



# NI OCR Training Interface Help

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The *NI OCR Training Interface Help* contains information about how to use the OCR Training Interface to train characters, save character sets, and verify characters by comparing them to a reference character.

For more information about this help file, refer to the following topics:

[Using Help](#)

[Related Documentation](#)

[Important Information](#)

[Technical Support and Professional Services](#)

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# Using Help

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# Conventions

This help file uses the following conventions:

- » The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
- This icon denotes a tip, which alerts you to advisory information.
- This icon denotes a note, which alerts you to important information.
- bold** Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
- green Underlined text in this color denotes a link to a help topic, help file, or Web address.
- italic* Italic text denotes variables, emphasis, cross references, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.
- monospace Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

## Navigating Help (Windows Only)

To navigate this help file, use the **Contents**, **Index**, and **Search** tabs to the left of this window or use the following toolbar buttons located above the tabs:

- **Hide**—Hides the navigation pane from view.
- **Locate**—Locates the currently displayed topic in the **Contents** tab, allowing you to view related topics.
- **Back**—Displays the previously viewed topic.
- **Forward**—Displays the topic you viewed before clicking the **Back** button.
- **Options**—Displays a list of commands and viewing options for the help file.

## Searching Help (Windows Only)

Use the **Search** tab to the left of this window to locate content in this help file. If you want to search for words in a certain order, such as "related documentation," add quotation marks around the search words as shown in the example. Searching for terms on the **Search** tab allows you to quickly locate specific information and information in topics that are not included on the **Contents** tab.

## Wildcards

You also can search using asterisk (\*) or question mark (?) wildcards. Use the asterisk wildcard to return topics that contain a certain string. For example, a search for "prog\*" lists topics that contain the words "program," "programmatically," "progress," and so on.

Use the question mark wildcard as a substitute for a single character in a search term. For example, "?ext" lists topics that contain the words "next," "text," and so on.




**Note** Wildcard searching will not work on Simplified Chinese, Traditional Chinese, Japanese, and Korean systems.

## **Nested Expressions**

Use nested expressions to combine searches to further refine a search. You can use Boolean expressions and wildcards in a nested expression. For example, "example AND (program OR VI)" lists topics that contain "example program" or "example VI." You cannot nest expressions more than five levels.



## Boolean Expressions

Click the  button to add Boolean expressions to a search. The following Boolean operators are available:

- **AND** (default)—Returns topics that contain both search terms. You do not need to specify this operator unless you are using nested expressions.
- **OR**—Returns topics that contain either the first or second term.
- **NOT**—Returns topics that contain the first term without the second term.
- **NEAR**—Returns topics that contain both terms within eight words of each other.


## Search Options

Use the following checkboxes on the **Search** tab to customize a search:

- **Search previous results**—Narrows the results from a search that returned too many topics. You must remove the checkmark from this checkbox to search all topics.
- **Match similar words**—Broadens a search to return topics that contain words similar to the search terms. For example, a search for "program" lists topics that include the words "programs," "programming," and so on.
- **Search titles only**—Searches only in the titles of topics.

## Printing Help File Topics (Windows Only)

Complete the following steps to print an entire book from the **Contents** tab:

1. Right-click the book.
2. Select **Print** from the shortcut menu to display the **Print Topics** dialog box.
3. Select the **Print the selected heading and all subtopics** option.  
 **Note** Select **Print the selected topic** if you want to print the single topic you have selected in the **Contents** tab.
4. Click the **OK** button.

## **Printing PDF Documents**

This help file may contain links to PDF documents. To print PDF documents, click the print button located on the Adobe Acrobat Viewer toolbar.

## Accessing the OCR Training Interface

You can access the NI OCR Training Interface from the **Start** menu if the NI Vision Development Module is installed. You can also access the NI OCR Training interface from within NI Vision Assistant or NI Vision Builder for Automated Inspection (Vision Builder AI).

## **From the Start Menu**

To launch the OCR Training Interface from the **Start** menu, select **Start»All Programs»National Instruments»Vision»OCR Training**.

## From Vision Assistant

The OCR Training Interface opens from Vision Assistant in a wizard to guide you through the creation of a new template. Complete the following steps to launch the OCR Training Interface wizard in Vision Assistant.

1. Acquire or open an image that contains the characters you want to read. Refer to the *NI Vision Assistant Help* for information about acquiring or opening images.
2. To access the OCR/OCV Setup panel, select **Identification»OCR/OCV**, or click **OCR/OCV** on the **Identification** tab of the Processing Functions palette.
3. Click **New Character Set File** on the **Main** tab of the OCR/OCV Setup panel.

## From Vision Builder AI

The OCR Training Interface opens from Vision Builder AI in a wizard to guide you through the creation of a new template. Complete the following steps to launch the OCR Training Interface wizard in Vision Builder AI.

1. Acquire, or simulate the acquisition of, an image that contains the characters you want to read. Refer to the *Vision Builder for Automated Inspection: Configuration Help* for information about acquiring images or simulating acquisitions.
2. On the **Identify Parts** tab of the Inspection Steps palette, click **Read/Verify Text**.
3. Select the **Mode** tab on the Read/Verify Text Setup panel, and click **New Character Set File**.



# OCR Training Interface Tutorial

This tutorial walks you through the steps for training characters with OCR using a specific set of images. This tutorial illustrates the various steps required to train varying representations of the same characters.

This tutorial includes the following sections:

- [Training Characters with OCR](#)
- [Reviewing Character Specifications](#)
- [Saving the Character Set File](#)

## Training Characters with OCR

Complete the following steps to train characters with OCR:

1. [Launch the OCR Training Interface.](#)
2. Select **File»Open Images.**
3. Complete one of the following sets of steps to open the tutorial images:
  - **NI Vision and Vision Assistant**
    - a. Navigate to <Vision>\Images\OCR Tutorial, where <Vision> is the location to which you installed the NI Vision Development Module.
    - b. Select the following images:
      - Tip** You can select multiple image files by pressing the <Ctrl> key and clicking each file. Enable the **Select all files** checkbox to open all images in the directory you specified.
        - NIOCRExample1.tif
        - NIOCRExample2.tif
        - NIOCRExample3.tif
        - NIOCRExample4.tif
        - NIOCRExample5.tif
    - c. Click **Open.**
  - **Vision Builder AI**
    - a. Navigate to <Vision Builder AI>\DemoImg\OCR, where <Vision Builder AI> is the location to which you installed Vision Builder AI.
    - b. Select the following images:
      - Tip** You can select multiple image files by pressing the <Ctrl> key and clicking each file. Enable the **Select all files** checkbox to open all images in the directory you specified.
        - NIOCRExample1.tif
        - NIOCRExample2.tif

- NIOCRExample3.tif
- NIOCRExample4.tif
- NIOCRExample5.tif

c. Click **Open**.

4. Use the [navigation buttons](#) to locate NIOCRExample1.tif.
5. Verify that the  **Rotated Rectangle Tool** is selected on the OCR Training Interface toolbar. On the image, draw a region of interest (ROI) around the characters.

**Tip** When you draw the ROI, exclude the barcode, but ensure that the region you draw is large enough to encompass possible locations of characters in the other images you analyze.



OCR segments objects in the ROI, displaying them in blue and drawing character bounding rectangles around them, according to the settings on each of the tabs at the bottom of the dialog box.

On the **Train/Read** tab, **Text Read** displays recognized characters and the substitution character based on the character set file you are using. If you have not opened a character set file or trained any characters, **Text Read** displays the substitution character for each of the segmented objects in the ROI. For example, in the previous illustration, **Text Read** contains six substitution characters. Any object that is surrounded by a character bounding rectangle is a segmented object.

You can specify the substitution character in the [Read Options](#) tab.

6. Enter BACE30 in **Correct String**, then click **Train**.
7. Use the [navigation buttons](#) to locate NIOCRExample2.tif file.

When analyzing this image, OCR uses the ROI you drew on the NIOCRExample1.tif image. Because the barcode in the NIOCRExample2.tif file is positioned differently, the ROI encompasses part of it, and OCR segments portions of the barcode.

8. Enable the **Reject Particles Touching ROI** checkbox on the **Threshold** tab to configure OCR to segment the characters

correctly without segmenting any portion of the barcode.

9. Set the **Remove Particles (Erosions)** control to 1.

Setting this control to 1 performs one erosion on the image. An erosion decreases the size of the objects in the image by removing a layer of pixels along the boundary of the particle. Performing an erosion helps to separate the characters in the image from the background of the image.



10. Enter B8F1E9 in **Correct String**, then click **Train**.

11. Navigate to the NIOCRExample3.tif file.

When analyzing this image, OCR uses the ROI you drew on the NIOCRExample1.tif file and the settings you modified to correctly segment the characters in the NIOCRExample2.tif file.

12. Verify that the objects in the ROI are segmented correctly.



13. Enter B7ODF4 in **Correct String**, then click **Train**.

14. Navigate to the NIOCRExample4.tif file.

When analyzing this image, OCR uses the ROI you drew on the NIOCRExample1.tif file and the settings you modified to correctly segment the characters in the NIOCRExample3.tif file. Because the character size and spacing in the NIOCRExample4.tif file are different from the character size and spacing in the other three files you have used to train characters, OCR incorrectly segments the two instances of the letter A.

15. Use the **Results** tab to [review character specifications](#) for the two instances of the letter A.

16. Select the **Size & Spacing** tab. Based on the character size statistics you viewed in the **Results** tab, change **Max** for the **Bounding Rect Width**. For example, in the following image, **Max** is set to 50 for **Bounding Rect Width**.



17. Enter B85AA6 in **Correct String**, then click **Train**.

18. Navigate to the NIOCRExample5.tif file.

When analyzing this image, OCR uses the ROI you drew on the

NIOCRExample1.tif file and the settings you modified to correctly segment the characters in the NIOCRExample4.tif file.

19. Verify that the objects are segmented correctly.

20. Enter B8CE72 in **Correct String**, then click **Train**.

## Reviewing Character Specifications

Use the **Results** tab to view statistics about the characters OCR segmented in the ROI.

The following list includes descriptions of each of the columns on the **Results** tab.

- **Character**—Lists the index of each of the characters in the current ROI.
- **Class**—Lists, by index, the character value for each of the characters you trained in the current ROI.
- **Left** and **Top**—List, by index, the x and y coordinates of the top left corner of each of the character bounding rectangles in the current ROI. The status bar in the image viewer displays the **Left** and **Top** coordinates of the character bounding rectangles as you move the mouse over the image.
- **Width** and **Height**—List, by index, the width and height of each of the characters you trained in the current ROI.
- **Size**—Lists, by index, the size of the character in pixels.
- **Class. Score**(classification score)—Lists, by index, a value that indicates the degree to which the assigned character class represents the object value better than other character classes in the character set. The range of values is 0 to 1000.
- **Verif. Score** (verification score)—Lists, by index, a value that indicates how closely a character matched its reference character in the character set. The range of values is 0 to 1000. A value of 1000 indicates a perfect match between an object and the reference character.
  - Note** You can set a reference character for each class. When you set a reference character, OCR returns a verification score that indicates how closely the character matched the reference character for its class. Use the verification score to perform optical character verification. OCR returns a value of 0 for the verification score if you do not set a reference for a class.

## Saving the Character Set File

Now that you have trained several characters, you are ready to save the character set file. Each character set file contains the current state of the OCR parameters as well as the characters you have trained.

1. Use the navigation buttons to scroll through each of the images you used in this tutorial. Review each image and the information in **Text Read** to ensure the characters are trained correctly.

Perform this step to ensure that the parameters you have set in OCR enable you to train an optimum number of characters. Because you will use this character set file in a reading procedure, you must ensure that it contains a broad spectrum of characters and parameters that configure OCR to correctly segment characters on a broad variety of images.

2. Use the **Edit Character Set File** tab to [review and modify the character set](#) you trained.
3. Select **File»Save Character Set File**, enter NIOCRTutorial.abc in **File Name** for the character set file, and click **OK** to save the character set.

**Note** You can use the NIOCRTutorial.abc character set file in the [examples](#) that are available with OCR.

# Training Characters

[Selecting an ROI Tool for OCR](#)

[Training Characters](#)

[Training Single Characters or Patterns](#)

[Training Incorrect Characters](#)

[Verifying the Quality of Characters](#)

[Modifying the Character Set File](#)



## Selecting an ROI Tool for OCR

In OCR applications, you want to focus on specific areas of the image. You can define these specific areas with region of interest (ROI) tools. The following tools are available depending on the orientation of the text in the image:

- Rotated Rectangle ROI tool**—Use this tool to draw a rotatable rectangle in the image. Click and drag to select a rectangular region. Press the <Shift> key while you click and drag to contain the region to a square, and then click the lines inside the rectangle and drag to adjust the rotation angle.
- Annulus ROI tool**—Use this tool to draw an annulus in the image. Click the center position and drag to the size you want. Adjust the inner and outer radii, and adjust the start and end angles.

The **Annulus Orientation** control becomes available when you select the Annulus ROI tool. Choose one of the following options.

- **Baseline Inside**—Select this option when the imaginary line on which the bottoms of the letters align is closer to the center of the annulus.
- **Baseline Outside**—Select this option when the imaginary line on which the bottoms of the letters align is closer to the outside of the annulus.

# Training Characters

Use the **Train/Read** tab to open images and train characters, and save the character values to a character set file.

Complete the following steps to train characters:

1. [Access the OCR Training Interface](#).
2. Select **File»Open Images**, and select the image or images you want to use for training. You can select multiple image files by pressing the <Ctrl> key and clicking each file. You can also enable the **Select all files** checkbox to open all images in the directory you specified.
3. Click **Open**.
4. Use the [navigation buttons](#) to locate the image you want to use for training.
5. On the image, draw an ROI around the characters you want to train.

**Tip** You can [modify the view of the image](#) if necessary.

The OCR Training Interface segments objects in the ROI, drawing character bounding rectangles around them according to the settings on each of the tabs at the bottom of the training interface. Any object that is surrounded by a character bounding rectangle is a segmented object.

On the Train/Read tab, **Text Read** displays recognized characters and the substitution character based on the character set file you are using. If you have not opened a character set file, **Text Read** displays the substitution character for each of the segmented objects in the ROI. For example, if the ROI contains three segmented objects, **Text Read** contains three substitution characters.

You can specify the substitution character in the [Read Options](#) tab.

6. Use the **Threshold**, **Advanced Threshold**, **Size & Spacing**, and **Read Options** tabs to set up the parameters you want to use in the training process. Adjust threshold methods and settings and make changes in the other tabs to configure OCR to draw

character bounding rectangles around objects in the ROI appropriately. OCR displays objects in blue.

7. Select the **Train All Characters** option.
8. In the **Correct String** textbox, enter the character values you want to associate with each of the objects in the ROI you specified. The number of character values you enter must match the number of objects found in the ROI.
9. Click **Train**.
10. If **Text Read** displays incorrect characters, adjust the parameters on the **Threshold**, **Advanced Threshold**, and **Size & Spacing** tabs to improve the results.
11. Repeat steps 3 through 10 to train additional characters.
12. Select **File»Save Character Set File**, enter a name for the character set file, and click **Save**.
13. Use the navigation buttons to view each image. Ensure that **Text Read** displays the correct characters for each image. If **Text Read** displays the substitution character or an incorrect character, adjust the parameters on the Read Options tab and/or [train the incorrect characters](#), and then save the character set file.

# Training Single Characters or Patterns

Complete the following steps to train single characters or patterns:

1. [Access the OCR Training Interface](#).
2. Select **File»Open Images**, and select the image or images you want to use for training. You can select multiple image files by pressing the <Ctrl> key and clicking each file. You can also enable the **Select all files** checkbox to open all images in the directory you specified.
3. Click **Open**.
4. Use the navigation buttons to locate the image you want to use for training.
5. On the image, draw an ROI around the characters you want to train.

OCR segments objects in the ROI, drawing character bounding rectangles around them according to the settings on each of the tabs at the bottom of the training interface. **Text Read** displays recognized characters and the substitution character based on the character set file you are using. If you have not opened a character set file, **Text Read** displays the substitution character for each of the segmented objects in the ROI. For example, if the ROI contains three segmented objects, **Text Read** contains three substitution characters. Any object that is surrounded by a character bounding rectangle is a segmented object.

6. Use the **Threshold**, **Advanced Threshold**, **Size & Spacing**, and **Read Options** tabs to set up the parameters you want to use in the training process. Adjust threshold methods and settings and make changes in the other tabs to configure OCR to draw character bounding rectangles around objects in the ROI appropriately. OCR displays objects in blue.
7. Click **Train Single Character**.
8. Select the **Index** of the character you want to train. OCR displays the character bounding rectangle of the corresponding character with a different color.
9. Enter the appropriate character value in **Correct String**.
10. Click **Train**.

## Training Incorrect Characters

Use **Train Incorrect Characters** to train incorrect characters in a segmented object, or to avoid training characters individually. Although you must enter character values for all segmented objects in **Correct String**, OCR trains only objects that do not have a match or have an incorrect match in **Text Read**.

For example, if you analyze an image that contains the letters A, P, and R and you train these letters, saving them to a character set file, you can later use the character set file to train characters on another image. If the second image contains the letters A, P, R, and O, OCR displays the recognized characters, A, P, and R, and replaces O with the substitution character in **Text Read**. You can use **Train Incorrect Characters** to train O without selecting it individually.

You also train incorrect characters when OCR displays the wrong character value for a segmented object. For example, if an ROI contains the letters A, P, R, and O and **Text Read** includes the letter B instead of P, you can use the **Train Incorrect Characters** option to correctly train the letter P.

Complete the following steps to train incorrect characters:

1. [Access the OCR Training Interface](#).
2. Select **File»Open Images**, and select the image or images you want to use for training. You can select multiple image files by pressing the <Ctrl> key and clicking each file. You can also enable the **Select all files** checkbox to open all images in the directory you specified.
3. Click **Open**.
4. Use the navigation buttons to locate the image you want to use for training.
5. On the image, draw an ROI around the characters you want to train.

OCR segments objects in the ROI, drawing character bounding rectangles around them according to the settings on each of the tabs at the bottom of the training interface. **Text Read** displays recognized characters and the substitution character based on the character set file you are using. If you have not opened a

character set file, **Text Read** displays the substitution character for each of the segmented objects in the ROI. For example, if the ROI contains three segmented objects, **Text Read** contains three substitution characters. Any object that is surrounded by a character bounding rectangle is a segmented object.

6. Use the **Threshold**, **Advanced Threshold**, **Size & Spacing**, and **Read Options** tabs to set up the parameters you want to use in the training process. Adjust threshold methods and settings and make changes in the other tabs to configure OCR to draw character bounding rectangles around objects in the ROI appropriately. OCR displays objects in blue.
7. Click **Train Incorrect Characters**.
8. Enter the appropriate character values in **Correct String**, including the previously trained and recognized characters, and click **Train**.

# Verifying the Quality of Characters

Complete the following steps to verify the quality of characters you have trained.

1. Click the **Edit Character Set File** tab.
2. Click on the most representative character, known as the reference character, for each class in the image window.
3. Enable the **Reference Character** checkbox.



**Note** The OCR Training Interface displays a warning if you do not specify a reference character for all classes.



4. Select the **Train/Read** tab.
5. Select the **Results** tab.
6. On the image, draw an ROI around the characters.

The **Verif. Score** (verification score) on the **Results** tab indicates how closely the character read matched the reference character you specified for that class. The range of values is 0 to 1000. A value of 1000 indicates a perfect match between an object and the reference character.



# Modifying the Character Set File

Use the **Edit Character Set File** tab to review and/or modify the contents of a character set file.

Complete the following steps to review and/or modify a character set file:

1. Select **File»Open Character Set File**, select the character set file you want to review and/or modify, and click **Open**.
2. Select the **Edit Character Set File** tab.  
The browser displays the trained characters.
3. If you want to rename a character, select the character in the browser and click **Rename**. Type the new character value in **New Class** and click **OK**.
  - Tip** If you rename a reference character, its reference designation is removed. Reset the character as a reference character after you rename it.
4. If you want to delete a character from the character set file, select the character in the browser and click **Delete** or press the <Delete> key.
5. If you want to set a character as a reference character to perform optical character verification (OCV), select the character or characters in the browser and enable the **Reference Character** checkbox. An overlay indicates that the character is now a reference character. A warning indicates if you have not selected a reference character in all classes.
  - Note** When you set a reference character, OCR returns a verification score that indicates how closely the character matched the reference character for its class. Select the **Train/Read** tab, then select the **Results** tab to view the verification score.
6. Select **All Trained Characters** to display the entire contents of the character set file in the browser. To display characters of only one class value, select **Characters of Class** and select the character you want to view.

**Samples** displays the number of instances of the selected character class in the character set file.



The **Character Histogram** graphically displays the number of instances of each character value in the character set.

# Configuring OCR Settings

[Setting Up the Threshold](#)

[Setting Up the Advanced Threshold](#)

[Setting Up Character Size and Spacing Criteria](#)

[Setting Up Read Options for the Training Process](#)

[Reviewing Character Statistics](#)

## Setting Up the Threshold

Use the settings on the **Threshold** tab to determine how you want OCR to calculate the threshold value it uses to segment objects on an image.

Complete the following steps to set up thresholding:

1. Select the **Threshold** tab, and select a threshold **Mode**:
  - **Fixed Range**—A method in which you manually determine the threshold value for the entire ROI.
  - **Uniform**—A method in which OCR calculates a single threshold value for the entire ROI.
  - **Linear**—A method in which OCR divides an ROI into the number of blocks you specify, calculates a threshold value for the first and last boxes, then linearly interpolates values for the blocks in between.
  - **Non Linear**—A method in which OCR divides the ROI into the number of blocks you specify, and calculates a threshold value for each block. Specify the number of blocks on the [Advanced Threshold](#) tab.
2. If you selected **Fixed Range** in **Mode**, use **Min** and **Max**, or the slider at the bottom of the histogram, to set the threshold value.
3. If you selected **Uniform**, **Linear**, or **Non Linear** in **Mode**, select **Dark on Light** in **Characters** if the image contains dark characters on a light background. Select **Light on Dark** in **Characters** if the image contains light characters on a dark background.
4. Enable the **Reject Particles Touching ROI** checkbox to ignore particles that are touching the border of the ROI you drew.
5. In **Remove Particles (Erosions)**, select the number of erosions you want OCR to perform to remove small particles from the ROI.

As you manipulate settings on the **Threshold** tab, OCR displays segmented objects in blue.

- Tip** If the objects in the ROI are not segmented as you expect them to be, experiment with settings on the **Threshold**, **Advanced Threshold**, and [Size & Spacing](#) tabs to improve the segmentation.

## Setting Up the Advanced Threshold

Use the **Advanced Threshold** tab to set up additional options for the **Non-Linear** threshold methods. If you selected **Fixed Range** in **Mode** on the **Threshold** tab, the options on the **Advanced Threshold** tab are not available.

Complete the following steps to set up additional options for thresholding:

1. Use **Lower Value** and **Higher Value** to determine the threshold limit that OCR uses to calculate the threshold.
2. Enter the **# of Blocks** you want to use with the **Linear** and **Non-Linear** threshold calculation methods.
3. If speed takes precedence in calculating the threshold, enable **Optimize for Speed** to perform the thresholding calculation more quickly, but less accurately. If accuracy takes precedence, disable **Optimize for Speed** to perform the thresholding calculation more slowly, but more accurately.

If you enable **Optimize for Speed**, you also can enable **Bi modal Calculation** to enable OCR to calculate both the upper and lower threshold levels for images that are dominated by two pixel intensity levels. If you enable **Bi modal Calculation**, OCR disregards the pixel intensity level setting you selected in **Characters** on the [Threshold](#) tab.

- Tip** If the objects in the ROI are not segmented as you expect them to be, experiment with settings on the **Threshold**, **Advanced Threshold**, and [Size & Spacing](#) tabs to improve the segmentation.

## Setting Up Character Size and Spacing Criteria

Use the **Size & Spacing** tab to indicate the character size and spacing values required for character recognition. OCR does not recognize any characters in the ROI that do not meet the criteria you set here.

Modify the fields on the **Size & Spacing** tab to set up the character size and spacing requirements.

- **AutoSplit**—Allows you to configure OCR to handle slanted characters.
- **Bounding Rect Width**—Indicates the width limits, in pixels, for the character bounding rectangle.
- **Bounding Rect Height**—Indicates the height limits, in pixels, for the character bounding rectangle.
- **Character Size**—Indicates the size (area) requirements, in pixels, for an object in an ROI to be considered a character that can be trained.
- **Min Char Spacing**—Indicates the minimum amount of space, in pixels, that can be between characters in the ROI you specified. This value must be greater than **Max Element Spacing (x)**.
- **Max Element Spacing (x)**—Indicates the maximum amount of space, in pixels, that can be between horizontally adjacent elements, such as in dot-matrix objects. This value must be less than **Min Char Spacing**.
- **Max Element Spacing (y)**—Indicates the maximum amount of space, in pixels, that can be between vertically adjacent elements.

**Tip** If the objects in the ROI are not segmented as you expect them to be, experiment with settings on the [Threshold](#), [Advanced Threshold](#), and **Size & Spacing** tabs to improve the segmentation.

# Setting Up Read Options for the Training Process

Use the **Read Options** tab to determine how OCR processes the image to detect characters.

Complete the following steps to configure the OCR reading process:

1. Select a **Read Strategy**.
  - **Conservative**—Configures OCR to use extensive criteria to determine if read characters match trained characters.
  - **Aggressive**—Configures OCR to use few criteria to determine if read characters match trained characters.

The **Aggressive** strategy processes images faster than the **Conservative** strategy.

2. To configure OCR to consider character size during the read process, select **Aspect Ratio Dependent** and select an **Aspect Ratio** value to indicate the allowable difference, as a percentage, between the training and reading character size and height/width ratio. The minimum value is 100 percent, which indicates that the read character must be the exact same size as the trained character.
3. Select the **Read Resolution** to determine the level of character detail you want OCR to use during the reading procedure.
4. Select an **Acceptance Level** value to indicate how closely an object must match a trained character to be a recognized character. The range of values is 0 to 1000.
5. Enter the **Substitution Character** you want OCR to use for objects that are not yet trained and recognized.

# Reviewing Character Statistics

Use the **Results** tab to view statistics about the characters OCR segmented in the ROI.

The following list includes descriptions of each of the columns on the **Results** tab.

- **Character**—Lists the index of each of the characters in the current ROI.
- **Class**—Lists, by index, the character value for each of the characters you trained in the current ROI.
- **Left** and **Top**—List, by index, the x and y coordinates of the top left corner of each of the character bounding rectangles in the current ROI. The status bar in the image viewer displays the **Left** and **Top** coordinates of the character bounding rectangles as you move the mouse over the image.
- **Width** and **Height**—List the width and height of each of the characters you trained in the current ROI.
- **Size**—Lists, by index, the size of the character in pixels.
- **Class. Score** (classification score)—Lists, by index, a value that indicates the degree to which the assigned character class represents the object value better than other character classes in the character set. The range of values is 0 to 1000.
- **Verif. Score** (verification score)—Lists, by index, a value that indicates how closely a character matched the reference character from its assigned class. The range of values is 0 to 1000. A value of 1000 indicates a perfect match between an object and the reference character.
  - Note** You can set a character as reference for each class. When you set a reference character, OCR returns a verification score that indicates how closely the character matched the reference character for its class. Use the verification score to perform optical character verification. OCR returns a value of 0 for the verification score if you do not set a reference for a class.

# Developing OCR Applications

Use the following OCR examples to learn how to use the NI OCR Training Interface to create OCR applications in LabVIEW, LabWindows/CVI, or Microsoft Visual Basic:

- [LabVIEW OCR example](#)
- [LabWindows™/CVI™ OCR example](#)
- [Microsoft Visual Basic OCR example](#)



# OCR Example for LabVIEW

You can use the OCR example for LabVIEW to perform OCR on an image using the character set file you created with the [OCR Training Interface Tutorial](#).

Complete the following steps to use the OCR example for LabVIEW:

1. Navigate to <LabVIEW>\examples\Vision\2.Functions\OCR\OCR First Example.llb and open the OCR First Example VI, where <LabVIEW> is the location to which you installed LabVIEW.
2. Run the VI.
3. Click **Open Character Set File** and open the NIOCRTutorial.abc file you created upon completing the OCR Training Interface Tutorial.
4. Click **Open Image**, select one of the NIOCRExample\* image files, and click **Open**.
5. Draw an ROI on the image and click **Read**.
  - **Read String** displays the recognized characters and the substitution character.
  - **Time (ms)** displays the amount of time it took OCR to read the image.
6. Click **Return** to exit the example.

## OCR Example for LabWindows/CVI

You can use the OCR example for LabWindows™/CVI™ to classify samples using the file you created with the [NI OCR Training Interface Tutorial](#).

## Opening the LabWindows/CVI OCR Example

The location of the example depends on the operating system and version of LabWindows/CVI. To open the example, choose one of the following paths:

- For LabWindows/CVI 8.5, navigate to <CVI>\Samples\Vision\2.Functions\OCR\OCR First Example.prj, where <CVI Application> is the location to which you installed LabWindows/CVI.
- For LabWindows/CVI 8.5.1 on Windows Vista, navigate to C:\Users\Public\Documents\National Instruments\CVI\Samples\Vision\2.Functions\OCR\OCR First Example.prj.
- For LabWindows/CVI 8.5.1 on Windows XP/2000, navigate to C:\Documents and Settings\All Users\Documents\National Instruments\CVI\Samples\Vision\2.Functions\OCR\OCR First Example.prj.

## Using the LabWindows/CVI OCR Examples

1. Select **Build»Configuration»Debug**, and then Select **Run»Debug OCR First Example.exe** to run the example.
2. Click **Open Character Set File** and open the NIOCRTutorial.abc file you created upon completing the OCR Training Interface Tutorial.
3. Click **Open Image**, select one of the NIOCRExample\* image files, and click **Load**.
4. Draw an ROI on the image and click **Read**.
  - **Read String** displays the recognized characters and the substitution character.
  - **Time (ms)** displays the amount of time it took OCR to read the image.
5. Click **Quit** to exit the example.

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## Related Documentation

The following documents contain information that you might find helpful as you use this help file:

- *NI Vision Concepts Manual*—Describes the basic concepts of image analysis, image processing, and machine vision. This document also contains in-depth discussions about imaging functions for advanced users.
- *NI Vision for LabVIEW Help*—Combines the *NI Vision for LabVIEW User Manual* and *NI Vision for LabVIEW VI Reference Help* from previous releases into one document. The *NI Vision for LabVIEW Help* contains reference information about NI Vision for LabVIEW palettes and VIs.
- *NI Vision for LabWindows/CVI Function Reference Help*—Contains reference information about NI Vision for LabWindows/CVI functions.
- *NI Vision for Visual Basic Reference Help*—Contains reference information about NI Vision for Visual Basic objects and their associated properties, methods, and events.
- *NI Vision Builder for Automated Inspection: Configuration Help*—Contains information about using the Vision Builder for Automated Inspection Configuration Interface to create a machine vision application.
- *NI Vision Assistant Help*—Contains descriptions of the NI Vision Assistant features and functions and provides instructions for using them.

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## Navigating Images

You can use the toolbar buttons to navigate the images you opened for training. Refer to the following button descriptions for information about how to view images.

- First Image**—Navigates to the first image in the list of images you opened.
- Previous Image**—Navigates to the previous image.
- Next Image**—Navigates to the next image.
- Last Image**—Navigates to the last image in the list of images you opened.

## Viewing Images

You can use the toolbar buttons to view images in greater or lesser detail. Refer to the following button descriptions for information about how to view images:

- Zooms in on an image.
- Zooms out on an image.
- Displays an image at regular magnification.

# OCR Example for Microsoft Visual Basic

You can use the OCR example for Microsoft Visual Basic to perform OCR on an image using the character set file you created with the [OCR Training Interface Tutorial](#).

Complete the following steps to use the OCR example for Microsoft Visual Basic:

1. Open the example.
  - For Microsoft Visual Basic 6.0, navigate to <Vision>\Examples\MSVB\2.Functions\OCR, where <Vision> is the location to which you installed the NI Vision Development Module, and open the OCR First Example.vbp file.
  - For Microsoft Visual Basic .NET, navigate to <Vision>\Examples\MSVB.NET\2.Functions\OCR, where <Vision> is the location to which you installed the NI Vision Development Module, and open the OCR First Example.vbproj file.
2. Run the example.
3. Click **Open Character Set File** and open the NIOCRTutorial.abc file you created upon completing the OCR Training Interface Tutorial.
4. Click **Open Image**, select one of the NIOCRExample\* image files, and click **Open**.
5. Draw an ROI on the image.
  - **Read String** displays the recognized characters and the substitution character.
  - **Time (ms)** displays the amount of time it took OCR to read the image.
6. Click **Quit** to exit the example.

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