

AutoCAD Raster Design 2010

Tutorials

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Welcome to the AutoCAD Raster Design 2010 Tutorials

1

Use these tutorials to learn how to perform specific tasks with images from various sources, such as scanned drawings, photographs, and satellite imagery.

Nine tutorials are included in the full installation of AutoCAD Raster Design:

- [Basic Tasks Tutorial](#) (page 5)
- [Scanned Drawing Cleanup Tutorial](#) (page 17)
- [Bitonal Image Tutorial](#) (page 47)
- [Hybrid Image Tutorial](#) (page 75)
- [Photograph and Map Tutorial](#) (page 103)
- [Tonal Adjustment Tutorial](#) (page 151)
- [Palette Manager Tutorial](#) (page 171)
- [Vectorization Tutorial](#) (page 183)
- [Text Recognition Tutorial](#) (page 221)

Organization of the Tutorials

Each tutorial contains a set of exercises using images designed to explore the various features of Raster Design. Each tutorial refers to a folder containing the images and drawings for the exercises.

You should first complete [Basic Tasks Tutorial](#) (page 5) to learn some basic skills, then move on to the other tutorials in any order you choose. However, the exercises within each tutorial are organized in a logical sequence, and you should follow them in that order to avoid confusion.

Related Exercises

You can explore some features of Raster Design in more than one exercise. For example, you can use several methods to insert images into drawings. When additional exercises are available, the exercise introduction contains links to the related exercises.

Getting More Information

To obtain more detailed information about Raster Design features and commands, refer to the following documentation:

- *AutoCAD Raster Design 2010 Getting Started* manual (PDF or printed manual).
- AutoCAD Raster Design 2010 User Guide (online Help).

Conventions Used in These Tutorials

The step-by-step procedures in each exercise use the following text conventions:

- Commands in all uppercase letters are AutoCAD commands. For example, COPY refers to the AutoCAD copy command.
- A red pointer in the left margin indicates a hidden illustration. Click the red pointer to display the graphic.

Using the Tutorial Images and Drawings

When you install Raster Design using the Full Installation option, six folders containing the images and drawings used in the tutorials are copied to the ..\Program Files\Raster Design\Tutorials folder on your system. Each folder corresponds to a tutorial:

Tutorial Name	Folder Name
Basic Tasks Tutorial (page 5)	Tutorial1
Scanned Drawing Cleanup Tutorial (page 17)	Tutorial2
Bitonal Image Tutorial (page 47)	Tutorial3
Hybrid Image Tutorial (page 75)	Tutorial4

Tutorial Name	Folder Name
Photograph and Map Tutorial (page 103)	Tutorial5
Vectorization Tutorial (page 183)	Tutorial6
Palette Manager Tutorial (page 171)	Tutorial7
Tonal Adjustment Tutorial (page 151)	Tutorial8
Text Recognition Tutorial (page 221)	Tutorial9

If these folders are not installed in the ..\Program Files\Raster Design\Tutorials folder on your system, use the AutoCAD Raster Design CD to perform a custom installation and install the tutorial folders.

Create a Working Folder for the Tutorials

In order to experiment freely with the tutorial images and drawings, create a working folder on your system and copy the tutorial folders to this folder. Use these copies of the tutorial files to complete the exercises. Retain the original tutorial folders in ..\Program Files\Raster Design\Tutorials.

Even if you intend to complete only certain exercises in a tutorial, it is a good idea to copy the entire folder for that tutorial to your working folder. This ensures that you have all the drawings, images, and related files, such as correlation files, that you need to complete the exercises.

Starting the Exercises

Click one of the following links to begin:

- [Get started with Raster Design \(recommended\)](#) (page 5)
- [Clean up images from scanned drawings](#) (page 17)
- [Edit black and white \(bitonal\) images](#) (page 47)
- [Work with hybrid images \(containing raster and vector data\)](#) (page 75)
- [Work with photographs, maps, or satellite data](#) (page 103)
- [Work with tonal adjustment](#) (page 151)
- [Work with the Palette Manager](#) (page 171)

- [Create vector entities from raster images](#) (page 183)
- [Work with text recognition](#) (page 221)

Basic Tasks Tutorial

2

This tutorial introduces the following Raster Design features:

- Raster Design setup options
- Image management features
- Image properties
- Methods of saving images

In these exercises, you set Raster Design options that control feature settings and learn how to control image display. Also, you learn how to view and modify the properties of an image or a group of images, and how to save modified images.

You should complete the exercises in this tutorial before continuing with the other Raster Design tutorials. The subsequent tutorials assume that you are familiar with the features covered in these exercises.

You can access Raster Design commands and features in the following ways:

- Image menu
- Shortcut menu
- Raster Design Toolbar

Each of the tutorial exercises requires a specific drawing file from the \Tutorials folder where Raster Design is installed. For information on these drawing files, see [Using the Tutorial Images and Drawings](#) (page 2).

Exercise A1: Setting Raster Design Options

In this exercise, you use the Raster Design Options dialog box to control feature settings.

This dialog box contains settings that apply to all features, such as the image detach options, and settings that apply to specific features, such as the raster entity manipulation (REM) settings.

You can access the Raster Design Options dialog box using either of these methods:

- Click Image ► Options.

- On the Raster Design Toolbar, click Options  .

To Set Raster Design Options

- 1 **NOTE** An open drawing is not required for this exercise. Step 1 is optional.

In the Program Files\Raster Design\Tutorials\Tutorial1 folder, open the drawing file GettingStarted_01.dwg.

- 2 To display the Raster Design Options dialog box, click Image ► Options.

- 3 On the Paths tab, clear the checkbox for Use Correlation Search Path Before Using Image Directory.

When this checkbox is cleared, Raster Design looks first in the same directory as the image for resource correlation files.

- 4 On the User Preferences tab, specify the following settings:

- Under Image Detach Options, select Always Detach.
When you erase an image, Raster Design automatically detaches the image from the drawing.
- Under Mouse Settings, select Shift + Left Click Image Select.
Using shift-click to select an image is particularly helpful when you are zoomed in to the image and cannot see the image frame to select it.
- Under Qsave Preferences, select Prompt During QSAVE.
Raster Design prompts you to save edited images during quick saves.
- Under Startup Options, select Load Menu on Raster Design Startup.
The Image menu is included with the AutoCAD menus when you start Raster Design.
- Under Message Display, select Message Box.
Raster Design displays warning messages in message boxes.

- 5 On the Feature Settings tab, specify the following settings:
 - Under Locking Settings, select No Locking.
Image files are not locked while you are working with them.
 - Under Thumbnail Option, select Save Thumbnail With Image.
Thumbnails allow faster display of the image preview when you insert an image.
- 6 On the Image Defaults tab, specify the following settings:
 - Under Insertion Point, specify 0 for X, Y, and Z values.
 - Under Scale/Rotation, specify 1 for Scale and 0 for Rotation.
 - Under Density, specify 300 for Value and select Inches for Units.
 - Under Vertical Units, select Meters.
- 7 Click OK to return to the drawing.
Access Raster Design Options from the shortcut menu
- 8 Right-click in the display area of the drawing window to open the shortcut menu.
If you right-click when the pointer is positioned outside the drawing area, a different shortcut menu is displayed.
- 9 Click Image ► Options on the shortcut menu to display the Raster Design Options dialog box.
- 10 Click Cancel to return to the drawing.
- 11 Close the drawing, without saving changes.

Exercise A2: Managing Images in a Drawing


In this exercise you control the display of images inserted into a drawing.

Use the Image Manager toolspace to view and edit image insertions, color maps, and other data associated with an image. The toolspace provides two views of the image data, the Image Insertions view and the Image Data view.

Access the Image Manager toolspace using the following methods:

- Click Image menu ► Manage.
- On the command line, enter imanage.

- Right-click in the drawing area and click Image ► Manage.

- On the Raster Design Toolbar, click Image Management  .

Related Exercises



- [Exercise A3: Viewing and Changing Image Properties](#) (page 13)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).




Open the drawing file for this exercise

- 1 In the \Tutorial1 folder, open the drawing file GettingStarted_02.dwg.
You should see a set of six images, with one on the right overlapping three others. If you see only the rectangular frame for any image, select the frame, then right-click and click Image ► Show. The image should appear.

Explore the Image Insertions view of the toolspace

- 2 To display the toolspace, click Image menu ► Manage. If necessary, click the Images tab to display the Image Manager.
- 3 On the drop-down menu at the top of the toolspace, select the Image Insertions view.
- 4 On the management toolbar above the drop-down menu, click  to expand the object tree.
You can see an object for each image inserted into the drawing. Below each image insertion is the color map: BIN for bitonal, CLR for color, etc.
- 5 Click the drawing name (GettingStarted_02) at the top of the tree.
Attributes for each image are displayed in the tabular item view.
- 6 Lower in the tree, click one of the image insertion names (Aerial, Arch, etc.) to select it.
Properties for the selected insertion are displayed in the item view.
- 7 In the management toolbar, click  .
The item view is replaced by a preview of the selected image insertion.
You can resize the preview pane to change the size of previews.

NOTE Image previews are available in the Image Insertions view of the Image Manager toolspace, but not in the Image Data view.

- 8 Click other image insertion objects to see a preview of each one.
Use the standard toolspace controls
- 9 On the command line, enter `dockts`. The toolspace is moved to a docked position on the left side of your drawing.
- 10 On the command line, enter `floatts`. The toolspace is floated over the drawing.
Further exploration: You can also dock and float the toolspace with the cursor. Click and drag the floating toolspace to the top or left side of the window to dock it. Click and drag the handle of the docked toolspace to float it. Other commands you can try are `hidets` to hide the toolspace, and `imanager` or `showts` to show the toolspace.
- 11 On the floating toolspace colored control bar, click  to turn auto-hide on.
Now, when you move your cursor off the toolspace, it retracts into the control bar, giving you clear access to the drawing. To expand the toolspace again, move your cursor over the control bar. Auto-hide is convenient when you want to work in the drawing but retain quick access to the Image Manager toolspace.
- 12 To turn auto-hide off, click  .
- 13 Click  to see the Properties menu for the toolspace.
You can use options on this menu to disable the docking feature, control the transparency of the toolspace, and turn auto-hide on or off.
Show and hide images
- 14 Click any image insertion name in the tree, then right-click and click Hide.
In the drawing, the image disappears, but the frame remains visible. Note that the image object remains both in the tree and in the preview window.
- 15 To redisplay a hidden image, right-click the insertion name and click Show.

TIP Another way to hide and show images is to select the image frame, then right-click and click Image ► Show (or Hide). When the frame is selected, it changes to dotted lines with a blue square at each corner.

Using the Hide option is the simplest way to remove an image from the display, creating minimal change in the drawing. Related commands are as follows:

- Unload deletes the image from working memory. This option is available on the Image Data view when you right-click an image data definition. Reverse this option with the Reload option on the same shortcut menu.
- Erase deletes the image and frame from the drawing and the object tree, but leaves an unreferenced data definition in the Image Data view, unless the Raster Design Options are set to always detach. The erase option is available on the Image Insertions view when you right-click an image insertion. If an image is erased but not detached, you can reverse the erase operation by right-clicking the image in the Image Data view and clicking New Insertion.
- Detach is the most complete form of image removal, as it clears all of the image data from the drawing. This option is available on the Image Data view when you right-click an image data definition. Reverse this option by creating a new image insertion.

Zoom to an image

- 16 Right-click an image insertion name and click Zoom To. The display zooms to that image.
- 17 To return to the previous view, on the Edit menu, select Undo Group of Commands.



Control image display order

In the drawing, notice that the image Aerial overlaps Pyrmd and Tractor. This display order is reflected in the Image Insertions view, where you see Aerial higher up the tree than either Pyrmd or Tractor. The order of insertions in this tree corresponds directly to their display order within the drawing.

- 18 In the Image Insertions tree, click and drag the Aerial image to a position below Pyrmd. Notice how this changes the display.
- 19 Click and drag Aerial to a position below Tractor.
- 20 Right-click Aerial and click Bring To Front.

TIP In some instances, the menu selections can provide more precise control of image display order than the click-and-drag method.

Edit color maps

- 21** Right-click Arch and click Edit Color Map.
The Select Color dialog box opens. This is the color map control for all bitonal images.
- 22** Use the cursor to select a different foreground color for the linework, preferably a color that will be clearly visible against the background.
- 23** Click OK, then click in the drawing window to see the change.
Your color choice is applied to the linework and frame of the image, but not the preview. Notice also that the RGB color values are listed in the label of the color map.
- 24** Click the color map object  for any image insertion to see its color properties in the tabular item view.
- 25** Right-click Tractor and click Edit Color Map.
The Image Adjust dialog box opens. This is the color map control for single-band grayscale and color images.
- 26** Change the settings for brightness, contrast, and fade.
- 27** Click OK, then click in the drawing window to see the change.
Your settings are applied to the image. Notice also that the numeric values of these settings are listed in the label of the color map.
Explore the Image Data view
- 28** On the drop-down menu in the upper part of the toolspace, select the Image Data view.
- 29** In the management toolbar above the drop-down menu, click  to expand the object tree.
Note the different object tree in this view. Each image is represented by a branch of five or more objects. At the top of each branch is the image data definition, followed by a band group (with subordinate bands), and a color map with subordinate image insertion.
- 30** Click various data objects to see their properties in the item view.
Create new insertions

- 31 Right-click the color map for Aerial and click Edit Color Map.
- 32 Change the values for brightness, contrast, and fade. Note that these settings appear in the label for the color map object.
- 33 Right-click the color map for Aerial and click New Insertion.
A duplicate instance of the grayscale color map is created in the tree, with a subordinate new insertion named Aerial:1.
- 34 Right-click the image data definition for Aerial and click New Insertion. This action creates a new insertion, Aerial:2, with the default color map.
Unload an image
- 35 Right-click the image data definition for Tractor, then click Unload. The image disappears, but the frame remains.
- 36 Click the drawing object at the top of the tree and notice the entry for Tractor in the Status column of the item view.
- 37 Right-click the image data definition for Tractor, click Reload, then click in the drawing window. The image reappears in the frame.

TIP Temporarily unload one or more images from a drawing to get faster application performance. You can easily reload the images when you need them.

Change the layout of item view columns

You can do this on either tab of the Image Manager toolspace.


- 38 Click the drawing name at the top of the tree.
In the item view, you see columns of information arranged using a default layout.
- 39 Right-click anywhere in the column header area to see a complete list of available columns to display.
Checked columns are those you see displayed in the table. Add and remove check marks to control the data in the table. You can also select Show All Columns, or hide a column by right-clicking its head row and clicking Hide Column.
- 40 Add or clear check marks to change the columns in the table.
You can change the order of columns in the table by clicking and dragging column head rows to a new location.

- 41 Drag one or more columns to rearrange the table. Note that when you drag a column, a blue line between columns indicates where the column will go when you release the mouse button.
- 42 If you want to change the width of a column, click and drag the vertical line between column head rows.
Turn image frames off or on
- 43 To turn off the frames around all the images, click Image ► Toggle Frames.
- 44 In the drawing window, right-click and click Repeat Toggle Frames to turn on the image frames.
In the drawing window, you can also right-click and click Image ► Show Image Frame(s) to turn on the image frames.
- 45 Close the drawing without saving changes.

Exercise A3: Viewing and Changing Image Properties

In this exercise, you view and change properties of a selected image or of a group of selected images.

Access the Properties window using the following methods:

- Click Modify menu ► Properties.
- Select one or more images, right-click, then click Properties.
- On the AutoCAD Standard toolbar, click Properties  .

Related Exercises

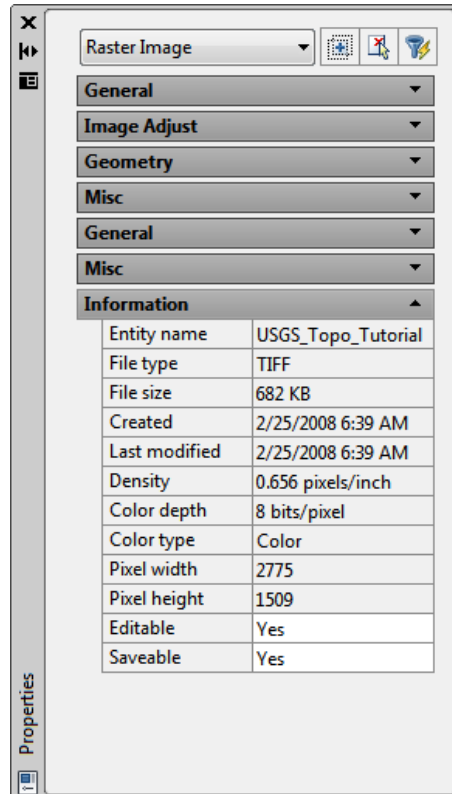
- [Exercise A2: Managing Images in a Drawing](#) (page 7)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

Open the drawing file for this exercise


- 1 In the \Tutorial1 folder, open the drawing file GettingStarted_03.dwg.
View image properties

- 2 Select the image frame of the tractor image.
- 3 Right-click and click Properties to display the Properties window.
- 4 Scroll to the end of the properties list.



This example shows the appearance of the Properties window when an image is selected. Raster Image is selected, and the image data appears at the end of the properties list in the Information section.

View the edit status of an image

- 5 Click the Editable row, then click  at the end of the row.
The Edit Status dialog box indicates that this image can be edited and saved. When an image cannot be edited or saved, you can open the Edit Status dialog box to determine why.
- 6 Click Close.

- 7 Press Esc to deselect the tractor image, but do not close the Properties window.
Change image properties
- 8 Select the image frame of the USGS quad sheet in the lower left of the drawing window.
- 9 In the Properties window, in the General section, change the layer to TU_image_usgs.
View properties for multiple images
- 10 Select the image frame of the aerial photograph.
Raster Image (2) appears at the top of the Properties window, indicating that two images are selected. Properties common to both images are displayed.
- 11 Close the Properties window.
- 12 Close the drawing without saving changes.

Exercise A4: Saving Images

In this exercise you save images and set the file name, path, and format in the process.

When you save an image, the image format that you select determines whether Raster Design prompts you to specify additional parameters, such as the encoding method for TIFF images.

You can access the Save and Save As dialog boxes using one of these methods:



- Click Image menu ► Save. Or click Save As.
- In the Image Manager toolspace, Image Insertions view, select the image insertion object, then right-click and click Write ► Save or Save As from the shortcut menu.
- In the drawing window, select an image, then right-click and click Image ► Write ► Save or Save As from the shortcut menu.
- On the Raster Design Toolbar, click Save  or Save As .
You can also export images, which enables you to save an image with a correlation file that determines the position, rotation, and scale of the

image when the image is inserted. Correlation files are helpful when you intend to use an image in more than one drawing or in another system.

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

Open the drawing file for this exercise

- 1 In the \Tutorial1 folder, open the drawing file GettingStarted_04.dwg.
Save the images
- 2 Click Image menu ► Save.
- 3 Select the image frame of the USGS quad sheet and press Enter.
- 4 Click Image menu ► Save As. Then select the image frame of the tractor image.
- 5 Browse to your Tutorial1 directory, change the filename to farm and click Save.
- 6 Select the image frame of the aerial photograph in the upper right of the drawing area.
- 7 Right-click and click Repeat Save As from the shortcut menu.
- 8 Change the filename to Aerial_photo and click Save.
The aerial photograph is a TIFF image. Raster Design prompts you to select an encoding method.
- 9 Select Uncompressed and click Next.
- 10 Select Tiled and click Finish.
The image is saved.
- 11 Close the drawing without saving changes.

Scanned Drawing Cleanup Tutorial

3

This tutorial shows you how to use Raster Design to clean up images of scanned paper drawings. Several problems are frequently associated with images scanned from paper drawings:

- Images scanned from negatives or blueprints have dark backgrounds and light line work that is difficult to read.
- Images may be reversed so that the text and the line work are upside down or backwards.
- Images may show speckles from dirty or faded original drawings.
- Documents may have been skewed or tilted as they were fed through the scanner.
- Images may be distorted, reflecting distortion in the scanned document itself, perhaps introduced through prior reproductive processes (for example, a copy of a copy).
- Images may contain rough line work that is difficult to read.
- Images may contain artifacts from creases, stains, and tears on the original drawing.

Raster Design cleanup utilities, image processing filters, and editing tools are intended to address these problems. The exercises in this tutorial show you how to use these tools to improve the quality of the raster images created from your scanned drawings.

Later tutorials show you how to update raster images by editing or removing raster entities and by adding new raster or vector geometry.

Exercise S1: Inserting Images of Scanned Drawings

In this exercise you learn to use the Insertion Wizard to guide you through inserting and positioning an image into a drawing.

Related Help Topics

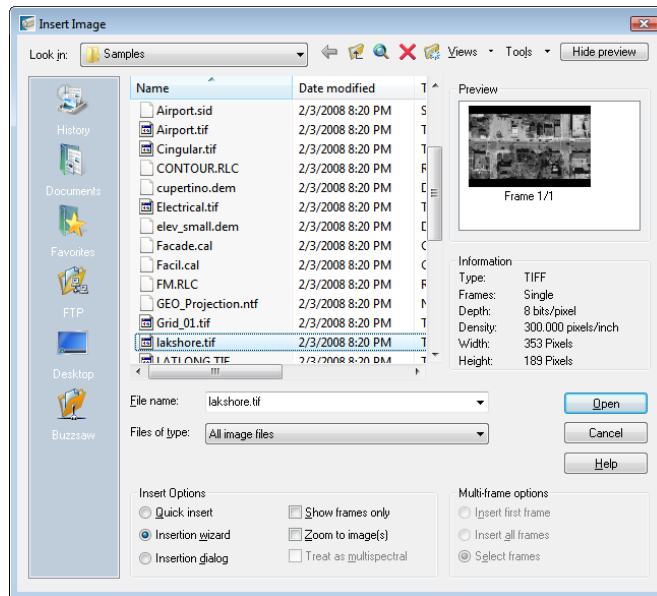
- Inserting Images
- Correlating Images

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

Choose an image to insert

- 1 In the \Tutorial2 folder, open the drawing file Scanned_01.dwg.
- 2 To display the Insert Image dialog box, click Image ► Insert.
- 3 From the Files of Type list, select All Image Files.
- 4 If necessary, navigate to the \Tutorial2 folder.
- 5 Select the image file FoundationDetail_01.tif.
- 6 Review the values shown for each parameter in the Information box.
This parameter list identifies important characteristics of the image.
The scanned drawing in the image is turned on its side (portrait orientation). In addition, the image, which was scanned from a blueprint, has a light background with line work that is difficult to see.
The values for Depth and Density are important for this image:
 - The depth of 1 bit per pixel indicates a bitonal image.
 - The density of 200 dots per inch (dpi) indicates that the image was scanned at a low resolution. This low-quality scan may be responsible for some of the problems with this image that you correct in later exercises.



Position and insert the image using the Insertion Wizard

- 7 Under Insert Options select the Insertion Wizard option.
Also under Insert Options, ensure that Show Frames Only is not selected.
- 8 Click Open to display the Pick Correlation Source dialog box.
This dialog box is the first dialog box of the Insertion Wizard. When you choose a correlation source, the dialog box shows the insertion point, rotation, and scale associated with the selected correlation source.
- 9 Accept the default correlation source, Image File, and click Next.
- 10 Change the rotation value to 90 and click Next.
- 11 Verify the AutoCAD values and click Apply.
- 12 Click Finish to insert the image.
- 13 Zoom to the drawing extents.
The image was rotated 90 degrees when it was inserted.



- 14 Close the drawing without saving changes.

Exercise S2: Cleaning Up Images Using Despeckle

In this exercise you use Despeckle to clean up raster images and to remove scanning artifacts from an image.

Despeckle removes speckles and spots on images scanned from dirty or faded drawings. You can apply the Despeckle utility to the entire image or to a small region.

Related Help Topics

- Removing Speckles from an Image
- Removing (Rubbing) Images

Related Exercises

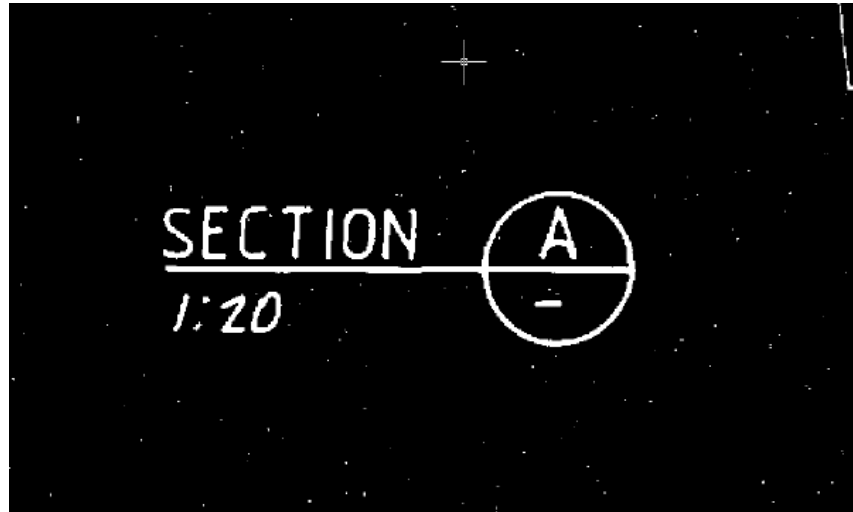
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

Open the drawing file for this exercise

- 1 In the \Tutorial2 folder, open the drawing file Scanned_03.dwg.
Remove speckles from the image

- 2 Click View menu ► Named Views. Then select the view named TU_speckles, click Set Current, and click OK.

This example shows an area of the image that contains many speckles.



- 3 Click Image menu ► Cleanup ► Despeckle. Note on the command line that you can use various methods to define image sub-regions to apply Despeckle. In this case, choose the option to despeckle the entire image by pressing Enter.

A command prompt gives you options for determining the size of speckles to remove.

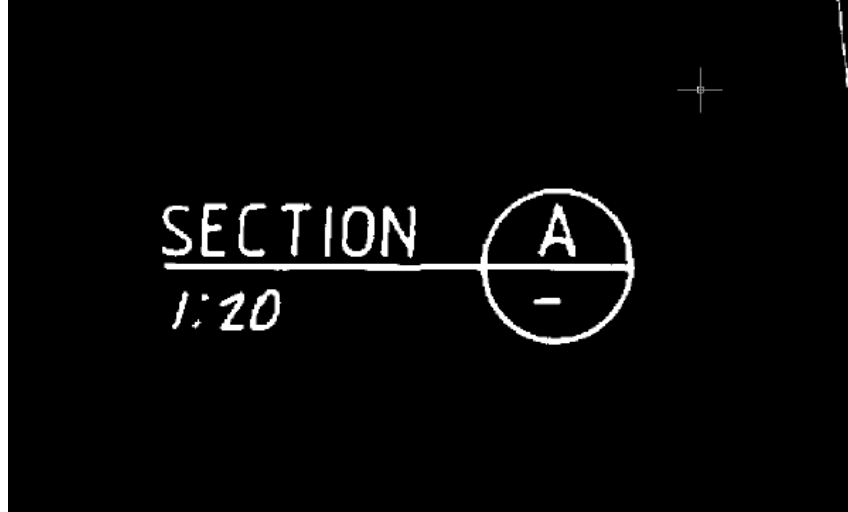
- 4 Enter p for Pick and select a speckle that could represent the largest size to be removed. Note the size detected is somewhat less than 0.50 AutoCAD units. Enter r for Respecify and enter .01

A window size of 0.01 is suitable for this image. If the speckle size is too large, Despeckle removes raster data that is actually part of the drawing, such as decimal points in dimensions. However, the Despeckle process also allows you to prevent such speckles from being removed.

- 5 Press Enter to continue.

A preview displays the highlighted speckles that are about to be removed. If you want to prevent any of these from being removed (such as the colon in 1:20), simply pick a speckle to de-select it. Note that you can also use the Window or Polygon option to de-select speckles inside a rectangle or polygon.

- 6 Press Enter to remove the highlighted speckles.



- 7 Close the drawing without saving changes.

Exercise S3: Cleaning Up Images with Invert and Mirror

In this exercise you use the Invert and Mirror utilities to improve the readability of a raster image.

- Invert reverses the light and dark shades of an image.
- Mirror reverses an image in which the text and line work are backwards.

Related Help Topics

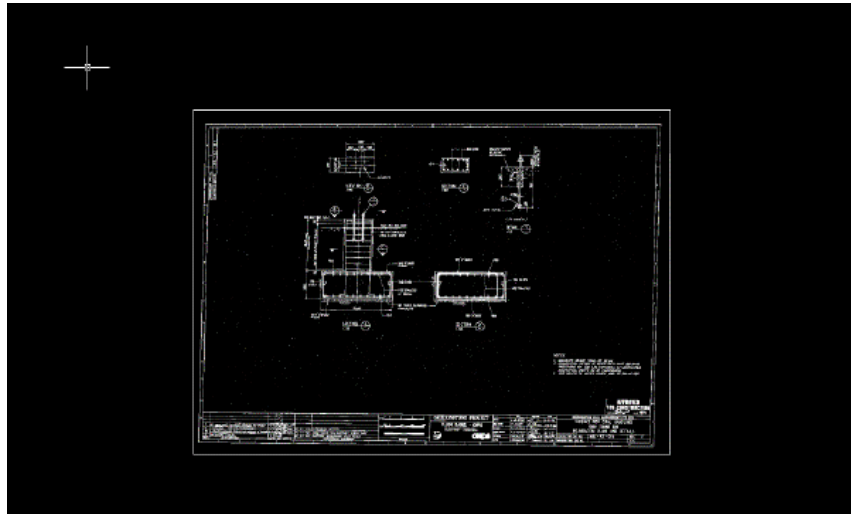
- Reversing the Light and Dark Shades in an Image
- Mirroring an Image

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

Open the drawing file for this exercise

- 1 In the \Tutorial2 folder, open the drawing file Scanned_02.dwg.
Depending on whether your AutoCAD background color is light or dark, the image has a contrasting background, indicating it was scanned from a blueprint. Invert changes this so the image background is the same as the AutoCAD background.
Invert the image
- 2 Click Image menu ► Cleanup ► Invert.
Reverse the image
- 3 Zoom in so that you can clearly see the text in the drawing. Note that the entire drawing is upside down.
- 4 Click Image menu ► Cleanup ► Mirror.
Select Top To Bottom and click OK.
Selecting the appropriate axis properly can help avoid unnecessary rotations after performing the mirror.
After mirroring, the title block is at the bottom of the image, which is its correct location.



- 6 Close the drawing, without saving changes.

Exercise S4: Using REM Operations Tools

In this exercise you use REM Operations tools to correct imperfections in scanned bitonal drawings.

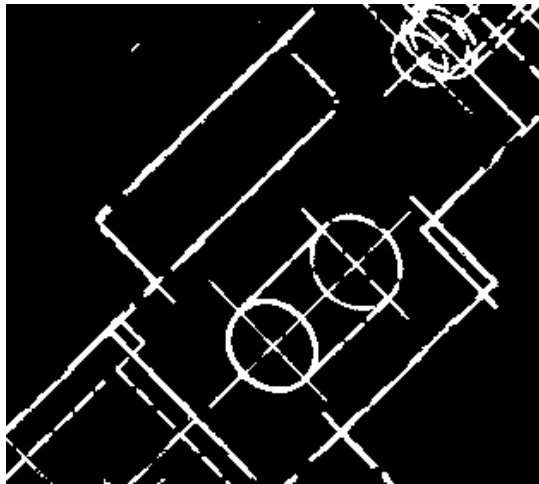
Related Help Topic

- Using REM Operations

Related Exercise

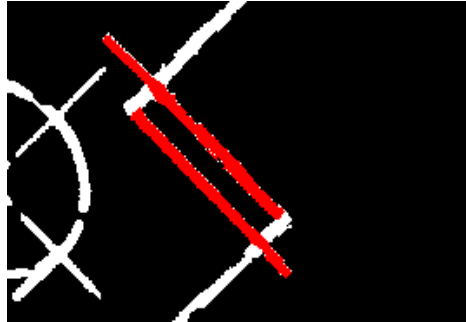
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the Tutorial2 folder, open the drawing file Scanned_07.dwg.
Note that several of the lines in the drawing overshoot (extend beyond) their intersection and require trimming. Others undershoot and must be extended to form a proper intersection.

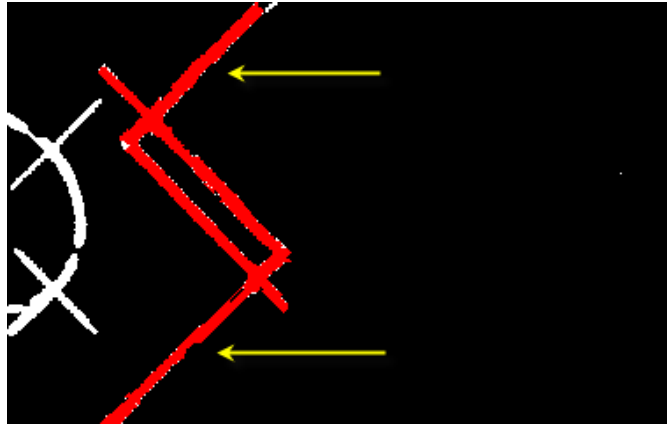


Trim Lines

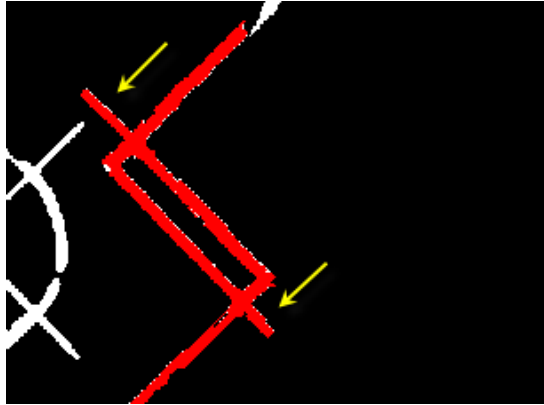
- 2 Click Image menu ► Raster Entity Manipulation ► Create Primitive ► Line.
- 3 Click a line that you want to trim (shorten). A REM line is created over the raster line.
- 4 Right click and click Repeat Line. Click another line that you want to trim.



- 5 Use the Repeat Line command again to create a “cutting edge” for each REM line to be trimmed. The cutting edge in this case is an intersecting raster line where the trimmed line will end. In other contexts, you can use a vector line as a cutting edge.



- 6 Click Image menu ► Raster Entity Manipulation ► REM Operations ► Trim.
- 7 Click one or more cutting edges, then right-click to end the selection process.
- 8 Click the ends of the lines that you want to remove (trim). They are deleted along with the underlying raster.



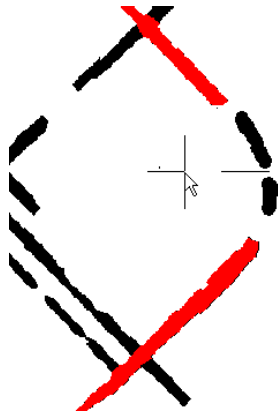
- 9 Right-click and click Enter to end the command.
- 10 Click Image menu ► Raster Entity Manipulation ► Merge To Raster Image.
- 11 Click the REM lines that you want to convert to raster data, then right-click to end the selection process.
- 12 Right-click, then click REM ► Clear All. The REM lines are deleted, leaving the edited raster data.



Extend Lines

- 13 Click Image menu ► Raster Entity Manipulation ► Create Primitive ► Line.
- 14 Click a line that you want to extend.

- 15 Right click and click Repeat Line. Click another line that you want to extend.
- 16 For each line that you want to extend, create a REM line on the other side of the gap to act as a boundary edge (endpoint) for the extended line.
- 17 Click Image menu ► Raster Entity Manipulation ► REM Operations ► Extend.
- 18 Click the boundary edge for the extended line, then right-click to end the selection process.
- 19 Click the object that you want to extend. It is extended.
- 20 Right-click and click Enter to end the command.
- 21 Click Image menu ► Raster Entity Manipulation ► Merge To Raster Image.
- 22 Click the REM lines that you want to convert to raster data, then right-click to end the selection process.
- 23 Right-click, then click REM ► Clear All. The REM lines are deleted, leaving the edited raster data.
Create a Corner Fillet
- 24 Click View menu ► Named Views. Set the current view to Fillet View. You see a corner fillet that needs repair.
- 25 Click Image menu ► Raster Entity Manipulation ► Create Primitive ► Line.
- 26 Click one of the lines that extends toward the corner fillet.
- 27 Right click and click Repeat Line. Click the other line that extends toward the corner.
- 28 Click Image menu ► Raster Entity Manipulation ► REM Operations ► Fillet.
- 29 To create a rounded corner, enter r, then specify the radius by drawing a line or entering a numeric value.



- 30 Click one of the two lines that extend toward the corner.
- 31 Click the other line that extends toward the corner. The corner is created.
- 32 Click Image menu ► Raster Entity Manipulation ► Merge To Raster Image.
- 33 Click the REM lines that you want to convert to raster data, then right-click to end the selection process.
- 34 Right-click, then click REM ► Clear All. The REM lines are deleted, leaving the edited raster data.
Offset a Line
- 35 Click Image menu ► Raster Entity Manipulation ► Create Primitive ► Line.
- 36 Click a line that you want to copy and offset. The line is converted to a REM line.
- 37 Click Image menu ► Raster Entity Manipulation ► REM Operations ► Offset.
- 38 Click the REM line that you want to offset.
- 39 Click and drag a line perpendicular to the REM line to specify the offset distance, then click to specify an endpoint.
- 40 Click the REM line to offset, then click on the side of the line where you want the offset line. The offset line is drawn.

- 41 Further exploration: Offset a circle. Select named view Circle-A and convert the existing circle to a REM object, then use the Offset command to create a larger concentric circle.
- 42 Keep the drawing open and continue with the next exercise, [Exercise S5: Using Touchup Tools](#) (page 29), or close the drawing without saving changes.

Exercise S5: Using Touchup Tools



In this exercise you learn to use touchup tools to correct imperfections in scanned bitonal drawings.

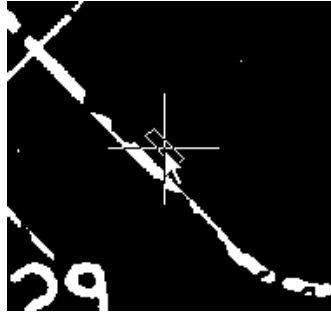
Related Help Topic





- [Touching Up an Image](#)

Related Exercise

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the Tutorial2 folder, open the drawing file Scanned_07.dwg.
- 2 You see diagonal lines of varying thickness that need repair. To work more accurately, you should zoom in close.
Repair Diagonal Lines
- 3 Click Image menu ► Cleanup ► Touchup.
- 4 On the Touchup toolbar, click  to select a diagonal brush, then click  to resize the brush.
- 5 Click on the edge of a line that you want to repair, click another point along the same edge, then click a third point to specify a brush width that is approximately equal to the width of the line.



- 6 On the Touchup toolbar, ensure that the drawing color icon  shows the white square in front, indicating that the brush will create white pixels, rather than erasing them.
- 7 Use the brush to repair some gaps in the line. Note that this brush, depending on its length, may be suitable for editing lines in only one direction. To work on lines in another direction, you must resize the brush.
- 8 Optionally, to draw a straight line with the brush, click to start the line, then hold down the Shift key and click an endpoint for the line.
Use Round Brush
- 9 On the Touchup toolbar, click  to select a round brush.
- 10 Click  to resize the brush, so its diameter matches the width of a line.
- 11 Use this brush to repair some gaps in a line. Note that this brush is useful for drawing in different directions and around curves.
- 12 Click the drawing color icon  to draw in the background color (black).
Use the brush to erase unwanted pixels along some of the lines.
- 13 Further exploration: Use the square brush in the same way as the round brush to draw and erase. This brush shape is better suited to working with vertical and horizontal lines. See the right side of the drawing for lines of this type.
- 14 Close the drawing without saving changes.

Exercise S6: Correcting Skewed Images

In this exercise you use Deskew to correct images that are skewed or tilted in the image frame.

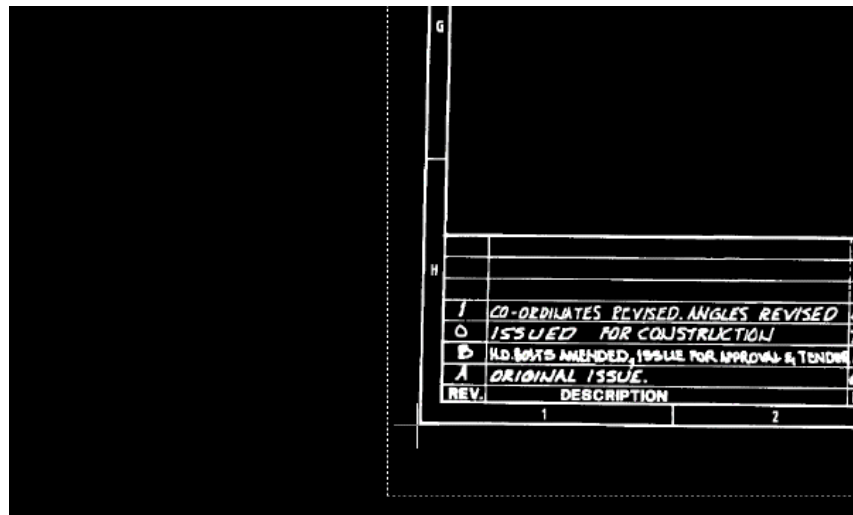
Related Help Topics

- Deskewing an Image

Related Exercises

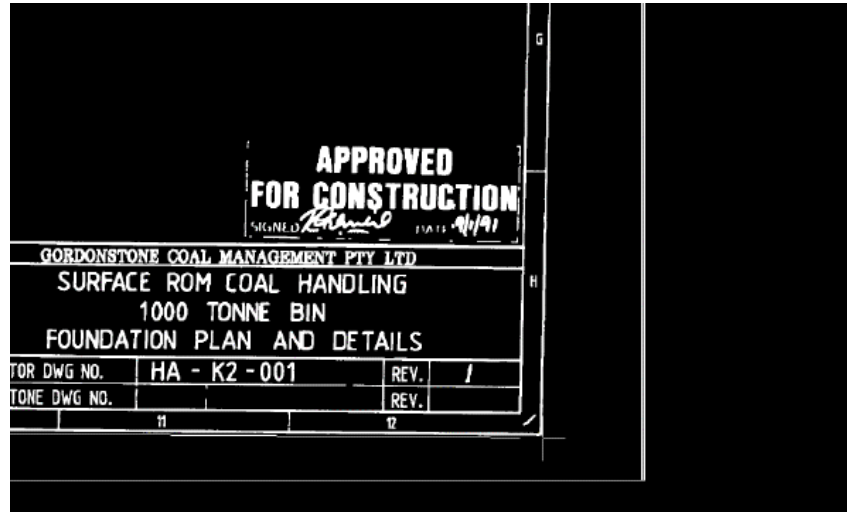
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the Tutorial2 folder, open the drawing file Scanned_04.dwg.
Move the image
- 2 Enter m for Move, select the image frame, and press Enter.
- 3 Zoom in and select the lower-left corner of the raster image for the base point. Do not select the image frame.



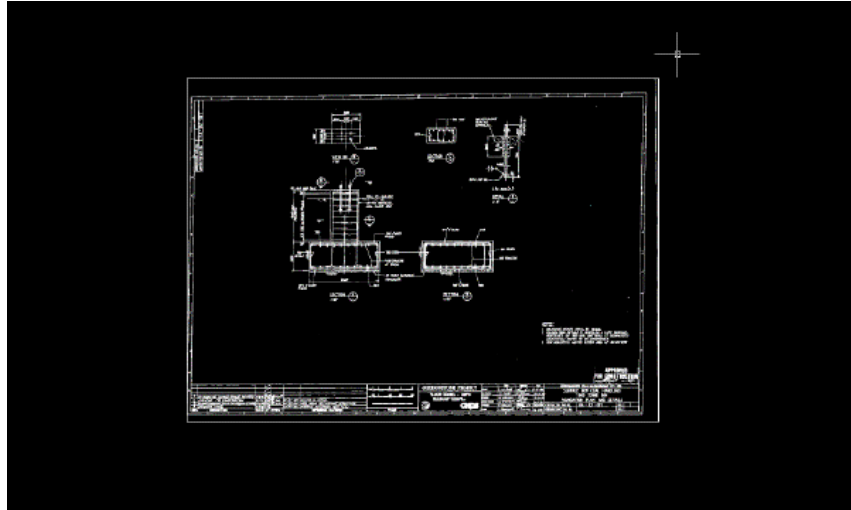
- 4 Enter 0,0 for the second point (destination point).
The base point of the image moves to 0,0.
Deskew the image
- 5 Enter VIEW and restore the view named TU_extents_new.

- 6 Click Image menu ► Cleanup ► Deskew.
- 7 Enter 0,0 for the base point.
- 8 Enter 0,0 for the source angle point.
- 9 Zoom in and select the lower-right corner of the raster image for the second angle point. Do not select the image frame.



The baseline of the image has been specified as a reference line for the deskew operation.

- 10 Accept 0 as the destination angle.
The image is aligned to the horizontal axis of the drawing.
- 11 Enter VIEW, restore the view named TU_extents_new, and examine the deskewed image.
After deskewing, the image is no longer tilted in the image frame.



12 Close the drawing without saving changes.

Exercise S7: Correcting Distortions Using Triangular Rubbersheet

In this exercise you use Rubbersheet to correct a distorted image of a scanned drawing.

The image in this exercise was distorted in the reproduction process and then scanned. You draw a rectangle to represent the new border for the image and then use Rubbersheet to stretch the image to fit the rectangle. You use the Triangular rubbersheet method in order to have the points move exactly to their desired locations.

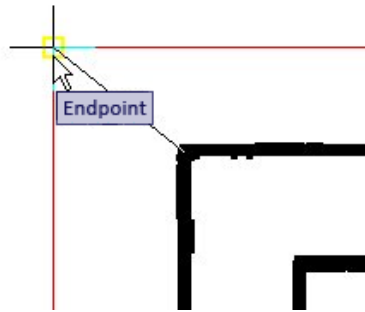
Related Exercises

- [Exercise S8: Correcting Distortions Using Grid Points](#) (page 38)
- [Exercise P3: Correcting Distortions in Photographic Images](#) (page 110)

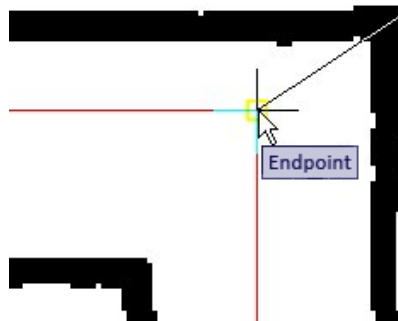
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial2 folder, open the drawing file Scanned_05.dwg.
Create a temporary vector border as a guide

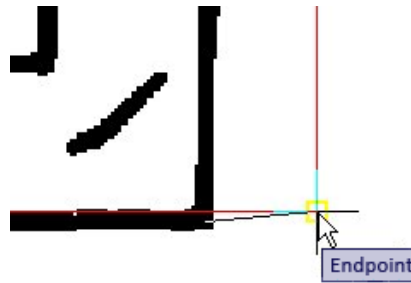
NOTE Click OSNAP off before selecting each source raster point, then click OSNAP on to select the destination vector point.



- 9 Click in the upper-right viewport to make it active. Select the corner of the raster border as the third source point.
- 10 Select the upper-right corner of the vector border for the destination point.



- 11 Click in the lower-right viewport to make it active. Select the corner of the raster border as the fourth source point.
- 12 Select the lower-right corner of the vector border for the destination point.



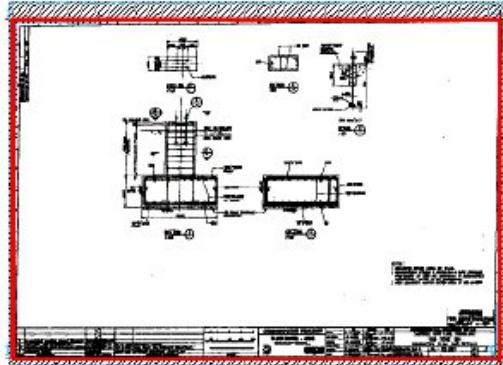
- 13 At the command line, enter d to end the selection process. The Rubbersheet - Set Control Points dialog box redisplay and the points are listed.

Set the rubbersheet method and preview the results

You use the Triangular rubbersheet method for this example. This method causes the four corners to go exactly to the specified destination points. You can verify the results using the Preview button. Since you are using the Triangular method, areas outside the cluster of control points are discarded after the rubbersheet.

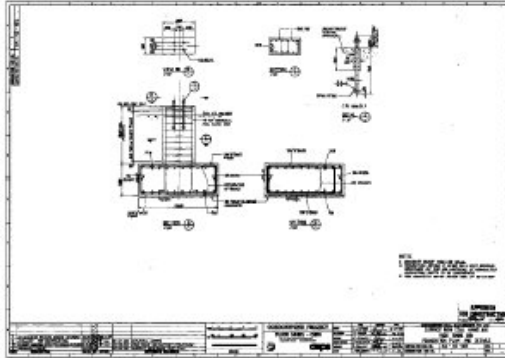
NOTE If you want to maintain the original image size despite the changes to the raster border in the image, additional control points can be anchored at each corner of the image frame.

- 14 In the Method area, click Triangular.
- 15 Click the Preview button. A preview of the rubbersheet is shown. The full preview is shown in the last active viewport and the other viewports show the preview in their respective zoom levels.



The preview shows the extents of the result in red and the extents of what makes that area up in cyan. The hatched area between the cyan extents and the original frame of the image are discarded in the final result.

- 16** Right-click or press Enter to exit the preview.
Rubbersheet the image
- 17** Click the Export button to display the Export dialog box. Name the file FoundationDetail_05.txt. Note where the file is being saved, then click Export to finish the export. If you want to repeat the rubbersheet operation with different settings you can use this file as a starting point.
- 18** Click OK. The rubbersheet processes and the Rubbersheet-Set Control Points dialog box closes.
- 19** Click View menu ► Viewports ► Named Viewports. Then restore the viewport named Rubbersheet Final Result.
- 20** Erase the vector border.



21 Close the drawing without saving any changes to the drawing or image.

Exercise S8: Correcting Distortions Using Grid Points

In this exercise you use rubbersheeting to correct distortions in maps and scanned drawings that have a grid structure.

You can use the Grid Points feature in the Rubbersheet tool to create a regular rectangular pattern of control points for an image. In this exercise, you rubbersheet a map broken up into regular cells. After invoking Rubbersheet, you use the Grid Points function to define the grid of destination points. Then you use the Add Points function to pick source points for all of the destination points in the grid. After the control points for the grid are specified, you can rubbersheet the image using the Polynomial method.

Related Help Topic

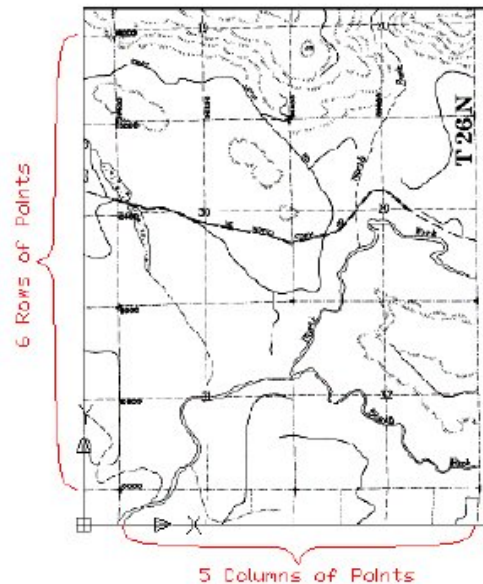
- [Rubbersheeting an Image](#)

Related Exercises

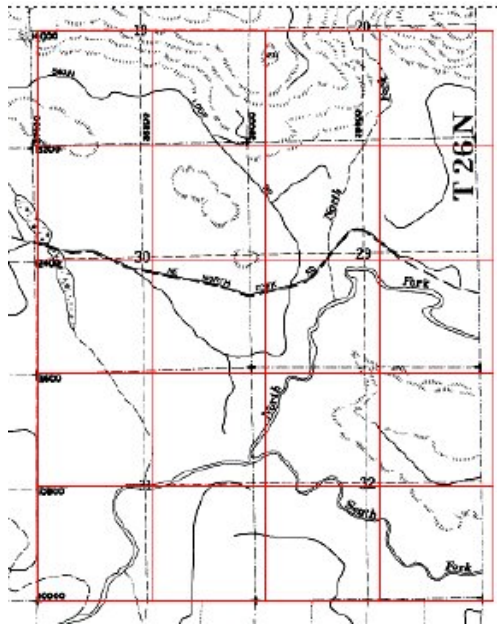
- [Exercise S7: Correcting Distortions Using Triangular Rubbersheet](#) (page 33)
- [Exercise P3: Correcting Distortions in Photographic Images](#) (page 110)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial2 folder, open the drawing file GridRubbersheet_01.dwg. The drawing includes an image of a scanned map.
- 2 To display the Rubbersheet-Set Control Points dialog box, click Image ► Correlate ► Rubbersheet.
- 3 In the Method area, select Polynomial.
- 4 Click the Grid Points button to display the Grid Parameters dialog box. Set the grid parameters
In this box you set the parameters for the destination point grid. The data to specify these parameters can be read from information in the image.
- 5 Note that the image contains 6 rows and 5 columns of points that would approximate the grid contained in the image. In the Points section, enter 6 rows and 5 columns. Note the total number of points in the grid is shown so you know how many points can be used in the rubbersheet operation.
This example shows the rows and columns in the image.



- 6 In the image, note that the grid origin (lower left corner) should be at the point labeled 10000. The coordinates of this point are (37,400, 10,000). In the Grid section, specify 37400 for X Origin and 10000 for Y Origin.
- 7 Note the size of the grid cells in the image. They are 800 by 800. In the Cell box, enter 800 for X Size and 800 for Y Size.
- 8 Click Preview to check the grid layout.
Note that each vertex of the new grid is close to the location of a vertex in the image grid. In the next part of the rubbersheeting process, Raster Design takes you to each grid point (vertex) where you specify the source point in the image that will be stretched to the destination point on the grid.



- 9 Right-click or press Enter to exit the preview window.
Add the source control points corresponding to the grid
- 10 In the Grid Parameters dialog box, click Add Points. The dialog box closes and the screen zooms and pans to the grid origin. Because this point was used to correlate the image, the source and destination points are correctly aligned.
- 11 Enter a to anchor the origin point.

The command line prompts for point (0,1) and the display moves to this point, which is one cell over to the right.

TIP When adding source points, turn off OSNAP for better cursor control.

- 12 Pick the intersection of the dotted raster gridlines in the image as the source point for (0,1).

NOTE You can change the zoom level for adding points. The new zoom level is maintained for subsequent point selection until it is changed again.



- 13 Continue picking source points for every node in the grid. If any grid points are correctly aligned with a source point, enter a to anchor the point. You can also enter s to skip any point, or u to go back and reposition one or more previous points.

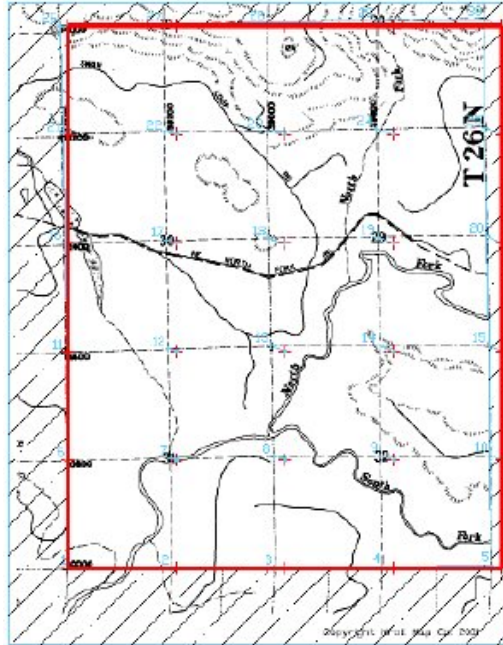
Sometimes zooming out helps you position a source point when the intersection in the image is not clear. After you specify all the points, the Rubbersheet-Set Control Points dialog box displays to show the location of corresponding source and destination points.

Further exploration: You can select any row of this table, then right-click and zoom to that point to see how the current error level affects the actual destination of the point. If you increase the Polynomial Degree setting, the error level decreases for the control points, but this results in greater warping of the image in areas away from control points.

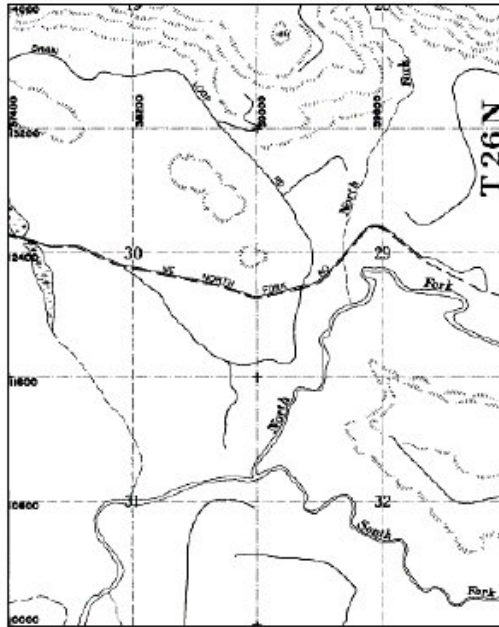
Setup and preview the rubbersheet

The preview indicates that areas outside the control point cluster are discarded in the final image.

- 14 Select the Preview button to preview the rubbersheet results. The red boundary shows the extents of the image after the rubbersheet, and the cyan boundary shows the data included in these extents. The hatched area is excluded from the new image.



- 15 Right-click or press Enter to exit the preview.
Perform the rubbersheet
Before performing the rubbersheet you export the control points in case the rubbersheet needs to be repeated.
- 16 Click the Export button to display the Export dialog box. Name the file Grid_01.txt in the Export dialog box and click Export to finish the export.
- 17 Click OK. The rubbersheet operation occurs and the Rubbersheet-Set Control Points dialog box closes.



18 Close the drawing without saving changes.

Exercise S9: Using Bitonal Filters and Editing Tools

In this exercise you use bitonal filters to improve raster line work and use raster editing tools to remove unwanted spots from an image.

- Bitonal filters improve the appearance of raster line work in a bitonal image, often eliminating the need for redrawing.
- Raster editing tools allow defects and scanning artifacts to be removed from the image.

In this exercise, you improve existing line work by applying a line thickening filter to a portion of the drawing. You also use the raster Remove tool to remove unwanted raster pixels from the drawing.

Related Help Topics

- Using Bitonal Filters

- Removing (Rubbing) Images

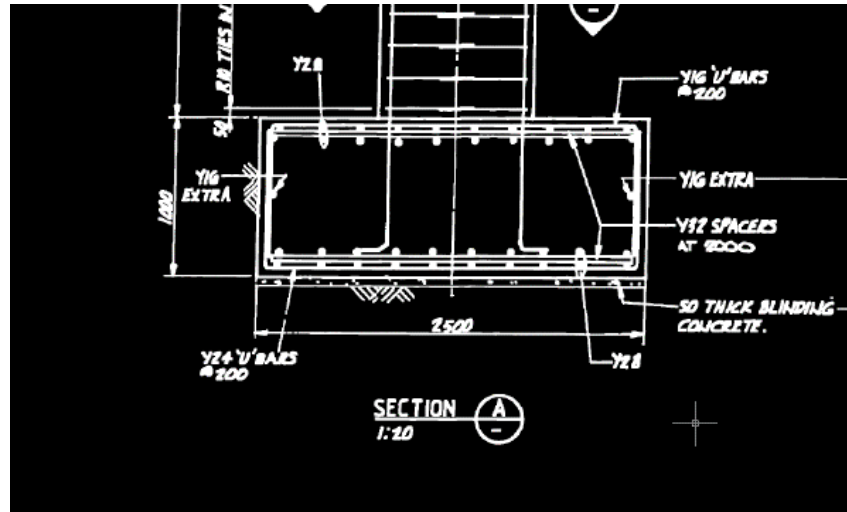
Related Exercise

- [Exercise S2: Cleaning Up Images Using Despeckle](#) (page 20)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial2 folder, open the drawing file Scanned_06.dwg.
Clean up jagged line work
- 2 Click View menu ► Named Views. Set the current view to TU-pad.
Some of the raster lines are very thin. Some lines, such as the dimension lines, have gaps due to poor scanning quality.
- 3 Click Image menu ► Image Processing ► Bitonal Filters. Then (as noted on the command line) press Enter to select the whole image.
- 4 In the Bitonal Filters dialog box, select Thicken for the filter type, and enter 2 for the number of passes. Verify that all directions are checked, then click OK.

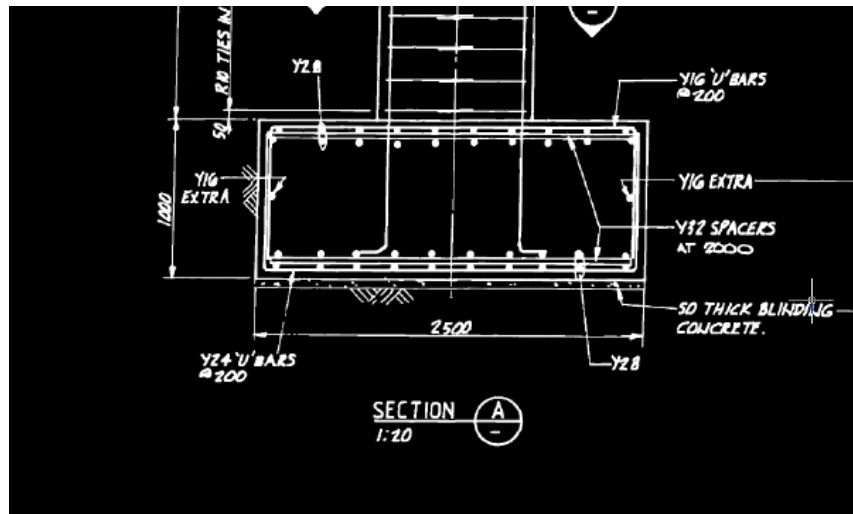
After you thicken the lines twice, some closely spaced parallel lines have merged into a single line.



Undo the Bitonal Filter Thicken command

- 5 Enter u to undo the Thicken command.
- 6 Click Image menu ► Image Processing ► Bitonal Filters. Then press Enter to select the whole image.
- 7 Again select Thicken for the filter type, but select 1 for the number of passes, then click OK.

With one pass, the gaps in dimension lines are repaired, but the closely spaced lines remain separate. Some experimentation and iteration is often necessary to achieve optimum results with filters.



- 8 Click View menu ► Named Views. Set the current view to TU_extents. Raster Design has applied the thickening filter to the entire image.
- 9 Use PAN and ZOOM to examine the line work in the image.
Remove spots
- 10 Click View menu ► Named Views. Set the current view to TU_spots. This area of the image contains spots (scanning artifacts) from small holes in the original drawing.
- 11 Click Image menu ► Remove ► Circular Region.
- 12 Click the middle of a spot for the center point, then click a second point to mark the radius of the circular area to be removed.

- 13 Press Enter to repeat the command and draw a circle to remove another artifact.
- 14 Close the drawing without saving changes.

Bitonal Image Tutorial

4

This tutorial shows you how to use the raster entity manipulation (REM) commands to edit bitonal (black and white) images of scanned drawings.

Using REM commands, you can define raster objects and manipulate them much as you do AutoCAD vector objects. As a result, you can update raster images without having to convert the raster entities into vectors.

You can use AutoCAD commands such as MOVE, COPY, and SCALE on REM objects to manipulate the raster data. The REM objects can be merged into existing images or they can be used to create new images.

Raster Design allows you to create three types of REM objects.

REM Object	Description	Image Types
Region object	Contains all pixels within the region geometry (for example, all pixels within a polygonal region), whether or not the pixels comprise individual entities.	Bitonal, grayscale, or color
Enhanced bitonal region object	Facilitates the selection of a group of entities that intersect each other. Standard AutoCAD object selection criteria is enhanced with three methods: Smart. Selects raster entities that intersect with or cross a defined window or polyline (fence). Connected. Selects raster entities that are connected to entities selected by means of a window or fence. Connected Entity. Selects all raster entities connected to a specified point.	Bitonal only
Primitive object	Includes a single raster line, arc, or circle.	Bitonal only

In this tutorial, you work with the three types of REM objects and observe their varying behavior. You then use REM commands to modify a part in a mechanical drawing.

Exercise B1: Copying Raster Entities Using Region Objects

In this exercise, you review REM settings, define REM region objects, and copy raster entities from one image to another.

You can define region objects in bitonal, grayscale, and color images.

In this exercise, you work in a drawing that contains two bitonal images scanned from mechanical drawings:

- A detail drawing of a drill jig
- An assembly drawing of the same drill jig

You use REM commands to select entities in each image and then copy the entities to an empty image that is already in the drawing. In later exercises, you modify these entities using REM commands.

Related Help Topics


- [Defining REM Region Objects](#)
- [Resizing a REM Object](#)

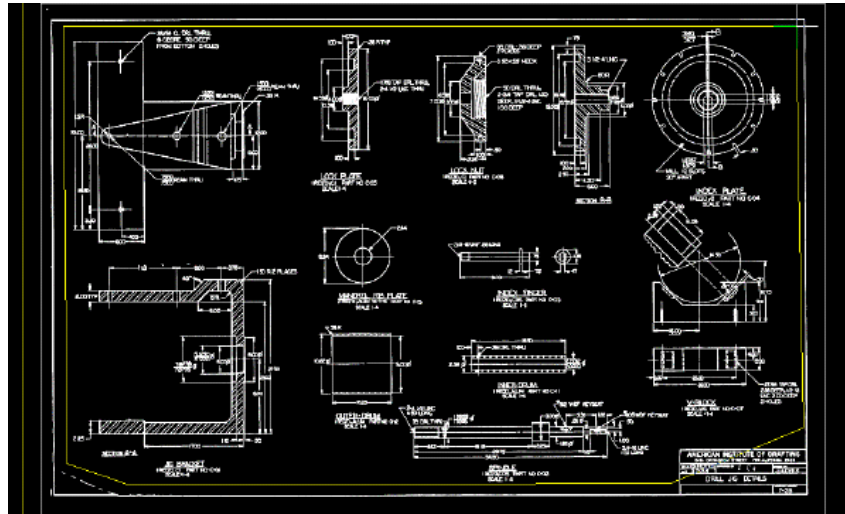
Related Exercises

- [Exercise A2: Managing Images in a Drawing](#) (page 7)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial3 folder, open the drawing REM_02.dwg.
Review the REM Settings
- 2 To display the Raster Design Options dialog box, click Image ► Options.
- 3 Click the REM tab and ensure that the color of REM Objects is red.

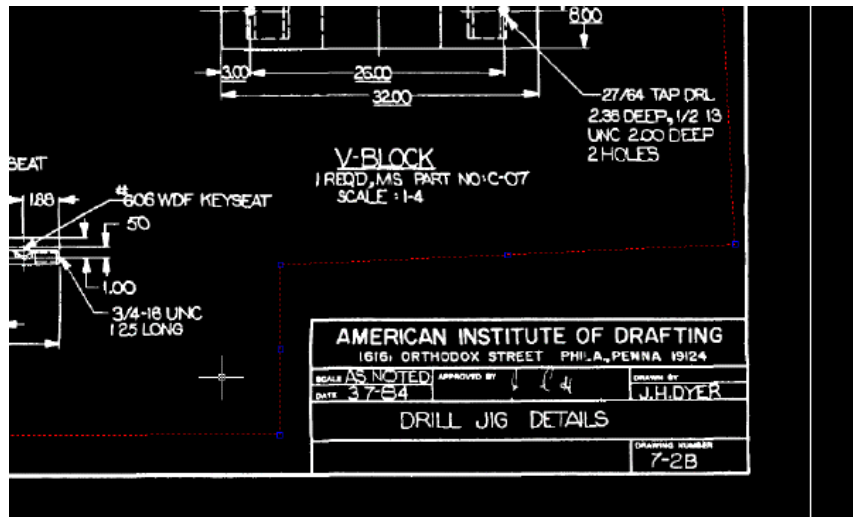
- 4 Click the Raster Entity Detection tab and ensure the following settings are in effect:
 - Max Jump Length is 10.
 - Use Raster Pick Gravity is selected.
 - Pick Aperture is 4.
 - Float Tolerance is 2.
- 5 Click OK.
- 6 Right-click the AutoCAD toolbar or any open Raster Design toolbar and click the Raster Entity Manipulation Toolbar to open it.
- 7 To display the Image Manager toolspace, click Image ► Manage. Select the Image Insertions view.
- 8 Click + beside REM_02.dwg, right-click Mech_02a, and click Zoom To to see this image of 13 detail drawings.
Create a polygonal region object
- 9 On the Raster Entity Manipulation Toolbar, click Polygonal Region .
- 10 Draw a polygon that includes all of the detail drawings and their annotations, along with part of the title block in the lower right corner, then press Enter to end the process.



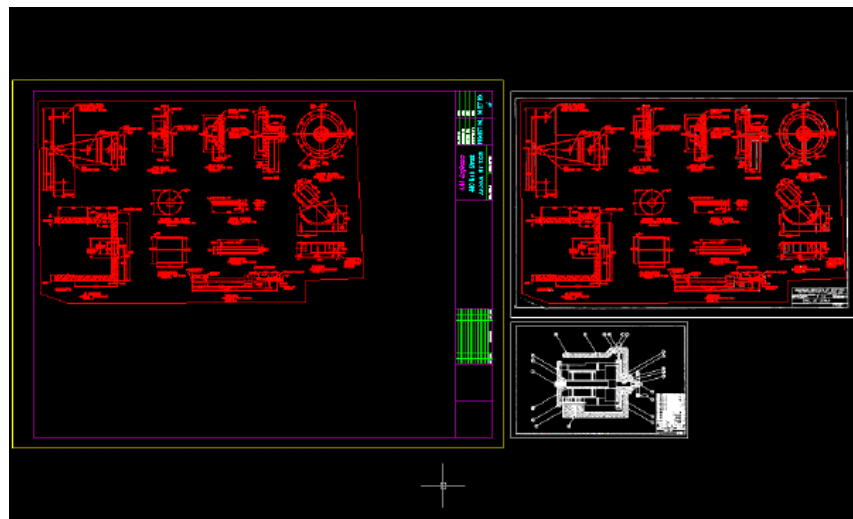
The polygon and all the entities within it now are displayed in red, which indicates they have been captured as part of the REM region object.

Refine the region object


- 11 Click the polygon boundary to select the REM region object.
 - 12 Right-click and click Refine Mode. Only the region boundary is highlighted.
 - 13 Transparently pan and zoom to the lower-right corner of the image.
 - 14 Select the region boundary. Select the midpoint grip in the title block, and drag this grip to exclude the title block from the region object.
- The following example shows how the image should appear after the region object is refined to exclude the title block.

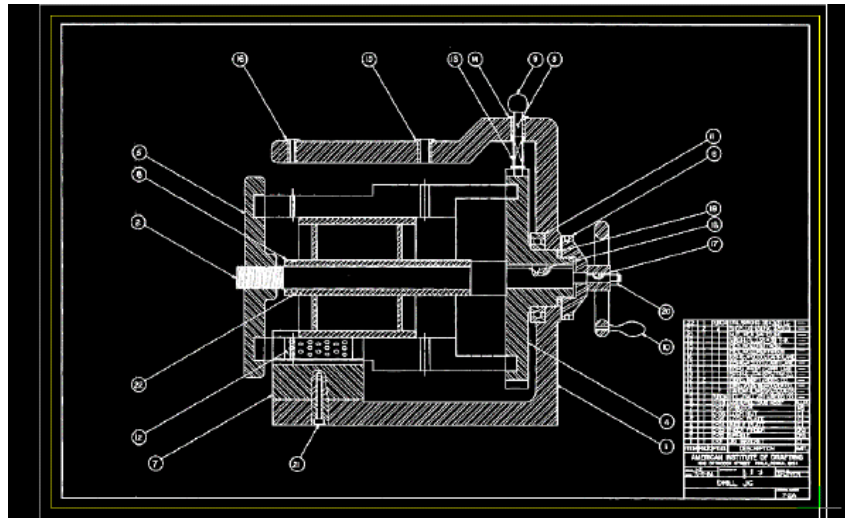


- 15 Right-click and click Refine Mode from the shortcut menu. Refine Mode is now de-activated.
Copy the region object to the empty image
- 16 Zoom out to the drawing extents.
- 17 Use the COPY command to copy the region object to the upper-left corner of the empty image.



Create a rectangular region object

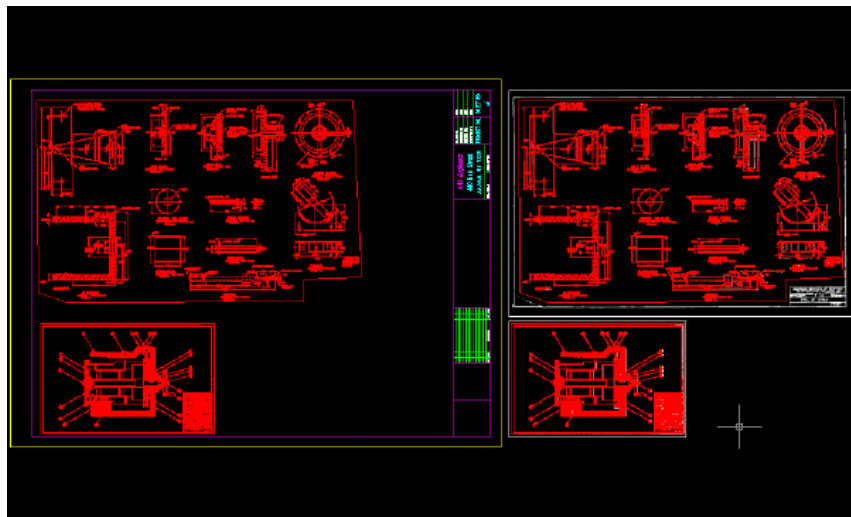
- 18 In Image Manager, select Mech_02b, right-click and click Zoom To to see this image.
- 19 Click Rectangular Region  on the Raster Entity Manipulation Toolbar.
- 20 Draw a rectangle that includes the entire image: all of the entities, the title block, and the border.



The rectangle and all the entities within it are now red, which indicates they have been included as part of the REM Region object.

Copy the region object

- 21 Zoom to the drawing extents.
- 22 Use COPY to copy the region object to the lower-left corner of the image that contains the other region object.



Merge the region objects into the image

- 23 Select the two region objects, right-click, and click Merge to Raster Image. After you merge the region objects into the image, the objects are no longer displayed in red because they are no longer region objects. However, the objects in the original images are still defined as region objects.



- 24 Right-click and click REM ► Clear All from the shortcut menu.

The REM region objects are no longer defined in the original images. At this point in a real project, you could save the new image (Mech_new_02) and detach the original source images from the drawing.

- 25 Close the drawing without saving changes.

Exercise B2: Defining Enhanced Bitonal Region Objects

In this exercise you create and work with REM enhanced bitonal region objects.

You can define an enhanced bitonal region by drawing a selection rectangle, polygon, or polyline (fence). From this selection figure, you can select raster entities within the figure, crossing the figure, or connected to such entities.

After you define the enhanced bitonal region object, you can modify the object using AutoCAD commands and REM commands.

In this exercise, you move raster entities in an image of a drill jig drawing. You also practice creating different types of enhanced bitonal region objects to better understand the various rules Raster Design uses to construct such objects.


Related Help Topics

- Defining REM Enhanced Bitonal Regions

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

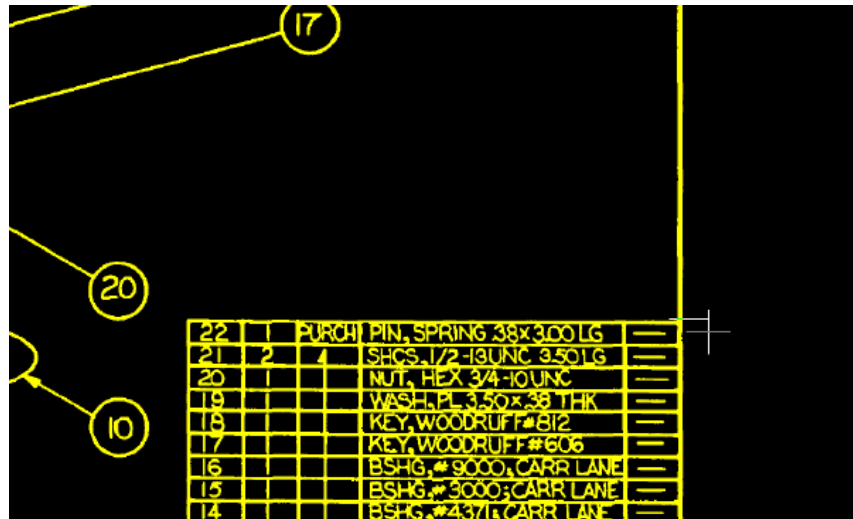
Separate the title block and schedule from the border

- 1 In the \Tutorial3 folder, open the drawing file REM_03.dwg.
- 2 Right-click on an open toolbar and open the REM Enhanced Bitonal Regions toolbar and the Raster Entity Manipulation Toolbar.
- 3 Click View menu ► Named Views. Set the current view to TU_assembled_jig.
- 4 Click Knife  on the Raster Entity Manipulation Toolbar.

In the next few steps you will use this tool to separate the title block and schedule from the border of this drawing.

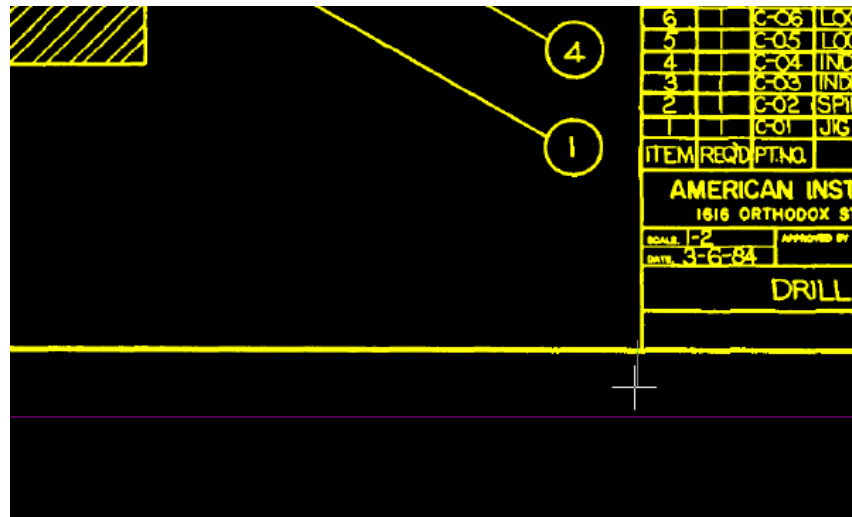
- 5 Just above the title block and schedule, select a start point inside the border, and an end point outside the border. These two points define a knife cut across the border.

The crosshairs show where to draw the first knife cut.



- 6 On the lower left of the title block and schedule, define a vertical knife cut across the border, then press Enter to end the command.

The crosshairs show where to draw the second knife cut.



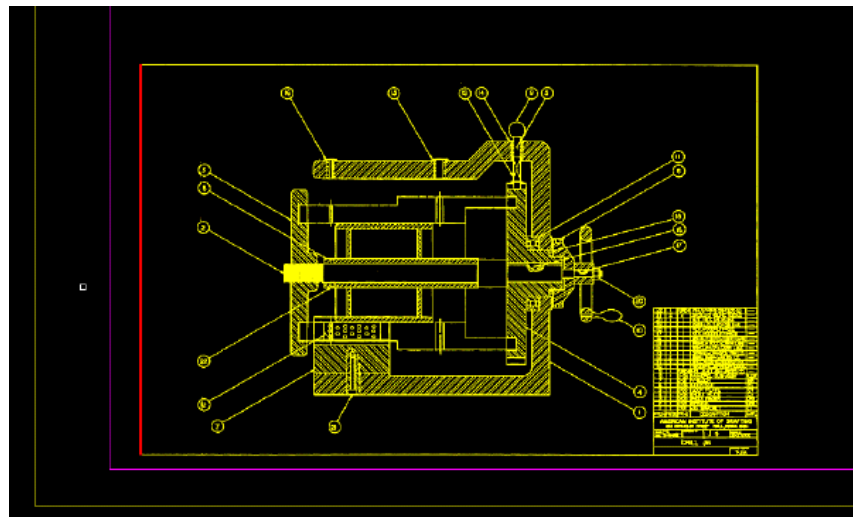
Remove the border from the drawing

- 7 Click View menu ► Named Views. Set the current view to TU_assembled_jig.




- 8 Click Smart Fence on the REM Enhanced Bitonal Regions toolbar.
- 9 Draw the fence across the left vertical line of the border and press Enter. The vertical line becomes a REM object.

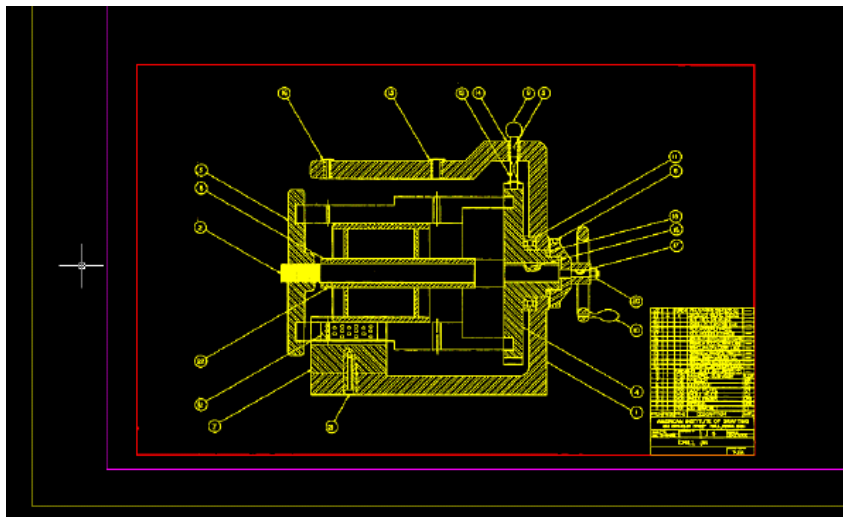
Using a smart fence selects all raster primitives (lines, circles, and arcs) that touch the fence. In this example, only one line touches the fence.



- 10 Right-click and click REM ► Clear All.
The vertical line is no longer selected as a REM object.



- 11 Click Connected Fence  on the REM Enhanced Bitonal Regions toolbar.
- 12 Draw the fence across the left vertical line of the border and press Enter.
The whole border becomes a REM object.
Using a connected fence selects all raster entities connected to the raster entities that touch the fence. The border becomes a REM object when you use a connected fence to select the vertical line because the vertical and horizontal lines that make up the border are connected.
The title block and schedule, which you separated from the border using the Knife command, are not included in REM object.



- 13 Select the border and enter e (ERASE) to remove it, leaving the title block and schedule in place.

Move the title block and schedule



- 14 Click Smart Window  on the REM Enhanced Bitonal Regions toolbar.

- 15 Draw a window around the title block and schedule.

The title block and schedule become a REM object.

- 16 Use the MOVE command to move the title block and schedule up and to the right of the assembly.

- 17 Select the REM object, right-click, and click Merge to Raster Image.

Raster Design merges the REM object into the image. The title block and schedule are no longer a REM object.

Define REM objects using smart and connected windows

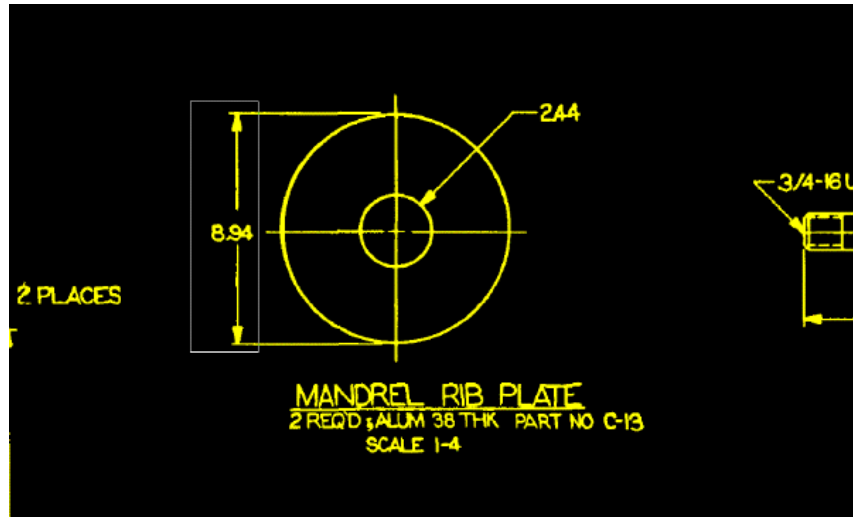
- 18 Click View menu ► Named Views. Set the current view to TU_mandrel_rib_plate.



- 19 Click Smart Window  on the REM Enhanced Bitonal Regions toolbar.

- 20 Draw a window around the vertical leader line and the dimension text.

The following example shows where to draw the window around the leader line and the dimension text.



Using a smart window selects only the raster entities that are completely within the window: the vertical leader line and dimension text.

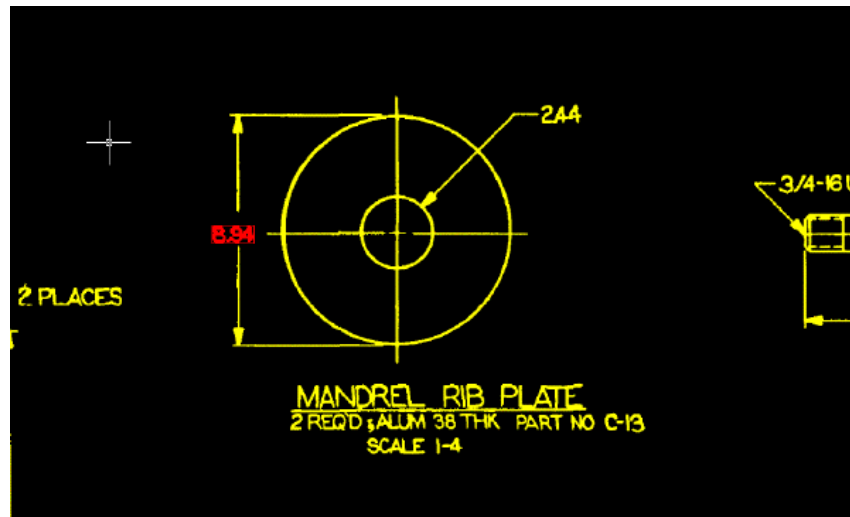
The horizontal dimension lines that cross the window are not selected.

- 21 Right-click and click REM ► Clear All from the shortcut menu. The raster entities are deselected.

- 22 Click Connected Window  on the REM Enhanced Bitonal Regions toolbar.

- 23 Draw a window around the same vertical leader line and the dimension text.

Using a connected window selects only the raster entities that are completely within the window and not connected to entities outside the window. In the following example, the leader lines are not selected because they are connected to the dimension lines, which extend outside the window.



- 24 Right-click and click REM ► Clear All from the shortcut menu. The entities are deselected.

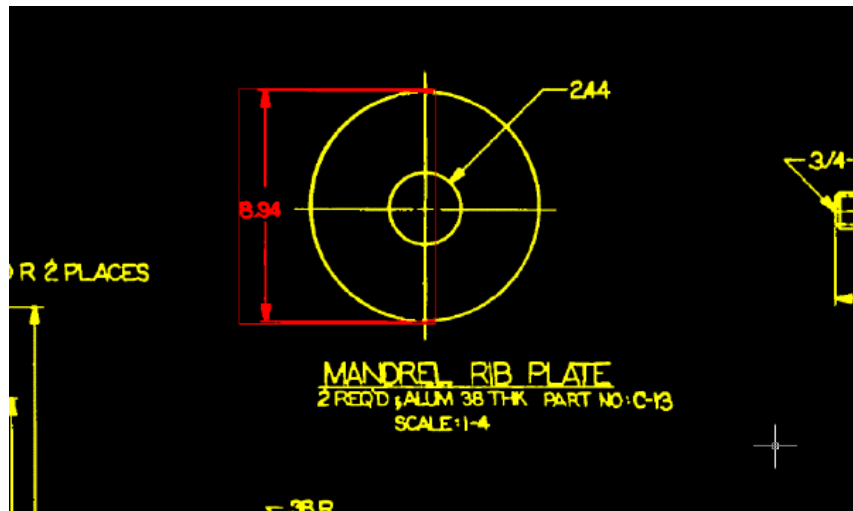
Define REM objects using crossing windows

- 25 Select Smart Crossing  on the REM Enhanced Bitonal Regions toolbar.

- 26 Draw a crossing window around the same vertical leader line and dimension text.

Using a smart crossing window selects all raster entities inside the window or crossing the window:

- The vertical leader line
- The dimension text
- The horizontal dimension lines



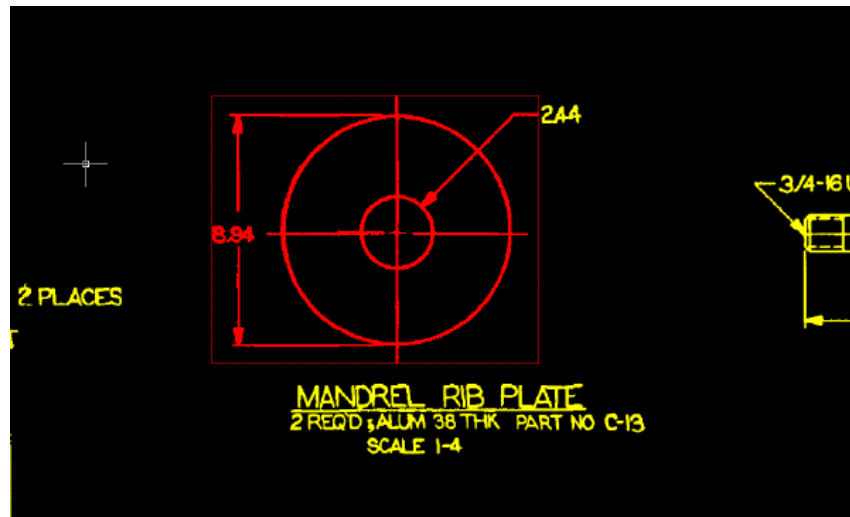
27 Right-click and click REM ► Clear All.

28 Click Connected Crossing  on the REM Enhanced Bitonal Regions toolbar.

29 Draw a crossing window around the vertical leader line and the dimension text.

Using a connected crossing window selects all raster entities that are within the window, crossing the window, or connected to entities that cross the window.

In the following example, only the dimension text to the right of the part is not selected, because it is the only entity not connected to entities that cross the selection window.



- 30 Right-click and click REM ► Clear All from the shortcut menu.
- 31 Close the drawing without saving changes.

Exercise B3: Defining Primitive Objects

In this exercise you create REM primitive objects from raster data in bitonal images.

You can create line, arc, or circle primitives. You can also use Smart Pick to click a raster entity and let Raster Design determine whether to create a primitive line, arc, or circle.

In this exercise, you create different primitive objects and operate on them using various methods to better understand how Raster Design applies the commands to different REM primitive entities.


Related Help Topics

- Defining REM Primitive Objects


Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).


- 1 In the \Tutorial3 folder, open the drawing file REM_04.dwg.
- 2 Click View menu ► Named Views. Set the current view to TU_index_plate.
Define REM line, arc, and circle primitives
- 3 Right-click on an open toolbar and open the REM Primitives toolbar.

- 4 Click Line  on the REM Primitives toolbar.
- 5 Select the line that enters the circular part from the left.
Raster Design defines the line as a REM primitive.




- 6 Click Circle  on the REM Primitives toolbar.
- 7 Select the outer circle defined by a solid line.
Raster Design defines the circle as a REM primitive. The line you selected in the previous step remains defined.



- 8 Click Arc  on the REM Primitives toolbar.
- 9 Select an arc on the outer edge of the part.
Raster Design defines the arc as a REM primitive. The line and circle primitives remain defined.



Define primitive objects using Smart Pick

- 10 Click Smart  on the REM Primitives toolbar.
This option interprets the raster entities you select and creates REM lines, circles, or arcs to represent them.
- 11 Select any line in the image.
Raster Design detects that you selected a line, and creates a REM line.
- 12 Press Enter to repeat the command.
You can also right-click and select Repeat Smart from the shortcut menu.
- 13 Select a circle defined by a solid line.
Raster Design creates a REM circle.
- 14 Press Enter to repeat the command.
- 15 Select an arc on the outer edge of the part.
Raster Design creates a REM arc.
This exercise demonstrates how you can use REM primitives to selectively create REM objects as a basis for editing the image.
Clear the REM objects
- 16 Right-click and click REM ► Clear All to clear the REM objects from the image.
- 17 Click View menu ► Named Views. Set the current view to TU_extents.
- 18 Close the drawing without saving changes.

Exercise B4: Modifying a Part Using REM Commands

In this exercise you learn how to use REM commands to modify a raster image.

You will modify a lock plate that is part of a drill jig, increasing the back plane thickness of the lock plate, then updating the dimension text to reflect the change in thickness.


Related Help Topics

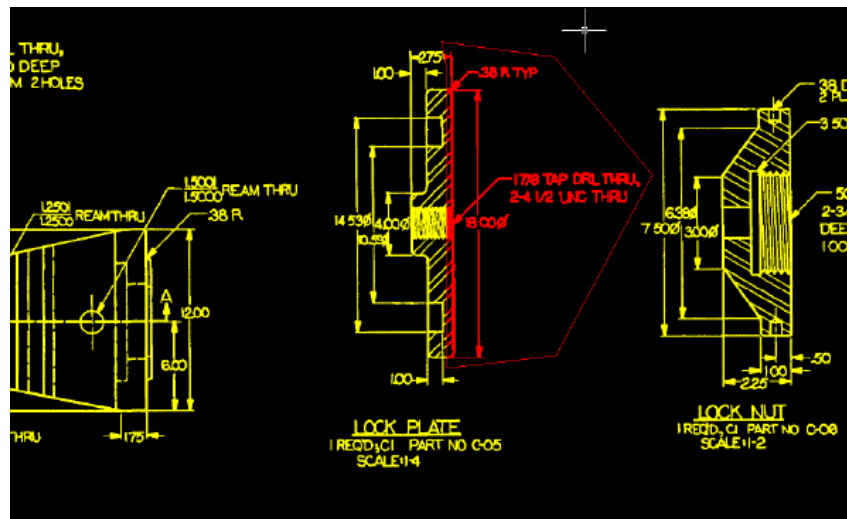
- Defining REM Region Objects
- Defining REM Primitive Objects

■ Vectorizing Raster Text

Related Exercises

Before doing this exercise, you should ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial3 folder, open the drawing file REM_05.dwg.
- 2 Click View menu ► Named Views. Set the current view to TU_lock_plate. Separate the lock plate into two pieces.
- 3 Open the REM toolbars, if necessary.
- 4 Click Polygonal Region  on the Raster Entity Manipulation Toolbar.
- 5 Draw a polygon with a vertical line that bisects the thinnest area of the lock plate and includes the dimension text to the right of the part. Press Enter.



- 6 Enter m and move the REM object exactly 0.25 inches to the right. To do this, use the Displacement option and specify the displacement as 0.25,0,0.
This action creates a gap in the raster image. You must merge the region object into the image before you can make other changes to the part.

- 7 Select the region object, right-click, and click Merge to Raster Image from the shortcut menu.

Close the top horizontal line

- 8 Click View menu ► Named Views. Set the current view to TU_2.75.

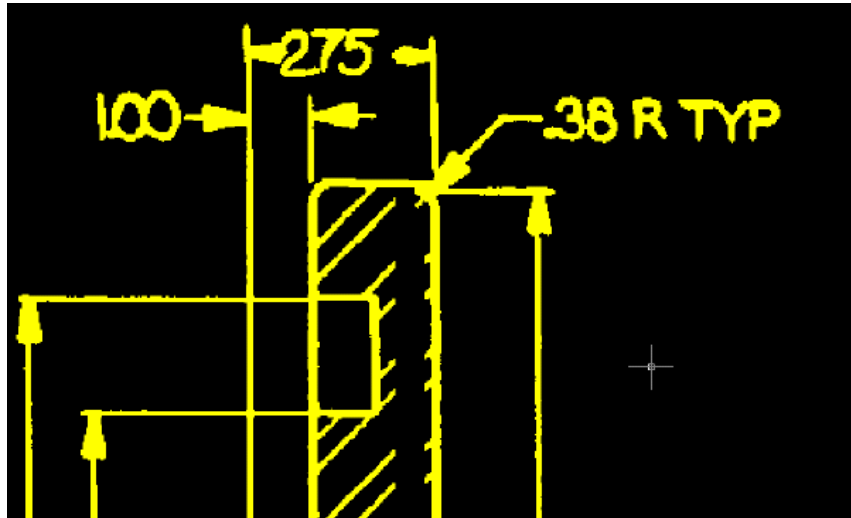


- 9 Click Line on the Raster Entity Manipulation Toolbar and select the horizontal line at the top of the lock plate.

The line becomes a primitive object.

- 10 Select the primitive object, select its right grip, and stretch the line to close the 0.25 inch gap.

- 11 Select the primitive object, right-click, and click Merge to Raster Image.



Close the bottom horizontal line

- 12 Click View menu ► Named Views. Set the current view to TU_bottom.

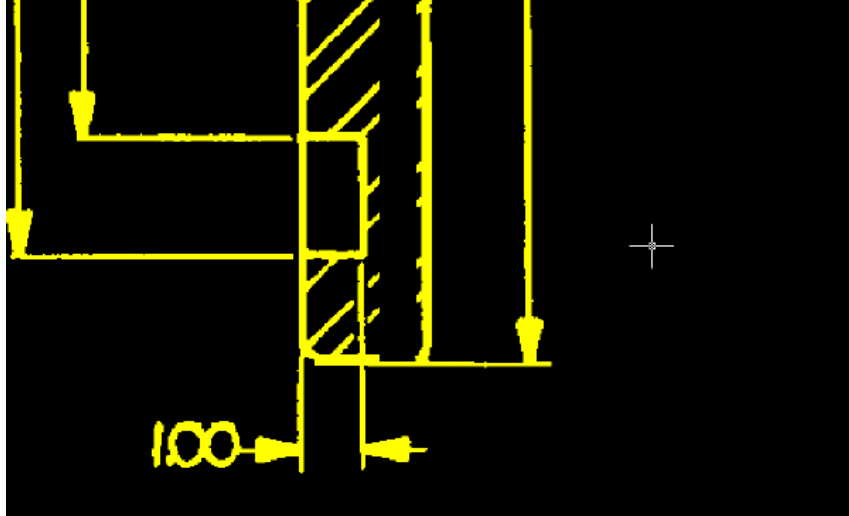


- 13 Click Line on the Raster Entity Manipulation Toolbar and select the horizontal line at the bottom of the lock plate.


The line becomes a primitive object.

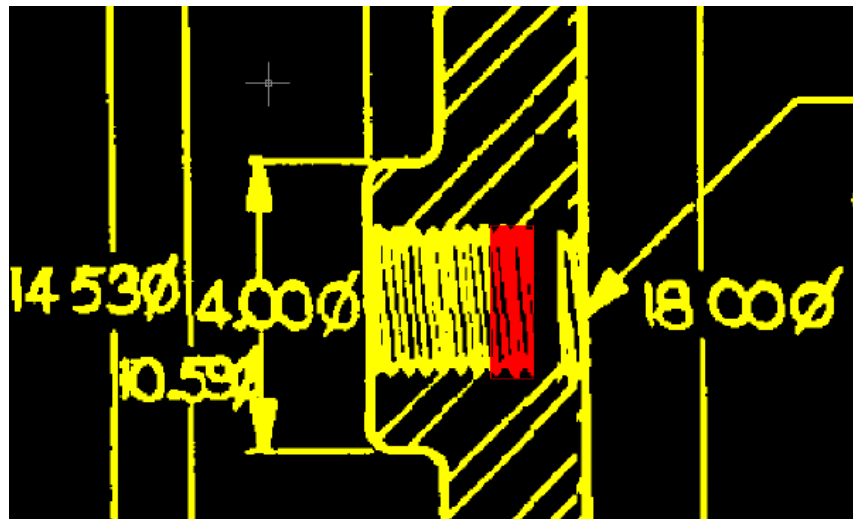
- 14 Select the primitive object, select its right grip, and stretch the line to close the 0.25 inch gap.

- 15 Select the primitive object, right-click, and click Merge to Raster Image.

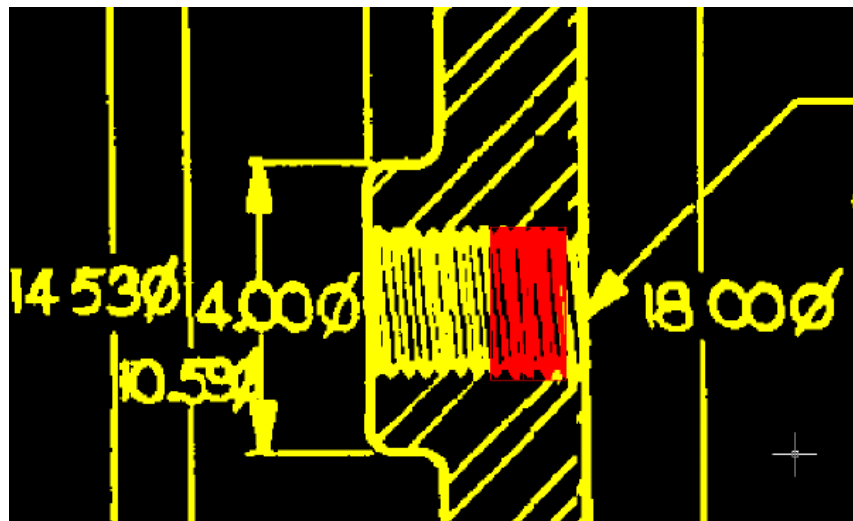


Close the thread lines

- 16 Click View menu ► Named Views. Set the current view to TU_thread.
- 17 Click Rectangular  on the Raster Entity Manipulation Toolbar.
- 18 Draw a narrow rectangle around some of the thread lines.
You can then copy this object to close the gap in the thread lines.

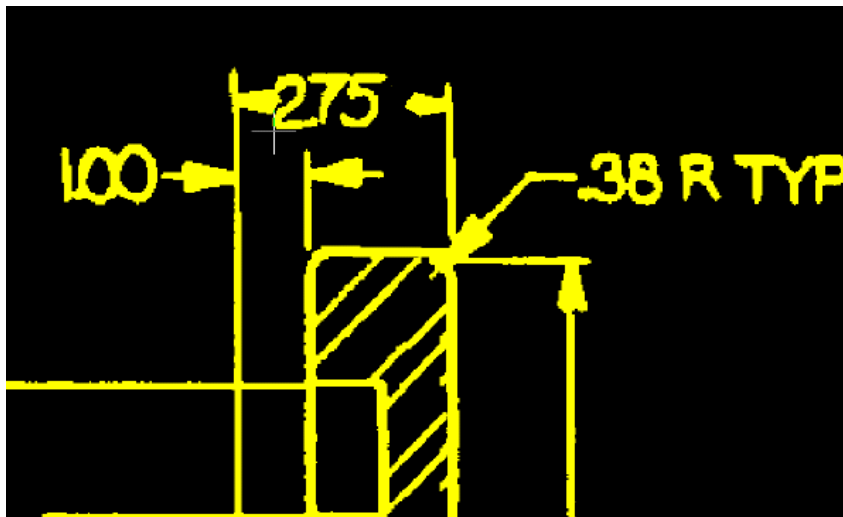


- 19 Use COPY to copy the region object.
- 20 Place the copy of the region object so that it closes the gap in the thread lines.



- 21 Select the copy of the region object, right-click, and click Merge to Raster Image.

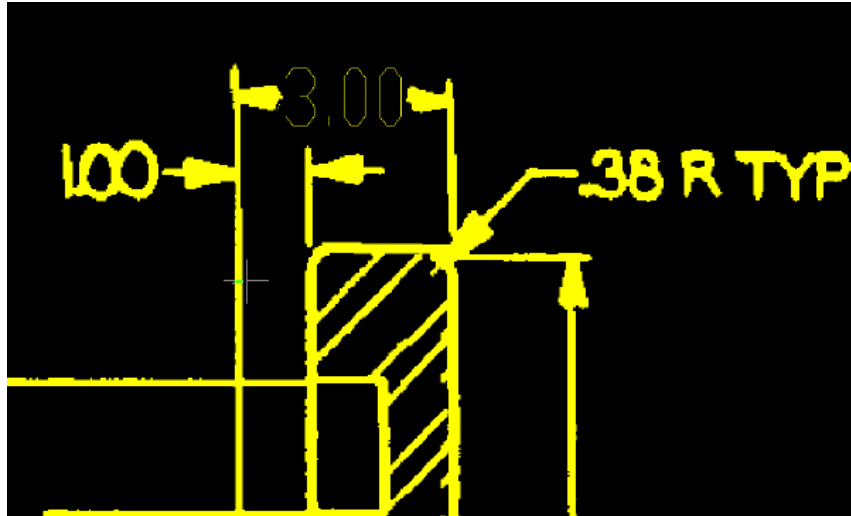
- 22 Right-click and click REM ► Clear All from the shortcut menu.
Replace the dimension text
You will now change the dimension text from 2.75 to 3.00 to indicate the new thickness of the lock plate.
- 23 Click View menu ► Named Views. Set the current view to TU_2.75.
- 24 Use the Layer Properties Manager to set TU_image_new as the current layer.
- 25 Click Image menu ► Vectorization Tools ► Text. Then select a point at the base of the numeral 2 on the left.
The crosshairs identify where to select a point for placing new dimension text.



- 26 In the VText Edit dialog box, enter 3.00 and click OK.
Raster Design places the new dimension text at the point you selected. On the command line, note that you are presented with a Smart Window option for removing the raster text. You will next use this method to remove the raster text 2.75.
- 27 Draw a window around the old dimension text. It does not matter if part of the arrowheads are included within the window; they are excluded by the smart selection method. Note that the text about to be removed is highlighted. Press Enter to remove the selected text, then press Enter again to end the command.

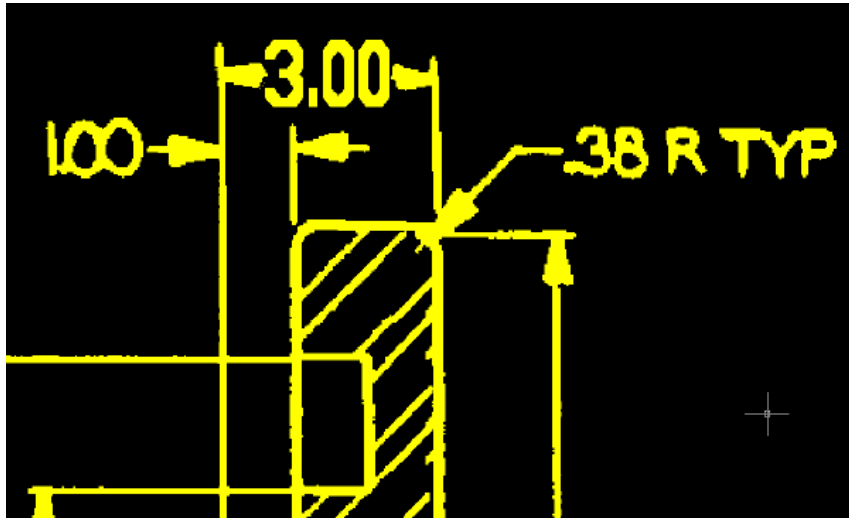
- 28 Select the vector text, then right-click, click Properties, and change the Width Factor of the text to 0.8.
- 29 Center the dimension text between the leader arrows if necessary.
- 30 To open the Raster Pen Settings dialog box, click Image ► Merge ► Configure Raster Pens.
- 31 Select Yellow, change the units to AutoCAD, and click Pick.
- 32 Select two points representing the width across the vertical dimension line.

The following example shows where to select the two points that determine the raster pen width for the new dimension text. When you create raster text from the vector dimension text, the thickness of the text should be comparable to the line work in the image.



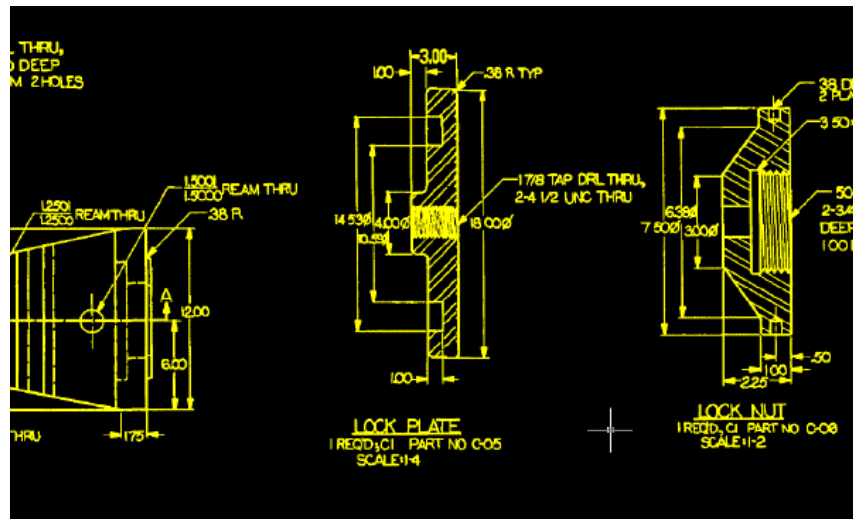
- 33 Verify that Pen Width is set to approximately 0.10 and click OK.
- 34 Select the vector text, then right-click and click Merge Vector To Raster Image.
- 35 Enter y (Yes) to delete the vector text after the merge.

The following example shows how the image should appear after you replace the old dimension text with new raster text created from vector dimension text.



Review the Changes to the Lock Plate

- 36 Click View menu ► Named Views. Set the current view to TU_lock_plate.
- 37 Review the changes to the part and its dimensions.
This example shows how the lock plate and its dimension text should appear after you update them.



38 Close the drawing without saving changes.

Hybrid Image Tutorial

5

Drawings that combine raster and vector data are called hybrid drawings. This tutorial covers some of the most common activities in hybrid drawings:

- Scaling images and correlating images to vector objects in a drawing
- Adding vector objects to images of scanned drawings
- Editing raster geometry in the image
- Converting raster geometry to vector
- Converting vector objects to raster
- Saving the modified image as a new image

When using Raster Design, you can decide which method to use to update an image based on factors such as the following:

- The quality and readability of the raster data in an image.
- The complexity and amount of change required.
- The anticipated use of an image.
- The projected need for future updates.

The exercises in this tutorial use a scanned drawing of a floor plan for a school building. Your objective is to update this image with the following revisions:

- Create a new entrance to the building.
- Add classrooms.
- Replace a staircase with an access ramp for the physically disabled.

Other areas of the floor plan do not change. These areas can remain in raster format.

Exercise H1: Inserting Images with Resource Correlation Files

In this exercise, you use the Insertion Wizard to insert an image into a drawing.

The Insertion Wizard guides you through the process of inserting an image and positioning the image relative to the other objects in the drawing.

Related Help Topics

- Inserting Images
- Specifying Correlation Settings

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_01.dwg.
- 2 View the vector linework in the drawing.
The magenta line represents the outline of the school building. The dimensions of the outline were obtained from field taping measurements. The other vector linework shows the proposed changes to the building.
Choose an image to insert
- 3 To display the Insert Image dialog box, click Image ► Insert.
- 4 Click the Views menu to verify that Preview and Information are checked on. This causes Raster Design to display a preview and a list of parameters for each selected image.
- 5 From the Files of Type list, choose CALS Type 1.
- 6 If necessary, navigate to the \Tutorial4 folder.
- 7 Select the image file Floorplan_01.cal.
- 8 Review the values shown for each parameter.
This parameter list identifies important characteristics of the image.
Position and insert the image
- 9 In Insert Options, select Insertion Wizard.
- 10 In Insert Options ensure that Show Frames Only is not selected.

- 11** Click Open to display the Pick Correlation Source dialog box.
This dialog box is the first dialog box of the Insertion Wizard. When you choose a correlation source, the dialog box shows the insertion point, rotation, and scale associated with the selected correlation source.
- 12** Select each of the options in the Correlation Source list, one after another, and view the insertion parameters and image density associated with each source.
The correlation sources are listed in descending order of priority. The resource file has the highest priority as a correlation source.
- 13** Select Resource File for the correlation source and click Next.
- 14** Zoom out and notice that the inserted image is much bigger than the rectangle enclosing the vector linework.
- 15** In the Modify Correlation Values dialog box, change the Scale value from 300 to 25. Click Apply to see the results.
The Modify Correlation Values dialog box gives you the opportunity to alter correlation information before AutoCAD units are applied. Raster Design shows where the image will appear in the drawing when the image is inserted according to the specified correlation values.
- 16** Click Next.
- 17** The Insertion dialog box shows the correlation of the image in AutoCAD units. Click Finish to accept the values shown here.
The image of the floor plan is inserted in the drawing, which already contains some vector linework.



18 Close the drawing without saving changes.

Exercise H2: Scaling and Matching Images

In this exercise, you use two of the correlation commands available in Raster Design:

- **Scale.** Makes an image larger or smaller by specifying a known distance between two points on the image itself. Scale only performs the re-scaling about a specified base point, no rotation is involved.
- **Match.** Aligns an image to existing vector linework by specifying two source points on the image and two destination points in the drawing. The image is rotated, scaled, and moved as necessary to match the source points to the destination points.

By correlating the image with the existing geometry before you make any design changes, you avoid perpetuating inconsistencies in scale and position when you modify the raster or vector data.

Related Help Topics

- Scaling an Image
- Correlating an Image After Insertion

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_02.dwg.
Scale the image
- 2 View the current vector and raster linework in the drawing.
The linework in the image and in the drawing are not aligned.
- 3 Click View menu ► Named Views. Then expand the Model Views list, and set the current view to TU_scale.
- 4 Enter dist (DISTANCE command) to determine the width of the center classroom, measuring from left to right.

The width of the classroom is approximately 34 feet (10.4 meters). It needs to be shown in the drawing as 25 feet (7.5 meters) instead.

This example shows the two points you select to measure the width of the center classroom.

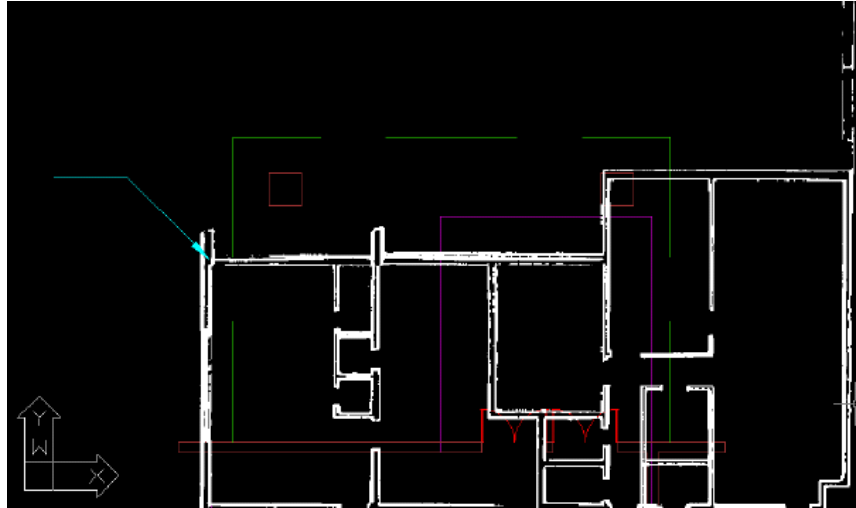


- 5 Click Image menu ► Correlate ► Scale. Then select the intersection of the outside wall and the left wall of the center classroom for the base point.

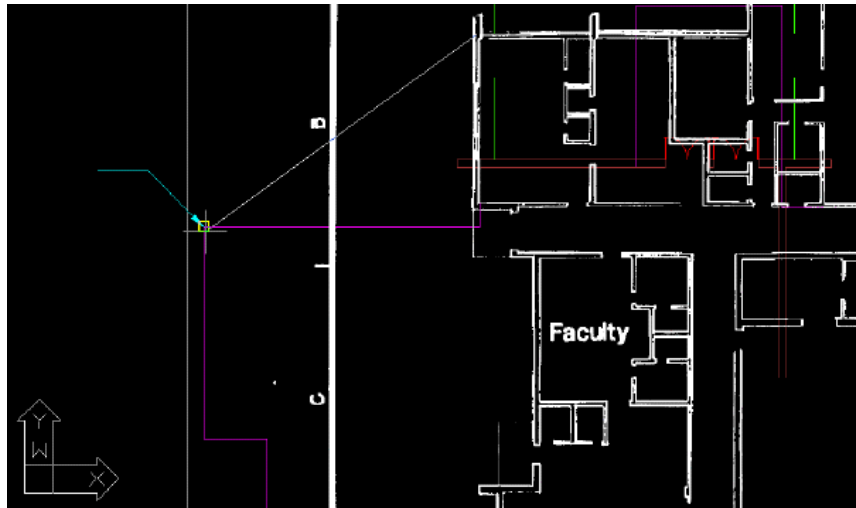


- 6 When prompted, enter 34 feet (10.4 meters) for the source distance, and 25 feet (7.6 meters) for the destination distance.
- 7 Use the DISTANCE command to verify the width of the center classroom is now approximately 25 feet (7.6 meters).
Match the image to the vector linework
- 8 Click View menu ► Named Views. Then set the current view to TU_extents.
- 9 Click Image menu ► Correlate ► Match. Then select the intersection of the outside walls at the upper-left corner of the building for the first source point.

TIP Use Pan and Zoom to more clearly display this area of the drawing.



- 10 Use an Endpoint OSNAP to select the first destination point at the upper-left corner of the purple vector linework of the building.



- 11 For the second source point, select the intersection of the outside walls at the upper-right corner of the building.



- 12 For the second destination point, select the upper-right corner of the purple vector line of the building.



The image is aligned with the vector line.

- 13 Close the drawing without saving changes.

Exercise H3: Improving Existing Linework

In this exercise you learn about using bitonal image processing tools, REM smoothing tools, and using vector to fill in for raster.

You work with an image of a floor plan. In areas where the raster linework is jagged, you use bitonal smoothing filters to improve existing raster on a regional basis. You also use REM smoothing tools to improve raster on an entity-by-entity basis.

You use vector linework to fill in missing raster. Raster snaps, which operate much as AutoCAD object snaps operate on vector objects, help to re-create linework precisely and quickly.

Related Help Topics

- Specifying Raster Snap Settings
- Vectorizing Raster Lines and Polylines
- Smoothing REM Linework

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_03.dwg.
View the image and the proposed vector changes
- 2 Click View menu ► Named Views. Then expand the Model Views list, and set the current view to TU_entry to see the vector linework for the proposed new entrance to the building.
- 3 Set the view to TU_classroom to see the vector linework for the proposed new classrooms.
- 4 Set the view to TU_ramp to see the vector linework for the ramp to the stage.
- 5 Set the view to TU_storeroom to see an area of the image where the raster linework needs improvement.

This example shows an area of the image where the linework is poor: some raster lines are thin, while others overlap. Bitonal filters are one option for enhancing the linework. However, these filters work best on images where the line density is relatively uniform.



Apply line smoothing to a region of the image

- 6 Click Image menu ► Image Processing ► Bitonal Filters. Then press Enter to process the entire image.
- 7 In the Bitonal Filters dialog box, select Smooth for the filter type, 1 for the number of passes, and click OK.

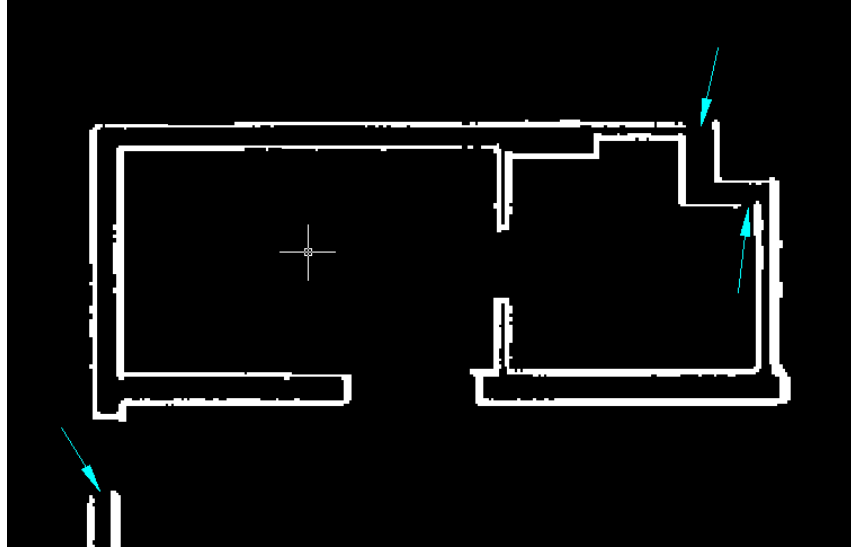
After applying one pass of the smoothing filter, the raster lines are more accurate.



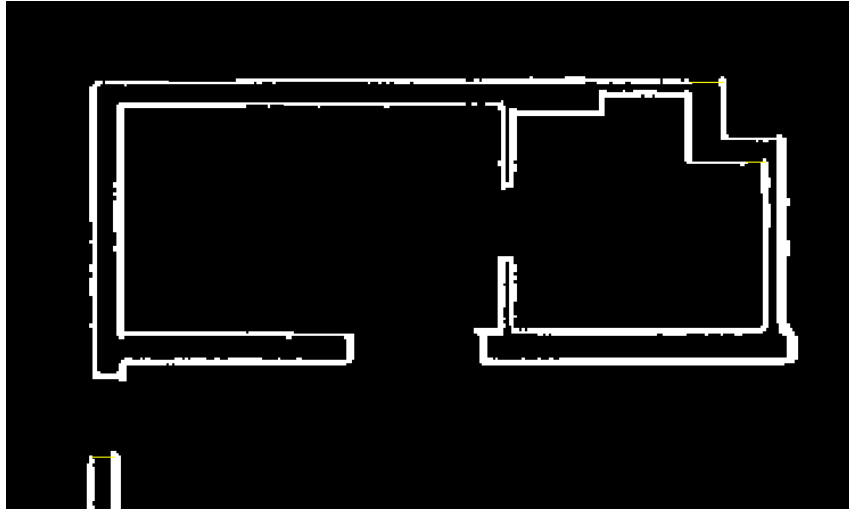
Specify the raster snap settings

- 8 Set the view to TU_linework to see an area of the image where some raster lines are missing.

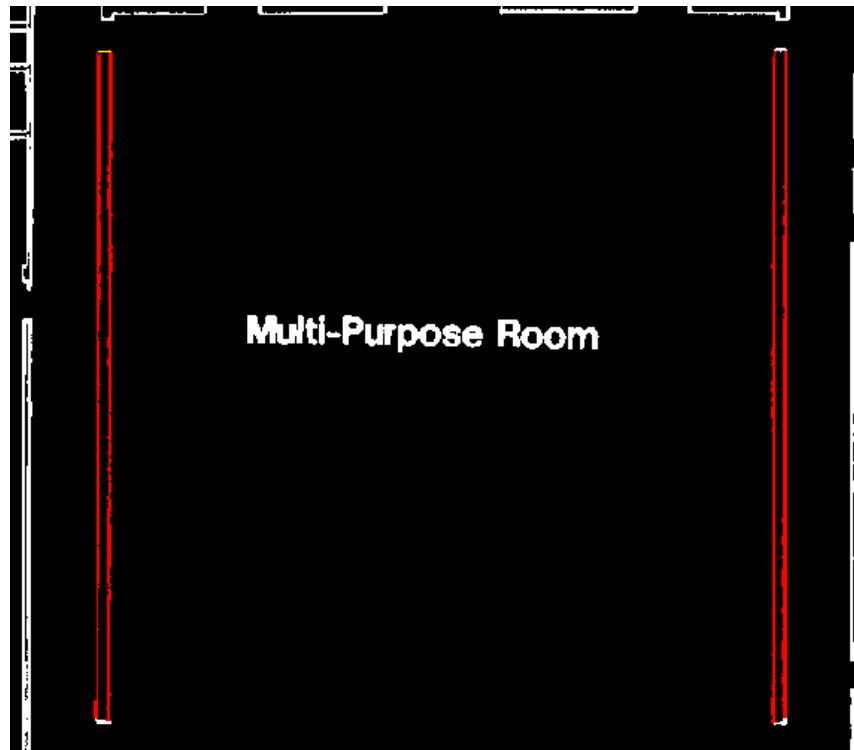
This example shows where lines are missing in the image. New vector lines need to be drawn in where indicated.



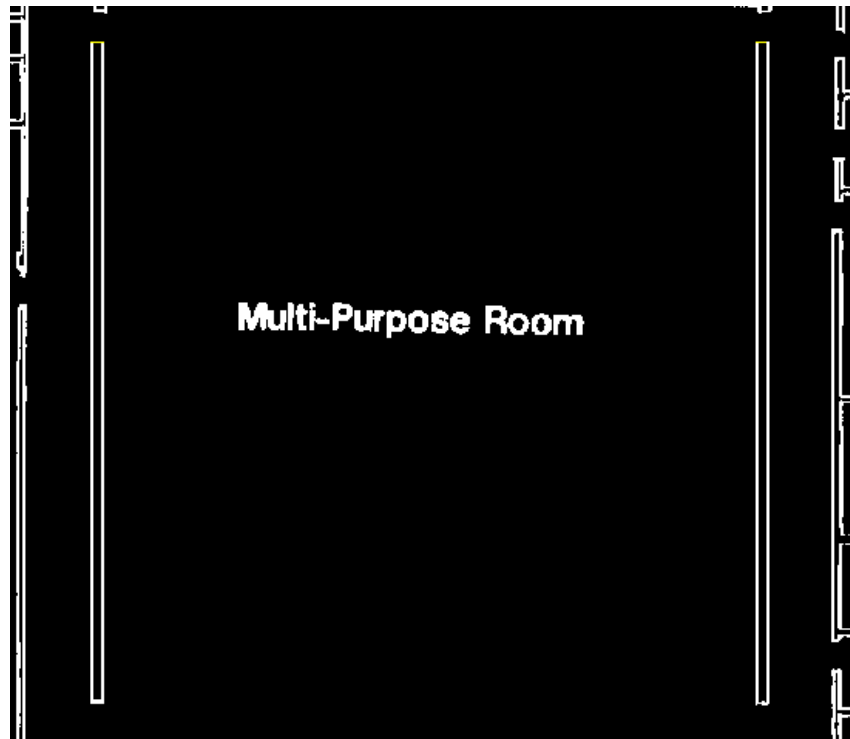
- 9 To display the AutoCAD Drafting Settings dialog box, click Image > Raster Snap.
- 10 Specify the following settings for the raster snaps:
 - Raster Snap: On
 - Raster Snap Modes: End
 - Aperture Size: 25
- 11 Click OK.
Create vector linework from the thin raster lines
- 12 Turn ORTHO Mode On.
- 13 Fill in the gaps in the raster lines with vector lines.
This example shows the vector lines filling in where the raster was missing.



- 14** Turn ORTHO Mode Off.
In a later exercise, you merge the vector linework with the raster image.
Turn off raster snaps
- 15** Click Image ► Raster Snap.
- 16** Clear Raster Snap On, and click OK.
Apply line smoothing to specific lines in the image
- 17** Set the view to TU_multi_purpose. Note the vertical wall lines are jagged and of varying widths.
- 18** Click Image menu ► Raster Entity Manipulation ► Create Primitive ► Line.
- 19** Zoom in and select the four vertical lines that form the side walls of the multi-purpose room, repeating the REM Line command as necessary. The lines are now represented by REM entities.



- 20 Select the four REM lines, then right-click and click Properties. The Object Properties dialog box appears. Ensure that the selected objects are identified as REM Line (4).
- 21 In the Properties dialog, in the Geometry section, set the Width to 3. The four lines are redrawn to a uniform width and smoothed automatically.
- 22 Close the Object Properties dialog box.
- 23 Ensure that the four lines are selected, then right-click and select Merge To Raster Image. The modified lines are merged back into the image. The following example shows the four lines smoothed with equal width and merged back into the image.



24 Close the drawing without saving changes.

Exercise H4: Removing Raster Entities

In this exercise you learn about using the Remove and Raster Entity Manipulation (REM) commands to change raster geometry in images.

Use the Remove commands as follows:

- Define a region, such as a rectangle, polygon, or circle, then remove the raster data within that region.
- Remove raster entities that have particular geometric shapes, such as lines, arcs, circles, or polylines.

Use the REM commands to edit REM entities as if they were vector objects, without actually changing the entities to vector. You create a selection set of REM objects and then select an AutoCAD command. The selection set can be

an area of an image, or, for bitonal images only, it can be lines, arcs, and circles.

In this exercise, you focus on removing raster data to make room for new vector objects in the floor plan of the school building.

Related Help Topics

- Removing (Rubbing) Images

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_04.dwg.
Remove the raster entrance
- 2 Change the color of the TU_image_bitonal layer to yellow.
- 3 Click View menu ► Named Views. Then expand the Model Views list, and set the current view to TU_entry.
The vector linework in this view shows the proposed entrance. The raster linework shows the old entrance.
- 4 Click Image menu ► Remove ► Polygonal Region.
- 5 Draw a polygon around the old entrance, including the outer wall.
The following example shows where to draw the polygon to remove the old entrance to the building. Raster Design removes the raster data within the polygon.



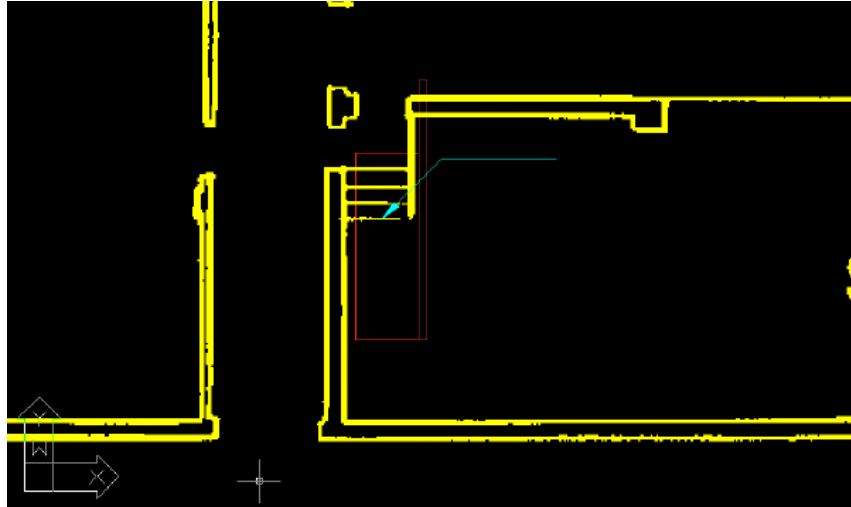
- 6 Press Enter.
Raster Design removes the raster data within the polygon.



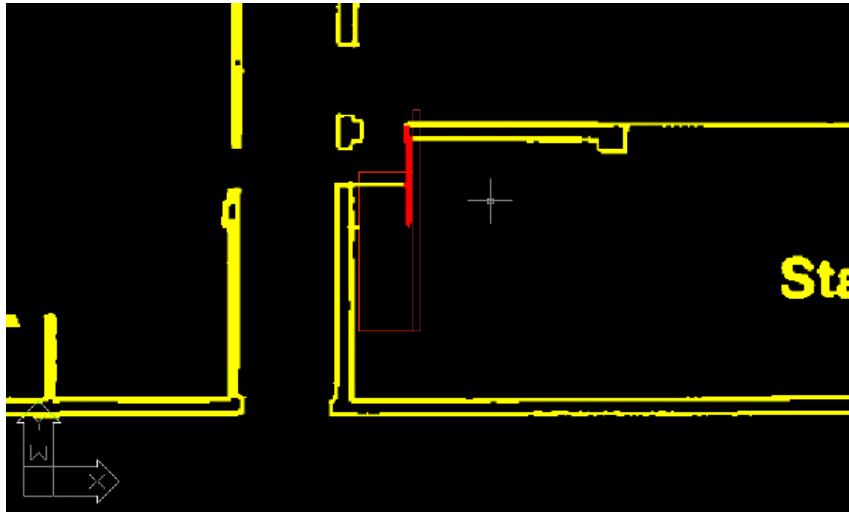
Remove the raster staircase

- 7 Set the current view to TU_ramp.
The vector linework in this view shows the proposed ramp. The raster linework shows the staircase to be removed.

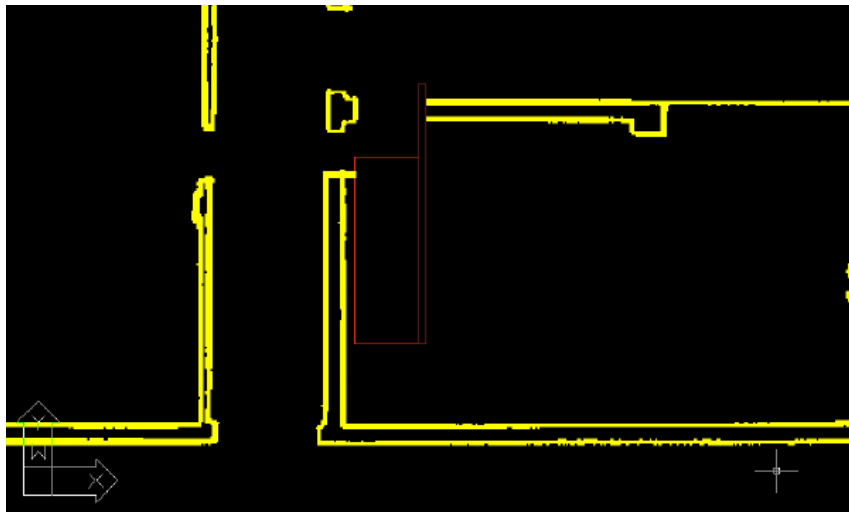
- 8 Click Image menu ► Remove ► Line Entity.
- 9 Select the lowest of the four horizontal stair lines. Raster Design removes the line as soon as you select it.
This example shows the line you select to begin removing the raster linework of the staircase.



- 10 Right-click and select Repeat Line Entity from the shortcut menu to remove the next two stair lines.
- 11 Right-click and click REM ► Create ► Smart Pick. Click the vertical line to the right of the old staircase. In this case, Raster Design selects the line but does not perform an action. The line is now part of a REM selection set. You can now execute AutoCAD commands, such as ERASE, on the selection set.

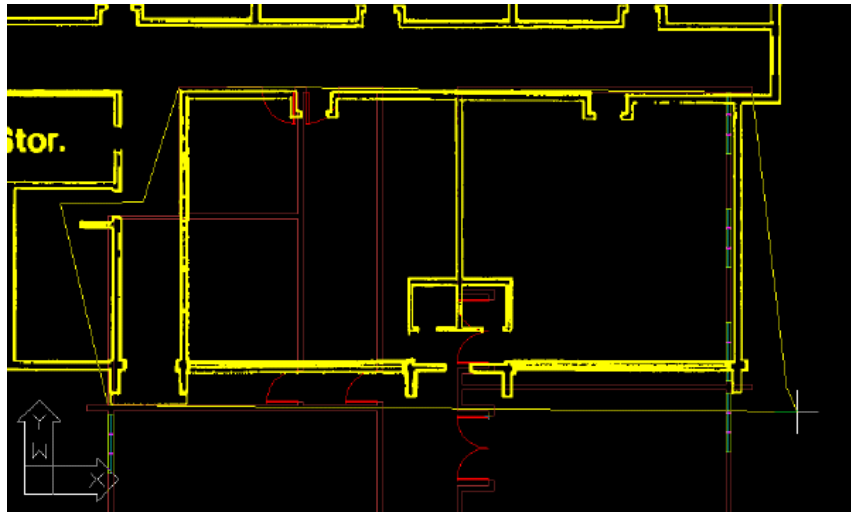


- 12 Enter e for ERASE, select the highlighted line, then press Enter.
- 13 Click Image menu ► Remove ► Rectangular Region. Then remove the remaining stair line.
- 14 Right-click and select Repeat Rectangular Region from the menu to remove the portion of the lines that extend into the vertical vector wall.

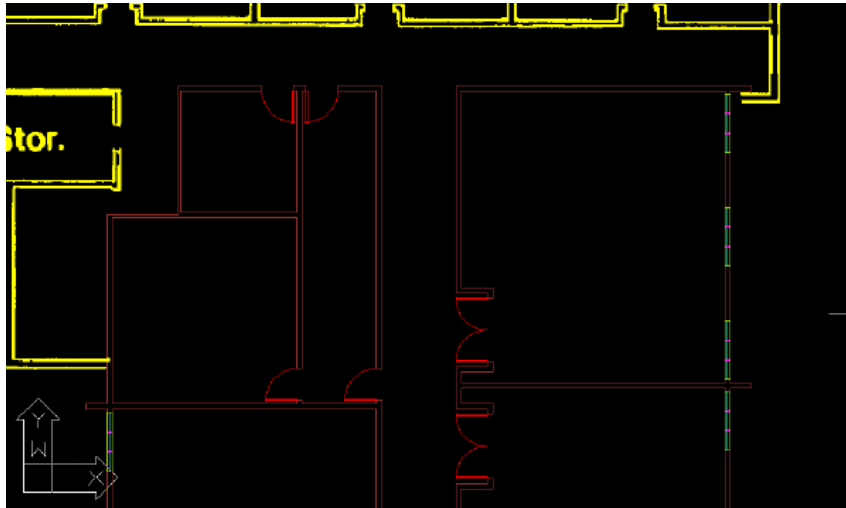


Remove the raster walls near the new classrooms

- 15 Set the current view to TU_classroom.
The vector linework in this view shows the proposed additional classrooms. The raster linework shows the old classroom walls and exterior walls.
- 16 Set the current view to TU_upper.
- 17 Click Image menu ► Remove ► Polygonal Region.
- 18 Draw a polygon around the old classrooms and the walls that define the hallway to the left of the classrooms.



- 19 Press Enter.
Raster Design removes the raster data within the polygon.



- 20 Change the color of the TU_image_bitonal layer to white.
- 21 Close the drawing without saving changes.

Exercise H5: Masking Images of Scanned Drawings

In this exercise you use Mask to exclude areas of an image from view without deleting the raster data.

You create a mask to display a subset of the images in a drawing. A mask shows the area of the image inside the mask boundary and hides areas of the image outside the mask boundary.

If the drawing contains more than one image, Raster Design has settings to control what happens with images that are completely outside the mask boundary. Options for these images are to hide, unload, or leave them unaffected. Unlike cropping and rubbing, masking does not permanently modify images. Also, you can have multiple masks defined in a drawing and can selectively turn them on and off to redisplay the images.

In this exercise, you create a mask to hide the title block in the image of a floor plan of a school building. This raster title block contains old information and cannot be updated readily. Using Mask, you can hide the old title block, retaining the data for historical purposes. You can then insert a new vector title block, annotate it for the revised floor plan, and plot the drawing.

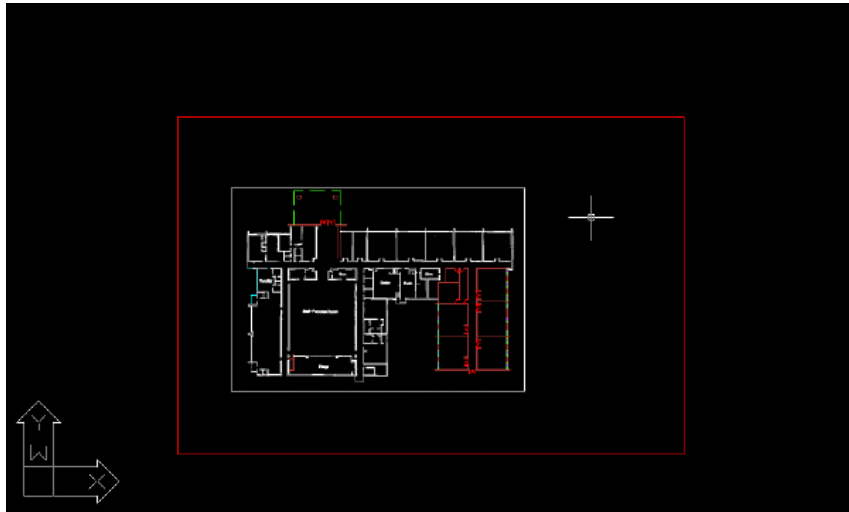
Related Help Topics

- Masking Images
- Changing an Existing Mask

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_05.dwg.
Select the image mask options
- 2 Click Image menu ► Mask ► Create.
- 3 In the New Image Mask dialog box, specify the following settings:
 - Select Enable Mask.
 - Under Image(s) Outside the Image Mask, select Hide Image(s).
 - Clear Show Image Frame(s).Define the image mask
- 4 Click Rectangular.
- 5 Draw a rectangle around the floor plan excluding the title block and border.
Raster Design hides areas of the image that are outside the rectangle.



Turn the image mask off and on

The mask boundary is an AutoCAD object that you can move, stretch, scale, and erase.

- 6 Select the rectangular mask boundary, then right-click and click Enable from the shortcut menu to turn off the image mask.

Raster Design displays the entire image.



- 7 Select the mask boundary, right-click, and click Enable to turn the image mask back on.
Convert the image mask to a clip and hide the mask boundary
- 8 Click Image menu ► Mask ► Convert to Image Clip.
Converting the image mask to an image clip allows you to use the IMAGECLIP command options to turn the clip off or on, change its boundaries, and delete the clip.
- 9 Select the mask boundary and press Enter.
- 10 Right-click and click Image ► Show Image Frames to hide the clip boundary.
Insert a vector title block
- 11 Set 0 as the current layer.
- 12 Use the INSERT command to open the Insert dialog box.
- 13 Browse to the \Tutorial4 folder, and insert the drawing file Title.dwg, using the default insertion parameters, as follows:
 - Insertion Point: 0,0,0
 - Scale: 1,1,1
 - Rotation: 0
- 14 Freeze the layer named TU_border.
The following example shows how the drawing should appear after you turn on the image mask and insert a vector title block.
You can annotate the floor plan, complete the title block, and plot the drawing.



15 Close the drawing without saving changes.

Exercise H6: Merging Vector Changes with Raster Images

In this exercise you merge vector objects into a raster image.

By merging vector objects, you can make precise changes to your raster image using the power of AutoCAD drawing tools yet keeping your data in raster format.

In this exercise, you merge the following vector changes with the raster image of the floor plan:

- The new entrance
- The ramp that replaced the staircase
- The new classrooms
- The vector lines you drew to replace missing raster linework

When you merge vector objects into a raster image, you can control the following parameters:

- The line width of the raster linework created from the vector object(s), based on the color of each object
- Which vector objects to merge into the image
- Whether or not to create a new image for the merged data
- If display order should be respected when merging
- If an existing image should be expanded if necessary to accommodate the new data

Related Help Topics

- Merging Vectors into a Raster Image
- Selecting Pen Widths for Vector Merge

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_06.dwg.
Select the color and width of the new raster linework
- 2 To display the Raster Pen Settings dialog box, click Image ► Merge ► Configure Raster Pens.
- 3 Verify that the pen width for all colors is set to 3 pixels and click OK.
Merge the vector objects into the image
- 4 Click Image menu ► Merge ► Vector into Raster.
- 5 Draw a rectangle that includes all of the vector linework except the title block and border then press Enter.
- 6 When prompted, enter y to delete the vector objects you selected.
If you want to keep the vector linework, you can enter n when prompted.
You can then freeze the layers that contain the vector linework so that the vectors are not displayed.

The following example shows how the drawing should appear after you merge the vector objects into the image.



Review the raster entities created from the vector objects

- 7 Click View menu ► Named Views. Then expand the Model Views list, and set the current view to TU_entry to see the linework for the proposed new entrance to the building.
- 8 Set the current view to TU_classroom to see the linework for the proposed new classrooms.
- 9 Set the current view to TU_ramp to see the linework for the proposed ramp.
- 10 Set the current view to TU_linework to see the area of the image where you replaced some of the missing raster linework with vector lines.
The raster lines created from the vector lines are smooth and distinct.
- 11 Close the drawing without saving changes

Exercise H7: Exporting Images with Resource Correlation Files

In this exercise you export an image with a resource correlation file.

A correlation file contains the parameters used to determine insertion point, scale, and rotation for an image when you insert the image in a drawing.

Having a correlation file enables you to use an image in other drawings or in other applications at the correct insertion point, scale, and rotation.

In this exercise, you export an image that contains edits that were performed by merging vector data into the image. Raster Design creates the resource correlation file as part of the export process. You can also create a World correlation file without saving the image. Click Image menu ► Export ► World File.

Related Help Topics

- Exporting Images

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial4 folder, open the drawing file Hybrid_07.dwg.
- 2 Click Image menu ► Export ► Image.
- 3 If necessary, change the location where the exported image will be saved.
- 4 Enter Floorplan_update.cal for the filename, select CALS1 for the file type, and click Export.
- 5 In the Export Options dialog box, specify the following settings:
 - Select Maintain Drawing Link to Image.
This changes the saved path for the image in the drawing. The exported image will be the one inserted into the drawing.
 - Select World File for the correlation output type.
- 6 Click Finish.
- 7 Close the drawing without saving changes.

Photograph and Map Tutorial

6

This tutorial shows you how to use Raster Design to work with images of photographs and maps.

Use Raster Design to enhance the usefulness of aerial photographs, satellite images, and maps:

- Correlate images to the vector geometry in your AutoCAD drawings.
- Export images with correlation files so that they can be used in other drawings and applications.
- Correct image distortions.
- Improve the readability of images.
- Extract valuable information from map images, such as soils maps and US Geological Survey (USGS) quad sheets.
- Insert images from the Internet.
- Create displayable maps from digital elevation models (DEM).
- Use multispectral satellite images to display special features of a land surface.
- Convert grayscale images to bitonal (black and white) to isolate features of interest.
- Create vector objects by tracing raster entities such as soil boundaries, streams, and contours.
- Remove unneeded areas of images and make areas transparent.
- Create image mosaics of multiple images to cover large areas.
- Create new images by merging existing images together.

The lessons in this tutorial show you how to use Raster Design with the following images:

- An aerial photograph showing current land use for a proposed development.

- A Natural Resources Conservation Service (NRCS) soils map showing soil boundaries and soil types for the region around the development.
- Two adjacent USGS quad sheets showing the physical characteristics of the region.
- A digital elevation model.
- A four-band set of multispectral satellite images.

Exercise P1: Inserting an Aerial Photograph from the Internet

In this exercise you insert an image of an aerial photograph from the Internet.

The images used in this exercise are in highly compressed wavelet formats making them particularly suitable for this purpose.

In this lesson, you insert an aerial photograph into a drawing that contains a plan view of an undeveloped parcel of land. The photograph shows the current land use for the site and the surrounding region.

NOTE The images you can insert in this exercise are available both on the AutoCAD Raster Design Web site and in the \Tutorial5 folder.


Related Help Topics

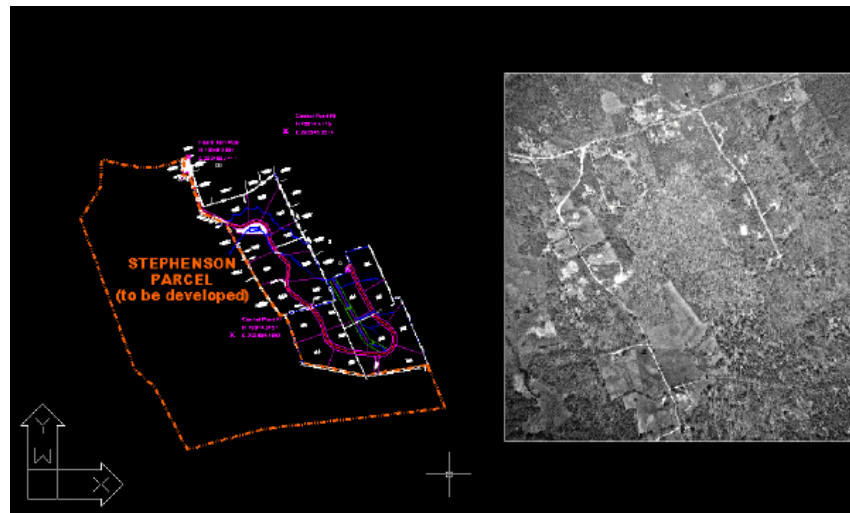
- Inserting an Image from the Internet Using the Insert Image Dialog Box
- Specifying Correlation Settings
- Saving an Image to Another File Name, Type, or Location

Related Exercises

Before doing this exercise, you should ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_01.dwg.
Locate the image to insert
- 2 To display the Insert Image dialog box, click Image menu ► Insert.

- 3 Under Insert Options select the Insertion Dialog option. Ensure that Show Frames Only and Zoom To Image(s) are cleared.
- 4 Click Search the Web  to display the Browse the Web - Open dialog box.
- 5 In the Address field, enter <http://www.autodesk.com/rasterdesign-tutorial> and press Enter.
This takes you to a page on the Autodesk website that contains an aerial image available in two formats: .ecw and .sid.
- 6 Click the link for either the Downloadable .sid image or Downloadable .ecw image.
In the Browse the Web - Open dialog box, the address of the file is displayed in the Name or URL field.
- 7 Click Open.
Insert the image
- 8 In the Image Insertion dialog box, on the Insertion tab, click Pick.
You will be prompted to pick the location of the bottom left corner of the image frame, then the rotation angle, then the size of the image.
- 9 Move the image frame to the right of the vector drawing, then click to place the bottom left corner.
In later exercises of this tutorial, you correlate the image to the vector drawing of the site using Match and Rubbersheet.
- 10 Press Enter to specify a rotation of 0.
- 11 Move your cursor to the upper right, then click a corner point that makes the image frame about the same height as the existing drawing.
- 12 Click OK.



Save the image as a TIFF file

- 13 Click Image menu ► Save As.
You must save the wavelet compressed files (.sid or .ecw) as a format Raster Design can write to.
- 14 If necessary, navigate to the \Tutorial5 folder.
- 15 Enter Aerial_01.tif for the filename, select TIF for the file type, and click Save.
- 16 Choose Uncompressed for the Encoding Method and click Next.
- 17 Choose Tiled for the Data Organization and click Finish.
The image can now be modified, having been saved in an editable format.
- 18 Close the drawing without saving changes.

Exercise P2: Matching Images to Drawings

In this exercise you use Match to correlate an aerial photograph to a vector drawing.

Match applies linear correlation, adjusting insertion point, scale, and rotation as necessary, to align a raster image with known points in a vector drawing or with another image.

To match an image to a drawing, you select two source points on the image and two corresponding destination points in the drawing. Raster Design uses these points as a reference to reposition the image relative to the drawing.

Related Help Topics

- [Correlating an Image After Insertion](#)

Related Exercises

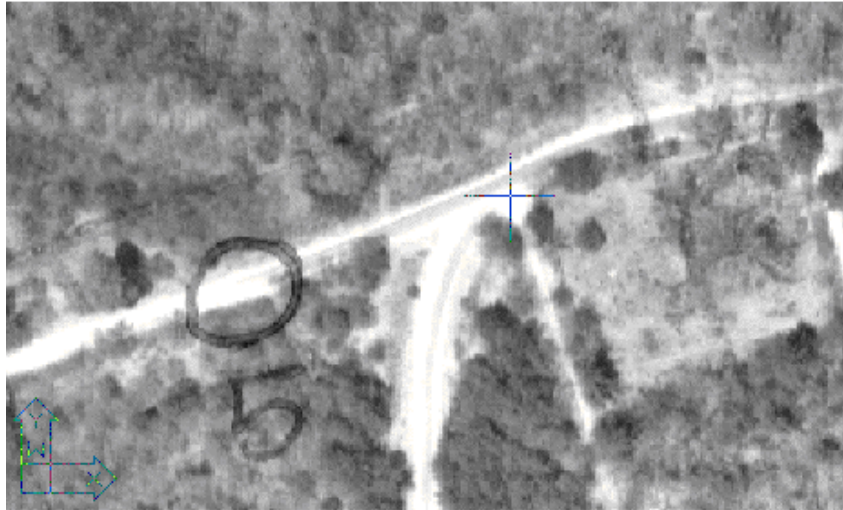
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_02.dwg.
Restore the viewport TU_match
- 2 Click View menu ► Viewports ► Named Viewports. Click the viewport TU_match, then click OK.

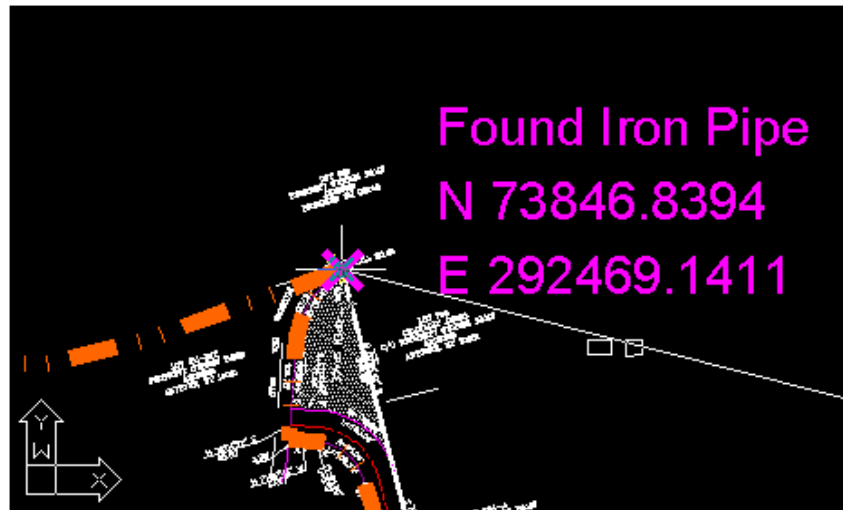


Match the first point

- 3 Click Image menu ► Correlate ► Match.
- 4 For the first source point, select the upper right viewport, then select the source point on the image.



- 5 For the first destination point, select the upper left viewport, then select the intersection of the stone wall and the parcel boundary, at the center of the X.



Match the second point

- 6 For the second source point, select the lower right viewport, then select the source point on the image, at the lower right corner of the barn.



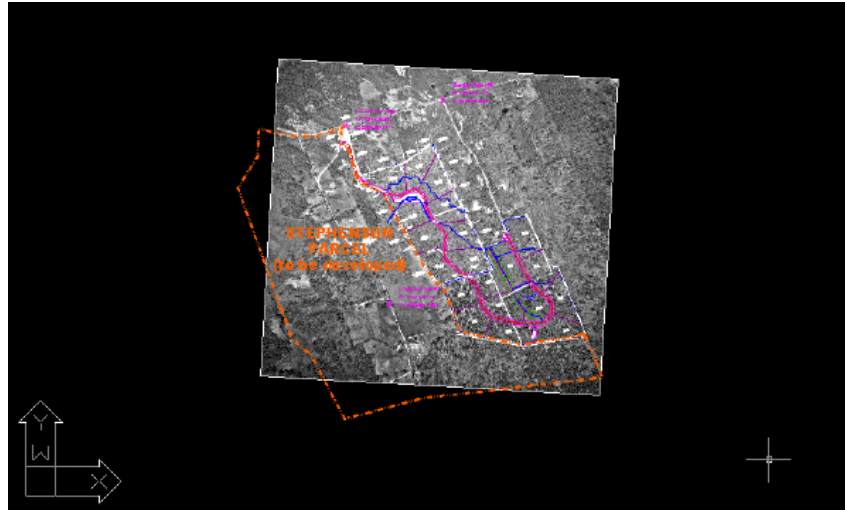
- 7 For the second destination point, select the lower left viewport, then select the center of the X.



When you click the second destination point, the image immediately snaps into alignment with the drawing.

View the results of matching the points

- 8 To set a single viewport, click View menu ► Viewports ► 1 Viewport. Then zoom out to see the vector lines overlaid on the aerial photo.



- 9 Close the drawing without saving changes.

Exercise P3: Correcting Distortions in Photographic Images

In this exercise you use rubbersheeting to correct distortions in aerial photographs.

After the image is rubbersheeted, it can serve as a valuable reference for engineering, facilities, and mapping projects. Rubbersheeting can be a low-cost alternative to orthophotography if approximate accuracy is acceptable.

In this exercise, you use rubbersheeting to correct an image involved in a parking lot project. Import control points, add additional points, explore differences between Triangular and Polynomial methods, and learn how to use the rubbersheet preview and check points to predict your results.

Related Exercises

- [Exercise S7: Correcting Distortions Using Triangular Rubbersheet](#) (page 33)
- [Exercise S8: Correcting Distortions Using Grid Points](#) (page 38)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Rsheet_01.dwg. A grayscale image of a parking lot automatically inserts with the drawing.

Invoke rubbersheet and import a point file

For convenience, a point file has already been created for you to use as a starting point for this exercise. In normal practice, you create pairs of source and destination points to specify where the image must stretch to align with the vector line work. It is recommended as a best practice to export your points before executing the rubbersheet. Then if you want to try the rubbersheet operation again with a different method or with different points you have a good place to start.

- 2 To display the Rubbersheet-Set Control Points dialog box, click Image ► Correlate ► Rubbersheet.
- 3 Click the Import button, choose the point file \Tutorial5\ Rsheet_01.txt and click Open. The imported points display in the control point list box. The OK and Preview buttons are available now that there are sufficient points to perform a rubbersheet (at least 3 are required).

Preview the rubbersheet and re-pick a point

In the next few steps, you compare previews for both methods, Polynomial and Triangular. Based on the previews you re-pick any points that were incorrectly defined.

- 4 In the Rubbersheet-Set Control Points dialog box, under Method, select Polynomial and leave the Degree at the default setting 1. The Error column shows how much the actual location of destination points, after rubbersheeting, will differ from the entered values.
- 5 Click the Preview button. The Rubbersheet-Set Control Points dialog box closes and a preview of the rubbersheet is shown.

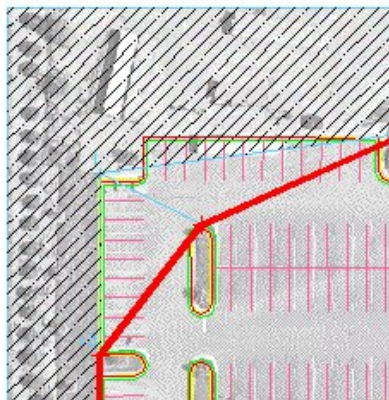
The red border previews the extents of the raster image after the rubbersheet. The cyan border shows the extents of the original image. The amount of variation in these extents indicates how much the image must be distorted to match up with the control points. The upper left and lower right corners are areas of considerable distortion.



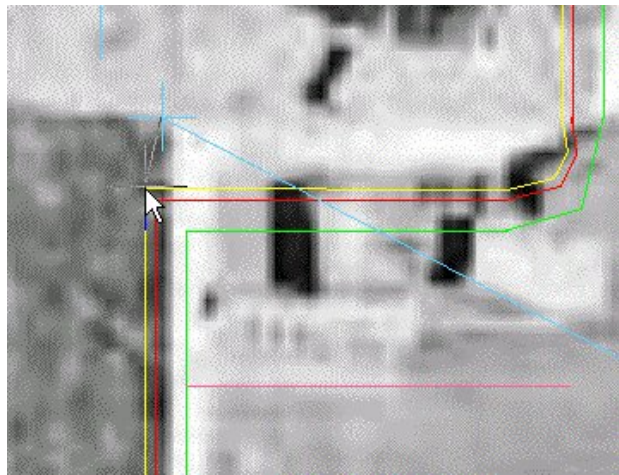
6 Right-click or press Enter to exit the preview.

7 Set the Method to Triangular. Select the Preview button.

The preview shows the extents of the result in red and previews the extents of that area with a thin cyan line. The area between the cyan extents and the original frame of the image is discarded in the final triangular rubbersheeted result. The triangular algorithm can be applied only over the area contained by the control points; the rest must be discarded. Zoom into the upper left to see this more clearly. We can see from this preview that point 1 apparently has been incorrectly defined. The destination for this point should be at the corner of the parking lot, not on the round island to the right.



- 8 Right-click or press Enter to exit the preview.
- 9 Highlight the row for point 1 in the control point list box. Click the Repick button. The Rubbersheet-Set Control Points dialog box is closed temporarily and the screen is zoomed to the region of point 1.
- 10 At the command line you are prompted to specify a new Source point. Press Enter to accept the current source point, which is the blue point just above the corner of the yellow vector perimeter. You are now prompted to specify the new Destination point. Pick the point at the corner of the yellow perimeter. This action moves the destination point from the round island to the corner of the parking lot.



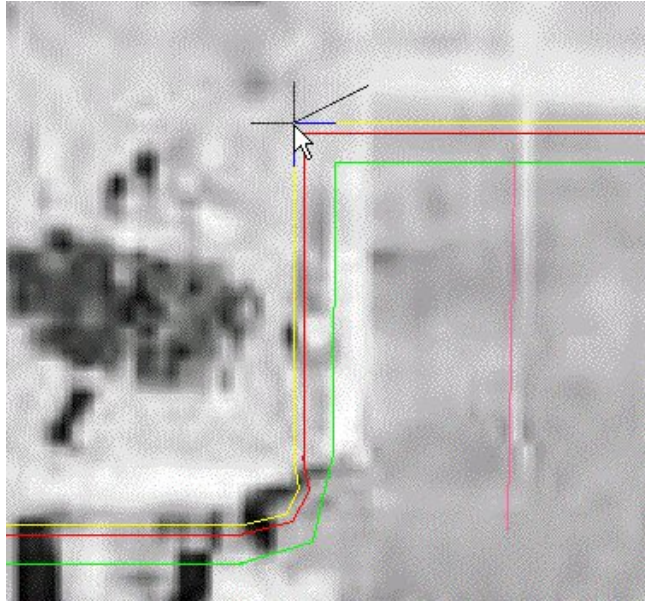
The Rubbersheet-Set Control Points dialog box is displayed after you pick the new destination point.

Add control points for triangular rubbersheet

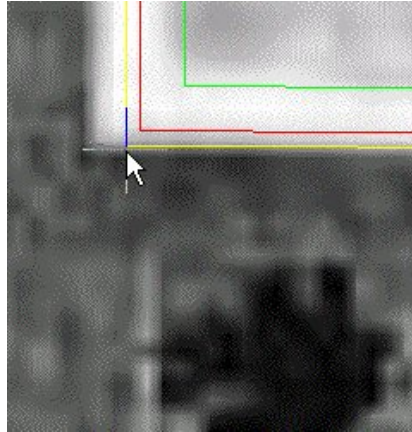
As you saw in the Triangular rubbersheet preview, the final result includes only that portion of the image contained by the control points. To get a rubbersheeted image that covers the whole parking lot, you need to add several control points.

- 11 Click Preview to see where control points need to be added. Note the areas in the upper left, lower left, and lower right of the parking lot where the wide red border deviates significantly from some parts of the parking lot. You can add a control point in each of these areas to correct this situation. Press Enter to exit the preview.

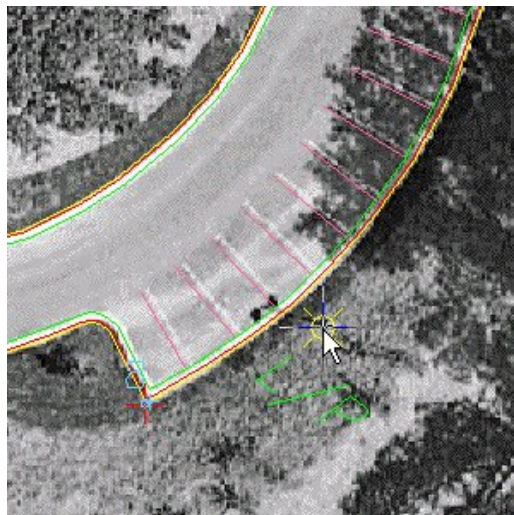
- 12** Click Add Points. At the command line you are prompted to specify a new Source point. Transparently zoom to the upper left corner of the project. Pick the upper corner of the parking lot in the image. At the command line you are prompted to specify the Destination point. Pick the corresponding corner represented by the yellow border.



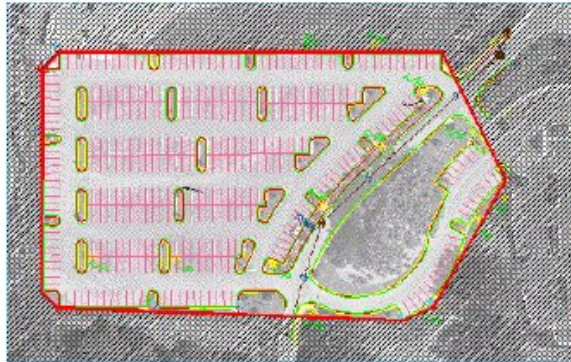
- 13** At the command line you are prompted to specify the next Source point. Transparently pan and zoom to the lower left corner of the parking lot. Similar to before, pick the corner of the parking lot in the image as the Source point and the corner of the yellow border as the Destination point.



- 14 At the command line you are prompted to specify another Source point. Transparently pan and zoom to the lower right corner of the parking lot. Locate the light pole labeled in the drawing. Notice the image and drawing line up closely at this point so you can make this an anchor point where the Source and Destination points are the same. Pick the light pole and then enter a to anchor the point. Enter d to finish adding points and return to the Rubbersheet-Set Control Points dialog box.



- 15 Click the Preview button. Notice that the whole parking lot is now contained within the red image boundary as desired. Right-click or press Enter to exit after examining the preview.

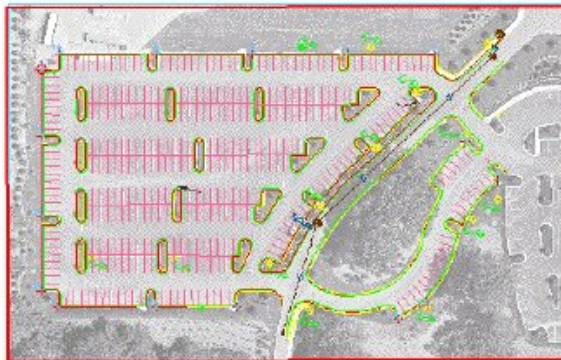


Preview polynomial rubbersheet

Now that all the control points are in place, see how a Polynomial rubbersheet would look. Often you find that the Triangular method gives just the results desired but there may be other cases where the Polynomial method would be the better choice. One case might be where you might need to preserve the image data outside the area of known control points.

- 16** In the Rubbersheet-Select Control Points dialog box, under Method, select Polynomial. Leave the Degree at 1. Click the Preview button to see the projected results.

Note that the outline of the image would change very little from its present form. This means the rubbersheet operation will introduce very little distortion and the data outside the control points is reasonable.



- 17** Press Enter to close the preview window.
- 18** Note the errors reported for the individual control points in the Error column of the Rubbersheet-Set Control Points dialog box. All are under

2 feet and some are under a foot. Note the Total RMS Error which is a form of an average error of all the points.

- 19 Raise the polynomial Degree to 4 to see how this affects the individual and Total RMS Error as well as the preview. The individual errors and the Total RMS Error drop significantly. Leave the degree at 4.

- 20 Click the Preview button to see how the higher degree affects the overall image.

Significant warping is now present in the red new image outline. The higher polynomial degree allows greater warping in order to match the control points more closely. The result is dramatic warping in areas where there are no control points. This degree of warping renders the image useless for those areas outside the control points.



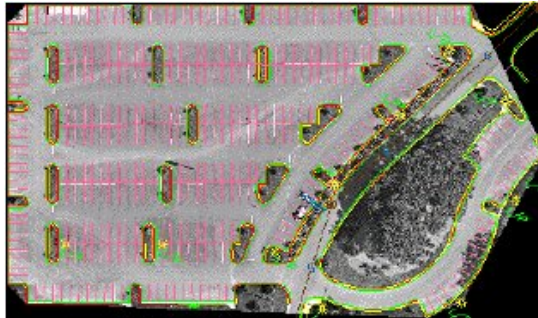
- 21 Right-click or enter Enter to exit the preview.

Add check points

You have seen that for the polynomial method there is an inverse relationship between control point error and the amount of warping present in the image. This relationship is affected by polynomial degree as well as by the number and arrangement of control points.

Another tool for evaluating this relationship is the check point. A check point is a control point that is disabled so it is not included in the calculation of the image transformation. Instead, the distance that point is moved, based on the control points used, is reported in the error column. In this way, you can get a quantitative measure for the extent that image warping occurs in a specific part of the image. While you explore check points in the context of a Polynomial method rubbersheet, they are equally useful for evaluating movement between control points for Triangular method rubbersheets.

- 22** Click the Add Points button and set anchor points at each corner of the image frame. (Anchor points are not necessary for this use but are cleaner and easier to define). Point numbers 17, 18, 19 and 20 are defined when you are done. Type d when you are finished adding points. The Rubbersheet-Set Control Points dialog box displays.
- 23** In the Rubbersheet-Set Control Points dialog box, clear the check boxes for points 17, 18, 19, and 20 to disable them. These check points display gray in the control point list box. The error calculation is dynamically updated as you enable or disable control points.
- 24** With the four points now set as check points, the Error column values for these points show exactly how far the corners of the image move in order to accomplish the warp using the defined control points and the polynomial Degree of 4. Change the Degree to 1 and note that the check point movement is significantly less.
Perform the rubbersheet
You have explored the possibility through previews and check points of performing this rubbersheet using the Triangular and Polynomial methods. You have also seen the advantages of changing polynomial degree and adding more control points. The Triangular method will be used for the final rubbersheet because there are no errors at the defined control points, and the image data outside the parking lot boundary (the control point cluster) is not required.
- 25** In the Rubbersheet-Set Control Points dialog box, change the Method to Triangular.
- 26** Export the control points in case you want to repeat the rubbersheet later using different settings. Click the Export button, then in the Export dialog box name the file Rsheet_01new.txt, and click Export.
- 27** Click OK. The rubbersheet processes and the Rubbersheet-Set Control Points dialog box closes. Enter REGEN to correct the display order if necessary.



28 Close the drawing without saving any changes to the drawing or image.

Exercise P4: Enhancing Grayscale Images

In this exercise you use three image processing functions to improve the image clarity of a grayscale aerial photograph.

Several editing filters are available in Raster Design. Those that use the histogram include functions to convert color images to grayscale or bitonal (black and white) images, and to convert grayscale images to bitonal images.

In this lesson, you experiment with the Brightness, Contrast, and Equalize functions. You can observe the effects of each function on the image by using both the preview and histogram display before you apply the changes.

In this exercise you process the whole image. Raster Design also allows only a specified portion of the image to be processed.

Related Help Topics

- Adjusting the Brightness and Contrast of an Image
- Maximizing Details in an Image

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_04.dwg.
- 2 If the vector line work is not displayed on top of the aerial photo, enter REGEN to restore the display order.

Adjust the contrast and the brightness

- 3** Click Image menu ► Image Processing ► Histogram. Press Enter for the whole image. The Histogram dialog box appears.
Ensure that Brightness/Contrast is the active tab.
- 4** Move the pointer over the histogram display until the index value equals 69.
The frequency value identifies the number of pixels in the image assigned to this shade of gray. In the next few steps, you will see the effects of the contrast and brightness controls.
- 5** Move the Contrast slider to the right to increase the contrast, observing the effect in the preview window.
Increasing the contrast displays mid-tone image values in more extreme light and dark shades. Increasing the contrast to an extreme value in a grayscale image polarizes the shades of gray to display in black and white.
- 6** Move the Contrast slider to the left to decrease the contrast, observing the effect in the preview window.
Decreasing the contrast in a grayscale image displays more image values in midrange shades. At extreme low contrast, all the image values display as a single shade of gray.
- 7** Move the Brightness slider to 128 to increase the brightness, observing the effect in the preview window.
In grayscale images, increasing the brightness displays gray image values in lighter shades. At extreme brightness, all image values display as white.
- 8** Move the Brightness slider to the left to decrease the brightness, observing the effect in the preview window.
In grayscale images, decreasing the brightness displays image values in darker shades. In the extreme case, all image values display as black.
- 9** Click Reset. The Contrast and Brightness sliders return to center.
Equalize the grayscale of the image
- 10** Click the Equalize tab.
Equalization is useful for images in which a large percentage of pixels are approximately the same color. In a grayscale image, equalization changes the darkest pixels to black and the lightest pixels to white and then reassigns the remaining pixels to use all shades in between.

- 11 Click Apply to equalize the shades of gray across the full range of grays and observe the effect in the preview window.
- 12 Click Close.
Note that image details are more visible in the equalized image.
- 13 Close the drawing without saving changes.

Exercise P5: Using a World Correlation File

In this exercise you use a world correlation file to insert an image of a soils map.

Using a correlation file, such as a world file or a resource file, is one of several options for specifying the insertion point, rotation, and scale when you insert an image.

Also in this exercise, you work with the setting for image units in relation to drawing units.

Related Help Topics

- [Specifying Correlation Settings](#)

Related Exercises

- [Exercise S1: Inserting Images of Scanned Drawings](#) (page 17)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

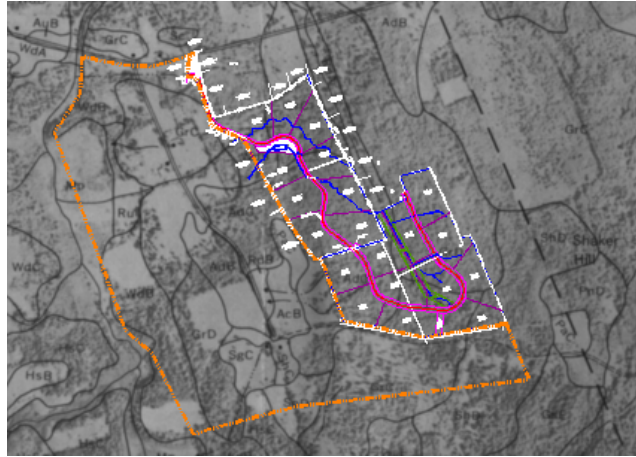
- 1 In the \Tutorial5 folder, open the drawing file Map_05.dwg.
Choose an image to insert
- 2 To display the Insert Image dialog box, click Image menu ► Insert.
- 3 From the Files of Type list, choose TIFF.
- 4 If necessary, navigate to the \Tutorial5 folder.
- 5 Select the image file Soilsmap_world_01.tif.
- 6 On the Views menu verify that Preview and Information are checked.
This displays a preview window and a list of information about the image.
- 7 Review the values shown for each parameter.

Insert the image using a world correlation file

- 8 Under Insert Options, select the Insertion Dialog option. Also make sure that Show Frames Only and Zoom To Image(s) boxes are cleared.
- 9 Click Open to display the Image Correlation dialog box. Select the Source tab.
Raster Design detects that a world correlation file (soilsmap_world_01.tfw) is associated with this image. The dialog box shows the insertion point, rotation, and scale specified in the correlation file.
- 10 Click the Insertion tab.
Note the Drawing Units are specified as Meters. The image must use the same setting for proper correlation.
- 11 Click the Modify tab. Under Units, note that the Image Units can be changed here.
- 12 Ensure that the image units are set to Meters to match the drawing units.

TIP In this step, you are setting the image units for this insertion only. In your real work with images, if you ever want to change the default setting for all insertions, click Image menu ► Options. In the Raster Design Options dialog box, click the Image Defaults tab. On this tab you can set both horizontal units (under Density) and vertical units.

- 13 Click Apply to see the image displayed in the drawing, then click OK to finish the insertion process.
- 14 If the vector line work is not displayed on top of the image, enter REGEN to correct the display order.



15 Close the drawing without saving changes.

Exercise P6: Converting Grayscale Images to Bitonal Images

In this exercise you convert a grayscale image to bitonal (black and white) images and clean up the converted image:

- Threshold converts a grayscale image of a soils map to a bitonal image.
- Invert reverses light and dark areas of the image to improve readability. In the case of bitonal images, it also has the effect of reversing background and foreground colors.
- Despeckle removes undesired spots and speckles from the image.

By converting the grayscale image to a bitonal (black and white) image, inverting the image, and removing speckles, you make the soil boundaries in the image easier to identify. The resulting map can be readily converted to vector using the Raster Design Vectorization Tools.

In this lesson, you also export the modified image with a world correlation file.

Related Help Topics

- Converting a Grayscale or Color Image to Bitonal

- Exporting Images
- Reversing the Light and Dark Shades in an Image
- Removing Speckles from an Image

Related Exercises

- [Exercise S3: Cleaning Up Images with Invert and Mirror](#) (page 22)
- [Exercise V1: Setting Options and Creating Basic Vector Objects](#) (page 183)

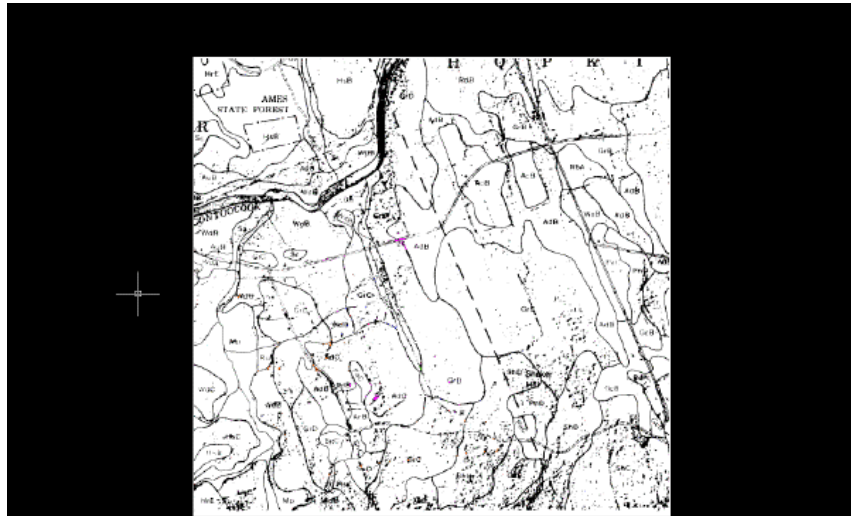
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_06.dwg. In the next few steps, you will change the background color of the Model space to black.
- 2 At the Command line, enter the OPTIONS command to open the Options dialog box.
- 3 Click the Display tab.
- 4 Click the Colors button. The Drawing Window Colors dialog box opens.
- 5 In the Interface Element list, select Uniform Background.
- 6 In the Color list, select Black.
- 7 Click Apply & Close in the Drawing Window Colors dialog box, then click OK in the Options dialog box.
Convert the grayscale image to bitonal
- 8 Click Image menu ► Image Processing ► Histogram. Press Enter to edit the entire image. The Histogram dialog box is displayed.
On the Threshold tab, use the slider to determine which pixels will be black and which will be white after you convert the image. The shades of gray to the left of the slider become black, and those to the right become white.
- 9 Move the slider to 82, observing the effect on the image in the preview window.

This exercise uses one image. However, if you select multiple images, you can select the image name below the preview to observe the effect of the threshold value on that image. The selected images convert to black and white when you click Apply and Close.

- 10 Click Apply and Close to convert the image.

The following example shows how the image of the soils map should appear after you convert it to a bitonal (black and white) image. The image has a light background and dark line work that is difficult to read. The image also contains large speckles.



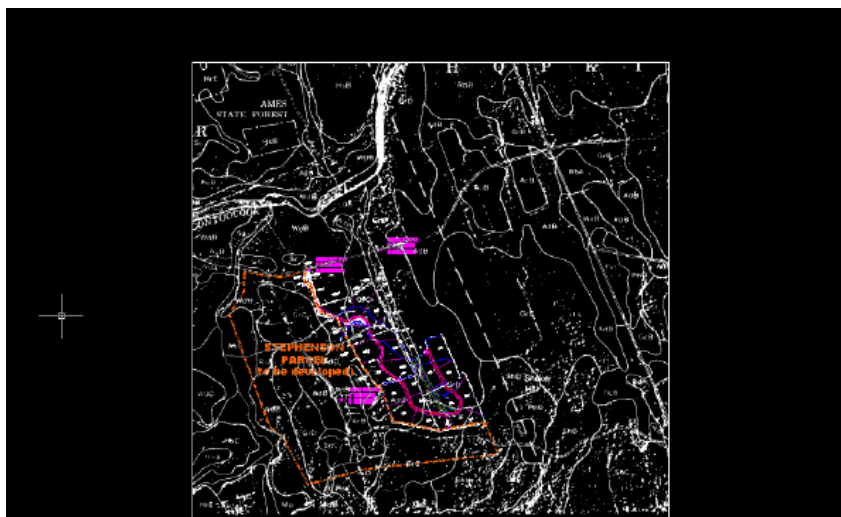
Export the image

- 11 Click Image menu ► Export ► Image.
- 12 In the Export dialog box, enter Soilsmap_world_03.cal for the filename, select CALS1 for the file type, and click Export.
- 13 In the Export Options dialog box, select Maintain Drawing Link to Image and under Correlation, select World File.
- 14 Click Finish.

Invert the image

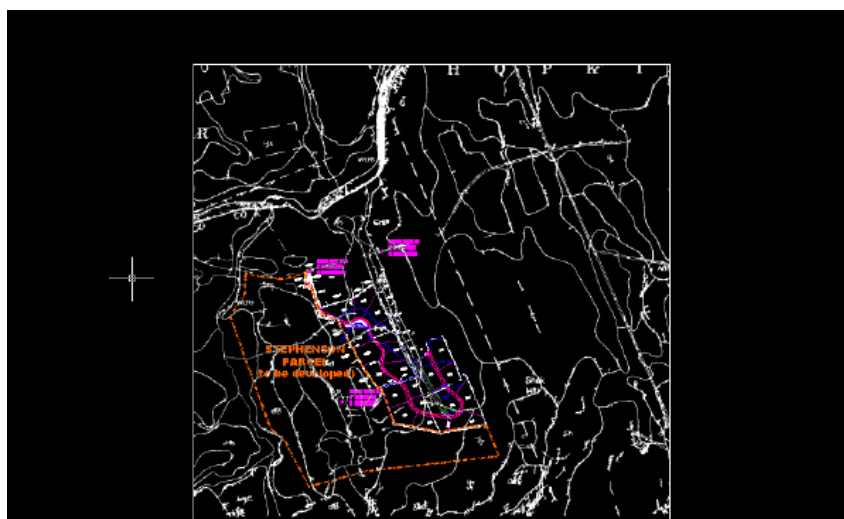
- 15 Click Image menu ► Cleanup ► Invert.

The following example shows how the image of the soils map should appear after you invert the light and dark areas of the image. The image still contains many large speckles.



Remove speckles from the image

- 16 Under Insert Options, select the Insertion Dialog option. Also make sure that Show Frames Only and Zoom To Image(s) boxes are cleared.
- 17 Click Open to display the Image Correlation dialog box. Select the Source tab.
You are prompted to continue or to respecify the pixel size.
- 18 Click the Insertion tab and click OK.
The pixels about to be removed are highlighted. In a real project, this is when you can zoom in to inspect the image and ensure that essential data is not highlighted for removal. You can specify pixels to exclude from the removal set in a variety of ways.
- 19 Press Enter to remove the highlighted speckles.
The following example shows how the image of the soils map should appear after you remove the speckles.



20 Close the drawing without saving changes.

Exercise P7: Inserting USGS Quad Sheets Using Quick Insert

In this exercise you use the Quick Insert method to insert a color image of a USGS quad sheet.

The Quick Insert method is one of several options for specifying the insertion point, rotation, and scale when you insert an image. This method uses the default correlation (World file, Resource file, Raster Design defaults etc.) to insert the image, rather than prompting you to specify or modify values.

The Quick Insert method is useful when you want to insert images without changing any of the correlation values.

Related Help Topics

- Inserting Images

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_07.dwg.
Choose an image to insert
- 2 To display the Insert Image dialog box, click Image ► Insert.
- 3 From the Files of Type list, choose TIFF.
- 4 If necessary, navigate to the \Tutorial5 folder.
- 5 Select the image file henniker_01.tif.
- 6 On the Views menu verify that Preview and Information are checked.
This displays a preview window and a list of information about the image.
- 7 Review the values shown for each parameter.
Insert the image
- 8 Under Insert Options select the Quick Insert option. Also verify that Show Frames Only and Zoom To Image are not selected.
- 9 Click Open to insert the image.
This image is a GeoTIFF file that contains correlation data. Raster Design uses these values when it inserts the image.
View the image
- 10 If the vector line work is not displayed on top of the image, enter REGEN to restore the display order.
- 11 Click View menu ► Named Views. Then set the current view to TU_henniker.



12 Close the drawing without saving changes.

Exercise P8: Making Part of an Image Transparent

In this exercise you learn about making an image color transparent.

You can specify one transparency color in each image. Then all parts of the image with that color (or shade of gray) can be made opaque or transparent. This is useful if you want to see information displayed behind the image. In bitonal images, the transparency color is always the background color of the image.

Related Help Topics

- AutoCAD Properties

Related Exercises

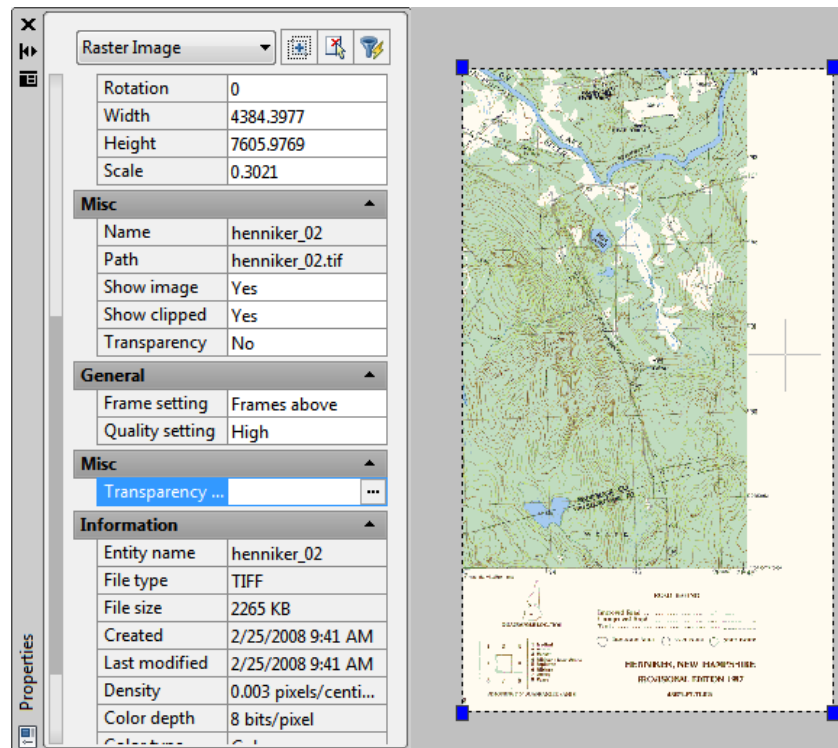
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_08.dwg.
- 2 Select the image frame of the USGS quad sheet.
- 3 Right-click and select Properties to display the Properties window.

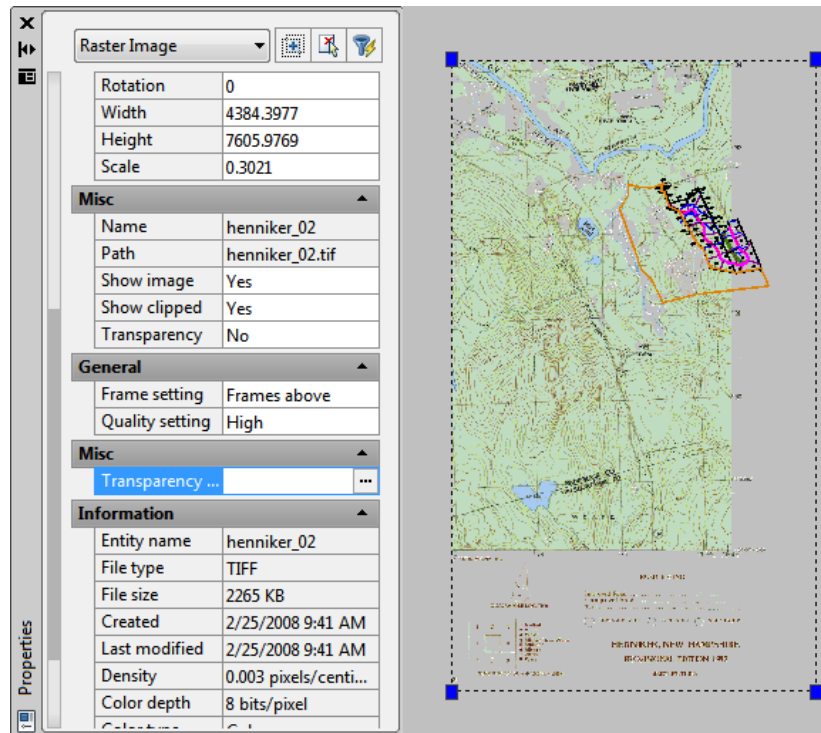
The Properties window contains a long table; use the vertical slider to scroll up and down. Note that near the bottom are two separate tabs labeled Misc.

Specify the transparency properties for the image

- 4 On the upper Misc tab, click Transparency and change the value to Yes. The transparency properties appear near the end of the properties list under Misc.
- 5 On the lower Misc tab, click Transparency Color, then click the pick button [...] to display the Transparency Color dialog box.
- 6 Click Select, click anywhere in the white border area of the USGS image, then click OK.



Note that the white border becomes transparent, along with any white areas within the map.



- 7 Close the Properties window.
- 8 Close the drawing without saving changes.

Exercise P9: Cropping USGS Images

In this exercise, you use Crop to remove areas of an image.

Crop preserves a selected area of a raster image and removes the rest of the image. Cropping an image permanently removes raster data outside the area you select and adjusts the size of the image frame to fit the cropped area.

Other methods of removing raster data have different effects:

- Remove commands erase raster data from an image without re-sizing the image. You can also use these commands to remove raster data that is not along the border of the image.

- Mask removes an area from view without deleting that area from the image. A mask can affect multiple images, and can be converted to an AutoCAD image clip for each image.

In this lesson, you crop the white border of a USGS quad sheet. This procedure can be useful if you want to merge the images of adjacent quad sheets.

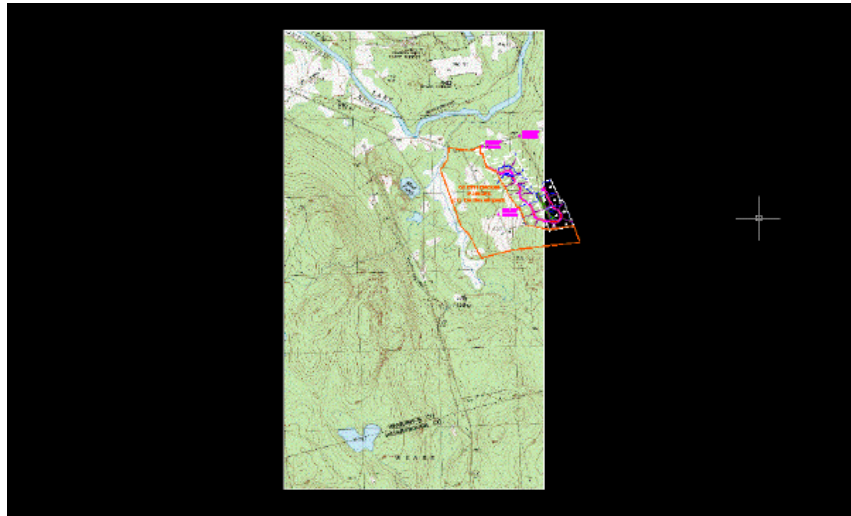
Related Help Topics

- [Cropping Images](#)

Related Exercises

- [Exercise A4: Saving Images](#) (page 15)
- [Exercise P11: Masking Images of Maps](#) (page 134)
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_09.dwg.
Crop the white border from the image
- 2 Click Image menu ► Crop ► Rectangular Region.
- 3 Use Endpoint OSNAP to select the upper-left corner of the image for the first point.
- 4 Press Enter to accept the default 0 rotation for the crop region.
- 5 Select the lower-right corner of the map portion of the image for the second point.
Raster Design automatically resizes the image frame to fit the cropped image. The raster data that you cropped is removed from the image.



- 6 Close the drawing without saving changes.

Exercise P10: Inserting Multiple Images

In this exercise you simultaneously insert two USGS quad sheets into a drawing.

The quad sheets are for adjacent areas and have correlation data that position the images next to each other when they are inserted.

Related Help Topics

- Inserting Images

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_10.dwg.
Choose multiple images
- 2 To display the Insert Image dialog box, click Image ► Insert.
- 3 From the Files of Type list, choose TIFF.
- 4 If necessary, navigate to the \Tutorial5 folder.

- 5 Select the image file henniker_crop.tif, then hold down the Ctrl key and select hopkinton_crop.tif.
- 6 On the Views menu verify that Preview and Information are checked.
Because you selected multiple images, a preview is not displayed and the list of parameters contains no values.
Insert the images using the default correlation values
- 7 In the Insert Options area, click Quick Insert.
- 8 Click Open to insert the images.
Raster Design detects the presence of world correlation files for these images and uses them to insert and position the images.



View the images

- 9 If necessary, use the REGEN command to restore the display order.
- 10 Close the drawing without saving changes.

Exercise P11: Masking Images of Maps

In this exercise you use Mask to exclude areas of map images from view without deleting the raster data.

A mask shows the portions of images inside the mask boundary and hides or unloads images that are completely outside the mask boundary.

Unlike cropping and rubbing, masking does not permanently modify images. You can turn off the mask to redisplay the complete images.

In this lesson, you create a mask for the two images of USGS quad sheets. These quad sheets were inserted into a drawing of an undeveloped parcel of land. However, the region shown in the quad sheets is much larger than the area covered by the parcel. You mask out the areas in the images that are unrelated to the parcel.

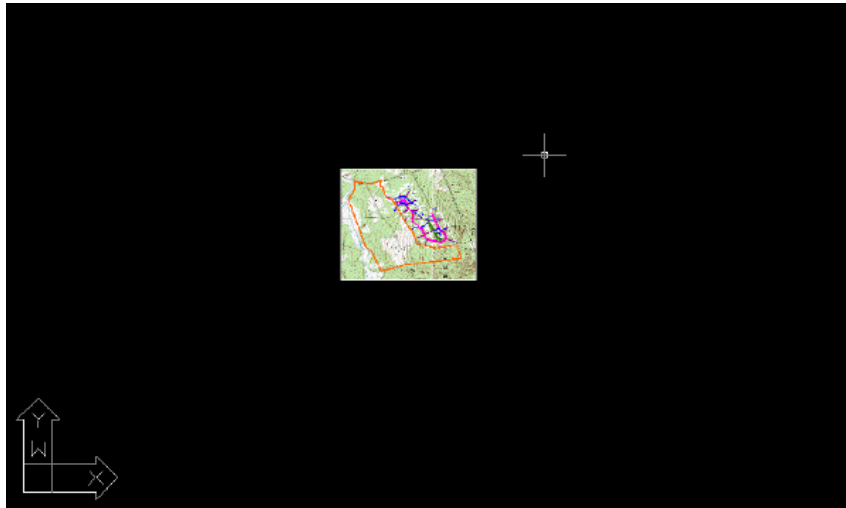
Related Help Topics

- Changing the Image Mask Properties

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_11.dwg.
Select the image mask options
- 2 To display the New Image Mask dialog box, click Image ► Mask ► Create.
- 3 Specify the following settings for the image mask options:
 - Select Enable Mask.
 - Under Image(s) Outside the Image Mask, select Hide Image(s).
 - Select Show Image Frame(s).
- 4 Click Rectangular.
- 5 Draw a rectangle around the undeveloped parcel and the adjacent development.
Raster Design masks areas of the images that are outside the rectangle.



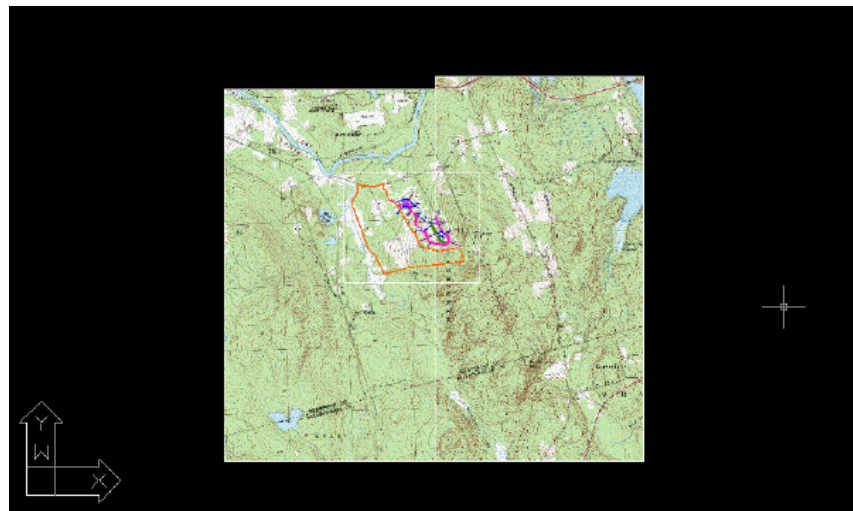
Turn the image mask off and on

- 6 Select the mask boundary, which corresponds to the rectangle that you drew.

The mask boundary is an AutoCAD object that you can move, stretch, scale, and erase. Feel free to modify the mask region. Note that if you move a midpoint along any side, more midpoints are added to the polygon.

- 7 Right-click, and click Enable from the shortcut menu to turn off the image mask.

Raster Design displays the original images, but the mask boundary remains visible. You can select it and continue to modify the boundary while the full images are visible.



- 8 Select the mask boundary, right-click, and click Enable to turn the image mask back on.
The areas outside the mask boundary are hidden.
- 9 Close the drawing without saving changes.

Exercise P12: Converting Color Images to Bitonal Images

In this exercise you convert color images to bitonal (black and white) images. You convert a color image of a USGS quad sheet to a bitonal image, preparing to trace the contours with Raster Design Vectorization Tools.

Related Help Topics

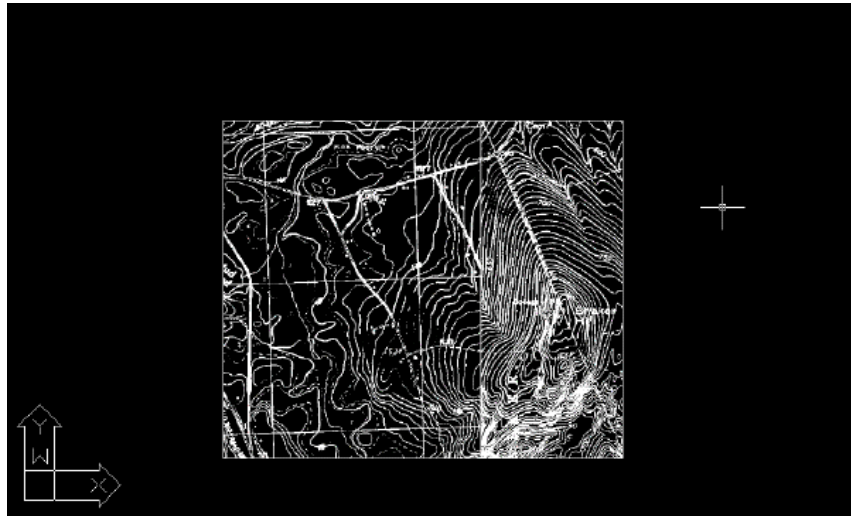
- [Converting a Grayscale or Color Image to Bitonal](#)
- [Reversing the Light and Dark Shades in an Image](#)

Related Exercises

- [Exercise S3: Cleaning Up Images with Invert and Mirror](#) (page 22)
- [Vectorization Tutorial](#) (page 183)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial5 folder, open the drawing file Map_12.dwg.
Convert the image to bitonal
- 2 Isolate the TU_image_usgs layer. To do this, select this layer in the Layer Properties Manager, right click and click Select All But Current, then freeze all the selected layers, and click OK.
- 3 Click Image menu ► Image Processing ► Histogram. Press Enter for entire image. The Histogram dialog box is displayed.
- 4 Click the Threshold tab.
Use the Threshold slider to determine which pixels will be black and which will be white after you convert the image.
- 5 Move the slider as close as you can to 171, observing the effect on the image in the preview window.
This exercise uses one image. However, if you select multiple images, you can select the image name below the preview to observe the effect of the threshold value on that image. The selected images convert to black and white when you click Apply and Close.
- 6 Click Apply and Close to convert the image.
Save the image
- 7 Click Image menu ► Save As.
- 8 Enter usgs.cal for the filename, select CALS1 for the file type, and click Save.
Invert the image
- 9 Click Image menu ► Cleanup ► Invert.



After you convert an image (and invert it, if necessary), you typically use the editing filters, such as Despeckle and the bitonal filters, to eliminate raster data that could interfere with tracing the contours.

- 10 Close the drawing without saving changes.

Exercise P13: Displaying a Digital Elevation Model

In this exercise you display data from a digital elevation model (DEM).

DEM files make use of a palette color map, which is very versatile. This type of color map uses a palette of colors in which each color represents a range of values. The values can be surface elevation, slope, or aspect (slope direction). Each color can represent an equal range of values, or the ranges can be calculated using a formula for quantile or standard deviation distribution.

A quantile distribution assigns an equal number of values to each range (color), and adjusts the range spread accordingly. If your land surface has a majority of data values clustered around a subset of the full range, the individual ranges for that subset will be narrower to show that area in greater detail.

A standard deviation distribution sets the spread of each range equal to one standard deviation for the full set of data values in the file. The center six ranges of the palette cover the spread of values in the file. If the image has a set of values that approximate a normal distribution, the third and fourth

ranges together represent about 68% of the full range. The dividing line between these two center ranges is the arithmetic mean value of the data set.

While palette color maps are complex, they can also be saved for ease of reuse with other files, including DEM and 16-bit integer formats.

In this exercise you will import an existing palette, located in the folder \Tutorials\Tutorial5.

The palette color map includes additional controls not covered in this exercise. For more information, see Palette Color Map Definition Dialog Box.

Related Help Topics

- Inserting Images
- Assigning a Color Map to an Image
- Changing the Color Map of an Image

Related Exercises

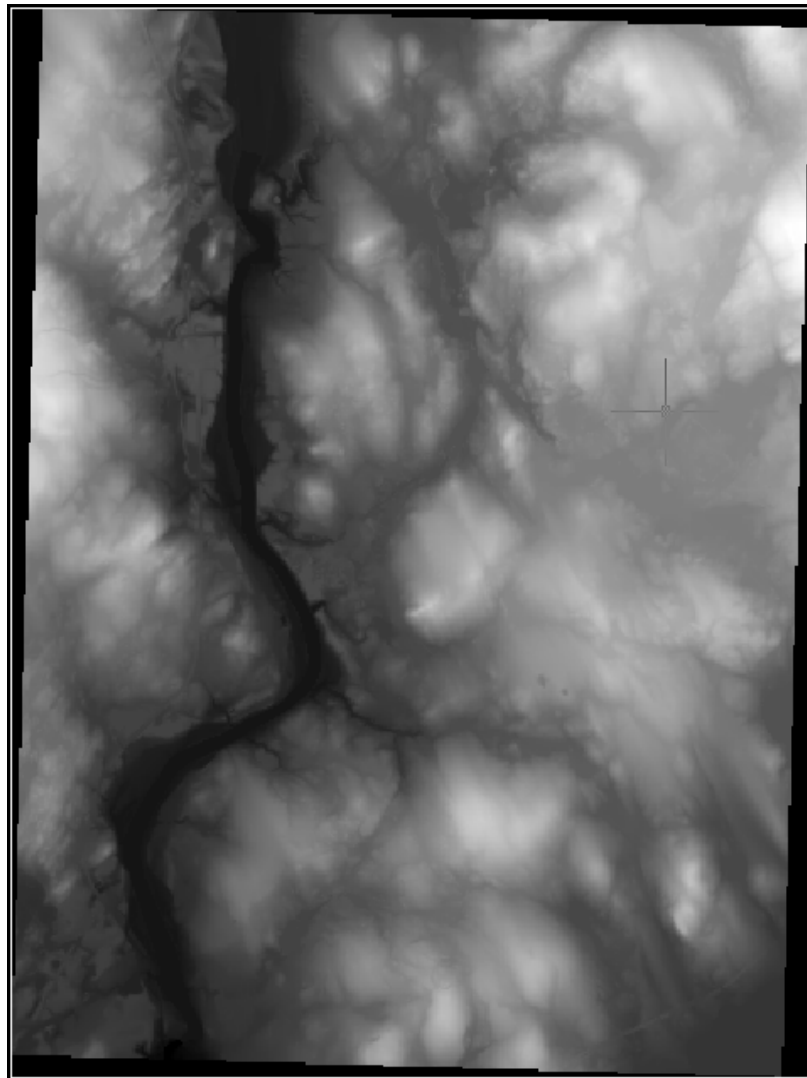
- [Exercise A2: Managing Images in a Drawing](#) (page 7)

Before doing this exercise, you should ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 Open a new drawing or use the default Drawing1.dwg.
Insert a DEM image
- 2 Click Image menu ► Insert.
- 3 In the Insert Image Dialog Box, select
\Tutorial5\Manchester_North_map.dem.
- 4 In the Insert Options area, click Insertion Wizard, then click Open.
- 5 On the Assign Color Map tab, click Next, click Next on the other tabs, then click Finish on the Insertion tab.
The DEM image is inserted in the drawing, using the default palette color map.
- 6 If the Image Manager Toolspace is not open, to open it, click Image menu ► Manage.


- 7 If the image is not clearly visible, then in the Image Manager toolspace, Image Insertions view, right-click the image insertion name (Manchester_North_map) and select Zoom To.

This view of the land surface shows elevations in shades of gray.



In the next few steps we will examine the information contained in this color map and explore some other views of the same data file.

Edit the color map

- 8 In the Image Manager toolspace, Image Insertions view, right-click the image insertion name and select Edit Color Map.
- 9 On the Palette Assignment Color Map Dialog Box, click  to create a new color map.
- 10 In the Palette Color Map Definition Dialog Box, examine the Range Table to understand the current map display.

By using the scroll bar on the far right of the dialog box, you can see that the palette has 256 color ranges defined. The Range Spread column shows that each color represents an elevation range of about 2.4 feet. The Range Upper Value column shows you that the elevations in the image range from 732 feet down to 126 feet (128.3765 minus 2.3765).

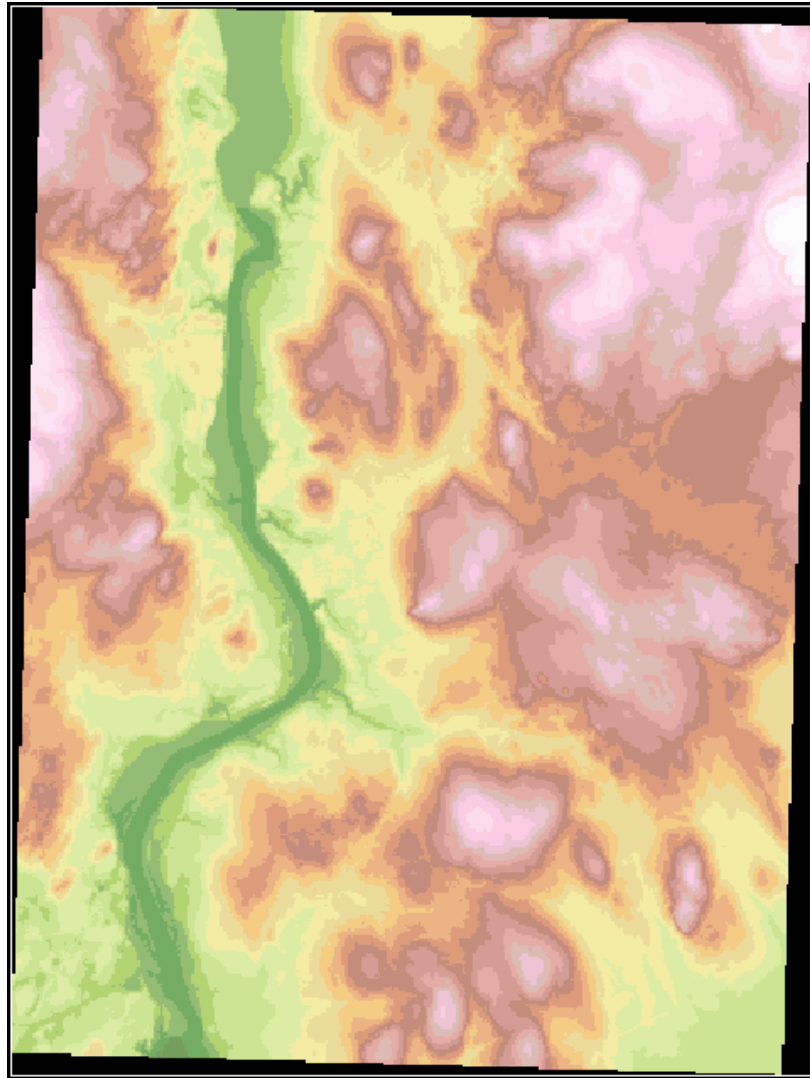
NOTE You can verify the elevation units and range for this image on the Image Data view of Image Manager: click Elevation, then click the image data band (FLT:32-bit) to see its properties.

The Data Interpretation setting (on the left side of the Palette Color Map Definition dialog box) shows you that the image displays Value rather than surface height, slope, or aspect (slope direction). The Value Distribution setting shows you that the palette colors represent equal ranges that are calculated mathematically (parametric) rather than set manually.

- 11 Change the Data Interpretation setting to Height (US survey feet). This setting reflects the actual values in the image data, so the range values do not change.
Further exploration: Change the Data Interpretation setting to Height (meters), and you immediately see the values in the Range Table converted to meters. Select other Data Interpretation options, and in each case, the range values change to show the new interpretation.
In the next few steps we will create a new color map that uses a smaller number of data ranges.
- 12 In the Palette area of the Palette Color Map Definition dialog box, click Import.
- 13 In the Import Palette Dialog Box, browse to \Tutorials\Tutorial5.
- 14 Select the palette file USGS National Map.pf and click Open. The palette is brought into the Palette Color Map Definition dialog box.


The Range Table automatically adjusts to the new palette, so the elevation range is spread equally across 22 colors.

- 15 In the Color Map Name field in the upper left of the dialog box, enter the name USGS-E Color Map, then click OK to save the color map.
- 16 In the Palette Assignment Color Map dialog box, click Apply. The new color map is applied to the display.




In the next few steps we will change the color map to use a quantile distribution of ranges.

Create a quantile color map

- 17 In the Palette Assignment Color Map dialog box, click  to create a new color map.
- 18 In the Palette Color Map Definition dialog box, in the Value Distribution area, click the menu and select Quantile.
The Range Table automatically adjusts to the elevation data, allocating an equal number of data points to each range. As a result, the elevation spread for each range is variable. Around elevations of 300–325 feet and 415–440 feet, we see narrow ranges, indicating a relatively large number of readings in these ranges. Around 575–732 feet, the ranges are wide, indicating fewer instances of these elevations.
- 19 In the Color Map Name field in the upper left of the dialog box, enter the name USGS-Q Color Map, then click OK to save the color map.
- 20 In the Palette Assignment Color Map dialog box, click Apply. The new color map is applied to the display.
- 21 In the Color Map Name area of this dialog box, select USGS-E Color Map and click Apply to revert to the first color map you created.
The controls in this dialog box allow you to easily compare the effects of different color maps.

Create a hillshading color map

- 22 In the Palette Assignment Color Map dialog box, click  to create a new color map.
- 23 In the Palette Color Map Definition dialog box, in the Range Table area, select the entire range as follows:
 - In the Index column, click 0 to select the bottom row
 - Use the scroll bar on the right to scroll to the top row
 - Hold down the Shift key and click index
- 24 Right-click within the range table and select Assign Color.
- 25 In the Select Color dialog box, on the True Color tab, ensure that the Color Model setting is HSL.

- 26 In the Color field in the lower left, enter 150,150,150, or use the vertical Luminance slider to select a similar light gray tone.
- 27 Click OK to return to the Palette Color Map Definition dialog box.
In the Range Table, note that all of the ranges are set to the gray tone you selected.
- 28 In the Display Enhancements area, select Hillshade, then set the Vertical Exaggeration factor to 5.
- 29 In the Color Map Name field in the upper left of the dialog box, enter the name Gray-5 Color Map, then click OK to save the color map.
- 30 In the Palette Assignment Color Map dialog box, click Apply.
This color map exaggerates the topographic relief of the surface and simulates a light source in the upper left to cast shadows on the terrain.
Further exploration: Return to the Palette Color Map Definition dialog box and create more color maps that
 - use Standard Deviation value distribution (import palette Std-Dev-6.pf for this one)
 - display surface slope
 - display surface aspect

TIP If you want to discard all unused palette color maps from your drawing, enter `ipurgecm` on the command line.

- 31 Save or discard your drawing, as you prefer.

Exercise P14: Displaying Multispectral Imagery

In this exercise you combine several image bands from a multispectral dataset into a single displayed image.

While each band of a multispectral data set can be displayed individually as a grayscale image, the real analytic value of this data type is revealed when you assign two or three bands to different color channels and display them as a “false color” image.

In this exercise, you will use color map controls to display a set of seven image bands in different ways.

Related Help Topics

- Inserting Images
- Assigning a Color Map to an Image
- Changing the Color Map of an Image

Related Exercises

- [Exercise A2: Managing Images in a Drawing](#) (page 7)
- LiveView Exercise: Editing Color Maps in *Getting Started*, “Task-Specific Concepts”
 - 1 In the \Tutorial5 folder, open the drawing file Multispec_CA.dwg.
This drawing contains a multispectral set of seven satellite images, and the color map is set to display a standard false color image.
 - 2 If the Image Manager toolspace is not open, click Image ► Manage.
Use a standard false color map
 - 3 In Image Manager, expand the object tree under the drawing name so you can see the color map (R:B40 G:B30 B:B20), which is configured as follows:
 - Red channel – B40 (Visible Near Infrared)
 - Green channel – B30 (Red)
 - Blue channel – B20 (Green)

This color map produces an image in which different types of vegetation and water are easier to see, so it is useful for analyzing water depths and land cover. In the next few steps we will look at two examples.
 - 4 Click View menu ► Named Views. Then set the current view to Trees.
In this view, coniferous forest cover is dark red, and deciduous forest cover is lighter red.

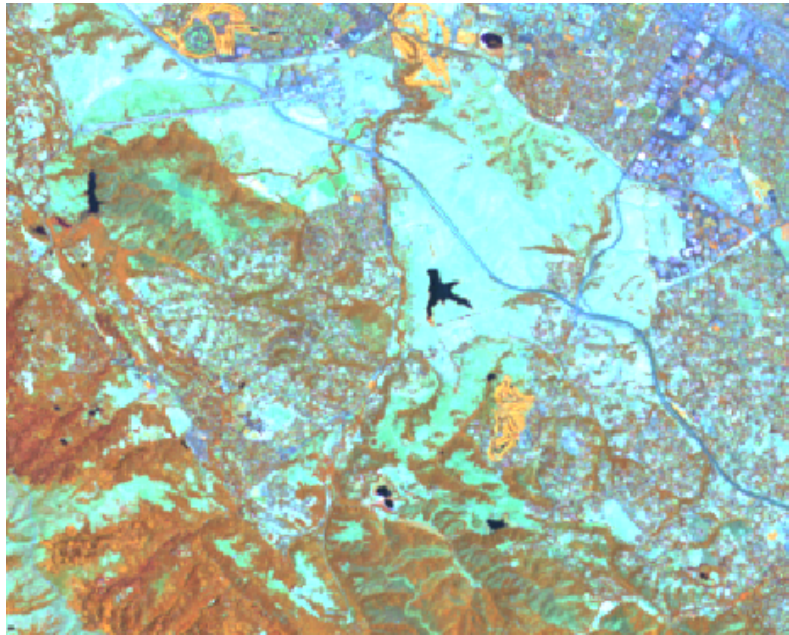


- 5 Click View menu ► Named Views. Then set the current view to Water.
In this view, clear water is dark blue, and shallow or sedimented water is light blue. The underwater channels and shelves are clearly visible.
- 6 Click View menu ► Named Views. Then set the current view to Vegetation.
Create a natural color map
- 7 In Image Manager, right-click the image color map, click Edit Color Map, and assign the color channels to image bands as follows:
 - Red channel – B30 (Red)
 - Green channel – B20 (Green)
 - Blue channel – B10 (Blue)This color map shows the terrain in colors close to its natural appearance. The gray urban area in the upper right is bordered by light brown hills with green forest cover. By changing color maps, we can see the features of this region in greater detail.
Create a color map for analysis of land cover

- 8 In Image Manager, right-click the image color map, click Edit Color Map, and assign the color channels to image bands as follows:

- Red channel – B40 (Visible Near Infrared)
- Green channel – B50 (Mid Infrared)
- Blue channel – B30 (Red)

Band 5 (B50) is very sensitive to variations in moisture content of plants and ground surface. As a result, this color map shows varying amounts of green coloration for different types of land cover.



In this view, trees are reddish brown, but drier vegetation has more green tones, so it appears orange or green. Natural grasslands in this photo are dry and sparsely covered, so they appear light greenish blue. Bare soil and urban areas appear blue and gray.

Create a color map for analysis of rock and soil

- 9 In Image Manager, right-click the image color map, click Edit Color Map, and assign the color channels to image bands as follows:

- Red channel – B70 (Far Infrared)
- Green channel – B40 (Visible Near Infrared)

- Blue channel – B20 (Green)
Band 7 in this color map displays the moisture content of rocks and soils as shades of red, with darker red indicating more moisture. Because band 4 is assigned to the green channel, vegetation appears in different shades of green.

10 Close your drawing without saving changes.

Tonal Adjustment Tutorial

7

This tutorial shows you several ways to improve images by adjusting tone with histograms and contrast curves.

Tonal adjustment in Raster Design uses a contrast curve to change image brightness and contrast. Unlike the simpler Brightness and Contrast controls, the contrast curve can adjust ranges of tones in an image independently of others. For example, dark shadowed areas can be brightened without significantly affecting the brighter parts of the image. Curve definitions can be exported and imported so the same curve can be applied to other images or other parts of the same image.

The exercises in this tutorial use an aerial photo. Part of the photo appears washed out, possibly due to cloud cover or ground fog when the photo was taken. You can use tonal adjustment to enhance the photo, making it appear more uniform. The tutorial includes the following activities:

- Open the drawing and insert the pre-correlated image.
- See how the histogram looks for a “normal” part of the image.
- Select a problem area and create a piecewise linear contrast curve to correct it.
- Select a roadway segment in the image to make it appear more uniform.
- Switch to a fitted curve and adjust the tone. Export the curve.
- Apply the curve to this and other roadway segments.
- See the overall results of your tonal enhancement.

Exercise T1: Using the Histogram

In this exercise, you learn some basic controls for the Histogram to assist in tonal adjustments.

Tonal adjustment is one of several features that use the Histogram. The Histogram is especially useful in identifying and correcting tonal problems with images. The preview window shows the effects of making adjustments and may be used in conjunction with or instead of the histogram.

Related Help Topics

- [Adjusting Images with the Histogram](#)

Related Exercises

- [Exercise P4: Enhancing Grayscale Images](#) (page 119)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial8 folder, open the drawing file TonalAdjustment01.dwg.
- 2 View the vector line work in the drawing. The red lines represent the footprints of existing buildings in the project. The yellow outline is the building proposed for the project and is the reason the aerial photography is being introduced. Light gray lines represent the edge of pavement, cyan lines are boundaries of concrete walks, and green lines are parking areas.

Choose an image to insert

- 3 To display the Insert Image dialog box, click Image ► Insert.
- 4 From the Files of Type list, choose All Image Files.
- 5 If necessary, navigate to the \Tutorial8 folder.
- 6 Select the image file SiteAerial01.tif.
Insert the image using Quick Insert
- 7 In the Insert Options area, select Quick Insert. Ensure that Show Frames Only and Zoom to Image are not selected.
- 8 Click Open to insert the image.

The image was pre-correlated and is properly scaled for the project.

If necessary, use REGEN to ensure the vector information is displayed on top of the image.

Note the extreme difference in shading between the lower right and upper left portions of the project. Leaving it this way would detract from the project presentation, and obtaining replacement photographs may be

cost prohibitive. Our goal is to use Tonal Adjustment to make the tone as consistent as possible over the entire photo.



Compare histograms for the two areas

- 9 Click Image menu ► Image Processing ► Histogram. Enter e (Existing) to indicate that you will use an existing closed vector entity to define a sub-region for analysis.
- 10 Pick a point on the edge of pavement (light gray) line that completely surrounds the buildings in the upper left. The histogram will evaluate the image tone in this region.



- 11 In the Histogram dialog box, click the Tonal Adjustment tab. Note the appearance of the histogram for this area of the image.

The histogram graphically shows the number of pixels in the area that have each level of gray. In this case, we see a high frequency of midrange values, and a few at the right end that are very close to white. There are not too many pixels in this area that are very light (washed out) or very dark (shadowy). The visual appearance of this area is reasonably good.



- 12 Click Cancel to close the Histogram dialog box, making a mental note of its general appearance.
- 13 Click Image menu ► Image Processing ► Histogram. Enter e (Existing).
- 14 Pick a point on the edge of pavement (light gray) line in the lower right area to define another region for analysis.
The following example shows where to select the point at the edge of the pavement.



- 15** In the Histogram dialog box, select the Tonal Adjustment tab.
- Note that the histogram is skewed, showing a high frequency of light gray and white. In the next exercise, we will modify the tonal balance in this part of the image, making it look as similar to the upper left section as possible. This means we need to make adjustments that effectively slide these high frequency values toward the left middle values. Note the secondary peak on the right which is more pronounced than the one contained on the upper left portion histogram. This peak represents the lighter colors of the building fronts which show more in the lower right portion of the project. We should perform the adjustment so that the peak is preserved, although it may be modified in appearance.



- 16** Click Cancel to close the Histogram dialog box.
- 17** Close the drawing without saving changes.

Exercise T2: Using a Contrast Curve for Tonal Adjustment

In this exercise, you create and modify a contrast curve using control points.

With the piecewise linear contrast curve, you can place up to 64 control points through which the curve is automatically drawn. You make the image adjustments by dragging the control points to change the shape of the curve. The curve is constrained so that for each possible input value in the selected area, only one new output value is established. With this form of tonal adjustment any image can be made more useful.

Related Help Topics

- [Making Tonal Adjustments to an Image](#)

Related Exercises

- [Exercise P4: Enhancing Grayscale Images](#) (page 119)
- [Exercise T1: Using the Histogram](#) (page 151)
- [Exercise T3: Using the Fitted Contrast Curve](#) (page 162)

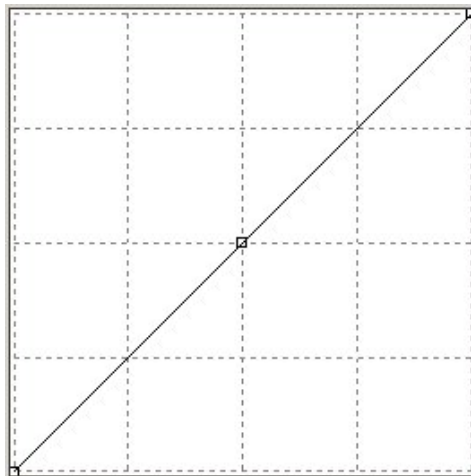
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial8 folder, open the drawing file TonalAdjustment02.dwg. If necessary, enter REGEN to see the vector data on top of the image.
Start tonal adjustment
- 2 Click Image menu ► Image Processing ► Histogram. Enter e (Existing) to indicate that you will use an existing closed vector entity to define a sub-region for analysis.
- 3 Pick a point on the edge of pavement (light gray) line for the lower right area.



NOTE In a real project, if you did not have an existing closed vector entity around the region where you want to adjust tone, you could create a polygon especially for this purpose.

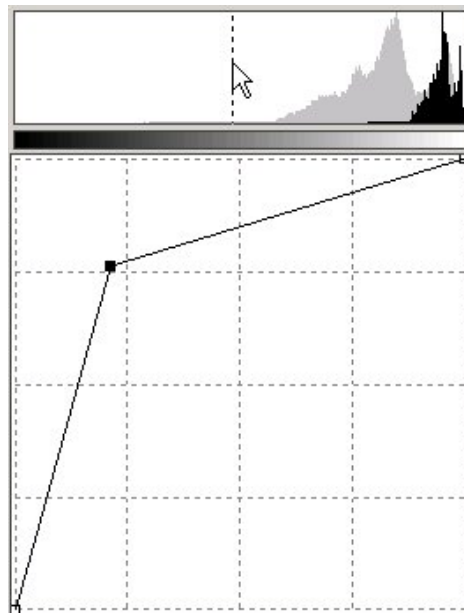
- 4 In the Histogram dialog box, click the Tonal Adjustment tab.
- 5 In the Select Curve Type box, select Piecewise Linear.

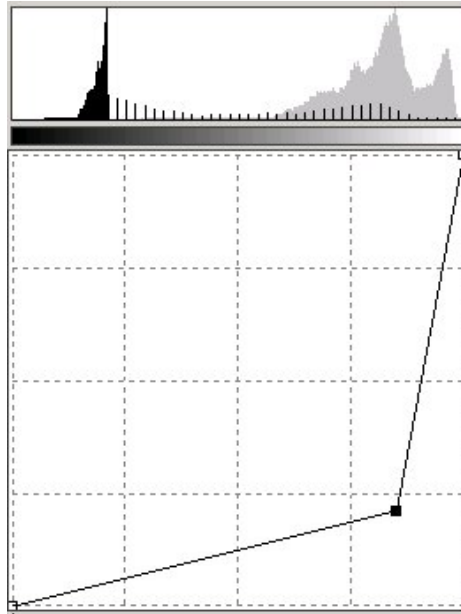


The straight line in the contrast window indicates the initial linear relationship between input tonal values from the image across the bottom

(black on the left, white on the right) and their corresponding display values on the vertical (black at the bottom, white at the top). Because of this relationship, moving the line up and down uniformly tends to change the brightness of all the values. Similarly, changing the slope of the line tends to change the contrast for all the values. But if we make the graph non-linear and manipulate several control points, we can change the output brightness and contrast for different ranges of input tones in the image.

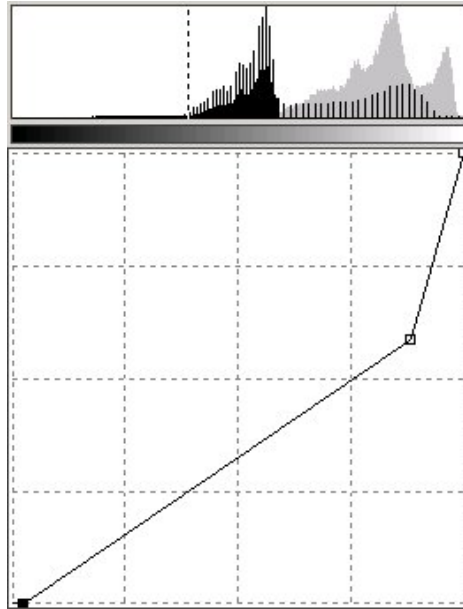
- 6 Place your cursor over the control point in the middle of the line. Note that the cursor turns into a move cursor. When you click and drag it, a tooltip reports its current position. By dragging the point diagonally between upper left and lower right corners you can see the effect on the histogram of manipulating the resulting nonlinear curve.



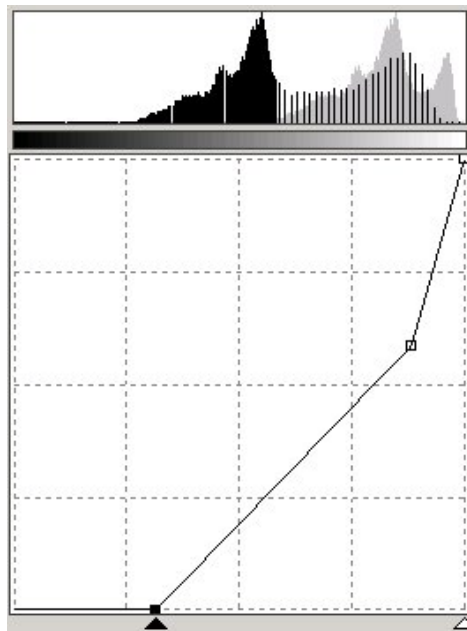


Moving the control point to the upper left makes the gray tones much whiter; moving it to the lower right makes them much darker.

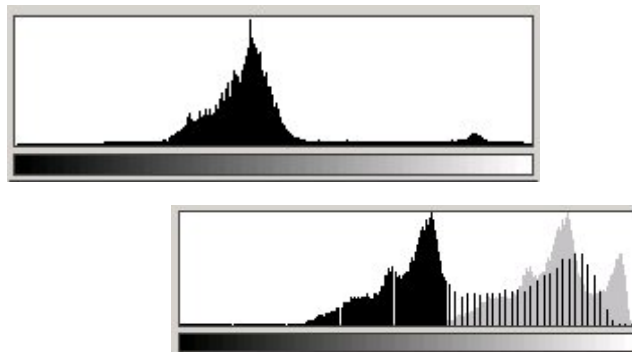
- 7 Move the control point to a spot near 225,150, stretching the histogram to the left and separating the peaks. The left segment of the curve is mostly lowering the brightness and increasing the contrast for the roof and landscaping tones; the right segment is mostly lowering the contrast for the lighter tones. In the histogram we see this in the left peak (roof & landscaping tones) as a move to the left which is decreasing brightness and some compression of the peak which is decreasing contrast. For the right peak (representing the building facade and walkway tones) we see a stretching effect which is increasing contrast and some movement to the left which is decreasing brightness.



- 8 To regain the original contrast in the roof and landscaping tones, put the slope for that section back to a 45-degree angle by adjusting the left (black) triangular slider at the bottom of the Contrast window. Move the black slider in until the black cutoff is at about 84. The fact that the curve is horizontal at 0 output value between input values of 0 and 80 is immaterial, as there are few or no pixels within that range in the original lower right area of the project.



The curve is now quite nonlinear, applying different correction factors to different tonal values in the area. The original idea was to make the histogram curve look more like the one in the upper left area of the project. Compare the current result for the upper left area with the one for the lower right area.



The main histogram peak from the lower right area, while different in shape than the peak from the upper left area, occupies the same basic range of output values. The higher prevalence of elements to the right of the main peak in the lower right area histogram is because more

building sides and concrete work (both of which are fairly light) show in that part of the project.

- 9 Save the curve for future use by exporting it to an external file. In the Histogram dialog box, click Export to display the Export dialog box. Set the directory to \Tutorial8. Enter Tutorial02 for the filename and leave Gamma Point List (*.gpl) as the file type. Click Export.
- 10 In the Histogram dialog box, in the Apply Changes To area, click Sub-region.
- 11 Click Apply to update the lower right part of the project image. Click Close to exit the dialog box. The end result is an image where both upper left part and the lower right part are similar in tone.



The only areas that still need correction are some parts of the roadway. This is addressed in the next exercise, [Exercise T3: Using the Fitted Contrast Curve](#) (page 162).

- 12 Close the drawing without saving changes.

Exercise T3: Using the Fitted Contrast Curve

In this exercise, you learn how to create a fitted contrast curve and apply it to different parts of an image.

The fitted contrast curve provides detailed control over tonal adjustment. You can place up to 16 control points through which a smooth curve is automatically drawn. You can adjust the image by moving, adding, or deleting control points. The curve is constrained so that for each possible input value in the selected area, only one new output value is established.

Related Help Topics

- [Making Tonal Adjustments to an Image](#)

Related Exercises

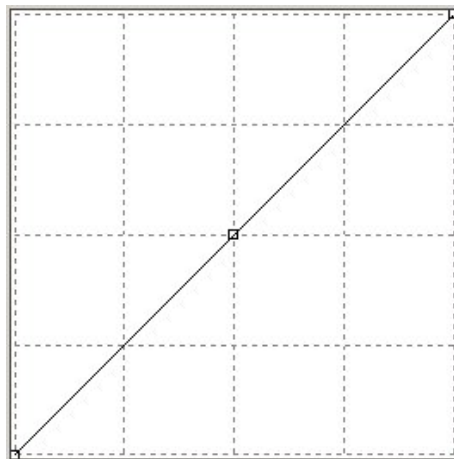
- [Exercise P4: Enhancing Grayscale Images](#) (page 119)
- [Exercise T2: Using a Contrast Curve for Tonal Adjustment](#) (page 156)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial8 folder, open the drawing file TonalAdjustment03.dwg. The drawing automatically inserts the image properly correlated. If necessary, enter REGEN to see the vector data on top of the image.
Start tonal adjustment
- 2 Click Image menu ► Image Processing ► Histogram. Enter e (Existing) to indicate that you will use an existing closed vector entity to define a sub-region for analysis.
- 3 The streets in the project are outlined in green. Pick on the green street outline for Highland Way.



- 4 In the Histogram dialog box, click the Tonal Adjustment tab.
- 5 In the Select Curve Type box, select Fitted.

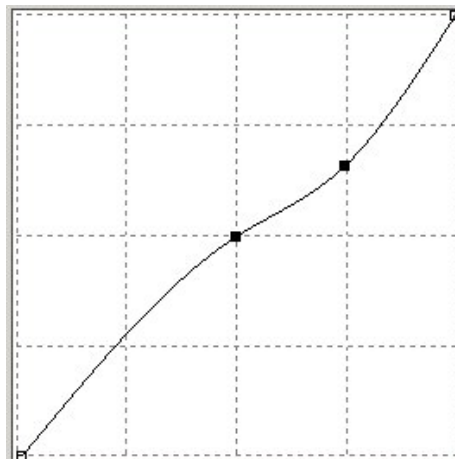


The straight line in the contrast window indicates the initial linear relationship between input tonal values from the image across the bottom (black on the left, white on the right) and their corresponding display values on the vertical (black at the bottom, white at the top). Because of this relationship, moving the line up and down uniformly tends to change the brightness of all the values. Similarly, changing the slope of the line tends to change the contrast for all the values. But if we make the graph non-linear and manipulate several control points, we can change the

output brightness and contrast for different ranges of input tones in the image.

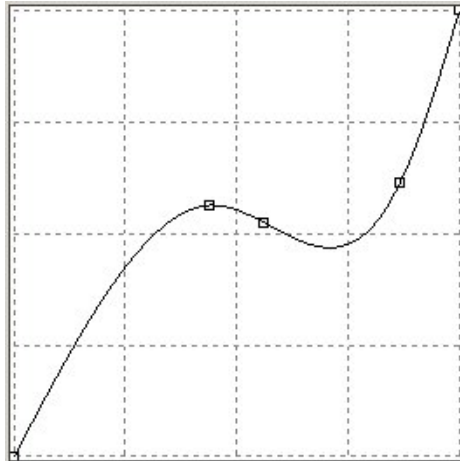
Our goal is to even out the tones contained in the roadway. We can refer to the preview display while making adjustments. We want to make the curve flatter over the values of interest in order to decrease the contrast between lighter and darker values. This is best accomplished by adding another control point to the right of the middle one.

- 6 Click in the curve window above the existing middle control point, between the graphed line and the right side of the window.



The roadway still shows too much contrast along its length. We need to make the curve flatter for the higher whiter values.

- 7 Move the right control point up to a spot near 245,210. The double inflection in the curve is not a critical factor for this type of enhancement.



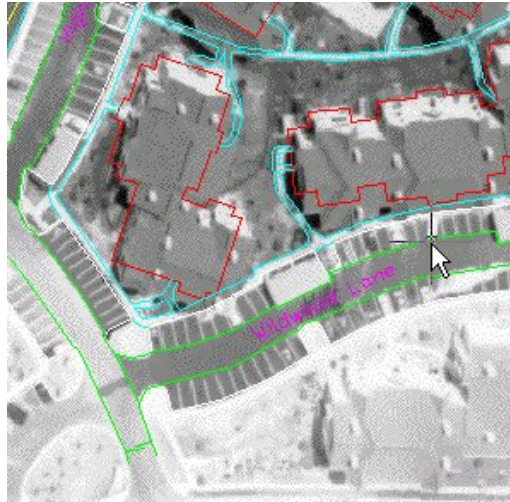
Export the curve to use in other road sections

- 8 Click Export to display the Export dialog box. Set the directory to \Tutorial8. Enter Tutorial03 for the filename and leave Gamma Point List (*.gpl) as the file type. Click Export.
- 9 Click Apply to update the imagery for Highland Way. Click Close.
- 10 Enter REGEN.



Apply the curve to Wildwood Lane

- 11 Click Image menu ► Image Processing ► Histogram. Enter e (Existing).
- 12 Select Wildwood Lane as the connected entity in which to apply the tonal adjustment.



- 13 In the Histogram dialog box, click the Tonal Adjustment tab, and ensure that the curve type is set to Fitted.
- 14 Click Import. Set the directory to Tutorial8 and select the file Tutorial03.gpl. You should see the same curve we used for Highland Way. Click Apply and then Close. The two streets Highland Way and Wildwood Lane should appear very similar in tone in the resulting image.



Apply the curve to Prospect Street

- 15 Click Image menu ► Image Processing ► Histogram. Enter e (Existing).
- 16 Select Prospect Street as the connected entity in which to apply the tonal adjustment.



17

18 In the Histogram dialog box, click the Tonal Adjustment tab, and ensure that the curve type is set to Fitted.

19 Click Import. Set the directory to Tutorial8 and select the file Tutorial03.gpl. You should see the same curve we used for Highland Way and Wildwood Lane. Click Apply and then Close. All the streets and indeed the whole project should now appear with proper image tone.



20 Close the drawing without saving changes.

Palette Manager Tutorial

8

This tutorial shows you how to use the Palette Manager to alter the visual appearance of images. When you complete this tutorial you should be able to:

- Change colors in the image to new colors for better effect or to hide undesirable features.
- Combine colors in a map to isolate features of interest.
- Convert a grayscale image to color and add special effects for presentation purposes.
- Assign a transparency color to an image.
- Combine colors in an image to improve its appearance.
- Compress the image palette to eliminate unused palette entries.

The Palette Manager works with grayscale and palette color images of 8-bit format (256 colors). The image palette is shown graphically in the dialog box and can be sorted in different ways, making it easier to work with. You can combine or change individual colors. Change operations modify only the palette itself whereas Combine operations operate on the actual image data. The Compress operation eliminates unused colors and cleans up the palette. Compressing an image palette typically modifies both the palette as well as the image data.

This tutorial consists of three exercises. Each one uses a different image type and covers typical palette operations for that image type:

- Scanned USGS map. Modify a map from the United States Geological Survey using palette controls to hide a feature by changing its color to match the background. Combine features by changing them to a single color. Isolate a feature by changing the color of everything else to match the background.
- Grayscale aerial photo. Modify a photo for presentation purposes, using an external palette in order to emphasize specific areas within the project boundary.
- Color satellite image. Assign a transparency color, combine several colors to consolidate the display of a feature, and compress the palette to eliminate unused entries.

Exercise M1: Modifying a Scanned USGS Map

In this exercise you learn how to modify the colors in an existing scanned USGS map.

First, you remove the green vegetation feature from the map in order to make the map more printer friendly and to allow other features to show more clearly. You can accomplish this by changing the green color in the map to the white background color. Next, you change the purple revisions to black in order to have them blend in with the rest of the map. Apply the same principle to highlight features in the map by changing them to a contrasting color. Finally, you isolate the contours by changing all other colors to the white background color.

This prepares the map for a contour-following operation.

Related Help Topics

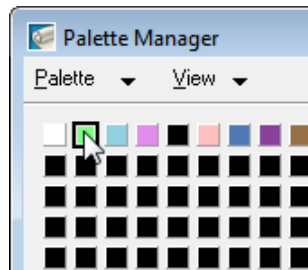
- [Manipulating the Color Table](#)

Related Exercises

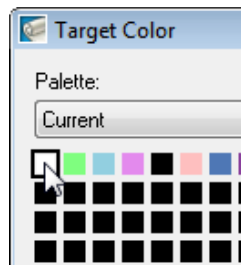
- [Setting Vectorization Tools Options](#)

Before doing this exercise, you should ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial7 folder, open the drawing file Palette Manager01.dwg. The USGS topographic map image inserts with the drawing.
Eliminate vegetation features from the map
- 2 To display the Palette Manager dialog box, click Image ► Image Processing ► Palette Manager.
Change green features to white
- 3 Click the green button in the color table, (Index 1). The color and index are highlighted in the list view.



- 4 When you select a color button, the Change button is available. Click Change to display the Target Color dialog box. The Target Color dialog box defaults to the last color picked, which in this exercise is green.
- 5 Click the white button in the color table (Index 0). White is the background color of the map and by changing the green portion to white, the green is eliminated. Notice that details of the current selection are shown in the status bar just below the color buttons.

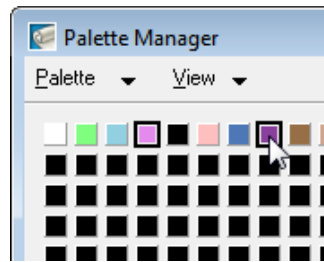


- 6 Click OK to return to the Palette Manager dialog box. The green button has changed to white, reflecting the change you just made.
- 7 If necessary, move the Palette Manager dialog box aside to see the green area of the map, then click Apply. The green vegetation feature is removed from the map.

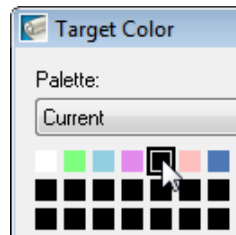
Consolidate revisions by combining colors

Next, you change the purple map revisions to black in order to give the image a more uniform appearance. The purple revisions represent two different shades so it is possible to use either Change or Combine to consolidate them. In this part of the exercise you use Combine, which changes the index values in the image file.

- 8 Click light purple (index 3), then press the Ctrl key and click dark purple (index 7).



- 9 When you select more than one color, the Combine button becomes available. Click Combine. In the Target Color dialog box, click black (index 4).



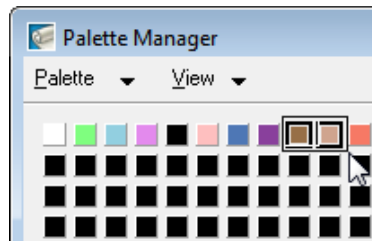
- 10 Click OK on the Target Color dialog box, then click OK on the Palette Manager dialog box. The revision features that were purple are now black.

Isolate the contour information

One common use for scanned USGS topographical maps is to extract the contour information to vector so it can be used for terrain modeling. Using the Palette Manager, we can isolate the brown contour lines by changing the color of all other features to the background color. Once this is accomplished, we can convert the image to bitonal and use the VContour tool to convert the raster contours to vector.

One common use for scanned USGS topographical maps is to extract the contour information to vector so it can be used for terrain modeling. Using the Palette Manager, we can isolate the brown contour lines by changing the color of all other features to the background color.

- 11 To open the Palette Manager dialog box, click Image ► Image Processing ► Palette Manager.
- 12 Select the two shades of brown (indices 8 & 9) to start the isolation process. Since they are right next to each other you can window them for selection.



- 13 With the cursor within the color table, right-click and click Invert Selection. All the color buttons with the exception of the two brown buttons are selected.
- 14 Click Combine to display the Target Color dialog box. Click the white button (index 0) for the target color and click OK.
- 15 Click OK in the Palette Manager dialog box. The result is an image that shows only contours.
- 16 After inspecting the results, close the drawing without saving changes.

Exercise M2: Preparing an Image for Presentation

In this exercise, you use the Palette Manager to produce special effects on an image by applying an external palette.

You use the Raster Entity Manipulation (REM) feature to isolate the project extents from the original image. Then you create a new image from this REM region, apply a colored palette, and overlay the new image on top of the background. The effect you obtain can produce eye-catching graphics for presentations.

Related Help Topics

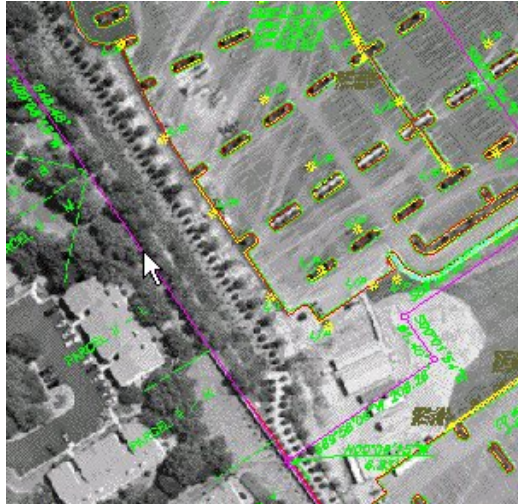
- [Controlling Palette Views](#)
- [Defining REM Region Objects](#)

Related Exercises

- [Exercise H4: Removing Raster Entities](#) (page 88)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial7 folder, open the drawing file Palette Manager02.dwg.
An aerial photo inserts with the drawing.
Extract project area using raster entity manipulation
You use the REM function to isolate the area within the project boundary, then use the Palette Manager to tone the rest of the image which serves as the background.
- 2 Click Image menu ► Raster Entity Manipulation ► Create Region ► From Existing Vector.
- 3 At the command line you are prompted to select a closed vector object. Select the magenta boundary of the project.
Picking this boundary creates the REM object. The boundary color changes to red to signify that it is a REM object.



- 4 Select the REM object, right-click and click Convert to Raster Image.
The new image is given a default name of "Cingular Tutorial_1", and it appears in Image Manager.
Tone the background image using Palette Manager
- 5 Click Image menu ► Image Processing ► Palette Manager. In the drawing select the frame of the large, main image (not the one just created using REM).



In the Palette Manager dialog box, you see some image data, but other values are blank.

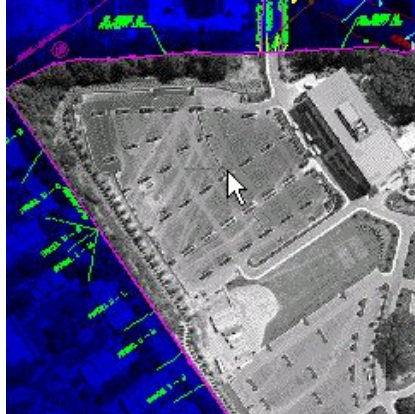
- 6 Click the Convert to Color button. This action creates a complete grayscale palette as a basis for changes.
- 7 Click Palette menu ► Import. The Import Palette dialog box is displayed. The Import Palette dialog box may point by default to the support directory that contains several predefined palette files (.pf), including Blue.pf. If you need to navigate to this file, it is in the Raster Design root directory\UserDataCache\Support.
- 8 Select the Blue.pf file. At the bottom of the dialog box, click the Substitute option for importing palette files. The option replaces the gray levels in the original image, index by index, with the corresponding blue levels. Import the palette
- 9 In the Import Palette dialog box click Open to apply the palette. The Palette Manager dialog box is displayed and the results of the palette substitution are automatically applied to the image. Click OK to close the Palette Manager dialog box.

The project area is highlighted in gray tones, while the surrounding spatial data is muted by the blue tones.

Change the display order

Since the project image is obscuring some of the vector data, it needs to be moved back in the display. The easiest way to do this is to move both images to the back so they retain their relative positions with the project image over the background image.

- 10 Select both images by pressing Shift+Left-click inside the gray project image. Both images are highlighted in the Image Select dialog box. Click OK.



- 11 Right-click and click Image ► Send to Back. The vector data now shows over both images.
- 12 After inspecting the results, close the drawing without saving changes or saving any images.

Exercise M3: Working with Satellite Images

In this exercise you use the Palette Manager to create a transparency color and combine color usage in an image.

You can use the Palette Manager to customize existing images, either commercial data or existing files, to fit your need. The number of colors used, color assignments, and transparency can all be modified. In this exercise, you look at the color usage in an image, create a transparency color, and combine colors selected from the image to improve its appearance. Then you compress the palette to eliminate unused colors and reorganize the palette.

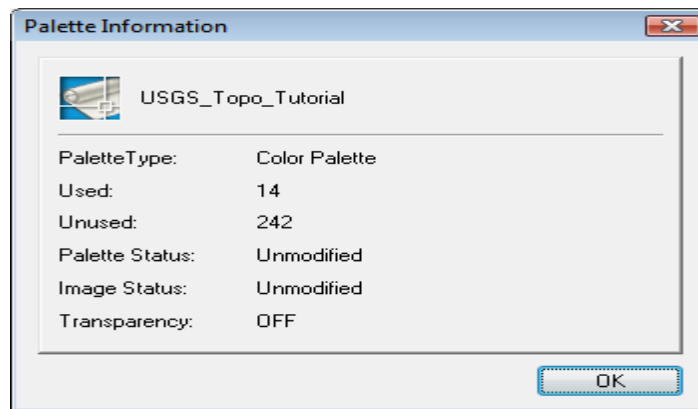
Related Help Topics

- Controlling Palette Views

Related Exercises

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial7 folder, open the drawing file Palette Manager03.dwg. A color satellite image inserts with the drawing.
Analyze the image palette
Using the Palette Manager you can see detailed information about the image and the colors it uses.
- 2 Click Image menu ► Image Processing ► Palette Manager.
- 3 In the Palette Manager dialog box, click Palette menu ► Information. The Palette Information dialog box shows that only 90 of the possible 256 colors are being used and that transparency is not activated for this image. Click OK.



- 4 Click View menu ► Show Unused. The unused colors in the palette are marked with an X through them.
- 5 Click the View menu again. Note that Show Transparency is unavailable, indicating that a transparency color has not yet been defined.

Assign a transparency color

The transparency color is used as a background for future Remove or Deskew operations. Black is a logical choice for the transparency color, but before selecting it, you should check to see if it is already used in the image. If it is used, you typically do not select it as the transparency color, to avoid the appearance of holes in the image when transparency is turned on.

10 In the Sort By list, select Index to re-sort the colors to Index order.

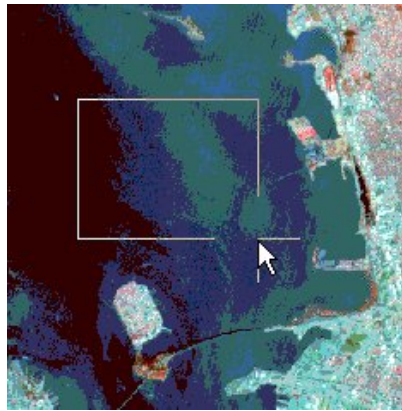
11 Click Apply.

Consolidate colors in the image

When you look at the image, you see the water regions are made up of several different colors. It would be more useful for our purpose if the water was represented by a single color. You can use the Combine operation to consolidate these colors.

12 Click Select Color. The Palette Manager dialog box closes temporarily so you can pick color(s) from the image.

13 At the command line, enter w for the Window option. Select a window that encompasses all the colors (there are about 6) that make up the water region.



After you make the selection, the Palette Manager dialog box redisplay and the selected colors show in the palette.

14 Click Combine. The Target Color dialog box is displayed. Choose a medium shade of blue as the target color for consolidation, then click OK.

The colors are combined in the image. Depending on your choice of color, some or all of the original colors for water become unused colors in the palette.

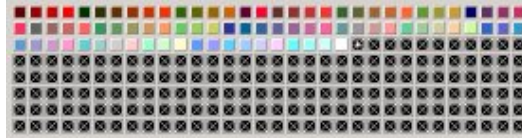
15 Click Apply to update the image and see the results of the consolidation.

Compress the palette

From the palette display, you can see a large number of unused colors. By compressing the palette, you eliminate unused colors. Compress also

changes the indices in the image so the used colors are grouped together at the top of the palette.

- 16 Click Compress to eliminate the unused colors in the image.



- 17 Click OK to update the image and close the Palette Manager dialog box.
- 18 After inspecting your results, close the drawing without saving changes to either the drawing or to the image.

Vectorization Tutorial

9

This tutorial shows you how to use Raster Design to convert raster data into standard AutoCAD vector entities. The following types of vector objects are created in these exercises:

- Lines
- Circles
- Multiline text
- Single Line text
- 2D polylines
- 2D polylines with elevation (contours)
- 3D polylines

You also learn how to use Raster Design options and separation tables to control how the vector objects are drawn and basic layer management.

NOTE Only bitonal images can be used for raster conversion. If you are using grayscale or color images, please refer to [Exercise P6: Converting Grayscale Images to Bitonal Images](#) (page 123) or [Exercise P12: Converting Color Images to Bitonal Images](#) (page 137).

Exercise V1: Setting Options and Creating Basic Vector Objects

In this exercise you learn how to set options for vectorization tools and convert basic raster geometry into vector entities.

The Vectorization Tools settings are contained in three of the tabs on the Raster Design Options dialog box: Raster Entity Detection, VTools General, and VTools Follower.

The basic elements of any drawing include lines, arcs, circles, rectangles, and polylines.

Related Help Topics

- [Setting the Options](#)
- [Vectorizing Raster Geometry](#)

Related Exercises

- [Basic Tasks Tutorial](#) (page 5)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial6 folder, open the drawing file VTools_02.dwg.
Access the Raster Design Options Dialog Box
- 2 To display the Raster Design Options dialog box, click Image ► Options.
- 3 On the Raster Entity Detection tab, set the Max Jump Length option to 20.
This setting specifies the maximum length of a gap that Raster Design will tolerate when following a raster polyline. It can be used to jump over labels embedded in the line or to follow non-continuous lines such as dashed lines.
- 4 On the VTools General tab, ensure that the Removal Method is set to REM.
This option erases the underlying raster while preserving intersecting raster data. To completely remove all raster data underneath the new entity, you would use the Rub option.
- 5 Click the Round Values option, click Specified Precision, and set the Length precision to 0.01.
This setting overrides the AutoCAD precision for distances when creating vectors using single-pick options in vectorization tools. However, if you are manually selecting the dimensions, (multi-picking), the chosen points take precedence and the dimensions of the new entity use the AutoCAD precision.
- 6 On the VTools Follower tab, click End Current Polyline If Closed Loop Detected.

This option causes new vector polyline entities to finish when a closed boundary or loop is encountered.

- 7 Click OK to close the Raster Design Options dialog box.
Convert a raster circle to a vector using a single pick
- 8 To create a new circle, click Image menu ► Vectorization Tools ► Circle.
- 9 Click a point anywhere on the edge of the circle.



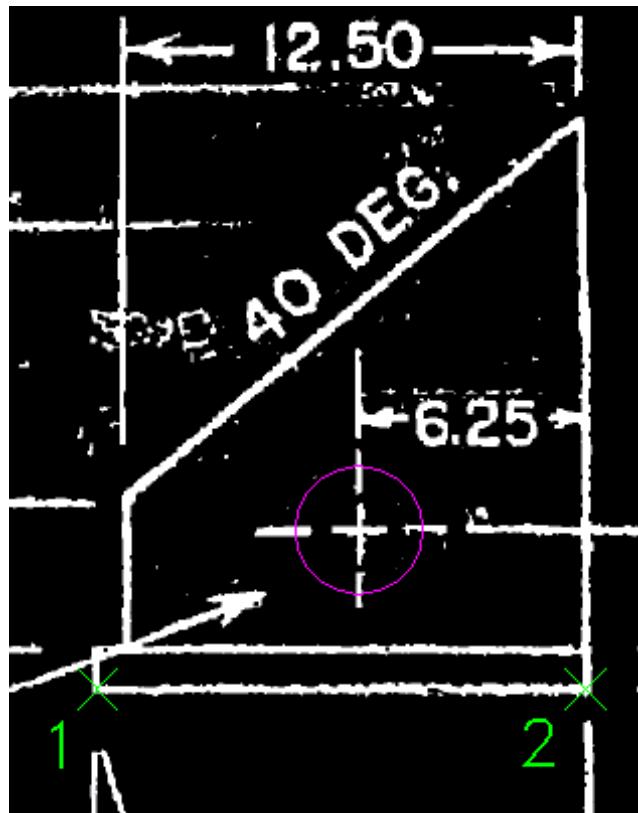
Verify the circle properties

- 10 Enter r to enter a new radius for the circle.
- 11 Enter 1.75 for the new radius.
This forces the new vector circle to match the labeled dimension (3.5 diameter).
- 12 Press Enter to exit the command.
The command removes the raster data below the new circle, but preserves the intersecting raster dimension lines.



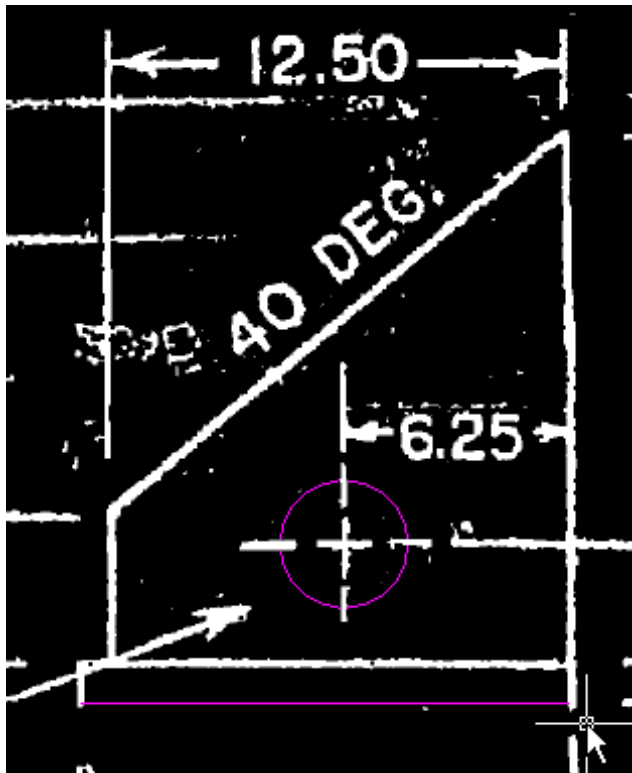
Set a raster snap

- 13 To set a running raster snap, click Image ► Raster Snap.
 - 14 Select Raster Snap On, then click Clear All.
This activates the raster snaps, and clears the default selections. Raster snaps select points on raster geometry in the same way an OSNAP selects points on vector geometry.
 - 15 Select Corner, then click OK.
This sets the raster snaps to select a corner where two raster lines connect.
- Convert a raster line to a vector using two picks
- 16 To create a new line, click Image menu ► Vectorization Tools ► Line.
 - 17 Enter 2p to draw the line by selecting two points.
 - 18 Select the lower left corner of the base of the part, then the lower right corner.



Verify the line properties

- 19 Enter l (Length) to change the length of the line.
- 20 Enter 13.3 for the new length.
This forces the new vector line to match the labeled dimension.
- 21 Enter a (Angle) to change the direction of the line.
- 22 Enter 0 for the new angle.
This forces the new vector line to be orthogonal.
- 23 Press Enter to exit the command.
The command removes the raster information below the new line.



24 Close the drawing without saving changes.

Exercise V2: Replacing Raster Text

In this exercise you learn how to replace multiline text paragraphs (e.g., construction notes), or single lines of text with vector versions.

Often when you try to use scanned drawings as part of a construction document set, text must be modified or updated.

Related Help Topics

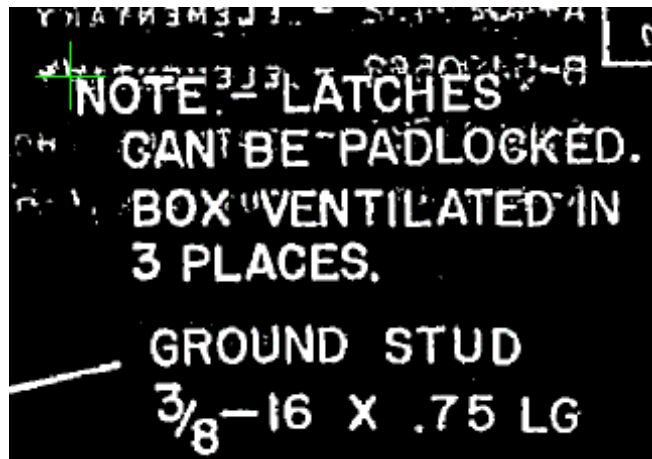
- [Vectorizing Raster Text](#)

Related Exercises

- [Basic Tasks Tutorial](#) (page 5)

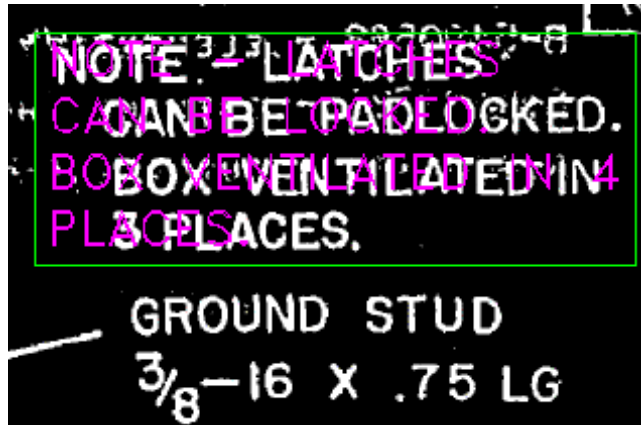
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial6 folder, open the drawing file VTools_03.dwg.
Turn off raster snaps
- 2 Click Image ► Raster Snap.
- 3 Clear the Raster Snap On check box, then click OK.
This turns off any Raster Snaps so any point in the image can be selected.
You can also accomplish this by pressing Ctrl + F3 to toggle Raster Snap.
Convert raster notes to multiline text
- 4 To create a new, corrected block of text, click Image menu ► Vectorization Tools ► Multiline Text.
- 5 Select a point at the upper left corner of the existing note for the box.

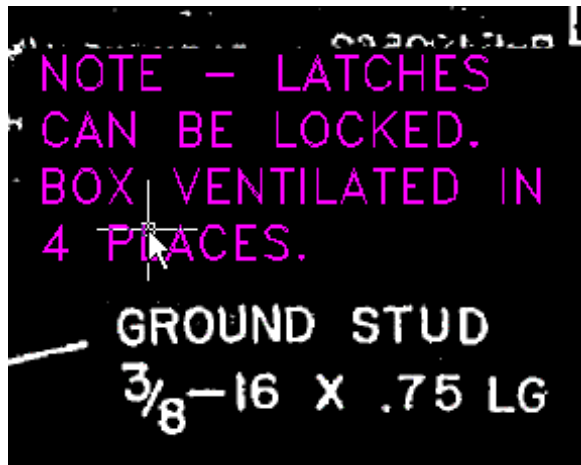


- 6 Press Enter to accept the rotation angle of 0.
- 7 Drag a window around the existing four lines of text to specify the area to be used by the multiline text.
- 8 In the multiline text frame, enter the following replacement text:
NOTE: LATCHES CAN BE LOCKED. BOX VENTILATED IN 4 PLACES.
- 9 In the Text Formatting toolbar, click OK to finish.
- 10 Select two points outside the new text to create a selection window for removing the raster from behind the new text. The background raster is

highlighted to show what will be removed. If the wrong area was selected, you can enter r (Repick) and select a new area.



- 11 Press Enter to remove the raster and complete the command.

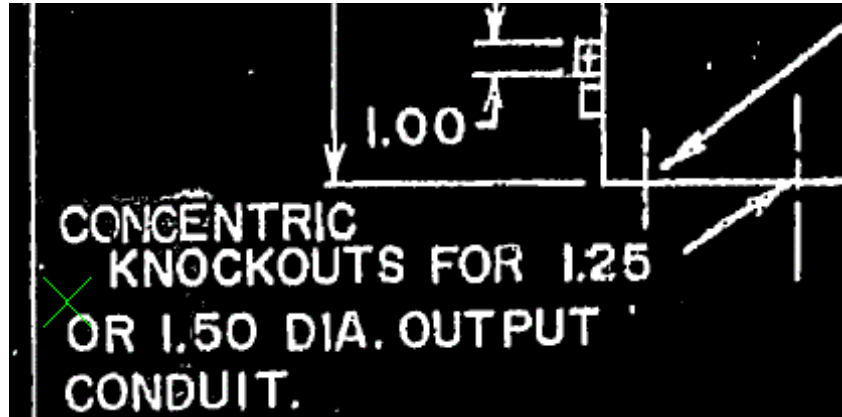


NOTE If you need to edit the vector text, select it, then right-click and click MText Edit.

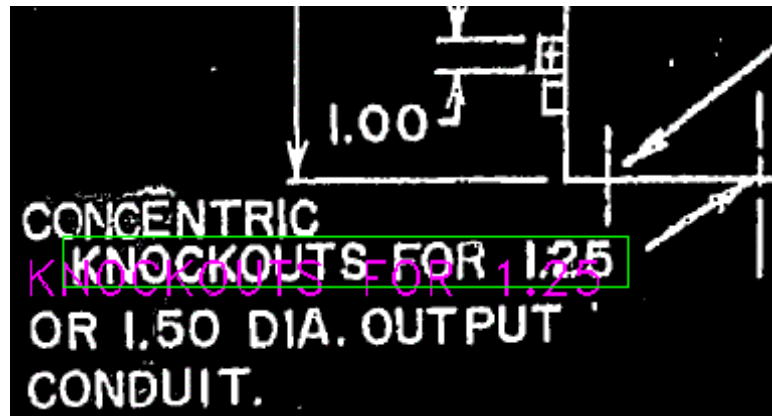
Convert a raster label to a single line of text

In the next few steps, you will replace a single line of text to correct an alignment problem with the second line of the label for concentric knockouts in the lower left region of the drawing.

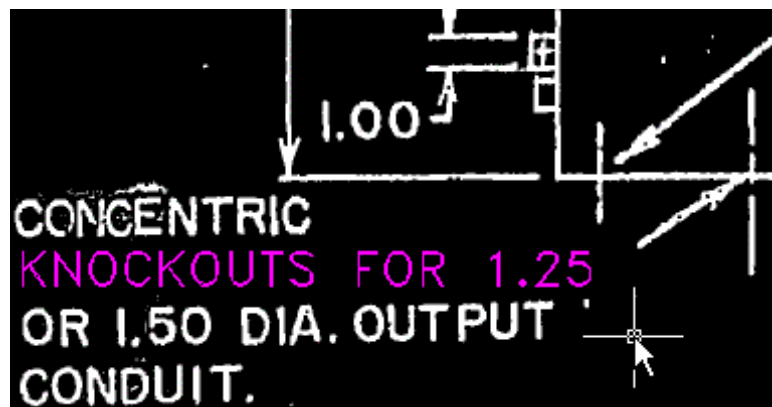
- 12 To create a new line of text, click Image menu ► Vectorization Tools ► Text.
 - 13 Select a point to mark the lower left corner of the inserted text, just above the left edge of the line “OR 1.50 DIA. OUTPUT”.
- The following example shows you where to select the starting point for the new single line of text.



- 14 In the VText Edit dialog box, enter the following replacement text:
KNOCKOUTS FOR 1.25
 - 15 Select two points outside the new text to create a selection window for removing the raster text from behind the new vector text.
- The background raster is highlighted to show what will be removed. If the wrong area was selected, you can enter r (Repick) to re-select the window.



- 16 Press Enter to remove the raster. Press Enter a second time to complete the command.



- 17 Close the drawing without saving changes.

Exercise V3: Converting Raster Polylines to 2D Polylines

In this exercise you learn how to work with a follower command that automatically follows a selected raster path.

Polylines can form a closed boundary or an open path. Raster Design can automatically follow a selected raster path, stopping for your input when a

decision point is reached. A decision point is typically an intersection, endpoint, or location with confusing geometry.


Related Help Topics

- [Following Polylines](#)

Related Exercises

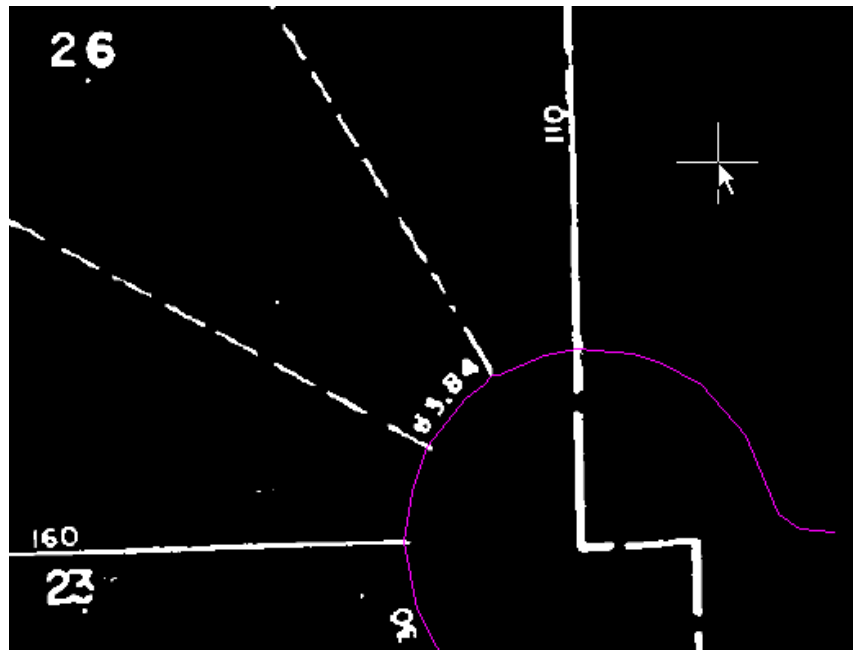
- [Basic Tasks Tutorial](#) (page 5)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5) and in the exercise [Exercise V1: Setting Options and Creating Basic Vector Objects](#) (page 183).

- 1 In the \Tutorial6 folder, open the drawing file VTools_04.dwg.
- 2 Ensure that the Raster Design Quick Bar is visible. If it is not, click Image ► Toggle Quick Bar.
- 3 On the Raster Design Quick Bar, clear the Stop at Raster Intersections button . It is cleared when it is not outlined.
Convert raster polylines
- 4 To create a new polyline, click Image menu ► Vectorization Tools ► Polyline Follower.
- 5 Select a point on the edge of the cul-de-sac.

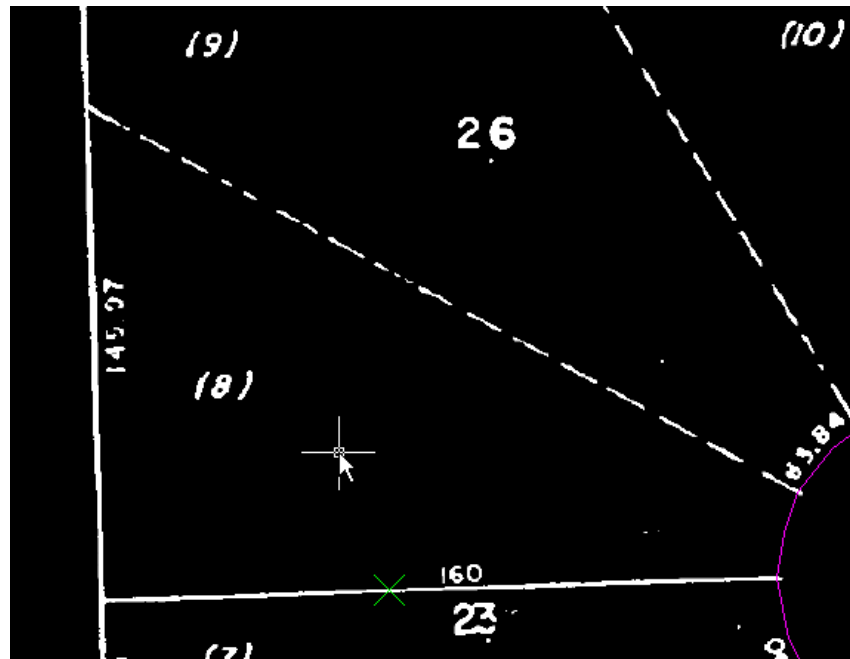


- 6 Press Enter twice, first to draw the polyline and then to remove the raster from behind the new vector.

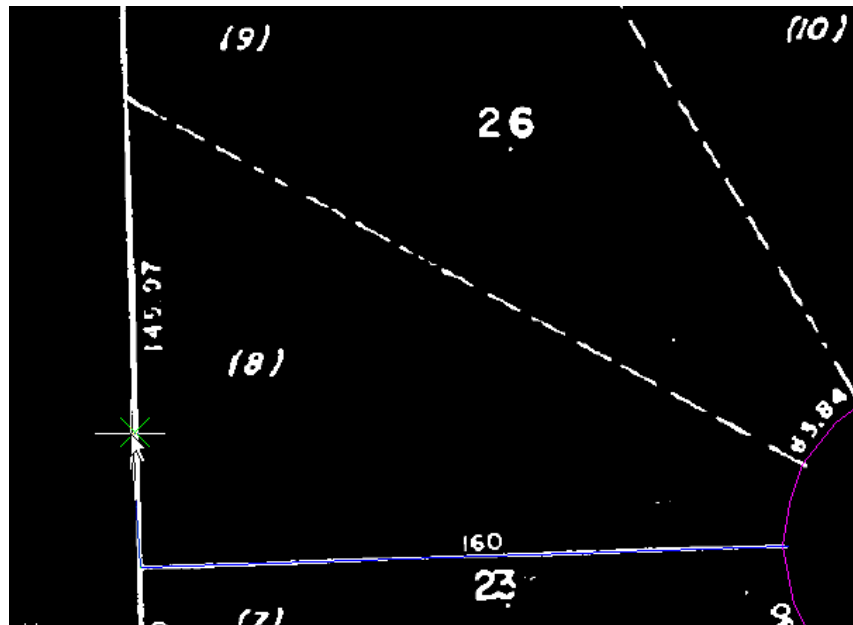


Convert closed raster polylines

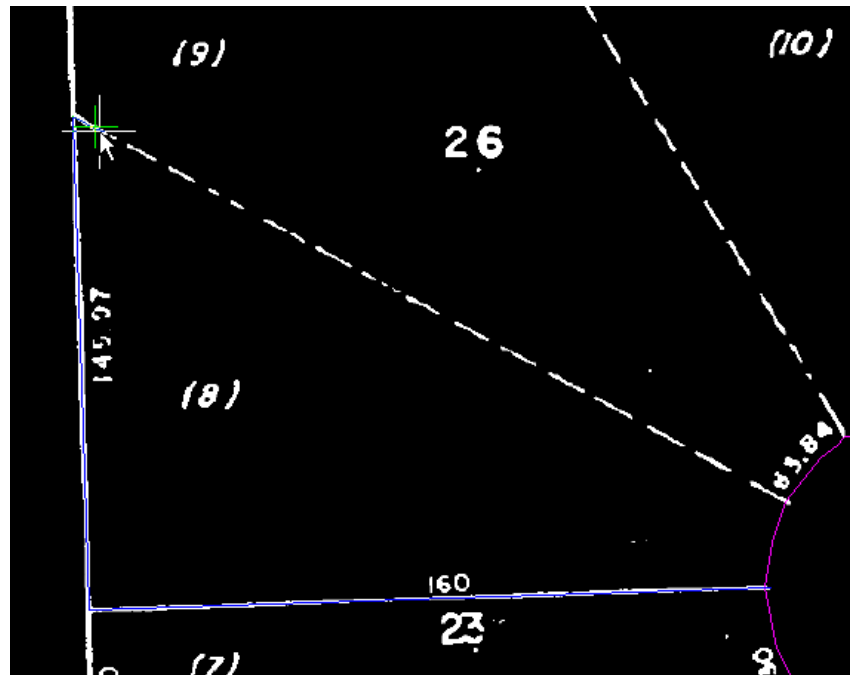
- 7 On the Raster Design Quick Bar, select Stop at Raster Intersections.
This option enables you to direct the new vector entity when it reaches an intersection.
- 8 To create a new polyline, click Image menu ► Vectorization Tools ► Polyline Follower.
- 9 Pick a point on the lot line between parcel (7) and (8).



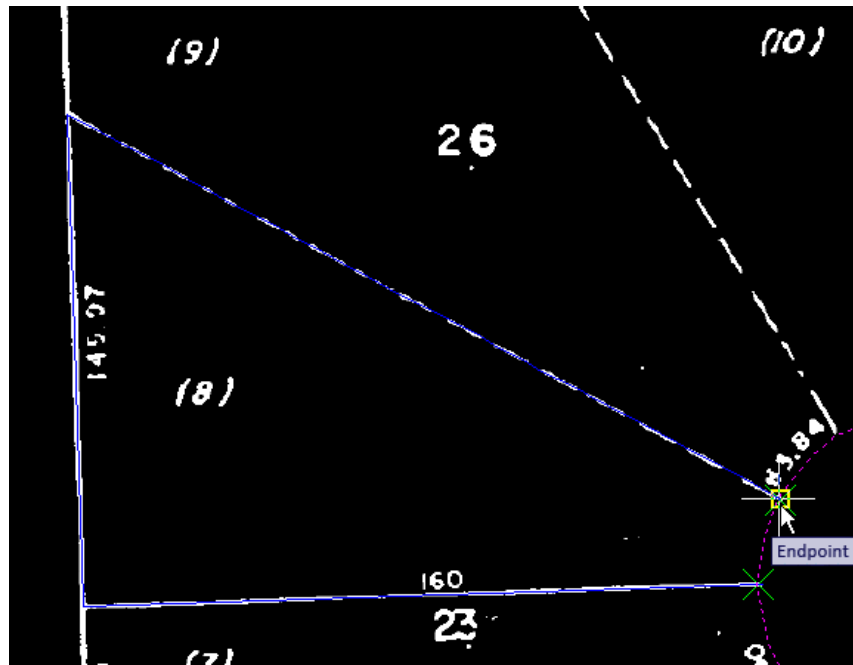
- 10 When the follower reaches the end of the lot line, enter d (Direction) then pick a point along the back lot line to specify the direction to trace the polyline around lot (8).
The Direction option is typically used at decision points.



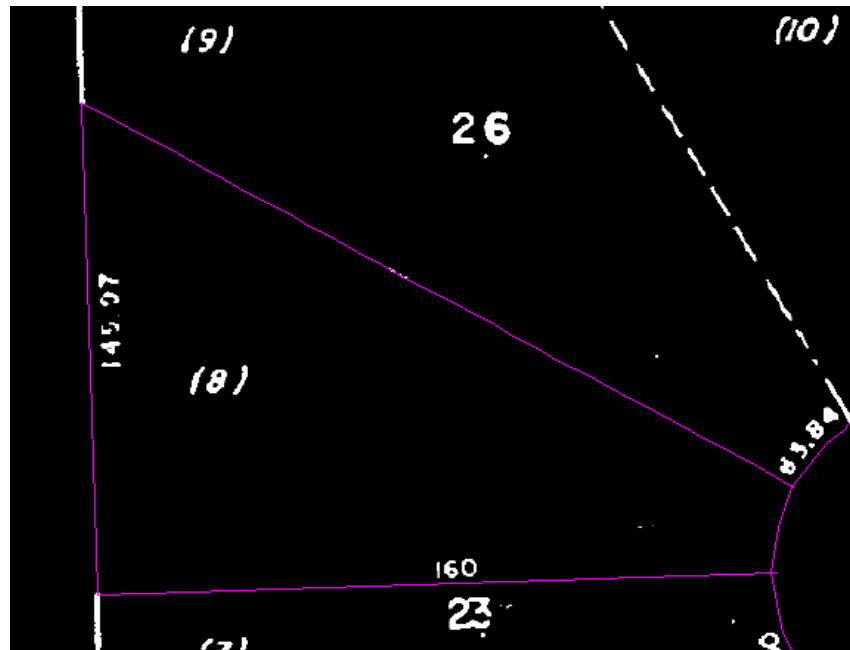
- 11 When the follower reaches the intersection between the back line and the dashed lot line, enter d then pick a point near the beginning of the dashed lot line to continue to trace the polyline around lot (8).



- 12 When the follower reaches the cul-de-sac, enter v (Vector), then pick the edge of the cul-de-sac to specify this as the vector line to follow.
The Vector option allows you to follow a vector polyline when lines or boundaries overlap.
- 13 When prompted, select the beginning and end vertices of the curved polyline. The beginning is the upper vertex; the end is the lower vertex, where the polygon can be closed.
These points specify the direction and distance to follow on the vector polyline. The AutoCAD Endpoint OSNAP is activated for these point selections.



- 14 Enter c to close the new polyline and remove the raster from behind the new vector.
- 15 Press Enter twice to exit the command.
The lot lines for Lot 8 were converted to a single polyline.



16 Close the drawing without saving changes.

Exercise V4: Using Dynamic Input Prompts

In this exercise you learn how to vectorize linework with great precision, using AutoCAD Dynamic Input prompts.

Dynamic Input provides useful prompts of line lengths, angles, and command options in the vicinity of the cursor. This exercise involves setting the options for Dynamic Input, then vectorizing street edges and cul-de-sacs in a property drawing.

Related Help Topics

- Setting the Options
- Dynamic Input Settings

Related Exercises

- [Basic Tasks Tutorial](#) (page 5)

■ **Exercise V3: Converting Raster Polylines to 2D Polylines** (page 192)

To configure Dynamic Input settings and vectorize linework

- 1 In the \Tutorial6 folder, open the drawing file VTools_Dyn.dwg.



After setting some tool options, you can start vectorizing the street edges in this raster image.

- 2 On the command line, enter the AutoCAD command `OPTIONS`.
- 3 In the Options dialog box, on the Display tab, in the Window Elements area, select Show ToolTips; on the Drafting tab, in the AutoSnap Settings area, select Display AutoSnap Tooltip. Close the Options dialog box.
- 4 Along the bottom of your drawing window, right-click DYN and click Settings. Alternatively, enter the AutoCAD command `DSETTINGS`.
- 5 In the Drafting Settings dialog box, on the Dynamic Input tab, select all three options to enable Pointer Input, Dimension Input, and Dynamic Prompts.
- 6 In the Pointer Input area, click Settings.
- 7 In the Pointer Input Settings dialog box, in the Format area, select Polar Format and Absolute Coordinates; in the Visibility area, select Always. Click OK to close the dialog box.
- 8 On the Dynamic Input tab, in the Dimension Input area, click Settings.

- 9 In the Dimension Input Settings dialog box, click Show the Following Dimension Input Fields Simultaneously, and select Resulting Dimension, Absolute Angle, and Arc Radius. Click OK to close the dialog box.
- 10 In the Drafting Settings dialog box, click Drafting Tooltip Appearance.
- 11 In the Tooltip Appearance dialog box, click Colors.
- 12 In the Drawing Window Colors dialog box, in the Context area, select 2D Model Space; in the Interface Element area, click Crosshairs; in the Color area, select a color such as Green that contrasts well with the white lines in the image. Click Apply & Close.
- 13 In the Tooltip Appearance dialog box, click OK.
- 14 In the Drafting Settings dialog box, on the Object Snap tab, select Object Snap On; in the Object Snap Modes area, select Endpoint and Intersection.
- 15 In the Drafting Settings dialog box, on the Raster Snap tab, select Raster Snap On; in the Raster Snap Modes area, select Center, End, and Corner; in the Preferences area, select Show Aperture and Snap. Click OK to close the dialog box.

Now you are ready to start vectorizing lines, beginning with the left (west) edge of Elmhurst Avenue. The following instructions use standard compass directions, assuming that the top of the image is north.

- 16 Click Image menu ► Vectorization Tools ► Line. Or enter the command `vline`.
- 17 Move the cursor to the west edge of Elmhurst Avenue, and snap to the center of the raster line. You should see the Raster Snap symbol and Raster Center tooltip to confirm this.



- 18 Click to vectorize the line.

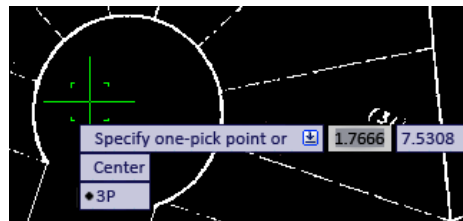
Tooltips show the line length and angle (252 degrees).

- 19 Right-click and click Enter to vectorize the line.
- 20 Move the cursor to the northeast side of Elmhurst Avenue, snap to the centre of this line, then click.
- 21 Right-click and click Enter to vectorize the line, then right-click and click Cancel to end the command.

Tooltips show that the angle of this line is also 252 degrees. The presence of these two parallel vector lines provides a good base for vectorizing the cul-de-sac.

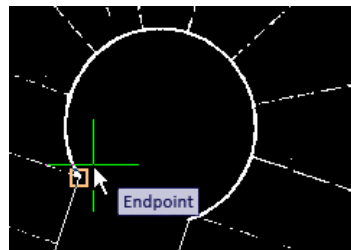
- 22 Click Image menu ► Vectorization Tools ► Arc. Or enter varc.

The tooltip “Specify one-pick point or...” shows a Down Arrow icon. When you press the keyboard Down Arrow once, you see the two other options, Center and 3p; press again, and a black dot marks the first choice.



At this point, you can use the Up/Down Arrows to select an option. You can also select an option with the cursor, or right-click the mouse to select an option from the shortcut menu.

- 23 Select the 3p option, then, as prompted, select the start point. Use the square Object Snap marker to select the end of the first vectorized line.



- 24 Select another point along the arc, then select the third point at the end of the other street edge, using the Object Snap marker again. Press Enter to end the command.

In the next few steps, you will vectorize the rectangle bounded by Elmhurst, Highland, Northside, and Elm Place.

25 Click Image menu ► Vectorization Tools ► Rectangle. Or enter vrect.

26 Click the north corner of the rectangle, where Elmhurst meets Northside, and move the cursor a short distance to the southwest, along the east side of Elmhurst Ave.

Notice that the angle prompt is highlighted. In this state, you can lock the line to a specific angle by entering the numeric value.

27 Enter 252, the angle you used for other edges of Elmhurst Ave.

28 To specify the second corner point, click the diagonally opposite corner of the rectangle, where Highland and Elm Place meet.

29 Right-click and click Enter, then right-click and click Cancel to end the command.

Note that the east and west corners of the rectangle are displaced from the raster corners. In a real project, you could decide at this point whether it is more important to follow the raster lines or keep the vector lines parallel.

Further exploration: To follow the raster lines, first click File menu ► Undo. Do this one or more times to undo the vrect command, then use the polyline vectorization tool (vpline), with the 2p option, to vectorize the lines by clicking each corner point in a sequence around the rectangle, using the Object Snap marker to ensure that the start and end points join to form a closed figure.

In the next few steps, you will use the polyline vectorization tool to vectorize along Northside.

30 Click Image menu ► Vectorization Tools ► Polyline. Or enter vpline.

31 Select the 2p option.

TIP When using the 2p option to vectorize a polyline, click the start point, then click each vertex in sequence until you reach the endpoint.

32 Click the end of the vector line at the corner of Elmhurst and Northside, and move the cursor a short distance east along Northside.



Notice that when you have two numeric prompts, such as angle and length, one of them is highlighted, indicating that you can enter a numeric value.

- 33 Press the Tab key to switch the highlight from angle to length several times, then stop on angle.
- 34 Enter 342, which is 90 degrees from the angle of Elmhurst (252 degrees), then press Tab to switch the highlight to the length value.
Now the angle is locked at 342.
- 35 Slide the cursor east to the edge of Oak Place, click on the raster street edge, then follow this edge north east toward the cul-de-sac.
- 36 At the Raster Corner prompt, click once to mark the endpoint, then right-click and click Enter.

You have finished the steps of this exercise, and should feel comfortable using the vectorization commands with Dynamic Input prompts.

Further exploration: Continue vectorizing more of the street edges in this image, deciding whether to lock angles or follow raster lines. After you vectorize both sides of Oak Place, use the Copy With Base Point command to copy the cul-de-sac from Elmhurst to Oak Place. With one of the arc endpoints as a base point, use Object Snap to attach the arc precisely to one street edge.

- 37 Close the drawing without saving changes.

Exercise V5: Working with Separation Tables

In this exercise you learn how to use separation tables to control the assignment of lines to layers when converting raster lines to vector.

The layer for the new vectors can be controlled by the raster line width or linetype (continuous vs. non-continuous). These layer controls are generally


used for basic vector objects, such as lines and circles, and the polyline follower. When you are converting text or contours, other types of layer control can apply.

Related Help Topics

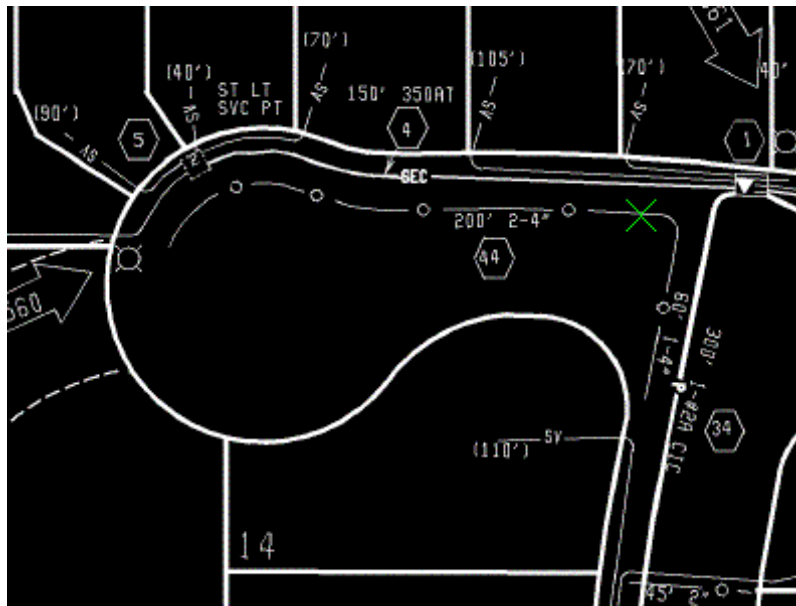
- [Setting the Options](#)
- [Changing the Quick Bar Visibility](#)

Related Exercises

- [Basic Tasks Tutorial](#) (page 5)
- [Exercise V3: Converting Raster Polylines to 2D Polylines](#) (page 192)

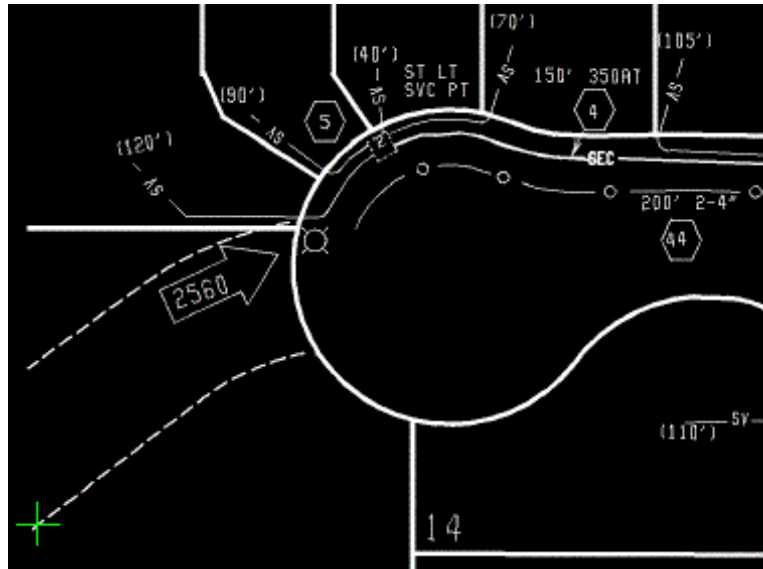
- 1 In the \Tutorial6 folder, open the drawing file VTools_05.dwg.
Access the Raster Design Quick Bar
- 2 Ensure that the Raster Design Quick Bar is visible. If it is not, click Image ► Toggle Quick Bar.
- 3 On the Raster Design Quick Bar, clear the Stop At Raster Intersections option  .
Change the raster entity detection settings
- 4 To display the Raster Design Options dialog box, click Image ► Options.
- 5 Click the Raster Entity Detection tab and change the Max Jump Length option to 70.
This setting specifies the maximum length of a gap that Raster Design will tolerate when following a raster polyline. It can be used to jump over labels embedded in the line or to follow non-continuous lines such as dashed lines. This length is in pixels and can be selected on the screen using the Pick button.
- 6 Change the Max Dash Length option to 50, and the Max Blank Length to 20.
These settings control how Raster Design detects the presence of dashed or non-continuous linetypes.
Change the vector separation settings
- 7 Click the VTools General tab, then click Vector Separation to display the Vector Separation Options dialog box.

- 8 Click the General tab and select Override Width Table For Non-continuous Entities. In the Layer list, change the Layer to easement lines. With this setting, lines detected as non-continuous will be placed on the easement lines layer.
Add width table entries
- 9 Select the Use Width Table option.
This setting allows you to specify layers based on ranges of widths in pixels for raster linework. When using the vectorization tools, the width of the raster selected is compared to the width table, and the layer is assigned based on these settings.
- 10 Click Insert Below to add a range.
- 11 Click Query Width and select a point in a utility line to determine its width in pixels.



- 12 Click OK to exit the Entity Width Information dialog box. In the Width Table, click on the new range once to activate it, then click on the Maximum value, and change it to 4.
- 13 Click on the range once to activate it again, then click on the Layer setting. Use the list to change the layer to s-util for thin raster lines.

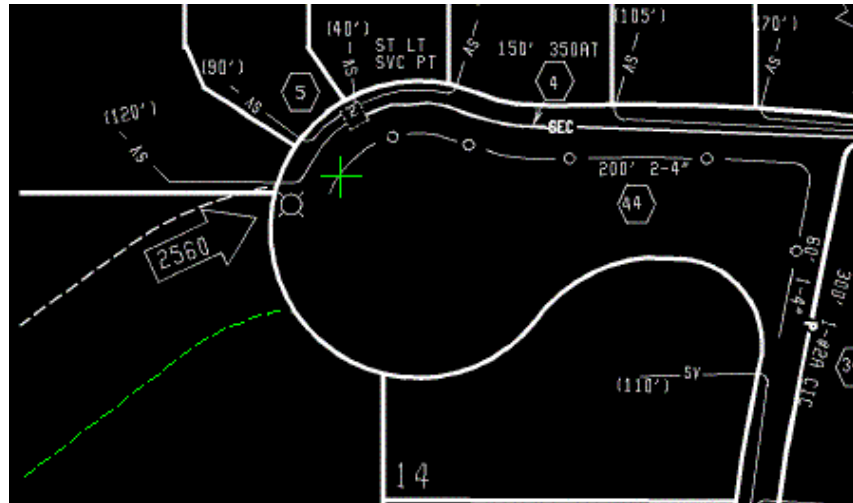
- 14 Click Insert Below to add another range.
Note that the new range is set to accept wider lines.
- 15 Click on the new range once to activate it, click on the Layer setting, change the layer to *PROMPT*, and press Enter.
This setting forces the vectorization tools to prompt for a layer when thick raster selections are encountered. This option is very useful when several different types of lines have similar appearances in the raster file, but should be separated on different layers in the vector file.
- 16 Click OK to exit the Vector Separation Options dialog box; click OK again to exit the Raster Design Options dialog box.
Convert a dashed raster line to vector
- 17 To create a new polyline, click Image menu ► Vectorization Tools ► Polyline Follower.
- 18 Click the lower left end of the bottom easement line to convert it to a polyline. The entire line is highlighted.



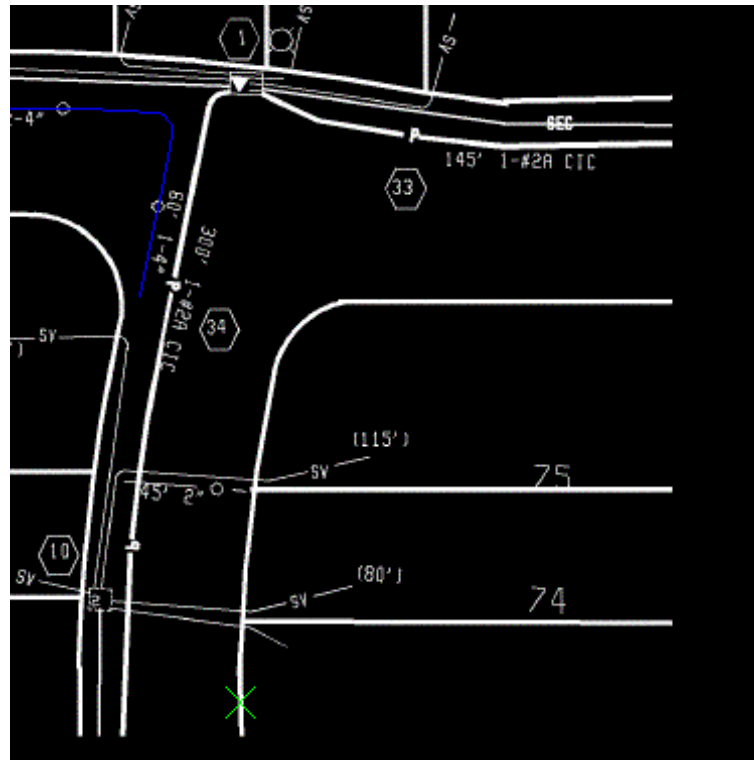
- 19 Press Enter to accept the polyline.
The new polyline is placed on the easement lines layer.
- 20 Press Enter to exit the command. The new polyline is displayed in the green color assigned to the layer.


Convert raster lines with differing widths to vector

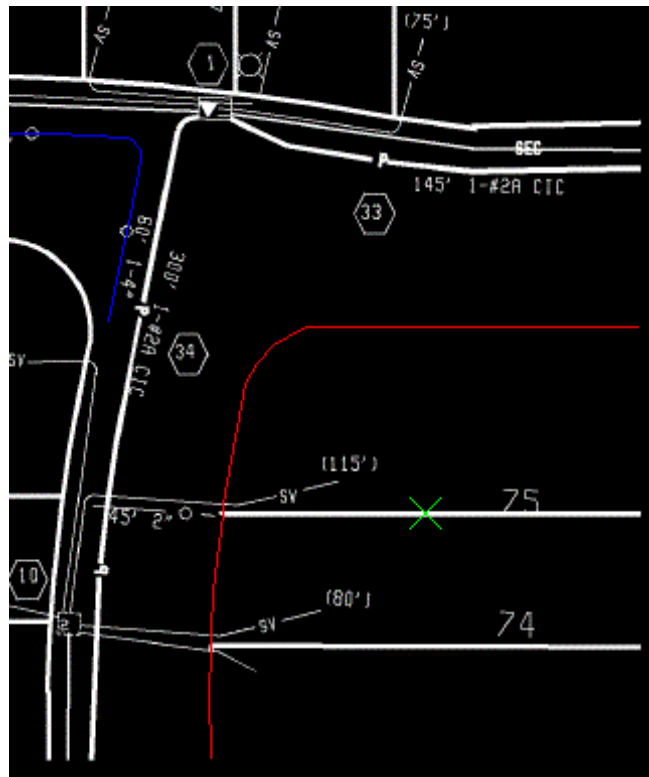
- 21 To create a new polyline, click Image menu ► Vectorization Tools ► Polyline Follower.
- 22 Click the left end of the utility line inside the cul-de-sac to convert it to a polyline.



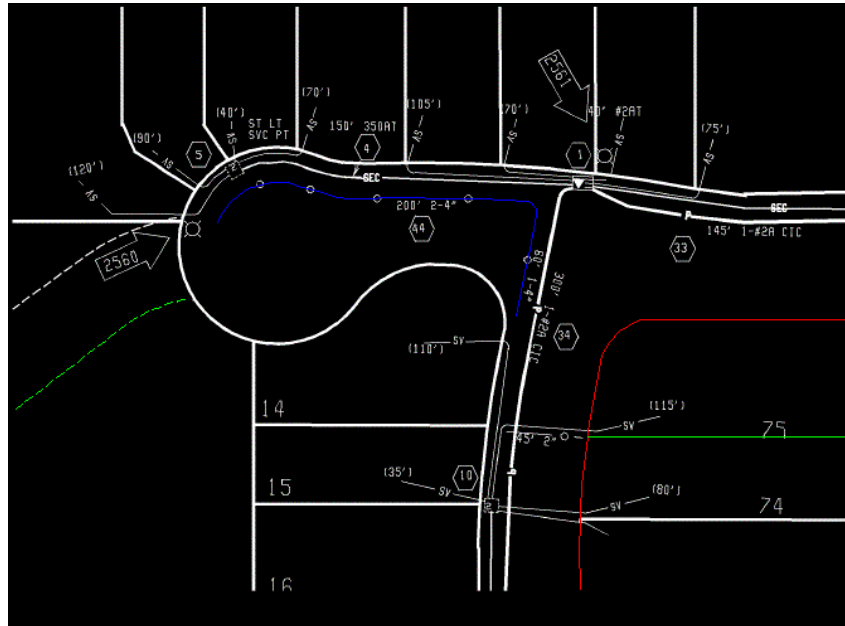
- 23 Press Enter to accept the polyline and start another.
The new polyline is placed on the s-util layer.
- 24 Click on the bottom end of the short right-of-way line.



- 25 When the follower reaches the end of the right-of-way, press Enter to complete the polyline.
- 26 From the Select Layer dialog box, select the row layer, and then click OK.
- 27 Press Enter to exit the command.
- 28 From the Raster Design Quick Bar, select the Stop At Vector Intersections option .
- 29 To create a new line using the single pick option, click Image menu ► Vectorization Tools ► Line.
- 30 Click the line between lots 74 and 75 and zoom to the area.
The following example shows where to select the point on the lot line to convert it to a vector.



- 31 When prompted, select the lot lines layer for the new line.
- 32 Press Enter to exit the command.
 The command removes the raster information below the new line.
 The following example shows how the drawing should appear after the various types of lines have been converted and placed on the appropriate layers.



33 Close the drawing without saving changes.

Exercise V6: Creating Contours from Scanned Topo Maps

In this exercise you use the contour follower to convert a raster contour to a vector polyline with elevation.

You can convert a raster contour to a vector polyline with elevation using settings to control elevation assignment, layer management, and decision point behavior. Elevation levels can represent ground elevation or another attribute of the terrain, such as temperature or population density.

Related Help Topics

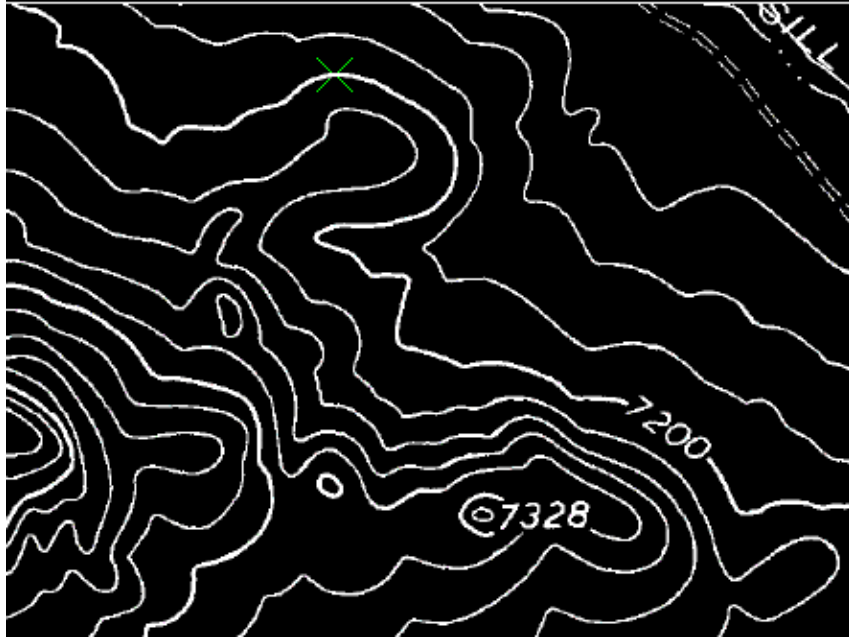
- Setting the Options
- Using the Contour Follower

Related Exercises

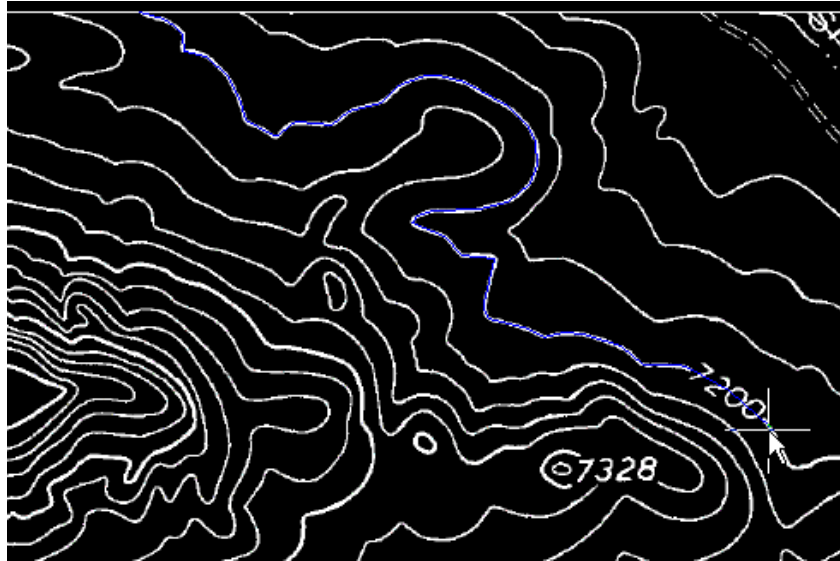
- [Basic Tasks Tutorial](#) (page 5)
- [Exercise V3: Converting Raster Polylines to 2D Polylines](#) (page 192)

- 1 In the \Tutorial6 folder, open the drawing file VTools_06.dwg.
Access the Raster Design Options dialog box
- 2 To display the Raster Design Options dialog box, click Image ► Options.
- 3 Select the Raster Entity Detection tab and change the Max Jump Length option to 5.
This setting specifies the maximum length of a gap that Raster Design will tolerate when following a raster polyline. It can be used to draw through labels embedded in the line or to follow non-continuous lines such as dashed lines.
This length is in pixels and can be selected on screen using the Pick button. In this case, the jump length is set to 5 so that the follower does not automatically draw through contour labels.
- 4 Click the VTools Follower tab. In the Contour Settings area, change Elevation to Prompt, and set the Elevation Interval to 20.
This setting controls the default elevations displayed for contours as they are converted.
- 5 Click the VTools General tab and click Vector Separation to display the Vector Separation Options dialog box.
- 6 Click the Contour tab on the Vector Separation Options dialog box and verify that the option Separate Contours By Elevation is selected.
This setting assigns contours to layers based on their elevation interval.
- 7 In the Minor section, set the Interval to 20 and Layer to contour20. In the Major section, set the Interval to 100 and Layer to contour100. Set the Polyline Width to Actual for both the Minor and Major polylines.
These settings ensure that all contours with an elevation divisible by 100 are placed on the contour100 layer automatically. All contours with an elevation divisible by 20, but not by 100, are placed on the contour20 layer. All polylines use a width that matches the original raster data.
- 8 Click OK to exit the Vector Separation Options dialog box; click OK again to exit the Raster Design Options dialog box.
Create a contour from raster information

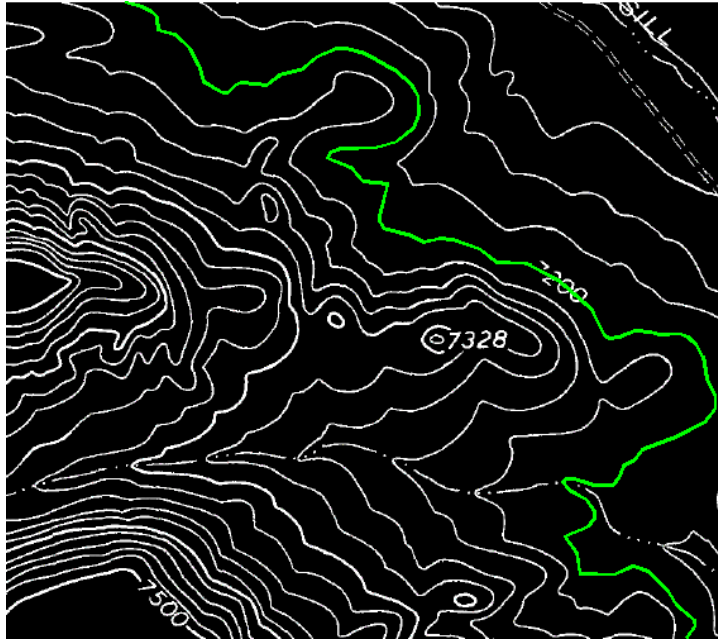
- 9 To create contours, click Image menu ► Vectorization Tools ► Contour Follower.
- 10 Click on the upper half of the 7200 contour.



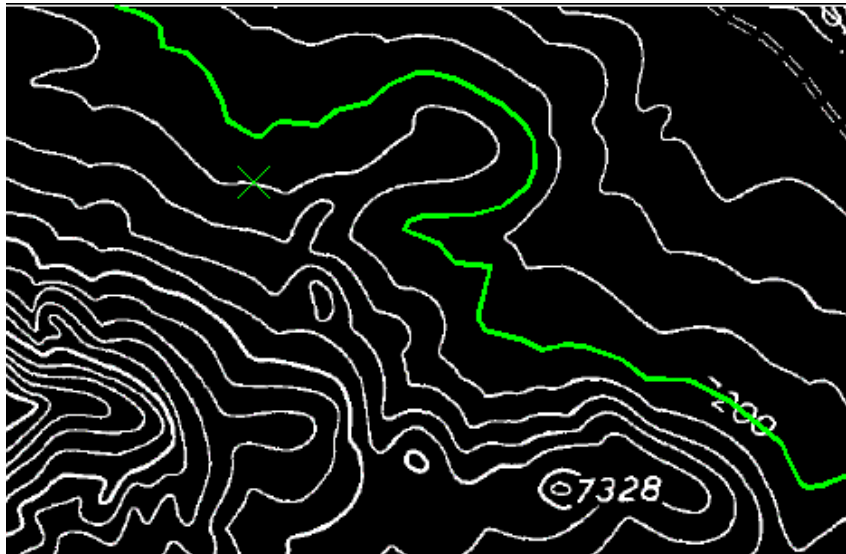
- 11 When the follower reaches the break where the label is located, manually add one or two points across the label, then click on the contour line on the other side of the label.



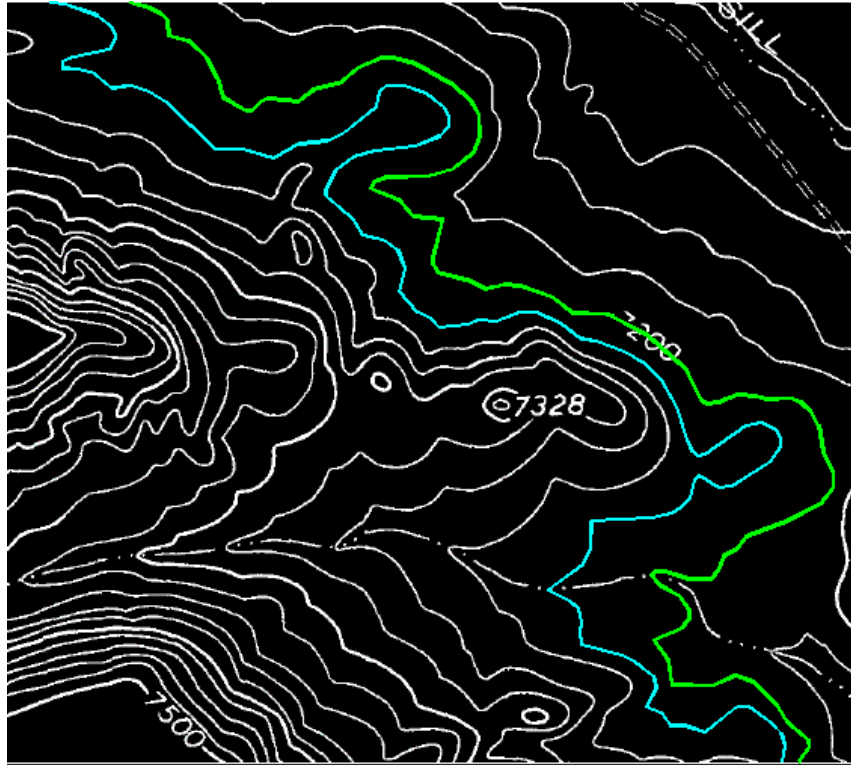
- 12 Enter o (Continue) to continue following the contour to the far end.
- 13 Press Enter to stop the following process.
- 14 Enter 7200 to set the elevation for the new contour.
The new contour is placed on the contour100 layer and the polyline width is set to match the original raster.



- 15 Click on the 7220 contour, to the left of the 7200 contour. The entire line is followed.



- 16 Press Enter to stop the following process.
- 17 Press Enter to accept the default elevation of 7220 for the new contour. The new contour is placed on the contour20 layer and the polyline width is set to match the original raster.



- 18 Close the drawing without saving changes.

Exercise V7: Creating 3D Breaklines from Topo Maps

In this exercise, you follow along a path defined by vector, stopping along the way to enter elevations.

The 3D polyline follower differs from other followers in that it does not attempt to digitize existing raster. The decision points for this follower can be either

vertices in the path or raster impact points. At each decision point, elevation information is requested. You can do this in three ways:

- Enter the elevation explicitly
- Assign the elevation automatically based on an increment or intersection with vector data
- Interpolate the elevation between known points

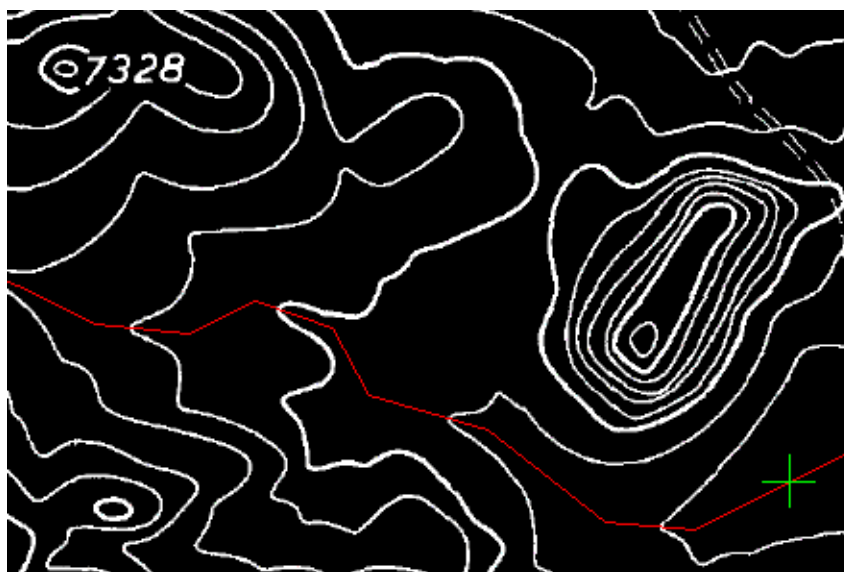
Related Help Topics

- [Setting the Options](#)
- [Using the 3D Polyline Follower](#)

Related Exercises

- [Basic Tasks Tutorial](#) (page 5)
- [Exercise V3: Converting Raster Polylines to 2D Polylines](#) (page 192)

- 1 In the \Tutorial6 folder, open the drawing file VTools_07.dwg.
Access the Raster Design Options dialog box
- 2 To display the Raster Design Options dialog box, click Image ► Options.
- 3 Click the VTools Follower tab. In the 3D Polyline Settings area, change the Elevation Interval to 20; ensure that the options Use Raster Impact Points Only and Ignore Raster Speckles are both cleared.
These settings control how the new vector line is created and the default elevations used when raster contours are encountered. All vertices and raster impact points along the existing vector polyline will be used for the new 3D breakline.
- 4 Click OK to exit the Raster Design Options dialog box.
Create a 3D breakline
- 5 To create a breakline of the stream bed, click Image menu ► Vectorization Tools ► 3D Polyline Follower.
- 6 Enter v (Vector) to use the existing vector 2D polyline.
- 7 Select the existing polyline near the right end.



The cursor is positioned at the right end of the polyline, waiting for you to specify an elevation.

- 8 Enter 7155 for the first elevation. The cursor moves to the next vertex of the polyline.
- 9 Enter i (Interpolate) to interpolate the elevation of the polyline vertex.
- 10 Enter 7160 to set the elevation for the next point, near the intersection with the raster contour.
- 11 For the rest of the vertices except the last endpoint, use i to interpolate elevations where there is no raster data, and press Enter to accept the elevation calculated by the program where raster and vector intersect.
Watch the command line to see the elevations being used by the routine. If the elevation is zero, it is a polyline vertex and you should use the interpolation option to calculate an elevation for that point. If there is an elevation displayed at the command line, the point is an intersection between raster and vector and the program is using the interval set in the options to determine the elevation at that point. You can enter known elevations at any time.
- 12 When you reach the end of the polyline, enter 7342 to specify the elevation at the end of the breakline.

There is a new 3D polyline drawn on the current layer. If you list this polyline, you can see that each vertex has an elevation. Several of the vertices have interpolated elevations, while the rest are even elevations where the raster contours intersect the original polyline path.



- 13** Select the 3D polyline and enter the LIST command.
The system displays the coordinates of each vertex, with elevations shown as Z values.
- 14** Close the drawing without saving changes.

Text Recognition Tutorial

10

This tutorial shows you how to use the Text Recognition commands to change raster text to AutoCAD text or multiline text (Mtext).

You begin by selecting an area of text or a table in your drawing, then entering the search parameters for the recognition engine. You can view the results in the Verify Text dialog box and make any changes in the Edit window before inserting the text into the drawing.

Exercise R1: Recognize Machine-Printed Text

In this exercise you change machine-printed raster text to AutoCAD text and Mtext in your drawing.

The settings you select in the Text Recognition Setup dialog box define the parameters for the search engine. The results from the search are displayed in the Verify Text window where you can make the necessary corrections and then enter the new text into the drawing.

In this exercise you:

- Enter the parameters for the recognition engine.
- Select a rectangular area of machine-printed raster text.
- Make corrections to the recognized text using the tools in the Verify Text window.
- Insert the AutoCAD Mtext into the drawing.

Related Help Topics

- Using Text Recognition

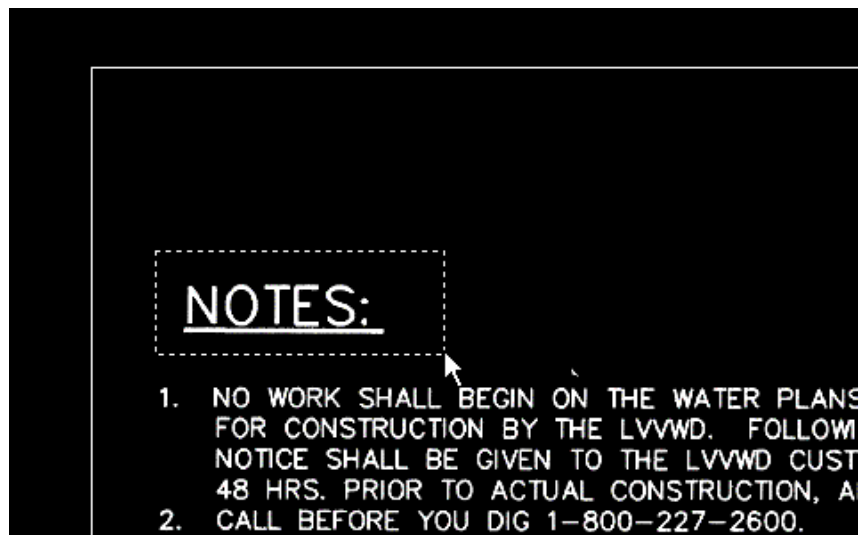
Related Exercises

- [Exercise B4: Modifying a Part Using REM Commands](#) (page 65)

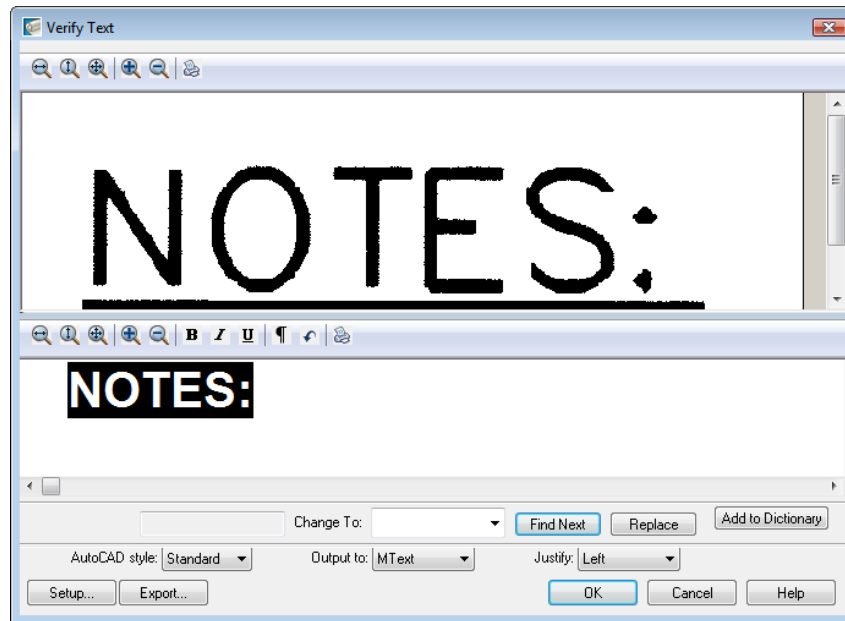
Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

- 1 In the \Tutorial9 folder, open the drawing file textrec_01.dwg.
Choose an image to insert
- 2 To display the Insert Image dialog box, click Image ► Insert.
- 3 From the Files of Type list, choose All Image Files.
- 4 If necessary, navigate to the \Tutorial9 folder. Select the image file text_rec_mach.tif.
- 5 In the Insert Options area, click Quick Insert and Zoom to Image. Click Open.
The image is inserted.
Convert machine-printed raster text to AutoCAD Mtext
- 6 To display the Text Recognition Setup dialog box, click Image ► Text Recognition ► Recognize Setup.
- 7 In the Input section, select the following settings:
 - Text Format is Machine Printed.
 - Selection Shape is Rectangular.
 - Select the Spelling dictionary.
 - Select English in the Spelling Language list.
 - Select the AutoCAD Custom dictionary.
 - Click Language Character Set and select English then click OK.
 - In the Recognize section, select only Uppercase and Punctuation, clearing other check boxes.
- 8 In the AutoCAD Output section, select the following settings:
 - Output Type is MText.
 - AutoCAD Style is Standard.
 - Text Height is Automatic.

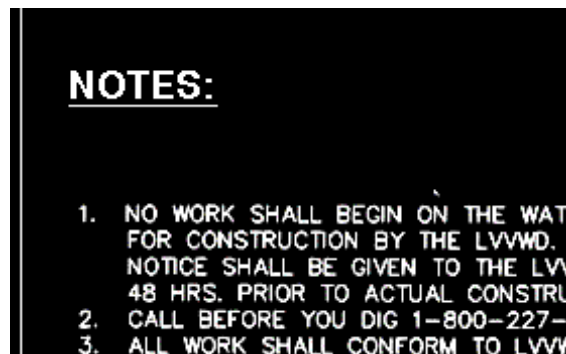
- Removal Method is Rub.
- 9 In the Verification Display section, select the Underline check box and clear the check boxes for Bold, Italic and Enable Verifier.
- 10 Click OK.
- 11 Click Image menu ► Text Recognition ► Recognize Text.
- 12 Draw a rectangle around the word “NOTES” as follows: click the upper left corner, press Enter to set the angle to 0, then click the bottom right corner.



The Verify Text window displays the word NOTES: in both the View pane (upper pane) and the Edit pane (lower pane). If the word NOTES: is not underlined in the Edit pane, click and drag to select the word and click the underline formatting option on the Edit toolbar. If the recognition engine has inserted any unwanted characters, delete them from the Edit pane.



- 13 Click OK to insert the word NOTES: into the drawing as AutoCAD Mtext. The following example shows how the Mtext displays in the drawing.

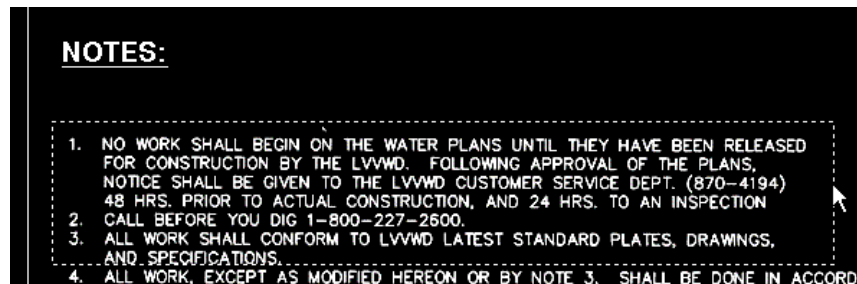


- 14 Enter s at the command line to display the Text Recognition Setup dialog box.
- 15 Change the following settings:
 - In the Input section, select the check boxes for Uppercase, Numbers, Punctuation, and Miscellaneous.

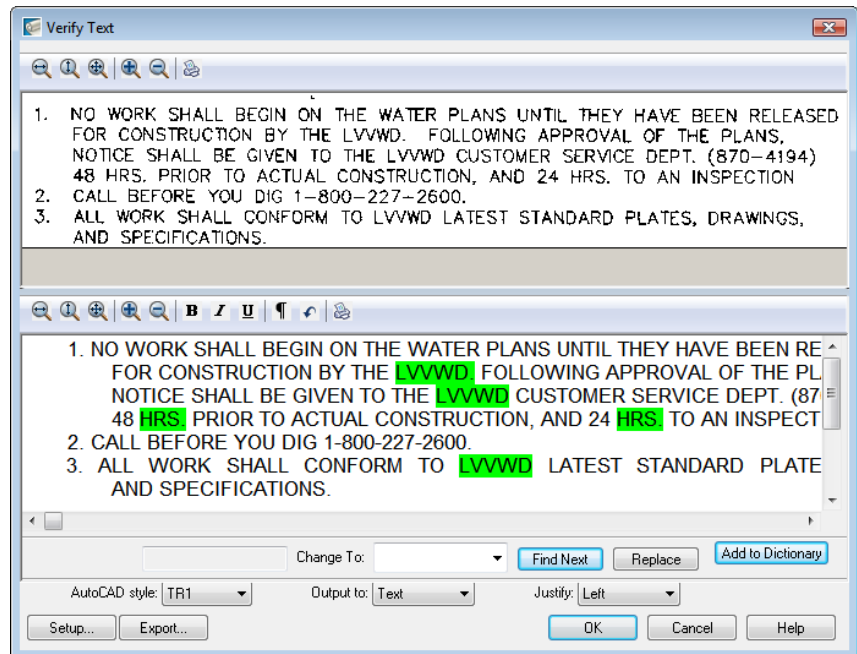
- In the AutoCAD Output section, set the Output Type to MText and set AutoCAD Style to TR1.
- In the Verification Display section, clear the formatting check boxes and select Enable Verifier.

Click OK.

- 16 Draw a rectangle around steps 1 through 3 as follows: click the upper left corner, press Enter to set the angle to 0, then click the bottom right corner.



The Verify Text window opens. The View pane displays the original raster text; the Edit pane displays the output from the recognition engine.



- 17 Review the areas of highlighted text in the Edit pane. Click Find Next to display the first suspect word or rejected character in the Change To box. Select a word from the Change To list or enter the correct word in the box and click Replace. Click Add to Dictionary if you want to add the word or acronym to the recognition dictionary. When you click OK, you are prompted to add the word to the AutoCAD custom dictionary too.

IMPORTANT Because no recognition engine is 100% accurate, you should carefully check the results in the Edit pane, not just the highlighted areas, and make all necessary changes.

- 18 After making changes, click OK to insert the new AutoCAD text in the image.

NOTES:

1. NO WORK SHALL BEGIN ON THE WATER PLANS UNTIL THEY HAVE BEEN RELEASED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING APPROVAL OF THE PLANS, NOTICE SHALL BE GIVEN TO THE LVVWD CUSTOMER SERVICE DEPT. (870-4194) 48 HRS. PRIOR TO ACTUAL CONSTRUCTION, AND 24 HRS. TO AN INSPECTION
2. CALL BEFORE YOU DIG 1-800-227-2600.
3. ALL WORK SHALL CONFORM TO LVVWD LATEST STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS.
4. ALL WORK, EXCEPT AS MODIFIED HEREON OR BY NOTE 3, SHALL BE DONE IN ACCORDANCE WITH THE CURRENT DRAFT OF ADDITION OF THE UNIFORM STANDARD SPECIFICATIONS

TIP You can use the AutoCAD MOVE command to align the text block. To edit the text, select it, then right-click and click MText Edit.

- 19 Close the drawing without saving changes.

Exercise R2: Recognize Hand-Printed Text

In this exercise you change hand-printed raster text to AutoCAD text in your drawing.

The general process is as follows:

- Enter the parameters for the recognition engine.
- Select a hand-printed note in raster text using the polygonal selection method.

- Make corrections to the recognized text using the tools in the Verify Text window.
- Insert the AutoCAD text into the drawing at an angle.

Related Help Topics

- Using Text Recognition

Related Exercises

- [Exercise R1: Recognize Machine-Printed Text](#) (page 221)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

Open the drawing file for this exercise

- 1 In the \Tutorial9 folder, open the drawing file textrec_03.dwg.
Choose an image to insert
- 2 To display the Insert Image dialog box, click Image ► Insert.
- 3 From the Files of Type list, choose All Image Files.
- 4 If necessary, navigate to the \Tutorial9 folder. Select the image file text_rec_hand.tif.
- 5 In the Insert Options area, click Quick Insert and Zoom to Image. Click Open.
The image is inserted.
Convert hand-printed raster text to AutoCAD text
- 6 To display the Text Recognition Setup dialog box, click Image ► Text Recognition ► Recognize Setup.
- 7 In the Input section, select the following settings:
 - Text Format is Hand Printed.
 - Selection Shape is Polygonal.
 - Select the Spelling dictionary.
 - Select English in the Spelling Language list.
 - Select the AutoCAD Custom dictionary.

- Click Language Character Set and select English.
 - In the Recognize section, select Uppercase, Numbers, Punctuation and Miscellaneous.
- 8 In the AutoCAD Output section, select the following settings:
 - Output Type is MText.
 - Text Height is Style Height.
 - AutoCAD Style is Note.
 - Removal Method is Rub.
 - 9 In the Verification Display section, clear the check boxes for Italic, Underline, and Enable Verifier.
 - 10 Click OK.
 - 11 Click Image menu ► Text Recognition ► Recognize Text.
 - 12 Zoom to the handwritten note in the upper right section of the drawing.
 - 13 Enter a at the command line for angle and enter the rotation angle of the text. You can do this either by selecting two points to draw a baseline for the text (parallel to the long side of the enclosing rectangle) or by entering 339. Press Enter.
 - 14 Draw a polygon around the text within the border, then press Enter to finish the polygon.



The Verify Text window opens.

- 15 Review the areas of highlighted text in the Edit pane (lower pane). You can revise text directly in the Edit pane, or use the editing buttons. Click Find Next to display the first suspect word or rejected character in the Change To box. Select a word from the Change To list or enter the correct word in the box and click Replace. Click Add to Dictionary if you want to add the word or acronym to the recognition dictionary. When you click OK, you are prompted to add the word to the AutoCAD custom dictionary too.

IMPORTANT Because no recognition engine is 100% accurate, you should carefully review the results in the Edit pane, not just the highlighted areas, and make all necessary changes.

- 16 Click OK to insert the new note in the drawing, and then press Esc to end the Text Recognition command.

TIP You can use the AutoCAD MOVE command to align the text block. To edit the text, select it, then right-click and click MText Edit.

- 17 Close the drawing without saving changes.

Exercise R3: Recognize a Table

In this exercise, you change text in a table from raster text to AutoCAD text in your drawing.

The general process is as follows:

- Enter the parameters for the recognition engine.
- Select a table in your drawing using the rectangular selection method.
- Make corrections to the recognized text using the tools in the Verify Table window.
- Insert the table into the drawing as AutoCAD text.

Related Help Topics

- [Using Text Recognition](#)

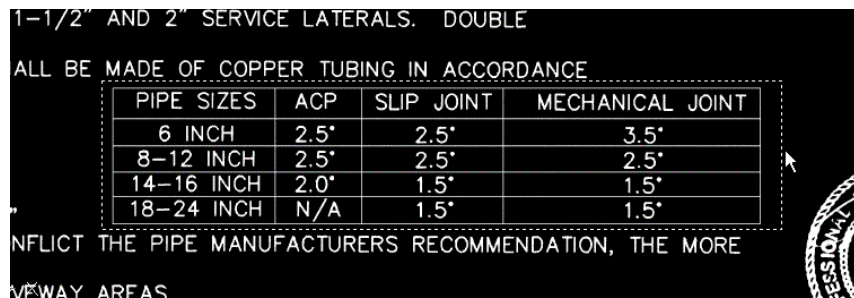
Related Exercises

- [Exercise R1: Recognize Machine-Printed Text](#) (page 221)
- [Exercise R2: Recognize Hand-Printed Text](#) (page 226)

Before doing this exercise, ensure that Raster Design options are set as described in the exercise [Exercise A1: Setting ProductNameShort Options](#) (page 5).

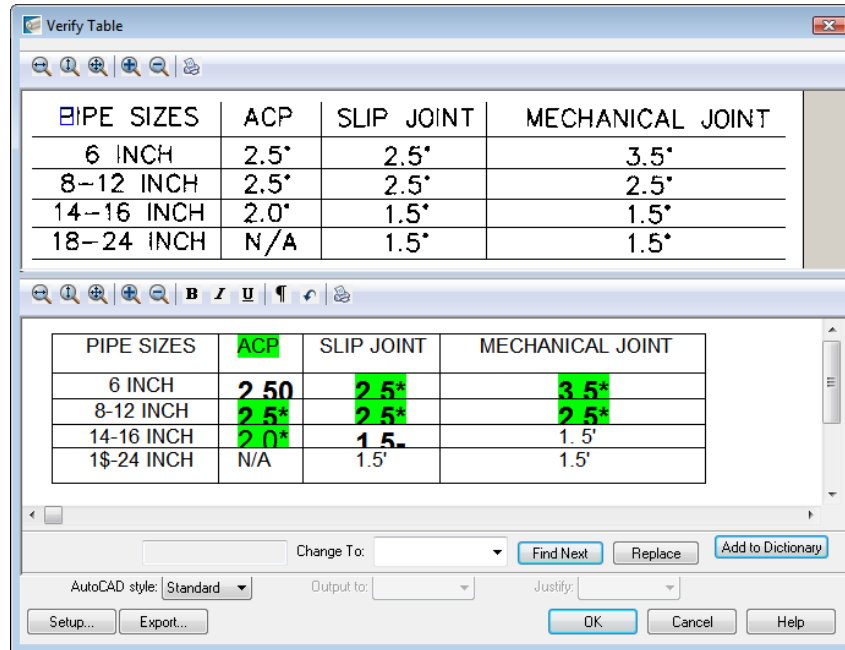
- 1 In the \Tutorial9 folder, open the drawing file textrec_02.dwg.
Choose an image to insert
- 2 To display the Insert Image dialog box, click Image ► Insert.
- 3 From the Files of Type list, select All Image Files.
- 4 If necessary, navigate to the \Tutorial9 folder. Select the image file text_rec_table.tif.
- 5 In the Insert Options area, click Quick Insert and Zoom to Image. Click Open.
The image is inserted.
Convert raster text in a table to AutoCAD text
- 6 To display the Text Recognition Setup dialog box, click Image ► Text Recognition ► Recognize Setup.

- 7 In the Input section, select the following settings:
 - Text Format is Machine Printed.
 - Selection Shape is Rectangular.
 - Select the Spelling dictionary.
 - Select English in the Spelling Language list.
 - Select the AutoCAD Custom dictionary.
 - Click Language Character Set and select English.
 - In the Recognize section, select Uppercase, Numbers, Punctuation, and Miscellaneous.
- 8 In the AutoCAD Output section, select the following settings:
 - Output Type is Text.
 - Text Height is Style Height.
 - AutoCAD Style is Table Text.
 - Removal Method is Rub.
- 9 In the Verification Display section, clear all the check boxes.
- 10 Click OK.
- 11 Click Image menu ► Text Recognition ► Recognize Table.
- 12 Draw a rectangle to enclose the table as follows: click the upper left corner, press Enter to set the angle to 0, then click the bottom right corner.



- 13 The Verify Table window opens. The View pane (upper pane) displays the original raster text; the Edit pane (lower pane) displays the output from the recognition engine.

The following example shows typical results for the Recognize Table command.



- 14 Review the results in the Edit pane of the Verify Table window. In this example you would change the \$ characters in the first column to the numeral 8 and correct the spacing for the word INCH.

IMPORTANT Because no recognition engine is 100% accurate, you should carefully review the results in the Edit pane, not just the highlighted areas, and make all necessary changes.

- 15 Click OK to insert the table as AutoCAD text in the drawing.
If necessary, you can use standard AutoCAD commands to move or edit the text.
- 16 Close the drawing without saving changes.

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