



# Autodesk® AutoCAD® Raster Design: Advanced Tricks for Faster Raster Manipulation

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## AC3129

Working with raster images presents a unique set of challenges. Oftentimes a raster image may be so degraded that it will benefit from a vector redraw. At other times, adding vector to just part of the drawing may meet your requirements. In either case, working with raster images can be frustrating, but fortunately Autodesk AutoCAD Raster Design software has integrated tools that make the process less painful. Couple these tools with the power of AutoLISP® programming, and your process just got a whole lot easier, faster, and more accurate. This class covers the thought process behind enhancing raster commands, shows you the fastest ways to get the job done, and helps you take the first steps toward a smarter way to use AutoCAD Raster Design, no matter what version you currently use.

## Learning Objectives

At the end of this class, you will be able to:

- Use the basic commands of Raster Design more efficiently
- Identify ways that your company can improve raster image workflows in AutoCAD
- Integrate AutoLISP® routines to enhance Raster Design commands
- Generate faster vector from raster images

## About the Speaker

Russell is an AutoCAD Power User with over 15 years of hands on experience, most currently as a Senior Drafter and CAD administrator for the Nuclear Configuration Management drafting group at PPL Corporation, based in Allentown, PA. Ever since selecting his career in the field of drafting, Russell has always been committed to helping his co-workers advance their drafting skills, and is heavily involved in CAD training initiatives and conducts custom training sessions for his peers. As one of the CAD administrators, he enjoys conversing with other users about standards, best practices, new methods of drafting, and is responsible for writing the “CAD Tip of the Week” for the drafting group. He holds a degree in Mechanical Engineering Technologies from Penn State University, and is skillful in LISP programming, 3D modeling, raster manipulation, Navisworks animation/clash detection, and CUI setup.

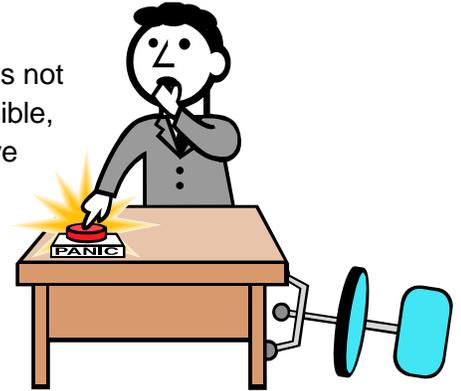
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## Raster: The Final Frontier

We have walked on the moon! We have constructed sky scrapers that defy physics! We have even printed replacement limbs in 3D! HOWEVER... If you would like to change that old hand-drawn set of prints into vector lines, well you're just asking too much...

The above is obviously an exaggeration, but it serves to prove a point. It's not that you *can't* change raster data into vector lines, as you know it *is* possible, but sometimes it just doesn't seem worth the effort. How many times have you wished that there was a button in Raster Design entitled "Just convert this entire drawing to vector for me right now"?

Raster Design already provides the tools you need to get the job done, albeit one piece at a time. So the question is, is there a better, faster, more accurate way to manipulate raster drawings within AutoCAD?



### The challenge

Yes there is a better way to work with raster images. There are some obstacles in your way to the elusive one-click "raster to vector" button.

The first and foremost obstacle is the idea itself; one click conversion is just a bad idea! As good as it sounds on the surface; you would actually be losing the ability to control the vector data at the time of creation.

You can however combine tools provided through Raster Design & AutoCAD, enhance them for speed/accuracy, and fit them into your company's standards!

### Keep your purpose in mind

First and foremost, you must recognize the overall goal you are trying to obtain when it comes to these raster images.

Are you revising a legacy drawing? If so, are you modifying part of an existing design, just changing some notes, deleting revision clouds, or redrawing all the drawing? The overall goal will decide the best path for you to take.

At times redrawing (all or in part) may be the right way to go, other times you may decide that converting raster to vector is a better idea. What should drive the decision? A balance of time and accuracy. Converting some raster to vector may save you time, but does that savings payoff when the results are inaccurate for your purposes? On the other hand, what if you

painstakingly trace and convert every square inch of a drawing with a high attention to detail, when you could have easily redrawn the drawing in half the time?

Some quick indicators of when a total vector redraw may be in order are:

- When the image is highly degraded/ unreadable in scanned format
- When drawing is not to scale
- When the drawing is very simple in design
- When image is not accurate/poorly drawn from the start

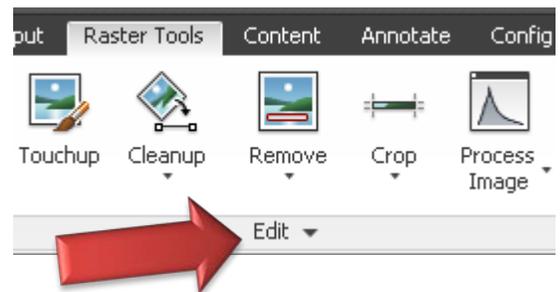


The opposite of the above list would apply for situations when raster images should be converted to vector lines. Some hand drawn prints are beautiful works of art that are both highly accurate and contain amazingly detailed information. To throw the print away and start over would be a crime! Pay respect to your drafting ancestors and use these prints as the basis for your raster to vector conversions.

## Lay a Foundation for Success

So after you have decided that the drawing is a good starting point, what's next? Well, a good end product is backed up by a thought out plan. The same can be said when working with raster drawings with Raster Design. You really want to jump straight to the end result, but there are a few basic commands that you should understand if you want to get the most out of your drawing:

- Despeckle – (Get rid of small dots and specks on drawing)
- Deskew- (Fix the angle of the page lines)
- Scale - (Make image full size if required)
- Thicken/thin lines- (Makes drawing easier to work with)



There are many other tools on the “EDIT” panel of your “Raster Tools” that will help you get the best final product. Take the time to become familiar with these!

### The next step

After you are satisfied with the starting point of your raster image, you can now begin converting the raster into vector data. There are 2 main tools that allow you to do this easily. These are found in the “Vectorize & Recognize Text” panel, **Followers** and **Primitives**.



Both of these tools will allow you to click on raster data and then convert that data into your selected vector format. *Followers* take it a step farther, and do exactly what it suggests, tracing the raster image (until it gets confused or comes to an intersection).

### Time saving TIP!



**Raster Snap!** Use Raster Snaps when working to convert to vector! This will easily allow you to pick raster components without having to slow down to zoom in and study the image.

So during a normal process, you select one of these raster to vector conversion buttons, and begin to click away! AutoCAD will happily make all the lines/polylines/circles/boxes that you choose. You may notice one problem though... it can be sloppy!

### Reverse Engineering a Solution

When sloppy or unexpected result rear their ugly heads, don't fret! Just take a step back and think. For example, if you are trying to convert a building on a city block plan view into vector data and you don't like the end result, take the time to study what you do not like about it.

We can fix this! So what's the problem? Are the lines at an off angle? Does the polyline not connect at the corners to form one entity? Is there data that is overlapping? Are the lines broken up into too many segments? Finding the problem will help you to reverse engineer a solution.

### Baby steps....

So let's go back to our city block example. Upon converting the raster lines of one building into primitive polylines with Raster Design you find one big mess! This is where some would either give up, or start to manually moving grips points. We can handle this though! Break the issues down to help find the solutions:

- One of the corners do not intersect
- Some lines are not straight,
- Some angles are not square

So now we have an idea of what went wrong! If these 3 problems could be corrected, we would be very happy with our raster to vector building conversion.

How can we fix these issues? Some possible solutions: You could certainly fix the polyline not connecting with a PEDIT and CLOSE, but that would create another line segment. How about an EXTEND and TRIM? What about dragging the grip point to the end of the line segment and then closing the polyline?

As you can see, we have many ways to fix these issues, but which one is best? Which one saves the most time?

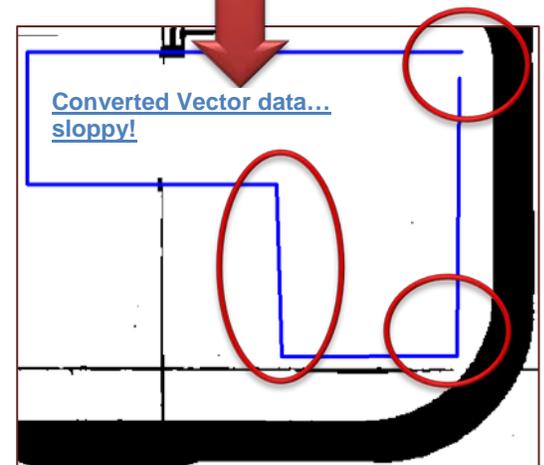
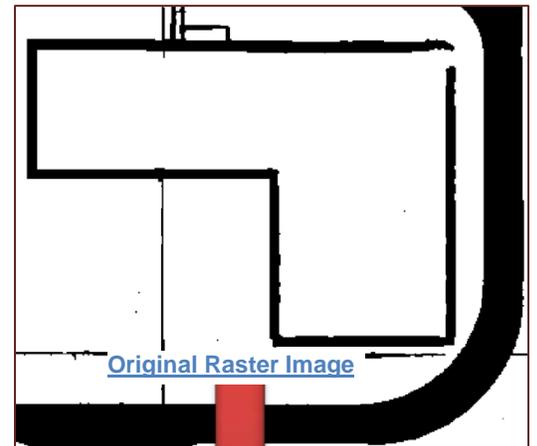
Fortunately there is a super-secret yet easy to use method that will take care of these issues all in one step!

### Time saving TIP!



**AUTO CONSTRAIN!** Remember this button. This is Raster Design's best friend! Most simple shapes can be fixed using the following method to constrain a polyline to specific criteria of properties.

Before you **Auto Constrain** your selection, make sure you setup the constraints to your liking (see next page). In the Constraints Settings dialog box choose the items that are most important for the job that you are working on. These may vary from drawing to drawing depending on what you are trying to accomplish, so keep your *purpose* in mind!

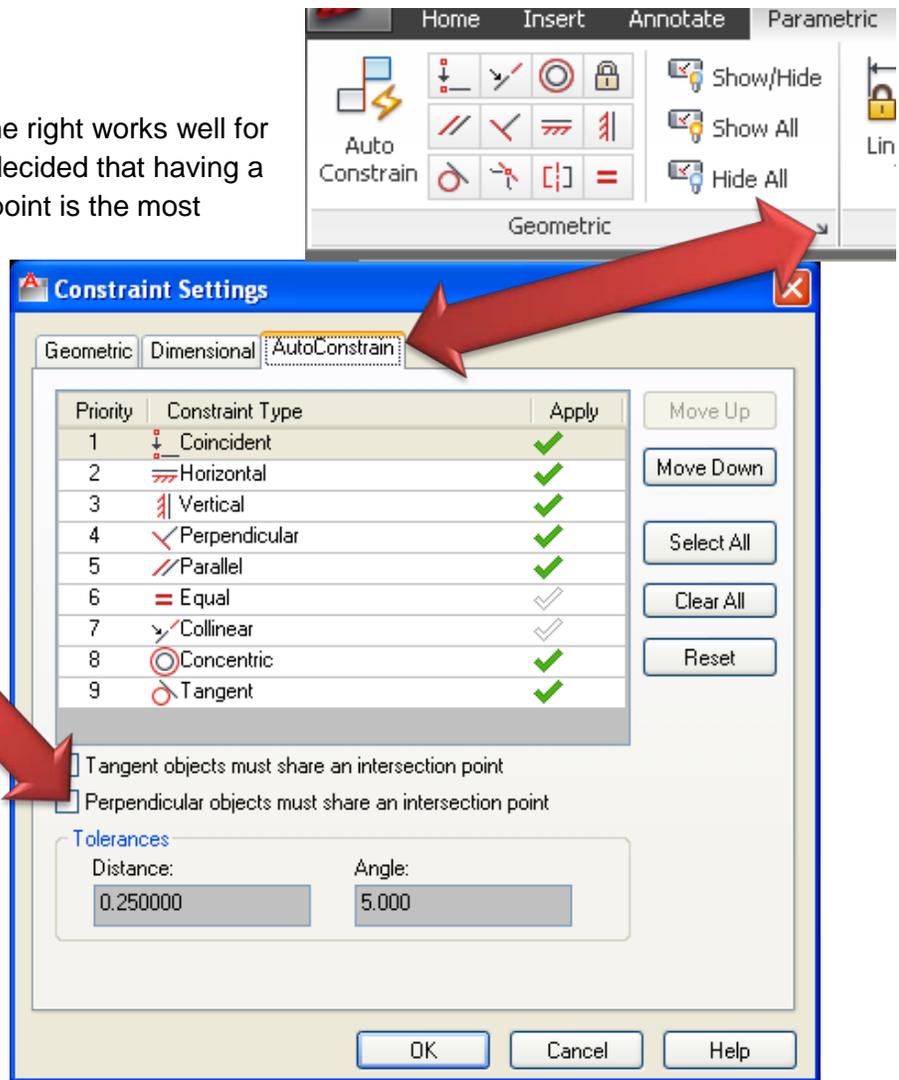


The **Constraints Settings** shown to the right works well for most of my jobs. For instance, I have decided that having a line beginning or ending on the same point is the most important. Next horizontal and perpendicular options, followed by perpendicular corners. These options may differ for you, so watch out!

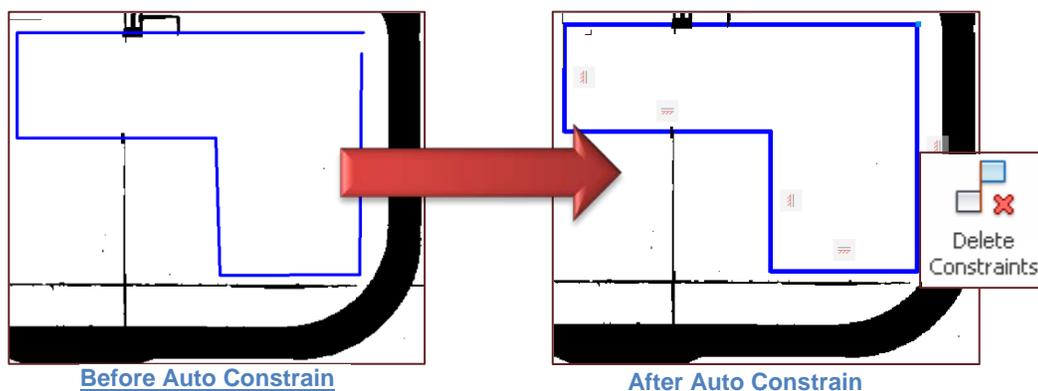
The **Tolerances** box at the bottom is equally important for controlling the final look of the raster to vector conversions. If your raster drawing does not fall into these tolerances, you are not going to see any difference in the final outcome.

Once you have all of these values setup in line with the purpose that you are trying to accomplish, you are ready to see the magic happen!

**NOTE:** If your value for "Distances" is too large in comparison to the typical spaces between your raster lines, IT WILL COMBINE YOUR LINES INTO ONE ENTITY. Be careful.



Now, select your raster to vector conversion and hit the **Auto Constrain** button. BAM! Now *that* is a raster conversion that I can live with! Just delete your constraints using the **Delete Constraints** button and you're finished. Don't worry; your polyline will retain the constrained geometry. You fixed it!



## Putting it All Together

So now we know the process.

Preliminary Steps:

1. Clean Raster image
2. Setup Auto Constraints

Conversion Steps:

1. Choose **Followers** or **Primitives** command
2. Select Raster data
3. **Auto Constrain** selected vector conversion
4. **Delete Auto Constrains**

If we know the steps we can put this into a program and make it even faster!

The basics:

```
(setq lastEnt (entlast))
```

Set starting point for  
"Selection Set"

```
(command "vpline") ;;AUTOCAD RASTER DESIGN REQUIRED
```

Run Primitive command  
to convert to Pline

```
(setq ss (ssadd))  
(while (setq lastEnt (entnext lastEnt))  
  (ssadd lastEnt ss)  
)
```

Add these items to  
"Selection Set"

```
(command "Autoconstrain" ss "") ;;Will get polyline close to clean  
(command "DelConstraint" ss "") ;;Delete constraints (drawing will retain new lines based off constraints)
```

Auto Constrain these  
items and then delete  
constraints

Now add other options and error checking to your liking:

```

;;Convert raster to vector, joins polylines, constrains
;;and then delete constraints.
;;NEED AUTOCAD RASTER DESIGN
;;Reccomeneded to change your CONSTRAINSETTINGS under
;;the AUTOCONSTRAIN tab to your liking for tolerance and constrain types
;;RTKarshick 2013

(defun c:Rast2Vect (/ cmdecho peditaccept ss lastEnt)
  (setq cmdecho (getvar "cmdecho"))
  (setq peditaccept (getvar "peditaccept"))

  (defun *error* (errmsg)
    (if (not (wcmatch errmsg "Function cancelled,quit / exit abort"))
      (princ (strcat "\nError: " errmsg))
    ); end if
    (if ucschanged (command "_ucs" "_prev"))
    (command "_undo" "_end")
    (setvar 'cmdecho cmde)
  )
  ;;;;;;;;;;;;;;
  (command "_undo" "_begin")
  (setq lastEnt (entlast))

  (princ "\nSelect ALL the raster you wish to change into vector: ")
  (command "vpline") ;;AUTOCAD RASTER DESIGN REQUIRED

  (while (= 1 (getvar "cmdactive"))
    (command pause))

  (setq ss (ssadd))
  (while (setq lastEnt (entnext lastEnt))
    (ssadd lastEnt ss)
  )
  ;;;;;;;;;;;;;;

  (setvar "cmdecho" 0)
  (setvar "peditaccept" 1)
  (if ss
    (progn
      (if (= (sslength ss) 1)
        (command "_pedit" ss "_J" "_all" "" "") ;;PEDIT to Ensure polyline
        (command "_pedit" "_M" ss "" "_J" "0.2" "") ;;Change FUZZ amount here
      )
    )
  )

  (command "Autoconstrain" ss "") ;;Will get polyline close to clean
  (command "DelConstraint" ss "") ;;Delete constraints
  (while (= 1 (getvar "cmdactive"))
    (command pause))

  (setvar "cmdecho" cmdecho)
  (setvar "peditaccept" peditaccept)

  (command "-overkill" ss "" "d") ;;Overkill to delete any double lines
  (while (= 1 (getvar "cmdactive"))
    (command pause))
  (command "_pedit" "_M" ss "" "_J" "0.2" "")
  (command "_undo" "_end")
  (princ)
)

```

## Modifying ANY Lisp

Any LISP that you use can be modified to work with raster to vector conversions in a similar manner. Some things to keep in mind when editing LISP programs:

1. There may be custom settings that need to be “disabled”
2. There will most likely be user inputs that should be removed (built into program another way) to streamline the process
3. Setup an “Undo” at the beginning and the end of the LISP
4. You will need to add the selection set coding
5. You will need to incorporate this selection set into LISP code commands
6. If command changes selection set into different line segments/types, you will need to define a new selection set based on these new entities

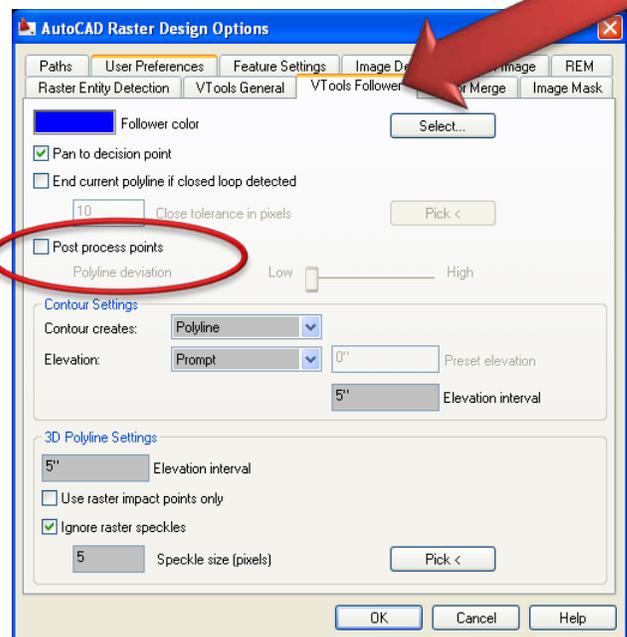
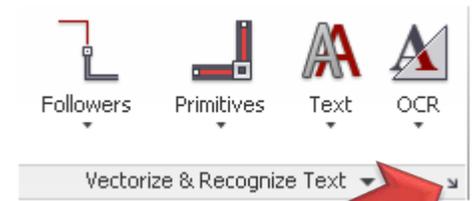
## Special considerations for followers

Using the **Followers** command saves you from clicking on every line, but it also introduces other potential problems. These problems are inherit in the command and have to do with the number of segments generated when converting to vector data.

There are different ways to control this. Number ones, **DO NOT** use the “post process point” option. This option is found under the **Raster Design Options** “VTools Follower” tab. Make sure this does not have a check in the box. This option basically adds more segments to our line depending on the amount of deviation we choose (the lower the deviation, the more segmented our polyline becomes). In most cases (when adding to lisp programs) this tends to over complicate our vector data and makes it harder to control.

So how else can you deal with these potential over bloated polylines? Put them on a DIET, a polyline diet!

There is a LISP program called **Polyline Diet** by Kent Cooper (based on the work of others) that is just begging to be used in conjunction with raster editing! Using the same basic structuring



as the above examples, we can add our raster commands and selection set criteria into Polyline Diet LISP!

### Summary

The intent of this hand out is to challenge you. To challenge you to find a faster, better, more accurate way to manipulate raster drawings. No matter what field of design you're in, working with raster drawings doesn't have to feel like a punishment. You already have all the tools at your disposal; all that is needed is to tie them together!

Please use the above information as a guide on your journey. There are many different ways to attack a drawing, so find the best one that works for *you*, and never stop improving!