

INTELLISPEC

Programming Guide

For Software Versions 3.0 and 3.1

See Addendum for 3.1 features

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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.

About this manual

This manual is your guide to programming and operating the Intellispec system. We will discuss all menus and operations of the Intellispec system. The Hardware portion of the system is discussed in a separate manual: "The Intellispec Hardware Reference Guide."

We recommend a formal training class either in our classroom facilities in Cleveland, Ohio USA, or on-site at your facility. Please contact Pressco's training department for information about classes. This manual should be used as a reference after you have received training.

Typographical conventions of this manual

For your understanding of this manual, following is a list of conventions we use:

 *Tips or notes about a subject appear like this*

Warnings or Cautions are headed like this

Warning or Caution messages

- Names of menu items or parameters are Capitalized.

Parameters These are described and written like this.

How to Contact Pressco

If you need assistance in setting up your Intellispec or troubleshooting it, please contact Pressco:

Pressco Technology Inc. 29200 Aurora Rd. Cleveland, OH USA 44139

Phone: (440) 498-2600

Fax: (440) 498-4761

E-mail: service@pressco.com

Web Site: www.pressco.com

Business Hours: Monday - Friday, 8:00am - 5:00pm Eastern Standard Time

Technical Support Hotline: (440) 498-2000
Monday - Friday 8:00am - 8:00pm
Saturday, Sunday 8:00am - 5:00pm EST

Dial-in Support

An additional service that Pressco provides is a dial-in service. If your system's modem is properly connected to a phone line, Pressco can dial into your Intellispec and view your Intellispec screen exactly as you see it – online or offline. A Pressco technician can provide suggestions in parameters and system configuration, and troubleshoot your system.

Your Intellispec must be operational (i.e., If your system is not on or if there is a power failure and the entire system is down, Pressco will not be able to view the data either).

This service requires a phone line and pcAnywhere™ software (this is already installed on your machine). Please contact Pressco technical support during regular business hours to use this service.

Please see Chapter 11 for more information about Dial-in Support.

Safety Considerations

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

Warning

Many Intellispec systems utilize a part rejection device which blows defective products off the conveyor with high-pressure compressed air. They also utilize reject arms. Be aware of the potential for projectiles to strike persons and cause injury.



Warning

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

Static Discharge Protection



Electronic components can be damaged by static electricity discharge. 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.

Power Up/ Power Down

Refer to your Intellispec Hardware Guide for locations of switches and hardware components.

Power Up

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

Note: The following three switches must be in the ON position:

- The breaker on the front of the AC power module (Up position for ON)
- The power switch on the right front of the UPS (Uninterruptible Power Supply)
- The power switch on the left front of the computer

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

Power Down

If UPS is configured:

If the UPS is configured, simply switch off the rotary switch on the left side of the Processor Cabinet.

☞ *To see whether your system's UPS is configured, you must be logged in as an Administrator, and the system must be offline. Click the System Configuration*



button , and check the Show All Advanced Parameters button in the System menu. The UPS is configured if the box next to 'UPS Configured' is checked.

If 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.

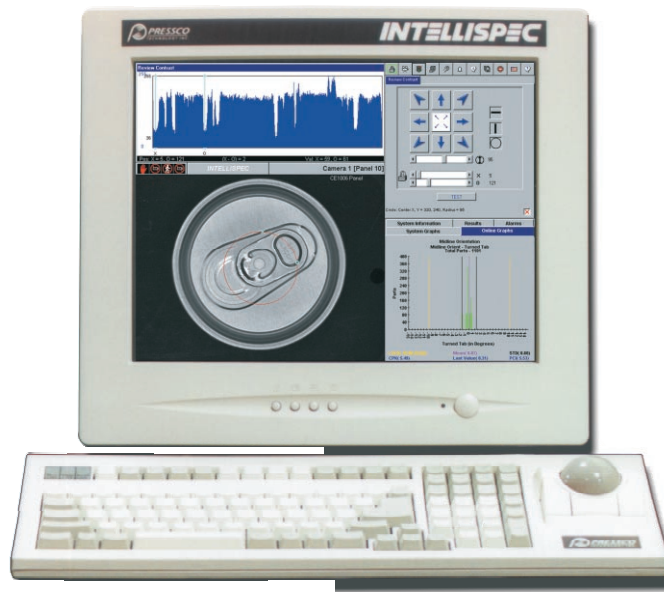
➡ Refer to your Intellispec Hardware Guide for location of components and switches. Look for Power-down Procedure topic.

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

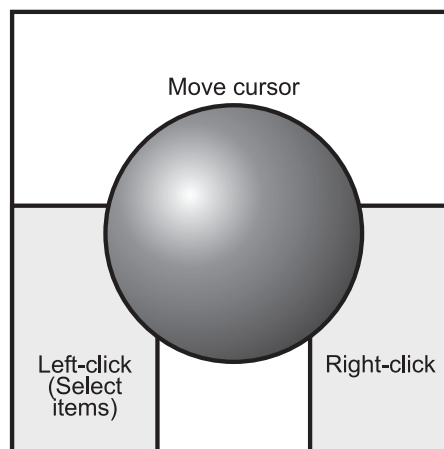


Chapter 2 - Navigating Through the System

User Interface

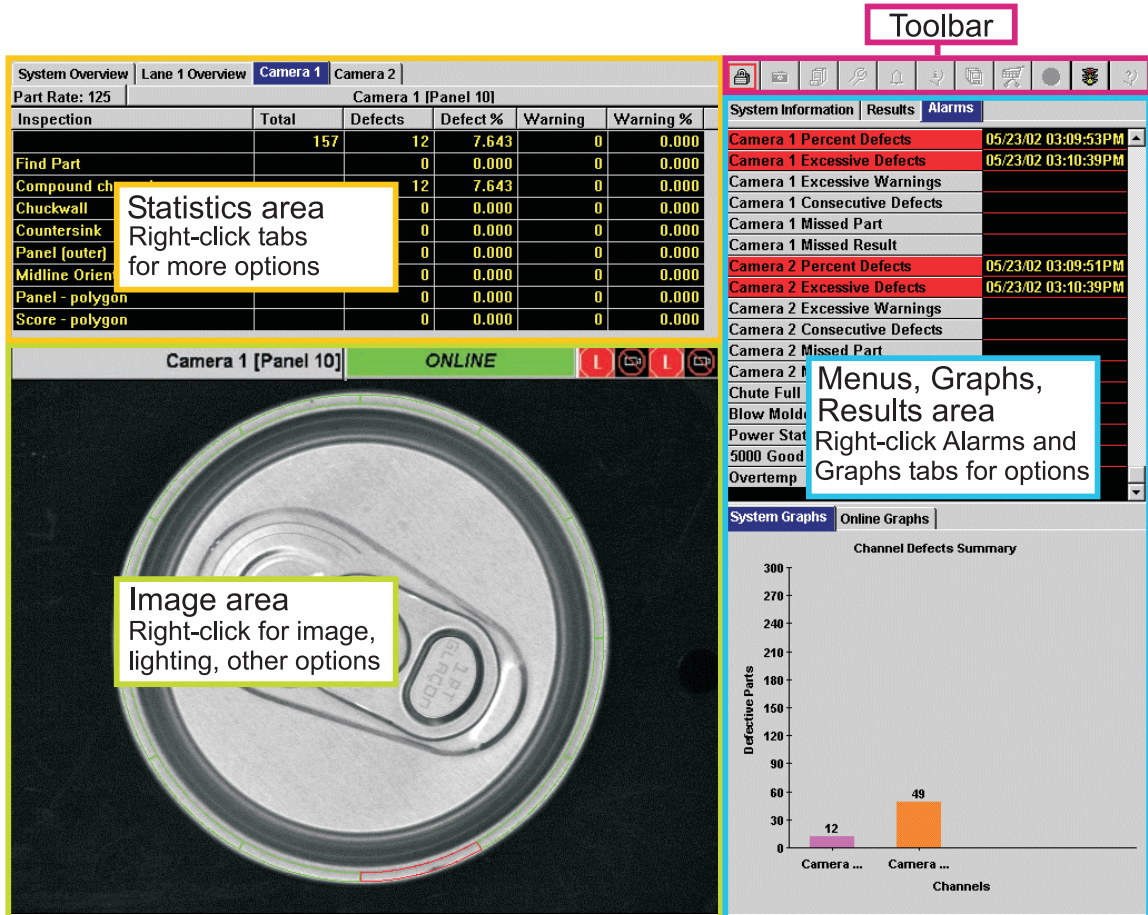


The user interface consists of a monitor and keyboard with a built-in trackball. The trackball moves the cursor. The left trackball button selects items on the screen. The right trackball button calls up additional menus in some places on the screen.



Areas of the screen

This picture shows the different areas of the screen, which are described next.



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. Most of the detailed configuration information, however, is described in later chapters.

Login/ Logoff



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.

Note that on the System Information screen, the logged-in user is displayed, along with the user’s access level. User’s actions, such as putting the system online or

offline, or job changes, are recorded in the system log files, and are viewable by the Administrator.



Single Snap/ Continuous Snap

Offline only. Right-click to change modes.

Single snap

Click to snap an image. The current channel's camera takes one image. This is useful for testing a parameter change in a job.

Continuous snap

Right-click and select Continuous Snap to put into this mode. The button changes to a movie camera when in Continuous Snap mode.

Click the movie camera to begin snapping images. The current channel's 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.

The images taken depend on Offline Acquire mode in System Configuration (Administrator only). The Administrator can choose between Immediate and Part Present. Immediate means that the camera will take a picture regardless of what is under the camera – the production line does not need to be moving. Part Present means that the system will wait till the next part triggers the part present sensor, then takes a picture – the production line must be moving.

Snap Interval

Click to enter the time interval between images, and click OK.

Live Image

Right-click and select Live Image to put into this mode. The button changes to an eye when in Live Image mode.

Live image displays images as fast as they are digitized, with no delay between images. This mode is useful for setting focus and lighting.



Part Management

Offline only. Available if Administrator has selected Which Part in System Configuration and has programmed at least one part. Through this option, you can choose a part to inspect, and the system will assign the proper jobs to all channels.



System Configuration

Offline only. Administrators only. This group of menus allows you to perform advanced system and channel setup, and to configure the correlation option if present.



Alarm Configuration

Offline only. Viewable by Mechanics; only Administrators can change settings. These menus allow you to enable or disable alarms, choose whether an audible or visual signal should be triggered by an alarm, and choose the duration of these signals.



Diagnostics Tools

Offline only. Mechanic user level and higher. These hardware diagnostics allow you to test individual I/O signals, correlation signals (if present), and to view the Intellispec's computer hardware configuration.



Database Tools

Offline only. Mechanic user level and higher. Through these menus, you can save or load different system or inspection databases, perform database repairs, or use the Database Detective (Wombat).



Miscellaneous

Offline only. Administrators only. These menus allow you to view log files, upgrade the software, manage user accounts, shut down the system, among other options.



Language Selection

Offline only. Select a language in which to operate the Intellispec. Languages available are displayed in the drop-down menu.



Online/ Offline

Click to change modes.

The Intellispec system has two modes of operation: Online and Offline mode. Online mode is used for everyday inspecting of a product. Offline mode is used to train the system to a particular product and to configure the system.

The light on this button is green when the system is online. It is red when the system is offline.



Help

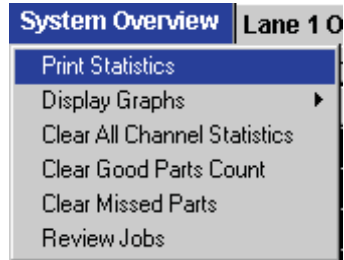
Offline only. Select a help topic to assist you with inspecting your product.

Statistics area

System Overview	Sidel Overview	Base	Neck	Seal	Cavities	Spindles	Infeed Transfer Arms	◀	▶
Part Rate: 124		Base [Base Inspection 5]							
Inspection		Total	Defects	Defect %	Warning	Warning %	▲		
		14	12	85.714	0	0.000			
Find Gate			5	35.714	0	0.000			
Gate Defects			6	42.857	0	0.000			
Around the Gate Defects			9	64.286	0	0.000	▼		
Date/Time	Cavity	Spindle	Infeed Transfer	Outfeed Transfer	▲				
2002-05-23 14:46:37	10	89	7	8					
2002-05-23 14:46:36	9	88	6	7					
2002-05-23 14:46:36	8	87	5	6					
2002-05-23 14:46:35	7	86	4	5					
2002-05-23 14:46:34	4	83	1	2					
2002-05-23 14:46:34	3	82	8	1					

This area displays inspection results. The tabs at the top of this section will vary depending on your system configuration. The System Overview tab displays inspection results for all channels. You may have a Sidel Overview or Lane 1 Overview tab that displays correlation results (if applicable) or channel group statistics. Individual channel statistics tabs are also present. In addition, if your system has the correlation option, correlation summary tabs are present.

Statistics options



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

Print Statistics

You can print job statistics if your Intellispec has a printer attached and configured. You may print these statistics whether the system is online or offline. If you encounter an error, make sure your printer is properly attached, configured, and ready.

Display Graphs

Display the summary graphs for defects on all channels, or correlation graphs if you have the correlation option installed.

Clear All Channel Statistics

Resets the number of inspected parts, the number of defective parts, and the number of warning parts to zero on all channels.

Clear Good Parts Count

Resets the Good Parts alarm counter to zero.

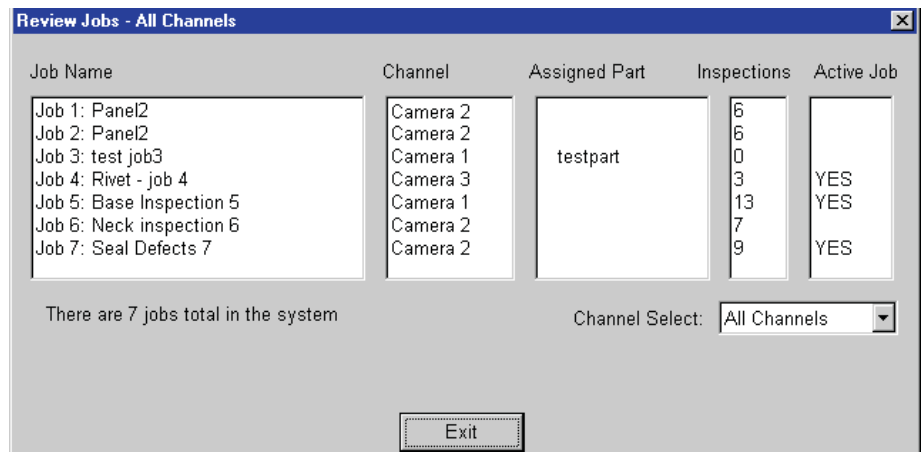
Good Parts is an alarm that can be used as a part counter. For example, say you are inspecting preforms, and have a box at the end of the conveyor (after inspection) that holds 5000 preforms. This alarm will count the number of good inspected parts, and notify you when 5000 good parts have reached that box. In addition, the External Stop signal, in this application, will 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.

Clear Missed Parts

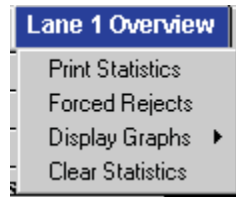
Resets the number of Missed Parts to zero. Please see page 2-11 for more information about Missed Parts.

Review Jobs

Offline only. This displays a list of all jobs in the current database, the channel to which they are assigned, whether the jobs are assigned to Parts, the number of inspections per job, and whether any of the jobs are currently assigned to channels (active job).



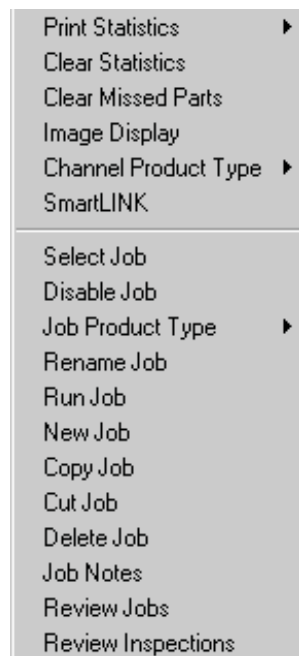
Channel Group Overview



The name of this tab varies depending on your system configuration. The information under this tab reports statistics for a group of channels.

Print Statistics	You can print channel group statistics if your Intellispec has a printer attached and configured. You may print these statistics whether the system is online or offline. If you encounter an error, make sure your printer is properly attached, configured, and ready.
Forced Rejects	This menu is only valid if you have the correlation option installed. Please see page 6-4 for information about the Forced Reject menu.
Display Graphs	Display the summary graphs for defects on all channels, or correlation graphs if you have the correlation option installed.
Clear Sidel Statistics	Resets the statistics for the group of channels reported in this tab.

Job options



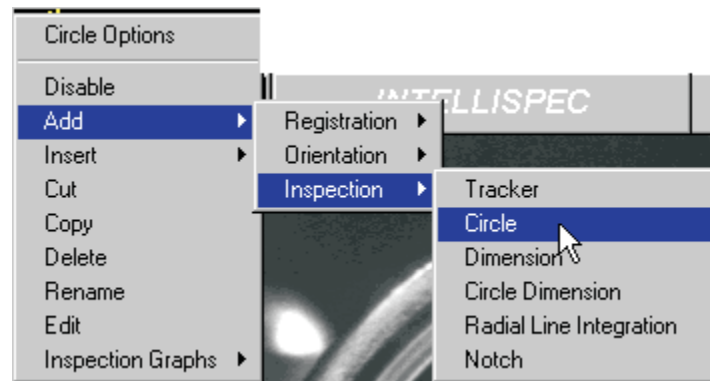
Right-click the Camera *n* tab to see the job options. Some options are only available to Mechanic or Administrator user levels.

Print Statistics	You can print channel statistics if your Intellispec has a printer attached and configured. You may print these statistics whether the system is online or offline. If you encounter an error, make sure your printer is properly attached, configured, and ready.
Clear Statistics	Resets the number of inspected parts, the number of defective parts, and the number of warning parts to zero for this channel. All channels that are part of the same channel group will have their statistics cleared as well.

Clear Missed Parts	Resets the number of Missed Parts for the current channel to zero. Please see page 2-11 for more information about Missed Parts.
Image Display	Set Freeze Frame settings, or Image Display settings to display images online. See pages 5-3 and 5-4 for information about these settings.
Channel Product Type	(Mechanic user level and higher) Offline only. View the default product type for the current channel. Product Type limits the available inspections to those that are most commonly used for a certain type of part.
SmartLINK	Available only when SmartLINK enabled for a channel. To enable (Administrators only), go to System Configuration, Channel Groups, choose a group, Channel tab, choose a channel, and check SmartLINK under the General tab. This feature 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, (4) pulse the SmartLINK output, or (5) run another job, 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. See page 4-10 for more information about this feature.
Select Job	Offline only. Select the job to run on the current channel. Note that if Part Management (described on page 5-1) is available, all jobs are loaded for all channels by choosing one part name.
Disable Job	(Mechanic user level and higher) Disable the current job. This can be done online so that other channels continue to inspect while you make changes to this job.
Job Product Type	(Mechanic user level and higher) 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 channel's Default Product Type.
Rename Job	(Mechanic user level and higher) Offline only. Change the name of the current job.
Run Job	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.
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 channel, 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 channel or another channel.
Cut Job	(Administrator only) Offline only. Select a job to remove it from the list of jobs from the selected channel. This places the job on the clipboard. Then use Paste Job to place the job into any channel.
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 channel.
Delete Job	(Administrator only) Offline only. Removes a job from the selected channel. This removes it completely from memory. It will also remove the job from the current database if you save the database again.
Job Notes	(Editing: Mechanic user level and higher) Select the job to review job notes. When Editing is Enabled, enter notes about the job (e.g., 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, the channel to which they are assigned, whether the jobs are assigned to Parts, the number of inspections per job, and whether any of the jobs are currently assigned to channels (active job). (See example on page 2-5)
Review Inspections	Select a job to see all the inspections used in that job. It lists the inspections by name and inspection type. This is useful if you want to modify an inspection and need to refer to the Inspections chapter (Chapter 10).

Inspection options

When the System Overview or individual channel 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 menu.



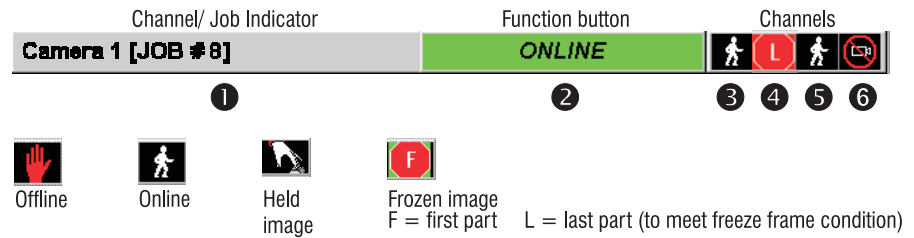
Note that your user access level limits available menu options.

- Disable** (Administrator only) Disables the selected inspection. This can be done online, so you can modify the inspection without stopping inspection on the channel, if desired.
- Add** (Administrator only) Offline only. Add a Registration, Orientation, or Inspection to the job. The item is added as the last element of the job.
- Insert** (Administrator only) Offline only. Insert a Registration, Orientation, or Inspection *before* the inspection over which you right-clicked to see this menu.
- Cut** (Administrator only) 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** (Administrator only) 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** (Administrator only) 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.
- Delete** (Administrator only) 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.
- Rename** (Mechanic user level and higher) Offline only. Rename the currently selected inspection.
- Edit** (Mechanic user level and higher) The inspection menus are displayed on screen right, and the proper channel's image is displayed.

☞ *Alternative to using Edit in menu: simply double-click the desired inspection name in the black area.*

- Inspection Graphs** Select an inspection graph to display on the Online Graphs screen. (See page 3-12 for more information about graphs)

Image toolbar



This allows you to easily select a channel to display, release frozen images (online), and see the active channel and job. The next few paragraphs explain how the above-numbered buttons of the image toolbar can be used.

Change channel

Click one of these **3 4 5 6** to display desired channel. Click **2** to scroll through all channels (online). Current channel, job name displayed on **1**.

Hold/ Freeze channel (online)

Hold image: Select desired channel (**3 4 5 6**), then left-click on image.

Freeze Frame setup (for all channels): Click any channel's Statistics tab, right-click for menu, select Image Display. Select desired freeze frame condition in menus on screen right. Click OK [✓].

Release channel (online)

Right-click one of these **3 4 5 6** to release a frozen channel. Right-click **2** to release all frozen channels. Note: Freeze Frame conditions may cause another image to freeze.

Image area



One image at a time is displayed here, along with inspection regions if you are programming a job or displaying regions 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. For example, Camera Control and lighting options are available to Administrators.

Clear Image Graphics

This menu item, available by right-clicking on the image, removes inspection/ orientation/ registration graphics from the grayscale image.

Please see Chapter 7 for a description of camera, lighting, and imaging options.

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. The system tabs are described next.

System Information

System Information | Results | Alarms

Intellispec 3.00
Copyright 1990-2002

Current User: Administrator
User Access: Pressco Technician
Current Part: Another part
Active Database: — No Database —
System status: Offline
Lane 1 Group rejecter: Enabled

Missed Part Overview

Channel:	1	2	3	Total
Part Presents:	0	0	0	0
Results:	0	0	0	0
Date last cleared:	05/10/2002 15:10:46			

May 13, 2002 02:01:10 PM

This screen displays information such as the current software version, the user currently logged in, the name of the part being inspected (if Part Management is being used), and whether the system is online or offline.

Missed Parts

The Missed Part 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.

A Missed Part is defined in two ways: either a missed part present signal or missed part results. A missed part present signal indicates the system was busy processing other parts when this part present inspection request came in. Missed part results means 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, click the System Overview tab (upper left screen), right-click, and select Clear Missed Parts.

Results

System Graphs | **Results** | Online Graphs | Alarms | Offline Graphs

INSPECTION FAILED.

FAILED 1 Segments

Edge Count PASSED: (0 to 28)
Fewest: 6 Most: 27 Average: 12

Edge Blob Count FAILED: (0 to 0)
Fewest: 0 Most: 2 Average: 0

Largest Edge Blob Mass: (10 - 20000) 15

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

Alarms

Alarms	
Alarms	Time Occurred
Channel 1 Percent Defects	01/04/02 04:34:42PM
Channel 1 Excessive Warnings	
Channel 2 Percent Defects	
Channel 2 Excessive Warnings	01/04/02 04:34:45PM
Channel 3 Percent Defects	01/04/02 04:34:42PM
Channel 3 Excessive Warnings	
Chute Full*	
Blow Molder Door*	

Red is Alarm, Yellow is Warning.

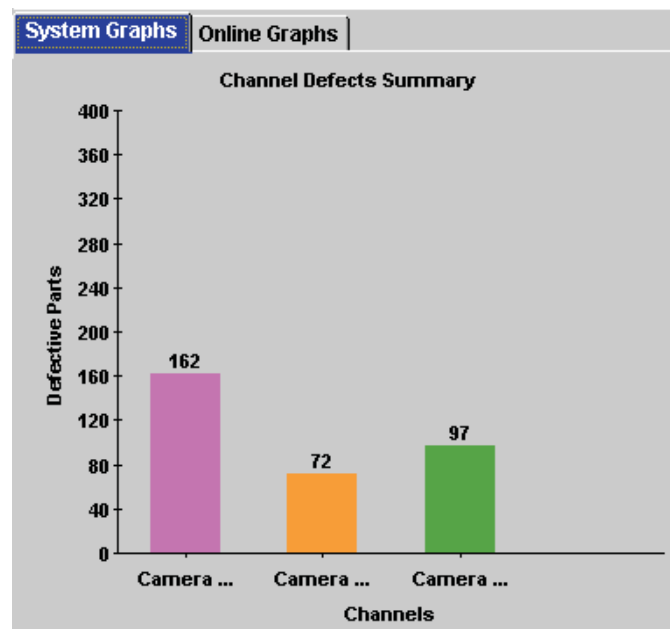
*PET-specific application alarms. Chute full alarm – clear chute. Blow molder door alarm – close door.

This screen displays the status of all enabled alarms. If an alarm has been triggered, it is displayed in red, along with the time and date at which it was triggered. If an alarm reaches warning status, it is displayed in yellow. If an alarm has not been triggered, it is simply listed in gray.

To clear alarms, click the Alarms tab. Right-click for menu. Clear all alarms or a selected alarm.

When the system is online, if any alarms have been triggered, this screen remains displayed on top of the other screens until you clear the alarm(s).

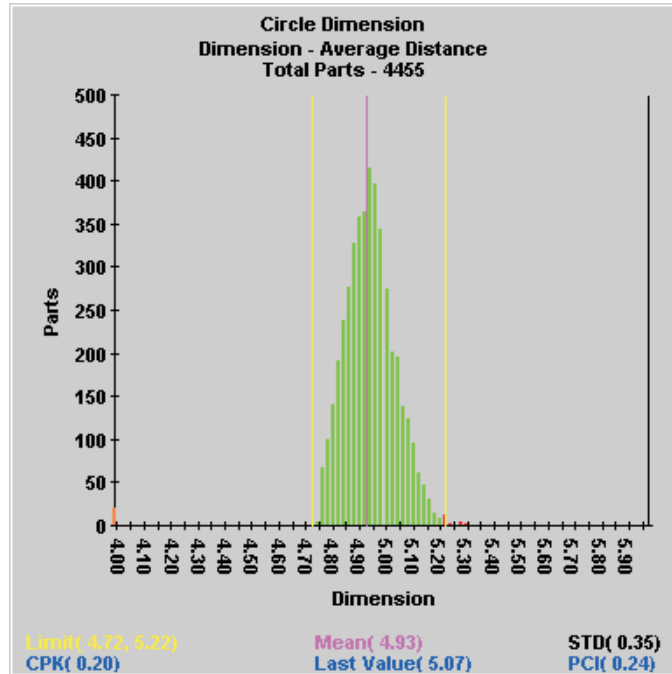
System Graphs



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, right-click the System Graphs tab, and make your selection from the available graphs. You may also choose a graph by selecting System Overview tab or Sidel or Lane 1 Overview tab. Right-click, and select a graph from the list.

Online Graphs



These are the inspection graphs. To select a graph, right-click the name of an inspection in the Statistics area, click Inspection Graphs, and 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.

➡ See page 3-12 for more information about graphs.

Offline Graphs

These are inspection graphs available when you are editing an inspection (Mechanic user level and higher). They are useful when setting up and testing an inspection as you can adjust parameter limits while viewing the test data on the graph.

To view a graph, edit an inspection – double-click on the inspection name. Right-click the Offline Graphs tab, and select a graph.

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

Exiting menus



To exit inspection menus, configuration menus, etc., 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.



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.

Passwords

To protect system configuration and parameters from being changed by unauthorized users, the Intellispec has multiple user levels to allow different users different privileges.

The levels and the general areas they can access are illustrated below:

User Level	Online access: edit jobs	Assign jobs, view & print statistics, put system online & offline	Offline: edit jobs, database access, load & save images, image analysis	User account management, create jobs, light control, camera control, system configuration
Operator		■		
Mechanic	■	■	■	
Administrator	■	■	■	■

Additionally, there is a built-in Pressco Technician account that you cannot modify, for use by Pressco Service Engineers.

Enabling or Disabling Password to go offline

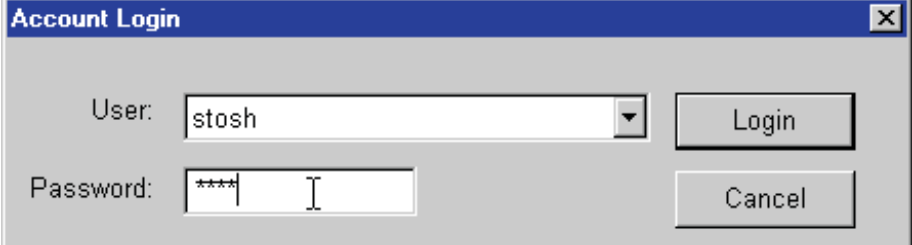
The Administrator can determine whether you need a password or not to take the system offline. Log in as Administrator. With the system offline, click the System Configuration button . With the System tab selected, check the Show All Advanced Parameters box. Check the Offline Password Required box to enable this feature, or un-check to disable it. If Enabled, users are required to select a user name and enter the correct password before the system will go offline. Save changes and exit the menu.

Login

Offline login

To log in, click the  button. 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. Click Login.

A screenshot of a Windows-style dialog box titled "Account Login". It has a blue title bar with a close button (X) in the top right corner. The dialog box has a light gray background. It contains two input fields: "User:" with a dropdown menu showing "stosh" and "Password:" with a masked input field showing four asterisks. To the right of the input fields are two buttons: "Login" and "Cancel".

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.

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

You must log in to access most system functions. If your access level does not allow you to enter a certain area of the system, you will not be allowed to enter that menu.

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.

Online login

When the system is online, you will be required to log in if you want to edit a job (Mechanic user level and higher), or if your system requires a password to take the system offline.

Logoff

Once you are finished modifying a job, for example, you would probably want to log off to prevent unauthorized users from altering the system setup. To log off, simply click the  button.

If you put the system online, the system automatically logs you off.

What is my user access level?

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

Change Password

To change your password, you must first log in (in offline mode). Click the Miscellaneous  button. Under the Users tab, click Change Password. Enter your current password (Old Password), move the cursor and enter the New Password, then move the cursor and enter your new password a Second Time to verify. Click Change to complete the changing of your password, or Cancel if you decide not to

change your password.

A dialog box for changing a password. It contains four text input fields: 'User' with the text 'operator', 'Old Password' with six asterisks, 'New' with five asterisks, and 'Second Time' with five asterisks. To the right of the 'User' field is a 'Change' button. To the right of the 'Old Password' field is a 'Cancel' button.

User Account Management

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.

If you are an Administrator, log in (in offline mode), click the Miscellaneous button, Users tab, and Account Setup button.

Create New Users

To add a new user account, click the New button. Type a name for the new user in the New Account box. Then move the cursor and type a password from one to 10 digits in length. Choose an Access Level for the user from the drop-down menu, and click Create.

A dialog box for creating a new user. It contains four text input fields: 'Select Account' with a dropdown menu showing 'Administrator', 'New Account' with the text 'Shift 1', 'Password' with three asterisks, and 'Access Level' with a dropdown menu showing 'Operator'. To the right of the 'Select Account' field is a 'Modify' button. To the right of the 'New Account' field is a 'New' button. At the bottom left is a 'Create' button, and at the bottom right is an 'Exit' button.

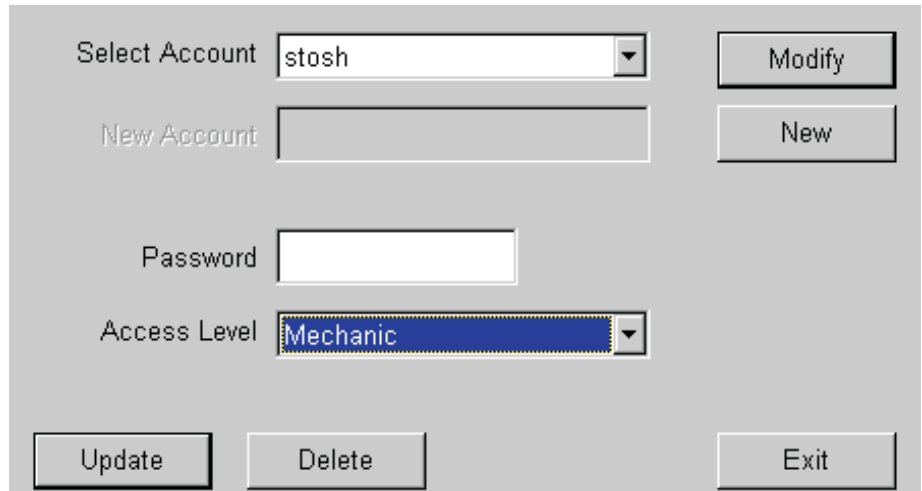
The system will verify that a new user account has been created. Click Exit to close the menu.

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

Change a User Account

If you want to change the user Access Level or password for an existing user, click the Modify button from the User Account Management menu. Choose an account from the Select Account drop-down menu. Type a new password, or change the

Access Level for that user, and click Update.

A screenshot of a 'User Account Management' dialog box. It has a light gray background. At the top, there's a 'Select Account' label followed by a text box containing 'stosh' and a small downward arrow. To the right of this is a 'Modify' button. Below that is a 'New Account' label followed by an empty text box, with a 'New' button to its right. In the center, there's a 'Password' label followed by an empty text box. Below that is an 'Access Level' label followed by a dropdown menu showing 'Mechanic' in blue text. At the bottom, there are three buttons: 'Update', 'Delete', and 'Exit', spaced out horizontally.

The system will verify that the account has been changed. Click Exit to close the menu.

Delete a User

From the User Account Management menu, Select an Account from the drop-down menu, and click Delete.

The system will ask if you are sure you want to do this. If you click Yes, the system will verify that the account has been deleted. Click Exit to close the menu.

Language selection

Click the Language selection  button to select a different language in which to display the Intellispec software. The available languages will appear in the drop-down menu.

Help

Click the Help  button to see tutorials that will assist you in inspecting specific parts, and specific defects for that type of part. Note that these tutorials are based on standard part programs. Your parts might be slightly different and may require different parameter settings.

Menu flowcharts

See the next few pages.

Statistics area

System Overview

- X — Print Statistics
- X — Display Graphs
 - Channel Defects Summary
- O — Clear all channel statistics
- O — Clear good parts count
- O — Clear missed parts
- O — Review Jobs

Lane Statistics

- X — Print Statistics
- O — Forced Rejects
- X — Display Graphs
 - Channel Defects Summary
- O — Clear Sidel Statistics

Channel *n* Statistics

- X — Print Statistics
- O — Clear Statistics
- O — Clear Missed Parts
- X — Image Display (Freeze Frame, Display Control menu)
- M — Channel Product Type (view only)
- M — SmartLINK (when enabled)
- O — Select Job
- M — Disable Job
- M — Job Product Type
- M — Rename Job
- O — Run Job
- A — New Job
- A — Copy Job
- A — Cut Job
- A — Paste Job
- A — Delete Job
- O — Job Notes
- O — Review Jobs

3.0 Software Menu tree page 1 of 5

Information/ Graphs area

- X System Information
- X Results
- X Alarms
 - Clear All Alarms
 - Clear Individual Alarms
- X Online Graphs
 - Clear
 - Rescale
 - Print
 - Save
- X System Graphs
 - Channel Defects Summary
 - Print
- M Offline Graphs
 - available inspection graphs
 - Clear
 - Rescale
 - Print
 - Save
 - Save All

Image area

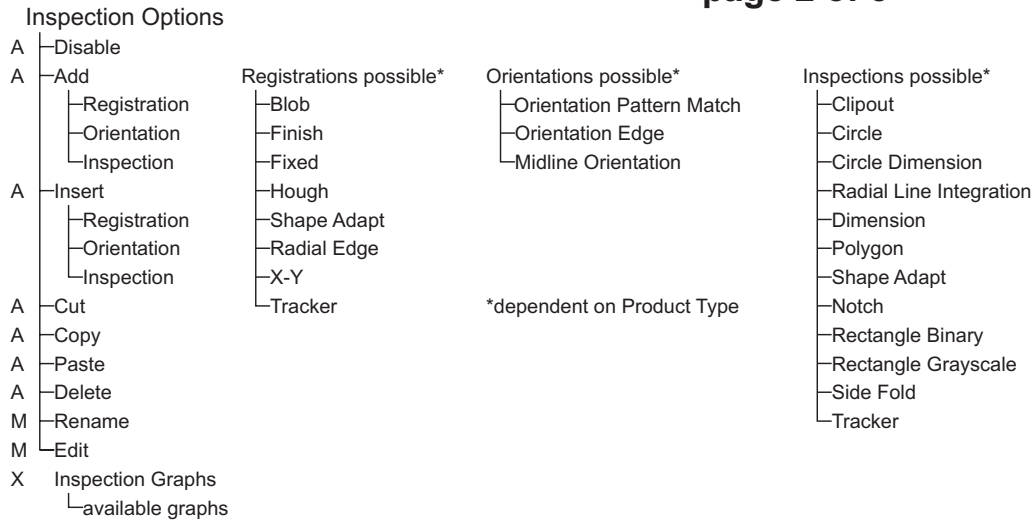
- X — Select
 - Channel *n*
- M — Image
 - Save
 - Restore
 - Autosave
 - Tools
 - Acquire Mode
 - Image Source
 - Memory
- O — Image Display Options
 - Freeze Frame
 - Image Display Settings
- M — Image Analysis...
- A — Camera Control Tool...
- A — Lighting...
- A — Pixel Calibrate...
- O — Clear Image Graphics

Access level key

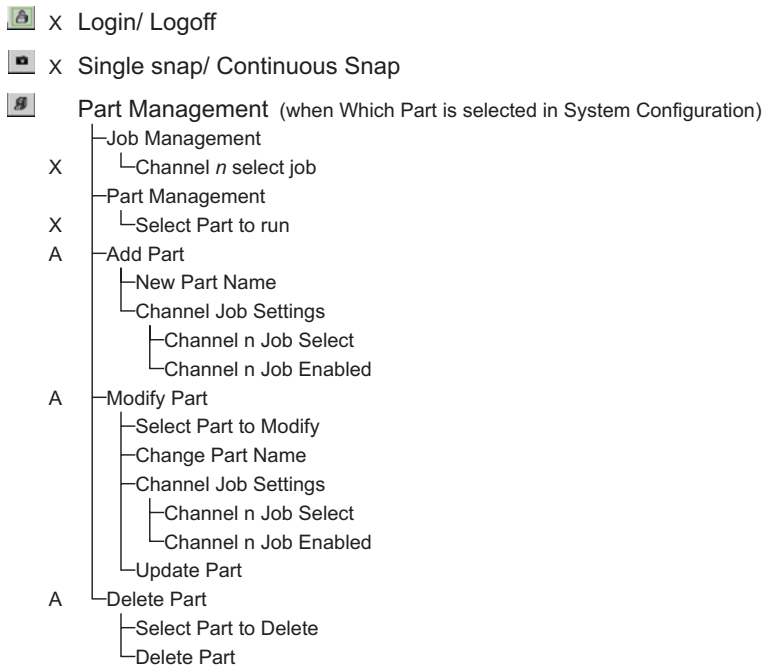
- X = anyone can access
- O = Operator level and higher
- M = Mechanic level and higher
- ↓ A = Administrator only
highest access level

3.0 Software Menu tree page 2 of 5

Inspections



Toolbar menus

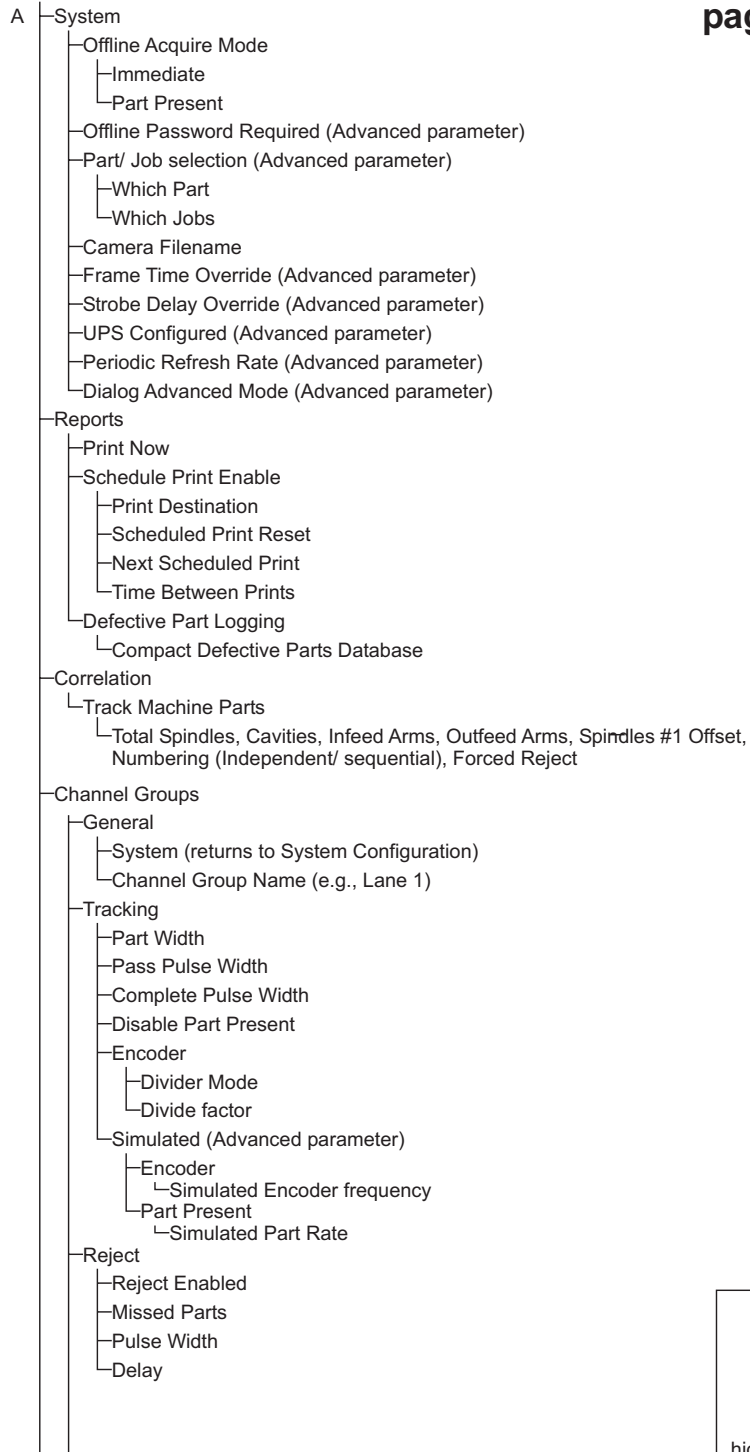


Access level key

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



System Configuration



3.0 Software Menu tree

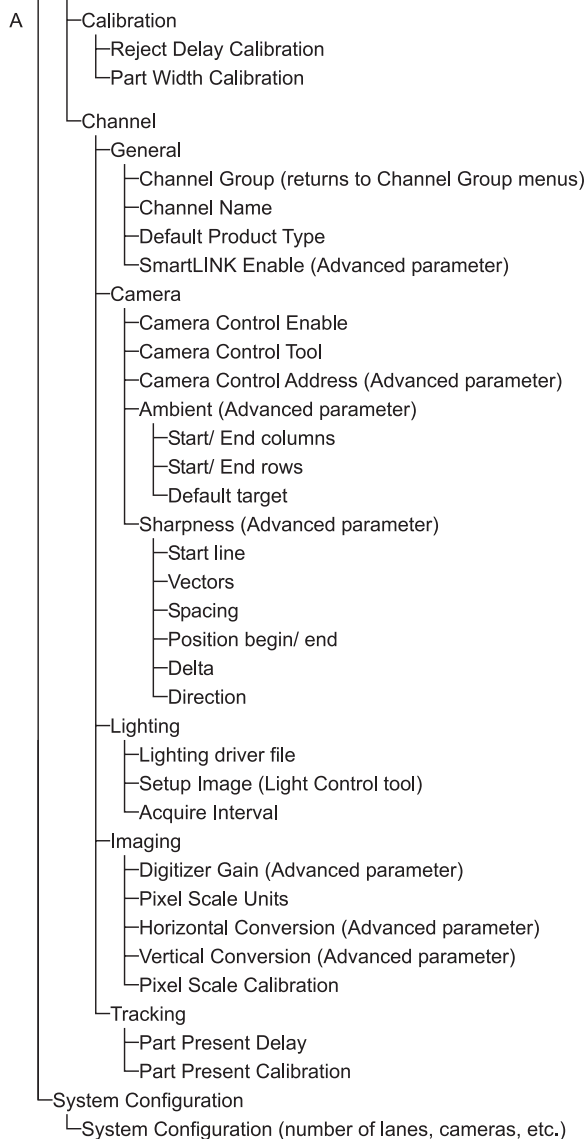
page 3 of 5

Access level key

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



System Configuration (continued)



3.0 Software Menu tree page 4 of 5

Access level key

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

3.0 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
- A
 - Channel Alarms
 - Percent Rejects
 - Excessive Defects
 - Excessive Warnings
 - Consecutive Defects
 - Missed Parts
 - Missed Results

Diagnostics Tools

- M
 - General
 - Computer
 - Color Test
- M
 - I/O
 - I/O Testing
 - Show I/O Rates
 - Part Rate
 - Encoder frequency

Database Tools

- Database Tools
 - M
 - Vision Database
 - Load
 - Save
 - System Database
 - Load
 - Save
 - M
 - Database Utilities
 - Vision Repair
 - Configuration Repair
 - Alarm Repair
 - Database Detective (Wombat)
 - File/ Directory Utilities
 - M
 - Browse Directory
 - A
 - Delete Files
 - M
 - Format Floppy

-  A Miscellaneous
 - System
 - View Log Files
 - Shutdown (only if UPS not configured)
 - Utilities
 - Clear All Jobs
 - Clear Configuration
 - Software Upgrade
 - Hardware Controls
 - Toggle Video Mode
 - Reset Frame Grabber
 - Users
 - O
 - Change Password
 - A
 - Account Setup
 - A
 - Date/ Time adjust
-  O Language Selection
 - Select a Language
 - English
-  X Online/ Offline
-  X Help

Access level key

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

Chapter 3 - Reports, Statistics, Graphs

Overview

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 some statistics automatically, at intervals programmable by your Administrator. Statistics graphs can also be printed or saved on demand.

In this Chapter, we will describe how to save statistics or graphs manually, and how to copy this information to floppy diskette for you to use outside of the Intellispec.

What data is collected?

The following data is collected by the Intellispec:

1. Job statistics – parts inspected, parts rejected, which inspections failed
2. Correlation data – how many defects were associated with each cavity, infeed/outfeed transfer arm, and spindle. Only available if you have the correlation option.
3. Individual inspection graphs – 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.
4. Event logs
5. System setup parameters

The next few sections describe how to view, print, and save these items.

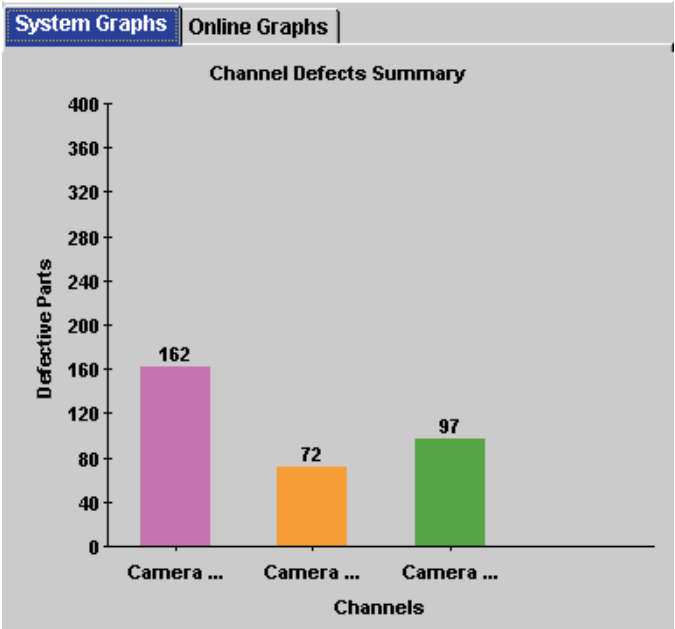
1 – Job statistics

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 Channel Defects Summary graph displays the overall statistics for all channels. This is a graph that shows the defects found from all the channels. There is a vertical

color-coded bar for each of the channels. The bar height represents how many parts have failed for each channel. This can be displayed whether the system is offline or online. To display, click System Graphs tab, right-click, and choose Channel Defects Summary.



System Overview						Online Graphs					
System Overview						Base					
Part Rate: 124						Base [Base Inspection 5]					
Inspection		Total	Defects	Defect %	Warning	Warning %					
		14	12	85.714	0	0.000					
Find Gate			5	35.714	0	0.000					
Gate Defects			6	42.857	0	0.000					
Around the Gate Defects			9	64.286	0	0.000					
Date/Time	Cavity	Spindle		Infeed Transfer		Outfeed Transfer					
2002.05.23 14:46:37	10	89		7		8					
2002.05.23 14:46:36	9	88		6		7					
2002.05.23 14:46:36	8	87		5		6					
2002.05.23 14:46:35	7	86		4		5					
2002.05.23 14:46:34	4	83		1		2					
2002.05.23 14:46:34	3	82		8		1					

Statistics

The Statistics area displays detailed job information in tabular format. These graphs display the Part Rate, job name, total number of inspected parts for each channel, total number of defective parts for each channel, and the percentage of defective parts from each channel. The results for each inspection of the active job are also displayed.

You can select which statistics to display whether the system is online or offline:

- To display defect information for all channels, click the System Overview tab.
- Group statistics – may be labeled Sidel Overview if you have the correlation option, or Lane 1 Overview – displays statistics for a group of channels. It displays the total number of parts inspected, and the number of defective or warning parts. This tab also displays correlation data for this group of channels if you have the correlation option.
- To display defect information by channel, click the Channel *n* Overview tabs. If your system has the correlation option, the cavity, spindle, and transfer arm data is displayed by channel. Each occurrence is listed by time (most recent first).

- If your system has the correlation option, additional tabs are available – Cavities, Spindles, Transfer Arm correlation statistics.

Printing and saving job statistics

Automatic print or save

Job statistics information can be printed or saved automatically by the Intellispec if the system is set up to do so. The data can be saved every shift, hour, minute, or any time interval you find useful. Ask your Administrator if you want to have the system save data automatically. This is programmed through System Configuration, Reports.

The statistics are saved to a text (.txt) file into the C:\PETProvision\Reports folder. 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.

The text files are named as shown below:

	Channel number	
	Channel 1 = CH0	
	Channel 2 = CH1	Time
	Channel 3 = CH2	24 hour clock
	Channel 4 = CH3	Hour/minute/second



SysID

INTELLISPEC1

CH3

D06132001

T105329

.txt

Your system's identification

Date

Month/Day/Year

Automatic print configuration

Administrators only. Located under System Configuration, Reports tab.

System

Reports

Correlation

Channel Groups

System Config

Print Now

☒ Scheduled Print Enable

Print Destination

File

☐ Scheduled Print Reset

Next Scheduled Print

10:00

Time Between Prints

1:00

☐ Defective Part Logging

The next several parameters allow you to set up the Intellispec to print or save system statistics.

Print Now

Print the job statistics for all configured channels. This report prints the total parts rejected, percent rejected, warning parts, warning percentage, total passing parts, and passing percentage. A separate report is generated for each channel. The destination of the printed reports depends on the setting of Scheduled Print Destination (see below).

	The printing setup parameters are described next:
Scheduled Print Enable	Enables or disables the scheduled print feature. If Disabled, the next few parameters are not used. You will have to manually tell the system to print statistics when you want them printed. If Enabled, the next several parameters tell the system when and where to print the statistics automatically.
Print Destination	Choose between Printer, File, or Printer & File. When printing to a File, the system prints the inspection statistics data to a text (.txt) file in the C:\PETProvision\Reports folder. One file is created for each channel. This file can 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. See page 3-5 for an example of a printed text file. When you choose to print the statistics to a Printer, the system will output the current data to the system's attached printer. The data will not be saved to disk. When you choose Printer & File, the system saves the text files to disk, as well as printing the statistics to the attached printer.
Scheduled Print Reset	Choose whether to have the system reset the statistics after it prints the data to a file or printer. This can be useful if you schedule the printing to occur at the beginning or end of a shift. The statistics can be reset automatically.
Next Scheduled Print	Set the time that the next scheduled statistics print should occur. Specify the print time by hour and minute, using a 24 hour clock setting. This number updates dynamically, depending on the Time Between Prints. For example, if you want the system to print statistics automatically every ½ hour, beginning at 8:00am, set the Next Scheduled Print to 08 hours and 00 minutes. Then set the Time Between Prints to 0 hours and 30 minutes. After the system prints the statistics at 8:00am, this number will automatically update to read 08:30.
Time Between Prints	Set the number of hours and minutes between automatic printing. See the example above.
	<i>Defective Parts Database</i>
Defective Part Logging	If this is Enabled, the system will save the defective part information to a Microsoft Access database at: \PETProvision\Data\DefectiveParts.mdb. The information in this database includes the job that was running, the time and date when the defect occurred, and which inspection(s) failed. Additionally, if your system has correlation hardware, the database includes the spindle, cavity, and transfer arm that handled the defective part. To copy this database to floppy disk to use on your personal computer, use the Database Detective: Click the Database Tools button, Database Utilities, Database Detective, choose the Other tab, select Copy Files to Floppy, and click Next. Click Images. In the dialog box, scroll to .mdb files to list files of that type. Select the DefectiveParts.mdb file, click OK, and insert a floppy disk into the Intellispec drive. Click the Compress box to decrease the database file size for floppy if necessary, and click Next. The database will be copied to floppy diskette. See the Database Detective section (page 9-2) for more information about this tool. Consult your Microsoft Access Database user guide for information about using the database.

Compact Defective Parts Database

(Advanced parameter) This process takes the defective parts database and compresses it to allow more free space on the Intellispec's hard disk. You may also wish to compress the database before copying it to floppy if the file is very large.

Print on demand

You can print job statistics on demand if your Intellispec has a printer attached and configured. Click the desired Statistics tab, right-click, and select Print. You may print these statistics whether the system is online or offline.

If you encounter an error, make sure your printer is properly attached, configured, and online.

The inspection results for the jobs are printed, including the number of rejects, reject percentage, warning parts, warning percentage, and passing parts. These are listed by inspection name so that you know which inspection failed or had a warning status, and how many times. Note that the totals listed on the bottom are the maximum number in that column, not the sum of the column.

Intellispec Statistics Report

System ID: DOCUMENTATION
Job[Channel]: Job #49 [Neck]
Current Time: May 08, 2000 02:51 PM
Last Reset: May 08, 2000 02:12 PM

Inspection Name	Reject	Rej%	Warning	Warn%	Passing	Pass%	Total
Horiz Reg	0	0.00%	0	0.00%	948	100.00%	948
NECK REG	0	0.00%	0	0.00%	948	100.00%	948
NECK REG	0	0.00%	0	0.00%	948	100.00%	948
NECK REG	0	0.00%	0	0.00%	948	100.00%	948
upperneck	0	0.00%	0	0.00%	948	100.00%	948
chokedneck	0	0.00%	0	0.00%	948	100.00%	948
lowerneck	77	8.12%	0	0.00%	871	91.88%	948
color	0	0.00%	429	45.25%	948	100.00%	948
RECTANGLE	0	0.00%	0	0.00%	948	100.00%	948
RECTANGLE	0	0.00%	0	0.00%	948	100.00%	948
DENSITY	0	0.00%	0	0.00%	948	100.00%	948
Total	77	8.12%	429	45.25%	871	91.88%	948

Definitions:

Reject: Number of inspections reporting a Reject.
Warning: Number of inspections reporting a Warning.
Total: Total number of parts inspected.

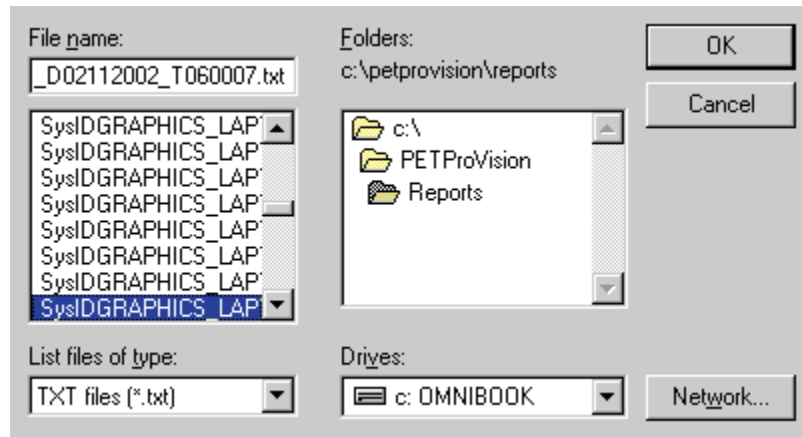
Note: Totals under the Reject and Warning columns may not reflect a sum of that column since one part may trigger a reject or warning for more than one inspection.

Saving job statistics to floppy diskette

System must be offline. Log in as Mechanic user level or higher. Use the Database Detective tool to quickly select files and copy them to diskette. Click Database Tools , Database Utilities, and select Database Detective.

For Job Statistics, click the Other tab in the Database Detective, select Copy Files to Floppy, and select Reports. Select the appropriate files to copy.

When selecting a file, look in the box directly underneath "File Name". This box shows the part of the file name that lists the date and time when the file was created. You can scroll through the names of files with the up and down arrow keys on the keyboard. See example screen below.



See the Database Detective section (page 9-2) for more information about this tool.

Clearing job statistics

You can clear the Intellispec screen statistics for one channel group or all channels, whether the system is online or offline. This does not clear setup parameters; it clears the number of parts inspected, defects, percent defects, etc.

- To clear all job statistics as well as correlation statistics: Log in. Click System Overview tab, right-click, and select Clear All Channel Statistics.
- To clear a channel group's statistics: Log in. Click a channel's statistics tab, right-click, and select Clear Statistics. All channels that are part of the same channel group will have their statistics cleared as well. Note: this 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.

2 - Correlation data

Correlation data associates defects to certain machine components – cavities, spindles, and transfer arms. This data can be generated by the Intellispec only if you have the correlation option installed.

Viewing correlation statistics on screen

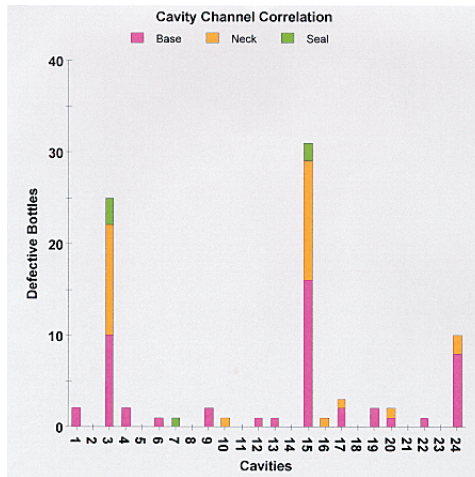
Graphs

To select a graph, click the System Graphs tab, right-click, and select a graph.

The available correlation graphs are described next.

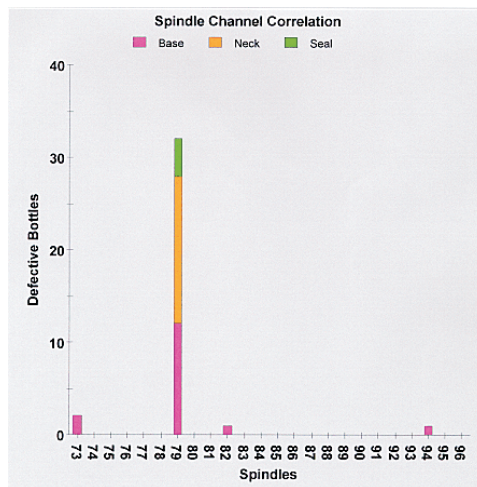
Cavities Correlation

The graph displays data for the machine cavities. Vertical color-coded bars are displayed, representing the number of parts that failed from each channel, that were manufactured in their corresponding cavities.



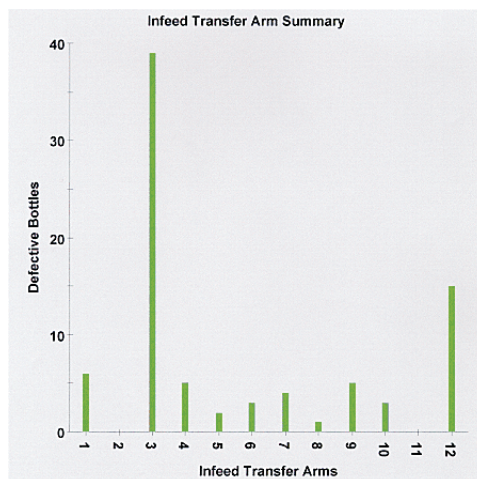
Spindles Correlation

Similar to Cavities Correlation described above, this graph displays the defects found for each channel, correlated to each spindle. The graph is color-coded for defects that occurred on each channel.



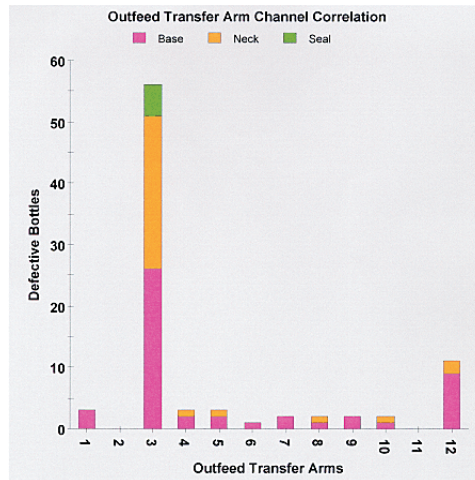
Infeed Transfer Arms Correlation

Similar to Cavities Correlation described above, this graph displays the defects found for each channel, correlated to each infeed transfer arm.



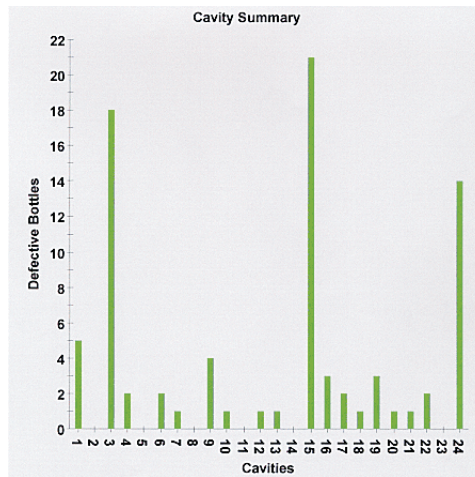
Outfeed Transfer Arms Correlation

Similar to Cavities Correlation described above, this graph displays the defects found for each channel, correlated to each outfeed transfer arm.



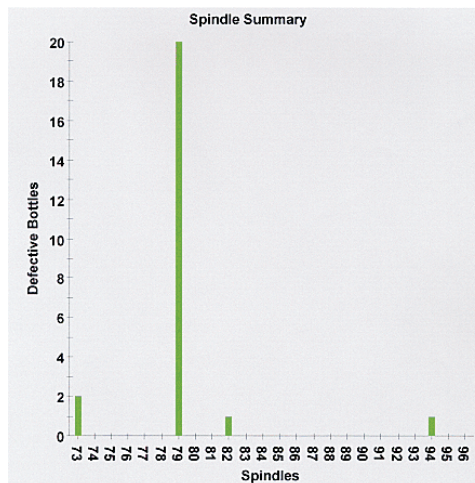
Cavities Summary

This graph is a summary of all the defects that were correlated to all of the cavities in the machine. (All channels combined)



Spindles Summary

This graph is a summary of all the defective parts correlated to all of the spindles in the machine. (All channels combined)



Infeed Transfer Arms Summary

This graph is a summary of all the defective parts correlated to all of the infeed transfer arms in the machine. (All channels combined)

Outfeed Transfer Arms Summary

This graph is a summary of all the defective parts correlated to all of the outfeed transfer arms in the machine. (All channels combined)

Correlation tables

You can also 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 Sidel Overview, Cavities Summary, Spindles Summary, or Infeed or Outfeed Transfer Arms Summary for correlation data. These are described next.

Sidel Statistics

Lists the machine correlation data for all channels. The lower part of the table shows the correlation data for part failures (most recent first). There is an X in the column for the channel that failed. In this example, the Seal Surface “S” channel had defects. Base channel = “B”, and Neck = “N”. The data for the last 50 failed parts is displayed.

System Overview	Sidel Overview	Base	Neck	Seal	Cavities	Spindles	Infeed Transfer Arms	◀	▶
Part Rate: 124	Base [Base Inspection 5]								
Inspection	Total	Defects	Defect %	Warning	Warning %				
	14	12	85.714	0	0.000				
Find Gate		5	35.714	0	0.000				
Gate Defects		6	42.857	0	0.000				
Around the Gate Defects		9	64.286	0	0.000				
Date/Time	Cavity	Spindle	Infeed Transfer	Outfeed Transfer					
2002-05-23 14:46:37	10	89	7	8					
2002-05-23 14:46:36	9	88	6	7					
2002-05-23 14:46:36	8	87	5	6					
2002-05-23 14:46:35	7	86	4	5					
2002-05-23 14:46:34	4	83	1	2					
2002-05-23 14:46:34	3	82	8	1					

Cavities Summary

This table shows how many parts were rejected that were correlated to each cavity. This is useful for determining failure trends on specific components, especially if one cavity in particular generated a large number of defects.

Spindles Summary

Similar to the Cavities Summary. This table displays defects that were correlated to each spindle.

Infeed Transfer Arms Summary

Similar to the Cavities Summary. This table displays defects that were correlated to each infeed transfer arm.

Outfeed Transfer Arms Summary

Similar to the Cavities Summary. This table displays defects that were correlated to each outfeed transfer arm.

Printing and saving correlation statistics

Automatic print or save

Correlation information can be printed or saved automatically by the Intellispec if the system is set up to do so. The data can be saved every shift, hour, minute, or any time interval you find useful. Ask your Administrator if you want to have the system save data automatically. This is programmed through System Configuration, Reports.

Print Destination can be specified as Printer, File, or Printer & File.

If Print Destination is File or Printer & File, one file per time interval is saved to the C:\PETProvision\Reports folder. It contains the correlation data from all the machine parts you are tracking (cavities, spindles, transfer arms). The correlation file is

named AllCorrelation*.txt, where * specifies the date_time at which the file was saved. It also lists the data for the last 50 defective parts at the end of the file.

Printing graphs on demand

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. Click System Graphs tab, right-click, and select desired graph. Right-click again and select Print.

AllCorrelation02262002_102814.txt - Notepad	
File	Edit Search Help
Correlation Statistics	
System ID:	SAMPLE_SYSTEM
Date:	February 26, 2002 10:28:14 AM
Total Cavity Defects	
Cavity	Defects
1	6
2	6
3	5
4	5
5	5
6	5
7	5
8	6
9	6
10	6
Total Spindle Defects	
Spindle	Defects
1	1
2	0
3	0

...

AllCorrelation02262002_102814.txt - Notepad		
File Edit Search Help		
Last 50 Defective Parts		
Date/Time	Cavity	Spindle
2002-02-26 10:22:03	2	1
2002-02-26 10:22:03	1	100
2002-02-26 10:22:02	10	99
2002-02-26 10:22:02	9	98
2002-02-26 10:22:01	8	97
2002-02-26 10:22:01	7	96
2002-02-26 10:22:00	6	95
2002-02-26 10:22:00	5	94
2002-02-26 10:21:59	4	93
2002-02-26 10:21:59	3	92
2002-02-26 10:21:58	2	91
2002-02-26 10:21:58	1	90
2002-02-26 10:21:57	10	89
2002-02-26 10:21:57	9	88
2002-02-26 10:21:56	8	87
2002-02-26 10:21:56	7	86
2002-02-26 10:21:55	6	85

Saving correlation statistics to floppy diskette

Use the Database Detective tool to quickly select files and copy them to diskette.

First you must log in as Mechanic user level or higher. Click the Database Tools  button, Database Utilities, and select Database Detective.

For Correlation Statistics, click the Other tab in the Database Detective, select Copy Files to Floppy, and select Reports. Select the appropriate files to copy (AllCorrelation*.txt).

When selecting a file, look in the box directly underneath "File Name". This box shows the part of the file name that lists the date and time when the file was created. You can scroll through the names of files with the up and down arrow keys on the keyboard.

See the Database Detective section (page 9-2) for more information on this tool.

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.

Clearing correlation statistics

You can clear the correlation statistics from the Intellispec screen whether the system is offline or online. First log in. Click the Sidel Overview tab, right-click it, and select Clear Sidel Statistics.

The data will be cleared from all correlation graphs and tables on the screen. The system updates statistics every few seconds, so you may have to wait to see the results on the screen. Note: the job statistics (number of defects) are not cleared.

To clear all job statistics and correlation statistics at once: Log in. Click System Overview tab, right-click it, and select Clear All Channel Statistics.

3 - Inspection graphs

Online graphs vs. Offline graphs

Online graphs are inspection graphs that receive data when the system is inspecting online. They remain on screen when the system is offline, but the inspection data will not change offline.

Offline graphs are inspection graphs that are only displayed when the system is offline and when you are editing an inspection (Mechanic user level and higher). The data is updated when you test an inspection. That is, run a job, or snap images while you are editing the inspection. When you exit from editing the inspection, offline graphs are removed from the screen.

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.

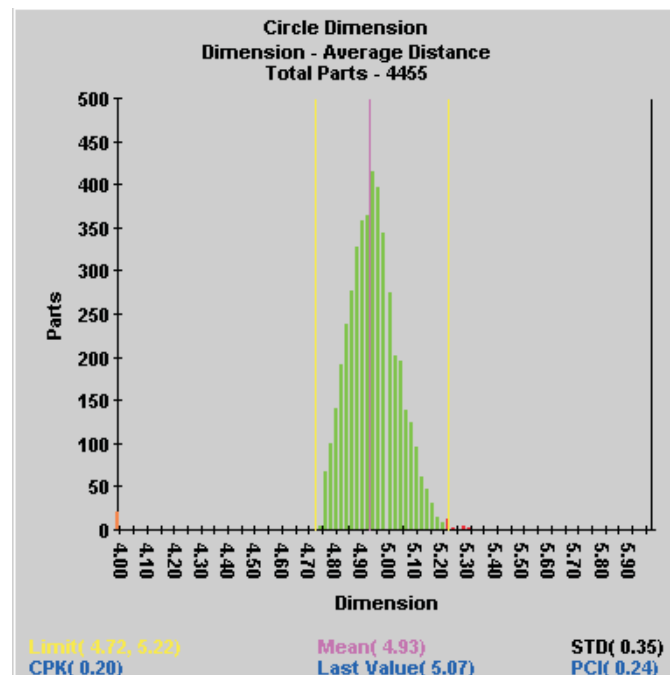
Viewing the inspection graphs on screen

The types of inspection graphs available varies, depending on the types of inspections programmed in your job. For example, the Polygon inspection can have 21 available graphs.

To display a graph:

Online graphs

Right-click on an inspection name in the statistics area. Click Inspection Graphs, and select the desired graph.

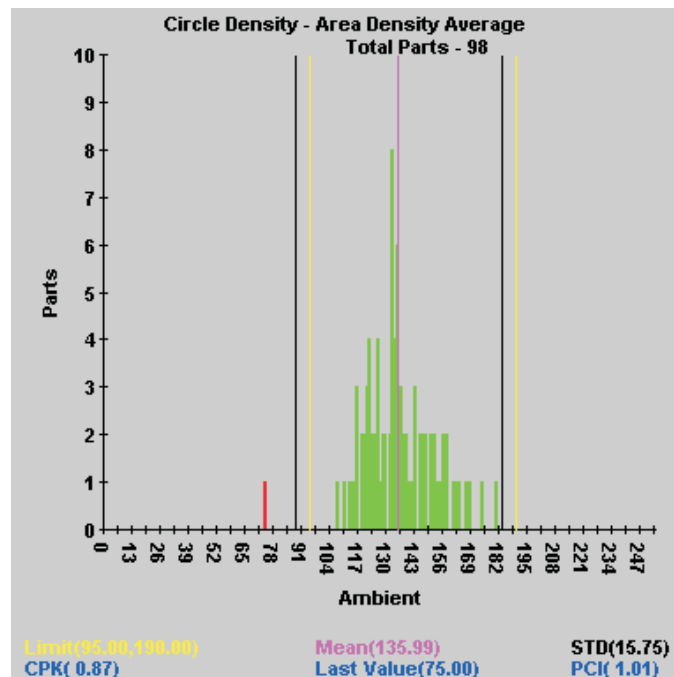


Offline graphs

Double-click an inspection name to edit the inspection (Mechanic user level and higher). Offline Graphs tab will be displayed. Click Offline Graphs tab, right-click it, and select a graph.

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.



The information displayed in the inspection graphs is described next:

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)

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 vectors 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 vectors 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.  <i>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.</i>
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.

To view the error details, make sure inspection graphs are displayed (see page 3-12). Select the Online Graphs or Offline Graphs tab, right-click it, and select Error Details. The Error Details graphs are described with their respective inspections.

Clearing inspection graphs

Right-click the Online Graphs or Offline Graphs tab; select Clear. The graph data is reset to zero parts.

Re-scaling inspection graphs

Click to reset the graph and zoom in.

Printing inspection graphs

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. Make sure inspection graphs are displayed (see page 3-12).

Right-click the Online Graphs or Offline Graphs tab. Select Print.

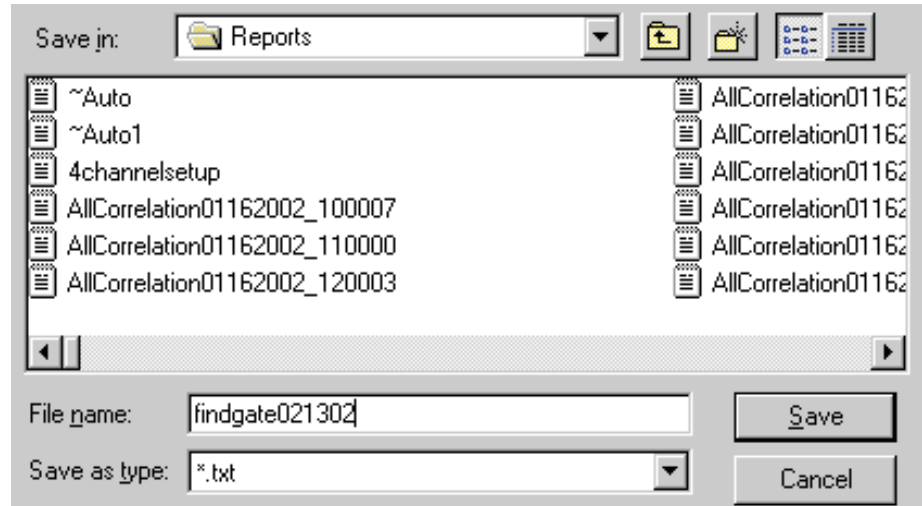
Saving inspection graph data

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 graph data, make sure inspection graphs are displayed (see page 3-12).

Save

To save the data, click the Online Graphs or Offline Graphs (if available) tab. Right-click it, and select Save. Name the file. The data will be saved as a text file. The default folder is C:\PETProvision\Reports.



Save All

With Offline Graphs, 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.

Saving graph data to floppy diskette

Use the Database Detective tool to quickly select files and copy them to diskette. Log in as Mechanic user level or higher. Click the Database Tools  button, Database Utilities, and select Database Detective.

For Graphs, click the Other tab in the Database Detective, and select Copy Files to Floppy, and select Reports. Select the appropriate file to copy (your graph name*.txt). If you did not save the graph to the Reports folder, scroll to the appropriate folder and choose the file.

See the Database Detective section (page 9-2) for more information on this tool.

4 - Event logs

There are three types of logs that are automatically recorded and saved to Intellispec's hard drive: Alarm, Change, and System logs.

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.

Viewing log files

To view the log files, log in as Administrator. Click the Miscellaneous button, and click the View log files button under the System tab. Choose between Alarm, Change, or System logs in the lower right corner.

	Date	Time	User	Description
	08-May-02	2:39:08 PM	Administr...	User logged in: Administrator.
	08-May-02	2:38:57 PM	Administr...	User logged out: stosh.
	08-May-02	2:38:51 PM	Administr...	User logged in: stosh.
	08-May-02	2:38:44 PM	N/A	User logged out: operator.
	08-May-02	2:38:33 PM	N/A	User logged in: operator.
	08-May-02	2:38:24 PM	N/A	User logged out: Administrator.
	08-May-02	1:56:49 PM	Administr...	User logged in: Administrator.
	08-May-02	1:56:36 PM	N/A	User logged out: stosh.
	08-May-02	12:26:21 PM	stosh	User logged in: stosh.
	08-May-02	12:26:14 PM	N/A	User logged out: Administrator.

Filter

Refresh

Print

Clear Log

System Log

Clicking Date, Time, User, or Description at the top of the log screen sorts the data from the lowest to the highest or highest to lowest (click again to toggle). For example, Date sorts the records from the earliest to latest date or latest to earliest date. User sorts the records alphabetically according to user.

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.

DATE

From: 5 / 8 /02

To: 5 /29/02

SEVERITY

☒ Informational

☒ Warning

☒ Fatal

FIND

roast beef

☒ Find in description

USER

ALL USERS

Display

Refresh

Print

Clear Log

System Log

Date

Choose to view a log file recorded between certain dates. Click the down arrow to display a monthly calendar. Click the left or right arrows to scroll through the months, and pick a day. Clicking “today” at the bottom of the calendar selects today’s date.



Severity

Informational Severity

Check this box to view the Information messages, such as Going Online or Offline. If this is not checked, these messages are not displayed on the screen.

Warning Severity

Check this box to view the system Warning messages, such as hardware communication errors. If this is not checked, these messages are not displayed on the screen.

Fatal Severity

Check this box to view Fatal system errors. If this is not checked, these messages are not displayed on the screen.

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 if you have a printer attached and configured.

Clear Log button

Clears the events in the log file that is currently being displayed. If you wish to save the contents of the log before clearing, see Saving or Copying Log Files to Floppy.

Caution

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

Saving or Copying log files to floppy

Use the Database Detective to copy files to diskette for use outside of the Intellispec. These files can be imported into a spreadsheet or database application; they are saved as text (.txt) files.

Use the Database Detective tool to quickly select files and copy them to diskette. Log in as Mechanic user level or higher. Click the Database Tools  button, Database Utilities, and select Database Detective.

For Logs, click the Other tab in the Database Detective, and select Copy Files to Floppy, and select Logs. Select the appropriate file(s) to copy.

See the Database Detective section (page 9-2) for more information on this tool.

Online/ Offline history

The Intellispec's Database Detective tool also allows you to view or print a simple report that lists when the Intellispec went online, and when it was taken offline. This report also lists what user was logged into the system when the system was taken offline (if system is password-protected to go offline).

To view this report, log in as Mechanic user level or higher. Click the Database Tools  button, Database Utilities, and select Database Detective. Select the Other tab, and choose Online-Offline History. You can view the report on screen, or print it to a file.

See the Database Detective section (page 9-2) for more information about this tool.

5 - System setup parameters

The Intellispec's 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 channel.

To view this report, log in as Mechanic user level or higher. Click the Database Tools  button, select Database Utilities, and select Database Detective. Select Make Process Sheet and click Next. Choose a database to display its parameters.

See the Database Detective section (page 9-2) for more information about this tool.

Displayed below is an example file:

SUMMARY OF INTELLISPEC SETUP PARAMETERS, page 14

Job [7] "Seal Defects 7" [continued from previous page]

(6) Inspection Name:	"Tracker"
Type:	TRACKER INSPECTION
Uses registration:	(5) "Tracker Registration"
Inspection Enabled:	Enabled
Radial Grid Spacing:	1.2
Correct Bad Shape Points:	Enabled
(7) Inspection Name:	"Dimension"
Type:	DIMENSION
Uses registration:	(5) "Tracker Registration"
Inspection Enabled:	Enabled
Orientation Available:	Disabled
Use Orientation:	Enabled
Dimension Units:	Millimeters
Reject Minimum:	0
Reject Maximum:	500
(8) Orientation Name:	"Orientation For Thread"
Type:	DONUT ORIENT/PATTERN MATCH
Uses registration:	(5) "Tracker Registration"
Inner Radius:	218
Outer Radius:	223
Inspection Enabled:	Enabled
Symmetry:	1
Radial Spacing:	1
Fail Limit:	30
(9) Inspection Name:	"Circle"
Type:	CIRCLE
Uses registration:	(8) "Orientation For Thread"
Inner Radius:	213
Outer Radius:	220
Inspection Enabled:	Enabled
Segments:	4
Arcs Enabled:	Enabled
Ambient Reject:	Disabled
Edge Detection:	Enabled
Zones:	Disabled
Blob Enabled:	Disabled



Chapter 4 - Programming Inspections

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 four separate channels on the Intellispec. Each channel has its own camera and lighting module. Each channel inspects a different location on each part, and the jobs you program for each channel determine whether the part is acceptable.

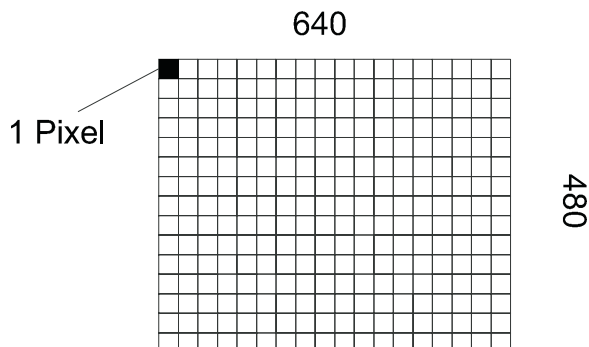
Inspection terminology

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 short for picture element. It is the smallest element of a video image.

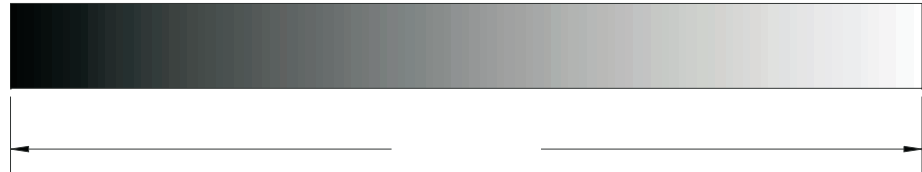
An analog image is received from the camera. This analog signal is digitized and stored in memory on the frame buffer board. The image occupies a 640 horizontal by 480 vertical matrix of memory locations. Each of these 307,200 separate memory locations represents one pixel.



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 a 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.



Edge

The system searches for edges which are rapid changes in gray level. These changes represent border areas between regions, the actual edges of a part, or may represent defects on a part.

Gradient / Delta / Edge Thickness

Gradient, delta, and edge thickness are parameters used in registration and all inspections that use grayscale analysis. The relationship between the three is important in understanding how to set the other parameters.

Gradient

Gradient is the minimum gray shade difference between pixels being compared which can determine an edge. It is calculated from the gray shade values of the pixels along the inspection line. The gray shades of two pixels (separated by delta) are compared. If the difference between the shades is greater than or equal to the gradient, it is considered an edge.

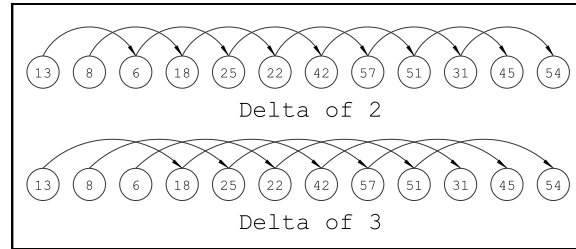
As an example, the vision system compares the shade of the first pixel along its inspection line, to the shade of the third (if the delta is 2. Delta is explained next). Then it compares the shades of the second and fourth pixels, then third and fifth, etc. If the gradient is 15, an edge is found every time there are 15 gray shades or more difference between the two pixels being compared. See the pictures in the delta explanation.

If the inspection is overlooking an edge that you want to catch, lower the gradient. If the inspection is finding edges in small shade variations before the proper edges, raise the gradient. Each time you adjust it, the system immediately calculates and displays the results.

Delta

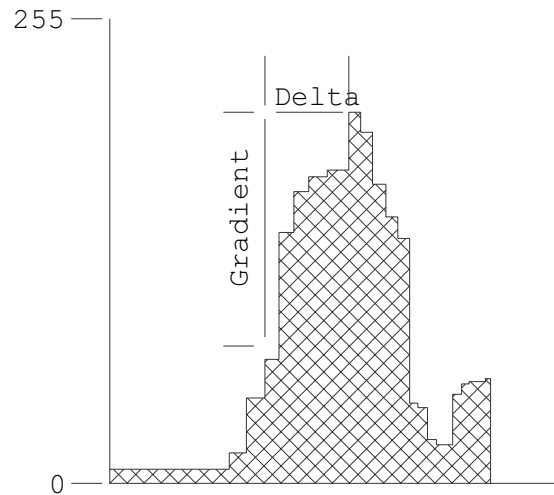
Delta is the distance between pixels whose shades are being compared when looking for an edge point. Delta is used in conjunction with gradient. It is adjustable between 1 and 7. For example, if the delta is 2, the shades of the first and third pixels in the region are compared looking for a difference equal to the gradient. Then it goes back to compare the second and fourth pixel shades. If the delta is 3, the first and fourth

are compared, the second and fifth, third and sixth, etc.



A delta of 1 or 2 detects sharp edges. A higher number is better for fuzzy or unclear edges. The default value of delta is 2.

In the figure below, a bar graph shows pixel gray shade values along a line. The bottom of the graph shows low values that are dark. Bars that are high on the graph are the white, high values. The delta is the horizontal distance in which the system looks for a vertical amount of change. The vertical distance is the gradient. If the gradient is found within the delta, an edge is defined. This can also be described as the slope, rise over run, or gradient over delta.



Edge thickness

Edge thickness is the number of consecutive times that the gradient must be met to define an edge. With an edge thickness of 5, the gradient of 20 must be met 5 times in a row before the edge is valid. Edge thickness is used in many inspections that detect edges using grayscale analysis. However, in some of these inspections it is a hidden parameter with a default value of 2 or 3.

What are Jobs?

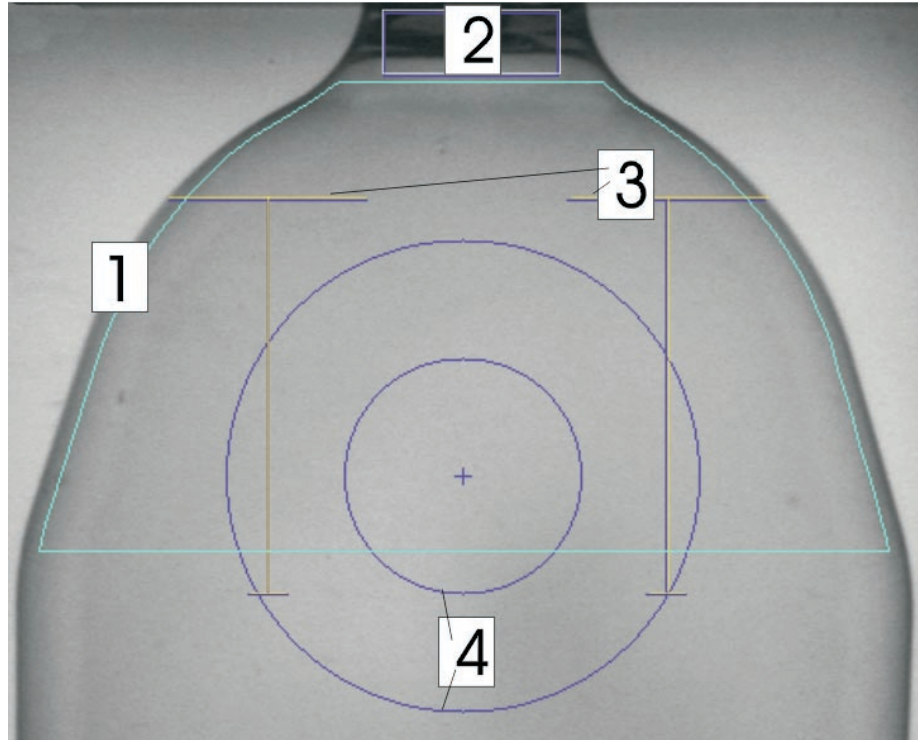
The jobs are the programs that inspect each part within the field of view of each camera. The job is made up of several inspections. You may have many inspections in each job, but the more inspections, the longer the job may take to run. Each channel runs a different job.

What are Inspections?

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.

What are Inspection regions?

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, as you will see in later chapters.

What is Registration?

Registration allows you to inspect parts whose placement varies slightly in the camera's field of view. Through registration, features of the part are found and the inspection regions are placed relative to these features.

Registration will track the part as long as it is within the range that you define. If the part is outside the range, or outside the field of view of the camera, the registration will not pass and the job will fail.

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.

What is Orientation?

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

Once you use Orientation in a job, the following inspections use that orientation as a reference. Therefore, no further registrations need to be programmed for that job.

How to begin programming jobs

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.

✎ *Use the Database Detective, Make Process Sheet, and print to file or printer – this records system settings and inspection parameters.*

If necessary, check the configuration. Log in as Administrator, and click the System Configuration button to set up online and offline conditions, display settings, and part tracking information. See page 6-1 for details on System Configuration. If necessary, check the Channel Groups menus as well.

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

Programming jobs on moving parts

Many times, it is not practical to stop the production line to acquire images on a still part. A feature in the Intellispec – acquire image at part present – allows you to capture an image without stopping the part. Log in as Administrator, click the System Configuration button, and click the System tab. For Offline Acquire Mode, choose Part Present. This captures an image and keeps it on the screen until you choose to acquire a new image.

Consider the number of inspections to use on each channel

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 four channels, 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.

Begin Programming

Before you start programming the jobs, define your objectives. The first question to ask 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 are available to help you program effective inspections. See below for a step-by-step example on how to create a job.

When you have become familiar with the terms used in the Intellispec system, how to navigate through the system, and have set up the system properly, you can program jobs for your specific parts. Please refer to the inspection chapter or inspection addendums for specific information.

Creating a new Job

👉 *Administrators only. Offline only.*

The following steps are an example of how to begin a job. The details of inspections, orientations, and registrations are discussed in the inspection addendums.

1. Log in as Administrator. Load an image from disk, or snap the camera to obtain a desired image.
2. Click the Statistics tab for the channel you want to program (e.g., Camera 2 tab). Right-click the tab and select New Job. Name the new job. You will see the new job name in the statistics area.
3. Right-click in the black statistics area under Inspection. Choose Add, and select a Registration, Orientation, or Inspection. If this is a brand new job, you will probably want to add a registration. The registrations, orientations, and inspections that are available will depend on the channel's Product Type. In this example, we added a Radial Edge Registration.



4. Use the Region menu to place the inspection region if available to your chosen registration/ orientation/ inspection. For circular registrations, you may need to adjust the Target Circle as well.
5. Adjust the registration/ orientation/ inspection parameters. Refer to the inspection chapter or addendums for specific parameter information.

Repeat steps 3-5 and continue adding registrations/ orientations/ and inspections as necessary for your job.

Modifying an existing job

 *Mechanic level user and higher*

You may make changes to jobs while the system is online or offline. However, not all changes are available while the system is online.

Modifying inspections

To modify an inspection (cut, paste, or disable), right-click the inspection name for the available options (most are described in Chapter 2).

To edit an inspection (change parameters):

Inspection	Total	Defects	Defect %	Warning	Warning %
Radial Edge Registration	0	0	0.000	0	0.000
Radial Edge Registration Options					
Disable					
Add					
Insert					
Cut					
Copy					
Delete					
Rename					
Edit					

- Right-click the inspection name for menu and select Edit. Or:
- Double-click the inspection name

Inspections are described in the Inspection chapter or inspection addendums.

 *See also Modifying a Job Online, page 5-5.*

Selecting a job

Offline only.

If Part Management is enabled (Part Management  button is active): Click the Part Management button, select a part to run, and click OK.

If Part Management is not enabled (Part Management button is grayed out): Click the desired channel's statistics tab, right-click for menu. Click Select Job, and select a job from the drop-down list. Click OK. Repeat for all channels.

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

Running a job offline

To test inspections on parts without rejecting any parts, you can run a job offline. Click the desired channel's statistics tab, and right-click for menu. Click Run Job. Select the job you want to run. The system will run the job once and display the results on the Results screen.

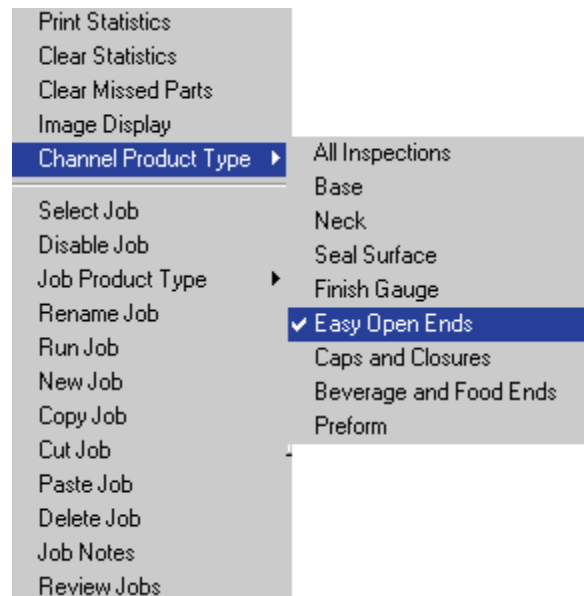


To run the job again, click the Snap button. If the button is in Single Snap mode, the job will run once each time you click the Snap button. If the button is in Continuous mode (right-click the Snap button to change modes), the system will run the job continuously until you click the Snap button again.

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.

To see the assigned product type for any channel (Mechanic user level and higher), click the channel's statistics tab and right-click for the menu. Select Channel Product Type, and view the assigned product type.



Each job has an assigned product type as well. This usually matches the channel's product type. However, on occasion, you may need an inspection that is not included in the channel's product type. To change it (Administrators only), select the channel's statistics tab, right-click for the menu, select Job Product Type, and select a new product type. The All Inspections type has every available inspection type.

Assigning a Channel Product Type

 *This is normally assigned during system installation and should not necessarily be changed.*

Log in (Administrators only). Click the System Configuration button. Click Channel Groups, and select the group to which the channel belongs. Click the Channel tab, select the channel, and choose the Default Product Type. Click OK and exit.

Part Management

Select a part, and the system will assign the proper jobs!

 *You must be an Administrator to set up Part Management*

The purpose of Part Management is to simplify the Job assignments for each type of part that you inspect.

With this feature, users will simply be able to choose a part to inspect, and the system will assign the appropriate jobs and make any necessary channel configuration changes that you assign.

If Part Management is enabled and a part is assigned, the system will run the part's assigned jobs when it is put online. Even if you selected a different job (through the statistics tab) or ran a different job offline, the part's assigned job will run online.

Parts vs. Jobs

To inspect, users must choose either parts or jobs. If Part Management is available to users, they can select one part, and the system will assign the proper jobs that are programmed by you (Administrator).

If Part Management is not available, users must select a job for each channel through each channel's statistics tab.

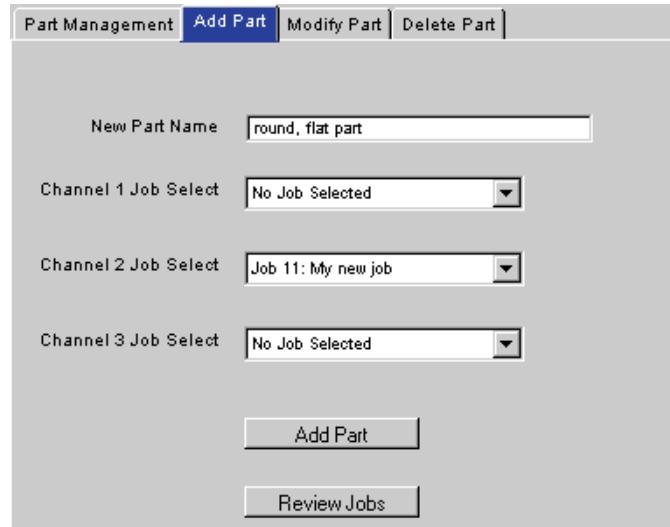
To enable Part Management, click the System Configuration button. Under the System tab, click the Show All Advanced Parameters box. For Part/Job Selection, choose Which Jobs (Part Management disabled) or Which Part (Part Management enabled). Re-boot the system to see the menu changes take effect.

 *You must have programmed jobs for each channel before you can assign them to parts.*

Which Jobs	This is the default system setting. When chosen, there is no part management option. You must select each channel separately, and assign a job to each channel.
Which Part	The Part Management button becomes active. After you add a part or parts, any user can simply choose a part, and the system will assign all the proper jobs to all the channels.

Add Parts

Click the Part Management button, and click the Add Part tab.



The screenshot shows a software interface with four tabs at the top: 'Part Management', 'Add Part' (which is highlighted in blue), 'Modify Part', and 'Delete Part'. Below the tabs, there are four input fields. The first is labeled 'New Part Name' and contains the text 'round, flat part'. The next three are labeled 'Channel 1 Job Select', 'Channel 2 Job Select', and 'Channel 3 Job Select'. 'Channel 1 Job Select' and 'Channel 3 Job Select' both show 'No Job Selected' with a dropdown arrow. 'Channel 2 Job Select' shows 'Job 11: My new job' with a dropdown arrow. At the bottom of the form are two buttons: 'Add Part' and 'Review Jobs'.

Type a new part name. Select a job for each channel.

Select a channel to change its active job. Assign a job to each channel. You can also assign No Job to a channel, and perhaps create a new job for that channel later.

For different types of parts, you can enable or disable certain channels. This is useful if you do not need inspection from certain camera views.

Click the Add Part button to finish.

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.

Modify Parts

Choose the Modify Part tab to make any changes to a part, such as changing a channel's job assignment, or enabling or disabling a channel. Select the part to modify, make changes, then click the Modify Part button to complete the changes. If you have not created any parts, there will be no Modify options.

Delete Parts

Choose the Delete Part tab to delete a part from the system's memory. Select the part to delete, then click the Delete Part button to complete the task.

SmartLINK

 *You might not use this feature when programming certain jobs. As such, it may have been disabled upon installation of your system. If disabled, this menu does not appear on your system.*

To enable (Administrators only), go to System Configuration, Channel Groups, choose a group, Channel tab, choose a channel, and check SmartLINK under the General tab.

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)

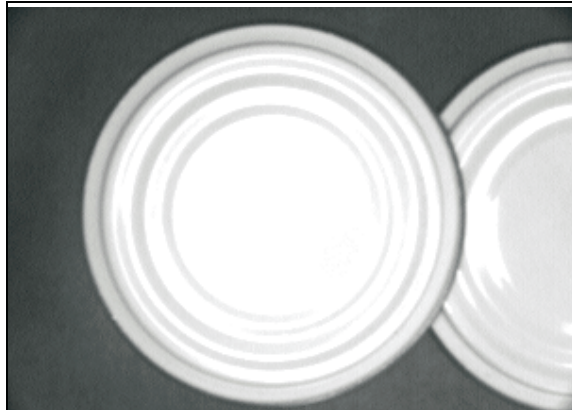
force fail a part, or (4) pulse the SmartLINK output, based on the pass or fail condition of an individual inspection. This function uses Boolean algebra and adds power to the capabilities of the Intellispec system.

 *Note: jobs that fail due to this logic are NOT counted as part of system statistics.*

An example

SmartLINK logic was developed to detect ends that were lying on top of each other, or shingled. These were not bad parts, but were failing the inspections because they were shingled. This logic allowed the customer to fully inspect the part and then decide if it was a valid inspection or if the ends were shingled.

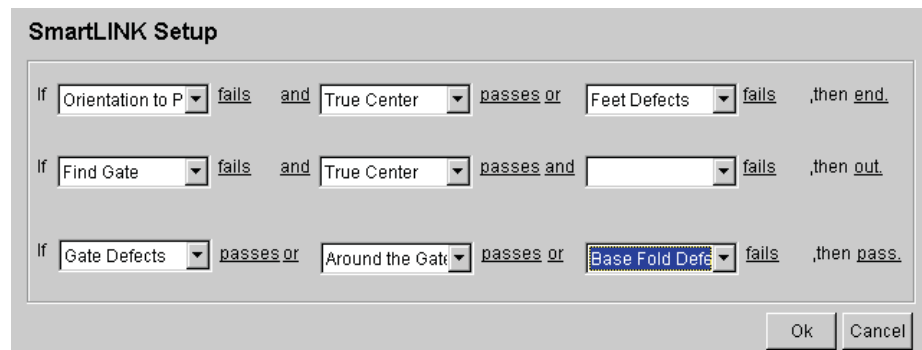
The test consisted of inspections to inspect the ends and two inspections placed on the conveyor belt. If one of the inspections on the belt failed, the part was unconditionally passed. This reduced the false rejects due to shingling. Unfortunately, these parts remain uninspected.



Components

SmartLINK uses Boolean algebra logic. Each of the three boxes on each line can contain an inspection. The words between them are the logic operators. These can be 'and' or 'or'. 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 — i.e., 'end'.



The image shows a software window titled "SmartLINK Setup". It contains three lines of logic configuration, each with a series of dropdown menus and text labels. The first line reads: "If Orientation to P fails and True Center passes or Feet Defects fails, then end." The second line reads: "If Find Gate fails and True Center passes and [empty dropdown] fails, then out." The third line reads: "If Gate Defects passes or Around the Gate passes or Base Fold Defects fails, then pass." At the bottom right of the window are "Ok" and "Cancel" buttons.

Programming

Click the desired channel's statistics tab. Right-click for menu, and select SmartLINK. When you enter SmartLINK logic, the screen above is displayed.

Inspections

Choose an inspection from the drop-down menu. Choose the condition ('passes' or 'fails') that the inspection must meet to make the condition true. If this condition evaluates true, the next inspection box is evaluated. Program it with another inspection or leave the box clear.

Logic operators

'And' and 'or' are standard Boolean algebra operators. 'And' means that the box on the right and left of it must be true to make the statement true. 'Or' means that either inspection box on the right or left must be true to make the statement true. Click the word to toggle between 'and' and 'or'.

Since there are three inspection boxes per line, you can make a conditional 'and' and a conditional 'or' within the same statement.

Actions

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

<i>Action</i>	<i>Does</i>	<i>Description</i>
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.
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*	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.

**The output is pulsed as soon as a result is known (not at reject time)*

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.



Chapter 5 - Online Inspection

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

Before Going Online

Configure the system

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

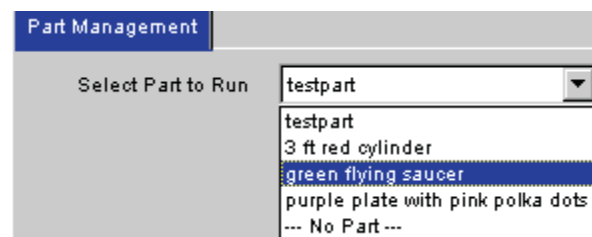
- Program a job for a good part – for each channel. Jobs are normally loaded during installation for your application. To program a job from scratch, see Chapter 4, or the Inspection chapters.
- Choose a job or part to run – see Select a Job or Part to inspect (topic below)
- Program SmartLINK logic if needed (see page 4-11)
- Calibrate the part width for strobe fire – for each channel (see Calibrate Part Width, page 6-7)
- Calibrate the time delay for the reject station – for each channel (see Calibrate Reject Delay, page 6-8)

Select a Part or Job to inspect

Select a job to run for each of your channels. Log in. Choose the proper job(s) for the part you are inspecting, either by selecting a part or selecting a job for each channel.

Select a part

If Part Management  button is active, click the button and select a part from the drop-down menu.

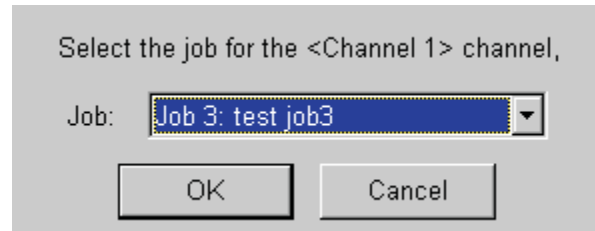


Your Administrator must first have programmed these parts. Part Management is configured through System Configuration, System menu. It is an advanced parameter. See page 4-9 for information on Part Management.

This feature allows you to select a part name, and all the correct jobs for all channels are loaded. Note that one or more channels may be disabled – this is okay. See No Job below.

Select jobs

If Part Management is not available, select a job for each channel. Click the channel's statistics tab (e.g., Camera 1), right-click the tab, Select Job. Select a job from the drop-down menu, click OK.



No Job

You can select No Job for any channel. This disables the channel. In the event of a hardware error on a specific channel (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 channel if you run a different type of product, and want the system to ignore a certain channel's inspection view.

Go Online

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

While the system is online, you can clear statistics and choose graphs, the same as when the system is offline. Right-click the statistics tabs for these functions.



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 Hold freeze frame indicator becomes active when you hold an image. Please see page 5-4 for a description of all the freeze frame indicators.

Releasing an image

Right-click the channel's indicator to release a held or frozen image. Or right-click the function button to release all channels. Note that a freeze frame setting might cause another image to freeze.

See also Image Toolbar, page 2-9.



Freezing an image (Freeze Frame settings)

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.

To set Freeze Frame, click one of the channel statistics tabs, right-click, and select Image Display. The menu is displayed on screen right. Selecting a freeze frame mode affects all channels. Click OK [✓] for it to take effect.

The screenshot shows a software window titled 'Image Display'. It contains two main sections. The top section, 'Freeze Frame Settings', has a 'Freeze Mode' dropdown menu set to 'Last Reject' and a 'Graphics Display' dropdown menu set to 'Show Failed Regions'. The bottom section, 'Image Display Settings', has a 'Display Control' dropdown menu set to 'By Channel', a 'Display Units' dropdown menu set to 'Seconds', and a 'Display Count' slider set to 7.

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, Passing, Good, or Warning part.

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. See page 5-5 for a description.
First Reject	The system freezes the image of the first part to be rejected after going online.
First Pass	The system freezes the image of the first part to pass inspection. This could be either a good part or a part with a warning status.
First Good	The system freezes the image of the first good part — no defects, no warnings.
First Warning	The system freezes the image of the first part to pass inspection with a warning status.
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 Pass	The system freezes the image of the last part to pass inspection. This could be either a good part or a part with a warning status.
Last Good	The system freezes the image of the last good part — no defects, no warnings.
Last Warning	The system freezes the image of the last part to pass inspection with a warning status.

Graphics Display

Show Failed Regions

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

Show All Regions

Displays all the inspection regions on the Freeze Frame image.

Show No Regions

Displays only the Freeze Frame image.

Click [✓] OK to accept menu changes.



Freeze Frame Indicators

These indicators change depending on the system mode. Offline, these will indicate a Halt  status. There is one indicator for each of four possible channels. If you see a picture of a camera with a line through it as shown above, this indicates that a channel is not configured.

Online, these change to a figure running . If you have the system in certain freeze frame modes, these will change accordingly.



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 channel 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.

<i>Icon</i>	<i>Description</i>
“F” - red background	First failed part frozen
“F” - yellow background	First warning part frozen
“F” - blue background	First passing part frozen, either warning or good part
“F” - green background	First good part frozen
“L” - red background	Last failed part frozen
“L” - yellow background	Last warning part frozen
“L” - blue background	Last passing part frozen, either warning or good part
“L” - green background	Last good part frozen



When you hold an image, the current channel will have a touch key icon. When you release that image, the icon switches back to the previous mode. Also, the image is automatically held and this icon appears on the current channel when you are editing a job online.

Displaying a channel

To display a channel:

- Click one of the channel indicators, or
- Right-click on the image, click Display, and select one channel or All Channels

The length of time between image updates depends on the settings in the Image Display Control menu. Select this menu by clicking one of the channel statistics tabs, right-click, and select Image Display.

Image Display settings

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

Display Control

 This feature works only if you have chosen “All Channels” by right-clicking the image and selecting All Channels. If you are displaying only Channel 1, for instance, only Channel 1 is displayed on screen. Also, if you have Freeze Frame enabled, it overrides Display Control.

By Channel	Display images by channel number. That is, Channel 1, Channel 2, Channel 3, etc. Channel 1's image will be displayed until the system processes an image for Channel 2, etc. This is a good way to sample activity on all the channels.
As Received	Display images from all channels by the order in which they were processed. This is not necessarily in order by channel number.

Display Units

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. Click OK [✓] to accept menu changes.

Modifying a job online

 Mechanic level user and higher

When you modify a job online, the system continues to inspect parts in the background.

To modify a job, log in. Click the statistics tab for the desired channel. In the black inspection name area, right-click over the inspection you want to modify and choose Edit, or just double-click the desired inspection name.

The system will hold an image while you adjust the parameters. Adjust the parameters as necessary. Note that not all parameters or settings (such as Region menu) 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 applicable).

Disabling a job online

 *Mechanic level user or higher*

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

To disable the job, click the statistics tab for the desired channel. Right-click for the menu. Choose Disable Job. The system will stop inspecting that channel. The channel indicator becomes grayed out to indicate that it is disabled.

To enable the job, right-click the statistics tab and choose Enable Job from the menu. The system resumes inspection on that channel.

Go Offline

If you want to take the system offline, simply click the  button. The light on the online/ offline button turns red to indicate that the system is offline.

You may be required to enter your user account name and password to take the system offline. The Administrator can specify whether a password is required to take the system offline through System Configuration, System menu. It is an advanced parameter.



Chapter 6 - System Configuration

Overview

All functions discussed in this chapter are available to Administrators only.

System Configuration

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 will restart to reflect the configuration changes.

System tab

The screenshot shows the 'System' tab of a configuration window. It contains several settings: 'Offline Acquire Mode' set to 'Part Present', 'Offline Password Required' checked, 'Part/Job Selection' set to 'Which Part', 'Camera File Name' set to 'PPS4', 'Frame Time Override' checked with a slider at 33, 'Strobe Delay Override' checked with a slider at 350, 'UPS Configured' unchecked, 'Periodic Refresh Rate' set to 10, and 'Dialog Advanced Mode' set to 'Immediate'. At the bottom, 'Show All Advanced Parameters' is checked, and there is a red 'X' icon in the bottom right corner.

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.

☞ This feature is also available by right-clicking on the image, and choosing *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.]

Offline Password Required

(Advanced parameter) When this is Enabled, all users must log in to the system with their user name and password to take the system offline. If Disabled, users can simply click the Offline button to take the system offline.

Camera configuration

The following are all Advanced parameters.

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.

Frame Time Override

Allows the system to override the default camera acquisition time. Default = Enabled.

Caution

Changing this setting may cause errors in image acquisition.

Frame Time

This is the image acquisition time, in milliseconds, for the current image. This value is used only if Frame Time Override is Enabled.

Strobe Delay Override

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

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 Enabled.

UPS configuration

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 Enabled, 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 Disabled, the UPS will not provide battery backup. To shut down the Intellispec, you must click Shutdown from Miscellaneous, 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 alarm is issued. See page 8-4 for

Power Status alarm information. This ensures alarms are not triggered by short power glitches.

Display settings

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 lower number (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. If Enabled, you need not click the Show All Advanced Parameters box to see all available parameters.

Correlation configuration

This menu is only applicable for systems that have the correlation option installed (with a blow molder or other machine).

The screenshot shows the 'Correlation' tab in a software window. At the top are tabs for 'System', 'Reports', 'Correlation' (selected), 'Channel Groups', and 'System Config'. The main area contains several settings: a checked checkbox for 'Track Machine Parts'; sliders for 'Total Spindles', 'Total Cavities', 'Total Infeed Arms', 'Total Outfeed Arms', 'Spindles #1 Offset', 'Cavity #1 Offset', 'Infeed Arm #1 Offset', and 'Outfeed Arm #1 Offset', all set to 1; a dropdown for 'Outfeed Arm Numbering' set to 'Independent'; an unchecked checkbox for 'Dual Cavity System'; and a 'Forced Reject' button.

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.

☞ *The Database Detective has a two page reference list for various Sidel models' spindles, arms, and cavities. In Database Detective, right-click the Wombat name, and select About Wombat. Double-click inside the About Wombat screen, and double-click again or right-click for another screen.*

SIDEL SERIES 1: SPINDLES ARMS CAVITIES

SBO-04	96	3	4
SBO-06	120	3	6
SBO-10	150	6	10
SBO-16	160	8	16
SBO-24/20	144	12	24
SBO-24/24	186	12	24
SBO-24/26	250	14	24

Double or right-click for more info

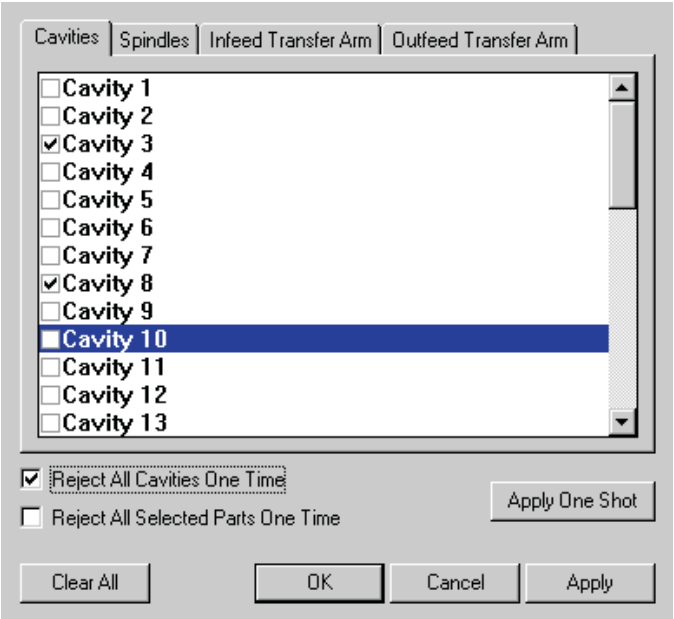
Total Spindles	Define the total number of spindles inside your blow molder or other machine.
Total Cavities	Define the total number of cavities.
Total Infeed Arms	Define the total number of infeed transfer arms.
Total Outfeed Arms	Define the total number of outfeed transfer arms.
Spindles #1 Offset	This allows you to change the mapping between what the inspection system considers Spindle #1 and the actual spindles. You may need to do this if you have replaced components in your blow molder and have changed the relationships between the component designated “number one” and other components. This information is required to be correct for the inspection system to track data properly.
Cavity #1 Offset	See the description of Spindle #1 Offset. This setting, of course, applies to the cavities in the blow molder instead of the spindles.
Infeed Arm #1 Offset	See the description of Spindle #1 Offset for more information. This setting applies to the Infeed Transfer Arms.
Outfeed Arm #1 Offset	See the description of Spindle #1 Offset for more information. This setting applies to the Outfeed Transfer Arms.
Outfeed Arm Numbering	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	Enable this if your system is a dual cavity machine.
Forced Reject...	Click this button to open the Forced Reject menu. This allows you to force any part associated with a particular cavity, spindle, infeed transfer arm, or outfeed transfer arm to be rejected. The system will reject all parts associated with the checked components, regardless of the condition of those parts.

 This menu is also available by right-clicking the System or Lane Overview tabs.

Reject parts associated with known-defective machine components

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.



Reject All Cavities One Time

Any component that is checked will cause the system to reject all parts correlated to that component, regardless of inspection criteria. The Clear All button clears the check marks from all components at once (i.e., Cavities, Spindles, Transfer Arms). Click the Apply button to make the changes you have made to this menu.

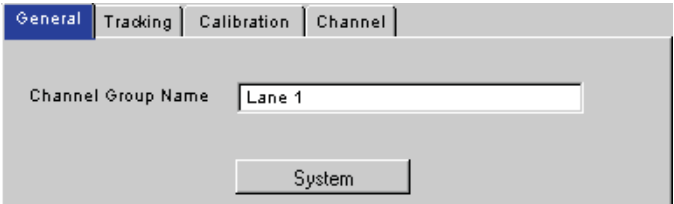
Reject All Selected Parts One Time

Check this box to purge the blow-molder or machine of all parts currently associated with all cavities. Click Apply One Shot to reject these parts. The menu will automatically close.

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

Channel Groups tab

Choose the group that you would like to configure. These menus configure part tracking for the entire system, as well as the imaging and part present delay for each channel.



General tab

Channel Group Name

Name the group of channels. These channels all share the same part present sensor and reject device.

System button

Returns to the system configuration menus.

Part Tracking tab

The screenshot shows the 'Part Tracking' tab with the following settings:

Parameter	Value
Part Width	0
Pass Pulse Width	0
Complete Pulse Width	0
Disable Part Present	103

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 page 6-7 for System Calibration).

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 “Part Complete” output referenced in the Intellispec Hardware Guide.

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.

☞ *The resulting encoder frequency, even after dividing, should not be less than 400Hz. Check Diagnostics Tools, I/O, Show I/O Rates, Encoder for resulting frequency.*

Simulated hardware settings (Advanced parameters)

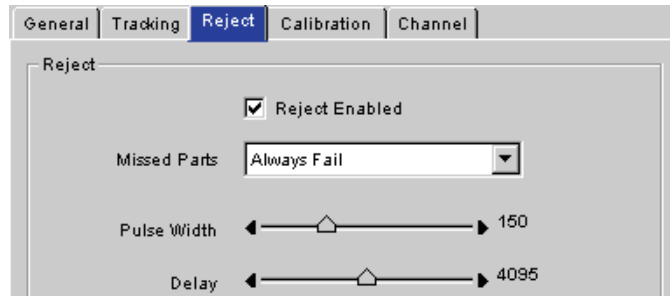
Encoder Enable If Disabled, the system uses the actual encoder pulses for part imaging and tracking. If Enabled, the system generates a constant signal to process and track parts. This is useful if your conveyor or belt speed does not vary.

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



Reject Enabled

Enable or Disable the reject device for the current channel group.

Missed Parts

You may choose to 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 occurs.

A Missed Part is defined in two ways: either a missed part present signal or missed part results. A Missed Part Present Signal indicates the system was busy processing other parts when this part present inspection request came in. Missed Part Results means that the inspection was still being processed when the part made it to the reject station. Effectively, these parts were not inspected.

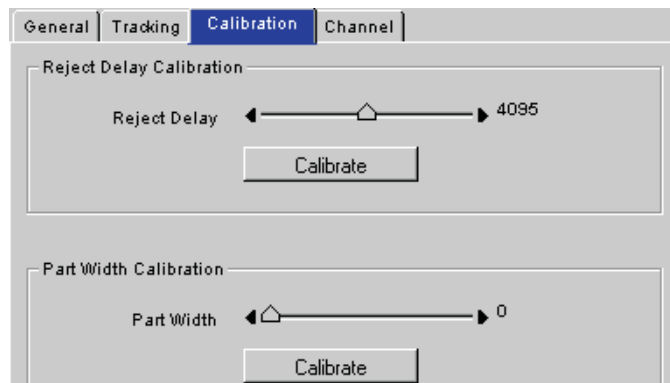
Pulse Width

This is the length of time, in milliseconds, that the reject signal from the Intellispec remains active.

Delay

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

Calibration of part tracking



Through this menu, you can calibrate the channel group for part tracking and reject timing.

➡ *Part Width must be calibrated before Reject Delay*

Calibrate the Part Width

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

Click the Calibrate button under Part Width. Run several parts through the system, enough for a good sampling of parts. 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 through the slider bar above the Calibrate button.

Calibrate the Reject Delay

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

Caution

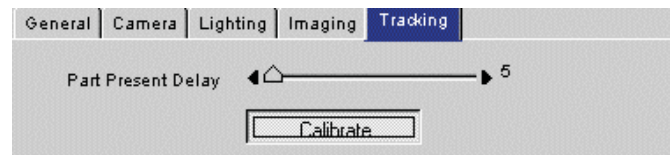
When you enter the Reject Delay calibration, the reject mechanism will attempt to blow off all parts.

1. Click the Calibrate button under Reject Delay.
2. Run parts through the system, preferably slow enough so that you can ensure each 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. Click the Calibrate button again when the correct reject position is achieved.
4. You can make changes if necessary to the Reject Delay by using the slider bar. If you do not click the Calibrate button, no parts will be rejected at this time.

Click OK to save changes.

Calibrate the Part Present Delay

Go to System Configuration, Channel Groups tab, select a group, Channel tab, select a channel, Tracking tab. Each channel's part present delay is calibrated separately.

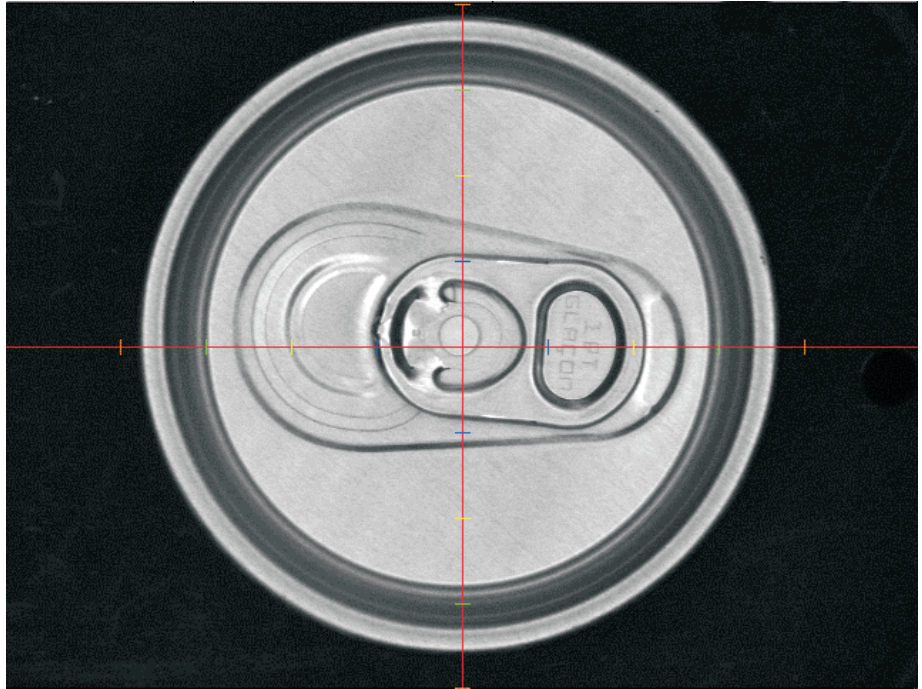


➡ *Part Width must be calibrated before Part Present Delay. If you have not calibrated Part Width already, back up to the Part Width calibration: click the General tab, Channel Group button, Calibration tab.*

Part Present Delay is the number of encoder ticks between the part present signal and when the part is directly centered in the camera's field of view.

To calibrate the part present delay:

1. Select a channel to calibrate. Click the Tracking tab. 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.



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

You can make changes if necessary to the Part Present Delay setting by using the slider bar. However, the image and target are not displayed if you do not click the Calibrate button.

Channel configuration

These menus will configure the current channel, select the light type, and set the search vector options for the Camera Control Tool.

A screenshot of a software interface for channel configuration. The interface has a tabbed menu at the top with five tabs: General, Camera, Lighting, Imaging, and Tracking. The 'General' tab is currently selected. Below the tabs, there are two main configuration fields: 'Channel Name' with a text input field containing 'Camera 2', and 'Default Product Type' with a dropdown menu showing 'Easy Open Ends'. At the bottom of the form is a 'Channel Group' button.

The menus for each channel are the same.

General tab

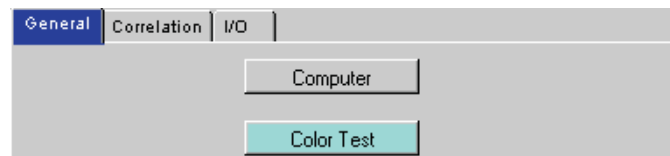
Channel Name	Name the current channel. This name will be used on the statistics tab for this channel, the channel indicator bar, and the system graphs.
Default Product Type	This selection should only be done during installation of the system. It allows the most useful inspections to be available for each product type, thus simplifying setup.
SmartLINK	(Advanced parameter) Enable or disable the SmartLINK feature. SmartLINK allows you to pass or fail the part based on the pass/fail/warn status of individual inspection regions. You can conditionally pass a part if a certain region passes, conditionally fail a part if a certain region fails, or make your own conditions. It also lets you pulse an output based on the pass/fail/warn condition of any inspection. The SmartLINK setup takes place after a registration. See page 4-11 for SmartLINK setup.

Camera, Lighting, Imaging

Please see Chapter 7 for a description of these features.

Diagnostics tools

General tab



Computer diagnostics

Displays information about your computer system. Technical support representatives may request this information for assistance in troubleshooting. Your configuration will be different from this example.

Color test

Click this to display 15 colors in the image area of the Intellispec. This can be used to troubleshoot video.

Correlation diagnostics

	Sensor Count	Part Present	Pocket Detect
Spindle:	0	0 ms 0 ms	0 ms 0 ms
Cavity:	0	0 ms 0 ms	0 ms 0 ms
Transfer Arm:	0	0 ms 0 ms	0 ms 0 ms
Pocket Detect:		0 ms 0 ms	

Stop

Exit

This screen can help you verify the sensor operation if you have the correlation option installed. Click Start to begin the diagnostic. 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.

 *The Database Detective has a two page reference list for various Sidel models' spindles, arms, and cavities. In Database Detective, right-click the Wombat name, and select About Wombat. Double-click inside the About Wombat screen, and double-click again for another screen.*

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 diagnostics

Located under Diagnostics Tools, I/O tab.

I/O testing

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.

Shown below is the configuration of inputs and outputs of the Intellispec. 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. Refer to your Intellispec Hardware Guide for more information.

Move your cursor over each button to see each signal name.

Inputs

Channel 1 Encoder	Channel 2 Encoder	Channel 3 Encoder	Channel 4 Encoder	Reject container full	Sidel door status	Ch. 1 part present	Ch. 2 part present
Ch. 3 part present	Ch. 4 part present	Transfer arm index	Spindle index	Cavity index	Pocket detect	Ch. 1 reject confirm	Ch. 2 reject confirm
Ch. 3 reject confirm	Ch. 4 reject confirm	Keyboard recover	AC power failure	Low battery backup	High temp.		

Channel 1 reject	Channel 2 reject	Channel 3 reject	Channel 4 reject	Ch. 1 good part	Ch. 2 good part	Ch. 3 good part	Ch. 4 good part
Ch. 1 part complete	Ch. 2 part complete	Ch. 3 part complete	Ch. 4 part complete	Ch. 1 fire strobe	Ch. 2 fire strobe	Ch. 3 fire strobe	Ch. 4 fire strobe
Sidel stop	Ch. 2 stop	Ch. 3 stop	Ch. 4 stop	Lighting reset	Online status	Visual alarm	Audible alarm
Warning indicator	Watch dog						

Outputs

When you are ready, click the desired output channel button to toggle the output. Check the output through the hardware; for example, check the reject device if you toggle a reject output.

Click the small x in the upper corner of the I/O screen to exit this diagnostic.

Show I/O Rates

Displays current information about part present or encoder rates. Check the Part Rate or Encoder Frequency box to view.

Part Rate

Click the Start Diagnostic button to measure the current part rate.

Run parts through the part present sensor. The time between part present signals is timed and averaged. Run enough parts through for a good average and click Stop Diagnostic to finish.

Use the part present rate to determine how long an inspection can take.

Encoder frequency

Click the Start Diagnostic button to measure the encoder frequency. If there is no encoder attached to your system, this will read 0 Hz.

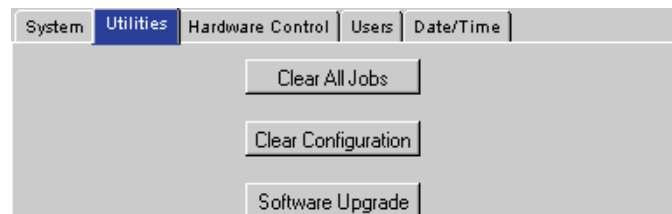
If you are using the encoder divider, this rate will read the speed after it has been divided. Be sure to compensate when determining production speed.

☛ *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.*

Click Stop Diagnostic to finish. Click Exit to remove the I/O rates screen.

Miscellaneous functions

Utilities



Clear All Jobs

Located under Misc., Utilities.

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.

All vision job information is erased. The only way to retrieve vision database information is if you have saved it to disk. See page 9-1 for more information about saving to disk.

Clear Configuration

Located under Misc., Utilities.

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 page 9-1 for more information about saving to disk.

Warning

This utility completely erases all information from the system.

Software Upgrade

Located under Misc., Utilities.

Use this utility if you receive a disk with a software upgrade from Pressco. The system will properly configure the new version of software.

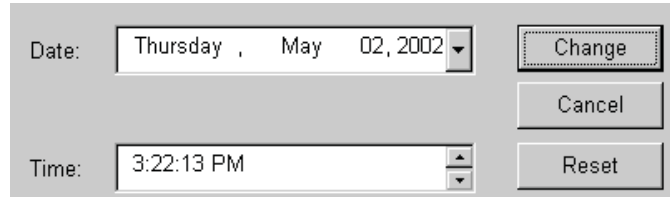
Hardware Control

Toggle Video Mode

Toggles between slow and fast video modes. Fast video mode is the normal operating mode of Intellispec.

Slow video mode is useful when someone is controlling the Intellispec via pcAnywhere™. Without slow video mode, the Remote computer cannot see images. When remote diagnostics is finished, click the Toggle Video Mode button again to switch back to fast video mode.

Date and Time adjustment

A screenshot of a 'Date and Time adjustment' dialog box. It has a light gray background. The 'Date:' label is on the left, followed by a text field containing 'Thursday , May 02, 2002' and a small downward arrow. To the right of this is a 'Change' button with a dashed border. Below the date field is a 'Time:' label, followed by a text field containing '3:22:13 PM' and small up/down arrow buttons. To the right of the time field are 'Cancel' and 'Reset' buttons.

Located under Misc., Date/ Time.

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.

Set the time in 12 hour format. Highlight the hour/ minute/ second/ or AM/PM. Type the new value or use the up/ down arrow buttons to adjust.

Click Change to accept the new settings. Click Cancel to exit the menu without making changes. Click Reset to change the date/ time to the values they were when you entered this screen.

Click the small x in the upper right corner of the Date and Time Editor to exit.

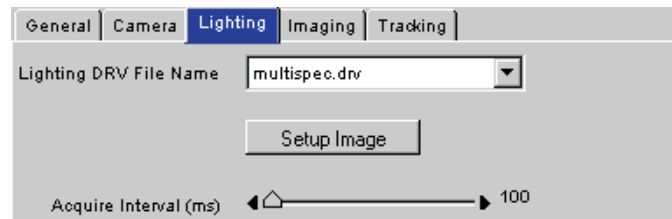


Chapter 7 - Lighting, Cameras, Imaging

Lighting configuration

Administrators only

This menu allows you to choose the type of lighting configuration for each channel. This affects the operation of the Light Control program (see below). 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.

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 active Image Analysis). See Light Control below.

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.

Light Control

Administrators only

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 should have been configured during installation. If not, see Lighting Configuration topic above. 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 your parts are moving through the system, go to System Configuration, System tab, Offline Acquire Mode: select Part Present. (Described on page 6-1). Or, right-click on image, select Image, Tools, Acquire Mode, and select Part Present.
 - If your parts are not moving, go to System Configuration, System tab, Offline Acquire Mode: select Immediate. Or, right-click on image, select Image, Tools, Acquire Mode, and select Immediate.

You are ready to control the lighting. Right-click on the image and select Lighting. The Image Analysis program appears (only if you selected Light Control by right-clicking on image) to assist you with achieving optimum gray levels.

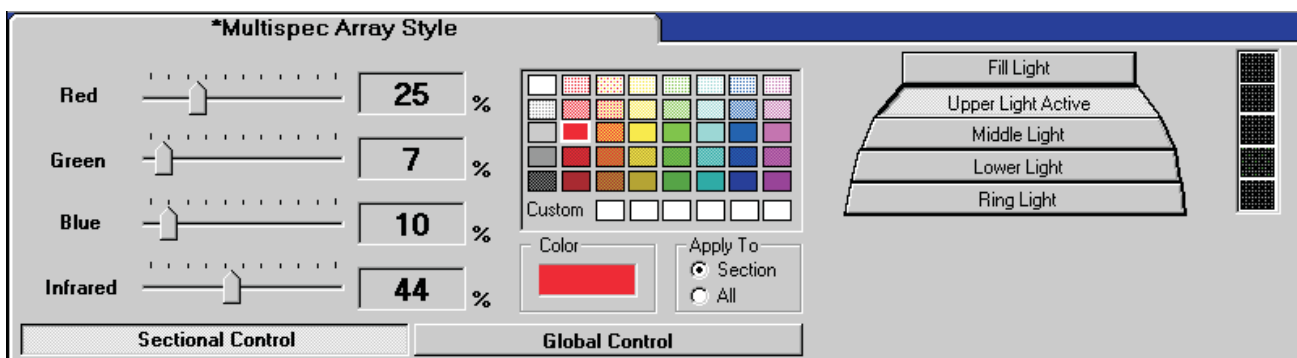
What does it control?

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.

Chromapulse lighting

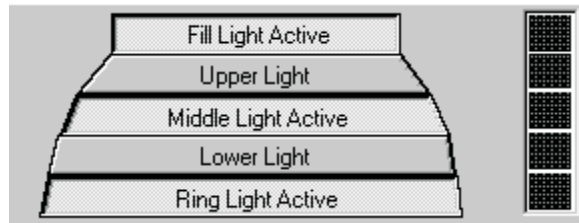
If your system is using the Multispec Light Type (see page 6-6), your Smartlight screen will look similar to the one shown below.



The different parts of the Main Control Screen are as follows:

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.

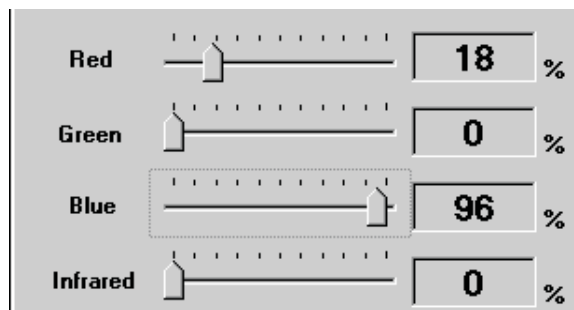


You must select at least one section to change its lighting. To control multiple sections at one time, click the Global Control button (see page 7-5).

Color

Located to the right of Section control shown above, this vertical row of color blocks displays the current color setting for each section. The letters IR will appear in 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.

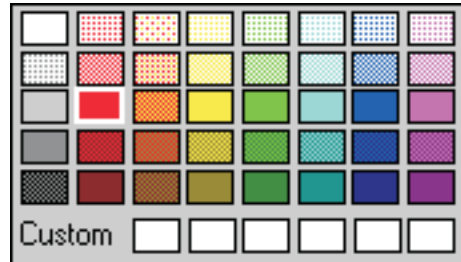
Intensity Control Sliders



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:

- 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 on page 7-6).
- 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.)

Color Presets Grid



This provides 40 preset color options and six additional customizable preset colors. Click the desired color box to assign a color to the selected light section. Use of the Color Preset Grid is in lieu of setting the color mix with the Intensity Sliders. Remember to ensure the desired light section is selected before choosing a color on the grid.

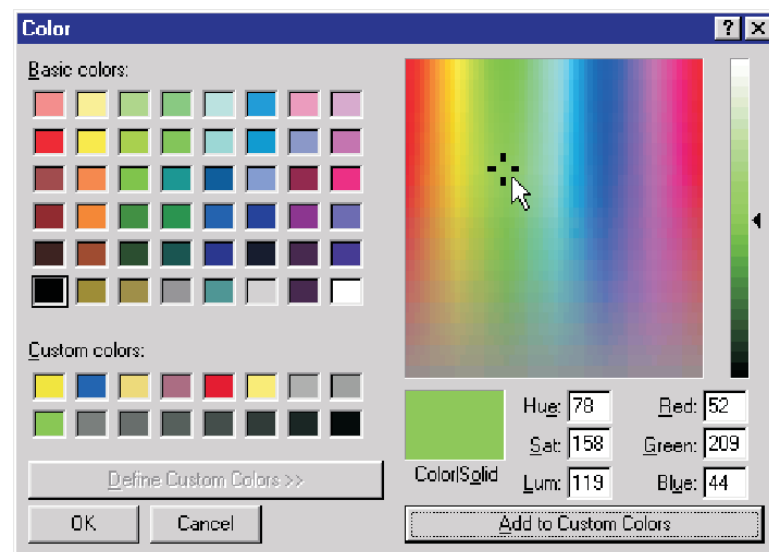
To create a custom color preset, double click one of the six custom color preset boxes located along the bottom of the grid. A new screen will appear allowing you to specify a custom color for the preset.

Creating Custom Color Presets

Located at the bottom of the color presets area of the main menu are spaces for six custom color presets. You can create a custom color for each.

To create a custom color preset:

Double click one of the six Custom boxes below the color presets grid. A color dialog box will appear as shown below.

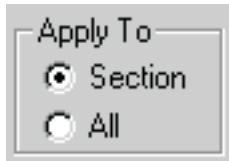


Create a custom color or choose a predefined color. To create a custom color, click on a point in the large box on the right. You can use the vertical slider on the far right to brighten or darken the chosen color.

When you have achieved the desired color, click OK. Your custom color will be available as a preset on the main menu.

➡ Create up to 16 custom colors within the color dialog box by clicking the Add to Custom Colors button after creating 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 preset 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, a preset color is applied to all sections. The All option is handy if you want to quickly set all light sections to the same preset color.

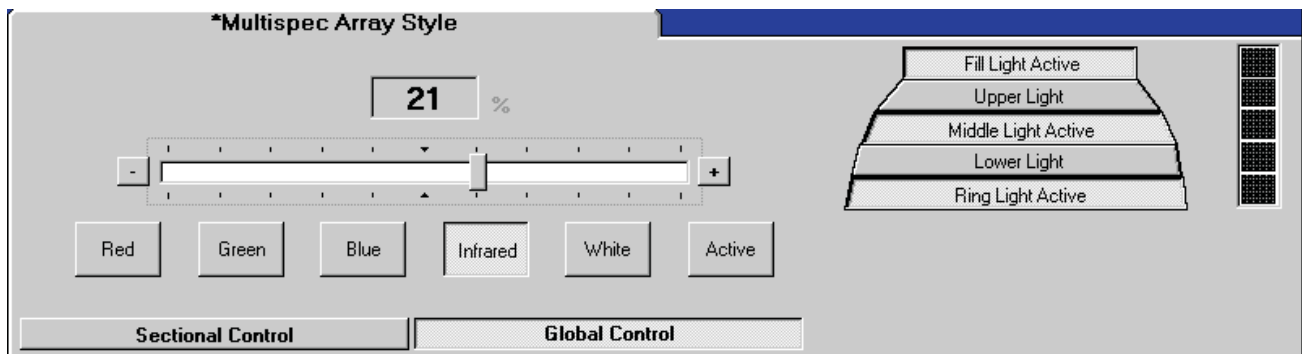
Sectional Control button

Selects the screen shown on page 7-2. You make most of the lighting adjustments from this screen.

Global Control button

Selects the Global Control screen. The Global Control screen allows you to make lighting adjustments that affect multiple or all light sections simultaneously.

The Global Control screen is shown below.



To use the Global Control screen:

- First select the light sections you want to adjust simultaneously. Click the desired sections in the Lighting Sections portion of the screen.
- Next, select the color or colors you want to increase or decrease. You can select any combination of the four colors by clicking on the appropriate color buttons.
- Next, click and drag the slider to the right to increase the color intensities, or drag to the left to decrease intensities.

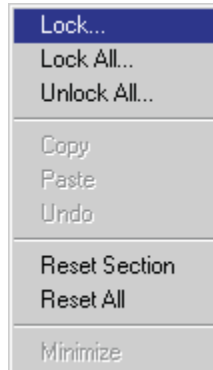
White button

Selecting the White button is the same as selecting Red, Green and Blue.

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.

Pop-up Menu (from Intensity Control)



When you right-click on the slider bar area of the main menu, the pop-up menu shown above will appear. This menu provides several functions, described next.

Lock, Lock All, Unlock All

You can lock two or more sliders together so they will move together. When you drag one locked slider, all locked sliders move in proportion. To lock two or three sliders together, right click on one to display the pop-up menu. Then select the Lock option. 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.

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.

Copy and Paste

Copy and Paste allow you to copy the light settings from one light section and paste them to a different section.

Select the light section you want to copy settings from, then select copy from the pop-up menu.

Select the light section you want to copy settings to, then select paste from the pop-up menu.

Undo

Allows you to undo the last change you made to the lighting.

Reset Section

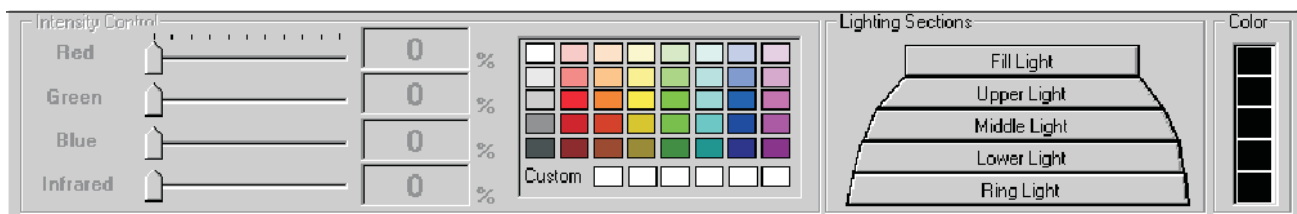
Sets all lights in the selected section to zero.

Reset All

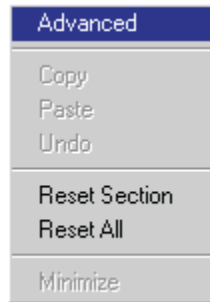
Sets all lights in all sections to zero.

Minimize/Maximize

Causes the main menu to be reduced in size to take up less space on the screen. This can make it easier to view the other inspection system menus and images which may be displayed under the light control screen. Once you have selected Minimize, that item will change to Maximize allowing you to return the screen to its original size. The minimized screen is shown below. Note that this might not be active on your system.



Pop-up Menu (from Lighting sections)

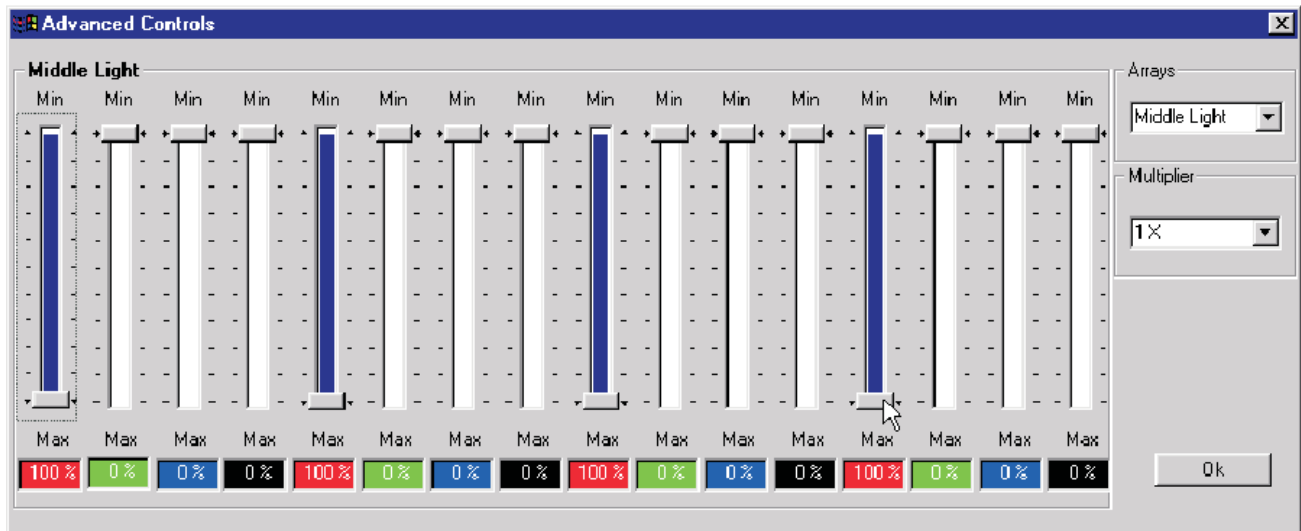


When you right-click on the Lighting sections area, the pop-up menu shown above will appear. This menu is similar to the one described above. Most of the functions are the same. However, the Lock options are absent.

One new item appears on this pop-up menu that is not on the other: Advanced. Advanced provides the capability to adjust the light intensity of a single zone independently.

Advanced Controls

The Advanced Controls screen allows you to control each light zone independently. A zone is the smallest independently controllable portion of a light section.



 *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.

The number of zones and colors within a light section may vary depending on application.

Selecting Light Sections

Before adjusting an individual zone, you must select the light section containing the zone. Under the Arrays heading in the upper right of the window, select the desired light section.

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 on the right side of the window 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 additional light intensity is required.

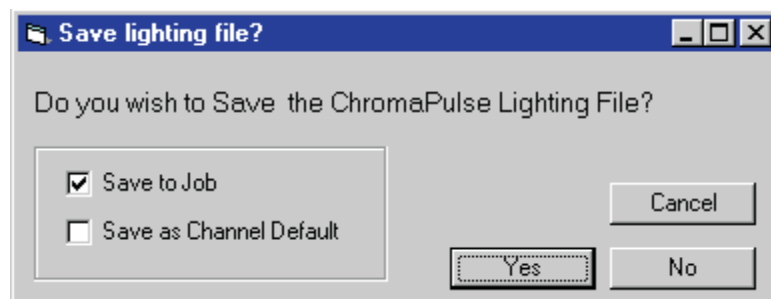
Caution

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.

Exiting Smartlight

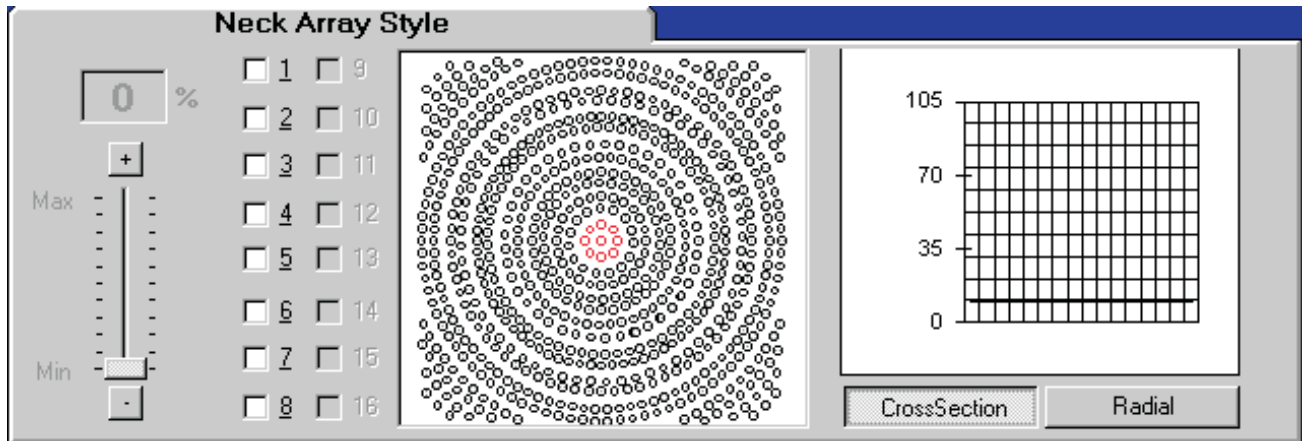
Simply click the Close button. The system asks whether you want to save the changes you made.



- Click Cancel to return to Smartlight.
- Click No to discard any changes you made and exit.
- Click Yes save 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.
- Click Yes to save and exit.

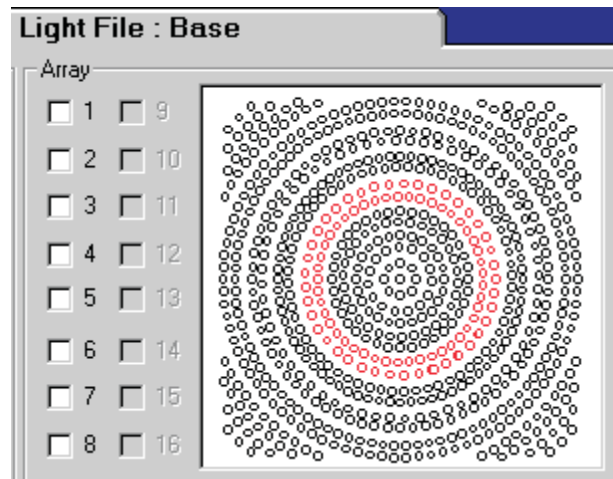
PET application lighting

If your system is using Base, Neck, or Seal Surface lighting configurations, Smartlight will look similar to the screen shown below.



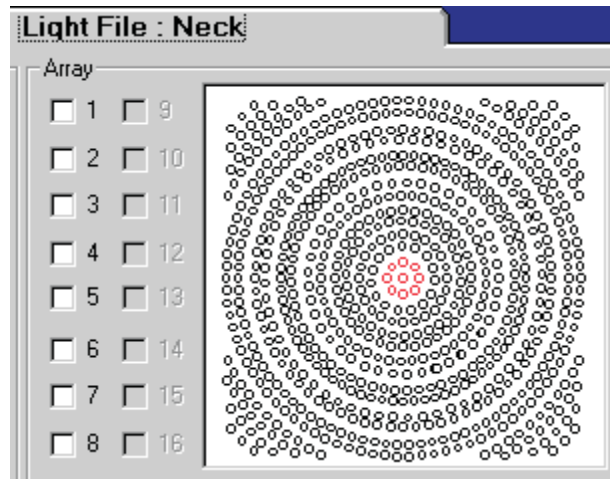
Zones for Base, Neck, and Seal Surface applications

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.



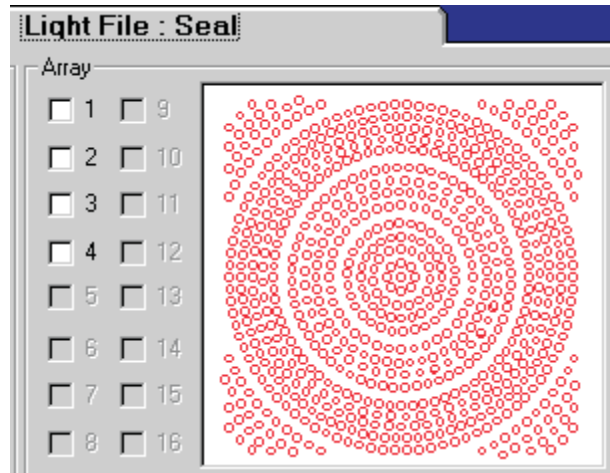
Base lighting array

The Neck array also 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.



Neck lighting array

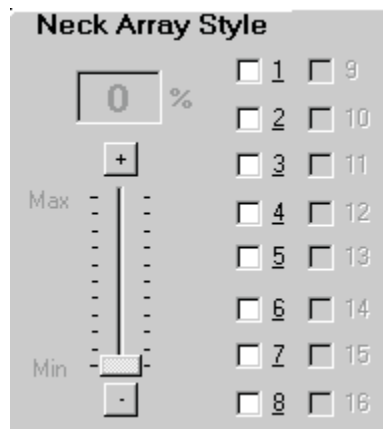
The Seal Surface array is made up of four zones of red LEDs.



Seal Surface lighting array

Intensity Control

This area of the light control program allows you to make adjustments for separate zones of the lighting array.

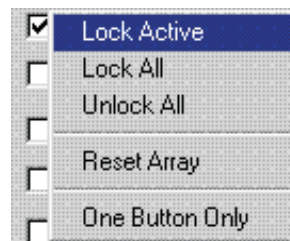


The slider controls the light intensity of the different zones. You must first select the desired zone(s) before making adjustments with the slider. Note the following:

- 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.

Pop-up Menu (from Intensity Control)

When you right click on the slider bar area or zone area (if a zone is active), the pop-up menu shown below will appear.



This menu provides several functions. They are defined below.

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.

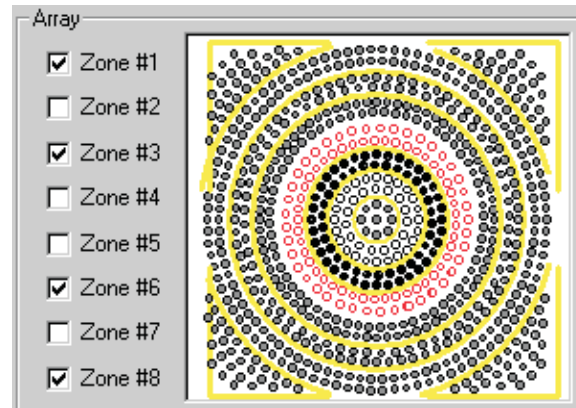
Reset Array

Selecting Reset Array will set all zones to zero.

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 Array

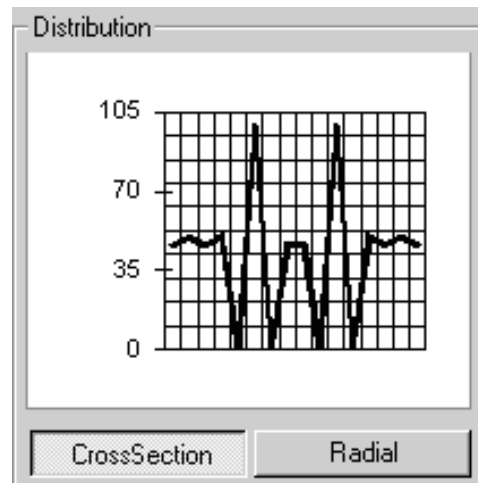


This section shows the different zones of light used on each channel. This section varies slightly, depending on the current channel. When you activate (click the check box of) a zone, the Intellispec highlights it, so you can see which parts of the array you are controlling. The LEDs illustrated in the array become more intense as you increase the light intensity.

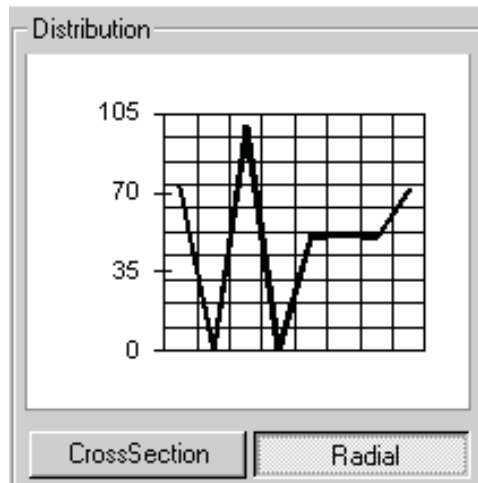
Distribution

The graph in this section 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.



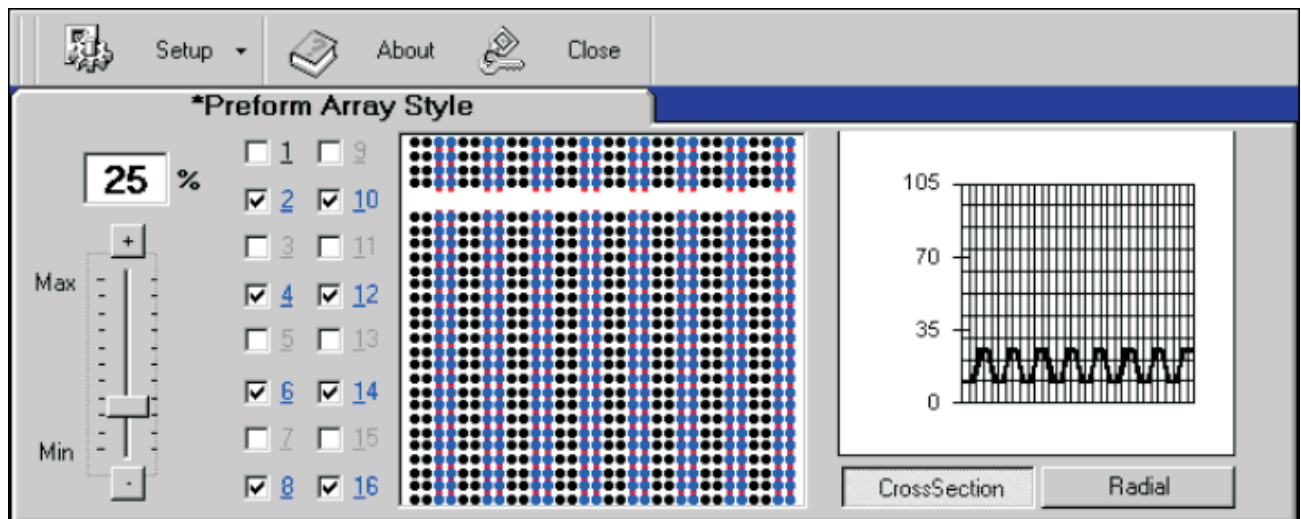
The Radial view shows the intensity of the zones along a radial. View this as looking from the center of the array (left side of the graph) outwards to any edge of the array (right side of the graph).



See page 7-8 for information on saving the light file and exiting Smartlight.

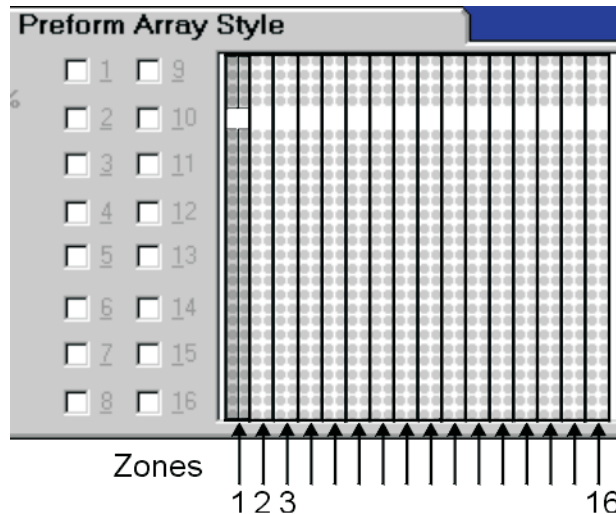
Preform application lighting

If your system is inspecting preforms, and the preform light driver is selected for any preform channel, your light control screen will look like the screen shown below.



Zones for Preform 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

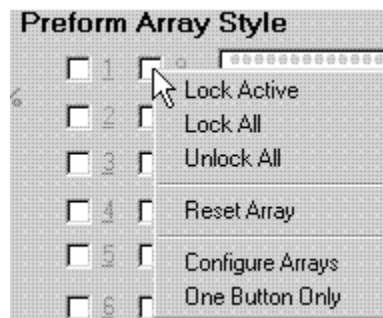
The intensity control section works the same as that described under PET applications.

To check or adjust Preform lighting:

- Check all odd-numbered zones. These are the infrared LEDs. These should be set to 10% intensity level. Then un-check zone numbers.
- Check all even-numbered zones. These are the blue LEDs. These should be set to 25% intensity level. Then un-check zone numbers.

The Preform light control should look like the screen on page 7-13, including the distribution graph.

Pop-up Menu (from Intensity Control)



When you right click on the slider bar area or zone area, the pop-up menu shown below will appear. Most of the functions operate the same as those described on page 7-11. However, the Configure Arrays option is unique to Preform applications, and is described below.

Configure Arrays

This option allows you to identify which section of LEDs belongs to which zone. This procedure should be done only during installation, and should not be changed under normal operating conditions.

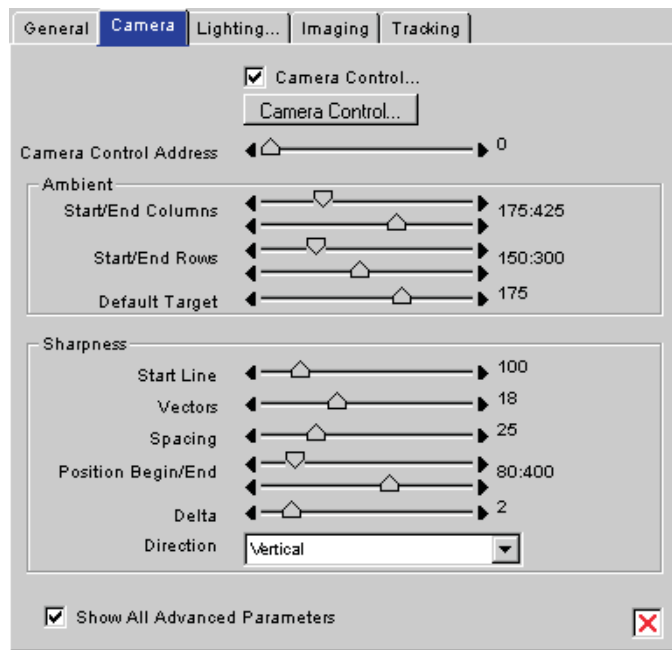
To assign a section of LEDs to a zone:

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.

Camera Control

 *Administrators only*

Camera Control Tool setup



Located under System Configuration, Channel Groups tab, select a group, Channel tab, select a channel, Camera tab. Show All Advanced Parameters.

The following parameters are used to set up the search region for the Camera Control tool. See page 7-17 for a description of the Camera Control tool.

Camera Control

Indicates whether there is a controllable camera attached to the current channel. Enabled means Camera Control is available. The default setting is Disabled.

You will see a channel button in the Camera Control tool for each channel that has Camera Control Enabled.

Some system configurations (hardware) do not support software camera control (e.g., Seal Surface camera does use software Camera Control).

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, and Channel 2 = address 1, etc.

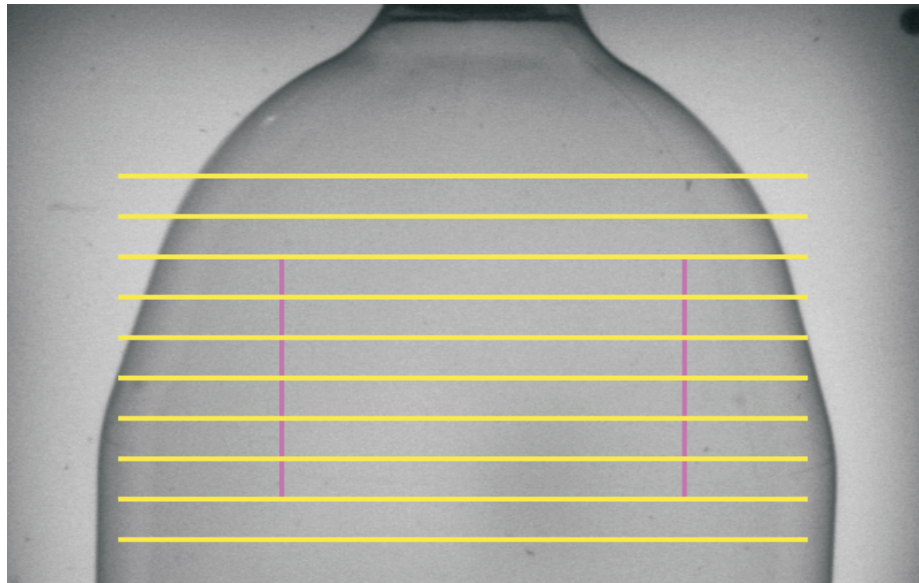
☞ *This should be set up during installation and should not be changed*

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.

Ambient Start/ End columns Indicates the top left and right coordinates of the rectangular ambient search region for the Camera Control tool.



Sharpness search vectors - yellow

Ambient search region - magenta rectangle

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 a desired image intensity. This is just a target and has no effect on the operation of the Camera Control tool nor the system.

Sharpness settings

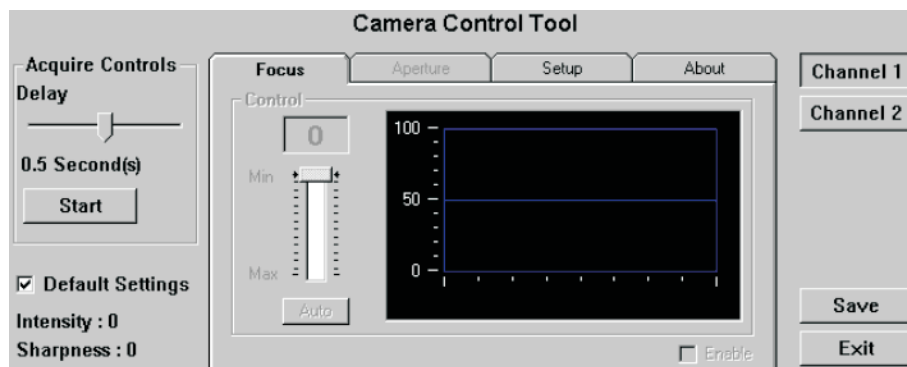
The Camera Control tool automatically computes the sharpness of a newly acquired image. This will help you set the camera focus.

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.

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.
	 <i>Be careful with this parameter – increasing it may result in better looking sharpness values, but it may not be a true indication of focus.</i>
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, such as in Neck, Finish, or Preform applications.

Camera Control Tool



Administrators only

This tool makes it easier for you to modify camera focus when inspection modules are mounted inside part conveying systems (e.g., blow molder, or inside a preform conveying system). The camera control utility is currently available for several, but not all cameras (e.g., not available for Seal Surface cameras).

Focus control is available on Base, Neck, and Preform Sidewall cameras. Hardware support for aperture control is not available as of this printing. See your Intellispec Hardware Guide for specific focus and aperture adjustments for your application.

Before using Camera Control:

1. Camera control must be enabled for each channel on which you want to use camera control. See page 7-15.
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.
 - If your parts are moving through the system, right-click on image, select Image, Tools, Acquire Mode, and select Part Present. (See Offline Acquire Mode, page 6-1)
 - If your parts are not moving, right-click on image, select Image, Tools, Acquire Mode, and select Immediate.
3. Assign a job for each channel you want to modify with the Camera Control tool.

- The changes you make with the Camera Control tool will be saved with a particular job, unless you make and save changes to the Default Settings.
- To select a job, either select a Part from Part Management, or click the channel's statistics tab, right-click for menu, and choose Select Job.

After configuring the camera control parameters, select Camera Control by selecting a channel, right-clicking on its image, and selecting Camera Control from the menu.

Using 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.

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.

Caution

Saving changes with the Default Settings box checked changes the settings for all jobs in that channel that use the default settings.

- Any other job for that channel can use the same default settings to simplify setup.

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, 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 Auto button allows the system to try to achieve the best focus position. If you press 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.

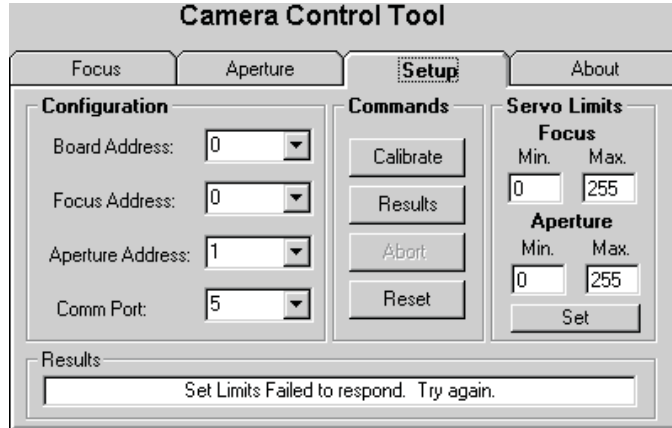
The Enable box is used to lock the settings and prevent accidental changes.

- 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 Smartlight (see page 6-14).
- Setup tab** This is where the system is configured to talk to the Camera Control tool.

Caution

The tool is set up during initial installation, and should not be altered

Below is the Camera Control Setup screen, and a description of its parameters.



Board Address – The address of the camera control board. Address is 0 for Channel 1 and 1 for Channel 2.

Focus Address – The board level address that selects between the focus and aperture servos. The default address for focus is 0.

Aperture Address – the board level address that selects between the focus and aperture servos. The default address for aperture is 1.

Comm Port – The communications port used to communicate to the camera control board.

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.

Abort – Allows you to stop a calibration task.

Results – Pressing this button shows you the current servo limits used by the camera control board, displayed in the results area of the screen.

Reset – Sends a reset command to the camera control board.

Servo Limits – Allows you to modify the calibration limits.

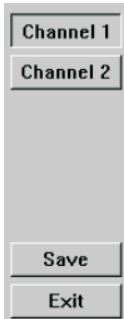
Caution

If you enter a value outside of the system's calibrated limits, this may cause camera malfunction.

Set – Sends the modified calibration limits to the camera control board.

- About tab** Shows the current version of the Camera Control Tool.

Channel Buttons



Save

Each channel that has Camera Control enabled will have a button. If the name of the channel 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 channels, you will be prompted whether to save the changes from the channel which you were previously using.

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. Press Yes to save the changes as the Default Settings. Otherwise, press No.

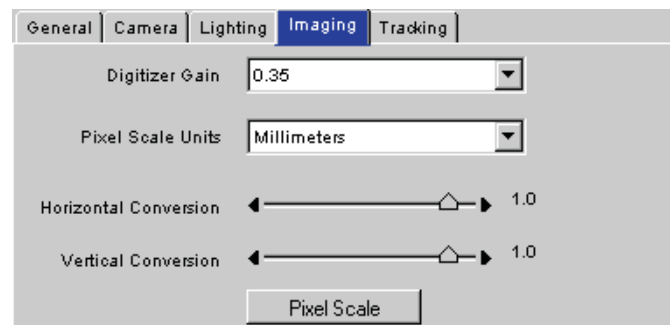
Exit

This allows you to abort any changes you have made in the Camera Control tool and exit the tool.

Imaging configuration

Administrators only

Located under System Configuration, Channel Groups tab, select a group, Channel tab, select a channel, Imaging tab.



Digitizer Gain

Change the gain of the current camera from the available choices. This procedure should only be performed during installation.

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 (see below).

Pixel Scale Units

Choose to have measurements reported in millimeters, inches, pixels, or custom. Custom allows any measurement conversion.

Horizontal Conversion

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

Specify how many pixels vertically convert to one Pixel Scale Unit (e.g., 1 pixel = 1 millimeter, or 10.78 pixels = 1 inch). Enter the appropriate number of pixels.

Pixel Scale Calibration

 Administrators only

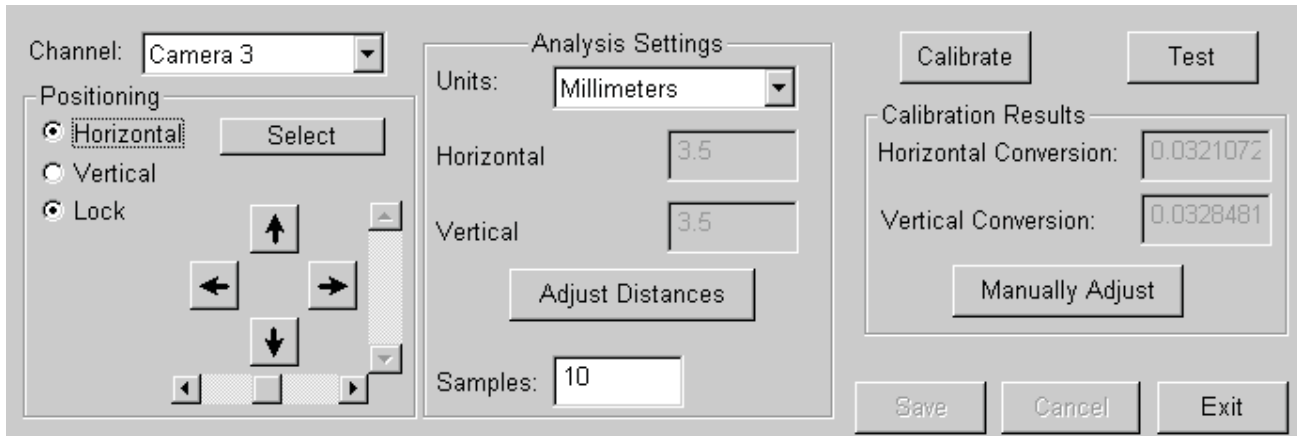
Click the Pixel Scale button from the Imaging menu shown above, or access this tool by selecting a channel, right-clicking on its image, and selecting Pixel Calibrate.

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.

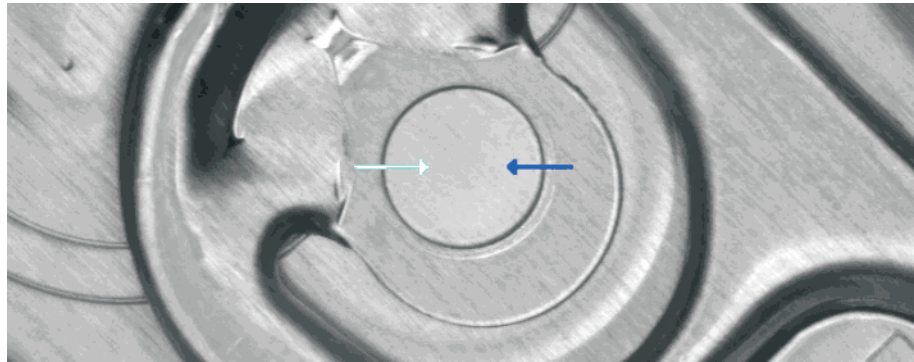
Before Entering Pixel Scale Calibration

Acquire an image on the channel for which you are calibrating the pixel scale. Put a calibrated part, of which you know the exact measurements where the system will report the measurements. Select the channel, right-click its image, choose Image, Tools, Acquire Mode, and choose Immediate.

Calibrating the Pixel Scale

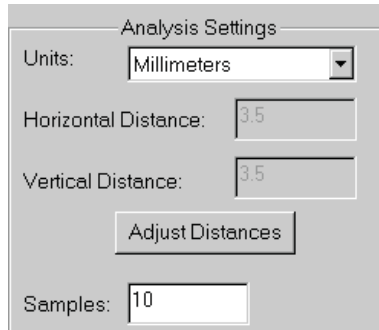


1. Enter the Pixel Scale Calibration tool by right-clicking on the image and selecting Pixel Calibrate. Choose a channel to calibrate its pixel scale. Each channel must be done separately because the hardware adjustments for each channel may be slightly different from each other.
2. Positioning – set areas on an image where the system will calibrate the pixel scale. Click the Horizontal button. The system displays an image with two horizontal arrows.



3. To move the screen arrows, click the arrow buttons under Positioning. Hold the left trackball button down on an arrow button to move the screen arrows quickly. 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.
 - 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.

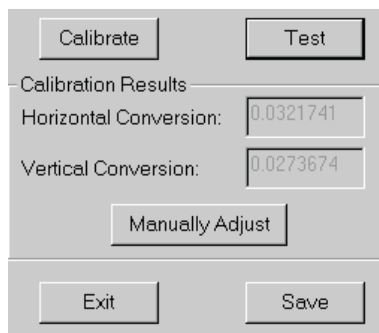
- Select – the cyan arrow on screen is the one currently selected. To select the other arrow, toggle the Select button. Note that if the Lock button is checked, both arrows will move.
4. Click the Vertical button. Move the vertical arrows to a place on the part where you know its exact vertical measurement. The body of the arrows must cross over the edge transition that you want the system to find.
 5. Analysis settings – this is where you tell the system your desired units of measure, and your part's exact vertical and horizontal measurements.



The 'Analysis Settings' dialog box contains the following elements:

- Units:** A dropdown menu currently set to 'Millimeters'.
- Horizontal Distance:** A text input field containing the value '3.5'.
- Vertical Distance:** A text input field containing the value '3.5'.
- Adjust Distances:** A button located below the distance input fields.
- Samples:** A text input field containing the value '10'.

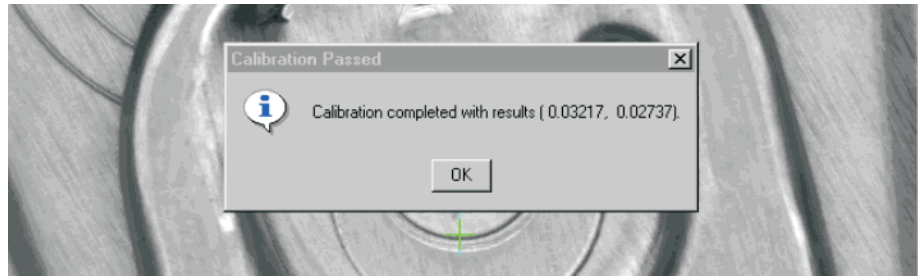
- Units – choose the unit of measure you used to measure your part. Choose from millimeters, inches, pixels, or custom. Custom allows any measurement values.
 - Adjust distances – click this button, then enter the exact measurements of your calibrated part. Click View Distances.
 - Samples – this is the number of images the system will take to compute the measurements. It will use the average value of all the samples.
6. Click the Calibrate button.



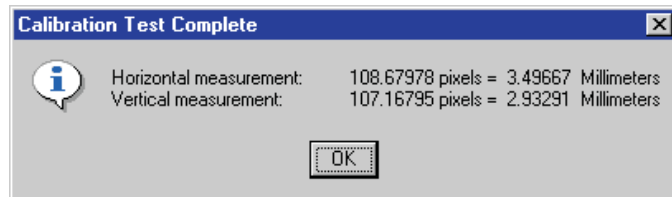
The 'Calibration Results' dialog box contains the following elements:

- Buttons:** 'Calibrate' and 'Test' buttons at the top.
- Calibration Results:** A section header.
- Horizontal Conversion:** A text input field displaying the value '0.0321741'.
- Vertical Conversion:** A text input field displaying the value '0.0273674'.
- Manually Adjust:** A button located below the conversion fields.
- Exit and Save:** 'Exit' and 'Save' buttons at the bottom.

- The system acquires the number of images you 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. Click OK.



- If you encounter an error, check the Inspection settings. Make sure the Horizontal and Vertical search arrows are positioned correctly on the image to find an edge. See step 3.
7. 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 channel, 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.
8. Repeat steps 1-6 for all channels on which you want to calibrate the pixel scale.

To resume normal inspection, right-click on the image, choose Image, Tools, Acquire Mode, and choose Part Present.

Image Analysis

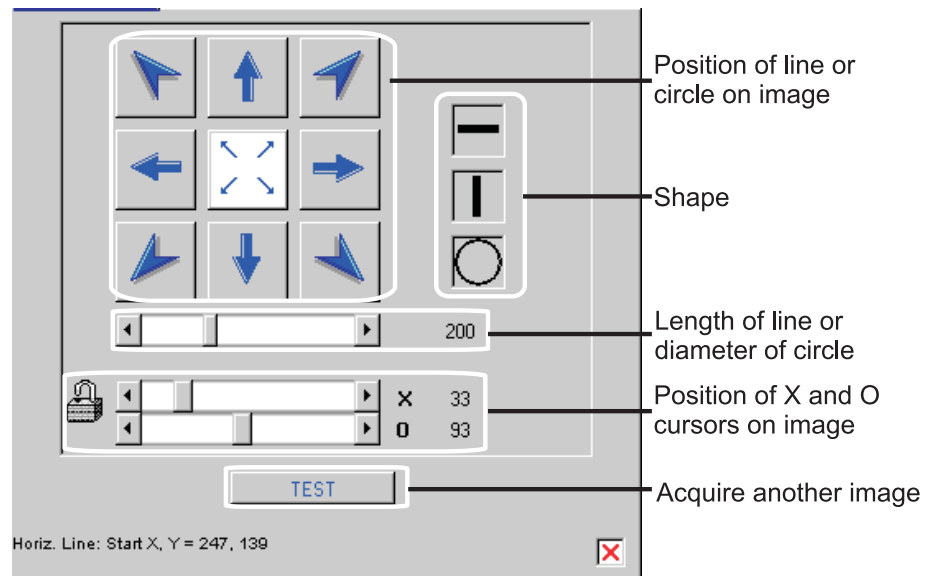
This tool displays the gray shade value for any group of pixels in your image. This is useful in programming jobs or setting up lighting. You can measure grayscale values of pixels in horizontal or vertical lines, or over a circle.

 *Mechanic user level and higher*

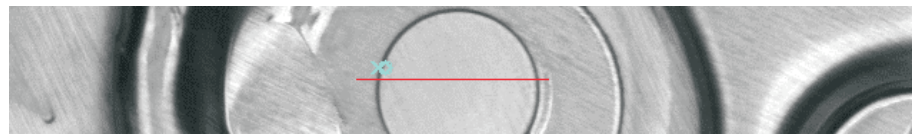
To activate Image Analysis, select a channel, right-click on its image, and choose Image Analysis from the menu.

The defined area, called a contrast plot, shows the pixel values along the line or circle. Moving the cursors (X and O) within the contrast plot will provide gray shade information on specific areas, set a delta, and determine the gradient.

Image Analysis control panel



Choose a shape to view gray shades. Choose from horizontal line, vertical line, or circle. See the shape displayed on the image.



The arrow buttons move the shape around the image. The outer arrows move the shape in small increments. The inner arrow button is a coarse adjustment: hold the left trackball button and slide the shape around the image with the trackball.

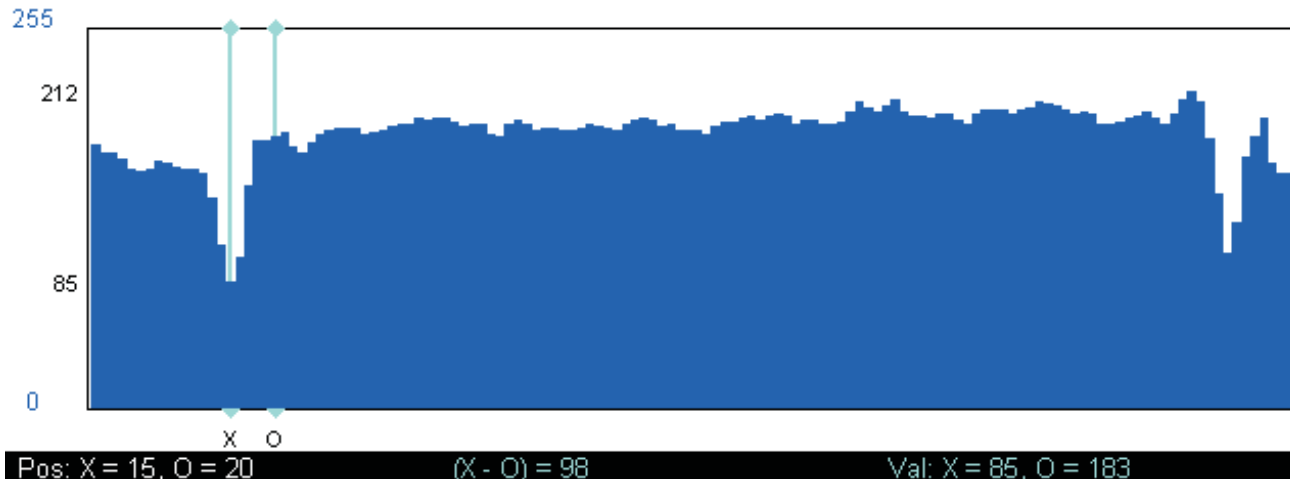
The slider directly underneath the arrow buttons controls the length of the line or radius of the circle. Click the end arrows to increase or decrease one pixel at a time. Click the white area of the slider to increase or decrease in larger increments. Click and hold the middle slider button to adjust length or radius quickly.

The two sliders near the bottom of the control panel position the X and O cursors on the line or circle. Click the lock symbol to lock these sliders together to move the cursors similarly along the line or circle. X is always left or top; O is always right or bottom. If you try to move O to a value lower than X, X will move as well.

The shape's position is displayed at the bottom of the control panel.

Click the Test button to acquire another image to measure its grayscale values.

Image Analysis plot



The vertical scale represents the gray shade of each pixel (from 0 to 255) along the line or circle. The high/ low values give you a quick view of the maximum and minimum grayscale values along that line or circle.

The horizontal scale represents each pixel along the line or circle. The two cyan markers represent the X and O cursors. Their grayscale values are shown at the bottom right of the plot.

The X and O positions along the line or circle are listed at the lower left of the plot. These are positions with respect to the left or top pixel of the line, or the top pixel of the circle. The difference between the X and O positions represent Delta.

The difference between grayscale values (Gradient) of X and O is shown in the bottom middle of the plot.

Image Archive

The image archive functions allow you to save and restore images between the Intellispec's memory and disk drives. You can save an image to disk to forward to Pressco service, or you can save images for use in programming jobs. Images are saved as Windows® bitmaps (.bmp).

Save an image

The image that will be saved is the one currently displayed on screen. Right-click on the image, select Image, Save. Select the type of image:

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.
- Scroll to the desired folder and type a file name. The images are saved as Windows® bitmap “.bmp” files. Click Save, or Cancel to exit without saving.

Saving images that were frozen online

Images can only be saved while the system is offline. If you want to save an image that was frozen when the system was online, take the system offline and immediately right-click on the image, select Image, Save, Grayscale. You must choose Grayscale as the type of image to save. Online graphics cannot be saved.

To freeze an online image, use a freeze frame mode (see page 5-3) or simply click on the image to hold the current image. Then take the system offline and save the image as described above.

Restore an image

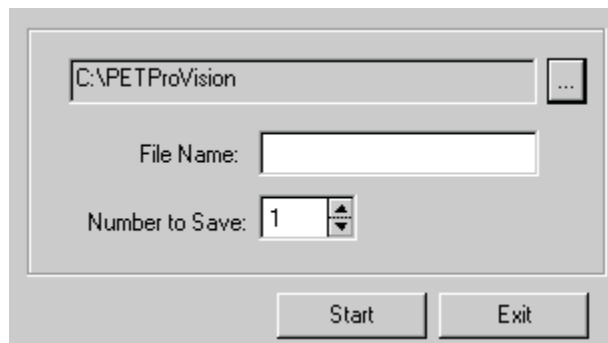
This option allows you to display an image that was previously saved on disk. Select the desired channel before you restore an image. Right-click the image area for the menu, choose Image, Restore, and browse for the desired image or .pvl file.

When you restore an image, it will be displayed on the current channel when you program or modify a job, use Image Analysis, etc. Therefore, you should choose an image that corresponds to the current channel.

Choose an image type to open

You can restore one image at a time for each channel (.bmp), or open a .pvl file (if available). A .pvl file is a special Intellispec text file that contains a list of bitmap (.bmp) images for up to four channels. For more information about creating and using .pvl files, see page 9-8.

Autosave



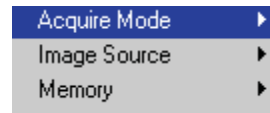
Saves several images taken in a row (from one channel) to disk. This is especially useful if you want to create a .pvl file.

To save these images, select Autosave. Browse to another folder if desired, using the ... button. Note that most images are saved under the C:\PETProvision\Data folder. Name the image(s). The system will add a number extension to the name. Select the number of images to save, click Start, or Exit if you decide not to save the images.

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 .pvl file, save images for the remaining channels.

Image Tools



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.

☛ *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 Copies the image currently in the work buffer to frame buffer whenever the system is asked to acquire an image. It tells the system to acquire an image from the work buffer instead of reading a new image from the 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.

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.



Chapter 8 - Alarms

Alarm Configuration

You may view the alarm settings as a Mechanic level user and higher. However, you must be an Administrator to change alarm settings.

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, and choose whether the blow molder (if applicable) should stop based on an alarm. There are a number of system alarms, and a number of alarms available for each channel. These alarms are described below.

☞ You can quickly see which alarms are enabled by looking at the Alarms screen.

Enabled Alarms

Alarms	
Alarms	Time Occurred
Channel 1 Percent Defects	01/04/02 04:34:42PM
Channel 1 Excessive Warnings	
Channel 2 Percent Defects	
Channel 2 Excessive Warnings	01/04/02 04:34:45PM
Channel 3 Percent Defects	01/04/02 04:34:42PM
Channel 3 Excessive Warnings	
Chute Full*	
Blow Molder Door*	

Alarms: Red = Alarm triggered. Yellow = Warning. Gray = normal.

The alarms highlighted in red are those which have had alarms triggered based on setup parameters. The yellow alarms are those which have reached a warning status. The time the alarm was triggered is displayed to the right of the triggered alarm.

Each triggered alarm is also recorded in the system's Alarm Log, which can be viewed or saved to disk for record-keeping or servicing purposes (see page 3-15 for information on log files).

Disabled Alarms

If an alarm is Disabled, no events are logged, other than the fact that you switched off the alarm. The alarm does not appear in the Alarms tab when Disabled.

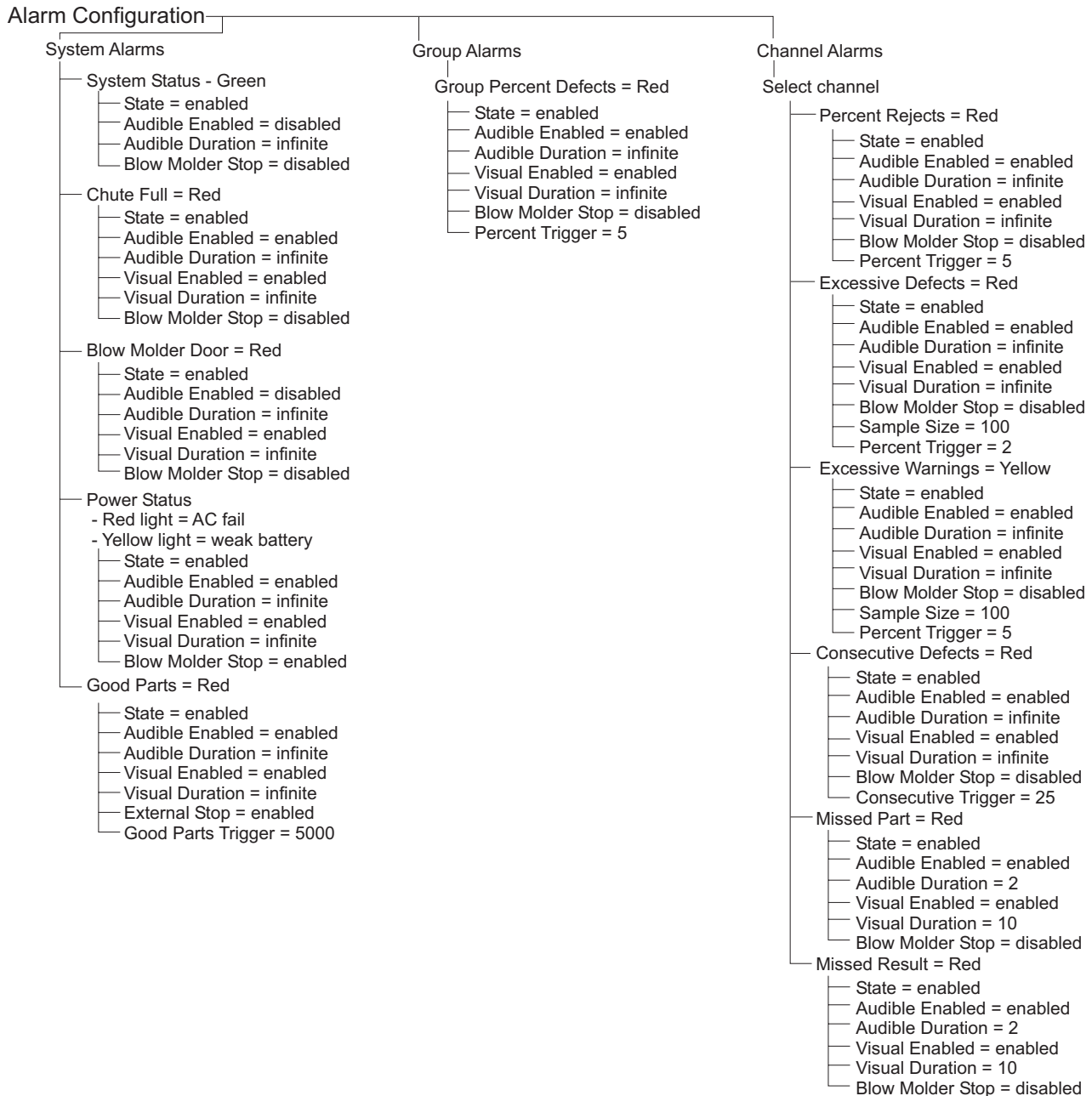
Clearing an Alarm

Click the Alarms tab. Right-click to see a list of alarms that have been triggered. Choose an alarm to clear, or choose Clear All Alarms. If no alarms have been triggered, there will not be a list.

The alarm may be triggered again if you do not clear the condition (e.g., The Chute Full alarm will remain triggered until you empty the internal reject chute in a blow molder). The description of each alarm in this section explains the conditions that trigger an alarm.

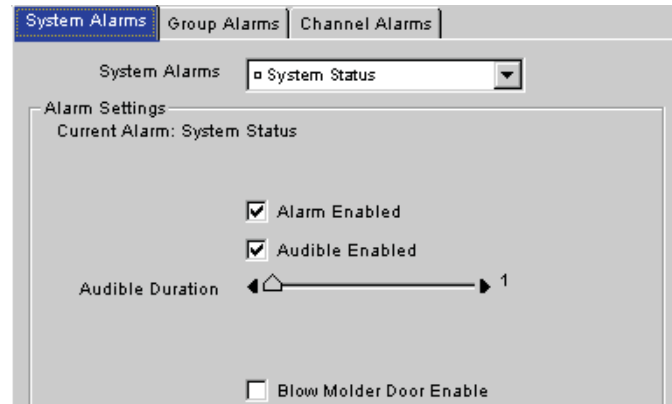
Alarm Defaults

The following chart lists the Intellispec's default status of each of the alarms, as well as the color of the corresponding light in the light tree.



System Alarms

Select an alarm from the System Alarms tab to view or change options.



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.

Alarm Enabled	If this alarm is Enabled, the green light will switch on when the system is online. The light will switch off when the system goes offline. Also, if the system goes offline, the audible alarm sounds (if enabled) and the blow molder stops (if enabled). If Disabled, none of the following parameters are used.
Audible Enabled	If this parameter is Enabled, the audible alarm will sound when the system goes offline. The default is Disabled.
Audible Duration	The number of seconds the audible alarm will sound if the Intellispec goes offline. 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). The default value is one second.
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to the blow molder (if applicable to your system) to stop when the Intellispec is offline. Default value is Disabled.

Chute Full

This alarm is mainly used in systems that have inspection modules installed within a blow molder, and use the blow molder's internal reject chute. This alarm may not apply to your system.

 *This alarm is disabled when the Intellispec is offline.*

Alarm Enabled	This alarm is triggered when the blow molder's internal reject chute is full. If this alarm is Enabled and triggered, the blow molder's internal rejecter will be disabled, thus not allowing any more defective parts to be rejected. The rejecter will remain disabled until you clear the chute and then clear the alarm from the alarms tab. If you clear the alarm without clearing the chute, the alarm will be triggered again. If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered. If Disabled, none of the following parameters are used.
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 the blow molder reject chute is full. A value of zero indicates an infinite duration, until the chute is cleared and the alarm is cleared 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 the alarm is triggered.
Visual Duration	The number of seconds the red light will remain on when the alarm is triggered. A value of zero indicates an infinite duration, until the chute is cleared and the alarm is cleared from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder when the internal reject chute is full. The default value is Disabled.

Blow Molder Door

This alarm is used for systems that have inspection modules installed within a blow molder. This alarm may not apply to your system.

 *In PET Preform applications, this alarm is triggered when the Bypass Gate opens.*

This alarm is triggered when the blow molder door is opened. It will remain triggered until the door is closed.

Alarm Enabled	If this alarm is enabled, the Intellispec will issue an alarm status in the Alarms area, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.
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 the blow molder door is closed. 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 on the light tree when triggered.
Visual Duration	The number of seconds the red light will remain on when the alarm is triggered. A value of zero indicates an infinite duration, until the blow molder door is closed. Or, you can enter values up to 3600 seconds (60 minutes).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder when the blow molder door is open. The default value is Disabled.

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	If this alarm is enabled and AC power is lost, the Intellispec will issue an alarm status in the alarms tab, switch on the red or yellow light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled). If this alarm is enabled and the UPS battery is weak, the Intellispec will issue a warning status (yellow) in the alarms tab.
Audible Enabled	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.

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 AC power is restored or the battery has been charged or replaced. Or, you can enter values up to 3600 seconds (60 minutes).
Visual Enabled	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.
Visual Duration	The number of seconds the red or yellow light will remain on when the alarm is triggered. A value of zero indicates an infinite duration, until the AC power is restored or the battery has been charged or replaced. Or, you can enter values up to 3600 seconds (60 minutes).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder when AC power to the Intellispec is lost, or when the UPS battery is low. The default value is Enabled.

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. In addition, the External Stop signal, in this application, will 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.

This alarm is triggered when a number of good inspected parts (Good Parts Trigger) has been reached. The Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the conveyor (if enabled).

This alarm 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	If this alarm is Enabled and triggered, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the conveyor (if enabled). If Disabled, none of the following parameters are used.
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 the correct number of Good Parts has passed inspection. A value of zero indicates an infinite duration, until the alarm is cleared 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 the alarm is triggered.
Visual Duration	The number of seconds the red light will remain on when the alarm is triggered. A value of zero indicates an infinite duration, until the alarm is cleared from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).
External Stop	If this is Enabled, and the number of Good Parts is met, this signal will stop the conveyor from feeding parts through the inspection system.
Good Parts Trigger	Define the number of parts that must pass inspection (Pass or Warning inspection status) to trigger the alarm.

Overtemp

This alarm is not configurable in the Intellispec. 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 the clear the alarm from the alarm tab. If you clear the alarm and the cabinet is still too hot, the alarm will trigger again.

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	If this alarm is Enabled and triggered, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled).
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 too many defects occur. A value of zero indicates an infinite duration, until the alarm is cleared 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 the alarm is triggered.
Visual Duration	The number of seconds the red light will remain on when the alarm is triggered. A value of zero indicates an infinite duration, until the alarm is cleared from the alarms tab. Or, you can enter values up to 3600 seconds (60 minutes).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder when the Percent Trigger is reached. The default value is Disabled.
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.

Channel Alarms

Each channel has a set of alarms with several parameters. Choose a channel and its associated alarm.

Percent Defects

The screenshot shows a software interface for configuring channel alarms. At the top, there are three tabs: 'System Alarms', 'Group Alarms', and 'Channel Alarms', with 'Channel Alarms' being the active tab. Below the tabs, there are three camera selection dropdowns. 'Camera 1' has 'Percent Rejects' selected, while 'Camera 2' and 'Camera 3' have 'None Selected'. Below these is a section titled 'Alarm Settings' with the text 'Current Alarm: Percent Rejects'. Inside this section, there are four checkboxes: 'Alarm Enabled' (checked), 'Audible Enabled' (checked), 'Visual Enabled' (checked), and 'Blow Molder Door Enable' (unchecked). There are also two sliders: 'Audible Duration' and 'Visual Duration', both set to 0, and a 'Percent Trigger' slider set to 5.0.

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	If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.
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 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. 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).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder (if applicable to your system) when the total percent defects alarm is triggered. The default value is Disabled.
Percent Trigger	Define the percentage of parts inspected that must fail to trigger the total percent defects alarm. This number must be a minimum value of one and maximum value of 100. The default value is five percent.

Excessive Defects

This alarm is triggered when a percentage of the last n parts have been found defective. n = Sample Size.

This alarm will remain triggered until you clear it from the alarms tab.

Alarm Enabled	If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.
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 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. 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).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder (if applicable to your system) when the total percent defects alarm is triggered. The default value is Disabled.
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 must be a minimum value of one and a maximum value of 50,000. The default value is 100.
Percent Trigger	Define the percentage of the Sample Size that must be defective to trigger the alarm. This percentage must be a minimum value of one and a maximum value of 100 percent. The default value is two percent.

Excessive Warnings

This alarm is triggered when a percentage of the last n parts have been found with a warning status. n = Sample Size.

This alarm will remain triggered until you clear it from the alarms tab.

Alarm Enabled	If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the yellow light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.
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. 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).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder (if applicable to your system) when the excessive warning alarm is triggered. The default value is Disabled.
Sample Size	Define the number of parts that must be inspected to determine the excessive warning percentage. This is a sliding window: for example, if three percent of the last 1000 parts have had a warning status, the alarm is triggered. This number must be a minimum value of one and a maximum value of 50,000. The default value is 100.
Percent Trigger	Define the percentage of the Sample Size that must have a warning status to trigger the alarm. This percentage must be a minimum value of one and a maximum value of 100 percent. The default value is two percent.

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.

This alarm will remain triggered until you clear it from the alarms tab.

Alarm Enabled	If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.
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 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. 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).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder (if applicable to your system) when the consecutive defects alarm is triggered. The default value is Disabled.
Consecutive Trigger	Define the number of defects in a row that the system must have to trigger the alarm. This number must be a minimum value of one and a maximum value of 100. The default value is 25. If this parameter is set to zero, the alarm is disabled.

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.

Alarm Enabled	If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.
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 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. 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).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder (if applicable to your system) when the consecutive defects alarm is triggered. The default value is Disabled.

 You can determine whether parts are rejected based on Missed Part or Missed Result status. See page 6-7 for information.

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	If this alarm is Enabled, the Intellispec will issue an alarm status in the alarms tab, switch on the red light of the light tree (if enabled), sound the audible alarm (if enabled), and stop the blow molder (if enabled) when triggered.

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 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. 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).
Blow Molder Stop	If this parameter is Enabled, the Intellispec outputs a signal to stop the blow molder (if applicable to your system) when the consecutive defects alarm is triggered. The default value is Disabled.



Chapter 9 - Database Tools

Load and Save Databases

Located under Database Tools  button, Database Tools tab.

There are two databases – Vision and System. The Vision database saves job and inspection information. The System database saves vision jobs, calibration, and system configuration information. Note that you cannot save a System database without the Vision information.

Loading a Database

Load a previously created database into Intellispec's memory. Note that the system and channel configuration may be different from that which you were previously running. A database consists of a file folder, and several files within that folder, including the configuration file, a vision database file, and statistics files.

☞ *Save your current database before loading a different one.*

Click the Database Tools button. Click Load under either Vision or System database. Browse through the folders if necessary. Vision databases have a .vdb extension and System databases have a .cfg extension. 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 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.

Saving a Database

When you save a database, you can store it on the hard disk or a floppy, and load it at a later time.

Click Save under either Vision or System Database. System database saves configuration information as well as inspection jobs. Vision database saves only inspection jobs. You might want to save a Vision database separately from a System database if your configuration is the same for multiple types of parts. In this way, you can save multiple Vision databases and use the same System database. Note: when Loading the database, load the System database first, then load Vision database.

☞ *If you have saved 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 and run it, you must also save it to hard disk.*

Database Utilities

Located under Database Tools  button, Database Utilities tab.

Vision Repair

This 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 either 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.

If everything in this database checks OK, it will report that the repair was successful. 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

Similar to Vision Repair, Configuration Repair checks and repairs the system's configuration database. A warning is displayed at power-up if any parameters do not fall within the correct limits.

Alarm Repair

This checks and repairs alarm values that are illogical to the system.

Database Detective

Located under Database Tools  button, Database Utilities tab.

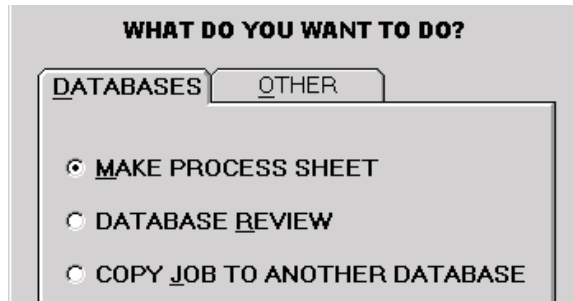
 *Mechanic user level and higher*

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.

This program is available through Database Tools , Database Utilities.

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.

From one of the tabs, choose a task to perform. The choices are described below:



Databases

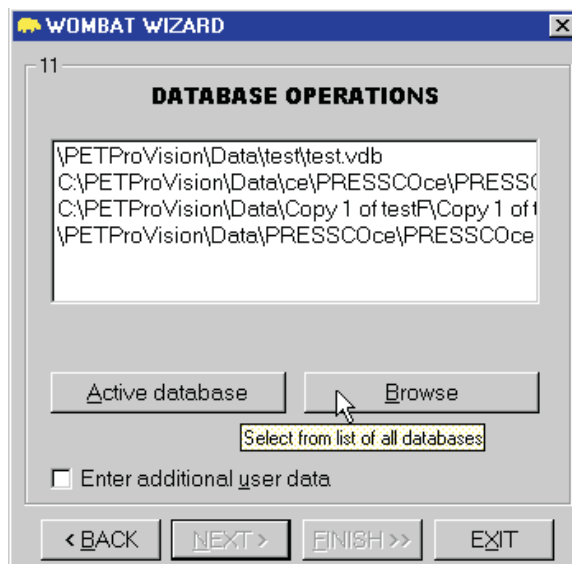
Make a Process Sheet

A process sheet is composed of two parts: a summary of the system and channel 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 channels.

To make a process sheet:

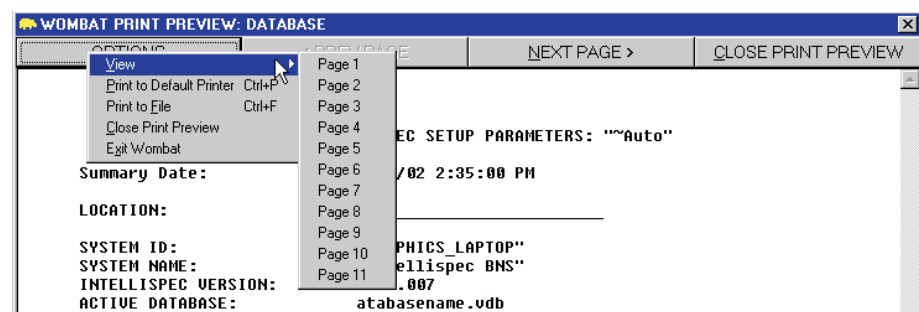
1. Click Next.
2. Choose a database to create the process sheet. Move your cursor over the option buttons to see a description of each button.



- 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 you click the Browse button, Wombat will search your Intellispec and provide a list of all databases. Select the desired database and click OK. Go to step 3.
3. Check the 'Enter additional user data' box, if desired, to add more detailed information about your system.
 4. Click Next. If you have checked 'Enter additional user data', the screen below is displayed. This information will be entered on your process sheet. If you check 'Remember these', this information will remain in this program so you do not have to enter it the next time you run the Database Detective. However, you must check the 'Enter additional user data' box for the program to include it in your process sheet. 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. Click the Options button to make your choice. The choices are described below.



View

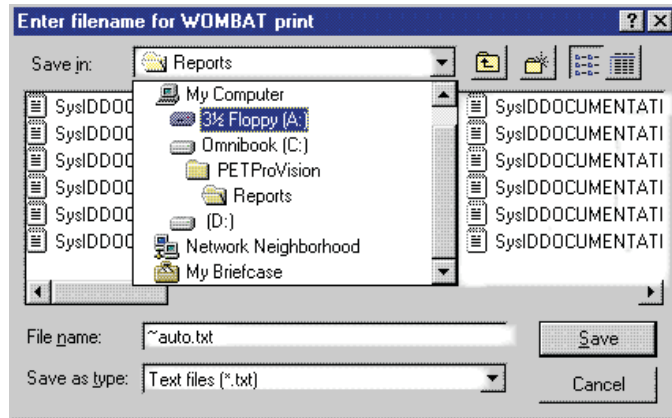
This displays a list of pages. Choose one to view. The number of pages will vary depending on the size of your database.

Print to Default Printer

Prints the report to the attached printer (if you have one already set up).

Print to File

Wombat saves the Process Sheet as a text (.txt) file to the default Reports folder, which happens to be the same folder where the system statistics are printed. If you would like to save this data to floppy disk instead, and use it outside of the Intellispec, scroll up to the A: drive and allow Wombat to print it to a floppy disk. Or, you can save reports to the Reports folder and copy them to floppy at a later time, as you will see later in this chapter.



Close Print Preview
Exit Wombat

Closes the report. No Process Sheet is saved to disk.
 Closes the Wombat program.

Database Review

This feature provides a printable list of databases within the Intellispec. This information is useful, especially prior to a software upgrade. It contains the number of jobs in the database, the number of parts (from Part Management) created in the database, obsolete inspections, and more.

```

                                DATABASE SUMMARY
Summary Date: 5/20/02 2:36:26 PM

Abbreviations: C Channels
                CG Channel Groups
                CW (reserved)
                IN Inspections
                J Jobs
                MRJ Jobs with Multiple Registrations
                OI Obsolete Inspections
                P Parts

NAME            VERSION  DATE&TIME SAVED  CW CG C P J  IN  MRJ OI
PREFORM CLEAR   2.00.023  10-29-2001 17:20  0 1 4 1 3  31 3  0
PRESSCO         2.00.023  10-29-2001 17:20  0 1 4 1 14 66 6  0

2 databases found.

Databases saved outside of the 2.x convention may not be found.
Presence of {%} in name means the name was shortened for this list.
Non-zero value/s in columns MRJ or OI indicates need for conversion if
database is intended for use with upgraded Intellispec version.
Intellispec version 3.0 allows 20 jobs maximum, * after job count
indicates presence of job/s numbered higher than 20 (or no jobs).
Use Wombat's DATABASE BUSTER to split up a large multi-PART database.

```

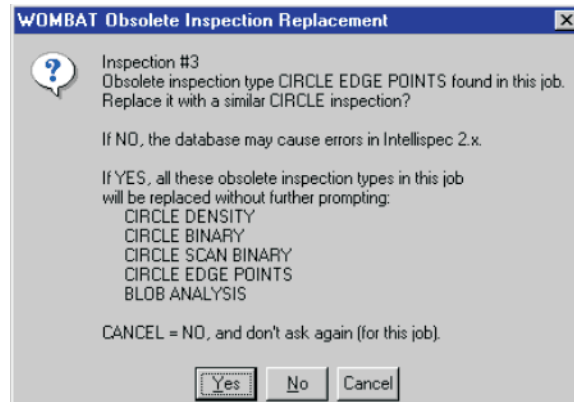
Copy a Job to Another Database

This option allows you to take a job you have already created, and use it within another database.

To copy a job to another database:

1. Click Next. Wombat will search your Intellispec and display all available databases.
2. Choose the database that contains the job you want to copy. Click OK.
3. Choose a database into which you want to copy the job (except ~Auto). Click OK.
4. Select the job to copy. Click Next. Wombat tells you that it is about to copy a job. Click OK to continue or Cancel if you do not want to copy the job.

Obsolete inspection notification



If you copy a job that was created in an earlier version of Intellispec, Wombat will notify you that certain inspections are obsolete. It recommends replacement inspections.

If you want Wombat to replace the obsolete inspections in the copy of the job, click Yes. You may need to modify these new inspections to work properly in your application.

If you click No, the obsolete inspection* mentioned in the dialog box will remain in the new copy.

If you click Cancel, the obsolete inspection* will remain, as will subsequent obsolete inspections (if any) from the job being copied. You will not be prompted again during this job copy operation.

☞ **These inspections will cause errors if you try to run them in a newer version of Intellispec.*

Other Database Detective options

Online - Offline History

This option reports the time and date of when the system went online, and when it was taken offline. It also lists which user was logged into the system when the system went offline. This information is displayed in reverse order, with the most recent information first.

The duration of online/ offline history is displayed. If the report reads "Going OFFLINE.... Online (4) 14:54:16", this indicates that the system was online for four days, 14 hours, 54 minutes, and 16 seconds.

WOMBAT PRINT PREVIEW: ON/OFFLINE LOG

OPTIONS< PREV PAGENEXT PAGE >CLOSE PRINT PREVIEW

RECORD OF PRESSCO INTELLISPEC ON-LINE TIME

Summary Date:3/27/02 5:37:11 PM

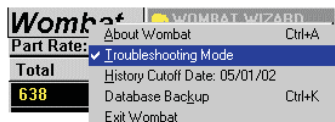
TOUCHED = parameters viewed offline, may have been modified.
* = no job assigned to channel.

Duration: (days) hr:min:sec

3/26/02 4:35:52 PM	Offline changes made to <Hough Registration>		
3/26/02 4:35:46 PM	Offline changes made to <Hough Registration>		
3/26/02 4:35:34 PM	Offline changes made to <Mighty Blob>		
3/26/02 4:35:31 PM	Offline changes made to <Mighty Blob>		
3/21/02 11:18:46 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:14
3/21/02 11:18:32 AM	Going OFFLINE	On-line:	0:00:06
3/21/02 11:18:30 AM	User logged in: Pressco Technician.		
3/21/02 11:18:26 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:53
3/21/02 11:17:39 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:06
3/21/02 11:17:33 AM	Going OFFLINE	On-line:	0:00:12
3/21/02 11:17:26 AM	User logged in: Pressco Technician.		
3/21/02 11:17:21 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:04
3/21/02 11:17:17 AM	Going OFFLINE	On-line:	0:00:10
3/21/02 11:17:14 AM	User logged in: Pressco Technician.		
3/21/02 11:17:07 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	22:34:14
3/20/02 3:31:11 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	2:48:18
3/20/02 12:42:53 PM	Going OFFLINE	On-line: (2)	2:52:46
3/20/02 12:05:48 PM	Going OFFLINE	On-line: (2)	2:15:41
3/19/02 5:33:55 PM	User logged in: Pressco Technician.		
3/18/02 9:50:07 AM	Going On-line Channels: 1; 2; 3	OFFLINE: (3)	0:47:57
3/15/02 5:33:38 PM	User Pressco Technician logged off		
3/15/02 11:16:59 AM	User Pressco Technician logged off		
3/15/02 9:02:26 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:16
3/15/02 9:02:10 AM	Going OFFLINE	On-line:	0:12:26
3/15/02 8:49:44 AM	Going On-line Channels: 1; 2; 3	OFFLINE:	19:13:12
3/14/02 1:50:23 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:13:51
3/14/02 1:36:46 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:14
3/14/02 1:36:34 PM	User logged in: Pressco Technician.		
3/14/02 1:36:32 PM	Going OFFLINE	On-line:	0:00:14
3/14/02 1:36:18 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:09:15
3/14/02 1:27:23 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:20
3/14/02 1:27:03 PM	Going OFFLINE	On-line:	22:03:31
3/13/02 3:23:35 PM	Going OFFLINE	On-line:	0:00:03
3/13/02 3:23:32 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	0:00:26
3/13/02 3:23:09 PM	User logged in: Pressco Technician.		
3/13/02 3:23:06 PM	Going OFFLINE	On-line:	0:00:10
3/13/02 3:22:56 PM	Going On-line Channels: 1; 2; 3	OFFLINE:	1:42:21

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. *See also History Cutoff Date.*

You have the same options to print or save as a text file as described under Make Process Sheet.



Troubleshooting Mode

If Troubleshooting mode is enabled, more information is displayed in the online-offline history. This information includes Missed Parts, Missed Results, and inspections that were modified online. Also, inspections that were changed offline are listed.

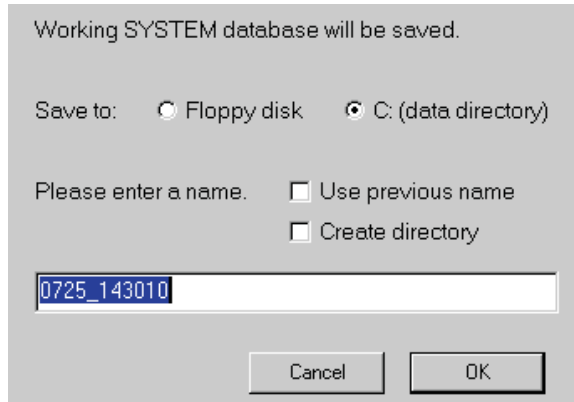
Troubleshooting mode can be enabled or disabled. It displays the additional information, such as inspections being changed, so that you can determine exactly what was accessed in your system. To enable troubleshooting mode, right-click the Wombat name. Click Troubleshooting Mode. If a check appears next to Troubleshooting Mode, it is enabled. If you remove the check mark, Troubleshooting Mode is disabled.

History Cutoff Date

You can choose how far back the online/ offline history report goes. To enable this feature, right-click the Wombat name and check History Cutoff Date. Enter the earliest date from which you want to see the data.

Database Backup

If enabled, Wombat will save your working database (~auto). To enable this feature, right-click the Wombat name and select Database Backup. You will see a screen as shown below.



Choose whether to backup your database to floppy diskette or to the C:\data directory (default). Then 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.

Wombat can name the database as date_time (default) as shown in the above screen.

If you click Create Directory, Wombat will create a directory with the name you have typed in the box, along with the database file (same name).

Make SmartCAL/ PVL files

A SmartCAL/ PVL file is a special Intellispec text file that contains a list of bitmap (.bmp) images for up to four channels. The Intellispec can display images stored on its hard drive, rather than acquiring new images from a production line. This is useful for programming jobs or testing jobs offline, so that actual parts do not get rejected.

Restoring image files on Intellispec

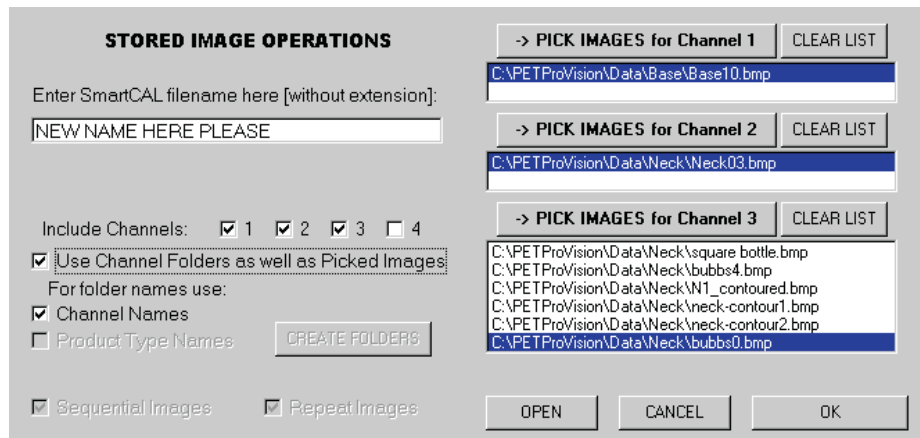
You can restore images, one at a time per channel, by right-clicking the image area, selecting Image, Restore, and selecting a bitmap (.bmp) file.

With a PVL file, you can load one file (.pvl) and have the Intellispec load multiple images for multiple channels at once. When you are testing a job, each time you click the Snap Image button, or use the Continuous Snap feature, a different image is displayed, just as though a new part image was acquired from a production line.

Note that once a PVL file is loaded, it will remain in memory until either the system is re-booted, or until you load another PVL file.

Creating the PVL file

1. Select SmartCAL/ PVL from the Other tab of the Database Detective. Click Next.
2. From the Stored Image Operations screen, Enter a name for your PVL file.
 - You do not need to have image folders already created, nor images already stored. Wombat can create the image folders. Later, you can save images to them after they are created.
3. Pick Images (see instructions for screen options below). Click OK. Click Finish. Your PVL file will be written to the Data folder.



The options on the screen are described next:

Include Channels

Select all the channels for which you want to have images loaded through one PVL file.

Use Channel Folders as well as Picked Images

This option allows you to pick images you have already saved on the Intellispec regardless of the folders where they are stored. It also creates a new set of folders into which you can move or save images. Wombat will create a folder for each selected channel (unless these folders were created previously). The folders will be named based on Channel name or Product Type. If your application uses the same Product Type on more than one channel, they will be named by Channel name.

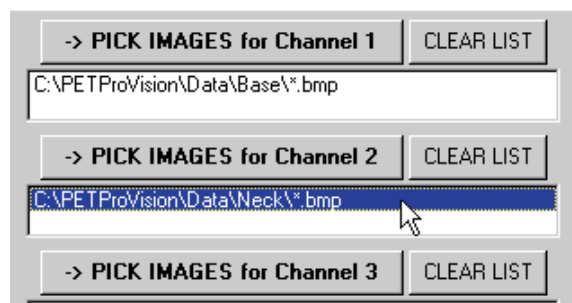
You can store images in each channel's folder (e.g., Panel images in Channel_1 folder, and Rivet images in Channel_2 folder).

Pick Images

You may choose several image files for each channel, regardless of the folders where they are stored, and the PVL file will reference all your selected images.

Click the appropriate Pick Images button for each channel. Browse to the folder(s) where the images are stored, and select the desired files.

- To select more than one contiguous file, select the first file, hold the Shift key, and scroll to the last desired file. Click Open.
- To select more than one non-contiguous file, select the first file, hold the Control (Ctrl) key, and select the remaining desired images. Click Open.
- To select all bitmap files within one folder: Click the Pick Images for Channel *n* button. Browse to the desired folder, select one file name and click Open. Select that file name under Pick Images, and right-click. The file name will change to C:\PETProvision\Data\~folder name*.bmp. This indicates that all bitmap files within that folder will be part of the PVL. If you right-click again, the name will toggle back to its original file name.



- Click Clear List to remove all the files from the channel's list.

Modifying PVL image lists

You can use these items whether you are initially creating the PVL file, or you have an existing PVL file.

Modifying an existing PVL

To change items in an existing PVL file, select SmartCAL/ PVL from the Other tab of the Database Detective. Click Next. Click Open. Browse to the desired folder and select the desired PVL file. Click Open.

If Wombat asks "Clear existing entries?", it wants to know if it should clear the image names currently on screen under the Pick Images for Channel *n* lists. If Yes, just those entries are cleared, not the images you previously saved with the PVL file. If No, the images currently on screen will be added to the PVL file when you save it.

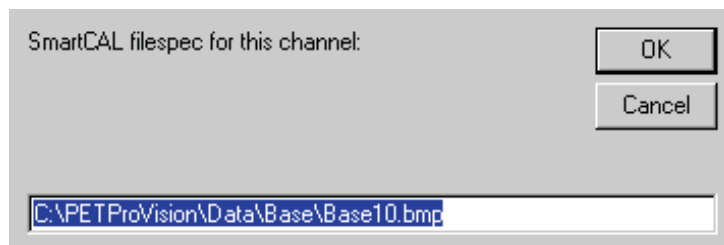
- To add more images to a channel's list, click the Pick Images for Channel *n* button. Add desired images.
- Use the techniques described above in Pick Images topic to add new images
- To clear all images from the channel's image list, click the Clear List button
- To remove one item from the image list, shift-right-click on the image file name in the list

To save the PVL file, click OK after adding or deleting images. Enter a new PVL name, or keep the old name. Click Finish. If you use the same name, Wombat will ask whether to overwrite the existing file. If Yes, the new image lists will be saved under the old PVL file name. If No, you will be required to enter a new PVL file name.

Manually entering image file names in PVL

To type a known image file name or folder into a PVL file:

- From the Pick Images list, click an image name that you want to change. Shift-left-click to bring up the create/edit box. Type or change the file name, and click OK.



- You may type a known path and folder name that contains bitmap files, and type "*.bmp" as the image name. The PVL will use all bitmap images within that folder.
- If you type an unknown file name, you will get an error when you try to restore the .pvl file on the image screen.

Saving images for use with PVL file

Saving a Single image

Log in – Mechanic user level and higher. Select channel, right-click on image area, choose Save, Grayscale. Scroll to the desired folder, name the file, and click Save. Intellispec will save the file as a bitmap (.bmp).

Select the other channels, and save an image into each channel's folder.

Autosave multiple images

A quick way to save multiple images for each channel is to use the Autosave feature when your production line is running, provided the camera is able to snap multiple images (i.e., your production line is running and enough parts trigger the part present sensor).

1. Select a channel. Right-click on image, choose Image, Autosave.
2. Select the folder into which you want to save the images. Scroll through the directories if desired.
3. Enter a file name; Intellispec will add numbers to this file name.
4. Enter the number of images you want to save into one channel's folder.
5. Click Start. Intellispec will capture the specified number of images, then display "Done". Click Exit.

Repeat steps 1-5 for each additional channel.

Using the PVL file

1. Right-click on the image area, choose Image, Tools, Image Source, SmartCAL Images. This tells the system to acquire an image from disk instead of reading a new image from the camera.
2. Right-click on the image area, choose Image, Restore. Select the desired PVL file. The Intellispec will load all the images you have saved to the PVL folders, and display them on their proper channels. Note: you may have to click the Snap  button to update the screen.

Copy Files to Floppy



This option is a useful, all-purpose tool for copying images, reports, or logs to floppy diskette. You can use any of this information outside of the Intellispec to generate reports, spreadsheets, or to troubleshoot the system.

Copying Images to Floppy

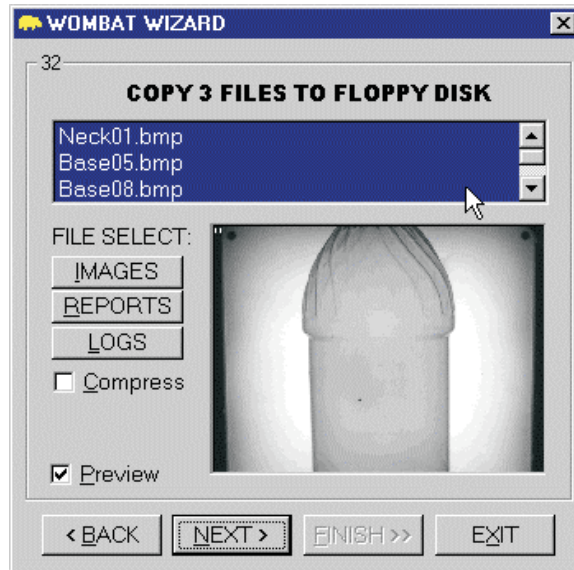
You must first save images to Intellispec's hard drive before you can copy them to floppy disk. This can be done by right-clicking on an image, choosing Image, and Save.

- To copy an image, click the Images button on the Wombat Wizard. You will see a dialog box in which you can browse for image files. The default image folder (C:\PETProvision\Data) will be opened for you. Highlight the desired file. 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. Click OK.
- To select more than one non-contiguous file, select one file, hold the Control (Ctrl) key, and select the remaining desired files. Click OK.
- To remove any file from the list of files to copy in the Wombat Wizard, right-click the file name.

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. Insert a diskette into Intellispec's floppy drive, and Wombat will copy these files to your diskette.

File size

The bitmap 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. 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.

 *You must have a compression program (such as Winzip) on your PC to extract the zipped files.*

Click the Compress box to create a single zipped file, using all the files highlighted in the upper window of the dialog box. Click Next. Wombat will give you the name of the zipped file.

The bitmap files in the Intellispec are approximately 302KB each. Uncompressed, approximately four images will fit on a blank floppy diskette at one time. However, with compression, several more can be copied at one time.

You will be asked to insert the first disk of a multi-volume set.



Click OK. Wombat will store as much information as possible onto the disk in the drive. If it runs out of space, you will be asked to insert another disk, until all the information has been copied.

Take out the diskette and insert it into your own PC to verify its contents.

 *You must have a compression program (such as Winzip) to unzip the files. Consult your compression program's instructions for extracting files.*

Preview If the preview button is selected, the first selected image will be displayed in the preview window.

Copying Defective Parts Database to floppy

Another file that can be easily copied through the Images button is the Defective Parts Database as it usually resides in the default C:\PETProvision\Data folder. This is not an image, but rather a Microsoft Access Database that contains defective parts

data. Therefore, Wombat's Preview option cannot display it. Also, you must choose MDB files as file type (*.mdb) to see it in the list.

This database can be saved by Administrators in System Configuration, Reports. See page 3-4 for more information about this database.

☛ *Use the Compact Defective Parts DB... option to compress this database before copying it to floppy disk, as it can be rather large.*

Copying databases to floppy

System or Vision databases are also usually saved under the default C:\PETProvision\Data folder. Click the Images button in the Wombat Wizard to open this default folder. Look for Vision and Config (*.vdb, *.cfg) in the List Files of Type box.

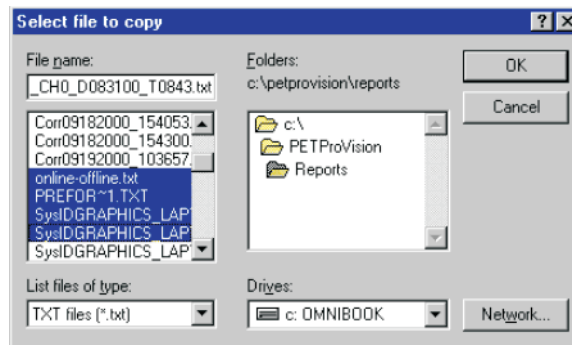
Copying reports to floppy

Select the Other tab from Database Detective. Select Copy files to Floppy. Click Next. Click the Reports button to save Job Statistics, correlation data, or any other report that was previously saved to the Intellispec's hard disk.

☛ *See page 3-3 for information on saving and printing reports.*

The default Reports folder is opened for you, from which you can select the desired reports. Highlight the desired file. The latest files are at the top of the list.

- 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. Click OK.
- To select more than one non-contiguous file, select one file, hold the Control (Ctrl) key, and select the remaining desired files. Click OK.



- To add more reports, click the Reports button again and select the desired files.
- To remove an item from the list, right-click the unwanted item.



Select all files in the top area of the window to copy all of them to diskette. (Click the first file, hold the Shift key, and move the cursor down to the last file.) Insert a diskette into Intellispec's floppy drive and click Next. The selected files will be copied to diskette. The Compress and Preview options are discussed on page 9-13.

Copying logs to floppy

Follow the same procedure as described under "Copying reports to floppy". In this option, you can select and copy alarm logs, change logs, or event logs.

File/ Directory Utilities

Located under Database Tools  button, Database Utilities tab.

Browse Directory

Look at the current directory structure on Intellispec.

Delete Files

Administrator only. You can delete a folder and its contents. The system displays the current directory structure. If you still want to delete the folder, select the folder name, and click OK.

Caution

All items in the selected folder are deleted. That is, if you have saved any database or image files in that directory, they will all be deleted.

Format Floppy

Format erases all files on a floppy disk and prepares it for data storage.



Chapter 10 - Registrations, Orientations, Inspections

Overview

☛ *You must have a user level of Mechanic or higher to access the registration/ orientation/ inspection parameters.*

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.

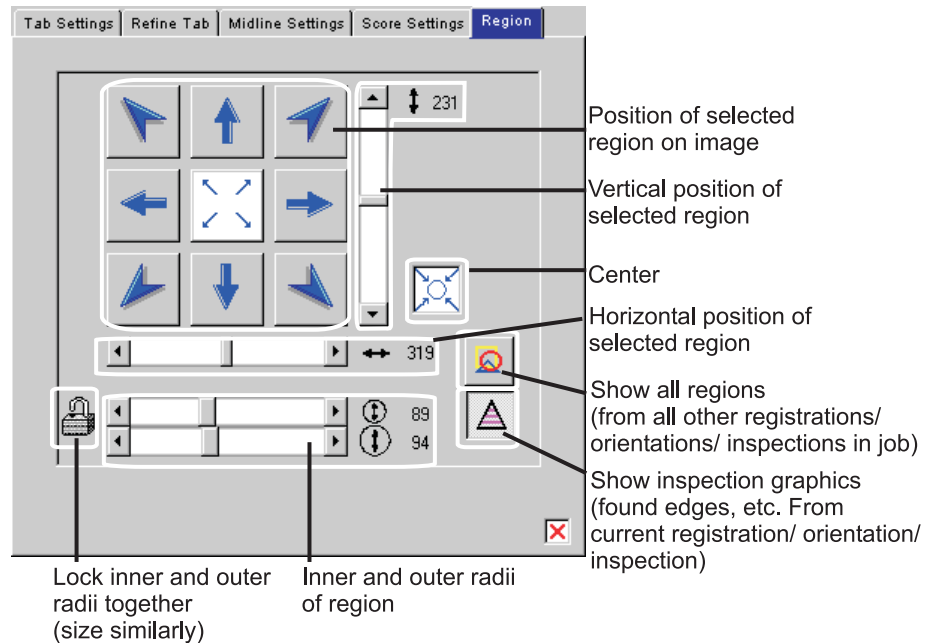
The registrations, orientations, and inspections in this chapter are discussed in the order in which they appear in the software, as shown below.

Registrations possible*	Orientations possible*	Inspections possible*
— Blob — Finish — Fixed — Hough — Shape Adapt — Radial Edge — X-Y — Tracker	— Orientation Pattern Match — Orientation Edge — Midline Orientation *dependent on Product Type	— Clipout — Circle — Circle Dimension — Radial Line Integration — Dimension — Polygon — Shape Adapt — Notch — Rectangle Binary — Rectangle Grayscale — Side Fold — Tracker

☛ *Information about how to program inspections may be found in Chapter 4. This chapter discusses the detailed parameters.*

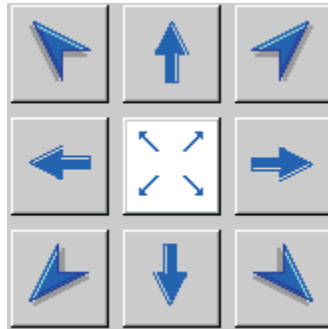
Using Region menus

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.



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.



Using slider bars

The slider bars can be used as both coarse and fine adjustment. 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 (as shown above) or position of the region.



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.

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.

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.

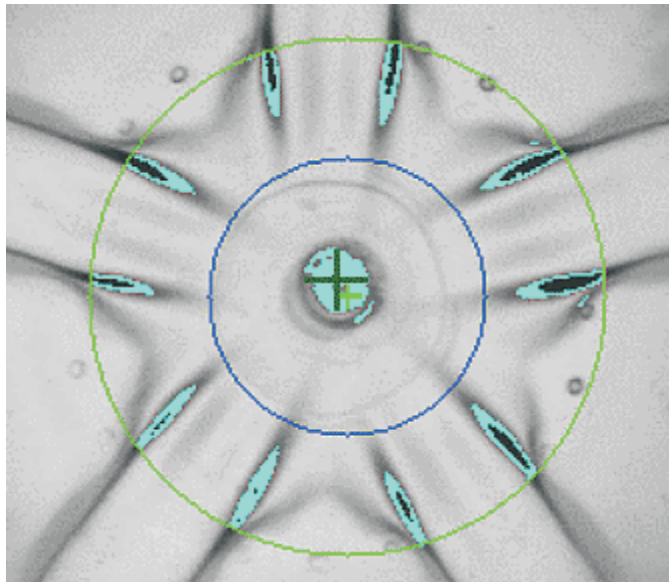
Centering menu

Go to the Centering menu and choose a centering type. There are two centers to consider:

- The registration Center is the center point of the Blob registration region (shown by light green '+')
- 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 '+'.

Largest Blob

The center of the part will be set to the center of mass of the largest valid blob found (e.g., the gate in PET Base applications).



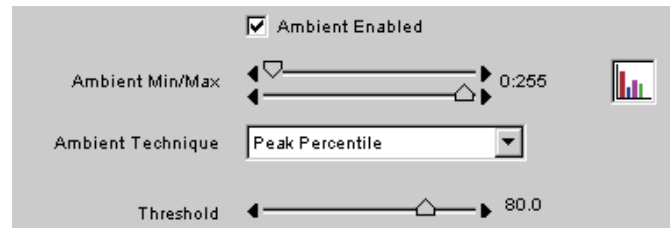
Blob Circle Fit

The center of the part is computed by fitting the center of mass of each valid blob to a circle.

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 Show the circle fit lines.

Ambient menu



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.

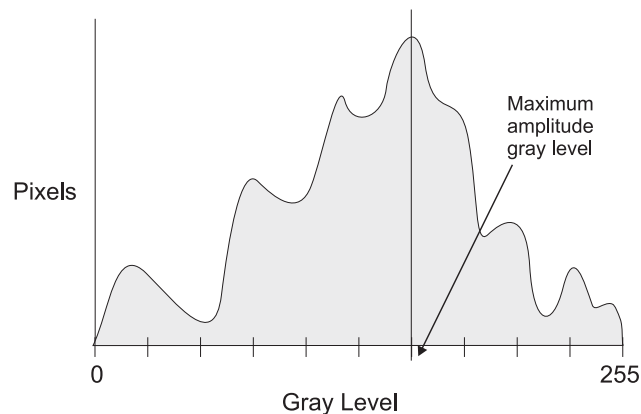
The Ambient that is determined through the settings in this menu can be used in the calculations of the Zone and Blob analyses.

Ambient Enabled This determines if the found ambient is used as a reject criteria or not. You may Enable or Disable whether to reject based on the gray shade found on each new image. If you Disable the Ambient Reject option, 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.

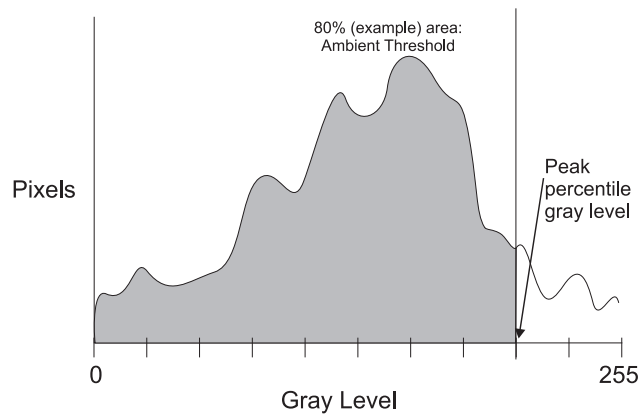
Ambient Min/ Max The minimum and maximum acceptable ambient gray level values. Any computed ambient found lower than or higher than these values will cause the registration to fail.

Ambient Technique This method determines the region's ambient. Choose the method through the drop-down menu.

1. **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.



2. **Peak Percentile** computes the ambient by locating the gray shade value that exceeds the threshold you define by Threshold.



- **Threshold** is used only when the ambient search technique is Peak Percentile. This defines what percentage of the search area to use as a threshold.
 - If you use 80% as Threshold, the system counts the pixels in the first 80% of the histogram as shown in the above illustration. The first gray level above that 80% threshold is considered the ambient.
3. **Ambient Density** computes the ambient by taking the average of all the pixel gray levels — total gray level divided by pixels.

Blob menu

Ambient	Blob	Centering	Region
Blob Mass Criteria			
☒ Blob Mass Enabled			
Blob Mass Min/Max		0:10000	
Blob Threshold Criteria			
Threshold Technique: Percent of Ambient			
Threshold Min/Max		25.0: 45.0	
Blob Count Criteria			
☒ Blob Count Enabled			
Blob Count Min/Max		1:50	
Blob Area Min/Max		300:600	
Blob Tolerance Criteria			
☒ Tolerance Enabled			
Tolerance Max		50.0	
☒ Show Blob Search			

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 or not.

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 thresholds. The thresholds define the gray shade limits of a blob. Described below. Percent of Ambient technique: This technique uses a percentage of the found Ambient to define the low and high thresholds. ☛ <i>The blob pixels are those with gray levels that fall between the Minimum and Maximum gray levels. These pixels must also be connected.</i>
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 *(Threshold Min / 100) When the system inspects a part, it computes the Minimum Gray Level by multiplying that part's Ambient by Threshold Min percentage. For example, if the ambient value for a part is 200, and you choose a Threshold Min percentage of 20, the Minimum Gray Level is 40. [200 x (20/100)] = 40. Maximum Gray Level = Ambient *(Threshold Max / 100) When the system inspects a part, it computes the Maximum Gray Level by multiplying that part's Ambient by Threshold Max percentage. For example, if the part's Ambient is 200, and you choose a Threshold Max percentage of 80, the Maximum Gray Level is 160. [200 x (80/100)] = 160. ☛ <i>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.</i> 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. Blob Count Criteria The following parameters are common to both Blob Threshold Techniques:
Blob Count Enabled	This determines whether the number of qualifying blobs is used as reject criteria or not.
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.
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 if 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 registration fails. Diagnostics
Show Blob Search	If Enabled, the blob pixels are highlighted on the image.

Graphs - Blob registration

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

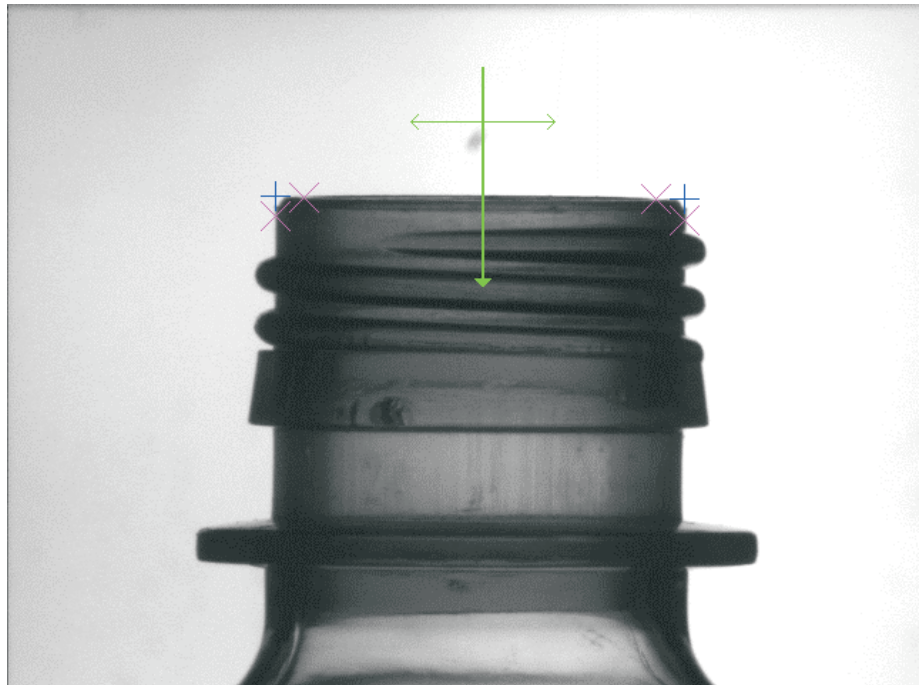
Blob Center X	Indicates the horizontal position of the found center (X coordinate). This information is helpful in positioning the camera or part present sensor (depending on the movement of the part with respect to the camera).
Blob Center Y	Indicates the vertical position of the found center (Y coordinate). 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.
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	The distance from the center of mass of the largest blob to the found center.

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.

Place 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."



Then go to the Search menu to set the remaining search vector parameters.

Search menu

Search	
Search Spacing	17
Search Length	106
Edge Threshold	30
Edge Transition	Either
Edge Size	2
Search Direction	Top to Bottom

Display	
☒	Show Finish Search
☐	Show Finish Edges
☒	Show Finish Corners
☐	Show Framing Lines

☞ Enable Show Finish Search to view the parameters we will discuss next.

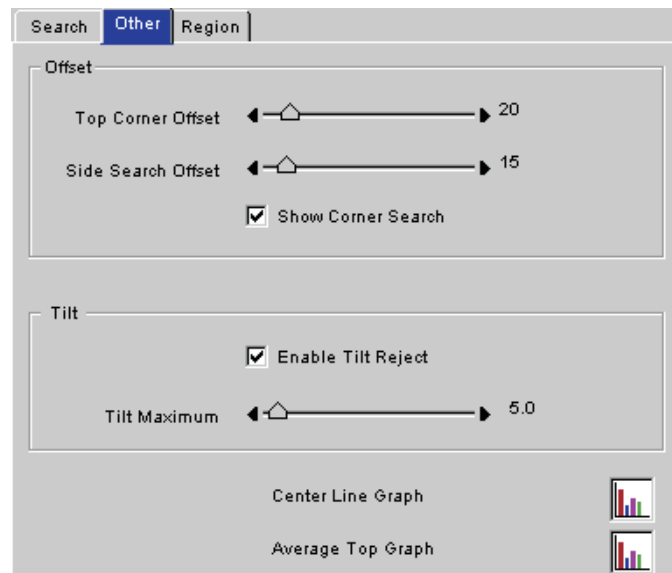
- Search Spacing** The number of pixels between the vectors that search for the top of the container. After the top is located (by the big “T”), the system searches to the right and left to find the corners of the container.
- Search Length** The length (in pixels) of the vectors that search for the 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, and thus is an adapting number for each image.

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: $150 \times .25 = 37.5$. 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.

Edge Transition	Indicates what type of edge for which to search: Light to Dark edges, Dark to Light edges, or Either. This parameter is important in determining which type of edges will be found in the image.
Edge Size	This indicates how many pixels in a row to compare (e.g. 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.
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	Shows the vectors that search for the corners of the container.
Show Finish Edges	Displays the edges found by the search vectors. Turn off Show Finish Search to view these edges.
Show Finish Corners	Shows where the system located the corners of the container.
Show Framing Lines	Shows where the system projected the top and sides of the container.

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.
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. <i>Tilt</i>
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

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

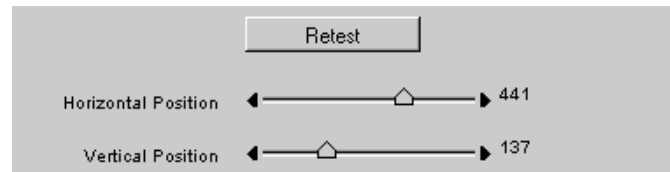
- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

See page 3-12 for more information about graphs.

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 simply specifies a position on the image to reference. It does not find any edges nor 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.



Hough registration

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

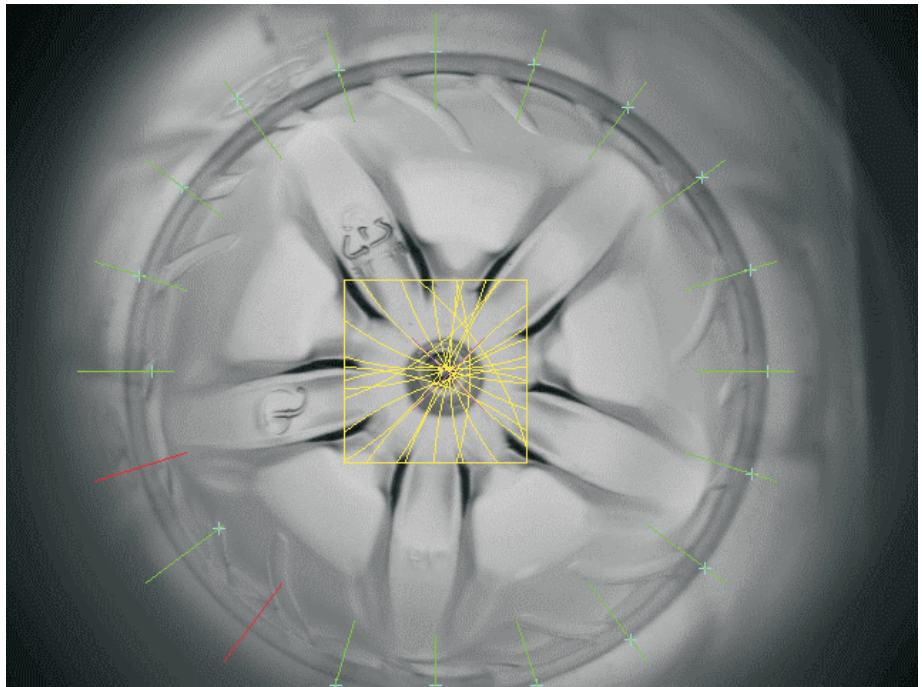
wish to find does not need to fit completely within the camera image. As long as a good portion of the feature can be found within the image, the computed center point is accurate. It also works well if the feature you wish to find is not clearly defined for 360 degrees.

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 specify the radius of the feature by placing a circle over the feature you want the system to find. This is the target circle.

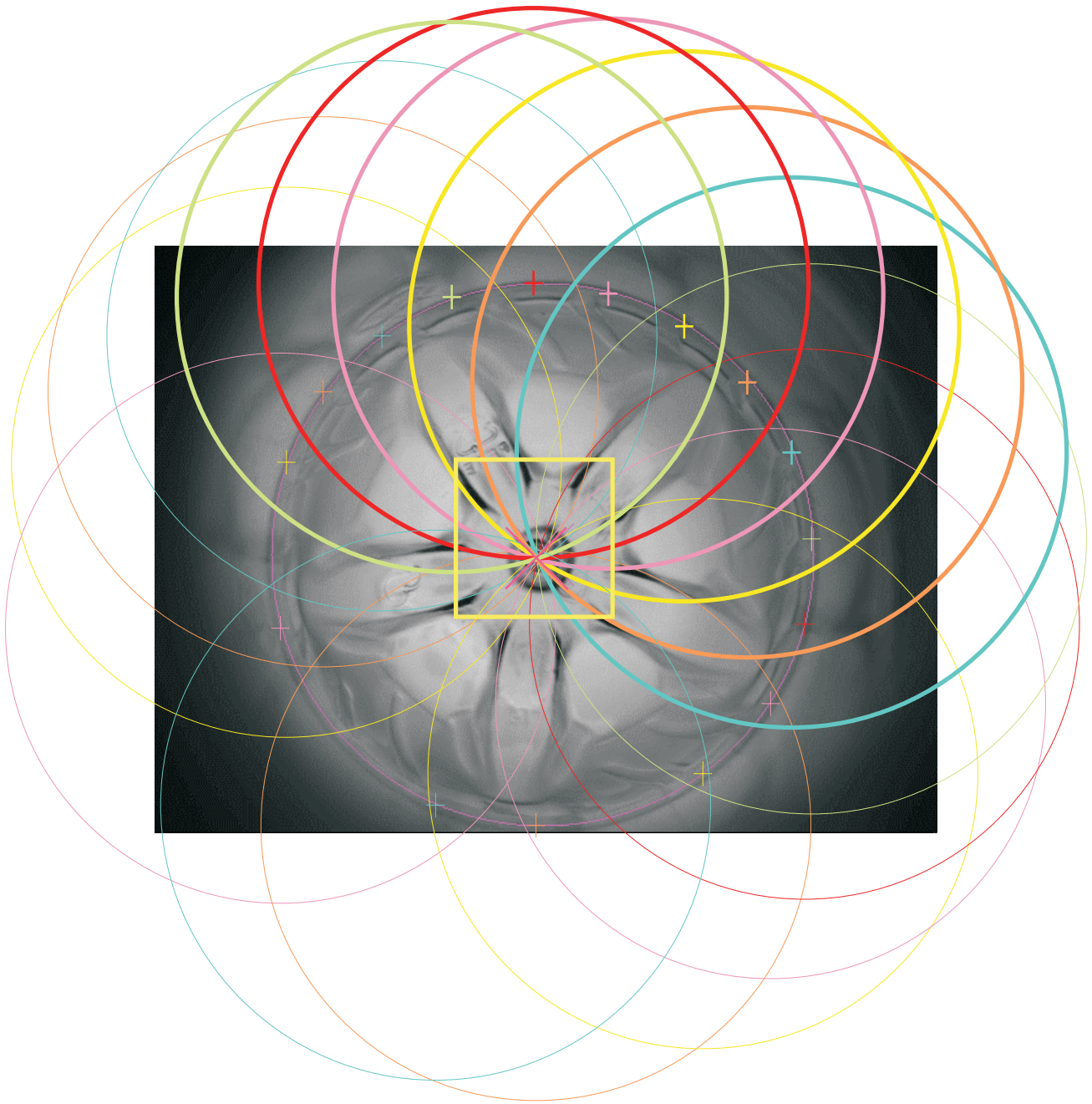
The system has a set of default parameters with a certain number of search vectors, edge gradient, edge transition, etc. which you can modify to make the inspection more accurate.

Each search vector tries to detect an edge, using transition, gradient, and edge thickness parameters. Found edges are marked with a cyan x.



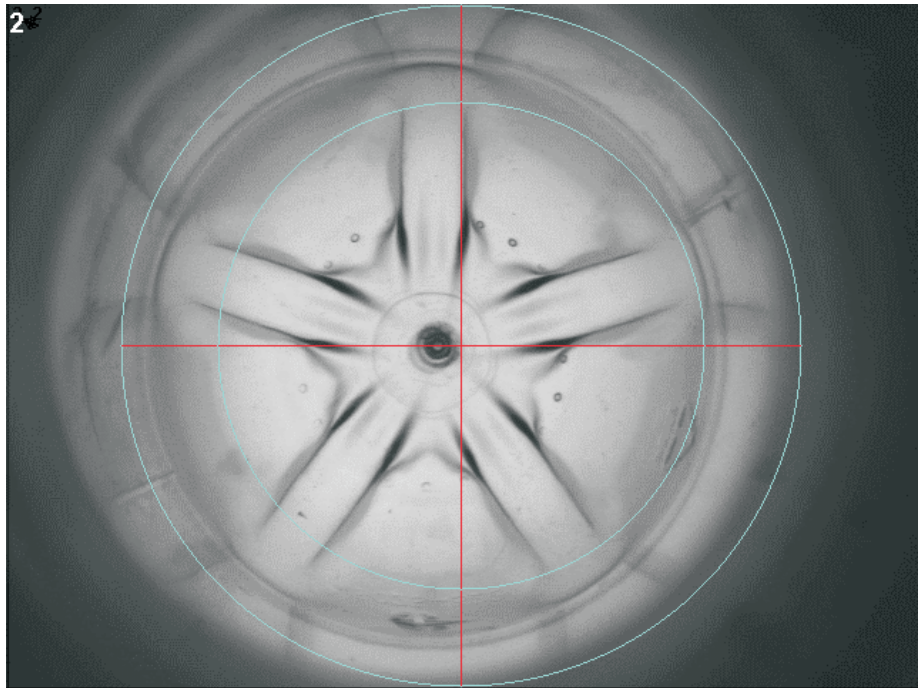
These found edge points are used in a computation that draws a circle (with a radius = target radius) around each point. The points where the circles intersect are then averaged and arcs of these circles are drawn on the image. (See illustration below)

The average intersection point of these arcs is used as the predicted center, or registration point for inspections in the current job.



Defining Hough registration

First, set up a region to surround the feature you want the system to find. It is completely valid to allow parts of the inner and outer circles to move outside the camera's field of view. The inspection will search for edges between the inner and outer circles. Allow for slight part movement in the field of view. See illustration below.



Adjust Target circle

Next, adjust the Target Circle for the feature you want the system to find. Move and re-size the cyan circle as necessary to closely match the feature. The Target Circle can be moved partially outside of the image to match features that are only partially within the camera's field of view.

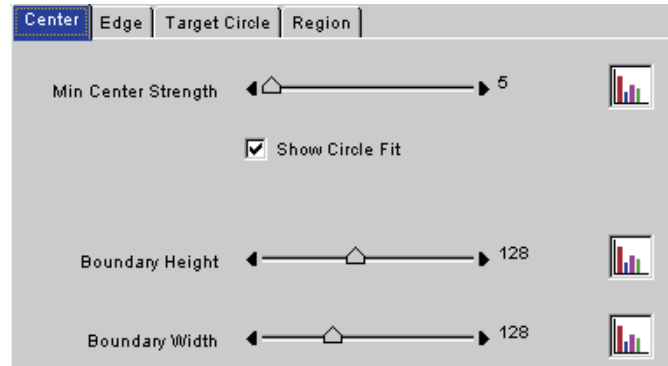
The position is adjusted by the arrows in the top portion of the Target Circle menu. The radius is adjusted by the slider bars at the bottom of the menu. Note that both sliders keep the same radius – either one will adjust the Target Circle.

When you have adjusted the cyan circle to approximately the size of the feature you want to find, click the Set Target button. If the edge parameters are set so that they can correctly find the feature, the Target Circle will lock onto the feature. If not, try adjusting the Edge parameters.

Hough parameters

Set the Hough registration parameters to best find the desired feature on your product, as recommended by your instructor or service engineer. The parameters are described on the next few pages.

Center menu



Minimum Center Strength

This number is based on the number of edges the system uses to compute the center of the feature. With a Hough registration, the system draws a circle around each found edge, with the radius of these circles equaling the target circle radius. Arcs of these circles are drawn within the Bounding Area. The system calculates the center of the feature by averaging the location of where these arcs intersect. The more arcs that intersect the center, the stronger it is. (See also Search Resolution in Edge menu)

Any located center with a strength less than this minimum number causes this registration to fail.

Show Circle Fit

If this is Enabled, you will be able to see the bounding area, the arcs projected by the found edges, and the predicted center. The bounding area is the yellow box in the center, the arcs are shown within the bounding area in yellow, and the center is shown by the large purple X.

The purple circle is generated by the system, calculated by the found edges, based on the Target Circle.

Boundary Height/ Width

Adjust Bounding Area

The boundary area is a rectangular area (represented in yellow) used to restrict the center search to a limited area. This makes the search more efficient.

Adjust the boundary area on the image, where you would expect the center point of the target circle to fall. This area can be moved or re-sized to accommodate normal movement of containers within the image.

Edge menu

The Edge menu interface includes the following controls:

- Search Vectors:** A slider set to 20.
- Search Direction:** A dropdown menu set to "Search Outward".
- Edge Transition:** A dropdown menu set to "Either".
- Edge Filter Enable:** An unchecked checkbox.
- Edge Gradient:** A slider set to 30.
- Edge Thickness:** A slider set to 1.
- Search Resolution:** A slider set to 3.
- Show Search Vectors:** A checked checkbox.
- Show Feature Edges:** A checked checkbox.

➡ Enable *Show Search Vectors* and *Show Feature Edges* to see the graphics for the parameters described next.

Search Vectors	Indicates the number of search vectors used to locate the feature on the container. Each vector is placed equally around the image by the system.
Search Direction	The direction used to find the edges. Available choices are Search Inward or Search Outward. The search vectors look for the first pixel that is above the Edge Gradient. Use the direction that will have the least amount of noise or false edges on the image.
Edge Transition	The type of edge you want the system to look for – Light to Dark, Dark to Light, or Either. This parameter is important in determining the type of edges that will be located in the image. For example, if the feature you want the system to look for is very bright, choose Dark to Light to find those edges.
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. If the filter is set at 128, for example, 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.
Edge Gradient	(Only used when Edge Filter disabled) This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge. See illustrations of Edge Gradient and Edge Thickness beginning on page 10-29.
Edge Thickness	Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Search Resolution	The area 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. (See Minimum Center Strength in Center menu)
Show Search Vectors	If this is Enabled, you can see the location of the search vectors on the image. The search vectors are color-coded to indicate whether or not an edge was found. Green

vectors indicate that an edge was found. Red vectors indicate that an edge could not be found.

Some search vectors may extend outside of the image if the search region and target circle is near or outside the image.

Show Feature Edges

If this is Enabled, the system puts a cyan x on the valid edges of the feature. If there are other features or noise near the desired feature, the system may consider these as edges. As long as the majority of the edges fall on the desired feature of the container, the correct center will be properly computed.

Graphs - Hough registration

There are three inspection graphs available for the Hough registration.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 *See page 3-12 for more information about graphs*

Hough Center X

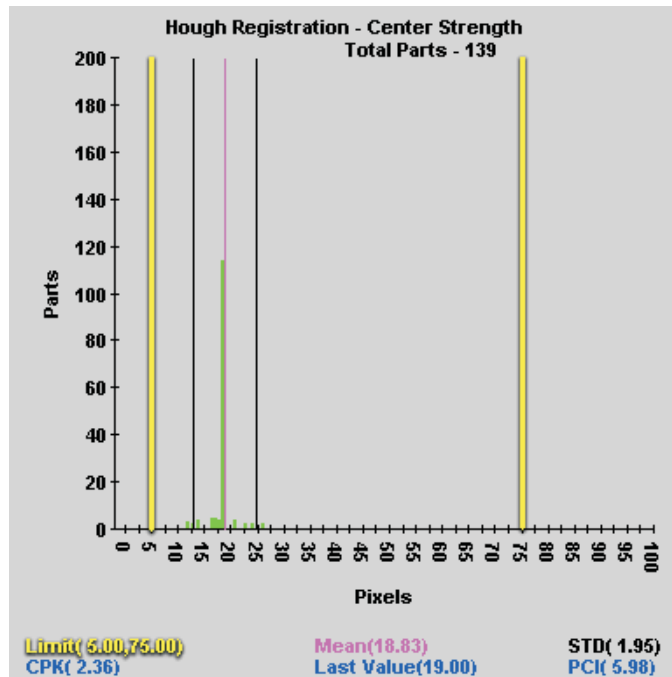
Plots the X center coordinate found in each acquired image. This information can help you position the camera or inspection sensor, depending on the movement of the object with respect to the camera. The ideal value is the center of the screen.

Hough Center Y

Plots the Y center found in each image. This information can help you position the camera or inspection sensor, depending on the movement of the object with respect to the camera.

Hough Center Strength

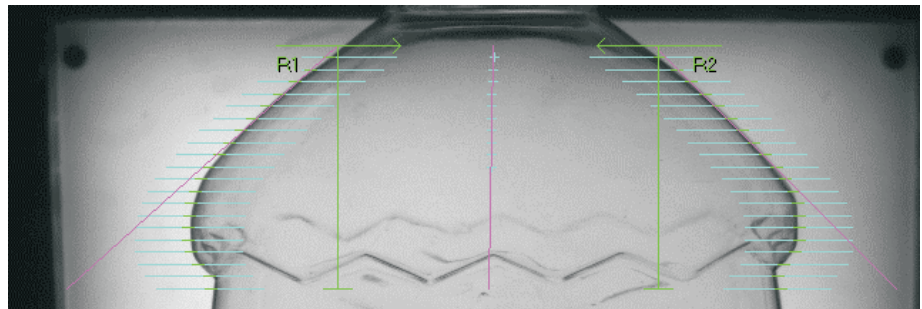
Plots the center strength found over a number of acquired images. This can assist you in adjusting the value for center strength.



Increasing the Search Resolution for the Hough registration increases the upper limit. In the example shown above, you would probably want to decrease the upper limit.

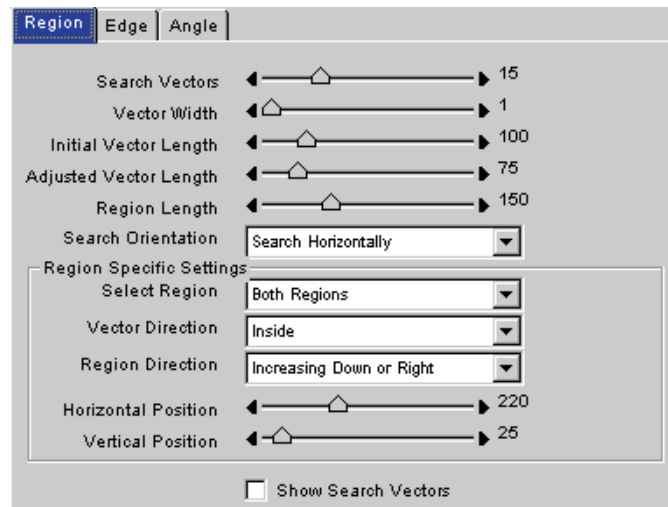
Shape Adapt registration

Shape Adapt is a registration that finds the sides of a part, its shape and angles. The Shape Adapt Inspection uses the part edges found in Shape Adapt Registration to create a custom inspection region that follows the shape of each part.



When you add a Shape Adapt registration, the system displays an image with the default search vectors. Adjust the search vectors through the region menu.

Shape Adapt Region menu



☞ Enable Show Search Vectors to see the vectors described next.

Search Vectors (Advanced parameter) This is the number of search vectors used to locate the side of the container. The spacing between these vectors is automatically determined based on the length of the search region (the length of the “T”) and the number of vectors.

Vector Width (Advanced parameter) Adds a number of search vectors at each search point to filter out noise and to help eliminate false edge locations. You may have a width of up to 10. Note that a larger width may add time to the inspection.

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.

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 with Shape Adapt inspection.

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 (Advanced parameter) 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 (Advanced parameter) 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.

Edge menu

These settings determine what edges the search vectors are supposed to find.

☛ *Enable Show Edges to see the results of the Edge parameters we will describe next.*

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.

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

(Available if Common Edge Setup is disabled) 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.

If you choose Simple, the number you choose for **Threshold** is simply a gradient, a change in gray level, that the system must find to determine an edge.

If you choose Adaptive, the **Threshold** becomes a percentage of the minimum and maximum gray level of each vector that determines an edge, and adapts to the gray level changes of each image. The larger the threshold, the stronger the edge must be.

Example: Maximum gray level found for a vector is 200. Minimum gray level for that same vector is 50. We set Threshold at 25%. The system subtracts the minimum gray level from the maximum, $200 - 50 = 150$, and multiplies the result by our Threshold: $150 \times .25 = 37.5$. 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.

Edge Transition

Indicates what type of edge for which to search: Light to Dark edges, Dark to Light edges, or Either. This parameter is important in determining which type of edges will be found in the image.

Edge Delta

Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

Edge Size

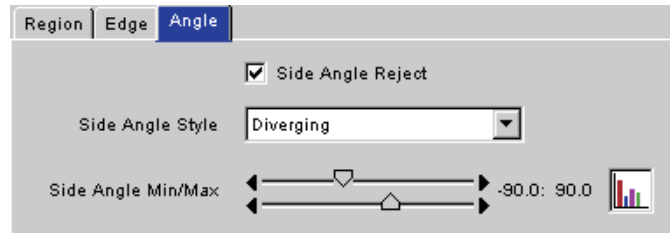
This indicates how many pixels in a row to compare (e.g. 1 to 1, 2 to 2, etc.). The larger the Edge Size, the stronger the edge will need to be. This parameter acts like a filter that looks at a length in pixels before and after the edge.

Best Edge

Indicates whether to use the First edge that is above the threshold or the Strongest edge. The Strongest edge is the edge that the system finds that has the maximum contrast from the threshold.

Show Edges If Enabled, you will be able to see the edge graphic results. If Disabled, you will not be able to see the edge points.

Angle menu



The angle is the computed angle of the found sides.

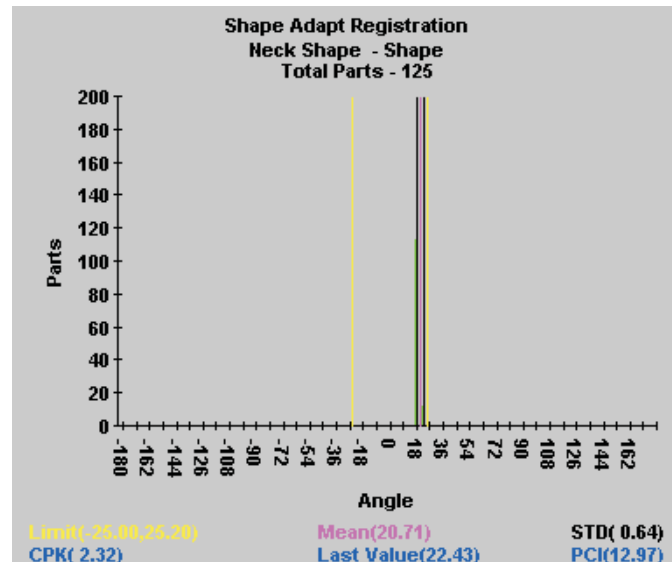
Side Angle Reject This determines whether the computed angle of the sides of the container is used as a reject criteria or not. You can enable or disable this function.

Side Angle Style This indicates the method of computing the angle of the two sides. Choose from Parallel or Diverging. The system computes the angle for these two different types of angles with different methods. You might use the Parallel style for a container type such as Preform, where the sides are supposed to be straight. The Diverging style might be used for many bottle types, where the neck tapers inwards on both sides.

Side Angle Min/ Max The minimum and maximum angles allowed for the sides of the container. The angle is computed by averaging the two side angles. This parameter is only applied if Side Angle Reject is enabled. If the computed angle is less than or greater than these numbers, the registration fails.

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.



Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

☞ See page 3-12 for more information about graphs

Radial Edge registration

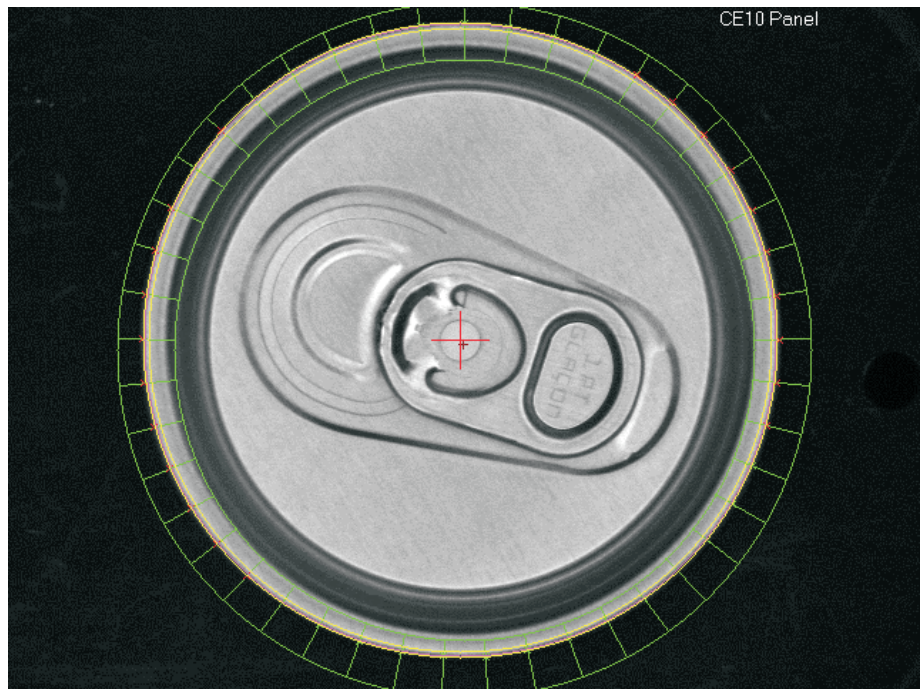
Radial Edge registration is good for circular parts that have a distinct edge either on the inside or outside of the part.

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.

Within the search region, the registration sends the specified number of search lines (default is 18, max is 100) from the inside circle out or from the outside in to search for edges.

Each line tries to detect an edge, using the gradient and edge thickness parameters. Found edges are marked with a green or red x for pass or fail points.

The system then draws a registration circle, for your approval. If it is not correct, adjust the parameters until it is.

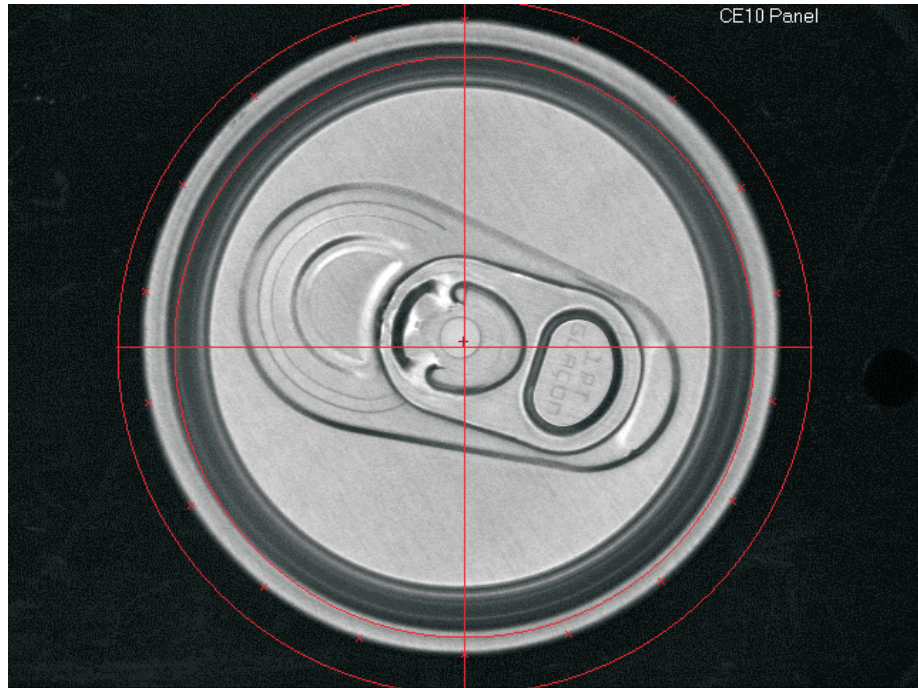


Place the Radial Edge region

First, set up a region for the registration through the Region menu. Adjust the two circles to surround the edges that the registration will identify. This is the range that

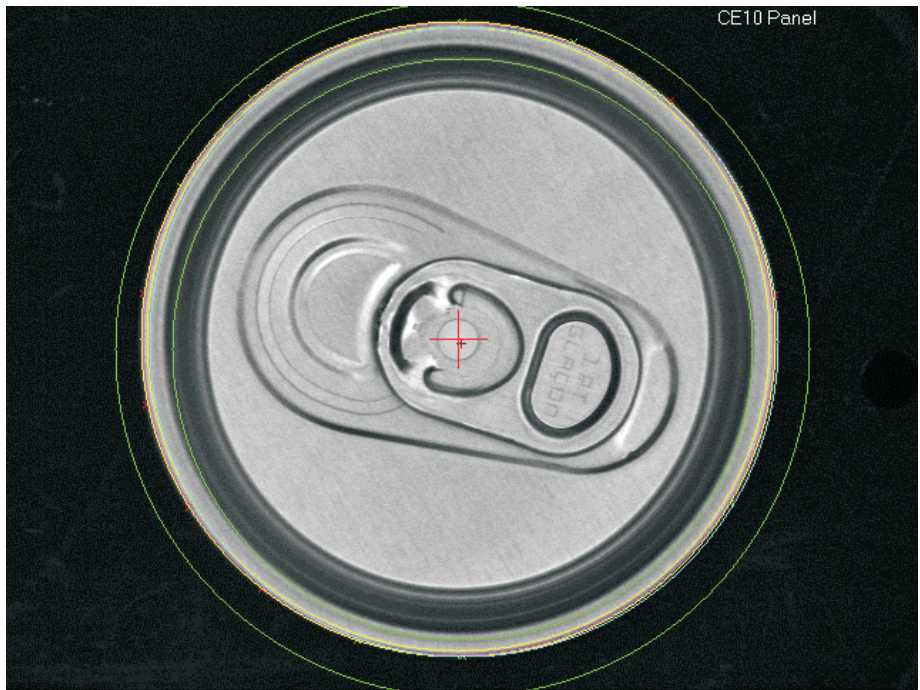
the part may move within and still be located. The circles may fall outside of the image. Use the Center button to quickly move the entire region to the center of the image.

Next go to the Main menu and select a direction in which to search for a transition. This can be Outside In or Inside Out. Search for the edge that is best defined, with the least amount of noise or other features in the image. In the image below, the outer edge of the converted end is the cleanest; we chose Outside In.



Your image may vary – use the search direction that best suits your image.

Next, go to the Target Circle menu. Adjust the cyan circle to the same size and position as the edge you want to find. Click Set Target. When the system finds the edges, it will lock on and draw a target circle. The target circle is displayed in purple surrounded by yellow when it is locked on target.



You may need to adjust the edge parameters from the Main menu to find the desired edge. These parameters are discussed next.

Modify the Radial Edge parameters

Main menu

Main Target Circle Region

Scan Direction: Outside In

Number Of Vectors: 18

☐ Binary Filter

Gradient: 30

Edge Thickness: 1

Qualifying Edge (%): 50.0

Edge Transition: Either

Radius Tolerance: 2

☐ Show Vectors

☞ Enable Show Vectors to see the search lines on the image.

- Scan Direction** Select between Inside-Out or Outside-In.
- Number of Vectors** Specify the number of search vectors the system should use to find the edges of the feature. Use a greater number of vectors (e.g., 45) to find the edge more accurately.

☞ Note: a greater number of search vectors uses more inspection time

Binary Filter	If this is Disabled, the system uses the Gradient value to qualify an edge. If Enabled, the system binarizes the search vectors, using the Filter parameter as the threshold.
Filter	(Only used when Binary Filter enabled) This is the threshold at which the system binarizes the search vector. If the filter is set at 128, for example, 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	(Only used when Binary Filter disabled) The difference in gray shade value between individual pixels being compared.
 See illustrations of Edge Gradient and Edge Thickness beginning on page 10-29.	
Edge Thickness	Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Qualifying Edge %	This is a percentage of the search vectors that must meet the Gradient and Edge Thickness to define the registration radius. This parameter is useful to handle changes in sample size of parts.
Edge Transition	Indicates what type of edge for which to search: Light to Dark edges, Dark to Light edges, or Either. This parameter is important in determining which type of edges will be found in the image.
Radius Tolerance	The number of pixels in either direction of the target circle that the system will acknowledge as an edge (i.e., 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.
Show Vectors	If Enabled, you will be able to see the search lines on the image.

Graphs - Radial Edge Registration

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

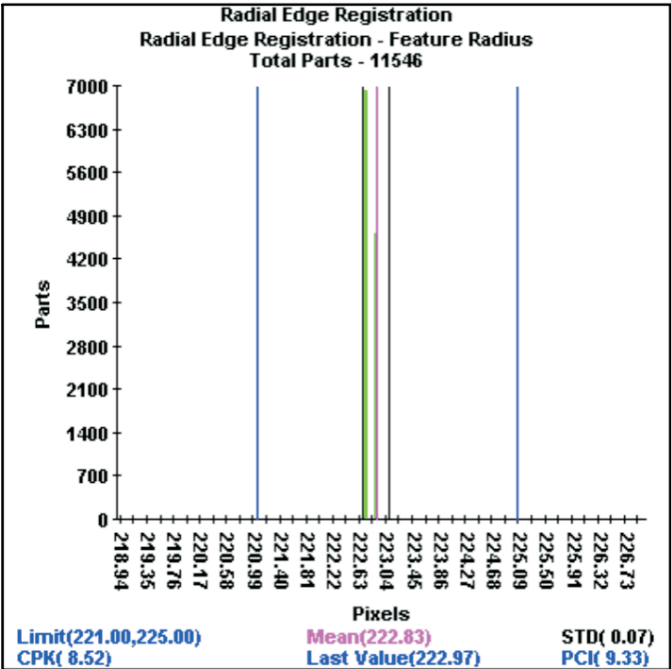
To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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).

Feature Radius This is a sub-pixel radius of the found circular feature used to compute the center of the part.



Qualified Edges This indicates how many of the search edges found actually qualified as edges on the feature circle.

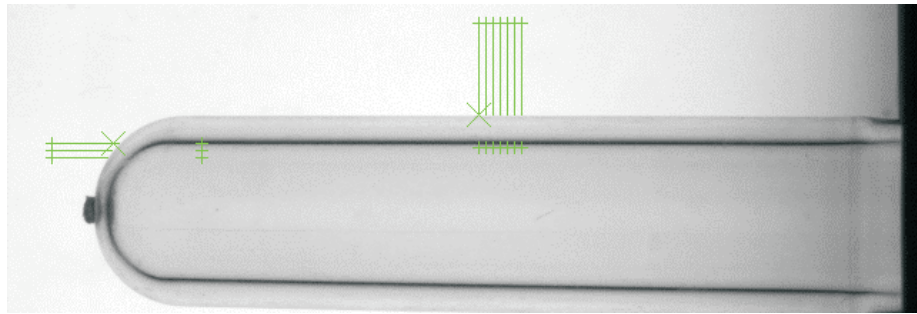
X-Y registration

This registration finds one edge of a part (vertically and/or horizontally) and places inspections relative to this edge.

Defining X-Y registration

Click the Horizontal or Vertical Setup tab. Cursors are placed on the image. 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 first.

To adjust the search vectors, click the Horizontal Region or Vertical Region tab. Use the arrows and sliders near the top of the menu to adjust position, and use the slider at the bottom of the menu to adjust length.

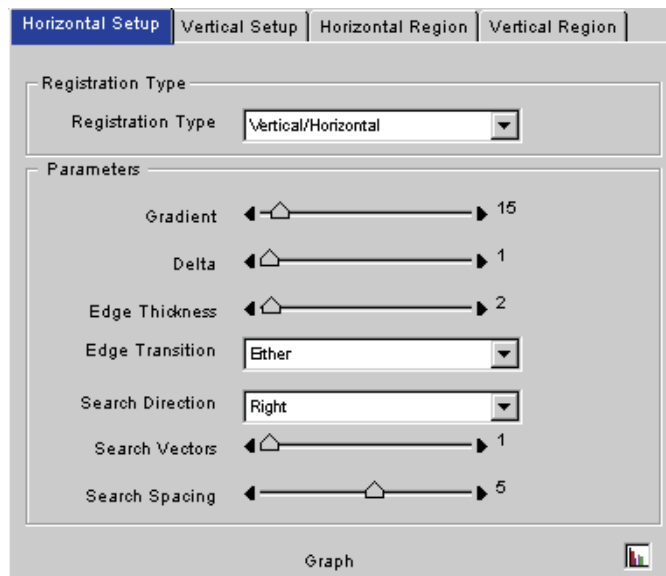


Vertical/ Horizontal registration type being used. There are 7 vertical search vectors and 3 horizontal search vectors shown.

Then adjust the parameters to find the desired edges.

X-Y registration parameters

Horizontal Setup or Vertical Setup menu



Gradient This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

☞ See illustrations of Edge Gradient and Edge Thickness beginning on page 10-29.

Delta Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

Edge Thickness Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

Edge Transition Indicates what type of edge for which to search: Light to Dark edges, Dark to Light edges, or Either. This parameter is important in determining which type of edges will be found in the image.

Search Direction Search in the desired direction to find an edge. This could be left/ right or up/ down depending whether you are using horizontal or vertical searches.

Search Vectors	Use a number of search vectors to search for an edge more accurately.
Search Spacing	Set the number of pixels between each search vector.

Graphs - X-Y registration

Depending on the setup of X-Y registration, you will have one or two graphs available.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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. You can set the start angle and direction in which the system searches for a feature.

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 to use these points to generate the inspection region.

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.

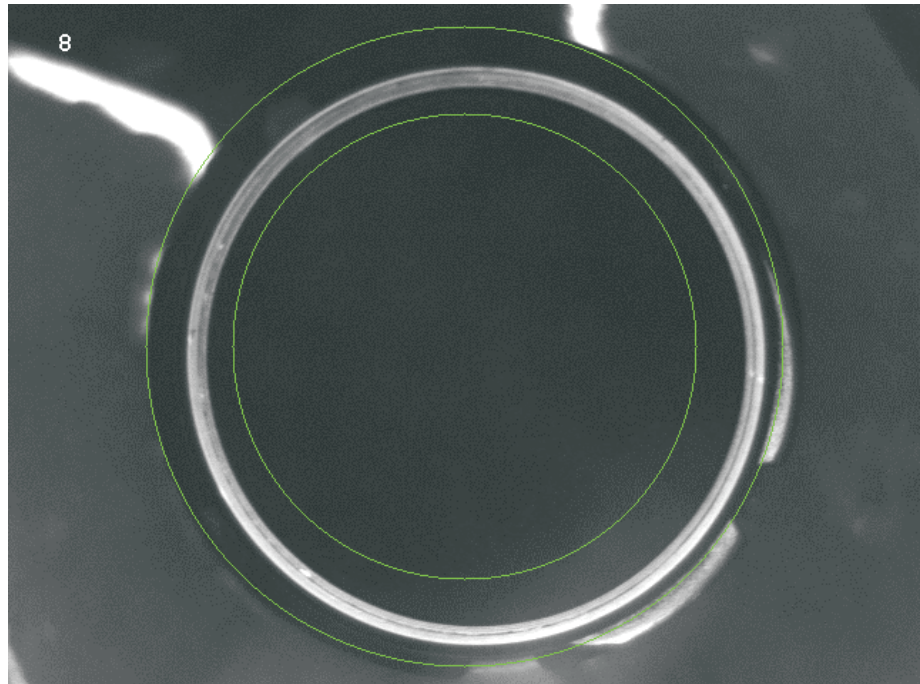
You can also have the system generate a center point of the tracked feature by applying one of several available centering methods.

Place the Tracker region

First, set up a region for registration through the Region menu. Adjust the two circles to surround the edges that the registration will identify. Allow enough room for the part to move within the image and still be located. It is completely valid to allow parts of a search circle to fall outside the image area.

Next, go to the Vectors menu and select a direction in which to search for a transition. 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. In the example below, the inner edge of the seal surface is the cleanest.



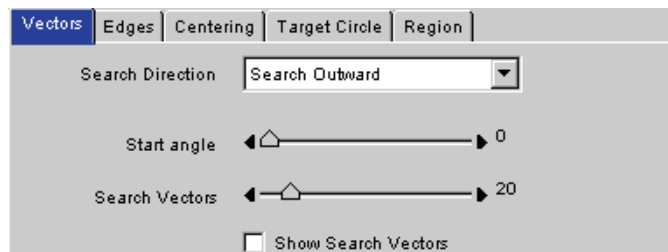
Next, go to the Target Circle* menu. Adjust the cyan circle to the same size and position as the edge you want to find. Click Set Target. When the system finds the edges, it will lock on and draw a target circle. The target circle is displayed in purple surrounded by yellow when it is locked on target.

You may need to adjust the other parameters to find the desired edge. These parameters are discussed next.

*Target Circle not used with Average Center Technique.

Adjust Tracker registration parameters

Vectors menu



Search Direction Indicates whether the search vectors will search for edges from outside to in (Inward) or inside to out (Outward).

Start Angle This is the start angle used to show where the system begins to search for the desired feature. This may be used on images that have a distinct feature that starts in a certain location on the image. Use with an orientation in place to assure the search region starts at the same location regardless of the part's orientation in the camera's field of view.

☞ *Start Angle settings are rarely used in typical seal surface inspections.*

Search Vectors The number of search vectors that will be used to track the shape of the feature. The larger the number of search vectors, the more precise the shape of the found feature. However, a greater number of search vectors will also use more processing time.

Edge menu

Search Type Choose the type of edge for which to search. The three types of searches are explained below.

Edge Location

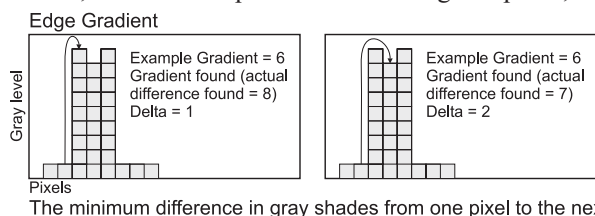
The following parameters apply when the Search Type is Edge Location. This search type is useful when you searching for a narrow edge transition area that has a definite change in gray shade from the pixels surrounding it.

Edge Transition The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

Edge Filter Enable Indicates whether the system should apply a binary filter to the edge search. If Enabled, set a filter value to indicate the binary threshold between dark and light pixels. If the filter is set at 128, for example, 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.

Filter Value (If Edge Filter Enabled) Set the threshold value for the binary search.

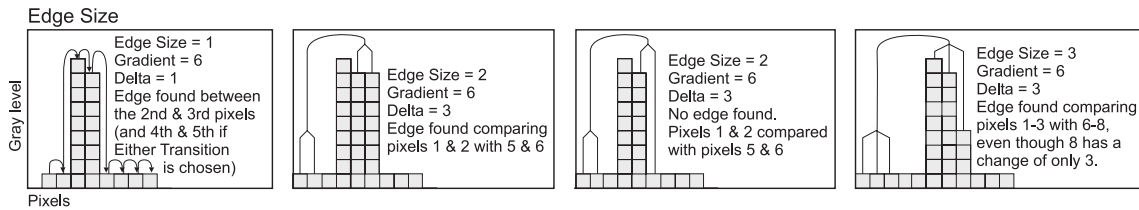
Edge Gradient (If Edge Filter Disabled) This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.



The minimum difference in gray shades from one pixel to the next.

Delta Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

Size This indicates how many pixels in a row to compare (e.g 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.



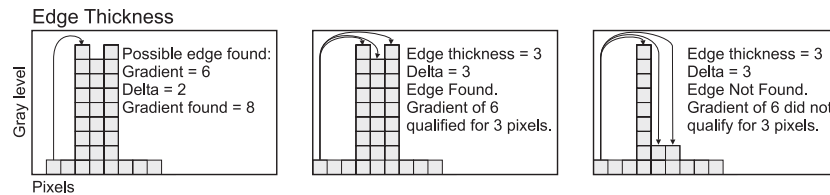
The number pixels in a row to compare. The system takes the average gray level of each group of pixels, subtracts the difference, and compares that difference to the gradient. If the difference is equal to or greater than the gradient, an edge is found.

In the drawing on the right above, the system finds a gray level of one for pixels 1-3. It adds these and divides by Edge Size. It finds gray levels of 9, 8, and 4 for pixels 6-8, respectively. It adds these and divides by Edge Size.

It then takes the difference between these two average gray levels and compares it to Gradient. If this difference is equal to or greater than Gradient, an edge is found.

$1+1+1 = 3$. $3/3 = 1$ (average gray level of pixels 1-3)
 $9+8+4 = 21$. $21/3 = 7$ (average gray level of pixels 6-8)
 $7-1 = 6$. 6 is equal to Gradient. Edge is Found.

Thickness Indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.



The expected width of the edge. The gradient must qualify first.
 If the width is not met because of noise or a grain pattern, an edge is not found.

Best Edge This indicates whether the system should locate the First edge found that meets the Gradient criteria, or to look for the Best edge that meets the Gradient criteria. The best edge is the greatest change in gray scale found above the Gradient criteria.

Missed Edges Max The number of search vectors that are allowed to fail without causing the inspection to fail.

Show Edges When Enabled, you will be able to view the found edge positions on the image.

Feature Location

The following parameters apply when the Search Type is Feature Location. 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.

Edge Transition The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

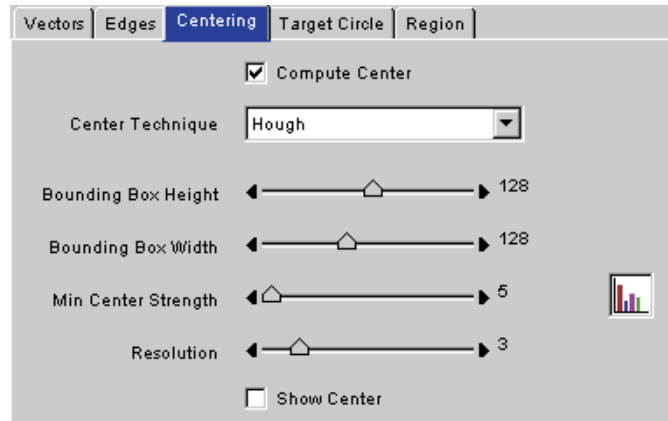
Edge Filter Enable	Indicates whether the system should apply a binary filter to the edge search. If Enabled, set a filter value to indicate the binary threshold between dark and light pixels. If the filter is set at 128, for example, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.
Filter Value	(If Edge Filter Enabled) Set the threshold value for the binary search.
Edge Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
Best Edge	This indicates whether the system should locate the First edge found that meets the Gradient criteria, or to look for the Best edge that meets the Gradient criteria. The Best Edge is the greatest change in gray scale found above the Gradient criteria.
Missed Edges Max	The number of search vectors that are allowed to fail without causing the inspection to fail.
Show Edges	When Enabled, you will be able to view the found edge positions on the image.

Dual Edge Location

The following parameters apply when the Search Type is Dual Edge Location which looks for a pair of edge transitions. This search type is useful when you are locating a surface that has good edge transitions on either side of the surface. This search type is another good method for finding edges of a Seal Surface, for example. If searching for a Seal Surface, the system would probably look for a Dark to Light then a Light to Dark edge transition.

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.
Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image. In Dual Edge Location search type, the Edge Transition is the first edge transition. For example, when searching for a seal surface, you might be Searching Outward (determined in the Vectors menu) for a Dark to Light transition. The Dual Edge Location will then search for an opposite transition (Light to Dark) as the second edge transition.
Edge Filter Enable	Indicates whether the system should apply a binary filter to the edge search. If Enabled, set a filter value to indicate the binary threshold between dark and light pixels. If the filter is set at 128, for example, 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.
Filter Value	(If Edge Filter Enabled) Set the threshold value for the binary search.
Edge Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
Best Edge	This indicates whether the system should locate the First edge found that meets the Gradient criteria, or to look for the Best edge that meets the Gradient criteria. The Best Edge is the greatest change in gray scale found above the Gradient criteria.
Missed Edges Max	The number of search vectors that are allowed to fail without causing the inspection to fail.
Show Edges	When Enabled, you will be able to view the found edge positions on the image.

Centering menu



This menu determines whether or not the system should compute a center point from the found edges. It also determines the type of calculation used to compute the center point.

Compute Centering

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.

Centering Technique

Allows you to select the technique used to calculate the center point. Choose from:

Average Center - Uses the found edges of the feature, and simply calculates the average center of those edges.

Hough Centering - 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. This technique uses additional parameters, explained below.

Radial Edge Centering - 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.

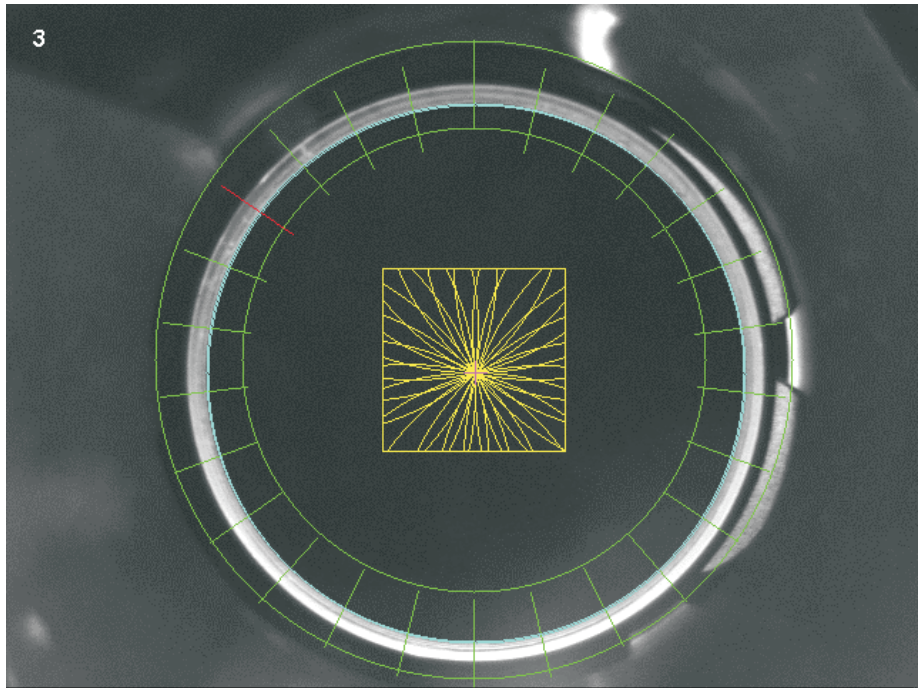
Show Center

This displays the center point, when Enabled.

Hough Centering technique:

Adjust Target Circle – Go to the Target Circle menu and adjust the Target Circle. Adjust the size of the circle where you would expect the system to find the edge of the desired feature. It uses the radius of this circle to calculate the Hough center.

Make sure you set the Target Circle to match the edge specified in the Edge and Vectors menus. That is, if you have Search Outward in Vectors menu, Dual Edge Location, and First Edge Location set in the Edge menu, set the Target Circle where you expect the system to find the first edge searching outward.



Then set the remaining parameters in the Centering menu.

Adjust Bounding Area

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 (e.g. The shape of a defective part could be distorted).

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) that the arcs must intersect to determine the found center. (Not the bounding area) A larger resolution allows a larger area – the arcs do not all have to cross at the same point – and increases the strength. (See Center Strength)

Show Center

When Enabled, the system displays the Bounding Box (yellow box), the arcs projected by the found edges (in yellow), the target circle (magenta circle), and the predicted center (magenta cross).

Radial Edge Centering technique:

Adjust Target Circle – Go to the Target Circle menu and adjust the Target Circle. Adjust the size of the circle where you would expect the system to find the edge of the desired feature. It uses the radius of this circle to calculate the center.

Make sure you set the Target Circle to match the edge specified in the Edge and Vectors menus. That is, if you have Search Outward in Vectors menu, Dual Edge Location, and First Edge Location set in the Edge menu, set the Target Circle where you expect the system to find the first edge searching outward.

Then set the remaining parameters in the Centering menu.

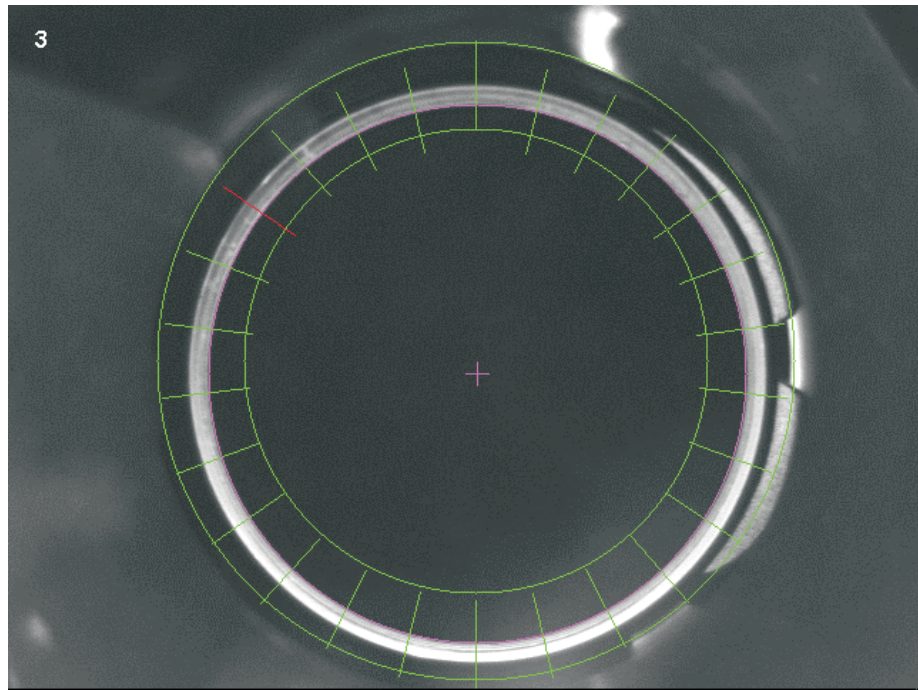
Radius Tolerance

The number of pixels the found edges of the feature can be from the target circle. This allows edges to be slightly off the target circle by the tolerance specified.

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 When Enabled, you will be able to view the target circle (magenta) and the calculated center point (magenta cross).

Graphs - Tracker Registration

The following graphs are available to help you adjust the Tracker registration parameters if necessary.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

☛ See page 3-12 for more information about graphs

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 and centering technique is Radial Edge Centering) 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 and centering technique is Hough Center Strength) The number of arcs that intersected the center. It indicates how accurate the center is. Larger numbers indicate better center confidence.
Tracker Edges Found	The Minimum Passing notation on the graph is the Minimum Center Strength 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.

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.

Pattern Match

When the system inspects parts, Orientation/ Pattern Match rotates the reference pattern until it makes a pattern match with the image on the screen. If the system must rotate the reference pattern 25 degrees to match the current image, it will rotate all following inspections in that job by 25 degrees.

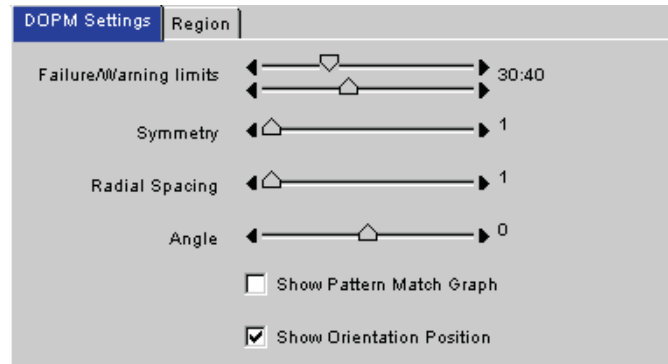
Define the Orientation/ Pattern Match region

A registration should be placed prior to creating an orientation (preferable, but not mandatory). The orientation will be centered on the registration reference point.

Place the orientation region (donut) so that it crosses through several distinct features – this makes it easier to determine the part's orientation. Using the Region menu, 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.

Set up the Orient/ Pattern match parameters to best inspect your product, as recommended by your instructor or service engineer.

Orientation/ Pattern Match parameters



DOPM is short for Donut Orientation Pattern Match

Failure Limit The system generates a graph that displays the probability of pattern match at any degree of rotation of the part. 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.

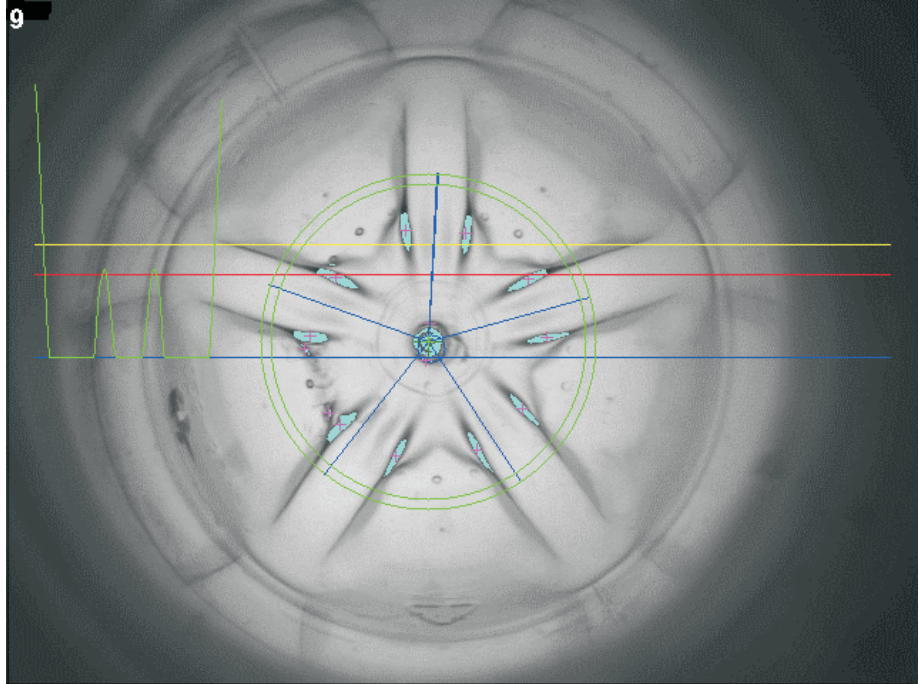
The system always uses the strongest pattern match generated. However, if all peaks fall below the limit, the inspection fails – no pattern match.

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.

☞ *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 (i.e., 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 $1/\text{symmetry squared}$. 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 Show All Regions button. Then, in the DOPM 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.

Graphs - Orient/ Pattern Match

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

➡ See page 3-12 for more information about graphs

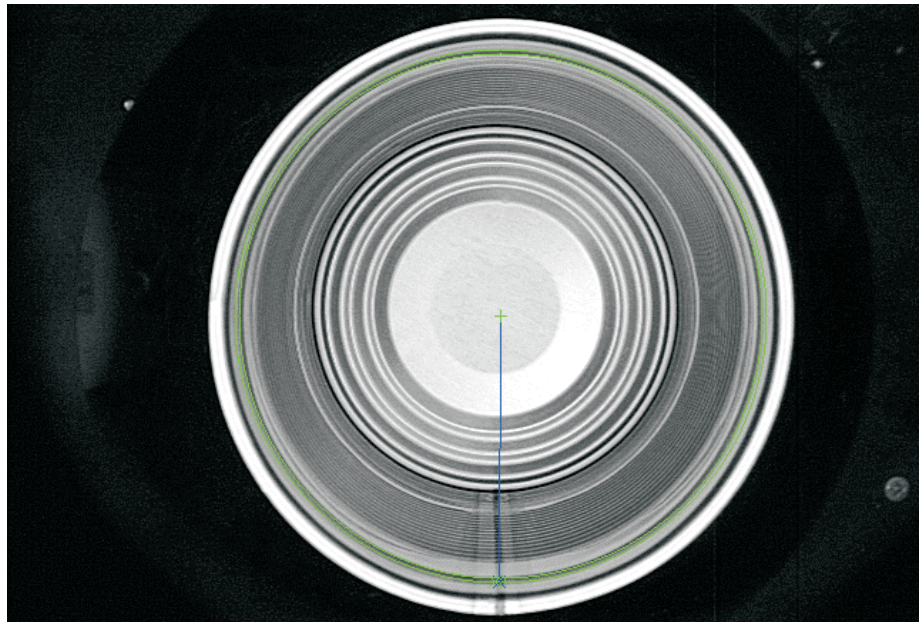
Peak Correlation	This shows the strength of the correlation (pattern match) found in the orientation search. If the inspected image matched the reference pattern by 100 percent, it records that strength as 100.
Peak Index	This shows the index (degree of rotation) where the pattern was best matched.

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 fluctuate 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.

Defining Orientation Edge

Define the region

First, define a region for orientation through the Region menu. 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.

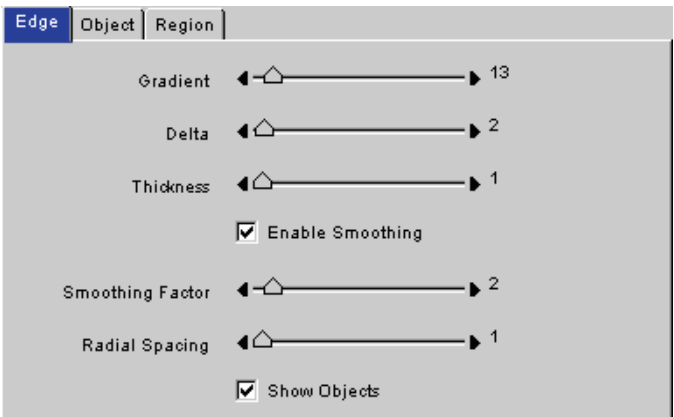
Light or dark objects

Orientation Edge can find light or dark objects. Use the least cluttered part of the image as the object.

Modify parameters

Adjust the parameters for your application.

Edge menu



- Gradient** This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
- Delta** Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
- Thickness** Indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
- Enable Smoothing** Smoothing is used to de-emphasize sudden changes in gray levels and reduce the effect of noise.
- Smoothing Factor** Disable smoothing by setting it to 1. Maximum setting is 20.
- Radial 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. The default value of one usually works well.

Show Objects When Enabled, the objects for which the orientation is searching are displayed.

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 will be considered an object.

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

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

➡ See page 3-12 for more information about graphs

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.

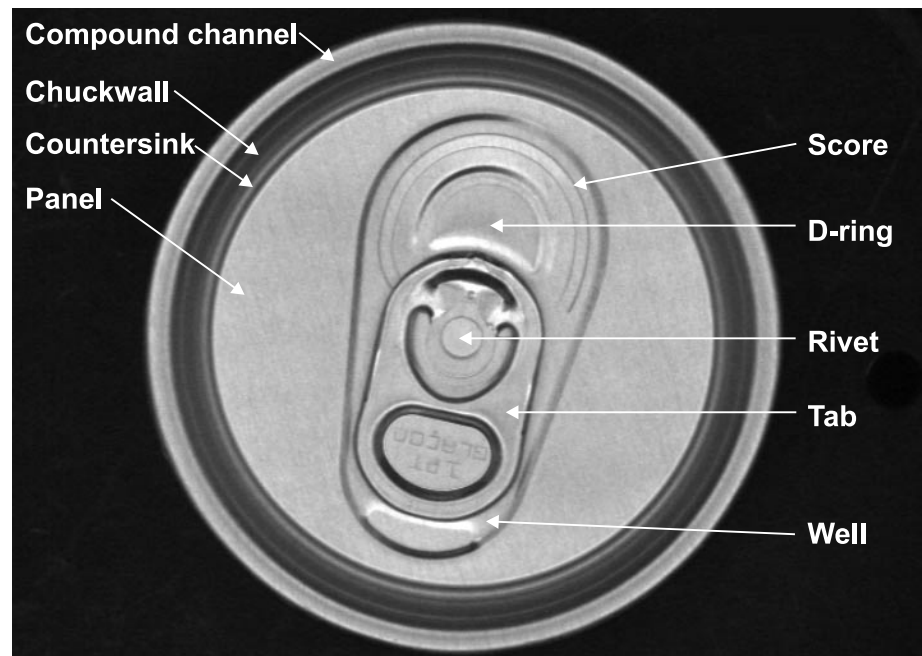
Acceptable Objects Plots the number of objects found that meet the Object Count Min/ Max criteria.

Midline Orientation

This orientation 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.



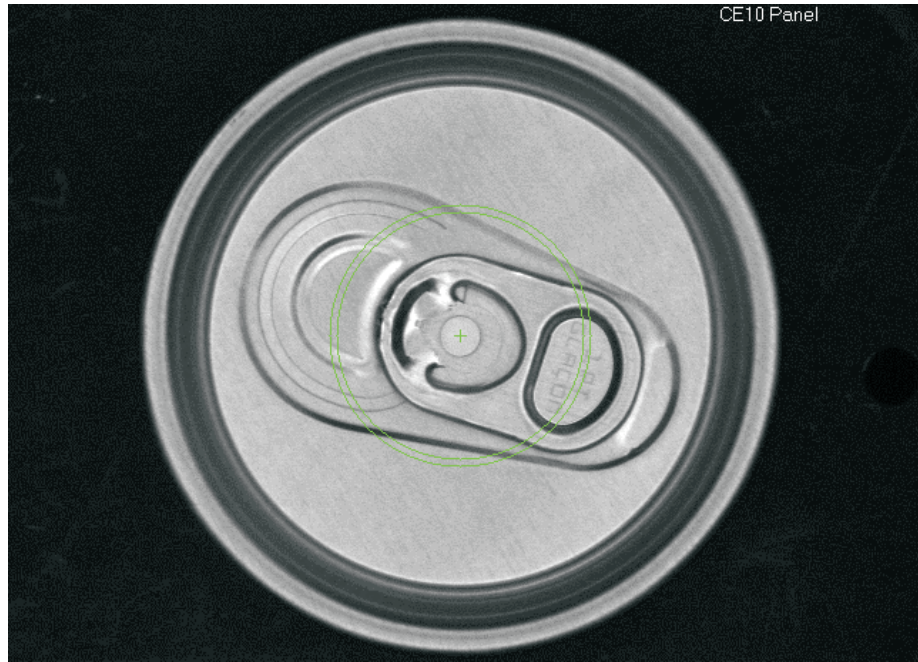
Midline Orientation finds the orientation of the well, or on some parts, the strengtheners, of the converted end.

✎ *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.

Place the orientation region

First make sure you have a good registration in place. Then 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.

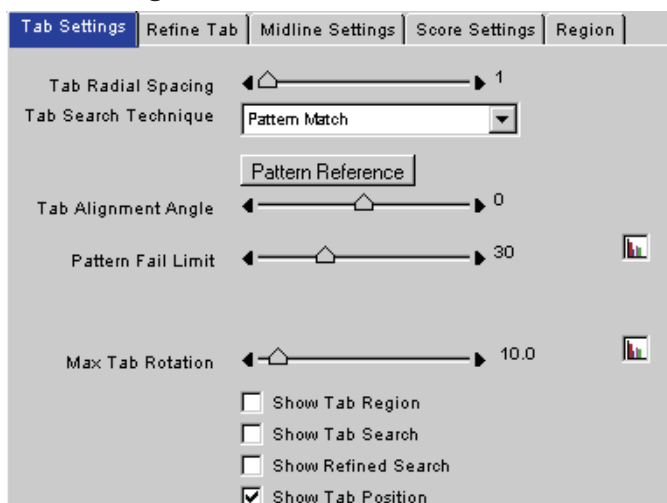


Adjust Midline Orientation parameters

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

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 Radial 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. 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.

☞ *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

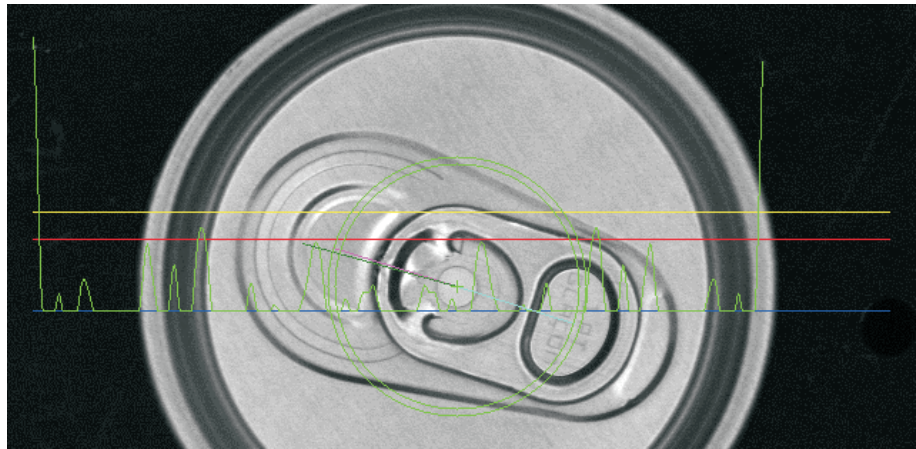
Set the reference orientation to approximately the center of the tab. This will give the reference pattern, that was set previously, a starting reference point.

Pattern Fail Limit

The system computes the probability of a pattern match at any degree of rotation of the part. This is a percentage of gray shades measured that must match the reference pattern.

☞ *Enable Show Tab Search to see the graph discussed below.*

The system generates a graph that displays the probability of pattern match at any degree of rotation of the part. 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.

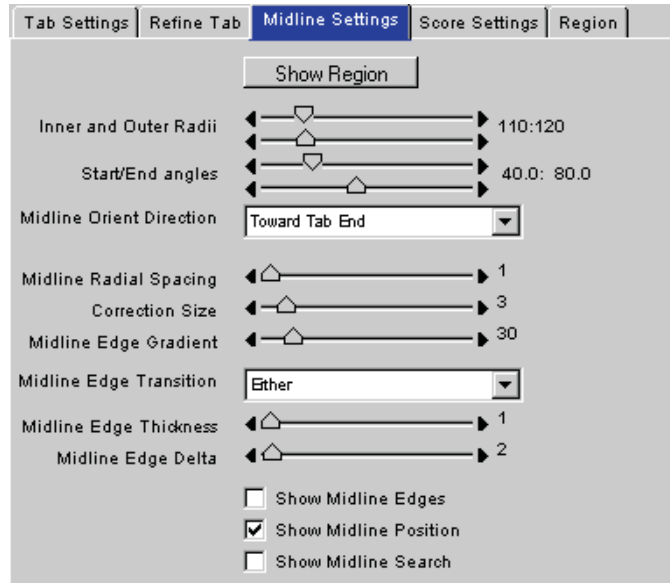
Max Tab Rotation	This specifies the number of degrees in either direction from the reference midline that the found midline of the tab may fall. If the tab is rotated greater than this number, the orientation fails.
Show Tab Region	If Enabled, the tab search region is highlighted on screen.
Show Tab Search	If Enabled, the Pattern Match fail limit information is displayed on screen, or edge location position if Tab Search Technique = Edge Search.
Show Refined Search	If Enabled, the found tab edge positions are marked with cyan x's.
Show Tab Position	If Enabled, the found tab midline is displayed in cyan.

Edge Search

The following parameters are available when Tab Search Technique = Edge Search

Tab Edge Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.  See illustrations for Edge Gradient, Edge Size, and Edge Thickness beginning on page 10-29.
Tab Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Tab Edge Thickness	Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Tab Edge Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Tab Edge Size	This indicates how many pixels in a row to compare (e.g. 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



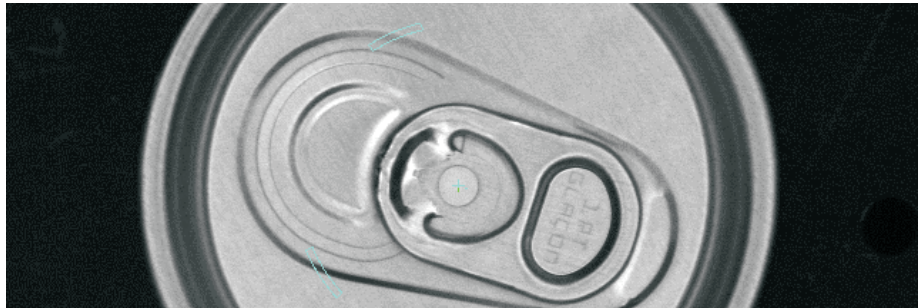
This menu sets the parameters that find the sides of the well, and computes the midline of the well.

Show Region Click this to view the search region that finds the sides of the well.

 *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)



 *Pattern Reference and Tab Alignment Angle in the Tab menu must be done before adjusting the midline region.*

Midline Orient Direction

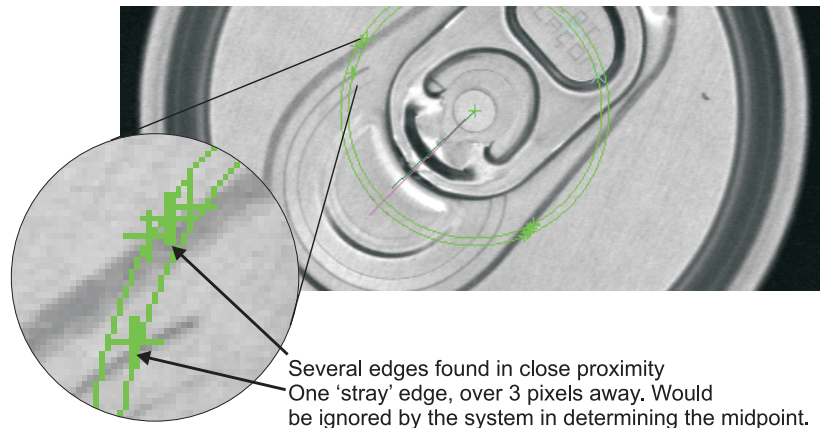
Indicates which direction along the midline to use as the orientation position (Tab End or Opposite Tab End). For converted end inspection, we recommend Opposite Tab End.

Midline Radial Spacing

Change the number of search vectors in the search region. This number indicates the distance between radial vectors (in number of radial vectors). Set this parameter between one and 25. The default value of one usually works well.

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 Edge Gradient This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, 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.

☛ *Enable Show Midline Edges to see the effect of this parameter.*

Midline Edge Transition The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

In the example above, the search vectors are searching from a light area to the dark well transition. We are using Light to Dark.

Midline Edge Thickness Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

Set Edge Thickness large enough (we are using 3) to distinguish the well transitions from any other noise in the image.

Midline Edge Delta Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

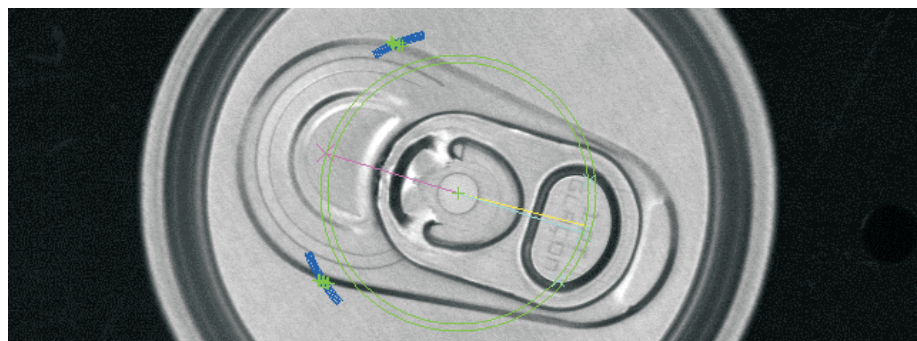
Set this high enough, say 5, to accurately capture the edge transition.

Show Midline Edges If Enabled, the edges used to compute the midline are displayed as green x's. The midline position is displayed as a magenta x.

Show Midline Position If Enabled, the found midline is highlighted in magenta.

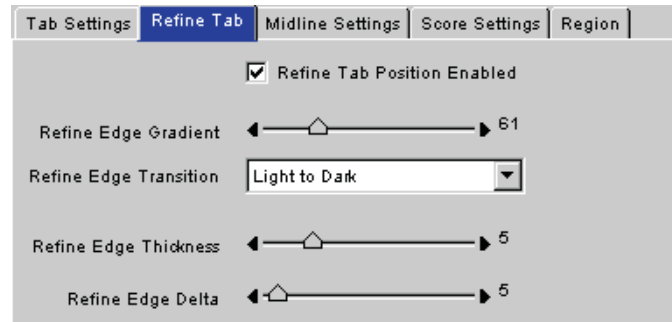
Show Midline Search If Enabled, the position of the midline search is displayed in blue.

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.

☛ *Enable this only after you set the Midline parameters in the Midline menu.*

Refine Edge Gradient

This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

☛ *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).

Refine Edge Transition

The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

In searching for a tab, we use Light to Dark. We want to find the dark tab edges.

Refine Edge Thickness

Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

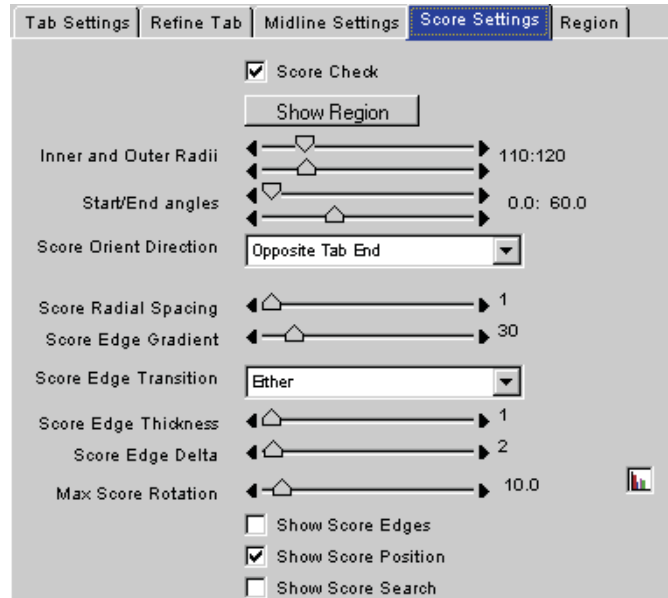
In our example, we are using a value of 5. Set this high enough to find a well-defined edge.

Refine Edge Delta

Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

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** Click this to view the score search region.
- 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.

☞ *Set Score Orient Direction (usually Opposite Tab End) before adjusting the search region.*

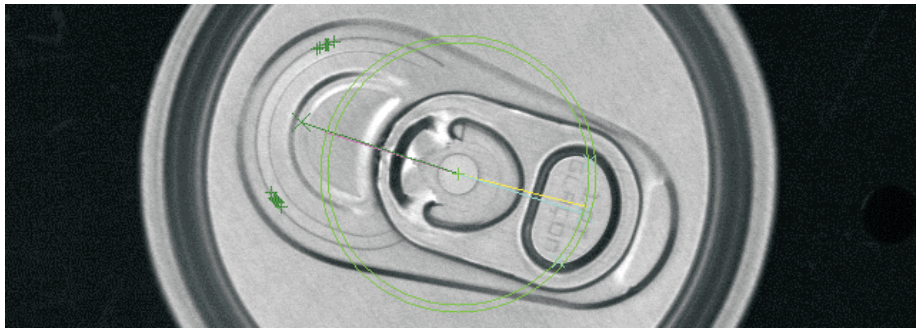
Choose the score or D-ring on your part – whichever has the greatest contrast. In our example, we use the lower edge of the score where the search region does not cross the D-ring.



- 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.

☞ *Enable Show Score Search to see the effects of this parameter.*

- Score Radial Spacing** This is used to change the number of search vectors in the search region. This number indicates the distance between radial vectors (in number of radial vectors). Set this number between one and 25. The default value of one usually works well.
- Score Edge Gradient** This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge. Make this high enough to consistently find the score edges (green x's).



☛ *Enable Show Score Edges to see edges*

Score Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image. In the above example, we are searching from a light area to the dark score. We are using Light to Dark transition.
Score Edge Thickness	Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Score Edge Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels. Set this high enough, say 5, to accurately capture the edge transition.
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	If Enabled, the score edges are displayed as green x's. The midpoint of the score is displayed as a large green x.
Show Score Position	If Enabled, the found midline position of the score is displayed as a dark green line.
Show Score Search	If Enabled, the score search area is highlighted in blue.

Graphs – Midline Orientation

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

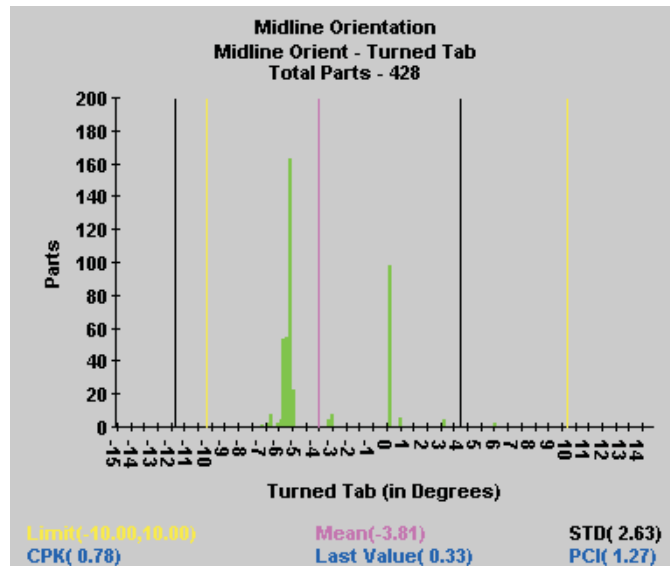
- Click a graph icon (if present) next to a parameter to view its graph.
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

☛ *See page 3-12 for more information about graphs*

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.

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.

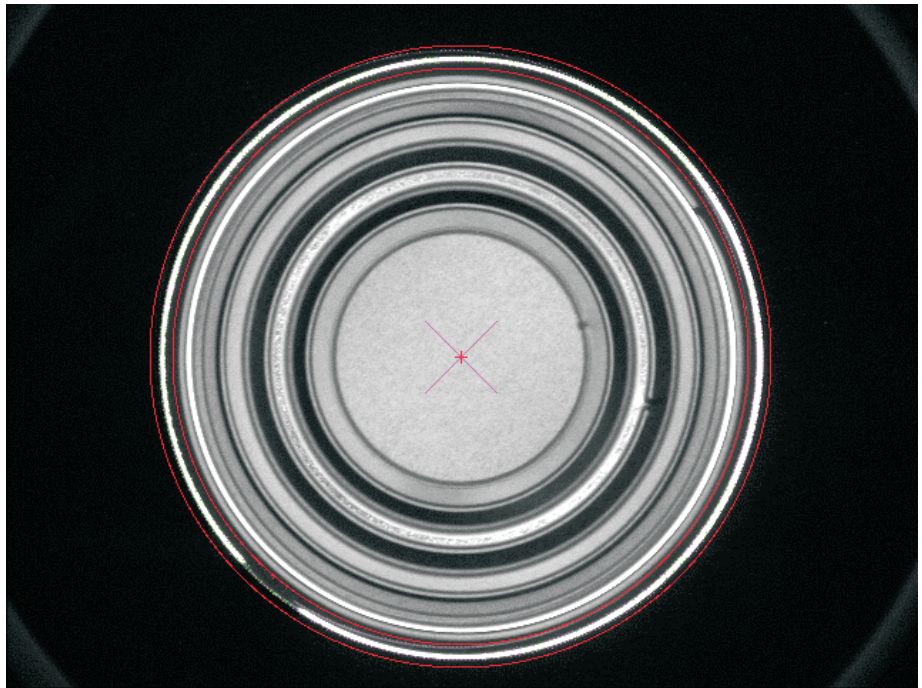
Clipout inspection

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 quadrants along diagonal lines. Each quadrant 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.

Place the 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.



Then adjust the parameters to best inspect your part, as recommended by your instructor or Pressco Service Engineer.

Clipout Parameters

Parameters	Contrast Tool	Region
Gradient	◀ ◻ ▶	15
Neg. Gradient	◀ ◻ ▶	15
Edge Count Limits	◀ ◻ ▶	0:20
Edge Count Warning	◀ ◻ ▶	0:30
Min Segment Pass	◀ ◻ ▶	4
Grid Spacing	◀ ◻ ▶	3
Curl Limits	◀ ◻ ▶	1:4
Delta	◀ ◻ ▶	1
Thickness	◀ ◻ ▶	2
Start angle	◀ ◻ ▶	0
End angle	◀ ◻ ▶	0

Gradient

Finds the dark-to-light, or leading edge transition.

Negative Gradient

Finds the light-to-dark, or trailing edge transition.

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

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%.
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.
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.
Curl Limits	The minimum and maximum number of pixels wide that the curl can be. Anything outside these parameters is considered a defect.
Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
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.

 *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.*

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.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

See page 3-12 for more information about graphs.

Circle inspection

You can 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, and zone analyses can be performed to find specific defects.

If segments are used, you can specify that a certain number of segments must pass inspection, or are allowed to fail, to determine whether the whole circle inspection passes.

Create the Circle inspection

Place the inspection region through the Region menu.

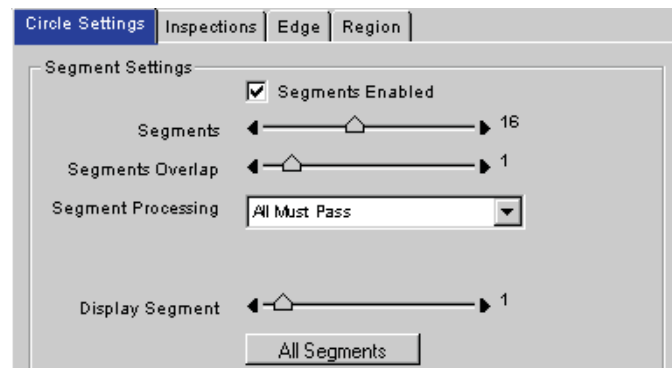
Arcs Enabled

To inspect just an arc instead of the whole circle, check this box (in the Region menu). If Enabled, the system will inspect only a portion of the circle between the start and stop angles you specify. Zero degrees is the top of the circle.

☛ *Use Arcs with an orientation in place. This will ensure that the arc inspection region is placed on the same location of the part regardless of the part's orientation.*

Then go to the Circle Settings menu to determine whether to use segments, and to specify segment conditions. After, set up the remaining inspection parameters. Use the Inspections menu to add the desired types of inspections.

Circle Settings menu



Segments Enabled

If Enabled, the circle will be divided into a number of segments. If Disabled, the circle will be inspected as one continuous inspection region.

Segments Disabled

If Disabled, the following parameters specify how the continuous circle is inspected.

Scan Method

Specify the method to inspect the circle.

- **Circular Scan** - this method inspects the region circularly in concentric circles, looking for edge transitions.
- **X-Y Scan** - this method inspects the region horizontally and vertically. This method is good for inspecting large areas such as a flat panel.

Segments Enabled

If Segments are Enabled, the following parameters specify how the segmented circle is inspected.

Segments

Divide the circle into a number of segments between one and 36.

Segment Overlap

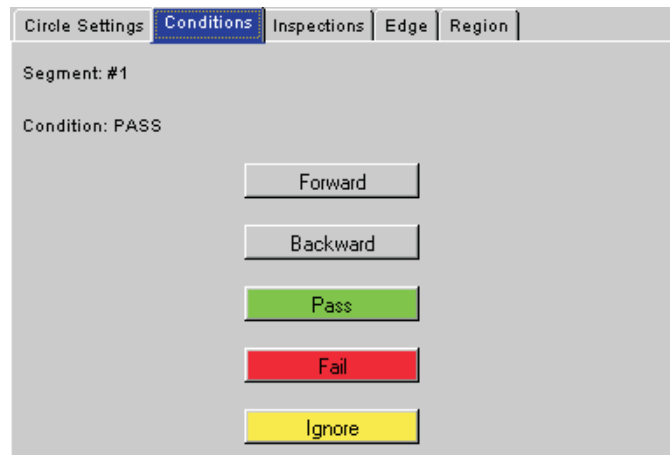
Specify the number of pixels by which each segment will overlap each other. The segments can overlap from zero to 10 pixels. Overlapping ensures that pixels are not missed during inspection.

Segment Processing

Specify how many segments must pass for the whole inspection to pass.

- **All must pass** - all the segments must pass inspection for the Circle inspection to pass.

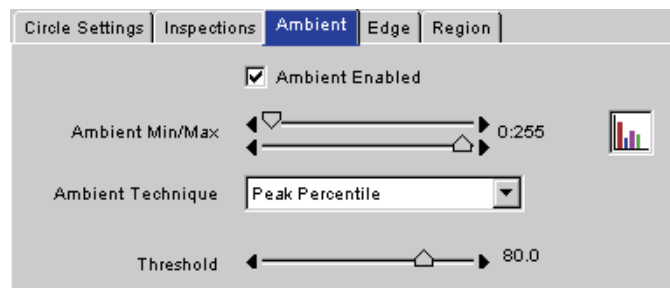
- **Minimum passing** - specify the minimum number of segments that must pass (through Passing Minimum parameter) for the Circle inspection to pass.
- **Special Conditions** - allows you to specify that a segment pass, fail, or be ignored. Use the Conditions menu to specify the conditions. Click the Forward or Backward button to highlight a segment. Its 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 Circle inspection passes. You might use PASS or IGNORE on inspection segments that have a recycle logo, for example, that would normally not pass edge inspections (if inspection uses orientation).



Circle Test Parameters

From the Inspections menu, choose which portions of the Circle inspection to use to detect different types of defects. All the available types of inspections are described in this section.

Ambient menu



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.

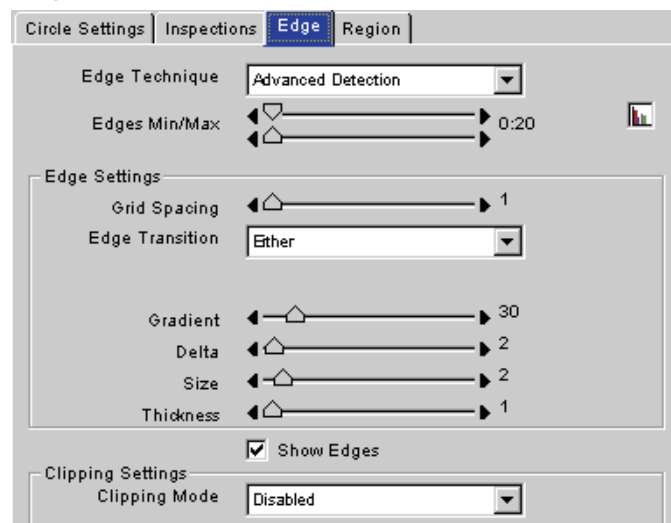
The Ambient that is determined through the settings in this menu can be used in the calculations of the Zone and Blob analyses.

Ambient Enabled

This determines if the found ambient is used as a reject criteria or not. You may Enable or Disable whether to reject based on the gray shade found on each new image. If you Disable the Ambient option, the Ambient Min/ Max parameters are not used. However, the ambient is still calculated for use in other inspection areas (edge, blob, zone), and you can choose an ambient search 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.
- ☞ 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 from one of the techniques listed below:
1. **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.
 2. **Peak Percentile** computes the ambient by locating the gray shade value that exceeds the threshold you define by Threshold.
 - **Threshold** is used only when the ambient search technique is Peak Percentile. This defines what percentage of the search area to use as a threshold.
 - If you use 80% as Threshold, the system counts the pixels in the first 80% of the histogram as shown in the above illustration. The first gray level above that 80% threshold is considered the ambient.
- ☞ See page 10-4 for illustrations of Maximum Amplitude and Peak Percentile.
3. **Ambient Density** computes the ambient by taking the average of all the pixel gray levels — total gray level divided by pixels.

Edge menu



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:
1. **Simple Detection** uses a gradient and delta to locate an edge.
 2. **Advanced Detection** qualifies edges by adding extra parameters. These are discussed below.
 3. **Adapting Detection** allows the inspection to adapt to the gray level changes of each image. See below.
 4. **Object Fill** locates objects within the inspection region and fills them in. See below for extra parameters.

The following parameters are common to all edge detection techniques.

Edges Min/ Max The minimum and maximum number of edges expected in the inspection region. If the number of edges is less than or greater than these numbers, the inspection fails.

Edge Settings

- 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.
- Delta** Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
- Show Edges** If Enabled, the edge points are displayed on the screen. If Disabled, the edge points are not displayed.

Simple Edge Detection technique:

This technique simply uses a gradient and delta to find edges.

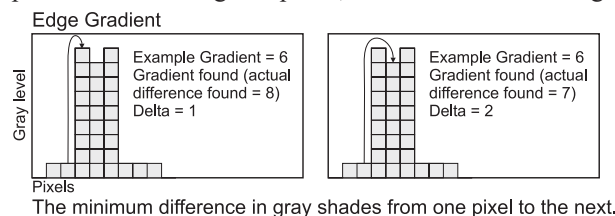
Gradient This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

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.

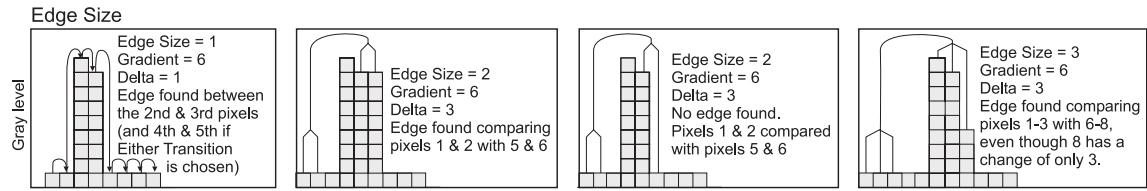
Edge Transition The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

Gradient This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.



Size This indicates how many pixels in a row to compare (e.g. 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.



The number pixels in a row to compare. The system takes the average gray level of each group of pixels, subtracts the difference, and compares that difference to the gradient. If the difference is equal to or greater than the gradient, an edge is found.

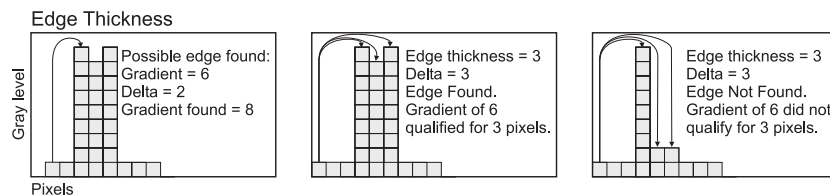
In the drawing on the right above, the system finds a gray level of one for pixels 1-3. It adds these and divides by Edge Size. It finds gray levels of 9, 8, and 4 for pixels 6-8, respectively. It adds these and divides by Edge Size.

It then takes the difference between these two average gray levels and compares it to Gradient. If this difference is equal to or greater than Gradient, an edge is found.

$1+1+1 = 3$. $3/3 = 1$ (average gray level of pixels 1-3)
 $9+8+4 = 21$. $21/3 = 7$ (average gray level of pixels 6-8)
 $7-1 = 6$. 6 is equal to Gradient. Edge is Found.

Thickness

Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.



The expected width of the edge. The gradient must qualify first.
 If the width is not met because of noise or a grain pattern, an edge is not found.

Clipping Mode

Used to change gray shades to a specified value. Clipping de-sensitizes the inspection to noise by clipping off normal variations in the gray shades of the part. It allows flaws in the failure range to be detected more easily.

- **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.

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 Transition

The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

Threshold

This is the edge sensitivity setting. The higher this value, the stronger the edge must be. This is a percentage of the gray level of the current search area.

Size This indicates how many pixels in a row to compare (e.g. 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.

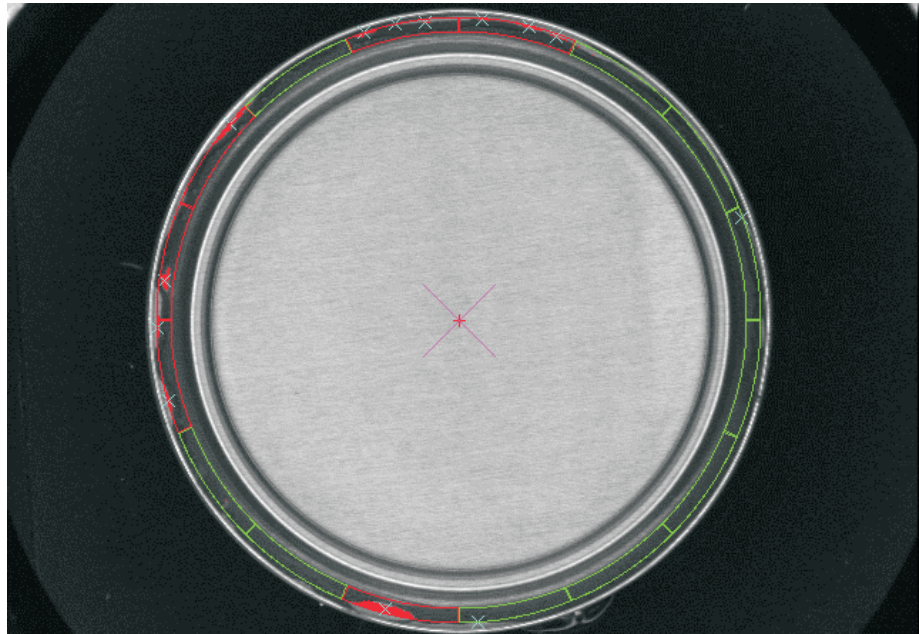
☛ See the illustrations for Size and Thickness under Advanced Edge Detection technique.

Thickness Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

Clipping Mode Refer to Clipping Mode description under Advanced Edge Detection technique.

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 objects found are filled in as well as marked with an x.

The following parameters are added for this edge detection technique:

Edge Transition The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.

Gradient This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

☛ See the illustrations for Size and Thickness under Advanced Edge Detection technique.

Size This indicates how many pixels in a row to compare (e.g. 1 to 1, 2 to 2, etc.). The larger the 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.

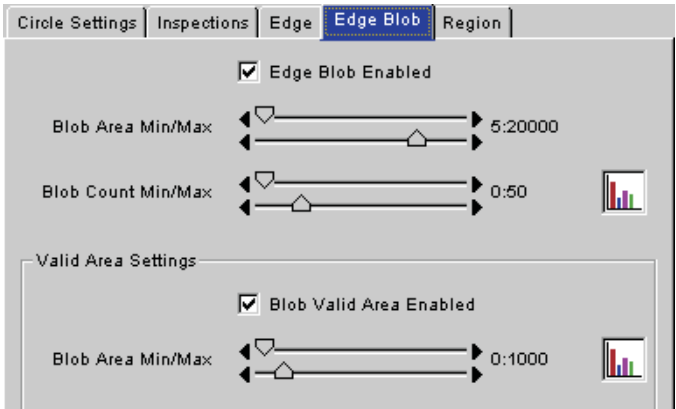
Thickness Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge.

If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

Clipping Mode

Refer to Clipping Mode description under Advanced Edge Detection technique.

Edge Blob menu



Edge Blob Enabled

If Enabled, the located edges (determined by the parameters in the edge menu) 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.

Blob Area Min/ Max

The smallest and largest connected set of pixels considered to be a blob.

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.

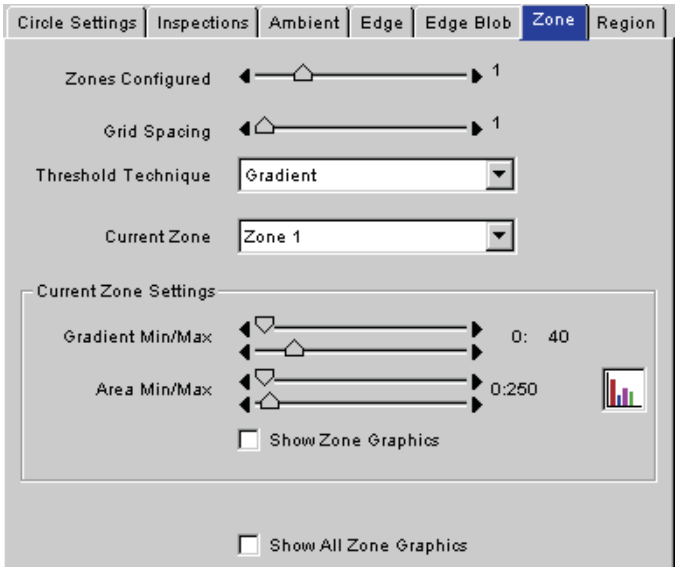
Valid Area Settings

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.

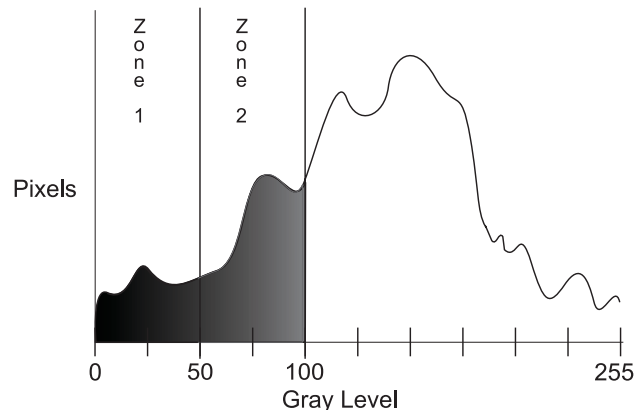
Blob Area Min/ Max

The minimum and maximum blob areas that qualify a valid blob.



Zone menu

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.

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. Described below.

Current Zone

Identifies which zone is currently being adjusted. The parameters are set in the Current Zone Settings section of the menu.

Current Zone Settings

Percent of Ambient technique:

This technique uses a percentage of the found Ambient to define the low and high thresholds.

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.

The Minimum Gray Level is computed by multiplying the Ambient by Threshold Min/100. For example, if the Ambient is 200, and the Threshold Min is 20, the Minimum Gray Level for this zone is 40. $[200 \times (20/100)] = 40$.

The Maximum Gray Level is computed by multiplying the Ambient by Threshold Max/100. For example, if the Ambient is 200, and the Threshold Max is 80, the Maximum Gray Level for this zone is 160. $[200 \times (80/100)] = 160$.

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.

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.

Again, the system allows for up to five different zones to be defined. The zone data and pixels in each zone are color-coded as follows:

- Zone 1 - Blue
- Zone 2 - Cyan
- Zone 3 - Magenta
- Zone 4 - Orange
- Zone 5 - Yellow

Show all Zone Area Graphics

If enabled, the system allows you to see the zone graphic information for all the zones without having to enable the graphics for each zone. If disabled, the system allows you to enable the graphics for each zone independently.

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 inspection.

Blob Mass Enabled **Blob Mass Min/ Max**

This determines whether the total blob mass is used as a reject criteria or not.

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. Described below.

Percent of Ambient technique:

This technique uses a percentage of the found Ambient to define the low and high thresholds.

☛ *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 a blob pixel candidates. The system computes the minimum gray level as follows:

$$\text{Minimum Gray Level} = \text{Ambient} * (\text{Threshold Min} / 100)$$

When the system inspects a part, it computes the Minimum Gray Level by multiplying that part's Ambient by the percentage you choose. For example, if the ambient value for a part is 200, and you choose a Threshold Min percentage of 20, the Minimum Gray Level is 40. $[200 \times (20/100)] = 40$.

The system computes the maximum gray level as follows:

$$\text{Maximum Gray Level} = \text{Ambient} * (\text{Threshold Max} / 100)$$

When the system inspects a part, it computes the Maximum Gray Level by multiplying that part's Ambient by the Threshold Max percentage you choose. For example, if the part's Ambient is 200, and you choose a Threshold Max Percentage of 80, the Maximum Gray Level is 160. $[200 \times (80/100)] = 160$.

☛ In the examples stated above, if the Minimum Gray Level is 40, and the Maximum Gray Level is 160, any 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.

Blob Count Criteria

The following parameters are common to both Threshold Techniques:

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.

Graphs - Circle inspection

There are a number of graphs from which you can choose to help modify the Circle inspection. The available graphs depend on what parts of the inspection are enabled.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

☛ See page 3-12 for more information about graphs

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.

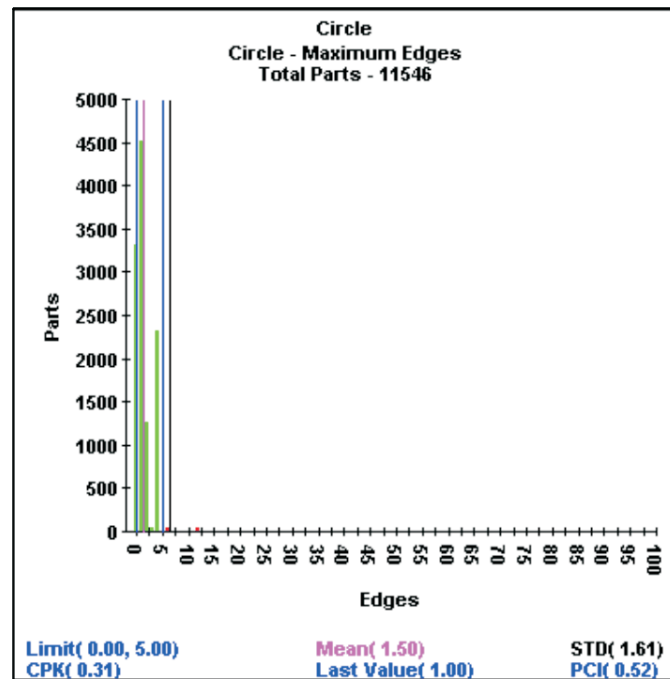
Edge graphs

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.



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.

Edge Blob Count

The number of edge blobs found in the inspection region.

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.

Error Details graph

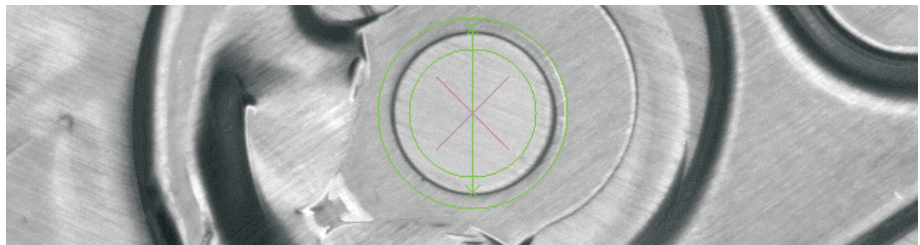
Ambient	(If Ambient inspection is Enabled) The number of parts that failed the Ambient inspection criteria.
Edge Count	(If Edge inspection is Enabled) The number of parts that failed the Edges Min/ Max limits.
Edge Blob Count	(If Edge Blob inspection is Enabled) The number of parts that failed the Blob 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.

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.

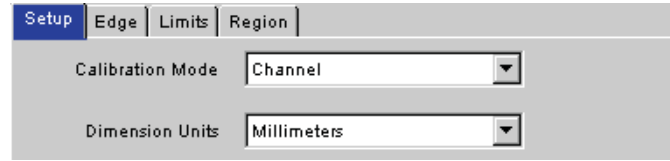
Place the Circle Dimension region

Using the Region menu, place the inspection region to surround the desired area. The inner radius could be a value of one. The system will search for edges through edge detection techniques. Tell the system whether to search inwards (from the outer circle towards the inner circle) or outwards. This is defined through the Edge menu.



Circle Dimension inspection parameters

Setup 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 Circle Dimension 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 the Pixel Calibrate menu item. (See page 7-21 for a description of this feature.) 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

This allows you to 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.

☞ *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 Calibration

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.

Calibrated Size

This is used to calibrate the pixel scale of the current inspection. A setting of <-1> disables this parameter.

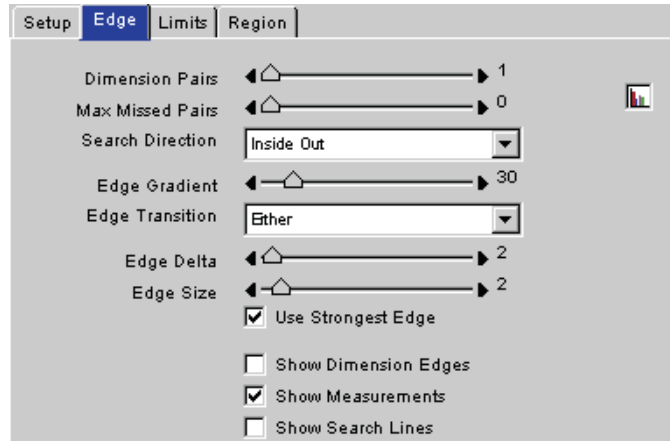
Use a part, such as one on which you are currently programming a job, and measure it (with calipers or a ruler) exactly where you would have the Circle Dimension inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Enter your measured value.

Calibrate Scale

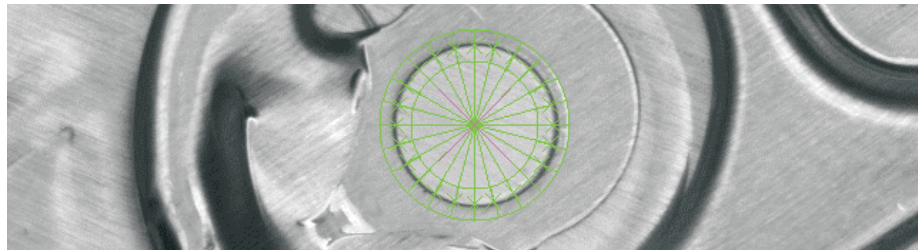
Press this after you have entered the correct Calibrated Size. The system will use the pixel-to-unit of measurement ratio as specified in the Horizontal and Vertical Calibration parameters.

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.

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.



☞ *Enable Show Search Lines to see Dimension Pairs*

Max Missed Pairs The maximum number of Dimension Pairs allowed to fail the Circle Dimension measurement before the whole inspection fails.

Search Direction Inside Out searches from the inner circle towards the outer circle. In the example above, the inspection searches Outward for the outer edge of the rivet. Outside In searches from the outer circle towards the inner circle.

Edge Gradient This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

☞ *See illustrations of Edge Gradient and Edge Size beginning on page 10-29.*

Edge Transition The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image. In the example above, we are searching from the inner radius to the dark edges on the outside of the rivet, so we use Light to Dark.

Edge Delta Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

Edge Size This indicates how many pixels in a row to compare (e.g. 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 This indicates whether the system should locate the first edge found that meets the Gradient criteria or to look for 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	When this is Enabled, you will be able to view the found dimension edges on the screen.
Show Measurements	When Enabled, the Dimension Pairs are shown on the image.
Show Search Lines	When Enabled, the search lines between the inner and outer circles are displayed on the image.

Limits menu

This menu determines the tolerance of the dimension measurements.

☞ Click the graphs buttons to see the offline graph for each measurement.

Dimension Min	The smallest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup. If a measured dimension is smaller than this value, the inspection fails.
Dimension Max	This is the largest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup. If a measured dimension is larger than this value, the inspection fails.
Average Min	This is the smallest acceptable value for the average dimension (diameter) measured across the circle. If the average dimension is smaller, the inspection fails.
Average Max	This is the largest acceptable value for the average dimension (diameter) measured across the circle. If the average dimension is larger, the inspection fails.
Range Max	This is the largest acceptable difference between the Minimum distance measured, and the Maximum distance measured across the circle. If the difference is larger than this number, the inspection fails.

☞ This parameter checks for ovality.

Graphs - Circle Dimension inspection

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

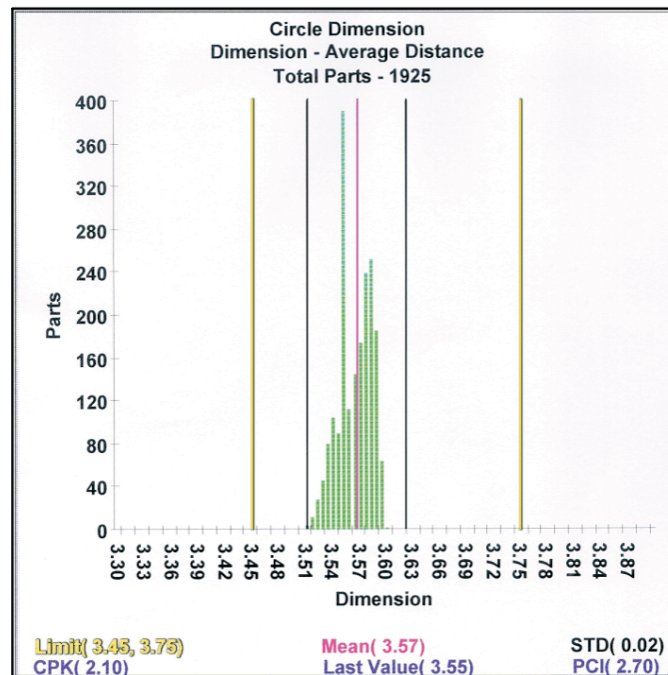
- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

☞ See page 3-12 for more information about graphs

Minimum Distance	This plots the smallest distance measured across the circle for each part.

Maximum Distance
Average Distance

This plots the largest distance measured across the circle for each part.
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.

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.

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 inspection

This section is a guide to setting up the inspection referred to as Radial Line Integration (RLI). First, some key terms and concepts are explained. Then, the parameters available through the Radial Line Integration menus are defined.

How RLI works

Concepts and Terminology

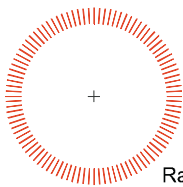
Radial Line Integration (referred to as RLI from this point on) is a suite of four inspections:

1. Orient
2. Lug
3. Wrinkle
4. Radial Edge

These inspections provide the following features:

- 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



Radial sample lines

RLI inspection is made up of many radial sample lines. (See illustration to the left) 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.

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

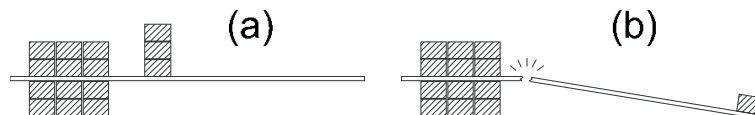
In RLI, the word hit refers to occurrences of sample line differences which are greater than a specified value (referred to as the Threshold). Hence, every hit has a specific data value. The size of the hit value as well as the count is important.

Moment

Moment Max. Limit is the most common parameter to adjust when tuning for defect detection.

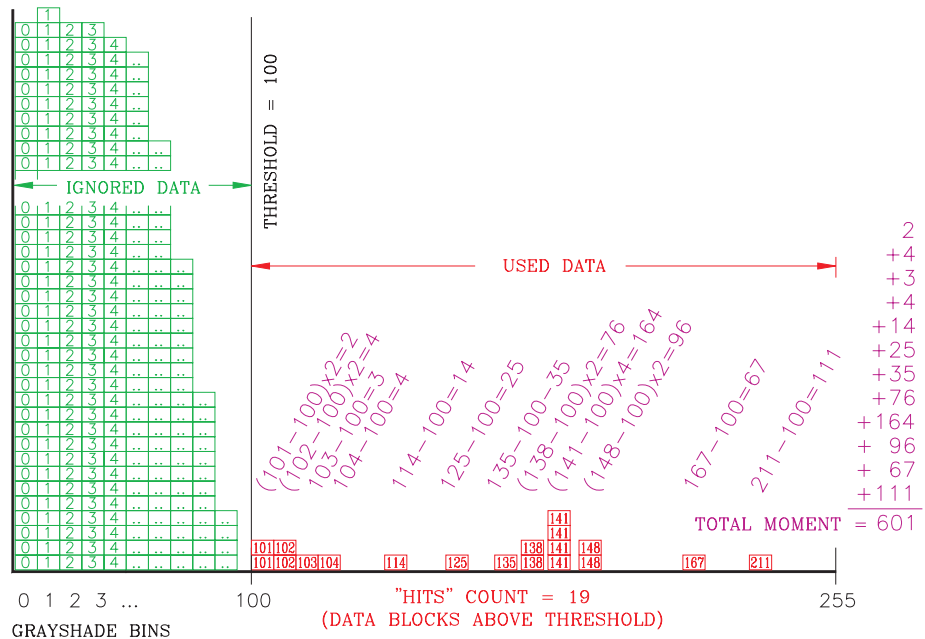
A value which RLI calculates based on the size of each hit and the total count. Hits are said to be weighted because all hits are not of equal value. Higher hit values are an indication of more contrast and hence a more severe defect. Moment Max Limit is the most common parameter to adjust when tuning for defect detection.

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.

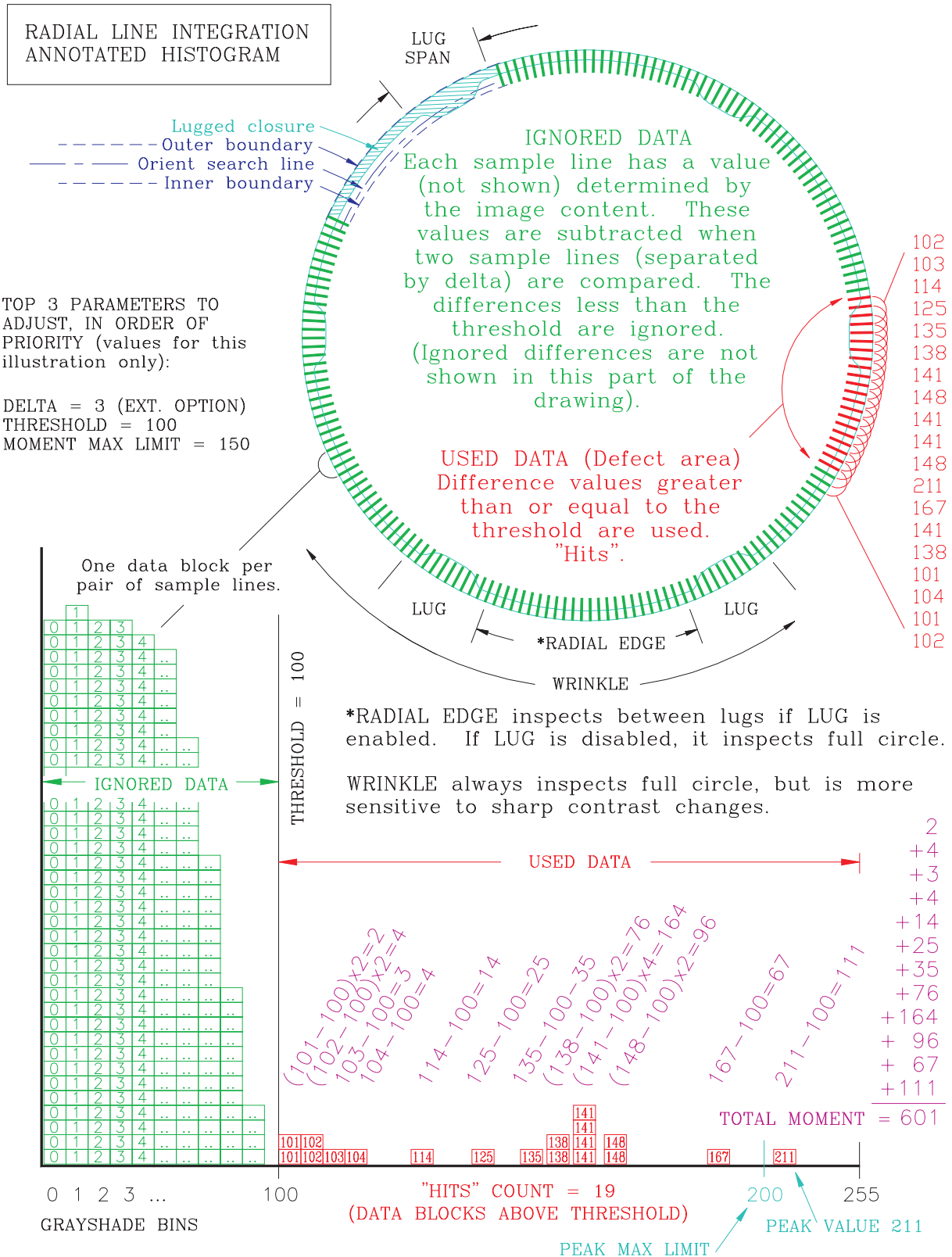
The horizontal bottom line is analogous to the board shown above. The higher-value data contribute more to the total moment than the lower-value data – like the brick towards the board's end having more leverage. The angled mathematical statements show how the values contribute to the total moment.



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.



Defining a Radial Line Integration Inspection

Place the inspection region using the Region menu. Then go through the menus to change any necessary parameters, or perhaps disable some unnecessary RLI inspections.

Programming Sequence

The sequence of parameter adjustment will vary with the user and 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.

Region menu

The Region menu is the same as used in most other inspections, with the exception of Display Method.

Display Method

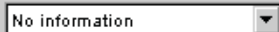
For viewing convenience only – functionality is not affected. Choose from Line or Point. Selecting Point allows more of the underlying image to be visible behind the graphic overlays when defects are found.

 *On lugged closures, place the region's outer radius on the outside edge of the part, or if decoration comes up to the edge, place the outer radius one or two pixels in from the outer edge. Place the inner radius so it is almost but not quite touching the lug tips.*

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.

RLI Parameters menu

Radial Edge Parameters	Radial Tool	Region
RLI parameters		Inspections
Radial Grid Spacing		1.0
Concentric Grid Spacing		1.0
Inspection Information		

This menu contains three settings which apply to both Wrinkle and Radial Edge inspections.

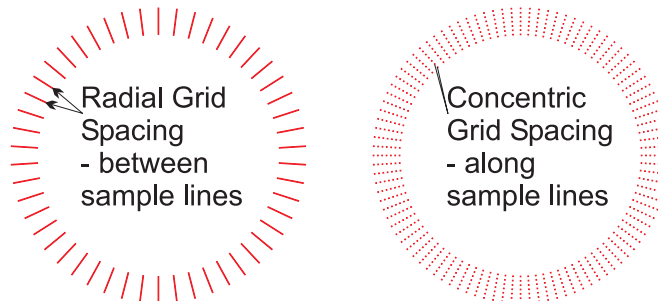
The RLI menu initially appears with default values automatically entered. In most cases, the default values will suffice and can be left unchanged. Usually, the only reason to make changes would be to decrease inspection time and thus increase inspection speed.

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

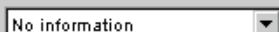
Spacing of pixels *along* sample lines. The default value is one. Increasing for speed can reduce sensitivity to smaller defects.



Inspection information

The Radial Line Integration histogram displayed in the Offline Graphs tab, provides pixel grayscale information for the entire inspection area. Choose No Information to disable the graph.

Radial Edge menu

☒ Perform Radial Edge Test	
Threshold	 25
Filter	 0
Delta	 3
Moment	 0.25 
Peak	 0.255 
Count	 0.25 
Inspection Information	

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

If Enabled, the inspection will look for edges along the radial spokes.

Threshold

Specifies the smallest gray level value that will be considered a hit (see page 10-70 'hit'). All gray level values equal to or greater than Threshold are hits. All gray levels below the Threshold are ignored. All gray levels at and above Threshold are used in Moment, Count, and Peak value calculations. The setting range is 0 to 255.

Filter

This is a low-pass ("smoothing") filter used to reduce 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. The setting range is 0 to 255. Increasing the value decreases sensitivity to high frequency variance.

☛ See the After Filter graph under Inspection Information to see the effects of this parameter.

Delta

Specifies the separation between compared radial sample lines. The range of settings is 1 to 20. Increasing this value increases sensitivity to gradual (low-frequency) gray level variance.

Moment Min/ Max

Specifies the minimum and maximum allowable moment. The Min value is usually left at zero (default). The Max value is the primary failure criterion and thus the most likely parameter to adjust when tuning the inspection. Setting range is 0 to 10,000. Exceeding this value causes inspection to fail. (See page 10-70 'moment').

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. Setting range is 0 to 256.

Count Min/ Max

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. Setting range is 0 to 10,000.

Inspection information

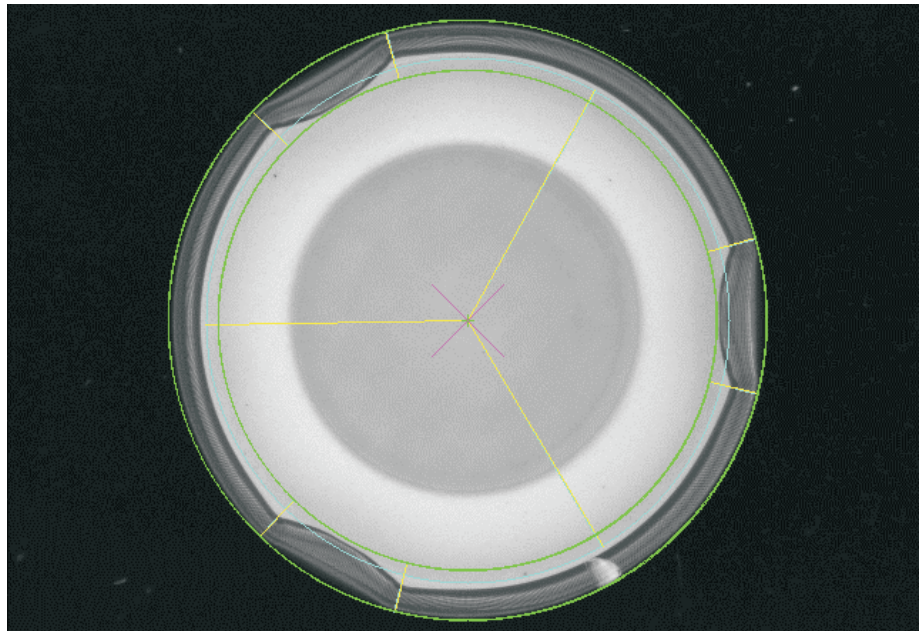
Choose a graph to see the gray level values of the inspection area as affected by certain parameters. Radial Line Integration provides raw data over the inspection area. After Filter and After Gradient show the gray levels after those parameters are applied. Histogram shows the average gray level value of each inspection radial.

Orient Menu

The screenshot shows the 'Orient Menu' interface. At the top, there is a checkbox labeled 'Perform Orient Test' which is checked. Below this are several input fields: 'Number of Lugs' with a value of 6, 'Lug Span' with a value of 15, and 'Alignment Offset' with a value of 0. There is also a dropdown menu for 'Object Type' set to 'Light'. A 'Set Radius' slider is positioned at the center, with a range from 0 to 100. Below the slider are two checkboxes: 'Orient Theta Graph' and 'Orient Amplitude Graph', both of which are checked. At the bottom, there is a dropdown menu for 'Inspection Information' set to 'No information'. On the right side of the menu, there are two small thumbnail images of graphs.

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	Allows you to enable or disable the Orient feature. Orient must be enabled for Lug inspection to work, but can be used without Lug inspection.
Number of Lugs	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).



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	(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 Graph	(Available when Orient menu is Enabled) 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.

Lug Menu

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.

 *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

Algorithm

Both Lug and Orient must be enabled to use Lug inspection.

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.

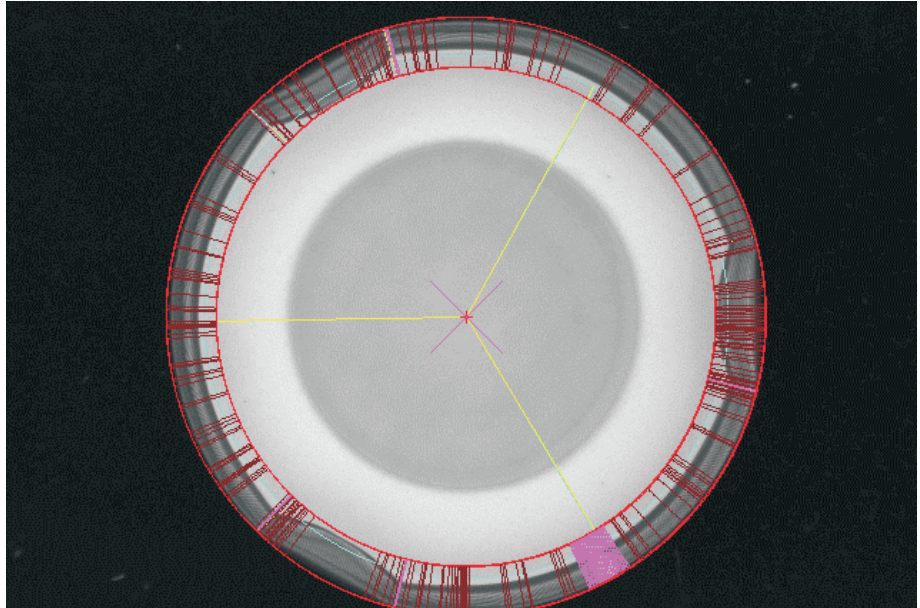
Lug Alignment Offset Limit	Allows angular offset of lug inspection area, relative to where Lug finds the lug midpoint. Designed for tapered or otherwise asymmetrical lugs. Specified in degrees.
Auto Filter Enable	(Available when Algorithm is Solid) Filtering is a method of ignoring certain data by cutting 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.
Inspection information	Display graphs to see the effects of parameters after they are applied.

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 page 10-70 'hit'). 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 20. Increasing this value increases sensitivity to gradual (low-frequency) gray level variance.
Moment Min/ Max Limit	Specifies the minimum and maximum allowable moment. The Min value is usually left at zero (default). Exceeding the Max value causes inspection to fail. This is the

primary failure criterion and thus the most likely parameter to adjust when tuning the inspection. (See page 10-70 'moment').



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.
Inspection information	Display graphs to see the effects of different parameters after they are applied.

Graphs - Radial Line Integration

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

➡ See page 3-12 for more information about 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.

Lug Error	(Available when Lug inspection is Enabled) This plots the errors found in lug size for each part.
Lug Mismatch Orient	(Available when Lug inspection is Enabled) This plots changes in position of lugs (lugs that are found in the wrong place on a part), or damaged lugs.
Lug Mismatch Peak	(Available when Lug inspection is Enabled) 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.
Lug Low Pass Data	(Available when Lug inspection is enabled) This plots the lug information after the low frequency cutoff filter is applied.
Lug High Pass Data	(Available when Lug inspection is enabled) This plots the lug information after the high frequency cutoff filter is applied.
Lug High Pass 2 Data	(Available when Lug inspection is enabled) This plots the lug information after the second high frequency cutoff filter is applied.
Wrinkle Moment	(Available when Wrinkle inspection is Enabled) 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	(Available when Wrinkle 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.
Wrinkle Peak	(Available when Wrinkle inspection is Enabled) 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.
Radial Derivative	This plots the radial information after Threshold, Filter, and Delta parameters are applied.
Radial Data	This plots the gray level information for all the radials in the inspection region.
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.

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.

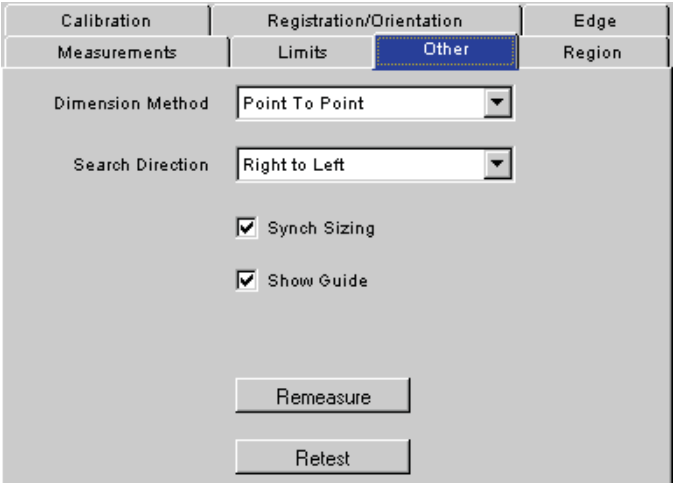
There are a number of options available for search regions. Each region can be simply a line, or an area. The system searches for edges in the line(s) or within the area(s). You can choose how the system computes the dimension (see Dimension Method page 10-81).

The system can report and reject parts based on up to 12 dimension measurements, depending on inspection setup.

Defining a Dimension inspection

Choose the Dimension Method through the Other menu, place the inspection regions, then modify the Dimension inspection parameters. The menus of this inspection are described in this order within this section.

Other menu



Dimension Method

First pick a Dimension method from this menu before placing the search regions.

This determines the type of dimension calculation the system will make. 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.

Search Direction

Choose a direction in which the search regions will search for edge transitions.

Synch Sizing

Change the size of each region by the same amount, when adjusting through the Region menu.

Show Guide

This shows where the dimension calculations are made. Displayed in magenta for Point to Point dimension type only.

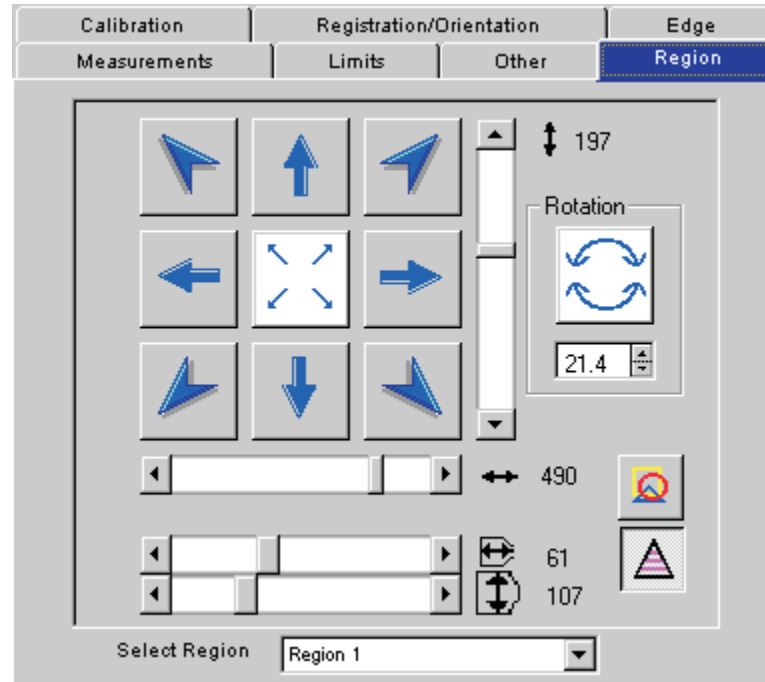
Re-measure

Ensure that the region control's values match the current image.

Re-test

Run the inspection using the current region setup.

Region menu



Next, 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.

The two slider bars near the bottom of the menu adjust the height and width of the search region(s).

Select Region

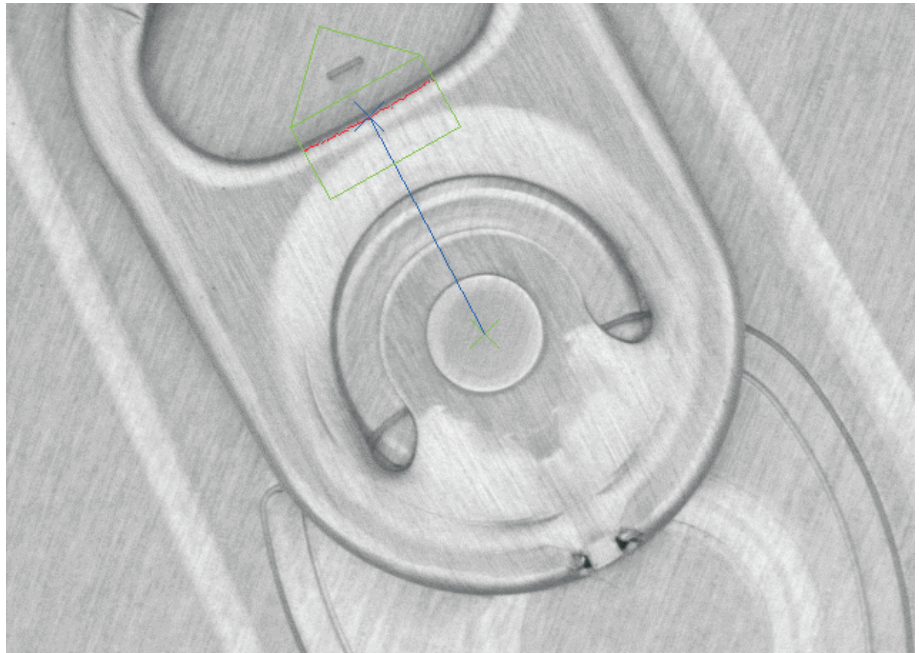
(Only if Point to Point method chosen in Other menu) Select a region from the drop-down menu to adjust one or both regions.

- If you enabled Synch Sizing in the Other menu, both regions will be sized by the same amount.
- Region 1, Region 2, and Regions 1 and 2 are self-explanatory choices.
- Region 1 + Horizontal Lock – allows you to move Region 1 alone, but the horizontal distance between the two regions remains constant.
- Region 1 + Vertical Lock – allows you to move Region 1 alone, but the vertical distance between the two regions remains constant.

Rotation

Rotate the selected search region. This is only available if an orientation is in place before you add the Dimension inspection. Use Orientation must also be checked in the Registration/ Orientation menu.

This assures proper rotation of the search regions regardless of the orientation of the part in the camera's field of view.



Dimension region rotated to match the orientation of the part

Calibration menu

Calibration	Registration/Orientation	Edge
Calibration Mode	Channel	
Dimension Units	Millimeters	

You will determine the type of dimension calculation 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 Dimension 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 the Pixel Calibrate menu item. (See page 7-21 for a description of this feature.) 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. Note: this option not available if Point-to-Point is the only measurement enabled in the Measurements menu.

Dimension Units

This allows you to 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.

☛ *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.*

Units Per Pixel

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.

Click Accept to save your changes.

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.

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, exactly in the location where you would have the dimension inspection make a measurement. Use the same unit of measurement as specified in Dimension Units. Measure the part the same way as the Measurement (such as Horizontal Minimum distance). 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.

Registration/ Orientation menu

Region	Parameter	Value	Range
Region 1	Horizontal Offset	-34.03	-34.0 to 34.0
	Vertical Offset	7.68	7.7 to -7.7
Region 2	Horizontal Offset	20.84	20.8 to -20.8
	Vertical Offset	8.36	8.4 to -8.4

Use Orientation

Allows you to place and rotate search regions with respect to the orientation. An orientation must already be in place before you add the Dimension inspection for this feature to be available.

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.

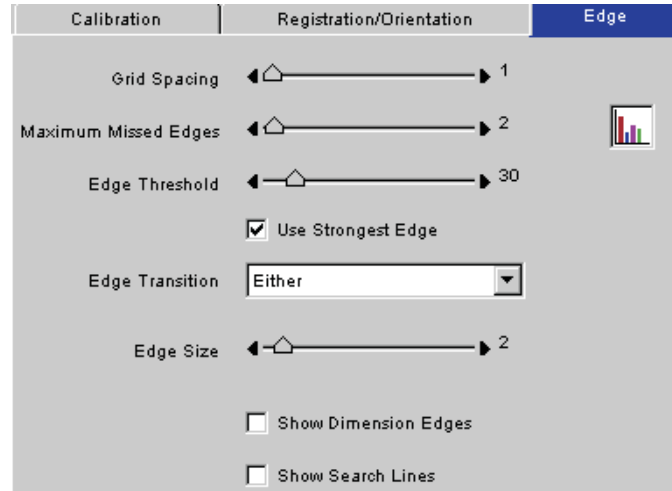
In this case, it is much easier to enter a numerical value rather than trying to place it graphically on the image where you think it should be.

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.

Modify the Dimension Inspection parameters

Modify the parameters to work best for your application.

Edge menu



This menu allows you to define the edge qualifications for the search regions.

➡ *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.

Maximum Missed Edges

(Only when the search area is a wide arrow, not just a line arrow) The maximum number of search vectors allowed to fail the edge detection before the inspection fails.

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, and thus is an adapting number for each image.

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: $150 \times .25 = 37.5$. 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.

Use Strongest Edge

Indicates whether to use the First edge that is above the threshold or the Strongest edge. The Strongest edge is the edge that the system finds that has the maximum contrast from the threshold.

Edge Transition

Indicates what type of edge for which to search: Light to Dark edges, Dark to Light edges, or Either. This parameter is important in determining which type of edges will be found in the image.

Edge Size	This indicates how many pixels in a row to compare (e.g. 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	If Enabled, you will be able to see the edge points found in the search area(s).
Show Search Lines	If Enabled, you will be able to see the search vectors that are searching for edges. If Disabled, the search vectors are not displayed.

Measurements menu

The screenshot shows the 'Measurements' menu with the following options:

- Measurement Directions:**
 - ☐ Horizontal
 - ☐ Vertical
 - ☒ Point To Point
- Special Mode Selection:**
 - ☐ Enable Special Mode
- Measurement Endpoints:**
 - ☒ Minimum
 - ☐ Maximum
 - ☐ Average
- Select Graph:** A dropdown menu showing 'XY distance minimum'.
- ☒ Show Measurements

The dimension inspection can generate between one and 12 measurements, depending on the type of dimension chosen and the enabled measurements.

The screenshot shows the 'Results' screen with the following data:

```

Edge Detection PASSED: Missed Edges 0 (2)
Dimension Units = Millimeters
Rej (H MIN 0.00 - 500.00): 287.65 mm
Rej (H MAX 0.00 - 500.00): 288.27 mm
Rej (H AVG 0.00 - 500.00): 287.91 mm
Rej (V MIN 0.00 - 500.00): 6.00 mm
Rej (V MAX 0.00 - 500.00): 1.00 mm
Rej (V AVG 0.00 - 500.00): 1.00 mm
Rej (D MIN 0.00 - 500.00): 287.71 mm
Rej (D MAX 0.00 - 500.00): 288.27 mm
Rej (D AVG 0.00 - 500.00): 287.91 mm
Rej (H SPC 0.00 - 500.00): 287.87 mm
Rej (V SPC 0.00 - 500.00): 10.00 mm
Rej (D SPC 0.00 - 500.00): 288.04 mm

```

Results screen with all possible dimension measurements enabled.

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.

Measurement Directions

Horizontal	This is the horizontal component of the dimension points. If Enabled, 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. If Disabled, the horizontal measurement is not reported, and parts are not rejected based on horizontal measurement.

Vertical This is the vertical component of the dimension points. If Enabled, 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. If Disabled, the vertical measurement is not reported, and parts are not rejected based on vertical measurement.

Point to Point This is the distance between the two dimension points. If Enabled, the system will report the point to point distance, and reject parts if the measurement is out of limits. The reject criteria for point to point distance is set through the Limits menu. If Disabled, this value is not reported, and parts are not rejected based on this measurement.

☛ *Point to Point is a commonly used distance measurement.*

Special Mode Selection

Enable Special Mode (Available only with Point to Point Dimension Method set in Other menu) 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.

This measurement is displayed in orange on the image.

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.

Measurement Endpoints

Minimum 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 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.

This measurement is displayed in magenta on the image.

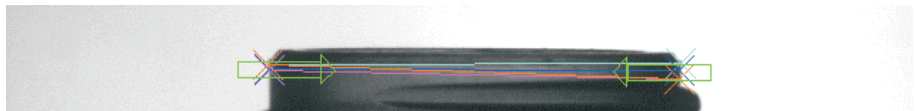
Maximum This parameter is only available when the search region(s) is a wide arrow, not just a line arrow. When this is Enabled, the system will report the maximum distance of the located edges between the two regions, and reject parts if the measurement is out of limits. Set the reject criteria in the Limits menu.

This measurement is displayed in cyan on the image.

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.

This measurement is displayed in blue on the image.

Show Measurements If Enabled, you will be able to see the points where the measurement calculations are being made. If Disabled, you will not be able to see the measurement points.



Limits menu

Measurements	Limits	Other	Region
Measurement	Horizontal minimum		
Reject Minimum	285		
Reject Maximum	290		
Warning Minimum	286		
Warning Maximum	289		

This menu allows you to set reject 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 below 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 in the Measurements menu is Enabled, the Special distance measurements are available.

Reject Minimum This is the smallest acceptable dimension. Enter the value in a number of Dimension Units you chose in the Calibration menu. If a measured dimension is smaller than this value, the part is rejected.

Reject Maximum This is the largest acceptable dimension. Enter the value in a number of Dimension Units you chose in the Calibration menu. If a measured dimension is larger than this value, the part is rejected.

Warning Minimum This allows you to set a warning flag that tells you 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 allows you to set a warning flag that tells you 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.

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.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

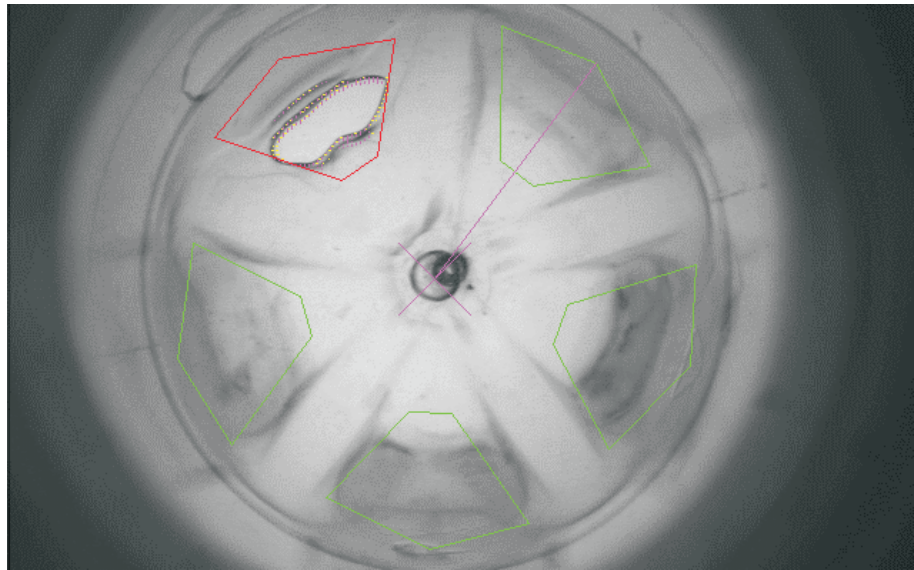
- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

➡ See page 3-12 for more information about graphs

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.
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.
<i>Error Details graph</i>	
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.

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) to detect many types of defects. Use the Inspections menu to add the desired types of inspections.

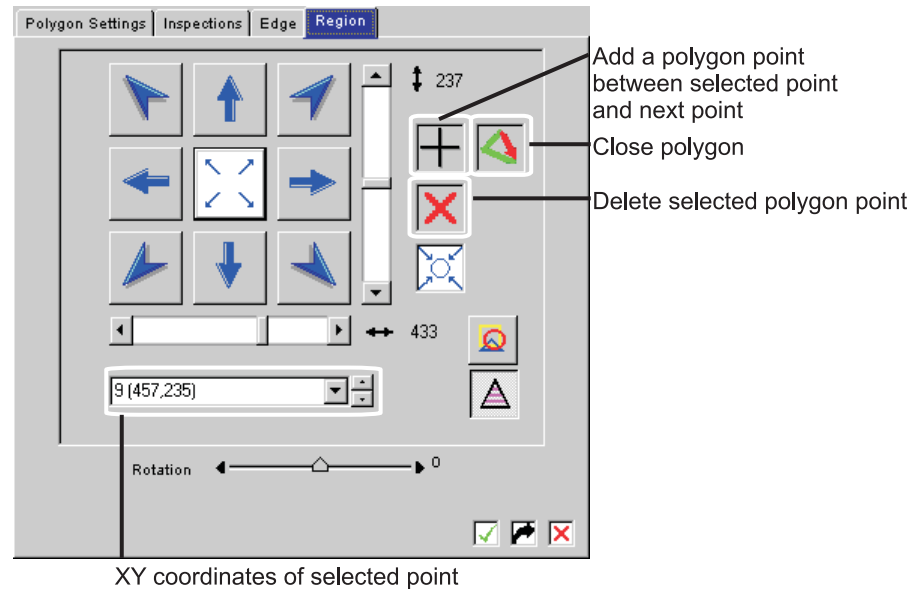


Draw a polygon

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.

Region menu



Polygon inspection's Region menu is slightly different than most inspections.

To create the first polygon:

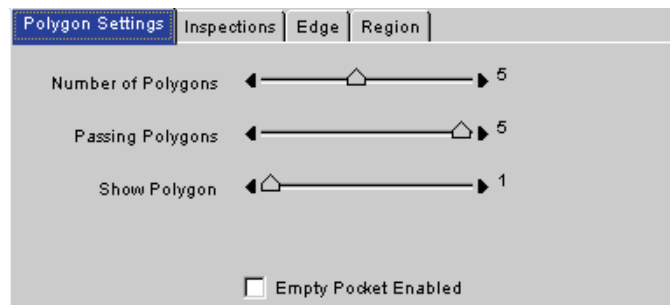
1. Move the cyan dot to the first desired point of your polygon with the arrow buttons or X-Y sliders. The first point's position is displayed in the box – see 'XY coordinates of selected point' in illustration above.
2. Add another polygon point by clicking the '+' button. Move that cyan dot to the 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.

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 (out of the number of polygons defined above) that must pass inspection for the whole inspection to pass.

Show Polygon

Display the inspection results for a specific polygon (out of the polygons defined above).

Empty Pocket Enabled

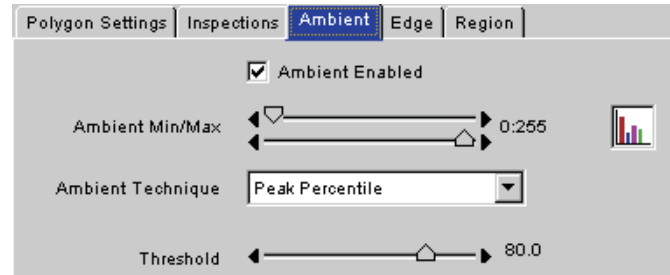
This is used for specific applications where you must determine whether a part is present in a pocket before proceeding with inspection.

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.

Adjust Polygon inspection parameters

After the polygons are drawn, adjust the inspection parameters. These are described next.

Ambient menu



The ambient is a gray level value that is representative of the gray levels of an area.

☛ *This menu allows you to configure how the system adapts to image intensity shifts. It can be used to reject grossly different part colors.*

Ambient Enabled This determines if the found ambient is used as a reject criteria or not. You may Enable or Disable whether to reject based on the gray shade found on each new image.

If you disable the Ambient option, the Ambient Min/ Max parameters are not used. However, the Ambient is still calculated for use in other parts of the inspection (edge, blob, zone), and you can choose an ambient search technique.

The Ambient that is determined through the settings in this menu can be used in the calculations of the Zone and Blob analyses.

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.

☛ *Click the graph box to view the Ambient Average graph. The yellow limits are set by Ambient Min/ Max.*

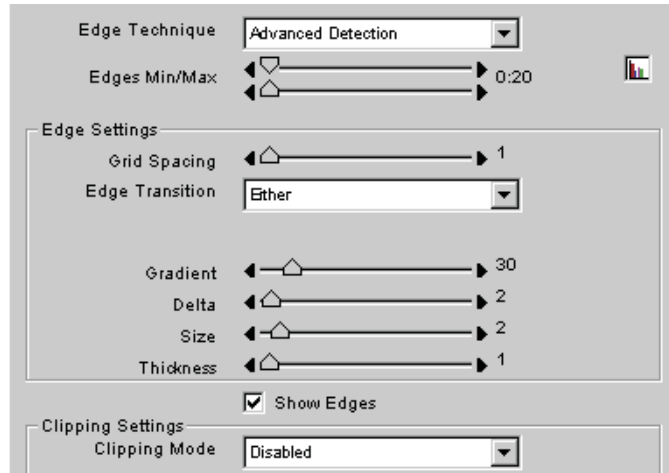
Ambient Technique This method determines the region's ambient. Choose from one of the techniques listed below:

1. **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.
2. **Peak Percentile** computes the ambient by locating the gray shade value that exceeds the threshold you define by Threshold.
 - **Threshold** is used only when the ambient search technique is Peak Percentile. This defines what percentage of the search area to use as a threshold.
 - If you use 80% as Threshold, the system counts the pixels in the first 80% of the histogram as shown in the above illustration. The first gray level above that 80% threshold is considered the ambient.

☛ *See page 10-4 for illustrations of Maximum Amplitude and Peak Percentile.*

3. **Ambient Density** computes the ambient by taking the average of all the pixel gray levels — total gray level divided by pixels.

Edge menu



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:

1. **Simple Detection** uses a gradient and delta to locate an edge.
2. **Advanced Detection** qualifies edges by adding extra parameters. These are discussed below.
3. **Adapting Detection** allows the inspection to adapt to the gray level changes of each image. See below.
4. **Object Fill** locates objects within the inspection region and fills them in. See below for extra parameters.

The following parameters are common to all edge detection techniques.

Edges Min/ Max

The minimum and maximum number of edges expected in the inspection region. If the number of edges is less than or greater than these numbers, the inspection fails.

Edge Settings

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.

Delta

Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.

Show Edges

If Enabled, the edge points are displayed on the screen. If Disabled, the edge points are not displayed.

Simple Edge Detection technique:

This technique simply uses a gradient and delta to find edges.

Gradient

This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

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.

Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
Size	This indicates how many pixels in a row to compare (e.g. 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.
Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

☛ See the illustrations for Gradient, Size, and Thickness beginning on page 10-29.

Clipping Mode Used to change gray shades to a specified value. Clipping de-sensitizes the inspection to noise by clipping off normal variations in the gray shades of the part. It allows flaws in the failure range to be detected more easily.

- **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.

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 Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Threshold	This is the edge sensitivity setting. The higher this value, the stronger the edge must be. This is a percentage of the gray level of the current search area.
Size	This indicates how many pixels in a row to compare (e.g. 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.

☛ See the illustrations for Gradient, Size, and Thickness beginning on page 10-29.

Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Clipping Mode	Refer to Clipping Mode description under Advanced Edge Detection technique.

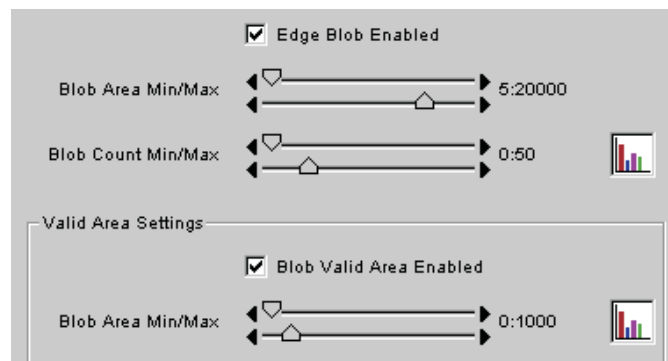
Object Fill edge detection technique:

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:

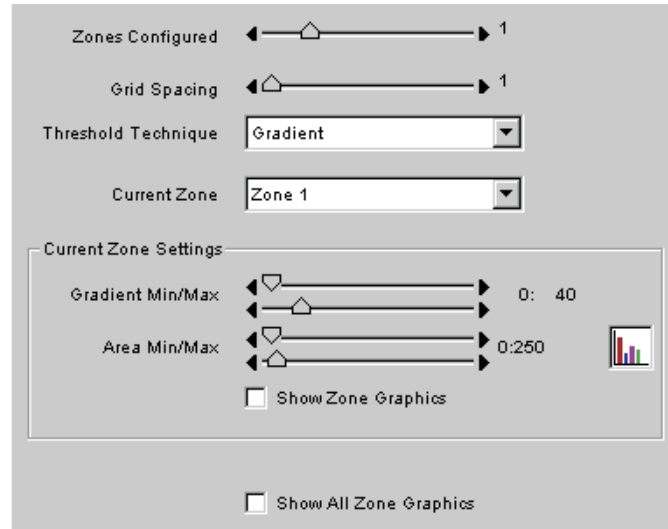
Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
☛ See the illustrations for Gradient, Size, and Thickness beginning on page 10-29.	
Size	This indicates how many pixels in a row to compare (e.g. 1 to 1, 2 to 2, etc.). The larger the 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.
Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Clipping Mode	Refer to Clipping Mode description under Advanced Edge Detection technique.

Edge Blob menu

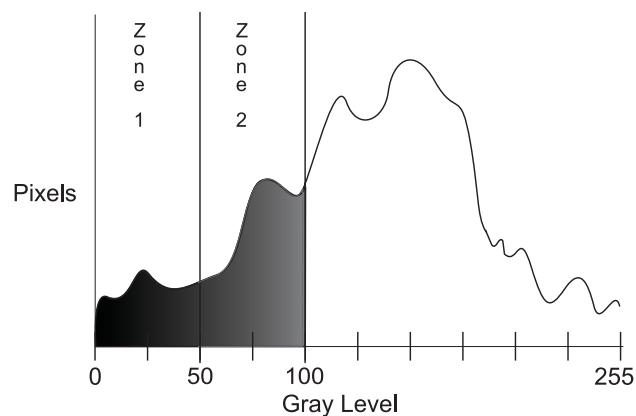


Edge Blob Enabled	If Enabled, the located edges (determined by the parameters in the edge menu) will be checked for blob connectivity. A blob is defined as a connected set of pixels. It determines whether the edges found in the inspection are connected or not. This will allow you to ignore small or large defects. This is useful in cases where you might have a grain, a pattern, or a feature you wish to ignore.
Blob Area Min/ Max	The smallest and largest connected set of pixels considered to be a blob.
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.
Valid 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.

Zone menu



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.

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. Described below.

Current Zone

Identifies which zone is currently being adjusted. The parameters are set in the Current Zone Settings section of the menu.

Current Zone Settings

Percent of Ambient technique:

This technique uses a percentage of the found Ambient to define the low and high thresholds.

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.

The Minimum Gray Level is computed by multiplying the Ambient by Threshold Min/100. For example, if the Ambient is 200, and the Threshold Min is 20, the Minimum Gray Level for this zone is 40. $[200 \times (20/100)] = 40$.

The Maximum Gray Level is computed by multiplying the Ambient by Threshold Max/100. For example, if the Ambient is 200, and the Threshold Max is 80, the Maximum Gray Level for this zone is 160. $[200 \times (80/100)] = 160$.

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.

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.

Again, the system allows for up to five different zones to be defined. The zone data and pixels in each zone are color-coded as follows:

- Zone 1 - Blue
- Zone 2 - Cyan
- Zone 3 - Magenta
- Zone 4 - Orange
- Zone 5 - Yellow

Show all Zone Area Graphics

If enabled, the system allows you to see the zone graphic information for all the zones without having to enable the graphics for each zone. If disabled, the system allows you to enable the graphics for each zone independently.

Blob menu

The screenshot shows a software interface for configuring blob inspection parameters. It is divided into three main sections:

- Blob Mass Criteria:** Includes a checkbox for "Blob Mass Enabled" (checked), a "Blob Mass Min/Max" slider set to 0:10000, and a small histogram icon.
- Blob Threshold Criteria:** Includes a "Threshold Technique" dropdown menu set to "Gradient", a "Gradient Min/Max" slider set to 0: 45, and a small histogram icon.
- Blob Count Criteria:** Includes a checkbox for "Blob Count Enabled" (checked), a "Blob Count Min/Max" slider set to 0:50, a "Blob Area Min/Max" slider set to 5:20000, and a small histogram icon.

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.

Blob Mass Enabled **Blob Mass Min/ Max**

This determines whether the total blob mass is used as a reject criteria or not.

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. Described below.

Percent of Ambient technique:

This technique uses a percentage of the found Ambient to define the low and high thresholds.

☛ *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 a blob pixel candidates. The system computes the minimum gray level as follows:

$$\text{Minimum Gray Level} = \text{Ambient} * (\text{Threshold Min} / 100)$$

When the system inspects a part, it computes the Minimum Gray Level by multiplying that part's Ambient by the percentage you choose. For example, if the ambient value for a part is 200, and you choose a Threshold Min percentage of 20, the Minimum Gray Level is 40. $[200 \times (20/100)] = 40$.

The system computes the maximum gray level as follows:

$$\text{Maximum Gray Level} = \text{Ambient} * (\text{Threshold Max} / 100)$$

When the system inspects a part, it computes the Maximum Gray Level by multiplying that part's Ambient by the Threshold Max percentage you choose. For example, if the part's Ambient is 200, and you choose a Threshold Max Percentage of 80, the Maximum Gray Level is 160. $[200 \times (80/100)] = 160$.

☛ *In the examples stated above, if the Minimum Gray Level is 40, and the Maximum Gray Level is 160, any 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.

Blob Count Criteria

The following parameters are common to both Threshold Techniques:

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.

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.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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

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.

Zone graphs

The following graphs are available if Zone inspection is enabled.

Zone <i>n</i> Area Total	The total pixel area found in the <i>n</i> th 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 <i>n</i> Area Maximum	The maximum pixel area found in the <i>n</i> th 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	The following graph is available if Blob Tolerance is enabled. The distance from the center of mass that the largest blob is from the registration reference point.

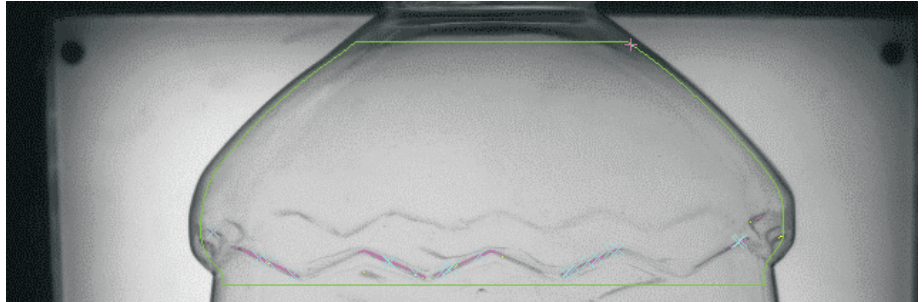
Error Details graph

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.

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. See page 10-7 to set up a Shape Adapt registration.

You can use the Shape Adapt inspection to detect squeezed, bent, and malformed parts. It also performs Ambient, Blob, Edge, Edge Blob, and Zone 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. These parameters are discussed on the next several pages.

Region menu

A screenshot of the 'Region' menu in a software interface. The menu has several tabs: 'Region', 'Inspections', 'Ambient', 'Edge', 'Edge Blob', 'Zone', and 'Blob'. The 'Region' tab is selected. Under 'Shape Placement', there is a checkbox for 'Region Correction Enabled', a 'Placement Mode' dropdown set to 'Single', a 'Placement Offset' input field set to '10', and an 'Offset Direction' dropdown set to 'Inside'. Under 'Shape Learn', there is a 'Learn Mode' dropdown set to 'Learn at setup', a 'Learn' button, and a 'Learn Count' slider set to '5'. Under 'Shape Checking', there are checkboxes for 'Area Deviation Enabled' and 'Vertices Deviation Enabled', both of which are checked. Below these are sliders for 'Area Deviation' (set to '0') and 'Vertices Deviation' (set to '1').

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.

☛ You must run *Learn* (see below) 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'.

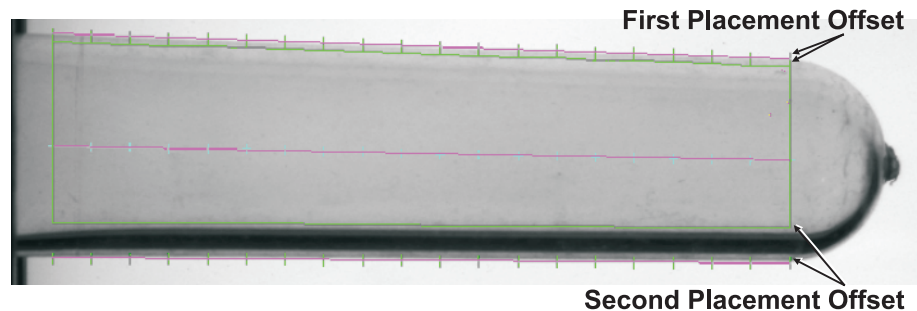
☛ *If you copy a job using Shape Adapt for a different part, you must first Disable Region Correction, then run Learn, then Enable Region Correction again. The system must first learn the basic shape of the part before it applies Region Correction.*

Placement Mode An Offset is a number of pixels away from the found edge of the part where you would like 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.



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.

Shape Learn

Learn Mode This feature allows you to set up the system to learn the shape of a number of parts, and have the system draw the search region based on the shape of those parts.

Learn at Setup allows you to program the number of parts from which to learn the shape. For example, if you program the system to Learn 10 parts at setup, the system will examine 10 parts. From these parts, it will take any slight variations of shape into account, and build the search region based on all these variations.

Adapt On-Line creates a running average of the container shapes while on-line. The system conforms the search region to the container based on any changes it sees over time.

Learn Click this button to begin snapping images and learn the shape of the part.

Learn Count This is the quantity of images to use to build the search region shape. This parameter is only used when Learn Mode is set to Learn at Setup.

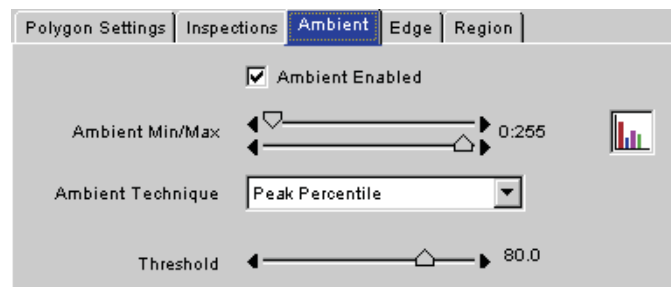
When you use the Learn mode, the system prompts you with suggested values to use to create the search region.

The Learned search region area shows how many pixels were counted in the region.

Area Deviation Enabled	This determines whether the search region information is used as a reject criteria or not. This qualifies 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. You can Enable or Disable this feature.
Area Deviation	This is the maximum number of pixels that the search region area can deviate from the learned area (or adapting area average). This parameter is only applied if Area Deviation is Enabled.
Vertices Deviation Enabled	This determines whether the search region's vertex points may be used as a reject criteria or not. It looks at opposing search region vertex 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. You can Enable or Disable this feature.
Vertices Shape Deviation	This is the maximum number of pixel deviation allowed between two opposite vertex points in the search region. This parameter is only applied if Vertices Deviation is Enabled.

Adjust Shape Adapt inspection parameters

Ambient menu



The ambient is a gray level value that is representative of the gray levels of an area.

 This menu allows you to configure how the system adapts to image intensity shifts. It can be used to reject grossly different part colors.

Ambient Enabled	This determines if the found ambient is used as a reject criteria or not. You may Enable or Disable whether to reject based on the gray shade found on each new image. If you disable the Ambient option, the Ambient Min/ Max parameters are not used. However, the Ambient is still calculated for use in other parts of the inspection (edge, blob, zone), and you can choose an ambient search technique. The Ambient that is determined through the settings in this menu can be used in the calculations of the Zone and Blob analyses.
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.

 Click the graph box to view the Ambient Average graph. The yellow limits are set by Ambient Min/ Max.

Ambient Technique

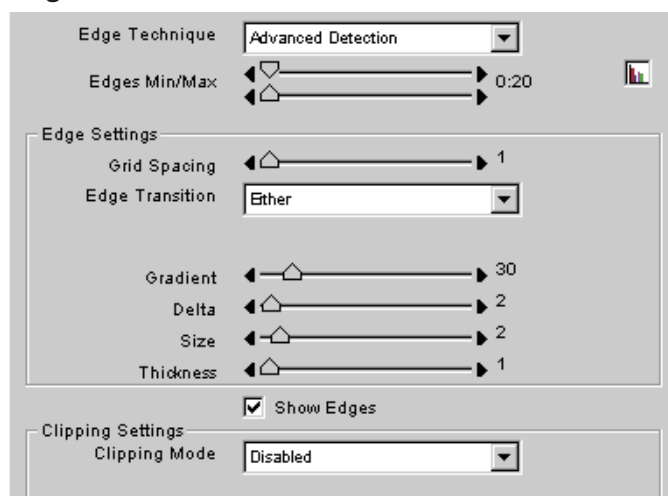
This method determines the region's ambient. Choose from one of the techniques listed below:

1. **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.
2. **Peak Percentile** computes the ambient by locating the gray shade value that exceeds the threshold you define by Threshold.
 - **Threshold** is used only when the ambient search technique is Peak Percentile. This defines what percentage of the search area to use as a threshold.
 - If you use 80% as Threshold, the system counts the pixels in the first 80% of the histogram as shown in the above illustration. The first gray level above that 80% threshold is considered the ambient.

➡ See page 10-4 for illustrations of Maximum Amplitude and Peak Percentile.

3. **Ambient Density** computes the ambient by taking the average of all the pixel gray levels — total gray level divided by pixels.

Edge menu



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:

1. **Simple Detection** uses a gradient and delta to locate an edge.
2. **Advanced Detection** qualifies edges by adding extra parameters. These are discussed below.
3. **Adapting Detection** allows the inspection to adapt to the gray level changes of each image. See below.
4. **Object Fill** locates objects within the inspection region and fills them in. See below for extra parameters.

The following parameters are common to all edge detection techniques.

Edges Min/ Max

The minimum and maximum number of edges expected in the inspection region. If the number of edges is less than or greater than these numbers, the inspection fails.

Edge Settings

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.
Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Show Edges	If Enabled, the edge points are displayed on the screen. If Disabled, the edge points are not displayed.

Simple Edge Detection technique:

This technique simply uses a gradient and delta to find edges.

Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

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.

Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
Size	This indicates how many pixels in a row to compare (e.g. 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.
Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

➡ See the illustrations for Gradient, Size, and Thickness beginning on page 10-29.

Clipping Mode	Used to change gray shades to a specified value. Clipping de-sensitizes the inspection to noise by clipping off normal variations in the gray shades of the part. It allows flaws in the failure range to be detected more easily. • 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.

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 Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Threshold	This is the edge sensitivity setting. The higher this value, the stronger the edge must be. This is a percentage of the gray level of the current search area.
Size	This indicates how many pixels in a row to compare (e.g. 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.
Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Clipping Mode	Refer to Clipping Mode description under Advanced Edge Detection technique.

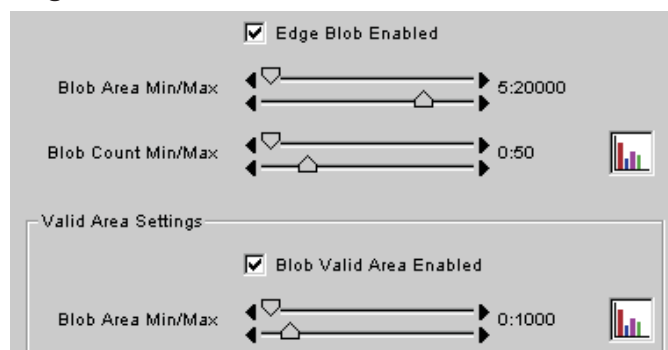
Object Fill edge detection technique:

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:

Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
	 See illustrations of Gradient, Size and Thickness beginning on page 10-29.
Size	This indicates how many pixels in a row to compare (e.g. 1 to 1, 2 to 2, etc.). The larger the 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.
Thickness	Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.
Clipping Mode	Refer to Clipping Mode description under Advanced Edge Detection technique.

Edge Blob menu



Edge Blob Enabled	If Enabled, the located edges (determined by the parameters in the edge menu) 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

Blob Area Min/ Max
Blob Count Min/ Max

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.

The smallest and largest connected set of pixels considered to be a blob.

The minimum and maximum number of blobs expected in the search region. Too few or too many blobs will cause the inspection to fail.

Valid 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

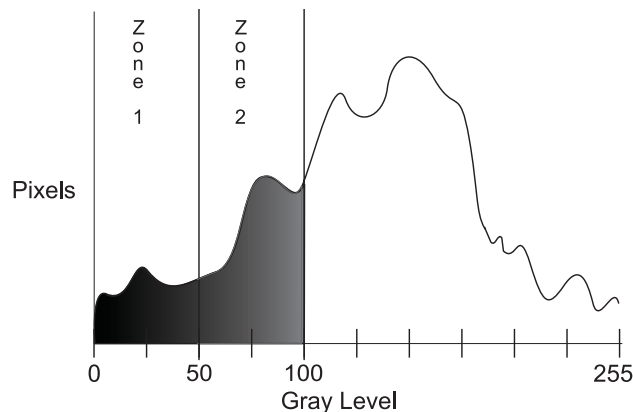
The minimum and maximum blob areas that qualify a valid blob.

Zone menu

The screenshot shows a software interface for configuring inspection zones. It includes sliders for 'Zones Configured' and 'Grid Spacing', both set to 1. There are dropdown menus for 'Threshold Technique' (set to 'Gradient') and 'Current Zone' (set to 'Zone 1'). A section titled 'Current Zone Settings' contains sliders for 'Gradient Min/Max' (set to 0:40) and 'Area Min/Max' (set to 0:250). There are checkboxes for 'Show Zone Graphics' and 'Show All Zone Graphics'.

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.

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. Described below.
Current Zone	Identifies which zone is currently being adjusted. The parameters are set in the Current Zone Settings section of the menu. <i>Current Zone Settings</i> <i>Percent of Ambient technique:</i> This technique uses a percentage of the found Ambient to define the low and high thresholds.
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. The Minimum Gray Level is computed by multiplying the Ambient by Threshold Min/100. For example, if the Ambient is 200, and the Threshold Min is 20, the Minimum Gray Level for this zone is 40. $[200 \times (20/100)] = 40$. The Maximum Gray Level is computed by multiplying the Ambient by Threshold Max/100. For example, if the Ambient is 200, and the Threshold Max is 80, the Maximum Gray Level for this zone is 160. $[200 \times (80/100)] = 160$. <i>Gradient technique:</i> 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.
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. Again, the system allows for up to five different zones to be defined. The zone data and pixels in each zone are color-coded as follows: • Zone 1 - Blue • Zone 2 - Cyan • Zone 3 - Magenta • Zone 4 - Orange • Zone 5 - Yellow
Show all Zone Area Graphics	If enabled, the system allows you to see the zone graphic information for all the zones without having to enable the graphics for each zone. If disabled, the system allows you to enable the graphics for each zone independently.

Blob menu

The screenshot shows a software interface for blob inspection settings. It is divided into three main sections:

- Blob Mass Criteria:** Includes a checkbox for "Blob Mass Enabled" (checked), a "Blob Mass Min/Max" slider set to 0:10000, and a small histogram icon.
- Blob Threshold Criteria:** Includes a "Threshold Technique" dropdown menu set to "Gradient", a "Gradient Min/Max" slider set to 0: 45, and a small histogram icon.
- Blob Count Criteria:** Includes a checkbox for "Blob Count Enabled" (checked), a "Blob Count Min/Max" slider set to 0:50, a "Blob Area Min/Max" slider set to 5:20000, and a small histogram icon.

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.

Blob Mass Enabled **Blob Mass Min/ Max**

This determines whether the total blob mass is used as a reject criteria or not.

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. Described below.

Percent of Ambient technique:

This technique uses a percentage of the found Ambient to define the low and high thresholds.

☛ *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 a blob pixel candidates. The system computes the minimum gray level as follows:

$$\text{Minimum Gray Level} = \text{Ambient} * (\text{Threshold Min} / 100)$$

When the system inspects a part, it computes the Minimum Gray Level by multiplying that part's Ambient by the percentage you choose. For example, if the ambient value for a part is 200, and you choose a Threshold Min percentage of 20, the Minimum Gray Level is 40. $[200 \times (20/100)] = 40$.

The system computes the maximum gray level as follows:

$$\text{Maximum Gray Level} = \text{Ambient} * (\text{Threshold Max} / 100)$$

When the system inspects a part, it computes the Maximum Gray Level by multiplying that part's Ambient by the Threshold Max percentage you choose. For example, if the part's Ambient is 200, and you choose a Threshold Max Percentage of 80, the Maximum Gray Level is 160. $[200 \times (80/100)] = 160$.

☛ *In the examples stated above, if the Minimum Gray Level is 40, and the Maximum Gray Level is 160, any 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.

Blob Count Criteria

The following parameters are common to both Threshold Techniques:

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.

Graphs - Shape Adapt

There are a number of Shape Adapt graphs available, depending on what parts of the inspection are enabled.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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 (Shape 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.

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.

Edge Blob graphs

The following graphs are available when Edge Blob inspection is enabled.

Edge Blobs	The number of blobs found in the search region for each image, determined in the Edge menu.
Edge Blobs Largest	The largest blob found in the search region for each image, determined in the Edge menu.
<i>Zone graphs</i>	
Zone <i>n</i> 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.
<i>Blob graphs</i>	
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.
<i>Error Details graph</i>	
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.
Vertex Limit	(If Shape Deviation is Enabled) The number of parts that failed the Maximum Shape Deviation criteria.
Vertex Count	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 is Enabled) The number of parts that failed the Maximum Area Deviation criteria.

Notch inspection

Notch inspection is an inspection designed specifically to locate 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.

Place the inspection regions

Before you place the notch inspection arcs, place a registration to determine the center point of the seal surface. Use a tracker or radial edge registration or something similar to locate the inside edges of the seal surface.

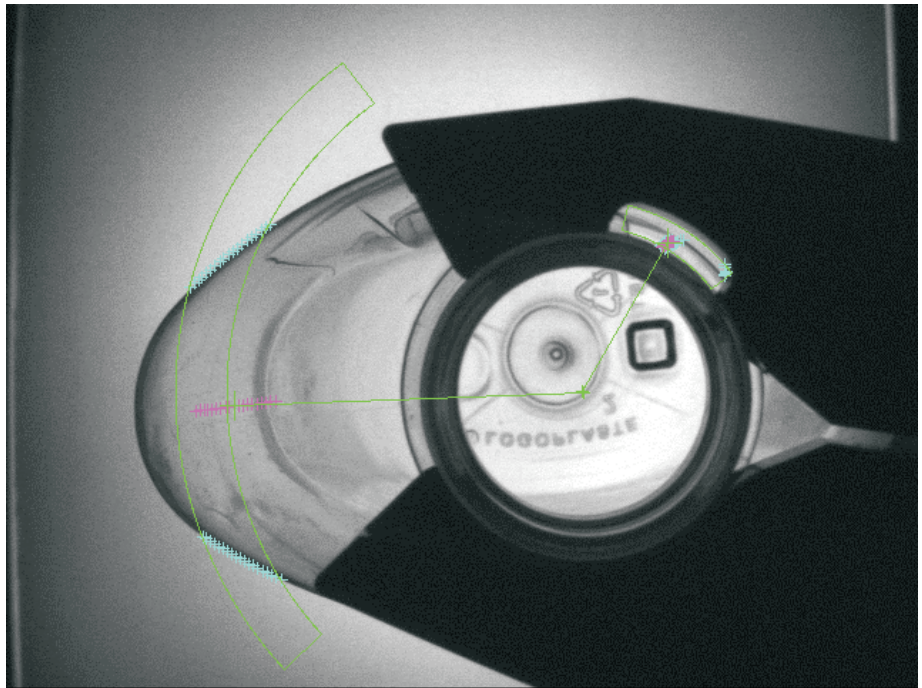
First, set up the notch search arcs using the Region menu. The first arc should intersect the oblong end of the part. This gives the system the part orientation. The second arc should be placed within the window that has been cut out of the gripper fingers. The second arc give the system the notch position.

Region menu

The screenshot shows a software interface with a tabbed menu at the top: 'Region' (selected), 'Part', 'Notch', and 'Reject'. Below the tabs, there are two main sections: 'Part' and 'Notch'. Each section contains three horizontal sliders with numerical values on the right.

Section	Parameter	Value
Part	Part Radii	250:286
	Start Angle	227
	End Angle	324
Notch	Notch Radii	116:134
	Start Angle	14
	End Angle	52

Use the Part settings to place the first arc over the oblong end of the part. Use the Notch settings to place the second arc within the gripper finger window.



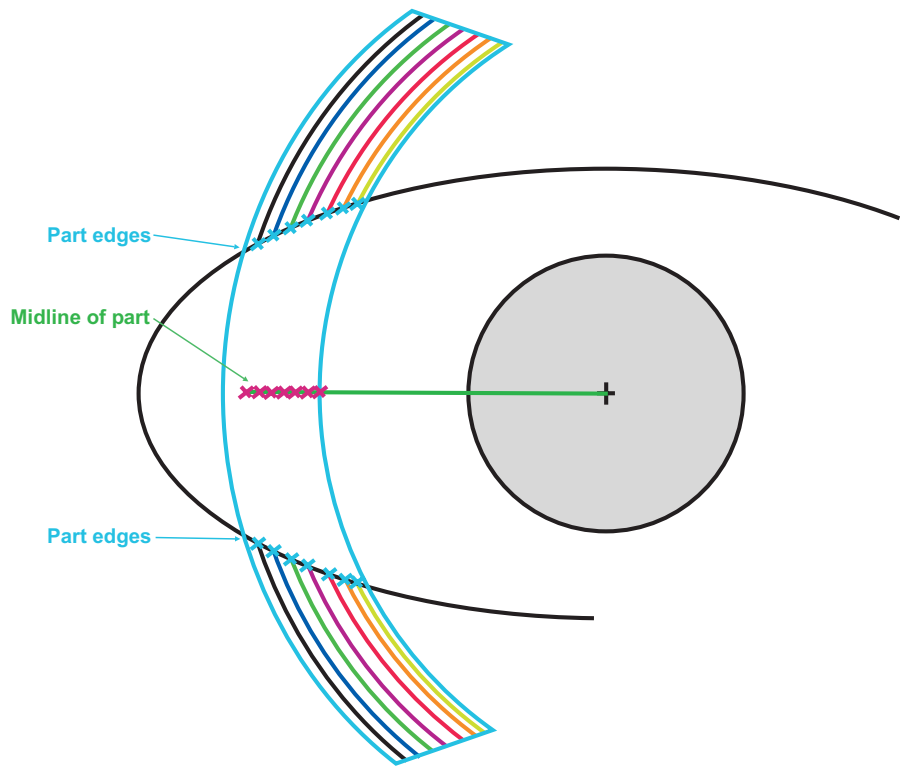
Modify the Notch inspection parameters

Part menu

 A screenshot of the 'Part menu' in a software interface. The menu has tabs for 'Region', 'Part', 'Notch', and 'Reject', with 'Part' currently selected. Under the 'Part' tab, there are five sliders: 'Part Search Spacing' (set to 2), 'Part Edge Gradient' (set to 55), 'Part Edge Thickness' (set to 1), and 'Part Edge Delta' (set to 2). The 'Part Edge Transition' is a dropdown menu set to 'Light to Dark'. Below these sliders is a 'Diagnostics' section with two checked checkboxes: 'Show Part Edges' and 'Show Part Position'. A small bar chart icon is visible in the bottom right corner of the 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 each part edge is 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.

☛ *Enable Show Part Edges and Show Part Position to view the parameters we will discuss next.*

Part Search Spacing	This allows you to speed up the part search, if necessary, by skipping vectors. The default value of one does not skip search vectors. A value of two searches every other vector, a value of three searches every third vector, and so on.
Part Edge Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels being compared, to be considered an edge.
Part Edge Transition	This tells the system whether to search for a transition from Dark to Light, Light to Dark, or either. In the image on page 10-113, the part edge is darker than the background, so we would use a Light to Dark transition to find the dark edges of the part.
Part Edge Thickness	Indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than Gradient, an edge is found.
Part Edge Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Show Part Edges	If Enabled, the found edge points are displayed in cyan on the screen. If Disabled, the edge points are not displayed.

Show Part Position

If Enabled, the system displays a line from the center of the part (must be determined by a registration) to the midline position of the part. The magenta crosses are the computed midpoints of the two sides.

Notch menu

Region | Part | **Notch** | Reject

Notch

☐ Notch Edge Filter

Notch Edge Gradient 55

Notch Edge Transition Light to Dark

Notch Edge Thickness 2

Notch Edge Delta 5

Diagnostics

☒ Show Notch Edges

☒ Show Notch Position

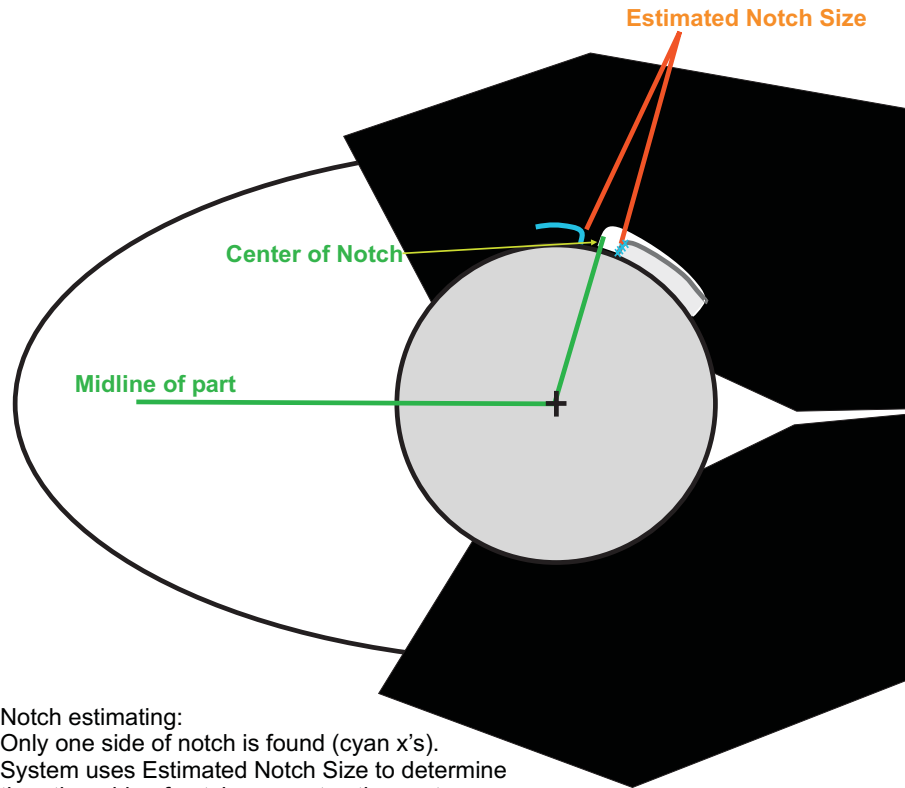
This menu specifies the notch edges, and whether to reject parts based on notch size and its position with respect to the part.

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.

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.



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.

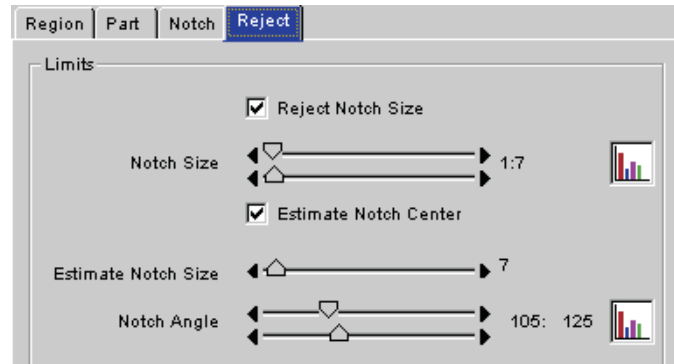
➡ *Enable Show Notch Edges and Show Notch Position to view the parameters we will discuss next.*

Notch Edge Filter	Indicates whether the system should apply a binary filter to the edge search. If Enabled, the value you enter for Notch Edge Filter indicates the binary threshold between dark and light pixels. This filter is helpful in finding some noisy edges.
Notch Edge Filter value	(Only available if Notch Edge Filter is Enabled) Indicates the binary threshold to distinguish between dark and light pixels. If you specify a value of 128, all pixels in the search area with a gray shade value below 128 will be considered dark pixels. All pixels in the search area found with a gray shade value of 128 or higher will be considered light pixels.
Notch Edge Gradient	This qualifies an edge of the notch. It is the minimum difference in gray shades, between two pixels being compared, to be considered an edge.
Notch Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining how the edges of the notch are found.
Notch Edge Thickness	Indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the Thickness range have a change greater than the Gradient, an edge is found.
Notch Edge Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Show Notch Edges	If Enabled, you can view where the notch edge points were found (in cyan). You can also see the midpoint of the notch (in magenta).

Show Notch Position

When Enabled, you can view a line from the center of the part (determined by registration) to the notch center.

Notch Reject menu



Reject Notch Size

This determines whether the part should be rejected based on the found size of the notch. The next four parameters define the notch size criteria.

Notch Size

This is the smallest and largest 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

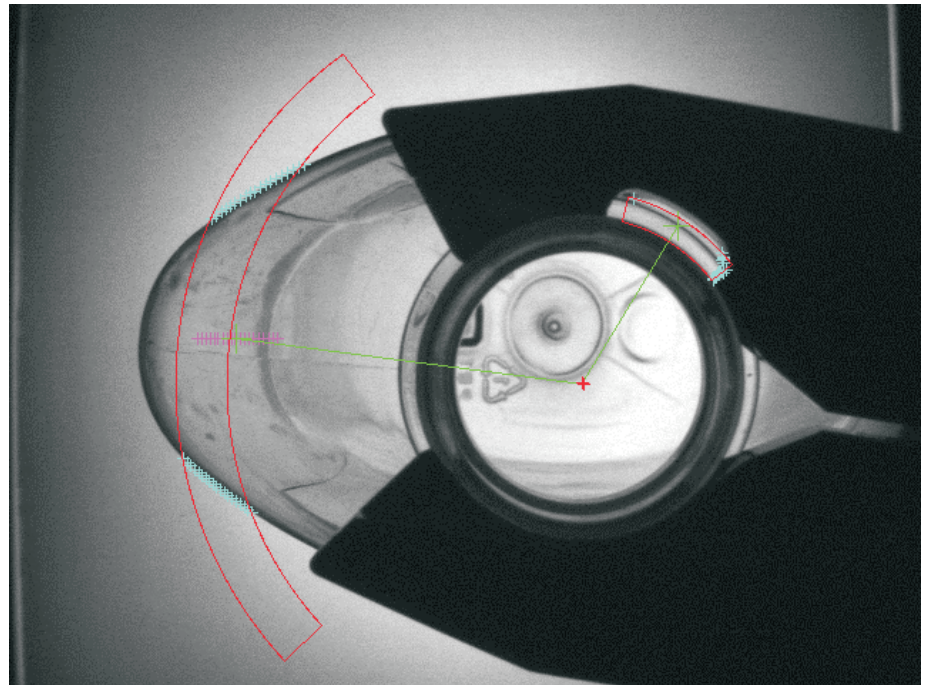
If Enabled, the system estimates the notch position if the system sees only one side of the notch within the gripper finger window.

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. This is only available if Estimate Notch Center is Enabled.

Notch Angle

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 angle is smaller than Notch Minimum Angle, the part is rejected. If this angle is smaller than or greater than these values, the inspection fails.



Inspection failed – the position of the notch was not in the correct place

Graphs – Notch inspection

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

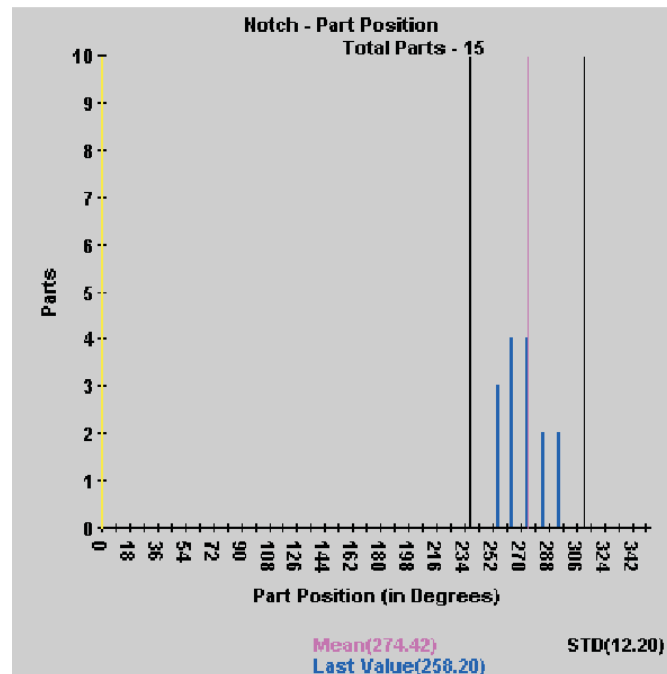
- Click a graph icon (if present) next to a parameter to view its graph.
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

➡ See page 3-12 for more information about graphs

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.



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.

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.

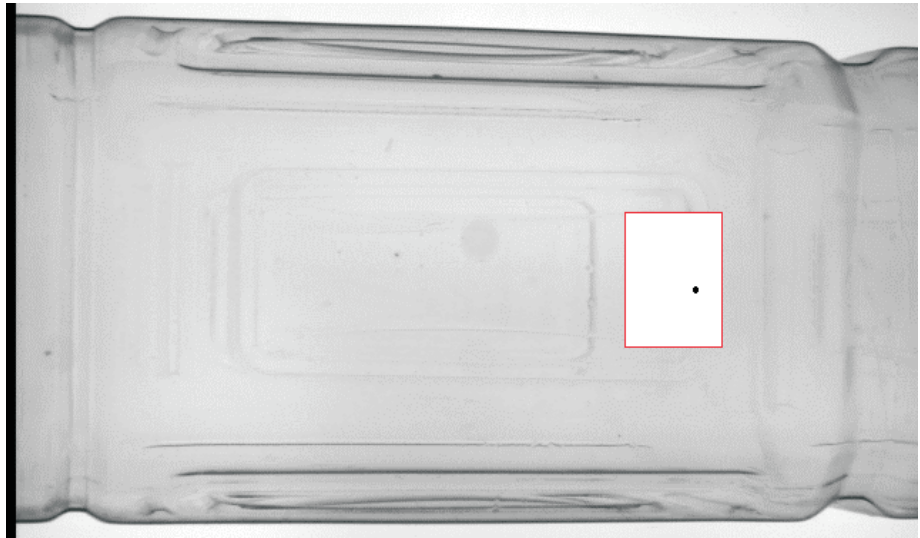
No Notch The number of parts that failed because no valid notch was found.

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

A rectangular inspection uses a rectangular shaped region with either binary or edge detection inspection techniques (Rectangle Binary or Rectangle Grayscale inspection). Use this shape inspection when the area you are inspecting is not conducive to the use of a circular region.

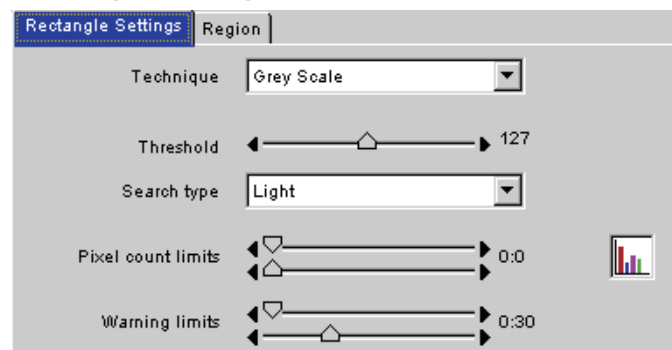


Place the inspection region

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.

Modify the inspection 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.

Gray Scale Technique

This technique uses an actual gray scale value (**Threshold**) to determine what pixels are considered light/ dark. For example, if Threshold is set at 128, any pixels in the search area with a gray scale value of zero - 127 will be considered dark pixels. Any

pixels within the search area with a gray scale value of 128 or higher will be considered light pixels.

Percent of Ambient Technique

This technique uses a percentage of the found Ambient to distinguish between light and dark pixels.

Threshold This percentage is used to compute the gray levels considered as light/ dark pixels. The system computes the threshold as follows:

$$\text{Gray Level} = \text{Ambient} * (\text{Threshold} / 100)$$

When the system inspects a part, it computes the Gray Level by multiplying that part's Ambient by Threshold percentage. For example, if the ambient value for a part is 200, and you choose a Threshold percentage of 50, the Gray Level is 100. $[200 \times (50 / 100)] = 100$.

In the example stated above, any 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.

Search type Defines whether you want to count Dark pixels or count Light pixels. If your part is light and the flaws are dark, choose Dark.

Pixel 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.

Warning Limits Warning Limits lets you set portions at each end of the Pixel Count Limits as warning ranges. If the number of edges counted falls within one of these two ranges, the part still passes, but it is also 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.

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.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

Rectangle Grayscale inspection

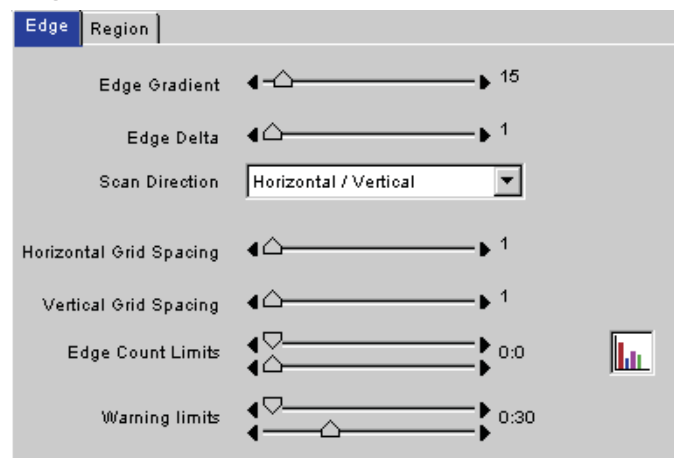
A rectangular inspection uses a rectangular shaped region with either binary or edge detection inspection techniques (Rectangle Binary or Rectangle Grayscale inspection). Use this shape inspection when the area you are inspecting is not conducive to the use of a circular region.

Place the 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.

Modify the inspection parameters

Edge menu



Edge Gradient

This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.



Edge Delta

Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge

	transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Scan Direction	Defines the direction in which the system will scan for edges. • 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.
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%.

Graph - Rectangular Grayscale inspection

There is one graph available for Rectangular Edge 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.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph.
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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. See page 10-7 to set up Shape Adapt registration.

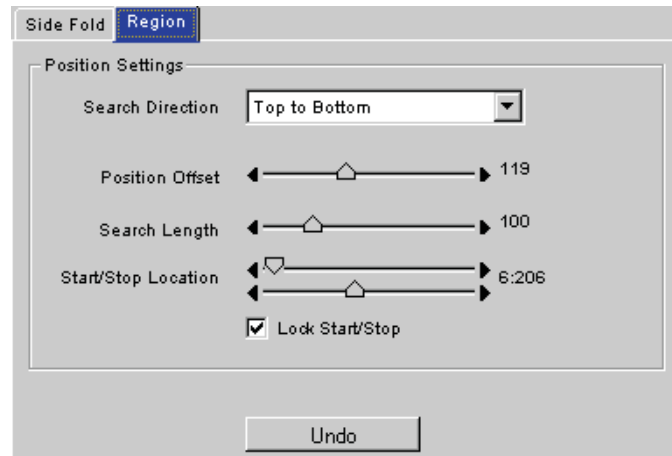
The types of folds this inspection looks for may be only visible as indentations in the side of the container, and may be as small as a single pixel in height. This inspection will look on the left and right sides of the container, in the specified region area, and find container profile changes.

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.

Position the search 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.

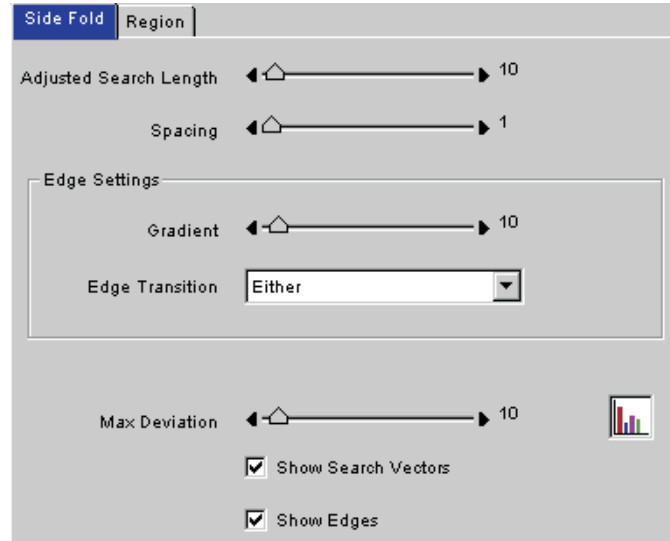
Region menu



Search Direction	Choose the direction that the search vectors will be applied. The vectors are applied from the top of the “T” towards the bottom of the “T”. You can also rotate the “T” 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.
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.
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.

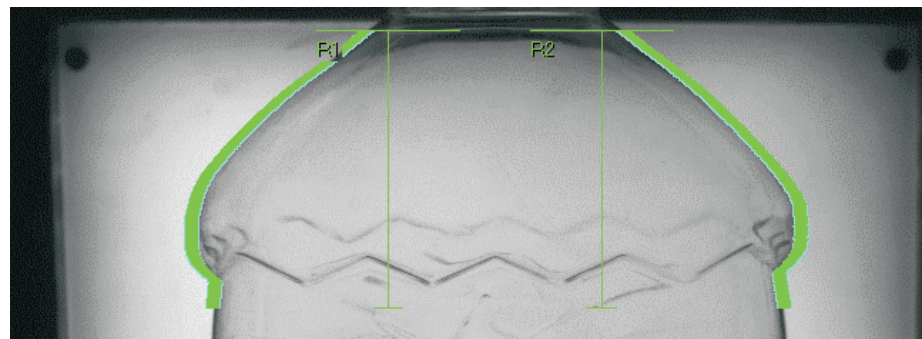
Modify the parameters

Side Fold inspection parameters



➡ 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** This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
- Edge Transition** Choose what type of edge transition the system should look for: Light to Dark, Dark to Light, or Either Transition. In the picture below, the system searches for transitions from the Light background to the Dark edges of the bottle.



- Max Deviation** The maximum allowable pixel deviation between search vectors. If the difference in pixels is greater than this value, the inspection will fail. 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** Enable this to see the actual search vectors on the image. They are displayed in cyan. If the Max Deviation is exceeded, the search vectors are displayed in red.

Show Edges Enable this to see where the search vectors found the edges of the container. 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

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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.

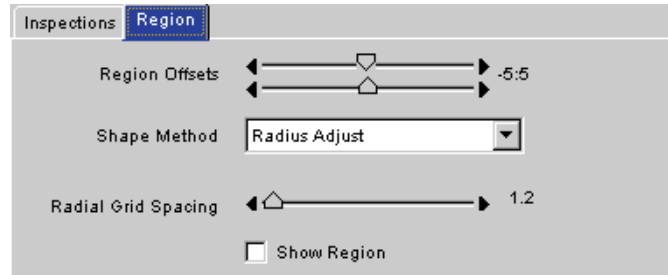
The Tracker Inspection requires Tracker Registration. This registration searches for a feature, say the edge of a seal surface, and generates edge points around that feature. The Tracker Inspection uses those edge points to accurately place the inspection region.

Please see the descriptions of the individual Tracker inspections to see how each works.

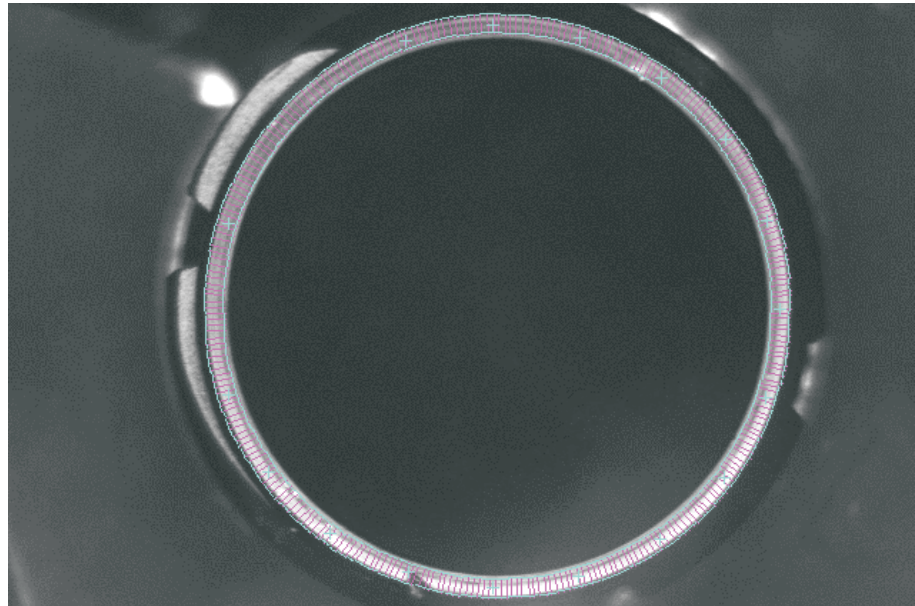
Place the inspection region

Place the inspection region on the desired area of the part using the Region menu. Note that this inspection region is not simply composed of circles. The region follows the shape of the part, as the system learned in the Tracker registration.

Tracker Region menu



Region Offsets Define the inner and outer region. The offsets are the number of pixels away to place the inspection region with respect to the Tracker registration edge position.



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 being defined by the number of search vectors applied 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.

Shape 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.

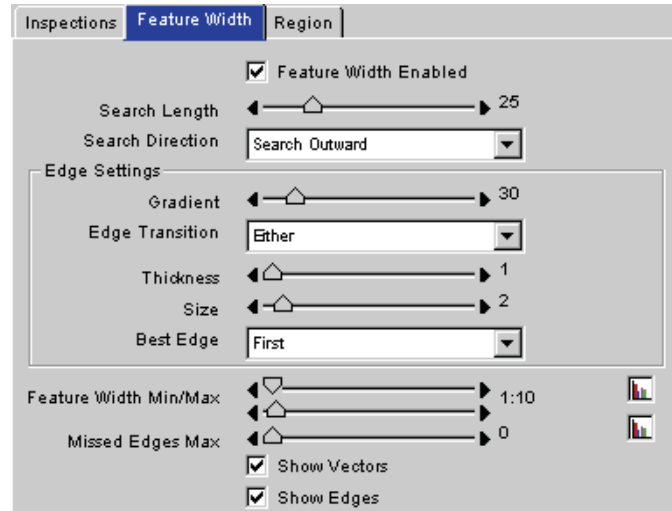
Radial Grid Spacing This parameter sets up the inspection vectors that will be applied in several of the Tracker inspections. This number indicates the distance between radial vectors, specified in degrees. For example, if the Radial Grid Spacing is 1.20, there will be 300 inspection vectors, placed 1.20 degrees apart (360 degrees divided by 1.2) You can adjust this number in 0.1 degree increments as low as 0.5 degrees.

Show Region If this is Enabled, you will be able to see the inspection vectors on the image.

Modify 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.

Feature Width menu



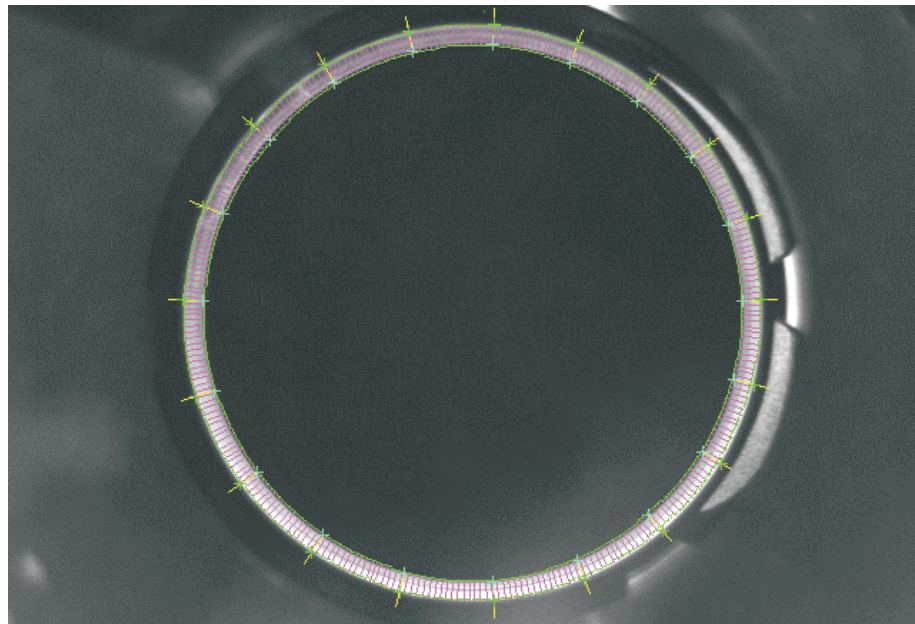
Example of Feature Width usage: Feature Width inspection is good for locating short shots on a seal surface. The seal width is measured at each inspection vector by the system looking for the inner and outer edge transitions of the seal surface. Short shots typically have a smaller seal surface.

Note that the placement of the tracker inspection region does not affect where this inspection takes place. The system uses the Tracker Registration points as locations to check feature width.

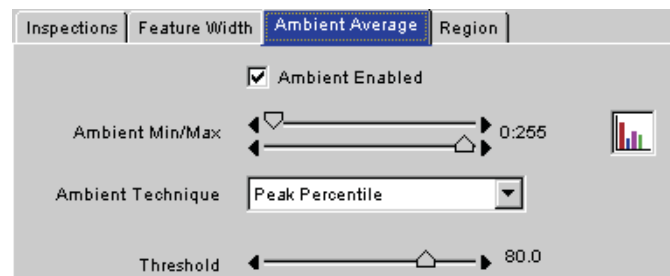
☛ *Enable Show Vectors and Show Edges to view the following parameters on the image.*

Feature Width Enabled	Allows you to Enable or Disable the Feature Width portion of the inspection (if it has been added as an 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 shown in yellow if Show Vectors is enabled.
Search Direction	Choose the direction that the search vectors will look for the width of the feature, starting from the found edges of the Tracker Registration.
Edge Settings	
Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
☛ <i>See page 10-29 for illustrations of Gradient, Thickness, and Size.</i>	
Edge Transition	Indicates what type of edge for which to search: Light to Dark edges, Dark to Light edges, or Either. This parameter is important in determining which type of edges will be found in the image.
Thickness	Edge Thickness indicates the expected width of the edge. This parameter is used to check subsequent pixels to make sure they have enough Gradient to be considered an edge. If all the pixels within the thickness range have a change greater than the Gradient, an edge is found.

Size	This indicates how many pixels in a row to compare (e.g. 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 the 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 is the edge that the system finds that has the maximum contrast from the threshold.
Feature Width Min/ Max	The minimum and maximum number of pixels wide the found feature can be. If the feature width is found to be narrower or wider than these numbers, the inspection fails.
Missed Edges Max	The number of search vectors that are allowed to fail without causing the inspection to fail.
Show Vectors	If this is enabled, you will be able to see the feature width inspection vectors on the image. These are displayed as yellow vectors, extending as far as the Search Length.
Show Edges	If this is enabled, the system displays the found edges of the feature. The found edges are marked with green crosses.



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. These, and the other parameters of this inspection are described below.

Ambient Enabled

This determines if the found ambient is used as a reject criteria or not. You may Enable or Disable whether to reject parts based on the ambient found on each image. If you Disable the Ambient reject option, the Ambient Min/ Max parameters are not used. However, the ambient is still calculated for use in other inspection areas, and you can choose an ambient technique.

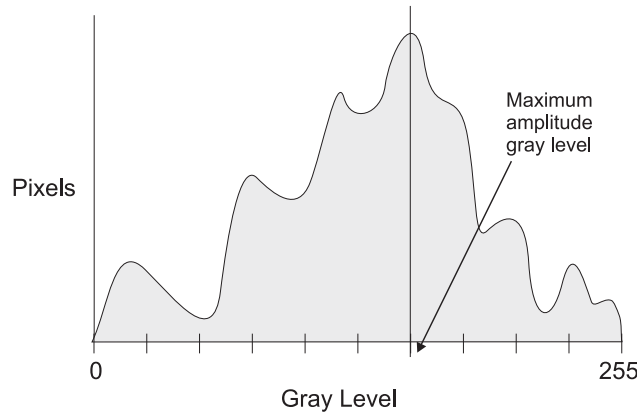
Ambient Min/ Max

The minimum and maximum acceptable gray level values. Any computed ambient found lower than or greater than these values will cause the inspection to fail.

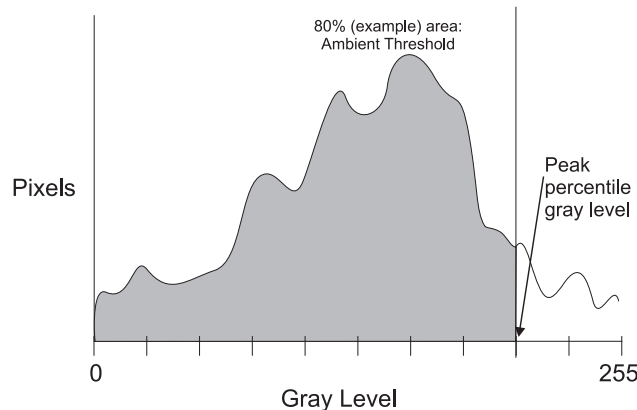
Ambient Technique

This is the method used to locate the inspection region ambient. Choose from the following:

1. **Maximum Amplitude** looks for the maximum gray shade amplitude — the gray level with the most pixel counts — within the histogram of the search area.

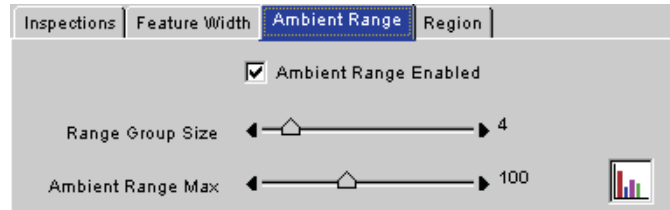


2. **Peak Percentile** computes the ambient by locating the gray shade value that exceeds the threshold you define by Threshold.



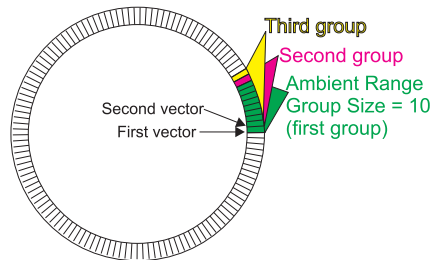
- **Threshold** is used only when the ambient search technique is Peak Percentile. This defines what percentage of the search area to use as a threshold.
 - If you use 80% as Threshold, the system counts the pixels in the first 80% of the histogram as shown in the above illustration. The first gray level above that 80% threshold is considered the ambient.
3. **Ambient Density** computes the ambient by taking the average of all the pixel gray levels — total gray level divided by pixels.

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

Allows you to Enable or Disable the Ambient Range portion of the Tracker inspection (if it has been added as an inspection).

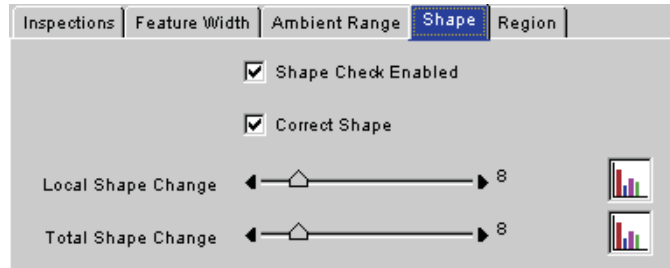
Range Group Size

Define the number of inspection vectors in a group.

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. If the difference between the highest and lowest gray shade values exceeds Ambient Range Max, the inspection fails.

Shape Check



Example of Tracker Shape Check usage: in seal surface inspection, you can verify that the local and total shape of the seal surface is within tolerance. This inspection is good for looking for blown finishes, where the defect may be localized on the seal surface. It is also good for detecting ovality on the seal surface.

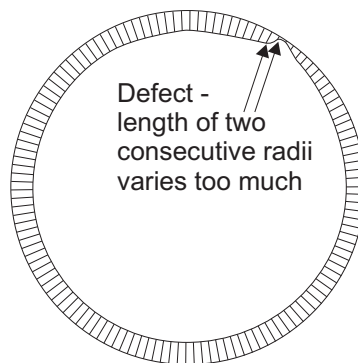
Shape Check Enabled

Allows you to Enable or Disable the Shape Check portion of the Tracker inspection (if it has been added as an inspection).

Local Shape Change

The maximum allowable difference in the length of consecutive radii around the inspection region. This is specified in number of pixels. If the difference in length between two radii is greater than this number, the inspection fails.

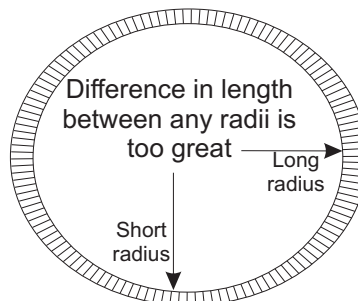
This inspection is good for detecting blown finishes where the defect is localized on the seal surface.



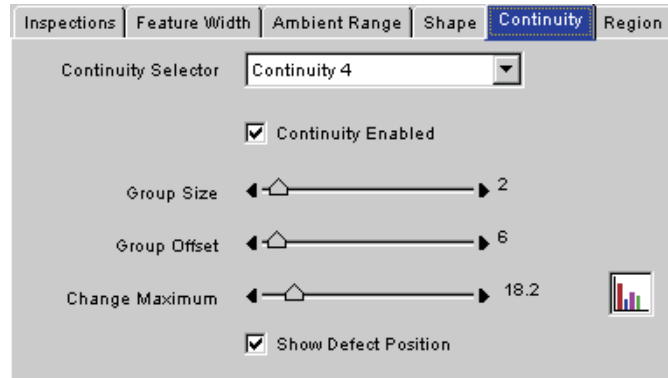
Total Shape Change

The maximum allowable difference in length of all radii around the inspection region. This is specified in number of pixels. If the difference in length between the shortest and longest radii is greater than this number, the part is rejected.

This inspection is good for detecting ovality of the seal surface.



Continuity menu



The screenshot shows the 'Continuity' tab selected in a menu bar with other tabs: 'Inspections', 'Feature Width', 'Ambient Range', 'Shape', 'Continuity', and 'Region'. Below the menu bar, the 'Continuity Selector' dropdown is set to 'Continuity 4'. There are two checked checkboxes: 'Continuity Enabled' and 'Show Defect Position'. Three sliders are visible: 'Group Size' with a value of 2, 'Group Offset' with a value of 6, and 'Change Maximum' with a value of 18.2. A small bar chart icon is located to the right of the 'Change Maximum' slider.

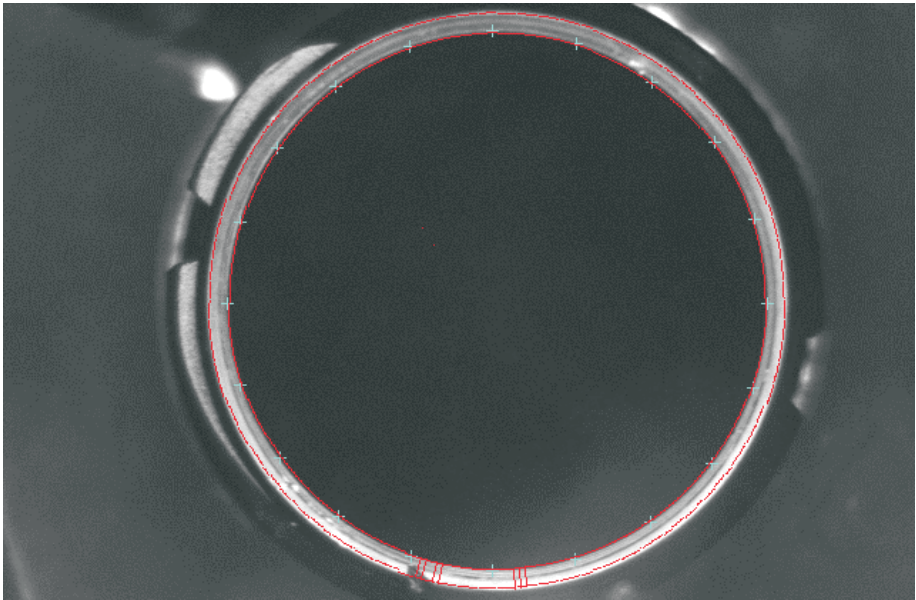
Example of Tracker Continuity usage: in seal surface inspection, the Continuity inspections can detect a number of different defects on the seal surface. You can apply up to five continuity checks to look for various sizes and intensities of defects. The defects can vary in size, depth, and position on the seal surface (inner, outer, middle, or across the entire surface).

The majority of seal surface defects occur due to a lack of continuity around the seal surface. This inspection looks for variations in gray shades between one section of the seal surface and another. The system computes the average gray shade of each radial 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 (Change Max). If the difference is greater than Change Max, the inspection fails.

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, 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. It uses the sliding group concept as shown in Tracker Ambient Range. It repeats this process around the entire inspection region.

You can apply up to five continuity inspections. Set each to look for specific defects: small scratches, large scratches, shallow cuts, deep cuts, etc.



Nick found on seal surface using Continuity inspection

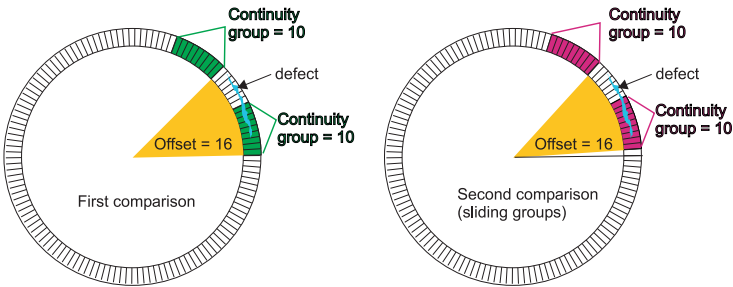
- Continuity Selector

There are up to five continuity checks available. Choose the current continuity inspection to configure. The parameters below pertain to the current continuity inspection only. That is, you must configure each continuity inspection separately.
- Continuity Enabled

Allows you to Enable or Disable the current continuity inspection of the Tracker inspection. Note: this is the same as checking the Continuity *n* box in the Tracker Inspections menu.
- Group Size

The number of vectors to group together. The system computes the average gray shade of all vectors within the group, then it determines the average gray shade of this group.
- Group Offset

The number of vectors away to begin the next group. In the illustration below, the second group starts 16 vectors away from the first group. Increasing the spacing can make the inspection more sensitive to different types of defects. A small offset value can cause the system to miss some defects that might spread across two or more groups of inspection vectors. That is because it would be comparing the gray shades of two sections that are part of the same defect.



- Change Maximum

To catch smaller defects, try decreasing Group Size and Group Offset parameters.
The maximum allowable change in gray shade between two groups. This number is entered as a percentage of change. A higher percentage means the inspection is less sensitive and a greater number of defects will pass through.
- Show Defect Position

When this is Enabled, you will be able to see the sections of the inspection area that failed the continuity checks (if they fail). The failed vectors are displayed in red.

Graphs - Tracker inspections

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.

Graphs may be viewed while the system is online or offline. Offline Graphs are available when you are editing a registration/ orientation/ inspection offline. They are removed from the screen when you exit from editing.

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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.

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 <i>n</i> Checking is Enabled) The number of parts that failed the Continuity <i>n</i> Change Maximum criteria.



Chapter 11 - Dial-in Support

Basic Information

pcAnywhere™

Pressco uses Symantec's pcAnywhere™ to dial in to your Intellispec from Pressco. This software comes pre-loaded on your machine. It will automatically start up if Pressco dials in to your machine.

The Pressco technician who dials in to your machine will see exactly what you see on your Intellispec monitor. Your Intellispec must be operational – that is, it must be switched on, and the system must be functioning. If the entire system is down (e.g., from a power outage), and you cannot operate the Intellispec at all, the remote technician will not be able to dial in, either.

The remote technician will be able to control your Intellispec just as if he were there pressing keys. It is important that you know when Pressco is dialing in to your system, as the technician can make changes to your system, and put the system online and offline.

Host and Remote

Your Intellispec is configured as a Host. A Pressco dial-in computer will be configured as the Remote computer.

If your Administrator purchases this software program, he or she can also dial in to your Intellispec to troubleshoot it from home or a remote location. The Administrator's computer must have a modem, and configure pcAnywhere™ as a Remote computer.

Video Mode

To see images better through the Remote computer, set the Intellispec to slow video mode. This is done by clicking the Miscellaneous button, Hardware Control tab, and selecting Toggle Video Mode.

When remote diagnostics are finished, click the Toggle Video Mode button again to switch it back to fast video mode.

Chatting

The remote technician can send you text messages via a chat box to let you know the system's status, or to ask you to perform a task in the plant.

Switch to Voice

The remote technician can suspend the data session to allow a voice conversation using the same phone line. Both the remote technician and you must have a phone connected to the modem line.

Saving files

The remote technician can save and transfer files during a dial-in session. He or she can also save Intellispec screens and transfer them to assist in troubleshooting a system.

What you need

You will need to provide a telephone number to the technical support representative or technician who will be dialing in to your system. You must connect the Intellispec's modem to a phone line in order for the technician to dial in.



Chapter 12 - Glossary

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.
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.
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	An inspection module, consisting of a camera and light source. In the Intellispec, multiple views of each part may be acquired and displayed by up to four different channels. Each channel has a different set of inspections by which to inspect and reject parts.
Channel Group	Includes a channel or channels that share the same encoder, part present, and reject devices.
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.
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.

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 the blow molder, such as mold cavity, infeed transfer arm, outfeed transfer arm, and spindle.
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.
Delta	A parameter used in registration and all inspections. It is the number of pixels between pixel gray shades that are compared to find the gradient.
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.
Edge	Parts of an image characterized by rapid changes in intensity value that represent borderlines between regions. Edges can also identify flaws within an inspection area.
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.
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.
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.
Gradient	The minimum shade difference between two pixels that defines an edge.
Gray shade	Also Gray level, or Grayscale. The measurement of image brightness. The description of an image derived by converting analog video data from a camera into digital numbers. The number is proportional to the brightness of a pixel.
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.
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 blow molder component that created the part.

Hough 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.
Image Analysis	A tool that lets you see the gray shade value of any pixel in your image and displays a contrast plot of values along a scan line or circle.
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	Non-destructive examination of an object to verify conformance to design.
Job	One or more inspections run on a single part for pass or fail status.
Limits	The extent to which an inspection's parameters may measure to determine pass or failing status.
Midline Orientation	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.
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.
Orientation	Location, or position, such as in relation to the points on a compass. In the Intellispec, an orientation algorithm determines the rotation of each part, and rotates subsequent inspections. See also Midline Orientation and Orient/ Pattern Match.
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.
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	An acronym for P icture E lement. A pixel's value is the smallest item of information in a digitized image. It is represented by a number that indicates the color or gray scale of the element. The gray scale in the Intellispec software ranges from zero (black) to 255 (white).

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.
Radial Edge 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	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 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.
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	Parts may pass through the camera's field of view at different speeds, and possibly varying locations. With registration, the software finds a reference point on each part, and places the inspection regions relative to that reference point.
Search Vector	A line that looks for an edge transition, often to determine the edge of a part.
Segment	Pie slice divisions that inspection circles or donuts 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, especially neck folds, 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, especially the sides of a neck image. 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.
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.

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 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.
Wombat	A marsupial native to Australia that, by some accounts, is very fond of chocolate biscuits. Also known as Database Detective.
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.



Appendix A - Rescue Kit

Using the Intellispec Rescue Kit

Purpose

Keeping a backup of a hard-drive partition is the first line of defense against hard-drive corruption. Backing up the C: partition is also recommended to preserve Intellispec upgrades that may have occurred on site. Restoring a corrupted C: partition from a Backup CD can take less than five minutes, compared to hours of tedious reinstallation of Windows NT, drivers and application software.

Intellispec Rescue is powered by a program named Symantec Ghost, which will appear on screen in some menus.

This appendix explains how to use the Intellispec Rescue Kit to backup and restore the C: partition on the Intellispec hard drive.

Overview

Along with a CD-RW drive, which is installed in the Intellispec vision processor, the Rescue Kit contains two CDs:

Rescue	This is a bootable disc supplied by Pressco. It contains all software needed to both backup the C: partition as an image file to a Backup CD and restore the image file from a Backup CD.
Backup	This is a generic CDR, which, after the backup procedure is run, will contain the C: partition image file. Backup CDs are not bootable. CD-RW discs are not recommended for use with the Rescue Kit but may work in some cases if completely erased—not quick erased. Use at your own risk.

The two parts of this appendix are as follows:

- PART 1—Backup the C: partition to a Backup CD
- PART 2—Restore the C: partition from the Backup CD explain how to backup and restore the C: partition of your Intellispec hard drive with the Rescue CD.

Assumptions And Other Notes

- Intellispec software is always located on the C: partition. The Rescue CD will only save from and restore to the C: partition.
- An image created from one Intellispec should only be restored to the same system.
- The word *image* is used in this appendix for a file containing a restorable partition.
- The Rescue procedure is not intended to be a substitute for regularly saving databases (part-files) to floppy disk.
- The Rescue Kit alone will not repair a physically damaged hard drive.

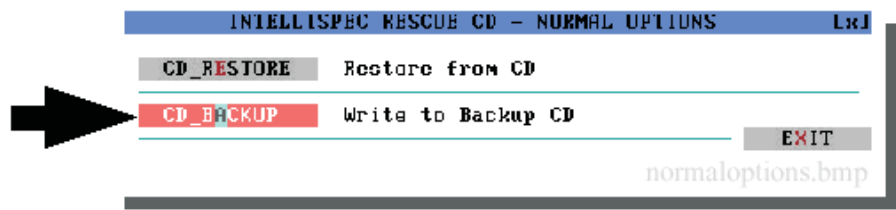
PART 1: Backup the C: partition to a backup CD

Required

- The Rescue CD
- One or more blank CDR writeable CDs. (CDRW discs not recommended)
- An installed CD writer
- Ability to boot from the CD drive (if needed see Troubleshooting section for details)

Procedure

1. Restart the computer with the Rescue CD in the CD drive and wait while the system configures itself. If the menu shown below does not appear, see Troubleshooting section for configuring the BIOS to allow booting from CDROM.

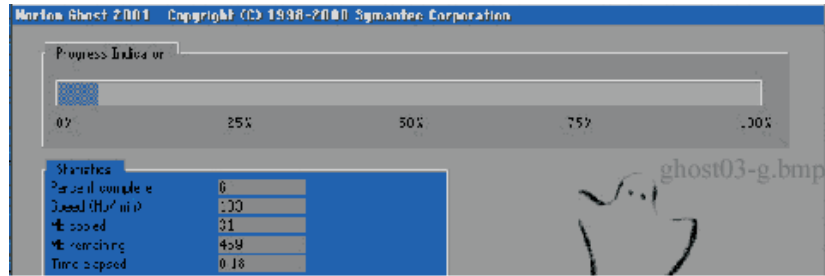


2. At the first menu select CD_BACKUP and hit enter.
3. The next step is to remove the Rescue CD and insert a blank CDR into the drive. This is the last prompt before Rescue starts writing. Hit enter or click OK to continue after the LED changes state (see note on page A-5).



- It is possible the backup will not fit on a single CD. In this case another CDR will be prompted for when the previous CD is full. Label the Backup CDs accordingly.

4. A progress bar is displayed as the image is written to the CD. (Different screen style)



When Rescue is finished, remove the CD and restart the computer.

PART 2: Restore the C: partition from the backup CD

Important

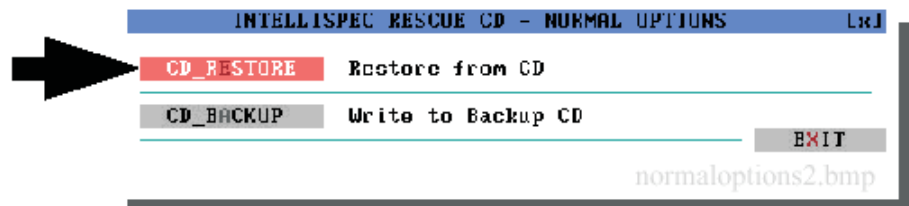
Restoring an image from any source will replace EVERYTHING on the C: partition.

Required

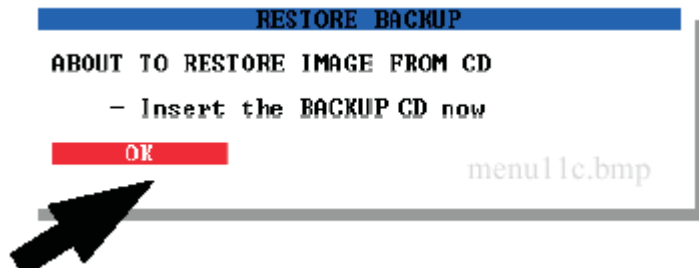
- The Rescue CD
- The Backup CD if the desired image is not on the Rescue CD
- Ability to boot from the CD drive (if needed see Troubleshooting section for details)

Procedure

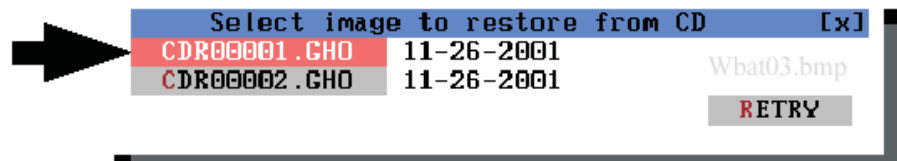
1. Restart the computer with the Rescue CD in the CD drive and wait while the system configures itself. If the menu shown below does not appear, see appendix for configuring the BIOS to allow booting from CDROM.



2. At this first menu select CD_RESTORE and hit enter.
3. The next prompt allows you to remove the Rescue CD and insert the Backup CD. Hit the enter key or click OK to continue.

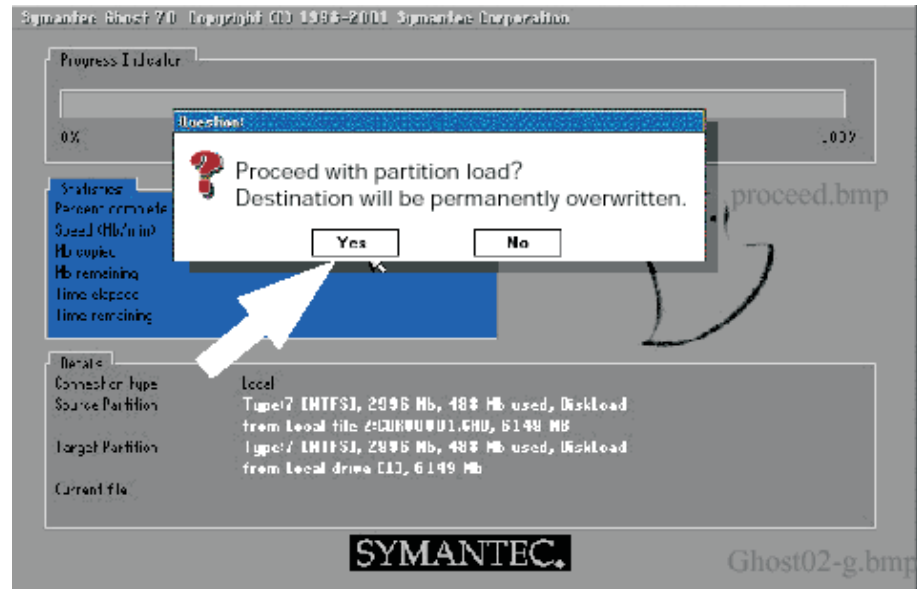


4. A prompt may appear for image file-name confirmation. If needed, hit enter or mouse-click the selection to proceed. If more than one filename appears when only one is expected, select the lowest number.

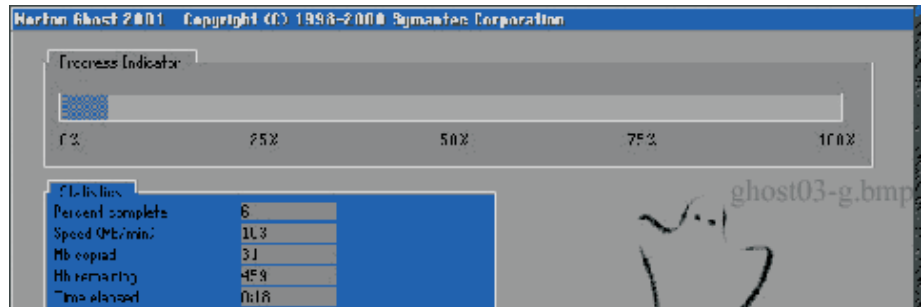


Note: The next screen will be of a different style.

5. A final confirmation is requested before starting the restore process. Select YES with the keyboard arrows and hit enter, or click YES with the mouse.

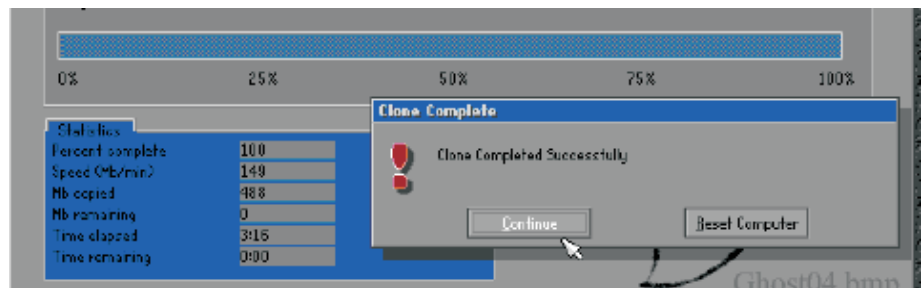


A progress bar is displayed as the image is restored from CD to the hard-drive.



If the backup spans more than one CD, you will be prompted for the next CD when required. Be sure to wait until the CD drive LED changes state* before clicking the continue prompt.

6. When the Rescue process is finished, remove the CD and restart the computer.



 **Note: When the CD is first placed in the drive, the drive will take a little time to check the CD, perhaps five or ten seconds. During this operation the LED may flash, change color or state in some way, depending on the drive model or manufacturer. This is one of the times when it is important to wait until this operation is finished before proceeding.*

Troubleshooting

Problems when booting from CDROM:

1. Some Intellispec systems may not be configured to boot from the CDROM. The BIOS setting can be changed as follows:
2. When the system first starts, a message is briefly visible prompting the user to press the DEL key to enter the BIOS setup. Press the DEL key at this time.
 - A menu appears, navigable with the arrow keys on the QWERTY keyboard. Select ADVANCED BIOS SETTINGS. Wording may vary, this is often the second option from the top.
3. Change the boot device options so the sequence is one of the following:
 - FLOPPY—CDROM—IDE-0

- CDROM—FLOPPY—IDE-0

4. Hit escape and select the option equal or similar to SAVE SETTINGS AND REBOOT

Note: All systems do not have identical BIOS. That is why the first option may not be available in step 3, and why wording may vary.

Problems when booting from BACKUP CD:

Sometimes the computer will not recognize that you've inserted a new CD. If this happens, remove the CD, reinsert and try again.



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INTELLISPEC

Programming Guide Addendum

For Software Version 3.00.021/ .022

Insert this addendum behind your Intellispec Programming Guide

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Addendum - 3.00.021/ .022

Version Software Release

What's new in 3.00.021/ .022?

The following features are new to this release, and are an addition to the information included in The Intellispec Programming Guide part number 49888.

- Channel Product Type – easier to change
- Part Management – easier to enable
- Printing Statistics – easier to print
- Shape Adapt inspection – new feature allows offsetting individual points in region of interest
- Blob inspections – new feature improves the ability to fail parts with one big defect or numerous small defects in a region of interest
- Edge inspections – new feature added to “Object Fill” technique to support the use of Ambient in fill comparisons

The above features will be discussed within this addendum.

Channel Product Type

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

In previous versions of 3.0 software, Mechanic and above level users were able to view the Channel Product type by right-clicking the channel's statistics tab, and selecting Channel Product Type from the drop-down menu. This allowed viewing of Channel Product Type only – you could not change Product Type from this menu. Only Administrators were allowed to change it through the System Configuration menus.

Now, Mechanic and Administrators users may simply select a new Channel Product Type by right-clicking the channel's statistics tab, selecting Channel Product Type, and selecting a new Product Type.

Part Management

The purpose of Part Management is to simplify the Job assignments for each type of part that you inspect. This feature is now easier to enable or disable.

In previous versions of 3.0 software, only the Administrator could enable or disable this feature through the System Configuration menus.

In 3.00.021/ .022 software, both Mechanics and Administrators can enable this feature by clicking the Part Management button, and checking the Enable Part Management box.

Note the following, which has not changed:

- Only Administrators can Add or Modify parts
- The Administrator must have programmed jobs for each channel before assigning them to parts
- Once a part is assigned, the associated jobs will run when the system is put online. That is, even if you select another job to run offline from its statistics tab, the system will re-load the correct jobs for the assigned part when it goes online.

Printing Statistics

Printing is now easier with 3.00.021/ .022 software.

In previous versions of 3.0 software, you could right-click on a channel's statistics tab, select Print, and it would print only to a printer. For printing to a file, the Administrator had to enter the System Configuration menus and select a print destination. Or the Administrator could have set up automatic printing, which could have printed to a printer, or file, or both.

In 3.00.021/ .022 software, Operator-level and higher users may easily select the print destination. Log in with your user name and password. Right-click the desired channel's statistics tab. Choose Print Statistics, and choose whether to print to printer, to file, or both.

When printing to a file, refer to the Intellispec Programming Guide part number 49888 page 3-3 for file name and destination information. To copy this data to floppy diskette to use outside of the Intellispec, log in as Mechanic-level user or higher, use the Database Detective Copy Files to Floppy function, and follow the instructions given in the Intellispec Programming Guide page 9-14.

Shape Adapt inspection enhancement

This section is a supplement to the Shape Adapt inspection description beginning on page 10-101 of the Intellispec Programming Guide part number 49888.

A new feature, introduced in version 3.00.021/ .022 software, allows offsetting individual points in the region of interest. This allows you to change the shape of the inspection region of interest. Previously, the shape was determined by the Shape Adapt registration, which followed the shape of the container.

This 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 (i.e., the smooth outer sidewall). With the new feature, 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.

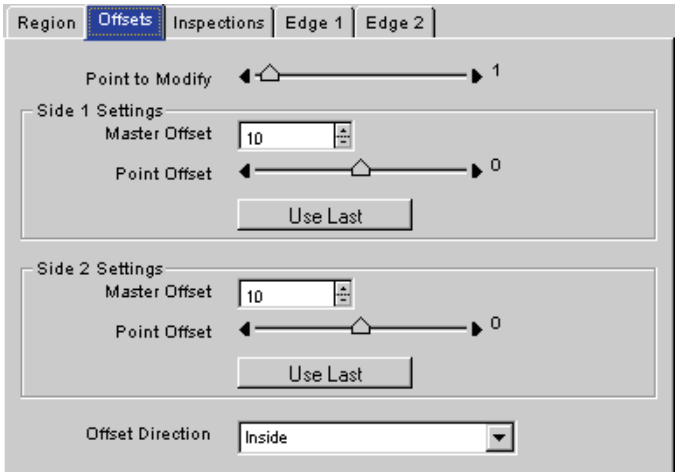


Without Special Placement Mode



With Special Placement Mode

To enable this feature in Shape Adapt inspection, go to the Region menu, and choose Special for Placement Mode. A new Offsets menu will be available. Its parameters are discussed below.



Point to Modify

The number of points available depends on the number of search vectors you have set up in the Shape Adapt Registration.

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

The Offsets menu provides you with a Master Offset for both sides of the inspection region, just like the Dual Offset Placement Mode described in the Intellispec Programming Guide part number 49888 page 10-102.

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.
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. Use Last refers to the previous number point only. If adjusting Point 11, Use Last would use the offset value used in Point 10 only.
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.

Edge inspection enhancement

This section is a supplement to Edge inspection as described in Chapter 10 of the Intellispec Programming Guide, part number 49888.

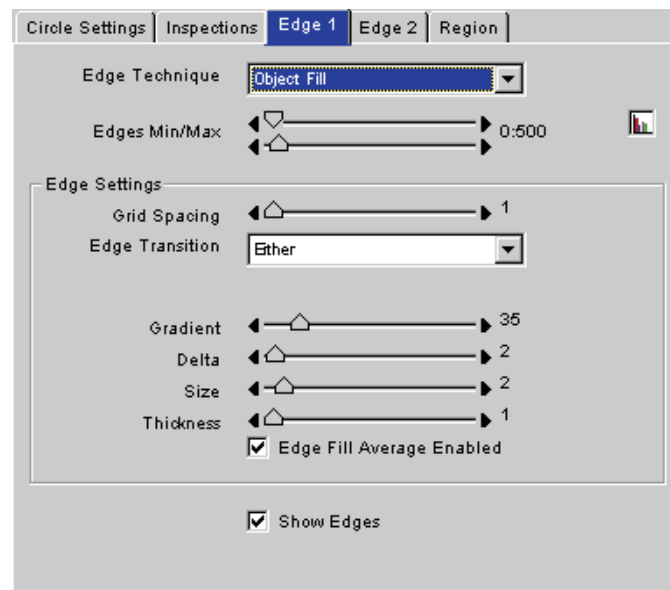
In addition to the new parameter described below, the **Clipping** feature has been moved to a new menu called Edge 2. Its function remains the same.

Edge inspection is used in the following inspections:

- Circle
- Polygon
- Shape Adapt

Edge Fill Average

A new parameter, “Edge Fill Average Enabled,” is available when Object Fill is selected as Edge Technique. The new menu is shown below:



The standard parameters – Gradient, Delta, Size, and Thickness – remain the same as described in the Intellispec Programming Guide.

Some background information: Object Fill looks for an edge transition, using Gradient, Delta, Size, and Thickness parameters. Once an edge is located, the system continues to search in the same direction, filling in pixels as long as it sees an edge transition that exceeds the gradient. You can allow the system to search for a dark-to-light, or a light-to-dark transition, or either. In Polygon and Shape Adapt inspections, you can also program the system to search horizontally (left to right), vertically (top to bottom), or both. Choose the edge gradient, delta, size, and thickness to detect the desired defects.

Edge Fill Average Enabled

When Enabled, 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.

Blob inspection enhancement

This section is a supplement to Blob inspection as described in Chapter 10 of the Intellispec Programming Guide, part number 49888.

Blob inspection is used in the following inspections and registration:

- Circle
- Polygon
- Shape Adapt
- Blob Registration

A new parameter, “Sum Valid Blobs,” is available in the Blob menu under Blob Mass Criteria.

The screenshot shows the 'Blob' tab selected in the software interface. The 'Blob Mass Criteria' section has 'Blob Mass Enabled' and 'Sum Valid Blobs' checked, with a slider for 'Blob Mass Min/Max' set to 2:6148. The 'Blob Threshold Criteria' section has 'Threshold Technique' set to 'Percent of Ambient' and 'Threshold Min/Max' set to 0: 76. The 'Blob Count Criteria' section has 'Blob Count Enabled' checked, with sliders for 'Blob Count Min/Max' set to 4:50 and 'Blob Area Min/Max' set to 5:20000.

Sum Valid Blobs

When Enabled, 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 if 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 Disabled, every set of pixels that meets the Blob Threshold Criteria is counted in the Blob Mass Total, regardless of size.



INTELLISPEC

Programming Guide Addendum

For Software Version 3.1 Feature Packs 1 and 2

Insert this addendum behind your Intellispec Programming Guide

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Addendum – 3.1 software

What's new in 3.1?

The following features are new to this release, and are an addition to the information included in The Intellispec Programming Guide part number 49888.

This list includes features from both feature pack 1 and feature pack 2 releases.

New feature	FP ¹	Page	Description
Alarms - Programmable Output	FP2	b-68	Extended I/O assembly provides up to four programmable outputs for alarm conditions.
Auto Logout	FP2	b-90	After a user-defined period of time that the Intellispec remains idle, it logs out the current user. (optional)
Blob inspection enhancement	FP1	b-37	New Neighborhood Size parameter allows pixels to be up to 10 pixels apart and still be considered blob pixels
CD burner access	FP1	b-7	Copy those defective images you have saved to CD
Circle Dimension inspection enhancements	FP2	b-30	Circle Dimension Database added to log dimension information. Continuity add to inspection to perform a profile check of the part.
Circle inspection enhancement	FP2	b-34	Radial Scan method added
Circle Width Dimension inspection	FP1	b-25	New inspection that is excellent for measuring the dimensions of a donut-shaped area, such as Seal Surface or Flange Width
Circular Registration	FP1	b-17	Registration that replaces Radial Edge registration and Hough registration. Offers both types of centering within one registration. <i>Note: Since Circular Registration replaces Radial Edge and Hough Registrations, 3.1 databases will not be backwards compatible with Intellispec 3.0 or earlier software</i>
Correlation – machine part numbers saved on images	FP2	b-59	If a system has correlation enabled, when it goes online, it will put machine part numbers on each image.
Correlation enhancements	FP1	b-39	New feature that provides correlation (which machine component handled the defective part) for up to two lanes of inspection in non-blow molder applications
Defective Image Manager	FP1	b-3	Quickly save up to the last 50 images

1 FP = Feature Pack. Indicates whether the feature was introduced in Feature Pack 1 (FP1) or Feature Pack 2 (FP2).

Defective Parts Database	FP1	b-64	New Reason Inspection Failed report that lists indicator value results for all inspections, recorded with each part's unique part ID
Diagnostic Test Pattern	FP1	b-79	New feature that displays a grayscale pattern to ensure that the display hardware is functioning properly
Edge inspection enhancement	FP1	b-35	New Absolute Gradient parameter allows the system to reject parts if any edge comparison exceeds a certain gradient
Extended I/O assembly	FP1	b-66	Additional I/O ports have been added to offer more process monitoring and control of your system
Freeze on Inspection	FP2	b-78	New feature allows selection of individual inspection on which to freeze image when defect occurs online.
Harmonic inspection	FP2	b-44	New inspection for parts with radially symmetric features, such as crowns, plastic closures, and lugged closures.
Hotkeys	FP1	b-3	Quickly snap images and run job
Inspection Grouping	FP2	b-88	New feature that groups inspections so that you can quickly see whether a certain area of the part is failing more than another area.
Last n parts statistics	FP1	b-77	New feature that presents statistics for the last n ($n = 100$ to $25,000$) parts so you can view how the most recent parts have done without clearing statistics
Light Meter inspection	FP1	b-42	New inspection that automatically adjusts lighting to compensate for stock changes and part variations due to washer and other process variables
Line Integration inspection	FP2	b-52	New inspection for rectangular inspection regions that compares the average gray shade of one group of vectors to another.
Machine Status Logging	FP2	b-65	New database that logs online/ offline status of Intellispec
Online at Powerup	FP2	b-77	New feature that puts Intellispec into online inspection mode if the Intellispec is re-booted.
Online Freeze mode enhancement	FP1	b-78	New Last Reject Time Release allows system to display last reject up to a specified number of seconds
Online region sizing	FP2	b-77	New feature that enables adjustment of inspection region sizing during online programming.
Orientation Stealer	FP2	b-54	New orientation option that allows you to use information from a previous orientation even if another registration has been run
Pattern Learn inspection	FP1	b-9	Learn the pattern of a part and perform a pattern match on each inspected part
Radial Line Integration inspection enhancement	FP1	b-37	Allows segmenting of inspection region as well as arc inspections. Clipping now available.
Registrations – Independent/ Dependent	FP2	b-56	Allows you to specify whether registrations operate independently of one another or are dependent on the previous registration/ orientation.

Reject – Adaptive, Pulse Width new settings	FP1	b-70	New Adaptive Reject time delay. Pulse Width can now be specified as either Milliseconds or Encoder ticks.
Reject – disable for individual inspection	FP1	b-70	New feature that allows you to inspect certain regions and collect data, but not reject parts from that inspection
Reject – Dual Rejecter	FP2	b-71	New feature that allows up to two reject devices on one channel of inspection.
Reject Confirm	FP2	b-74	New feature that uses an optional part detect sensor to detect missed rejects.
Reports enhancements	FP1	b-61	Print file type added, Keep File Name when using Scheduled Printing added (overwrites same file name instead of creating new ones)
Rescue Kit enhancements	FP1	b-80	New screens and procedures such as Backup Image integrity test, and verifying the Restore
X-Y Registration enhancement	FP2	b-55	X and Y search vectors independent of each other – useful for locating non-round parts

Hotkeys



Several new hotkeys are available to make viewing images and running inspections simpler.

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.

The above three hotkeys are available offline only. F6 is available offline or online.

F6 Bring up the Defective Image Manager

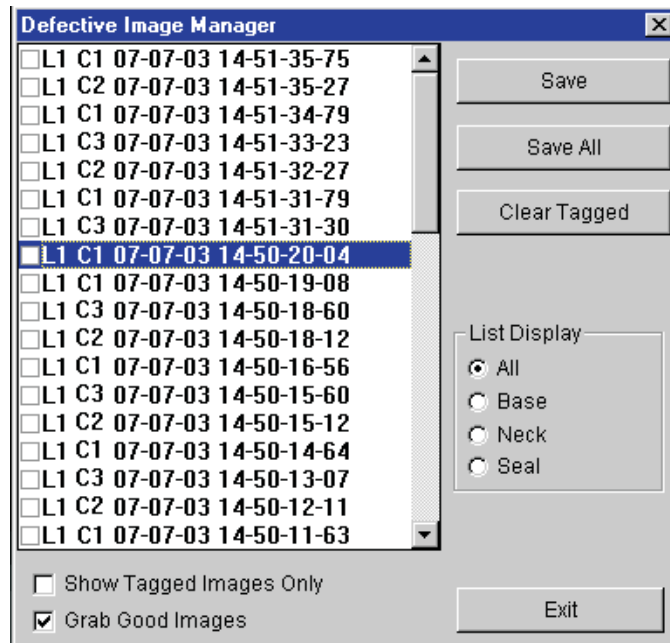
See also page b-5 for information about using the S and Alt+S keys to save defective images.

Defective Image Manager



This feature provides an easy way to review and save images of defective or good parts. The system automatically stores the last 50 defective or good images in memory while the system is online. The memory operates in ring buffer configuration. That is, the oldest image will be overwritten after 50 images have been stored. The system continuously updates the images (online).

Press F6 to bring up the Defective Image Manager while the system is online or offline. If the system is online, the system stops writing defective images to memory as soon as you press F6. The dialog screen is shown below.



This screen lists the names of the last 50 images from most recent (top of list) to oldest (bottom of list). The images are named as follows:

Lane *n* Channel *n* Date Time (including hundredths of seconds)

Capturing images

Image manager collects either defective images or good images, but not both at once. The system must be put online to collect images.

If Grab Good Images is checked, the system will save only good images.

Reviewing images

- Highlight any file name to view it in the image area of the screen
- 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 Defective 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 47 more defective images to the buffer.

Show Tagged Images Only

If you have several tagged images, you may display the list showing only those images.

Clear Tagged button

Click this button to un-check all the boxes from the entire image list (all channels).

Saving images

The system will save images as .bmp (bitmap format) to the C:\PETProvision\DefectiveImages folder.

If you save images to that folder, then save images again later, if there are any images with the same name (i.e., you try to save the same image again), the image in the folder will be overwritten.

Quickly save all images



Press “S” to quickly save all images in the defective image buffer. This saves the last 50 defective images (if there are 50) in grayscale format to the C:\PETProvision\DefectiveImages folder. You do not need to enter the Defective Image Manager to save in this manner.

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” and “S” to save all images (the last 50 defective images) in the defective image buffer. This saves both the grayscale images (filename.bmp), plus each image with graphics (filename_c.bmp) to the C:\PETProvision\DefectiveImages folder. This equals a total of 100 images saved. You do not need to enter the Defective Image Manager to save in this manner.

Save selected images

The following options are available when you bring up the Defective Image Manager (F6).

Save button

Saves only the image you have highlighted.

Save All

Saves all images displayed in the image list.

- If you select All in the List Display options, all 50 defective images are saved.
- If you have one channel selected in List Display options, all defective 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.

- If you have tagged images and check Show Tagged Images Only, and select All in the List Display options, all tagged images from all channels are saved.
- If you have tagged images and check Show Tagged Images Only, and select one channel in the List Display options, only tagged images from the selected channel are saved.

Save selected images with graphics

Bring up the Defective Image Manager (F6). Highlight the name of an image. Right-click on that image name.

The current job for that channel will run on that image, and you will see the resultant 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.

The screenshot displays the Intellispec software interface. At the top, there are tabs for 'System Overview', 'Lane 1 Overview', 'Camera 1', and 'Camera 2'. Below these, a table shows inspection results for 'Camera 2 [Seal Defects 7]'. The table has columns for 'Inspection', 'Total', 'Defects', 'Defect %', 'Last 10000', and 'Last 100000'. The 'Inspection' column lists various checks: Center, High Choke, Seal Defects, Ovality Defects, Tracker Registration, Tracker, Dimension, Orientation For Thread, Circle, Circle Width Dimension, and Radial Line Integration. The 'Status' column shows 'PASS' or 'FAIL' with reasons. The 'Results' column shows specific values. Below the table, a large circular image shows a defect on a seal. To the right, a 'Defective Image Manager' window is open, showing a list of images with their names and timestamps. An arrow points to the image name 'L1 C1 01-22-03 14-09-51-72' in the list, with a right-click action indicated. Below the list, there are buttons for 'Save', 'Save All', 'Clear Tagged', 'List Display', 'All', 'Camera 1', 'Camera 2', and 'Exit'.

Inspection	Total	Defects	Defect %	Last 10000	Last 100000
Center		0	0.000	0	0.0
High Choke		0	0.000	0	0.0
Seal Defects		0	0.000	0	0.0
Ovality Defects		0	0.000	0	0.0
Tracker Registration		50	0.607	0	0.0
Tracker		100	1.213	0	0.0
Dimension		0	0.000	0	0.0
Orientation For Thread		1643	19.930	1993	19.9
Circle		0	0.000	0	0.0

Camera 2 [Seal Defects 7]

Intellitrainer

Defective Image Manager

- L1 C1 01-22-03 14-09-53-30
- L1 C1 01-22-03 14-09-53-21
- L1 C1 01-22-03 14-09-53-04
- L1 C3 01-22-03 14-09-52-93
- L1 C1 01-22-03 14-09-52-92
- L1 C1 01-22-03 14-09-52-80
- L1 C1 01-22-03 14-09-52-68
- L1 C3 01-22-03 14-09-52-57
- L1 C1 01-22-03 14-09-52-56
- L1 C1 01-22-03 14-09-52-43
- L1 C1 01-22-03 14-09-52-33
- L1 C1 01-22-03 14-09-52-21
- L1 C1 01-22-03 14-09-52-11
- L1 C1 01-22-03 14-09-52-01
- L1 C1 01-22-03 14-09-51-84
- L1 C1 01-22-03 14-09-51-72**
- L1 C1 01-22-03 14-09-51-72
- L1 C1 01-22-03 14-09-51-60
- L1 C1 01-22-03 14-09-51-48

Show Tagged Images Only

Save

Save All

Clear Tagged

List Display

All

Camera 1

Camera 2

Exit

Right-click image name.

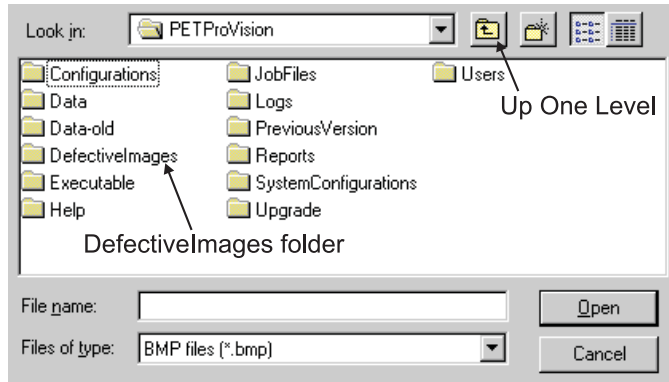
Job is run, graphics displayed, results displayed. Click Save in Defective Image Manager to save this image with graphics.

To save the displayed image with its graphics, click the Save button. It saves whatever image is on the screen at the time.

Copying images to floppy diskette

To use the images you have saved outside of the Intellispec, use the Database Detective to copy the images to floppy diskette. To enter, log in as Mechanic level user or higher. Click the Database Tools button, Database Utilities tab, select Database Detective, and click the Other tab. Click Copy Files to Floppy and click Next.

Click the Images button, click Up One Level button to scroll to the PETProvision folder, and select the DefectiveImages folder. Double-click the folder name or click Open.



Highlight the desired file(s).

- To select more than one contiguous file, select the first file, hold the Shift key, and scroll to the last desired file. Click Open.
- To select more than one non-contiguous file, select one file, hold the Control (Ctrl) key, and select the remaining desired files. Click Open.
- To remove any file from the list of files to copy in the Wombat Wizard, first select that file only, then right-click the file name.

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 again), then click Next. Insert a diskette into Intellispec's floppy drive, and Wombat will copy these files to your diskette.

The bitmap 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. If you encounter a disk error, make sure that you have enough room on your diskette. Use the Compress option to copy more images at one time to floppy.

See page 9-13 in the Intellispec Programming Guide (p/n 49888) for more information about compression and the Database Detective.

Using images

The Defective Image Manager allows you to quickly review images so 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 file. This file is a list of images that the system can load so that you do not need parts running through the system.

Refer to page 9-8 for instructions on creating and using the SmartCAL (.pvl) file. Remember to use the CH *n* number in the image file names to assign images to each different channel in the SmartCAL file.

Copying images to CD

You may have saved a great deal of images through the Defective Image Manager and want to use them outside of the Intellispec (say, on your Intellitrainer). Instead of copying the images to floppy diskette, you can use the Intellispec's recordable CD drive to copy many images to CD ROM.

What you need:

- A blank (or recordable session) CD
- Administrator privileges

To burn the CD:

1. Make sure you have already saved all the desired images to hard disk
2. Log in as Administrator. Click the Miscellaneous button, Utilities, CD Burner Software.
3. When the Nero Wizard appears, it will ask you what kind of CD to compile. Choose Data Disc. Click Next.
4. 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.*

5. Select the directory and folder in which your images are saved. Default image directory = C:\PETProvision\DefectiveImages.

If you click outside the Nero program window and need to return to it, press the Alt + Tab keys and select the Nero icon (pressing Tab key while holding the Alt key scrolls through selections).

- To save all the images in one folder, simply highlight the folder name.
- To choose specific images, browse to the images folder and highlight all the images you want to copy.
 - To select more than one contiguous file, select one file, hold the Shift key, and move the cursor to the last desired file name. Release the Shift key.
 - To select more than one non-contiguous file, select one file, hold the Control (Ctrl) key, and select all the remaining desired files. Release the Ctrl key.
- When all the desired files are highlighted, hold the left trackball button and trackball, and drag & drop the files into the left window on the screen.

6. Follow the instructions on screen to continue. Click Finish.

7. Click the Burn button.

Important

Wait until the burn process is complete (even if one of the progress bars says 100% – don't click any buttons at this time).

8. When a message pops up that says “Burn Process Completed Successfully,” click OK.
9. Press the Enter key or click Discard to end the burn process. Your CD will be ejected.
10. Click the x in the upper right of the Nero program window to close the program. It will ask you whether you want to save changes.
 - If you do not need Nero 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

Pattern Learn inspection

Pattern Learn is a new feature added to several inspections. This 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.

Pattern Learn is available in the following inspection types:

- Circle
- Polygon
- Shape Adapt

The Circle inspection allows you to learn a pattern from a circle, arc, segmented circle, or segmented arc. The Polygon inspection will create a learned pattern for each individual polygon. The Shape Adapt inspection learns the pattern from the region of interest generated by the Shape Adapt registration. The Circle and Polygon inspections also allow the region to be oriented to a specific location on a part.

How Pattern Learn works

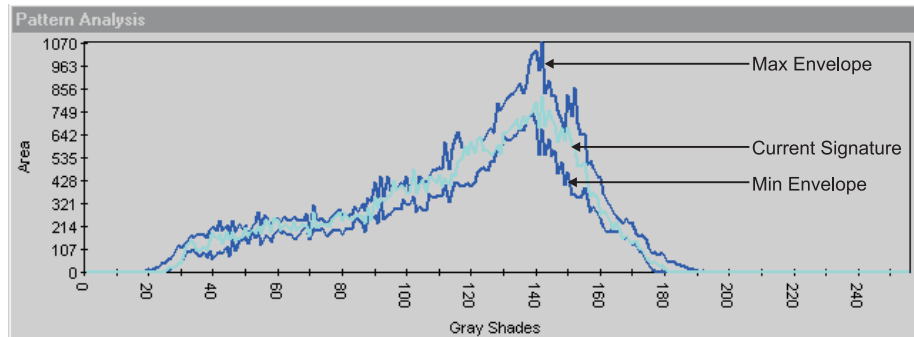
You define an inspection region on your part (in Shape Adapt inspections, the inspection region is created by the Shape Adapt registration). Then you specify a number of parts (samples) that the system can use to create upper and lower limits within which each inspected part must fall. Adjust the Pattern Learn inspection parameters to fit your part, and tell the system to learn the pattern.

The system creates an envelope (defined below) that is the upper and lower limits of the learned pattern. If the signature (defined below) does not fall within the learned envelope, the inspection fails.

Terminology used in this section

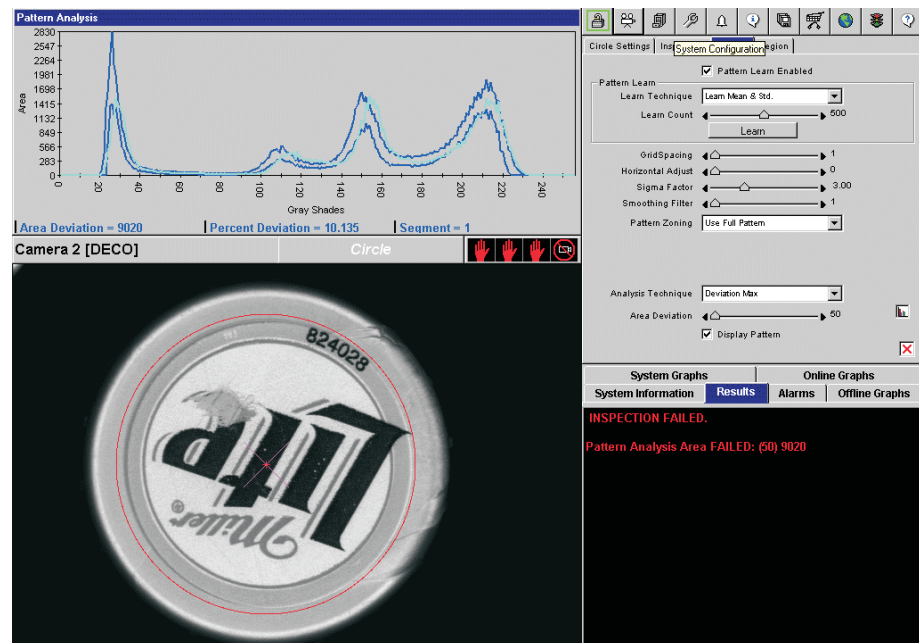
The following are terms we use in the description of the Pattern Learn inspection:

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.

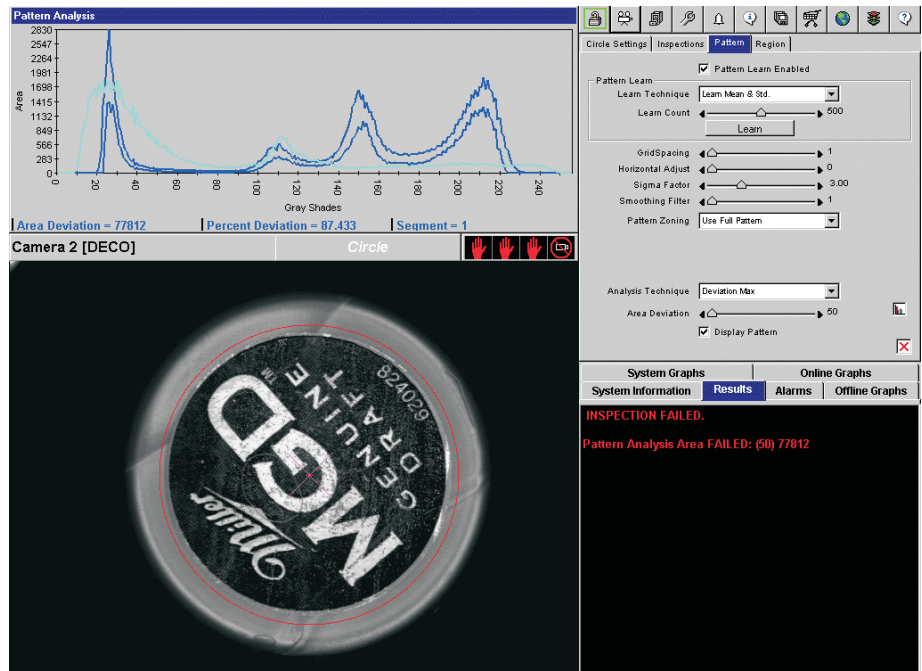


Examples of Pattern Learn usage

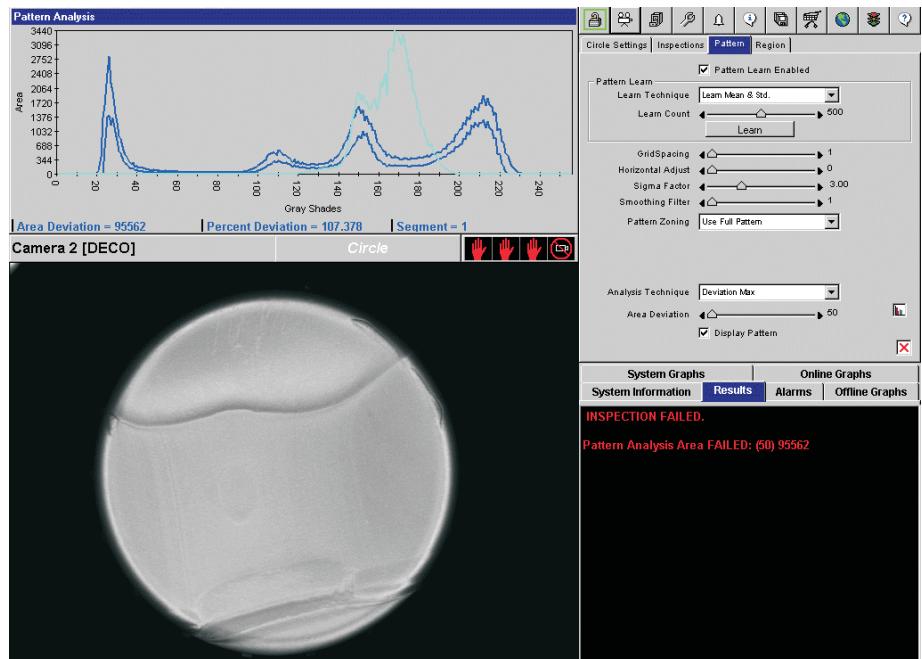
The Pattern Learn inspection can be used for finding several types of defects, such as the examples shown below:



Part missing print. Signature outside learned limits. Part is rejected because signature falls below or goes above learned limits.



Mixed label. Signature outside learned limits. Part is rejected.



No print. Signature outside learned limits. Part is rejected.

Defining a Pattern Learn inspection

1. Select a channel and job, or create a new job.
2. Create a registration if necessary.
3. Add a Circle inspection. (This example uses a Circle inspection. You may also use Shape Adapt or Polygon for your application.) Place the region of interest over the desired inspection area. In the example shown below, the inner circle has a radius of one, and the outer circle was placed to inspect the entire region of interest.



4. Go to the Inspections tab and Enable the Pattern Learn inspection. You may want to disable the Edge inspection.

Go to the Pattern tab to set the parameters.

☛ Check the Display Pattern box to see the inspection signature and the learned envelope. You will also see the effects of certain parameters (e.g., Horizontal Adjust) on this display.

Pattern Learn Enabled

Enable or Disable the Pattern Learn inspection. It is Enabled if the box is checked.

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.

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 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 (see below), 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.

Saving SmartCAL images for use in learning

You can save a set of images while the system is offline, and your production line is running.

1. To save images (one channel at a time), Log in (Mechanic user level and higher). Select a channel. Right-click the image area. Choose Image, Autosave... from the menu.
2. Note that most images are saved under the C:\PETProvision\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 (e.g., 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.
3. Name the image(s) in the File Name box. The system will add a number extension to the name to create several image names (e.g., image001, image002, etc.). Select the number of images to save, click Start, or Exit if you decide not to save the images.
4. 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.
5. If you intend to create a SmartCAL (.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 2.

Avoid using the “# or \” symbols in your file names or folder names – these may cause errors

Next, go to the Database Detective (Wombat) to create the SmartCAL file. A SmartCAL/.pvl file is a special Intellispec text file that contains a list of bitmap (.bmp) images for up to four channels.

To create the SmartCAL file:

1. Click the Database Tools  button, Database Utilities tab, and select Database Detective. Click the Other tab. Select SmartCAL/.pvl. Click Next.
2. From the Stored Image Operations screen, enter a name for your SmartCAL file.
3. Pick Images (see instructions for screen options below). Click OK. Click Finish. Your SmartCAL file will be written to the Data folder.

The options on the Stored Image Operations screen are described next. If you have just saved images through the Autosave option as described above, the Pick Images buttons will allow you to select those images for your SmartCAL file.

Include Channels

Select all the channels for which you want to have images loaded through one SmartCAL file.

Use Channel Folders as well as Picked Images

This option allows you to pick images you have already saved on the Intellispec regardless of the folders where they are stored. It also creates a new set of folders into which you can move or save images. The Database Detective will create a folder for each selected channel (unless these folders were created previously). The folders will be named based on Channel name or Product Type. If your application uses the same Product Type on more than one channel, they will be named by Channel name. You can store images in each channel's folder (e.g., Panel images in Channel_1 folder, and Rivet images in Channel_2 folder).

Pick Images

You may choose several image files for each channel, 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 channel. Browse to the folder(s) where the images are stored, and select the desired files.

- To select more than one contiguous file, select the first file, hold the Shift key, and scroll to the last desired file. Click Open.
 - To select more than one non-contiguous file, select the first file, hold the Control (Ctrl) key, and select the remaining desired images. Click Open.
 - To select all bitmap files within one folder: Click the Pick Images for Channel *n* button. Browse to the desired folder, select one file name and click Open. Select that file name under Pick Images, and right-click. The file name will change to C:\PETProvision\Data\~folder name*.bmp. This indicates that all bitmap files within that folder will be part of the SmartCAL file. If you right-click again, the name will toggle back to its original file name.
 - Click Clear List to remove all the files from the channel's list.
4. Exit from the Database Detective and Database Tools screens.
 5. To load the SmartCAL file, right-click on the image area. Change Image Source by selecting Image, Tools, Image Source, SmartCAL Images. Then restore the SmartCAL file by right-clicking the image, select Image, Restore, scroll through the Data folder and highlight the SmartCAL file name. Click Open.

Now your images should be loaded into memory, and you may proceed with the learning process for Pattern Learn. To make sure the images have been loaded, press F1 repeatedly to see the different images on screen.

 *For more information about SmartCAL/.pvl files, as well as the Database Detective, see page 9-8 in the Intellispec Programming Guide (p/n 49888).*

Set 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.

☛ *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 Specify the number of parts the Intellispec should sample to create the upper and lower limits (envelope). Remember, the greater number of learned parts, the better the envelope will resemble the sample population, and the better it will be able to detect defects.

Learn button Click this to begin the learn process. You should have parts moving through the inspection module so that the system can detect and inspect all n parts. (n = Learn Count) Or use SmartCAL images to learn (See page b-13 for more information).

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.

☛ *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 smooths 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.

☞ *If you change Smoothing Filter, re-learn the pattern. This affects the learned envelope.*

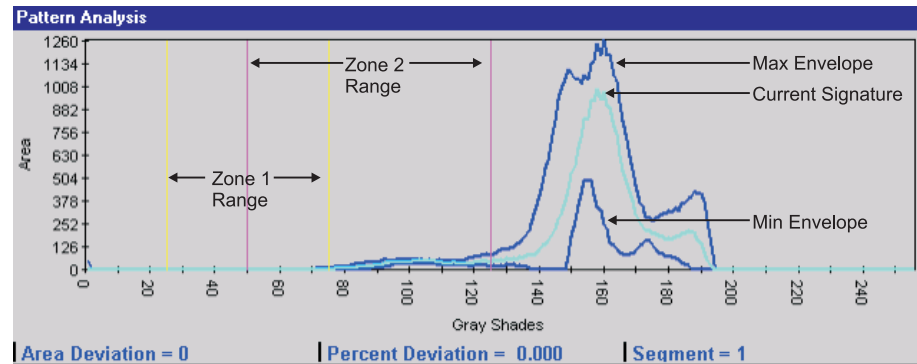
Pattern Zoning Define the number of zones to analyze. You may choose to analyze the Full Pattern, One Pattern Zone, or Two Pattern Zones.

Full Pattern zoning looks at all gray shades (0 to 255) and analyzes the deviation (see Analysis Technique) from the entire signature.

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 (e.g., 100 - 150 and 175 - 225). You may overlap the two zones.

This is the same type of zone analysis used in Zone inspection which is discussed fully on page 10-60 of the Intellispec Programming Guide (p/n 49888).

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 Enabled, 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.

Circular Registration

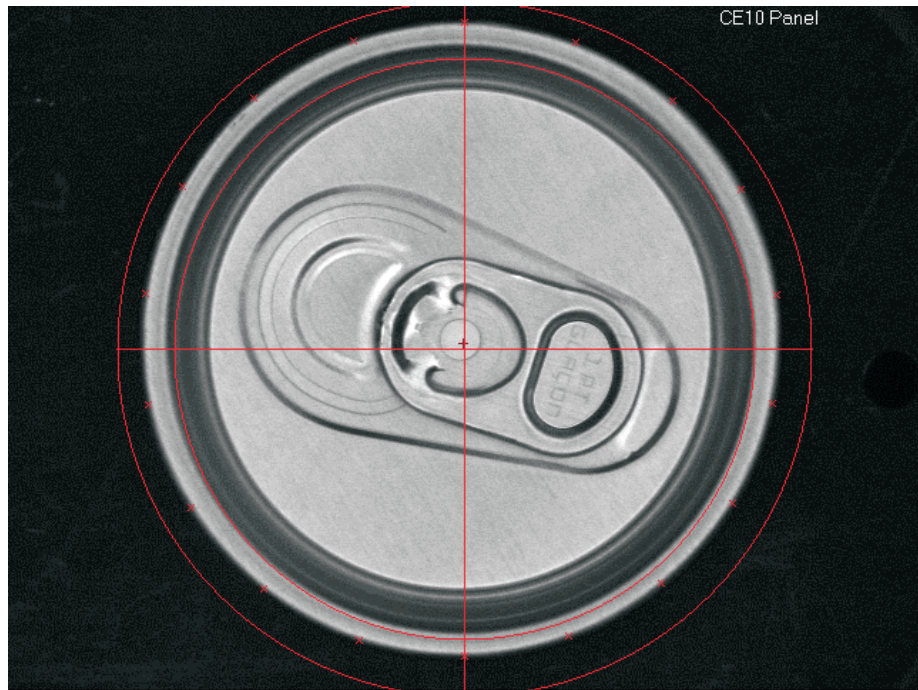
Circular Registration is good for locating edges on circular parts. It replaces both Radial Edge and Hough registrations found in earlier versions of Intellispec software. If your jobs from previous versions of software used either Radial Edge or Hough registrations, they were automatically converted to Circular registration in 3.1. Because of this, databases saved in 3.1 software will *not* be backwards compatible with Intellispec version 3.0 or earlier software.

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).

Place the Circular registration region

First, set up a region for the registration through 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.

Next go to the Edge menu and select a direction in which to search for a transition. 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. In the image below, the outer edge of the converted end is the cleanest; we chose Search Inward.



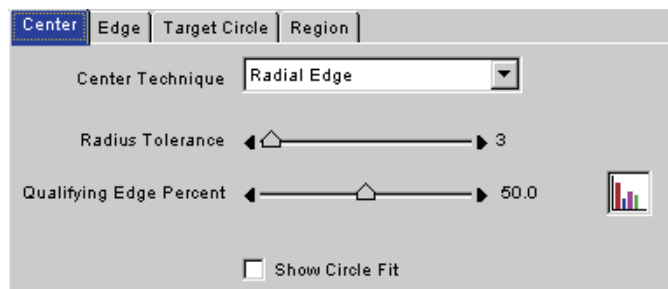
Your image may vary – use the search direction that best suits your image.

Select an Edge Transition. If searching for a light edge against a dark background, choose Dark to Light.

Next, go to the Target Circle menu. Adjust the cyan circle to the same size and position as the feature you want to find. Click Set Target. When the system finds the feature, it will lock on and draw a target circle in magenta. You may need to adjust the parameters in the Center and Edge menus to find the desired feature accurately. These menus are discussed next.

Modify the Circular Registration parameters

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 perhaps part of it falls outside the camera's field of view, choose Hough.

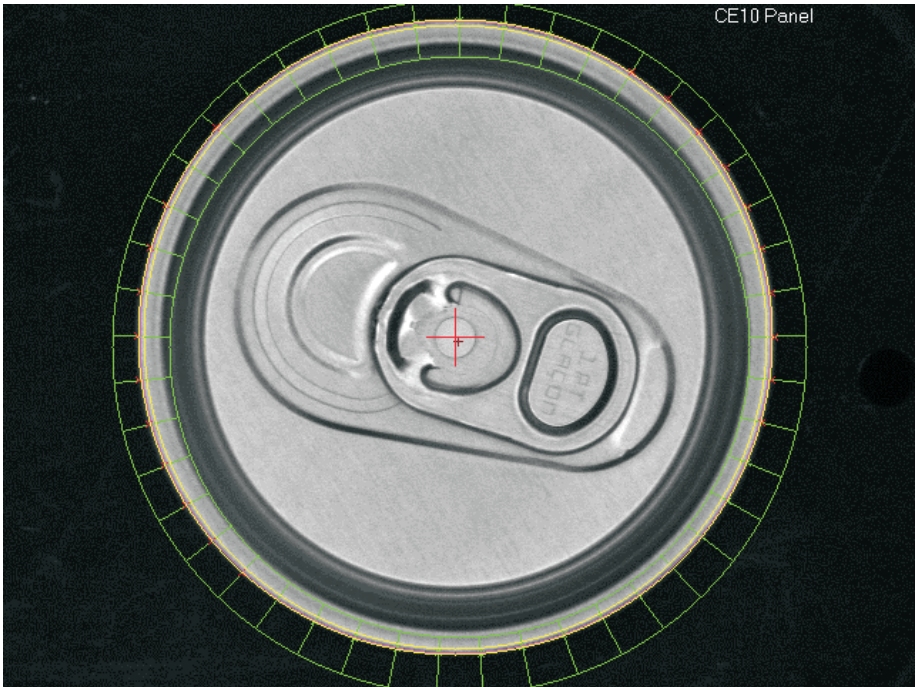
Radial Edge centering

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 acknowledge as an edge (i.e., 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.

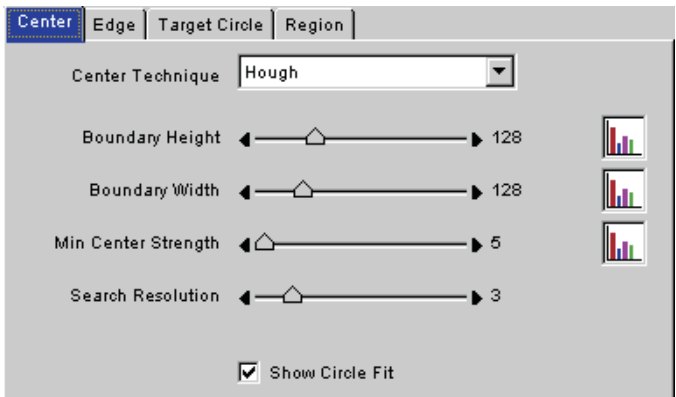
Qualifying Edge Percent

This is a percentage of the search vectors that must meet the Gradient and other Edge parameters to define the registration radius. This parameter is useful to handle changes in sample size of parts.

Show Circle Fit

If Enabled, the system displays the Target Circle (magenta) and the Radius Tolerance (yellow circles).

Hough centering



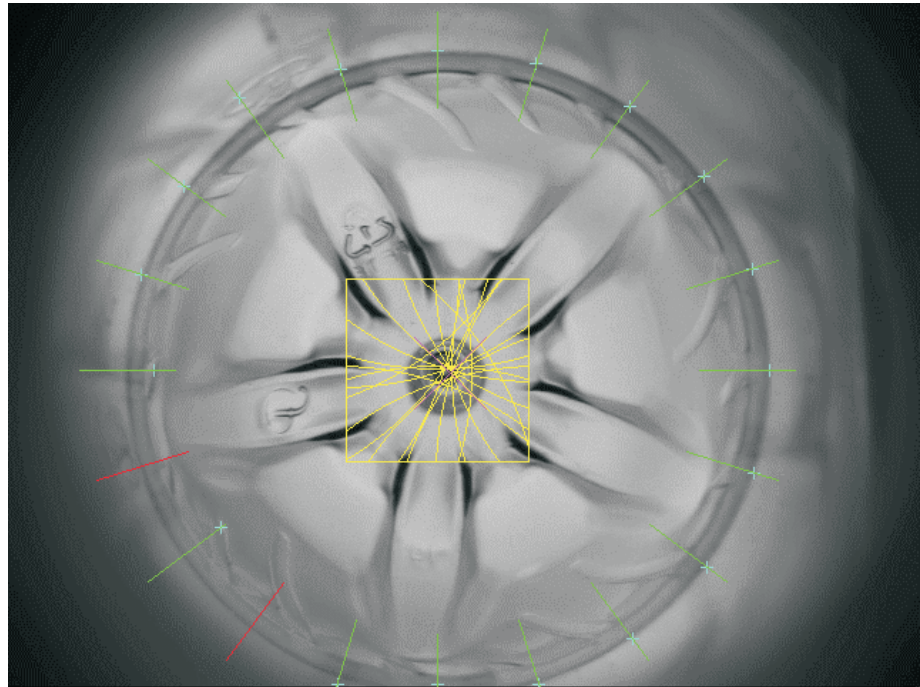
This registration locates a circular feature within an image and computes the center point of that feature. An important strength of this registration is that the feature you wish to find does not need to fit completely within the camera image. As long as a

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 specify the radius of the feature by placing a circle over the feature you want the system to find. This is the target circle.

Each search vector tries to detect an edge, using the Edge menu parameters. Found edges are marked with a cyan x.



Boundary Height/ Boundary Width

The boundary is a rectangular area (represented in yellow) used to restrict the center search to a limited area. This makes the search more efficient.

Adjust the boundary area on the image, in which you would expect the center point of the target circle to fall. This area can be moved or re-sized to accommodate normal movement of parts within the image.

Min Center Strength

This number is based on the number of edges the system uses to compute the center of the feature. With a Hough registration, the system draws a circle around each found edge, with the radius of these circles equaling the target circle radius. Arcs of these circles are drawn within the boundary area. The system calculates the center of the feature by averaging the location of where these arcs intersect. The more arcs that intersect the center, the stronger it is. (See also Search Resolution)

☛ *See illustration next page*

Any located center with a strength less than this minimum number causes this registration to fail.

Search Resolution

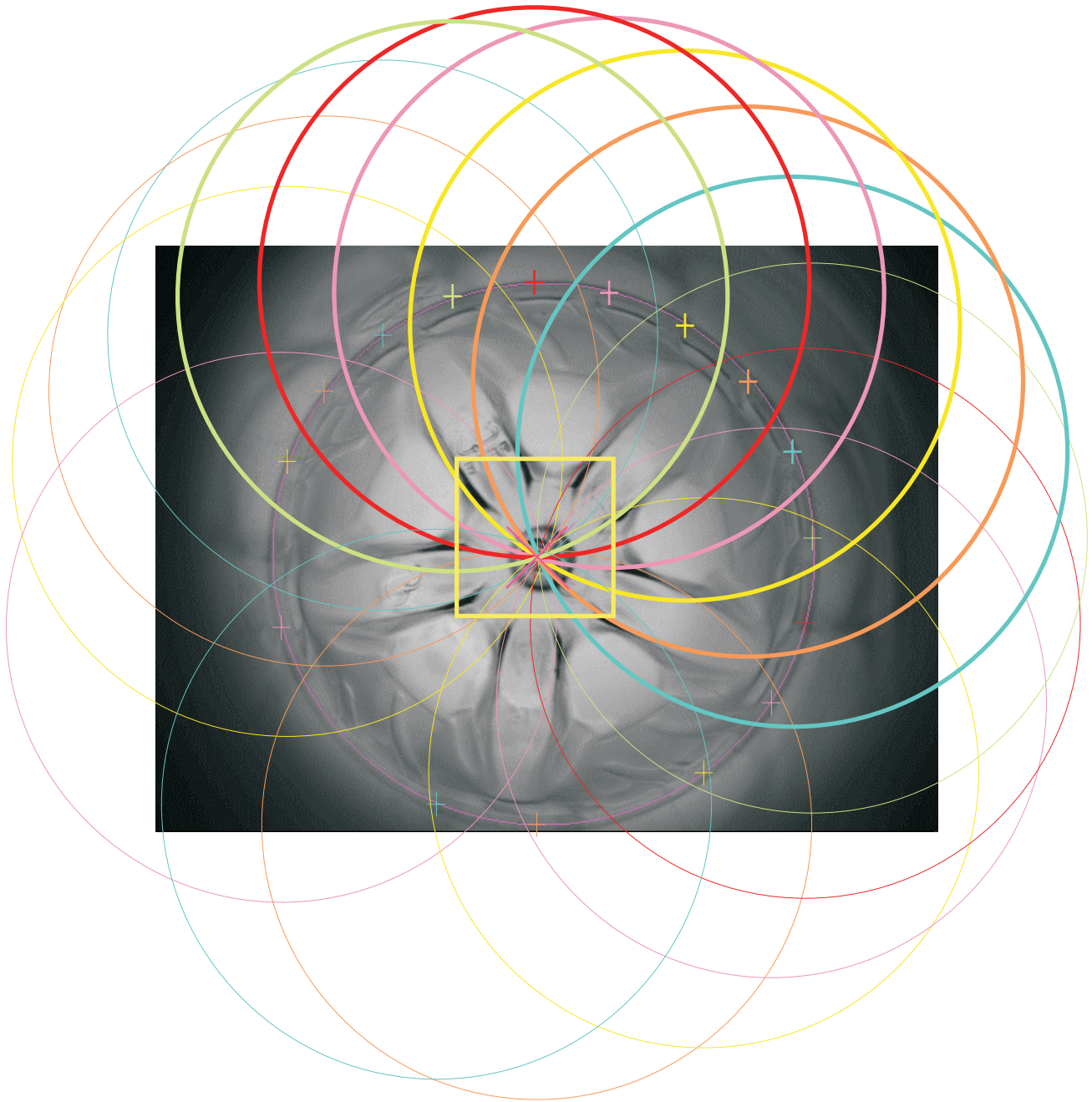
The area that the arcs must intersect to determine the found center. A larger resolution allows a larger area – the arcs do not all have to cross at the same point – and increases the strength.

Show Circle Fit

If this is Enabled, you will be able to see the bounding area, the arcs projected by the found edges, and the predicted center. The bounding area is the yellow box in the

center, the arcs are shown within the bounding area in yellow, and the center is shown by the large magenta X.

The magenta circle is generated by the system, calculated by the found edges, based on the Target Circle.



Hough centering draws circles around each found point. The radius of each circle equals the target circle. The pixel (within the yellow boundary box) where the arcs of most of these circles cross is the computed center.

Edge menu

Search Vectors Indicates the number of search vectors used to locate the feature on the container. Each vector is placed equally around the image by the system.

Search Direction The direction used to find the edges. Available choices are Search Inward or Search Outward. Use the direction that will have the least amount of noise or false edges on the image.

Edge Transition The type of edge you want the system to look for – Light to Dark, Dark to Light, or Either. This parameter is important in determining the type of edges that will be located in the image. For example, if the feature you want the system to look for is very bright, choose Dark to Light to find those edges.

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.

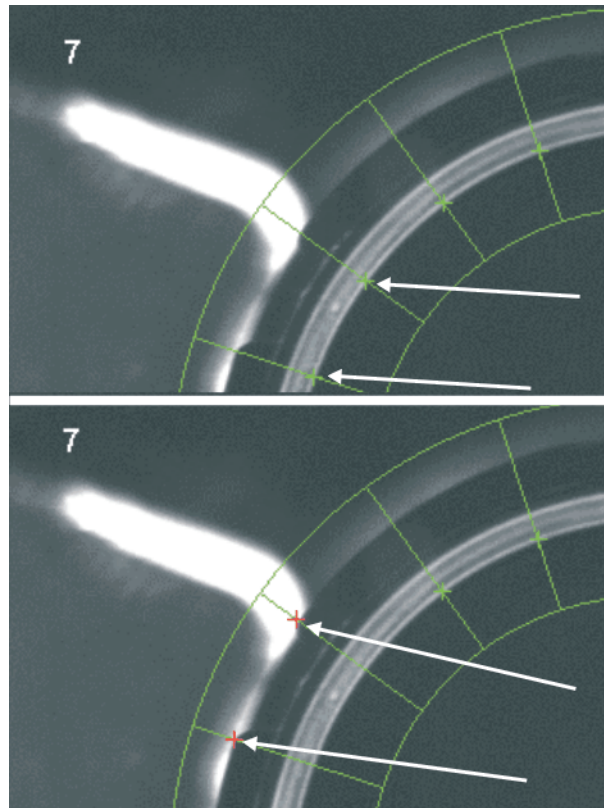
Edge Filter value (Only used when Edge Filter enabled) This is the threshold at which the system binarizes the search vector. If the filter is set at 128, for example, any pixels in the search vector found with a gray shade value of zero-127 will be considered dark pixels. Any pixels in the search vector with a gray shade of 128 or greater will be considered light pixels.

Edge Gradient (Only used when Edge Filter disabled) This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.

This parameter now 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.

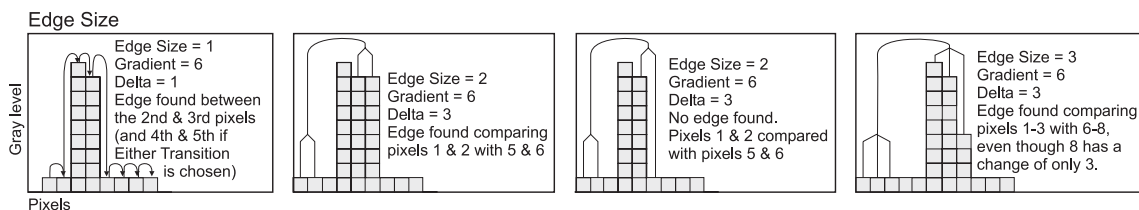
- If Min = Max, this is the standard edge search. The system finds an edge at the first pixel that has a gray level change greater than the Gradient value.
- If Min & Max are different values (e.g., Min = 25, Max = 40), the Max value is used as a threshold to stop looking for edges if the system finds a pixel with a gray level change greater than Max. The edge location passes if the Min value is exceeded.
 - In the example below, the image has bright spots in the background that we want to ignore. We want the system to find the inner edge of the seal surface. We set Min to a value that sees the change (searching outward) in gray level at the edge of the surface. We set Max to a slightly greater value. The inner

edge of the seal surface is found, as seen in the top view. If we set Min to the desired value and Max to 255 in this case, as shown in the bottom view, the system finds the undesired bright spot.



- If Max = 255, the system searches for the pixel with the greatest gray level change above the Gradient Min value. This searches for Best Edge or Strongest Edge, as found in other inspections in Intellispec.

- Delta** Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
- Size** This indicates how many pixels in a row to compare (e.g 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.



The number pixels in a row to compare. The system takes the average gray level of each group of pixels, subtracts the difference, and compares that difference to the gradient. If the difference is equal to or greater than the gradient, an edge is found.

In the drawing on the right above, the system finds a gray level of one for pixels 1-3. It adds these and divides by Edge Size. It finds gray levels of 9, 8, and 4 for pixels 6-8, respectively. It adds these and divides by Edge Size. It then takes the difference between these two average gray levels and compares it to Gradient. If this difference is equal to or greater than Gradient, an edge is found.

$1+1+1 = 3$. $3/3 = 1$ (average gray level of pixels 1-3)

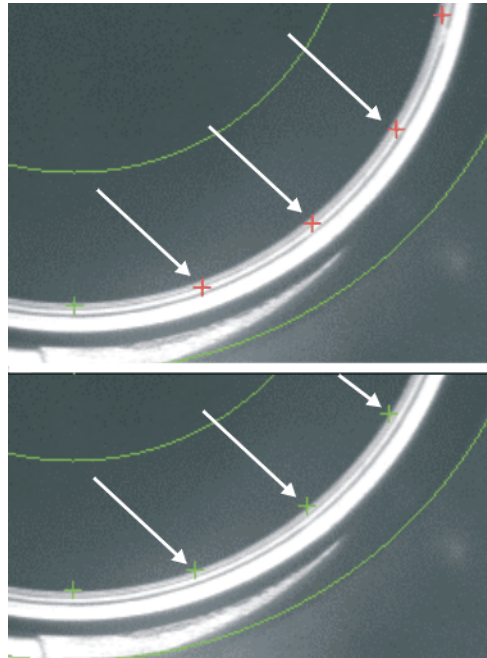
Subpixel Location

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.

Note that 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 would be computed to subpixel values (if Subpixel Location were enabled), and the center would be computed as the pixel in which most arcs cross.

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.



Same image

Top view, Subpixel Location disabled

Bottom view, Subpixel Location enabled

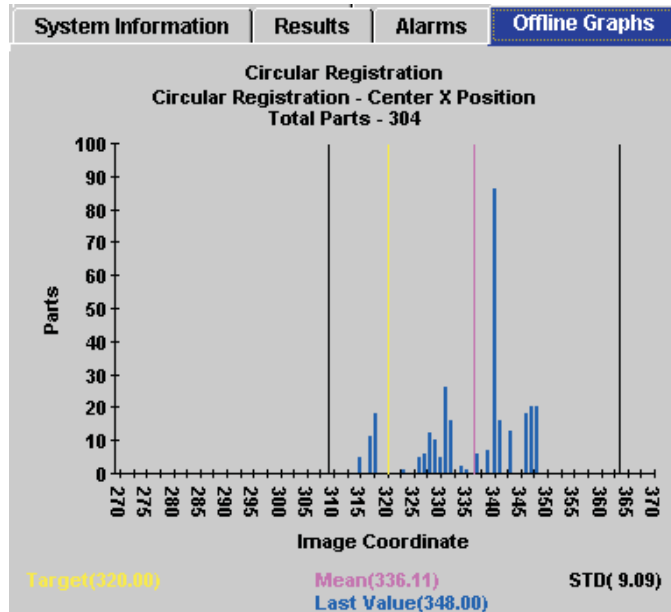
In this example, the edges were found better with Subpixel Location enabled (not always true)

Graphs - Circular registration

If using Radial Edge centering, the following graphs are available:

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.

Circle Width Dimension inspection

A new inspection has been added to 3.1 software – Circle Width Dimension inspection. The difference between Circle Dimension and Circle Width Dimension is the number of inspection regions. Circle Dimension has one circle or donut, and Circle Width Dimension has two circles or donuts, between which dimension measurements are made. Circle Width Dimension is excellent for measuring donut-shaped areas, such as Seal Surface or Flange Width.

Circle Width Dimension is available in the following Product Types (inspections available if your job or channel product type = one of the following):

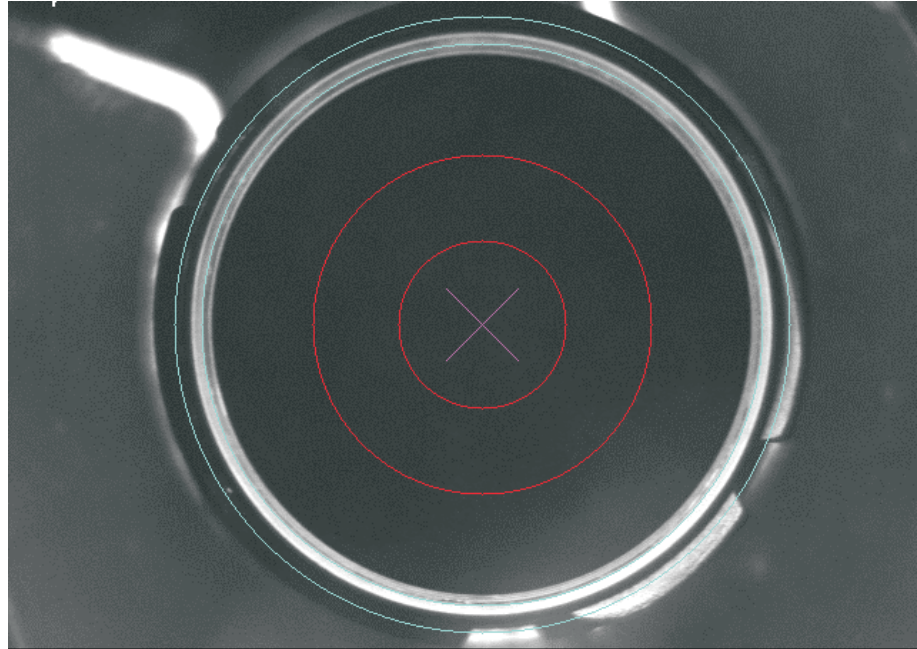
- Beverage & Food Ends
- Preforms
- Seal Surface
- Easy Open Ends

In Circle Width Dimension, you place two regions of interest. For example, you can place one inspection region to search for the outer edge of the seal surface, and one inspection region to search for the inner edge of the seal surface. The system will

determine the diameter of each region, and report the difference between these two diameters (i.e., surface width).

Place the inspection regions

Using the Region menu, place the first inspection region (R1) to surround one edge you wish to locate – say, the outer edge.



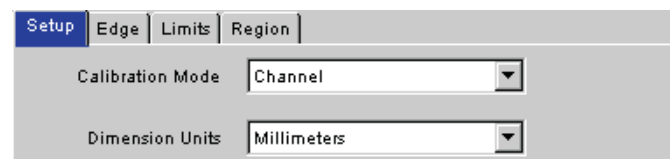
Place the two circles of Region 1 to surround the edge you want to find. Then select R2 and place those two circles to surround the other edge you want to find.

From the Current Region drop-down menu, select the other region (R2). 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.

Circle Width Dimension inspection parameters

Setup 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 Circle Dimension 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 the Pixel Calibrate menu item. (See page 7-21 for a description of

this feature.) 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 This allows you to 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.

☛ *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 Calibration 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.

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 Circle Dimension 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.

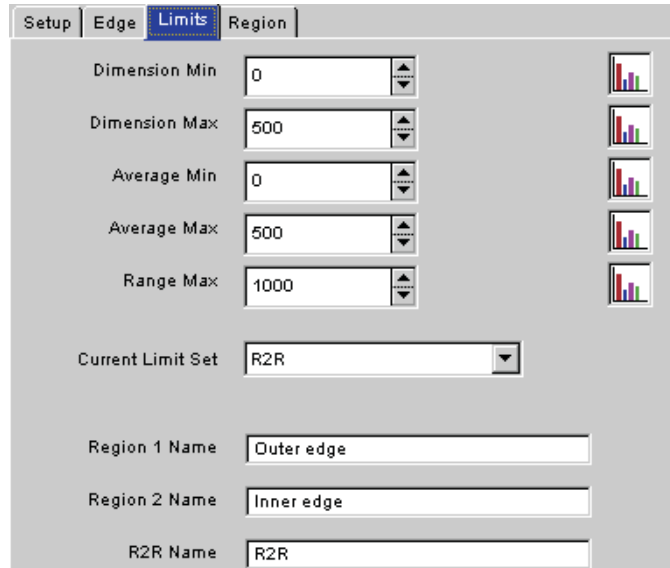
Edge menu

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. This inspection supports up to 180 Dimension Pairs.

☛ *Enable Show Measurements to see Dimension Pairs*

Use Single Setup	If checked, the system will use 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. As an example, in seal surface inspection, you may wish to have the system search Outside In as the Search Direction for Region 1. Then you may wish to have the system search Inside Out to find the edges for Region 2. In this case, you would un-check the Use Single Setup box.  <i>To save setup time, if you will be using similar edge parameters, such as Gradient, Delta, and Edge Size, you can leave this box checked, set up the common parameters, then un-check the box and set up the parameters that will be different between search regions.</i> 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. The system will use the last setting made for number of Dimension Pairs. For the parameters below, you may set the criteria differently for the two search regions if Use Single Setup is un-checked.
Max Missed Pairs	The maximum number of Dimension Pairs allowed to fail the Circle Width Dimension measurement before the whole inspection fails.
Search Direction	Inside Out searches from the inner circle towards the outer circle. Outside In searches from the outer circle towards the inner circle.
Edge Gradient	This qualifies an edge. It is the minimum difference in gray shades, between two pixels that are being compared, to be considered an edge.
	 <i>See illustrations of Edge Gradient and Edge Size beginning on page 10-29.</i>
Edge Transition	The type of edge for which to search: Light to Dark, Dark to Light, or Either. This parameter is important in determining which type of edges will be located in the image.
Edge Delta	Indicates the distance between pixel-to-pixel comparison. Increasing this value can improve sensitivity to the contrast changes of an edge. This is because most edge transitions are not sharp. Therefore, side-by-side contrast comparisons are not as strong as when the comparison is separated by a few pixels.
Edge Size	This indicates how many pixels in a row to compare (e.g., 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	This indicates whether the system should locate the first edge found that meets the Gradient criteria or to look for 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	When this is Enabled, you will be able to view the found dimension edges on the screen. Region 1 edges are cyan and Region 2 edges are shown in magenta.
Show Measurements	When Enabled, the Dimension Pairs are shown on the image.
Show Search Lines	When Enabled, the search lines between the inner and outer circles are displayed on the image.
Current Region	If the Use Single Setup box is un-checked, select a region from the drop-down list to adjust the edge parameters for each region.

Limits menu



This menu determines the tolerance of the dimension measurements.

 *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.*

Dimension Min The smallest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup. If a measured dimension is smaller than this value, the inspection fails.

Dimension Max This is the largest acceptable dimension (individual diameter) across the circle. Enter the value in a number of Dimension Units you chose under Setup. If a measured dimension is larger than this value, the inspection fails.

 *Click the graphs buttons to see the offline graph for each measurement.*

Average Min This is the smallest acceptable value for the average dimension (diameter) measured across the circle. If the average dimension is smaller, the inspection fails.

Average Max This is the largest acceptable value for the average dimension (diameter) measured across the circle. If the average dimension is larger, the inspection fails.

Range Max This is the largest acceptable difference between the Minimum distance measured, and the Maximum distance measured across the circle. If the difference is larger than this number, the inspection fails.

 *This parameter checks for ovality.*

Current Limit Set Select the current region to set its limits. Each region's limits must be set separately.
Region 1 or Region 2 Name Define a name for each region that makes sense to you.
R2R Name This is the difference in dimension measured between Region 1 and Region 2. You can give this a more meaningful name.

Graphs - Circle Width Dimension inspection

To view Offline Graphs when editing a registration/ orientation/ inspection:

- Click a graph icon (if present) next to a parameter to view its graph. Or:
- Click the Offline Graphs tab, right-click, and select an offline graph to view.

To view Online Graphs:

- Click the name of a registration/ orientation/ inspection in the statistics area, right-click, select Inspection Graphs, and select the desired graph.

 See page 3-12 for more information about graphs

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.

Circle Dimension inspection enhancements

Dimension pairs increased

This inspection now supports up to 180 Dimension pairs, up from the 36 pairs available in previous versions of software.

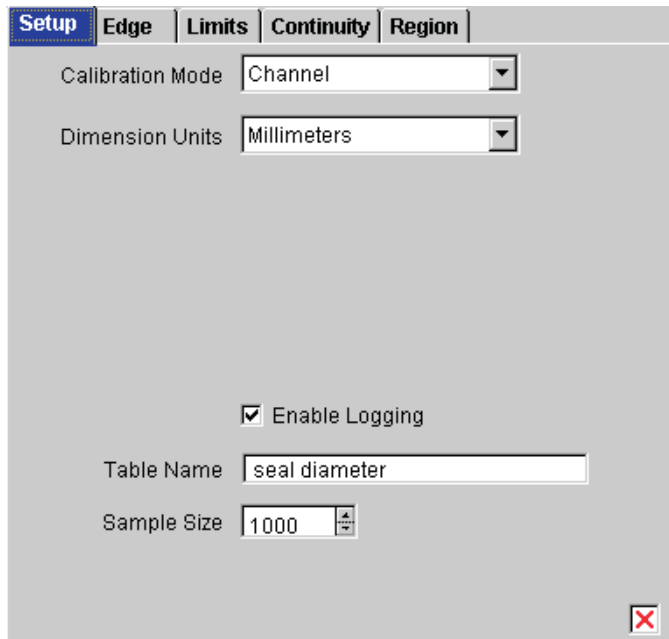
Circle Dimension Database

The Circle Dimension inspection now offers 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.

This section explains the new features of Circle Dimension inspection. For more information about this inspection, see page 10-65. The following procedure assumes you already have a Circle Dimension inspection set up in your job.

To enable Dimension database:

1. Log in as Administrator. Enter the Circle Dimension inspection menus (double-click the inspection name in the statistics area).



2. Click the Setup tab, and check Enable Logging. Set the parameters to suit your needs:

Table Name Rename the Table Name to something more useful (e.g., Rivet Diameter) so that you know where this data has been generated (limited to 19 characters).

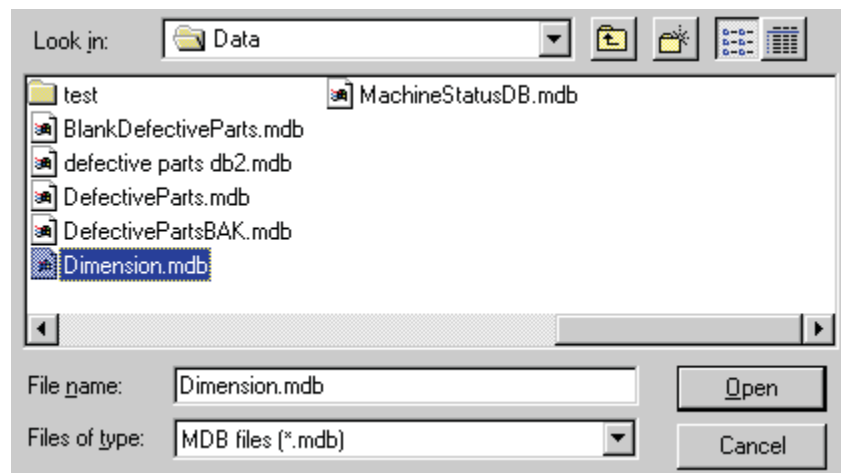
Sample Size The number of parts' data that are averaged before the information is written to the database. Note: defective parts data is not included in the average calculations.

3. Click OK and exit the Circle Dimension inspection.

Put the system online to inspect parts. The database will start collecting data when enough good dimension measurements have been taken (i.e., 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:

The database is saved as Dimension.mdb in the C:\PETProvision\Data directory. To copy the database to floppy, use the Database Detective, Copy Files to Floppy option.



Choose MDB files as File type, select Dimension as the file name, and Open. Click Compress if the database is large (move cursor over file name to see its size). Insert a floppy disk into Intellispec's drive and click Next. Exit the Database Detective.

The data collected (Min Dimension Average, Average Dimension, etc.) is shown in the sample below. A new record is created for each sample set (when the Intellispec collects data from n number of parts with good Circle Dimension inspections).

seal diameter : Table							
	ID	DateTime	MinDimensionAvg	MaxDimensionAvg	AvgDimensionAvg	DimensionRangeAvg	SampleSize
	1	2004 10:14:56 AM	376.3075	378.3345	377.3254	2.0269	100
	2	2004 10:15:44 AM	376.3075	378.3345	377.3254	2.0269	100
	3	2004 10:16:32 AM	376.3075	378.3345	377.3254	2.0269	100
*	AutoNumber)						

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 passed Circle Dimension inspection, no database information is saved.

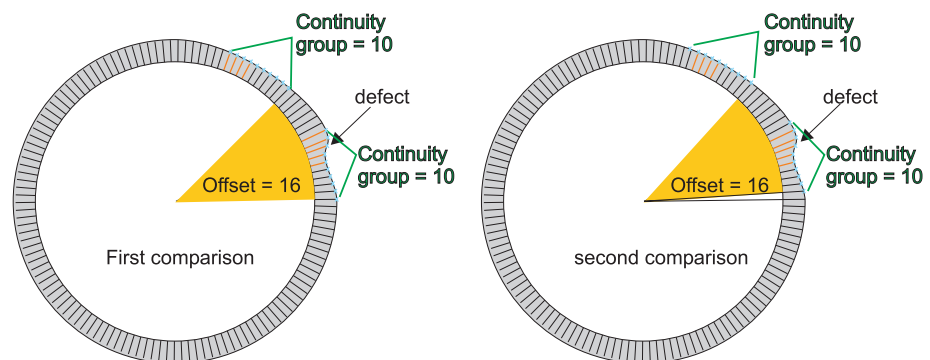
Circle Dimension Continuity

A new feature has been added to the Circle Dimension inspection that 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.

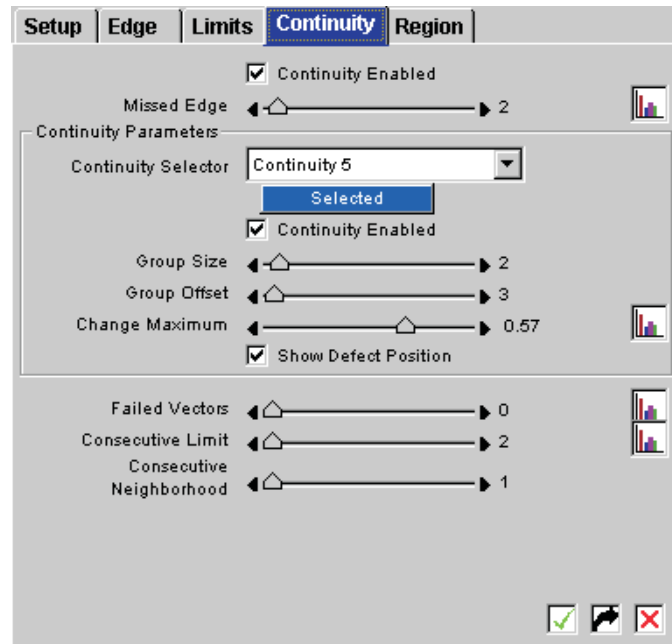


You can apply up to five continuity inspections. Set each to look for different size defects, different position defects, etc.

To set up Continuity inspection

Go to the Circle Dimension inspection, Continuity menu. Enable the Continuity inspection.

There are five continuity checks available. 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
Missed Edge

Enables or disables the continuity portion of the Circle Dimension inspection.

The number of search vectors that are allowed to fail without causing the inspection to fail. If too many edges are missed, the edge position comparison would not be accurate.

Continuity parameters

Continuity Selector
Selected

Use the Continuity Selector to determine which continuity check is being configured – each one must be enabled and configured independently.

Shows the color of the selected continuity check. #1 = gold or orange, #2 = cyan, #3 = magenta, #4 = yellow, and #5 = blue.

Continuity Enabled
Group Size

Enables the individual continuity checks (one through five).

The number of vectors to group together. The system finds the edge position of all vectors within the group, then it determines the average edge position of this group. Then it compares this average position to the average position of another group.

Group Offset

The number of vectors away to begin the next group. Increasing the offset can make the inspection more sensitive to different types of defects. A small offset value can cause the system to miss some defects that might spread across two or more groups of inspection vectors. That is because it would be comparing the edge position of two groups that are part of the same defect.

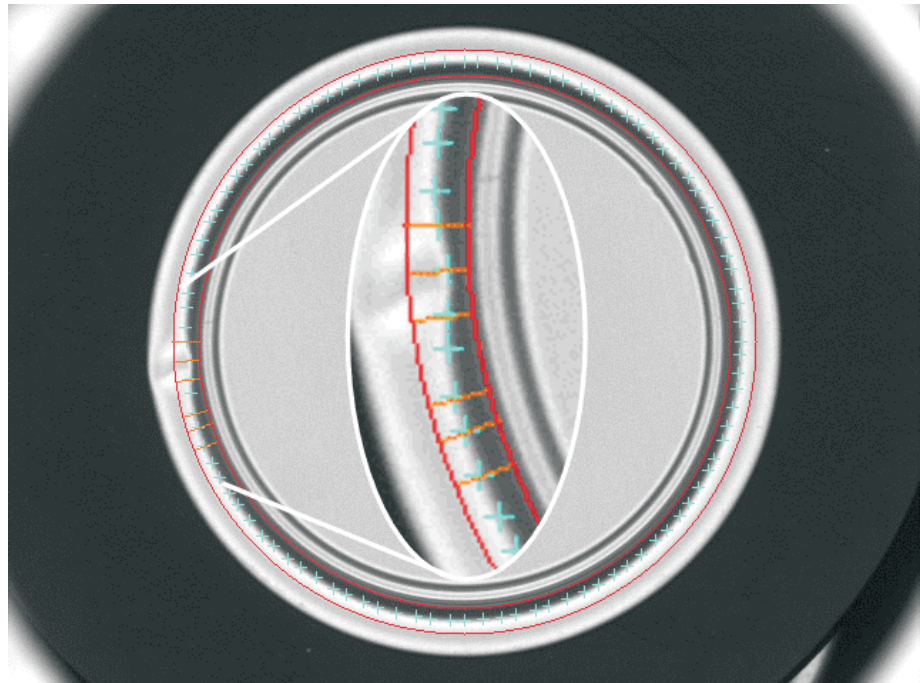
Change Maximum

To catch smaller defects, try decreasing Group Size and Group Offset parameters.

The maximum allowable change in edge position between two groups. This number is entered as a number of units specified in the setup menu (e.g., millimeters).

Show Defect Position

When this is Enabled, you will be able to see the sections of the inspection area that failed the continuity checks (if they fail). The failed vectors are displayed in the various colors of the continuity checks.



The inspection found a change in edge position where the part was crushed (top set of orange vectors). The orange lines represent the failed continuity #1 vectors. Group size =3, Group Offset = 2, Change Maximum = 1mm. You see the second (bottom) set of orange vectors displayed because they are reflecting the bad edge position.

Common Continuity parameters

Failed Vectors

The number of search vectors allowed to fail the continuity checks before the entire inspection fails. This is a total number of vectors, and is added throughout all the continuity checks. If a vector fails more than one continuity check, it counts as one vector.

Consecutive Limit

The total number of consecutive vectors allowed to fail the continuity checks before the entire inspection fails. This is a total number of vectors throughout all continuity checks (could be vectors from failing continuity checks 3, 2, and 1 consecutively on the same part).

Consecutive Neighborhood

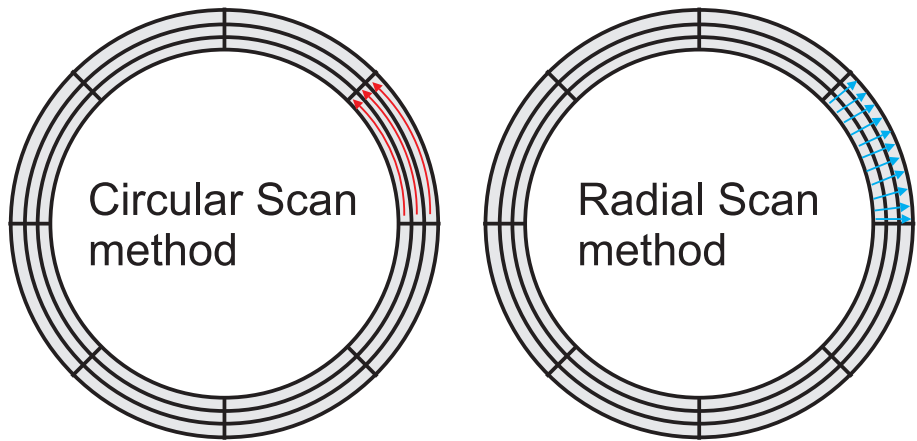
Determines what Consecutive means in the Consecutive Limit. A setting of one means that the failing vectors need to be next to each other to be considered part of the same defect. A setting of five means that if vectors #1 and #6 fail, they could be part of the same defect, and are counted in the Consecutive Failed counts.

Circle inspection enhancement

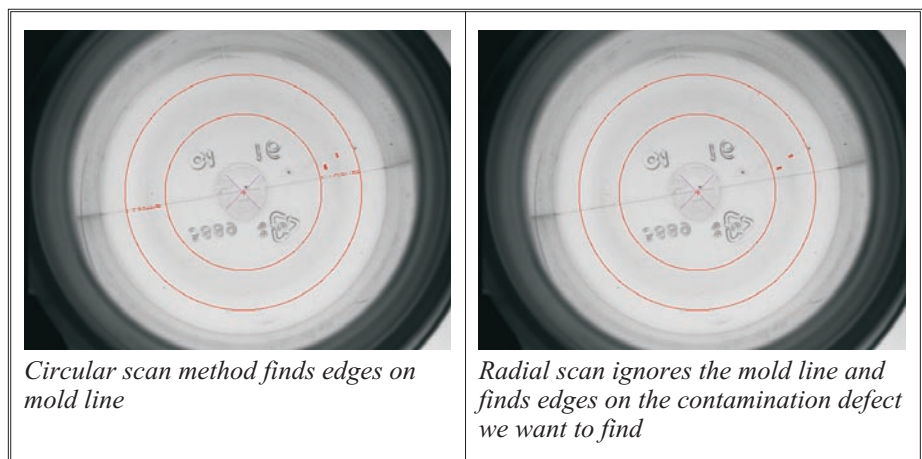
See also Edge inspection enhancement (b-35), Blob inspection enhancement (b-37), and Pattern Learn inspection (b-9).

This section describes the Scan Method that is new to Circle inspection in the Edge menu. For more information about the Circle inspection, see page 10-52.

You may now choose between Circular Scan (this is what was available previously), and Radial Scan. 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.



Edge inspection enhancement

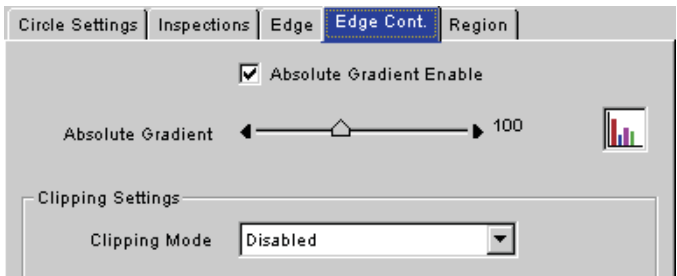
This section is a supplement to Edge inspection as described in Chapter 10 of the Intellispec Programming Guide, part number 49888.

Edge inspection is used in the following inspections:

- Circle
- Polygon
- Shape Adapt

Absolute Gradient

An Absolute Gradient parameter has been added to the Edge Cont. (Continued) menu that allows the system to reject parts if any edge comparison exceeds a certain gradient. This feature can be enabled or disabled.

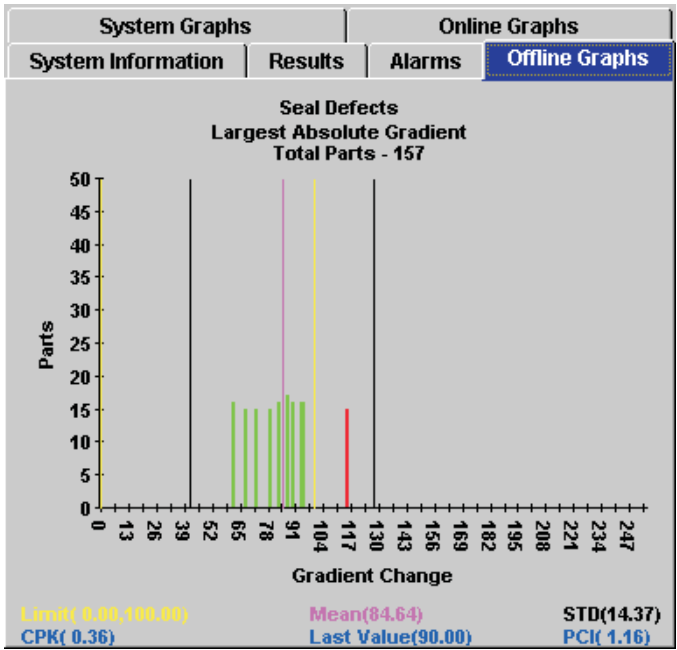


Use the Absolute Gradient slider to set the maximum gradient change allowed between inspected pixels. The pixels being compared continue to use the delta and grid spacing as specified in the Edge menu. If the difference in gray shades between any two compared pixels exceeds the Absolute Gradient, the inspection fails.

Graphs - Edge inspection

The following graph is available when the Absolute Gradient parameter is enabled. This plots the largest gradient change for each inspected part. The yellow limit is set by the Absolute Gradient parameter.

Largest Absolute Gradient



Edge Cont. menu

A slight change has been made to the Edge menus. We now have Edge and Edge Cont. (Continued) menus in place of Edge (in software 3.0) or Edge 1 and Edge 2 (in 3.00.021 & .022).

The Clipping mode feature can be found in the Edge Cont. menu (not available with Simple edge detection). See the description of Clipping mode in the descriptions of

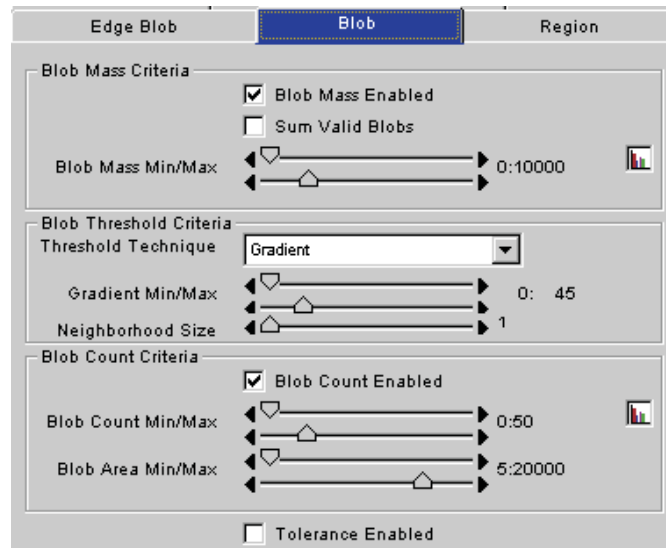
Blob inspection enhancement

This section is a supplement to Blob inspection as described in Chapter 10 of the Intellispec Programming Guide, part number 49888.

Blob inspection is used in the following inspections and registration:

- Circle
- Polygon
- Shape Adapt
- Blob Registration

A new parameter called “Neighborhood Size” is available in the Blob menu and Blob Registration menu under Blob Threshold Criteria. It is also available in the Edge Blob menu.



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.

Radial Line Integration inspection enhancement

This section is a supplement to Radial Line Integration inspection as described in Chapter 10 of the Intellispec Programming Guide, part number 49888.

Segmented Regions of Interest

New features are available with Radial Line Integration (RLI) that involve segmenting the inspection region into rings or wedge-shaped pieces. The inspection now also allows you to place the inspection region on an arc, instead of the whole circle.

The changes in menus are described below:

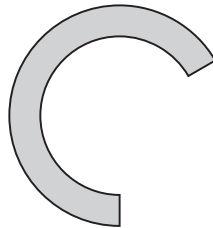
Region menu

Changes to Region menu in 3.1 software:

- Display Method parameter moved to RLI parameters menu. Only available if Segmenting is disabled.
- Arc Enabled - New parameter

Arc Enabled

To inspect just an arc instead of the whole circle, check this box. If Enabled, the system will inspect only a portion of the circle between the start and stop angles you specify. Zero degrees is the top of the circle.



Arc inspection

Use Arcs with an orientation in place. This will ensure that the arc inspection region is placed on the same location of the part regardless of the part's orientation.

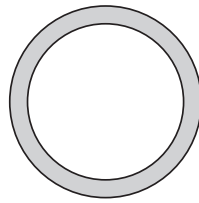
Then go to the RLI Parameters menu to determine whether to use segments, and to specify segment conditions. After, set up the remaining inspection parameters. Use the Inspections menu to add the desired types of inspections.

RLI Parameters menu

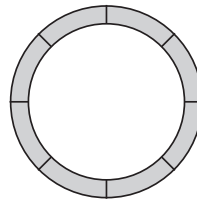
Inspections	Radial Edge	Radial Tool	Region
RLI parameters		Conditions	Clipping
Radial Grid Spacing		1.0	
Concentric grid spacing		1.0	
Segment Settings			
Segment Mode		Ring and Standard Segments	
Ring Segments		3	
Ring Overlap		0	
Segments		5	
Segment Overlap		0	
Segment Processing		Special Conditions	
Display Ring Segment		1	
Display Segment		1	
Alignment Mode		No Alignment	
Inspection Information		No information	

This menu has a new Segment Settings feature. It also has the Display Method parameter moved from the Region menu (for non-segmented inspections).

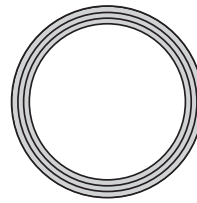
Segment Settings



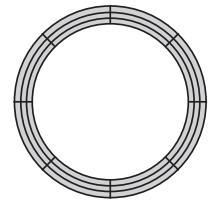
Inspection region
(no segments)



8 Standard segments
(no overlap shown)



3 Ring segments
(no overlap shown)



Ring and Standard
Segments

Segment Mode

Choose the type of segmenting (if any) to divide the inspection region. The choices are described below:

Segments disabled

The inspection region will be inspected as one continuous region.

Ring Segments

The inspection region will be divided into concentric circles.

Ring Segments

(When Ring segments is enabled) Define the number of rings (between one and 10) into which the inspection region will be divided.

Ring Overlap

(When Ring segments is enabled) Specify the number of pixels by which each segment will overlap each other. The segments can overlap from zero to 10 pixels. Overlapping ensures that pixels are not missed during inspection.

Standard Segments

The inspection region will be divided into wedge-shaped segments.

Segments

(When Segments is enabled) Define the number of segments (between one and 36) into which to divide the inspection region.

Segment Overlap

(When segmenting is enabled) Specify the number of pixels by which each segment will overlap each other. The segments can overlap from zero to 10 pixels. Overlapping ensures that pixels are not missed during inspection.

Ring and Standard Segments

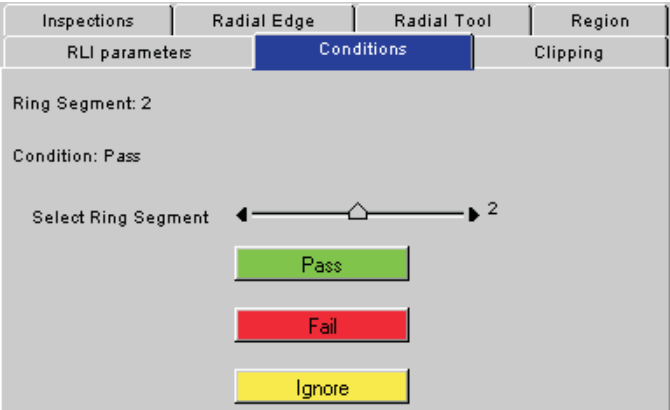
The inspection region will be divided into both concentric circles and wedge-shaped segments. Use both the Ring and Standard Segments parameters to define the number of segments. If you select Special Conditions for Segment Processing, you can define Pass/ Fail/ Ignore conditions for each segment.

Segment Processing

(When segmenting is enabled) Specify how many segments must pass for the whole inspection to pass.

- **All must pass** - all the segments must pass inspection for the RLI inspection to pass.
- **Minimum passing** - specify the minimum number of segments that must pass (through Passing Minimum parameter) for the RLI inspection to pass.
- **Special Conditions** - allows you to specify that a segment pass, fail, or be ignored. Use the Conditions menu to specify the conditions. Select (Ring) Segment to specify the conditions of each segment. Its 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

inspection segments that have a recycle logo, for example, that would normally not pass RLI inspections (if job uses orientation).

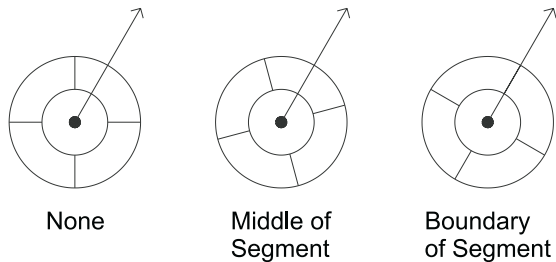


Display (Ring) Segment (When segmenting is enabled) Highlights the selected segment on screen. It will outline the segment in red if the inspection failed, or green if the inspection passed. It also displays the results on the Results tab screen about the selected segment.

The Results screen will show you how the selected segment inspection results compared to the Conditions for that segment (if Special Conditions is chosen in Segment Processing). For example, it might show that Ring Segment 2 failed when it should have passed.

Alignment Mode (When segmenting is enabled) Aligns the segments to the orientation in the present job. If you do not have an orientation programmed prior to the Radial Line Integration inspection, the system uses zero degrees (the top of the circle) as a reference point.

Your choices are None, Middle of segment, and Boundary of segment. (See below)



Inspection Information Display graphs to see the effects of parameters after they are applied.

Radial Edge, Lug, Wrinkle menus

A couple new parameters are available if the inspection was divided into Segments and/or Ring Segments.

Display Segment or Display Ring Segment Highlights the selected segment on screen. It will outline the segment in red if the inspection failed, or green if the inspection passed. It also displays the results on the Results tab screen about the selected segment.

The Results screen will show you how the selected segment inspection results compared to the Conditions for that segment (if Special Conditions is chosen in Segment Processing). For example, it might show that Ring Segment 2 failed when it should have passed.

Graphs – Radial Line Integration

Two new graphs are available if Ring Segmenting or Standard Segmenting are enabled:

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 segment. Segment number is displayed across the bottom of the graph.

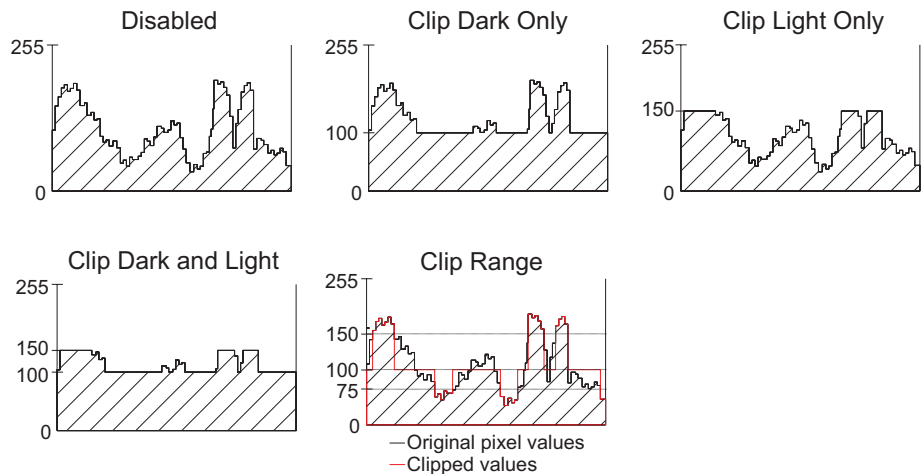
Radial Line Integration Segment Error

(If Segmenting is enabled in RLI Parameters menu) Plots the number of errors that occurred within each segment. Segment number is displayed across the bottom of the graph.

Clipping

The Clipping feature is now available in Radial Line Integration. It is used to change gray shades to a specified value. It allows you to ignore light reflections or normal grain in a part so that the defects can be detected more easily. 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.



RLI inspection results – color coding

The inspection vectors are color coded based on how close they are to peak value. The red inspection vectors have the most severe moment; they are between 95 and 100 percent of the peak value. The yellow inspection vectors are between 90 and 95 percent of the peak value. The remaining vectors (hits) are displayed in magenta.

See page 10-70 of the Intellispec Programming Guide (part number 49888) for a complete description of Radial Line Integration. The Moment and Peak parameters are also described on page 10-75.

Light Meter - new

A new inspection has been added to Intellispec to adjust the lighting automatically while the system is online. 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.

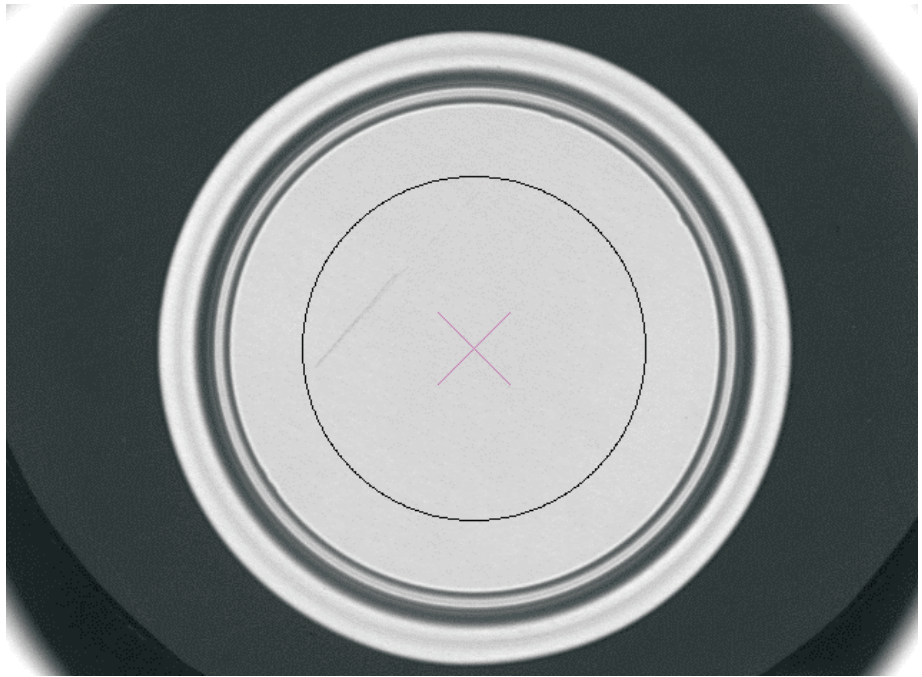
Light Meter inspection is available in the following Product Types (inspections available if your job or channel product type = one of the following):

- Base
- Neck
- Easy Open Ends
- Caps & Closures
- Beverage & Food Ends
- Preforms

Create the Light Meter inspection

Administrators only

Within the inspection list, preferably after a registration, right-click for Inspection Options, and choose Add, Inspection, Light Meter. 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.

Adjust the Light Meter parameters

Light Meter Parameters Region

Light Meter Settings

Grey Level Range: 0:255

Parts Per Check: 5

Checks Per Update: 5

Grid Spacing: 1

Stock Change Settings

☒ Stock Change Enable

Check Parts: 2

Light Meter Settings

Gray Level Range

The system measures the gray level of each pixel in the 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.

Parts Per Check

Specifies the number of parts that will be inspected between gray level checks.

Checks Per Update

Specifies 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.
<i>Stock Change Settings</i>	
Stock Change Enabled	When this is enabled, 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 20 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.
Check Parts	Specifies how many consecutive parts (2, 3, or 4) must be found with a gray level difference of 20 or more from the Gray Level Range. This would indicate a change in stock material.

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

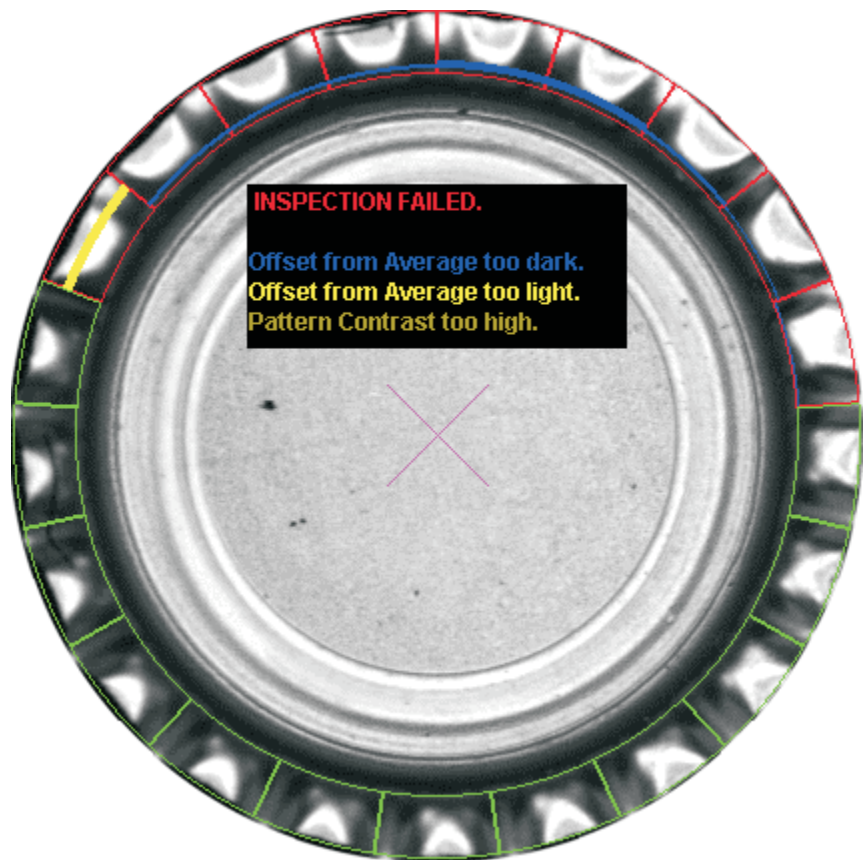
The Harmonic inspection is a new inspection designed for inspecting parts that have radially symmetric features, such as metal crowns, plastic closures, and lugged closures.

Harmonic inspection is available for the following Product Types:

- Base
- Seal Surface
- Easy Open Ends
- Caps and Closures
- Beverage and Food Ends

How Harmonic inspection works

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.



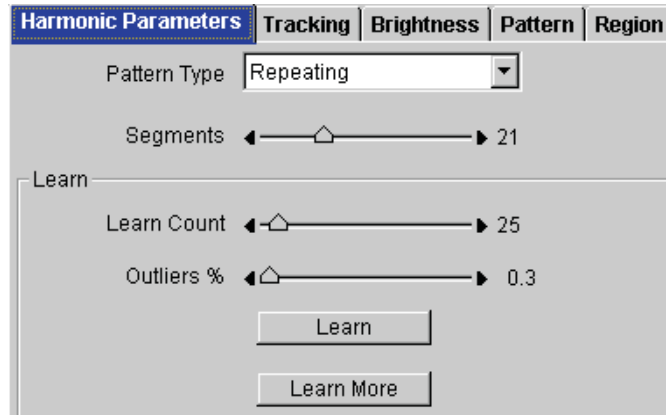
The results are color-coded with the graphics on the image. This example shows the Offset from Average being too dark (shown in blue), and the Offset from Average being too light (shown in yellow), and Pattern Contrast too high (shown in gold).

Place the Harmonic inspection region

Using the Region menu, place the region over the desired inspection area. Go to the Harmonic Parameters tab and choose a Pattern Type.

Adjust the parameters

Harmonic Parameters menu

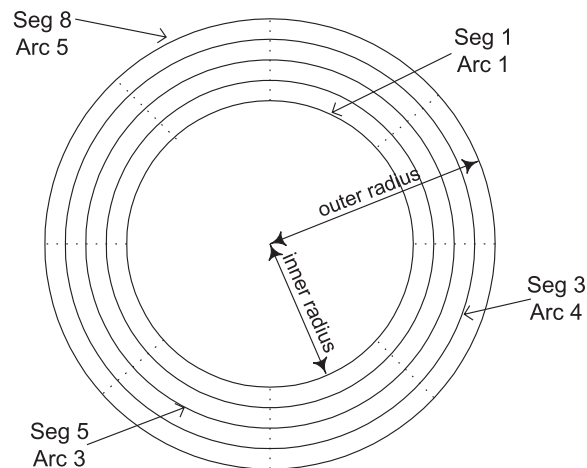


Pattern Type

There are two types of patterns from which to choose to inspect different types of parts.

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.

Segments

Set the number of segments equal to the number of repeating pattern sequences around the part. You may inspect up to 72 segments.

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 pattern of your part. More images will give a better example of the overall inspection population.

- Outliers %** This specifies what 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.
- Example: if there are 20 segments in the region and Learn Count is 50, then the total population of learned arc parameters for a given radius is 1000 (i.e., 20 x 50). Then if Outliers % is set to 0.3%, then the inspection will exclude the three (i.e., .003 x 1000) most extreme samples. For parameters with Min/ Max limits (e.g., Brightness Min/ Max), this number of samples will be excluded from both upper and lower ranges.
- Learn** Click the Learn button to allow Intellispec to snap the correct number of images and collect pattern information. Make sure your conveyor is running so that the correct number of parts may be examined.
- 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:
- 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 Check this box to enable 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 (nearer the inner radius) to dark.
- Edge (Dark-to-Light)** A gray level transition in a radius that goes from dark (nearer the inner radius) 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.
Nominal Position	Set this to where you expect the feature to normally fall. This is displayed in magenta on the image.
Variability	Set this the number of pixels from the nominal position that the found feature is allowed to fall (in either direction). Please note that the inspection region effectively shrinks twice the width of the variability factor, so be careful when using this parameter. You will see the new inspection region highlighted in cyan on the image as you adjust this parameter.

Brightness menu

Harmonic Parameters
Tracking
Brightness
Pattern
Region

Display Radius
0

Average Brightness

Brightness Range
125:200

Dark Tolerance
4

Light Tolerance
5

Offset from Average

Offset Range
-83:172

Dark Tolerance
2

Light Tolerance
2

☒ Show All Advanced Parameters
☒
☐
☐

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 is 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.

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 is set by adjusting Dark Tolerance and Light Tolerance.

☛ *Keep in mind that 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)

Harmonic Parameters | Tracking | Brightness | **Pattern** | Region

Display Radius ← 14

Pattern Contrast

Contrast Range ← 0.0: 8.1

Low Tolerance ← 2.5

High Tolerance ← 3.5

Pattern Difference

Nominal Difference ← 28.4

Tolerance ← 1.6

☒ Show All Advanced Parameters

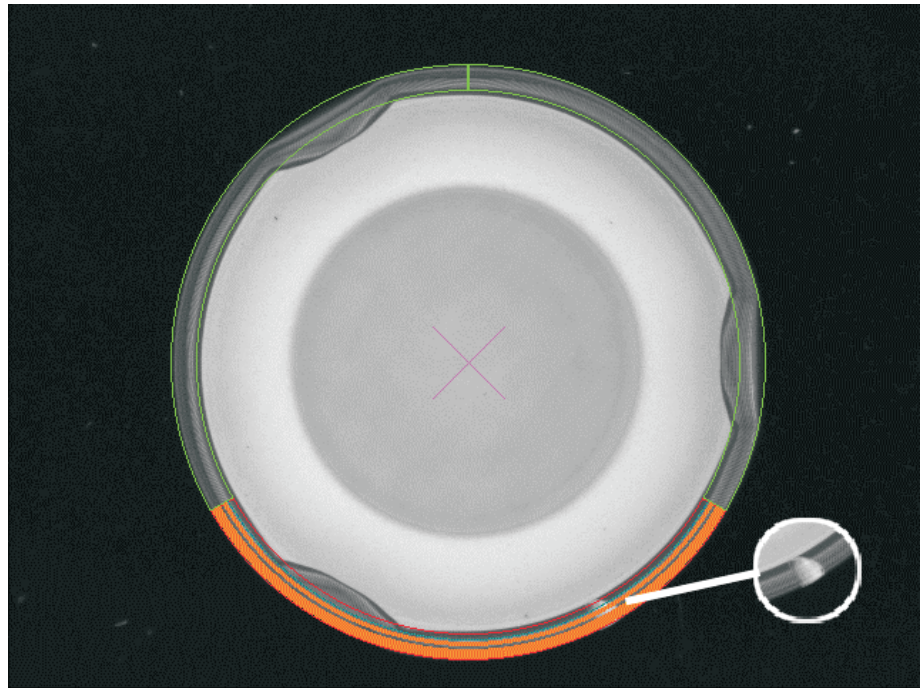
This menu is available when Repeating Pattern Type is chosen in the Harmonic Parameters menu. The Pattern menu controls the detection of defects based on a frequency analysis of the Learned pattern. A frequency analysis is the determination of the number of occurrences of an event within a given interval.

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 is set by adjusting Low Tolerance and High Tolerance.



Pattern Contrast too high

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.

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 criteria 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.

Harmonic Parameters	Tracking	Brightness	Pixel	Region
Radial Select ◀ ◻ ▶ 4				
Light Defects				
Light Defect Size ◀ ◻ ▶ 5				
Contrast Threshold ◀ ◻ ▶ 0				
Contrast Tolerance ◀ ◻ ▶ 0				
Dark Defects				
Dark Defect Size ◀ ◻ ▶ 5				
Contrast Threshold ◀ ◻ ▶ 0				
Contrast Tolerance ◀ ◻ ▶ 0				

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.

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

Define 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.

Line Integration inspection

For you expert users, Line Integration is like a cross between Radial Line Integration and Tracker Continuity inspection, except in a rectangular region.

Line Integration is available for Neck and Preform product types.

How Line Integration inspection works

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.

Place the Line Integration inspection region

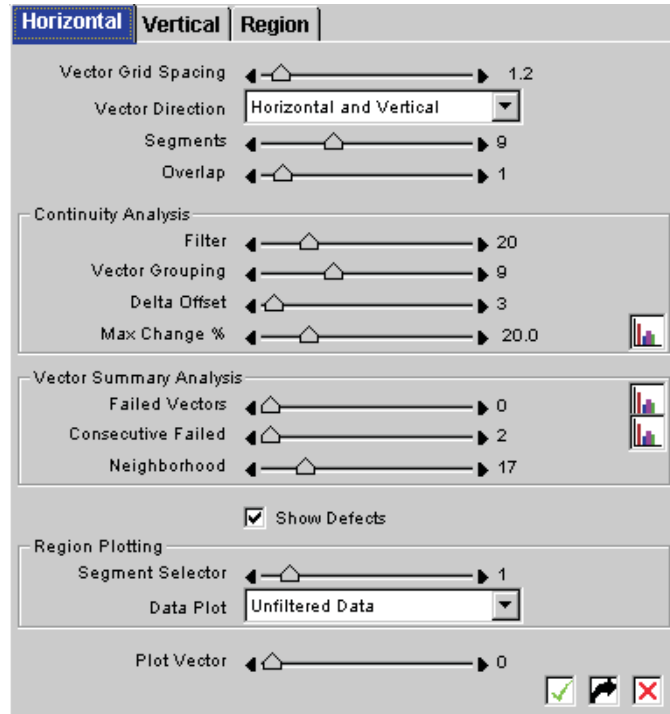
Place the rectangular region over the area you want to inspect. If desired, use the Rotation parameter to adjust the region. We recommend that you only use Rotation if your Line Integration inspection follows an Orientation. Otherwise, the inspection region may not fall correctly on all inspected parts.

Click the Show Region box to see the inspection vectors on the image. You may want to view these while adjusting parameters, but may want to turn them off while the system is inspecting parts.

Adjust the 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

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.

 To see the search vectors, go to the Region menu and check the Show Region box.

Vector Direction

Choose a direction in which the search regions will search for edge transitions. Your choices are Horizontal, Vertical, or both Horizontal and Vertical. If you choose both, there will be two menus in which you need to adjust parameters separately for each direction.

Segments

Divide the inspection region into a number of segments between one and 25. In the Results tab, these are labeled S1, S2, S3, etc.

Overlap

Specify the number of pixels by which each segment will overlap each other. The segments can overlap from zero to 15 pixels. Overlapping ensures that pixels are not missed during inspection.

Continuity Analysis

The continuity settings allow you to define the size of defects you want to catch.

Filter

This is a low-pass (“smoothing”) filter used to reduce 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. The setting range is 0 to 100. Increasing the value decreases sensitivity to high frequency variance.

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.

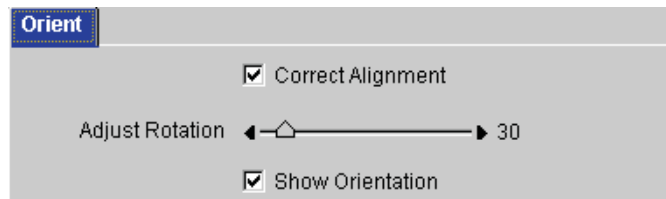
Vector Grouping

The number of vectors to group together. The system computes the average gray shade of all vectors within the group, then it determines the average gray shade of this group. Then it compares this average gray shade to that of another group.

Delta Offset	The number of vectors away to begin the next group. Increasing the offset can make the inspection more sensitive to different types of defects. A small offset value can cause the system to miss some defects that might spread across two or more groups of inspection vectors. That is because it would be comparing the gray shades of two sections that are part of the same defect.
Max Change %	The maximum allowable change in gray shade between two groups. This number is entered as a percentage of change. A higher percentage means the inspection is less sensitive and therefore a greater number of defects will pass through.
<i>Vector Summary Analysis</i>	
Failed Vectors	The number of search vectors allowed to fail the continuity check before the entire inspection fails. The Horizontal and Vertical vectors are counted independently.
Consecutive Failed	The total number of consecutive vectors allowed to fail the continuity checks before the entire inspection fails.
Neighborhood	Determines what Consecutive means in the Consecutive Failed limit. A setting of one means that the failing vectors need to be next to each other to be considered part of the same defect. A setting of five means that if vectors #1 and #6 fail, they could be part of the same defect, and are counted in the Consecutive Failed counts.
Show Defects	Displays the failed vectors on the image. If Show Region was enabled in the Region menu, the region vectors are turned off, and the failing vectors are displayed.
<i>Region Plotting</i>	
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. This display is only visible when you click the Segment Selector bar.
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.
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.

Orientation Stealer

This new orientation option allows you to use information from a previous orientation even after a new registration has been run. Orientation Stealer is available for the following product types: Base, Seal, EZO Ends, and Caps & Closures.



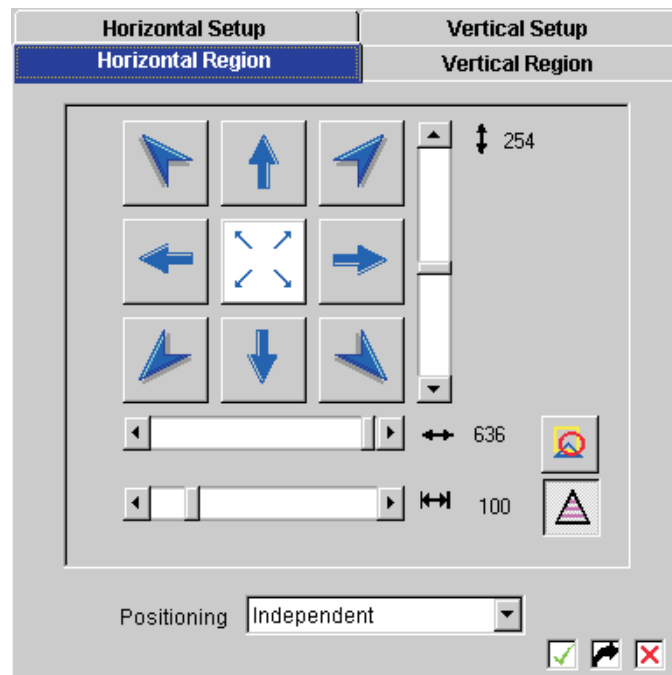
Correct Alignment	This assumes that a fixed offset exists between the previous orientation and the area you are about to inspect. That is, the registration just before Orientation Stealer has a different center than the registration used for the previous orientation. Correct Alignment allows the orientation 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.

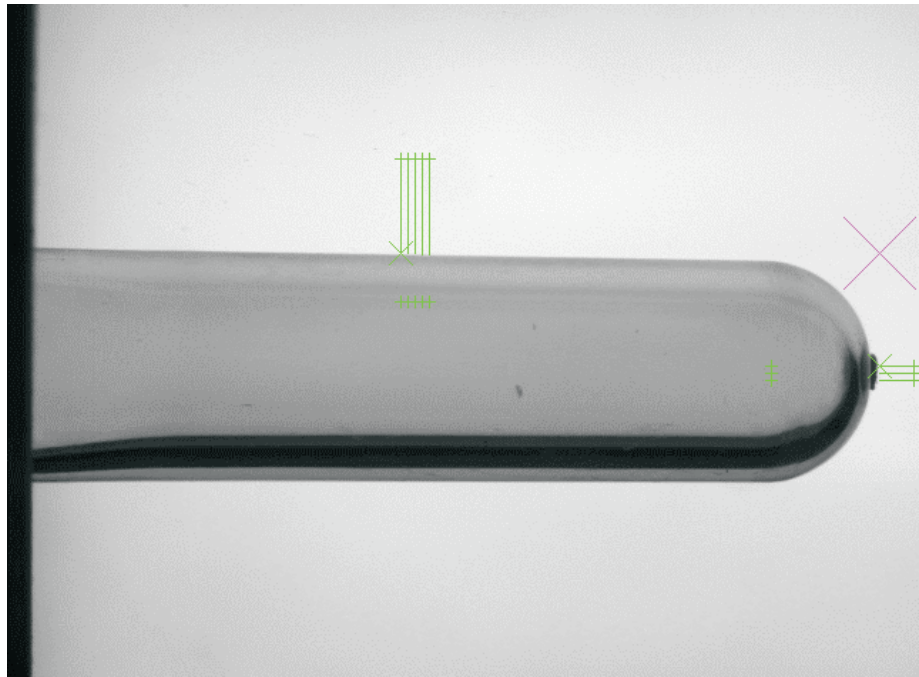
X-Y Registration enhancement

A new feature has been added to X-Y registration to make the X and Y search vectors operate independently of one another. Previously, you could use just Horizontal or just Vertical, or Horizontal/ Vertical or Vertical/ Horizontal. In the case of the last two options (e.g., Vertical/ Horizontal) the second direction (Horizontal) would be placed after the Vertical edge was found. You can still use this method by choosing Dependent positioning in the Region menus.

With the new feature, you may choose Independent positioning in the Region menus. This way, the second search vector will search based on its initial 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.

Registrations – Independent/ Dependent

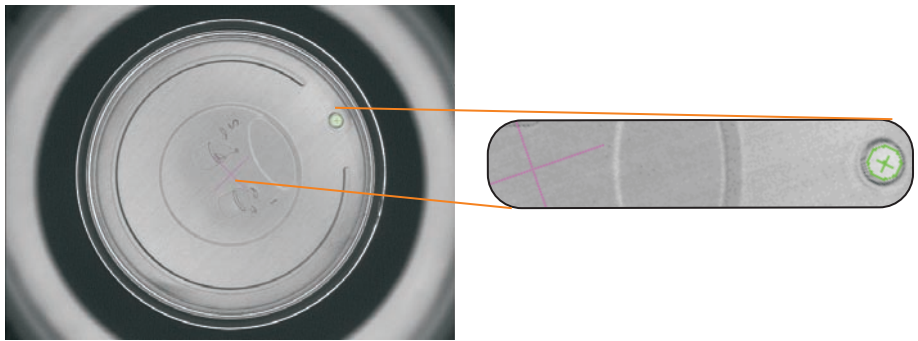
In previous versions of software, each registration that you programmed into a job operated independently. That is, they would start from scratch to find the center of the part or feature. Now, you can program subsequent registrations to use the information from the previous one.

☞ *Note that all **Orientations** are Dependent on the previous Registration. You cannot make them independent.*

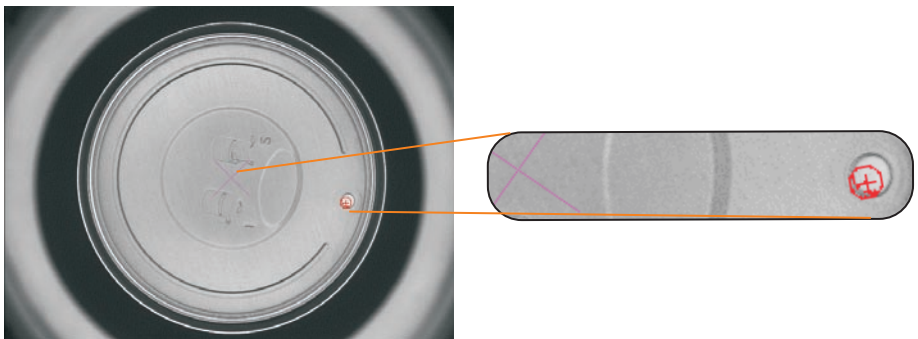
For example, say you have an orientation on a part to find a feature such as a rivet on the product side of an EZO end. You could use that orientation as reference to a new registration to find the center of that rivet, then ultimately use a circle inspection to inspect that rivet.

Without this new feature, you could place that circle inspection using that orientation (without an additional registration), but have no guarantee that it would be centered on the circle of interest.

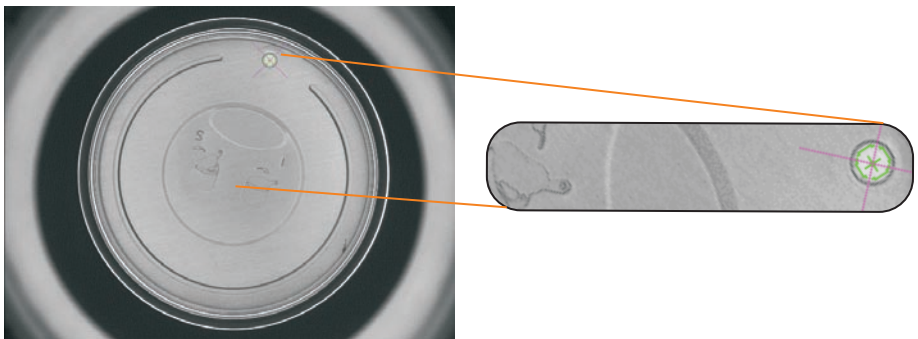
The first image shows a programmed circle inspection using the orientation.



But the next part comes along and is oriented and centered differently in the field of view. That circle inspection is oriented, but is not centered where we want it.



Now we programmed a Circle Registration dependent on the Orientation, and the Circle Inspection that follows is now centered AND oriented properly.



To make a registration dependent:

Select the name of a registration that you want to make dependent on the previous one. 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.

	Set up the correlation information by clicking the System Configuration button, Correlation tab. Check the Track Machine Parts box. Use the following parameters to customize correlation in your system.
Total Machine Parts	Select the number of correlation sensors in your system (1-4).
Machine Part #n name	Rename each machine part to something more recognizable to you (e.g., Cavity, Spindle, or Liner Gun #1).
Number	Set the number of components in each machine part (e.g., 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 for example) and the actual parts. You may need to do this if you have changed machine parts or have moved the correlation sensor. This information is required to be correct for the inspection system to track components properly.
Outfeed Transfer Sequential	(Advanced parameter) 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) Enable this if your system is a dual cavity machine.
Forced Reject	Click this button to open the Forced Reject menu. Please see page 6-4 for more information about this feature.

Correlation – Images with machine part numbers

A new feature has been introduced in Feature Pack 2 for systems with correlation enabled. 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.

Part Rate: 124

Base [Base Inspection 5]

Inspection	Total	Defects	Defect %	Last 10000	Last 10000%
Gate Defects		54	10.247	54	39.416
Around the Gate Defects		81	15.370	81	59.124
Base Fold Defects		137	25.996	137	100.000
>True Center		98	18.596	98	71.533

Date/Time	Machine Part #1	Machine Part #2	Machine Part #3	Machine Part #4
2004-01-27 16:1...	2	31	5	6
2004-01-27 16:1...	1	30	4	5
2004-01-27 16:1...	10	29	3	4
2004-01-27 16:1...	9	28	2	3
2004-01-27 16:1...	8	27	1	2
2004-01-27 16:1...	7	26	8	1

Machine Part (blowmolder parts)

+ Base [Base Inspection 5]

Intellitrainer

Hand icon

Hand icon

Hand icon

Hand icon

(Cavity) 1

(Spindle) 2

(Infeed TA) 3

(Outfeed TA) 4

1

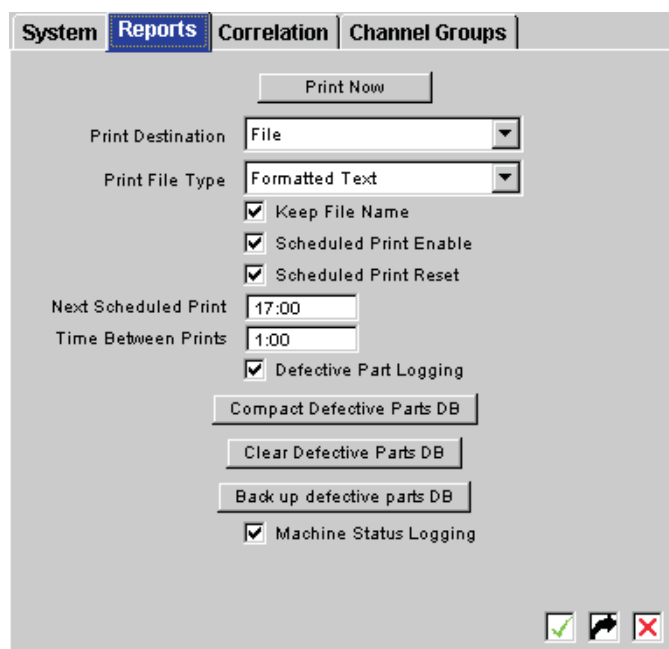
2

3

4

Reports

New features have been added to the Reports tab in 3.1 software. This section explains the new features. For more information about the original features found in 3.0 software, refer to page 3-4 of the Intellispec 3.0 Programming Guide (p/n 49888). This is the new menu:



Defective Parts Database new features are discussed on page b-64.
Machine Status Logging is discussed on page b-65.

Print File Type

Administrators only

A new feature has been added that allows you to select the type of format in which to save the inspection statistics. This is available when you use scheduled printing or the Print Now button in the System Configuration, Reports menu. Previously, when the Print Destination was File or Printer & File, the file generated was saved as a text (.txt) file.

Now you may select from three file types:

Formatted text

This is how the files were saved in previous versions of Intellispec. When printing to a File, the system prints the inspection statistics data to a text (.txt) file in the C:\PETProvision\Reports folder.

One file is created for each channel (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.

In Feature Pack 2 software, the Last Statistics Reset Date and Time were added to this report.

Comma Separated Variable

The system prints the inspection statistics to a .csv file into the C:\PETProvision\Reports folder. 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.

Excel .xls

Already formatted to open easily in Microsoft Excel, this file contains the inspection information for all channels in the active database, plus the Channel Group information.

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.

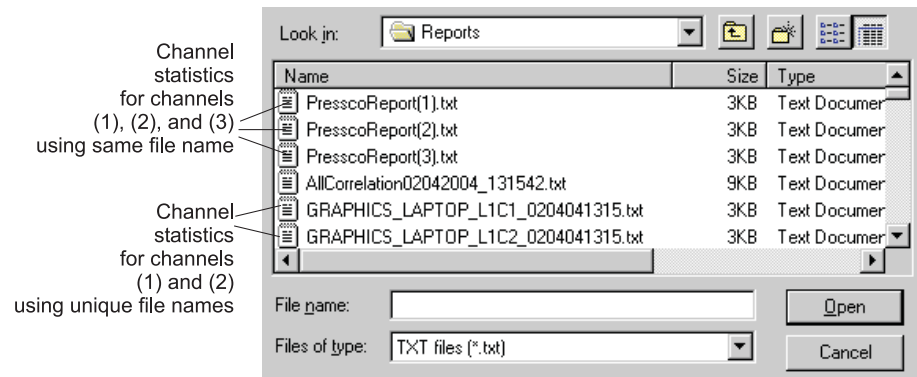
Note the following:

- Scheduled Printing must be enabled for this feature to be available
- The statistics reports will Keep File Name if generated by scheduled intervals, by the Print Now button in the Reports menu, or if someone right-clicks a tab in the statistics area and prints channel statistics to file (from System Overview tab or Channel *n* tabs).

☛ *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 (saved as .txt files) that were saved as unique file names, and as generic names (one per channel).



Printing the system statistics

Any logged in user may print the statistics to a printer, to file, or both. Log in with your name and password. Right-click on any statistics tab (System Overview, Lane *n* Overview, or Camera *n*) and select Print Statistics. Choose Printer, File, or Both.

To copy this data to floppy diskette to use outside of the Intellispec, log in as Mechanic-level user or higher, use the Database Detective Copy Files to Floppy function, and follow the instructions given on screen, or in the Intellispec Programming Guide (p/n 49888) page 9-14.

Printing statistics to file

All logged in users

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 (e.g., Pocket instead of Machine Part-1) as they can be customized by the Administrator in the System Configuration menus.

Logged-in user	When you select this:	What:	This is printed:
Operator level and higher	Right-click System Overview tab, Print Statistics to File	Inspection statistics for all channels.	One text file for each channel SysID_Camera n_Date_Time.txt
Operator level and higher	Right-click Lane <i>n</i> Overview tab, Print Statistics to File	Summary of defects for all channels, and Last 50 correlation defects.	Lane <i>n</i> Channels_Summary_Date_Time.txt [Last_50_Correlation_Defects_Date_Time.txt]
Operator level and higher	Right-click Camera <i>n</i> tab, Print Statistics to File	Inspection statistics for one channel, and Last 50 correlation defects 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 #1 tab, Print Statistics to File] [Cavities tab on BNS]	Correlation statistics for Machine Part #1	[Machine Part #1_Date_Time.txt]
Operator level and higher	[Right-click Spindles tab, Print Statistics to File] [Spindles tab on BNS]	Correlation statistics for Machine Part #2	[Machine Part #2_Date_Time.txt]
Operator level and higher	[Right-click Machine Part #3 tab, Print Statistics to File] [Infeed TA on BNS]	Correlation statistics for Machine Part #3	[Machine Part #3_Date_Time.txt]
Operator level and higher	[Right-click Machine Part #4 tab, Print Statistics to File] [Outfeed TA on BNS]	Correlation statistics for Machine Part #4	[Machine Part #4_Date_Time.txt]
Administrator	System Configuration Reports tab, Scheduled Print or Print Now	Inspection statistics for all channels, plus total correlation defects for all channels, 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) [AllCorrelation_Date_Time.txt]

Administrator	System Configuration Reports tab, Scheduled Print or Print Now	Inspection statistics for all channels and channel groups. [No correlation information printed]	If Print File Type = Comma Separated Variable: SysID_Date_Time.csv – Channel data (All channels & channel group info. included)
Administrator	System Configuration Reports tab, Scheduled Print or Print Now	Inspection statistics for all channels and channel groups. [No correlation information printed]	If Print File Type = Excel xls: SysID_Date_Time_Ch. xls (All channels & channel group info. included)

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:\PETProvision\Reports folder. To retrieve these files and use them outside of the Intellispec, use the Database Detective. Instructions for copying these files may be found on page 3-5 of the Intellispec Programming Guide (p/n 49888).

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

Defective Parts Database

This is a Microsoft Access database that can be generated by the system.

The Defective Parts Database is generated if Defective Part Logging is enabled in the System Configuration menu under the Reports tab. Only Administrators may enable this feature. If the defective part logging is enabled, the database saves the information for each defective part as it occurs when the system is online.

A new report has been added to the defective parts database. It is called “Reason Inspection Failed”. It lists the indicator value results for all inspections, recorded with each part’s unique part ID.

A sample of the new report 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
	11	9	Edge Count	70
	12	10	Edge Count	27

Also, a new field was added to the Parts table that displays “Total Parts”. This quickly shows you how many parts failed on that particular channel. The new table is shown below.

Part : Table											
ID	JobNum	JobName	ChannelN	ChannelName	TotalParts	ISPECPartID	Cavity	Spindle	InfeedTA	OutfeedTA	DateTime
316	5	Base Inspection	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
* (number)	0		0		0	0	0	0	0	0	

Copying Defective Parts Database to your PC

Defective Parts Database is saved under the C:\PETProvision\Data folder. Since this file can get larger than what will fit on a floppy disk, we recommend that you burn it to CD to transport to your PC. To burn the CD, follow the instructions beginning on page b-7 (for copying images). When selecting files to burn, scroll to the \PETProvision\Data folder and select **DefectiveParts.mdb**.

Machine Status Logging

A new database has been added that reports the status of the Intellispec system. 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).

To enable Machine Status Logging, Log in as Administrator. Click System Configuration button, Reports tab. Check the Machine Status Logging box.

The Machine Status log is saved in the C:\PETProvision\Data folder. To copy it to a floppy to transport it to your PC, use the procedure described on page b-65, and choose MachineStatusDB.mdb as the file name.

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
	11	04 11:10:58 AM	Yellow Off	No User Logged In
	12	04 11:57:02 AM	Green 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.

Extended I/O assembly

Additional I/O ports have been added that offer more process monitoring and control for your system. These are available through an Extended I/O assembly included in your system’s hardware. The I/O screen shown below is valid for 3.1 software and is accessible through the Diagnostics button, I/O tab, I/O testing button (Mechanic user level and higher).

Inputs							
0	Channel 1 Encoder	Channel 2 Encoder	Channel 3 Encoder	Channel 4 Encoder	Reject container full	Sidel door status	Ch. 1 part present
8	Ch. 3 part present	Ch. 4 part present	Transfer arm index	Spindle index	Cavity index	Pocket detect	Ch. 1 reject confirm
16	Ch. 3 reject confirm	Ch. 4 reject confirm	Keyboard recover	AC power failure	Low battery backup	High temp.	Clear Alarms
24	Activate Inputs 25, 26, 27	Print Stats	Reset Stats	Print Indicator Values	Not assigned	Not assigned	Not assigned
32	Channel 1 reject	Channel 2 reject	Channel 3 reject	Channel 4 reject	Ch. 1 good part	Ch. 2 good part	Ch. 3 good part
40	Ch. 1 part complete	Ch. 2 part complete	Ch. 3 part complete	Ch. 4 part complete	Ch. 1 fire strobe	Ch. 2 fire strobe	Ch. 3 fire strobe
48	Prog. Alarm output 1	Prog. Alarm output 2	Prog. Alarm output 3	Prog. Alarm output 4	Lighting reset	Online status	Visual alarm
56	Warning indicator	Watch dog	Not assigned	Not assigned	Not assigned	System State (online/offline)	Part Present 1
64	Part Present 3	Part Present 4	Group output one	Group output two	Group output three	Not available	
72							
80							
Outputs							

The new I/O functions are listed below:

I/O assignment	Function	Type	Description
I/O3-15, CLR	Clear Alarms	Input	Clears all active alarms
IN01	Activate	Input	Alerts to application software to read the status of inputs Print Statistics, Reset Statistics, and Print Indicator Values Graphs and take appropriate action
IN02	Print Statistics *	Input	Initiates a print of the current job statistical results
IN03	Reset Statistics *	Input	Initiates a reset of the current job statistics
IN04	Print Indicator Value Reports *	Input	Prints a report for each active indicator value for all currently running inspections
OUT01-OUT04	Part Good (n) **	Output	Produces a pulse of (user definable) length for each good part that passes through the lane. See “Pass Pulse Width” in part tracking section of Intellispec Programming Guide.
OUT05-OUT08	Inspection Complete (n) **	Output	Produces a pulse of (user definable) length for each part that passes through the lane. See “Complete Pulse Width” in part tracking section of Intellispec Programming Guide.
OUT09-OUT12	Programmable Alarm (m)	Output	User selectable outputs tied to the activation of alarm. Outputs go active when alarm initiates, and go inactive when alarm is cleared.
OUT13	System State	Output	Indicates whether the system is Online or Offline Online - active Offline - inactive
OUT14-OUT17	Part Present (n)	Output	Produces a pulse for each valid part present
OUT18-OUT20	Inspection Group	Output	Produces a pulse when any inspection within any group assigned to the output fails.

* Must be used in conjunction with input Activate.

** Not new to Extended I/O

n - Four different outputs but number must be tied to an active lane

m - Four different outputs, all available through user discretion

 More information about the Extended I/O assembly and the use of its I/O modules may be found in Intellispec Hardware Guides released in 2003 or later. Contact Pressco if you do not have this information - it is available in .pdf format.

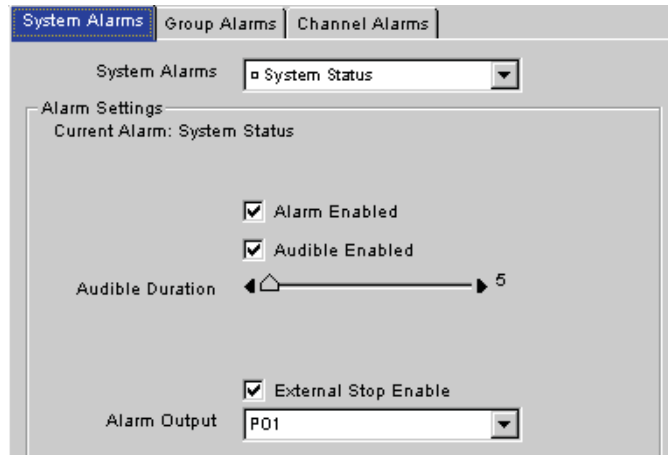
External Statistics and Report activation

Inputs IN01 through IN04 allow you to generate an input signal that will cause the Intellispec to print the system statistics, reset the statistics, or print indicator values. Input IN01 must be energized in order for inputs IN02-IN04 to work. Details about

these signals and sample circuits may be found in the Intellispec Hardware Guide within the Extended I/O assembly section.

Alarms - Programmable Output

The 3.1 software includes changes to the Alarms that offer up to four Programmable Outputs.



The parameter formerly labeled Blow Molder Door Enable is now called External Stop Enable. In addition, there are now four Programmable Outputs (PO1 - PO4) available 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.

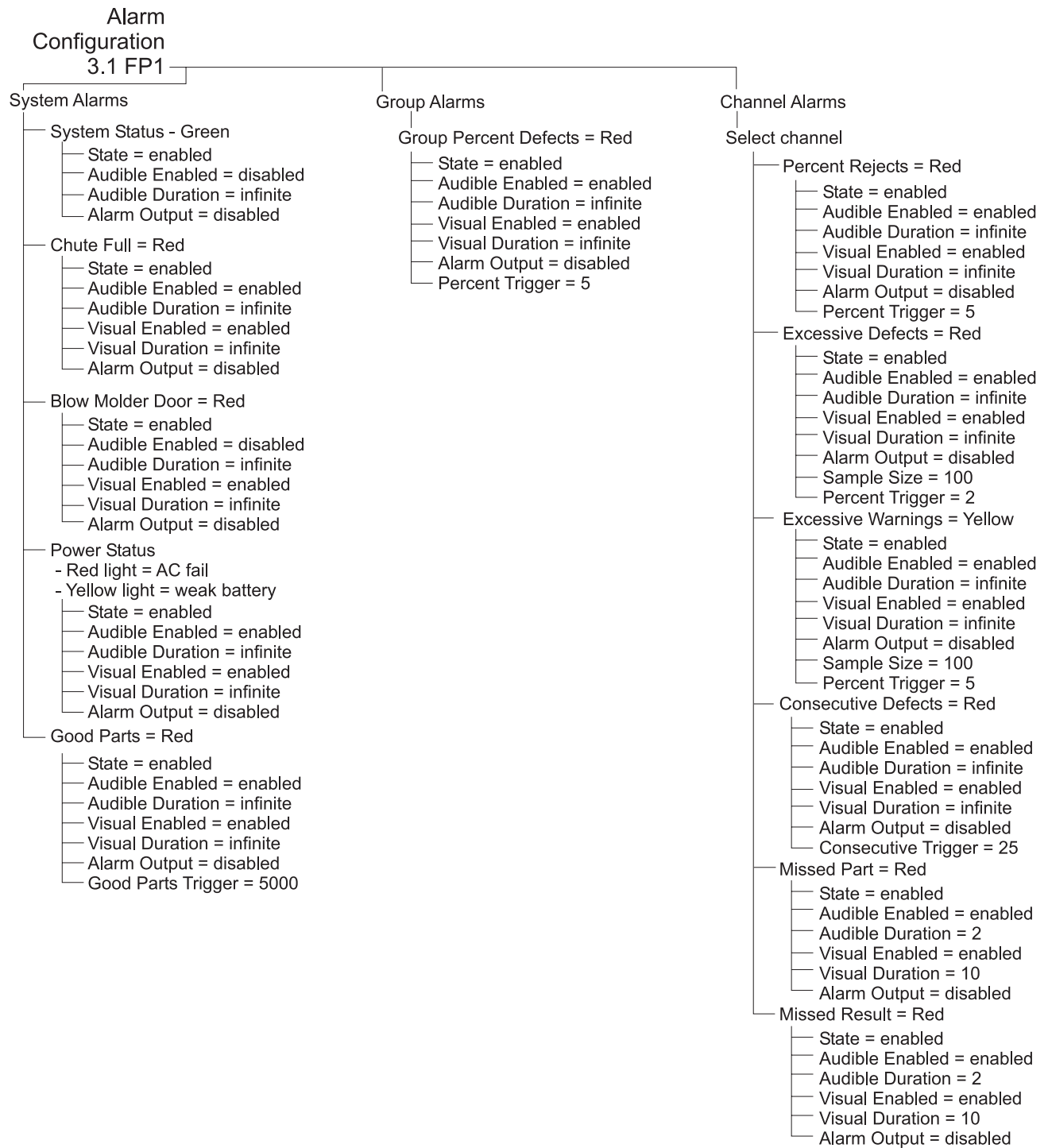
For example, you might assign the Power Status alarm to PO1 and the Group Percent Defects alarm to PO2. You may assign more than one alarm to any of the four outputs. The programmable output will go active when any of the assigned alarms is triggered (e.g., Power Status OR System Status).

Outputs PO1 through PO4 can be monitored by your plant equipment, such as a PLC, to notify you when certain alarms are triggered.

See the Intellispec Hardware Guide Extended I/O section (published in 2003) for more information about these outputs.

Alarm Defaults - 3.1

The chart below shows the default status for each of the alarms, as well as the corresponding color of the light tree.



Disabling rejecter for individual inspections

Now you can disable the rejecter (Administrator only) for individual inspections, rather than disabling an entire job, for example. This allows the system to perform the inspections of the job and collect inspection data without rejecting parts.

To disable, right-click the inspection name on which you want the reject device disabled. Choose Disable Reject. The inspection name becomes highlighted in blue to remind you that parts will not be rejected on this inspection.

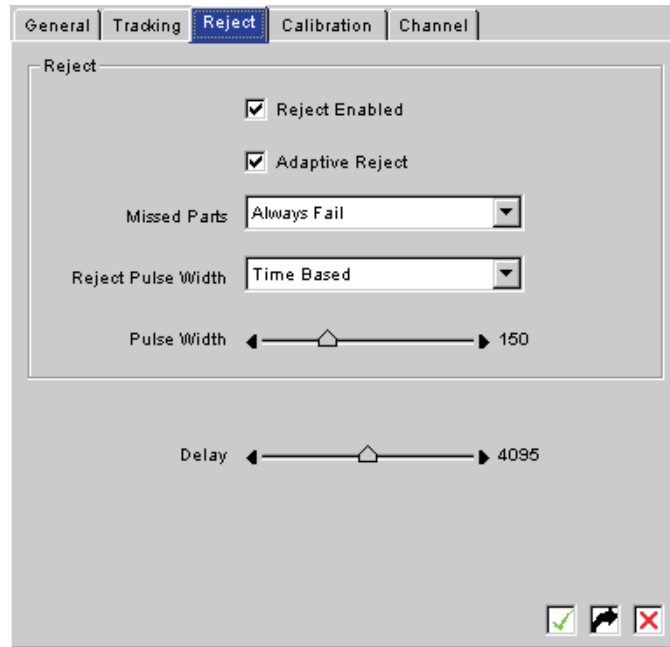
To enable the reject device again, right-click the inspection name, and choose Enable Reject.

New Reject Settings

Two new settings have been added to the Reject menu that allow the system to compute an adaptive reject time delay in some applications, and allow you to select either Encoder Ticks or Milliseconds as the reject Pulse Width setting.

Mechanic user level and higher

To access the Reject menu, click the System Configuration button, Channel Groups tab, select a group, then select the Reject tab.



The new parameters are discussed below. The remaining parameters are discussed in the Intellispec Programming Guide (p/n 49888) on page 6-7.

Adaptive Reject

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 encoder speed increases, more delay is added.

Your system must have the proper hardware attached for this function.

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

If using this feature, enable Adaptive Reject before calibrating the reject delay. (See page 6-8 in Intellispec Programming Guide [p/n 49888] for calibration procedure).

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.

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

Reject Pulse Width

In previous versions of Intellispec software, the Pulse Width was specified as a number of milliseconds. With this new parameter, you may choose to keep Pulse Width as Time Based (milliseconds), or have Pulse Width measured in Encoder ticks (Encoder Based setting). The number of units of either Time Based or Encoder Based is specified with the Pulse Width parameter.

This feature can be selected independently from the Adaptive Reject function.

Dual Rejecter

This feature allows you to have up to two reject devices per channel. You can program the system to 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.

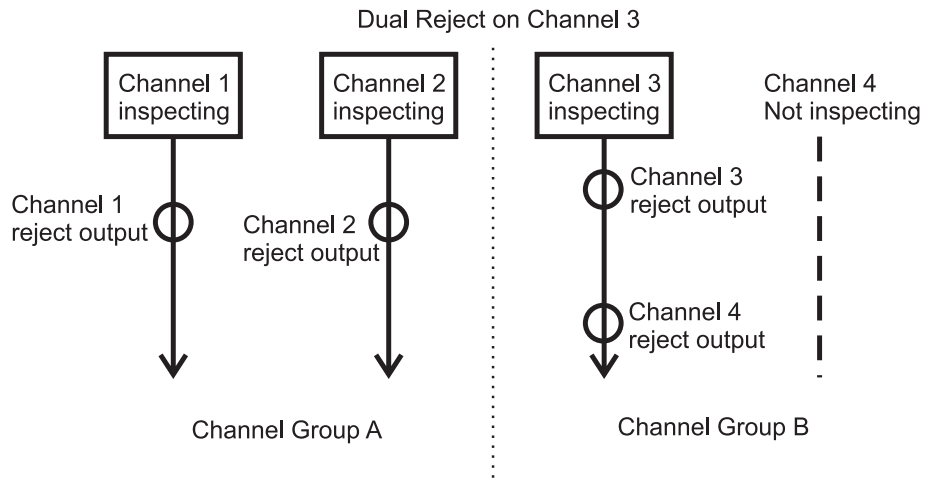
Certain conditions apply to Dual Reject usage:

- A total of four reject outputs is present in Intellispec hardware
- If you already have four channels of inspection, all four reject outputs are being used, so Dual Reject may not be used.
- No more than two rejects per lane 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).

Following are several scenarios in which Dual Reject may or may not be used:

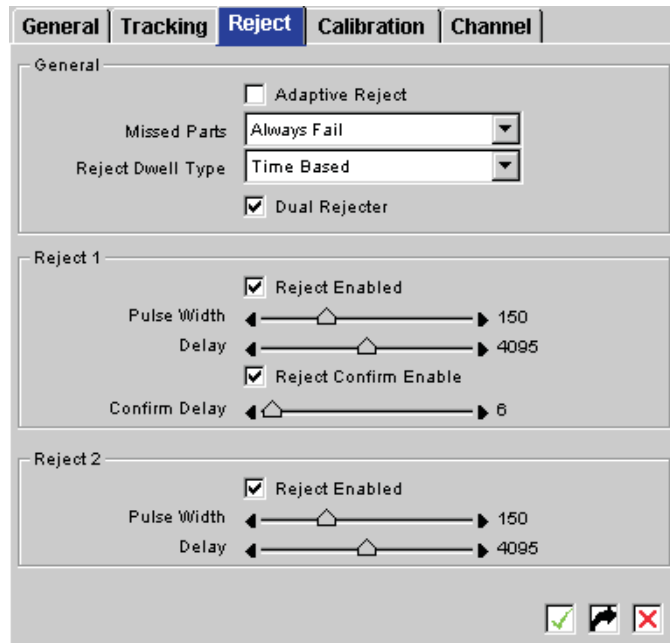
- If you have one lane of inspection, you may have Dual Rejects for that lane.
- If you have two lanes of inspection on two different channel groups, you may have Dual Rejects for both lanes.
- If you have two lanes of inspection within one channel group, you can have one reject per channel, but may not use the Dual Reject feature.
- If you have three lanes of inspection within one channel group, you can have one reject per channel, but may not use the Dual Reject feature.
- If you have three lanes of inspection, and Channels 1 & 2 are in one channel group, and Channel 3 is in another channel group, only Channel 3 may use the Dual Reject feature (illustrated below).
- If you have four lanes of inspection, you may not use the Dual Reject feature.

Please contact Pressco if you are unsure whether your system may use the Dual Reject feature.



Example of Dual Reject used on Channel 3.

To set up Dual Rejecter:



Log in as Administrator. Click System Configuration button, Channel Groups tab, choose a Channel Group, click Reject tab, check the Dual Rejecter box.

Set the Pulse Width (length of time the reject signal is active) for Reject 1. Set the Delay (number of encoder ticks between inspection station and reject station). If desired, set Reject Confirm (described on page b-74).

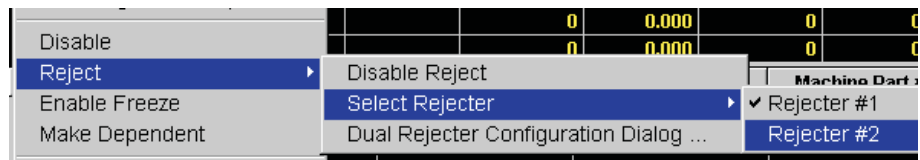
For Reject 2, check the Reject Enabled box. Set the Pulse Width (length of time the reject signal is active) for Reject 2. Set the Delay (number of encoder ticks between inspection station and reject station).

Click OK to apply the menu changes. The system will restart.

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 channel.

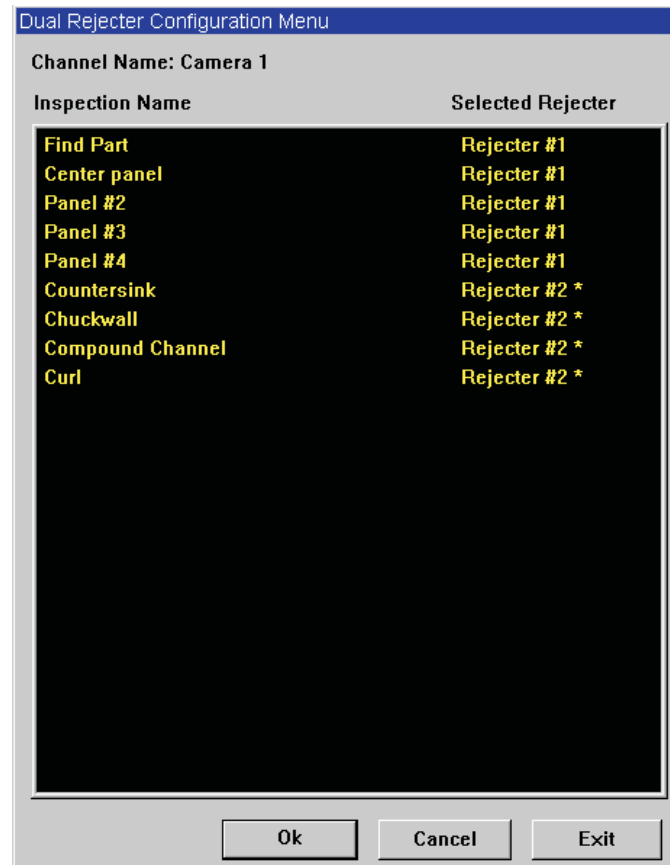


To assign one inspection to a rejecter:

Right-click the inspection name, select Reject, Select Rejecter, and select Reject #1 or Reject #2.

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 for any listed inspection to toggle to the other 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

This new feature can detect missed rejects. Coupled with the Missed Reject Alarm, Reject Confirm will reliably detect and notify you of any missed reject condition.

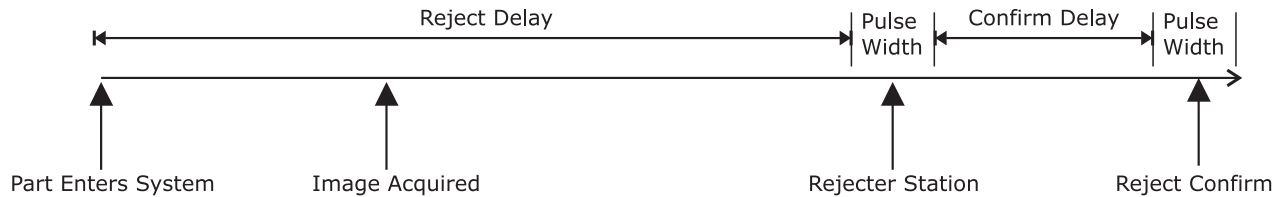
Reject Confirm uses a part detect sensor (optional – must be installed at your site) positioned at a calibrated and defined distance (Confirm Delay) past the normal reject mechanism to determine whether the defective part was actually rejected. Confirm Delay must be a value of 1024 or less.

✎ *Reject Confirm may only be used with Rejecter 1 if Dual Reject is enabled.*

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 will issue a pulse 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.

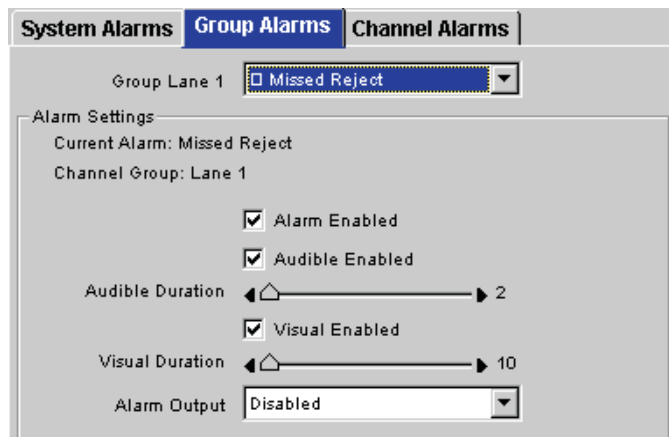
Part Chronology in system with Reject Confirm



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

To set up Reject Confirm:

Log in as Administrator. Enabled the Missed Rejects alarm – click the Alarms button, Group Alarms, Missed Reject. Make sure the alarm is enabled, and set up the desired audible, visual, and programmable outputs (see page b-68). Exit the Alarms menu.



Calibrate reject using normal procedures (see page 6-8).

Enable Reject Confirm: Go to System Configuration button, Channel Groups, select a channel group, Reject Tab, and check Reject Confirm Enable.

General	Tracking	Reject	Calibration	Channel
General ☐ Adaptive Reject Missed Parts Always Fail Reject Dwell Type Time Based ☒ Dual Rejecter				
Reject 1 ☒ Reject Enabled Pulse Width 150 Delay 4095 ☒ Reject Confirm Enable Confirm Delay 6				
Reject 2 ☒ Reject Enabled Pulse Width 150 Delay 4095				
☒ ☐ ☐				

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.

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

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

System Configuration menu changes

A couple new features have been added to the software: Online at Powerup, Online Region Sizing, and Last n parts statistics. See page 6-1 for information about the previously available features. The new menu is shown below:

The screenshot shows the 'System' tab of a configuration window. The parameters are as follows:

- Offline Acquire Mode:** Immediate (dropdown)
- ☐ Online at powerup
- ☒ Online Region Sizing
- ☐ Offline Password Required
- Part/Job Selection:** Which Jobs (dropdown)
- Camera File Name:** PPS4 (text field)
- ☒ Strobe Delay Override
- Strobe Delay:** Slider set to 350
- ☒ UPS Configured
- UPS Model:** Behlman (dropdown)
- UPS Shutdown Time:** Slider set to 120
- UPS Interruption Time:** Slider set to 10
- Periodic Refresh Rate:** Slider set to 10
- Dialog Advanced Mode:** Hidden (dropdown)
- Last N Defect Count:** Slider set to 10000
- ☒ Show All Advanced Parameters

At the bottom right, there are three icons: a green checkmark, a black mouse cursor, and a red X.

Online at Powerup

If this is enabled: In the event of a loss of power, 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 this is not enabled, the system will re-boot, but someone will have to click the Online button.

Online Region Sizing

(Advanced parameter) When this is enabled, 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.

Last *n* Defect Count

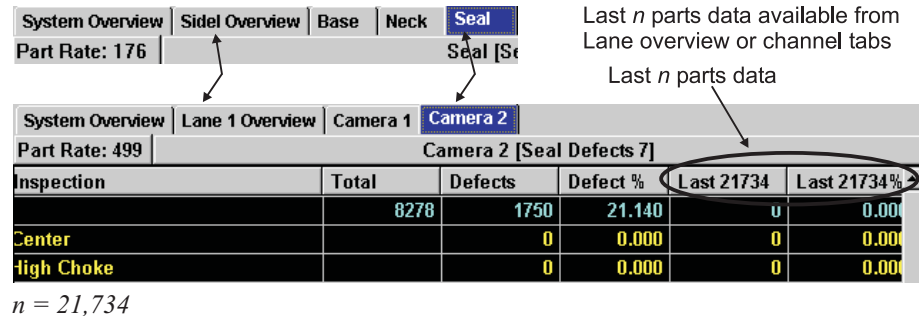
(Advanced parameter) A new feature has been added to the statistics screens that allows you to see the most recent production data. It lists the number of parts that were defective from the Last *n* parts inspected. It also lists the percentage of defective parts from the Last *n* parts inspected. *N* is defined by you – it can be set between 100 and 25,000. 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.*

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.

The Lane Overview and Channel statistics tabs allow you to view this most recent data. The statistics area is discussed more on page 3-1 of the Intellispec Programming Guide (p/n 49888).



Part Rate: 176

Part Rate: 499

Inspection	Total	Defects	Defect %	Last 21734	Last 21734%
	8278	1750	21.140	0	0.000
Center		0	0.000	0	0.000
High Choke		0	0.000	0	0.000

$n = 21,734$

Online Freeze mode enhancement

A new feature, called Last Reject Timed Release, is available under Freeze Frame mode to display images online.

This setting will hold 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.

To enable this feature, Log in. Right-click a Channel's tab (e.g., Camera 1) or right-click in the image area and select Image Display from the menu. From the Freeze Mode selection list, choose Last reject, timed release. Select the desired number of seconds to display the last defective image through the Hold Duration parameter. Click OK [✓] and exit the Image Display menu.

See page 5-3 in the Intellispec Programming Guide (p/n 49888) for more information about Freeze Frame mode.

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. 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 deselected for you.
- Freeze Frame mode must use a valid Defect condition; that is,
 - Last Reject, Timed Release
 - Last Reject
 - First Reject, or

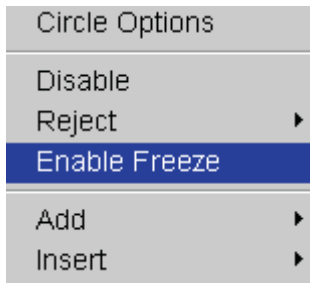
To set Freeze Frame Condition:

1. Log in (Operator level user and higher)
2. Right-click on either the image or on one channel's statistics tabs. Choose Image Display Options or Image Display...
3. For Freeze Mode, select one of the above defect conditions

Click OK and Exit the Image Display menu.

To set Freeze on Inspection:

1. Log in (Operator level user and higher). System may be online or offline.
2. Right-click the name of the inspection in the statistics area.
3. Select Enable Freeze. The inspection row is highlighted in green to distinguish it.



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

4. 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, or for as long as the Freeze Frame 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 the freeze frame indicator button).

You may wish to edit the selected inspection (Mechanic level user and higher) while the image is held. Double-click the inspection name in the statistics area to edit.

To disable Freeze on Inspection:

- Right-click the inspection name, and select Disable Freeze
- If you select another inspection to Freeze on Inspection, the first inspection will be disabled automatically.

Diagnostics – display Test Pattern

 Mechanic user level and higher

This new feature under the Diagnostics button, General tab displays a grayscale test pattern to ensure the display hardware is functioning properly.

This removes any inspection image you may have displayed on the screen. You will have to snap the camera or restore an image from disk to continue programming jobs.

Rescue Kit enhancement

Administrators only

A few enhancements have been made to the Rescue CD procedure that allow you to run a backup image integrity test, as well as verifying a restored drive. There are a few more notes and procedures added since the Appendix A in the Intellispec Programming Guide (p/n 49888) was written. This section is an updated version of Appendix A from that manual.

Purpose

Keeping a backup of a hard-drive partition is the first line of defense against hard-drive corruption. Backing up the C: partition is also recommended to preserve Intellispec upgrades that may have occurred on site. Restoring a corrupted C: partition from a Backup CD can take less than five minutes, compared to hours of tedious reinstallation of Windows NT, drivers and application software.

Intellispec Rescue is powered by a program named Symantec Ghost, which will appear on screen in some menus.

This section explains how to use the Intellispec Rescue Kit to back up and restore the C: partition on the Intellispec hard drive. We will also describe how to verify the restore CD.

Overview

Along with a CD-RW drive, which is installed in the Intellispec vision processor, the Rescue Kit contains at least two CDs:

Rescue	This is a bootable disc supplied by Pressco. It contains all software needed to both back up the C: partition as an image file to a Backup CD and restore the image file from a Backup CD.
Backup	This is a generic CDR that, after the backup procedure is run, will contain the C: partition image file. Backup CDs are not bootable. CD-RW discs are not recommended for use with the Rescue Kit but may work in some cases if completely erased—not quick erased. Use at your own risk.

The two parts of this Rescue Kit section are as follows:

- PART 1—Back up the C: partition to a Backup CD
- PART 2—Restore the C: partition from the Backup CD

These explain how to back up and restore the C: partition of your Intellispec hard drive with the Rescue CD.

Assumptions And Other Notes

- Intellispec software is always located on the C: partition. The Rescue CD will only save from and restore to the C: partition.

- An image created from one Intellispec should only be restored to the same system.
- The word *image* is used in this Rescue Kit section for a file containing a restorable partition.
- The Rescue procedure is not intended to be a substitute for regularly saving databases (part-files) to floppy disk
- The Rescue Kit alone will not repair a physically damaged hard drive
- It is possible for a hard drive to become so corrupted that Rescue cannot restore to it. The drive may still be salvageable by *reformatting*. See Troubleshooting section.

Waiting for CD ROM drive to scan

- When a CD is first placed in the drive, the drive will take a little time to check the CD, perhaps 10 seconds. During this operation the LED may flash or change color (change state), depending on the drive model or manufacturer. When the operation is finished, the LED will revert to its former state (i.e., the color will change back, or the LED will stop flashing or even turn off – depends on model and manufacturer).
- It is important to wait until this operation is finished before proceeding.

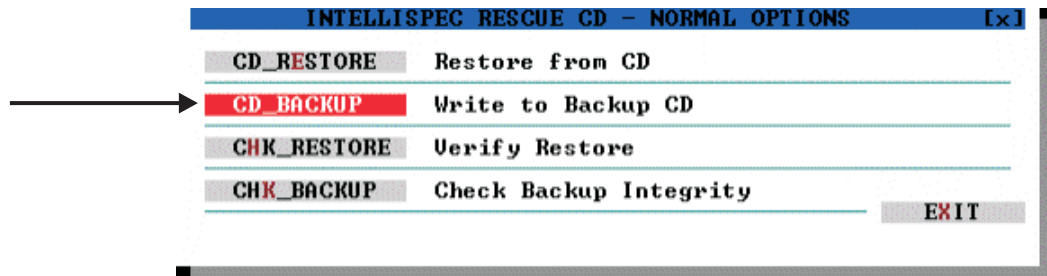
PART 1: Backup the C: partition to a Backup CD

Required

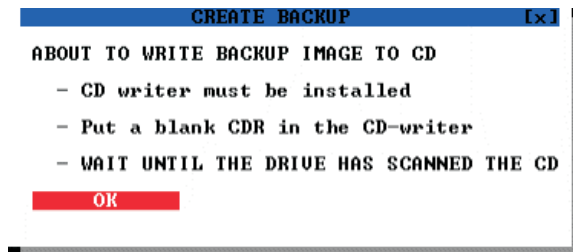
- The Rescue CD
- One or more blank CDR writeable CDs (CDRW discs not recommended)
- An installed CD writer (CDRW/ DVD drives are not supported)
- Ability to boot from the CD drive (if needed see Troubleshooting section for details)

Procedure

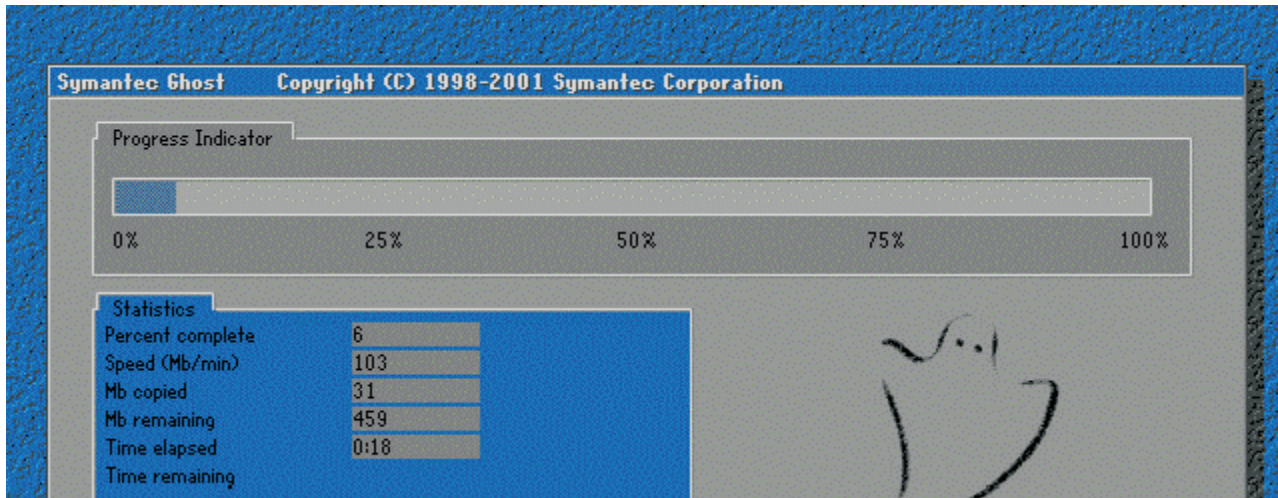
1. Restart the computer with the Rescue CD in the CD drive and wait while the system configures itself. If the menu shown below does not appear, see Troubleshooting section for configuring the BIOS to allow booting from CDROM.



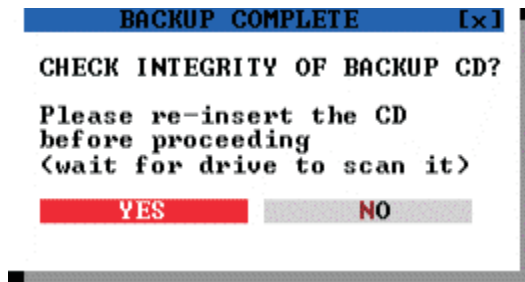
2. At the first menu select CD_BACKUP and hit enter.
3. The next step is to remove the Rescue CD and insert a blank CDR into the drive. This is the last prompt before Rescue starts writing. Hit enter or click OK to continue after the LED changes state (see “Waiting for CD...” on page b-81).
 - It is possible the Backup will not fit on a single CD. In this case another CDR will be prompted for when the previous CD is full. Label the Backup CDs accordingly.



4. A progress bar is displayed as the image is written to the CD. (Different screen style)



5. The Backup image integrity test is *strongly* recommended but not mandatory. If the newly written CD has been ejected, reload it. This step can take almost as long as the time spent writing the CD. Click Yes to proceed with the integrity test.
 - There have been reported instances of Backup CDs created, apparently without problems, that were not known to be faulty until a Restore attempt was made. (Multiple image files may indicate faulty CD drive or media)



6. The Ghost progress bar is displayed again. (See above)
7. When no problems have been found, you can have confidence in your Backup CD.



8. If the integrity test fails, you should start over and create another Backup CD. If problems persist, try a different brand of blank CD-R.



When Rescue is finished, remove the CD and restart the computer.

PART 2: Restore the C: partition from the Backup CD

Warning

Restoring an image from any source will replace EVERYTHING on the C: partition.

Important

If you are not sure that the Backup CD is good, check it prior to restoring. Restoring an unverified, corrupt, or incomplete image may force you to reformat the hard drive. To check Backup CD, follow step 1 below, and select CHK_BACKUP from the menu. Then insert the Backup CD.

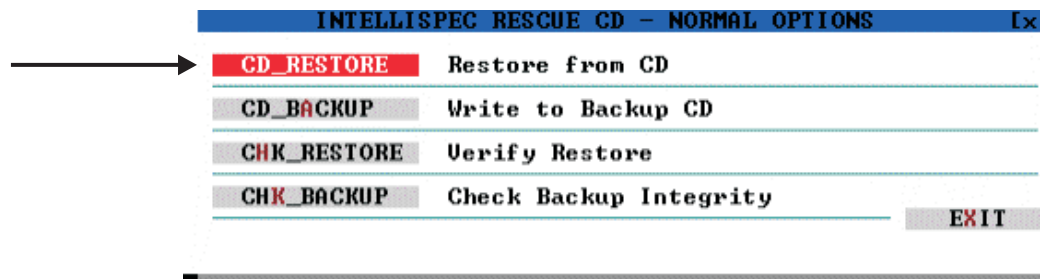
Required

- The Rescue CD
- The Backup CD if the desired image is not on the Rescue CD

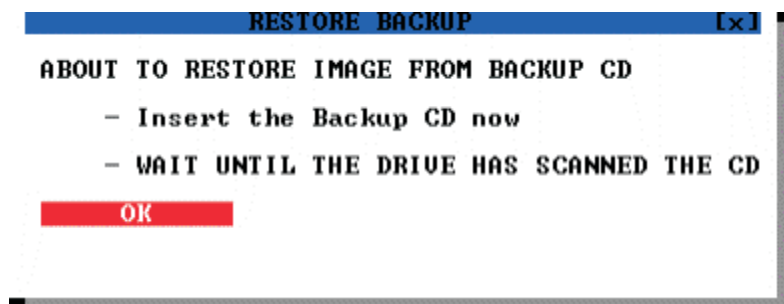
Ability to boot from the CD drive (if needed see Troubleshooting section for details)

Procedure

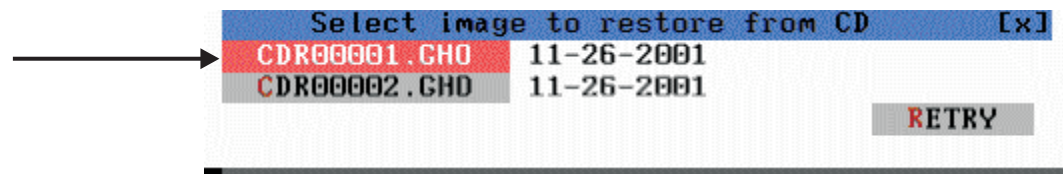
1. Restart the computer with the Rescue CD in the CD drive and wait while the system configures itself. If the menu shown below does not appear, see Troubleshooting section for configuring the BIOS to allow booting from CDROM.
2. At this first menu select CD_RESTORE and hit enter.



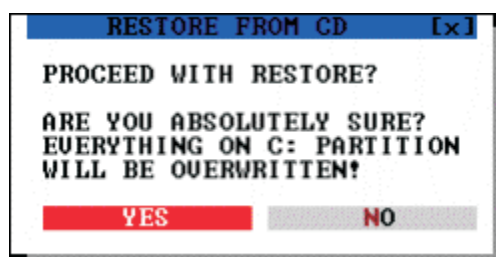
3. The next prompt allows you to remove the Rescue CD and insert the Backup CD. Hit the enter key or click OK to continue.



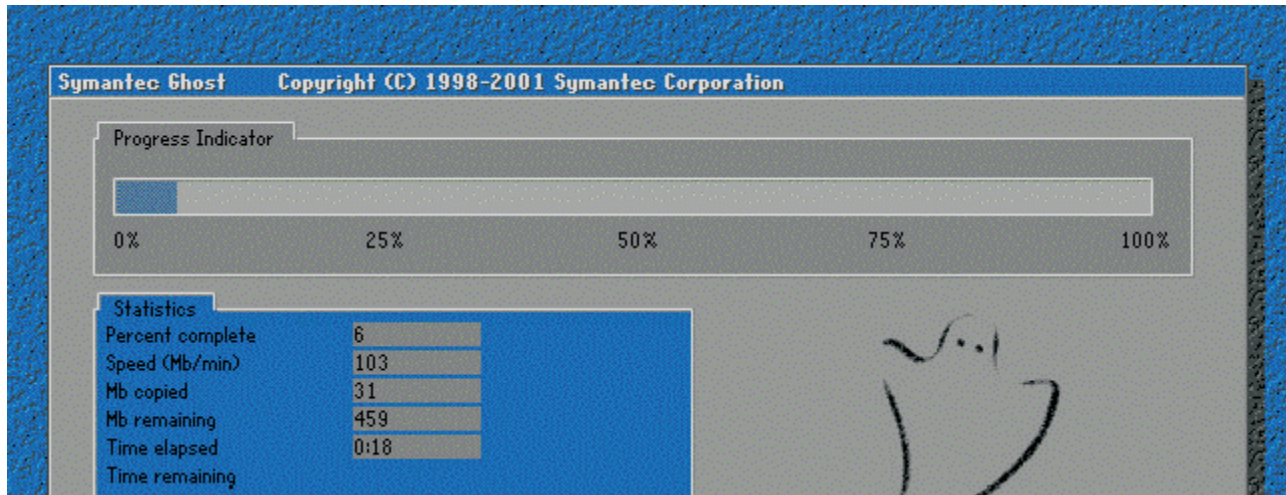
4. A prompt may appear for image filename confirmation. If needed, hit enter or mouse-click the selection to proceed. If more than one filename appears when only one is expected, select the lowest number. (Multiple image files may indicate faulty CD drive or media)



5. A final confirmation is requested before starting the restore process. Select YES with the keyboard arrows and hit enter, or click YES with the mouse.



A progress bar is displayed as the image is restored from CD to the hard-drive.



6. If the Backup spans more than one CD, you will be prompted for the next CD when required. Be sure to wait until the CD drive LED changes state (see "Waiting for CD..." on page b-81) before clicking the continue prompt.
7. Further Rescue activity is optional. You may:
 - Stop here, remove the CD and restart the computer to find out if the operation was a success (if the Intellispec starts, you were successful), OR:
 - Verify the Restore. This will take longer than the Restore itself. It compares the Backup image to a file that must be created from the hard drive. If verifying Restore, always do it immediately after restoring.
8. To verify the Restore, click Yes.
9. The progress bar (see above) is displayed twice as a compare file is created from the hard drive and that file is compared to the Backup image on the CD.
10. If successful, remove the CD and restart the Intellispec.
11. If verification was not successful, there are possible reasons, listed below:
 - The wrong CD was compared. OR:
 - Something changed on the hard drive after the restore (simply starting the Intellispec will change the contents of the hard drive).

When the Rescue process is finished, remove the CD and restart the computer.

Troubleshooting

Problems when booting from CDROM:

Some Intellispec systems may not be configured to boot from the CDROM. The BIOS setting can be changed as follows:

1. When the system first starts, a message is briefly visible prompting the user to press the DEL key to enter the BIOS setup. Press the DEL key at this time.
2. A menu appears, navigable with the arrow keys on the keyboard. Select ADVANCED BIOS SETTINGS. Wording may vary; this is often the second option from the top.
3. Change the boot device options so the sequence is one of the following:

- FLOPPY—CDROM—IDE-0
 - CDROM—FLOPPY—IDE-0
4. Hit escape and select the option equal or similar to SAVE SETTINGS AND REBOOT

 *Note: All systems do not have identical BIOS. That is why the first option may not be available in step 3, and why wording may vary.*

Problems when booting from BACKUP CD:

Sometimes the computer will not recognize that you have inserted a new CD. If this happens, remove the CD, reinsert and try again.

If the Backup spans more than one CD, you will be prompted for the next CD when required. Be sure to wait until the CD drive LED changes state before clicking the Continue prompt.

Ghost error message “Error reading FILE_VOLUME.MFT record”

This may be seen when trying to restore a Backup. It is an indication that the hard drive may have become corrupted. Confirm by trying to boot from the hard drive. You may need to re-format the drive before a Backup can be Restored. Typically Ghost will hang when this message appears, and restarting the computer is the only option.

Replacing or reformatting the hard drive

If the computer cannot recognize the hard drive, or you are unable to restore the drive, the hard drive may be physically damaged. Fully loaded replacement hard drives are available from Pressco, but replacement with a locally purchased hard drive is sometimes the preferred solution.

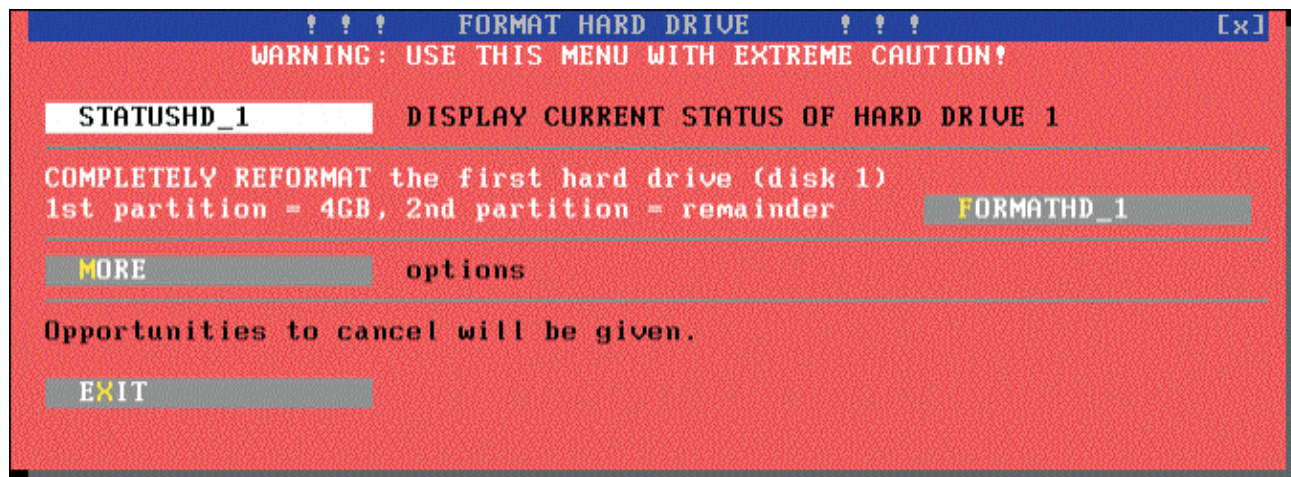
- New hard drives must be formatted prior to restoring a Backup
- A newly formatted hard drive may not be recognized by Ghost until you have re-booted
- There is no point in formatting a hard drive unless you have a Backup to restore it
- A Backup made on one Intellispec system may or may not operate on another Intellispec system, due to potential hardware differences (e.g., CPU, motherboard, etc.)

In addition to replacing a hard drive with a new (or known good) drive, another solution may be to reformat the suspect drive. Cases have been seen where a drive that could not be restored became usable by reformatting. An aborted Restore can put a hard drive into such a state.

Whether it is a new drive or not, the drive can be reformatted as follows:

- After booting with the Rescue CD, escape to DOS at the first color menu by hitting the ESC key. AT the DOS prompt, type PRESSCO, select HDUTIL, and the following menu will appear:

Most of the selections in this menu lead to easy Continue/ Status/ or Exit selections and are not further explained here.



However, the More Options choice may appear on screen. It is explained below:

- Of the four Format choices associated with hard disk 1, the FORMATTED_1 choice conforms to the way many Intellispecs are set up. (Older Series 1 Intellispecs with smaller hard drives may or may not require the 3GB setting. Current Intellispec systems may have 3GB or 4GB primary partitions.) To change this setting, highlight the 3GB or 4GB choice and hit the space bar to enable it.
- At the time of this printing, no Intellispec systems have a second hard drive
- Intellispec systems use only one partition and are not expected to have more than two partitions
- Windows NT installation imposes a 4GB limitation on the size of the primary partition

➡ *After Formatting, reboot the system prior to restoring from a Backup CD.*

Ghost Explorer

Ghost Explorer runs under Windows and allows you to view or copy files from a Ghost image. To run: copy \Win \Ghostexp.exe (and Ghostexp.chm, optional) from the Rescue CD to the hard drive on a Windows computer. Run Ghostexp.exe, then load the Backup CD and open the GHO file.

Multiple Image Files

Multiple image files are thought to indicate faulty CD drive or media. However, multiple image files may still be successfully restored from, provided the lowest number file is selected (usually CDR00001.gho). Multiple image files may not verify successfully but still be usable.

Legal Notes

Your copy of Intellispec Rescue includes a version of Symantec Ghost which is licensed for use on one computer only – your Intellispec system. Windows NT and other software installed on the Intellispec is also only legal on that system. Do not use Rescue to illegally put programs on another computer.

Inspection Grouping

This feature allows you to assemble the inspection data into groups that you define. You may define up to 16 groups. For example, you can place a base gate registration along with its associated inspections into Group 1 (and rename it “Gate”), and another set of related inspections into Group 2 (e.g., “Feet”).

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

Use arrows to
scroll to all tabs

Neck	Seal	Machine Part #1	Machine Part #2	Machine Part #3	Machine Part #4	Groups	
Groups		Defects		Defects %			
Gate		195		100.000			
Feet		176		90.256			

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.
- The setup procedure will use the inspections from the currently selected job, so select the desired job before entering setup.

To assign inspections to groups:

1. Log in – Operator level user and higher.
2. Click the Part Management  button, Group Reporting tab, Setup button.
3. [See Group Setup screen below] Select the desired channel and the desired group. Rename group if desired.

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. Repeat steps 3 and 4 for up to 16 groups. Click OK when finished.

The statistics area will display 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.

Using 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 from one channel, but different groups can be from different channels, and can be assigned to one output.

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).

Auto Logout

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

To set up Auto Logout:

1. Log in as Administrator
2. Click the Miscellaneous button, Users tab, and check the Auto Logout box.
3. Set the number of minutes of inactivity after which the system will log out the current user. Click the Exit box.

To disable Auto Logout, un-check the Auto Logout box.



INTELLISPEC

Programming Guide Addendum

For Multi-Void Tube Inspection

Insert this addendum behind your Intellispec Programming Guide

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Addendum - Multi-Void Tube Inspection

Overview

The Multi-Void Tube inspection application of the Intellispec has unique screens and unique hardware to inspect this type of product. This addendum covers the unique software and hardware pertaining to this application.

What's different about this application?

A standard Intellispec application takes images of and inspects one part at a time – that part normally fits entirely within Intellispec's field of view. The Multi-Void Tubes, however, are longer than the Intellispec's field of view; therefore, multiple images of each part are taken. The part is accepted or rejected based on the inspections of all images for one part.

That's where the unique hardware comes in. The Intellispec normally uses one part detect signal per part to track a part from inspection through reject station. As each Multi-Void Tube requires multiple images, one part detect signal is not enough to trigger the system to inspect more than one image. A part tracker Shell is installed in the Intellispec to create "fake" part detect signals so that the Intellispec is triggered to snap several images for one part, and track that part to the reject station. The hardware is discussed later in this addendum (page c- 8).

Items that have different meaning on Intellispec screens

Parts

Any reference to "part" on the standard Intellispec screens (all but within the Cut to Length dialog box) will more likely refer to image. For instance, the statistics area will display number of parts, number of defective parts, etc. Actually, these will be number of images, defective images, etc.

Alarms

The Consecutive and Percent Reject alarms will actually refer to consecutive defective images, and percentage of reject images, respectively. This does not indicate consecutive Multi-Void Tubes or their percentage of rejection. Instead, look at the Statistics tab in the Cut to Length menus to see the number of parts inspected and rejected.

Reports

Intellispec generated reports, graphs, and databases, when referring to parts, actually refer to images. Such reports included are: Defective Parts Database, Channels

Summary reports, and graphs such as Channel Defects Summary, Online Inspection Graphs, and Offline Inspection Graphs. Look at the Statistics tab in the Cut to Length menus to see actual Multi-Void Tube statistics.

Cut to Length menus

To view the Cut to Length menus, log in as Administrator, click the System Configuration button , System Configuration tab. Select the Cut to Length (CTL) box and exit. The Cut to Length menus can be moved around the Intellispec screen by clicking the active title bar and dragging the menus around the interface.

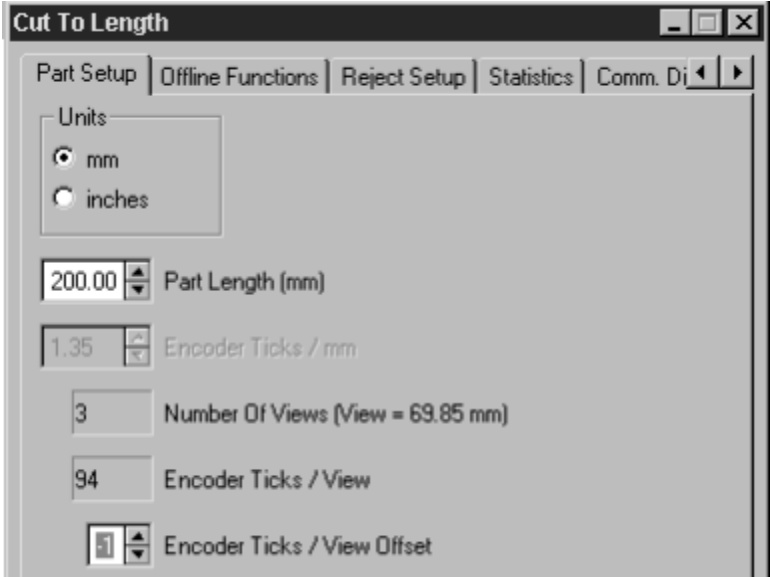
The menus can be minimized, maximized, or closed using the buttons in the upper right corner of the Cut to Length menus.

 *Be careful not to close the Cut to Length menus, especially when the system is Online. If menus are closed, they can only be re-opened with the system in Offline mode. (System Configuration only available offline)*

When setting up a part database, it is best to follow the Cut to Length menus in order from left to right.

When you make a change to a parameter, click Apply to begin using the parameter change. Clicking Cancel will reset the parameters to the values they had before you entered the screen, and it will exit the Cut to Length menus. Clicking OK will apply parameter changes and exit the Cut to Length menus.

Part Setup



Units	Choose part length measurement in either millimeters or inches.
Part Length	The length of the part to be inspected.
Encoder ticks/ units	This fixed informational parameter designates the number of encoder ticks per unit of movement of the part on the conveyor.
Number of Views	Derived parameter based on the length of the part and a fixed view size of 69.85 mm (2.75 inches).

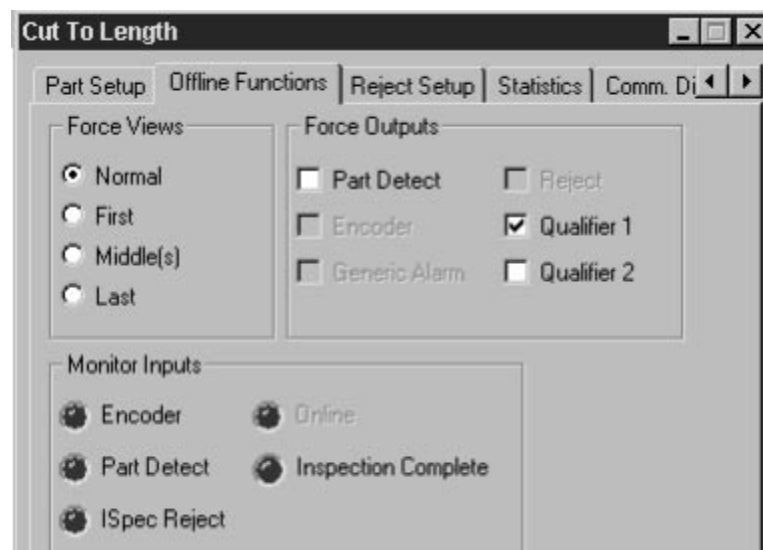
Encoder Ticks/ View

Fixed informational parameter based on a view size of 69.85 mm and 1.35 encoder ticks per mm ($69.85 \times 1.35 = 94$).

Encoder Ticks/ View Offset

Adds or subtracts from the Encoder Ticks / View parameter to aid in the placement of the last view of the part being inspected. A positive number will move the part image to the left; a negative number will make it move to the right.

Offline Functions

**Force Views**

When snapping pictures (Online or Offline), snap all views of the part (Normal) or only snap a particular view of the part (First, Middle(s), or Last).

☛ *When you force a view, the system only inspects that particular view. This mode is intended for setting up the system (part programming) or diagnostics.*

Force Outputs

Diagnostic tool that forces the state of various outputs from the part tracker Shell. These are the signals used on the part tracker Shell which is specially designed for this application.

☛ *For more information about these signals, refer to the hardware section beginning on page c-8.*

Part Detect
Qualifier 1, 2

Enables/Disables the fake part detect output from the part tracker Shell.

Enables/Disables the qualifier outputs from the part tracker Shell. The qualifier outputs are used by Intellispec to determine what image of the part is being snapped (first, middle(s), or last).

Monitor Inputs

Diagnostic tool used to display the state of various inputs into the part tracker Shell.

Encoder

Monitors the state of the conveyor's encoder signal as seen by the part tracking board.

Part Detect

Monitors the state of the conveyor's part detect signal as seen by the part tracking board.

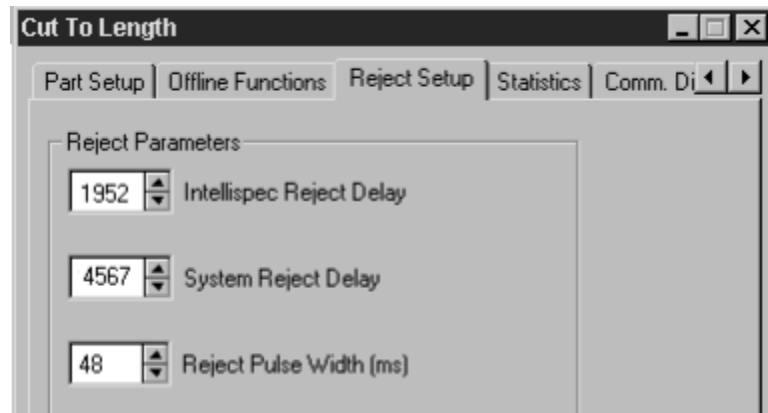
ISpec Reject

Monitors the state of the reject signal coming from Intellispec.

Inspection Complete

Monitors the state of the signal from Intellispec that the inspection of a view of the part is complete; that is, the part has reached the rejecter.

Reject Setup



Intellispec Reject Delay

The number of encoder ticks after the part detect that the reject signal is activated by Intellispec, if that view of the part is bad. It is also number of encoder ticks after the part detect that the Inspection Complete signal is activated.

This number must be less than System Reject Delay. (Refer to timing diagram on page c-10 for more information)

Important

If rejecter does not appear to be rejecting parts in proper position, adjust System Reject Delay – not Intellispec Reject Delay.

System Reject Delay

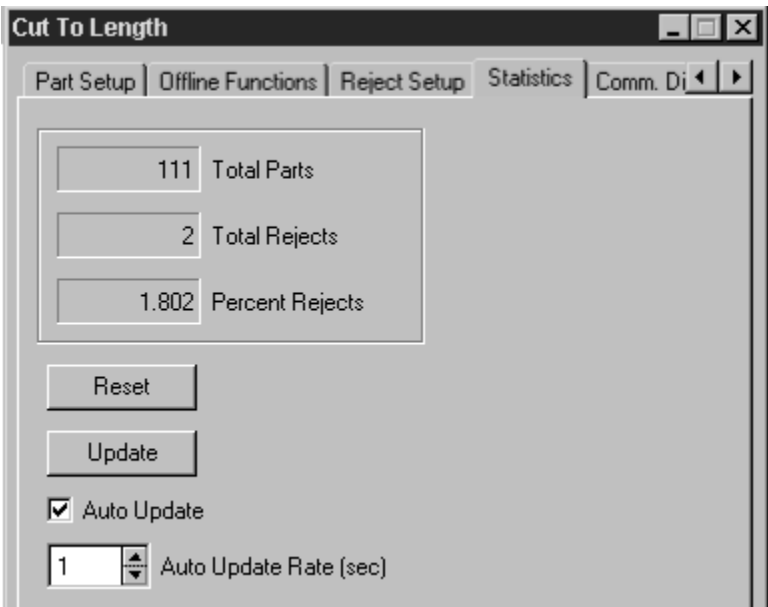
The number of encoder ticks after the part detect that the part tracker Shell activates the rejecter if any of the view of the part is bad.

Part should be in the middle of rejecter when reject pulse is activated.

Reject Pulse Width

The time, in milliseconds, that the reject signal from the part tracking board is activated when rejecting a bad part.

Statistics

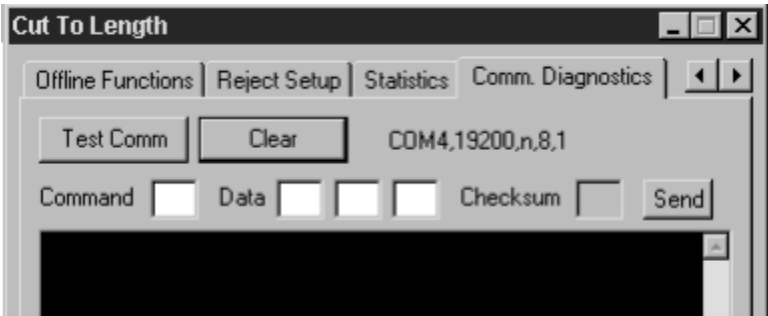


☛ The statistics will update only if this screen is visible. You may have to wait (depending on Auto Update Rate) to see statistics update.

Total Parts	The total number of parts inspected as reported by the part tracker Shell.
Total Rejects	The total number of parts rejected as reported by the part tracker Shell.
Percent Rejects	$(\text{Total Rejects} / \text{Total Parts}) \times 100$.
Reset	Resets the statistics to zero on the part tracker Shell. Updates the Statistics display in the Cut to Length menus.
Update	Gets the latest statistics from the part tracker Shell and updates the Statistics display in the Cut to Length menus.
Auto Update	Enable/Disable the automatic updating of the statistics within the Cut to Length menus.
Auto Update Rate (seconds)	The rate at which the statistics are automatically updated if Auto Update is enabled.

Communication Diagnostics

This menu is mostly used by Pressco technicians to diagnose the system.



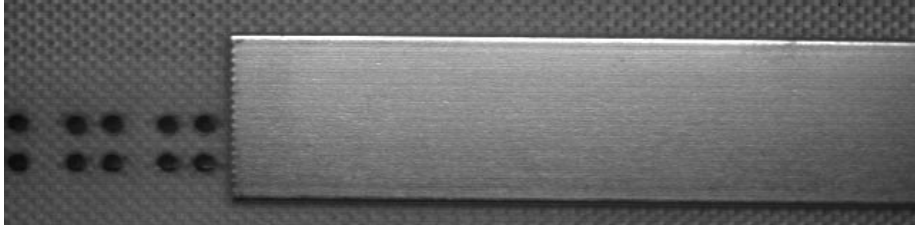
Test Comm	Tests the communication link between Intellispec and the part tracker Shell. The test results are displayed in the scrolling text window.
Clear	Clears the text window of previous Test Comm results.

Command	A hexadecimal input field for a specific command to be sent to the part tracker Shell. This is intended for diagnostics purposes, by Pressco service engineers.
Data	Hexadecimal fields for any data that may be associated with the command being sent to the part tracker Shell.
Checksum	The checksum of the command and data being sent to the part tracker Shell.
Send	Sends the command and data entered in the Command and Data fields to the part tracker Shell.

Setting up part tracking and reject for Multi-Void tube inspection

Go to the menus listed in the table below, and adjust the parameters as necessary. These adjustments should be performed for each length of part. These settings will be saved as part of the Vision Database that you save for each part.

The following parameters are in the standard System Configuration menus:

Part Width	See page 6-7, Calibrate the Part Width.
Part Present Delay	First go to the Cut to Length menus, Offline Functions tab, and choose Force Views - First. Then see page 6-8, Calibrate the Part Present Delay. Follow the instructions given, but note the following: – the length of the part does not matter. – Instead of centering the part on screen, make the leading edge fall to the left of center screen  – when finished, go back to Cut to Length menu, Offline Functions tab, and choose Force Views - Normal.
Disable Part Present	Leave at default, 103. Access from System Configuration, Channel Groups, select a group, Tracking tab.
Reject Delay	This is also known as Intellispec Reject Delay in the Cut to Length Reject Setup menus. May also be accessed from System Configuration, Channel Groups, select a group, Reject tab. Set manually (cannot use the System Configuration Calibration feature). This number must be less than System Reject Delay found in Cut to Length menus. Refer to timing diagram on page c-10 for more information about this parameter.
Pulse Width	Set only once for system. Leave Reject Pulse Width in Time Based mode. Leave Adaptive Reject disabled. Access from System Configuration, Channel Groups, select a group, Reject tab.
Complete Pulse Width	Set once for system equal to Pulse Width. Access from System Configuration, Channel Groups, select a group, Tracking tab.

The following parameters are found in the Cut to Length menus.

Part Length	Set for each part. Access from Cut to Length menus, Part Setup tab.
System Reject Delay	After initial setting, this may need to be changed for very short part lengths. Access from Cut to Length menus, Reject Setup tab.
Reject Pulse Width	Set once for system. Access from Cut to Length menus, Reject Setup tab.

Setting up a Part Database

We recommend saving a separate inspection database for each different part length you inspect. Your system will have at least one database already set up from our factory.

To create a new part database:

1. Open an existing database: log in as Administrator, click the Database Tools button, and click Load from the Vision Database selection buttons. Choose a database and click Open.
2. Save the database under a different name for the new part: click the Database Tools button and click Save from the Vision Database selection buttons. Type a new file name and click Save.
3. Enter the new part length in the Part Setup tab of the Cut to Length menus.
4. Set up part tracking and reject settings for this part as necessary (see page c-6 for applicable parameters).
5. Run actual parts and verify proper operation. Modify the position of inspection regions in the end view if necessary.
6. Re-save the database.

Programming inspections on Multi-Void Tubes

Cut to Length Delimiter inspection

Any inspection run under each delimiter only inspects a certain view of the part. When creating the inspection, re-name the CTL Delimiter to First, Middle, Last, or something that makes more sense to you.

Choose from First, Middle, or Last View. If you choose First, only the leading edge of the part is inspected.

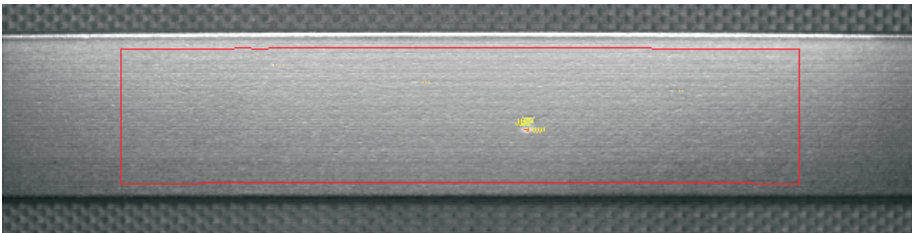
You can select Force Views in the Offline Functions Cut to Length screen. If you choose First for Force View, you will see only the leading edge of each part displayed on the screen.

A registration is recommended for the inspections of First, Middle, and Last views.

The picture below illustrates a database for one part length. The delimiters are named GROUP 1, GROUP 2, and GROUP 3 for First, Middle, and Last views, respectively. There are registrations in each group.

System Overview		Lane 1 Overview		Camera 1	Camera 2				
Part Rate: 0		Camera 1 [736mm Top]			Part Rate: 0		Camera 2 [736mm Bottom]		
Total		Defects	Defect %	▲	Total		Defects	Defect %	▲
2786		32	1.149		2786		16	0.574	
GROUP 1		0	0.000		GROUP 1		0	0.000	
- Registration		1	0.036		- Registration		1	0.036	
- Main1		1	0.036		- Main1		2	0.072	
- Top Edge		1	0.036		- Top Edge		2	0.072	
- Bottom Edge		2	0.072		- Bottom Edge		1	0.036	
GROUP 2		0	0.000		GROUP 2		0	0.000	
- Registration		8	0.287		- Registration		9	0.323	
- Main1		23	0.826		- Main1		10	0.359	
- Top Edge		10	0.359		- Top Edge		11	0.395	
- Bottom Edge		43	0.467	▼	- Bottom Edge		44	0.395	

Program inspections as recommended by your Pressco service engineer. A sample Middle view inspection (failed) is shown below.



Special Hardware for Multi-Void Tube inspection

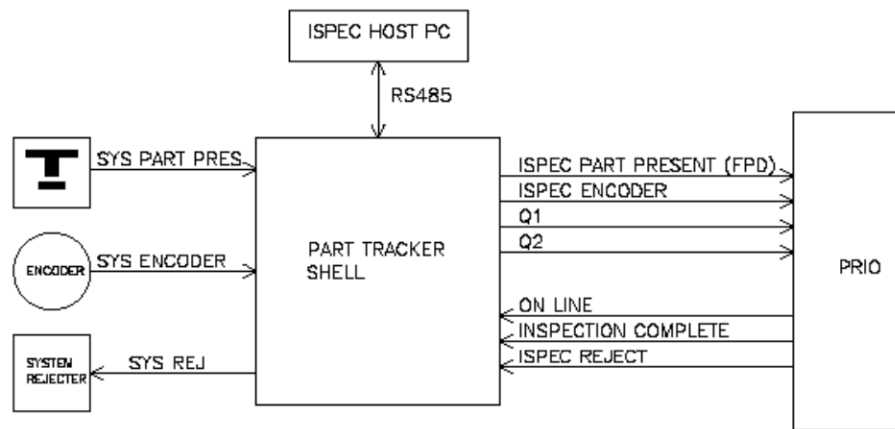
Overview

The Multi-Void Tube Inspection Shell provides a means by which the Intellispec can inspect various lengths of micro-void tubes.

The Intellispec normally expects that for each part present signal, one part image will be snapped, and that part normally falls within the field of view of one image.

However, since the multi-void tubes do not fit within one image view, the Shell compensates by sending “fake” part detect signals so that the Intellispec thinks it is inspecting multiple parts, when in fact it is inspecting multiple views of each part.

Following is a block diagram of the Shell, and a brief description of each signal:

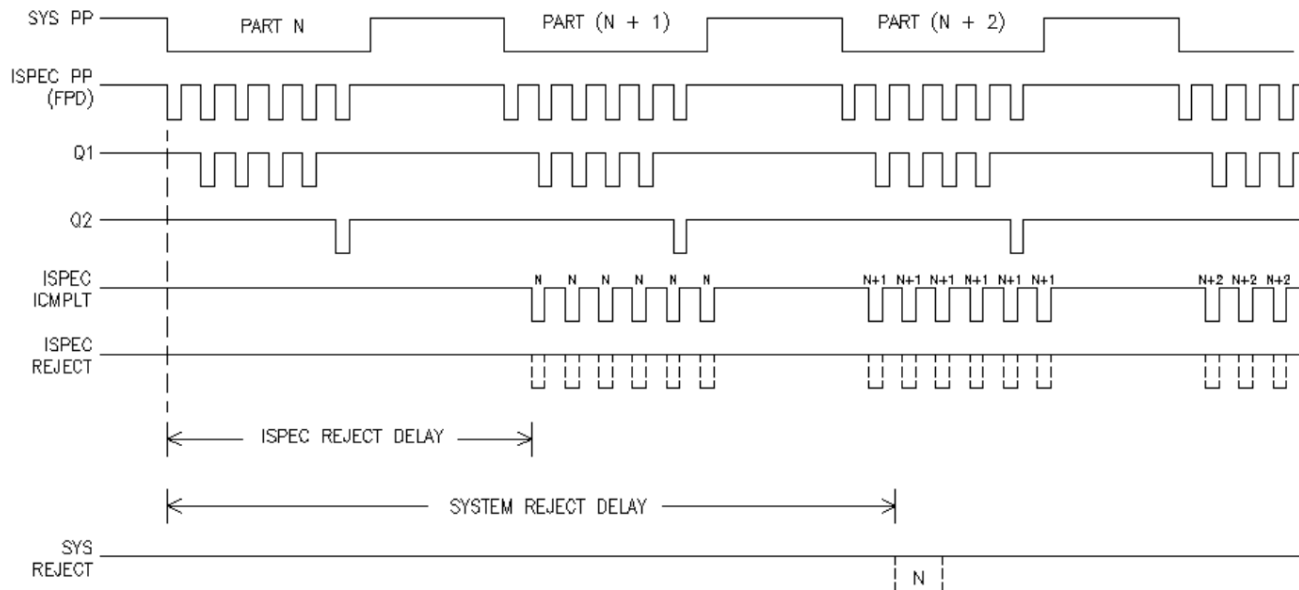


Multi-Void Shell block diagram

The signals to the left of the Shell represent interaction with physical devices such as the conveyor encoder, system part detect sensor, and system part rejecter. The signals to the right of the Shell represent interaction between the Shell and the Intellispec PRIO board.

System Part Present	This signal is active low whenever any part of a length of multi-void tube is under the system part sensor.
System Encoder	This signal is a pulse train from the encoder installed on the conveyor shaft.
System Reject	This is the signal sent by the Shell to the system part rejecter.
Ispec Part Present (Fake part detect)	This is the part detect signal sent from the Shell to the PRIO. There are multiple Fake Part Detect signals for each system part. This is the driving signal that forces the Intellispec to make multiple inspections of a single system part.
Ispec Encoder	This is a conditioned version of the System Encoder. The Shell uses it and passes it to the PRIO as the lane encoder.
Q1	Q1 is a qualifying signal sent from the Shell to the PRIO. Q1 is active for fake part detects that are generated for middle views of the system part. The Intellispec executes the middle view inspections for fake part detects that are presented with the Q1 active.
Q2	Q2 is a qualifying signal sent from the Shell to the PRIO. Q2 is active for fake part detects that are generated for trailing edge views of the system part. The Intellispec executes the trailing edge view scan for fake part detects that are presented with Q2 active.
Online	The Online signal is sent from the PRIO to the Shell. The Shell uses the Online signal to determine if the inspected and rejected part counters are to be enabled. The inspected and rejected counts are sent from the Shell to the Intellispec host PC as part of the statistics package maintained by the Shell.
Ispec Inspection Complete	This is the standard Intellispec Inspection Complete signal. The Intellispec generates an Inspection Complete for each fake part detect once the programmed Intellispec reject delay period has expired.
Ispec Reject	The Intellispec Reject signal is active coincident with the Inspection Complete signal if the Intellispec has determined that a defect has been detected in a fake part detect inspection and the Intellispec determines to reject the part.

Overall System Timing



Multi-Void Shell timing diagram

Sys PP	This active low system part present signal is a relatively wide signal indicative of the long cut to length multi-void tubes passing under the system part detect sensor.
Ispec PP (FPD)	The Intellispec part present (or Fake Part Detect) signal. Note that there are multiple fake part detect pulses for each system part present signal.
Q1	Qualifying signal. Neither Q1 nor Q2 are active for the first or leading edge FPD pulse. Q1 is active for the middle FPD pulses. The Intellispec monitors the Q1 and Q2 signals to determine whether a leading edge, middle, or trailing edge inspection should be performed for a given FPD pulse.
Q2	Qualifying signal, active for the final, or trailing edge, FPD pulse.
Ispec ICMPLT	The Intellispec activates the Inspection Complete signal for each FPD pulse. These pulses are active after the Ispec Reject Delay expires for each FPD pulse. This signal may be monitored on the Extended I/O board, I/O Rack 1 position 8, terminals 17 & 18 (see drawing on page c-14).
Ispec Reject	This signal is active only for FPD inspections that the Intellispec has determined to reject. The Shell will mark a system part (multi-void tube) bad if any active Ispec Reject signal is detected in response to the generation of an FPD pulse. These pulses are marked in dashed lines because not every image will be rejected.
Ispec Reject Delay	This value may be set through the Cut to Length menus, Reject Setup tab. It is the number of encoder ticks after the part detect that the reject signal is activated by Intellispec, if that view of the part is bad. It is also number of encoder ticks after the part detect that the Ispec ICMPLT signal is activated. This number must be greater than the number of encoder ticks required to inspect an entire part. Additionally, there must be enough time after Intellispec Reject Delay for all Inspection Complete pulses to occur before System Reject Delay. See diagram below.



System Reject Delay

This value may be set through the Cut to Length menus, Reject Setup tab. It is the delay from when the system part is first detected until the part is in place at the system rejecter. It must fall after all inspections are complete for each part.

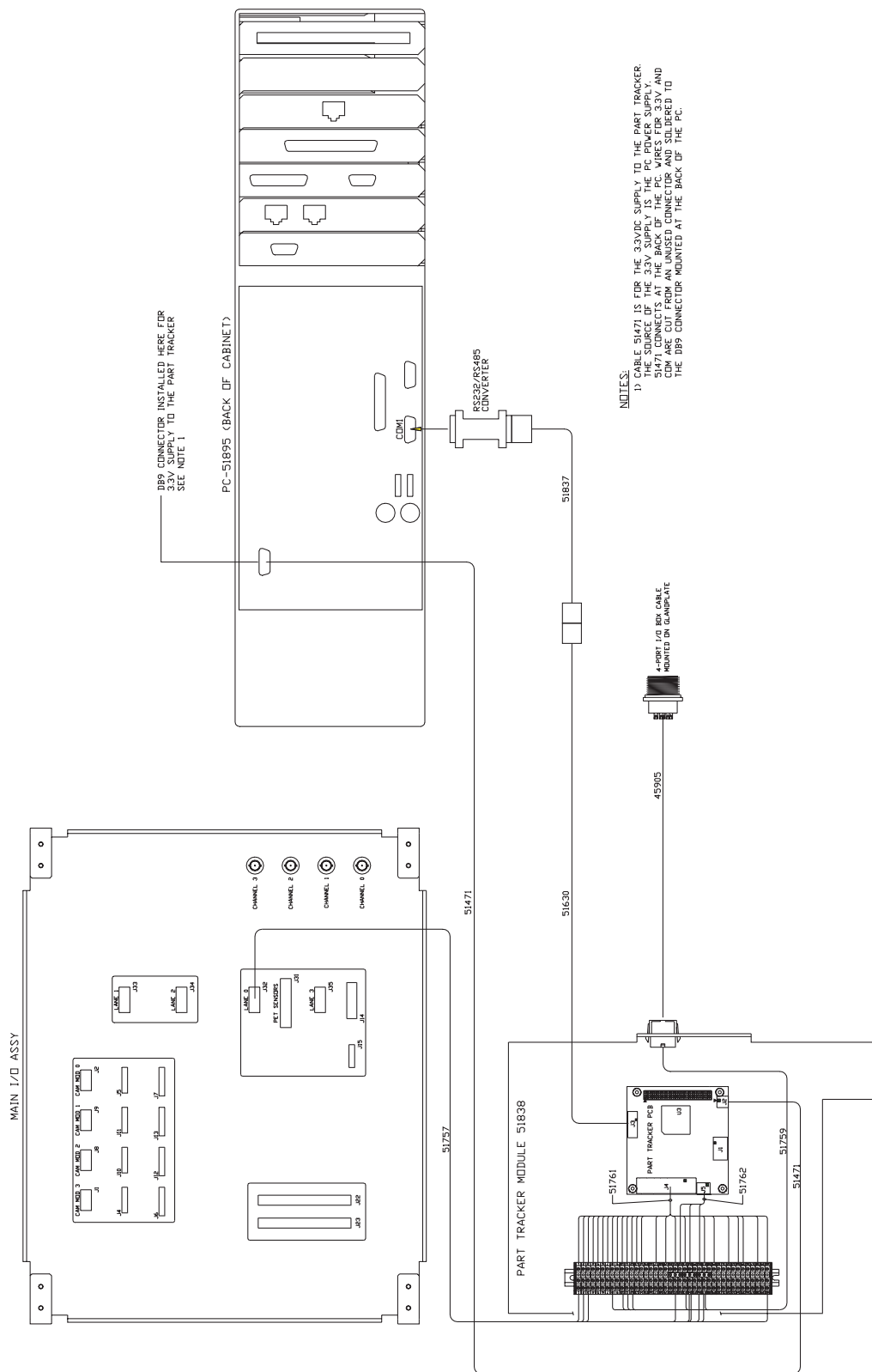
Sys Reject

This signal is activated after the System Reject Delay expires. The duration of the signal is defined by Reject Pulse Width in the Cut to Length Reject Setup menu.

Wiring Diagrams

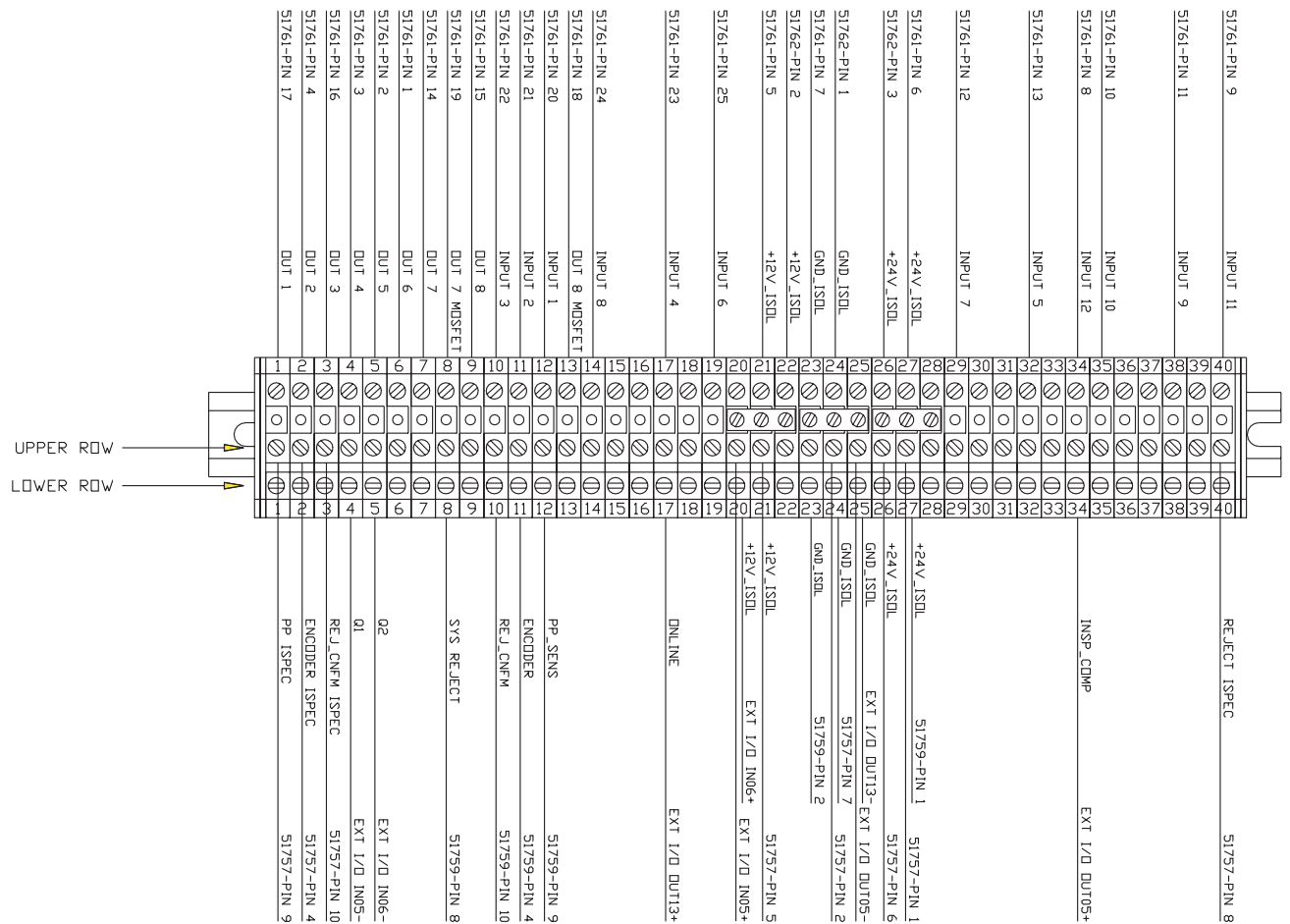
The Shell consists of the Part Tracker module board and its terminal block to which various cables are connected. The Shell also uses signals provided through the Extended I/O board in the Intellispec cabinet. The Shell wiring diagrams follow on the next few pages.

Refer to the Intellispec Hardware Guide for more information about the cabinet and its components.



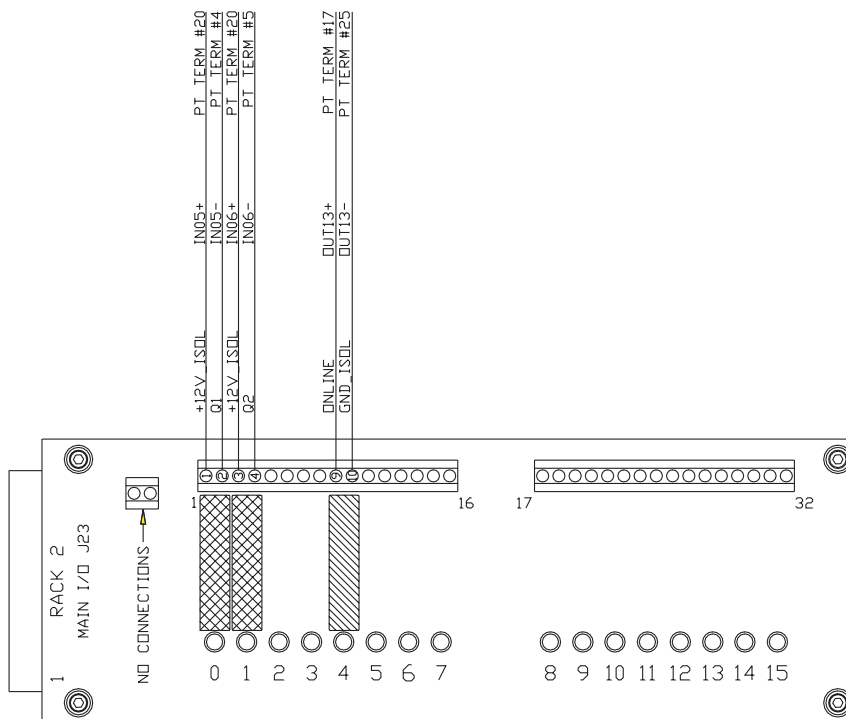
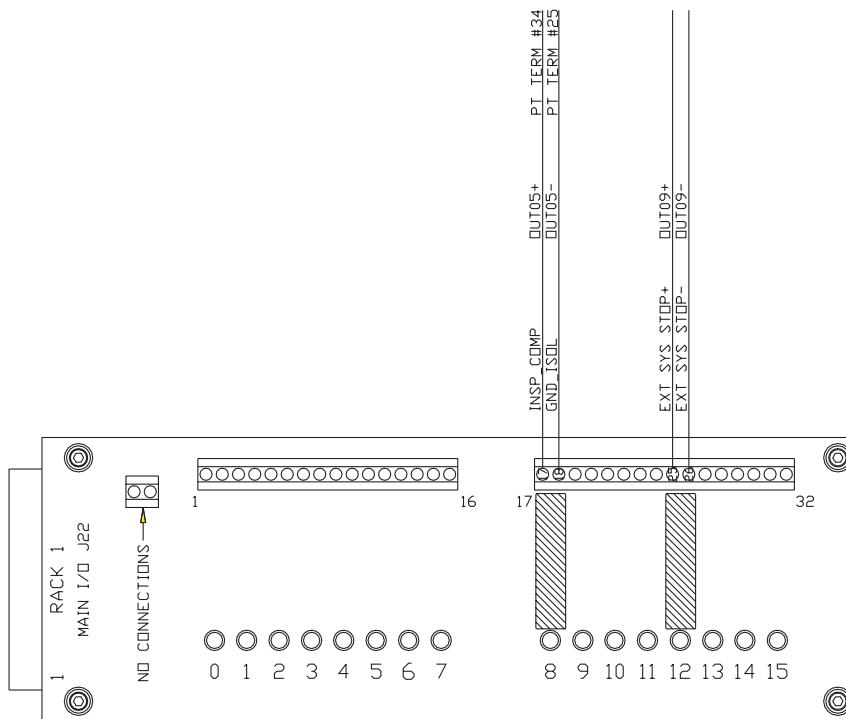
NOTES:

1) CABLE 51471 IS FOR THE 3.3VDC SUPPLY TO THE PART TRACKER. THE SOURCE OF THE 3.3V SUPPLY IS THE PC POWER SUPPLY. THE DB9 CONNECTOR ON THE PC POWER SUPPLY AND THE DB9 CONNECTOR ON THE PART TRACKER ARE CUT FROM AN UNUSED CONNECTOR AND SOLDERED TO THE DB9 CONNECTOR MOUNTED AT THE BACK OF THE PC.



NOTES:

- 1) UNLESS OTHERWISE INDICATED-
- CABLE 51757 IS WIRED TO THE UPPER ROW OF TERMINAL BLOCK.
- CABLE 51759 IS WIRED TO THE LOWER ROW OF TERMINAL BLOCK.



NOTES:

- EXT SYS STOP IS NOT WIRED TO THE PART TRACKER MODULE.
- EXT SYS STOP IS WIRED AT SYSTEM INSTALLATION.