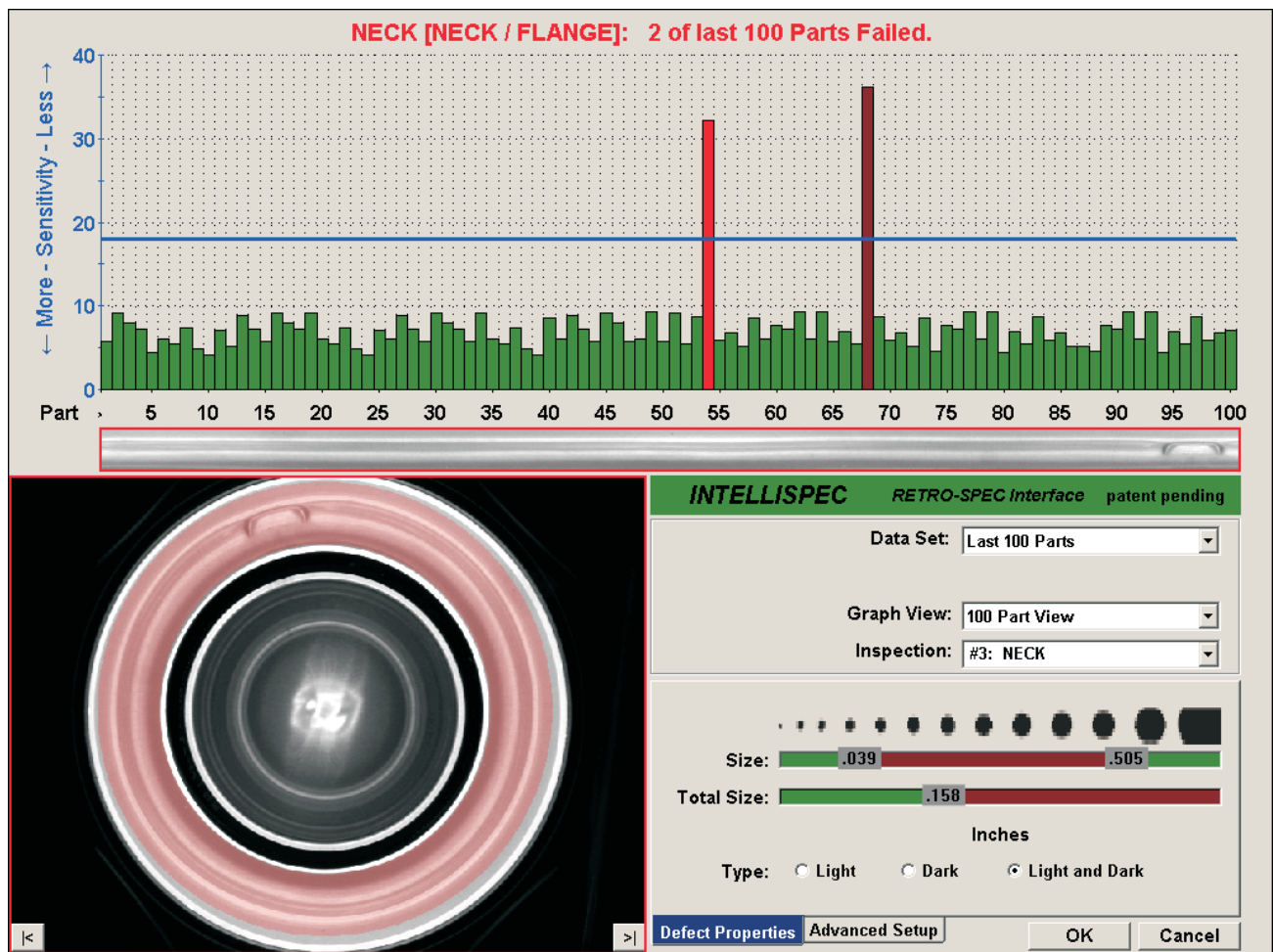


INTELLISPEC

Programming Guide Supplement:

RETRO-SPEC

Software Version 4.0.017



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Table of Contents

Using Contrast Integration (<i>RETRO-SPEC</i>)	1
Viewing and using the Retro-Spec interface	1
How Contrast Integration works.	2
Pop-up information	3
Adding Contrast Integration to your jobs.	5
1) Before placing the inspection.	5
2) Place a Circular Extractor for each Contrast Integration region of interest	5
3) Add a Contrast Integration inspection	6
4) Adjust the Contrast Integration parameters	7
Defect Properties.	7
Advanced Setup	9
What about the Yellow bars?.	11
5) Add another Contrast Integration	11
6) Assign the inspections to the Part Graphic	11
7) Repeat for all channels	12
Setting up the Part Graphic	12
What is a Part Graphic?	12
Features	12
Notes about usage	13
Enabling the part graphic	13
Assigning inspections to groups in part graphic	14
Using the part graphic	14
Part Graphic Options	15
Inspection Grouping	15
Assigning inspections to groups:.	15
Using Group Outputs	17
Series IV systems.	17
Series III systems with Extended I/O.	17

Using Contrast Integration (*RETRO-SPEC*)

RETRO-SPEC (patent pending) 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. 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.*

Contrast Integration is available for the All Inspection Product Type.

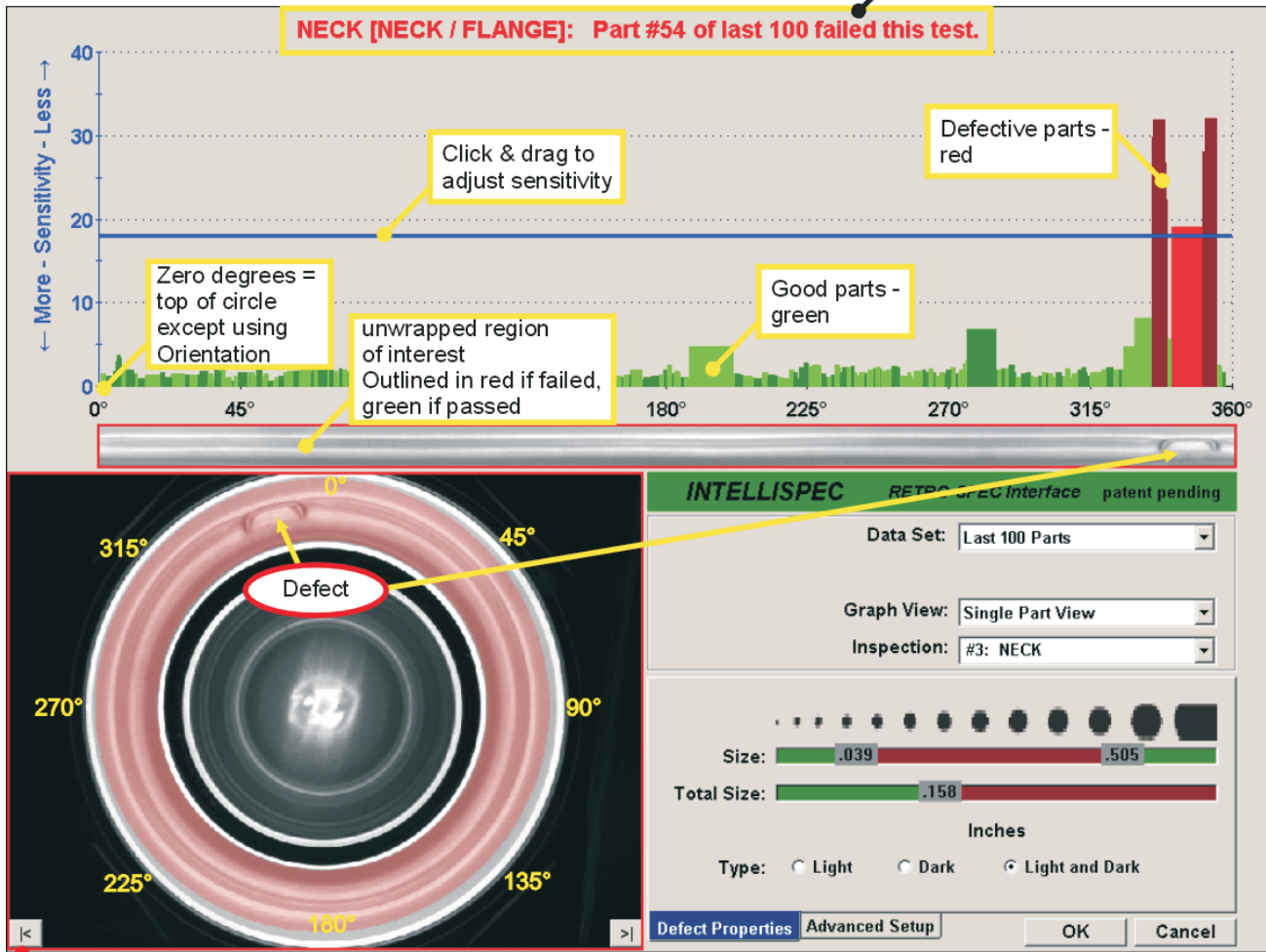
Viewing and using the Retro-Spec interface

The interface is displayed when you place or edit the inspection (you may be asked to log in – Mechanic or Administrators only). To edit:

- The quickest way is to 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. Or:
- Right-click the name of the inspection in the statistics area, right-click, and choose Edit from the menu.

The screen and its components are illustrated on the next few pages. There are different displays for single part mode and multiple part mode. The menus in the lower right of the screen are discussed on page 7.

Single Part View



current part image
Outlined in red if failed,
green if passed

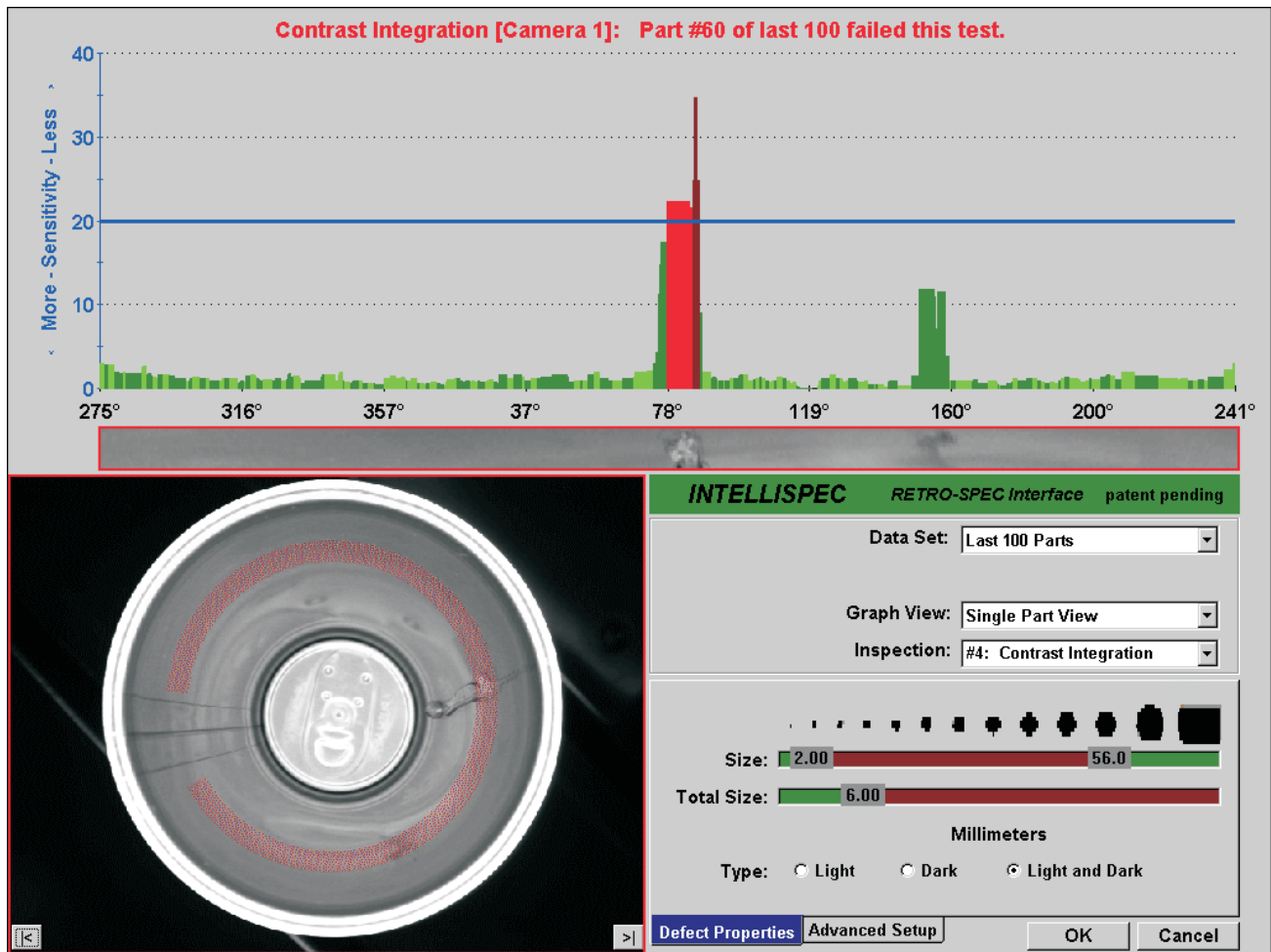
How Contrast Integration works

This inspection uses a set of sample vectors to determine the position and contrast of edges along each vector. Each sample represents either the gray level at a point in the image, or the sum of the gray levels along a specific trajectory.

The contrast integration results are represented by bars on the graph. When the system finds edges with high contrast – a defect – it displays a higher bar.

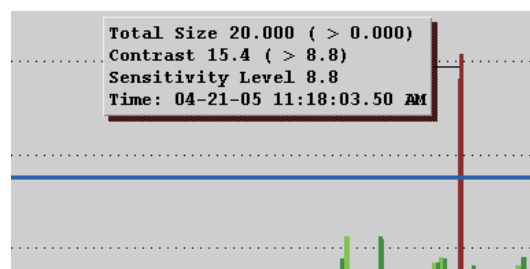
You can view this through the Single Part View of the interface. In the above example, we are using no orientation nor arcs on the part.

If the inspection region is an arc and uses orientation, zero degrees would still remain at the top of the circle (on the image). The graph would display the beginning to end angles of that part's search region instead of zero to 360 degrees. Example shown on next page.



Single part view, with oriented arc region of interest shown

Pop-up information



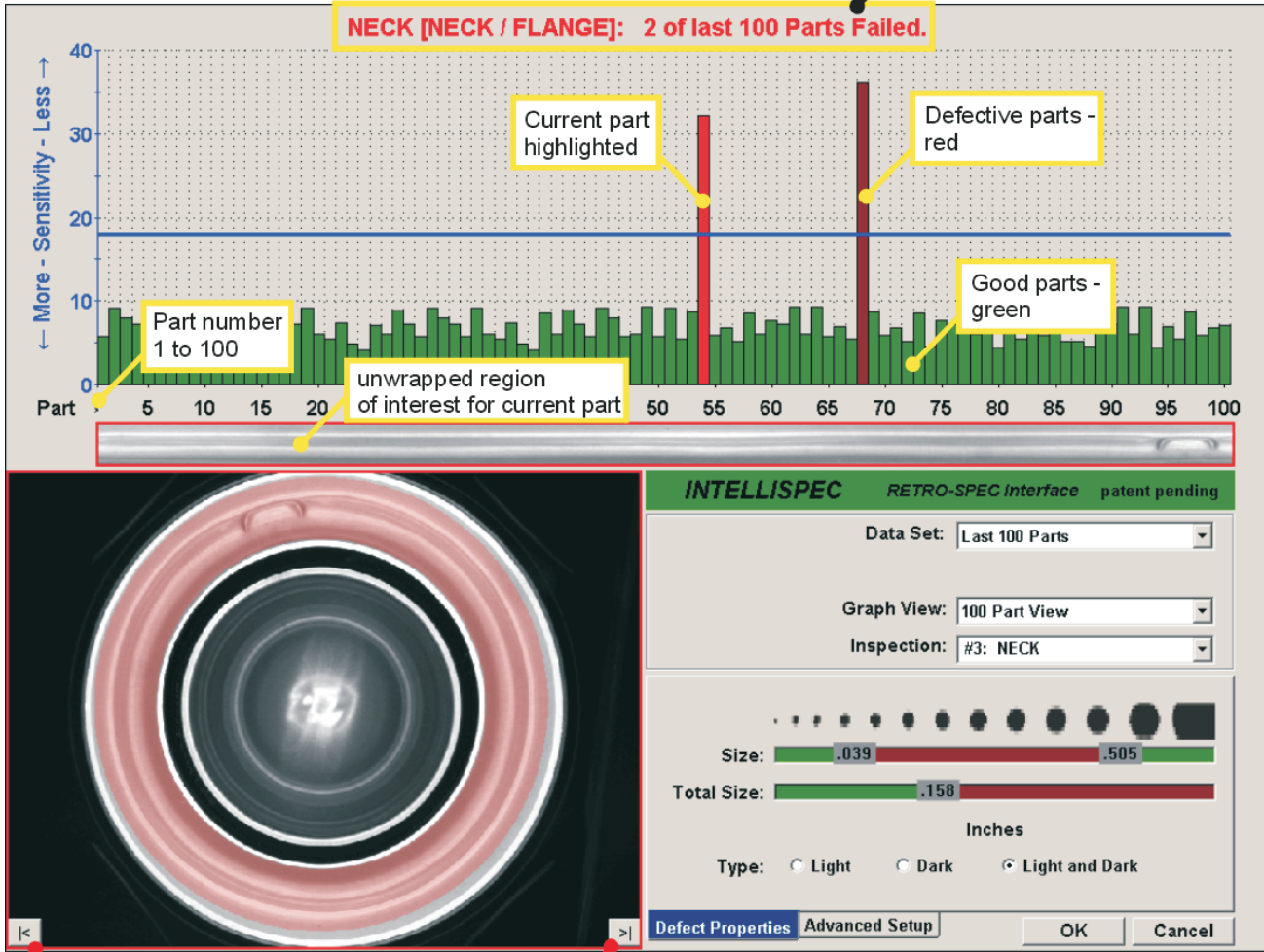
Click anywhere on graph to see information about current part or highlighted part, including date and time when that part was inspected

The pop-up box tells you about the inspection settings used to generate the graph.

- If in Single Part mode, click anywhere on the graph to display the information. If Segments are used, cyan lines are displayed showing you which bars are included within that arc, and the arc number is displayed in the pop-up.
- If in Multiple Part mode, click on any bar to see one part's information.

100 Part View

Title - shows how many parts failed



Show previous part

Show next part

Adding Contrast Integration to your jobs

These instructions assume that your System Configuration has been set up for all channels, and you are starting a new job. To begin a new job: Right-click channel tab > and select New Job. Name the job.

This supplement does not cover all aspects of inspection such as lighting, system configuration, and all types of inspections. Please refer to the Intellispec Programming Guide for more information.

1) Before placing the inspection

1. As in all jobs, use a part registration, such as Circular Registration, to locate the part.
2. If you have a part on which the Contrast Integration inspection needs to be oriented, place an Orientation, such as Orientation Pattern Match to locate the orientation feature.

Refer to Intellispec Programming Guide for information about programming jobs, and details about registrations and orientations.

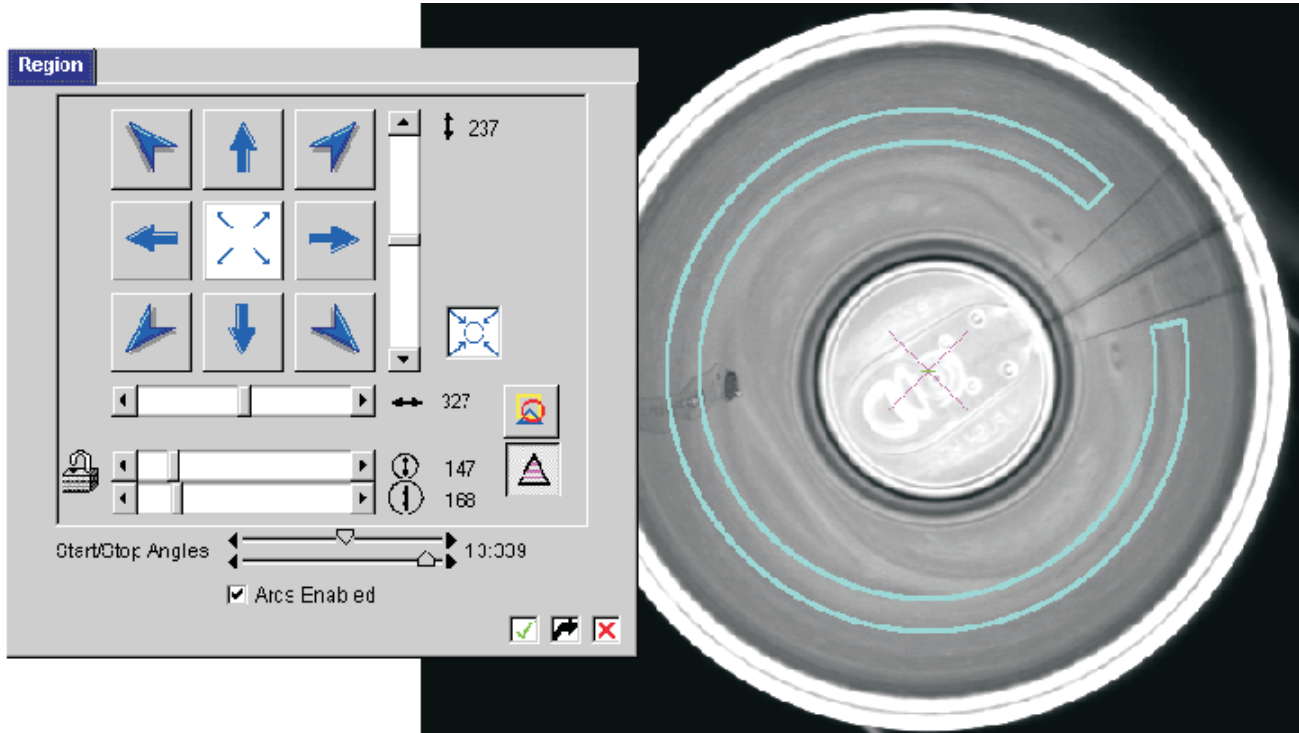
2) Place a Circular Extractor for each Contrast Integration region of interest

The region placement is done separately from the inspection. This keeps inspection time very short. In addition, you may add multiple inspections for one region of interest, perhaps one that looks for small defects, and another that looks for larger defects.

Select channel >
Right-click on black statistics area > choose Add > Registration > Circular Extractor

System Overview	Lane 1 Overview	MAIN IMAGE	NECK / FLANGE	Groups
Part Rate: 499	MAIN IMAGE [JOB # 5 for screens]			
Inspection	Total	Defects	Defect %	Las
	0	0	0.000	
Inspection Options				
Add	Registration	Blob Registration	Circular Registration	Finish Registration
	Orientation	Fixed Registration	Shape Adapt Registration	X-Y Registration
	Inspection	Tracker Registration	Circular Extractor	
+ MAIN IMAGE [JOB # 5 for screens]				

Add a Circular Extractor registration to place the inspection region. Determine whether the region should be a complete circle or arc. If you want an arc region, check the Arcs Enabled box, and set up start/ stop angles. The example below shows an arc region.



3) Add a Contrast Integration inspection

• Right-click in Statistics area > choose Add > Inspection > Contrast Integration

When you add the inspection, the Retro-Spec interface is displayed. Most likely, you will not have much data to work with (not many parts). Get more samples by doing the following:

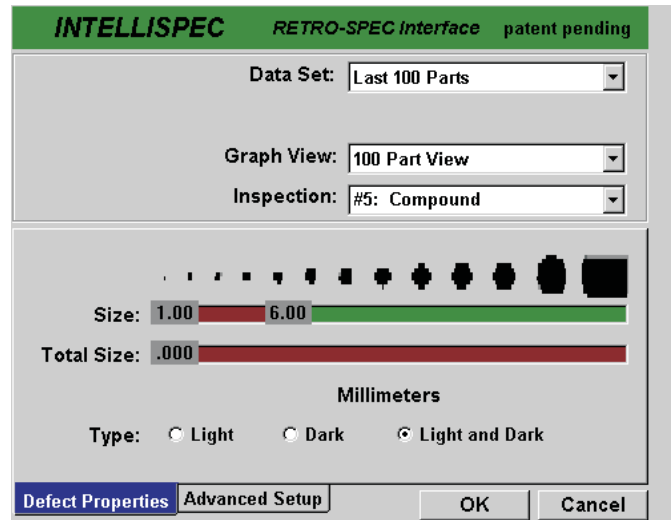
1. Exit the interface by clicking OK.
2. Run some parts through production. Click the camera icon (snap) several times to get information on several parts. Contrast Integration will measure the contrast in the region of interest for those parts.

Go back to Contrast Integration to adjust parameters: Double-click the name of the inspection in the statistics area.

4) Adjust the Contrast Integration parameters

This menu allows you to change inspection parameters to see how they perform on the current part or a set of archived images.

Defect Properties



Data Set Choose display information. Choose from current part, Last 100 parts, or 10,000 part archive.

Note, if you do not have an archive of 10,000 inspected parts, an error will be displayed. Currently, the 10,000 part archive must be set up by Pressco. The archive will be stored on hard disk.

Graph View Choose type of display for graph, available when Data Set = Last 100 parts or 10,000 part archive.

The Graph View type that is displayed when you exit Contrast Integration is the default view the next time you view the interface

- **Single part view** allows you to see the data from each vector, and the arc information on the graph.
- **100 part view** allows you to see how many parts out of 100 passed or failed, and you can click on each bar to see the related image and its inspection information in the pop-up on the graph.
 - Double-click any bar to see Single Part View of that part.
- (Only when Data Set = 10,000 part archive) **10,000 part view** 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.

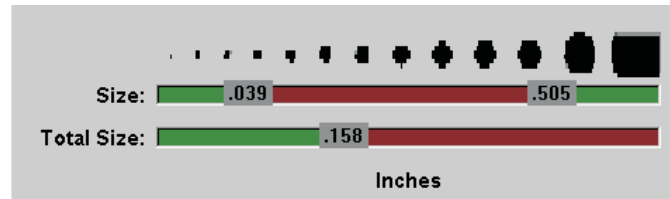
Inspection Choose from all Contrast Integration inspections available from the current job. If you have made changes to the current inspection, you will be asked whether you want to save changes when you switch inspections. Note: if an inspection has been disabled previously, it is not available for editing.

Size Choose the range of defect size you want to catch – hold the left trackball button and drag the marker. You may want to pass very small defects but catch slightly larger ones, or catch larger defects but pass smaller ones. Note: the graphic above the size bar does not indicate actual defect size.

The area between the defect markers is red to indicate defects, while the area outside of them is green.

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 Programming Guide for a description).

In the example below, we are looking for defects between 0.039 inches and 0.505 inches.



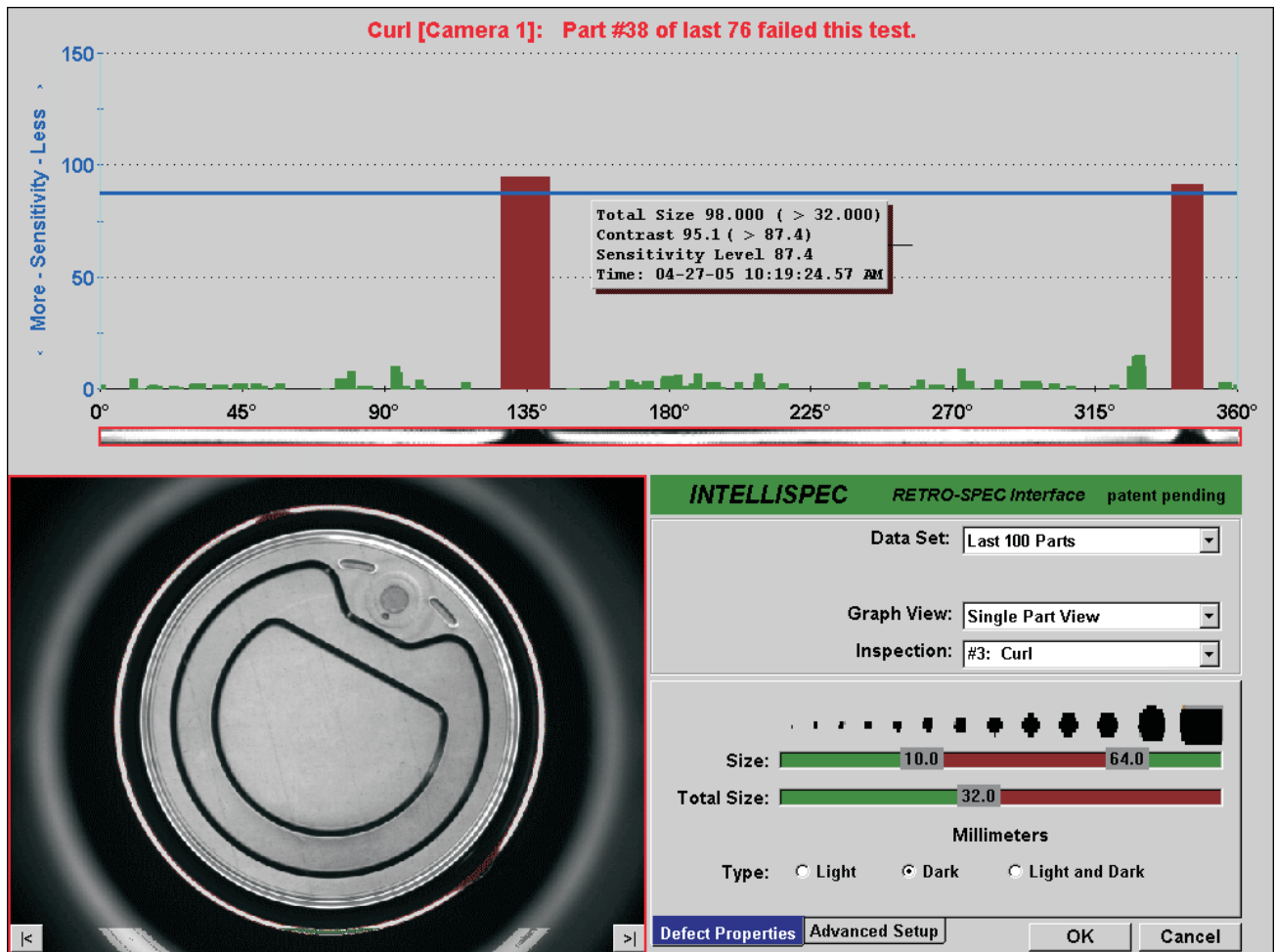
Total Size The total number of units (pixels, millimeters, etc.) that the sum of the defects can be. It can also be described as the sum of the width of defective bars at or above the sensitivity level within an inspection region or arc.

☛ *Total Size should be greater than the minimum Size parameter.*

We will describe through the following example (see graphic on next page).

Note the following:

- Segments (under Advanced Setup) = 1
- The left defect (in graph) is 59mm
- The right defect is 39mm
- Total Size = 98mm [59 + 32 = 98]. Since this is greater than our specification of 32, the part fails.

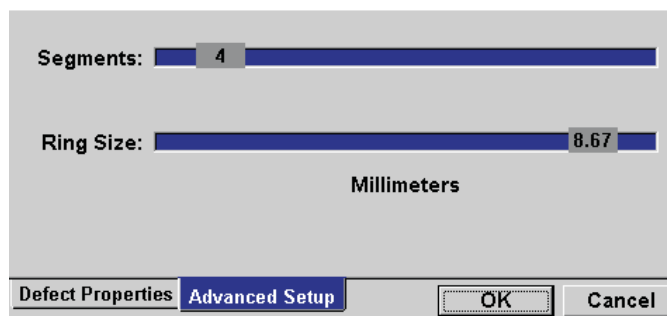


Variations:

Say Segments = 4. That divides our region into four inspection segments. The Total Size of the bars within each segment must exceed 32 to fail. In this example, the part would still fail: (39 > 32), or (59 > 32). In Intellispec statistics, this counts as one part failure.

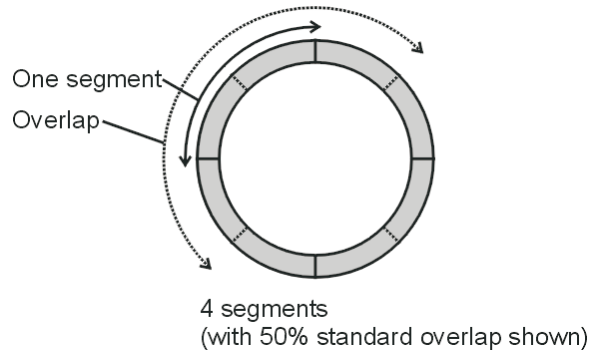
Type Choose the type of defects you want to catch. For example, if the material is normally dark, you might want to catch Light defects.

Advanced Setup



This menu divides the inspection region into segments and/or ring segments. You can view the segments dividing the region on the graph.

Segments The inspection region will be divided into wedge-shaped segments, between one and 72 segments. Dividing the region into segments allows you to find smaller defects.



The segments have a standard 50% overlap, ensuring all pixels are inspected.

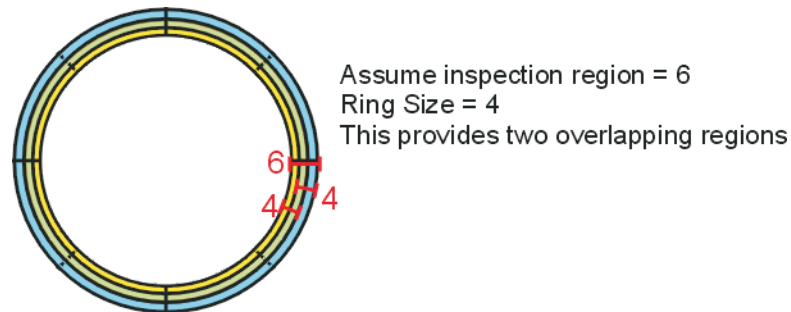
Ring Size The inspection region can be divided into concentric circles with a 50% overlap. This provides greater inspection density. When an region of interest is greater than 4 pixels, it should be divided into rings.

The maximum Ring Size (slider all the way to the right) equals the width of the inspection region. This creates one ring (not divided). If inspection region is 14 (pixels) wide and the slider is all the way to the right, the resulting inspection region is one ring, 14 pixels wide.

When Ring Size is set lower than maximum value, Intellispec divides the ring into concentric circles, with a standard 50% overlap. That is, if your region is a total of 0.5 inches wide and Ring Size is set to 0.25, the new ring sizes are 0.25 inches plus 50% overlap.

☛ *The smaller the Ring Size, the greater the number of rings.*

The example below shows a region six pixels wide. We set Ring Size = 4. This creates new regions 4 pixels wide. They have a 50% overlap.



Ring and Standard Segments

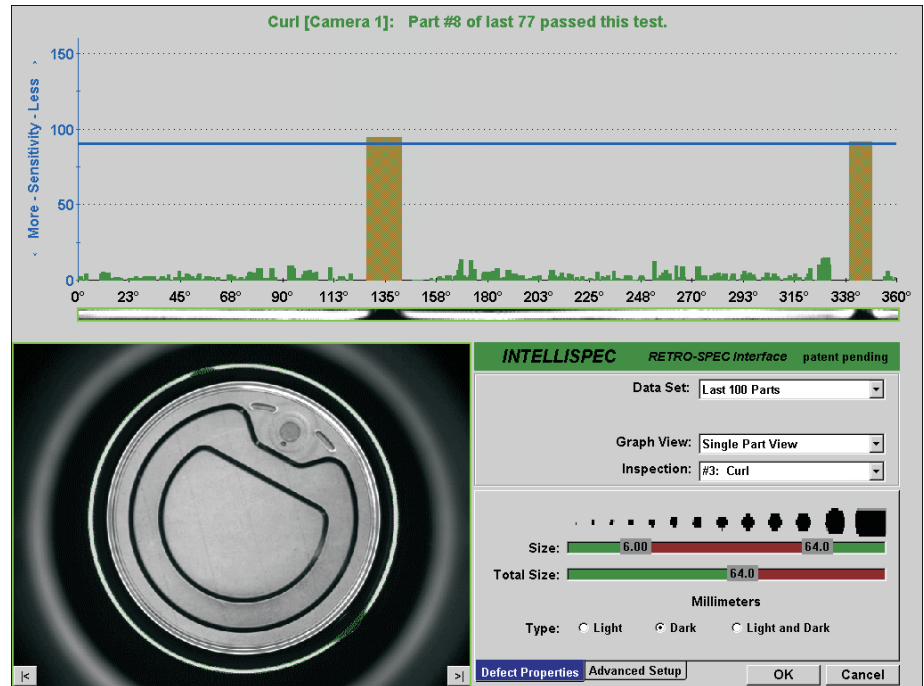
Exit the Retro-Spec screen to view the rings on screen. Click Yes to save changes when exiting. Press F1 or F3 to snap a new image.

The buttons at the bottom right of the screen allow you to save and exit.

- OK** Exits inspection. You will be asked whether to save any changes you have made.
- Cancel** Exits inspection, saves no changes.

What about the Yellow bars?

If your settings are such that Total Size passes, but Contrast does not, the bars are yellow. This allows the part to pass inspection, but gives a warning status in the group statistics. If you have a part graphic, that group region will be yellow. You can program the system to output a signal to your equipment if a certain percentage of parts has a warning percentage. (See Inspection Grouping on page 15)



5) Add another Contrast Integration

- If you want another inspection in the same region of interest, simply Add > Inspection > Contrast Integration from the statistics screen.
- To add another Contrast Integration on another area of the part, first place another Circular Extractor, then place another Contrast Integration. See step 2 on page 5 to begin the process.

6) Assign the inspections to the Part Graphic

By assigning the inspections to the Part Graphic, you will be able to:

- See pass/ fail/ warning performance from a distance
- Collect inspection statistics by area of the part
- Quickly access the inspections you want to modify

Part Graphic is described beginning on page 12.

7) Repeat for all channels

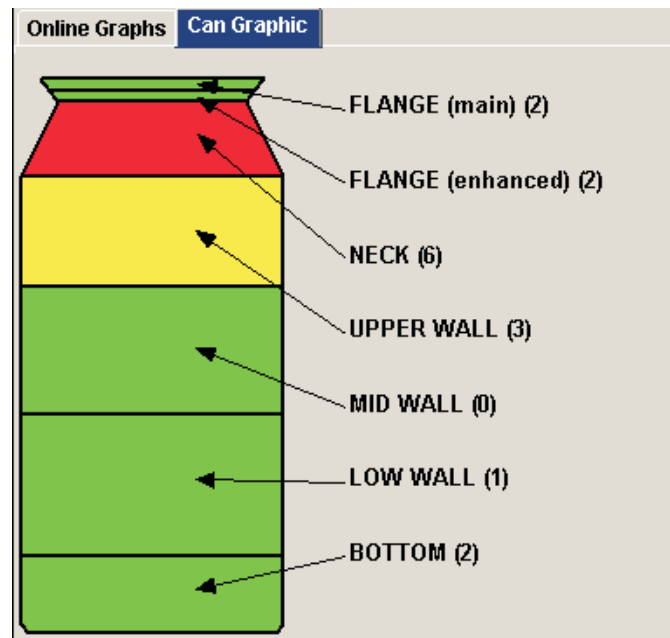
If you have more channels, select another channel and begin with step 1 on page 5.

Setting up the Part Graphic



What is a Part Graphic?

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



Features

- Single click to see statistics for an area
- Right-click to bring up Retro-Spec for an area

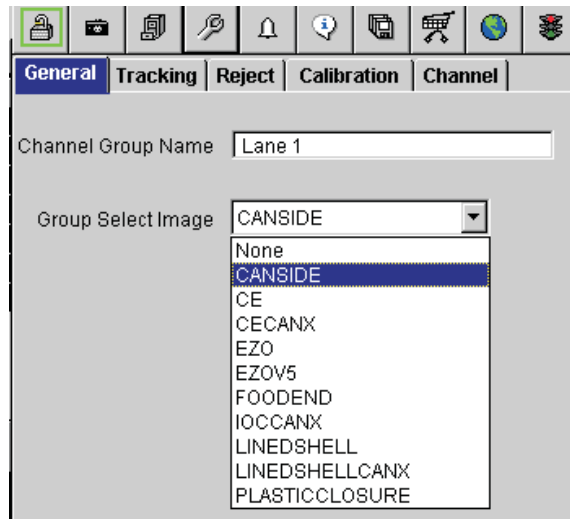
- Can be displayed in full screen mode to see from a distance
- Green areas let users know parts are passing inspection
- Yellow warning areas notify users that the spoilage rate is approaching, but has not yet reached a critical level. This allows users to make necessary changes to the manufacturing 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

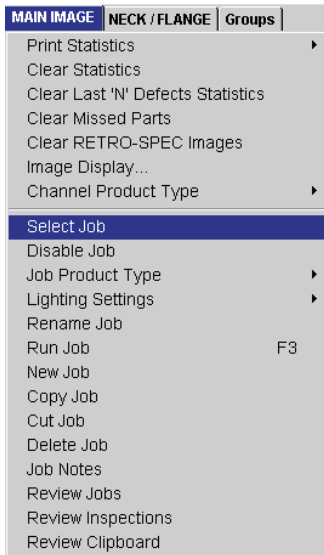
- The graphic may not look exactly like your part. It is a representation.
- This feature is not available for all types of parts (as of this printing)
- The graphic must be enabled for each lane or channel group
- The graphic uses Inspection Grouping to identify the areas of the part. Groups are pre-assigned. Assign inspections to those groups. (See page 15 about Inspection Grouping)

Enabling the part graphic

1. Log in as Mechanic or Administrator.
2. Click the System Configuration button > Channel Groups tab > choose a channel group.
3. Under the General tab > choose an image type next to Group Select Image. Click OK and exit.

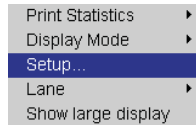


When enabled, the part graphic will be displayed in the lower right corner of screen.



Assigning inspections to groups in part graphic

1. Make sure appropriate job(s) are programmed and selected for appropriate channel group. If part management is active, click the Part Management button and Select a Part to Run or Load a Vision Database. Otherwise, right-click the statistics tabs for each channel and Select Job.
2. The part graphic is already labeled for each area of inspection (i.e., flange, neck, etc.) Look at part graphic to see which groups are assigned to specific areas of the part.
3. Right-click the part graphic tab and choose Setup...

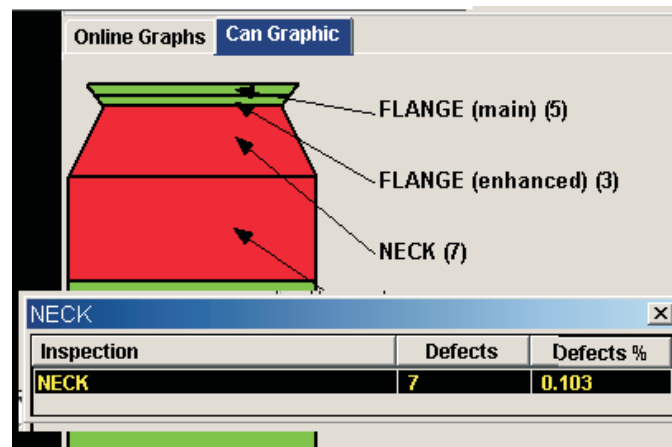


4. Assign appropriate inspections to the proper groups. Note that you can re-name the groups to something more meaningful, if desired.

See page 15 for information on Inspection Grouping.

Using the part graphic

- Move your cursor over the part graphic to see the associated group names highlighted
- Right-click to bring up Retro-Spec interface for that area (if available)
- Click on an area to see individual inspection statistics for that group
 - Double-click the name of the inspection to modify it



We clicked on Neck area of part graphic to display statistics

☞ *Be sure to click the 'X' in the upper right corner of the statistics box to remove from screen*

Part Graphic Options

Right-click on part graphic tab to see options.

Print Statistics	Print to printer, file, or both, online or offline. When you print to file, its file type (.txt, .csv, .xls) is determined by the setting in the System Configuration, Reports menu (Administrator only).
Display Mode	Choose between Count and Percent. Count displays the number of defects in the group on the part graphic. Percent displays the percentage of defects in the group since the statistics were last reset.
Setup...	Brings up Group Reporting screen. See below for details.
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 (as shown on page 12). 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. To exit the large display, right-click over the name of the part graphic and choose Exit Large Display. Or, if you choose Setup..., this exits the large display and also brings up the Group Reporting screen.

Inspection Grouping

This feature allows you to assemble inspection data into groups. You may define up to 16 groups.

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.

MyCamera 4	Machine Part #1	Machine Part #2	Machine Part #3	Machine Part #4	Groups
Groups		Last (10000)		Last (10000)%	
Group 1		0		0.000	
Group 2		26		7.471	
Group 3		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 channel. No mixing inspections from channel 1, channel 2, etc.
- Inspections must be programmed before you enter group setup.
- If using Part Graphic, groups are already assigned to part areas.
- The setup procedure will use the inspections from the currently selected job, so select the desired job before entering setup.

Assigning inspections to groups:

1. Log in.
2. Choose any method to get to the setup screen:

- Right-click Part Graphic tab and choose Setup... OR:
 - Right-click Groups tab, Choose Setup... OR:
 - Click the Part Management  button, Group Reporting tab, Setup... button.
3. Select the desired channel and the desired group. Rename group if desired.

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



The screenshot displays the software interface with several key components:

- System Overview / Groups Tab:** Shows inspection data for two channels: MAIN IMAGE [202-12 OZ.] and NECK / FLANGE [202-12 OZ.].
- Channel Defects Summary Bar Chart:** A bar chart showing the number of defective parts for each channel. The Y-axis is 'Defective Parts' (0-10). The X-axis is 'Channels'. The bars are labeled 'MAIN IMAGE' with a value of 8 and 'NECK / FLA...' with a value of 7.
- Group Reporting Dialog:** A dialog box for configuring a group. It has two columns: 'Inspections (202-12 OZ.)' and 'Inspections (from MAIN IMAGE) In'. The first column lists various inspection types like TOP CENTERING, FLANGE, etc. The second column shows 'UPPER WALL' is selected. Below the columns are 'Add >>' and '<< Remove' buttons. At the bottom, there are fields for 'Channel' (MAIN IMAGE), 'Group' (UPPER WALL), and two percentage boxes (0.040% and 0.080%) for warning and failure thresholds. An 'OK' button is at the bottom right.
- Online Graphs / Can Graphic:** A 3D diagram of a can with colored sections. Labels point to different parts: FLANGE (main) (2) in red, FLANGE (enhanced) (2) in yellow, NECK (6) in yellow, UPPER WALL (3) in green, MID WALL (0) in green, LOW WALL (1) in green, and BOTTOM (2) in green.

4. From the Inspections column, select all the registrations and inspections you want in the selected group. (Click the inspection name again if you want to de-select it). Click Add.
5. Type a warning percentage in the yellow box. Type a failure percentage in the red box. These numbers are used in the part graphic for quick defect percentage identification. See page 12 for part graphic.
6. Repeat steps 3-5 for all groups in the part graphic. Click OK when finished.
7. Repeat for all channels.

The Groups tab in the statistics area displays the total defects and defect 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.

MyCamera 4	Machine Part #1	Machine Part #2	Machine Part #3	Machine Part #4	Groups
Groups		Last (10000)		Last (10000)%	
Group 1		0		0.000	
Group 2		26		7.471	
Group 3		0		0.000	

Using Group Outputs

You can assign each group to one of three 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
- Each group can only be made up from one channel, but multiple groups can be from different channels, and can be assigned to one output.

Series IV systems

The outputs may be accessed from the Extended I/O terminal block TB1, terminals 64, 65, and 66 (Group 1, Group 2, Group 3 respectively). See page 2-14 in the Intellispec Hardware Guide for a sample circuit.

Series III systems with Extended I/O

The outputs 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). Please refer to the Intellispec Hardware Guide for information about outputs – required modules, power supplies, circuits, etc. It can be found in Chapter 2 in the Extended I/O assembly section (published in 2003 or later).