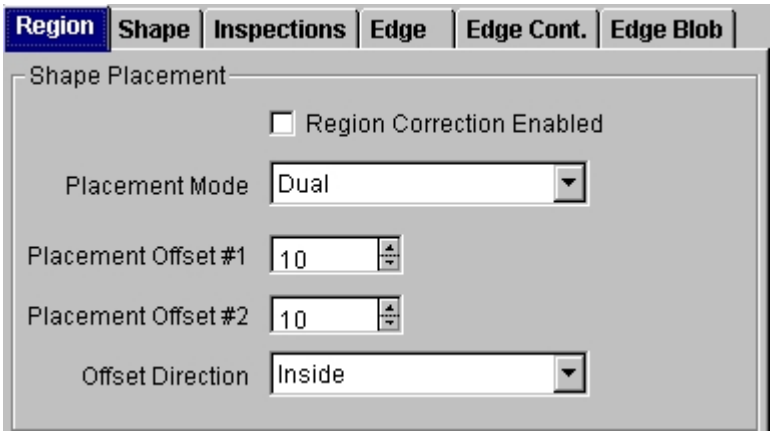
Setting the Shape Adapt inspection region

Shape Adapt Inspection Region Menu



This menu allows you to modify how the system places the automatically generated search region. You can also specify the tolerance of the shape of each part.

Region Correction Enabled

Allows the system to fill in missed edges based on the learned shape of the part. This can be useful in cases where there are noisy edges in the part image.

❖ *Note: You must run Learn (see Shape menu) first, so that the system finds the basic shape of the part.*

After Region Correction, the corrected shape points are highlighted with a yellow ‘x’.

❖ *Note: If you copy a job using Shape Adapt for a different part, you must first Disable Region Correction, then run Learn, then Enable Region Correction again. The system must first learn the basic shape of the part before it applies Region Correction.*

Placement Mode

An Offset is a number of pixels away from the found edge where you want the inspection region to begin.

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- **Single offset** indicates that the system will use one number of offset pixels on both sides of the part to create the inspection region. This is good to use if the part image has uniform lighting, such as in a Neck image, or from the center sidewall camera in Preform inspection.
- **Dual offset** indicates that you can define two different numbers of offset pixels on either side of the part to create the inspection region. This is useful for the outer sidewall cameras in Preform inspection, where there is a dark area that needs to be inspected separately. Use Placement Offset #1 on one side of the part, and Placement Offset #2 on the other side of the part.
- **Special** placement allows offsetting individual points in the region of interest. This allows you to change the shape of the inspection region of interest. Select the Offset Direction, then go to the Offsets menu.

Placement Offset

Adjust the size of the search region with respect to the found Shape Adapt registration edges. Set this in number of pixels. The direction of the offset depends on the next parameter, whether Inside or Outside. This parameter is very helpful in allowing the system to avoid noise near the edge of the container.

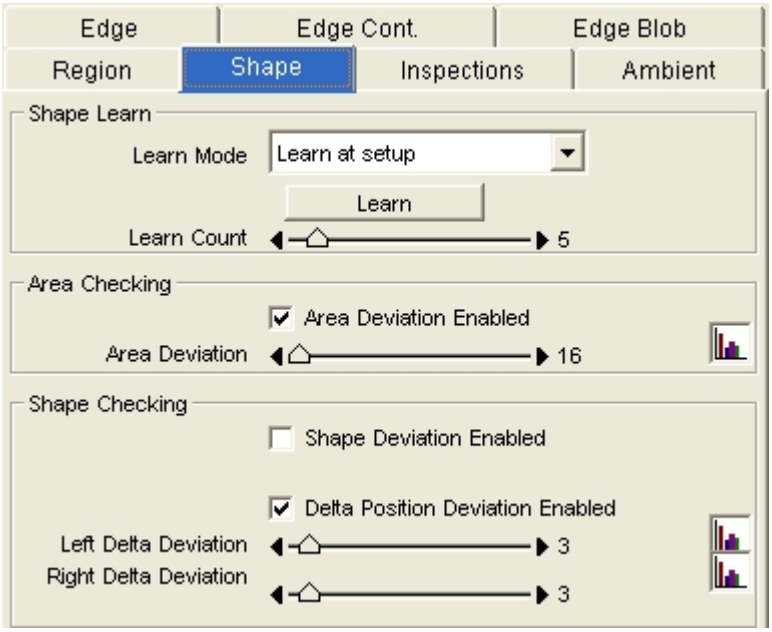
Offset Direction

- **Inside** causes the search region to shrink the number of Offset pixels towards the inside of the container.
- **Outside** enlarges the size of the search region the number of Offset pixels outside of the container.

Adjusting the Shape Adapt parameters

Shape Adapt Inspection Shape Menu

This menu allows you to define the shape of the inspection region.



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SHAPE LEARN

Learn Mode

This feature allows the system to learn the shape of a number of parts, and then draw the search region based on the shape of those parts.

- **Learn at Setup** is the number of parts from which to learn the shape. The system will build the search region based on these parts, incorporating any shape variations that might occur.
- **Adapt On-Line** creates a running average of the container shapes while online. The system conforms the search region to the container based on any changes it sees over time.

Learn button

Click this to begin the learn process. Make sure you have parts moving through the inspection module so that the system can detect and inspect the necessary number of parts.

Learn Count

Set the number of images from which the system can learn the part. More images will give a better example of the overall inspection population. This is only used when Learn Mode = Learn at Setup.

When you use the Learn mode, the system prompts you with suggested values to use to create the search region. You may adjust these later if desired.

AREA CHECKING

Area Deviation Enabled

If checked, the search region information is used as reject criteria. This determines if the total area of the search region is within acceptable limits. This feature can be made highly sensitive to correctly-shaped parts that are otherwise only very slightly under- or over-sized.

Area Deviation

The maximum number of pixels that the search region area can deviate from the learned area. This is only applied if Area Deviation is enabled.

SHAPE CHECKING

Shape Deviation Enabled

If checked, the search region's points are used as reject criteria. It looks at opposing search region points to ensure that the distance between them does not change by more than some acceptable limit. This feature helps ensure that the custom search region does not get fooled by an irregularly shaped container.

Shape Deviation

The maximum pixel deviation allowed between two opposite points in the search region.

Delta Position Deviation Enabled

If checked, the sides of the part will be checked independently for shape deviation from the learned area.

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Left Delta Deviation

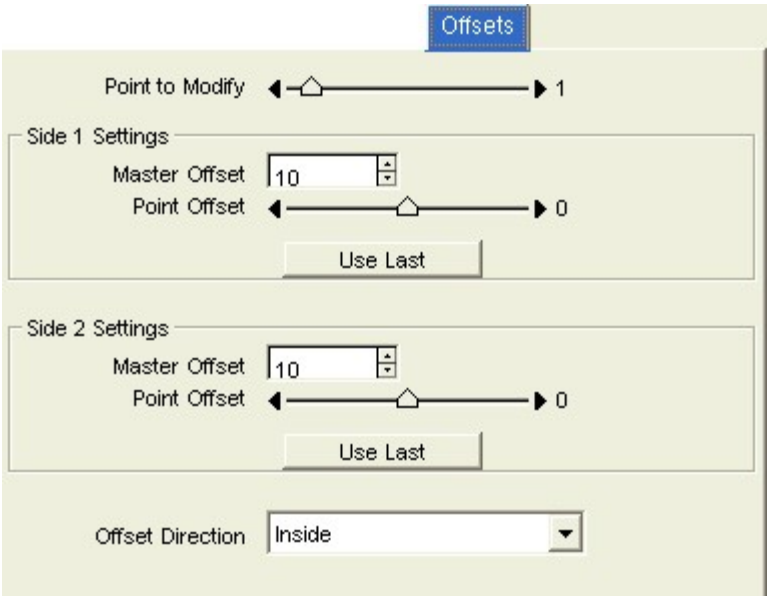
The maximum number of pixels that the left side of the part can vary from the learned region.

Right Delta Deviation

The maximum number of pixels that the right side of the part can vary from the learned region.

Shape Adapt Inspection Offsets Menu

This menu only appears if Placement Mode = Special in the Region menu.



The Special Placement feature is useful in applications such as preform sidewall inspection where the preforms have a smooth outer sidewall and a stepped inner sidewall. The shape adapt region would normally conform to the shape of the part (the smooth outer sidewall). With Special Placement, you can modify the shape adapt region to follow the shape of the stepped inner sidewall, while still tracking the smooth outer sidewall with Shape Adapt registration.

Point to Modify

The number of points equals the number of search vectors that created the Shape Adapt region.

Select the point to modify. The active point is highlighted in cyan. The points on both sides of the region are highlighted, which you can modify separately under the Side 1 Settings or Side 2 Settings section of the menu.

Side 1 Settings or Side 2 Settings

Similar to Dual Offset, these allow you to place the region a certain distance from the edge on one side, and another distance from the edge on the other side.

Master Offset

The number of pixels away from Side 1 or Side 2 that the inspection region will begin.

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Point Offset

Move the search region point a number of pixels inwards or outwards.

Use Last

This makes it easier to create the desired shape. For example, say you set Point 10 to -3 Point Offset. When adjusting Point 11, click the Use Last button to set it to -3 Point Offset also. You can then change its offset by another one or two as needed. This feature eliminates the need for setting each point to a large offset, and eliminates the need to remember what the last point's offset was.

Offset Direction

- **Inside** causes the search region to shrink the number of Offset pixels towards the inside of the container.
- **Outside** enlarges the size of the search region the number of Offset pixels outside of the container.

Shape Adapt inspection Test Parameters

From the Inspections menu, choose which portions of the Shape Adapt inspection to use to detect different types of defects. The inspections menu consists of several components that are common to many inspection types. Below are links to each inspection type.

- ***Ambient inspection*** (on page 347)
- ***Edge inspection*** (on page 348)
- ***Edge Blob inspection*** (on page 352)
- ***Zones inspection*** (on page 354)
- ***Blob inspection*** (on page 356)
- ***Pattern Learn inspection*** (on page 358)

Graphs - Shape Adapt Inspection

There are a number of Shape Adapt graphs available, depending on what parts of the inspection are enabled.

REGION GRAPHS

Region Area

(Area deviation must be enabled) The number of pixels that define the shape of the search region. There are reject limits on this size to make sure the system does not track bad shapes.

Vertices Deviation

(Vertices deviation must be enabled) This is a comparison of the vertex positions that make up the adapted shape. This is a plot of the maximum deviation from the expected template shape.

Left Vertex Delta Deviation

(Delta Position Deviation must be enabled) The number of pixels that the left side of the part deviates from the learned shape.

Right Vertex Delta Deviation

(Delta Position Deviation must be enabled) The number of pixels that the right side of the part deviates from the learned shape.

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AMBIENT GRAPH

Ambient

(Ambient must be enabled) The ambient found in the search region for each part.

EDGE GRAPHS

Edges

(Edge inspection must be enabled) The number of edges found in the search region. More edges can indicate more defects.

Largest Absolute Gradient

(If Absolute Gradient enabled in Edge cont. menu) This plots the largest gradient change for each inspected part. The yellow limit is set by the Absolute Gradient parameter.

EDGE BLOB GRAPHS

The following graphs are available when Edge Blob inspection is enabled.

Edge Blob Count

The number of edge blobs found in the search region.

Edge Blob Largest

The largest edge blob found in the search region for each image.

Edge Blob Valid Area

(If Blob Valid Area enabled) The area found for each edge blob.

ZONE GRAPHS

Zone *n* Area

(Zone inspection must be enabled) This is the pixel area found in the nth zone inspected in the search area. Since there may be zero to five zones, there may be zero to five instances of this graph.

BLOB GRAPHS

The following graphs are available if Blob inspection is enabled.

Total Area

The total number of pixels considered to be part of a blob for each image. The limits for this graph are set through the Blob Mass Min/ Max parameters.

Largest Blob Area

The number of pixels in the largest blob found in the search area for each image. The limits for this graph are set through the Blob Area Min/ Max parameters.

Blob Count

The number of blobs that were within the expected size tolerances for each image. The limits for this graph are set through the Blob Count Min/ Max parameters.

PATTERN LEARN GRAPHS

Area Deviation

(If Pattern Learn inspection enabled and Analysis Technique = Deviation Maximum) The number of pixels the current part's inspection area falls outside of the learned limits.

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Percent Deviation

(If Pattern Learn inspection enabled and Analysis Technique = Deviation Percent) The percentage the current part's inspection area falls outside of the learned limits.

ERROR DETAILS GRAPH

Ambient

(If Ambient inspection is enabled) The number of parts that failed the Ambient inspection criteria.

Edge Count

(If Edge inspection is enabled) The number of parts that failed the Edges Min/ Max limits.

Absolute Gradient

(If Absolute Gradient enabled in Edge cont. menu) The number of parts that failed the Absolute Gradient limit.

Edge Blob Count

(If Edge Blob inspection is enabled) The number of parts that failed the Blob Count Min/ Max limits.

Edge Blob Area

(If Edge Blob inspection is enabled) The number of parts that failed the Blob Area Min/ Max limits.

Blob

(If Blob inspection is enabled) The number of parts that failed the Blob inspection criteria.

Blob Area

(If Blob Mass is enabled) The number of parts that failed the Blob Mass Min/ Max limits.

Blob Count

(If Blob Count is enabled) The number of parts that failed the Blob Count Min/ Max criteria.

Zone

(If Zones are enabled) The number of parts that failed the Zone criteria.

Vertex Limit

(If Vertex Deviation enabled) The number of parts that failed the vertex check in the Shape menu.

Vertex Count

(If Vertex Deviation enabled) the number of parts that failed because there were no points to create the inspection region. This could be due to a failed registration, a grossly misshapen part, or other factors.

Area Deviation

(If Area Deviation enabled in Shape menu) The number of parts that failed the Area Deviation criteria.

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Pattern

(If Pattern Learn inspection enabled) The number of parts that failed the Pattern Learn inspection.

NOTCH INSPECTION

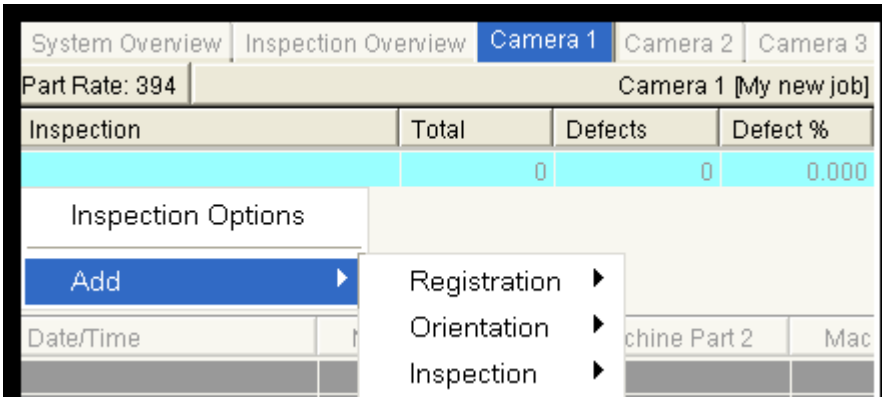
Notch inspection is designed for a specific type of part. It locates the position of an alignment notch in the tamper band with respect to the part. This is accomplished by setting up two arc search regions. The first arc intersects the oblong end of the part. This gives the system the orientation of the part. The second arc searches in a window that has been cut out of the gripper fingers (specifically on a Sidel blow molder). This gives the system the position of the notch.

The system compares the position of the notch with respect to the part. If there is no notch found in the second arc, or if the notch does not fall within the angular tolerance you specify, the inspection will fail.

Adding the Notch inspection

To add the Notch inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Notch inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Notch inspection region

Before you place the notch inspection arcs, place a registration to determine the center point of the seal surface. Use a circular registration or something similar to locate the inside edges of the seal surface.

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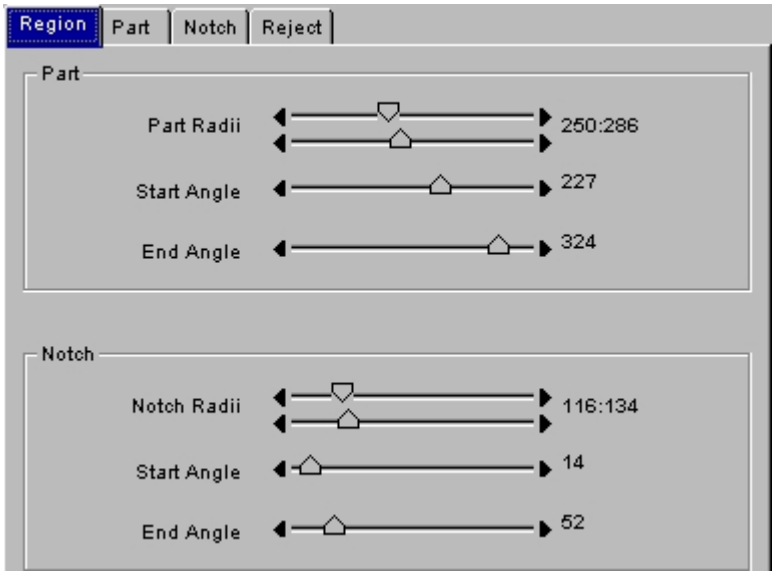
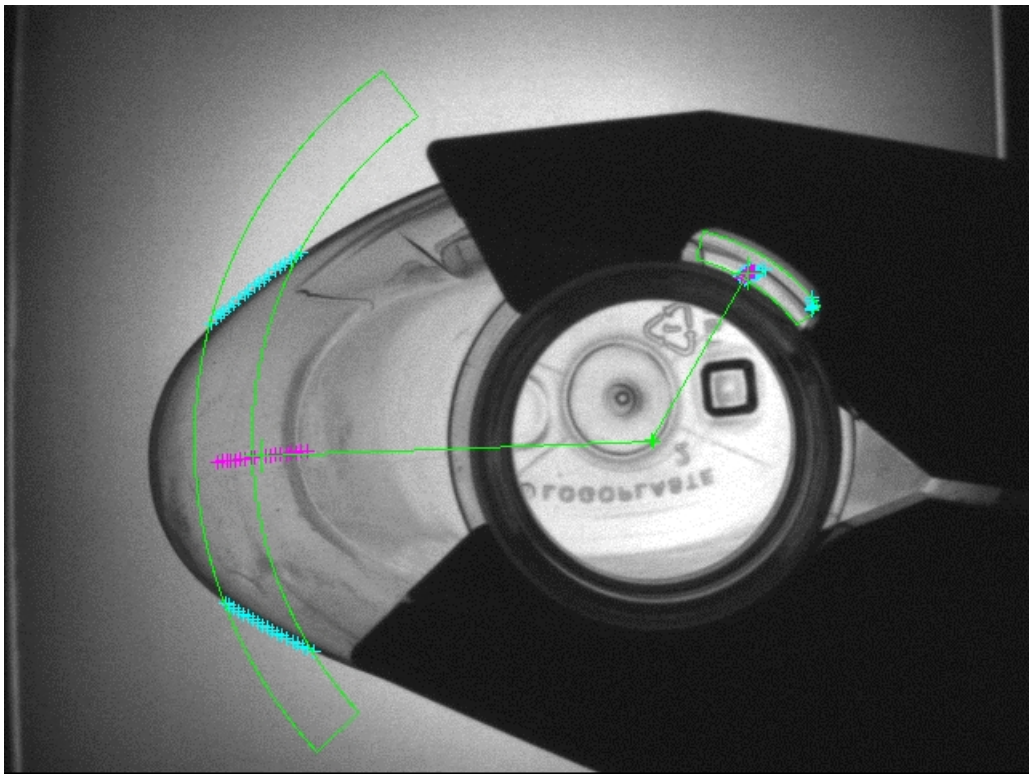
Notch Inspection Region Menu



First set up the notch search arcs using the Region menu. This gives the system the part orientation. Use the Part settings to place the first arc over the oblong end of the part. Assume zero degrees is the top of the circle for determining Start Angle and End Angles.

Use the Notch settings to place the second arc within the gripper finger window. The second arc allows the system to search for the notch.



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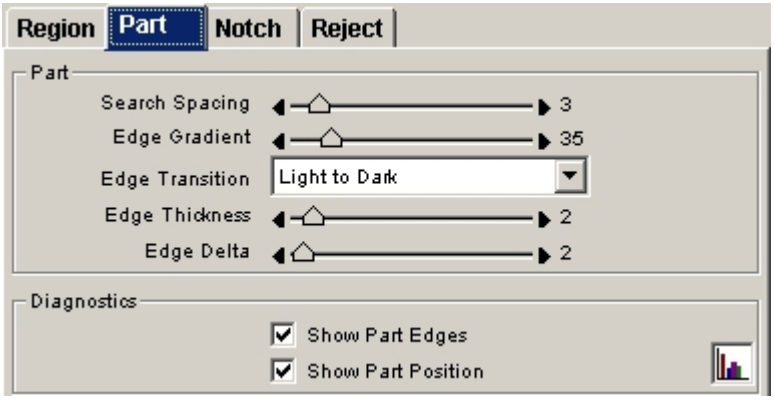
Adjusting the Notch Inspection Parameters

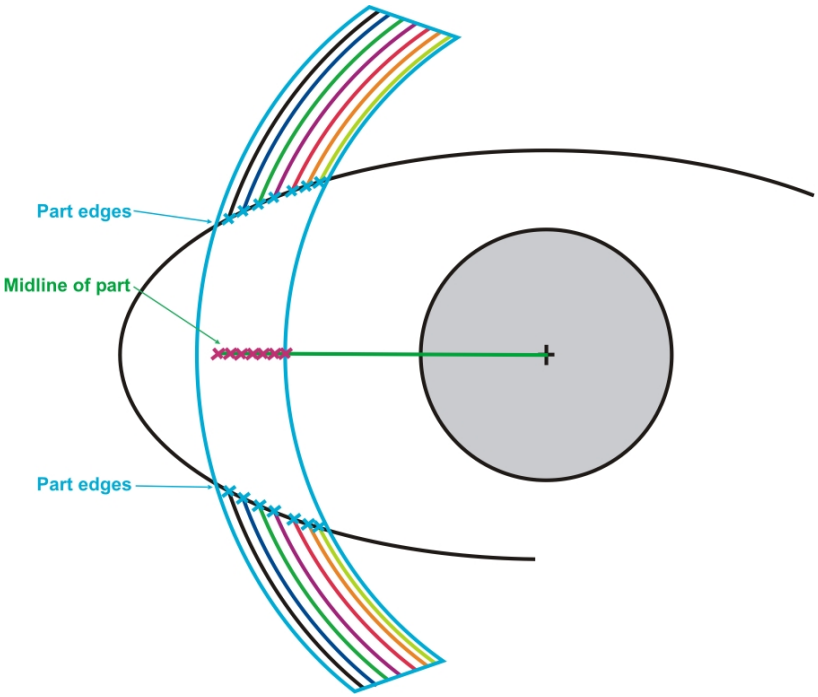
Part Menu

This menu specifies the edges of the part in the first arc search area, and the system computes the part angle from these edges.



The first arc (part arc) is searched from each end to locate the first edge above the Part Edge Gradient. This is done for each radius between the inner and outer radius of the arc. After all part edges are found, these positions are averaged together to compute the midline of the part. This determines the part angle.

The part angle is compared to the notch angle, which is determined by the parameters set in the Notch menu. You also set the tolerance levels in the Reject menu to determine whether the part should be rejected.



❖ *Note: Enable Show Part Edges and Show Part Position to view the parameters we will discuss next.*

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Search Spacing

Set the number of pixels between each search vector.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

In our sample image, the part edge is darker than the background, so we use a Light to Dark transition to find the dark edges of the part.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Show Edges

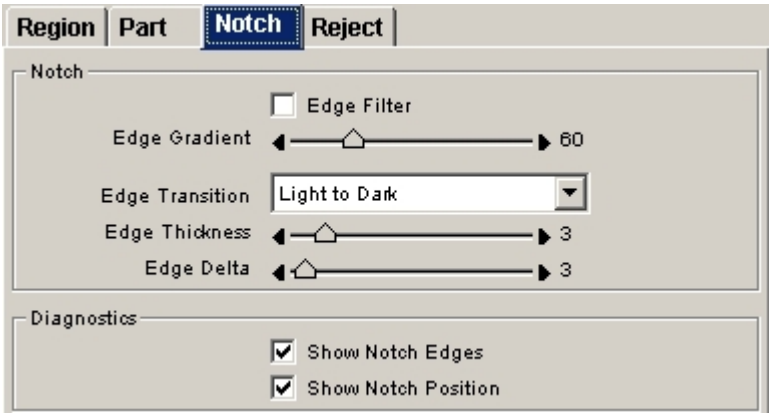
Displays the found edges in the search regions.

Show Part Position

Displays a line from the center of the part (determined by registration) to the midline position of the part. The magenta crosses are the computed midpoints of the two sides.

Notch Menu

This menu specifies the notch edges, and whether to reject parts based on notch size and its position with respect to the part.



The Notch arc is searched from each end to locate the first edge above the Notch Edge Gradient. This is done for each radius between the inner and outer radius of the arc. After each notch edge is found, these numbers are averaged together to compute the center position of the notch. These edges are also used to determine the average notch width.

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If the system cannot locate both edges of the notch in the gripper finger window, and Estimate Notch Center is Enabled (in the Reject menu), the system will use the Estimated Notch Size to determine the notch width. It will use one side of the notch, and project where the other side of the notch would be. The center point of the notch is determined by the center of these values.

The system compares the center of the notch to the midline of the part. The inspection will fail if the difference in angles does not fall within the Notch Angle values in the Reject menu.

If the system cannot find at least one side of the notch, or if the notch width does not fall within the Notch Size limits, the inspection fails.

❖ *Note: Enable Show Notch Edges and Show Notch Position to view the parameters we will discuss next.*

Edge Filter Enable

This filter is normally disabled. If disabled, the system uses Edge Gradient to qualify an edge. If enabled, the system binarizes the search vectors, using the Edge Filter value as the threshold.

Edge Filter value

(Only used when Edge Filter enabled) This is the threshold at which the system binarizes the search vector. For example, if the filter is set at 128, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Show Notch Edges

Displays the notch edge points in cyan. Also displays the midpoint of the notch in magenta.

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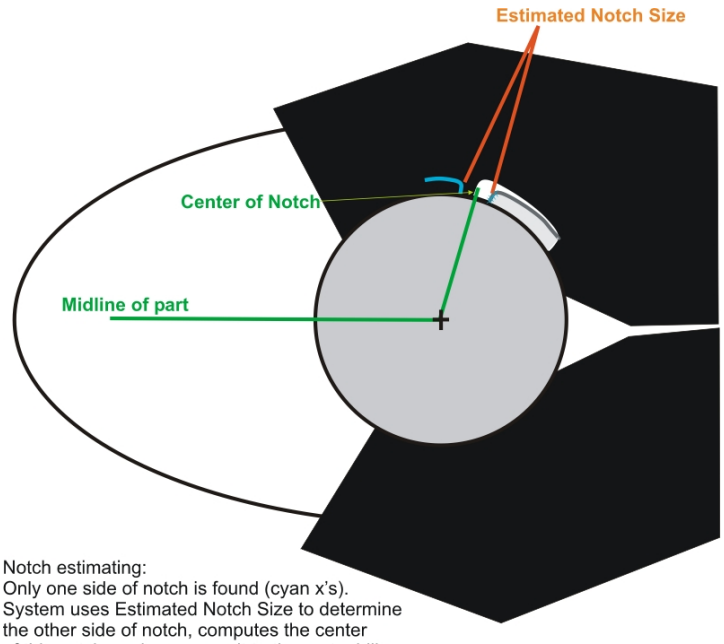
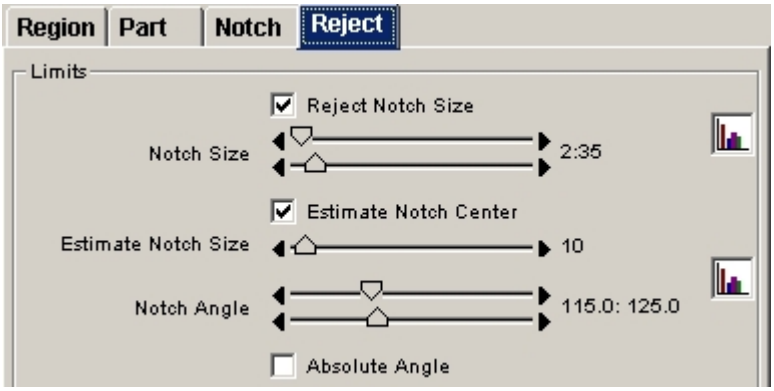
Show Notch Position

Displays a line from the center of the part (determined by registration) to the notch center.



Notch estimating:
Only one side of notch is found (cyan x's).
System uses Estimated Notch Size to determine the other side of notch, computes the center of this notch, and compares it to the part midline.

Notch Inspection Notch Reject Menu



Reject Notch Size

If checked, the notch size is used as reject criteria.

Notch Size

The minimum and maximum size that a valid notch can be. This is also used in Notch Estimating if only one side of the notch is visible in the window.

Estimate Notch Center

If checked, the system estimates the notch position if it sees only one side of the notch in the gripper finger window.

Estimate Notch Size

If the system sees only one side of the notch within the window, this parameter tells it where the other side of the notch would be.

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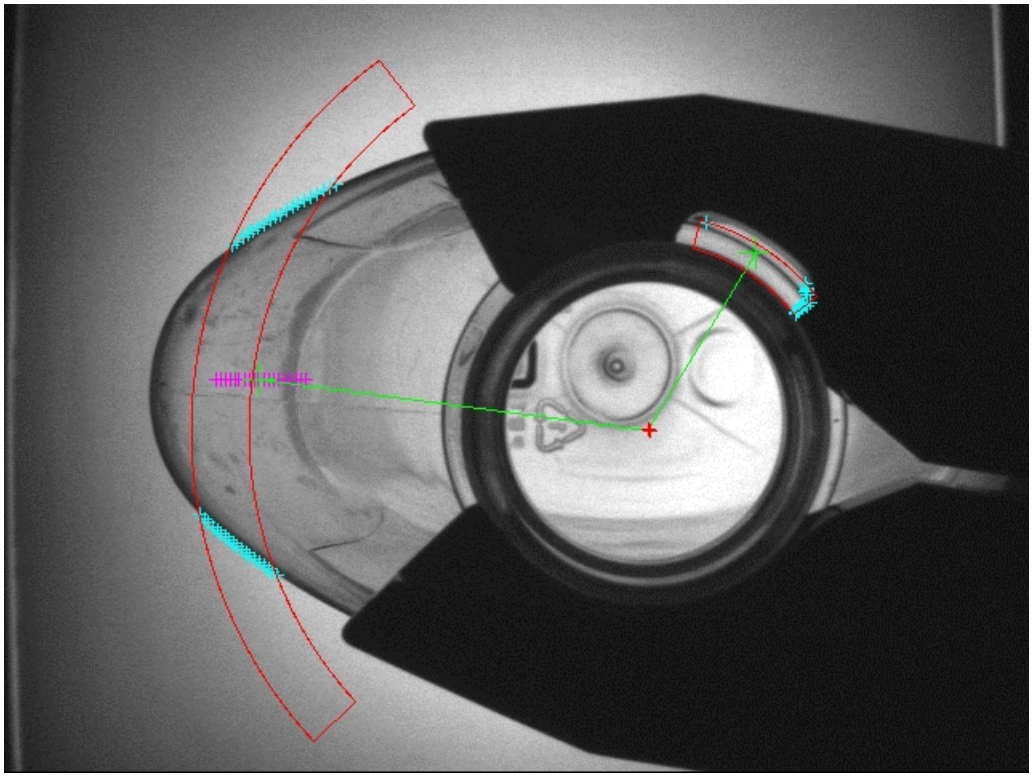
Notch Angle Min/ Max

This allows you to set the limits for the position of the notch with respect to the part. The system compares the midline position of the part to the middle of the notch. If this measured angle is smaller than or greater than Notch Angle values, the inspection fails.

Absolute Angle

This is used when the notch is at the same position as the part angle. This feature makes it easier to set reject values. For example, without this feature on, a +2 degree change in position would be reported as 2, whereas a -2 degree change in position would be reported as 358. This would make it difficult to set reject parameters. Using Absolute Angle in this example would make a +2 or -2 degree change in position to be reported as 2.

The image below shows that the system cannot find either edge of the notch - therefore the inspection fails.



Graphs – Notch Inspection

Part Position

This is a plot of the part position angle found in each image. It is helpful in determining the accuracy of the mechanical fixturing of the part. (See example next page)

Notch Angle Offset

This is a plot of the notch position angle with respect to the part position. This allows you to view and control the tolerance limits of the notch angle. The yellow limits are set through the Notch Angle parameters.

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Notch Width

This is a plot of the size of the found notch in each image. The yellow limits are determined by the Notch Size parameters.

ERROR DETAILS GRAPH

No Part

The number of parts that failed the Part menu criteria – either the part was not present, was grossly misshapen, or the system could not properly locate the edges of the part.

No Notch

The number of parts that failed because no valid notch was found.

Position

The number of parts that failed because the notch angle found did not meet the Notch Angle criteria.

Width

The number of parts that failed the Notch Size criteria.

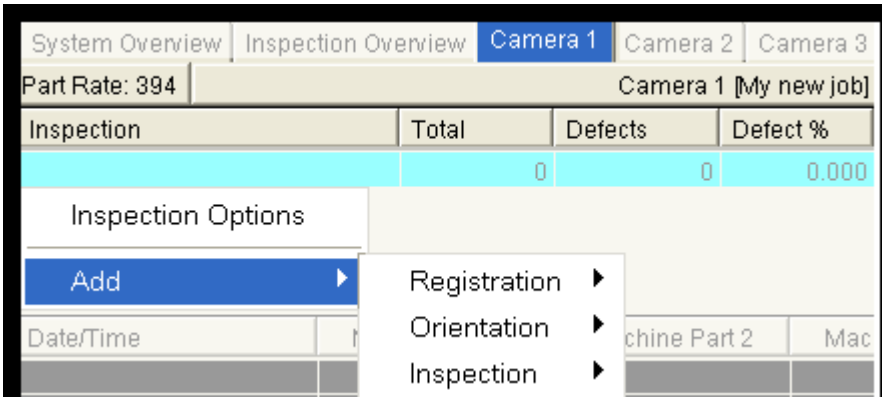
RECTANGLE BINARY INSPECTION

This uses a rectangular shaped region with binary inspection techniques.

Adding a Rectangle Binary inspection

To add the Rectangle Binary inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Rectangle Binary inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Rectangle Binary inspection region

A small square region appears on the image. Use the region menu to size and place the region. Make it surround the feature that you are inspecting, without including unnecessary background.

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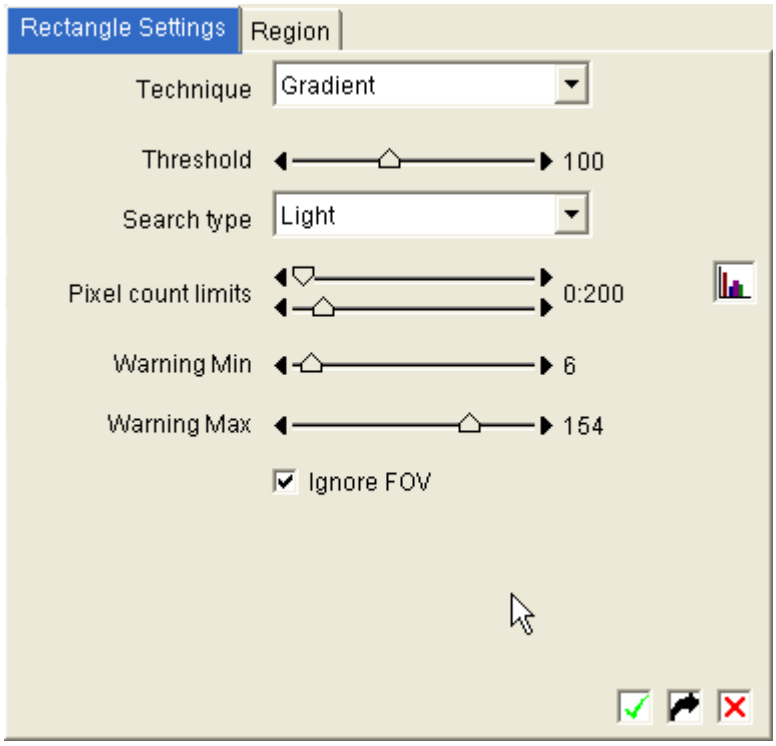
Adjusting the Rectangle Binary parameters

Rectangle Settings Menu



Technique

Choose whether to use a percentage of the Ambient, or use an actual gray scale value to define the binary threshold.

- **Gradient technique** - uses Threshold to determine what pixels are considered light or dark. For example, if Threshold = 128, all pixels in the search area with a gray scale value of zero - 127 will be considered dark pixels. All pixels with a gray scale value of 128 or higher will be considered light pixels.
- **Percent of Ambient technique** - uses a percentage of the found ambient to distinguish between light and dark pixels.

Threshold for Percent of Ambient technique

This percentage is used to compute the gray levels considered as light or dark pixels. The system computes the threshold as follows: Gray Level = Ambient *(Threshold / 100)

For example, if ambient = 200, and Threshold percentage = 50, Gray Level is 100. [200 x (50 / 100)] = 100.

In the example stated above, all pixels found with a gray level of zero - 99 will be considered dark pixels. Pixels with a gray level of 100 - 255 will be considered light pixels.

The following parameters are common to both techniques.

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Search type

Choose to count Dark pixels or count Light pixels. If your part is light and the flaws are dark, choose Dark.

Pixel Count Limits

The minimum and maximum number of pixels expected to be counted in the inspection region. Look at the Results screen while testing the inspection to determine the number of dark and light pixels expected in the area. **Warning Min** and **Warning Max** are available when you set Pixel Count Limits. If the number of dark or light pixels falls lower than Pixel Count Min or higher than Pixel Count Max, the part fails.

Warning Min

If the number of dark or light pixels falls between Pixel Count Min and Warning Min, a warning status is issued.

❖ *Note: Warning Min and Warning Max could trigger an* **excessive warning alarm** *(see "Excessive Warnings" on page 203) and light the yellow light on the light tree, if properly configured.*

Warning Max

If the number of dark or light pixels falls between Warning Max and Pixel Count Max, a warning status is issued.

Ignore FOV (Field of View)

When this parameter is enabled, the inspection will be ignored if part registration pushes the region out of the image field of view (FOV).

❖ *Note: This means that the inspection will not be run, yet the inspection will indicate that the part passed.*

Graphs - Rectangular Binary Inspection

There is one graph available for Rectangular Binary inspection. It is called Area Count and it shows how many pixels in the search area are considered dark or light pixels (depending on setup). A larger pixel count usually indicates more defects in the search area.

RECTANGLE GRAYSCALE INSPECTION

This inspection uses a rectangular shaped region with edge detection inspection techniques.

Adding the Rectangle Grayscale inspection

To add the Rectangle Grayscale inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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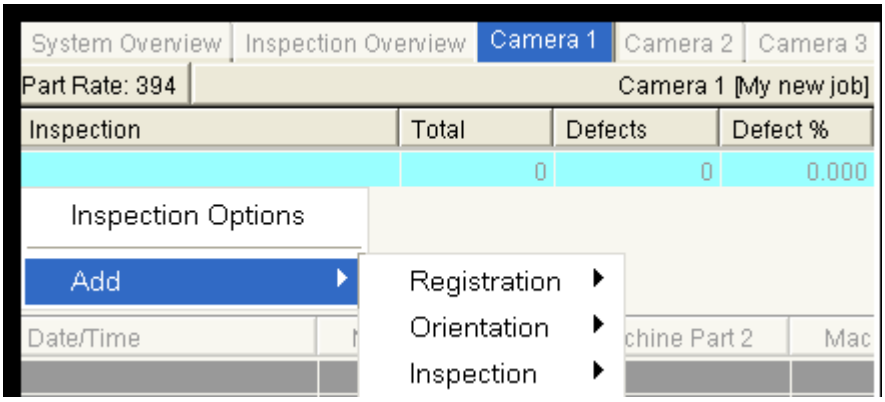
4) Right-click in the statistics area.



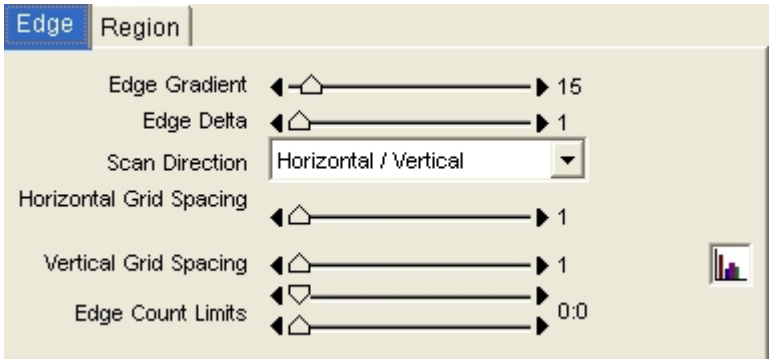
5) Select Add >> Inspection >> Rectangle Grayscale inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Rectangle Grayscale inspection region

A small square region appears on the image. Use the region menu to size and place the region. Make it surround the feature that you are inspecting, without including unnecessary background.

Adjusting the Rectangle Grayscale parameters

Edge Menu



Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Scan Direction

Defines the direction in which the system will scan for edges.

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- **Horizontal/Vertical** scans the area from left to right, then from top to bottom.
- **Horizontal** scans the area from left to right.
- **Vertical** scans the area from top to bottom.

Horizontal Grid Spacing/ Vertical Grid Spacing

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the grid spacing, the more accurate the inspection. The larger the grid spacing, the faster the inspection.

Edge Count Limits

Specify the minimum and maximum number of pixels expected to be counted in the inspection region. If the number of counted pixels is less than or greater than these values, the inspection fails.

Graph - Rectangular Grayscale Inspection

There is one graph available for Rectangular Grayscale inspection. It is called Edge Count and it shows how many edges were found in the search area. More edges usually indicate a larger defect or more accumulated defects.

SIDE FOLD INSPECTION

This inspection looks for folds in the neck area of PET containers, either in the dark area of the neck, or folds that are only visible on the edges of the container. It requires ***Shape Adapt registration*** (on page 276).

The types of folds this inspection looks for may be only visible as indentations in the side of the container, and may be as small as a single pixel in height. This inspection will look on the left and right sides of the container, in the specified region area, and find container profile changes.

This inspection is most effective when looking at a section of the container that has a constant angle. If it is used on a curve or change in direction, this inspection may not be as effective.

Adding a Side Fold inspection

To add the Side Fold inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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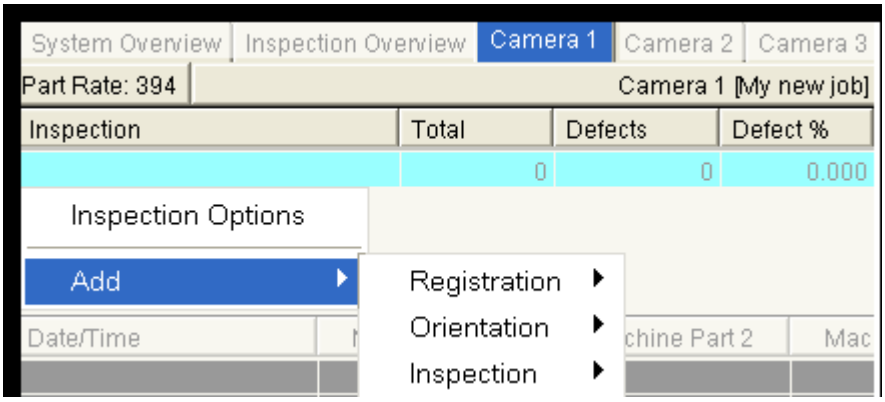
4) Right-click in the statistics area.

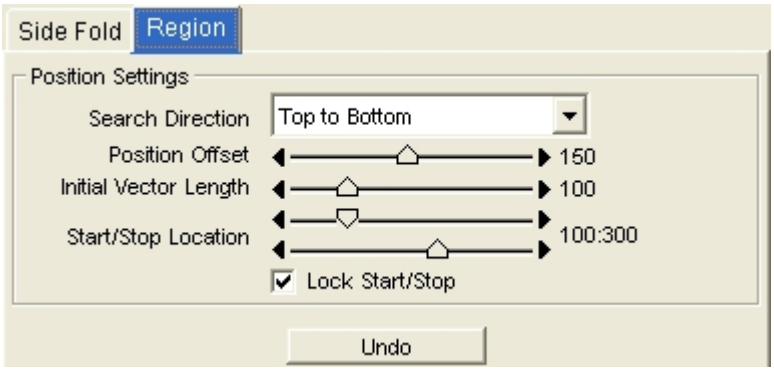


5) Select Add >> Inspection >> Side Fold inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Side Fold inspection region

The system displays an image with two search vectors. Position these vectors so that they are near the edges of the bottle. They search inwards for edges. The vectors are locked together, only in that they will re-size and move around the image at the same time.

Region Menu



Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image. The vectors are applied from the top of the "T" towards the bottom of the "T". You can also rotate the "T" (using right to left setting) in 90 degree increments to accommodate different image configurations.

Position Offset

Moves the search vectors closer together or further apart. The offset value is with respect to the centerline of the part.

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Initial Vector Length

The length of the first search vector (the length of the top of the "T"). This is typically longer than the remaining search vectors, to assure that the side of the container is located.

Start/ Stop Location

This is the length and position of the body of the "T".

Lock Start/ Stop

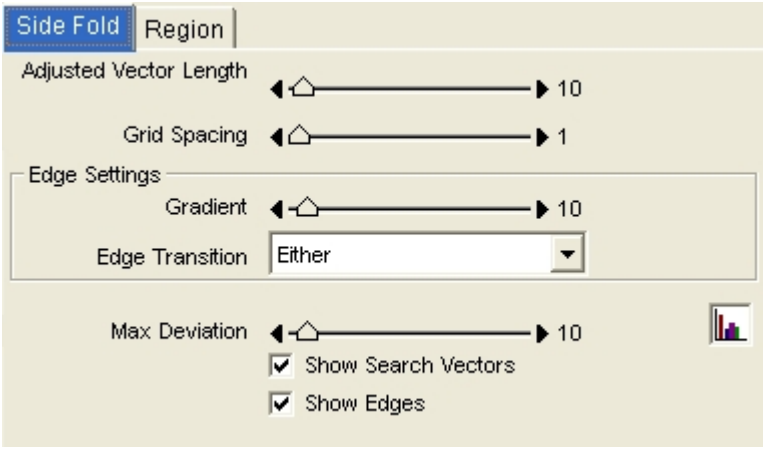
If checked, the length of the search region will not change when you adjust Start/ Stop Location.

Undo

Allows you to abort the current changes to the search regions and revert to the previous setup.

Adjusting the Side Fold parameters

Side Fold Inspection Parameters



❖ *Note: Enable Show Search Vectors and Show Edges to see the parameters we will describe next.*

Adjusted Search Length

The length of the search vectors after the first vector. The first vector length is determined from the Region menu (the length of the top of the "T") and is normally longer. The shorter length of the remaining vectors is used to optimize the analysis by taking less inspection time. The alignment of these vectors is based on the previous vectors' edge intersection point.

Spacing

The distance, in pixels, between side search vectors. Increase this only if you want to decrease the inspection time.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

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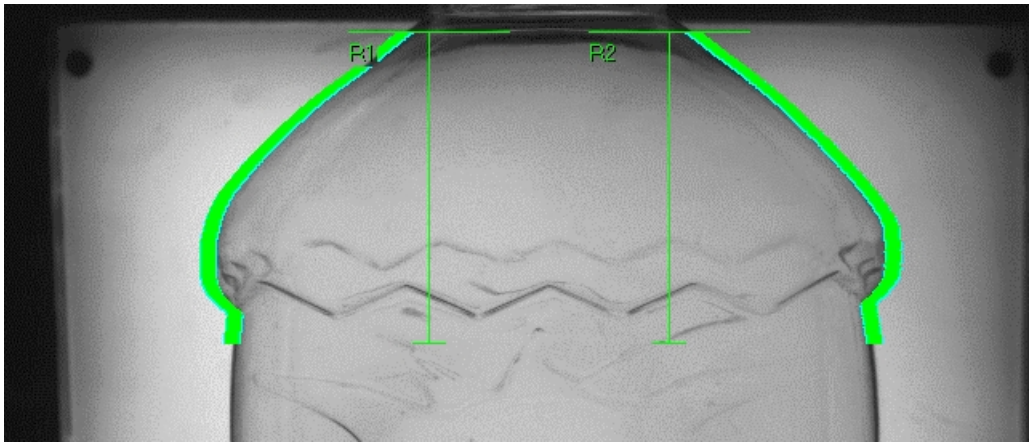
Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.



Max Deviation

The maximum allowable pixel deviation between search vectors. For example, if there were a neck fold, a search vector might fall many pixels inwards to find the edge of the bottle, thus causing the inspection to fail.

Show Search Vectors (or Search Lines)

Displays the search vectors. They are displayed in cyan. If the Max Deviation is exceeded, the search vectors are displayed in red.

Show Edges

Displays the found edges in the search regions. The edges are displayed in green if they meet all inspection criteria. An edge is displayed in red if the edge qualifications are not met.

Graphs - Side Fold Inspection

Maximum Deviation

This is the largest change found between search vectors used to look at the side profile of a part. Deviation usually indicates a problem with the profile of the part being inspected. Larger deviations indicate more severe changes in the profile.

Found Edges

This is the number of edges found in the search region for each part.

TRACKER INSPECTION

The Tracker Inspection encompasses several types of inspections within one analysis region. Each component of the inspection is designed to locate different types of defects. The benefit is that you need to place only one inspection region, but can program multiple types of inspections within that region.

The Tracker Inspection requires ***Tracker Registration*** (on page 286). The registration searches for a feature and generates edge points around that feature. The Tracker Inspection uses those edge points to accurately place the inspection region.

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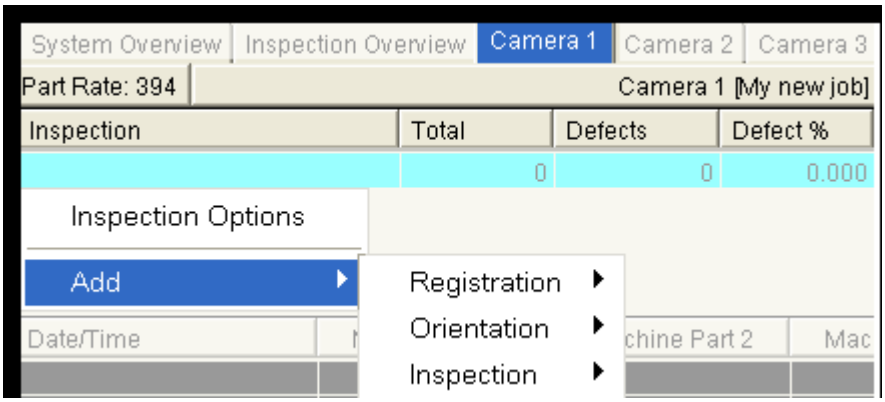
Adding a Tracker inspection

To add the Tracker inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.

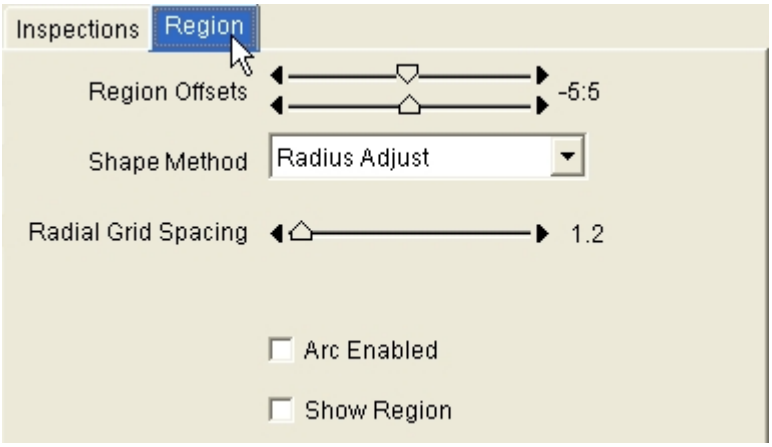


5) Select Add >> Inspection >> Tracker inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Tracker inspection region

Place the inspection region on the desired area of the part using the Region menu. The region follows the shape of the part, as the system learned in the Tracker registration.

Tracker Region Menu



Region Offsets

Use these sliders to place the search region with respect to the found edges from ***Tracker Registration*** (on page 286). An offset value of zero aligns the region exactly with the found tracker registration points. A negative offset places the region inside the found points, and a positive offset places the region outside the found points. You can have both offsets inside (negative values), or outside (positive values), if desired.

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Shape Method

There are three tracker shape methods from which to choose. These help you build the tracker shape that best fits your part.

- **Point to Point** – This builds the shape by simply connecting the registration points using straight lines. The result is a donut-shaped polygon with the number of points equaling the number of search vectors in the tracker registration.
- **Circle Fit** – This method uses all of the tracker registration points to determine a circle. The result is a typical circular donut. Note that if some edges were missed during registration, this circular donut may not fit the shape of your part.
- **Radius Adjust (most common)** – This method creates a curve between each tracker registration point. It adjusts the curve to match the radii of each found point, resulting in a region that closely follows the shape of the part.

Radial Grid Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Arcs Enabled

Allows you to inspect an arc instead of the whole region. The system will inspect a portion of the region between the Start and Stop angles. Make sure you have an Orientation in the job prior to using arcs. This will ensure that the inspection region is placed on the same location of the part regardless of the part's orientation.

Show Region

Displays the inspection vectors.

Adjusting the Tracker inspection parameters

Next, add the desired inspection components to best inspect your product, as recommended by your instructor or service engineer. Add the desired inspections by enabling them in the Tracker Inspections menu.

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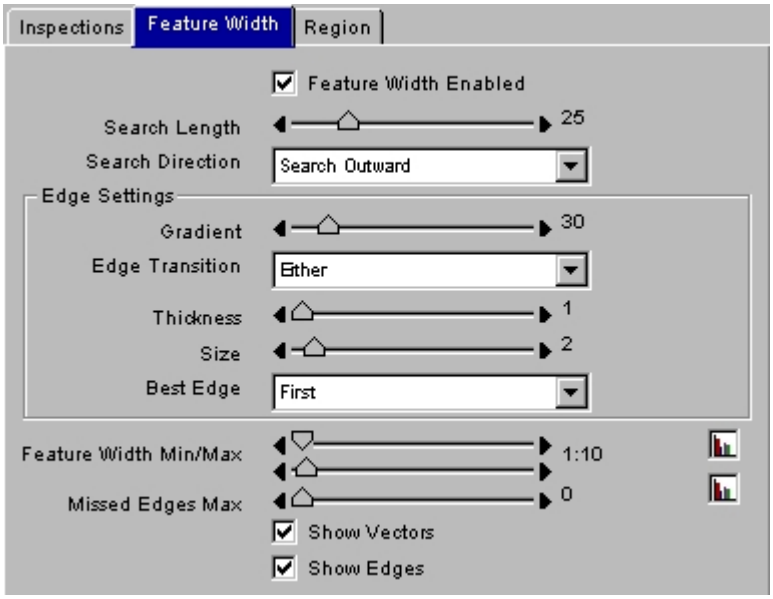
Feature Width Menu



Example of Feature Width usage: Feature Width inspection is good for locating short shots on a seal surface. The seal width is measured at each inspection vector by the system looking for the inner and outer edge transitions of the seal surface. Short shots typically have a smaller seal surface.

Feature width is computed from the found Tracker Registration points to a second edge that is found by the settings in this menu. If the registration does not locate the edge of the feature (say it was locating the midpoint of the feature), then the inspection may not measure the width you expect.

❖ *Note: Enable Show Vectors and Show Edges to view the following parameters on the image.*

Feature Width Enabled

Enables width inspection.

Search Length

The length of the feature width vectors (in pixels). The vectors start at the edge of the found feature (from the registration) and search inward or outward (depending on Search Direction) for another edge. These are displayed in yellow if Show Vectors is checked

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image. The search starts from the found edges of the Tracker Registration.

EDGE SETTINGS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

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Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Best Edge

Indicates whether to use the First edge that is above the threshold or the Strongest edge. The Strongest edge has the maximum contrast from the threshold.

Feature Width Min/ Max

The minimum and maximum number of pixels wide the found feature can be.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail.

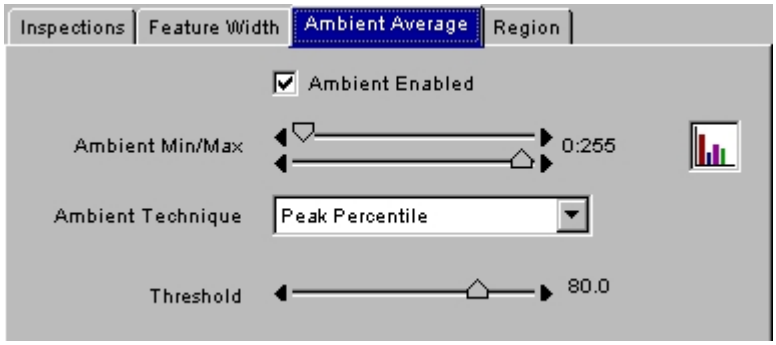
Show Vectors

Displays all search vectors. These are displayed as yellow vectors, extending as far as the Search Length.

Show Edges

Displays the found edges in the search regions. These are marked with green <<+>>.

Ambient Average Menu



Example of Tracker Ambient Average usage: the Ambient Average inspection is also good for detecting short shots, where the average gray level of a short shot would be lower than normal.

The ambient is computed by first averaging the gray level of the pixels in each inspection vector. Then, the system computes the average of all those gray levels. If you set a range of acceptable gray shades between Ambient Min and Max, you can detect short shots as the average gray level found would be too dark.

There are different techniques available to determine the ***ambient.*** (see "Ambient Inspection" on page 347) These are identical to those used in other inspections.

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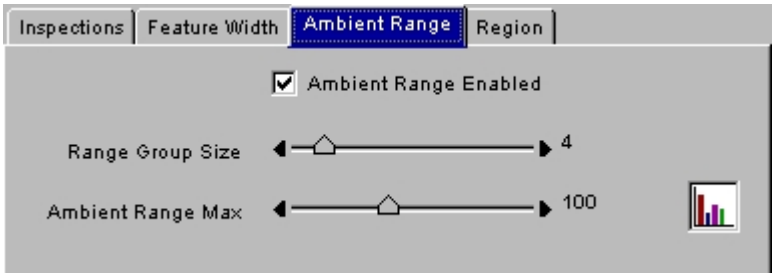
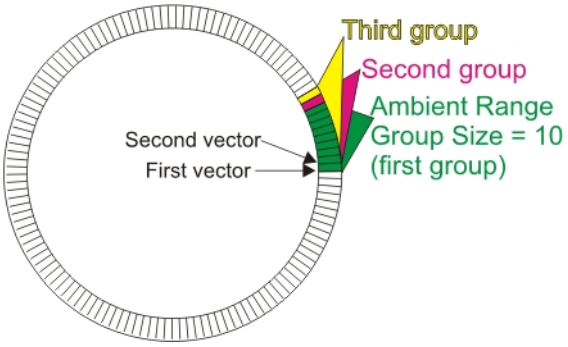
Ambient Range Menu



Example of Tracker Ambient Range inspection usage: in seal surface inspection, the Ambient Range inspection can be used to detect short shots and gross defects. The Ambient Range is the maximum allowable difference in average gray shade values throughout the inspection region. By setting a maximum allowable value for the difference in gray shades, the system can detect localized short shots due to a large variation in seal surface intensity. A gross defect can also have a large intensity change, and can be detected by this inspection.

The system uses a sliding group technique to inspect the entire inspection region. It computes the average gray shade for one group, then moves to the next group and computes its average gray shade. This process continues for all groups in the inspection region. Once each group's average gray shade is computed, the system uses the highest average gray shade, and the lowest average gray shade found. If the difference between these two values exceeds the Ambient Range Max, the inspection fails.



The first group's position is determined by the Start Angle, set in the Tracker Registration. After the system inspects the first group, it slides the region to the next vector, and inspects the next group. It continues this process around the entire inspection region.

Ambient Range Enabled

Enables the Ambient Range portion of the Tracker inspection.

Range Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

Ambient Range Max

The maximum allowable difference in average gray shade values throughout the inspection region. The system computes the average gray shade of each group. It uses the highest average gray shade and lowest average gray shade found.

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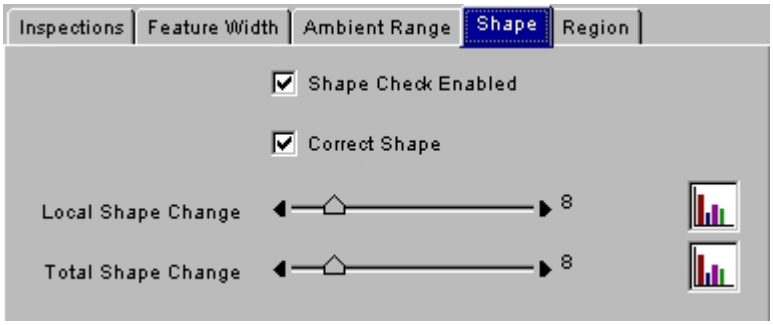
Shape Check



This inspection can check for ovality.

Shape Check Enabled

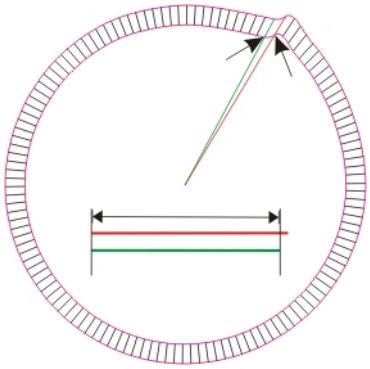
Enables the Shape Check portion of the Tracker inspection.

Correct Shape

Allows the system to correct bad region points. The region points will be corrected to fall within the Local Shape Change limit.

Local Shape Change

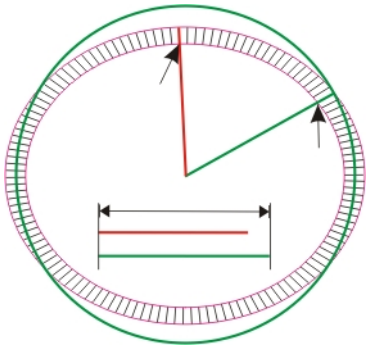
The maximum allowable pixel difference in the length of consecutive radii around the inspection region.



Total Shape Change

The maximum allowable pixel difference in length of all radii around the inspection region.

❖ *Note: This inspection is good for detecting ovality.*



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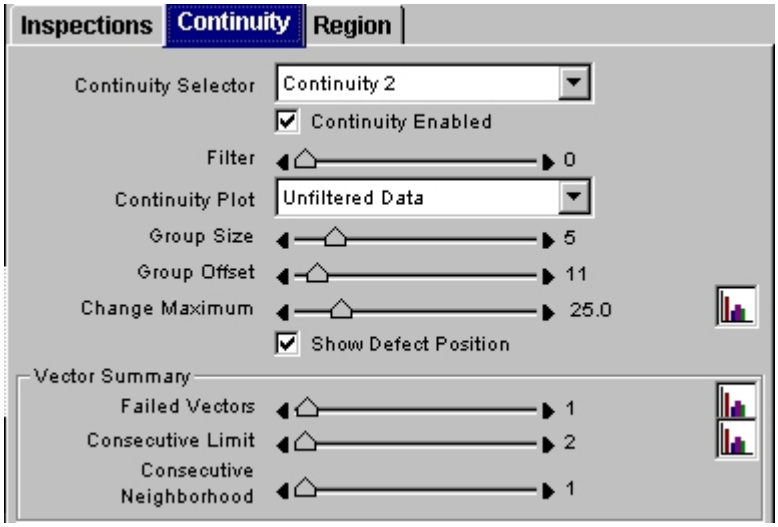
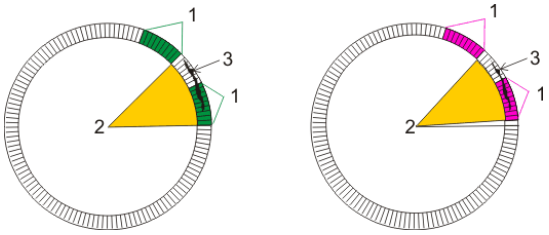
Continuity Menu



This portion of the inspection looks for lack of continuity around the inspection area. It uses groups of vectors to locate intensity changes. Small group sizes are good for finding rapidly changing high contrast defects, such as nicks. Larger group sizes are used to catch slower changing low contrast defects, such as localized short shots. You can apply up to five continuity inspections in one region to search for different defects. Set each to look for specific defects: small scratches, large scratches, shallow cuts, deep cuts, etc.

The position of the first vector is determined by the Start Angle, which is set during Tracker Registration.

After the first two groups of vectors are compared (left side of diagram), the system moves to the next vector, re-computes the average gray shade of the next two groups, and repeats the comparison of gray shades (right side of diagram).



1	continuity group = 10
2	offset = 16
3	defect

Continuity Selector

Use the Continuity Selector to determine which continuity check is being configured – each one must be enabled and configured independently.

Continuity Enabled

Enables or disables the continuity portion of the inspection. Note: this is the same as checking the Continuity *n* box in the Tracker Inspections menu.

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Filter

This is a smoothing filter used to decrease sensitivity to high frequency gray level variance. For example, if normal good metal stock has a visible grain, the Filter can be used to eliminate false rejects of good product. A higher value decreases sensitivity.

Continuity Plot

Shows what the inspection area looks like before and after filtering. On the Filtered Data plot, you can see that the difference between the max and min gray levels for the area can be greatly reduced as compared to Unfiltered Data. To remove the plot, click another parameter.

Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

Group Offset (or Delta Offset)

The number of vectors away to begin the next group. For larger defects, use a larger offset. For smaller defects, use a smaller Group Size and Group Offset.

Change Maximum

The maximum allowable change between two groups. This number is entered as a percentage of change. A higher percentage makes the inspection less sensitive.

Show Defects (or Show Defect Position)

Displays the failed vectors.

VECTOR SUMMARY

Using both **Failed Vectors** and **Consecutive Limit** together allows you to control the size of defects you want to catch.

Failed Vectors

The number of vectors allowed to fail before the whole inspection fails. This feature allows the inspection to detect small defects and only fail if there are too many of them.

Consecutive Limit (or Consecutive Failed)

The number of consecutive vectors allowed to fail before the whole inspection fails. This feature ensures that any defect larger than this number of vectors will fail. This is a total number of vectors throughout all continuity checks (could be from failing continuity checks 3, 2, and 1 consecutively).

Consecutive Neighborhood

Defines what Consecutive means. Examples:

- 1 = consecutive vectors must be next to each other
- 5 = consecutive vectors can be up to 5 vectors apart

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Graphs - Tracker Inspection

There are graphs available for all the Tracker inspections. Each is available only when the corresponding inspection has been added to the job. For example, the Feature Width graphs only appear when you have enabled the Feature Width inspection to the Tracker inspection.

Feature Width Minimum

This is a plot of the minimum values found for the feature width. It is helpful in setting up the Feature Width minimum value. The limits shown on the graph are set by the Feature Width Min/ Max parameters.

Feature Width Maximum

This is a plot of the maximum values found for the feature width. It is helpful in setting up the Feature Width Maximum value.

Feature Width Average

This is a plot of the average width found on the feature (e.g., seal surface) for each part.

Feature Missed Edges

This is a plot of the number of edges missed while trying to locate the feature, for each part.

Ambient Average

This is a plot of the average gray shade of the inspection region, for each part.

Ambient Range

This is a plot of the difference between the minimum and maximum gray shade values of the inspection vectors within a group of inspection vectors.

Shape Local Deviation

This is a plot of the maximum difference in the length of inspection vectors between two consecutive vectors throughout the inspection region.

Shape Global Deviation

This is a plot of the difference in length of inspection vectors from the shortest vector to the longest vector found. The system uses all the inspection vectors in this comparison.

Continuity Contrast Change

This is a plot of the percentage of difference in gray shade value between continuity analysis groups. The system plots the maximum change percentage found on each part.

Failed Vectors

Plots the number of failed vectors in the continuity analysis.

Consecutive Failures

Plots the number of consecutive failed vectors in the continuity analysis.

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ERROR DETAILS GRAPH

FOV (Field of View)

The number of parts that failed because the inspection region could not be generated. A Tracker Registration is required to generate the inspection region. A registration might fail because a part fell outside of the image, the part was grossly misshapen, or other factors.

Ambient Average

(If Ambient Average inspection is enabled) The number of parts that failed the Ambient Maximum and Ambient Minimum criteria.

Ambient Range

(If Ambient Range inspection is enabled) The number of parts that failed the Ambient Range Maximum criteria.

Local Shape

(If Shape Checking is enabled) The number of parts that failed the Local Shape Change Maximum criteria.

Global Shape

(If Shape Checking is enabled) The number of parts that failed the Total Shape Change Maximum criteria.

Feature Width

(If Feature Width is enabled) The number of parts that failed the Minimum Feature Width and Maximum Feature Width criteria.

Bad Edge

(If Feature Width is enabled) The number of parts that failed the Missed Edges Maximum criteria.

Bad Vectors

The number of parts that failed because the pixels in any search vector were invalid.

Continuity

(If Continuity *n* Checking is enabled) The number of parts that failed the Continuity *n* Change Maximum criteria.

CIRCLE WIDTH DIMENSION INSPECTION

Circle Width Dimension has two circles or donuts, between which dimension measurements are made. The difference between Circle Dimension and Circle Width Dimension is the number of inspection regions; Circle Dimension has one donut, and Circle Width Dimension has two donuts. Circle Width Dimension is excellent for measuring donut-shaped areas, such as Seal Surface or Flange Width.

Adding a Circle Width Dimension inspection

To add the Circle Width Dimension inspection:

1) Log in as Administrator.
2) Select the desired channel.

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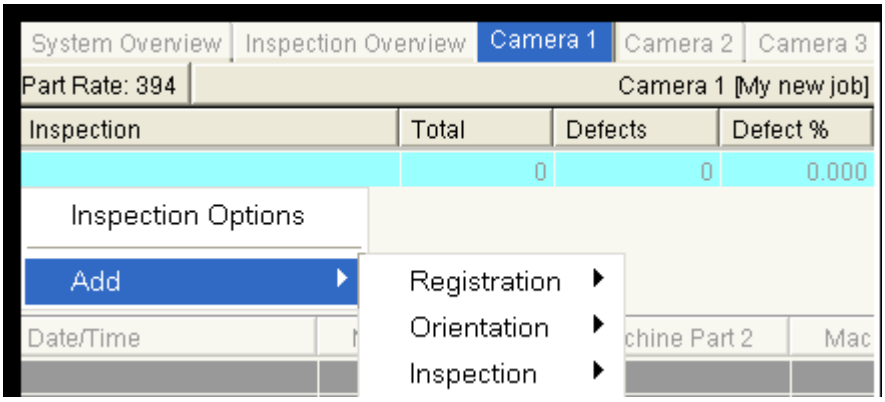
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.

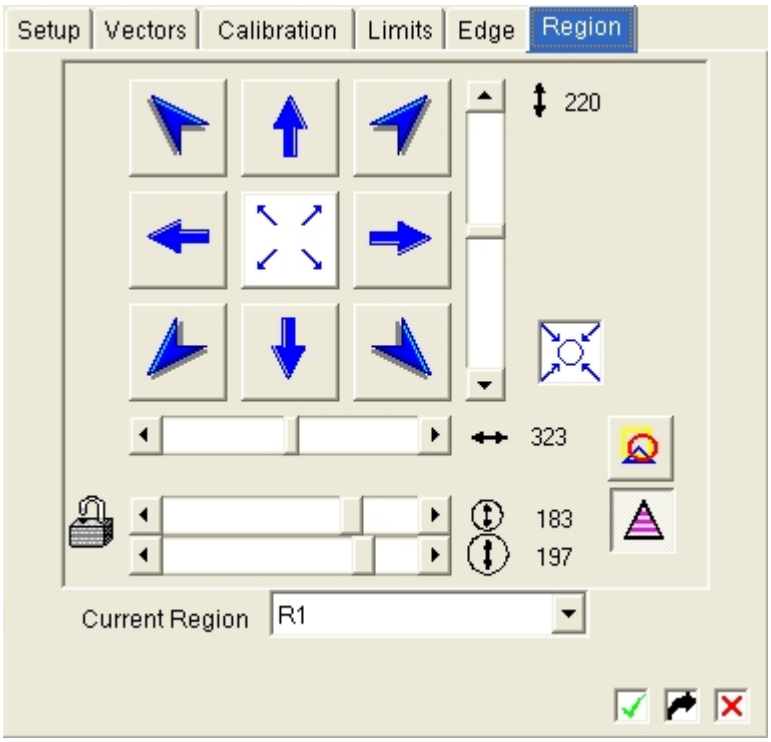


5) Select Add >> Inspection >> Circle Width Dimension inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Circle Width Dimension inspection region

To place the inspection regions:

1) Using the Region menu, place the first inspection region (R1) to surround one edge you wish to locate – say, the outer edge.



2) From the Current Region drop-down menu, select the other region (R2).

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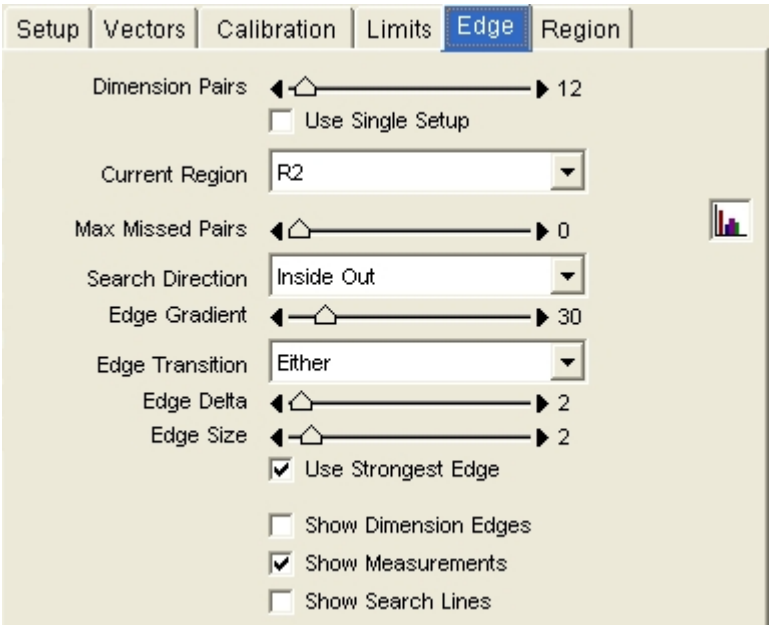
3) Place the second inspection region to surround the other edge you wish to locate – perhaps the inner edge. The system will search for edges in both these regions, using edge detection techniques. Set the edge criteria in the Edge menu.

Adjusting the Circle Width Dimension inspection parameters

Edge Menu



Dimension Pairs

The inspection sends a search vector in both directions from the registration reference point. These search vectors find an edge, and the system computes the distance between the edges. One Dimension Pair sends a search vector in two directions. Check Show Search Lines to see these Dimension Pairs. This inspection supports up to 360 Dimension Pairs.

Use Single Setup

If checked, the system uses the same criteria to find the edge of the part within both inspection regions. If un-checked, the system allows you to set separate edge detection criteria for Regions 1 and 2. For example, you might want the system to search inside to out to find the inner edge, and search outside to in for the outer edge.

Regardless of whether the Use Single Setup box is checked, the system will use the same number of **Dimension Pairs** between regions – this is how the difference between regions is computed.

For the parameters below, you may set the criteria differently for the two search regions if Use Single Setup is un-checked.

Current Region

Choose one region to program the search vectors.

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Max Missed Pairs

The maximum number of Dimension Pairs allowed to fail before the whole inspection fails.

Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Use Strongest Edge

Indicates whether the system should locate the first edge or the strongest edge that meets the gradient criteria. The strongest edge is the greatest change in grayscale value found above the gradient.

Show Dimension Edges

Displays the found dimension edges. Region 1 edges are cyan and Region 2 edges are shown in magenta, as shown in the example below.

Show Measurements

Displays where the measurement calculations are being made.

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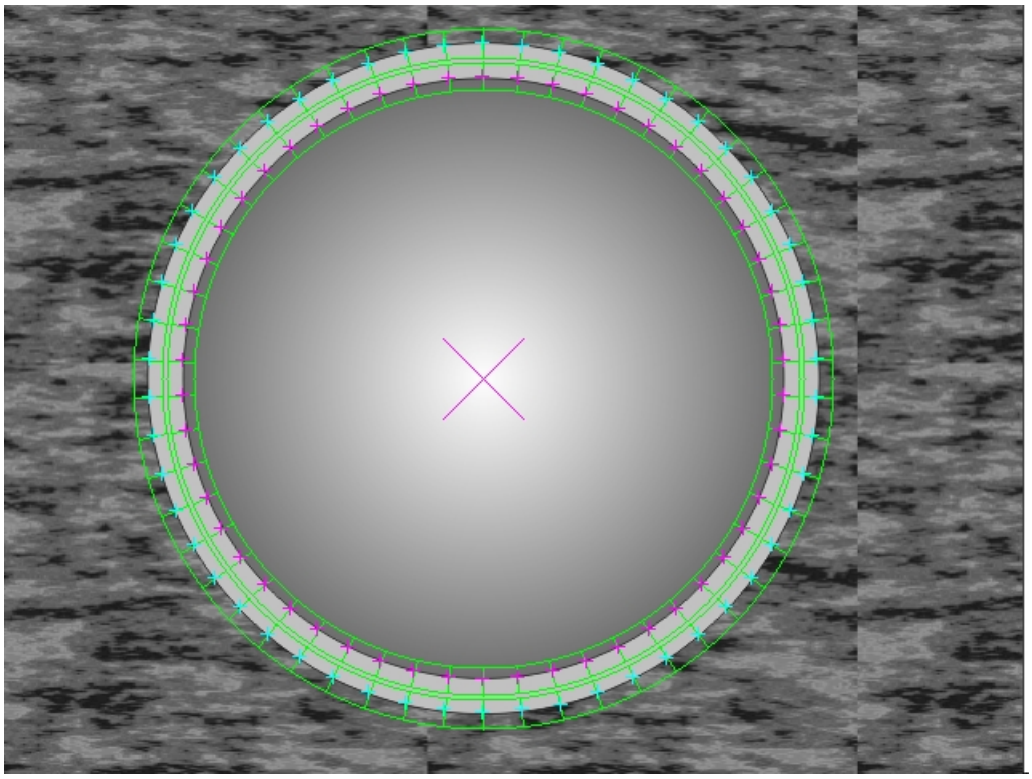
Show Search Vectors (or Search Lines)

Displays the search vectors.



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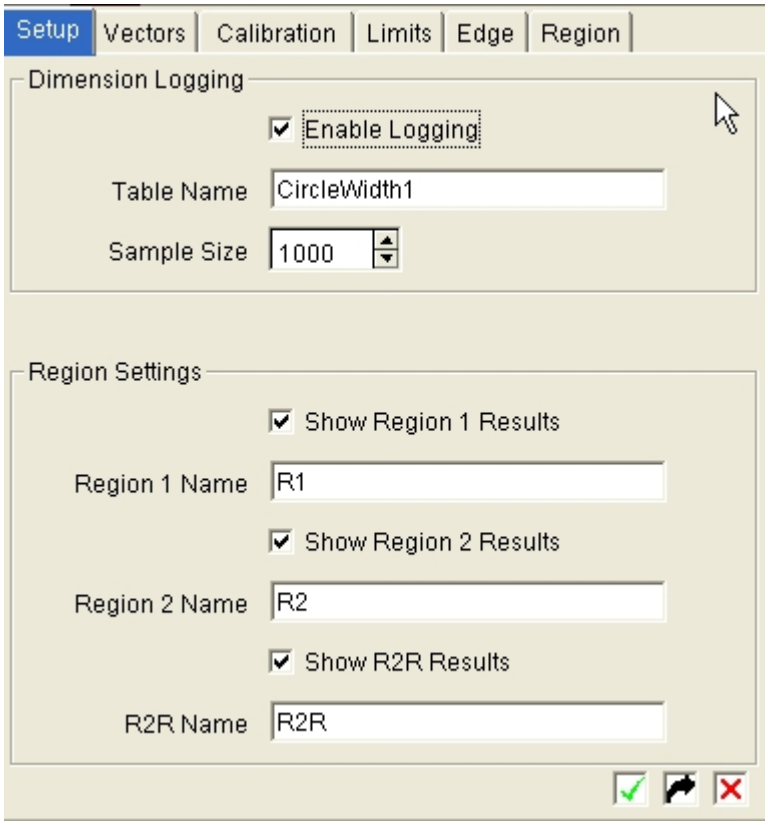
Setup Menu



This menu allows you to choose the dimension units in which the measurements are reported.

DIMENSION LOGGING

Enable Logging

This inspection offers a database that logs dimension information. This feature is useful for process monitoring so that you can view the average measurements over time.

Table Name

Rename the *TableName* to something more meaningful to you. The name is limited to 19 characters.

Sample Size

The number of parts' data that are averaged before the information is written to the database. Note: Defective parts data is not included in the average calculations.

To generate the Dimension database:

Put the system online to inspect parts. The database will start collecting data when enough good dimension measurements have been taken (example: if Sample Size = 1000, the system will wait until it has collected data from 1000 parts with good dimension inspections).

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To view the Dimension database:

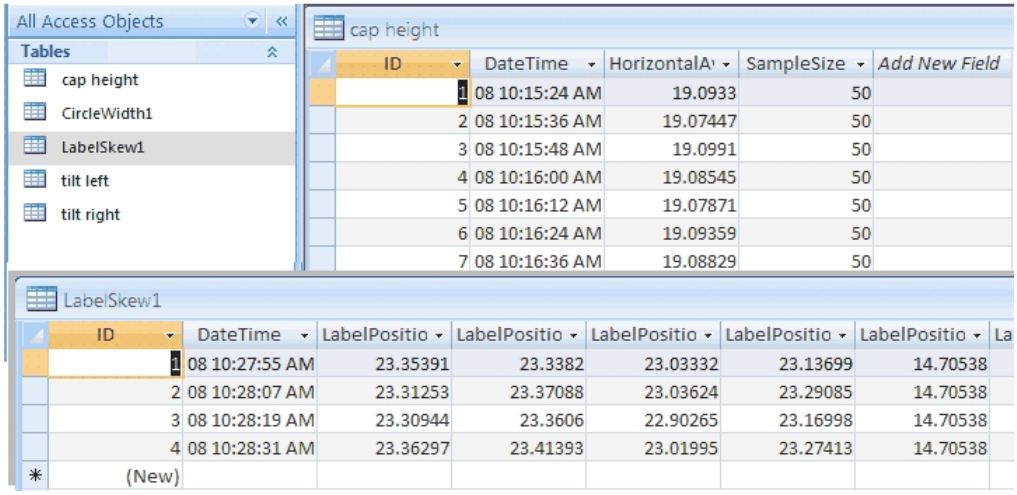
1) Take the Intellispec offline. The database is saved as C:\Intellispec\Data**Dimension.mdb**.
2) Use the Windows Explorer function to copy it to a floppy diskette or ***USB device*** (see "Copying Files to USB Device" on page 97).

A new record is created for each sample set (when the Intellispec collects data from *n* number of parts with inspections that passed).

If the Intellispec has not yet found enough parts to create an average, no database information is saved. That is, if Sample Size = 1000, and only 970 parts have passed inspection, no database information is saved.

❖ *Note: If you have more than one Dimension-type inspection, a separate table will be created for each inspection within the Dimension.mdb file. You will have a different TableName for each inspection. The Dimension-type inspections include: Dimension, Circle Dimension, Circle Width Dimension, Fill Height, and Label Skew Dimension inspections.*

A sample database with two different inspection tables is shown below:



REGION SETTINGS

These settings affect what is displayed on the Results screen. They do not affect what is displayed on the image.

Show R1 Results

Displays R1 measurements on the Results tab.

Region 1 Name

Name the region something more meaningful to you.

Show R2 Results

Displays R2 measurements on the Results tab.

Region 2 Name

Name the region something more meaningful to you.

Show R2R Results

Displays the difference in measurements between R1 and R2 on the Results tab.

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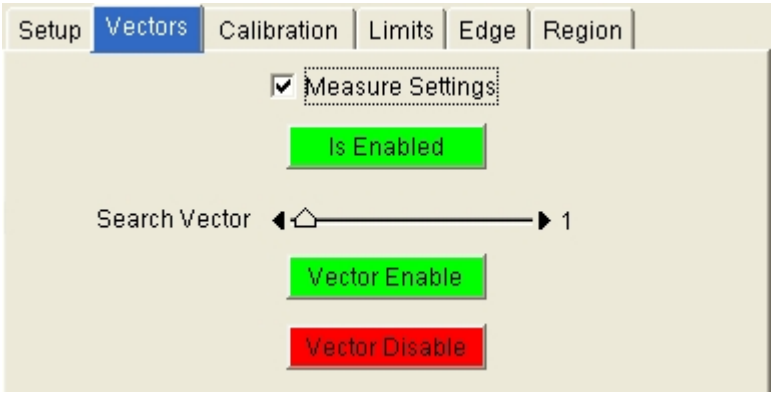
Region R2R Name

Name the region something more meaningful to you.

Vectors Menu



This menu allows you to selectively enable or disable individual vectors. You might choose to disable certain vectors where they cross an acceptable process anomaly, such as a logo, mold line, etc. If you do this, be sure to insert an Orientation prior to this inspection to ensure consistent placement from part to part.

Disabling vectors is also useful to ignore conveyors or other machine components if they are intrusive in the image.

Note that vectors are enabled and disabled in their dimension pairs.

❖ *Note: If you want all search vectors to inspect your part, you do not have to enter this menu or change anything.*

Measure settings

Enables the ability to enable or disable individual vectors. If you disable vectors and then un-check this box, all vectors become enabled again.

Is Enabled

Indicates the status of the current vector.

Search Vector

Scroll through each vector – each one will be highlighted on the image. Choose Vector Enable or Vector Disable for that vector.

Vector Enable

Enable the currently selected vector.

Vector Disable

Disable the currently selected vector.

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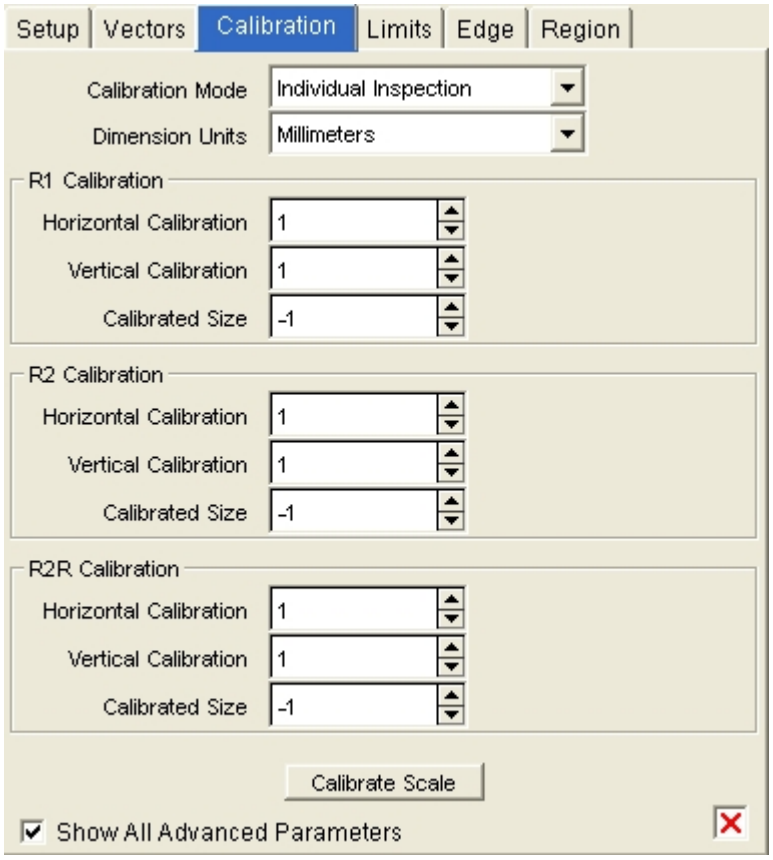
Calibration Menu



Calibration Mode

The system will convert the pixel dimensions into your preferred unit of measurement.

- **Channel** - the inspection will use the channel calibration parameters to convert the dimensions into real world values. The system Administrator can specify the units of measurement by right-clicking on the image and selecting ***Pixel Calibrate*** (see "Pixel Scale Calibration" on page 182). If you have calibrated the system to a carefully measured or Golden Part, the system will use those calibrated units.
- **Individual Inspection** - use this option to convert a pixel-to-unit of measurement ratio, and calibrate the system through the parameters below.

Dimension Units

Choose your preference in the reporting of the dimension calculations. Choose from millimeters, inches, pixels, and custom. Custom allows any conversion factor to be used.

❖ *Note: The following parameters are available for Individual Inspection calibration mode. It is best to set these parameters after you have placed the inspection regions, and after you have set up the Edge parameters.*

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Horizontal/ Vertical Conversion

This indicates the pixel size and is used to convert one pixel into the units selected. The initial conversion will be controlled by the Calibrate Scale results. From this parameter, you can override this calibration factor or choose to calibrate the dimension using the result of a specific measurement.

After adjusting the horizontal or vertical conversion factor, click the **Accept** button.

Calibrated Size

This is used to calibrate the pixel scale of the current inspection. A setting of [-1] disables this parameter.

Use a part, such as one on which you are currently programming a job, and measure it (with calipers or a ruler) exactly where you would have the inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Enter your measured value.

Calibrate Scale

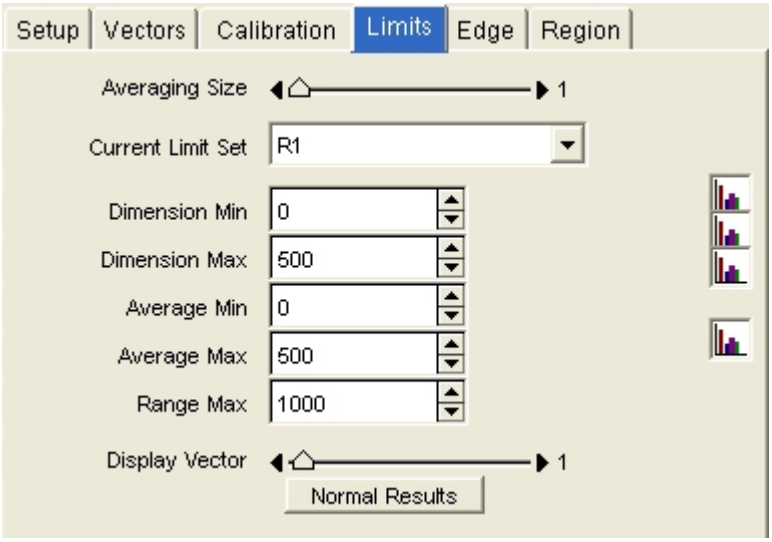
Press this after you have entered the correct Calibrated Size. The system will use the pixel-to-unit of measurement ratio as specified in the Horizontal and Vertical Calibration parameters. If you see an error, make sure you have your inspection regions properly placed on the image. Also make sure the Edge parameters are set up correctly.

Each region – R1, R2, and R2R (the difference between the two) – is calibrated separately.

R2R Calibration

Name may vary – it can be customized in the Setup menu. Measure the difference between regions on your part and enter the difference in the Calibrated Size box under R2R Calibration.

Limits Menu



This menu determines the tolerance of the dimension measurements.

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❖ *Note: The dimension limits are computed for each region. You must select a region from the Current Limit Set drop-down menu to adjust its limits.*

Current Limit Set

Select the current region to set its limits. Each region's limits must be set separately.

Averaging Size

This is a sliding window that averages the dimensions of *n* vectors. This allows the inspection to filter the data and ignore spikes or small changes between vectors, and catch changes that happen over several vectors.

- If *n* = 1, there is no averaging.
- If *n* = 2, then it averages the measurements of vectors 2 and 3, then 3 and 4, 4 and 5, etc.
- If *n* = 10, then it averages the measurements of vectors 1 through 10, then 2 through 11, 3 through 12, etc.

Dimension Min

The smallest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup.

Dimension Max

The largest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup.

Average Min

The smallest acceptable value for the average dimension (diameter) measured across the circle.

Average Max

The largest acceptable value for the average dimension (diameter) measured across the circle.

Range Max

The largest acceptable difference between the Minimum distance measured, and the Maximum distance measured across the circle. This parameter checks for ovality.

Display Vector

Displays inspection results for the selected vector in the Results tab. The vector and its opposite vector are highlighted on the image. To see measurement results, the boxes labeled Show R1, R2, and R2R Results must be checked in the Setup tab.

Normal Results

If you have been displaying results for individual vectors through the Display Vector scroll bar, this returns the Results tab to normal inspections results display.

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COLOR CODING

When you test Circle Width Dimension inspection in the limits menu, several color diagnostics are placed on the image. These distinguish the different measurements. Several of these color edges are only displayed if you check Show Dimension Edges in the Edge menu of this inspection.

- **Green** - a measurement that passed.
- **Red** - a measurement that failed.
- **Magenta** - the largest value. There are X's on the inner and outer features. The lines represent the largest width between the features.
- **Orange** - the smallest value. There are X's on the inner and outer features. The lines represent the smallest width between the features.
- **Black** - When you select R1, the R2 edges are "blacked out". The opposite happens if you select R2. When you select R2R, both regions are shown in pass/fail colors only (no magenta or orange).

Graphs - Circle Width Dimension Inspection

There are graphs available for Region 1, Region 2, and R2R measurements. They each consist of the following:

Missed Edge Pairs

This plots the number of Dimension Pairs that failed inspection for each part.

Minimum Distance

This plots the smallest distance measured across the circle for each part.

Maximum Distance

This plots the largest distance measured across the circle for each part.

Average Distance

This plots the average distance measured across the circle for each part.

Dimension Range

This plots the difference between the smallest and largest distances measured across the circle for each part.

Raw Values

This plots the actual dimensions measured for the dimension pairs that found edges. For the R2R measurements, this plots the difference in dimensions found between the two regions. It plots a value for each difference that it can compute – that is, for each dimension pair that found edges in both regions. So the Total Parts Count in this graph is the total number of Dimension Pairs that found edges in both regions at the same radial spoke.

Position Plot

This is a plot of the edge positions for each region. It is valid for the current image only. It shows the profile of the part no matter what the scale (pixels, mm, etc).

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LIGHT METER INSPECTION

This inspection adjusts the lighting automatically while the system is online. This prevents spoilage due to normal process variations. Automatic adjustment of the lighting allows the system to compensate for the following:

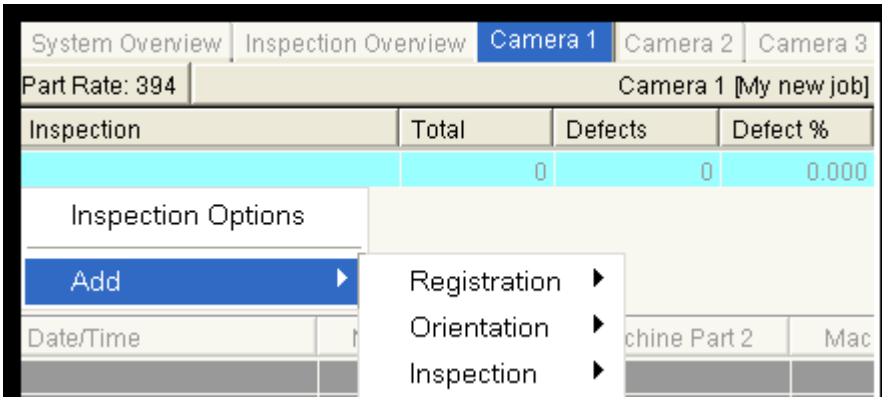
- Brightness variations of the stock
- Part variations due to washer and other process variables
- Change in lighting brightness due to the age of the lights
- Dust/ oil accumulation on the lighting and optics components such as lens and diffuser

The Light Meter inspection compares the average gray level of a one pixel wide inspection region to the Gray Level Range min/ max values. If too many parts do not fall within this range, the lighting will be automatically adjusted to compensate.

Adding a Light Meter inspection

To add the Light Meter inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Light Meter inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Light Meter inspection region

Through the Region menu, place the one pixel wide inspection region on an area of the part that is usually consistent in gray levels from part to part. The gray levels of the pixels on this circle are averaged, then compared to the Gray Level Range.

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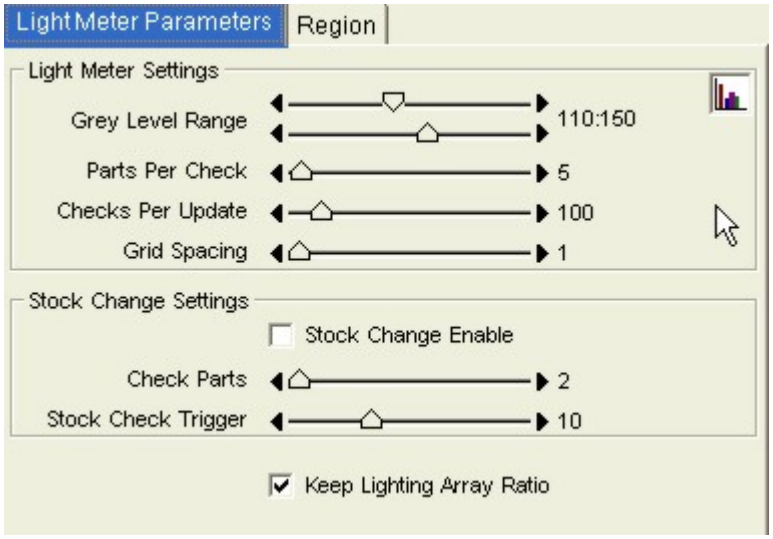
Adjusting the Light Meter Parameters

Light Meter Parameters



Gray Level Range

The system measures the gray level of each pixel of the inspection region and averages those values. This average gray level must fall within the Gray Level Range, or the lighting will be adjusted so that it does. We recommend that, for very high speed inspection lines, you make the range as wide as you can tolerate.

❖ *Tip: run several parts through* **Image Analysis** *(see "About the Image Analysis tool" on page 185) and note the gray level range. This will help you set values in Light Meter. (You must exit the inspection to run Image Analysis. Right-click Image >> Image Analysis. Right-click the* *button to put into Continuous Snap mode). Use the same radius in Image Analysis as the inspection region in Light Meter.*

Parts Per Check

The number of parts that will be inspected between gray level checks. The faster your inspection line, the more parts should be used (at least 20-50).

Checks Per Update

The number of gray level checks that will be performed before the lighting is adjusted.

Grid Spacing

Used to define search density. A value of one searches each pixel on the inspection circle, a value of two searches every other pixel, etc. The smaller the grid spacing the more accurate the inspection. The larger the grid spacing, the faster the inspection.

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STOCK CHANGE SETTINGS

Stock Change Enabled

When this is checked, the system will compensate for abrupt, but enduring, changes in part brightness, such as when your production line changes stock material. Stock Change is designed to make larger and faster changes to the lighting than the Light Meter normally makes. When Stock Change is enabled and a gray level difference of *n** or more is encountered, Light Control will be adjusted to bring the part brightness back to within the Gray Level Range.

The number of parts checked for Stock Change is specified by the Check Parts parameter (*x*).

Un-check this box to use Auto Stock Change (ASC).

Check Parts

(**x = number of consecutive parts = Check Parts**) Specifies how many consecutive parts must be found with a gray level difference of *n** or more from the Gray Level Range. This would indicate a change in stock material.

Stock Check Trigger

(***n = Stock Check Trigger value**) Specifies the how far outside of the Gray Level Range that automatic lighting adjustment will be triggered. For example, if Gray Level Range is 110 to 150 and Stock Check Trigger is 10, then lighting would automatically be adjusted if the gray level of *x* parts measure 100 or less, or 160 or higher.

A good starting point for Stock Check Trigger would be 10 or 15. If this is set lower, then automatic adjustment would occur too often.

Keep Lighting Array Ratio

If this is checked, the system adjusts all the lighting arrays by the same amount.

Graphs - Light Meter Inspection

One graph is available for the Light Meter inspection, called Light Meter Gray Level. It simply shows the average gray level for the inspection region on each part. The yellow limits are set by the Gray Level Range parameter.

HARMONIC INSPECTION

The Harmonic inspection is designed for inspecting parts that have radially symmetric features, such as metal crowns, plastic closures, and lugged closures.

This inspection learns the pattern of gray shades in a region of interest (ROI) on a part. During inspection, it compares the pattern of each inspected part to the learned population. The ROI can be divided into segments. The inspection will determine whether any segment is too bright or too dark, and also determine whether there are defects based on the absence or presence of pattern elements.

Adding a Harmonic inspection

To add the Harmonic inspection:

1) Log in as Administrator.

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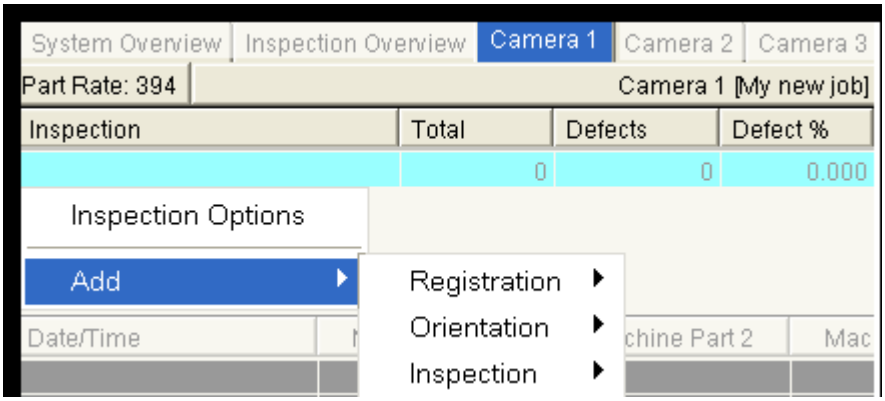
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Harmonic inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

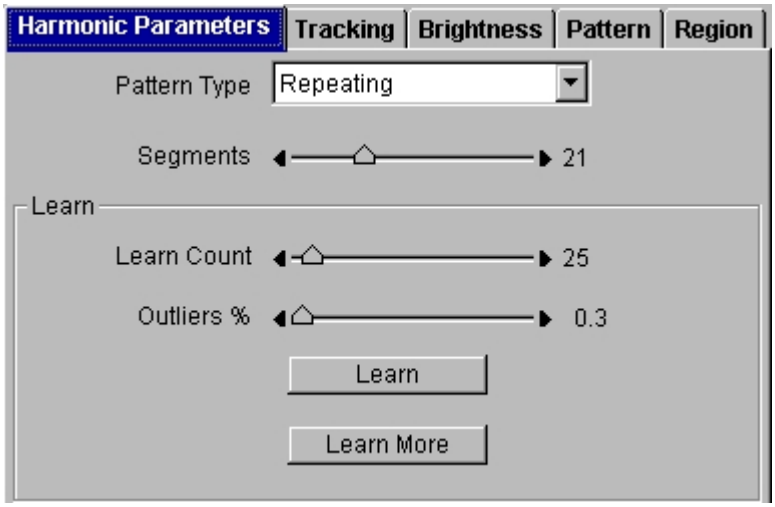
Setting the Harmonic Inspection Region

Using the Region menu, place the region over the desired inspection area.

Adjusting the Harmonic inspection parameters

Go to the Harmonic Parameters tab and choose a Pattern Type.

Harmonic Parameters Menu



PATTERN TYPE

There are two types of patterns from which to choose to inspect different types of parts: Repeating and Uniform.

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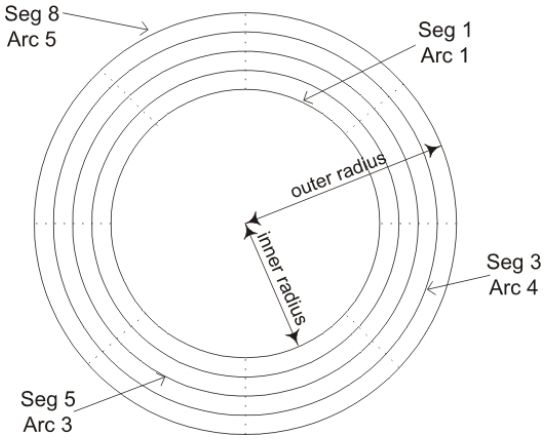
Repeating

This pattern type is used for inspecting regions that have similar features repeated around the inspection area.



Repeating pattern type does not require and does not accept Orientation data.

Uniform

This pattern type provides an alternative type of inspection to Circle or Radial Line Integration inspection. This is used on circular regions without any pattern, such as a compound channel of a shell or converted end. When using Uniform pattern type, a Pixel menu is available for inspection adjustments in place of the Pattern menu.

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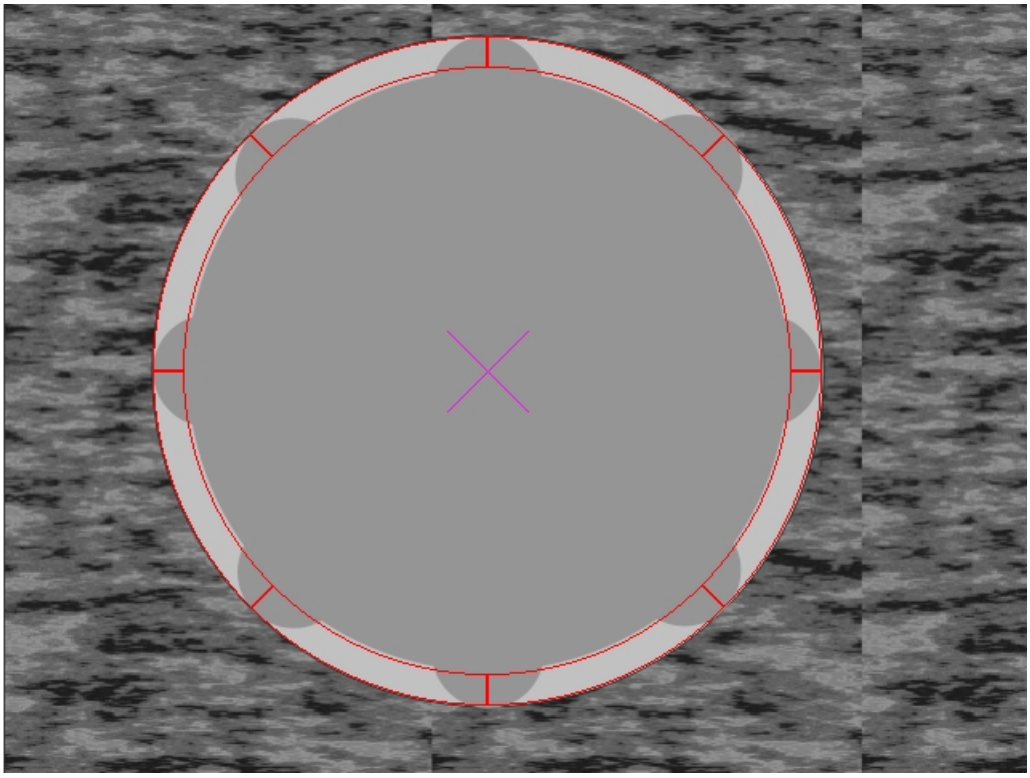
Segments

Divide the region into a number of segments between one and 72. Set the number of segments equal to the number of repeating pattern sequences around the part.



LEARN PARAMETERS

Next, set the Learn parameters to allow the Intellispec to learn the pattern of the inspection area on your part.

Learn Count

Set the number of images from which the system can learn the part. More images will give a better example of the overall inspection population.

Outliers %

Set the percentage of the learned data to ignore when adjusting the learned parameters. That is, the inspection will exclude the most extreme samples, like the brightest or darkest samples found. This can compensate for a couple defective parts that may pass through during the learn process.

Learn button

Click this to begin the learn process. Make sure you have parts moving through the inspection module so that the system can detect and inspect the necessary number of parts.

There are several parameters that the system adjusts after learning your part. They do not need to be adjusted manually, but can be if necessary. These are all Advanced parameters – the Show All Advanced Parameters box must be checked to view them. These parameters and the menus in which they are found are listed below:

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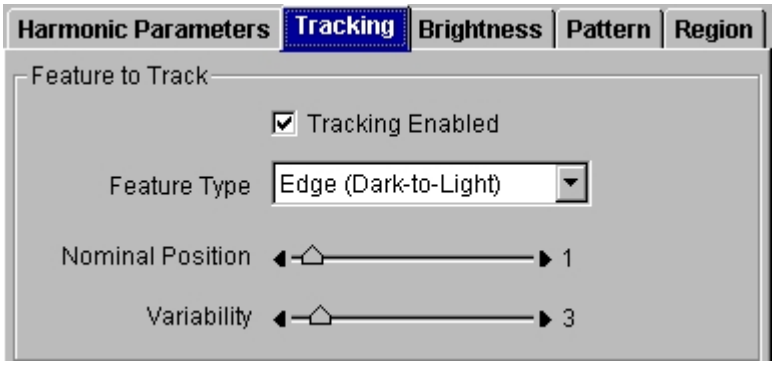
- Brightness Range Min/ Max – Brightness menu
- Offset Range Min/ Max – Brightness menu
- Contrast Range Min/ Max – Pattern menu
- Nominal Difference – Pattern menu

Learn More

Use this when you want to increase the Learn population. It will not overwrite the original Learned data – rather, it adds information to the Learned envelope.

Tracking Menu



Tracking is an optional feature that allows the inspection to follow a feature on slightly out-of-round parts, or features for which the registration center does not match the pattern center. The center may vary from segment to segment, or part to part for various reasons. Tracking adjusts the inspection region to compensate for these differences.

Tracking Enabled

Enables the Tracking option.

FEATURE TYPE

There are six feature types for which the system may search:

Edge (Light-to-Dark)

A gray level transition in a radius that goes from light to dark.

Edge (Dark-to-Light)

A gray level transition in a radius that goes from dark to light.

Ridge (Dark)

A narrow dark circular band between lighter regions.

Ridge (Light)

A narrow light circular band between darker regions.

Pattern (Inner Boundary)

A transition in the pattern contrast of a radius that goes from a low value to a high value.

Pattern (Outer Boundary)

A transition in the pattern contrast of a radius that goes from a low value to a high value.

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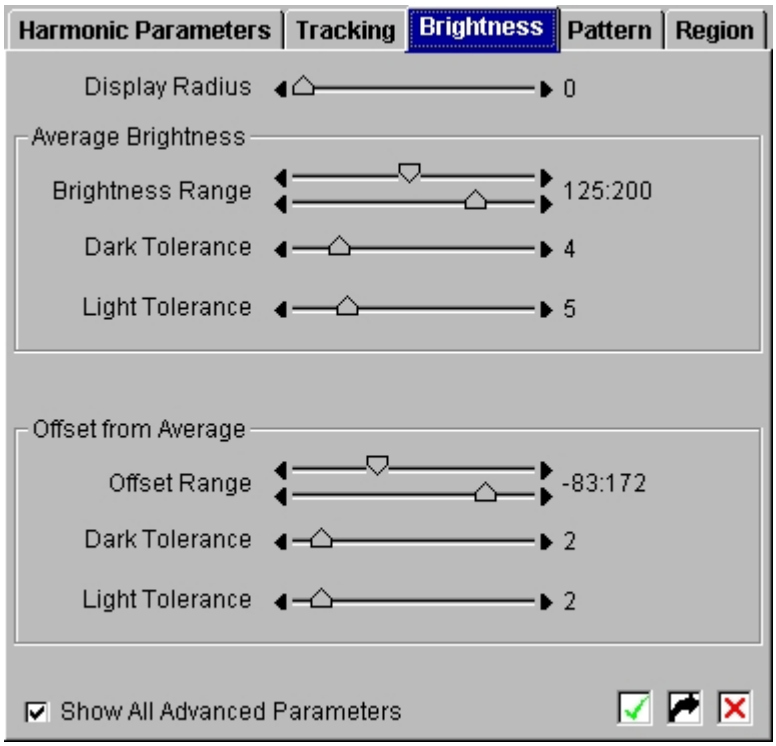
Nominal Position

Set this to where you expect the feature to normally fall. This is displayed in magenta on the image.

Variability

The number of pixels from the nominal position that the found feature is allowed to fall (in either direction). Note that the inspection region effectively shrinks twice the width of the variability value. You will see the new inspection region highlighted in cyan on the image.

Brightness Menu



The Brightness menu controls the detection of defects in a pattern where all or part of a segment is too light or too dark, compared to the learned population.

Display Radius

(Advanced parameter) This displays the Learned data for each radius – the values learned for Brightness Range and Offset Range. Scroll through the radii to see the different learned values.

AVERAGE BRIGHTNESS

These parameters control defect detection where an entire segment is too light or dark. The reject criteria are set by adjusting Dark Tolerance and Light Tolerance.

Brightness Range Min/Max

(Advanced parameters) Brightness Min and Max are adjusted by the system after the Learn process and do not need to be adjusted manually.

Dark Tolerance

If the computed average gray level of any segment is lower than Brightness Min - Dark Tolerance, the part fails.

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Light Tolerance

If the computed average gray level of any segment is greater than Brightness Max + Light Tolerance, the part fails.

OFFSET FROM AVERAGE

These parameters control defect detection where arcs within a segment are too light or dark. The reject criteria are set by adjusting Dark Tolerance and Light Tolerance.

❖ *Note: If Tracking is Enabled, the number of arcs within a segment = the width of the original ROI minus twice the Tracking Variability.*

Offset Range Min/ Max

(Advanced parameters) Offset Min and Max are adjusted by the system after the Learn process and do not need to be adjusted manually.

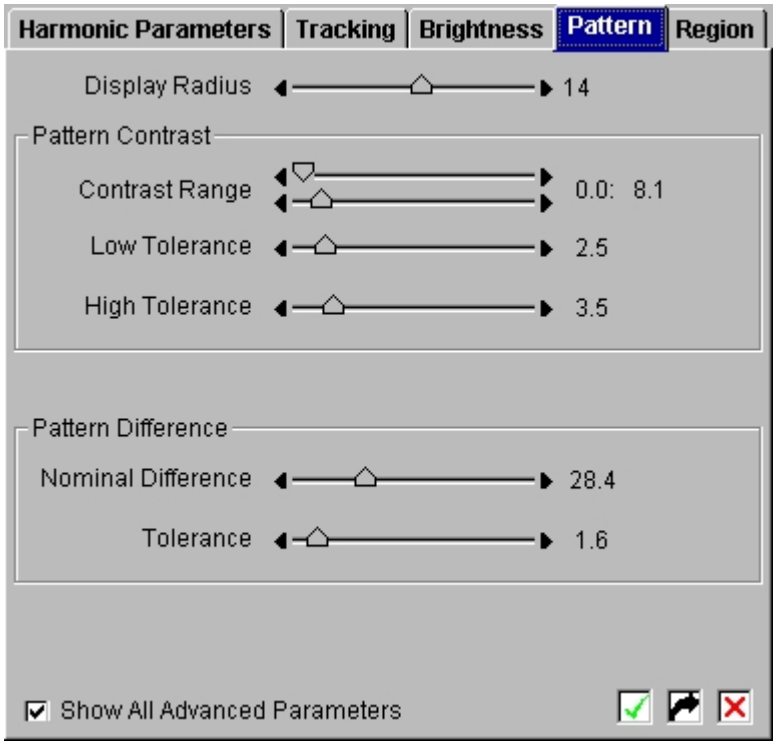
Dark Tolerance

If the computed average gray level of any arc within any segment or the average gray level within the vicinity of an arc is less than Average Brightness (segment) - Offset Min (radius) - Dark Tolerance, the part fails.

Light Tolerance

If the computed average gray level of any arc within any segment or the average gray level within the vicinity of an arc is greater than Average Brightness (segment) + Offset Max (radius) + Light Tolerance, the part fails. The vicinity of an arc is the average gray shade of the arc and the two arcs surrounding it.

Pattern Menu (Repeating pattern type)



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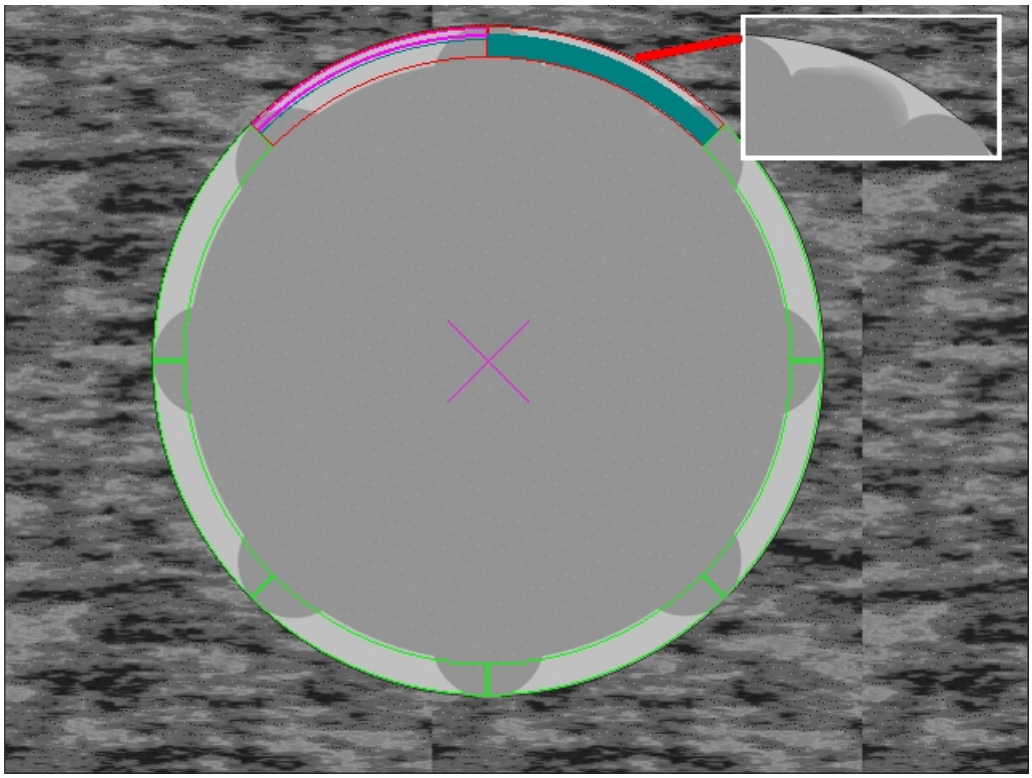
This menu is available when Repeating Pattern Type is chosen in the Harmonic Parameters menu. The Pattern menu controls the detection of defects based on a frequency analysis of the Learned pattern. A frequency analysis is the determination of the number of occurrences of an event within a given interval.

Display Radius

(Advanced parameter) This displays the Learned data for each radius – the values learned for Contrast Range and Nominal Difference. Scroll through the radii to see the different learned values.

PATTERN CONTRAST

Parts are inspected for defects by looking at each arc in each segment and comparing them to the values expected at that radial position. Pattern Contrast is capable of detecting both presence of unexpected pattern content as well as absence of expected content. The reject criteria are set by adjusting Low Tolerance and High Tolerance.



Contrast Range Min/ Max

(Advanced parameter) Contrast Min and Max are adjusted by the system after the Learn process and do not need to be adjusted manually.

Low Tolerance

If the computed contrast for any arc within any segment is less than Contrast Min (radius) - Low Tolerance, the part fails.

High Tolerance

If the computed contrast for any arc within any segment is greater than Contrast Max (radius) + High Tolerance, the part fails.

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PATTERN DIFFERENCE

Parts are inspected for defects by comparing arcs at the same radius on adjacent segments, with the expectation that the pattern in these two arcs should be similar for a good part. Pattern Difference is good for detecting defects that span segments.

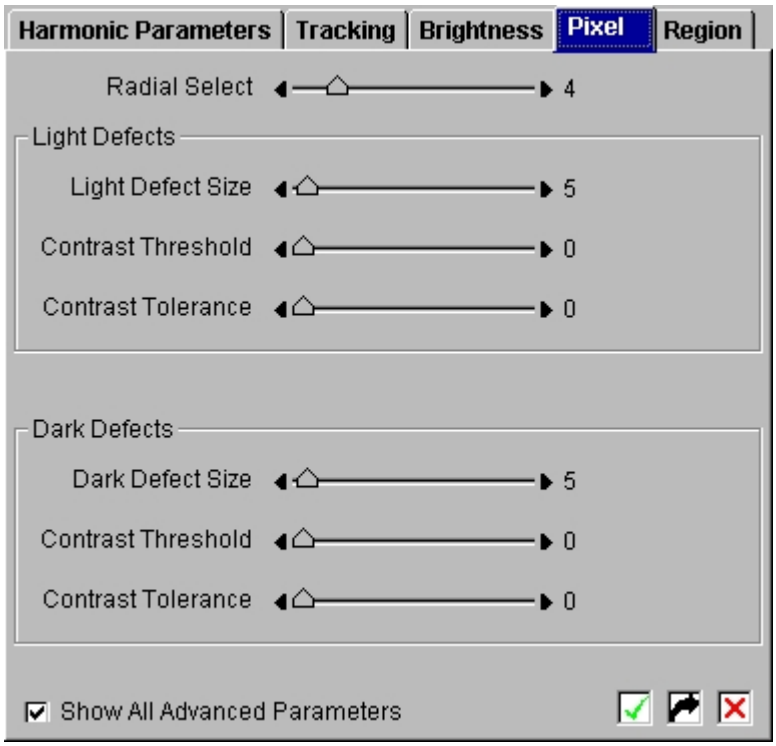
Nominal Difference

(Advanced parameter) Nominal Difference is adjusted by the system after the Learn process and does not need to be adjusted manually. The reject criterion is set by adjusting Tolerance.

Tolerance

If the magnitude of the computed difference between arcs on adjacent segments is greater than Nominal Difference (radius) + Tolerance, the part fails.

Pixel Menu (Uniform pattern type)



This menu is available when Uniform Pattern Type is chosen in the Harmonic Parameters menu. The Pixel inspection counts pixels in a segment and takes the average gray shade. For dark defects, it looks at all the segments and takes the lightest of the segments as the average. During inspection, if the average gray shade of a segment is darker than the average by so many pixels, it is considered a dark defect.

Display Radius

(Advanced parameter) This displays the Learned data for each radius – the values learned for Contrast Threshold. Scroll through the radii to see the different learned values.

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LIGHT DEFECTS

The system counts pixels in each segment and computes the average gray shade of each segment. It takes the darkest average gray shade from the learned population and uses that as a comparison. If the inspected segment is lighter by so many pixels, it is considered to have a light defect.

Light Defect Size

The number of light pixels by which the segment must exceed the average gray shade to be considered a light defect.

Contrast Threshold

(Advanced parameter) Contrast Threshold is computed by the system during the Learn process and does not need to be adjusted manually.

Contrast Tolerance

If the computed gray shade of the inspected segment is greater than Contrast Threshold + Contrast Tolerance, the part fails.

DARK DEFECTS

Dark Defect Size

The system counts pixels in each segment and computes the average gray shade of each segment. It takes the lightest average gray shade from the learned population and uses that as a comparison. If the inspected segment is darker by so many pixels, it is considered to have a dark defect.

Contrast Threshold

(Advanced parameter) Contrast Threshold is computed by the system during the Learn process and does not need to be adjusted manually.

Contrast Tolerance

If the computed gray shade of the inspected segment is less than Contrast Threshold - Contrast Tolerance, the part fails.

RECTANGULAR TRACKER INSPECTION

This inspection is similar to Tracker inspection, but can be used on different shaped parts, particularly non-round parts. We place a region of interest over a group of features to be inspected. We set up the inspection to find the edges of these features, which can then be inspected separately.

Before Adding a Rectangular Tracker inspection

1- Add a Tracker Registration

This inspection requires a ***Tracker Registration*** (see "Tracker Registration for Non-round Parts" on page 292). This first registration should be coarse, simply to find the center of the part. In the Tracker Registration:

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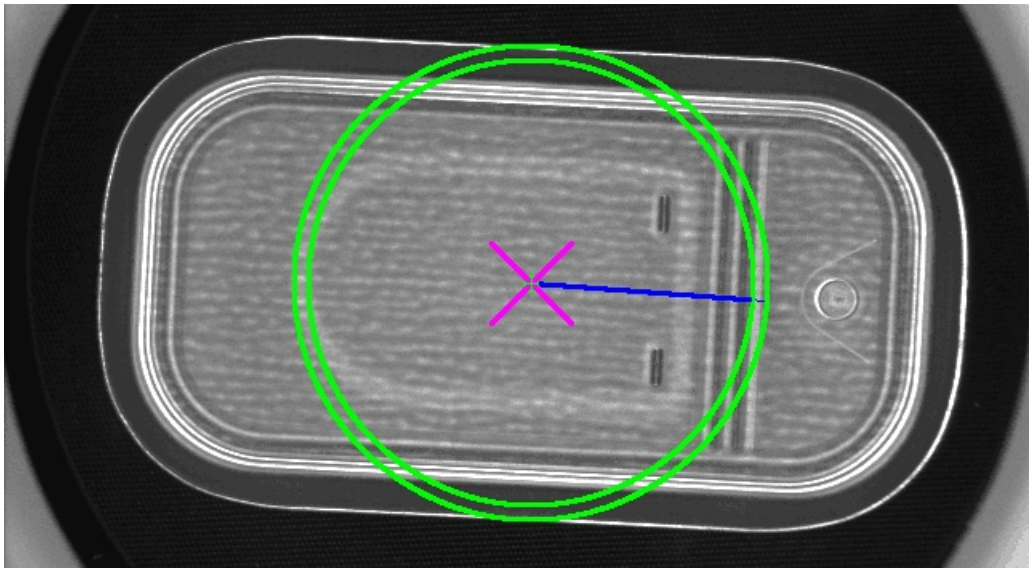
- In the Region menu, change Search Shape to Rectangle or Rounded Rectangle
- Adjust the region with the arrows and sliders to allow for maximum part movement within the camera's field of view. Adjust Region Thickness for the inner boundary. Ensure that the feature (edge of the part) falls between the inner and outer region boundaries.
- In the Centering menu, make sure that Compute Center is checked.
- In the Vectors menu, the default settings should suffice.
- In the Edges menu, adjust Search Direction, Edge Transition, Edge Gradient, Delta, and Size to best suit your part.

2 – Use an Orientation

If the parts do not move in a straight line down the conveyor, find the orientation of the part to accurately place the Rectangular Tracker.

To add the Orientation:

1) Right-click in the statistics area near the inspection names.
2) Add >> Orientation >> ***Orientation Pattern Match*** (see "Orientation/ Pattern Match" on page 318).
    - You may have to change Job Product Type to All Inspections to see Orientation Pattern Match: Right-click on the channel's statistics tab >> Select Job Product Type >> All Inspections
3) Adjust the orientation region of interest to fall on a distinctive area of the part.



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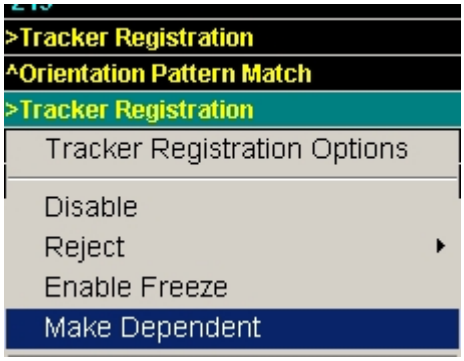
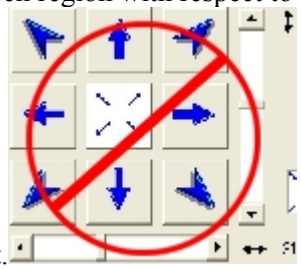
3 – Add another Rectangular Shaped Tracker Registration

Make the second Tracker registration dependent on the previous registration and orientation. This places the search region more precisely around the edges of the part. This registration will provide the edge information for the Rectangular Tracker inspection.



To make this registration dependent:

1) Right-click in the statistics area near the inspection name.
2) Add >> Registration >> ***Tracker Registration*** (see "Tracker Registration for Non-round Parts" on page 292).
3) Make this dependent on the first registration and the orientation: Right-click the new Tracker Registration name >> choose Make Dependent. You should now see the carat '^' next to the new registration's name, which means that it is dependent. Notice that this makes the search region oriented to the part.
4) In the Region menu, change Search Shape to Rectangle or Rounded Rectangle (depending on your part).
5) In the Region menu, click the button, then adjust the Horizontal width and Vertical height sliders to surround the edge of the part.
   - Click the button again to re-center the region each time you adjust the width and height of the region.
   - **Do not** adjust the region arrows, as this changes the placement of the search region with respect to the center of the part. 
   - Since this registration is dependent on the first registration and the orientation, you do not need to worry about part movement. That is, you can place the search region close to the edges of the part.

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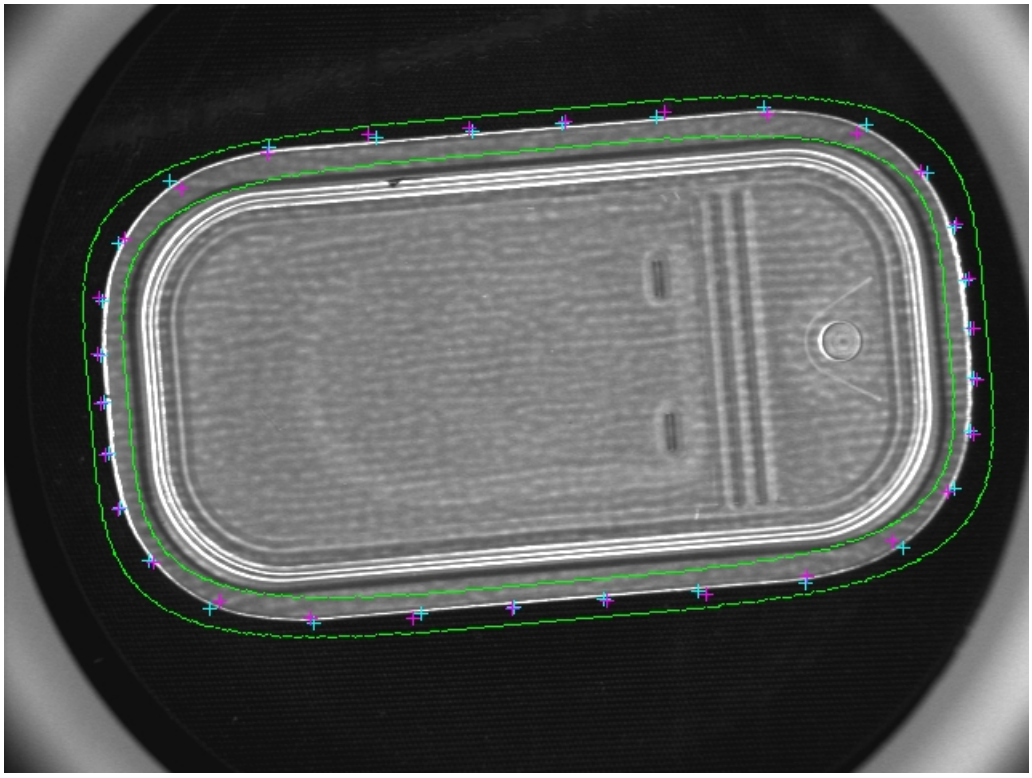
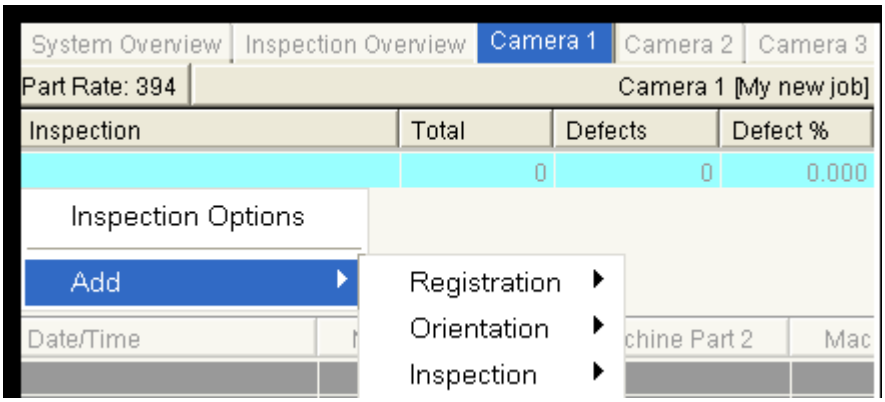
6) Adjust parameters through the Vectors, Edges, and Centering menu as necessary, or as recommended by your Pressco Service Engineer.



Adding a Rectangular Tracker inspection

To add the Rectangular Tracker inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Rectangular Tracker inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

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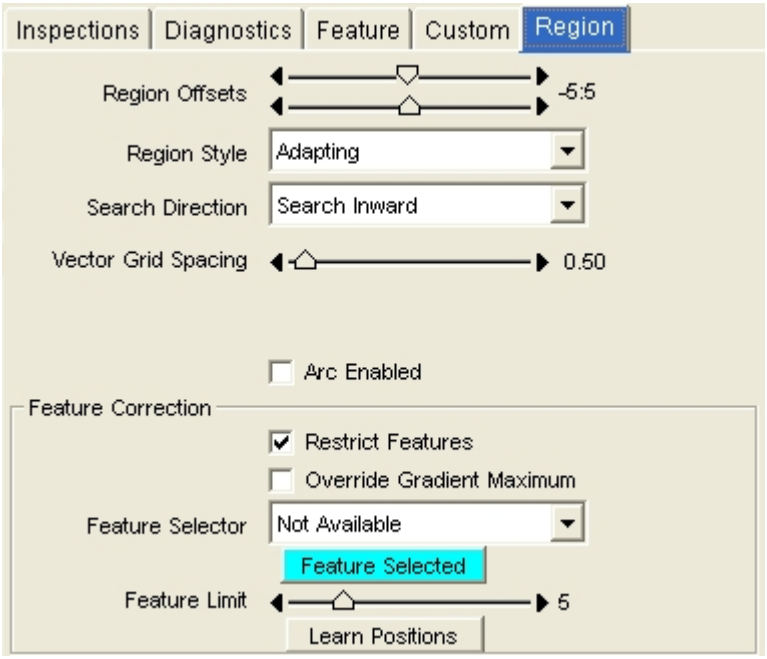
Setting the Rectangular Tracker inspection region

Adjust the Region Offsets through the Region menu to surround a group of features such as the curl and compound area. Be sure to extend the region beyond the features you want to inspect, because the system needs room to search for edges to find those features.



Region Offsets

Use these sliders to place the search region with respect to the found edges from ***Tracker Registration*** (on page 286). An offset value of zero aligns the region exactly with the found tracker registration points. A negative offset places the region inside the found points, and a positive offset places the region outside the found points. You can have both offsets inside (negative values), or outside (positive values), if desired.

Region Style

There are two methods to control the width of the search region:

- **Adapting Region** – takes a set of edge points that were found with Tracker Registration. It is important that these points are uniform and accurate with minimal chance for failing to locate the proper feature.
- **Fixed Region** – build the shape of the region one time based on the results of the Tracker Registration. The result is an inner and outer polygon with as many points as search vectors defined in the registration. This technique is good when it is difficult to get consistent edge locations from part to part.
  - *Important*: click the **Generate Region** button after selecting Fixed Region

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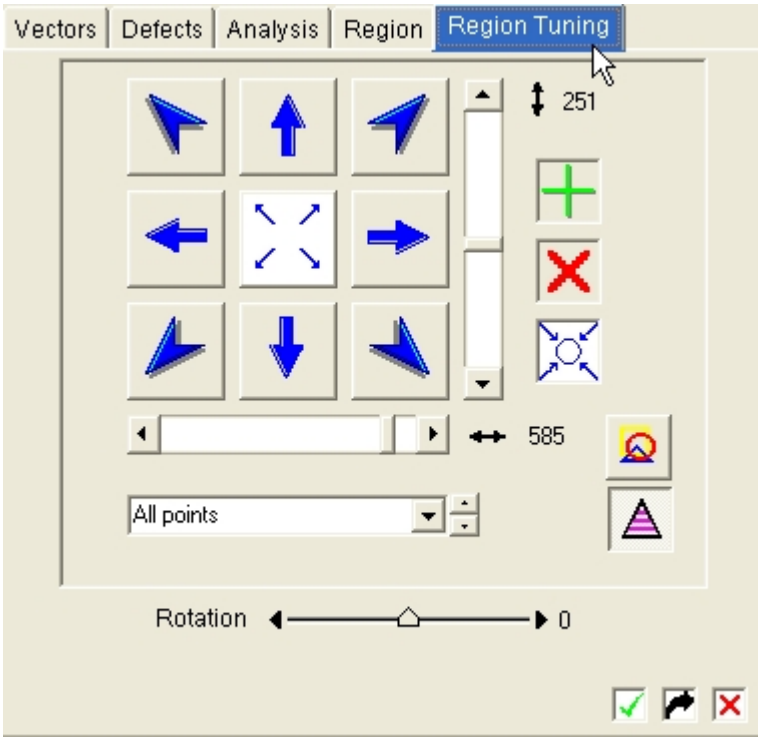
- You may need to insert an additional Orientation prior to the Rectangular Tracker inspection to make sure the fixed region is placed correctly on all parts.
- If you have only a registration to find the center of the part, then the region will move with the position of the center (left, right, up, or down). If you have a center registration and an orientation, then the region will be positioned with the center and rotated with orientation.
- You can manually adjust the position of any polygon point. The Region Tuning menu provides this adjustment.



Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Vector Grid Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well. You can adjust this number in 0.01 degree increments as low as 0.2 degrees.

Arcs Enabled

Allows you to inspect an arc instead of the whole region. The system will inspect a portion of the region between the Start and Stop angles. Make sure you have an Orientation in the job prior to using arcs. This will ensure that the inspection region is placed on the same location of the part regardless of the part's orientation.

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Important
Go to the Feature menu and set up parameters for all features prior to enabling Feature Correction.

The system limits the position where it will search for an edge of a feature. This prevents false edges or finding the wrong feature. This is only necessary when using the Adapting Region technique. It looks for any point that deviates from its neighbor by more than the configured limit.

To use Feature Correction:

1) Place the inspection region on a good part through the Region menu (if you haven't already).
2) Enable Restrict Features in the Region menu.
3) Through the Feature menu, set Feature Count to the number of features you want to find.
4) Adjust the Feature Edge Search parameters (Show All Advanced Parameters) to find the desired features.
5) Enable Check Feature Validity and Analyze Failed Vectors.
6) Make sure a good image is displayed on screen.
7) In the Region menu, click the Learn Positions button to allow the system to learn the average edge position and strength. When it asks "Do you want to override the maximum gradient?" click Yes.

The system will now use this information and correct any bad edges found in the region. The remainder of the parameters in the Region menu is described below.

Restrict Features

Enables Feature Correction.

Override Gradient Maximum

This refers to the Edge Gradient Maximum value in the Feature menu. If enabled, then Gradient Max is considered to be 255. The inspection will find the strongest edge regardless of what value Gradient Max has in the Feature menu. The actual value in the Feature menu is not changed.

Warning
If you re-learn or turn off Feature Correction, then these changes to the Maximum Gradient may cause the system to no longer find the proper edges.

Feature Selector

Select a feature.

Feature Selected

Both an indicator and a button. The color of the button matches the color of the vectors on screen that search for a particular feature. When you click the button, the image updates, highlighting vectors for that feature.

Feature Limit

The number of pixels that the search vector is allowed to step out to find an edge. If no edge is found within the limit, the system applies feature correction.

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Learn Positions

First, make sure a good part is displayed. Click this button to analyze the current image and search for features.

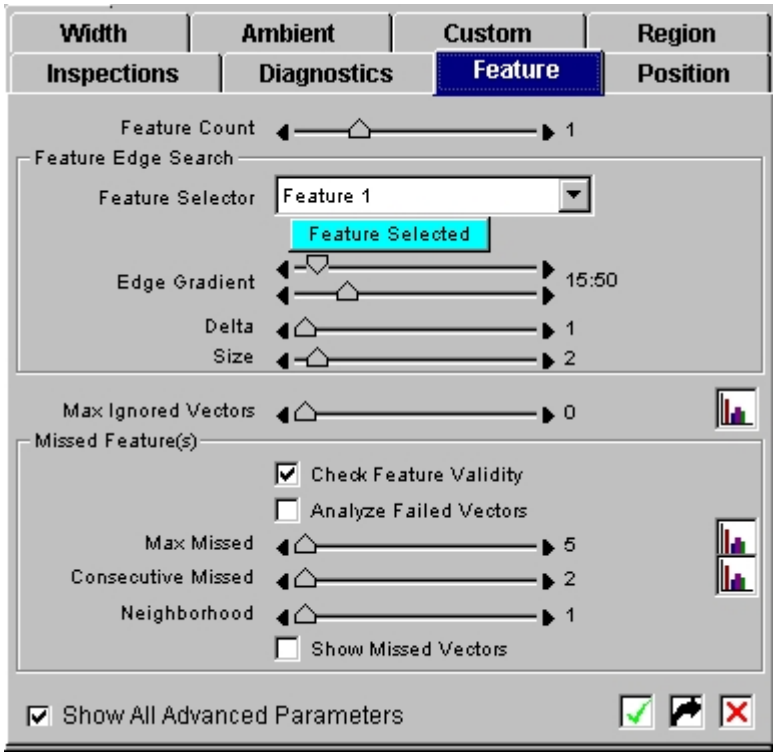
Important
Any time you change the Region Offsets, you must re-learn.

Adjusting the Rectangular Tracker parameters

❖ *Note: A diagnostic is available throughout this inspection: Click on the search region in the image to see the image analysis of any vector.*

Feature Menu

This menu allows you to choose how many features should be searched for in the image. If you choose zero features, the entire region will be inspected as a single Analysis Zone (AZ). If zero features, Position and Width analysis are not used, but Ambient analysis is still valid.



Feature Count

Specify how many features the inspection should search for. The inspection region should surround all those features (in Region menu), with room between the edge of the search region and the features.

FEATURE EDGE SEARCH

(Advanced Parameters) These parameters are used to locate all the desired features. The inspection searches for edges to distinguish each feature. The search direction is specified in the Region menu. Each feature's search criteria must be set up separately.

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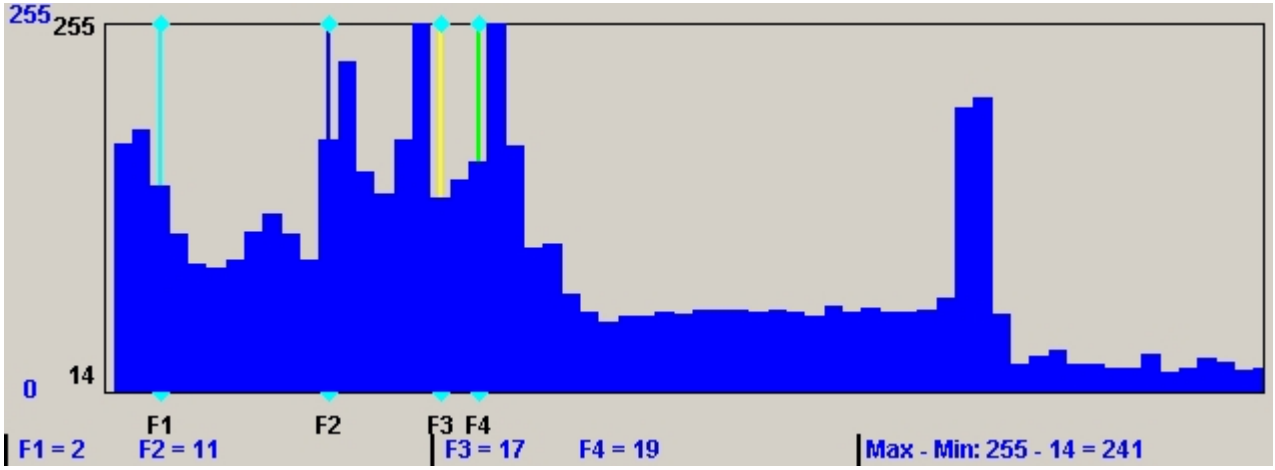
Feature Selector

Select a feature.

Feature Selected

Both an indicator and a button. The color of the button matches the color of the vectors on screen that search for a particular feature. When you click the button, the image updates, highlighting vectors for that feature.

If you click on a vector in the image, Image Analysis for that vector is displayed. This shows where each feature is located along that vector. This may help setting Gradient Min/ Max.



Click on the image (outside the inspection regions) to remove Image Analysis.

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Max Ignored Vectors

The number of vectors that may be ignored but a feature is still considered to be found.

MISSED FEATURES

These parameters specify how to handle vectors that miss one or more features.

Check Feature Validity

Choose whether to count missing features. If this is checked, then you have limits for how many can be missed and how many consecutive missed features are allowed. If this remains unchecked, most of the missing features will probably fail other inspection logic throughout the algorithm.

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Analyze Failed Vectors

This option should only be used in conjunction with feature correction logic, which is set up through the Region menu. When a vector has a feature position that is corrected, it is marked as a missed vector and can be rejected through the Max Missed or Consecutive Missed parameters described below.

If this parameter is enabled, it allows the inspection to continue analyzing the region and determine if there really is something wrong with that area of the part, and the error will be detected by other inspection criteria.

Max Missed

The number of features that are allowed to be missed before the inspection fails.

Consecutive Missed

The number of consecutive features that are allowed to be missed before the inspection fails.

Consecutive Neighborhood

Defines what Consecutive means. Examples:

- 1 = consecutive vectors must be next to each other
- 5 = consecutive vectors can be up to 5 vectors apart

Show Missed Vectors

Display the vectors that did not find features.

❖ *Note: After you set the parameters in the Feature menu (for all features), then you can go back to the Region menu to set up Feature Correction if desired.*

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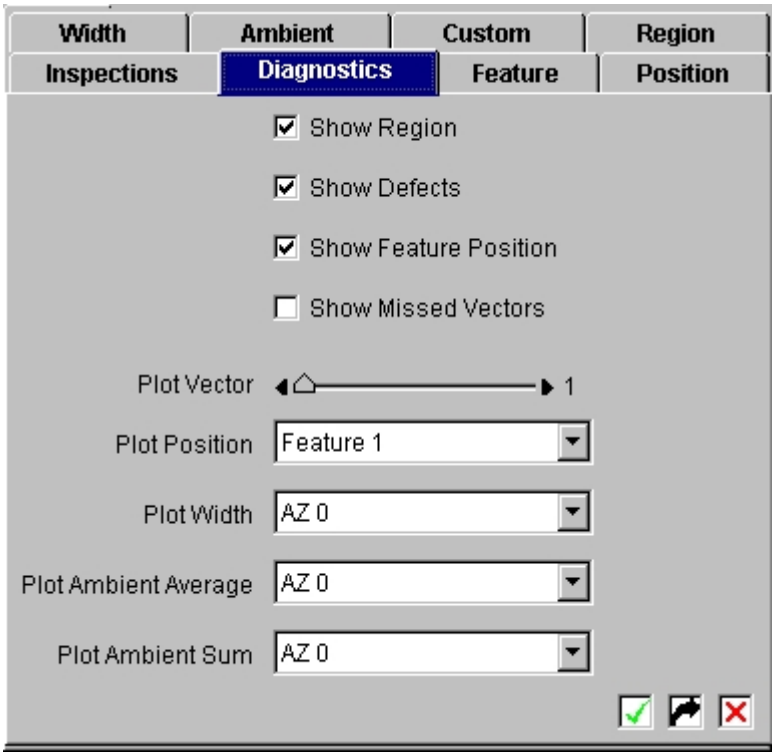
Diagnostics Menu

This menu enables the various diagnostics available for the inspection. Enabling some of these diagnostics makes it easier to see the inspection vectors and regions that the inspection finds.



Show Region

Displays the inspection vectors. When used in conjunction with other diagnostics, regions will be color-coded.

Show Defects (or Show Defect Position)

Displays the failed vectors. This is more visible when Show Region and Show Feature Position are NOT checked.

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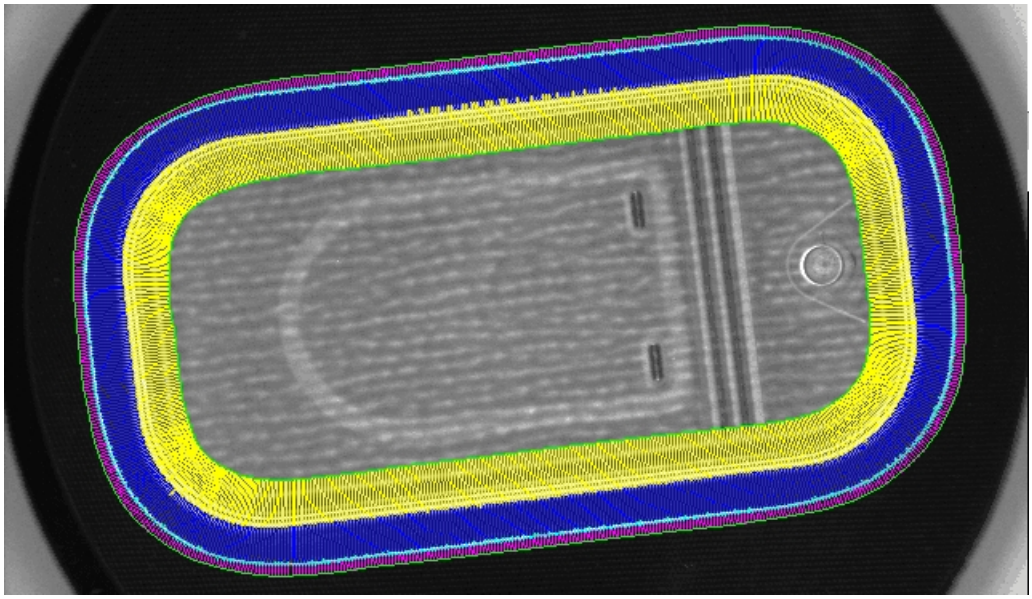
Show Feature Position

Displays the edge positions for each feature. This is more useful when both this diagnostic and Show Region are checked.



Show Missed Vectors

Display the vectors that did not find features. If using Feature Correction, those vectors that were restricted are displayed as well.

Plot Vector

Displays Image Analysis of selected vector (vector highlighted in green on image). Click on the image (away from the inspection area) to remove display.

❖ *Note: The names Feature 1, AZ 0, etc. can be customized in the Custom menu.*

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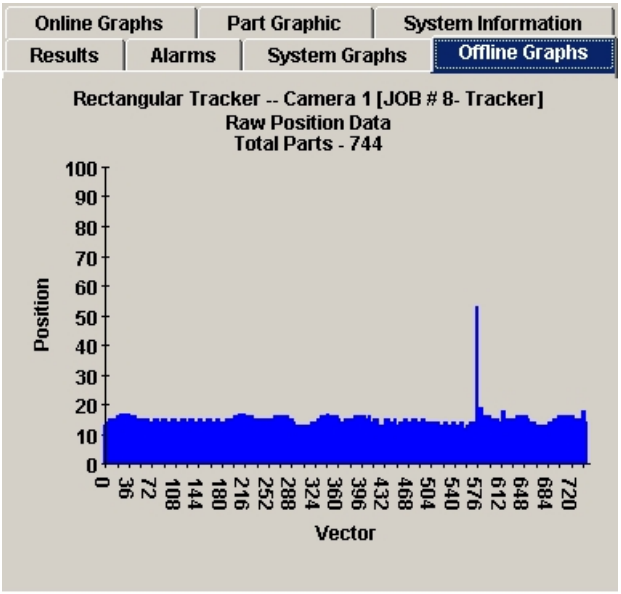
Plot Position

Displays a graph of the positions for each vector. One graph is available for each feature.



Plot Width

(When Width inspection is enabled) Displays a graph of the width of all vectors for each analysis zone.

Plot Ambient Average

Displays a graph of the average gray shade of each vector for each analysis zone. (Ambient Average must be enabled for the feature in the Ambient menu)

Plot Ambient Sum

Displays a graph of the total gray shade sum of each vector for each analysis zone. (Ambient Energy must be enabled for the feature in the Ambient menu)

Inspections Menu

This menu allows you to enable up to three inspection types: Position, Width, and Ambient inspection. Separate menus are available for each enabled inspection. Each type of analysis could be used to detect different kinds of defects. For example, a compound void would most likely be detected through Ambient analysis, whereas a bent curl might be detected through Position analysis.

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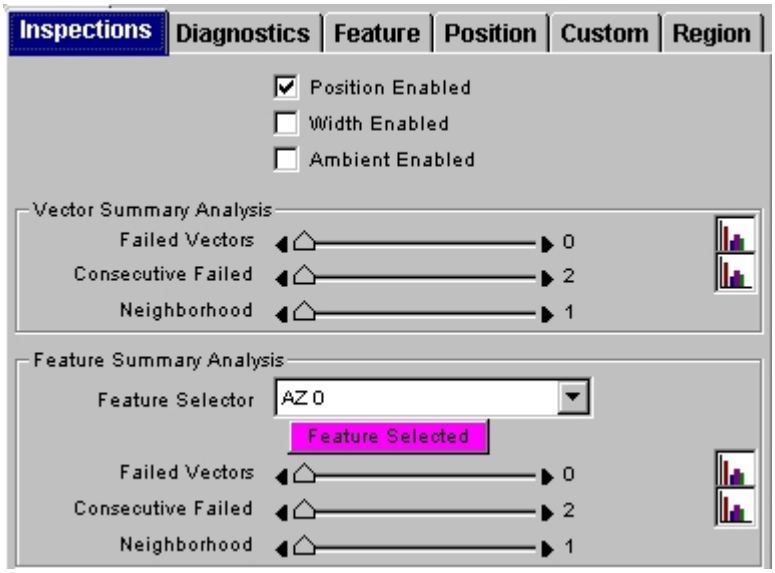
The Vector Summary Analysis and Feature Summary Analysis sections allow you to set reject limits for the inspection.



VECTOR SUMMARY ANALYSIS

This is a global analysis of the vectors that have failed. The vectors may fail in any one of the inspections – position, width, or ambient.

Failed Vectors

The number of vectors allowed to fail before the whole inspection fails.

Consecutive Limit (or Consecutive Failed)

The number of consecutive vectors allowed to fail before the whole inspection fails. This feature ensures that any defect larger than this number of vectors will fail.

Consecutive Neighborhood

Defines what Consecutive means. Examples:

- 1 = consecutive vectors must be next to each other
- 5 = consecutive vectors can be up to 5 vectors apart

FEATURE SUMMARY ANALYSIS

This is similar to Vector Summary Analysis except that the analysis is restricted to each analysis zone. Missed vectors or features in other analysis zones do not affect the defect count for Current Analysis Zone.

Feature Selector

Select a feature.

Feature Selected

Both an indicator and a button. The color of the button matches the color of the vectors on screen that search for a particular feature. When you click the button, the image updates, highlighting vectors for that feature.

Failed Vectors

The number of vectors allowed to fail before the feature is considered to have failed.

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Consecutive Limit (or Consecutive Failed)

The number of consecutive vectors allowed to fail before the whole inspection fails. This feature ensures that any defect larger than this number of vectors will fail.

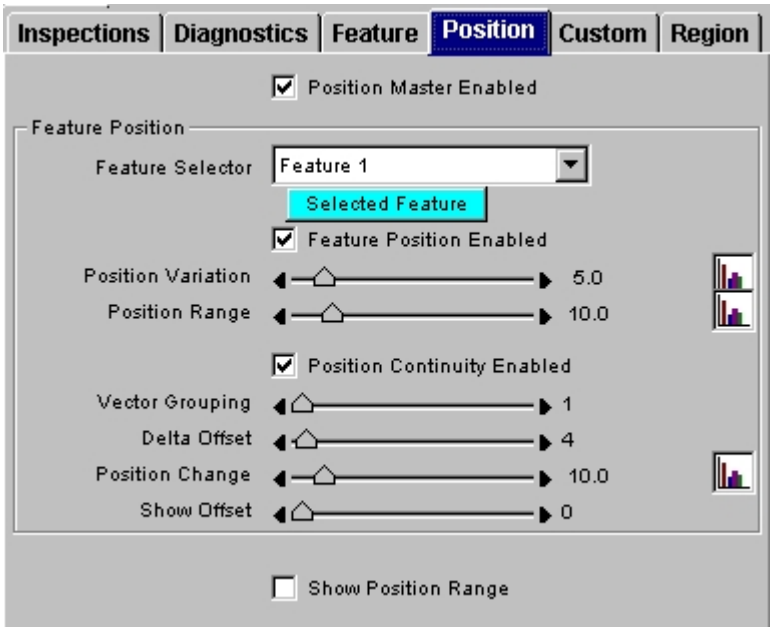
Consecutive Neighborhood

Defines what Consecutive means. Examples:

- 1 = consecutive vectors must be next to each other
- 5 = consecutive vectors can be up to 5 vectors apart

Position Menu

(Position must be checked in Inspections menu) Position inspection looks at the sub-pixel edge location of each feature. There are three types of position analysis that can be performed: Variation, Range, and Continuity. These parameters are described below.



Position Master Enabled

Enables Position analysis.

FEATURE POSITION

Feature Selector

Select a feature.

Feature Selected

Both an indicator and a button. The color of the button matches the color of the vectors on screen that search for a particular feature. When you click the button, the image updates, highlighting vectors for that feature.

Feature Position Enabled

Enable the Variation and Continuity portions of the analysis.

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Position Variation

This is a simple form of the continuity analysis. The system looks at the difference in position between consecutive vectors. If the deviation is greater than the value specified with this parameter, then it is considered a deviation defect. Each vector that is out of specification is marked for total defect analysis (set up in the Inspections menu). This inspection can be performed on each feature being located.

❖ *Tip: This is similar to Local Shape Change in* **Tracker inspection** *(on page 438)*

Position Range

This inspection looks at the minimum and maximum edge position for the selected feature. If the difference between minimum and maximum exceeds the Position Range value, the entire inspection fails.

❖ *Tip: This is similar to Total Shape Change in* **Tracker inspection** *(on page 438)*

Position Continuity Enabled

Enables or disables the continuity portion of the inspection.

This inspection compares the position of one group of vectors to the position of another group of vectors. By controlling the vector grouping size, you can locate different sizes and intensities of defects.

You can run this inspection on some features, and turn it off for others.

Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

❖ *Note: Click the Show Offset slider to see the group size and delta on your image. Click on the image (not in the inspection area) to clear Image Analysis from screen.*

Group Offset (or Delta Offset)

The number of vectors away to begin the next group. For larger defects, use a larger offset. For smaller defects, use a smaller Group Size and Group Offset.

Position Change

The amount of change allowed between two compared inspection groups before the position continuity inspection fails. If this fails, it is marked for total defect analysis in the Inspections menu.

Show Offset

Displays the Image Analysis for the two vector groups. Move the slider to see different compared groups around the image. Click on the image (away from the inspection area) to clear Image Analysis from screen.

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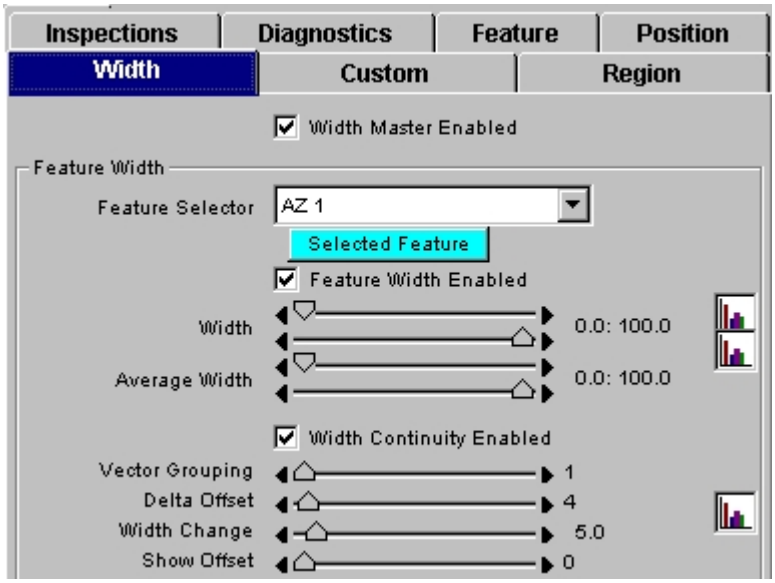
Show Position Range

Displays the vectors that have the minimum and maximum position variation within the inspection region.

Width Menu

(Width must be checked in Inspections menu) Width Analysis compares the distance between features. This is a sub-pixel measurement because the edge of each feature is located on a sub-pixel basis. There is one more width comparison available than the total number of features being located. It searches from the beginning of the search vector to the first feature (this is analysis zone AZ0), then it searches the width of each feature from edge to edge, up to the end of the search vector.

You will notice that the feature selector has AZ0 through AZ(n). n = number of features. The color corresponding to each feature is the same as in other Rectangular Tracker screens (like Diagnostics menu). A new color (magenta) is added for Analysis Zone 0 (AZ0).



Width Master Enabled

Enables Width analysis. If you un-check this box, it also becomes un-checked in the Inspections menu.

Feature Width

Feature Selector

Select a feature.

Feature Selected

Both an indicator and a button. The color of the button matches the color of the vectors on screen that search for a particular feature. When you click the button, the image updates, highlighting vectors for that feature.

Feature Width Enabled

Enables width inspection for the selected analysis zone.

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Width Min/ Max

The minimum and maximum allowable width for the analysis zone. Any vector that falls outside these limits is marked as a failed vector and counted in the Inspections menu.

Average Width Min/ Max

Takes the average width of the selected analysis zone, and compares that average to the Min/ Max limits you set here. If the average width of the current part falls outside these limits, the entire inspection fails.

Width Continuity Enabled

Enables width continuity inspection for the selected analysis zone. This analyzes the difference in width between two groups of vectors.

Vector Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

❖ *Note: Click the Show Offset slider to see the group size and delta on your image. Click on the image (not in the inspection area) to clear Image Analysis from screen.*

Group Offset (or Delta Offset)

The number of vectors away to begin the next group. For larger defects, use a larger offset. For smaller defects, use a smaller Group Size and Group Offset.

Width Change

The amount of change allowed between two compared inspection groups before the width continuity inspection fails. If this fails, it is marked for total defect analysis in the Inspections menu.

Show Offset

Displays the Image Analysis for the two vector groups. Move the slider to see different compared groups around the image. Click on the image (away from the inspection area) to clear Image Analysis from screen.

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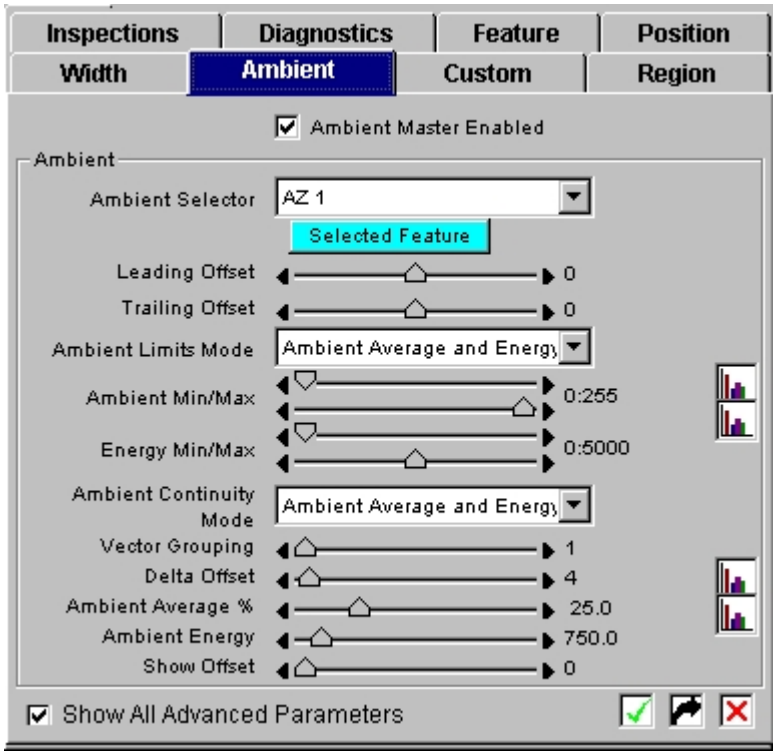
Ambient Menu

(Ambient must be checked in Inspections menu) This inspection looks at the gray shade values of an analysis zone. There are several types of ambient analyses available, as you will see below.



Ambient Master Enabled

Enables Ambient inspection. If you un-check this box, it also becomes un-checked in the Inspections menu.

Ambient Selector

Select an analysis zone to adjust the parameters for its ambient analysis. Each zone must be adjusted separately.

Selected Feature

Both an indicator and a button. The color of the button matches the color of the vectors on screen that search for a particular feature. When you click the button, the image updates, highlighting vectors for that feature.

Leading/ Trailing Offset

These two parameters allow you to grow or shrink the selected analysis zone to overlap a feature or restrict the region to avoid boundary conditions.

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Ambient Limits Mode

- **Ambient Average** – simple comparison of the average of the gray shades of an analysis zone to the **Ambient Min/ Max** limits. If Ambient Average for a zone exceeds these limits, the entire inspection fails.
- **Ambient Energy** – looks at the total sum of the gray shade values for each vector. It is called Energy because it is weighted based on the width of an analysis zone. A narrower (defective) zone will have a lower sum than a normal zone. A wider (defective) zone will have a greater sum than a normal zone. Any vector that exceeds the **Energy Min/ Max** limits is counted in the Vector Summary Analysis in the Inspections menu.
- **Ambient Average and Energy** – enables both types of inspection described above.

Ambient Continuity Mode

The continuity inspections compare the change in ambient sums between two groups of vectors.

- **Ambient Average** – compares the change in the average gray shade of one group of vectors to the average gray shade of another group of vectors. If the change in gray shade exceeds **Ambient Average %**, then the vectors are marked for total defect analysis through the Inspections menu.
- **Ambient Energy Continuity** – compares the energy of one group of vectors to another group. If it exceeds the **Ambient Energy** value, then the vectors are marked for total defect analysis through the Inspections menu.

Vector Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

Group Offset (or Delta Offset)

The number of vectors away to begin the next group. For larger defects, use a larger offset. For smaller defects, use a smaller Group Size and Group Offset.

Show Offset

Displays the Image Analysis for the two vector groups. Move the slider to see different compared groups around the image. Click on the image (away from the inspection area) to clear Image Analysis from screen.

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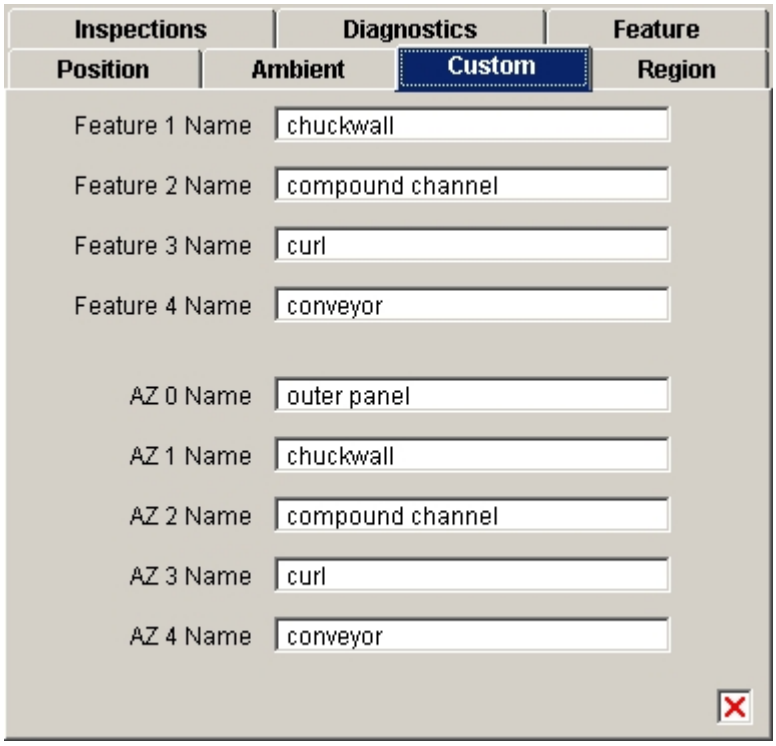
Custom Menu



Feature or AZ name

Re-name the features, or analysis zones, to something more meaningful. Note that AZ0 is an additional analysis zone that searches from the beginning of the search vector to the first feature. It is not a feature. However, you may want to call AZ1 and Feature 1 by the same name – these are the same.

Graphs - Rectangular Tracker

FEATURE MENU GRAPHS

Ignored Vectors

If Feature count is greater than zero. Uses Max Ignored Vectors parameter as limit – shows number of vectors that were ignored in the search for a feature.

Missed Features

If Check Feature Validity is enabled. Uses Max Missed as limit – shows number of features missed.

Consecutive Missed Features

If Check Feature Validity is enabled. Uses Consecutive Missed as limit – shows number of consecutive features missed.

INSPECTIONS MENU GRAPHS

Failed Vectors

Uses Vector Summary Analysis >> Failed Vectors parameter as limit – shows the number of vectors that failed global analysis for one part.

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Consecutive Failures

Uses Vector Summary Analysis >> Consecutive Failed parameter as limit – shows the number of consecutive vectors that failed global analysis for one part.

AZ n Failed Vectors

Uses Feature Summary Analysis >> Failed Vectors as limit – shows the number of vectors that failed a particular feature search.

AZ n Consecutive Vectors

Uses Feature Summary Analysis >> Consecutive Failed parameter as limit – shows the number of consecutive vectors that failed a particular feature search.

POSITION MENU GRAPHS

The following graphs are available if Position inspection is enabled.

Feature n Position Variation

(If Feature Position enabled) Uses Position Variation parameter as limit – shows the greatest difference in position between two consecutive vectors for one part for a particular feature.

Feature n Position Range

(If Feature Position enabled) Uses Position Range parameter as limit – shows the greatest difference in position between any two vectors for one part for a particular feature.

Feature n Position Continuity

(If Position Continuity enabled) Uses Position Change parameter as limit – shows the greatest change in position between two compared groups for one part for a particular feature.

WIDTH MENU GRAPHS

The following graphs are available if Width inspection is enabled.

AZ n Width Min Max

(If Feature Width enabled) Uses Width parameter as limits – shows the min and max width of the particular analysis zone for one part.

AZ n Average Width

(If Feature Width enabled) Uses Average Width parameter as limits – shows the average width of the particular analysis zone.

AZ n Width Continuity

(If Width Continuity enabled) Uses Width Change parameter as limit – shows the greatest change in width between two continuity groups for a particular analysis zone.

AMBIENT GRAPHS

The following graphs are available if Ambient inspection is enabled.

AZ n Ambient Average

(If Ambient Average enabled in Ambient Limits mode) Uses Ambient Min/ Max as limits – shows average gray shade for a particular analysis zone.

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AZ n Ambient Average Continuity

(If Ambient Average enabled in Ambient Continuity mode) Uses Ambient Average % as limit – shows the percentage of change in average gray shades between two continuity groups for a particular analysis zone.

AZ n Ambient Energy Continuity

(If Energy enabled in Ambient Continuity mode) Uses Ambient Energy as limit – shows the greatest sum of gray shades from all vectors.

Error Details

Depending which inspections are enabled, shows the number of parts that failed each inspection.

LINE INTEGRATION INSPECTION

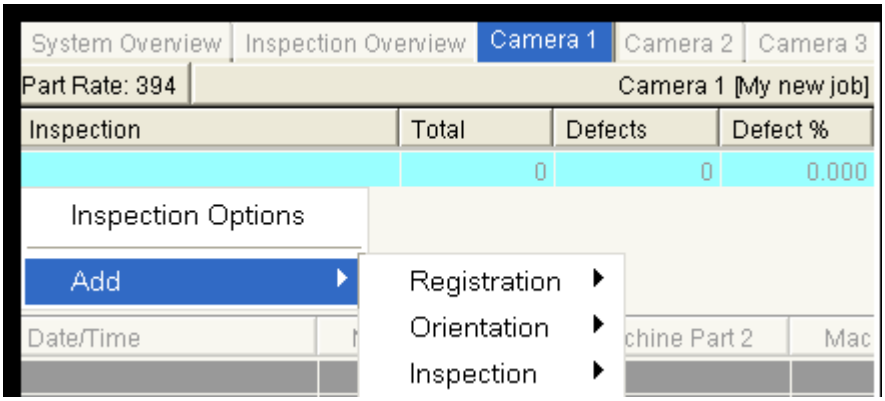
For you expert users, Line Integration is like a cross between Radial Line Integration and Tracker Continuity inspections, except in a rectangular region.

This inspection looks for variations in gray shades between areas in the inspection region. The system computes the average gray shade of each vector. It then compares the average of a group of vectors to that of another group of vectors. The system determines whether the difference in gray shades between the groups is greater than the reject limit (Max Change %). If the difference is greater than Max Change %, the inspection fails.

Adding a Line Integration inspection

To add the Line Integration inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Line Integration inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

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Setting the Line Integration inspection region

Place the rectangular region over the area you want to inspect. If desired, use the Rotation parameter to adjust the region. We recommend that you only use Rotation if your Line Integration inspection follows an Orientation. Otherwise, the inspection region may not fall correctly on all inspected parts.

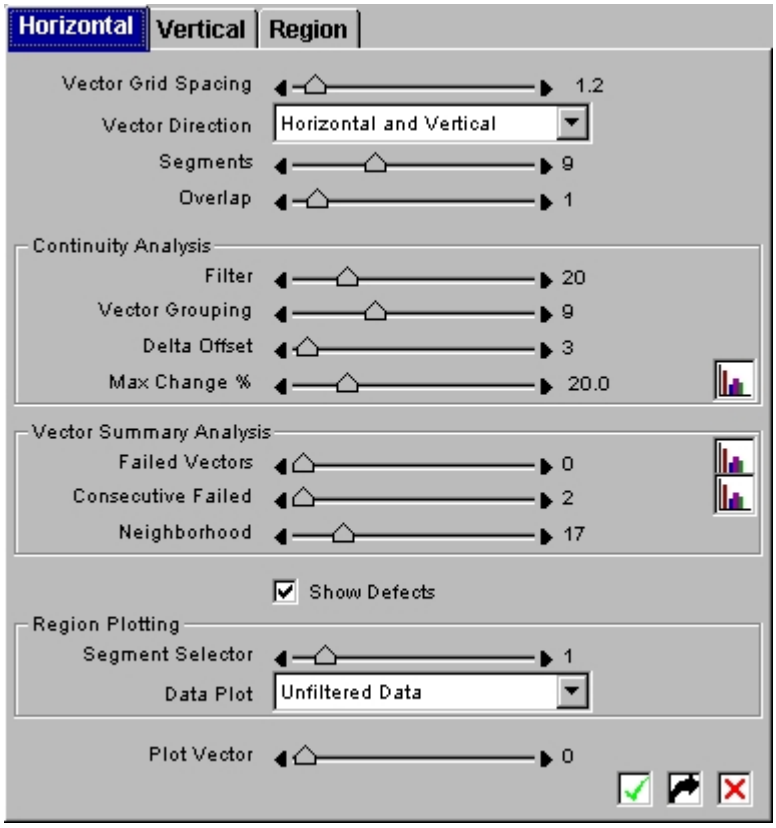
Click the Show Region box to see the inspection vectors on the image when you enter the parameters menus. You may want to view these while adjusting parameters, but may want to turn them off while the system is inspecting parts.

Adjusting the Line Integration parameters

Adjust the inspection parameters to suit your inspection needs.

Horizontal and Vertical Parameters Menu

The Horizontal and Vertical menus are identical. You may use either one or both to inspect your part. It depends on the type of part you are inspecting, and the type of defects you are trying to detect.



Vector Grid Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

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❖ *Note: To see the search vectors, go to the Region menu and check the Show Region box.*

Vector Direction

Choose to analyze the region Horizontally, Vertically, or both. If you choose both, there will be two menus in which you need to adjust parameters. If you change a parameter, say Segments, in one menu, it will not change in the other menu.

Segments

Divide the region into a number of segments between one and 25. In the Results tab, these are labeled S1, S2, S3, etc.

Segment Overlap

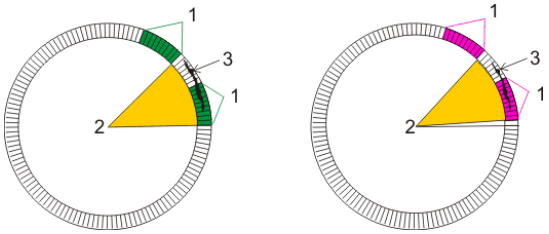
Specify the number of pixels by which each segment will overlap each other. Overlapping ensures that pixels are not missed during inspection. The overlap is highlighted on the image. The segments can overlap between zero and 15 pixels.

CONTINUITY ANALYSIS

This portion of the inspection looks for lack of continuity around the inspection area. It uses groups of vectors to locate intensity changes. Small group sizes are good for finding rapidly changing high contrast defects, such as nicks. Larger group sizes are used to catch slower changing low contrast defects, such as localized short shots. You can apply up to five continuity inspections in one region to search for different defects. Set each to look for specific defects: small scratches, large scratches, shallow cuts, deep cuts, etc.

The position of the first vector is determined by the Start Angle, which is set during Tracker Registration.

After the first two groups of vectors are compared (left side of diagram), the system moves to the next vector, re-computes the average gray shade of the next two groups, and repeats the comparison of gray shades (right side of diagram).



1	continuity group = 10
2	offset = 16
3	defect

Filter

This is a smoothing filter used to decrease sensitivity to high frequency gray level variance. For example, if normal good metal stock has a visible grain, the Filter can be used to eliminate false rejects of good product. A higher value decreases sensitivity.

The best visual of this parameter can be seen by using the Region Plotting tool in this menu. Switch between Unfiltered and Filtered Data to see the difference.

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Vector Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

Group Offset (or Delta Offset)

The number of vectors away to begin the next group. For larger defects, use a larger offset. For smaller defects, use a smaller Group Size and Group Offset.

Change Maximum

The maximum allowable change between two groups. This number is entered as a percentage of change. A higher percentage makes the inspection less sensitive.

VECTOR SUMMARY ANALYSIS

Using both **Failed Vectors** and **Consecutive Limit** together allows you to control the size of defects you want to catch.

Failed Vectors

The number of vectors allowed to fail before the whole inspection fails. This feature allows the inspection to detect small defects and only fail if there are too many of them. The Horizontal and Vertical vectors are counted independently.

Consecutive Limit (or Consecutive Failed)

The number of consecutive vectors allowed to fail before the whole inspection fails. This feature ensures that any defect larger than this number of vectors will fail.

Consecutive Neighborhood

Defines what Consecutive means. Examples:

- 1 = consecutive vectors must be next to each other
- 5 = consecutive vectors can be up to 5 vectors apart

Show Defects (or Show Defect Position)

Displays the failed vectors.

REGION PLOTTING

Segment Selector

When you click the selector bar, the Image Analysis graph displays the gray shade range for the selected segment. It shows the segment vector gray shades from left to right (Vertical inspection) or top to bottom (Horizontal inspection). The high and low gray shades are noted on the graph.

Click anywhere within the inspection region on the image. The Image Analysis plot for that vector is displayed. If you are in the Vertical menu, it displays the vertical vectors, and if you are in the Horizontal menu, it displays horizontal vectors.

Data Plot

Unfiltered Data shows the actual gray shades of the segment. Filtered Data shows the gray shades after the smoothing filter has been applied.

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Plot Vector

Shows the actual gray shades (no filter) of each search vector across all segments. The Results tab displays the corresponding ambient values for that vector for each segment.

Graphs - Line Integration

Failed Vectors

Uses Failed Vectors parameter as limit – shows the number of vectors that failed the continuity checks.

Consecutive Failures

Uses Consecutive Failed parameter as limit – shows the number of consecutive vectors that failed the continuity checks.

Ambient Continuity

Uses Max Change % as limit – shows the percentage of change in ambient between two inspection groups.

TRACKER LINE INTEGRATION INSPECTION

This inspection combines the region generation capabilities of ***Tracker registration*** (on page 286)/ ***inspection*** (see "Tracker Inspection" on page 438) with segmenting and the Radial Edge inspection capabilities of ***Radial Line Integration*** (see "Radial Line Integration (RLI)" on page 377).

Before Adding Tracker Line Integration

This inspection requires Tracker Registration. If you are placing this inspection on a rectangular part, we recommend following topics 1-3 "Before Adding a ***Rectangular Tracker inspection*** (on page 471)".

Adding the Tracker Line Integration inspection

To add the Tracker Line Integration inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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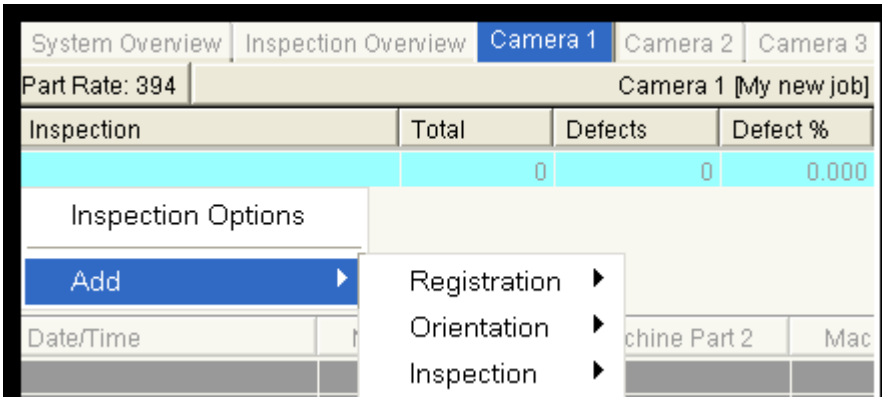
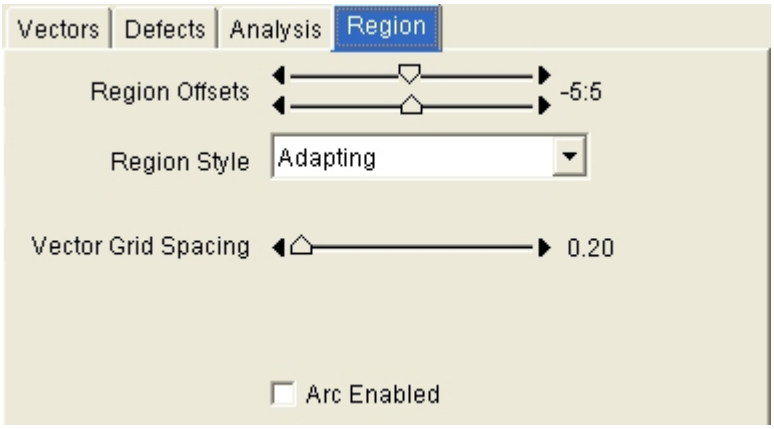
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Tracker Line Integration inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Tracker Line Integration inspection region

Place a Tracker Line Integration inspection through the region menu, and adjust the position of the search region with respect to the edges found in the Tracker Registration.



Region Offsets

Use these sliders to place the search region with respect to the found edges from ***Tracker Registration*** (on page 286). An offset value of zero aligns the region exactly with the found tracker registration points. A negative offset places the region inside the found points, and a positive offset places the region outside the found points. You can have both offsets inside (negative values), or outside (positive values), if desired.

Region Style

There are two methods to control the width of the search region:

- **Adapting Region** – takes a set of edge points that were found with Tracker Registration. It is important that these points are uniform and accurate with minimal chance for failing to locate the proper feature.

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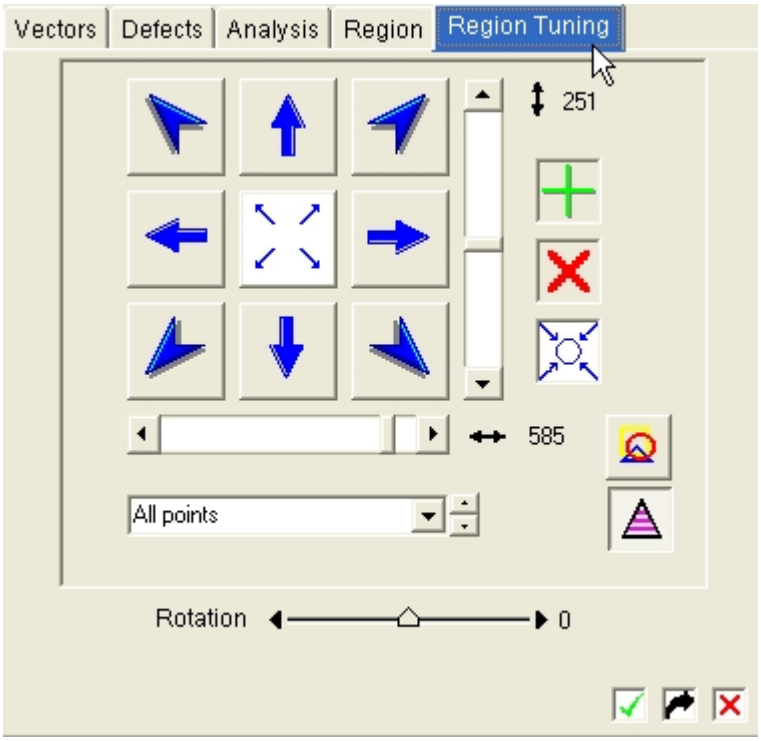
- **Fixed Region** – build the shape of the region one time based on the results of the Tracker Registration. The result is an inner and outer polygon with as many points as search vectors defined in the registration. This technique is good when it is difficult to get consistent edge locations from part to part.
  - *Important*: click the **Generate Region** button after selecting Fixed Region
  - You may need to insert an additional Orientation prior to the Tracker Line Integration inspection to make sure the fixed region is placed correctly on all parts.
  - If you have only a registration to find the center of the part, then the region will move with the position of the center (left, right, up, or down). If you have a center registration and an orientation, then the region will be positioned with the center and rotated with orientation.
  - You can manually adjust the position of any polygon point. The Region Tuning menu provides this adjustment.



Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

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Arcs Enabled

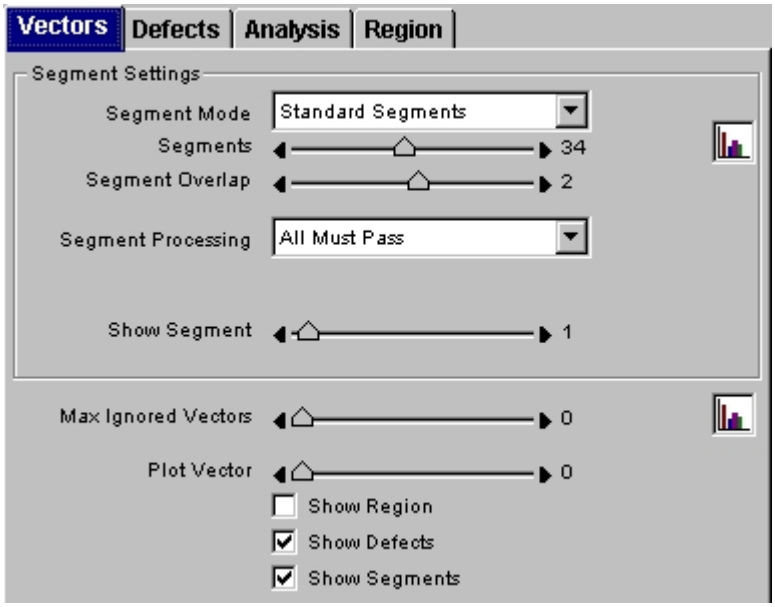
Allows you to inspect an arc instead of the whole region. The system will inspect a portion of the region between the Start and Stop angles. Make sure you have an Orientation in the job prior to using arcs. This will ensure that the inspection region is placed on the same location of the part regardless of the part's orientation.

Adjusting the Tracker Line Integration parameters

❖ *Note: A diagnostic is available throughout this inspection: Click on the search region in the image to see the image analysis of any vector.*

Vectors Menu

Through the Vectors menu, determine whether to divide the region into segments. Dividing the region into segments allows you to catch smaller defects. You may have Standard and/or Ring Segments.



SEGMENT SETTING

Segment Mode

Choose if and what type of segments to divide the search region.

- **Segments Disabled** – The inspection region will be inspected as one continuous region.
- **Ring Segments** – The inspection region will be divided into concentric circles (or shapes).
- **Standard Segments** – The inspection region will be divided into wedge-shaped segments.
- **Ring and Standard Segments** – The inspection region will be divided into both concentric circles and wedge-shaped segments. Use both the Ring and Standard Segments parameters to define the number of segments.

Segments

Divide the region into a number of segments between one and 72.

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Segment Overlap

Specify the number of pixels by which each segment will overlap each other. Overlapping ensures that pixels are not missed during inspection. The overlap is highlighted on the image. The segments can overlap between -30 and 30 pixels.

If negative overlap is used, each segment becomes independent and has a gap between neighboring segments. This helps in avoiding certain patterns that are symmetrical. The negative overlap is displayed in cyan on the image. This area will *not* be inspected. This would be beneficial if you had a pattern under those areas. Using other negative overlap values and other numbers of segments results in different patterns.

Segment Processing

Specify how many segments must pass for the whole inspection to pass.

- **All must pass** - all segments must pass inspection.
- **Minimum passing** - specify the minimum number of segments that must pass (through Passing Minimum parameter).
- **Special Conditions** - allows you to specify that a segment pass, fail, or be ignored.

To use Special Conditions:

1) Use the Conditions menu.
2) Click the segment selector to highlight a segment. The corresponding condition is listed in the upper left of the menu.

   Use the PASS, FAIL, or IGNORE buttons to change the segment condition. During inspection, if the segment matches the specified condition, the inspection passes. You might use PASS or IGNORE on segments that have a recycle logo, for example, that would normally not pass inspections.

Show Segment or Ring Segment

(When segmenting is enabled) Highlights the selected segment on screen. It will outline the segment in red if the inspection fails, or green if the inspection passes. It also displays the results on the Results tab about the selected segment.

The Results screen will show you how the selected segment inspection results compare to the Conditions for that segment (if Special Conditions is chosen in Segment Processing).

Max Ignored Vectors

The number of vectors that may be ignored but a feature is still considered to be found.

Plot Vector

Displays Image Analysis of selected vector (vector highlighted in green on image). Click on the image (away from the inspection area) to remove display.

Show Region

Displays the inspection vectors.

Show Defects (or Show Defect Position)

Displays the failed vectors. They are displayed in yellow. This may be more visible if Show Region is also checked.

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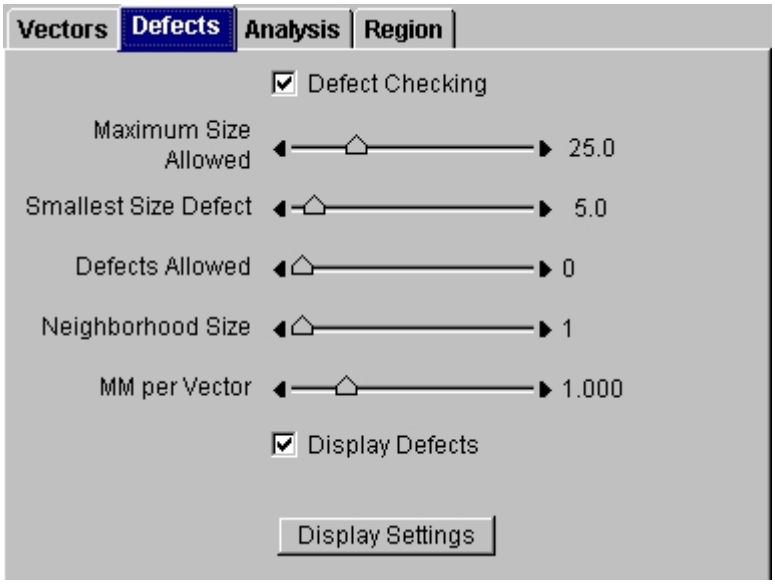
Show Segments

Displays the defective segment(s) (if any) in red. This works only if Segments is enabled.

Adjusting the Tracker Line Integration Parameters

Defects Menu

This menu allows you to specify the size of defects you want to catch. For example, you might allow the part to pass if it has small defects, but would fail the part if larger defects occur.



Defect Checking

Allows the inspection to pass defects that are small, and/ or allow it to pass a number of defects within a size range.

Maximum Size Allowed

Specify the largest size defect allowed.

Smallest Size Defect

Specify the smallest size defect allowed.

Defects Allowed

Specify how many defects between the minimum and maximum size are allowed to pass before the entire inspection fails.

Neighborhood Size

Specify the number of vectors apart that defects can be to be considered connected.

MM per Vector

Specify the number of millimeters wide to consider each vector. A smaller setting makes the inspection less sensitive, and a larger setting makes the inspection more sensitive. This is an arbitrary number. It is not calibrated, nor does it refer to the system's Pixel Calibration.

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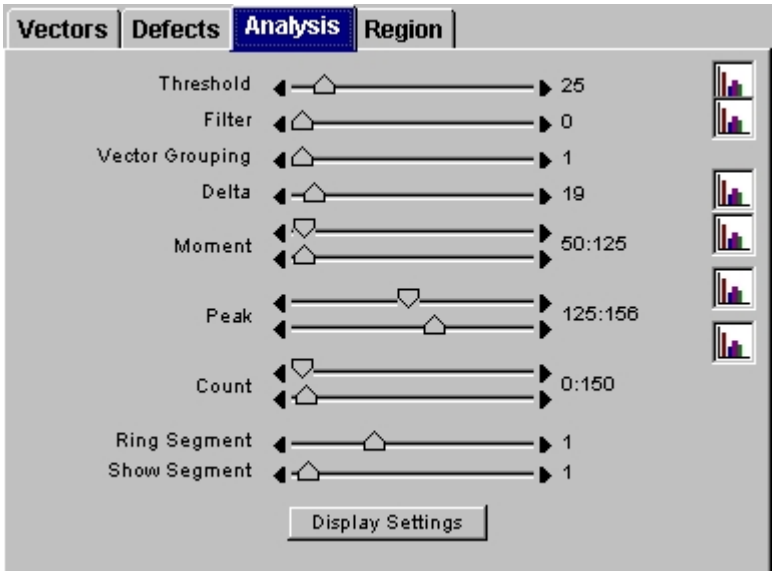
Display Defects

Highlights the group(s) of vectors that the inspection considers defects.

Color Coding: Maximum Size = red, Smallest Defect Size = yellow, Neighborhood Size = cyan.

Analysis Menu



Threshold

The lowest gray level value that will be considered a hit.

- All gray level values equal to or greater than Threshold are ***hits*** (see "About Radial Line Integration" on page 387). These are used in Moment, Count, and Peak value calculations.
- All gray levels below Threshold are ignored.

Filter

This is a smoothing filter used to decrease sensitivity to high frequency gray level variance. For example, if normal good metal stock has a visible grain, the Filter can be used to eliminate false rejects of good product. A higher value decreases sensitivity.

Vector Group Size

The number of vectors to group together. A small vector group typically locates small, abrupt changes. A larger vector group detects larger defects that have a more gradual change.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Moment Min/ Max

The Min value is usually left at zero (default). The Max value is the most likely parameter to adjust when tuning the inspection. (***Moment - definition*** (see "About Radial Line Integration" on page 387))

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Peak Min/ Max

The minimum and maximum allowable difference between the sum of gray levels of any two compared sample lines. The Min value is usually left at zero (default). Reducing the Max value from 255 increases sensitivity.

Count Min/ Max

The minimum and maximum allowable number of ***hits*** (see "About Radial Line Integration" on page 387). The Min value is usually left at zero (default). If the Max number of hits is exceeded, the inspection fails. All hits above the Threshold are counted, regardless of Moment.

Ring Segment

Highlights the selected segment on screen. It also displays information on Results tab about the selected segment.

Show Segment

Highlights each segment on the image as you scroll through segment numbers.

Display Settings

Provides a visual indication of the vector group size and delta spacing in the upper left of the image. Note: if your group size and/ or delta are relatively small, this may appear as a single line, or one group may overlap the other. Also displays the vector group size and delta in the results menu. Click on the image to clear the display settings.

Graphs - Tracker Line Integration

Ignored Vectors

Vectors menu – uses Max Ignored Vectors parameter as limit – shows the number of vectors that were ignored.

ANALYSIS MENU GRAPHS

The following graphs are available to assist setup of parameters in the Analysis menu.

Failed Count

Uses Count as limits – shows how many vectors failed the allowable number of hits.

Maximum Moment

Uses Moment as limits – shows the greatest moment for each part.

Peak

Uses Peak as limits – shows the greatest peak for each part.

Raw Vector Data

Shows the average gray shades of each pixel along all vectors for one part.

Filtered Vector Data

Shows the average gray shades of each pixel along all vectors after Filter has been applied, for one part.

Threshold Vector Data

Shows the average gray shades above the threshold where the hits occurred.

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Error Details

Depending which inspections are enabled, shows the number of parts that failed each inspection.

LABEL SKEW INSPECTION

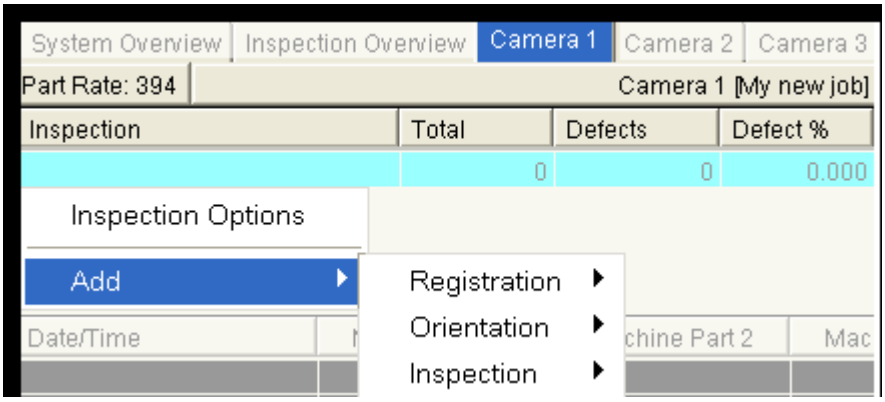
This inspection determines whether labels are skewed and fall outside of specified limits. The inspection is self-registering – it ignores any registration or orientation that may come before it in the job.

The inspection is flexible. It can use one or two regions to find the part or label. One part search region is used if only one side of the container is visible. Likewise, one label search region is used if only one side of the label is visible. If two sides of the container and label are visible, two search regions are used for each.

Adding the Label Skew inspection

To add the Label Skew inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Right-click in the statistics area.



4) Select Add >> Inspection >> Label Skew inspection. The default region is place on the image, and the inspection menus are displayed in the upper right screen.

Setting the Label Skew region

We recommend the following sequence to set up this inspection:

1) Find part.
2) Find label.
3) Adjust inspection parameters.

The following menus are listed in that order.

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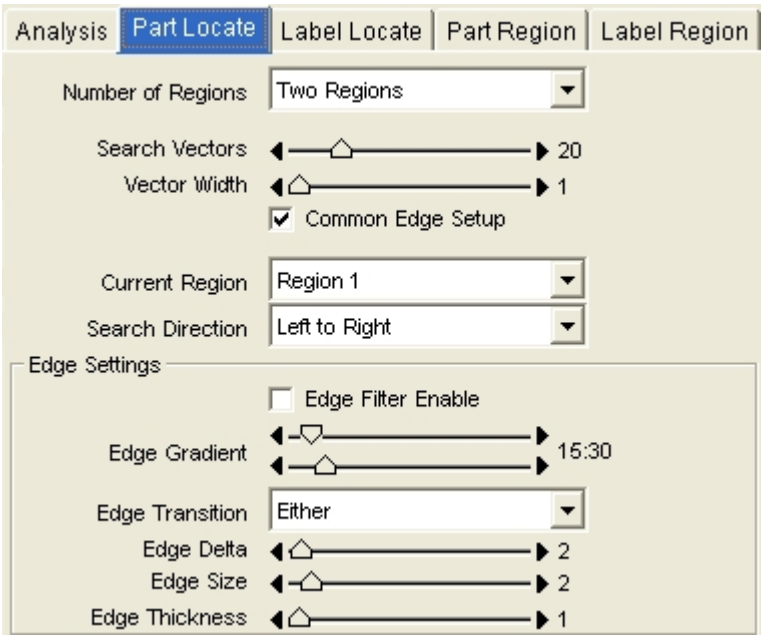
Part Locate Menu



This menu is used for part registration. Specify the number of regions, and set the search vector and edge locate criteria.

Number of Regions

Choose the number of regions to locate the part. One region is used if only one side of the part is visible. Two regions are used if both sides of the part are visible.

The regions are marked on the image: PR1 for Part Region 1 and PR2 for Part Region 2.

Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Vector Width

Adds a number of search vectors at each search point to filter out noise and to help eliminate false edge locations. Note that a larger width may add time to the inspection.

Common Edge Setup

This allows you to have common edge search parameters for both sides of the part, or create individual edge search parameters for each side. Individual setup is used if each side of the container looks different. This is only present if Two Regions is selected.

Current Region

Choose one region to program the search vectors. This is only present if Two Regions is selected.

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Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

If using Two Regions, set the search direction for each region.

EDGE SETTINGS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

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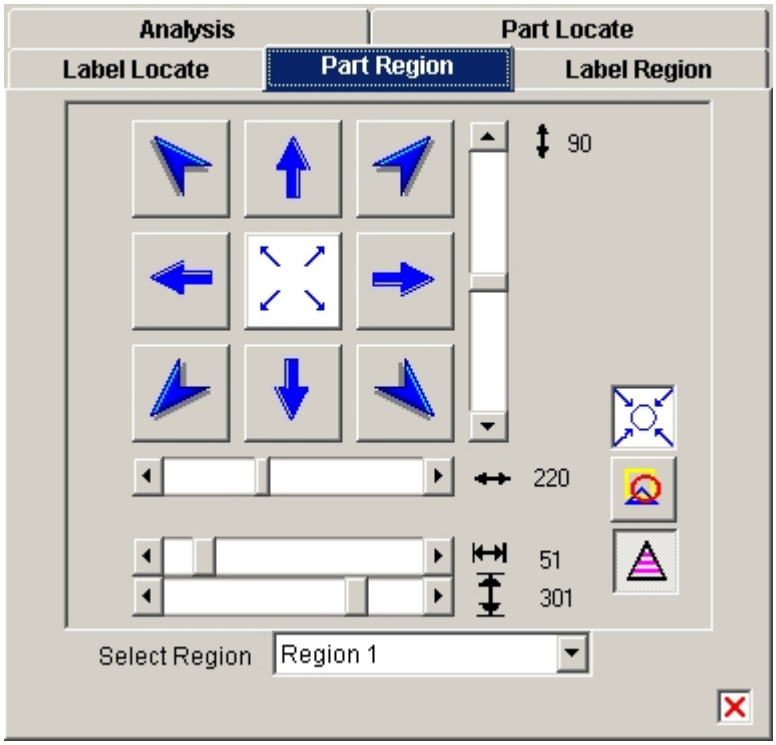
Part Region Menu

This menu is similar to most other region menus, except that it provides setup for two regions (Two Regions must be specified in the Part Locate menu to see two regions on image). Each region is marked on the image: PR for Part Regions 1 and 2, and LR for Label Regions 1 and 2. The regions can be locked horizontally or vertically.



To set the part region:

1) Select the region.
2) Move the arrows and/or region width/height sliders to find one edge of the part, allowing room for part movement in the image.
3) Repeat for other region if applicable to your part.

Label Locate Menu

This is similar to Part Locate menu, except that you set the search regions to locate the edge of the label. Choose the number of regions to locate the label. One region is used if only one side of the label is visible. Two regions are used if both sides of the label are visible. The label regions are marked on the image: LR1 for Label Region 1 and LR2 for Label Region 2.

Label Region Menu

This is similar to Part Region menu, except that you set the search regions to locate the edge of the label.

Follow Part

When this is checked, the label regions will follow the location of the part.

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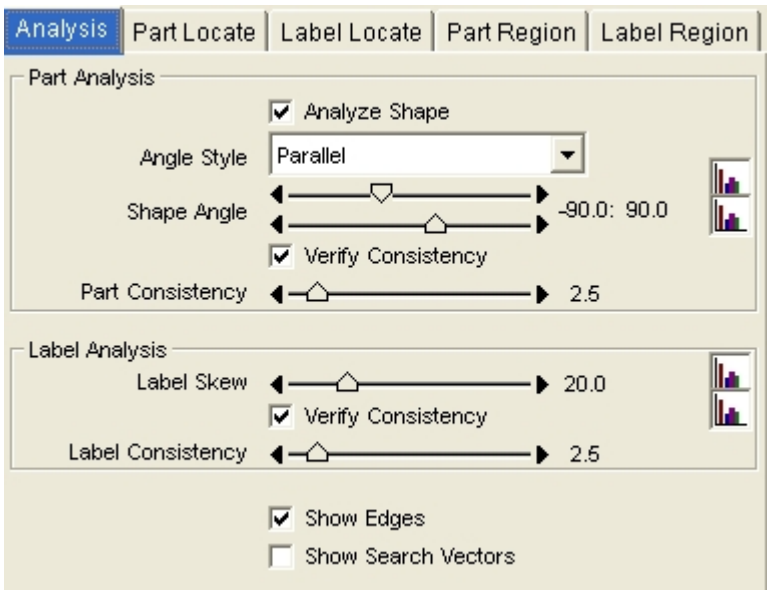
Adjusting the Label Skew inspection parameters

Analysis Menu



This menu sets the inspection and rejection criteria.

PART ANALYSIS

This section inspects the part and can reject it if out of specification. It can also reject the part if the label is torn.

Analyze Shape

Enable the Shape reject criteria.

Angle Style

Choose Parallel or Diverging. This depends on the shape of the part. If the part is straight on both sides, such as the sides of a can, use Parallel style. If the part is tapered, such as the neck of a bottle, use Diverging.

Shape Angle Min/ Max

The minimum and maximum angles allowed for the sides of the part. The angle is computed by averaging the two side angles.

Verify Consistency

Enables a check to see whether the found edges form a straight enough line. This is used to catch torn labels which could appear in either the part or label inspection regions.

Part Consistency

Allows you to set a limit of how consistent the edges must be for the inspection to pass.

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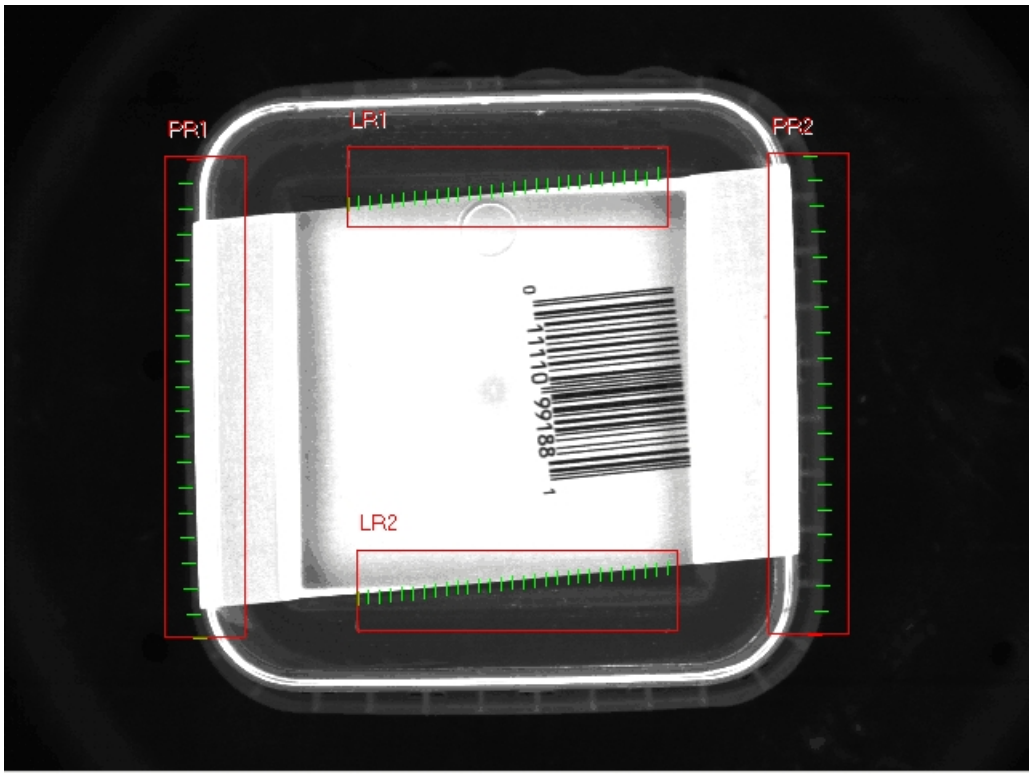
LABEL ANALYSIS

Label Skew

The number of degrees the label is allowed to be skewed with respect to the part. If the label skew exceeds this value, the inspection fails. See example below.



Verify Consistency

Enables a check to see whether the found edges form a straight enough line. This is used to catch torn labels which could appear in either the part or label inspection regions.

Label Consistency

Allows you to set a limit of how consistent the edges must be for the inspection to pass.

Show Edges

Displays the found edges in the search regions.

Show Search Vectors (or Search Lines)

Displays the search vectors.

Graphs - Label Skew

Part Shape

Uses Shape Angle as limits – shows the angle skew of the part.

Part Shape Fit

Updates if Verify Consistency is enabled under Part Analysis. Uses pre-defined limits – shows how well the part fits within the inspection population.

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Label Skew

Uses Label Skew parameter as limits – shows the angle skew of the label.

Label Shape Fit

Updates if Verify Consistency is enabled under Label Analysis. Uses pre-defined limits – shows how well the label fits within the inspection population.

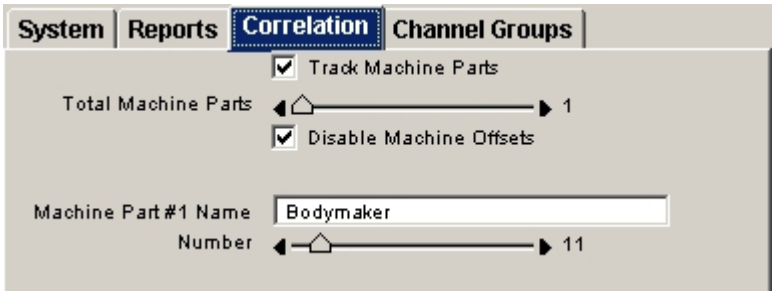
CORRELATION INSPECTION

This inspection uses vision-based correlation instead of hardware-based correlation. The part must be manufactured with a set of marks that the Pressco vision system understands. Work with Pressco Sales on implementing the marking scheme so that it can be detected by this algorithm.

In this section, we are using an example Bodymaker ID part. There is one orientation mark and a machine part mark. The orientation mark is wider than the machine part mark. Each Bodymaker puts a mark at a different location on the part (spaced by a number of degrees), which distinguishes those parts.

Before Using Correlation Inspection

1) First set correlation parameters in the System Configuration menu: button >> Correlation tab >> check Track Machine Parts.
2) Set number of machine parts.
3) Check Disable Machine Offsets. It is important that these offsets are disabled when this inspection is in use.



4) Re-name Machine Part #n to desired name. Set number of components + 1 for each machine part. That is, if you have 10 (body makers, molds, etc.), set the number to 11. The last component number is used during the inspection for parts that do not match the learned correlation codes.
5) Click OK to save changes. The system must re-start.
6) Place a registration (such as Circular Registration) on the part to find its center.

Next set up the Correlation inspection.

Adding the Correlation inspection

To add the Correlation inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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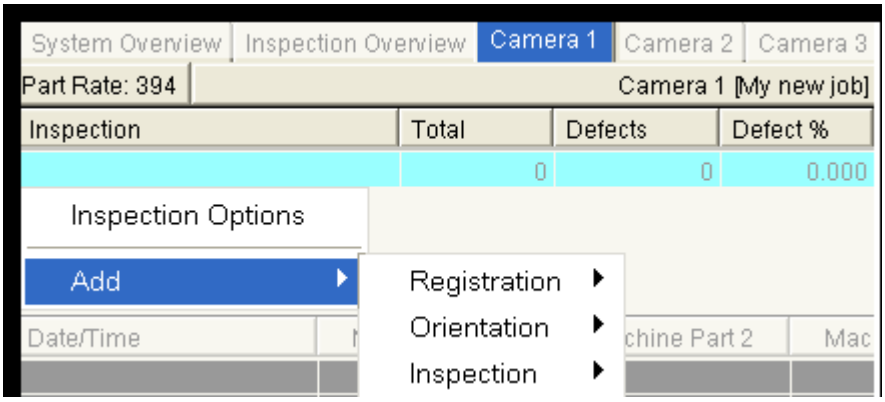
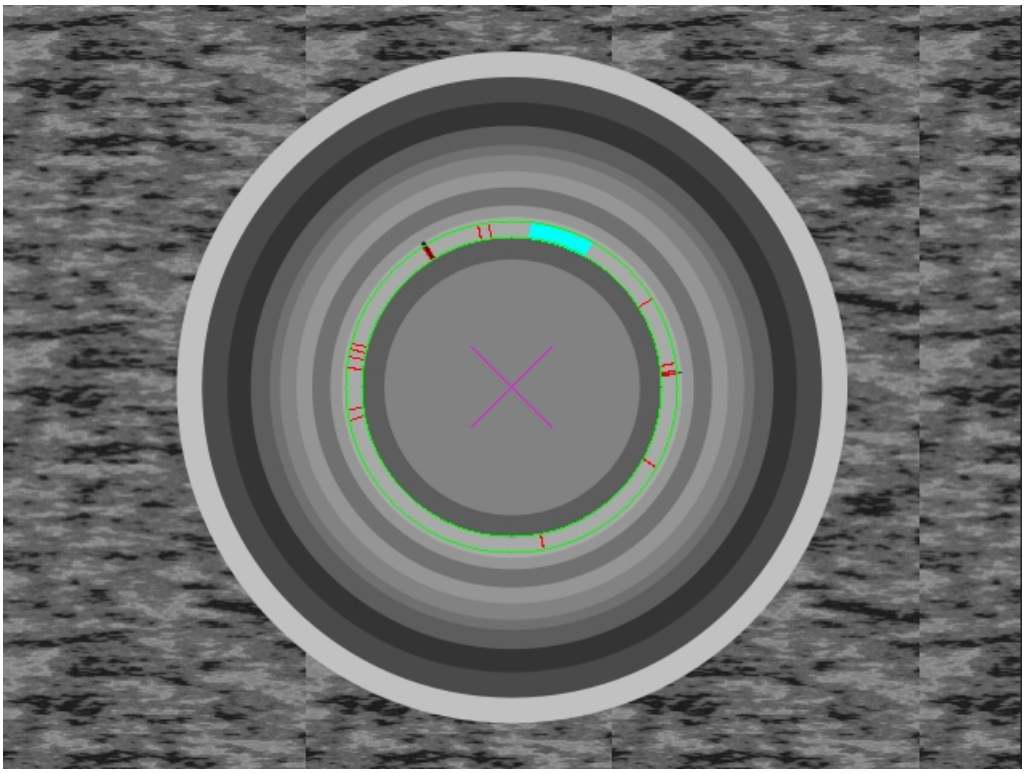
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Correlation inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Correlation inspection region

Using the region menu, surround the area containing the correlation marks. Note: when you first place the inspection, the correlation marks will not be properly located until the system learns them. It will learn them later when you adjust the Learn menu.



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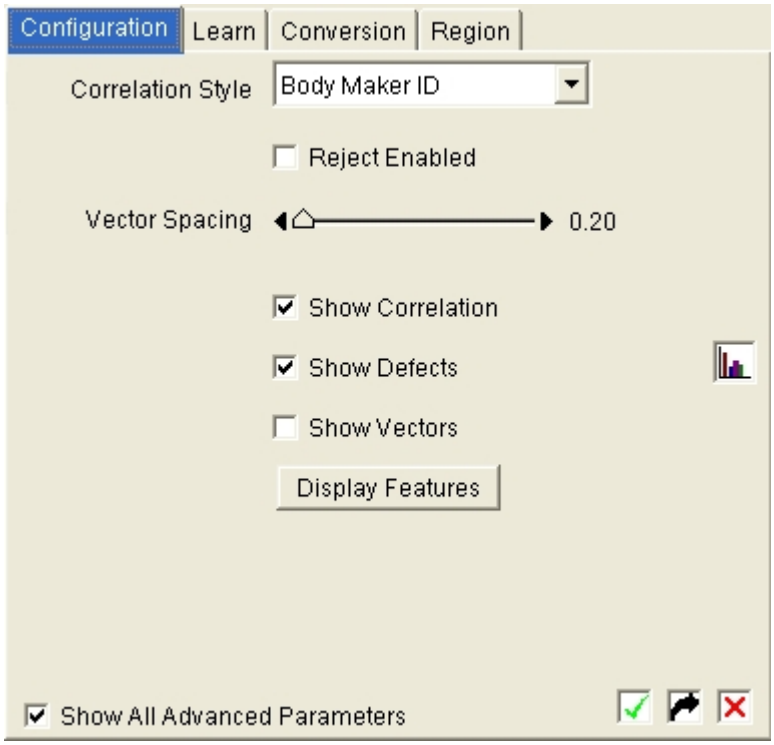
Adjusting the Correlation inspection parameters

Configuration menu

Select desired Correlation style, and set overall parameters for this inspection.



Correlation Style

From the drop-down menu, choose your plant's style of correlation.

Reject Enabled

If Enabled, the system will reject parts on which it could not find correlation marks. If Disabled, parts will be correlated, but only rejected if they have defects caught by other inspections.

Vector Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well. You can adjust this number in 0.1 degree increments as low as 0.2 degrees.

Show Correlation

Displays color-coded correlation marks. Orientation mark is displayed in magenta, and correlation mark is displayed in cyan. These correspond to the information on the Results screen.

Show Defects (or Show Defect Position)

Displays the failed vectors. This may be more visible if Show Correlation and Show Vectors are OFF.

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Show Vectors

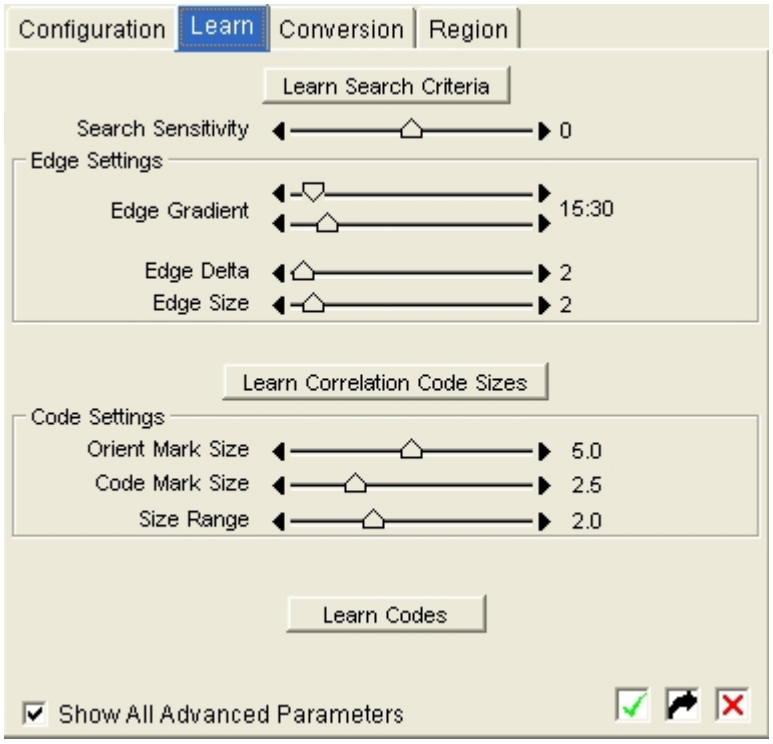
Displays all search vectors.

Display Features

Displays all information about the correlation marks. Click button again to see information about the next mark.

Learn Menu

This is where the system learns the size of the orientation marks and the correlation marks.



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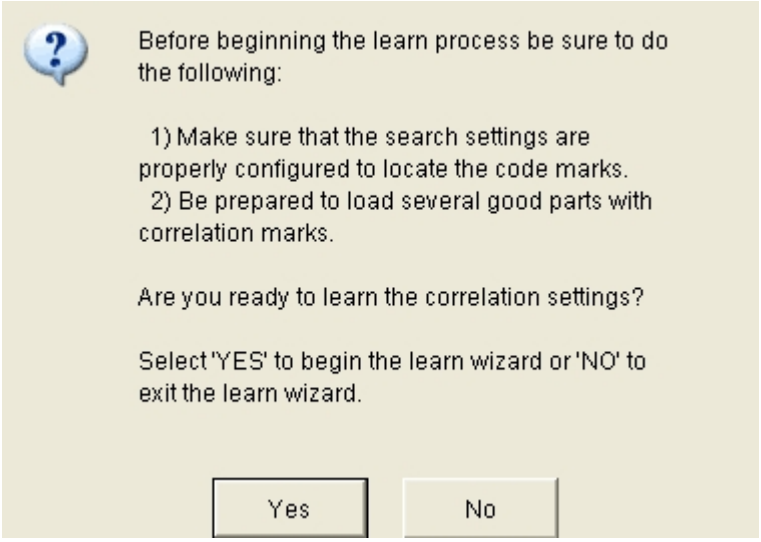
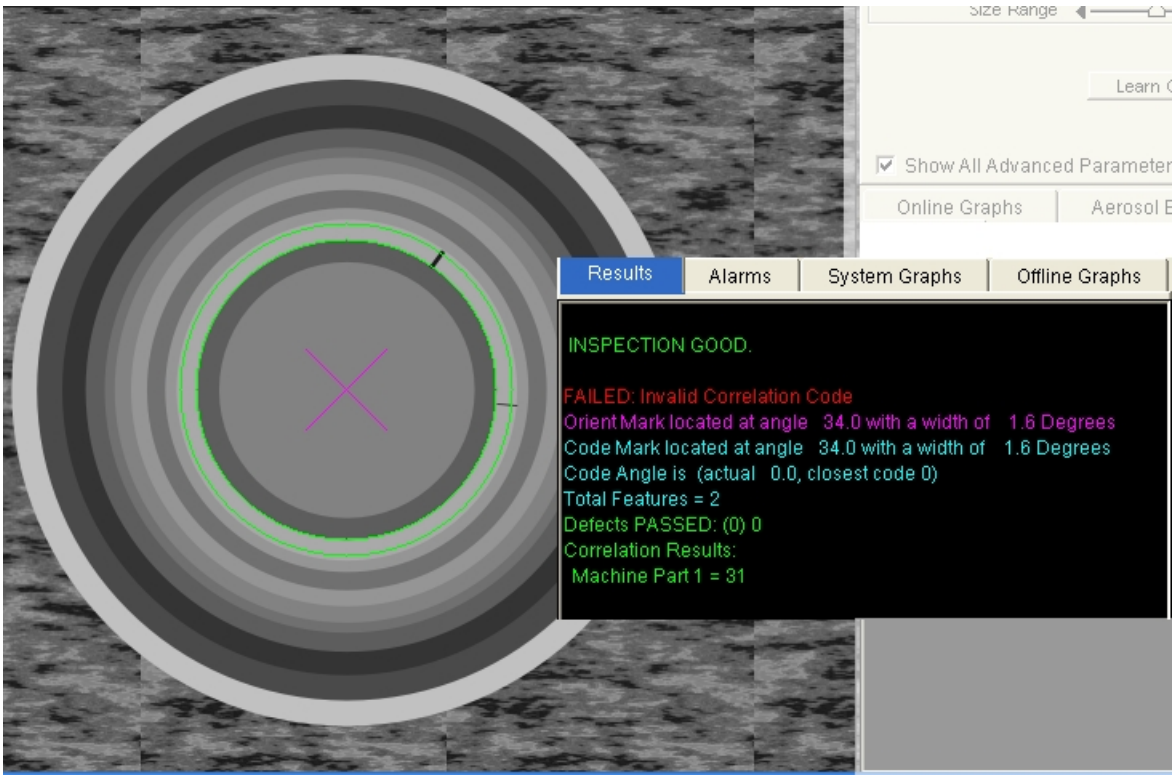
Learn Search Criteria

Press the Learn Search Criteria button to start the Learn Wizard. Follow instructions on screen. Be prepared to run parts with correlation marks through the system when the wizard requests.



The system first learns the grayscale values of the area to set the edge parameters. Then it learns the correlation marks. The system should find the orientation mark and code mark (see image and results screen below). Don't worry about the failed Correlation Code at this point: we will adjust it later in the menu.



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Click the button several times to make sure the correlation marks are being located on each image (look at Results screen). If not, adjust the other parameters in the menu. First try **Search Sensitivity**: click the arrows to make the more or less sensitive. If necessary, check the Show All Advanced Parameters box and adjust the Edge Settings. All parameters of the Learn menu are described below.

❖ *Note: we recommend that you re-learn the part a second time if you change Sensitivity.*

Search Sensitivity

Easy adjustment to make the edge settings more or less sensitive.

EDGE SETTINGS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

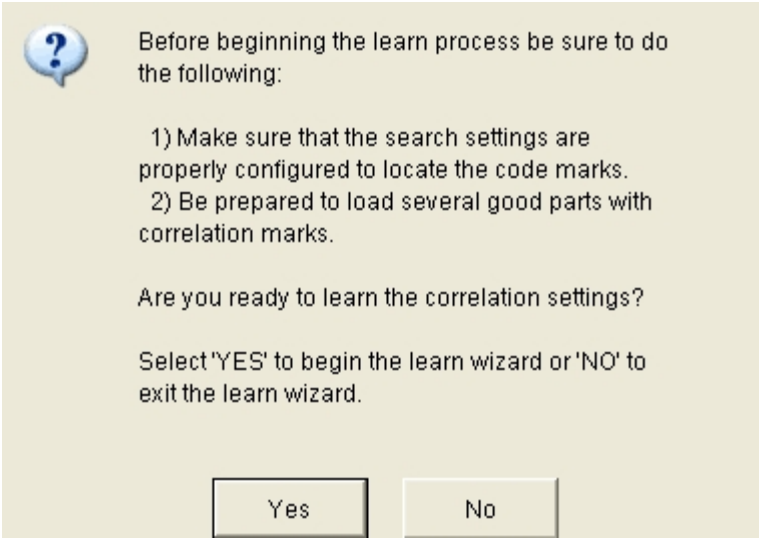
Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Learn Correlation Code Sizes

Starts a Learn Wizard to determine the widths of the orientation and the correlation marks. Be sure you have already used the Learn Search Criteria command. To Learn Code Sizes, be prepared to run several marked parts through the system. Follow the instructions on screen.



CODE SETTINGS

These settings are determined through the Learn Wizard and do not have to be changed. However, you can change them if necessary.

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Orient Mark Size

The width of the orientation mark. The orientation mark is normally wider than the correlation mark – the system needs to distinguish between them.

Code Mark Size

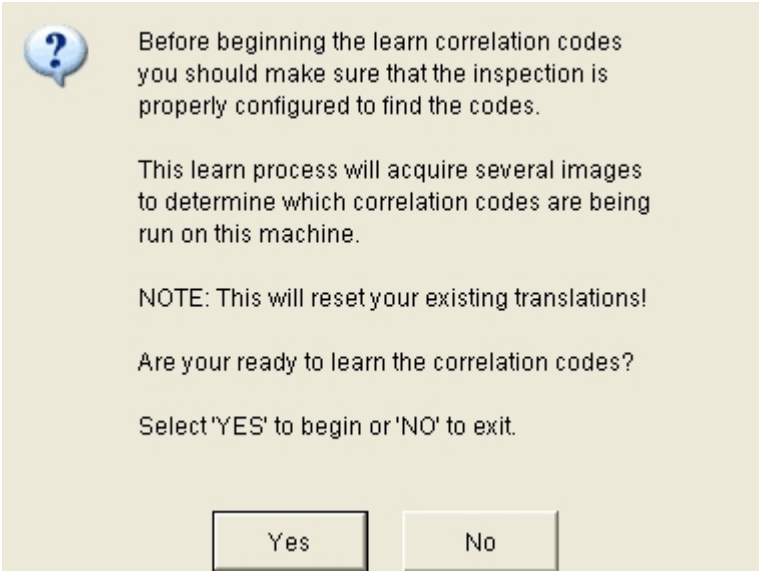
The width of the correlation, or Machine Part ID, mark, in pixels.

Size Range

This is used by the orient and code sizes. Any mark found within the orient or code mark size +/- Size Range is considered an orient or code mark.

Learn Codes

This runs a wizard to learn which correlation mark corresponds to each machine part. Make sure you have already learned the Search Criteria and Correlation Code Sizes prior to using this wizard. Follow the instructions on screen.



As the system acquires images, it determines the angle of each correlation mark.

When the system has run through samples, it displays Correlation Code Information. Look at the image on screen and the results tab, and click Yes or No to set the correlation code for the current part. The number of degrees is computed from the angle difference between the orientation mark and the correlation mark.

When the system finds all the codes, it displays the Correlation Translation Table.

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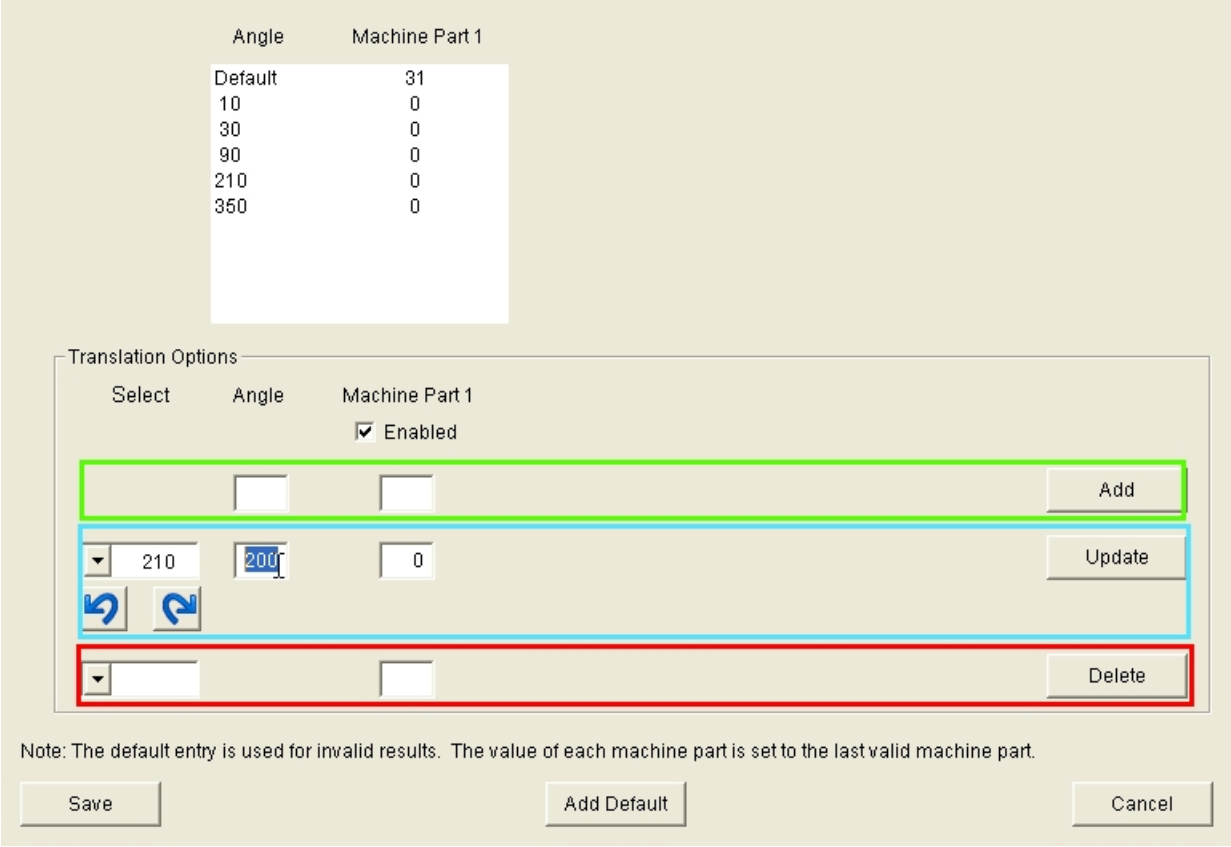
TRANSLATION OPTIONS

This area allows you to change the learned codes.



Enabled

This enables or disables the need to type Machine Part when you are adding or updating the correlation codes. For example, if you only have one machine part, un-check the box - the system will automatically assign the default Machine Part number to the translation table.

Add

To add another correlation code, type the Angle (and Machine Part number) and click Add.

Update

To change a correlation code: select the desired Angle from the drop-down list. Type a new correlation code (and Machine Part). Click Update. The arrows below the box allow you to scroll through all the correlation codes.

Delete

To delete a correlation code: select the desired Angle from the drop-down list. Click Delete.

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Save

Save your changes and exit.

Add Default

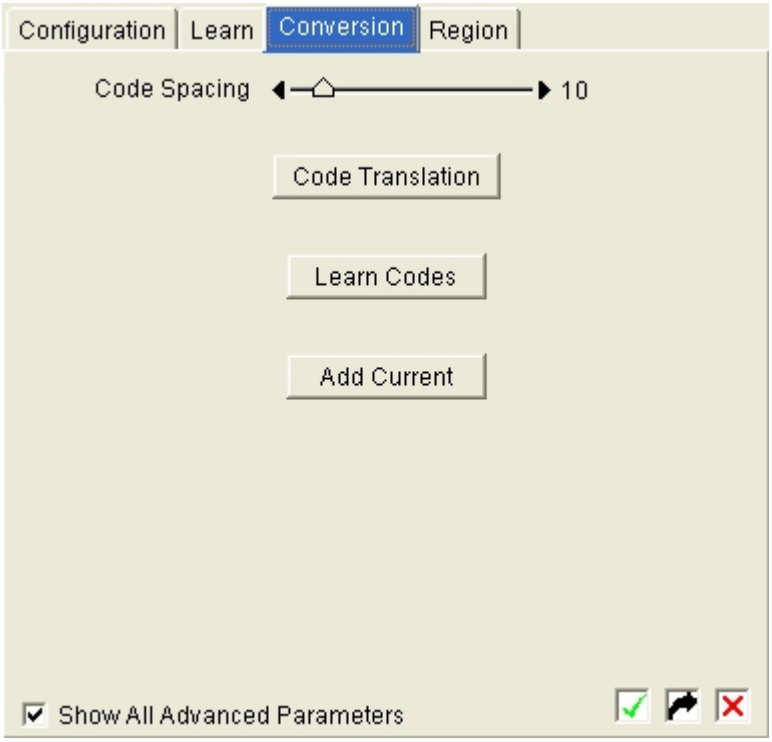
Adds a default correlation code. This is used for parts that are inspected but do not match any existing correlation code. These parts are assigned to the highest component number of the machine part. This is why you set number of components + 1 in the system configuration.

In System Graphs, the highest bin number collects these parts.

Cancel

Do not save any changes, and exit.

Conversion Menu



This menu allows you to map which correlation marks correspond to each machine part. Set Code Spacing first, then use Learn Codes before clicking the Translation button.

Code Spacing

(Advanced parameter) The number of degrees between correlation marks. If marks are supposed to be five degrees apart, set code spacing to five. This number is important because the system rounds off the correlation code to the nearest increment.

Code Translation

Displays the Correlation Translation Table that you can modify. We recommend using all the wizards in the Learn menu first when setting up this inspection. Then you can enter this table and modify it if necessary.

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Learn Codes

This is the same wizard that is used in the Learn menu. See above for details.

Add Current

Allows you to add an additional correlation code from the current image.

Graphs - Correlation Inspection

Excessive Defects

Shows number of defects per machine component part.

Average Circle Vector

Shows average gray shades for the inspection region.

ALPHANUMERIC CORRELATION INSPECTION

This inspection is used to determine the manufacturing identification number of parts. These identification numbers, such as Body-Maker ID numbers, are stamped into the part during manufacturing. The numbers can be used to correlate parts back to the machines where they were manufactured.

The part may be imaged from either inside or outside of the part; therefore, the number may look backwards in the image. The means of imaging is dependent on the manufacturing environment.

Before adding an Alphanumeric Correlation Inspection

Place a registration, such as a Circular Registration, to locate the part. Then add the Alphanumeric Correlation inspection.

Adding the Alphanumeric Correlation Inspection

To add the Alphanumeric Correlation inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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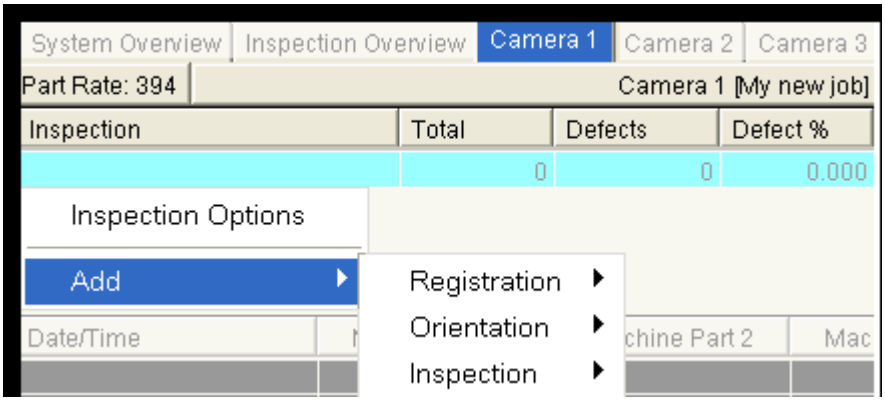
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Alphanumeric Correlation inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Region

To set the Alphanumeric Correlation region:

1) Go to the Region menu.
2) Use the region sliders and arrows to adjust the size of the region, noting the following:
   - Keep the region size as small as possible. This keeps inspection time to a minimum.
   - Keep the outer radius close to the outer edges of the largest size number (typically an "8").
   - Inner radius is optional. Some ID numbers have a large space between them, and an inner radius is used to decrease the overall region size.
3) Snap several images to make sure the region covers all ID numbers. Adjust as necessary.

Next, set the appropriate filters.

Setting the Alphanumeric Correlation Filters

This menu helps adjust the image before it is processed. Set the filters as recommended for your type of part. Leave the Advanced Parameters at their default values.

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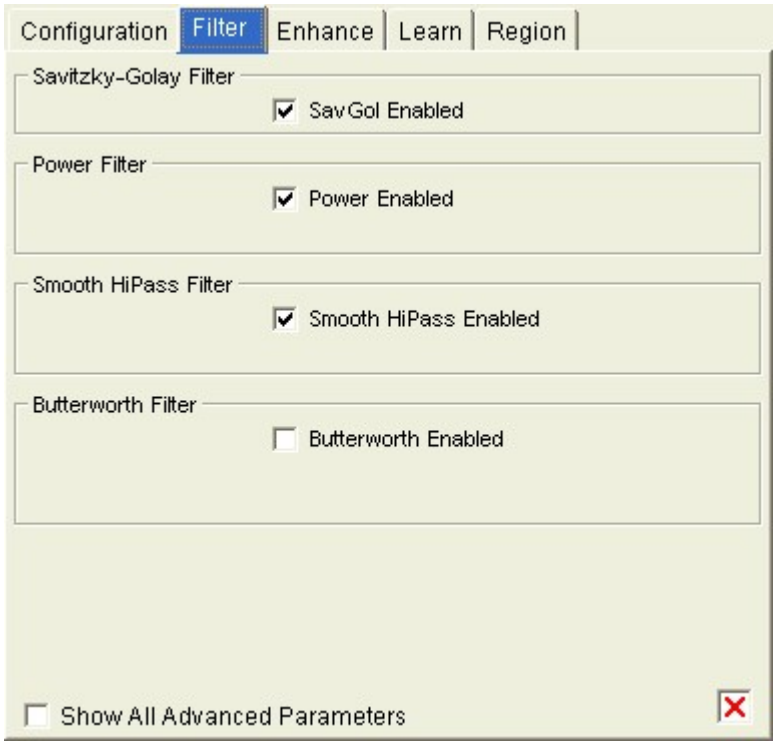
Alphanumeric Correlation Filter menu



SavGol Enabled

This filters out undesired grain shine. This filter should always be on when using this inspection for cans.

Power Enabled

This adjusts the gray scale of the image. This filter should always be on when using this inspection for cans.

Smooth HiPass Enabled

This smoothes the gray scale of the image. This filter should always be on when using this inspection for cans.

Butterworth Enabled

This filter should only be used when this inspection is used to identify the Mold Number ID of plastic caps.

Next, configure the inspection for your part.

Setting the Alphanumeric Correlation Configuration parameters

This menu has system-level settings such as reject, as well as inspection-level settings. Typically, the default settings work well. The only parameter you may need to enable is Template Mask Enabled.

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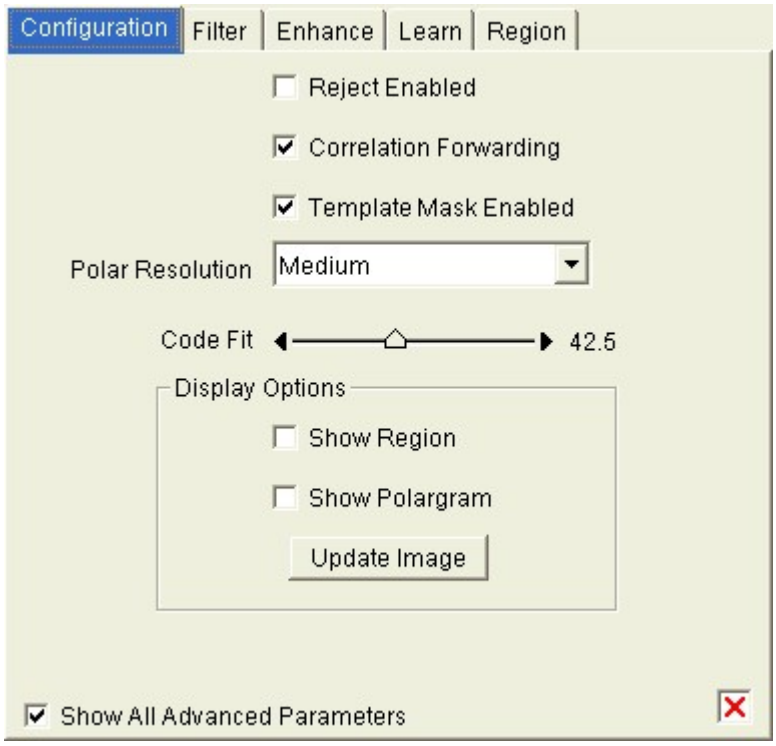
Alphanumeric Correlation Configuration menu



Reject Enabled

Allows the system to reject parts that are not identified with an ID number through this inspection. Normally, this is left unchecked.

Correlation Forwarding

This forwards the results of the Alphanumeric Correlation inspection to another inspection lane. This is only used in specific applications where two-lane systems are used with Alphanumeric Correlation.

Template Mask Enabled

This is used as part of the template creation process to mask out unwanted data. This should always be checked.

Polar Resolution

This sets the sensitivity of the inspection. The Medium setting is normally used for cans.

Code Fit

This is a pattern match strength that must be achieved in order to be counted as an ID number. This is typically left low enough so that all cans are assigned an ID number.

DISPLAY OPTIONS

Show Region

This is used during inspection setup to view the Processed Region of Interest graphic. This graphic shows the effect of the filters and enhancements on the displayed image.

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Show Polargram

This is used during system installation, and does not need to be used in manufacturing plants.

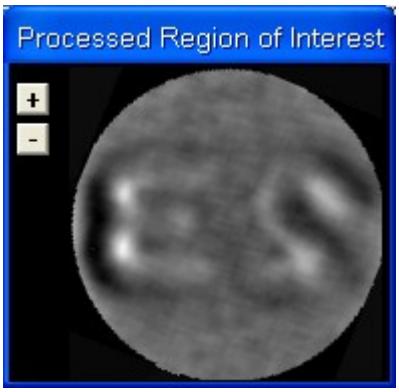
Update Image

This posts the Processed Region of Interest graphic to the display image. This will remain until the camera is snapped.

Using the Processed Region of Interest

The Processed Region of Interest graphic is a useful tool for setting inspection templates. When you adjust template masks and filters, you will see the results on this graphic. This region of interest is what the Intellispec uses to identify ID marks.

- To see the Processed Region of Interest graphic, check the Show Region box in the Configuration menu. It is usually displayed in the upper left of the Intellispec screen, although you can move it by clicking and dragging the title bar.



- To see a larger picture, click the [+] button.
- To see a smaller picture, click the [-] button.
- This region of interest is NOT saved with Intellispec images, unless:
  - You click the Update Image button in the Configuration menu. This displays the processed region of interest on the inspection image. Then,
  - You save the image: right-click over the image >> choose Image >> Save >> and select a grayscale image type.

Setting the Image Enhancements

Set Enhancements only if needed for your application. Otherwise, no adjustment is necessary in this menu.

This menu provides image enhancement to help identify patterns. These should only be set once for a part program, not for each template. The effect of the settings is best seen through the Processed Region of Interest graphic (check Show Region in the Configuration menu).

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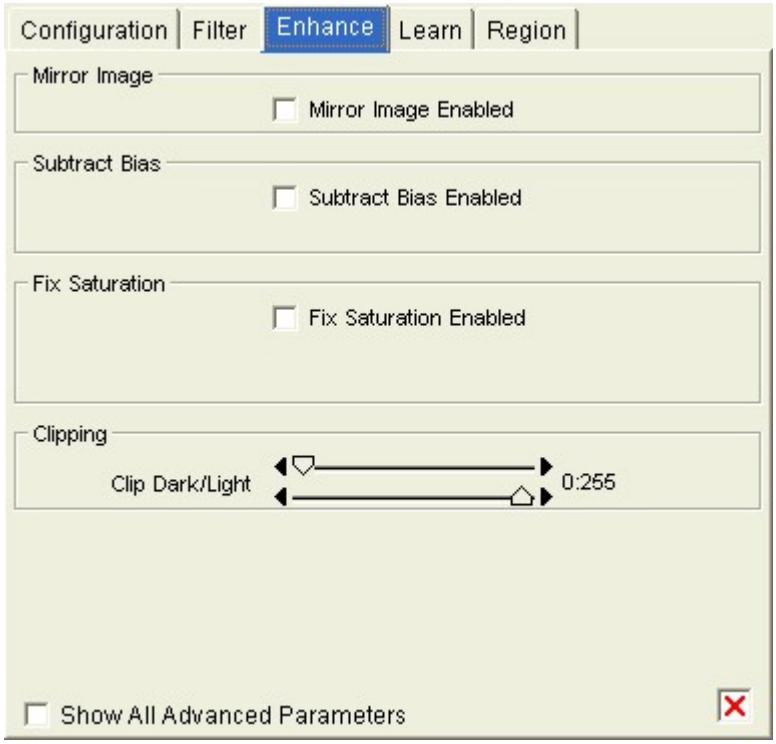
❖ *Note: These settings should NOT be changed during online inspection. Changing settings can affect proper ID matches.*



Mirror Image Enabled

Reverses the image. This can be used for ID numbers that appear backwards in the camera view. Look at the Processed Region of Interest graphic to make sure this does not adversely affect the template image.

Subtract Bias Enabled

Changes the gray shade bias across the whole image. This is not a drastic enhancement, but can be used with very dark images.

Fix Saturation Enabled

Fixes the saturation of the image. This should NOT be used for can applications.

Clipping

Clips out light and/or dark regions. This is rarely used for can applications. An applications report for specific applications will mention use of clipping. Otherwise, leave un-checked.

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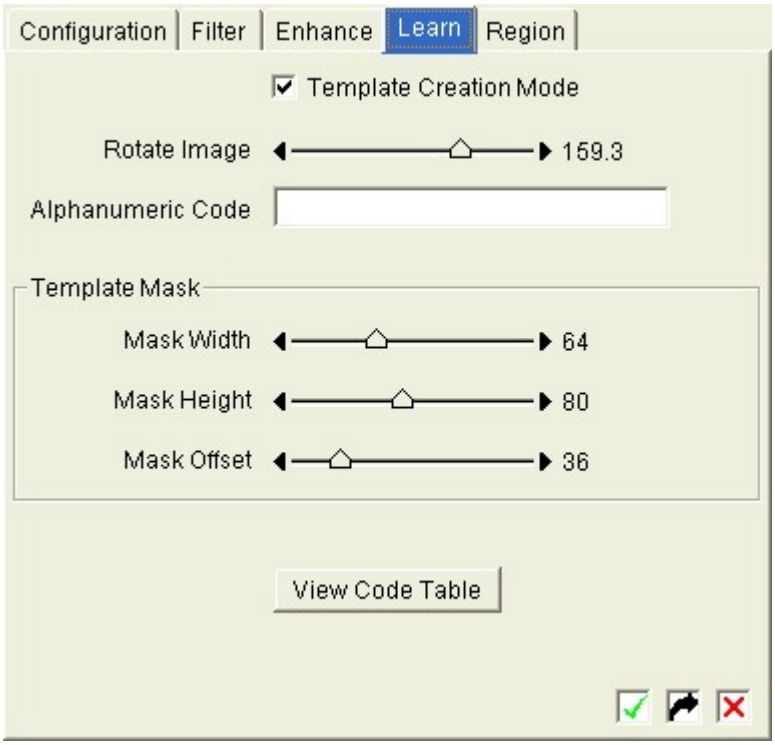
Setting up the Templates

Alphanumeric Correlation Learn menu

This menu allows the system to 'learn' the IDs, and allows you to set up templates for all your ID numbers. For best viewing, check the Show Region box in the Configuration menu. This displays the Processed Region of Interest, which shows you the results after the system has applied the appropriate filters and mask templates.



Before setting up a template:

1) Go to the Alphanumeric Correlation Configuration menu.
2) Check the Template Mask Enabled box.
3) Check the Show Region box.
4) Go to the Filter menu.
5) Enable the appropriate filters for your type of part.
6) Go to the Learn menu.
7) Get a list of all the ID numbers from all the machine parts [body-makers] in the current production line. You will create a template for each of these numbers.

Next, set up the templates through the Learn menu.

To set up a template:

1) Find a good image for one of the ID numbers.
    - If the production line is running, click the button to see one image at a time. Stop when you see a good image for one of the ID numbers. A good image is one where you can clearly read the ID number (even if it is backwards on the image).
    - If the production line is not running, put a part under the inspection system. Snap an image.

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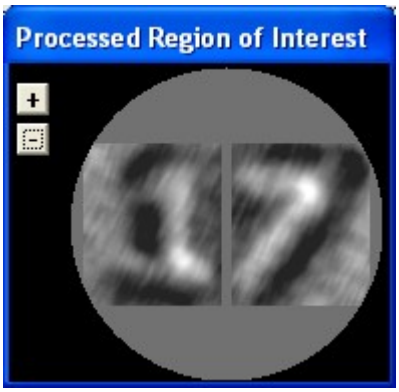
2) Check the Template Creation Mode box.
3) Look at the Processed Region of Interest graphic. Use this image to create the template.
4) If the ID number is backwards on the image, go to the Enhance menu and check the Mirror Image Enabled box. Return to the Learn menu.
5) Adjust Mask Width, Mask Height, and Rotate Image so that you can see the entire ID number in the Processed Region of Interest.
6) Adjust Mask Width and Mask Height so that the region is close to the edges of the ID numbers. If there is a space between the numbers, use Mask Offset to create a template space between the numbers, which speeds inspection time. This may take a little trial and error. Make sure you see good dark-to-light transitions in the template area.



7) When the template region is set satisfactorily, type an ID number in the Alphanumeric Code box. This saves the ID number that will be correlated to all images that match this template. It also prompts you to save a template, which is a small bitmap image. Use alphanumeric codes, if desired, such as "4a".
8) In the Save BMID Template dialog box, type a file name to associate the template with the ID number. If the ID number is 16, you could call the bitmap "VIC12_16.bmp", for example. Use a prefix to identify the production line or product type [in this example, VIC12 is the production line]. This is important where you have multiple production lines.
    - If you try to save a file and the name already exists, the system will ask whether you want to overwrite the file.

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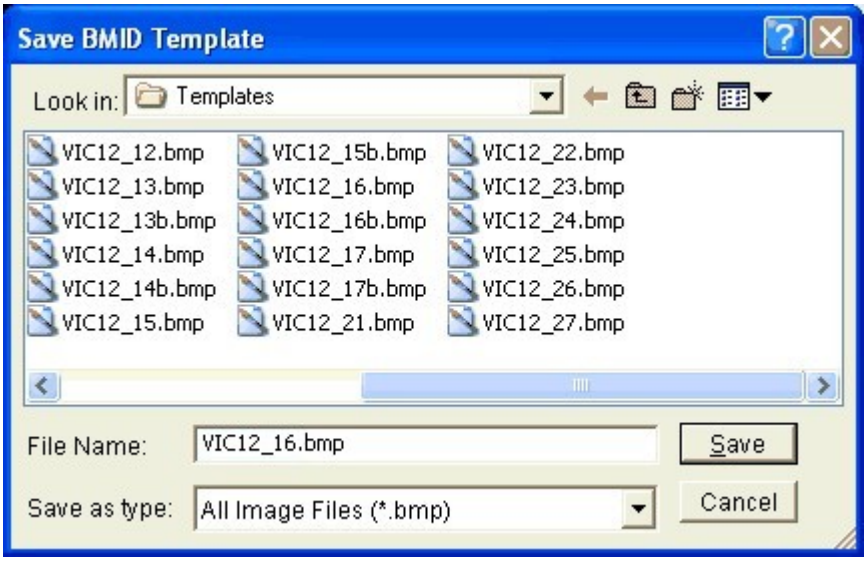
- The file is saved to the Templates directory.



9) Un-check the Template Creation Mode box. The system will run the inspection on the current image and display information in the Results tab.
   - If the results are good, that is, the system properly identified the part, go to step 10.
   - If the results are unsatisfactory, repeat steps 2-9 until the desired results are achieved.

10) Repeat steps 1-9 for the remaining ID numbers in the current production process.

If needed, you can re-create a template by over-writing the existing one.

Learn menu parameters

Template Creation Mode

Check this box to create a new ID template. When this is checked, the masked area is displayed on the Processed Region of Interest graphic. The masked area allows the system to ignore areas of the image, to speed inspection time. This box should be un-checked during normal inspection mode.

Rotate Image

Used during template creation. This rotates the Processed Region under the mask, to allow for horizontal characters and proper fitting to the mask.

Alphanumeric Code

This is where you enter the ID number to correlate to your production line's machine parts [body-makers]. This also triggers the creation of a template, and should be performed as the last step in template creation.

TEMPLATE MASK

Mask Width

Used during template creation. Changes the width of the mask boxes.

Mask Height

Used during template creation. Changes the height of the mask boxes.

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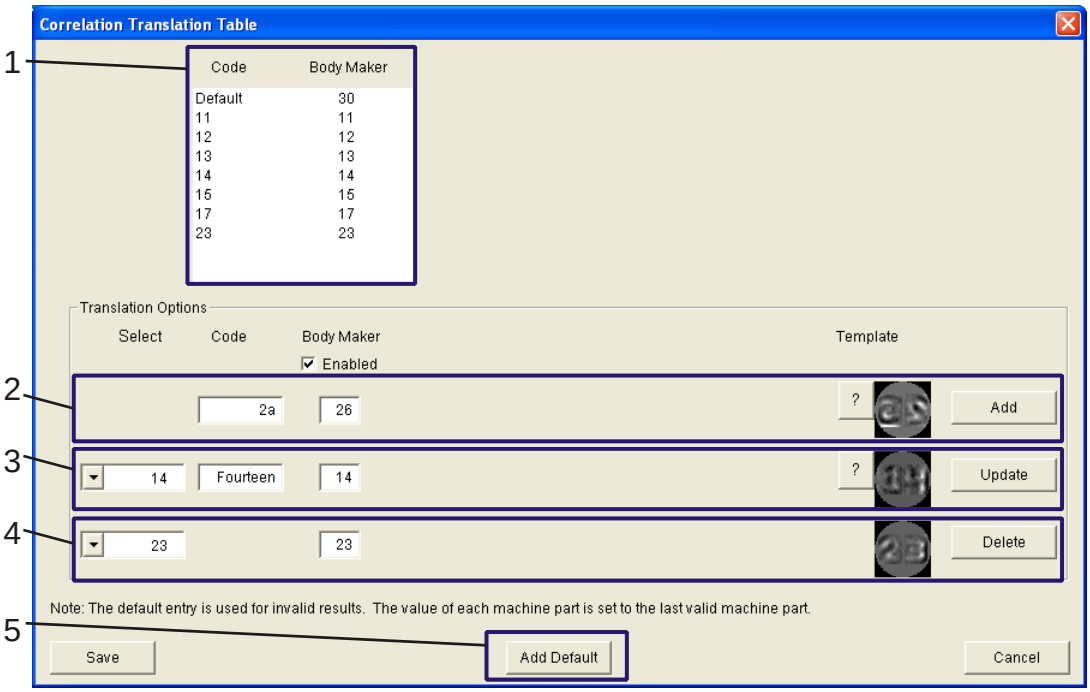
Mask Offset

Used during template creation. Changes the distance between the two mask boxes.

View Code Table

Click the View Code Table button to see a list of all templates currently used in the part program. You can load templates that were saved at another time, or change information for a current template. Additionally, you can specify a Default code number. This Default code is assigned to parts during inspection that did not match any of the existing templates.



1	The table lists the Codes and Body-Maker numbers to which they are correlated.
2	Use the Add row to import an existing template into your part program. Type the correlation Code, and type a Body-Maker number. Click the ? button to load a template. The template must have been previously saved on the Intellispec hard drive. Click Add to complete the task. ▪ Note: For Body-Maker number, only numeric digits between 1 and "n" can be entered. "n" = the Number of machine parts specified in ***Correlation Configuration*** (on page 126).
3	Use the Update row to change the Code name or to change the template for a code. Select an existing code from the drop-down menu. Type a new Code name if desired. Change the Body-Maker number if desired. Click the ? button to change the template if desired. Click Update to complete the changes.
4	Use the Delete row to remove a template from the part program. Select an existing code from the drop-down menu. Click Delete to complete the task. This procedure does *not* delete the template from the Intellispec hard drive.
5	Click the Add Default button to add a default code number. When an inspected

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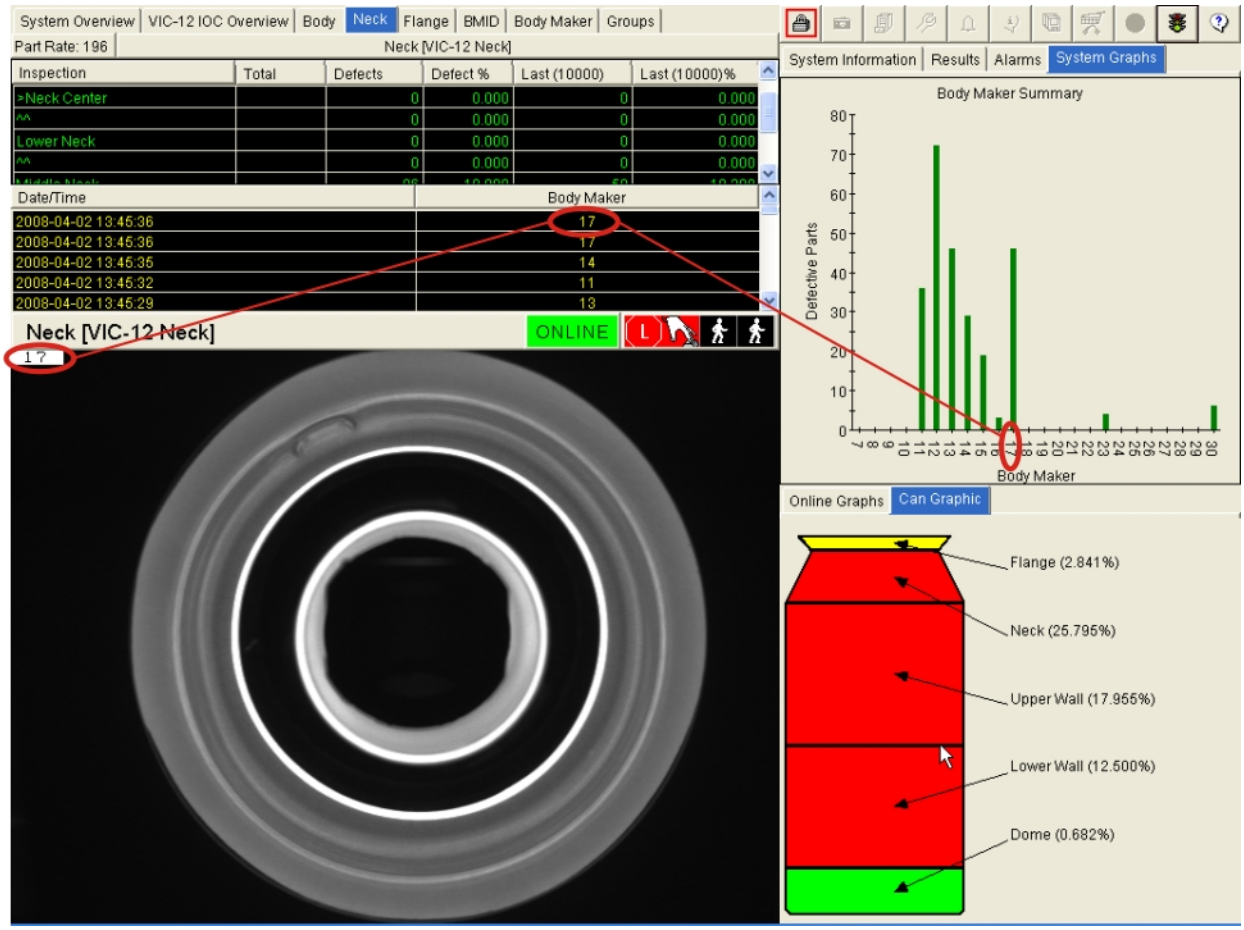
	part does not match any of the templates in the part program, the default Body-Maker number is assigned. This allows you to track parts that are not identified by the templates.

When you are finished making changes in this menu, click Save to save changes to the part program, or click Cancel to cancel changes that have not yet been applied.

Viewing the inspection results

When you put the system online to inspect parts, you can see the defective parts correlated to the machine parts. This is viewed in several ways:



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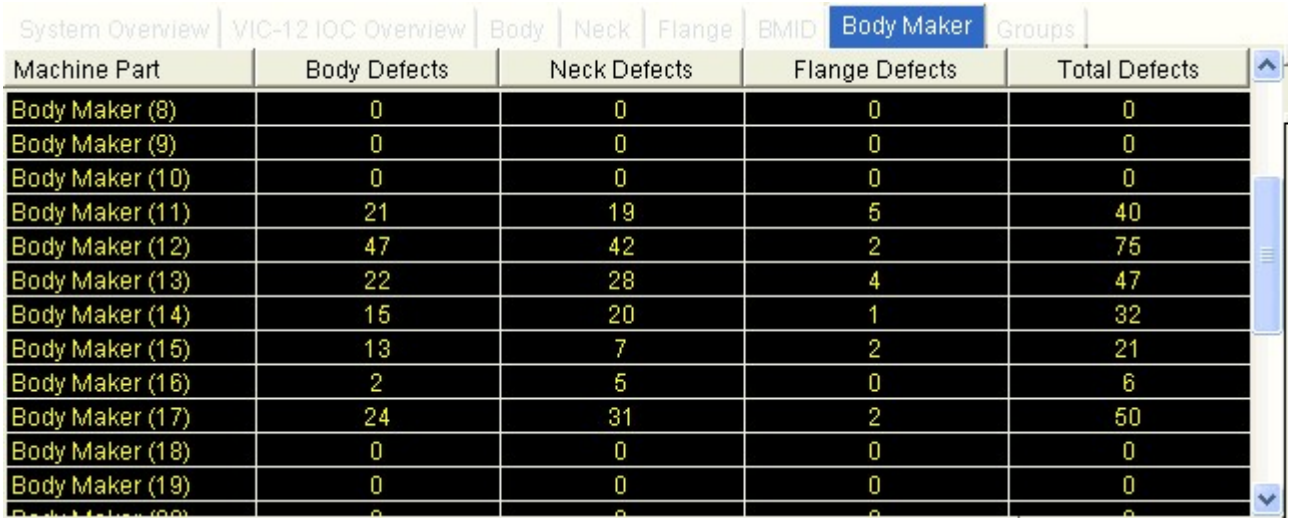
- The Alphanumeric Correlation number is displayed in the upper left corner of the part image
- The statistics grid area shows the defective parts per channel correlated to a machine part
- The Summary graph shows the number of defective parts per machine part
- The Machine Part [BodyMaker] statistics tab shows the number of defects for each camera, correlated to each machine part



Machine Part	Body Defects	Neck Defects	Flange Defects	Total Defects
Body Maker (8)	0	0	0	0
Body Maker (9)	0	0	0	0
Body Maker (10)	0	0	0	0
Body Maker (11)	21	19	5	40
Body Maker (12)	47	42	2	75
Body Maker (13)	22	28	4	47
Body Maker (14)	15	20	1	32
Body Maker (15)	13	7	2	21
Body Maker (16)	2	5	0	6
Body Maker (17)	24	31	2	50
Body Maker (18)	0	0	0	0
Body Maker (19)	0	0	0	0

About Alphanumeric Correlation Templates

Templates are created for each production line. They must be saved and backed up, as they are part of the inspection.

Templates are created through the Alphanumeric Correlation Learn menu, and are saved as small bitmap images.

Important

Templates are not saved when you save or back up an inspection database. We recommend that you ***copy them to CD*** (see "Burning a CD" on page 97) as a backup.

Where the templates are saved

Templates are saved under C:\Intellispec\Data\Templates.

If you are using Alphanumeric Correlation in version 4.2 software, the templates are saved under C:\Intellispec\Data\BMID Templates.

FILL HEIGHT INSPECTION

This inspection is used for determining the fill level of containers, mainly to find containers with no fill or low fill. It uses many of the ***Dimension inspection*** (on page 396) techniques. The Fill Height inspection compares the fill level of the liquid to a standard reference level, with is typically the neck ring of a container.

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This inspection locates the top and bottom of the fill level. The liquid sloshes around in the container as it moves in front of the inspection module. The distance between the top and bottom of the fill level is usually (but not always) associated with foaming that can occur in some liquids.

Before adding a Fill Height inspection

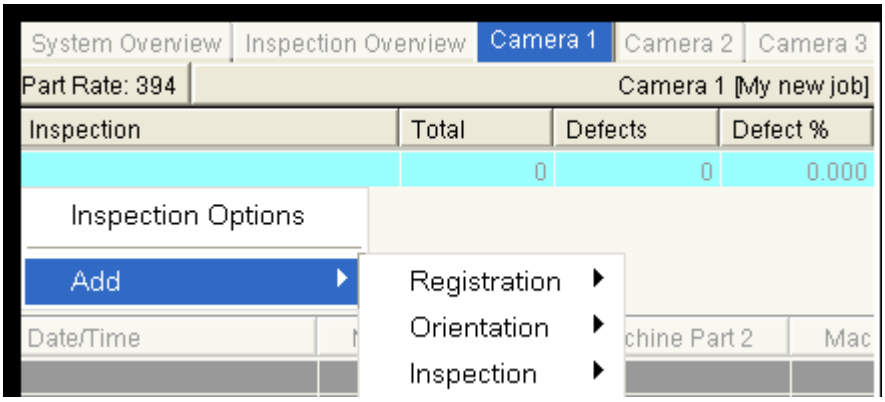
A Fill Height inspection requires a ***Finish registration*** (on page 271), which locates the part in the image.

Adding the Fill Height inspection

After setting up the Finish registration, add the Fill Height inspection.

To add the Fill Height inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Fill Height inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

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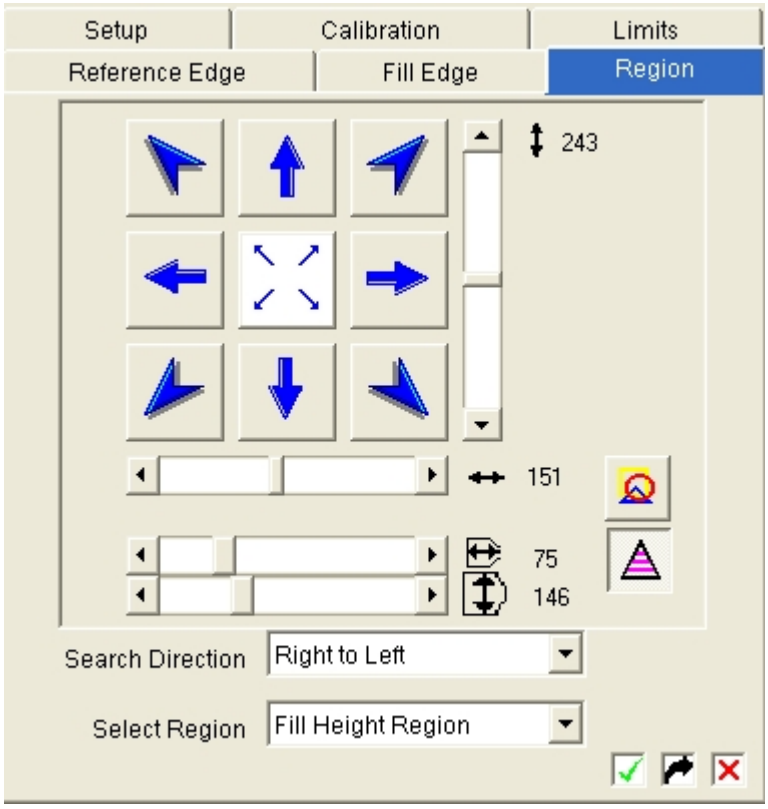
Place both the Reference and Fill Height regions.



Setting the Reference region

To set the Reference region:

1) Go to the Region menu.
2) From the Select Region drop-down menu, choose Reference Region.
3) From the Search Direction drop-down menu, choose an appropriate direction for your part image. In our example, the part image is sideways to optimize the inspection area on the screen. We would choose Right to Left to search for the transition from neck ring to bottle.
4) Set the region size, and move the region to the approximate center of the part using the arrows and/or sliders of the Region menu.

Setting the Fill Height region

To set the Fill Height region:

1) Go to the Region menu.
2) From the Select Region drop-down menu, choose Fill Height Region.
3) From the Search Direction drop-down menu, choose an appropriate direction for your part image. In our example, we are searching from Right-to-Left.

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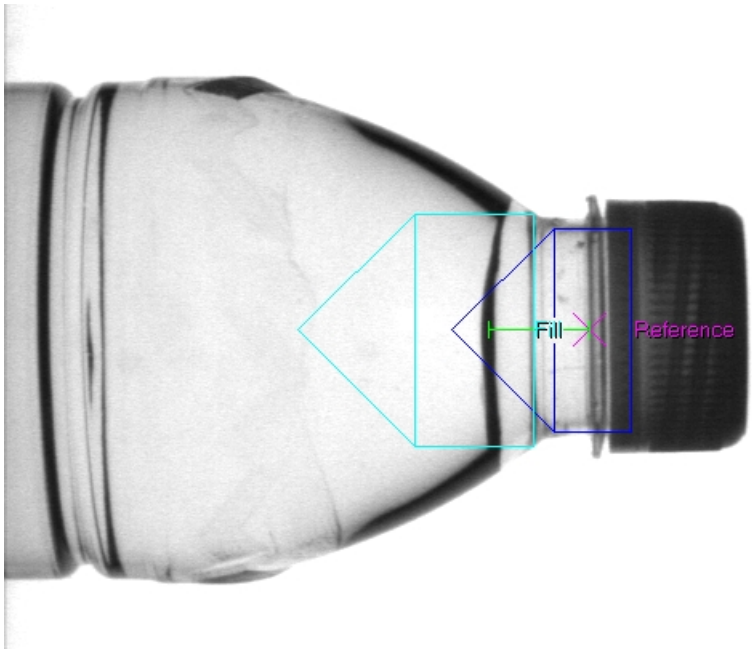
4) Using the arrows and/or sliders of the Region menu, make the rectangle large enough to search for the top of the fill. The width of the area can be maximized for optimum detection across the entire part, or set slightly narrower than the part to ignore some sloshing of the liquid.



Setting the Reference edges

Program the inspection to find a stable reference point, which is typically the neck ring of the container.

To set the Reference edges:

1) Go to the Reference Edge menu.

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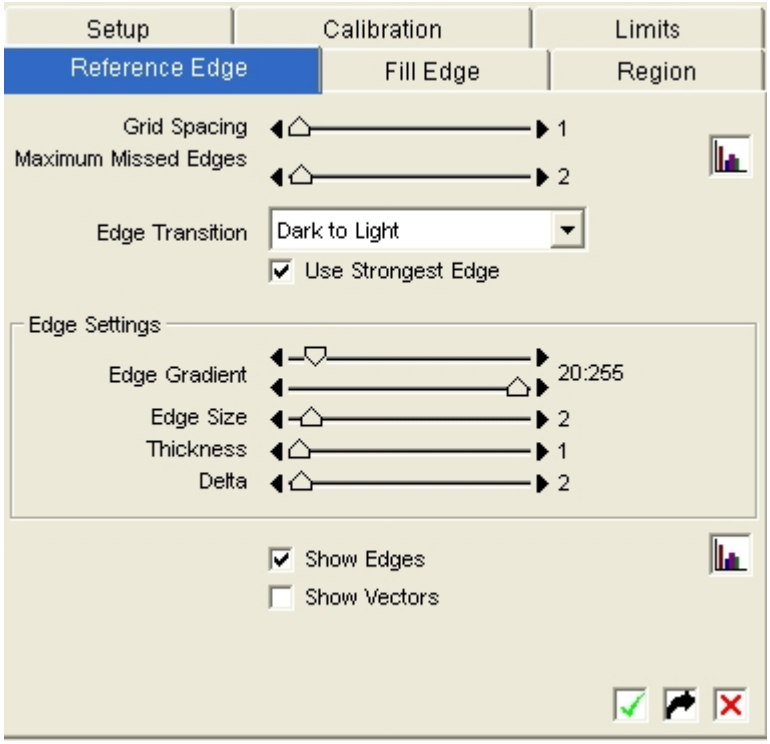
2) Set the parameters to search for a transition. In our example, we search for the transition between the neck ring and the bottle. This will be the point from which the distance to the fill level will be measured.



The parameters of this menu are as follows:

Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail. This is generally kept to a minimum number except when water droplets commonly appear near the Reference Region.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Use Strongest Edge

Indicates whether the system should locate the first edge or the strongest edge that meets the gradient criteria. The strongest edge is the greatest change in grayscale value found above the gradient.

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EDGE SETTINGS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Show Edges

Displays the found edges in the search regions. They are displayed in magenta for the reference region.

Show Vectors

Displays all search vectors. They are displayed in cyan.

Setting the Fill Height edges

Program the inspection to find the fill level. For water applications, only one fill edge is required to accurately determine fill height. For applications where foam occurs, you can set two edges - one to find the top, and one to find the bottom edge (see Selected Setup).

To set the Fill Height search:

1) Go to the Fill Edge menu.

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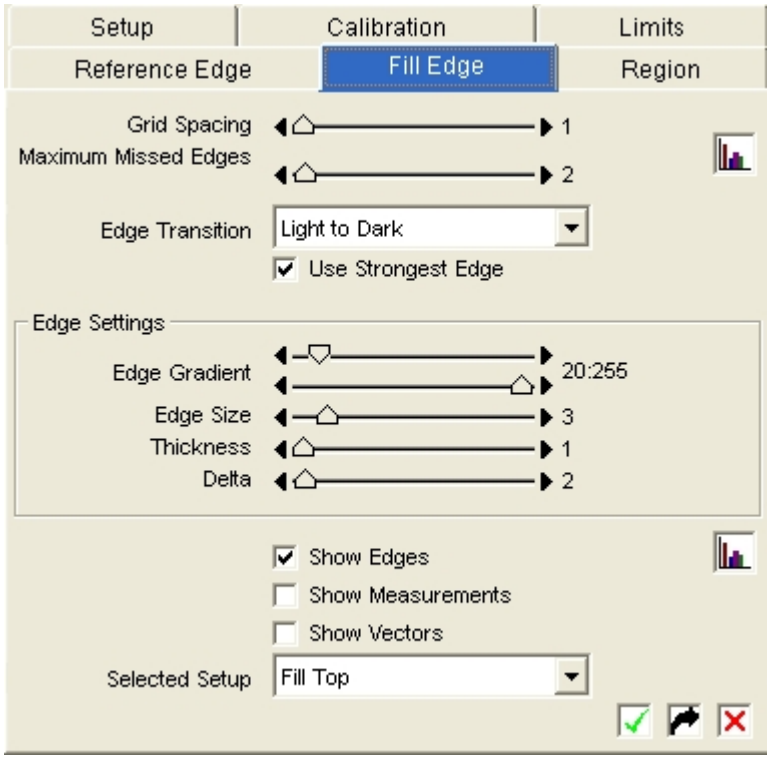
2) Set the parameters to find a transition of the fill level.



Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Use Strongest Edge

Indicates whether the system should locate the first edge or the strongest edge that meets the gradient criteria. The strongest edge is the greatest change in grayscale value found above the gradient.

EDGE SETTINGS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

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Size (or Edge Size)

Indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

❖ *Note: Edge size and thickness can be set to help ignore non-fill line bottle features.*

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Show Edges

Displays the found edges in the search regions. The edges are displayed in cyan for the fill height region.

Show Measurements

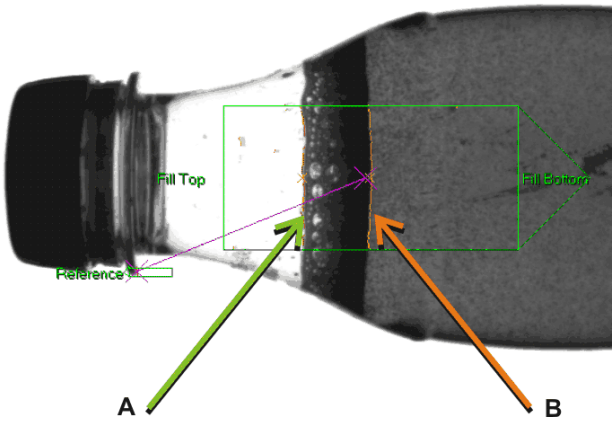
Displays where the measurement calculations are being made.

Show Vectors

Displays all search vectors.

Selected Setup

(Only if Enable Fill Width is enabled in the Setup menu) Choose Fill Top or Fill Bottom to set up each edge transition. This is mostly used for bottles with carbonated beverages - the fill line is usually several pixels high.



A = fill top	B = fill bottom

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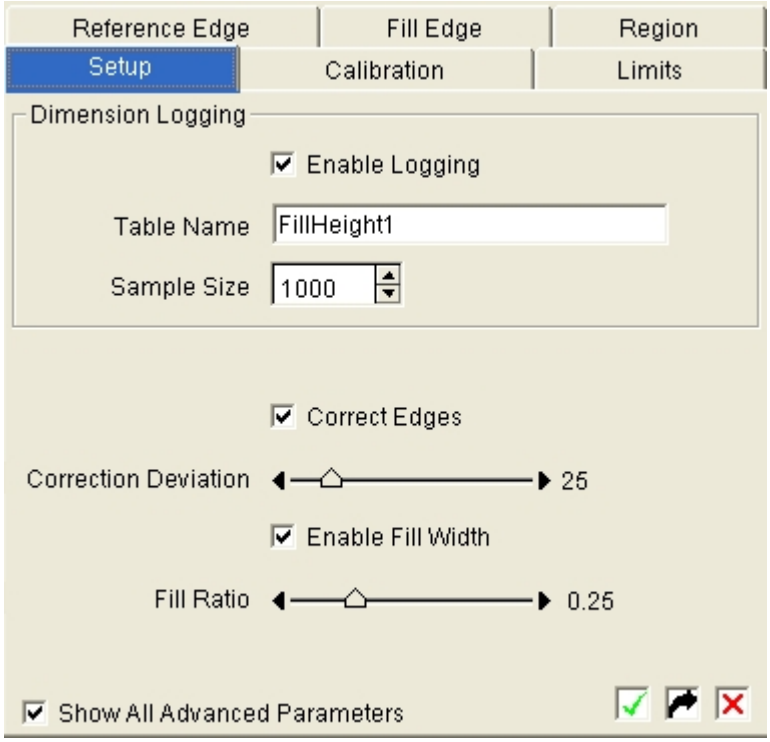
Setup menu

This menu contains optional parameters.



DIMENSION LOGGING

Enable Logging

This inspection offers a database that logs dimension information. This feature is useful for process monitoring so that you can view the average measurements over time.

Table Name

Rename the *TableName* to something more meaningful to you. The name is limited to 19 characters.

Sample Size

The number of parts' data that are averaged before the information is written to the database. Note: Defective parts data is not included in the average calculations.

To generate the Dimension database:

Put the system online to inspect parts. The database will start collecting data when enough good dimension measurements have been taken (example: if Sample Size = 1000, the system will wait until it has collected data from 1000 parts with good dimension inspections).

To view the Dimension database:

1) Take the Intellispec offline. The database is saved as C:\Intellispec\Data**Dimension.mdb**.
2) Use the Windows Explorer function to copy it to a floppy diskette or ***USB device*** (see "Copying Files to USB Device" on page 97).

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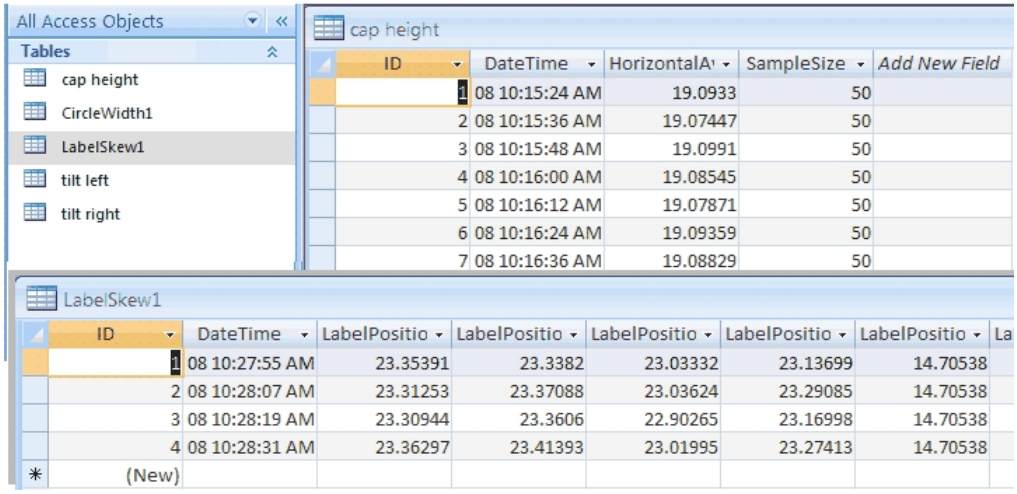
A new record is created for each sample set (when the Intellispec collects data from *n* number of parts with inspections that passed).

If the Intellispec has not yet found enough parts to create an average, no database information is saved. That is, if Sample Size = 1000, and only 970 parts have passed inspection, no database information is saved.

❖ *Note: If you have more than one Dimension-type inspection, a separate table will be created for each inspection within the Dimension.mdb file. You will have a different TableName for each inspection. The Dimension-type inspections include: Dimension, Circle Dimension, Circle Width Dimension, Fill Height, and Label Skew Dimension inspections.*

A sample database with two different inspection tables is shown below:



OTHER FILL HEIGHT OPTIONAL SETTINGS

Correct Edges

Enables Edge Correction, where the system uses a "moving average" technique to eliminate outlying edges (example, edges caused by water spots or bubbles in the liquid).

Correction Deviation

This is used to correct stray points that fall too far away from the moving average edge position. The value is in pixels. Make sure you use a high enough value, or the inspection will not properly detect sloshing liquid. A common value to use is 25 or higher.

Enable Fill Width

(Advanced parameter) This enables the ability to search for the top and bottom edges of the fill height. Use this option for carbonated beverages. Leave it un-checked for water and other un-carbonated beverages.

When you enable this parameter, you must also set up search criteria for the top and bottom of the region. In the Fill Edge menu, you will need to set up the search criteria for both the top and bottom of the fill level.

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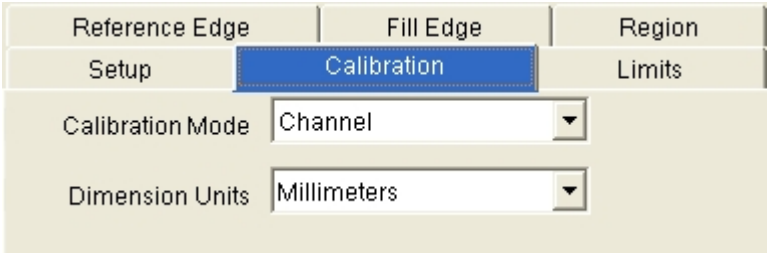
Fill Ratio

(Advanced parameter) This is used to compensate for foaming. The value is a percentage of the distance between the top and bottom of the liquid level. After the average edge position is computed for the top and bottom of the liquid level, this value is added to the bottom of the liquid level to give a more accurate position. A typical setting is 0.25 in applications that contain foam, and 0.50 in applications without foam.

Calibration menu

Determine the type of dimension calculation that the system will report and your preference of unit of measurement.



Calibration Mode

The system will convert the pixel dimensions into your preferred unit of measurement.

- **Channel** - the inspection will use the channel calibration parameters to convert the dimensions into real world values. The system Administrator can specify the units of measurement by right-clicking on the image and selecting ***Pixel Calibrate*** (see "Pixel Scale Calibration" on page 182). If you have calibrated the system to a carefully measured or Golden Part, the system will use those calibrated units.
- **Individual Inspection** - use this option to convert a pixel-to-unit of measurement ratio, and calibrate the system through the parameters below.

Dimension Units

Choose your preference in the reporting of the dimension calculations. Choose from millimeters, inches, pixels, and custom. Custom allows any conversion factor to be used.

❖ *Note: The following parameters are available for Individual Inspection calibration mode. It is best to set these parameters after you have placed the inspection regions, and after you have set up the Edge parameters.*

Horizontal/ Vertical Conversion

This indicates the pixel size and is used to convert one pixel into the units selected. The initial conversion will be controlled by the Calibrate Scale results. From this parameter, you can override this calibration factor or choose to calibrate the dimension using the result of a specific measurement.

After adjusting the horizontal or vertical conversion factor, click the **Accept** button.

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Calibrated Size

This is used to calibrate the pixel scale of the current inspection. A setting of [-1] disables this parameter.

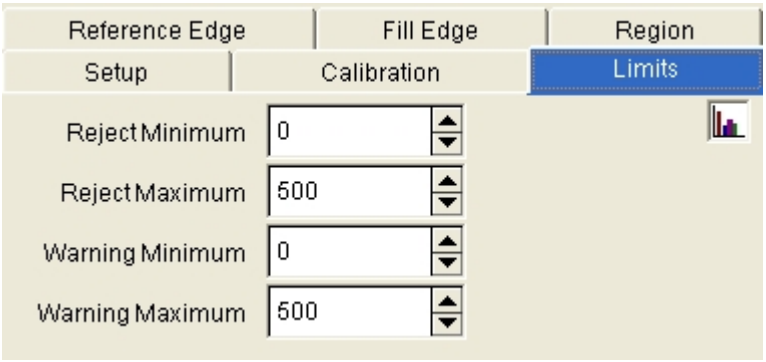
Use a part, such as one on which you are currently programming a job, and measure it (with calipers or a ruler) exactly where you would have the inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Enter your measured value.

Calibrate Scale

Press this after you have entered the correct Calibrated Size. The system will use the pixel-to-unit of measurement ratio as specified in the Horizontal and Vertical Calibration parameters. If you see an error, make sure you have your inspection regions properly placed on the image. Also make sure the Edge parameters are set up correctly.

Limits menu

This menu allows you to set reject and warning limits for parts. The inspection finds the average Reference edge position and the average Fill Edge position. The measurement is the difference between those two positions.



Reject Minimum

The smallest acceptable dimension. Enter the value in a number of Dimension Units you chose in the Calibration menu.

Reject Maximum

The largest acceptable dimension. Enter the value in a number of Dimension Units you chose in the Calibration menu.

Warning Minimum

This sets a warning flag when the dimension is approaching the Reject Minimum. Any dimension that is between the Warning Minimum and Reject Minimum is given a warning status, but not rejected.

Warning Maximum

This sets a warning flag when the dimension is approaching the Reject Maximum. Any dimension that is between the Warning Maximum and Reject Maximum is given a warning status, but not rejected.

Note: Warnings are used in alarms, shown by the yellow light on the light tree, and also used in Groups.

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Finding un-filled, under-filled, or over-filled bottles

If the inspection does not find both of the transitions of the Fill Height Edge menu, then it is assumed that the bottle is not filled or it has low fill.

Sometimes, a bottle can be overfilled and the Fill Height inspection does not see a transition. To determine whether a bottle is filled, add a simple Ambient inspection in the liquid area, after the Fill Height inspection. For example, add a Circle inspection >> Enable the Ambient inspection >> select Ambient Density >> and select a range of values that normally occurs when a bottle is filled. If the Ambient inspection does not find the proper gray levels, the bottle will be considered un-filled or under-filled, and the part will fail.

Graphs - Fill Height inspection

Fill Height

Displays the fill level in calibration units (from calibration menu). This is the measurement between the reference edges and the fill edges.

Fill Level Width

(If Fill Width is enabled in Setup menu) This displays the distance between the top edge and bottom edge of the fill line.

Fill Level Edges

Displays the number of edges missed in the search for the fill line.

Reference Edges

Displays the number of edges missed in the search for the reference edge.

About the Spin Doctor

This feature is still under development. Leave the box for enabling Spin Doctor un-checked.

LABEL SKEW DIMENSION INSPECTION

This inspection was designed for a specific application to quantify proper position of labels on bottles. The system has four cameras within two inspection modules. All four images are multiplexed into a single image on screen. The registration is built into this inspection.

Adding the Label Skew Dimension inspection

To add the Label Skew Dimension inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure that the job already has a registration to find the part or feature.

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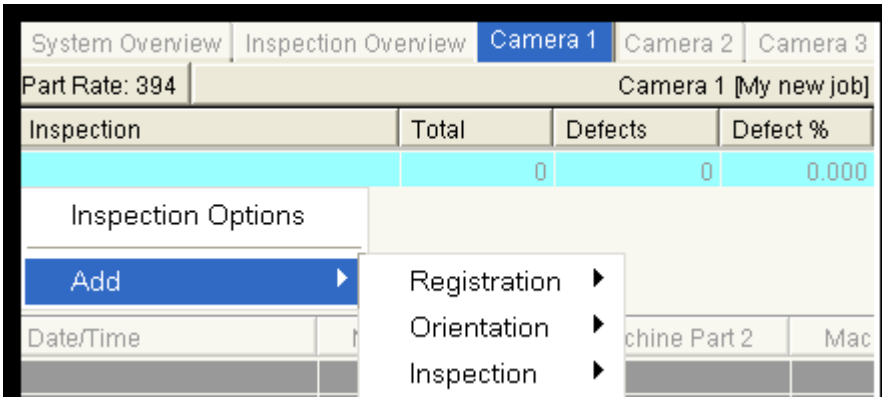
4) Right-click in the statistics area.



5) Select Add >> Inspection >> Label Skew Dimension inspection. The default region is placed on the image, and the inspection menus are displayed in the upper right screen.

Setting the Label Skew Dimension part locate regions

First we locate the bottle in all four image areas, then we place the inspection region with respect to the bottle reference position.

To set the bottle reference location:

1) Go to the Part Locate menu.
2) Choose a Part View from the Selected View drop-down menu. OR: click in the image to select one of the four part views.
3) Set the number of Search Vectors and Search Spacing as recommended by your service engineer. A good place to start is the settings shown in the Part Locate menu below.
4) Set the Edge Settings to consistently find the edge of the bottle. The goal is to have the large green X on the edge of the bottle. (see sample below)
5) Move the reference location if necessary, by using the Part Region menu. Avoid placing the search region on the dark ridge of the bottle.
6) Click the button several times to make sure the edge is found consistently.
7) Repeat steps 1-6 for the remaining part views.

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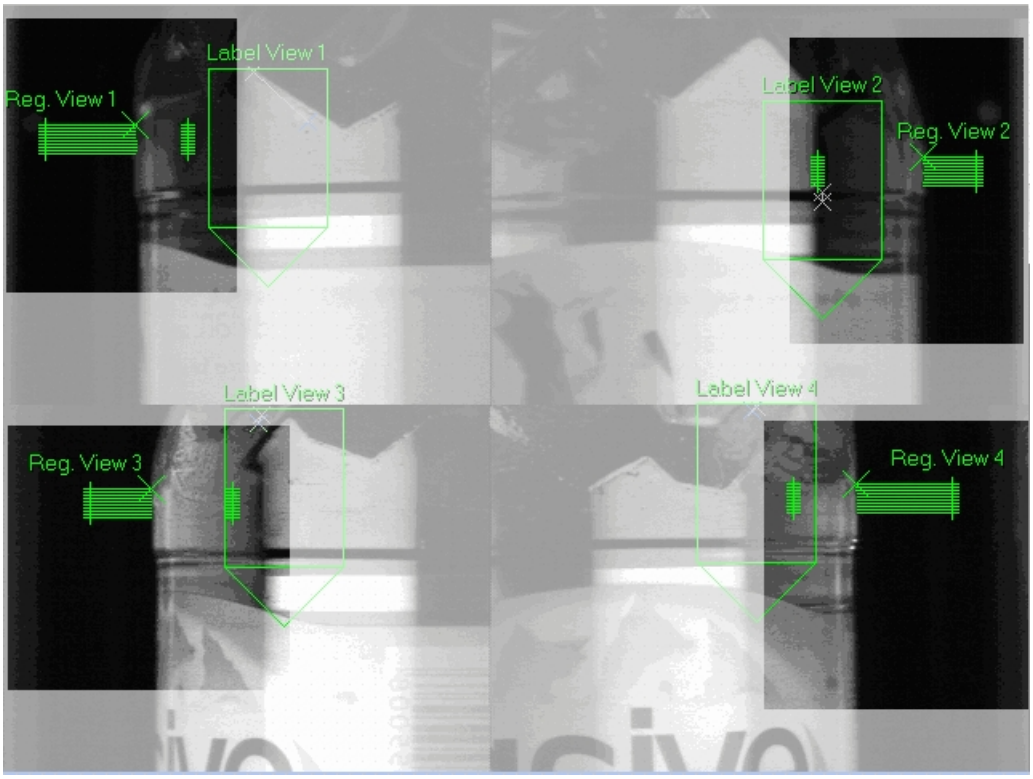
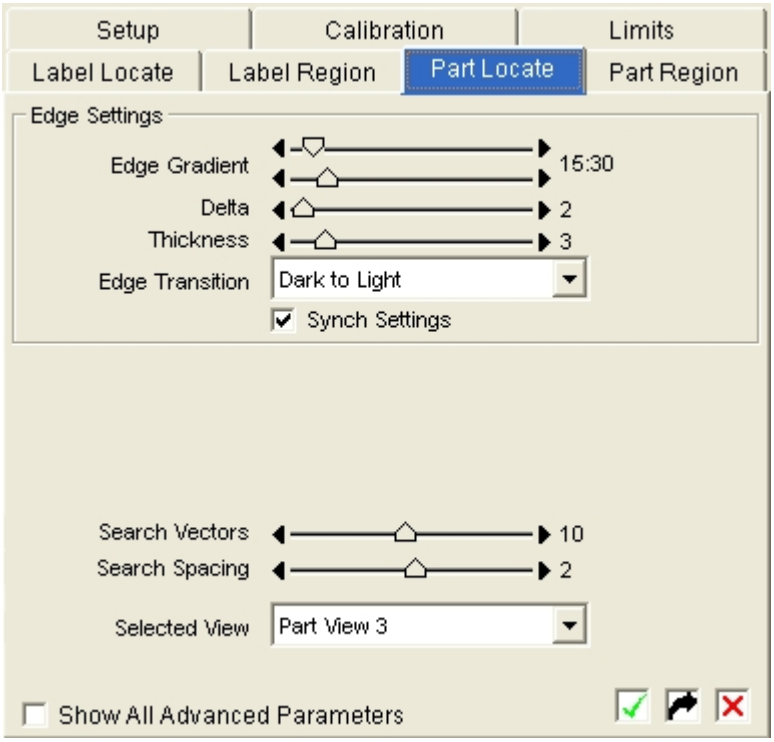
This sample shows the part locate search vectors.



Part Locate menu

This menu sets the search vectors for all four part views.



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EDGE SETTINGS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Edge Thickness

The number of consecutive times that the gradient must be met to define an edge.

Edge Transition

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

Synch Settings

When this is checked, the edge settings apply to all views. When un-checked, the edge settings can be set separately for each view.

MISALIGNMENT CORRECTION (ADVANCED PARAMETERS)

Nominal Location

The expected registration value when the part is centered on the conveyor.

Alignment Factor

Correction applied to label position, proportional to the difference between current and nominal part locations.

SEARCH SETTINGS

Search Vectors

Set the number of search vectors to locate the feature on the container. More vectors provide a more accurate search, but also take more processing time.

Search Spacing

Set the number of pixels between each search vector.

Selected View

Select a part view to set its parameters.

❖ *Note: you can also click on the part view in the image to select it.*

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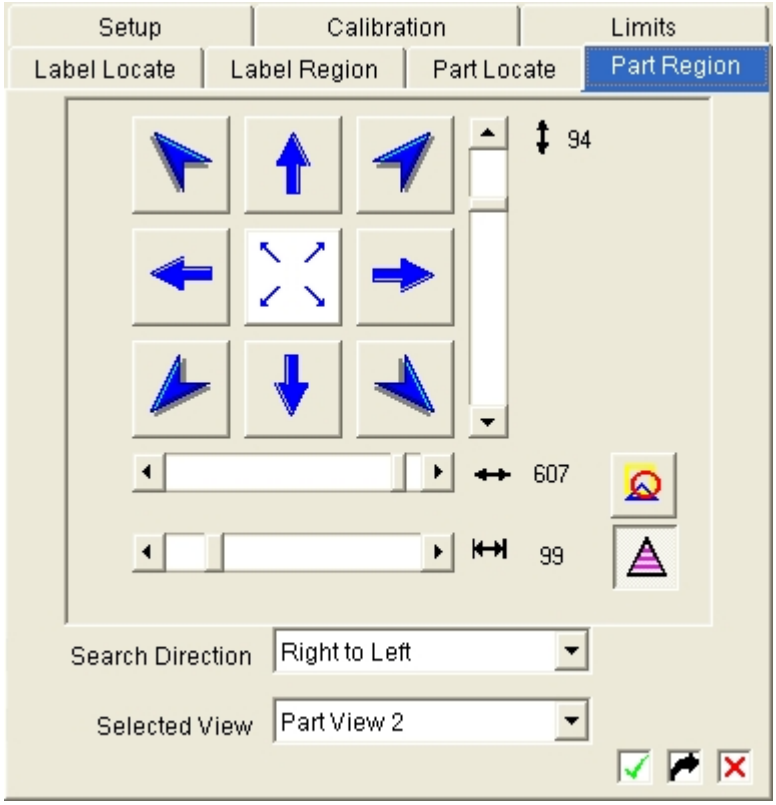
Part Region menu

This menu is similar to most other ***region menus,*** (see "Using Region Menus" on page 255) with the exception of the ability to select part views and set search directions.



Search Direction

Choose a direction in which the search regions will search for edge transitions. Use the direction that will have the least amount of noise or false edges on the image.

Selected View

Select a part view to move its region. OR: click in the image to select one of the four part views.

Setting the Label Skew Dimension label regions

Place the label regions with respect to the bottle reference positions.

To set the label region positions:

1) Go to the Label Region menu.
2) Select a part view.
3) Adjust the size and position of the region to fall on the bright (glare) portion of the image. Make sure the region covers a reference edge, and allows enough room to find the top of the label.
    - Use the ridge in the bottle as a reference edge
    - The region is placed with respect to the Bottle Reference edge
4) Repeat steps 2-3 for the remaining regions.

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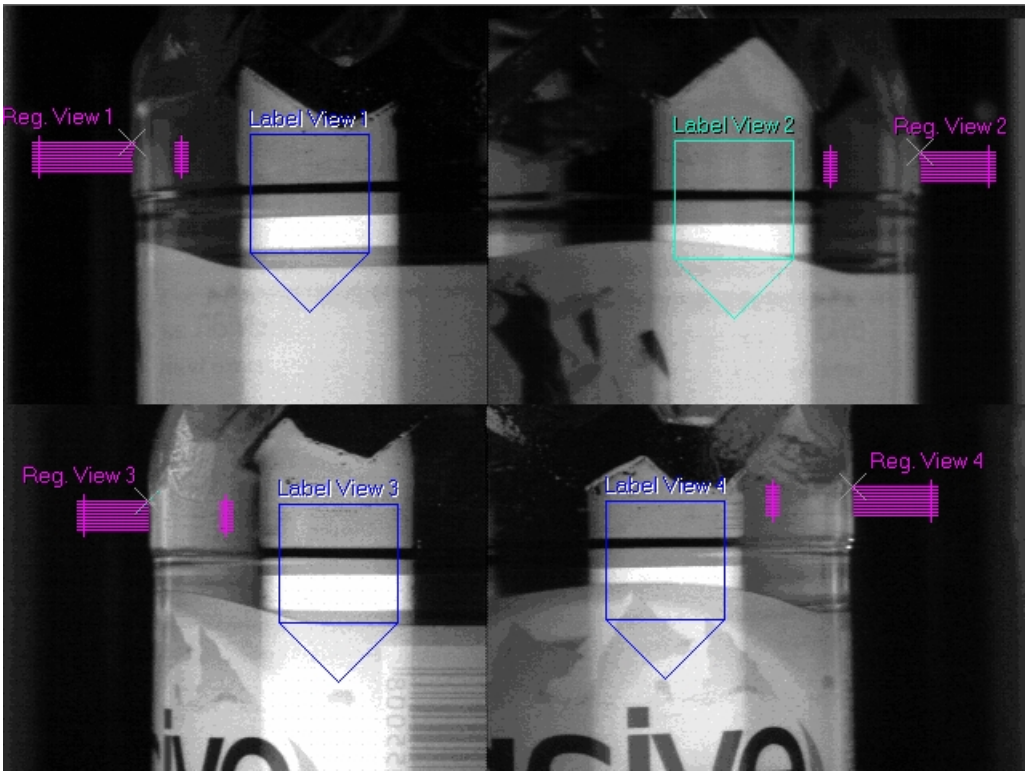
This example shows where the label regions are placed.



Next, set up the Label Locate parameters to find the label positions on the bottle.

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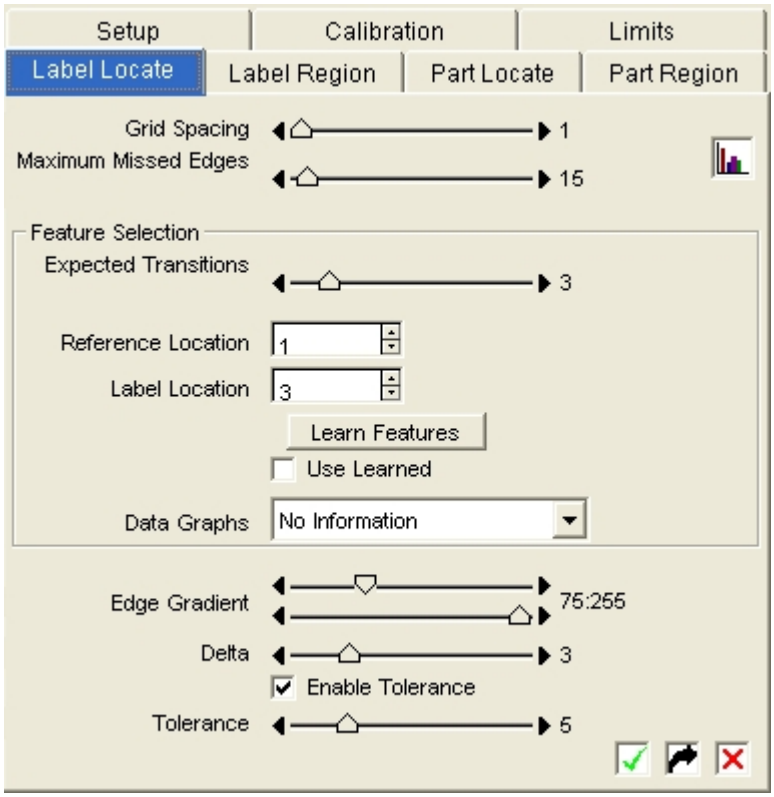
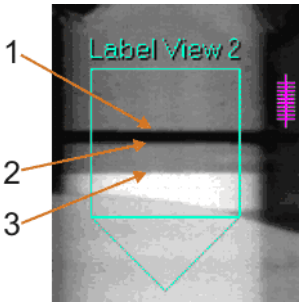
Label Locate menu

In this menu, you set the number of features you expect the system to find. The settings apply to all four views - this means that the Edge Gradient and Delta must work for all four views.



To set the number of features:

1) Set the number of Expected Transitions. In our example, we are searching for three transitions.



1	First transition - from bottle to dark ridge (top to bottom)
2	Second transition - from dark ridge to bottle
3	Third transition - from bottle to bright label edge

1) Set the number of the Reference Location. In our example, the reference is the dark ridge on the bottle. It is transition number 1.
2) Set the number of the Label Location. In our example, the label is transition number 3.

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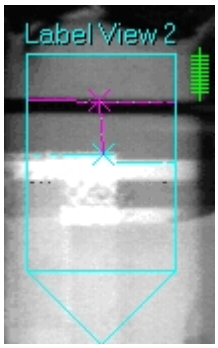
3) Set Edge Gradient Min/Max and Delta so that the system finds the desired features. These settings affect all four views.
4) Click the button several times to make sure that the desired features are located on most parts.
5) Set Maximum Missed Edges so that the features are located properly, but that the system ignores noise or designs on the bottle.

❖ *Note: In the Setup menu, enable Show Edges and Show Measurements to see the located edges.*

In this example, the Reference Location is shown in cyan, and the Label Location is shown in magenta.



The remaining parameters of the Label Locate menu are described below.

Spacing (or Grid Spacing)

Used to define search density. A value of one searches each line, a value of two searches every other line, etc. The smaller the spacing, the more accurate the inspection. The larger the spacing, the faster the inspection. The default value of one usually works well.

Missed Edges Max

The number of search vectors that are allowed to fail without causing the inspection to fail.

FEATURE SELECTION

Expected Transitions

The number of edge transitions you expect the system to find in the label locate area.

Reference Location

Specify which transition number to use as the reference location. Use a transition that is consistent from part to part.

Label Location

Specify which transition number to use as the label location.

Learn Features

Use this to allow the system to analyze the label search region and automatically determine the number of features. NOTE: this feature may find more transitions than necessary. We recommend using Expected Transitions and setting the Reference Location and Label Location instead.

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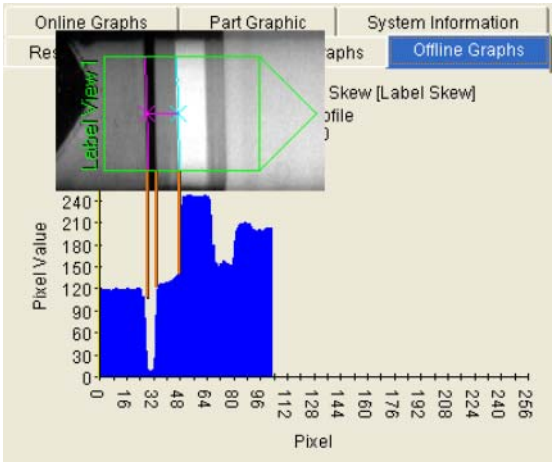
Use Learned

After using Learn Features, and you accept the learned values, this box becomes checked. You can un-check the box and manually change the other Feature Selection parameters if necessary.

Data Graphs

- **Vector Profile** - Shows the gray scale values of the pixels in the search region. It can help you see the transitions in the label regions.



- **Vector after Gradient** - Shows the gray scale values of the search vectors above the gradient. This can help you set Edge Gradient - you can see if there are still transitions visible after you change the gradient settings.

EDGE PARAMETERS

Gradient (or Edge Gradient)

The minimum (and sometimes maximum) difference in gray shades between two pixels to be considered an edge.

Delta (or Edge Delta)

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

Enable Tolerance

Enables the system to find edges slightly away from the average position.

Tolerance

The number of pixels any edge can deviate from the average location and still be included as an edge. Any edge found outside of this tolerance value is considered a missed edge. Example: if the average edge location is 112 and tolerance is 5, the edge must be found between 107 and 117.

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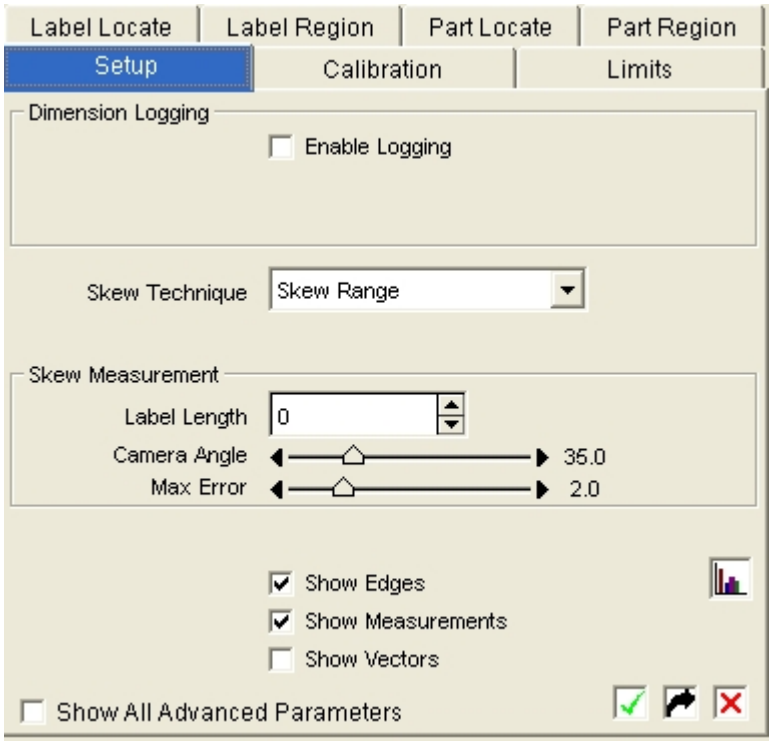
Setup menu

This menu provides additional features and setup information for this inspection.



DIMENSION LOGGING

Enable Logging

This inspection offers a database that logs dimension information. This feature is useful for process monitoring so that you can view the average measurements over time.

Table Name

Rename the *TableName* to something more meaningful to you. The name is limited to 19 characters.

Sample Size

The number of parts' data that are averaged before the information is written to the database. Note: Defective parts data is not included in the average calculations.

To generate the Dimension database:

Put the system online to inspect parts. The database will start collecting data when enough good dimension measurements have been taken (example: if Sample Size = 1000, the system will wait until it has collected data from 1000 parts with good dimension inspections).

To view the Dimension database:

1) Take the Intellispec offline. The database is saved as C:\Intellispec\Data**Dimension.mdb**.
2) Use the Windows Explorer function to copy it to a floppy diskette or ***USB device*** (see "Copying Files to USB Device" on page 97).

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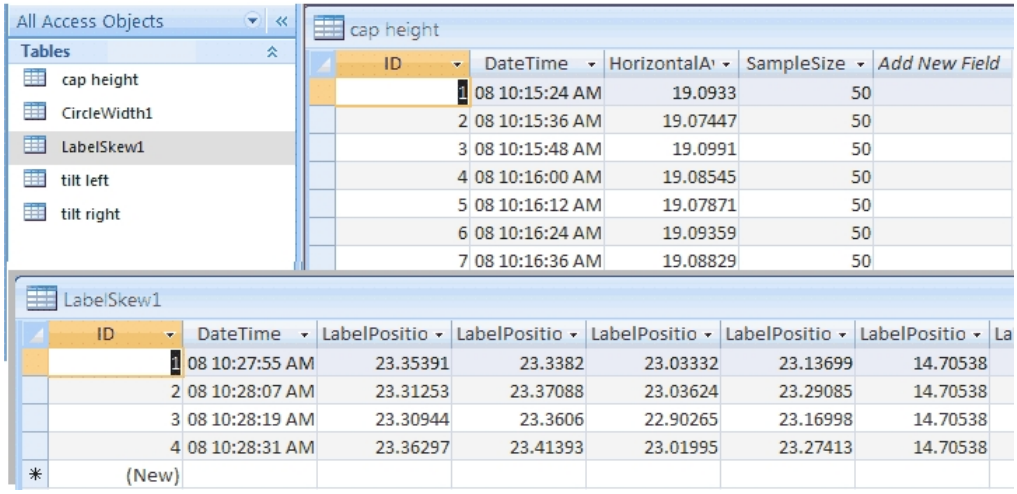
A new record is created for each sample set (when the Intellispec collects data from *n* number of parts with inspections that passed).

If the Intellispec has not yet found enough parts to create an average, no database information is saved. That is, if Sample Size = 1000, and only 970 parts have passed inspection, no database information is saved.

❖ *Note: If you have more than one Dimension-type inspection, a separate table will be created for each inspection within the Dimension.mdb file. You will have a different TableName for each inspection. The Dimension-type inspections include: Dimension, Circle Dimension, Circle Width Dimension, Fill Height, and Label Skew Dimension inspections.*

A sample database with two different inspection tables is shown below:



SKEW TECHNIQUE

This allows you to choose how to measure the label skew. This changes the settings in the Limits menu.

Skew Angle Only

Measures the angle of the label with respect to the reference location. You can set the angle reject limits in the Limits menu.

Skew Range

Allows you to set limits on the actual label position, as well as the angle. The limits are set in the Limits menu. The range is based on the Dimension Units set in the Calibration menu.

Skew Average Pairs

Measures the difference in label angles between camera pairs. As of this writing, the only legitimate pairing is 1-4 against 2-3. This means that the system measures the average label position from cameras 1 and 4 which are in the same camera module, against the average position from cameras 2 and 3, which are in the same camera module. These camera modules are on opposite sides of the bottle.

Skew Range and Average Pairs

Measures the actual label position, as well as the difference in label angles, between camera pairs.

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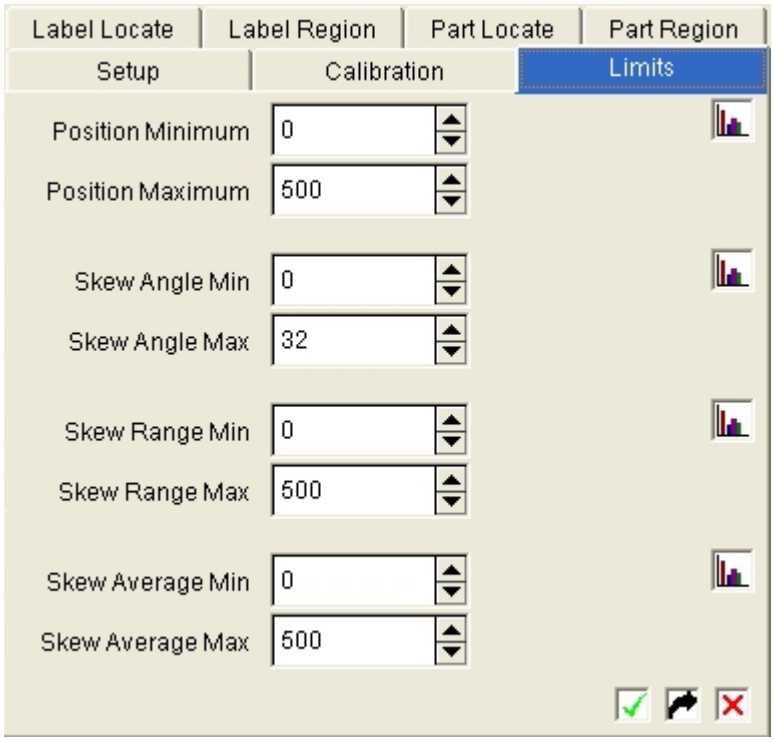
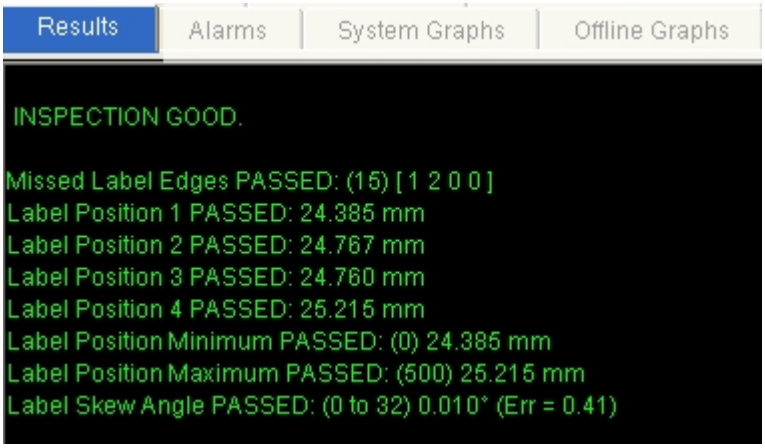
Limits menu

The measurements available in this menu depend on the settings of Skew Technique in the Setup menu.



Position Minimum/ Maximum

The number of Dimension Units allowed by your quality control department. This measurement is the average of all valid edges in the label search region. In the example below, the label location is within the specified limits.



Skew Angle Min/ Max

The minimum and maximum angle allowed. This is the measurement of the label angle with respect to the reference location.

Skew Range Min/ Max

The minimum and maximum distance allowed. This is the measurement of the label distance from the reference location.

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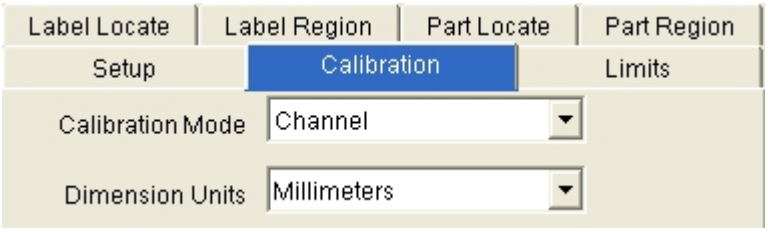
Skew Average Min/ Max

The minimum and maximum distance allowed. This compares the average distance of the label from the reference location between one pair of cameras to the other pair.

Calibration menu

Determine the type of dimension calculation that the system will report and your preference of units of measurement.



Calibration Mode

The system will convert the pixel dimensions into your preferred unit of measurement.

- **Channel** - the inspection will use the channel calibration parameters to convert the dimensions into real world values. The system Administrator can specify the units of measurement by right-clicking on the image and selecting ***Pixel Calibrate*** (see "Pixel Scale Calibration" on page 182). If you have calibrated the system to a carefully measured or Golden Part, the system will use those calibrated units.
- **Individual Inspection** - use this option to convert a pixel-to-unit of measurement ratio, and calibrate the system through the parameters below.

Dimension Units

Choose your preference in the reporting of the dimension calculations. Choose from millimeters, inches, pixels, and custom. Custom allows any conversion factor to be used.

❖ *Note: The following parameters are available for Individual Inspection calibration mode. It is best to set these parameters after you have placed the inspection regions, and after you have set up the Edge parameters.*

Horizontal/ Vertical Conversion

This indicates the pixel size and is used to convert one pixel into the units selected. The initial conversion will be controlled by the Calibrate Scale results. From this parameter, you can override this calibration factor or choose to calibrate the dimension using the result of a specific measurement.

After adjusting the horizontal or vertical conversion factor, click the **Accept** button.

Calibrated Size

This is used to calibrate the pixel scale of the current inspection. A setting of [-1] disables this parameter.

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Use a part, such as one on which you are currently programming a job, and measure it (with calipers or a ruler) exactly where you would have the inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Enter your measured value.

Calibrate Scale

Press this after you have entered the correct Calibrated Size. The system will use the pixel-to-unit of measurement ratio as specified in the Horizontal and Vertical Calibration parameters. If you see an error, make sure you have your inspection regions properly placed on the image. Also make sure the Edge parameters are set up correctly.

USING RETRO-SPEC INSPECTIONS

What is Retro-Spec?

Retro-Spec (patent pending) is an easy to use interface that allows you to see pass/fail information for one part up to 10,000 previous parts. It also allows you to change the sensitivity and see how that inspection would have performed at different sensitivities over the recent inspection population. This is valuable because it allows you to try different settings without inspecting and rejecting more parts.

This inspection can be viewed and modified while the system remains online inspecting new parts. It uses an archive of previously inspected parts. It does not apply parameter changes to actual inspection until you are ready.

The *Retro-Spec* interface is available for the following inspections (the common interface is described below):

- ***Contrast inspection*** (see "Retro-Spec Contrast Inspection" on page 570)
- ***Measurement inspection*** (see "Retro-Spec Measurement Inspection" on page 585)
- ***Intensity inspection*** (see "Retro-Spec Intensity Inspection" on page 599)

Retro-Spec requires a ***Circular Region*** (see "Circular Region for Retro-Spec" on page 301), ***Poly Region*** (see "Poly Region for Retro-Spec" on page 304), or ***Shape Adapt Region*** (see "Shape Adapt Region for Retro-Spec" on page 308).

Viewing the Retro-Spec interface

The interface is displayed when you place or edit the inspection (only Mechanic or Administrator user levels can edit an inspection).

To display a Retro-Spec screen:

- Right-click over the related inspection area in the Part Graphic (if available). Or:
- Double-click the related area in the Part Graphic (if available). From the pop-up statistics menu, double-click the inspection name. Or:
- Double-click the name of the inspection in the standard statistics area.

❖ *Note: if the inspection is not a* RETRO-SPEC *inspection, then the appropriate inspection will be displayed.*

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What views are available

There are up to four different Retro-Spec graph views available:

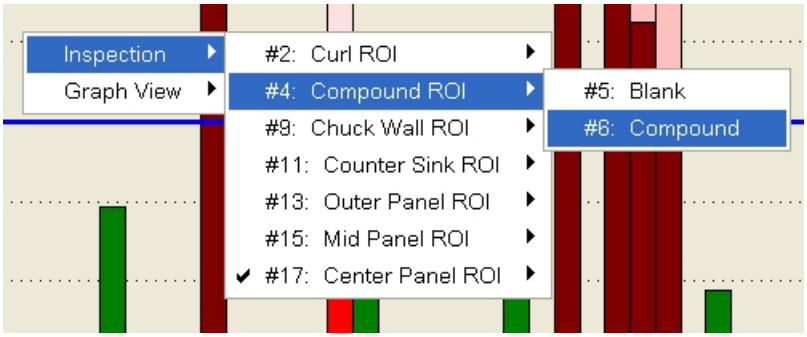
- **Part Detail** (see "About the Retro-Spec Part Detail Graph View" on page 559) – shows data for a single part (not available for Intensity inspection)
- **100 Parts** (see "About the Retro-Spec 100 Parts Graph View" on page 561) – shows data for 100 parts
- **Comparison** (see "About the Retro-Spec Comparison View" on page 562) – shows data for up to 100 parts compared to another set of up to 100 parts
- **10,000 Parts** (see "About the Retro-Spec 10,000 Part View" on page 564) – shows data from a 10,000 part archive (if enabled)

How to view another Retro-Spec inspection

You can see other Retro-Spec inspections on the same part, or on the selected data sets.

To view another Retro-Spec inspection:

1) Right-click over the graph.
2) Choose Inspection.
3) Move your cursor over the available choices and select the desired inspection.



- The inspections are grouped by Region. In the example screen above, #2, #4, #9, etc. are all different Circular Regions.
- All *Retro-Spec* inspections in the current job (and current channel) are available through this method, including Contrast, Intensity, and Measurement inspections
- If you have made changes to the current inspection, you will be asked whether you want to save changes when you switch inspections
- If an inspection has been disabled previously, it is not available for viewing

How to Identify Inspection Type

It is important to appropriately name the registrations and inspections in the job. However, you may need to identify the registration or inspection type (for example, identify Retro-Spec inspections).

To identify registration or inspection type:

1) Make sure the system is offline.
2) Log in.

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3) Click the tab for the desired channel.
4) Right-click the tab to show the channel options menu.
5) Click Review Inspections.
6) From the pop-up menu, select a job to review its inspections and click OK. Another pop-up window shows all registrations, orientations, and inspections in the job.

How to Add a Retro-Spec Inspection

You can add or insert a Retro-Spec inspection to almost any job.

Before adding a Retro-Spec inspection

Place a ***Circular Region*** (see "Circular Region for Retro-Spec" on page 301), ***Poly Region*** (see "Poly Region for Retro-Spec" on page 304), or ***Shape Adapt Region*** (see "Shape Adapt Region for Retro-Spec" on page 308) to set the inspection area.

Adding the Retro-Spec inspection

To add or insert the Retro-Spec inspection:

1) Log in as Administrator.
2) Select the desired channel.
3) Make sure a Circular, Poly, or Shape Adapt Region is in place. If a Region covering the desired area of interest is not already in the job, add or insert it as necessary.
4) Run several parts through the system so that Retro-Spec collects some images: Right-click the button and click Continuous Snap. Let it run for about a minute.
5) Click the button when finished, to stop collecting images.
6) Right-click in the statistics area.
7) Choose Add (or Insert after the correct Circular Region, if in an existing job) >> Inspection >> Retro-Spec >> Retro-Spec Wizard Dialog... The dialog box appears.

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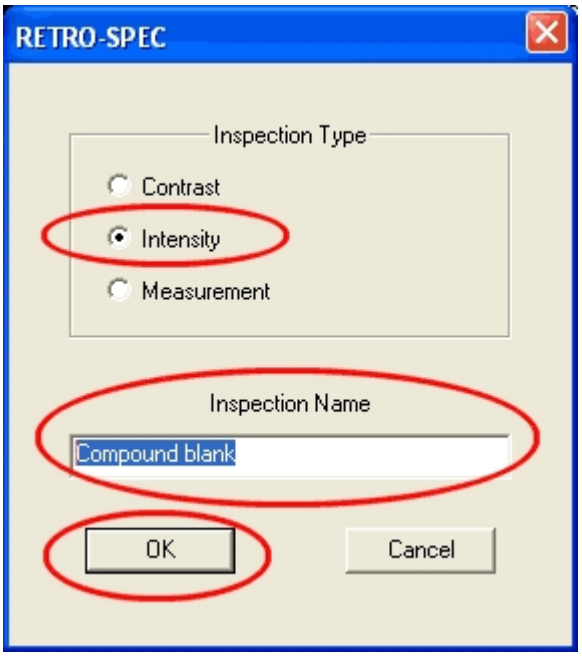
- Instead of using the Wizard Dialog, you can choose Contrast, Intensity, or Measurement from the menu, and re-name the inspection later.



8) Choose an **inspection type**.
9) Type an **inspection name** – this should describe the area of inspection, or the type of defect you are looking for.
10) Click OK. The Retro-Spec screen is displayed. The system will assign default settings.
11) Set up the ***Contrast,*** (see "Retro-Spec Contrast Inspection" on page 570) ***Intensity,*** (see "Retro-Spec Intensity Inspection" on page 599) or ***Measurement*** (see "Retro-Spec Measurement Inspection" on page 585) inspection.

How to save changes in Retro-Spec

To save changes:

1) Click Exit.
2) The system will ask whether you want to save your changes.
3) Click Yes. The system will exit the Retro-Spec inspection.

About the Retro-Spec Part Detail Graph View

> ❖ *Note: Available for Contrast and most Measurement inspections, but not Intensity. This view is not available with Shape Adapt nor Poly Regions.*

This view shows data from each inspection vector. Click anywhere on the graph to see inspection details. If you have segments, each arc's information is displayed when you click in the related area. You will see the arc area highlighted, including its overlap range.

To view the Part Detail graph:

1) Right-click on the *Retro-Spec* graph.

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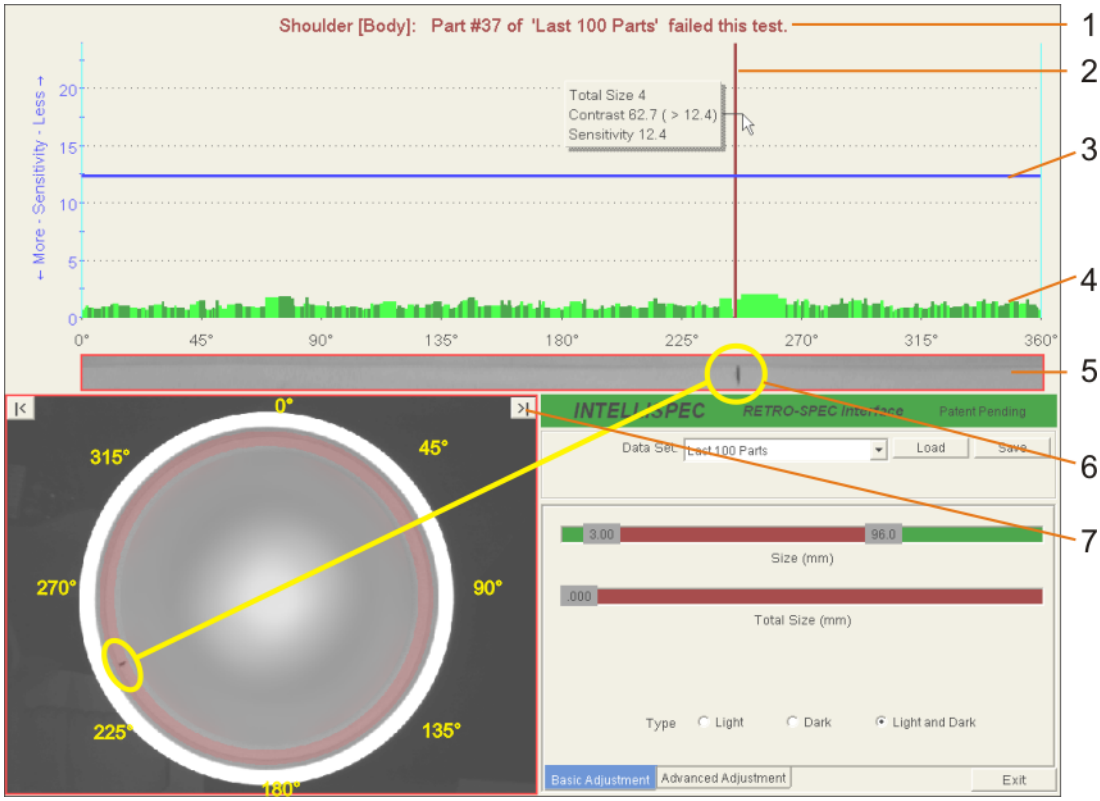
2) Choose Graph view.
3) Choose Part Detail. The Part Detail graph is displayed.

The part displayed is the one that was highlighted on the graph prior to entering this view.



Referring to the above illustration:

1	Title of graph displays name of inspection, which part (out of 100) passed or failed. The title is displayed in red if the part failed, and green if the part passed.
2	The bars in red show the defective area of the inspection region. When you click on the graph as shown in the example, the inspection data is displayed.
3	The blue line shows the sensitivity level of the inspection. Click and drag this bar to change sensitivity.
4	The bars in green show the passing area of the inspection region.
5	This is the unwrapped region of interest. It is outlined in red if the region failed, and in green if the region passed inspection. The degrees represent where the unwrapped region begins and ends.
6	If there is a defect, it will be displayed in the unwrapped region, and correlate to the part image. If the inspection is set up to catch that type of defect, you will also see red bars above that defective area.

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7	Click the right or left arrows* to scroll through remaining parts in the data set. The part image is outlined in red if the inspection region failed, and in green if the inspection region passed. * These can be disabled by right-clicking the image and de-selecting Image Selection Controls.

❖ *Note: If your settings are such that Total Size passes, but Contrast does not, the bars are displayed in **yellow**. This is for Contrast inspection. The most common occurrence of yellow bars is when the registration or orientation of the part fails.*

Using Orientation in Retro-Spec

If the inspection region is an arc and uses orientation, zero degrees would be at the top of the circle (on the image). The graph displays the start to end angles of that part's search region instead of zero to 360 degrees.

About the Retro-Spec 100 Parts Graph View

This shows how many parts out of 100 passed or failed. You can click on each bar to see the related image and its inspection information in the pop-up box.

To view the 100 Parts View graph:

1) Right-click on the *Retro-Spec* graph.
2) Choose Graph view.
3) Choose 100 Parts View. The 100 Parts View graph is displayed.

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Referring to the above illustration:

1	Title of graph displays name of inspection, and how many parts out of the last 100 failed that inspection.
2	The bars in red show the parts that failed inspection. The currently selected part is highlighted on the graph, in bright green, bright red, or bright cyan.
3	The blue line adjusts sensitivity or tolerance (depending on inspection). Click and drag this line to change the value.
4	The bars in green show the parts that passed inspection.
5	This is the unwrapped region of interest. It is outlined in red if the currently selected part failed, and in green if the part passed inspection. The numbers represent the part number up to 100.
6	The inspection region is displayed in the unwrapped region, and correlates to the part image.
7	Click the right or left arrows to scroll through remaining parts in the data set. The part image is outlined in red if the part failed, and in green if the part passed.

About the Retro-Spec Comparison View

This shows two different views at once. It displays graphs of Last 100 Parts vs. Previous 100 Rejects, for example. The system automatically selects a different data set from the one you already had displayed. The large black bar is the divider.

To view the Comparison graph:

1) Right-click on the *Retro-Spec* graph.
2) Choose Graph view.
3) Choose Comparison. The Comparison graph is displayed.

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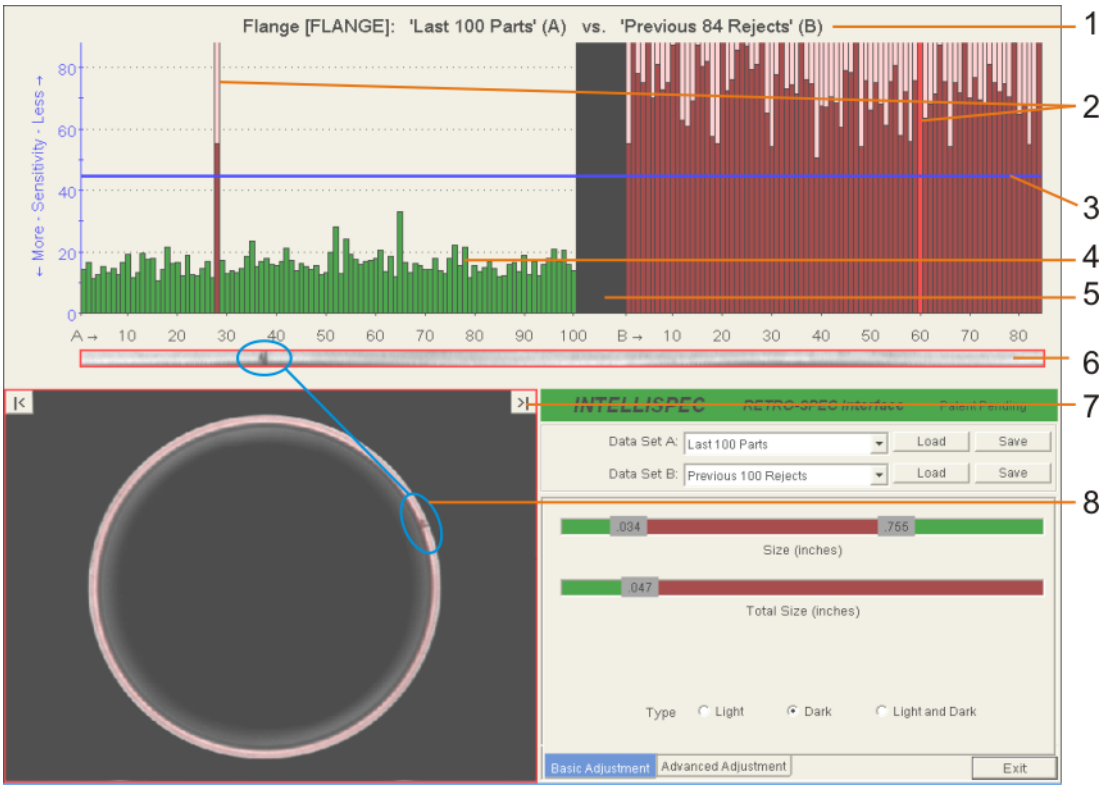
- See the lower right screen for choosing ***data set A and data set B*** (see "About the Retro-Spec Data Sets" on page 564)
- When comparison view is selected, two Data Set selectors are available. You can load data from an image set saved previously and compare it to the most recently inspected parts.
- If no data is available for one of the views (example, no parts in the Previous 100 Rejects category), the black bar falls at either end of the graph
- You can ***move*** (see "Moving samples between data sets" on page 566) data samples from one set to another, or ***delete*** (see "Deleting samples" on page 566) samples



Referring to the above illustration:

1	Title of graph displays name of inspection, Data Set A, and Data Set B.
2	The bars in red show the parts that failed inspection. The currently selected part is highlighted on the graph in bright green, bright red, or in some graphs, bright cyan.
3	The blue line adjusts sensitivity or tolerance (depending on inspection). Click and drag this line to change the value.
4	The bars in green show the parts that passed inspection.
5	The black bar visually divides Data Set A from Data Set B.
6	This is the unwrapped region of interest. It is outlined in red if the currently selected part failed, and in green if the part passed inspection. The numbers represent the part number up to 100, for both Data Sets A and B.

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7	Click the right or left arrows to scroll through remaining parts in the data set. The part image is outlined in red if the part failed, and in green if the part passed.
8	The inspection region is displayed in the unwrapped region, and correlates to the part image.

About the Retro-Spec 10,000 Part View

This is available when Data Set = 10,000 part archive. It shows a graph of up to 100 bars, and the X axis is labeled Groups instead of Parts. Each bar represents a group of 100 parts. The value of each bar represents the highest contrast, or worst part, found in each group.

When the 10,000 part archive is collected, it collects groups of 100 consecutive parts. These *groups* are not consecutive. That is, the archive will collect images for 100 parts, then several hundred more parts may be inspected by Intellispec, then the archive will collect data for another 100 parts. This provides a good sampling of parts over time.

If there is no archive available when you select the 10,000 part data set, an error message will be displayed.

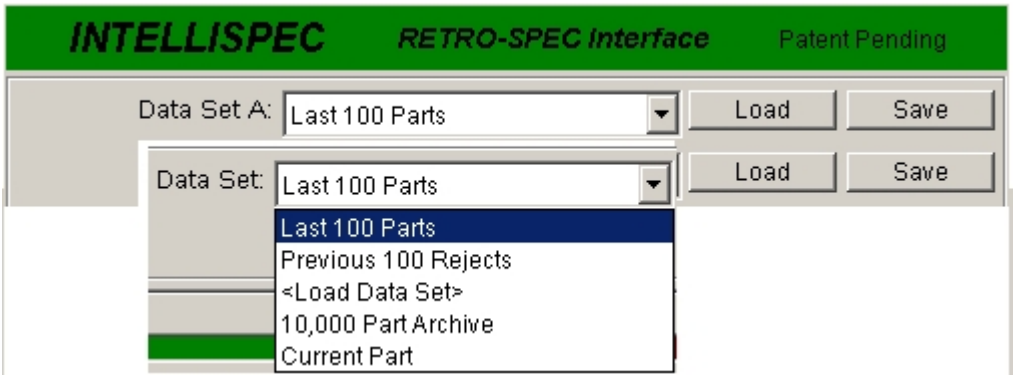
To view the 10,000 Parts View graph:

1) Right-click on the *Retro-Spec* graph.
2) Choose Graph view.
3) Choose 10,000 Parts View. The 10,000 Parts View graph is displayed.

> ❖ *Note: Archiving must be enabled by Pressco. The archive will be stored on one of the hard drives. This is available on Series IV Intellispec systems where two hard drives have been installed. Not available on Series III systems.*

About the Retro-Spec Data Sets

The *Retro-Spec* interface allows you to view and/or load data from previously inspected parts. Choose which data to display through the Data Set area of the interface.



Data Set A or Data Set B

These two choices appear when you choose Comparison graph view. In other graph views, only one data set is necessary. Data Set choices are described next.

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Last 100 Parts

Shows the results of inspection for up to the last 100 parts. Results could be from online or offline inspection.

Previous 100 Rejects

Shows the results of inspection for up to the last 100 rejects. Results are from online inspection only. The parts were rejected based on the settings when they were inspected – if inspection parameters were changed subsequently, parts could be shown as passing.

- If Archiving is not enabled, Previous 100 Rejects shows up to the last 100 rejects available in memory
  - If less than 100 parts were rejected online, it displays only the number of parts actually rejected
  - Memory stores a total of 100 rejects from each inspection. When you switch inspection views, the number of displayed rejects may change.

<<Load Data Set>>/ Load button

Click this option from the drop-down menu or the Load button. The inspection will load any set of bitmap images saved on the hard drive(s). This option is useful for loading a set of "Golden Part" images to make sure the inspection is running correctly. Also, a set of part images with certain defects can be loaded to make sure the inspection is catching those defects.

- Browse to the desired folder and click Open. If *.bmp is shown as file name, all bitmap images from that folder will be loaded.
- To load specific images, highlight the desired images while holding the Shift (for contiguous files) or Ctrl (for non-contiguous files) key and click Open.
- Notice that the image set name will be displayed in the Data Set drop-down box.

Save button

Saves the images currently in memory. A default folder and image set name is provided, but you can browse to any folder and name the image set as you wish. The grayscale images are saved without the inspection region displayed on them.

This saves the images currently selected by the Data Set parameters: The Last 100 parts, Previous 100 Rejects, etc. If a data set was loaded from disk, clicking Save saves those images again under a different folder name.

10,000 Part Archive

Archiving must be enabled by Pressco. The archive will be stored on one of the hard drives. This is available on Series IV Intellispec systems where two hard drives have been installed. Not available on Series III systems.

❖ *Note: if you do not have an archive of 10,000 inspected parts, an error will be displayed.*

Current Part

Displays Part Detail view for the most recently acquired image.

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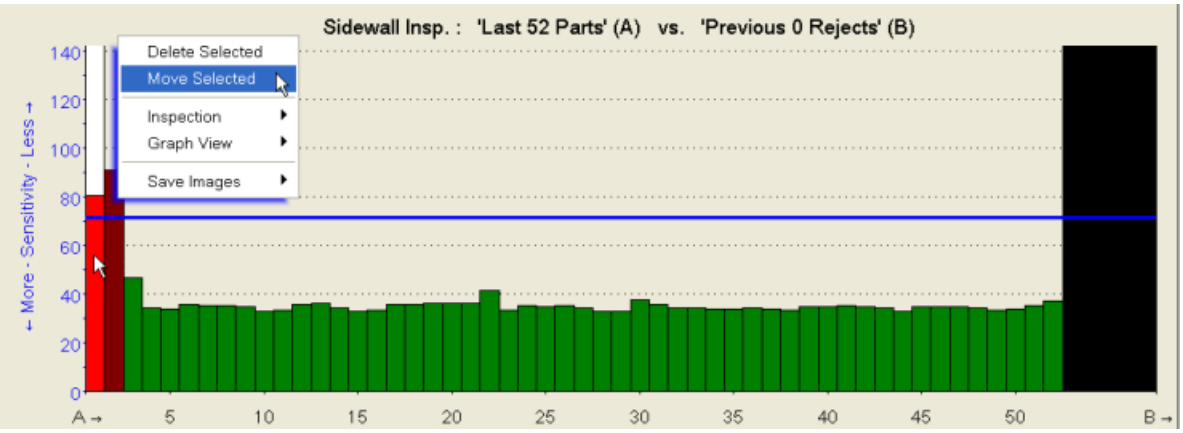
Moving samples between data sets

In Comparison View, you can move image samples from one data set to the other. This allows you to quickly make a data set with all good parts, to compare it to a data set with all bad parts.

To move a sample from one data set to the other:

1) Select the bar of the sample you want to move. In the example below, we've selected part #1.



- To move **several contiguous samples**, hold the Shift key while selecting multiple samples. The samples must be next to each other.
- To move **several non-contiguous samples**, hold the Ctrl key while selecting multiple samples. The samples do not need to be next to each other.

2) Right-click and choose Move Selected. Retro-Spec removes the selected sample from the current data set (A) and moves it to the data set being compared (B). You could also move samples from (B) to (A).

- The name of the data sets change to Scratch 1 (A) and Scratch 2 (B). These are temporary data sets. Original data sets remain unchanged. To keep a copy of the data set, ***save*** (see "About the Retro-Spec Data Sets" on page 564) it.
- If the sample set consisted of several images from hard drive, those original images are not moved from the original folder. If you save the new data set, a new default name is given to the set of images (i.e. A0017.bmp).

Deleting samples

Occasionally, you may want to delete a sample from the set because it might be skewing the inspection setup. In the example below, we want to remove part #1 because it failed registration. We do not want to use that part to set up our inspection.

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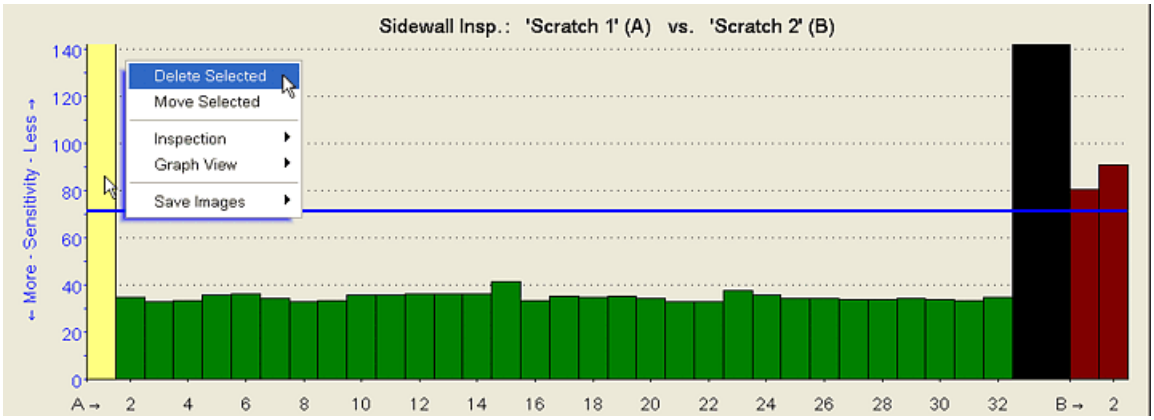
To delete a sample:

1) Select the bar of the sample you want to delete. In the example below, we've selected part #1.



- To delete **several contiguous samples**, hold the Shift key while selecting multiple samples. The samples must be next to each other.
- To delete **several non-contiguous samples**, hold the Ctrl key while selecting multiple samples. The samples do not need to be next to each other.

2) Right-click and choose Delete Selected. Retro-Spec deletes the selected sample from the current data set. If the image was originally loaded from the hard drive, the original file is not deleted.

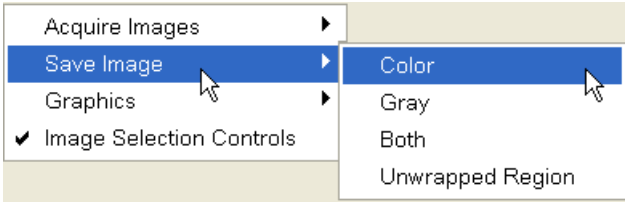
For information about the data set name [Scratch], see the topic ***Moving Samples Between Data Sets*** (on page 566).

How to Save Retro-Spec Images

You can save images through the ***Data Sets*** (see "About the Retro-Spec Data Sets" on page 564), or save an individual Retro-Spec image.

To save a Retro-Spec image:

1) Right-click on the image.



2) Choose Save Image to save a bitmap of the image. Your choice of images include:

- **Color** – Saves the inspection region on the part image. The image is named "*_c.bmp", where "*" changes for every image.
- **Gray** – Saves only the grayscale part image.
- **Both** – Saves two images – one grayscale image with the inspection region, and one without the inspection region.
- **Unwrapped Region** - Saves the unwrapped portion of the image that is normally displayed below the graph

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- If the inspection does not have an unwrapped region, as in inspections with Poly Regions, only a portion of the original image is saved. That is, the inspection region area is saved, and the rest of the image is masked out.

Where the image is saved

A default image name and folder is provided when you save the image. However, you can re-name the images and choose any folder before saving.

How to Load Retro-Spec Images

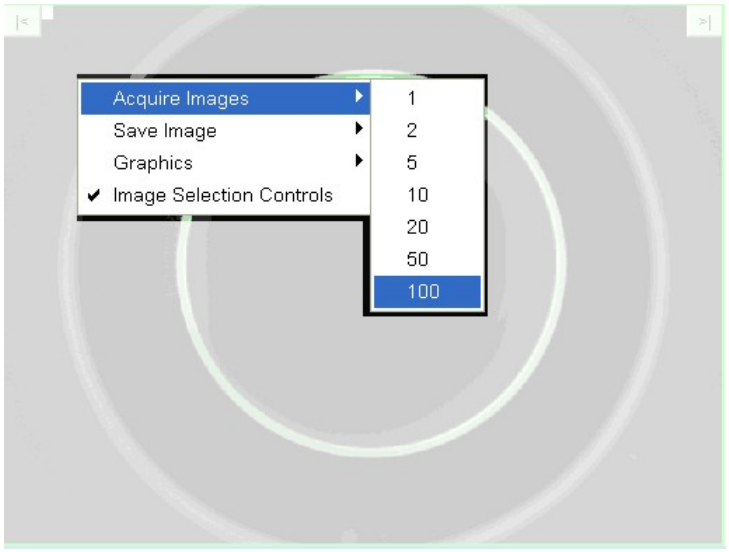
If you are editing a Retro-Spec inspection, you can load more images so that you can test the inspection.

You can load images from file, or snap new images through the camera.

To load images from file, use the Load button to load a ***Data Set.*** (see "About the Retro-Spec Data Sets" on page 564)

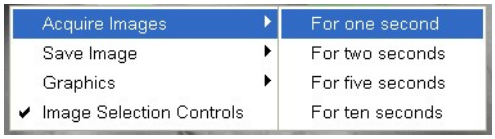
To snap new images through the camera while the system is offline:

1) Right-click over the part image.
2) Select Acquire Images >> select a number of images for the camera to snap. The images are loaded into Retro-Spec memory and appended to the current data set in the graphs.



To snap new images through the camera while the system is online:

1) Right-click over the part image.
2) Select Acquire Images >> select a number of seconds for the camera to snap. The images are loaded into Retro-Spec memory and appended to the current data set in the graphs.



While the system is online, the choice is available in number of seconds instead of images in case the production line is not moving.

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How to Remove the Retro-Spec Inspection Region from the Image

Sometimes, you might want to see the defect more clearly. You can remove the inspection region, then display it again if you wish.

To remove the inspection region:

1) Right-click on the image.
2) Choose Graphics >> Clear.

To display the inspection region again, right-click on the image and choose Graphics >> Refresh.

How to Scroll Through Retro-Spec Images

Click the left or right arrow to scroll through the images in the currently selected data set. If you reach the first or last image in the data set, the image will not change.

To disable scrolling:

1) Right-click on the image.
2) Un-check Image Selection Controls.

To enable scrolling again, right-click on the image >> check Image Selection Controls.

How to Apply Retro-Spec Changes to Your Job

Retro-Spec does not make changes to the actual inspection of your products until you are ready. After you have made all the desired changes to the Retro-Spec inspection, simply click Exit.

A pop-up window asks whether you want to save your changes.

- **Yes** applies the changes to the job, and exits the inspection.
- **No** reverts to the Retro-Spec settings from when you entered the interface, and exits the inspection.
- **Cancel** does not save changes, and returns you to the Retro-Spec interface.

Undoing changes in the Retro-Spec interface

You can undo changes made to parameters and other settings without exiting the Retro-Spec interface.

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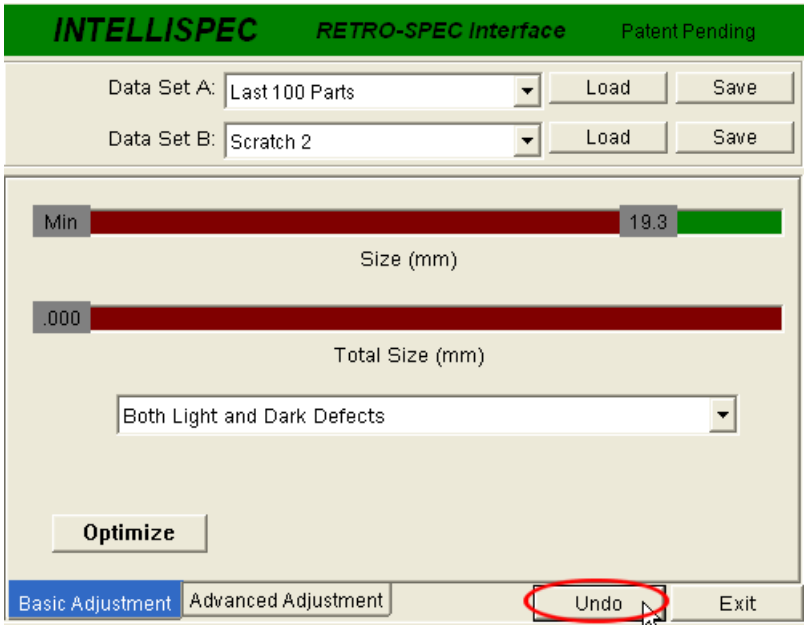
To undo changes:

Click the Undo button at the bottom right of the screen. This resets all Retro-Spec parameters and settings for that inspection back to the last saved version. That is, everything is reset to the point where you entered the interface.



RETRO-SPEC CONTRAST INSPECTION

Contrast inspection uses Pressco's *Retro-Spec* (patent pending) interface. Contrast inspection can discriminate defects based on their size, contrast, and whether they are dark or light. The contrast results are represented by bars on the graph. When the system finds a defect, it displays a higher bar.

For many applications, Contrast inspections can replace Radial Line Integration and/or Circle inspections.

❖ *Note: This inspection can be viewed and modified while the system remains online inspecting new parts. It uses an archive of previously inspected parts. It does not apply parameter changes to actual inspection until you are ready.*

Contrast inspection is available for the All Inspection Product Type (Channel Product Type or Job Product Type).

See ***how to add a Contrast inspection*** (see "How to Add a Retro-Spec Inspection" on page 558).

How to Adjust Contrast Inspection for Your Part

You can change inspection parameters to see how they perform on the current part or a set of archived images.

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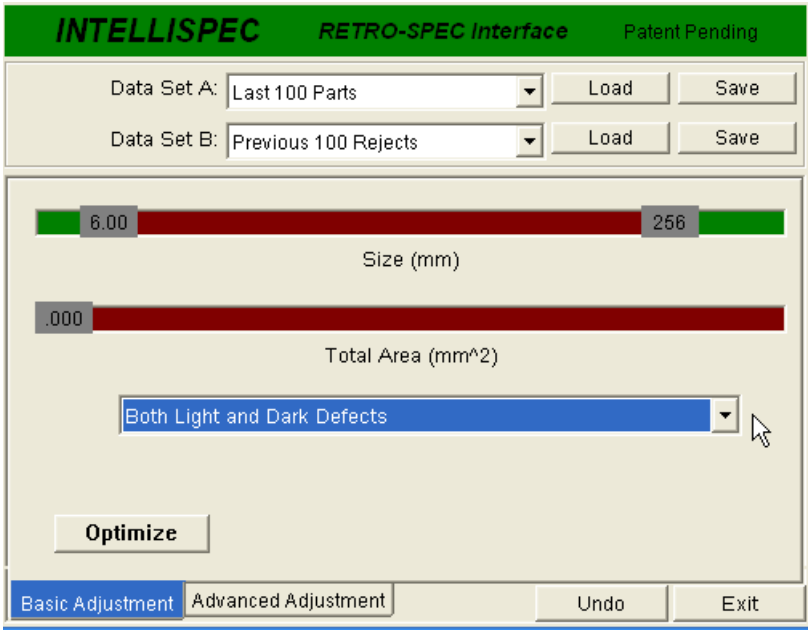
Making Basic Adjustments

This area of the screen provides data set selection, and allows you to determine what type of defects you want to catch.



Data Set **(see "About the Retro-Spec Data Sets" on page 564)**

Size

Choose the range of defect size you want to catch – hold the left trackball button and drag the markers for min and max size. For example, you may want to pass very small defects but fail larger ones.

❖ *Tip: The effect of these settings is best viewed through* **Part Detail view** *(see "About the Retro-Spec Part Detail Graph View" on page 559).*

The area between the size markers is red to indicate defects, while the area outside of them is green to indicate passing size. If the min and max markers are at 6 and 256, respectively, then any anomalies on the part that are smaller than 6 (mm) or larger than 256 (mm) are ignored. If you look at the Part Detail view, those anomalies below 6 and greater than 256 are not shown on the graph. Even if you had 500 dark spots on the part that measured 5 mm, they would be ignored and not visible on the Part Detail graph.

The size units depend on how the channel is calibrated. This can be measured in millimeters, pixels, inches, or custom units. The administrator can calibrate the channel through ***Pixel Calibration*** (see "Pixel Scale Calibration" on page 182).

Total Size (or Total Area)

Total Size should be left at its default setting of zero unless you have a part with one or more small anomalies you want to pass. If so, set Total Size to the total acceptable amount of anomalies. If a part has more than an acceptable amount of anomalies, it fails.

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To see Total Size on a part, click on the graph. In 100 Part View or Comparison View, Total Size is shown when you click on each part. In Part Detail View, click anywhere on the graph to see Total Size.

If you view the Part Detail graph, total size only applies to those peaks that go above the sensitivity bar. For example, if you have 5 peaks above the sensitivity bar and each of those peaks is 5 mm, then Total Size is 25. If Total Size is set for anything less than 25, the part would be rejected. If Total Size is greater than 25, then the peaks would be displayed in green and the part would pass.

A good use of Total Size is if you want to ignore 1 or 2 small anomalies but reject the part if there are too many anomalies.

This setting is called Total Area if Linear Stripes was chosen in the Region of Interest.

Type

Choose the type of defects you want to catch – Light, Dark, or Light AND Dark. For example, if the material is normally dark, you might want to catch Light defects.

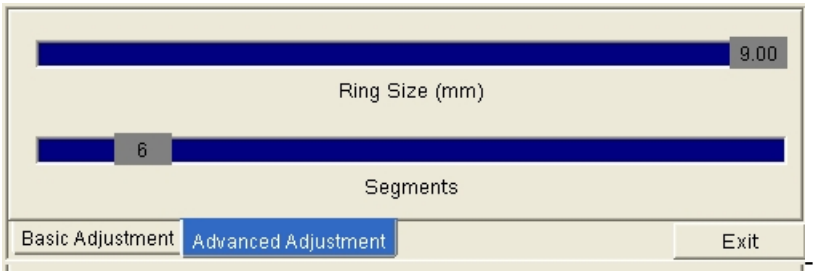
Using the Optimize button **(on page 574)**

To save changes:

1) Click Exit.
2) The system will ask whether you want to save your changes.
3) Click Yes. The system will exit the Retro-Spec inspection.

Making Advanced Adjustments

This menu divides the inspection region into segments and/or ring segments. It also provides additional options for advanced users.



Ring Size (or Sample Size)

Ring Size can improve inspection sensitivity to defects that do not span the width of the inspection region. An example would be nicks on the inner edge of a Seal Surface.

To optimize sensitivity for a particular defect, set Ring Size to approximately the size of the defect. You cannot see the rings on the image. You might have to measure the actual defect to see the size.

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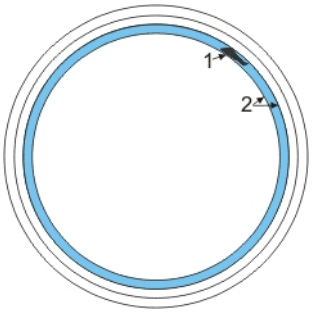
The maximum Ring Size (slider all the way to the right) equals the width of the inspection region. This creates one ring (not divided). The smaller the Ring Size, the greater the number of rings.



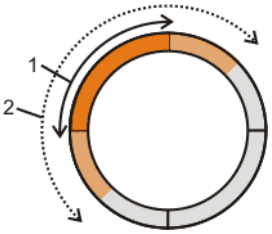
1	Defect
2	Ring Size

This setting is called **Sample size** if Linear stripes was chosen in the Region of Interest. Set Sample Size to approximately the number of pixels of the defects you want to catch. With Sample Size, Segments are not used.

Segments

Divide the region into a number of segments between one and 360. Segments can be used if you want the system to catch a cluster of small anomalies, while passing parts with a similar number of widely scattered small anomalies. When Total Size = 0 (in Basic Adjustment), segments have no effect on the inspection.

You can view the segments in ***Part Detail View*** (see "About the Retro-Spec Part Detail Graph View" on page 559) when you click an area of the graph. These are represented by cyan divider lines which include overlap. The segments have a standard 50% overlap, ensuring that small anomalies do not get divided between segments.



1	Segment
2	Segment with overlap

To save changes:

1) Click Exit.
2) The system will ask whether you want to save your changes.
3) Click Yes. The system will exit the Retro-Spec inspection.

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How to Adjust Sensitivity in Retro-Spec Contrast Inspection

This is best done through ***100 Part View*** (see "About the Retro-Spec 100 Parts Graph View" on page 561) or ***Comparison view*** (see "About the Retro-Spec Comparison View" on page 562) graphs.

Using the data on the graph, click and drag the blue line up or down to change sensitivity. Click on one of the green or red bars on the graph to see its corresponding image. If you think a passing (green) part should have failed, adjust sensitivity towards zero until that bar turns red.

Caution

Once you change sensitivity and save your changes, the inspection will operate with the new settings. Making the inspection too insensitive may cause the system to miss certain defects.

Using the Optimize button

In Retro-Spec Contrast inspections, an Optimize feature is available that simplifies setup for you. This feature automatically adjusts Retro-Spec settings based on a sample set of parts. This feature is only available offline.

Optimize is used with the Comparison View graph. You will need a data set of good parts in Data Set A, and a set of bad parts in Data Set B.

To use the Optimize feature:

1) Load a set of good parts into Data Set A.
2) Load a set of bad parts into Data Set B. These parts should have defects in the current inspection's region of interest.
3) If there are any parts that do not belong in either sample set, try ***moving*** (see "Moving samples between data sets" on page 566) or ***deleting*** (see "Deleting samples" on page 566) those samples.
4) In the Basic Adjustment tab, choose whether to search for Light Defects Only, Dark Defects Only, or Both Light and Dark Defects from the drop-down menu.
5) ***Adjust the Size*** (see "How to Adjust Contrast Inspection for Your Part" on page 570) slider to catch the size of defect you want to detect.
6) Click the Optimize button. In the pop-up dialog box, click Yes. Retro-Spec will analyze the part sets and determine the best settings to pass the good parts while failing the bad parts. Wait till the optimization process is complete - this may take several seconds.
7) Look at the Retro-Spec graph (example below) to determine whether the good parts are still passing and the bad parts are failing. Most likely, you will see a significant separation of contrast between good and bad parts.

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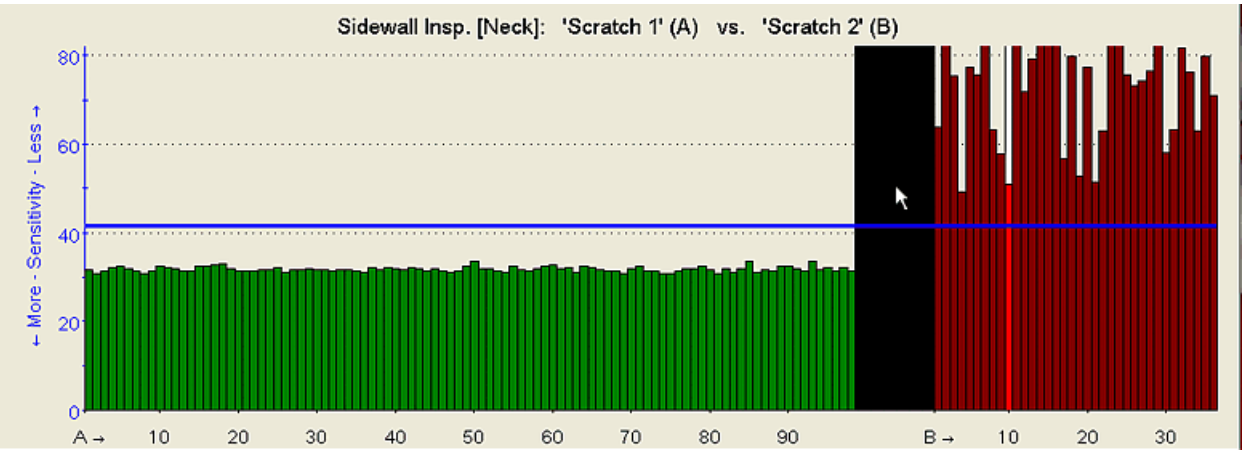
8) Test the inspection by ***loading*** (see "How to Load Retro-Spec Images" on page 568) more images. You can make slight adjustments in the Basic Adjustment and Advanced Adjustment tabs if necessary.

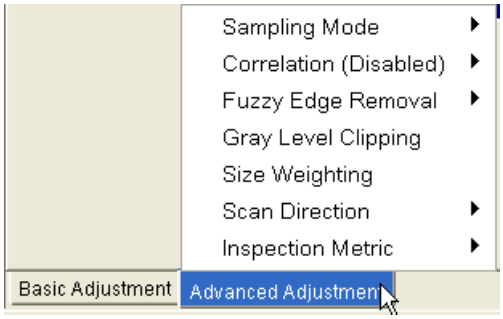


How to Identify Failed Parts in Retro-Spec Contrast Inspection

If a part on the graph has a red bar, it has failed inspection. These bars are extended in pink to the top of the graph for easy identification.

Additional Advanced Options in Retro-Spec Contrast inspection

The following options are available by right-clicking on the Advanced Adjustment tab. These are intended for advanced users.



Sampling Mode

The default selection is Integration. Leave that selected for most applications. Concavity is used for detecting and ignoring draw marks in two-piece beverage cans. See more about ***using the Draw Mark Filter*** (on page 583).

Correlation

See more about ***using Color Dot Correlation*** (on page 578).

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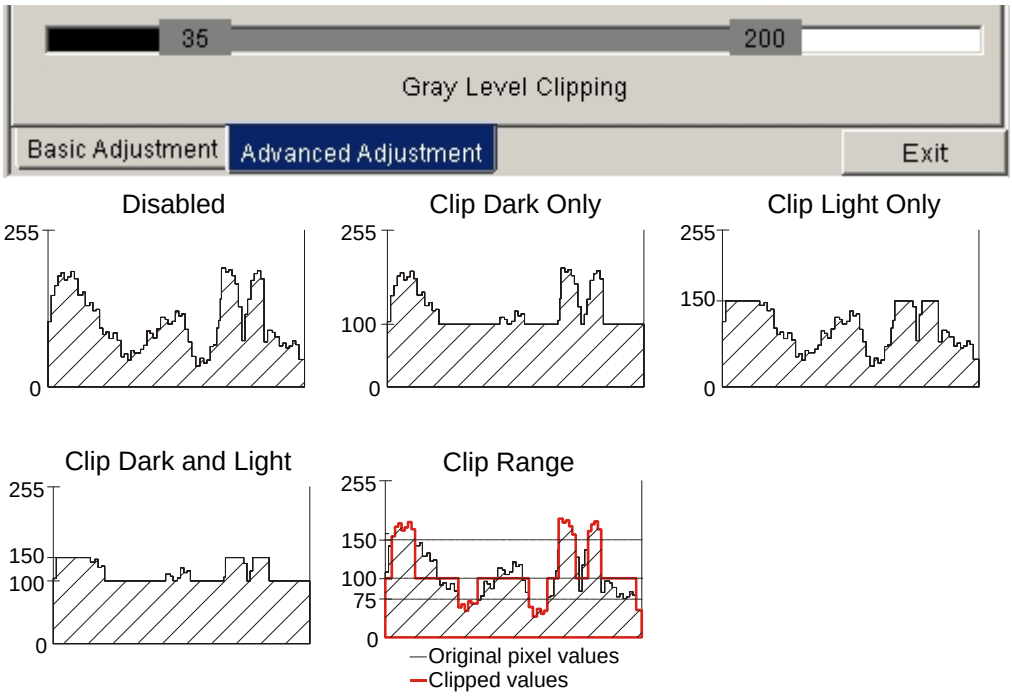
Fuzzy Edge Removal

This is for parts that have normal anomalies that are fuzzy, but the defects are sharp and clear on the image. The default is disabled. The higher the Filter Level, the stronger the fuzzy edge removal. Be aware that this filtering increases inspection time.

Gray Level Clipping

This is the same clipping as used in Circle, Radial Line Integration, and other inspections. It is enabled if there is a check mark next to it.



Size Weighting

This feature is similar to ***Moment in Radial Line Integration*** (see "About Radial Line Integration" on page 387). It is enabled if there is a check mark next to it. This feature helps find defects such as wrinkles on metal parts.

- If an area of the part fails (that is, the size falls in the red area of the Size sliders), it is weighted. If the area does not fail, it is not weighted.
- To see the Total Size and weighted number, click on the graph. This is best viewed in the ***Part Detail*** (see "About the Retro-Spec Part Detail Graph View" on page 559) graph.
- If the size of an object is lower than the left slider (in the green area), then it is not weighted
- If the size of the object is between the numbers on the lower and upper sliders (yellow area), it is weighted
- If the size of the object is greater than the higher slider number (red area), the part automatically fails
- The Basic Adjustment sliders change to provide adjustment for weighting.
- The left slider is Total Size, as in the standard Contrast sliders.

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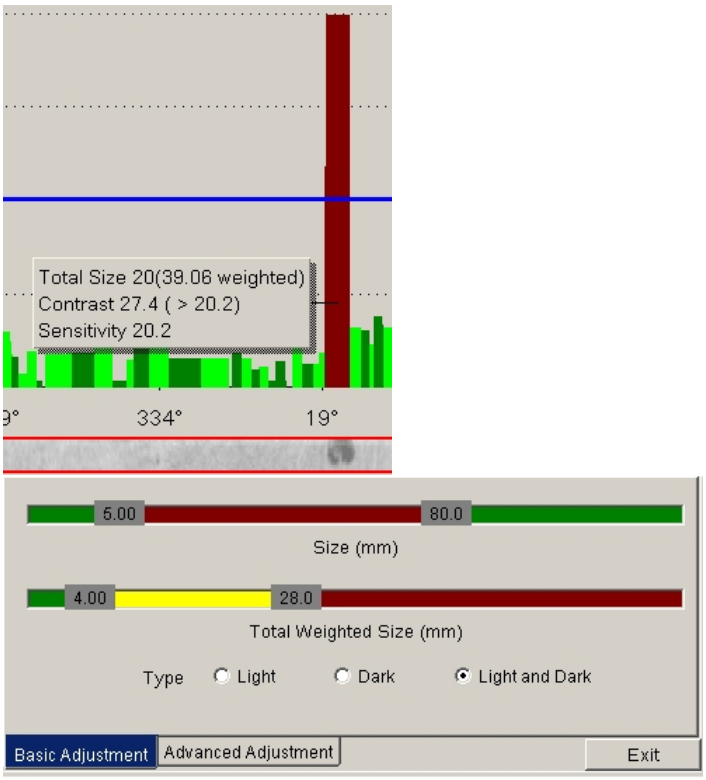
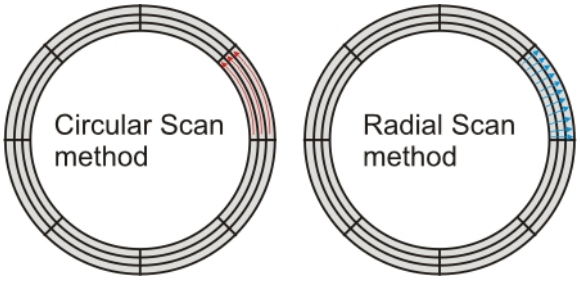
- The right slider adjusts the weighted size limit. If the weighted value is higher than the right slider, the part fails.

In the example below, the weighted value (39.06) is greater than the right slider value (28), so the part fails.



Scan Direction

This feature is similar to Scan Method in Circle ***Edge inspection*** (on page 348). It allows you to set the inspection to use Circular or Radial scanning.



Inspection Metric

This allows you to choose between Width and Area for the inspection.

Width, the default setting, adds the number of units (pixels, millimeters, etc.) of defective bars at or above the sensitivity level within an inspection region or segment.

Area adds all the defect pixels. Suppose your part had two small defects along the same radial line. Normally, the width of the predominant defect would be counted. But with Area enabled, all defect pixels are counted. This results in a larger defect area counted.

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Using Color Dot Correlation

This feature of Retro-Spec Contrast inspection is used for an application where colored dots are applied to cans to identify specific spray heads. These spray heads apply inside coating as well as small colored dots to the cans.

The inspection determines the dot's color, the number of color dots, and correlates the dots back to the spray heads. This information can be used to correlate data or reject parts.

❖ *Note: Color Mode must first be enabled in the* **Circular Region** *(see "Circular Region for Retro-Spec" on page 301). Also, your system must have a color camera installed.*

Finding different colors

To find dots that are different colors, you must set up a separate Retro-Spec Contrast inspection for each color. You may use the same Circular Region. The inspections are run in order. If the first inspection searches for cyan, and parts are identified with cyan dots, then those parts are correlated to the appropriate spray heads. Those parts with the cyan dots will not be considered for any other color dot.

Below is a typical inspection list for color dot inspection. A standard Circular Registration is used to find the center of the part. A Circular Region is placed over the entire area where a color dot is likely to occur. Then a set of Contrast inspections is added to locate each color dot.

Inspection	Total	Defects	Defect %	Last (10000)	Last (10000)%
	0	0	0.000	0	0.000
>Circular Registration		0	0.000	0	0.000
^Circular Region		0	0.000	0	0.000
Aqua to Cyan		0	0.000	0	0.000
Green to Aqua		0	0.000	0	0.000
Sky Blue to Blue		0	0.000	0	0.000
Magenta to Violet		0	0.000	0	0.000
Orange to Yellow		0	0.000	0	0.000
Dark		0	0.000	0	0.000
None		0	0.000	0	0.000

❖ *Tip: Dark and None are the last 'colors' we search for.*

Setting up color dot inspection

To use the color dot feature:

1) Make sure you have a Circular Region large enough to locate the dots regardless of where they appear on the part.
2) Enable Color Mode in ***Circular Region*** (see "Circular Region for Retro-Spec" on page 301). It does not matter whether you Display Color Image from the Image menu options - that is not necessary for inspection.
3) Add a Retro-Spec Contrast ***inspection*** (see "How to Add a Retro-Spec Inspection" on page 558).
4) Click the Advanced Adjustment tab.

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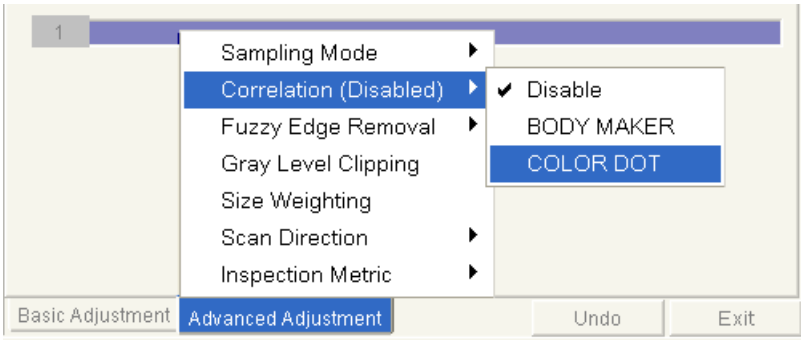
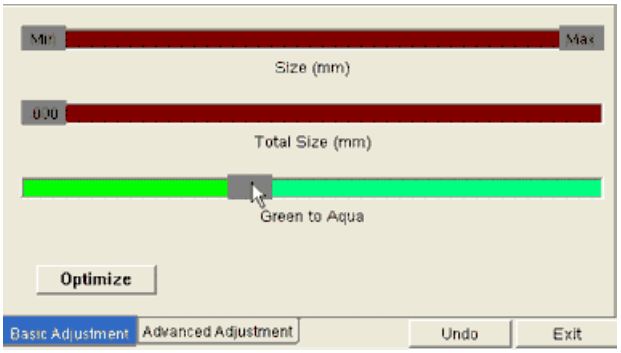
5) Right-click the Advanced Adjustment tab, select Correlation, and select Color Dot from the pop-up menu. The Color Dot option will become enabled, and more correlation options become available. The bars on the graph also change colors to gray and the color that the inspection is set up to detect.



6) Click the Basic Adjustment tab.
7) On the color slider, move the slider through the different color combinations. Notice the height of the bars on the graph for each color. Leave the slider at the most predominant color - the color that has the greatest number of the highest bars. Scroll through the parts and look at the images to make sure they have the same color dots indicated by the color slider bar. You might have to move the blue sensitivity bar to see a greater distinction between colors. See an example of color bars in the *Setting up Correlation* section.



8) Exit the Retro-Spec interface and Save changes.
9) ***Re-name*** (see "Inspection Options" on page 36) the inspection to match the color it is searching for.
10) Add another Retro-Spec Contrast inspection to search for another color. Repeat steps 3 - 9 until all color dots have separate inspections, and you have Dark and None inspections at the end of the search list.
    - The color 'dark' captures the remaining color dots that are not captured by any of the other color inspections
    - The inspection 'none' captures the remaining parts that have no dots

Order of Inspections

The order in which the inspections appear in the inspection list are important to the proper detection of color dots. Try detecting one color and test it on your parts. If that inspection detects dots that it is not supposed to detect, try switching the order of color inspections.

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Setting up correlation

From the production line, get a list of all the color dots you will search for, and the numbers of the machine parts (spray heads) to which they are correlated.

The machine parts are configured under >> Correlation tab. If these are not set up already, go to ***correlation configuration*** (on page 126).

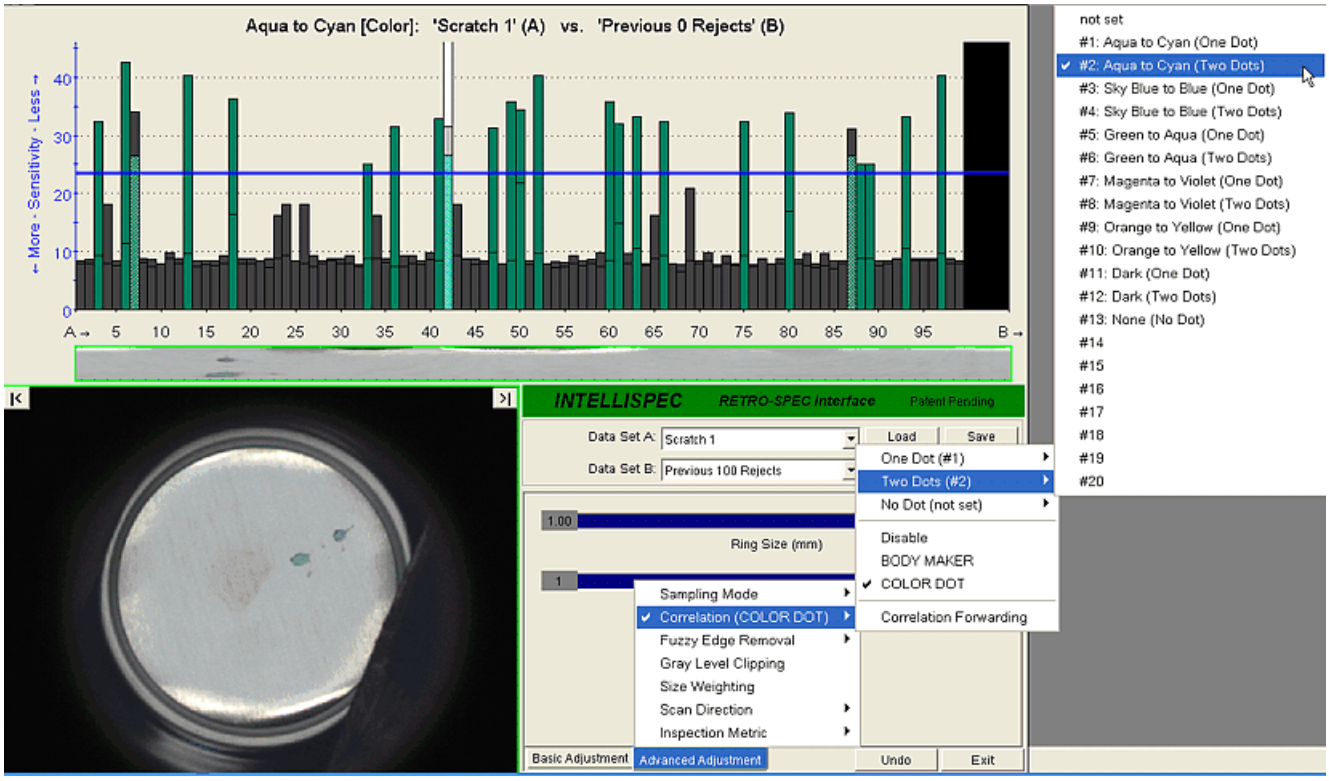
Also note for each machine part whether it will correlate to one color dot or two color dots. Correlation within Retro-Spec should be set up after you have programmed all the Retro-Spec inspections that detect each color.

The correlation portion of the Retro-Spec Contrast inspection must be enabled (see *Setting up color dot inspection* above).

Example: The current inspection is searching for two color dots in Aqua to Cyan, correlated to machine part # 2.

To correlate the dot to the machine part:

1) Right-click the Advanced Adjustment tab.
2) Select Correlation (COLOR DOT) >> Two Dots >> select #2 (these are example choices).



If the color that the inspection is looking for will have parts with one dot as well as two dots, then select a machine part # for one dot, and also select a machine part # for two dots.

Repeat this process for the remaining inspections to correlate dots to the proper machine parts. See ***how to view another Retro-Spec inspection*** (on page 557) without exiting the Retro-Spec interface.

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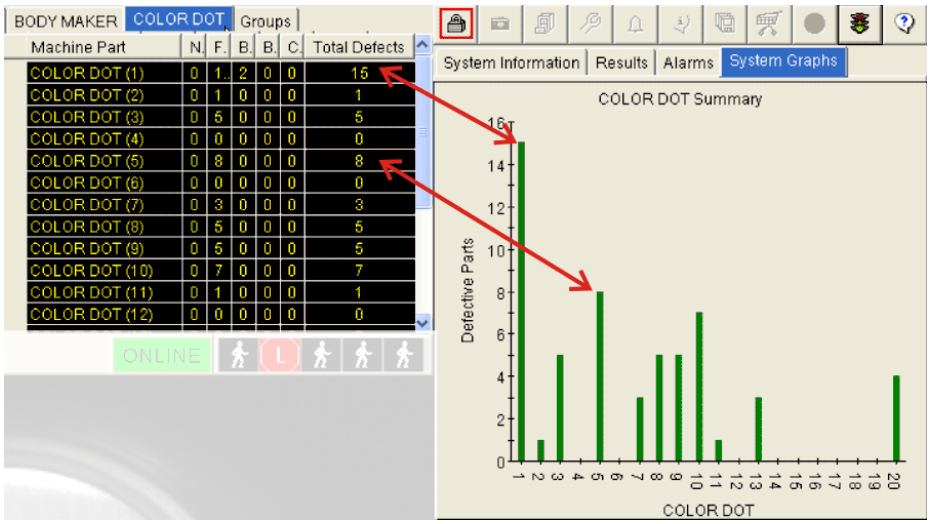
❖ *Note: The numbers to which you assign each inspection do not need to match the physical spray head number. Keep a table that references each color, the spray head number, the number of dots that are supposed to be sprayed, and the machine part to which it is assigned in the inspection.*

The numbers available are 1 through x where x = number of Color Dot machine parts specified in the System Configuration menus. In the example shown above, x = 20.

The numbers correlate to the correlation tables and graphs, as seen in the example below. The ***correlation data*** (on page 79) also gets saved in the correlation reports.



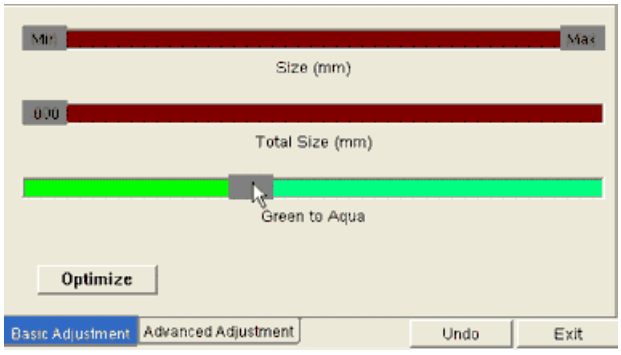
Using No Dot correlation

Assigning an inspection to No Dot is important. This inspection should be last on the inspection list. After all other color dots have been detected, the No Dot bin collects the data from all remaining parts. These parts may have no dot on purpose, or a dot that did not fit the criteria of any of the other inspections.

About the basic settings for Color Dot Correlation

The Basic Adjustment screen is different from that of a standard Contrast inspection. The differences include:

- A color slider bar is available
- **Total size** has a different meaning: if the dot(s) detected measure less than the Total Size setting, it is considered one dot. If the dot(s) detected measure greater than the Total Size setting, it qualifies as two dots.



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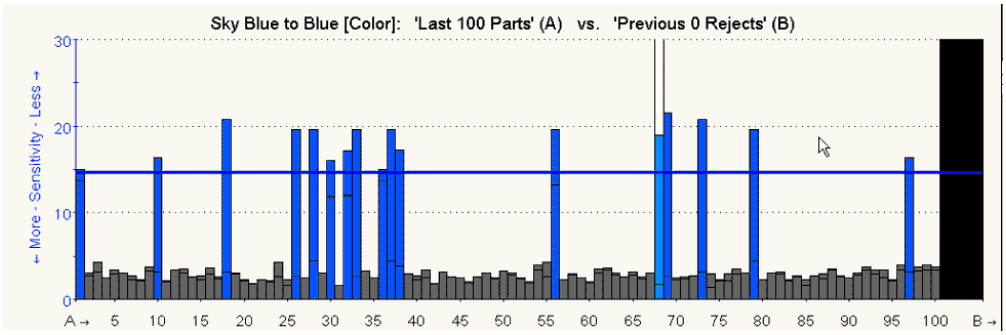
Detecting one dot vs. two dots

When the inspection is first set up, it detects one dot. You can enable two dot detection by using the correlation settings. Assign the inspection to two dots, as shown above in the *Setting up Correlation* section. Then set Size and Total Size to detect the desired dots. Use Total Size to distinguish the size difference between one dot and two dots.

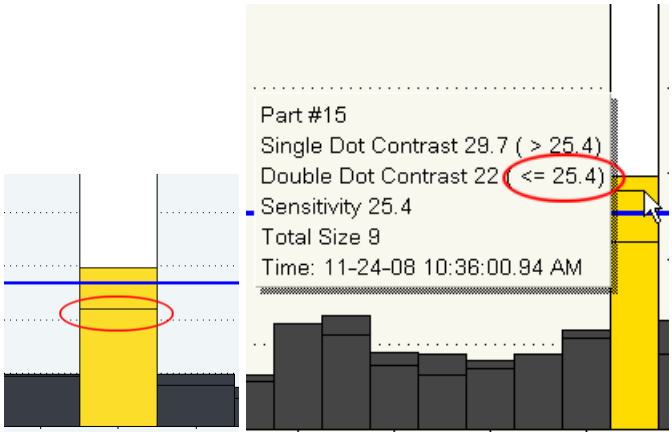
About the Retro-Spec graphs for Color Dot Correlation

The graph looks different than a standard Retro-Spec Contrast graph.



The differences include:

- The bar colors of the 'good' parts match the color you are searching for.
- The remaining parts in the sample set are shown with gray bars. These are not 'bad' parts, but they are parts that do not have the color dot the inspection is searching for.
- When the inspection is set up to detect two color dots, the bars are divided into two parts: a top portion (single dot contrast) and a bottom portion (double dot contrast). See example below.



- Some bars have stippled color. This occurs when the inspection is set up for detecting two color dots.
  - This means that both color dots are larger than the number specified in **Total Size**.
  - When both Single Dot Contrast and Double Dot Contrast are greater than the sensitivity setting, the color is stippled, and the single dot portion of the bar is represented in gray at the top of the bar.

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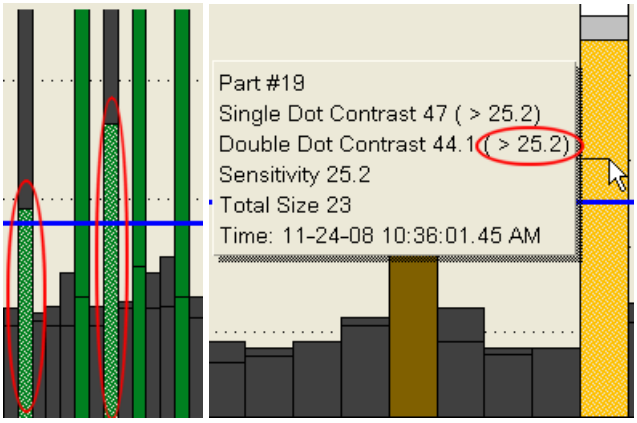
Note: it is possible for both dots' contrast to equal each other, and therefore the bar portions are the same size (overlapping each other) - you do not see the divider bar nor the gray portion at the top.



About Correlation Forwarding

This forwards the results of the inspection to another inspection lane. This is only used in specific applications where multiple lane systems are used.

Using the Draw Mark Filter

Draw marks are normally-occurring marks that are sometimes left on parts as part of the manufacturing process. Draw marks do not indicate bad parts. However, many times these marks are detected as defects, and therefore produce false rejects, which increases spoilage. A Concavity feature built into Retro-Spec Contrast inspection allows the system to find draw marks, but does not reject parts just because they have draw marks. Additionally, Retro-Spec can differentiate between draw marks and defects on the same part.

What you need

You will need images of parts:

- With a variety of draw marks - light and dark draw marks
- With a variety of pleats or other defects that usually occur in the same area as draw marks

Save these images (good and bad parts) to separate folders on the Intellispec hard drive. When you enter the Retro-Spec interface, you will load the good part images into Data Set A and the bad part images into Data Set B.

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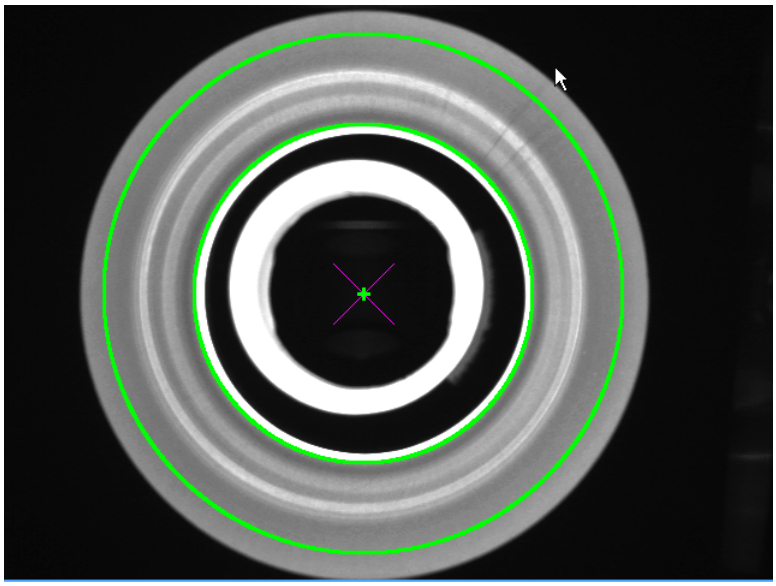
Circular Region for draw mark detection

Set up a separate Circular Region for the draw mark inspection. Place the region over the area where draw marks normally occur on the neck. Make this region wider than normal inspection regions when using the draw mark filter, as shown in the example below.

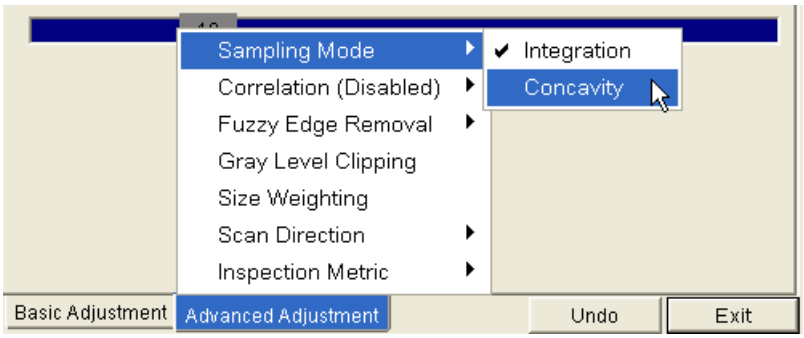


Setting up the draw mark inspection

Add a Retro-Spec Contrast inspection after the wide Circular Region. Then enable the draw mark filter.

To enable the draw mark filter:

1) In the Retro-Spec Contrast interface, click the Advanced Adjustment tab.
2) Right-click the Advanced Adjustment tab and select Sampling Mode >> Concavity.



3) Click the Basic Adjustment tab to set up the inspection.

Next, load images to set up the inspection.

To load images:

1) Make sure the graph is in Comparison view. Right-click on the graph >> choose Graph View >> Comparison.
2) For Data Set A, load a set of images that represent good parts with draw marks.

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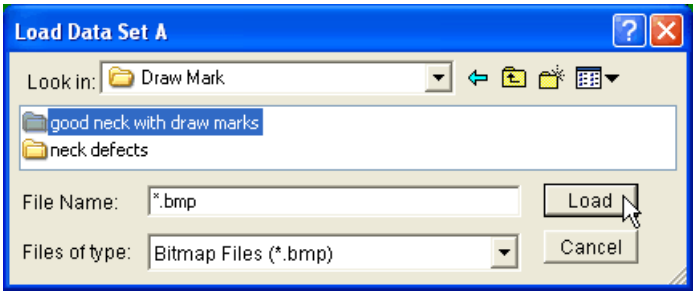
- Click the Load button on the Retro-Spec interface >> scroll to and select the folder with good parts images >> click Load >> Load.
- To load all the images in the folder, make sure the folder name is highlighted, and [*.bmp] is in the File Name box.



3) For Data Set B, follow the instructions in step 2, except to load the defective images instead.

You can move parts between data sets or delete them from the data set if necessary. See ***moving samples between data sets*** (on page 566) or ***deleting samples*** (on page 566).

Next, use the ***Optimize*** (see "Using the Optimize button" on page 574) button to allow Retro-Spec to set up the inspection parameters for you. You can make slight adjustments after optimization is complete, if necessary.

RETRO-SPEC MEASUREMENT INSPECTION

The Measurement inspection measures circular part features. It can be used in place of the ***Circle Dimension*** (see "Circle Dimension Inspection" on page 366) or ***Circle Width Dimension*** (see "Circle Width Dimension Inspection" on page 448) inspection. This inspection has several measurements available for each region of interest.

See ***how to add a Measurement inspection*** (see "How to Add a Retro-Spec Inspection" on page 558).

❖ *Note: When adding a Circular Region for a Measurement inspection, the region circles should fall outside of the actual inspection area – the inspection needs to find the feature's edges.*

What the Retro-Spec Measurement Inspection Measures

This inspection can inspect a part with up to 13 criteria, depending on what is enabled. These include:

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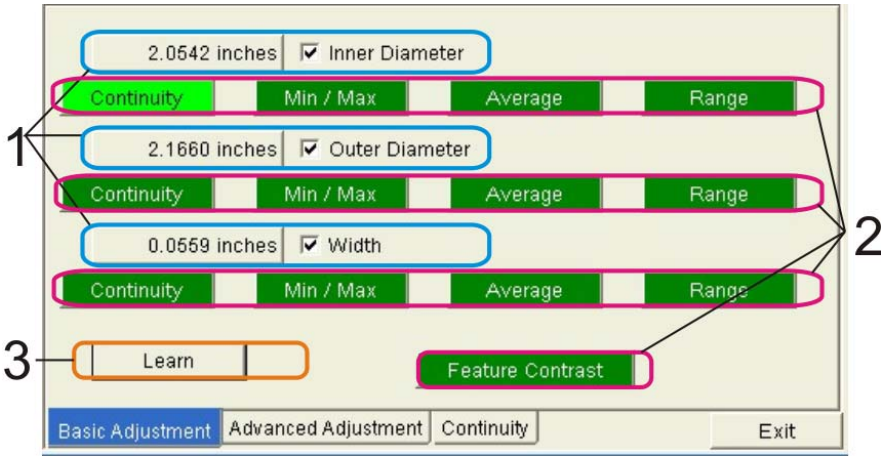
- Min/ Max dimensions (up to 3)
- Average dimension (up to 3)
- Range of measurement (up to 3)
- Continuity checks (up to 3)
- Feature Contrast

The initial measurements will be made based on the images you have just run. The default unit of measure is based on the channel's calibration unit.



Referring to the above example, the following are the components of the measurement inspection:

1	The number on the button indicates the average value of the measurement. ▪ You can disable or enable any of the measurements by clicking the check boxes ▪ You can also ***independently*** (see "Detailed Calibration Information for Retro-Spec Measurement" on page 594) enable or disable the Continuity, Min/Max, Average, or Range measurements ▪ Continuity is turned off by default
2	Each of these is a button and an indicator for each measurement in the inspection. The highlighted button (bright green or bright red) is the measurement shown in the graph at the top of the screen. ▪ Select any button to view another measurement on the graph ▪ If a button is **red,** the currently selected part has failed that measurement ▪ If a button is **green,** the currently selected part has passed that measurement ▪ If a button is **yellow** or **gold**, then the part most likely failed registration or orientation
3	The Learn button will take measurements of the parts in ***Data Set A*** (see "About the Retro-Spec Data Sets" on page 564), and automatically adjust parameters and tolerance based on those parts. ▪ If you entered Measurement inspection with only one image, it will learn parameters from just that image ▪ If a defective part is included in Data Set A, it may skew the measurements ▪ You can load a set of images into Data Set A (perhaps a set of Golden Parts) from which you can learn the measurements

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About the Retro-Spec Measurement Graphs

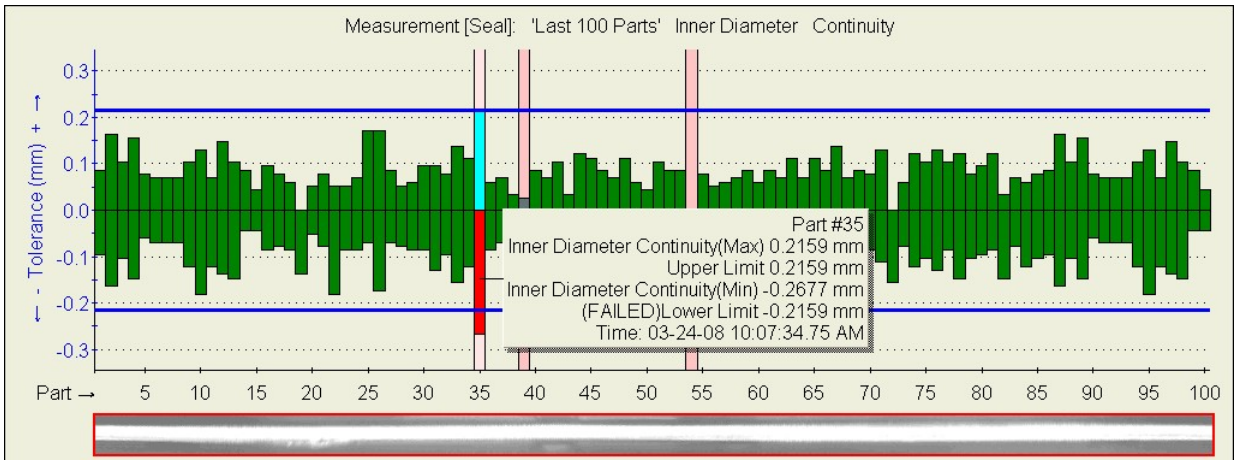
Each measurement has a different graph. To see different graphs, click the dimension buttons in the ***measurement screen*** (see "What the Retro-Spec Measurement Inspection Measures" on page 585).

❖ *Tip: Also to select a graph: right-click over the graph >> choose a measurement >> and choose a dimension.*

Continuity graph

The ***continuity*** (see "About Retro-Spec Continuity" on page 597) measurement detects small measurement deviations that can occur with clipouts, nicks, and other defects. Continuity is turned off by default and must be enabled.

The graph shows the minimum and maximum continuity values measured. The blue lines represent Tolerance, which you can adjust simply by clicking and dragging.



- One Continuity graph is available for each enabled measurement (Inner Diameter, Outer Diameter, or Width).
- Click on any part on the graph to see its measured values.
- This graph also has Part Detail and Comparison views available. To see another view, right-click over the graph >> select Graph View >> and select the desired view. To see the Part Detail graph, double-click over the highlighted part on the graph.
- The Part Detail view shows each segment of the part (the inspection is automatically segmented, although you can change the number of ***segments*** (see "How to Make Advanced Adjustments in Measurement Inspection" on page 593)). The graph shows the average measurement of each segment - whether it measured above, below, or at the nominal measurement value.

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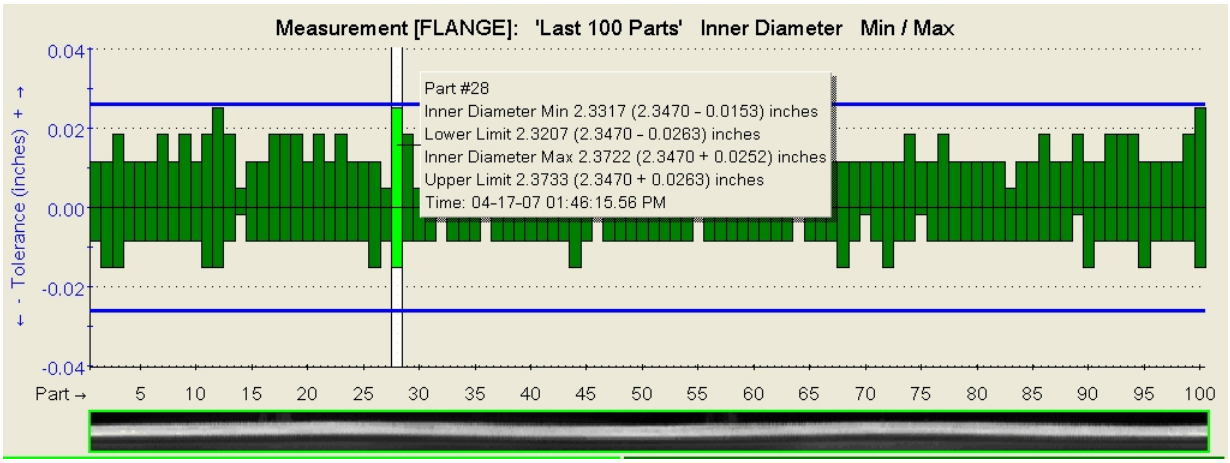
Min/ Max graph

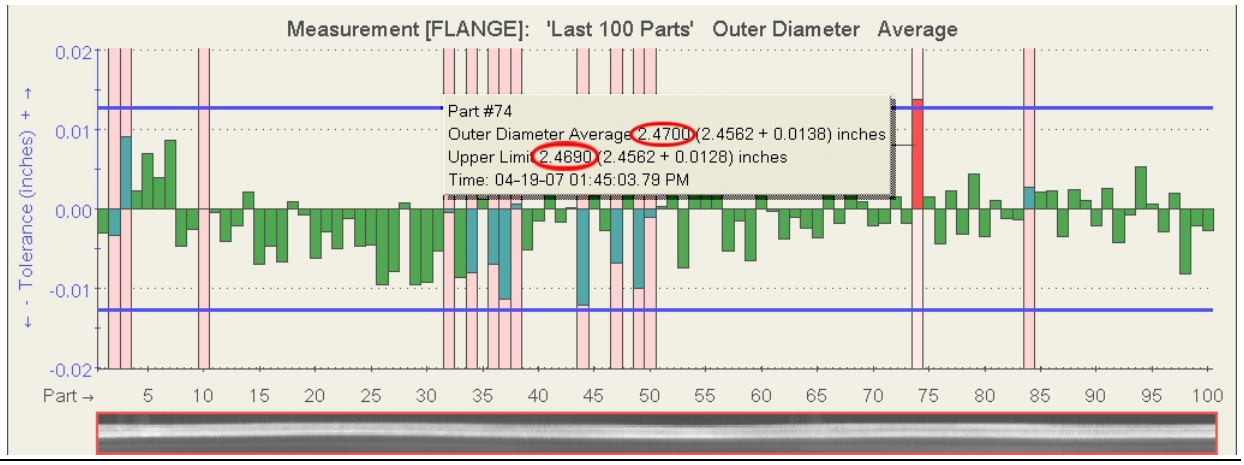
This graph shows the minimum and maximum values measured. In the example below, it shows the minimum and maximum values measured for Inner Diameter for the Last 100 Parts. The blue lines represent Tolerance, which you can adjust simply by clicking and dragging.



- One Min/ Max graph is available for each enabled measurement (Inner Diameter, Outer Diameter, or Width)
- Click on any part on the graph to see its measured values.
- This graph also has Part Detail and Comparison views available. To see another view, right-click over the graph >> select Graph View >> and select the desired view.
- The Part Detail view shows each segment of the part (the inspection is automatically segmented, although you can change the number of ***segments*** (see "How to Make Advanced Adjustments in Measurement Inspection" on page 593)). The graph shows the average measurement of each segment - whether it measured above, below, or at the nominal measurement value.

Average graph

This graph shows the average value of Inner Diameter, Outer Diameter, or Width. The example below shows a failed part – the Outer Diameter exceeded the Upper Limit.



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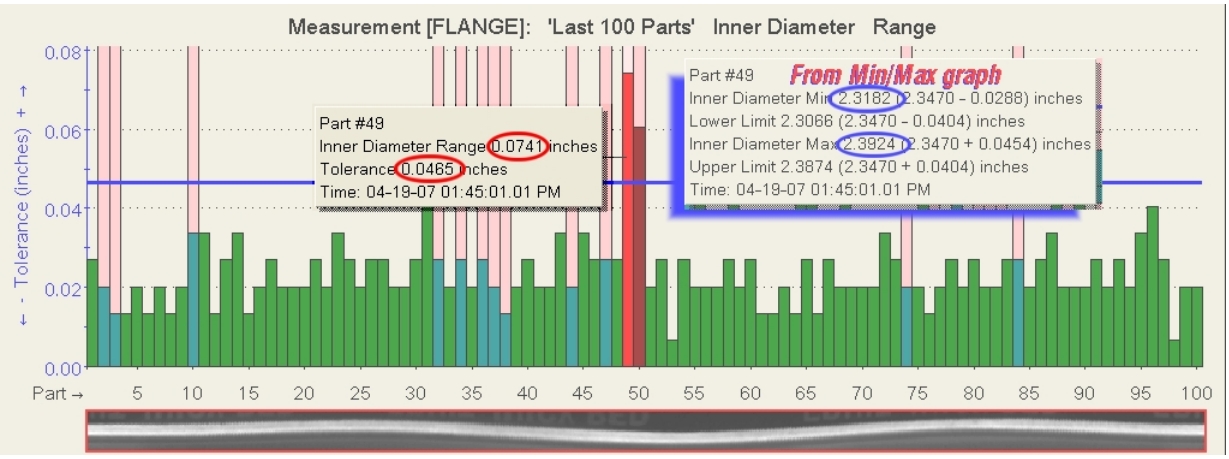
This graph also has Comparison view available. To see another view, right-click over the graph >> select Graph View >> and select the desired view.

Range graph

This graph shows the range of values for each measurement. The example below shows that the range of values from Inner Diameter Max - Inner Diameter Min exceeds Range Tolerance.



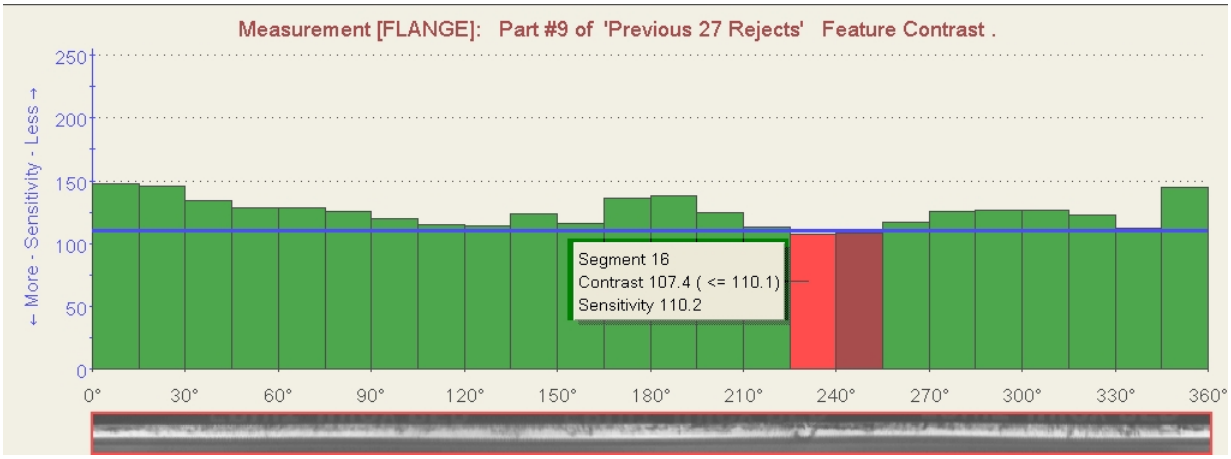
This graph also has Comparison view available. To see another view, right-click over the graph >> select Graph View >> and select the desired view.

❖ *Tip: The Range dimension is good for catching defects such as ovality.*

Feature Contrast graph

This graph shows whether the edges of the feature have enough contrast to compute the measurements. In this graph, the failed parts fall below the blue line (not enough contrast), as opposed to standard Retro-Spec graphs, where the failed parts go above the blue line.

The example below shows that two segments did not have enough contrast at the edges of the feature to complete the measurements.



- This graph also has Part Detail and Comparison views available. To see another view, right-click over the graph >> select Graph View >> and select the desired view.

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- The Part Detail view shows each segment of the part (the inspection is automatically segmented, although you can change the number of ***segments*** (see "How to Make Advanced Adjustments in Measurement Inspection" on page 593)). The graph shows the average measurement of each segment - whether it measured above, below, or at the nominal measurement value.

Identifying Failed Parts

The Measurement graphs make it easy to identify which parts failed.

- The failed parts always have a pink bar extended to the top and bottom of the graph.
- The red buttons indicate which portion of the inspection failed. Click a red button to view the graph in which the selected part failed.
- The cyan bars indicate that the selected part failed some portion of the Measurement inspection, but not from the currently selected graph.
- You can right-click over the graph to quickly see which portion of the inspection failed. In the example below, the Average dimension of the Min/Max measurement failed.

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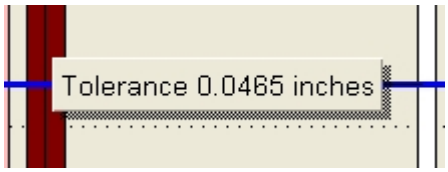
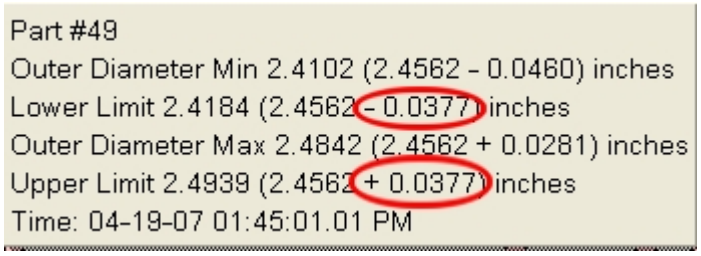
How to Adjust Tolerance in Retro-Spec Measurement Inspection

To adjust tolerance, simply click and drag the blue line for each dimension measurement. Click on the blue line to see current Tolerance.

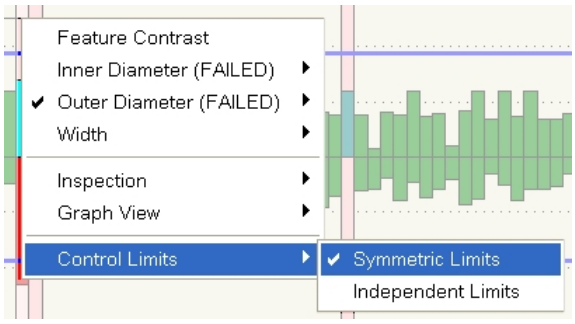


Upper and Lower Limits

In the graphs that have 2 blue lines (Min/Max and Average graphs), tolerance is displayed in the Upper and Lower Limits.



The Upper and Lower limits can be adjusted symmetrically or independently. Right-click over the graph >> select Control Limits >> and select the desired control.

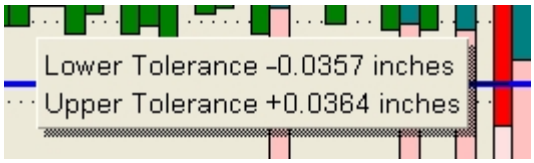


Symmetric Limits

The blue lines will move together, either towards the center or away from the center. This makes the Upper Limit the same tolerance as the Lower Limit.

Independent Limits

The blue lines will move independently. For your reference, both Upper Tolerance and Lower Tolerance are displayed on screen as you move the blue lines.



Precise Adjustments

You can type a tolerance value for each measurement.

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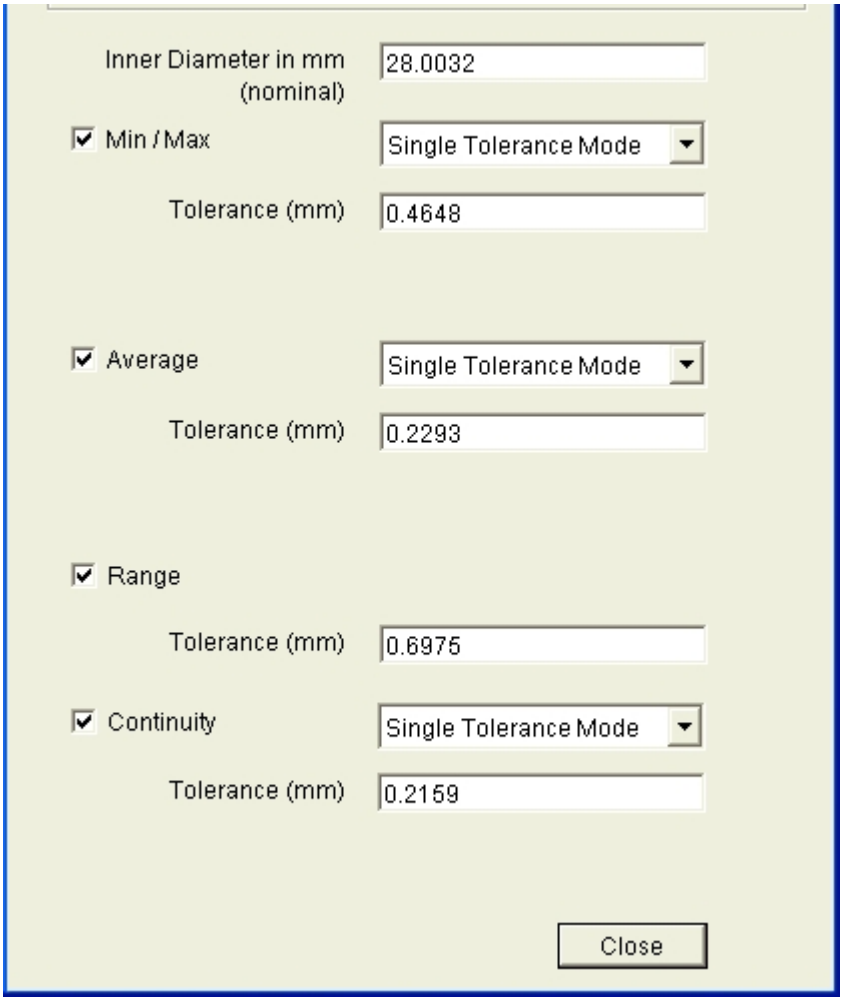
To enter a tolerance value:

1) Click a measurement

button.
2) In the dialog box, type the desired tolerance value for each enabled measurement.



3) Click Close to return to the Retro-Spec screen.

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How to Make Advanced Adjustments in Measurement Inspection

You can adjust the acceptable size of the feature through the Advanced Adjustment menu.

> ❖ *Tip: You can see changes to the inspection from this menu by viewing a Part Detail Graph from a Min/Max measurement. (Click a Min/Max button in Basic Adjustment menu, then right-click over the graph >> choose Graph View >> Part Detail.) Return to Advanced Adjustment menu.*

Size adjustment

Set the minimum and maximum size of the feature. Any feature with a width that falls outside this range is ignored. If no feature can be found that matches these size requirements, then the inspection fails.

- The setting is opposite that of Retro-Spec Contrast inspection. That is, in Measurement inspection, the size that falls between the markers is OK.
- The unit of measure matches that in the ***Calibration*** (see "Detailed Calibration Information for Retro-Spec Measurement" on page 594) section of the Measurement inspection.

Segments

This breaks up the inspection area into a number of wedges. Each segment is averaged to determine the measurement. A greater number of segments means smaller wedges, which can catch smaller defects or variations in measurement on the part.

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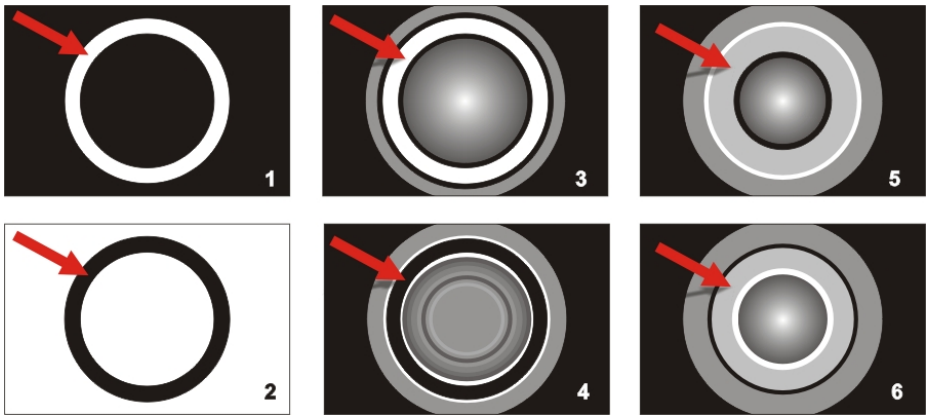
Feature Type

Determine the type of feature you want the inspection to search for. The drop-down menu allows for a complex feature search. For users of previous versions of Intellispec, the "borders" option replaces the dual regions used in Circle Width Dimension inspection. The following illustrations are basic examples. Use the type that best finds the region on your part.



1	Light Feature
2	Dark Feature
3	Borders - both dark
4	Borders - both light
5	Borders - dark inner, light outer
6	Borders - light inner, dark outer

Detailed Calibration Information for Retro-Spec Measurement

Click a measurement button

to see the calibration details. You can manually change calibration units, Golden Part measurements, and tolerance, if desired.

- *Note: You do not have to manually enter any of this information (except for enabling Continuity) – it is done for you by other means in the Retro-Spec interface, as well as through Pixel Calibration.*

CALIBRATION INFO

These settings are used instead of ***Pixel Calibration*** (see "Pixel Scale Calibration" on page 182) for Measurement inspection (if you have used Pixel Calibration for other inspections). Regardless, you will need an actual measurement from a part to type in this menu.

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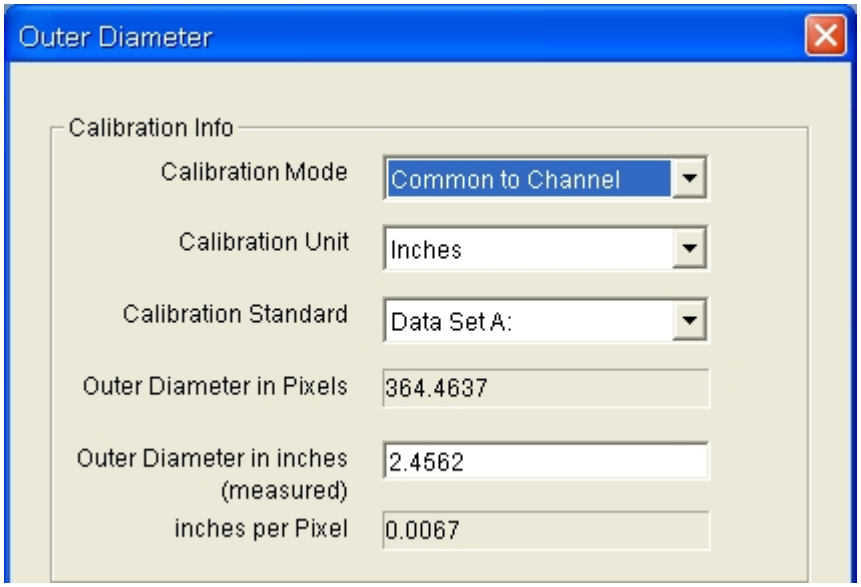
The following terms in **[brackets]** are variables, depending on which measurement button you clicked to get to this screen. For example, the screen could read **[Inner Diameter]** instead of **[Outer Diameter]**, or **[mm]** instead of **[inches]**.



Calibration Mode

- **Common to Channel** - writes the calibration information to the channel. That is, if another inspection requires a measurement, it uses the values in this menu. It overwrites settings in ***Pixel Scale Calibration*** (on page 182). This is useful in applications such as inside of can inspection. The flange and dome are similar sizes, but due to imaging, they appear different sizes in the image. You can calibrate flange on one channel, and dome on another.
- **Common to Inspection** - changes calibration information for the current inspection. Does not affect calibration for any other inspection (say, a Circle Dimension inspection).
- **All Independent** - sets calibration information for each measurement individually. That is, Inner Diameter can be calibrated differently than Outer Diameter.

Calibration Unit

Choose from millimeters, inches, pixels, or percent. Percent is similar to the Custom value used in Dimension inspections.

Calibration Standard

Choose from Data Set A or the current part:

- **Data Set A** - uses the average value of the measurement from all parts in ***Data Set A*** (see "About the Retro-Spec Data Sets" on page 564).
- **Current Part** - this is good to use if you have a Golden Part. This compares all future measurements to only one part.

[Outer Diameter] in Pixels

This is an Intellispec measured value - it cannot be changed.

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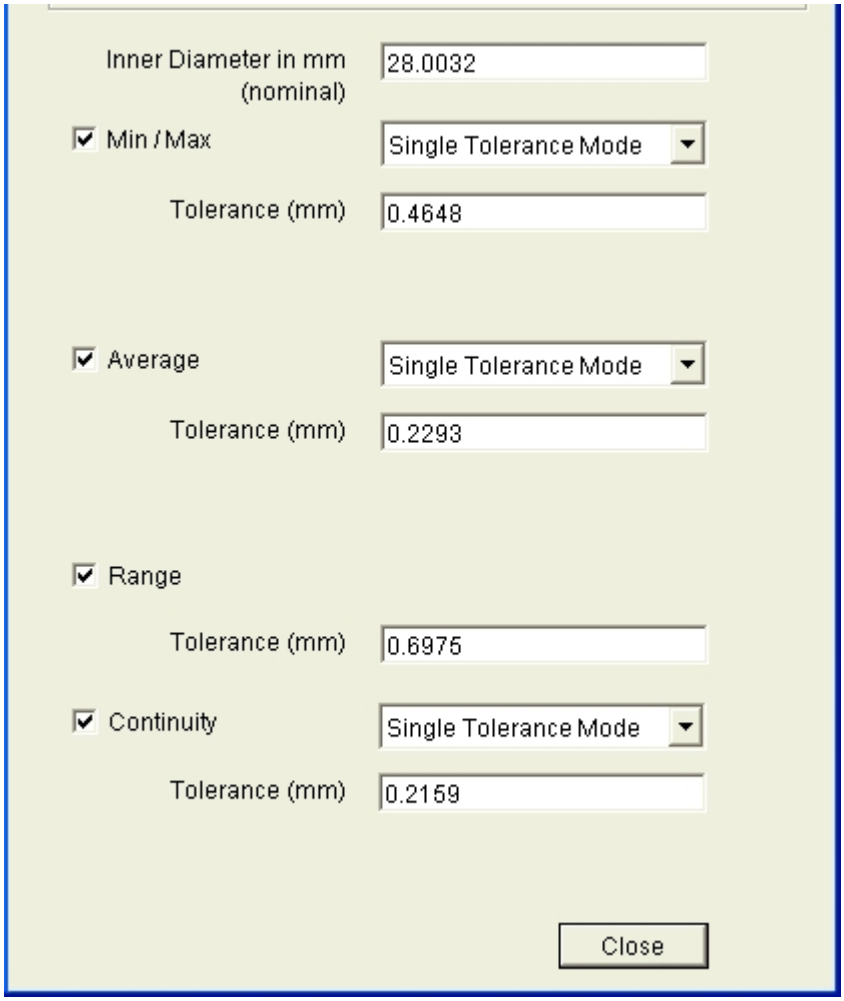
[Outer Diameter] in [inches] (measured)

Measure your sample part and type the measured value here.

[Inches] per Pixel

This is computed by Intellispec.

The following parameters allow you to set quality control limits.



[Inner Diameter] in [inches] (nominal)

Type the measurement that each part SHOULD measure, according to your Golden Part, or your quality assurance team.

INDEPENDENT MEASUREMENTS

The following dimensions, Min/ Max, Average, Range, and ***Continuity*** (see "About Retro-Spec Continuity" on page 597) can all be enabled or disabled independently. If one is disabled, no button is shown on the Retro-Spec measurement screen.

Tolerance Mode

Allows you to set tolerance either equally or independently.

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❖ *Note:* **Tolerance** *(see "How to Adjust Tolerance in Retro-Spec Measurement Inspection" on page 591) can also be easily set through Retro-Spec interface with the blue lines.*

- **Single Tolerance Mode** - computes tolerance equally above and below the nominal value.
- **Dual Tolerance Mode** - allows you to set upper and lower tolerance independently. Two boxes are available to type upper and lower limits.

Tolerance ([inches])

Type the allowable tolerance for the appropriate measurement, as computed above or below the nominal value.

About Retro-Spec Continuity

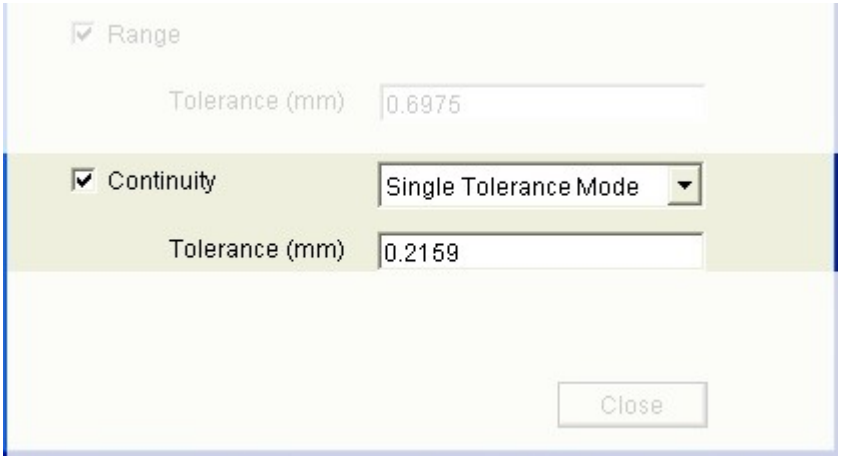
Continuity uses the measurement data to find local variation defects such as clipouts, nicks, and more. Continuity uses the data computed in the other measurements [Min/Max, Average, Range], and compares the difference between segments. If the difference between segments is larger than acceptable Tolerance, the inspection fails.

Continuity is off by default and must be enabled. When continuity is enabled, an additional tab is added to the Measurement inspection.

To enable continuity:

1) Click the measurement

button that pertains to the measurement where you want to check continuity [Inner Diameter, Outer Diameter, or Width].
2) At the bottom of the dialog box, check the Continuity box.



3) Set ***Tolerance Mode*** (see "Detailed Calibration Information for Retro-Spec Measurement" on page 594) and Tolerance level as desired.

Setting Continuity

To set continuity, make adjustments through the Continuity tab. The following instructions assume you have already set up Measurement inspection for the desired Min/Max, Average, and Range measurements.

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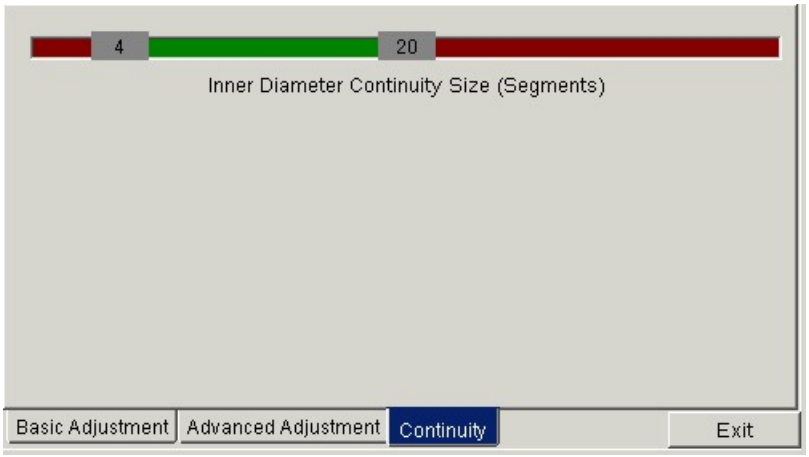
To set continuity:

1) Make sure continuity is enabled (see above).
2) Adjust Tolerance as needed.
3) Go to the Continuity tab.
4) Adjust Continuity Size for each enabled continuity measurement. If you have enabled continuity for Inner Diameter, Outer Diameter, and Width, you will see three adjustment bars.

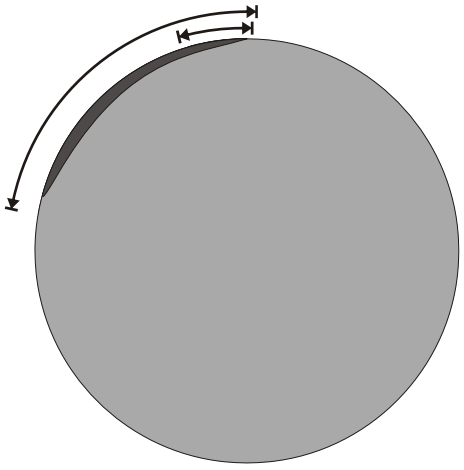
❖ *Note: if you enable Continuity, then re-Learn the same data set, you may have to re-adjust Tolerance for Min/Max, Average, Range, and Feature Contrast measurements.*



Continuity Size

The Continuity Size (Segments) equals the size range of the defects you want to catch. How large a defect do you want to catch?

Example: Assume that in the Advanced Adjustment screen, Segments =90. This divides the region into four degree segments (360 degrees divided by number of segments). In the above-shown Continuity screen, Continuity Size is set between 4 and 20. This means that the defects we are trying to catch fall between 16 and 80 degrees. [4 x 4 degrees, and 20 x 4 degrees]



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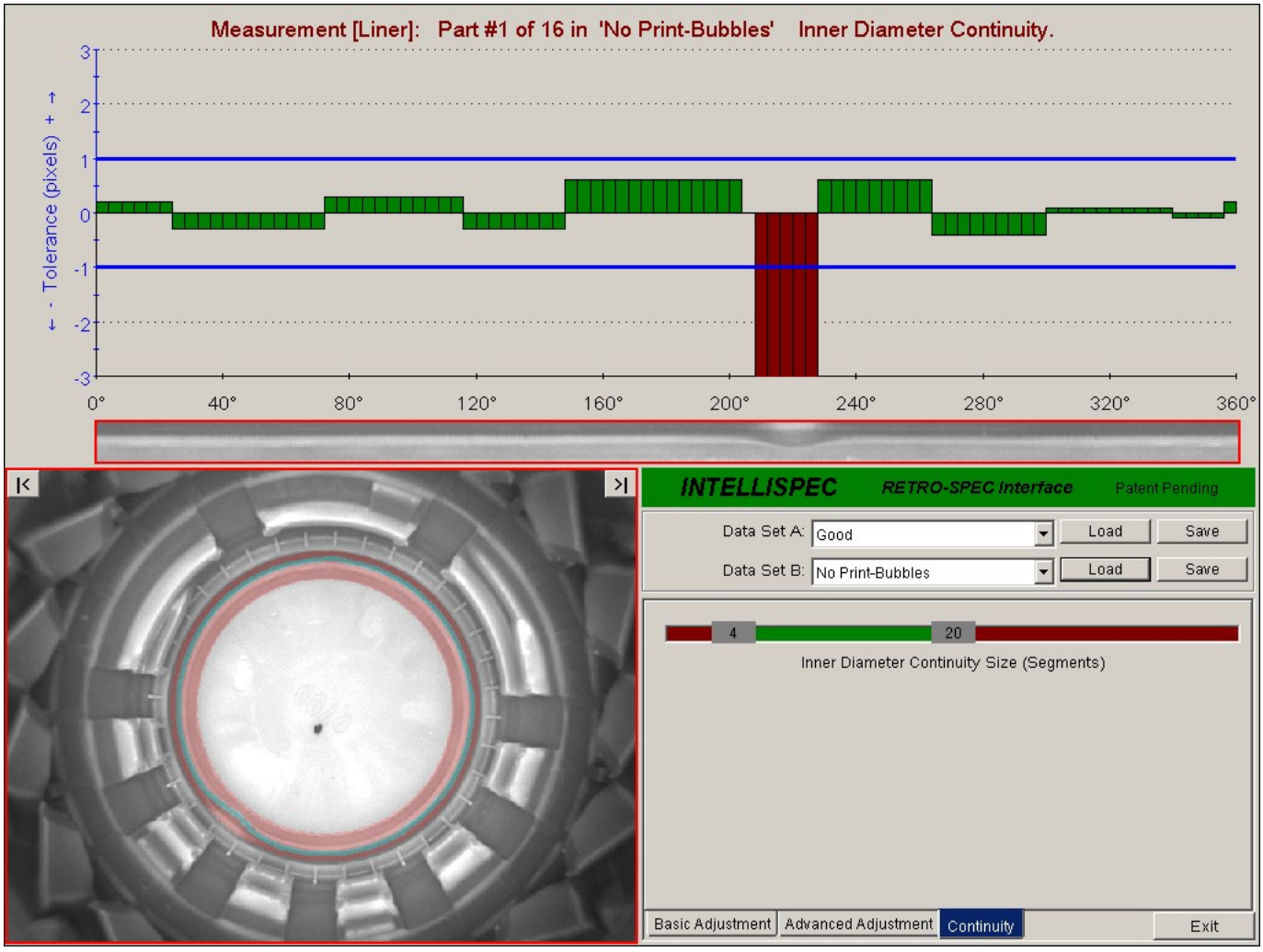
If you look at Part Detail view (double-click the highlighted part on a 100 Part View or Comparison View graph), you will see which segments failed the inspection, as shown below.



RETRO-SPEC INTENSITY INSPECTION

The Intensity inspection finds areas of parts that are lighter or darker than normal. It is good for catching defects such as compound blanks, or wrong color parts.

See ***how to add an Intensity inspection*** (see "How to Add a Retro-Spec Inspection" on page 558). The system will use default Intensity values when you first enter the inspection.

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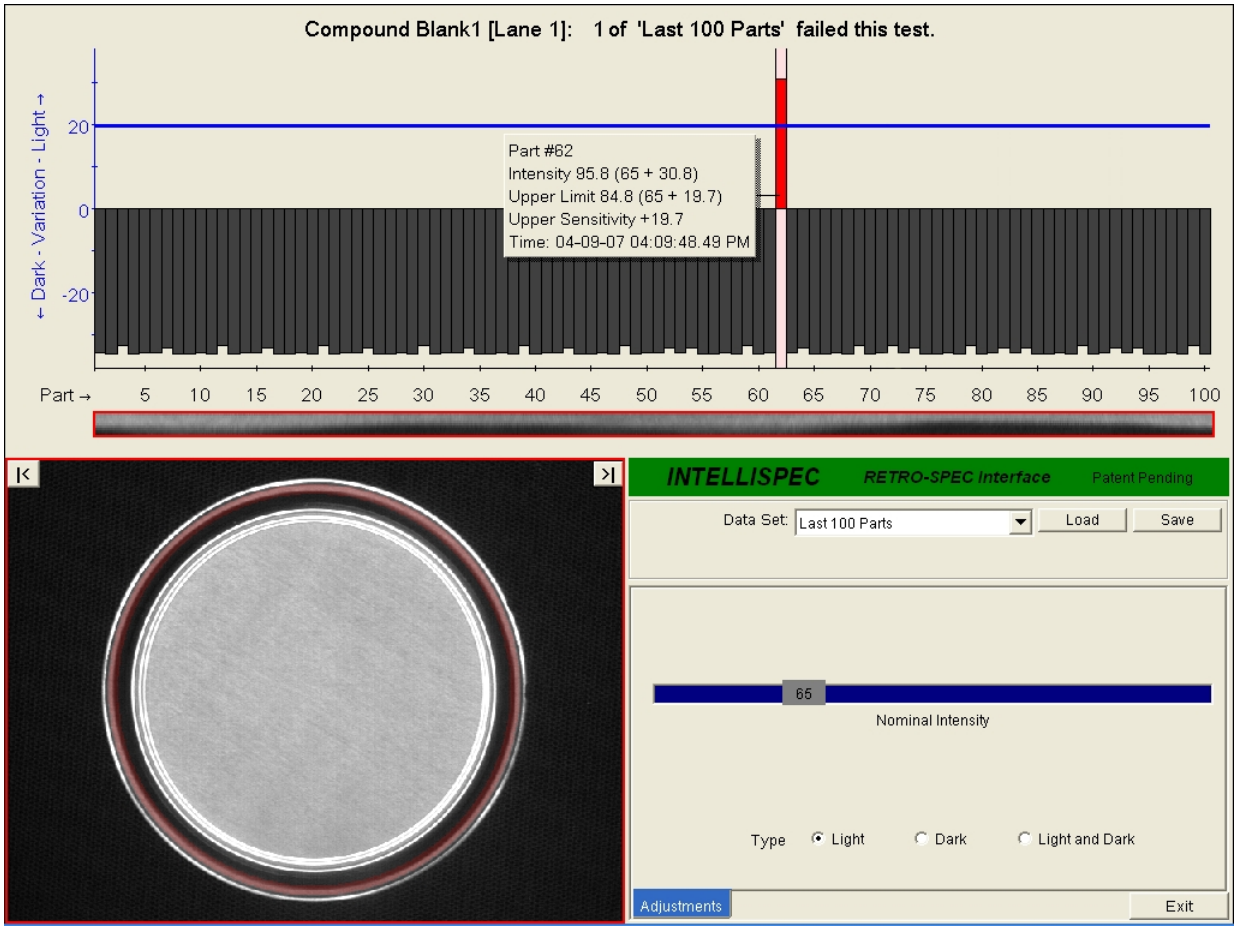
What the Intensity inspection measures

The Intensity inspection measures the degree of brightness of the region of interest. The part is rejected if it measures outside of the allowable tolerance values. In the example below, the inspection found a compound blank – the inspection area was too light.



Green bars

Passing parts.

Red bars

Failing parts.

Gray bars

Gray bars are used for only Light or only Dark inspection types. These parts are OK – the intensity value is in the opposite direction of failing parts.

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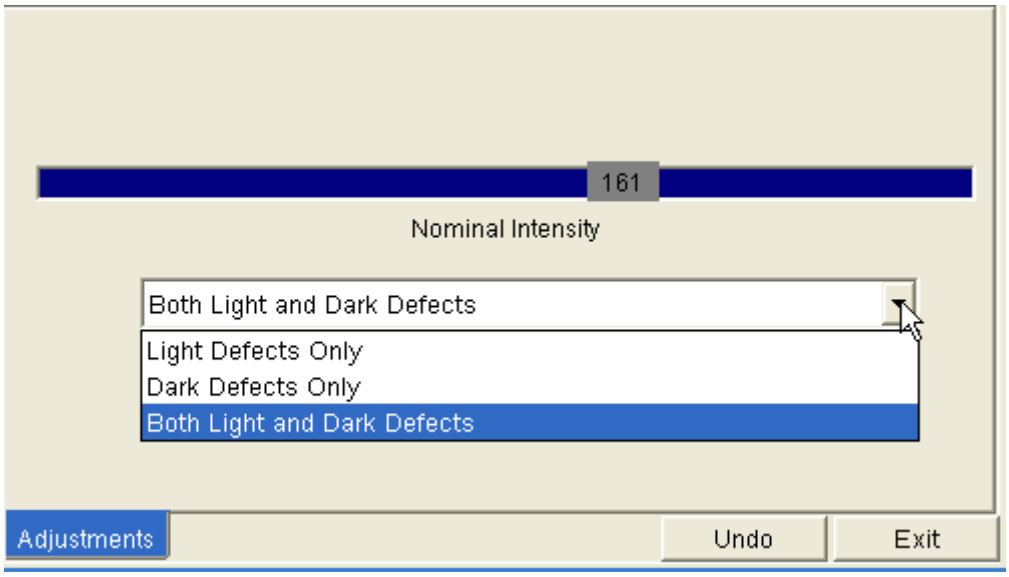
How to Adjust Intensity inspection for your part

To adjust Intensity inspection:



1) Using the slider, set Nominal Intensity to a gray scale value that the inspected area SHOULD measure. This number is used as the zero line on the graph.
    - You can adjust the slider while watching the graph - adjust so that the most parts have the smallest bars
    - If you need to measure the gray scale value, exit Retro-Spec and use ***Image Analysis*** (see "About the Image Analysis tool" on page 185)
2) Choose whether to inspect for Light areas, Dark areas, or both. Select from the drop-down menu.

Next, adjust Tolerance (the blue line).

How to adjust Tolerance

To adjust tolerance:

1) Using the data on the graph, click and drag the blue line up or down to change tolerance.
2) Click on one of the green, red, or gray bars on the graph to see its corresponding image. If you think a passing (green) part should have failed, adjust Tolerance towards zero until that bar turns red.
    - If you are searching for Light and Dark features, you have 2 blue lines on screen. By default, they move symmetrically towards or away from zero. To adjust separately, right-click over the graph >> choose Control Limits >> and choose Independent Limits.

To save changes:

1) Click Exit.
2) The system will ask whether you want to save your changes.
3) Click Yes. The system will exit the Retro-Spec inspection.

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Chapter 12

REMOTE SUPPORT

SMART SUPPORT

The remote support tool, known as Smart Support, allows a Pressco Technical Support representative remote access to your Intellispec for troubleshooting purposes. It is available at any time, from anywhere in the world, as long as an internet connection can be established. The Smart Support software is installed on your Intellispec.

WHAT YOU NEED

- A functioning Intellispec (systems without power, or systems that are not capable of running Intellispec software, cannot be remotely accessed)
- An internet connection to your Intellispec. This can be established through your network. Contact your network administrator for help.

USING SMART SUPPORT

Important
Do not change any of the settings in the connection box - they have been set up during installation.

To use Smart Support:

1) Notify a ***Technical Support*** (see "How to Contact Pressco" on page 633) representative that you require remote support.

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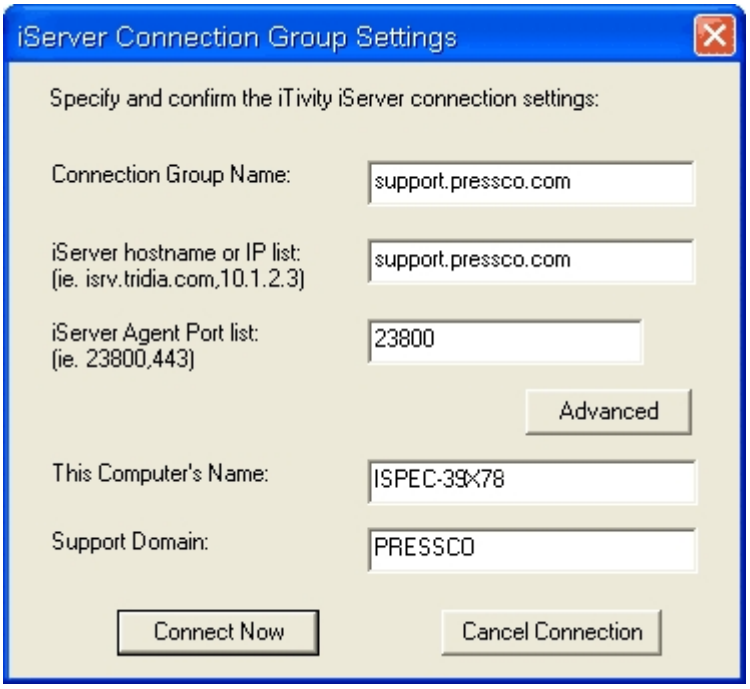
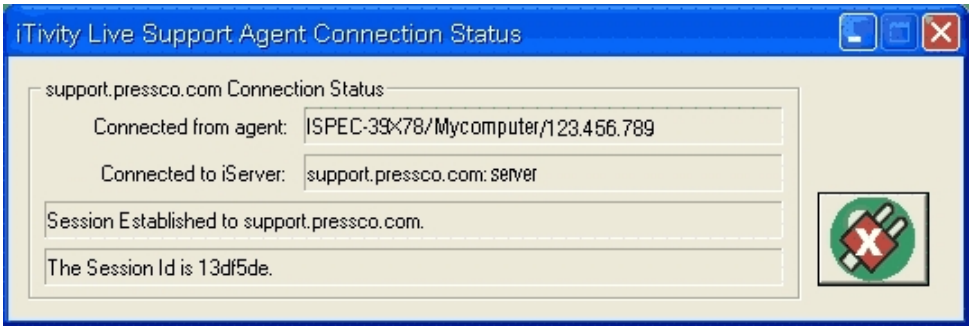
2) In the Intellispec software, click the button >> choose Smart Support. A connection box is displayed.



3) Click Connect Now. The connection status will change. You may need to use (Alt+Tab) to scroll through the programs on your Intellispec computer to see the status box. This means that the Tech Support representative can now connect to your Intellispec.



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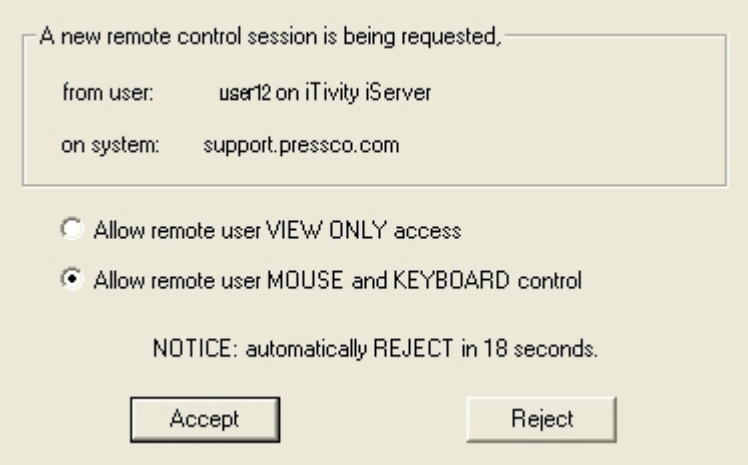
4) When the Tech Support representative is connected, you will be asked to give him control of your Intellispec. Check Allow remote user MOUSE and KEYBOARD control and click Accept. The Tech Support representative will now perform the necessary troubleshooting of your system.

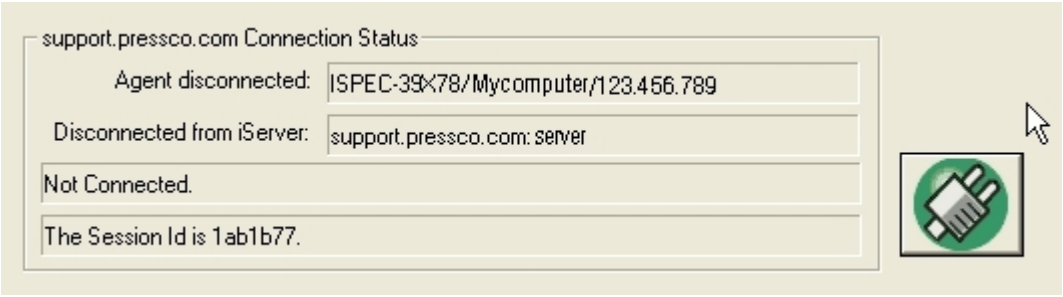


5) When the Tech Support representative is finished, you will need to disconnect your Intellispec from Smart Support.

To disconnect from Smart Support:

1) Click the X in the upper right corner of the 'iTivity Live Support Agent Connection Status' box. You may need to use (Alt+Tab) to scroll through the programs on your Intellispec computer to see the status box.
2) When the system asks "Do you really wish to exit the iTivity Live Support Agent?" click OK. The system will be disconnected.

- Note: if you click the button, the session will be disconnected, but this does not close the Smart Support program.
- If the session is disconnected and you want to allow Tech Support to be able to access your system again, click the button.



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Chapter 13

ABOUT OPC

OPC (OLE {Object Linking and Embedding} for Process Control) is a data communication standard developed by leading manufacturing equipment and software vendors, in conjunction with Microsoft. Its purpose is to promote interoperability between a wide variety of data sources and the consumers of that data, eliminating the need for diverse and incompatible "drivers" for each separate device or program.

The OPC specifications are developed and administered by the OPC Foundation: ***http://www.OPCFoundation.org*** http://www.OPCFoundation.org

Pressco has been an OPC Foundation Member since Spring of 2004, and participated in their Interoperability Workshop of April 2005.

THE INTELLISPEC OPC SERVER

The Pressco OPC Server for Intellispec systems supports the OPC Foundation "Data Access" specification. It is compatible with all versions of the specification in widespread use today (1.0a, 2.05 and 3.00). The OPC Server does not support other OPC specifications (including Alarms & Events, Historical Data or XML Data).

The Intellispec OPC Server is an optional feature - ***contact*** (see "How to Contact Pressco" on page 633) your Pressco sales manager for details.

Sampling rate

Sampling of data is based on an 'update rate', which is specific to a group of OPC data items. There may be several groups of items, each having an update rate appropriate for the items in that group. The maximum update rate supported by the OPC Server is 100 milliseconds (i.e. 10 updates / second); this may be less depending on the system configuration, inspection jobs and part rates. Note that OPC does NOT support event-driven data updates; example, every 10,000 parts inspected or every rotation of a machine part.

Defect statistics

The data items available from the Intellispec OPC Server include most inspection defect statistics produced by the system. In particular, the following five items will be found:

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- **TotalNumberInspected**: the number of parts inspected by the system since last reset.
- **TotalNumberDefects**: the number of parts rejected by the system since last reset.
- **TotalPercentDefects**: the rejected part rate expressed as a percentage of total number inspected, since statistics were last reset.
- **RecentNumberDefects**: the number of parts rejected over the last "N" number of parts inspected, where "N" is a configurable system parameter.
- **RecentPercentDefects**: the rejected part rate expressed as a percentage of the last "N" parts inspected, where "N" is a configurable system parameter.

These data items appear repeatedly within a hierarchical ("multi-level") structuring of the data items and represent a variety of different subsets of the parts inspected. More specifically, they are maintained for every lane in the system (top level), every channel within each lane (second level) and every individual inspection within each channel (third level). Some values are also available for inspection groups and correlated machine parts when the system is so configured.

The exact names of the levels containing these data items are automatically derived from the names given to the lanes, channels and inspections programmed into the Intellispec system. This makes "browsing the tree" of available data items extremely intuitive and eliminates the tedious and time-consuming process of OPC server configuration.

System-level data items

A number of system-level data items are presented, including:

- Online status
- Alarm and warning status
- Missed part and missed result counts
- User name and access level
- Vision database in use
- Current job names, and
- Date and time that statistics were last reset

Data items not available

The following data items are NOT currently available from the OPC Server:

- Individual inspection parameters or results (example, number of missed edges, out-of-tolerance points, etc.)
- Dimensional measurement results (example, circle diameters, distance between points, etc.)
- Individual lane or channel alarm status or settings
- System configuration parameters (example, lighting, part tracking or camera settings, report setup values, etc.)

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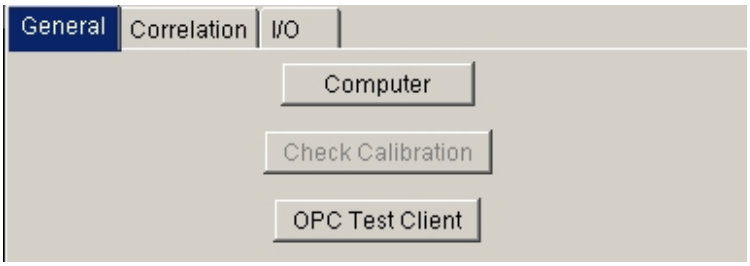
THE INTELLISPEC OPC TEST CLIENT

USER LEVEL: ADMINISTRATOR

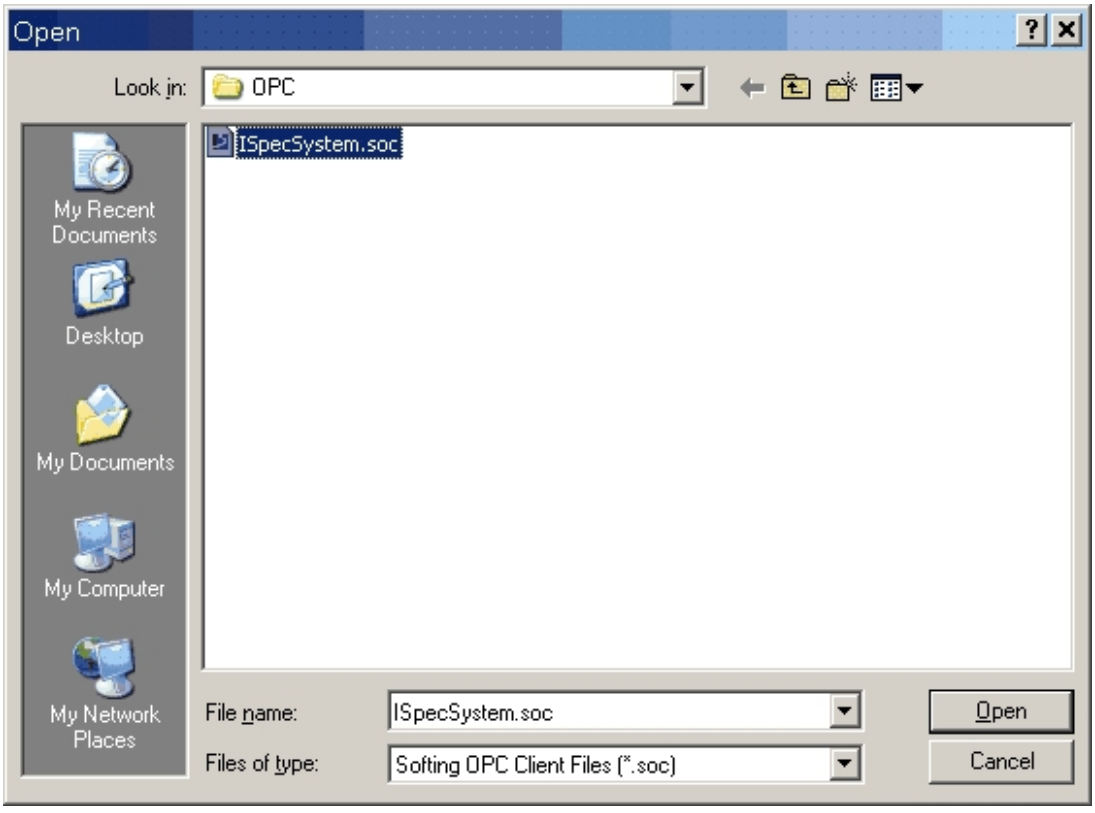
The Intellispec provides test client software to make sure that the OPC server is properly working. It is not a fully functional software client - it is only intended to be used to verify the functionality of the server. This is only available if your system has been configured for OPC.

To use the OPC test client:

1) Log in.
2) Click the button.



3) Click the OPC Test Client button. The Softing OPC Toolbox Demo Client opens.
4) Click Open on the program's toolbar. The File Open dialog box is displayed.



5) Click the IspecSystem.soc file >> click Open.

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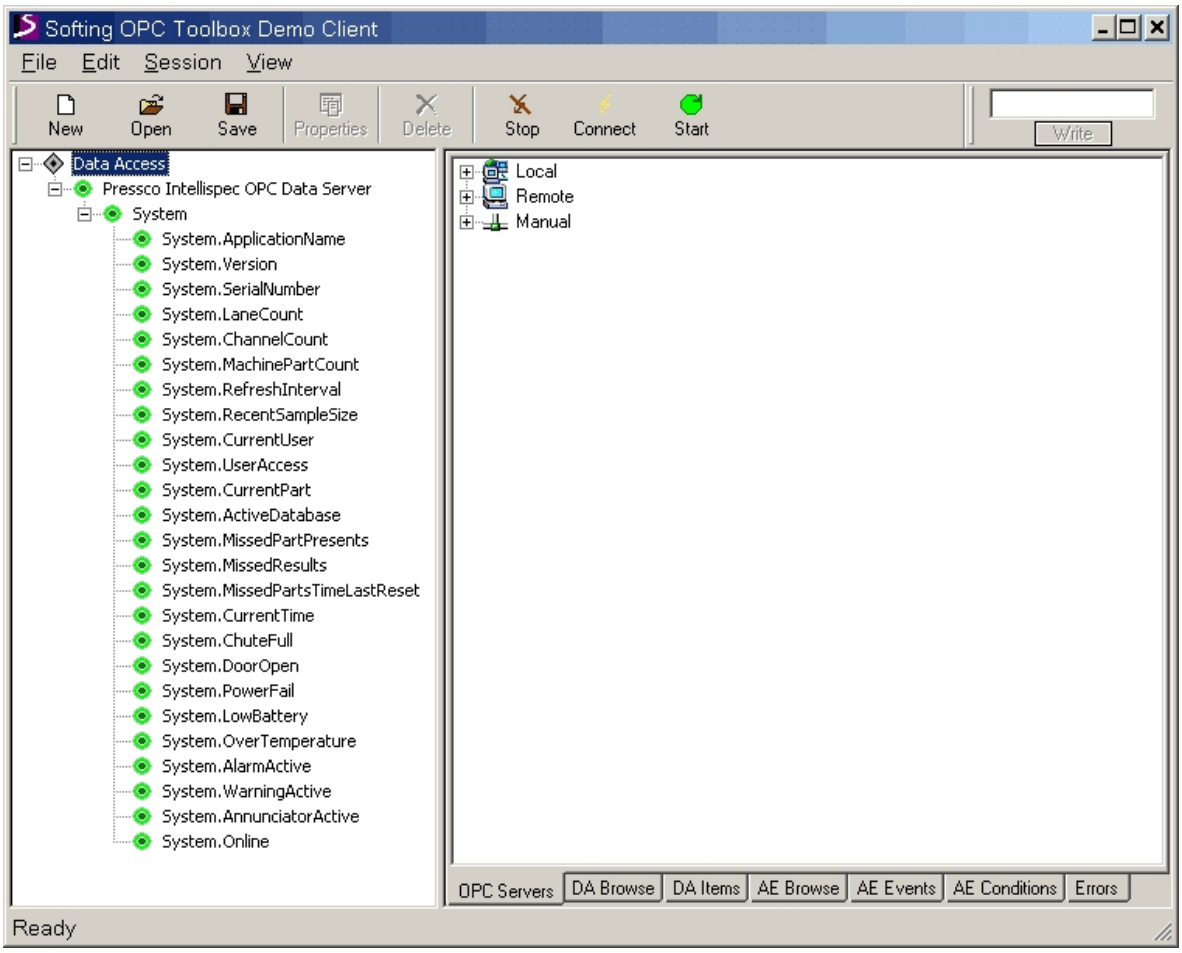
- The left pane of the demo client window should now display ‘Data Access’ at the very top, with ‘Pressco Intellispec OPC Data Server’ below that, a group named ‘System’ below that, and a list of data items (all beginning with ‘System.’) below the group. Each of these items (except ‘Data Access’) should have a solid green circle containing a black dot to the left of it.



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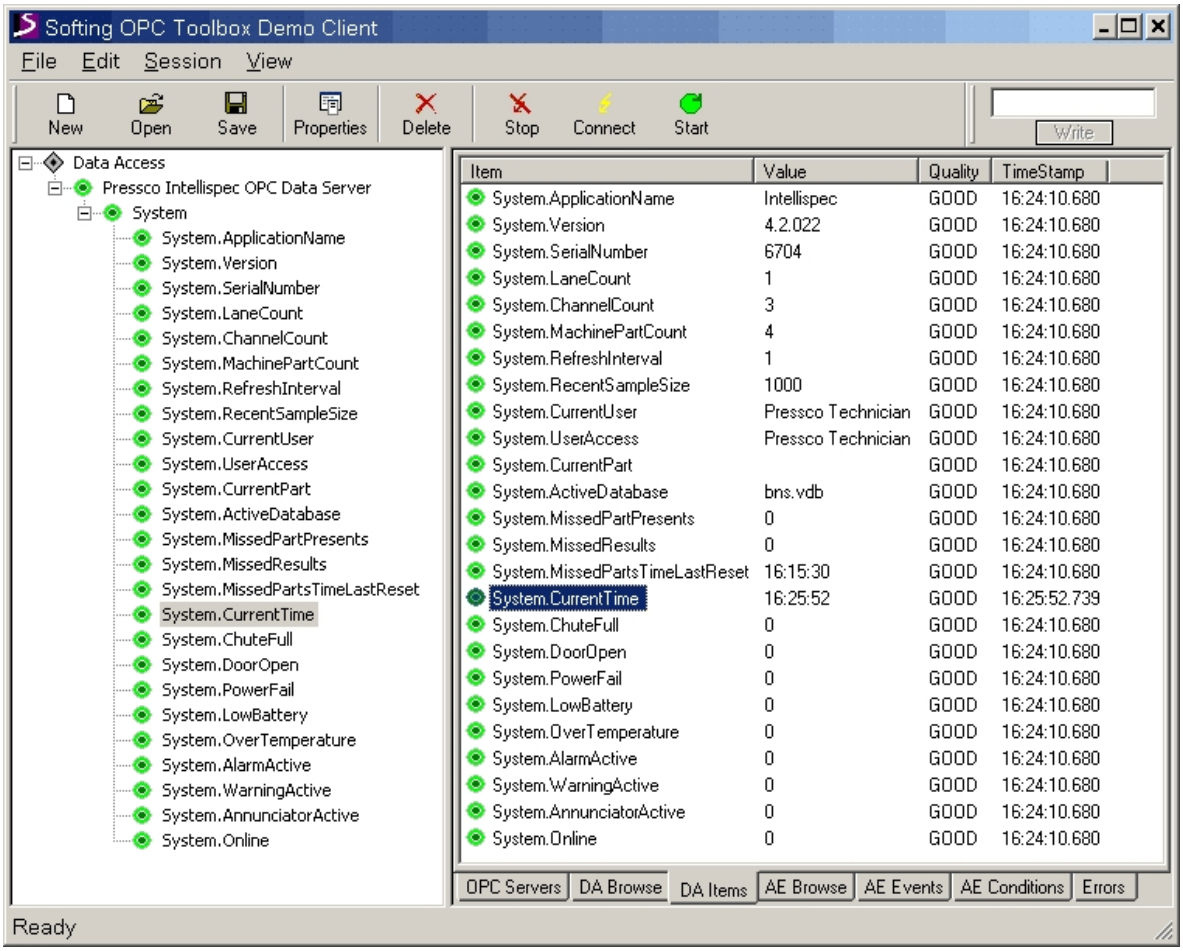
6) Click the DA Items tab at the bottom of the window. Note that there are columns for Value, Quality, and Time Stamp for each of the items in the left window frame.



7) Verify that all data items have a solid green circle next to them.
8) Verify that all data items have GOOD status in the Quality column.
9) Verify that data item "System.Current.Time" is being updated once per second.
10) In the left window frame, select Pressco Intellispec OPC Data Server.
11) At the bottom of the right window frame, select the DA Browse tab.
12) At the top of the right window frame, click the '+' to the left of the blue diamond. There should be one blue square for each channel group configured on the Intellispec, plus a blue square named System. Each blue square is a container for whatever data items are available for each group, and additional nested containers if appropriate.

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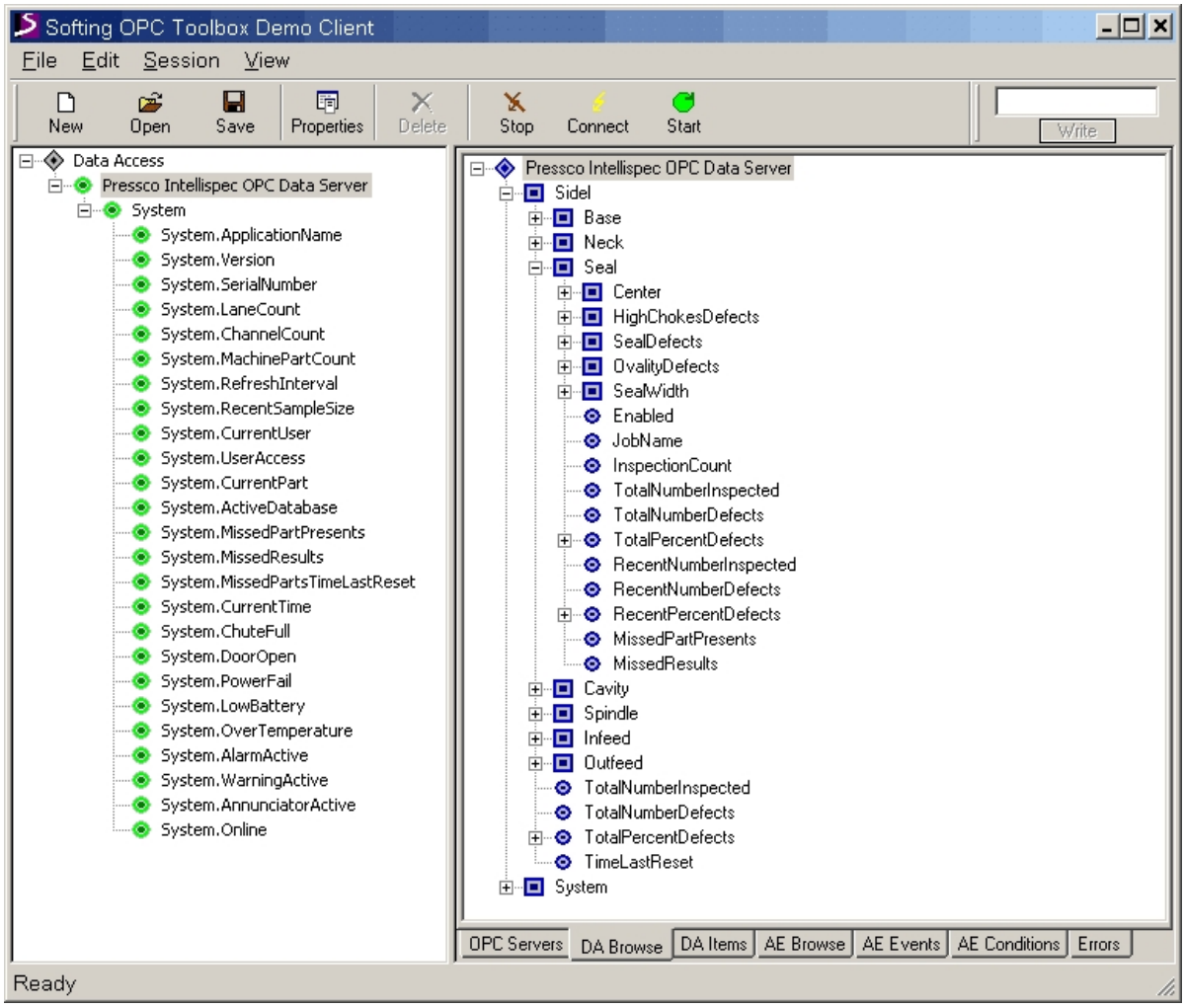

Interpreting the Data

The data items in the OPC test client correspond to the statistics on the Intellispec screen.

To see the individual data items:

1) Click on the '+' next to the blue square for a lane. This will display a nested blue square for each channel and machine part configured on that lane, plus four blue circles for the data items summarizing that lane:TotalNumberInspected, TotalNumberDefects, TotalPercentDefects and TimeLastReset.

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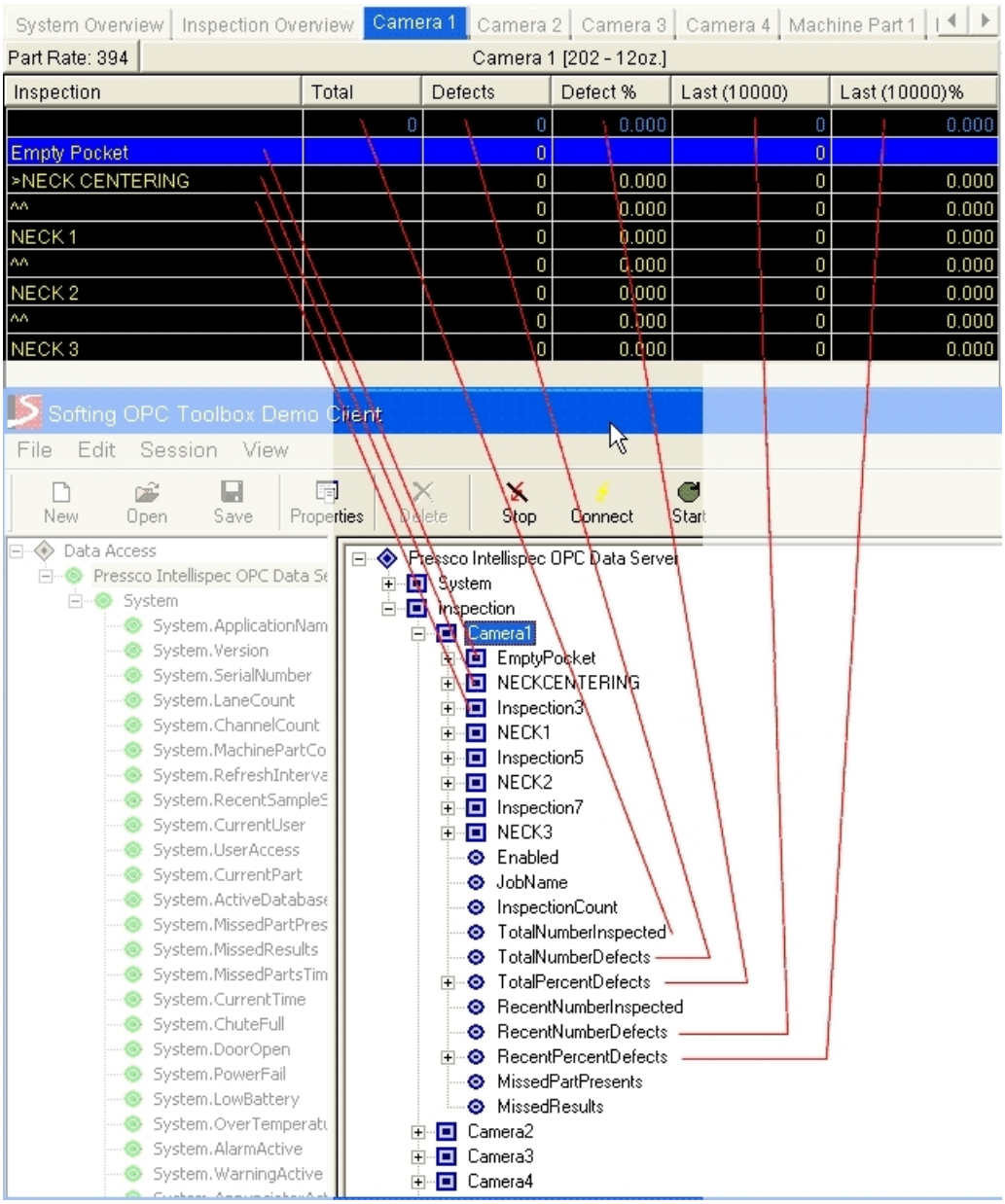
2) Click on the '+' next to the blue square for a channel. This will display a nested blue square for each inspection currently programmed for that channel, plus 11 blue circles for the data items summarizing that channel: Enabled, JobName, InspectionCount, TotalNumberInspected, TotalNumberDefects, TotalPercentDefects, RecentNumberInspected, RecentNumberDefects, RecentPercentDefects, MissedPartPresents and MissedResults.



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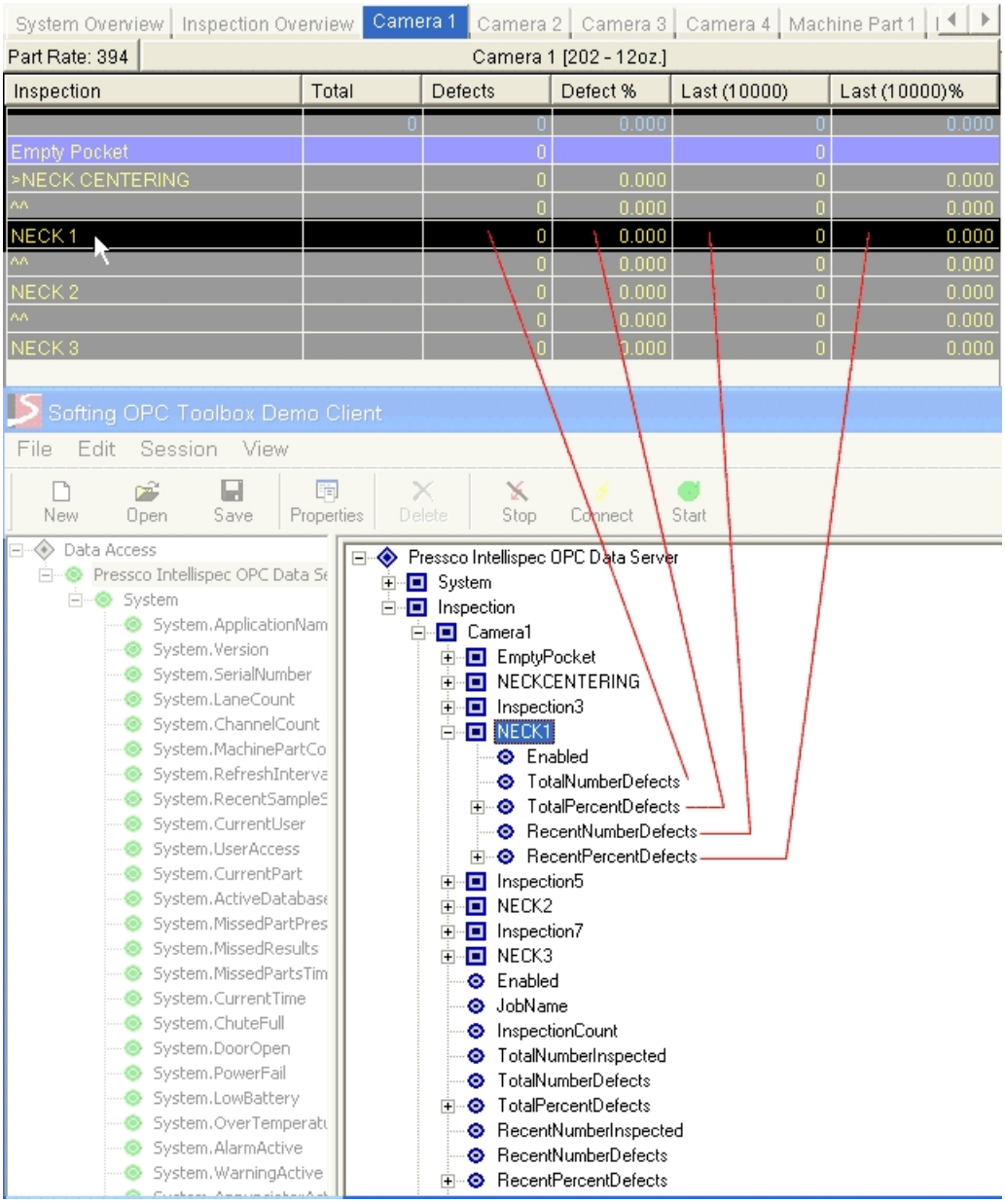
3) Click on the '+' next to the blue square for an inspection. This will display five (5) blue circles for the data items summarizing that inspection: Enabled, TotalNumberDefects, TotalPercentDefects, RecentNumberDefects and RecentPercentDefects.



4) Click the '+' next to the blue square for a machine part (if any). This will display a blue circle for each channel in the lane, named '<ChannelName>NumberDefects', plus a blue circle named 'TotalNumberDefects'. Note that each of these data items is an array containing defect counts for the machine part correlation feature.

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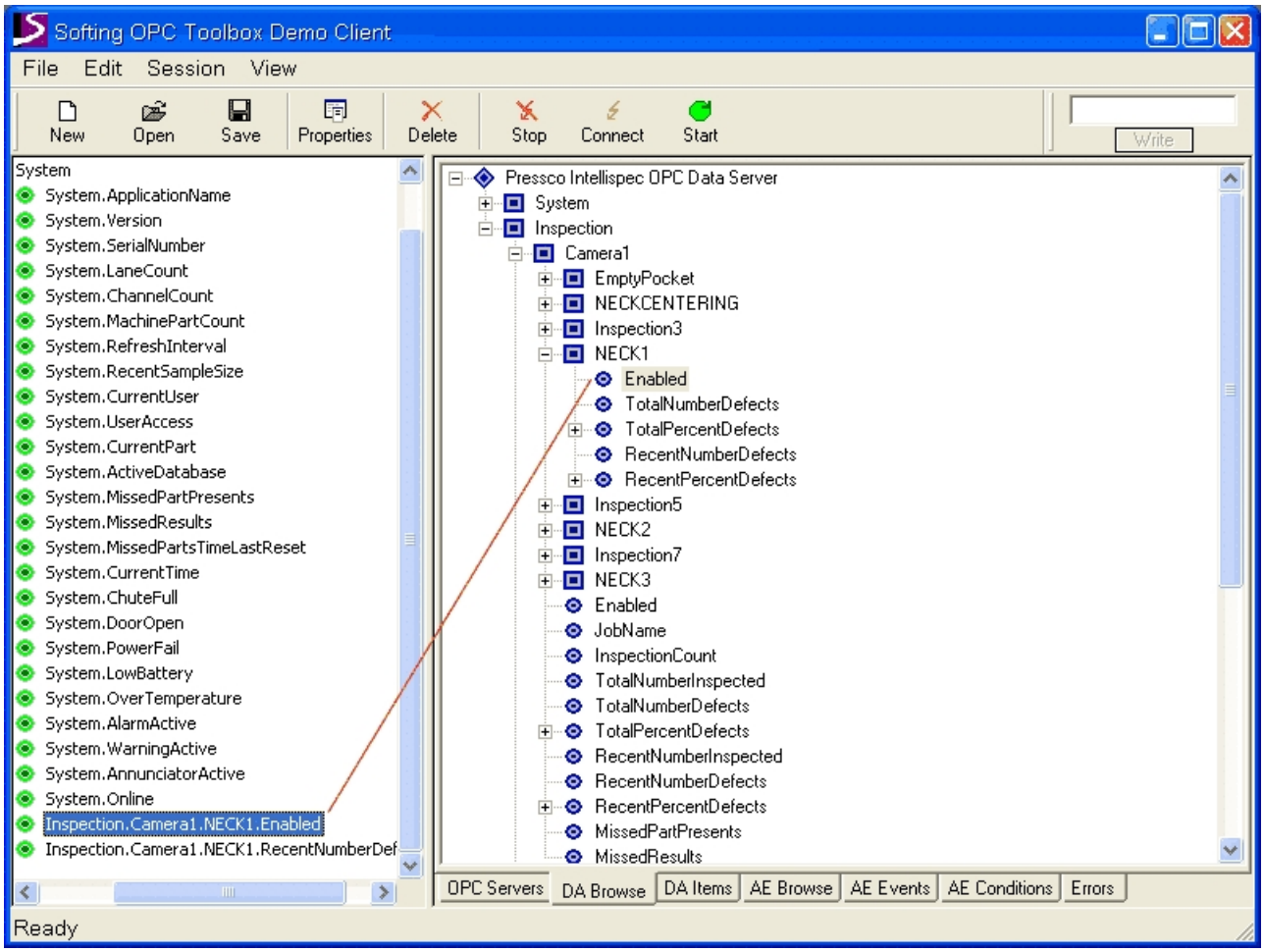
Adding data items to those being monitored

Double-click a data item (blue circle) in the 'DA Browse' tab to add that data item to the list of those which are being monitored in the 'DA Items' tab.



Checking for Errors

At the bottom of the right window frame, click the Errors tab. Verify that no errors have been reported.

Exiting the Test Client

Click the 'X' in the upper right corner of the Softing OPC Toolbox Demo Client window to close the program. If you are prompted to save changes (probably due to changing the list of data items being monitored), click No.

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INTELLISPEC OPC SERVER QUICK REFERENCE

The following tables contain the common data item IDs that are available on the Intellispec OPC Server. Note that the names of the data items depend on your system configuration.

TABLE I: System specific data item IDs

ITEM ID ("TAG")	TYPE	DESCRIPTION
System.ApplicationName	String (VT_BSTR)	"Intellispec".
System.Version	String (VT_BSTR)	Current version of application (e.g. "4.1.001").
System.SerialNumber	String (VT_BSTR)	Unit serial number (e.g. "6789").
System.LaneCount	Integer (VT_I4)	Total number of lanes (channel groups) configured.
System.ChannelCount	Integer (VT_I4)	Total number of channels configured.
System.MachinePartCount	Integer (VT_I4)	Total number of correlated machine parts configured.
System.RefreshInterval	Integer (VT_I4)	Number of seconds between channel and inspection statistics updates (NOTE: lane and correlation statistics are updated continuously).
System.RecentSampleSize	Integer (VT_I4)	Value of (N) in "Last (N) …" statistics.
System.CurrentUser	String (VT_BSTR)	Name of the user currently logged on.
System.UserAccess	String (VT_BSTR)	Access (privilege) level of user currently logged on.
System.CurrentPart	String (VT_BSTR)	Name of the currently active part.
System.ActiveDatabase	String (VT_BSTR)	Returns the name of the currently active vision database.
System.CurrentTime	Date & Time (VT_DATE)	Gets the current system date & time.
System.ChuteFull	Boolean (VT_BOOL)	Gets the state of the Chute Full input.
System.DoorOpen	Boolean (VT_BOOL)	Gets the state of the Door Open input.
System.PowerFail	Boolean (VT_BOOL)	Gets the state of the AC Failed input.
System.LowBattery	Boolean (VT_BOOL)	Gets the state of the Low Battery Alarm.
System.OverTemperature	Boolean (VT_BOOL)	Gets the state of the Over-Temperature input.
System.AlarmActive	Boolean (VT_BOOL)	Gets the state of the red light on the light tree.

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System.WarningActive	Boolean (VT_BOOL)	Gets the state of the yellow light on the light tree.
System.AnnunciatorActive	Boolean (VT_BOOL)	Gets the state of the audible alarm.
System.Online	Boolean (VT_BOOL)	Returns “True” if inspecting, “False” if not.

TABLE II: Lane, Channel and Inspection specific data item IDs

ITEM ID (“TAG”)	TYPE	DESCRIPTION
<context>.TotalNumberInspected	Integer (VT_I4)	Total number of parts inspected <context> = Lane[.Channel]
<context>.TotalNumberDefects	Integer (VT_I4)	Total number of defective parts <context> = Lane[.Channel[.Inspection]]
<context>.TotalPercentDefects	Real (VT_R8)	Total defective parts expressed as a percentage of total number inspected <context> = Lane[.Channel[.Inspection]]
<context>.RecentNumberInspected	Integer (VT_I4)	Recent (e.g. last “N”) number of parts inspected; max. value = “N” <context> = Lane.Channel
<context>.RecentNumberDefects	Integer (VT_I4)	Recent (e.g. last “N”) number of defective parts <context> = Lane.Channel[.Inspection]
<context>.RecentPercentDefects	Real (VT_R8)	Recent (e.g. last “N”) defective parts expressed as percentage of recent number inspected <context> = Lane.Channel[.Inspection]
<context>.Enabled	Boolean (VT_BOOL)	Returns “True” if currently enabled, “False” if currently disabled. <context> = Lane.Channel[.Inspection]
<context>.JobName	String (VT_BSTR)	Gets the name of the job currently assigned to the channel. <context> = Lane.Channel
<context>.InspectionCount	Integer (VT_I4)	Gets the number of inspections present in the active job for the channel <context> = Lane.Channel
<context>.MissedPartPresents	Integer (VT_I4)	Missed part count (no image to inspect) <context> = System | Lane.Channel
<context>.MissedResults	Integer (VT_I4)	Missed result count (inspection took too long) <context> = System | Lane.Channel

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<context>.TimeLastReset	Date & Time (VT_DATE)	Date & time statistics were last reset. <context> = System | Lane

TABLE III: Machine Part (Correlation) specific data item IDs

ITEM ID ("TAG")	TYPE	DESCRIPTION
Lane.MachinePart.ChannelNumberDefects	Integer Array (VT_I4 | VT_ARRAY)	Number of defective parts on the named channel. One array element per machine part instance; One data item (array) per channel in this lane.
Lane.MachinePart.TotalNumberDefects	Integer Array (VT_I4 | VT_ARRAY)	Total number of defective parts (all channels). One array element per machine part instance.

REFERENCES

To learn more about OPC, visit these links:

OPC Foundation (http://www.opcfoundation.org/Default.aspx/01_about/01_whatis.asp?MID=AboutOPC)

OLE for process control (http://en.wikipedia.org/wiki/OLE_for_process_control)

Or perform a search on the Internet, using "OLE for process control" as the search criteria.

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GLOSSARY OF TERMS

A

ACQUIRE

The process of transferring a video image from the camera into memory.

AMBIENT

A grayscale value that is representative of the pixels in a given area.

B

BINARIZE

The system uses a grayscale threshold, and determines that pixels in a given area are simply light or dark. Any pixel gray level found that is equal to or higher than the threshold is considered a light pixel. Any pixel gray level found that is lower than the threshold is considered a dark pixel.

BLOB

A single, connected set of pixels in an image.

BLOB REGISTRATION

Searches for the largest connected set of pixels within the search area. The pixels counted are determined by gray shades that are programmed within the inspection parameters.

C

CAMERA

Just as it sounds, the camera is the imaging device that takes pictures of one view on a part.

CENTERING

In Intellispec software, also referred to as Registration. Parts may pass through the camera's field of view at different speeds, and possibly varying locations. With this feature, the software finds a reference point on each part, and places the inspection regions relative to that reference point.

CHANNEL

A channel is an acquisition point. In most cases a channel is an inspection module, consisting of one or more cameras and a light source. The camera and lighting triggers must occur at the same time to be considered part of the same channel. An example channel is a CP4412E module with three digital cameras and a lighting source that are all triggered at the same time.

CHANNEL GROUP

Includes a channel or channels that share the same encoder, part present, and reject devices.

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CHANNEL INDICATOR

A section of the Intellispec screen that displays which channel you are currently viewing or programming. It is important to note the correct channel before you modify an inspection.

CIRCLE DIMENSION INSPECTION

An inspection that allows measurements to be made on circular features. For example, in converted end applications, the Intellispec can measure the diameter of a rivet.

CIRCLE INSPECTION

An inspection that inspects a circular or donut area of a part. The system uses edge detection techniques, ambient calculations, and blob and zone analyses to find defects. The inspection region can be segmented, or the system can inspect an arc of a circle.

CIRCLE WIDTH DIMENSION INSPECTION

An inspection that makes dimension measurements between two donut inspection regions. The donuts each find an edge, and the inspection calculates the dimension between found edges along the same search vector. This inspection is excellent for measuring donut-shaped areas, such as Seal Surface or Flange Width.

*CIRCULAR EXTRACTOR**

A registration algorithm, required by Contrast Integration. This determines the region of interest for the Contrast Integration inspection.

*Replaced by Circular Region in 4.2 software

CIRCULAR REGISTRATION

A registration effective at locating edges on circular parts. Contains both Radial Edge and Hough centering techniques.

CLIPOUT INSPECTION

An inspection that finds the discontinuity of a donut inspection area by searching for gray level changes radially, like the spokes of a wheel. For example, it will detect a clipout on the curl of a food end or converted end.

CLIPPING

A parameter used in many inspections that desensitizes the inspection to noise by clipping off normal variations in the gray shades, allowing flaws in the failure range to be detected more easily.

*CONTRAST INTEGRATION***

This inspection unwraps a region of interest (ROI) on a part and allows you to see pass/fail information for a part, up to 10,000 previous parts. It allows you to change the sensitivity to see how that inspection would have performed at different sensitivities over the recent inspection population.

**Replaced by Contrast inspection in 4.2 software.

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CORRELATION

A patented feature of the Intellispec System is the ability to correlate defect data with specific machine components. This information can be used to diagnose equipment and processing problems relating to particular components of a blow molder, such as mold cavity, infeed transfer arm, outfeed transfer arm, and spindle. Correlation is also used in non-blow molder applications.

D

DATABASE DETECTIVE

A useful tool that allows you to perform database tasks such as: generating reports that list all inspection parameters for a job, saving databases to floppy disk, as well as online/ offline history reports, and more.

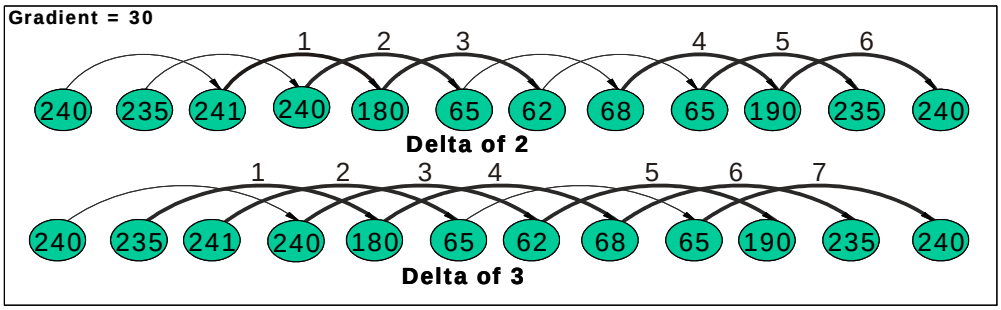
DEFECT

A part that did not pass inspection. Note that one part may fail more than one inspection.

DELTA

Indicates the distance between pixels being compared when seeking an edge. A higher Delta value increases inspection sensitivity because it finds more edges.

- If Delta = 2, the gray shades of the first and third pixels are compared.
- If Delta = 3, the gray shades of the first and fourth pixels are compared.
- In the example below, if Gradient = 30, the system finds 6 edges when Delta = 2, and 7 edges when Delta = 3.



DIMENSION INSPECTION

An inspection that allows measurements to be made either in a line or within a region. It uses sub-pixel accuracy techniques to make precise measurements, particularly on a threaded finish of a bottle.

DONUT

The inspected area of an image between two concentric circles.

E

EDGE SIZE

This indicates how many pixels in a row to compare (1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

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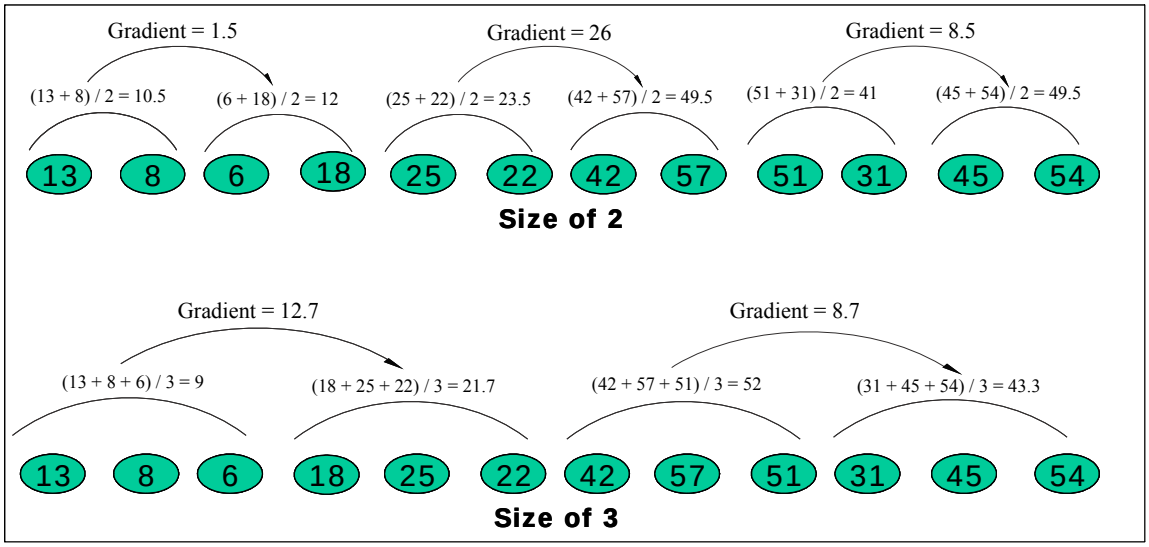
Edge size is the difference between how many pixels are grouped together and are being compared when seeking an edge point. It is adjustable between 1 and 20. In the example, if the size is 2, the shades from the first two pixels is averaged and compared with the average of the third and fourth pixels in the region. If the size is 3, then the first, second, and third pixels are grouped together and compared with a group comprising the fourth, fifth, and sixth pixels.



EDGE THICKNESS

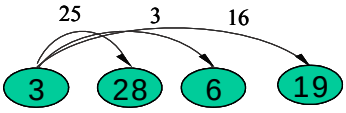
The number of consecutive times that the gradient must be met to define an edge.

Edge Thickness is a method of comparing one pixel with multiple pixels in order to discriminate against smaller defects. In this scan, all comparisons must exceed the gradient setpoint in the inspection for an edge to be found. It is adjustable between 1 and 7.

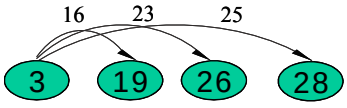
EXAMPLE:

In the example below, assume that the inspection gradient is set at 15 and that the thickness is set at 3. The first pixel is not only compared with another pixel but is compared with the next 3. All comparisons must exceed 15 in order for an edge to be found.

ASSUME: Inspection value for gradient is set at 15



Thickness of 3, no edge found



Thickness of 3, edge found

EDGE THRESHOLD

This is the threshold used to locate an edge within a search vector. The larger the threshold, the stronger the edge must be. This number is a percentage of the minimum and maximum gray level within the vector, so it changes for each image.

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EXAMPLE:

- Maximum gray level for a vector is 200.
- Minimum gray level for that same vector is 50.
- We set Edge Threshold at 25%.

The system subtracts the minimum gray level from the maximum, 200-50=150, and multiplies the result by our Edge Threshold: 150 x .25 = 37.5. The system rounds up 37.5 to 38. This value of 38 is the gray level threshold for this vector, where the system determines an edge.

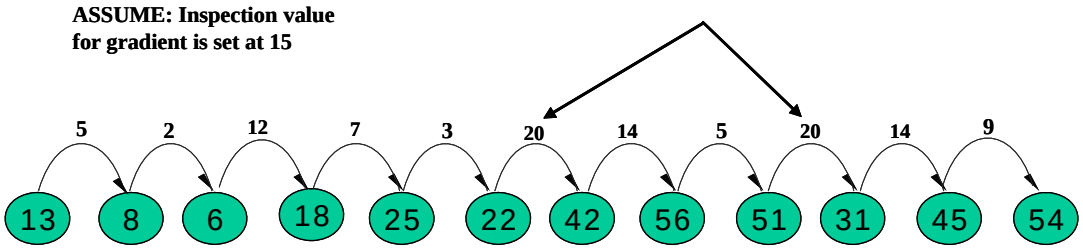
THRESHOLD/GRADIENT

Threshold can be defined as the value at which the limit of a parameter is reached. When the threshold point is reached, it will trigger an event.

In the Pressco vision inspection application, threshold can be applied to the term "gradient". Gradient is defined as the minimum shade difference between two pixels that defines an edge. An Edge is when a pixel-to-pixel comparison represents either a boundary between regions or a flaw (defect) on a surface.

EXAMPLE:

In the following example, assume that the value for gradient in an inspection has been set at "15". As the grayscale is compared from pixel to pixel you find that in two of the comparisons the gradient was >15, indicating that two edges were found.



EDGE TRANSITION

The type of edge for which you want the system to look – Light to Dark, Dark to Light, or Either. For example, if the feature you want to find is very bright, choose Dark to Light.

ENCODER

A device used to indicate mechanical motion with a pulse rate directly proportional to line/ conveyor speed. The system tracks part movement through encoder ticks, from the moment the part is detected until it passes the reject station.

F

FIXED REGISTRATION

Specify a fixed coordinate position on the inspection image. The inspections that use this registration will be placed with respect to this fixed position. Note that in most applications, parts move slightly in the image from one part to the next. Fixed registration is good to use if you wish to find the position of an object with respect to the designated point on the image.

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FRAME BUFFER

Memory designed to store an image. The Intellispec has three dynamically allocated frame buffers.

FREEZE FRAME

This occurs when the Intellispec automatically holds the image of a part when that part's inspection meets some criteria. For example, it can freeze the last defective part's image.

G

GRADIENT

The minimum gray shade difference between two pixels that defines an edge.

This parameter has minimum and maximum settings that allow you to use Gradient three different ways depending on your application. The Min value is the top slider; the Max value is the bottom slider.

Edge Gradient Min/Max example:

The gradient range allows you to find the best edge within a range of gradient changes. As soon as Gradient Max is exceeded the algorithm will stop. Example vector:

Pixel:	1	2	3	4	5	6	7	8	9	10
Gradient:	6	6	16	22	17	36	20	75	6	6

If Gradient Min = 15 and Gradient Max = 15, then the edge will be the first position > 15. So the position is 3 (gradient of 16) and the search stops at position 3.

Gradient Min = 15; Gradient Max = 15

Pixel:	1	2	3	4	5	6	7	8	9	10
Gradient:	6	6	16	22	17	36	20	75	6	6

Edge position = first above 15

If Gradient Min = 15 and Gradient Max = 27, then the edge will be the strongest between 15 and 27 or the first above 27. So the position is 6 (gradient of 36) and the search stops at position 6.

Gradient Min = 15; Gradient Max = 27

Pixel:	1	2	3	4	5	6	7	8	9	10
Gradient:	6	6	16	22	17	36	20	75	6	6

Edge position = strongest between 15 and 27, or the first above 27

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If Gradient Min = 15 and Gradient Max = 100, then the edge will be the strongest between 15 and 100 or the first above 100. So the search goes through the entire vector, but the strongest edge found is position is 8 (gradient of 75).

Gradient Min = 15; Gradient Max = 100

Pixel:	1	2	3	4	5	6	7	8	9	10
Gradient:	6	6	16	22	17	36	20	75	6	6

Edge position = strongest edge

GRAY SHADE

Also Gray level, or Grayscale. When the image is digitized, each pixel is assigned a gray shade number between 0 and 255 depending on its brightness. The number 0 represents black. The lighter the value the higher the number. The number 255 represents white. The value for each pixel of the image is stored in memory.

Lighting is critical in machine vision as it creates the differences in pixel gray shades that distinguish an acceptable part from an unacceptable part. The human eye cannot see gray shade differences close in shade, but the imaging equipment can.

GRAYSCALE IMAGE

In Intellispec's Image menus, an image of a part that contains no graphics or data overlay.

GRID SPACING

The number of lines of pixels until the next line is inspected in edge detection inspections. The smaller the grid spacing, the more accurate the inspection. The larger the grid spacing, the faster the inspection.

H

HARMONIC INSPECTION

An inspection for inspecting parts that have radially symmetric features, such as metal crowns, plastic closures, and lugged closures.

HISTOGRAM

A graphical display that shows the frequency counts of the occurrence of each gray shade in an image or search area. Also, some of the graphs represent the number of defective parts categorized by channel, or correlated to the machine component that created the part.

HOUGH REGISTRATION

Located within Circular Registration. A mathematical determination of a center or reference point. The system locates a circular feature on a part. It places several edge points on that feature. Then the true center of the part is computed by using those edge points.

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I

IMAGE ANALYSIS

A graphic representation of the gray shade values of pixels along a line or the edge of a circle. One axis of the graph represents each pixel in the area. The other axis represents gray shade values of correlating pixels. This feature is available to Mechanic-level users and higher, by right-clicking on the image and selecting Image Analysis.

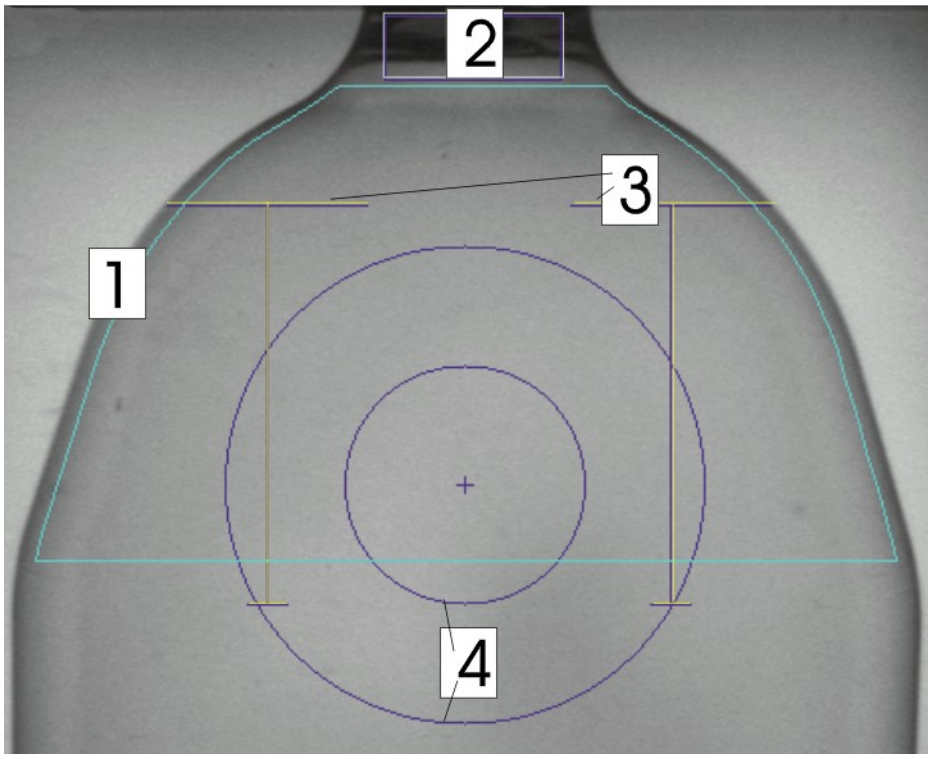
INSPECTION

An inspection analyzes the pixel shade information within a region and compares it to programmed reference values. The inspection passes or fails based on these comparisons. You may have many inspections in a job for each camera.

INSPECTION REGION

Also referred to as "windows".

Regions let you section off a portion of an image to analyze.



The above illustration shows four inspections. Some can take the shape of the part (1), have a rectangular shape (2), have vectors that search from a location (3), or be donut-shaped (4). There are other shapes, and many types of inspections in the Intellispec.

J

JOBS

The jobs are the programs that inspect each part within the field of view of each camera.

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- A job is made up of several inspections
- Each camera runs a different job

L

LABEL SKEW INSPECTION

This inspection determines whether labels are skewed and fall outside of specified limits. The inspection is unique in that it does not require an additional registration – it has its own registration built into the inspection.

LANE

Also referred to as Channel Group. A lane usually refers to one production line, and can contain multiple channels.

LIGHT METER INSPECTION

An inspection that adjusts the lighting automatically while the system is online. This prevents spoilage due to normal process variations.

LIMITS

The extent to which an inspection's parameters may measure to determine pass or failing status.

LINE INTEGRATION INSPECTION

An inspection that is a combination of Radial Line Integration and Tracker Continuity inspections, except in a rectangular region.

M

MIDLINE ORIENTATION INSPECTION

An orientation algorithm that determines the orientation of an object, then finds the midline of that object to determine the object's rotation. For example, in converted end applications, the Intellispec can find the midline of the tab, and determine whether it is rotated correctly or incorrectly with respect to the bead area of the converted end.

N

NOTCH INSPECTION

An inspection designed for a specific PET application where the Intellispec must locate the position of an alignment notch in the tamper band with respect to the part. If the notch is not located in the correct position, or it does not match correct angular specifications, the part fails.

O

ORIENTATION

Related to registration, orientation is used to properly place inspections on parts, regardless of their rotation in the camera's field of view.

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ORIENTATION EDGE

An orientation algorithm. The system locates an object within a donut region. It uses edge detection techniques to locate the object. It compares the object size to specified limits. If the object does not meet the size specifications, the orientation fails. Additional inspections can be placed with respect to the orientation of the found object.

ORIENTATION PATTERN MATCH

An orientation algorithm that uses a donut-shaped area to determine a pattern of gray shades. It is used by subsequent inspections to place those inspections properly on the part, regardless of each part's orientation.

ORIENTATION STEALER

An orientation algorithm that allows you to use information from a previous orientation even after a new registration has been run.

P

PARAMETER

A programmable value that allows you to customize your software to the specific needs of the application.

PART PRESENT

A sensor, also called Part Detect, activated when a part passes in front of (or through) it. In the Intellispec, it ultimately initiates the acquisition of images and subsequent inspection.

PIXEL

Pixel is an acronym for **Pic**ture **El**ement and is the smallest element in a digitized image. The layout of pixels is known as the Cartesian grid system.

Each pixel has an X, Y address that corresponds to its location on the grid. Software uses these coordinates to inspect the image against the inspection algorithm.

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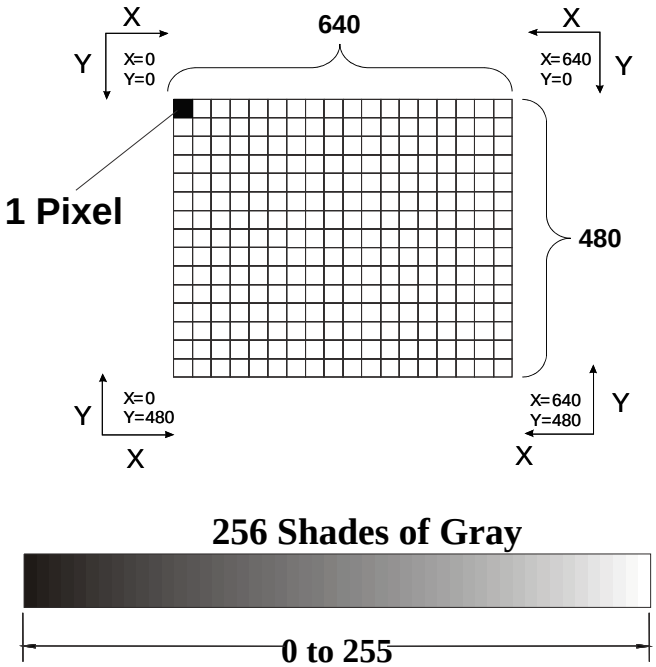
Each pixel is assigned a gray scale or gray shade value that is proportional to its brightness. **Gray shade** is a value between 0-255 where 0 is black, 255 is white, and every other number is some shade of gray.



POLYGON INSPECTION

An inspection that allows you to analyze multiple free-form regions. The system uses edge detection, ambient, and zone techniques to locate flaws, such as pearling, hazing, or holes in the feet of a bottle, for example.

R

RADIAL EDGE REGISTRATION

Located within Circular Registration. This is a registration that is good for circular parts that have a distinct edge either on the inside or the outside of the part. You specify a radius where you would expect a transition to appear (i.e., the edge of a part), the system finds edge points along that radius, and calculates a reference point from those edges.

RADIAL LINE INTEGRATION INSPECTION

For lug/rim inspection and other difficult part inspections, radial line integration combines the use of four separate but loosely related algorithms to provide a quick and powerful tool to examine circular shapes such as lugged closures. It can be used with many circular parts that have repeating features.

RECTANGLE - BINARY OR GRAYSCALE INSPECTION

An inspection that allows you to define a rectangular region on a part. You may use a grayscale or binary method of analysis. It searches the region horizontally, vertically, or horizontally and vertically looking for edges or pixels. The test results are then compared to a minimum and maximum for pass and fail status.

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RECTANGULAR TRACKER INSPECTION

An inspection similar to Tracker inspection, but can be used on different shaped parts, particularly non-round parts.

REGION

A selected portion of an image where the presence or absence of features are evaluated. All other parts of the image are ignored for that part of the inspection.

REGISTRATION

Registration allows you to inspect parts whose placement varies slightly in the camera's field of view. With registration, the software finds a reference point on each part, and places the inspection regions relative to that reference point.

❖ *Note: Some applications cannot use registration because of physical limitations or requirements of the test. If you choose not to use registration, the tests are performed relative to the camera's field of view, not relative to the part. Note that this requires perfect part handling. If the position of the part varies, the inspection regions remain where they were originally programmed and the job will fail.*

REJECT

A part that failed one or more inspections from any camera. The part can be physically rejected, or simply counted in the statistics.

S

SEARCH VECTOR

A line that looks for an edge transition, often to determine the edge of a part.

SEGMENT

Pie slice divisions into which inspection circles or donuts can be divided. This allows you to set a maximum number of edges or pixels found per segment. You can also specify that all or just some of the segments pass to determine a part's pass/fail status.

SHAPE ADAPT INSPECTION

An inspection that searches for defects, neck folds for example, within an area of a container. The shape of the region is created by the system, based on Shape Adapt registration. The shape of the inspection follows the shape of the container.

SHAPE ADAPT REGISTRATION

A registration that searches for edges of a container, the sides of a neck image for example. It can indicate whether a container is over- or under-blown, based on the angles of each container. It is a required registration for both Shape Adapt and Side Fold inspections.

SIDE FOLD INSPECTION

An inspection that searches for defects, especially neck folds, on the edge of a container. The inspection is sensitive enough to catch folds that may appear only one pixel in height in an image.

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SMARTLIGHT

The interface program that allows you to control the lighting of all channels in the Intellispec system. Each channel has a number of zones within each lighting array that may be controlled individually, or as groups. You control the amount of time that each zone remains on during image acquisition.

SMARTLINK

Boolean algebra logic that allows you to pass or fail a part based on the pass/fail status of individual regions.

SNAP

Another term for camera image acquisition.

T

TEXTUAL GRID

An area at the top of the screen that displays the statistics for each channel in text format. It displays the number of parts inspected, rejected, and shows the number of times each inspection region failed.

THRESHOLD

A parameter in many inspections. It is the gray shade dividing point between what is considered light and dark pixels.

TRACKER INSPECTION

An inspection that places inspections based on the actual shape of the part. This inspection requires Tracker registration for placement. The inspection has several different inspections within it to find several different defects.

TRACKER LINE INTEGRATION INSPECTION

This inspection combines the region generation capabilities of Tracker registration/ inspection with segmenting and the Radial Edge inspection capabilities of Radial Line Integration.

TRACKER REGISTRATION

This registration locks on to a feature and tracks its shape. The result of this registration is a series of edge points that the system uses to place inspections on a part. This tracked shape is used in lieu of standard donut or rectangular shaped inspection regions. A tracker inspection region does not need to be perfectly round nor rectangular shaped, as might be the case on certain parts that you inspect.

TRANSITION

A parameter that defines the type of edge the system is looking for. It may be set to Light to Dark, Dark to Light, or Don’t Care which will find either transition.

W

WOMBAT

A marsupial native to Australia that, by some accounts, is very fond of chocolate biscuits. Also known as Database Detective.

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X

X-Y REGISTRATION

This type of registration includes horizontal, vertical, horizontal/vertical, and vertical/horizontal search vectors. A horizontal search can find a vertical edge, and a vertical search can find a horizontal edge. A horizontal/vertical search first searches in the horizontal direction for an edge, then searches vertically for another edge. The vertical/horizontal type searches vertically then horizontally. The two directions help increase the accuracy of the search.

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